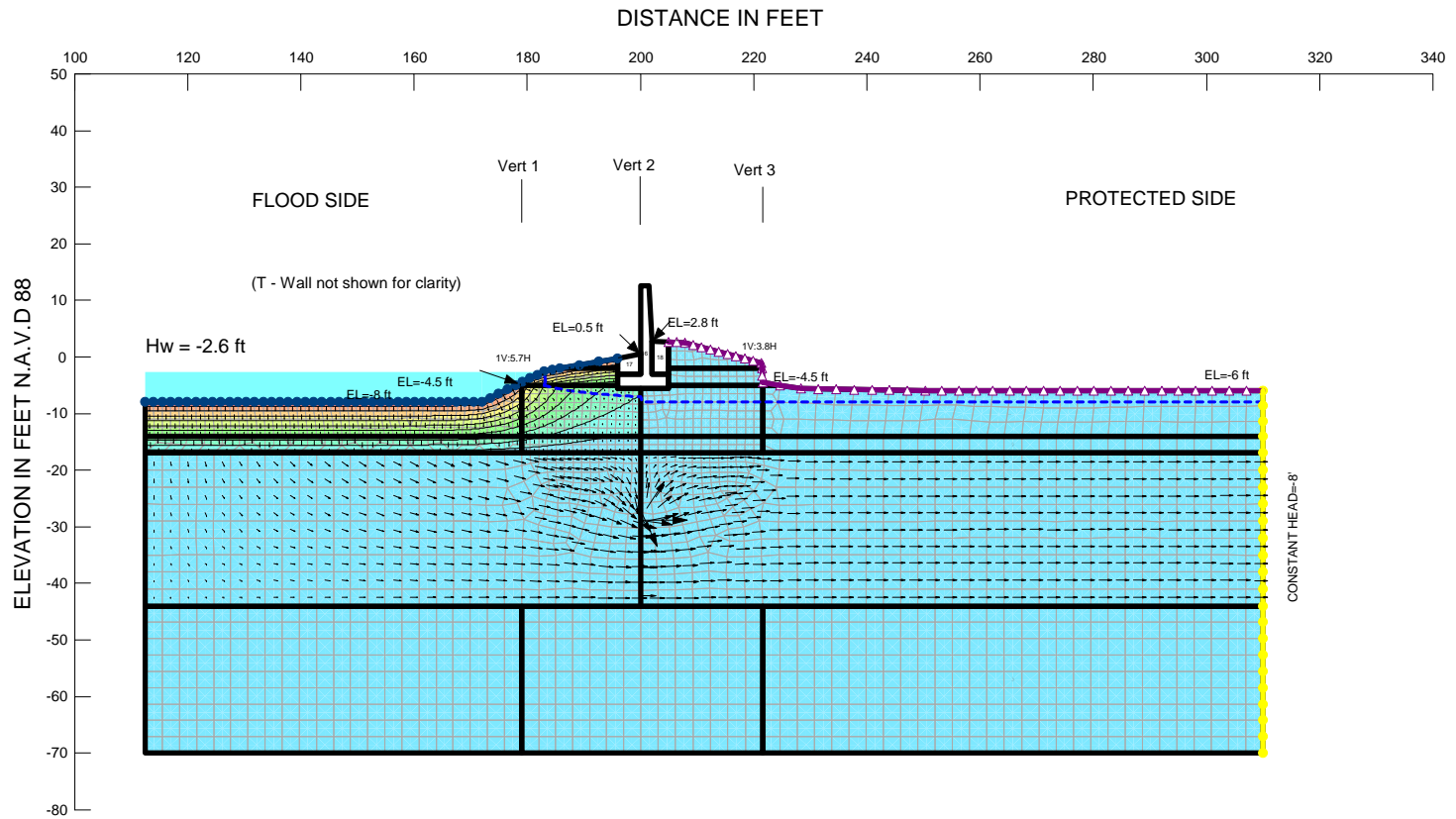


7	36265	187.46015	-7.455719	242.25108	509.14559	0	201
8	36265	188.49125	-7.8310005	264.54318	551.93438	0	202.16
9	36265	189.5223	-8.206282	287.50968	594.72317	0	203.31
10	36265	190.55335	-8.581564	311.4149	637.50285	0	204.46
11	36265	191.58445	-8.9568455	335.67555	680.29164	0	205.61
12	36265	192.58335	-9.320405	359.70468	721.38271	0	206.72
13	36265	193.55	-9.672243	384.05568	760.85953	0	207.8
14	36265	194.51665	-10.024081	408.95106	802.10556	0	208.88
15	36265	195.4875	-10.2	424.36923	752.44103	0	209.96
16	36265	196.4625	-10.2	432.25641	769.97949	0	211.05
17	36265	197.4375	-10.2	441.53846	787.51795	0	212.14
18	36265	198.4125	-10.2	452.5641	805.05641	0	213.23
19	36265	199.45	-10.2	466.6	813.42727	0	214.39
20	36265	200.25	-10.2	357.56	813.18	0	214.85
21	36265	200.75	-10.2	334.16	813.48	0	214.55
22	36265	201.5	-10.2	334.03	1389.7	0	214.11
23	36265	202.5	-10.2	333.81	1392.3	0	213.51
24	36265	203.5	-10.2	333.56	1394.9	0	212.92
25	36265	204.5	-10.2	333.27	1397.5	0	212.32
26	36265	205.45	-9.75	304.74736	1095.7014	0	211.76
27	36265	206.35	-8.85	248.08453	1027.5049	0	211.22
28	36265	207.30805	-7.891954	187.76301	949.49724	0	210.65
29	36265	208.32415	-6.875862	123.77424	861.60403	0	210.05
30	36265	209.34025	-5.85977	59.818883	773.71081	0	209.44
31	36265	210.4069	-4.7931035	-7.4296622	665.62533	0	222.57
32	36265	211.52415	-3.675862	-77.967466	550.48107	0	221.77
33	36265	212.6414	-2.5586205	-148.44768	363.88193	0	220.97



Name: 8-EL. -17 TO -44, BEACH SAND Model: Saturated Only K-Sat: 0.00049 ft/sec K-Ratio: 1
 Name: 9-EL. -44 TO -70, BAY SOUND CLAY Model: Saturated Only K-Sat: 3.28e-008 ft/sec K-Ratio: 1
 Name: Sheet Pile Model: Saturated Only K-Sat: 1e-010 ft/sec K-Ratio: 1
 Name: 6-EL. -14 TO -17, LACUSTRINE Model: Saturated Only K-Sat: 3.28e-007 ft/sec K-Ratio: 1
 Name: 1A-EL. +2.8 TO -5, EMBANKMENT FILL Model: Saturated Only K-Sat: 3.28e-008 ft/sec K-Ratio: 1
 Name: 5-EL. -5 TO -17, MARSH Model: Saturated Only K-Sat: 3.28e-007 ft/sec K-Ratio: 1

GENERAL NOTES

CLASSIFICATION STRATIFICATION
 SHEAR STRENGTHS AND UNIT WEIGHTS OF
 THE SOIL WERE BASED ON THE RESULTS OF
 UNDISTURBED BORINGS AND CPT DATA. SEE
 BOTH BORING AND CPT DATA PLATES.

WHERE INDICATED, SHEAR STRENGTHS BETWEEN
 VERTICALS WERE ASSUMED TO VARY LINEARLY
 BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

Hw IS CANAL WATER LEVEL

LAKE PONTCHARTRAIN, LA. AND VICINITY
 HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 5,
 PROTECTED SIDE STABILITY ANALYSIS,
 CASE: LWL Q Case (seepage)
 STA. 29+16 TO 42+00 WEST
 ORLEANS PARISH, LOUISIANA

LWL Q Case (seepage)

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File Information

Created By: [Moraille, Jacques](#)
Revision Number: [591](#)
Last Edited By: [Jamerson, James MVK](#)
Date: [6/17/2013](#)
Time: [10:41:36 AM](#)
File Name: [Reach 5.gsz](#)
Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix E LWL\](#)
Last Solved Date: [6/17/2013](#)
Last Solved Time: [10:42:00 AM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Mass(M) Units: [lbs](#)
Mass Flux Units: [lbs/sec](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

LWL Q Case (seepage)

Kind: [SEEP/W](#)
Method: [Steady-State](#)
Settings
 Include Air Flow: [No](#)
Control
 Apply Runoff: [No](#)
Convergence
 Convergence Type: [Head Vector Norm](#)
 Maximum Number of Iterations: [500](#)
 Tolerance: [0.001](#)
 Maximum Change in K: [0.1](#)
 Rate of Change in K: [1.02](#)
 Minimum Change in K: [1e-005](#)
 Equation Solver: [Parallel Direct](#)
 Potential Seepage Max # of Reviews: [10](#)
Time

Starting Time: 0 sec

Duration: 0 sec

Ending Time: 0 sec

Materials

8-EL. -17 TO -44, BEACH SAND

Model: Saturated Only

Hydraulic

K-Sat: 0.00049 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

9-EL. -44 TO -70, BAY SOUND CLAY

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-008 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

Sheet Pile

Model: Saturated Only

Hydraulic

K-Sat: 1e-010 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

6-EL. -14 TO -17, LACUSTRINE

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-007 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

1A-EL. +2.8 TO -5, EMBANKMENT FILL

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-008 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

5-EL. -5 TO -17, MARSH

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-007 ft/sec
Volumetric Water Content: 0 ft³/ft³
Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

Boundary Conditions

Drainage Face

Review: true
Type: Total Flux (Q) 0

PS Groudwater Level -8'

Type: Head (H) -8

Extreme Low Water Level -2.6'

Type: Head (H) -2.6

Regions

	Material	Points	Area (ft ²)
Region 1	5-EL. -5 TO -17, MARSH	7,11,48,19,17,1,9,18,41,43,42	378.9
Region 2	9-EL. -44 TO -70, BAY SOUND CLAY	22,12,13,23	1729
Region 3	9-EL. -44 TO -70, BAY SOUND CLAY	10,4,5,14	2298.4
Region 4	5-EL. -5 TO -17, MARSH	20,8,16,48,11,21	411.075
Region 5	9-EL. -44 TO -70, BAY SOUND CLAY	13,12,15,10,14,56	1107.6
Region 6	1A-EL. +2.8 TO -5, EMBANKMENT FILL	39,37,27,28,38	49.5525
Region 7	1A-EL. +2.8 TO -5, EMBANKMENT FILL	41,33,39,38,29,43	49.6125
Region 8	5-EL. -5 TO -17, MARSH	43,40,30,31,2,3,42	717.19
Region 9	6-EL. -14 TO -17, LACUSTRINE	42,3,45,47	265.2
Region 10	6-EL. -14 TO -17, LACUSTRINE	11,7,42,47,46	127.8
Region 11	6-EL. -14 TO -17, LACUSTRINE	21,11,46,44	199.5
Region 12	1A-EL. +2.8 TO -5, EMBANKMENT FILL	16,24,52,51,32,19,48	44.606648
Region 13	8-EL. -17 TO -44, BEACH SAND	22,44,46,47,45,4,10,15,12	5332.5
Region 14	1A-EL. +2.8 TO -5, EMBANKMENT FILL	52,36,51	9.1290118
Region 15	1A-EL. +2.8 TO -5, EMBANKMENT FILL	43,29,40	0.75
Region 16		32,19,17,1,9,18,41,33,35,50,26,25,49,34	51.075
Region 17		36,51,32,34,49	12.58824
Region 18		50,35,33,39,37	17.175

Lines

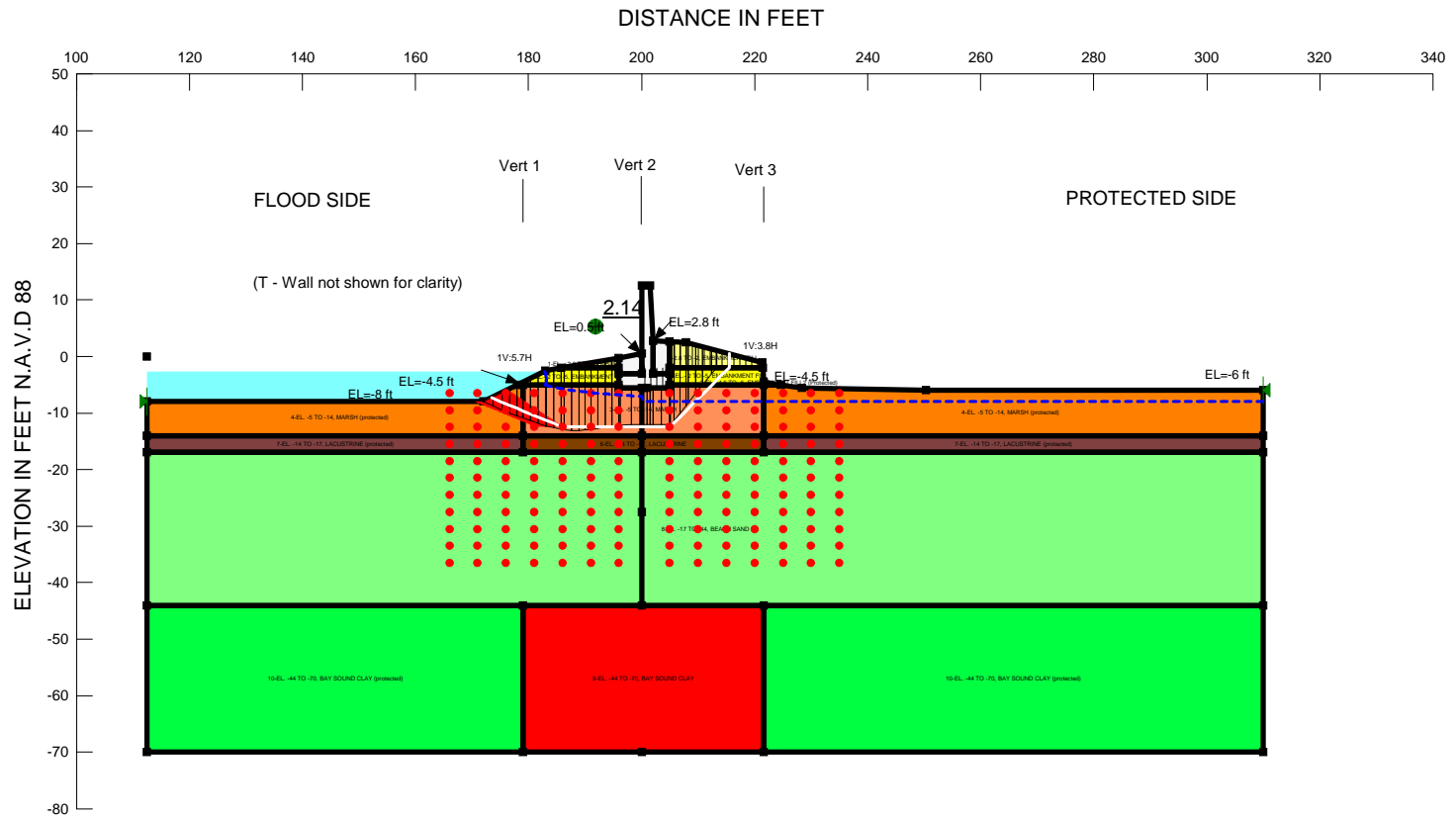
	Start Point	End Point	Left Side Material	Hydraulic Boundary	Right Side Material
Line 1	9	1	Sheet Pile		
Line 2	10	4			
Line 3	7	11			
Line 4	4	5		PS Groudwater Level -8'	
Line 5	5	14			
Line 6	12	13			
Line 7	14	10			
Line 8	10	15			
Line 9	15	12			
Line 10	9	18			Sheet Pile
Line 11	19	17			
Line 12	17	1			
Line 13	1	7	Sheet Pile		
Line 14	20	8		Extreme Low Water Level -2.6'	
Line 15	11	21			
Line 16	22	12			
Line 17	13	23			
Line 18	21	20			
Line 19	23	22			
Line 20	39	37			
Line 21	37	27		Drainage Face	
Line 22	27	28		Drainage Face	
Line 23	28	38		Drainage Face	
Line 24	38	39			
Line 25	38	29		Drainage Face	
Line 26	41	33			
Line 27	33	39			
Line 28	7	42			
Line 29	40	43			
Line 30	43	41			
Line 31	18	41			
Line 32	42	3			
Line 33	46	44			
Line 34	45	47			
Line 35	47	46			
Line 36	16	24		Extreme Low Water Level -2.6'	
Line 37	43	42			
Line 38	40	30		Drainage Face	
Line 39	30	31		Drainage Face	
Line 40	31	2		Drainage Face	
Line 41	2	3		PS Groudwater Level -8'	
Line 42	3	45		PS Groudwater Level -8'	
Line 43	47	42			
Line 44	46	11			
Line 45	44	21			

Line 46	11	48			
Line 47	48	16			
Line 48	16	8		Extreme Low Water Level -2.6'	
Line 49	48	19			
Line 50	32	19			
Line 51	22	44			
Line 52	45	4		PS Groudwater Level -8'	
Line 53	51	32			
Line 54	24	52		Extreme Low Water Level -2.6'	
Line 55	52	51			
Line 56	52	36		Extreme Low Water Level -2.6'	
Line 57	36	51			
Line 58	29	43			
Line 59	29	40		Drainage Face	
Line 60	7	53	Sheet Pile		
Line 61	53	6	Sheet Pile		
Line 62	6	15			
Line 63	13	56			
Line 64	56	14			
Line 65	33	35			
Line 66	35	50			
Line 67	50	26			
Line 68	26	25			
Line 69	25	49			
Line 70	49	34			
Line 71	34	32			
Line 72	49	36			
Line 73	37	50			

Points

	X (ft)	Y (ft)
Point 1	200	-5.5
Point 2	310	-6
Point 3	310	-14
Point 4	310	-44
Point 5	310	-70
Point 6	200	-27.5
Point 7	200	-14
Point 8	172	-8
Point 9	201	-5.5
Point 10	221.6	-44
Point 11	179	-14
Point 12	179	-44
Point 13	179	-70
Point 14	221.6	-70
Point 15	200	-44
Point 16	177.95	-5

Point 17	196	-5.5
Point 18	205	-5.5
Point 19	196	-5
Point 20	112.5	-8
Point 21	112.5	-14
Point 22	112.5	-44
Point 23	112.5	-70
Point 24	183	-2.5
Point 25	200	12.5
Point 26	201.5	12.5
Point 27	207.8	2.5
Point 28	221.4	-1.1
Point 29	221.6	-4.5
Point 30	228.3	-5.6
Point 31	250.3	-6
Point 32	196	-3
Point 33	205	-3
Point 34	200	-3
Point 35	202	-3
Point 36	196	-0.20588
Point 37	205	2.65
Point 38	221.45	-2
Point 39	205	-2
Point 40	224.6	-5
Point 41	205	-5
Point 42	221.6	-14
Point 43	221.6	-5
Point 44	112.5	-17
Point 45	310	-17
Point 46	179	-17
Point 47	221.6	-17
Point 48	179	-5
Point 49	200	0.5
Point 50	202	2.8
Point 51	196	-2
Point 52	185.82341	-2
Point 53	200	-17
Point 54	112.5	-150
Point 55	310	-150
Point 56	200	-70
Point 57	112.5	0



Name: 1-EL. +2.8 TO -2, EMBANKMENT FILL Model: Undrained (Phi=0) Unit Weight: 112 pcf Cohesion: 700 psf
Name: 2-EL. -4.5 TO -5, EMBANKMENT FILL2 (Protected) Model: Undrained (Phi=0) Unit Weight: 80 pcf Cohesion: 200 psf
Name: 8-EL. -17 TO -44, BEACH SAND Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand
Name: 9-EL. -44 TO -70, BAY SOUND CLAY Model: Spatial Mohr-Coulomb Unit Weight: 110 pcf Cohesion Spatial Fn: Clay Phi: 0 °
Name: 3-EL. -5 TO -14, MARSH Model: Spatial Mohr-Coulomb Weight Fn: Marsh Cohesion Fn: Marsh Phi: 0 °
Name: 2A-EL. -2 TO -5, EMBANKMENT FILL Model: Undrained (Phi=0) Unit Weight: 77 pcf Cohesion: 350 psf
Name: 4-EL. -5 TO -14, MARSH (protected) Model: Undrained (Phi=0) Unit Weight: 80 pcf Cohesion: 190 psf
Name: 10-EL. -44 TO -70, BAY SOUND CLAY (protected) Model: Spatial Mohr-Coulomb Unit Weight: 110 pcf Cohesion Fn: Clay Phi: 0 °
Name: 6-EL. -14 TO -17, LACUSTRINE Model: Spatial Mohr-Coulomb Unit Weight: 114 pcf Cohesion Fn: Lacustrine Phi: 0 °
Name: 7-EL. -14 TO -17, LACUSTRINE (protected) Model: Undrained (Phi=0) Unit Weight: 114 pcf Cohesion: 200 psf

GENERAL NOTES

CLASSIFICATION STRATIFICATION
SHEAR STRENGTHS AND UNIT WEIGHTS OF
THE SOIL WERE BASED ON THE RESULTS OF
UNDISTURBED BORINGS AND CPT DATA. SEE
BOTH BORING AND CPT DATA PLATES.

WHERE INDICATED, SHEAR STRENGTHS BETWEEN
VERTICALS WERE ASSUMED TO VARY LINEARLY
BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

Hw IS CANAL WATER LEVEL

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 5,
PROTECTED SIDE STABILITY ANALYSIS,
CASE: LWL Q Case (Block)
STA. 29+16 TO 42+00 WEST
ORLEANS PARISH, LOUISIANA

LWL Q Case (Block)

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File Information

Created By: [Moraille, Jacques](#)
Revision Number: [591](#)
Last Edited By: [Jamerson, James MVK](#)
Date: [6/17/2013](#)
Time: [10:41:36 AM](#)
File Name: [Reach 5.gsz](#)
Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix E LWL\](#)
Last Solved Date: [6/17/2013](#)
Last Solved Time: [10:45:54 AM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Strength Units: [psf](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

LWL Q Case (Block)

Kind: [SLOPE/W](#)
Parent: [LWL Q Case \(seepage\)](#)
Method: [Spencer](#)
Settings
 PWP Conditions Source: [Parent Analysis](#)
Slip Surface
 Direction of movement: [Right to Left](#)
 Use Passive Mode: [No](#)
 Slip Surface Option: [Block](#)
 Critical slip surfaces saved: [10](#)
 Optimize Critical Slip Surface Location: [Yes](#)
 Tension Crack
 Tension Crack Option: [Tension Crack Line](#)
 Percentage Wet: [1](#)
 Tension Crack Fluid Unit Weight: [62.4 pcf](#)
FOS Distribution
 FOS Calculation Option: [Constant](#)

Restrict Block Crossing: [Yes](#)

Advanced

Number of Slices: [30](#)

Optimization Tolerance: [0.01](#)

Minimum Slip Surface Depth: [0.1 ft](#)

Optimization Maximum Iterations: [2000](#)

Optimization Convergence Tolerance: [1e-007](#)

Starting Optimization Points: [8](#)

Ending Optimization Points: [16](#)

Complete Passes per Insertion: [1](#)

Driving Side Maximum Convex Angle: [5 °](#)

Resisting Side Maximum Convex Angle: [1 °](#)

Materials

1-EL. +2.8 TO -2, EMBANKMENT FILL

Model: [Undrained \(Phi=0\)](#)

Unit Weight: [112 pcf](#)

Cohesion: [700 psf](#)

2-EL. -4.5 TO -5, EMBANKMENT FILL2 (Protected)

Model: [Undrained \(Phi=0\)](#)

Unit Weight: [80 pcf](#)

Cohesion: [200 psf](#)

8-EL. -17 TO -44, BEACH SAND

Model: [Shear/Normal Fn.](#)

Unit Weight: [122 pcf](#)

Strength Function: [Sand](#)

Phi-B: [0 °](#)

9-EL. -44 TO -70, BAY SOUND CLAY

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [110 pcf](#)

Cohesion Spatial Fn: [Clay](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

3-EL. -5 TO -14, MARSH

Model: [Spatial Mohr-Coulomb](#)

Weight Fn: [Marsh](#)

Cohesion Fn: [Marsh](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

2A-EL.- 2 TO -5, EMBANKMENT FILL

Model: [Undrained \(Phi=0\)](#)

Unit Weight: 77 pcf

Cohesion: 350 psf

4-EL. -5 TO -14, MARSH (protected)

Model: Undrained (Phi=0)

Unit Weight: 80 pcf

Cohesion: 190 psf

10-EL. -44 TO -70, BAY SOUND CLAY (protected)

Model: Spatial Mohr-Coulomb

Unit Weight: 110 pcf

Cohesion Fn: Clay

Phi: 0 °

Phi-B: 0 °

6-EL. -14 TO -17, LACUSTRINE

Model: Spatial Mohr-Coulomb

Unit Weight: 114 pcf

Cohesion Fn: Lacustrine

Phi: 0 °

Phi-B: 0 °

7-EL. -14 TO -17, LACUSTRINE (protected)

Model: Undrained (Phi=0)

Unit Weight: 114 pcf

Cohesion: 200 psf

Slip Surface Limits

Left Coordinate: (112.5, -8) ft

Right Coordinate: (310, -6) ft

Slip Surface Block

Left Grid

Upper Left: (166, -6.5) ft

Lower Left: (166, -36.5) ft

Lower Right: (196, -36.5) ft

X Increments: 6

Y Increments: 10

Starting Angle: 135 °

Ending Angle: 180 °

Angle Increments: 4

Right Grid

Upper Left: (205, -6.5) ft

Lower Left: (205, -36.5) ft

Lower Right: (235, -36.5) ft

X Increments: 6

Y Increments: 10
Starting Angle: 25 °
Ending Angle: 45 °
Angle Increments: 4

Tension Crack Line

	X (ft)	Y (ft)
	200	-2
	221	-2

Cohesion Functions

Clay

Model: Spline Data Point Function

Function: Cohesion vs. Y

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 570

Data Points: Y (ft), Cohesion (psf)

Data Point: (-70, 850)

Data Point: (-44, 570)

Marsh

Model: Spline Data Point Function

Function: Cohesion vs. X

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 150

Data Points: X (ft), Cohesion (psf)

Data Point: (186.9, 150)

Data Point: (208, 200)

Data Point: (250.4, 150)

Lacustrine

Model: Spline Data Point Function

Function: Cohesion vs. X

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 200

Data Points: X (ft), Cohesion (psf)

Data Point: (179, 200)

Data Point: (200, 220)

Data Point: (221.6, 200)

Shear/Normal Strength Functions

Sand

Model: [Spline Data Point Function](#)

Function: [Shear Stress vs. Normal Stress](#)

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 0

Data Points: [Normal Stress \(psf\)](#), [Shear Stress \(psf\)](#)

Data Point: (-10000, 0)

Data Point: (0, 0)

Data Point: (10000, 6494)

Estimation Properties

Intact Rock Param.: 10

Geological Strength: 100

Disturbance Factor: 0

SigmaC: 600000 psf

Sigma3: 300000 psf

Num. Points: 20

Unit Weight Functions

Marsh

Model: [Spline Data Point Function](#)

Function: [Unit Weight vs. X](#)

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 80

Data Points: [X \(ft\)](#), [Unit Weight \(pcf\)](#)

Data Point: (179, 80)

Data Point: (200, 77)

Data Point: (221.6, 80)

Spatial Functions

Clay

Model: [Linear Interpolation](#)

Limit Range By: [Data Values](#)

Data Points: [X \(ft\)](#), [Y \(ft\)](#), [Cohesion \(psf\)](#)

Data Point: (112.5, -44, 570)

Data Point: (112.5, -70, 850)

Data Point: (179, -44, 570)

Data Point: (179, -70, 850)

Data Point: (200, -44, 615)

Data Point: (200, -70, 900)

Data Point: (221.6, -44, 570)

Data Point: (221.6, -70, 850)

Data Point: (310, -44, 570)

Data Point: (310, -70, 850)

Regions

	Material	Points	Area (ft ²)
Region 1	3-EL. -5 TO -14, MARSH	7,11,48,19,17,1,9,18,41,43,42	378.9
Region 2	10-EL. -44 TO -70, BAY SOUND CLAY (protected)	22,12,13,23	1729
Region 3	10-EL. -44 TO -70, BAY SOUND CLAY (protected)	10,4,5,14	2298.4
Region 4	4-EL. -5 TO -14, MARSH (protected)	20,8,16,48,11,21	411.075
Region 5	9-EL. -44 TO -70, BAY SOUND CLAY	13,12,15,10,14,56	1107.6
Region 6	1-EL. +2.8 TO -2, EMBANKMENT FILL	39,37,27,28,38	49.5525
Region 7	2A-EL.- 2 TO -5, EMBANKMENT FILL	41,33,39,38,29,43	49.6125
Region 8	4-EL. -5 TO -14, MARSH (protected)	43,40,30,31,2,3,42	717.19
Region 9	7-EL. -14 TO -17, LACUSTRINE (protected)	42,3,45,47	265.2
Region 10	6-EL. -14 TO -17, LACUSTRINE	11,7,42,47,46	127.8
Region 11	7-EL. -14 TO -17, LACUSTRINE (protected)	21,11,46,44	199.5
Region 12	2A-EL.- 2 TO -5, EMBANKMENT FILL	16,24,52,51,32,19,48	44.606648
Region 13	8-EL. -17 TO -44, BEACH SAND	22,44,46,47,45,4,10,15,12	5332.5
Region 14	1-EL. +2.8 TO -2, EMBANKMENT FILL	52,36,51	9.1290118
Region 15	2-EL. -4.5 TO -5, EMBANKMENT FILL2 (Protected)	43,29,40	0.75
Region 16		32,19,17,1,9,18,41,33,35,50,26,25,49,34	51.075
Region 17		36,51,32,34,49	12.58824
Region 18		50,35,33,39,37	17.175

Points

	X (ft)	Y (ft)
Point 1	200	-5.5
Point 2	310	-6
Point 3	310	-14
Point 4	310	-44
Point 5	310	-70
Point 6	200	-27.5
Point 7	200	-14
Point 8	172	-8
Point 9	201	-5.5
Point 10	221.6	-44
Point 11	179	-14
Point 12	179	-44
Point 13	179	-70
Point 14	221.6	-70
Point 15	200	-44
Point 16	177.95	-5
Point 17	196	-5.5
Point 18	205	-5.5
Point 19	196	-5
Point 20	112.5	-8

Point 21	112.5	-14
Point 22	112.5	-44
Point 23	112.5	-70
Point 24	183	-2.5
Point 25	200	12.5
Point 26	201.5	12.5
Point 27	207.8	2.5
Point 28	221.4	-1.1
Point 29	221.6	-4.5
Point 30	228.3	-5.6
Point 31	250.3	-6
Point 32	196	-3
Point 33	205	-3
Point 34	200	-3
Point 35	202	-3
Point 36	196	-0.20588
Point 37	205	2.65
Point 38	221.45	-2
Point 39	205	-2
Point 40	224.6	-5
Point 41	205	-5
Point 42	221.6	-14
Point 43	221.6	-5
Point 44	112.5	-17
Point 45	310	-17
Point 46	179	-17
Point 47	221.6	-17
Point 48	179	-5
Point 49	200	0.5
Point 50	202	2.8
Point 51	196	-2
Point 52	185.82341	-2
Point 53	200	-17
Point 54	112.5	-150
Point 55	310	-150
Point 56	200	-70
Point 57	112.5	0

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	2.14	(193.959, -0.678)	18.25874	(213.261, 1.05454)	(172.006, -7.99718)
2	3225	2.22	(193.959, -0.678)	18.386	(215.5, 0.461765)	(173.414, -7.28687)
3	3015	2.25	(193.887, -0.663)	18.546	(215.5, 0.461765)	(173.291, -7.34905)
4	3050	2.25	(192.223, -0.5)	19.744	(215.5, 0.461765)	(170.136, -8)
5	3190	2.26	(195.529, -1.022)	17.203	(215.5, 0.461765)	(176.141, -5.91224)
6	3400	2.28	(195.26, -0.963)	17.418	(215.5, 0.461765)	(175.669, -6.14987)
7	2840	2.31	(191.799, -0.5)	19.936	(215.5, 0.461765)	(169.265, -8)

8	3610	2.32	(193.359, -0.549)	18.872	(215.5, 0.461765)	(172.39, -7.80359)
9	2000	2.34	(194.313, -1.09)	14.999	(212.5, 1.25588)	(176.681, -5.63989)
10	2805	2.34	(192.886, -0.5)	19.147	(215.5, 0.461765)	(171.5, -8)
11	3224	2.34	(194.989, -0.678)	18.997	(217.513, -0.0711975)	(173.414, -7.28687)

Slices of Slip Surface: **Optimized**

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	172.8415	-8.387994	329.85129	450.56322	0	190
2	Optimized	174.51325	-9.169618	328.37199	528.66807	0	190
3	Optimized	175.99935	-9.79942	328.45277	579.08504	0	190
4	Optimized	177.2998	-10.2774	329.4488	628.69182	0	190
5	Optimized	178.45415	-10.70169	332.04558	671.78045	0	190
6	Optimized	179.6458	-11.12269	336.25684	701.69597	0	150
7	Optimized	181	-11.586935	343.0774	746.92783	0	150
8	Optimized	182.33335	-12.044025	352.56299	791.26957	0	150
9	Optimized	183.05595	-12.291745	358.8751	822.32381	0	150
10	Optimized	183.78975	-12.45159	361.7224	826.6331	0	150
11	Optimized	185.1455	-12.73293	367.57946	866.5709	0	150
12	Optimized	186.02805	-12.91607	372.36562	893.73968	0	150
13	Optimized	186.9076	-13.00038	372.83243	897.01318	0	150.02
14	Optimized	188.2574	-13.084065	372.04862	929.03088	0	153.22
15	Optimized	189.452	-13.078995	367.90746	929.46556	0	156.05
16	Optimized	190.4914	-12.985165	360.05029	941.34714	0	158.51
17	Optimized	191.6349	-12.829625	348.77128	938.35876	0	161.22
18	Optimized	192.8825	-12.61238	334.05193	944.43918	0	164.18
19	Optimized	194.1301	-12.395135	319.41944	950.5196	0	167.13
20	Optimized	195.37695	-12.221615	307.46759	970.56382	0	170.09
21	Optimized	196.10655	-12.145625	302.07321	509.02509	0	171.82
22	Optimized	197.18825	-12.118055	299.01647	516.16793	0	174.38
23	Optimized	199.0817	-12.10188	296.62701	515.36765	0	178.87
24	Optimized	200.5	-12.10234	262.63	515.11	0	182.23
25	Optimized	201.25	-12.10258	262.62	515.88	0	184
26	Optimized	201.75	-12.102745	262.62	516.4	0	185.19
27	Optimized	202.75	-12.10307	262.59333	517.41333	0	187.56
28	Optimized	204.25	-12.103555	262.57333	518.94667	0	191.11
29	Optimized	205.0602	-12.10382	262.55916	1310.0556	0	193.03
30	Optimized	205.4276	-11.73876	239.7634	1077.6201	0	193.9
31	Optimized	206.2511	-10.71936	176.11531	988.01662	0	195.86
32	Optimized	207.2837	-9.4107245	94.404479	888.43511	0	198.3
33	Optimized	207.9975	-8.5061095	37.918848	815.1925	0	199.99
34	Optimized	208.87635	-7.364455	-33.364767	705.15809	0	198.97
35	Optimized	210.1532	-5.73655	-135.00801	564.10386	0	197.46
36	Optimized	211.539	-4.022535	-242.03422	328.44433	0	350
37	Optimized	212.79495	-2.522535	-335.68788	186.01385	0	350

Slices of Slip Surface: **3225**

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
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1	3225	174.17035	-7.599985	288.60837	381.24855	0	190
2	3225	175.6822	-8.2262235	283.29806	444.89895	0	190
3	3225	177.19405	-8.852462	281.29982	508.54936	0	190
4	3225	178.475	-9.383043	281.8536	561.53389	0	190
5	3225	179.66665	-9.8766475	285.62421	600.54463	0	150
6	3225	181	-10.42893	293.36401	653.36511	0	150
7	3225	182.33335	-10.981215	304.94945	705.93616	0	150
8	3225	183.70585	-11.549735	319.98969	771.71866	0	150
9	3225	185.11755	-12.13448	338.80491	837.49013	0	150
10	3225	185.9117	-12.463425	350.82212	874.91028	0	150
11	3225	186.7143	-12.5	348.7821	844.13025	0	150
12	3225	188.14285	-12.5	342.7131	870.94026	0	152.95
13	3225	189.5714	-12.5	337.4491	897.68027	0	156.33
14	3225	191	-12.5	332.9271	924.42028	0	159.72
15	3225	192.4286	-12.5	329.0561	951.23029	0	163.1
16	3225	193.85715	-12.5	325.7871	977.97029	0	166.49
17	3225	195.2857	-12.5	323.0991	1004.7103	0	169.87
18	3225	196.66665	-12.5	321.10508	546.75764	0	173.14
19	3225	198	-12.5	319.77758	545.50514	0	176.3
20	3225	199.33335	-12.5	319.02758	544.25264	0	179.46
21	3225	200.5	-12.5	287.44	544.15	0	182.23
22	3225	201.25	-12.5	287.42	544.92	0	184
23	3225	201.75	-12.5	287.4	545.44	0	185.19
24	3225	202.75	-12.5	287.36	546.47333	0	187.56
25	3225	204.25	-12.5	287.30667	548.02	0	191.11
26	3225	205.7	-11.8	243.57303	1129.6536	0	194.55
27	3225	207.1	-10.4	156.14433	1018.2843	0	197.87
28	3225	208.58335	-8.9166665	63.513241	883.05611	0	199.31
29	3225	210.15	-7.35	-34.323418	724.40841	0	197.46
30	3225	211.71665	-5.7833335	-132.15827	565.0837	0	195.62
31	3225	213.25	-4.25	-227.90998	346.9255	0	350
32	3225	214.75	-2.75	-321.56865	188.77397	0	350

Slices of Slip Surface: 3015

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	3015	174.06755	-7.8678825	297.91916	431.03084	0	190
2	3015	175.6205	-8.9055515	305.2274	530.27297	0	190
3	3015	177.1735	-9.943223	319.20139	629.52582	0	190
4	3015	178.475	-10.81285	336.03257	711.7223	0	190
5	3015	180	-11.83182	361.72247	792.18252	0	150
6	3015	182	-12.5	375.095	780.45	0	150
7	3015	183.70585	-12.5	364.46708	801.01721	0	150
8	3015	185.11755	-12.5	356.56175	818.72629	0	150
9	3015	186.5503	-12.5	349.48435	841.17543	0	150
10	3015	188.0041	-12.5	343.23865	868.41441	0	152.62
11	3015	189.4579	-12.5	337.85276	895.65339	0	156.06
12	3015	190.9117	-12.5	333.20287	922.89237	0	159.51

13	3015	192.3655	-12.5	329.22708	950.13135	0	162.95
14	3015	193.8193	-12.5	325.87036	977.37032	0	166.4
15	3015	195.2731	-12.5	323.12582	1004.6093	0	169.84
16	3015	196.66665	-12.5	321.10508	546.84764	0	173.14
17	3015	198	-12.5	319.77758	545.59514	0	176.3
18	3015	199.33335	-12.5	319.02758	544.34264	0	179.46
19	3015	200.5	-12.5	287.44	544.24	0	182.23
20	3015	201.25	-12.5	287.42	545.02	0	184
21	3015	201.75	-12.5	287.4	545.52	0	185.19
22	3015	202.75	-12.5	287.36	546.56667	0	187.56
23	3015	204.25	-12.5	287.30667	548.11333	0	191.11
24	3015	205.7	-11.8	243.57303	1128.896	0	194.55
25	3015	207.1	-10.4	156.14433	1017.7792	0	197.87
26	3015	208.58335	-8.9166665	63.513241	882.83044	0	199.31
27	3015	210.15	-7.35	-34.323418	724.45355	0	197.46
28	3015	211.71665	-5.7833335	-132.15827	565.44477	0	195.62
29	3015	213.25	-4.25	-227.90998	348.82526	0	350
30	3015	214.75	-2.75	-321.56865	190.73973	0	350

Slices of Slip Surface: 3050

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	3050	171.068	-8.386039	344.68265	417.86099	0	190
2	3050	172.74375	-9.0801495	346.35398	491.04442	0	190
3	3050	174.23125	-9.6962905	346.62726	553.6695	0	190
4	3050	175.71875	-10.312435	348.3477	616.30078	0	190
5	3050	177.20625	-10.92858	353.41584	678.91964	0	190
6	3050	178.475	-11.45411	360.36575	731.39571	0	190
7	3050	180	-12.085785	372.07869	783.44999	0	150
8	3050	182	-12.5	375.095	780.45	0	150
9	3050	183.70585	-12.5	364.46708	801.01721	0	150
10	3050	185.11755	-12.5	356.56175	818.72629	0	150
11	3050	186.5503	-12.5	349.48435	841.17543	0	150
12	3050	188.0041	-12.5	343.23865	868.34562	0	152.62
13	3050	189.4579	-12.5	337.85276	895.5846	0	156.06
14	3050	190.9117	-12.5	333.20287	922.82358	0	159.51
15	3050	192.3655	-12.5	329.22708	950.06256	0	162.95
16	3050	193.8193	-12.5	325.87036	977.30154	0	166.4
17	3050	195.2731	-12.5	323.12582	1004.5405	0	169.84
18	3050	196.66665	-12.5	321.10508	546.83264	0	173.14
19	3050	198	-12.5	319.77758	545.58764	0	176.3
20	3050	199.33335	-12.5	319.02758	544.33514	0	179.46
21	3050	200.5	-12.5	287.44	544.22	0	182.23
22	3050	201.25	-12.5	287.42	545	0	184
23	3050	201.75	-12.5	287.4	545.52	0	185.19
24	3050	202.75	-12.5	287.36	546.55333	0	187.56
25	3050	204.25	-12.5	287.30667	548.1	0	191.11
26	3050	205.7	-11.8	243.57303	1129.098	0	194.55

27	3050	207.1	-10.4	156.14433	1017.9812	0	197.87
28	3050	208.58335	-8.9166665	63.513241	882.96584	0	199.31
29	3050	210.15	-7.35	-34.323418	724.58895	0	197.46
30	3050	211.71665	-5.7833335	-132.15827	565.58017	0	195.62
31	3050	213.25	-4.25	-227.90998	349.00911	0	350
32	3050	214.75	-2.75	-321.56865	190.91886	0	350

Slices of Slip Surface: 3190

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	3190	177.04535	-6.5167015	206.85662	340.2114	0	190
2	3190	178.475	-7.471956	209.84714	430.36876	0	190
3	3190	179.66665	-8.268202	219.73876	490.79999	0	150
4	3190	181	-9.1591065	237.97289	572.63533	0	150
5	3190	182.33335	-10.05001	262.34327	654.09651	0	150
6	3190	183.70585	-10.9671	292.68313	749.53927	0	150
7	3190	185.11755	-11.910375	327.91607	845.60233	0	150
8	3190	185.9117	-12.441005	349.71726	900.02495	0	150
9	3190	186.625	-12.5	349.168	842.16	0	150
10	3190	187.875	-12.5	343.792	865.52	0	152.31
11	3190	189.125	-12.5	339.08	888.96	0	155.27
12	3190	190.375	-12.5	334.904	912.4	0	158.23
13	3190	191.625	-12.5	331.224	935.76	0	161.2
14	3190	192.875	-12.5	327.992	959.2	0	164.16
15	3190	194.125	-12.5	325.208	982.64	0	167.12
16	3190	195.375	-12.5	322.944	1006	0	170.08
17	3190	196.66665	-12.5	321.10508	546.36014	0	173.14
18	3190	198	-12.5	319.77758	545.10014	0	176.3
19	3190	199.33335	-12.5	319.02758	543.84014	0	179.46
20	3190	200.5	-12.5	287.44	543.73	0	182.23
21	3190	201.25	-12.5	287.42	544.5	0	184
22	3190	201.75	-12.5	287.4	545	0	185.19
23	3190	202.75	-12.5	287.36	546.04	0	187.56
24	3190	204.25	-12.5	287.30667	547.58	0	191.11
25	3190	205.7	-11.8	243.57303	1135.5125	0	194.55
26	3190	207.1	-10.4	156.14433	1023.7391	0	197.87
27	3190	208.3875	-9.1125	75.741665	907.86489	0	199.54
28	3190	209.5625	-7.9375	2.3649862	788.46917	0	198.16
29	3190	210.7375	-6.7625	-71.011572	668.77254	0	196.77
30	3190	211.9125	-5.5875	-144.38819	548.69679	0	195.39
31	3190	213.25	-4.25	-227.90998	350.76273	0	350
32	3190	214.75	-2.75	-321.56865	192.48393	0	350

Slices of Slip Surface: 3400

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	3400	176.23955	-6.38603	219.18805	296.46656	0	190
2	3400	177.37985	-6.858352	210.68077	344.47193	0	190
3	3400	178.475	-7.311975	203.88698	389.63073	0	190

4	3400	179.66665	-7.8055795	200.528	429.1604	0	150
5	3400	181	-8.3578645	202.3157	482.37585	0	150
6	3400	182.33335	-8.9101495	209.25173	535.37649	0	150
7	3400	183.70585	-9.4786655	221.38483	601.47852	0	150
8	3400	185.11755	-10.063415	237.24851	667.5314	0	150
9	3400	186.4705	-10.623815	255.74414	734.73613	0	150
10	3400	187.76465	-11.159865	275.76877	803.34101	0	152.05
11	3400	189.0588	-11.69592	297.41393	872.01728	0	155.12
12	3400	190.35295	-12.231975	320.76529	940.55077	0	158.18
13	3400	191.625	-12.5	331.224	935.76	0	161.2
14	3400	192.875	-12.5	327.992	959.2	0	164.16
15	3400	194.125	-12.5	325.208	982.64	0	167.12
16	3400	195.375	-12.5	322.944	1006	0	170.08
17	3400	196.66665	-12.5	321.10508	546.38264	0	173.14
18	3400	198	-12.5	319.77758	545.12264	0	176.3
19	3400	199.33335	-12.5	319.02758	543.86264	0	179.46
20	3400	200.5	-12.5	287.44	543.75	0	182.23
21	3400	201.25	-12.5	287.42	544.52	0	184
22	3400	201.75	-12.5	287.4	545.04	0	185.19
23	3400	202.75	-12.5	287.36	546.06	0	187.56
24	3400	204.25	-12.5	287.30667	547.6	0	191.11
25	3400	205.7	-11.8	243.57303	1135.1084	0	194.55
26	3400	207.1	-10.4	156.14433	1023.436	0	197.87
27	3400	208.3875	-9.1125	75.741665	907.62418	0	199.54
28	3400	209.5625	-7.9375	2.3649862	788.40899	0	198.16
29	3400	210.7375	-6.7625	-71.011572	668.77254	0	196.77
30	3400	211.9125	-5.5875	-144.38819	548.79909	0	195.39
31	3400	213.25	-4.25	-227.90998	351.52641	0	350
32	3400	214.75	-2.75	-321.56865	193.27588	0	350

Slices of Slip Surface: 2840

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	2840	169.94895	-8.4568215	347.45241	451.47104	0	190
2	2840	171.3163	-9.370464	363.46931	527.62733	0	190
3	2840	172.66665	-10.272738	376.78678	619.00017	0	190
4	2840	174	-11.163645	390.31895	704.23414	0	190
5	2840	175.33335	-12.05455	407.63015	789.54294	0	190
6	2840	176.975	-12.5	410.83077	751.53846	0	190
7	2840	178.475	-12.5	400.05714	762.47619	0	190
8	2840	179.66665	-12.5	391.3726	768.22519	0	150
9	2840	181	-12.5	381.9526	775.20019	0	150
10	2840	182.33335	-12.5	372.99009	782.1752	0	150
11	2840	183.70585	-12.5	364.46708	801.01721	0	150
12	2840	185.11755	-12.5	356.56175	818.72629	0	150
13	2840	186.5503	-12.5	349.48435	841.17543	0	150
14	2840	188.0041	-12.5	343.23865	868.34562	0	152.62
15	2840	189.4579	-12.5	337.85276	895.5846	0	156.06

16	2840	190.9117	-12.5	333.20287	922.82358	0	159.51
17	2840	192.3655	-12.5	329.22708	950.06256	0	162.95
18	2840	193.8193	-12.5	325.87036	977.30154	0	166.4
19	2840	195.2731	-12.5	323.12582	1004.5405	0	169.84
20	2840	196.66665	-12.5	321.10508	546.83264	0	173.14
21	2840	198	-12.5	319.77758	545.58014	0	176.3
22	2840	199.33335	-12.5	319.02758	544.33514	0	179.46
23	2840	200.5	-12.5	287.44	544.22	0	182.23
24	2840	201.25	-12.5	287.42	545	0	184
25	2840	201.75	-12.5	287.4	545.52	0	185.19
26	2840	202.75	-12.5	287.36	546.54667	0	187.56
27	2840	204.25	-12.5	287.30667	548.1	0	191.11
28	2840	205.7	-11.8	243.57303	1129.5526	0	194.55
29	2840	207.1	-10.4	156.14433	1018.6378	0	197.87
30	2840	208.58335	-8.9166665	63.513241	883.86853	0	199.31
31	2840	210.15	-7.35	-34.323418	725.67218	0	197.46
32	2840	211.71665	-5.7833335	-132.15827	566.88907	0	195.62
33	2840	213.25	-4.25	-227.90998	352.30894	0	350
34	2840	214.75	-2.75	-321.56865	194.26583	0	350

Slices of Slip Surface: 3610

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	3610	173.0846	-7.9418445	315.34268	375.73015	0	190
2	3610	174.47475	-8.218355	301.21064	409.31402	0	190
3	3610	175.86485	-8.4948655	289.12468	442.89789	0	190
4	3610	177.25495	-8.7713765	277.61727	476.48176	0	190
5	3610	178.475	-9.014061	267.9131	505.02022	0	190
6	3610	179.66665	-9.251098	260.14101	527.01266	0	150
7	3610	181	-9.5163145	253.86644	556.14934	0	150
8	3610	182.33335	-9.781531	250.06344	585.19039	0	150
9	3610	183.70585	-10.05454	248.99921	626.65959	0	150
10	3610	185.11755	-10.335345	250.72914	667.5666	0	150
11	3610	186.5503	-10.62034	255.01929	713.49543	0	150
12	3610	188.0041	-10.90952	261.52279	764.63286	0	152.62
13	3610	189.4579	-11.1987	269.65216	815.7703	0	156.06
14	3610	190.9117	-11.487875	279.20501	866.77281	0	159.51
15	3610	192.3655	-11.77705	290.05991	917.70786	0	162.95
16	3610	193.8193	-12.06623	302.05494	968.44051	0	166.4
17	3610	195.2731	-12.35541	315.09566	1019.1057	0	169.84
18	3610	196.66665	-12.5	321.10508	546.55514	0	173.14
19	3610	198	-12.5	319.77758	545.29514	0	176.3
20	3610	199.33335	-12.5	319.02758	544.04264	0	179.46
21	3610	200.5	-12.5	287.44	543.93	0	182.23
22	3610	201.25	-12.5	287.42	544.7	0	184
23	3610	201.75	-12.5	287.4	545.22	0	185.19
24	3610	202.75	-12.5	287.36	546.24667	0	187.56
25	3610	204.25	-12.5	287.30667	547.79333	0	191.11

26	3610	205.7	-11.8	243.57303	1133.3406	0	194.55
27	3610	207.1	-10.4	156.14433	1022.0218	0	197.87
28	3610	208.58335	-8.9166665	63.513241	886.80227	0	199.31
29	3610	210.15	-7.35	-34.323418	728.15457	0	197.46
30	3610	211.71665	-5.7833335	-132.15827	568.82986	0	195.62
31	3610	213.25	-4.25	-227.90998	353.55345	0	350
32	3610	214.75	-2.75	-321.56865	195.40663	0	350

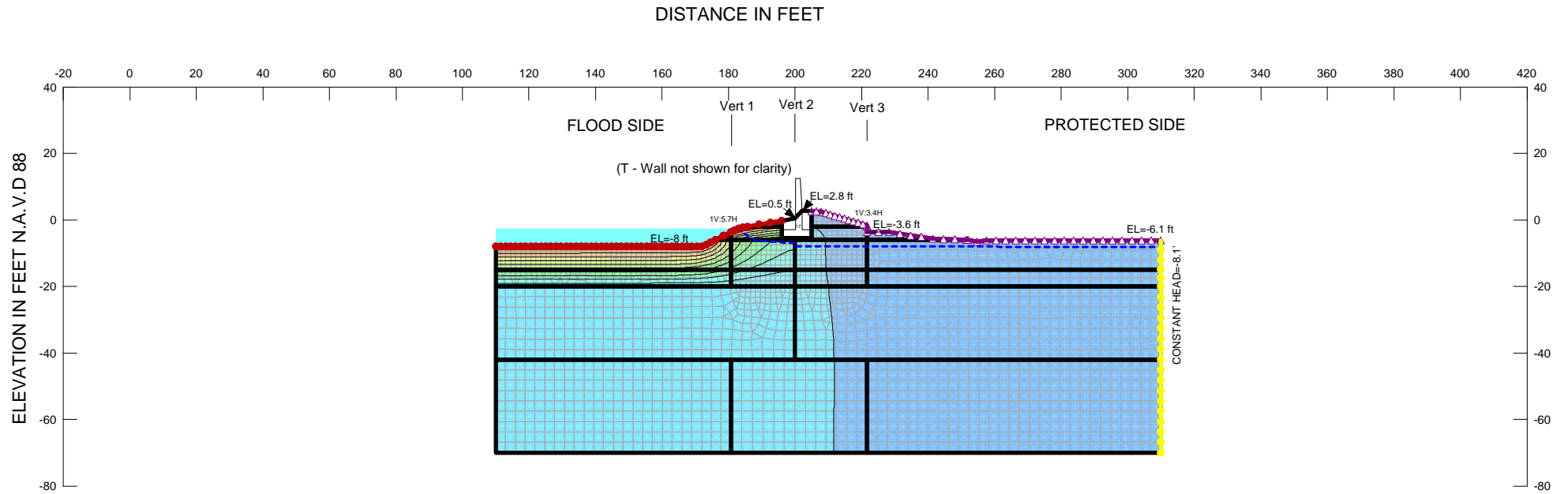
Slices of Slip Surface: 2000

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	2000	177.31545	-5.902737	183.82631	272.73296	0	190
2	2000	178.475	-6.383043	169.66825	320.61254	0	190
3	2000	179.66665	-6.8766475	161.43405	359.89717	0	150
4	2000	181	-7.4289325	159.50776	413.34128	0	150
5	2000	182.33335	-7.981217	165.21733	466.57058	0	150
6	2000	183.70585	-8.549733	175.48223	533.43612	0	150
7	2000	185.11755	-9.1344805	190.63912	600.49031	0	150
8	2000	185.9117	-9.463427	201.08863	638.64317	0	150
9	2000	186.625	-9.5	197.328	607.136	0	150
10	2000	187.875	-9.5	188.928	631.088	0	152.31
11	2000	189.125	-9.5	181.496	655.072	0	155.27
12	2000	190.375	-9.5	174.928	679.056	0	158.23
13	2000	191.625	-9.5	169.08	703.032	0	161.2
14	2000	192.875	-9.5	163.872	727.016	0	164.16
15	2000	194.125	-9.5	159.312	751	0	167.12
16	2000	195.375	-9.5	155.368	774.976	0	170.08
17	2000	196.66665	-9.5	152.00254	315.91508	0	173.14
18	2000	198	-9.5	149.47504	315.26258	0	176.3
19	2000	199.33335	-9.5	148.02004	314.61008	0	179.46
20	2000	200.5	-9.5	100.28	314.6	0	182.23
21	2000	201.25	-9.5	100.246	315.08	0	184
22	2000	201.75	-9.5	100.222	315.4	0	185.19
23	2000	202.5	-9.5	100.19	315.88	0	186.97
24	2000	203.5	-9.5	100.14	316.52	0	189.34
25	2000	204.5	-9.5	100.1	317.15	0	191.71
26	2000	205.7	-8.8	56.361461	894.23753	0	194.55
27	2000	207.1	-7.4	-31.069262	784.98954	0	197.87
28	2000	208.65	-5.85	-127.86155	645.6301	0	199.23
29	2000	210	-4.5	-212.16732	456.63528	0	350
30	2000	211	-3.5	-274.61898	357.97977	0	350
31	2000	212	-2.5	-337.06356	234.54018	0	350

Slices of Slip Surface: 2805

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	2805	171.75	-8.25	341.26387	471.37151	0	190
2	2805	172.66665	-9.1666665	349.14283	565.91526	0	190
3	2805	174	-10.500002	370.67423	690.6489	0	190

4	2805	175.33335	-11.833335	400.62197	815.38254	0	190
5	2805	176.975	-12.5	410.83077	751.48718	0	190
6	2805	178.475	-12.5	400.05714	762.44762	0	190
7	2805	179.66665	-12.5	391.3726	768.22519	0	150
8	2805	181	-12.5	381.9526	775.20019	0	150
9	2805	182.33335	-12.5	372.99009	782.1752	0	150
10	2805	183.70585	-12.5	364.46708	800.94637	0	150
11	2805	185.11755	-12.5	356.56175	818.72629	0	150
12	2805	186.5503	-12.5	349.48435	841.10665	0	150
13	2805	188.0041	-12.5	343.23865	868.34562	0	152.62
14	2805	189.4579	-12.5	337.85276	895.5846	0	156.06
15	2805	190.9117	-12.5	333.20287	922.82358	0	159.51
16	2805	192.3655	-12.5	329.22708	950.06256	0	162.95
17	2805	193.8193	-12.5	325.87036	977.30154	0	166.4
18	2805	195.2731	-12.5	323.12582	1004.5405	0	169.84
19	2805	196.66665	-12.5	321.10508	546.80264	0	173.14
20	2805	198	-12.5	319.77758	545.55764	0	176.3
21	2805	199.33335	-12.5	319.02758	544.30514	0	179.46
22	2805	200.5	-12.5	287.44	544.19	0	182.23
23	2805	201.25	-12.5	287.42	544.96	0	184
24	2805	201.75	-12.5	287.4	545.48	0	185.19
25	2805	202.75	-12.5	287.36	546.52	0	187.56
26	2805	204.25	-12.5	287.30667	548.06667	0	191.11
27	2805	205.7	-11.8	243.57303	1130.4112	0	194.55
28	2805	207.1	-10.4	156.14433	1019.547	0	197.87
29	2805	208.58335	-8.9166665	63.513241	884.77122	0	199.31
30	2805	210.15	-7.35	-34.323418	726.62	0	197.46
31	2805	211.71665	-5.7833335	-132.15827	567.79176	0	195.62
32	2805	213.25	-4.25	-227.90998	353.93529	0	350
33	2805	214.75	-2.75	-321.56865	195.89218	0	350



Name: 9-EL. -20 TO -42, BEACH SAND Model: Saturated Only K-Sat: 0.00049 ft/sec K-Ratio: 1
Name: 10-EL. -42 TO -70, BAY SOUND CLAY Model: Saturated Only K-Sat: 3.28e-008 ft/sec K-Ratio: 1
Name: Sheet Pile Model: Saturated Only K-Sat: 1e-010 ft/sec K-Ratio: 1
Name: 5-EL. -6 TO -15, MARSH Model: Saturated Only K-Sat: 3.28e-007 ft/sec K-Ratio: 1
Name: 7-EL. -15 TO -20, LACUSTRINE Model: Saturated Only K-Sat: 3.28e-007 ft/sec K-Ratio: 1
Name: 3-EL. +2.8 TO -6, EMBANKMENT FILL Model: Saturated Only K-Sat: 3.28e-008 ft/sec K-Ratio: 1

GENERAL NOTES

CLASSIFICATION STRATIFICATION
SHEAR STRENGTHS AND UNIT WEIGHTS OF
THE SOIL WERE BASED ON THE RESULTS OF
UNDISTURBED BORINGS AND CPT DATA. SEE
BOTH BORING AND CPT DATA PLATES.

WHERE INDICATED, SHEAR STRENGTHS BETWEEN
VERTICALS WERE ASSUMED TO VARY LINEARLY
BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 6,
PROTECTED SIDE STABILITY ANALYSIS,
CASE: T-Wall Analysis (-2.6' seepage)
STA. 42+00 TO 50+00 WEST
ORLEANS PARISH, LOUISIANA

T-Wall Analysis (-2.6' seepage)

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File Information

Created By: [Moraille, Jacques](#)
Revision Number: [580](#)
Last Edited By: [Bishop, Charles E MVR](#)
Date: [6/4/2013](#)
Time: [3:25:49 PM](#)
File Name: [Reach 6.gsz](#)
Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix E LWL\](#)
Last Solved Date: [6/4/2013](#)
Last Solved Time: [3:26:04 PM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Mass(M) Units: [lbs](#)
Mass Flux Units: [lbs/sec](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

T-Wall Analysis (-2.6' seepage)

Kind: [SEEP/W](#)
Method: [Steady-State](#)
Settings
 Include Air Flow: [No](#)
Control
 Apply Runoff: [No](#)
Convergence
 Convergence Type: [Head Vector Norm](#)
 Maximum Number of Iterations: [500](#)
 Tolerance: [0.001](#)
 Maximum Change in K: [0.1](#)
 Rate of Change in K: [1.02](#)
 Minimum Change in K: [1e-005](#)
 Equation Solver: [Parallel Direct](#)
 Potential Seepage Max # of Reviews: [10](#)
Time

Starting Time: 0 sec

Duration: 0 sec

Ending Time: 0 sec

Materials

9-EL. -20 TO -42, BEACH SAND

Model: Saturated Only

Hydraulic

K-Sat: 0.00049 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

10-EL. -42 TO -70, BAY SOUND CLAY

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-008 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

Sheet Pile

Model: Saturated Only

Hydraulic

K-Sat: 1e-010 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

5-EL. -6 TO -15, MARSH

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-007 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

7-EL. -15 TO -20, LACUSTRINE

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-007 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

3-EL. +2.8 TO -6, EMBANKMENT FILL

Model: Saturated Only
Hydraulic
K-Sat: 3.28e-008 ft/sec
Volumetric Water Content: 0 ft³/ft³
Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

Boundary Conditions

Drainage Face

Review: true
Type: Total Flux (Q) 0

PS Groundwater Level -8.1'

Type: Head (H) -8.1

Extreme Low Water Level -2.6'

Type: Head (H) -2.6

Regions

	Material	Points	Area (ft²)
Region 1	10-EL. -42 TO -70, BAY SOUND CLAY	21,12,13,22	1979.6
Region 2	10-EL. -42 TO -70, BAY SOUND CLAY	10,4,5,14	2472.4
Region 3	5-EL. -6 TO -15, MARSH	19,8,53,45,11,20	508.3
Region 4	10-EL. -42 TO -70, BAY SOUND CLAY	13,12,15,10,14,61	1148
Region 5	3-EL. +2.8 TO -6, EMBANKMENT FILL	38,36,26,27,37	46.165184
Region 6	3-EL. +2.8 TO -6, EMBANKMENT FILL	39,50,1,9,17,32,38,37,28,54	69.3
Region 7	7-EL. -15 TO -20, LACUSTRINE	40,3,42,44	441.5
Region 8	7-EL. -15 TO -20, LACUSTRINE	11,7,40,44,58,43	205
Region 9	7-EL. -15 TO -20, LACUSTRINE	20,11,43,41	353.5
Region 10	3-EL. +2.8 TO -6, EMBANKMENT FILL	23,57,56,31,16,1,50,18,45,52	60.086028
Region 11	9-EL. -20 TO -42, BEACH SAND	21,41,43,58,44,42,4,10,15,12	4400
Region 12	5-EL. -6 TO -15, MARSH	11,45,18,50,39,54,40,7	369
Region 13	5-EL. -6 TO -15, MARSH	54,51,48,49,2,3,40	787.9175
Region 14	3-EL. +2.8 TO -6, EMBANKMENT FILL	57,35,56	9.1536989
Region 15	3-EL. +2.8 TO -6, EMBANKMENT FILL	54,28,29,47,30,51	35.4375
Region 16	3-EL. +2.8 TO -6, EMBANKMENT FILL	53,45,52	5.64
Region 17		31,16,1,9,17,32,38,36,55,46,63,35,56	61.558079

Lines

	Start Point	End Point	Hydraulic Boundary	Left Side Material	Right Side Material
Line 1	10	4			
Line 2	7	11			
Line 3	4	5	PS Groundwater Level -8.1'		
Line 4	5	14			
Line 5	12	13			
Line 6	14	10			
Line 7	10	15			
Line 8	15	12			
Line 9	19	8	Extreme Low Water Level -2.6'		
Line 10	11	20			
Line 11	21	12			
Line 12	13	22			
Line 13	20	19			
Line 14	22	21			
Line 15	38	36			
Line 16	36	26	Drainage Face		
Line 17	26	27	Drainage Face		
Line 18	27	37			
Line 19	37	38			
Line 20	37	28	Drainage Face		
Line 21	32	38			
Line 22	7	40			
Line 23	40	3			
Line 24	43	41			
Line 25	42	44			
Line 26	3	42	PS Groundwater Level -8.1'		
Line 27	44	40			
Line 28	43	11			
Line 29	41	20			
Line 30	11	45			
Line 31	45	18			
Line 32	21	41			
Line 33	42	4	PS Groundwater Level -8.1'		
Line 34	48	49	Drainage Face		
Line 35	49	2	Drainage Face		
Line 36	1	50		Sheet Pile	
Line 37	50	7		Sheet Pile	
Line 38	17	32			
Line 39	39	50			
Line 40	1	9			Sheet Pile
Line 41	9	17			
Line 42	51	48	Drainage Face		
Line 43	31	16			
Line 44	16	1			
Line 45	50	18			
Line 46	52	23	Extreme Low Water Level -2.6'		

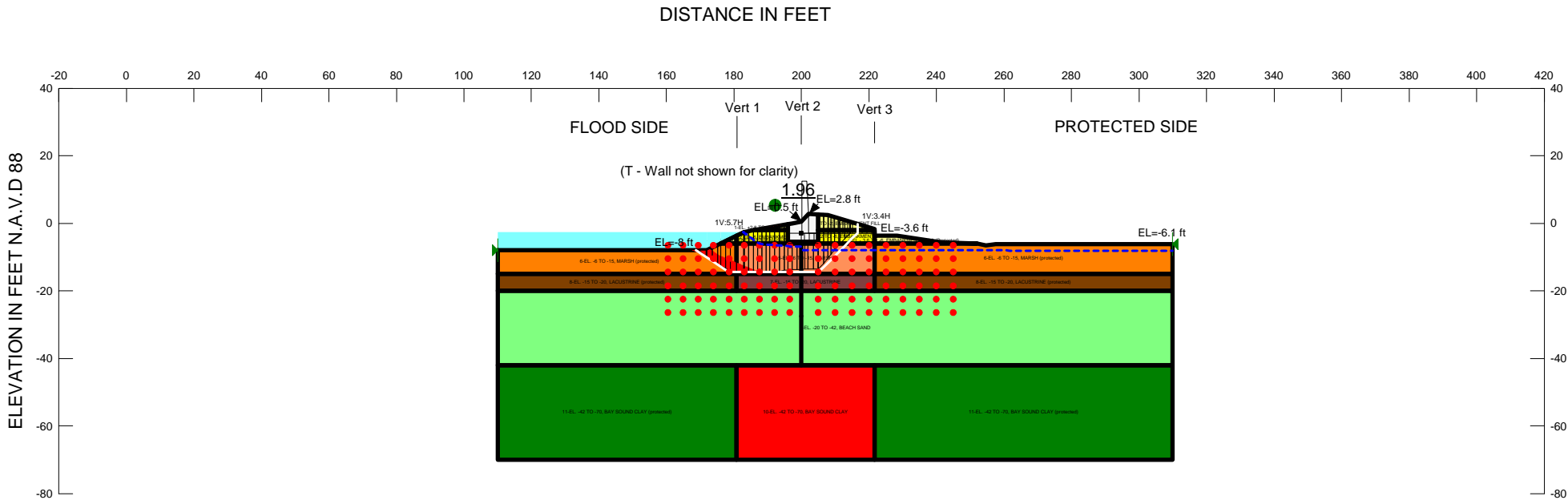
Line 47	8	53	Extreme Low Water Level -2.6'		
Line 48	53	23	Extreme Low Water Level -2.6'		
Line 49	45	53			
Line 50	51	54			
Line 51	54	39			
Line 52	54	40			
Line 53	2	3	PS Groundwater Level -8.1'		
Line 54	56	31			
Line 55	23	57	Extreme Low Water Level -2.6'		
Line 56	57	56			
Line 57	57	35	Extreme Low Water Level -2.6'		
Line 58	35	56			
Line 59	28	54			
Line 60	28	29	Drainage Face		
Line 61	29	47	Drainage Face		
Line 62	47	30	Drainage Face		
Line 63	30	51	Drainage Face		
Line 64	45	52			
Line 65	52	53	Extreme Low Water Level -2.6'		
Line 66	6	15			
Line 67	7	58		Sheet Pile	
Line 68	58	6		Sheet Pile	
Line 69	13	61			
Line 70	61	14			
Line 71	43	58			
Line 72	58	44			
Line 73	36	55			
Line 74	55	46			
Line 75	46	63			
Line 76	63	35			

Points

	X (ft)	Y (ft)
Point 1	200	-5.5
Point 2	310	-6.1
Point 3	310	-15
Point 4	310	-42
Point 5	310	-70
Point 6	200	-27.5
Point 7	200	-15
Point 8	172	-8
Point 9	201	-5.5
Point 10	221.7	-42
Point 11	180.7	-15
Point 12	180.7	-42
Point 13	180.7	-70
Point 14	221.7	-70

Point 15	200	-42
Point 16	196	-5.5
Point 17	205	-5.5
Point 18	196	-6
Point 19	110	-8
Point 20	110	-15
Point 21	110	-42
Point 22	110	-70
Point 23	183	-2.5
Point 24	200	12.5
Point 25	201.5	12.5
Point 26	207.8	2.5
Point 27	221.7	-1.7
Point 28	221.7	-3.6
Point 29	228.3	-3.6
Point 30	251.4	-5.9
Point 31	196	-3
Point 32	205	-3
Point 33	200	-3
Point 34	202	-3
Point 35	196	-0.20588
Point 36	205	2.64656
Point 37	221.7	-2
Point 38	205	-2
Point 39	205	-6
Point 40	221.7	-15
Point 41	110	-20
Point 42	310	-20
Point 43	180.7	-20
Point 44	221.7	-20
Point 45	180.7	-6
Point 46	200	0.5
Point 47	241.3	-5.7
Point 48	254.6	-6.5
Point 49	257.5	-6.1
Point 50	200	-6
Point 51	251.95	-6
Point 52	180.7	-3.6
Point 53	176	-6
Point 54	221.7	-6
Point 55	202	2.8
Point 56	196	-2
Point 57	185.79589	-2
Point 58	200	-20
Point 59	110	-150
Point 60	310	-150
Point 61	200	-70
Point 62	110	0

Point 63	197.16666	0
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Name: 1-EL. +2.8 TO -2, EMBANKMENT FILL Model: Undrained (Phi=0) Unit Weight: 112 pcf Cohesion: 700 psf
Name: 9-EL. -20 TO -42, BEACH SAND Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand
Name: 10-EL. -42 TO -70, BAY SOUND CLAY Model: Spatial Mohr-Coulomb Unit Weight: 109 pcf Cohesion Spatial Fn: Clay Phi: 0 °
Name: 5-EL. -6 TO -15, MARSH Model: Spatial Mohr-Coulomb Unit Weight: 90 pcf Cohesion Fn: Marsh Phi: 0 °
Name: 2-EL. -2 TO -6, EMBANKMENT FILL Model: Spatial Mohr-Coulomb Unit Weight: 100 pcf Cohesion Fn: Fill 2 Phi: 0 °
Name: 6-EL. -6 TO -15, MARSH (protected) Model: Undrained (Phi=0) Unit Weight: 90 pcf Cohesion: 190 psf
Name: 11-EL. -42 TO -70, BAY SOUND CLAY (protected) Model: Spatial Mohr-Coulomb Unit Weight: 109 pcf Cohesion Fn: Clay Phi: 0 °
Name: 7-EL. -15 TO -20, LACUSTRINE Model: Spatial Mohr-Coulomb Unit Weight: 125 pcf Cohesion Fn: Lacustrine Phi: 0 °
Name: 8-EL. -15 TO -20, LACUSTRINE (protected) Model: Undrained (Phi=0) Unit Weight: 125 pcf Cohesion: 200 psf
Name: 4-EL. -3.6 TO -6, EMBANKMENT FILL2 (Protected) Model: Undrained (Phi=0) Unit Weight: 100 pcf Cohesion: 200 psf

GENERAL NOTES

CLASSIFICATION STRATIFICATION
SHEAR STRENGTHS AND UNIT WEIGHTS OF
THE SOIL WERE BASED ON THE RESULTS OF
UNDISTURBED BORINGS AND CPT DATA. SEE
BOTH BORING AND CPT DATA PLATES.

WHERE INDICATED, SHEAR STRENGTHS BETWEEN
VERTICALS WERE ASSUMED TO VARY LINEARLY
BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 6,
PROTECTED SIDE STABILITY ANALYSIS,
CASE: Slope Stability (-2.6' block, FS slope)
STA. 42+00 TO 50+00 WEST
ORLEANS PARISH, LOUISIANA

Slope Stability (-2.6' block, FS slope)

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File Information

Created By: [Moraille, Jacques](#)
Revision Number: [580](#)
Last Edited By: [Bishop, Charles E MVR](#)
Date: [6/4/2013](#)
Time: [3:25:49 PM](#)
File Name: [Reach 6.gsz](#)
Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix E LWL\](#)
Last Solved Date: [6/4/2013](#)
Last Solved Time: [3:28:46 PM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Strength Units: [psf](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

Slope Stability (-2.6' block, FS slope)

Kind: [SLOPE/W](#)
Parent: [T-Wall Analysis \(-2.6' seepage\)](#)
Method: [Spencer](#)
Settings
 PWP Conditions Source: [Parent Analysis](#)
Slip Surface
 Direction of movement: [Right to Left](#)
 Use Passive Mode: [No](#)
 Slip Surface Option: [Block](#)
 Critical slip surfaces saved: [1](#)
 Optimize Critical Slip Surface Location: [Yes](#)
 Tension Crack
 Tension Crack Option: [Tension Crack Line](#)
 Percentage Wet: [1](#)
 Tension Crack Fluid Unit Weight: [62.4 pcf](#)
FOS Distribution
 FOS Calculation Option: [Constant](#)

Restrict Block Crossing: [Yes](#)

Advanced

Number of Slices: [30](#)

Optimization Tolerance: [0.01](#)

Minimum Slip Surface Depth: [0.1 ft](#)

Optimization Maximum Iterations: [2000](#)

Optimization Convergence Tolerance: [1e-007](#)

Starting Optimization Points: [8](#)

Ending Optimization Points: [16](#)

Complete Passes per Insertion: [1](#)

Driving Side Maximum Convex Angle: [5 °](#)

Resisting Side Maximum Convex Angle: [1 °](#)

Materials

1-EL. +2.8 TO -2, EMBANKMENT FILL

Model: [Undrained \(Phi=0\)](#)

Unit Weight: [112 pcf](#)

Cohesion: [700 psf](#)

9-EL. -20 TO -42, BEACH SAND

Model: [Shear/Normal Fn.](#)

Unit Weight: [122 pcf](#)

Strength Function: [Sand](#)

Phi-B: [0 °](#)

10-EL. -42 TO -70, BAY SOUND CLAY

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [109 pcf](#)

Cohesion Spatial Fn: [Clay](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

5-EL. -6 TO -15, MARSH

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [90 pcf](#)

Cohesion Fn: [Marsh](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

2-EL.- 2 TO -6, EMBANKMENT FILL

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [100 pcf](#)

Cohesion Fn: [Fill 2](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

6-EL. -6 TO -15, MARSH (protected)

Model: Undrained (Phi=0)

Unit Weight: 90 pcf

Cohesion: 190 psf

11-EL. -42 TO -70, BAY SOUND CLAY (protected)

Model: Spatial Mohr-Coulomb

Unit Weight: 109 pcf

Cohesion Fn: Clay

Phi: 0 °

Phi-B: 0 °

7-EL. -15 TO -20, LACUSTRINE

Model: Spatial Mohr-Coulomb

Unit Weight: 125 pcf

Cohesion Fn: Lacustrine

Phi: 0 °

Phi-B: 0 °

8-EL. -15 TO -20, LACUSTRINE (protected)

Model: Undrained (Phi=0)

Unit Weight: 125 pcf

Cohesion: 200 psf

4-EL.- 3.6 TO -6, EMBANKMENT FILL2 (Protected)

Model: Undrained (Phi=0)

Unit Weight: 100 pcf

Cohesion: 200 psf

Slip Surface Limits

Left Coordinate: (110, -8) ft

Right Coordinate: (310, -6.1) ft

Slip Surface Block

Left Grid

Upper Left: (160.5, -6.5) ft

Lower Left: (160.5, -26.5) ft

Lower Right: (196.5, -26.5) ft

X Increments: 8

Y Increments: 5

Starting Angle: 135 °

Ending Angle: 180 °

Angle Increments: 4

Right Grid

Upper Left: (205, -6.5) ft

Lower Left: (205, -26.5) ft

Lower Right: (245, -26.5) ft

X Increments: 8

Y Increments: 5

Starting Angle: 25 °

Ending Angle: 45 °

Angle Increments: 4

FullySpecFixedPoints

[1]

flag: Yes

[2]

flag: Yes

Tension Crack Line

	X (ft)	Y (ft)
	200	-2.9
	221.7	-2.9

Cohesion Functions

Clay

Model: Spline Data Point Function

Function: Cohesion vs. Y

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 520

Data Points: Y (ft), Cohesion (psf)

Data Point: (-70, 810)

Data Point: (-42, 520)

Marsh

Model: Spline Data Point Function

Function: Cohesion vs. X

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 190

Data Points: X (ft), Cohesion (psf)

Data Point: (180.7, 190)

Data Point: (200, 200)

Data Point: (221.7, 190)

Fill 2

Model: Spline Data Point Function

Function: Cohesion vs. X

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 200

Data Points: [X \(ft\)](#), [Cohesion \(psf\)](#)

Data Point: [\(180.7, 200\)](#)

Data Point: [\(200, 275\)](#)

Data Point: [\(221.7, 200\)](#)

Lacustrine

Model: [Spline Data Point Function](#)

Function: [Cohesion vs. X](#)

Curve Fit to Data: [100 %](#)

Segment Curvature: [0 %](#)

Y-Intercept: [200](#)

Data Points: [X \(ft\)](#), [Cohesion \(psf\)](#)

Data Point: [\(180.7, 200\)](#)

Data Point: [\(200, 220\)](#)

Data Point: [\(221.7, 200\)](#)

Shear/Normal Strength Functions

Sand

Model: [Spline Data Point Function](#)

Function: [Shear Stress vs. Normal Stress](#)

Curve Fit to Data: [100 %](#)

Segment Curvature: [0 %](#)

Y-Intercept: [0](#)

Data Points: [Normal Stress \(psf\)](#), [Shear Stress \(psf\)](#)

Data Point: [\(-10000, 0\)](#)

Data Point: [\(0, 0\)](#)

Data Point: [\(10000, 6494\)](#)

Estimation Properties

Intact Rock Param.: [10](#)

Geological Strength: [100](#)

Disturbance Factor: [0](#)

SigmaC: [600000 psf](#)

Sigma3: [300000 psf](#)

Num. Points: [20](#)

Spatial Functions

Clay

Model: [Linear Interpolation](#)

Limit Range By: [Data Values](#)

Data Points: [X \(ft\)](#), [Y \(ft\)](#), [Cohesion \(psf\)](#)

Data Point: [\(110, -42, 520\)](#)

Data Point: [\(110, -70, 810\)](#)

Data Point: [\(180.7, -42, 520\)](#)

Data Point: [\(180.7, -70, 810\)](#)

Data Point: (200, -42, 540)
 Data Point: (200, -70, 830)
 Data Point: (221.7, -42, 520)
 Data Point: (221.7, -70, 810)
 Data Point: (310, -42, 510)
 Data Point: (310, -70, 810)

Regions

	Material	Points	Area (ft²)
Region 1	11-EL. -42 TO -70, BAY SOUND CLAY (protected)	21,12,13,22	1979.6
Region 2	11-EL. -42 TO -70, BAY SOUND CLAY (protected)	10,4,5,14	2472.4
Region 3	6-EL. -6 TO -15, MARSH (protected)	19,8,53,45,11,20	508.3
Region 4	10-EL. -42 TO -70, BAY SOUND CLAY	13,12,15,10,14,61	1148
Region 5	1-EL. +2.8 TO -2, EMBANKMENT FILL	38,36,26,27,37	46.165184
Region 6	2-EL.- 2 TO -6, EMBANKMENT FILL	39,50,1,9,17,32,38,37,28,54	69.3
Region 7	8-EL. -15 TO -20, LACUSTRINE (protected)	40,3,42,44	441.5
Region 8	7-EL. -15 TO -20, LACUSTRINE	11,7,40,44,58,43	205
Region 9	8-EL. -15 TO -20, LACUSTRINE (protected)	20,11,43,41	353.5
Region 10	2-EL.- 2 TO -6, EMBANKMENT FILL	23,57,56,31,16,1,50,18,45,52	60.086028
Region 11	9-EL. -20 TO -42, BEACH SAND	21,41,43,58,44,42,4,10,15,12	4400
Region 12	5-EL. -6 TO -15, MARSH	11,45,18,50,39,54,40,7	369
Region 13	6-EL. -6 TO -15, MARSH (protected)	54,51,48,49,2,3,40	787.9175
Region 14	1-EL. +2.8 TO -2, EMBANKMENT FILL	57,35,56	9.1536989
Region 15	4-EL.- 3.6 TO -6, EMBANKMENT FILL2 (Protected)	54,28,29,47,30,51	35.4375
Region 16	4-EL.- 3.6 TO -6, EMBANKMENT FILL2 (Protected)	53,45,52	5.64
Region 17		31,16,1,9,17,32,38,36,55,46,63,35,56	61.558079

Points

	X (ft)	Y (ft)
Point 1	200	-5.5
Point 2	310	-6.1
Point 3	310	-15
Point 4	310	-42
Point 5	310	-70
Point 6	200	-27.5
Point 7	200	-15
Point 8	172	-8
Point 9	201	-5.5
Point 10	221.7	-42
Point 11	180.7	-15
Point 12	180.7	-42
Point 13	180.7	-70
Point 14	221.7	-70
Point 15	200	-42
Point 16	196	-5.5
Point 17	205	-5.5

Point 18	196	-6
Point 19	110	-8
Point 20	110	-15
Point 21	110	-42
Point 22	110	-70
Point 23	183	-2.5
Point 24	200	12.5
Point 25	201.5	12.5
Point 26	207.8	2.5
Point 27	221.7	-1.7
Point 28	221.7	-3.6
Point 29	228.3	-3.6
Point 30	251.4	-5.9
Point 31	196	-3
Point 32	205	-3
Point 33	200	-3
Point 34	202	-3
Point 35	196	-0.20588
Point 36	205	2.64656
Point 37	221.7	-2
Point 38	205	-2
Point 39	205	-6
Point 40	221.7	-15
Point 41	110	-20
Point 42	310	-20
Point 43	180.7	-20
Point 44	221.7	-20
Point 45	180.7	-6
Point 46	200	0.5
Point 47	241.3	-5.7
Point 48	254.6	-6.5
Point 49	257.5	-6.1
Point 50	200	-6
Point 51	251.95	-6
Point 52	180.7	-3.6
Point 53	176	-6
Point 54	221.7	-6
Point 55	202	2.8
Point 56	196	-2
Point 57	185.79589	-2
Point 58	200	-20
Point 59	110	-150
Point 60	310	-150
Point 61	200	-70
Point 62	110	0
Point 63	197.16666	0

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.96	(192.278, -1.625)	19.53961	(214.486, 0.479867)	(169.552, -8)
2	5000	2.03	(192.278, -1.625)	20.704	(216.6, -0.158993)	(168.772, -8)

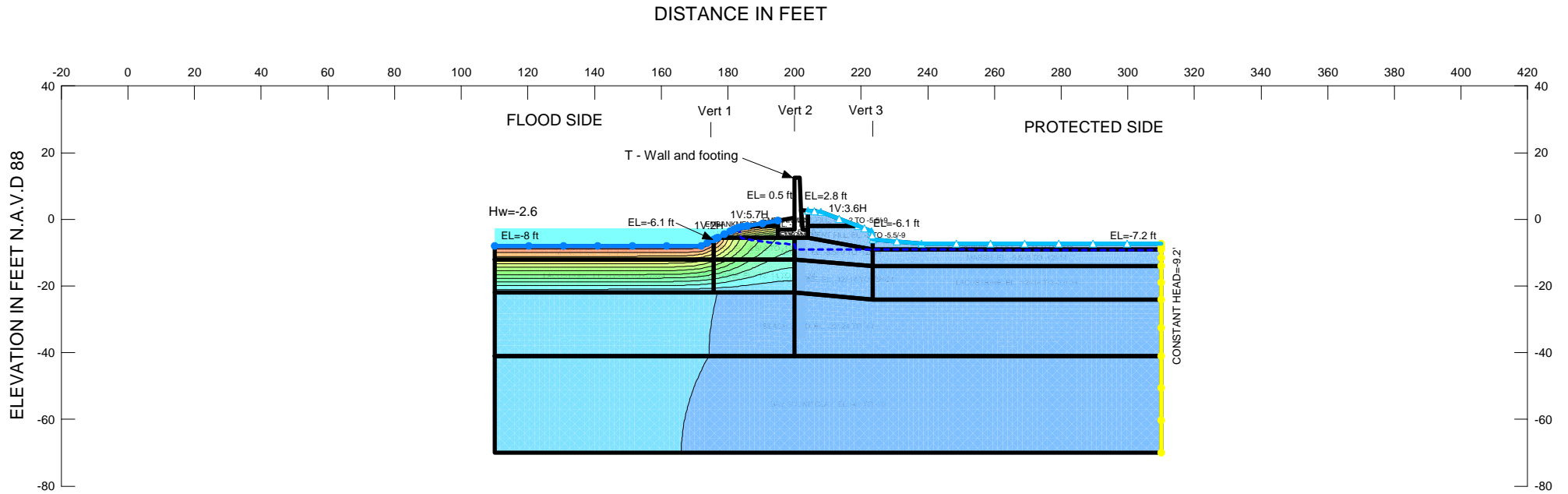
Slices of Slip Surface: Optimized

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	170.67385	-8.954075	363.96727	546.54513	0	190
2	Optimized	171.89775	-9.97919	389.31205	621.22725	0	190
3	Optimized	172.80125	-10.60686	402.21273	704.46933	0	190
4	Optimized	174.40375	-11.720115	427.43751	831.36195	0	190
5	Optimized	175.6025	-12.47739	446.24108	886.74384	0	190
6	Optimized	176.7237	-13.04337	459.91877	958.55729	0	190
7	Optimized	178.17115	-13.77403	480.17294	1053.9073	0	190
8	Optimized	179.79745	-14.322045	493.9389	1080.1707	0	190
9	Optimized	181.81715	-14.73085	501.53338	1153.1802	0	190.58
10	Optimized	182.96715	-14.95712	506.84415	1162.4843	0	191.17
11	Optimized	183.69895	-14.96042	503.577	1176.8585	0	191.55
12	Optimized	185.0969	-14.966725	497.96882	1202.4673	0	192.28
13	Optimized	186.4297	-14.972735	493.22214	1228.0064	0	192.97
14	Optimized	187.69725	-14.97845	489.21451	1253.5668	0	193.63
15	Optimized	188.9173	-14.92392	482.58915	1253.0716	0	194.26
16	Optimized	190.08985	-14.80914	473.1421	1265.8034	0	194.87
17	Optimized	191.38515	-14.61383	459.24364	1255.2452	0	195.54
18	Optimized	192.80325	-14.337995	440.87943	1258.2217	0	196.27
19	Optimized	194.22135	-14.06216	422.77826	1261.2674	0	197.01
20	Optimized	195.4652	-13.86706	409.79934	1284.8758	0	197.65
21	Optimized	196.61165	-13.744485	401.41037	737.7397	0	198.24
22	Optimized	197.9175	-13.663015	395.55643	743.42804	0	198.92
23	Optimized	199.30585	-13.63087	392.97128	740.54765	0	199.64
24	Optimized	200.5	-13.60322	350.04619	738.08219	0	199.77
25	Optimized	201.49685	-13.580135	348.56263	735.99864	0	199.31
26	Optimized	202.74365	-13.56597	347.63065	737.74585	0	198.74
27	Optimized	204.24035	-13.56066	347.22869	737.22741	0	198.05
28	Optimized	204.99355	-13.550835	346.58122	577.21188	0	197.7
29	Optimized	205.7622	-12.694325	293.10259	1306.6457	0	197.34
30	Optimized	207.1622	-11.06264	191.21762	1144.4723	0	196.7
31	Optimized	208.2345	-9.747305	109.08205	1019.1995	0	196.21
32	Optimized	209.26475	-8.5235925	32.665494	896.65254	0	195.73
33	Optimized	210.4563	-7.1421375	-53.603466	745.2006	0	195.18
34	Optimized	211.2686	-6.225705	-110.83438	659.93821	0	194.81
35	Optimized	212.19225	-5.2627025	-170.97945	526.03038	0	232.86
36	Optimized	213.60655	-3.7881075	-263.06413	346.80907	0	227.97
37	Optimized	214.3997	-2.975405	-313.81227	125.56251	0	225.23

Slices of Slip Surface: 5000

	Slip				Base Normal	Frictional	Cohesive
--	------	--	--	--	-------------	------------	----------

	Surface	X (ft)	Y (ft)	PWP (psf)	Stress (psf)	Strength (psf)	Strength (psf)
1	5000	169.57905	-8.5392095	353.36077	472.13854	0	190
2	5000	171.193	-9.6176295	382.06608	573.17897	0	190
3	5000	172.66665	-10.60229	403.1215	684.65302	0	190
4	5000	174	-11.493195	422.68391	785.9884	0	190
5	5000	175.33335	-12.3841	444.83427	887.38615	0	190
6	5000	176.625	-13.247165	469.09527	989.18291	0	190
7	5000	177.875	-14.08239	495.52935	1091.1544	0	190
8	5000	179.6	-14.5	503.22727	1054.7273	0	190
9	5000	181.85	-14.5	490.30435	1094.3913	0	190.6
10	5000	183.69895	-14.5	480.64838	1133.0203	0	191.55
11	5000	185.0969	-14.5	474.16744	1158.057	0	192.28
12	5000	186.64625	-14.5	467.77034	1187.3451	0	193.08
13	5000	188.34695	-14.5	461.71984	1220.861	0	193.96
14	5000	190.0476	-14.5	456.55133	1254.3769	0	194.84
15	5000	191.74825	-14.5	452.1825	1287.8928	0	195.72
16	5000	193.44895	-14.5	448.58395	1321.4087	0	196.61
17	5000	195.14965	-14.5	445.73804	1354.9246	0	197.49
18	5000	196.58335	-14.5	443.95968	820.74469	0	198.23
19	5000	197.875	-14.5	442.86249	820.72748	0	198.9
20	5000	199.29165	-14.5	442.17778	820.79807	0	199.63
21	5000	200.5	-14.5	405.99	820.79	0	199.77
22	5000	201.5	-14.5	405.95	820.77	0	199.31
23	5000	202.75	-14.5	405.9	820.73333	0	198.73
24	5000	204.25	-14.5	405.84	820.73333	0	198.04
25	5000	205.7	-13.8	362.09423	1441.8917	0	197.37
26	5000	207.1	-12.4	274.67058	1315.4206	0	196.73
27	5000	208.5125	-10.9875	186.45292	1168.9842	0	196.08
28	5000	209.9375	-9.5625	97.456698	1002.6031	0	195.42
29	5000	211.3625	-8.1375	8.4589833	836.22213	0	194.76
30	5000	212.7875	-6.7125	-80.540716	669.84112	0	194.11
31	5000	214.275	-5.225	-173.43733	474.71956	0	225.66
32	5000	215.825	-3.675	-270.22884	272.75618	0	220.31



Name: BEACH SAND, EL. -22/-24 TO -41 Model: Saturated Only K-Sat: 0.00049 ft/sec K-Ratio: 1
Name: BAY SOUND CLAY, EL. -41 TO -70 Model: Saturated Only K-Sat: 3.28e-008 ft/sec K-Ratio: 1
Name: Sheet Pile Model: Saturated Only K-Sat: 1e-010 ft/sec K-Ratio: 1
Name: MARSH, EL. -5.5/-9 TO -12/-14 Model: Saturated Only K-Sat: 3.28e-007 ft/sec K-Ratio: 1
Name: LACUSTRINE, EL. -12/-14 TO -22/-24 Model: Saturated Only K-Sat: 3.28e-007 ft/sec K-Ratio: 1
Name: EMBANKMENT FILL, EL. -2 TO -5.5/-9 Model: Saturated Only K-Sat: 3.28e-008 ft/sec K-Ratio: 1

GENERAL NOTES

CLASSIFICATION STRATIFICATION
SHEAR STRENGTHS AND UNIT WEIGHTS OF
THE SOIL WERE BASED ON THE RESULTS OF
UNDISTURBED BORINGS AND CPT DATA. SEE
BOTH BORING AND CPT DATA PLATES.

WHERE INDICATED, SHEAR STRENGTHS BETWEEN
VERTICALS WERE ASSUMED TO VARY LINEARLY
BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

Hw IS CANAL WATER LEVEL

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 7,
PROTECTED SIDE STABILITY ANALYSIS,
CASE: 3 - T-Wall Analysis Extreme Low -2.6ft
STA. 50+00 TO 59+00 WEST
ORLEANS PARISH, LOUISIANA

3 - T-Wall Analysis Extreme Low -2.6ft

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File Information

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Date: [6/4/2013](#)
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Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix E LWL\](#)
Last Solved Date: [6/4/2013](#)
Last Solved Time: [2:46:36 PM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Mass(M) Units: [lbs](#)
Mass Flux Units: [lbs/sec](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

3 - T-Wall Analysis Extreme Low -2.6ft

Kind: [SEEP/W](#)
Method: [Steady-State](#)
Settings
 Include Air Flow: [No](#)
Control
 Apply Runoff: [No](#)
Convergence
 Convergence Type: [Head Vector Norm](#)
 Maximum Number of Iterations: [500](#)
 Tolerance: [0.001](#)
 Maximum Change in K: [0.1](#)
 Rate of Change in K: [1.02](#)
 Minimum Change in K: [1e-005](#)
 Equation Solver: [Parallel Direct](#)
 Potential Seepage Max # of Reviews: [10](#)
Time

Starting Time: 0 sec

Duration: 0 sec

Ending Time: 0 sec

Materials

BEACH SAND, EL. -22/-24 TO -41

Model: Saturated Only

Hydraulic

K-Sat: 0.00049 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

BAY SOUND CLAY, EL. -41 TO -70

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-008 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

Sheet Pile

Model: Saturated Only

Hydraulic

K-Sat: 1e-010 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

MARSH, EL. -5.5/-9 TO -12/-14

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-007 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

LACUSTRINE, EL. -12/-14 TO -22/-24

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-007 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

EMBANKMENT FILL, EL. -2 TO -5.5/-9

Model: Saturated Only
Hydraulic
K-Sat: 3.28e-008 ft/sec
Volumetric Water Content: 0 ft³/ft³
Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

Boundary Conditions

Potential Seepage Face

Review: true
Type: Total Flux (Q) 0

Protected Water -9.2ft

Type: Head (H) -9.2

Extreme Low Water -2.6ft

Type: Head (H) -2.6

Regions

	Material	Points	Area (ft²)
Region 1	BEACH SAND, EL. -22/-24 TO -41	9,48,6,32,34,30,36,31	3603.4
Region 2	EMBANKMENT FILL, EL. -2 TO -5.5/-9	4,5,19,3,20	164.02
Region 3	BAY SOUND CLAY, EL. -41 TO -70	6,7,49,8,9,48	5800
Region 4	EMBANKMENT FILL, EL. -2 TO -5.5/-9	46,38,24,45	41.22
Region 5		22,40,25,27,29,10,13,12,28,26,23,41,2	52.525
Region 6	LACUSTRINE, EL. -12/-14 TO -22/-24	31,37,17,36	658
Region 7	MARSH, EL. -5.5/-9 TO -12/-14	22,2,14,17,39,47	156.94
Region 8	MARSH, EL. -5.5/-9 TO -12/-14	16,14,2,41,23,19	141.55
Region 9	LACUSTRINE, EL. -12/-14 TO -22/-24	30,14,16,34	234
Region 10	MARSH, EL. -5.5/-9 TO -12/-14	35,16,19,5	433
Region 11	LACUSTRINE, EL. -12/-14 TO -22/-24	34,16,35,32	866
Region 12	MARSH, EL. -5.5/-9 TO -12/-14	37,1,15,39,17	266.81
Region 13	LACUSTRINE, EL. -12/-14 TO -22/-24	36,17,14,30	242
Region 14	EMBANKMENT FILL, EL. -2 TO -5.5/-9	44,21,43,42,25,40,22,47	50.425
Region 15	EMBANKMENT FILL, EL. -2 TO -5.5/-9	23,26,46,45,18,3,19	97.715
Region 16	EMBANKMENT FILL, EL. -2 TO -5.5/-9	43,33,42	7.28
Region 17		25,42,33,29,27	15.25
Region 18		28,12,38,46,26	9.95

Lines

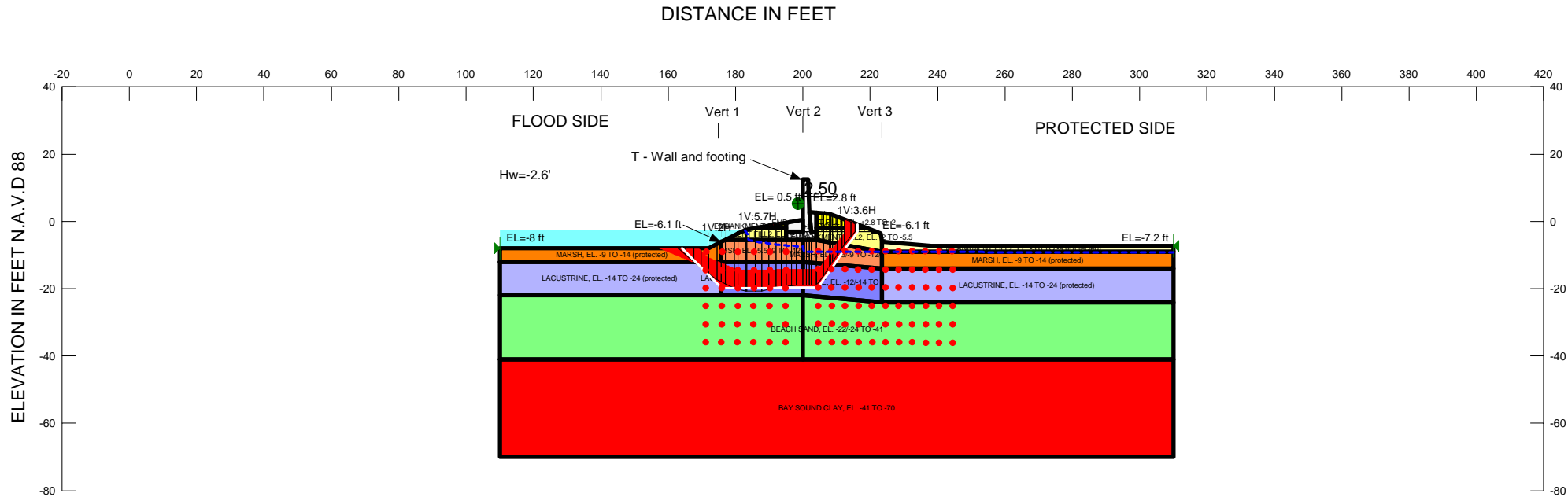
	Start Point	End Point	Hydraulic Boundary	Left Side Material	Right Side Material
Line 1	5	4	Protected Water -9.2ft		
Line 2	22	2			
Line 3	2	14		Sheet Pile	
Line 4	25	27			
Line 5	10	13			
Line 6	13	12			
Line 7	26	28			
Line 8	28	12			
Line 9	30	11		Sheet Pile	
Line 10	31	9			
Line 11	6	32	Protected Water -9.2ft		
Line 12	14	17			
Line 13	3	19			
Line 14	3	20	Potential Seepage Face		
Line 15	32	34			
Line 16	34	30			
Line 17	16	34			
Line 18	5	19			
Line 19	35	16			
Line 20	35	32	Protected Water -9.2ft		
Line 21	30	36			
Line 22	36	31			
Line 23	1	15	Extreme Low Water -2.6ft		
Line 24	1	37			
Line 25	38	24	Potential Seepage Face		
Line 26	15	39	Extreme Low Water -2.6ft		
Line 27	37	17			
Line 28	39	17			
Line 29	25	40			
Line 30	40	22			
Line 31	19	16			
Line 32	5	35	Protected Water -9.2ft		
Line 33	2	41			Sheet Pile
Line 34	41	23			
Line 35	4	20	Potential Seepage Face		
Line 36	42	25			
Line 37	43	21	Extreme Low Water -2.6ft		
Line 38	44	21	Extreme Low Water -2.6ft		
Line 39	24	45	Potential Seepage Face		
Line 40	46	38			
Line 41	45	46			
Line 42	23	26			
Line 43	26	46			
Line 44	45	18	Potential Seepage Face		
Line 45	31	37			

Line 46	17	36			
Line 47	14	30		Sheet Pile	
Line 48	43	42			
Line 49	43	33	Extreme Low Water -2.6ft		
Line 50	33	42			
Line 51	22	47			
Line 52	47	39	Extreme Low Water -2.6ft		
Line 53	8	9			
Line 54	6	7	Protected Water -9.2ft		
Line 55	14	16			
Line 56	23	19			
Line 57	27	29			
Line 58	29	10			
Line 59	6	48			
Line 60	48	9			
Line 61	8	49			
Line 62	49	7			
Line 63	11	48			
Line 64	44	47	Extreme Low Water -2.6ft		
Line 65	3	18	Potential Seepage Face		
Line 66	33	29			
Line 67	12	38			

Points

	X (ft)	Y (ft)
Point 1	110	-8
Point 2	200	-5.5
Point 3	223.4	-6.1
Point 4	310	-7.2
Point 5	310	-9
Point 6	310	-41
Point 7	310	-70
Point 8	110	-70
Point 9	110	-41
Point 10	200	12.5
Point 11	200	-35.5
Point 12	202	2.8
Point 13	201.5	12.5
Point 14	200	-12
Point 15	172	-8
Point 16	223.4	-14
Point 17	175.8	-12
Point 18	223.1	-3.6
Point 19	223.4	-9
Point 20	238.2	-7.2
Point 21	183	-2.5
Point 22	195	-5.5

Point 23	204	-5.5
Point 24	207.9	2.3
Point 25	195	-3
Point 26	204	-3
Point 27	200	-3
Point 28	202.5	-3
Point 29	200	0.5
Point 30	200	-22
Point 31	110	-22
Point 32	310	-24
Point 33	195	-0.4
Point 34	223.4	-24
Point 35	310	-14
Point 36	175.8	-22
Point 37	110	-12
Point 38	204	2.6
Point 39	175.8	-6.1
Point 40	195	-4
Point 41	201	-5.5
Point 42	195	-2
Point 43	185.9	-2
Point 44	180.7	-3.6
Point 45	219	-2
Point 46	204	-2
Point 47	177	-5.5
Point 48	200	-41
Point 49	200	-70
Point 50	195	0



Name: EMBANKMENT FILL2, EL. -2 TO -5.5 Model: Spatial Mohr-Coulomb Unit Weight: 96 pcf Cohesion Fn: Fill 2 Phi: 0 °
Name: BEACH SAND, EL. -22/-24 TO -41 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand
Name: BAY SOUND CLAY, EL. -41 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 101 pcf Cohesion Fn: Clay Phi: 0 °
Name: MARSH, EL. -5.5/-9 TO -12/-14 Model: Spatial Mohr-Coulomb Unit Weight: 78 pcf Cohesion Fn: Marsh Phi: 0 °
Name: EMBANKMENT FILL1, EL. +2.8 TO -2 Model: Undrained (Phi=0) Unit Weight: 109 pcf Cohesion: 700 psf
Name: MARSH, EL. -9 TO -14 (protected) Model: Undrained (Phi=0) Unit Weight: 78 pcf Cohesion: 245 psf
Name: EMBANKMENT FILL2, EL. -3.6 TO -9 (Protected) Model: Undrained (Phi=0) Unit Weight: 96 pcf Cohesion: 245 psf
Name: LACUSTRINE, EL. -14 TO -24 (protected) Model: Undrained (Phi=0) Unit Weight: 100 pcf Cohesion: 200 psf
Name: LACUSTRINE, EL. -12/-14 TO -22/-24 Model: Spatial Mohr-Coulomb Unit Weight: 100 pcf Cohesion Fn: Lacustrine Phi: 0 °

GENERAL NOTES

CLASSIFICATION STRATIFICATION
SHEAR STRENGTHS AND UNIT WEIGHTS OF
THE SOIL WERE BASED ON THE RESULTS OF
UNDISTURBED BORINGS AND CPT DATA. SEE
BOTH BORING AND CPT DATA PLATES.

WHERE INDICATED, SHEAR STRENGTHS BETWEEN
VERTICALS WERE ASSUMED TO VARY LINEARLY
BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

Hw IS CANAL WATER LEVEL

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 7,
PROTECTED SIDE STABILITY ANALYSIS,
CASE: Extreme Low -2.6ft F/S Block
STA. 50+00 TO 59+00 WEST
ORLEANS PARISH, LOUISIANA

Extreme Low -2.6ft F/S Block

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File Information

Created By: [Jiang, Cheng-Ping](#)
Revision Number: [719](#)
Last Edited By: [Hendrix, Joshua M MVR](#)
Date: [6/4/2013](#)
Time: [2:46:26 PM](#)
File Name: [Reach 7.gsz](#)
Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix E LWL\](#)
Last Solved Date: [6/4/2013](#)
Last Solved Time: [2:47:38 PM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Strength Units: [psf](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

Extreme Low -2.6ft F/S Block

Kind: [SLOPE/W](#)
Parent: [3 - T-Wall Analysis Extreme Low -2.6ft](#)
Method: [Spencer](#)
Settings
 PWP Conditions Source: [Parent Analysis](#)
Slip Surface
 Direction of movement: [Right to Left](#)
 Use Passive Mode: [No](#)
 Slip Surface Option: [Block](#)
 Critical slip surfaces saved: [1](#)
 Optimize Critical Slip Surface Location: [Yes](#)
Tension Crack
 Tension Crack Option: [Tension Crack Line](#)
 Percentage Wet: [1](#)
 Tension Crack Fluid Unit Weight: [62.4 pcf](#)
FOS Distribution
 FOS Calculation Option: [Constant](#)

Restrict Block Crossing: [Yes](#)

Advanced

Number of Slices: [30](#)

Optimization Tolerance: [0.01](#)

Minimum Slip Surface Depth: [0.1 ft](#)

Optimization Maximum Iterations: [2000](#)

Optimization Convergence Tolerance: [1e-007](#)

Starting Optimization Points: [8](#)

Ending Optimization Points: [16](#)

Complete Passes per Insertion: [1](#)

Driving Side Maximum Convex Angle: [5 °](#)

Resisting Side Maximum Convex Angle: [1 °](#)

Materials

EMBANKMENT FILL2, EL. -2 TO -5.5

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [96 pcf](#)

Cohesion Fn: [Fill 2](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

BEACH SAND, EL. -22/-24 TO -41

Model: [Shear/Normal Fn.](#)

Unit Weight: [122 pcf](#)

Strength Function: [Sand](#)

Phi-B: [0 °](#)

BAY SOUND CLAY, EL. -41 TO -70

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [101 pcf](#)

Cohesion Fn: [Clay](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

MARSH, EL. -5.5/-9 TO -12/-14

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [78 pcf](#)

Cohesion Fn: [Marsh](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

EMBANKMENT FILL1, EL. +2.8 TO -2

Model: [Undrained \(Phi=0\)](#)

Unit Weight: [109 pcf](#)

Cohesion: [700 psf](#)

MARSH, EL. -9 TO -14 (protected)

Model: [Undrained \(Phi=0\)](#)

Unit Weight: [78 pcf](#)

Cohesion: [245 psf](#)

EMBANKMENT FILL2, EL. -3.6 TO -9 (Protected)

Model: [Undrained \(Phi=0\)](#)

Unit Weight: [96 pcf](#)

Cohesion: [245 psf](#)

LACUSTRINE, EL. -14 TO -24 (protected)

Model: [Undrained \(Phi=0\)](#)

Unit Weight: [100 pcf](#)

Cohesion: [200 psf](#)

LACUSTRINE, EL. -12/-14 TO -22/-24

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [100 pcf](#)

Cohesion Fn: [Lacustrine](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

Slip Surface Limits

Left Coordinate: [\(110, -8\) ft](#)

Right Coordinate: [\(310, -7.2\) ft](#)

Slip Surface Block

Left Grid

Upper Left: [\(171.3, -9.1\) ft](#)

Lower Left: [\(171.1, -35.9\) ft](#)

Lower Right: [\(194.8, -35.9\) ft](#)

X Increments: [5](#)

Y Increments: [5](#)

Starting Angle: [135 °](#)

Ending Angle: [180 °](#)

Angle Increments: [2](#)

Right Grid

Upper Left: [\(204.5, -8.8\) ft](#)

Lower Left: [\(204.6, -35.9\) ft](#)

Lower Right: [\(244.5, -36\) ft](#)

X Increments: [10](#)

Y Increments: [5](#)

Starting Angle: [45 °](#)

Ending Angle: [65 °](#)

Angle Increments: [2](#)

FullySpecFixedPoints

[1]

flag: Yes

[2]

flag: Yes

Tension Crack Line

	X (ft)	Y (ft)
	200	-3
	221	-3

Cohesion Functions

Clay

Model: Spline Data Point Function

Function: Cohesion vs. Y

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 555

Data Points: Y (ft), Cohesion (psf)

Data Point: (-70, 800)

Data Point: (-41, 555)

Marsh

Model: Spline Data Point Function

Function: Cohesion vs. X

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 245

Data Points: X (ft), Cohesion (psf)

Data Point: (175.8, 245)

Data Point: (200, 250)

Data Point: (223.1, 245)

Lacustrine

Model: Spline Data Point Function

Function: Cohesion vs. X

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 200

Data Points: X (ft), Cohesion (psf)

Data Point: (175.8, 200)

Data Point: (200, 250)

Data Point: (223.1, 200)

Fill 2

Model: Spline Data Point Function

Function: Cohesion vs. X

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 245

Data Points: X (ft), Cohesion (psf)

Data Point: (175.8, 245)

Data Point: (200, 450)

Data Point: (223.1, 245)

Shear/Normal Strength Functions

Sand

Model: Spline Data Point Function

Function: Shear Stress vs. Normal Stress

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 0

Data Points: Normal Stress (psf), Shear Stress (psf)

Data Point: (-10000, 0)

Data Point: (0, 0)

Data Point: (10000, 6494)

Estimation Properties

Intact Rock Param.: 10

Geological Strength: 100

Disturbance Factor: 0

SigmaC: 600000 psf

Sigma3: 300000 psf

Num. Points: 20

Regions

	Material	Points	Area (ft ²)
Region 1	BEACH SAND, EL. -22/-24 TO -41	9,48,6,32,34,30,36,31	3603.4
Region 2	EMBANKMENT FILL2, EL. -3.6 TO -9 (Protected)	4,5,19,3,20	164.02
Region 3	BAY SOUND CLAY, EL. -41 TO -70	6,7,49,8,9,48	5800
Region 4	EMBANKMENT FILL1, EL. +2.8 TO -2	46,38,24,45	41.22
Region 5		22,40,25,27,29,10,13,12,28,26,23,41,2	52.525
Region 6	LACUSTRINE, EL. -14 TO -24 (protected)	31,37,17,36	658
Region 7	MARSH, EL. -5.5/-9 TO -12/-14	22,2,14,17,39,47	156.94
Region 8	MARSH, EL. -5.5/-9 TO -12/-14	16,14,2,41,23,19	141.55
Region 9	LACUSTRINE, EL. -12/-14 TO -22/-24	30,14,16,34	234
Region 10	MARSH, EL. -9 TO -14 (protected)	35,16,19,5	433
Region 11	LACUSTRINE, EL. -14 TO -24 (protected)	34,16,35,32	866
Region 12	MARSH, EL. -9 TO -14 (protected)	37,1,15,39,17	266.81
Region 13	LACUSTRINE, EL. -12/-14 TO -22/-24	36,17,14,30	242
Region 14	EMBANKMENT FILL2, EL. -2 TO -5.5	44,21,43,42,25,40,22,47	50.425
Region 15	EMBANKMENT FILL2, EL. -2 TO -5.5	23,26,46,45,18,3,19	97.715

Region 16	EMBANKMENT FILL1, EL. +2.8 TO -2	43,33,42	7.28
Region 17		25,42,33,29,27	15.25
Region 18		28,12,38,46,26	9.95

Points

	X (ft)	Y (ft)
Point 1	110	-8
Point 2	200	-5.5
Point 3	223.4	-6.1
Point 4	310	-7.2
Point 5	310	-9
Point 6	310	-41
Point 7	310	-70
Point 8	110	-70
Point 9	110	-41
Point 10	200	12.5
Point 11	200	-35.5
Point 12	202	2.8
Point 13	201.5	12.5
Point 14	200	-12
Point 15	172	-8
Point 16	223.4	-14
Point 17	175.8	-12
Point 18	223.1	-3.6
Point 19	223.4	-9
Point 20	238.2	-7.2
Point 21	183	-2.5
Point 22	195	-5.5
Point 23	204	-5.5
Point 24	207.9	2.3
Point 25	195	-3
Point 26	204	-3
Point 27	200	-3
Point 28	202.5	-3
Point 29	200	0.5
Point 30	200	-22
Point 31	110	-22
Point 32	310	-24
Point 33	195	-0.4
Point 34	223.4	-24
Point 35	310	-14
Point 36	175.8	-22
Point 37	110	-12
Point 38	204	2.6
Point 39	175.8	-6.1
Point 40	195	-4
Point 41	201	-5.5

Point 42	195	-2
Point 43	185.9	-2
Point 44	180.7	-3.6
Point 45	219	-2
Point 46	204	-2
Point 47	177	-5.5
Point 48	200	-41
Point 49	200	-70
Point 50	195	0

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	2.50	(189.806, -1.75)	23.92779	(215.579, -0.674846)	(163.065, -8)
2	1289	2.67	(189.806, -1.75)	23.839	(216.191, -0.912005)	(164.14, -8)

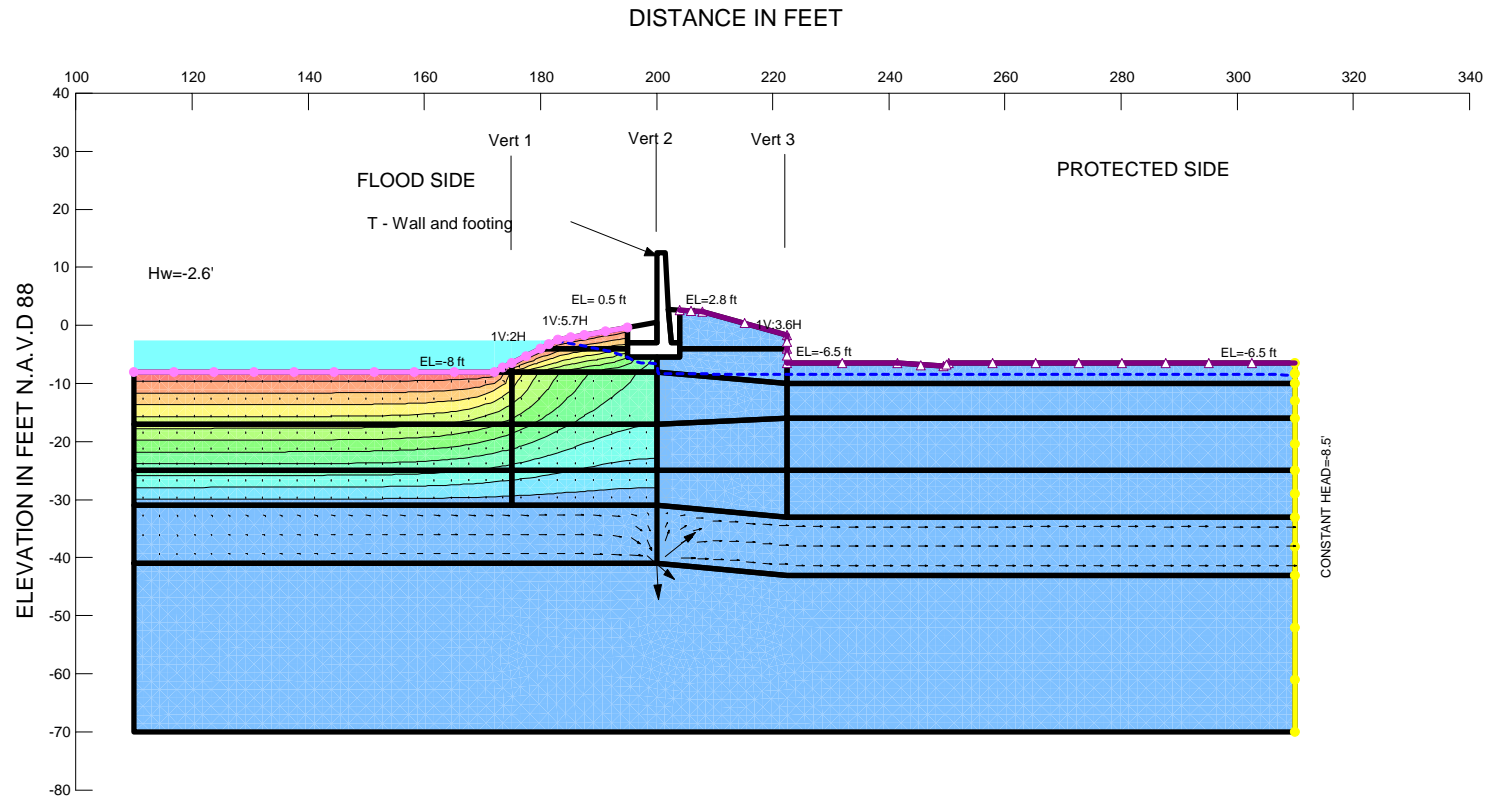
Slices of Slip Surface: Optimized

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	164.1564	-8.9606575	368.71037	519.81835	0	245
2	Optimized	166.33995	-10.881973	430.94141	675.01778	0	245
3	Optimized	167.5282	-11.921315	463.06412	750.486	0	245
4	Optimized	168.7185	-12.892225	492.96086	833.078	0	200
5	Optimized	170.90615	-14.676675	545.95141	1017.376	0	200
6	Optimized	172.01045	-15.577425	573.42881	1117.2704	0	200
7	Optimized	173.2936	-16.437215	600.56853	1196.402	0	200
8	Optimized	175.18315	-17.598455	637.96087	1307.1947	0	200
9	Optimized	176.4	-18.209925	658.22178	1378.7973	0	201.24
10	Optimized	178.29825	-19.163775	691.91863	1503.4243	0	205.16
11	Optimized	180.14825	-19.94895	721.77619	1576.9197	0	208.98
12	Optimized	181.85	-20.35859	736.73879	1645.9004	0	212.5
13	Optimized	183.184	-20.6797	749.70001	1706.1045	0	215.26
14	Optimized	184.634	-20.73813	750.90101	1700.9602	0	218.25
15	Optimized	186.8396	-20.76276	750.0717	1742.5226	0	222.81
16	Optimized	188.8578	-20.51294	735.87927	1716.4508	0	226.98
17	Optimized	191.01495	-19.992325	707.35438	1705.4554	0	231.44
18	Optimized	192.82015	-19.607035	685.75598	1712.2877	0	235.17
19	Optimized	194.2734	-19.357065	671.18231	1715.0003	0	238.17
20	Optimized	195.0044	-19.231325	664.0212	1209.2864	0	239.68
21	Optimized	195.7791	-19.166355	660.06046	1215.3936	0	241.28
22	Optimized	197.31965	-19.037925	652.10402	1202.521	0	244.46
23	Optimized	199.04495	-18.967285	647.87421	1206.5905	0	248.03
24	Optimized	200.5	-18.957495	617.67579	1204.6723	0	248.92
25	Optimized	201.25	-18.952445	617.32605	1202.7528	0	247.29
26	Optimized	201.75	-18.94908	617.10605	1201.4728	0	246.21
27	Optimized	202.25	-18.945715	616.88606	1200.1729	0	245.13
28	Optimized	203.25	-18.938985	616.42603	1197.5729	0	242.97
29	Optimized	204.0147	-18.93384	616.06347	2032.7205	0	241.31

30	Optimized	205.06775	-17.483575	525.54914	1657.5809	0	239.03
31	Optimized	207.00305	-14.67679	350.35821	1364.5094	0	234.84
32	Optimized	208.1018	-13.01494	246.61671	1195.1782	0	232.46
33	Optimized	208.5916	-12.27413	200.36194	1107.1853	0	248.14
34	Optimized	209.5631	-10.842665	110.99189	973.23329	0	247.93
35	Optimized	210.93015	-8.850895	-13.367625	775.98704	0	247.63
36	Optimized	211.9538	-7.4256695	-102.35537	656.10403	0	247.41
37	Optimized	213.29905	-5.7275845	-208.39852	415.53056	0	331.98
38	Optimized	214.94175	-3.72942	-333.16284	183.58795	0	317.4

Slices of Slip Surface: 1289

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	1289	165.14	-9	369.78151	527.67846	0	245
2	1289	167.14	-11	433.77467	689.1463	0	245
3	1289	169.105	-12.965	494.57176	851.75231	0	200
4	1289	171.035	-14.895	552.93556	1051.5375	0	200
5	1289	172.95	-16.81	615.85274	1262.8182	0	200
6	1289	174.85	-18.71	682.13469	1473.7593	0	200
7	1289	175.88	-19.74	720.89527	1588.2058	0	200.17
8	1289	176.48	-19.816725	722.78348	1470.6434	0	201.4
9	1289	177.925	-19.807625	719.66128	1489.1054	0	204.39
10	1289	179.775	-19.795975	715.82352	1518.8345	0	208.21
11	1289	181.85	-19.782905	710.89883	1550.882	0	212.5
12	1289	183.725	-19.771095	706.81345	1585.9683	0	216.37
13	1289	185.175	-19.761965	703.77903	1609.1402	0	219.37
14	1289	186.81	-19.751665	700.81031	1637.55	0	222.75
15	1289	188.63	-19.7402	697.45873	1671.3406	0	226.51
16	1289	190.45	-19.72874	694.65659	1705.0762	0	230.27
17	1289	192.27	-19.71728	692.01928	1738.8667	0	234.03
18	1289	194.09	-19.705815	689.71163	1772.6023	0	237.79
19	1289	195.83335	-19.694835	688.06624	1278.6944	0	241.39
20	1289	197.5	-19.68434	686.74627	1277.6744	0	244.83
21	1289	199.16665	-19.67384	685.72629	1276.6545	0	248.28
22	1289	200.5	-19.665445	661.81676	1274.8745	0	248.92
23	1289	201.25	-19.660725	661.5069	1272.9948	0	247.29
24	1289	201.75	-19.657575	661.28691	1271.7348	0	246.21
25	1289	202.25	-19.654425	661.08691	1270.4548	0	245.13
26	1289	203.25	-19.648125	660.66012	1267.908	0	242.97
27	1289	204.27	-19.6417	660.22766	2101.2547	0	240.76
28	1289	205.38	-18.440355	585.2186	1761.494	0	238.35
29	1289	207.06	-16.041065	435.4742	1523.2208	0	234.72
30	1289	208.61555	-13.819475	296.77035	1279.4935	0	231.35
31	1289	210.3158	-11.39125	145.16353	1004.7162	0	247.77
32	1289	212.2852	-8.5786875	-30.447004	722.46831	0	247.34
33	1289	214.0003	-6.129304	-183.38429	417.27151	0	325.75
34	1289	215.4611	-4.0431015	-313.62703	170.84691	0	312.79



Name: BEACH SAND, EL. -31/-33 TO -41/-43 Model: Saturated Only K-Sat: 0.00049 ft/sec K-Ratio: 1
 Name: BAY SOUND CLAY, EL. -41/-43 TO -70 Model: Saturated Only K-Sat: 3.28e-008 ft/sec K-Ratio: 1
 Name: Sheet Pile Model: Saturated Only K-Sat: 1e-010 ft/sec K-Ratio: 1
 Name: MARSH, EL. -8/-10 TO -16/-17 Model: Saturated Only K-Sat: 3.28e-007 ft/sec K-Ratio: 1
 Name: LACUSTRINE, EL. -16/-17 TO -31/-33 Model: Saturated Only K-Sat: 3.28e-007 ft/sec K-Ratio: 1
 Name: EMBANKMENT FILL, EL. +0.5 TO -8/-10 Model: Saturated Only K-Sat: 3.28e-008 ft/sec K-Ratio: 1

GENERAL NOTES

CLASSIFICATION STRATIFICATION
 SHEAR STRENGTHS AND UNIT WEIGHTS OF
 THE SOIL WERE BASED ON THE RESULTS OF
 UNDISTURBED BORINGS AND CPT DATA. SEE
 BOTH BORING AND CPT DATA PLATES.

WHERE INDICATED, SHEAR STRENGTHS BETWEEN
 VERTICALS WERE ASSUMED TO VARY LINEARLY
 BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

Hw IS CANAL WATER LEVEL

LAKE PONTCHARTRAIN, LA. AND VICINITY
 HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 8,
 PROTECTED SIDE STABILITY ANALYSIS,
 CASE: LWL Q Case (seepage)
 STA. 59+00 TO 63+58 WEST
 ORLEANS PARISH, LOUISIANA

LWL Q Case (seepage)

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File Information

Created By: [Jiang, Cheng-Ping](#)
Revision Number: [937](#)
Last Edited By: [Jamerson, James MVK](#)
Date: [6/17/2013](#)
Time: [10:35:35 AM](#)
File Name: [Reach 8.gsz](#)
Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix E LWL\](#)
Last Solved Date: [6/17/2013](#)
Last Solved Time: [10:35:52 AM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Mass(M) Units: [lbs](#)
Mass Flux Units: [lbs/sec](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

LWL Q Case (seepage)

Kind: [SEEP/W](#)
Method: [Steady-State](#)
Settings
 Include Air Flow: [No](#)
Control
 Apply Runoff: [No](#)
Convergence
 Convergence Type: [Head Vector Norm](#)
 Maximum Number of Iterations: [500](#)
 Tolerance: [0.001](#)
 Maximum Change in K: [0.1](#)
 Rate of Change in K: [1.02](#)
 Minimum Change in K: [1e-005](#)
 Equation Solver: [Parallel Direct](#)
 Potential Seepage Max # of Reviews: [10](#)
Time

Starting Time: 0 sec

Duration: 0 sec

Ending Time: 0 sec

Materials

BEACH SAND, EL. -31/-33 TO -41/-43

Model: Saturated Only

Hydraulic

K-Sat: 0.00049 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

BAY SOUND CLAY, EL. -41/-43 TO -70

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-008 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

Sheet Pile

Model: Saturated Only

Hydraulic

K-Sat: 1e-010 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

MARSH, EL. -8/-10 TO -16/-17

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-007 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

LACUSTRINE, EL. -16/-17 TO -31/-33

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-007 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

EMBANKMENT FILL, EL. +0.5 TO -8/-10

Model: Saturated Only
Hydraulic
K-Sat: 3.28e-008 ft/sec
Volumetric Water Content: 0 ft³/ft³
Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

Boundary Conditions

Drainage

Review: true
Type: Total Flux (Q) 0

Curb

Type: Head (H) -8.5

Canal Water (-2.6)

Type: Head (H) -2.6

Regions

	Material	Points	Area (ft²)
Region 1	BEACH SAND, EL. -31/-33 TO -41/-43	9,52,49,48,6,35,37,33,40,34	2000
Region 2	EMBANKMENT FILL, EL. +0.5 TO -8/-10	4,5,20,3,21,41,42	304.025
Region 3	BAY SOUND CLAY, EL. -41/-43 TO -70	52,49,48,6,7,51,59,53,8,9	5602.5
Region 4	EMBANKMENT FILL, EL. +0.5 TO -8/-10	46,27,43,25,19,50	89.383352
Region 5		23,45,26,28,30,11,14,13,29,27,46,24,54,2	52.525
Region 6	MARSH, EL. -8/-10 TO -16/-17	18,39,10,1,16	585
Region 7	LACUSTRINE, EL. -16/-17 TO -31/-33	57,10,39,56	520
Region 8	EMBANKMENT FILL, EL. +0.5 TO -8/-10	45,23,2,15,18,44,47	86.263875
Region 9	EMBANKMENT FILL, EL. +0.5 TO -8/-10	15,2,54,24,46,50,3,20	106.43639
Region 10	MARSH, EL. -8/-10 TO -16/-17	32,15,20,17	168.75
Region 11	LACUSTRINE, EL. -16/-17 TO -31/-33	60,32,17,55	191.25
Region 12	MARSH, EL. -8/-10 TO -16/-17	38,17,20,5	525
Region 13	LACUSTRINE, EL. -16/-17 TO -31/-33	55,17,38,58	787.5
Region 14	EMBANKMENT FILL, EL. +0.5 TO -8/-10	16,44,18	2.25
Region 15	MARSH, EL. -8/-10 TO -16/-17	39,18,15,32	225
Region 16	LACUSTRINE, EL. -16/-17 TO -31/-33	56,39,32,60	200
Region 17	EMBANKMENT FILL, EL. +0.5 TO -8/-10	47,22,31,36,26,45	33.016163
Region 18	LACUSTRINE, EL. -16/-17 TO -31/-33	57,56,40,34	390
Region 19	LACUSTRINE, EL. -16/-17 TO -31/-33	55,58,35,37	700

Region 20		13,29,27,43	10.044502
Region 21		26,36,61,30,28	15.305224
Region 22	LACUSTRINE, EL. -16/-17 TO -31/-33	56,60,55,37,33,40	307.5

Lines

	Start Point	End Point	Hydraulic Boundary	Left Side Material	Right Side Material
Line 1	5	4	Curb		
Line 2	23	2			
Line 3	2	15		Sheet Pile	
Line 4	26	28			
Line 5	11	14			
Line 6	14	13			
Line 7	25	19	Drainage		
Line 8	27	29			
Line 9	29	13			
Line 10	33	12		Sheet Pile	
Line 11	34	9			
Line 12	6	35	Curb		
Line 13	15	18			
Line 14	3	20			
Line 15	20	15			
Line 16	3	21	Drainage		
Line 17	35	37			
Line 18	37	33			
Line 19	17	32			
Line 20	5	20			
Line 21	38	17			
Line 22	33	40			
Line 23	40	34			
Line 24	32	39			
Line 25	41	21	Drainage		
Line 26	4	42	Drainage		
Line 27	42	41	Drainage		
Line 28	27	43			
Line 29	43	25	Drainage		
Line 30	16	44	Canal Water (-2.6)		
Line 31	39	10			
Line 32	44	18			
Line 33	26	45			
Line 34	45	23			
Line 35	24	46			
Line 36	46	27			
Line 37	44	47	Canal Water (-2.6)		
Line 38	39	18			
Line 39	15	32		Sheet Pile	
Line 40	20	17			
Line 41	5	38	Curb		

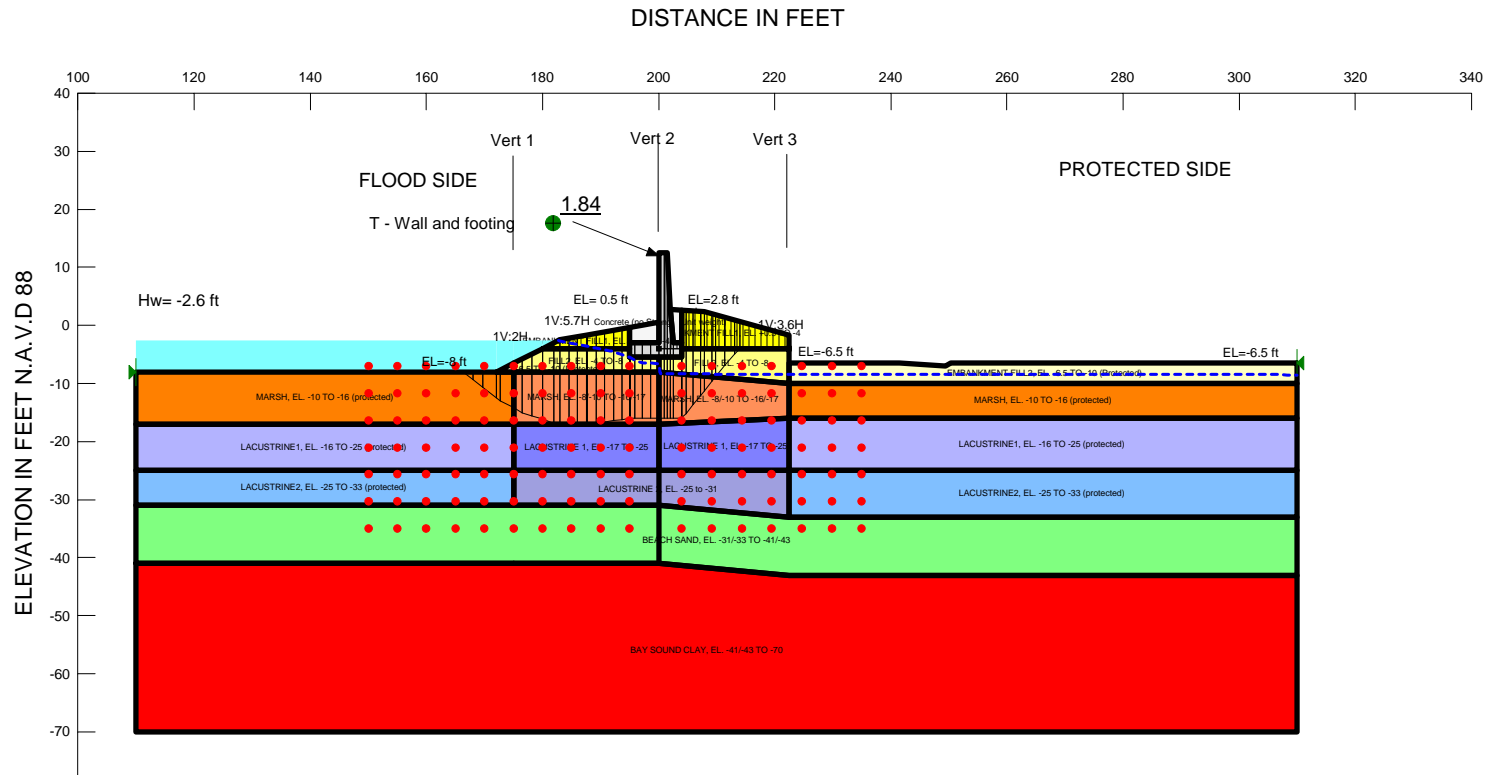
Line 42	6	48			
Line 43	48	49			
Line 44	50	19	Drainage		
Line 45	50	46			
Line 46	50	3	Drainage		
Line 47	47	45			
Line 48	47	22	Canal Water (-2.6)		
Line 49	22	31	Canal Water (-2.6)		
Line 50	31	36	Canal Water (-2.6)		
Line 51	36	26			
Line 52	49	52			
Line 53	52	9			
Line 54	53	8			
Line 55	7	51			
Line 56	2	54			Sheet Pile
Line 57	54	24			
Line 58	55	17			
Line 59	38	58	Curb		
Line 60	58	55			
Line 61	57	10			
Line 62	39	56			
Line 63	56	57			
Line 64	56	40			
Line 65	34	57			
Line 66	58	35	Curb		
Line 67	37	55			
Line 68	13	43			
Line 69	12	49		Sheet Pile	
Line 70	53	59			
Line 71	59	51			
Line 72	28	30			
Line 73	30	11			
Line 74	18	16			
Line 75	10	1			
Line 76	1	16	Canal Water (-2.6)		
Line 77	32	60		Sheet Pile	
Line 78	55	60			
Line 79	60	56			
Line 80	6	7	Curb		
Line 81	8	9			
Line 82	60	33		Sheet Pile	
Line 83	36	61			
Line 84	61	30			

Points

	X (ft)	Y (ft)
Point 1	110	-8

Point 2	200	-5.5
Point 3	222.5	-6.5
Point 4	310	-6.5
Point 5	310	-10
Point 6	310	-43
Point 7	310	-70
Point 8	110	-70
Point 9	110	-41
Point 10	110	-17
Point 11	200	12.5
Point 12	200	-35.5
Point 13	202	2.8
Point 14	201.5	12.5
Point 15	200	-8
Point 16	172	-8
Point 17	222.5	-16
Point 18	175	-8
Point 19	222.4	-1.6
Point 20	222.5	-10
Point 21	241.4	-6.5
Point 22	183	-2.5
Point 23	195	-5.5
Point 24	204	-5.5
Point 25	207.9	2.4
Point 26	195	-3
Point 27	204	-3
Point 28	200	-3
Point 29	202.5	-3
Point 30	200	0.5
Point 31	187.5	-1.7
Point 32	200	-17
Point 33	200	-31
Point 34	110	-31
Point 35	310	-33
Point 36	195	-0.37791
Point 37	222.5	-33
Point 38	310	-16
Point 39	175	-17
Point 40	175	-31
Point 41	249.4	-7
Point 42	250.3	-6.5
Point 43	204.00118	2.69108
Point 44	175	-6.5
Point 45	195	-4
Point 46	204	-4
Point 47	179.9889	-4
Point 48	222.5	-43
Point 49	200	-41

Point 50	222.44911	-4
Point 51	222.5	-70
Point 52	175	-41
Point 53	175	-70
Point 54	201	-5.5
Point 55	222.5	-25
Point 56	175	-25
Point 57	110	-25
Point 58	310	-25
Point 59	200	-70
Point 60	200	-25
Point 61	197.15233	0



Name: FILL2, EL. -4 TO -8 Model: Undrained (Phi=0) Unit Weight: 96 pcf Cohesion: 340 psf

Name: BEACH SAND, EL. -31/-33 TO -41/-43 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand

Name: BAY SOUND CLAY, EL. -41/-43 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 105 pcf Cohesion Spatial Fn: Bay Sound Phi: 0 °

Name: MARSH, EL. -8/-10 TO -16/-17 Model: Spatial Mohr-Coulomb Weight Fn: Marsh Cohesion Fn: Marsh Phi: 0 °

Name: EMBANKMENT FILL1, EL. +0.5 TO -4 Model: Undrained (Phi=0) Unit Weight: 109 pcf Cohesion: 600 psf

Name: MARSH, EL. -10 TO -16 (protected) Model: Undrained (Phi=0) Unit Weight: 81 pcf Cohesion: 175 psf

Name: Concrete (no Strength/Unit weight) Model: Undrained (Phi=0) Unit Weight: 0.01 pcf Cohesion: 0.01 psf

Name: EMBANKMENT FILL2, EL. -6.5 TO -10 (Protected) Model: Undrained (Phi=0) Unit Weight: 96 pcf Cohesion: 340 psf

Name: LACUSTRINE1, EL. -16 TO -25 (protected) Model: Undrained (Phi=0) Unit Weight: 101 pcf Cohesion: 200 psf

Name: LACUSTRINE 1, EL. -17 TO -25 Model: Spatial Mohr-Coulomb Weight Fn: Lacustrine Cohesion Spatial Fn: Lacustrine 1 Phi: 0 °

Name: LACUSTRINE2, EL. -25 TO -33 (protected) Model: Spatial Mohr-Coulomb Unit Weight: 111 pcf Cohesion Fn: Lacustrine Phi: 0 °

Name: LACUSTRINE 2, EL. -25 TO -31 Model: Spatial Mohr-Coulomb Weight Fn: Lacustrine 2 Cohesion Spatial Fn: Lacustrine 2 Phi: 0 °

GENERAL NOTES

CLASSIFICATION STRATIFICATION
SHEAR STRENGTHS AND UNIT WEIGHTS OF
THE SOIL WERE BASED ON THE RESULTS OF
UNDISTURBED BORINGS AND CPT DATA. SEE
BOTH BORING AND CPT DATA PLATES.

WHERE INDICATED, SHEAR STRENGTHS BETWEEN
VERTICALS WERE ASSUMED TO VARY LINEARLY
BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

Hw IS CANAL WATER LEVEL

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 8,
PROTECTED SIDE STABILITY ANALYSIS,
CASE: LWL Q Case (Block)
STA. 59+00 TO 63+58 WEST
ORLEANS PARISH, LOUISIANA

LWL Q Case (Block)

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File Information

Created By: [Jiang, Cheng-Ping](#)
Revision Number: [937](#)
Last Edited By: [Jamerson, James MVK](#)
Date: [6/17/2013](#)
Time: [10:35:35 AM](#)
File Name: [Reach 8.gsz](#)
Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix E LWL\](#)
Last Solved Date: [6/17/2013](#)
Last Solved Time: [10:38:52 AM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Strength Units: [psf](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

LWL Q Case (Block)

Kind: [SLOPE/W](#)
Parent: [LWL Q Case \(seepage\)](#)
Method: [Spencer](#)
Settings
 PWP Conditions Source: [Parent Analysis](#)
Slip Surface
 Direction of movement: [Right to Left](#)
 Use Passive Mode: [No](#)
 Slip Surface Option: [Block](#)
 Critical slip surfaces saved: [1](#)
 Optimize Critical Slip Surface Location: [Yes](#)
 Tension Crack
 Tension Crack Option: [Tension Crack Line](#)
 Percentage Wet: [1](#)
 Tension Crack Fluid Unit Weight: [62.4 pcf](#)
FOS Distribution
 FOS Calculation Option: [Constant](#)

Restrict Block Crossing: [Yes](#)

Advanced

Number of Slices: [30](#)

Optimization Tolerance: [0.01](#)

Minimum Slip Surface Depth: [0.1 ft](#)

Optimization Maximum Iterations: [2000](#)

Optimization Convergence Tolerance: [1e-007](#)

Starting Optimization Points: [8](#)

Ending Optimization Points: [16](#)

Complete Passes per Insertion: [1](#)

Driving Side Maximum Convex Angle: [5 °](#)

Resisting Side Maximum Convex Angle: [1 °](#)

Materials

FILL2, EL. -4 TO -8

Model: [Undrained \(Phi=0\)](#)

Unit Weight: [96 pcf](#)

Cohesion: [340 psf](#)

BEACH SAND, EL. -31/-33 TO -41/-43

Model: [Shear/Normal Fn.](#)

Unit Weight: [122 pcf](#)

Strength Function: [Sand](#)

Phi-B: [0 °](#)

BAY SOUND CLAY, EL. -41/-43 TO -70

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [105 pcf](#)

Cohesion Spatial Fn: [Bay Sound](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

MARSH, EL. -8/-10 TO -16/-17

Model: [Spatial Mohr-Coulomb](#)

Weight Fn: [Marsh](#)

Cohesion Fn: [Marsh](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

EMBANKMENT FILL1, EL. +0.5 TO -4

Model: [Undrained \(Phi=0\)](#)

Unit Weight: [109 pcf](#)

Cohesion: [600 psf](#)

MARSH, EL. -10 TO -16 (protected)

Model: [Undrained \(Phi=0\)](#)

Unit Weight: 81 pcf

Cohesion: 175 psf

Concrete (no Strength/Unit weight)

Model: Undrained (Phi=0)

Unit Weight: 0.01 pcf

Cohesion: 0.01 psf

EMBANKMENT FILL2, EL. -6.5 TO -10 (Protected)

Model: Undrained (Phi=0)

Unit Weight: 96 pcf

Cohesion: 340 psf

LACUSTRINE1, EL. -16 TO -25 (protected)

Model: Undrained (Phi=0)

Unit Weight: 101 pcf

Cohesion: 200 psf

LACUSTRINE 1, EL. -17 TO -25

Model: Spatial Mohr-Coulomb

Weight Fn: Lacustrine

Cohesion Spatial Fn: Lacustrine 1

Phi: 0 °

Phi-B: 0 °

LACUSTRINE2, EL. -25 TO -33 (protected)

Model: Spatial Mohr-Coulomb

Unit Weight: 111 pcf

Cohesion Fn: Lacustrine

Phi: 0 °

Phi-B: 0 °

LACUSTRINE 2, EL. -25 to -31

Model: Spatial Mohr-Coulomb

Weight Fn: Lacustrine 2

Cohesion Spatial Fn: Lacustrine 2

Phi: 0 °

Phi-B: 0 °

Slip Surface Limits

Left Coordinate: (110, -8) ft

Right Coordinate: (310, -6.5) ft

Slip Surface Block

Left Grid

Upper Left: (150, -7) ft

Lower Left: (150, -35) ft
Lower Right: (195, -35) ft
X Increments: 9
Y Increments: 6
Starting Angle: 135 °
Ending Angle: 185 °
Angle Increments: 4

Right Grid

Upper Left: (204, -7) ft
Lower Left: (204, -35) ft
Lower Right: (235, -35) ft
X Increments: 6
Y Increments: 6
Starting Angle: 25 °
Ending Angle: 45 °
Angle Increments: 4

Tension Crack Line

	X (ft)	Y (ft)
	200	-4
	222.5	-4

Cohesion Functions

Marsh

Model: Spline Data Point Function
Function: Cohesion vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 175
Data Points: X (ft), Cohesion (psf)
Data Point: (175, 175)
Data Point: (200, 200)
Data Point: (222.4, 175)

Lacustrine

Model: Spline Data Point Function
Function: Cohesion vs. Y
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 200
Data Points: Y (ft), Cohesion (psf)
Data Point: (-33, 280)
Data Point: (-25, 200)

Shear/Normal Strength Functions

Sand

Model: [Spline Data Point Function](#)

Function: [Shear Stress vs. Normal Stress](#)

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 0

Data Points: [Normal Stress \(psf\)](#), [Shear Stress \(psf\)](#)

Data Point: (-10000, 0)

Data Point: (0, 0)

Data Point: (10000, 6494)

Estimation Properties

Intact Rock Param.: 10

Geological Strength: 100

Disturbance Factor: 0

SigmaC: 600000 psf

Sigma3: 300000 psf

Num. Points: 20

Unit Weight Functions

Marsh

Model: [Spline Data Point Function](#)

Function: [Unit Weight vs. X](#)

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 81

Data Points: [X \(ft\)](#), [Unit Weight \(pcf\)](#)

Data Point: (175, 81)

Data Point: (200, 82)

Data Point: (222.4, 81)

Lacustrine

Model: [Spline Data Point Function](#)

Function: [Unit Weight vs. X](#)

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 101

Data Points: [X \(ft\)](#), [Unit Weight \(pcf\)](#)

Data Point: (175, 101)

Data Point: (200, 103)

Data Point: (222.4, 101)

Lacustrine 2

Model: [Spline Data Point Function](#)

Function: [Unit Weight vs. X](#)

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 111

Data Points: X (ft), Unit Weight (pcf)

Data Point: (175, 111)

Data Point: (200, 103)

Data Point: (222.4, 111)

Spatial Functions

Lacustrine 1

Model: Linear Interpolation

Limit Range By: Data Values

Data Points: X (ft), Y (ft), Cohesion (psf)

Data Point: (200, -17, 200)

Data Point: (200, -25, 286)

Data Point: (222.5, -16, 200)

Data Point: (222.5, -25, 200)

Data Point: (175, -17, 200)

Data Point: (175, -25, 200)

Bay Sound

Model: Linear Interpolation

Limit Range By: Data Values

Data Points: X (ft), Y (ft), Cohesion (psf)

Data Point: (200, -41, 500)

Data Point: (200, -70, 770)

Data Point: (222.4, -43, 500)

Data Point: (222.4, -70, 770)

Data Point: (175, -41, 500)

Data Point: (175, -70, 770)

Data Point: (310, -43, 500)

Data Point: (310, -70, 770)

Data Point: (110, -41, 500)

Data Point: (110, -70, 770)

Lacustrine 2

Model: Linear Interpolation

Limit Range By: Data Values

Data Points: X (ft), Y (ft), Cohesion (psf)

Data Point: (200, -31, 350)

Data Point: (200, -25, 286)

Data Point: (222.5, -25, 200)

Data Point: (222.5, -33, 280)

Data Point: (175, -31, 280)

Data Point: (175, -25, 200)

Regions

	Material	Points	Area (ft²)
Region 1	BEACH SAND, EL. -31/-33 TO -41/-43	9,52,49,48,6,35,37,33,40,34	2000
Region 2	EMBANKMENT FILL2, EL. -6.5 TO -10 (Protected)	4,5,20,3,21,41,42	304.025
Region 3	BAY SOUND CLAY, EL. -41/-43 TO -70	52,49,48,6,7,51,59,53,8,9	5602.5
Region 4	EMBANKMENT FILL1, EL. +0.5 TO -4	46,27,43,25,19,50	89.383352
Region 5	Concrete (no Strength/Unit weight)	23,45,26,28,30,11,14,13,29,27,46,24,54,2	52.525
Region 6	MARSH, EL. -10 TO -16 (protected)	18,39,10,1,16	585
Region 7	LACUSTRINE1, EL. -16 TO -25 (protected)	57,10,39,56	520
Region 8	FILL2, EL. -4 TO -8	45,23,2,15,18,44,47	86.263875
Region 9	FILL2, EL. -4 TO -8	15,2,54,24,46,50,3,20	106.43639
Region 10	MARSH, EL. -8/-10 TO -16/-17	32,15,20,17	168.75
Region 11	LACUSTRINE 1, EL. -17 TO -25	60,32,17,55	191.25
Region 12	MARSH, EL. -10 TO -16 (protected)	38,17,20,5	525
Region 13	LACUSTRINE1, EL. -16 TO -25 (protected)	55,17,38,58	787.5
Region 14	EMBANKMENT FILL2, EL. -6.5 TO -10 (Protected)	16,44,18	2.25
Region 15	MARSH, EL. -8/-10 TO -16/-17	39,18,15,32	225
Region 16	LACUSTRINE 1, EL. -17 TO -25	56,39,32,60	200
Region 17	EMBANKMENT FILL1, EL. +0.5 TO -4	47,22,31,36,26,45	33.016163
Region 18	LACUSTRINE2, EL. -25 TO -33 (protected)	57,56,40,34	390
Region 19	LACUSTRINE2, EL. -25 TO -33 (protected)	55,58,35,37	700
Region 20		13,29,27,43	10.044502
Region 21		26,36,61,30,28	15.305224
Region 22	LACUSTRINE 2, EL. -25 to -31	56,60,55,37,33,40	307.5

Points

	X (ft)	Y (ft)
Point 1	110	-8
Point 2	200	-5.5
Point 3	222.5	-6.5
Point 4	310	-6.5
Point 5	310	-10
Point 6	310	-43
Point 7	310	-70

Point 8	110	-70
Point 9	110	-41
Point 10	110	-17
Point 11	200	12.5
Point 12	200	-35.5
Point 13	202	2.8
Point 14	201.5	12.5
Point 15	200	-8
Point 16	172	-8
Point 17	222.5	-16
Point 18	175	-8
Point 19	222.4	-1.6
Point 20	222.5	-10
Point 21	241.4	-6.5
Point 22	183	-2.5
Point 23	195	-5.5
Point 24	204	-5.5
Point 25	207.9	2.4
Point 26	195	-3
Point 27	204	-3
Point 28	200	-3
Point 29	202.5	-3
Point 30	200	0.5
Point 31	187.5	-1.7
Point 32	200	-17
Point 33	200	-31
Point 34	110	-31
Point 35	310	-33
Point 36	195	-0.37791
Point 37	222.5	-33
Point 38	310	-16
Point 39	175	-17
Point 40	175	-31
Point 41	249.4	-7
Point 42	250.3	-6.5
Point 43	204.00118	2.69108
Point 44	175	-6.5
Point 45	195	-4
Point 46	204	-4
Point 47	179.9889	-4
Point 48	222.5	-43
Point 49	200	-41
Point 50	222.44911	-4
Point 51	222.5	-70
Point 52	175	-41
Point 53	175	-70
Point 54	201	-5.5
Point 55	222.5	-25

Point 56	175	-25
Point 57	110	-25
Point 58	310	-25
Point 59	200	-70
Point 60	200	-25
Point 61	197.15233	0

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.84	(191.383, -3)	20.7188	(213.95, 0.731087)	(166.32, -8)
2	4590	1.92	(191.383, -3)	21.252	(216.333, 0.0735632)	(166.919, -8)

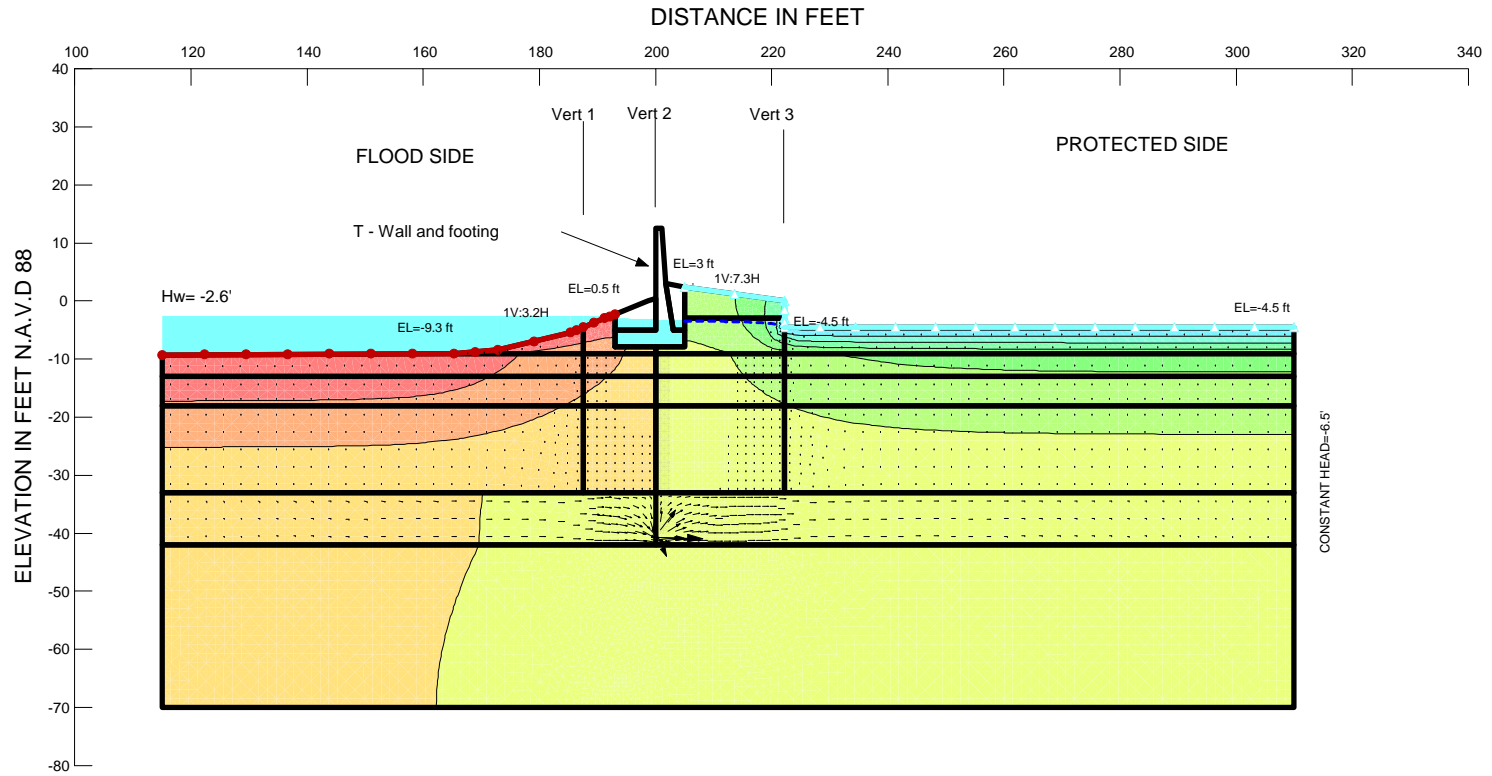
Slices of Slip Surface: Optimized

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	167.1567	-8.673245	365.98319	498.01863	0	175
2	Optimized	168.83095	-10.019735	421.23533	612.656	0	175
3	Optimized	170.83405	-11.557395	473.42541	734.37262	0	175
4	Optimized	172.38395	-12.70646	514.67976	848.83088	0	175
5	Optimized	173.88395	-13.60717	544.99066	920.18897	0	175
6	Optimized	175.72415	-14.62297	581.75859	1035.9985	0	175.72
7	Optimized	177.33345	-15.310435	605.76139	1083.0752	0	177.33
8	Optimized	179.10375	-15.88588	624.83246	1160.3264	0	179.1
9	Optimized	181.00005	-16.50229	647.02532	1249.7525	0	181
10	Optimized	182.5056	-16.84563	658.46538	1260.319	0	182.51
11	Optimized	183.75	-16.882505	654.73945	1295.8982	0	183.75
12	Optimized	185.25	-16.926955	650.99443	1329.2836	0	185.25
13	Optimized	186.75	-16.971405	647.78917	1362.6023	0	186.75
14	Optimized	187.60745	-16.996815	646.08234	1381.6645	0	187.61
15	Optimized	187.7267	-17.00035	645.90085	1384.8954	0	200
16	Optimized	188.4895	-16.896125	637.72262	1359.4972	0	188.49
17	Optimized	189.98895	-16.68733	621.30467	1371.6712	0	189.99
18	Optimized	191.48585	-16.478885	605.47795	1383.7133	0	191.49
19	Optimized	192.9257	-16.27883	590.67997	1395.4898	0	192.93
20	Optimized	194.30855	-16.087165	576.87693	1406.7356	0	194.31
21	Optimized	195.03735	-15.986155	569.95658	877.59282	0	195.04
22	Optimized	195.4558	-15.961095	567.86916	889.39922	0	195.46
23	Optimized	196.4946	-15.93963	565.06495	895.98487	0	196.49
24	Optimized	197.86425	-15.936345	563.69435	896.16874	0	197.86
25	Optimized	199.2881	-15.93293	562.61277	896.37944	0	199.29
26	Optimized	200.5	-15.93002	472.57858	896.99731	0	199.44
27	Optimized	201.25	-15.92822	472.39868	897.49749	0	198.6
28	Optimized	201.75	-15.92702	472.27868	897.77749	0	198.05
29	Optimized	202.25	-15.92582	472.15868	898.03749	0	197.49
30	Optimized	203.2442	-15.923435	471.91526	898.66866	0	196.38
31	Optimized	203.9942	-15.915565	471.35862	740.19615	0	195.54
32	Optimized	204.0006	-15.90886	470.94212	1269.1771	0	195.54

33	Optimized	204.3492	-15.542545	448.06913	1530.4753	0	195.15
34	Optimized	205.33725	-14.41413	377.60493	1412.359	0	194.04
35	Optimized	206.6174	-12.888685	282.33622	1288.3771	0	192.61
36	Optimized	207.57875	-11.701635	208.20064	1171.2108	0	191.54
37	Optimized	208.52755	-10.44848	129.92066	1058.2476	0	190.48
38	Optimized	209.4674	-9.2444785	54.713054	960.65622	0	189.43
39	Optimized	210.605	-7.8779405	-30.665444	724.61802	0	340
40	Optimized	212.25555	-5.895207	-154.50946	500.88339	0	340
41	Optimized	213.5153	-4.45192	-244.64515	321.84148	0	340

Slices of Slip Surface: 4590

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	4590	167.7661	-8.539462	359.94142	457.2996	0	175
2	4590	169.45965	-9.618387	402.54496	547.4966	0	175
3	4590	171.1532	-10.69731	434.84995	637.68364	0	175
4	4590	172.75	-11.714575	465.09091	743.64617	0	175
5	4590	174.25	-12.67018	496.79118	848.39536	0	175
6	4590	175.8315	-13.677695	533.12749	959.34548	0	175.83
7	4590	177.49445	-14.737125	574.86683	1076.6011	0	177.49
8	4590	179.1574	-15.79655	619.75057	1194.0088	0	179.16
9	4590	180.74445	-16.329795	639.11001	1172.3778	0	180.74
10	4590	182.25	-16.33333	631.62	1206.3333	0	182.25
11	4590	183.75	-16.33333	624.36	1244.6	0	183.75
12	4590	185.25	-16.33333	617.85333	1274.2	0	185.25
13	4590	186.75	-16.33333	611.89333	1303.8	0	186.75
14	4590	188.25	-16.33333	606.56667	1333.3333	0	188.25
15	4590	189.75	-16.33333	601.86667	1362.6667	0	189.75
16	4590	191.25	-16.33333	597.68667	1392	0	191.25
17	4590	192.75	-16.33333	594.22	1421.4	0	192.75
18	4590	194.25	-16.33333	591.18667	1450.7333	0	194.25
19	4590	196.07615	-16.33333	588.52499	927.04186	0	196.08
20	4590	197.86425	-16.33333	586.76743	927.63558	0	197.86
21	4590	199.2881	-16.33333	585.91761	928.19744	0	199.29
22	4590	200.5	-16.33333	497.72	929.01	0	199.44
23	4590	201.25	-16.33333	497.66	929.66	0	198.6
24	4590	201.75	-16.33333	497.62	930.04	0	198.05
25	4590	202.25	-16.33333	497.56	930.38	0	197.49
26	4590	203.25	-16.33333	497.47333	931.2	0	196.37
27	4590	204.0006	-16.33274	497.37172	1328.402	0	195.54
28	4590	204.9759	-15.357445	436.47135	1541.8868	0	194.45
29	4590	206.9253	-13.408035	314.69972	1377.7521	0	192.27
30	4590	208.75665	-11.5767	200.28288	1205.9814	0	190.23
31	4590	210.4699	-9.8634365	93.22624	1026.4462	0	188.31
32	4590	212.161	-8.1723355	-12.440318	764.54446	0	340
33	4590	213.82995	-6.503401	-116.69207	563.9707	0	340
34	4590	215.49885	-4.834467	-220.92348	348.90682	0	340



Name: BEACH SAND, EL. -33 TO -42 Model: Saturated Only K-Sat: 0.00049 ft/sec K-Ratio: 1
 Name: BAY SOUND CLAY, EL. -42 TO -70 Model: Saturated Only K-Sat: 3.28e-008 ft/sec K-Ratio: 1
 Name: Sheet Pile Model: Saturated Only K-Sat: 1e-010 ft/sec K-Ratio: 1
 Name: EMBANKMENT FILL, EL. +2.5 TO -9.0 Model: Saturated Only K-Sat: 3.28e-008 ft/sec K-Ratio: 1
 Name: MARSH, EL. -9.0 TO -18.0 Model: Saturated Only K-Sat: 3.28e-007 ft/sec K-Ratio: 1
 Name: LACUSTRINE, EL. -18.0 TO -33.0 Model: Saturated Only K-Sat: 3.28e-007 ft/sec K-Ratio: 1

GENERAL NOTES

CLASSIFICATION STRATIFICATION
 SHEAR STRENGTHS AND UNIT WEIGHTS OF
 THE SOIL WERE BASED ON THE RESULTS OF
 UNDISTURBED BORINGS AND CPT DATA. SEE
 BOTH BORING AND CPT DATA PLATES.

WHERE INDICATED, SHEAR STRENGTHS BETWEEN
 VERTICALS WERE ASSUMED TO VARY LINEARLY
 BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

Hw IS CANAL WATER LEVEL

LAKE PONTCHARTRAIN, LA. AND VICINITY
 HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 9,
 PROTECTED SIDE STABILITY ANALYSIS,
 CASE: LWL Q Case (seepage)
 STA. 65+00 TO 90+27 WEST
 ORLEANS PARISH, LOUISIANA

LWL Q Case (seepage)

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File Information

Created By: [Moraille, Jacques](#)
Revision Number: [609](#)
Last Edited By: [Jamerson, James MVK](#)
Date: [6/14/2013](#)
Time: [2:45:01 PM](#)
File Name: [Reach 9.gsz](#)
Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix E LWL\](#)
Last Solved Date: [6/14/2013](#)
Last Solved Time: [2:45:44 PM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Mass(M) Units: [lbs](#)
Mass Flux Units: [lbs/sec](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

LWL Q Case (seepage)

Kind: [SEEP/W](#)
Method: [Steady-State](#)
Settings
 Include Air Flow: [No](#)
Control
 Apply Runoff: [No](#)
Convergence
 Convergence Type: [Head Vector Norm](#)
 Maximum Number of Iterations: [500](#)
 Tolerance: [0.001](#)
 Maximum Change in K: [0.1](#)
 Rate of Change in K: [1.02](#)
 Minimum Change in K: [1e-005](#)
 Equation Solver: [Parallel Direct](#)
 Potential Seepage Max # of Reviews: [10](#)
Time

Starting Time: 0 sec

Duration: 0 sec

Ending Time: 0 sec

Materials

BEACH SAND, EL. -33 TO -42

Model: Saturated Only

Hydraulic

K-Sat: 0.00049 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

BAY SOUND CLAY, EL. -42 TO -70

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-008 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

Sheet Pile

Model: Saturated Only

Hydraulic

K-Sat: 1e-010 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

EMBANKMENT FILL, EL. +2.5 TO -9.0

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-008 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

MARSH, EL. -9.0 TO -18.0

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-007 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

LACUSTRINE, EL. -18.0 TO -33.0

Model: Saturated Only
Hydraulic
K-Sat: 3.28e-007 ft/sec
Volumetric Water Content: 0 ft³/ft³
Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

Boundary Conditions

Potential Seepage Face

Review: true
Type: Total Flux (Q) 0

Extreme Low Water Surface -2.6ft

Type: Head (H) -2.6

Regions

	Material	Points	Area (ft²)
Region 1	BEACH SAND, EL. -33 TO -42	9,53,51,54,6,39,42,37,46,38	1755
Region 2	EMBANKMENT FILL, EL. +2.5 TO -9.0	4,5,21,3,22	395.1
Region 3	BAY SOUND CLAY, EL. -42 TO -70	8,9,53,51,54,6,7,55,52,56	5460
Region 4	EMBANKMENT FILL, EL. +2.5 TO -9.0	27,26,20,41	71.847238
Region 5		24,28,30,32,11,14,13,31,29,25,17,2	66.06
Region 6	MARSH, EL. -9.0 TO -18.0	19,40,1,50,49	282.44782
Region 7	LACUSTRINE, EL. -18.0 TO -33.0	38,10,45,46	1087.5
Region 8	EMBANKMENT FILL, EL. +2.5 TO -9.0	34,35,33,28,24,2,15,19	39.088126
Region 9	EMBANKMENT FILL, EL. +2.5 TO -9.0	15,2,17,25,29,27,41,3,21	109.05
Region 10	MARSH, EL. -9.0 TO -18.0	48,15,21,47	88.8
Region 11	LACUSTRINE, EL. -18.0 TO -33.0	37,36,18,42	333
Region 12	MARSH, EL. -9.0 TO -18.0	43,47,21,5	351.2
Region 13	MARSH, EL. -9.0 TO -18.0	18,47,43,44	439
Region 14	LACUSTRINE, EL. -18.0 TO -33.0	42,18,44,39	1317
Region 15	EMBANKMENT FILL, EL. +2.5 TO -9.0	40,16,23,34,19	37.395648
Region 16	MARSH, EL. -9.0 TO -18.0	49,19,15,48	50
Region 17	LACUSTRINE, EL. -18.0 TO -33.0	46,45,36,37	187.5
Region 18	MARSH, EL. -9.0 TO -18.0	45,49,48,36	62.5
Region 19	MARSH, EL. -9.0 TO -18.0	36,48,47,18	111
Region 20	MARSH, EL. -9.0 TO -18.0	10,45,49,50	362.5
Region 21		28,33,57,32,30	28.821698
Region 22		31,13,26,27,29	20.134645

Lines

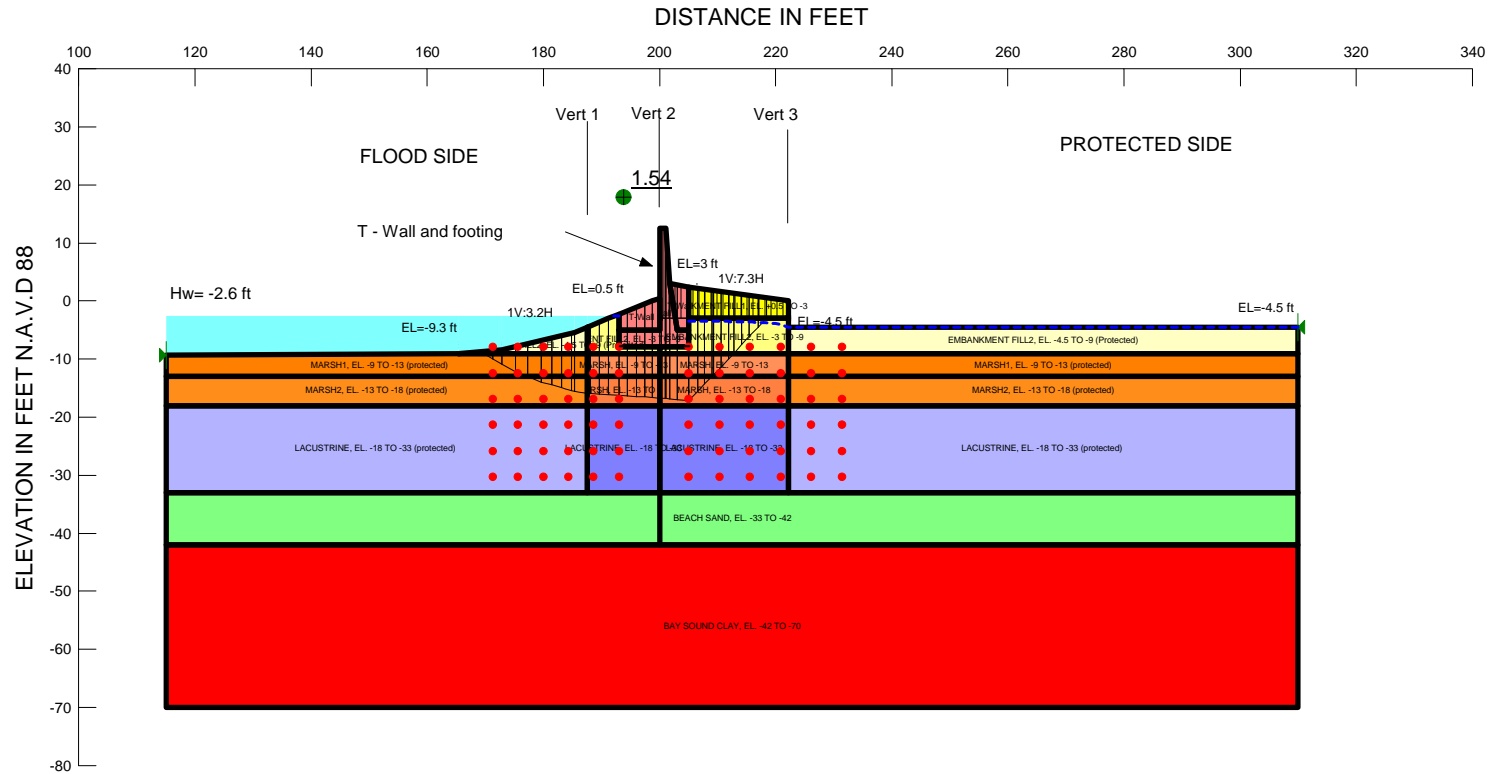
	Start Point	End Point	Right Side Material	Left Side Material	Hydraulic Boundary
Line 1	17	2	Sheet Pile	Sheet Pile	
Line 2	5	4			
Line 3	17	25			
Line 4	24	2			
Line 5	2	15		Sheet Pile	
Line 6	28	30			
Line 7	11	14			
Line 8	14	13			
Line 9	27	26			
Line 10	26	20			Potential Seepage Face
Line 11	4	22			Potential Seepage Face
Line 12	29	31			
Line 13	31	13			
Line 14	36	37		Sheet Pile	
Line 15	37	12		Sheet Pile	
Line 16	38	9			
Line 17	6	39			
Line 18	15	19			
Line 19	19	40			
Line 20	40	1			Extreme Low Water Surface -2.6ft
Line 21	38	10			
Line 22	35	33			Extreme Low Water Surface -2.6ft
Line 23	34	35			Extreme Low Water Surface -2.6ft
Line 24	41	20			Potential Seepage Face
Line 25	41	27			
Line 26	29	27			
Line 27	41	3			Potential Seepage Face
Line 28	3	21			
Line 29	21	15			
Line 30	3	22			Potential Seepage Face
Line 31	39	42			
Line 32	42	37			
Line 33	18	36			
Line 34	18	42			
Line 35	5	21			
Line 36	5	43			
Line 37	43	44			
Line 38	44	18			
Line 39	44	39			
Line 40	10	45			
Line 41	37	46			
Line 42	46	38			
Line 43	19	34			
Line 44	40	16			Extreme Low Water Surface -2.6ft

Line 45	16	23			Extreme Low Water Surface -2.6ft
Line 46	23	34			Extreme Low Water Surface -2.6ft
Line 47	45	46			
Line 48	36	45			
Line 49	18	47			
Line 50	47	21			
Line 51	43	47			
Line 52	8	9			
Line 53	6	7			
Line 54	15	48		Sheet Pile	
Line 55	45	49			
Line 56	49	19			
Line 57	48	49			
Line 58	47	48			
Line 59	48	36		Sheet Pile	
Line 60	1	50			
Line 61	50	49			
Line 62	50	10			
Line 63	12	51			
Line 64	13	26			
Line 65	28	24			
Line 66	25	29			
Line 67	30	32			
Line 68	32	11			
Line 69	51	53			
Line 70	53	9			
Line 71	6	54			
Line 72	54	51			
Line 73	52	55			
Line 74	55	7			
Line 75	8	56			
Line 76	56	52			
Line 77	33	57			
Line 78	57	32			
Line 79	33	28			

Points

	X (ft)	Y (ft)
Point 1	115	-9.3
Point 2	200	-7.83
Point 3	222.2	-4.5
Point 4	310	-4.5
Point 5	310	-9
Point 6	310	-42
Point 7	310	-70
Point 8	115	-70
Point 9	115	-42

Point 10	115	-18
Point 11	200	12.5
Point 12	200	-40
Point 13	201.7	3
Point 14	201.1	12.5
Point 15	200	-9
Point 16	172.8	-8.4
Point 17	201	-7.83
Point 18	222.2	-18
Point 19	187.5	-9
Point 20	222.2	0
Point 21	222.2	-9
Point 22	234.4	-4.5
Point 23	185.3	-5.4
Point 24	193	-7.83
Point 25	205	-7.83
Point 26	205	2.35433
Point 27	205	-3
Point 28	193	-5
Point 29	205	-5
Point 30	200	-5
Point 31	203	-5
Point 32	200	0.5
Point 33	193	-2.26523
Point 34	187.5	-4.5
Point 35	191.18941	-3
Point 36	200	-18
Point 37	200	-33
Point 38	115	-33
Point 39	310	-33
Point 40	165.34784	-9
Point 41	222.2	-3
Point 42	222.2	-33
Point 43	310	-13
Point 44	310	-18
Point 45	187.5	-18
Point 46	187.5	-33
Point 47	222.2	-13
Point 48	200	-13
Point 49	187.5	-13
Point 50	115	-13
Point 51	200	-42
Point 52	200	-70
Point 53	187.5	-42
Point 54	222.2	-42
Point 55	222.2	-70
Point 56	187.5	-70
Point 57	198.73428	0



Name: EMBANKMENT FILL2, EL. -3 TO -9 Model: Undrained (Phi=0) Unit Weight: 96 pcf Cohesion: 250 psf
Name: BEACH SAND, EL. -33 TO -42 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand
Name: BAY SOUND CLAY, EL. -42 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 102 pcf Cohesion Spatial Fn: Bay Sound Phi: 0 °
Name: MARSH, EL. -9 TO -13 Model: Spatial Mohr-Coulomb Weight Fn: Marsh Cohesion Fn: Marsh Phi: 0 °
Name: EMBANKMENT FILL1, EL. +0.5 TO -3 Model: Undrained (Phi=0) Unit Weight: 109 pcf Cohesion: 600 psf
Name: MARSH1, EL. -9 TO -13 (protected) Model: Undrained (Phi=0) Unit Weight: 81 pcf Cohesion: 150 psf
Name: EMBANKMENT FILL2, EL. -4.5 TO -9 (Protected) Model: Undrained (Phi=0) Unit Weight: 96 pcf Cohesion: 250 psf
Name: MARSH2, EL. -13 TO -18 (protected) Model: Undrained (Phi=0) Unit Weight: 98 pcf Cohesion: 150 psf
Name: LACUSTRINE, EL. -18 TO -33 (protected) Model: Spatial Mohr-Coulomb Unit Weight: 100 pcf Cohesion Fn: Lacustrine Phi: 0 °
Name: LACUSTRINE, EL. -18 TO -33 Model: Spatial Mohr-Coulomb Weight Fn: Lacustrine 2 Cohesion Spatial Fn: Lacustrine Phi: 0 °
Name: MARSH, EL. -13 TO -18 Model: Spatial Mohr-Coulomb Weight Fn: Marsh (2) Cohesion Fn: Marsh Phi: 0 °
Name: T-Wall Model: Mohr-Coulomb Unit Weight: 0.1 pcf Cohesion: 1e+014 psf Phi: 0 °

GENERAL NOTES

CLASSIFICATION STRATIFICATION
SHEAR STRENGTHS AND UNIT WEIGHTS OF
THE SOIL WERE BASED ON THE RESULTS OF
UNDISTURBED BORINGS AND CPT DATA. SEE
BOTH BORING AND CPT DATA PLATES.

WHERE INDICATED, SHEAR STRENGTHS BETWEEN
VERTICALS WERE ASSUMED TO VARY LINEARLY
BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

Hw IS CANAL WATER LEVEL

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 9,
PROTECTED SIDE STABILITY ANALYSIS,
CASE: LWL Q Case (Block)
STA. 65+00 TO 90+27 WEST
ORLEANS PARISH, LOUISIANA

LWL Q Case (Block)

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File Information

Created By: [Moraille, Jacques](#)
Revision Number: [609](#)
Last Edited By: [Jamerson, James MVK](#)
Date: [6/14/2013](#)
Time: [2:45:01 PM](#)
File Name: [Reach 9.gsz](#)
Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix E LWL\](#)
Last Solved Date: [6/14/2013](#)
Last Solved Time: [2:46:26 PM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Strength Units: [psf](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

LWL Q Case (Block)

Kind: [SLOPE/W](#)
Parent: [LWL Q Case \(seepage\)](#)
Method: [Spencer](#)
Settings
 PWP Conditions Source: [Parent Analysis](#)
Slip Surface
 Direction of movement: [Right to Left](#)
 Use Passive Mode: [No](#)
 Slip Surface Option: [Block](#)
 Critical slip surfaces saved: [1](#)
 Optimize Critical Slip Surface Location: [Yes](#)
 Tension Crack
 Tension Crack Option: [Tension Crack Line](#)
 Percentage Wet: [1](#)
 Tension Crack Fluid Unit Weight: [62.4 pcf](#)
FOS Distribution
 FOS Calculation Option: [Constant](#)

Restrict Block Crossing: [Yes](#)

Advanced

Number of Slices: [30](#)

Optimization Tolerance: [0.01](#)

Minimum Slip Surface Depth: [0.1 ft](#)

Optimization Maximum Iterations: [2000](#)

Optimization Convergence Tolerance: [1e-007](#)

Starting Optimization Points: [8](#)

Ending Optimization Points: [16](#)

Complete Passes per Insertion: [1](#)

Driving Side Maximum Convex Angle: [5 °](#)

Resisting Side Maximum Convex Angle: [1 °](#)

Materials

EMBANKMENT FILL2, EL. -3 TO -9

Model: [Undrained \(Phi=0\)](#)

Unit Weight: [96 pcf](#)

Cohesion: [250 psf](#)

BEACH SAND, EL. -33 TO -42

Model: [Shear/Normal Fn.](#)

Unit Weight: [122 pcf](#)

Strength Function: [Sand](#)

Phi-B: [0 °](#)

BAY SOUND CLAY, EL. -42 TO -70

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [102 pcf](#)

Cohesion Spatial Fn: [Bay Sound](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

MARSH, EL. -9 TO -13

Model: [Spatial Mohr-Coulomb](#)

Weight Fn: [Marsh](#)

Cohesion Fn: [Marsh](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

EMBANKMENT FILL1, EL. +0.5 TO -3

Model: [Undrained \(Phi=0\)](#)

Unit Weight: [109 pcf](#)

Cohesion: [600 psf](#)

MARSH1, EL. -9 TO -13 (protected)

Model: [Undrained \(Phi=0\)](#)

Unit Weight: 81 pcf

Cohesion: 150 psf

EMBANKMENT FILL2, EL. -4.5 TO -9 (Protected)

Model: Undrained (Phi=0)

Unit Weight: 96 pcf

Cohesion: 250 psf

MARSH2, EL. -13 TO -18 (protected)

Model: Undrained (Phi=0)

Unit Weight: 98 pcf

Cohesion: 150 psf

LACUSTRINE, EL. -18 TO -33 (protected)

Model: Spatial Mohr-Coulomb

Unit Weight: 100 pcf

Cohesion Fn: Lacustrine

Phi: 0 °

Phi-B: 0 °

LACUSTRINE, EL. -18 TO -33

Model: Spatial Mohr-Coulomb

Weight Fn: Lacustrine 2

Cohesion Spatial Fn: Lacustrine

Phi: 0 °

Phi-B: 0 °

MARSH, EL. -13 TO -18

Model: Spatial Mohr-Coulomb

Weight Fn: Marsh (2)

Cohesion Fn: Marsh

Phi: 0 °

Phi-B: 0 °

T-Wall

Model: Mohr-Coulomb

Unit Weight: 0.1 pcf

Cohesion: 1e+014 psf

Phi: 0 °

Phi-B: 0 °

Slip Surface Limits

Left Coordinate: (115, -9.3) ft

Right Coordinate: (310, -4.5) ft

Slip Surface Block

Left Grid

Upper Left: (171.3, -7.9) ft
Lower Left: (171.3, -30.3) ft
Lower Right: (193, -30.3) ft
X Increments: 5
Y Increments: 5
Starting Angle: 135 °
Ending Angle: 180 °
Angle Increments: 2

Right Grid

Upper Left: (205, -7.9) ft
Lower Left: (205, -30.3) ft
Lower Right: (231.4, -30.3) ft
X Increments: 5
Y Increments: 5
Starting Angle: 45 °
Ending Angle: 65 °
Angle Increments: 2

Tension Crack Line

	X (ft)	Y (ft)
	200	-3
	222.2	-3

Cohesion Functions

Marsh

Model: Spline Data Point Function

Function: Cohesion vs. X

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 150

Data Points: X (ft), Cohesion (psf)

Data Point: (187.5, 150)

Data Point: (200, 200)

Data Point: (222.2, 150)

Lacustrine

Model: Spline Data Point Function

Function: Cohesion vs. Y

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 150

Data Points: Y (ft), Cohesion (psf)

Data Point: (-33, 250)

Data Point: (-18, 150)

Shear/Normal Strength Functions

Sand

Model: [Spline Data Point Function](#)

Function: [Shear Stress vs. Normal Stress](#)

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 0

Data Points: [Normal Stress \(psf\)](#), [Shear Stress \(psf\)](#)

Data Point: (-10000, 0)

Data Point: (0, 0)

Data Point: (10000, 6494)

Estimation Properties

Intact Rock Param.: 10

Geological Strength: 100

Disturbance Factor: 0

SigmaC: 600000 psf

Sigma3: 300000 psf

Num. Points: 20

Unit Weight Functions

Marsh

Model: [Spline Data Point Function](#)

Function: [Unit Weight vs. X](#)

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 81

Data Points: [X \(ft\)](#), [Unit Weight \(pcf\)](#)

Data Point: (187.5, 81)

Data Point: (200, 82)

Data Point: (222.2, 81)

Marsh (2)

Model: [Spline Data Point Function](#)

Function: [Unit Weight vs. X](#)

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 98

Data Points: [X \(ft\)](#), [Unit Weight \(pcf\)](#)

Data Point: (187.5, 98)

Data Point: (200, 82)

Data Point: (222.2, 98)

Lacustrine 2

Model: [Spline Data Point Function](#)

Function: [Unit Weight vs. X](#)

Curve Fit to Data: [100 %](#)

Segment Curvature: [0 %](#)

Y-Intercept: [100](#)

Data Points: [X \(ft\)](#), [Unit Weight \(pcf\)](#)

Data Point: [\(187.5, 100\)](#)

Data Point: [\(200, 98\)](#)

Data Point: [\(222, 100\)](#)

Spatial Functions

Lacustrine

Model: [Linear Interpolation](#)

Limit Range By: [Data Values](#)

Data Points: [X \(ft\)](#), [Y \(ft\)](#), [Cohesion \(psf\)](#)

Data Point: [\(200, -18, 200\)](#)

Data Point: [\(200, -33, 350\)](#)

Data Point: [\(222.2, -18, 150\)](#)

Data Point: [\(222.2, -33, 250\)](#)

Data Point: [\(187.5, -18, 150\)](#)

Data Point: [\(187.5, -33, 250\)](#)

Bay Sound

Model: [Linear Interpolation](#)

Limit Range By: [Data Values](#)

Data Points: [X \(ft\)](#), [Y \(ft\)](#), [Cohesion \(psf\)](#)

Data Point: [\(200, -42, 420\)](#)

Data Point: [\(200, -70, 690\)](#)

Data Point: [\(222.2, -42, 370\)](#)

Data Point: [\(222.2, -70, 610\)](#)

Data Point: [\(187.5, -42, 370\)](#)

Data Point: [\(187.5, -70, 610\)](#)

Data Point: [\(310, -42, 370\)](#)

Data Point: [\(310, -70, 610\)](#)

Data Point: [\(115, -42, 370\)](#)

Data Point: [\(115, -70, 610\)](#)

Regions

	Material	Points	Area (ft²)
Region 1	BEACH SAND, EL. -33 TO -42	9,53,51,54,6,39,42,37,46,38	1755
Region 2	EMBANKMENT FILL2, EL. -4.5 TO -9 (Protected)	4,5,21,3,22	395.1
Region 3	BAY SOUND CLAY, EL. -42 TO -70	8,9,53,51,54,6,7,55,52,56	5460
Region 4	EMBANKMENT FILL1, EL. +0.5 TO -3	27,26,20,41	71.847238
Region 5	T-Wall	24,28,30,32,11,14,13,31,29,25,17,2	66.06
Region 6	MARSH1, EL. -9 TO -13 (protected)	19,40,1,50,49	282.44782

Region 7	LACUSTRINE, EL. -18 TO -33 (protected)	38,10,45,46	1087.5
Region 8	EMBANKMENT FILL2, EL. -3 TO -9	34,35,33,28,24,2,15,19	39.088126
Region 9	EMBANKMENT FILL2, EL. -3 TO -9	15,2,17,25,29,27,41,3,21	109.05
Region 10	MARSH, EL. -9 TO -13	48,15,21,47	88.8
Region 11	LACUSTRINE, EL. -18 TO -33	37,36,18,42	333
Region 12	MARSH1, EL. -9 TO -13 (protected)	43,47,21,5	351.2
Region 13	MARSH2, EL. -13 TO -18 (protected)	18,47,43,44	439
Region 14	LACUSTRINE, EL. -18 TO -33 (protected)	42,18,44,39	1317
Region 15	EMBANKMENT FILL2, EL. -4.5 TO -9 (Protected)	40,16,23,34,19	37.395648
Region 16	MARSH, EL. -9 TO -13	49,19,15,48	50
Region 17	LACUSTRINE, EL. -18 TO -33	46,45,36,37	187.5
Region 18	MARSH, EL. -13 TO -18	45,49,48,36	62.5
Region 19	MARSH, EL. -13 TO -18	36,48,47,18	111
Region 20	MARSH2, EL. -13 TO -18 (protected)	10,45,49,50	362.5
Region 21	T-Wall	28,33,57,32,30	28.821698
Region 22	T-Wall	31,13,26,27,29	20.134645

Points

	X (ft)	Y (ft)
Point 1	115	-9.3
Point 2	200	-7.83
Point 3	222.2	-4.5
Point 4	310	-4.5
Point 5	310	-9
Point 6	310	-42
Point 7	310	-70
Point 8	115	-70
Point 9	115	-42
Point 10	115	-18
Point 11	200	12.5
Point 12	200	-40
Point 13	201.7	3
Point 14	201.1	12.5
Point 15	200	-9
Point 16	172.8	-8.4
Point 17	201	-7.83
Point 18	222.2	-18
Point 19	187.5	-9
Point 20	222.2	0
Point 21	222.2	-9
Point 22	234.4	-4.5
Point 23	185.3	-5.4
Point 24	193	-7.83
Point 25	205	-7.83
Point 26	205	2.35433
Point 27	205	-3
Point 28	193	-5

Point 29	205	-5
Point 30	200	-5
Point 31	203	-5
Point 32	200	0.5
Point 33	193	-2.26523
Point 34	187.5	-4.5
Point 35	191.18941	-3
Point 36	200	-18
Point 37	200	-33
Point 38	115	-33
Point 39	310	-33
Point 40	165.34784	-9
Point 41	222.2	-3
Point 42	222.2	-33
Point 43	310	-13
Point 44	310	-18
Point 45	187.5	-18
Point 46	187.5	-33
Point 47	222.2	-13
Point 48	200	-13
Point 49	187.5	-13
Point 50	115	-13
Point 51	200	-42
Point 52	200	-70
Point 53	187.5	-42
Point 54	222.2	-42
Point 55	222.2	-70
Point 56	187.5	-70
Point 57	198.73428	0

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.54	(191.598, -1.5)	22.06799	(218.456, 0.512465)	(169.289, -8.68269)
2	829	1.69	(191.598, -1.5)	23.44	(218.86, 0.457178)	(165.344, -9.00002)

Slices of Slip Surface: Optimized

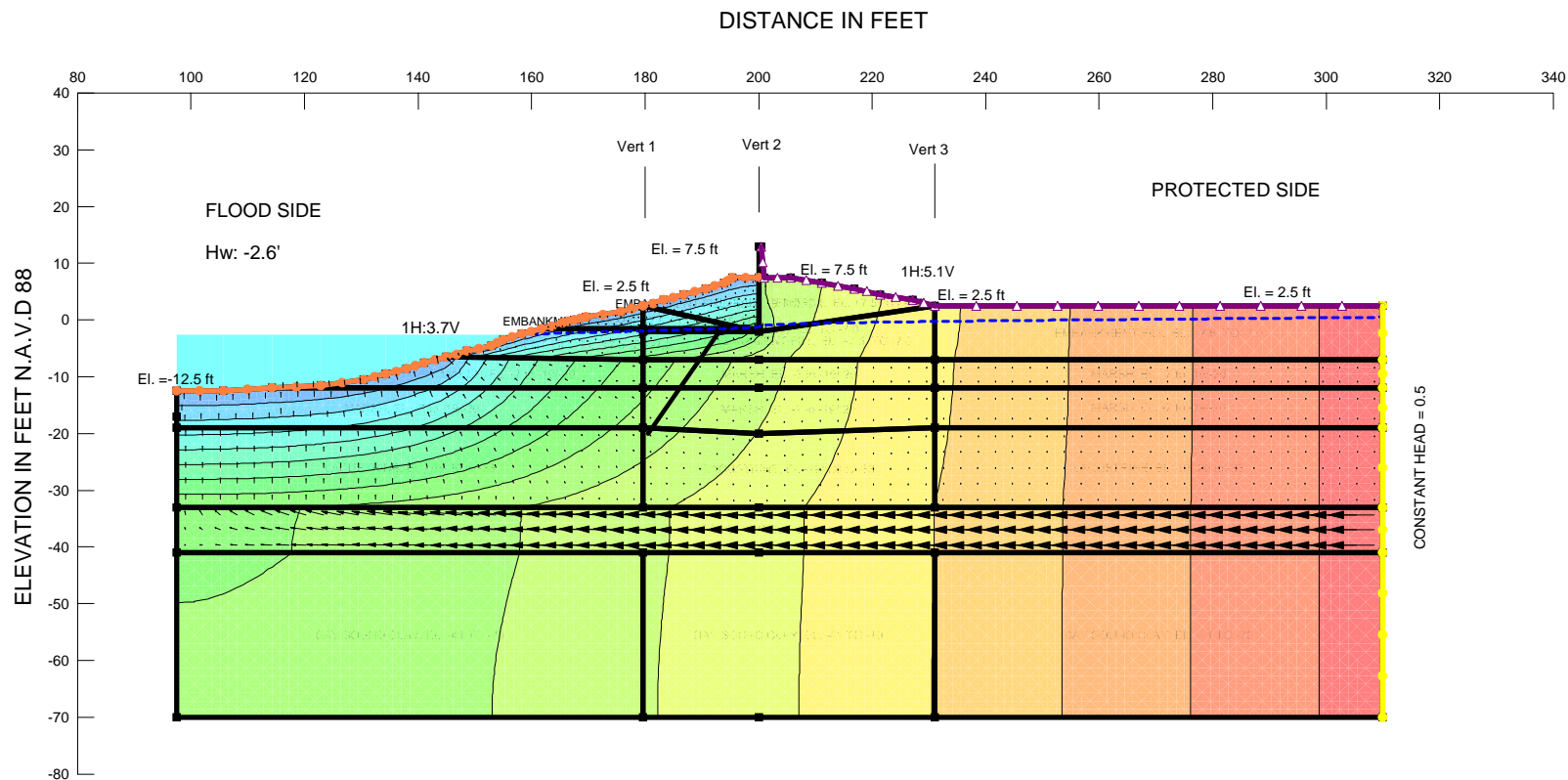
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	169.528	-8.841344	386.76886	529.85974	0	250
2	Optimized	170.5272	-9.504455	424.10421	542.81984	0	150
3	Optimized	172.04365	-10.423375	478.74373	608.76315	0	150
4	Optimized	173.9782	-11.483435	541.7329	711.55477	0	150
5	Optimized	176.221	-12.564515	606.12278	800.209	0	150
6	Optimized	178.46255	-13.48142	660.82543	902.41245	0	150
7	Optimized	180.5085	-14.210685	704.41316	973.4856	0	150
8	Optimized	182.2465	-14.70637	733.95968	1036.6731	0	150
9	Optimized	183.98455	-15.202055	763.61685	1099.8052	0	150

10	Optimized	185.0768	-15.487155	780.6621	1118.6088	0	150
11	Optimized	186.4	-15.70801	793.70239	1158.3401	0	150
12	Optimized	187.8045	-15.942435	807.58636	1199.3299	0	151.22
13	Optimized	188.8791	-16.03165	812.71869	1200.2402	0	155.52
14	Optimized	190.4193	-16.10843	816.9337	1222.677	0	161.68
15	Optimized	191.2007	-16.147385	819.08914	1233.9858	0	164.8
16	Optimized	192.106	-16.2033	822.24677	1250.0049	0	168.42
17	Optimized	193.7608	-16.30575	828.17989	751.30465	0	175.04
18	Optimized	195.28245	-16.399955	833.68972	754.19075	0	181.13
19	Optimized	196.71605	-16.49186	839.16395	757.51677	0	186.86
20	Optimized	198.06155	-16.58146	844.57743	759.96396	0	192.25
21	Optimized	199.36715	-16.668405	849.80722	762.0595	0	197.47
22	Optimized	200.1569	-16.720995	844.29137	765.39544	0	199.65
23	Optimized	200.6569	-16.75954	838.67371	772.31472	0	198.52
24	Optimized	201.05	-16.791735	840.67542	775.92221	0	197.64
25	Optimized	201.4	-16.8204	842.46263	778.65958	0	196.85
26	Optimized	202.35	-16.898205	847.31664	786.98021	0	194.71
27	Optimized	204	-17.03334	855.5855	802.51319	0	190.99
28	Optimized	205.00665	-17.115785	860.6798	1862.5848	0	188.72
29	Optimized	205.764	-16.358855	813.03672	1570.0925	0	187.02
30	Optimized	207.1483	-14.951035	724.47966	1435.1922	0	183.9
31	Optimized	208.4155	-13.650345	642.59297	1311.3434	0	181.05
32	Optimized	209.2067	-12.838195	591.45679	1233.976	0	179.26
33	Optimized	209.99385	-12.014005	539.52904	1155.5396	0	177.49
34	Optimized	211.25295	-10.68924	456.01109	1036.6425	0	174.66
35	Optimized	212.34375	-9.51343	381.84783	922.47354	0	172.2
36	Optimized	213.46785	-8.26223	301.45434	748.89695	0	250
37	Optimized	214.7935	-6.78669	204.66993	595.84066	0	250
38	Optimized	216.20625	-5.28669	105.00332	456.27067	0	250
39	Optimized	217.70615	-3.76223	2.573554	283.55012	0	250

Slices of Slip Surface: 829

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	829	165.34605	-9.0007475	399.40187	452.30958	0	150
2	829	166.27935	-9.387322	421.63309	488.7183	0	150
3	829	168.1424	-10.15902	466.31855	557.88628	0	150
4	829	170.00545	-10.930715	511.51973	627.01459	0	150
5	829	171.8685	-11.70241	556.99366	696.19249	0	150
6	829	173.90055	-12.54413	606.71767	780.86306	0	150
7	829	175.933	-13.386	656.75821	873.77741	0	150
8	829	177.7968	-14.158	702.85868	966.32534	0	150
9	829	179.6606	-14.93	749.207	1058.8237	0	150
10	829	181.52435	-15.702	795.65446	1151.3221	0	150
11	829	183.3881	-16.474	842.30021	1243.8204	0	150
12	829	184.81	-16.86	865.46939	1226.2245	0	150
13	829	186.4	-16.86	864.81818	1246.2727	0	150
14	829	188.42235	-16.86	864.04059	1268.6039	0	153.69

15	829	190.26705	-16.86	863.44429	1284.433	0	161.07
16	829	192.0947	-16.86	862.8679	1300.1287	0	168.38
17	829	193.9557	-16.86	862.44466	791.34594	0	175.82
18	829	195.86715	-16.86	862.07844	782.81828	0	183.47
19	829	197.7786	-16.86	861.81685	774.34294	0	191.11
20	829	199.36715	-16.86	861.72297	767.2708	0	197.47
21	829	200.5	-16.86	844.98	766.92	0	198.87
22	829	201.05	-16.86	844.96	768.31	0	197.64
23	829	201.4	-16.86	844.95	768.71667	0	196.85
24	829	202.35	-16.86	844.92308	770.61538	0	194.71
25	829	204	-16.86	844.75	774.75	0	190.99
26	829	205.965	-15.895	783.936	1529.4391	0	186.57
27	829	207.895	-13.965	662.48216	1347.9728	0	182.22
28	829	209.86	-12	538.70933	1165.1353	0	177.79
29	829	211.86	-10	412.56147	984.99979	0	173.29
30	829	213.86	-8	284.16148	748.43721	0	250
31	829	215.86	-6	151.74512	538.67397	0	250
32	829	217.86	-4	17.081226	318.77789	0	250



Name: BEACH SAND, EL. -33 to -41 Model: Saturated Only K-Sat: 2.3e-005 ft/sec K-Ratio: 1
 Name: Sheet Pile Model: Saturated Only K-Sat: 1e-010 ft/sec K-Ratio: 1
 Name: LACUSTRINE, EL -19/-20 to -33 Model: Saturated Only K-Sat: 3.28e-007 ft/sec K-Ratio: 1
 Name: BAY SOUND CLAY, EL. -41 TO -70 Model: Saturated Only K-Sat: 3.28e-008 ft/sec K-Ratio: 1
 Name: MARSH, EL. -7 to -19/-20 Model: Saturated Only K-Sat: 3.28e-007 ft/sec K-Ratio: 1
 Name: EMBANKMENT FILL, EL. +7.5 TO -7.0 Model: Saturated Only K-Sat: 3.28e-008 ft/sec K-Ratio: 1

GENERAL NOTES

CLASSIFICATION STRATIFICATION
 SHEAR STRENGTHS AND UNIT WEIGHTS OF
 THE SOIL WERE BASED ON THE RESULTS OF
 UNDISTURBED BORINGS AND CPT DATA. SEE
 BOTH BORING AND CPT DATA PLATES.

WHERE INDICATED, SHEAR STRENGTHS BETWEEN
 VERTICALS WERE ASSUMED TO VARY LINEARLY
 BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

Hw IS CANAL WATER LEVEL

LAKE PONTCHARTRAIN, LA. AND VICINITY
 HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 10A,
 PROTECTED SIDE STABILITY ANALYSIS,
 CASE: LWL Q Case (seepage)
 STA. 91+88 TO 93+53 WEST
 ORLEANS PARISH, LOUISIANA

LWL Q Case (seepage)

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Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix E LWL\](#)
Last Solved Date: [6/14/2013](#)
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Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Mass(M) Units: [lbs](#)
Mass Flux Units: [lbs/sec](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

LWL Q Case (seepage)

Kind: [SEEP/W](#)
Method: [Steady-State](#)
Settings
 Include Air Flow: [No](#)
Control
 Apply Runoff: [No](#)
Convergence
 Convergence Type: [Head Vector Norm](#)
 Maximum Number of Iterations: [500](#)
 Tolerance: [0.001](#)
 Maximum Change in K: [0.1](#)
 Rate of Change in K: [1.02](#)
 Minimum Change in K: [1e-005](#)
 Equation Solver: [Parallel Direct](#)
 Potential Seepage Max # of Reviews: [10](#)
Time

Starting Time: 0 sec

Duration: 0 sec

Ending Time: 0 sec

Materials

BEACH SAND, EL. -33 to -41

Model: Saturated Only

Hydraulic

K-Sat: 2.3e-005 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

Sheet Pile

Model: Saturated Only

Hydraulic

K-Sat: 1e-010 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

LACUSTRINE, EL -19/-20 to -33

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-007 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

BAY SOUND CLAY, EL. -41 TO -70

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-008 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

MARSH, EL. -7 to -19/-20

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-007 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

EMBANKMENT FILL, EL. +7.5 TO -7.0

Model: Saturated Only
Hydraulic
K-Sat: 3.28e-008 ft/sec
Volumetric Water Content: 0 ft³/ft³
Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

Boundary Conditions

Drainage

Review: true
Type: Total Flux (Q) 0

Curb

Type: Head (H) 0.5

Extreme Lowl Water Level -2.6ft

Type: Head (H) -2.6

Regions

	Material	Points	Area (ft²)
Region 1	EMBANKMENT FILL, EL. +7.5 TO -7.0	29,30,31,32,33,34,5,8,50,4	164.775
Region 2	EMBANKMENT FILL, EL. +7.5 TO -7.0	5,6,36,35	749.55
Region 3	MARSH, EL. -7 to -19/-20	35,36,59,58	394.5
Region 4	LACUSTRINE, EL -19/-20 to -33	38,41,42,39	1105.3
Region 5	BAY SOUND CLAY, EL. -41 TO -70	40,43,9,49	2289.55
Region 6	EMBANKMENT FILL, EL. +7.5 TO -7.0	22,23,24,25,26,27,4,50,69	103.14
Region 7	EMBANKMENT FILL, EL. +7.5 TO -7.0	8,5,35,63,44,52	327.475
Region 8	MARSH, EL. -7 to -19/-20	44,63,35,58,62,60	257.5
Region 9	LACUSTRINE, EL -19/-20 to -33	45,37,38,39,64,46	694.55
Region 10	BEACH SAND, EL. -33 to -41	56,55,46,64,39,42,43,40,65,47	1700
Region 11	BAY SOUND CLAY, EL. -41 TO -70	47,65,40,49,66,48	1492.05
Region 12	EMBANKMENT FILL, EL. +7.5 TO -7.0	13,14,15,16,17,18,51,52,44	138.55
Region 13	MARSH, EL. -7 to -19/-20	67,2,3,10,11,12,13,44,60	242.2
Region 14	LACUSTRINE, EL -19/-20 to -33	54,45,46,55	1149.4
Region 15	BAY SOUND CLAY, EL. -41 TO -70	47,48,57,56	2380.9
Region 16		4,28,7,29	4.05
Region 17	EMBANKMENT FILL, EL. +7.5 TO -7.0	18,19,68,20,21,22,51	37
Region 18	MARSH, EL. -7 to -19/-20	61,53,1,67,60,45,54	568.45
Region 19	MARSH, EL. -7 to -19/-20	60,62,58,38,37,45	386.25

Region 20	MARSH, EL. -7 to -19/-20	58,59,41,38	552.3
Region 21	EMBANKMENT FILL, EL. +7.5 TO -7.0	69,50,8	0.5675
Region 22	EMBANKMENT FILL, EL. +7.5 TO -7.0	51,69,8,52	9.6325
Region 23	EMBANKMENT FILL, EL. +7.5 TO -7.0	22,69,51	36.26

Lines

	Start Point	End Point	Hydraulic Boundary	Right Side Material
Line 1	6	5	Drainage	
Line 2	29	30	Drainage	
Line 3	30	31	Drainage	
Line 4	31	32	Drainage	
Line 5	32	33	Drainage	
Line 6	33	34	Drainage	
Line 7	34	5	Drainage	
Line 8	36	35		
Line 9	41	38		
Line 10	41	42	Curb	
Line 11	42	39		
Line 12	43	40		
Line 13	43	9	Curb	
Line 14	22	23	Extreme Lowl Water Level -2.6ft	
Line 15	23	24	Extreme Lowl Water Level -2.6ft	
Line 16	24	25	Extreme Lowl Water Level -2.6ft	
Line 17	25	26	Extreme Lowl Water Level -2.6ft	
Line 18	26	27	Extreme Lowl Water Level -2.6ft	
Line 19	27	4	Extreme Lowl Water Level -2.6ft	
Line 20	37	45		
Line 21	46	45		
Line 22	48	47		
Line 23	13	14	Extreme Lowl Water Level -2.6ft	
Line 24	14	15	Extreme Lowl Water Level -2.6ft	
Line 25	15	16	Extreme Lowl Water Level -2.6ft	
Line 26	16	17	Extreme Lowl Water Level -2.6ft	
Line 27	17	18	Extreme Lowl Water Level -2.6ft	
Line 28	44	13		
Line 29	2	3	Extreme Lowl Water Level -2.6ft	
Line 30	3	10	Extreme Lowl Water Level -2.6ft	
Line 31	10	11	Extreme Lowl Water Level -2.6ft	
Line 32	11	12	Extreme Lowl Water Level -2.6ft	
Line 33	12	13	Extreme Lowl Water Level -2.6ft	
Line 34	4	29		Sheet Pile
Line 35	4	28		
Line 36	28	7		
Line 37	7	29	Drainage	
Line 38	20	21	Extreme Lowl Water Level -2.6ft	
Line 39	21	22	Extreme Lowl Water Level -2.6ft	
Line 40	39	38		

Line 41	9	49		
Line 42	49	40		
Line 43	38	37		
Line 44	50	4		Sheet Pile
Line 45	18	51		
Line 46	50	8		
Line 47	42	43	Curb	
Line 48	5	8		
Line 49	44	52		
Line 50	52	51		
Line 51	52	8		
Line 52	51	22		
Line 53	18	19	Extreme Lowl Water Level -2.6ft	
Line 54	5	35		
Line 55	36	6	Curb	
Line 56	55	54		
Line 57	56	55		
Line 58	57	56		
Line 59	54	45		
Line 60	46	55		
Line 61	56	47		
Line 62	57	48		
Line 63	44	60		
Line 64	59	58		
Line 65	60	45		
Line 66	54	61		
Line 67	58	38		
Line 68	59	41	Curb	
Line 69	58	62		
Line 70	62	60		
Line 71	44	63		
Line 72	63	35		
Line 73	46	64		
Line 74	64	39		
Line 75	47	65		
Line 76	65	40		
Line 77	48	66		
Line 78	66	49		
Line 79	35	58		
Line 80	59	36	Curb	
Line 81	67	2	Extreme Lowl Water Level -2.6ft	
Line 82	60	67		
Line 83	61	53		
Line 84	53	1	Extreme Lowl Water Level -2.6ft	
Line 85	1	67	Extreme Lowl Water Level -2.6ft	
Line 86	19	68	Extreme Lowl Water Level -2.6ft	
Line 87	68	20	Extreme Lowl Water Level -2.6ft	
Line 88	50	69		

Line 89	69	22		
Line 90	8	69		
Line 91	51	69		

Points

	X (ft)	Y (ft)	Mesh
Point 1	105.7	-12.5	
Point 2	122.9	-11.5	
Point 3	130.4	-10.5	
Point 4	200	7.5	
Point 5	231.1	2.5	
Point 6	310	2.5	
Point 7	200.5	12.9	
Point 8	200	-2	
Point 9	310	-70	
Point 10	134.3	-9.5	
Point 11	137.9	-8.5	
Point 12	141.1	-7.5	
Point 13	145	-6.5	
Point 14	148.6	-5.5	
Point 15	152.9	-4.5	
Point 16	155	-3.5	
Point 17	158.2	-2.5	
Point 18	161.8	-1.5	
Point 19	165.4	-0.5	
Point 20	169.6	0.5	
Point 21	175.7	1.5	
Point 22	179.6	2.5	
Point 23	183.2	3.5	
Point 24	186.8	4.5	
Point 25	190.7	5.5	
Point 26	194	6.5	
Point 27	195.4	7.5	
Point 28	200	12.9	
Point 29	201	7.5	
Point 30	205.7	7.5	
Point 31	211.1	6.5	
Point 32	216.8	5.5	
Point 33	221.4	4.5	
Point 34	227.1	3.5	
Point 35	231.1	-7	
Point 36	310	-7	
Point 37	200	-20	
Point 38	231.1	-19	
Point 39	231	-33	
Point 40	231	-41	
Point 41	310	-19	

Point 42	310	-33	
Point 43	310	-41	
Point 44	179.6	-7	
Point 45	179.6	-19	
Point 46	179.6	-33	
Point 47	179.6	-41	
Point 48	179.6	-70	
Point 49	231.1	-70	
Point 50	200	-1.5	
Point 51	179.6	-1.5	
Point 52	179.6	-2	
Point 53	97.5	-12.5	
Point 54	97.5	-19	
Point 55	97.5	-33	
Point 56	97.5	-41	
Point 57	97.5	-70	
Point 58	231.1	-12	
Point 59	310	-12	
Point 60	179.6	-12	
Point 61	97.5	-17	
Point 62	200	-12	
Point 63	200	-7	
Point 64	200	-33	
Point 65	200	-41	
Point 66	200	-70	
Point 67	114.3	-12	
Point 68	167.5	0	
Point 69	197.73	-1.5	

LWL Q Case (Block)

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File Information

Created By: [Liljegren, James](#)
Revision Number: [375](#)
Last Edited By: [Jamerson, James MVK](#)
Date: [6/14/2013](#)
Time: [2:22:02 PM](#)
File Name: [Reach 10AUpdated.gsz](#)
Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix E LWL\](#)
Last Solved Date: [6/14/2013](#)
Last Solved Time: [2:23:08 PM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Strength Units: [psf](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

LWL Q Case (Block)

Kind: [SLOPE/W](#)
Parent: [LWL Q Case \(seepage\)](#)
Method: [Spencer](#)
Settings
 PWP Conditions Source: [Parent Analysis](#)
Slip Surface
 Direction of movement: [Right to Left](#)
 Use Passive Mode: [No](#)
 Slip Surface Option: [Block](#)
 Critical slip surfaces saved: [1](#)
 Optimize Critical Slip Surface Location: [Yes](#)
 Tension Crack
 Tension Crack Option: [Tension Crack Line](#)
 Percentage Wet: [1](#)
 Tension Crack Fluid Unit Weight: [62.4 pcf](#)
FOS Distribution
 FOS Calculation Option: [Constant](#)

Restrict Block Crossing: [Yes](#)

Advanced

Number of Slices: [30](#)

Optimization Tolerance: [0.01](#)

Minimum Slip Surface Depth: [0.1 ft](#)

Optimization Maximum Iterations: [2000](#)

Optimization Convergence Tolerance: [1e-007](#)

Starting Optimization Points: [8](#)

Ending Optimization Points: [16](#)

Complete Passes per Insertion: [1](#)

Driving Side Maximum Convex Angle: [5 °](#)

Resisting Side Maximum Convex Angle: [1 °](#)

Materials

FILL 1, EL. +7.5 TO -2

Model: [Undrained \(Phi=0\)](#)

Unit Weight: [106 pcf](#)

Cohesion: [1000 psf](#)

MARSH 1, EL. -7 to -12

Model: [Spatial Mohr-Coulomb](#)

Weight Fn: [Marsh 1](#)

Cohesion Fn: [Marsh](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

BEACH SAND, EL. -33 to -41

Model: [Shear/Normal Fn.](#)

Unit Weight: [122 pcf](#)

Strength Function: [Sand](#)

Phi-B: [0 °](#)

BAY SOUND CLAY, EL. -41 TO -70 (protected)

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [113 pcf](#)

Cohesion Fn: [Bay Sound Clay](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

FILL 2, EL. -2 to -7

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [102 pcf](#)

Cohesion Fn: [FILL 2](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

LACUSTRINE, EL -19/-20 to -33

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [100 pcf](#)

Cohesion Spatial Fn: [Lacustrine](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

MARSH 1, EL. -7 to -12 (protected)

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [81 pcf](#)

Cohesion: [200 psf](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

LACUSTRINE, EL. -19 to -33 (protected)

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [100 pcf](#)

Cohesion Fn: [Lacustrine](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

FILL 2, EL. 2.5 to -7 (protected)

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [102 pcf](#)

Cohesion: [400 psf](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

MARSH 2, EL. -12 to -19 (protected)

Model: [Undrained \(Phi=0\)](#)

Unit Weight: [98 pcf](#)

Cohesion: [300 psf](#)

MARSH 2, EL. -12 to -19/-20

Model: [Spatial Mohr-Coulomb](#)

Weight Fn: [MARSH 2](#)

Cohesion Fn: [Marsh 2](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

BAY SOUND CLAY, EL. -41 TO -70

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [113 pcf](#)

Cohesion Spatial Fn: [Bay Sound](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

Slip Surface Limits

Left Coordinate: (97.5, -12.5) ft
Right Coordinate: (310, 2.5) ft

Slip Surface Block

Left Grid
Upper Left: (140, -0.5) ft
Lower Left: (140, -40.5) ft
Lower Right: (170, -40.5) ft
X Increments: 6
Y Increments: 7
Starting Angle: 135 °
Ending Angle: 180 °
Angle Increments: 2

Right Grid
Upper Left: (180, -0.5) ft
Lower Left: (180, -40.5) ft
Lower Right: (230, -40.5) ft
X Increments: 10
Y Increments: 7
Starting Angle: 45 °
Ending Angle: 65 °
Angle Increments: 2

Tension Crack Line

	X (ft)	Y (ft)
	180	-1
	202	-1
	231	-1

Cohesion Functions

Marsh

Model: Spline Data Point Function
Function: Cohesion vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 200
Data Points: X (ft), Cohesion (psf)
Data Point: (179.6, 200)
Data Point: (200, 370)
Data Point: (231.1, 200)

Lacustrine

Model: [Spline Data Point Function](#)

Function: [Cohesion vs. Y](#)

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 300

Data Points: [Y \(ft\)](#), [Cohesion \(psf\)](#)

Data Point: (-33, 365)

Data Point: (-19, 300)

Marsh 2

Model: [Spline Data Point Function](#)

Function: [Cohesion vs. X](#)

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 300

Data Points: [X \(ft\)](#), [Cohesion \(psf\)](#)

Data Point: (179.6, 300)

Data Point: (200, 370)

Data Point: (231.1, 300)

Bay Sound Clay

Model: [Spline Data Point Function](#)

Function: [Cohesion vs. Y](#)

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 500

Data Points: [Y \(ft\)](#), [Cohesion \(psf\)](#)

Data Point: (-70, 820)

Data Point: (-41, 500)

FILL 2

Model: [Spline Data Point Function](#)

Function: [Cohesion vs. X](#)

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 330

Data Points: [X \(ft\)](#), [Cohesion \(psf\)](#)

Data Point: (180, 330)

Data Point: (200, 400)

Data Point: (231, 330)

Shear/Normal Strength Functions

Sand

Model: [Spline Data Point Function](#)

Function: [Shear Stress vs. Normal Stress](#)

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 0

Data Points: Normal Stress (psf), Shear Stress (psf)

Data Point: (-10000, 0)

Data Point: (0, 0)

Data Point: (10000, 6494)

Estimation Properties

Intact Rock Param.: 10

Geological Strength: 100

Disturbance Factor: 0

SigmaC: 600000 psf

Sigma3: 300000 psf

Num. Points: 20

Unit Weight Functions

Marsh 1

Model: Spline Data Point Function

Function: Unit Weight vs. X

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 81

Data Points: X (ft), Unit Weight (pcf)

Data Point: (179.6, 81)

Data Point: (200, 82)

Data Point: (231, 81)

MARSH 2

Model: Spline Data Point Function

Function: Unit Weight vs. X

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 98

Data Points: X (ft), Unit Weight (pcf)

Data Point: (180, 98)

Data Point: (200, 82)

Data Point: (231, 98)

Spatial Functions

Lacustrine

Model: Linear Interpolation

Limit Range By: Data Values

Data Points: X (ft), Y (ft), Cohesion (psf)

Data Point: (179.6, -19, 300)

Data Point: (179.6, -33, 365)

Data Point: (200, -20, 315)
 Data Point: (200, -33, 385)
 Data Point: (231.1, -19, 300)
 Data Point: (231.1, -33, 365)

Bay Sound

Model: Linear Interpolation
 Limit Range By: Data Values
 Data Points: X (ft), Y (ft), Cohesion (psf)
 Data Point: (179.6, -41, 500)
 Data Point: (179.6, -70, 820)
 Data Point: (200, -41, 540)
 Data Point: (200, -70, 815)
 Data Point: (231.1, -41, 500)
 Data Point: (231.1, -70, 820)

Regions

	Material	Points	Area (ft²)
Region 1	FILL 1, EL. +7.5 TO -2	29,30,31,32,33,34,5,8,50,4	164.775
Region 2	FILL 2, EL. 2.5 to -7 (protected)	5,6,36,35	749.55
Region 3	MARSH 1, EL. -7 to -12 (protected)	35,36,59,58	394.5
Region 4	LACUSTRINE, EL. -19 to -33 (protected)	38,41,42,39	1105.3
Region 5	BAY SOUND CLAY, EL. -41 TO -70 (protected)	40,43,9,49	2289.55
Region 6	FILL 1, EL. +7.5 TO -2	22,23,24,25,26,27,4,50,69	103.14
Region 7	FILL 2, EL. -2 to -7	8,5,35,63,44,52	327.475
Region 8	MARSH 1, EL. -7 to -12	44,63,35,58,62,60	257.5
Region 9	LACUSTRINE, EL -19/-20 to -33	45,37,38,39,64,46	694.55
Region 10	BEACH SAND, EL. -33 to -41	56,55,46,64,39,42,43,40,65,47	1700
Region 11	BAY SOUND CLAY, EL. -41 TO -70	47,65,40,49,66,48	1492.05
Region 12	FILL 2, EL. 2.5 to -7 (protected)	13,14,15,16,17,18,51,52,44	138.55
Region 13	MARSH 1, EL. -7 to -12 (protected)	67,2,3,10,11,12,13,44,60	242.2
Region 14	LACUSTRINE, EL. -19 to -33 (protected)	54,45,46,55	1149.4
Region 15	BAY SOUND CLAY, EL. -41 TO -70 (protected)	47,48,57,56	2380.9
Region 16		4,28,7,29	4.05
Region 17	FILL 2, EL. 2.5 to -7 (protected)	18,19,68,20,21,22,51	37
Region 18	MARSH 2, EL. -12 to -19 (protected)	61,53,1,67,60,45,54	568.45
Region 19	MARSH 2, EL. -12 to -19/-20	60,62,58,38,37,45	386.25
Region 20	MARSH 2, EL. -12 to -19 (protected)	58,59,41,38	552.3
Region 21	FILL 1, EL. +7.5 TO -2	69,50,8	0.5675
Region 22	FILL 2, EL. -2 to -7	51,69,8,52	9.6325
Region 23	FILL 2, EL. -2 to -7	22,69,51	36.26

Points

	X (ft)	Y (ft)
Point 1	105.7	-12.5
Point 2	122.9	-11.5

Point 3	130.4	-10.5
Point 4	200	7.5
Point 5	231.1	2.5
Point 6	310	2.5
Point 7	200.5	12.9
Point 8	200	-2
Point 9	310	-70
Point 10	134.3	-9.5
Point 11	137.9	-8.5
Point 12	141.1	-7.5
Point 13	145	-6.5
Point 14	148.6	-5.5
Point 15	152.9	-4.5
Point 16	155	-3.5
Point 17	158.2	-2.5
Point 18	161.8	-1.5
Point 19	165.4	-0.5
Point 20	169.6	0.5
Point 21	175.7	1.5
Point 22	179.6	2.5
Point 23	183.2	3.5
Point 24	186.8	4.5
Point 25	190.7	5.5
Point 26	194	6.5
Point 27	195.4	7.5
Point 28	200	12.9
Point 29	201	7.5
Point 30	205.7	7.5
Point 31	211.1	6.5
Point 32	216.8	5.5
Point 33	221.4	4.5
Point 34	227.1	3.5
Point 35	231.1	-7
Point 36	310	-7
Point 37	200	-20
Point 38	231.1	-19
Point 39	231	-33
Point 40	231	-41
Point 41	310	-19
Point 42	310	-33
Point 43	310	-41
Point 44	179.6	-7
Point 45	179.6	-19
Point 46	179.6	-33
Point 47	179.6	-41
Point 48	179.6	-70
Point 49	231.1	-70
Point 50	200	-1.5

Point 51	179.6	-1.5
Point 52	179.6	-2
Point 53	97.5	-12.5
Point 54	97.5	-19
Point 55	97.5	-33
Point 56	97.5	-41
Point 57	97.5	-70
Point 58	231.1	-12
Point 59	310	-12
Point 60	179.6	-12
Point 61	97.5	-17
Point 62	200	-12
Point 63	200	-7
Point 64	200	-33
Point 65	200	-41
Point 66	200	-70
Point 67	114.3	-12
Point 68	167.5	0
Point 69	197.73	-1.5

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.42	(168.996, 0.498)	21.84326	(195.99, 7.5)	(144.732, -6.5686)
2	1720	1.51	(168.996, 0.498)	22.69	(195.929, 7.5)	(143.082, -6.99186)

Slices of Slip Surface: Optimized

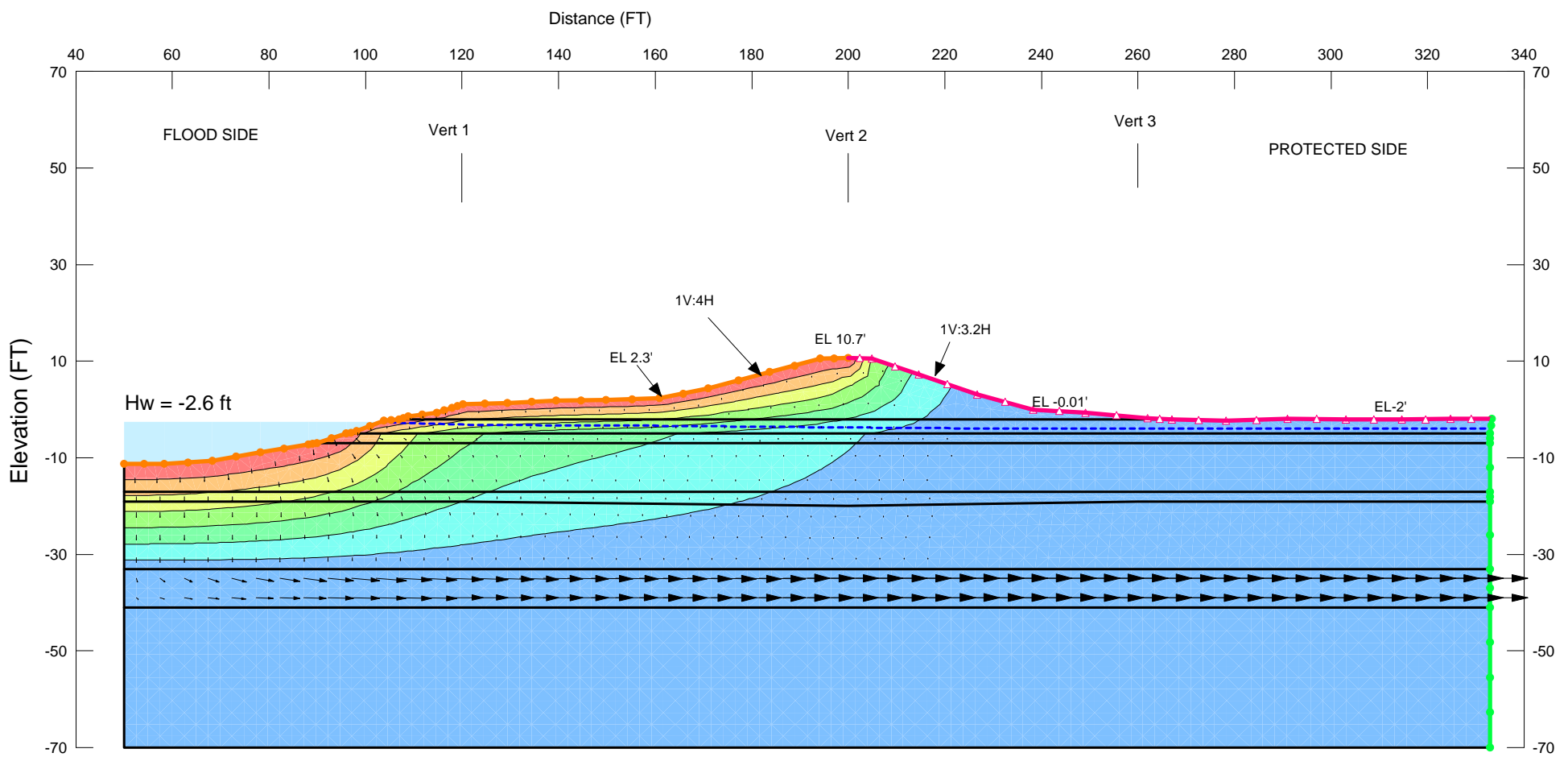
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	144.8662	-6.6372615	252.58003	386.15726	0	200
2	Optimized	145.9	-7.1678305	295.34007	444.41874	0	200
3	Optimized	147.7	-8.0916515	366.71614	546.00893	0	200
4	Optimized	148.7533	-8.632246	405.95348	603.89606	0	200
5	Optimized	149.90495	-9.1004005	440.72787	624.98542	0	200
6	Optimized	151.90165	-9.8793405	497.84206	711.02298	0	200
7	Optimized	153.37425	-10.45383	539.38795	783.09372	0	200
8	Optimized	154.42425	-10.77783	563.05211	789.17288	0	200
9	Optimized	155.8	-11.109925	587.9862	835.62329	0	200
10	Optimized	157.4	-11.496155	616.48026	887.62951	0	200
11	Optimized	158.3401	-11.723095	633.13643	927.36518	0	200
12	Optimized	159.3666	-11.854465	643.75841	930.84517	0	200
13	Optimized	161.0265	-11.96176	653.90654	959.88593	0	200
14	Optimized	162.3257	-11.978135	657.4197	998.53154	0	200
15	Optimized	164.1257	-11.98572	661.13666	1047.2248	0	200
16	Optimized	166.45	-11.98747	665.09492	1109.6661	0	200
17	Optimized	168.55	-11.98905	668.52349	1161.4756	0	200
18	Optimized	170.4544	-11.990485	671.44807	1201.9236	0	200
19	Optimized	172.16325	-11.99177	673.96439	1231.1247	0	200

20	Optimized	173.8721	-11.993055	676.36367	1260.3257	0	200
21	Optimized	175.21325	-11.944395	675.0463	1245.9484	0	200
22	Optimized	176.7584	-11.78788	667.1141	1269.2276	0	200
23	Optimized	178.7084	-11.470125	649.38148	1251.2792	0	200
24	Optimized	180.554	-11.034295	624.03117	1267.6494	0	207.95
25	Optimized	182.354	-10.45198	589.27179	1213.5558	0	222.95
26	Optimized	183.91315	-9.7939945	549.47554	1205.6396	0	235.94
27	Optimized	185.3394	-9.1920845	513.08155	1198.3401	0	247.83
28	Optimized	186.42625	-8.664143	480.97549	1126.6174	0	256.89
29	Optimized	188.04195	-7.682883	420.83386	1091.0711	0	270.35
30	Optimized	189.99195	-6.3195755	331.86964	907.98513	0	364.97
31	Optimized	191.37165	-5.132823	249.92875	835.69201	0	369.8
32	Optimized	192.7149	-3.9773875	170.74485	768.41675	0	374.5
33	Optimized	193.69325	-3.116969	111.9399	697.45039	0	377.93
34	Optimized	194.4526	-2.417134	64.350283	672.76293	0	380.58
35	Optimized	195.1526	-1.7720025	20.791946	660.85394	0	383.03
36	Optimized	195.42385	-1.5220025	3.8792276	654.65912	0	383.98
37	Optimized	195.66815	-1.296864	-11.371069	634.22634	0	384.84
38	Optimized	195.93945	-1.046864	-28.239364	-2568.9173	0	1000

Slices of Slip Surface: 1720

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	1720	144.04085	-7.3891495	302.92566	421.94404	0	200
2	1720	145.9	-8.159228	362.66377	503.71451	0	200
3	1720	147.7	-8.9048125	419.6928	588.45992	0	200
4	1720	149.675	-9.7228825	480.58929	678.29953	0	200
5	1720	151.825	-10.61344	545.30383	775.887	0	200
6	1720	153.95	-11.493645	608.08861	885.95633	0	200
7	1720	155.8	-11.92857	640.75	836.875	0	200
8	1720	157.4	-11.92857	644.25	855.6875	0	200
9	1720	159.1	-11.92857	647.94444	897.44444	0	200
10	1720	160.9	-11.92857	651.5	948.94444	0	200
11	1720	162.7	-11.92857	654.94444	1000.5	0	200
12	1720	164.5	-11.92857	658.16667	1052.0556	0	200
13	1720	166.45	-11.92857	661.38095	1103.6667	0	200
14	1720	168.55	-11.92857	664.66667	1155.2857	0	200
15	1720	170.61665	-11.92857	667.7706	1198.4264	0	200
16	1720	172.65	-11.92857	670.62306	1233.0494	0	200
17	1720	174.68335	-11.92857	673.32798	1267.6723	0	200
18	1720	176.675	-11.92857	675.94872	1310.7692	0	200
19	1720	178.625	-11.92857	678.35897	1362.359	0	200
20	1720	180.5	-11.92857	680.66667	1416.3889	0	207.5
21	1720	182.3	-11.92857	682.83333	1472.9444	0	222.5
22	1720	184.1	-11.92857	684.94444	1529.4444	0	237.5
23	1720	185.9	-11.02857	630.03224	1169.3584	0	252.5
24	1720	187.58215	-9.346428	525.53211	1086.6391	0	266.52
25	1720	189.14645	-7.782143	428.47185	1007.8048	0	279.55

26	1720	190.3143	-6.6142855	353.15523	904.49281	0	366.1
27	1720	191.525	-5.403571	269.28773	828.17217	0	370.34
28	1720	193.175	-3.753571	155.80779	726.43448	0	376.11
29	1720	194.4643	-2.4642855	67.69657	664.53802	0	380.63
30	1720	195.1643	-1.7642855	20.278965	647.89193	0	383.07
31	1720	195.4143	-1.5142855	3.3019767	641.01707	0	383.95
32	1720	195.6366	-1.2920085	-11.811532	621.08877	0	384.73
33	1720	195.8866	-1.0420085	-28.730665	-3218.5549	0	1000



Name: 1-El +10.7 to -2, Fill GR Model: Saturated Only K-Sat: 3.28e-008 ft/sec Volumetric Water Content: 0 ft³/ft³ Mv: 0 /psf K-Ratio: 1 K-Direction: 0 °
 Name: 2-El -2 to -5, Fill Model: Saturated Only K-Sat: 3.28e-008 ft/sec Volumetric Water Content: 0 ft³/ft³ Mv: 0 /psf K-Ratio: 1 K-Direction: 0 °
 Name: 3-El -5 to -7, Fill Model: Saturated Only K-Sat: 3.28e-007 ft/sec Volumetric Water Content: 0 ft³/ft³ Mv: 0 /psf K-Ratio: 1 K-Direction: 0 °
 Name: 4-El -7 to -17, Marsh Model: Saturated Only K-Sat: 3.28e-007 ft/sec Volumetric Water Content: 0 ft³/ft³ Mv: 0 /psf K-Ratio: 1 K-Direction: 0 °
 Name: 5-El -17 to -19, -20, Marsh Model: Saturated Only K-Sat: 3.28e-007 ft/sec Volumetric Water Content: 0 ft³/ft³ Mv: 0 /psf K-Ratio: 1 K-Direction: 0 °
 Name: 6-El -19, -20 to -33, Lancustrine Model: Saturated Only K-Sat: 3.28e-007 ft/sec Volumetric Water Content: 0 ft³/ft³ Mv: 0 /psf K-Ratio: 1 K-Direction: 0 °
 Name: 7-El -33 to -41, Sand Model: Saturated Only K-Sat: 0.000492 ft/sec Volumetric Water Content: 0 ft³/ft³ Mv: 0 /psf K-Ratio: 1 K-Direction: 0 °
 Name: 8-El -41 to -70, BaySound Model: Saturated Only K-Sat: 3.28e-008 ft/sec Volumetric Water Content: 0 ft³/ft³ Mv: 0 /psf K-Ratio: 1 K-Direction: 0 °

CROSS SECTION AT STA 95+00W

GENERAL NOTES

CLASSIFICATION STRATIFICATION
 SHEAR STRENGTHS AND UNIT WEIGHTS OF
 THE SOIL WERE BASED ON THE RESULTS OF
 UNDISTURBED BORINGS AND CPT DATA. SEE
 BOTH BORING AND CPT DATA PLATES.

WHERE INDICATED, SHEAR STRENGTHS BETWEEN
 VERTICALS WERE ASSUMED TO VARY LINEARLY
 BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

LAKE PONTCHARTRAIN, LA. AND VICINITY
 HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL,
 REMEDIATION OF CANAL WALLS AND LEVEES
 PROTECTED SIDE STABILITY ANALYSIS,
 CASE: Name: LWL Q Case (see page)
 REACH 10B, STA. 93+53 TO STA. 98+70 WEST
 ORLEANS PARISH, LOUISIANA

LWL Q Case (seepage)

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File Information

Created By: [Vicky Curtis](#)
Revision Number: [103](#)
Last Edited By: [Bishop, Charles E MVR](#)
Date: [6/18/2013](#)
Time: [4:51:44 PM](#)
File Name: [Reach 10B.gsz](#)
Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix E LWL\](#)
Last Solved Date: [6/18/2013](#)
Last Solved Time: [4:51:56 PM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Mass(M) Units: [lbs](#)
Mass Flux Units: [lbs/sec](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

LWL Q Case (seepage)

Kind: [SEEP/W](#)
Method: [Steady-State](#)
Settings
 Include Air Flow: [No](#)
Control
 Apply Runoff: [Yes](#)
Convergence
 Convergence Type: [Gauss Point K](#)
 Convergence Settings
 Maximum Number of Iterations: [500](#)
 Tolerance: [0.01](#)
 Maximum Change in K: [0.1](#)
 Rate of Change in K: [1.02](#)
 Minimum Change in K: [0.0001](#)
Equation Solver: [Parallel Direct](#)
Potential Seepage Max # of Reviews: [10](#)

Time

Starting Time: 0 sec

Duration: 0 sec

Ending Time: 0 sec

Materials

1-El +10.7 to -2, Fill GR

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-008 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

2-El -2 to -5, Fill

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-008 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

3-El -5 to -7, Fill

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-007 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

4-El -7 to -17, Marsh

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-007 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

5-El -17 to -19, -20, Marsh

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-007 ft/sec

Volumetric Water Content: 0 ft³/ft³
Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

6-El -19, -20 to -33, Lancustrine

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-007 ft/sec
Volumetric Water Content: 0 ft³/ft³
Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

7-El -33 to -41, Sand

Model: Saturated Only

Hydraulic

K-Sat: 0.000492 ft/sec
Volumetric Water Content: 0 ft³/ft³
Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

8-El -41 to -70, BaySound

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-008 ft/sec
Volumetric Water Content: 0 ft³/ft³
Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

Boundary Conditions

Drainage Face

Review: true
Type: Total Flux (Q) 0

PS Groundwater Level -3.99'

Type: Head (H) -3.99

Extreme Low Water Level -2.6'

Type: Head (H) -2.6

Regions

	Material	Points	Area (ft ²)

Region 1	1-El +10.7 to -2, Fill GR	32,24,23,22,21,20,19,18,17,16,15,14,13,12,11,10,9,8,7,33	841.33799
Region 2	2-El -2 to -5, Fill	34,26,25,32,33,6,5,4,3,2,1,35	695.15027
Region 3	3-El -5 to -7, Fill	36,34,35,37	480
Region 4	4-El -7 to -17, Marsh	31,30,29,28,27,36,37,38,39	2718.1262
Region 5	5-El -17 to -19, -20, Marsh	39,38,40,42,43,44,41	636
Region 6	6-El -19, -20 to -33, Lancustrine	41,44,43,42,40,45,46	3892
Region 7	7-El -33 to -41, Sand	46,45,47,48	2264
Region 8	8-El -41 to -70, BaySound	48,47,49,50	8207

Lines

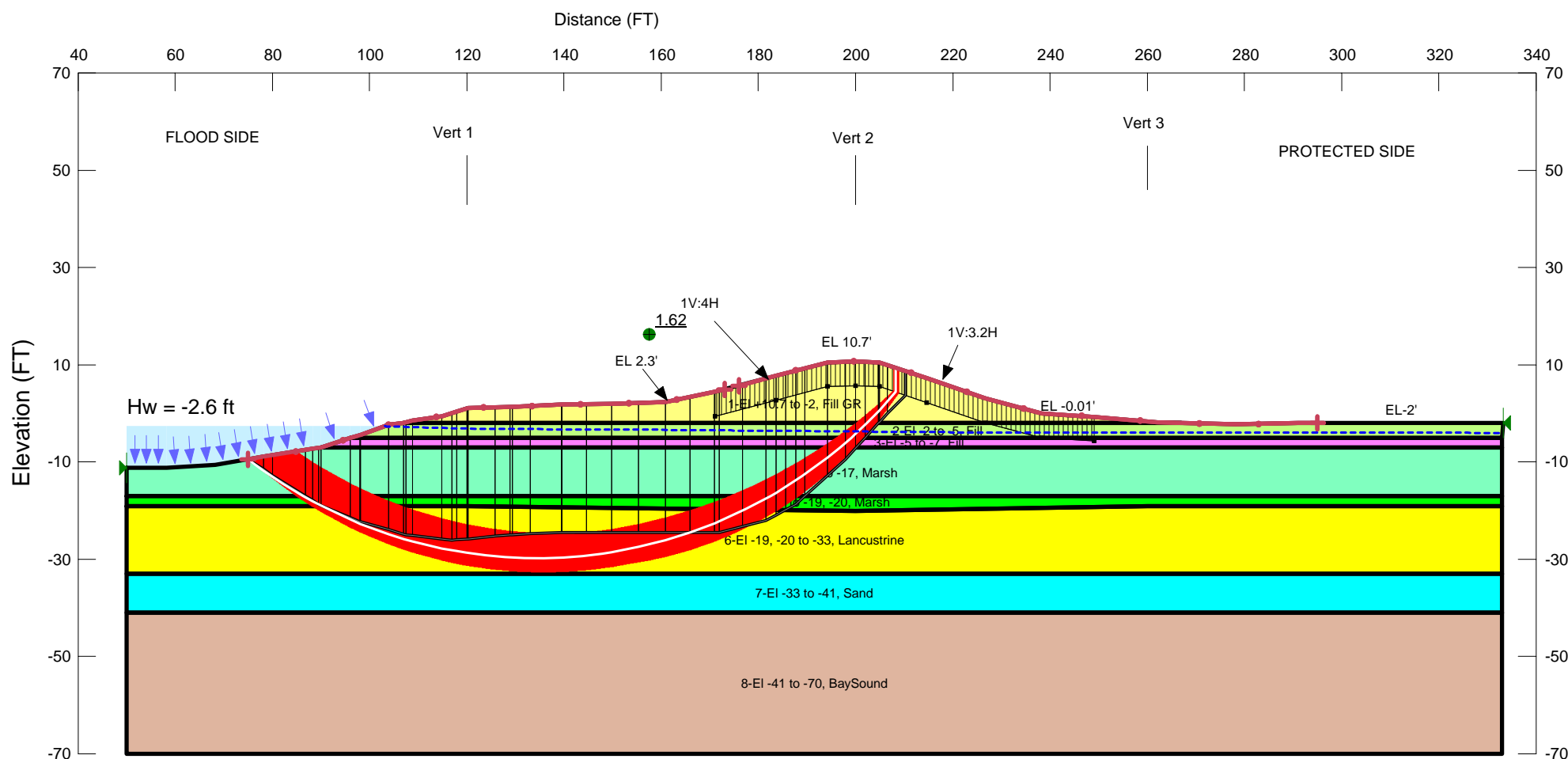
	Start Point	End Point	Hydraulic Boundary
Line 1	32	24	Extreme Low Water Level -2.6'
Line 2	24	23	Extreme Low Water Level -2.6'
Line 3	23	22	Extreme Low Water Level -2.6'
Line 4	22	21	Extreme Low Water Level -2.6'
Line 5	21	20	Extreme Low Water Level -2.6'
Line 6	20	19	Extreme Low Water Level -2.6'
Line 7	19	18	Extreme Low Water Level -2.6'
Line 8	18	17	Extreme Low Water Level -2.6'
Line 9	17	16	Extreme Low Water Level -2.6'
Line 10	16	15	Extreme Low Water Level -2.6'
Line 11	15	14	Extreme Low Water Level -2.6'
Line 12	14	13	Extreme Low Water Level -2.6'
Line 13	13	12	Drainage Face
Line 14	12	11	Drainage Face
Line 15	11	10	Drainage Face
Line 16	10	9	Drainage Face
Line 17	9	8	Drainage Face
Line 18	8	7	Drainage Face
Line 19	7	33	Drainage Face
Line 20	33	32	
Line 21	34	26	Extreme Low Water Level -2.6'
Line 22	26	25	Extreme Low Water Level -2.6'
Line 23	25	32	Extreme Low Water Level -2.6'
Line 24	33	6	Drainage Face
Line 25	6	5	Drainage Face
Line 26	5	4	Drainage Face
Line 27	4	3	Drainage Face
Line 28	3	2	Drainage Face
Line 29	2	1	Drainage Face
Line 30	1	35	PS Groundwater Level -3.99'
Line 31	35	34	
Line 32	36	34	Extreme Low Water Level -2.6'
Line 33	35	37	PS Groundwater Level -3.99'
Line 34	37	36	
Line 35	31	30	Extreme Low Water Level -2.6'
Line 36	30	29	Extreme Low Water Level -2.6'

Line 37	29	28	Extreme Low Water Level -2.6'
Line 38	28	27	Extreme Low Water Level -2.6'
Line 39	27	36	Extreme Low Water Level -2.6'
Line 40	37	38	PS Groundwater Level -3.99'
Line 41	38	39	
Line 42	39	31	
Line 43	38	40	PS Groundwater Level -3.99'
Line 44	40	42	
Line 45	42	43	
Line 46	43	44	
Line 47	44	41	
Line 48	41	39	
Line 49	40	45	PS Groundwater Level -3.99'
Line 50	45	46	
Line 51	46	41	
Line 52	45	47	PS Groundwater Level -3.99'
Line 53	47	48	
Line 54	48	46	
Line 55	47	49	PS Groundwater Level -3.99'
Line 56	49	50	
Line 57	50	48	

Points

	X (ft)	Y (ft)
Point 1	333.26943	-1.97
Point 2	324.72844	-1.95
Point 3	314.64956	-2.01
Point 4	303.10265	-1.99
Point 5	291.00986	-1.96
Point 6	278.25315	-2.25
Point 7	261.949	-1.81
Point 8	249.07504	-0.69
Point 9	238.23459	-0.01
Point 10	226.63885	3.07
Point 11	214.6191	7.27
Point 12	204.87471	10.52
Point 13	200	10.72
Point 14	194.19656	10.52
Point 15	183.65527	7.76
Point 16	171.0077	4.39
Point 17	160.88163	2.36
Point 18	149.8344	2.01
Point 19	139.53756	1.82
Point 20	129.34623	1.37
Point 21	120.24527	1.16
Point 22	117.87852	0.33
Point 23	114.82892	-0.65

Point 24	108.82186	-1.43
Point 25	103.87248	-2.33
Point 26	98.10619	-4.47
Point 27	88.22537	-7.27
Point 28	78.16792	-8.85
Point 29	68.28474	-10.57
Point 30	58.32233	-11.24
Point 31	50	-11.24
Point 32	107	-2
Point 33	267	-2
Point 34	96	-5
Point 35	333	-5
Point 36	90	-7
Point 37	333	-7
Point 38	333	-17
Point 39	50	-17
Point 40	333	-19
Point 41	50	-19
Point 42	260	-19
Point 43	200	-20
Point 44	120	-19
Point 45	333	-33
Point 46	50	-33
Point 47	333	-41
Point 48	50	-41
Point 49	333	-70
Point 50	50	-70



Name: 1-EI +10.7 to -2, Fill GR Model: Spatial Mohr-Coulomb Weight Spatial Fn: Fill Gr to -2 Cohesion Spatial Fn: Fill GR to -2 Phi: 0° Phi-B: 0°
 Name: 2-EI -2 to -5, Fill Model: Spatial Mohr-Coulomb Unit Weight: 103 pcf Cohesion Spatial Fn: Fill -2 to -5 Phi: 0° Phi-B: 0°
 Name: 3-EI -5 to -7, Fill Model: Spatial Mohr-Coulomb Unit Weight: 103 pcf Cohesion Spatial Fn: Fill -5 to -7 Phi: 0° Phi-B: 0°
 Name: 4-EI -7 to -17, Marsh Model: Spatial Mohr-Coulomb Unit Weight: 82 pcf Cohesion Spatial Fn: Mrsh -7 to -17 Phi: 0° Phi-B: 0°
 Name: 5-EI -17 to -19, -20, Marsh Model: Spatial Mohr-Coulomb Unit Weight: 82 pcf Cohesion Spatial Fn: Marsh -17 to -19, -20 Phi: 0° Phi-B: 0°
 Name: 6-EI -19, -20 to -33, Lancustrine Model: Spatial Mohr-Coulomb Unit Weight: 102 pcf Cohesion Spatial Fn: Lanc -19,20 to -33 Phi: 0° Phi-B: 0°
 Name: 7-EI -33 to -41, Sand Model: Mohr-Coulomb Unit Weight: 122 pcf Cohesion: 0 psf Phi: 33° Phi-B: 0°
 Name: 8-EI -41 to -70, BaySound Model: Spatial Mohr-Coulomb Unit Weight: 113 pcf Cohesion Spatial Fn: BaySound -41 to -70 Phi: 0° Phi-B: 0°

CROSS SECTION AT STA 95+00W

GENERAL NOTES

CLASSIFICATION STRATIFICATION
 SHEAR STRENGTHS AND UNIT WEIGHTS OF
 THE SOIL WERE BASED ON THE RESULTS OF
 UNDISTURBED BORINGS AND CPT DATA. SEE
 BOTH BORING AND CPT DATA PLATES.

WHERE INDICATED, SHEAR STRENGTHS BETWEEN
 VERTICALS WERE ASSUMED TO VARY LINEARLY
 BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

LAKE PONTCHARTRAIN, LA. AND VICINITY
 HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL,
 REMEDIATION OF CANAL WALLS AND LEVEES
 PROTECTED SIDE STABILITY ANALYSIS,
 CASE: Name: LWL Q Case (Entry/Exit)
 REACH 10B, STA. 93+53 TO STA. 98+70 WEST
 ORLEANS PARISH, LOUISIANA

LWL Q Case (Entry/Exit)

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File Information

Created By: [Vicky Curtis](#)
Revision Number: [103](#)
Last Edited By: [Bishop, Charles E MVR](#)
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Time: [4:51:44 PM](#)
File Name: [Reach 10B.gsz](#)
Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix E LWL\](#)
Last Solved Date: [6/18/2013](#)
Last Solved Time: [4:55:02 PM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Strength Units: [psf](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

LWL Q Case (Entry/Exit)

Kind: [SLOPE/W](#)
Parent: [LWL Q Case \(seepage\)](#)
Method: [Spencer](#)
Settings
 PWP Conditions Source: [Parent Analysis](#)
Slip Surface
 Direction of movement: [Right to Left](#)
 Use Passive Mode: [No](#)
 Slip Surface Option: [Entry and Exit](#)
 Critical slip surfaces saved: [1](#)
 Optimize Critical Slip Surface Location: [Yes](#)
 Tension Crack
 Tension Crack Option: [Tension Crack Line](#)
 Percentage Wet: [1](#)
 Tension Crack Fluid Unit Weight: [62.4 pcf](#)
FOS Distribution
 FOS Calculation Option: [Constant](#)

Advanced

Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 7000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

1-El +10.7 to -2, Fill GR

Model: Spatial Mohr-Coulomb
Weight Spatial Fn: Fill Gr to -2
Cohesion Spatial Fn: Fill GR to -2
Phi: 0 °
Phi-B: 0 °

2-El -2 to -5, Fill

Model: Spatial Mohr-Coulomb
Unit Weight: 103 pcf
Cohesion Spatial Fn: Fill -2 to -5
Phi: 0 °
Phi-B: 0 °

3-El -5 to -7, Fill

Model: Spatial Mohr-Coulomb
Unit Weight: 103 pcf
Cohesion Spatial Fn: Fill -5 to -7
Phi: 0 °
Phi-B: 0 °

4-El -7 to -17, Marsh

Model: Spatial Mohr-Coulomb
Unit Weight: 82 pcf
Cohesion Spatial Fn: Mrsh -7 to-17
Phi: 0 °
Phi-B: 0 °

5-El -17 to -19, -20, Marsh

Model: Spatial Mohr-Coulomb
Unit Weight: 82 pcf
Cohesion Spatial Fn: Marsh -17 to -19,-20
Phi: 0 °

Phi-B: 0 °

6-El -19, -20 to -33, Lancustrine

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [102 pcf](#)

Cohesion Spatial Fn: [Lanc -19,20 to-33](#)

Phi: 0 °

Phi-B: 0 °

7-El -33 to -41, Sand

Model: [Mohr-Coulomb](#)

Unit Weight: [122 pcf](#)

Cohesion: [0 psf](#)

Phi: [33 °](#)

Phi-B: 0 °

8-El -41 to -70, BaySound

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [113 pcf](#)

Cohesion Spatial Fn: [BaySound -41 to-70](#)

Phi: 0 °

Phi-B: 0 °

Slip Surface Entry and Exit

Left Projection: [Range](#)

Left-Zone Left Coordinate: [\(75, -9.40132\) ft](#)

Left-Zone Right Coordinate: [\(173, 4.92086\) ft](#)

Left-Zone Increment: [10](#)

Right Projection: [Range](#)

Right-Zone Left Coordinate: [\(176, 5.72022\) ft](#)

Right-Zone Right Coordinate: [\(295, -1.9699\) ft](#)

Right-Zone Increment: [10](#)

Radius Increments: [70](#)

Slip Surface Limits

Left Coordinate: [\(50, -11.24\) ft](#)

Right Coordinate: [\(333.26943, -1.97\) ft](#)

Tension Crack Line

	X (ft)	Y (ft)
	171.077	-0.61
	183.65527	2.76
	194.19656	5.52
	200	5.72
	204.87471	5.52

	214.6191	2.27
	226.63885	-1.93
	238.23459	-5.01
	249.07504	-5.69

Spatial Functions

Fill GR to -2

Model: [Linear Interpolation](#)

Limit Range By: [Data Values](#)

Data Points: [X \(ft\)](#), [Y \(ft\)](#), [Cohesion \(psf\)](#)

Data Point: [\(120, 1, 400\)](#)

Data Point: [\(120, -2, 400\)](#)

Data Point: [\(200, 10.72, 650\)](#)

Data Point: [\(200, -2, 650\)](#)

Data Point: [\(260, -1.5, 400\)](#)

Data Point: [\(260, -2, 400\)](#)

Fill -2 to -5

Model: [Linear Interpolation](#)

Limit Range By: [Data Values](#)

Data Points: [X \(ft\)](#), [Y \(ft\)](#), [Cohesion \(psf\)](#)

Data Point: [\(120, -2, 400\)](#)

Data Point: [\(120, -5, 400\)](#)

Data Point: [\(200, -2, 650\)](#)

Data Point: [\(200, -5, 650\)](#)

Data Point: [\(260, -2, 400\)](#)

Data Point: [\(260, -5, 400\)](#)

Fill -5 to -7

Model: [Linear Interpolation](#)

Limit Range By: [Data Values](#)

Data Points: [X \(ft\)](#), [Y \(ft\)](#), [Cohesion \(psf\)](#)

Data Point: [\(120, -5, 400\)](#)

Data Point: [\(120, -7, 400\)](#)

Data Point: [\(200, -5, 390\)](#)

Data Point: [\(200, -7, 390\)](#)

Data Point: [\(260, -5, 400\)](#)

Data Point: [\(260, -7, 400\)](#)

Mrsh -7 to-17

Model: [Linear Interpolation](#)

Limit Range By: [Data Values](#)

Data Points: [X \(ft\)](#), [Y \(ft\)](#), [Cohesion \(psf\)](#)

Data Point: [\(120, -7, 200\)](#)

Data Point: [\(120, -17, 200\)](#)

Data Point: [\(200, -7, 420\)](#)

Data Point: (200, -17, 420)

Data Point: (260, -7, 200)

Data Point: (260, -17, 200)

Marsh -17 to -19,-20

Model: [Linear Interpolation](#)

Limit Range By: [Data Values](#)

Data Points: [X \(ft\)](#), [Y \(ft\)](#), [Cohesion \(psf\)](#)

Data Point: (120, -17, 400)

Data Point: (120, -19, 400)

Data Point: (200, -17, 420)

Data Point: (200, -19, 420)

Data Point: (260, -17, 400)

Data Point: (260, -19, 400)

Lanc -19,20 to-33

Model: [Linear Interpolation](#)

Limit Range By: [Data Values](#)

Data Points: [X \(ft\)](#), [Y \(ft\)](#), [Cohesion \(psf\)](#)

Data Point: (120, -19, 210)

Data Point: (120, -33, 390)

Data Point: (200, -20, 350)

Data Point: (200, -33, 500)

Data Point: (260, -19, 210)

Data Point: (260, -33, 390)

Data Point: (30, -19, 210)

Data Point: (310, -19, 210)

BaySound -41 to-70

Model: [Linear Interpolation](#)

Limit Range By: [Data Values](#)

Data Points: [X \(ft\)](#), [Y \(ft\)](#), [Cohesion \(psf\)](#)

Data Point: (120, -41, 500)

Data Point: (120, -70, 820)

Data Point: (200, -41, 630)

Data Point: (200, -70, 950)

Data Point: (260, -41, 500)

Data Point: (260, -70, 820)

Fill Gr to -2

Model: [Linear Interpolation](#)

Limit Range By: [Data Values](#)

Data Points: [X \(ft\)](#), [Y \(ft\)](#), [Unit Weight \(pcf\)](#)

Data Point: (120, 1, 103)

Data Point: (120, -2, 103)

Data Point: (200, 10.72, 111)

Data Point: (200, -2, 111)

Data Point: (260, -1.5, 103)

Data Point: (260, -2, 103)

Regions

	Material	Points	Area (ft²)
Region 1	1-El +10.7 to -2, Fill GR	32,24,23,22,21,20,19,18,17,16,15,14,13,12,11,10,9,8,7,33	841.33799
Region 2	2-El -2 to -5, Fill	34,26,25,32,33,6,5,4,3,2,1,35	695.15027
Region 3	3-El -5 to -7, Fill	36,34,35,37	480
Region 4	4-El -7 to -17, Marsh	31,30,29,28,27,36,37,38,39	2718.1262
Region 5	5-El -17 to -19, -20, Marsh	39,38,40,42,43,44,41	636
Region 6	6-El -19, -20 to -33, Lancustrine	41,44,43,42,40,45,46	3892
Region 7	7-El -33 to -41, Sand	46,45,47,48	2264
Region 8	8-El -41 to -70, BaySound	48,47,49,50	8207

Points

	X (ft)	Y (ft)
Point 1	333.26943	-1.97
Point 2	324.72844	-1.95
Point 3	314.64956	-2.01
Point 4	303.10265	-1.99
Point 5	291.00986	-1.96
Point 6	278.25315	-2.25
Point 7	261.949	-1.81
Point 8	249.07504	-0.69
Point 9	238.23459	-0.01
Point 10	226.63885	3.07
Point 11	214.6191	7.27
Point 12	204.87471	10.52
Point 13	200	10.72
Point 14	194.19656	10.52
Point 15	183.65527	7.76
Point 16	171.0077	4.39
Point 17	160.88163	2.36
Point 18	149.8344	2.01
Point 19	139.53756	1.82
Point 20	129.34623	1.37
Point 21	120.24527	1.16
Point 22	117.87852	0.33
Point 23	114.82892	-0.65
Point 24	108.82186	-1.43
Point 25	103.87248	-2.33
Point 26	98.10619	-4.47
Point 27	88.22537	-7.27
Point 28	78.16792	-8.85
Point 29	68.28474	-10.57
Point 30	58.32233	-11.24
Point 31	50	-11.24

Point 32	107	-2
Point 33	267	-2
Point 34	96	-5
Point 35	333	-5
Point 36	90	-7
Point 37	333	-7
Point 38	333	-17
Point 39	50	-17
Point 40	333	-19
Point 41	50	-19
Point 42	260	-19
Point 43	200	-20
Point 44	120	-19
Point 45	333	-33
Point 46	50	-33
Point 47	333	-41
Point 48	50	-41
Point 49	333	-70
Point 50	50	-70

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.62	(134.414, 67.123)	56.31133	(210.254, 8.72573)	(75, -9.40132)
2	247	1.70	(134.414, 67.123)	96.881	(208.246, 9.39551)	(75, -9.40132)

Slices of Slip Surface: Optimized

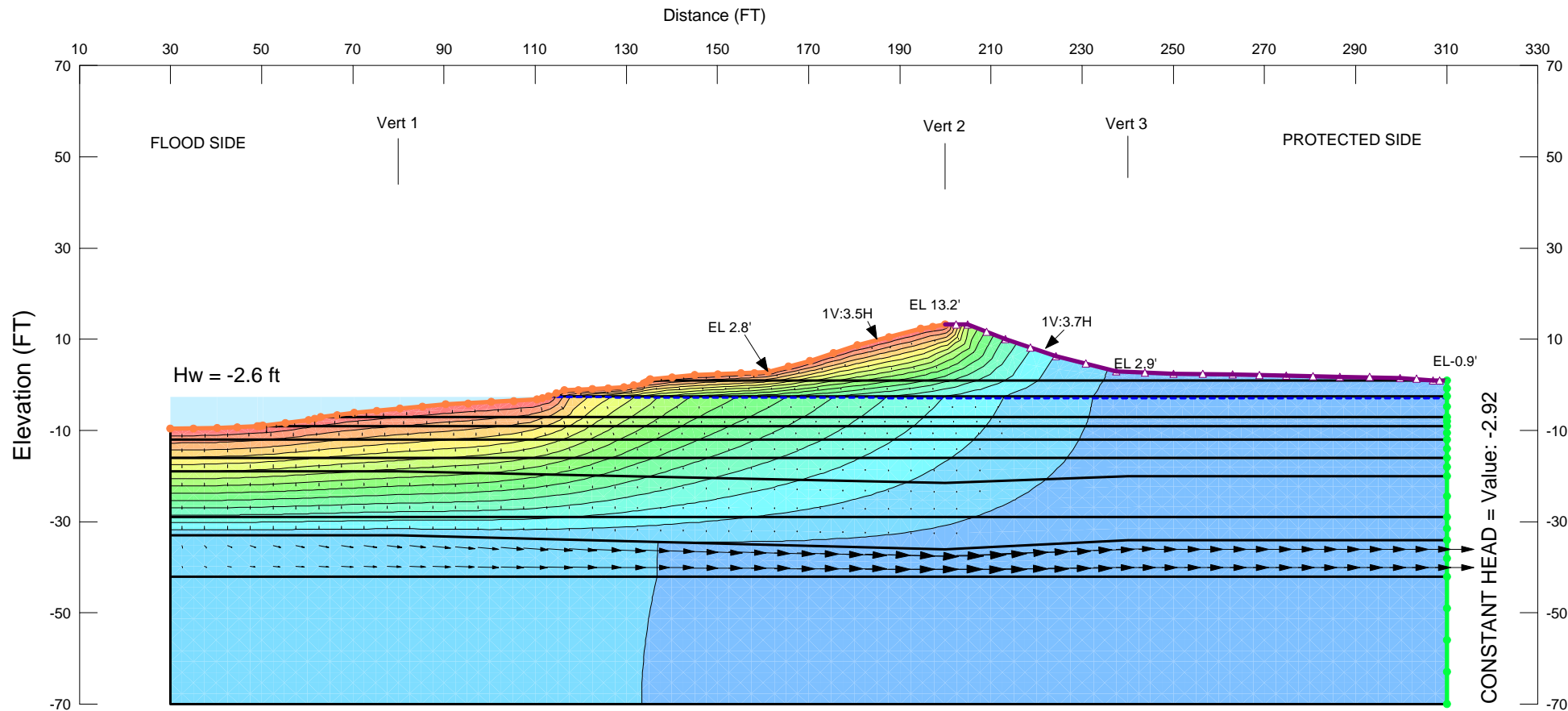
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	76.58396	-10.441872	484.78449	640.33766	0	200
2	Optimized	79.13426	-12.11724	582.16395	792.42106	0	200
3	Optimized	83.477885	-14.87603	742.55915	1037.4473	0	200
4	Optimized	87.54027	-17.43086	890.99216	1360.2118	0	400
5	Optimized	88.871755	-18.26823	939.77565	1436.0521	0	400
6	Optimized	89.75907	-18.776855	969.40028	1407.6692	0	400
7	Optimized	93	-20.150495	1048.9237	1538.0531	0	224.79
8	Optimized	97.02494	-21.856435	1148.1754	1773.1299	0	246.73
9	Optimized	98.078035	-22.29871	1173.9987	1789.9815	0	252.41
10	Optimized	100.98935	-23.111685	1221.067	1920.6951	0	262.86
11	Optimized	105.43625	-24.353475	1293.5256	2130.962	0	278.83
12	Optimized	107.2177	-24.850945	1322.7496	2208.6379	0	285.23
13	Optimized	108.12865	-24.997535	1331.2021	2201.2043	0	287.11
14	Optimized	111.8254	-25.455055	1357.5001	2312.1183	0	292.99
15	Optimized	115.89085	-25.958205	1386.7277	2440.6165	0	299.46
16	Optimized	117.41565	-26.04468	1391.5934	2420.6392	0	300.57
17	Optimized	118.93925	-25.89672	1382.1043	2458.9718	0	298.67
18	Optimized	120.12265	-25.7818	1374.786	2489.8163	0	297.38
19	Optimized	123.02255	-25.500185	1356.9086	2472.4497	0	298.08

20	Optimized	127.312	-25.111265	1332.1581	2450.0581	0	299.52
21	Optimized	129.0852	-24.97709	1323.5817	2448.6194	0	300.47
22	Optimized	131.22995	-24.854155	1315.6584	2445.5007	0	302.12
23	Optimized	136.31	-24.638005	1301.5418	2455.9665	0	307.03
24	Optimized	139.52195	-24.52982	1294.4067	2472.4185	0	310.52
25	Optimized	142.1118	-24.52782	1293.9693	2477.8466	0	314.4
26	Optimized	147.2602	-24.52384	1293.0952	2488.5295	0	322.13
27	Optimized	152.5962	-24.519715	1292.2511	2503.6131	0	330.15
28	Optimized	158.1198	-24.515445	1291.4002	2522.9845	0	338.45
29	Optimized	163.41315	-24.51135	1290.6088	2587.7749	0	346.42
30	Optimized	168.4762	-24.507435	1289.8385	2698.3804	0	354.05
31	Optimized	171.4741	-24.50512	1289.3954	2767.6763	0	358.57
32	Optimized	174.3346	-23.89349	1251.2941	2684.2642	0	355.59
33	Optimized	179.1228	-22.67095	1175.1674	2701.2621	0	348.36
34	Optimized	182.5861	-21.46552	1100.1808	2566.6526	0	339.46
35	Optimized	184.60185	-20.345355	1030.5784	2517.114	0	329.4
36	Optimized	186.61835	-19.22478	960.90493	2450.7896	0	416.65
37	Optimized	188.58825	-17.815105	873.28171	2254.9174	0	417.15
38	Optimized	191.8424	-14.86777	690.10517	2128.9223	0	397.57
39	Optimized	196.02485	-11.07966	454.35842	1906.8459	0	409.07
40	Optimized	198.92655	-8.2608895	278.74217	1637.1379	0	417.05
41	Optimized	200.96835	-6.0489995	140.87861	1465.3141	0	390.16
42	Optimized	203.32135	-3.5	-14.078146	1064.8132	0	636.16
43	Optimized	204.79035	-1.908612	-109.73867	907.11189	0	630.04
44	Optimized	205.70745	-0.915127	-169.8355	777.47767	0	626.22
45	Optimized	208.3973	1.856352	-339.51924	421.39626	0	615.01

Slices of Slip Surface: 247

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	247	76.58396	-10.580171	492.91197	666.83025	0	200
2	247	80.21561	-13.14171	641.97727	887.46416	0	200
3	247	84.31099	-15.7622	794.44619	1111.8026	0	200
4	247	87.292025	-17.519605	896.38768	1339.2222	0	400
5	247	89.112685	-18.50862	953.89658	1419.4136	0	400
6	247	93	-20.3976	1063.6468	1578.9813	0	227.97
7	247	97.053095	-22.25736	1172.1209	1817.4291	0	251.88
8	247	100.98935	-23.757925	1259.8974	2019.8854	0	271.17
9	247	105.43625	-25.308545	1351.1361	2246.7882	0	291.11
10	247	107.91095	-26.05788	1395.4245	2364.1598	0	300.74
11	247	111.8254	-27.037495	1453.4703	2522.8689	0	313.34
12	247	116.3537	-28.047375	1513.7125	2702.202	0	326.32
13	247	118.93925	-28.508375	1541.2678	2829.2172	0	332.25
14	247	120.12265	-28.69831	1552.6474	2887.1346	0	334.87
15	247	122.52055	-28.99812	1570.5814	2918.3145	0	342.17
16	247	127.071	-29.45263	1597.7907	2956.8671	0	354.5
17	247	131.89405	-29.69193	1611.9619	2977.6017	0	364.43
18	247	136.98975	-29.69045	1611.4863	2978.3414	0	371.68

19	247	142.1118	-29.417395	1594.3623	2944.1827	0	375.58
20	247	147.2602	-28.867625	1560.2232	2875.448	0	376.12
21	247	152.5962	-27.995185	1506.1807	2777.7442	0	373.04
22	247	158.1198	-26.76995	1430.3095	2648.9618	0	366.08
23	247	163.41315	-25.27815	1337.8807	2539.891	0	355.75
24	247	168.4762	-23.532475	1229.6827	2452.3766	0	342.27
25	247	174.1862	-21.14918	1081.8014	2337.2006	0	322.47
26	247	179.9168	-18.35853	908.47084	2200.142	0	414.98
27	247	183.0621	-16.655555	802.55476	2149.4035	0	373.42
28	247	186.2906	-14.639035	677.15064	2060.8654	0	382.3
29	247	191.56125	-11.040192	453.0779	1890.3007	0	396.79
30	247	195.49715	-8.056712	267.11097	1707.5385	0	407.62
31	247	197.9486	-6	138.84061	1529.4537	0	390.26
32	247	199.54975	-4.591059	52.220899	1271.1401	0	648.59
33	247	201.14795	-3.091059	-36.938103	1105.4911	0	645.22
34	247	203.5853	-0.68465955	-181.21545	827.80311	0	635.06
35	247	206.56045	2.5130949	-376.22981	388.93306	0	622.66



Name: 1-El +13.2 to +1, fill GR Model: Saturated Only K-Sat: 3.28e-008 ft/sec Volumetric Water Content: 0 ft³/ft³ Mv: 0 /psf K-Ratio: 1 K-Direction: 0 °

Name: 2-El +1 to -2.5, Fill Model: Saturated Only K-Sat: 3.28e-008 ft/sec Volumetric Water Content: 0 ft³/ft³ Mv: 0 /psf K-Ratio: 1 K-Direction: 0 °

Name: 3- El -2.5 to -7, Fill Model: Saturated Only K-Sat: 3.28e-007 ft/sec Volumetric Water Content: 0 ft³/ft³ Mv: 0 /psf K-Ratio: 1 K-Direction: 0 °

Name: 4-El -7 to -9, Fill Model: Saturated Only K-Sat: 3.28e-007 ft/sec Volumetric Water Content: 0 ft³/ft³ Mv: 0 /psf K-Ratio: 1 K-Direction: 0 °

Name: 5-El -9 to -12, Silt Model: Saturated Only K-Sat: 3.28e-007 ft/sec Volumetric Water Content: 0 ft³/ft³ Mv: 0 /psf K-Ratio: 1 K-Direction: 0 °

Name: 6-El -12 to -16, Clay Model: Saturated Only K-Sat: 3.28e-007 ft/sec Volumetric Water Content: 0 ft³/ft³ Mv: 0 /psf K-Ratio: 1 K-Direction: 0 °

Name: 7-El -16 to -19, 20, 21.5, Silt Model: Saturated Only K-Sat: 3.28e-007 ft/sec Volumetric Water Content: 0 ft³/ft³ Mv: 0 /psf K-Ratio: 1 K-Direction: 0 °

Name: 8-El -19, 20, 21.5 to -29, Lanc Model: Saturated Only K-Sat: 3.28e-007 ft/sec Volumetric Water Content: 0 ft³/ft³ Mv: 0 /psf K-Ratio: 1 K-Direction: 0 °

Name: 9-El -29 to -33, -34, -36, Lanc Model: Saturated Only K-Sat: 3.28e-007 ft/sec Volumetric Water Content: 0 ft³/ft³ Mv: 0 /psf K-Ratio: 1 K-Direction: 0 °

Name: 10-El -33, -34, -36 to -42, Beach Model: Saturated Only K-Sat: 0.000492 ft/sec Volumetric Water Content: 0 ft³/ft³ Mv: 0 /psf K-Ratio: 1 K-Direction: 0 °

Name: 11-El -42 to -70, BaySound Model: Saturated Only K-Sat: 3.28e-008 ft/sec Volumetric Water Content: 0 ft³/ft³ Mv: 0 /psf K-Ratio: 1 K-Direction: 0 °

CROSS SECTION AT STA 103+00W

GENERAL NOTES

CLASSIFICATION STRATIFICATION
SHEAR STRENGTHS AND UNIT WEIGHTS OF
THE SOIL WERE BASED ON THE RESULTS OF
UNDISTURBED BORINGS AND CPT DATA. SEE
BOTH BORING AND CPT DATA PLATES.

WHERE INDICATED, SHEAR STRENGTHS BETWEEN
VERTICALS WERE ASSUMED TO VARY LINEARLY
BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

LAKE PONTCHARTRAIN, LA. AND VICINITY HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL,
REMEDICATION OF CANAL WALLS AND LEVEES
PROTECTED SIDE STABILITY ANALYSIS,
CASE: Name: LWL Q Case (seepage)
REACH 11, STA. 98+70 TO STA. 112+50 WEST
ORLEANS PARISH, LOUISIANA

LWL Q Case (seepage)

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File Information

Created By: [Vicky Curtis](#)
Revision Number: [108](#)
Last Edited By: [Bishop, Charles E MVR](#)
Date: [6/18/2013](#)
Time: [4:47:00 PM](#)
File Name: [Reach 11.gsz](#)
Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix E LWL\](#)
Last Solved Date: [6/18/2013](#)
Last Solved Time: [4:47:16 PM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Mass(M) Units: [lbs](#)
Mass Flux Units: [lbs/sec](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

LWL Q Case (seepage)

Kind: [SEEP/W](#)
Method: [Steady-State](#)
Settings
 Include Air Flow: [No](#)
Control
 Apply Runoff: [Yes](#)
Convergence
 Convergence Type: [Gauss Point K](#)
 Convergence Settings
 Maximum Number of Iterations: [500](#)
 Tolerance: [0.01](#)
 Maximum Change in K: [0.1](#)
 Rate of Change in K: [1.02](#)
 Minimum Change in K: [0.0001](#)
Equation Solver: [Parallel Direct](#)
Potential Seepage Max # of Reviews: [10](#)

Time

Starting Time: 0 sec

Duration: 0 sec

Ending Time: 0 sec

Materials

1-El +13.2 to +1, fill GR

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-008 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

2-El +1 to -2.5, Fill

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-008 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

3- El -2.5 to -7, Fill

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-007 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

4-El -7 to -9, Fill

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-007 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

5-El -9 to -12, Silt

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-007 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

6-El -12 to -16, Clay

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-007 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

7-El -16 to -19, 20, 21.5, Silt

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-007 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

8-El -19, 20, 21.5 to -29, Lanc

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-007 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

9-El -29 to -33, -34, -36, Lanc

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-007 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

10-El -33, -34, -36 to -42, Beach

Model: Saturated Only

Hydraulic

K-Sat: 0.000492 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

11-El -42 to -70, BaySound

Model: Saturated Only
Hydraulic
K-Sat: 3.28e-008 ft/sec
Volumetric Water Content: 0 ft³/ft³
Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

Boundary Conditions

Drainage Face

Review: true
Type: Total Flux (Q) 0

PS Groundwater Level -2.92'

Type: Head (H) -2.92

Extreme Low Water Level -2.6'

Type: Head (H) -2.6

Regions

	Material	Points	Area (ft²)
Region 1	1-El +13.2 to +1, fill GR	31,17,16,15,14,13,12,11,10,9,8,7,6,5,4,3,2,1,32	666.31223
Region 2	2-El +1 to -2.5, Fill	33,21,20,19,18,31,32,57,34	649.6394
Region 3	3- El -2.5 to -7, Fill	35,26,25,24,23,22,33,34,36	1003.0252
Region 4	4-El -7 to -9, Fill	38,28,27,35,36,37	505.36899
Region 5	5-El -9 to -12, Silt	30,29,38,37,39,40	831.99503
Region 6	6-El -12 to -16, Clay	40,39,41,42	1120
Region 7	7-El -16 to -19, 20, 21.5, Silt	42,41,43,44,45,46,47	1130
Region 8	8-El -19, 20, 21.5 to -29, Lanc	47,46,45,44,43,48,49,58,59,60	2510
Region 9	9-El -29 to -33, -34, -36, Lanc	60,59,58,49,48,61,62,50,51,52	1450
Region 10	10-El -33, -34, -36 to -42, Beach	52,51,50,62,61,53,54	2190
Region 11	11-El -42 to -70, BaySound	54,53,55,56	7840

Lines

	Start Point	End Point	Hydraulic Boundary
Line 1	31	17	Extreme Low Water Level -2.6'
Line 2	17	16	Extreme Low Water Level -2.6'
Line 3	16	15	Extreme Low Water Level -2.6'
Line 4	15	14	Extreme Low Water Level -2.6'
Line 5	14	13	Extreme Low Water Level -2.6'
Line 6	13	12	Extreme Low Water Level -2.6'
Line 7	12	11	Extreme Low Water Level -2.6'

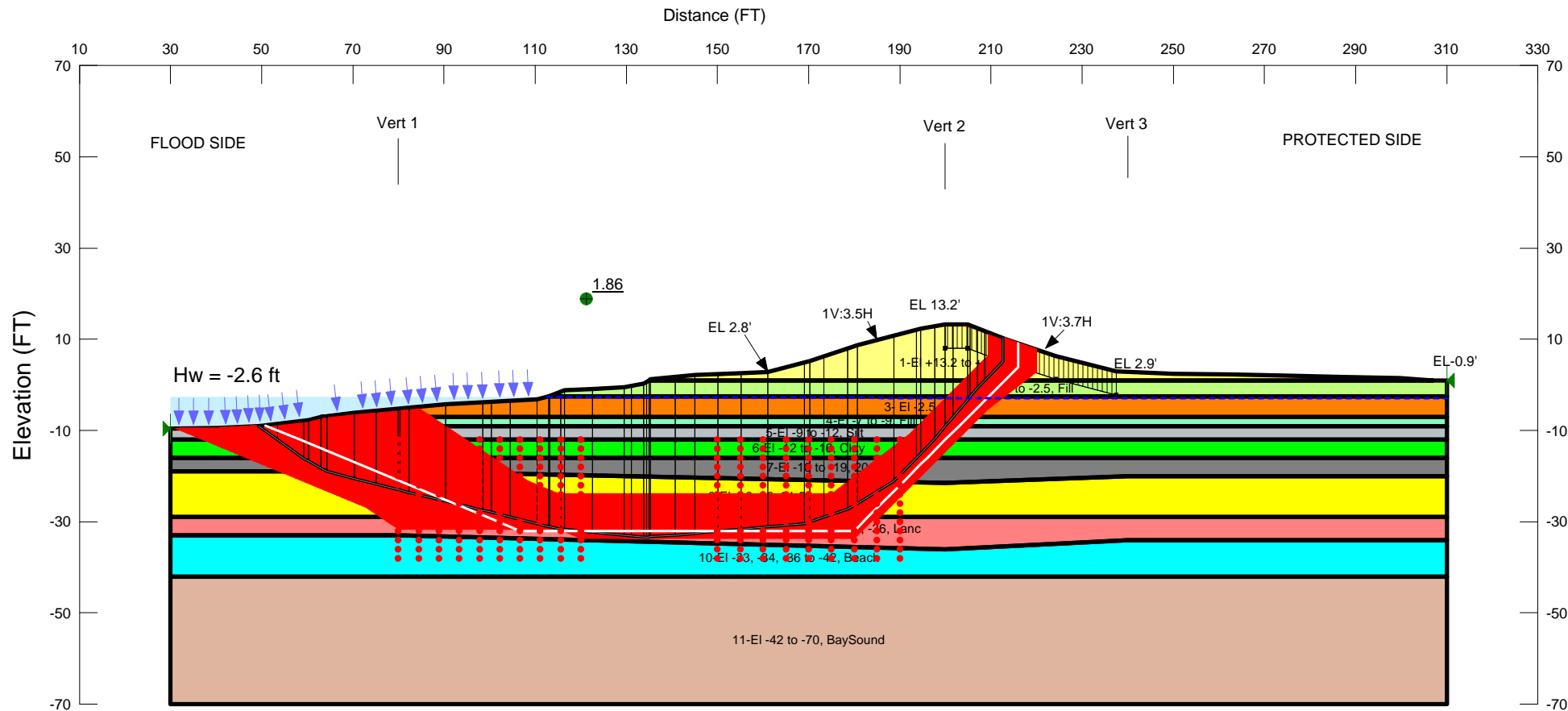
Line 8	11	10	Extreme Low Water Level -2.6'
Line 9	10	9	Drainage Face
Line 10	9	8	Drainage Face
Line 11	8	7	Drainage Face
Line 12	7	6	Drainage Face
Line 13	6	5	Drainage Face
Line 14	5	4	Drainage Face
Line 15	4	3	Drainage Face
Line 16	3	2	Drainage Face
Line 17	2	1	Drainage Face
Line 18	1	32	Drainage Face
Line 19	32	31	
Line 20	33	21	Extreme Low Water Level -2.6'
Line 21	21	20	Extreme Low Water Level -2.6'
Line 22	20	19	Extreme Low Water Level -2.6'
Line 23	19	18	Extreme Low Water Level -2.6'
Line 24	18	31	Extreme Low Water Level -2.6'
Line 25	34	33	
Line 26	35	26	Extreme Low Water Level -2.6'
Line 27	26	25	Extreme Low Water Level -2.6'
Line 28	25	24	Extreme Low Water Level -2.6'
Line 29	24	23	Extreme Low Water Level -2.6'
Line 30	23	22	Extreme Low Water Level -2.6'
Line 31	22	33	Extreme Low Water Level -2.6'
Line 32	34	36	PS Groundwater Level -2.92'
Line 33	36	35	
Line 34	38	28	Extreme Low Water Level -2.6'
Line 35	28	27	Extreme Low Water Level -2.6'
Line 36	27	35	Extreme Low Water Level -2.6'
Line 37	36	37	PS Groundwater Level -2.92'
Line 38	37	38	
Line 39	30	29	Extreme Low Water Level -2.6'
Line 40	29	38	Extreme Low Water Level -2.6'
Line 41	37	39	PS Groundwater Level -2.92'
Line 42	39	40	
Line 43	39	41	PS Groundwater Level -2.92'
Line 44	41	42	
Line 45	42	40	
Line 46	41	43	PS Groundwater Level -2.92'
Line 47	43	44	
Line 48	44	45	
Line 49	45	46	
Line 50	46	47	
Line 51	47	42	
Line 52	30	40	
Line 53	32	57	Drainage Face
Line 54	57	34	PS Groundwater Level -2.92'
Line 55	43	48	PS Groundwater Level -2.92'

Line 56	48	49	
Line 57	49	58	
Line 58	58	59	
Line 59	59	60	
Line 60	60	47	
Line 61	48	61	PS Groundwater Level -2.92'
Line 62	61	62	
Line 63	62	50	
Line 64	50	51	
Line 65	51	52	
Line 66	52	60	
Line 67	61	53	PS Groundwater Level -2.92'
Line 68	53	54	
Line 69	54	52	
Line 70	53	55	PS Groundwater Level -2.92'
Line 71	55	56	
Line 72	56	54	

Points

	X (ft)	Y (ft)
Point 1	299.76482	1.57
Point 2	286.5021	1.81
Point 3	274.72265	2.1
Point 4	263.0598	2.25
Point 5	250.11037	2.42
Point 6	237.47421	2.92
Point 7	224.25455	6.32
Point 8	213.13888	10.07
Point 9	204.83191	13.2
Point 10	200	13.2
Point 11	194.6022	12.34
Point 12	180.69592	8.67
Point 13	170.26269	5.28
Point 14	161.02916	2.8
Point 15	155.11244	2.62
Point 16	145.03996	2.11
Point 17	135.24107	1.24
Point 18	133.74292	0.31
Point 19	129.56031	-0.55
Point 20	122.62305	-0.91
Point 21	116.39775	-1.23
Point 22	110.42069	-3.2
Point 23	100.32551	-3.66
Point 24	90.33436	-4.27
Point 25	80.38231	-5.21
Point 26	70.35922	-6.08
Point 27	60.30838	-7.67

Point 28	50.29143	-8.96
Point 29	40.30759	-9.49
Point 30	30	-9.65
Point 31	135	1
Point 32	307	1
Point 33	113	-2.5
Point 34	310	-2.5
Point 35	63	-7
Point 36	310	-7
Point 37	310	-9
Point 38	49	-9
Point 39	310	-12
Point 40	30	-12
Point 41	310	-16
Point 42	30	-16
Point 43	310	-20
Point 44	240	-20
Point 45	200	-21.5
Point 46	80	-19
Point 47	30	-19
Point 48	310	-29
Point 49	240	-29
Point 50	200	-36
Point 51	80	-33
Point 52	30	-33
Point 53	310	-42
Point 54	30	-42
Point 55	310	-70
Point 56	30	-70
Point 57	310	0.92
Point 58	200	-29
Point 59	80	-29
Point 60	30	-29
Point 61	310	-34
Point 62	240	-34



Name: 1-EI +13.2 to +1, fill GR Model: Spatial Mohr-Coulomb Weight Spatial Fn: Fill Gr to 1 Cohesion Spatial Fn: fill GR to -1 Phi: 0 ° Phi-B: 0 °
 Name: 2-EI +1 to -2.5, Fill Model: Spatial Mohr-Coulomb Weight Spatial Fn: Fill 1 to -2.5 Cohesion Spatial Fn: Fill 1 to -2.5 Phi: 0 ° Phi-B: 0 °
 Name: 3-EI -2.5 to -7, Fill Model: Spatial Mohr-Coulomb Weight Spatial Fn: fill -2.5 to -7 Cohesion Spatial Fn: Fill -2.5 to -7 Phi: 0 ° Phi-B: 0 °
 Name: 4-EI -7 to -9, Fill Model: Spatial Mohr-Coulomb Weight Spatial Fn: Fill -7 to -9 Cohesion Spatial Fn: Fill -7 to -9 Phi: 0 ° Phi-B: 0 °
 Name: 5-EI -9 to -12, Silt Model: Mohr-Coulomb Unit Weight: 117 pcf Cohesion: 200 psf Phi: 15 ° Phi-B: 0 °
 Name: 6-EI -12 to -16, Clay Model: Spatial Mohr-Coulomb Weight Spatial Fn: Fill -12 to -16 (2) Cohesion Spatial Fn: Fill -12 to -16 Phi: 0 ° Phi-B: 0 °
 Name: 7-EI -16 to -19, 20, 21.5, Silt Model: Mohr-Coulomb Unit Weight: 117 pcf Cohesion: 200 psf Phi: 15 ° Phi-B: 0 °
 Name: 8-EI -19, 20, 21.5 to -29, Lanc Model: Spatial Mohr-Coulomb Weight Spatial Fn: Lanc -19, 20, 21.5 to -29 Cohesion Spatial Fn: Lanc -19, 21.5, 20 to -29 Phi: 0 ° Phi-B: 0 °
 Name: 9-EI -29 to -33, -34, -36, Lanc Model: Spatial Mohr-Coulomb Weight Spatial Fn: Lanc -29 to -33, 34, 36 Cohesion Spatial Fn: Lanc -29 to -33, 34, 36 Phi: 0 ° Phi-B: 0 °
 Name: 10-EI -33, -34, -36 to -42, Beach Model: Mohr-Coulomb Unit Weight: 122 pcf Cohesion: 0 psf Phi: 33 ° Phi-B: 0 °
 Name: 11-EI -42 to -70, BaySound Model: Spatial Mohr-Coulomb Unit Weight: 107 pcf Cohesion Spatial Fn: BaySound -42 to -70 Phi: 0 ° Phi-B: 0 °

CROSS SECTION AT STA 103+00W

GENERAL NOTES

CLASSIFICATION STRATIFICATION
 SHEAR STRENGTHS AND UNIT WEIGHTS OF
 THE SOIL WERE BASED ON THE RESULTS OF
 UNDISTURBED BORINGS AND CPT DATA. SEE
 BOTH BORING AND CPT DATA PLATES.

WHERE INDICATED, SHEAR STRENGTHS BETWEEN
 VERTICALS WERE ASSUMED TO VARY LINEARLY
 BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

LAKE PONTCHARTRAIN, LA. AND VICINITY HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL,
 REMEDIATION OF CANAL WALLS AND LEVEES
 PROTECTED SIDE STABILITY ANALYSIS,
 CASE: Name: LWL Q Case (Block)
 REACH 11, STA. 98+70 TO STA. 112+50 WEST
 ORLEANS PARISH, LOUISIANA

LWL Q Case (Block)

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File Information

Created By: [Vicky Curtis](#)
Revision Number: [109](#)
Last Edited By: [Bishop, Charles E MVR](#)
Date: [6/18/2013](#)
Time: [4:58:53 PM](#)
File Name: [Reach 11.gsz](#)
Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix E LWL\](#)
Last Solved Date: [6/18/2013](#)
Last Solved Time: [5:02:44 PM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Strength Units: [psf](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

LWL Q Case (Block)

Kind: [SLOPE/W](#)
Parent: [LWL Q Case \(seepage\)](#)
Method: [Spencer](#)
Settings
 PWP Conditions Source: [Parent Analysis](#)
Slip Surface
 Direction of movement: [Right to Left](#)
 Use Passive Mode: [No](#)
 Slip Surface Option: [Block](#)
 Critical slip surfaces saved: [1](#)
 Optimize Critical Slip Surface Location: [Yes](#)
 Tension Crack
 Tension Crack Option: [Tension Crack Line](#)
 Percentage Wet: [1](#)
 Tension Crack Fluid Unit Weight: [62.4 pcf](#)
FOS Distribution
 FOS Calculation Option: [Constant](#)

Restrict Block Crossing: [Yes](#)

Advanced

Number of Slices: [30](#)

Optimization Tolerance: [0.01](#)

Minimum Slip Surface Depth: [0.1 ft](#)

Optimization Maximum Iterations: [9000](#)

Optimization Convergence Tolerance: [1e-007](#)

Starting Optimization Points: [8](#)

Ending Optimization Points: [16](#)

Complete Passes per Insertion: [1](#)

Driving Side Maximum Convex Angle: [5 °](#)

Resisting Side Maximum Convex Angle: [1 °](#)

Materials

1-El +13.2 to +1, fill GR

Model: [Spatial Mohr-Coulomb](#)

Weight Spatial Fn: [Fill Gr to 1](#)

Cohesion Spatial Fn: [fill GR to -1](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

2-El +1 to -2.5, Fill

Model: [Spatial Mohr-Coulomb](#)

Weight Spatial Fn: [Fiil 1 to -2.5](#)

Cohesion Spatial Fn: [Fill 1 to -2.5](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

3- El -2.5 to -7, Fill

Model: [Spatial Mohr-Coulomb](#)

Weight Spatial Fn: [fill -2.5 t0-7](#)

Cohesion Spatial Fn: [Fill -2.5 tp -7](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

4-El -7 to -9, Fill

Model: [Spatial Mohr-Coulomb](#)

Weight Spatial Fn: [Fill -7 to -9](#)

Cohesion Spatial Fn: [Fill -7 to-9](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

5-El -9 to -12, Silt

Model: [Mohr-Coulomb](#)

Unit Weight: [117 pcf](#)

Cohesion: [200 psf](#)

Phi: 15 °

Phi-B: 0 °

6-El -12 to -16, Clay

Model: Spatial Mohr-Coulomb

Weight Spatial Fn: Fill -12 to -16 (2)

Cohesion Spatial Fn: Fill -12 to -16

Phi: 0 °

Phi-B: 0 °

7-El -16 to -19, 20, 21.5, Silt

Model: Mohr-Coulomb

Unit Weight: 117 pcf

Cohesion: 200 psf

Phi: 15 °

Phi-B: 0 °

8-El -19, 20, 21.5 to -29, Lanc

Model: Spatial Mohr-Coulomb

Weight Spatial Fn: Lanc-19,20,21.5 to -29

Cohesion Spatial Fn: Lanc -19,21.5,20 to-29

Phi: 0 °

Phi-B: 0 °

9-El -29 to -33, -34, -36, Lanc

Model: Spatial Mohr-Coulomb

Weight Spatial Fn: Lan -29 to -33,34,36

Cohesion Spatial Fn: Lanc-29 to -33,34,36

Phi: 0 °

Phi-B: 0 °

10-El -33, -34, -36 to -42, Beach

Model: Mohr-Coulomb

Unit Weight: 122 pcf

Cohesion: 0 psf

Phi: 33 °

Phi-B: 0 °

11-El -42 to -70, BaySound

Model: Spatial Mohr-Coulomb

Unit Weight: 107 pcf

Cohesion Spatial Fn: BaySound -42 to-70

Phi: 0 °

Phi-B: 0 °

Slip Surface Limits

Left Coordinate: (30, -9.65) ft

Right Coordinate: (310, 0.92) ft

Slip Surface Block

Left Grid

Upper Left: (80, -12) ft

Lower Left: (80, -38) ft

Lower Right: (120, -38) ft

X Increments: 9

Y Increments: 13

Starting Angle: 135 °

Ending Angle: 180 °

Angle Increments: 4

Right Grid

Upper Left: (150, -12) ft

Lower Left: (150, -38) ft

Lower Right: (190, -38) ft

X Increments: 8

Y Increments: 13

Starting Angle: 15 °

Ending Angle: 45 °

Angle Increments: 4

Tension Crack Line

	X (ft)	Y (ft)
	200	8
	204.832	8
	213.138	4.9
	224.255	1.2
	237.474	-2.2

Spatial Functions

fill GR to -1

Model: Linear Interpolation

Limit Range By: Data Values

Data Points: X (ft), Y (ft), Cohesion (psf)

Data Point: (200, 12.84, 800)

Data Point: (200, 1, 800)

Data Point: (240, 2.9, 550)

Data Point: (240, 1, 550)

fill -2.5 to -7

Model: Linear Interpolation

Limit Range By: Data Values

Data Points: X (ft), Y (ft), Unit Weight (pcf)

Data Point: (80, -5.2, 118)
Data Point: (80, -7, 118)
Data Point: (200, -2.5, 100)
Data Point: (200, -7, 100)
Data Point: (240, -2.5, 97)
Data Point: (240, -7, 97)

Fill -7 to -9

Model: [Linear Interpolation](#)
Limit Range By: [Data Values](#)
Data Points: [X \(ft\)](#), [Y \(ft\)](#), [Unit Weight \(pcf\)](#)
Data Point: (80, -7, 118)
Data Point: (80, -9, 118)
Data Point: (200, -7, 110)
Data Point: (200, -9, 110)
Data Point: (240, -7, 118)
Data Point: (240, -9, 118)

Fill -12 to -16 (2)

Model: [Linear Interpolation](#)
Limit Range By: [Data Values](#)
Data Points: [X \(ft\)](#), [Y \(ft\)](#), [Unit Weight \(pcf\)](#)
Data Point: (80, -12, 118)
Data Point: (80, -16, 118)
Data Point: (200, -12, 110)
Data Point: (200, -16, 110)
Data Point: (240, -12, 118)
Data Point: (240, -16, 118)

Lanc-19,20,21.5 to -29

Model: [Linear Interpolation](#)
Limit Range By: [Data Values](#)
Data Points: [X \(ft\)](#), [Y \(ft\)](#), [Unit Weight \(pcf\)](#)
Data Point: (80, -19, 101)
Data Point: (80, -29, 101)
Data Point: (200, -21.5, 103)
Data Point: (200, -29, 103)
Data Point: (240, -20, 101)
Data Point: (240, -29, 101)

Lan -29 to -33,34,36

Model: [Linear Interpolation](#)
Limit Range By: [Data Values](#)
Data Points: [X \(ft\)](#), [Y \(ft\)](#), [Unit Weight \(pcf\)](#)
Data Point: (80, -29, 101)
Data Point: (80, -33, 101)
Data Point: (200, -29, 103)
Data Point: (200, -36, 103)

Data Point: (240, -29, 101)

Data Point: (240, -34, 101)

Fill 1 to -2.5

Model: [Linear Interpolation](#)

Limit Range By: [Data Values](#)

Data Points: [X \(ft\)](#), [Y \(ft\)](#), [Cohesion \(psf\)](#)

Data Point: (200, 1, 350)

Data Point: (200, -2.5, 350)

Data Point: (240, 1, 550)

Data Point: (240, -2.5, 550)

Fill -2.5 tp -7

Model: [Linear Interpolation](#)

Limit Range By: [Data Values](#)

Data Points: [X \(ft\)](#), [Y \(ft\)](#), [Cohesion \(psf\)](#)

Data Point: (80, -5.2, 350)

Data Point: (80, -7, 350)

Data Point: (200, -2.5, 350)

Data Point: (200, -7, 350)

Data Point: (240, -2.5, 175)

Data Point: (240, -7, 175)

Fill -7 to-9

Model: [Linear Interpolation](#)

Limit Range By: [Data Values](#)

Data Points: [X \(ft\)](#), [Y \(ft\)](#), [Cohesion \(psf\)](#)

Data Point: (80, -7, 350)

Data Point: (80, -9, 350)

Data Point: (200, -7, 470)

Data Point: (200, -9, 470)

Data Point: (240, -7, 350)

Data Point: (240, -9, 350)

Fill -12 to -16

Model: [Linear Interpolation](#)

Limit Range By: [Data Values](#)

Data Points: [X \(ft\)](#), [Y \(ft\)](#), [Cohesion \(psf\)](#)

Data Point: (80, -12, 350)

Data Point: (80, -16, 350)

Data Point: (200, -12, 470)

Data Point: (200, -16, 470)

Data Point: (240, -12, 350)

Data Point: (240, -16, 350)

Lanc -19,21.5,20 to-29

Model: [Linear Interpolation](#)

Limit Range By: [Data Values](#)

Data Points: [X \(ft\)](#), [Y \(ft\)](#), [Cohesion \(psf\)](#)

Data Point: (80, -19, 240)
Data Point: (80, -29, 332)
Data Point: (200, -21.5, 470)
Data Point: (200, -29, 563)
Data Point: (240, -20, 350)
Data Point: (240, -29, 450)
Data Point: (30, -19, 240)
Data Point: (310, -20, 350)

Lanc-29 to -33,34,36

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (80, -29, 332)
Data Point: (80, -33, 370)
Data Point: (200, -29, 563)
Data Point: (200, -36, 650)
Data Point: (240, -29, 320)
Data Point: (240, -34, 320)
Data Point: (30, -29, 332)
Data Point: (310, -29, 320)

BaySound -42 to-70

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (80, -42, 600)
Data Point: (80, -70, 820)
Data Point: (200, -42, 605)
Data Point: (200, -70, 830)
Data Point: (240, -42, 600)
Data Point: (240, -70, 820)

Fill Gr to 1

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Unit Weight (pcf)
Data Point: (200, 12.84, 105)
Data Point: (200, 1, 105)
Data Point: (240, 2.9, 110)
Data Point: (240, 1, 110)

Fiil 1 to -2.5

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Unit Weight (pcf)
Data Point: (200, 1, 105)
Data Point: (200, -2.5, 105)

Data Point: (240, 1, 110)

Data Point: (240, -2.5, 110)

Regions

	Material	Points	Area (ft ²)
Region 1	1-El +13.2 to +1, fill GR	31,17,16,15,14,13,12,11,10,9,8,7,6,5,4,3,2,1,32	666.31223
Region 2	2-El +1 to -2.5, Fill	33,21,20,19,18,31,32,57,34	649.6394
Region 3	3- El -2.5 to -7, Fill	35,26,25,24,23,22,33,34,36	1003.0252
Region 4	4-El -7 to -9, Fill	38,28,27,35,36,37	505.36899
Region 5	5-El -9 to -12, Silt	30,29,38,37,39,40	831.99503
Region 6	6-El -12 to -16, Clay	40,39,41,42	1120
Region 7	7-El -16 to -19, 20, 21.5, Silt	42,41,43,44,45,46,47	1130
Region 8	8-El -19, 20, 21.5 to -29, Lanc	47,46,45,44,43,48,49,58,59,60	2510
Region 9	9-El -29 to -33, -34, -36, Lanc	60,59,58,49,48,61,62,50,51,52	1450
Region 10	10-El -33, -34, -36 to -42, Beach	52,51,50,62,61,53,54	2190
Region 11	11-El -42 to -70, BaySound	54,53,55,56	7840

Points

	X (ft)	Y (ft)
Point 1	299.76482	1.57
Point 2	286.5021	1.81
Point 3	274.72265	2.1
Point 4	263.0598	2.25
Point 5	250.11037	2.42
Point 6	237.47421	2.92
Point 7	224.25455	6.32
Point 8	213.13888	10.07
Point 9	204.83191	13.2
Point 10	200	13.2
Point 11	194.6022	12.34
Point 12	180.69592	8.67
Point 13	170.26269	5.28
Point 14	161.02916	2.8
Point 15	155.11244	2.62
Point 16	145.03996	2.11
Point 17	135.24107	1.24
Point 18	133.74292	0.31
Point 19	129.56031	-0.55
Point 20	122.62305	-0.91
Point 21	116.39775	-1.23
Point 22	110.42069	-3.2
Point 23	100.32551	-3.66
Point 24	90.33436	-4.27
Point 25	80.38231	-5.21
Point 26	70.35922	-6.08
Point 27	60.30838	-7.67

Point 28	50.29143	-8.96
Point 29	40.30759	-9.49
Point 30	30	-9.65
Point 31	135	1
Point 32	307	1
Point 33	113	-2.5
Point 34	310	-2.5
Point 35	63	-7
Point 36	310	-7
Point 37	310	-9
Point 38	49	-9
Point 39	310	-12
Point 40	30	-12
Point 41	310	-16
Point 42	30	-16
Point 43	310	-20
Point 44	240	-20
Point 45	200	-21.5
Point 46	80	-19
Point 47	30	-19
Point 48	310	-29
Point 49	240	-29
Point 50	200	-36
Point 51	80	-33
Point 52	30	-33
Point 53	310	-42
Point 54	30	-42
Point 55	310	-70
Point 56	30	-70
Point 57	310	0.92
Point 58	200	-29
Point 59	80	-29
Point 60	30	-29
Point 61	310	-34
Point 62	240	-34

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.86	(132.663, 7.172)	69.13688	(212.569, 10.2848)	(49.3582, -8.98891)
2	23975	1.97	(132.663, 7.172)	68.659	(215.961, 9.11807)	(50.8649, -8.88615)

Slices of Slip Surface: Optimized

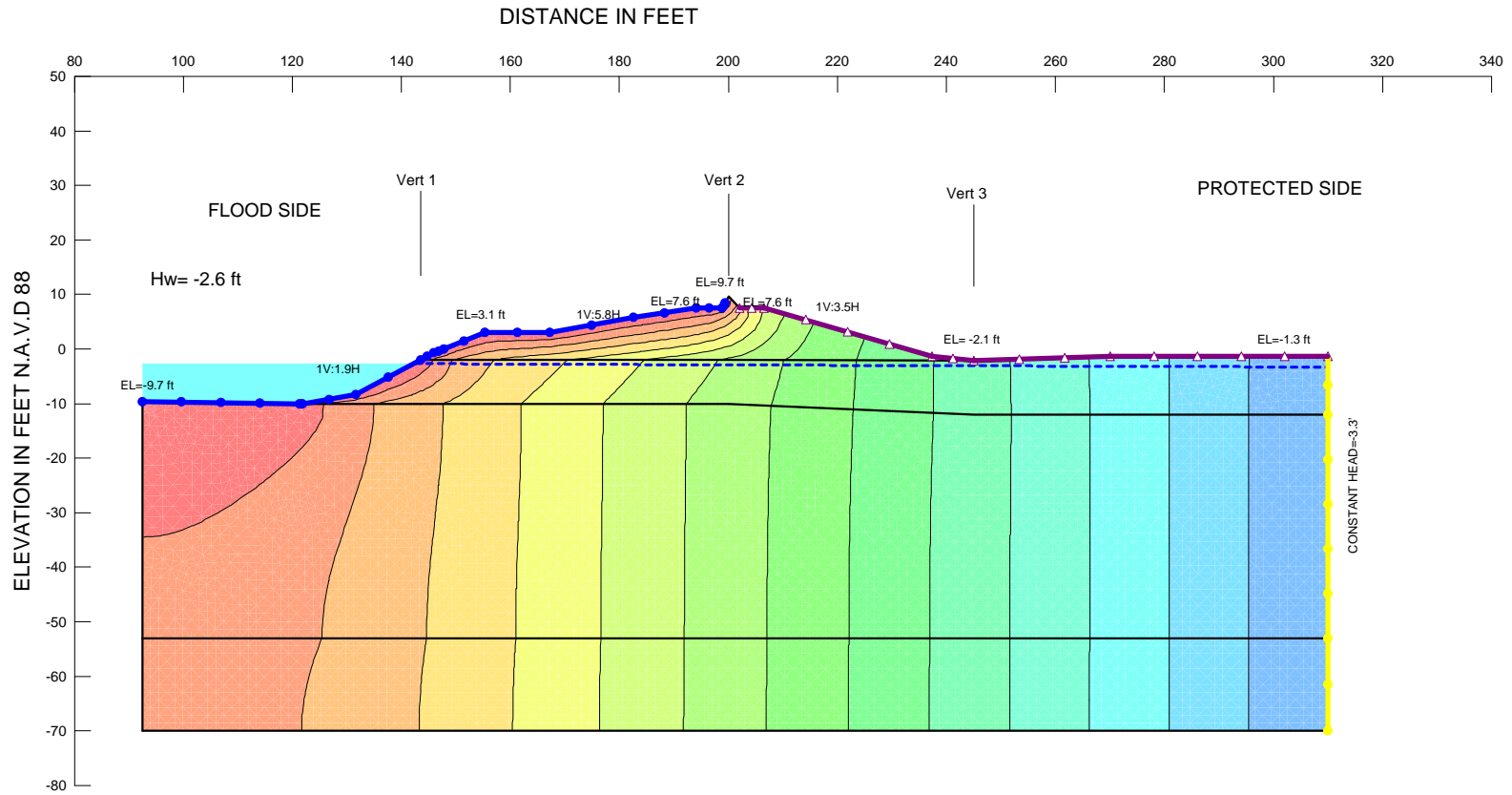
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	49.82479	-9.327265	419.4725	568.86464	40.029502	200
2	Optimized	51.90114	-10.832812	512.11073	783.92045	72.831195	200
3	Optimized	56.343115	-14.053655	710.31244	1249.2066	0	350

4	Optimized	59.74188	-16.419025	855.94074	1524.3617	179.10286	200
5	Optimized	61.65419	-17.471275	920.74264	1686.775	205.25775	200
6	Optimized	63.658335	-18.57406	988.66344	1850.8328	231.01758	200
7	Optimized	67.337945	-19.719415	1059.1407	1863.4366	0	246.62
8	Optimized	72.769415	-21.12724	1145.8159	2043.3028	0	259.57
9	Optimized	77.589805	-22.376675	1222.7887	2197.3286	0	271.07
10	Optimized	80.191155	-23.050935	1264.3321	2280.3503	0	277.61
11	Optimized	81.334355	-23.34725	1282.6053	2317.3727	0	282.41
12	Optimized	86.31038	-24.554355	1357.0264	2462.9039	0	302.68
13	Optimized	94.410625	-26.4875	1476.3504	2698.2111	0	335.88
14	Optimized	99.406195	-27.692255	1550.702	2845.107	0	356.8
15	Optimized	102.45745	-28.4621	1598.1984	2933.4756	0	370.03
16	Optimized	107.50505	-29.73563	1676.9133	3078.4702	0	392.67
17	Optimized	111.71035	-30.796645	1742.4647	3214.5677	0	412.14
18	Optimized	113.0869	-31.14396	1763.9247	3278.3621	0	418.57
19	Optimized	114.40975	-31.375495	1778.2256	3317.8095	0	423.68
20	Optimized	116.02175	-31.6235	1793.6237	3376.2718	0	429.56
21	Optimized	119.51045	-31.979765	1815.5302	3443.4509	0	440.4
22	Optimized	126.0917	-32.651845	1857.2167	3546.5081	0	461
23	Optimized	130.36	-33.087725	1884.1883	3626.439	0	474.46
24	Optimized	132.4513	-33.2373	1893.4585	3661.8179	0	480.37
25	Optimized	134.13375	-33.32576	1899.0015	3720.8421	0	484.77
26	Optimized	134.7623	-33.33058	1899.2498	3697.3702	0	486.1
27	Optimized	135.12055	-33.306875	1897.7869	3720.9868	0	486.56
28	Optimized	137.9647	-33.11867	1885.9965	3738.1051	0	490.19
29	Optimized	142.86415	-32.74435	1862.8034	3731.146	0	495.8
30	Optimized	147.5581	-32.325635	1836.7411	3719.5638	0	500.39
31	Optimized	152.5943	-31.87638	1808.7756	3697.6108	0	505.2
32	Optimized	158.0708	-31.387855	1778.3871	3667.3763	0	510.32
33	Optimized	165.0815	-30.762475	1739.2518	3722.579	0	516.71
34	Optimized	169.69825	-30.21434	1705.1275	3668.6229	0	519.19
35	Optimized	171.81655	-29.513845	1661.4909	3665.1478	0	514.91
36	Optimized	175.9586	-28.14413	1576.1469	3664.5066	0	506.79
37	Optimized	179.62135	-26.6291	1481.723	3496.5537	0	496
38	Optimized	184.72615	-23.497705	1286.564	3332.7358	0	468.24
39	Optimized	191.20685	-18.512735	975.80621	2704.7399	463.26638	200
40	Optimized	194.12975	-15.515535	788.90319	2548.4004	0	464.13
41	Optimized	196.15015	-13.443755	659.74515	2367.4601	0	466.15
42	Optimized	198.84905	-10.467582	474.11691	1952.101	396.02464	200
43	Optimized	200.8613	-8.0393615	322.6319	1786.5841	0	467.42
44	Optimized	203.27725	-5.124001	140.72957	1585.5471	0	335.66
45	Optimized	205.14185	-2.874001	0.31191033	1374.1101	0	327.5
46	Optimized	206.22495	-1.567	-80.818334	1179.5532	0	381.12
47	Optimized	207.79015	0.183	-189.27543	992.40525	0	388.95
48	Optimized	210.57555	3.056202	-367.93603	425.02775	0	733.9

Slices of Slip Surface: 23975

	Slip	X (ft)	Y (ft)	PWP (psf)	Base Normal	Frictional	Cohesive
--	------	--------	--------	-----------	-------------	------------	----------

	Surface				Stress (psf)	Strength (psf)	Strength (psf)
1	23975	54.623645	-10.443074	487.91393	684.15608	52.582926	200
2	23975	59.34539	-12.398885	608.05758	978.52371	0	350
3	23975	61.65419	-13.35522	666.85248	1122.8165	0	350
4	23975	65.519625	-14.956335	765.35743	1351.3382	0	350
5	23975	69.199235	-16.48048	859.17906	1571.9293	190.98086	200
6	23975	72.820555	-17.98048	951.60521	1779.7743	221.90723	200
7	23975	77.640945	-19.977155	1074.6557	1984.3955	0	248.99
8	23975	80.191155	-21.033485	1139.8001	2109.0386	0	259.05
9	23975	82.870325	-22.14323	1208.2411	2241.3619	0	274.05
10	23975	87.84635	-24.20437	1335.4039	2487.1839	0	302.22
11	23975	92.606775	-26.176205	1457.1203	2717.4642	0	329.56
12	23975	97.15161	-28.058735	1573.3565	2933.3489	0	356.02
13	23975	99.874765	-29.186705	1643.0282	3062.6406	0	372.17
14	23975	103.4961	-30.686705	1735.6733	3232.1141	0	394.73
15	23975	108.5437	-32	1816.9308	3205.8941	0	418.55
16	23975	111.71035	-32	1816.92	3227.1421	0	424.93
17	23975	114.6989	-32	1816.9082	3316.018	0	430.95
18	23975	119.51045	-32	1816.9405	3397.266	0	440.62
19	23975	126.0917	-32	1816.8556	3429.7403	0	453.81
20	23975	131.6516	-32	1816.7364	3491.1216	0	464.93
21	23975	134.37145	-32	1816.6704	3571.0536	0	470.36
22	23975	135.12055	-32	1816.6922	3619.5296	0	471.86
23	23975	137.6908	-32	1816.6547	3653.6791	0	476.99
24	23975	142.59025	-32	1816.5935	3696.9493	0	486.75
25	23975	147.5581	-32	1816.5139	3730.5609	0	496.64
26	23975	152.5943	-32	1816.4543	3754.7853	0	506.64
27	23975	158.0708	-32	1816.378	3774.8956	0	517.51
28	23975	163.33755	-32	1816.3151	3846.6329	0	527.95
29	23975	167.9543	-32	1816.2501	3974.428	0	537.08
30	23975	172.697	-32	1816.1689	4120.2344	0	546.46
31	23975	177.56565	-32	1816.1073	4283.7293	0	556.08
32	23975	180.34795	-31.65204	1794.3881	3810.9918	0	557.35
33	23975	181.84795	-30.15204	1700.9871	3713.4095	0	542.06
34	23975	186.84695	-25.15306	1389.605	3380.545	0	491.71
35	23975	192.64805	-19.35196	1028.0064	2852.7991	488.95175	200
36	23975	195.3011	-16.6989	862.61147	2627.6465	472.9397	200
37	23975	198	-14	694.27282	2475.0506	0	468
38	23975	201.5	-10.5	475.92997	2065.718	425.98243	200
39	23975	203.91595	-8.084045	325.1693	1885.003	0	458.25
40	23975	207.16595	-4.834045	122.31288	1549.758	0	318.65
41	23975	211.31945	-0.68056	-136.41064	961.51436	0	406.6
42	23975	214.54975	2.5497295	-337.4026	372.53617	0	709.06



Name: EMBANKMENT FILL, EL. +10.3 TO -2.0/-2.1 Model: Saturated Only K-Sat: 3.28e-008 ft/sec K-Ratio: 1
Name: MARSH 1, EL. -2.0/-2.1 TO -10.0/-12.0 Model: Saturated Only K-Sat: 3.28e-007 ft/sec K-Ratio: 1
Name: BEACH SAND, EL. -10.0/-12.0 TO -53.0 Model: Saturated Only K-Sat: 0.00049 ft/sec K-Ratio: 1
Name: BAY SOUND CLAY, EL. -53.0 TO -70.0 Model: Saturated Only K-Sat: 3.28e-008 ft/sec K-Ratio: 1

GENERAL NOTES

CLASSIFICATION STRATIFICATION
SHEAR STRENGTHS AND UNIT WEIGHTS OF
THE SOIL WERE BASED ON THE RESULTS OF
UNDISTURBED BORINGS AND CPT DATA. SEE
BOTH BORING AND CPT DATA PLATES.

WHERE INDICATED, SHEAR STRENGTHS BETWEEN
VERTICALS WERE ASSUMED TO VARY LINEARLY
BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

Hw IS CANAL WATER LEVEL

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 12A,
PROTECTED SIDE STABILITY ANALYSIS,
CASE: LWL Q Case (seepage)
STA. 2+45 TO 3+70 EAST
ORLEANS PARISH, LOUISIANA

LWL Q Case (seepage)

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File Information

Created By: [Liljegren, James](#)
Revision Number: [396](#)
Last Edited By: [Jamerson, James MVK](#)
Date: [6/14/2013](#)
Time: [11:42:12 AM](#)
File Name: [Reach 12A.gsz](#)
Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix E LWL\](#)
Last Solved Date: [6/14/2013](#)
Last Solved Time: [11:42:24 AM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Mass(M) Units: [lbs](#)
Mass Flux Units: [lbs/sec](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

LWL Q Case (seepage)

Kind: [SEEP/W](#)
Method: [Steady-State](#)
Settings
 Include Air Flow: [No](#)
Control
 Apply Runoff: [No](#)
Convergence
 Convergence Type: [Head Vector Norm](#)
 Maximum Number of Iterations: [500](#)
 Tolerance: [0.001](#)
 Maximum Change in K: [0.1](#)
 Rate of Change in K: [1.02](#)
 Minimum Change in K: [1e-005](#)
 Equation Solver: [Parallel Direct](#)
 Potential Seepage Max # of Reviews: [10](#)
Time

Starting Time: 0 sec

Duration: 0 sec

Ending Time: 0 sec

Materials

EMBANKMENT FILL, EL. +10.3 TO -2.0/-2.1

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-008 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

MARSH 1, EL. -2.0/-2.1 TO -10.0/-12.0

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-007 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

BEACH SAND, EL. -10.0/-12.0 TO -53.0

Model: Saturated Only

Hydraulic

K-Sat: 0.00049 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

BAY SOUND CLAY, EL. -53.0 TO -70.0

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-008 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

Boundary Conditions

Drainage

Review: true

Type: Total Flux (Q) 0

Canal Water

Type: Head (H) -2.6

Curb

Type: Head (H) -3.3

Regions

	Material	Points	Area (ft²)
Region 1	BEACH SAND, EL. -10.0/-12.0 TO -53.0	25,24,31,19,9,18,5,6,20,16	9180.3494
Region 2	BAY SOUND CLAY, EL. -53.0 TO -70.0	6,7,21,17,16,20	3697.5
Region 3	MARSH 1, EL. -2.0/-2.1 TO -10.0/-12.0	18,3,13,4,5	685.5
Region 4	MARSH 1, EL. -2.0/-2.1 TO -10.0/-12.0	31,23,28,19	64.950592
Region 5	EMBANKMENT FILL, EL. +10.3 TO -2.0/-2.1	12,33,26,11,1,14,22,35,34,27,10,2,3,8,28	575.393
Region 6	MARSH 1, EL. -2.0/-2.1 TO -10.0/-12.0	8,3,18,9,19,28	853.95

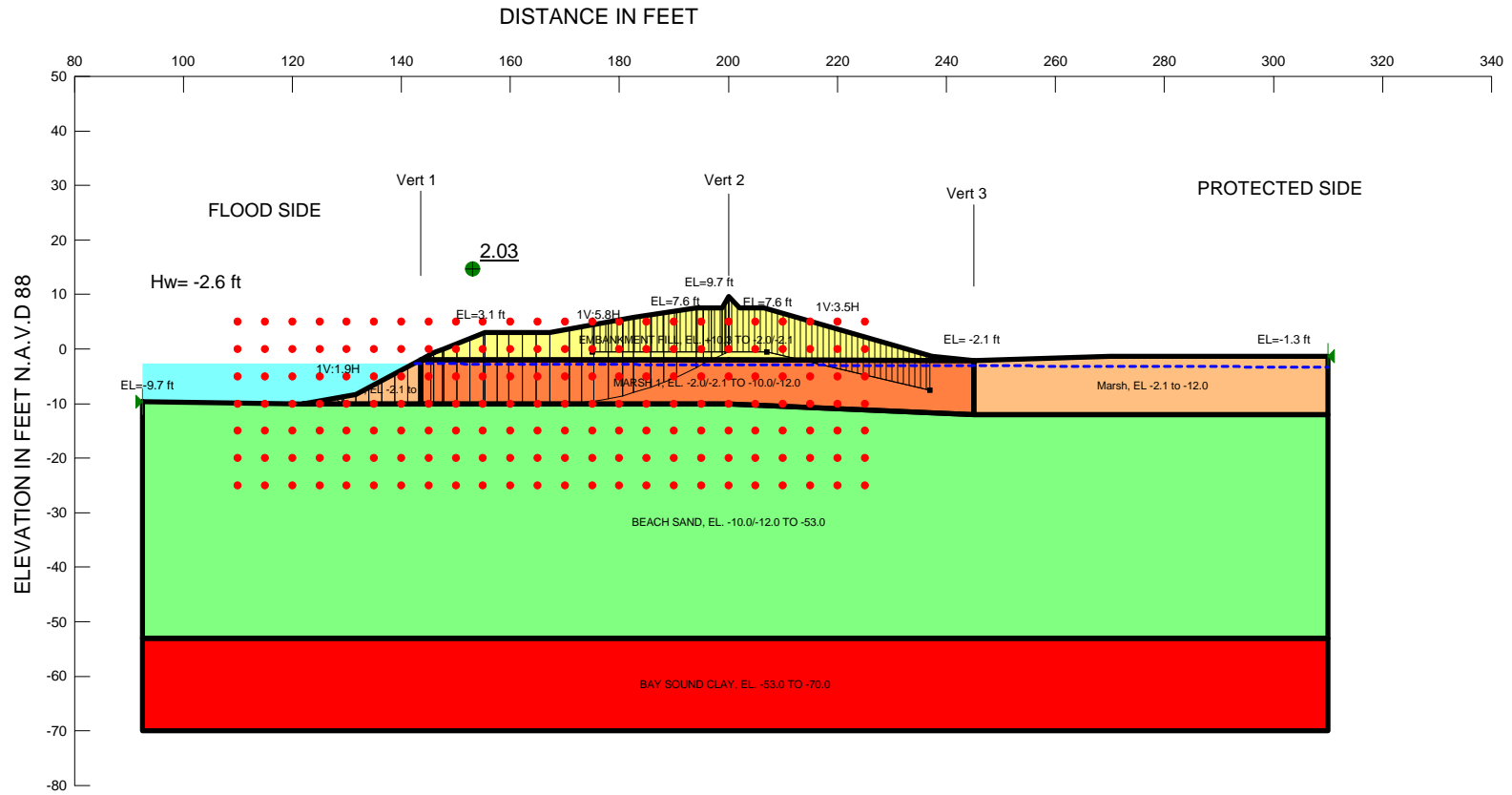
Lines

	Start Point	End Point	Hydraulic Boundary
Line 1	5	6	Curb
Line 2	6	7	Curb
Line 3	17	16	
Line 4	5	18	
Line 5	18	9	
Line 6	4	5	Curb
Line 7	9	19	
Line 8	6	20	
Line 9	20	16	
Line 10	7	21	
Line 11	21	17	
Line 12	26	11	Canal Water
Line 13	11	1	Canal Water
Line 14	1	14	Canal Water
Line 15	14	22	Canal Water
Line 16	27	10	Drainage
Line 17	10	2	Drainage
Line 18	8	3	
Line 19	2	3	Drainage
Line 20	23	28	Canal Water
Line 21	28	19	
Line 22	28	8	
Line 23	28	12	Canal Water
Line 24	3	18	
Line 25	3	13	Drainage
Line 26	4	13	Drainage
Line 27	31	23	Canal Water

Line 28	19	31	
Line 29	16	25	
Line 30	25	24	Canal Water
Line 31	24	31	Canal Water
Line 32	12	33	Canal Water
Line 33	33	26	Canal Water
Line 34	27	34	
Line 35	34	35	
Line 36	35	22	Canal Water

Points

	X (ft)	Y (ft)
Point 1	182.6	5.8
Point 2	237.3	-1.3
Point 3	245	-2.1
Point 4	310	-1.3
Point 5	310	-12
Point 6	310	-53
Point 7	310	-70
Point 8	200	-2
Point 9	200	-10
Point 10	206.5	7.6
Point 11	167.2	3
Point 12	146	-0.7
Point 13	270	-1.3
Point 14	194.1	7.6
Point 15	92.5	-12
Point 16	92.5	-53
Point 17	92.5	-70
Point 18	245	-12
Point 19	143.6	-10
Point 20	200	-53
Point 21	200	-70
Point 22	198.8	7.6
Point 23	131.7	-8.4
Point 24	121.3	-10.1
Point 25	92.5	-9.7
Point 26	155.4	3.1
Point 27	202	7.6
Point 28	143.6	-2
Point 29	92.5	-150
Point 30	310	-150
Point 31	121.91176	-10
Point 32	92.5	0
Point 33	147.73158	0
Point 34	200	9.7
Point 35	199.34	8.5



Name: EMBANKMENT FILL, EL. +10.3 TO -2.0/-2.1 Model: Undrained (Phi=0) Unit Weight: 116 pcf Cohesion: 550 psf
Name: MARSH 1, EL. -2.0/-2.1 TO -10.0/-12.0 Model: Spatial Mohr-Coulomb Weight Fn: MARSH Cohesion Spatial Fn: Marsh Phi: 0 °
Name: BEACH SAND, EL. -10.0/-12.0 TO -53.0 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand
Name: BAY SOUND CLAY, EL. -53.0 TO -70.0 Model: Spatial Mohr-Coulomb Unit Weight: 110 pcf Cohesion Spatial Fn: Bay Sound Phi: 0 °
Name: Marsh, EL. -2.1 to -12.0 Model: Spatial Mohr-Coulomb Unit Weight: 104 pcf Cohesion Fn: Marsh 1 Phi: 0 °

GENERAL NOTES

CLASSIFICATION STRATIFICATION
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WHERE INDICATED, SHEAR STRENGTHS BETWEEN
VERTICALS WERE ASSUMED TO VARY LINEARLY
BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

Hw IS CANAL WATER LEVEL

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 12A,
PROTECTED SIDE STABILITY ANALYSIS,
CASE: LWL Q Case (Block)
STA. 2+45 TO 3+70 EAST
ORLEANS PARISH, LOUISIANA

LWL Q Case (Block)

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File Information

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Revision Number: [396](#)
Last Edited By: [Jamerson, James MVK](#)
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File Name: [Reach 12A.gsz](#)
Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix E LWL\](#)
Last Solved Date: [6/14/2013](#)
Last Solved Time: [11:46:22 AM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Strength Units: [psf](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

LWL Q Case (Block)

Kind: [SLOPE/W](#)
Parent: [LWL Q Case \(seepage\)](#)
Method: [Spencer](#)
Settings
 PWP Conditions Source: [Parent Analysis](#)
Slip Surface
 Direction of movement: [Right to Left](#)
 Use Passive Mode: [No](#)
 Slip Surface Option: [Block](#)
 Critical slip surfaces saved: [1](#)
 Optimize Critical Slip Surface Location: [Yes](#)
 Tension Crack
 Tension Crack Option: [Tension Crack Line](#)
 Percentage Wet: [1](#)
 Tension Crack Fluid Unit Weight: [62.4 pcf](#)
FOS Distribution
 FOS Calculation Option: [Constant](#)

Restrict Block Crossing: [Yes](#)

Advanced

Number of Slices: [30](#)

Optimization Tolerance: [0.01](#)

Minimum Slip Surface Depth: [0.1 ft](#)

Optimization Maximum Iterations: [4000](#)

Optimization Convergence Tolerance: [1e-007](#)

Starting Optimization Points: [8](#)

Ending Optimization Points: [16](#)

Complete Passes per Insertion: [1](#)

Driving Side Maximum Convex Angle: [5 °](#)

Resisting Side Maximum Convex Angle: [1 °](#)

Materials

EMBANKMENT FILL, EL. +10.3 TO -2.0/-2.1

Model: [Undrained \(Phi=0\)](#)

Unit Weight: [116 pcf](#)

Cohesion: [550 psf](#)

MARSH 1, EL. -2.0/-2.1 TO -10.0/-12.0

Model: [Spatial Mohr-Coulomb](#)

Weight Fn: [MARSH](#)

Cohesion Spatial Fn: [Marsh](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

BEACH SAND, EL. -10.0/-12.0 TO -53.0

Model: [Shear/Normal Fn.](#)

Unit Weight: [122 pcf](#)

Strength Function: [Sand](#)

Phi-B: [0 °](#)

BAY SOUND CLAY, EL. -53.0 TO -70.0

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [110 pcf](#)

Cohesion Spatial Fn: [Bay Sound](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

Marsh, EL -2.1 to -12.0

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [104 pcf](#)

Cohesion Fn: [Marsh 1](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

Slip Surface Limits

Left Coordinate: (92.5, -9.7) ft
Right Coordinate: (310, -1.3) ft

Slip Surface Block

Left Grid

Upper Left: (110, 5) ft
Lower Left: (110, -25) ft
Lower Right: (170, -25) ft
X Increments: 12
Y Increments: 6
Starting Angle: 135 °
Ending Angle: 165 °
Angle Increments: 5

Right Grid

Upper Left: (175, 5) ft
Lower Left: (175, -25) ft
Lower Right: (225, -25) ft
X Increments: 10
Y Increments: 6
Starting Angle: 25 °
Ending Angle: 45 °
Angle Increments: 4

Tension Crack Line

	X (ft)	Y (ft)
	175	-0.5
	207	-0.5
	237	-7.5

Cohesion Functions

Marsh 1

Model: Spline Data Point Function
Function: Cohesion vs. Y
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 350
Data Points: Y (ft), Cohesion (psf)
Data Point: (-12, 410)
Data Point: (-0.8, 350)

Shear/Normal Strength Functions

Sand

Model: [Spline Data Point Function](#)

Function: [Shear Stress vs. Normal Stress](#)

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 0

Data Points: [Normal Stress \(psf\)](#), [Shear Stress \(psf\)](#)

Data Point: (-10000, 0)

Data Point: (0, 0)

Data Point: (10000, 6494)

Estimation Properties

Intact Rock Param.: 10

Geological Strength: 100

Disturbance Factor: 0

SigmaC: 600000 psf

Sigma3: 300000 psf

Num. Points: 20

Unit Weight Functions

MARSH

Model: [Spline Data Point Function](#)

Function: [Unit Weight vs. X](#)

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 104

Data Points: [X \(ft\)](#), [Unit Weight \(pcf\)](#)

Data Point: (169.5, 104)

Data Point: (200, 103)

Data Point: (248.5, 104)

Spatial Functions

Bay Sound

Model: [Linear Interpolation](#)

Limit Range By: [Data Values](#)

Data Points: [X \(ft\)](#), [Y \(ft\)](#), [Cohesion \(psf\)](#)

Data Point: (200, -53, 730)

Data Point: (200, -70, 895)

Data Point: (310, -53, 640)

Data Point: (310, -70, 815)

Data Point: (143.6, -53, 640)

Data Point: (143.6, -70, 815)

Data Point: (92.5, -53, 640)

Data Point: (92.5, -70, 815)

Data Point: (245, -53, 640)

Data Point: (245, -70, 815)

Marsh

Model: Linear Interpolation

Limit Range By: Data Values

Data Points: X (ft), Y (ft), Cohesion (psf)

Data Point: (143.6, -2, 350)

Data Point: (143.6, -10, 410)

Data Point: (200, -2, 370)

Data Point: (200, -10, 430)

Data Point: (245, -2.1, 350)

Data Point: (245, -12, 410)

Regions

	Material	Points	Area (ft ²)
Region 1	BEACH SAND, EL. -10.0/-12.0 TO -53.0	25,24,31,19,9,18,5,6,20,16	9180.3494
Region 2	BAY SOUND CLAY, EL. -53.0 TO -70.0	6,7,21,17,16,20	3697.5
Region 3	Marsh, EL -2.1 to -12.0	18,3,13,4,5	685.5
Region 4	Marsh, EL -2.1 to -12.0	31,23,28,19	64.950592
Region 5	EMBANKMENT FILL, EL. +10.3 TO -2.0/-2.1	12,33,26,11,1,14,22,35,34,27,10,2,3,8,28	575.393
Region 6	MARSH 1, EL. -2.0/-2.1 TO -10.0/-12.0	8,3,18,9,19,28	853.95

Points

	X (ft)	Y (ft)
Point 1	182.6	5.8
Point 2	237.3	-1.3
Point 3	245	-2.1
Point 4	310	-1.3
Point 5	310	-12
Point 6	310	-53
Point 7	310	-70
Point 8	200	-2
Point 9	200	-10
Point 10	206.5	7.6
Point 11	167.2	3
Point 12	146	-0.7
Point 13	270	-1.3
Point 14	194.1	7.6
Point 15	92.5	-12
Point 16	92.5	-53
Point 17	92.5	-70
Point 18	245	-12
Point 19	143.6	-10
Point 20	200	-53
Point 21	200	-70

Point 22	198.8	7.6
Point 23	131.7	-8.4
Point 24	121.3	-10.1
Point 25	92.5	-9.7
Point 26	155.4	3.1
Point 27	202	7.6
Point 28	143.6	-2
Point 29	92.5	-150
Point 30	310	-150
Point 31	121.91176	-10
Point 32	92.5	0
Point 33	147.73158	0
Point 34	200	9.7
Point 35	199.34	8.5

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	2.03	(165.805, 1.371)	28.45688	(200, 9.69983)	(127.874, -9.02536)
2	15131	2.30	(165.805, 1.371)	27.313	(200.373, 9.30854)	(132.474, -7.98352)

Slices of Slip Surface: **Optimized**

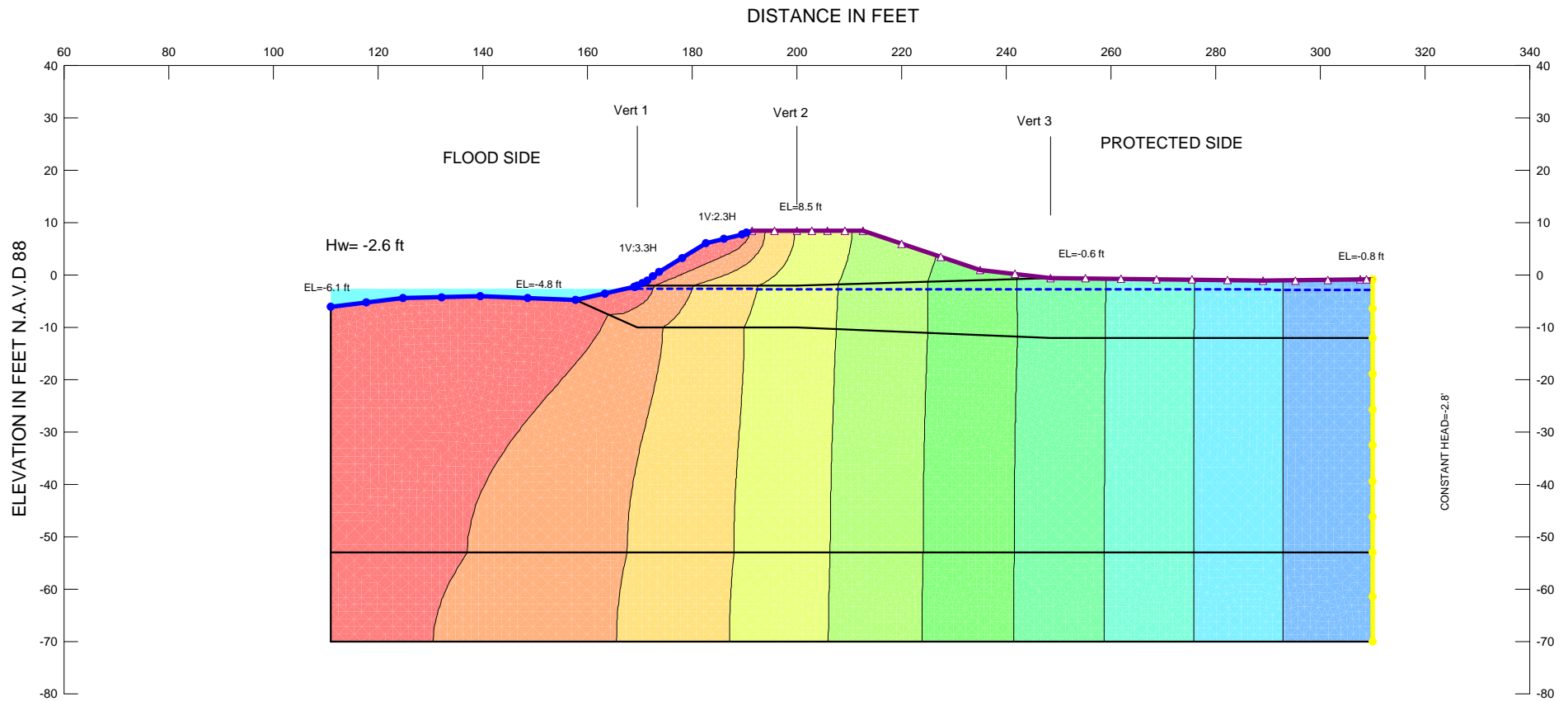
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	128.53335	-9.512681	428.99642	730.10155	0	396.68
2	Optimized	129.27455	-10.06074	461.06404	670.03798	135.70926	3.376e-006
3	Optimized	130.52835	-10.115375	464.04603	548.07276	54.567595	1.7721e-006
4	Optimized	132.89	-10.10307	462.55681	602.09274	90.615698	2.2518e-006
5	Optimized	135.27	-10.090665	461.08624	649.23497	122.18521	-5.2859e-007
6	Optimized	137.65	-10.07826	459.6997	696.41921	153.72744	-5.1507e-006
7	Optimized	140.03	-10.06586	458.31317	743.60345	185.26968	-6.2068e-006
8	Optimized	142.41	-10.05346	456.96865	790.74567	216.75733	-7.2625e-006
9	Optimized	144.5072	-10.04253	455.78076	916.54381	299.22302	-2.7485e-005
10	Optimized	145.7072	-10.03272	454.88375	990.40769	347.77331	-7.2531e-005
11	Optimized	146.79695	-10.01382	453.45737	1046.3388	385.02167	-8.0305e-005
12	Optimized	147.66275	-10	452.40032	1093.6161	0	411.44
13	Optimized	148.95245	-10	452.09934	1154.1454	0	411.9
14	Optimized	151.39415	-10	451.56693	1268.6958	0	412.76
15	Optimized	153.83585	-10	451.03452	1383.2872	0	413.63
16	Optimized	155.22835	-9.997442	450.57051	1441.8082	0	414.1
17	Optimized	156.4725	-9.9789005	449.1484	1446.9094	0	414.41
18	Optimized	158.61745	-9.9469335	446.70107	1441.502	0	414.93
19	Optimized	160.9416	-9.933684	445.39978	1445.4122	0	415.65
20	Optimized	163.44495	-9.939152	445.20005	1443.5746	0	416.58
21	Optimized	165.9483	-9.94462	445.00032	1441.7771	0	417.51
22	Optimized	168.9868	-9.951257	444.79094	1479.0173	0	418.64
23	Optimized	171.90585	-9.85888	438.43257	1491.3184	0	418.98
24	Optimized	174.17035	-9.66632	425.98915	1518.1149	0	418.34

25	Optimized	176.62855	-9.3214725	404.03164	1488.1826	0	416.62
26	Optimized	179.2804	-8.8243375	372.56454	1491.8519	0	413.84
27	Optimized	181.60315	-8.28401	338.4762	1440.1317	0	410.61
28	Optimized	184.2063	-7.522105	290.5391	1412.53	0	405.82
29	Optimized	186.99685	-6.5825	231.49849	1327.2277	0	399.76
30	Optimized	189.36535	-5.64358	172.57688	1276.7918	0	393.56
31	Optimized	192.3248	-4.2810015	87.151835	1157.9484	0	384.39
32	Optimized	194.7688	-3.0513965	10.082884	1071.5986	0	376.03
33	Optimized	196.17395	-2.357455	-33.437181	1011.7837	0	371.32
34	Optimized	197.85515	-1.541314	-83.994609	901.92806	0	550
35	Optimized	199.07	-0.9515545	-120.26973	886.87142	0	550
36	Optimized	199.67	-0.6602801	-138.22475	968.47287	0	550
37	Optimized	200.0001	-0.5000396	-148.10643	-2989599.6	0	550

Slices of Slip Surface: 15131

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	15131	133.72865	-8.3196	354.71329	513.74129	0	390.28
2	15131	136.2372	-8.99176	394.02748	638.69186	0	393.88
3	15131	138.74575	-9.66392	433.99626	763.60392	0	397.49
4	15131	140.9	-10	453.98889	764.27778	0	399.29
5	15131	142.7	-10	453.55556	807.55556	0	399.29
6	15131	144.8	-10	453.04167	934	0	410.43
7	15131	146.8658	-10	452.58088	1050.0237	0	411.16
8	15131	149.00965	-10	452.08791	1150.6412	0	411.92
9	15131	151.5658	-10	451.54021	1270.5486	0	412.82
10	15131	154.12195	-10	450.95339	1390.495	0	413.73
11	15131	156.58	-10	450.42373	1449.322	0	414.6
12	15131	158.94	-10	449.91525	1447.0339	0	415.44
13	15131	161.3	-10	449.44915	1444.7881	0	416.28
14	15131	163.66	-10	448.94068	1442.5	0	417.11
15	15131	166.02	-10	448.4322	1440.2542	0	417.95
16	15131	168.26665	-10	447.96569	1461.6565	0	418.75
17	15131	170.4	-10	447.52038	1506.4221	0	419.5
18	15131	172.53335	-10	447.07976	1550.9065	0	420.26
19	15131	174.66665	-10	446.63913	1595.3909	0	421.02
20	15131	176.8	-10	446.19851	1639.8753	0	421.77
21	15131	178.93335	-10	445.75788	1684.3596	0	422.53
22	15131	181.3	-9.3938	407.55958	1482.789	0	418.82
23	15131	183.75	-8.251346	335.99591	1417.7807	0	411.12
24	15131	186.05	-7.1788385	268.79909	1353.5511	0	403.89
25	15131	188.35	-6.106331	201.58651	1289.4791	0	396.67
26	15131	190.65	-5.0338235	134.36211	1225.5647	0	389.44
27	15131	192.95	-3.961316	67.121948	1161.8079	0	382.21
28	15131	195.62805	-2.712531	-11.208535	1061.8081	0	373.79
29	15131	197.97805	-1.616708	-79.442436	928.66609	0	550
30	15131	199.07	-1.107513	-110.77095	922.23527	0	550
31	15131	199.67	-0.82772835	-128.01598	1005.782	0	550

32	15131	200.1864	-0.5869234	-142.89059	-94.356066	0	550
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Name: EMBANKMENT FILL, EL. +10.3 TO -2.0/-0.6 Model: Saturated Only K-Sat: 3.28e-008 ft/sec K-Ratio: 1
Name: MARSH, EL. -2.0/-0.6 TO -10.0/-12.0 Model: Saturated Only K-Sat: 3.28e-007 ft/sec K-Ratio: 1
Name: BEACH SAND, EL. -10/-12 TO -53 Model: Saturated Only K-Sat: 0.00049 ft/sec K-Ratio: 1
Name: BAY SOUND CLAY, EL. -53.0 TO -70.0 Model: Saturated Only K-Sat: 3.28e-008 ft/sec K-Ratio: 1

GENERAL NOTES

CLASSIFICATION STRATIFICATION
SHEAR STRENGTHS AND UNIT WEIGHTS OF
THE SOIL WERE BASED ON THE RESULTS OF
UNDISTURBED BORINGS AND CPT DATA. SEE
BOTH BORING AND CPT DATA PLATES.

WHERE INDICATED, SHEAR STRENGTHS BETWEEN
VERTICALS WERE ASSUMED TO VARY LINEARLY
BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

Hw IS CANAL WATER LEVEL

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 12B,
PROTECTED SIDE STABILITY ANALYSIS,
CASE: Global Analysis (see page)
STA. 3+70 TO 4+70 EAST
ORLEANS PARISH, LOUISIANA

Global Analysis (seepage)

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File Information

Created By: [Liljegren, James](#)
Revision Number: [420](#)
Last Edited By: [Jamerson, James MVK](#)
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Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix E LWL\](#)
Last Solved Date: [10/3/2013](#)
Last Solved Time: [12:51:24 PM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Mass(M) Units: [lbs](#)
Mass Flux Units: [lbs/sec](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

Global Analysis (seepage)

Kind: [SEEP/W](#)
Method: [Steady-State](#)
Settings
 Include Air Flow: [No](#)
Control
 Apply Runoff: [No](#)
Convergence
 Convergence Type: [Head Vector Norm](#)
 Maximum Number of Iterations: [500](#)
 Tolerance: [0.001](#)
 Maximum Change in K: [0.1](#)
 Rate of Change in K: [1.02](#)
 Minimum Change in K: [1e-005](#)
 Equation Solver: [Parallel Direct](#)
 Potential Seepage Max # of Reviews: [10](#)
Time

Starting Time: 0 sec

Duration: 0 sec

Ending Time: 0 sec

Materials

EMBANKMENT FILL, EL. +10.3 TO -2.0/-0.6

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-008 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

MARSH, EL. -2.0/-0.6 TO -10.0/-12.0

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-007 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

BEACH SAND, EL. -10/-12 TO -53

Model: Saturated Only

Hydraulic

K-Sat: 0.00049 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

BAY SOUND CLAY, EL. -53.0 TO -70.0

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-008 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

Boundary Conditions

Drainage

Review: true

Type: Total Flux (Q) 0

Canal Water

Type: Head (H) -2.6

Curb

Type: Head (H) -2.8

Regions

	Material	Points	Area (ft²)
Region 1	EMBANKMENT FILL, EL. +10.3 TO -2.0/-0.6	15,11,8,4,5,9,22,30,1,2,3,16	503.505
Region 2	MARSH, EL. -2.0/-0.6 TO -10.0/-12.0	9,5,31,10,24,22	714.45
Region 3	BEACH SAND, EL. -10/-12 TO -53	19,29,28,27,13,24,10,31,23,6,25,20	8668.91
Region 4	BAY SOUND CLAY, EL. -53.0 TO -70.0	6,7,26,21,20,25	3383
Region 5	MARSH, EL. -2.0/-0.6 TO -10.0/-12.0	13,12,22,24	46.13
Region 6	MARSH, EL. -2.0/-0.6 TO -10.0/-12.0	31,5,14,17,18,23	683.98

Lines

	Start Point	End Point	Hydraulic Boundary
Line 1	8	4	Drainage
Line 2	4	5	Drainage
Line 3	6	7	Curb
Line 4	11	8	Drainage
Line 5	15	11	Drainage
Line 6	20	19	
Line 7	21	20	
Line 8	9	22	
Line 9	10	24	
Line 10	24	22	
Line 11	13	12	Canal Water
Line 12	12	22	Canal Water
Line 13	6	25	
Line 14	25	20	
Line 15	7	26	
Line 16	26	21	
Line 17	1	2	Canal Water
Line 18	2	3	Canal Water
Line 19	3	16	Canal Water
Line 20	29	28	Canal Water
Line 21	28	27	Canal Water
Line 22	27	13	Canal Water
Line 23	22	30	Canal Water
Line 24	30	1	Canal Water
Line 25	15	16	Drainage
Line 26	6	23	Curb
Line 27	23	31	

Line 28	31	10	
Line 29	5	9	
Line 30	5	31	
Line 31	5	14	Drainage
Line 32	14	17	Drainage
Line 33	17	18	Drainage
Line 34	18	23	Curb
Line 35	24	13	
Line 36	19	29	

Points

	X (ft)	Y (ft)
Point 1	173.7	0.6
Point 2	182.6	6.1
Point 3	189.5	7.8
Point 4	235	1
Point 5	248.5	-0.6
Point 6	310	-53
Point 7	310	-70
Point 8	212.7	8.5
Point 9	200	-2
Point 10	200	-10
Point 11	205.8	8.5
Point 12	169	-2.3
Point 13	157.7	-4.8
Point 14	289.1	-1.1
Point 15	200	8.5
Point 16	191.5	8.5
Point 17	307.7	-0.8
Point 18	310	-0.8
Point 19	111	-10
Point 20	111	-53
Point 21	111	-70
Point 22	169.5	-2
Point 23	310	-12
Point 24	169.5	-10
Point 25	200	-53
Point 26	200	-70
Point 27	139.5	-4
Point 28	124.8	-4.4
Point 29	111	-6.1
Point 30	171.5	-1
Point 31	248.5	-12

Slope Stability (Entry/Exit)

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File Information

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Last Solved Date: [10/3/2013](#)
Last Solved Time: [1:52:52 PM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Strength Units: [psf](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

Slope Stability (Entry/Exit)

Kind: [SLOPE/W](#)
Parent: [Global Analysis \(seepage\)](#)
Method: [Spencer](#)
Settings
 PWP Conditions Source: [Parent Analysis](#)
Slip Surface
 Direction of movement: [Right to Left](#)
 Use Passive Mode: [No](#)
 Slip Surface Option: [Entry and Exit](#)
 Critical slip surfaces saved: [1](#)
 Optimize Critical Slip Surface Location: [Yes](#)
 Tension Crack
 Tension Crack Option: [Tension Crack Line](#)
 Percentage Wet: [1](#)
 Tension Crack Fluid Unit Weight: [62.4 pcf](#)
FOS Distribution
 FOS Calculation Option: [Constant](#)

Advanced

Number of Slices: 40
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 4000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

EMBANKMENT FILL, EL. +10.3 TO -2.0/-0.6

Model: Undrained (Phi=0)
Unit Weight: 116 pcf
Cohesion: 550 psf

MARSH, EL. -2.0/-0.6 TO -10.0/-12.0

Model: Spatial Mohr-Coulomb
Unit Weight: 103 pcf
Cohesion Spatial Fn: Marsh
Phi: 0 °
Phi-B: 0 °

BEACH SAND, EL. -10/-12 TO -53

Model: Shear/Normal Fn.
Unit Weight: 122 pcf
Strength Function: Sand
Phi-B: 0 °

BAY SOUND CLAY, EL. -53.0 TO -70.0

Model: Spatial Mohr-Coulomb
Unit Weight: 110 pcf
Cohesion Spatial Fn: Bay Sound
Phi: 0 °
Phi-B: 0 °

Marsh, EL -0.6 to -12.0 (Protected)

Model: Spatial Mohr-Coulomb
Unit Weight: 104 pcf
Cohesion Fn: Marsh 1
Phi: 0 °
Phi-B: 0 °

Slip Surface Entry and Exit

Left Projection: [Range](#)
Left-Zone Left Coordinate: [\(111.46112, -6.0432\)](#) ft
Left-Zone Right Coordinate: [\(180, 4.49326\)](#) ft
Left-Zone Increment: [15](#)
Right Projection: [Range](#)
Right-Zone Left Coordinate: [\(195, 8.5\)](#) ft
Right-Zone Right Coordinate: [\(260, -0.74163\)](#) ft
Right-Zone Increment: [15](#)
Radius Increments: [10](#)

Slip Surface Limits

Left Coordinate: [\(111, -6.1\)](#) ft
Right Coordinate: [\(310, -0.8\)](#) ft

Tension Crack Line

	X (ft)	Y (ft)
	190	1.5
	212.5	1.5

Cohesion Functions

Marsh 1

Model: [Spline Data Point Function](#)
Function: [Cohesion vs. Y](#)
Curve Fit to Data: [100 %](#)
Segment Curvature: [0 %](#)
Y-Intercept: [350](#)
Data Points: [Y \(ft\), Cohesion \(psf\)](#)
Data Point: [\(-12, 410\)](#)
Data Point: [\(-0.5, 350\)](#)

Shear/Normal Strength Functions

Sand

Model: [Spline Data Point Function](#)
Function: [Shear Stress vs. Normal Stress](#)
Curve Fit to Data: [100 %](#)
Segment Curvature: [0 %](#)
Y-Intercept: [0](#)
Data Points: [Normal Stress \(psf\), Shear Stress \(psf\)](#)
Data Point: [\(-10000, 0\)](#)
Data Point: [\(0, 0\)](#)

Data Point: (10000, 6494)

Estimation Properties

Intact Rock Param.: 10

Geological Strength: 100

Disturbance Factor: 0

SigmaC: 600000 psf

Sigma3: 300000 psf

Num. Points: 20

Spatial Functions

Bay Sound

Model: Linear Interpolation

Limit Range By: Data Values

Data Points: X (ft), Y (ft), Cohesion (psf)

Data Point: (200, -53, 730)

Data Point: (200, -70, 895)

Data Point: (310, -53, 640)

Data Point: (310, -70, 815)

Data Point: (169.5, -53, 640)

Data Point: (169.5, -70, 815)

Data Point: (111, -53, 640)

Data Point: (111, -70, 815)

Data Point: (315, -53, 640)

Data Point: (315, -70, 815)

Marsh

Model: Linear Interpolation

Limit Range By: Data Values

Data Points: X (ft), Y (ft), Cohesion (psf)

Data Point: (169.5, -2, 350)

Data Point: (169.5, -10, 410)

Data Point: (200, -2, 370)

Data Point: (200, -10, 430)

Data Point: (248.5, -0.5, 350)

Data Point: (248.5, -12, 410)

Regions

	Material	Points	Area (ft ²)
Region 1	EMBANKMENT FILL, EL. +10.3 TO -2.0/-0.6	15,11,8,4,5,9,22,30,1,2,3,16	503.505
Region 2	MARSH, EL. -2.0/-0.6 TO -10.0/-12.0	9,5,31,10,24,22	714.45
Region 3	BEACH SAND, EL. -10/-12 TO -53	19,29,28,27,13,24,10,31,23,6,25,20	8668.91
Region 4	BAY SOUND CLAY, EL. -53.0 TO -70.0	6,7,26,21,20,25	3383
Region 5	Marsh, EL -0.6 to -12.0 (Protected)	13,12,22,24	46.13
Region 6	Marsh, EL -0.6 to -12.0 (Protected)	31,5,14,17,18,23	683.98

Points

	X (ft)	Y (ft)
Point 1	173.7	0.6
Point 2	182.6	6.1
Point 3	189.5	7.8
Point 4	235	1
Point 5	248.5	-0.6
Point 6	310	-53
Point 7	310	-70
Point 8	212.7	8.5
Point 9	200	-2
Point 10	200	-10
Point 11	205.8	8.5
Point 12	169	-2.3
Point 13	157.7	-4.8
Point 14	289.1	-1.1
Point 15	200	8.5
Point 16	191.5	8.5
Point 17	307.7	-0.8
Point 18	310	-0.8
Point 19	111	-10
Point 20	111	-53
Point 21	111	-70
Point 22	169.5	-2
Point 23	310	-12
Point 24	169.5	-10
Point 25	200	-53
Point 26	200	-70
Point 27	139.5	-4
Point 28	124.8	-4.4
Point 29	111	-6.1
Point 30	171.5	-1
Point 31	248.5	-12

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.42	(174.02, 31.125)	19.35235	(198.074, 8.5)	(154.398, -4.65483)
2	1623	1.48	(174.02, 31.125)	41.044	(202.427, 8.5)	(153.87, -4.63164)

Slices of Slip Surface: Optimized

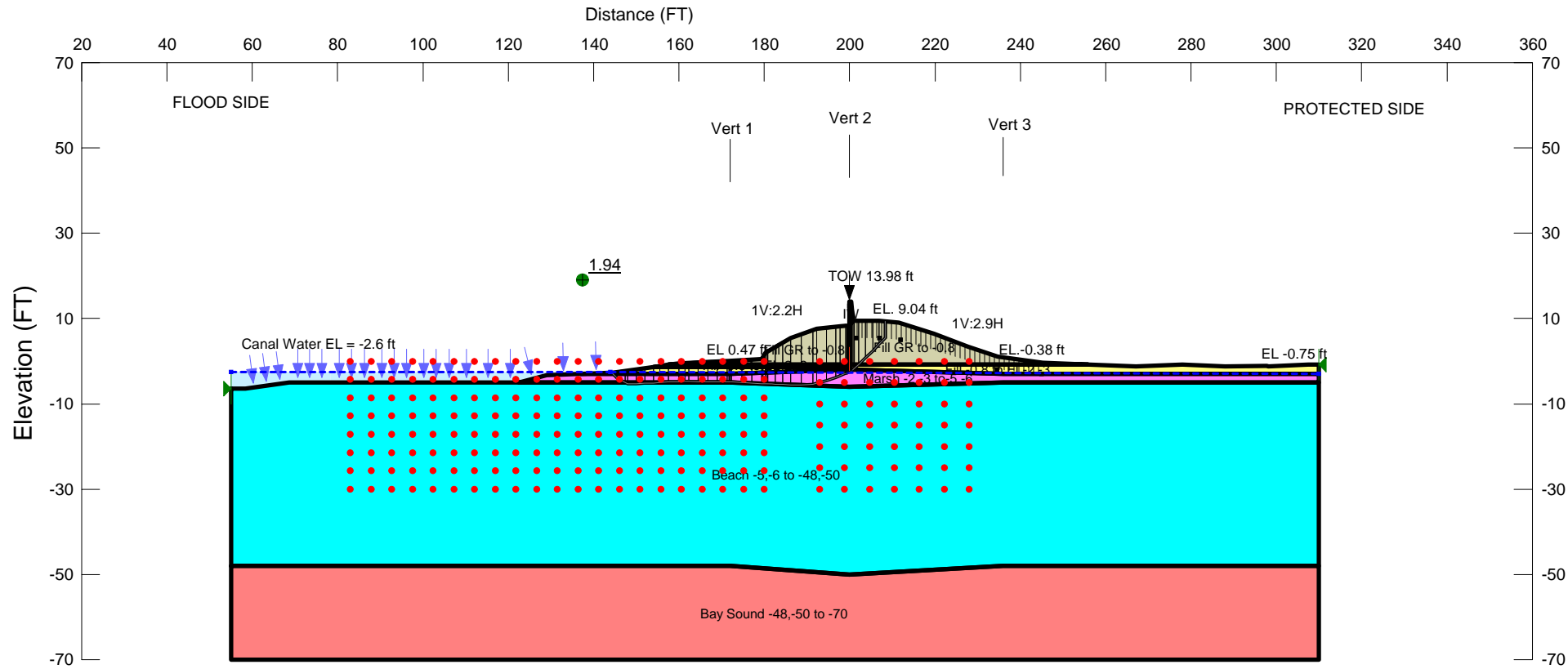
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	154.9479	-4.8591385	140.95146	172.96382	20.789069	-7.6172e-007
2	Optimized	156.04875	-5.2677495	166.38932	234.56142	44.271481	1.4349e-006
3	Optimized	157.1496	-5.6763605	191.81867	296.15903	67.759423	-2.9272e-007
4	Optimized	158.477	-6.169068	222.32465	386.49208	106.61158	-4.6051e-007

5	Optimized	159.8079	-6.653423	252.25946	460.94668	135.52306	3.3635e-006
6	Optimized	160.91565	-7.045329	276.51354	524.56045	161.08355	3.9983e-006
7	Optimized	162.0234	-7.437235	300.81868	588.16571	186.60534	4.632e-006
8	Optimized	163.1312	-7.829141	325.12382	651.77097	212.12714	5.2657e-006
9	Optimized	164.239	-8.221047	349.43748	715.36773	237.63788	5.8991e-006
10	Optimized	165.403	-8.6275425	374.66321	776.76537	261.12819	-2.396e-005
11	Optimized	166.62325	-9.0486275	400.79296	844.62679	288.22906	7.156e-006
12	Optimized	167.67505	-9.3994785	422.54697	885.4475	300.61111	7.4636e-006
13	Optimized	168.55835	-9.6800955	439.95079	948.47024	330.23639	-3.0308e-005
14	Optimized	169.16565	-9.8730245	451.91512	1001.3021	356.77609	-7.4347e-005
15	Optimized	169.41565	-9.9524465	456.83438	1043.7878	0	399.32
16	Optimized	169.53265	-9.989624	459.13665	1051.3395	0	409.94
17	Optimized	169.6631	-10.03107	461.70428	1054.5083	384.97141	-8.0224e-005
18	Optimized	170.1957	-10.052835	463.00092	906.1683	287.79626	7.1492e-006
19	Optimized	171.06525	-10.034225	461.73617	958.90825	322.86733	8.0204e-006
20	Optimized	172.08235	-10.01246	460.26728	1037.3417	374.75653	-7.8135e-005
21	Optimized	173.18235	-9.988923	458.69318	1132.2956	0	412.33
22	Optimized	174.19615	-9.967229	457.24289	1208.9768	0	412.83
23	Optimized	175.1884	-9.945995	455.8323	1277.6927	0	413.33
24	Optimized	176.18065	-9.924761	454.42171	1346.4086	0	413.82
25	Optimized	177.17295	-9.903527	453.01112	1415.0237	0	414.31
26	Optimized	178.19775	-9.805045	446.7866	1392.6337	0	414.24
27	Optimized	179.2551	-9.629315	435.74032	1448.2383	0	413.62
28	Optimized	180.3255	-9.383305	420.32189	1425.1729	0	412.47
29	Optimized	181.4089	-9.067015	400.51035	1467.6135	0	410.81
30	Optimized	182.2753	-8.7722195	382.06893	1425.2363	0	409.17
31	Optimized	183.1733	-8.394309	358.42792	1426.1713	0	406.92
32	Optimized	184.31985	-7.9117895	328.2501	1411.0582	0	404.06
33	Optimized	185.4515	-7.3864415	295.39175	1345.3162	0	400.86
34	Optimized	186.5683	-6.818265	259.8694	1321.9326	0	397.33
35	Optimized	187.6851	-6.2500885	224.33907	1298.6287	0	393.8
36	Optimized	188.87175	-5.5689145	181.75653	1207.2477	0	389.47
37	Optimized	189.97065	-4.8743415	138.33451	1178.0658	0	384.98
38	Optimized	190.912	-4.279367	101.14897	1158.7592	0	381.14
39	Optimized	191.44135	-3.934578	79.595995	1070.4586	0	378.9
40	Optimized	192.0851	-3.415457	47.157235	1028.2115	0	375.43
41	Optimized	193.25535	-2.471819	-11.808101	947.72133	0	369.12
42	Optimized	194.591	-1.39479	-79.023179	782.60847	0	550
43	Optimized	195.7969	-0.40798333	-140.58146	670.81889	0	550
44	Optimized	196.7077	0.35521002	-188.21337	595.89541	0	550
45	Optimized	197.6185	1.1184033	-235.86212	213.1486	0	550

Slices of Slip Surface: 1623

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	1623	154.50815	-4.9766535	148.26911	202.49022	35.211595	-4.7919e-007
2	1623	155.7849	-5.6383055	189.45837	303.77471	74.237904	1.8409e-006
3	1623	157.06165	-6.2446315	227.1813	390.47054	106.04127	-4.5812e-007

4	1623	158.2975	-6.782133	260.50552	475.27319	139.47176	3.4624e-006
5	1623	159.49245	-7.256095	289.84759	540.65646	162.87719	4.045e-006
6	1623	160.6874	-7.687486	316.57101	597.21031	182.24929	4.5273e-006
7	1623	161.8824	-8.077713	340.76138	645.81345	198.10313	4.9221e-006
8	1623	163.0774	-8.4279955	362.46086	687.19966	210.88784	5.2405e-006
9	1623	164.27235	-8.7393875	381.75838	721.95361	220.92536	5.4907e-006
10	1623	165.4673	-9.0127955	398.67474	750.57415	228.52615	5.6801e-006
11	1623	166.6623	-9.2489915	413.27887	773.47257	233.91252	-7.8388e-006
12	1623	167.85725	-9.448626	425.59757	794.68708	239.68953	5.9585e-006
13	1623	168.72735	-9.5748295	433.3729	852.03268	0	397.35
14	1623	169.25	-9.639535	437.37596	875.74514	0	397.68
15	1623	170	-9.718	442.18337	915.58589	0	408.21
16	1623	171	-9.8041045	447.41393	972.65632	0	409.51
17	1623	172.05	-9.8674285	451.24307	1043.8866	0	410.68
18	1623	173.15	-9.9055215	453.49817	1128.6557	0	411.68
19	1623	174.3357	-9.9122925	453.80687	1207.5038	0	412.51
20	1623	175.60715	-9.8827975	451.85401	1279.9635	0	413.13
21	1623	176.8786	-9.8138045	447.44548	1347.5619	0	413.44
22	1623	178.15	-9.7051135	440.56104	1410.1866	0	413.46
23	1623	179.4214	-9.5564055	431.18356	1467.9717	0	413.18
24	1623	180.69285	-9.3672395	419.28422	1520.9025	0	412.59
25	1623	181.9643	-9.1370445	404.83293	1568.9745	0	411.7
26	1623	183.175	-8.880025	388.70824	1586.3826	0	410.57
27	1623	184.325	-8.599279	371.10795	1573.9893	0	409.22
28	1623	185.475	-8.2829805	351.29514	1557.9531	0	407.6
29	1623	186.625	-7.9302655	329.20091	1538.2184	0	405.71
30	1623	187.775	-7.540136	304.78428	1514.6637	0	403.53
31	1623	188.925	-7.111445	277.95107	1487.2614	0	401.07
32	1623	190	-6.675938	250.69956	1463.7804	0	398.51
33	1623	191	-6.237339	223.26533	1444.6152	0	395.88
34	1623	192.06285	-5.7345875	191.81256	1399.3596	0	392.8
35	1623	193.1886	-5.161736	155.99215	1328.054	0	389.25
36	1623	194.31435	-4.544162	117.37383	1252.878	0	385.35
37	1623	195.44005	-3.879494	75.816528	1173.618	0	381.11
38	1623	196.56575	-3.164989	31.149217	1090.0667	0	376.49
39	1623	197.6915	-2.3974545	-16.829028	1002.108	0	371.47
40	1623	199.1272	-1.3246901	-83.819486	808.79008	0	550
41	1623	200.60665	-0.1334127	-158.20148	654.45363	0	550
42	1623	201.81995	0.94127735	-225.30915	327.10567	0	550



Name: Fill -0.8 to EL-2,-3 Model: Spatial Mohr-Coulomb Unit Weight: 109 pcf Cohesion Spatial Fn: Fill -0.8 to -2,-3 Phi: 0° Phi-B: 0° Piezometric Line: 1
 Name: Marsh -2,-3 to -5,-6 Model: Spatial Mohr-Coulomb Unit Weight: 101 pcf Cohesion Spatial Fn: Marsh -2,-3 to -5,-6 Phi: 0° Phi-B: 0° Piezometric Line: 1
 Name: Beach -5,-6 to -48,-50 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: New Function Phi-B: 0° Piezometric Line: 1
 Name: Bay Sound -48,-50 to -70 Model: Spatial Mohr-Coulomb Unit Weight: 102 pcf Cohesion Spatial Fn: Bay -48,-50 to -70 Phi: 0° Phi-B: 0° Piezometric Line: 1
 Name: IW Model: Undrained (Phi=0) Unit Weight: 0.01 pcf Cohesion: 0.01 psf Piezometric Line: 1
 Name: Fill GR to -0.8 Model: Spatial Mohr-Coulomb Unit Weight: 109 pcf Cohesion Spatial Fn: Fill -0.8 to -2,-3 Phi: 0° Phi-B: 0° Piezometric Line: 1

GENERAL NOTES

CLASSIFICATION STRATIFICATION
 SHEAR STRENGTHS AND UNIT WEIGHTS OF
 THE SOIL WERE BASED ON THE RESULTS OF
 UNDISTURBED BORINGS AND CPT DATA. SEE
 BOTH BORING AND CPT DATA PLATES.

WHERE INDICATED, SHEAR STRENGTHS BETWEEN
 VERTICALS WERE ASSUMED TO VARY LINEARLY
 BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

LAKE PONTCHARTRAIN, LA. AND VICINITY
 HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL,
 REMEDIATION OF CANAL WALLS AND LEVEES
 FLOOD SIDE STABILITY ANALYSIS,
 CASE: Name: LWL Q Case (Block)
 REACH 13A, STA. 4+70 TO STA. 7+00
 ORLEANS PARISH, LOUISIANA

CROSS SECTION AT STA 4+70

LWL Q Case (Block)

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File Information

Created By: [Vicky Curtis](#)
Revision Number: [280](#)
Last Edited By: [Jamerson, James MVK](#)
Date: [6/14/2013](#)
Time: [11:20:01 AM](#)
File Name: [Reach 13A.gsz](#)
Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix E LWL\](#)
Last Solved Date: [6/14/2013](#)
Last Solved Time: [11:23:28 AM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Strength Units: [psf](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

LWL Q Case (Block)

Kind: [SLOPE/W](#)
Method: [Spencer](#)
Settings
 Apply Phreatic Correction: [No](#)
 PWP Conditions Source: [Piezometric Line](#)
 Use Staged Rapid Drawdown: [No](#)
Slip Surface
 Direction of movement: [Right to Left](#)
 Use Passive Mode: [No](#)
 Slip Surface Option: [Block](#)
 Critical slip surfaces saved: [1](#)
 Optimize Critical Slip Surface Location: [Yes](#)
Tension Crack
 Tension Crack Option: [Tension Crack Line](#)
 Percentage Wet: [1](#)
 Tension Crack Fluid Unit Weight: [62.4 pcf](#)
FOS Distribution

FOS Calculation Option: [Constant](#)

Restrict Block Crossing: [Yes](#)

Advanced

Number of Slices: [30](#)

Optimization Tolerance: [0.01](#)

Minimum Slip Surface Depth: [0.1 ft](#)

Optimization Maximum Iterations: [7000](#)

Optimization Convergence Tolerance: [1e-007](#)

Starting Optimization Points: [8](#)

Ending Optimization Points: [16](#)

Complete Passes per Insertion: [1](#)

Driving Side Maximum Convex Angle: [5 °](#)

Resisting Side Maximum Convex Angle: [1 °](#)

Materials

Fill -0.8 to EL-2,-3

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [109 pcf](#)

Cohesion Spatial Fn: [Fill -0.8 to -2,-3](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: [1](#)

Marsh -2,-3 to -5,-6

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [101 pcf](#)

Cohesion Spatial Fn: [Marsh -2,-3 to -5,-6](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: [1](#)

Beach -5,-6 to -48,-50

Model: [Shear/Normal Fn.](#)

Unit Weight: [122 pcf](#)

Strength Function: [New Function](#)

Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: [1](#)

Bay Sound -48,-50 to -70

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [102 pcf](#)

Cohesion Spatial Fn: [Bay -48,-50 to -70](#)

Phi: [0 °](#)

Phi-B: 0 °

Pore Water Pressure

Piezometric Line: 1

IW

Model: Undrained (Phi=0)

Unit Weight: 0.01 pcf

Cohesion: 0.01 psf

Pore Water Pressure

Piezometric Line: 1

Fill GR to -0.8

Model: Spatial Mohr-Coulomb

Unit Weight: 109 pcf

Cohesion Spatial Fn: Fill -0.8 to -2,-3

Phi: 0 °

Phi-B: 0 °

Pore Water Pressure

Piezometric Line: 1

Slip Surface Limits

Left Coordinate: (55, -6.48) ft

Right Coordinate: (310, -0.75) ft

Slip Surface Block

Left Grid

Upper Left: (83, 0) ft

Lower Left: (83, -30) ft

Lower Right: (180, -30) ft

X Increments: 20

Y Increments: 7

Starting Angle: 135 °

Ending Angle: 180 °

Angle Increments: 5

Right Grid

Upper Left: (193, 0) ft

Lower Left: (193, -30) ft

Lower Right: (228, -30) ft

X Increments: 6

Y Increments: 6

Starting Angle: 25 °

Ending Angle: 65 °

Angle Increments: 4

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
	55	-2.6
	144	-2.6
	310	-3

Reinforcements

Reinforcement 1

Type: [Pile](#)

Outside Point: [\(200, 13\) ft](#)

Inside Point: [\(200, 3.7\) ft](#)

Slip Surface Intersection: [\(200, -2.4681\) ft](#)

Total Length: [9.3 ft](#)

Reinforcement Direction: [90 °](#)

Applied Load Option: [Variable](#)

F of S Dependent: [No](#)

Pile Spacing: [1 ft](#)

Shear Capacity: [8000 lbs](#)

Shear Safety Factor: [1](#)

Shear Load Used: [8000 lbs](#)

Shear Option: [Parallel to Slip](#)

Resisting Force Used: [0 lbs/ft](#)

Tension Crack Line

	X (ft)	Y (ft)
	201.5	5.5
	207	5.5
	212	5
	234.5	-2
	245	-3

Shear/Normal Strength Functions

New Function

Model: [Spline Data Point Function](#)

Function: [Shear Stress vs. Normal Stress](#)

Curve Fit to Data: [100 %](#)

Segment Curvature: [0 %](#)

Y-Intercept: [0](#)

Data Points: [Normal Stress \(psf\), Shear Stress \(psf\)](#)

Data Point: (-10000, 0)

Data Point: (0, 0)

Data Point: (10000, 6494)

Estimation Properties

Intact Rock Param.: 10

Geological Strength: 100

Disturbance Factor: 0

SigmaC: 600000 psf

Sigma3: 300000 psf

Num. Points: 20

Spatial Functions

Fill -0.8 to -2,-3

Model: Linear Interpolation

Limit Range By: Data Values

Data Points: X (ft), Y (ft), Cohesion (psf)

Data Point: (172, -0.8, 600)

Data Point: (172, -3, 600)

Data Point: (200, -0.8, 550)

Data Point: (200, -2, 550)

Data Point: (236, -0.8, 600)

Data Point: (236, -3, 600)

Marsh -2,-3 to -5,-6

Model: Linear Interpolation

Limit Range By: Data Values

Data Points: X (ft), Y (ft), Cohesion (psf)

Data Point: (172, -3, 190)

Data Point: (172, -5, 190)

Data Point: (200, -2, 200)

Data Point: (200, -6, 200)

Data Point: (236, -3, 190)

Data Point: (236, -5, 190)

Bay -48,-50 to -70

Model: Linear Interpolation

Limit Range By: Data Values

Data Points: X (ft), Y (ft), Cohesion (psf)

Data Point: (172, -48, 780)

Data Point: (172, -70, 980)

Data Point: (200, -50, 830)

Data Point: (200, -70, 1000)

Data Point: (236, -48, 780)

Data Point: (236, -70, 980)

Data Point: (50, -48, 780)

Data Point: (310, -48, 780)

Regions

	Material	Points	Area (ft²)
Region 1	IW	20,21,22,23	3.1924
Region 2	Fill GR to -0.8	61,11,12,13,14,15,16,17,18,19,20,62	157.3064
Region 3	Fill -0.8 to EL-2,-3	38,10,36,37,62,32,33,34,57,58,59,60,35,39,40,41,42	287.87785
Region 4	Marsh -2,-3 to-5,-6	8,9,38,42,41,40,39,43,44,45,46	430.5125
Region 5	Beach -5,-6 to -48,-50	1,2,3,4,5,6,7,8,46,45,44,43,47,48,49,50,51	10984.346
Region 6	Bay Sound -48,-50 to -70	51,50,49,48,47,52,53,54,55,56	5546
Region 7	Fill -0.8 to EL-2,-3	36,61,62,37	22.125
Region 8	Fill GR to -0.8	62,20,23,24,25,26,27,28,30,31,32	269.2559

Points

	X (ft)	Y (ft)
Point 1	55	-6.48
Point 2	58.4	-6.48
Point 3	68.7	-5
Point 4	78.4	-5
Point 5	88.3	-5
Point 6	98.2	-5
Point 7	108.2	-5
Point 8	122.5	-5
Point 9	129.03	-3.27
Point 10	144.52	-2.69
Point 11	159.96	-0.46
Point 12	171.67	0.1
Point 13	179.42	0.47
Point 14	180.22	2.02
Point 15	186.18	5.49
Point 16	192.31	7.58
Point 17	197.81	8.13
Point 18	199.07	8.32
Point 19	199.3	8.34
Point 20	200	8.34
Point 21	200	13.98
Point 22	200.43	13.94
Point 23	200.79	9.42
Point 24	201.16	9.42
Point 25	206.93	9.53
Point 26	211.58	9.04
Point 27	219.73	6.48
Point 28	227.68	3.46
Point 29	234.71	1.15
Point 30	234.74	1.08
Point 31	245.25	-0.38
Point 32	255.96	-0.8

Point 33	267.15	-1.17
Point 34	277.99	-0.82
Point 35	310	-0.75
Point 36	154	-1.3
Point 37	200	-1.3
Point 38	137	-3
Point 39	310	-3
Point 40	236	-3
Point 41	200	-2
Point 42	172	-3
Point 43	310	-5
Point 44	236	-5
Point 45	200	-6
Point 46	172	-5
Point 47	310	-48
Point 48	236	-48
Point 49	200	-50
Point 50	172	-48
Point 51	55	-48
Point 52	310	-70
Point 53	236	-70
Point 54	200.5	-70
Point 55	171	-70
Point 56	55	-70
Point 57	287.93	-1.16
Point 58	297.84	-1.15
Point 59	298.05	-1.16
Point 60	307.55	-0.75
Point 61	157.5	-0.8
Point 62	200	-0.8

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.94	(175.769, 7.289)	26.44048	(208.407, 9.37431)	(144.222, -2.70228)
2	7183	2.16	(175.769, 7.289)	26.616	(209.121, 9.2991)	(143.89, -2.71599)

Slices of Slip Surface: Optimized

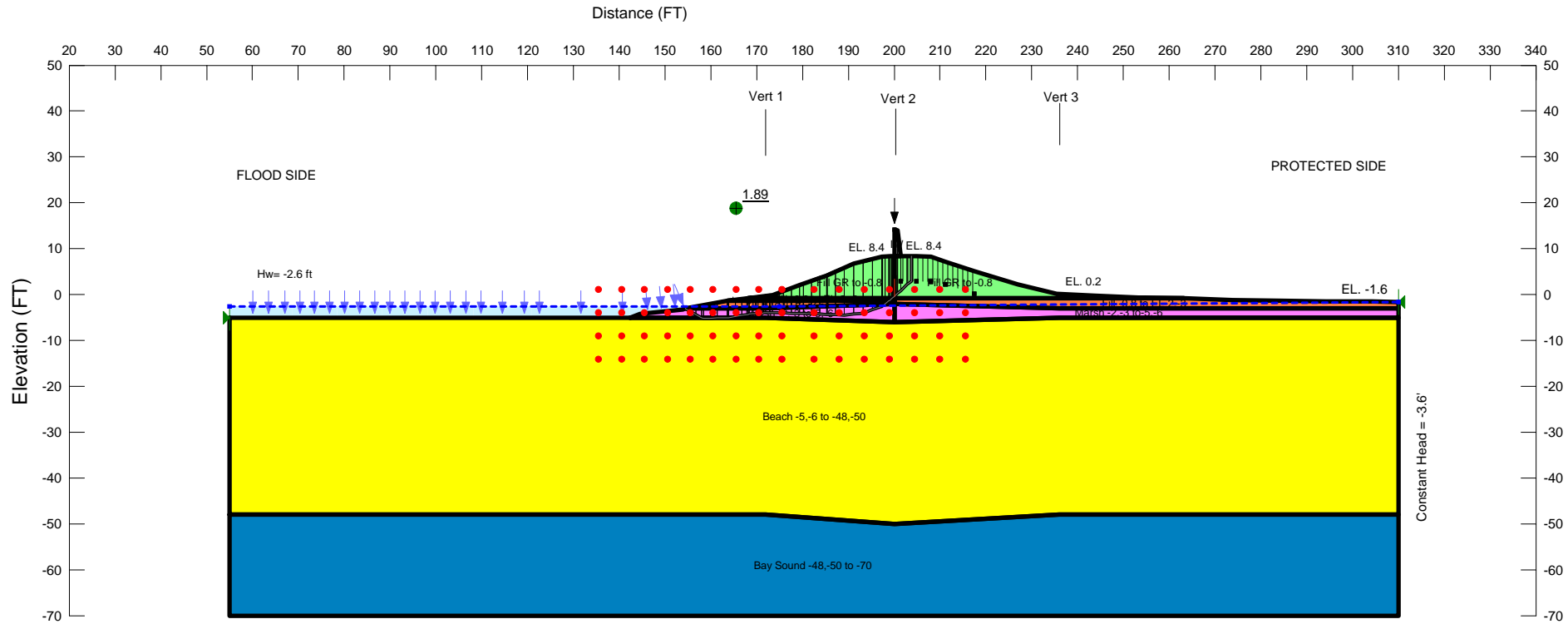
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	144.3711	-2.838231	14.809741	367.30479	0	600
2	Optimized	144.81775	-3.246081	40.192789	181.43302	0	190
3	Optimized	145.34015	-3.7231225	69.880799	240.52906	0	190
4	Optimized	146.5138	-4.464135	115.94235	294.74644	0	190
5	Optimized	147.7423	-5.157805	159.04508	375.23359	140.39446	3.4907e-006
6	Optimized	149.01815	-5.273628	166.08023	342.94501	114.85734	2.8543e-006
7	Optimized	151.0109	-5.1896635	160.54004	364.97038	132.75862	-4.4478e-006
8	Optimized	153.00365	-5.105699	154.99985	387.00077	150.66316	3.7441e-006

9	Optimized	154.7561	-5.0318585	150.1292	406.05512	166.20023	4.1302e-006
10	Optimized	156.5061	-4.9581225	145.26452	425.79125	0	190
11	Optimized	158.73	-4.864419	139.08389	450.25085	0	190
12	Optimized	160.67025	-4.7826665	133.69157	464.15057	0	190
13	Optimized	161.85315	-4.75128	131.55689	472.74156	0	190
14	Optimized	163.43915	-4.765796	132.22334	485.02098	0	190
15	Optimized	165.66585	-4.7977485	133.88034	499.88459	0	190
16	Optimized	167.89255	-4.829701	135.54183	514.70331	0	190
17	Optimized	170.11925	-4.8616535	137.19883	529.56693	0	190
18	Optimized	171.4513	-4.884436	138.42198	541.3542	0	190
19	Optimized	171.835	-4.896376	139.10844	544.58494	0	190
20	Optimized	172.16115	-4.906525	139.69289	547.27957	0	190.06
21	Optimized	173.50525	-4.968352	143.34947	562.77566	0	190.54
22	Optimized	175.87115	-5.081976	150.08336	586.0804	0	191.38
23	Optimized	178.23705	-5.1955995	156.81725	609.34292	0	192.23
24	Optimized	179.5271	-5.2575555	160.48815	644.21856	0	192.69
25	Optimized	179.9271	-5.2750795	161.52333	729.78869	0	192.83
26	Optimized	180.47115	-5.298075	162.87517	810.08982	0	193.03
27	Optimized	180.74775	-5.3097655	163.56389	828.82406	0	193.12
28	Optimized	181.67435	-5.34331	165.51701	889.85494	0	193.46
29	Optimized	183.4766	-5.40825	169.29867	1010.735	0	194.1
30	Optimized	185.27885	-5.47319	173.08034	1131.6706	0	194.74
31	Optimized	187.43735	-5.550965	177.60843	1243.2431	0	195.51
32	Optimized	190.0717	-5.503995	174.28167	1312.3024	0	196.45
33	Optimized	191.87935	-5.288853	160.58388	1307.1793	0	197.1
34	Optimized	193.41625	-4.8503695	132.99078	1290.9642	0	197.65
35	Optimized	195.62875	-4.2191365	93.26914	1251.6728	0	198.44
36	Optimized	197.2725	-3.66721	58.583798	1181.673	0	199.03
37	Optimized	198.44	-3.153936	26.379974	1147.0628	0	199.44
38	Optimized	199.185	-2.826415	5.8305638	1126.0722	0	199.71
39	Optimized	199.3482	-2.7546715	1.3292416	1120.0962	0	199.77
40	Optimized	199.6982	-2.600802	-8.3247267	1105.1105	0	199.89
41	Optimized	200.215	-2.3735995	-22.579467	1113.8366	0	199.94
42	Optimized	200.5108	-2.243565	-30.738705	1143.551	0	199.86
43	Optimized	200.6908	-2.1124495	-38.946429	1052.7729	0	199.81
44	Optimized	200.975	-1.838589	-56.078462	896.44966	0	551.35
45	Optimized	201.60645	-1.2301645	-94.136396	836.35575	0	552.23
46	Optimized	202.89775	0.0141075	-171.97809	714.10369	0	554.02
47	Optimized	204.5875	1.6423225	-273.83279	554.12605	0	556.37
48	Optimized	206.1812	3.187057	-370.46383	398.70922	0	558.59
49	Optimized	207.6687	4.638471	-461.25465	216.73814	0	560.65

Slices of Slip Surface: 7183

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	7183	143.94475	-2.7561475	9.7438123	261.25976	0	600
2	7183	144.1402	-2.898151	18.583668	278.36547	0	600
3	7183	144.4002	-3.087052	30.331819	130.50136	0	190

4	7183	144.81775	-3.3904255	49.200128	166.00662	0	190
5	7183	145.58275	-3.9462305	83.766402	236.83069	0	190
6	7183	147.04375	-4.299162	105.57021	215.83432	0	190
7	7183	149.03125	-4.326058	106.9487	250.36198	0	190
8	7183	151.01875	-4.3529535	108.32719	284.88964	0	190
9	7183	153.00625	-4.379849	109.71071	319.41729	0	190
10	7183	154.875	-4.405138	111.00699	351.52786	0	190
11	7183	156.625	-4.4288195	112.21831	381.21086	0	190
12	7183	158.73	-4.457305	113.68066	416.30339	0	190
13	7183	161.131	-4.4897965	115.34813	444.2378	0	190
14	7183	163.473	-4.5214895	116.97479	459.69326	0	190
15	7183	165.815	-4.5531825	118.59719	475.10603	0	190
16	7183	168.157	-4.5848755	120.22386	490.5188	0	190
17	7183	170.499	-4.6165685	121.85052	505.97426	0	190
18	7183	171.835	-4.6346475	122.77664	514.77107	0	190
19	7183	173.23665	-4.653615	123.74877	523.65821	0	190.44
20	7183	175.71	-4.6870855	125.46694	539.26325	0	191.32
21	7183	178.18335	-4.720556	127.18107	554.86829	0	192.21
22	7183	179.82	-4.742704	128.31326	647.72823	0	192.79
23	7183	180.47115	-4.751516	128.77154	748.99441	0	193.03
24	7183	181.63195	-4.767224	129.57682	824.07012	0	193.44
25	7183	183.4512	-4.7918425	130.84099	941.63739	0	194.09
26	7183	185.2704	-4.816461	132.09966	1059.2596	0	194.74
27	7183	187.20165	-4.8425955	133.44132	1157.2189	0	195.43
28	7183	189.245	-4.8702465	134.86044	1235.5152	0	196.16
29	7183	191.28835	-4.897898	136.27956	1313.8115	0	196.89
30	7183	193.22665	-4.9241285	137.62196	1364.0025	0	197.58
31	7183	195.06	-4.9489375	138.89821	1385.9823	0	198.24
32	7183	196.89335	-4.973747	140.169	1408.0167	0	198.89
33	7183	198.32165	-4.993076	141.16297	1428.0452	0	199.4
34	7183	198.95165	-4.8816665	134.11227	1207.6587	0	199.63
35	7183	199.185	-4.648333	119.5195	1188.9233	0	199.71
36	7183	199.65	-4.183333	90.431886	1147.1292	0	199.87
37	7183	200.215	-3.618333	55.091843	1124.415	0	199.94
38	7183	200.61	-3.223333	30.383985	1141.7221	0	199.83
39	7183	200.9429	-2.8904565	9.5624355	1135.6375	0	199.74
40	7183	201.1279	-2.7054565	-2.009384	1118.7703	0	199.69
41	7183	201.4719	-2.3614415	-23.527385	1087.9162	0	199.59
42	7183	202.40855	-1.424775	-82.1162	866.20679	0	553.35
43	7183	204.0075	0.1741665	-182.13235	710.28857	0	555.57
44	7183	205.95585	2.1225	-304.00031	520.33147	0	558.27
45	7183	208.0256	4.192273	-433.45224	283.74148	0	561.15



Name: Fill -0.8 to EL-2,-3 Model: Spatial Mohr-Coulomb Unit Weight: 109 pcf Cohesion Spatial Fn: Fill -0.8 to -2,-3 Phi: 0 ° Phi-B: 0 ° Piezometric Line: 1
 Name: Marsh -2,-3 to -5,-6 Model: Spatial Mohr-Coulomb Unit Weight: 101 pcf Cohesion Spatial Fn: Marsh -2.3 to -5,-6 Phi: 0 ° Phi-B: 0 ° Piezometric Line: 1
 Name: Beach -5,-6 to -48,-50 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Beach Sand Phi-B: 0 ° Piezometric Line: 1
 Name: Bay Sound -48,-50 to -70 Model: Spatial Mohr-Coulomb Unit Weight: 102 pcf Cohesion Spatial Fn: Bay -48,-50 to -70 Phi: 0 ° Phi-B: 0 ° Piezometric Line: 1
 Name: IW Model: Undrained (Phi=0) Unit Weight: 0.01 pcf Cohesion: 0.01 psf Piezometric Line: 1
 Name: Fill GR to -0.8 Model: Spatial Mohr-Coulomb Unit Weight: 109 pcf Cohesion Spatial Fn: Fill -0.8 to -2,-3 Phi: 0 ° Phi-B: 0 ° Piezometric Line: 1

Existing Condition

Cross Section at Sta 11+00

GENERAL NOTES

CLASSIFICATION STRATIFICATION
 SHEAR STRENGTHS AND UNIT WEIGHTS OF
 THE SOIL WERE BASED ON THE RESULTS OF
 UNDISTURBED BORINGS AND CPT DATA. SEE
 BOTH BORING AND CPT DATA PLATES.

WHERE INDICATED, SHEAR STRENGTHS BETWEEN
 VERTICALS WERE ASSUMED TO VARY LINEARLY
 BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

LAKE PONTCHARTRAIN, LA. AND VICINITY
 HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL,
 REMEDIATION OF CANAL WALLS AND LEVEES
 PROTECTED SIDE STABILITY ANALYSIS
 CASE: Name: LWL Q Case (Block)
 REACH 13B, STA. 7+00 TO STA. 11+20
 ORLEANS PARISH, LOUISIANA

LWL Q Case (Block)

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File Information

Created By: [Vicky Curtis](#)
Revision Number: [364](#)
Last Edited By: [Jamerson, James MVK](#)
Date: [6/14/2013](#)
Time: [11:13:43 AM](#)
File Name: [Reach 13B.gsz](#)
Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix E LWL\](#)
Last Solved Date: [6/14/2013](#)
Last Solved Time: [11:14:52 AM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Strength Units: [psf](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

LWL Q Case (Block)

Kind: [SLOPE/W](#)
Method: [Spencer](#)
Settings
 Apply Phreatic Correction: [No](#)
 PWP Conditions Source: [Piezometric Line](#)
 Use Staged Rapid Drawdown: [No](#)
Slip Surface
 Direction of movement: [Right to Left](#)
 Use Passive Mode: [No](#)
 Slip Surface Option: [Block](#)
 Critical slip surfaces saved: [1](#)
 Optimize Critical Slip Surface Location: [Yes](#)
Tension Crack
 Tension Crack Option: [Tension Crack Line](#)
 Percentage Wet: [1](#)
 Tension Crack Fluid Unit Weight: [62.4 pcf](#)
FOS Distribution

FOS Calculation Option: [Constant](#)

Restrict Block Crossing: [Yes](#)

Advanced

Number of Slices: [30](#)

Optimization Tolerance: [0.01](#)

Minimum Slip Surface Depth: [0.1 ft](#)

Optimization Maximum Iterations: [2000](#)

Optimization Convergence Tolerance: [1e-007](#)

Starting Optimization Points: [8](#)

Ending Optimization Points: [16](#)

Complete Passes per Insertion: [1](#)

Driving Side Maximum Convex Angle: [5 °](#)

Resisting Side Maximum Convex Angle: [1 °](#)

Materials

Fill -0.8 to EL-2,-3

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [109 pcf](#)

Cohesion Spatial Fn: [Fill -0.8 to -2,-3](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: [1](#)

Marsh -2,-3 to -5,-6

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [101 pcf](#)

Cohesion Spatial Fn: [Marsh -2,-3 to -5,-6](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: [1](#)

Beach -5,-6 to -48,-50

Model: [Shear/Normal Fn.](#)

Unit Weight: [122 pcf](#)

Strength Function: [Beach Sand](#)

Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: [1](#)

Bay Sound -48,-50 to -70

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [102 pcf](#)

Cohesion Spatial Fn: [Bay -48,-50 to -70](#)

Phi: [0 °](#)

Phi-B: 0 °

Pore Water Pressure

Piezometric Line: 1

IW

Model: Undrained (Phi=0)

Unit Weight: 0.01 pcf

Cohesion: 0.01 psf

Pore Water Pressure

Piezometric Line: 1

Fill GR to -0.8

Model: Spatial Mohr-Coulomb

Unit Weight: 109 pcf

Cohesion Spatial Fn: Fill -0.8 to -2,-3

Phi: 0 °

Phi-B: 0 °

Pore Water Pressure

Piezometric Line: 1

Slip Surface Limits

Left Coordinate: (55, -5) ft

Right Coordinate: (310, -1.6) ft

Slip Surface Block

Left Grid

Upper Left: (135.5, 1.125) ft

Lower Left: (135.5, -14.0625) ft

Lower Right: (175.5, -14.0625) ft

X Increments: 8

Y Increments: 3

Starting Angle: 135 °

Ending Angle: 180 °

Angle Increments: 6

Right Grid

Upper Left: (182.5, 1.12484) ft

Lower Left: (182.5, -14.0635) ft

Lower Right: (215.5, -14.0635) ft

X Increments: 6

Y Increments: 3

Starting Angle: 45 °

Ending Angle: 65 °

Angle Increments: 5

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
	55	-2.6
	175	-2.6
	310	-1.6

Reinforcements

Reinforcement 1

Type: [Pile](#)
Outside Point: [\(200, 14.1\) ft](#)
Inside Point: [\(200, 3.7\) ft](#)
Slip Surface Intersection: [\(200, -0.37092\) ft](#)
Total Length: [10.4 ft](#)
Reinforcement Direction: [90 °](#)
Applied Load Option: [Variable](#)
F of S Dependent: [No](#)
Pile Spacing: [1 ft](#)
Shear Capacity: [81201 lbs](#)
Shear Safety Factor: [1](#)
Shear Load Used: [81201 lbs](#)
Shear Option: [Parallel to Slip](#)
Resisting Force Used: [0 lbs/ft](#)

Tension Crack Line

	X (ft)	Y (ft)
	201.4	2.9
	204.9	2.9
	208	2.7
	211.1	2.2
	217.5	0.1

Shear/Normal Strength Functions

Beach Sand

Model: [Spline Data Point Function](#)
Function: [Shear Stress vs. Normal Stress](#)
Curve Fit to Data: [100 %](#)
Segment Curvature: [0 %](#)
Y-Intercept: [0](#)
Data Points: [Normal Stress \(psf\), Shear Stress \(psf\)](#)

Data Point: (-10000, 0)

Data Point: (0, 0)

Data Point: (10000, 6494)

Estimation Properties

Intact Rock Param.: 10

Geological Strength: 100

Disturbance Factor: 0

SigmaC: 600000 psf

Sigma3: 300000 psf

Num. Points: 20

Spatial Functions

Fill -0.8 to -2,-3

Model: Linear Interpolation

Limit Range By: Data Values

Data Points: X (ft), Y (ft), Cohesion (psf)

Data Point: (172, -0.8, 600)

Data Point: (172, -3, 600)

Data Point: (200, -0.8, 550)

Data Point: (200, -2, 550)

Data Point: (236, -0.8, 600)

Data Point: (236, -3, 600)

Marsh -2,-3 to -5,-6

Model: Linear Interpolation

Limit Range By: Data Values

Data Points: X (ft), Y (ft), Cohesion (psf)

Data Point: (172, -3, 190)

Data Point: (172, -5, 190)

Data Point: (200, -2, 200)

Data Point: (200, -6, 200)

Data Point: (236, -3, 190)

Data Point: (236, -5, 190)

Bay -48,-50 to -70

Model: Linear Interpolation

Limit Range By: Data Values

Data Points: X (ft), Y (ft), Cohesion (psf)

Data Point: (172, -48, 780)

Data Point: (172, -70, 980)

Data Point: (200, -50, 830)

Data Point: (200, -70, 1000)

Data Point: (236, -48, 780)

Data Point: (236, -70, 980)

Data Point: (55, -48, 780)

Data Point: (310, -48, 780)

Regions

	Material	Points	Area (ft²)
Region 1	Beach -5,-6 to -48,-50	1,2,3,4,5,6,7,55,60,15,14,13,12,16,17,18,19,20	10997
Region 2	Bay Sound -48,-50 to -70	20,19,18,17,16,21,22,23,24,25	5546
Region 3	Fill GR to -0.8	30,31,32,33,34,35,36,37,38,57	148.585
Region 4	Fill -0.8 to EL-2,-3	30,57,58,29	17.075
Region 5	Fill -0.8 to EL-2,-3	56,28,29,58,10,11	55.21
Region 6	Marsh -2,-3 to-5,-6	10,9,8,12,13,14	256
Region 7	IW	38,39,40,41	6.2
Region 8	Fill GR to -0.8	57,38,41,42,43,44,45,46,47,48,49,50	213.995
Region 9	Fill -0.8 to EL-2,-3	10,58,57,50,51,52,53,54,59,8,9	199.925
Region 10	Marsh -2,-3 to-5,-6	60,26,27,56,11,10,14,15	132.78552

Points

	X (ft)	Y (ft)
Point 1	55	-5
Point 2	58.4	-5
Point 3	68.7	-5
Point 4	78.4	-5
Point 5	88.3	-5
Point 6	98.2	-5
Point 7	108.2	-5
Point 8	310	-3
Point 9	236	-3
Point 10	200	-2
Point 11	172	-3
Point 12	310	-5
Point 13	236	-5
Point 14	200	-6
Point 15	172	-5
Point 16	310	-48
Point 17	236	-48
Point 18	200	-50
Point 19	172	-48
Point 20	55	-48
Point 21	310	-70
Point 22	236	-70
Point 23	200.5	-70
Point 24	171	-70
Point 25	55	-70
Point 26	144.5	-4.2
Point 27	153.8	-3.3
Point 28	161.4	-1.8
Point 29	163.6	-1.3
Point 30	168.1	-0.8

Point 31	171.3	-0.4
Point 32	173.4	-0.1
Point 33	179.3	2.1
Point 34	185.2	4.2
Point 35	191.2	6.7
Point 36	197.3	8.3
Point 37	199.4	8.4
Point 38	200	8.4
Point 39	200	14.1
Point 40	200.8	14
Point 41	201.4	8.4
Point 42	204.9	8.4
Point 43	208	8.2
Point 44	211.1	7.2
Point 45	217.5	5.1
Point 46	227	2.2
Point 47	235.4	0.2
Point 48	243.8	-0.3
Point 49	254	-0.6
Point 50	263.3	-0.8
Point 51	273.8	-1.2
Point 52	284.5	-1.3
Point 53	294.3	-1.5
Point 54	304.2	-1.5
Point 55	121	-5
Point 56	154.5	-3
Point 57	200	-0.8
Point 58	200	-1.3
Point 59	310	-1.6
Point 60	142.33621	-5

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.89	(179.493, 4.332)	19.72687	(203.739, 8.4)	(154.364, -3.05825)
2	4345	2.16	(179.493, 4.332)	20.903	(205.781, 8.34315)	(154.237, -3.1129)

Slices of Slip Surface: **Optimized**

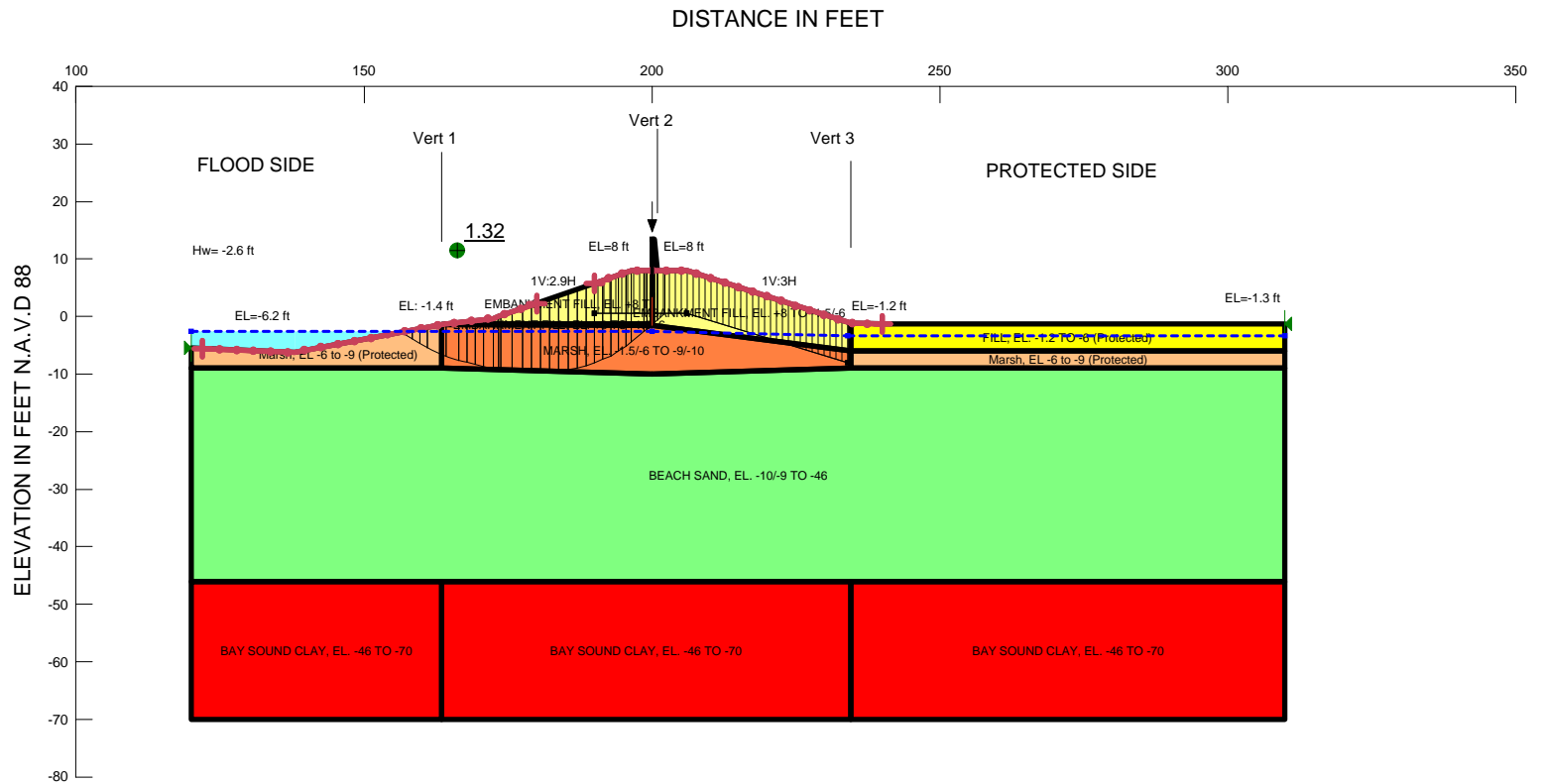
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	154.43205	-3.094414	30.8514	112.21053	0	190
2	Optimized	155.65	-3.742626	71.300406	193.11022	0	190
3	Optimized	157.40625	-4.6773355	129.62563	317.81393	0	190
4	Optimized	158.18555	-5.0921	155.50678	358.76567	131.99786	3.2813e-006
5	Optimized	159.11895	-5.164581	160.03303	314.89246	100.56689	2.4993e-006
6	Optimized	160.63965	-5.1253425	157.58099	339.98472	118.45437	-5.1245e-007
7	Optimized	162.5	-5.0773395	154.58493	377.329	144.65169	-4.8464e-006
8	Optimized	163.6133	-5.048613	152.79232	402.23543	161.99025	-5.4277e-006

9	Optimized	163.77845	-5.024135	151.26466	382.47844	150.15198	3.7313e-006
10	Optimized	164.62525	-4.889548	142.86465	378.46414	0	190
11	Optimized	166.01515	-4.668644	129.07984	373.11365	0	190
12	Optimized	167.40505	-4.44774	115.30214	367.76315	0	190
13	Optimized	168.27035	-4.310214	106.71773	364.67351	0	190
14	Optimized	169.1555	-4.2182985	100.98048	377.82693	0	190
15	Optimized	170.58515	-4.0886155	92.892844	384.12428	0	190
16	Optimized	171.44455	-4.010662	88.026707	388.20215	0	190
17	Optimized	171.79455	-3.9958575	87.100972	405.1457	0	190
18	Optimized	172.41915	-3.9907125	86.781028	414.22908	0	190.15
19	Optimized	173.11915	-3.9897985	86.724255	427.68418	0	190.4
20	Optimized	174.2	-3.999568	87.333952	465.32485	0	190.79
21	Optimized	175.384	-4.0102695	88.178225	514.29594	0	191.21
22	Optimized	176.651	-4.031337	90.077594	569.70073	0	191.66
23	Optimized	178.417	-4.066531	93.089428	644.77011	0	192.29
24	Optimized	179.706	-4.092219	95.289081	698.85883	0	192.75
25	Optimized	181.01085	-4.1334675	98.467754	757.14493	0	193.22
26	Optimized	182.8085	-4.1997825	103.43756	833.52651	0	193.86
27	Optimized	184.45365	-4.273038	108.76655	908.71811	0	194.45
28	Optimized	185.2729	-4.3170525	111.89366	945.51751	0	194.74
29	Optimized	186.28825	-4.371602	115.76752	997.31084	0	195.1
30	Optimized	188.1731	-4.4728675	122.95664	1093.4659	0	195.78
31	Optimized	190.15775	-4.4084335	119.85285	1132.3436	0	196.48
32	Optimized	192.19455	-4.1835685	106.76441	1184.0281	0	197.21
33	Optimized	194.2168	-3.6999805	77.519132	1124.7246	0	197.93
34	Optimized	196.27225	-2.9524015	31.822392	1108.2195	0	198.67
35	Optimized	197.3212	-2.570896	8.5013763	1099.3117	0	199.04
36	Optimized	197.42705	-2.4982135	4.014812	995.99428	0	199.08
37	Optimized	197.747	-2.2526545	-11.160215	975.08798	0	199.2
38	Optimized	198.4308	-1.727771	-43.59679	823.68161	0	552.8
39	Optimized	198.9255	-1.34174	-67.456742	739.39245	0	551.92
40	Optimized	199.18585	-1.1065208	-82.014318	718.13205	0	551.45
41	Optimized	199.46255	-0.85652075	-97.488881	695.25621	0	550.96
42	Optimized	199.76255	-0.585458	-114.2624	669.3626	0	550.42
43	Optimized	200.4	-0.00949895	-149.90892	613.98383	0	550.56
44	Optimized	201.1	0.6229809	-189.04559	552.79173	0	551.53
45	Optimized	202.11365	1.5388569	-245.73435	464.20243	0	552.94
46	Optimized	203.2832	2.541835	-307.77298	266.91022	0	554.56

Slices of Slip Surface: 4345

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	4345	154.3683	-3.130244	33.087265	62.266547	0	190
2	4345	155.65	-3.2989855	43.614945	89.936966	0	190
3	4345	157.725	-3.5721645	60.665693	145.07783	0	190
4	4345	159.575	-3.8157215	75.858913	205.83462	0	190
5	4345	160.95	-3.937505	83.46	228.93333	0	190
6	4345	162.5	-3.9375225	83.463636	264.71364	0	190

7	4345	164.35	-3.937544	83.46	301.04667	0	190
8	4345	165.85	-3.9375615	83.466667	319.21333	0	190
9	4345	167.35	-3.9375785	83.466667	337.38667	0	190
10	4345	168.9	-3.937596	83.46875	357.36875	0	190
11	4345	170.5	-3.937614	83.46875	379.16875	0	190
12	4345	171.65	-3.937627	83.468571	395.52857	0	190
13	4345	172.7	-3.937639	83.471429	411.69286	0	190.25
14	4345	174.2	-3.9376565	83.46875	454.7125	0	190.79
15	4345	175.71665	-3.937674	83.804671	515.95826	0	191.33
16	4345	177.15	-3.93769	84.467462	573.83734	0	191.84
17	4345	178.58335	-3.9377065	85.130252	631.7234	0	192.35
18	4345	180.28335	-3.937726	85.916935	698.54225	0	192.96
19	4345	182.25	-3.9377485	86.827104	774.3558	0	193.66
20	4345	184.21665	-3.937771	87.737273	850.1185	0	194.36
21	4345	185.2729	-3.937783	88.226983	891.32367	0	194.74
22	4345	186.3215	-3.937795	88.710578	938.65846	0	195.11
23	4345	188.2729	-3.9378175	89.612494	1026.749	0	195.81
24	4345	190.2243	-3.93784	90.519534	1114.8907	0	196.51
25	4345	191.9625	-3.9378595	91.32459	1180.5246	0	197.13
26	4345	193.4875	-3.937877	92.02623	1223.7377	0	197.67
27	4345	195.0125	-3.9378945	92.734426	1266.9508	0	198.22
28	4345	196.5375	-3.937912	93.442623	1310.1639	0	198.76
29	4345	198.15	-3.9379305	94.188235	1335.9412	0	199.34
30	4345	199.2	-3.73794	82.194096	1081.3254	0	199.71
31	4345	199.7	-3.23794	51.223996	1037.5968	0	199.89
32	4345	200.2635	-2.6744255	16.321592	987.50664	0	199.93
33	4345	200.6635	-2.2744255	-8.4535478	952.05382	0	199.82
34	4345	200.8563	-2.081645	-20.394193	934.95626	0	199.76
35	4345	201.1563	-1.781645	-38.975688	782.69088	0	551.61
36	4345	201.76895	-1.16897	-76.922782	723.58795	0	552.46
37	4345	202.82845	-0.109485	-142.54474	621.43158	0	553.93
38	4345	204.2095	1.271545	-228.08183	488.23622	0	555.85
39	4345	205.34055	2.4026075	-298.14045	248.15077	0	557.42



Name: EMBANKMENT FILL, EL. +8 TO -1.5/-6 Model: Undrained (Phi=0) Unit Weight: 110 pcf Cohesion: 540 psf Piezometric Line: 1
 Name: MARSH, EL. -1.5/-6 TO -9/-10 Model: Spatial Mohr-Coulomb Unit Weight: 96 pcf Cohesion Spatial Fn: Marsh Phi: 0 ° Piezometric Line: 1
 Name: BEACH SAND, EL. -10/-9 TO -46 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand Piezometric Line: 1
 Name: BAY SOUND CLAY, EL. -46 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 105 pcf Cohesion Spatial Fn: Clay Phi: 0 ° Piezometric Line: 1
 Name: Marsh, EL. -6 to -9 (Protected) Model: Spatial Mohr-Coulomb Unit Weight: 96 pcf Cohesion Fn: Marsh Protected Side Toe Phi: 0 ° Piezometric Line: 1
 Name: FILL, EL. -1.2 TO -6 (Protected) Model: Undrained (Phi=0) Unit Weight: 110 pcf Cohesion: 600 psf Piezometric Line: 1

GENERAL NOTES

CLASSIFICATION STRATIFICATION
 SHEAR STRENGTHS AND UNIT WEIGHTS OF
 THE SOIL WERE BASED ON THE RESULTS OF
 UNDISTURBED BORINGS AND CPT DATA. SEE
 BOTH BORING AND CPT DATA PLATES.

WHERE INDICATED, SHEAR STRENGTHS BETWEEN
 VERTICALS WERE ASSUMED TO VARY LINEARLY
 BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

Hw IS CANAL WATER LEVEL

LAKE PONTCHARTRAIN, LA. AND VICINITY
 HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 14,
 PROTECTED SIDE STABILITY ANALYSIS,
 CASE: LWL Q Case (Entry/Exit)
 STA. 11+20 to 20+50 EAST
 ORLEANS PARISH, LOUISIANA

LWL Q Case (Entry/Exit)

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File Information

Created By: [Liljegren, James](#)
Revision Number: [408](#)
Last Edited By: [Jamerson, James MVK](#)
Date: [10/3/2013](#)
Time: [2:12:55 PM](#)
File Name: [Reach 14.gsz](#)
Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix E LWL\](#)
Last Solved Date: [10/3/2013](#)
Last Solved Time: [2:14:44 PM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Strength Units: [psf](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

LWL Q Case (Entry/Exit)

Kind: [SLOPE/W](#)
Method: [Spencer](#)
Settings
 Apply Phreatic Correction: [No](#)
 PWP Conditions Source: [Piezometric Line](#)
 Use Staged Rapid Drawdown: [No](#)
Slip Surface
 Direction of movement: [Right to Left](#)
 Use Passive Mode: [No](#)
 Slip Surface Option: [Entry and Exit](#)
 Critical slip surfaces saved: [1](#)
 Optimize Critical Slip Surface Location: [Yes](#)
Tension Crack
 Tension Crack Option: [Tension Crack Line](#)
 Percentage Wet: [1](#)
 Tension Crack Fluid Unit Weight: [62.4 pcf](#)
FOS Distribution

FOS Calculation Option: [Constant](#)

Advanced

Number of Slices: [30](#)

Optimization Tolerance: [0.01](#)

Minimum Slip Surface Depth: [0.1 ft](#)

Optimization Maximum Iterations: [2000](#)

Optimization Convergence Tolerance: [1e-007](#)

Starting Optimization Points: [8](#)

Ending Optimization Points: [16](#)

Complete Passes per Insertion: [1](#)

Driving Side Maximum Convex Angle: [5 °](#)

Resisting Side Maximum Convex Angle: [1 °](#)

Materials

EMBANKMENT FILL, EL. +8 TO -1.5/-6

Model: [Undrained \(Phi=0\)](#)

Unit Weight: [110 pcf](#)

Cohesion: [540 psf](#)

Pore Water Pressure

Piezometric Line: [1](#)

MARSH, EL. -1.5/-6 TO -9/-10

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [96 pcf](#)

Cohesion Spatial Fn: [Marsh](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: [1](#)

BEACH SAND, EL. -10/-9 TO -46

Model: [Shear/Normal Fn.](#)

Unit Weight: [122 pcf](#)

Strength Function: [Sand](#)

Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: [1](#)

BAY SOUND CLAY, EL. -46 TO -70

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [105 pcf](#)

Cohesion Spatial Fn: [Clay](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: [1](#)

Marsh, EL -6 to -9 (Protected)

Model: [Spatial Mohr-Coulomb](#)
Unit Weight: [96 pcf](#)
Cohesion Fn: [Marsh Protected Side Toe](#)
Phi: [0 °](#)
Phi-B: [0 °](#)
Pore Water Pressure
Piezometric Line: [1](#)

FILL, EL. -1.2 TO -6 (Protected)

Model: [Undrained \(Phi=0\)](#)
Unit Weight: [110 pcf](#)
Cohesion: [600 psf](#)
Pore Water Pressure
Piezometric Line: [1](#)

Slip Surface Entry and Exit

Left Projection: [Range](#)
Left-Zone Left Coordinate: [\(122, -5.57821\) ft](#)
Left-Zone Right Coordinate: [\(180, 2.3046\) ft](#)
Left-Zone Increment: [20](#)
Right Projection: [Range](#)
Right-Zone Left Coordinate: [\(190, 5.77741\) ft](#)
Right-Zone Right Coordinate: [\(240, -1.27333\) ft](#)
Right-Zone Increment: [20](#)
Radius Increments: [15](#)

Slip Surface Limits

Left Coordinate: [\(120, -5.5\) ft](#)
Right Coordinate: [\(310, -1.3\) ft](#)

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
	120	-2.6
	200	-2.6
	234	-3.3
	310	-3.3

Reinforcements

Reinforcement 1

Type: [Pile](#)
Outside Point: [\(200, 13.4\) ft](#)
Inside Point: [\(200, 3.7\) ft](#)
Slip Surface Intersection: [\(200, -1.4684\) ft](#)
Total Length: [9.7 ft](#)
Reinforcement Direction: [90 °](#)
Applied Load Option: [Variable](#)
F of S Dependent: [No](#)
Pile Spacing: [1 ft](#)
Shear Capacity: [0 lbs](#)
Shear Safety Factor: [1](#)
Shear Load Used: [0 lbs](#)
Shear Option: [Parallel to Slip](#)
Resisting Force Used: [0 lbs/ft](#)

Tension Crack Line

	X (ft)	Y (ft)
	190	0.5
	206	0.5
	234	-8

Cohesion Functions

Marsh Protected Side Toe

Model: [Spline Data Point Function](#)
Function: [Cohesion vs. Y](#)
Curve Fit to Data: [100 %](#)
Segment Curvature: [0 %](#)
Y-Intercept: [200](#)
Data Points: [Y \(ft\), Cohesion \(psf\)](#)
Data Point: [\(-9, 220\)](#)
Data Point: [\(-6, 200\)](#)

Shear/Normal Strength Functions

Sand

Model: [Spline Data Point Function](#)
Function: [Shear Stress vs. Normal Stress](#)
Curve Fit to Data: [100 %](#)
Segment Curvature: [0 %](#)
Y-Intercept: [0](#)
Data Points: [Normal Stress \(psf\), Shear Stress \(psf\)](#)
Data Point: [\(-10000, 0\)](#)

Data Point: (0, 0)
Data Point: (10000, 6494)

Estimation Properties

Intact Rock Param.: 10
Geological Strength: 100
Disturbance Factor: 0
SigmaC: 600000 psf
Sigma3: 300000 psf
Num. Points: 20

Spatial Functions

Marsh

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (200, -1.5, 175)
Data Point: (200, -10, 240)
Data Point: (234.5, -6, 200)
Data Point: (234.5, -9, 220)
Data Point: (163.5, -1.5, 200)
Data Point: (163.5, -9, 220)

Clay

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (200, -46, 620)
Data Point: (200, -70, 830)
Data Point: (234.5, -46, 570)
Data Point: (234.5, -70, 780)
Data Point: (163.5, -46, 570)
Data Point: (163.5, -70, 780)
Data Point: (120, -46, 570)
Data Point: (120, -70, 780)
Data Point: (310, -46, 570)
Data Point: (310, -70, 780)

Regions

	Points	Area (ft ²)	Material
Region 1	4,11,12,13	4.05	
Region 2	28,2,34,3,4,22	160.66498	EMBANKMENT FILL, EL. +8 TO -1.5/-6
Region 3	19,31,16,24,17,8,25,29,32,20	6994.5	BEACH SAND, EL. -10/-9 TO -46
Region 4	26,30,33,32,29,25	1704	BAY SOUND CLAY, EL. -46 TO -70
Region 5	23,5,18,6,7	355.225	FILL, EL. -1.2 TO -6 (Protected)
Region 6	24,23,7,17	226.5	Marsh, EL -6 to -9 (Protected)

Region 7	22,4,13,10,5,23,14	275.195	EMBANKMENT FILL, EL. +8 TO -1.5/-6
Region 8	16,31,27,14,23,24	492.2	MARSH, EL. -1.5/-6 TO -9/-10
Region 9	26,25,8,9	1812	BAY SOUND CLAY, EL. -46 TO -70
Region 10	28,22,14,27	5.435	EMBANKMENT FILL, EL. +8 TO -1.5/-6
Region 11	27,15,1,19,31	189.505	Marsh, EL -6 to -9 (Protected)
Region 12	21,33,32,20	1044	BAY SOUND CLAY, EL. -46 TO -70

Points

	X (ft)	Y (ft)
Point 1	120	-5.5
Point 2	172.5	-0.3
Point 3	196.4	8
Point 4	200	8
Point 5	234.5	-1.2
Point 6	310	-1.3
Point 7	310	-6
Point 8	310	-46
Point 9	310	-70
Point 10	206.2	8
Point 11	200	13.4
Point 12	200.5	13.4
Point 13	201	8
Point 14	200	-1.5
Point 15	137.9	-6.2
Point 16	200	-10
Point 17	310	-9
Point 18	242	-1.3
Point 19	120	-9
Point 20	120	-46
Point 21	120	-70
Point 22	200	-1.3
Point 23	234.5	-6
Point 24	234.5	-9
Point 25	234.5	-46
Point 26	234.5	-70
Point 27	163.5	-1.4
Point 28	164.3	-1.3
Point 29	200	-46
Point 30	200	-70
Point 31	163.5	-9
Point 32	163.5	-46
Point 33	163.5	-70
Point 34	173.36386	0

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
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1	Optimized	1.32	(177.635, 26.094)	19.05777	(202.326, 8)	(156.401, -2.73106)
2	4153	1.33	(177.635, 26.094)	35.334	(201.995, 8)	(157.033, -2.61252)

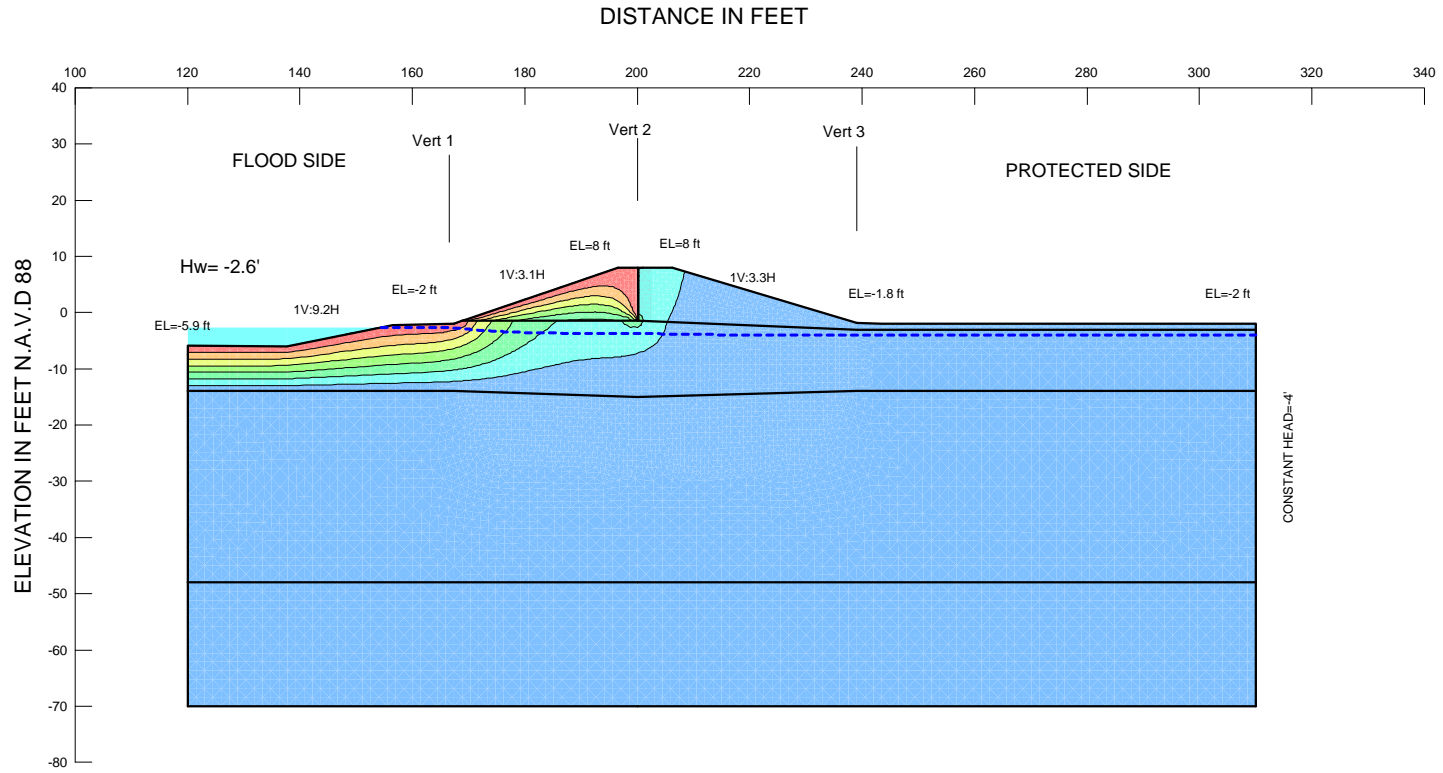
Slices of Slip Surface: **Optimized**

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	156.7505	-2.941667	21.319725	155.92477	0	200
2	Optimized	157.7465	-3.5418535	58.771744	233.69194	0	200
3	Optimized	159.0395	-4.321016	107.39005	340.58519	0	200
4	Optimized	160.33255	-5.1001785	156.01101	447.47843	0	200
5	Optimized	162.12415	-5.99515	211.85635	536.65162	0	200
6	Optimized	163.3846	-6.5403805	245.88052	594.04708	0	203.6
7	Optimized	163.9	-6.7183335	256.98728	623.95329	0	213.96
8	Optimized	165.3844	-7.230863	288.96444	697.35007	0	215.65
9	Optimized	167.1851	-7.7900165	323.8581	755.25209	0	217.79
10	Optimized	168.6177	-8.15949	346.91309	812.56852	0	219.43
11	Optimized	170.05035	-8.5289635	369.96808	869.81736	0	221.21
12	Optimized	171.63335	-8.8727435	391.42164	904.10567	0	223.1
13	Optimized	172.93195	-9.111051	406.29171	956.83042	0	224.57
14	Optimized	173.5879	-9.2314275	413.80558	994.6173	0	225.34
15	Optimized	174.7505	-9.2996775	418.06247	998.21667	0	226.13
16	Optimized	176.6277	-9.3539525	421.44914	1075.6416	0	227.17
17	Optimized	178.351	-9.402325	424.46593	1145.9727	0	228.12
18	Optimized	179.92045	-9.444795	427.11558	1210.4304	0	228.97
19	Optimized	181.4899	-9.487265	429.76523	1274.8245	0	229.83
20	Optimized	183.0593	-9.529735	432.41487	1339.2823	0	230.68
21	Optimized	184.64225	-9.3963485	424.09178	1308.6489	0	230.54
22	Optimized	186.2388	-9.087105	404.79504	1339.2728	0	229.29
23	Optimized	187.83535	-8.7778615	385.49829	1369.8967	0	227.89
24	Optimized	189.34215	-8.3208265	356.97852	1304.0038	0	225.4
25	Optimized	190.75925	-7.716	319.23821	1301.0833	0	221.74
26	Optimized	192.17635	-7.1111735	281.4979	1298.2276	0	217.85
27	Optimized	193.53685	-6.3900075	236.49678	1216.1677	0	212.93
28	Optimized	194.84075	-5.5525025	184.23518	1190.2273	0	206.96
29	Optimized	195.94635	-4.768248	135.29937	1116.0224	0	201.15
30	Optimized	197.5187	-3.501373	56.244786	1026.6126	0	191.4
31	Optimized	198.90375	-2.38543	-13.389215	934.28157	0	182.4
32	Optimized	199.58505	-1.8196415	-48.694057	878.00136	0	177.71
33	Optimized	200.25	-1.25683	-84.134472	651.90782	0	540
34	Optimized	200.75	-0.8336441	-111.18446	610.1856	0	540
35	Optimized	201.66285	-0.0610256	-160.56959	371.59355	0	540

Slices of Slip Surface: **4153**

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	4153	157.8666	-3.175391	35.904475	211.49116	0	200
2	4153	159.5	-4.2168925	100.89563	337.65066	0	200
3	4153	161.1	-5.1193155	157.20486	447.75551	0	200
4	4153	162.7	-5.9163525	206.94096	546.07675	0	200

5	4153	163.9	-6.458372	240.75941	617.75145	0	213.25
6	4153	165.12	-6.937816	270.68143	673.2396	0	214.75
7	4153	166.76	-7.5138225	306.6219	740.20185	0	216.8
8	4153	168.4	-8.001253	337.03904	797.83837	0	218.82
9	4153	170.04	-8.403873	362.16289	846.55732	0	220.75
10	4153	171.68	-8.7246325	382.17705	886.82001	0	222.54
11	4153	172.93195	-8.922877	394.54319	923.65258	0	223.8
12	4153	174.13175	-9.0574055	402.94191	973.01388	0	224.83
13	4153	175.66745	-9.176753	410.38821	1030.4077	0	225.97
14	4153	177.2032	-9.2289585	413.64528	1080.6345	0	226.82
15	4153	178.73895	-9.2143205	412.73184	1123.7922	0	227.35
16	4153	180.2747	-9.1327555	407.64261	1159.9623	0	227.52
17	4153	181.81045	-8.9837955	398.34836	1189.2	0	227.28
18	4153	183.3462	-8.766575	384.7916	1211.3976	0	226.58
19	4153	184.88195	-8.479805	366.89968	1226.674	0	225.37
20	4153	186.41765	-8.121733	344.55899	1234.789	0	223.62
21	4153	187.9534	-7.6900865	317.62115	1235.6604	0	221.25
22	4153	189.48915	-7.181996	285.91898	1229.1701	0	218.21
23	4153	191.0249	-6.5938875	249.21623	1215.0496	0	214.43
24	4153	192.56065	-5.921338	207.25346	1193.0146	0	209.85
25	4153	194.0964	-5.1588795	159.67636	1162.7177	0	204.37
26	4153	195.63215	-4.2997215	106.06254	1123.6578	0	197.91
27	4153	197.32675	-3.222513	38.8447	1036.841	0	189.44
28	4153	198.9792	-2.049596	-34.344991	916.63496	0	179.83
29	4153	199.8283	-1.399596	-74.905021	686.32979	0	540
30	4153	199.97585	-1.280291	-82.350524	670.57176	0	540
31	4153	200.25	-1.0523071	-96.897629	640.55481	0	540
32	4153	200.75	-0.6277701	-124.03081	584.84265	0	540
33	4153	201.4975	0.04424595	-166.92357	277.47477	0	540



Name: EMBANKMENT FILL, EL. +8 TO -1.5/-3 Model: Saturated Only K-Sat: 3.28e-008 ft/sec K-Ratio: 1
Name: BEACH SAND, EL. -14/15 TO -48 Model: Saturated Only K-Sat: 0.00049 ft/sec K-Ratio: 1
Name: BAY SOUND CLAY, EL. -48 TO -70 Model: Saturated Only K-Sat: 3.28e-008 ft/sec K-Ratio: 1
Name: Sheet Pile Model: Saturated Only K-Sat: 1e-010 ft/sec K-Ratio: 1
Name: MARSH, EL. -1.5 TO -14/-15 Model: Saturated Only K-Sat: 3.28e-007 ft/sec K-Ratio: 1

GENERAL NOTES

CLASSIFICATION STRATIFICATION
SHEAR STRENGTHS AND UNIT WEIGHTS OF
THE SOIL WERE BASED ON THE RESULTS OF
UNDISTURBED BORINGS AND CPT DATA. SEE
BOTH BORING AND CPT DATA PLATES.

WHERE INDICATED, SHEAR STRENGTHS BETWEEN
VERTICALS WERE ASSUMED TO VARY LINEARLY
BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

Hw IS CANAL WATER LEVEL

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 15,
PROTECTED SIDE STABILITY ANALYSIS,
CASE: LWL Q Case (seepage)
STA. 20+50 TO 30+00 EAST
ORLEANS PARISH, LOUISIANA

LWL Q Case (seepage)

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File Information

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Revision Number: [364](#)
Last Edited By: [Jamerson, James MVK](#)
Date: [10/3/2013](#)
Time: [2:23:44 PM](#)
File Name: [Reach 15.gsz](#)
Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix E LWL\](#)
Last Solved Date: [10/3/2013](#)
Last Solved Time: [2:24:16 PM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Mass(M) Units: [lbs](#)
Mass Flux Units: [lbs/sec](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

LWL Q Case (seepage)

Kind: [SEEP/W](#)
Method: [Steady-State](#)
Settings
 Include Air Flow: [No](#)
Control
 Apply Runoff: [No](#)
Convergence
 Convergence Type: [Head Vector Norm](#)
 Maximum Number of Iterations: [500](#)
 Tolerance: [0.001](#)
 Maximum Change in K: [0.1](#)
 Rate of Change in K: [1.02](#)
 Minimum Change in K: [1e-005](#)
 Equation Solver: [Parallel Direct](#)
 Potential Seepage Max # of Reviews: [10](#)
Time

Starting Time: 0 sec

Duration: 0 sec

Ending Time: 0 sec

Materials

EMBANKMENT FILL, EL. +8 TO -1.5/-3

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-008 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

BEACH SAND, EL. -14/15 TO -48

Model: Saturated Only

Hydraulic

K-Sat: 0.00049 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

BAY SOUND CLAY, EL. -48 TO -70

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-008 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

Sheet Pile

Model: Saturated Only

Hydraulic

K-Sat: 1e-010 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

MARSH, EL. -1.5 TO -14/-15

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-007 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

Boundary Conditions

Drainage

Review: true
Type: Total Flux (Q) 0

Canal Water

Type: Head (H) -2.6

Curb

Type: Head (H) -4

Regions

	Points	Area (ft²)	Material
Region 1	3,11,12,13	4.05	
Region 2	2,3,22,41,43,44	158.39295	EMBANKMENT FILL, EL. +8 TO -1.5/-3
Region 3	3,13,9,4,24,14,40,41,22	245.1963	EMBANKMENT FILL, EL. +8 TO -1.5/-3
Region 4	14,24,25,10,32,1,40	399.975	MARSH, EL. -1.5 TO -14/-15
Region 5	19,33,15,26,16,7,36,30,34,20	6424.2	BEACH SAND, EL. -14/15 TO -48
Region 6	7,8,37,31,35,21,20,34,30,36	4180	BAY SOUND CLAY, EL. -48 TO -70
Region 7	32,10,25,26,15,33	501.2	MARSH, EL. -1.5 TO -14/-15
Region 8	24,4,17,5,27	71.43	EMBANKMENT FILL, EL. +8 TO -1.5/-3
Region 9	25,24,27,6	319.5	MARSH, EL. -1.5 TO -14/-15
Region 10	26,25,6,16	461.5	MARSH, EL. -1.5 TO -14/-15
Region 11	19,33,32,18	308.1	MARSH, EL. -1.5 TO -14/-15
Region 12	18,23,38,39,1,32	150.215	MARSH, EL. -1.5 TO -14/-15

Lines

	Start Point	End Point	Hydraulic Boundary	Left Side Material
Line 1	3	11	Canal Water	
Line 2	11	12		
Line 3	12	13	Drainage	
Line 4	13	3		Sheet Pile
Line 5	2	3	Canal Water	
Line 6	13	9	Drainage	
Line 7	7	8	Curb	
Line 8	16	7	Curb	
Line 9	4	9	Drainage	
Line 10	20	21		
Line 11	19	20		
Line 12	3	22	Canal Water	Sheet Pile

Line 13	25	10		
Line 14	15	26		
Line 15	26	16		
Line 16	24	4		
Line 17	4	17	Drainage	
Line 18	17	5	Drainage	
Line 19	5	27	Curb	
Line 20	27	24		
Line 21	25	24		
Line 22	24	14		
Line 23	25	26		
Line 24	27	6	Curb	
Line 25	6	25		
Line 26	6	16	Curb	
Line 27	22	14		
Line 28	10	32		
Line 29	32	18		
Line 30	19	33		
Line 31	33	15		
Line 32	30	34		
Line 33	34	20		
Line 34	31	35		
Line 35	35	21		
Line 36	7	36		
Line 37	36	30		
Line 38	8	37		
Line 39	37	31		
Line 40	14	40		
Line 41	22	41		
Line 42	1	40	Canal Water	
Line 43	40	41	Canal Water	
Line 44	33	32		
Line 45	18	19		
Line 46	32	1		
Line 47	18	23		
Line 48	23	38	Canal Water	
Line 49	38	39	Canal Water	
Line 50	39	1	Canal Water	
Line 51	41	43	Canal Water	
Line 52	43	44	Canal Water	
Line 53	44	2	Canal Water	

Points

	X (ft)	Y (ft)
Point 1	167.4	-2
Point 2	196.5	8
Point 3	200	8

Point 4	239	-1.8
Point 5	310	-2
Point 6	310	-7.5
Point 7	310	-48
Point 8	310	-70
Point 9	206.2	8
Point 10	200	-7.5
Point 11	200	13.4
Point 12	200.5	13.4
Point 13	201	8
Point 14	200	-1.5
Point 15	200	-15
Point 16	310	-14
Point 17	243.3	-2
Point 18	120	-7.5
Point 19	120	-14
Point 20	120	-48
Point 21	120	-70
Point 22	200	-1.3
Point 23	120	-5.9
Point 24	239	-3
Point 25	239	-7.5
Point 26	239	-14
Point 27	310	-3
Point 28	120	-130
Point 29	310	-130
Point 30	200	-48
Point 31	200	-70
Point 32	167.4	-7.5
Point 33	167.4	-14
Point 34	167.4	-48
Point 35	167.4	-70
Point 36	239	-48
Point 37	239	-70
Point 38	137.7	-6
Point 39	156.5	-2.2
Point 40	168.9	-1.5
Point 41	169.437	-1.3
Point 42	120	0
Point 43	173.22	0
Point 44	187.188	4.8

LWL Q Case (Entry/Exit)

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File Information

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Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Strength Units: [psf](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

LWL Q Case (Entry/Exit)

Kind: [SLOPE/W](#)
Parent: [LWL Q Case \(seepage\)](#)
Method: [Spencer](#)
Settings
 PWP Conditions Source: [Parent Analysis](#)
Slip Surface
 Direction of movement: [Right to Left](#)
 Use Passive Mode: [No](#)
 Slip Surface Option: [Entry and Exit](#)
 Critical slip surfaces saved: [1](#)
 Optimize Critical Slip Surface Location: [Yes](#)
 Tension Crack
 Tension Crack Option: [Tension Crack Line](#)
 Percentage Wet: [1](#)
 Tension Crack Fluid Unit Weight: [62.4 pcf](#)
FOS Distribution
 FOS Calculation Option: [Constant](#)

Advanced

Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 2000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

EMBANKMENT FILL, EL. +8 TO -1.5/-3

Model: Undrained (Phi=0)
Unit Weight: 111 pcf
Cohesion: 600 psf

MARSH 1, EL. -1.5 TO -7.5

Model: Spatial Mohr-Coulomb
Unit Weight: 93 pcf
Cohesion Fn: MARSH 1
Phi: 0 °
Phi-B: 0 °

BEACH SAND, EL. -14/15 TO -48

Model: Shear/Normal Fn.
Unit Weight: 122 pcf
Strength Function: Sand
Phi-B: 0 °

BAY SOUND CLAY, EL. -48 TO -70

Model: Spatial Mohr-Coulomb
Unit Weight: 105 pcf
Cohesion Spatial Fn: CLAY
Phi: 0 °
Phi-B: 0 °

Marsh 1, EL -3 to -7.5 (Protected)

Model: Spatial Mohr-Coulomb
Unit Weight: 93 pcf
Cohesion: 300 psf
Phi: 0 °
Phi-B: 0 °

MARSH 2, EL. -7.5 TO -15

Model: [Spatial Mohr-Coulomb](#)
Unit Weight: [93 pcf](#)
Cohesion Spatial Fn: [Marsh 2](#)
Phi: [0 °](#)
Phi-B: [0 °](#)

Marsh 2, EL -7.5 to -14 (Protected)

Model: [Spatial Mohr-Coulomb](#)
Unit Weight: [93 pcf](#)
Cohesion Fn: [Marsh 2 \(protected\)](#)
Phi: [0 °](#)
Phi-B: [0 °](#)

FILL, EL. -1.8 TO -3 (Protected)

Model: [Spatial Mohr-Coulomb](#)
Unit Weight: [111 pcf](#)
Cohesion: [550 psf](#)
Phi: [0 °](#)
Phi-B: [0 °](#)

Slip Surface Entry and Exit

Left Projection: [Range](#)
Left-Zone Left Coordinate: [\(120, -5.9\) ft](#)
Left-Zone Right Coordinate: [\(185, 4.04811\) ft](#)
Left-Zone Increment: [15](#)
Right Projection: [Range](#)
Right-Zone Left Coordinate: [\(197, 8\) ft](#)
Right-Zone Right Coordinate: [\(240, -1.84651\) ft](#)
Right-Zone Increment: [15](#)
Radius Increments: [8](#)

Slip Surface Limits

Left Coordinate: [\(120, -5.9\) ft](#)
Right Coordinate: [\(310, -2\) ft](#)

Reinforcements

Reinforcement 1

Type: [Pile](#)
Outside Point: [\(200, 13.4\) ft](#)
Inside Point: [\(200, 3.7\) ft](#)
Slip Surface Intersection: [\(200, -5.1512\) ft](#)
Total Length: [9.7 ft](#)
Reinforcement Direction: [90 °](#)
Applied Load Option: [Variable](#)

F of S Dependent: No
Pile Spacing: 1 ft
Shear Capacity: 0 lbs
Shear Safety Factor: 1
Shear Load Used: 0 lbs
Shear Option: Parallel to Slip
Resisting Force Used: 0 lbs/ft

Tension Crack Line

	X (ft)	Y (ft)
	196.5	3
	206.4	3
	239	-6.8

Cohesion Functions

MARSH 1

Model: Spline Data Point Function
Function: Cohesion vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 300
Data Points: X (ft), Cohesion (psf)
Data Point: (166.5, 300)
Data Point: (200, 400)
Data Point: (239, 300)

Marsh 2 (protected)

Model: Spline Data Point Function
Function: Cohesion vs. Y
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 140
Data Points: Y (ft), Cohesion (psf)
Data Point: (-14, 200)
Data Point: (-7.5, 140)

Shear/Normal Strength Functions

Sand

Model: Spline Data Point Function
Function: Shear Stress vs. Normal Stress
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 0

Data Points: [Normal Stress \(psf\)](#), [Shear Stress \(psf\)](#)

Data Point: [\(-10000, 0\)](#)

Data Point: [\(0, 0\)](#)

Data Point: [\(10000, 6494\)](#)

Estimation Properties

Intact Rock Param.: [10](#)

Geological Strength: [100](#)

Disturbance Factor: [0](#)

SigmaC: [600000 psf](#)

Sigma3: [300000 psf](#)

Num. Points: [20](#)

Spatial Functions

CLAY

Model: [Linear Interpolation](#)

Limit Range By: [Data Values](#)

Data Points: [X \(ft\)](#), [Y \(ft\)](#), [Cohesion \(psf\)](#)

Data Point: [\(120, -48, 630\)](#)

Data Point: [\(120, -70, 840\)](#)

Data Point: [\(167.4, -48, 630\)](#)

Data Point: [\(167.4, -70, 840\)](#)

Data Point: [\(200, -48, 730\)](#)

Data Point: [\(200, -70, 930\)](#)

Data Point: [\(239, -48, 630\)](#)

Data Point: [\(239, -70, 840\)](#)

Data Point: [\(310, -48, 630\)](#)

Data Point: [\(310, -70, 840\)](#)

Marsh 2

Model: [Linear Interpolation](#)

Limit Range By: [Data Values](#)

Data Points: [X \(ft\)](#), [Y \(ft\)](#), [Cohesion \(psf\)](#)

Data Point: [\(167.4, -7.5, 140\)](#)

Data Point: [\(167.4, -14, 200\)](#)

Data Point: [\(200, -7.5, 300\)](#)

Data Point: [\(200, -15, 300\)](#)

Data Point: [\(239, -7.5, 140\)](#)

Data Point: [\(239, -14, 200\)](#)

Regions

	Points	Area (ft ²)	Material
Region 1	3,11,12,13	4.05	
Region 2	2,3,22,41,43,44	158.39295	EMBANKMENT FILL, EL. +8 TO -1.5/-3
Region 3	3,13,9,4,24,14,40,41,22	245.1963	EMBANKMENT FILL, EL. +8 TO -1.5/-3
Region 4	14,24,25,10,32,1,40	399.975	MARSH 1, EL. -1.5 TO -7.5

Region 5	19,33,15,26,16,7,36,30,34,20	6424.2	BEACH SAND, EL. -14/15 TO -48
Region 6	7,8,37,31,35,21,20,34,30,36	4180	BAY SOUND CLAY, EL. -48 TO -70
Region 7	32,10,25,26,15,33	501.2	MARSH 2, EL. -7.5 TO -15
Region 8	24,4,17,5,27	71.43	FILL, EL. -1.8 TO -3 (Protected)
Region 9	25,24,27,6	319.5	Marsh 1, EL -3 to -7.5 (Protected)
Region 10	26,25,6,16	461.5	Marsh 2, EL -7.5 to -14 (Protected)
Region 11	19,33,32,18	308.1	Marsh 2, EL -7.5 to -14 (Protected)
Region 12	18,23,38,39,1,32	150.215	Marsh 1, EL -3 to -7.5 (Protected)

Points

	X (ft)	Y (ft)
Point 1	167.4	-2
Point 2	196.5	8
Point 3	200	8
Point 4	239	-1.8
Point 5	310	-2
Point 6	310	-7.5
Point 7	310	-48
Point 8	310	-70
Point 9	206.2	8
Point 10	200	-7.5
Point 11	200	13.4
Point 12	200.5	13.4
Point 13	201	8
Point 14	200	-1.5
Point 15	200	-15
Point 16	310	-14
Point 17	243.3	-2
Point 18	120	-7.5
Point 19	120	-14
Point 20	120	-48
Point 21	120	-70
Point 22	200	-1.3
Point 23	120	-5.9
Point 24	239	-3
Point 25	239	-7.5
Point 26	239	-14
Point 27	310	-3
Point 28	120	-130
Point 29	310	-130
Point 30	200	-48
Point 31	200	-70
Point 32	167.4	-7.5
Point 33	167.4	-14
Point 34	167.4	-48
Point 35	167.4	-70
Point 36	239	-48

Point 37	239	-70
Point 38	137.7	-6
Point 39	156.5	-2.2
Point 40	168.9	-1.5
Point 41	169.437	-1.3
Point 42	120	0
Point 43	173.22	0
Point 44	187.188	4.8

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.41	(173.851, 32.495)	27.42051	(208.123, 7.42541)	(145.924, -4.33764)
2	914	1.48	(173.851, 32.495)	45.874	(208.458, 7.32532)	(146.381, -4.24528)

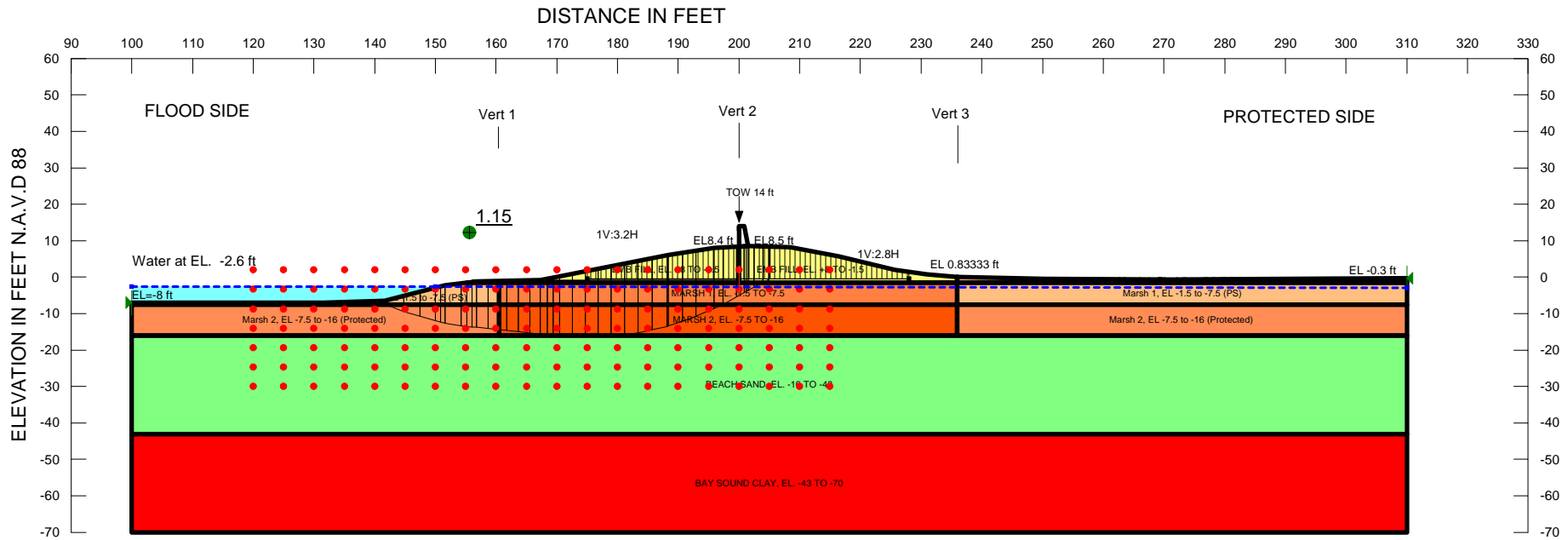
Slices of Slip Surface: Optimized

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	146.8369	-4.978038	141.2684	361.14034	0	300
2	Optimized	148.66215	-6.258826	207.85291	498.69988	0	300
3	Optimized	149.99585	-7.18434	256.60616	591.50395	0	300
4	Optimized	151.74135	-7.9210725	295.0907	535.29093	0	143.89
5	Optimized	154.34545	-8.8090275	341.7595	638.67493	0	152.08
6	Optimized	156.06255	-9.3715385	371.70822	715.78488	0	157.28
7	Optimized	157.68385	-9.8391585	396.75599	771.92313	0	161.59
8	Optimized	160.05155	-10.52206	433.56255	842.6956	0	167.9
9	Optimized	162.25055	-11.17489	468.89848	913.8948	0	173.92
10	Optimized	164.28085	-11.797655	502.81166	978.40613	0	179.67
11	Optimized	166.31115	-12.42042	536.99795	1042.9175	0	185.42
12	Optimized	167.36315	-12.7425	554.82806	1072.6146	0	188.39
13	Optimized	168.15	-12.971025	567.57304	1119.4097	0	192.85
14	Optimized	169.1685	-13.266835	584.21961	1184.2478	0	198.61
15	Optimized	170.0857	-13.533225	599.34331	1247.6573	0	203.65
16	Optimized	171.9772	-13.824095	616.03009	1297.6968	0	211.58
17	Optimized	174.4367	-14.026875	627.92574	1412.0957	0	220.26
18	Optimized	176.92885	-14.232345	640.15859	1527.9806	0	228.85
19	Optimized	179.3388	-14.28419	643.36965	1588.173	0	236.17
20	Optimized	181.56865	-14.17941	637.26854	1663.3457	0	242.21
21	Optimized	183.75935	-14.07647	631.11289	1737.1678	0	248.37
22	Optimized	186.02135	-13.644005	605.06606	1696.0346	0	253.75
23	Optimized	188.43215	-12.85671	557.40772	1713.3669	0	259.19
24	Optimized	190.75135	-11.853885	496.47813	1637.2635	0	264.88
25	Optimized	192.90145	-10.66083	423.88528	1607.5757	0	270.83
26	Optimized	195.23825	-9.0959625	328.60901	1486.9298	0	278.53
27	Optimized	196.9207	-7.8047425	249.97454	1415.9944	0	285.12
28	Optimized	198.6707	-6.3165115	159.38096	1195.3148	0	396.03
29	Optimized	200.1856	-4.9884615	78.438674	1077.9721	0	399.52
30	Optimized	200.4356	-4.765031	64.699201	1036.4298	0	398.88

31	Optimized	200.75	-4.4685885	46.478504	1011.3949	0	398.08
32	Optimized	202.37285	-2.9384705	-48.840505	882.28778	0	393.92
33	Optimized	204.4743	-0.957093	-175.73861	581.73441	0	600
34	Optimized	205.70145	0.20705865	-249.38577	455.19787	0	600
35	Optimized	207.0193	1.4684286	-329.04593	299.63486	0	600
36	Optimized	207.98085	2.3673135	-385.76859	43.129475	0	600

Slices of Slip Surface: 914

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	914	147.63155	-5.116869	147.5198	370.80888	0	300
2	914	150.1321	-6.7442305	232.51532	522.84204	0	300
3	914	152.6618	-8.1667195	307.70798	590.2132	0	146.15
4	914	155.2206	-9.402359	373.7703	727.11483	0	157.56
5	914	157.59	-10.384645	426.80733	839.84667	0	166.63
6	914	159.77	-11.149685	468.294	908.21184	0	173.69
7	914	161.95	-11.79426	503.33645	964.27782	0	179.64
8	914	164.13	-12.32359	532.16646	1008.7	0	184.53
9	914	166.31	-12.741735	555.00103	1042.1314	0	188.39
10	914	168.15	-13.0174	570.19006	1085.3172	0	193.26
11	914	169.1685	-13.138905	576.95147	1126.8939	0	197.5
12	914	170.38275	-13.23819	582.51926	1178.1122	0	202.09
13	914	172.27425	-13.34246	588.28533	1251.1763	0	208.76
14	914	174.2177	-13.367035	589.5288	1317.67	0	214.96
15	914	176.21315	-13.30762	585.81267	1377.2228	0	220.81
16	914	178.2086	-13.160955	576.85352	1427.9407	0	226.28
17	914	180.204	-12.9262	562.5729	1469.7372	0	231.52
18	914	182.1994	-12.60197	542.83953	1502.5163	0	236.67
19	914	184.19485	-12.18632	517.47927	1526.0732	0	241.86
20	914	186.1903	-11.676655	486.38442	1540.1449	0	247.22
21	914	188.32955	-11.018125	446.14489	1543.9481	0	253.3
22	914	190.61265	-10.190043	395.59021	1535.215	0	260.37
23	914	192.89575	-9.220635	336.44079	1512.0093	0	268.22
24	914	195.17885	-8.0997425	268.11368	1473.0801	0	277.06
25	914	196.4102	-7.4492915	228.47556	1413.3774	0	389.28
26	914	197.375	-6.875781	193.57149	1353.053	0	392.16
27	914	199.125	-5.77513	126.45589	1231.5621	0	397.39
28	914	200.25	-5.0213675	80.357894	1149.5355	0	399.36
29	914	200.75	-4.6644875	58.287679	1112.0961	0	398.08
30	914	201.86585	-3.815491	5.6030234	1023.6319	0	395.22
31	914	203.59755	-2.4095655	-84.262971	878.14217	0	390.78
32	914	205.3317	-0.85199231	-183.47007	587.78256	0	600
33	914	207.32905	1.1744957	-311.17275	269.24839	0	600



Name: EMB FILL, EL. +8 TO -1.5 Model: Undrained (Phi=0) Unit Weight: 105 pcf Cohesion: 500 psf Piezometric Line: 1
Name: MARSH 1, EL. -1.5 TO -7.5 Model: Undrained (Phi=0) Unit Weight: 105 pcf Cohesion: 400 psf Piezometric Line: 1
Name: BEACH SAND, EL. -16 TO -43 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand Piezometric Line: 1
Name: BAY SOUND CLAY, EL. -43 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 105 pcf Cohesion Spatial Fn: Bay Sound Phi: 0 ° Piezometric Line: 1
Name: Marsh 1, EL. -1.5 to -7.5 (PS) Model: Spatial Mohr-Coulomb Unit Weight: 105 pcf Cohesion: 400 psf Phi: 0 ° Piezometric Line: 1
Name: MARSH 2, EL. -7.5 TO -16 Model: Spatial Mohr-Coulomb Unit Weight: 93 pcf Cohesion Spatial Fn: Marsh 2 (-7.5 to-16) Phi: 0 ° Piezometric Line: 1
Name: Marsh 2, EL. -7.5 to -16 (Protected) Model: Spatial Mohr-Coulomb Unit Weight: 93 pcf Cohesion Fn: Marsh 2 (protected side) Phi: 0 ° Piezometric Line: 1

REACH 16 CROSS-SECTION AT STA 30+00

GENERAL NOTES

CLASSIFICATION STRATIFICATION
SHEAR STRENGTHS AND UNIT WEIGHTS OF
THE SOIL WERE BASED ON THE RESULTS OF
UNDISTURBED BORINGS AND CPT DATA. SEE
BOTH BORING AND CPT DATA PLATES.

WHERE INDICATED, SHEAR STRENGTHS BETWEEN
VERTICALS WERE ASSUMED TO VARY LINEARLY
BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL
REMEDICATION OF CANAL WALLS AND LEVEES
FLOOD SIDE STABILITY ANALYSIS
CASE: LWL Q Case (Block)
REACH 16, STA. 30+00 TO 36+40 EAST
ORLEANS PARISH, LOUISIANA

LWL Q Case (Block)

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File Information

Created By: [Liljegren, James](#)
Revision Number: [477](#)
Last Edited By: [Jamerson, James MVK](#)
Date: [10/3/2013](#)
Time: [2:42:10 PM](#)
File Name: [Reach 16.gsz](#)
Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix E LWL\](#)
Last Solved Date: [10/3/2013](#)
Last Solved Time: [2:44:56 PM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Strength Units: [psf](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

LWL Q Case (Block)

Kind: [SLOPE/W](#)
Method: [Spencer](#)
Settings
 Apply Phreatic Correction: [No](#)
 PWP Conditions Source: [Piezometric Line](#)
 Use Staged Rapid Drawdown: [No](#)
Slip Surface
 Direction of movement: [Right to Left](#)
 Use Passive Mode: [No](#)
 Slip Surface Option: [Block](#)
 Critical slip surfaces saved: [1](#)
 Optimize Critical Slip Surface Location: [Yes](#)
Tension Crack
 Tension Crack Option: [Tension Crack Line](#)
 Percentage Wet: [1](#)
 Tension Crack Fluid Unit Weight: [62.4 pcf](#)
FOS Distribution

FOS Calculation Option: [Constant](#)

Restrict Block Crossing: [Yes](#)

Advanced

Number of Slices: [30](#)

Optimization Tolerance: [0.01](#)

Minimum Slip Surface Depth: [0.1 ft](#)

Optimization Maximum Iterations: [7000](#)

Optimization Convergence Tolerance: [1e-007](#)

Starting Optimization Points: [8](#)

Ending Optimization Points: [16](#)

Complete Passes per Insertion: [1](#)

Driving Side Maximum Convex Angle: [5 °](#)

Resisting Side Maximum Convex Angle: [1 °](#)

Materials

EMB FILL, EL. +8 TO -1.5

Model: [Undrained \(Phi=0\)](#)

Unit Weight: [105 pcf](#)

Cohesion: [500 psf](#)

Pore Water Pressure

Piezometric Line: [1](#)

MARSH 1, EL. -1.5 TO -7.5

Model: [Undrained \(Phi=0\)](#)

Unit Weight: [105 pcf](#)

Cohesion: [400 psf](#)

Pore Water Pressure

Piezometric Line: [1](#)

BEACH SAND, EL. -16 TO -43

Model: [Shear/Normal Fn.](#)

Unit Weight: [122 pcf](#)

Strength Function: [Sand](#)

Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: [1](#)

BAY SOUND CLAY, EL. -43 TO -70

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [105 pcf](#)

Cohesion Spatial Fn: [Bay Sound](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: [1](#)

Marsh 1, EL -1.5 to -7.5 (PS)

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [105 pcf](#)

Cohesion: [400 psf](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: [1](#)

MARSH 2, EL. -7.5 TO -16

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [93 pcf](#)

Cohesion Spatial Fn: [Marsh 2 \(-7.5 to-16\)](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: [1](#)

Marsh 2, EL -7.5 to -16 (Protected)

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [93 pcf](#)

Cohesion Fn: [Marsh 2 \(protected side\)](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: [1](#)

Slip Surface Limits

Left Coordinate: [\(100, -6.9\) ft](#)

Right Coordinate: [\(310, -0.3\) ft](#)

Slip Surface Block

Left Grid

Upper Left: [\(120, 2\) ft](#)

Lower Left: [\(120, -30\) ft](#)

Lower Right: [\(170, -30\) ft](#)

X Increments: [10](#)

Y Increments: [6](#)

Starting Angle: [135 °](#)

Ending Angle: [180 °](#)

Angle Increments: [4](#)

Right Grid

Upper Left: [\(175, 2\) ft](#)

Lower Left: [\(175, -30\) ft](#)

Lower Right: [\(215, -30\) ft](#)

X Increments: [8](#)

Y Increments: 6
Starting Angle: 25 °
Ending Angle: 65 °
Angle Increments: 4

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
	100	-2.6
	150	-2.6
	310	-3

Reinforcements

Reinforcement 1

Type: Pile
Outside Point: (200, 13.4) ft
Inside Point: (200, 3.7) ft
Slip Surface Intersection: (200, -4.9868) ft
Total Length: 9.7 ft
Reinforcement Direction: 90 °
Applied Load Option: Variable
F of S Dependent: No
Pile Spacing: 1 ft
Shear Capacity: 0 lbs
Shear Safety Factor: 1
Shear Load Used: 0 lbs
Shear Option: Parallel to Slip
Resisting Force Used: 0 lbs/ft

Tension Crack Line

	X (ft)	Y (ft)
	175	-0.5
	228	-0.5

Cohesion Functions

Marsh 2 (protected side)

Model: Spline Data Point Function
Function: Cohesion vs. Y

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 140

Data Points: Y (ft), Cohesion (psf)

Data Point: (-16, 200)

Data Point: (-7.5, 140)

Shear/Normal Strength Functions

Sand

Model: Spline Data Point Function

Function: Shear Stress vs. Normal Stress

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 0

Data Points: Normal Stress (psf), Shear Stress (psf)

Data Point: (-10000, 0)

Data Point: (0, 0)

Data Point: (10000, 6494)

Estimation Properties

Intact Rock Param.: 10

Geological Strength: 100

Disturbance Factor: 0

SigmaC: 600000 psf

Sigma3: 300000 psf

Num. Points: 20

Spatial Functions

Marsh 2 (-7.5 to-16)

Model: Linear Interpolation

Limit Range By: Data Values

Data Points: X (ft), Y (ft), Cohesion (psf)

Data Point: (160.5, -7.5, 140)

Data Point: (160.5, -16, 200)

Data Point: (200, -7.5, 250)

Data Point: (200, -16, 250)

Data Point: (236, -7.5, 140)

Data Point: (236, -16, 200)

Bay Sound

Model: Linear Interpolation

Limit Range By: Data Values

Data Points: X (ft), Y (ft), Cohesion (psf)

Data Point: (160.5, -43, 550)

Data Point: (160.5, -70, 800)

Data Point: (200, -43, 580)
 Data Point: (200, -70, 800)
 Data Point: (236, -43, 550)
 Data Point: (236, -70, 800)
 Data Point: (112.5, -43, 550)
 Data Point: (112.5, -70, 800)
 Data Point: (310, -43, 550)
 Data Point: (310, -70, 800)

Regions

	Points	Area (ft²)	Material
Region 1	4,12,13,14	6.675	
Region 2	24,28,36,1,2,35,43,3,44,4,15	188.38	EMB FILL, EL. +8 TO -1.5
Region 3	4,14,10,46,47,45,51,5,16,23,29,40,28,24,15	236.42857	EMB FILL, EL. +8 TO -1.5
Region 4	23,16,5,25,11,19,33,29	453	MARSH 1, EL. -1.5 TO -7.5
Region 5	20,34,17,26,18,8,31,21	5670	BEACH SAND, EL. -16 TO -43
Region 6	8,9,32,22,21,31	5670	BAY SOUND CLAY, EL. -43 TO -70
Region 7	19,11,25,26,17,34,33	641.75	MARSH 2, EL. -7.5 TO -16
Region 8	25,5,6,7	444	Marsh 1, EL -1.5 to -7.5 (PS)
Region 9	26,25,7,18	629	Marsh 2, EL -7.5 to -16 (Protected)
Region 10	29,33,30,41,39,38,37,40	109.92	Marsh 1, EL -1.5 to -7.5 (PS)
Region 11	27,30,33,34,20	514.25	Marsh 2, EL -7.5 to -16 (Protected)
Region 12	51,48,49,50,6,5	79.173544	Marsh 1, EL -1.5 to -7.5 (PS)

Points

	X (ft)	Y (ft)
Point 1	161.8	-1
Point 2	167.3	-0.8
Point 3	195.9	8
Point 4	200	8.4
Point 5	236	-1.5
Point 6	310	-1.5
Point 7	310	-7.5
Point 8	310	-43
Point 9	310	-70
Point 10	208.5	8.2
Point 11	200	-7.5
Point 12	200	14
Point 13	200.9	14
Point 14	201.5	8.5
Point 15	200	-1.3
Point 16	200	-1.5
Point 17	200	-16
Point 18	310	-16
Point 19	165.6	-7.5
Point 20	100	-16

Point 21	100	-43
Point 22	100	-70
Point 23	165.6	-1.5
Point 24	165.6	-1.3
Point 25	236	-7.5
Point 26	236	-16
Point 27	100	-8
Point 28	156	-1.3
Point 29	160.5	-1.5
Point 30	100	-7.5
Point 31	200	-43
Point 32	200	-70
Point 33	160.5	-7.5
Point 34	160.5	-16
Point 35	169.4	-0.1
Point 36	156.8	-1.2
Point 37	151.6	-2.3
Point 38	141.6	-6.5
Point 39	131.6	-6.9
Point 40	155.2	-1.5
Point 41	100	-6.9
Point 42	178.9	3.1
Point 43	188.4	6.1
Point 44	199.6	8.4
Point 45	231	0.83333
Point 46	216.5	5.8
Point 47	225.7	2.1
Point 48	250.4	-0.5
Point 49	271	-0.6
Point 50	310	-0.3
Point 51	236	0.09077

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.15	(171.179, 1.027)	27.62168	(205.069, 8.34703)	(140.302, -6.55191)
2	8832	1.24	(171.179, 1.027)	27.178	(204.28, 8.38086)	(138.935, -6.6066)

Slices of Slip Surface: **Optimized**

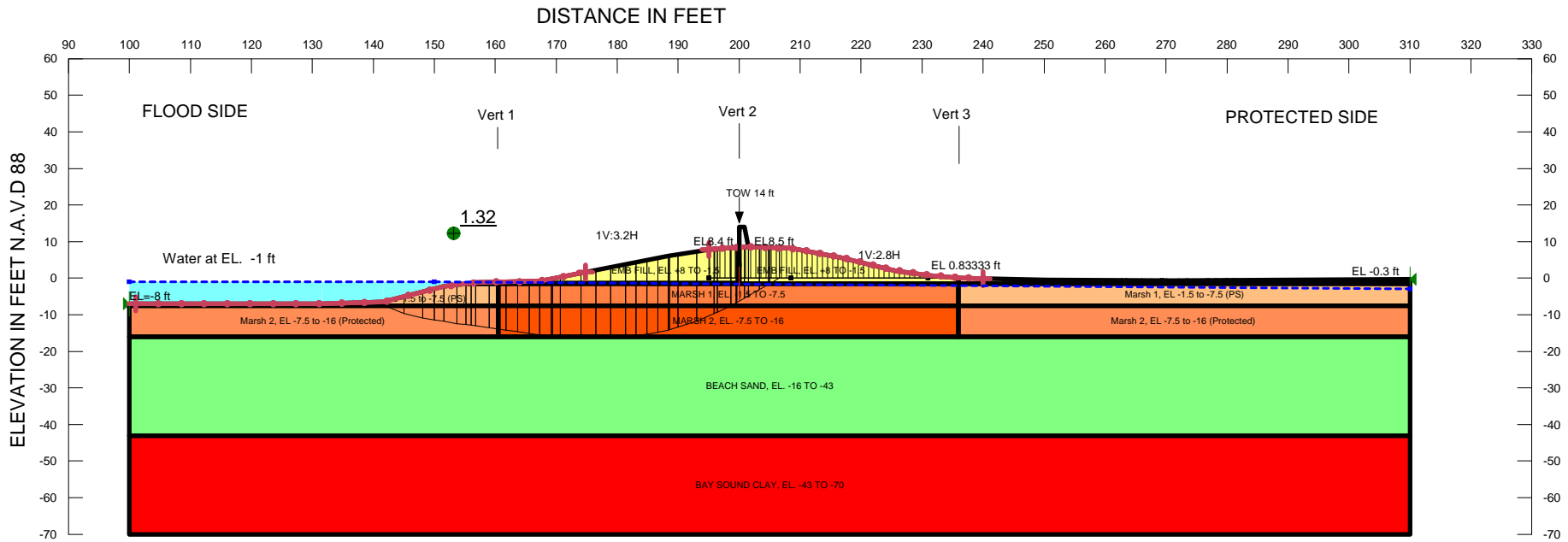
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	140.95115	-6.9764805	273.09131	602.48904	0	400
2	Optimized	143.1975	-8.4464175	364.8229	615.01337	0	146.68
3	Optimized	146.09625	-10.102475	468.16453	797.1563	0	158.37
4	Optimized	148.69875	-11.323865	544.37736	967.2177	0	166.99
5	Optimized	150.4231	-12.133125	594.79928	1079.8777	0	172.7
6	Optimized	151.2231	-12.44262	613.99411	1085.2909	0	174.89
7	Optimized	152.9288	-12.944625	645.05696	1184.0242	0	178.43

8	Optimized	154.7288	-13.418575	674.34039	1238.3007	0	181.78
9	Optimized	155.6	-13.571805	683.76685	1275.0533	0	182.86
10	Optimized	156.4	-13.712515	692.4215	1304.5997	0	183.85
11	Optimized	157.725	-13.945565	706.77285	1336.4587	0	185.5
12	Optimized	159.575	-14.27095	726.78992	1375.8007	0	187.79
13	Optimized	161.15	-14.547965	743.81324	1409.5935	0	190.74
14	Optimized	162.75	-14.82938	761.10649	1443.8371	0	195.06
15	Optimized	164.65	-15.16356	781.68534	1484.1654	0	199.97
16	Optimized	166.45	-15.48015	801.17259	1522.338	0	204.41
17	Optimized	167.89265	-15.73389	816.76505	1571.6608	0	207.83
18	Optimized	168.94265	-15.875065	825.40736	1588.5918	0	209.99
19	Optimized	169.92345	-15.954275	830.19378	1630.5678	0	211.68
20	Optimized	171.50185	-15.996895	832.60936	1659.6734	0	213.91
21	Optimized	173.6117	-15.99758	832.32498	1732.2844	0	216.59
22	Optimized	175.72155	-15.998265	832.0406	1804.8954	0	219.26
23	Optimized	177.83145	-15.99895	831.75622	1877.5064	0	221.93
24	Optimized	180.0071	-15.8005	819.01679	1863.0392	0	223.98
25	Optimized	182.2485	-15.40292	793.88927	1902.0044	0	225.64
26	Optimized	184.5576	-14.76364	753.6268	1845.6223	0	227.04
27	Optimized	186.9344	-13.88266	698.27746	1844.7938	0	228.52
28	Optimized	188.2614	-13.36496	665.76415	1771.6316	0	229.61
29	Optimized	189.5339	-12.656165	621.33312	1742.0749	0	230.5
30	Optimized	191.8017	-11.392995	542.16891	1687.2956	0	232.87
31	Optimized	194.4178	-9.665509	433.96769	1535.8805	0	236.61
32	Optimized	196.6579	-8.009219	330.25441	1435.2453	0	241
33	Optimized	198.5079	-6.408383	230.07671	1131.1243	0	400
34	Optimized	199.8	-5.177392	153.06043	1025.2417	0	400
35	Optimized	200.45	-4.5581235	114.31394	969.21488	0	400
36	Optimized	201.0543	-3.9823895	78.297142	918.24478	0	400
37	Optimized	201.3543	-3.7088065	61.177101	928.30434	0	400
38	Optimized	201.9898	-3.156716	26.62905	874.27744	0	400
39	Optimized	203.1882	-2.1155995	-38.523698	769.45122	0	400
40	Optimized	204.41765	-1.047525	-105.3663	601.45537	0	500
41	Optimized	205.00395	-0.547525	-136.65426	-1265.347	0	500

Slices of Slip Surface: 8832

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	8832	139.60355	-7.0533	277.8847	599.20638	0	400
2	8832	140.93605	-7.9436495	333.44249	520.95145	0	143.13
3	8832	142.65	-9.088887	404.92563	673.92579	0	151.22
4	8832	144.75	-10.492062	492.46748	860.09576	0	161.12
5	8832	146.85	-11.895235	580.00934	1046.3053	0	171.03
6	8832	148.95	-13.29841	667.59079	1232.4753	0	180.93
7	8832	150.44025	-14	711.28781	1129.0744	0	185.88
8	8832	151.24025	-14	711.16203	1152.1742	0	185.88
9	8832	152.5	-14	710.94444	1189.0556	0	185.88
10	8832	154.3	-14	710.66667	1231.0556	0	185.88

11	8832	155.6	-14	710.4875	1262.5	0	185.88
12	8832	156.4	-14	710.3625	1278.25	0	185.88
13	8832	157.725	-14	710.16216	1287.4054	0	185.88
14	8832	159.575	-14	709.89189	1295.1892	0	185.88
15	8832	161.15	-14	709.62308	1301.9231	0	186.94
16	8832	162.75	-14	709.36842	1308.5263	0	189.53
17	8832	164.65	-14	709.05263	1316.0526	0	192.62
18	8832	166.45	-14	708.76471	1323.2353	0	195.54
19	8832	168.35	-14	708.47619	1363.4762	0	198.62
20	8832	170.5143	-14	708.1668	1438.7695	0	202.14
21	8832	172.74285	-14	707.80783	1515.4554	0	205.76
22	8832	174.9714	-14	707.44885	1592.1413	0	209.37
23	8832	177.2	-14	707.13475	1668.8721	0	212.99
24	8832	179.4286	-14	706.77578	1745.558	0	216.61
25	8832	181.65715	-14	706.4168	1822.2439	0	220.23
26	8832	183.8857	-14	706.05783	1898.9747	0	223.84
27	8832	185.85	-13.404825	668.62075	1648.7602	0	225.53
28	8832	187.55	-12.21447	594.07792	1600.1411	0	225.82
29	8832	189.3805	-10.932745	513.80077	1540.5251	0	226.94
30	8832	191.3415	-9.559649	427.83313	1469.7626	0	229.07
31	8832	193.3025	-8.186549	341.8446	1398.6242	0	232.17
32	8832	195.0915	-6.933869	263.39905	1255.8009	0	400
33	8832	196.825	-5.720046	187.38656	1167.5795	0	400
34	8832	198.675	-4.424662	106.26394	1061.3111	0	400
35	8832	199.8	-3.6369285	56.935167	994.55305	0	400
36	8832	200.45	-3.1817935	28.433681	953.31106	0	400
37	8832	200.9992	-2.797223	4.3507174	919.51214	0	400
38	8832	201.2992	-2.587161	-8.8038534	901.07053	0	400
39	8832	202.17595	-1.973288	-47.246447	839.96645	0	400
40	8832	203.56595	-1	-108.19371	509.97822	0	500



Name: EMB FILL, EL. +8 TO -1.5 Model: Undrained (Phi=0) Unit Weight: 105 pcf Cohesion: 500 psf Piezometric Line: 1
Name: MARSH 1, EL. -1.5 TO -7.5 Model: Undrained (Phi=0) Unit Weight: 105 pcf Cohesion: 400 psf Piezometric Line: 1
Name: BEACH SAND, EL. -16 TO -43 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand Piezometric Line: 1
Name: BAY SOUND CLAY, EL. -43 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 105 pcf Cohesion Spatial Fn: Bay Sound Phi: 0 ° Piezometric Line: 1
Name: Marsh 1, EL -1.5 to -7.5 (PS) Model: Spatial Mohr-Coulomb Unit Weight: 105 pcf Cohesion: 400 psf Phi: 0 ° Piezometric Line: 1
Name: MARSH 2, EL. -7.5 TO -16 Model: Spatial Mohr-Coulomb Unit Weight: 93 pcf Cohesion Spatial Fn: Marsh 2 (-7.5 to -16) Phi: 0 ° Piezometric Line: 1
Name: Marsh 2, EL -7.5 to -16 (Protected) Model: Spatial Mohr-Coulomb Unit Weight: 93 pcf Cohesion Fn: Marsh 2 (protected side) Phi: 0 ° Piezometric Line: 1

REACH 16 CROSS-SECTION AT STA 30+00

GENERAL NOTES

CLASSIFICATION STRATIFICATION
SHEAR STRENGTHS AND UNIT WEIGHTS OF
THE SOIL WERE BASED ON THE RESULTS OF
UNDISTURBED BORINGS AND CPT DATA. SEE
BOTH BORING AND CPT DATA PLATES.

WHERE INDICATED, SHEAR STRENGTHS BETWEEN
VERTICALS WERE ASSUMED TO VARY LINEARLY
BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL
REMEDICATION OF CANAL WALLS AND LEVEES
FLOOD SIDE STABILITY ANALYSIS
CASE: LWL Q Case (Entry/Exit)
REACH 16, STA. 30+00 TO 36+40 EAST
ORLEANS PARISH, LOUISIANA

LWL Q Case (Entry/Exit)

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File Information

Created By: [Liljegren, James](#)
Revision Number: [473](#)
Last Edited By: [Jamerson, James MVK](#)
Date: [6/13/2013](#)
Time: [6:09:31 PM](#)
File Name: [Reach 16.gsz](#)
Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix E LWL\WL -1\](#)
Last Solved Date: [6/13/2013](#)
Last Solved Time: [6:10:32 PM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Strength Units: [psf](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

LWL Q Case (Entry/Exit)

Kind: [SLOPE/W](#)
Method: [Spencer](#)
Settings
 Apply Phreatic Correction: [No](#)
 PWP Conditions Source: [Piezometric Line](#)
 Use Staged Rapid Drawdown: [No](#)
Slip Surface
 Direction of movement: [Right to Left](#)
 Use Passive Mode: [No](#)
 Slip Surface Option: [Entry and Exit](#)
 Critical slip surfaces saved: [1](#)
 Optimize Critical Slip Surface Location: [Yes](#)
Tension Crack
 Tension Crack Option: [Tension Crack Line](#)
 Percentage Wet: [0.5](#)
 Tension Crack Fluid Unit Weight: [62.4 pcf](#)
FOS Distribution

FOS Calculation Option: [Constant](#)

Advanced

Number of Slices: [30](#)

Optimization Tolerance: [0.01](#)

Minimum Slip Surface Depth: [0.1 ft](#)

Optimization Maximum Iterations: [2000](#)

Optimization Convergence Tolerance: [1e-007](#)

Starting Optimization Points: [8](#)

Ending Optimization Points: [16](#)

Complete Passes per Insertion: [1](#)

Driving Side Maximum Convex Angle: [5 °](#)

Resisting Side Maximum Convex Angle: [1 °](#)

Materials

EMB FILL, EL. +8 TO -1.5

Model: [Undrained \(Phi=0\)](#)

Unit Weight: [105 pcf](#)

Cohesion: [500 psf](#)

Pore Water Pressure

Piezometric Line: [1](#)

MARSH 1, EL. -1.5 TO -7.5

Model: [Undrained \(Phi=0\)](#)

Unit Weight: [105 pcf](#)

Cohesion: [400 psf](#)

Pore Water Pressure

Piezometric Line: [1](#)

BEACH SAND, EL. -16 TO -43

Model: [Shear/Normal Fn.](#)

Unit Weight: [122 pcf](#)

Strength Function: [Sand](#)

Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: [1](#)

BAY SOUND CLAY, EL. -43 TO -70

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [105 pcf](#)

Cohesion Spatial Fn: [Bay Sound](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: [1](#)

Marsh 1, EL -1.5 to -7.5 (PS)

Model: [Spatial Mohr-Coulomb](#)
Unit Weight: [105 pcf](#)
Cohesion: [400 psf](#)
Phi: [0 °](#)
Phi-B: [0 °](#)
Pore Water Pressure
Piezometric Line: [1](#)

MARSH 2, EL. -7.5 TO -16

Model: [Spatial Mohr-Coulomb](#)
Unit Weight: [93 pcf](#)
Cohesion Spatial Fn: [Marsh 2 \(-7.5 to-16\)](#)
Phi: [0 °](#)
Phi-B: [0 °](#)
Pore Water Pressure
Piezometric Line: [1](#)

Marsh 2, EL -7.5 to -16 (Protected)

Model: [Spatial Mohr-Coulomb](#)
Unit Weight: [93 pcf](#)
Cohesion Fn: [Marsh 2 \(protected side\)](#)
Phi: [0 °](#)
Phi-B: [0 °](#)
Pore Water Pressure
Piezometric Line: [1](#)

Slip Surface Entry and Exit

Left Projection: [Range](#)
Left-Zone Left Coordinate: [\(101, -6.9\) ft](#)
Left-Zone Right Coordinate: [\(174.81398, 1.66667\) ft](#)
Left-Zone Increment: [20](#)
Right Projection: [Range](#)
Right-Zone Left Coordinate: [\(195, 7.772\) ft](#)
Right-Zone Right Coordinate: [\(240, -0.07333\) ft](#)
Right-Zone Increment: [20](#)
Radius Increments: [25](#)

Slip Surface Limits

Left Coordinate: [\(100, -6.9\) ft](#)
Right Coordinate: [\(310, -0.3\) ft](#)

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
	100	-1
	150	-1
	310	-3

Reinforcements

Reinforcement 1

Type: [Pile](#)

Outside Point: [\(200, 13.4\) ft](#)

Inside Point: [\(200, 3.7\) ft](#)

Slip Surface Intersection: [\(200, -6.2945\) ft](#)

Total Length: [9.7 ft](#)

Reinforcement Direction: [90 °](#)

Applied Load Option: [Variable](#)

F of S Dependent: [No](#)

Pile Spacing: [1 ft](#)

Shear Capacity: [0 lbs](#)

Shear Safety Factor: [1](#)

Shear Load Used: [0 lbs](#)

Shear Option: [Parallel to Slip](#)

Resisting Force Used: [0 lbs/ft](#)

Tension Crack Line

	X (ft)	Y (ft)
	195	0
	208.5	0
	231	0
	240	0

Cohesion Functions

Marsh 2 (protected side)

Model: [Spline Data Point Function](#)

Function: [Cohesion vs. Y](#)

Curve Fit to Data: [100 %](#)

Segment Curvature: [0 %](#)

Y-Intercept: [140](#)

Data Points: [Y \(ft\), Cohesion \(psf\)](#)

Data Point: [\(-16, 200\)](#)

Data Point: [\(-7.5, 140\)](#)

Shear/Normal Strength Functions

Sand

Model: [Spline Data Point Function](#)

Function: [Shear Stress vs. Normal Stress](#)

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 0

Data Points: [Normal Stress \(psf\)](#), [Shear Stress \(psf\)](#)

Data Point: (-10000, 0)

Data Point: (0, 0)

Data Point: (10000, 6494)

Estimation Properties

Intact Rock Param.: 10

Geological Strength: 100

Disturbance Factor: 0

SigmaC: 600000 psf

Sigma3: 300000 psf

Num. Points: 20

Spatial Functions

Marsh 2 (-7.5 to-16)

Model: [Linear Interpolation](#)

Limit Range By: [Data Values](#)

Data Points: [X \(ft\)](#), [Y \(ft\)](#), [Cohesion \(psf\)](#)

Data Point: (160.5, -7.5, 140)

Data Point: (160.5, -16, 200)

Data Point: (200, -7.5, 250)

Data Point: (200, -16, 250)

Data Point: (236, -7.5, 140)

Data Point: (236, -16, 200)

Bay Sound

Model: [Linear Interpolation](#)

Limit Range By: [Data Values](#)

Data Points: [X \(ft\)](#), [Y \(ft\)](#), [Cohesion \(psf\)](#)

Data Point: (160.5, -43, 550)

Data Point: (160.5, -70, 800)

Data Point: (200, -43, 580)

Data Point: (200, -70, 800)

Data Point: (236, -43, 550)

Data Point: (236, -70, 800)

Data Point: (112.5, -43, 550)

Data Point: (112.5, -70, 800)

Data Point: (310, -43, 550)

Data Point: (310, -70, 800)

Regions

	Points	Area (ft²)	Material
Region 1	4,12,13,14	6.675	
Region 2	24,28,36,1,2,35,43,3,44,4,15	188.38	EMB FILL, EL. +8 TO -1.5
Region 3	4,14,10,46,47,45,51,5,16,23,29,40,28,24,15	236.42857	EMB FILL, EL. +8 TO -1.5
Region 4	23,16,5,25,11,19,33,29	453	MARSH 1, EL. -1.5 TO -7.5
Region 5	20,34,17,26,18,8,31,21	5670	BEACH SAND, EL. -16 TO -43
Region 6	8,9,32,22,21,31	5670	BAY SOUND CLAY, EL. -43 TO -70
Region 7	19,11,25,26,17,34,33	641.75	MARSH 2, EL. -7.5 TO -16
Region 8	25,5,6,7	444	Marsh 1, EL -1.5 to -7.5 (PS)
Region 9	26,25,7,18	629	Marsh 2, EL -7.5 to -16 (Protected)
Region 10	29,33,30,41,39,38,37,40	109.92	Marsh 1, EL -1.5 to -7.5 (PS)
Region 11	27,30,33,34,20	514.25	Marsh 2, EL -7.5 to -16 (Protected)
Region 12	51,48,49,50,6,5	79.173544	Marsh 1, EL -1.5 to -7.5 (PS)

Points

	X (ft)	Y (ft)
Point 1	161.8	-1
Point 2	167.3	-0.8
Point 3	195.9	8
Point 4	200	8.4
Point 5	236	-1.5
Point 6	310	-1.5
Point 7	310	-7.5
Point 8	310	-43
Point 9	310	-70
Point 10	208.5	8.2
Point 11	200	-7.5
Point 12	200	14
Point 13	200.9	14
Point 14	201.5	8.5
Point 15	200	-1.3
Point 16	200	-1.5
Point 17	200	-16
Point 18	310	-16
Point 19	165.6	-7.5
Point 20	100	-16
Point 21	100	-43
Point 22	100	-70
Point 23	165.6	-1.5
Point 24	165.6	-1.3
Point 25	236	-7.5
Point 26	236	-16
Point 27	100	-8
Point 28	156	-1.3

Point 29	160.5	-1.5
Point 30	100	-7.5
Point 31	200	-43
Point 32	200	-70
Point 33	160.5	-7.5
Point 34	160.5	-16
Point 35	169.4	-0.1
Point 36	156.8	-1.2
Point 37	151.6	-2.3
Point 38	141.6	-6.5
Point 39	131.6	-6.9
Point 40	155.2	-1.5
Point 41	100	-6.9
Point 42	178.9	3.1
Point 43	188.4	6.1
Point 44	199.6	8.4
Point 45	231	0.83333
Point 46	216.5	5.8
Point 47	225.7	2.1
Point 48	250.4	-0.5
Point 49	271	-0.6
Point 50	310	-0.3
Point 51	236	0.09077

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.32	(171.663, 33.706)	28.66035	(206.591, 8.28182)	(140.266, -6.55335)
2	6228	1.37	(171.663, 33.706)	49.56	(207.997, 8.22157)	(142.288, -6.21114)

Slices of Slip Surface: Optimized

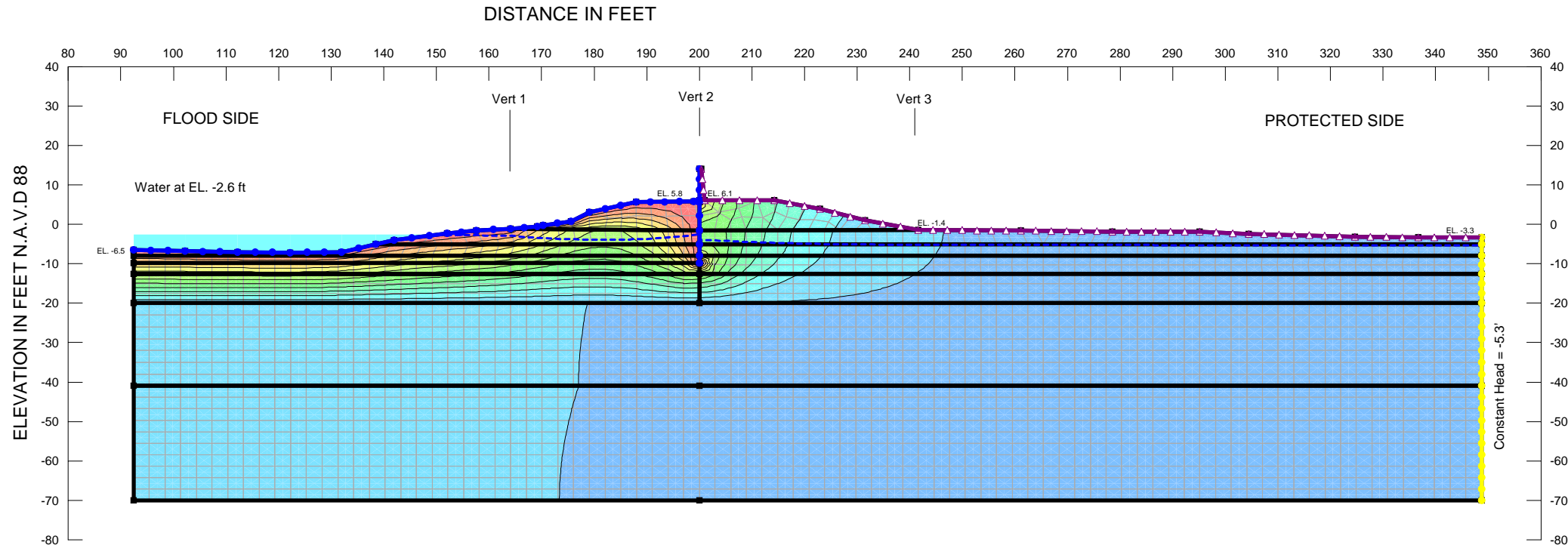
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	140.9332	-6.97898	373.08655	634.95755	0	400
2	Optimized	143.314	-8.4986825	467.90824	688.64566	0	147.05
3	Optimized	146.57035	-10.235455	576.2804	881.44747	0	159.31
4	Optimized	149.05635	-11.129065	632.03085	983.30134	0	165.62
5	Optimized	150.8	-11.592675	660.36961	1057.8115	0	168.89
6	Optimized	152.66865	-12.089515	689.91181	1127.2448	0	172.4
7	Optimized	154.46865	-12.537775	716.45375	1177.0121	0	175.56
8	Optimized	155.6	-12.791665	731.43262	1211.6144	0	177.35
9	Optimized	156.4	-12.9712	742.00711	1234.4221	0	178.62
10	Optimized	157.89525	-13.30676	761.79599	1269.467	0	180.99
11	Optimized	159.7539	-13.72387	786.368	1313.7874	0	183.93
12	Optimized	161.15865	-14.041115	805.0974	1351.2805	0	187.24
13	Optimized	162.75	-14.40319	826.40556	1393.0294	0	192.22
14	Optimized	164.65	-14.83549	851.91159	1442.5019	0	197.9
15	Optimized	166.45	-15.245035	876.08004	1489.3475	0	203.01

16	Optimized	168.24935	-15.654435	900.19905	1566.22	0	207.85
17	Optimized	169.29935	-15.878265	913.33564	1584.4689	0	210.47
18	Optimized	170.056	-15.937085	916.42869	1616.2884	0	211.76
19	Optimized	172.356	-15.988355	917.82797	1678.964	0	214.95
20	Optimized	175.2238	-15.988835	915.61555	1777.4651	0	218.59
21	Optimized	177.67145	-15.989245	913.73619	1861.5051	0	221.69
22	Optimized	180.1191	-15.989655	911.85684	1945.586	0	224.8
23	Optimized	182.2286	-15.836275	900.66638	1950.628	0	226.98
24	Optimized	183.99995	-15.52911	880.08544	1982.2781	0	228.4
25	Optimized	185.7642	-15.071245	850.13409	1947.2582	0	229.62
26	Optimized	187.5214	-14.462675	810.82433	1950.5385	0	230.78
27	Optimized	188.48055	-14.130495	789.32242	1951.6916	0	231.57
28	Optimized	189.28055	-13.720045	763.09834	1879.9488	0	232.06
29	Optimized	191.5375	-12.51994	686.44583	1829.5173	0	234.03
30	Optimized	194.4875	-10.70297	570.76659	1690.714	0	237.8
31	Optimized	196.1786	-9.50642	494.77985	1622.0657	0	240.73
32	Optimized	197.543	-8.404645	424.97278	1503.4314	0	243.55
33	Optimized	199.03785	-7.159185	346.08143	1320.7308	0	400
34	Optimized	199.52345	-6.7458745	319.91543	1243.0959	0	400
35	Optimized	199.8	-6.4839605	303.36275	1218.0977	0	400
36	Optimized	200.45	-5.8683495	264.43634	1160.393	0	400
37	Optimized	201.2	-5.158029	219.52187	1095.2981	0	400
38	Optimized	202.4118	-4.0103405	146.96227	980.30589	0	400
39	Optimized	204.0822	-2.416145	46.183126	810.69585	0	400
40	Optimized	204.9371	-1.592755	-5.8631101	726.01749	0	400
41	Optimized	205.8121	-0.75	-59.131699	553.85674	0	500

Slices of Slip Surface: 6228

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	6228	143.20635	-6.855569	365.38969	668.27024	0	400
2	6228	145.1041	-8.121737	444.39348	674.62974	0	144.39
3	6228	147.06245	-9.303541	518.15515	817.92276	0	152.73
4	6228	149.0208	-10.366654	584.46092	948.31827	0	160.24
5	6228	150.8	-11.24103	638.39425	1056.4316	0	166.41
6	6228	152.5	-11.98978	683.80719	1141.5743	0	171.69
7	6228	154.3	-12.703905	726.95845	1217.7894	0	176.73
8	6228	155.6	-13.177655	755.51387	1269.0836	0	180.08
9	6228	156.4	-13.44418	771.52263	1296.5148	0	181.96
10	6228	157.89525	-13.89046	798.19425	1334.9285	0	185.11
11	6228	159.74525	-14.39426	828.20741	1378.4381	0	188.67
12	6228	161.15	-14.72236	847.56784	1409.105	0	191.95
13	6228	162.75	-15.03717	865.95865	1438.1561	0	196.44
14	6228	164.65	-15.34669	883.80352	1465.8853	0	201.13
15	6228	166.45	-15.572415	896.46934	1485.5945	0	204.97
16	6228	168.35	-15.732685	905.01822	1531.7082	0	208.42
17	6228	170.55	-15.82887	909.29244	1606.1602	0	211.82
18	6228	172.85	-15.82713	907.3914	1673.0844	0	214.79

19	6228	175.02855	-15.72953	899.60454	1726.9943	0	217.18
20	6228	177.0857	-15.54624	886.55841	1769.0097	0	219.14
21	6228	179.14285	-15.275905	868.09518	1802.5049	0	220.9
22	6228	181.2	-14.917075	844.08857	1827.3718	0	222.56
23	6228	183.25715	-14.46776	814.4571	1843.4341	0	224.22
24	6228	185.3143	-13.925395	778.98325	1850.4006	0	225.97
25	6228	187.37145	-13.286755	737.562	1847.916	0	227.89
26	6228	189.2	-12.6402	695.78891	1831.9187	0	229.84
27	6228	190.98335	-11.921085	649.52243	1800.1398	0	232.01
28	6228	192.95	-11.036845	592.81578	1756.0405	0	234.82
29	6228	194.91665	-10.046363	529.45616	1701.3359	0	238.16
30	6228	196.7251	-9.03997	465.24807	1629.2779	0	241.78
31	6228	198.37525	-8.0281075	400.82032	1540.9099	0	245.63
32	6228	199.40015	-7.3650305	358.64811	1415.6213	0	400
33	6228	199.8	-7.0921255	341.3003	1385.1022	0	400
34	6228	200.45	-6.6330515	312.15293	1333.302	0	400
35	6228	201.2	-6.089241	277.63071	1273.4611	0	400
36	6228	202.70945	-4.893759	201.85621	1128.7287	0	400
37	6228	205.12835	-2.812586	70.106376	873.17518	0	400
38	6228	206.4415	-1.6021115	-6.4524908	725.34683	0	400
39	6228	207.2709	-0.75	-60.270085	534.81316	0	500



Name: EMB FILL to EL. -1.5 Model: Saturated Only K-Sat: 3.28e-008 ft/sec K-Ratio: 1
 Name: MARSH 1, EL. -1.5 TO -5 Model: Saturated Only K-Sat: 3.28e-007 ft/sec K-Ratio: 1
 Name: BEACH SAND, EL. -20 TO -41 Model: Saturated Only K-Sat: 0.00049 ft/sec K-Ratio: 1
 Name: Sheet Pile Model: Saturated Only K-Sat: 1e-010 ft/sec K-Ratio: 1
 Name: MARSH 2, EL. -5 to -8 Model: Saturated Only K-Sat: 3.28e-007 ft/sec K-Ratio: 1
 Name: MARSH 3, EL. -8 to -12.5 Model: Saturated Only K-Sat: 3.28e-007 ft/sec K-Ratio: 1
 Name: MARSH 4, EL. -12.5 to -20 Model: Saturated Only K-Sat: 3.28e-007 ft/sec K-Ratio: 1
 Name: BAY SOUND CLAY, EL. -41 to -70 Model: Saturated Only K-Sat: 3.28e-008 ft/sec K-Ratio: 1

GENERAL NOTES

CLASSIFICATION STRATIFICATION
 SHEAR STRENGTHS AND UNIT WEIGHTS OF
 THE SOIL WERE BASED ON THE RESULTS OF
 UNDISTURBED BORINGS AND CPT DATA. SEE
 BOTH BORING AND CPT DATA PLATES.

WHERE INDICATED, SHEAR STRENGTHS BETWEEN
 VERTICALS WERE ASSUMED TO VARY LINEARLY
 BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

LAKE PONTCHARTRAIN, LA. AND VICINITY
 HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL
 REMEDIATION OF CANAL WALLS AND LEVEES
 PROTECTED SIDE STABILITY ANALYSIS,
 CASE: Name: LWL Q Case (seepage)
 REACH 17, STA. 37+29 TO 50+00 EAST
 ORLEANS PARISH, LOUISIANA

Existing Condition
 Sta 37+29 to 47+00

Cross Section at Sta 42+00

LWL Q Case (seepage)

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File Information

Created By: [Liljegren, James](#)
Revision Number: [588](#)
Last Edited By: [Jamerson, James MVK](#)
Date: [10/3/2013](#)
Time: [2:52:15 PM](#)
File Name: [Reach 17A.gsz](#)
Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix E LWL\](#)
Last Solved Date: [10/3/2013](#)
Last Solved Time: [2:52:46 PM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Mass(M) Units: [lbs](#)
Mass Flux Units: [lbs/sec](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

LWL Q Case (seepage)

Kind: [SEEP/W](#)
Method: [Steady-State](#)
Settings
 Include Air Flow: [No](#)
Control
 Apply Runoff: [No](#)
Convergence
 Convergence Type: [Head Vector Norm](#)
 Maximum Number of Iterations: [500](#)
 Tolerance: [0.001](#)
 Maximum Change in K: [0.1](#)
 Rate of Change in K: [1.02](#)
 Minimum Change in K: [1e-005](#)
 Equation Solver: [Parallel Direct](#)
 Potential Seepage Max # of Reviews: [10](#)
Time

Starting Time: 0 sec

Duration: 0 sec

Ending Time: 0 sec

Materials

EMB FILL to EL. -1.5

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-008 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

MARSH 1, EL. -1.5 TO -5

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-007 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

BEACH SAND, EL. -20 TO -41

Model: Saturated Only

Hydraulic

K-Sat: 0.00049 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

Sheet Pile

Model: Saturated Only

Hydraulic

K-Sat: 1e-010 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

MARSH 2, EL. -5 to -8

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-007 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

MARSH 3, EL. -8 to -12.5

Model: Saturated Only
Hydraulic
K-Sat: 3.28e-007 ft/sec
Volumetric Water Content: 0 ft³/ft³
Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

MARSH 4, EL. -12.5 to -20

Model: Saturated Only
Hydraulic
K-Sat: 3.28e-007 ft/sec
Volumetric Water Content: 0 ft³/ft³
Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

BAY SOUND CLAY, EL. -41 to -70

Model: Saturated Only
Hydraulic
K-Sat: 3.28e-008 ft/sec
Volumetric Water Content: 0 ft³/ft³
Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

Boundary Conditions

Drainage

Review: true
Type: Total Flux (Q) 0

Canal Water

Type: Head (H) -2.6

Curb

Type: Head (H) -5.3

Regions

	Material	Points	Area (ft²)
Region 1	EMB FILL to EL. -1.5	9,10,11,12,13,14,15,30,43	157.095

Region 2		52,16,17,18	5.6
Region 3	EMB FILL to EL. -1.5	43,22,21,20,19,18,52,30	209.6
Region 4	MARSH 1, EL. -1.5 TO -5	51,6,7,8,9,43,44	193.885
Region 5	MARSH 2, EL. -5 to -8	37,1,2,3,4,5,51,44,45	239.55
Region 6	MARSH 3, EL. -8 to -12.5	31,37,45,46	193.68
Region 7	MARSH 3, EL. -8 to -12.5	32,31,46,47	290.52
Region 8	MARSH 4, EL. -12.5 to -20	32,47,48,33	807
Region 9	BAY SOUND CLAY, EL. -41 to -70	34,49,41,42,50,35	7432.7
Region 10	MARSH 1, EL. -1.5 TO -5	43,22,23,24,25,26,27,28,29,36,44	439.835
Region 11	MARSH 2, EL. -5 to -8	44,36,38,45	446.1
Region 12	MARSH 3, EL. -8 to -12.5	45,38,39,47,46	669.15
Region 13	MARSH 4, EL. -12.5 to -20	47,39,40,48	1115.25
Region 14	BEACH SAND, EL. -20 TO -41	33,48,40,41,49,34	5382.3

Lines

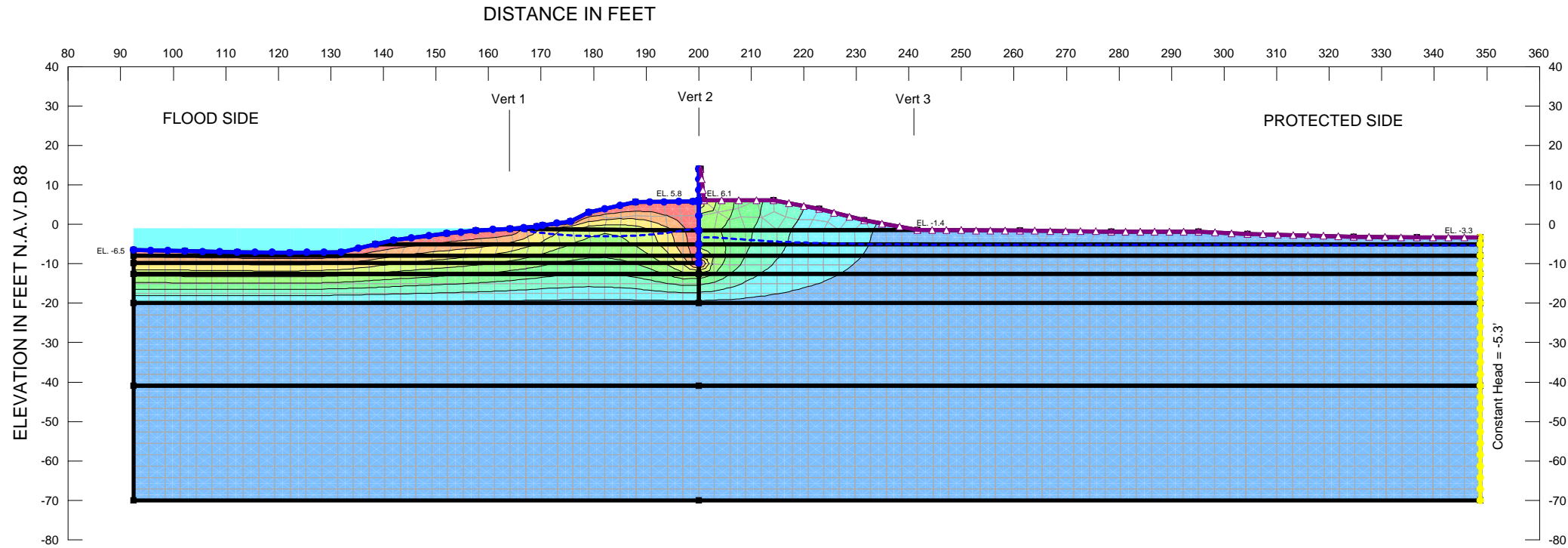
	Start Point	End Point	Hydraulic Boundary	Left Side Material
Line 1	9	10	Canal Water	
Line 2	10	11	Canal Water	
Line 3	11	12	Canal Water	
Line 4	12	13	Canal Water	
Line 5	13	14	Canal Water	
Line 6	14	15	Canal Water	
Line 7	15	30	Canal Water	
Line 8	30	43	Canal Water	Sheet Pile
Line 9	43	9		
Line 10	52	16	Canal Water	
Line 11	16	17		
Line 12	17	18	Drainage	
Line 13	18	52		
Line 14	43	22		
Line 15	22	21	Drainage	
Line 16	21	20	Drainage	
Line 17	20	19	Drainage	
Line 18	19	18	Drainage	
Line 19	52	30	Canal Water	Sheet Pile
Line 20	51	6	Canal Water	
Line 21	6	7	Canal Water	
Line 22	7	8	Canal Water	
Line 23	8	9	Canal Water	
Line 24	43	44	Canal Water	Sheet Pile
Line 25	44	51		
Line 26	37	1		
Line 27	1	2	Canal Water	
Line 28	2	3	Canal Water	
Line 29	3	4	Canal Water	
Line 30	4	5	Canal Water	
Line 31	5	51	Canal Water	

Line 32	44	45	Canal Water	Sheet Pile
Line 33	45	37		
Line 34	31	37		
Line 35	45	46	Canal Water	Sheet Pile
Line 36	46	31		
Line 37	32	31		
Line 38	46	47		
Line 39	47	32		
Line 40	47	48		
Line 41	48	33		
Line 42	33	32		
Line 43	41	49		
Line 44	49	34		
Line 45	41	42	Curb	
Line 46	42	50		
Line 47	50	35		
Line 48	35	34		
Line 49	22	23	Drainage	
Line 50	23	24	Drainage	
Line 51	24	25	Drainage	
Line 52	25	26	Drainage	
Line 53	26	27	Drainage	
Line 54	27	28	Drainage	
Line 55	28	29	Drainage	
Line 56	29	36	Curb	
Line 57	36	44		
Line 58	36	38	Curb	
Line 59	38	45		
Line 60	38	39	Curb	
Line 61	39	47		
Line 62	39	40	Curb	
Line 63	40	48		
Line 64	40	41	Curb	
Line 65	34	33		

Points

	X (ft)	Y (ft)
Point 1	92.4	-6.5
Point 2	102.2	-6.8
Point 3	112.2	-7
Point 4	122.2	-7.2
Point 5	132	-7
Point 6	142	-4
Point 7	152	-2.3
Point 8	157.6	-1.6
Point 9	164.1	-1.1
Point 10	169.2	-0.6

Point 11	170.3	-0.2
Point 12	175.6	0.7
Point 13	179.1	3.1
Point 14	188	5.6
Point 15	198.9	5.8
Point 16	200	14.1
Point 17	200.4	14.1
Point 18	201	6.1
Point 19	214.3	6.1
Point 20	222.9	3.9
Point 21	231.5	1
Point 22	241.6	-1.4
Point 23	261.1	-1.6
Point 24	278.5	-1.8
Point 25	295.1	-1.9
Point 26	304.5	-2.4
Point 27	324.6	-3.1
Point 28	336.7	-3.3
Point 29	348.7	-3.3
Point 30	200	5.8
Point 31	92.4	-9.8
Point 32	92.4	-12.5
Point 33	92.4	-20
Point 34	92.4	-41
Point 35	92.4	-70
Point 36	348.7	-5
Point 37	92.4	-8
Point 38	348.7	-8
Point 39	348.7	-12.5
Point 40	348.7	-20
Point 41	348.7	-41
Point 42	348.7	-70
Point 43	200	-1.5
Point 44	200	-5
Point 45	200	-8
Point 46	200	-9.8
Point 47	200	-12.5
Point 48	200	-20
Point 49	200	-41
Point 50	200	-70
Point 51	138.5	-5
Point 52	200	6.1



Name: EMB FILL to EL. -1.5 Model: Saturated Only K-Sat: 3.28e-008 ft/sec K-Ratio: 1
 Name: MARSH 1, EL. -1.5 TO -5 Model: Saturated Only K-Sat: 3.28e-007 ft/sec K-Ratio: 1
 Name: BEACH SAND, EL. -20 TO -41 Model: Saturated Only K-Sat: 0.00049 ft/sec K-Ratio: 1
 Name: Sheet Pile Model: Saturated Only K-Sat: 1e-010 ft/sec K-Ratio: 1
 Name: MARSH 2, EL. -5 to -8 Model: Saturated Only K-Sat: 3.28e-007 ft/sec K-Ratio: 1
 Name: MARSH 3, EL. -8 to -12.5 Model: Saturated Only K-Sat: 3.28e-007 ft/sec K-Ratio: 1
 Name: MARSH 4, EL. -12.5 to -20 Model: Saturated Only K-Sat: 3.28e-007 ft/sec K-Ratio: 1
 Name: BAY SOUND CLAY, EL. -41 to -70 Model: Saturated Only K-Sat: 3.28e-008 ft/sec K-Ratio: 1

GENERAL NOTES

CLASSIFICATION STRATIFICATION
 SHEAR STRENGTHS AND UNIT WEIGHTS OF
 THE SOIL WERE BASED ON THE RESULTS OF
 UNDISTURBED BORINGS AND CPT DATA. SEE
 BOTH BORING AND CPT DATA PLATES.

WHERE INDICATED, SHEAR STRENGTHS BETWEEN
 VERTICALS WERE ASSUMED TO VARY LINEARLY
 BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

LAKE PONTCHARTRAIN, LA. AND VICINITY
 HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL
 REMEDIATION OF CANAL WALLS AND LEVEES
 PROTECTED SIDE STABILITY ANALYSIS,
 CASE: Name: LWL Q Case (seepage)
 REACH 17, STA. 37+29 TO 50+00 EAST
 ORLEANS PARISH, LOUISIANA

Existing Condition
 Sta 37+29 to 47+00

Cross Section at Sta 42+00

LWL Q Case (seepage)

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File Information

Created By: [Liljegren, James](#)
Revision Number: [584](#)
Last Edited By: [Jamerson, James MVK](#)
Date: [6/13/2013](#)
Time: [5:36:56 PM](#)
File Name: [Reach 17A.gsz](#)
Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix E LWL\WL -1\](#)
Last Solved Date: [6/13/2013](#)
Last Solved Time: [5:37:06 PM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Mass(M) Units: [lbs](#)
Mass Flux Units: [lbs/sec](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

LWL Q Case (seepage)

Kind: [SEEP/W](#)
Method: [Steady-State](#)
Settings
 Include Air Flow: [No](#)
Control
 Apply Runoff: [No](#)
Convergence
 Convergence Type: [Head Vector Norm](#)
 Maximum Number of Iterations: [500](#)
 Tolerance: [0.001](#)
 Maximum Change in K: [0.1](#)
 Rate of Change in K: [1.02](#)
 Minimum Change in K: [1e-005](#)
 Equation Solver: [Parallel Direct](#)
 Potential Seepage Max # of Reviews: [10](#)
Time

Starting Time: 0 sec

Duration: 0 sec

Ending Time: 0 sec

Materials

EMB FILL to EL. -1.5

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-008 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

MARSH 1, EL. -1.5 TO -5

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-007 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

BEACH SAND, EL. -20 TO -41

Model: Saturated Only

Hydraulic

K-Sat: 0.00049 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

Sheet Pile

Model: Saturated Only

Hydraulic

K-Sat: 1e-010 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

MARSH 2, EL. -5 to -8

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-007 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

MARSH 3, EL. -8 to -12.5

Model: Saturated Only
Hydraulic
K-Sat: 3.28e-007 ft/sec
Volumetric Water Content: 0 ft³/ft³
Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

MARSH 4, EL. -12.5 to -20

Model: Saturated Only
Hydraulic
K-Sat: 3.28e-007 ft/sec
Volumetric Water Content: 0 ft³/ft³
Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

BAY SOUND CLAY, EL. -41 to -70

Model: Saturated Only
Hydraulic
K-Sat: 3.28e-008 ft/sec
Volumetric Water Content: 0 ft³/ft³
Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

Boundary Conditions

Drainage

Review: true
Type: Total Flux (Q) 0

Canal Water

Type: Head (H) -1

Curb

Type: Head (H) -5.3

Regions

	Material	Points	Area (ft²)
Region 1	EMB FILL to EL. -1.5	9,10,11,12,13,14,15,30,43	157.095

Region 2		52,16,17,18	5.6
Region 3	EMB FILL to EL. -1.5	43,22,21,20,19,18,52,30	209.6
Region 4	MARSH 1, EL. -1.5 TO -5	51,6,7,8,9,43,44	193.885
Region 5	MARSH 2, EL. -5 to -8	37,1,2,3,4,5,51,44,45	239.55
Region 6	MARSH 3, EL. -8 to -12.5	31,37,45,46	193.68
Region 7	MARSH 3, EL. -8 to -12.5	32,31,46,47	290.52
Region 8	MARSH 4, EL. -12.5 to -20	32,47,48,33	807
Region 9	BAY SOUND CLAY, EL. -41 to -70	34,49,41,42,50,35	7432.7
Region 10	MARSH 1, EL. -1.5 TO -5	43,22,23,24,25,26,27,28,29,36,44	439.835
Region 11	MARSH 2, EL. -5 to -8	44,36,38,45	446.1
Region 12	MARSH 3, EL. -8 to -12.5	45,38,39,47,46	669.15
Region 13	MARSH 4, EL. -12.5 to -20	47,39,40,48	1115.25
Region 14	BEACH SAND, EL. -20 TO -41	33,48,40,41,49,34	5382.3

Lines

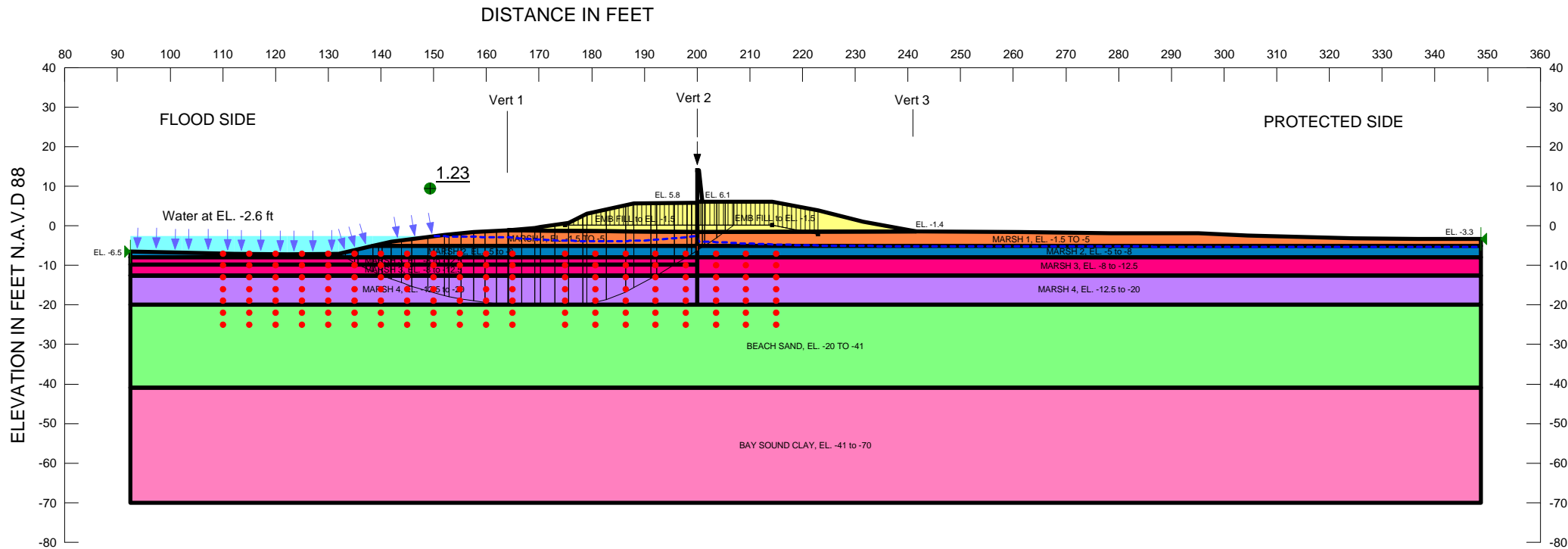
	Start Point	End Point	Hydraulic Boundary	Left Side Material
Line 1	9	10	Canal Water	
Line 2	10	11	Canal Water	
Line 3	11	12	Canal Water	
Line 4	12	13	Canal Water	
Line 5	13	14	Canal Water	
Line 6	14	15	Canal Water	
Line 7	15	30	Canal Water	
Line 8	30	43	Canal Water	Sheet Pile
Line 9	43	9		
Line 10	52	16	Canal Water	
Line 11	16	17		
Line 12	17	18	Drainage	
Line 13	18	52		
Line 14	43	22		
Line 15	22	21	Drainage	
Line 16	21	20	Drainage	
Line 17	20	19	Drainage	
Line 18	19	18	Drainage	
Line 19	52	30	Canal Water	Sheet Pile
Line 20	51	6	Canal Water	
Line 21	6	7	Canal Water	
Line 22	7	8	Canal Water	
Line 23	8	9	Canal Water	
Line 24	43	44	Canal Water	Sheet Pile
Line 25	44	51		
Line 26	37	1		
Line 27	1	2	Canal Water	
Line 28	2	3	Canal Water	
Line 29	3	4	Canal Water	
Line 30	4	5	Canal Water	
Line 31	5	51	Canal Water	

Line 32	44	45	Canal Water	Sheet Pile
Line 33	45	37		
Line 34	31	37		
Line 35	45	46	Canal Water	Sheet Pile
Line 36	46	31		
Line 37	32	31		
Line 38	46	47		
Line 39	47	32		
Line 40	47	48		
Line 41	48	33		
Line 42	33	32		
Line 43	41	49		
Line 44	49	34		
Line 45	41	42	Curb	
Line 46	42	50		
Line 47	50	35		
Line 48	35	34		
Line 49	22	23	Drainage	
Line 50	23	24	Drainage	
Line 51	24	25	Drainage	
Line 52	25	26	Drainage	
Line 53	26	27	Drainage	
Line 54	27	28	Drainage	
Line 55	28	29	Drainage	
Line 56	29	36	Curb	
Line 57	36	44		
Line 58	36	38	Curb	
Line 59	38	45		
Line 60	38	39	Curb	
Line 61	39	47		
Line 62	39	40	Curb	
Line 63	40	48		
Line 64	40	41	Curb	
Line 65	34	33		

Points

	X (ft)	Y (ft)
Point 1	92.4	-6.5
Point 2	102.2	-6.8
Point 3	112.2	-7
Point 4	122.2	-7.2
Point 5	132	-7
Point 6	142	-4
Point 7	152	-2.3
Point 8	157.6	-1.6
Point 9	164.1	-1.1
Point 10	169.2	-0.6

Point 11	170.3	-0.2
Point 12	175.6	0.7
Point 13	179.1	3.1
Point 14	188	5.6
Point 15	198.9	5.8
Point 16	200	14.1
Point 17	200.4	14.1
Point 18	201	6.1
Point 19	214.3	6.1
Point 20	222.9	3.9
Point 21	231.5	1
Point 22	241.6	-1.4
Point 23	261.1	-1.6
Point 24	278.5	-1.8
Point 25	295.1	-1.9
Point 26	304.5	-2.4
Point 27	324.6	-3.1
Point 28	336.7	-3.3
Point 29	348.7	-3.3
Point 30	200	5.8
Point 31	92.4	-9.8
Point 32	92.4	-12.5
Point 33	92.4	-20
Point 34	92.4	-41
Point 35	92.4	-70
Point 36	348.7	-5
Point 37	92.4	-8
Point 38	348.7	-8
Point 39	348.7	-12.5
Point 40	348.7	-20
Point 41	348.7	-41
Point 42	348.7	-70
Point 43	200	-1.5
Point 44	200	-5
Point 45	200	-8
Point 46	200	-9.8
Point 47	200	-12.5
Point 48	200	-20
Point 49	200	-41
Point 50	200	-70
Point 51	138.5	-5
Point 52	200	6.1



Name: EMB FILL to EL. -1.5 Model: Undrained (Phi=0) Unit Weight: 116 pcf Cohesion: 700 psf
Name: MARSH 1, EL. -1.5 TO -5 Model: Spatial Mohr-Coulomb Unit Weight: 97 pcf Cohesion Fn: MARSH 1 Phi: 0 °
Name: BEACH SAND, EL. -20 TO -41 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand
Name: MARSH 2, EL. -5 TO -8 Model: Spatial Mohr-Coulomb Unit Weight: 97 pcf Cohesion Fn: MARSH 2 Phi: 0 °
Name: MARSH 3, EL. -8 TO -12.5 Model: Spatial Mohr-Coulomb Unit Weight: 73 pcf Cohesion Fn: MARSH 3 Phi: 0 °
Name: MARSH 4, EL. -12.5 TO -20 Model: Spatial Mohr-Coulomb Unit Weight: 111 pcf Cohesion Fn: MARSH 4 Phi: 0 °
Name: BAY SOUND CLAY, EL. -41 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 105 pcf Cohesion Spatial Fn: Bay Sound Phi: 0 °

GENERAL NOTES

CLASSIFICATION STRATIFICATION
SHEAR STRENGTHS AND UNIT WEIGHTS OF
THE SOIL WERE BASED ON THE RESULTS OF
UNDISTURBED BORINGS AND CPT DATA. SEE
BOTH BORING AND CPT DATA PLATES.

WHERE INDICATED, SHEAR STRENGTHS BETWEEN
VERTICALS WERE ASSUMED TO VARY LINEARLY
BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

Existing Condition
Sta 37+29 to 47+00

Cross Section at Sta 42+00

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL
REMEDICATION OF CANAL WALLS AND LEVEES
PROTECTED SIDE STABILITY ANALYSIS,
CASE: Name: Low Water (Block)
REACH 17, STA. 37+29 TO 50+00 EAST
ORLEANS PARISH, LOUISIANA

Low Water (Block)

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File Information

Created By: [Liljegren, James](#)
Revision Number: [588](#)
Last Edited By: [Jamerson, James MVK](#)
Date: [10/3/2013](#)
Time: [2:52:15 PM](#)
File Name: [Reach 17A.gsz](#)
Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix E LWL\](#)
Last Solved Date: [10/3/2013](#)
Last Solved Time: [2:55:00 PM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Strength Units: [psf](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

Low Water (Block)

Kind: [SLOPE/W](#)
Parent: [LWL Q Case \(seepage\)](#)
Method: [Spencer](#)
Settings
 PWP Conditions Source: [Parent Analysis](#)
Slip Surface
 Direction of movement: [Right to Left](#)
 Use Passive Mode: [No](#)
 Slip Surface Option: [Block](#)
 Critical slip surfaces saved: [1](#)
 Optimize Critical Slip Surface Location: [Yes](#)
 Tension Crack
 Tension Crack Option: [Tension Crack Line](#)
 Percentage Wet: [1](#)
 Tension Crack Fluid Unit Weight: [62.4 pcf](#)
FOS Distribution
 FOS Calculation Option: [Constant](#)

Restrict Block Crossing: [Yes](#)

Advanced

Number of Slices: [30](#)

Optimization Tolerance: [0.01](#)

Minimum Slip Surface Depth: [0.1 ft](#)

Optimization Maximum Iterations: [2000](#)

Optimization Convergence Tolerance: [1e-007](#)

Starting Optimization Points: [8](#)

Ending Optimization Points: [16](#)

Complete Passes per Insertion: [1](#)

Driving Side Maximum Convex Angle: [5 °](#)

Resisting Side Maximum Convex Angle: [1 °](#)

Materials

EMB FILL to EL. -1.5

Model: [Undrained \(Phi=0\)](#)

Unit Weight: [116 pcf](#)

Cohesion: [700 psf](#)

MARSH 1, EL. -1.5 TO -5

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [97 pcf](#)

Cohesion Fn: [MARSH 1](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

BEACH SAND, EL. -20 TO -41

Model: [Shear/Normal Fn.](#)

Unit Weight: [122 pcf](#)

Strength Function: [Sand](#)

Phi-B: [0 °](#)

MARSH 2, EL. -5 to -8

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [97 pcf](#)

Cohesion Fn: [MARSH 2](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

MARSH 3, EL. -8 to -12.5

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [73 pcf](#)

Cohesion Fn: [MARSH 3](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

MARSH 4, EL. -12.5 to -20

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [111 pcf](#)

Cohesion Fn: [MARSH 4](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

BAY SOUND CLAY, EL. -41 to -70

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [105 pcf](#)

Cohesion Spatial Fn: [Bay Sound](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

Slip Surface Limits

Left Coordinate: [\(92.4, -6.5\) ft](#)

Right Coordinate: [\(348.7, -3.3\) ft](#)

Slip Surface Block

Left Grid

Upper Left: [\(110, -7\) ft](#)

Lower Left: [\(110, -25\) ft](#)

Lower Right: [\(165, -25\) ft](#)

X Increments: [11](#)

Y Increments: [6](#)

Starting Angle: [135 °](#)

Ending Angle: [155 °](#)

Angle Increments: [4](#)

Right Grid

Upper Left: [\(175, -7\) ft](#)

Lower Left: [\(175, -25\) ft](#)

Lower Right: [\(215, -25\) ft](#)

X Increments: [7](#)

Y Increments: [6](#)

Starting Angle: [35 °](#)

Ending Angle: [55 °](#)

Angle Increments: [4](#)

Reinforcements

Reinforcement 1

Type: [Pile](#)

Outside Point: [\(200, 14.1\) ft](#)

Inside Point: [\(200, -4.8\) ft](#)

Slip Surface Intersection: (200, -6.2607) ft

Total Length: 18.9 ft

Reinforcement Direction: 90 °

Applied Load Option: Variable

F of S Dependent: No

Pile Spacing: 1 ft

Shear Capacity: 0 lbs

Shear Safety Factor: 1

Shear Load Used: 0 lbs

Shear Option: Parallel to Slip

Resisting Force Used: 0 lbs/ft

Tension Crack Line

	X (ft)	Y (ft)
	175	0.1
	214.3	0.1
	222.9	-2.1

Cohesion Functions

MARSH 1

Model: Spline Data Point Function

Function: Cohesion vs. X

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 200

Data Points: X (ft), Cohesion (psf)

Data Point: (164.1, 200)

Data Point: (200, 275)

Data Point: (241.6, 200)

MARSH 2

Model: Spline Data Point Function

Function: Cohesion vs. X

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 350

Data Points: X (ft), Cohesion (psf)

Data Point: (164.1, 350)

Data Point: (200, 400)

Data Point: (241.6, 350)

MARSH 3

Model: Spline Data Point Function

Function: Cohesion vs. X

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 180

Data Points: X (ft), Cohesion (psf)

Data Point: (164.1, 180)

Data Point: (200, 250)

Data Point: (241.6, 180)

MARSH 4

Model: Spline Data Point Function

Function: Cohesion vs. X

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 180

Data Points: X (ft), Cohesion (psf)

Data Point: (164.1, 180)

Data Point: (200, 250)

Data Point: (241.6, 180)

Shear/Normal Strength Functions

Sand

Model: Spline Data Point Function

Function: Shear Stress vs. Normal Stress

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 0

Data Points: Normal Stress (psf), Shear Stress (psf)

Data Point: (-10000, 0)

Data Point: (0, 0)

Data Point: (10000, 6494)

Estimation Properties

Intact Rock Param.: 10

Geological Strength: 100

Disturbance Factor: 0

SigmaC: 600000 psf

Sigma3: 300000 psf

Num. Points: 20

Spatial Functions

Bay Sound

Model: Linear Interpolation

Limit Range By: Data Values

Data Points: X (ft), Y (ft), Cohesion (psf)

Data Point: (92.4, -41, 580)

Data Point: (164.1, -41, 580)

Data Point: (200, -41, 610)
 Data Point: (241.6, -41, 580)
 Data Point: (348.7, -41, 580)
 Data Point: (92.4, -70, 855)
 Data Point: (164.1, -70, 855)
 Data Point: (200, -70, 885)
 Data Point: (241.6, -70, 855)
 Data Point: (348.7, -70, 855)

Regions

	Material	Points	Area (ft ²)
Region 1	EMB FILL to EL. -1.5	9,10,11,12,13,14,15,30,43	157.095
Region 2		52,16,17,18	5.6
Region 3	EMB FILL to EL. -1.5	43,22,21,20,19,18,52,30	209.6
Region 4	MARSH 1, EL. -1.5 TO -5	51,6,7,8,9,43,44	193.885
Region 5	MARSH 2, EL. -5 to -8	37,1,2,3,4,5,51,44,45	239.55
Region 6	MARSH 3, EL. -8 to -12.5	31,37,45,46	193.68
Region 7	MARSH 3, EL. -8 to -12.5	32,31,46,47	290.52
Region 8	MARSH 4, EL. -12.5 to -20	32,47,48,33	807
Region 9	BAY SOUND CLAY, EL. -41 to -70	34,49,41,42,50,35	7432.7
Region 10	MARSH 1, EL. -1.5 TO -5	43,22,23,24,25,26,27,28,29,36,44	439.835
Region 11	MARSH 2, EL. -5 to -8	44,36,38,45	446.1
Region 12	MARSH 3, EL. -8 to -12.5	45,38,39,47,46	669.15
Region 13	MARSH 4, EL. -12.5 to -20	47,39,40,48	1115.25
Region 14	BEACH SAND, EL. -20 TO -41	33,48,40,41,49,34	5382.3

Points

	X (ft)	Y (ft)
Point 1	92.4	-6.5
Point 2	102.2	-6.8
Point 3	112.2	-7
Point 4	122.2	-7.2
Point 5	132	-7
Point 6	142	-4
Point 7	152	-2.3
Point 8	157.6	-1.6
Point 9	164.1	-1.1
Point 10	169.2	-0.6
Point 11	170.3	-0.2
Point 12	175.6	0.7
Point 13	179.1	3.1
Point 14	188	5.6
Point 15	198.9	5.8
Point 16	200	14.1
Point 17	200.4	14.1
Point 18	201	6.1

Point 19	214.3	6.1
Point 20	222.9	3.9
Point 21	231.5	1
Point 22	241.6	-1.4
Point 23	261.1	-1.6
Point 24	278.5	-1.8
Point 25	295.1	-1.9
Point 26	304.5	-2.4
Point 27	324.6	-3.1
Point 28	336.7	-3.3
Point 29	348.7	-3.3
Point 30	200	5.8
Point 31	92.4	-9.8
Point 32	92.4	-12.5
Point 33	92.4	-20
Point 34	92.4	-41
Point 35	92.4	-70
Point 36	348.7	-5
Point 37	92.4	-8
Point 38	348.7	-8
Point 39	348.7	-12.5
Point 40	348.7	-20
Point 41	348.7	-41
Point 42	348.7	-70
Point 43	200	-1.5
Point 44	200	-5
Point 45	200	-8
Point 46	200	-9.8
Point 47	200	-12.5
Point 48	200	-20
Point 49	200	-41
Point 50	200	-70
Point 51	138.5	-5
Point 52	200	6.1

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.23	(168.198, 1.888)	32.65173	(206.992, 6.1)	(132, -7)
2	11566	1.30	(168.198, 1.888)	33.697	(207.992, 6.1)	(129.381, -7.05346)

Slices of Slip Surface: Optimized

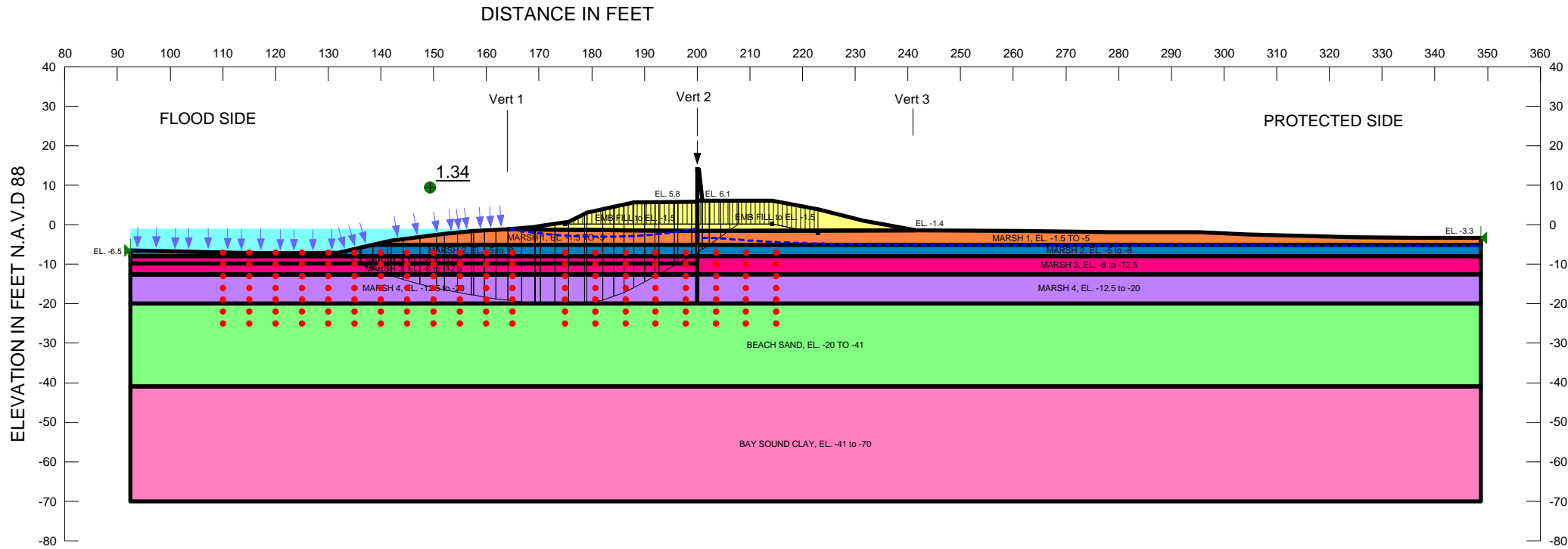
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	131.99995	-7.000022	274.56625	547.44493	0	350
2	Optimized	132.6309	-7.5000215	295.79099	610.89227	0	350
3	Optimized	134.12805	-8.686435	351.60341	606.07706	0	180
4	Optimized	135.3403	-9.586435	394.40233	653.52935	0	180

5	Optimized	137.09315	-10.66833	446.33406	754.57615	0	180
6	Optimized	139.0122	-11.85278	504.40539	864.62849	0	180
7	Optimized	139.86075	-12.33445	528.20553	883.09445	0	180
8	Optimized	141.09855	-12.943685	558.40428	958.70764	0	180
9	Optimized	142.9664	-13.86301	604.40239	1078.1295	0	180
10	Optimized	144.8992	-14.81429	652.72673	1198.7314	0	180
11	Optimized	147.3992	-15.8728	706.85722	1308.1765	0	180
12	Optimized	150.4664	-17.038545	767.19944	1461.5311	0	180
13	Optimized	152.4424	-17.78955	806.49038	1578.4534	0	180
14	Optimized	154.0636	-18.20823	828.44769	1603.0844	0	180
15	Optimized	156.4212	-18.709335	854.79305	1688.5098	0	180
16	Optimized	158.68085	-19.189615	880.34144	1765.2531	0	180
17	Optimized	160.84625	-19.533635	898.68498	1791.685	0	180
18	Optimized	163.0154	-19.76223	910.97187	1833.4971	0	180
19	Optimized	164.161	-19.882955	917.52918	1855.9298	0	180.12
20	Optimized	165.45725	-19.94288	920.73167	1861.1575	0	182.65
21	Optimized	167.94625	-19.996245	923.62175	1884.4117	0	187.5
22	Optimized	169.75	-19.99605	923.54545	1922.4545	0	191.02
23	Optimized	171.625	-19.99585	923.4717	1972.3019	0	194.67
24	Optimized	174.275	-19.995565	923.39623	2025.283	0	199.84
25	Optimized	176.9657	-19.995275	923.31293	2160.8649	0	205.09
26	Optimized	178.7157	-19.8759	916.53597	2190.2875	0	208.5
27	Optimized	180.93235	-19.188205	877.76726	2203.5138	0	212.82
28	Optimized	184.59225	-17.674565	793.14124	2091.0419	0	219.96
29	Optimized	187.2099	-16.169245	710.32708	1952.9735	0	225.06
30	Optimized	189.60965	-14.4679	618.70409	1798.5395	0	229.74
31	Optimized	191.74555	-12.91335	537.4775	1614.7338	0	233.91
32	Optimized	193.99055	-11.15	448.40084	1479.9516	0	238.28
33	Optimized	196.9079	-8.85856	343.37904	1323.2576	0	243.97
34	Optimized	198.50325	-7.570053	291.35542	1109.3247	0	397.92
35	Optimized	199.45	-6.741848	251.88539	1033.5286	0	399.23
36	Optimized	200.2	-6.085751	165.25616	1006.0143	0	399.76
37	Optimized	200.7	-5.648353	107.44491	966.24278	0	399.16
38	Optimized	201.22055	-5.192957	74.86487	924.82342	0	398.53
39	Optimized	202.5603	-4.020935	-2.6388092	896.87501	0	270.38
40	Optimized	204.499	-2.2645425	-119.29841	719.46459	0	266.89
41	Optimized	206.1552	-0.6936075	-221.3537	228.02657	0	700

Slices of Slip Surface: 11566

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	11566	130.3955	-7.526729	300.83372	483.50031	0	350
2	11566	131.7052	-8.137462	329.31848	470.25073	0	180
3	11566	133.63525	-9.037462	370.13965	561.0427	0	180
4	11566	136.88525	-10.55296	440.79691	709.64738	0	180
5	11566	139.78035	-11.90296	505.94158	840.82926	0	180
6	11566	141.53035	-12.719	546.2675	928.16749	0	180
7	11566	143.25	-13.520885	586.30859	1031.4144	0	180

8	11566	145.75	-14.686655	645.43611	1179.8676	0	180
9	11566	148.25	-15.852425	705.36117	1328.2846	0	180
10	11566	150.75	-17.018195	766.01129	1482.4294	0	180
11	11566	153.5	-18.30054	833.47079	1669.4188	0	180
12	11566	156.3	-19	870.42308	1664.3077	0	180
13	11566	159.225	-19	870	1692.2154	0	180
14	11566	162.475	-19	869.50769	1716.4615	0	180
15	11566	165.375	-19	869.01961	1743.4902	0	182.49
16	11566	167.925	-19	868.58824	1773.2941	0	187.46
17	11566	169.75	-19	868.26364	1811.5455	0	191.02
18	11566	171.625	-19	867.96226	1861.434	0	194.67
19	11566	174.275	-19	867.58491	1914.4528	0	199.84
20	11566	177.35	-19	867.28571	2080.7143	0	205.84
21	11566	179.90715	-19	867.19454	2246.9996	0	210.82
22	11566	181.9286	-18.14975	819.33041	2009.2838	0	214.76
23	11566	184.35715	-16.449245	724.27985	1902.8663	0	219.5
24	11566	186.7857	-14.74874	630.64595	1796.4825	0	224.23
25	11566	188.9986	-13.199245	547.00435	1670.4611	0	228.55
26	11566	191.9252	-11.15	440.443	1506.0844	0	234.26
27	11566	195.13855	-8.9	332.57876	1353.4493	0	240.52
28	11566	197.66195	-7.133113	255.1292	1143.4647	0	396.74
29	11566	199.45	-5.8811115	198.91246	1029.1529	0	399.23
30	11566	200.2	-5.3559555	115.94484	1013.6188	0	399.76
31	11566	200.5542	-5.107957	70.115616	990.82074	0	399.33
32	11566	200.8542	-4.897895	55.635855	1029.8307	0	273.46
33	11566	202.18165	-3.968401	-5.460973	944.7778	0	271.07
34	11566	204.5449	-2.313623	-116.33554	793.30555	0	266.81
35	11566	206.8592	-0.693117	-223.83173	395.76715	0	700



Name: EMB FILL to EL. -1.5 Model: Undrained (Phi=0) Unit Weight: 116 pcf Cohesion: 700 psf
Name: MARSH 1, EL. -1.5 TO -5 Model: Spatial Mohr-Coulomb Unit Weight: 97 pcf Cohesion Fn: MARSH 1 Phi: 0 °
Name: BEACH SAND, EL. -20 TO -41 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand
Name: MARSH 2, EL. -5 TO -8 Model: Spatial Mohr-Coulomb Unit Weight: 97 pcf Cohesion Fn: MARSH 2 Phi: 0 °
Name: MARSH 3, EL. -8 TO -12.5 Model: Spatial Mohr-Coulomb Unit Weight: 73 pcf Cohesion Fn: MARSH 3 Phi: 0 °
Name: MARSH 4, EL. -12.5 TO -20 Model: Spatial Mohr-Coulomb Unit Weight: 111 pcf Cohesion Fn: MARSH 4 Phi: 0 °
Name: BAY SOUND CLAY, EL. -41 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 105 pcf Cohesion Spatial Fn: Bay Sound Phi: 0 °

GENERAL NOTES

CLASSIFICATION STRATIFICATION
SHEAR STRENGTHS AND UNIT WEIGHTS OF
THE SOIL WERE BASED ON THE RESULTS OF
UNDISTURBED BORINGS AND CPT DATA. SEE
BOTH BORING AND CPT DATA PLATES.

WHERE INDICATED, SHEAR STRENGTHS BETWEEN
VERTICALS WERE ASSUMED TO VARY LINEARLY
BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

Existing Condition
Sta 37+29 to 47+00

Cross Section at Sta 42+00

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL
REMEDICATION OF CANAL WALLS AND LEVEES
PROTECTED SIDE STABILITY ANALYSIS,
CASE: Name: Low Water (Block)
REACH 17, STA. 37+29 TO 50+00 EAST
ORLEANS PARISH, LOUISIANA

Low Water (Block)

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File Information

Created By: [Liljegren, James](#)
Revision Number: [585](#)
Last Edited By: [Jamerson, James MVK](#)
Date: [6/13/2013](#)
Time: [5:42:42 PM](#)
File Name: [Reach 17A.gsz](#)
Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix E LWL\WL -1\](#)
Last Solved Date: [6/13/2013](#)
Last Solved Time: [5:45:04 PM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Strength Units: [psf](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

Low Water (Block)

Kind: [SLOPE/W](#)
Parent: [LWL Q Case \(seepage\)](#)
Method: [Spencer](#)
Settings
 PWP Conditions Source: [Parent Analysis](#)
Slip Surface
 Direction of movement: [Right to Left](#)
 Use Passive Mode: [No](#)
 Slip Surface Option: [Block](#)
 Critical slip surfaces saved: [1](#)
 Optimize Critical Slip Surface Location: [Yes](#)
 Tension Crack
 Tension Crack Option: [Tension Crack Line](#)
 Percentage Wet: [1](#)
 Tension Crack Fluid Unit Weight: [62.4 pcf](#)
FOS Distribution
 FOS Calculation Option: [Constant](#)

Restrict Block Crossing: [Yes](#)

Advanced

Number of Slices: [30](#)

Optimization Tolerance: [0.01](#)

Minimum Slip Surface Depth: [0.1 ft](#)

Optimization Maximum Iterations: [2000](#)

Optimization Convergence Tolerance: [1e-007](#)

Starting Optimization Points: [8](#)

Ending Optimization Points: [16](#)

Complete Passes per Insertion: [1](#)

Driving Side Maximum Convex Angle: [5 °](#)

Resisting Side Maximum Convex Angle: [1 °](#)

Materials

EMB FILL to EL. -1.5

Model: [Undrained \(Phi=0\)](#)

Unit Weight: [116 pcf](#)

Cohesion: [700 psf](#)

MARSH 1, EL. -1.5 TO -5

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [97 pcf](#)

Cohesion Fn: [MARSH 1](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

BEACH SAND, EL. -20 TO -41

Model: [Shear/Normal Fn.](#)

Unit Weight: [122 pcf](#)

Strength Function: [Sand](#)

Phi-B: [0 °](#)

MARSH 2, EL. -5 to -8

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [97 pcf](#)

Cohesion Fn: [MARSH 2](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

MARSH 3, EL. -8 to -12.5

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [73 pcf](#)

Cohesion Fn: [MARSH 3](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

MARSH 4, EL. -12.5 to -20

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [111 pcf](#)

Cohesion Fn: [MARSH 4](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

BAY SOUND CLAY, EL. -41 to -70

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [105 pcf](#)

Cohesion Spatial Fn: [Bay Sound](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

Slip Surface Limits

Left Coordinate: [\(92.4, -6.5\) ft](#)

Right Coordinate: [\(348.7, -3.3\) ft](#)

Slip Surface Block

Left Grid

Upper Left: [\(110, -7\) ft](#)

Lower Left: [\(110, -25\) ft](#)

Lower Right: [\(165, -25\) ft](#)

X Increments: [11](#)

Y Increments: [6](#)

Starting Angle: [135 °](#)

Ending Angle: [155 °](#)

Angle Increments: [4](#)

Right Grid

Upper Left: [\(175, -7\) ft](#)

Lower Left: [\(175, -25\) ft](#)

Lower Right: [\(215, -25\) ft](#)

X Increments: [7](#)

Y Increments: [6](#)

Starting Angle: [35 °](#)

Ending Angle: [55 °](#)

Angle Increments: [4](#)

Reinforcements

Reinforcement 1

Type: [Pile](#)

Outside Point: [\(200, 14.1\) ft](#)

Inside Point: [\(200, -4.8\) ft](#)

Slip Surface Intersection: (200, -7.0989) ft

Total Length: 18.9 ft

Reinforcement Direction: 90 °

Applied Load Option: Variable

F of S Dependent: No

Pile Spacing: 1 ft

Shear Capacity: 0 lbs

Shear Safety Factor: 1

Shear Load Used: 0 lbs

Shear Option: Parallel to Slip

Resisting Force Used: 0 lbs/ft

Tension Crack Line

	X (ft)	Y (ft)
	175	0.1
	214.3	0.1
	222.9	-2.1

Cohesion Functions

MARSH 1

Model: Spline Data Point Function

Function: Cohesion vs. X

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 200

Data Points: X (ft), Cohesion (psf)

Data Point: (164.1, 200)

Data Point: (200, 275)

Data Point: (241.6, 200)

MARSH 2

Model: Spline Data Point Function

Function: Cohesion vs. X

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 350

Data Points: X (ft), Cohesion (psf)

Data Point: (164.1, 350)

Data Point: (200, 400)

Data Point: (241.6, 350)

MARSH 3

Model: Spline Data Point Function

Function: Cohesion vs. X

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 180

Data Points: X (ft), Cohesion (psf)

Data Point: (164.1, 180)

Data Point: (200, 250)

Data Point: (241.6, 180)

MARSH 4

Model: Spline Data Point Function

Function: Cohesion vs. X

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 180

Data Points: X (ft), Cohesion (psf)

Data Point: (164.1, 180)

Data Point: (200, 250)

Data Point: (241.6, 180)

Shear/Normal Strength Functions

Sand

Model: Spline Data Point Function

Function: Shear Stress vs. Normal Stress

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 0

Data Points: Normal Stress (psf), Shear Stress (psf)

Data Point: (-10000, 0)

Data Point: (0, 0)

Data Point: (10000, 6494)

Estimation Properties

Intact Rock Param.: 10

Geological Strength: 100

Disturbance Factor: 0

SigmaC: 600000 psf

Sigma3: 300000 psf

Num. Points: 20

Spatial Functions

Bay Sound

Model: Linear Interpolation

Limit Range By: Data Values

Data Points: X (ft), Y (ft), Cohesion (psf)

Data Point: (92.4, -41, 580)

Data Point: (164.1, -41, 580)

Data Point: (200, -41, 610)
 Data Point: (241.6, -41, 580)
 Data Point: (348.7, -41, 580)
 Data Point: (92.4, -70, 855)
 Data Point: (164.1, -70, 855)
 Data Point: (200, -70, 885)
 Data Point: (241.6, -70, 855)
 Data Point: (348.7, -70, 855)

Regions

	Material	Points	Area (ft ²)
Region 1	EMB FILL to EL. -1.5	9,10,11,12,13,14,15,30,43	157.095
Region 2		52,16,17,18	5.6
Region 3	EMB FILL to EL. -1.5	43,22,21,20,19,18,52,30	209.6
Region 4	MARSH 1, EL. -1.5 TO -5	51,6,7,8,9,43,44	193.885
Region 5	MARSH 2, EL. -5 to -8	37,1,2,3,4,5,51,44,45	239.55
Region 6	MARSH 3, EL. -8 to -12.5	31,37,45,46	193.68
Region 7	MARSH 3, EL. -8 to -12.5	32,31,46,47	290.52
Region 8	MARSH 4, EL. -12.5 to -20	32,47,48,33	807
Region 9	BAY SOUND CLAY, EL. -41 to -70	34,49,41,42,50,35	7432.7
Region 10	MARSH 1, EL. -1.5 TO -5	43,22,23,24,25,26,27,28,29,36,44	439.835
Region 11	MARSH 2, EL. -5 to -8	44,36,38,45	446.1
Region 12	MARSH 3, EL. -8 to -12.5	45,38,39,47,46	669.15
Region 13	MARSH 4, EL. -12.5 to -20	47,39,40,48	1115.25
Region 14	BEACH SAND, EL. -20 TO -41	33,48,40,41,49,34	5382.3

Points

	X (ft)	Y (ft)
Point 1	92.4	-6.5
Point 2	102.2	-6.8
Point 3	112.2	-7
Point 4	122.2	-7.2
Point 5	132	-7
Point 6	142	-4
Point 7	152	-2.3
Point 8	157.6	-1.6
Point 9	164.1	-1.1
Point 10	169.2	-0.6
Point 11	170.3	-0.2
Point 12	175.6	0.7
Point 13	179.1	3.1
Point 14	188	5.6
Point 15	198.9	5.8
Point 16	200	14.1
Point 17	200.4	14.1
Point 18	201	6.1

Point 19	214.3	6.1
Point 20	222.9	3.9
Point 21	231.5	1
Point 22	241.6	-1.4
Point 23	261.1	-1.6
Point 24	278.5	-1.8
Point 25	295.1	-1.9
Point 26	304.5	-2.4
Point 27	324.6	-3.1
Point 28	336.7	-3.3
Point 29	348.7	-3.3
Point 30	200	5.8
Point 31	92.4	-9.8
Point 32	92.4	-12.5
Point 33	92.4	-20
Point 34	92.4	-41
Point 35	92.4	-70
Point 36	348.7	-5
Point 37	92.4	-8
Point 38	348.7	-8
Point 39	348.7	-12.5
Point 40	348.7	-20
Point 41	348.7	-41
Point 42	348.7	-70
Point 43	200	-1.5
Point 44	200	-5
Point 45	200	-8
Point 46	200	-9.8
Point 47	200	-12.5
Point 48	200	-20
Point 49	200	-41
Point 50	200	-70
Point 51	138.5	-5
Point 52	200	6.1

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.34	(168.198, 1.888)	33.21377	(207.838, 6.1)	(132.003, -6.99904)
2	11566	1.43	(168.198, 1.888)	33.697	(207.992, 6.1)	(129.381, -7.05346)

Slices of Slip Surface: Optimized

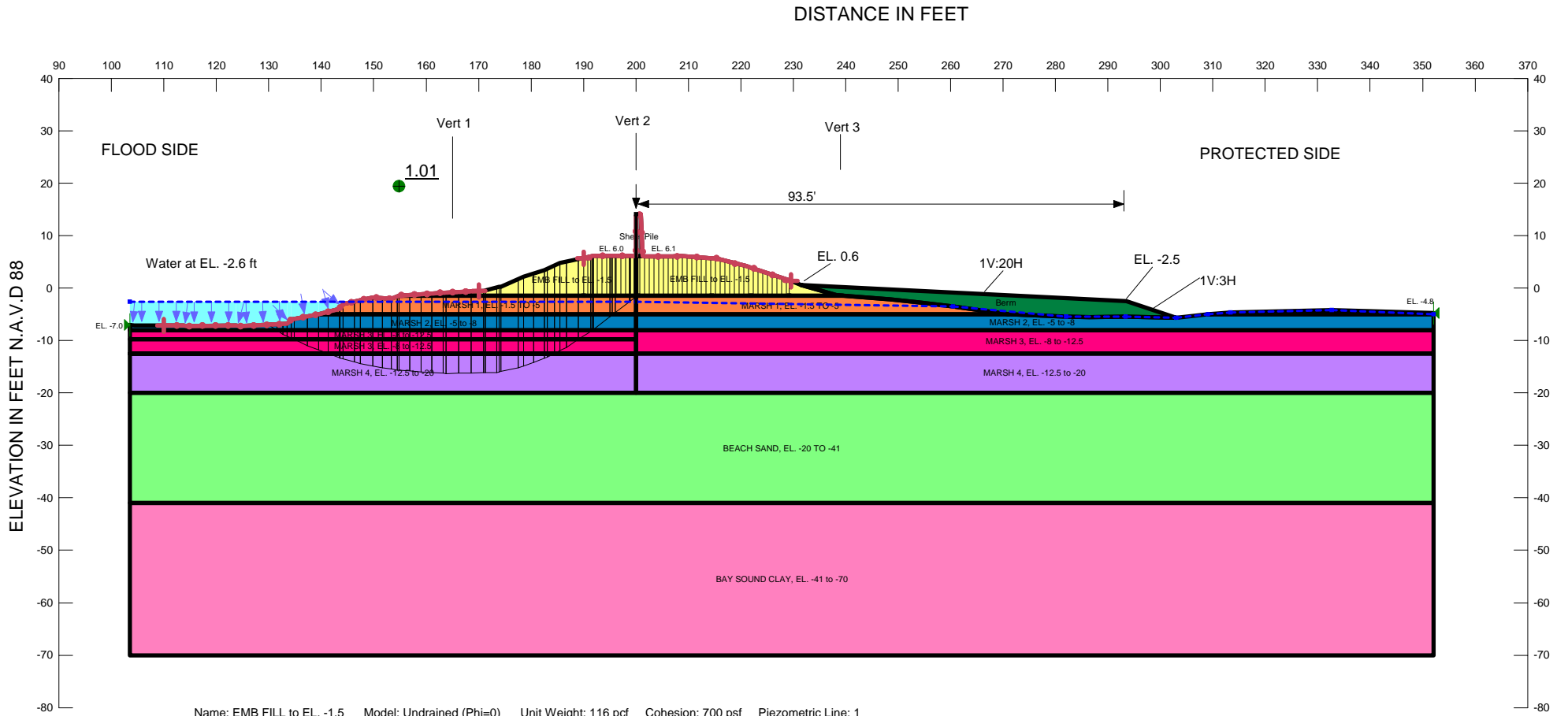
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	132.69705	-7.499522	389.38877	667.08782	0	350
2	Optimized	134.6389	-8.9	442.12788	704.21986	0	180
3	Optimized	136.0572	-9.922895	482.19042	797.35984	0	180
4	Optimized	137.3638	-10.590445	508.12806	816.61597	0	180

5	Optimized	139.9237	-11.81755	557.41508	934.50397	0	180
6	Optimized	141.6737	-12.65642	592.51239	1020.8203	0	180
7	Optimized	143.1361	-13.357435	622.35888	1109.5069	0	180
8	Optimized	145.8408	-14.43434	668.92045	1219.1853	0	180
9	Optimized	148.97805	-15.498965	715.85747	1358.1551	0	180
10	Optimized	151.27335	-16.220865	748.34153	1436.0967	0	180
11	Optimized	153.2854	-16.7458	772.16023	1504.875	0	180
12	Optimized	155.8562	-17.416505	803.02405	1591.5948	0	180
13	Optimized	157.3708	-17.802795	821.0845	1632.7785	0	180
14	Optimized	158.64295	-18.0855	834.32078	1668.2204	0	180
15	Optimized	160.7289	-18.54904	856.316	1725.9227	0	180
16	Optimized	162.93595	-18.968035	876.45158	1764.3534	0	180
17	Optimized	165.375	-19.36033	895.54909	1820.369	0	182.49
18	Optimized	167.925	-19.77047	915.99223	1896.9534	0	187.46
19	Optimized	169.25905	-19.985035	926.84281	1938.826	0	190.06
20	Optimized	169.80905	-19.994705	927.33836	1922.8065	0	191.13
21	Optimized	171.625	-19.995355	927.28302	1970.2642	0	194.67
22	Optimized	174.275	-19.9963	927.20755	2023.3208	0	199.84
23	Optimized	177.12815	-19.997315	927.14322	2171.9612	0	205.4
24	Optimized	178.87815	-19.93764	923.92963	2228.21	0	208.82
25	Optimized	180.6259	-19.46323	898.85708	2242.5573	0	212.22
26	Optimized	183.1475	-18.572365	852.14933	2167.6045	0	217.14
27	Optimized	185.1389	-17.619015	802.91544	2126.9763	0	221.02
28	Optimized	187.0673	-16.4907	745.83019	2005.1987	0	224.78
29	Optimized	188.9927	-15.14551	679.6994	1891.5313	0	228.54
30	Optimized	190.9781	-13.758405	613.84346	1746.1115	0	232.41
31	Optimized	192.34815	-12.782425	570.78585	1630.9834	0	235.08
32	Optimized	194.22765	-11.37577	510.99621	1524.5942	0	238.74
33	Optimized	196.0356	-10.02577	462.17671	1434.9629	0	242.27
34	Optimized	197.6207	-8.855491	431.42128	1353.973	0	245.36
35	Optimized	199.45	-7.5049235	394.41706	1176.9834	0	399.23
36	Optimized	200.0043	-7.0956975	378.76195	1172.057	0	399.99
37	Optimized	200.2043	-6.9170605	291.20801	1100.7659	0	399.75
38	Optimized	200.7	-6.4726175	219.01221	1060.0915	0	399.16
39	Optimized	201.67125	-5.601822	151.05978	980.38835	0	397.99
40	Optimized	203.4263	-4.028305	40.13806	911.96008	0	268.82
41	Optimized	205.33855	-2.270893	-81.218145	739.92721	0	265.38
42	Optimized	207.0027	-0.692588	-186.94453	270.16749	0	700

Slices of Slip Surface: 11566

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	11566	130.3955	-7.526729	396.76583	569.98476	0	350
2	11566	131.7052	-8.137462	419.55324	563.97499	0	180
3	11566	133.63525	-9.037462	451.25058	655.78759	0	180
4	11566	136.88525	-10.55296	507.75695	804.05375	0	180
5	11566	139.78035	-11.90296	561.61462	934.83281	0	180
6	11566	141.53035	-12.719	595.64047	1021.9057	0	180

7	11566	143.25	-13.520885	629.73886	1124.2566	0	180
8	11566	145.75	-14.686655	680.81836	1272.2385	0	180
9	11566	148.25	-15.852425	733.16669	1420.2567	0	180
10	11566	150.75	-17.018195	786.63885	1568.2749	0	180
11	11566	153.5	-18.30054	846.67267	1728.5101	0	180
12	11566	156.3	-19	879.65385	1710.6154	0	180
13	11566	159.225	-19	878.98462	1720.3385	0	180
14	11566	162.475	-19	878.15385	1728.8923	0	180
15	11566	165.375	-19	877.37255	1741.8039	0	182.49
16	11566	167.925	-19	876.66667	1771.5686	0	187.46
17	11566	169.75	-19	876.19091	1809.8182	0	191.02
18	11566	171.625	-19	875.73585	1859.6604	0	194.67
19	11566	174.275	-19	875.13208	1912.6038	0	199.84
20	11566	177.35	-19	874.65714	2078.8286	0	205.84
21	11566	179.90715	-19	874.44232	2245.0792	0	210.82
22	11566	181.9286	-18.14975	829.71919	2026.1487	0	214.76
23	11566	184.35715	-16.449245	741.17848	1919.4276	0	219.5
24	11566	186.7857	-14.74874	654.96513	1812.7066	0	224.23
25	11566	188.9986	-13.199245	579.07734	1686.2926	0	228.55
26	11566	191.9252	-11.15	485.13948	1521.4222	0	234.26
27	11566	195.13855	-8.9	396.53254	1368.3623	0	240.52
28	11566	197.66195	-7.133113	338.53358	1163.2481	0	396.74
29	11566	199.45	-5.8811115	295.29688	1048.5147	0	399.23
30	11566	200.2	-5.3559555	182.58286	1032.9303	0	399.76
31	11566	200.5542	-5.107957	118.76673	1010.0272	0	399.33
32	11566	200.8542	-4.897895	103.4746	1044.5205	0	273.46
33	11566	202.18165	-3.968401	40.543955	958.98915	0	271.07
34	11566	204.5449	-2.313623	-74.848779	806.71968	0	266.81
35	11566	206.8592	-0.693117	-186.12085	426.61132	0	700



Name: EMB FILL to EL. -1.5 Model: Undrained (Phi=0) Unit Weight: 116 pcf Cohesion: 700 psf Piezometric Line: 1
Name: MARSH 1, EL. -1.5 TO -5 Model: Spatial Mohr-Coulomb Unit Weight: 97 pcf Cohesion Fn: MARSH 1 Phi: 0 ° Piezometric Line: 1
Name: BEACH SAND, EL. -20 TO -41 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand Piezometric Line: 1
Name: Sheet Pile Model: Undrained (Phi=0) Unit Weight: 0.1 pcf Cohesion: 0.01 psf Piezometric Line: 1
Name: Berm Model: Mohr-Coulomb Unit Weight: 110 pcf Cohesion: 400 psf Phi: 0 ° Piezometric Line: 1
Name: MARSH 2, EL. -5 TO -8 Model: Spatial Mohr-Coulomb Unit Weight: 97 pcf Cohesion Fn: MARSH 2 Phi: 0 ° Piezometric Line: 1
Name: MARSH 3, EL. -8 TO -12.5 Model: Spatial Mohr-Coulomb Unit Weight: 73 pcf Cohesion Fn: MARSH 3 Phi: 0 ° Piezometric Line: 1
Name: MARSH 4, EL. -12.5 TO -20 Model: Spatial Mohr-Coulomb Unit Weight: 111 pcf Cohesion Fn: MARSH 4 Phi: 0 ° Piezometric Line: 1
Name: BAY SOUND CLAY, EL. -41 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 105 pcf Cohesion Spatial Fn: Bay Sound Phi: 0 ° Piezometric Line: 1

Existing Condition
Sta 47+00 to 50+00

Cross Section at Sta 50+00

GENERAL NOTES

CLASSIFICATION STRATIFICATION
SHEAR STRENGTHS AND UNIT WEIGHTS OF
THE SOIL WERE BASED ON THE RESULTS OF
UNDISTURBED BORINGS AND CPT DATA. SEE
BOTH BORING AND CPT DATA PLATES.

WHERE INDICATED, SHEAR STRENGTHS BETWEEN
VERTICALS WERE ASSUMED TO VARY LINEARLY
BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL
REMEDICATION OF CANAL WALLS AND LEVEES
PROTECTED SIDE STABILITY ANALYSIS,
CASE: Name: LWL Q Case (Entry/Exit)
REACH 17, STA. 37+29 TO 50+00 EAST
ORLEANS PARISH, LOUISIANA

LWL Q Case (Entry/Exit)

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File Information

Created By: [Liljegren, James](#)
Revision Number: [714](#)
Last Edited By: [Jamerson, James MVK](#)
Date: [10/3/2013](#)
Time: [3:19:02 PM](#)
File Name: [Reach 17B.gsz](#)
Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix E LWL\](#)
Last Solved Date: [10/3/2013](#)
Last Solved Time: [3:21:26 PM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Strength Units: [psf](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

LWL Q Case (Entry/Exit)

Kind: [SLOPE/W](#)
Method: [Spencer](#)
Settings
 Apply Phreatic Correction: [No](#)
 PWP Conditions Source: [Piezometric Line](#)
 Use Staged Rapid Drawdown: [No](#)
Slip Surface
 Direction of movement: [Right to Left](#)
 Use Passive Mode: [No](#)
 Slip Surface Option: [Entry and Exit](#)
 Critical slip surfaces saved: [1](#)
 Optimize Critical Slip Surface Location: [Yes](#)
Tension Crack
 Tension Crack Option: [Tension Crack Line](#)
 Percentage Wet: [1](#)
 Tension Crack Fluid Unit Weight: [62.4 pcf](#)
FOS Distribution

FOS Calculation Option: **Constant**

Advanced

Number of Slices: **30**

Optimization Tolerance: **0.01**

Minimum Slip Surface Depth: **0.1 ft**

Optimization Maximum Iterations: **2000**

Optimization Convergence Tolerance: **1e-007**

Starting Optimization Points: **8**

Ending Optimization Points: **16**

Complete Passes per Insertion: **1**

Driving Side Maximum Convex Angle: **5 °**

Resisting Side Maximum Convex Angle: **1 °**

Materials

EMB FILL to EL. -1.5

Model: **Undrained (Phi=0)**

Unit Weight: **116 pcf**

Cohesion: **700 psf**

Pore Water Pressure

Piezometric Line: **1**

MARSH 1, EL. -1.5 TO -5

Model: **Spatial Mohr-Coulomb**

Unit Weight: **97 pcf**

Cohesion Fn: **MARSH 1**

Phi: **0 °**

Phi-B: **0 °**

Pore Water Pressure

Piezometric Line: **1**

BEACH SAND, EL. -20 TO -41

Model: **Shear/Normal Fn.**

Unit Weight: **122 pcf**

Strength Function: **Sand**

Phi-B: **0 °**

Pore Water Pressure

Piezometric Line: **1**

Sheet Pile

Model: **Undrained (Phi=0)**

Unit Weight: **0.1 pcf**

Cohesion: **0.01 psf**

Pore Water Pressure

Piezometric Line: **1**

Berm

Model: [Mohr-Coulomb](#)
Unit Weight: [110 pcf](#)
Cohesion: [400 psf](#)
Phi: [0 °](#)
Phi-B: [0 °](#)
Pore Water Pressure
Piezometric Line: [1](#)

MARSH 2, EL. -5 to -8

Model: [Spatial Mohr-Coulomb](#)
Unit Weight: [97 pcf](#)
Cohesion Fn: [MARSH 2](#)
Phi: [0 °](#)
Phi-B: [0 °](#)
Pore Water Pressure
Piezometric Line: [1](#)

MARSH 3, EL. -8 to -12.5

Model: [Spatial Mohr-Coulomb](#)
Unit Weight: [73 pcf](#)
Cohesion Fn: [MARSH 3](#)
Phi: [0 °](#)
Phi-B: [0 °](#)
Pore Water Pressure
Piezometric Line: [1](#)

MARSH 4, EL. -12.5 to -20

Model: [Spatial Mohr-Coulomb](#)
Unit Weight: [111 pcf](#)
Cohesion Fn: [MARSH 4](#)
Phi: [0 °](#)
Phi-B: [0 °](#)
Pore Water Pressure
Piezometric Line: [1](#)

BAY SOUND CLAY, EL. -41 to -70

Model: [Spatial Mohr-Coulomb](#)
Unit Weight: [105 pcf](#)
Cohesion Spatial Fn: [Bay Sound](#)
Phi: [0 °](#)
Phi-B: [0 °](#)
Pore Water Pressure
Piezometric Line: [1](#)

Slip Surface Entry and Exit

Left Projection: [Range](#)
Left-Zone Left Coordinate: [\(110, -7.1\) ft](#)

Left-Zone Right Coordinate: (170, -0.54675) ft
Left-Zone Increment: 25
Right Projection: Range
Right-Zone Left Coordinate: (190, 5.71525) ft
Right-Zone Right Coordinate: (229.57721, 1.3524) ft
Right-Zone Increment: 15
Radius Increments: 25

Slip Surface Limits

Left Coordinate: (103.5, -7) ft
Right Coordinate: (352.1, -4.8) ft

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
	103.5	-2.6
	200	-2.6
	260.5	-3.5
	282	-5.4
	293.4	-5.4
	303	-5.6
	309	-5
	313.4	-4.6
	332.7	-4.2
	352.1	-5

Reinforcements

Reinforcement 1

Type: Pile
Outside Point: (200, 14.1) ft
Inside Point: (200, -4.8) ft
Slip Surface Intersection: (200, -1.7478) ft
Total Length: 18.9 ft
Reinforcement Direction: 90 °
Applied Load Option: Variable
F of S Dependent: No
Pile Spacing: 1 ft
Shear Capacity: 0 lbs
Shear Safety Factor: 1
Shear Load Used: 0 lbs

Shear Option: [Parallel to Slip](#)
Resisting Force Used: [0 lbs/ft](#)

Tension Crack Line

	X (ft)	Y (ft)
	190	-1.5
	200.4	-1.5
	214.5	-1.5
	222	-1.5
	229.2	-1.5

Cohesion Functions

MARSH 1

Model: [Spline Data Point Function](#)

Function: [Cohesion vs. X](#)

Curve Fit to Data: [100 %](#)

Segment Curvature: [0 %](#)

Y-Intercept: [200](#)

Data Points: [X \(ft\)](#), [Cohesion \(psf\)](#)

Data Point: [\(165, 200\)](#)

Data Point: [\(200, 275\)](#)

Data Point: [\(239.5, 200\)](#)

MARSH 2

Model: [Spline Data Point Function](#)

Function: [Cohesion vs. X](#)

Curve Fit to Data: [100 %](#)

Segment Curvature: [0 %](#)

Y-Intercept: [350](#)

Data Points: [X \(ft\)](#), [Cohesion \(psf\)](#)

Data Point: [\(165, 350\)](#)

Data Point: [\(200, 400\)](#)

Data Point: [\(239.5, 350\)](#)

MARSH 3

Model: [Spline Data Point Function](#)

Function: [Cohesion vs. X](#)

Curve Fit to Data: [100 %](#)

Segment Curvature: [0 %](#)

Y-Intercept: [180](#)

Data Points: [X \(ft\)](#), [Cohesion \(psf\)](#)

Data Point: [\(165, 180\)](#)

Data Point: [\(200, 250\)](#)

Data Point: [\(239.5, 180\)](#)

MARSH 4

Model: [Spline Data Point Function](#)

Function: [Cohesion vs. X](#)

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 180

Data Points: [X \(ft\)](#), [Cohesion \(psf\)](#)

Data Point: (165, 180)

Data Point: (200, 250)

Data Point: (239.5, 180)

Shear/Normal Strength Functions

Sand

Model: [Spline Data Point Function](#)

Function: [Shear Stress vs. Normal Stress](#)

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 0

Data Points: [Normal Stress \(psf\)](#), [Shear Stress \(psf\)](#)

Data Point: (-10000, 0)

Data Point: (0, 0)

Data Point: (10000, 6494)

Estimation Properties

Intact Rock Param.: 10

Geological Strength: 100

Disturbance Factor: 0

SigmaC: 600000 psf

Sigma3: 300000 psf

Num. Points: 20

Spatial Functions

Bay Sound

Model: [Linear Interpolation](#)

Limit Range By: [Data Values](#)

Data Points: [X \(ft\)](#), [Y \(ft\)](#), [Cohesion \(psf\)](#)

Data Point: (103.5, -41, 580)

Data Point: (165, -41, 580)

Data Point: (200, -41, 610)

Data Point: (239.5, -41, 580)

Data Point: (352.1, -41, 580)

Data Point: (103.5, -70, 855)

Data Point: (165, -70, 855)

Data Point: (200, -70, 885)

Data Point: (239.5, -70, 855)

Data Point: (352.1, -70, 855)

Regions

	Material	Points	Area (ft ²)
Region 1	MARSH 3, EL. -8 to -12.5	1,7,15,16	173.7
Region 2	MARSH 3, EL. -8 to -12.5	2,1,16,17	260.55
Region 3	MARSH 4, EL. -12.5 to -20	2,17,18,3	723.75
Region 4	BAY SOUND CLAY, EL. -41 to -70	4,19,11,12,20,5	7209.4
Region 5	MARSH 3, EL. -8 to -12.5	15,8,9,17,16	684.45
Region 6	MARSH 4, EL. -12.5 to -20	17,9,10,18	1140.75
Region 7	BEACH SAND, EL. -20 TO -41	3,18,10,11,19,4	5220.6
Region 8	EMB FILL to EL. -1.5	33,34,35,36,38,37,39,40,41,42,43,44,45,46,13	162.855
Region 9	MARSH 1, EL. -1.5 TO -5	73,29,30,31,32,33,13,14	193.77
Region 10	MARSH 2, EL. -5 to -8	21,22,23,24,25,26,27,28,73,14,15,7	222.71
Region 11	EMB FILL to EL. -1.5	59,60,13,46,49,50,51,52,53,54,55,56,57,58	198.42
Region 12	MARSH 1, EL. -1.5 TO -5	65,14,13,60,61,62,63,64	204.175
Region 13	MARSH 1, EL. -1.5 TO -5	74,70,71,72,6	22.16
Region 14	MARSH 2, EL. -5 to -8	14,65,66,67,68,69,74,6,8,15	442.39
Region 15	Sheet Pile	46,75,47,48,49	8.775
Region 16	Berm	58,76,69,68,67,66,65,64,63,62,61,60,59	172.285

Points

	X (ft)	Y (ft)
Point 1	103.5	-9.8
Point 2	103.5	-12.5
Point 3	103.5	-20
Point 4	103.5	-41
Point 5	103.5	-70
Point 6	352.1	-5
Point 7	103.5	-8
Point 8	352.1	-8
Point 9	352.1	-12.5
Point 10	352.1	-20
Point 11	352.1	-41
Point 12	352.1	-70
Point 13	200	-1.5
Point 14	200	-5
Point 15	200	-8
Point 16	200	-9.8
Point 17	200	-12.5
Point 18	200	-20
Point 19	200	-41
Point 20	200	-70
Point 21	103.5	-7
Point 22	104.4	-7.1
Point 23	113.7	-7.1

Point 24	114.4	-7.2
Point 25	123.7	-7.1
Point 26	124.4	-7.3
Point 27	133.5	-6.8
Point 28	134.3	-6
Point 29	143.5	-3.9
Point 30	144.2	-3.1
Point 31	149.8	-1.8
Point 32	153.4	-2
Point 33	154.8	-1.4
Point 34	163.2	-0.9
Point 35	170.9	-0.5
Point 36	171.3	-0.4
Point 37	174.2	0.2
Point 38	173.9	0.2
Point 39	178.6	2.2
Point 40	182.5	3.4
Point 41	185.5	4.8
Point 42	191.4	6
Point 43	191.8	6.1
Point 44	195	6.1
Point 45	198.9	6.1
Point 46	200	6
Point 47	200	13.9
Point 48	200.9	14.1
Point 49	201.3	6.1
Point 50	201.5	6
Point 51	206.9	6
Point 52	208.4	6.1
Point 53	214.5	5.7
Point 54	215.2	5.7
Point 55	221	4.2
Point 56	222	3.9
Point 57	229.2	1.5
Point 58	231.5	0.6
Point 59	238.3	-1.3
Point 60	239.5	-1.4
Point 61	248.5	-2.1
Point 62	253.8	-2.7
Point 63	260.5	-3.5
Point 64	269.3	-4.7
Point 65	271.1	-5
Point 66	282	-5.4
Point 67	286.5	-5.5
Point 68	293.4	-5.4
Point 69	303	-5.6
Point 70	313.4	-4.6
Point 71	332.7	-4.2

Point 72	352.1	-4.8
Point 73	139.5	-5
Point 74	309	-5
Point 75	200	6.1
Point 76	293.5	-2.5

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.01	(160.046, 45.098)	29.40439	(200.411, 13.9913)	(129.98, -6.99342)
2	3158	1.04	(160.046, 45.098)	61.757	(200.574, 14.0276)	(127.121, -7.15048)

Slices of Slip Surface: Optimized

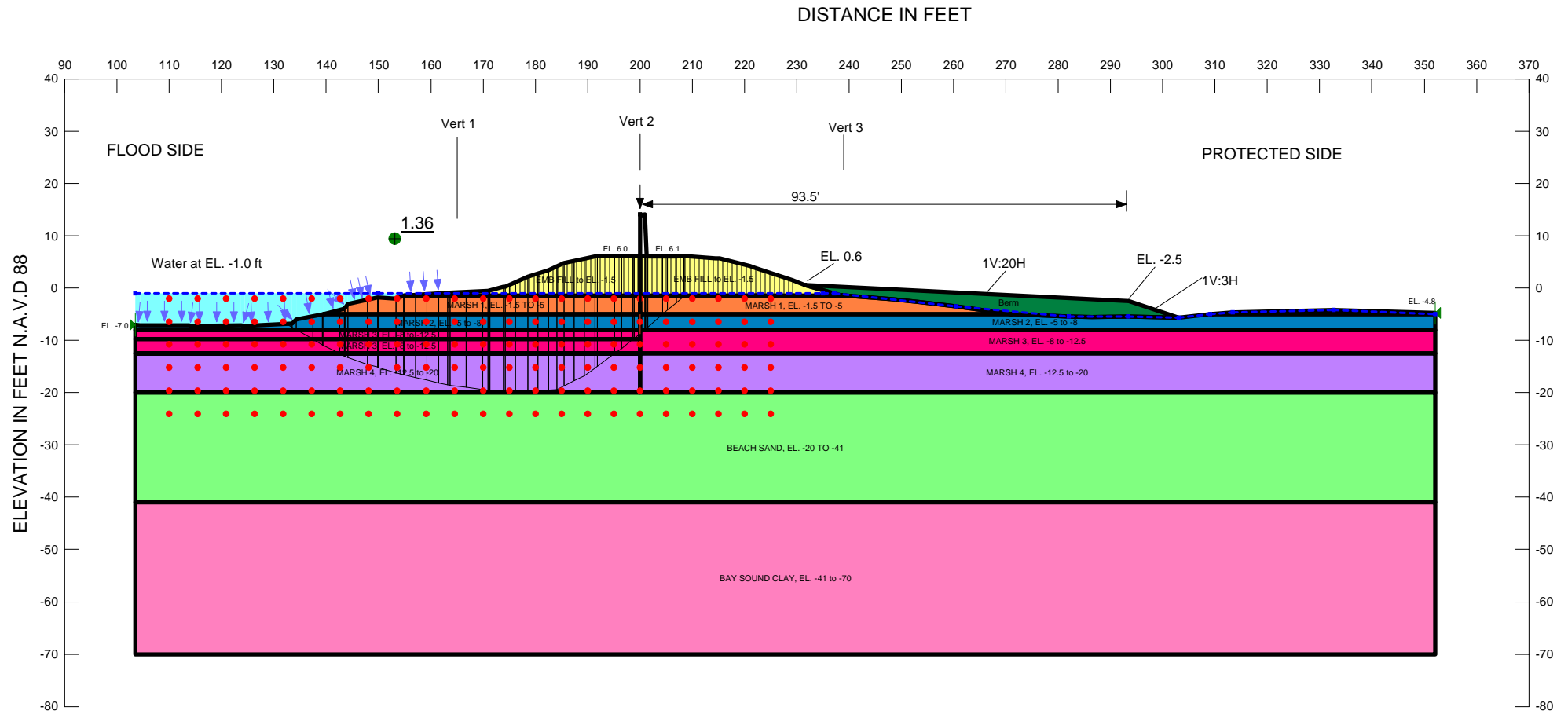
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	130.73855	-7.4967115	305.5549	703.85528	0	350
2	Optimized	132.09785	-8.39827	361.81113	633.55286	0	180
3	Optimized	133.09915	-8.983755	398.34536	619.62448	0	180
4	Optimized	133.9	-9.357793	421.68589	708.91431	0	180
5	Optimized	134.5734	-9.672308	441.31327	712.53377	0	180
6	Optimized	136.1125	-10.39116	486.16264	780.30123	0	180
7	Optimized	138.4391	-11.38656	548.27063	844.44863	0	180
8	Optimized	140.4306	-12.1454	595.65768	922.0544	0	180
9	Optimized	142.4306	-12.907485	643.17631	1016.9971	0	180
10	Optimized	143.5605	-13.338015	670.05061	1093.358	0	180
11	Optimized	143.9105	-13.44019	676.43074	1072.0371	0	180
12	Optimized	145.2769	-13.813665	699.73415	1126.2746	0	180
13	Optimized	146.9049	-14.258625	727.49377	1199.6965	0	180
14	Optimized	148.628	-14.616305	749.80854	1241.4188	0	180
15	Optimized	150.7	-14.98237	772.64541	1305.6137	0	180
16	Optimized	152.5	-15.300375	792.50452	1332.0925	0	180
17	Optimized	153.94485	-15.555645	808.42858	1379.7017	0	180
18	Optimized	154.64485	-15.662475	815.10432	1374.3389	0	180
19	Optimized	155.85	-15.744545	820.24302	1397.4775	0	180
20	Optimized	157.95	-15.887555	829.1272	1428.3108	0	180
21	Optimized	160.05	-16.03056	838.0589	1459.1442	0	180
22	Optimized	162.15	-16.173565	846.99059	1490.025	0	180
23	Optimized	163.5086	-16.266085	852.76037	1509.6849	0	180
24	Optimized	164.99765	-16.2584	852.2862	1476.469	0	180
25	Optimized	167.3586	-16.201	848.68702	1485.107	0	184.72
26	Optimized	169.71955	-16.1436	845.13018	1493.7874	0	189.44
27	Optimized	171.1	-16.110035	843.02589	1503.4057	0	192.2
28	Optimized	172.38225	-16.07886	841.09646	1535.0438	0	194.76
29	Optimized	173.68225	-16.008095	836.65412	1479.7306	0	197.36
30	Optimized	174.05	-15.93302	831.97251	1477.295	0	198.1
31	Optimized	175.85615	-15.56429	808.96834	1522.0366	0	201.71
32	Optimized	178.05615	-15.02817	775.5218	1503.4093	0	206.11
33	Optimized	179.575	-14.47518	741.02951	1504.9	0	209.15

34	Optimized	181.525	-13.76522	696.69688	1495.6479	0	213.05
35	Optimized	182.80065	-13.30078	667.73139	1494.8126	0	215.6
36	Optimized	183.7681	-12.84566	639.3282	1427.86	0	217.54
37	Optimized	184.96745	-12.22392	600.53595	1433.0545	0	219.93
38	Optimized	186.14535	-11.61328	562.43109	1431.9054	0	222.29
39	Optimized	187.91035	-10.53936	495.40888	1337.0152	0	225.82
40	Optimized	190.215	-9.0174645	400.43787	1284.4081	0	230.43
41	Optimized	191.5779	-8.1174645	344.28947	1254.1538	0	233.16
42	Optimized	191.7779	-7.985392	336.04852	1184.1952	0	388.25
43	Optimized	191.8428	-7.942507	333.36874	1181.0605	0	388.35
44	Optimized	193.4428	-6.6677695	253.83396	998.5155	0	390.63
45	Optimized	195.26315	-5.2106545	162.90711	873.58435	0	393.23
46	Optimized	195.76475	-4.80914	137.8504	908.18143	0	265.92
47	Optimized	197.39185	-3.60914	62.97015	831.43667	0	269.41
48	Optimized	198.84025	-2.5565905	-2.7087584	739.68794	0	272.51
49	Optimized	199.3128	-2.2131955	-24.13611	705.86829	0	273.53
50	Optimized	199.8628	-1.83049	-48.017143	711.19054	0	274.71
51	Optimized	200.20545	-1.623885	-61.099784	-2252.7667	0	274.61

Slices of Slip Surface: 3158

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	3158	127.8154	-7.5752415	310.45601	674.41286	0	350
2	3158	130.13435	-8.9	393.11046	634.04305	0	180
3	3158	132.62955	-10.23132	476.19685	727.50724	0	180
4	3158	133.9	-10.84957	514.77517	830.05897	0	180
5	3158	136.0329	-11.76825	572.09232	873.6748	0	180
6	3158	138.6329	-12.820565	637.78877	967.66272	0	180
7	3158	140.5	-13.474825	678.5666	1048.987	0	180
8	3158	142.5	-14.104885	717.88696	1126.711	0	180
9	3158	143.85	-14.496365	742.33273	1194.4763	0	180
10	3158	145.2769	-14.85676	764.84404	1237.5182	0	180
11	3158	148.0769	-15.462575	802.63402	1335.4839	0	180
12	3158	151.6	-16.05171	839.39317	1406.6474	0	180
13	3158	154.1	-16.368025	859.13316	1443.7618	0	180
14	3158	156.2	-16.52311	868.80985	1485.1109	0	180
15	3158	159	-16.63419	875.73141	1496.428	0	180
16	3158	161.8	-16.618105	874.7181	1493.5396	0	180
17	3158	164.48335	-16.485835	866.46755	1476.8459	0	180
18	3158	167.05	-16.246825	851.57101	1447.8914	0	184.1
19	3158	169.61665	-15.898925	829.84645	1407.0439	0	189.23
20	3158	171.1	-15.66117	815.02082	1383.9071	0	192.2
21	3158	172.6	-15.35481	795.9031	1379.2641	0	195.2
22	3158	174.05	-15.049915	776.88676	1369.3725	0	198.1
23	3158	175.3	-14.73454	757.18802	1381.7547	0	200.6
24	3158	177.5	-14.129925	719.45457	1410.7431	0	205
25	3158	179.53135	-13.496035	679.92833	1413.499	0	209.06
26	3158	181.39405	-12.843155	639.15725	1391.7589	0	212.79

27	3158	182.4127	-12.46608	615.64941	1378.8048	0	214.83
28	3158	184	-11.80066	574.12822	1397.3485	0	218
29	3158	186.9161	-10.48458	491.99667	1385.9957	0	223.83
30	3158	189.8661	-8.953737	396.46116	1316.6757	0	229.73
31	3158	191.49085	-8.053737	340.31144	1274.6223	0	232.98
32	3158	191.69085	-7.9348585	332.89715	1213.3598	0	388.13
33	3158	193.4	-6.8422505	264.71263	1096.3736	0	390.57
34	3158	195.57905	-5.407392	175.18337	940.67664	0	393.68
35	3158	197.52905	-3.9523455	84.385031	848.22605	0	269.71
36	3158	199.0867	-2.7523455	9.5063831	725.14751	0	273.04
37	3158	199.6367	-2.2965355	-18.936227	674.60375	0	274.22
38	3158	200.287	-1.7465355	-53.522911	-1491.5051	0	274.46



Name: EMB FILL to EL. -1.5 Model: Undrained (Phi=0) Unit Weight: 116 pcf Cohesion: 700 psf Piezometric Line: 1
Name: MARSH 1, EL. -1.5 TO -5 Model: Spatial Mohr-Coulomb Unit Weight: 97 pcf Cohesion Fn: MARSH 1 Phi: 0 ° Piezometric Line: 1
Name: BEACH SAND, EL. -20 TO -41 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand Piezometric Line: 1
Name: Berm Model: Mohr-Coulomb Unit Weight: 110 pcf Cohesion: 400 psf Phi: 0 ° Piezometric Line: 1
Name: MARSH 2, EL. -5 TO -8 Model: Spatial Mohr-Coulomb Unit Weight: 97 pcf Cohesion Fn: MARSH 2 Phi: 0 ° Piezometric Line: 1
Name: MARSH 3, EL. -8 TO -12.5 Model: Spatial Mohr-Coulomb Unit Weight: 73 pcf Cohesion Fn: MARSH 3 Phi: 0 ° Piezometric Line: 1
Name: MARSH 4, EL. -12.5 TO -20 Model: Spatial Mohr-Coulomb Unit Weight: 111 pcf Cohesion Fn: MARSH 4 Phi: 0 ° Piezometric Line: 1
Name: BAY SOUND CLAY, EL. -41 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 105 pcf Cohesion Spatial Fn: Bay Sound Phi: 0 ° Piezometric Line: 1

Existing Condition
Sta 47+00 to 50+00

Cross Section at Sta 50+00

GENERAL NOTES

CLASSIFICATION STRATIFICATION
SHEAR STRENGTHS AND UNIT WEIGHTS OF
THE SOIL WERE BASED ON THE RESULTS OF
UNDISTURBED BORINGS AND CPT DATA. SEE
BOTH BORING AND CPT DATA PLATES.

WHERE INDICATED, SHEAR STRENGTHS BETWEEN
VERTICALS WERE ASSUMED TO VARY LINEARLY
BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL
REMEDICATION OF CANAL WALLS AND LEVEES
PROTECTED SIDE STABILITY ANALYSIS,
CASE: Name: LWL Q Case (Block)
REACH 17, STA. 37+29 TO 50+00 EAST
ORLEANS PARISH, LOUISIANA

LWL Q Case (Block)

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File Information

Created By: [Liljegren, James](#)
Revision Number: [710](#)
Last Edited By: [Jamerson, James MVK](#)
Date: [6/13/2013](#)
Time: [5:07:38 PM](#)
File Name: [Reach 17B.gsz](#)
Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix E LWL\WL -1\](#)
Last Solved Date: [6/13/2013](#)
Last Solved Time: [5:08:54 PM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Strength Units: [psf](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

LWL Q Case (Block)

Kind: [SLOPE/W](#)
Method: [Spencer](#)
Settings
 Apply Phreatic Correction: [No](#)
 PWP Conditions Source: [Piezometric Line](#)
 Use Staged Rapid Drawdown: [No](#)
Slip Surface
 Direction of movement: [Right to Left](#)
 Use Passive Mode: [No](#)
 Slip Surface Option: [Block](#)
 Critical slip surfaces saved: [1](#)
 Optimize Critical Slip Surface Location: [Yes](#)
Tension Crack
 Tension Crack Option: [Tension Crack Line](#)
 Percentage Wet: [0.5](#)
 Tension Crack Fluid Unit Weight: [62.4 pcf](#)
FOS Distribution

FOS Calculation Option: [Constant](#)

Restrict Block Crossing: [Yes](#)

Advanced

Number of Slices: [30](#)

Optimization Tolerance: [0.01](#)

Minimum Slip Surface Depth: [0.1 ft](#)

Optimization Maximum Iterations: [2000](#)

Optimization Convergence Tolerance: [1e-007](#)

Starting Optimization Points: [8](#)

Ending Optimization Points: [16](#)

Complete Passes per Insertion: [1](#)

Driving Side Maximum Convex Angle: [5 °](#)

Resisting Side Maximum Convex Angle: [1 °](#)

Materials

EMB FILL to EL. -1.5

Model: [Undrained \(Phi=0\)](#)

Unit Weight: [116 pcf](#)

Cohesion: [700 psf](#)

Pore Water Pressure

Piezometric Line: [1](#)

MARSH 1, EL. -1.5 TO -5

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [97 pcf](#)

Cohesion Fn: [MARSH 1](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: [1](#)

BEACH SAND, EL. -20 TO -41

Model: [Shear/Normal Fn.](#)

Unit Weight: [122 pcf](#)

Strength Function: [Sand](#)

Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: [1](#)

Berm

Model: [Mohr-Coulomb](#)

Unit Weight: [110 pcf](#)

Cohesion: [400 psf](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: 1

MARSH 2, EL. -5 to -8

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [97 pcf](#)

Cohesion Fn: [MARSH 2](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: 1

MARSH 3, EL. -8 to -12.5

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [73 pcf](#)

Cohesion Fn: [MARSH 3](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: 1

MARSH 4, EL. -12.5 to -20

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [111 pcf](#)

Cohesion Fn: [MARSH 4](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: 1

BAY SOUND CLAY, EL. -41 to -70

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [105 pcf](#)

Cohesion Spatial Fn: [Bay Sound](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: 1

Slip Surface Limits

Left Coordinate: [\(103.5, -7\) ft](#)

Right Coordinate: [\(352.1, -4.8\) ft](#)

Slip Surface Block

Left Grid

Upper Left: [\(110, -2\) ft](#)

Lower Left: [\(110, -24\) ft](#)

Lower Right: (170, -24.0025) ft

X Increments: 11

Y Increments: 5

Starting Angle: 135 °

Ending Angle: 180 °

Angle Increments: 4

Right Grid

Upper Left: (175, -2) ft

Lower Left: (175, -24) ft

Lower Right: (225, -24) ft

X Increments: 10

Y Increments: 5

Starting Angle: 0 °

Ending Angle: 45 °

Angle Increments: 4

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
	103.5	-1
	150	-1
	235	-1
	237.2	-1
	260.5	-3.5
	282	-5.4
	293.4	-5.4
	303	-5.6
	309	-5
	313.4	-4.6
	332.7	-4.2
	352.1	-5

Reinforcements

Reinforcement 1

Type: Pile

Outside Point: (200, 14.1) ft

Inside Point: (200, -4.8) ft

Slip Surface Intersection: (200, -8.6978) ft

Total Length: 18.9 ft

Reinforcement Direction: 90 °

Applied Load Option: Variable

F of S Dependent: No
Pile Spacing: 1 ft
Shear Capacity: 0 lbs
Shear Safety Factor: 1
Shear Load Used: 0 lbs
Shear Option: Parallel to Slip
Resisting Force Used: 0 lbs/ft

Tension Crack Line

	X (ft)	Y (ft)
	175	-1.5
	200	-1.5
	208.4	-1.5
	214.5	-1.5
	222	-1.5
	229.2	-1.5

Cohesion Functions

MARSH 1

Model: Spline Data Point Function
Function: Cohesion vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 200
Data Points: X (ft), Cohesion (psf)
Data Point: (165, 200)
Data Point: (200, 275)
Data Point: (239.5, 200)

MARSH 2

Model: Spline Data Point Function
Function: Cohesion vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 350
Data Points: X (ft), Cohesion (psf)
Data Point: (165, 350)
Data Point: (200, 400)
Data Point: (239.5, 350)

MARSH 3

Model: Spline Data Point Function
Function: Cohesion vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %

Y-Intercept: 180

Data Points: X (ft), Cohesion (psf)

Data Point: (165, 180)

Data Point: (200, 250)

Data Point: (239.5, 180)

MARSH 4

Model: Spline Data Point Function

Function: Cohesion vs. X

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 180

Data Points: X (ft), Cohesion (psf)

Data Point: (165, 180)

Data Point: (200, 250)

Data Point: (239.5, 180)

Shear/Normal Strength Functions

Sand

Model: Spline Data Point Function

Function: Shear Stress vs. Normal Stress

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 0

Data Points: Normal Stress (psf), Shear Stress (psf)

Data Point: (-10000, 0)

Data Point: (0, 0)

Data Point: (10000, 6494)

Estimation Properties

Intact Rock Param.: 10

Geological Strength: 100

Disturbance Factor: 0

SigmaC: 600000 psf

Sigma3: 300000 psf

Num. Points: 20

Spatial Functions

Bay Sound

Model: Linear Interpolation

Limit Range By: Data Values

Data Points: X (ft), Y (ft), Cohesion (psf)

Data Point: (103.5, -41, 580)

Data Point: (165, -41, 580)

Data Point: (200, -41, 610)

Data Point: (239.5, -41, 580)
 Data Point: (352.1, -41, 580)
 Data Point: (103.5, -70, 855)
 Data Point: (165, -70, 855)
 Data Point: (200, -70, 885)
 Data Point: (239.5, -70, 855)
 Data Point: (352.1, -70, 855)

Regions

	Material	Points	Area (ft ²)
Region 1	MARSH 3, EL. -8 to -12.5	1,7,15,16	173.7
Region 2	MARSH 3, EL. -8 to -12.5	2,1,16,17	260.55
Region 3	MARSH 4, EL. -12.5 to -20	2,17,18,3	723.75
Region 4	BAY SOUND CLAY, EL. -41 to -70	4,19,11,12,20,5	7209.4
Region 5	MARSH 3, EL. -8 to -12.5	15,8,9,17,16	684.45
Region 6	MARSH 4, EL. -12.5 to -20	17,9,10,18	1140.75
Region 7	BEACH SAND, EL. -20 TO -41	3,18,10,11,19,4	5220.6
Region 8	EMB FILL to EL. -1.5	33,34,35,36,38,37,39,40,41,42,43,44,45,46,13	162.855
Region 9	MARSH 1, EL. -1.5 TO -5	73,29,30,31,32,33,13,14	193.77
Region 10	MARSH 2, EL. -5 to -8	21,22,23,24,25,26,27,28,73,14,15,7	222.71
Region 11	EMB FILL to EL. -1.5	59,60,13,46,49,50,51,52,53,54,55,56,57,58	198.42
Region 12	MARSH 1, EL. -1.5 TO -5	65,14,13,60,61,62,63,64	204.175
Region 13	MARSH 1, EL. -1.5 TO -5	74,70,71,72,6	22.16
Region 14	MARSH 2, EL. -5 to -8	14,65,66,67,68,69,74,6,8,15	442.39
Region 15		46,75,47,48,49	8.775
Region 16	Berm	58,76,69,68,67,66,65,64,63,62,61,60,59	172.285

Points

	X (ft)	Y (ft)
Point 1	103.5	-9.8
Point 2	103.5	-12.5
Point 3	103.5	-20
Point 4	103.5	-41
Point 5	103.5	-70
Point 6	352.1	-5
Point 7	103.5	-8
Point 8	352.1	-8
Point 9	352.1	-12.5
Point 10	352.1	-20
Point 11	352.1	-41
Point 12	352.1	-70
Point 13	200	-1.5
Point 14	200	-5
Point 15	200	-8
Point 16	200	-9.8
Point 17	200	-12.5

Point 18	200	-20
Point 19	200	-41
Point 20	200	-70
Point 21	103.5	-7
Point 22	104.4	-7.1
Point 23	113.7	-7.1
Point 24	114.4	-7.2
Point 25	123.7	-7.1
Point 26	124.4	-7.3
Point 27	133.5	-6.8
Point 28	134.3	-6
Point 29	143.5	-3.9
Point 30	144.2	-3.1
Point 31	149.8	-1.8
Point 32	153.4	-2
Point 33	154.8	-1.4
Point 34	163.2	-0.9
Point 35	170.9	-0.5
Point 36	171.3	-0.4
Point 37	174.2	0.2
Point 38	173.9	0.2
Point 39	178.6	2.2
Point 40	182.5	3.4
Point 41	185.5	4.8
Point 42	191.4	6
Point 43	191.8	6.1
Point 44	195	6.1
Point 45	198.9	6.1
Point 46	200	6
Point 47	200	13.9
Point 48	200.9	14.1
Point 49	201.3	6.1
Point 50	201.5	6
Point 51	206.9	6
Point 52	208.4	6.1
Point 53	214.5	5.7
Point 54	215.2	5.7
Point 55	221	4.2
Point 56	222	3.9
Point 57	229.2	1.5
Point 58	231.5	0.6
Point 59	238.3	-1.3
Point 60	239.5	-1.4
Point 61	248.5	-2.1
Point 62	253.8	-2.7
Point 63	260.5	-3.5
Point 64	269.3	-4.7
Point 65	271.1	-5

Point 66	282	-5.4
Point 67	286.5	-5.5
Point 68	293.4	-5.4
Point 69	303	-5.6
Point 70	313.4	-4.6
Point 71	332.7	-4.2
Point 72	352.1	-4.8
Point 73	139.5	-5
Point 74	309	-5
Point 75	200	6.1
Point 76	293.5	-2.5

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.36	(172.55, -0.185)	32.20122	(208.428, 6.09815)	(132.506, -6.85463)
2	16074	1.43	(172.55, -0.185)	32.971	(212.089, 5.85813)	(133.54, -6.75957)

Slices of Slip Surface: Optimized

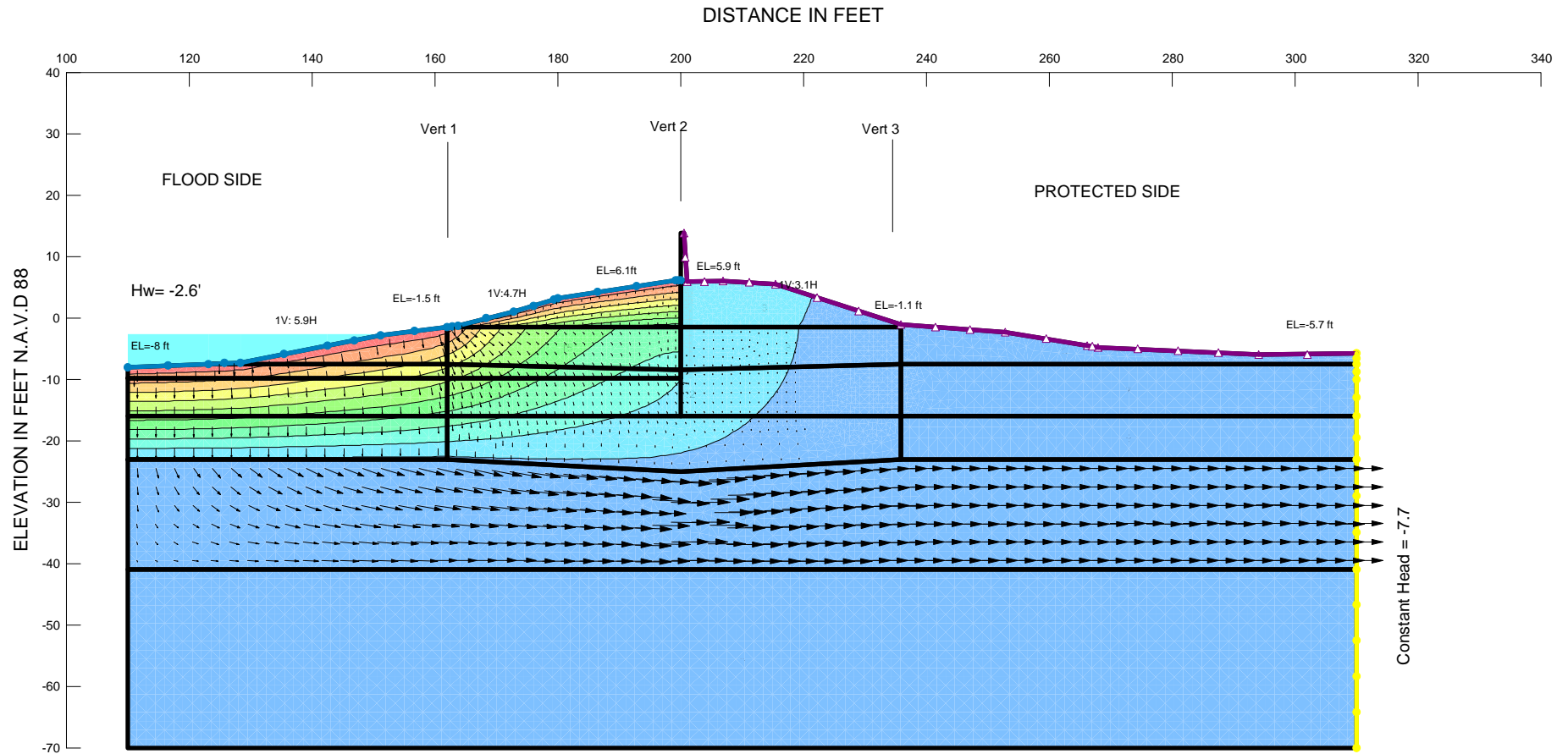
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	133.0029	-7.147216	383.58618	576.84856	0	350
2	Optimized	133.9	-7.675251	416.53686	661.43688	0	350
3	Optimized	135.9049	-8.8553475	490.18279	685.69744	0	180
4	Optimized	138.39585	-10.32154	581.67526	813.88823	0	180
5	Optimized	139.39095	-10.898485	617.68512	849.48053	0	180
6	Optimized	141.0216	-11.726945	669.34879	927.85429	0	180
7	Optimized	143.0216	-12.74304	732.76529	1032.4706	0	180
8	Optimized	143.51665	-12.994535	748.44871	1074.5074	0	180
9	Optimized	143.86665	-13.122315	756.43758	1073.0721	0	180
10	Optimized	146.0667	-13.909825	805.57223	1182.9131	0	180
11	Optimized	148.8667	-14.85059	864.25232	1298.4355	0	180
12	Optimized	149.9	-15.152375	883.10604	1338.9135	0	180
13	Optimized	151.7	-15.678085	915.91183	1394.6467	0	180
14	Optimized	154.1	-16.379035	959.62328	1481.9447	0	180
15	Optimized	154.837	-16.59428	973.08587	1515.9766	0	180
16	Optimized	155.98165	-16.8539	989.27311	1534.6021	0	180
17	Optimized	158.19695	-17.351545	1020.3228	1597.7144	0	180
18	Optimized	160.4123	-17.84919	1051.3724	1660.8267	0	180
19	Optimized	162.36	-18.2867	1078.7141	1719.4147	0	180
20	Optimized	163.4257	-18.52609	1093.6185	1753.6154	0	180
21	Optimized	165.20785	-18.78762	1109.9464	1773.9659	0	180.42
22	Optimized	168.32075	-19.20928	1136.2728	1840.9759	0	186.64
23	Optimized	170.3886	-19.467815	1152.386	1873.1383	0	190.78
24	Optimized	171.1	-19.534175	1156.5292	1889.5968	0	192.2
25	Optimized	172.6	-19.674095	1165.2492	1946.3965	0	195.2
26	Optimized	174.05	-19.809355	1173.7046	1996.7979	0	198.1
27	Optimized	175.1941	-19.91608	1180.3467	2061.6755	0	200.39

28	Optimized	177.3941	-19.915005	1180.3	2134.2711	0	204.79
29	Optimized	179.575	-19.74535	1169.6971	2213.518	0	209.15
30	Optimized	181.525	-19.593655	1160.2385	2266.0772	0	213.05
31	Optimized	183.3361	-19.452765	1151.4325	2330.2303	0	216.67
32	Optimized	184.8361	-19.04962	1126.2929	2248.4247	0	219.67
33	Optimized	186.4574	-18.223935	1074.7714	2215.1134	0	222.91
34	Optimized	188.3722	-17.24876	1013.9011	2152.4747	0	226.74
35	Optimized	190.3648	-16.007415	936.4449	2004.9831	0	230.73
36	Optimized	191.6	-15.10803	880.33246	1936.7355	0	233.2
37	Optimized	193.4	-13.797385	798.55235	1800.368	0	236.8
38	Optimized	195.0909	-12.566185	721.7502	1667.038	0	240.18
39	Optimized	195.8571	-12.00829	686.8973	1624.6474	0	241.71
40	Optimized	197.58825	-10.65829	602.67018	1507.0613	0	245.18
41	Optimized	198.77205	-9.695994	542.61667	1438.386	0	247.54
42	Optimized	199.45	-9.1449	508.2443	1393.4957	0	248.9
43	Optimized	200.45	-8.332013	457.51882	1334.2323	0	249.2
44	Optimized	200.96145	-7.916262	431.5741	1227.657	0	398.78
45	Optimized	201.16145	-7.7461965	420.95986	1195.3646	0	398.53
46	Optimized	201.4	-7.53939	408.0564	1171.9579	0	398.23
47	Optimized	202.9146	-6.2263485	326.12072	1045.4237	0	396.31
48	Optimized	204.81075	-4.582525	223.55226	967.3274	0	265.87
49	Optimized	206.09615	-3.481885	154.87093	870.23659	0	263.43
50	Optimized	207.65	-2.1613285	72.465609	754.57704	0	260.47
51	Optimized	208.4141	-1.5119685	31.947387	-76.393454	0	259.02

Slices of Slip Surface: 16074

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	16074	133.9202	-6.916883	369.21329	526.61699	0	350
2	16074	135.41755	-7.5370975	407.91669	595.80596	0	350
3	16074	138.01755	-8.614053	475.10357	648.57386	0	180
4	16074	140.19035	-9.514053	531.27877	732.98752	0	180
5	16074	142.19035	-10.34248	582.97006	813.61148	0	180
6	16074	143.85	-11.029935	625.86243	897.35104	0	180
7	16074	145.79955	-11.837455	676.24937	977.43679	0	180
8	16074	148.59955	-12.997255	748.62396	1105.5238	0	180
9	16074	149.9	-13.53593	782.24894	1175.2212	0	180
10	16074	151.7	-14.28151	828.77439	1256.0687	0	180
11	16074	154.1	-15.27562	890.81789	1376.8445	0	180
12	16074	155.92	-16.02949	937.82003	1475.6086	0	180
13	16074	158.16	-16.95733	995.72747	1588.0001	0	180
14	16074	160.4	-17.88517	1053.6349	1700.3505	0	180
15	16074	162.36	-18.69703	1104.3109	1801.8399	0	180
16	16074	163.87275	-19.32362	1143.3692	1882.8409	0	180
17	16074	166.1341	-19.602095	1160.7753	1839.0928	0	182.27
18	16074	169.31135	-19.601745	1160.7438	1858.5435	0	188.62
19	16074	171.1	-19.601545	1160.725	1874.1	0	192.2
20	16074	172.6	-19.601375	1160.7308	1914.8462	0	195.2

21	16074	174.05	-19.601215	1160.7	1949.7667	0	198.1
22	16074	175.3	-19.60108	1160.7273	2007.9091	0	200.6
23	16074	177.5	-19.600835	1160.6818	2124.0909	0	205
24	16074	180.55	-19.600495	1160.6667	2252	0	211.1
25	16074	183.75	-19.60014	1160.64	2389.56	0	217.5
26	16074	185.25	-19.432955	1150.2218	2278.5593	0	220.5
27	16074	186.975	-18.280345	1078.2892	2199.8994	0	223.95
28	16074	189.925	-16.30922	955.28808	2052.7997	0	229.85
29	16074	191.6	-15.190025	885.45279	1970.3336	0	233.2
30	16074	193.4	-13.9873	810.39711	1845.0052	0	236.8
31	16074	195.31295	-12.709105	730.65338	1705.8454	0	240.63
32	16074	197.26295	-11.40616	649.33432	1604.302	0	244.53
33	16074	199.28335	-10.05616	565.10568	1503.1241	0	248.57
34	16074	199.83335	-9.68866	542.17357	1471.0615	0	249.67
35	16074	200.45	-9.27664	516.46263	1444.2624	0	249.2
36	16074	201.1	-8.842324	489.36145	1419.6097	0	248.05
37	16074	201.4	-8.64187	476.84773	1401.7328	0	247.52
38	16074	201.9303	-8.287526	454.74351	1371.4088	0	246.58
39	16074	203.48305	-7.25	390.01026	1217.2913	0	395.59
40	16074	205.75275	-5.733444	295.36562	1075.7271	0	392.72
41	16074	207.65	-4.465754	216.26521	1017.9403	0	260.47
42	16074	210.2443	-2.73231	108.09704	843.69524	0	255.55



Name: EMBANKMENT FILL, EL. +5.4 TO -1.5 Model: Saturated Only K-Sat: 3.28e-008 ft/sec K-Ratio: 1
 Name: BEACH SAND, EL. -23/-25 TO -41 Model: Saturated Only K-Sat: 0.00049 ft/sec K-Ratio: 1
 Name: BAY SOUND CLAY, EL. -41 TO -70 Model: Saturated Only K-Sat: 3.28e-008 ft/sec K-Ratio: 1
 Name: Sheet Pile Model: Saturated Only K-Sat: 1e-010 ft/sec K-Ratio: 1
 Name: LACUSTRINE, EL. -16 TO -23/-25 Model: Saturated Only K-Sat: 3.28e-007 ft/sec K-Ratio: 1
 Name: MARSH, EL. -1.5 TO -16 Model: Saturated Only K-Sat: 3.28e-007 ft/sec K-Ratio: 1

GENERAL NOTES

CLASSIFICATION STRATIFICATION
 SHEAR STRENGTHS AND UNIT WEIGHTS OF
 THE SOIL WERE BASED ON THE RESULTS OF
 UNDISTURBED BORINGS AND CPT DATA. SEE
 BOTH BORING AND CPT DATA PLATES.

WHERE INDICATED, SHEAR STRENGTHS BETWEEN
 VERTICALS WERE ASSUMED TO VARY LINEARLY
 BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.
 Hw IS CANAL WATER LEVEL

LAKE PONTCHARTRAIN, LA. AND VICINITY
 HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 18A,
 PROTECTED SIDE STABILITY ANALYSIS,
 CASE: LWL Q Case (seepage)
 STA. 50+00 TO 61+00 EAST
 ORLEANS PARISH, LOUISIANA

LWL Q Case (seepage)

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File Information

Created By: [Liljegren, James](#)
Revision Number: [453](#)
Last Edited By: [Jamerson, James MVK](#)
Date: [10/4/2013](#)
Time: [4:48:48 PM](#)
File Name: [Reach 18A.gsz](#)
Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix E LWL\](#)
Last Solved Date: [10/4/2013](#)
Last Solved Time: [4:48:58 PM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Mass(M) Units: [lbs](#)
Mass Flux Units: [lbs/sec](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

LWL Q Case (seepage)

Kind: [SEEP/W](#)
Method: [Steady-State](#)
Settings
 Include Air Flow: [No](#)
Control
 Apply Runoff: [No](#)
Convergence
 Convergence Type: [Head Vector Norm](#)
 Maximum Number of Iterations: [500](#)
 Tolerance: [0.001](#)
 Maximum Change in K: [0.1](#)
 Rate of Change in K: [1.02](#)
 Minimum Change in K: [1e-005](#)
 Equation Solver: [Parallel Direct](#)
 Potential Seepage Max # of Reviews: [10](#)
Time

Starting Time: 0 sec

Duration: 0 sec

Ending Time: 0 sec

Materials

EMBANKMENT FILL, EL. +5.4 TO -1.5

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-008 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

BEACH SAND, EL. -23/-25 TO -41

Model: Saturated Only

Hydraulic

K-Sat: 0.00049 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

BAY SOUND CLAY, EL. -41 TO -70

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-008 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

Sheet Pile

Model: Saturated Only

Hydraulic

K-Sat: 1e-010 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

LACUSTRINE, EL. -16 TO -23/-25

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-007 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

MARSH, EL. -1.5 TO -16

Model: Saturated Only
Hydraulic
K-Sat: 3.28e-007 ft/sec
Volumetric Water Content: 0 ft³/ft³
Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

Boundary Conditions

Drainage

Review: true
Type: Total Flux (Q) 0

Curb

Type: Head (H) -7.7

Canal Water (Global)

Type: Head (H) -2.6

Regions

	Points	Area (ft²)	Material
Region 1	5,20,21,22	5.825	
Region 2	37,2,49,54,3,4,5,25	162.72219	EMBANKMENT FILL, EL. +5.4 TO -1.5
Region 3	5,22,48,6,7,39,25	188.56	EMBANKMENT FILL, EL. +5.4 TO -1.5
Region 4	19,18,52,14,15,53	5800	BAY SOUND CLAY, EL. -41 TO -70
Region 5	17,44,28,34,13,14,52,18	3526.2	BEACH SAND, EL. -23/-25 TO -41
Region 6	40,9,30,10,11,32,38,39,7,8	239.50247	MARSH, EL. -1.5 TO -16
Region 7	33,32,11,29,12	630.7	MARSH, EL. -1.5 TO -16
Region 8	23,47,25,39,38,32	232.7	MARSH, EL. -1.5 TO -16
Region 9	34,33,12,13	519.4	LACUSTRINE, EL. -16 TO -23/-25
Region 10	17,16,43,44	364	LACUSTRINE, EL. -16 TO -23/-25
Region 11	44,43,27,33,34,28	590.4	LACUSTRINE, EL. -16 TO -23/-25
Region 12	27,33,32,23,24,46,43	522	MARSH, EL. -1.5 TO -16
Region 13	16,35,46,43	322.4	MARSH, EL. -1.5 TO -16
Region 14	42,41,37,31,45,1,55	114.65366	MARSH, EL. -1.5 TO -16
Region 15	42,41,37,25,47,23	247	MARSH, EL. -1.5 TO -16
Region 16	46,42,23,24	68.4	MARSH, EL. -1.5 TO -16
Region 17	35,36,26,55,42,46	116.33214	MARSH, EL. -1.5 TO -16

Lines

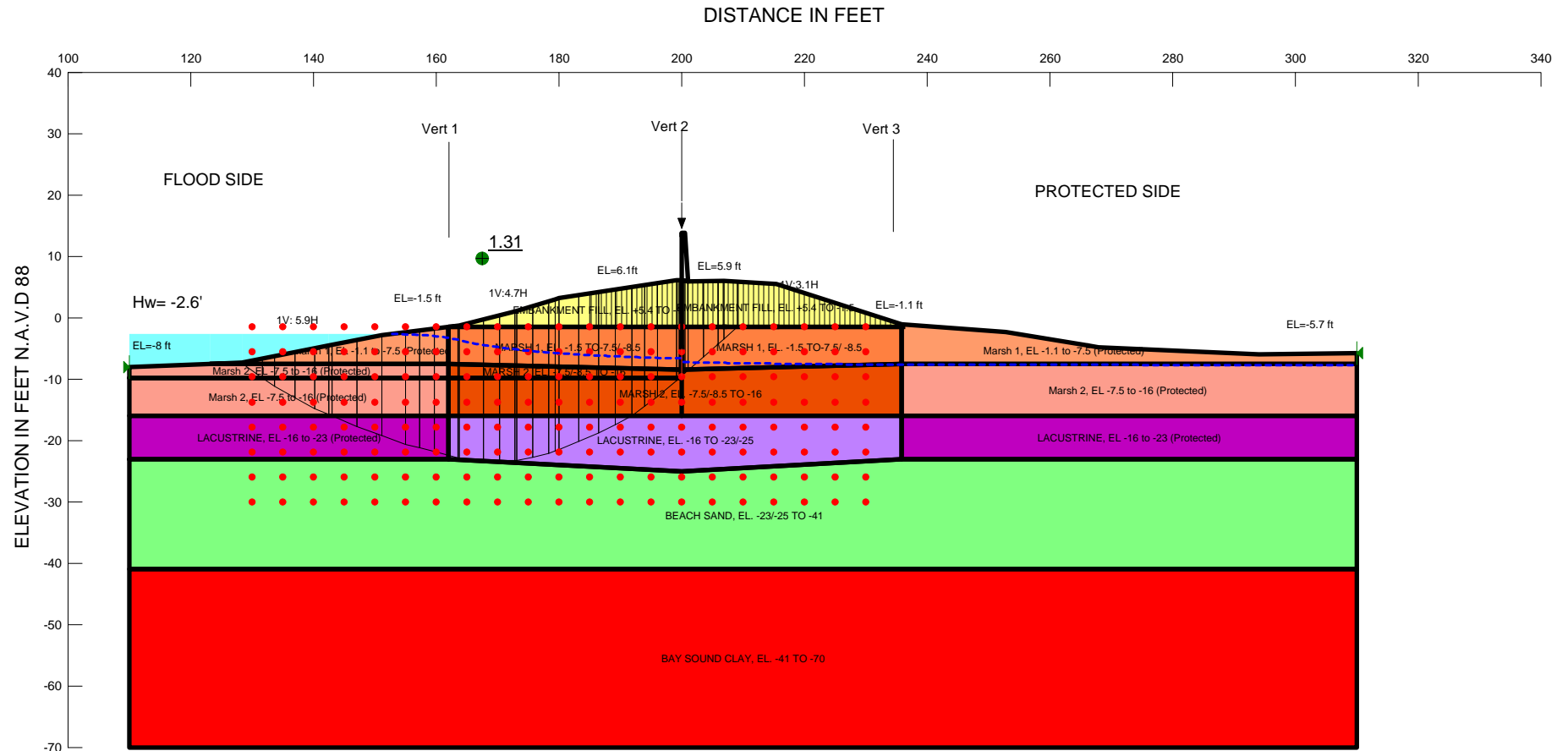
	Start Point	End Point	Hydraulic Boundary	Left Side Material
Line 1	5	20		
Line 2	20	21		
Line 3	21	22	Drainage	
Line 4	22	5		Sheet Pile
Line 5	4	5	Canal Water (Global)	
Line 6	5	25		Sheet Pile
Line 7	6	7	Drainage	
Line 8	23	24		Sheet Pile
Line 9	19	18		
Line 10	14	15	Curb	
Line 11	13	14	Curb	
Line 12	18	17		
Line 13	4	3	Canal Water (Global)	
Line 14	28	34		
Line 15	34	13		
Line 16	37	25		
Line 17	37	2	Canal Water (Global)	
Line 18	7	39		
Line 19	39	25		
Line 20	39	38		
Line 21	40	9	Drainage	
Line 22	9	30	Drainage	
Line 23	30	10	Drainage	
Line 24	10	11	Curb	
Line 25	11	32		
Line 26	32	38		
Line 27	33	32		
Line 28	11	29	Curb	
Line 29	29	12	Curb	
Line 30	12	33		
Line 31	32	23		
Line 32	27	33		
Line 33	33	34		
Line 34	12	13	Curb	
Line 35	28	44		
Line 36	44	17		
Line 37	17	16		
Line 38	16	43		
Line 39	43	44		
Line 40	43	27		
Line 41	23	42		
Line 42	16	35		
Line 43	42	41		
Line 44	45	1	Canal Water (Global)	
Line 45	41	37		
Line 46	42	46		

Line 47	46	43		
Line 48	24	46		
Line 49	35	46		
Line 50	35	36		
Line 51	25	47		Sheet Pile
Line 52	47	23		Sheet Pile
Line 53	22	48	Drainage	
Line 54	48	6	Drainage	
Line 55	7	8	Drainage	
Line 56	8	40	Drainage	
Line 57	37	31	Canal Water (Global)	
Line 58	31	45	Canal Water (Global)	
Line 59	18	52		
Line 60	52	14		
Line 61	15	53		
Line 62	53	19		
Line 63	24	27		
Line 64	49	54	Canal Water (Global)	
Line 65	54	3		
Line 66	1	55	Canal Water (Global)	
Line 67	55	26	Canal Water (Global)	
Line 68	55	42		
Line 69	36	26		
Line 70	49	2	Canal Water (Global)	

Points

	X (ft)	Y (ft)
Point 1	128.3	-7.3
Point 2	163.7	-1.3
Point 3	180	3.2
Point 4	199.1	6.1
Point 5	200	6.1
Point 6	215.4	5.5
Point 7	235.8	-1.1
Point 8	252.8	-2.3
Point 9	267.9	-4.8
Point 10	310	-5.7
Point 11	310	-7.5
Point 12	310	-16
Point 13	310	-23
Point 14	310	-41
Point 15	310	-70
Point 16	110	-16
Point 17	110	-23
Point 18	110	-41
Point 19	110	-70
Point 20	200	13.8

Point 21	200.5	13.8
Point 22	201	5.9
Point 23	200	-8.5
Point 24	200	-9.8
Point 25	200	-1.5
Point 26	110	-8
Point 27	200	-16
Point 28	200	-25
Point 29	310	-10
Point 30	294	-6
Point 31	151.1	-2.8
Point 32	235.8	-7.5
Point 33	235.8	-16
Point 34	235.8	-23
Point 35	110	-9.8
Point 36	110	-8.5
Point 37	162	-1.5
Point 38	235.8	-4.5
Point 39	235.8	-1.5
Point 40	266.12598	-4.5
Point 41	162	-4.5
Point 42	162	-7.5
Point 43	162	-16
Point 44	162	-23
Point 45	142.50631	-4.5
Point 46	162	-9.8
Point 47	200	-6.6
Point 48	206.9	6
Point 49	172.78125	1
Point 50	110	-150
Point 51	310	-150
Point 52	200	-41
Point 53	200	-70
Point 54	179.34375	3
Point 55	123.07143	-7.5



Name: EMBANKMENT FILL, EL. +5.4 TO -1.5 Model: Undrained (Phi=0) Unit Weight: 115 pcf Cohesion: 540 psf

Name: MARSH 1, EL. -1.5 TO -7.5/-8.5 Model: Spatial Mohr-Coulomb Unit Weight: 102 pcf Cohesion Fn: Marsh 1 Phi: 0 °

Name: BEACH SAND, EL. -23/-25 TO -41 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand

Name: BAY SOUND CLAY, EL. -41 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 103 pcf Cohesion Spatial Fn: Bay Sound Phi: 0 °

Name: MARSH 2, EL. -7.5/-8.5 TO -16 Model: Spatial Mohr-Coulomb Unit Weight: 80 pcf Cohesion Fn: MARSH 2 Phi: 0 °

Name: Marsh 1, EL. -1.1 to -7.5 (Protected) Model: Undrained (Phi=0) Unit Weight: 102 pcf Cohesion: 280 psf

Name: Marsh 2, EL. -7.5 to -16 (Protected) Model: Undrained (Phi=0) Unit Weight: 80 pcf Cohesion: 180 psf

Name: LACUSTRINE, EL. -16 to -23 (Protected) Model: Spatial Mohr-Coulomb Unit Weight: 108 pcf Cohesion Fn: Lacustrine Phi: 0 °

Name: LACUSTRINE, EL. -16 TO -23/-25 Model: Spatial Mohr-Coulomb Unit Weight: 108 pcf Cohesion Spatial Fn: Lacustrine Phi: 0 °

GENERAL NOTES

CLASSIFICATION STRATIFICATION
SHEAR STRENGTHS AND UNIT WEIGHTS OF
THE SOIL WERE BASED ON THE RESULTS OF
UNDISTURBED BORINGS AND CPT DATA. SEE
BOTH BORING AND CPT DATA PLATES.

WHERE INDICATED, SHEAR STRENGTHS BETWEEN
VERTICALS WERE ASSUMED TO VARY LINEARLY
BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

Hw IS CANAL WATER LEVEL

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 18A,
PROTECTED SIDE STABILITY ANALYSIS,
CASE: LWL Q Case (Block)
STA. 50+00 TO 61+00 EAST
ORLEANS PARISH, LOUISIANA

LWL Q Case (Block)

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File Information

Created By: [Liljegren, James](#)
Revision Number: [453](#)
Last Edited By: [Jamerson, James MVK](#)
Date: [10/4/2013](#)
Time: [4:48:48 PM](#)
File Name: [Reach 18A.gsz](#)
Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix E LWL\](#)
Last Solved Date: [10/4/2013](#)
Last Solved Time: [4:51:26 PM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Strength Units: [psf](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

LWL Q Case (Block)

Kind: [SLOPE/W](#)
Parent: [LWL Q Case \(seepage\)](#)
Method: [Spencer](#)
Settings
 PWP Conditions Source: [Parent Analysis](#)
Slip Surface
 Direction of movement: [Right to Left](#)
 Use Passive Mode: [No](#)
 Slip Surface Option: [Block](#)
 Critical slip surfaces saved: [1](#)
 Optimize Critical Slip Surface Location: [Yes](#)
 Tension Crack
 Tension Crack Option: [Tension Crack Line](#)
 Percentage Wet: [1](#)
 Tension Crack Fluid Unit Weight: [62.4 pcf](#)
FOS Distribution
 FOS Calculation Option: [Constant](#)

Restrict Block Crossing: [Yes](#)

Advanced

Number of Slices: [30](#)

Optimization Tolerance: [0.01](#)

Minimum Slip Surface Depth: [0.1 ft](#)

Optimization Maximum Iterations: [2000](#)

Optimization Convergence Tolerance: [1e-007](#)

Starting Optimization Points: [8](#)

Ending Optimization Points: [16](#)

Complete Passes per Insertion: [1](#)

Driving Side Maximum Convex Angle: [5 °](#)

Resisting Side Maximum Convex Angle: [1 °](#)

Materials

EMBANKMENT FILL, EL. +5.4 TO -1.5

Model: [Undrained \(Phi=0\)](#)

Unit Weight: [115 pcf](#)

Cohesion: [540 psf](#)

MARSH 1, EL. -1.5 TO-7.5/ -8.5

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [102 pcf](#)

Cohesion Fn: [Marsh 1](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

BEACH SAND, EL. -23/-25 TO -41

Model: [Shear/Normal Fn.](#)

Unit Weight: [122 pcf](#)

Strength Function: [Sand](#)

Phi-B: [0 °](#)

BAY SOUND CLAY, EL. -41 TO -70

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [103 pcf](#)

Cohesion Spatial Fn: [Bay Sound](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

MARSH 2, EL. -7.5/-8.5 TO -16

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [80 pcf](#)

Cohesion Fn: [MARSH 2](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

Marsh 1, EL -1.1 to -7.5 (Protected)

Model: [Undrained \(Phi=0\)](#)

Unit Weight: [102 pcf](#)

Cohesion: [280 psf](#)

Marsh 2, EL -7.5 to -16 (Protected)

Model: [Undrained \(Phi=0\)](#)

Unit Weight: [80 pcf](#)

Cohesion: [180 psf](#)

LACUSTRINE, EL -16 to -23 (Protected)

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [108 pcf](#)

Cohesion Fn: [Lacustrine](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

LACUSTRINE, EL. -16 TO -23/-25

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [108 pcf](#)

Cohesion Spatial Fn: [Lacustrine](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

Slip Surface Limits

Left Coordinate: [\(110, -8\) ft](#)

Right Coordinate: [\(310, -5.7\) ft](#)

Slip Surface Block

Left Grid

Upper Left: [\(130, -1.5\) ft](#)

Lower Left: [\(130, -30\) ft](#)

Lower Right: [\(180, -30\) ft](#)

X Increments: [10](#)

Y Increments: [7](#)

Starting Angle: [135 °](#)

Ending Angle: [180 °](#)

Angle Increments: [5](#)

Right Grid

Upper Left: [\(185, -1.5\) ft](#)

Lower Left: [\(185, -30\) ft](#)

Lower Right: [\(230, -30\) ft](#)

X Increments: [9](#)

Y Increments: [7](#)

Starting Angle: [0 °](#)

Ending Angle: [45 °](#)

Angle Increments: 5

Reinforcements

Reinforcement 1

Type: [Pile](#)

Outside Point: [\(200, 13.5\)](#) ft

Inside Point: [\(200, -4.8\)](#) ft

Slip Surface Intersection: [\(200, -9.4407\)](#) ft

Total Length: [18.3](#) ft

Reinforcement Direction: [90 °](#)

Applied Load Option: [Variable](#)

F of S Dependent: [No](#)

Pile Spacing: [1](#) ft

Shear Capacity: [0](#) lbs

Shear Safety Factor: [1](#)

Shear Load Used: [0](#) lbs

Shear Option: [Parallel to Slip](#)

Resisting Force Used: [0](#) lbs/ft

Tension Crack Line

	X (ft)	Y (ft)
	185	-1.5
	207	-1.5
	215.5	-1.5
	236	-1.5

Cohesion Functions

Marsh 1

Model: [Spline Data Point Function](#)

Function: [Cohesion vs. X](#)

Curve Fit to Data: [100 %](#)

Segment Curvature: [0 %](#)

Y-Intercept: [280](#)

Data Points: [X \(ft\)](#), [Cohesion \(psf\)](#)

Data Point: [\(162, 280\)](#)

Data Point: [\(200, 300\)](#)

Data Point: [\(235.8, 280\)](#)

MARSH 2

Model: [Spline Data Point Function](#)

Function: [Cohesion vs. X](#)

Curve Fit to Data: [100 %](#)

Segment Curvature: [0 %](#)

Y-Intercept: 180

Data Points: X (ft), Cohesion (psf)

Data Point: (162, 180)

Data Point: (200, 370)

Data Point: (235.8, 180)

Lacustrine

Model: Spline Data Point Function

Function: Cohesion vs. Y

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 180

Data Points: Y (ft), Cohesion (psf)

Data Point: (-23, 225)

Data Point: (-16, 180)

Shear/Normal Strength Functions

Sand

Model: Spline Data Point Function

Function: Shear Stress vs. Normal Stress

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 0

Data Points: Normal Stress (psf), Shear Stress (psf)

Data Point: (-10000, 0)

Data Point: (0, 0)

Data Point: (10000, 6494)

Estimation Properties

Intact Rock Param.: 10

Geological Strength: 100

Disturbance Factor: 0

SigmaC: 600000 psf

Sigma3: 300000 psf

Num. Points: 20

Spatial Functions

Lacustrine

Model: Linear Interpolation

Limit Range By: Data Values

Data Points: X (ft), Y (ft), Cohesion (psf)

Data Point: (200, -16, 280)

Data Point: (200, -25, 360)

Data Point: (235.8, -16, 180)

Data Point: (235.8, -23, 225)

Data Point: (162, -16, 180)

Data Point: (162, -23, 225)

Bay Sound

Model: Linear Interpolation

Limit Range By: Data Values

Data Points: X (ft), Y (ft), Cohesion (psf)

Data Point: (200, -41, 560)

Data Point: (200, -70, 800)

Data Point: (235.8, -41, 500)

Data Point: (235.8, -70, 750)

Data Point: (162, -41, 500)

Data Point: (162, -70, 750)

Data Point: (310, -41, 500)

Data Point: (310, -70, 750)

Data Point: (110, -41, 500)

Data Point: (110, -70, 750)

Regions

	Points	Area (ft ²)	Material
Region 1	5,20,21,22	5.825	
Region 2	37,2,49,54,3,4,5,25	162.72219	EMBANKMENT FILL, EL. +5.4 TO -1.5
Region 3	5,22,48,6,7,39,25	188.56	EMBANKMENT FILL, EL. +5.4 TO -1.5
Region 4	19,18,52,14,15,53	5800	BAY SOUND CLAY, EL. -41 TO -70
Region 5	17,44,28,34,13,14,52,18	3526.2	BEACH SAND, EL. -23/-25 TO -41
Region 6	40,9,30,10,11,32,38,39,7,8	239.50247	Marsh 1, EL -1.1 to -7.5 (Protected)
Region 7	33,32,11,29,12	630.7	Marsh 2, EL -7.5 to -16 (Protected)
Region 8	23,47,25,39,38,32	232.7	MARSH 1, EL. -1.5 TO-7.5/ -8.5
Region 9	34,33,12,13	519.4	LACUSTRINE, EL -16 to -23 (Protected)
Region 10	17,16,43,44	364	LACUSTRINE, EL -16 to -23 (Protected)
Region 11	44,43,27,33,34,28	590.4	LACUSTRINE, EL. -16 TO -23/-25
Region 12	27,33,32,23,24,46,43	522	MARSH 2, EL. -7.5/-8.5 TO -16
Region 13	16,35,46,43	322.4	Marsh 2, EL -7.5 to -16 (Protected)
Region 14	42,41,37,31,45,1,55	114.65366	Marsh 1, EL -1.1 to -7.5 (Protected)
Region 15	42,41,37,25,47,23	247	MARSH 1, EL. -1.5 TO-7.5/ -8.5
Region 16	46,42,23,24	68.4	MARSH 2, EL. -7.5/-8.5 TO -16
Region 17	35,36,26,55,42,46	116.33214	Marsh 2, EL -7.5 to -16 (Protected)

Points

	X (ft)	Y (ft)
Point 1	128.3	-7.3
Point 2	163.7	-1.3
Point 3	180	3.2
Point 4	199.1	6.1
Point 5	200	6.1
Point 6	215.4	5.5

Point 7	235.8	-1.1
Point 8	252.8	-2.3
Point 9	267.9	-4.8
Point 10	310	-5.7
Point 11	310	-7.5
Point 12	310	-16
Point 13	310	-23
Point 14	310	-41
Point 15	310	-70
Point 16	110	-16
Point 17	110	-23
Point 18	110	-41
Point 19	110	-70
Point 20	200	13.8
Point 21	200.5	13.8
Point 22	201	5.9
Point 23	200	-8.5
Point 24	200	-9.8
Point 25	200	-1.5
Point 26	110	-8
Point 27	200	-16
Point 28	200	-25
Point 29	310	-10
Point 30	294	-6
Point 31	151.1	-2.8
Point 32	235.8	-7.5
Point 33	235.8	-16
Point 34	235.8	-23
Point 35	110	-9.8
Point 36	110	-8.5
Point 37	162	-1.5
Point 38	235.8	-4.5
Point 39	235.8	-1.5
Point 40	266.12598	-4.5
Point 41	162	-4.5
Point 42	162	-7.5
Point 43	162	-16
Point 44	162	-23
Point 45	142.50631	-4.5
Point 46	162	-9.8
Point 47	200	-6.6
Point 48	206.9	6
Point 49	172.78125	1
Point 50	110	-150
Point 51	310	-150
Point 52	200	-41
Point 53	200	-70
Point 54	179.34375	3

Point 55	123.07143	-7.5
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Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.31	(169.491, -0.033)	35.14454	(209.073, 5.8722)	(128.147, -7.30584)
2	21725	1.40	(169.491, -0.033)	36.392	(213.019, 5.64005)	(126.561, -7.36653)

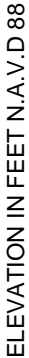
Slices of Slip Surface: Optimized

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	128.22365	-7.359787	295.41962	497.78557	0	280
2	Optimized	129.98875	-8.6068665	341.87447	559.6266	0	180
3	Optimized	132.6499	-10.487	415.65403	741.69639	0	180
4	Optimized	135.2745	-12.083715	479.6636	863.9724	0	180
5	Optimized	138.57895	-13.90314	554.36749	1042.6732	0	180
6	Optimized	141.36875	-15.298255	612.90789	1151.6734	0	180
7	Optimized	142.7598	-15.89183	637.98125	1211.8505	0	180
8	Optimized	145.0337	-16.862105	679.60891	1337.5027	0	185.54
9	Optimized	149.07705	-18.458865	749.50238	1534.1776	0	195.81
10	Optimized	153.04405	-19.899525	814.24673	1724.974	0	205.07
11	Optimized	156.15675	-20.905645	860.54176	1844.0358	0	211.54
12	Optimized	158.49405	-21.505875	888.5966	1940.3008	0	215.39
13	Optimized	160.83135	-22.106105	917.31448	2036.5658	0	219.25
14	Optimized	162.74035	-22.596345	941.7461	2117.2771	0	224.76
15	Optimized	163.59035	-22.799685	952.29385	2104.8347	0	228.79
16	Optimized	165.7228	-23.05672	966.37646	2196.415	0	237.29
17	Optimized	169.0045	-23.284	979.73532	2270.8255	0	249.29
18	Optimized	171.52235	-23.250915	978.98077	2342.3498	0	257.04
19	Optimized	172.96865	-23.23191	978.43615	2384.5796	0	261.46
20	Optimized	174.45435	-22.9569	963.95278	2330.8843	0	264.09
21	Optimized	177.051	-22.411805	934.36633	2363.5613	0	268.04
22	Optimized	178.84655	-21.933995	907.7972	2297.0065	0	269.87
23	Optimized	179.6719	-21.593275	888.66947	2289.9511	0	269.72
24	Optimized	181.61955	-20.78922	842.96556	2245.6157	0	269.23
25	Optimized	184.8587	-19.452025	765.26092	2162.7175	0	267.95
26	Optimized	187.79795	-18.087575	684.5773	2031.3774	0	265.06
27	Optimized	190.4871	-16.66955	599.53781	1933.1825	0	260.58
28	Optimized	192.9093	-15.1568	508.05474	1731.0018	0	334.55
29	Optimized	195.01465	-13.575635	411.89008	1642.4711	0	345.07
30	Optimized	197.58365	-11.49556	283.92563	1486.1195	0	357.92
31	Optimized	199.33875	-10.003035	190.85011	1395.3292	0	366.69
32	Optimized	199.78875	-9.620357	167.12679	1365.6979	0	368.94
33	Optimized	200.0444	-9.402952	152.70941	1348.0767	0	369.76
34	Optimized	200.2944	-9.186064	127.8522	1319.4855	0	368.44
35	Optimized	200.75	-8.7891235	99.633056	1281.1515	0	366.02
36	Optimized	202.2609	-7.472747	13.257551	1197.0723	0	298.74
37	Optimized	204.72385	-5.3268875	-124.27785	997.96743	0	297.36

38	Optimized	206.41295	-3.8493535	-218.13728	857.48447	0	296.42
39	Optimized	207.9863	-2.4595585	-306.20602	660.5147	0	295.54

Slices of Slip Surface: 21725

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	21725	126.69155	-7.4332675	299.92353	441.8984	0	280
2	21725	127.56125	-7.8764065	317.06402	437.65159	0	180
3	21725	129.81825	-9.0264065	360.00893	550.67957	0	180
4	21725	132.73275	-10.51141	416.52361	697.66269	0	180
5	21725	135.5252	-11.93423	472.52169	838.50345	0	180
6	21725	138.31765	-13.357055	530.37042	979.34421	0	180
7	21725	141.1101	-14.77988	589.81454	1120.185	0	180
8	21725	143.0055	-15.745645	630.98712	1215.764	0	180
9	21725	144.7706	-16.645	669.93634	1325.5491	0	184.15
10	21725	147.30235	-17.935	726.77324	1494.6169	0	192.44
11	21725	149.8341	-19.224995	784.73632	1663.7198	0	200.73
12	21725	153.05	-20.863565	860.09552	1874.4494	0	211.27
13	21725	156.75	-21.85714	906.28571	1873.2571	0	217.65
14	21725	160.25	-21.85714	905.22857	1915.8286	0	217.65
15	21725	162.85	-21.85714	904.82353	1949.2353	0	220.3
16	21725	165.21355	-21.85714	904.93059	2006.6183	0	227.64
17	21725	168.24065	-21.85714	904.93059	2097.1014	0	236.98
18	21725	171.26775	-21.85714	904.69934	2187.5515	0	246.27
19	21725	174.4219	-21.85714	904.38095	2291.5048	0	255.88
20	21725	177.70315	-21.85714	903.77143	2408.9905	0	265.82
21	21725	179.6719	-21.85714	903.36	2479.3905	0	271.76
22	21725	181.25	-21.85714	903	2513.96	0	276.51
23	21725	183.75	-21.85714	902.36	2559.52	0	284
24	21725	186.3436	-20.88095	845.83011	2223.2733	0	283.8
25	21725	189.0308	-18.92857	731.78831	2073.5257	0	275.44
26	21725	191.71805	-16.97619	615.75951	1924.0189	0	266.45
27	21725	194.57125	-14.903225	490.44775	1756.6674	0	342.86
28	21725	197.5904	-12.70967	355.101	1635.7101	0	357.95
29	21725	199.55	-11.285945	264.42275	1549.8071	0	367.75
30	21725	200.25	-10.777365	230.48894	1505.5968	0	368.67
31	21725	200.75	-10.414095	205.42559	1468.1393	0	366.02
32	21725	202.25995	-9.31707	130.42614	1384.7183	0	358.01
33	21725	205.20995	-7.1737705	-9.1087119	1228.5763	0	297.09
34	21725	208.4298	-4.834396	-158.48219	997.22995	0	295.29
35	21725	211.4894	-2.6114655	-299.69253	724.74613	0	293.58



With DSM

Cross Section at Sta 62+00

WHERE INDICATED, SHEAR STRENGTHS BETWEEN VERTICALS WERE ASSUMED TO VARY LINEARLY BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

ORLEANS AVE OUTFALL CANAL
REMEDICATION OF CANAL WALLS AND LEVEES
PROTECTED SIDE STABILITY ANALYSIS,
CASE: Name: LWL Q Case (Entry/Exit)
REACH 18B, STA. 60+00 TO 64+00 EAST
ORLEANS PARISH, LOUISIANA

LWL Q Case (Entry/Exit)

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File Information

Created By: [Liljegren, James](#)
Revision Number: [745](#)
Last Edited By: [Jamerson, James MVK](#)
Date: [10/4/2013](#)
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File Name: [Reach 18B.gsz](#)
Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix E LWL\](#)
Last Solved Date: [10/4/2013](#)
Last Solved Time: [5:43:06 PM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Strength Units: [psf](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

LWL Q Case (Entry/Exit)

Kind: [SLOPE/W](#)
Method: [Spencer](#)
Settings
 Apply Phreatic Correction: [No](#)
 PWP Conditions Source: [Piezometric Line](#)
 Use Staged Rapid Drawdown: [No](#)
Slip Surface
 Direction of movement: [Right to Left](#)
 Use Passive Mode: [No](#)
 Slip Surface Option: [Entry and Exit](#)
 Critical slip surfaces saved: [1](#)
 Optimize Critical Slip Surface Location: [Yes](#)
Tension Crack
 Tension Crack Option: [Tension Crack Line](#)
 Percentage Wet: [1](#)
 Tension Crack Fluid Unit Weight: [62.4 pcf](#)
FOS Distribution

FOS Calculation Option: [Constant](#)

Advanced

Number of Slices: [30](#)

Optimization Tolerance: [0.01](#)

Minimum Slip Surface Depth: [0.1 ft](#)

Optimization Maximum Iterations: [2000](#)

Optimization Convergence Tolerance: [1e-007](#)

Starting Optimization Points: [8](#)

Ending Optimization Points: [16](#)

Complete Passes per Insertion: [1](#)

Driving Side Maximum Convex Angle: [5 °](#)

Resisting Side Maximum Convex Angle: [1 °](#)

Materials

EMB FILL to EL. -1.5

Model: [Undrained \(Phi=0\)](#)

Unit Weight: [115 pcf](#)

Cohesion: [540 psf](#)

Pore Water Pressure

Piezometric Line: [1](#)

MARSH 1, EL. -1.5 TO -7.5,-8.5

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [102 pcf](#)

Cohesion Fn: [MARSH 1](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: [1](#)

BEACH SAND, EL. -23,-25 TO -41

Model: [Shear/Normal Fn.](#)

Unit Weight: [122 pcf](#)

Strength Function: [Sand](#)

Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: [1](#)

DSM1

Model: [Undrained \(Phi=0\)](#)

Unit Weight: [99.2 pcf](#)

Cohesion: [550 psf](#)

Pore Water Pressure

Piezometric Line: [1](#)

MARSH 2, EL. -7.5,-8.5 to -16

Model: [Spatial Mohr-Coulomb](#)
Unit Weight: [80 pcf](#)
Cohesion Fn: [MARSH 2](#)
Phi: [0 °](#)
Phi-B: [0 °](#)
Pore Water Pressure
Piezometric Line: [1](#)

LACUSTRINE, EL. -16 to -23,-25

Model: [Spatial Mohr-Coulomb](#)
Unit Weight: [108 pcf](#)
Cohesion Spatial Fn: [Lacustrine](#)
Phi: [0 °](#)
Phi-B: [0 °](#)
Pore Water Pressure
Piezometric Line: [1](#)

BAY SOUND CLAY, EL. -41 to -70

Model: [Spatial Mohr-Coulomb](#)
Unit Weight: [103 pcf](#)
Cohesion Spatial Fn: [Bay Sound](#)
Phi: [0 °](#)
Phi-B: [0 °](#)
Pore Water Pressure
Piezometric Line: [1](#)

Slip Surface Entry and Exit

Left Projection: [Range](#)
Left-Zone Left Coordinate: [\(120, -7.63263\) ft](#)
Left-Zone Right Coordinate: [\(175, 2.0786\) ft](#)
Left-Zone Increment: [25](#)
Right Projection: [Range](#)
Right-Zone Left Coordinate: [\(190, 4.41236\) ft](#)
Right-Zone Right Coordinate: [\(240, -1.22648\) ft](#)
Right-Zone Increment: [25](#)
Radius Increments: [25](#)

Slip Surface Limits

Left Coordinate: [\(92.1, -7.71\) ft](#)
Right Coordinate: [\(350.1, -5.09\) ft](#)

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
	92.25	-2.6
	200	-2.6
	235.5	-7.33333
	350.1	-5.09

Reinforcements

Reinforcement 1

Type: [Pile](#)

Outside Point: [\(200, 13.92\)](#) ft

Inside Point: [\(200, -4.8\)](#) ft

Slip Surface Intersection: [\(200, -5.8525\)](#) ft

Total Length: [18.72](#) ft

Reinforcement Direction: [90 °](#)

Applied Load Option: [Variable](#)

F of S Dependent: [No](#)

Pile Spacing: [1](#) ft

Shear Capacity: [0](#) lbs

Shear Safety Factor: [1](#)

Shear Load Used: [0](#) lbs

Shear Option: [Parallel to Slip](#)

Resisting Force Used: [0](#) lbs/ft

Tension Crack Line

	X (ft)	Y (ft)
	180	-0.5
	190	-0.5
	200	-0.5
	230	-0.5

Cohesion Functions

MARSH 1

Model: [Spline Data Point Function](#)

Function: [Cohesion vs. X](#)

Curve Fit to Data: [100](#) %

Segment Curvature: [0](#) %

Y-Intercept: [280](#)

Data Points: [X \(ft\)](#), [Cohesion \(psf\)](#)

Data Point: [\(161, 280\)](#)

Data Point: [\(200, 300\)](#)

Data Point: [\(235.3, 280\)](#)

MARSH 2

Model: [Spline Data Point Function](#)

Function: [Cohesion vs. X](#)

Curve Fit to Data: [100 %](#)

Segment Curvature: [0 %](#)

Y-Intercept: [180](#)

Data Points: [X \(ft\)](#), [Cohesion \(psf\)](#)

Data Point: [\(161, 180\)](#)

Data Point: [\(200, 370\)](#)

Data Point: [\(235.3, 180\)](#)

Shear/Normal Strength Functions

Sand

Model: [Spline Data Point Function](#)

Function: [Shear Stress vs. Normal Stress](#)

Curve Fit to Data: [100 %](#)

Segment Curvature: [0 %](#)

Y-Intercept: [0](#)

Data Points: [Normal Stress \(psf\)](#), [Shear Stress \(psf\)](#)

Data Point: [\(-10000, 0\)](#)

Data Point: [\(0, 0\)](#)

Data Point: [\(10000, 6494\)](#)

Estimation Properties

Intact Rock Param.: [10](#)

Geological Strength: [100](#)

Disturbance Factor: [0](#)

SigmaC: [600000 psf](#)

Sigma3: [300000 psf](#)

Num. Points: [20](#)

Spatial Functions

Bay Sound

Model: [Linear Interpolation](#)

Limit Range By: [Data Values](#)

Data Points: [X \(ft\)](#), [Y \(ft\)](#), [Cohesion \(psf\)](#)

Data Point: [\(92.1, -41, 500\)](#)

Data Point: [\(161, -41, 500\)](#)

Data Point: [\(200, -41, 560\)](#)

Data Point: [\(235.3, -41, 500\)](#)

Data Point: [\(350.1, -41, 500\)](#)

Data Point: [\(92.1, -70, 750\)](#)

Data Point: [\(161, -70, 750\)](#)

Data Point: [\(200, -70, 800\)](#)

Data Point: (235.3, -70, 750)

Data Point: (350.1, -70, 750)

Lacustrine

Model: Linear Interpolation

Limit Range By: Data Values

Data Points: X (ft), Y (ft), Cohesion (psf)

Data Point: (92.1, -16, 180)

Data Point: (161, -16, 180)

Data Point: (200, -16, 280)

Data Point: (235.3, -16, 180)

Data Point: (350.1, -16, 180)

Data Point: (92.1, -23, 225)

Data Point: (161, -23, 225)

Data Point: (200, -25, 360)

Data Point: (235.3, -23, 225)

Data Point: (350.1, -23, 225)

Regions

	Material	Points	Area (ft²)
Region 1	BAY SOUND CLAY, EL. -41 to -70	1,5,3,4,6,2	7482
Region 2	EMB FILL to EL. -1.5	14,15,16,17,18,19,20,52	160.844
Region 3	EMB FILL to EL. -1.5	20,23,24,25,26,27,28,52	176.0595
Region 4	MARSH 1, EL. -1.5 TO -7.5,-8.5	10,11,12,13,14,52,53,38,42	370.611
Region 5	MARSH 2, EL. -7.5,-8.5 to -16	7,8,9,10,42,38,39,46	220.4075
Region 6		20,21,22,23	7.421
Region 7	DSM1	54,59,60,61,62,63,58,57,64,56,55	250
Region 8	MARSH 1, EL. -1.5 TO -7.5,-8.5	38,53,52,28,29,30,31,32,33,34,35,36,37,49,44,60,59,54,55	598.9505
Region 9	MARSH 2, EL. -7.5,-8.5 to -16	38,55,56,39	5.2
Region 10	MARSH 2, EL. -7.5,-8.5 to -16	39,56,64,40	24.8
Region 11	MARSH 2, EL. -7.5,-8.5 to -16	46,39,40,47	668.98
Region 12	LACUSTRINE, EL. -16 to -23,-25	47,40,64,57,41,43,48	830.3
Region 13	MARSH 2, EL. -7.5,-8.5 to -16	60,44,49,50,61	1148.33
Region 14	LACUSTRINE, EL. -16 to -23,-25	61,50,51,45,62	967.61
Region 15	BEACH SAND, EL. -23,-25 TO -41	48,43,41,57,58,63,62,45,51,3,5,1	4542.09

Points

	X (ft)	Y (ft)
Point 1	92.1	-41
Point 2	92.1	-70
Point 3	350.1	-41
Point 4	350.1	-70
Point 5	200	-41
Point 6	200	-70
Point 7	92.1	-7.71
Point 8	102.1	-7.71

Point 9	112	-7.77
Point 10	121.9	-7.6
Point 11	132	-7.02
Point 12	142	-4.56
Point 13	152.1	-2.51
Point 14	161	-1.2
Point 15	166.9	-0.26
Point 16	170	0.16
Point 17	178.6	3.46
Point 18	188.1	4.06
Point 19	199.1	6.1
Point 20	200	6.1
Point 21	200	13.92
Point 22	200.4	13.92
Point 23	201.5	6.14
Point 24	209.3	5.93
Point 25	215.2	5.35
Point 26	222.9	3.06
Point 27	228.8	1.15
Point 28	235.3	-0.8
Point 29	251.5	-2.27
Point 30	263.7	-2.83
Point 31	276.9	-3.51
Point 32	287.2	-4.03
Point 33	299.3	-4.58
Point 34	310.6	-5.02
Point 35	322.8	-5.12
Point 36	336.4	-5.07
Point 37	350.1	-5.09
Point 38	200	-8.5
Point 39	200	-9.8
Point 40	200	-16
Point 41	200	-25
Point 42	161	-7.5
Point 43	161	-23
Point 44	235.3	-7.5
Point 45	235.3	-23
Point 46	92.1	-9.8
Point 47	92.1	-16
Point 48	92.1	-23
Point 49	350.1	-7.5
Point 50	350.1	-16
Point 51	350.1	-23
Point 52	200	-1.5
Point 53	200	-6.5
Point 54	204	-2
Point 55	204	-8.5
Point 56	204	-9.8

Point 57	204	-25
Point 58	204	-27
Point 59	214	-2
Point 60	214	-8.3
Point 61	214	-16
Point 62	214	-24.4
Point 63	214	-27
Point 64	204	-16

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.34	(162.531, 29.721)	34.71417	(205.662, 6.02795)	(126.782, -7.31962)
2	2278	1.36	(162.531, 29.721)	51.524	(204.261, 6.06567)	(126.721, -7.32316)

Slices of Slip Surface: Optimized

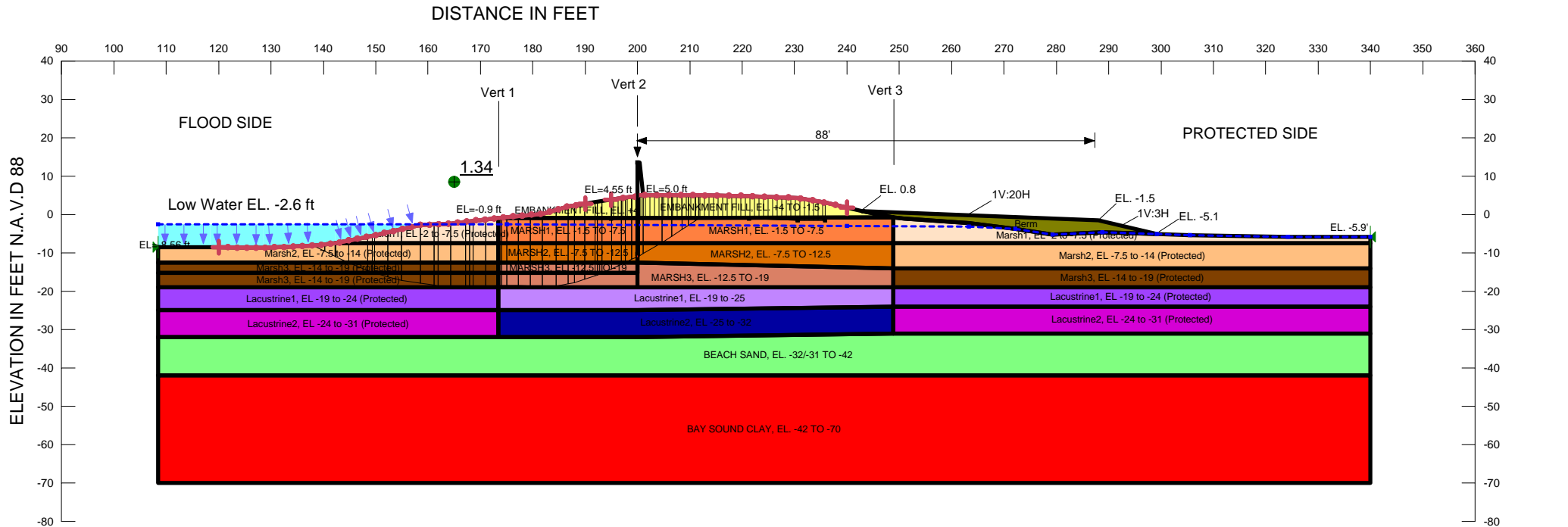
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	126.96535	-7.4530995	302.82548	510.70058	0	280
2	Optimized	128.66485	-8.6932885	380.22358	558.76381	0	180
3	Optimized	131.0907	-10.46355	490.6886	715.1341	0	180
4	Optimized	132.16745	-11.24929	539.72184	790.41811	0	180
5	Optimized	133.9728	-12.293045	604.85244	860.70755	0	180
6	Optimized	137.24865	-14.13618	719.86353	1047.5507	0	180
7	Optimized	140.04695	-15.528875	806.7533	1154.1359	0	180
8	Optimized	141.60365	-16.16092	846.19692	1226.6197	0	181.03
9	Optimized	143.8183	-17.060095	902.3084	1347.2841	0	186.81
10	Optimized	147.1416	-18.292685	979.23296	1493.1535	0	194.74
11	Optimized	150.1516	-19.28135	1040.9085	1628.9407	0	201.09
12	Optimized	151.8783	-19.848505	1076.3164	1709.7777	0	204.74
13	Optimized	152.3987	-20.019435	1086.9648	1738.4757	0	205.84
14	Optimized	154.16	-20.456005	1114.2151	1784.576	0	208.65
15	Optimized	157.08525	-21.132935	1156.4457	1904.7733	0	213
16	Optimized	159.77395	-21.61406	1186.477	1961.5556	0	216.09
17	Optimized	162.0353	-21.87718	1202.8865	2029.3404	0	220.93
18	Optimized	164.1059	-22.118105	1217.9496	2096.4526	0	228.8
19	Optimized	166.0206	-22.21566	1223.9989	2094.6381	0	235.27
20	Optimized	168.45	-22.15237	1220.0698	2129.8901	0	242.18
21	Optimized	171.1457	-22.082145	1215.6672	2198.9768	0	249.77
22	Optimized	173.37795	-21.774435	1196.4625	2180.9794	0	254.17
23	Optimized	175.55105	-21.218705	1161.8218	2217.225	0	256.43
24	Optimized	177.6188	-20.480735	1115.7714	2152.649	0	256.8
25	Optimized	179.93805	-19.393205	1047.8857	2092.6248	0	254.95
26	Optimized	182.6141	-18.13836	969.59535	1983.2755	0	252.4
27	Optimized	185.29085	-16.75547	883.31068	1830.1146	0	248.4
28	Optimized	187.3648	-15.5851	810.28465	1715.5102	0	308.44
29	Optimized	188.4279	-14.985165	772.83265	1680.25	0	313.62
30	Optimized	190.0495	-13.90245	705.26336	1582.9766	0	321.52

31	Optimized	192.63695	-12.10709	593.23918	1495.4974	0	334.13
32	Optimized	194.75165	-10.504705	493.23871	1356.3256	0	344.43
33	Optimized	196.37205	-9.1137375	406.45738	1281.3966	0	352.33
34	Optimized	197.9197	-7.7852275	323.55702	1229.2611	0	298.93
35	Optimized	198.88395	-6.933683	270.42549	1134.4606	0	299.43
36	Optimized	199.55	-6.288451	230.15676	1077.6029	0	299.77
37	Optimized	200.2	-5.658767	189.20299	1018.6651	0	299.89
38	Optimized	200.95	-4.932209	137.62825	952.25845	0	299.46
39	Optimized	201.9812	-3.933245	66.711246	858.183	0	298.88
40	Optimized	202.71635	-3.2315655	16.81035	800.96373	0	298.46
41	Optimized	203.5073	-2.4980205	-35.544417	729.25279	0	298.01
42	Optimized	204.36395	-1.703562	-92.24573	651.597	0	297.53
43	Optimized	205.17265	-0.953562	-145.77699	326.20852	0	540

Slices of Slip Surface: 2278

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	2278	126.85825	-7.455065	302.95053	566.27053	0	280
2	2278	128.2351	-8.6934835	380.23477	584.21034	0	180
3	2278	130.73725	-10.790995	511.12759	748.29777	0	180
4	2278	133.1296	-12.56734	621.94601	898.91969	0	180
5	2278	135.38875	-14.05309	714.65707	1030.0587	0	180
6	2278	137.6479	-15.376745	797.25513	1147.6893	0	180
7	2278	140.38875	-16.76744	884.04412	1296.9716	0	184.93
8	2278	143.20705	-18.02343	962.41531	1447.405	0	193.01
9	2278	145.6212	-18.931515	1019.0918	1554.4222	0	198.85
10	2278	148.03535	-19.70506	1067.3615	1645.6597	0	203.82
11	2278	150.4495	-20.35032	1107.6222	1722.0954	0	207.97
12	2278	151.8783	-20.688425	1128.7101	1765.1293	0	210.14
13	2278	153.58335	-20.99697	1147.9574	1816.111	0	212.12
14	2278	156.55	-21.432105	1175.1066	1890.8372	0	214.92
15	2278	159.51665	-21.69252	1191.3807	1945.9499	0	216.59
16	2278	162.475	-21.7811	1196.9144	1988.1342	0	221.63
17	2278	165.425	-21.6997	1191.809	2017.1133	0	229.97
18	2278	168.45	-21.43736	1175.4497	2022.3169	0	237.17
19	2278	171.43335	-21.006495	1148.5762	2044.6161	0	242.87
20	2278	174.3	-20.41853	1111.8752	2088.247	0	246.85
21	2278	177.16665	-19.65727	1064.3713	2112.254	0	249.25
22	2278	179.8808	-18.77422	1009.2541	2070.886	0	249.98
23	2278	182.44245	-17.779105	947.19212	1966.1734	0	249.09
24	2278	185.0041	-16.621105	874.90674	1844.6173	0	246.57
25	2278	187.19245	-15.50512	805.297	1719.9565	0	307.6
26	2278	189.34795	-14.249125	726.89945	1630.9146	0	318.11
27	2278	191.8439	-12.624125	625.50917	1526.1857	0	330.27
28	2278	194.33985	-10.78012	510.44715	1401.1459	0	342.42
29	2278	196.3754	-9.113628	406.452	1283.6233	0	352.34
30	2278	198.1315	-7.5009585	305.81887	1183.6682	0	299.04
31	2278	199.55	-6.109744	219.00839	1048.8694	0	299.77

32	2278	200.2	-5.430506	174.9652	974.69162	0	299.89
33	2278	200.95	-4.600532	116.92846	886.01807	0	299.46
34	2278	201.9483	-3.452212	36.968278	760.98276	0	298.9
35	2278	202.98415	-2.174359	-51.388025	619.25915	0	298.31
36	2278	203.91615	-0.9645865	-134.6294	137.55143	0	540



Name: EMBANKMENT FILL, EL. -4 TO -1.5 Model: Undrained (Phi=0) Unit Weight: 117 pcf Cohesion: 500 psf Piezometric Line: 1
Name: MARSH1, EL. -1.5 TO -7.5 Model: Spatial Mohr-Coulomb Unit Weight: 103 pcf Cohesion Fn: MARSH 1 Phi: 0 ° Piezometric Line: 1
Name: BEACH SAND, EL. -32/-31 TO -42 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand Piezometric Line: 1
Name: BAY SOUND CLAY, EL. -42 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 105 pcf Cohesion Spatial Fn: Bay Sound Phi: 0 ° Piezometric Line: 1
Name: Marsh2, EL. -7.5 to -14 (Protected) Model: Undrained (Phi=0) Unit Weight: 80 pcf Cohesion: 125 psf Piezometric Line: 1
Name: MARSH2, EL. -7.5 TO -12.5 Model: Spatial Mohr-Coulomb Weight Fn: Marsh2 Cohesion Spatial Fn: Marsh 2 (2) Phi: 0 ° Piezometric Line: 1
Name: MARSH3, EL. -12.5 TO -19 Model: Spatial Mohr-Coulomb Unit Weight: 77 pcf Cohesion Spatial Fn: Marsh 3 Phi: 0 ° Piezometric Line: 1
Name: Marsh3, EL. -14 to -19 (Protected) Model: Undrained (Phi=0) Unit Weight: 106 pcf Cohesion: 175 psf Piezometric Line: 1
Name: Marsh1, EL. -2 to -7.5 (Protected) Model: Undrained (Phi=0) Unit Weight: 110 pcf Cohesion: 285 psf Piezometric Line: 1
Name: Lacustrine1, EL. -19 to -24 (Protected) Model: Spatial Mohr-Coulomb Unit Weight: 100 pcf Cohesion Fn: Lacustrine (protected) Phi: 0 ° Piezometric Line: 1
Name: Lacustrine1, EL. -19 to -25 Model: Spatial Mohr-Coulomb Weight Fn: Lacustrine1 Cohesion Spatial Fn: Lacustrine Phi: 0 ° Piezometric Line: 1
Name: Lacustrine2, EL. -25 to -32 Model: Spatial Mohr-Coulomb Weight Fn: Lacustrine2 Cohesion Spatial Fn: Lacustrine Phi: 0 ° Piezometric Line: 1
Name: Lacustrine2, EL. -24 to -31 (Protected) Model: Spatial Mohr-Coulomb Unit Weight: 98 pcf Cohesion Fn: Lacustrine (protected) Phi: 0 ° Piezometric Line: 1
Name: Berm Model: Undrained (Phi=0) Unit Weight: 110 pcf Cohesion: 400 psf Piezometric Line: 1

GENERAL NOTES

CLASSIFICATION STRATIFICATION
SHEAR STRENGTHS AND UNIT WEIGHTS OF
THE SOIL WERE BASED ON THE RESULTS OF
UNDISTURBED BORINGS AND CPT DATA. SEE
BOTH BORING AND CPT DATA PLATES.

WHERE INDICATED, SHEAR STRENGTHS BETWEEN
VERTICALS WERE ASSUMED TO VARY LINEARLY
BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

With Stability Berm

Protected Side Cross Section Sta 71+00
Canal Side Cross Section Sta 66+00

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL
REMEDICATION OF CANAL WALLS AND LEVEES
PROTECTED SIDE STABILITY ANALYSIS,
CASE: LWL Q Case (Entry/Exit)
REACH 19, STA. 65+00 TO 90+62 EAST
ORLEANS PARISH, LOUISIANA

LWL Q Case (Entry/Exit)

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File Information

Created By: [Liljegren, James](#)
Revision Number: [581](#)
Last Edited By: [Vroman, Noah D MVK](#)
Date: [12/20/2013](#)
Time: [2:15:03 PM](#)
File Name: [Reach 19.gsz](#)
Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix E LWL\](#)
Last Solved Date: [12/20/2013](#)
Last Solved Time: [2:16:32 PM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Strength Units: [psf](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

LWL Q Case (Entry/Exit)

Kind: [SLOPE/W](#)
Method: [Spencer](#)
Settings
 Apply Phreatic Correction: [No](#)
 PWP Conditions Source: [Piezometric Line](#)
 Use Staged Rapid Drawdown: [No](#)
Slip Surface
 Direction of movement: [Right to Left](#)
 Use Passive Mode: [No](#)
 Slip Surface Option: [Entry and Exit](#)
 Critical slip surfaces saved: [1](#)
 Optimize Critical Slip Surface Location: [Yes](#)
Tension Crack
 Tension Crack Option: [Tension Crack Line](#)
 Percentage Wet: [0.5](#)
 Tension Crack Fluid Unit Weight: [62.4 pcf](#)
FOS Distribution

FOS Calculation Option: [Constant](#)

Advanced

Number of Slices: [30](#)

Optimization Tolerance: [0.01](#)

Minimum Slip Surface Depth: [0.1 ft](#)

Optimization Maximum Iterations: [2000](#)

Optimization Convergence Tolerance: [1e-007](#)

Starting Optimization Points: [8](#)

Ending Optimization Points: [16](#)

Complete Passes per Insertion: [1](#)

Driving Side Maximum Convex Angle: [5 °](#)

Resisting Side Maximum Convex Angle: [1 °](#)

Materials

EMBANKMENT FILL, EL. +4 TO -1.5

Model: [Undrained \(Phi=0\)](#)

Unit Weight: [117 pcf](#)

Cohesion: [500 psf](#)

Pore Water Pressure

Piezometric Line: [1](#)

MARSH1, EL. -1.5 TO -7.5

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [103 pcf](#)

Cohesion Fn: [MARSH 1](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: [1](#)

BEACH SAND, EL. -32/-31 TO -42

Model: [Shear/Normal Fn.](#)

Unit Weight: [122 pcf](#)

Strength Function: [Sand](#)

Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: [1](#)

BAY SOUND CLAY, EL. -42 TO -70

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [105 pcf](#)

Cohesion Spatial Fn: [Bay Sound](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: [1](#)

Marsh2, EL -7.5 to -14 (Protected)

Model: [Undrained \(Phi=0\)](#)

Unit Weight: [80 pcf](#)

Cohesion: [125 psf](#)

Pore Water Pressure

Piezometric Line: [1](#)

MARSH2, EL. -7.5 TO -12.5

Model: [Spatial Mohr-Coulomb](#)

Weight Fn: [Marsh2](#)

Cohesion Spatial Fn: [Marsh 2 \(2\)](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: [1](#)

MARSH3, EL. -12.5 TO -19

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [77 pcf](#)

Cohesion Spatial Fn: [Marsh 3](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: [1](#)

Marsh3, EL -14 to -19 (Protected)

Model: [Undrained \(Phi=0\)](#)

Unit Weight: [106 pcf](#)

Cohesion: [175 psf](#)

Pore Water Pressure

Piezometric Line: [1](#)

Marsh1, EL -2 to -7.5 (Protected)

Model: [Undrained \(Phi=0\)](#)

Unit Weight: [110 pcf](#)

Cohesion: [285 psf](#)

Pore Water Pressure

Piezometric Line: [1](#)

Lacustrine1, EL -19 to -24 (Protected)

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [100 pcf](#)

Cohesion Fn: [Lacustrine \(protected\)](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: [1](#)

Lacustrine1, EL -19 to -25

Model: [Spatial Mohr-Coulomb](#)

Weight Fn: [Lacustrine1](#)

Cohesion Spatial Fn: [Lacustrine](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: [1](#)

Lacustrine2, EL -25 to -32

Model: [Spatial Mohr-Coulomb](#)

Weight Fn: [Lacustrine2](#)

Cohesion Spatial Fn: [Lacustrine](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: [1](#)

Lacustrine2, EL -24 to -31 (Protected)

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [98 pcf](#)

Cohesion Fn: [Lacustrine \(protected\)](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: [1](#)

Berm

Model: [Undrained \(Phi=0\)](#)

Unit Weight: [110 pcf](#)

Cohesion: [400 psf](#)

Pore Water Pressure

Piezometric Line: [1](#)

Slip Surface Entry and Exit

Left Projection: [Range](#)

Left-Zone Left Coordinate: [\(120, -8.52119\) ft](#)

Left-Zone Right Coordinate: [\(190, 2.84692\) ft](#)

Left-Zone Increment: [40](#)

Right Projection: [Range](#)

Right-Zone Left Coordinate: [\(195, 3.8828\) ft](#)

Right-Zone Right Coordinate: [\(240, 1.72\) ft](#)

Right-Zone Increment: [20](#)

Radius Increments: [20](#)

Slip Surface Limits

Left Coordinate: (108.4, -8.56) ft

Right Coordinate: (340, -5.9) ft

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
	108.4	-2.6
	175	-2.6
	240	-3
	263.3	-3.2
	272.2	-3.7
	279.3	-5.3
	288.8	-4.7
	299.2	-5.13593
	305.5	-5.4
	324.2	-5.9
	340	-5.9

Reinforcements

Reinforcement 1

Type: **Pile**

Outside Point: (200, 13.48) ft

Inside Point: (200, -10.3) ft

Slip Surface Intersection: (200, -11.01) ft

Total Length: 23.78 ft

Reinforcement Direction: 90 °

Applied Load Option: **Variable**

F of S Dependent: **No**

Pile Spacing: 1 ft

Shear Capacity: 0 lbs

Shear Safety Factor: 1

Shear Load Used: 0 lbs

Shear Option: **Parallel to Slip**

Resisting Force Used: 0 lbs/ft

Tension Crack Line

	X (ft)	Y (ft)
	195	-1
	221.3	-1
	230.6	-1.5

	235.8	-1.5
--	-------	------

Cohesion Functions

MARSH 1

Model: [Spline Data Point Function](#)

Function: [Cohesion vs. X](#)

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 285

Data Points: [X \(ft\)](#), [Cohesion \(psf\)](#)

Data Point: (173.4, 285)

Data Point: (200, 300)

Data Point: (248.9, 285)

Lacustrine (protected)

Model: [Spline Data Point Function](#)

Function: [Cohesion vs. Y](#)

Curve Fit to Data: 100 %

Segment Curvature: 100 %

Y-Intercept: 175

Data Points: [Y \(ft\)](#), [Cohesion \(psf\)](#)

Data Point: (-31, 300)

Data Point: (-19, 175)

Shear/Normal Strength Functions

Sand

Model: [Spline Data Point Function](#)

Function: [Shear Stress vs. Normal Stress](#)

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 0

Data Points: [Normal Stress \(psf\)](#), [Shear Stress \(psf\)](#)

Data Point: (-10000, 0)

Data Point: (0, 0)

Data Point: (10000, 6494)

Estimation Properties

Intact Rock Param.: 10

Geological Strength: 100

Disturbance Factor: 0

SigmaC: 600000 psf

Sigma3: 300000 psf

Num. Points: 20

Unit Weight Functions

Lacustrine1

Model: [Spline Data Point Function](#)

Function: [Unit Weight vs. X](#)

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 100

Data Points: [X \(ft\)](#), [Unit Weight \(pcf\)](#)

Data Point: (173.4, 100)

Data Point: (200, 105)

Data Point: (248.9, 100)

Marsh2

Model: [Spline Data Point Function](#)

Function: [Unit Weight vs. X](#)

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 80

Data Points: [X \(ft\)](#), [Unit Weight \(pcf\)](#)

Data Point: (173.4, 80)

Data Point: (200, 92)

Data Point: (248.9, 80)

Lacustrine2

Model: [Spline Data Point Function](#)

Function: [Unit Weight vs. X](#)

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 98

Data Points: [X \(ft\)](#), [Unit Weight \(pcf\)](#)

Data Point: (173.4, 98)

Data Point: (200, 102)

Data Point: (248.9, 98)

Spatial Functions

Marsh 2 (2)

Model: [Linear Interpolation](#)

Limit Range By: [Data Values](#)

Data Points: [X \(ft\)](#), [Y \(ft\)](#), [Cohesion \(psf\)](#)

Data Point: (200, -7.5, 225)

Data Point: (200, -12.5, 225)

Data Point: (248.9, -7.5, 125)

Data Point: (248.9, -14, 125)

Data Point: (173.4, -7.5, 125)

Data Point: (173.4, -12.5, 125)

Marsh 3

Model: [Linear Interpolation](#)
Limit Range By: [Data Values](#)
Data Points: [X \(ft\)](#), [Y \(ft\)](#), [Cohesion \(psf\)](#)
Data Point: [\(200, -12.5, 300\)](#)
Data Point: [\(200, -19, 300\)](#)
Data Point: [\(248.9, -14, 175\)](#)
Data Point: [\(248.9, -19, 175\)](#)
Data Point: [\(173.4, -12.5, 175\)](#)
Data Point: [\(173.4, -19, 175\)](#)

Lacustrine

Model: [Linear Interpolation](#)
Limit Range By: [Data Values](#)
Data Points: [X \(ft\)](#), [Y \(ft\)](#), [Cohesion \(psf\)](#)
Data Point: [\(200, -19, 300\)](#)
Data Point: [\(200, -32, 425\)](#)
Data Point: [\(248.9, -19, 175\)](#)
Data Point: [\(248.9, -31, 300\)](#)
Data Point: [\(173.4, -19, 175\)](#)
Data Point: [\(173.4, -32, 300\)](#)

Bay Sound

Model: [Linear Interpolation](#)
Limit Range By: [Data Values](#)
Data Points: [X \(ft\)](#), [Y \(ft\)](#), [Cohesion \(psf\)](#)
Data Point: [\(200, -42, 510\)](#)
Data Point: [\(200, -70, 770\)](#)
Data Point: [\(248.9, -42, 460\)](#)
Data Point: [\(248.9, -70, 725\)](#)
Data Point: [\(173.4, -42, 460\)](#)
Data Point: [\(173.4, -70, 725\)](#)
Data Point: [\(310, -42, 460\)](#)
Data Point: [\(310, -70, 725\)](#)
Data Point: [\(108.4, -42, 460\)](#)
Data Point: [\(108.4, -70, 725\)](#)

Regions

	Material	Points	Area (ft²)
Region 1	MARSH1, EL. -1.5 TO -7.5	7,30,8,39,1	175.56
Region 2	MARSH2, EL. -7.5 TO -12.5	8,9,40,39	133
Region 3	BEACH SAND, EL. -32/-31 TO -42	21,43,24,16,2,3,37,31,44,22	2431.55
Region 4	MARSH3, EL. -12.5 TO -19	42,28,9,14,15,23,41	379.595
Region 5	Lacustrine1, EL -19 to -25	35,15,23,41,46,33	428.55
Region 6	Marsh2, EL -7.5 to -14 (Protected)	13,27,11,14	592.15
Region 7	Marsh3, EL -14 to -19 (Protected)	14,11,12,15	455.5

Region 8	Lacustrine1, EL -19 to -24 (Protected)	15,12,36,35	455.5
Region 9	BAY SOUND CLAY, EL. -42 TO -70	25,22,44,31,37,3,26,38,32,45	6484.8
Region 10	MARSH3, EL. -12.5 TO -19	40,9,28,42	74.48
Region 11	MARSH1, EL. -1.5 TO -7.5	8,30,7,10,13	327.63
Region 12	MARSH2, EL. -7.5 TO -12.5	9,8,13,14	281.175
Region 13	Marsh3, EL -14 to -19 (Protected)	29,19,40,42	182
Region 14	Marsh3, EL -14 to -19 (Protected)	20,29,42,41	240.5
Region 15	Lacustrine2, EL -24 to -31 (Protected)	21,34,46,43	455
Region 16	Lacustrine1, EL -19 to -24 (Protected)	34,46,41,20	390
Region 17	Lacustrine2, EL -25 to -32	16,24,43,46,33,35	528.5
Region 18	Lacustrine2, EL -24 to -31 (Protected)	16,35,36,2	637.7
Region 19	Marsh1, EL -2 to -7.5 (Protected)	58,50,51,52,1,39	118.991
Region 20	Marsh2, EL -7.5 to -14 (Protected)	18,47,48,49,58,39,40,19	293.6835
Region 21	EMBANKMENT FILL, EL. +4 TO -1.5	1,53,54,55,56,57,4,7	72.852
Region 22		71,5,6,59	6.36
Region 23	EMBANKMENT FILL, EL. +4 TO -1.5	7,4,71,59,60,61,62,63,64,10	220.1
Region 24	Marsh1, EL -2 to -7.5 (Protected)	10,65,66,67,17,68,74,69,70,72,27,13	272.07498
Region 25	Berm	64,73,74,68,17,67,66,65,10	125.82563

Points

	X (ft)	Y (ft)
Point 1	173.4	-0.9
Point 2	340	-31
Point 3	340	-42
Point 4	200	4.55
Point 5	200	13.48
Point 6	200.4	13.48
Point 7	200	-0.9
Point 8	200	-7.5
Point 9	200	-12.5
Point 10	248.9	-0.7
Point 11	340	-14
Point 12	340	-19
Point 13	248.9	-7.5
Point 14	248.9	-14
Point 15	248.9	-19
Point 16	248.9	-31
Point 17	279.3	-5.3
Point 18	108.4	-8.56
Point 19	108.4	-12.5
Point 20	108.4	-19
Point 21	108.4	-32
Point 22	108.4	-42
Point 23	200	-19
Point 24	200	-32
Point 25	108.4	-70
Point 26	340	-70

Point 27	340	-7.5
Point 28	200	-15.3
Point 29	108.4	-15.3
Point 30	200	-6.5
Point 31	200	-42
Point 32	200	-70
Point 33	200	-25
Point 34	108.4	-25
Point 35	248.9	-24
Point 36	340	-24
Point 37	248.9	-42
Point 38	248.9	-70
Point 39	173.4	-7.5
Point 40	173.4	-12.5
Point 41	173.4	-19
Point 42	173.4	-15.3
Point 43	173.4	-32
Point 44	173.4	-42
Point 45	173.4	-70
Point 46	173.4	-25
Point 47	118.4	-8.48
Point 48	128.5	-8.74
Point 49	138.4	-8.05
Point 50	148.5	-5.84
Point 51	158.5	-2.78
Point 52	164.3	-2.38
Point 53	181.8	0.16
Point 54	186.7	2.06
Point 55	191.9	3.3
Point 56	196.9	4.24
Point 57	198.9	4.55
Point 58	142.2	-7.5
Point 59	201.1	5
Point 60	211	5
Point 61	221.3	4.8
Point 62	230.6	4.3
Point 63	235.8	3.1
Point 64	242.8	0.8
Point 65	250.9	-1.1
Point 66	263.3	-2.2
Point 67	272.2	-3.7
Point 68	288.8	-4.7
Point 69	305.5	-5.4
Point 70	324.2	-5.9
Point 71	200	5
Point 72	340	-5.9
Point 73	288	-1.5
Point 74	299.2	-5.13593

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.34	(171.381, 36.743)	31.60005	(211.648, 4.98742)	(138.015, -8.07686)
2	4631	1.36	(171.381, 36.743)	56.002	(212.754, 4.96595)	(137.821, -8.09033)

Slices of Slip Surface: Optimized

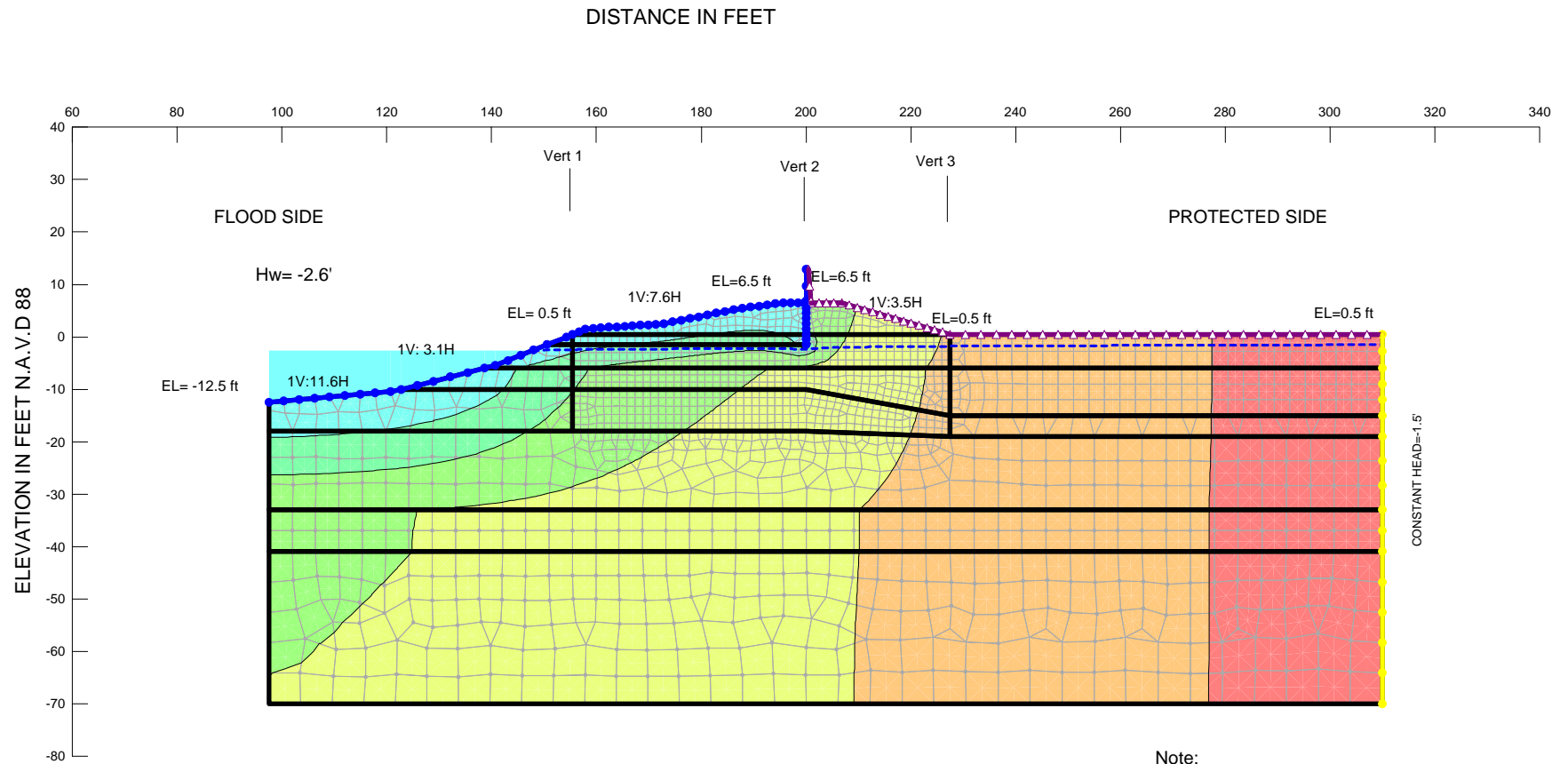
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	138.2073	-8.2083795	349.95924	449.27402	0	125
2	Optimized	139.35	-8.9883025	398.63135	519.95961	0	125
3	Optimized	141.25	-10.285108	479.53135	634.4194	0	125
4	Optimized	142.2828	-10.990035	523.55786	700.4874	0	125
5	Optimized	143.60015	-11.77328	572.39866	768.4452	0	125
6	Optimized	146.66735	-13.578775	685.07161	1014.5465	0	175
7	Optimized	148.91155	-14.899805	767.50627	1191.4905	0	175
8	Optimized	149.5354	-15.22103	787.54374	1185.7631	0	175
9	Optimized	151.0402	-15.780715	822.4602	1268.7345	0	175
10	Optimized	153.62515	-16.74214	882.46865	1411.2319	0	175
11	Optimized	156.7088	-17.57339	934.35183	1501.8335	0	175
12	Optimized	159.805	-18.179325	972.13323	1596.8343	0	175
13	Optimized	161.5404	-18.51895	993.34275	1641.054	0	175
14	Optimized	163.1354	-18.69292	1004.1886	1640.9295	0	175
15	Optimized	165.7102	-18.89133	1016.592	1696.3233	0	175
16	Optimized	167.5257	-19.03123	1025.3037	1743.7532	0	175.33
17	Optimized	168.2769	-19.03123	1025.3063	1712.8748	0	175.33
18	Optimized	169.80385	-18.89337	1016.7245	1725.6151	0	175
19	Optimized	172.16595	-18.680105	1003.4009	1745.1367	0	175
20	Optimized	173.3735	-18.573205	996.7227	1776.7895	0	175
21	Optimized	173.74185	-18.569525	996.49824	1560.6623	0	176.61
22	Optimized	174.54185	-18.56937	996.49357	1578.9419	0	180.37
23	Optimized	176.13335	-18.580695	996.76891	1607.3417	0	187.84
24	Optimized	178.4	-18.59683	996.90125	1647.8848	0	198.5
25	Optimized	180.66665	-18.612965	997.0336	1688.3838	0	209.15
26	Optimized	183.1216	-18.630435	997.17509	1772.7305	0	220.68
27	Optimized	185.5716	-18.36229	979.48983	1790.3529	0	232.2
28	Optimized	187.33615	-17.92827	951.77689	1828.068	0	240.49
29	Optimized	188.9542	-17.33599	914.17455	1767.612	0	248.09
30	Optimized	190.91805	-16.46437	859.02248	1757.5124	0	257.32
31	Optimized	192.1344	-15.924525	824.86483	1749.9596	0	263.04
32	Optimized	192.78195	-15.560245	801.89261	1678.0084	0	266.08
33	Optimized	194.1213	-14.716515	748.74532	1644.5175	0	272.37
34	Optimized	195.97375	-13.54955	675.20905	1598.249	0	281.08
35	Optimized	197.26995	-12.733035	623.75438	1564.5894	0	287.17
36	Optimized	198.26995	-12.103085	584.05619	1559.4124	0	218.5
37	Optimized	199.43905	-11.36661	537.65525	1506.4456	0	222.89
38	Optimized	199.98905	-11.01854	515.7163	1437.2014	0	224.96
39	Optimized	200.2	-10.85493	505.42796	1472.6832	0	224.59

40	Optimized	200.75	-10.428405	478.60545	1435.8389	0	223.47
41	Optimized	202.89545	-8.7646	373.94929	1292.461	0	219.08
42	Optimized	205.63865	-6.516945	232.65132	1013.5608	0	298.27
43	Optimized	207.5341	-4.806395	125.18521	849.13815	0	297.69
44	Optimized	209.092	-3.382336	35.726167	704.59723	0	297.21
45	Optimized	210.3511	-2.208668	-37.993704	592.03648	0	296.82
46	Optimized	211.32385	-1.301892	-94.950239	473.09111	0	296.53

Slices of Slip Surface: 4631

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	4631	138.1107	-8.3040135	355.92853	462.5792	0	125
2	4631	139.35	-9.180305	410.60977	535.93645	0	125
3	4631	141.25	-10.449457	489.78965	639.28618	0	125
4	4631	143.45445	-11.778	572.71857	762.50782	0	125
5	4631	145.6567	-12.990225	648.33103	918.32838	0	175
6	4631	147.55225	-13.926165	706.73976	1035.5237	0	175
7	4631	149.5989	-14.83594	763.5434	1153.5307	0	175
8	4631	151.99815	-15.779875	822.42194	1279.4994	0	175
9	4631	154.5989	-16.668325	877.84973	1400.906	0	175
10	4631	157.19965	-17.417385	924.59787	1506.8747	0	175
11	4631	159.805	-18.033645	963.0599	1583.5702	0	175
12	4631	162.705	-18.55964	995.87645	1642.8539	0	175
13	4631	165.14895	-18.90493	1017.4321	1695.8567	0	175
14	4631	167.2316	-19.091675	1029.0728	1743.0095	0	175.95
15	4631	169.69895	-19.220425	1037.1164	1788.6723	0	177.3
16	4631	172.1663	-19.240185	1038.3335	1823.061	0	177.5
17	4631	174.2	-19.18254	1034.7484	1609.3936	0	180.51
18	4631	175.88175	-19.071105	1027.4764	1619.1034	0	187.35
19	4631	178.0226	-18.849565	1012.8236	1626.3455	0	196.72
20	4631	180.54085	-18.49031	989.43653	1628.3374	0	208.56
21	4631	183.025	-18.02102	959.20983	1657.3977	0	220.23
22	4631	185.475	-17.44191	922.13119	1713.1952	0	231.74
23	4631	188	-16.71915	876.03283	1737.2276	0	243.61
24	4631	190.6	-15.839875	820.16306	1728.6136	0	255.83
25	4631	191.9818	-15.33236	787.96061	1719.8482	0	262.32
26	4631	193.2727	-14.78632	753.40813	1698.7936	0	268.39
27	4631	195.6909	-13.68981	684.04131	1652.6808	0	279.75
28	4631	197.47625	-12.80349	628.06424	1609.7183	0	288.14
29	4631	198.47625	-12.265705	594.12022	1601.1033	0	219.27
30	4631	199.45	-11.71281	559.2532	1553.4549	0	222.93
31	4631	200.2	-11.274175	531.60157	1559.7576	0	224.59
32	4631	200.75	-10.938555	510.44096	1525.9101	0	223.47
33	4631	202.25365	-9.9603695	448.83729	1428.73	0	220.39
34	4631	204.5609	-8.3488845	347.37907	1271.6287	0	215.67
35	4631	207.0359	-6.4081725	225.32682	1028.7395	0	297.84
36	4631	209.67865	-4.0766065	78.823552	773.8859	0	297.03
37	4631	211.0076	-2.82925	0.47827113	638.40696	0	296.62

38	4631	211.8844	-1.910816	-57.167638	526.40295	0	296.35
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Note:
The permeability of Fill(Hydraulic)
is assumed the same as Marsh

Name: BEACH SAND, EL. -33 TO -41 Model: Saturated Only K-Sat: 2.3e-005 ft/sec K-Ratio: 1
 Name: BAY SOUND CLAY, EL. -41 TO -70 Model: Saturated Only K-Sat: 3.28e-008 ft/sec K-Ratio: 1
 Name: Sheet Pile Model: Saturated Only K-Sat: 1e-010 ft/sec K-Ratio: 1
 Name: Lacustrine, EL. -18/-19 to -33 Model: Saturated Only K-Sat: 3.28e-007 ft/sec K-Ratio: 1
 Name: FILL, EL. -6 TO -10/-15 Model: Saturated Only K-Sat: 3.28e-007 ft/sec K-Ratio: 1
 Name: FILL (Hydraulic), EL. -10/-15 TO -18/-19 Model: Saturated Only K-Sat: 3.28e-007 ft/sec K-Ratio: 1
 Name: EMBANKMENT FILL, EL. +6.5 TO -6 Model: Saturated Only K-Sat: 3.28e-008 ft/sec K-Ratio: 1

GENERAL NOTES

CLASSIFICATION STRATIFICATION
 SHEAR STRENGTHS AND UNIT WEIGHTS OF
 THE SOIL WERE BASED ON THE RESULTS OF
 UNDISTURBED BORINGS AND CPT DATA. SEE
 BOTH BORING AND CPT DATA PLATES.

WHERE INDICATED, SHEAR STRENGTHS BETWEEN
 VERTICALS WERE ASSUMED TO VARY LINEARLY
 BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

Hw IS CANAL WATER LEVEL

LAKE PONTCHARTRAIN, LA. AND VICINITY
 HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 20A,
 PROTECTED SIDE STABILITY ANALYSIS,
 CASE: LWL Q-Case Seepage Analysis
 STA. 92+20 TO 93+46 EAST
 ORLEANS PARISH, LOUISIANA

LWL Q-Case Seepage Analysis

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File Information

Created By: [Liljegren, James](#)
Revision Number: [339](#)
Last Edited By: [Higgins, James](#)
Date: [6/11/2013](#)
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File Name: [Reach 20A.gsz](#)
Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix E LWL\](#)
Last Solved Date: [6/11/2013](#)
Last Solved Time: [12:12:10 PM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Mass(M) Units: [lbs](#)
Mass Flux Units: [lbs/sec](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

LWL Q-Case Seepage Analysis

Kind: [SEEP/W](#)
Method: [Steady-State](#)
Settings
 Include Air Flow: [No](#)
Control
 Apply Runoff: [No](#)
Convergence
 Convergence Type: [Head Vector Norm](#)
 Maximum Number of Iterations: [500](#)
 Tolerance: [0.001](#)
 Maximum Change in K: [0.1](#)
 Rate of Change in K: [1.02](#)
 Minimum Change in K: [1e-005](#)
 Equation Solver: [Parallel Direct](#)
 Potential Seepage Max # of Reviews: [10](#)
Time

Starting Time: 0 sec

Duration: 0 sec

Ending Time: 0 sec

Materials

BEACH SAND, EL. -33 TO -41

Model: Saturated Only

Hydraulic

K-Sat: 2.3e-005 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

BAY SOUND CLAY, EL. -41 TO -70

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-008 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

Sheet Pile

Model: Saturated Only

Hydraulic

K-Sat: 1e-010 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

Lacustrine, EL -18/-19 to -33

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-007 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

FILL, EL. -6 TO -10/-15

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-007 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

FILL (Hydraulic), EL. -10/-15 TO -18/-19

Model: Saturated Only
Hydraulic
K-Sat: 3.28e-007 ft/sec
Volumetric Water Content: 0 ft³/ft³
Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

EMBANKMENT FILL, EL. +6.5 TO -6

Model: Saturated Only
Hydraulic
K-Sat: 3.28e-008 ft/sec
Volumetric Water Content: 0 ft³/ft³
Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

Boundary Conditions

Drainage

Review: true
Type: Total Flux (Q) 0

Canal Water

Type: Head (H) -2.6

Curb

Type: Head (H) -1.5

Regions

	Material	Points	Area (ft²)
Region 1	Sheet Pile	7,18,19,20	4.8
Region 2	EMBANKMENT FILL, EL. +6.5 TO -6	7,20,8,9,21	102.9
Region 3	Lacustrine, EL -18/-19 to -33	12,11,39,44,35,15,16,45	3091.25
Region 4	BEACH SAND, EL. -33 TO -41	13,12,45,16,17,46	1700
Region 5	BAY SOUND CLAY, EL. -41 TO -70	25,13,46,17,26,47	6162.5
Region 6	EMBANKMENT FILL, EL. +6.5 TO -6	7,27,6,23,24,5,4,29,21	144.9
Region 7	FILL (Hydraulic), EL. -10/-15 TO -18/-19	38,40,31,28,1,42,11,39	428.68444
Region 8	FILL, EL. -6 TO -10/-15	34,33,32,14	742.5
Region 9	EMBANKMENT FILL, EL. +6.5 TO -6	41,36,3,30,37	47.411173
Region 10	EMBANKMENT FILL, EL. +6.5 TO -6	36,41,29,49	4.9575125

Region 11	EMBANKMENT FILL, EL. +6.5 TO -6	9,33,32,10	536.25
Region 12	FILL (Hydraulic), EL. -10/-15 TO -18/-19	35,34,14,15	330
Region 13	EMBANKMENT FILL, EL. +6.5 TO -6	21,22,41,37,48,33,9	379
Region 14	FILL, EL. -6 TO -10/-15	40,37,48,33,34,43	356.75
Region 15	FILL (Hydraulic), EL. -10/-15 TO -18/-19	39,38,40,43,34,35,44	521
Region 16	EMBANKMENT FILL, EL. +6.5 TO -6	41,29,21,22	89
Region 17	FILL, EL. -6 TO -10/-15	31,2,30,37,40	98.734098

Lines

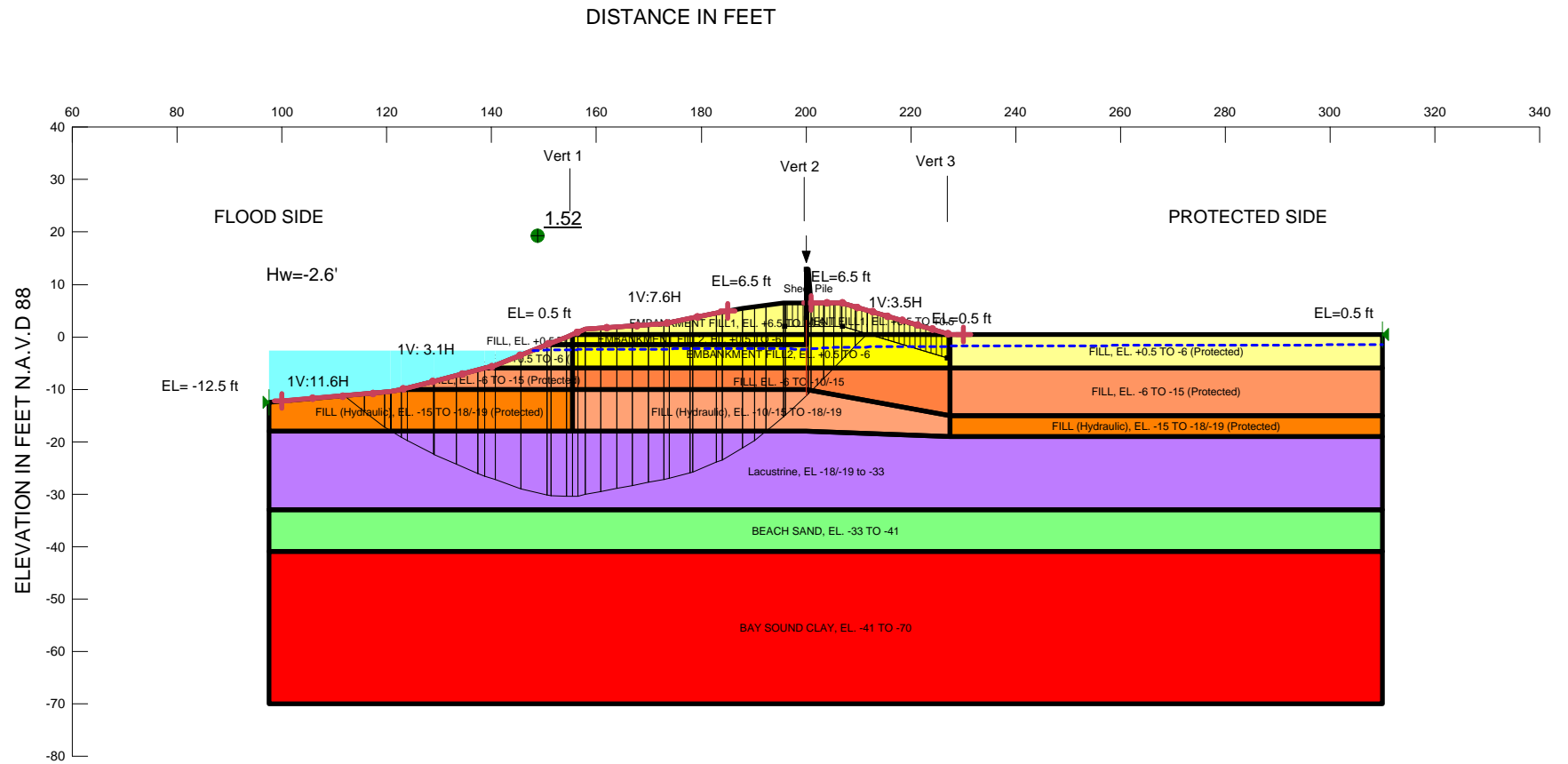
	Start Point	End Point	Hydraulic Boundary	Left Side Material
Line 1	7	18	Canal Water	
Line 2	18	19		
Line 3	19	20	Drainage	
Line 4	20	7		Sheet Pile
Line 5	7	21	Canal Water	Sheet Pile
Line 6	21	22	Canal Water	Sheet Pile
Line 7	20	8	Drainage	
Line 8	8	9	Drainage	
Line 9	9	21		
Line 10	12	11		
Line 11	15	16	Curb	
Line 12	13	12		
Line 13	16	17	Curb	
Line 14	25	13		
Line 15	17	26	Curb	
Line 16	7	27	Canal Water	
Line 17	27	6	Canal Water	
Line 18	6	23	Canal Water	
Line 19	23	24	Canal Water	
Line 20	24	5	Canal Water	
Line 21	5	4	Canal Water	
Line 22	4	29	Canal Water	
Line 23	29	21		
Line 24	15	35		
Line 25	32	33		
Line 26	32	14	Curb	
Line 27	14	34		
Line 28	36	3	Canal Water	
Line 29	3	30	Canal Water	
Line 30	37	30		
Line 31	39	11		
Line 32	9	33		
Line 33	10	9	Drainage	
Line 34	35	34		
Line 35	14	15	Curb	
Line 36	39	38		
Line 37	37	40		

Line 38	41	36		
Line 39	37	41		
Line 40	41	29		
Line 41	22	41		
Line 42	42	11		
Line 43	40	38		
Line 44	10	32	Curb	
Line 45	31	2	Canal Water	
Line 46	2	30	Canal Water	
Line 47	34	43		
Line 48	43	40		
Line 49	40	31		
Line 50	31	28	Canal Water	
Line 51	28	1	Canal Water	
Line 52	1	42		
Line 53	35	44		
Line 54	44	39		
Line 55	33	34		
Line 56	12	45		
Line 57	45	16		
Line 58	17	46		
Line 59	46	13		
Line 60	26	47		
Line 61	47	25		
Line 62	33	48		
Line 63	48	37		
Line 64	29	49	Canal Water	
Line 65	49	36	Canal Water	

Points

	X (ft)	Y (ft)
Point 1	97.5	-12.5
Point 2	128.9	-8.5
Point 3	140.7	-5.5
Point 4	157.9	1.5
Point 5	172.9	2.5
Point 6	187.9	5.5
Point 7	200	6.5
Point 8	206.8	6.5
Point 9	227.5	0.5
Point 10	310	0.5
Point 11	97.5	-18
Point 12	97.5	-33
Point 13	97.5	-41
Point 14	310	-15
Point 15	310	-19
Point 16	310	-33

Point 17	310	-41
Point 18	200	12.9
Point 19	200.5	12.9
Point 20	201	6.5
Point 21	200	0.5
Point 22	200	-1.5
Point 23	182.9	4.5
Point 24	177.9	3.5
Point 25	97.5	-70
Point 26	310	-70
Point 27	195.7	6.5
Point 28	120.7	-10.5
Point 29	155.5	0.5
Point 30	138.71539	-6
Point 31	122.76222	-10
Point 32	310	-6
Point 33	227.5	-6
Point 34	227.5	-15
Point 35	227.5	-19
Point 36	150.54249	-1.5
Point 37	155.5	-6
Point 38	155.5	-14
Point 39	155.5	-18
Point 40	155.5	-10
Point 41	155.5	-1.5
Point 42	97.5	-14
Point 43	200	-10
Point 44	200	-18
Point 45	200	-33
Point 46	200	-41
Point 47	200	-70
Point 48	200	-6
Point 49	154.26062	0



Name: EMBANKMENT FILL1, EL. +6.5 TO +0.5 Model: Undrained (Phi=0) Unit Weight: 111 pcf Cohesion: 500 psf
Name: BEACH SAND, EL. -33 TO -41 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand
Name: BAY SOUND CLAY, EL. -41 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 106 pcf Cohesion Spatial Fn: Bay Sound Phi: 0 °
Name: Sheet Pile Model: Undrained (Phi=0) Unit Weight: 0.1 pcf Cohesion: 0.01 psf
Name: Lacustrine, EL. -18/-19 to -33 Model: Spatial Mohr-Coulomb Unit Weight: 103 pcf Cohesion Spatial Fn: Lacustrine Phi: 0 °
Name: EMBANKMENT FILL2, EL. +0.5 TO -6 Model: Spatial Mohr-Coulomb Unit Weight: 101 pcf Cohesion Fn: Fill2 Phi: 0 °
Name: FILL, EL. +0.5 TO -6 (Protected) Model: Spatial Mohr-Coulomb Unit Weight: 101 pcf Cohesion: 400 psf Phi: 0 °
Name: FILL, EL. -6 TO -10/-15 Model: Spatial Mohr-Coulomb Unit Weight: 92 pcf Cohesion Fn: Fill Phi: 0 °
Name: FILL (Hydraulic), EL. -10/-15 TO -18/-19 Model: Spatial Mohr-Coulomb Unit Weight: 82 pcf Cohesion: 400 psf Phi: 0 °
Name: FILL, EL. -6 TO -15 (Protected) Model: Spatial Mohr-Coulomb Unit Weight: 92 pcf Cohesion: 200 psf Phi: 0 °
Name: FILL (Hydraulic), EL. -15 TO -18/-19 (Protected) Model: Spatial Mohr-Coulomb Unit Weight: 82 pcf Cohesion: 400 psf Phi: 0 °

GENERAL NOTES

CLASSIFICATION STRATIFICATION
SHEAR STRENGTHS AND UNIT WEIGHTS OF
THE SOIL WERE BASED ON THE RESULTS OF
UNDISTURBED BORINGS AND CPT DATA. SEE
BOTH BORING AND CPT DATA PLATES.

WHERE INDICATED, SHEAR STRENGTHS BETWEEN
VERTICALS WERE ASSUMED TO VARY LINEARLY
BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

Hw IS CANAL WATER LEVEL

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 20A,
PROTECTED SIDE STABILITY ANALYSIS,
CASE: LWL Q Case (Entry/Exit)
STA. 92+20 TO 93+46 EAST
ORLEANS PARISH, LOUISIANA

LWL Q Case (Entry/Exit)

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File Name: [Reach 20A.gsz](#)
Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix E LWL\](#)
Last Solved Date: [6/11/2013](#)
Last Solved Time: [12:12:38 PM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Strength Units: [psf](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

LWL Q Case (Entry/Exit)

Kind: [SLOPE/W](#)
Parent: [LWL Q-Case Seepage Analysis](#)
Method: [Spencer](#)
Settings
 PWP Conditions Source: [Parent Analysis](#)
Slip Surface
 Direction of movement: [Right to Left](#)
 Use Passive Mode: [No](#)
 Slip Surface Option: [Entry and Exit](#)
 Critical slip surfaces saved: [1](#)
 Optimize Critical Slip Surface Location: [Yes](#)
 Tension Crack
 Tension Crack Option: [Tension Crack Line](#)
 Percentage Wet: [1](#)
 Tension Crack Fluid Unit Weight: [62.4 pcf](#)
FOS Distribution
 FOS Calculation Option: [Constant](#)

Advanced

Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 2000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

EMBANKMENT FILL1, EL. +6.5 TO +0.5

Model: Undrained (Phi=0)
Unit Weight: 111 pcf
Cohesion: 500 psf

BEACH SAND, EL. -33 TO -41

Model: Shear/Normal Fn.
Unit Weight: 122 pcf
Strength Function: Sand
Phi-B: 0 °

BAY SOUND CLAY, EL. -41 TO -70

Model: Spatial Mohr-Coulomb
Unit Weight: 106 pcf
Cohesion Spatial Fn: Bay Sound
Phi: 0 °
Phi-B: 0 °

Sheet Pile

Model: Undrained (Phi=0)
Unit Weight: 0.1 pcf
Cohesion: 0.01 psf

Lacustrine, EL -18/-19 to -33

Model: Spatial Mohr-Coulomb
Unit Weight: 103 pcf
Cohesion Spatial Fn: Lacustrine
Phi: 0 °
Phi-B: 0 °

EMBANKMENT FILL2, EL. +0.5 TO -6

Model: Spatial Mohr-Coulomb
Unit Weight: 101 pcf

Cohesion Fn: [Fill2](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

FILL, EL. +0.5 TO -6 (Protected)

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [101 pcf](#)

Cohesion: [400 psf](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

FILL, EL. -6 TO -10/-15

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [92 pcf](#)

Cohesion Fn: [Fill](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

FILL (Hydraulic), EL. -10/-15 TO -18/-19

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [82 pcf](#)

Cohesion: [400 psf](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

FILL, EL. -6 TO -15 (Protected)

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [92 pcf](#)

Cohesion: [200 psf](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

FILL (Hydraulic), EL. -15 TO -18/-19 (Protected)

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [82 pcf](#)

Cohesion: [400 psf](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

Slip Surface Entry and Exit

Left Projection: [Range](#)

Left-Zone Left Coordinate: [\(100, -12.28448\) ft](#)

Left-Zone Right Coordinate: [\(185, 4.92\) ft](#)

Left-Zone Increment: [15](#)

Right Projection: [Range](#)

Right-Zone Left Coordinate: [\(201, 6.5\) ft](#)

Right-Zone Right Coordinate: [\(230, 0.5\) ft](#)

Right-Zone Increment: 10

Radius Increments: 8

Slip Surface Limits

Left Coordinate: (97.5, -12.5) ft

Right Coordinate: (310, 0.5) ft

Reinforcements

Reinforcement 1

Type: [Pile](#)

Outside Point: (200, 12.9) ft

Inside Point: (200, 3.5) ft

Slip Surface Intersection: (200, -11.253) ft

Total Length: 9.4 ft

Reinforcement Direction: 90 °

Applied Load Option: [Variable](#)

F of S Dependent: [No](#)

Pile Spacing: 1 ft

Shear Capacity: 0 lbs

Shear Safety Factor: 1

Shear Load Used: 0 lbs

Shear Option: [Parallel to Slip](#)

Resisting Force Used: 0 lbs/ft

Tension Crack Line

	X (ft)	Y (ft)
	196	2
	207	2
	227	-4

Cohesion Functions

Fill2

Model: [Spline Data Point Function](#)

Function: [Cohesion vs. X](#)

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 400

Data Points: X (ft), Cohesion (psf)

Data Point: (155.5, 400)

Data Point: (200, 500)

Data Point: (227.5, 400)

Fill

Model: [Spline Data Point Function](#)

Function: [Cohesion vs. X](#)

Curve Fit to Data: [100 %](#)

Segment Curvature: [0 %](#)

Y-Intercept: [200](#)

Data Points: [X \(ft\)](#), [Cohesion \(psf\)](#)

Data Point: [\(155.5, 200\)](#)

Data Point: [\(200, 300\)](#)

Data Point: [\(227.5, 200\)](#)

Shear/Normal Strength Functions

Sand

Model: [Spline Data Point Function](#)

Function: [Shear Stress vs. Normal Stress](#)

Curve Fit to Data: [100 %](#)

Segment Curvature: [0 %](#)

Y-Intercept: [0](#)

Data Points: [Normal Stress \(psf\)](#), [Shear Stress \(psf\)](#)

Data Point: [\(-10000, 0\)](#)

Data Point: [\(0, 0\)](#)

Data Point: [\(10000, 6494\)](#)

Estimation Properties

Intact Rock Param.: [10](#)

Geological Strength: [100](#)

Disturbance Factor: [0](#)

SigmaC: [600000 psf](#)

Sigma3: [300000 psf](#)

Num. Points: [20](#)

Spatial Functions

Lacustrine

Model: [Linear Interpolation](#)

Limit Range By: [Data Values](#)

Data Points: [X \(ft\)](#), [Y \(ft\)](#), [Cohesion \(psf\)](#)

Data Point: [\(200, -18, 235\)](#)

Data Point: [\(200, -33, 350\)](#)

Data Point: [\(227.5, -19, 220\)](#)

Data Point: [\(227.5, -33, 340\)](#)

Data Point: [\(310, -19, 220\)](#)

Data Point: [\(310, -33, 340\)](#)

Data Point: [\(155.5, -18, 220\)](#)

Data Point: [\(155.5, -33, 340\)](#)

Data Point: [\(97.5, -18, 220\)](#)

Data Point: (97.5, -33, 340)

Bay Sound

Model: Linear Interpolation

Limit Range By: Data Values

Data Points: X (ft), Y (ft), Cohesion (psf)

Data Point: (200, -41, 525)

Data Point: (200, -70, 810)

Data Point: (227.5, -41, 500)

Data Point: (227.5, -70, 770)

Data Point: (310, -41, 500)

Data Point: (310, -70, 770)

Data Point: (155.5, -41, 500)

Data Point: (155.5, -70, 770)

Data Point: (97.5, -41, 500)

Data Point: (97.5, -70, 770)

Regions

	Material	Points	Area (ft²)
Region 1	Sheet Pile	7,18,19,20	4.8
Region 2	EMBANKMENT FILL1, EL. +6.5 TO +0.5	7,20,8,9,21	102.9
Region 3	Lacustrine, EL -18/-19 to -33	12,11,39,44,35,15,16,45	3091.25
Region 4	BEACH SAND, EL. -33 TO -41	13,12,45,16,17,46	1700
Region 5	BAY SOUND CLAY, EL. -41 TO -70	25,13,46,17,26,47	6162.5
Region 6	EMBANKMENT FILL1, EL. +6.5 TO +0.5	7,27,6,23,24,5,4,29,21	144.9
Region 7	FILL (Hydraulic), EL. -15 TO -18/-19 (Protected)	38,40,31,28,1,42,11,39	428.68444
Region 8	FILL, EL. -6 TO -15 (Protected)	34,33,32,14	742.5
Region 9	FILL, EL. +0.5 TO -6 (Protected)	41,36,3,30,37	47.411173
Region 10	FILL, EL. +0.5 TO -6 (Protected)	36,41,29,49	4.9575125
Region 11	FILL, EL. +0.5 TO -6 (Protected)	9,33,32,10	536.25
Region 12	FILL (Hydraulic), EL. -15 TO -18/-19 (Protected)	35,34,14,15	330
Region 13	EMBANKMENT FILL2, EL. +0.5 TO -6	21,22,41,37,48,33,9	379
Region 14	FILL, EL. -6 TO -10/-15	40,37,48,33,34,43	356.75
Region 15	FILL (Hydraulic), EL. -10/-15 TO -18/-19	39,38,40,43,34,35,44	521
Region 16	EMBANKMENT FILL2, EL. +0.5 TO -6	41,29,21,22	89
Region 17	FILL, EL. -6 TO -15 (Protected)	31,2,30,37,40	98.734098

Points

	X (ft)	Y (ft)
Point 1	97.5	-12.5
Point 2	128.9	-8.5
Point 3	140.7	-5.5
Point 4	157.9	1.5
Point 5	172.9	2.5
Point 6	187.9	5.5
Point 7	200	6.5

Point 8	206.8	6.5
Point 9	227.5	0.5
Point 10	310	0.5
Point 11	97.5	-18
Point 12	97.5	-33
Point 13	97.5	-41
Point 14	310	-15
Point 15	310	-19
Point 16	310	-33
Point 17	310	-41
Point 18	200	12.9
Point 19	200.5	12.9
Point 20	201	6.5
Point 21	200	0.5
Point 22	200	-1.5
Point 23	182.9	4.5
Point 24	177.9	3.5
Point 25	97.5	-70
Point 26	310	-70
Point 27	195.7	6.5
Point 28	120.7	-10.5
Point 29	155.5	0.5
Point 30	138.71539	-6
Point 31	122.76222	-10
Point 32	310	-6
Point 33	227.5	-6
Point 34	227.5	-15
Point 35	227.5	-19
Point 36	150.54249	-1.5
Point 37	155.5	-6
Point 38	155.5	-14
Point 39	155.5	-18
Point 40	155.5	-10
Point 41	155.5	-1.5
Point 42	97.5	-14
Point 43	200	-10
Point 44	200	-18
Point 45	200	-33
Point 46	200	-41
Point 47	200	-70
Point 48	200	-6
Point 49	154.26062	0

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.52	(156.564, 31.883)	44.89094	(211.773, 5.0586)	(111.849, -11.2631)
2	240	1.55	(156.564, 31.883)	62.33	(210.651, 5.38381)	(111.602, -11.2843)

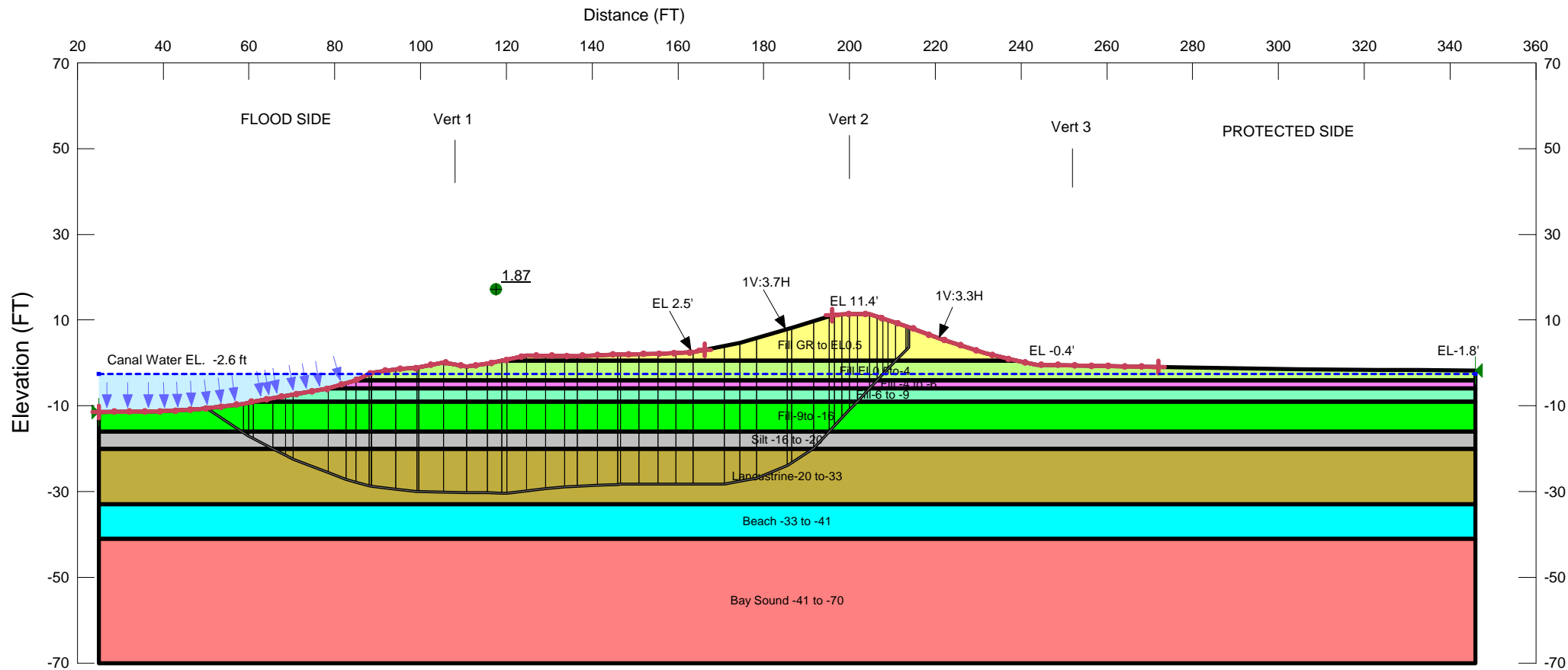
Slices of Slip Surface: **Optimized**

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	113.77975	-12.746085	635.97889	929.47127	0	400
2	Optimized	117.6423	-15.71213	826.8629	1191.2797	0	400
3	Optimized	120.1368	-17.535325	944.26654	1293.674	0	400
4	Optimized	120.80305	-17.93775	970.22828	1334.2248	0	400
5	Optimized	121.83415	-18.56054	1010.3791	1324.6209	0	224.48
6	Optimized	123.34185	-19.47119	1068.9873	1433.9551	0	231.77
7	Optimized	126.41075	-21.07765	1172.6256	1607.2249	0	244.62
8	Optimized	129.00945	-22.38923	1257.2	1769.6494	0	255.11
9	Optimized	131.17725	-23.35412	1319.4844	1872.8911	0	262.83
10	Optimized	135.294	-25.17344	1436.7289	2101.2258	0	277.39
11	Optimized	138.0339	-26.329015	1511.0788	2220.2424	0	286.63
12	Optimized	139.7077	-26.932995	1550.0073	2299.9145	0	291.46
13	Optimized	143.13405	-28.169365	1629.4924	2481.7626	0	301.35
14	Optimized	148.0553	-29.615005	1722.3361	2668.8801	0	312.92
15	Optimized	150.94895	-30.27506	1764.7239	2859.1765	0	318.2
16	Optimized	152.808	-30.371805	1771.2494	2858.7892	0	318.97
17	Optimized	154.8803	-30.37755	1772.0079	2943.7987	0	319.02
18	Optimized	155.9688	-30.38057	1772.4218	2991.1152	0	319.16
19	Optimized	157.1688	-30.240865	1763.8441	2956.146	0	318.34
20	Optimized	159.4	-29.81059	1737.1589	2956.9833	0	315.45
21	Optimized	162.4	-29.232045	1701.2866	2920.3581	0	311.6
22	Optimized	165.4	-28.6535	1665.5124	2883.7329	0	307.78
23	Optimized	168.4	-28.07496	1629.7382	2847.1078	0	303.97
24	Optimized	171.4	-27.49642	1593.9967	2810.4499	0	300.2
25	Optimized	173.387	-27.11323	1570.331	2793.3685	0	297.71
26	Optimized	175.887	-26.46074	1529.8791	2751.9633	0	293.27
27	Optimized	178.14455	-25.83432	1491.0196	2738.5109	0	288.98
28	Optimized	180.64455	-24.85588	1430.1199	2651.9637	0	282.03
29	Optimized	183.47345	-23.713775	1359.0366	2600.1915	0	273.94
30	Optimized	185.97345	-22.33537	1273.119	2457.7493	0	263.97
31	Optimized	189.01835	-20.522725	1160.0854	2338.5727	0	250.85
32	Optimized	191.26725	-18.928485	1060.6269	2152.1502	0	239.24
33	Optimized	194.0489	-16.644	918.04029	1916.0221	0	400
34	Optimized	195.88285	-15.137825	824.07232	1820.7605	0	400
35	Optimized	198.03285	-13.120325	698.1544	1619.0723	0	400
36	Optimized	200.25	-11.015685	566.8695	1456.9184	0	400
37	Optimized	200.75	-10.541055	537.27856	1420.655	0	400
38	Optimized	202.1892	-9.174865	452.15657	1365.1298	0	292.04
39	Optimized	204.35525	-7.022995	318.27789	1158.4185	0	284.16
40	Optimized	206.06605	-5.231376	205.81355	878.42199	0	477.94
41	Optimized	208.1058	-3.095276	71.425644	640.5566	0	470.52
42	Optimized	210.5922	-0.57982225	-85.153194	339.30716	0	461.48

Slices of Slip Surface: **240**

	Slip				Base Normal	Frictional	Cohesive
--	------	--	--	--	-------------	------------	----------

	Surface	X (ft)	Y (ft)	PWP (psf)	Stress (psf)	Strength (psf)	Strength (psf)
1	240	113.4991	-13.100815	658.68757	1011.8632	0	400
2	240	117.2939	-16.458645	874.65101	1259.0941	0	400
3	240	119.94565	-18.54773	1009.1063	1332.37	0	224.38
4	240	121.7311	-19.790525	1089.0976	1469.0313	0	234.32
5	240	124.29665	-21.414575	1193.5902	1647.3886	0	247.32
6	240	127.36555	-23.15757	1305.8801	1840.6271	0	261.26
7	240	130.5359	-24.723775	1406.7126	2014.3618	0	273.79
8	240	133.8077	-26.11781	1496.4965	2169.0322	0	284.94
9	240	137.0795	-27.298245	1572.5661	2300.0609	0	294.39
10	240	139.7077	-28.115625	1625.2184	2393.1745	0	300.93
11	240	142.3404	-28.779045	1668.0169	2484.2647	0	306.23
12	240	145.62125	-29.456325	1711.7417	2586.6065	0	311.65
13	240	148.9021	-29.952235	1743.8716	2697.3732	0	315.62
14	240	152.40155	-30.279985	1765.3502	2854.9914	0	318.24
15	240	154.8803	-30.42122	1774.7566	2956.1263	0	319.37
16	240	156.7	-30.43535	1776.0372	3027.5341	0	319.78
17	240	159.4	-30.36439	1772.0951	3070.4483	0	319.87
18	240	162.4	-30.154945	1759.4653	3052.9214	0	318.94
19	240	165.4	-29.798965	1737.6614	3020.3671	0	316.85
20	240	168.4	-29.293885	1706.456	2972.6757	0	313.61
21	240	171.4	-28.63596	1665.6798	2909.5168	0	309.18
22	240	174.15	-27.90054	1620.0043	2856.5738	0	304.11
23	240	176.65	-27.10722	1570.6854	2815.6924	0	298.54
24	240	179.15	-26.19549	1513.9495	2762.9485	0	292.08
25	240	181.65	-25.15966	1449.4298	2697.7665	0	284.69
26	240	184.15	-23.992815	1376.719	2619.6182	0	276.31
27	240	186.65	-22.686525	1295.334	2527.721	0	266.9
28	240	189.4092	-21.061095	1193.9866	2396.7568	0	255.14
29	240	192.4276	-19.062415	1069.3298	2221.8556	0	240.65
30	240	194.8184	-17.31449	960.32014	2004.8569	0	400
31	240	197.85	-14.72446	798.73506	1776.3208	0	400
32	240	200.25	-12.574275	664.65069	1577.3186	0	400
33	240	200.75	-12.07733	633.66454	1531.899	0	400
34	240	201.6681	-11.125405	574.31312	1445.3375	0	400
35	240	204.1984	-8.21238	392.74805	1236.4259	0	284.73
36	240	206.4303	-5.506963	223.75265	819.00108	0	476.62
37	240	208.6085	-2.256963	18.80232	407.49733	0	468.7
38	240	210.5339	0.70237355	-165.95474	-151.24057	0	500



Name: Fill GR to EL 0.5 Model: Mohr-Coulomb Unit Weight: 111 pcf Cohesion: 850 psf Phi: 0° Phi-B: 0° Piezometric Line: 1
 Name: Fill EL 0.5 to -4 Model: Spatial Mohr-Coulomb Unit Weight: 101 pcf Cohesion Spatial Fn: Fill -0.5 to -4 Phi: 0° Phi-B: 0° Piezometric Line: 1
 Name: Fill -4 to -6 Model: Spatial Mohr-Coulomb Unit Weight: 101 pcf Cohesion Spatial Fn: Fill -4 to -6 Phi: 0° Phi-B: 0° Piezometric Line: 1
 Name: Fill -6 to -9 Model: Spatial Mohr-Coulomb Unit Weight: 92 pcf Cohesion Spatial Fn: Fill -6 to -9 Phi: 0° Phi-B: 0° Piezometric Line: 1
 Name: Fill -9 to -16 Model: Spatial Mohr-Coulomb Weight Spatial Fn: Fill -9 to -16 Cohesion Spatial Fn: Fill Hyd -9 to -16 Phi: 0° Phi-B: 0° Piezometric Line: 1
 Name: Silt -16 to -20 Model: Mohr-Coulomb Unit Weight: 117 pcf Cohesion: 200 psf Phi: 15° Phi-B: 0° Piezometric Line: 1
 Name: Lancustrine -20 to -33 Model: Spatial Mohr-Coulomb Unit Weight: 101 pcf Cohesion Spatial Fn: Lanc -20 to -33 Phi: 0° Phi-B: 0° Piezometric Line: 1
 Name: Beach -33 to -41 Model: Mohr-Coulomb Unit Weight: 122 pcf Cohesion: 0 psf Phi: 33° Phi-B: 0° Piezometric Line: 1
 Name: Bay Sound -41 to -70 Model: Spatial Mohr-Coulomb Unit Weight: 106 pcf Cohesion Spatial Fn: BaySound -41 to -70 Phi: 0° Phi-B: 0° Piezometric Line: 1

CROSS SECTION AT STA 95+00 EAST

GENERAL NOTES

CLASSIFICATION STRATIFICATION
 SHEAR STRENGTHS AND UNIT WEIGHTS OF
 THE SOIL WERE BASED ON THE RESULTS OF
 UNDISTURBED BORINGS AND CPT DATA. SEE
 BOTH BORING AND CPT DATA PLATES.

WHERE INDICATED, SHEAR STRENGTHS BETWEEN
 VERTICALS WERE ASSUMED TO VARY LINEARLY
 BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

LAKE PONTCHARTRAIN, LA. AND VICINITY
 HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL,
 REMEDIATION OF CANAL WALLS AND LEVEES
 FLOOD SIDE STABILITY ANALYSIS,
 CASE: Name: LWL Q Case (Entry/Exit)
 REACH 20B, STA. 93+46 TO STA. 103+00 EAST
 ORLEANS PARISH, LOUISIANA

LWL Q Case (Entry/Exit)

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File Information

Created By: [Vicky Curtis](#)
Revision Number: [138](#)
Last Edited By: [Vicky Curtis](#)
Date: [6/11/2013](#)
Time: [11:43:14 AM](#)
File Name: [Reach 20B.gsz](#)
Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix E LWL\](#)
Last Solved Date: [6/11/2013](#)
Last Solved Time: [11:50:22 AM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Strength Units: [psf](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

LWL Q Case (Entry/Exit)

Kind: [SLOPE/W](#)
Method: [Spencer](#)
Settings
 Apply Phreatic Correction: [No](#)
 PWP Conditions Source: [Piezometric Line](#)
 Use Staged Rapid Drawdown: [No](#)
Slip Surface
 Direction of movement: [Right to Left](#)
 Use Passive Mode: [No](#)
 Slip Surface Option: [Entry and Exit](#)
 Critical slip surfaces saved: [1](#)
 Optimize Critical Slip Surface Location: [Yes](#)
Tension Crack
 Tension Crack Option: [Tension Crack Line](#)
 Percentage Wet: [1](#)
 Tension Crack Fluid Unit Weight: [62.4 pcf](#)
FOS Distribution

FOS Calculation Option: [Constant](#)

Advanced

Number of Slices: [30](#)

Optimization Tolerance: [0.01](#)

Minimum Slip Surface Depth: [0.1 ft](#)

Optimization Maximum Iterations: [9000](#)

Optimization Convergence Tolerance: [1e-007](#)

Starting Optimization Points: [8](#)

Ending Optimization Points: [16](#)

Complete Passes per Insertion: [1](#)

Driving Side Maximum Convex Angle: [5 °](#)

Resisting Side Maximum Convex Angle: [1 °](#)

Materials

Fill GR to EL0.5

Model: [Mohr-Coulomb](#)

Unit Weight: [111 pcf](#)

Cohesion: [850 psf](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: [1](#)

Fill EL0.5to-4

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [101 pcf](#)

Cohesion Spatial Fn: [Fill -0.5 to -4](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: [1](#)

Fill -4 to -6

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [101 pcf](#)

Cohesion Spatial Fn: [Fill -4 to -6](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: [1](#)

Fill-6 to -9

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [92 pcf](#)

Cohesion Spatial Fn: [Fill -6 to-9](#)

Phi: [0 °](#)

Phi-B: 0 °

Pore Water Pressure

Piezometric Line: 1

Fill-9to -16

Model: [Spatial Mohr-Coulomb](#)

Weight Spatial Fn: [Fill -9 to -16](#)

Cohesion Spatial Fn: [Fill Hyd -9 to -16](#)

Phi: 0 °

Phi-B: 0 °

Pore Water Pressure

Piezometric Line: 1

Silt -16 to -20

Model: [Mohr-Coulomb](#)

Unit Weight: [117 pcf](#)

Cohesion: [200 psf](#)

Phi: [15 °](#)

Phi-B: 0 °

Pore Water Pressure

Piezometric Line: 1

Lancustrine-20 to-33

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [101 pcf](#)

Cohesion Spatial Fn: [Lanc -20 to-33](#)

Phi: 0 °

Phi-B: 0 °

Pore Water Pressure

Piezometric Line: 1

Beach -33 to -41

Model: [Mohr-Coulomb](#)

Unit Weight: [122 pcf](#)

Cohesion: [0 psf](#)

Phi: [33 °](#)

Phi-B: 0 °

Pore Water Pressure

Piezometric Line: 1

Bay Sound -41 to -70

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [106 pcf](#)

Cohesion Spatial Fn: [BaySound -41 to-70](#)

Phi: 0 °

Phi-B: 0 °

Pore Water Pressure

Piezometric Line: 1

Slip Surface Entry and Exit

Left Projection: [Range](#)
Left-Zone Left Coordinate: [\(25, -11.39\)](#) ft
Left-Zone Right Coordinate: [\(166.25091, 3\)](#) ft
Left-Zone Increment: [40](#)
Right Projection: [Range](#)
Right-Zone Left Coordinate: [\(196, 11.133\)](#) ft
Right-Zone Right Coordinate: [\(272, -0.93951\)](#) ft
Right-Zone Increment: [20](#)
Radius Increments: [80](#)

Slip Surface Limits

Left Coordinate: [\(25, -11.39\)](#) ft
Right Coordinate: [\(346, -1.77\)](#) ft

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
	25	-2.6
	346	-2.6

Tension Crack Line

	X (ft)	Y (ft)
	196	7
	205	6.5
	239	-4.5
	244	-4.5
	272	-4.5

Spatial Functions

Fill -0.5 to -4

Model: [Linear Interpolation](#)
Limit Range By: [Data Values](#)
Data Points: [X \(ft\), Y \(ft\), Cohesion \(psf\)](#)
Data Point: [\(108, 0, 400\)](#)
Data Point: [\(108, -4, 400\)](#)
Data Point: [\(200, 0.5, 850\)](#)
Data Point: [\(200, -4, 850\)](#)

Data Point: (252, 0, 400)

Data Point: (252, -4, 400)

Fill -4 to -6

Model: Linear Interpolation

Limit Range By: Data Values

Data Points: X (ft), Y (ft), Cohesion (psf)

Data Point: (108, -4, 400)

Data Point: (108, -6, 400)

Data Point: (200, -4, 600)

Data Point: (200, -6, 600)

Data Point: (252, -4, 400)

Data Point: (252, -6, 400)

Fill -6 to-9

Model: Linear Interpolation

Limit Range By: Data Values

Data Points: X (ft), Y (ft), Cohesion (psf)

Data Point: (108, -6, 300)

Data Point: (108, -9, 300)

Data Point: (200, -6, 400)

Data Point: (200, -9, 400)

Data Point: (252, -6, 300)

Data Point: (252, -9, 300)

Fill Hyd -9 to -16

Model: Linear Interpolation

Limit Range By: Data Values

Data Points: X (ft), Y (ft), Cohesion (psf)

Data Point: (108, -9, 200)

Data Point: (108, -16, 200)

Data Point: (200, -9, 400)

Data Point: (200, -16, 400)

Data Point: (252, -9, 200)

Data Point: (252, -16, 200)

Lanc -20 to-33

Model: Linear Interpolation

Limit Range By: Data Values

Data Points: X (ft), Y (ft), Cohesion (psf)

Data Point: (108, -20, 220)

Data Point: (108, -33, 340)

Data Point: (200, -20, 400)

Data Point: (200, -33, 520)

Data Point: (252, -20, 220)

Data Point: (252, -33, 340)

Data Point: (30, -20, 220)

Data Point: (310, -20, 220)

BaySound -41 to -70

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (108, -41, 500)
Data Point: (108, -70, 770)
Data Point: (200, -41, 540)
Data Point: (200, -70, 780)
Data Point: (252, -41, 500)
Data Point: (252, -70, 770)
Data Point: (25, -41, 500)
Data Point: (25, -70, 770)
Data Point: (346, -41, 500)
Data Point: (346, -70, 770)

Fill -9 to -16

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Unit Weight (pcf)
Data Point: (108, -9, 92)
Data Point: (108, -16, 92)
Data Point: (200, -9, 82)
Data Point: (200, -16, 82)
Data Point: (252, -9, 92)
Data Point: (252, -16, 92)

Regions

	Material	Points	Area (ft²)
Region 1	Fill GR to EL0.5	35,13,14,15,16,17,18,19,20,21,22,23,24,25,36	520.247
Region 2	Fill EL0.5to-4	37,7,8,9,10,11,12,35,36,26,27,28,29,30,31,32,33,34,38	942.8625
Region 3	Fill -4 to -6	6,37,38,39	529.805
Region 4	Fill-6 to -9	40,5,6,39,41	827.8375
Region 5	Fill-9to -16	1,2,3,4,40,41,42,43	2180.9675
Region 6	Silt -16 to -20	43,42,44,45	1284
Region 7	Lancustrine-20 to-33	45,44,46,47	4173
Region 8	Beach -33 to -41	47,46,50,51	2568
Region 9	Bay Sound -41 to -70	51,50,48,49	9309

Points

	X (ft)	Y (ft)
Point 1	25	-11.39
Point 2	38.5	-11.38
Point 3	48.5	-10.85
Point 4	58.7	-9.52
Point 5	68.5	-7.66
Point 6	78.5	-6.01

Point 7	88.5	-2.35
Point 8	94.2	-1.45
Point 9	99.2	-1.16
Point 10	105.4	0.15
Point 11	110.8	-0.8
Point 12	115.6	-0.17
Point 13	124.7	1.67
Point 14	136.6	1.63
Point 15	145.9	1.96
Point 16	155.4	2.16
Point 17	163.6	2.46
Point 18	174.4	4.66
Point 19	186.5	8.15
Point 20	196.5	11.29
Point 21	200	11.41
Point 22	204.7	11.33
Point 23	213.2	8.59
Point 24	221.6	5.47
Point 25	231.7	2.27
Point 26	243.7	-0.37
Point 27	258.3	-0.74
Point 28	271	-0.92
Point 29	283.3	-1.16
Point 30	296.1	-1.36
Point 31	309.2	-1.53
Point 32	319.4	-1.59
Point 33	332.4	-1.62
Point 34	346	-1.77
Point 35	119	0.5
Point 36	239	0.5
Point 37	85	-4
Point 38	346	-4
Point 39	346	-6
Point 40	61	-9
Point 41	346	-9
Point 42	346	-16
Point 43	25	-16
Point 44	346	-20
Point 45	25	-20
Point 46	346	-33
Point 47	25	-33
Point 48	346	-70
Point 49	25	-70
Point 50	346	-41
Point 51	25	-41

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.87	(126.242, 94.308)	67.57651	(213.883, 8.3363)	(50.2919, -10.6164)
2	14127	1.99	(126.242, 94.308)	127.31	(215.174, 7.85696)	(53.5291, -10.1942)

Slices of Slip Surface: **Optimized**

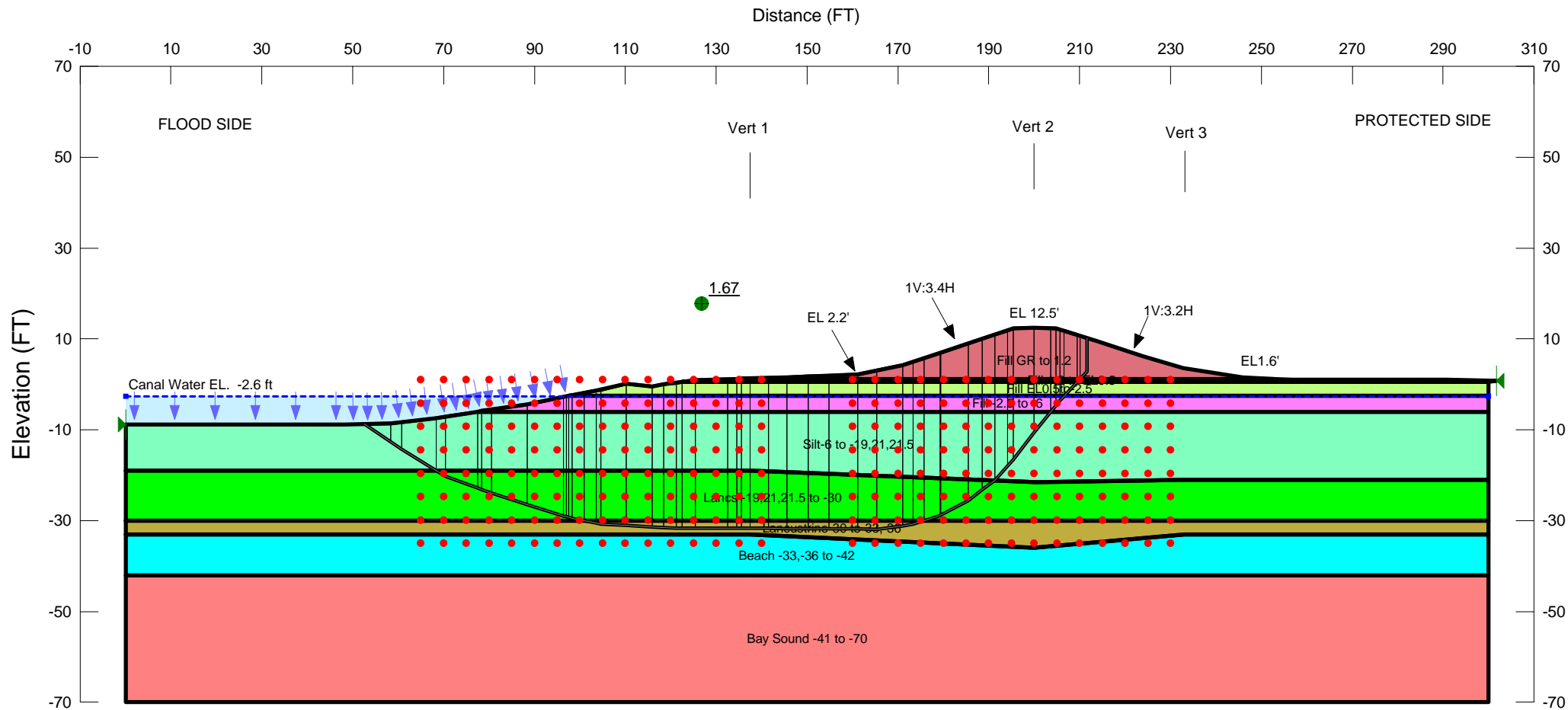
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	54.495955	-13.442435	676.56735	892.16674	0	200
2	Optimized	59.29363	-16.667575	877.82394	1285.4899	109.23377	200
3	Optimized	60.44363	-17.35317	920.62992	1338.0013	111.83433	200
4	Optimized	63.29147	-18.819855	1012.1181	1538.8462	141.13639	200
5	Optimized	67.04147	-20.751165	1132.6372	1743.147	0	226.93
6	Optimized	69.42126	-21.976795	1209.1072	1886.3018	0	238.25
7	Optimized	74.42126	-24.040415	1337.8983	2098.5117	0	257.3
8	Optimized	80.549175	-26.427965	1486.8701	2396.5348	0	279.34
9	Optimized	83.799175	-27.54866	1556.792	2516.3553	0	289.68
10	Optimized	86.48485	-28.269495	1601.7606	2632.6881	0	296.33
11	Optimized	88.23485	-28.7392	1631.0791	2720.772	0	300.67
12	Optimized	88.545775	-28.822655	1636.2444	2743.0039	0	301.44
13	Optimized	91.395775	-29.12985	1655.466	2768.0353	0	304.28
14	Optimized	96.7	-29.68767	1690.2788	2884.891	0	309.42
15	Optimized	99.42349	-29.974085	1708.1512	2933.6181	0	312.07
16	Optimized	102.52349	-30.052545	1713.031	2979.1087	0	312.79
17	Optimized	108.1	-30.159085	1719.6863	3003.3411	0	313.97
18	Optimized	113.2	-30.256525	1725.7684	2993.6203	0	324.85
19	Optimized	117.3	-30.33486	1730.655	3064.4412	0	333.59
20	Optimized	119.5847	-30.37851	1733.3676	3114.47	0	338.47
21	Optimized	122.4347	-30.13551	1718.2236	3105.6779	0	341.8
22	Optimized	126.93	-29.631125	1686.7345	3101.8126	0	345.94
23	Optimized	131.39005	-29.1307	1655.5181	3046.5544	0	350.05
24	Optimized	135.11005	-28.814085	1635.7637	3034.8106	0	354.4
25	Optimized	138.925	-28.644055	1625.1394	3023.4503	0	360.3
26	Optimized	143.575	-28.436805	1612.2275	3017.2199	0	367.48
27	Optimized	146.23965	-28.318045	1604.8137	3013.2907	0	371.6
28	Optimized	148.78445	-28.30268	1603.8373	3032.4055	0	376.44
29	Optimized	153.1948	-28.302215	1603.8147	3039.4344	0	385.06
30	Optimized	157.45	-28.301765	1603.7805	3050	0	393.38
31	Optimized	161.55	-28.301335	1603.7561	3063.6585	0	401.4
32	Optimized	167.19665	-28.30074	1603.7235	3149.337	0	412.44
33	Optimized	172.59665	-27.970845	1583.1364	3160.2725	0	419.96
34	Optimized	176.3811	-27.27934	1539.9798	3191.3362	0	420.98
35	Optimized	181.93485	-25.444035	1425.5291	3089.6383	0	414.91
36	Optimized	186.00375	-23.639935	1312.9048	2941.8792	0	406.22
37	Optimized	189.08665	-21.58496	1184.6579	2844.8324	0	393.28
38	Optimized	193.47215	-17.930385	956.62273	2369.8124	378.66303	200
39	Optimized	195.8855	-15.340545	794.99175	2279.5274	0	391.06
40	Optimized	197.38415	-13.732285	694.65327	2175.5239	0	394.31
41	Optimized	199.13415	-11.8548	577.4993	2033.908	0	398.12

42	Optimized	200.8979	-9.96306	459.44302	1889.9099	0	396.55
43	Optimized	203.2479	-7.442519	302.17432	1676.9982	0	393.75
44	Optimized	205.57875	-4.942519	146.17193	1324.6346	0	578.54
45	Optimized	207.11015	-3.3	43.679741	1008.8862	0	788.47
46	Optimized	208.34855	-1.97171	-39.205335	846.21358	0	777.75
47	Optimized	209.85215	-0.42171	-135.92682	683.51638	0	764.74
48	Optimized	211.985	1.720078	-269.57374	354.18341	0	850
49	Optimized	213.5415	3.283114	-367.10463	81.122314	0	850

Slices of Slip Surface: 14127

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	14127	56.114555	-11.901355	580.40405	745.72657	0	200
2	14127	59.85	-14.311395	730.77618	988.82375	0	200
3	14127	61.84037	-15.50716	805.4086	1109.8041	0	200
4	14127	65.59037	-17.57728	934.58636	1398.503	124.3061	200
5	14127	69.34613	-19.57728	1059.3691	1658.7795	160.61155	200
6	14127	72.269195	-20.9724	1146.4268	1780.0989	0	228.98
7	14127	76.423065	-22.82814	1262.2404	1987.3246	0	246.11
8	14127	81.75	-24.92424	1393.0345	2245.8115	0	265.45
9	14127	86.48485	-26.62515	1499.17	2477.5892	0	281.16
10	14127	88.23485	-27.19624	1534.8004	2571.7984	0	286.43
11	14127	91.35	-28.091625	1590.6824	2716.009	0	294.69
12	14127	96.7	-29.5006	1678.5954	2908.7406	0	307.7
13	14127	102.3	-30.6909	1752.8141	3097.8791	0	318.69
14	14127	108.1	-31.67349	1814.1927	3200.8695	0	327.95
15	14127	113.2	-32.30952	1853.8786	3232.0657	0	343.8
16	14127	117.3	-32.676445	1876.764	3320.8936	0	355.21
17	14127	121.85	-32.894565	1890.4523	3425.5024	0	366.12
18	14127	125.0872	-32.996485	1896.6881	3488.5168	0	373.4
19	14127	126.24215	-33	1896.9865	3484.1041	0	375.69
20	14127	129.40745	-32.94036	1893.2444	3464.7979	0	381.33
21	14127	134.2025	-32.73049	1880.1324	3423.2854	0	388.78
22	14127	138.925	-32.347445	1856.2437	3374.7356	0	394.48
23	14127	143.575	-31.79506	1821.7746	3319.1158	0	398.48
24	14127	148.275	-31.058085	1775.7941	3241.2706	0	400.87
25	14127	153.025	-30.129505	1717.8404	3140.7093	0	401.6
26	14127	157.45	-29.09992	1653.6035	3034.239	0	400.75
27	14127	161.55	-27.989665	1584.3189	2924.2294	0	398.52
28	14127	166.3	-26.502565	1491.5173	2826.2789	0	394.09
29	14127	171.7	-24.574895	1371.2297	2734.3298	0	386.86
30	14127	178.34605	-21.77124	1196.3238	2615.5206	0	373.98
31	14127	184.39605	-18.9194	1018.3328	2435.4838	379.72445	200
32	14127	188.1518	-16.9194	893.52687	2309.2101	379.33117	200
33	14127	193.1518	-13.930235	707.01083	2231.9237	0	385.11
34	14127	198.25	-10.659974	502.94707	2065.0116	0	396.2
35	14127	200.3211	-9.2297385	413.69406	1948.0992	0	398.77
36	14127	202.6711	-7.4765155	304.29057	1781.9749	0	394.86

37	14127	205.91685	-4.9765155	148.2953	1428.4419	0	577.24
38	14127	207.9697	-3.3	43.679867	1108.6538	0	781.03
39	14127	210.5587	-1.05	-96.719602	793.00501	0	758.63
40	14127	212.75585	0.9114245	-219.10909	471.82246	0	850
41	14127	214.1868	2.265701	-303.62091	244.33795	0	850



Name: Fill 1.2 to EL0.5 Model: Spatial Mohr-Coulomb Unit Weight: 111 pcf Cohesion Spatial Fn: Fill 1.2 to 0.5 Phi: 0° Phi-B: 0° Piezometric Line: 1
 Name: Fill EL0.5 to 2.5 Model: Mohr-Coulomb Unit Weight: 111 pcf Cohesion: 400 psf Phi: 0° Phi-B: 0° Piezometric Line: 1
 Name: Fill -2.5 to -6 Model: Spatial Mohr-Coulomb Unit Weight: 102 pcf Cohesion Spatial Fn: Fill -2.5 to -6 Phi: 0° Phi-B: 0° Piezometric Line: 1
 Name: Silt-6 to -19,21,21.5 Model: Mohr-Coulomb Unit Weight: 117 pcf Cohesion: 200 psf Phi: 15° Phi-B: 0° Piezometric Line: 1
 Name: Lancs -19,21,21.5 to -30 Model: Spatial Mohr-Coulomb Weight Spatial Fn: Lanc -19,21,21.5 to -30 Cohesion Spatial Fn: lancs -19,21,21.5 to -30 Phi: 0° Phi-B: 0° Piezometric Line: 1
 Name: Lancustrine-30 to -33,-36 Model: Spatial Mohr-Coulomb Weight Spatial Fn: Lanc -30 to -33,-36 Cohesion Spatial Fn: Lanc -30 to -33,36 Phi: 0° Phi-B: 0° Piezometric Line: 1
 Name: Beach -33,-36 to -42 Model: Mohr-Coulomb Unit Weight: 122 pcf Cohesion: 0 psf Phi: 33° Phi-B: 0° Piezometric Line: 1
 Name: Bay Sound -41 to -70 Model: S=f(depth) Unit Weight: 106 pcf C-Top of Layer: 600 psf C-Rate of Change: 7.5 psf/ft Limiting C: 825 psf Piezometric Line: 1
 Name: Fill GR to 1.2 Model: Mohr-Coulomb Unit Weight: 111 pcf Cohesion: 850 psf Phi: 0° Phi-B: 0° Piezometric Line: 1

CROSS SECTION AT STA 103+00 EAST

GENERAL NOTES

CLASSIFICATION STRATIFICATION
 SHEAR STRENGTHS AND UNIT WEIGHTS OF
 THE SOIL WERE BASED ON THE RESULTS OF
 UNDISTURBED BORINGS AND CPT DATA. SEE
 BOTH BORING AND CPT DATA PLATES.

WHERE INDICATED, SHEAR STRENGTHS BETWEEN
 VERTICALS WERE ASSUMED TO VARY LINEARLY
 BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

LAKE PONTCHARTRAIN, LA. AND VICINITY
 HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL,
 REMEDIATION OF CANAL WALLS AND LEVEES
 FLOOD SIDE STABILITY ANALYSIS,
 CASE: Name: LWL F/S Q Case (Block)
 REACH 21, STA. 103+00 TO STA. 113+05 EAST
 ORLEANS PARISH, LOUISIANA

LWL F/S Q Case (Block)

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File Information

Created By: [Vicky Curtis](#)
Revision Number: [211](#)
Last Edited By: [Vicky Curtis](#)
Date: [6/11/2013](#)
Time: [2:14:03 PM](#)
File Name: [Reach 21.gsz](#)
Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix E LWL\](#)
Last Solved Date: [6/11/2013](#)
Last Solved Time: [2:16:00 PM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Strength Units: [psf](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

LWL F/S Q Case (Block)

Kind: [SLOPE/W](#)
Method: [Spencer](#)
Settings
 Apply Phreatic Correction: [No](#)
 PWP Conditions Source: [Piezometric Line](#)
 Use Staged Rapid Drawdown: [No](#)
Slip Surface
 Direction of movement: [Right to Left](#)
 Use Passive Mode: [No](#)
 Slip Surface Option: [Block](#)
 Critical slip surfaces saved: [1](#)
 Optimize Critical Slip Surface Location: [Yes](#)
Tension Crack
 Tension Crack Option: [Tension Crack Line](#)
 Percentage Wet: [1](#)
 Tension Crack Fluid Unit Weight: [62.4 pcf](#)
FOS Distribution

FOS Calculation Option: [Constant](#)

Restrict Block Crossing: [Yes](#)

Advanced

Number of Slices: [30](#)

Optimization Tolerance: [0.01](#)

Minimum Slip Surface Depth: [0.1 ft](#)

Optimization Maximum Iterations: [7000](#)

Optimization Convergence Tolerance: [1e-007](#)

Starting Optimization Points: [8](#)

Ending Optimization Points: [16](#)

Complete Passes per Insertion: [1](#)

Driving Side Maximum Convex Angle: [5 °](#)

Resisting Side Maximum Convex Angle: [1 °](#)

Materials

Fill 1.2 to EL0.5

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [111 pcf](#)

Cohesion Spatial Fn: [Fill 1.2 to 0.5](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: [1](#)

Fill EL0.5to-2.5

Model: [Mohr-Coulomb](#)

Unit Weight: [111 pcf](#)

Cohesion: [400 psf](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: [1](#)

Fill -2.5 to -6

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [102 pcf](#)

Cohesion Spatial Fn: [Fill -2.5 to -6](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

Pore Water Pressure

Piezometric Line: [1](#)

Silt-6 to -19,21,21.5

Model: [Mohr-Coulomb](#)

Unit Weight: [117 pcf](#)

Cohesion: [200 psf](#)

Phi: 15 °

Phi-B: 0 °

Pore Water Pressure

Piezometric Line: 1

Lancs -19,21,21.5 to -30

Model: Spatial Mohr-Coulomb

Weight Spatial Fn: Lanc -19,21,21.5 to -30

Cohesion Spatial Fn: lancs -19,21,21.5 to -30

Phi: 0 °

Phi-B: 0 °

Pore Water Pressure

Piezometric Line: 1

Lancustrine-30 to-33,-36

Model: Spatial Mohr-Coulomb

Weight Spatial Fn: Lanc -30 to -33, -36

Cohesion Spatial Fn: Lanc -30 to-33,36

Phi: 0 °

Phi-B: 0 °

Pore Water Pressure

Piezometric Line: 1

Beach -33,-36 to -42

Model: Mohr-Coulomb

Unit Weight: 122 pcf

Cohesion: 0 psf

Phi: 33 °

Phi-B: 0 °

Pore Water Pressure

Piezometric Line: 1

Bay Sound -41 to -70

Model: $S=f(\text{depth})$

Unit Weight: 106 pcf

C-Top of Layer: 600 psf

C-Rate of Change: 7.5 psf/ft

Limiting C: 825 psf

Pore Water Pressure

Piezometric Line: 1

Fill GR to 1.2

Model: Mohr-Coulomb

Unit Weight: 111 pcf

Cohesion: 850 psf

Phi: 0 °

Phi-B: 0 °

Pore Water Pressure

Piezometric Line: 1

Slip Surface Limits

Left Coordinate: (0, -8.9) ft
Right Coordinate: (301.72743, 0.75) ft

Slip Surface Block

Left Grid
Upper Left: (65, 1) ft
Lower Left: (65, -35) ft
Lower Right: (140, -35) ft
X Increments: 15
Y Increments: 7
Starting Angle: 135 °
Ending Angle: 180 °
Angle Increments: 4

Right Grid
Upper Left: (160, 1) ft
Lower Left: (160, -35) ft
Lower Right: (230, -35) ft
X Increments: 14
Y Increments: 7
Starting Angle: 25 °
Ending Angle: 65 °
Angle Increments: 4

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
	0	-2.6
	300	-2.6

Tension Crack Line

	X (ft)	Y (ft)
	195.5	5
	204.5	5
	229.5	-2.49005
	246	-5.5

Spatial Functions

Fill 1.2 to 0.5

Model: [Linear Interpolation](#)

Limit Range By: [Data Values](#)

Data Points: [X \(ft\)](#), [Y \(ft\)](#), [Cohesion \(psf\)](#)

Data Point: [\(137.5, 1.2, 400\)](#)

Data Point: [\(137.5, 0.5, 400\)](#)

Data Point: [\(200, 1.2, 850\)](#)

Data Point: [\(200, 0.5, 850\)](#)

Data Point: [\(233, 1.2, 400\)](#)

Data Point: [\(233, 0.5, 400\)](#)

Fill -2.5 to -6

Model: [Linear Interpolation](#)

Limit Range By: [Data Values](#)

Data Points: [X \(ft\)](#), [Y \(ft\)](#), [Cohesion \(psf\)](#)

Data Point: [\(137.5, -2.5, 175\)](#)

Data Point: [\(137.5, -6, 175\)](#)

Data Point: [\(200, -2.5, 275\)](#)

Data Point: [\(200, -6, 275\)](#)

Data Point: [\(233, -2.5, 175\)](#)

Data Point: [\(233, -6, 175\)](#)

lanacs -19,21,21.5 to -30

Model: [Linear Interpolation](#)

Limit Range By: [Data Values](#)

Data Points: [X \(ft\)](#), [Y \(ft\)](#), [Cohesion \(psf\)](#)

Data Point: [\(137.5, -19, 240\)](#)

Data Point: [\(137.5, -30, 342\)](#)

Data Point: [\(200, -21.5, 470\)](#)

Data Point: [\(200, -30, 537\)](#)

Data Point: [\(233, -21, 365\)](#)

Data Point: [\(233, -30, 450\)](#)

Data Point: [\(310, -21, 365\)](#)

Data Point: [\(310, -30, 450\)](#)

Data Point: [\(50, -19, 240\)](#)

Data Point: [\(50, -30, 342\)](#)

Lanc -30 to-33,36

Model: [Linear Interpolation](#)

Limit Range By: [Data Values](#)

Data Points: [X \(ft\)](#), [Y \(ft\)](#), [Cohesion \(psf\)](#)

Data Point: [\(137.5, -30, 342\)](#)

Data Point: [\(137.5, -33, 370\)](#)

Data Point: [\(200, -30, 537\)](#)

Data Point: [\(200, -36, 585\)](#)

Data Point: [\(233, -30, 370\)](#)

Data Point: [\(233, -33, 370\)](#)

Data Point: (310, -30, 370)
 Data Point: (310, -33, 370)
 Data Point: (50, -30, 342)
 Data Point: (50, -33, 370)

Lanc -19,21,21.5 to -30

Model: [Linear Interpolation](#)

Limit Range By: [Data Values](#)

Data Points: X (ft), Y (ft), Unit Weight (pcf)

Data Point: (85, -19, 101)
 Data Point: (85, -30, 101)
 Data Point: (200, -21.5, 105)
 Data Point: (200, -30, 105)
 Data Point: (233, -21, 101)
 Data Point: (233, -30, 101)
 Data Point: (50, -19, 101)
 Data Point: (50, -30, 101)
 Data Point: (310, -21, 101)
 Data Point: (310, -30, 101)

Lanc -30 to -33, -36

Model: [Linear Interpolation](#)

Limit Range By: [Data Values](#)

Data Points: X (ft), Y (ft), Unit Weight (pcf)

Data Point: (85, -30, 101)
 Data Point: (85, -33, 101)
 Data Point: (200, -30, 105)
 Data Point: (200, -36, 105)
 Data Point: (233, -30, 101)
 Data Point: (233, -33, 101)
 Data Point: (310, -30, 101)
 Data Point: (310, -33, 101)
 Data Point: (50, -30, 101)
 Data Point: (50, -33, 101)

Regions

	Material	Points	Area (ft²)
Region 1	Fill GR to 1.2	54,13,14,15,16,17,18,19,20,21,22,23,24,25,26,55	515.15788
Region 2	Fill EL0.5to-2.5	34,7,8,9,10,11,33,32,35	576.21261
Region 3	Fill -2.5 to -6	36,5,6,34,35,37	740.68609
Region 4	Silt-6 to -19,21,21.5	1,2,3,4,36,37,38,39,40,41,42	3991.8145
Region 5	Lancs -19,21,21.5 to -30	42,41,40,39,38,43,44	3014.125
Region 6	Lancustrine-30 to-33,-36	44,43,45,46,47,48,49	1043.25
Region 7	Beach -33,-36 to -42	49,48,47,46,45,50,51	2556.75
Region 8	Bay Sound -41 to -70	51,50,52,53	8400
Region 9	Fill 1.2 to EL0.5	33,12,54,55,27,28,29,30,31,32	113.41926

Points

	X (ft)	Y (ft)
Point 1	0	-8.9
Point 2	48.27777	-8.9
Point 3	58.33585	-8.6
Point 4	68.39447	-7.39
Point 5	78.43568	-5.8
Point 6	88.42691	-4.43
Point 7	98.30442	-2.34
Point 8	103.64343	-1.43
Point 9	110.26068	0.16
Point 10	115.91608	-0.54
Point 11	118.42632	-0.02
Point 12	125.39055	0.87
Point 13	135.5655	1.24
Point 14	145.62969	1.59
Point 15	154.84688	1.9
Point 16	161.11587	2.21
Point 17	171.09548	4.16
Point 18	179.42154	6.95
Point 19	188.55592	10.03
Point 20	195.33167	12.26
Point 21	200	12.48
Point 22	204.77923	12.31
Point 23	213.80464	9.5
Point 24	223.81999	6.27
Point 25	232.81486	3.55
Point 26	245.87715	1.56
Point 27	256.78921	1
Point 28	267.70177	1.02
Point 29	279.07955	1.01
Point 30	290.76907	0.98
Point 31	301.72743	0.75
Point 32	300	0.48
Point 33	122.5	0.5
Point 34	97.5	-2.5
Point 35	300	-2.5
Point 36	77.5	-6
Point 37	300	-6
Point 38	300	-21
Point 39	233	-21
Point 40	200.5	-21.5
Point 41	137.5	-19
Point 42	0	-19
Point 43	300	-30
Point 44	0	-30
Point 45	300	-33

Point 46	233	-33
Point 47	200	-36
Point 48	137.5	-33
Point 49	0	-33
Point 50	300	-42
Point 51	0	-42
Point 52	300	-70
Point 53	0	-70
Point 54	134.5	1.2
Point 55	253	1.2

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.67	(130.293, 5.483)	66.11824	(211.644, 10.1728)	(52.5972, -8.77116)
2	38798	1.75	(130.293, 5.483)	66.681	(212.47, 9.91569)	(49.3293, -8.86864)

Slices of Slip Surface: Optimized

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	55.46653	-10.710963	506.12112	768.84676	70.397124	200
2	Optimized	59.52995	-13.45803	677.54819	1144.6027	125.14688	200
3	Optimized	64.55926	-16.60401	873.84622	1568.2193	186.05671	200
4	Optimized	69.42926	-19.573735	1059.1492	1895.8994	0	245.32
5	Optimized	73.982025	-21.518465	1180.5168	2076.8191	0	263.35
6	Optimized	77.96784	-23.006885	1273.439	2268.8419	0	277.15
7	Optimized	79.482255	-23.57241	1308.668	2337.4761	0	282.4
8	Optimized	84.47787	-25.228915	1412.0144	2522.1174	0	297.76
9	Optimized	92.401925	-27.768615	1570.4847	2847.1399	0	321.31
10	Optimized	96.703415	-29.110945	1654.3393	2982.9375	0	333.76
11	Optimized	97.264945	-29.22845	1661.6194	3003.1824	0	334.85
12	Optimized	97.90221	-29.3618	1669.9051	3031.6006	0	336.08
13	Optimized	99.62826	-29.72298	1692.4923	3104.2087	0	339.43
14	Optimized	102.29775	-30.28159	1727.3151	3214.7082	0	344.63
15	Optimized	104.1262	-30.6642	1751.2423	3294.2616	0	348.2
16	Optimized	107.43485	-30.919725	1767.0875	3346.5479	0	350.58
17	Optimized	113.0884	-31.228835	1786.4183	3417.2886	0	353.47
18	Optimized	117.1712	-31.452065	1800.3659	3432.0357	0	355.55
19	Optimized	119.8044	-31.59604	1809.364	3496.314	0	356.9
20	Optimized	121.84125	-31.66997	1813.9755	3509.0889	0	357.59
21	Optimized	123.9453	-31.66544	1813.6989	3539.1103	0	357.54
22	Optimized	128.96555	-31.65463	1813.0052	3574.6818	0	357.44
23	Optimized	133.52025	-31.653295	1812.9105	3598.212	0	357.43
24	Optimized	135.03275	-31.66312	1813.5712	3605.9321	0	357.52
25	Optimized	136.53275	-31.672865	1814.1254	3613.4153	0	357.61
26	Optimized	139.5324	-31.692355	1815.3568	3629.8279	0	363.99
27	Optimized	143.59725	-31.71877	1817.005	3652.9525	0	376.66
28	Optimized	147.934	-31.74695	1818.759	3677.3991	0	390.19

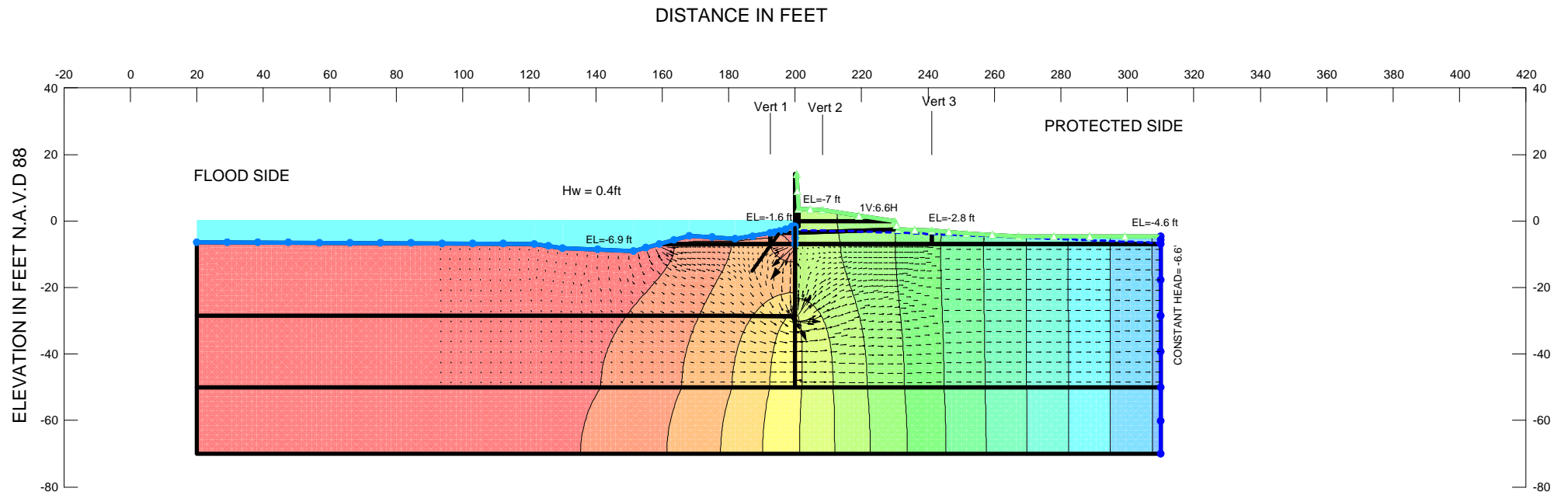
29	Optimized	152.5426	-31.77689	1820.6467	3703.0029	0	404.6
30	Optimized	157.9814	-31.81223	1822.9028	3738.8011	0	421.62
31	Optimized	163.2262	-31.84631	1824.9691	3811.19	0	438.06
32	Optimized	168.216	-31.480955	1802.1377	3817.2335	0	450.35
33	Optimized	172.22415	-30.95331	1769.2286	3869.6742	0	458.33
34	Optimized	174.57615	-30.402365	1734.8516	3801.6949	0	461.03
35	Optimized	177.53745	-29.42838	1674.0897	3812.6622	0	462.08
36	Optimized	179.34845	-28.818025	1636.0284	3717.7682	0	462.61
37	Optimized	182.45175	-27.172685	1533.3347	3667.4369	0	458.64
38	Optimized	187.01895	-24.39672	1360.1085	3449.8507	0	450.36
39	Optimized	189.94625	-22.16957	1221.1401	3335.4818	0	441.75
40	Optimized	192.7522	-19.55521	1058.0065	2867.39	484.82283	200
41	Optimized	194.74975	-17.26509	915.09194	2617.9201	456.27144	200
42	Optimized	197.66585	-13.589325	685.73878	2270.8407	424.72679	200
43	Optimized	201.84335	-8.323555	357.15321	1739.9124	370.50919	200
44	Optimized	204.23295	-5.311444	169.19581	1619.0278	0	262.17
45	Optimized	205.23925	-4.043039	90.047915	1484.2031	0	259.12
46	Optimized	206.10505	-3.031595	26.93142	1406.2882	0	256.5
47	Optimized	207.96335	-1.0548967	-96.414261	1063.827	0	400
48	Optimized	209.74955	0.84510335	-214.97443	629.43379	0	717.05
49	Optimized	210.8634	2.029883	-288.90257	333.22959	0	850

Slices of Slip Surface: 38798

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	38798	51.580915	-9.8012985	449.35416	584.67535	36.259204	200
2	38798	56.084205	-11.666625	565.75992	825.71365	69.654392	200
3	38798	60.850505	-13.640895	688.94495	1096.9038	109.31225	200
4	38798	65.879815	-15.7241	818.94878	1393.3941	153.92216	200
5	38798	71.091505	-17.88285	953.65281	1706.5177	201.72953	200
6	38798	75.64427	-19.76867	1071.328	1915.6604	0	247.13
7	38798	77.96784	-20.731125	1131.3493	2038.5615	0	256.05
8	38798	80.93349	-21.959535	1208.0341	2185.9682	0	267.44
9	38798	85.929105	-24.028785	1337.1579	2433.6003	0	286.63
10	38798	90.577655	-25.95428	1457.3122	2672.0935	0	304.49
11	38798	94.879145	-27.736015	1568.483	2899.5468	0	321.01
12	38798	97.264945	-28.724245	1630.154	3029.2341	0	330.17
13	38798	97.90221	-28.98821	1646.6102	3072.1333	0	332.62
14	38798	99.15221	-29.505975	1678.9236	3153.4101	0	337.42
15	38798	101.8217	-29.85714	1700.8423	3077.5945	0	340.68
16	38798	106.95205	-29.85714	1700.8576	3202.0855	0	340.68
17	38798	113.0884	-29.85714	1700.8523	3253.8812	0	340.68
18	38798	117.1712	-29.85714	1700.8334	3245.2275	0	340.68
19	38798	120.46315	-29.85714	1700.8454	3303.8923	0	340.68
20	38798	123.9453	-29.85714	1700.8528	3354.2405	0	340.68
21	38798	127.66795	-29.85714	1700.8491	3385.0562	0	340.68
22	38798	132.22265	-29.85714	1700.8491	3404.5963	0	340.68
23	38798	135.03275	-29.85714	1700.8916	3416.7058	0	340.68

24	38798	136.53275	-29.85714	1700.8529	3423.2101	0	340.68
25	38798	141.56485	-29.85714	1700.8029	3447.3639	0	353.37
26	38798	147.934	-29.85714	1700.8437	3478.5005	0	373.26
27	38798	152.5426	-29.85714	1700.8437	3500.85	0	387.65
28	38798	157.9814	-29.85714	1700.9119	3532.3074	0	404.63
29	38798	163.6108	-29.85714	1700.848	3609.5599	0	422.21
30	38798	168.6006	-29.85714	1700.848	3722.9912	0	437.8
31	38798	173.177	-29.85714	1700.8525	3858.9681	0	452.09
32	38798	177.34	-29.85714	1700.8525	4017.7467	0	465.09
33	38798	179.71075	-29.85714	1700.8436	4108.3221	0	472.5
34	38798	182.139	-27.71816	1567.3686	3490.9385	0	462.21
35	38798	186.41695	-23.4402	1300.4242	3235.0686	0	440.5
36	38798	191.9438	-17.913345	955.54768	2730.017	475.46761	200
37	38798	197.66585	-12.191307	598.499	2245.6777	441.3602	200
38	38798	201.92855	-7.9285715	332.49469	1804.6778	394.47029	200
39	38798	204.31815	-5.5389565	183.3933	1706.7885	0	261.91
40	38798	206.01815	-3.8389565	77.310777	1504.3812	0	256.76
41	38798	208.80215	-1.0549492	-96.410487	1062.7075	0	400
42	38798	210.70215	0.84505085	-214.97129	649.77469	0	704.06
43	38798	211.7633	1.906165	-281.18454	360.54525	0	850

APPENDIX F NWL S-CASE STABILITY ANALYSES



Name: BEACH SAND, EL. -7 TO -50 Model: Saturated Only K-Sat: 0.00049 ft/sec K-Ratio: 1
 Name: BAY SOUND CLAY, EL. -50 TO -70 Model: Saturated Only K-Sat: 3.28e-008 ft/sec K-Ratio: 1
 Name: Sheet Pile Model: Saturated Only K-Sat: 1e-010 ft/sec K-Ratio: 1
 Name: MARSH, EL. -2.5/-3.5 TO -7 Model: Saturated Only K-Sat: 3.28e-007 ft/sec K-Ratio: 1
 Name: EMBANKMENT FILL, EL. +3.6 TO -2.5/-3.5 Model: Saturated Only K-Sat: 3.28e-008 ft/sec K-Ratio: 1

GENERAL NOTES

CLASSIFICATION STRATIFICATION
 SHEAR STRENGTHS AND UNIT WEIGHTS OF
 THE SOIL WERE BASED ON THE RESULTS OF
 UNDISTURBED BORINGS AND CPT DATA. SEE
 BOTH BORING AND CPT DATA PLATES.

WHERE INDICATED, SHEAR STRENGTHS BETWEEN
 VERTICALS WERE ASSUMED TO VARY LINEARLY
 BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

LAKE PONTCHARTRAIN, LA. AND VICINITY
 HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 1A,
 PROTECTED SIDE STABILITY ANALYSIS,
 CASE: 3 - Normal Water Level 0.4ft
 STA. 2+45 TO 7+00 WEST
 ORLEANS PARISH, LOUISIANA

3 - Normal Water Level 0.4ft

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File Information

Created By: [Liljegren, James](#)
Revision Number: [585](#)
Last Edited By: [Hendrix, Joshua M MVR](#)
Date: [6/19/2013](#)
Time: [10:26:21 AM](#)
File Name: [Reach 1A.gsz](#)
Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix F NWL\](#)
Last Solved Date: [6/19/2013](#)
Last Solved Time: [10:26:28 AM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Mass(M) Units: [lbs](#)
Mass Flux Units: [lbs/sec](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

3 - Normal Water Level 0.4ft

Kind: [SEEP/W](#)
Method: [Steady-State](#)
Settings
 Include Air Flow: [No](#)
Control
 Apply Runoff: [No](#)
Convergence
 Convergence Type: [Head Vector Norm](#)
 Maximum Number of Iterations: [500](#)
 Tolerance: [0.001](#)
 Maximum Change in K: [0.1](#)
 Rate of Change in K: [1.02](#)
 Minimum Change in K: [1e-005](#)
 Equation Solver: [Parallel Direct](#)
 Potential Seepage Max # of Reviews: [10](#)
Time

Starting Time: 0 sec

Duration: 0 sec

Ending Time: 0 sec

Materials

BEACH SAND, EL. -7 TO -50

Model: Saturated Only

Hydraulic

K-Sat: 0.00049 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

BAY SOUND CLAY, EL. -50 TO -70

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-008 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

Sheet Pile

Model: Saturated Only

Hydraulic

K-Sat: 1e-010 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

MARSH, EL. -2.5/-3.5 TO -7

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-007 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

EMBANKMENT FILL, EL. +3.6 TO -2.5/-3.5

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-008 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

Boundary Conditions

Potential Seepage Face

Review: true
Type: Total Flux (Q) 0

Protected Side Water

Type: Head (H) -6.6

Normal Water Level

Type: Head (H) 0.4

Regions

	Material	Points	Area (ft²)
Region 1	EMBANKMENT FILL, EL. +3.6 TO -2.5/-3.5	21,4,5,26	60.99
Region 2	MARSH, EL. -2.5/-3.5 TO -7	6,7,29,46,18,27	167.935
Region 3	BEACH SAND, EL. -7 TO -50	18,47,23,19,20,36,33,32,37,38,40,42,16,31	3858.445
Region 4	BEACH SAND, EL. -7 TO -50	20,36,34,15,28,43,12,11,29,46,18,47,23,19	8599.1
Region 5	BAY SOUND CLAY, EL. -50 TO -70	15,34,35,14,30,44,13,12,43,28	5800
Region 6	Sheet Pile	17,22,21,26,25,3	13.075
Region 7	EMBANKMENT FILL, EL. +3.6 TO -2.5/-3.5	27,3,25,26,5,6	90.15
Region 8	MARSH, EL. -2.5/-3.5 TO -7	16,42,41,1,39,31	66.5965
Region 9	MARSH, EL. -2.5/-3.5 TO -7	29,7,8,9,10,11	186.6
Region 10	MARSH, EL. -2.5/-3.5 TO -7	31,39,27,18	26.145
Region 11	EMBANKMENT FILL, EL. +3.6 TO -2.5/-3.5	2,24,3,27,39	6.9625

Lines

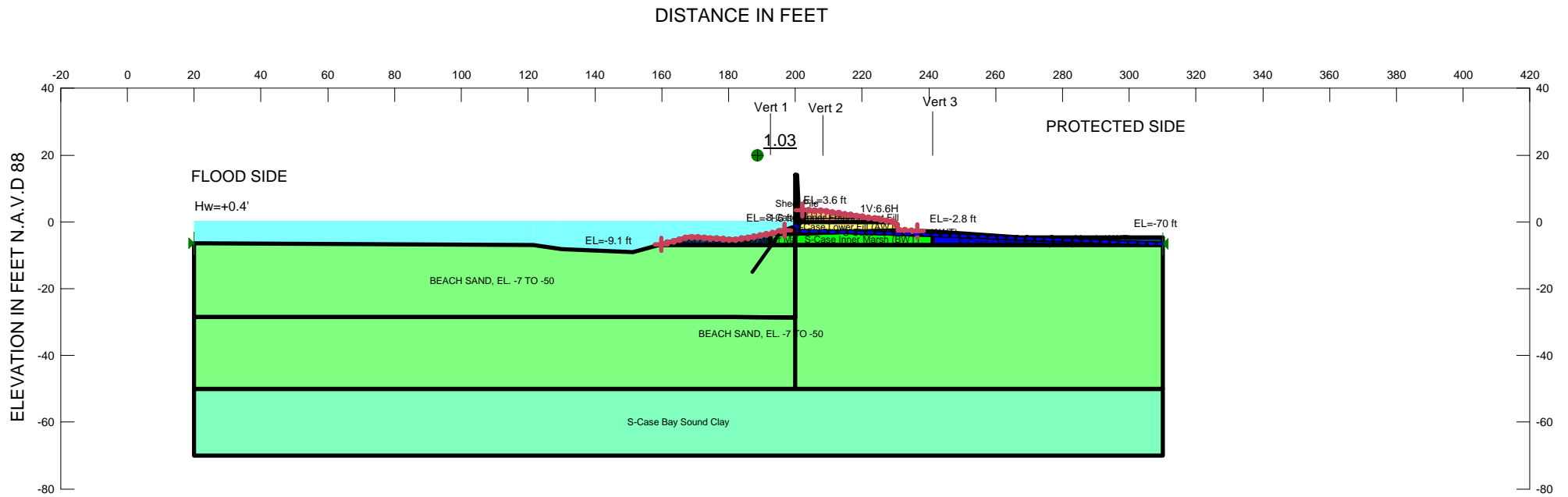
	Start Point	End Point	Hydraulic Boundary	Left Side Material	Right Side Material
Line 1	19	20			
Line 2	13	12	Protected Side Water		
Line 3	17	22			
Line 4	22	21	Potential Seepage Face		
Line 5	23	19		Sheet Pile	
Line 6	21	4	Potential Seepage Face		
Line 7	25	3		Sheet Pile	Sheet Pile
Line 8	5	4	Potential Seepage Face		
Line 9	17	3			
Line 10	25	26			
Line 11	26	21			
Line 12	3	27	Normal Water Level	Sheet Pile	
Line 13	6	7	Potential Seepage Face		

Line 14	5	26			
Line 15	27	6			
Line 16	5	6	Potential Seepage Face		
Line 17	27	18	Normal Water Level	Sheet Pile	
Line 18	12	11	Protected Side Water		
Line 19	11	29			
Line 20	28	15			
Line 21	30	14			
Line 22	7	29			
Line 23	7	8	Potential Seepage Face		
Line 24	8	9	Potential Seepage Face		
Line 25	9	10	Potential Seepage Face		
Line 26	10	11	Protected Side Water		
Line 27	31	16			
Line 28	18	31			
Line 29	2	24	Normal Water Level		
Line 30	24	3	Normal Water Level		
Line 31	15	34			
Line 32	34	35			
Line 33	35	14			
Line 34	20	36			
Line 35	36	34			
Line 36	36	33			
Line 37	19	28			
Line 38	31	39			
Line 39	39	27			
Line 40	1	39	Normal Water Level		
Line 41	39	2	Normal Water Level		
Line 42	41	1	Normal Water Level		
Line 43	42	16			
Line 44	42	41	Normal Water Level		
Line 45	38	40	Normal Water Level		
Line 46	40	42	Normal Water Level		
Line 47	33	32			
Line 48	32	37	Normal Water Level		
Line 49	37	38	Normal Water Level		
Line 50	12	43			
Line 51	43	28			
Line 52	13	44			
Line 53	44	30			
Line 54	29	46			
Line 55	46	18			
Line 56	23	47			Sheet Pile
Line 57	47	18			Sheet Pile

Points

	X (ft)	Y (ft)

Point 1	182	-5.4
Point 2	195.3	-3
Point 3	200	-1.6
Point 4	208.3	3.3
Point 5	230	0
Point 6	231	-2.5
Point 7	241.1	-2.8
Point 8	251.6	-3.7
Point 9	267.3	-4.6
Point 10	310	-4.6
Point 11	310	-7
Point 12	310	-50
Point 13	310	-70
Point 14	182	-70
Point 15	182	-50
Point 16	182	-7
Point 17	200	14.1
Point 18	200	-7
Point 19	200	-28.6
Point 20	182	-28.5
Point 21	201	3.6
Point 22	200.5	14.1
Point 23	200	-23.5
Point 24	199.1	-1.6
Point 25	201	-1.6
Point 26	201	0
Point 27	200	-3.5
Point 28	200	-50
Point 29	241.1	-7
Point 30	200	-70
Point 31	192.53	-7
Point 32	20	-6.4
Point 33	20	-7
Point 34	20	-50
Point 35	20	-70
Point 36	20	-28.5
Point 37	121.6	-6.9
Point 38	130	-8.2
Point 39	192.53	-3.5
Point 40	151.4	-9.1
Point 41	168.1	-4.5
Point 42	159.1	-7
Point 43	241.1	-50
Point 44	241.1	-70
Point 45	199	0
Point 46	201.6	-7
Point 47	200	-21.3



Name: BEACH SAND, EL. -7 TO -50 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand
Name: Sheet Pile Model: Undrained (Phi=0) Unit Weight: 0.1 pcf Cohesion: 1e+012 psf
Name: S-Case Upper Embankment Fill Model: Spatial Mohr-Coulomb Unit Weight: 110 pcf Cohesion Spatial Fn: Above WT Cohesion Phi: 26 °
Name: S-Case Lower Fill (AWT) Model: Spatial Mohr-Coulomb Unit Weight: 94 pcf Cohesion: 75 psf Phi: 26 °
Name: S-Case Inner Marsh (AWT) Model: Spatial Mohr-Coulomb Weight Fn: Marsh Cohesion: 75 psf Phi: 24 °
Name: S-Case Outer Marsh (AWT) Model: Spatial Mohr-Coulomb Unit Weight: 100 pcf Cohesion: 75 psf Phi: 24 °
Name: S-Case Bay Sound Clay Model: Spatial Mohr-Coulomb Unit Weight: 102 pcf Cohesion: 0 psf Phi: 26 °
Name: S-Case Lower Fill (BWT) Model: Spatial Mohr-Coulomb Unit Weight: 94 pcf Cohesion: 0 psf Phi: 26 °
Name: S-Case Inner Marsh (BWT) Model: Spatial Mohr-Coulomb Weight Fn: Marsh Cohesion: 0 psf Phi: 24 °
Name: S-Case Outer Marsh (BWT) Model: Spatial Mohr-Coulomb Unit Weight: 100 pcf Cohesion: 0 psf Phi: 24 °

GENERAL NOTES

CLASSIFICATION STRATIFICATION
SHEAR STRENGTHS AND UNIT WEIGHTS OF
THE SOIL WERE BASED ON THE RESULTS OF
UNDISTURBED BORINGS AND CPT DATA. SEE
BOTH BORING AND CPT DATA PLATES.

WHERE INDICATED, SHEAR STRENGTHS BETWEEN
VERTICALS WERE ASSUMED TO VARY LINEARLY
BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 1A,
PROTECTED SIDE STABILITY ANALYSIS,
CASE: NWL S-Case F/S (Entry/Exit)
STA. 2+45 TO 7+00 WEST
ORLEANS PARISH, LOUISIANA

NWL S-Case F/S (Entry/Exit)

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File Information

Created By: [Liljegren, James](#)
Revision Number: [592](#)
Last Edited By: [Hendrix, Joshua M MVR](#)
Date: [6/19/2013](#)
Time: [5:14:52 PM](#)
File Name: [Reach 1A.gsz](#)
Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix F NWL\](#)
Last Solved Date: [6/19/2013](#)
Last Solved Time: [5:21:58 PM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Strength Units: [psf](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

NWL S-Case F/S (Entry/Exit)

Kind: [SLOPE/W](#)
Parent: [NWL S-Case P/S \(Block\)](#)
Method: [Spencer](#)
Settings
 PWP Conditions Source: [Other GeoStudio Analysis](#)
 PWP Other Analysis: [3 - Normal Water Level 0.4ft \[\(last\)\]](#)
Slip Surface
 Direction of movement: [Right to Left](#)
 Use Passive Mode: [No](#)
 Slip Surface Option: [Entry and Exit](#)
 Critical slip surfaces saved: [1](#)
 Optimize Critical Slip Surface Location: [Yes](#)
Tension Crack
 Tension Crack Option: [Tension Crack Line](#)
 Percentage Wet: [0](#)
 Tension Crack Fluid Unit Weight: [62.4 pcf](#)
FOS Distribution

FOS Calculation Option: [Constant](#)

Advanced

Number of Slices: [30](#)

Optimization Tolerance: [0.01](#)

Minimum Slip Surface Depth: [0.1 ft](#)

Optimization Maximum Iterations: [4000](#)

Optimization Convergence Tolerance: [1e-007](#)

Starting Optimization Points: [8](#)

Ending Optimization Points: [16](#)

Complete Passes per Insertion: [1](#)

Driving Side Maximum Convex Angle: [5 °](#)

Resisting Side Maximum Convex Angle: [1 °](#)

Materials

BEACH SAND, EL. -7 TO -50

Model: [Shear/Normal Fn.](#)

Unit Weight: [122 pcf](#)

Strength Function: [Sand](#)

Phi-B: [0 °](#)

Sheet Pile

Model: [Undrained \(Phi=0\)](#)

Unit Weight: [0.1 pcf](#)

Cohesion: [1e+012 psf](#)

S-Case Upper Embankment Fill

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [110 pcf](#)

Cohesion Spatial Fn: [Above WT Cohesion](#)

Phi: [26 °](#)

Phi-B: [0 °](#)

S-Case Lower Fill (AWT)

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [94 pcf](#)

Cohesion: [75 psf](#)

Phi: [26 °](#)

Phi-B: [0 °](#)

S-Case Inner Marsh (AWT)

Model: [Spatial Mohr-Coulomb](#)

Weight Fn: [Marsh](#)

Cohesion: [75 psf](#)

Phi: [24 °](#)

Phi-B: [0 °](#)

S-Case Outer Marsh (AWT)

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [100 pcf](#)

Cohesion: [75 psf](#)

Phi: [24 °](#)

Phi-B: [0 °](#)

S-Case Bay Sound Clay

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [102 pcf](#)

Cohesion: [0 psf](#)

Phi: [26 °](#)

Phi-B: [0 °](#)

S-Case Lower Fill (BWT)

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [94 pcf](#)

Cohesion: [0 psf](#)

Phi: [26 °](#)

Phi-B: [0 °](#)

S-Case Inner Marsh (BWT)

Model: [Spatial Mohr-Coulomb](#)

Weight Fn: [Marsh](#)

Cohesion: [0 psf](#)

Phi: [24 °](#)

Phi-B: [0 °](#)

S-Case Outer Marsh (BWT)

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [100 pcf](#)

Cohesion: [0 psf](#)

Phi: [24 °](#)

Phi-B: [0 °](#)

Slip Surface Entry and Exit

Left Projection: [Range](#)

Left-Zone Left Coordinate: [\(159.9, -6.77778\) ft](#)

Left-Zone Right Coordinate: [\(196.81954, -2.44017\) ft](#)

Left-Zone Increment: [20](#)

Right Projection: [Range](#)

Right-Zone Left Coordinate: [\(202.15364, 3.55259\) ft](#)

Right-Zone Right Coordinate: [\(236.50623, -2.66355\) ft](#)

Right-Zone Increment: [20](#)

Radius Increments: [15](#)

Slip Surface Limits

Left Coordinate: (20, -6.4) ft
Right Coordinate: (310.00131, -6.6111) ft

Tension Crack Line

	X (ft)	Y (ft)
	200	1
	223	1

Shear/Normal Strength Functions

Sand

Model: Spline Data Point Function
Function: Shear Stress vs. Normal Stress
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
Data Point: (-10000, 0)
Data Point: (0, 0)
Data Point: (10000, 6494)
Estimation Properties
Intact Rock Param.: 10
Geological Strength: 100
Disturbance Factor: 0
SigmaC: 600000 psf
Sigma3: 300000 psf
Num. Points: 20

Unit Weight Functions

Marsh

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 100
Data Points: X (ft), Unit Weight (pcf)
Data Point: (192.5, 100)
Data Point: (208.3, 94)
Data Point: (241.1, 100)

Spatial Functions

Above WT Cohesion

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (310, -6.6, 0)
Data Point: (310, -4.6, 0)
Data Point: (304.4, -6.4, 0)
Data Point: (276.7, -5.3, 0)
Data Point: (224, -3.3, 0)
Data Point: (200, -2.5, 0)
Data Point: (200, -1.6, 75)
Data Point: (199.7, 14.3, 75)
Data Point: (310, 14.3, 75)
Data Point: (310, -6.5, 75)
Data Point: (304.4, -6.3, 75)
Data Point: (200, -2.4, 75)
Data Point: (224, -3.2, 75)
Data Point: (276.7, -5.2, 75)
Data Point: (210.4, -3, 0)
Data Point: (210.4, -2.9, 75)
Data Point: (304.4, 14.3, 75)
Data Point: (276.7, 14.3, 75)
Data Point: (210.4, 14.3, 75)
Data Point: (224, 14.3, 75)
Data Point: (218, -3.1, 0)

Regions

	Material	Points	Area (ft²)
Region 1	S-Case Upper Embankment Fill	18,4,5,23	60.99
Region 2	BEACH SAND, EL. -7 TO -50	15,44,20,16,17,33,30,29,34,35,37,39,13,28	3858.445
Region 3	BEACH SAND, EL. -7 TO -50	17,33,31,12,25,40,9,8,26,43,15,44,20,16	8599.1
Region 4	S-Case Bay Sound Clay	12,31,32,11,27,41,10,9,40,25	5800
Region 5	Sheet Pile	14,19,18,23,22,3	13.075
Region 6	S-Case Outer Marsh (AWT)	13,39,38,1,36,28	66.5965
Region 7	S-Case Inner Marsh (BWT)	28,36,24,15	26.145
Region 8	S-Case Lower Fill (BWT)	2,21,3,45,24,36	6.9625
Region 9	S-Case Lower Fill (AWT)	23,5,6,46,45,3,22	84.345552
Region 10	S-Case Lower Fill (BWT)	45,24,46	5.804408
Region 11	S-Case Inner Marsh (BWT)	24,46,47,26,43,15	148.37527
Region 12	S-Case Inner Marsh (AWT)	46,6,7,47	19.559768
Region 13	S-Case Outer Marsh (BWT)	47,48,8,26	120.7741
Region 14	S-Case Outer Marsh (AWT)	47,7,49,50,51,48	68.131381

Points

	X (ft)	Y (ft)
--	--------	--------

Point 1	182	-5.4
Point 2	195.3	-3
Point 3	200	-1.6
Point 4	208.3	3.3
Point 5	230	0
Point 6	231	-2.5
Point 7	241.1	-2.8
Point 8	310	-7
Point 9	310	-50
Point 10	310	-70
Point 11	182	-70
Point 12	182	-50
Point 13	182	-7
Point 14	200	14.1
Point 15	200	-7
Point 16	200	-28.6
Point 17	182	-28.5
Point 18	201	3.6
Point 19	200.5	14.1
Point 20	200	-23.5
Point 21	199.1	-1.6
Point 22	201	-1.6
Point 23	201	0
Point 24	200	-3.5
Point 25	200	-50
Point 26	241.1	-7
Point 27	200	-70
Point 28	192.53	-7
Point 29	20	-6.4
Point 30	20	-7
Point 31	20	-50
Point 32	20	-70
Point 33	20	-28.5
Point 34	121.6	-6.9
Point 35	130	-8.2
Point 36	192.53	-3.5
Point 37	151.4	-9.1
Point 38	168.1	-4.5
Point 39	159.1	-7
Point 40	241.1	-50
Point 41	241.1	-70
Point 42	199	0
Point 43	201.6	-7
Point 44	200	-21.3
Point 45	200	-2.7
Point 46	214.51102	-3.0319
Point 47	241.1	-3.88318
Point 48	310.00131	-6.6111

Point 49	251.66214	-3.57485
Point 50	267.3579	-4.61829
Point 51	309.99399	-4.54755

Critical Slip Surfaces

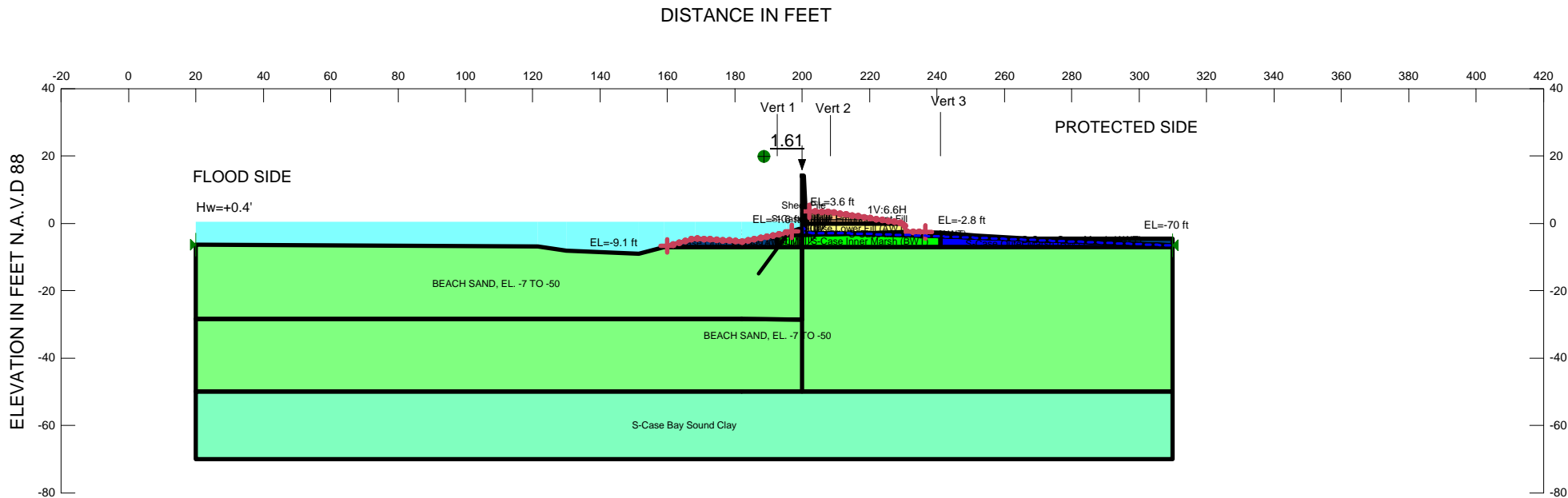
	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.03	(195.52, 8.324)	5.308783	(203.173, 3.51068)	(194.875, -3.07667)
2	6425	1.32	(195.52, 8.324)	11.38	(204.23, 3.46728)	(195.045, -3.04606)

Slices of Slip Surface: Optimized

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	194.98145	-3.0611495	215.81859	219.06146	1.5816534	0
2	Optimized	195.1938	-3.0301145	213.59145	217.34218	1.8293548	0
3	Optimized	195.3213	-3.0114835	212.16322	232.31296	9.8276827	0
4	Optimized	195.4653	-2.9822475	209.62218	224.4944	7.2536668	0
5	Optimized	195.7107	-2.9300025	205.50452	221.97916	8.0352197	0
6	Optimized	195.95605	-2.8777575	201.62203	219.44398	8.6923463	0
7	Optimized	196.2014	-2.8255125	197.90697	216.89685	9.2619857	0
8	Optimized	196.4786	-2.7655985	193.80944	213.41202	9.560817	0
9	Optimized	196.78755	-2.698015	189.4368	210.01635	10.037316	0
10	Optimized	197.0965	-2.6304315	185.33607	206.60487	10.373486	0
11	Optimized	197.3881	-2.5641085	181.42181	201.56835	9.8261249	0
12	Optimized	197.66225	-2.499045	177.65232	198.09701	9.9715432	0
13	Optimized	197.93635	-2.4339815	173.91477	194.62212	10.09965	0
14	Optimized	198.20095	-2.368039	169.93719	189.0719	9.3326234	0
15	Optimized	198.45605	-2.3012165	165.94795	185.32914	9.4528415	0
16	Optimized	198.71115	-2.2343935	162.1028	181.5788	9.4990792	0
17	Optimized	198.96625	-2.167571	158.46622	177.81329	9.4361959	0
18	Optimized	199.0969	-2.133517	156.74224	180.00484	11.345929	0
19	Optimized	199.25	-2.1017505	155.10318	159.79655	2.2891099	0
20	Optimized	199.55	-2.039504	151.65985	154.21542	1.2464347	0
21	Optimized	199.85	-1.977258	148.16756	148.63755	0.22922936	0
22	Optimized	200.0039	-1.9453225	143.74556	1404.3172	614.82186	75
23	Optimized	200.13085	-1.930001	58.372009	47.754147	-5.1786773	75
24	Optimized	200.37695	-1.9009825	-56.087816	52.43553	25.574517	75
25	Optimized	200.62405	-1.871845	-58.769374	49.186627	23.989921	75
26	Optimized	200.87215	-1.8425885	-61.399225	45.648136	22.264084	75
27	Optimized	200.9981	-1.825657	-62.729193	-21.310422	-10.393788	75
28	Optimized	201.1186	-1.679198	-72.045492	264.75513	129.12971	75
29	Optimized	201.35585	-1.390886	-90.490745	249.59344	121.73485	75
30	Optimized	201.64535	-1.0312075	-113.51284	224.13131	109.31615	75
31	Optimized	201.987	-0.6001625	-140.96747	201.96908	98.5069	75
32	Optimized	202.30775	-0.19232	-166.80483	178.48615	87.053513	75
33	Optimized	202.58575	0.16425	-189.29731	158.96258	77.531232	75
34	Optimized	202.85985	0.53242	-212.535	126.54433	61.719795	75
35	Optimized	203.0897	0.86817	-233.70683	94.171622	45.930569	75

Slices of Slip Surface: 6425

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	6425	195.1724	-3.049957	214.16541	229.05389	7.2615985	0
2	6425	195.45835	-3.054707	211.73059	241.48068	14.510089	0
3	6425	195.775	-3.052008	209.05052	242.57576	16.351354	0
4	6425	196.09165	-3.040486	206.8487	242.64549	17.459263	0
5	6425	196.40835	-3.020114	204.74958	241.77614	18.059063	0
6	6425	196.725	-2.990845	202.52887	240.02515	18.288155	0
7	6425	197.04165	-2.952609	200.56463	237.40846	17.969936	0
8	6425	197.35835	-2.905314	198.36483	233.98212	17.371712	0
9	6425	197.675	-2.848845	195.7396	229.77008	16.597774	0
10	6425	197.99165	-2.783062	192.61458	224.78328	15.689725	0
11	6425	198.30835	-2.707799	188.63685	219.03232	14.824862	0
12	6425	198.625	-2.6228595	184.02213	212.5127	13.895781	0
13	6425	198.94165	-2.528016	179.31398	205.23272	12.641416	0
14	6425	199.25	-2.4260365	174.64076	185.92091	5.5016962	0
15	6425	199.55	-2.3171725	168.61748	175.30084	3.2596887	0
16	6425	199.85	-2.1986305	161.88137	164.06379	1.0644377	0
17	6425	200.125	-2.0815775	71.692139	58.776581	-6.2993387	75
18	6425	200.375	-1.9672795	-51.991989	19.68909	9.6030108	75
19	6425	200.625	-1.8455515	-60.392764	8.3671897	4.0809511	75
20	6425	200.875	-1.716123	-69.266312	-3.4600333	-1.687571	75
21	6425	201.1628	-1.5564545	-79.801283	415.21947	202.51607	75
22	6425	201.48845	-1.3631385	-92.368863	389.00546	189.73064	75
23	6425	201.8141	-1.1546935	-105.83345	362.21799	176.66552	75
24	6425	202.1397	-0.9300946	-120.25025	334.80551	163.29556	75
25	6425	202.46535	-0.6881315	-135.6876	306.7413	149.60773	75
26	6425	202.791	-0.4273602	-152.24801	278.02775	135.6032	75
27	6425	203.11665	-0.1460378	-170.08583	248.58715	121.24406	75
28	6425	203.4378	0.1534597	-189.04243	217.20685	105.93886	75
29	6425	203.75445	0.47301315	-209.22684	183.887	89.687684	75
30	6425	204.07115	0.81955345	-231.09613	149.73971	73.032939	75



Name: BEACH SAND, EL. -7 TO -50 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand
Name: Sheet Pile Model: Undrained (Phi=0) Unit Weight: 0.1 pcf Cohesion: 1e+012 psf
Name: S-Case Upper Embankment Fill Model: Spatial Mohr-Coulomb Unit Weight: 110 pcf Cohesion Spatial Fn: Above WT Cohesion Phi: 26 °
Name: S-Case Lower Fill (AWT) Model: Spatial Mohr-Coulomb Unit Weight: 94 pcf Cohesion: 75 psf Phi: 26 °
Name: S-Case Inner Marsh (AWT) Model: Spatial Mohr-Coulomb Weight Fn: Marsh Cohesion: 75 psf Phi: 24 °
Name: S-Case Outer Marsh (AWT) Model: Spatial Mohr-Coulomb Unit Weight: 100 pcf Cohesion: 75 psf Phi: 24 °
Name: S-Case Bay Sound Clay Model: Spatial Mohr-Coulomb Unit Weight: 102 pcf Cohesion: 0 psf Phi: 26 °
Name: S-Case Lower Fill (BWT) Model: Spatial Mohr-Coulomb Unit Weight: 94 pcf Cohesion: 0 psf Phi: 26 °
Name: S-Case Inner Marsh (BWT) Model: Spatial Mohr-Coulomb Weight Fn: Marsh Cohesion: 0 psf Phi: 24 °
Name: S-Case Outer Marsh (BWT) Model: Spatial Mohr-Coulomb Unit Weight: 100 pcf Cohesion: 0 psf Phi: 24 °

GENERAL NOTES

CLASSIFICATION STRATIFICATION
SHEAR STRENGTHS AND UNIT WEIGHTS OF
THE SOIL WERE BASED ON THE RESULTS OF
UNDISTURBED BORINGS AND CPT DATA. SEE
BOTH BORING AND CPT DATA PLATES.

WHERE INDICATED, SHEAR STRENGTHS BETWEEN
VERTICALS WERE ASSUMED TO VARY LINEARLY
BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 1A,
PROTECTED SIDE STABILITY ANALYSIS,
CASE: NWL S-Case F/S (Entry/Exit) (w/ sheetpile)
STA. 2+45 TO 7+00 WEST
ORLEANS PARISH, LOUISIANA

NWL S-Case F/S (Entry/Exit) (w/ sheetpile)

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File Information

Created By: [Liljegren, James](#)
Revision Number: [592](#)
Last Edited By: [Hendrix, Joshua M MVR](#)
Date: [6/19/2013](#)
Time: [5:14:52 PM](#)
File Name: [Reach 1A.gsz](#)
Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix F NWL\](#)
Last Solved Date: [6/19/2013](#)
Last Solved Time: [5:24:06 PM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Strength Units: [psf](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

NWL S-Case F/S (Entry/Exit) (w/ sheetpile)

Kind: [SLOPE/W](#)
Parent: [NWL S-Case P/S \(Block\)](#)
Method: [Spencer](#)
Settings
 PWP Conditions Source: [Other GeoStudio Analysis](#)
 PWP Other Analysis: [3 - Normal Water Level 0.4ft \[\(last\)\]](#)
Slip Surface
 Direction of movement: [Right to Left](#)
 Use Passive Mode: [No](#)
 Slip Surface Option: [Entry and Exit](#)
 Critical slip surfaces saved: [1](#)
 Optimize Critical Slip Surface Location: [Yes](#)
Tension Crack
 Tension Crack Option: [Tension Crack Line](#)
 Percentage Wet: [0](#)
 Tension Crack Fluid Unit Weight: [62.4 pcf](#)
FOS Distribution

FOS Calculation Option: [Constant](#)

Advanced

Number of Slices: [30](#)

Optimization Tolerance: [0.01](#)

Minimum Slip Surface Depth: [0.1 ft](#)

Optimization Maximum Iterations: [4000](#)

Optimization Convergence Tolerance: [1e-007](#)

Starting Optimization Points: [8](#)

Ending Optimization Points: [16](#)

Complete Passes per Insertion: [1](#)

Driving Side Maximum Convex Angle: [5 °](#)

Resisting Side Maximum Convex Angle: [1 °](#)

Materials

BEACH SAND, EL. -7 TO -50

Model: [Shear/Normal Fn.](#)

Unit Weight: [122 pcf](#)

Strength Function: [Sand](#)

Phi-B: [0 °](#)

Sheet Pile

Model: [Undrained \(Phi=0\)](#)

Unit Weight: [0.1 pcf](#)

Cohesion: [1e+012 psf](#)

S-Case Upper Embankment Fill

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [110 pcf](#)

Cohesion Spatial Fn: [Above WT Cohesion](#)

Phi: [26 °](#)

Phi-B: [0 °](#)

S-Case Lower Fill (AWT)

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [94 pcf](#)

Cohesion: [75 psf](#)

Phi: [26 °](#)

Phi-B: [0 °](#)

S-Case Inner Marsh (AWT)

Model: [Spatial Mohr-Coulomb](#)

Weight Fn: [Marsh](#)

Cohesion: [75 psf](#)

Phi: [24 °](#)

Phi-B: [0 °](#)

S-Case Outer Marsh (AWT)

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [100 pcf](#)

Cohesion: [75 psf](#)

Phi: [24 °](#)

Phi-B: [0 °](#)

S-Case Bay Sound Clay

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [102 pcf](#)

Cohesion: [0 psf](#)

Phi: [26 °](#)

Phi-B: [0 °](#)

S-Case Lower Fill (BWT)

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [94 pcf](#)

Cohesion: [0 psf](#)

Phi: [26 °](#)

Phi-B: [0 °](#)

S-Case Inner Marsh (BWT)

Model: [Spatial Mohr-Coulomb](#)

Weight Fn: [Marsh](#)

Cohesion: [0 psf](#)

Phi: [24 °](#)

Phi-B: [0 °](#)

S-Case Outer Marsh (BWT)

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [100 pcf](#)

Cohesion: [0 psf](#)

Phi: [24 °](#)

Phi-B: [0 °](#)

Slip Surface Entry and Exit

Left Projection: [Range](#)

Left-Zone Left Coordinate: [\(159.9, -6.77778\) ft](#)

Left-Zone Right Coordinate: [\(196.81954, -2.44017\) ft](#)

Left-Zone Increment: [20](#)

Right Projection: [Range](#)

Right-Zone Left Coordinate: [\(202.15364, 3.55259\) ft](#)

Right-Zone Right Coordinate: [\(236.50623, -2.66355\) ft](#)

Right-Zone Increment: [20](#)

Radius Increments: [15](#)

Slip Surface Limits

Left Coordinate: (20, -6.4) ft
Right Coordinate: (310.00131, -6.6111) ft

Reinforcements

Reinforcement 1

Type: [Pile](#)
Outside Point: (200, 14.1) ft
Inside Point: (200, -7) ft
Slip Surface Intersection: (200, -7.0006) ft
Total Length: [21.1 ft](#)
Reinforcement Direction: [90 °](#)
Applied Load Option: [Variable](#)
F of S Dependent: [No](#)
Pile Spacing: [1 ft](#)
Shear Capacity: [81201 lbs](#)
Shear Safety Factor: [1](#)
Shear Load Used: [81201 lbs](#)
Shear Option: [Parallel to Slip](#)
Resisting Force Used: [0 lbs/ft](#)

Tension Crack Line

	X (ft)	Y (ft)
	200	1
	223	1

Shear/Normal Strength Functions

Sand

Model: [Spline Data Point Function](#)
Function: [Shear Stress vs. Normal Stress](#)
Curve Fit to Data: [100 %](#)
Segment Curvature: [0 %](#)
Y-Intercept: [0](#)
Data Points: [Normal Stress \(psf\), Shear Stress \(psf\)](#)
Data Point: (-10000, 0)
Data Point: (0, 0)
Data Point: (10000, 6494)
Estimation Properties
Intact Rock Param.: [10](#)
Geological Strength: [100](#)
Disturbance Factor: [0](#)
SigmaC: [600000 psf](#)

Sigma3: 300000 psf

Num. Points: 20

Unit Weight Functions

Marsh

Model: Spline Data Point Function

Function: Unit Weight vs. X

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 100

Data Points: X (ft), Unit Weight (pcf)

Data Point: (192.5, 100)

Data Point: (208.3, 94)

Data Point: (241.1, 100)

Spatial Functions

Above WT Cohesion

Model: Linear Interpolation

Limit Range By: Data Values

Data Points: X (ft), Y (ft), Cohesion (psf)

Data Point: (310, -6.6, 0)

Data Point: (310, -4.6, 0)

Data Point: (304.4, -6.4, 0)

Data Point: (276.7, -5.3, 0)

Data Point: (224, -3.3, 0)

Data Point: (200, -2.5, 0)

Data Point: (200, -1.6, 75)

Data Point: (199.7, 14.3, 75)

Data Point: (310, 14.3, 75)

Data Point: (310, -6.5, 75)

Data Point: (304.4, -6.3, 75)

Data Point: (200, -2.4, 75)

Data Point: (224, -3.2, 75)

Data Point: (276.7, -5.2, 75)

Data Point: (210.4, -3, 0)

Data Point: (210.4, -2.9, 75)

Data Point: (304.4, 14.3, 75)

Data Point: (276.7, 14.3, 75)

Data Point: (210.4, 14.3, 75)

Data Point: (224, 14.3, 75)

Data Point: (218, -3.1, 0)

Regions

	Material	Points	Area (ft²)
Region 1	S-Case Upper Embankment Fill	18,4,5,23	60.99
Region 2	BEACH SAND, EL. -7 TO -50	15,44,20,16,17,33,30,29,34,35,37,39,13,28	3858.445
Region 3	BEACH SAND, EL. -7 TO -50	17,33,31,12,25,40,9,8,26,43,15,44,20,16	8599.1
Region 4	S-Case Bay Sound Clay	12,31,32,11,27,41,10,9,40,25	5800
Region 5	Sheet Pile	14,19,18,23,22,3	13.075
Region 6	S-Case Outer Marsh (AWT)	13,39,38,1,36,28	66.5965
Region 7	S-Case Inner Marsh (BWT)	28,36,24,15	26.145
Region 8	S-Case Lower Fill (BWT)	2,21,3,45,24,36	6.9625
Region 9	S-Case Lower Fill (AWT)	23,5,6,46,45,3,22	84.345552
Region 10	S-Case Lower Fill (BWT)	45,24,46	5.804408
Region 11	S-Case Inner Marsh (BWT)	24,46,47,26,43,15	148.37527
Region 12	S-Case Inner Marsh (AWT)	46,6,7,47	19.559768
Region 13	S-Case Outer Marsh (BWT)	47,48,8,26	120.7741
Region 14	S-Case Outer Marsh (AWT)	47,7,49,50,51,48	68.131381

Points

	X (ft)	Y (ft)
Point 1	182	-5.4
Point 2	195.3	-3
Point 3	200	-1.6
Point 4	208.3	3.3
Point 5	230	0
Point 6	231	-2.5
Point 7	241.1	-2.8
Point 8	310	-7
Point 9	310	-50
Point 10	310	-70
Point 11	182	-70
Point 12	182	-50
Point 13	182	-7
Point 14	200	14.1
Point 15	200	-7
Point 16	200	-28.6
Point 17	182	-28.5
Point 18	201	3.6
Point 19	200.5	14.1
Point 20	200	-23.5
Point 21	199.1	-1.6
Point 22	201	-1.6
Point 23	201	0
Point 24	200	-3.5
Point 25	200	-50
Point 26	241.1	-7
Point 27	200	-70
Point 28	192.53	-7
Point 29	20	-6.4

Point 30	20	-7
Point 31	20	-50
Point 32	20	-70
Point 33	20	-28.5
Point 34	121.6	-6.9
Point 35	130	-8.2
Point 36	192.53	-3.5
Point 37	151.4	-9.1
Point 38	168.1	-4.5
Point 39	159.1	-7
Point 40	241.1	-50
Point 41	241.1	-70
Point 42	199	0
Point 43	201.6	-7
Point 44	200	-21.3
Point 45	200	-2.7
Point 46	214.51102	-3.0319
Point 47	241.1	-3.88318
Point 48	310.00131	-6.6111
Point 49	251.66214	-3.57485
Point 50	267.3579	-4.61829
Point 51	309.99399	-4.54755

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.61	(197.697, 4.393)	10.11106	(208.124, 3.30723)	(189.516, -4.0439)
2	5455	2.12	(197.697, 4.393)	11.767	(208.964, 3.19901)	(189.498, -4.04702)

Slices of Slip Surface: Optimized

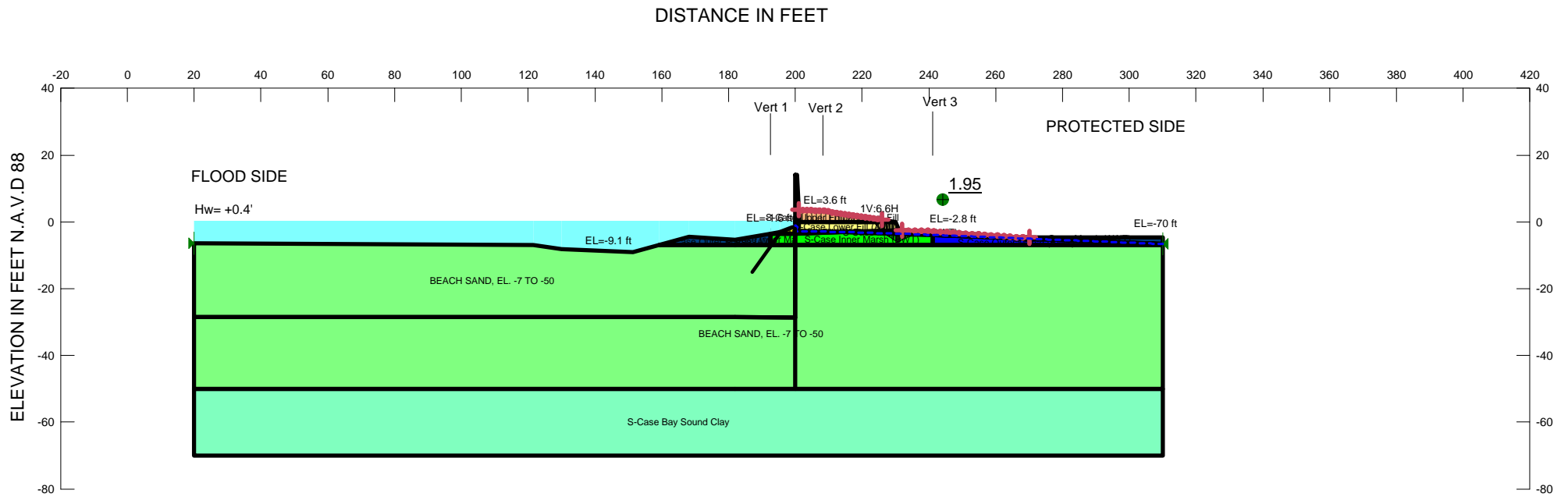
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	189.7951	-4.156316	281.16814	344.38781	28.147209	75
2	Optimized	190.3539	-4.381152	289.22002	375.13435	38.251525	75
3	Optimized	191.07055	-4.66135	299.75209	410.71524	49.403976	75
4	Optimized	191.76335	-4.9130245	309.18653	436.54565	56.703935	75
5	Optimized	192.27445	-5.0808135	315.50708	459.5599	64.136446	75
6	Optimized	192.71445	-5.225269	321.1582	454.58139	59.403832	0
7	Optimized	193.16815	-5.3747775	327.73513	474.18085	65.201837	0
8	Optimized	193.70665	-5.5526725	335.93468	497.10432	71.75735	0
9	Optimized	194.3069	-5.745778	345.53692	519.89027	77.627116	0
10	Optimized	194.96895	-5.9540945	356.77529	546.30046	84.382042	0
11	Optimized	195.31085	-6.0616715	362.75171	565.22472	90.146793	0
12	Optimized	195.70465	-6.1715825	369.53944	576.35423	92.079876	0
13	Optimized	196.47055	-6.3845675	383.94264	607.51293	99.539908	0
14	Optimized	197.15675	-6.5652015	397.02078	628.8872	103.23358	0
15	Optimized	197.76325	-6.713485	409.67445	650.70276	107.31272	0
16	Optimized	198.3697	-6.8617685	422.29608	672.43823	111.37046	0

17	Optimized	198.88645	-6.946324	434.77793	655.92043	98.458982	0
18	Optimized	199.55	-6.978683	448.72227	654.66641	91.692237	0
19	Optimized	200.25	-7.01282	294.45008	547.14977	164.1051	4.0771e-006
20	Optimized	200.7437	-7.036896	262.37312	544.50158	183.21637	4.5522e-006
21	Optimized	200.9937	-7.042379	262.70377	418.71665	101.31595	2.5179e-006
22	Optimized	201.47915	-6.549529	231.85498	788.81367	247.97398	0
23	Optimized	202.33325	-5.68228	177.28011	713.99501	238.96087	0
24	Optimized	203.08315	-4.92068	129.3299	648.6798	231.22947	0
25	Optimized	203.7017	-4.2809025	89.003104	587.00734	221.72577	0
26	Optimized	204.18895	-3.7629475	56.356586	543.27428	216.78973	0
27	Optimized	204.49645	-3.428431	35.266155	499.15104	206.53486	0
28	Optimized	204.7878	-3.0838015	13.447846	462.08259	218.81379	0
29	Optimized	205.21515	-2.5783005	-18.58715	390.89869	190.65403	75
30	Optimized	205.6852	-2.0125285	-54.43793	348.20182	169.82938	75
31	Optimized	206.2256	-1.353805	-96.190929	304.4712	148.50053	75
32	Optimized	206.76605	-0.6950815	-137.88172	260.72885	127.16596	75
33	Optimized	207.1816	-0.18286	-170.29014	223.0046	108.76661	75
34	Optimized	207.60335	0.34795	-203.85963	184.44121	89.95799	75
35	Optimized	208.00195	0.84795	-235.44229	147.2748	71.83072	75

Slices of Slip Surface: 5455

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	5455	189.80155	-4.321693	288.26256	413.94431	55.957118	75
2	5455	190.40785	-4.835818	308.96306	467.81915	70.727289	75
3	5455	191.01415	-5.284625	327.60944	512.61242	82.368633	75
4	5455	191.6205	-5.676923	344.05401	550.204	91.783888	75
5	5455	192.22685	-6.019144	359.19628	581.66087	99.047616	75
6	5455	192.9009	-6.3441005	374.60292	585.88173	94.067385	0
7	5455	193.6427	-6.6460055	389.97019	613.02903	99.312197	0
8	5455	194.3845	-6.8911155	403.63822	633.57165	102.37296	0
9	5455	195.0277	-7.0634535	414.85948	657.19464	157.37429	3.9104e-006
10	5455	195.61665	-7.183817	424.06939	673.479	161.9685	4.0246e-006
11	5455	196.25	-7.279987	432.77616	683.19058	162.62103	4.0406e-006
12	5455	196.88335	-7.3412105	439.29723	688.50378	161.83663	4.0211e-006
13	5455	197.51665	-7.368035	445.10023	689.53987	158.74096	3.9443e-006
14	5455	198.15	-7.3606965	449.35091	686.55392	154.04143	3.8275e-006
15	5455	198.78335	-7.319131	453.64301	679.64697	146.76869	3.6466e-006
16	5455	199.55	-7.2179575	460.9241	656.38453	126.93349	-5.49e-007
17	5455	200.25	-7.090575	299.09888	517.01935	141.51921	3.5162e-006
18	5455	200.5695	-7.0175	261.15898	497.72597	153.62841	3.8172e-006
19	5455	200.8195	-6.9503225	256.95152	491.15622	104.27465	0
20	5455	201.3118	-6.799958	247.52468	976.27273	324.45954	0
21	5455	201.9354	-6.578834	233.55829	938.18237	313.71886	0
22	5455	202.55895	-6.316861	216.96146	896.59782	302.5936	0
23	5455	203.1825	-6.010939	197.57682	851.23436	291.02709	0
24	5455	203.8061	-5.657033	175.0894	801.70855	278.98882	0
25	5455	204.4297	-5.249827	149.22567	747.52211	266.37874	0

26	5455	205.0533	-4.7821695	119.57393	687.98584	253.07329	0
27	5455	205.67685	-4.244145	85.517795	622.17783	238.93644	0
28	5455	206.3004	-3.621397	46.114019	548.70731	223.76895	0
29	5455	206.78775	-3.072984	11.370823	478.14442	227.6607	0
30	5455	207.29745	-2.386007	-32.179752	376.08202	183.42746	75
31	5455	207.9658	-1.3111563	-100.24267	270.90296	132.1282	75
32	5455	208.45655	-0.35478225	-160.57699	182.80557	89.160236	75
33	5455	208.7886	0.5	-214.3401	104.96211	51.193442	75



Name: BEACH SAND, EL. -7 TO -50	Model: Shear/Normal Fn.	Unit Weight: 122 pcf	Strength Function: Sand
Name: S-Case Upper Embankment Fill	Model: Spatial Mohr-Coulomb	Unit Weight: 110 pcf	Cohesion Spatial Fn: Above WT Cohesion Phi: 26 °
Name: S-Case Lower Fill (AWT)	Model: Spatial Mohr-Coulomb	Unit Weight: 94 pcf	Cohesion: 75 psf Phi: 26 °
Name: S-Case Inner Marsh (AWT)	Model: Spatial Mohr-Coulomb	Weight Fn: Marsh	Cohesion: 75 psf Phi: 24 °
Name: S-Case Outer Marsh (AWT)	Model: Spatial Mohr-Coulomb	Unit Weight: 100 pcf	Cohesion: 75 psf Phi: 24 °
Name: S-Case Bay Sound Clay	Model: Spatial Mohr-Coulomb	Unit Weight: 102 pcf	Cohesion: 0 psf Phi: 26 °
Name: S-Case Lower Fill (BWT)	Model: Spatial Mohr-Coulomb	Unit Weight: 94 pcf	Cohesion: 0 psf Phi: 26 °
Name: S-Case Inner Marsh (BWT)	Model: Spatial Mohr-Coulomb	Weight Fn: Marsh	Cohesion: 0 psf Phi: 24 °
Name: S-Case Outer Marsh (BWT)	Model: Spatial Mohr-Coulomb	Unit Weight: 100 pcf	Cohesion: 0 psf Phi: 24 °

GENERAL NOTES

CLASSIFICATION STRATIFICATION
SHEAR STRENGTHS AND UNIT WEIGHTS OF
THE SOIL WERE BASED ON THE RESULTS OF
UNDISTURBED BORINGS AND CPT DATA. SEE
BOTH BORING AND CPT DATA PLATES.

WHERE INDICATED, SHEAR STRENGTHS BETWEEN
VERTICALS WERE ASSUMED TO VARY LINEARLY
BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 1A,
PROTECTED SIDE STABILITY ANALYSIS,
CASE: NWL S-Case P/S (Entry/Exit)
STA. 2+45 TO 7+00 WEST
ORLEANS PARISH, LOUISIANA

NWL S-Case P/S (Entry/Exit)

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File Information

Created By: [Liljegren, James](#)
Revision Number: [592](#)
Last Edited By: [Hendrix, Joshua M MVR](#)
Date: [6/19/2013](#)
Time: [5:14:52 PM](#)
File Name: [Reach 1A.gsz](#)
Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix F NWL\](#)
Last Solved Date: [6/19/2013](#)
Last Solved Time: [5:24:44 PM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Strength Units: [psf](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

NWL S-Case P/S (Entry/Exit)

Kind: [SLOPE/W](#)
Parent: [NWL S-Case P/S \(Block\)](#)
Method: [Spencer](#)
Settings
 PWP Conditions Source: [Other GeoStudio Analysis](#)
 PWP Other Analysis: [3 - Normal Water Level 0.4ft \[\(last\)\]](#)
Slip Surface
 Direction of movement: [Left to Right](#)
 Use Passive Mode: [No](#)
 Slip Surface Option: [Entry and Exit](#)
 Critical slip surfaces saved: [1](#)
 Optimize Critical Slip Surface Location: [Yes](#)
Tension Crack
 Tension Crack Option: [Tension Crack Line](#)
 Percentage Wet: [0](#)
 Tension Crack Fluid Unit Weight: [62.4 pcf](#)
FOS Distribution

FOS Calculation Option: [Constant](#)

Advanced

Number of Slices: [30](#)

Optimization Tolerance: [0.01](#)

Minimum Slip Surface Depth: [0.1 ft](#)

Optimization Maximum Iterations: [4000](#)

Optimization Convergence Tolerance: [1e-007](#)

Starting Optimization Points: [8](#)

Ending Optimization Points: [16](#)

Complete Passes per Insertion: [1](#)

Driving Side Maximum Convex Angle: [5 °](#)

Resisting Side Maximum Convex Angle: [1 °](#)

Materials

BEACH SAND, EL. -7 TO -50

Model: [Shear/Normal Fn.](#)

Unit Weight: [122 pcf](#)

Strength Function: [Sand](#)

Phi-B: [0 °](#)

S-Case Upper Embankment Fill

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [110 pcf](#)

Cohesion Spatial Fn: [Above WT Cohesion](#)

Phi: [26 °](#)

Phi-B: [0 °](#)

S-Case Lower Fill (AWT)

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [94 pcf](#)

Cohesion: [75 psf](#)

Phi: [26 °](#)

Phi-B: [0 °](#)

S-Case Inner Marsh (AWT)

Model: [Spatial Mohr-Coulomb](#)

Weight Fn: [Marsh](#)

Cohesion: [75 psf](#)

Phi: [24 °](#)

Phi-B: [0 °](#)

S-Case Outer Marsh (AWT)

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [100 pcf](#)

Cohesion: [75 psf](#)

Phi: [24 °](#)

Phi-B: 0 °

S-Case Bay Sound Clay

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: 102 pcf

Cohesion: 0 psf

Phi: 26 °

Phi-B: 0 °

S-Case Lower Fill (BWT)

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: 94 pcf

Cohesion: 0 psf

Phi: 26 °

Phi-B: 0 °

S-Case Inner Marsh (BWT)

Model: [Spatial Mohr-Coulomb](#)

Weight Fn: [Marsh](#)

Cohesion: 0 psf

Phi: 24 °

Phi-B: 0 °

S-Case Outer Marsh (BWT)

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: 100 pcf

Cohesion: 0 psf

Phi: 24 °

Phi-B: 0 °

Slip Surface Entry and Exit

Left Projection: [Range](#)

Left-Zone Left Coordinate: (201, 3.6) ft

Left-Zone Right Coordinate: (226, 0.60829) ft

Left-Zone Increment: 20

Right Projection: [Range](#)

Right-Zone Left Coordinate: (232.02971, -2.53059) ft

Right-Zone Right Coordinate: (270.07729, -4.61378) ft

Right-Zone Increment: 20

Radius Increments: 4

Slip Surface Limits

Left Coordinate: (20, -6.4) ft

Right Coordinate: (310.00131, -6.6111) ft

Tension Crack Line

	X (ft)	Y (ft)
	200	0
	226	0

Shear/Normal Strength Functions

Sand

Model: [Spline Data Point Function](#)
Function: [Shear Stress vs. Normal Stress](#)
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 0
Data Points: [Normal Stress \(psf\)](#), [Shear Stress \(psf\)](#)
Data Point: (-10000, 0)
Data Point: (0, 0)
Data Point: (10000, 6494)
Estimation Properties
Intact Rock Param.: 10
Geological Strength: 100
Disturbance Factor: 0
SigmaC: 600000 psf
Sigma3: 300000 psf
Num. Points: 20

Unit Weight Functions

Marsh

Model: [Spline Data Point Function](#)
Function: [Unit Weight vs. X](#)
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 100
Data Points: [X \(ft\)](#), [Unit Weight \(pcf\)](#)
Data Point: (192.5, 100)
Data Point: (208.3, 94)
Data Point: (241.1, 100)

Spatial Functions

Above WT Cohesion

Model: [Linear Interpolation](#)
Limit Range By: [Data Values](#)
Data Points: [X \(ft\)](#), [Y \(ft\)](#), [Cohesion \(psf\)](#)

Data Point: (310, -6.6, 0)
 Data Point: (310, -4.6, 0)
 Data Point: (304.4, -6.4, 0)
 Data Point: (276.7, -5.3, 0)
 Data Point: (224, -3.3, 0)
 Data Point: (200, -2.5, 0)
 Data Point: (200, -1.6, 75)
 Data Point: (199.7, 14.3, 75)
 Data Point: (310, 14.3, 75)
 Data Point: (310, -6.5, 75)
 Data Point: (304.4, -6.3, 75)
 Data Point: (200, -2.4, 75)
 Data Point: (224, -3.2, 75)
 Data Point: (276.7, -5.2, 75)
 Data Point: (210.4, -3, 0)
 Data Point: (210.4, -2.9, 75)
 Data Point: (304.4, 14.3, 75)
 Data Point: (276.7, 14.3, 75)
 Data Point: (210.4, 14.3, 75)
 Data Point: (224, 14.3, 75)
 Data Point: (218, -3.1, 0)

Regions

	Material	Points	Area (ft ²)
Region 1	S-Case Upper Embankment Fill	18,4,5,23	60.99
Region 2	BEACH SAND, EL. -7 TO -50	15,44,20,16,17,33,30,29,34,35,37,39,13,28	3858.445
Region 3	BEACH SAND, EL. -7 TO -50	17,33,31,12,25,40,9,8,26,43,15,44,20,16	8599.1
Region 4	S-Case Bay Sound Clay	12,31,32,11,27,41,10,9,40,25	5800
Region 5		14,19,18,23,22,3	13.075
Region 6	S-Case Outer Marsh (AWT)	13,39,38,1,36,28	66.5965
Region 7	S-Case Inner Marsh (BWT)	28,36,24,15	26.145
Region 8	S-Case Lower Fill (BWT)	2,21,3,45,24,36	6.9625
Region 9	S-Case Lower Fill (AWT)	23,5,6,46,45,3,22	84.345552
Region 10	S-Case Lower Fill (BWT)	45,24,46	5.804408
Region 11	S-Case Inner Marsh (BWT)	24,46,47,26,43,15	148.37527
Region 12	S-Case Inner Marsh (AWT)	46,6,7,47	19.559768
Region 13	S-Case Outer Marsh (BWT)	47,48,8,26	120.7741
Region 14	S-Case Outer Marsh (AWT)	47,7,49,50,51,48	68.131381

Points

	X (ft)	Y (ft)
Point 1	182	-5.4
Point 2	195.3	-3
Point 3	200	-1.6
Point 4	208.3	3.3
Point 5	230	0

Point 6	231	-2.5
Point 7	241.1	-2.8
Point 8	310	-7
Point 9	310	-50
Point 10	310	-70
Point 11	182	-70
Point 12	182	-50
Point 13	182	-7
Point 14	200	14.1
Point 15	200	-7
Point 16	200	-28.6
Point 17	182	-28.5
Point 18	201	3.6
Point 19	200.5	14.1
Point 20	200	-23.5
Point 21	199.1	-1.6
Point 22	201	-1.6
Point 23	201	0
Point 24	200	-3.5
Point 25	200	-50
Point 26	241.1	-7
Point 27	200	-70
Point 28	192.53	-7
Point 29	20	-6.4
Point 30	20	-7
Point 31	20	-50
Point 32	20	-70
Point 33	20	-28.5
Point 34	121.6	-6.9
Point 35	130	-8.2
Point 36	192.53	-3.5
Point 37	151.4	-9.1
Point 38	168.1	-4.5
Point 39	159.1	-7
Point 40	241.1	-50
Point 41	241.1	-70
Point 42	199	0
Point 43	201.6	-7
Point 44	200	-21.3
Point 45	200	-2.7
Point 46	214.51102	-3.0319
Point 47	241.1	-3.88318
Point 48	310.00131	-6.6111
Point 49	251.66214	-3.57485
Point 50	267.3579	-4.61829
Point 51	309.99399	-4.54755

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.95	(231.168, 3.889)	7.074741	(223.399, 1.00388)	(237.329, -2.68799)
2	1804	2.14	(231.168, 3.889)	9.31	(222.709, 1.10879)	(237.744, -2.70033)

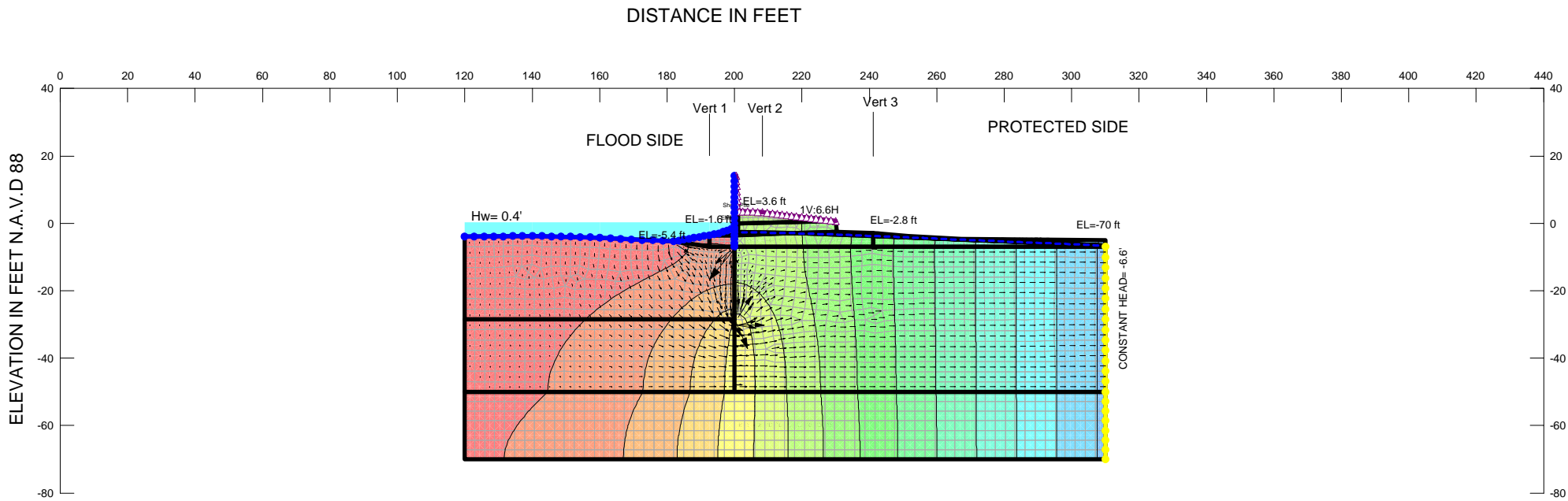
Slices of Slip Surface: Optimized

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	223.59265	-0.21678165	-191.0086	64.608076	31.511464	75
2	Optimized	223.98055	-0.650345	-164.78274	89.651311	43.725866	75
3	Optimized	224.36845	-1.0839084	-138.57578	114.69455	55.940268	75
4	Optimized	224.76525	-1.516005	-112.48551	143.18043	69.833763	75
5	Optimized	225.1709	-1.946635	-86.516783	168.16538	82.019736	75
6	Optimized	225.62335	-2.4136675	-58.412581	199.41425	97.26083	75
7	Optimized	226.05345	-2.8473175	-32.298801	228.5287	101.74753	75
8	Optimized	226.4458	-3.2250205	-9.5060504	259.59943	115.58111	75
9	Optimized	226.6928	-3.4532605	4.2400735	299.10013	131.28015	0
10	Optimized	226.94445	-3.64471	15.675439	327.59455	138.87534	0
11	Optimized	227.37755	-3.96267	34.633711	349.42674	140.15489	0
12	Optimized	227.807	-4.2669975	52.753676	374.87214	143.41638	0
13	Optimized	228.23275	-4.5576925	70.018163	394.61961	144.52188	0
14	Optimized	228.70465	-4.865037	88.215749	420.91814	148.12865	0
15	Optimized	229.2228	-5.189031	107.34705	442.55151	149.24264	0
16	Optimized	229.74095	-5.513025	126.4489	464.25035	150.3989	0
17	Optimized	230.0615	-5.713491	138.27673	466.34113	146.06368	0
18	Optimized	230.3291	-5.813715	143.9559	454.49728	138.26193	0
19	Optimized	230.6927	-5.86956	146.65572	412.76265	118.47844	0
20	Optimized	230.9251	-5.8327285	143.84476	390.01258	109.60098	0
21	Optimized	231.2522	-5.697676	134.69974	353.94831	97.61575	0
22	Optimized	231.75655	-5.4894135	120.59789	330.16116	93.303581	0
23	Optimized	232.2609	-5.281151	106.50153	306.31904	88.964487	0
24	Optimized	232.78125	-5.0591665	91.499923	283.19535	85.348304	0
25	Optimized	233.31755	-4.82346	75.605819	256.03659	80.332956	0
26	Optimized	233.85385	-4.5877535	59.7083	228.80955	75.288729	0
27	Optimized	234.39015	-4.3434635	43.266811	202.77418	71.017254	0
28	Optimized	234.92645	-4.0905905	26.291663	173.32697	65.464338	0
29	Optimized	235.4755	-3.831712	8.9128804	143.10006	59.74398	0
30	Optimized	235.9775	-3.561035	-9.0981447	153.81904	68.484651	75
31	Optimized	236.4197	-3.284565	-27.3347	116.63457	51.929057	75
32	Optimized	236.98485	-2.917159	-51.520075	70.494025	31.385962	75

Slices of Slip Surface: 1804

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	1804	222.9449	-0.44751985	-175.46668	60.404814	29.461396	75
2	1804	223.4169	-1.2509319	-126.39538	120.59958	58.820345	75
3	1804	223.8889	-1.9033945	-86.720991	172.47368	84.121035	75
4	1804	224.3609	-2.453258	-53.460296	218.03817	106.34432	75

5	1804	224.785	-2.883806	-27.486984	258.59974	115.13602	75
6	1804	225.1612	-3.2199805	-7.2365477	288.9502	128.64892	75
7	1804	225.60765	-3.5714595	13.81219	341.37907	145.84217	0
8	1804	226.1244	-3.930658	35.195841	374.67747	151.14696	0
9	1804	226.64115	-4.241149	53.538585	403.50492	155.81505	0
10	1804	227.1579	-4.5083755	69.164005	428.33276	159.91223	0
11	1804	227.67465	-4.736383	82.338621	449.49479	163.46846	0
12	1804	228.1914	-4.9282295	93.23708	467.27635	166.53301	0
13	1804	228.70815	-5.0862445	102.01562	481.83997	169.1087	0
14	1804	229.2249	-5.2121975	108.78874	493.36561	171.22466	0
15	1804	229.74165	-5.307411	113.61865	501.92695	172.88599	0
16	1804	230.25	-5.3722415	116.57129	453.47985	150.00136	0
17	1804	230.75	-5.408237	117.73932	345.35189	101.33964	0
18	1804	231.2504	-5.417234	117.20385	290.2143	77.029215	0
19	1804	231.7512	-5.399267	114.98692	290.96966	78.352563	0
20	1804	232.25205	-5.354148	111.0733	289.10114	79.2631	0
21	1804	232.7529	-5.281476	105.42736	284.46871	79.714348	0
22	1804	233.2537	-5.1805865	98.019966	276.98249	79.679249	0
23	1804	233.7545	-5.0505205	88.791649	266.47277	79.10873	0
24	1804	234.2553	-4.8899765	77.652095	252.68717	77.930635	0
25	1804	234.7561	-4.6972385	64.504303	235.33486	76.058667	0
26	1804	235.25695	-4.47007	49.210845	214.04754	73.390024	0
27	1804	235.7578	-4.205557	31.580107	188.31345	69.78218	0
28	1804	236.2586	-3.8998725	11.387966	157.38344	65.001374	0
29	1804	236.81785	-3.5000115	-14.806906	152.91725	68.083147	75
30	1804	237.43555	-2.982079	-48.498224	93.677518	41.707918	75



Name: FILL2, EL.0 TO -2.5/-3.5 Model: Saturated Only K-Sat: 3.28e-007 ft/sec K-Ratio: 1
 Name: BEACH SAND, EL. -7 TO -50 Model: Saturated Only K-Sat: 0.00049 ft/sec K-Ratio: 1
 Name: BAY SOUND CLAY, EL. -50 TO -70 Model: Saturated Only K-Sat: 3.28e-008 ft/sec K-Ratio: 1
 Name: Sheet Pile Model: Saturated Only K-Sat: 1e-010 ft/sec K-Ratio: 1
 Name: MARSH, EL. -2.8/-3.5 TO -7 Model: Saturated Only K-Sat: 3.28e-007 ft/sec K-Ratio: 1
 Name: EMBANKMENT FILL, EL. +3.6 TO -3.5 Model: Saturated Only K-Sat: 3.28e-008 ft/sec K-Ratio: 1

GENERAL NOTES

CLASSIFICATION STRATIFICATION
 SHEAR STRENGTHS AND UNIT WEIGHTS OF
 THE SOIL WERE BASED ON THE RESULTS OF
 UNDISTURBED BORINGS AND CPT DATA. SEE
 BOTH BORING AND CPT DATA PLATES.

WHERE INDICATED, SHEAR STRENGTHS BETWEEN
 VERTICALS WERE ASSUMED TO VARY LINEARLY
 BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

Hw IS CANAL WATER LEVEL

LAKE PONTCHARTRAIN, LA. AND VICINITY
 HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 1B,
 PROTECTED SIDE STABILITY ANALYSIS,
 CASE: Normal Water Level +0.4ft (seepage)
 STA. 7+00 TO 9+25 WEST
 ORLEANS PARISH, LOUISIANA

Normal Water Level +0.4ft (seepage)

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File Information

Created By: [Liljegren, James](#)
Revision Number: [665](#)
Last Edited By: [Castro, Felix R MVR](#)
Date: [6/20/2013](#)
Time: [1:49:54 PM](#)
File Name: [Reach 1B.gsz](#)
Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix F NWL\](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Mass(M) Units: [lbs](#)
Mass Flux Units: [lbs/sec](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

Normal Water Level +0.4ft (seepage)

Kind: [SEEP/W](#)
Method: [Steady-State](#)
Settings
 Include Air Flow: [No](#)
Control
 Apply Runoff: [No](#)
Convergence
 Convergence Type: [Head Vector Norm](#)
 Maximum Number of Iterations: [500](#)
 Tolerance: [0.001](#)
 Maximum Change in K: [0.1](#)
 Rate of Change in K: [1.02](#)
 Minimum Change in K: [1e-005](#)
 Equation Solver: [Parallel Direct](#)
 Potential Seepage Max # of Reviews: [10](#)
Time
 Starting Time: [0 sec](#)
 Duration: [0 sec](#)

Ending Time: 0 sec

Materials

FILL2, EL.0 TO -2.5/-3.5

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-007 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

BEACH SAND, EL. -7 TO -50

Model: Saturated Only

Hydraulic

K-Sat: 0.00049 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

BAY SOUND CLAY, EL. -50 TO -70

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-008 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

Sheet Pile

Model: Saturated Only

Hydraulic

K-Sat: 1e-010 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

MARSH, EL. -2.8/-3.5 TO -7

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-007 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

EMBANKMENT FILL, EL. +3.6 TO -3.5

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-008 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

Boundary Conditions

Drainage

Review: true

Type: Total Flux (Q) 0

Curb

Type: Head (H) -6.6

Canal Water (Global) NWL

Type: Head (H) 0.4

Regions

	Material	Points	Area (ft ²)
Region 1	EMBANKMENT FILL, EL. +3.6 TO -3.5	18,4,5,23	58.435
Region 2	BEACH SAND, EL. -7 TO -50	15,20,16,17,33,30,29,34,35,1,28	1900.824
Region 3	BEACH SAND, EL. -7 TO -50	17,33,31,12,25,9,8,26,40,15,20,16	6450
Region 4	BAY SOUND CLAY, EL. -50 TO -70	12,31,32,11,27,10,9,25	3800
Region 5	Sheet Pile	14,19,18,23,22,3	13.075
Region 6	MARSH, EL. -2.8/-3.5 TO -7	1,36,28	18.4275
Region 7	MARSH, EL. -2.8/-3.5 TO -7	28,36,24,15	26.145
Region 8	FILL2, EL.0 TO -2.5/-3.5	2,21,3,37,24,36	6.9625
Region 9	MARSH, EL. -2.8/-3.5 TO -7	24,38,39,26,40,15	152.30503
Region 10	MARSH, EL. -2.8/-3.5 TO -7	38,6,7,39	15.840016
Region 11	MARSH, EL. -2.8/-3.5 TO -7	39,26,8,41	124.02
Region 12	MARSH, EL. -2.8/-3.5 TO -7	39,7,42,43,44,41	54.04
Region 13	FILL2, EL.0 TO -2.5/-3.5	23,5,6,38,37,3,22	90.539952
Region 14	FILL2, EL.0 TO -2.5/-3.5	37,38,24	8.85

Lines

	Start Point	End Point	Hydraulic Boundary	Left Side Material	Right Side Material
Line 1	16	17			
Line 2	10	9	Curb		
Line 3	14	19			

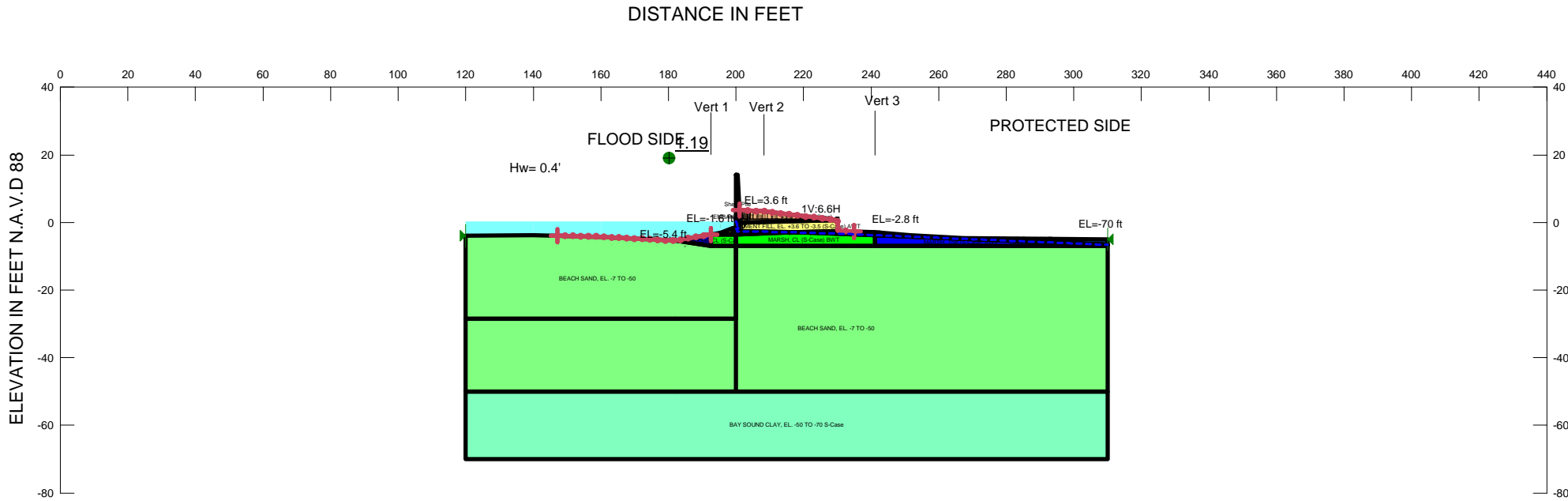
Line 4	19	18	Drainage		
Line 5	20	16		Sheet Pile	
Line 6	18	4	Drainage		
Line 7	22	3		Sheet Pile	Sheet Pile
Line 8	5	4	Drainage		
Line 9	14	3	Canal Water (Global) NWL		
Line 10	22	23			
Line 11	23	18			
Line 12	5	23			
Line 13	24	15	Canal Water (Global) NWL	Sheet Pile	
Line 14	9	8	Curb		
Line 15	8	26			
Line 16	25	12			
Line 17	9	25			
Line 18	27	11			
Line 19	10	27			
Line 20	20	15			Sheet Pile
Line 21	15	28			
Line 22	2	21	Canal Water (Global) NWL		
Line 23	21	3	Canal Water (Global) NWL		
Line 24	12	31			
Line 25	31	32			
Line 26	32	11			
Line 27	17	33			
Line 28	33	31			
Line 29	33	30			
Line 30	29	34	Canal Water (Global) NWL		
Line 31	34	35	Canal Water (Global) NWL		
Line 32	35	1	Canal Water (Global) NWL		
Line 33	16	25			
Line 34	28	36			
Line 35	36	24			
Line 36	1	36	Canal Water (Global) NWL		
Line 37	36	2	Canal Water (Global) NWL		
Line 38	28	1			
Line 39	30	29			
Line 40	3	37	Canal Water (Global) NWL	Sheet Pile	
Line 41	37	24	Canal Water (Global) NWL	Sheet Pile	
Line 42	24	38			
Line 43	38	6			
Line 44	7	39			
Line 45	39	26			
Line 46	26	40			
Line 47	40	15			
Line 48	38	39			
Line 49	6	7			
Line 50	8	41			
Line 51	41	39			

Line 52	7	42			
Line 53	42	43			
Line 54	43	44			
Line 55	44	41			
Line 56	5	6			
Line 57	38	37			

Points

	X (ft)	Y (ft)
Point 1	182	-5.4
Point 2	195.3	-3
Point 3	200	-1.6
Point 4	208.3	3.3
Point 5	230	0.7
Point 6	230.4	-2.5
Point 7	241.1	-2.8
Point 8	310	-7
Point 9	310	-50
Point 10	310	-70
Point 11	182	-70
Point 12	182	-50
Point 13	182	-7
Point 14	200	14.1
Point 15	200	-7
Point 16	200	-28.5
Point 17	182	-28.5
Point 18	201	3.6
Point 19	200.5	14.1
Point 20	200	-23.5
Point 21	199.1	-1.6
Point 22	201	-1.6
Point 23	201	0
Point 24	200	-3.5
Point 25	200	-50
Point 26	241.1	-7
Point 27	200	-70
Point 28	192.53	-7
Point 29	120	-4
Point 30	120	-7
Point 31	120	-50
Point 32	120	-70
Point 33	120	-28.5
Point 34	140	-3.7
Point 35	160	-4.2
Point 36	192.53	-3.5
Point 37	200	-2.5
Point 38	217.7	-2.91776

Point 39	241.1	-3.8
Point 40	240.4	-7
Point 41	310	-6.6
Point 42	251.6	-3.7
Point 43	267.3	-4.6
Point 44	310	-5



Name: BEACH SAND, EL. -7 TO -50 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand
Name: Sheet Pile Model: Undrained (Phi=0) Unit Weight: 0.1 pcf Cohesion: 0.01 psf
Name: EMBANKMENT FILL, EL. +3.6 TO 0 (S-Case) Model: Mohr-Coulomb Unit Weight: 110 pcf Cohesion: 75 psf Phi: 26 °
Name: EMBANKMENT FILL, EL. +3.6 TO -3.5 (S-Case) AWT Model: Mohr-Coulomb Unit Weight: 110 pcf Cohesion: 75 psf Phi: 26 °
Name: MARSH, CL (S-Case) AWT Model: Spatial Mohr-Coulomb Weight Fn: Marsh Cohesion: 75 psf Phi: 24 °
Name: MARSH, Toe (S-Case) BWT Model: Mohr-Coulomb Unit Weight: 100 pcf Cohesion: 0 psf Phi: 24 °
Name: BAY SOUND CLAY, EL. -50 TO -70 S-Case Model: Mohr-Coulomb Unit Weight: 102 pcf Cohesion: 0 psf Phi: 26 °
Name: EMBANKMENT FILL, EL. +3.6 TO -3.5 (S-Case) BWT Model: Mohr-Coulomb Unit Weight: 110 pcf Cohesion: 0 psf Phi: 26 °
Name: MARSH, CL (S-Case) BWT Model: Spatial Mohr-Coulomb Weight Fn: Marsh Cohesion: 0 psf Phi: 24 °
Name: MARSH, Toe (S-Case) AWT Model: Mohr-Coulomb Unit Weight: 100 pcf Cohesion: 75 psf Phi: 24 °

GENERAL NOTES

CLASSIFICATION STRATIFICATION
SHEAR STRENGTHS AND UNIT WEIGHTS OF
THE SOIL WERE BASED ON THE RESULTS OF
UNDISTURBED BORINGS AND CPT DATA. SEE
BOTH BORING AND CPT DATA PLATES.

WHERE INDICATED, SHEAR STRENGTHS BETWEEN
VERTICALS WERE ASSUMED TO VARY LINEARLY
BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

Hw IS CANAL WATER LEVEL

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 1B,
PROTECTED SIDE STABILITY ANALYSIS,
CASE: NWL S Case F/S (Entry/Exit)
STA. 7+00 TO 9+25 WEST
ORLEANS PARISH, LOUISIANA

NWL S Case F/S (Entry/Exit)

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File Information

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File Name: [Reach 1B.gsz](#)
Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix F NWL\](#)
Last Solved Date: [6/20/2013](#)
Last Solved Time: [12:29:04 PM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Strength Units: [psf](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

NWL S Case F/S (Entry/Exit)

Kind: [SLOPE/W](#)
Parent: [NWL S Case F/S \(Block\)](#)
Method: [Spencer](#)
Settings
 PWP Conditions Source: [Other GeoStudio Analysis](#)
 PWP Other Analysis: [Normal Water Level +0.4ft \(seepage\) \[\(last\)\]](#)
Slip Surface
 Direction of movement: [Right to Left](#)
 Use Passive Mode: [No](#)
 Slip Surface Option: [Entry and Exit](#)
 Critical slip surfaces saved: [1](#)
 Optimize Critical Slip Surface Location: [Yes](#)
Tension Crack
 Tension Crack Option: [Tension Crack Line](#)
 Percentage Wet: [0](#)
 Tension Crack Fluid Unit Weight: [62.4 pcf](#)
FOS Distribution

FOS Calculation Option: [Constant](#)

Advanced

Number of Slices: [30](#)

Optimization Tolerance: [0.01](#)

Minimum Slip Surface Depth: [0.1 ft](#)

Optimization Maximum Iterations: [2000](#)

Optimization Convergence Tolerance: [1e-007](#)

Starting Optimization Points: [8](#)

Ending Optimization Points: [16](#)

Complete Passes per Insertion: [1](#)

Driving Side Maximum Convex Angle: [5 °](#)

Resisting Side Maximum Convex Angle: [1 °](#)

Materials

BEACH SAND, EL. -7 TO -50

Model: [Shear/Normal Fn.](#)

Unit Weight: [122 pcf](#)

Strength Function: [Sand](#)

Phi-B: [0 °](#)

Sheet Pile

Model: [Undrained \(Phi=0\)](#)

Unit Weight: [0.1 pcf](#)

Cohesion: [0.01 psf](#)

EMBANKMENT FILL, EL. +3.6 TO 0 (S-Case)

Model: [Mohr-Coulomb](#)

Unit Weight: [110 pcf](#)

Cohesion: [75 psf](#)

Phi: [26 °](#)

Phi-B: [0 °](#)

EMBANKMENT FILL, EL. +3.6 TO -3.5 (S-Case) AWT

Model: [Mohr-Coulomb](#)

Unit Weight: [110 pcf](#)

Cohesion: [75 psf](#)

Phi: [26 °](#)

Phi-B: [0 °](#)

MARSH, CL (S-Case) AWT

Model: [Spatial Mohr-Coulomb](#)

Weight Fn: [Marsh](#)

Cohesion: [75 psf](#)

Phi: [24 °](#)

Phi-B: [0 °](#)

MARSH, Toe (S-Case) BWT

Model: [Mohr-Coulomb](#)

Unit Weight: [100 pcf](#)

Cohesion: [0 psf](#)

Phi: [24 °](#)

Phi-B: [0 °](#)

BAY SOUND CLAY, EL. -50 TO -70 S-Case

Model: [Mohr-Coulomb](#)

Unit Weight: [102 pcf](#)

Cohesion: [0 psf](#)

Phi: [26 °](#)

Phi-B: [0 °](#)

EMBANKMENT FILL, EL. +3.6 TO -3.5 (S-Case) BWT

Model: [Mohr-Coulomb](#)

Unit Weight: [110 pcf](#)

Cohesion: [0 psf](#)

Phi: [26 °](#)

Phi-B: [0 °](#)

MARSH, CL (S-Case) BWT

Model: [Spatial Mohr-Coulomb](#)

Weight Fn: [Marsh](#)

Cohesion: [0 psf](#)

Phi: [24 °](#)

Phi-B: [0 °](#)

MARSH, Toe (S-Case) AWT

Model: [Mohr-Coulomb](#)

Unit Weight: [100 pcf](#)

Cohesion: [75 psf](#)

Phi: [24 °](#)

Phi-B: [0 °](#)

Slip Surface Entry and Exit

Left Projection: [Range](#)

Left-Zone Left Coordinate: [\(147.2, -3.88\) ft](#)

Left-Zone Right Coordinate: [\(192.6, -3.48736\) ft](#)

Left-Zone Increment: [20](#)

Right Projection: [Range](#)

Right-Zone Left Coordinate: [\(201, 3.6\) ft](#)

Right-Zone Right Coordinate: [\(235, -2.62897\) ft](#)

Right-Zone Increment: [15](#)

Radius Increments: [15](#)

Slip Surface Limits

Left Coordinate: (120, -4) ft

Right Coordinate: (310, -5) ft

Tension Crack Line

	X (ft)	Y (ft)
	200	1
	230	1

Shear/Normal Strength Functions

Sand

Model: Spline Data Point Function

Function: Shear Stress vs. Normal Stress

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 0

Data Points: Normal Stress (psf), Shear Stress (psf)

Data Point: (-10000, 0)

Data Point: (0, 0)

Data Point: (10000, 6494)

Estimation Properties

Intact Rock Param.: 10

Geological Strength: 100

Disturbance Factor: 0

SigmaC: 600000 psf

Sigma3: 300000 psf

Num. Points: 20

Unit Weight Functions

Marsh

Model: Spline Data Point Function

Function: Unit Weight vs. X

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 100

Data Points: X (ft), Unit Weight (pcf)

Data Point: (192.53, 100)

Data Point: (208.3, 94)

Data Point: (241.1, 100)

Regions

	Material	Points	Area (ft²)
Region 1	EMBANKMENT FILL, EL. +3.6 TO 0 (S-Case)	18,4,5,23	58.435
Region 2	BEACH SAND, EL. -7 TO -50	15,20,16,17,33,30,29,34,35,1,28	1900.824
Region 3	BEACH SAND, EL. -7 TO -50	17,33,31,12,25,9,8,26,40,15,20,16	6450
Region 4	BAY SOUND CLAY, EL. -50 TO -70 S-Case	12,31,32,11,27,10,9,25	3800
Region 5	Sheet Pile	14,19,18,23,22,3	13.075
Region 6	MARSH, Toe (S-Case) BWT	1,36,28	18.4275
Region 7	MARSH, CL (S-Case) BWT	28,36,24,15	26.145
Region 8	EMBANKMENT FILL, EL. +3.6 TO -3.5 (S-Case) BWT	2,21,3,37,24,36	6.9625
Region 9	MARSH, CL (S-Case) BWT	24,38,39,26,40,15	152.30503
Region 10	MARSH, CL (S-Case) AWT	38,6,7,39	15.840016
Region 11	MARSH, Toe (S-Case) BWT	39,26,8,41	124.02
Region 12	MARSH, Toe (S-Case) AWT	39,7,42,43,44,41	54.04
Region 13	EMBANKMENT FILL, EL. +3.6 TO -3.5 (S-Case) AWT	23,5,6,38,37,3,22	90.539952
Region 14	EMBANKMENT FILL, EL. +3.6 TO -3.5 (S-Case) BWT	37,38,24	8.85

Points

	X (ft)	Y (ft)
Point 1	182	-5.4
Point 2	195.3	-3
Point 3	200	-1.6
Point 4	208.3	3.3
Point 5	230	0.7
Point 6	230.4	-2.5
Point 7	241.1	-2.8
Point 8	310	-7
Point 9	310	-50
Point 10	310	-70
Point 11	182	-70
Point 12	182	-50
Point 13	182	-7
Point 14	200	14.1
Point 15	200	-7
Point 16	200	-28.5
Point 17	182	-28.5
Point 18	201	3.6
Point 19	200.5	14.1
Point 20	200	-23.5
Point 21	199.1	-1.6
Point 22	201	-1.6
Point 23	201	0
Point 24	200	-3.5
Point 25	200	-50
Point 26	241.1	-7
Point 27	200	-70
Point 28	192.53	-7
Point 29	120	-4

Point 30	120	-7
Point 31	120	-50
Point 32	120	-70
Point 33	120	-28.5
Point 34	140	-3.7
Point 35	160	-4.2
Point 36	192.53	-3.5
Point 37	200	-2.5
Point 38	217.7	-2.91776
Point 39	241.1	-3.8
Point 40	240.4	-7
Point 41	310	-6.6
Point 42	251.6	-3.7
Point 43	267.3	-4.6
Point 44	310	-5

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.19	(196.4, 5.498)	6.92041	(204.199, 3.46854)	(192.188, -3.56176)
2	5165	1.40	(196.4, 5.498)	9.756	(205.058, 3.43325)	(192.6, -3.48736)

Slices of Slip Surface: Optimized

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	192.35885	-3.5719225	247.44657	258.84407	5.0744956	0
2	Optimized	192.7519	-3.5952625	248.05725	264.56591	7.3501295	0
3	Optimized	193.19575	-3.6216175	248.79947	271.3808	10.053856	0
4	Optimized	193.6396	-3.6479725	249.56417	278.19568	12.747568	0
5	Optimized	194.04195	-3.6736725	250.35868	285.11974	15.476621	0
6	Optimized	194.4029	-3.6987175	251.33432	291.0344	17.675613	0
7	Optimized	194.75275	-3.7217	252.22134	296.13999	19.553839	0
8	Optimized	195.0915	-3.74262	253.01981	301.38453	21.53336	0
9	Optimized	195.28045	-3.753147	253.40772	300.30514	20.880078	0
10	Optimized	195.4744	-3.7538105	253.25217	309.63365	25.102653	0
11	Optimized	195.82315	-3.7550035	253.22923	315.74088	27.831979	0
12	Optimized	196.2282	-3.7427215	252.47869	317.07532	28.760273	0
13	Optimized	196.6896	-3.716965	250.96386	322.2041	31.718198	0
14	Optimized	197.151	-3.6912085	249.62216	327.33288	34.599042	0
15	Optimized	197.6141	-3.6535485	248.09511	327.31355	35.27032	0
16	Optimized	198.0789	-3.603985	245.80605	330.05185	37.508647	0
17	Optimized	198.5437	-3.5544215	243.43143	332.81156	39.794598	0
18	Optimized	198.8556	-3.51482	241.72992	327.7175	38.284137	0
19	Optimized	199.01755	-3.4846235	240.22739	327.08974	42.3656	0
20	Optimized	199.3427	-3.4239935	237.14755	315.60269	38.265126	0
21	Optimized	199.7927	-3.3585535	234.04408	315.38297	39.671629	0
22	Optimized	200.25	-3.314021	72.815539	225.69234	74.562998	0
23	Optimized	200.74945	-3.2653825	37.813945	184.46542	71.526704	0

24	Optimized	200.99945	-3.240401	36.155068	120.29496	41.037766	0
25	Optimized	201.27795	-2.8882175	13.966184	437.5967	206.61841	0
26	Optimized	201.7785	-2.2552465	-25.900578	346.78545	169.13857	75
27	Optimized	202.2411	-1.6570775	-63.525738	297.81071	145.25199	75
28	Optimized	202.72115	-1.0236925	-103.3001	254.87805	124.31233	75
29	Optimized	203.1344	-0.48069	-137.47412	219.48558	107.05027	75
30	Optimized	203.42105	-0.096601465	-161.64401	184.98484	90.223133	75
31	Optimized	203.7605	0.37547853	-191.30596	153.77321	75.000206	75
32	Optimized	204.0927	0.84489	-220.7982	117.48258	57.300082	75

Slices of Slip Surface: 5165

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	5165	192.615	-3.493682	242.88942	269.31354	12.887904	0
2	5165	192.8525	-3.58688	247.46796	280.56278	14.734759	0
3	5165	193.2975	-3.748415	255.40183	300.39755	20.033384	0
4	5165	193.7425	-3.8860795	262.16415	316.82402	24.336143	0
5	5165	194.1875	-4.000914	267.8435	330.19733	27.761713	0
6	5165	194.6325	-4.09374	272.51467	340.78146	30.394334	0
7	5165	195.0775	-4.1651935	276.0798	348.81792	32.385098	0
8	5165	195.5111	-4.214968	278.52269	362.01582	37.173535	0
9	5165	195.9333	-4.2444045	280.28898	368.83739	39.424295	0
10	5165	196.35555	-4.255484	281.05761	373.59086	41.198458	0
11	5165	196.7778	-4.248269	280.80248	376.34396	42.537806	0
12	5165	197.2	-4.2227185	279.90146	377.17536	43.30913	0
13	5165	197.6222	-4.178688	278.35236	376.1258	43.53154	0
14	5165	198.04445	-4.1159225	275.66069	373.24382	43.446812	0
15	5165	198.4667	-4.0340505	271.74045	368.56245	43.107933	0
16	5165	198.8889	-3.932574	266.83393	362.05325	42.394371	0
17	5165	199.325	-3.8061365	260.43582	344.47063	37.414707	0
18	5165	199.775	-3.6524285	252.2372	327.06604	33.315947	0
19	5165	200.09235	-3.531686	186.64046	279.57734	41.378164	0
20	5165	200.34235	-3.424274	47.92418	177.91043	63.398531	0
21	5165	200.75	-3.2300365	35.596604	154.98825	58.231197	0
22	5165	201.2303	-2.974143	19.372144	590.83908	278.72305	0
23	5165	201.69095	-2.694092	1.6353933	545.72073	265.36815	0
24	5165	202.1376	-2.3879965	-17.723946	477.30828	232.7988	75
25	5165	202.57015	-2.053948	-38.794884	429.75136	209.60374	75
26	5165	203.0027	-1.678266	-62.464177	379.55545	185.12156	75
27	5165	203.4353	-1.2539375	-89.219725	326.33593	159.16467	75
28	5165	203.8679	-0.77096545	-119.66933	269.64951	131.51686	75
29	5165	204.30045	-0.21422546	-154.74697	208.8759	101.87558	75
30	5165	204.7871	0.5424435	-202.3529	133.55348	65.138383	75

NWL S Case F/S (Entry/Exit) (w/ sheetpile)

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File Information

Created By: [Liljegren, James](#)
Revision Number: [665](#)
Last Edited By: [Castro, Felix R MVR](#)
Date: [6/20/2013](#)
Time: [1:49:54 PM](#)
File Name: [Reach 1B.gsz](#)
Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix F NWL\](#)
Last Solved Date: [6/20/2013](#)
Last Solved Time: [1:55:22 PM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Strength Units: [psf](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

NWL S Case F/S (Entry/Exit) (w/ sheetpile)

Kind: [SLOPE/W](#)
Parent: [NWL S Case F/S \(Block\)](#)
Method: [Spencer](#)
Settings
PWP Conditions Source: [Other GeoStudio Analysis](#)
PWP Other Analysis: [Normal Water Level +0.4ft \(seepage\) \[\(last\)\]](#)

Slip Surface

Direction of movement: [Right to Left](#)
Use Passive Mode: [No](#)
Slip Surface Option: [Entry and Exit](#)
Critical slip surfaces saved: [1](#)
Optimize Critical Slip Surface Location: [Yes](#)
Tension Crack
Tension Crack Option: [Tension Crack Line](#)
Percentage Wet: [0](#)
Tension Crack Fluid Unit Weight: [62.4 pcf](#)

FOS Distribution

FOS Calculation Option: [Constant](#)

Advanced

Number of Slices: [30](#)

Optimization Tolerance: [0.01](#)

Minimum Slip Surface Depth: [0.1 ft](#)

Optimization Maximum Iterations: [2000](#)

Optimization Convergence Tolerance: [1e-007](#)

Starting Optimization Points: [8](#)

Ending Optimization Points: [16](#)

Complete Passes per Insertion: [1](#)

Driving Side Maximum Convex Angle: [5 °](#)

Resisting Side Maximum Convex Angle: [1 °](#)

Materials

BEACH SAND, EL. -7 TO -50

Model: [Shear/Normal Fn.](#)

Unit Weight: [122 pcf](#)

Strength Function: [Sand](#)

Phi-B: [0 °](#)

Sheet Pile

Model: [Undrained \(Phi=0\)](#)

Unit Weight: [0.1 pcf](#)

Cohesion: [0.01 psf](#)

EMBANKMENT FILL, EL. +3.6 TO 0 (S-Case)

Model: [Mohr-Coulomb](#)

Unit Weight: [110 pcf](#)

Cohesion: [75 psf](#)

Phi: [26 °](#)

Phi-B: [0 °](#)

EMBANKMENT FILL, EL. +3.6 TO -3.5 (S-Case) AWT

Model: [Mohr-Coulomb](#)

Unit Weight: [110 pcf](#)

Cohesion: [75 psf](#)

Phi: [26 °](#)

Phi-B: [0 °](#)

MARSH, CL (S-Case) AWT

Model: [Spatial Mohr-Coulomb](#)

Weight Fn: [Marsh](#)

Cohesion: [75 psf](#)

Phi: [24 °](#)

Phi-B: [0 °](#)

MARSH, Toe (S-Case) BWT

Model: [Mohr-Coulomb](#)

Unit Weight: [100 pcf](#)

Cohesion: [0 psf](#)

Phi: [24 °](#)

Phi-B: [0 °](#)

BAY SOUND CLAY, EL. -50 TO -70 S-Case

Model: [Mohr-Coulomb](#)

Unit Weight: [102 pcf](#)

Cohesion: [0 psf](#)

Phi: [26 °](#)

Phi-B: [0 °](#)

EMBANKMENT FILL, EL. +3.6 TO -3.5 (S-Case) BWT

Model: [Mohr-Coulomb](#)

Unit Weight: [110 pcf](#)

Cohesion: [0 psf](#)

Phi: [26 °](#)

Phi-B: [0 °](#)

MARSH, CL (S-Case) BWT

Model: [Spatial Mohr-Coulomb](#)

Weight Fn: [Marsh](#)

Cohesion: [0 psf](#)

Phi: [24 °](#)

Phi-B: [0 °](#)

MARSH, Toe (S-Case) AWT

Model: [Mohr-Coulomb](#)

Unit Weight: [100 pcf](#)

Cohesion: [75 psf](#)

Phi: [24 °](#)

Phi-B: [0 °](#)

Slip Surface Entry and Exit

Left Projection: [Range](#)

Left-Zone Left Coordinate: [\(147.2, -3.88\) ft](#)

Left-Zone Right Coordinate: [\(192.6, -3.48736\) ft](#)

Left-Zone Increment: [20](#)

Right Projection: [Range](#)

Right-Zone Left Coordinate: [\(201, 3.6\) ft](#)

Right-Zone Right Coordinate: [\(235, -2.62897\) ft](#)

Right-Zone Increment: [15](#)

Radius Increments: [15](#)

Slip Surface Limits

Left Coordinate: (120, -4) ft
Right Coordinate: (310, -5) ft

Reinforcements

Reinforcement 1

Type: [Pile](#)
Outside Point: (200, 14.1) ft
Inside Point: (200, -7) ft
Slip Surface Intersection: (200, -7.0001) ft
Total Length: 21.1 ft
Reinforcement Direction: 90 °
Applied Load Option: [Variable](#)
F of S Dependent: [No](#)
Pile Spacing: 1 ft
Shear Capacity: 81201 lbs
Shear Safety Factor: 1
Shear Load Used: 81201 lbs
Shear Option: [Parallel to Slip](#)
Resisting Force Used: 0 lbs/ft

Tension Crack Line

	X (ft)	Y (ft)
	200	1
	230	1

Shear/Normal Strength Functions

Sand

Model: [Spline Data Point Function](#)
Function: [Shear Stress vs. Normal Stress](#)
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 0
Data Points: [Normal Stress \(psf\), Shear Stress \(psf\)](#)
Data Point: (-10000, 0)
Data Point: (0, 0)
Data Point: (10000, 6494)
Estimation Properties
Intact Rock Param.: 10
Geological Strength: 100
Disturbance Factor: 0
SigmaC: 600000 psf

Sigma3: 300000 psf
Num. Points: 20

Unit Weight Functions

Marsh

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 100
Data Points: X (ft), Unit Weight (pcf)
Data Point: (192.53, 100)
Data Point: (208.3, 94)
Data Point: (241.1, 100)

Regions

	Material	Points	Area (ft²)
Region 1	EMBANKMENT FILL, EL. +3.6 TO 0 (S-Case)	18,4,5,23	58.435
Region 2	BEACH SAND, EL. -7 TO -50	15,20,16,17,33,30,29,34,35,1,28	1900.824
Region 3	BEACH SAND, EL. -7 TO -50	17,33,31,12,25,9,8,26,40,15,20,16	6450
Region 4	BAY SOUND CLAY, EL. -50 TO -70 S-Case	12,31,32,11,27,10,9,25	3800
Region 5	Sheet Pile	14,19,18,23,22,3	13.075
Region 6	MARSH, Toe (S-Case) BWT	1,36,28	18.4275
Region 7	MARSH, CL (S-Case) BWT	28,36,24,15	26.145
Region 8	EMBANKMENT FILL, EL. +3.6 TO -3.5 (S-Case) BWT	2,21,3,37,24,36	6.9625
Region 9	MARSH, CL (S-Case) BWT	24,38,39,26,40,15	152.30503
Region 10	MARSH, CL (S-Case) AWT	38,6,7,39	15.840016
Region 11	MARSH, Toe (S-Case) BWT	39,26,8,41	124.02
Region 12	MARSH, Toe (S-Case) AWT	39,7,42,43,44,41	54.04
Region 13	EMBANKMENT FILL, EL. +3.6 TO -3.5 (S-Case) AWT	23,5,6,38,37,3,22	90.539952
Region 14	EMBANKMENT FILL, EL. +3.6 TO -3.5 (S-Case) BWT	37,38,24	8.85

Points

	X (ft)	Y (ft)
Point 1	182	-5.4
Point 2	195.3	-3
Point 3	200	-1.6
Point 4	208.3	3.3
Point 5	230	0.7
Point 6	230.4	-2.5
Point 7	241.1	-2.8
Point 8	310	-7
Point 9	310	-50

Point 10	310	-70
Point 11	182	-70
Point 12	182	-50
Point 13	182	-7
Point 14	200	14.1
Point 15	200	-7
Point 16	200	-28.5
Point 17	182	-28.5
Point 18	201	3.6
Point 19	200.5	14.1
Point 20	200	-23.5
Point 21	199.1	-1.6
Point 22	201	-1.6
Point 23	201	0
Point 24	200	-3.5
Point 25	200	-50
Point 26	241.1	-7
Point 27	200	-70
Point 28	192.53	-7
Point 29	120	-4
Point 30	120	-7
Point 31	120	-50
Point 32	120	-70
Point 33	120	-28.5
Point 34	140	-3.7
Point 35	160	-4.2
Point 36	192.53	-3.5
Point 37	200	-2.5
Point 38	217.7	-2.91776
Point 39	241.1	-3.8
Point 40	240.4	-7
Point 41	310	-6.6
Point 42	251.6	-3.7
Point 43	267.3	-4.6
Point 44	310	-5

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.45	(198.738, 5.081)	10.75658	(208.593, 3.26495)	(188.211, -4.2793)
2	4942	1.90	(198.738, 5.081)	12.279	(210.32, 3.05802)	(190.356, -3.8923)

Slices of Slip Surface: Optimized

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	188.63365	-4.392633	296.75415	322.46347	11.446528	0
2	Optimized	189.47895	-4.619291	306.28374	353.97739	21.234581	0
3	Optimized	190.1974	-4.8074935	314.71472	379.23083	28.724422	0

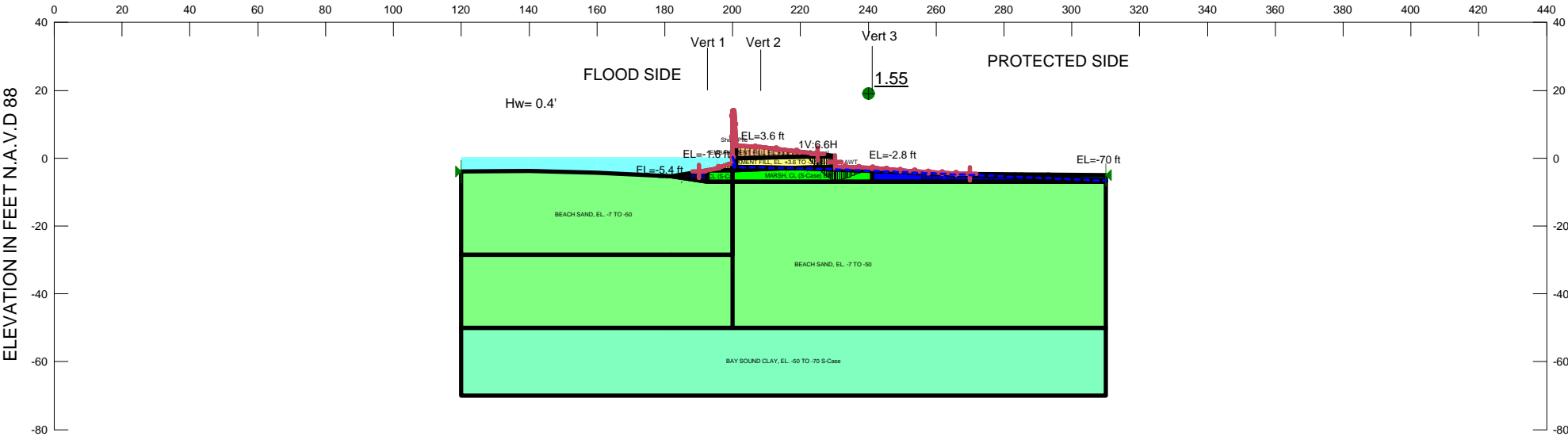
4	Optimized	190.789	-4.95724	321.72841	400.09164	34.889557	0
5	Optimized	191.3806	-5.1069865	328.95513	420.93606	40.952548	0
6	Optimized	192.1032	-5.297845	338.4141	448.90513	49.193776	0
7	Optimized	192.7067	-5.46184	346.75719	471.7012	55.628659	0
8	Optimized	193.18545	-5.5907735	353.43288	489.63548	60.641304	0
9	Optimized	193.7896	-5.7526205	361.84262	512.54642	67.097657	0
10	Optimized	194.39375	-5.9144675	370.52415	535.34545	73.383168	0
11	Optimized	194.9979	-6.0763145	379.41353	558.03256	79.526312	0
12	Optimized	195.35595	-6.172229	384.72791	576.44026	85.355835	0
13	Optimized	195.7971	-6.26503	390.26116	585.48079	86.917383	0
14	Optimized	196.56755	-6.42065	399.98142	615.30319	95.867426	0
15	Optimized	197.338	-6.57627	410.52868	644.93474	104.3643	0
16	Optimized	198.0674	-6.709001	420.72378	664.61706	108.58828	0
17	Optimized	198.7558	-6.818843	431.41079	687.31081	113.93403	0
18	Optimized	199.24365	-6.896682	441.81072	695.54593	112.97019	0
19	Optimized	199.69365	-6.9598485	450.99959	696.43449	109.27466	0
20	Optimized	200.25	-7.0329405	306.16927	618.0693	202.55025	-6.7837e-006
21	Optimized	200.74	-7.097312	278.67967	601.35814	209.54985	5.2059e-006
22	Optimized	200.99	-7.1190105	279.98649	451.56236	111.42268	-4.8212e-007
23	Optimized	201.0556	-7.0545905	275.94496	828.39318	358.76407	-7.4832e-005
24	Optimized	201.3977	-6.71866	254.7633	848.1028	264.17176	0
25	Optimized	201.9707	-6.15598	219.23839	798.74396	258.01251	0
26	Optimized	202.57045	-5.5832525	183.0447	758.05422	256.01073	0
27	Optimized	203.19695	-5.0004775	146.12488	706.78254	249.62087	0
28	Optimized	203.82315	-4.40721	108.39278	648.96064	240.67632	0
29	Optimized	204.449	-3.80345	70.006425	596.55759	234.43568	0
30	Optimized	204.83805	-3.419959	45.630844	547.1132	223.27433	0
31	Optimized	205.2439	-2.984949	18.084421	496.9207	233.54406	0
32	Optimized	205.9763	-2.199925	-31.543283	394.96866	192.63909	75
33	Optimized	206.69225	-1.413255	-81.366268	323.98244	158.01679	75
34	Optimized	207.3085	-0.677905	-127.91478	253.12525	123.45743	75
35	Optimized	207.78755	-0.06475665	-166.71023	200.82103	97.946961	75
36	Optimized	208.1318	0.39056335	-195.49625	167.28241	81.589081	75
37	Optimized	208.4463	0.80652	-221.78548	135.81501	66.241404	75

Slices of Slip Surface: 4942

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	4942	190.7182	-4.2052555	283.20962	349.92887	29.705327	0
2	4942	191.44295	-4.786133	312.23864	419.57275	47.788226	0
3	4942	192.16765	-5.28377	337.63854	475.97105	61.589601	0
4	4942	192.87625	-5.70173	359.37772	521.71744	72.278301	0
5	4942	193.56875	-6.0507705	377.692	558.88933	80.674251	0
6	4942	194.26125	-6.347215	393.48201	589.34233	87.202635	0
7	4942	194.95375	-6.595091	407.1191	613.89994	92.064762	0
8	4942	195.6098	-6.788976	418.06789	639.57879	98.623008	0
9	4942	196.2294	-6.9353155	427.10501	658.50162	103.02441	0
10	4942	196.8593	-7.0495805	434.8561	682.30004	160.69197	-5.3825e-006

11	4942	197.4995	-7.131628	442.16225	694.61992	163.94793	4.0733e-006
12	4942	198.1397	-7.179721	447.66237	702.47092	165.47461	4.1112e-006
13	4942	198.7799	-7.1942605	453.09767	705.99011	164.23028	4.0801e-006
14	4942	199.55	-7.1633395	460.15647	692.36891	150.80052	3.7466e-006
15	4942	200.25	-7.1024835	310.32009	576.99491	173.18065	4.3024e-006
16	4942	200.7186	-7.035731	274.83814	538.77394	171.40191	-5.7409e-006
17	4942	200.9686	-6.994202	272.18425	532.57321	115.93264	0
18	4942	201.3382	-6.9151	267.13263	1064.3839	354.95913	0
19	4942	202.0146	-6.748117	256.49293	1028.6644	343.79291	0
20	4942	202.69105	-6.5393885	243.22312	989.49178	332.26021	0
21	4942	203.3675	-6.2866055	227.03791	946.612	320.37502	0
22	4942	204.0439	-5.986736	207.74974	899.74675	308.09692	0
23	4942	204.7203	-5.6358065	185.25221	848.5122	295.30237	0
24	4942	205.39675	-5.228571	159.20676	792.39513	281.91363	0
25	4942	206.0732	-4.7579865	129.16724	730.74664	267.84041	0
26	4942	206.7496	-4.214342	94.315145	662.59013	253.01232	0
27	4942	207.426	-3.583718	54.01115	586.61974	237.13262	0
28	4942	208.0032	-2.969565	14.908758	503.30781	238.20813	0
29	4942	208.2711	-2.6589215	-4.8055291	433.29113	211.3302	75
30	4942	208.58555	-2.239141	-31.351987	383.67144	187.12906	75
31	4942	209.1567	-1.3955833	-84.731741	288.77102	140.84304	75
32	4942	209.72785	-0.35931445	-150.18087	182.27704	88.902453	75
33	4942	210.1665	0.60878235	-211.13865	92.795078	45.259184	75

DISTANCE IN FEET



Name: BEACH SAND, EL. -7 TO -50 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand
Name: Sheet Pile Model: Undrained (Phi=0) Unit Weight: 0.1 pcf Cohesion: 0.01 psf
Name: EMBANKMENT FILL, EL. +3.6 TO 0 (S-Case) Model: Mohr-Coulomb Unit Weight: 110 pcf Cohesion: 75 psf Phi: 26 °
Name: EMBANKMENT FILL, EL. +3.6 TO -3.5 (S-Case) AWT Model: Mohr-Coulomb Unit Weight: 110 pcf Cohesion: 75 psf Phi: 26 °
Name: MARSH, CL (S-Case) AWT Model: Spatial Mohr-Coulomb Weight Fn: Marsh Cohesion: 75 psf Phi: 24 °
Name: MARSH, Toe (S-Case) BWT Model: Mohr-Coulomb Unit Weight: 100 pcf Cohesion: 0 psf Phi: 24 °
Name: BAY SOUND CLAY, EL. -50 TO -70 S-Case Model: Mohr-Coulomb Unit Weight: 102 pcf Cohesion: 0 psf Phi: 26 °
Name: EMBANKMENT FILL, EL. +3.6 TO -3.5 (S-Case) BWT Model: Mohr-Coulomb Unit Weight: 110 pcf Cohesion: 0 psf Phi: 26 °
Name: MARSH, CL (S-Case) BWT Model: Spatial Mohr-Coulomb Weight Fn: Marsh Cohesion: 0 psf Phi: 24 °
Name: MARSH, Toe (S-Case) AWT Model: Mohr-Coulomb Unit Weight: 100 pcf Cohesion: 75 psf Phi: 24 °

GENERAL NOTES

CLASSIFICATION STRATIFICATION
SHEAR STRENGTHS AND UNIT WEIGHTS OF
THE SOIL WERE BASED ON THE RESULTS OF
UNDISTURBED BORINGS AND CPT DATA. SEE
BOTH BORING AND CPT DATA PLATES.

WHERE INDICATED, SHEAR STRENGTHS BETWEEN
VERTICALS WERE ASSUMED TO VARY LINEARLY
BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

HW IS CANAL WATER LEVEL

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 1B,
PROTECTED SIDE STABILITY ANALYSIS,
CASE: NWL S Case P/S (Entry/Exit)
STA. 7+00 TO 9+25 WEST
ORLEANS PARISH, LOUISIANA

NWL S Case P/S (Entry/Exit)

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File Information

Created By: [Liljegren, James](#)
Revision Number: [664](#)
Last Edited By: [Castro, Felix R MVR](#)
Date: [6/20/2013](#)
Time: [12:25:16 PM](#)
File Name: [Reach 1B.gsz](#)
Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix F NWL\](#)
Last Solved Date: [6/20/2013](#)
Last Solved Time: [12:30:10 PM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Strength Units: [psf](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

NWL S Case P/S (Entry/Exit)

Kind: [SLOPE/W](#)
Parent: [NWL S Case F/S \(Block\)](#)
Method: [Spencer](#)
Settings
 PWP Conditions Source: [Other GeoStudio Analysis](#)
 PWP Other Analysis: [Normal Water Level +0.4ft \(seepage\) \[\(last\)\]](#)
Slip Surface
 Direction of movement: [Left to Right](#)
 Use Passive Mode: [No](#)
 Slip Surface Option: [Entry and Exit](#)
 Critical slip surfaces saved: [1](#)
 Optimize Critical Slip Surface Location: [Yes](#)
Tension Crack
 Tension Crack Option: [Tension Crack Line](#)
 Percentage Wet: [0](#)
 Tension Crack Fluid Unit Weight: [62.4 pcf](#)
FOS Distribution

FOS Calculation Option: [Constant](#)

Advanced

Number of Slices: [30](#)

Optimization Tolerance: [0.01](#)

Minimum Slip Surface Depth: [0.1 ft](#)

Optimization Maximum Iterations: [2000](#)

Optimization Convergence Tolerance: [1e-007](#)

Starting Optimization Points: [8](#)

Ending Optimization Points: [16](#)

Complete Passes per Insertion: [1](#)

Driving Side Maximum Convex Angle: [5 °](#)

Resisting Side Maximum Convex Angle: [1 °](#)

Materials

BEACH SAND, EL. -7 TO -50

Model: [Shear/Normal Fn.](#)

Unit Weight: [122 pcf](#)

Strength Function: [Sand](#)

Phi-B: [0 °](#)

Sheet Pile

Model: [Undrained \(Phi=0\)](#)

Unit Weight: [0.1 pcf](#)

Cohesion: [0.01 psf](#)

EMBANKMENT FILL, EL. +3.6 TO 0 (S-Case)

Model: [Mohr-Coulomb](#)

Unit Weight: [110 pcf](#)

Cohesion: [75 psf](#)

Phi: [26 °](#)

Phi-B: [0 °](#)

EMBANKMENT FILL, EL. +3.6 TO -3.5 (S-Case) AWT

Model: [Mohr-Coulomb](#)

Unit Weight: [110 pcf](#)

Cohesion: [75 psf](#)

Phi: [26 °](#)

Phi-B: [0 °](#)

MARSH, CL (S-Case) AWT

Model: [Spatial Mohr-Coulomb](#)

Weight Fn: [Marsh](#)

Cohesion: [75 psf](#)

Phi: [24 °](#)

Phi-B: [0 °](#)

MARSH, Toe (S-Case) BWT

Model: [Mohr-Coulomb](#)

Unit Weight: [100 pcf](#)

Cohesion: [0 psf](#)

Phi: [24 °](#)

Phi-B: [0 °](#)

BAY SOUND CLAY, EL. -50 TO -70 S-Case

Model: [Mohr-Coulomb](#)

Unit Weight: [102 pcf](#)

Cohesion: [0 psf](#)

Phi: [26 °](#)

Phi-B: [0 °](#)

EMBANKMENT FILL, EL. +3.6 TO -3.5 (S-Case) BWT

Model: [Mohr-Coulomb](#)

Unit Weight: [110 pcf](#)

Cohesion: [0 psf](#)

Phi: [26 °](#)

Phi-B: [0 °](#)

MARSH, CL (S-Case) BWT

Model: [Spatial Mohr-Coulomb](#)

Weight Fn: [Marsh](#)

Cohesion: [0 psf](#)

Phi: [24 °](#)

Phi-B: [0 °](#)

MARSH, Toe (S-Case) AWT

Model: [Mohr-Coulomb](#)

Unit Weight: [100 pcf](#)

Cohesion: [75 psf](#)

Phi: [24 °](#)

Phi-B: [0 °](#)

Slip Surface Entry and Exit

Left Projection: [Range](#)

Left-Zone Left Coordinate: [\(190, -3.95651\) ft](#)

Left-Zone Right Coordinate: [\(225, 1.29908\) ft](#)

Left-Zone Increment: [10](#)

Right Projection: [Range](#)

Right-Zone Left Coordinate: [\(230.23265, -1.16119\) ft](#)

Right-Zone Right Coordinate: [\(270, -4.62529\) ft](#)

Right-Zone Increment: [10](#)

Radius Increments: [15](#)

Slip Surface Limits

Left Coordinate: (120, -4) ft

Right Coordinate: (310, -5) ft

Tension Crack Line

	X (ft)	Y (ft)
	200	0
	230	0

Shear/Normal Strength Functions

Sand

Model: Spline Data Point Function

Function: Shear Stress vs. Normal Stress

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 0

Data Points: Normal Stress (psf), Shear Stress (psf)

Data Point: (-10000, 0)

Data Point: (0, 0)

Data Point: (10000, 6494)

Estimation Properties

Intact Rock Param.: 10

Geological Strength: 100

Disturbance Factor: 0

SigmaC: 600000 psf

Sigma3: 300000 psf

Num. Points: 20

Unit Weight Functions

Marsh

Model: Spline Data Point Function

Function: Unit Weight vs. X

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 100

Data Points: X (ft), Unit Weight (pcf)

Data Point: (192.53, 100)

Data Point: (208.3, 94)

Data Point: (241.1, 100)

Regions

	Material	Points	Area (ft²)
Region 1	EMBANKMENT FILL, EL. +3.6 TO 0 (S-Case)	18,4,5,23	58.435
Region 2	BEACH SAND, EL. -7 TO -50	15,20,16,17,33,30,29,34,35,1,28	1900.824
Region 3	BEACH SAND, EL. -7 TO -50	17,33,31,12,25,9,8,26,40,15,20,16	6450
Region 4	BAY SOUND CLAY, EL. -50 TO -70 S-Case	12,31,32,11,27,10,9,25	3800
Region 5	Sheet Pile	14,19,18,23,22,3	13.075
Region 6	MARSH, Toe (S-Case) BWT	1,36,28	18.4275
Region 7	MARSH, CL (S-Case) BWT	28,36,24,15	26.145
Region 8	EMBANKMENT FILL, EL. +3.6 TO -3.5 (S-Case) BWT	2,21,3,37,24,36	6.9625
Region 9	MARSH, CL (S-Case) BWT	24,38,39,26,40,15	152.30503
Region 10	MARSH, CL (S-Case) AWT	38,6,7,39	15.840016
Region 11	MARSH, Toe (S-Case) BWT	39,26,8,41	124.02
Region 12	MARSH, Toe (S-Case) AWT	39,7,42,43,44,41	54.04
Region 13	EMBANKMENT FILL, EL. +3.6 TO -3.5 (S-Case) AWT	23,5,6,38,37,3,22	90.539952
Region 14	EMBANKMENT FILL, EL. +3.6 TO -3.5 (S-Case) BWT	37,38,24	8.85

Points

	X (ft)	Y (ft)
Point 1	182	-5.4
Point 2	195.3	-3
Point 3	200	-1.6
Point 4	208.3	3.3
Point 5	230	0.7
Point 6	230.4	-2.5
Point 7	241.1	-2.8
Point 8	310	-7
Point 9	310	-50
Point 10	310	-70
Point 11	182	-70
Point 12	182	-50
Point 13	182	-7
Point 14	200	14.1
Point 15	200	-7
Point 16	200	-28.5
Point 17	182	-28.5
Point 18	201	3.6
Point 19	200.5	14.1
Point 20	200	-23.5
Point 21	199.1	-1.6
Point 22	201	-1.6
Point 23	201	0
Point 24	200	-3.5
Point 25	200	-50
Point 26	241.1	-7
Point 27	200	-70
Point 28	192.53	-7
Point 29	120	-4

Point 30	120	-7
Point 31	120	-50
Point 32	120	-70
Point 33	120	-28.5
Point 34	140	-3.7
Point 35	160	-4.2
Point 36	192.53	-3.5
Point 37	200	-2.5
Point 38	217.7	-2.91776
Point 39	241.1	-3.8
Point 40	240.4	-7
Point 41	310	-6.6
Point 42	251.6	-3.7
Point 43	267.3	-4.6
Point 44	310	-5

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.55	(231.814, 7.351)	8.748948	(222.38, 1.61298)	(240.38, -2.77981)
2	1643	1.83	(231.814, 7.351)	13.944	(219.965, 1.90238)	(241.351, -2.82151)

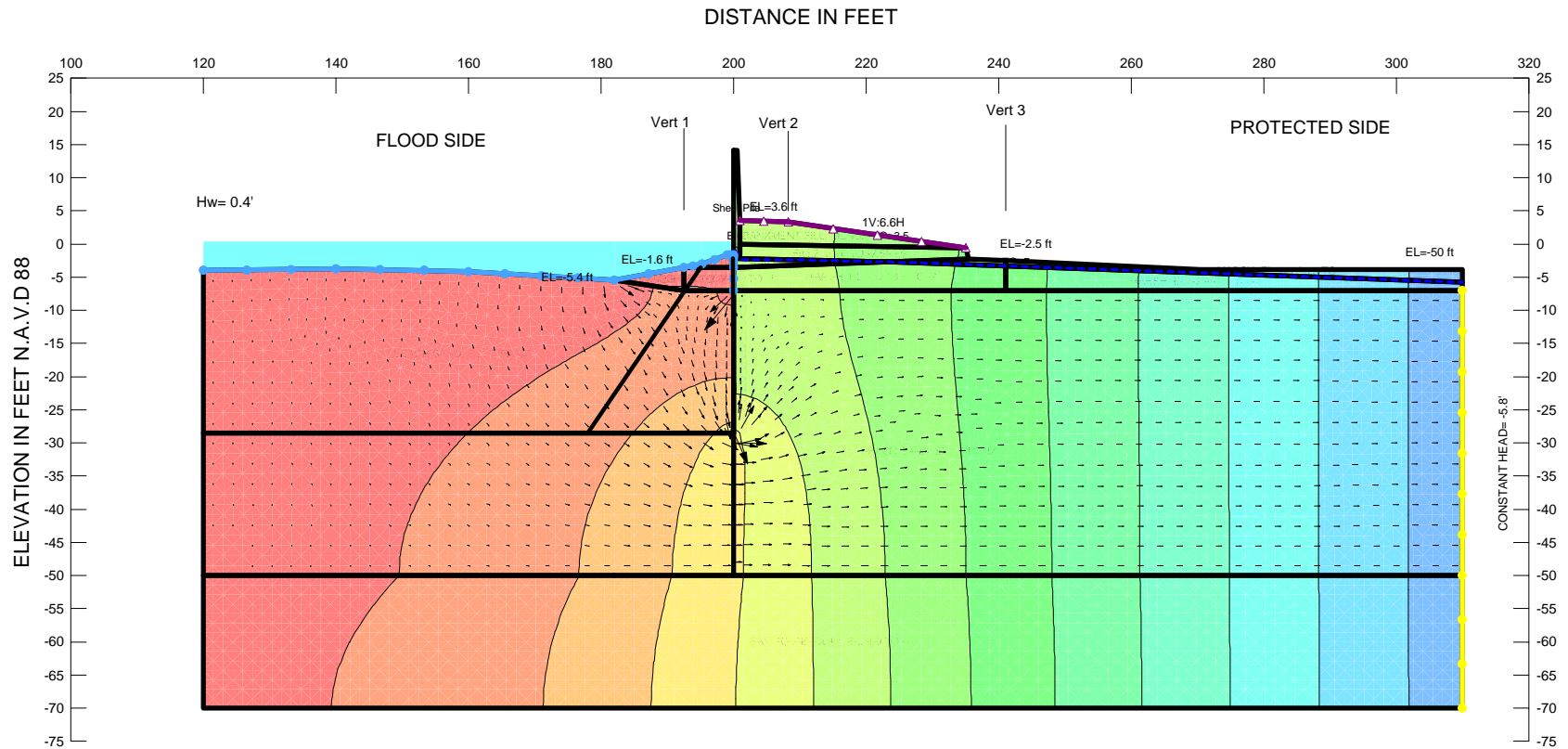
Slices of Slip Surface: Optimized

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	222.66925	-0.341485	-170.62276	109.28819	53.303414	75
2	Optimized	223.26865	-1.026895	-128.86994	161.6055	78.820269	75
3	Optimized	223.89625	-1.698772	-88.040714	214.92427	104.82557	75
4	Optimized	224.53075	-2.3546765	-48.256603	260.81511	127.20803	75
5	Optimized	224.9377	-2.7753395	-22.792929	294.84716	131.27441	75
6	Optimized	225.21655	-3.038168	-6.9560049	327.71368	145.90753	75
7	Optimized	225.64365	-3.422287	16.141017	384.37838	163.94984	0
8	Optimized	226.11955	-3.850289	41.900087	415.75111	166.4492	0
9	Optimized	226.7168	-4.358575	72.34786	462.11806	173.53688	0
10	Optimized	227.43535	-4.947145	107.45432	505.13984	177.061	0
11	Optimized	228.0714	-5.4556925	137.67814	548.10993	182.736	0
12	Optimized	228.625	-5.8842175	163.00024	579.39295	185.38998	0
13	Optimized	229.17635	-6.287525	186.63771	620.78076	193.29294	0
14	Optimized	229.72545	-6.665615	208.76185	648.12469	195.61694	0
15	Optimized	230.1055	-6.927315	224.08913	592.94754	164.22634	0
16	Optimized	230.3055	-6.971881	226.39411	575.85167	155.58853	0
17	Optimized	230.62695	-6.876321	219.7352	468.90921	110.93942	0
18	Optimized	231.1898	-6.686135	206.63974	456.58168	111.28132	0
19	Optimized	231.86155	-6.440705	189.81941	428.75753	106.3821	0
20	Optimized	232.5333	-6.195275	172.97112	400.86347	101.46421	0
21	Optimized	233.1268	-5.972315	157.68354	378.26683	98.210007	0
22	Optimized	233.64195	-5.771825	143.96209	355.31032	94.098291	0
23	Optimized	234.21235	-5.548035	128.63749	330.2533	89.765142	0

24	Optimized	234.838	-5.300945	111.71228	301.8142	84.638826	0
25	Optimized	235.4636	-5.053855	94.804922	273.30077	79.471473	0
26	Optimized	236.08925	-4.806765	77.893098	244.71301	74.27301	0
27	Optimized	236.70715	-4.5621795	61.149366	216.4853	69.160014	0
28	Optimized	237.3173	-4.3200985	44.575163	188.31829	63.998565	0
29	Optimized	237.9275	-4.0780175	27.994866	160.10559	58.819483	0
30	Optimized	238.5377	-3.835937	11.426146	131.80453	53.595908	0
31	Optimized	238.8622	-3.7071935	2.6186445	145.30365	63.527458	75
32	Optimized	239.26805	-3.46336	-13.558757	141.41692	62.962869	75
33	Optimized	240.0171	-3.003518	-44.012929	77.63108	34.563584	75

Slices of Slip Surface: 1643

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	1643	220.34075	-0.546302	-153.85566	138.46105	67.531967	75
2	1643	221.09285	-1.545748	-92.721923	225.01199	109.74568	75
3	1643	221.84495	-2.3839675	-41.694652	302.51684	147.54732	75
4	1643	222.40295	-2.9354885	-8.2676769	359.28525	159.9641	75
5	1643	222.95565	-3.407202	20.154817	427.59362	181.40344	0
6	1643	223.69715	-3.9780895	54.357347	481.31516	190.09387	0
7	1643	224.43865	-4.474923	83.909268	528.55961	197.97109	0
8	1643	225.1802	-4.9067775	109.41428	570.081	205.10204	0
9	1643	225.92175	-5.28036	131.22518	606.4077	211.56489	0
10	1643	226.66325	-5.6007405	149.58847	637.96595	217.43966	0
11	1643	227.40475	-5.8718045	164.84484	665.05971	222.71001	0
12	1643	228.14625	-6.096546	177.19435	687.93407	227.39597	0
13	1643	228.88775	-6.277265	186.66761	706.74462	231.55321	0
14	1643	229.62925	-6.415701	193.50382	721.64353	235.14295	0
15	1643	230.2	-6.49784	197.26764	560.03538	161.5146	0
16	1643	230.75105	-6.5479895	199.10383	394.37329	86.939561	0
17	1643	231.45315	-6.5839195	199.67514	401.10157	89.680825	0
18	1643	232.15525	-6.584405	198.03043	404.50435	91.928112	0
19	1643	232.85735	-6.549451	194.18215	404.4988	93.639006	0
20	1643	233.55945	-6.478788	188.1086	401.00255	94.786492	0
21	1643	234.26155	-6.371862	179.7706	393.85199	95.315176	0
22	1643	234.96365	-6.227815	169.10229	382.88043	95.180163	0
23	1643	235.66575	-6.045446	156.06005	367.81771	94.280583	0
24	1643	236.3679	-5.823158	140.50914	348.39214	92.555473	0
25	1643	237.07005	-5.558882	122.34167	324.18043	89.864405	0
26	1643	237.77215	-5.249967	101.3874	294.69442	86.065832	0
27	1643	238.47425	-4.89302	77.440634	259.25315	80.948148	0
28	1643	239.17635	-4.4836725	50.232301	216.91221	74.210677	0
29	1643	239.87845	-4.016231	19.409917	166.38233	65.436336	0
30	1643	240.66475	-3.4091585	-20.305649	145.69179	64.866165	75
31	1643	241.2255	-2.936326	-51.098757	83.025559	36.965361	75



Name: FILL2, EL. 0 TO -2.5/-3.5 Model: Saturated Only K-Sat: 3.28e-007 ft/sec K-Ratio: 1
 Name: BEACH SAND, EL. -7 TO -50 Model: Saturated Only K-Sat: 0.00049 ft/sec K-Ratio: 1
 Name: BAY SOUND CLAY, EL. -50 TO -70 Model: Saturated Only K-Sat: 3.28e-008 ft/sec K-Ratio: 1
 Name: Sheet Pile Model: Saturated Only K-Sat: 1e-010 ft/sec K-Ratio: 1
 Name: MARSH, EL. -2.8/-3.5 TO -7 Model: Saturated Only K-Sat: 3.28e-007 ft/sec K-Ratio: 1
 Name: EMBANKMENT FILL, EL. +3.6 TO -3.5 Model: Saturated Only K-Sat: 3.28e-008 ft/sec K-Ratio: 1

GENERAL NOTES

CLASSIFICATION STRATIFICATION
 SHEAR STRENGTHS AND UNIT WEIGHTS OF
 THE SOIL WERE BASED ON THE RESULTS OF
 UNDISTURBED BORINGS AND CPT DATA. SEE
 BOTH BORING AND CPT DATA PLATES.

WHERE INDICATED, SHEAR STRENGTHS BETWEEN
 VERTICALS WERE ASSUMED TO VARY LINEARLY
 BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

Hw IS CANAL WATER LEVEL

LAKE PONTCHARTRAIN, LA. AND VICINITY
 HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 1C,
 PROTECTED SIDE STABILITY ANALYSIS,
 CASE: Normal Water Level +0.4ft (seepage)
 STA. 9+25 TO 11+00 WEST
 ORLEANS PARISH, LOUISIANA

Normal Water Level +0.4ft (seepage)

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File Information

Created By: [Liljegren, James](#)

Revision Number: [549](#)

Last Edited By: [Hendrix, Joshua M MVR](#)

Date: [6/20/2013](#)

Time: [11:54:58 AM](#)

File Name: [Reach 1C.gsz](#)

Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix F NWL\](#)

Last Solved Date: [6/20/2013](#)

Last Solved Time: [12:00:12 PM](#)

Project Settings

Length(L) Units: [feet](#)

Time(t) Units: [Seconds](#)

Force(F) Units: [lbf](#)

Pressure(p) Units: [psf](#)

Mass(M) Units: [lbs](#)

Mass Flux Units: [lbs/sec](#)

Unit Weight of Water: [62.4 pcf](#)

View: [2D](#)

Analysis Settings

Normal Water Level +0.4ft (seepage)

Kind: [SEEP/W](#)

Method: [Steady-State](#)

Settings

Include Air Flow: [No](#)

Control

Apply Runoff: [No](#)

Convergence

Convergence Type: [Head Vector Norm](#)

Maximum Number of Iterations: [500](#)

Tolerance: [0.001](#)

Maximum Change in K: [0.1](#)

Rate of Change in K: [1.02](#)

Minimum Change in K: [1e-005](#)

Equation Solver: [Parallel Direct](#)

Potential Seepage Max # of Reviews: [10](#)

Time

Starting Time: 0 sec

Duration: 0 sec

Ending Time: 0 sec

Materials

FILL2, EL.0 TO -2.5/-3.5

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-007 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

BEACH SAND, EL. -7 TO -50

Model: Saturated Only

Hydraulic

K-Sat: 0.00049 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

BAY SOUND CLAY, EL. -50 TO -70

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-008 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

Sheet Pile

Model: Saturated Only

Hydraulic

K-Sat: 1e-010 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

MARSH, EL. -2.8/-3.5 TO -7

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-007 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

EMBANKMENT FILL, EL. +3.6 TO -3.5

Model: Saturated Only
Hydraulic
K-Sat: 3.28e-008 ft/sec
Volumetric Water Content: 0 ft³/ft³
Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

Boundary Conditions

Drainage

Review: true
Type: Total Flux (Q) 0

Curb

Type: Head (H) -5.8

Normal Water

Type: Head (H) 0.4

Regions

	Material	Points	Area (ft²)
Region 1	EMBANKMENT FILL, EL. +3.6 TO -3.5	18,4,5,23	71.595
Region 2	BEACH SAND, EL. -7 TO -50	15,20,16,17,33,30,29,34,35,1,28	1900.824
Region 3	BEACH SAND, EL. -7 TO -50	17,33,31,12,25,9,8,26,15,20,16	6450
Region 4	BAY SOUND CLAY, EL. -50 TO -70	12,31,32,11,27,10,9,25	3800
Region 5	Sheet Pile	14,19,18,23,22,3	13.075
Region 6	MARSH, EL. -2.8/-3.5 TO -7	1,36,28	18.4275
Region 7	MARSH, EL. -2.8/-3.5 TO -7	28,36,24,15	26.145
Region 8	FILL2, EL.0 TO -2.5/-3.5	2,21,3,37,24,36	6.9625
Region 9	FILL2, EL.0 TO -2.5/-3.5	23,22,3,37,38,39,6,5	75.40371
Region 10	FILL2, EL.0 TO -2.5/-3.5	37,24,39,38	15.136218
Region 11	MARSH, EL. -2.8/-3.5 TO -7	24,39,40,26,15	161.87484
Region 12	MARSH, EL. -2.8/-3.5 TO -7	39,6,7,40	9.435228
Region 13	MARSH, EL. -2.8/-3.5 TO -7	7,41,42,43,40	70.785
Region 14	MARSH, EL. -2.8/-3.5 TO -7	40,26,8,43	168.805

Lines

	Start Point	End Point	Hydraulic Boundary	Left Side Material	Right Side Material
Line 1	16	17			

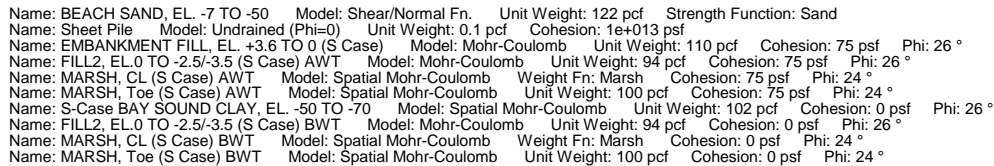
Line 2	10	9	Curb		
Line 3	14	19			
Line 4	19	18			
Line 5	20	16		Sheet Pile	
Line 6	18	4	Drainage		
Line 7	22	3		Sheet Pile	Sheet Pile
Line 8	5	4	Drainage		
Line 9	14	3			
Line 10	22	23			
Line 11	23	18			
Line 12	5	23			
Line 13	24	15	Normal Water	Sheet Pile	
Line 14	9	8	Curb		
Line 15	8	26			
Line 16	26	15			
Line 17	25	12			
Line 18	9	25			
Line 19	27	11			
Line 20	10	27			
Line 21	20	15			Sheet Pile
Line 22	15	28			
Line 23	2	21	Normal Water		
Line 24	21	3	Normal Water		
Line 25	12	31			
Line 26	31	32			
Line 27	32	11			
Line 28	17	33			
Line 29	33	31			
Line 30	33	30			
Line 31	29	34	Normal Water		
Line 32	34	35	Normal Water		
Line 33	35	1	Normal Water		
Line 34	16	25			
Line 35	28	36			
Line 36	36	24			
Line 37	1	36	Normal Water		
Line 38	36	2	Normal Water		
Line 39	28	1			
Line 40	30	29			
Line 41	3	37	Normal Water	Sheet Pile	
Line 42	37	24	Normal Water	Sheet Pile	
Line 43	24	39			
Line 44	39	6			
Line 45	7	40			
Line 46	40	26			
Line 47	37	38			
Line 48	38	39			
Line 49	6	5			

Line 50	39	40			
Line 51	6	7			
Line 52	7	41			
Line 53	41	42			
Line 54	42	43			
Line 55	43	40			
Line 56	8	43			

Points

	X (ft)	Y (ft)
Point 1	182	-5.4
Point 2	195.3	-3
Point 3	200	-1.6
Point 4	208.3	3.3
Point 5	235.1	-0.6
Point 6	235.5	-2.3
Point 7	241.1	-2.5
Point 8	310	-7
Point 9	310	-50
Point 10	310	-70
Point 11	182	-70
Point 12	182	-50
Point 13	182	-7
Point 14	200	14.1
Point 15	200	-7
Point 16	200	-28.5
Point 17	182	-28.5
Point 18	201	3.6
Point 19	200.5	14.1
Point 20	200	-23.5
Point 21	199.1	-1.6
Point 22	201	-1.6
Point 23	201	0
Point 24	200	-3.5
Point 25	200	-50
Point 26	241.1	-7
Point 27	200	-70
Point 28	192.53	-7
Point 29	120	-4
Point 30	120	-7
Point 31	120	-50
Point 32	120	-70
Point 33	120	-28.5
Point 34	140	-3.7
Point 35	160	-4.2
Point 36	192.53	-3.5
Point 37	200	-2.1

Point 38	203.6	-2.3
Point 39	223.4	-2.70901
Point 40	241.1	-3.3
Point 41	270.5	-3.8
Point 42	310	-3.8
Point 43	310	-5.8



CLASSIFICATION STRATIFICATION
SHEAR STRENGTHS AND UNIT WEIGHTS OF
THE SOIL WERE BASED ON THE RESULTS OF
UNDISTURBED BORINGS AND CPT DATA. SEE
BOTH BORING AND CPT DATA PLATES.

Hw IS CANAL WATER LEVEL

ORLEANS AVE OUTFALL CANAL, REACH 1C,
PROTECTED SIDE STABILITY ANALYSIS,
CASE: NWL S Case F/S (Entry/Exit)
STA. 9+25 TO 11+00 WEST
ORLEANS PARISH, LOUISIANA

NWL S Case F/S (Entry/Exit)

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File Information

Created By: [Liljegren, James](#)
Revision Number: [549](#)
Last Edited By: [Hendrix, Joshua M MVR](#)
Date: [6/20/2013](#)
Time: [11:54:58 AM](#)
File Name: [Reach 1C.gsz](#)
Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix F NWL\](#)
Last Solved Date: [6/20/2013](#)
Last Solved Time: [12:11:46 PM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Strength Units: [psf](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

NWL S Case F/S (Entry/Exit)

Kind: [SLOPE/W](#)
Parent: [NWL S Case F/S \(Block\)](#)
Method: [Spencer](#)
Settings
 PWP Conditions Source: [Other GeoStudio Analysis](#)
 PWP Other Analysis: [Normal Water Level +0.4ft \(seepage\) \[\(last\)\]](#)
Slip Surface
 Direction of movement: [Right to Left](#)
 Use Passive Mode: [No](#)
 Slip Surface Option: [Entry and Exit](#)
 Critical slip surfaces saved: [1](#)
 Optimize Critical Slip Surface Location: [Yes](#)
Tension Crack
 Tension Crack Option: [Tension Crack Line](#)
 Percentage Wet: [0](#)
 Tension Crack Fluid Unit Weight: [62.4 pcf](#)
FOS Distribution

FOS Calculation Option: [Constant](#)

Advanced

Number of Slices: [30](#)

Optimization Tolerance: [0.01](#)

Minimum Slip Surface Depth: [0.1 ft](#)

Optimization Maximum Iterations: [4000](#)

Optimization Convergence Tolerance: [1e-007](#)

Starting Optimization Points: [8](#)

Ending Optimization Points: [16](#)

Complete Passes per Insertion: [1](#)

Driving Side Maximum Convex Angle: [5 °](#)

Resisting Side Maximum Convex Angle: [1 °](#)

Materials

BEACH SAND, EL. -7 TO -50

Model: [Shear/Normal Fn.](#)

Unit Weight: [122 pcf](#)

Strength Function: [Sand](#)

Phi-B: [0 °](#)

Sheet Pile

Model: [Undrained \(Phi=0\)](#)

Unit Weight: [0.1 pcf](#)

Cohesion: [1e+013 psf](#)

EMBANKMENT FILL, EL. +3.6 TO 0 (S Case)

Model: [Mohr-Coulomb](#)

Unit Weight: [110 pcf](#)

Cohesion: [75 psf](#)

Phi: [26 °](#)

Phi-B: [0 °](#)

FILL2, EL.0 TO -2.5/-3.5 (S Case) AWT

Model: [Mohr-Coulomb](#)

Unit Weight: [94 pcf](#)

Cohesion: [75 psf](#)

Phi: [26 °](#)

Phi-B: [0 °](#)

MARSH, CL (S Case) AWT

Model: [Spatial Mohr-Coulomb](#)

Weight Fn: [Marsh](#)

Cohesion: [75 psf](#)

Phi: [24 °](#)

Phi-B: [0 °](#)

MARSH, Toe (S Case) AWT

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [100 pcf](#)

Cohesion: [75 psf](#)

Phi: [24 °](#)

Phi-B: [0 °](#)

S-Case BAY SOUND CLAY, EL. -50 TO -70

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [102 pcf](#)

Cohesion: [0 psf](#)

Phi: [26 °](#)

Phi-B: [0 °](#)

FILL2, EL.0 TO -2.5/-3.5 (S Case) BWT

Model: [Mohr-Coulomb](#)

Unit Weight: [94 pcf](#)

Cohesion: [0 psf](#)

Phi: [26 °](#)

Phi-B: [0 °](#)

MARSH, CL (S Case) BWT

Model: [Spatial Mohr-Coulomb](#)

Weight Fn: [Marsh](#)

Cohesion: [0 psf](#)

Phi: [24 °](#)

Phi-B: [0 °](#)

MARSH, Toe (S Case) BWT

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [100 pcf](#)

Cohesion: [0 psf](#)

Phi: [24 °](#)

Phi-B: [0 °](#)

Slip Surface Entry and Exit

Left Projection: [Range](#)

Left-Zone Left Coordinate: [\(160, -4.2\) ft](#)

Left-Zone Right Coordinate: [\(198, -2.00526\) ft](#)

Left-Zone Increment: [20](#)

Right Projection: [Range](#)

Right-Zone Left Coordinate: [\(201, 3.6\) ft](#)

Right-Zone Right Coordinate: [\(239.19694, -2.43203\) ft](#)

Right-Zone Increment: [20](#)

Radius Increments: [15](#)

Slip Surface Limits

Left Coordinate: (120, -4) ft
Right Coordinate: (310, -3.8) ft

Tension Crack Line

	X (ft)	Y (ft)
	200	1
	230	1

Shear/Normal Strength Functions

Sand

Model: Spline Data Point Function
Function: Shear Stress vs. Normal Stress
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
Data Point: (-10000, 0)
Data Point: (0, 0)
Data Point: (10000, 6494)
Estimation Properties
Intact Rock Param.: 10
Geological Strength: 100
Disturbance Factor: 0
SigmaC: 600000 psf
Sigma3: 300000 psf
Num. Points: 20

Unit Weight Functions

Marsh

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 100
Data Points: X (ft), Unit Weight (pcf)
Data Point: (192.53, 100)
Data Point: (208.3, 94)
Data Point: (241.1, 100)

Regions

	Material	Points	Area (ft ²)
Region 1	EMBANKMENT FILL, EL. +3.6 TO 0 (S Case)	18,4,5,23	71.595
Region 2	BEACH SAND, EL. -7 TO -50	15,20,16,17,33,30,29,34,35,1,28	1900.824
Region 3	BEACH SAND, EL. -7 TO -50	17,33,31,12,25,9,8,26,15,20,16	6450
Region 4	S-Case BAY SOUND CLAY, EL. -50 TO -70	12,31,32,11,27,10,9,25	3800
Region 5	Sheet Pile	14,19,18,23,22,3	13.075
Region 6	MARSH, Toe (S Case) BWT	1,36,28	18.4275
Region 7	MARSH, CL (S Case) BWT	28,36,24,15	26.145
Region 8	FILL2, EL.0 TO -2.5/-3.5 (S Case) BWT	2,21,3,37,24,36	6.9625
Region 9	FILL2, EL.0 TO -2.5/-3.5 (S Case) AWT	23,22,3,37,38,39,6,5	75.40371
Region 10	FILL2, EL.0 TO -2.5/-3.5 (S Case) BWT	37,24,39,38	15.136218
Region 11	MARSH, CL (S Case) BWT	24,39,40,26,15	161.87484
Region 12	MARSH, CL (S Case) AWT	39,6,7,40	9.435228
Region 13	MARSH, Toe (S Case) AWT	7,41,42,43,40	70.785
Region 14	MARSH, Toe (S Case) BWT	40,26,8,43	168.805

Points

	X (ft)	Y (ft)
Point 1	182	-5.4
Point 2	195.3	-3
Point 3	200	-1.6
Point 4	208.3	3.3
Point 5	235.1	-0.6
Point 6	235.5	-2.3
Point 7	241.1	-2.5
Point 8	310	-7
Point 9	310	-50
Point 10	310	-70
Point 11	182	-70
Point 12	182	-50
Point 13	182	-7
Point 14	200	14.1
Point 15	200	-7
Point 16	200	-28.5
Point 17	182	-28.5
Point 18	201	3.6
Point 19	200.5	14.1
Point 20	200	-23.5
Point 21	199.1	-1.6
Point 22	201	-1.6
Point 23	201	0
Point 24	200	-3.5
Point 25	200	-50
Point 26	241.1	-7
Point 27	200	-70
Point 28	192.53	-7
Point 29	120	-4

Point 30	120	-7
Point 31	120	-50
Point 32	120	-70
Point 33	120	-28.5
Point 34	140	-3.7
Point 35	160	-4.2
Point 36	192.53	-3.5
Point 37	200	-2.1
Point 38	203.6	-2.3
Point 39	223.4	-2.70901
Point 40	241.1	-3.3
Point 41	270.5	-3.8
Point 42	310	-3.8
Point 43	310	-5.8

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	0.96	(195.289, 6.143)	6.882529	(203.259, 3.50717)	(190.956, -3.78397)
2	5756	1.24	(195.289, 6.143)	10.061	(203.937, 3.47929)	(192.46, -3.51271)

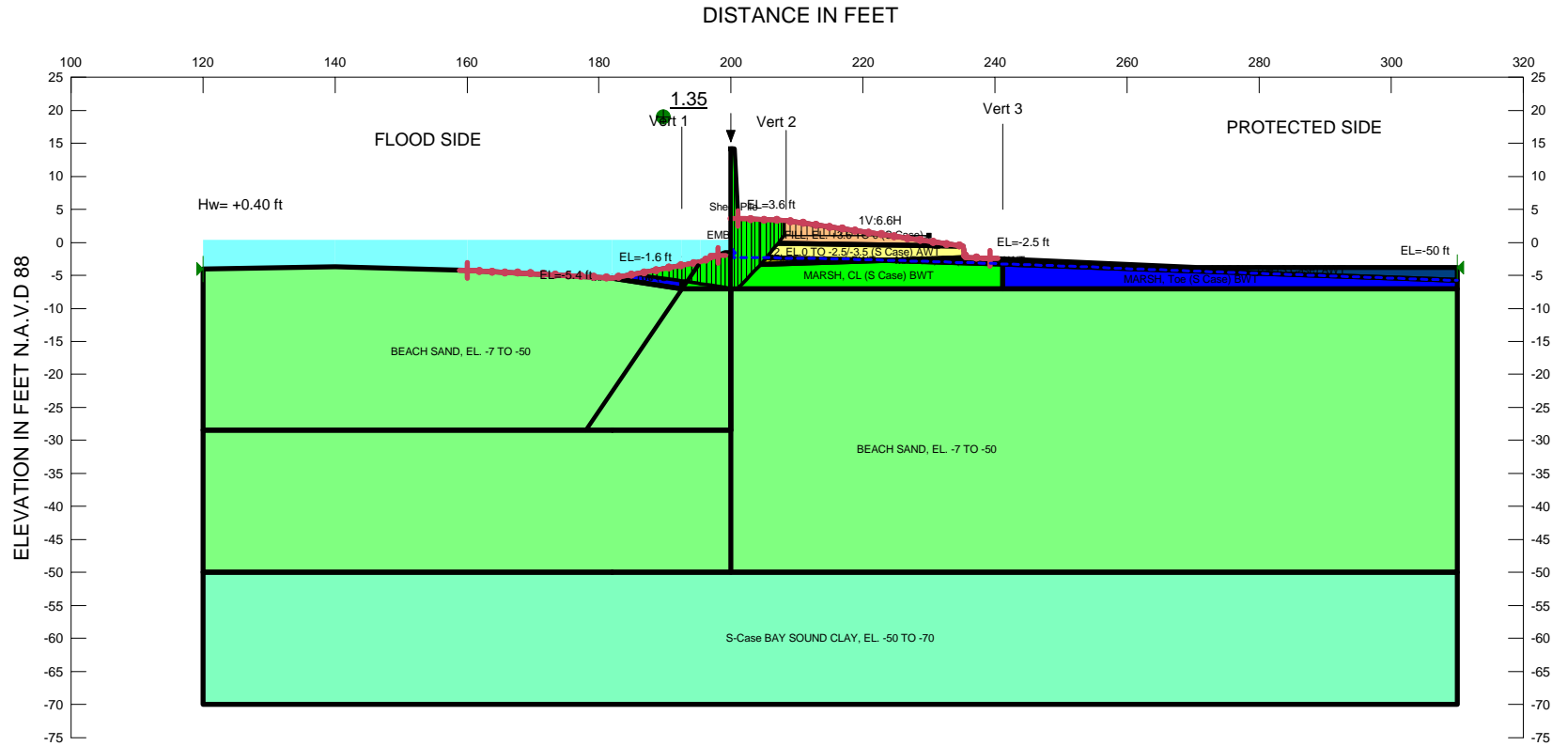
Slices of Slip Surface: **Optimized**

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	191.15235	-3.75839	259.38658	262.36978	1.3282056	0
2	Optimized	191.5446	-3.7072385	256.02416	259.84165	1.6996529	0
3	Optimized	191.9368	-3.656087	252.66427	257.31351	2.0699746	0
4	Optimized	192.329	-3.6049355	249.31197	254.81066	2.4481755	0
5	Optimized	192.52755	-3.579084	247.62596	254.4136	3.0220493	0
6	Optimized	192.70345	-3.559106	246.31047	253.38465	3.1496294	0
7	Optimized	193.0504	-3.519702	243.71278	251.35118	3.4008347	0
8	Optimized	193.43855	-3.4756175	240.77526	249.26858	4.1424698	0
9	Optimized	193.86785	-3.4268525	237.51216	247.04689	4.6504021	0
10	Optimized	194.28545	-3.383537	234.63208	246.37939	5.7295441	0
11	Optimized	194.6913	-3.3456705	232.078	245.06677	6.3350473	0
12	Optimized	195.0971	-3.307804	229.51901	243.74925	6.9405505	0
13	Optimized	195.3589	-3.2833755	227.86655	251.17137	11.366521	0
14	Optimized	195.65155	-3.2325	224.67045	243.50498	9.1862107	0
15	Optimized	196.11905	-3.14174	219.0012	239.78847	10.138627	0
16	Optimized	196.5527	-3.05446	213.53068	235.20989	10.573658	0
17	Optimized	196.95245	-2.97066	208.39613	231.46855	11.253171	0
18	Optimized	197.35215	-2.88686	203.39625	227.72965	11.868196	0
19	Optimized	197.73125	-2.8078335	198.66884	224.36177	12.531278	0
20	Optimized	198.08975	-2.73358	194.21689	221.08699	13.105422	0
21	Optimized	198.4483	-2.6593265	189.68301	217.81495	13.720863	0
22	Optimized	198.8638	-2.578726	184.87211	215.77365	15.071685	0
23	Optimized	199.3109	-2.496436	180.27514	201.94715	10.570141	0
24	Optimized	199.7609	-2.4339675	176.69037	200.47481	11.600448	0

25	Optimized	200.25	-2.3855835	32.807858	89.773796	27.784144	0
26	Optimized	200.74955	-2.336166	1.3616711	72.224999	34.562355	0
27	Optimized	200.99955	-2.3108345	-0.30729524	35.664266	17.394625	0
28	Optimized	201.053	-2.235817	-5.0261389	320.92023	156.52325	0
29	Optimized	201.312	-1.8724425	-27.885434	252.07204	122.94375	75
30	Optimized	201.6882	-1.34241	-61.205808	223.17971	108.85202	75
31	Optimized	202.0408	-0.83302075	-93.182134	191.04841	93.180537	75
32	Optimized	202.40565	-0.29630225	-126.81245	164.17621	80.074089	75
33	Optimized	202.5977	-0.013831495	-144.51552	149.93057	73.126024	75
34	Optimized	202.84825	0.363425	-168.25783	124.82239	60.879947	75
35	Optimized	203.17405	0.863285	-199.71523	88.560337	43.193763	75

Slices of Slip Surface: 5756

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	5756	192.4948	-3.5228875	244.64009	272.42708	12.371565	0
2	5756	192.72785	-3.5851675	247.67646	279.34777	14.100974	0
3	5756	193.12355	-3.680889	252.3583	289.54821	16.558012	0
4	5756	193.51925	-3.759878	256.15288	297.54731	18.429985	0
5	5756	193.915	-3.822533	259.09978	303.53477	19.783731	0
6	5756	194.31075	-3.8691615	261.29256	307.62049	20.626525	0
7	5756	194.70645	-3.8999865	262.67696	309.95478	21.04944	0
8	5756	195.10215	-3.915154	263.19992	310.62492	21.114971	0
9	5756	195.50445	-3.914465	262.85392	318.35889	24.712404	0
10	5756	195.91335	-3.897388	261.89519	317.57446	24.79001	0
11	5756	196.3222	-3.863581	259.99188	315.16747	24.565758	0
12	5756	196.73105	-3.8128725	257.10158	311.12631	24.053361	0
13	5756	197.13995	-3.745003	253.35432	305.52045	23.225859	0
14	5756	197.54885	-3.6596155	248.95091	298.37884	22.006733	0
15	5756	197.95775	-3.5562455	243.35553	289.66854	20.619881	0
16	5756	198.39665	-3.423845	235.86355	278.61876	20.85311	0
17	5756	198.86555	-3.258501	226.32804	265.29513	19.00552	0
18	5756	199.325	-3.070758	215.62231	241.26982	12.509128	0
19	5756	199.775	-2.8600965	203.1369	221.01804	8.7212141	0
20	5756	200.25	-2.606238	46.622958	92.233358	22.245678	0
21	5756	200.75	-2.302843	-0.72663983	51.582778	25.158602	0
22	5756	201.18565	-2.006881	-19.417658	409.50599	199.72941	75
23	5756	201.55695	-1.724665	-37.226586	373.6351	182.23401	75
24	5756	201.92825	-1.4136595	-56.814331	336.41449	164.08031	75
25	5756	202.29955	-1.0701195	-78.409817	297.70159	145.19877	75
26	5756	202.67085	-0.6891015	-102.31551	257.36207	125.52387	75
27	5756	203.04215	-0.2638571	-129.0307	215.15696	104.93906	75
28	5756	203.40515	0.20317785	-158.40881	169.58579	82.712518	75
29	5756	203.7599	0.7227769	-191.10373	120.47025	58.757267	75



Name: BEACH SAND, EL. -7 TO -50 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand
 Name: Sheet Pile Model: Undrained (Phi=0) Unit Weight: 0.1 pcf Cohesion: 1e+013 psf
 Name: EMBANKMENT FILL, EL. +3.6 TO 0 (S Case) Model: Mohr-Coulomb Unit Weight: 110 pcf Cohesion: 75 psf Phi: 26 °
 Name: FILL2, EL.0 TO -2.5/-3.5 (S Case) AWT Model: Mohr-Coulomb Unit Weight: 94 pcf Cohesion: 75 psf Phi: 26 °
 Name: MARSH, CL (S Case) AWT Model: Spatial Mohr-Coulomb Weight Fn: Marsh Cohesion: 75 psf Phi: 24 °
 Name: MARSH, Toe (S Case) AWT Model: Spatial Mohr-Coulomb Unit Weight: 100 pcf Cohesion: 75 psf Phi: 24 °
 Name: S-Case BAY SOUND CLAY, EL. -50 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 102 pcf Cohesion: 0 psf Phi: 26 °
 Name: FILL2, EL.0 TO -2.5/-3.5 (S Case) BWT Model: Mohr-Coulomb Unit Weight: 94 pcf Cohesion: 0 psf Phi: 26 °
 Name: MARSH, CL (S Case) BWT Model: Spatial Mohr-Coulomb Weight Fn: Marsh Cohesion: 0 psf Phi: 24 °
 Name: MARSH, Toe (S Case) BWT Model: Spatial Mohr-Coulomb Unit Weight: 100 pcf Cohesion: 0 psf Phi: 24 °

GENERAL NOTES

CLASSIFICATION STRATIFICATION
 SHEAR STRENGTHS AND UNIT WEIGHTS OF
 THE SOIL WERE BASED ON THE RESULTS OF
 UNDISTURBED BORINGS AND CPT DATA. SEE
 BOTH BORING AND CPT DATA PLATES.

WHERE INDICATED, SHEAR STRENGTHS BETWEEN
 VERTICALS WERE ASSUMED TO VARY LINEARLY
 BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

Hw IS CANAL WATER LEVEL

LAKE PONTCHARTRAIN, LA. AND VICINITY
 HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 1C,
 PROTECTED SIDE STABILITY ANALYSIS,
 CASE: NWL S Case F/S (Entry/Exit) (w/ sheetpile)
 STA. 9+25 TO 11+00 WEST
 ORLEANS PARISH, LOUISIANA

NWL S Case F/S (Entry/Exit) (w/ sheetpile)

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File Information

Created By: [Liljegren, James](#)
Revision Number: [550](#)
Last Edited By: [Hendrix, Joshua M MVR](#)
Date: [6/20/2013](#)
Time: [12:23:44 PM](#)
File Name: [Reach 1C.gsz](#)
Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix F NWL\](#)
Last Solved Date: [6/20/2013](#)
Last Solved Time: [12:26:00 PM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Strength Units: [psf](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

NWL S Case F/S (Entry/Exit) (w/ sheetpile)

Kind: [SLOPE/W](#)
Parent: [NWL S Case F/S \(Block\)](#)
Method: [Spencer](#)
Settings
 PWP Conditions Source: [Other GeoStudio Analysis](#)
 PWP Other Analysis: [Normal Water Level +0.4ft \(seepage\) \[\(last\)\]](#)
Slip Surface
 Direction of movement: [Right to Left](#)
 Use Passive Mode: [No](#)
 Slip Surface Option: [Entry and Exit](#)
 Critical slip surfaces saved: [1](#)
 Optimize Critical Slip Surface Location: [Yes](#)
Tension Crack
 Tension Crack Option: [Tension Crack Line](#)
 Percentage Wet: [0](#)
 Tension Crack Fluid Unit Weight: [62.4 pcf](#)
FOS Distribution

FOS Calculation Option: [Constant](#)

Advanced

Number of Slices: [30](#)

Optimization Tolerance: [0.01](#)

Minimum Slip Surface Depth: [0.1 ft](#)

Optimization Maximum Iterations: [4000](#)

Optimization Convergence Tolerance: [1e-007](#)

Starting Optimization Points: [8](#)

Ending Optimization Points: [16](#)

Complete Passes per Insertion: [1](#)

Driving Side Maximum Convex Angle: [5 °](#)

Resisting Side Maximum Convex Angle: [1 °](#)

Materials

BEACH SAND, EL. -7 TO -50

Model: [Shear/Normal Fn.](#)

Unit Weight: [122 pcf](#)

Strength Function: [Sand](#)

Phi-B: [0 °](#)

Sheet Pile

Model: [Undrained \(Phi=0\)](#)

Unit Weight: [0.1 pcf](#)

Cohesion: [1e+013 psf](#)

EMBANKMENT FILL, EL. +3.6 TO 0 (S Case)

Model: [Mohr-Coulomb](#)

Unit Weight: [110 pcf](#)

Cohesion: [75 psf](#)

Phi: [26 °](#)

Phi-B: [0 °](#)

FILL2, EL.0 TO -2.5/-3.5 (S Case) AWT

Model: [Mohr-Coulomb](#)

Unit Weight: [94 pcf](#)

Cohesion: [75 psf](#)

Phi: [26 °](#)

Phi-B: [0 °](#)

MARSH, CL (S Case) AWT

Model: [Spatial Mohr-Coulomb](#)

Weight Fn: [Marsh](#)

Cohesion: [75 psf](#)

Phi: [24 °](#)

Phi-B: [0 °](#)

MARSH, Toe (S Case) AWT

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [100 pcf](#)

Cohesion: [75 psf](#)

Phi: [24 °](#)

Phi-B: [0 °](#)

S-Case BAY SOUND CLAY, EL. -50 TO -70

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [102 pcf](#)

Cohesion: [0 psf](#)

Phi: [26 °](#)

Phi-B: [0 °](#)

FILL2, EL.0 TO -2.5/-3.5 (S Case) BWT

Model: [Mohr-Coulomb](#)

Unit Weight: [94 pcf](#)

Cohesion: [0 psf](#)

Phi: [26 °](#)

Phi-B: [0 °](#)

MARSH, CL (S Case) BWT

Model: [Spatial Mohr-Coulomb](#)

Weight Fn: [Marsh](#)

Cohesion: [0 psf](#)

Phi: [24 °](#)

Phi-B: [0 °](#)

MARSH, Toe (S Case) BWT

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [100 pcf](#)

Cohesion: [0 psf](#)

Phi: [24 °](#)

Phi-B: [0 °](#)

Slip Surface Entry and Exit

Left Projection: [Range](#)

Left-Zone Left Coordinate: [\(160, -4.2\) ft](#)

Left-Zone Right Coordinate: [\(198, -2.00526\) ft](#)

Left-Zone Increment: [20](#)

Right Projection: [Range](#)

Right-Zone Left Coordinate: [\(201, 3.6\) ft](#)

Right-Zone Right Coordinate: [\(239.19694, -2.43203\) ft](#)

Right-Zone Increment: [20](#)

Radius Increments: [15](#)

Slip Surface Limits

Left Coordinate: (120, -4) ft
Right Coordinate: (310, -3.8) ft

Reinforcements

Reinforcement 1

Type: [Pile](#)
Outside Point: (200, 14.1) ft
Inside Point: (200, -7) ft
Slip Surface Intersection: (200, -7.0014) ft
Total Length: 21.1 ft
Reinforcement Direction: 90 °
Applied Load Option: [Variable](#)
F of S Dependent: [No](#)
Pile Spacing: 1 ft
Shear Capacity: 81201 lbs
Shear Safety Factor: 1
Shear Load Used: 81201 lbs
Shear Option: [Parallel to Slip](#)
Resisting Force Used: 0 lbs/ft

Tension Crack Line

	X (ft)	Y (ft)
	200	1
	230	1

Shear/Normal Strength Functions

Sand

Model: [Spline Data Point Function](#)
Function: [Shear Stress vs. Normal Stress](#)
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 0
Data Points: [Normal Stress \(psf\), Shear Stress \(psf\)](#)
Data Point: (-10000, 0)
Data Point: (0, 0)
Data Point: (10000, 6494)
Estimation Properties
Intact Rock Param.: 10
Geological Strength: 100
Disturbance Factor: 0
SigmaC: 600000 psf

Sigma3: 300000 psf

Num. Points: 20

Unit Weight Functions

Marsh

Model: Spline Data Point Function

Function: Unit Weight vs. X

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 100

Data Points: X (ft), Unit Weight (pcf)

Data Point: (192.53, 100)

Data Point: (208.3, 94)

Data Point: (241.1, 100)

Regions

	Material	Points	Area (ft ²)
Region 1	EMBANKMENT FILL, EL. +3.6 TO 0 (S Case)	18,4,5,23	71.595
Region 2	BEACH SAND, EL. -7 TO -50	15,20,16,17,33,30,29,34,35,1,28	1900.824
Region 3	BEACH SAND, EL. -7 TO -50	17,33,31,12,25,9,8,26,15,20,16	6450
Region 4	S-Case BAY SOUND CLAY, EL. -50 TO -70	12,31,32,11,27,10,9,25	3800
Region 5	Sheet Pile	14,19,18,23,22,3	13.075
Region 6	MARSH, Toe (S Case) BWT	1,36,28	18.4275
Region 7	MARSH, CL (S Case) BWT	28,36,24,15	26.145
Region 8	FILL2, EL.0 TO -2.5/-3.5 (S Case) BWT	2,21,3,37,24,36	6.9625
Region 9	FILL2, EL.0 TO -2.5/-3.5 (S Case) AWT	23,22,3,37,38,39,6,5	75.40371
Region 10	FILL2, EL.0 TO -2.5/-3.5 (S Case) BWT	37,24,39,38	15.136218
Region 11	MARSH, CL (S Case) BWT	24,39,40,26,15	161.87484
Region 12	MARSH, CL (S Case) AWT	39,6,7,40	9.435228
Region 13	MARSH, Toe (S Case) AWT	7,41,42,43,40	70.785
Region 14	MARSH, Toe (S Case) BWT	40,26,8,43	168.805

Points

	X (ft)	Y (ft)
Point 1	182	-5.4
Point 2	195.3	-3
Point 3	200	-1.6
Point 4	208.3	3.3
Point 5	235.1	-0.6
Point 6	235.5	-2.3
Point 7	241.1	-2.5
Point 8	310	-7
Point 9	310	-50

Point 10	310	-70
Point 11	182	-70
Point 12	182	-50
Point 13	182	-7
Point 14	200	14.1
Point 15	200	-7
Point 16	200	-28.5
Point 17	182	-28.5
Point 18	201	3.6
Point 19	200.5	14.1
Point 20	200	-23.5
Point 21	199.1	-1.6
Point 22	201	-1.6
Point 23	201	0
Point 24	200	-3.5
Point 25	200	-50
Point 26	241.1	-7
Point 27	200	-70
Point 28	192.53	-7
Point 29	120	-4
Point 30	120	-7
Point 31	120	-50
Point 32	120	-70
Point 33	120	-28.5
Point 34	140	-3.7
Point 35	160	-4.2
Point 36	192.53	-3.5
Point 37	200	-2.1
Point 38	203.6	-2.3
Point 39	223.4	-2.70901
Point 40	241.1	-3.3
Point 41	270.5	-3.8
Point 42	310	-3.8
Point 43	310	-5.8

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.35	(196.996, 4.49)	11.68886	(208.033, 3.31099)	(185.32, -4.80101)
2	5119	1.84	(196.996, 4.49)	12.026	(208.505, 3.27017)	(188.678, -4.19502)

Slices of Slip Surface: Optimized

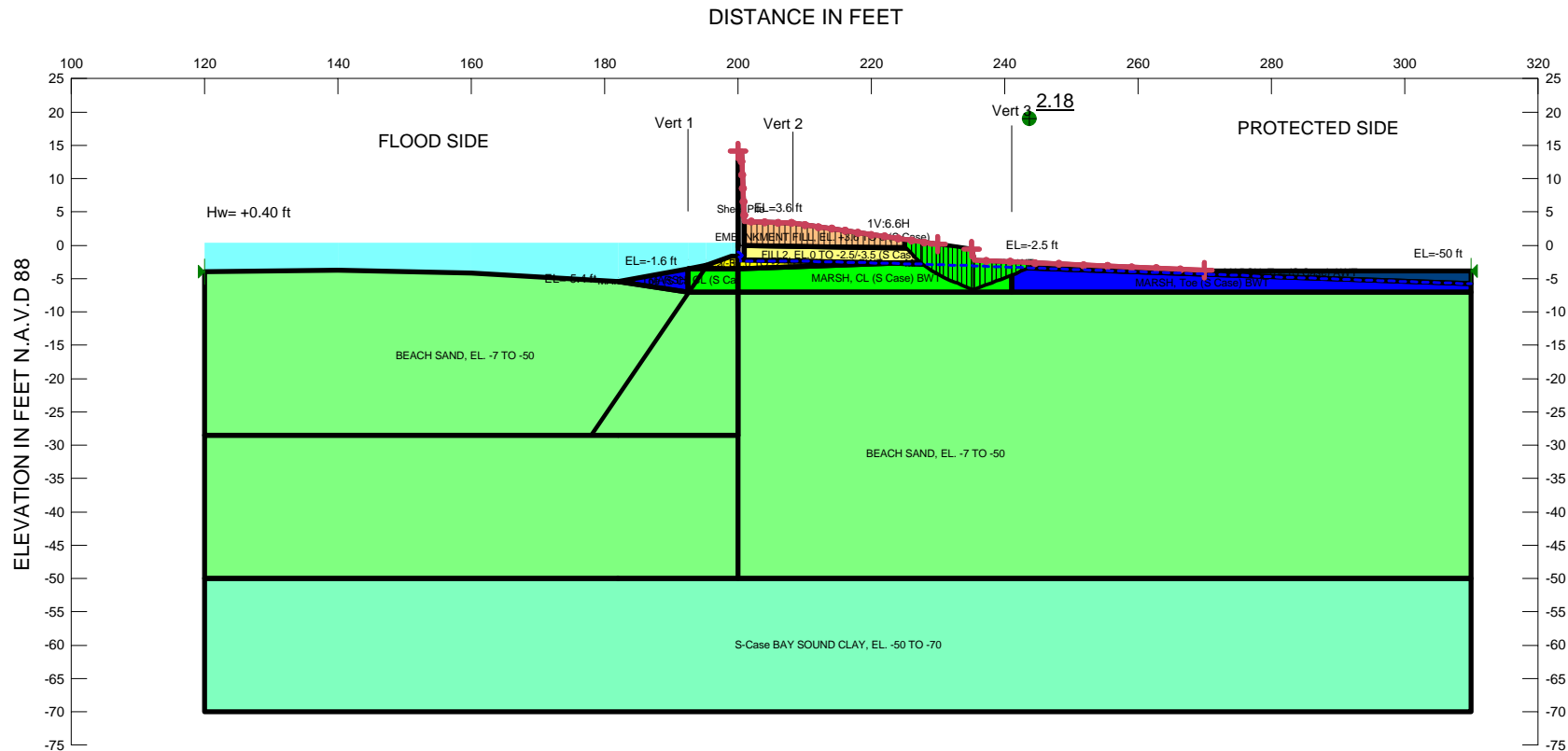
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	185.6691	-4.848646	325.74306	343.66502	7.979373	0
2	Optimized	186.3679	-4.9439225	328.57881	358.99228	13.540945	0
3	Optimized	187.0667	-5.039199	331.88247	374.26281	18.868945	0
4	Optimized	187.7655	-5.1344755	335.49805	389.51917	24.051749	0

5	Optimized	188.46435	-5.229752	339.6099	404.71881	28.988355	0
6	Optimized	189.24625	-5.3397325	344.42719	422.67541	34.838352	0
7	Optimized	190.11115	-5.4644175	350.08011	442.25463	41.038743	0
8	Optimized	190.8747	-5.5766935	355.67025	460.32834	46.596784	0
9	Optimized	191.53685	-5.67656	360.77771	475.77019	51.197951	0
10	Optimized	192.19895	-5.7764265	365.9897	491.1971	55.745925	0
11	Optimized	192.8121	-5.86891	370.85414	504.87056	59.667957	0
12	Optimized	193.55395	-5.9848575	376.96718	521.88186	64.520173	0
13	Optimized	194.4735	-6.1316525	385.03231	542.00711	69.889682	0
14	Optimized	195.11665	-6.2348255	390.94714	556.3696	73.650822	0
15	Optimized	195.81565	-6.3483355	397.78182	579.22951	80.785719	0
16	Optimized	196.6774	-6.486138	406.68406	601.96834	86.946166	0
17	Optimized	197.3696	-6.594274	414.46346	620.46761	91.718958	0
18	Optimized	198.06175	-6.7024095	422.95656	638.82413	96.110436	0
19	Optimized	198.7539	-6.810545	433.10546	656.98082	99.67573	0
20	Optimized	199.5401	-6.9333715	448.70617	666.6838	97.049895	0
21	Optimized	199.9901	-7.001768	461.60296	647.08569	120.45389	-5.2088e-007
22	Optimized	200.0192	-7.000703	451.0797	613.93847	105.76172	-4.573e-007
23	Optimized	200.2692	-6.9915395	310.93668	521.64803	93.814733	0
24	Optimized	200.75	-6.9739155	292.54353	519.17132	100.9012	0
25	Optimized	201.004	-6.964606	291.90198	1073.1236	347.82229	0
26	Optimized	201.31035	-6.662055	272.82978	794.14686	232.10532	0
27	Optimized	201.9777	-5.9765175	229.63048	726.68757	221.30408	0
28	Optimized	202.7077	-5.2102525	181.27976	661.48922	213.80303	0
29	Optimized	203.33635	-4.5440915	139.13574	601.4609	205.84042	0
30	Optimized	203.92925	-3.9076665	98.823203	547.91126	199.94688	0
31	Optimized	204.3476	-3.452148	69.971859	499.97289	191.44879	0
32	Optimized	204.89045	-2.830113	30.685373	439.74325	199.51086	0
33	Optimized	205.6409	-1.94663	-25.02245	324.32011	158.18149	75
34	Optimized	206.2343	-1.21949	-70.813833	278.04498	135.6116	75
35	Optimized	206.8291	-0.4818654	-117.32448	228.03221	111.21874	75
36	Optimized	207.36485	0.1903196	-159.76743	182.53515	89.028339	75
37	Optimized	207.81755	0.744225	-194.74972	147.01389	71.703466	75

Slices of Slip Surface: 5119

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	5119	188.9991	-4.4811435	300.87041	380.8002	35.587034	0
2	5119	189.6411	-5.0156335	327.21171	444.77877	52.344231	0
3	5119	190.2831	-5.480121	350.83136	496.92926	65.046976	0
4	5119	190.92505	-5.884093	371.80709	540.07211	74.916415	0
5	5119	191.567	-6.2344365	390.41035	575.94282	82.604378	0
6	5119	192.209	-6.536294	406.74703	605.65542	88.559724	0
7	5119	192.98835	-6.8378275	423.10294	632.80849	93.366924	0
8	5119	193.7556	-7.0864665	437.22028	666.6331	148.98243	-4.9902e-006
9	5119	194.37335	-7.24199	447.11809	680.14777	151.33124	-5.0688e-006
10	5119	194.9911	-7.3633	455.07376	689.15455	152.01385	3.7767e-006
11	5119	195.61665	-7.452138	461.11175	700.74933	155.62246	3.8661e-006

12	5119	196.25	-7.508422	465.61573	704.83751	155.35244	3.8595e-006
13	5119	196.88335	-7.5311	468.02663	704.79508	153.75923	3.8198e-006
14	5119	197.51665	-7.5203625	469.23369	700.72715	150.33361	3.7346e-006
15	5119	198.15	-7.476119	468.60661	692.78842	145.58537	3.6165e-006
16	5119	198.78335	-7.397995	467.50124	681.05504	138.68346	3.4452e-006
17	5119	199.55	-7.2525435	466.33493	652.05026	120.60494	2.9961e-006
18	5119	200.25	-7.0844165	327.23802	510.90026	119.27166	-5.1583e-007
19	5119	200.52305	-7.007072	294.65786	490.10817	126.92691	3.1532e-006
20	5119	200.77305	-6.9249185	289.44759	483.22143	86.273674	0
21	5119	201.325	-6.7243975	276.74778	949.70042	299.61782	0
22	5119	201.975	-6.451078	259.46449	905.69616	287.72088	0
23	5119	202.625	-6.130972	239.2109	857.77167	275.401	0
24	5119	203.275	-5.759672	215.62539	805.51222	262.63454	0
25	5119	203.9207	-5.334598	188.57296	748.7988	249.42861	0
26	5119	204.56205	-4.848821	157.70629	686.98009	235.64788	0
27	5119	205.2034	-4.2892855	122.20796	618.75114	221.07526	0
28	5119	205.84475	-3.6405585	81.095543	542.66958	205.506	0
29	5119	206.5205	-2.8296265	29.719513	443.4242	201.77726	0
30	5119	207.18215	-1.8773035	-30.365753	308.55984	150.49469	75
31	5119	207.79525	-0.75595105	-100.92378	205.41838	100.18924	75
32	5119	208.2009	0.12968495	-156.59123	128.3094	62.580678	75
33	5119	208.4025	0.692164	-191.92131	79.50233	38.775877	75



Name: BEACH SAND, EL. -7 TO -50 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand
 Name: Sheet Pile Model: Undrained (Phi=0) Unit Weight: 0.1 pcf Cohesion: 1e+013 psf
 Name: EMBANKMENT FILL, EL. +3.6 TO 0 (S Case) Model: Mohr-Coulomb Unit Weight: 110 pcf Cohesion: 75 psf Phi: 26 °
 Name: FILL2, EL.0 TO -2.5/-3.5 (S Case) AWT Model: Mohr-Coulomb Unit Weight: 94 pcf Cohesion: 75 psf Phi: 26 °
 Name: MARSH, CL (S Case) AWT Model: Spatial Mohr-Coulomb Weight Fn: Marsh Cohesion: 75 psf Phi: 24 °
 Name: MARSH, Toe (S Case) AWT Model: Spatial Mohr-Coulomb Unit Weight: 100 pcf Cohesion: 75 psf Phi: 24 °
 Name: S-Case BAY SOUND CLAY, EL. -50 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 102 pcf Cohesion: 0 psf Phi: 26 °
 Name: FILL2, EL.0 TO -2.5/-3.5 (S Case) BWT Model: Mohr-Coulomb Unit Weight: 94 pcf Cohesion: 0 psf Phi: 26 °
 Name: MARSH, CL (S Case) BWT Model: Spatial Mohr-Coulomb Weight Fn: Marsh Cohesion: 0 psf Phi: 24 °
 Name: MARSH, Toe (S Case) BWT Model: Spatial Mohr-Coulomb Unit Weight: 100 pcf Cohesion: 0 psf Phi: 24 °

GENERAL NOTES

CLASSIFICATION STRATIFICATION
 SHEAR STRENGTHS AND UNIT WEIGHTS OF
 THE SOIL WERE BASED ON THE RESULTS OF
 UNDISTURBED BORINGS AND CPT DATA. SEE
 BOTH BORING AND CPT DATA PLATES.

WHERE INDICATED, SHEAR STRENGTHS BETWEEN
 VERTICALS WERE ASSUMED TO VARY LINEARLY
 BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

Hw IS CANAL WATER LEVEL

LAKE PONTCHARTRAIN, LA. AND VICINITY
 HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 1C,
 PROTECTED SIDE STABILITY ANALYSIS,
 CASE: NWL S Case P/S (Entry/Exit)
 STA. 9+25 TO 11+00 WEST
 ORLEANS PARISH, LOUISIANA

NWL S Case P/S (Entry/Exit)

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File Information

Created By: [Liljegren, James](#)
Revision Number: [550](#)
Last Edited By: [Hendrix, Joshua M MVR](#)
Date: [6/20/2013](#)
Time: [12:23:44 PM](#)
File Name: [Reach 1C.gsz](#)
Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix F NWL\](#)
Last Solved Date: [6/20/2013](#)
Last Solved Time: [12:27:30 PM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Strength Units: [psf](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

NWL S Case P/S (Entry/Exit)

Kind: [SLOPE/W](#)
Parent: [NWL S Case F/S \(Block\)](#)
Method: [Spencer](#)
Settings
 PWP Conditions Source: [Other GeoStudio Analysis](#)
 PWP Other Analysis: [Normal Water Level +0.4ft \(seepage\) \[\(last\)\]](#)
Slip Surface
 Direction of movement: [Left to Right](#)
 Use Passive Mode: [No](#)
 Slip Surface Option: [Entry and Exit](#)
 Critical slip surfaces saved: [1](#)
 Optimize Critical Slip Surface Location: [Yes](#)
Tension Crack
 Tension Crack Option: [Tension Crack Line](#)
 Percentage Wet: [0](#)
 Tension Crack Fluid Unit Weight: [62.4 pcf](#)
FOS Distribution

FOS Calculation Option: [Constant](#)

Advanced

Number of Slices: [30](#)

Optimization Tolerance: [0.01](#)

Minimum Slip Surface Depth: [0.1 ft](#)

Optimization Maximum Iterations: [4000](#)

Optimization Convergence Tolerance: [1e-007](#)

Starting Optimization Points: [8](#)

Ending Optimization Points: [16](#)

Complete Passes per Insertion: [1](#)

Driving Side Maximum Convex Angle: [5 °](#)

Resisting Side Maximum Convex Angle: [1 °](#)

Materials

BEACH SAND, EL. -7 TO -50

Model: [Shear/Normal Fn.](#)

Unit Weight: [122 pcf](#)

Strength Function: [Sand](#)

Phi-B: [0 °](#)

Sheet Pile

Model: [Undrained \(Phi=0\)](#)

Unit Weight: [0.1 pcf](#)

Cohesion: [1e+013 psf](#)

EMBANKMENT FILL, EL. +3.6 TO 0 (S Case)

Model: [Mohr-Coulomb](#)

Unit Weight: [110 pcf](#)

Cohesion: [75 psf](#)

Phi: [26 °](#)

Phi-B: [0 °](#)

FILL2, EL.0 TO -2.5/-3.5 (S Case) AWT

Model: [Mohr-Coulomb](#)

Unit Weight: [94 pcf](#)

Cohesion: [75 psf](#)

Phi: [26 °](#)

Phi-B: [0 °](#)

MARSH, CL (S Case) AWT

Model: [Spatial Mohr-Coulomb](#)

Weight Fn: [Marsh](#)

Cohesion: [75 psf](#)

Phi: [24 °](#)

Phi-B: [0 °](#)

MARSH, Toe (S Case) AWT

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [100 pcf](#)

Cohesion: [75 psf](#)

Phi: [24 °](#)

Phi-B: [0 °](#)

S-Case BAY SOUND CLAY, EL. -50 TO -70

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [102 pcf](#)

Cohesion: [0 psf](#)

Phi: [26 °](#)

Phi-B: [0 °](#)

FILL2, EL.0 TO -2.5/-3.5 (S Case) BWT

Model: [Mohr-Coulomb](#)

Unit Weight: [94 pcf](#)

Cohesion: [0 psf](#)

Phi: [26 °](#)

Phi-B: [0 °](#)

MARSH, CL (S Case) BWT

Model: [Spatial Mohr-Coulomb](#)

Weight Fn: [Marsh](#)

Cohesion: [0 psf](#)

Phi: [24 °](#)

Phi-B: [0 °](#)

MARSH, Toe (S Case) BWT

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [100 pcf](#)

Cohesion: [0 psf](#)

Phi: [24 °](#)

Phi-B: [0 °](#)

Slip Surface Entry and Exit

Left Projection: [Range](#)

Left-Zone Left Coordinate: [\(200, 14.1\) ft](#)

Left-Zone Right Coordinate: [\(230, 0.14216\) ft](#)

Left-Zone Increment: [20](#)

Right Projection: [Range](#)

Right-Zone Left Coordinate: [\(235, -0.58545\) ft](#)

Right-Zone Right Coordinate: [\(270, -3.77789\) ft](#)

Right-Zone Increment: [10](#)

Radius Increments: [15](#)

Slip Surface Limits

Left Coordinate: (120, -4) ft
Right Coordinate: (310, -3.8) ft

Tension Crack Line

	X (ft)	Y (ft)
	200	0
	230	0

Shear/Normal Strength Functions

Sand

Model: Spline Data Point Function
Function: Shear Stress vs. Normal Stress
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
Data Point: (-10000, 0)
Data Point: (0, 0)
Data Point: (10000, 6494)
Estimation Properties
Intact Rock Param.: 10
Geological Strength: 100
Disturbance Factor: 0
SigmaC: 600000 psf
Sigma3: 300000 psf
Num. Points: 20

Unit Weight Functions

Marsh

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 100
Data Points: X (ft), Unit Weight (pcf)
Data Point: (192.53, 100)
Data Point: (208.3, 94)
Data Point: (241.1, 100)

Regions

	Material	Points	Area (ft ²)
Region 1	EMBANKMENT FILL, EL. +3.6 TO 0 (S Case)	18,4,5,23	71.595
Region 2	BEACH SAND, EL. -7 TO -50	15,20,16,17,33,30,29,34,35,1,28	1900.824
Region 3	BEACH SAND, EL. -7 TO -50	17,33,31,12,25,9,8,26,15,20,16	6450
Region 4	S-Case BAY SOUND CLAY, EL. -50 TO -70	12,31,32,11,27,10,9,25	3800
Region 5	Sheet Pile	14,19,18,23,22,3	13.075
Region 6	MARSH, Toe (S Case) BWT	1,36,28	18.4275
Region 7	MARSH, CL (S Case) BWT	28,36,24,15	26.145
Region 8	FILL2, EL.0 TO -2.5/-3.5 (S Case) BWT	2,21,3,37,24,36	6.9625
Region 9	FILL2, EL.0 TO -2.5/-3.5 (S Case) AWT	23,22,3,37,38,39,6,5	75.40371
Region 10	FILL2, EL.0 TO -2.5/-3.5 (S Case) BWT	37,24,39,38	15.136218
Region 11	MARSH, CL (S Case) BWT	24,39,40,26,15	161.87484
Region 12	MARSH, CL (S Case) AWT	39,6,7,40	9.435228
Region 13	MARSH, Toe (S Case) AWT	7,41,42,43,40	70.785
Region 14	MARSH, Toe (S Case) BWT	40,26,8,43	168.805

Points

	X (ft)	Y (ft)
Point 1	182	-5.4
Point 2	195.3	-3
Point 3	200	-1.6
Point 4	208.3	3.3
Point 5	235.1	-0.6
Point 6	235.5	-2.3
Point 7	241.1	-2.5
Point 8	310	-7
Point 9	310	-50
Point 10	310	-70
Point 11	182	-70
Point 12	182	-50
Point 13	182	-7
Point 14	200	14.1
Point 15	200	-7
Point 16	200	-28.5
Point 17	182	-28.5
Point 18	201	3.6
Point 19	200.5	14.1
Point 20	200	-23.5
Point 21	199.1	-1.6
Point 22	201	-1.6
Point 23	201	0
Point 24	200	-3.5
Point 25	200	-50
Point 26	241.1	-7
Point 27	200	-70
Point 28	192.53	-7
Point 29	120	-4

Point 30	120	-7
Point 31	120	-50
Point 32	120	-70
Point 33	120	-28.5
Point 34	140	-3.7
Point 35	160	-4.2
Point 36	192.53	-3.5
Point 37	200	-2.1
Point 38	203.6	-2.3
Point 39	223.4	-2.70901
Point 40	241.1	-3.3
Point 41	270.5	-3.8
Point 42	310	-3.8
Point 43	310	-5.8

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	2.18	(235.694, 7.034)	9.176123	(224.964, 0.874956)	(244.698, -2.65911)
2	3050	2.31	(235.694, 7.034)	13.131	(224.606, 0.927069)	(244.559, -2.65297)

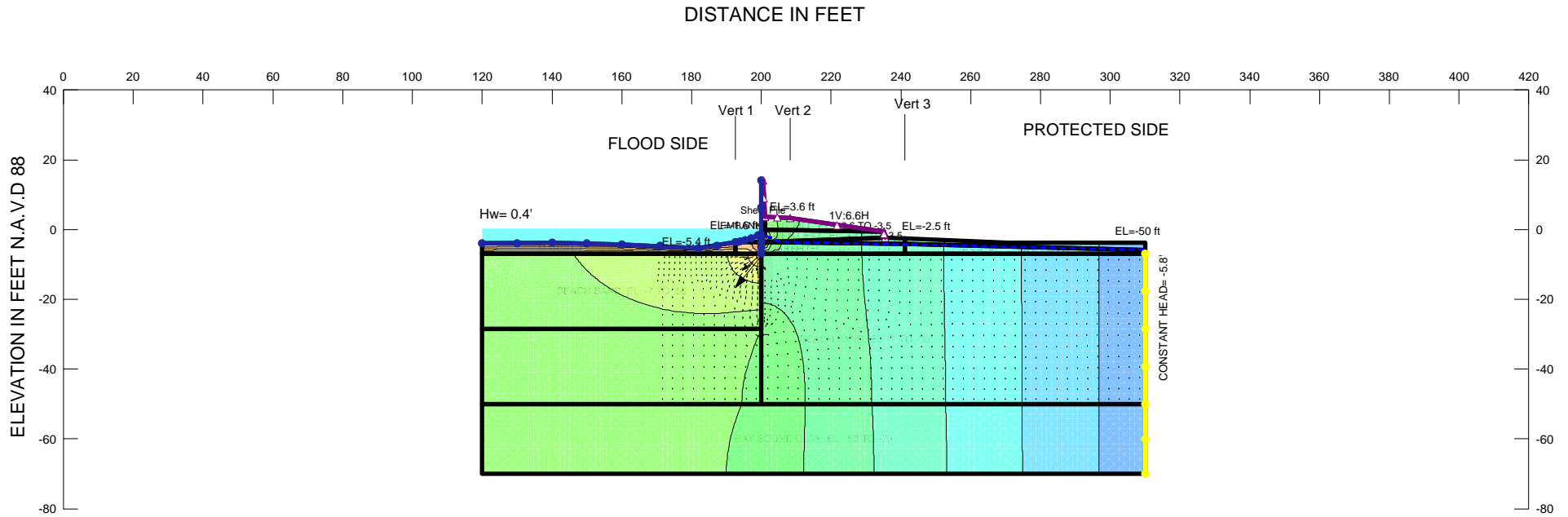
Slices of Slip Surface: Optimized

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	225.0492	-0.10387	-165.187	49.35547	24.072271	75
2	Optimized	225.2326	-0.3179274	-152.20797	68.908477	33.60891	75
3	Optimized	225.6775	-0.8150524	-122.01862	100.13192	48.837599	75
4	Optimized	226.3639	-1.545075	-77.723218	150.31719	73.314591	75
5	Optimized	227.04415	-2.2312455	-36.17279	191.88107	93.586651	75
6	Optimized	227.51015	-2.7012555	-7.7237716	223.82124	99.651638	75
7	Optimized	228.02515	-3.077335	14.778067	297.46567	125.86063	0
8	Optimized	228.78515	-3.5639	43.702327	330.85044	127.84658	0
9	Optimized	229.44065	-3.9592935	67.118567	364.3281	132.32621	0
10	Optimized	230.00995	-4.27526	85.728143	385.30745	133.3813	0
11	Optimized	230.57925	-4.5912265	104.31775	406.36359	134.47947	0
12	Optimized	231.19215	-4.908855	122.9056	433.09631	138.1058	0
13	Optimized	231.84865	-5.228145	141.49329	453.53468	138.92978	0
14	Optimized	232.5312	-5.5360835	159.27694	479.1066	142.39734	0
15	Optimized	233.2398	-5.83267	176.26561	496.99353	142.79727	0
16	Optimized	233.9484	-6.1292565	193.22825	514.95856	143.24356	0
17	Optimized	234.70135	-6.4130685	209.28409	539.36518	146.96157	0
18	Optimized	235.2108	-6.5862485	218.96061	509.3528	129.29094	0
19	Optimized	235.4108	-6.59231	218.90556	501.40168	125.77537	0
20	Optimized	235.90015	-6.4189525	207.09647	441.36375	104.30251	0
21	Optimized	236.7005	-6.1354375	187.74595	408.8106	98.424322	0
22	Optimized	237.5939	-5.80568	165.29121	373.23853	92.58411	0
23	Optimized	238.44165	-5.48145	143.23719	335.99724	85.822305	0
24	Optimized	239.15075	-5.20899	124.7089	304.4037	80.005284	0

25	Optimized	239.85985	-4.93653	106.16481	272.73119	74.16013	0
26	Optimized	240.6572	-4.6264805	85.065747	237.10018	67.690091	0
27	Optimized	241.3975	-4.3358855	65.305586	202.70704	61.175067	0
28	Optimized	242.10135	-4.047955	45.809314	169.4533	55.049849	0
29	Optimized	242.91405	-3.705645	22.679573	128.23524	46.996409	0
30	Optimized	243.4399	-3.458205	6.0949545	106.26051	44.596579	0
31	Optimized	243.84415	-3.201218	-10.816215	103.92776	46.271621	75
32	Optimized	244.41365	-2.8398145	-34.603051	55.422111	24.675514	75

Slices of Slip Surface: 3050

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	3050	224.7453	-0.2101262	-158.04271	53.40061	26.045218	75
2	3050	225.19805	-0.8385632	-119.69841	99.570183	48.563623	75
3	3050	225.82555	-1.614875	-72.404377	156.20935	76.18839	75
4	3050	226.45305	-2.2840395	-31.800277	206.89868	100.91123	75
5	3050	226.89695	-2.7126595	-5.885071	243.44051	108.3867	75
6	3050	227.36345	-3.1064625	17.81978	297.32559	124.444	0
7	3050	228.0362	-3.6244935	48.879222	341.34938	130.2161	0
8	3050	228.70895	-4.077641	75.869786	379.75792	135.29972	0
9	3050	229.3817	-4.4736265	99.278304	413.14048	139.74044	0
10	3050	230.05445	-4.8182145	119.45603	441.91669	143.56874	0
11	3050	230.72715	-5.1157995	136.68115	466.43222	146.81464	0
12	3050	231.3999	-5.369779	151.16803	486.94873	149.4992	0
13	3050	232.07265	-5.5827975	163.10629	503.64925	151.61949	0
14	3050	232.7454	-5.7569085	172.56883	516.6636	153.20086	0
15	3050	233.41815	-5.893689	179.69772	526.10807	154.23182	0
16	3050	234.0909	-5.9943185	184.56255	532.02994	154.70245	0
17	3050	234.76365	-6.059632	187.23676	534.48771	154.60608	0
18	3050	235.3	-6.0895555	187.98263	456.74378	119.66018	0
19	3050	235.85	-6.091419	186.88686	378.51625	85.318901	0
20	3050	236.55	-6.06441	183.66578	377.75221	86.412846	0
21	3050	237.25	-5.9997775	178.10745	373.23696	86.877254	0
22	3050	237.95	-5.896956	170.17343	364.79206	86.649794	0
23	3050	238.65	-5.755021	159.78859	352.25868	85.693204	0
24	3050	239.35	-5.5726475	146.89202	335.35725	83.910127	0
25	3050	240.05	-5.3480425	131.35324	313.79503	81.228318	0
26	3050	240.75	-5.078847	113.02634	287.12406	77.513297	0
27	3050	241.4219	-4.776668	92.706731	255.83379	72.628847	0
28	3050	242.0657	-4.4418545	70.424563	219.82383	66.516838	0
29	3050	242.7095	-4.0595895	45.183566	177.71739	59.007859	0
30	3050	243.3533	-3.624739	16.663238	128.51254	49.798518	0
31	3050	244.1173	-3.0232025	-22.516687	93.056488	41.431418	75



Name: EMBANKMENT FILL, EL. +3.6 TO 0 Model: Saturated Only K-Sat: 3.28e-008 ft/sec K-Ratio: 1
Name: BEACH SAND, EL. -7 TO -50 Model: Saturated Only K-Sat: 0.00049 ft/sec K-Ratio: 1
Name: BAY SOUND CLAY, EL. -50 TO -70 Model: Saturated Only K-Sat: 3.28e-008 ft/sec K-Ratio: 1
Name: Sheet Pile Model: Saturated Only K-Sat: 1e-010 ft/sec K-Ratio: 1
Name: MARSH, EL. -2.8/-3.5 TO -7 Model: Saturated Only K-Sat: 3.28e-007 ft/sec K-Ratio: 1
Name: EMBANKMENT FILL, EL. +3.6 TO -3.5 Model: Saturated Only K-Sat: 3.28e-008 ft/sec K-Ratio: 1

GENERAL NOTES

CLASSIFICATION STRATIFICATION
SHEAR STRENGTHS AND UNIT WEIGHTS OF
THE SOIL WERE BASED ON THE RESULTS OF
UNDISTURBED BORINGS AND CPT DATA. SEE
BOTH BORING AND CPT DATA PLATES.

WHERE INDICATED, SHEAR STRENGTHS BETWEEN
VERTICALS WERE ASSUMED TO VARY LINEARLY
BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

Hw IS CANAL WATER LEVEL

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 1D,
PROTECTED SIDE STABILITY ANALYSIS,
CASE: Normal Water Level +0.40ft (seepage)
STA. 11+00 TO 14+20 WEST
ORLEANS PARISH, LOUISIANA

Normal Water Level +0.40ft (seepage)

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File Information

Created By: [Liljegren, James](#)
Revision Number: [602](#)
Last Edited By: [Castro, Felix R MVR](#)
Date: [6/20/2013](#)
Time: [2:10:28 PM](#)
File Name: [Reach 1D.gsz](#)
Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix F NWL\](#)
Last Solved Date: [6/20/2013](#)
Last Solved Time: [2:10:46 PM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Mass(M) Units: [lbs](#)
Mass Flux Units: [lbs/sec](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

Normal Water Level +0.40ft (seepage)

Kind: [SEEP/W](#)
Method: [Steady-State](#)
Settings
 Include Air Flow: [No](#)
Control
 Apply Runoff: [No](#)
Convergence
 Convergence Type: [Head Vector Norm](#)
 Maximum Number of Iterations: [500](#)
 Tolerance: [0.001](#)
 Maximum Change in K: [0.1](#)
 Rate of Change in K: [1.02](#)
 Minimum Change in K: [1e-005](#)
 Equation Solver: [Parallel Direct](#)
 Potential Seepage Max # of Reviews: [10](#)
Time

Starting Time: 0 sec

Duration: 0 sec

Ending Time: 0 sec

Materials

EMBANKMENT FILL, EL. +3.6 TO 0

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-008 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

BEACH SAND, EL. -7 TO -50

Model: Saturated Only

Hydraulic

K-Sat: 0.00049 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

BAY SOUND CLAY, EL. -50 TO -70

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-008 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

Sheet Pile

Model: Saturated Only

Hydraulic

K-Sat: 1e-010 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

MARSH, EL. -2.8/-3.5 TO -7

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-007 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

EMBANKMENT FILL, EL. +3.6 TO -3.5

Model: Saturated Only
Hydraulic
K-Sat: 3.28e-008 ft/sec
Volumetric Water Content: 0 ft³/ft³
Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

Boundary Conditions

Drainage

Review: true
Type: Total Flux (Q) 0

Curb

Type: Head (H) -5.8

Canal Water (Global) NWL

Type: Head (H) 0.4

Regions

	Material	Points	Area (ft²)
Region 1	EMBANKMENT FILL, EL. +3.6 TO -3.5	18,4,5,23	71.595
Region 2	BEACH SAND, EL. -7 TO -50	15,20,16,17,33,30,13,28	1720
Region 3	BEACH SAND, EL. -7 TO -50	17,33,31,12,25,9,8,26,15,20,16	6450
Region 4	BAY SOUND CLAY, EL. -50 TO -70	12,31,32,11,27,10,9,25	3800
Region 5	Sheet Pile	14,19,18,23,22,3	13.075
Region 6	EMBANKMENT FILL, EL. +3.6 TO -3.5	24,3,22,23,5,6	90.54
Region 7	MARSH, EL. -2.8/-3.5 TO -7	1,36,28,13,30,29,34,35	199.2515
Region 8	MARSH, EL. -2.8/-3.5 TO -7	28,36,24,15	26.145
Region 9	EMBANKMENT FILL, EL. +3.6 TO 0	2,21,3,24,36	6.9625
Region 10	MARSH, EL. -2.8/-3.5 TO -7	15,26,37,24	130.12897
Region 11	MARSH, EL. -2.8/-3.5 TO -7	24,6,7,37	41.181029
Region 12	MARSH, EL. -2.8/-3.5 TO -7	7,38,39,40,37	100.50134
Region 13	MARSH, EL. -2.8/-3.5 TO -7	37,26,8,40	139.20429

Lines

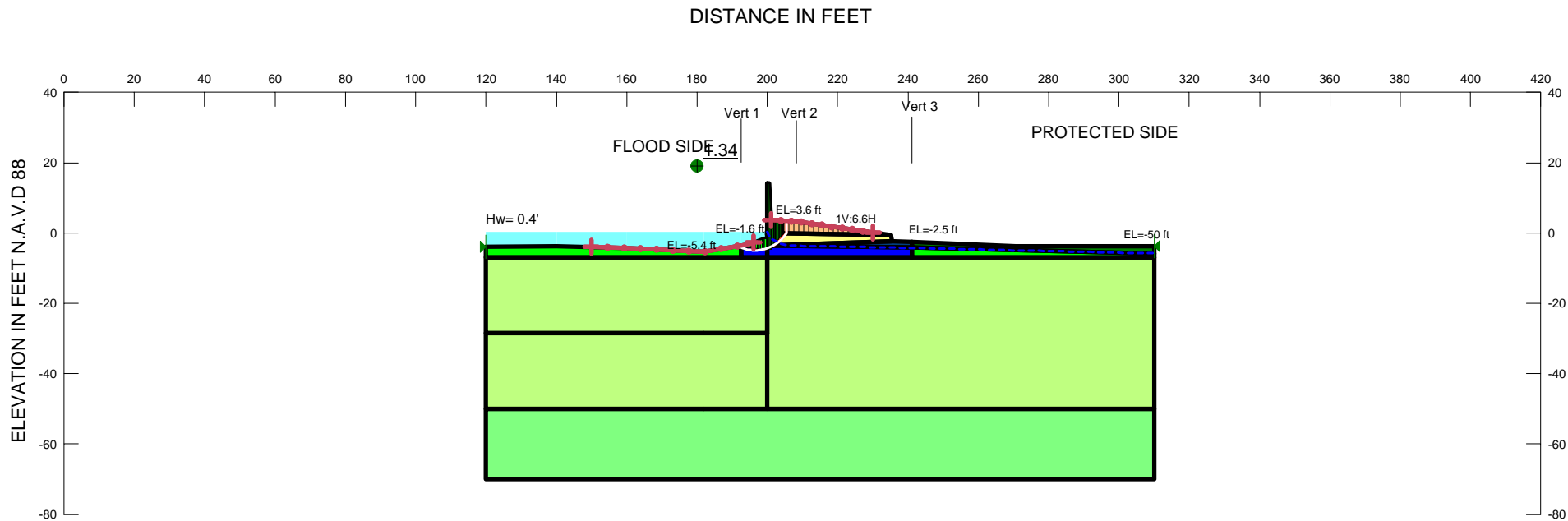
	Start Point	End Point	Hydraulic Boundary	Left Side Material	Right Side Material
Line 1	16	17			
Line 2	10	9	Curb		

Line 3	14	19			
Line 4	19	18	Drainage		
Line 5	20	16		Sheet Pile	
Line 6	18	4	Drainage		
Line 7	22	3		Sheet Pile	Sheet Pile
Line 8	5	4	Drainage		
Line 9	14	3	Canal Water (Global) NWL		
Line 10	22	23			
Line 11	23	18			
Line 12	3	24	Canal Water (Global) NWL	Sheet Pile	
Line 13	5	23			
Line 14	24	6			
Line 15	5	6	Drainage		
Line 16	24	15	Canal Water (Global) NWL	Sheet Pile	
Line 17	9	8	Curb		
Line 18	8	26			
Line 19	26	15			
Line 20	25	12			
Line 21	9	25			
Line 22	27	11			
Line 23	10	27			
Line 24	20	15			Sheet Pile
Line 25	15	28			
Line 26	2	21	Canal Water (Global) NWL		
Line 27	21	3	Canal Water (Global) NWL		
Line 28	12	31			
Line 29	31	32			
Line 30	32	11			
Line 31	17	33			
Line 32	33	31			
Line 33	33	30			
Line 34	29	34	Canal Water (Global) NWL		
Line 35	34	35	Canal Water (Global) NWL		
Line 36	35	1	Canal Water (Global) NWL		
Line 37	16	25			
Line 38	28	36			
Line 39	36	24			
Line 40	1	36	Canal Water (Global) NWL		
Line 41	36	2	Canal Water (Global) NWL		
Line 42	30	13			
Line 43	13	28			
Line 44	30	29			
Line 45	7	37			
Line 46	37	26			
Line 47	37	24			
Line 48	6	7			
Line 49	7	38			
Line 50	38	39			

Line 51	39	40			
Line 52	40	37			
Line 53	8	40			

Points

	X (ft)	Y (ft)
Point 1	182	-5.4
Point 2	195.3	-3
Point 3	200	-1.6
Point 4	208.3	3.3
Point 5	235.1	-0.6
Point 6	235.5	-2.3
Point 7	241.1	-2.5
Point 8	310	-7
Point 9	310	-50
Point 10	310	-70
Point 11	182	-70
Point 12	182	-50
Point 13	182	-7
Point 14	200	14.1
Point 15	200	-7
Point 16	200	-28.5
Point 17	182	-28.5
Point 18	201	3.6
Point 19	200.5	14.1
Point 20	200	-23.5
Point 21	199.1	-1.6
Point 22	201	-1.6
Point 23	201	0
Point 24	200	-3.5
Point 25	200	-50
Point 26	241.1	-7
Point 27	200	-70
Point 28	192.53	-7
Point 29	120	-4
Point 30	120	-7
Point 31	120	-50
Point 32	120	-70
Point 33	120	-28.5
Point 34	140	-3.7
Point 35	160	-4.2
Point 36	192.53	-3.5
Point 37	241.1	-4.16769
Point 38	270.59629	-3.8023
Point 39	310.02424	-3.79313
Point 40	309.98305	-5.79085



Name: Sheet Pile Model: Undrained (Phi=0) Unit Weight: 0.1 pcf Cohesion: 1e+012 psf
Name: EMBANKMENT FILL, EL. +3.6 TO 0 (S-Case) Model: Mohr-Coulomb Unit Weight: 110 pcf Cohesion: 75 psf Phi: 26 °
Name: FILL2, EL.0 TO -2.5/-3.5 (S-Case) Model: Mohr-Coulomb Unit Weight: 94 pcf Cohesion: 75 psf Phi: 26 °
Name: BEACH SAND, EL. -7 TO -50 (S-Case) Model: Mohr-Coulomb Unit Weight: 122 pcf Cohesion: 0 psf Phi: 33 °
Name: BAY SOUND CLAY, EL. -50 TO -70 (S-Case) Model: Mohr-Coulomb Unit Weight: 102 pcf Cohesion: 0 psf Phi: 26 °
Name: MARSH, CL (S-Case) AWT Model: Spatial Mohr-Coulomb Weight Fn: Marsh Cohesion: 75 psf Phi: 24 °
Name: MARSH, Toe (S-Case) AWT Model: Mohr-Coulomb Unit Weight: 100 pcf Cohesion: 75 psf Phi: 24 °
Name: MARSH, CL (S-Case) BWT Model: Spatial Mohr-Coulomb Weight Fn: Marsh Cohesion: 0 psf Phi: 24 °
Name: MARSH, Toe (S-Case) BWT Model: Mohr-Coulomb Unit Weight: 100 pcf Cohesion: 0 psf Phi: 24 °

GENERAL NOTES

CLASSIFICATION STRATIFICATION
SHEAR STRENGTHS AND UNIT WEIGHTS OF
THE SOIL WERE BASED ON THE RESULTS OF
UNDISTURBED BORINGS AND CPT DATA. SEE
BOTH BORING AND CPT DATA PLATES.

WHERE INDICATED, SHEAR STRENGTHS BETWEEN
VERTICALS WERE ASSUMED TO VARY LINEARLY
BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

Hw IS CANAL WATER LEVEL

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 1D,
PROTECTED SIDE STABILITY ANALYSIS,
CASE: NWL S Case F/S (Entry/Exit)
STA. 11+00 TO 14+20 WEST
ORLEANS PARISH, LOUISIANA

NWL S Case F/S (Entry/Exit)

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File Information

Created By: [Liljegren, James](#)
Revision Number: [602](#)
Last Edited By: [Castro, Felix R MVR](#)
Date: [6/20/2013](#)
Time: [2:10:28 PM](#)
File Name: [Reach 1D.gsz](#)
Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix F NWL\](#)
Last Solved Date: [6/20/2013](#)
Last Solved Time: [2:11:24 PM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Strength Units: [psf](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

NWL S Case F/S (Entry/Exit)

Kind: [SLOPE/W](#)
Parent: [Normal Water Level +0.40ft \(seepage\)](#)
Method: [Spencer](#)
Settings
 PWP Conditions Source: [Parent Analysis](#)
Slip Surface
 Direction of movement: [Right to Left](#)
 Use Passive Mode: [No](#)
 Slip Surface Option: [Entry and Exit](#)
 Critical slip surfaces saved: [1](#)
 Optimize Critical Slip Surface Location: [Yes](#)
 Tension Crack
 Tension Crack Option: [Tension Crack Line](#)
 Percentage Wet: [0](#)
 Tension Crack Fluid Unit Weight: [62.4 pcf](#)
FOS Distribution
 FOS Calculation Option: [Constant](#)

Advanced

Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 2000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

Sheet Pile

Model: Undrained (Phi=0)
Unit Weight: 0.1 pcf
Cohesion: 1e+012 psf

EMBANKMENT FILL, EL. +3.6 TO 0 (S-Case)

Model: Mohr-Coulomb
Unit Weight: 110 pcf
Cohesion: 75 psf
Phi: 26 °
Phi-B: 0 °

FILL2, EL.0 TO -2.5/-3.5 (S-Case)

Model: Mohr-Coulomb
Unit Weight: 94 pcf
Cohesion: 75 psf
Phi: 26 °
Phi-B: 0 °

BEACH SAND, EL. -7 TO -50 (S-Case)

Model: Mohr-Coulomb
Unit Weight: 122 pcf
Cohesion: 0 psf
Phi: 33 °
Phi-B: 0 °

BAY SOUND CLAY, EL. -50 TO -70 (S-Case)

Model: Mohr-Coulomb
Unit Weight: 102 pcf
Cohesion: 0 psf
Phi: 26 °
Phi-B: 0 °

MARSH, CL (S-Case) AWT

Model: Spatial Mohr-Coulomb
Weight Fn: Marsh
Cohesion: 75 psf
Phi: 24 °
Phi-B: 0 °

MARSH, Toe (S-Case) AWT

Model: Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion: 75 psf
Phi: 24 °
Phi-B: 0 °

MARSH, CL (S-Case) BWT

Model: Spatial Mohr-Coulomb
Weight Fn: Marsh
Cohesion: 0 psf
Phi: 24 °
Phi-B: 0 °

MARSH, Toe (S-Case) BWT

Model: Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion: 0 psf
Phi: 24 °
Phi-B: 0 °

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (150, -3.95) ft
Left-Zone Right Coordinate: (196, -2.74211) ft
Left-Zone Increment: 10
Right Projection: Range
Right-Zone Left Coordinate: (201, 3.6) ft
Right-Zone Right Coordinate: (230, 0.14216) ft
Right-Zone Increment: 10
Radius Increments: 15

Slip Surface Limits

Left Coordinate: (120, -4) ft
Right Coordinate: (310.02424, -3.79313) ft

Tension Crack Line



	X (ft)	Y (ft)
	200	0
	230	0

Unit Weight Functions

Marsh

Model: Spline Data Point Function

Function: Unit Weight vs. X

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 100

Data Points: X (ft), Unit Weight (pcf)

Data Point: (192.53, 100)

Data Point: (208.3, 94)

Data Point: (241.1, 100)

Regions

	Material	Points	Area (ft²)
Region 1	EMBANKMENT FILL, EL. +3.6 TO 0 (S-Case)	18,4,5,23	71.595
Region 2	BEACH SAND, EL. -7 TO -50 (S-Case)	15,20,16,17,33,30,13,28	1720
Region 3	BEACH SAND, EL. -7 TO -50 (S-Case)	17,33,31,12,25,9,8,26,15,20,16	6450
Region 4	BAY SOUND CLAY, EL. -50 TO -70 (S-Case)	12,31,32,11,27,10,9,25	3800
Region 5	Sheet Pile	14,19,18,23,22,3	13.075
Region 6	FILL2, EL.0 TO -2.5/-3.5 (S-Case)	24,3,22,23,5,6	90.54
Region 7	MARSH, Toe (S-Case) BWT	1,36,28,13,30,29,34,35	199.2515
Region 8	MARSH, CL (S-Case) BWT	28,36,24,15	26.145
Region 9	FILL2, EL.0 TO -2.5/-3.5 (S-Case)	2,21,3,24,36	6.9625
Region 10	MARSH, CL (S-Case) BWT	15,26,37,24	130.12897
Region 11	MARSH, CL (S-Case) AWT	24,6,7,37	41.181029
Region 12	MARSH, Toe (S-Case) AWT	7,38,39,40,37	100.50134
Region 13	MARSH, Toe (S-Case) BWT	37,26,8,40	139.20429

Points

	X (ft)	Y (ft)
Point 1	182	-5.4
Point 2	195.3	-3
Point 3	200	-1.6
Point 4	208.3	3.3
Point 5	235.1	-0.6
Point 6	235.5	-2.3
Point 7	241.1	-2.5
Point 8	310	-7
Point 9	310	-50

Point 10	310	-70
Point 11	182	-70
Point 12	182	-50
Point 13	182	-7
Point 14	200	14.1
Point 15	200	-7
Point 16	200	-28.5
Point 17	182	-28.5
Point 18	201	3.6
Point 19	200.5	14.1
Point 20	200	-23.5
Point 21	199.1	-1.6
Point 22	201	-1.6
Point 23	201	0
Point 24	200	-3.5
Point 25	200	-50
Point 26	241.1	-7
Point 27	200	-70
Point 28	192.53	-7
Point 29	120	-4
Point 30	120	-7
Point 31	120	-50
Point 32	120	-70
Point 33	120	-28.5
Point 34	140	-3.7
Point 35	160	-4.2
Point 36	192.53	-3.5
Point 37	241.1	-4.16769
Point 38	270.59629	-3.8023
Point 39	310.02424	-3.79313
Point 40	309.98305	-5.79085

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.34	(196.462, 5.715)	6.998577	(204.566, 3.45345)	(191.071, -3.76332)
2	1629	1.70	(196.462, 5.715)	10.644	(205.441, 3.41748)	(191.478, -3.6898)

Slices of Slip Surface: **Optimized**

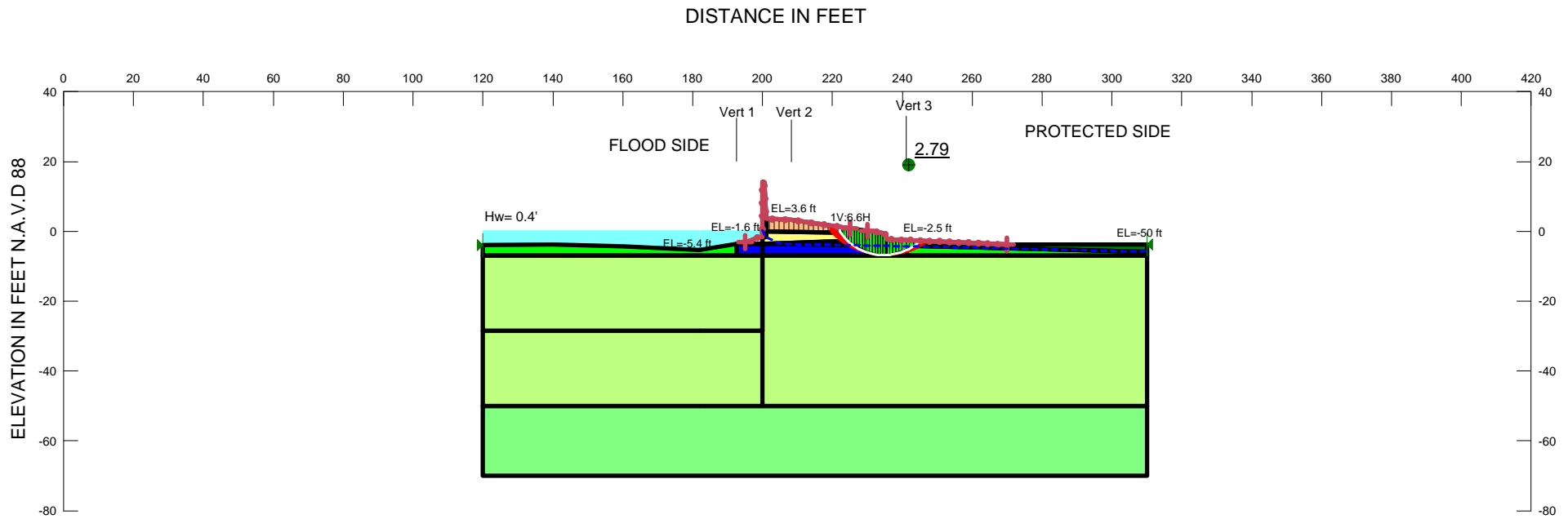
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	191.30525	-3.7871135	258.30039	270.53679	5.4479953	0
2	Optimized	191.77435	-3.834708	255.43746	279.16801	10.565523	0
3	Optimized	192.2435	-3.8823025	252.78659	287.77802	15.579189	0
4	Optimized	192.50405	-3.908871	251.3838	292.78954	18.435024	0
5	Optimized	192.76	-3.936197	246.48674	297.58238	22.749244	0
6	Optimized	193.22005	-3.9853065	237.45207	306.11993	30.572905	0
7	Optimized	193.6801	-4.034416	229.08742	314.61426	38.079001	0

8	Optimized	194.14015	-4.0835255	223.14356	322.89245	44.411066	0
9	Optimized	194.6002	-4.132635	222.81935	330.80319	48.077505	0
10	Optimized	195.0651	-4.1810965	222.60253	338.27707	51.501621	0
11	Optimized	195.4786	-4.2231815	222.52549	349.63954	56.594823	0
12	Optimized	195.8974	-4.261715	226.15054	356.95864	58.239517	0
13	Optimized	196.37785	-4.302425	230.69264	366.43689	60.437234	0
14	Optimized	196.85605	-4.3385975	235.09041	373.89691	61.800637	0
15	Optimized	197.3319	-4.3702325	242.89041	382.13724	61.996681	0
16	Optimized	197.80775	-4.4018675	252.57751	390.25176	61.296523	0
17	Optimized	198.28365	-4.4335025	262.34848	398.36628	60.559023	0
18	Optimized	198.8108	-4.4684175	274.49173	407.20068	59.085833	0
19	Optimized	199.41845	-4.5085425	291.6243	409.59631	52.524523	0
20	Optimized	199.86845	-4.540427	305.15408	413.19043	48.100878	0
21	Optimized	200.25	-4.571917	191.85968	313.27487	54.057525	0
22	Optimized	200.74385	-4.612675	172.42588	296.24522	55.127925	0
23	Optimized	200.99385	-4.6247965	165.06413	234.91705	31.100525	0
24	Optimized	201.191	-4.368225	156.36055	577.0692	187.31156	0
25	Optimized	201.573	-3.8710885	133.76266	538.10347	180.02413	0
26	Optimized	201.79885	-3.576155	118.28714	511.20422	174.93795	0
27	Optimized	201.8691	-3.4827055	110.57166	457.25077	154.35149	75
28	Optimized	202.09935	-3.1765055	78.254618	419.98409	166.6726	75
29	Optimized	202.489	-2.658275	25.1173	372.32522	169.34462	75
30	Optimized	202.89125	-2.1353525	-26.624043	340.22341	165.93805	75
31	Optimized	203.3062	-1.6077375	-71.730424	306.77762	149.62544	75
32	Optimized	203.712	-1.098765	-109.47212	278.63527	135.8995	75
33	Optimized	204.10865	-0.608435	-143.98402	247.19307	120.56412	75
34	Optimized	204.41445	-0.2126191	-171.40014	205.76394	100.35778	75
35	Optimized	204.544	-0.0309841	-183.79597	194.38569	94.808235	75

Slices of Slip Surface: 1629

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	1629	191.74105	-3.8200035	255.44847	296.05237	18.078022	0
2	1629	192.267	-4.0630195	256.01313	326.63864	31.444506	0
3	1629	192.76085	-4.261469	253.81298	350.54136	43.066247	0
4	1629	193.2225	-4.4208725	250.1908	368.7044	52.765656	0
5	1629	193.68415	-4.5570635	247.90506	383.29518	60.279565	0
6	1629	194.14585	-4.6709575	247.58676	394.68852	65.493923	0
7	1629	194.6075	-4.7632825	250.21313	403.12234	68.079567	0
8	1629	195.06915	-4.8346065	252.21604	409.17195	69.88127	0
9	1629	195.5375	-4.8857895	253.71097	418.68497	73.451158	0
10	1629	196.0125	-4.916538	258.40081	422.69619	73.149016	0
11	1629	196.4875	-4.9260055	262.12554	424.58822	72.333045	0
12	1629	196.9625	-4.914249	264.7802	424.41378	71.073451	0
13	1629	197.4375	-4.881198	271.35762	422.19338	67.156407	0
14	1629	197.9125	-4.8266515	277.24027	418.08158	62.706591	0
15	1629	198.3875	-4.7502725	281.734	412.13458	58.05808	0
16	1629	198.8625	-4.6515775	286.0929	404.35311	52.652837	0

17	1629	199.325	-4.533727	290.71416	388.46073	43.519574	0
18	1629	199.775	-4.397157	294.02224	373.42493	35.352355	0
19	1629	200.25	-4.2282005	197.99863	261.5436	28.292041	0
20	1629	200.75	-4.0228755	181.10908	217.36019	16.140031	0
21	1629	201.18485	-3.821255	158.11753	668.97837	227.4499	0
22	1629	201.5545	-3.6289875	134.93066	640.91175	225.27729	0
23	1629	201.81865	-3.4820495	114.09364	601.72823	217.10891	75
24	1629	202.11635	-3.2988725	83.574337	568.76872	236.64511	75
25	1629	202.55305	-3.009459	40.51768	525.67841	236.6287	75
26	1629	202.98975	-2.6873815	-0.14783679	479.63096	233.93165	75
27	1629	203.42645	-2.3286935	-33.781713	436.7352	213.00999	75
28	1629	203.86315	-1.9282055	-60.459743	391.13849	190.77099	75
29	1629	204.29985	-1.478876	-92.168846	342.46087	167.02933	75
30	1629	204.7366	-0.9707443	-128.0364	290.21795	141.54875	75
31	1629	205.17335	-0.38889012	-167.79013	233.64996	113.9587	75
32	1629	205.4165	-0.038636325	-191.01724	200.65247	97.864751	75



Name: Sheet Pile Model: Undrained (Phi=0) Unit Weight: 0.1 pcf Cohesion: 1e+012 psf
Name: EMBANKMENT FILL, EL. +3.6 TO 0 (S-Case) Model: Mohr-Coulomb Unit Weight: 110 pcf Cohesion: 75 psf Phi: 26 °
Name: FILL2, EL.0 TO -2.5/-3.5 (S-Case) Model: Mohr-Coulomb Unit Weight: 94 pcf Cohesion: 75 psf Phi: 26 °
Name: BEACH SAND, EL. -7 TO -50 (S-Case) Model: Mohr-Coulomb Unit Weight: 122 pcf Cohesion: 0 psf Phi: 33 °
Name: BAY SOUND CLAY, EL. -50 TO -70 (S-Case) Model: Mohr-Coulomb Unit Weight: 102 pcf Cohesion: 0 psf Phi: 26 °
Name: MARSH, CL (S-Case) AWT Model: Spatial Mohr-Coulomb Weight Fn: Marsh Cohesion: 75 psf Phi: 24 °
Name: MARSH, Toe (S-Case) AWT Model: Mohr-Coulomb Unit Weight: 100 pcf Cohesion: 75 psf Phi: 24 °
Name: MARSH, CL (S-Case) BWT Model: Spatial Mohr-Coulomb Weight Fn: Marsh Cohesion: 0 psf Phi: 24 °
Name: MARSH, Toe (S-Case) BWT Model: Mohr-Coulomb Unit Weight: 100 pcf Cohesion: 0 psf Phi: 24 °

GENERAL NOTES

CLASSIFICATION STRATIFICATION
SHEAR STRENGTHS AND UNIT WEIGHTS OF
THE SOIL WERE BASED ON THE RESULTS OF
UNDISTURBED BORINGS AND CPT DATA. SEE
BOTH BORING AND CPT DATA PLATES.

WHERE INDICATED, SHEAR STRENGTHS BETWEEN
VERTICALS WERE ASSUMED TO VARY LINEARLY
BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

Hw IS CANAL WATER LEVEL

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 1D,
PROTECTED SIDE STABILITY ANALYSIS,
CASE: NWL S Case P/S (Entry/Exit)
STA. 11+00 TO 14+20 WEST
ORLEANS PARISH, LOUISIANA

NWL S Case P/S (Entry/Exit)

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File Information

Created By: [Liljegren, James](#)
Revision Number: [602](#)
Last Edited By: [Castro, Felix R MVR](#)
Date: [6/20/2013](#)
Time: [2:10:28 PM](#)
File Name: [Reach 1D.gsz](#)
Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix F NWL\](#)
Last Solved Date: [6/20/2013](#)
Last Solved Time: [2:11:58 PM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Strength Units: [psf](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

NWL S Case P/S (Entry/Exit)

Kind: [SLOPE/W](#)
Parent: [Normal Water Level +0.40ft \(seepage\)](#)
Method: [Spencer](#)
Settings
 PWP Conditions Source: [Parent Analysis](#)
Slip Surface
 Direction of movement: [Left to Right](#)
 Use Passive Mode: [No](#)
 Slip Surface Option: [Entry and Exit](#)
 Critical slip surfaces saved: [1](#)
 Optimize Critical Slip Surface Location: [Yes](#)
Tension Crack
 Tension Crack Option: [Tension Crack Line](#)
 Percentage Wet: [0](#)
 Tension Crack Fluid Unit Weight: [62.4 pcf](#)
FOS Distribution
 FOS Calculation Option: [Constant](#)

Advanced

Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 2000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

Sheet Pile

Model: Undrained (Phi=0)
Unit Weight: 0.1 pcf
Cohesion: 1e+012 psf

EMBANKMENT FILL, EL. +3.6 TO 0 (S-Case)

Model: Mohr-Coulomb
Unit Weight: 110 pcf
Cohesion: 75 psf
Phi: 26 °
Phi-B: 0 °

FILL2, EL.0 TO -2.5/-3.5 (S-Case)

Model: Mohr-Coulomb
Unit Weight: 94 pcf
Cohesion: 75 psf
Phi: 26 °
Phi-B: 0 °

BEACH SAND, EL. -7 TO -50 (S-Case)

Model: Mohr-Coulomb
Unit Weight: 122 pcf
Cohesion: 0 psf
Phi: 33 °
Phi-B: 0 °

BAY SOUND CLAY, EL. -50 TO -70 (S-Case)

Model: Mohr-Coulomb
Unit Weight: 102 pcf
Cohesion: 0 psf
Phi: 26 °
Phi-B: 0 °

MARSH, CL (S-Case) AWT

Model: Spatial Mohr-Coulomb
Weight Fn: Marsh
Cohesion: 75 psf
Phi: 24 °
Phi-B: 0 °

MARSH, Toe (S-Case) AWT

Model: Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion: 75 psf
Phi: 24 °
Phi-B: 0 °

MARSH, CL (S-Case) BWT

Model: Spatial Mohr-Coulomb
Weight Fn: Marsh
Cohesion: 0 psf
Phi: 24 °
Phi-B: 0 °

MARSH, Toe (S-Case) BWT

Model: Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion: 0 psf
Phi: 24 °
Phi-B: 0 °

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (195, -3.05415) ft
Left-Zone Right Coordinate: (225, 0.86978) ft
Left-Zone Increment: 15
Right Projection: Range
Right-Zone Left Coordinate: (230, 0.14216) ft
Right-Zone Right Coordinate: (270, -3.77597) ft
Right-Zone Increment: 15
Radius Increments: 15

Slip Surface Limits

Left Coordinate: (120, -4) ft
Right Coordinate: (310.02424, -3.79313) ft

Tension Crack Line



	X (ft)	Y (ft)
	200	0
	225	0

Unit Weight Functions

Marsh

Model: Spline Data Point Function

Function: Unit Weight vs. X

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 100

Data Points: X (ft), Unit Weight (pcf)

Data Point: (192.53, 100)

Data Point: (208.3, 94)

Data Point: (241.1, 100)

Regions

	Material	Points	Area (ft²)
Region 1	EMBANKMENT FILL, EL. +3.6 TO 0 (S-Case)	18,4,5,23	71.595
Region 2	BEACH SAND, EL. -7 TO -50 (S-Case)	15,20,16,17,33,30,13,28	1720
Region 3	BEACH SAND, EL. -7 TO -50 (S-Case)	17,33,31,12,25,9,8,26,15,20,16	6450
Region 4	BAY SOUND CLAY, EL. -50 TO -70 (S-Case)	12,31,32,11,27,10,9,25	3800
Region 5	Sheet Pile	14,19,18,23,22,3	13.075
Region 6	FILL2, EL.0 TO -2.5/-3.5 (S-Case)	24,3,22,23,5,6	90.54
Region 7	MARSH, Toe (S-Case) BWT	1,36,28,13,30,29,34,35	199.2515
Region 8	MARSH, CL (S-Case) BWT	28,36,24,15	26.145
Region 9	FILL2, EL.0 TO -2.5/-3.5 (S-Case)	2,21,3,24,36	6.9625
Region 10	MARSH, CL (S-Case) BWT	15,26,37,24	130.12897
Region 11	MARSH, CL (S-Case) AWT	24,6,7,37	41.181029
Region 12	MARSH, Toe (S-Case) AWT	7,38,39,40,37	100.50134
Region 13	MARSH, Toe (S-Case) BWT	37,26,8,40	139.20429

Points

	X (ft)	Y (ft)
Point 1	182	-5.4
Point 2	195.3	-3
Point 3	200	-1.6
Point 4	208.3	3.3
Point 5	235.1	-0.6
Point 6	235.5	-2.3
Point 7	241.1	-2.5
Point 8	310	-7
Point 9	310	-50

Point 10	310	-70
Point 11	182	-70
Point 12	182	-50
Point 13	182	-7
Point 14	200	14.1
Point 15	200	-7
Point 16	200	-28.5
Point 17	182	-28.5
Point 18	201	3.6
Point 19	200.5	14.1
Point 20	200	-23.5
Point 21	199.1	-1.6
Point 22	201	-1.6
Point 23	201	0
Point 24	200	-3.5
Point 25	200	-50
Point 26	241.1	-7
Point 27	200	-70
Point 28	192.53	-7
Point 29	120	-4
Point 30	120	-7
Point 31	120	-50
Point 32	120	-70
Point 33	120	-28.5
Point 34	140	-3.7
Point 35	160	-4.2
Point 36	192.53	-3.5
Point 37	241.1	-4.16769
Point 38	270.59629	-3.8023
Point 39	310.02424	-3.79313
Point 40	309.98305	-5.79085

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	2.79	(234.776, 8.389)	10.53326	(221.724, 1.34657)	(245.464, -2.69268)
2	3690	2.90	(234.776, 8.389)	15.181	(222.124, 1.28824)	(245.165, -2.67948)

Slices of Slip Surface: **Optimized**

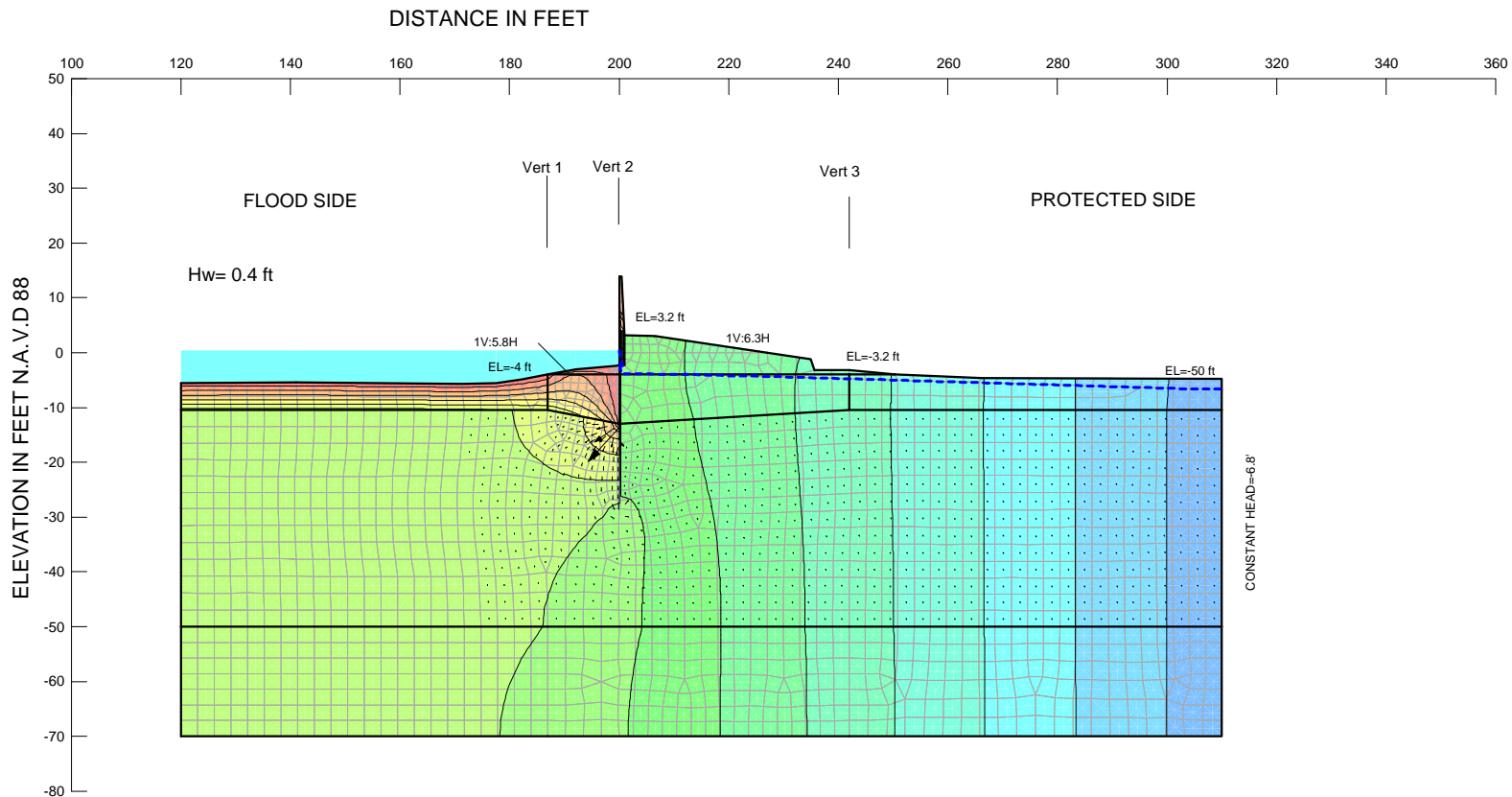
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	221.9089	-0.18557935	-229.40717	112.57595	54.906958	75
2	Optimized	222.39115	-0.668524	-199.96895	145.04798	70.744627	75
3	Optimized	222.98505	-1.2632546	-163.70398	182.15771	88.84425	75
4	Optimized	223.608	-1.83617	-128.80014	228.32858	111.36329	75
5	Optimized	224.26	-2.38727	-95.288206	262.60188	128.07949	75
6	Optimized	225.0044	-2.97585	-59.482948	310.84007	138.39492	75
7	Optimized	225.83725	-3.59899	-21.561088	351.32151	156.41842	75

8	Optimized	226.64655	-4.1024895	8.9173278	421.45522	183.6737	0
9	Optimized	227.4179	-4.480284	31.57569	445.25598	184.18233	0
10	Optimized	228.1709	-4.8490945	53.69358	468.60828	184.73193	0
11	Optimized	228.88995	-5.1662535	72.62346	498.45607	189.59289	0
12	Optimized	229.57505	-5.43176	88.362172	513.56327	189.31173	0
13	Optimized	230.26015	-5.6972665	104.08319	528.72492	189.06268	0
14	Optimized	231.01755	-5.9505565	118.94145	552.77623	193.15569	0
15	Optimized	231.84725	-6.19163	132.95702	563.8637	191.85201	0
16	Optimized	232.67695	-6.4327035	146.94945	575.02061	190.58956	0
17	Optimized	233.4265	-6.6217195	157.77511	592.6958	193.63917	0
18	Optimized	234.0959	-6.758679	165.45896	596.31087	191.82763	0
19	Optimized	234.7653	-6.8956385	173.14281	599.96985	190.03564	0
20	Optimized	235.18335	-6.981169	177.93607	571.43395	175.19654	0
21	Optimized	235.38335	-6.9746085	177.26579	536.67007	160.0171	0
22	Optimized	235.54685	-6.9415185	174.98334	483.32568	137.28286	0
23	Optimized	236.0175	-6.787545	164.75513	480.47532	140.56768	0
24	Optimized	236.86515	-6.498555	145.61651	447.43496	134.37823	0
25	Optimized	237.71285	-6.209565	126.4779	414.29411	128.14404	0
26	Optimized	238.59365	-5.904555	106.28658	380.15827	121.93553	0
27	Optimized	239.5076	-5.583525	85.044748	343.09836	114.89287	0
28	Optimized	240.5323	-5.2135105	60.60248	301.65319	107.32269	0
29	Optimized	241.56255	-4.8333205	35.514742	256.79734	98.521361	0
30	Optimized	242.5983	-4.431005	9.0319669	210.74859	89.810027	0
31	Optimized	243.7429	-3.8405	-29.324214	172.08301	76.616293	75
32	Optimized	244.88925	-3.0871515	-77.84152	77.827178	34.650892	75

Slices of Slip Surface: 3690

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	3690	222.25325	-0.1881123	-229.66274	91.373887	44.566022	75
2	3690	222.71565	-0.8133398	-191.35758	137.96879	67.291874	75
3	3690	223.38275	-1.6297445	-141.37266	197.98707	96.564744	75
4	3690	224.0498	-2.3424045	-97.830373	251.89977	122.85973	75
5	3690	224.7607	-3.00743	-57.224093	307.04421	136.70489	75
6	3690	225.5155	-3.6298645	-19.255813	357.84035	159.32079	75
7	3690	226.27655	-4.180057	14.206308	417.58425	179.59543	0
8	3690	227.0438	-4.66667	43.671883	458.58673	184.73199	0
9	3690	227.81105	-5.0920685	69.306103	494.13875	189.14768	0
10	3690	228.57835	-5.461923	91.468576	524.67284	192.87497	0
11	3690	229.3456	-5.780602	110.43337	550.52388	195.94092	0
12	3690	230.11285	-6.051508	126.38468	571.9558	198.38104	0
13	3690	230.8801	-6.2772985	139.51996	589.15566	200.19071	0
14	3690	231.64735	-6.4600375	149.96771	602.25575	201.37161	0
15	3690	232.4146	-6.601304	157.80504	611.3674	201.93897	0
16	3690	233.18185	-6.702266	163.11848	616.53211	201.87276	0
17	3690	233.9491	-6.7637315	165.96876	617.79214	201.16473	0
18	3690	234.71635	-6.786182	166.37092	615.13578	199.80299	0
19	3690	235.3	-6.780788	165.28399	532.25777	163.38726	0

20	3690	235.9	-6.744178	162.21584	449.42501	127.87376	0
21	3690	236.7	-6.6633515	156.11764	443.81501	128.09112	0
22	3690	237.5	-6.539247	147.31796	433.77639	127.53951	0
23	3690	238.3	-6.3707695	135.75973	419.09706	126.14991	0
24	3690	239.1	-6.156372	121.31614	399.48655	123.84945	0
25	3690	239.9	-5.8939795	103.88435	374.58983	120.52584	0
26	3690	240.7	-5.580877	83.290254	343.95567	116.05572	0
27	3690	241.45535	-5.237078	60.838532	308.84825	110.42104	0
28	3690	242.1661	-4.864755	36.662803	269.39799	103.62038	0
29	3690	242.87685	-4.442276	9.3603638	223.75642	95.455274	0
30	3690	243.55435	-3.9894925	-19.782407	196.4947	87.485075	75
31	3690	244.19865	-3.505875	-50.799817	139.41541	62.071739	75
32	3690	244.84295	-2.965088	-85.390139	72.464029	32.263064	75



Name: BEACH SAND, EL. -10.5/-13 TO -50 Model: Saturated Only K-Sat: 0.00049 ft/sec K-Ratio: 1
 Name: BAY SOUND CLAY, EL. -50 TO -70 Model: Saturated Only K-Sat: 3.28e-008 ft/sec K-Ratio: 1
 Name: Sheet Pile Model: Saturated Only K-Sat: 1e-010 ft/sec K-Ratio: 1
 Name: MARSH, CL (S Case) AWT Model: Saturated Only K-Sat: 3.28e-007 ft/sec K-Ratio: 1
 Name: EMBANKMENT FILL, EL. +3.2 TO -4.0 Model: Saturated Only K-Sat: 3.28e-008 ft/sec K-Ratio: 1
 Name: MARSH, Toe (S Case) BWT Model: Saturated Only K-Sat: 3.28e-007 ft/sec K-Ratio: 1

GENERAL NOTES

CLASSIFICATION STRATIFICATION
 SHEAR STRENGTHS AND UNIT WEIGHTS OF
 THE SOIL WERE BASED ON THE RESULTS OF
 UNDISTURBED BORINGS AND CPT DATA. SEE
 BOTH BORING AND CPT DATA PLATES.

WHERE INDICATED, SHEAR STRENGTHS BETWEEN
 VERTICALS WERE ASSUMED TO VARY LINEARLY
 BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

Hw IS CANAL WATER LEVEL

LAKE PONTCHARTRAIN, LA. AND VICINITY
 HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 2,
 PROTECTED SIDE STABILITY ANALYSIS,
 CASE: Normal Water Level +0.4ft (seepage)
 STA. 14+20 TO 21+75 WEST
 ORLEANS PARISH, LOUISIANA

Normal Water Level +0.4ft (seepage)

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File Information

Created By: [Moraille, Jacques](#)
Revision Number: [479](#)
Last Edited By: [Castro, Felix R MVR](#)
Date: [6/24/2013](#)
Time: [2:41:30 PM](#)
File Name: [Reach 2.gsz](#)
Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix F NWL\](#)
Last Solved Date: [6/24/2013](#)
Last Solved Time: [2:41:48 PM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Mass(M) Units: [lbs](#)
Mass Flux Units: [lbs/sec](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

Normal Water Level +0.4ft (seepage)

Kind: [SEEP/W](#)
Method: [Steady-State](#)
Settings
 Include Air Flow: [No](#)
Control
 Apply Runoff: [No](#)
Convergence
 Convergence Type: [Head Vector Norm](#)
 Maximum Number of Iterations: [500](#)
 Tolerance: [0.001](#)
 Maximum Change in K: [0.1](#)
 Rate of Change in K: [1.02](#)
 Minimum Change in K: [1e-005](#)
 Equation Solver: [Parallel Direct](#)
 Potential Seepage Max # of Reviews: [10](#)
Time

Starting Time: 0 sec

Duration: 0 sec

Ending Time: 0 sec

Materials

BEACH SAND, EL. -10.5/-13 TO -50

Model: Saturated Only

Hydraulic

K-Sat: 0.00049 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

BAY SOUND CLAY, EL. -50 TO -70

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-008 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

Sheet Pile

Model: Saturated Only

Hydraulic

K-Sat: 1e-010 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

MARSH, CL (S Case) AWT

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-007 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

EMBANKMENT FILL, EL. +3.2 TO -4.0

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-008 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

MARSH, Toe (S Case) BWT

Model: Saturated Only
Hydraulic
K-Sat: 3.28e-007 ft/sec
Volumetric Water Content: 0 ft³/ft³
Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

Boundary Conditions

Drainage

Review: true
Type: Total Flux (Q) 0

Curb

Type: Head (H) -6.8

Normal Water 0.4ft

Type: Head (H) 0.4

Regions

	Material	Points	Area (ft²)
Region 1	BEACH SAND, EL. -10.5/-13 TO -50	14,10,31,39,29,7,6,28,18,17,13	6012.5
Region 2	Sheet Pile	12,16,15,25,24,3,41,4	13.525
Region 3	BAY SOUND CLAY, EL. -50 TO -70	9,10,31,32	1338
Region 4	BAY SOUND CLAY, EL. -50 TO -70	29,7,8,33	1360
Region 5	EMBANKMENT FILL, EL. +3.2 TO -4.0	25,15,34,35	47.8
Region 6	MARSH, Toe (S Case) BWT	11,1,19,20,21,2,27,30	339.72
Region 7	EMBANKMENT FILL, EL. +3.2 TO -4.0	27,22,43,3,26	13.265015
Region 8	BEACH SAND, EL. -10.5/-13 TO -50	14,13,17,18,30,11	1423.625
Region 9	MARSH, CL (S Case) AWT	27,26,18,30	101.525
Region 10	BAY SOUND CLAY, EL. -50 TO -70	32,31,39,29,33,38	1102
Region 11	EMBANKMENT FILL, EL. +3.2 TO -4.0	36,5,37	3.337144
Region 12	EMBANKMENT FILL, EL. +3.2 TO -4.0	25,35,44,45,5,36,46,26,3,24	139.62263
Region 13	MARSH, CL (S Case) AWT	26,46,47,28,18	314.68655
Region 14	MARSH, CL (S Case) AWT	46,36,47	10.84988
Region 15	MARSH, Toe (S Case) BWT	36,37,48,49,50,47	82.993828
Region 16	MARSH, Toe (S Case) BWT	47,28,6,50	323.33001

Lines

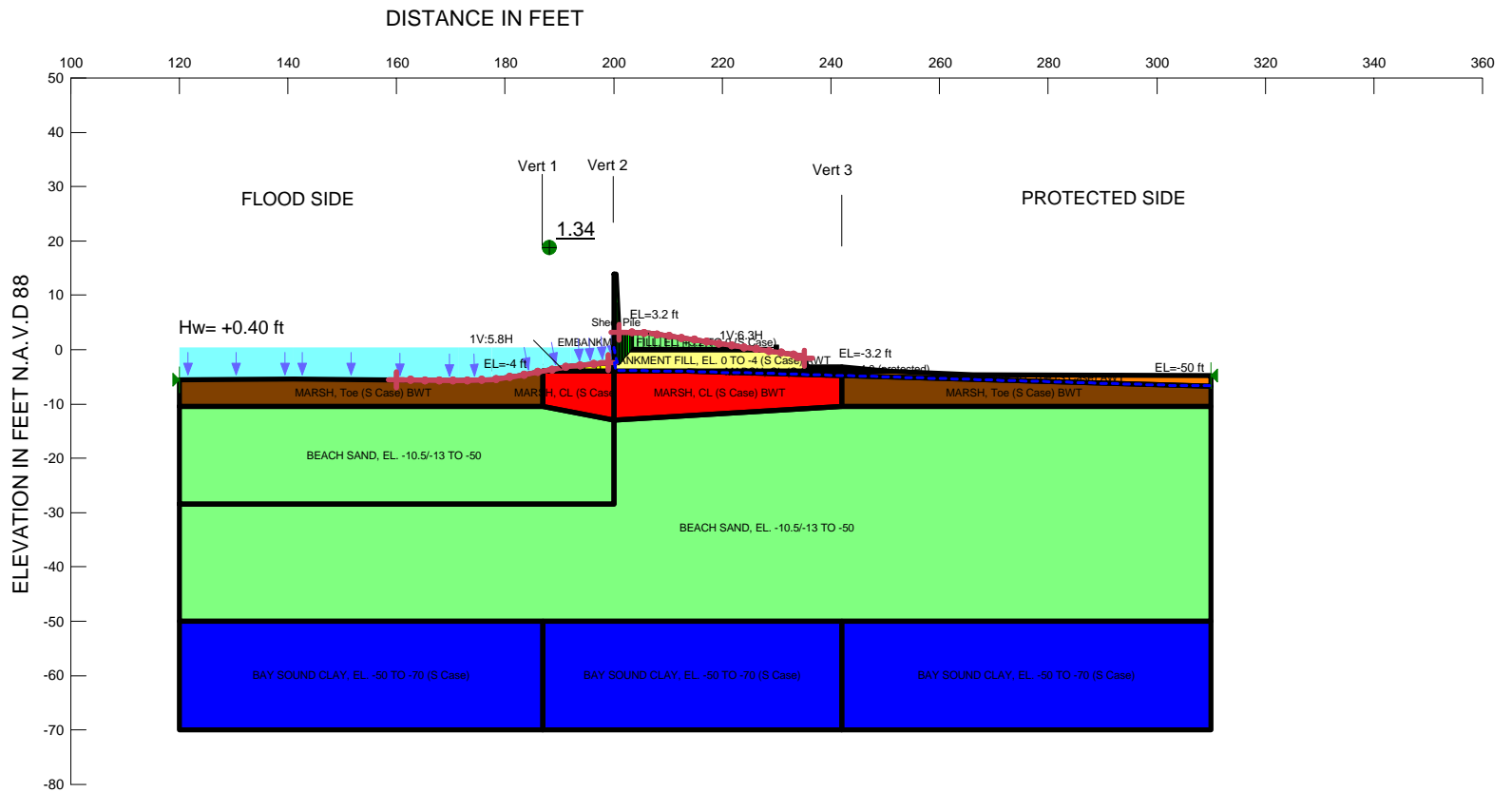
	Start Point	End Point	Hydraulic Boundary	Left Side Material	Right Side Material
Line 1	13	14			
Line 2	14	10			
Line 3	7	6	Curb		
Line 4	12	16			
Line 5	16	15	Drainage		
Line 6	17	13		Sheet Pile	
Line 7	12	4			
Line 8	24	3		Sheet Pile	
Line 9	24	25			
Line 10	25	15			
Line 11	26	3	Normal Water 0.4ft		Sheet Pile
Line 12	18	28			
Line 13	28	6			
Line 14	29	7			
Line 15	18	30			
Line 16	30	11			
Line 17	10	31			
Line 18	25	35			
Line 19	9	10			
Line 20	32	9			
Line 21	7	8	Curb		
Line 22	8	33			
Line 23	15	34	Drainage		
Line 24	34	35	Drainage		
Line 25	17	18			Sheet Pile
Line 26	11	1			
Line 27	19	20	Normal Water 0.4ft		
Line 28	20	21	Normal Water 0.4ft		
Line 29	21	2	Normal Water 0.4ft		
Line 30	2	27	Normal Water 0.4ft		
Line 31	27	22	Normal Water 0.4ft		
Line 32	11	14			
Line 33	27	30			
Line 34	26	18	Normal Water 0.4ft	Sheet Pile	
Line 35	27	26			
Line 36	31	32			
Line 37	33	29			
Line 38	36	37			
Line 39	36	5			
Line 40	5	37	Drainage		
Line 41	19	1	Normal Water 0.4ft		
Line 42	33	38			
Line 43	38	32			
Line 44	29	39			
Line 45	39	31			
Line 46	3	41	Normal Water 0.4ft		
Line 47	41	4	Normal Water 0.4ft		

Line 48	22	43	Normal Water 0.4ft		
Line 49	43	3			
Line 50	35	44			
Line 51	44	45			
Line 52	45	5			
Line 53	26	46			
Line 54	46	36			
Line 55	46	47			
Line 56	47	28			
Line 57	36	47			
Line 58	37	48			
Line 59	48	49			
Line 60	49	50			
Line 61	50	47			
Line 62	6	50			

Points

	X (ft)	Y (ft)
Point 1	120	-5.5
Point 2	182.2	-4.9
Point 3	200	-2.3
Point 4	200	3.5
Point 5	242	-3.2
Point 6	310	-10.5
Point 7	310	-50
Point 8	310	-70
Point 9	120	-70
Point 10	120	-50
Point 11	120	-10.5
Point 12	200	13.9
Point 13	200	-28.5
Point 14	120	-28.5
Point 15	201	3.2
Point 16	200.5	13.9
Point 17	200	-23.5
Point 18	200	-13
Point 19	141	-5.4
Point 20	171.3	-5.7
Point 21	177.6	-5.5
Point 22	192.1	-3
Point 23	198.9	-2.3
Point 24	201	-2.3
Point 25	201	0
Point 26	200	-4
Point 27	186.9	-4
Point 28	242	-10.5
Point 29	242	-50

Point 30	186.9	-10.5
Point 31	186.9	-50
Point 32	186.9	-70
Point 33	242	-70
Point 34	206.5	3
Point 35	227	0
Point 36	242	-4
Point 37	250.34286	-4
Point 38	200	-70
Point 39	200	-50
Point 40	120	0
Point 41	200	0
Point 42	199	0
Point 43	199.5	-2.3443
Point 44	235.00257	-1.14675
Point 45	235.6446	-3.13033
Point 46	213.63838	-4
Point 47	242.01121	-4.76511
Point 48	266.22581	-4.66277
Point 49	310.03645	-4.729
Point 50	310.01658	-6.72596



Name: EMBANKMENT FILL, EL. +3.2 TO 0 (S Case) Model: Mohr-Coulomb Unit Weight: 114 pcf Cohesion: 75 psf Phi: 26 °
 Name: Fill, EL. -3.2 to -4.0 (protected) Model: Spatial Mohr-Coulomb Unit Weight: 104 pcf Cohesion Fn: Fill Phi: 0 °
 Name: BEACH SAND, EL. -10.5/-13 TO -50 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand
 Name: Sheet Pile Model: Undrained (Phi=0) Unit Weight: 0.1 pcf Cohesion: 1e+005 psf
 Name: MARSH, CL (S Case) AWT Model: Spatial Mohr-Coulomb Weight Fn: Marsh Cohesion: 75 psf Phi: 24 °
 Name: EMBANKMENT FILL, EL. 0 TO -4 (S Case) BWT Model: Mohr-Coulomb Unit Weight: 104 pcf Cohesion: 0 psf Phi: 26 °
 Name: MARSH, Toe (S Case) AWT Model: Mohr-Coulomb Unit Weight: 83 pcf Cohesion: 75 psf Phi: 24 °
 Name: EMBANKMENT FILL, EL. 0 TO -4 (S Case) AWT Model: Mohr-Coulomb Unit Weight: 104 pcf Cohesion: 75 psf Phi: 26 °
 Name: BAY SOUND CLAY, EL. -50 TO -70 (S Case) Model: Mohr-Coulomb Unit Weight: 102 pcf Cohesion: 0 psf Phi: 26 °
 Name: MARSH, CL (S Case) BWT Model: Spatial Mohr-Coulomb Weight Fn: Marsh Cohesion: 0 psf Phi: 24 °
 Name: MARSH, Toe (S Case) BWT Model: Mohr-Coulomb Unit Weight: 83 pcf Cohesion: 0 psf Phi: 24 °

GENERAL NOTES

CLASSIFICATION STRATIFICATION
 SHEAR STRENGTHS AND UNIT WEIGHTS OF
 THE SOIL WERE BASED ON THE RESULTS OF
 UNDISTURBED BORINGS AND CPT DATA. SEE
 BOTH BORING AND CPT DATA PLATES.

WHERE INDICATED, SHEAR STRENGTHS BETWEEN
 VERTICALS WERE ASSUMED TO VARY LINEARLY
 BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

Hw IS CANAL WATER LEVEL

LAKE PONTCHARTRAIN, LA. AND VICINITY
 HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 2,
 PROTECTED SIDE STABILITY ANALYSIS,
 CASE: NWL S Case F/S (Entry/Exit)
 STA. 14+20 TO 21+75 WEST
 ORLEANS PARISH, LOUISIANA

NWL S Case F/S (Entry/Exit)

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File Information

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Revision Number: [479](#)
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File Name: [Reach 2.gsz](#)
Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix F NWL\](#)
Last Solved Date: [6/24/2013](#)
Last Solved Time: [2:45:26 PM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Strength Units: [psf](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

NWL S Case F/S (Entry/Exit)

Kind: [SLOPE/W](#)
Parent: [Normal Water Level +0.4ft \(seepage\)](#)
Method: [Spencer](#)
Settings
 PWP Conditions Source: [Parent Analysis](#)
Slip Surface
 Direction of movement: [Right to Left](#)
 Use Passive Mode: [No](#)
 Slip Surface Option: [Entry and Exit](#)
 Critical slip surfaces saved: [1](#)
 Optimize Critical Slip Surface Location: [Yes](#)
Tension Crack
 Tension Crack Option: [Tension Crack Line](#)
 Percentage Wet: [0](#)
 Tension Crack Fluid Unit Weight: [62.4 pcf](#)
FOS Distribution
 FOS Calculation Option: [Constant](#)

Advanced

Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 4000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

EMBANKMENT FILL, EL. +3.2 TO 0 (S Case)

Model: Mohr-Coulomb
Unit Weight: 114 pcf
Cohesion: 75 psf
Phi: 26 °
Phi-B: 0 °

Fill, EL. -3.2 to -4.0 (protected)

Model: Spatial Mohr-Coulomb
Unit Weight: 104 pcf
Cohesion Fn: Fill
Phi: 0 °
Phi-B: 0 °

BEACH SAND, EL. -10.5/-13 TO -50

Model: Shear/Normal Fn.
Unit Weight: 122 pcf
Strength Function: Sand
Phi-B: 0 °

Sheet Pile

Model: Undrained (Phi=0)
Unit Weight: 0.1 pcf
Cohesion: 1e+005 psf

MARSH, CL (S Case) AWT

Model: Spatial Mohr-Coulomb
Weight Fn: Marsh
Cohesion: 75 psf
Phi: 24 °
Phi-B: 0 °

EMBANKMENT FILL, EL. 0 TO -4 (S Case) BWT

Model: [Mohr-Coulomb](#)
Unit Weight: [104 pcf](#)
Cohesion: [0 psf](#)
Phi: [26 °](#)
Phi-B: [0 °](#)

MARSH, Toe (S Case) AWT

Model: [Mohr-Coulomb](#)
Unit Weight: [83 pcf](#)
Cohesion: [75 psf](#)
Phi: [24 °](#)
Phi-B: [0 °](#)

EMBANKMENT FILL, EL. 0 TO -4 (S Case) AWT

Model: [Mohr-Coulomb](#)
Unit Weight: [104 pcf](#)
Cohesion: [75 psf](#)
Phi: [26 °](#)
Phi-B: [0 °](#)

BAY SOUND CLAY, EL. -50 TO -70 (S Case)

Model: [Mohr-Coulomb](#)
Unit Weight: [102 pcf](#)
Cohesion: [0 psf](#)
Phi: [26 °](#)
Phi-B: [0 °](#)

MARSH, CL (S Case) BWT

Model: [Spatial Mohr-Coulomb](#)
Weight Fn: [Marsh](#)
Cohesion: [0 psf](#)
Phi: [24 °](#)
Phi-B: [0 °](#)

MARSH, Toe (S Case) BWT

Model: [Mohr-Coulomb](#)
Unit Weight: [83 pcf](#)
Cohesion: [0 psf](#)
Phi: [24 °](#)
Phi-B: [0 °](#)

Slip Surface Entry and Exit

Left Projection: [Range](#)
Left-Zone Left Coordinate: [\(160, -5.58812\) ft](#)
Left-Zone Right Coordinate: [\(199, -2.3886\) ft](#)
Left-Zone Increment: [15](#)
Right Projection: [Range](#)

Right-Zone Left Coordinate: (201, 3.2) ft
Right-Zone Right Coordinate: (235.14838, -1.59725) ft
Right-Zone Increment: 15
Radius Increments: 15

Slip Surface Limits

Left Coordinate: (120, -5.5) ft
Right Coordinate: (310.03645, -4.729) ft

Tension Crack Line

	X (ft)	Y (ft)
	200	0.4
	230	0.4

Cohesion Functions

Fill

Model: Spline Data Point Function

Function: Cohesion vs. X

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 150

Data Points: X (ft), Cohesion (psf)

Data Point: (186.9, 150)

Data Point: (200, 400)

Data Point: (242, 150)

Shear/Normal Strength Functions

Sand

Model: Spline Data Point Function

Function: Shear Stress vs. Normal Stress

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 0

Data Points: Normal Stress (psf), Shear Stress (psf)

Data Point: (-10000, 0)

Data Point: (0, 0)

Data Point: (10000, 6494)

Estimation Properties

Intact Rock Param.: 10

Geological Strength: 100

Disturbance Factor: 0

SigmaC: 600000 psf
Sigma3: 300000 psf
Num. Points: 20

Unit Weight Functions

Marsh

Model: Spline Data Point Function

Function: Unit Weight vs. X

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 83

Data Points: X (ft), Unit Weight (pcf)

Data Point: (186.9, 83)

Data Point: (200, 104)

Data Point: (242, 83)

Regions

	Material	Points	Area (ft ²)
Region 1	BEACH SAND, EL. -10.5/-13 TO -50	14,10,31,39,29,7,6,28,18,17,13	6012.5
Region 2	Sheet Pile	12,16,15,25,24,3,41,4	13.525
Region 3	BAY SOUND CLAY, EL. -50 TO -70 (S Case)	9,10,31,32	1338
Region 4	BAY SOUND CLAY, EL. -50 TO -70 (S Case)	29,7,8,33	1360
Region 5	EMBANKMENT FILL, EL. +3.2 TO 0 (S Case)	25,15,34,35	47.8
Region 6	MARSH, Toe (S Case) BWT	11,1,19,20,21,2,27,30	339.72
Region 7	EMBANKMENT FILL, EL. 0 TO -4 (S Case) BWT	27,22,43,3,26	13.265015
Region 8	BEACH SAND, EL. -10.5/-13 TO -50	14,13,17,18,30,11	1423.625
Region 9	MARSH, CL (S Case) BWT	27,26,18,30	101.525
Region 10	BAY SOUND CLAY, EL. -50 TO -70 (S Case)	32,31,39,29,33,38	1102
Region 11	Fill, EL. -3.2 to -4.0 (protected)	36,5,37	3.337144
Region 12	EMBANKMENT FILL, EL. 0 TO -4 (S Case) AWT	25,35,44,45,5,36,46,26,3,24	139.62263
Region 13	MARSH, CL (S Case) BWT	26,46,47,28,18	314.68655
Region 14	MARSH, CL (S Case) AWT	46,36,47	10.84988
Region 15	MARSH, Toe (S Case) AWT	36,37,48,49,50,47	82.993828
Region 16	MARSH, Toe (S Case) BWT	47,28,6,50	323.33001

Points

	X (ft)	Y (ft)
Point 1	120	-5.5
Point 2	182.2	-4.9
Point 3	200	-2.3
Point 4	200	3.5
Point 5	242	-3.2
Point 6	310	-10.5

Point 7	310	-50
Point 8	310	-70
Point 9	120	-70
Point 10	120	-50
Point 11	120	-10.5
Point 12	200	13.9
Point 13	200	-28.5
Point 14	120	-28.5
Point 15	201	3.2
Point 16	200.5	13.9
Point 17	200	-23.5
Point 18	200	-13
Point 19	141	-5.4
Point 20	171.3	-5.7
Point 21	177.6	-5.5
Point 22	192.1	-3
Point 23	198.9	-2.3
Point 24	201	-2.3
Point 25	201	0
Point 26	200	-4
Point 27	186.9	-4
Point 28	242	-10.5
Point 29	242	-50
Point 30	186.9	-10.5
Point 31	186.9	-50
Point 32	186.9	-70
Point 33	242	-70
Point 34	206.5	3
Point 35	227	0
Point 36	242	-4
Point 37	250.34286	-4
Point 38	200	-70
Point 39	200	-50
Point 40	120	0
Point 41	200	0
Point 42	199	0
Point 43	199.5	-2.3443
Point 44	235.00257	-1.14675
Point 45	235.6446	-3.13033
Point 46	213.63838	-4
Point 47	242.01121	-4.76511
Point 48	266.22581	-4.66277
Point 49	310.03645	-4.729
Point 50	310.01658	-6.72596

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
--	--------------	-----	-------------	-------------	------------	-----------

1	Optimized	1.34	(196.886, 9.945)	4.98932	(203.587, 3.10594)	(194.676, -2.77171)
2	3384	1.98	(196.886, 9.945)	13.165	(205.953, 3.01988)	(193.787, -2.85052)

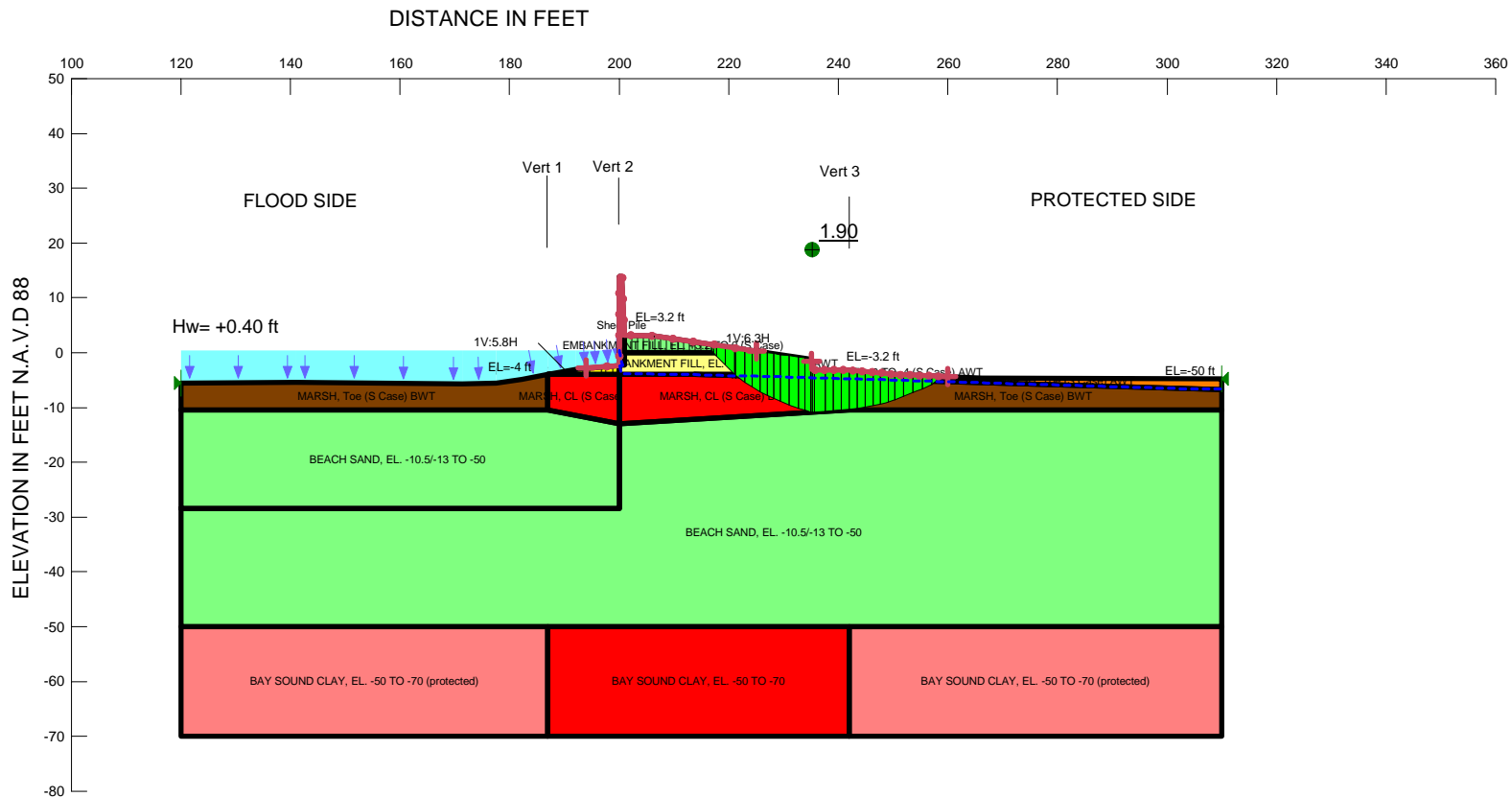
Slices of Slip Surface: **Optimized**

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	194.81385	-2.773945	197.56596	203.208	2.7518065	0
2	Optimized	195.0887	-2.778413	196.94391	204.84131	3.8518193	0
3	Optimized	195.36355	-2.782881	196.45283	206.46008	4.8808637	0
4	Optimized	195.63845	-2.7873495	196.07815	208.07157	5.8495847	0
5	Optimized	195.9133	-2.791818	195.81623	209.67579	6.7597567	0
6	Optimized	196.18815	-2.796286	195.66345	211.26909	7.6113795	0
7	Optimized	196.33685	-2.798845	195.62706	212.80781	8.3796152	0
8	Optimized	196.46025	-2.7969475	195.45967	210.57182	7.3706875	0
9	Optimized	196.6846	-2.7925025	195.16554	210.95508	7.7010752	0
10	Optimized	196.9809	-2.789945	195.02772	212.74591	8.6417388	0
11	Optimized	197.34915	-2.789275	195.09832	214.08733	9.2615601	0
12	Optimized	197.6738	-2.7891675	195.30453	215.49986	9.8499186	0
13	Optimized	197.95475	-2.789622	195.59639	216.61747	10.252665	0
14	Optimized	198.2357	-2.7900765	196.11605	217.71373	10.533892	0
15	Optimized	198.51665	-2.7905315	196.89553	218.79219	10.679714	0
16	Optimized	198.7976	-2.7909865	197.14824	219.9098	11.101556	0
17	Optimized	199.07855	-2.791441	197.04502	221.05945	11.712619	0
18	Optimized	199.3595	-2.7918955	197.24434	222.18062	12.162236	0
19	Optimized	199.625	-2.7923255	198.01976	223.05573	12.210858	0
20	Optimized	199.875	-2.79273	198.81176	224.05573	12.312307	0
21	Optimized	200.0055	-2.792941	194.44932	4467.3299	2084.0231	75
22	Optimized	200.13325	-2.795177	83.219653	63.963531	-9.3918384	75
23	Optimized	200.37775	-2.7996315	-62.168365	71.626723	34.934687	75
24	Optimized	200.62365	-2.8041115	-62.976559	71.846725	35.041989	75
25	Optimized	200.87095	-2.808617	-63.336379	71.777995	35.008467	75
26	Optimized	200.9973	-2.807658	-63.662525	-1.5220381	-0.74234757	75
27	Optimized	201.135	-2.6435645	-74.180787	364.90433	177.97573	75
28	Optimized	201.405	-2.3218015	-94.641332	343.28672	167.43212	75
29	Optimized	201.67165	-2.001995	-114.85634	319.54338	155.85172	75
30	Optimized	201.935	-1.684145	-134.94954	298.29702	145.48918	75
31	Optimized	202.19365	-1.3681775	-154.92852	273.29987	133.29725	75
32	Optimized	202.4476	-1.0540925	-174.72475	252.52819	123.16623	75
33	Optimized	202.7833	-0.63304	-201.26703	221.57647	108.07007	75
34	Optimized	203.1352	-0.184515	-229.53146	189.90186	92.621324	75
35	Optimized	203.3879	0.14107	-250.03752	167.9321	81.905956	75
36	Optimized	203.542	0.34107	-262.63601	151.03143	73.66295	75

Slices of Slip Surface: **3384**

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	3384	193.99105	-2.8965075	203.13511	220.9091	8.6689557	0
2	3384	194.39915	-2.9817485	204.0837	231.04314	13.149	0
3	3384	194.8072	-3.0536235	205.2835	239.34496	16.612887	0

4	3384	195.21525	-3.112353	206.62152	245.94386	19.178784	0
5	3384	195.62335	-3.1581135	208.27972	250.90357	20.789039	0
6	3384	196.03145	-3.1910415	209.94256	254.34615	21.657078	0
7	3384	196.4395	-3.211233	211.4653	256.35349	21.893432	0
8	3384	196.84755	-3.2187465	212.76961	256.9409	21.543777	0
9	3384	197.25565	-3.2136045	213.93582	256.20367	20.615408	0
10	3384	197.6637	-3.1957915	214.61014	254.19348	19.306084	0
11	3384	198.07175	-3.1652555	214.66802	250.89387	17.668529	0
12	3384	198.47985	-3.1219075	213.76138	246.36707	15.902857	0
13	3384	198.8879	-3.06562	211.98095	240.59757	13.957257	0
14	3384	199.29595	-2.9962235	209.20032	233.61217	11.906452	0
15	3384	199.75	-2.902489	205.10476	224.15703	9.2924151	0
16	3384	200.25	-2.7806635	-19.413083	112.77377	55.003443	75
17	3384	200.75	-2.6377975	-73.708524	28.232661	13.769989	75
18	3384	201.20515	-2.48977	-83.956584	558.88163	272.58478	75
19	3384	201.6154	-2.339544	-93.770459	534.41109	260.6497	75
20	3384	202.02565	-2.173571	-104.54098	508.85914	248.18719	75
21	3384	202.4359	-1.9911935	-116.30498	482.17276	235.17137	75
22	3384	202.84615	-1.7916445	-129.10732	454.33691	221.59492	75
23	3384	203.2564	-1.57403	-143.01932	425.31017	207.43763	75
24	3384	203.66665	-1.337303	-158.13207	395.07425	192.69059	75
25	3384	204.0769	-1.0802301	-174.522	363.57645	177.32808	75
26	3384	204.48715	-0.8013473	-192.27589	330.7814	161.33287	75
27	3384	204.8974	-0.49890225	-211.50616	296.62308	144.67274	75
28	3384	205.30765	-0.17077505	-232.3262	261.06256	127.32872	75
29	3384	205.73305	0.2	-255.83102	221.07941	107.82763	75



Name: EMBANKMENT FILL, EL. +3.2 TO 0 (S Case) Model: Mohr-Coulomb Unit Weight: 114 pcf Cohesion: 75 psf Phi: 26 °
 Name: BEACH SAND, EL. -10.5/-13 TO -50 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand
 Name: BAY SOUND CLAY, EL. -50 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 102 pcf Cohesion Spatial Fn: Bay Sound Phi: 0 °
 Name: Sheet Pile Model: Undrained (Phi=0) Unit Weight: 0.1 pcf Cohesion: 1e+005 psf
 Name: MARSH, CL (S Case) AWT Model: Spatial Mohr-Coulomb Weight Fn: Marsh Cohesion: 75 psf Phi: 24 °
 Name: EMBANKMENT FILL, EL. 0 TO -4 (S Case) BWT Model: Mohr-Coulomb Unit Weight: 104 pcf Cohesion: 0 psf Phi: 26 °
 Name: MARSH, Toe (S Case) AWT Model: Mohr-Coulomb Unit Weight: 83 pcf Cohesion: 75 psf Phi: 24 °
 Name: BAY SOUND CLAY, EL. -50 TO -70 (protected) Model: Spatial Mohr-Coulomb Unit Weight: 102 pcf Cohesion Fn: Clay Phi: 0 °
 Name: EMBANKMENT FILL, EL. 0 TO -4 (S Case) AWT Model: Mohr-Coulomb Unit Weight: 104 pcf Cohesion: 75 psf Phi: 26 °
 Name: MARSH, CL (S Case) BWT Model: Spatial Mohr-Coulomb Weight Fn: Marsh Cohesion: 0 psf Phi: 24 °
 Name: MARSH, Toe (S Case) BWT Model: Mohr-Coulomb Unit Weight: 83 pcf Cohesion: 0 psf Phi: 24 °

GENERAL NOTES

CLASSIFICATION STRATIFICATION
 SHEAR STRENGTHS AND UNIT WEIGHTS OF
 THE SOIL WERE BASED ON THE RESULTS OF
 UNDISTURBED BORINGS AND CPT DATA. SEE
 BOTH BORING AND CPT DATA PLATES.

WHERE INDICATED, SHEAR STRENGTHS BETWEEN
 VERTICALS WERE ASSUMED TO VARY LINEARLY
 BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

Hw IS CANAL WATER LEVEL

LAKE PONTCHARTRAIN, LA. AND VICINITY
 HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 2,
 PROTECTED SIDE STABILITY ANALYSIS,
 CASE: NWL S Case P/S (Entry/Exit)
 STA. 14+20 TO 21+75 WEST
 ORLEANS PARISH, LOUISIANA

NWL S Case P/S (Entry/Exit)

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File Information

Created By: [Moraille, Jacques](#)
Revision Number: [480](#)
Last Edited By: [Castro, Felix R MVR](#)
Date: [6/24/2013](#)
Time: [2:51:37 PM](#)
File Name: [Reach 2.gsz](#)
Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix F NWL\](#)
Last Solved Date: [6/24/2013](#)
Last Solved Time: [2:53:38 PM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Strength Units: [psf](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

NWL S Case P/S (Entry/Exit)

Kind: [SLOPE/W](#)
Parent: [Normal Water Level +0.4ft \(seepage\)](#)
Method: [Spencer](#)
Settings
 PWP Conditions Source: [Parent Analysis](#)
Slip Surface
 Direction of movement: [Left to Right](#)
 Use Passive Mode: [No](#)
 Slip Surface Option: [Entry and Exit](#)
 Critical slip surfaces saved: [1](#)
 Optimize Critical Slip Surface Location: [Yes](#)
Tension Crack
 Tension Crack Option: [Tension Crack Line](#)
 Percentage Wet: [0](#)
 Tension Crack Fluid Unit Weight: [62.4 pcf](#)
FOS Distribution
 FOS Calculation Option: [Constant](#)

Advanced

Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 4000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

EMBANKMENT FILL, EL. +3.2 TO 0 (S Case)

Model: Mohr-Coulomb
Unit Weight: 114 pcf
Cohesion: 75 psf
Phi: 26 °
Phi-B: 0 °

BEACH SAND, EL. -10.5/-13 TO -50

Model: Shear/Normal Fn.
Unit Weight: 122 pcf
Strength Function: Sand
Phi-B: 0 °

BAY SOUND CLAY, EL. -50 TO -70

Model: Spatial Mohr-Coulomb
Unit Weight: 102 pcf
Cohesion Spatial Fn: Bay Sound
Phi: 0 °
Phi-B: 0 °

Sheet Pile

Model: Undrained (Phi=0)
Unit Weight: 0.1 pcf
Cohesion: 1e+005 psf

MARSH, CL (S Case) AWT

Model: Spatial Mohr-Coulomb
Weight Fn: Marsh
Cohesion: 75 psf
Phi: 24 °
Phi-B: 0 °

EMBANKMENT FILL, EL. 0 TO -4 (S Case) BWT

Model: [Mohr-Coulomb](#)
Unit Weight: [104 pcf](#)
Cohesion: [0 psf](#)
Phi: [26 °](#)
Phi-B: [0 °](#)

MARSH, Toe (S Case) AWT

Model: [Mohr-Coulomb](#)
Unit Weight: [83 pcf](#)
Cohesion: [75 psf](#)
Phi: [24 °](#)
Phi-B: [0 °](#)

BAY SOUND CLAY, EL. -50 TO -70 (protected)

Model: [Spatial Mohr-Coulomb](#)
Unit Weight: [102 pcf](#)
Cohesion Fn: [Clay](#)
Phi: [0 °](#)
Phi-B: [0 °](#)

EMBANKMENT FILL, EL. 0 TO -4 (S Case) AWT

Model: [Mohr-Coulomb](#)
Unit Weight: [104 pcf](#)
Cohesion: [75 psf](#)
Phi: [26 °](#)
Phi-B: [0 °](#)

MARSH, CL (S Case) BWT

Model: [Spatial Mohr-Coulomb](#)
Weight Fn: [Marsh](#)
Cohesion: [0 psf](#)
Phi: [24 °](#)
Phi-B: [0 °](#)

MARSH, Toe (S Case) BWT

Model: [Mohr-Coulomb](#)
Unit Weight: [83 pcf](#)
Cohesion: [0 psf](#)
Phi: [24 °](#)
Phi-B: [0 °](#)

Slip Surface Entry and Exit

Left Projection: [Range](#)
Left-Zone Left Coordinate: [\(194, -2.83164\) ft](#)
Left-Zone Right Coordinate: [\(225, 0.29268\) ft](#)
Left-Zone Increment: [15](#)
Right Projection: [Range](#)

Right-Zone Left Coordinate: (235.14838, -1.59725) ft
Right-Zone Right Coordinate: (260, -4.40298) ft
Right-Zone Increment: 15
Radius Increments: 15

Slip Surface Limits

Left Coordinate: (120, -5.5) ft
Right Coordinate: (310.03645, -4.729) ft

Tension Crack Line

	X (ft)	Y (ft)
	200	0.4
	225	0.4

Cohesion Functions

Clay

Model: Spline Data Point Function

Function: Cohesion vs. X

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 555

Data Points: X (ft), Cohesion (psf)

Data Point: (186.9, 555)

Data Point: (200, 725)

Data Point: (242, 555)

Shear/Normal Strength Functions

Sand

Model: Spline Data Point Function

Function: Shear Stress vs. Normal Stress

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 0

Data Points: Normal Stress (psf), Shear Stress (psf)

Data Point: (-10000, 0)

Data Point: (0, 0)

Data Point: (10000, 6494)

Estimation Properties

Intact Rock Param.: 10

Geological Strength: 100

Disturbance Factor: 0

SigmaC: 600000 psf
Sigma3: 300000 psf
Num. Points: 20

Unit Weight Functions

Marsh

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 83
Data Points: X (ft), Unit Weight (pcf)
Data Point: (186.9, 83)
Data Point: (200, 104)
Data Point: (242, 83)

Spatial Functions

Bay Sound

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (186.9, -50, 555)
Data Point: (186.9, -70, 725)
Data Point: (200, -50, 700)
Data Point: (200, -70, 865)
Data Point: (242, -50, 555)
Data Point: (242, -70, 725)

Regions

	Material	Points	Area (ft²)
Region 1	BEACH SAND, EL. -10.5/-13 TO -50	14,10,31,39,29,7,6,28,18,17,13	6012.5
Region 2	Sheet Pile	12,16,15,25,24,3,41,4	13.525
Region 3	BAY SOUND CLAY, EL. -50 TO -70 (protected)	9,10,31,32	1338
Region 4	BAY SOUND CLAY, EL. -50 TO -70 (protected)	29,7,8,33	1360
Region 5	EMBANKMENT FILL, EL. +3.2 TO 0 (S Case)	25,15,34,35	47.8
Region 6	MARSH, Toe (S Case) BWT	11,1,19,20,21,2,27,30	339.72
Region 7	EMBANKMENT FILL, EL. 0 TO -4 (S Case) BWT	27,22,43,3,26	13.265015
Region 8	BEACH SAND, EL. -10.5/-13 TO -50	14,13,17,18,30,11	1423.625
Region 9	MARSH, CL (S Case) BWT	27,26,18,30	101.525
Region 10	BAY SOUND CLAY, EL. -50 TO -70	32,31,39,29,33,38	1102
Region 11	EMBANKMENT FILL, EL. 0 TO -4 (S Case) AWT	36,5,37	3.337144
Region 12	EMBANKMENT FILL, EL. 0 TO -4 (S Case) AWT	25,35,44,45,5,36,46,26,3,24	139.62263
Region 13	MARSH, CL (S Case) BWT	26,46,47,28,18	314.68655

Region 14	MARSH, CL (S Case) AWT	46,36,47	10.84988
Region 15	MARSH, Toe (S Case) AWT	36,37,48,49,50,47	82.993828
Region 16	MARSH, Toe (S Case) BWT	47,28,6,50	323.33001

Points

	X (ft)	Y (ft)
Point 1	120	-5.5
Point 2	182.2	-4.9
Point 3	200	-2.3
Point 4	200	3.5
Point 5	242	-3.2
Point 6	310	-10.5
Point 7	310	-50
Point 8	310	-70
Point 9	120	-70
Point 10	120	-50
Point 11	120	-10.5
Point 12	200	13.9
Point 13	200	-28.5
Point 14	120	-28.5
Point 15	201	3.2
Point 16	200.5	13.9
Point 17	200	-23.5
Point 18	200	-13
Point 19	141	-5.4
Point 20	171.3	-5.7
Point 21	177.6	-5.5
Point 22	192.1	-3
Point 23	198.9	-2.3
Point 24	201	-2.3
Point 25	201	0
Point 26	200	-4
Point 27	186.9	-4
Point 28	242	-10.5
Point 29	242	-50
Point 30	186.9	-10.5
Point 31	186.9	-50
Point 32	186.9	-70
Point 33	242	-70
Point 34	206.5	3
Point 35	227	0
Point 36	242	-4
Point 37	250.34286	-4
Point 38	200	-70
Point 39	200	-50
Point 40	120	0
Point 41	200	0

Point 42	199	0
Point 43	199.5	-2.3443
Point 44	235.00257	-1.14675
Point 45	235.6446	-3.13033
Point 46	213.63838	-4
Point 47	242.01121	-4.76511
Point 48	266.22581	-4.66277
Point 49	310.03645	-4.729
Point 50	310.01658	-6.72596

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.90	(239.14, 21.598)	18.68327	(216.86, 1.48388)	(259.26, -4.37212)
2	3304	1.96	(239.14, 21.598)	32.22	(214.875, 1.77444)	(258.267, -4.33067)

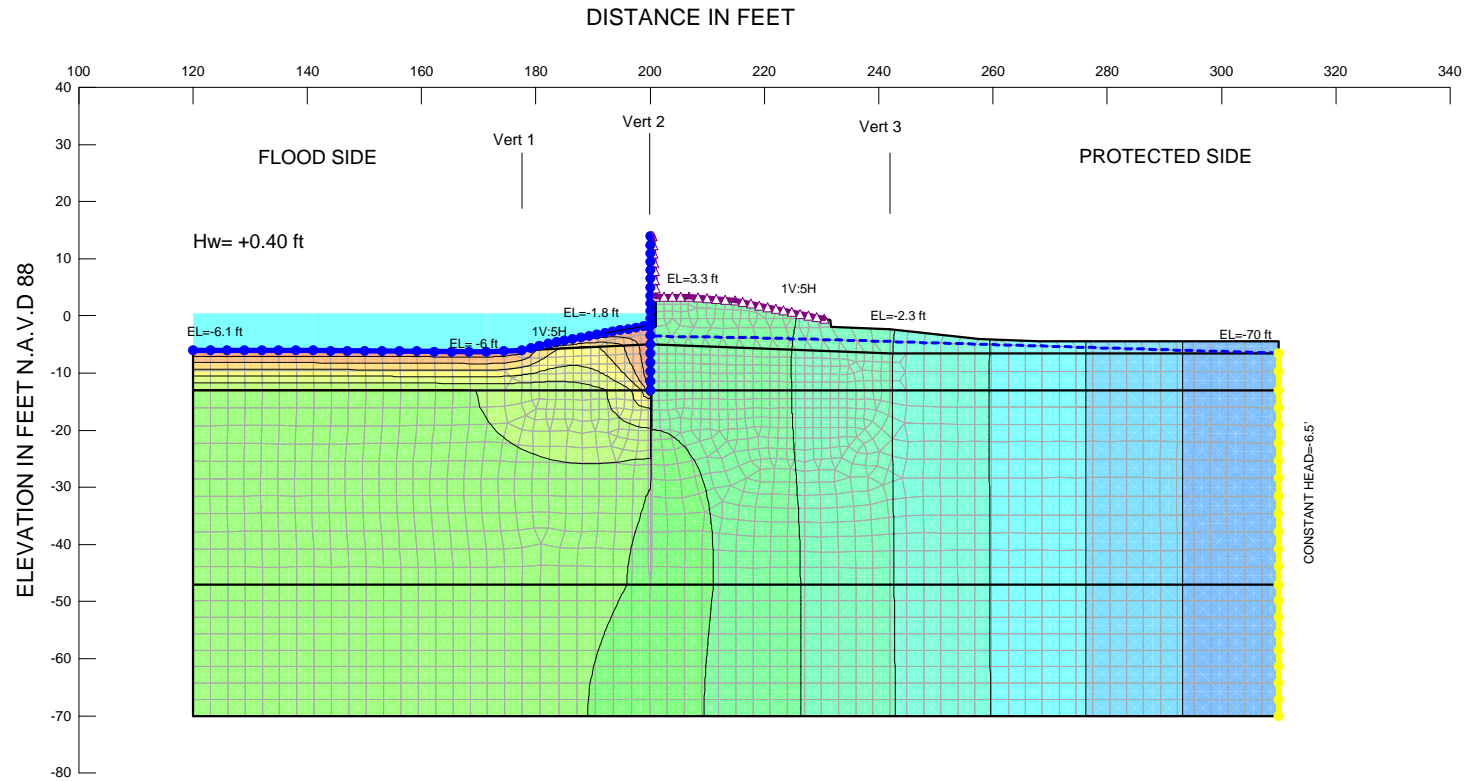
Slices of Slip Surface: Optimized

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	217.0321	0.2	-268.36631	73.335387	35.768058	75
2	Optimized	217.4996	-0.343645	-235.14263	110.02998	53.665209	75
3	Optimized	218.5567	-1.4909	-165.19308	191.85591	93.574381	75
4	Optimized	220.16965	-3.147255	-64.328335	305.74113	149.11991	75
5	Optimized	221.09705	-4.07615	-7.9043394	371.98859	165.61999	75
6	Optimized	222.0233	-4.76475	33.614809	473.69185	195.93492	0
7	Optimized	223.59875	-5.826675	97.372918	553.01629	202.8655	0
8	Optimized	225.0493	-6.725625	151.05489	606.61037	202.82637	0
9	Optimized	226.3873	-7.473555	195.48792	667.72997	210.25571	0
10	Optimized	227.59475	-8.06173	230.11631	698.54144	208.55631	0
11	Optimized	228.7843	-8.64117	264.22412	729.23319	207.03537	0
12	Optimized	230.2149	-9.2467625	299.51248	775.37599	211.86809	0
13	Optimized	231.8865	-9.8785075	335.95896	801.50912	207.27629	0
14	Optimized	233.29235	-10.35744	363.32972	834.04097	209.57415	0
15	Optimized	234.4325	-10.68356	381.62017	841.98454	204.96743	0
16	Optimized	235.09345	-10.87261	392.22762	820.43457	190.65002	0
17	Optimized	235.41445	-10.884385	392.39197	776.9348	171.2095	0
18	Optimized	236.6366	-10.808905	385.48144	687.69494	134.55412	0
19	Optimized	238.35715	-10.677675	374.21012	673.07679	133.06402	0
20	Optimized	239.8143	-10.53774	362.90416	654.27679	129.72745	0
21	Optimized	241.27145	-10.397805	351.62553	635.6954	126.47606	0
22	Optimized	242.69455	-10.26114	340.60901	613.57778	121.53353	0
23	Optimized	244.11875	-10.07373	326.42065	591.40799	117.97997	0
24	Optimized	245.57805	-9.83231	308.7688	555.13077	109.68742	0
25	Optimized	247.01905	-9.5299075	287.31162	523.9877	105.37498	0
26	Optimized	248.44175	-9.1665225	262.07217	476.70969	95.562782	0
27	Optimized	249.748	-8.763795	234.58347	438.81882	90.931434	0
28	Optimized	251.15255	-8.241935	199.49533	382.49822	81.478139	0
29	Optimized	252.77185	-7.640285	159.03127	322.78045	72.905833	0

30	Optimized	254.45195	-6.94748	112.78284	260.12225	65.599732	0
31	Optimized	256.1929	-6.16352	60.728013	182.49305	54.213287	0
32	Optimized	257.4933	-5.497726	16.840596	125.61532	48.429629	0
33	Optimized	258.59185	-4.798016	-28.795359	86.316071	38.430391	75

Slices of Slip Surface: 3304

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	3304	215.05235	0.2	-265.77646	100.62872	49.079908	75
2	3304	215.9537	-0.750798	-207.70251	169.91924	82.875151	75
3	3304	217.40105	-2.1636705	-121.58916	274.30458	133.78728	75
4	3304	218.8484	-3.4128725	-45.806589	369.55284	180.24296	75
5	3304	219.68155	-4.082957	-5.2618954	426.12763	189.72424	75
6	3304	220.5119	-4.6770015	30.542523	490.93796	204.98125	0
7	3304	221.9537	-5.642899	88.55844	562.18214	210.87086	0
8	3304	223.3955	-6.5016305	139.85104	623.28802	215.24001	0
9	3304	224.8373	-7.262807	184.94512	675.02483	218.19754	0
10	3304	226.2791	-7.934002	224.40887	717.99392	219.75822	0
11	3304	227.6669	-8.5021305	257.48863	752.92637	220.5831	0
12	3304	229.00065	-8.9774655	284.83814	780.75184	220.79501	0
13	3304	230.3344	-9.388122	308.12004	802.33959	220.04072	0
14	3304	231.66815	-9.7366485	327.49762	817.92358	218.3517	0
15	3304	233.0019	-10.025102	343.11925	827.73158	215.76331	0
16	3304	234.3357	-10.25512	355.07389	831.97044	212.32802	0
17	3304	235.3236	-10.393995	361.96503	735.28206	166.21145	0
18	3304	236.4181	-10.49788	366.47727	642.49464	122.89085	0
19	3304	237.96505	-10.5917	369.55067	649.61744	124.69376	0
20	3304	239.512	-10.610995	368.00723	650.3941	125.72674	0
21	3304	241.0538	-10.556325	361.89271	644.97017	126.0342	0
22	3304	241.91105	-10.50291	357.06128	640.05088	125.99509	0
23	3304	242.6999	-10.4174	350.35067	628.2953	123.74892	0
24	3304	244.0941	-10.2315	336.30559	603.38896	118.91318	0
25	3304	245.4827	-9.9839865	318.40586	572.86507	113.29254	0
26	3304	246.8713	-9.6728805	296.49313	536.38055	106.80476	0
27	3304	248.25995	-9.2962555	270.49745	493.62814	99.344186	0
28	3304	249.6486	-8.851675	240.2485	444.20649	90.807946	0
29	3304	251.01175	-8.346872	206.2941	393.88852	83.522417	0
30	3304	252.3495	-7.7809365	168.56778	342.692	77.525095	0
31	3304	253.68725	-7.14161	126.27886	284.0374	70.238627	0
32	3304	255.025	-6.423853	79.095362	217.12044	61.452725	0
33	3304	256.3628	-5.621439	26.628008	140.86553	50.861823	0
34	3304	257.6495	-4.764439	-29.152252	90.950098	40.493592	75



Name: BEACH SAND, EL. -13 TO -47 Model: Saturated Only K-Sat: 0.00049 ft/sec K-Ratio: 1
 Name: BAY SOUND CLAY, EL. -47 TO -70 Model: Saturated Only K-Sat: 3.28e-008 ft/sec K-Ratio: 1
 Name: Sheet Pile Model: Saturated Only K-Sat: 1e-010 ft/sec K-Ratio: 1
 Name: MARSH (S Case) Model: Saturated Only K-Sat: 3.28e-007 ft/sec K-Ratio: 1
 Name: EMBANKMENT FILL, EL. +3.3 TO -4/6.5 Model: Saturated Only K-Sat: 3.28e-008 ft/sec K-Ratio: 1

GENERAL NOTES

CLASSIFICATION STRATIFICATION
 SHEAR STRENGTHS AND UNIT WEIGHTS OF
 THE SOIL WERE BASED ON THE RESULTS OF
 UNDISTURBED BORINGS AND CPT DATA. SEE
 BOTH BORING AND CPT DATA PLATES.

WHERE INDICATED, SHEAR STRENGTHS BETWEEN
 VERTICALS WERE ASSUMED TO VARY LINEARLY
 BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

Hw IS CANAL WATER LEVEL

LAKE PONTCHARTRAIN, LA. AND VICINITY
 HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 4,
 PROTECTED SIDE STABILITY ANALYSIS,
 CASE: Normal Water Level +0.40ft (seepage)
 STA. 24+87 TO 29+16 WEST
 ORLEANS PARISH, LOUISIANA

Normal Water Level +0.40ft (seepage)

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File Information

Created By: [Moraille, Jacques](#)
Revision Number: [515](#)
Last Edited By: [Sibley, Heather M MVK](#)
Date: [6/24/2013](#)
Time: [3:18:16 PM](#)
File Name: [Reach 4.gsz](#)
Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix F NWL\](#)
Last Solved Date: [6/24/2013](#)
Last Solved Time: [3:18:32 PM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Mass(M) Units: [lbs](#)
Mass Flux Units: [lbs/sec](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

Normal Water Level +0.40ft (seepage)

Kind: [SEEP/W](#)
Method: [Steady-State](#)
Settings
 Include Air Flow: [No](#)
Control
 Apply Runoff: [No](#)
Convergence
 Convergence Type: [Head Vector Norm](#)
 Maximum Number of Iterations: [500](#)
 Tolerance: [0.001](#)
 Maximum Change in K: [0.1](#)
 Rate of Change in K: [1.02](#)
 Minimum Change in K: [1e-005](#)
 Equation Solver: [Parallel Direct](#)
 Potential Seepage Max # of Reviews: [10](#)
Time

Starting Time: 0 sec

Duration: 0 sec

Ending Time: 0 sec

Materials

BEACH SAND, EL. -13 TO -47

Model: Saturated Only

Hydraulic

K-Sat: 0.00049 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

BAY SOUND CLAY, EL. -47 TO -70

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-008 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

Sheet Pile

Model: Saturated Only

Hydraulic

K-Sat: 1e-010 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

MARSH (S Case)

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-007 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

EMBANKMENT FILL, EL. +3.3 TO -4/6.5

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-008 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

Boundary Conditions

Drainage

Review: true
Type: Total Flux (Q) 0

Canal Water

Type: Head (H) 0.4

Curb

Type: Head (H) -6.5

Regions

	Material	Points	Area (ft²)
Region 1	BEACH SAND, EL. -13 TO -47	14,10,30,35,28,7,6,27,18,17,13	5220
Region 2	Sheet Pile	12,16,15,25,24,40,3,4	13.05
Region 3	MARSH (S Case)	18,26,37,27	304.5
Region 4	BAY SOUND CLAY, EL. -47 TO -70	9,10,30,31	1324.8
Region 5	BAY SOUND CLAY, EL. -47 TO -70	28,7,8,32	1564
Region 6	MARSH (S Case)	38,6,27,37	442
Region 7	EMBANKMENT FILL, EL. +3.3 TO -4/6.5	25,15,33,34,36	75.87824
Region 8	BEACH SAND, EL. -13 TO -47	14,13,17,18,29,11	1240
Region 9	BAY SOUND CLAY, EL. -47 TO -70	31,30,35,28,32,39	1481.2
Region 10	EMBANKMENT FILL, EL. +3.3 TO -4/6.5	3,23,22,2,21,26	40.725
Region 11	MARSH (S Case)	21,26,18,29	168
Region 12	MARSH (S Case)	11,1,19,20,21,29	394.095
Region 13	EMBANKMENT FILL, EL. +3.3 TO -4/6.5	40,41,42,5,43,44,36,25,24	127.50611
Region 14	EMBANKMENT FILL, EL. +3.3 TO -4/6.5	3,40,41,42,37,26	74.904848
Region 15	EMBANKMENT FILL, EL. +3.3 TO -4/6.5	42,37,38	68.5491
Region 16	EMBANKMENT FILL, EL. +3.3 TO -4/6.5	42,5,45,46,47,38	91.79939

Lines

	Start Point	End Point	Hydraulic Boundary	Left Side Material	Right Side Material
Line 1	13	14			
Line 2	14	10			
Line 3	12	16			
Line 4	16	15	Drainage		
Line 5	17	13		Sheet Pile	
Line 6	12	4	Canal Water		
Line 7	3	4	Canal Water		
Line 8	24	25			

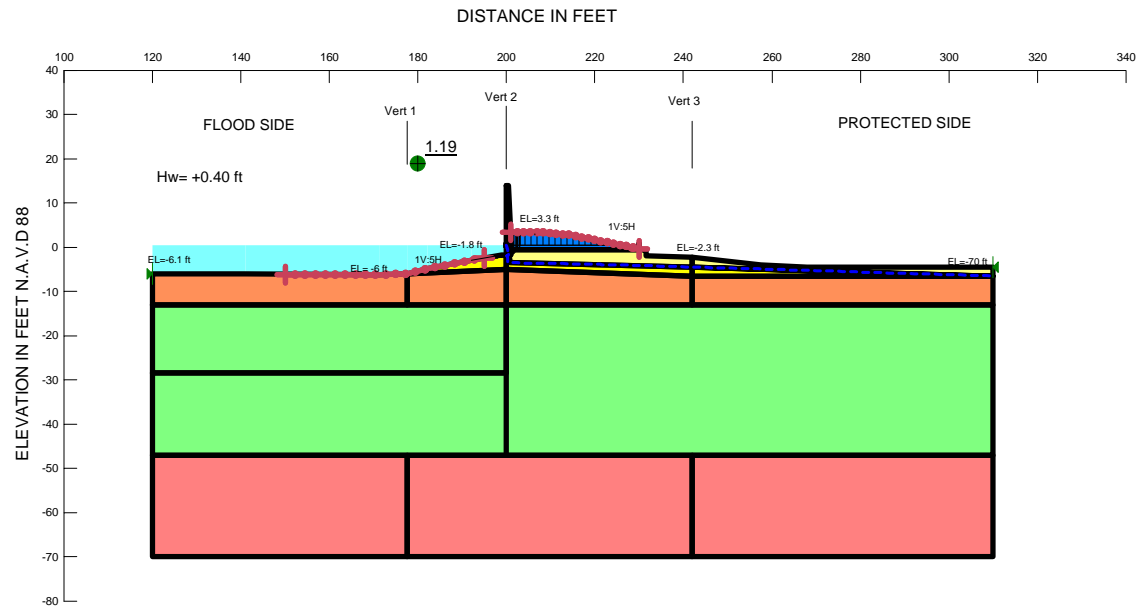
Line 9	25	15			
Line 10	26	3	Canal Water		Sheet Pile
Line 11	18	27			
Line 12	27	6			
Line 13	28	7			
Line 14	18	29			
Line 15	29	11			
Line 16	10	30			
Line 17	9	10			
Line 18	31	9			
Line 19	8	32			
Line 20	15	33	Drainage		
Line 21	33	34	Drainage		
Line 22	11	14			
Line 23	26	18	Canal Water	Sheet Pile	
Line 24	30	31			
Line 25	32	28			
Line 26	17	18			Sheet Pile
Line 27	28	35			
Line 28	35	30			
Line 29	36	25			
Line 30	34	36	Drainage		
Line 31	27	37			
Line 32	26	37			
Line 33	37	38			
Line 34	3	23	Canal Water		
Line 35	6	7	Curb		
Line 36	8	7	Curb		
Line 37	6	38	Curb		
Line 38	22	2	Canal Water		
Line 39	2	21	Canal Water		
Line 40	13	35			
Line 41	32	39			
Line 42	39	31			
Line 43	22	23	Canal Water		
Line 44	21	26			
Line 45	21	29			
Line 46	11	1			
Line 47	1	19	Canal Water		
Line 48	19	20	Canal Water		
Line 49	20	21	Canal Water		
Line 50	24	40		Sheet Pile	
Line 51	40	3		Sheet Pile	
Line 52	37	42			
Line 53	42	5			
Line 54	40	41			
Line 55	41	42			
Line 56	5	43			

Line 57	43	44			
Line 58	44	36			
Line 59	38	42			
Line 60	5	45			
Line 61	45	46			
Line 62	46	47			
Line 63	47	38			

Points

	X (ft)	Y (ft)
Point 1	120	-6.1
Point 2	182.2	-4.9
Point 3	200	-1.8
Point 4	200	3.5
Point 5	242	-2.3
Point 6	310	-13
Point 7	310	-47
Point 8	310	-70
Point 9	120	-70
Point 10	120	-47
Point 11	120	-13
Point 12	200	13.9
Point 13	200	-28.5
Point 14	120	-28.5
Point 15	201	3.3
Point 16	200.5	13.9
Point 17	200	-23.5
Point 18	200	-13
Point 19	141	-6.1
Point 20	171.3	-6.3
Point 21	177.6	-6
Point 22	192.1	-3
Point 23	198.9	-1.8
Point 24	201	-1.8
Point 25	201	-0.5
Point 26	200	-5
Point 27	242	-13
Point 28	242	-47
Point 29	177.6	-13
Point 30	177.6	-47
Point 31	177.6	-70
Point 32	242	-70
Point 33	206.8	3.4
Point 34	214.8	2.7
Point 35	200	-47
Point 36	230.51765	-0.5
Point 37	242	-6.5

Point 38	310	-6.5
Point 39	200	-70
Point 40	200.57544	-1.8
Point 41	200.80735	-3.52447
Point 42	242	-4.48385
Point 43	231.60262	-1.89238
Point 44	231.47864	-0.69639
Point 45	257.57574	-4.02494
Point 46	267.89217	-4.49529
Point 47	310.008	-4.45566



Name: EMBANKMENT FILL, EL. +3.3 TO -0.5 (S Case) Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion: 75 psf Phi: 26 °
 Name: BEACH SAND, EL. -13 TO -47 Model: Mohr-Coulomb Unit Weight: 122 pcf Cohesion: 0 psf Phi: 33 °
 Name: Sheet Pile Model: Mohr-Coulomb Unit Weight: 0.1 pcf Cohesion: 1e+013 psf Phi: 23 °
 Name: MARSH (S Case) Model: Mohr-Coulomb Unit Weight: 88 pcf Cohesion: 0 psf Phi: 24 °
 Name: EMBANKMENT FILL, EL. -0.5 TO -4/-6.5 (S Case) BWT Model: Mohr-Coulomb Unit Weight: 106 pcf Cohesion: 0 psf Phi: 26 °
 Name: BAY SOUND CLAY (S Case) Model: Mohr-Coulomb Unit Weight: 110 pcf Cohesion: 0 psf Phi: 26 °
 Name: EMBANKMENT FILL, EL. -0.5 TO -4/-6.5 (S Case) AWT Model: Mohr-Coulomb Unit Weight: 106 pcf Cohesion: 75 psf Phi: 26 °

GENERAL NOTES

CLASSIFICATION STRATIFICATION
 SHEAR STRENGTHS AND UNIT WEIGHTS OF
 THE SOIL WERE BASED ON THE RESULTS OF
 UNDISTURBED BORINGS AND CPT DATA. SEE
 BOTH BORING AND CPT DATA PLATES.

WHERE INDICATED, SHEAR STRENGTHS BETWEEN
 VERTICALS WERE ASSUMED TO VARY LINEARLY
 BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

Hw IS CANAL WATER LEVEL

LAKE PONTCHARTRAIN, LA. AND VICINITY
 HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 4,
 PROTECTED SIDE STABILITY ANALYSIS,
 CASE: NWL S Case F/S (Entry/Exit)
 STA. 24+87 TO 29+16 WEST
 ORLEANS PARISH, LOUISIANA

NWL S Case F/S (Entry/Exit)

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File Information

Created By: [Moraille, Jacques](#)
Revision Number: [519](#)
Last Edited By: [Sibley, Heather M MVK](#)
Date: [7/8/2013](#)
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File Name: [Reach 4.gsz](#)
Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix F NWL\](#)
Last Solved Date: [7/8/2013](#)
Last Solved Time: [12:05:06 AM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Strength Units: [psf](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

NWL S Case F/S (Entry/Exit)

Kind: [SLOPE/W](#)
Parent: [Normal Water Level +0.40ft \(seepage\)](#)
Method: [Spencer](#)
Settings
 PWP Conditions Source: [Parent Analysis](#)
Slip Surface
 Direction of movement: [Right to Left](#)
 Use Passive Mode: [No](#)
 Slip Surface Option: [Entry and Exit](#)
 Critical slip surfaces saved: [1](#)
 Optimize Critical Slip Surface Location: [Yes](#)
 Tension Crack
 Tension Crack Option: [Tension Crack Line](#)
 Percentage Wet: [0](#)
 Tension Crack Fluid Unit Weight: [62.4 pcf](#)
FOS Distribution
 FOS Calculation Option: [Constant](#)

Advanced

Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 2000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

EMBANKMENT FILL, EL. +3.3 TO -0.5 (S Case)

Model: Mohr-Coulomb
Unit Weight: 115 pcf
Cohesion: 75 psf
Phi: 26 °
Phi-B: 0 °

BEACH SAND, EL. -13 TO -47

Model: Mohr-Coulomb
Unit Weight: 122 pcf
Cohesion: 0 psf
Phi: 33 °
Phi-B: 0 °

Sheet Pile

Model: Mohr-Coulomb
Unit Weight: 0.1 pcf
Cohesion: 1e+013 psf
Phi: 23 °
Phi-B: 0 °

MARSH (S Case)

Model: Mohr-Coulomb
Unit Weight: 88 pcf
Cohesion: 0 psf
Phi: 24 °
Phi-B: 0 °

EMBANKMENT FILL, EL. -0.5 TO -4/-6.5 (S Case) BWT

Model: Mohr-Coulomb
Unit Weight: 106 pcf
Cohesion: 0 psf
Phi: 26 °

Phi-B: 0 °

BAY SOUND CLAY (S Case)

Model: Mohr-Coulomb
Unit Weight: 110 pcf
Cohesion: 0 psf
Phi: 26 °
Phi-B: 0 °

EMBANKMENT FILL, EL. -0.5 TO -4/-6.5 (S Case) AWT

Model: Mohr-Coulomb
Unit Weight: 106 pcf
Cohesion: 75 psf
Phi: 26 °
Phi-B: 0 °

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (150, -6.15941) ft
Left-Zone Right Coordinate: (195, -2.48824) ft
Left-Zone Increment: 20
Right Projection: Range
Right-Zone Left Coordinate: (201, 3.3) ft
Right-Zone Right Coordinate: (230, -0.39461) ft
Right-Zone Increment: 20
Radius Increments: 15

Slip Surface Limits

Left Coordinate: (120, -6.1) ft
Right Coordinate: (310.008, -4.45566) ft

Tension Crack Line

	X (ft)	Y (ft)
	200	0.4
	230	0.4

Regions

	Material	Points	Area (ft²)
Region 1	BEACH SAND, EL. -13 TO -47	14,10,30,35,28,7,6,27,18,17,13	5220
Region 2	Sheet Pile	12,16,15,25,24,40,3,4	13.05
Region 3	MARSH (S Case)	18,26,37,27	304.5
Region 4	BAY SOUND CLAY (S Case)	9,10,30,31	1324.8
Region 5	BAY SOUND CLAY (S Case)	28,7,8,32	1564

Region 6	MARSH (S Case)	38,6,27,37	442
Region 7	EMBANKMENT FILL, EL. +3.3 TO -0.5 (S Case)	25,15,33,34,36	75.87824
Region 8	BEACH SAND, EL. -13 TO -47	14,13,17,18,29,11	1240
Region 9	BAY SOUND CLAY (S Case)	31,30,35,28,32,39	1481.2
Region 10	EMBANKMENT FILL, EL. -0.5 TO -4/-6.5 (S Case) BWT	3,23,22,2,21,26	40.725
Region 11	MARSH (S Case)	21,26,18,29	168
Region 12	MARSH (S Case)	11,1,19,20,21,29	394.095
Region 13	EMBANKMENT FILL, EL. -0.5 TO -4/-6.5 (S Case) AWT	40,41,42,5,43,44,36,25,24	127.50611
Region 14	EMBANKMENT FILL, EL. -0.5 TO -4/-6.5 (S Case) BWT	3,40,41,42,37,26	74.904848
Region 15	EMBANKMENT FILL, EL. -0.5 TO -4/-6.5 (S Case) BWT	42,37,38	68.5491
Region 16	EMBANKMENT FILL, EL. -0.5 TO -4/-6.5 (S Case) AWT	42,5,45,46,47,38	91.79939

Points

	X (ft)	Y (ft)
Point 1	120	-6.1
Point 2	182.2	-4.9
Point 3	200	-1.8
Point 4	200	3.5
Point 5	242	-2.3
Point 6	310	-13
Point 7	310	-47
Point 8	310	-70
Point 9	120	-70
Point 10	120	-47
Point 11	120	-13
Point 12	200	13.9
Point 13	200	-28.5
Point 14	120	-28.5
Point 15	201	3.3
Point 16	200.5	13.9
Point 17	200	-23.5
Point 18	200	-13
Point 19	141	-6.1
Point 20	171.3	-6.3
Point 21	177.6	-6
Point 22	192.1	-3
Point 23	198.9	-1.8
Point 24	201	-1.8
Point 25	201	-0.5
Point 26	200	-5
Point 27	242	-13
Point 28	242	-47
Point 29	177.6	-13
Point 30	177.6	-47
Point 31	177.6	-70
Point 32	242	-70
Point 33	206.8	3.4

Point 34	214.8	2.7
Point 35	200	-47
Point 36	230.51765	-0.5
Point 37	242	-6.5
Point 38	310	-6.5
Point 39	200	-70
Point 40	200.57544	-1.8
Point 41	200.80735	-3.52447
Point 42	242	-4.48385
Point 43	231.60262	-1.89238
Point 44	231.47864	-0.69639
Point 45	257.57574	-4.02494
Point 46	267.89217	-4.49529
Point 47	310.008	-4.45566

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.19	(195.836, 6.802)	5.1369	(203.049, 3.33534)	(193.172, -2.81091)
2	6443	1.65	(195.836, 6.802)	10.16	(203.725, 3.34698)	(192.766, -2.8824)

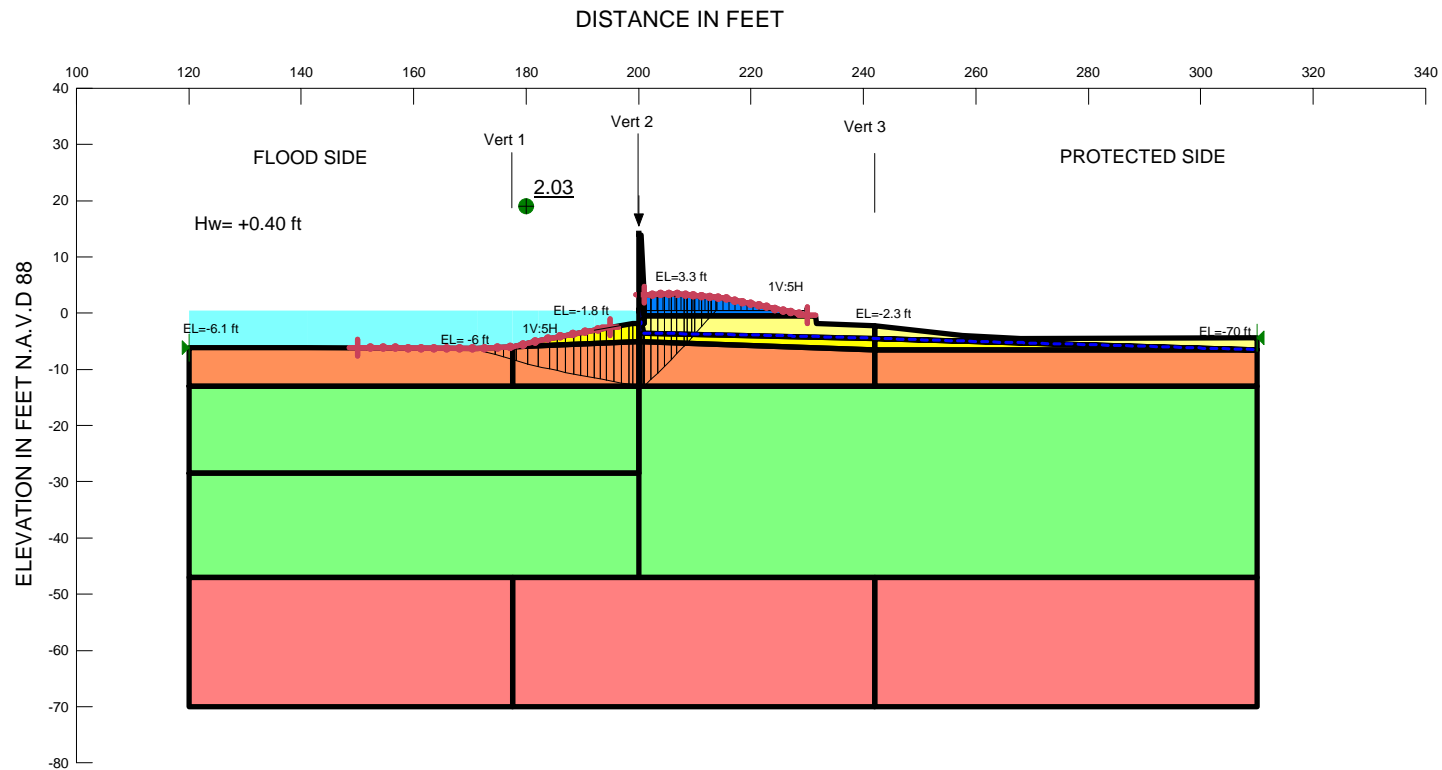
Slices of Slip Surface: Optimized

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	193.29785	-2.791535	199.07417	200.04436	0.47319649	0
2	Optimized	193.55055	-2.7527915	196.50784	197.85751	0.65827737	0
3	Optimized	193.84425	-2.7154635	193.84204	197.71282	1.8879059	0
4	Optimized	194.17895	-2.67955	191.11497	196.43247	2.5935161	0
5	Optimized	194.51365	-2.6436365	188.46216	195.14914	3.2614552	0
6	Optimized	194.8593	-2.6095385	185.92782	194.76158	4.3085111	0
7	Optimized	195.2159	-2.577255	183.54832	194.02985	5.1121854	0
8	Optimized	195.5725	-2.5449715	181.26936	193.29534	5.8654597	0
9	Optimized	195.89695	-2.5167215	179.33081	193.04444	6.6885855	0
10	Optimized	196.1892	-2.492505	177.71463	192.67961	7.2989065	0
11	Optimized	196.48145	-2.4682885	176.17347	192.31136	7.8709785	0
12	Optimized	196.7878	-2.4461285	174.80814	193.10162	8.9223248	0
13	Optimized	197.1082	-2.426025	173.64319	193.38818	9.630277	0
14	Optimized	197.42865	-2.4059215	172.59037	193.67475	10.283538	0
15	Optimized	197.7527	-2.3860675	171.66482	194.13444	10.959164	0
16	Optimized	198.0803	-2.3664625	170.26638	194.54575	11.841841	0
17	Optimized	198.40795	-2.3468575	168.82832	194.9601	12.745322	0
18	Optimized	198.7356	-2.3272525	167.44815	195.37141	13.619083	0
19	Optimized	198.8997	-2.3174495	167.24955	198.34947	15.168443	0
20	Optimized	199.08335	-2.3170305	167.64503	193.82132	12.767033	0
21	Optimized	199.45	-2.316194	168.3923	193.6686	12.328075	0
22	Optimized	199.81665	-2.315358	169.08775	193.52405	11.918381	0
23	Optimized	200.10735	-2.314695	82.235969	183.29322	49.288916	0
24	Optimized	200.35735	-2.3141755	-74.389216	60.227685	29.375005	0

25	Optimized	200.5377	-2.3138285	-75.062162	60.103282	29.314329	0
26	Optimized	200.60995	-2.3136895	-75.334703	59.922042	29.225933	0
27	Optimized	200.81925	-2.3132865	-75.987681	70.851445	34.556559	75
28	Optimized	200.997	-2.309045	-76.675668	-9.9644273	-4.8599759	75
29	Optimized	201.18135	-2.0694515	-91.822494	315.87678	154.0634	75
30	Optimized	201.5441	-1.598075	-121.74067	286.67314	139.81983	75
31	Optimized	201.90685	-1.1266985	-151.76309	257.45269	125.56807	75
32	Optimized	202.2391	-0.695505	-179.09969	231.15842	112.7435	75
33	Optimized	202.48105	-0.382015	-198.88937	211.07127	102.94634	75
34	Optimized	202.79395	0.04386	-225.80153	173.41884	84.582021	75
35	Optimized	203.0326	0.375875	-246.76505	147.5641	71.971822	75

Slices of Slip Surface: 6443

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	6443	192.9468	-2.935933	205.72107	231.65973	12.651131	0
2	6443	193.3076	-3.03583	207.64541	245.12434	18.279696	0
3	6443	193.6684	-3.1216085	209.55543	256.4022	22.848697	0
4	6443	194.0292	-3.193632	211.42489	265.67277	26.458457	0
5	6443	194.39	-3.2521965	213.17618	273.09409	29.223916	0
6	6443	194.7508	-3.2975365	214.74891	278.79771	31.238683	0
7	6443	195.1116	-3.3298295	216.09329	282.86807	32.568236	0
8	6443	195.4724	-3.3492005	217.26522	285.40296	33.232996	0
9	6443	195.8332	-3.355724	218.0783	286.47323	33.358436	0
10	6443	196.194	-3.3494245	218.47216	286.12945	32.998665	0
11	6443	196.5548	-3.3302775	218.37541	284.45644	32.229875	0
12	6443	196.9156	-3.2982105	217.68175	281.43442	31.094254	0
13	6443	197.2764	-3.2530995	216.42179	277.13249	29.610587	0
14	6443	197.6372	-3.1947675	214.55574	271.53475	27.790519	0
15	6443	197.998	-3.1229815	212.02174	264.6758	25.681099	0
16	6443	198.3588	-3.037446	208.10373	256.53741	23.622683	0
17	6443	198.7196	-2.9377985	203.16134	247.10765	21.434049	0
18	6443	199.08335	-2.8225495	197.73165	231.66978	16.552731	0
19	6443	199.45	-2.6909155	191.08277	217.10916	12.693917	0
20	6443	199.81665	-2.543046	183.14193	201.24309	8.8285277	0
21	6443	200.25	-2.3443285	-31.747187	90.731208	44.252567	0
22	6443	200.5377	-2.204004	-81.874525	37.249237	18.167667	0
23	6443	200.59955	-2.1715115	-84.126688	34.130405	16.646511	0
24	6443	200.81185	-2.0529895	-92.111302	7.6626595	3.7373288	75
25	6443	201.19	-1.8294285	-106.76897	451.52391	220.22293	75
26	6443	201.57	-1.581652	-122.80376	418.75878	204.2423	75
27	6443	201.95	-1.308504	-140.4103	384.31843	187.44462	75
28	6443	202.33	-1.0073105	-159.69755	348.05979	169.7601	75
29	6443	202.71	-0.674665	-180.85553	309.87919	151.13818	75
30	6443	203.10625	-0.28856767	-205.36311	266.35752	129.91124	75
31	6443	203.5187	0.16143233	-233.8515	217.10818	105.89074	75



Name: EMBANKMENT FILL, EL. +3.3 TO -0.5 (S Case) Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion: 75 psf Phi: 26 °
 Name: BEACH SAND, EL. -13 TO -47 Model: Mohr-Coulomb Unit Weight: 122 pcf Cohesion: 0 psf Phi: 33 °
 Name: Sheet Pile Model: Mohr-Coulomb Unit Weight: 0.1 pcf Cohesion: 1e+013 psf Phi: 23 °
 Name: MARSH (S Case) Model: Mohr-Coulomb Unit Weight: 88 pcf Cohesion: 0 psf Phi: 24 °
 Name: EMBANKMENT FILL, EL. -0.5 TO -4/-6.5 (S Case) BWT Model: Mohr-Coulomb Unit Weight: 106 pcf Cohesion: 0 psf Phi: 26 °
 Name: BAY SOUND CLAY (S Case) Model: Mohr-Coulomb Unit Weight: 110 pcf Cohesion: 0 psf Phi: 26 °
 Name: EMBANKMENT FILL, EL. -0.5 TO -4/-6.5 (S Case) AWT Model: Mohr-Coulomb Unit Weight: 106 pcf Cohesion: 75 psf Phi: 26 °

GENERAL NOTES

CLASSIFICATION STRATIFICATION
 SHEAR STRENGTHS AND UNIT WEIGHTS OF
 THE SOIL WERE BASED ON THE RESULTS OF
 UNDISTURBED BORINGS AND CPT DATA. SEE
 BOTH BORING AND CPT DATA PLATES.

WHERE INDICATED, SHEAR STRENGTHS BETWEEN
 VERTICALS WERE ASSUMED TO VARY LINEARLY
 BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

Hw IS CANAL WATER LEVEL

LAKE PONTCHARTRAIN, LA. AND VICINITY
 HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 4,
 PROTECTED SIDE STABILITY ANALYSIS,
 CASE: NWL S Case F/S (Entry/Exit) (w sheetpile)
 STA. 24+97 TO 29+16 WEST
 ORLEANS PARISH, LOUISIANA

NWL S Case F/S (Entry/Exit) (w sheetpile)

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File Information

Created By: [Moraille, Jacques](#)
Revision Number: [519](#)
Last Edited By: [Sibley, Heather M MVK](#)
Date: [7/8/2013](#)
Time: [12:03:18 AM](#)
File Name: [Reach 4.gsz](#)
Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix F NWL\](#)
Last Solved Date: [7/8/2013](#)
Last Solved Time: [12:05:34 AM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Strength Units: [psf](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

NWL S Case F/S (Entry/Exit) (w sheetpile)

Kind: [SLOPE/W](#)
Parent: [Normal Water Level +0.40ft \(seepage\)](#)
Method: [Spencer](#)
Settings
 PWP Conditions Source: [Parent Analysis](#)
Slip Surface
 Direction of movement: [Right to Left](#)
 Use Passive Mode: [No](#)
 Slip Surface Option: [Entry and Exit](#)
 Critical slip surfaces saved: [1](#)
 Optimize Critical Slip Surface Location: [Yes](#)
 Tension Crack
 Tension Crack Option: [Tension Crack Line](#)
 Percentage Wet: [0](#)
 Tension Crack Fluid Unit Weight: [62.4 pcf](#)
FOS Distribution
 FOS Calculation Option: [Constant](#)

Advanced

Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 2000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

EMBANKMENT FILL, EL. +3.3 TO -0.5 (S Case)

Model: Mohr-Coulomb
Unit Weight: 115 pcf
Cohesion: 75 psf
Phi: 26 °
Phi-B: 0 °

BEACH SAND, EL. -13 TO -47

Model: Mohr-Coulomb
Unit Weight: 122 pcf
Cohesion: 0 psf
Phi: 33 °
Phi-B: 0 °

Sheet Pile

Model: Mohr-Coulomb
Unit Weight: 0.1 pcf
Cohesion: 1e+013 psf
Phi: 23 °
Phi-B: 0 °

MARSH (S Case)

Model: Mohr-Coulomb
Unit Weight: 88 pcf
Cohesion: 0 psf
Phi: 24 °
Phi-B: 0 °

EMBANKMENT FILL, EL. -0.5 TO -4/-6.5 (S Case) BWT

Model: Mohr-Coulomb
Unit Weight: 106 pcf
Cohesion: 0 psf
Phi: 26 °

Phi-B: 0 °

BAY SOUND CLAY (S Case)

Model: [Mohr-Coulomb](#)

Unit Weight: 110 pcf

Cohesion: 0 psf

Phi: 26 °

Phi-B: 0 °

EMBANKMENT FILL, EL. -0.5 TO -4/-6.5 (S Case) AWT

Model: [Mohr-Coulomb](#)

Unit Weight: 106 pcf

Cohesion: 75 psf

Phi: 26 °

Phi-B: 0 °

Slip Surface Entry and Exit

Left Projection: [Range](#)

Left-Zone Left Coordinate: (150, -6.15941) ft

Left-Zone Right Coordinate: (195, -2.48824) ft

Left-Zone Increment: 20

Right Projection: [Range](#)

Right-Zone Left Coordinate: (201, 3.3) ft

Right-Zone Right Coordinate: (230, -0.39461) ft

Right-Zone Increment: 20

Radius Increments: 15

Slip Surface Limits

Left Coordinate: (120, -6.1) ft

Right Coordinate: (310.008, -4.45566) ft

Reinforcements

Reinforcement 1

Type: [Pile](#)

Outside Point: (200, 14.1) ft

Inside Point: (200, -13) ft

Slip Surface Intersection: (200, -13.009) ft

Total Length: 27.1 ft

Reinforcement Direction: 90 °

Applied Load Option: [Variable](#)

F of S Dependent: [No](#)

Pile Spacing: 1 ft

Shear Capacity: 81201 lbs

Shear Safety Factor: 1

Shear Load Used: 81201 lbs
Shear Option: Parallel to Slip
Resisting Force Used: 0 lbs/ft

Tension Crack Line

	X (ft)	Y (ft)
	200	0.4
	230	0.4

Regions

	Material	Points	Area (ft²)
Region 1	BEACH SAND, EL. -13 TO -47	14,10,30,35,28,7,6,27,18,17,13	5220
Region 2	Sheet Pile	12,16,15,25,24,40,3,4	13.05
Region 3	MARSH (S Case)	18,26,37,27	304.5
Region 4	BAY SOUND CLAY (S Case)	9,10,30,31	1324.8
Region 5	BAY SOUND CLAY (S Case)	28,7,8,32	1564
Region 6	MARSH (S Case)	38,6,27,37	442
Region 7	EMBANKMENT FILL, EL. +3.3 TO -0.5 (S Case)	25,15,33,34,36	75.87824
Region 8	BEACH SAND, EL. -13 TO -47	14,13,17,18,29,11	1240
Region 9	BAY SOUND CLAY (S Case)	31,30,35,28,32,39	1481.2
Region 10	EMBANKMENT FILL, EL. -0.5 TO -4/-6.5 (S Case) BWT	3,23,22,2,21,26	40.725
Region 11	MARSH (S Case)	21,26,18,29	168
Region 12	MARSH (S Case)	11,1,19,20,21,29	394.095
Region 13	EMBANKMENT FILL, EL. -0.5 TO -4/-6.5 (S Case) AWT	40,41,42,5,43,44,36,25,24	127.50611
Region 14	EMBANKMENT FILL, EL. -0.5 TO -4/-6.5 (S Case) BWT	3,40,41,42,37,26	74.904848
Region 15	EMBANKMENT FILL, EL. -0.5 TO -4/-6.5 (S Case) BWT	42,37,38	68.5491
Region 16	EMBANKMENT FILL, EL. -0.5 TO -4/-6.5 (S Case) AWT	42,5,45,46,47,38	91.79939

Points

	X (ft)	Y (ft)
Point 1	120	-6.1
Point 2	182.2	-4.9
Point 3	200	-1.8
Point 4	200	3.5
Point 5	242	-2.3
Point 6	310	-13
Point 7	310	-47
Point 8	310	-70
Point 9	120	-70
Point 10	120	-47
Point 11	120	-13
Point 12	200	13.9
Point 13	200	-28.5
Point 14	120	-28.5

Point 15	201	3.3
Point 16	200.5	13.9
Point 17	200	-23.5
Point 18	200	-13
Point 19	141	-6.1
Point 20	171.3	-6.3
Point 21	177.6	-6
Point 22	192.1	-3
Point 23	198.9	-1.8
Point 24	201	-1.8
Point 25	201	-0.5
Point 26	200	-5
Point 27	242	-13
Point 28	242	-47
Point 29	177.6	-13
Point 30	177.6	-47
Point 31	177.6	-70
Point 32	242	-70
Point 33	206.8	3.4
Point 34	214.8	2.7
Point 35	200	-47
Point 36	230.51765	-0.5
Point 37	242	-6.5
Point 38	310	-6.5
Point 39	200	-70
Point 40	200.57544	-1.8
Point 41	200.80735	-3.52447
Point 42	242	-4.48385
Point 43	231.60262	-1.89238
Point 44	231.47864	-0.69639
Point 45	257.57574	-4.02494
Point 46	267.89217	-4.49529
Point 47	310.008	-4.45566

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	2.03	(195.212, 11.662)	20.62353	(213.768, 2.79026)	(170.873, -6.29718)
2	4235	2.77	(195.212, 11.662)	25.232	(217.791, 2.09103)	(177.211, -6.01855)

Slices of Slip Surface: Optimized

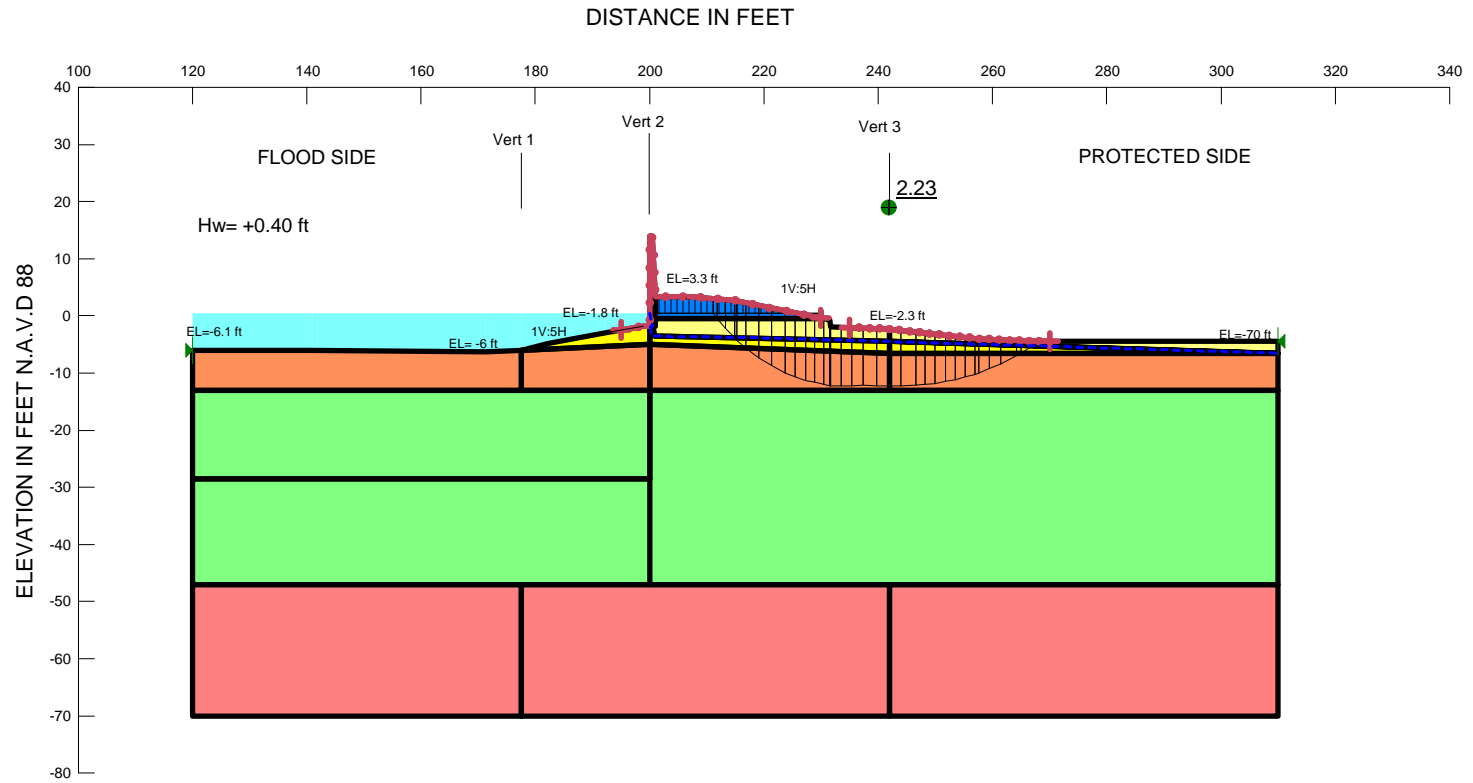
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	171.0865	-6.359656	420.12283	432.46154	5.493546	0
2	Optimized	172.0875	-6.652551	429.45432	462.87833	14.881327	0
3	Optimized	173.6625	-7.113391	443.70142	508.69695	28.937873	0
4	Optimized	175.2375	-7.5742305	456.1204	554.6679	43.876175	0
5	Optimized	176.8125	-8.03507	466.59549	600.81558	59.758634	0

6	Optimized	177.91165	-8.356675	472.84269	641.5028	75.092319	0
7	Optimized	179.27085	-8.75512	478.94181	694.02365	95.760603	0
8	Optimized	181.2592	-9.2816705	491.04405	757.84121	118.78575	0
9	Optimized	183.17855	-9.7290505	506.02336	815.98693	138.00467	0
10	Optimized	184.8677	-10.099715	522.25193	859.33555	150.07929	0
11	Optimized	186.2889	-10.38487	536.71907	896.79695	160.317	0
12	Optimized	187.71005	-10.670025	553.03513	934.12037	169.67008	0
13	Optimized	189.0498	-10.932095	569.60439	966.90658	176.89033	0
14	Optimized	190.3082	-11.17109	586.07733	998.52524	183.63364	0
15	Optimized	191.5187	-11.397245	602.87414	1027.337	188.98304	0
16	Optimized	192.63625	-11.602295	618.90255	1054.0033	193.71936	0
17	Optimized	193.70875	-11.799085	635.50175	1079.4065	197.63915	0
18	Optimized	194.9099	-12.02501	655.90006	1109.7711	202.07641	0
19	Optimized	196.23975	-12.280075	681.28292	1141.9705	205.11132	0
20	Optimized	197.5696	-12.53514	711.90927	1173.8745	205.68016	0
21	Optimized	198.56725	-12.72935	739.94362	1199.4415	204.58163	0
22	Optimized	199.4339	-12.903025	787.86488	1213.1452	189.34698	0
23	Optimized	199.9839	-13.009265	834.53019	1180.0769	224.40064	0
24	Optimized	200.09075	-13.004255	761.60909	1098.6525	218.87854	0
25	Optimized	200.34075	-12.99253	588.87042	1042.9887	202.18647	0
26	Optimized	200.5377	-12.98329	588.27159	1042.2264	202.11369	0
27	Optimized	200.6914	-12.97608	587.8147	1041.3714	201.93647	0
28	Optimized	200.9037	-12.966125	587.15619	1040.1749	201.69692	0
29	Optimized	201.00095	-12.961565	586.89484	1614.535	457.53489	0
30	Optimized	201.61575	-12.39216	551.01191	1337.055	349.96895	0
31	Optimized	202.84345	-11.25344	479.0442	1248.5511	342.60653	0
32	Optimized	204.05195	-10.090508	405.46114	1144.6795	329.12123	0
33	Optimized	205.2412	-8.9033625	330.33541	1052.7957	321.66005	0
34	Optimized	206.3179	-7.7962025	260.27282	955.64211	309.59836	0
35	Optimized	207.43035	-6.6110675	185.30653	858.3218	299.64571	0
36	Optimized	208.34555	-5.6238735	122.87091	767.28463	286.91147	0
37	Optimized	209.0638	-4.8279285	72.477243	682.33425	297.44714	0
38	Optimized	209.7648	-4.043476	22.746535	600.91334	281.99079	0
39	Optimized	210.62545	-3.065259	-39.294844	482.48247	235.32242	75
40	Optimized	211.81155	-1.717133	-124.7473	366.19459	178.60504	75
41	Optimized	212.66125	-0.771535	-184.66515	291.93929	142.38831	75
42	Optimized	213.3432	-0.05	-230.41635	225.09482	109.78608	75

Slices of Slip Surface: 4235

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	4235	177.40525	-6.212553	405.87129	454.65442	21.71965	0
2	4235	178.36665	-7.0950775	419.49471	561.01485	63.008828	0
3	4235	179.9	-8.369622	457.39358	699.80036	107.92645	0
4	4235	181.43335	-9.455865	498.44853	813.56054	140.29691	0
5	4235	182.83995	-10.316316	535.54711	899.13742	161.88084	0
6	4235	184.11985	-10.989915	567.00582	964.56389	177.00426	0
7	4235	185.39975	-11.57352	596.40087	1020.7049	188.91232	0

8	4235	186.67965	-12.0738	622.94496	1068.5464	198.39453	0
9	4235	187.95955	-12.495955	646.76777	1108.8645	205.73871	0
10	4235	189.23945	-12.844035	667.70916	1142.0612	211.19512	0
11	4235	190.43455	-13.107075	685.8763	1180.859	321.44552	0
12	4235	191.54485	-13.295725	701.51411	1204.1053	326.38657	0
13	4235	192.78	-13.44317	715.81846	1221.2687	328.24321	0
14	4235	194.14	-13.53796	728.70859	1231.6067	326.58585	0
15	4235	195.5	-13.559115	739.14281	1232.8605	320.62402	0
16	4235	196.86	-13.50682	749.05735	1225.4634	309.38171	0
17	4235	198.22	-13.38061	762.89846	1209.6138	290.10036	0
18	4235	199.45	-13.205195	799.26622	1183.8392	249.74462	0
19	4235	200.25	-13.060515	633.65646	1043.9438	266.44373	0
20	4235	200.52225	-13.004785	589.61681	1016.9076	277.48586	0
21	4235	200.55995	-12.99664	589.11388	1020.479	192.05611	0
22	4235	200.6914	-12.96748	587.25507	1017.0894	191.37458	0
23	4235	200.9037	-12.91938	584.23166	1011.495	190.22989	0
24	4235	201.725	-12.70328	570.5335	1537.4662	430.5062	0
25	4235	203.175	-12.268225	542.72032	1488.6413	421.15117	0
26	4235	204.625	-11.735295	508.46894	1431.3345	410.88623	0
27	4235	206.075	-11.09758	467.43752	1364.9751	399.60947	0
28	4235	207.49175	-10.365904	420.38038	1283.3382	384.21357	0
29	4235	208.8753	-9.534349	366.98318	1186.1585	364.72037	0
30	4235	210.25885	-8.5740545	305.45301	1078.4209	344.14746	0
31	4235	211.64235	-7.4654545	234.63547	958.44438	322.26049	0
32	4235	213.0259	-6.1805735	152.79963	824.07352	298.87039	0
33	4235	214.25885	-4.866299	69.20937	673.13969	294.5565	0
34	4235	214.9533	-4.0500905	17.348563	578.48181	273.68297	0
35	4235	215.6598	-3.0907575	-43.410041	445.22183	217.1492	75
36	4235	216.76615	-1.4120075	-149.51686	272.23065	132.77576	75
37	4235	217.5552	-0.05	-235.31889	139.93956	68.253082	75



Name: EMBANKMENT FILL, EL. +3.3 TO -0.5 (S Case) Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion: 75 psf Phi: 26 °
Name: BEACH SAND, EL. -13 TO -47 Model: Mohr-Coulomb Unit Weight: 122 pcf Cohesion: 0 psf Phi: 33 °
Name: Sheet Pile Model: Mohr-Coulomb Unit Weight: 0.1 pcf Cohesion: 1e+013 psf Phi: 23 °
Name: MARSH (S Case) Model: Mohr-Coulomb Unit Weight: 88 pcf Cohesion: 0 psf Phi: 24 °
Name: EMBANKMENT FILL, EL. -0.5 TO -4/-6.5 (S Case) BWT Model: Mohr-Coulomb Unit Weight: 106 pcf Cohesion: 0 psf Phi: 26 °
Name: BAY SOUND CLAY (S Case) Model: Mohr-Coulomb Unit Weight: 110 pcf Cohesion: 0 psf Phi: 26 °
Name: EMBANKMENT FILL, EL. -0.5 TO -4/-6.5 (S Case) AWT Model: Mohr-Coulomb Unit Weight: 106 pcf Cohesion: 75 psf Phi: 26 °

GENERAL NOTES

CLASSIFICATION STRATIFICATION
SHEAR STRENGTHS AND UNIT WEIGHTS OF
THE SOIL WERE BASED ON THE RESULTS OF
UNDISTURBED BORINGS AND CPT DATA. SEE
BOTH BORING AND CPT DATA PLATES.

WHERE INDICATED, SHEAR STRENGTHS BETWEEN
VERTICALS WERE ASSUMED TO VARY LINEARLY
BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

Hw IS CANAL WATER LEVEL

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 4,
PROTECTED SIDE STABILITY ANALYSIS,
CASE: NWL S Case P/S (Entry/Exit)
STA. 24+87 TO 29+16 WEST
ORLEANS PARISH, LOUISIANA

NWL S Case P/S (Entry/Exit)

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File Information

Created By: [Moraille, Jacques](#)
Revision Number: [519](#)
Last Edited By: [Sibley, Heather M MVK](#)
Date: [7/8/2013](#)
Time: [12:03:18 AM](#)
File Name: [Reach 4.gsz](#)
Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix F NWL\](#)
Last Solved Date: [7/8/2013](#)
Last Solved Time: [12:06:26 AM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Strength Units: [psf](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

NWL S Case P/S (Entry/Exit)

Kind: [SLOPE/W](#)
Parent: [Normal Water Level +0.40ft \(seepage\)](#)
Method: [Spencer](#)
Settings
 PWP Conditions Source: [Parent Analysis](#)
Slip Surface
 Direction of movement: [Left to Right](#)
 Use Passive Mode: [No](#)
 Slip Surface Option: [Entry and Exit](#)
 Critical slip surfaces saved: [1](#)
 Optimize Critical Slip Surface Location: [Yes](#)
 Tension Crack
 Tension Crack Option: [Tension Crack Line](#)
 Percentage Wet: [0](#)
 Tension Crack Fluid Unit Weight: [62.4 pcf](#)
FOS Distribution
 FOS Calculation Option: [Constant](#)

Advanced

Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 2000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

EMBANKMENT FILL, EL. +3.3 TO -0.5 (S Case)

Model: Mohr-Coulomb
Unit Weight: 115 pcf
Cohesion: 75 psf
Phi: 26 °
Phi-B: 0 °

BEACH SAND, EL. -13 TO -47

Model: Mohr-Coulomb
Unit Weight: 122 pcf
Cohesion: 0 psf
Phi: 33 °
Phi-B: 0 °

Sheet Pile

Model: Mohr-Coulomb
Unit Weight: 0.1 pcf
Cohesion: 1e+013 psf
Phi: 23 °
Phi-B: 0 °

MARSH (S Case)

Model: Mohr-Coulomb
Unit Weight: 88 pcf
Cohesion: 0 psf
Phi: 24 °
Phi-B: 0 °

EMBANKMENT FILL, EL. -0.5 TO -4/-6.5 (S Case) BWT

Model: Mohr-Coulomb
Unit Weight: 106 pcf
Cohesion: 0 psf
Phi: 26 °

Phi-B: 0 °

BAY SOUND CLAY (S Case)

Model: Mohr-Coulomb
Unit Weight: 110 pcf
Cohesion: 0 psf
Phi: 26 °
Phi-B: 0 °

EMBANKMENT FILL, EL. -0.5 TO -4/-6.5 (S Case) AWT

Model: Mohr-Coulomb
Unit Weight: 106 pcf
Cohesion: 75 psf
Phi: 26 °
Phi-B: 0 °

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (195, -2.48824) ft
Left-Zone Right Coordinate: (230, -0.39461) ft
Left-Zone Increment: 20
Right Projection: Range
Right-Zone Left Coordinate: (235, -2.02557) ft
Right-Zone Right Coordinate: (270, -4.49331) ft
Right-Zone Increment: 20
Radius Increments: 15

Slip Surface Limits

Left Coordinate: (120, -6.1) ft
Right Coordinate: (310.008, -4.45566) ft

Tension Crack Line

	X (ft)	Y (ft)
	200	0.4
	230	0.4

Regions

	Material	Points	Area (ft²)
Region 1	BEACH SAND, EL. -13 TO -47	14,10,30,35,28,7,6,27,18,17,13	5220
Region 2	Sheet Pile	12,16,15,25,24,40,3,4	13.05
Region 3	MARSH (S Case)	18,26,37,27	304.5
Region 4	BAY SOUND CLAY (S Case)	9,10,30,31	1324.8
Region 5	BAY SOUND CLAY (S Case)	28,7,8,32	1564

Region 6	MARSH (S Case)	38,6,27,37	442
Region 7	EMBANKMENT FILL, EL. +3.3 TO -0.5 (S Case)	25,15,33,34,36	75.87824
Region 8	BEACH SAND, EL. -13 TO -47	14,13,17,18,29,11	1240
Region 9	BAY SOUND CLAY (S Case)	31,30,35,28,32,39	1481.2
Region 10	EMBANKMENT FILL, EL. -0.5 TO -4/-6.5 (S Case) BWT	3,23,22,2,21,26	40.725
Region 11	MARSH (S Case)	21,26,18,29	168
Region 12	MARSH (S Case)	11,1,19,20,21,29	394.095
Region 13	EMBANKMENT FILL, EL. -0.5 TO -4/-6.5 (S Case) AWT	40,41,42,5,43,44,36,25,24	127.50611
Region 14	EMBANKMENT FILL, EL. -0.5 TO -4/-6.5 (S Case) BWT	3,40,41,42,37,26	74.904848
Region 15	EMBANKMENT FILL, EL. -0.5 TO -4/-6.5 (S Case) BWT	42,37,38	68.5491
Region 16	EMBANKMENT FILL, EL. -0.5 TO -4/-6.5 (S Case) AWT	42,5,45,46,47,38	91.79939

Points

	X (ft)	Y (ft)
Point 1	120	-6.1
Point 2	182.2	-4.9
Point 3	200	-1.8
Point 4	200	3.5
Point 5	242	-2.3
Point 6	310	-13
Point 7	310	-47
Point 8	310	-70
Point 9	120	-70
Point 10	120	-47
Point 11	120	-13
Point 12	200	13.9
Point 13	200	-28.5
Point 14	120	-28.5
Point 15	201	3.3
Point 16	200.5	13.9
Point 17	200	-23.5
Point 18	200	-13
Point 19	141	-6.1
Point 20	171.3	-6.3
Point 21	177.6	-6
Point 22	192.1	-3
Point 23	198.9	-1.8
Point 24	201	-1.8
Point 25	201	-0.5
Point 26	200	-5
Point 27	242	-13
Point 28	242	-47
Point 29	177.6	-13
Point 30	177.6	-47
Point 31	177.6	-70
Point 32	242	-70
Point 33	206.8	3.4

Point 34	214.8	2.7
Point 35	200	-47
Point 36	230.51765	-0.5
Point 37	242	-6.5
Point 38	310	-6.5
Point 39	200	-70
Point 40	200.57544	-1.8
Point 41	200.80735	-3.52447
Point 42	242	-4.48385
Point 43	231.60262	-1.89238
Point 44	231.47864	-0.69639
Point 45	257.57574	-4.02494
Point 46	267.89217	-4.49529
Point 47	310.008	-4.45566

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	2.23	(241.556, 28.43)	23.92659	(211.1, 3.02377)	(268.147, -4.49505)
2	4664	2.28	(241.556, 28.43)	41.25	(211.292, 3.00696)	(266.49, -4.43138)

Slices of Slip Surface: Optimized

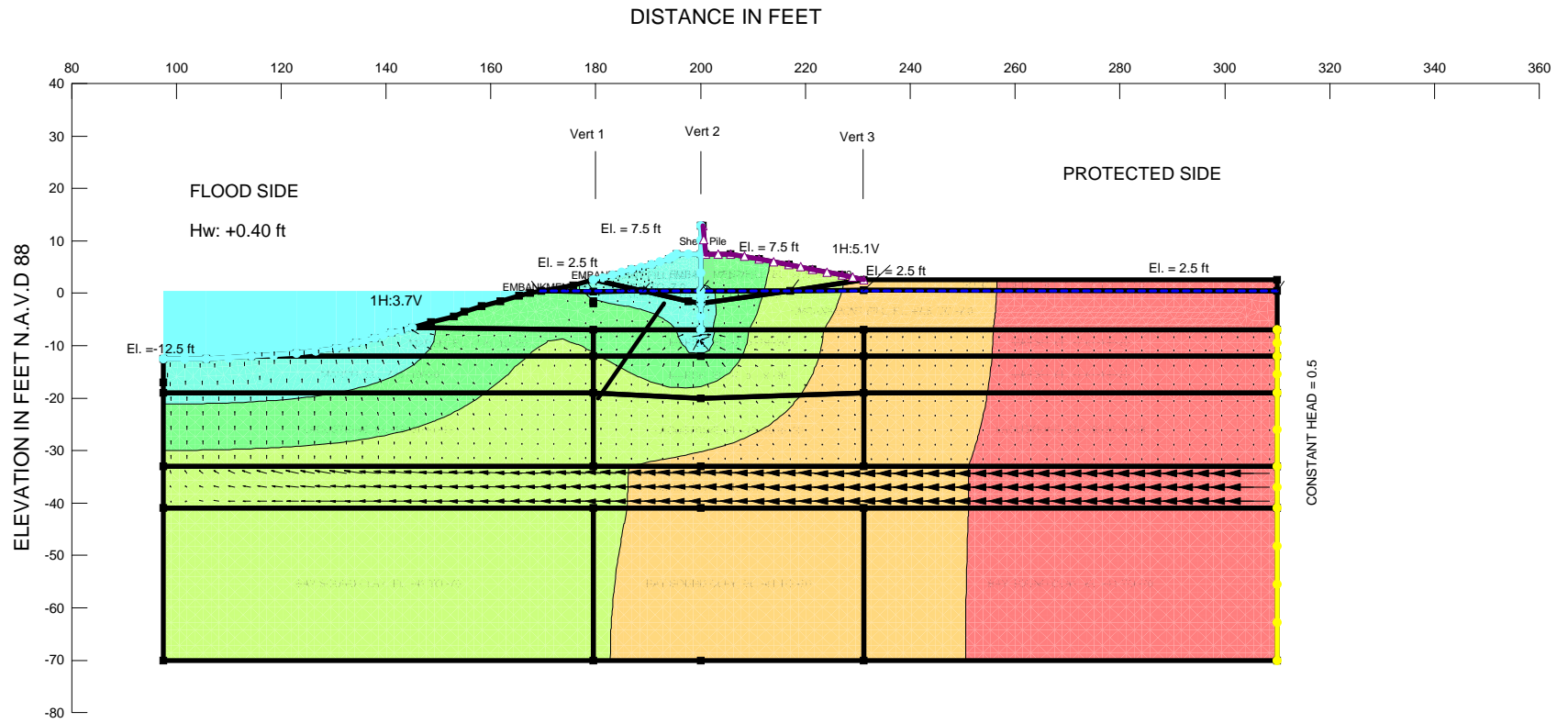
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	211.48355	-0.064225	-227.53761	231.4143	112.8683	75
2	Optimized	212.6005	-1.340476	-149.09896	336.1719	163.96199	75
3	Optimized	214.06685	-2.964528	-49.390401	455.00684	221.92166	75
4	Optimized	214.83405	-3.8142495	2.7522602	517.30401	250.96366	75
5	Optimized	215.07025	-4.0758325	18.816983	562.40436	265.12528	0
6	Optimized	216.08005	-4.951427	72.227664	667.11343	290.14518	0
7	Optimized	217.98865	-6.491452	165.75742	769.49586	268.80167	0
8	Optimized	220.24165	-8.020205	257.86158	891.79532	282.24549	0
9	Optimized	222.5457	-9.301075	334.25728	950.59335	274.4105	0
10	Optimized	224.5859	-10.274065	391.68776	1024.6112	281.79569	0
11	Optimized	226.3623	-10.939175	430.23655	1043.1686	272.89495	0
12	Optimized	228.0673	-11.451505	459.30346	1082.2719	277.36343	0
13	Optimized	229.7009	-11.81105	478.90667	1077.4294	266.47949	0
14	Optimized	230.99815	-12.096575	494.45564	1074.3999	258.2078	0
15	Optimized	231.4832	-12.203335	500.25477	1069.3771	253.38959	0
16	Optimized	231.5452	-12.20416	500.19761	1053.3592	246.28339	0
17	Optimized	232.56025	-12.20094	498.20318	989.80694	218.8761	0
18	Optimized	234.47555	-12.194865	494.41269	982.49747	217.30934	0
19	Optimized	236.3909	-12.18879	490.5961	975.13579	215.73097	0
20	Optimized	238.51145	-12.200505	487.50874	965.68779	212.89903	0
21	Optimized	240.83715	-12.23001	485.14407	960.05558	211.44423	0
22	Optimized	242.9792	-12.257185	482.91651	946.71692	206.49725	0
23	Optimized	245.2622	-12.216	476.1954	925.53105	200.05712	0
24	Optimized	247.4162	-12.08021	463.76158	897.22351	192.98968	0

25	Optimized	249.11655	-11.91585	450.39133	861.63194	183.09612	0
26	Optimized	250.8565	-11.67131	431.93923	832.53406	178.35631	0
27	Optimized	252.63605	-11.346585	408.41158	780.62506	165.72012	0
28	Optimized	254.3629	-10.94743	380.33105	737.75245	159.13426	0
29	Optimized	256.0371	-10.473845	347.70234	672.23066	144.48931	0
30	Optimized	257.22495	-10.095845	321.93467	638.14364	140.78531	0
31	Optimized	258.5401	-9.566425	286.47477	578.07666	129.82953	0
32	Optimized	260.46885	-8.789995	234.4724	494.14757	115.61484	0
33	Optimized	262.8402	-7.70341	162.29628	387.19124	100.12969	0
34	Optimized	264.6396	-6.75252	99.638219	297.3266	88.016538	0
35	Optimized	266.0222	-5.8627245	41.6008	189.06444	71.922821	0
36	Optimized	267.4523	-4.9423495	-18.444372	95.300542	46.48118	75
37	Optimized	268.01975	-4.57715	-42.279494	42.899118	20.923298	75

Slices of Slip Surface: 4664

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	4664	211.7214	-0.05	-228.6783	242.43773	118.24478	75
2	4664	213.4755	-1.733053	-125.5813	382.39977	186.50883	75
3	4664	215.3531	-3.4211145	-22.405039	519.39366	253.32521	75
4	4664	217.1137	-4.7652255	59.212242	641.27145	283.88924	0
5	4664	219.19235	-6.2166495	146.88076	750.65424	268.81727	0
6	4664	220.9347	-7.282013	210.74443	814.17998	268.66682	0
7	4664	222.67705	-8.2336405	267.41886	868.00914	267.40002	0
8	4664	224.4194	-9.080221	317.44681	912.83773	265.08511	0
9	4664	226.16175	-9.828748	361.27335	949.20044	261.76201	0
10	4664	227.9041	-10.4849	399.26757	977.33171	257.37074	0
11	4664	229.6465	-11.053295	431.72437	997.69876	251.98803	0
12	4664	230.99815	-11.443295	453.69371	1009.6501	247.52772	0
13	4664	231.5406	-11.586035	461.64403	954.97719	219.64607	0
14	4664	232.46905	-11.79727	473.1793	913.95885	196.2477	0
15	4664	234.20195	-12.15001	492.10106	945.87428	202.03285	0
16	4664	235.93485	-12.426235	506.23135	971.46157	207.13384	0
17	4664	237.66775	-12.627495	515.65794	990.77931	211.53766	0
18	4664	239.40065	-12.75489	520.47292	1003.8219	215.20083	0
19	4664	241.13355	-12.809105	520.70759	1010.5667	218.09934	0
20	4664	242.9735	-12.7845	515.83091	1002.4028	216.63578	0
21	4664	244.92045	-12.67133	505.20609	977.94705	210.47783	0
22	4664	246.8674	-12.465205	488.7843	944.67535	202.97577	0
23	4664	248.8144	-12.164705	466.46729	902.34573	194.06559	0
24	4664	250.76135	-11.76771	438.1318	850.51971	183.60693	0
25	4664	252.7083	-11.27132	403.58498	788.69618	171.46255	0
26	4664	254.6553	-10.67174	362.59397	716.25605	157.4605	0
27	4664	256.60225	-9.964119	314.85757	632.33573	141.35038	0
28	4664	258.5629	-9.1356985	259.55863	543.22147	126.29483	0
29	4664	260.53725	-8.1769125	196.09448	447.82797	112.07897	0
30	4664	262.5116	-7.082523	124.1634	337.15266	94.828929	0
31	4664	264.4854	-5.8398885	43.026487	196.57397	74.890112	0

32	4664	265.98115	-4.805577	-24.217746	92.191387	44.964744	75
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Name: BEACH SAND, EL. -33 to -41 Model: Saturated Only K-Sat: 2.3e-005 ft/sec K-Ratio: 1
 Name: Sheet Pile Model: Saturated Only K-Sat: 1e-010 ft/sec K-Ratio: 1
 Name: LACUSTRINE, EL -19/-20 to -33 Model: Saturated Only K-Sat: 3.28e-007 ft/sec K-Ratio: 1
 Name: BAY SOUND CLAY, EL. -41 TO -70 Model: Saturated Only K-Sat: 3.28e-008 ft/sec K-Ratio: 1
 Name: MARSH, EL. -7 to -19/-20 Model: Saturated Only K-Sat: 3.28e-007 ft/sec K-Ratio: 1
 Name: EMBANKMENT FILL, EL. +7.5 TO -7.0 Model: Saturated Only K-Sat: 3.28e-008 ft/sec K-Ratio: 1

GENERAL NOTES

CLASSIFICATION STRATIFICATION
 SHEAR STRENGTHS AND UNIT WEIGHTS OF
 THE SOIL WERE BASED ON THE RESULTS OF
 UNDISTURBED BORINGS AND CPT DATA. SEE
 BOTH BORING AND CPT DATA PLATES.

WHERE INDICATED, SHEAR STRENGTHS BETWEEN
 VERTICALS WERE ASSUMED TO VARY LINEARLY
 BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

Hw IS CANAL WATER LEVEL

LAKE PONTCHARTRAIN, LA. AND VICINITY
 HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 10A,
 PROTECTED SIDE STABILITY ANALYSIS,
 CASE: 3 - Normal Water Level 0.4ft
 STA. 91+88 TO 93+53 WEST
 ORLEANS PARISH, LOUISIANA

3 - Normal Water Level 0.4ft

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File Information

Created By: [Liljegren, James](#)
Revision Number: [371](#)
Last Edited By: [Hendrix, Joshua M MVR](#)
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Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix F NWL\](#)
Last Solved Date: [6/24/2013](#)
Last Solved Time: [5:10:30 PM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Mass(M) Units: [lbs](#)
Mass Flux Units: [lbs/sec](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

3 - Normal Water Level 0.4ft

Kind: [SEEP/W](#)
Method: [Steady-State](#)
Settings
 Include Air Flow: [No](#)
Control
 Apply Runoff: [No](#)
Convergence
 Convergence Type: [Head Vector Norm](#)
 Maximum Number of Iterations: [500](#)
 Tolerance: [0.001](#)
 Maximum Change in K: [0.1](#)
 Rate of Change in K: [1.02](#)
 Minimum Change in K: [1e-005](#)
 Equation Solver: [Parallel Direct](#)
 Potential Seepage Max # of Reviews: [10](#)
Time

Starting Time: 0 sec

Duration: 0 sec

Ending Time: 0 sec

Materials

BEACH SAND, EL. -33 to -41

Model: Saturated Only

Hydraulic

K-Sat: 2.3e-005 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

Sheet Pile

Model: Saturated Only

Hydraulic

K-Sat: 1e-010 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

LACUSTRINE, EL -19/-20 to -33

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-007 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

BAY SOUND CLAY, EL. -41 TO -70

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-008 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

MARSH, EL. -7 to -19/-20

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-007 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

EMBANKMENT FILL, EL. +7.5 TO -7.0

Model: Saturated Only
Hydraulic
K-Sat: 3.28e-008 ft/sec
Volumetric Water Content: 0 ft³/ft³
Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

Boundary Conditions

Drainage

Review: true
Type: Total Flux (Q) 0

Curb

Type: Head (H) 0.5

Normal Water Level +0.4ft

Type: Head (H) 0.4

Regions

	Material	Points	Area (ft²)
Region 1	EMBANKMENT FILL, EL. +7.5 TO -7.0	29,30,31,32,33,34,5,71,72,4	144.16491
Region 2	MARSH, EL. -7 to -19/-20	35,36,59,58	394.5
Region 3	LACUSTRINE, EL -19/-20 to -33	38,41,42,39	1104.6
Region 4	BAY SOUND CLAY, EL. -41 TO -70	40,43,9,49	2288.1
Region 5	EMBANKMENT FILL, EL. +7.5 TO -7.0	22,23,24,25,26,27,4,72,70	90.478893
Region 6	MARSH, EL. -7 to -19/-20	44,63,35,58,62,60	257.5
Region 7	LACUSTRINE, EL -19/-20 to -33	45,37,38,39,64,46	695.25
Region 8	BEACH SAND, EL. -33 to -41	56,55,46,64,39,42,43,40,65,47	1700
Region 9	BAY SOUND CLAY, EL. -41 TO -70	47,65,40,49,66,48	1493.5
Region 10	MARSH, EL. -7 to -19/-20	67,2,3,10,11,12,13,44,60	242.2
Region 11	LACUSTRINE, EL -19/-20 to -33	54,45,46,55	1149.4
Region 12	BAY SOUND CLAY, EL. -41 TO -70	47,48,57,56	2380.9
Region	Sheet Pile	4,28,7,29	4.05

13			
Region 14	MARSH, EL. -7 to -19/-20	61,53,1,67,60,45,54	568.45
Region 15	MARSH, EL. -7 to -19/-20	60,62,58,38,37,45	386.25
Region 16	MARSH, EL. -7 to -19/-20	58,59,41,38	552.3
Region 17	EMBANKMENT FILL, EL. +7.5 TO -7.0	70,72,71,8,69	33.838752
Region 18	EMBANKMENT FILL, EL. +7.5 TO -7.0	13,14,15,16,17,18,19,68,20,73,70,69,8,71,74,76,36,35,63,44	1106.8051
Region 19	EMBANKMENT FILL, EL. +7.5 TO -7.0	20,21,22,70,73	19.650406
Region 20	EMBANKMENT FILL, EL. +7.5 TO -7.0	71,5,6,76,74	171.69328

Lines

	Start Point	End Point	Hydraulic Boundary	Right Side Material	Left Side Material
Line 1	29	30	Drainage		
Line 2	30	31	Drainage		
Line 3	31	32	Drainage		
Line 4	32	33	Drainage		
Line 5	33	34	Drainage		
Line 6	34	5	Drainage		
Line 7	36	35			
Line 8	41	38			
Line 9	41	42	Curb		
Line 10	42	39			
Line 11	43	40			
Line 12	43	9	Curb		
Line 13	22	23	Normal Water Level +0.4ft		
Line 14	23	24	Normal Water Level +0.4ft		
Line 15	24	25	Normal Water Level +0.4ft		
Line 16	25	26	Normal Water Level +0.4ft		
Line 17	26	27	Normal Water Level +0.4ft		
Line 18	27	4	Normal Water Level +0.4ft		
Line 19	37	45			
Line 20	46	45			
Line 21	48	47			
Line 22	44	13			
Line 23	2	3	Normal Water Level +0.4ft		
Line 24	3	10	Normal Water Level +0.4ft		
Line 25	10	11	Normal Water Level +0.4ft		
Line 26	11	12	Normal Water Level +0.4ft		
Line 27	12	13	Normal Water Level +0.4ft		
Line 28	4	29		Sheet Pile	
Line 29	4	28	Normal Water Level +0.4ft		
Line 30	28	7			

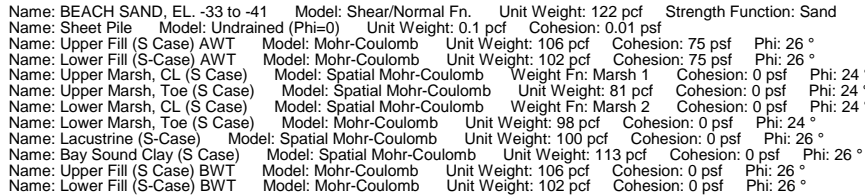
Line 31	7	29	Drainage		
Line 32	39	38			
Line 33	9	49			
Line 34	49	40			
Line 35	38	37			
Line 36	42	43	Curb		
Line 37	55	54			
Line 38	56	55			
Line 39	57	56			
Line 40	54	45			
Line 41	46	55			
Line 42	56	47			
Line 43	57	48			
Line 44	44	60			
Line 45	59	58			
Line 46	60	45			
Line 47	54	61			
Line 48	58	38			
Line 49	59	41	Curb		
Line 50	58	62			
Line 51	62	60			
Line 52	44	63			
Line 53	63	35			
Line 54	46	64			
Line 55	64	39			
Line 56	47	65			
Line 57	65	40			
Line 58	48	66			
Line 59	66	49			
Line 60	35	58			
Line 61	59	36	Curb		
Line 62	67	2	Normal Water Level +0.4ft		
Line 63	60	67			
Line 64	61	53			
Line 65	53	1	Normal Water Level +0.4ft		
Line 66	1	67	Normal Water Level +0.4ft		
Line 67	8	69			
Line 68	69	70			
Line 69	70	22			
Line 70	5	71			
Line 71	71	8			
Line 72	72	4	Normal Water Level +0.4ft	Sheet Pile	
Line 73	72	70			
Line 74	71	72			
Line 75	72	50	Normal Water Level +0.4ft		Sheet Pile
Line 76	8	63	Normal Water Level +0.4ft		Sheet Pile
Line 77	63	75	Normal Water Level +0.4ft		Sheet Pile
Line 78	13	14			

Line 79	14	15			
Line 80	15	16			
Line 81	16	17			
Line 82	17	18			
Line 83	18	19			
Line 84	19	68			
Line 85	68	20			
Line 86	20	73			
Line 87	73	70			
Line 88	71	74			
Line 89	74	76			
Line 90	76	36			
Line 91	20	21			
Line 92	21	22			
Line 93	5	6			
Line 94	6	76			

Points

	X (ft)	Y (ft)	Mesh
Point 1	105.7	-12.5	
Point 2	122.9	-11.5	
Point 3	130.4	-10.5	
Point 4	200	7.5	
Point 5	231.1	2.5	
Point 6	310	2.5	
Point 7	200.5	12.9	
Point 8	200	-2	
Point 9	310	-70	
Point 10	134.3	-9.5	
Point 11	137.9	-8.5	
Point 12	141.1	-7.5	
Point 13	145	-6.5	
Point 14	148.6	-5.5	
Point 15	152.9	-4.5	
Point 16	155	-3.5	
Point 17	158.2	-2.5	
Point 18	161.8	-1.5	
Point 19	165.4	-0.5	
Point 20	169.6	0.5	
Point 21	175.7	1.5	
Point 22	179.6	2.5	
Point 23	183.2	3.5	
Point 24	186.8	4.5	
Point 25	190.7	5.5	
Point 26	194	6.5	
Point 27	195.4	7.5	
Point 28	200	12.9	

Point 29	201	7.5	
Point 30	205.7	7.5	
Point 31	211.1	6.5	
Point 32	216.8	5.5	
Point 33	221.4	4.5	
Point 34	227.1	3.5	
Point 35	231.1	-7	
Point 36	310	-7	
Point 37	200	-20	
Point 38	231.1	-19	
Point 39	231.1	-33	
Point 40	231.1	-41	
Point 41	310	-19	
Point 42	310	-33	
Point 43	310	-41	
Point 44	179.6	-7	
Point 45	179.6	-19	
Point 46	179.6	-33	
Point 47	179.6	-41	
Point 48	179.6	-70	
Point 49	231.1	-70	
Point 50	200	-1.5	
Point 51	179.6	-1.5	
Point 52	179.6	-2	
Point 53	97.5	-12.5	
Point 54	97.5	-19	
Point 55	97.5	-33	
Point 56	97.5	-41	
Point 57	97.5	-70	
Point 58	231.1	-12	
Point 59	310	-12	
Point 60	179.6	-12	
Point 61	97.5	-17	
Point 62	200	-12	
Point 63	200	-7	
Point 64	200	-33	
Point 65	200	-41	
Point 66	200	-70	
Point 67	114.3	-12	
Point 68	167.5	0	
Point 69	197.73	-1.5	
Point 70	189.01504	0.42277	
Point 71	217.11919	0.47705	
Point 72	200	0.40784	
Point 73	179.6	0.36244	
Point 74	231.1	0.54405	
Point 75	200	-9.5	
Point 76	309.93291	0.4487	



CLASSIFICATION STRATIFICATION
SHEAR STRENGTHS AND UNIT WEIGHTS OF
THE SOIL WERE BASED ON THE RESULTS OF
UNDISTURBED BORINGS AND CPT DATA. SEE
BOTH BORING AND CPT DATA PLATES.

Hw IS CANAL WATER LEVEL

ORLEANS AVE OUTFALL CANAL, REACH 10A,
PROTECTED SIDE STABILITY ANALYSIS,
CASE: NWL S Case F/S (Block)
STA. 91+88 TO 93+53 WEST
ORLEANS PARISH, LOUISIANA

NWL S Case F/S (Block)

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File Information

Created By: [Liljegren, James](#)
Revision Number: [372](#)
Last Edited By: [Hendrix, Joshua M MVR](#)
Date: [6/24/2013](#)
Time: [5:21:59 PM](#)
File Name: [Reach 10A.gsz](#)
Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix F NWL\](#)
Last Solved Date: [6/24/2013](#)
Last Solved Time: [5:25:04 PM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Strength Units: [psf](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

NWL S Case F/S (Block)

Kind: [SLOPE/W](#)
Parent: [3 - Normal Water Level 0.4ft](#)
Method: [Spencer](#)
Settings
 PWP Conditions Source: [Parent Analysis](#)
Slip Surface
 Direction of movement: [Right to Left](#)
 Use Passive Mode: [No](#)
 Slip Surface Option: [Block](#)
 Critical slip surfaces saved: [1](#)
 Optimize Critical Slip Surface Location: [Yes](#)
 Tension Crack
 Tension Crack Option: [Tension Crack Line](#)
 Percentage Wet: [0](#)
 Tension Crack Fluid Unit Weight: [62.4 pcf](#)
FOS Distribution
 FOS Calculation Option: [Constant](#)

Restrict Block Crossing: [Yes](#)

Advanced

Number of Slices: [30](#)

Optimization Tolerance: [0.01](#)

Minimum Slip Surface Depth: [0.1 ft](#)

Optimization Maximum Iterations: [2000](#)

Optimization Convergence Tolerance: [1e-007](#)

Starting Optimization Points: [8](#)

Ending Optimization Points: [16](#)

Complete Passes per Insertion: [1](#)

Driving Side Maximum Convex Angle: [5 °](#)

Resisting Side Maximum Convex Angle: [1 °](#)

Materials

BEACH SAND, EL. -33 to -41

Model: [Shear/Normal Fn.](#)

Unit Weight: [122 pcf](#)

Strength Function: [Sand](#)

Phi-B: [0 °](#)

Sheet Pile

Model: [Undrained \(Phi=0\)](#)

Unit Weight: [0.1 pcf](#)

Cohesion: [0.01 psf](#)

Upper Fill (S Case) AWT

Model: [Mohr-Coulomb](#)

Unit Weight: [106 pcf](#)

Cohesion: [75 psf](#)

Phi: [26 °](#)

Phi-B: [0 °](#)

Lower Fill (S-Case) AWT

Model: [Mohr-Coulomb](#)

Unit Weight: [102 pcf](#)

Cohesion: [75 psf](#)

Phi: [26 °](#)

Phi-B: [0 °](#)

Upper Marsh, CL (S Case)

Model: [Spatial Mohr-Coulomb](#)

Weight Fn: [Marsh 1](#)

Cohesion: [0 psf](#)

Phi: [24 °](#)

Phi-B: [0 °](#)

Upper Marsh, Toe (S Case)

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: 81 pcf

Cohesion: 0 psf

Phi: 24 °

Phi-B: 0 °

Lower Marsh, CL (S Case)

Model: [Spatial Mohr-Coulomb](#)

Weight Fn: [Marsh 2](#)

Cohesion: 0 psf

Phi: 24 °

Phi-B: 0 °

Lower Marsh, Toe (S Case)

Model: [Mohr-Coulomb](#)

Unit Weight: 98 pcf

Cohesion: 0 psf

Phi: 24 °

Phi-B: 0 °

Lacustrine (S-Case)

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: 100 pcf

Cohesion: 0 psf

Phi: 26 °

Phi-B: 0 °

Bay Sound Clay (S Case)

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: 113 pcf

Cohesion: 0 psf

Phi: 26 °

Phi-B: 0 °

Upper Fill (S Case) BWT

Model: [Mohr-Coulomb](#)

Unit Weight: 106 pcf

Cohesion: 0 psf

Phi: 26 °

Phi-B: 0 °

Lower Fill (S-Case) BWT

Model: [Mohr-Coulomb](#)

Unit Weight: 102 pcf

Cohesion: 0 psf

Phi: 26 °

Phi-B: 0 °

Slip Surface Limits

Left Coordinate: (97.5, -12.5) ft
Right Coordinate: (310, 2.5) ft

Slip Surface Block

Left Grid
Upper Left: (130, 2.5) ft
Lower Left: (130, -20) ft
Lower Right: (180, -20) ft
X Increments: 10
Y Increments: 10
Starting Angle: 135 °
Ending Angle: 180 °
Angle Increments: 4

Right Grid
Upper Left: (185, 2.5) ft
Lower Left: (185, -20) ft
Lower Right: (225, -20) ft
X Increments: 10
Y Increments: 10
Starting Angle: 0 °
Ending Angle: 65 °
Angle Increments: 4

Tension Crack Line

	X (ft)	Y (ft)
	185	2.5
	225	2.5

Shear/Normal Strength Functions

Sand

Model: Spline Data Point Function
Function: Shear Stress vs. Normal Stress
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
Data Point: (-10000, 0)
Data Point: (0, 0)
Data Point: (10000, 6494)
Estimation Properties
Intact Rock Param.: 10

Geological Strength: 100
Disturbance Factor: 0
SigmaC: 600000 psf
Sigma3: 300000 psf
Num. Points: 20

Unit Weight Functions

Marsh 1

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 81
Data Points: X (ft), Unit Weight (pcf)
Data Point: (179.6, 81)
Data Point: (200, 82)
Data Point: (231.1, 81)

Marsh 2

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 98
Data Points: X (ft), Unit Weight (pcf)
Data Point: (179.6, 98)
Data Point: (200, 82)
Data Point: (231.1, 98)

Regions

	Material	Points	Area (ft²)
Region 1	Upper Fill (S Case) AWT	29,30,31,32,33,34,5,71,72,4	144.16491
Region 2	Upper Marsh, Toe (S Case)	35,36,59,58	394.5
Region 3	Lacustrine (S-Case)	38,41,42,39	1104.6
Region 4	Bay Sound Clay (S Case)	40,43,9,49	2288.1
Region 5	Upper Fill (S Case) AWT	22,23,24,25,26,27,4,72,70	90.478893
Region 6	Upper Marsh, CL (S Case)	44,63,35,58,62,60	257.5
Region 7	Lacustrine (S-Case)	45,37,38,39,64,46	695.25
Region 8	BEACH SAND, EL. -33 to -41	56,55,46,64,39,42,43,40,65,47	1700
Region 9	Bay Sound Clay (S Case)	47,65,40,49,66,48	1493.5
Region 10	Upper Marsh, Toe (S Case)	67,2,3,10,11,12,13,44,60	242.2
Region 11	Lacustrine (S-Case)	54,45,46,55	1149.4
Region 12	Bay Sound Clay (S Case)	47,48,57,56	2380.9
Region 13	Sheet Pile	4,28,7,29	4.05
Region 14	Lower Marsh, Toe (S Case)	61,53,1,67,60,45,54	568.45

Region 15	Lower Marsh, CL (S Case)	60,62,58,38,37,45	386.25
Region 16	Lower Marsh, Toe (S Case)	58,59,41,38	552.3
Region 17	Upper Fill (S Case) BWT	70,72,71,8,69	33.838752
Region 18	Lower Fill (S-Case) BWT	13,14,15,16,17,18,19,68,20,73,70,69,8,71,74,76,36,35,63,44	1106.8051
Region 19	Lower Fill (S-Case) AWT	20,21,22,70,73	19.650406
Region 20	Lower Fill (S-Case) AWT	71,5,6,76,74	171.69328

Points

	X (ft)	Y (ft)
Point 1	105.7	-12.5
Point 2	122.9	-11.5
Point 3	130.4	-10.5
Point 4	200	7.5
Point 5	231.1	2.5
Point 6	310	2.5
Point 7	200.5	12.9
Point 8	200	-2
Point 9	310	-70
Point 10	134.3	-9.5
Point 11	137.9	-8.5
Point 12	141.1	-7.5
Point 13	145	-6.5
Point 14	148.6	-5.5
Point 15	152.9	-4.5
Point 16	155	-3.5
Point 17	158.2	-2.5
Point 18	161.8	-1.5
Point 19	165.4	-0.5
Point 20	169.6	0.5
Point 21	175.7	1.5
Point 22	179.6	2.5
Point 23	183.2	3.5
Point 24	186.8	4.5
Point 25	190.7	5.5
Point 26	194	6.5
Point 27	195.4	7.5
Point 28	200	12.9
Point 29	201	7.5
Point 30	205.7	7.5
Point 31	211.1	6.5
Point 32	216.8	5.5
Point 33	221.4	4.5
Point 34	227.1	3.5
Point 35	231.1	-7
Point 36	310	-7
Point 37	200	-20
Point 38	231.1	-19

Point 39	231.1	-33
Point 40	231.1	-41
Point 41	310	-19
Point 42	310	-33
Point 43	310	-41
Point 44	179.6	-7
Point 45	179.6	-19
Point 46	179.6	-33
Point 47	179.6	-41
Point 48	179.6	-70
Point 49	231.1	-70
Point 50	200	-1.5
Point 51	179.6	-1.5
Point 52	179.6	-2
Point 53	97.5	-12.5
Point 54	97.5	-19
Point 55	97.5	-33
Point 56	97.5	-41
Point 57	97.5	-70
Point 58	231.1	-12
Point 59	310	-12
Point 60	179.6	-12
Point 61	97.5	-17
Point 62	200	-12
Point 63	200	-7
Point 64	200	-33
Point 65	200	-41
Point 66	200	-70
Point 67	114.3	-12
Point 68	167.5	0
Point 69	197.73	-1.5
Point 70	189.01504	0.42277
Point 71	217.11919	0.47705
Point 72	200	0.40784
Point 73	179.6	0.36244
Point 74	231.1	0.54405
Point 75	200	-9.5
Point 76	309.93291	0.4487

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.37	(161.461, 5.834)	33.07102	(197.407, 7.5)	(123.122, -11.4704)
2	21894	1.51	(161.461, 5.834)	31.672	(198.812, 7.5)	(127.87, -10.8373)

Slices of Slip Surface: Optimized

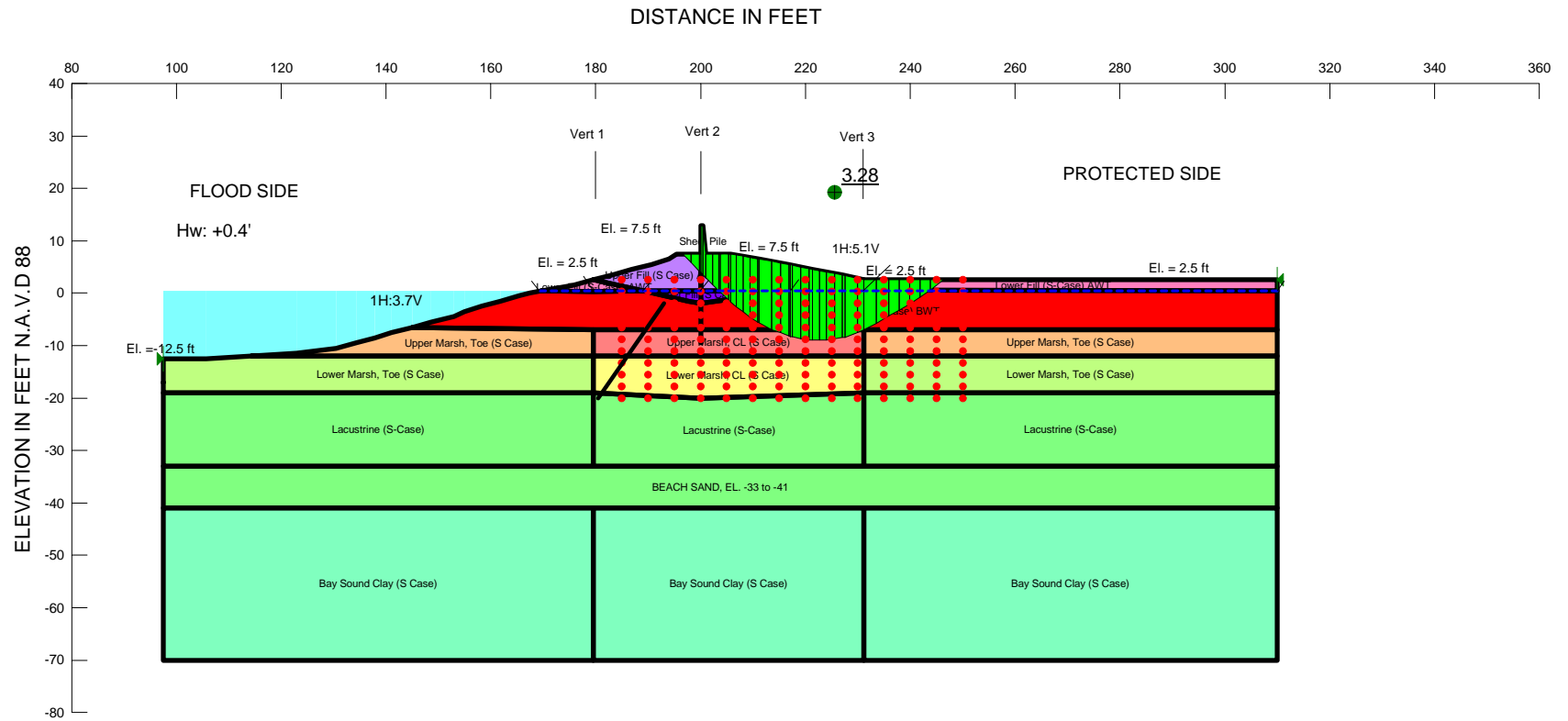
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)

1	Optimized	124.3351	-11.5163	743.62504	759.07175	6.8773168	0
2	Optimized	126.76105	-11.608125	749.39181	772.66485	10.361824	0
3	Optimized	129.187	-11.699955	755.19977	786.21676	13.809652	0
4	Optimized	130.9691	-11.76741	759.47167	805.04453	20.290347	0
5	Optimized	132.9191	-11.863555	765.53228	823.45429	25.78854	0
6	Optimized	134.8723	-11.96908	772.22832	842.64502	31.351534	0
7	Optimized	136.6723	-12.066325	778.38671	860.82088	36.702054	0
8	Optimized	138.6074	-12.17087	785.05522	883.16066	43.679354	0
9	Optimized	140.2074	-12.26605	791.06644	902.75825	49.728396	0
10	Optimized	142.06715	-12.38473	798.60328	921.65185	54.784753	0
11	Optimized	144.0015	-12.508165	806.49696	943.06282	60.803037	0
12	Optimized	144.98435	-12.570885	810.49283	953.96289	63.876986	0
13	Optimized	146.8	-12.68716	817.90799	987.92085	75.694606	0
14	Optimized	150.24655	-12.90787	832.03656	1046.1975	95.350587	0
15	Optimized	152.39655	-13.030465	839.88188	1074.3691	104.40043	0
16	Optimized	153.2324	-13.05895	841.72672	1095.1783	112.8439	0
17	Optimized	154.2824	-13.049225	841.21054	1101.9733	116.09905	0
18	Optimized	156.6	-12.981225	837.10853	1124.7348	128.05945	0
19	Optimized	159.29795	-12.902065	832.30342	1148.4458	140.75566	0
20	Optimized	161.0544	-12.8392	828.45649	1158.0795	146.75761	0
21	Optimized	161.75645	-12.806385	826.44022	1161.9379	149.37319	0
22	Optimized	163.6	-12.71465	820.79006	1173.1874	156.8974	0
23	Optimized	166.45	-12.572835	811.99545	1188.815	167.77087	0
24	Optimized	168.55	-12.468345	805.52726	1198.4697	174.94925	0
25	Optimized	170.5811	-12.36728	799.22714	1219.506	187.1202	0
26	Optimized	172.9755	-12.15923	786.26357	1224.4126	195.07651	0
27	Optimized	175.0444	-11.926135	771.73581	1237.6723	207.44831	0
28	Optimized	176.2907	-11.78572	762.9384	1252.7926	218.09713	0
29	Optimized	178.2407	-11.36503	736.64491	1230.779	220.00266	0
30	Optimized	180.37625	-10.80865	701.90201	1242.4931	240.68666	0
31	Optimized	182.17625	-10.151007	660.8015	1194.3336	237.54378	0
32	Optimized	184.0102	-9.335182	609.7977	1180.2391	253.97686	0
33	Optimized	185.8102	-8.3375855	547.42898	1103.3956	247.53229	0
34	Optimized	187.344	-7.3502055	485.71638	1066.103	258.40478	0
35	Optimized	188.3415	-6.708055	445.52744	1027.6268	283.90883	0
36	Optimized	188.905	-6.319948	421.17726	954.59546	260.16544	0
37	Optimized	189.8575	-5.487355	368.99874	900.91459	259.43269	0
38	Optimized	192.1193	-3.510282	245.08501	778.57897	260.20239	0
39	Optimized	193.7693	-1.9882075	149.76449	627.2384	232.87959	0
40	Optimized	194.3574	-1.2707697	104.85566	589.9428	236.5928	0
41	Optimized	195.0574	-0.41683569	51.431252	552.17329	244.22821	0
42	Optimized	195.5691	0.20736271	12.386019	515.09836	245.18919	0
43	Optimized	196.38935	1.2079662	-50.169919	400.42469	195.30017	75
44	Optimized	197.22385	2.25115	-115.36186	309.74415	151.07232	75

Slices of Slip Surface: 21894

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)

1	21894	129.1352	-11.08886	716.98457	751.64735	15.432866	0
2	21894	132.0579	-11.67022	753.43426	821.58409	30.34226	0
3	21894	134.0079	-12.0581	777.76229	865.01606	38.847879	0
4	21894	135.2	-12.29522	792.63801	897.20062	46.554275	0
5	21894	137	-12.65326	815.08709	943.73344	57.277042	0
6	21894	138.95	-13.04114	839.45896	996.94509	70.117341	0
7	21894	140.55	-13.25	852.62727	996.54545	64.076503	0
8	21894	142.075	-13.25	852.71795	1001.0256	66.030839	0
9	21894	144.025	-13.25	852.87179	1009.7949	69.866655	0
10	21894	145.9	-13.25	853	1025.4444	76.777213	0
11	21894	147.7	-13.25	853.16667	1046.1667	85.929136	0
12	21894	149.675	-13.25	853.34884	1065.1163	94.28494	0
13	21894	151.825	-13.25	853.53488	1085.7209	103.37589	0
14	21894	153.95	-13.25	853.71429	1122.9524	119.87252	0
15	21894	156.6	-13.25	853.875	1158.1563	135.47474	0
16	21894	159.1	-13.25	854	1187.5556	148.5085	0
17	21894	160.9	-13.25	854.11111	1207.7222	157.43781	0
18	21894	162.7	-13.25	854.16667	1227.8333	166.36712	0
19	21894	164.5	-13.25	854.22222	1247.9444	175.29643	0
20	21894	166.45	-13.25	854.28571	1267.8571	184.13386	0
21	21894	168.55	-13.25	854.33333	1288.0952	193.12324	0
22	21894	170.61665	-13.25	854.3608	1320.3445	207.4693	0
23	21894	172.65	-13.25	854.3608	1356.0002	223.34426	0
24	21894	174.68335	-13.25	854.3608	1391.656	239.21922	0
25	21894	176.675	-13.25	854.35897	1436.0513	258.9861	0
26	21894	178.625	-13.25	854.35897	1489.1795	282.6403	0
27	21894	180.5	-13.25	854.33333	1543.1667	306.68836	0
28	21894	182.3	-13.25	854.27778	1598.0556	331.1512	0
29	21894	184.1	-13.25	854.22222	1652.8889	355.58931	0
30	21894	185.5481	-12.625	815.1749	1313.4342	221.83935	0
31	21894	186.4481	-11.598745	751.02821	1254.9303	224.35164	0
32	21894	187.9075	-9.934607	647.04025	1166.649	231.3447	0
33	21894	189.74805	-7.835862	515.89581	1054.4135	239.76352	0
34	21894	190.59055	-6.875198	455.8252	990.11631	260.59119	0
35	21894	192.35	-4.8689315	330.0725	859.4073	258.17383	0
36	21894	194.7	-2.18927	162.25086	706.44185	265.41968	0
37	21894	195.54885	-1.221344	101.65177	661.32568	272.9712	0
38	21894	196.33945	-0.31983605	45.254994	582.85165	262.20341	0
39	21894	197.8968	1.4559715	-65.755386	406.76738	198.39371	75



Name: BEACH SAND, EL. -33 to -41 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand
 Name: Sheet Pile Model: Undrained (Phi=0) Unit Weight: 0.1 pcf Cohesion: 0.01 psf
 Name: Upper Fill (S Case) AWT Model: Mohr-Coulomb Unit Weight: 106 pcf Cohesion: 75 psf Phi: 26 °
 Name: Lower Fill (S-Case) AWT Model: Mohr-Coulomb Unit Weight: 102 pcf Cohesion: 75 psf Phi: 26 °
 Name: Upper Marsh, CL (S Case) Model: Spatial Mohr-Coulomb Weight Fn: Marsh 1 Cohesion: 0 psf Phi: 24 °
 Name: Upper Marsh, Toe (S Case) Model: Spatial Mohr-Coulomb Unit Weight: 81 pcf Cohesion: 0 psf Phi: 24 °
 Name: Lower Marsh, CL (S Case) Model: Spatial Mohr-Coulomb Weight Fn: Marsh 2 Cohesion: 0 psf Phi: 24 °
 Name: Lower Marsh, Toe (S Case) Model: Mohr-Coulomb Unit Weight: 98 pcf Cohesion: 0 psf Phi: 24 °
 Name: Lacustrine (S-Case) Model: Spatial Mohr-Coulomb Unit Weight: 100 pcf Cohesion: 0 psf Phi: 26 °
 Name: Bay Sound Clay (S Case) Model: Spatial Mohr-Coulomb Unit Weight: 113 pcf Cohesion: 0 psf Phi: 26 °
 Name: Upper Fill (S Case) BWT Model: Mohr-Coulomb Unit Weight: 106 pcf Cohesion: 0 psf Phi: 26 °
 Name: Lower Fill (S-Case) BWT Model: Mohr-Coulomb Unit Weight: 102 pcf Cohesion: 0 psf Phi: 26 °

GENERAL NOTES

CLASSIFICATION STRATIFICATION
 SHEAR STRENGTHS AND UNIT WEIGHTS OF
 THE SOIL WERE BASED ON THE RESULTS OF
 UNDISTURBED BORINGS AND CPT DATA. SEE
 BOTH BORING AND CPT DATA PLATES.

WHERE INDICATED, SHEAR STRENGTHS BETWEEN
 VERTICALS WERE ASSUMED TO VARY LINEARLY
 BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

Hw IS CANAL WATER LEVEL

LAKE PONTCHARTRAIN, LA. AND VICINITY
 HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 10A,
 PROTECTED SIDE STABILITY ANALYSIS,
 CASE: NWL S Case P/S (Block)
 STA. 91+88 TO 93+53 WEST
 ORLEANS PARISH, LOUISIANA

NWL S Case P/S (Block)

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File Information

Created By: [Liljegren, James](#)
Revision Number: [373](#)
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Time: [5:36:11 PM](#)
File Name: [Reach 10A.gsz](#)
Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix F NWL\](#)
Last Solved Date: [6/24/2013](#)
Last Solved Time: [5:38:50 PM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Strength Units: [psf](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

NWL S Case P/S (Block)

Kind: [SLOPE/W](#)
Parent: [3 - Normal Water Level 0.4ft](#)
Method: [Spencer](#)
Settings
 PWP Conditions Source: [Parent Analysis](#)
Slip Surface
 Direction of movement: [Left to Right](#)
 Use Passive Mode: [No](#)
 Slip Surface Option: [Block](#)
 Critical slip surfaces saved: [1](#)
 Optimize Critical Slip Surface Location: [Yes](#)
 Tension Crack
 Tension Crack Option: [\(none\)](#)
FOS Distribution
 FOS Calculation Option: [Constant](#)
Restrict Block Crossing: [Yes](#)
Advanced

Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 2000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

BEACH SAND, EL. -33 to -41

Model: Shear/Normal Fn.
Unit Weight: 122 pcf
Strength Function: Sand
Phi-B: 0 °

Sheet Pile

Model: Undrained (Phi=0)
Unit Weight: 0.1 pcf
Cohesion: 0.01 psf

Upper Fill (S Case) AWT

Model: Mohr-Coulomb
Unit Weight: 106 pcf
Cohesion: 75 psf
Phi: 26 °
Phi-B: 0 °

Lower Fill (S-Case) AWT

Model: Mohr-Coulomb
Unit Weight: 102 pcf
Cohesion: 75 psf
Phi: 26 °
Phi-B: 0 °

Upper Marsh, CL (S Case)

Model: Spatial Mohr-Coulomb
Weight Fn: Marsh 1
Cohesion: 0 psf
Phi: 24 °
Phi-B: 0 °

Upper Marsh, Toe (S Case)

Model: Spatial Mohr-Coulomb

Unit Weight: 81 pcf

Cohesion: 0 psf

Phi: 24 °

Phi-B: 0 °

Lower Marsh, CL (S Case)

Model: Spatial Mohr-Coulomb

Weight Fn: Marsh 2

Cohesion: 0 psf

Phi: 24 °

Phi-B: 0 °

Lower Marsh, Toe (S Case)

Model: Mohr-Coulomb

Unit Weight: 98 pcf

Cohesion: 0 psf

Phi: 24 °

Phi-B: 0 °

Lacustrine (S-Case)

Model: Spatial Mohr-Coulomb

Unit Weight: 100 pcf

Cohesion: 0 psf

Phi: 26 °

Phi-B: 0 °

Bay Sound Clay (S Case)

Model: Spatial Mohr-Coulomb

Unit Weight: 113 pcf

Cohesion: 0 psf

Phi: 26 °

Phi-B: 0 °

Upper Fill (S Case) BWT

Model: Mohr-Coulomb

Unit Weight: 106 pcf

Cohesion: 0 psf

Phi: 26 °

Phi-B: 0 °

Lower Fill (S-Case) BWT

Model: Mohr-Coulomb

Unit Weight: 102 pcf

Cohesion: 0 psf

Phi: 26 °

Phi-B: 0 °

Slip Surface Limits

Left Coordinate: (97.5, -12.5) ft

Right Coordinate: (310, 2.5) ft

Slip Surface Block

Left Grid

Upper Left: (185, 2.5) ft

Lower Left: (185, -20) ft

Lower Right: (215, -20) ft

X Increments: 6

Y Increments: 10

Starting Angle: 115 °

Ending Angle: 135 °

Angle Increments: 4

Right Grid

Upper Left: (220, 2.5) ft

Lower Left: (220, -20) ft

Lower Right: (250, -20) ft

X Increments: 6

Y Increments: 10

Starting Angle: 35 °

Ending Angle: 45 °

Angle Increments: 4

Shear/Normal Strength Functions

Sand

Model: Spline Data Point Function

Function: Shear Stress vs. Normal Stress

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 0

Data Points: Normal Stress (psf), Shear Stress (psf)

Data Point: (-10000, 0)

Data Point: (0, 0)

Data Point: (10000, 6494)

Estimation Properties

Intact Rock Param.: 10

Geological Strength: 100

Disturbance Factor: 0

SigmaC: 600000 psf

Sigma3: 300000 psf

Num. Points: 20

Unit Weight Functions

Marsh 1

Model: Spline Data Point Function

Function: Unit Weight vs. X

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 81

Data Points: X (ft), Unit Weight (pcf)

Data Point: (179.6, 81)

Data Point: (200, 82)

Data Point: (231.1, 81)

Marsh 2

Model: Spline Data Point Function

Function: Unit Weight vs. X

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 98

Data Points: X (ft), Unit Weight (pcf)

Data Point: (179.6, 98)

Data Point: (200, 82)

Data Point: (231.1, 98)

Regions

	Material	Points	Area (ft²)
Region 1	Upper Fill (S Case) AWT	29,30,31,32,33,34,5,71,72,4	144.16491
Region 2	Upper Marsh, Toe (S Case)	35,36,59,58	394.5
Region 3	Lacustrine (S-Case)	38,41,42,39	1104.6
Region 4	Bay Sound Clay (S Case)	40,43,9,49	2288.1
Region 5	Upper Fill (S Case) AWT	22,23,24,25,26,27,4,72,70	90.478893
Region 6	Upper Marsh, CL (S Case)	44,63,35,58,62,60	257.5
Region 7	Lacustrine (S-Case)	45,37,38,39,64,46	695.25
Region 8	BEACH SAND, EL. -33 to -41	56,55,46,64,39,42,43,40,65,47	1700
Region 9	Bay Sound Clay (S Case)	47,65,40,49,66,48	1493.5
Region 10	Upper Marsh, Toe (S Case)	67,2,3,10,11,12,13,44,60	242.2
Region 11	Lacustrine (S-Case)	54,45,46,55	1149.4
Region 12	Bay Sound Clay (S Case)	47,48,57,56	2380.9
Region 13	Sheet Pile	4,28,7,29	4.05
Region 14	Lower Marsh, Toe (S Case)	61,53,1,67,60,45,54	568.45
Region 15	Lower Marsh, CL (S Case)	60,62,58,38,37,45	386.25
Region 16	Lower Marsh, Toe (S Case)	58,59,41,38	552.3
Region 17	Upper Fill (S Case) BWT	70,72,71,8,69	33.838752
Region 18	Lower Fill (S-Case) BWT	13,14,15,16,17,18,19,68,20,73,70,69,8,71,74,76,36,35,63,44	1106.8051
Region 19	Lower Fill (S-Case) AWT	20,21,22,70,73	19.650406
Region 20	Lower Fill (S-Case) AWT	71,5,6,76,74	171.69328

Points

	X (ft)	Y (ft)
Point 1	105.7	-12.5
Point 2	122.9	-11.5
Point 3	130.4	-10.5
Point 4	200	7.5
Point 5	231.1	2.5
Point 6	310	2.5
Point 7	200.5	12.9
Point 8	200	-2
Point 9	310	-70
Point 10	134.3	-9.5
Point 11	137.9	-8.5
Point 12	141.1	-7.5
Point 13	145	-6.5
Point 14	148.6	-5.5
Point 15	152.9	-4.5
Point 16	155	-3.5
Point 17	158.2	-2.5
Point 18	161.8	-1.5
Point 19	165.4	-0.5
Point 20	169.6	0.5
Point 21	175.7	1.5
Point 22	179.6	2.5
Point 23	183.2	3.5
Point 24	186.8	4.5
Point 25	190.7	5.5
Point 26	194	6.5
Point 27	195.4	7.5
Point 28	200	12.9
Point 29	201	7.5
Point 30	205.7	7.5
Point 31	211.1	6.5
Point 32	216.8	5.5
Point 33	221.4	4.5
Point 34	227.1	3.5
Point 35	231.1	-7
Point 36	310	-7
Point 37	200	-20
Point 38	231.1	-19
Point 39	231.1	-33
Point 40	231.1	-41
Point 41	310	-19
Point 42	310	-33
Point 43	310	-41
Point 44	179.6	-7
Point 45	179.6	-19

Point 46	179.6	-33
Point 47	179.6	-41
Point 48	179.6	-70
Point 49	231.1	-70
Point 50	200	-1.5
Point 51	179.6	-1.5
Point 52	179.6	-2
Point 53	97.5	-12.5
Point 54	97.5	-19
Point 55	97.5	-33
Point 56	97.5	-41
Point 57	97.5	-70
Point 58	231.1	-12
Point 59	310	-12
Point 60	179.6	-12
Point 61	97.5	-17
Point 62	200	-12
Point 63	200	-7
Point 64	200	-33
Point 65	200	-41
Point 66	200	-70
Point 67	114.3	-12
Point 68	167.5	0
Point 69	197.73	-1.5
Point 70	189.01504	0.42277
Point 71	217.11919	0.47705
Point 72	200	0.40784
Point 73	179.6	0.36244
Point 74	231.1	0.54405
Point 75	200	-9.5
Point 76	309.93291	0.4487

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	3.28	(222.805, 8.75)	22.71706	(196.658, 7.5)	(246.366, 2.5)
2	7326	3.60	(222.805, 8.75)	21.891	(198.75, 7.5)	(246.067, 2.5)

Slices of Slip Surface: **Optimized**

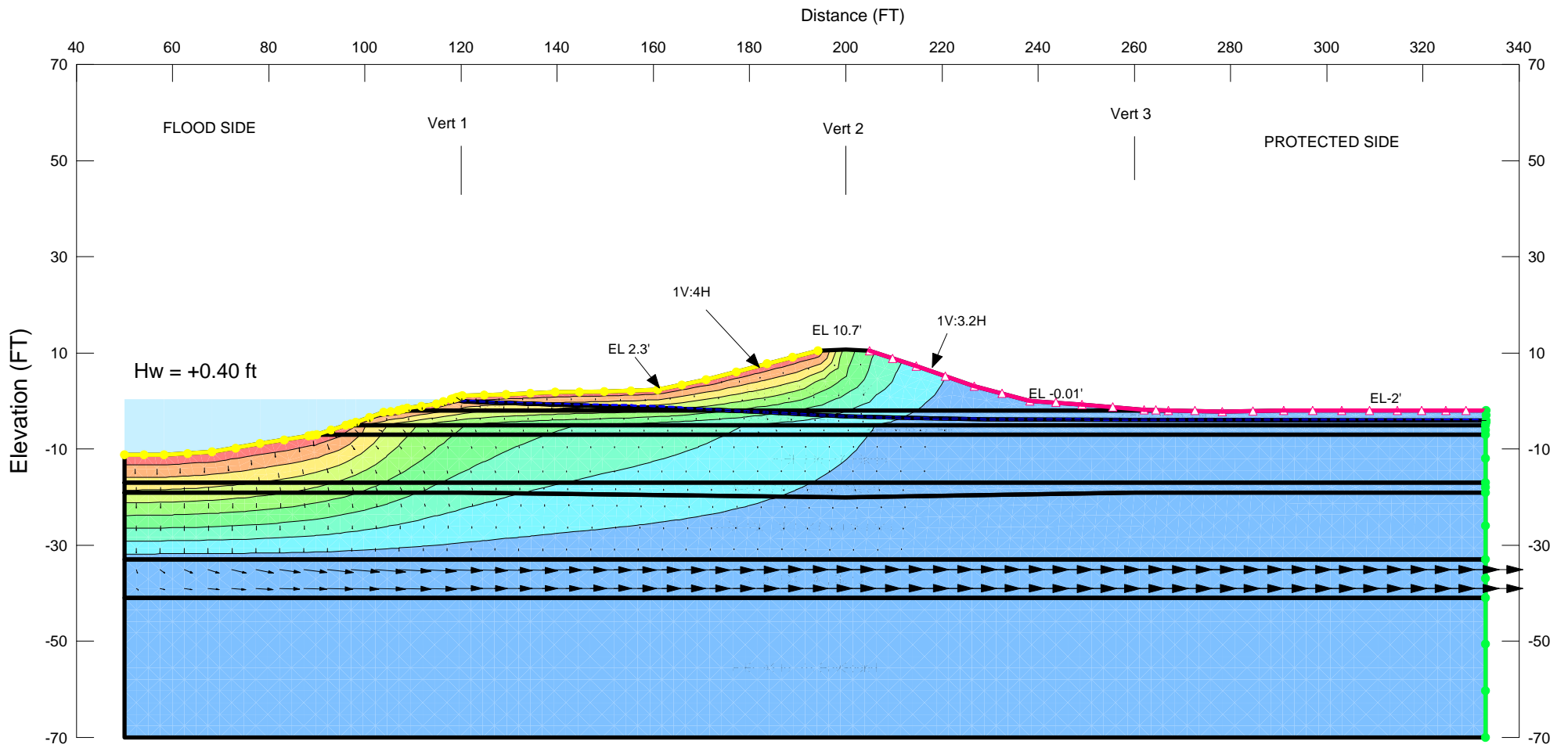
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	197.4543	6.65948	-390.57364	54.470221	26.566902	75
2	Optimized	199.04625	4.97844	-285.67603	200.22806	97.657749	75
3	Optimized	199.9211	4.0576125	-228.23445	282.72023	137.89187	75
4	Optimized	200.25	3.7227965	-206.14956	312.39878	152.36707	75
5	Optimized	200.75	3.2137795	-174.16688	356.61674	173.9336	75
6	Optimized	201.6231	2.324943	-118.75742	433.9912	211.67165	75
7	Optimized	202.8693	1.056287	-39.607925	544.75235	265.69348	75

8	Optimized	203.61565	0.2964945	7.8615288	629.81502	303.34698	0
9	Optimized	204.51035	-0.5323585	59.711843	721.35048	322.70273	0
10	Optimized	205.4909	-1.4263655	115.65468	806.08719	336.74644	0
11	Optimized	206.21585	-2.087307	157.02276	858.20679	341.9903	0
12	Optimized	207.4237	-3.0490785	217.23583	956.6954	360.65853	0
13	Optimized	208.8077	-4.031975	278.80837	1024.8541	363.87079	0
14	Optimized	210.1917	-5.0148715	340.37502	1093.0716	367.11466	0
15	Optimized	210.99185	-5.566248	374.91527	1158.0871	381.97841	0
16	Optimized	212.3149	-6.299453	420.85294	1205.3939	382.64622	0
17	Optimized	214.36695	-7.26365	481.27697	1299.9725	364.50672	0
18	Optimized	216.00205	-7.831855	516.88726	1315.5387	355.58253	0
19	Optimized	216.9596	-8.164599	537.74212	1323.8027	349.97671	0
20	Optimized	217.3021	-8.283619	545.18962	1325.5849	347.45436	0
21	Optimized	218.27115	-8.4838375	557.75604	1353.3777	354.23359	0
22	Optimized	219.84345	-8.7571525	574.92548	1339.0281	340.20039	0
23	Optimized	221.0148	-8.8985825	583.83694	1355.1133	343.39434	0
24	Optimized	222.0428	-8.911319	584.69266	1334.5425	333.85468	0
25	Optimized	223.3284	-8.9272465	585.76602	1310.9753	322.88399	0
26	Optimized	224.7534	-8.8117525	578.64692	1307.062	324.3113	0
27	Optimized	226.3178	-8.564838	563.32283	1255.224	308.05427	0
28	Optimized	227.3152	-8.4074155	553.55647	1220.3717	296.88527	0
29	Optimized	228.76455	-7.95845	525.5993	1174.3901	288.86029	0
30	Optimized	230.54935	-7.259236	482.05593	1094.2577	272.56978	0
31	Optimized	232.32895	-6.340726	424.80285	987.78412	274.58431	0
32	Optimized	234.73945	-5.03983	343.71869	851.80552	247.8105	0
33	Optimized	236.8944	-3.8023675	266.57628	717.30659	219.83586	0
34	Optimized	238.8412	-2.6606425	195.4039	589.96462	192.44012	0
35	Optimized	240.81275	-1.4351649	119.00149	460.06314	166.34688	0
36	Optimized	242.85705	-0.0944299	35.414004	308.83943	133.35849	0
37	Optimized	245.13435	1.545845	-66.861665	142.64079	69.57056	75

Slices of Slip Surface: 7326

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	7326	199.375	6.875	-404.0408	39.097913	19.069326	75
2	7326	200.25	6	-348.17937	116.57786	56.858823	75
3	7326	200.75	5.5	-316.72726	160.37181	78.21856	75
4	7326	201.78335	4.4666665	-252.24307	251.11922	122.47903	75
5	7326	203.35	2.9	-154.45019	389.04117	189.74806	75
6	7326	204.91665	1.3333335	-56.603152	526.94506	257.00828	75
7	7326	205.7593	0.4906819	-3.9174023	600.20146	292.73781	75
8	7326	206.5129	-0.26290015	43.199104	674.65339	307.98083	0
9	7326	208.1804	-1.9303731	147.51234	801.37293	318.90912	0
10	7326	210.1268	-3.876791	269.28586	946.17879	330.14274	0
11	7326	212.175	-5.925	397.45981	1099.5347	342.42478	0
12	7326	214.125	-7.875	519.42038	1237.9216	319.89736	0
13	7326	215.9	-8.75	574.16667	1463.8889	396.12986	0
14	7326	216.9596	-8.75	574.26611	1442.5577	386.58833	0

15	7326	217.83265	-8.75	574.3351	1421.7166	377.27855	0
16	7326	219.2596	-8.75	574.44022	1387.5875	362.03651	0
17	7326	220.68655	-8.75	574.53833	1353.4585	346.7976	0
18	7326	222.1125	-8.75	574.63158	1322.5263	332.98419	0
19	7326	223.5375	-8.75	574.71579	1294.8772	320.63651	0
20	7326	224.9625	-8.75	574.8	1267.1579	308.2576	0
21	7326	226.3875	-8.75	574.87719	1239.5088	295.91304	0
22	7326	227.825	-8.75	574.95862	1205.7931	280.86561	0
23	7326	229.275	-8.75	575.02759	1166.069	263.14858	0
24	7326	230.55	-8.364886	551.05105	1227.9834	301.38971	0
25	7326	231.79965	-7.489886	496.50505	1133.0188	283.39417	0
26	7326	233.26735	-6.462189	432.42935	1035.3604	294.06913	0
27	7326	234.8035	-5.3865675	365.36235	912.97928	267.09062	0
28	7326	236.33965	-4.310946	298.29002	790.65147	240.14072	0
29	7326	237.87575	-3.235324	231.22836	668.32366	213.18562	0
30	7326	239.4119	-2.1597025	164.16136	545.94252	186.20711	0
31	7326	240.94805	-1.0840811	97.0997	423.59871	159.24421	0
32	7326	242.4842	-0.00845925	30.034304	301.24423	132.27792	0
33	7326	243.9559	1.0220138	-34.215245	199.08491	97.100198	75
34	7326	245.3631	2.007338	-95.648074	79.267228	38.66121	75



Name: 1-EI +10.7 to -2, Fill GR Model: Saturated Only K-Sat: 3.28e-008 ft/sec Volumetric Water Content: 0 ft³/ft³ Mv: 0 /psf K-Ratio: 1 K-Direction: 0 °
Name: 2-EI -2 to -5, Fill Model: Saturated Only K-Sat: 3.28e-008 ft/sec Volumetric Water Content: 0 ft³/ft³ Mv: 0 /psf K-Ratio: 1 K-Direction: 0 °
Name: 3-EI -5 to -7, Fill Model: Saturated Only K-Sat: 3.28e-007 ft/sec Volumetric Water Content: 0 ft³/ft³ Mv: 0 /psf K-Ratio: 1 K-Direction: 0 °
Name: 4-EI -7 to -17, Marsh Model: Saturated Only K-Sat: 3.28e-007 ft/sec Volumetric Water Content: 0 ft³/ft³ Mv: 0 /psf K-Ratio: 1 K-Direction: 0 °
Name: 5-EI -17 to -19, -20, Marsh Model: Saturated Only K-Sat: 3.28e-007 ft/sec Volumetric Water Content: 0 ft³/ft³ Mv: 0 /psf K-Ratio: 1 K-Direction: 0 °
Name: 6-EI -19, -20 to -33, Lancustrine Model: Saturated Only K-Sat: 3.28e-007 ft/sec Volumetric Water Content: 0 ft³/ft³ Mv: 0 /psf K-Ratio: 1 K-Direction: 0 °
Name: 7-EI -33 to -41, Sand Model: Saturated Only K-Sat: 0.000492 ft/sec Volumetric Water Content: 0 ft³/ft³ Mv: 0 /psf K-Ratio: 1 K-Direction: 0 °
Name: 8-EI -41 to -70, BaySound Model: Saturated Only K-Sat: 3.28e-008 ft/sec Volumetric Water Content: 0 ft³/ft³ Mv: 0 /psf K-Ratio: 1 K-Direction: 0 °

CROSS SECTION AT STA 95+00W

GENERAL NOTES

CLASSIFICATION STRATIFICATION
SHEAR STRENGTHS AND UNIT WEIGHTS OF
THE SOIL WERE BASED ON THE RESULTS OF
UNDISTURBED BORINGS AND CPT DATA. SEE
BOTH BORING AND CPT DATA PLATES.

WHERE INDICATED, SHEAR STRENGTHS BETWEEN
VERTICALS WERE ASSUMED TO VARY LINEARLY
BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

LAKE PONTCHARTRAIN, LA. AND VICINITY HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL,
REMEDIATION OF CANAL WALLS AND LEVEES
PROTECTED SIDE STABILITY ANALYSIS,
CASE: Name: Normal Water Level +0.40ft (seepage)
REACH 10B, STA. 93+53 TO STA. 98+70 WEST
ORLEANS PARISH, LOUISIANA

Normal Water Level +0.40ft (seepage)

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File Information

Created By: [Vicky Curtis](#)
Revision Number: [109](#)
Last Edited By: [Bishop, Charles E MVR](#)
Date: [6/25/2013](#)
Time: [12:10:00 PM](#)
File Name: [Reach 10B.gsz](#)
Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix F NWL\](#)
Last Solved Date: [6/25/2013](#)
Last Solved Time: [12:10:14 PM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Mass(M) Units: [lbs](#)
Mass Flux Units: [lbs/sec](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

Normal Water Level +0.40ft (seepage)

Kind: [SEEP/W](#)
Method: [Steady-State](#)
Settings
 Include Air Flow: [No](#)
Control
 Apply Runoff: [No](#)
Convergence
 Convergence Type: [Head Vector Norm](#)
 Maximum Number of Iterations: [500](#)
 Tolerance: [0.001](#)
 Maximum Change in K: [0.1](#)
 Rate of Change in K: [1.02](#)
 Minimum Change in K: [1e-005](#)
 Equation Solver: [Parallel Direct](#)
 Potential Seepage Max # of Reviews: [10](#)
Time

Starting Time: 0 sec

Duration: 0 sec

Ending Time: 0 sec

Materials

1-EI +10.7 to -2, Fill GR

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-008 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

2-EI -2 to -5, Fill

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-008 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

3-EI -5 to -7, Fill

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-007 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

4-EI -7 to -17, Marsh

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-007 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

5-EI -17 to -19, -20, Marsh

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-007 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

6-El -19, -20 to -33, Lancustrine

Model: Saturated Only
Hydraulic
K-Sat: 3.28e-007 ft/sec
Volumetric Water Content: 0 ft³/ft³
Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

7-El -33 to -41, Sand

Model: Saturated Only
Hydraulic
K-Sat: 0.000492 ft/sec
Volumetric Water Content: 0 ft³/ft³
Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

8-El -41 to -70, BaySound

Model: Saturated Only
Hydraulic
K-Sat: 3.28e-008 ft/sec
Volumetric Water Content: 0 ft³/ft³
Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

Boundary Conditions

Drainage Face

Review: true
Type: Total Flux (Q) 0

PS Groundwater Level -3.99'

Type: Head (H) -3.99

Normal Water Level +0.4'

Type: Head (H) 0.4

Regions

	Material	Points	Area (ft²)
Region 1	3-El -5 to -7, Fill	36,34,35,37	480

Region 2	4-El -7 to -17, Marsh	31,30,29,28,27,36,37,38,39	2718.1262
Region 3	5-El -17 to -19, -20, Marsh	39,38,40,42,43,44,41	636
Region 4	6-El -19, -20 to -33, Lancustrine	41,44,43,42,40,45,46	3892
Region 5	7-El -33 to -41, Sand	46,45,47,48	2264
Region 6	8-El -41 to -70, BaySound	48,47,49,50	8207
Region 7	1-El +10.7 to -2, Fill GR	59,21,20,19,18,17,16,15,14,13,12,11,10,9,8,7,33,51,58,57	769.9119
Region 8	1-El +10.7 to -2, Fill GR	59,57,58,51,32,24,23,22	71.420701
Region 9	2-El -2 to -5, Fill	34,26,25,32,51,52,53,54,55,56,35	440.32692
Region 10	2-El -2 to -5, Fill	51,33,6,5,4,3,2,1,56,55,54,53,52	254.67029

Lines

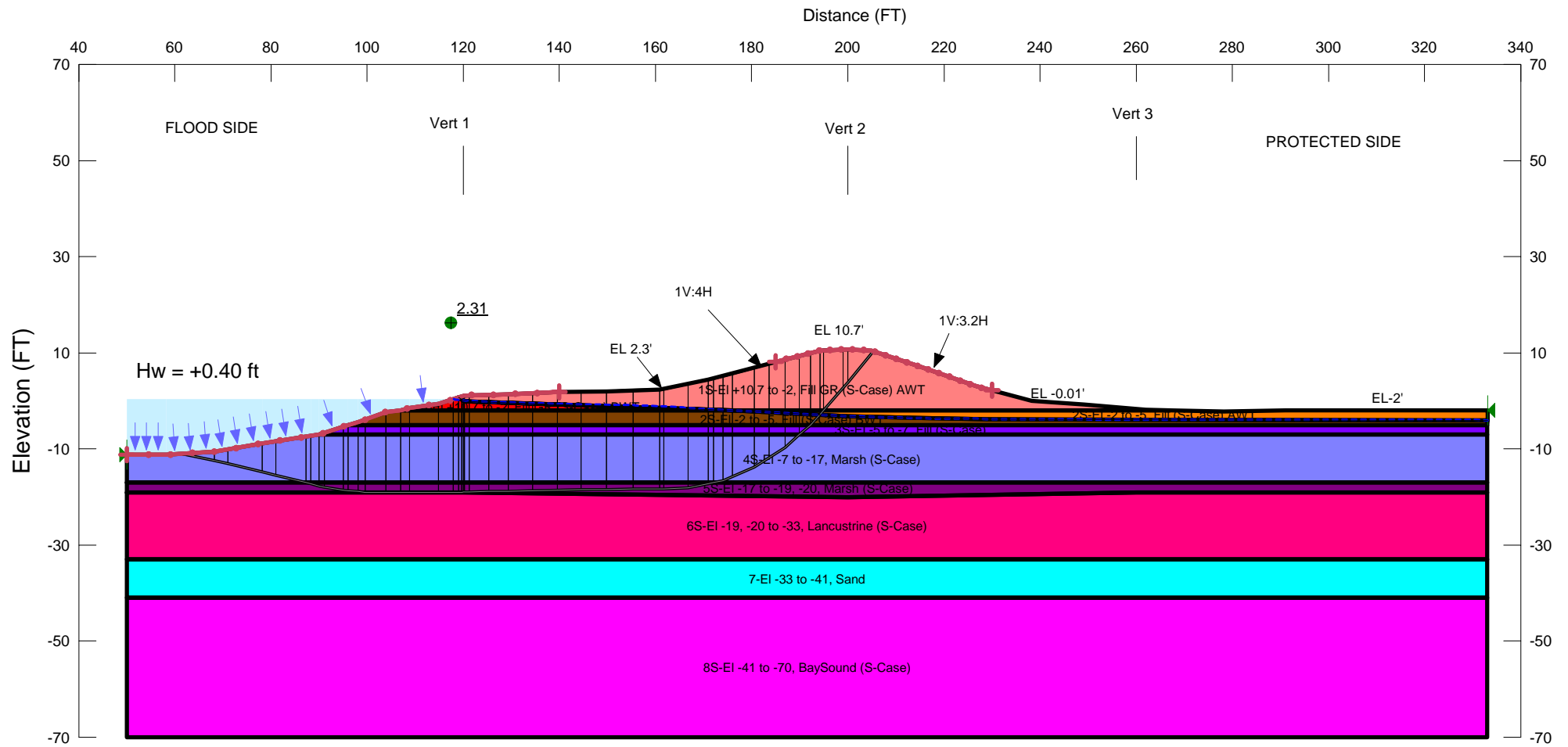
	Start Point	End Point	Hydraulic Boundary
Line 1	35	34	
Line 2	36	34	Normal Water Level +0.4'
Line 3	35	37	PS Groundwater Level -3.99'
Line 4	37	36	
Line 5	31	30	Normal Water Level +0.4'
Line 6	30	29	Normal Water Level +0.4'
Line 7	29	28	Normal Water Level +0.4'
Line 8	28	27	Normal Water Level +0.4'
Line 9	27	36	Normal Water Level +0.4'
Line 10	37	38	PS Groundwater Level -3.99'
Line 11	38	39	
Line 12	39	31	
Line 13	38	40	PS Groundwater Level -3.99'
Line 14	40	42	
Line 15	42	43	
Line 16	43	44	
Line 17	44	41	
Line 18	41	39	
Line 19	40	45	PS Groundwater Level -3.99'
Line 20	45	46	
Line 21	46	41	
Line 22	45	47	PS Groundwater Level -3.99'
Line 23	47	48	
Line 24	48	46	
Line 25	47	49	PS Groundwater Level -3.99'
Line 26	49	50	
Line 27	50	48	
Line 28	33	51	
Line 29	51	32	
Line 30	59	21	Normal Water Level +0.4'
Line 31	21	20	Normal Water Level +0.4'
Line 32	20	19	Normal Water Level +0.4'
Line 33	19	18	Normal Water Level +0.4'
Line 34	18	17	Normal Water Level +0.4'
Line 35	17	16	Normal Water Level +0.4'

Line 36	16	15	Normal Water Level +0.4'
Line 37	15	14	Normal Water Level +0.4'
Line 38	14	13	
Line 39	13	12	
Line 40	12	11	Drainage Face
Line 41	11	10	Drainage Face
Line 42	10	9	Drainage Face
Line 43	9	8	Drainage Face
Line 44	8	7	Drainage Face
Line 45	7	33	Drainage Face
Line 46	51	58	
Line 47	58	57	
Line 48	57	59	
Line 49	32	24	Normal Water Level +0.4'
Line 50	24	23	Normal Water Level +0.4'
Line 51	23	22	Normal Water Level +0.4'
Line 52	22	59	Normal Water Level +0.4'
Line 53	34	26	Normal Water Level +0.4'
Line 54	26	25	Normal Water Level +0.4'
Line 55	25	32	Normal Water Level +0.4'
Line 56	51	52	
Line 57	52	53	
Line 58	53	54	
Line 59	54	55	
Line 60	55	56	
Line 61	56	35	PS Groundwater Level -3.99'
Line 62	33	6	Drainage Face
Line 63	6	5	Drainage Face
Line 64	5	4	Drainage Face
Line 65	4	3	Drainage Face
Line 66	3	2	Drainage Face
Line 67	2	1	Drainage Face
Line 68	1	56	PS Groundwater Level -3.99'

Points

	X (ft)	Y (ft)
Point 1	333.11943	-1.97
Point 2	324.72844	-1.95
Point 3	314.64956	-2.01
Point 4	303.10265	-1.99
Point 5	291.00986	-1.96
Point 6	278.25315	-2.25
Point 7	261.949	-1.81
Point 8	249.07504	-0.69
Point 9	238.23459	-0.01
Point 10	226.63885	3.07
Point 11	214.6191	7.27

Point 12	204.87471	10.52
Point 13	200	10.72
Point 14	194.19656	10.52
Point 15	183.65527	7.76
Point 16	171.0077	4.39
Point 17	160.88163	2.36
Point 18	149.8344	2.01
Point 19	139.53756	1.82
Point 20	129.34623	1.37
Point 21	120.24527	1.16
Point 22	117.87852	0.33
Point 23	114.82892	-0.65
Point 24	108.82186	-1.43
Point 25	103.87248	-2.33
Point 26	98.10619	-4.47
Point 27	88.22537	-7.27
Point 28	78.16792	-8.85
Point 29	68.28474	-10.57
Point 30	58.32233	-11.24
Point 31	50	-11.24
Point 32	107	-2
Point 33	267	-2
Point 34	96	-5
Point 35	333	-5
Point 36	90	-7
Point 37	333	-7
Point 38	333	-17
Point 39	50	-17
Point 40	333	-19
Point 41	50	-19
Point 42	260	-19
Point 43	200	-20
Point 44	120	-19
Point 45	333	-33
Point 46	50	-33
Point 47	333	-41
Point 48	50	-41
Point 49	333	-70
Point 50	50	-70
Point 51	176	-2
Point 52	200	-3.15
Point 53	215.59271	-3.58673
Point 54	228.97977	-3.75443
Point 55	258.66416	-3.90038
Point 56	333.08974	-3.9908
Point 57	119.99773	0.03475
Point 58	121.22207	-0.10506
Point 59	119.02881	0.72885



Name: 7-EI -33 to -41, Sand Model: Mohr-Coulomb Unit Weight: 122 pcf Cohesion: 0 psf Phi: 33 ° Phi-B: 0 °
 Name: 1S-EI +10.7 to -2, Fill GR (S-Case) AWT Model: Spatial Mohr-Coulomb Weight Spatial Fn: Fill Gr to -2 Cohesion: 75 psf Phi: 26 ° Phi-B: 0 °
 Name: 2S-EI -2 to -5, Fill (S-Case) AWT Model: Spatial Mohr-Coulomb Unit Weight: 103 pcf Cohesion: 75 psf Phi: 26 ° Phi-B: 0 °
 Name: 3S-EI -5 to -7, Fill (S-Case) Model: Spatial Mohr-Coulomb Unit Weight: 103 pcf Cohesion: 0 psf Phi: 26 ° Phi-B: 0 °
 Name: 4S-EI -7 to -17, Marsh (S-Case) Model: Spatial Mohr-Coulomb Unit Weight: 82 pcf Cohesion: 0 psf Phi: 24 ° Phi-B: 0 °
 Name: 5S-EI -17 to -19, -20, Marsh (S-Case) Model: Spatial Mohr-Coulomb Unit Weight: 82 pcf Cohesion: 0 psf Phi: 24 ° Phi-B: 0 °
 Name: 6S-EI -19, -20 to -33, Lancustrine (S-Case) Model: Spatial Mohr-Coulomb Unit Weight: 102 pcf Cohesion: 0 psf Phi: 26 ° Phi-B: 0 °
 Name: 8S-EI -41 to -70, BaySound (S-Case) Model: Spatial Mohr-Coulomb Unit Weight: 113 pcf Cohesion: 0 psf Phi: 26 ° Phi-B: 0 °
 Name: 1S-EI +10.7 to -2, Fill GR (S-Case) BWT Model: Spatial Mohr-Coulomb Weight Spatial Fn: Fill Gr to -2 Cohesion: 0 psf Phi: 26 ° Phi-B: 0 °
 Name: 2S-EI -2 to -5, Fill (S-Case) BWT Model: Spatial Mohr-Coulomb Unit Weight: 103 pcf Cohesion: 0 psf Phi: 26 ° Phi-B: 0 °

CROSS SECTION AT STA 95+00W

GENERAL NOTES

CLASSIFICATION STRATIFICATION
 SHEAR STRENGTHS AND UNIT WEIGHTS OF
 THE SOIL WERE BASED ON THE RESULTS OF
 UNDISTURBED BORINGS AND CPT DATA. SEE
 BOTH BORING AND CPT DATA PLATES.

WHERE INDICATED, SHEAR STRENGTHS BETWEEN
 VERTICALS WERE ASSUMED TO VARY LINEARLY
 BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

LAKE PONTCHARTRAIN, LA. AND VICINITY
 HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL,
 REMEDIATION OF CANAL WALLS AND LEVEES
 PROTECTED SIDE STABILITY ANALYSIS,
 CASE: Name: NWL S Case F/S (Entry/Exit)
 REACH 10B, STA. 93+53 TO STA. 98+70 WEST
 ORLEANS PARISH, LOUISIANA

NWL S Case F/S (Entry/Exit)

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File Information

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Revision Number: [115](#)
Last Edited By: [Bishop, Charles E MVR](#)
Date: [7/8/2013](#)
Time: [12:20:20 AM](#)
File Name: [Reach 10B.gsz](#)
Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix F NWL\](#)
Last Solved Date: [7/8/2013](#)
Last Solved Time: [12:24:32 AM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Strength Units: [psf](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

NWL S Case F/S (Entry/Exit)

Kind: [SLOPE/W](#)
Parent: [Normal Water Level +0.40ft \(seepage\)](#)
Method: [Spencer](#)
Settings
 PWP Conditions Source: [Parent Analysis](#)
Slip Surface
 Direction of movement: [Right to Left](#)
 Use Passive Mode: [No](#)
 Slip Surface Option: [Entry and Exit](#)
 Critical slip surfaces saved: [1](#)
 Optimize Critical Slip Surface Location: [Yes](#)
Tension Crack
 Tension Crack Option: [Search for Tension Crack](#)
 Percentage Wet: [0](#)
 Tension Crack Fluid Unit Weight: [62.4 pcf](#)
FOS Distribution
 FOS Calculation Option: [Constant](#)

Advanced

Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 7000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

7-El -33 to -41, Sand

Model: Mohr-Coulomb
Unit Weight: 122 pcf
Cohesion: 0 psf
Phi: 33 °
Phi-B: 0 °

1S-El +10.7 to -2, Fill GR (S-Case) AWT

Model: Spatial Mohr-Coulomb
Weight Spatial Fn: Fill Gr to -2
Cohesion: 75 psf
Phi: 26 °
Phi-B: 0 °

2S-El -2 to -5, Fill (S-Case) AWT

Model: Spatial Mohr-Coulomb
Unit Weight: 103 pcf
Cohesion: 75 psf
Phi: 26 °
Phi-B: 0 °

3S-El -5 to -7, Fill (S-Case)

Model: Spatial Mohr-Coulomb
Unit Weight: 103 pcf
Cohesion: 0 psf
Phi: 26 °
Phi-B: 0 °

4S-El -7 to -17, Marsh (S-Case)

Model: Spatial Mohr-Coulomb
Unit Weight: 82 pcf
Cohesion: 0 psf
Phi: 24 °

Phi-B: 0 °

5S-EI -17 to -19, -20, Marsh (S-Case)

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: 82 pcf

Cohesion: 0 psf

Phi: 24 °

Phi-B: 0 °

6S-EI -19, -20 to -33, Lancustrine (S-Case)

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: 102 pcf

Cohesion: 0 psf

Phi: 26 °

Phi-B: 0 °

8S-EI -41 to -70, BaySound (S-Case)

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: 113 pcf

Cohesion: 0 psf

Phi: 26 °

Phi-B: 0 °

1S-EI +10.7 to -2, Fill GR (S-Case) BWT

Model: [Spatial Mohr-Coulomb](#)

Weight Spatial Fn: [Fill Gr to -2](#)

Cohesion: 0 psf

Phi: 26 °

Phi-B: 0 °

2S-EI -2 to -5, Fill (S-Case) BWT

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: 103 pcf

Cohesion: 0 psf

Phi: 26 °

Phi-B: 0 °

Slip Surface Entry and Exit

Left Projection: [Range](#)

Left-Zone Left Coordinate: (50, -11.24) ft

Left-Zone Right Coordinate: (140, 1.82853) ft

Left-Zone Increment: 20

Right Projection: [Range](#)

Right-Zone Left Coordinate: (185, 8.11209) ft

Right-Zone Right Coordinate: (230, 2.17723) ft

Right-Zone Increment: 20

Radius Increments: 15

Slip Surface Limits

Left Coordinate: (50, -11.24) ft
Right Coordinate: (333.11943, -1.97) ft

Spatial Functions

Fill Gr to -2

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Unit Weight (pcf)
Data Point: (120, 1, 103)
Data Point: (120, -2, 103)
Data Point: (200, 10.72, 111)
Data Point: (200, -2, 111)
Data Point: (260, -1.5, 103)
Data Point: (260, -2, 103)

Regions

	Material	Points	Area (ft²)
Region 1	3S-EI -5 to -7, Fill (S-Case)	36,34,35,37	480
Region 2	4S-EI -7 to -17, Marsh (S-Case)	31,30,29,28,27,36,37,38,39	2718.1262
Region 3	5S-EI -17 to -19, -20, Marsh (S-Case)	39,38,40,42,43,44,41	636
Region 4	6S-EI -19, -20 to -33, Lancustrine (S-Case)	41,44,43,42,40,45,46	3892
Region 5	7-EI -33 to -41, Sand	46,45,47,48	2264
Region 6	8S-EI -41 to -70, BaySound (S-Case)	48,47,49,50	8207
Region 7	1S-EI +10.7 to -2, Fill GR (S-Case) AWT	59,21,20,19,18,17,16,15,14,13,12,11,10,9,8,7,33,51,58,57	769.9119
Region 8	1S-EI +10.7 to -2, Fill GR (S-Case) BWT	59,57,58,51,32,24,23,22	71.420701
Region 9	2S-EI -2 to -5, Fill (S-Case) BWT	34,26,25,32,51,52,53,54,55,56,35	440.32692
Region 10	2S-EI -2 to -5, Fill (S-Case) AWT	51,33,6,5,4,3,2,1,56,55,54,53,52	254.67029

Points

	X (ft)	Y (ft)
Point 1	333.11943	-1.97
Point 2	324.72844	-1.95

Point 3	314.64956	-2.01
Point 4	303.10265	-1.99
Point 5	291.00986	-1.96
Point 6	278.25315	-2.25
Point 7	261.949	-1.81
Point 8	249.07504	-0.69
Point 9	238.23459	-0.01
Point 10	226.63885	3.07
Point 11	214.6191	7.27
Point 12	204.87471	10.52
Point 13	200	10.72
Point 14	194.19656	10.52
Point 15	183.65527	7.76
Point 16	171.0077	4.39
Point 17	160.88163	2.36
Point 18	149.8344	2.01
Point 19	139.53756	1.82
Point 20	129.34623	1.37
Point 21	120.24527	1.16
Point 22	117.87852	0.33
Point 23	114.82892	-0.65
Point 24	108.82186	-1.43
Point 25	103.87248	-2.33
Point 26	98.10619	-4.47
Point 27	88.22537	-7.27
Point 28	78.16792	-8.85
Point 29	68.28474	-10.57
Point 30	58.32233	-11.24
Point 31	50	-11.24
Point 32	107	-2
Point 33	267	-2
Point 34	96	-5
Point 35	333	-5
Point 36	90	-7
Point 37	333	-7
Point 38	333	-17
Point 39	50	-17
Point 40	333	-19
Point 41	50	-19
Point 42	260	-19
Point 43	200	-20
Point 44	120	-19
Point 45	333	-33
Point 46	50	-33
Point 47	333	-41
Point 48	50	-41
Point 49	333	-70
Point 50	50	-70

Point 51	176	-2
Point 52	200	-3.15
Point 53	215.59271	-3.58673
Point 54	228.97977	-3.75443
Point 55	258.66416	-3.90038
Point 56	333.08974	-3.9908
Point 57	119.99773	0.03475
Point 58	121.22207	-0.10506
Point 59	119.02881	0.72885

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	2.31	(117.376, 129.009)	60.64475	(204.875, 10.52)	(61.7575, -11.009)
2	1493	2.56	(117.376, 129.009)	147.959	(205.644, 10.2633)	(68.2878, -10.5695)

Slices of Slip Surface: Optimized

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	65.021115	-11.734	745.87478	798.62383	23.485388	0
2	Optimized	69.64933	-12.76217	793.07111	903.56167	49.193566	0
3	Optimized	74.59092	-13.918245	844.08776	1022.8338	79.582881	0
4	Optimized	79.60343	-15.113465	897.81132	1142.4657	108.92713	0
5	Optimized	84.165025	-16.22788	947.92713	1255.0365	136.73388	0
6	Optimized	87.75824	-17.11538	986.76318	1343.4984	158.82877	0
7	Optimized	89.112685	-17.44992	1001.5536	1376.5619	166.96441	0
8	Optimized	90.56976	-17.809805	1017.3255	1426.6071	182.22391	0
9	Optimized	93.11728	-18.2707	1035.6834	1482.5247	198.94654	0
10	Optimized	95.54752	-18.63177	1049.1066	1529.523	213.89515	0
11	Optimized	97.053095	-18.767855	1052.4519	1555.5312	223.98533	0
12	Optimized	98.861075	-18.931275	1056.6486	1594.8678	239.63064	0
13	Optimized	101.74423	-18.99945	1052.8319	1620.0793	252.55482	0
14	Optimized	105.43625	-18.99935	1043.2227	1653.8663	271.87604	0
15	Optimized	107.91095	-18.999285	1037.1818	1674.7719	283.87343	0
16	Optimized	111.8254	-18.999175	1028.3566	1700.1661	299.10886	0
17	Optimized	116.3537	-18.99905	1019.5108	1736.5556	319.24894	0
18	Optimized	118.45365	-18.998995	1016.0047	1772.3357	336.74026	0
19	Optimized	119.355	-18.99897	1014.4552	1805.2916	352.10303	0
20	Optimized	119.83945	-18.995135	1013.4141	1815.3028	357.02388	0
21	Optimized	120.1215	-18.98832	1012.5915	1825.1928	361.79342	0
22	Optimized	120.7337	-18.97353	1010.8947	1829.9329	364.65933	0
23	Optimized	123.25315	-18.912665	1003.9217	1831.852	368.6183	0
24	Optimized	127.3152	-18.814535	993.26527	1835.0021	374.7654	0
25	Optimized	131.89405	-18.70392	982.15631	1844.2848	383.84434	0
26	Optimized	136.98975	-18.58082	970.69893	1859.8229	395.86349	0
27	Optimized	142.0479	-18.458625	959.99012	1868.6077	404.5426	0
28	Optimized	147.1963	-18.39253	952.99991	1883.0855	414.10079	0
29	Optimized	152.5962	-18.381375	949.43051	1899.1145	422.82654	0

30	Optimized	158.1198	-18.369965	945.88212	1919.572	433.51469	0
31	Optimized	161.28265	-18.36343	943.8447	1938.6811	442.92969	0
32	Optimized	164.2295	-18.237835	934.75104	1976.3734	463.76014	0
33	Optimized	168.8915	-17.666195	897.77211	1971.1224	477.88635	0
34	Optimized	171.527	-17.10966	862.63519	1986.4717	500.36426	0
35	Optimized	173.05485	-16.78702	842.25068	2003.862	517.18269	0
36	Optimized	175.0317	-16.1607	803.1234	1929.7092	501.58834	0
37	Optimized	178.2859	-14.77157	716.8683	1909.0805	530.80709	0
38	Optimized	182.11355	-12.803045	594.59017	1783.3342	529.26296	0
39	Optimized	185.2896	-10.75794	467.62904	1709.0581	552.71982	0
40	Optimized	188.4437	-8.352785	318.21698	1528.6899	538.93727	0
41	Optimized	191.0847	-6.00194	172.0401	1386.6466	592.40315	0
42	Optimized	193.20125	-3.89117	53.432737	1184.6367	551.72502	0
43	Optimized	194.54475	-2.38923	-25.566664	1057.0197	515.54296	75
44	Optimized	196.9794	0.33259	-173.32897	839.67653	409.53761	75
45	Optimized	199.53295	3.243673	-340.8342	584.63593	285.146	75
46	Optimized	202.43735	6.840939	-566.05716	281.75922	137.42315	75

Slices of Slip Surface: 1493

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	1493	70.757805	-11.389625	721.36328	796.78665	33.580649	0
2	1493	75.69788	-12.93504	791.76433	945.26153	68.341358	0
3	1493	80.68228	-14.304075	854.19998	1074.95	98.284251	0
4	1493	85.711005	-15.4988	907.12264	1188.2978	125.18726	0
5	1493	89.112685	-16.22243	937.48513	1256.7467	142.14441	0
6	1493	91.717485	-16.697555	955.69561	1327.8472	165.69256	0
7	1493	94.717485	-17.198755	974.51656	1407.7035	192.86726	0
8	1493	97.053095	-17.543545	986.24635	1459.7819	210.83162	0
9	1493	100.98935	-18.010935	1000.4659	1550.8453	245.04473	0
10	1493	105.43625	-18.4589	1012.922	1627.3742	273.57177	0
11	1493	107.91095	-18.6439	1017.0908	1659.6744	286.09666	0
12	1493	111.8254	-18.81507	1017.8343	1692.8138	300.52027	0
13	1493	116.3537	-18.938385	1016.0106	1731.4315	318.52594	0
14	1493	118.45365	-18.944735	1012.8477	1763.7685	334.33149	0
15	1493	119.51325	-18.93355	1010.3805	1799.4448	351.31408	0
16	1493	120.1215	-18.92425	1008.835	1819.9987	361.15332	0
17	1493	120.7337	-18.910865	1007.2447	1823.6498	363.48701	0
18	1493	123.25315	-18.819035	998.4284	1817.9765	364.88634	0
19	1493	127.3152	-18.60153	980.72399	1803.193	366.1868	0
20	1493	131.89405	-18.213525	953.17126	1780.5511	368.37324	0
21	1493	136.98975	-17.621475	913.7822	1747.4446	371.17041	0
22	1493	140.4273	-17.140335	882.6602	1716.3053	371.16272	0
23	1493	143.44635	-16.618805	849.55552	1675.188	367.59528	0
24	1493	147.70505	-15.791615	797.54746	1610.1716	361.80358	0
25	1493	152.5962	-14.66861	727.482	1525.8255	355.44542	0
26	1493	158.1198	-13.200325	636.16371	1418.5374	348.33519	0
27	1493	163.41315	-11.580085	535.34676	1342.4494	359.34526	0

28	1493	168.4762	-9.819318	425.56954	1297.8944	388.38406	0
29	1493	173.31815	-7.943758	308.22349	1255.3521	421.68882	0
30	1493	175.8143	-6.920158	243.98135	1230.7402	481.27447	0
31	1493	178.0464	-5.920158	181.19095	1188.56	491.32673	0
32	1493	181.87405	-4.1371495	82.894164	1110.8722	501.37841	0
33	1493	184.4703	-2.859611	20.754645	1052.1942	503.06667	0
34	1493	185.71255	-2.2224615	-11.1728	1010.6905	492.9467	75
35	1493	188.154	-0.9026355	-78.714548	941.78437	459.33893	75
36	1493	192.1824	1.3752505	-202.36159	817.122	398.53703	75
37	1493	197.0983	4.412412	-386.89475	578.87618	282.33678	75
38	1493	202.43735	7.982093	-634.01081	232.75259	113.52102	75
39	1493	205.2595	9.979232	-775.29874	22.136757	10.796818	75

NWL S Case P/S (Entry/Exit)

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File Information

Created By: [Vicky Curtis](#)
Revision Number: [116](#)
Last Edited By: [Bishop, Charles E MVR](#)
Date: [7/8/2013](#)
Time: [12:34:57 AM](#)
File Name: [Reach 10B.gsz](#)
Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix F NWL\](#)
Last Solved Date: [7/8/2013](#)
Last Solved Time: [12:36:24 AM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Strength Units: [psf](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

NWL S Case P/S (Entry/Exit)

Kind: [SLOPE/W](#)
Parent: [Normal Water Level +0.40ft \(seepage\)](#)
Method: [Spencer](#)
Settings
 PWP Conditions Source: [Parent Analysis](#)
Slip Surface
 Direction of movement: [Left to Right](#)
 Use Passive Mode: [No](#)
 Slip Surface Option: [Entry and Exit](#)
 Critical slip surfaces saved: [1](#)
 Optimize Critical Slip Surface Location: [Yes](#)
 Tension Crack
 Tension Crack Option: [Tension Crack Line](#)
 Percentage Wet: [0](#)
 Tension Crack Fluid Unit Weight: [62.4 pcf](#)
FOS Distribution
 FOS Calculation Option: [Constant](#)

Advanced

Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 7000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

7-El -33 to -41, Sand

Model: Mohr-Coulomb
Unit Weight: 122 pcf
Cohesion: 0 psf
Phi: 33 °
Phi-B: 0 °

1S-El +10.7 to -2, Fill GR (S-Case) AWT

Model: Spatial Mohr-Coulomb
Weight Spatial Fn: Fill Gr to -2
Cohesion: 75 psf
Phi: 26 °
Phi-B: 0 °

2S-El -2 to -5, Fill (S-Case) AWT

Model: Spatial Mohr-Coulomb
Unit Weight: 103 pcf
Cohesion: 75 psf
Phi: 26 °
Phi-B: 0 °

3S-El -5 to -7, Fill (S-Case)

Model: Spatial Mohr-Coulomb
Unit Weight: 103 pcf
Cohesion: 0 psf
Phi: 26 °
Phi-B: 0 °

4S-El -7 to -17, Marsh (S-Case)

Model: Spatial Mohr-Coulomb
Unit Weight: 82 pcf
Cohesion: 0 psf
Phi: 24 °

Phi-B: 0 °

5S-EI -17 to -19, -20, Marsh (S-Case)

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: 82 pcf

Cohesion: 0 psf

Phi: 24 °

Phi-B: 0 °

6S-EI -19, -20 to -33, Lancustrine (S-Case)

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: 102 pcf

Cohesion: 0 psf

Phi: 26 °

Phi-B: 0 °

8S-EI -41 to -70, BaySound (S-Case)

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: 113 pcf

Cohesion: 0 psf

Phi: 26 °

Phi-B: 0 °

1S-EI +10.7 to -2, Fill GR (S-Case) BWT

Model: [Spatial Mohr-Coulomb](#)

Weight Spatial Fn: [Fill Gr to -2](#)

Cohesion: 0 psf

Phi: 26 °

Phi-B: 0 °

2S-EI -2 to -5, Fill (S-Case) BWT

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: 103 pcf

Cohesion: 0 psf

Phi: 26 °

Phi-B: 0 °

Slip Surface Entry and Exit

Left Projection: [Range](#)

Left-Zone Left Coordinate: (185, 8.11209) ft

Left-Zone Right Coordinate: (215, 7.1369) ft

Left-Zone Increment: 20

Right Projection: [Range](#)

Right-Zone Left Coordinate: (235, 0.84915) ft

Right-Zone Right Coordinate: (300, -1.9823) ft

Right-Zone Increment: 20

Radius Increments: 15

Slip Surface Limits

Left Coordinate: (50, -11.24) ft
Right Coordinate: (333.11943, -1.97) ft

Tension Crack Line

	X (ft)	Y (ft)
	187	9
	194.19656	9
	200	9
	204.87471	9
	211	9

Spatial Functions

Fill Gr to -2

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Unit Weight (pcf)
Data Point: (120, 1, 103)
Data Point: (120, -2, 103)
Data Point: (200, 10.72, 111)
Data Point: (200, -2, 111)
Data Point: (260, -1.5, 103)
Data Point: (260, -2, 103)

Regions

	Material	Points	Area (ft²)
Region 1	3S-El -5 to -7, Fill (S-Case)	36,34,35,37	480
Region 2	4S-El -7 to -17, Marsh (S-Case)	31,30,29,28,27,36,37,38,39	2718.1262
Region 3	5S-El -17 to -19, -20, Marsh (S-Case)	39,38,40,42,43,44,41	636
Region 4	6S-El -19, -20 to -33, Lancustrine (S-Case)	41,44,43,42,40,45,46	3892
Region 5	7-El -33 to -41, Sand	46,45,47,48	2264
Region 6	8S-El -41 to -70, BaySound (S-Case)	48,47,49,50	8207
Region 7	1S-El +10.7 to -2, Fill GR (S-Case) AWT	59,21,20,19,18,17,16,15,14,13,12,11,10,9,8,7,33,51,58,57	769.9119
Region 8	1S-El +10.7 to -2, Fill GR (S-Case) BWT	59,57,58,51,32,24,23,22	71.420701
Region	2S-El -2 to -5, Fill (S-Case) BWT	34,26,25,32,51,52,53,54,55,56,35	440.32692

9			
Region 10	2S-EI -2 to -5, Fill (S-Case) AWT	51,33,6,5,4,3,2,1,56,55,54,53,52	254.67029

Points

	X (ft)	Y (ft)
Point 1	333.11943	-1.97
Point 2	324.72844	-1.95
Point 3	314.64956	-2.01
Point 4	303.10265	-1.99
Point 5	291.00986	-1.96
Point 6	278.25315	-2.25
Point 7	261.949	-1.81
Point 8	249.07504	-0.69
Point 9	238.23459	-0.01
Point 10	226.63885	3.07
Point 11	214.6191	7.27
Point 12	204.87471	10.52
Point 13	200	10.72
Point 14	194.19656	10.52
Point 15	183.65527	7.76
Point 16	171.0077	4.39
Point 17	160.88163	2.36
Point 18	149.8344	2.01
Point 19	139.53756	1.82
Point 20	129.34623	1.37
Point 21	120.24527	1.16
Point 22	117.87852	0.33
Point 23	114.82892	-0.65
Point 24	108.82186	-1.43
Point 25	103.87248	-2.33
Point 26	98.10619	-4.47
Point 27	88.22537	-7.27
Point 28	78.16792	-8.85
Point 29	68.28474	-10.57
Point 30	58.32233	-11.24
Point 31	50	-11.24
Point 32	107	-2
Point 33	267	-2
Point 34	96	-5
Point 35	333	-5
Point 36	90	-7
Point 37	333	-7
Point 38	333	-17
Point 39	50	-17
Point 40	333	-19
Point 41	50	-19

Point 42	260	-19
Point 43	200	-20
Point 44	120	-19
Point 45	333	-33
Point 46	50	-33
Point 47	333	-41
Point 48	50	-41
Point 49	333	-70
Point 50	50	-70
Point 51	176	-2
Point 52	200	-3.15
Point 53	215.59271	-3.58673
Point 54	228.97977	-3.75443
Point 55	258.66416	-3.90038
Point 56	333.08974	-3.9908
Point 57	119.99773	0.03475
Point 58	121.22207	-0.10506
Point 59	119.02881	0.72885

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.90	(239.276, 34.59)	40.03502	(193.14, 10.2433)	(280.175, -2.20631)
2	1898	1.94	(239.276, 34.59)	52.845	(193.04, 10.2171)	(277.187, -2.2263)

Slices of Slip Surface: **Optimized**

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	193.66825	8.329683	-533.34786	125.46639	61.194048	75
2	Optimized	195.6659	5.795148	-437.57412	334.69481	163.24156	75
3	Optimized	198.5676	2.1945442	-279.19323	631.04467	307.78105	75
4	Optimized	200.80265	-0.51482585	-143.79771	844.07571	411.68323	75
5	Optimized	201.83745	-1.743905	-80.146622	966.1566	471.22606	75
6	Optimized	202.6315	-2.619721	-33.948433	1029.4033	502.07355	75
7	Optimized	203.99145	-4.119721	47.171895	1172.27	548.74701	0
8	Optimized	204.8321	-5.0469695	97.776025	1247.082	560.55399	0
9	Optimized	205.6744	-5.9759845	154.33925	1304.3517	560.89853	0
10	Optimized	208.24985	-8.43757	303.96109	1511.0956	537.45091	0
11	Optimized	211.174	-10.787665	447.13021	1677.7416	547.90348	0
12	Optimized	213.47075	-12.328775	540.98886	1720.6577	525.2224	0
13	Optimized	215.1059	-13.425975	607.96773	1750.7335	508.7921	0
14	Optimized	216.08555	-14.083315	648.1618	1767.8978	498.53859	0
15	Optimized	218.10105	-15.060505	707.67641	1874.8755	519.67052	0
16	Optimized	221.14635	-16.3535	786.56572	1868.9815	481.92254	0
17	Optimized	222.7471	-17.033155	828.13795	1866.2131	462.18083	0
18	Optimized	224.732	-17.46211	854.02499	1921.89	475.44413	0
19	Optimized	227.6687	-18.071675	890.93064	1871.848	436.73256	0
20	Optimized	228.8392	-18.28976	904.15399	1934.7509	458.85131	0

21	Optimized	230.48775	-18.34041	906.82281	1890.3355	437.88805	0
22	Optimized	233.50365	-18.433075	911.79407	1809.5692	399.71524	0
23	Optimized	236.6231	-18.21941	897.7688	1781.2941	393.37081	0
24	Optimized	239.7212	-17.71956	865.95409	1677.6532	361.39174	0
25	Optimized	242.69445	-17.239855	835.50624	1614.6657	346.90414	0
26	Optimized	244.45715	-16.95546	817.44936	1577.4125	338.35737	0
27	Optimized	246.9041	-16.39885	782.32005	1540.6991	337.6521	0
28	Optimized	251.03695	-15.423995	720.88309	1419.8889	311.21744	0
29	Optimized	254.4152	-14.511435	663.4556	1334.751	298.87997	0
30	Optimized	257.24785	-13.61188	606.99559	1225.9696	275.58498	0
31	Optimized	258.7848	-13.123805	576.34553	1167.0355	262.99211	0
32	Optimized	260.4272	-12.446395	533.87229	1121.9982	261.85051	0
33	Optimized	264.11865	-10.896095	436.72019	956.34795	231.35319	0
34	Optimized	266.64415	-9.8110175	368.73108	865.05614	220.97815	0
35	Optimized	269.1566	-8.5832475	291.85576	745.37683	201.92059	0
36	Optimized	271.7953	-7.264685	209.30209	630.55176	187.55244	0
37	Optimized	274.1716	-5.960075	127.65618	481.84017	172.74708	0
38	Optimized	276.82045	-4.4217525	31.407103	303.99214	132.9486	0
39	Optimized	277.91415	-3.699445	-13.76954	248.78454	121.34033	75
40	Optimized	279.21405	-2.8409235	-67.462332	129.03251	62.93336	75

Slices of Slip Surface: 1898

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	1898	193.6182	8.006621	-518.88477	124.42099	60.684172	75
2	1898	195.64745	4.8824885	-396.03377	382.96066	186.78239	75
3	1898	198.54915	0.9929681	-215.21135	729.65936	355.87865	75
4	1898	200.5736	-1.3828994	-96.012154	956.14527	466.34321	75
5	1898	201.7498	-2.6079435	-32.661513	1067.9229	520.86079	75
6	1898	203.31225	-4.1079435	47.562249	1236.0461	579.66231	0
7	1898	204.5734	-5.2623555	111.37296	1351.6744	604.93542	0
8	1898	205.7742	-6.2623555	171.92943	1431.0546	614.11637	0
9	1898	207.99795	-7.973138	275.49205	1547.9656	566.54171	0
10	1898	210.6464	-9.800348	386.38314	1635.2984	556.05288	0
11	1898	213.29485	-11.402485	483.71974	1702.8487	542.79117	0
12	1898	215.1059	-12.400945	544.48405	1739.5029	532.05668	0
13	1898	216.97345	-13.294445	598.80947	1763.5369	518.57006	0
14	1898	219.735	-14.48733	671.3787	1787.1808	496.78708	0
15	1898	222.49655	-15.499655	733.01277	1794.4529	472.58359	0
16	1898	225.25805	-16.342225	784.2973	1786.2804	446.11161	0
17	1898	227.2321	-16.861125	815.86532	1777.602	428.19275	0
18	1898	228.4026	-17.12137	831.6499	1775.3009	420.1405	0
19	1898	230.52225	-17.501945	854.67818	1763.1573	404.48099	0
20	1898	233.6072	-17.927645	880.31687	1733.7553	379.97527	0
21	1898	236.69215	-18.169685	894.66619	1687.6371	353.05338	0
22	1898	239.58965	-18.237185	898.21265	1659.3485	338.87952	0
23	1898	242.29975	-18.151455	892.372	1652.0891	338.24786	0
24	1898	245.00985	-17.92582	877.80948	1633.215	336.32819	0

25	1898	247.71995	-17.558455	854.44433	1602.42	333.02024	0
26	1898	249.90085	-17.16952	829.84254	1567.342	328.3559	0
27	1898	252.0496	-16.670345	798.42918	1518.9262	320.78592	0
28	1898	254.6954	-15.93697	752.30996	1448.5518	309.98686	0
29	1898	257.34125	-15.05183	696.76858	1364.1648	297.14392	0
30	1898	260.3066	-13.85745	621.89663	1250.4953	279.87017	0
31	1898	263.21175	-12.50267	537.02845	1128.6634	263.41284	0
32	1898	265.73725	-11.13001	451.13261	1012.4438	249.91186	0
33	1898	268.2196	-9.60036	355.40383	882.18207	234.53678	0
34	1898	270.6588	-7.900775	249.10837	735.66099	216.62718	0
35	1898	273.07915	-6	130.25372	547.75804	203.63046	0
36	1898	274.8719	-4.460395	34.010591	353.13336	155.64658	0
37	1898	276.3252	-3.0735465	-52.667018	213.59816	104.17878	75

Normal Water Level at +0.40ft (seeapage)

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File Information

Created By: [Vicky Curtis](#)
Revision Number: [115](#)
Last Edited By: [Bishop, Charles E MVR](#)
Date: [7/7/2013](#)
Time: [6:25:53 PM](#)
File Name: [Reach 11.gsz](#)
Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix F NWL\](#)
Last Solved Date: [7/7/2013](#)
Last Solved Time: [6:26:06 PM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Mass(M) Units: [lbs](#)
Mass Flux Units: [lbs/sec](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

Normal Water Level at +0.40ft (seeapage)

Kind: [SEEP/W](#)
Method: [Steady-State](#)
Settings
 Include Air Flow: [No](#)
Control
 Apply Runoff: [No](#)
Convergence
 Convergence Type: [Head Vector Norm](#)
 Maximum Number of Iterations: [500](#)
 Tolerance: [0.001](#)
 Maximum Change in K: [0.1](#)
 Rate of Change in K: [1.02](#)
 Minimum Change in K: [1e-005](#)
 Equation Solver: [Parallel Direct](#)
 Potential Seepage Max # of Reviews: [10](#)
Time

Starting Time: 0 sec

Duration: 0 sec

Ending Time: 0 sec

Materials

1-El +13.2 to +1, fill GR

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-008 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

2-El +1 to -2.5, Fill

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-008 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

3- El -2.5 to -7, Fill

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-007 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

4-El -7 to -9, Fill

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-007 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

5-El -9 to -12, Silt

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-007 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

6-El -12 to -16, Clay

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-007 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

7-El -16 to -19, 20, 21.5, Silt

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-007 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

8-El -19, 20, 21.5 to -29, Lanc

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-007 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

9-El -29 to -33, -34, -36, Lanc

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-007 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

10-El -33, -34, -36 to -42, Beach

Model: Saturated Only

Hydraulic

K-Sat: 0.000492 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

11-El -42 to -70, BaySound

Model: Saturated Only
Hydraulic
K-Sat: 3.28e-008 ft/sec
Volumetric Water Content: 0 ft³/ft³
Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

Boundary Conditions

Drainage Face

Review: true
Type: Total Flux (Q) 0

PS Groundwater Level -2.92'

Type: Head (H) -2.92

Normal Water Level +0.4'

Type: Head (H) 0.4

Regions

	Material	Points	Area (ft²)
Region 1	1-El +13.2 to +1, fill GR	31,17,16,15,14,13,12,11,10,9,8,7,6,5,4,3,2,1,32	666.31223
Region 2	4-El -7 to -9, Fill	38,28,27,35,36,37	505.36899
Region 3	5-El -9 to -12, Silt	30,29,38,37,39,40	831.99503
Region 4	6-El -12 to -16, Clay	40,39,41,42	1120
Region 5	7-El -16 to -19, 20, 21.5, Silt	42,41,43,44,45,46,47	1130
Region 6	8-El -19, 20, 21.5 to -29, Lanc	47,46,45,44,43,48,49,58,59,60	2510
Region 7	9-El -29 to -33, -34, -36, Lanc	60,59,58,49,48,61,62,50,51,52	1450
Region 8	10-El -33, -34, -36 to -42, Beach	52,51,50,62,61,53,54	2190
Region 9	11-El -42 to -70, BaySound	54,53,55,56	7840
Region 10	2-El +1 to -2.5, Fill	31,63,18,64,65,66,67,68,69,34,57,32	533.1392
Region 11	2-El +1 to -2.5, Fill	18,19,20,21,33,69,68,67,66,65,64	116.5002
Region 12	3- El -2.5 to -7, Fill	35,26,25,24,23,22,33,69,70,36	981.98447
Region 13	3- El -2.5 to -7, Fill	69,34,70	21.040764

Lines

	Start Point	End Point	Hydraulic Boundary
Line 1	31	17	Normal Water Level +0.4'
Line 2	17	16	Normal Water Level +0.4'
Line 3	16	15	Normal Water Level +0.4'
Line 4	15	14	Normal Water Level +0.4'
Line 5	14	13	Normal Water Level +0.4'

Line 6	13	12	Normal Water Level +0.4'
Line 7	12	11	Normal Water Level +0.4'
Line 8	11	10	Normal Water Level +0.4'
Line 9	10	9	Drainage Face
Line 10	9	8	Drainage Face
Line 11	8	7	Drainage Face
Line 12	7	6	Drainage Face
Line 13	6	5	Drainage Face
Line 14	5	4	Drainage Face
Line 15	4	3	Drainage Face
Line 16	3	2	Drainage Face
Line 17	2	1	Drainage Face
Line 18	1	32	Drainage Face
Line 19	32	31	
Line 20	36	35	
Line 21	38	28	Normal Water Level +0.4'
Line 22	28	27	Normal Water Level +0.4'
Line 23	27	35	Normal Water Level +0.4'
Line 24	36	37	PS Groundwater Level -2.92'
Line 25	37	38	
Line 26	30	29	Normal Water Level +0.4'
Line 27	29	38	Normal Water Level +0.4'
Line 28	37	39	PS Groundwater Level -2.92'
Line 29	39	40	
Line 30	39	41	PS Groundwater Level -2.92'
Line 31	41	42	
Line 32	42	40	
Line 33	41	43	PS Groundwater Level -2.92'
Line 34	43	44	
Line 35	44	45	
Line 36	45	46	
Line 37	46	47	
Line 38	47	42	
Line 39	30	40	
Line 40	43	48	PS Groundwater Level -2.92'
Line 41	48	49	
Line 42	49	58	
Line 43	58	59	
Line 44	59	60	
Line 45	60	47	
Line 46	48	61	PS Groundwater Level -2.92'
Line 47	61	62	
Line 48	62	50	
Line 49	50	51	
Line 50	51	52	
Line 51	52	60	
Line 52	61	53	PS Groundwater Level -2.92'
Line 53	53	54	

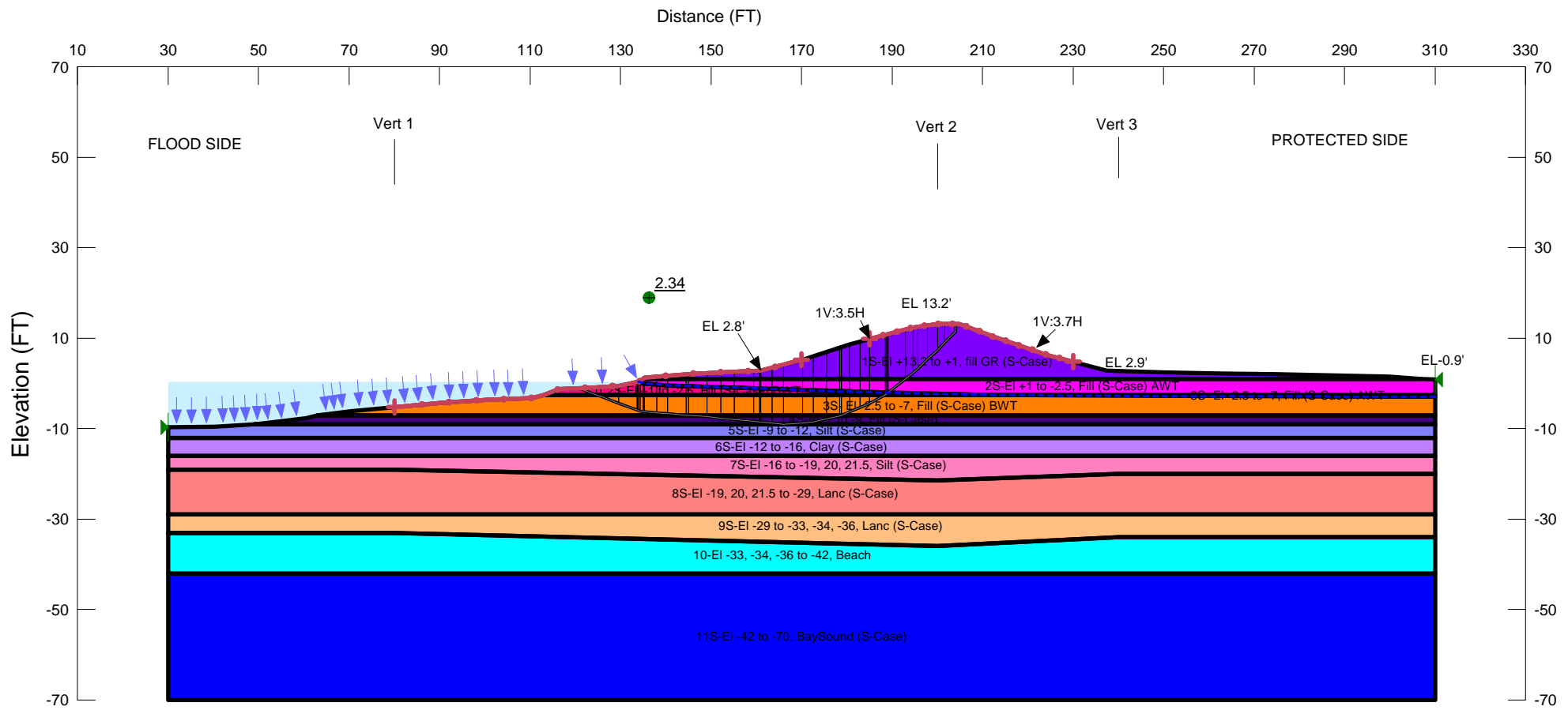
Line 54	54	52	
Line 55	53	55	PS Groundwater Level -2.92'
Line 56	55	56	
Line 57	56	54	
Line 58	34	69	
Line 59	69	33	
Line 60	31	63	Normal Water Level +0.4'
Line 61	63	18	Normal Water Level +0.4'
Line 62	18	64	
Line 63	64	65	
Line 64	65	66	
Line 65	66	67	
Line 66	67	68	
Line 67	68	69	
Line 68	34	57	PS Groundwater Level -2.92'
Line 69	57	32	Drainage Face
Line 70	18	19	Normal Water Level +0.4'
Line 71	19	20	Normal Water Level +0.4'
Line 72	20	21	Normal Water Level +0.4'
Line 73	21	33	Normal Water Level +0.4'
Line 74	35	26	Normal Water Level +0.4'
Line 75	26	25	Normal Water Level +0.4'
Line 76	25	24	Normal Water Level +0.4'
Line 77	24	23	Normal Water Level +0.4'
Line 78	23	22	Normal Water Level +0.4'
Line 79	22	33	Normal Water Level +0.4'
Line 80	69	70	
Line 81	70	36	PS Groundwater Level -2.92'
Line 82	34	70	PS Groundwater Level -2.92'

Points

	X (ft)	Y (ft)
Point 1	299.76482	1.57
Point 2	286.5021	1.81
Point 3	274.72265	2.1
Point 4	263.0598	2.25
Point 5	250.11037	2.42
Point 6	237.47421	2.92
Point 7	224.25455	6.32
Point 8	213.13888	10.07
Point 9	204.83191	13.2
Point 10	200	13.2
Point 11	194.6022	12.34
Point 12	180.69592	8.67
Point 13	170.26269	5.28
Point 14	161.02916	2.8
Point 15	155.11244	2.62

Point 16	145.03996	2.11
Point 17	135.24107	1.24
Point 18	133.74292	0.31
Point 19	129.56031	-0.55
Point 20	122.62305	-0.91
Point 21	116.39775	-1.23
Point 22	110.42069	-3.2
Point 23	100.32551	-3.66
Point 24	90.33436	-4.27
Point 25	80.38231	-5.21
Point 26	70.35922	-6.08
Point 27	60.30838	-7.67
Point 28	50.29143	-8.96
Point 29	40.30759	-9.49
Point 30	30	-9.65
Point 31	135	1
Point 32	307	1
Point 33	113	-2.5
Point 34	310	-2.5
Point 35	63	-7
Point 36	310	-7
Point 37	310	-9
Point 38	49	-9
Point 39	310	-12
Point 40	30	-12
Point 41	310	-16
Point 42	30	-16
Point 43	310	-20
Point 44	240	-20
Point 45	200	-21.5
Point 46	80	-19
Point 47	30	-19
Point 48	310	-29
Point 49	240	-29
Point 50	200	-36
Point 51	80	-33
Point 52	30	-33
Point 53	310	-42
Point 54	30	-42
Point 55	310	-70
Point 56	30	-70
Point 57	310	0.92
Point 58	200	-29
Point 59	80	-29
Point 60	30	-29
Point 61	310	-34
Point 62	240	-34
Point 63	133.90683	0.39997

Point 64	134.35933	0.13586
Point 65	135.35169	-0.03317
Point 66	140.34835	-0.39087
Point 67	160.75338	-1.08816
Point 68	189.74915	-2.06584
Point 69	212.22239	-2.5
Point 70	310	-2.93038



Name: 10-El -33, -34, -36 to -42, Beach	Model: Mohr-Coulomb	Unit Weight: 122 pcf	Cohesion: 0 psf	Phi: 33 °	Phi-B: 0 °
Name: 1S-El +13.2 to +1, fill GR (S-Case)	Model: Spatial Mohr-Coulomb	Weight Spatial Fn: Fill Gr to 1	Cohesion: 75 psf	Phi: 26 °	Phi-B: 0 °
Name: 2S-El +1 to -2.5, Fill (S-Case) AWT	Model: Spatial Mohr-Coulomb	Weight Spatial Fn: Fill 1 to -2.5	Cohesion: 75 psf	Phi: 26 °	Phi-B: 0 °
Name: 3S-El -2.5 to -7, Fill (S-Case) AWT	Model: Spatial Mohr-Coulomb	Weight Spatial Fn: fill -2.5 to -7	Cohesion: 75 psf	Phi: 24 °	Phi-B: 0 °
Name: 4S-El -7 to -9, Fill (S-Case)	Model: Spatial Mohr-Coulomb	Weight Spatial Fn: Fill -7 to -9	Cohesion: 0 psf	Phi: 24 °	Phi-B: 0 °
Name: 5S-El -9 to -12, Silt (S-Case)	Model: Mohr-Coulomb	Unit Weight: 117 pcf	Cohesion: 0 psf	Phi: 24 °	Phi-B: 0 °
Name: 6S-El -12 to -16, Clay (S-Case)	Model: Spatial Mohr-Coulomb	Weight Spatial Fn: Fill -12 to -16 (2)	Cohesion: 0 psf	Phi: 24 °	Phi-B: 0 °
Name: 7S-El -16 to -19, 20, 21.5, Silt (S-Case)	Model: Mohr-Coulomb	Unit Weight: 117 pcf	Cohesion: 0 psf	Phi: 24 °	Phi-B: 0 °
Name: 8S-El -19, 20, 21.5 to -29, Lanc (S-Case)	Model: Spatial Mohr-Coulomb	Weight Spatial Fn: Lanc -19,20,21.5 to -29	Cohesion: 0 psf	Phi: 24 °	Phi-B: 0 °
Name: 9S-El -29 to -33, -34, -36, Lanc (S-Case)	Model: Spatial Mohr-Coulomb	Weight Spatial Fn: Lanc -29 to -33,34,36	Cohesion: 0 psf	Phi: 24 °	Phi-B: 0 °
Name: 11S-El -42 to -70, BaySound (S-Case)	Model: Spatial Mohr-Coulomb	Unit Weight: 107 pcf	Cohesion: 0 psf	Phi: 23 °	Phi-B: 0 °
Name: 2S-El +1 to -2.5, Fill (S-Case) BWT	Model: Spatial Mohr-Coulomb	Weight Spatial Fn: Fill 1 to -2.5	Cohesion: 0 psf	Phi: 26 °	Phi-B: 0 °
Name: 3S-El -2.5 to -7, Fill (S-Case) BWT	Model: Spatial Mohr-Coulomb	Weight Spatial Fn: fill -2.5 to -7	Cohesion: 0 psf	Phi: 24 °	Phi-B: 0 °

CROSS SECTION AT STA 103+00W

GENERAL NOTES

CLASSIFICATION STRATIFICATION
SHEAR STRENGTHS AND UNIT WEIGHTS OF
THE SOIL WERE BASED ON THE RESULTS OF
UNDISTURBED BORINGS AND CPT DATA. SEE
BOTH BORING AND CPT DATA PLATES.

WHERE INDICATED, SHEAR STRENGTHS BETWEEN
VERTICALS WERE ASSUMED TO VARY LINEARLY
BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL,
REMEDICATION OF CANAL WALLS AND LEVEES
PROTECTED SIDE STABILITY ANALYSIS,
CASE: Name: NWL S Case F/S (Entry/Exit)
REACH 11, STA. 98+70 TO STA. 112+50 WEST
ORLEANS PARISH, LOUISIANA

NWL S Case F/S (Entry/Exit)

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File Information

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Revision Number: [116](#)
Last Edited By: [Bishop, Charles E MVR](#)
Date: [7/7/2013](#)
Time: [7:05:00 PM](#)
File Name: [Reach 11.gsz](#)
Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix F NWL\](#)
Last Solved Date: [7/7/2013](#)
Last Solved Time: [7:09:12 PM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Strength Units: [psf](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

NWL S Case F/S (Entry/Exit)

Kind: [SLOPE/W](#)
Parent: [Normal Water Level at +0.40ft \(seeapage\)](#)
Method: [Spencer](#)
Settings
 PWP Conditions Source: [Parent Analysis](#)
Slip Surface
 Direction of movement: [Right to Left](#)
 Use Passive Mode: [No](#)
 Slip Surface Option: [Entry and Exit](#)
 Critical slip surfaces saved: [1](#)
 Optimize Critical Slip Surface Location: [Yes](#)
Tension Crack
 Tension Crack Option: [Tension Crack Line](#)
 Percentage Wet: [0](#)
 Tension Crack Fluid Unit Weight: [62.4 pcf](#)
FOS Distribution
 FOS Calculation Option: [Constant](#)

Advanced

Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 9000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

10-El -33, -34, -36 to -42, Beach

Model: Mohr-Coulomb
Unit Weight: 122 pcf
Cohesion: 0 psf
Phi: 33 °
Phi-B: 0 °

1S-El +13.2 to +1, fill GR (S-Case)

Model: Spatial Mohr-Coulomb
Weight Spatial Fn: Fill Gr to 1
Cohesion: 75 psf
Phi: 26 °
Phi-B: 0 °

2S-El +1 to -2.5, Fill (S-Case) AWT

Model: Spatial Mohr-Coulomb
Weight Spatial Fn: Fill 1 to -2.5
Cohesion: 75 psf
Phi: 26 °
Phi-B: 0 °

3S- El -2.5 to -7, Fill (S-Case) AWT

Model: Spatial Mohr-Coulomb
Weight Spatial Fn: fill -2.5 to -7
Cohesion: 75 psf
Phi: 24 °
Phi-B: 0 °

4S-El -7 to -9, Fill (S-Case)

Model: Spatial Mohr-Coulomb
Weight Spatial Fn: Fill -7 to -9
Cohesion: 0 psf
Phi: 24 °

Phi-B: 0 °

5S-El -9 to -12, Silt (S-Case)

Model: [Mohr-Coulomb](#)

Unit Weight: 117 pcf

Cohesion: 0 psf

Phi: 24 °

Phi-B: 0 °

6S-El -12 to -16, Clay (S-Case)

Model: [Spatial Mohr-Coulomb](#)

Weight Spatial Fn: [Fill -12 to -16 \(2\)](#)

Cohesion: 0 psf

Phi: 24 °

Phi-B: 0 °

7S-El -16 to -19, 20, 21.5, Silt (S-Case)

Model: [Mohr-Coulomb](#)

Unit Weight: 117 pcf

Cohesion: 0 psf

Phi: 24 °

Phi-B: 0 °

8S-El -19, 20, 21.5 to -29, Lanc (S-Case)

Model: [Spatial Mohr-Coulomb](#)

Weight Spatial Fn: [Lanc-19,20,21.5 to -29](#)

Cohesion: 0 psf

Phi: 24 °

Phi-B: 0 °

9S-El -29 to -33, -34, -36, Lanc (S-Case)

Model: [Spatial Mohr-Coulomb](#)

Weight Spatial Fn: [Lan -29 to -33,34,36](#)

Cohesion: 0 psf

Phi: 24 °

Phi-B: 0 °

11S-El -42 to -70, BaySound (S-Case)

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: 107 pcf

Cohesion: 0 psf

Phi: 23 °

Phi-B: 0 °

2S-El +1 to -2.5, Fill (S-Case) BWT

Model: [Spatial Mohr-Coulomb](#)

Weight Spatial Fn: [Fiil 1 to -2.5](#)

Cohesion: 0 psf

Phi: 26 °

Phi-B: 0 °

3S- El -2.5 to -7, Fill (S-Case) BWT

Model: [Spatial Mohr-Coulomb](#)

Weight Spatial Fn: [fill -2.5 t0-7](#)

Cohesion: [0 psf](#)

Phi: [24 °](#)

Phi-B: [0 °](#)

Slip Surface Entry and Exit

Left Projection: [Range](#)

Left-Zone Left Coordinate: [\(80, -5.24318\) ft](#)

Left-Zone Right Coordinate: [\(170, 5.20945\) ft](#)

Left-Zone Increment: [15](#)

Right Projection: [Range](#)

Right-Zone Left Coordinate: [\(185, 9.80589\) ft](#)

Right-Zone Right Coordinate: [\(230, 4.84231\) ft](#)

Right-Zone Increment: [15](#)

Radius Increments: [15](#)

Slip Surface Limits

Left Coordinate: [\(30, -9.65\) ft](#)

Right Coordinate: [\(310, 0.92\) ft](#)

Tension Crack Line

	X (ft)	Y (ft)
	192	11.5
	210	11.5

Spatial Functions

fill -2.5 t0-7

Model: [Linear Interpolation](#)

Limit Range By: [Data Values](#)

Data Points: [X \(ft\)](#), [Y \(ft\)](#), [Unit Weight \(pcf\)](#)

Data Point: [\(80, -5.2, 118\)](#)

Data Point: [\(80, -7, 118\)](#)

Data Point: [\(200, -2.5, 100\)](#)

Data Point: [\(200, -7, 100\)](#)

Data Point: [\(240, -2.5, 97\)](#)

Data Point: [\(240, -7, 97\)](#)

Fill -7 to -9

Model: [Linear Interpolation](#)

Limit Range By: [Data Values](#)

Data Points: [X \(ft\)](#), [Y \(ft\)](#), [Unit Weight \(pcf\)](#)

Data Point: [\(80, -7, 118\)](#)

Data Point: [\(80, -9, 118\)](#)

Data Point: [\(200, -7, 110\)](#)

Data Point: [\(200, -9, 110\)](#)

Data Point: [\(240, -7, 118\)](#)

Data Point: [\(240, -9, 118\)](#)

Fill -12 to -16 (2)

Model: [Linear Interpolation](#)

Limit Range By: [Data Values](#)

Data Points: [X \(ft\)](#), [Y \(ft\)](#), [Unit Weight \(pcf\)](#)

Data Point: [\(80, -12, 118\)](#)

Data Point: [\(80, -16, 118\)](#)

Data Point: [\(200, -12, 110\)](#)

Data Point: [\(200, -16, 110\)](#)

Data Point: [\(240, -12, 118\)](#)

Data Point: [\(240, -16, 118\)](#)

Lanc-19,20,21.5 to -29

Model: [Linear Interpolation](#)

Limit Range By: [Data Values](#)

Data Points: [X \(ft\)](#), [Y \(ft\)](#), [Unit Weight \(pcf\)](#)

Data Point: [\(80, -19, 101\)](#)

Data Point: [\(80, -29, 101\)](#)

Data Point: [\(200, -21.5, 103\)](#)

Data Point: [\(200, -29, 103\)](#)

Data Point: [\(240, -20, 101\)](#)

Data Point: [\(240, -29, 101\)](#)

Lan -29 to -33,34,36

Model: [Linear Interpolation](#)

Limit Range By: [Data Values](#)

Data Points: [X \(ft\)](#), [Y \(ft\)](#), [Unit Weight \(pcf\)](#)

Data Point: [\(80, -29, 101\)](#)

Data Point: [\(80, -33, 101\)](#)

Data Point: [\(200, -29, 103\)](#)

Data Point: [\(200, -36, 103\)](#)

Data Point: [\(240, -29, 101\)](#)

Data Point: [\(240, -34, 101\)](#)

Fill Gr to 1

Model: [Linear Interpolation](#)

Limit Range By: [Data Values](#)

Data Points: [X \(ft\)](#), [Y \(ft\)](#), [Unit Weight \(pcf\)](#)

Data Point: [\(200, 12.84, 105\)](#)

Data Point: (200, 1, 105)
Data Point: (240, 2.9, 110)
Data Point: (240, 1, 110)

Fil 1 to -2.5

Model: Linear Interpolation

Limit Range By: Data Values

Data Points: X (ft), Y (ft), Unit Weight (pcf)

Data Point: (200, 1, 105)
Data Point: (200, -2.5, 105)
Data Point: (240, 1, 110)
Data Point: (240, -2.5, 110)

Regions

	Material	Points	Area (ft²)
Region 1	1S-El +13.2 to +1, fill GR (S-Case)	31,17,16,15,14,13,12,11,10,9,8,7,6,5,4,3,2,1,32	666.31223
Region 2	4S-El -7 to -9, Fill (S-Case)	38,28,27,35,36,37	505.36899
Region 3	5S-El -9 to -12, Silt (S-Case)	30,29,38,37,39,40	831.99503
Region 4	6S-El -12 to -16, Clay (S-Case)	40,39,41,42	1120
Region 5	7S-El -16 to -19, 20, 21.5, Silt (S-Case)	42,41,43,44,45,46,47	1130
Region 6	8S-El -19, 20, 21.5 to -29, Lanc (S-Case)	47,46,45,44,43,48,49,58,59,60	2510
Region 7	9S-El -29 to -33, -34, -36, Lanc (S-Case)	60,59,58,49,48,61,62,50,51,52	1450
Region 8	10-El -33, -34, -36 to -42, Beach	52,51,50,62,61,53,54	2190
Region 9	11S-El -42 to -70, BaySound (S-Case)	54,53,55,56	7840
Region 10	2S-El +1 to -2.5, Fill (S-Case) AWT	31,63,18,64,65,66,67,68,69,34,57,32	533.1392
Region 11	2S-El +1 to -2.5, Fill (S-Case) BWT	18,19,20,21,33,69,68,67,66,65,64	116.5002
Region 12	3S- El -2.5 to -7, Fill (S-Case) BWT	35,26,25,24,23,22,33,69,70,36	981.98447
Region 13	3S- El -2.5 to -7, Fill (S-Case) AWT	69,34,70	21.040764

Points

	X (ft)	Y (ft)
Point 1	299.76482	1.57
Point 2	286.5021	1.81
Point 3	274.72265	2.1
Point 4	263.0598	2.25
Point 5	250.11037	2.42
Point 6	237.47421	2.92
Point 7	224.25455	6.32
Point 8	213.13888	10.07
Point 9	204.83191	13.2
Point 10	200	13.2
Point 11	194.6022	12.34
Point 12	180.69592	8.67
Point 13	170.26269	5.28
Point 14	161.02916	2.8
Point 15	155.11244	2.62

Point 16	145.03996	2.11
Point 17	135.24107	1.24
Point 18	133.74292	0.31
Point 19	129.56031	-0.55
Point 20	122.62305	-0.91
Point 21	116.39775	-1.23
Point 22	110.42069	-3.2
Point 23	100.32551	-3.66
Point 24	90.33436	-4.27
Point 25	80.38231	-5.21
Point 26	70.35922	-6.08
Point 27	60.30838	-7.67
Point 28	50.29143	-8.96
Point 29	40.30759	-9.49
Point 30	30	-9.65
Point 31	135	1
Point 32	307	1
Point 33	113	-2.5
Point 34	310	-2.5
Point 35	63	-7
Point 36	310	-7
Point 37	310	-9
Point 38	49	-9
Point 39	310	-12
Point 40	30	-12
Point 41	310	-16
Point 42	30	-16
Point 43	310	-20
Point 44	240	-20
Point 45	200	-21.5
Point 46	80	-19
Point 47	30	-19
Point 48	310	-29
Point 49	240	-29
Point 50	200	-36
Point 51	80	-33
Point 52	30	-33
Point 53	310	-42
Point 54	30	-42
Point 55	310	-70
Point 56	30	-70
Point 57	310	0.92
Point 58	200	-29
Point 59	80	-29
Point 60	30	-29
Point 61	310	-34
Point 62	240	-34
Point 63	133.90683	0.39997

Point 64	134.35933	0.13586
Point 65	135.35169	-0.03317
Point 66	140.34835	-0.39087
Point 67	160.75338	-1.08816
Point 68	189.74915	-2.06584
Point 69	212.22239	-2.5
Point 70	310	-2.93038

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	2.34	(155.697, 58.777)	36.48306	(203.974, 13.2)	(120.76, -1.00576)
2	1911	2.42	(155.697, 58.777)	68.5	(205.266, 13.0363)	(122.132, -0.935251)

Slices of Slip Surface: Optimized

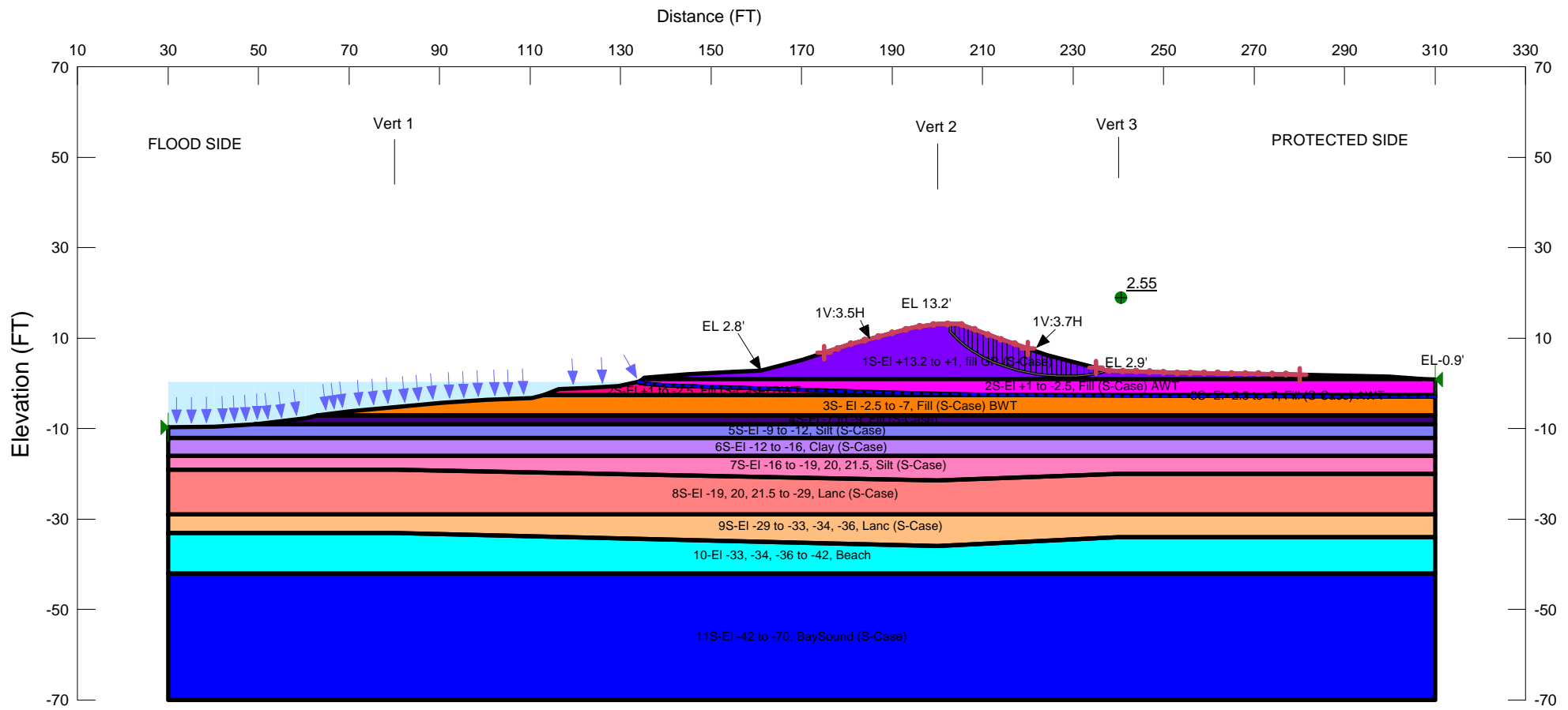
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	121.69165	-1.366152	96.448792	140.82575	21.644089	0
2	Optimized	123.62255	-2.113274	113.30331	237.58936	60.618358	0
3	Optimized	125.0795	-2.67702	130.78136	309.25394	79.461111	0
4	Optimized	127.54865	-3.6050735	179.18919	429.86872	111.60971	0
5	Optimized	131.60045	-5.1177785	258.62154	643.17873	171.21589	0
6	Optimized	133.69175	-5.8921855	299.77244	731.20458	192.08596	0
7	Optimized	133.82485	-5.9253265	301.47258	737.77101	194.25258	0
8	Optimized	134.13305	-6.0020645	305.41587	763.28233	203.85528	0
9	Optimized	134.67965	-6.138155	312.39118	814.53445	223.56859	0
10	Optimized	135.0115	-6.2207815	316.65194	846.25551	235.7947	0
11	Optimized	135.13205	-6.233155	317.14744	823.13947	225.28217	0
12	Optimized	136.61815	-6.362725	321.94518	862.71165	240.76475	0
13	Optimized	139.1718	-6.5762765	329.95765	908.7497	257.69483	0
14	Optimized	142.4265	-6.8348815	340.26715	967.8918	279.4365	0
15	Optimized	144.7723	-7.0212675	348.02862	1010.4747	294.94002	0
16	Optimized	147.04085	-7.2015125	355.85265	1043.9922	306.37947	0
17	Optimized	150.55935	-7.5057855	369.82586	1102.066	326.0143	0
18	Optimized	153.5947	-7.796377	383.7964	1151.1924	341.66673	0
19	Optimized	155.14335	-7.9446315	391.04499	1176.1144	349.53542	0
20	Optimized	157.25335	-8.17932	402.90266	1214.6355	361.40673	0
21	Optimized	160.0429	-8.474488	417.7359	1248.7357	369.98493	0
22	Optimized	160.8913	-8.550238	421.41441	1259.8008	373.27368	0
23	Optimized	162.254	-8.6719125	427.33653	1309.9837	392.97982	0
24	Optimized	164.7499	-8.8947675	438.23253	1408.5346	432.00631	0
25	Optimized	168.14185	-8.8602035	432.69121	1436.6675	446.99903	0
26	Optimized	171.4332	-8.6304335	415.45682	1508.575	486.68755	0
27	Optimized	174.04195	-8.2095075	387.28582	1479.509	486.28908	0
28	Optimized	176.9185	-7.5310825	343.19763	1498.0511	514.17387	0
29	Optimized	178.58765	-7.095935	315.00671	1433.4195	497.94946	0
30	Optimized	179.7572	-6.609933	284.24121	1421.4028	506.29696	0
31	Optimized	181.78535	-5.767172	230.83496	1395.8172	518.68352	0

32	Optimized	183.9642	-4.861784	173.34766	1363.0557	529.69216	0
33	Optimized	186.73255	-3.454545	84.49859	1243.2857	515.92527	0
34	Optimized	188.6158	-2.383855	18.193459	1181.5067	567.38578	0
35	Optimized	188.9601	-2.155832	6.2654725	1093.0674	530.06872	0
36	Optimized	191.00425	-0.521977	-79.635766	983.62734	479.74711	75
37	Optimized	193.7553	1.676941	-197.51129	859.92973	419.41575	75
38	Optimized	195.1642	2.803106	-258.51429	791.66528	386.12095	75
39	Optimized	196.79465	4.286796	-340.74752	653.62334	318.7934	75
40	Optimized	198.93155	6.355728	-459.05936	515.00449	251.18447	75
41	Optimized	200.8483	8.211512	-562.44127	380.23435	185.45268	75
42	Optimized	202.8354	10.266415	-686.73656	206.67021	100.7998	75

Slices of Slip Surface: 1911

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	1911	122.37745	-1.0719946	86.743011	110.86458	11.764873	0
2	1911	123.85235	-1.854369	105.62554	214.65045	53.175003	0
3	1911	126.20125	-3.0343085	148.97956	365.5855	96.43918	0
4	1911	128.4406	-4.054345	203.41981	495.12272	129.8745	0
5	1911	130.60595	-4.9517675	251.13901	614.97802	161.99156	0
6	1911	132.69725	-5.7362535	292.70299	724.06685	192.05556	0
7	1911	133.82485	-6.1366595	314.00085	780.50698	207.70191	0
8	1911	134.13305	-6.239315	319.48238	808.57507	217.7581	0
9	1911	134.67965	-6.4176265	328.99555	863.87701	238.14457	0
10	1911	135.12055	-6.558858	336.51997	914.36828	257.27464	0
11	1911	135.2964	-6.614075	339.46763	935.11739	265.20036	0
12	1911	135.96445	-6.8156655	350.16926	962.94201	272.82401	0
13	1911	138.4628	-7.4903975	385.69087	1058.5006	299.55419	0
14	1911	141.5213	-8.2289385	424.94377	1163.1006	328.64859	0
15	1911	143.8671	-8.682771	448.60541	1227.9544	346.98855	0
16	1911	145.407	-8.94423	462.25101	1263.9072	356.92033	0
17	1911	147.3304	-9.1915925	474.69858	1293.273	364.45283	0
18	1911	150.4432	-9.5029495	489.68422	1329.6554	373.97925	0
19	1911	153.556	-9.671404	496.41448	1348.2502	379.26168	0
20	1911	156.52265	-9.7030975	495.27152	1347.3725	379.37981	0
21	1911	159.34315	-9.6109205	486.85154	1328.9903	374.94435	0
22	1911	160.8913	-9.5252545	480.15701	1314.9721	371.68365	0
23	1911	162.17705	-9.4056815	471.66211	1326.3518	380.53239	0
24	1911	164.4728	-9.148297	453.81185	1347.0933	397.71451	0
25	1911	166.7812	-8.8096845	430.9927	1358.8791	413.12165	0
26	1911	169.1022	-8.3877545	403.10835	1361.8908	426.87745	0
27	1911	171.4014	-7.8878985	370.47516	1361.9392	441.42824	0
28	1911	173.6788	-7.3098285	333.01246	1358.9881	456.79378	0
29	1911	176.2871	-6.5367185	283.34868	1346.5893	473.38522	0
30	1911	179.2263	-5.5357825	219.33556	1322.0011	490.93834	0
31	1911	182.1002	-4.411351	147.76974	1275.5242	502.10864	0
32	1911	184.9088	-3.162287	68.525288	1207.7828	507.2301	0
33	1911	186.8189	-2.2420455	13.095576	1148.3948	553.72243	0

34	1911	188.6171	-1.2756167	-37.893668	1079.1723	526.34751	75
35	1911	191.2019	0.2164288	-117.66282	987.33289	481.55443	75
36	1911	193.54825	1.6989145	-198.20058	894.21553	436.13806	75
37	1911	195.95165	3.378376	-290.39992	774.6036	377.79942	75
38	1911	198.65055	5.445772	-409.36064	618.05204	301.44412	75
39	1911	201.208	7.6069925	-534.94079	442.61897	215.8797	75
40	1911	203.62395	9.865002	-673.12613	249.09629	121.49238	75
41	1911	205.04915	11.27432	-770.98673	125.69856	61.307285	75



Name: 10-El -33, -34, -36 to -42, Beach	Model: Mohr-Coulomb	Unit Weight: 122 pcf	Cohesion: 0 psf	Phi: 33 °	Phi-B: 0 °
Name: 1S-El +13.2 to +1, fill GR (S-Case)	Model: Spatial Mohr-Coulomb	Weight Spatial Fn: Fill Gr to 1	Cohesion: 75 psf	Phi: 26 °	Phi-B: 0 °
Name: 2S-El +1 to -2.5, Fill (S-Case) AWT	Model: Spatial Mohr-Coulomb	Weight Spatial Fn: Fill 1 to -2.5	Cohesion: 75 psf	Phi: 26 °	Phi-B: 0 °
Name: 3S-El -2.5 to -7, Fill (S-Case) AWT	Model: Spatial Mohr-Coulomb	Weight Spatial Fn: fill -2.5 to -7	Cohesion: 75 psf	Phi: 24 °	Phi-B: 0 °
Name: 4S-El -7 to -9, Fill (S-Case)	Model: Spatial Mohr-Coulomb	Weight Spatial Fn: Fill -7 to -9	Cohesion: 0 psf	Phi: 24 °	Phi-B: 0 °
Name: 5S-El -9 to -12, Silt (S-Case)	Model: Mohr-Coulomb	Unit Weight: 117 pcf	Cohesion: 0 psf	Phi: 24 °	Phi-B: 0 °
Name: 6S-El -12 to -16, Clay (S-Case)	Model: Spatial Mohr-Coulomb	Weight Spatial Fn: Fill -12 to -16 (2)	Cohesion: 0 psf	Phi: 24 °	Phi-B: 0 °
Name: 7S-El -16 to -19, 20, 21.5, Silt (S-Case)	Model: Mohr-Coulomb	Unit Weight: 117 pcf	Cohesion: 0 psf	Phi: 24 °	Phi-B: 0 °
Name: 8S-El -19, 20, 21.5 to -29, Lanc (S-Case)	Model: Spatial Mohr-Coulomb	Weight Spatial Fn: Lanc -19,20,21.5 to -29	Cohesion: 0 psf	Phi: 24 °	Phi-B: 0 °
Name: 9S-El -29 to -33, -34, -36, Lanc (S-Case)	Model: Spatial Mohr-Coulomb	Weight Spatial Fn: Lanc -29 to -33,34,36	Cohesion: 0 psf	Phi: 24 °	Phi-B: 0 °
Name: 11S-El -42 to -70, BaySound (S-Case)	Model: Spatial Mohr-Coulomb	Unit Weight: 107 pcf	Cohesion: 0 psf	Phi: 23 °	Phi-B: 0 °
Name: 2S-El +1 to -2.5, Fill (S-Case) BWT	Model: Spatial Mohr-Coulomb	Weight Spatial Fn: Fill 1 to -2.5	Cohesion: 0 psf	Phi: 26 °	Phi-B: 0 °
Name: 3S-El -2.5 to -7, Fill (S-Case) BWT	Model: Spatial Mohr-Coulomb	Weight Spatial Fn: fill -2.5 to -7	Cohesion: 0 psf	Phi: 24 °	Phi-B: 0 °

CROSS SECTION AT STA 103+00W

GENERAL NOTES

CLASSIFICATION STRATIFICATION
SHEAR STRENGTHS AND UNIT WEIGHTS OF
THE SOIL WERE BASED ON THE RESULTS OF
UNDISTURBED BORINGS AND CPT DATA. SEE
BOTH BORING AND CPT DATA PLATES.

WHERE INDICATED, SHEAR STRENGTHS BETWEEN
VERTICALS WERE ASSUMED TO VARY LINEARLY
BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL,
REMEDICATION OF CANAL WALLS AND LEVEES
PROTECTED SIDE STABILITY ANALYSIS,
CASE: Name: NWL S Case P/S (Entry/Exit)
REACH 11, STA. 98+70 TO STA. 112+50 WEST
ORLEANS PARISH, LOUISIANA

NWL S Case P/S (Entry/Exit)

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File Information

Created By: [Vicky Curtis](#)
Revision Number: [116](#)
Last Edited By: [Bishop, Charles E MVR](#)
Date: [7/7/2013](#)
Time: [7:05:00 PM](#)
File Name: [Reach 11.gsz](#)
Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix F NWL\](#)
Last Solved Date: [7/7/2013](#)
Last Solved Time: [7:10:58 PM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Strength Units: [psf](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

NWL S Case P/S (Entry/Exit)

Kind: [SLOPE/W](#)
Parent: [Normal Water Level at +0.40ft \(seeapage\)](#)
Method: [Spencer](#)
Settings
 PWP Conditions Source: [Parent Analysis](#)
Slip Surface
 Direction of movement: [Left to Right](#)
 Use Passive Mode: [No](#)
 Slip Surface Option: [Entry and Exit](#)
 Critical slip surfaces saved: [1](#)
 Optimize Critical Slip Surface Location: [Yes](#)
 Tension Crack
 Tension Crack Option: [Tension Crack Line](#)
 Percentage Wet: [0](#)
 Tension Crack Fluid Unit Weight: [62.4 pcf](#)
FOS Distribution
 FOS Calculation Option: [Constant](#)

Advanced

Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 9000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

10-El -33, -34, -36 to -42, Beach

Model: Mohr-Coulomb
Unit Weight: 122 pcf
Cohesion: 0 psf
Phi: 33 °
Phi-B: 0 °

1S-El +13.2 to +1, fill GR (S-Case)

Model: Spatial Mohr-Coulomb
Weight Spatial Fn: Fill Gr to 1
Cohesion: 75 psf
Phi: 26 °
Phi-B: 0 °

2S-El +1 to -2.5, Fill (S-Case) AWT

Model: Spatial Mohr-Coulomb
Weight Spatial Fn: Fill 1 to -2.5
Cohesion: 75 psf
Phi: 26 °
Phi-B: 0 °

3S- El -2.5 to -7, Fill (S-Case) AWT

Model: Spatial Mohr-Coulomb
Weight Spatial Fn: fill -2.5 to -7
Cohesion: 75 psf
Phi: 24 °
Phi-B: 0 °

4S-El -7 to -9, Fill (S-Case)

Model: Spatial Mohr-Coulomb
Weight Spatial Fn: Fill -7 to -9
Cohesion: 0 psf
Phi: 24 °

Phi-B: 0 °

5S-El -9 to -12, Silt (S-Case)

Model: [Mohr-Coulomb](#)

Unit Weight: 117 pcf

Cohesion: 0 psf

Phi: 24 °

Phi-B: 0 °

6S-El -12 to -16, Clay (S-Case)

Model: [Spatial Mohr-Coulomb](#)

Weight Spatial Fn: [Fill -12 to -16 \(2\)](#)

Cohesion: 0 psf

Phi: 24 °

Phi-B: 0 °

7S-El -16 to -19, 20, 21.5, Silt (S-Case)

Model: [Mohr-Coulomb](#)

Unit Weight: 117 pcf

Cohesion: 0 psf

Phi: 24 °

Phi-B: 0 °

8S-El -19, 20, 21.5 to -29, Lanc (S-Case)

Model: [Spatial Mohr-Coulomb](#)

Weight Spatial Fn: [Lanc-19,20,21.5 to -29](#)

Cohesion: 0 psf

Phi: 24 °

Phi-B: 0 °

9S-El -29 to -33, -34, -36, Lanc (S-Case)

Model: [Spatial Mohr-Coulomb](#)

Weight Spatial Fn: [Lan -29 to -33,34,36](#)

Cohesion: 0 psf

Phi: 24 °

Phi-B: 0 °

11S-El -42 to -70, BaySound (S-Case)

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: 107 pcf

Cohesion: 0 psf

Phi: 23 °

Phi-B: 0 °

2S-El +1 to -2.5, Fill (S-Case) BWT

Model: [Spatial Mohr-Coulomb](#)

Weight Spatial Fn: [Fiil 1 to -2.5](#)

Cohesion: 0 psf

Phi: 26 °

Phi-B: 0 °

3S- El -2.5 to -7, Fill (S-Case) BWT

Model: [Spatial Mohr-Coulomb](#)

Weight Spatial Fn: [fill -2.5 t0-7](#)

Cohesion: [0 psf](#)

Phi: [24 °](#)

Phi-B: [0 °](#)

Slip Surface Entry and Exit

Left Projection: [Range](#)

Left-Zone Left Coordinate: [\(175, 6.81926\) ft](#)

Left-Zone Right Coordinate: [\(220, 7.75532\) ft](#)

Left-Zone Increment: [15](#)

Right Projection: [Range](#)

Right-Zone Left Coordinate: [\(235, 3.55635\) ft](#)

Right-Zone Right Coordinate: [\(280, 1.97008\) ft](#)

Right-Zone Increment: [15](#)

Radius Increments: [15](#)

Slip Surface Limits

Left Coordinate: [\(30, -9.65\) ft](#)

Right Coordinate: [\(310, 0.92\) ft](#)

Tension Crack Line

	X (ft)	Y (ft)
	192	11.5
	210	11.5

Spatial Functions

fill -2.5 t0-7

Model: [Linear Interpolation](#)

Limit Range By: [Data Values](#)

Data Points: [X \(ft\), Y \(ft\), Unit Weight \(pcf\)](#)

Data Point: [\(80, -5.2, 118\)](#)

Data Point: [\(80, -7, 118\)](#)

Data Point: [\(200, -2.5, 100\)](#)

Data Point: [\(200, -7, 100\)](#)

Data Point: [\(240, -2.5, 97\)](#)

Data Point: [\(240, -7, 97\)](#)

Fill -7 to -9

Model: [Linear Interpolation](#)

Limit Range By: [Data Values](#)

Data Points: [X \(ft\)](#), [Y \(ft\)](#), [Unit Weight \(pcf\)](#)

Data Point: [\(80, -7, 118\)](#)

Data Point: [\(80, -9, 118\)](#)

Data Point: [\(200, -7, 110\)](#)

Data Point: [\(200, -9, 110\)](#)

Data Point: [\(240, -7, 118\)](#)

Data Point: [\(240, -9, 118\)](#)

Fill -12 to -16 (2)

Model: [Linear Interpolation](#)

Limit Range By: [Data Values](#)

Data Points: [X \(ft\)](#), [Y \(ft\)](#), [Unit Weight \(pcf\)](#)

Data Point: [\(80, -12, 118\)](#)

Data Point: [\(80, -16, 118\)](#)

Data Point: [\(200, -12, 110\)](#)

Data Point: [\(200, -16, 110\)](#)

Data Point: [\(240, -12, 118\)](#)

Data Point: [\(240, -16, 118\)](#)

Lanc-19,20,21.5 to -29

Model: [Linear Interpolation](#)

Limit Range By: [Data Values](#)

Data Points: [X \(ft\)](#), [Y \(ft\)](#), [Unit Weight \(pcf\)](#)

Data Point: [\(80, -19, 101\)](#)

Data Point: [\(80, -29, 101\)](#)

Data Point: [\(200, -21.5, 103\)](#)

Data Point: [\(200, -29, 103\)](#)

Data Point: [\(240, -20, 101\)](#)

Data Point: [\(240, -29, 101\)](#)

Lan -29 to -33,34,36

Model: [Linear Interpolation](#)

Limit Range By: [Data Values](#)

Data Points: [X \(ft\)](#), [Y \(ft\)](#), [Unit Weight \(pcf\)](#)

Data Point: [\(80, -29, 101\)](#)

Data Point: [\(80, -33, 101\)](#)

Data Point: [\(200, -29, 103\)](#)

Data Point: [\(200, -36, 103\)](#)

Data Point: [\(240, -29, 101\)](#)

Data Point: [\(240, -34, 101\)](#)

Fill Gr to 1

Model: [Linear Interpolation](#)

Limit Range By: [Data Values](#)

Data Points: [X \(ft\)](#), [Y \(ft\)](#), [Unit Weight \(pcf\)](#)

Data Point: [\(200, 12.84, 105\)](#)

Data Point: (200, 1, 105)
 Data Point: (240, 2.9, 110)
 Data Point: (240, 1, 110)

Fiil 1 to -2.5

Model: Linear Interpolation
 Limit Range By: Data Values
 Data Points: X (ft), Y (ft), Unit Weight (pcf)
 Data Point: (200, 1, 105)
 Data Point: (200, -2.5, 105)
 Data Point: (240, 1, 110)
 Data Point: (240, -2.5, 110)

Regions

	Material	Points	Area (ft²)
Region 1	1S-El +13.2 to +1, fill GR (S-Case)	31,17,16,15,14,13,12,11,10,9,8,7,6,5,4,3,2,1,32	666.31223
Region 2	4S-El -7 to -9, Fill (S-Case)	38,28,27,35,36,37	505.36899
Region 3	5S-El -9 to -12, Silt (S-Case)	30,29,38,37,39,40	831.99503
Region 4	6S-El -12 to -16, Clay (S-Case)	40,39,41,42	1120
Region 5	7S-El -16 to -19, 20, 21.5, Silt (S-Case)	42,41,43,44,45,46,47	1130
Region 6	8S-El -19, 20, 21.5 to -29, Lanc (S-Case)	47,46,45,44,43,48,49,58,59,60	2510
Region 7	9S-El -29 to -33, -34, -36, Lanc (S-Case)	60,59,58,49,48,61,62,50,51,52	1450
Region 8	10-El -33, -34, -36 to -42, Beach	52,51,50,62,61,53,54	2190
Region 9	11S-El -42 to -70, BaySound (S-Case)	54,53,55,56	7840
Region 10	2S-El +1 to -2.5, Fill (S-Case) AWT	31,63,18,64,65,66,67,68,69,34,57,32	533.1392
Region 11	2S-El +1 to -2.5, Fill (S-Case) BWT	18,19,20,21,33,69,68,67,66,65,64	116.5002
Region 12	3S- El -2.5 to -7, Fill (S-Case) BWT	35,26,25,24,23,22,33,69,70,36	981.98447
Region 13	3S- El -2.5 to -7, Fill (S-Case) AWT	69,34,70	21.040764

Points

	X (ft)	Y (ft)
Point 1	299.76482	1.57
Point 2	286.5021	1.81
Point 3	274.72265	2.1
Point 4	263.0598	2.25
Point 5	250.11037	2.42
Point 6	237.47421	2.92
Point 7	224.25455	6.32
Point 8	213.13888	10.07
Point 9	204.83191	13.2
Point 10	200	13.2
Point 11	194.6022	12.34
Point 12	180.69592	8.67
Point 13	170.26269	5.28
Point 14	161.02916	2.8
Point 15	155.11244	2.62

Point 16	145.03996	2.11
Point 17	135.24107	1.24
Point 18	133.74292	0.31
Point 19	129.56031	-0.55
Point 20	122.62305	-0.91
Point 21	116.39775	-1.23
Point 22	110.42069	-3.2
Point 23	100.32551	-3.66
Point 24	90.33436	-4.27
Point 25	80.38231	-5.21
Point 26	70.35922	-6.08
Point 27	60.30838	-7.67
Point 28	50.29143	-8.96
Point 29	40.30759	-9.49
Point 30	30	-9.65
Point 31	135	1
Point 32	307	1
Point 33	113	-2.5
Point 34	310	-2.5
Point 35	63	-7
Point 36	310	-7
Point 37	310	-9
Point 38	49	-9
Point 39	310	-12
Point 40	30	-12
Point 41	310	-16
Point 42	30	-16
Point 43	310	-20
Point 44	240	-20
Point 45	200	-21.5
Point 46	80	-19
Point 47	30	-19
Point 48	310	-29
Point 49	240	-29
Point 50	200	-36
Point 51	80	-33
Point 52	30	-33
Point 53	310	-42
Point 54	30	-42
Point 55	310	-70
Point 56	30	-70
Point 57	310	0.92
Point 58	200	-29
Point 59	80	-29
Point 60	30	-29
Point 61	310	-34
Point 62	240	-34
Point 63	133.90683	0.39997

Point 64	134.35933	0.13586
Point 65	135.35169	-0.03317
Point 66	140.34835	-0.39087
Point 67	160.75338	-1.08816
Point 68	189.74915	-2.06584
Point 69	212.22239	-2.5
Point 70	310	-2.93038

Critical Slip Surfaces

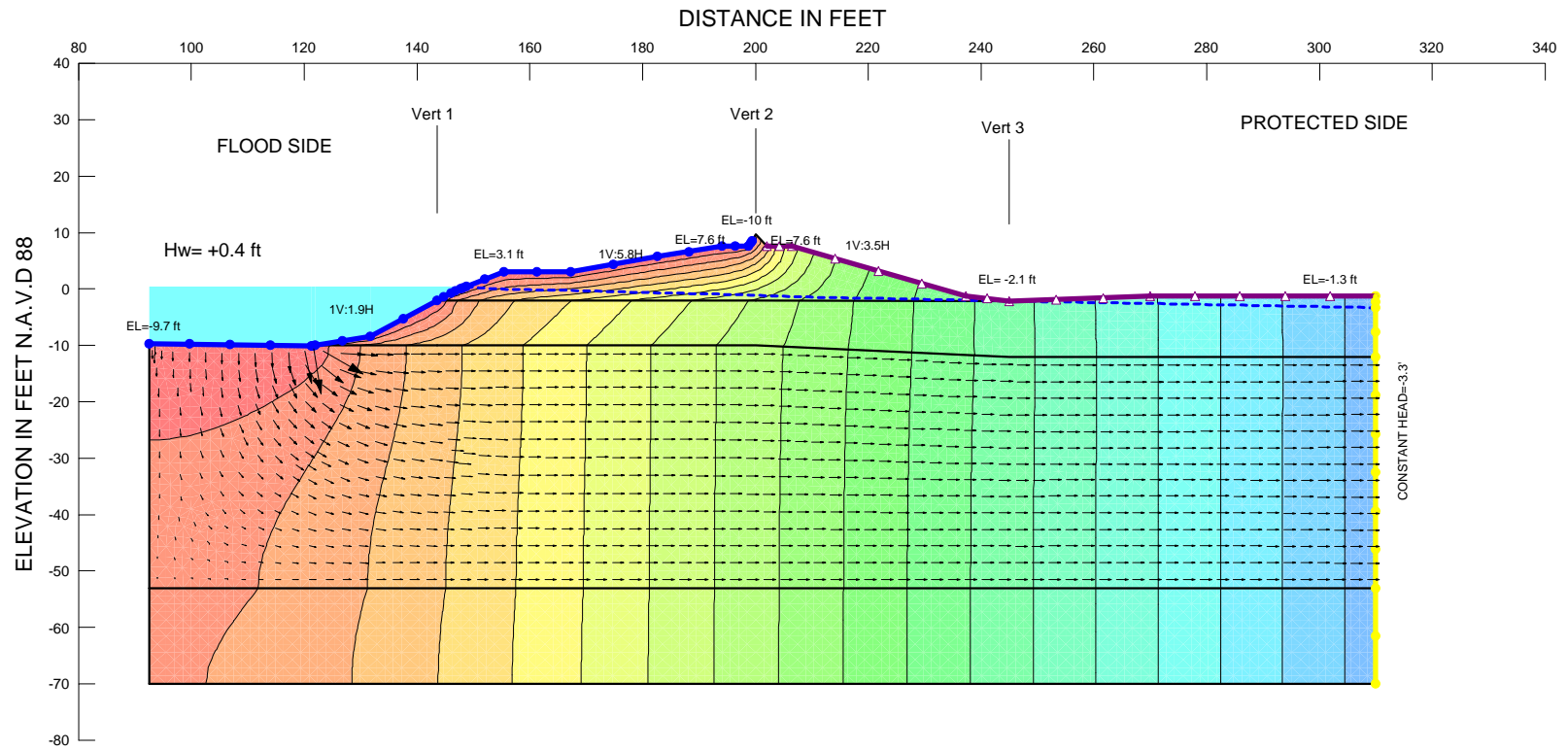
	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	2.55	(227.633, 34.228)	16.50537	(202.792, 13.2)	(237.476, 2.91995)
2	2327	2.57	(227.633, 34.228)	32.974	(203.744, 13.2)	(237.925, 2.90215)

Slices of Slip Surface: Optimized

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	203.3422	10.944125	-730.00118	154.34	75.276649	75
2	Optimized	204.36235	9.9519315	-685.6452	237.29012	115.73412	75
3	Optimized	205.3503	9.0339265	-641.92517	293.73111	143.26223	75
4	Optimized	206.3325	8.210715	-600.85282	355.61563	173.44533	75
5	Optimized	207.2601	7.527665	-565.87722	383.7159	187.15075	75
6	Optimized	208.305	6.8424125	-530.84107	433.35975	211.36367	75
7	Optimized	209.4672	6.1549575	-496.33788	455.82866	222.32249	75
8	Optimized	210.6305	5.538415	-466.15544	497.19151	242.4965	75
9	Optimized	211.79495	4.992785	-439.08539	507.70536	247.62445	75
10	Optimized	212.75805	4.5797885	-417.22969	535.84681	261.34995	75
11	Optimized	213.69265	4.2357975	-399.4553	537.73937	262.27302	75
12	Optimized	214.8001	3.828179	-378.42331	541.70512	264.20724	75
13	Optimized	216.024	3.431875	-358.46589	560.86441	273.55185	75
14	Optimized	217.36435	3.046885	-338.63119	555.07032	270.72589	75
15	Optimized	218.6779	2.71423	-320.63859	562.69115	274.44281	75
16	Optimized	219.96475	2.43391	-305.74141	547.75601	267.15846	75
17	Optimized	221.2508	2.2026175	-293.80316	547.3017	266.93688	75
18	Optimized	222.53605	2.0203525	-284.35099	521.418	254.31255	75
19	Optimized	223.7166	1.889414	-277.67169	510.60816	249.04024	75
20	Optimized	224.77145	1.811356	-274.09827	485.29332	236.69337	75
21	Optimized	225.8053	1.734852	-270.60632	465.05549	226.82272	75
22	Optimized	226.8595	1.6873435	-268.77804	454.18808	221.52233	75
23	Optimized	227.9341	1.66883	-268.4989	425.61407	207.58585	75
24	Optimized	229.0087	1.6503165	-268.21977	396.96563	193.61307	75
25	Optimized	230.26735	1.6778675	-270.94084	371.39621	181.14204	75
26	Optimized	231.71	1.7514825	-276.65207	319.91898	156.03491	75
27	Optimized	232.96395	1.856765	-283.93015	282.98048	138.0188	75
28	Optimized	234.02925	1.993715	-293.07296	233.22567	113.75176	75
29	Optimized	235.42465	2.258485	-310.36371	168.86598	82.361441	75
30	Optimized	236.8808	2.6870935	-337.88741	78.164071	38.123164	75
31	Optimized	237.4749	2.9196765	-352.70654	24.107246	11.757889	75

Slices of Slip Surface: 2327

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	2327	204.2881	10.95455	-742.39879	154.06268	75.141389	75
2	2327	205.42525	9.8681685	-691.66465	228.16153	111.28181	75
3	2327	206.61195	8.836023	-639.48503	283.75976	138.39888	75
4	2327	207.79865	7.89784	-590.85274	333.66	162.73685	75
5	2327	208.98535	7.0438455	-546.52164	378.0324	184.37872	75
6	2327	210.1721	6.266295	-506.78158	417.0157	203.39215	75
7	2327	211.35885	5.558947	-471.25856	450.72477	219.83316	75
8	2327	212.54555	4.9167035	-436.82672	479.25592	233.74873	75
9	2327	213.69465	4.3519865	-406.45237	504.10529	245.86858	75
10	2327	214.8062	3.857953	-380.23674	525.72302	256.41225	75
11	2327	215.9178	3.4119245	-356.92542	543.06146	264.86877	75
12	2327	217.02935	3.0118395	-335.92629	556.09789	271.22706	75
13	2327	218.1409	2.655948	-316.17472	564.83955	275.49066	75
14	2327	219.2525	2.3427685	-298.96757	569.23125	277.63263	75
15	2327	220.36405	2.0710515	-284.24562	569.2371	277.63548	75
16	2327	221.4756	1.8397515	-271.94543	564.78391	275.46352	75
17	2327	222.5872	1.6480065	-261.45517	555.7867	271.07529	75
18	2327	223.69875	1.4951215	-253.32986	542.12875	264.41386	75
19	2327	224.80535	1.3808955	-247.57781	528.62723	257.82873	75
20	2327	225.907	1.304593	-244.164	515.39588	251.37537	75
21	2327	227.00865	1.265274	-242.73122	497.46968	242.63217	75
22	2327	228.1103	1.262806	-243.46633	474.67947	231.51664	75
23	2327	229.2119	1.2971805	-246.48587	446.78453	217.91138	75
24	2327	230.31355	1.3685135	-251.79658	413.554	201.70376	75
25	2327	231.4152	1.477047	-259.41446	374.67571	182.74155	75
26	2327	232.51685	1.623152	-269.1469	329.81515	160.8616	75
27	2327	233.6185	1.8073375	-281.24004	278.57993	135.87251	75
28	2327	234.7201	2.0302585	-295.75171	220.49509	107.54264	75
29	2327	235.82175	2.2927265	-312.72999	155.00209	75.59957	75
30	2327	236.9234	2.595727	-332.22577	81.463901	39.732599	75
31	2327	237.6998	2.829821	-347.20786	31.618266	15.421259	75



Name: EMBANKMENT FILL (S-Case) AWT Model: Saturated Only K-Sat: 3.28e-008 ft/sec K-Ratio: 1
Name: MARSH, CL (S-Case) AWT Model: Saturated Only K-Sat: 3.28e-007 ft/sec K-Ratio: 1
Name: BEACH SAND, EL. -10.0/-12.0 TO -53.0 Model: Saturated Only K-Sat: 0.00049 ft/sec K-Ratio: 1
Name: BAY SOUND CLAY, EL. -53.0 TO -70.0 Model: Saturated Only K-Sat: 3.28e-008 ft/sec K-Ratio: 1

GENERAL NOTES

CLASSIFICATION STRATIFICATION
SHEAR STRENGTHS AND UNIT WEIGHTS OF
THE SOIL WERE BASED ON THE RESULTS OF
UNDISTURBED BORINGS AND CPT DATA. SEE
BOTH BORING AND CPT DATA PLATES.

WHERE INDICATED, SHEAR STRENGTHS BETWEEN
VERTICALS WERE ASSUMED TO VARY LINEARLY
BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

Hw IS CANAL WATER LEVEL

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 12A,
PROTECTED SIDE STABILITY ANALYSIS,
CASE: Normal Water Level at +0.40ft (seepage)
STA. 2+45 TO 3+70 EAST
ORLEANS PARISH, LOUISIANA

Normal Water Level at +0.40ft (seepage)

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File Information

Created By: [Liljegren, James](#)
Revision Number: [384](#)
Last Edited By: [Higgins, James](#)
Date: [7/7/2013](#)
Time: [7:23:00 PM](#)
File Name: [Reach 12A.gsz](#)
Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix F NWL\](#)
Last Solved Date: [7/7/2013](#)
Last Solved Time: [7:23:16 PM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Mass(M) Units: [lbs](#)
Mass Flux Units: [lbs/sec](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

Normal Water Level at +0.40ft (seepage)

Kind: [SEEP/W](#)
Method: [Steady-State](#)
Settings
 Include Air Flow: [No](#)
Control
 Apply Runoff: [No](#)
Convergence
 Convergence Type: [Head Vector Norm](#)
 Maximum Number of Iterations: [500](#)
 Tolerance: [0.001](#)
 Maximum Change in K: [0.1](#)
 Rate of Change in K: [1.02](#)
 Minimum Change in K: [1e-005](#)
 Equation Solver: [Parallel Direct](#)
 Potential Seepage Max # of Reviews: [10](#)
Time

Starting Time: 0 sec

Duration: 0 sec

Ending Time: 0 sec

Materials

EMBANKMENT FILL (S-Case) AWT

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-008 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

MARSH, CL (S-Case) AWT

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-007 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

BEACH SAND, EL. -10.0/-12.0 TO -53.0

Model: Saturated Only

Hydraulic

K-Sat: 0.00049 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

BAY SOUND CLAY, EL. -53.0 TO -70.0

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-008 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

Boundary Conditions

Drainage

Review: true

Type: Total Flux (Q) 0

Canal Water

Type: Head (H) 0.4

Curb

Type: Head (H) -3.3

Regions

	Material	Points	Area (ft²)
Region 1	BEACH SAND, EL. -10.0/-12.0 TO -53.0	25,24,31,19,9,18,5,6,20,16	9180.3494
Region 2	BAY SOUND CLAY, EL. -53.0 TO -70.0	6,7,21,17,16,20	3697.5
Region 3	MARSH, CL (S-Case) AWT	18,50,51,5	604.72165
Region 4	MARSH, CL (S-Case) AWT	31,23,28,19	64.950592
Region 5	EMBANKMENT FILL (S-Case) AWT	36,26,11,1,14,22,35,34,27,10,2,3,49,48,47,46,45,44,43,42,41,40,39,38,37	471.91561
Region 6	MARSH, CL (S-Case) AWT	8,49,50,18,9,19,28	853.94202
Region 7	EMBANKMENT FILL (S-Case) AWT	28,12,33,36,37,38,39,40,41,42,43,44,45,46,47,48,49,8	103.4774
Region 8	MARSH, CL (S-Case) AWT	49,3,50	0.0079632175
Region 9	MARSH, CL (S-Case) AWT	3,13,4,51,50	80.77835

Lines

	Start Point	End Point	Hydraulic Boundary
Line 1	5	6	Curb
Line 2	6	7	Curb
Line 3	17	16	
Line 4	5	18	
Line 5	18	9	
Line 6	9	19	
Line 7	6	20	
Line 8	20	16	
Line 9	7	21	
Line 10	21	17	
Line 11	26	11	Canal Water
Line 12	11	1	Canal Water
Line 13	1	14	Canal Water

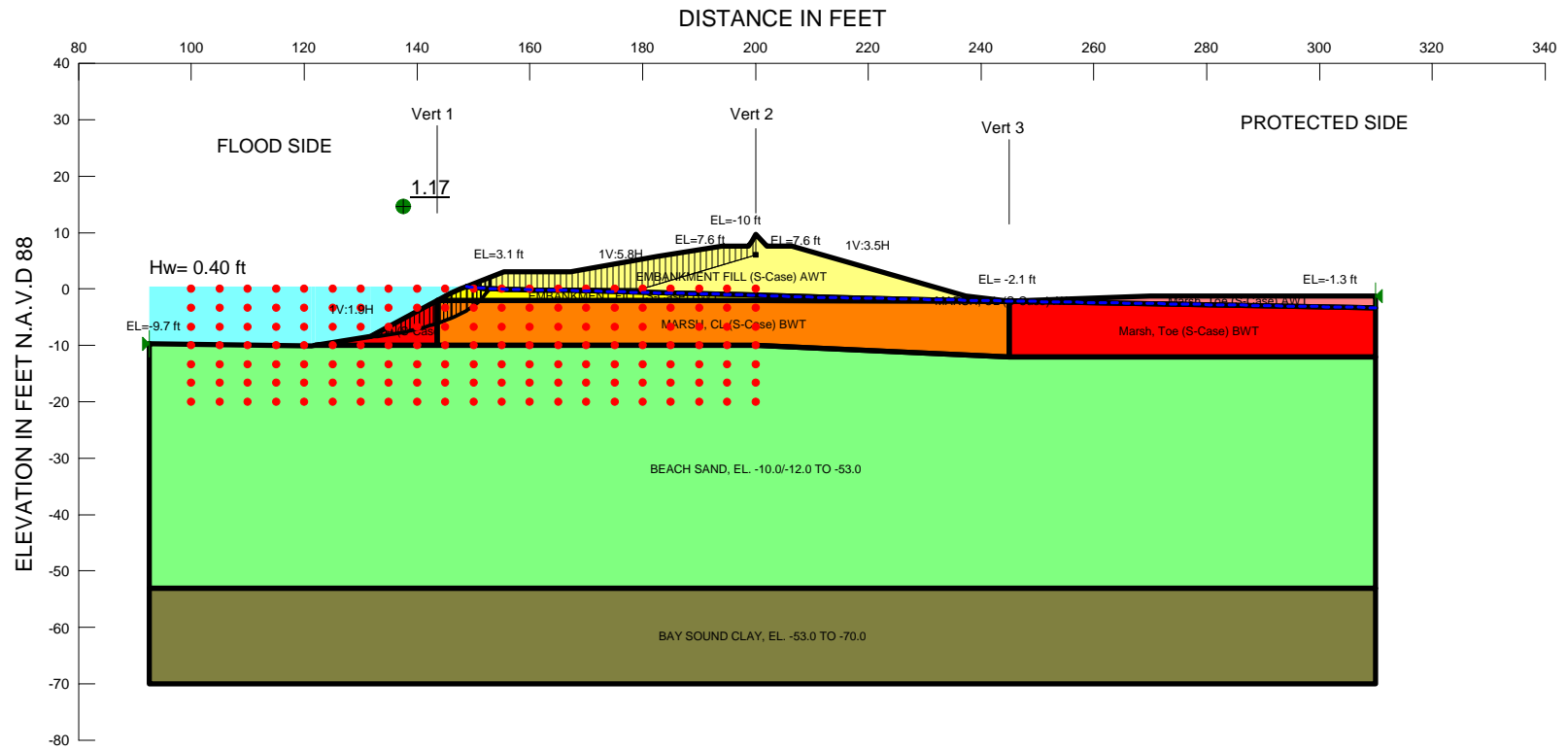
Line 14	14	22	Canal Water
Line 15	27	10	Drainage
Line 16	10	2	Drainage
Line 17	2	3	Drainage
Line 18	23	28	Canal Water
Line 19	28	19	
Line 20	28	8	
Line 21	31	23	Canal Water
Line 22	19	31	
Line 23	16	25	
Line 24	25	24	Canal Water
Line 25	24	31	Canal Water
Line 26	27	34	
Line 27	34	35	
Line 28	35	22	Canal Water
Line 29	36	26	Canal Water
Line 30	8	49	
Line 31	49	3	
Line 32	3	50	
Line 33	50	18	
Line 34	51	5	Curb
Line 35	49	48	
Line 36	48	47	
Line 37	47	46	
Line 38	46	45	
Line 39	45	44	
Line 40	44	43	
Line 41	43	42	
Line 42	42	41	
Line 43	41	40	
Line 44	40	39	
Line 45	39	38	
Line 46	38	37	
Line 47	37	36	
Line 48	28	12	Canal Water
Line 49	12	33	Canal Water
Line 50	33	36	Canal Water
Line 51	49	50	
Line 52	50	51	
Line 53	3	13	Drainage
Line 54	13	4	Drainage
Line 55	4	51	Curb

Points

	X (ft)	Y (ft)
Point 1	182.6	5.8
Point 2	237.3	-1.3

Point 3	245	-2.1
Point 4	310	-1.3
Point 5	310	-12
Point 6	310	-53
Point 7	310	-70
Point 8	200	-2
Point 9	200	-10
Point 10	206.5	7.6
Point 11	167.2	3
Point 12	146	-0.7
Point 13	270	-1.3
Point 14	194.1	7.6
Point 15	92.5	-12
Point 16	92.5	-53
Point 17	92.5	-70
Point 18	245	-12
Point 19	143.6	-10
Point 20	200	-53
Point 21	200	-70
Point 22	198.8	7.6
Point 23	131.7	-8.4
Point 24	121.3	-10.1
Point 25	92.5	-9.7
Point 26	155.4	3.1
Point 27	202	7.6
Point 28	143.6	-2
Point 29	92.5	-150
Point 30	310	-150
Point 31	121.91176	-10
Point 32	92.5	0
Point 33	147.73158	0
Point 34	200	9.7
Point 35	199.34	8.5
Point 36	148.724	0.40119
Point 37	149.94972	0.27999
Point 38	152.15674	0.11196
Point 39	153.60482	0.0365
Point 40	155.88302	-0.05266
Point 41	157.70768	-0.10098
Point 42	160.52411	-0.15092
Point 43	166.89377	-0.26088
Point 44	176.58463	-0.50644
Point 45	185.57258	-0.73318
Point 46	197.651	-1.02831
Point 47	215.19847	-1.53938
Point 48	230.48704	-1.84538
Point 49	244.10425	-2.09801
Point 50	245	-2.11778

Point 51	310	-3.2754
----------	-----	---------



Name: EMBANKMENT FILL (S-Case) AWT Model: Mohr-Coulomb Unit Weight: 116 pcf Cohesion: 75 psf Phi: 26 °
Name: MARSH, CL (S-Case) AWT Model: Spatial Mohr-Coulomb Weight Fn: Marsh Cohesion: 75 psf Phi: 24 °
Name: BEACH SAND, EL. -10.0/-12.0 TO -53.0 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand
Name: BAY SOUND CLAY, EL. -53.0 TO -70.0 Model: Spatial Mohr-Coulomb Unit Weight: 110 pcf Cohesion: 0 psf Phi: 26 °
Name: Marsh, Toe (S-Case) AWT Model: Spatial Mohr-Coulomb Unit Weight: 104 pcf Cohesion: 75 psf Phi: 24 °
Name: EMBANKMENT FILL (S-Case) BWT Model: Mohr-Coulomb Unit Weight: 116 pcf Cohesion: 0 psf Phi: 26 °
Name: MARSH, CL (S-Case) BWT Model: Spatial Mohr-Coulomb Weight Fn: Marsh Cohesion: 0 psf Phi: 24 °
Name: Marsh, Toe (S-Case) BWT Model: Spatial Mohr-Coulomb Unit Weight: 104 pcf Cohesion: 0 psf Phi: 24 °

GENERAL NOTES

CLASSIFICATION STRATIFICATION
SHEAR STRENGTHS AND UNIT WEIGHTS OF
THE SOIL WERE BASED ON THE RESULTS OF
UNDISTURBED BORINGS AND CPT DATA. SEE
BOTH BORING AND CPT DATA PLATES.

WHERE INDICATED, SHEAR STRENGTHS BETWEEN
VERTICALS WERE ASSUMED TO VARY LINEARLY
BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

Hw IS CANAL WATER LEVEL

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 12A,
PROTECTED SIDE STABILITY ANALYSIS,
CASE: NWL S-Case F/S (Block)
STA. 2+45 TO 3+70 EAST
ORLEANS PARISH, LOUISIANA

NWL S-Case F/S (Block)

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File Information

Created By: [Liljegren, James](#)
Revision Number: [389](#)
Last Edited By: [Higgins, James](#)
Date: [7/7/2013](#)
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File Name: [Reach 12A.gsz](#)
Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix F NWL\](#)
Last Solved Date: [7/7/2013](#)
Last Solved Time: [9:34:50 PM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Strength Units: [psf](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

NWL S-Case F/S (Block)

Kind: [SLOPE/W](#)
Parent: [Normal Water Level at +0.40ft \(seepage\)](#)
Method: [Spencer](#)
Settings
 PWP Conditions Source: [Parent Analysis](#)
Slip Surface
 Direction of movement: [Right to Left](#)
 Use Passive Mode: [No](#)
 Slip Surface Option: [Block](#)
 Critical slip surfaces saved: [1](#)
 Optimize Critical Slip Surface Location: [Yes](#)
 Tension Crack
 Tension Crack Option: [Tension Crack Line](#)
 Percentage Wet: [0](#)
 Tension Crack Fluid Unit Weight: [62.4 pcf](#)
FOS Distribution
 FOS Calculation Option: [Constant](#)

Restrict Block Crossing: [Yes](#)

Advanced

Number of Slices: [30](#)

Optimization Tolerance: [0.01](#)

Minimum Slip Surface Depth: [0.1 ft](#)

Optimization Maximum Iterations: [2000](#)

Optimization Convergence Tolerance: [1e-007](#)

Starting Optimization Points: [8](#)

Ending Optimization Points: [16](#)

Complete Passes per Insertion: [1](#)

Driving Side Maximum Convex Angle: [5 °](#)

Resisting Side Maximum Convex Angle: [1 °](#)

Materials

EMBANKMENT FILL (S-Case) AWT

Model: [Mohr-Coulomb](#)

Unit Weight: [116 pcf](#)

Cohesion: [75 psf](#)

Phi: [26 °](#)

Phi-B: [0 °](#)

MARSH, CL (S-Case) AWT

Model: [Spatial Mohr-Coulomb](#)

Weight Fn: [Marsh](#)

Cohesion: [75 psf](#)

Phi: [24 °](#)

Phi-B: [0 °](#)

BEACH SAND, EL. -10.0/-12.0 TO -53.0

Model: [Shear/Normal Fn.](#)

Unit Weight: [122 pcf](#)

Strength Function: [Sand](#)

Phi-B: [0 °](#)

BAY SOUND CLAY, EL. -53.0 TO -70.0

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [110 pcf](#)

Cohesion: [0 psf](#)

Phi: [26 °](#)

Phi-B: [0 °](#)

Marsh, Toe (S-Case) AWT

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [104 pcf](#)

Cohesion: [75 psf](#)

Phi: [24 °](#)

Phi-B: 0 °

EMBANKMENT FILL (S-Case) BWT

Model: [Mohr-Coulomb](#)

Unit Weight: 116 pcf

Cohesion: 0 psf

Phi: 26 °

Phi-B: 0 °

MARSH, CL (S-Case) BWT

Model: [Spatial Mohr-Coulomb](#)

Weight Fn: [Marsh](#)

Cohesion: 0 psf

Phi: 24 °

Phi-B: 0 °

Marsh, Toe (S-Case) BWT

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: 104 pcf

Cohesion: 0 psf

Phi: 24 °

Phi-B: 0 °

Slip Surface Limits

Left Coordinate: (92.5, -9.7) ft

Right Coordinate: (310, -1.3) ft

Slip Surface Block

Left Grid

Upper Left: (100, 0) ft

Lower Left: (100, -20) ft

Lower Right: (140, -20) ft

X Increments: 8

Y Increments: 6

Starting Angle: 135 °

Ending Angle: 155 °

Angle Increments: 4

Right Grid

Upper Left: (145, 0) ft

Lower Left: (145, -20) ft

Lower Right: (200, -20) ft

X Increments: 11

Y Increments: 6

Starting Angle: 25 °

Ending Angle: 45 °

Angle Increments: 4

Tension Crack Line

	X (ft)	Y (ft)
	151	0.2
	180	0
	200	6

Shear/Normal Strength Functions

Sand

Model: [Spline Data Point Function](#)
Function: [Shear Stress vs. Normal Stress](#)
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 0
Data Points: [Normal Stress \(psf\), Shear Stress \(psf\)](#)
Data Point: (-10000, 0)
Data Point: (0, 0)
Data Point: (10000, 6494)
Estimation Properties
Intact Rock Param.: 10
Geological Strength: 100
Disturbance Factor: 0
SigmaC: 600000 psf
Sigma3: 300000 psf
Num. Points: 20

Unit Weight Functions

Marsh

Model: [Spline Data Point Function](#)
Function: [Unit Weight vs. X](#)
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 104
Data Points: [X \(ft\), Unit Weight \(pcf\)](#)
Data Point: (143.5, 104)
Data Point: (200, 103)
Data Point: (245, 104)

Regions

	Material	Points	Area (ft²)
Region	BEACH SAND, EL. -10.0/-12.0	25,24,31,19,9,18,5,6,20,16	9180.3494

1	TO -53.0		
Region 2	BAY SOUND CLAY, EL. -53.0 TO -70.0	6,7,21,17,16,20	3697.5
Region 3	Marsh, Toe (S-Case) BWT	18,50,51,5	604.72165
Region 4	Marsh, Toe (S-Case) BWT	31,23,28,19	64.950592
Region 5	EMBANKMENT FILL (S-Case) AWT	36,26,11,1,14,22,35,34,27,10,2,3,49,48,47,46,45,44,43,42,41,40,39,38,37	471.91561
Region 6	MARSH, CL (S-Case) BWT	8,49,50,18,9,19,28	853.94202
Region 7	EMBANKMENT FILL (S-Case) BWT	28,12,33,36,37,38,39,40,41,42,43,44,45,46,47,48,49,8	103.4774
Region 8	MARSH, CL (S-Case) AWT	49,3,50	0.0079632175
Region 9	Marsh, Toe (S-Case) AWT	3,13,4,51,50	80.77835

Points

	X (ft)	Y (ft)
Point 1	182.6	5.8
Point 2	237.3	-1.3
Point 3	245	-2.1
Point 4	310	-1.3
Point 5	310	-12
Point 6	310	-53
Point 7	310	-70
Point 8	200	-2
Point 9	200	-10
Point 10	206.5	7.6
Point 11	167.2	3
Point 12	146	-0.7
Point 13	270	-1.3
Point 14	194.1	7.6
Point 15	92.5	-12
Point 16	92.5	-53
Point 17	92.5	-70
Point 18	245	-12
Point 19	143.6	-10
Point 20	200	-53
Point 21	200	-70
Point 22	198.8	7.6
Point 23	131.7	-8.4
Point 24	121.3	-10.1
Point 25	92.5	-9.7

Point 26	155.4	3.1
Point 27	202	7.6
Point 28	143.6	-2
Point 29	92.5	-150
Point 30	310	-150
Point 31	121.91176	-10
Point 32	92.5	0
Point 33	147.73158	0
Point 34	200	9.7
Point 35	199.34	8.5
Point 36	148.724	0.40119
Point 37	149.94972	0.27999
Point 38	152.15674	0.11196
Point 39	153.60482	0.0365
Point 40	155.88302	-0.05266
Point 41	157.70768	-0.10098
Point 42	160.52411	-0.15092
Point 43	166.89377	-0.26088
Point 44	176.58463	-0.50644
Point 45	185.57258	-0.73318
Point 46	197.651	-1.02831
Point 47	215.19847	-1.53938
Point 48	230.48704	-1.84538
Point 49	244.10425	-2.09801
Point 50	245	-2.11778
Point 51	310	-3.2754

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.17	(143.078, 1.884)	12.46384	(152.986, 2.12427)	(130.722, -8.55992)
2	5463	1.34	(143.078, 1.884)	10.67	(154.769, 2.84511)	(134.923, -6.66667)

Slices of Slip Surface: Optimized

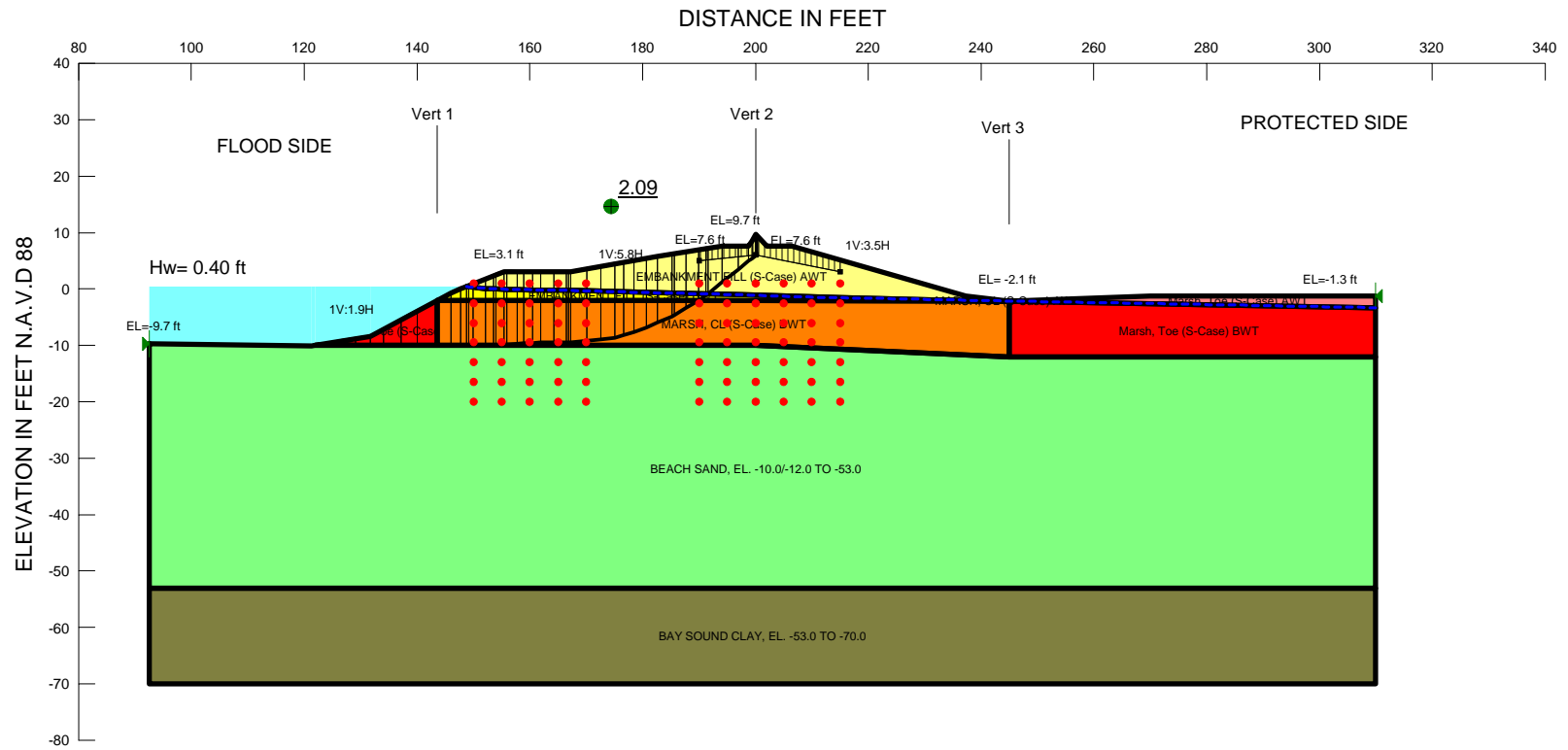
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	131.21085	-8.5209585	555.91666	561.76541	2.6040318	0
2	Optimized	132.0337	-8.455424	548.48249	580.35608	14.191033	0
3	Optimized	132.7011	-8.4022705	541.59696	588.78002	21.00725	0
4	Optimized	133.3685	-8.349117	535.59266	597.20397	27.43112	0
5	Optimized	134.13305	-8.25887	527.78734	598.99173	31.702237	0
6	Optimized	134.9947	-8.13153	518.77485	603.45779	37.703274	0
7	Optimized	135.84715	-7.986075	508.46497	602.29316	41.775001	0
8	Optimized	136.69045	-7.822505	496.61421	602.47942	47.134226	0
9	Optimized	137.53375	-7.658935	484.67032	602.64239	52.524549	0
10	Optimized	138.3584	-7.480225	472.55442	596.93307	55.376943	0
11	Optimized	139.16435	-7.286375	459.77877	593.21739	59.410704	0
12	Optimized	139.97025	-7.092525	447.0755	589.50172	63.412239	0

13	Optimized	140.7762	-6.898675	434.32397	585.78604	67.435258	0
14	Optimized	141.7186	-6.655545	418.1291	576.87232	70.677037	0
15	Optimized	142.5935	-6.407546	401.59749	565.91006	73.15667	0
16	Optimized	143.2645	-6.2039585	387.94994	558.46594	75.918617	0
17	Optimized	143.86465	-6.0218775	375.64661	553.417	79.148475	0
18	Optimized	144.4537	-5.8168225	362.02871	539.90018	79.193481	0
19	Optimized	145.10255	-5.5672875	345.53036	531.19792	82.66452	0
20	Optimized	145.7135	-5.309801	328.525	513.36683	82.296885	0
21	Optimized	146.08425	-5.138056	317.22028	504.43851	83.354928	0
22	Optimized	146.55925	-4.908422	302.08152	488.51922	83.007414	0
23	Optimized	147.3408	-4.527206	276.88506	465.65726	84.046798	0
24	Optimized	148.2278	-4.094562	247.78479	439.66404	85.430147	0
25	Optimized	148.80655	-3.812273	228.744	424.55902	87.182463	0
26	Optimized	149.35735	-3.478485	206.63056	402.06965	87.01509	0
27	Optimized	149.88765	-3.1312045	184.06432	370.64348	83.070394	0
28	Optimized	150.26085	-2.8080945	163.49619	354.34096	84.969567	0
29	Optimized	150.88315	-2.269365	129.13732	327.15032	88.161065	0
30	Optimized	151.261	-1.942225	108.81473	306.0917	96.218407	0
31	Optimized	151.7422	-1.3669563	78.080814	243.28425	80.5751	0
32	Optimized	152.52635	-0.38801186	25.251744	178.40878	74.699679	0
33	Optimized	152.9412	0.12986993	-2.7249127	97.377091	47.493981	75

Slices of Slip Surface: 5463

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	5463	135.25665	-6.666667	439.55672	471.6032	14.268014	0
2	5463	135.92415	-6.666667	436.75509	485.92599	21.892297	0
3	5463	136.5916	-6.666667	433.93847	500.24878	29.52325	0
4	5463	137.25905	-6.666667	431.48142	514.55658	36.987443	0
5	5463	137.92655	-6.666667	429.29405	528.8494	44.324897	0
6	5463	138.594	-6.666667	427.2565	543.14222	51.595648	0
7	5463	139.26145	-6.666667	425.33881	557.43505	58.813035	0
8	5463	139.92895	-6.666667	423.54097	571.72787	65.977059	0
9	5463	140.5964	-6.666667	421.72815	586.02069	73.147754	0
10	5463	141.26385	-6.666667	419.97525	600.29853	80.285096	0
11	5463	141.93135	-6.666667	418.17741	614.59135	87.44912	0
12	5463	142.5988	-6.666667	416.31965	628.88418	94.639826	0
13	5463	143.26625	-6.666667	414.38697	643.177	101.86388	0
14	5463	143.95	-6.666667	412.44286	660.22857	110.32131	0
15	5463	144.65	-6.666667	410.55714	679.94286	119.93825	0
16	5463	145.25	-6.491615	398.76321	591.18202	85.670375	0
17	5463	145.75	-6.141511	376.941	569.73662	85.838142	0
18	5463	146.2886	-5.7643815	353.23854	544.4046	85.112612	0
19	5463	146.8658	-5.3602265	327.72135	516.63088	84.107942	0
20	5463	147.443	-4.9560715	302.10481	488.82878	83.134865	0
21	5463	147.9797	-4.580269	277.99761	462.95517	82.348409	0
22	5463	148.4759	-4.232819	255.33189	438.96879	81.760416	0
23	5463	149.03045	-3.8445295	229.94961	418.55802	83.973872	0

24	5463	149.6433	-3.4154	201.93436	401.5965	88.895309	0
25	5463	150.23555	-3.000696	175.26332	385.28986	93.509838	0
26	5463	150.8072	-2.6004175	149.48467	369.55614	97.982131	0
27	5463	151.37885	-2.200139	123.63867	353.80809	102.47803	0
28	5463	151.9107	-1.8277315	101.22006	334.25379	113.65814	0
29	5463	152.51875	-1.401974	77.592269	313.98718	115.2975	0
30	5463	153.2428	-0.8949959	49.428119	289.86652	117.26964	0
31	5463	154.06335	-0.32044809	17.904454	262.59091	119.34156	0
32	5463	154.6457	0.087307062	-4.5031232	217.69672	106.17778	75



Name: EMBANKMENT FILL (S-Case) AWT Model: Mohr-Coulomb Unit Weight: 116 pcf Cohesion: 75 psf Phi: 26 °
 Name: MARSH, CL (S-Case) AWT Model: Spatial Mohr-Coulomb Weight Fn: Marsh Cohesion: 75 psf Phi: 24 °
 Name: BEACH SAND, EL. -10.0/-12.0 TO -53.0 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand
 Name: BAY SOUND CLAY, EL. -53.0 TO -70.0 Model: Spatial Mohr-Coulomb Unit Weight: 110 pcf Cohesion: 0 psf Phi: 26 °
 Name: Marsh, Toe (S-Case) AWT Model: Spatial Mohr-Coulomb Unit Weight: 104 pcf Cohesion: 75 psf Phi: 24 °
 Name: EMBANKMENT FILL (S-Case) BWT Model: Mohr-Coulomb Unit Weight: 116 pcf Cohesion: 0 psf Phi: 26 °
 Name: MARSH, CL (S-Case) BWT Model: Spatial Mohr-Coulomb Weight Fn: Marsh Cohesion: 0 psf Phi: 24 °
 Name: Marsh, Toe (S-Case) BWT Model: Spatial Mohr-Coulomb Unit Weight: 104 pcf Cohesion: 0 psf Phi: 24 °

GENERAL NOTES

CLASSIFICATION STRATIFICATION
 SHEAR STRENGTHS AND UNIT WEIGHTS OF
 THE SOIL WERE BASED ON THE RESULTS OF
 UNDISTURBED BORINGS AND CPT DATA. SEE
 BOTH BORING AND CPT DATA PLATES.

WHERE INDICATED, SHEAR STRENGTHS BETWEEN
 VERTICALS WERE ASSUMED TO VARY LINEARLY
 BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

Hw IS CANAL WATER LEVEL

LAKE PONTCHARTRAIN, LA. AND VICINITY
 HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 12A,
 PROTECTED SIDE STABILITY ANALYSIS,
 CASE: NWL S-Case F/S (Block) (2)
 STA. 2+45 TO 3+70 EAST
 ORLEANS PARISH, LOUISIANA

NWL S-Case F/S (Block) (2)

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File Information

Created By: [Liljegren, James](#)
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File Name: [Reach 12A.gsz](#)
Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix F NWL\](#)
Last Solved Date: [10/1/2013](#)
Last Solved Time: [2:33:48 PM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Strength Units: [psf](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

NWL S-Case F/S (Block) (2)

Description: [Examine Failure surfaces that pass through the levee](#)
Kind: [SLOPE/W](#)
Parent: [Normal Water Level at +0.40ft \(seepage\)](#)
Method: [Spencer](#)

Settings

PWP Conditions Source: [Parent Analysis](#)

Slip Surface

Direction of movement: [Right to Left](#)
Use Passive Mode: [No](#)
Slip Surface Option: [Block](#)
Critical slip surfaces saved: [1](#)
Optimize Critical Slip Surface Location: [Yes](#)

Tension Crack

Tension Crack Option: [Tension Crack Line](#)
Percentage Wet: [0](#)
Tension Crack Fluid Unit Weight: [62.4 pcf](#)

FOS Distribution

FOS Calculation Option: [Constant](#)

Restrict Block Crossing: [Yes](#)

Advanced

Number of Slices: [30](#)

Optimization Tolerance: [0.01](#)

Minimum Slip Surface Depth: [0.1 ft](#)

Optimization Maximum Iterations: [2000](#)

Optimization Convergence Tolerance: [1e-007](#)

Starting Optimization Points: [8](#)

Ending Optimization Points: [16](#)

Complete Passes per Insertion: [1](#)

Driving Side Maximum Convex Angle: [5 °](#)

Resisting Side Maximum Convex Angle: [1 °](#)

Materials

EMBANKMENT FILL (S-Case) AWT

Model: [Mohr-Coulomb](#)

Unit Weight: [116 pcf](#)

Cohesion: [75 psf](#)

Phi: [26 °](#)

Phi-B: [0 °](#)

MARSH, CL (S-Case) AWT

Model: [Spatial Mohr-Coulomb](#)

Weight Fn: [Marsh](#)

Cohesion: [75 psf](#)

Phi: [24 °](#)

Phi-B: [0 °](#)

BEACH SAND, EL. -10.0/-12.0 TO -53.0

Model: [Shear/Normal Fn.](#)

Unit Weight: [122 pcf](#)

Strength Function: [Sand](#)

Phi-B: [0 °](#)

BAY SOUND CLAY, EL. -53.0 TO -70.0

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [110 pcf](#)

Cohesion: [0 psf](#)

Phi: [26 °](#)

Phi-B: [0 °](#)

Marsh, Toe (S-Case) AWT

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [104 pcf](#)

Cohesion: [75 psf](#)

Phi: 24 °

Phi-B: 0 °

EMBANKMENT FILL (S-Case) BWT

Model: Mohr-Coulomb

Unit Weight: 116 pcf

Cohesion: 0 psf

Phi: 26 °

Phi-B: 0 °

MARSH, CL (S-Case) BWT

Model: Spatial Mohr-Coulomb

Weight Fn: Marsh

Cohesion: 0 psf

Phi: 24 °

Phi-B: 0 °

Marsh, Toe (S-Case) BWT

Model: Spatial Mohr-Coulomb

Unit Weight: 104 pcf

Cohesion: 0 psf

Phi: 24 °

Phi-B: 0 °

Slip Surface Limits

Left Coordinate: (92.5, -9.7) ft

Right Coordinate: (310, -1.3) ft

Slip Surface Block

Left Grid

Upper Left: (150, 1) ft

Lower Left: (150, -20) ft

Lower Right: (170, -20) ft

X Increments: 4

Y Increments: 6

Starting Angle: 135 °

Ending Angle: 155 °

Angle Increments: 4

Right Grid

Upper Left: (190, 1) ft

Lower Left: (190, -20) ft

Lower Right: (215, -20) ft

X Increments: 5

Y Increments: 6

Starting Angle: 25 °

Ending Angle: 45 °

Angle Increments: 4

Tension Crack Line

	X (ft)	Y (ft)
	190	5
	200	6
	215	3

Shear/Normal Strength Functions

Sand

Model: [Spline Data Point Function](#)

Function: [Shear Stress vs. Normal Stress](#)

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 0

Data Points: [Normal Stress \(psf\)](#), [Shear Stress \(psf\)](#)

Data Point: (-10000, 0)

Data Point: (0, 0)

Data Point: (10000, 6494)

Estimation Properties

Intact Rock Param.: 10

Geological Strength: 100

Disturbance Factor: 0

SigmaC: 600000 psf

Sigma3: 300000 psf

Num. Points: 20

Unit Weight Functions

Marsh

Model: [Spline Data Point Function](#)

Function: [Unit Weight vs. X](#)

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 104

Data Points: [X \(ft\)](#), [Unit Weight \(pcf\)](#)

Data Point: (143.5, 104)

Data Point: (200, 103)

Data Point: (245, 104)

Regions

	Material	Points	Area (ft ²)

Region 1	BEACH SAND, EL. -10.0/-12.0 TO -53.0	25,24,29,19,9,18,5,6,20,16	9180.3494
Region 2	BAY SOUND CLAY, EL. -53.0 TO -70.0	6,7,21,17,16,20	3697.5
Region 3	Marsh, Toe (S-Case) BWT	18,47,48,5	604.72165
Region 4	Marsh, Toe (S-Case) BWT	29,23,28,19	64.950592
Region 5	EMBANKMENT FILL (S-Case) AWT	33,26,11,1,14,22,32,31,27,10,2,3,46,45,44,43,42,41,40,39,38,37,36,35,34	471.91561
Region 6	MARSH, CL (S-Case) BWT	8,46,47,18,9,19,28	853.94202
Region 7	EMBANKMENT FILL (S-Case) BWT	28,12,30,33,34,35,36,37,38,39,40,41,42,43,44,45,46,8	103.4774
Region 8	MARSH, CL (S-Case) AWT	46,3,47	0.0079632175
Region 9	Marsh, Toe (S-Case) AWT	3,13,4,48,47	80.77835

Points

	X (ft)	Y (ft)
Point 1	182.6	5.8
Point 2	237.3	-1.3
Point 3	245	-2.1
Point 4	310	-1.3
Point 5	310	-12
Point 6	310	-53
Point 7	310	-70
Point 8	200	-2
Point 9	200	-10
Point 10	206.5	7.6
Point 11	167.2	3
Point 12	146	-0.7
Point 13	270	-1.3
Point 14	194.1	7.6
Point 15	92.5	-12
Point 16	92.5	-53
Point 17	92.5	-70
Point 18	245	-12
Point 19	143.6	-10
Point 20	200	-53
Point 21	200	-70
Point 22	198.8	7.6
Point 23	131.7	-8.4
Point 24	121.3	-10.1

Point 25	92.5	-9.7
Point 26	155.4	3.1
Point 27	202	7.6
Point 28	143.6	-2
Point 29	121.91176	-10
Point 30	147.73158	0
Point 31	200	9.7
Point 32	199.34	8.5
Point 33	148.724	0.40119
Point 34	149.94972	0.27999
Point 35	152.15674	0.11196
Point 36	153.60482	0.0365
Point 37	155.88302	-0.05266
Point 38	157.70768	-0.10098
Point 39	160.52411	-0.15092
Point 40	166.89377	-0.26088
Point 41	176.58463	-0.50644
Point 42	185.57258	-0.73318
Point 43	197.651	-1.02831
Point 44	215.19847	-1.53938
Point 45	230.48704	-1.84538
Point 46	244.10425	-2.09801
Point 47	245	-2.11778
Point 48	310	-3.2754

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	2.09	(170.809, 7.459)	33.94666	(200.121, 9.57308)	(124.008, -9.65738)
2	2375	2.83	(170.809, 7.459)	28.339	(204.583, 7.6)	(139.103, -4.4186)

Slices of Slip Surface: Optimized

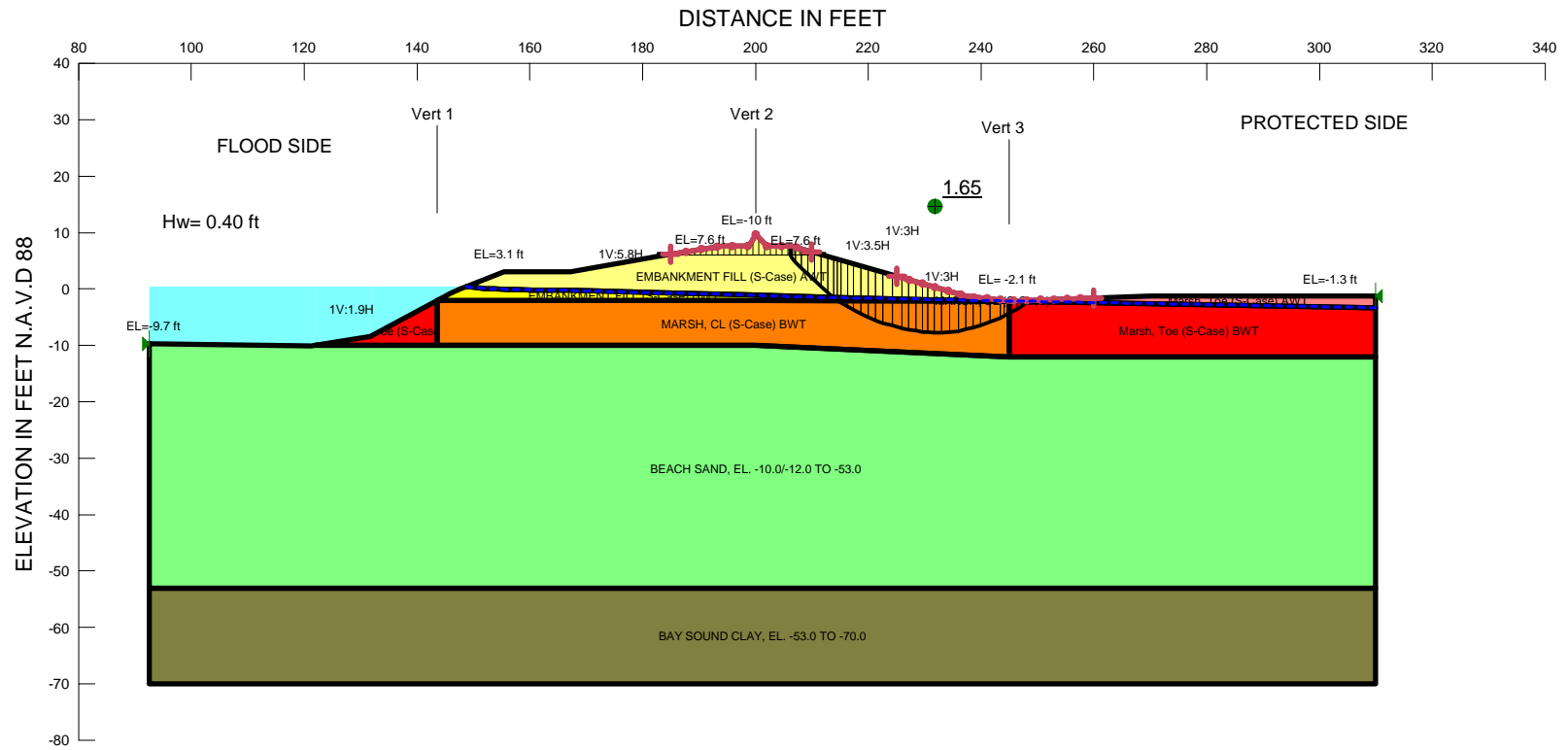
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	125.28985	-9.7009625	623.02406	656.5841	14.941893	0
2	Optimized	127.8539	-9.788127	619.20422	683.6738	28.703707	0
3	Optimized	130.41795	-9.8752915	617.68408	710.72452	41.424274	0
4	Optimized	132.8957	-9.959522	617.14026	779.16726	72.13907	0
5	Optimized	135.6129	-9.997675	614.93	834.97976	97.972469	0
6	Optimized	138.604	-9.99277	610.52367	896.58011	127.36054	0
7	Optimized	141.8368	-9.9917325	606.20738	964.11276	159.34974	0
8	Optimized	144.8	-9.9940395	602.62475	1033.9996	192.06044	0
9	Optimized	146.8658	-9.995648	600.20294	1084.0382	215.41735	0
10	Optimized	148.2278	-9.996708	598.61734	1112.5327	228.80984	0
11	Optimized	148.9395	-9.997262	597.80048	1133.4243	238.4751	0
12	Optimized	149.55235	-9.997353	597.07559	1162.5917	251.784	0
13	Optimized	151.0532	-9.9970625	595.28233	1234.6059	284.64521	0
14	Optimized	152.88075	-9.9967085	593.14403	1322.3026	324.64233	0

15	Optimized	153.8066	-9.996529	592.07038	1366.7204	344.89639	0
16	Optimized	154.7042	-9.944478	587.87742	1378.8488	352.16313	0
17	Optimized	155.6415	-9.8744135	582.53277	1403.9131	365.70207	0
18	Optimized	156.79535	-9.7881645	575.98001	1393.7416	364.0909	0
19	Optimized	158.29035	-9.676414	567.43178	1380.5633	362.02946	0
20	Optimized	159.69855	-9.599603	561.13418	1382.7439	365.80423	0
21	Optimized	161.2442	-9.537338	555.56712	1374.5561	364.63741	0
22	Optimized	163.1039	-9.498135	551.08638	1379.2734	368.73263	0
23	Optimized	165.3831	-9.477745	547.26944	1374.579	368.34196	0
24	Optimized	166.70825	-9.4548895	544.41615	1350.5403	358.90961	0
25	Optimized	167.0469	-9.43178	542.61013	1347.7777	358.48372	0
26	Optimized	168.6274	-9.3239205	534.27832	1366.4846	370.52211	0
27	Optimized	171.29615	-9.0798575	516.37219	1379.9926	384.50857	0
28	Optimized	173.7788	-8.7865525	495.6517	1401.3931	403.26204	0
29	Optimized	175.80235	-8.4119785	470.46817	1345.7728	389.71072	0
30	Optimized	177.52505	-7.9100435	437.79666	1329.9079	397.19352	0
31	Optimized	179.5377	-7.2374	394.31378	1277.4013	393.17589	0
32	Optimized	181.60495	-6.4068205	341.05806	1217.3402	390.14593	0
33	Optimized	183.90085	-5.4101655	277.3161	1161.2131	393.53631	0
34	Optimized	185.38715	-4.7329625	234.07111	1072.8682	373.45652	0
35	Optimized	186.6525	-3.9653485	185.49747	1020.6715	371.84345	0
36	Optimized	188.8123	-2.655116	102.54614	931.68341	369.1557	0
37	Optimized	190.56845	-1.58977	38.653399	848.35819	394.91941	0
38	Optimized	191.42665	-1.0301036	8.1420099	755.92849	364.71984	0
39	Optimized	192.8543	0.1424669	-55.607733	647.64027	315.87527	75
40	Optimized	195.5219	2.3334405	-176.02465	464.15811	226.38504	75
41	Optimized	197.8719	4.22416	-281.20508	295.06494	143.91279	75
42	Optimized	199.07	5.157333	-335.18115	250.10749	121.98557	75
43	Optimized	199.67	5.6246515	-362.85103	304.32629	148.42985	75
44	Optimized	200.06045	5.9287505	-382.06193	325.94507	158.97403	75

Slices of Slip Surface: 2375

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	2375	140.2272	-4.94286	326.21589	429.70663	46.077045	0
2	2375	142.47575	-5.991374	378.31193	605.20074	101.01741	0
3	2375	144.8	-7.0752	433.81933	795.66271	161.10305	0
4	2375	146.8658	-8.0384935	485.33252	964.46799	213.32486	0
5	2375	148.2278	-8.6736045	520.33125	1070.4886	244.94583	0
6	2375	149.362	-9.2024955	549.94993	1178.4844	279.84159	0
7	2375	151.07835	-9.5	565.43672	1179.1871	273.25928	0
8	2375	152.88075	-9.5	563.13878	1265.0544	312.51298	0
9	2375	154.5024	-9.5	561.16935	1342.3724	347.81398	0
10	2375	155.6415	-9.5	559.76978	1384.8495	367.34915	0
11	2375	156.79535	-9.5	558.4054	1383.5454	367.37601	0
12	2375	159.1159	-9.5	555.7035	1380.9681	367.43148	0
13	2375	161.5857	-9.5	552.88665	1378.2368	367.46957	0
14	2375	163.7089	-9.5	550.53174	1375.8819	367.46957	0

15	2375	165.83215	-9.5	548.12973	1373.4799	367.46957	0
16	2375	167.0469	-9.5	546.77857	1372.1386	367.47396	0
17	2375	168.3731	-9.5	545.31707	1397.05	379.21593	0
18	2375	170.71925	-9.5	542.71707	1447.1745	402.69039	0
19	2375	173.0654	-9.5	540.1597	1497.299	426.14587	0
20	2375	175.41155	-9.5	537.5597	1547.4235	449.62033	0
21	2375	177.5872	-9.5	535.17914	1593.9172	471.38055	0
22	2375	179.59235	-9.5	532.98476	1636.8073	491.45347	0
23	2375	181.59745	-9.5	530.84025	1679.6476	511.48198	0
24	2375	184.0863	-9.5	528.12708	1728.3639	534.37987	0
25	2375	186.67945	-9.5	525.31723	1776.0231	556.85011	0
26	2375	188.89315	-9.5	522.87788	1816.724	576.05739	0
27	2375	191.025	-8.475	457.58429	1424.9408	430.69486	0
28	2375	193.075	-6.425	329.25994	1271.8608	419.67295	0
29	2375	194.95	-4.55	211.72857	1119.5996	404.21024	0
30	2375	196.65	-2.85	105.03864	968.19558	384.30223	0
31	2375	197.5755	-1.9245	47.413628	876.34432	404.29651	0
32	2375	198.04975	-1.450268	21.05013	829.81316	394.46008	0
33	2375	198.62425	-0.875768	-10.985881	756.31523	368.87959	75
34	2375	199.07	-0.43	-36.013997	756.69594	369.06527	75
35	2375	199.67	0.17	-70.050708	797.83068	389.12802	75
36	2375	201	1.5	-147.30803	635.12334	309.77035	75
37	2375	203.29165	3.7916665	-285.65289	329.66687	160.78928	75



Name: EMBANKMENT FILL (S-Case) AWT Model: Mohr-Coulomb Unit Weight: 116 pcf Cohesion: 75 psf Phi: 26 °
Name: MARSH, CL (S-Case) AWT Model: Spatial Mohr-Coulomb Weight Fn: Marsh Cohesion: 75 psf Phi: 24 °
Name: BEACH SAND, EL. -10.0/-12.0 TO -53.0 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand
Name: BAY SOUND CLAY, EL. -53.0 TO -70.0 Model: Spatial Mohr-Coulomb Unit Weight: 110 pcf Cohesion: 0 psf Phi: 26 °
Name: Marsh, Toe (S-Case) AWT Model: Spatial Mohr-Coulomb Unit Weight: 104 pcf Cohesion: 75 psf Phi: 24 °
Name: EMBANKMENT FILL (S-Case) BWT Model: Mohr-Coulomb Unit Weight: 116 pcf Cohesion: 0 psf Phi: 26 °
Name: MARSH, CL (S-Case) BWT Model: Spatial Mohr-Coulomb Weight Fn: Marsh Cohesion: 0 psf Phi: 24 °
Name: Marsh, Toe (S-Case) BWT Model: Spatial Mohr-Coulomb Unit Weight: 104 pcf Cohesion: 0 psf Phi: 24 °

GENERAL NOTES

CLASSIFICATION STRATIFICATION
SHEAR STRENGTHS AND UNIT WEIGHTS OF
THE SOIL WERE BASED ON THE RESULTS OF
UNDISTURBED BORINGS AND CPT DATA. SEE
BOTH BORING AND CPT DATA PLATES.

WHERE INDICATED, SHEAR STRENGTHS BETWEEN
VERTICALS WERE ASSUMED TO VARY LINEARLY
BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

Hw IS CANAL WATER LEVEL

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 12A,
PROTECTED SIDE STABILITY ANALYSIS,
CASE: NWL S-Case P/S (Entry/Exit)
STA. 2+45 TO 3+70 EAST
ORLEANS PARISH, LOUISIANA

NWL S-Case P/S (Entry/Exit)

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File Information

Created By: [Liljegren, James](#)
Revision Number: [389](#)
Last Edited By: [Higgins, James](#)
Date: [7/7/2013](#)
Time: [9:32:28 PM](#)
File Name: [Reach 12A.gsz](#)
Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix F NWL\](#)
Last Solved Date: [7/7/2013](#)
Last Solved Time: [9:37:10 PM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Strength Units: [psf](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

NWL S-Case P/S (Entry/Exit)

Kind: [SLOPE/W](#)
Parent: [Normal Water Level at +0.40ft \(seepage\)](#)
Method: [Spencer](#)
Settings
 PWP Conditions Source: [Parent Analysis](#)
Slip Surface
 Direction of movement: [Left to Right](#)
 Use Passive Mode: [No](#)
 Slip Surface Option: [Entry and Exit](#)
 Critical slip surfaces saved: [1](#)
 Optimize Critical Slip Surface Location: [Yes](#)
Tension Crack
 Tension Crack Option: [Tension Crack Line](#)
 Percentage Wet: [0](#)
 Tension Crack Fluid Unit Weight: [62.4 pcf](#)
FOS Distribution
 FOS Calculation Option: [Constant](#)

Advanced

Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 2000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

EMBANKMENT FILL (S-Case) AWT

Model: Mohr-Coulomb
Unit Weight: 116 pcf
Cohesion: 75 psf
Phi: 26 °
Phi-B: 0 °

MARSH, CL (S-Case) AWT

Model: Spatial Mohr-Coulomb
Weight Fn: Marsh
Cohesion: 75 psf
Phi: 24 °
Phi-B: 0 °

BEACH SAND, EL. -10.0/-12.0 TO -53.0

Model: Shear/Normal Fn.
Unit Weight: 122 pcf
Strength Function: Sand
Phi-B: 0 °

BAY SOUND CLAY, EL. -53.0 TO -70.0

Model: Spatial Mohr-Coulomb
Unit Weight: 110 pcf
Cohesion: 0 psf
Phi: 26 °
Phi-B: 0 °

Marsh, Toe (S-Case) AWT

Model: Spatial Mohr-Coulomb
Unit Weight: 104 pcf
Cohesion: 75 psf
Phi: 24 °
Phi-B: 0 °

EMBANKMENT FILL (S-Case) BWT

Model: [Mohr-Coulomb](#)
Unit Weight: [116 pcf](#)
Cohesion: [0 psf](#)
Phi: [26 °](#)
Phi-B: [0 °](#)

MARSH, CL (S-Case) BWT

Model: [Spatial Mohr-Coulomb](#)
Weight Fn: [Marsh](#)
Cohesion: [0 psf](#)
Phi: [24 °](#)
Phi-B: [0 °](#)

Marsh, Toe (S-Case) BWT

Model: [Spatial Mohr-Coulomb](#)
Unit Weight: [104 pcf](#)
Cohesion: [0 psf](#)
Phi: [24 °](#)
Phi-B: [0 °](#)

Slip Surface Entry and Exit

Left Projection: [Range](#)
Left-Zone Left Coordinate: [\(185, 6.17565\) ft](#)
Left-Zone Right Coordinate: [\(210, 6.58864\) ft](#)
Left-Zone Increment: [10](#)
Right Projection: [Range](#)
Right-Zone Left Coordinate: [\(225, 2.25422\) ft](#)
Right-Zone Right Coordinate: [\(260, -1.62\) ft](#)
Right-Zone Increment: [15](#)
Radius Increments: [15](#)

Slip Surface Limits

Left Coordinate: [\(92.5, -9.7\) ft](#)
Right Coordinate: [\(310, -1.3\) ft](#)

Tension Crack Line

	X (ft)	Y (ft)
	183	6
	212	6

Shear/Normal Strength Functions

Sand

Model: Spline Data Point Function
Function: Shear Stress vs. Normal Stress
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
Data Point: (-10000, 0)
Data Point: (0, 0)
Data Point: (10000, 6494)
Estimation Properties
Intact Rock Param.: 10
Geological Strength: 100
Disturbance Factor: 0
SigmaC: 600000 psf
Sigma3: 300000 psf
Num. Points: 20

Unit Weight Functions

Marsh

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 104
Data Points: X (ft), Unit Weight (pcf)
Data Point: (143.5, 104)
Data Point: (200, 103)
Data Point: (245, 104)

Regions

	Material	Points	Area (ft²)
Region 1	BEACH SAND, EL. -10.0/-12.0 TO -53.0	25,24,31,19,9,18,5,6,20,16	9180.3494
Region 2	BAY SOUND CLAY, EL. -53.0 TO -70.0	6,7,21,17,16,20	3697.5
Region 3	Marsh, Toe (S-Case) BWT	18,50,51,5	604.72165
Region 4	Marsh, Toe (S-Case) BWT	31,23,28,19	64.950592
Region 5	EMBANKMENT FILL (S-Case) AWT	36,26,11,1,14,22,35,34,27,10,2,3,49,48,47,46,45,44,43,42,41,40,39,38,37	471.91561
Region	MARSH, CL (S-		

6	Case) BWT	8,49,50,18,9,19,28	853.94202
Region 7	EMBANKMENT FILL (S-Case) BWT	28,12,33,36,37,38,39,40,41,42,43,44,45,46,47,48,49,8	103.4774
Region 8	MARSH, CL (S-Case) AWT	49,3,50	0.0079632175
Region 9	Marsh, Toe (S-Case) AWT	3,13,4,51,50	80.77835

Points

	X (ft)	Y (ft)
Point 1	182.6	5.8
Point 2	237.3	-1.3
Point 3	245	-2.1
Point 4	310	-1.3
Point 5	310	-12
Point 6	310	-53
Point 7	310	-70
Point 8	200	-2
Point 9	200	-10
Point 10	206.5	7.6
Point 11	167.2	3
Point 12	146	-0.7
Point 13	270	-1.3
Point 14	194.1	7.6
Point 15	92.5	-12
Point 16	92.5	-53
Point 17	92.5	-70
Point 18	245	-12
Point 19	143.6	-10
Point 20	200	-53
Point 21	200	-70
Point 22	198.8	7.6
Point 23	131.7	-8.4
Point 24	121.3	-10.1
Point 25	92.5	-9.7
Point 26	155.4	3.1
Point 27	202	7.6
Point 28	143.6	-2
Point 29	92.5	-150
Point 30	310	-150
Point 31	121.91176	-10
Point 32	92.5	0
Point 33	147.73158	0
Point 34	200	9.7
Point 35	199.34	8.5
Point 36	148.724	0.40119

Point 37	149.94972	0.27999
Point 38	152.15674	0.11196
Point 39	153.60482	0.0365
Point 40	155.88302	-0.05266
Point 41	157.70768	-0.10098
Point 42	160.52411	-0.15092
Point 43	166.89377	-0.26088
Point 44	176.58463	-0.50644
Point 45	185.57258	-0.73318
Point 46	197.651	-1.02831
Point 47	215.19847	-1.53938
Point 48	230.48704	-1.84538
Point 49	244.10425	-2.09801
Point 50	245	-2.11778
Point 51	310	-3.2754

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.65	(232.091, 24.478)	20.12183	(206.113, 7.6)	(248.801, -1.97838)
2	2233	1.66	(232.091, 24.478)	32.2	(205.72, 7.6)	(250.524, -1.92323)

Slices of Slip Surface: Optimized

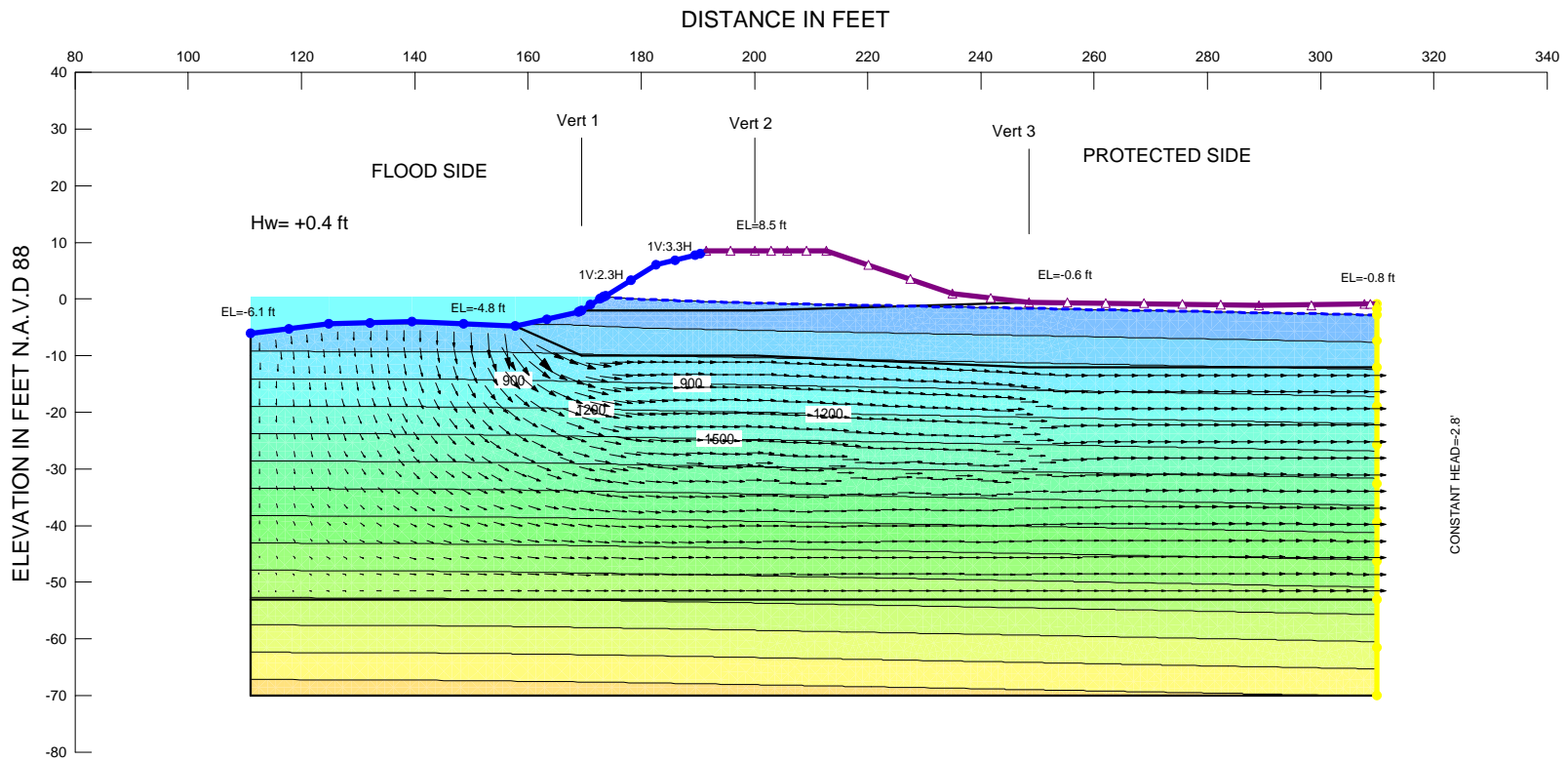
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	206.30675	5.762054	-418.74479	108.15141	52.748965	75
2	Optimized	206.79985	5.154974	-384.3068	147.67929	72.028001	75
3	Optimized	207.6379	4.23859	-332.34689	219.77757	107.19268	75
4	Optimized	208.7143	3.14409	-270.69139	283.48499	138.26487	75
5	Optimized	209.85145	2.0456125	-208.18143	360.63201	175.89199	75
6	Optimized	211.0494	0.9431575	-144.26263	424.1577	206.87553	75
7	Optimized	212.2154	-0.0815633	-84.664944	499.23146	243.49145	75
8	Optimized	213.34945	-1.0285498	-29.057085	552.79596	269.6166	75
9	Optimized	214.22925	-1.7632015	14.546406	618.84195	294.73463	0
10	Optimized	214.87025	-2.2216405	41.931456	705.82985	295.58661	0
11	Optimized	215.7506	-2.750788	73.794254	729.52896	291.9519	0
12	Optimized	216.85485	-3.4145225	113.7774	759.24039	287.37864	0
13	Optimized	218.0417	-4.0525575	152.09484	815.64274	295.43056	0
14	Optimized	219.31105	-4.6648925	188.75087	836.14912	288.24027	0
15	Optimized	220.59535	-5.230545	222.49191	875.24443	290.62415	0
16	Optimized	221.8947	-5.749515	253.33917	886.03669	281.69508	0
17	Optimized	223.3943	-6.25552	283.15218	921.88031	284.38008	0
18	Optimized	225.0941	-6.74856	311.95105	917.41668	269.57067	0
19	Optimized	226.5577	-7.1002185	332.21343	942.63111	271.77546	0
20	Optimized	227.78515	-7.310495	343.9371	924.00172	258.26141	0
21	Optimized	229.01265	-7.5207715	355.65274	905.37233	244.75093	0
22	Optimized	230.0567	-7.6452675	362.23494	922.37125	249.38875	0
23	Optimized	231.102	-7.6922885	363.98147	891.45612	234.84685	0

24	Optimized	232.332	-7.747616	366.0363	855.07016	217.7319	0
25	Optimized	233.7027	-7.701625	361.60217	843.99523	214.77523	0
26	Optimized	235.21405	-7.554315	350.69003	772.60861	187.85026	0
27	Optimized	236.63485	-7.305424	333.53396	736.79283	179.54242	0
28	Optimized	237.947	-6.9597285	310.4555	661.33859	156.22322	0
29	Optimized	239.24105	-6.6188095	287.68602	603.73862	140.71568	0
30	Optimized	240.75495	-6.1274975	255.2678	547.90267	130.28944	0
31	Optimized	242.4887	-5.4857925	213.19467	444.92683	103.1738	0
32	Optimized	243.72995	-4.966685	179.3544	389.13826	93.401793	0
33	Optimized	244.55215	-4.5312335	151.21111	319.7858	75.054286	0
34	Optimized	245.6815	-3.9331085	112.54182	239.02331	56.31319	0
35	Optimized	247.4277	-2.876079	44.498862	119.01215	33.175453	0
36	Optimized	248.64655	-2.079177	-6.6877159	71.828207	31.979978	75

Slices of Slip Surface: 2233

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	2233	206.1101	5.467184	-399.68587	121.821	59.416071	75
2	2233	207.3166	3.948939	-313.8724	231.05109	112.69115	75
3	2233	208.9498	2.1183995	-209.83665	359.52913	175.35407	75
4	2233	210.583	0.5396252	-118.76853	474.646	231.50032	75
5	2233	212.2162	-0.8351713	-38.997947	577.1962	281.5174	75
6	2233	213.4223	-1.7534985	15.018809	667.84544	318.40482	0
7	2233	214.50515	-2.482933	58.6532	727.9479	297.9892	0
8	2233	215.9629	-3.377749	112.57179	787.38553	300.44643	0
9	2233	217.49175	-4.209333	162.51281	839.6126	301.46425	0
10	2233	219.0206	-4.9379835	206.10638	881.78456	300.83131	0
11	2233	220.54945	-5.5712185	243.77511	914.3093	298.54106	0
12	2233	222.07835	-6.1149845	275.90233	937.68125	294.64296	0
13	2233	223.6072	-6.5739965	302.76033	952.05706	289.08553	0
14	2233	225.13605	-6.951978	324.58699	957.63541	281.85131	0
15	2233	226.6649	-7.2518335	341.54349	954.51653	272.91318	0
16	2233	228.19375	-7.475768	353.77614	942.68019	262.19697	0
17	2233	229.7226	-7.6253735	361.37403	922.10749	249.65462	0
18	2233	231.1683	-7.7012815	364.46439	894.54507	236.00712	0
19	2233	232.5309	-7.7114855	363.55231	860.92521	221.44468	0
20	2233	233.8935	-7.6639485	359.037	819.79345	205.14199	0
21	2233	235.2561	-7.558413	350.89846	770.87235	186.98442	0
22	2233	236.6187	-7.394302	339.09647	713.7527	166.8077	0
23	2233	237.98045	-7.170884	323.59158	664.73103	151.88507	0
24	2233	239.3413	-6.886964	304.30188	624.41202	142.52222	0
25	2233	240.70215	-6.5407695	281.11901	575.79019	131.19606	0
26	2233	242.063	-6.1301825	253.91003	518.1816	117.66128	0
27	2233	243.42385	-5.6525645	222.50712	450.66788	101.58371	0
28	2233	244.55215	-5.2086305	193.4806	387.00238	86.161446	0
29	2233	245.8514	-4.617968	155.0895	318.63081	72.81328	0
30	2233	247.5542	-3.748891	98.832694	225.44196	56.370079	0
31	2233	249.257	-2.745616	34.206852	109.15791	33.37036	0

32	2233	250.3163	-2.0659915	-9.4591067	81.144608	36.127907	75
----	------	----------	------------	------------	-----------	-----------	----



Name: EMBANKMENT FILL (S-Case) AWT Model: Saturated Only K-Sat: 3.28e-008 ft/sec K-Ratio: 1
 Name: MARSH, CL (S-Case) AWT Model: Saturated Only K-Sat: 3.28e-007 ft/sec K-Ratio: 1
 Name: BEACH SAND, EL. -10/-12 TO -53 Model: Saturated Only K-Sat: 0.00049 ft/sec K-Ratio: 1
 Name: BAY SOUND CLAY, EL. -53.0 TO -70.0 Model: Saturated Only K-Sat: 3.28e-008 ft/sec K-Ratio: 1

GENERAL NOTES

CLASSIFICATION STRATIFICATION
 SHEAR STRENGTHS AND UNIT WEIGHTS OF
 THE SOIL WERE BASED ON THE RESULTS OF
 UNDISTURBED BORINGS AND CPT DATA. SEE
 BOTH BORING AND CPT DATA PLATES.

WHERE INDICATED, SHEAR STRENGTHS BETWEEN
 VERTICALS WERE ASSUMED TO VARY LINEARLY
 BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

Hw IS CANAL WATER LEVEL

LAKE PONTCHARTRAIN, LA. AND VICINITY
 HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 12B,
 PROTECTED SIDE STABILITY ANALYSIS,
 CASE: Global Analysis (seepage)
 STA. 3+70 TO 4+70 EAST
 ORLEANS PARISH, LOUISIANA

Global Analysis (seepage)

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File Information

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Revision Number: [417](#)
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Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix F NWL\](#)
Last Solved Date: [7/7/2013](#)
Last Solved Time: [8:27:30 PM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Mass(M) Units: [lbs](#)
Mass Flux Units: [lbs/sec](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

Global Analysis (seepage)

Kind: [SEEP/W](#)
Method: [Steady-State](#)
Settings
 Include Air Flow: [No](#)
Control
 Apply Runoff: [No](#)
Convergence
 Convergence Type: [Head Vector Norm](#)
 Maximum Number of Iterations: [500](#)
 Tolerance: [0.001](#)
 Maximum Change in K: [0.1](#)
 Rate of Change in K: [1.02](#)
 Minimum Change in K: [1e-005](#)
 Equation Solver: [Parallel Direct](#)
 Potential Seepage Max # of Reviews: [10](#)
Time

Starting Time: 0 sec

Duration: 0 sec

Ending Time: 0 sec

Materials

EMBANKMENT FILL (S-Case) AWT

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-008 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

MARSH, CL (S-Case) AWT

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-007 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

BEACH SAND, EL. -10/-12 TO -53

Model: Saturated Only

Hydraulic

K-Sat: 0.00049 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

BAY SOUND CLAY, EL. -53.0 TO -70.0

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-008 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

Boundary Conditions

Drainage

Review: true

Type: Total Flux (Q) 0

Canal Water

Type: Head (H) 0.4

Curb

Type: Head (H) -2.8

Regions

	Material	Points	Area (ft²)
Region 1	EMBANKMENT FILL (S-Case) AWT	15,11,8,4,5,45,44,43,42,41,40,39,38,37,36,35,34,33,32,1,2,3,16	435.51238
Region 2	MARSH, CL (S-Case) AWT	9,45,46,31,10,24,22	703.11426
Region 3	BEACH SAND, EL. -10/-12 TO -53	19,29,28,27,13,24,10,31,23,6,25,20	8668.91
Region 4	BAY SOUND CLAY, EL. -53.0 TO -70.0	6,7,26,21,20,25	3383
Region 5	MARSH, CL (S-Case) AWT	13,12,22,24	46.13
Region 6	MARSH, CL (S-Case) AWT	31,46,47,23	601.4494
Region 7	MARSH, CL (S-Case) AWT	46,5,14,17,18,47	82.530603
Region 8	MARSH, CL (S-Case) AWT	46,45,5	11.335649
Region 9	EMBANKMENT FILL (S-Case) AWT	45,9,22,30,32,33,34,35,36,37,38,39,40,41,42,43,44	68.492707

Lines

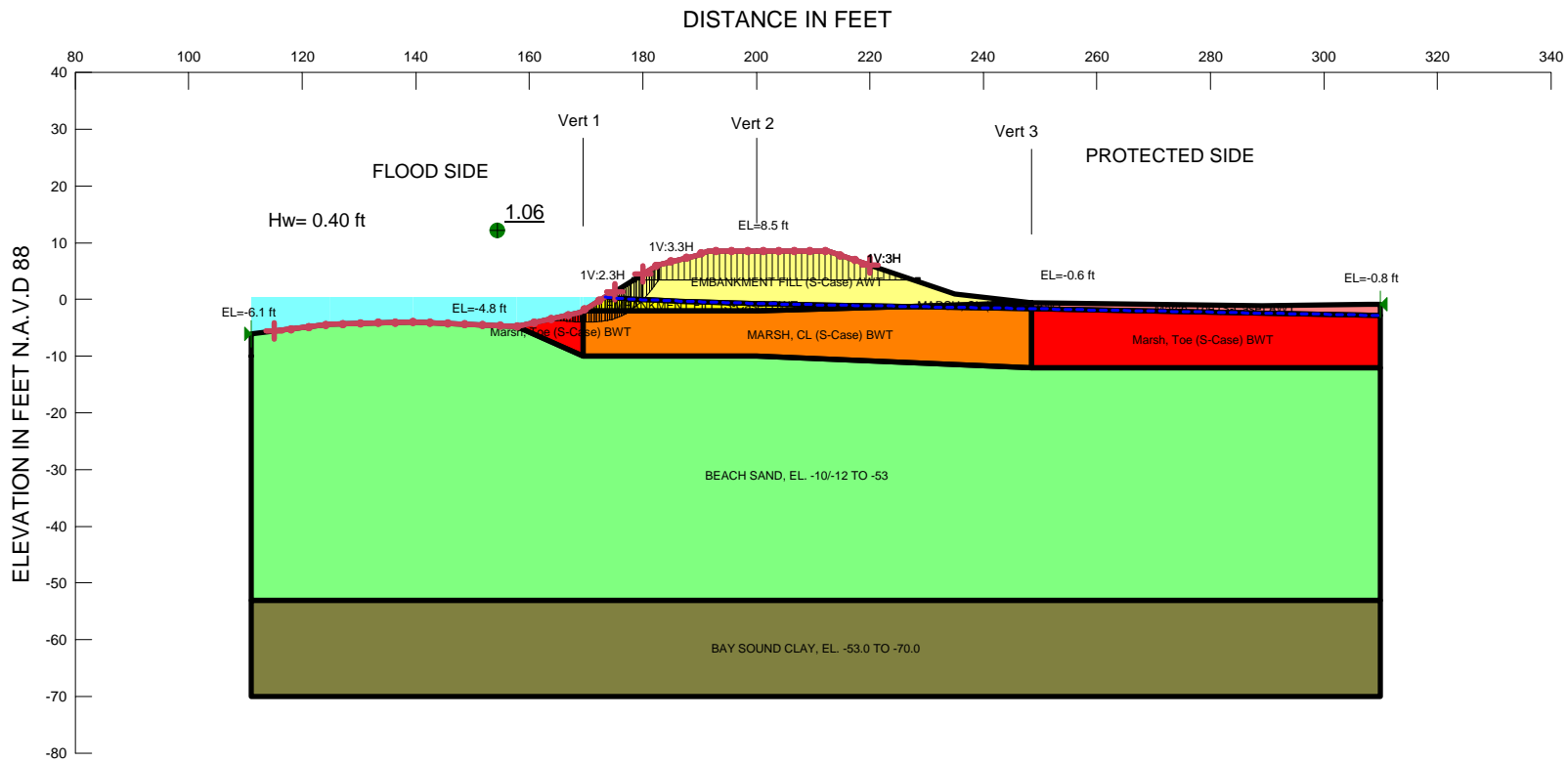
	Start Point	End Point	Hydraulic Boundary
Line 1	8	4	Drainage
Line 2	4	5	Drainage
Line 3	6	7	Curb
Line 4	11	8	Drainage
Line 5	15	11	Drainage
Line 6	20	19	
Line 7	21	20	
Line 8	9	22	
Line 9	10	24	
Line 10	24	22	
Line 11	13	12	Canal Water
Line 12	12	22	Canal Water
Line 13	6	25	
Line 14	25	20	
Line 15	7	26	
Line 16	26	21	

Line 17	1	2	Canal Water
Line 18	2	3	Canal Water
Line 19	3	16	Canal Water
Line 20	29	28	Canal Water
Line 21	28	27	Canal Water
Line 22	27	13	Canal Water
Line 23	15	16	Drainage
Line 24	6	23	Curb
Line 25	23	31	
Line 26	31	10	
Line 27	24	13	
Line 28	19	29	
Line 29	32	1	Canal Water
Line 30	5	45	
Line 31	45	9	
Line 32	46	31	
Line 33	47	23	Curb
Line 34	45	44	
Line 35	44	43	
Line 36	43	42	
Line 37	42	41	
Line 38	41	40	
Line 39	40	39	
Line 40	39	38	
Line 41	38	37	
Line 42	37	36	
Line 43	36	35	
Line 44	35	34	
Line 45	34	33	
Line 46	33	32	
Line 47	45	46	
Line 48	46	47	
Line 49	46	5	
Line 50	5	14	Drainage
Line 51	14	17	Drainage
Line 52	17	18	Drainage
Line 53	18	47	Curb
Line 54	22	30	Canal Water
Line 55	30	32	Canal Water

Points

	X (ft)	Y (ft)
Point 1	173.7	0.6
Point 2	182.6	6.1
Point 3	189.5	7.8
Point 4	235	1
Point 5	248.5	-0.6

Point 6	310	-53
Point 7	310	-70
Point 8	212.7	8.5
Point 9	200	-2
Point 10	200	-10
Point 11	205.8	8.5
Point 12	169	-2.3
Point 13	157.7	-4.8
Point 14	289.1	-1.1
Point 15	200	8.5
Point 16	191.5	8.5
Point 17	307.7	-0.8
Point 18	310	-0.8
Point 19	111	-10
Point 20	111	-53
Point 21	111	-70
Point 22	169.5	-2
Point 23	310	-12
Point 24	169.5	-10
Point 25	200	-53
Point 26	200	-70
Point 27	139.5	-4
Point 28	124.8	-4.4
Point 29	111	-6.1
Point 30	172.73077	0
Point 31	248.5	-12
Point 32	173.3764	0.39968
Point 33	173.71309	0.36827
Point 34	174.11089	0.33383
Point 35	174.48278	0.30266
Point 36	175.05865	0.25919
Point 37	175.81798	0.20115
Point 38	176.94866	0.13073
Point 39	177.98756	0.07299
Point 40	181.78715	-0.10202
Point 41	186.48799	-0.27388
Point 42	191.33071	-0.44208
Point 43	199.5762	-0.68341
Point 44	212.31862	-0.9607
Point 45	226.70319	-1.22919
Point 46	248.5	-1.64012
Point 47	310	-2.80055



Name: EMBANKMENT FILL (S-Case) AWT	Model: Mohr-Coulomb	Unit Weight: 116 pcf	Cohesion: 75 psf	Phi: 26 °
Name: MARSH, CL (S-Case) AWT	Model: Spatial Mohr-Coulomb	Weight Fn: Marsh	Cohesion: 75 psf	Phi: 24 °
Name: BEACH SAND, EL. -10/-12 TO -53	Model: Shear/Normal Fn.	Unit Weight: 122 pcf	Strength Function: Sand	
Name: BAY SOUND CLAY, EL. -53.0 TO -70.0	Model: Spatial Mohr-Coulomb	Unit Weight: 110 pcf	Cohesion: 0 psf	Phi: 26 °
Name: Marsh, Toe (S-Case) AWT	Model: Spatial Mohr-Coulomb	Unit Weight: 104 pcf	Cohesion: 75 psf	Phi: 24 °
Name: EMBANKMENT FILL (S-Case) BWT	Model: Mohr-Coulomb	Unit Weight: 116 pcf	Cohesion: 0 psf	Phi: 26 °
Name: MARSH, CL (S-Case) BWT	Model: Spatial Mohr-Coulomb	Weight Fn: Marsh	Cohesion: 0 psf	Phi: 24 °
Name: Marsh, Toe (S-Case) BWT	Model: Spatial Mohr-Coulomb	Unit Weight: 104 pcf	Cohesion: 0 psf	Phi: 24 °

GENERAL NOTES

CLASSIFICATION STRATIFICATION
SHEAR STRENGTHS AND UNIT WEIGHTS OF
THE SOIL WERE BASED ON THE RESULTS OF
UNDISTURBED BORINGS AND CPT DATA. SEE
BOTH BORING AND CPT DATA PLATES.

WHERE INDICATED, SHEAR STRENGTHS BETWEEN
VERTICALS WERE ASSUMED TO VARY LINEARLY
BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

Hw IS CANAL WATER LEVEL

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 12B,
PROTECTED SIDE STABILITY ANALYSIS,
CASE: NWL S-Case F/S (Entry/Exit)
STA. 3+70 TO 4+70 EAST
ORLEANS PARISH, LOUISIANA

NWL S-Case F/S (Entry/Exit)

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File Information

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Revision Number: [418](#)
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File Name: [Reach 12B.gsz](#)
Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix F NWL\](#)
Last Solved Date: [7/7/2013](#)
Last Solved Time: [9:24:48 PM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Strength Units: [psf](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

NWL S-Case F/S (Entry/Exit)

Kind: [SLOPE/W](#)
Parent: [Global Analysis \(seepage\)](#)
Method: [Spencer](#)
Settings
 PWP Conditions Source: [Parent Analysis](#)
Slip Surface
 Direction of movement: [Right to Left](#)
 Use Passive Mode: [No](#)
 Slip Surface Option: [Entry and Exit](#)
 Critical slip surfaces saved: [1](#)
 Optimize Critical Slip Surface Location: [Yes](#)
 Tension Crack
 Tension Crack Option: [Tension Crack Line](#)
 Percentage Wet: [0](#)
 Tension Crack Fluid Unit Weight: [62.4 pcf](#)
FOS Distribution
 FOS Calculation Option: [Constant](#)

Advanced

Number of Slices: 40
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 4000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

EMBANKMENT FILL (S-Case) AWT

Model: Mohr-Coulomb
Unit Weight: 116 pcf
Cohesion: 75 psf
Phi: 26 °
Phi-B: 0 °

MARSH, CL (S-Case) AWT

Model: Spatial Mohr-Coulomb
Weight Fn: Marsh
Cohesion: 75 psf
Phi: 24 °
Phi-B: 0 °

BEACH SAND, EL. -10/-12 TO -53

Model: Shear/Normal Fn.
Unit Weight: 122 pcf
Strength Function: Sand
Phi-B: 0 °

BAY SOUND CLAY, EL. -53.0 TO -70.0

Model: Spatial Mohr-Coulomb
Unit Weight: 110 pcf
Cohesion: 0 psf
Phi: 26 °
Phi-B: 0 °

Marsh, Toe (S-Case) AWT

Model: Spatial Mohr-Coulomb
Unit Weight: 104 pcf
Cohesion: 75 psf
Phi: 24 °
Phi-B: 0 °

EMBANKMENT FILL (S-Case) BWT

Model: [Mohr-Coulomb](#)
Unit Weight: [116 pcf](#)
Cohesion: [0 psf](#)
Phi: [26 °](#)
Phi-B: [0 °](#)

MARSH, CL (S-Case) BWT

Model: [Spatial Mohr-Coulomb](#)
Weight Fn: [Marsh](#)
Cohesion: [0 psf](#)
Phi: [24 °](#)
Phi-B: [0 °](#)

Marsh, Toe (S-Case) BWT

Model: [Spatial Mohr-Coulomb](#)
Unit Weight: [104 pcf](#)
Cohesion: [0 psf](#)
Phi: [24 °](#)
Phi-B: [0 °](#)

Slip Surface Entry and Exit

Left Projection: [Range](#)
Left-Zone Left Coordinate: [\(115, -5.60725\) ft](#)
Left-Zone Right Coordinate: [\(175, 1.40337\) ft](#)
Left-Zone Increment: [20](#)
Right Projection: [Range](#)
Right-Zone Left Coordinate: [\(180, 4.49326\) ft](#)
Right-Zone Right Coordinate: [\(220, 6.04484\) ft](#)
Right-Zone Increment: [15](#)
Radius Increments: [15](#)

Slip Surface Limits

Left Coordinate: [\(111, -6.1\) ft](#)
Right Coordinate: [\(310, -0.8\) ft](#)

Tension Crack Line

	X (ft)	Y (ft)
	178.5	3.5
	228.5	3.5

Shear/Normal Strength Functions

Sand

Model: Spline Data Point Function
Function: Shear Stress vs. Normal Stress
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
Data Point: (-10000, 0)
Data Point: (0, 0)
Data Point: (10000, 6494)
Estimation Properties
Intact Rock Param.: 10
Geological Strength: 100
Disturbance Factor: 0
SigmaC: 600000 psf
Sigma3: 300000 psf
Num. Points: 20

Unit Weight Functions

Marsh

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 104
Data Points: X (ft), Unit Weight (pcf)
Data Point: (169.5, 104)
Data Point: (200, 103)
Data Point: (248.5, 104)

Regions

	Material	Points	Area (ft²)
Region 1	EMBANKMENT FILL (S-Case) AWT	15,11,8,4,5,45,44,43,42,41,40,39,38,37,36,35,34,33,32,1,2,3,16	435.51238
Region 2	MARSH, CL (S-Case) BWT	9,45,46,31,10,24,22	703.11426
Region 3	BEACH SAND, EL. -10/-12 TO -53	19,29,28,27,13,24,10,31,23,6,25,20	8668.91
Region 4	BAY SOUND CLAY, EL. -53.0 TO -70.0	6,7,26,21,20,25	3383
Region 5	Marsh, Toe (S-Case) BWT	13,12,22,24	46.13
Region 6	Marsh, Toe (S-Case) BWT	31,46,47,23	601.4494
Region 7	Marsh, Toe (S-Case) AWT	46,5,14,17,18,47	82.530603

Region 8	MARSH, CL (S-Case) AWT	46,45,5	11.335649
Region 9	EMBANKMENT FILL (S-Case) BWT	45,9,22,30,32,33,34,35,36,37,38,39,40,41,42,43,44	68.492707

Points

	X (ft)	Y (ft)
Point 1	173.7	0.6
Point 2	182.6	6.1
Point 3	189.5	7.8
Point 4	235	1
Point 5	248.5	-0.6
Point 6	310	-53
Point 7	310	-70
Point 8	212.7	8.5
Point 9	200	-2
Point 10	200	-10
Point 11	205.8	8.5
Point 12	169	-2.3
Point 13	157.7	-4.8
Point 14	289.1	-1.1
Point 15	200	8.5
Point 16	191.5	8.5
Point 17	307.7	-0.8
Point 18	310	-0.8
Point 19	111	-10
Point 20	111	-53
Point 21	111	-70
Point 22	169.5	-2
Point 23	310	-12
Point 24	169.5	-10
Point 25	200	-53
Point 26	200	-70
Point 27	139.5	-4
Point 28	124.8	-4.4
Point 29	111	-6.1
Point 30	172.73077	0
Point 31	248.5	-12
Point 32	173.3764	0.39968
Point 33	173.71309	0.36827
Point 34	174.11089	0.33383
Point 35	174.48278	0.30266
Point 36	175.05865	0.25919
Point 37	175.81798	0.20115
Point 38	176.94866	0.13073
Point 39	177.98756	0.07299
Point 40	181.78715	-0.10202

Point 41	186.48799	-0.27388
Point 42	191.33071	-0.44208
Point 43	199.5762	-0.68341
Point 44	212.31862	-0.9607
Point 45	226.70319	-1.22919
Point 46	248.5	-1.64012
Point 47	310	-2.80055

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.06	(169.28, 12.351)	11.10798	(182.837, 6.15834)	(163.046, -3.61736)
2	4139	1.08	(169.28, 12.351)	16.676	(183.414, 6.30065)	(163.89, -3.43048)

Slices of Slip Surface: Optimized

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	163.2804	-3.6281035	251.04195	269.62977	8.275832	0
2	Optimized	163.75015	-3.649597	251.76505	276.60552	11.059693	0
3	Optimized	164.21985	-3.6710905	252.50941	283.60254	13.843554	0
4	Optimized	164.68955	-3.6925835	253.25377	290.57829	16.617946	0
5	Optimized	165.2089	-3.7212335	254.37487	300.4128	20.497404	0
6	Optimized	165.77795	-3.75704	255.86563	310.05884	24.128373	0
7	Optimized	166.34705	-3.7928465	257.39145	319.68734	27.735916	0
8	Optimized	166.8684	-3.829502	258.79028	330.80625	32.063574	0
9	Optimized	167.34205	-3.8670065	260.17925	339.81351	35.455455	0
10	Optimized	167.81575	-3.904511	261.463	348.84181	38.903554	0
11	Optimized	168.28945	-3.942015	262.62047	357.89116	42.417242	0
12	Optimized	168.76315	-3.979519	263.65168	366.96155	45.996519	0
13	Optimized	169.14045	-4.0093905	264.31809	391.18537	56.484956	0
14	Optimized	169.39045	-4.019589	264.14278	385.20917	53.90223	0
15	Optimized	169.7361	-4.016683	262.85656	395.30136	58.968227	0
16	Optimized	170.2083	-4.0127135	261.03528	409.51154	66.10589	0
17	Optimized	170.68045	-4.008744	259.21401	423.72172	73.243554	0
18	Optimized	171.1526	-4.0047745	257.39273	437.91073	80.371788	0
19	Optimized	171.6124	-3.9778585	254.19871	431.06254	78.74485	0
20	Optimized	172.05975	-3.927996	249.64437	438.81602	84.224645	0
21	Optimized	172.5071	-3.8781335	245.09003	446.56951	89.70444	0
22	Optimized	173.0536	-3.8172205	239.49083	456.03008	96.409483	0
23	Optimized	173.5382	-3.7632045	234.52722	471.5544	105.5313	0
24	Optimized	173.70655	-3.7444405	232.79827	481.9278	110.91961	0
25	Optimized	173.7432	-3.7403555	232.42547	484.17985	112.08827	0
26	Optimized	173.9421	-3.691479	228.82259	462.633	104.09911	0
27	Optimized	174.29685	-3.5958115	222.00224	476.74273	113.41777	0
28	Optimized	174.77385	-3.4671725	212.81903	495.74843	125.96828	0
29	Optimized	175.25315	-3.3065725	201.65771	478.82752	123.40395	0
30	Optimized	175.6297	-3.142358	190.54268	486.27649	131.66918	0
31	Optimized	176.00475	-2.9788105	179.45952	493.69651	139.90732	0

32	Optimized	176.37825	-2.81593	168.57002	501.10834	148.0556	0
33	Optimized	176.75685	-2.6183375	155.54049	472.83258	141.26754	0
34	Optimized	177.15605	-2.376639	139.73999	473.50715	148.60272	0
35	Optimized	177.57075	-2.1255465	123.30946	474.20843	156.23029	0
36	Optimized	177.78935	-1.993215	114.6859	470.07862	173.33661	0
37	Optimized	177.8941	-1.9072945	109.68727	424.79736	153.68946	0
38	Optimized	178.21325	-1.6371675	93.955702	415.88586	157.01583	0
39	Optimized	178.66455	-1.255185	71.6308	403.25199	161.74246	0
40	Optimized	179.11585	-0.87320305	49.375241	390.61813	166.43528	0
41	Optimized	179.56715	-0.49122105	27.067252	378.00118	171.16191	0
42	Optimized	179.91955	-0.16103322	7.8190654	328.44377	156.37912	0
43	Optimized	180.38035	0.34502678	-21.763566	272.08489	132.70467	75
44	Optimized	180.9231	0.9711435	-58.38684	231.72362	113.01916	75
45	Optimized	181.34055	1.48965	-88.664892	214.28238	104.5125	75
46	Optimized	181.758	2.0081565	-119.17279	196.82612	95.998511	75
47	Optimized	182.28335	2.713904	-160.55588	154.48149	75.345656	75
48	Optimized	182.68045	3.273809	-193.40681	132.81097	64.77624	75
49	Optimized	182.79885	3.44361	-203.35916	117.87594	57.491936	75

Slices of Slip Surface: 4139

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	4139	164.1457	-3.5131735	243.50371	287.1102	19.414861	0
2	4139	164.6567	-3.6696075	251.95879	309.11959	25.449628	0
3	4139	165.1677	-3.808373	259.43208	328.18281	30.609799	0
4	4139	165.67865	-3.9299225	265.93082	344.56165	35.008703	0
5	4139	166.1896	-4.034639	271.46791	358.45072	38.727242	0
6	4139	166.7006	-4.122844	275.98378	370.04719	41.879728	0
7	4139	167.2116	-4.1948025	279.28627	379.50852	44.621822	0
8	4139	167.72255	-4.2507255	281.51599	386.88963	46.91537	0
9	4139	168.2335	-4.2907745	282.70282	392.33464	48.81123	0
10	4139	168.7445	-4.3150645	282.80238	395.89985	50.354242	0
11	4139	169.25	-4.3237385	282.07955	414.21934	58.832424	0
12	4139	169.73075	-4.3179625	280.52429	422.69241	63.297323	0
13	4139	170.1923	-4.299091	277.93517	430.52151	67.935816	0
14	4139	170.65385	-4.267382	274.57727	436.65473	72.161534	0
15	4139	171.1154	-4.222762	270.4376	441.14623	76.004376	0
16	4139	171.57695	-4.165126	265.5057	444.03317	79.485552	0
17	4139	172.03845	-4.0943375	259.73105	445.31427	82.626977	0
18	4139	172.5	-4.0102255	253.13065	445.03544	85.441519	0
19	4139	173.0536	-3.8898175	243.92569	442.46987	88.39756	0
20	4139	173.5382	-3.772092	235.06894	445.27333	93.589023	0
21	4139	173.90545	-3.6700555	227.61305	455.49266	101.45854	0
22	4139	174.29685	-3.5520935	219.32654	464.95371	109.36026	0
23	4139	174.77075	-3.3930305	208.28667	474.12559	118.35911	0
24	4139	175.2485	-3.2198615	196.3564	481.38527	126.90303	0
25	4139	175.62815	-3.068956	186.04595	485.3669	133.26627	0
26	4139	176.10065	-2.864102	172.17627	488.05605	140.63874	0

27	4139	176.666	-2.5977375	154.49074	488.39551	148.66398	0
28	4139	177.1553	-2.347387	137.94295	486.06193	154.99256	0
29	4139	177.5685	-2.1183465	122.87298	481.91208	159.8545	0
30	4139	177.88135	-1.9360475	111.30583	472.51448	176.17323	0
31	4139	178.233	-1.7159115	98.260274	463.67931	178.22677	0
32	4139	178.7238	-1.3910875	79.062494	449.16376	180.51045	0
33	4139	179.2146	-1.0403957	58.458279	431.56855	181.97804	0
34	4139	179.7054	-0.661739	36.239662	410.75115	182.66146	0
35	4139	180.1962	-0.25258913	12.237698	386.49011	182.5351	0
36	4139	180.7114	0.21406282	-15.223023	326.05923	159.02971	75
37	4139	181.251	0.7464816	-46.540612	295.54837	144.14857	75
38	4139	181.7906	1.3310805	-80.8769	261.45988	127.5225	75
39	4139	182.3302	1.976751	-118.80788	223.52304	109.01947	75
40	4139	182.8036	2.598454	-155.28234	182.31669	88.921791	75
41	4139	183.2108	3.190387	-189.90328	138.93947	67.765307	75

NWL S-Case F/S (Entry/Exit) (2)

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File Information

Created By: [Liljegren, James](#)
Revision Number: [425](#)
Last Edited By: [Higgins, James](#)
Date: [10/1/2013](#)
Time: [3:24:05 PM](#)
File Name: [Reach 12B.gsz](#)
Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix F NWL\](#)
Last Solved Date: [10/1/2013](#)
Last Solved Time: [3:24:34 PM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Strength Units: [psf](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

NWL S-Case F/S (Entry/Exit) (2)

Description: [Examine Failure Surface through the levee](#)
Kind: [SLOPE/W](#)
Parent: [Global Analysis \(seepage\)](#)
Method: [Spencer](#)

Settings

PWP Conditions Source: [Parent Analysis](#)

Slip Surface

Direction of movement: [Right to Left](#)
Use Passive Mode: [No](#)
Slip Surface Option: [Entry and Exit](#)
Critical slip surfaces saved: [1](#)
Optimize Critical Slip Surface Location: [Yes](#)

Tension Crack

Tension Crack Option: [Tension Crack Line](#)
Percentage Wet: [0](#)
Tension Crack Fluid Unit Weight: [62.4 pcf](#)

FOS Distribution

FOS Calculation Option: [Constant](#)

Advanced

Number of Slices: [40](#)

Optimization Tolerance: [0.01](#)

Minimum Slip Surface Depth: [0.1 ft](#)

Optimization Maximum Iterations: [4000](#)

Optimization Convergence Tolerance: [1e-007](#)

Starting Optimization Points: [8](#)

Ending Optimization Points: [16](#)

Complete Passes per Insertion: [1](#)

Driving Side Maximum Convex Angle: [5 °](#)

Resisting Side Maximum Convex Angle: [1 °](#)

Materials

EMBANKMENT FILL (S-Case) AWT

Model: [Mohr-Coulomb](#)

Unit Weight: [116 pcf](#)

Cohesion: [75 psf](#)

Phi: [26 °](#)

Phi-B: [0 °](#)

MARSH, CL (S-Case) AWT

Model: [Spatial Mohr-Coulomb](#)

Weight Fn: [Marsh](#)

Cohesion: [75 psf](#)

Phi: [24 °](#)

Phi-B: [0 °](#)

BEACH SAND, EL. -10/-12 TO -53

Model: [Shear/Normal Fn.](#)

Unit Weight: [122 pcf](#)

Strength Function: [Sand](#)

Phi-B: [0 °](#)

BAY SOUND CLAY, EL. -53.0 TO -70.0

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [110 pcf](#)

Cohesion: [0 psf](#)

Phi: [26 °](#)

Phi-B: [0 °](#)

Marsh, Toe (S-Case) AWT

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [104 pcf](#)

Cohesion: [75 psf](#)

Phi: [24 °](#)

Phi-B: 0 °

EMBANKMENT FILL (S-Case) BWT

Model: [Mohr-Coulomb](#)

Unit Weight: [116 pcf](#)

Cohesion: [0 psf](#)

Phi: [26 °](#)

Phi-B: [0 °](#)

MARSH, CL (S-Case) BWT

Model: [Spatial Mohr-Coulomb](#)

Weight Fn: [Marsh](#)

Cohesion: [0 psf](#)

Phi: [24 °](#)

Phi-B: [0 °](#)

Marsh, Toe (S-Case) BWT

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [104 pcf](#)

Cohesion: [0 psf](#)

Phi: [24 °](#)

Phi-B: [0 °](#)

Slip Surface Entry and Exit

Left Projection: [Range](#)

Left-Zone Left Coordinate: [\(115, -5.60725\) ft](#)

Left-Zone Right Coordinate: [\(175, 1.40337\) ft](#)

Left-Zone Increment: [20](#)

Right Projection: [Range](#)

Right-Zone Left Coordinate: [\(205, 8.5\) ft](#)

Right-Zone Right Coordinate: [\(220, 6.04484\) ft](#)

Right-Zone Increment: [4](#)

Radius Increments: [15](#)

Slip Surface Limits

Left Coordinate: [\(111, -6.1\) ft](#)

Right Coordinate: [\(310, -0.8\) ft](#)

Tension Crack Line

	X (ft)	Y (ft)
	185	6.5
	228.5	6.5

Shear/Normal Strength Functions

Sand

Model: [Spline Data Point Function](#)
Function: [Shear Stress vs. Normal Stress](#)
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 0
Data Points: [Normal Stress \(psf\), Shear Stress \(psf\)](#)
Data Point: (-10000, 0)
Data Point: (0, 0)
Data Point: (10000, 6494)
Estimation Properties
Intact Rock Param.: 10
Geological Strength: 100
Disturbance Factor: 0
SigmaC: 600000 psf
Sigma3: 300000 psf
Num. Points: 20

Unit Weight Functions

Marsh

Model: [Spline Data Point Function](#)
Function: [Unit Weight vs. X](#)
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 104
Data Points: [X \(ft\), Unit Weight \(pcf\)](#)
Data Point: (169.5, 104)
Data Point: (200, 103)
Data Point: (248.5, 104)

Regions

	Material	Points	Area (ft²)
Region 1	EMBANKMENT FILL (S-Case) AWT	15,11,8,4,5,45,44,43,42,41,40,39,38,37,36,35,34,33,32,1,2,3,16	435.51238
Region 2	MARSH, CL (S-Case) BWT	9,45,46,31,10,24,22	703.11426
Region 3	BEACH SAND, EL. -10/-12 TO -53	19,29,28,27,13,24,10,31,23,6,25,20	8668.91
Region 4	BAY SOUND CLAY, EL. -53.0 TO -70.0	6,7,26,21,20,25	3383
Region 5	Marsh, Toe (S-Case) BWT	13,12,22,24	46.13
Region	Marsh, Toe (S-Case) BWT	31,46,47,23	601.4494

6			
Region 7	Marsh, Toe (S-Case) AWT	46,5,14,17,18,47	82.530603
Region 8	MARSH, CL (S-Case) AWT	46,45,5	11.335649
Region 9	EMBANKMENT FILL (S-Case) BWT	45,9,22,30,32,33,34,35,36,37,38,39,40,41,42,43,44	68.492707

Points

	X (ft)	Y (ft)
Point 1	173.7	0.6
Point 2	182.6	6.1
Point 3	189.5	7.8
Point 4	235	1
Point 5	248.5	-0.6
Point 6	310	-53
Point 7	310	-70
Point 8	212.7	8.5
Point 9	200	-2
Point 10	200	-10
Point 11	205.8	8.5
Point 12	169	-2.3
Point 13	157.7	-4.8
Point 14	289.1	-1.1
Point 15	200	8.5
Point 16	191.5	8.5
Point 17	307.7	-0.8
Point 18	310	-0.8
Point 19	111	-10
Point 20	111	-53
Point 21	111	-70
Point 22	169.5	-2
Point 23	310	-12
Point 24	169.5	-10
Point 25	200	-53
Point 26	200	-70
Point 27	139.5	-4
Point 28	124.8	-4.4
Point 29	111	-6.1
Point 30	172.73077	0
Point 31	248.5	-12
Point 32	173.3764	0.39968
Point 33	173.71309	0.36827
Point 34	174.11089	0.33383
Point 35	174.48278	0.30266
Point 36	175.05865	0.25919
Point 37	175.81798	0.20115

Point 38	176.94866	0.13073
Point 39	177.98756	0.07299
Point 40	181.78715	-0.10202
Point 41	186.48799	-0.27388
Point 42	191.33071	-0.44208
Point 43	199.5762	-0.68341
Point 44	212.31862	-0.9607
Point 45	226.70319	-1.22919
Point 46	248.5	-1.64012
Point 47	310	-2.80055

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.32	(175.455, 32.301)	22.39282	(202.046, 8.5)	(157.7, -4.79994)
2	1144	1.56	(175.455, 32.301)	41.009	(207.331, 8.5)	(157.893, -4.75727)

Slices of Slip Surface: Optimized

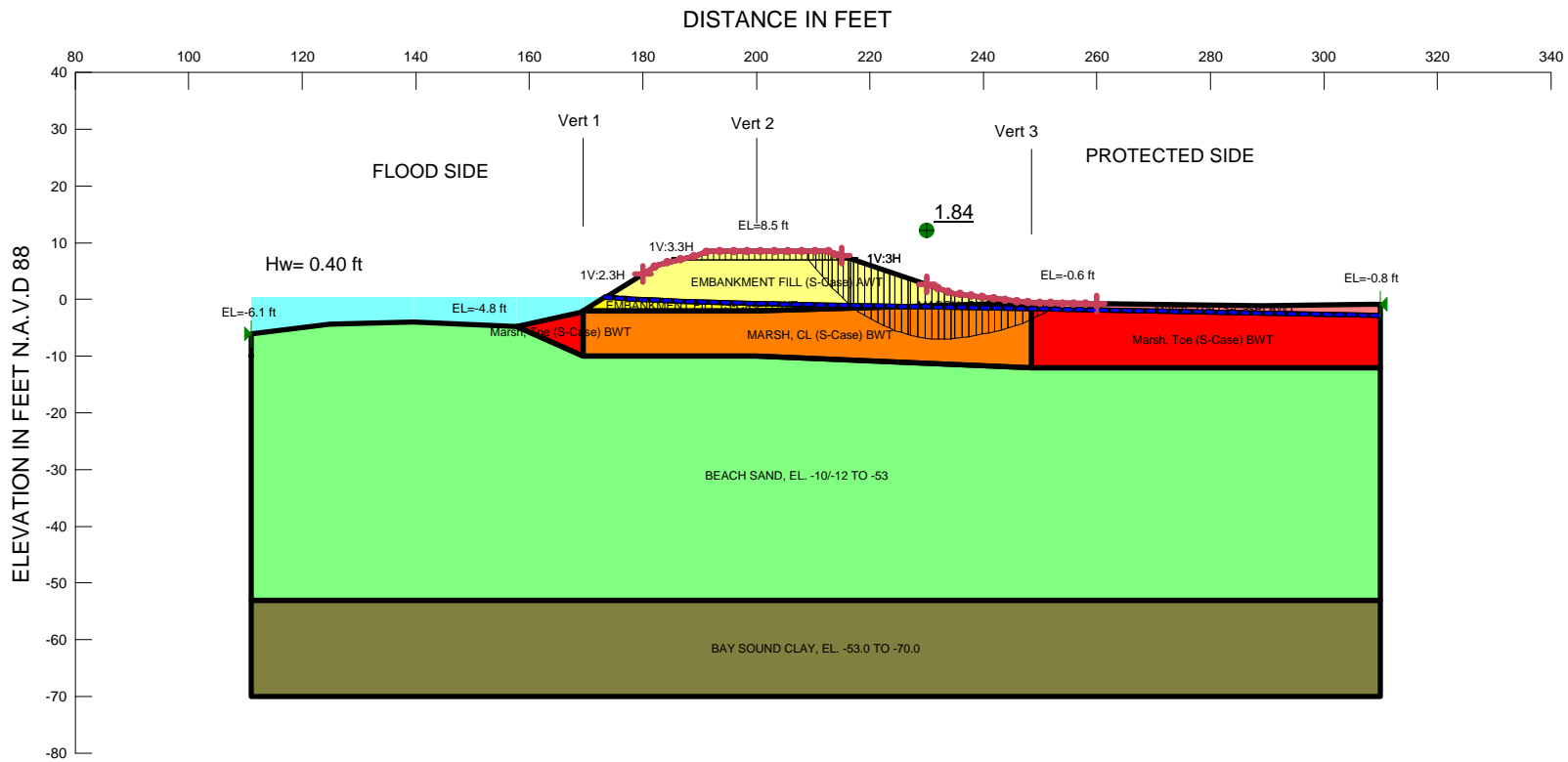
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	158.2468	-5.040679	337.1859	408.68887	31.835173	0
2	Optimized	159.3398	-5.5221635	362.60545	483.49906	53.8253	0
3	Optimized	160.4328	-6.003648	388.02501	558.30088	75.811699	0
4	Optimized	161.56605	-6.44884	413.09811	607.99094	86.771876	0
5	Optimized	162.73955	-6.85774	436.45081	671.00781	104.43151	0
6	Optimized	163.913	-7.26664	459.55405	734.08906	122.23087	0
7	Optimized	165.08645	-7.67554	483.09987	797.0657	139.78659	0
8	Optimized	166.2277	-8.032769	503.6379	830.59263	145.56962	0
9	Optimized	167.33665	-8.338327	520.46032	878.76472	159.5274	0
10	Optimized	168.44555	-8.6438845	537.47399	926.84119	173.35744	0
11	Optimized	169.25	-8.8655495	549.94466	978.10788	190.63054	0
12	Optimized	169.8578	-9.033023	559.01786	1018.0153	204.35881	0
13	Optimized	170.8444	-9.2163665	568.06791	1020.7507	201.54737	0
14	Optimized	172.102	-9.3858795	575.86165	1081.5876	225.16368	0
15	Optimized	173.0536	-9.5141485	581.93126	1127.5906	242.9432	0
16	Optimized	173.5382	-9.5794705	585.03674	1158.7727	255.44371	0
17	Optimized	173.70655	-9.602162	586.1279	1175.0116	262.18793	0
18	Optimized	173.77205	-9.610992	586.55507	1181.3793	264.8328	0
19	Optimized	173.97095	-9.6202865	586.81663	1145.9074	248.92325	0
20	Optimized	174.29685	-9.6234225	586.49039	1170.991	260.23646	0
21	Optimized	174.77075	-9.627983	586.0426	1207.4561	276.67113	0
22	Optimized	175.2055	-9.632167	585.6278	1240.9343	291.76124	0
23	Optimized	175.58515	-9.5905875	582.54002	1184.7176	268.10675	0
24	Optimized	176.38335	-9.4432155	572.41757	1224.8324	290.47378	0
25	Optimized	177.479	-9.240923	558.51527	1279.9521	321.20436	0
26	Optimized	178.5437	-8.9766725	540.83583	1272.0241	325.54601	0
27	Optimized	179.6125	-8.6439975	518.94904	1309.0083	351.75706	0
28	Optimized	180.96705	-8.1146165	484.54463	1288.7555	358.05774	0

29	Optimized	182.10445	-7.6111315	451.95234	1311.11	382.52163	0
30	Optimized	182.51085	-7.420919	439.64029	1270.468	369.90832	0
31	Optimized	183.08425	-7.1008485	419.12491	1257.5821	373.30519	0
32	Optimized	184.0528	-6.5602495	384.41496	1230.4452	376.67694	0
33	Optimized	185.0248	-5.9955875	348.1722	1183.9207	372.09919	0
34	Optimized	186.00025	-5.4068625	310.40506	1152.7625	375.04172	0
35	Optimized	186.90845	-4.858745	275.19491	1123.7287	377.79157	0
36	Optimized	187.74935	-4.351235	242.60403	1096.9514	380.37996	0
37	Optimized	188.8349	-3.6499355	197.61359	1033.3487	372.09324	0
38	Optimized	189.94675	-2.9017935	149.65261	995.45545	376.57569	0
39	Optimized	190.8621	-2.2858625	110.14585	969.29761	382.51901	0
40	Optimized	191.3652	-1.9473245	88.588541	943.57791	417.00618	0
41	Optimized	191.44985	-1.8805405	84.548588	874.68208	385.37385	0
42	Optimized	192.27385	-1.1646466	41.120011	808.65518	374.35192	0
43	Optimized	193.2693	-0.29977105	-11.964786	700.52017	341.66652	75
44	Optimized	194.0509	0.37336	-53.653004	647.76055	315.93393	75
45	Optimized	195.2028	1.3317525	-113.66639	581.27413	283.50634	75
46	Optimized	196.3866	2.2873975	-174.2889	500.19653	243.96215	75
47	Optimized	197.5704	3.2430425	-235.38467	419.11236	204.41476	75
48	Optimized	198.7542	4.1986875	-296.83538	338.03476	164.87057	75
49	Optimized	199.67305	4.89732	-342.15297	299.47097	146.06175	75
50	Optimized	200.51155	5.4635975	-379.02204	248.85547	121.37492	75
51	Optimized	201.53465	6.1545325	-424.17129	187.09318	91.25144	75

Slices of Slip Surface: 1144

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	1144	158.51015	-5.0372995	336.62133	415.72956	35.221252	0
2	1144	159.74425	-5.5732835	364.89407	492.09653	56.634187	0
3	1144	160.97835	-6.062088	391.12536	560.13464	75.247779	0
4	1144	162.21245	-6.5054985	416.37397	620.45044	90.860698	0
5	1144	163.44655	-6.905057	439.07624	673.98215	104.58685	0
6	1144	164.68065	-7.2620935	459.03887	721.28984	116.76165	0
7	1144	165.91475	-7.5777515	477.1144	762.65643	127.13151	0
8	1144	167.14885	-7.8530085	492.3093	798.58819	136.36414	0
9	1144	168.38295	-8.0886905	504.54476	829.37443	144.62349	0
10	1144	169.25	-8.2350005	512.33245	864.62897	156.85252	0
11	1144	170.03845	-8.3450245	517.62495	895.29777	168.15078	0
12	1144	171.11535	-8.4740875	523.26628	936.19143	183.84612	0
13	1144	172.1923	-8.574375	527.20926	973.11147	198.52845	0
14	1144	173.0536	-8.6362915	529.31634	999.92284	209.52751	0
15	1144	173.5382	-8.662799	530.01336	1021.3484	218.75645	0
16	1144	173.90545	-8.6781385	530.24962	1048.1203	230.5709	0
17	1144	174.29685	-8.691161	530.37536	1076.018	242.93574	0
18	1144	174.77075	-8.70122	530.15	1108.8632	257.65973	0
19	1144	175.43835	-8.70618	529.30866	1153.5036	277.90949	0
20	1144	176.38335	-8.693533	526.96358	1213.4716	305.65307	0
21	1144	177.46815	-8.655199	522.90334	1278.08	336.2263	0

22	1144	178.62085	-8.580628	516.56194	1341.3135	367.20303	0
23	1144	179.88735	-8.462733	507.45882	1405.1076	399.65897	0
24	1144	181.1539	-8.305002	495.94118	1462.6152	430.391	0
25	1144	182.1936	-8.14842	484.83579	1505.6085	454.47729	0
26	1144	183.248	-7.9552715	471.47207	1517.586	465.75992	0
27	1144	184.544	-7.6825295	452.85424	1507.3823	469.50614	0
28	1144	185.84	-7.3655795	431.52971	1492.4504	472.35233	0
29	1144	187.241	-6.969941	405.18556	1470.65	474.37531	0
30	1144	188.747	-6.4859055	373.2331	1441.1604	475.47188	0
31	1144	190.41535	-5.8690985	332.81798	1410.0086	479.59618	0
32	1144	191.41535	-5.4745755	307.01976	1393.353	483.66673	0
33	1144	192.1431	-5.1522595	286.06531	1354.9789	475.911	0
34	1144	193.42935	-4.55204	247.10234	1279.7444	459.76187	0
35	1144	194.7156	-3.896172	204.66867	1200.0777	443.18465	0
36	1144	196.0018	-3.1815635	158.53227	1116.0435	426.31146	0
37	1144	197.28805	-2.4045785	108.49666	1027.1877	409.02759	0
38	1144	198.7537	-1.4319153	46.824864	904.19495	418.16733	0
39	1144	199.69575	-0.77622175	5.452019	826.4223	400.41396	0
40	1144	199.90765	-0.620016	-4.4127113	787.83825	384.25439	75
41	1144	200.58	-0.10169205	-37.166982	731.74454	356.89566	75
42	1144	201.74	0.8324925	-96.313273	633.69463	309.07352	75
43	1144	202.9	1.8395095	-160.23118	532.39817	259.66794	75
44	1144	204.06	2.926877	-229.26298	427.80603	208.65494	75
45	1144	205.22	4.10393	-304.00674	319.93127	156.04091	75
46	1144	206.5653	5.6080875	-399.50597	189.89956	92.620206	75



Name: EMBANKMENT FILL (S-Case) AWT	Model: Mohr-Coulomb	Unit Weight: 116 pcf	Cohesion: 75 psf	Phi: 26 °
Name: MARSH, CL (S-Case) AWT	Model: Spatial Mohr-Coulomb	Weight Fn: Marsh	Cohesion: 75 psf	Phi: 24 °
Name: BEACH SAND, EL. -10/-12 TO -53	Model: Shear/Normal Fn.	Unit Weight: 122 pcf	Strength Function: Sand	
Name: BAY SOUND CLAY, EL. -53.0 TO -70.0	Model: Spatial Mohr-Coulomb	Unit Weight: 110 pcf	Cohesion: 0 psf	Phi: 26 °
Name: Marsh, Toe (S-Case) AWT	Model: Spatial Mohr-Coulomb	Unit Weight: 104 pcf	Cohesion: 75 psf	Phi: 24 °
Name: EMBANKMENT FILL (S-Case) BWT	Model: Mohr-Coulomb	Unit Weight: 116 pcf	Cohesion: 0 psf	Phi: 26 °
Name: MARSH, CL (S-Case) BWT	Model: Spatial Mohr-Coulomb	Weight Fn: Marsh	Cohesion: 0 psf	Phi: 24 °
Name: Marsh, Toe (S-Case) BWT	Model: Spatial Mohr-Coulomb	Unit Weight: 104 pcf	Cohesion: 0 psf	Phi: 24 °

GENERAL NOTES

CLASSIFICATION STRATIFICATION
SHEAR STRENGTHS AND UNIT WEIGHTS OF
THE SOIL WERE BASED ON THE RESULTS OF
UNDISTURBED BORINGS AND CPT DATA. SEE
BOTH BORING AND CPT DATA PLATES.

WHERE INDICATED, SHEAR STRENGTHS BETWEEN
VERTICALS WERE ASSUMED TO VARY LINEARLY
BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

Hw IS CANAL WATER LEVEL

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 12B,
PROTECTED SIDE STABILITY ANALYSIS,
CASE: NWL S-Case P/S (Entry/Exit)
STA. 3+70 TO 4+70 EAST
ORLEANS PARISH, LOUISIANA

NWL S-Case P/S (Entry/Exit)

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File Information

Created By: [Liljegren, James](#)
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File Name: [Reach 12B.gsz](#)
Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix F NWL\](#)
Last Solved Date: [7/7/2013](#)
Last Solved Time: [9:26:56 PM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Strength Units: [psf](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

NWL S-Case P/S (Entry/Exit)

Kind: [SLOPE/W](#)
Parent: [Global Analysis \(seepage\)](#)
Method: [Spencer](#)
Settings
 PWP Conditions Source: [Parent Analysis](#)
Slip Surface
 Direction of movement: [Left to Right](#)
 Use Passive Mode: [No](#)
 Slip Surface Option: [Entry and Exit](#)
 Critical slip surfaces saved: [1](#)
 Optimize Critical Slip Surface Location: [Yes](#)
 Tension Crack
 Tension Crack Option: [Tension Crack Line](#)
 Percentage Wet: [0](#)
 Tension Crack Fluid Unit Weight: [62.4 pcf](#)
FOS Distribution
 FOS Calculation Option: [Constant](#)

Advanced

Number of Slices: 40
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 4000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

EMBANKMENT FILL (S-Case) AWT

Model: Mohr-Coulomb
Unit Weight: 116 pcf
Cohesion: 75 psf
Phi: 26 °
Phi-B: 0 °

MARSH, CL (S-Case) AWT

Model: Spatial Mohr-Coulomb
Weight Fn: Marsh
Cohesion: 75 psf
Phi: 24 °
Phi-B: 0 °

BEACH SAND, EL. -10/-12 TO -53

Model: Shear/Normal Fn.
Unit Weight: 122 pcf
Strength Function: Sand
Phi-B: 0 °

BAY SOUND CLAY, EL. -53.0 TO -70.0

Model: Spatial Mohr-Coulomb
Unit Weight: 110 pcf
Cohesion: 0 psf
Phi: 26 °
Phi-B: 0 °

Marsh, Toe (S-Case) AWT

Model: Spatial Mohr-Coulomb
Unit Weight: 104 pcf
Cohesion: 75 psf
Phi: 24 °
Phi-B: 0 °

EMBANKMENT FILL (S-Case) BWT

Model: [Mohr-Coulomb](#)
Unit Weight: [116 pcf](#)
Cohesion: [0 psf](#)
Phi: [26 °](#)
Phi-B: [0 °](#)

MARSH, CL (S-Case) BWT

Model: [Spatial Mohr-Coulomb](#)
Weight Fn: [Marsh](#)
Cohesion: [0 psf](#)
Phi: [24 °](#)
Phi-B: [0 °](#)

Marsh, Toe (S-Case) BWT

Model: [Spatial Mohr-Coulomb](#)
Unit Weight: [104 pcf](#)
Cohesion: [0 psf](#)
Phi: [24 °](#)
Phi-B: [0 °](#)

Slip Surface Entry and Exit

Left Projection: [Range](#)
Left-Zone Left Coordinate: [\(180, 4.49326\) ft](#)
Left-Zone Right Coordinate: [\(215, 7.72646\) ft](#)
Left-Zone Increment: [15](#)
Right Projection: [Range](#)
Right-Zone Left Coordinate: [\(230, 2.68161\) ft](#)
Right-Zone Right Coordinate: [\(260, -0.74163\) ft](#)
Right-Zone Increment: [15](#)
Radius Increments: [15](#)

Slip Surface Limits

Left Coordinate: [\(111, -6.1\) ft](#)
Right Coordinate: [\(310, -0.8\) ft](#)

Tension Crack Line

	X (ft)	Y (ft)
	185.5	7
	217.5	7

Shear/Normal Strength Functions

Sand

Model: Spline Data Point Function
Function: Shear Stress vs. Normal Stress
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
Data Point: (-10000, 0)
Data Point: (0, 0)
Data Point: (10000, 6494)
Estimation Properties
Intact Rock Param.: 10
Geological Strength: 100
Disturbance Factor: 0
SigmaC: 600000 psf
Sigma3: 300000 psf
Num. Points: 20

Unit Weight Functions

Marsh

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 104
Data Points: X (ft), Unit Weight (pcf)
Data Point: (169.5, 104)
Data Point: (200, 103)
Data Point: (248.5, 104)

Regions

	Material	Points	Area (ft²)
Region 1	EMBANKMENT FILL (S-Case) AWT	15,11,8,4,5,45,44,43,42,41,40,39,38,37,36,35,34,33,32,1,2,3,16	435.51238
Region 2	MARSH, CL (S-Case) BWT	9,45,46,31,10,24,22	703.11426
Region 3	BEACH SAND, EL. -10/-12 TO -53	19,29,28,27,13,24,10,31,23,6,25,20	8668.91
Region 4	BAY SOUND CLAY, EL. -53.0 TO -70.0	6,7,26,21,20,25	3383
Region 5	Marsh, Toe (S-Case) BWT	13,12,22,24	46.13
Region 6	Marsh, Toe (S-Case) BWT	31,46,47,23	601.4494
Region 7	Marsh, Toe (S-Case) AWT	46,5,14,17,18,47	82.530603

Region 8	MARSH, CL (S-Case) AWT	46,45,5	11.335649
Region 9	EMBANKMENT FILL (S-Case) BWT	45,9,22,30,32,33,34,35,36,37,38,39,40,41,42,43,44	68.492707

Points

	X (ft)	Y (ft)
Point 1	173.7	0.6
Point 2	182.6	6.1
Point 3	189.5	7.8
Point 4	235	1
Point 5	248.5	-0.6
Point 6	310	-53
Point 7	310	-70
Point 8	212.7	8.5
Point 9	200	-2
Point 10	200	-10
Point 11	205.8	8.5
Point 12	169	-2.3
Point 13	157.7	-4.8
Point 14	289.1	-1.1
Point 15	200	8.5
Point 16	191.5	8.5
Point 17	307.7	-0.8
Point 18	310	-0.8
Point 19	111	-10
Point 20	111	-53
Point 21	111	-70
Point 22	169.5	-2
Point 23	310	-12
Point 24	169.5	-10
Point 25	200	-53
Point 26	200	-70
Point 27	139.5	-4
Point 28	124.8	-4.4
Point 29	111	-6.1
Point 30	172.73077	0
Point 31	248.5	-12
Point 32	173.3764	0.39968
Point 33	173.71309	0.36827
Point 34	174.11089	0.33383
Point 35	174.48278	0.30266
Point 36	175.05865	0.25919
Point 37	175.81798	0.20115
Point 38	176.94866	0.13073
Point 39	177.98756	0.07299
Point 40	181.78715	-0.10202

Point 41	186.48799	-0.27388
Point 42	191.33071	-0.44208
Point 43	199.5762	-0.68341
Point 44	212.31862	-0.9607
Point 45	226.70319	-1.22919
Point 46	248.5	-1.64012
Point 47	310	-2.80055

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.84	(233.589, 21.553)	20.82608	(209.111, 8.5)	(253.483, -0.66137)
2	3258	1.85	(233.589, 21.553)	28.775	(208.766, 8.5)	(251.902, -0.641894)

Slices of Slip Surface: Optimized

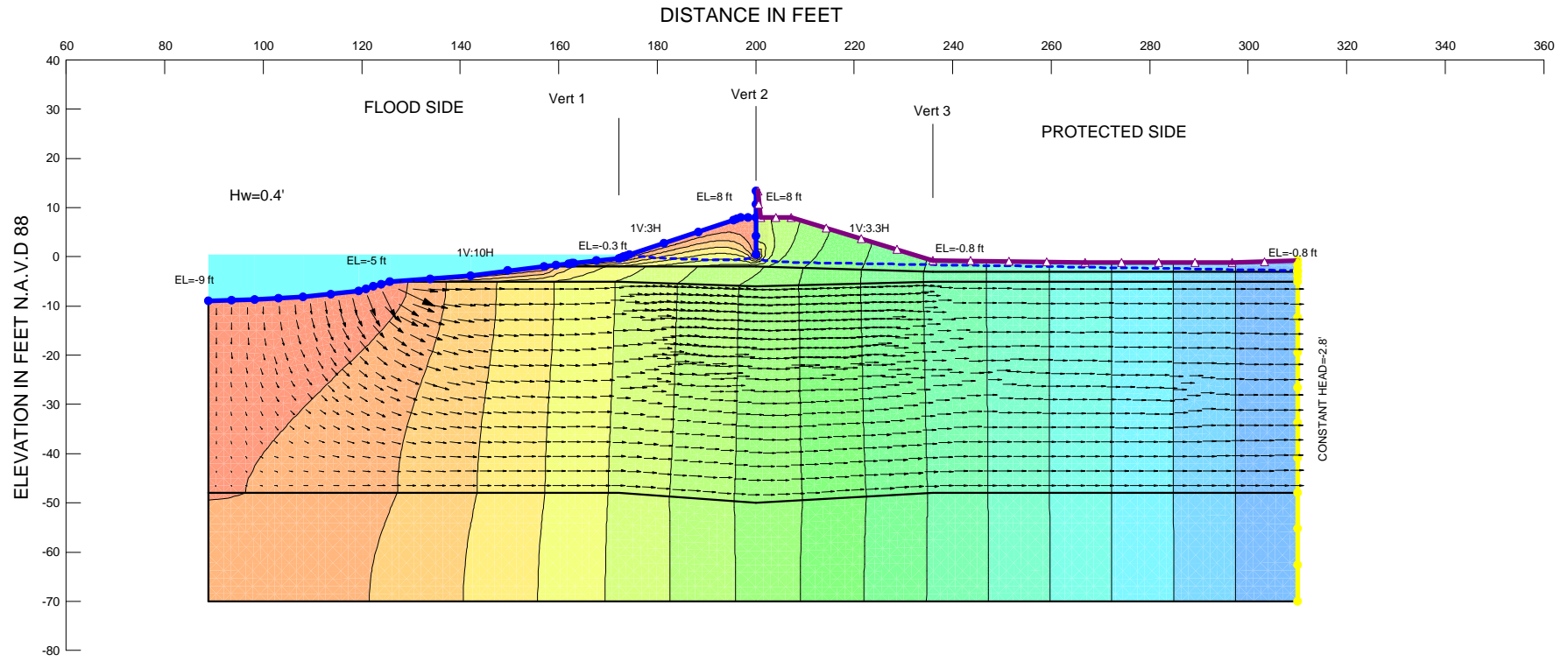
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	209.7874	6.169295	-439.1156	153.28743	74.763274	75
2	Optimized	211.02285	4.6973015	-349.21635	277.40426	135.2991	75
3	Optimized	212.14095	3.4147245	-270.99236	380.37665	185.52209	75
4	Optimized	213.02975	2.395178	-208.83215	453.32488	221.10132	75
5	Optimized	213.83595	1.550275	-157.40274	530.26145	258.62579	75
6	Optimized	214.7888	0.616985	-100.65408	582.01677	283.86855	75
7	Optimized	215.74165	-0.316305	-43.909922	633.76459	309.10764	75
8	Optimized	216.3823	-0.9112815	-7.767909	715.4893	348.96745	75
9	Optimized	216.8443	-1.2723955	14.082884	755.46534	361.59638	0
10	Optimized	217.5272	-1.806139	46.500479	792.21257	332.01241	0
11	Optimized	218.49285	-2.451755	85.661938	867.6539	348.16525	0
12	Optimized	219.65395	-3.141065	127.32651	892.61117	340.72668	0
13	Optimized	220.81505	-3.830375	168.99848	917.64249	333.31779	0
14	Optimized	221.9056	-4.396035	203.02989	979.61695	345.75884	0
15	Optimized	222.9256	-4.838045	229.43187	986.18371	336.92763	0
16	Optimized	223.9456	-5.280055	255.83385	992.66052	328.05637	0
17	Optimized	225.0175	-5.673725	279.15692	1031.347	334.8966	0
18	Optimized	226.1413	-6.019055	299.4011	1024.202	322.70215	0
19	Optimized	226.94195	-6.265095	313.83169	1019.2174	314.05796	0
20	Optimized	227.81335	-6.4635625	325.20325	1041.2645	318.81099	0
21	Optimized	229.07865	-6.7137475	339.34522	1018.5474	302.40028	0
22	Optimized	230.2948	-6.8885625	348.84535	1025.5587	301.2922	0
23	Optimized	231.46185	-6.9880075	353.68627	989.87077	283.24759	0
24	Optimized	232.60945	-7.02529	354.67379	981.66501	279.15448	0
25	Optimized	233.73755	-7.00041	351.8113	932.56847	258.56975	0
26	Optimized	234.6508	-6.9384525	346.87839	924.56955	257.20468	0
27	Optimized	235.6181	-6.801289	337.18404	884.88983	243.85433	0
28	Optimized	236.85425	-6.6259975	324.79333	846.68451	232.36092	0
29	Optimized	238.0904	-6.450706	312.39462	808.47918	220.87107	0
30	Optimized	239.25785	-6.243405	298.08842	788.31266	218.26189	0
31	Optimized	240.35655	-6.004095	281.85848	743.98936	205.75392	0

32	Optimized	241.45525	-5.764785	265.62854	699.65717	193.24199	0
33	Optimized	242.55395	-5.525475	249.3986	655.30719	180.72215	0
34	Optimized	243.73015	-5.2063835	228.09344	623.13922	175.88571	0
35	Optimized	244.98385	-4.80751	201.71855	556.00865	157.74012	0
36	Optimized	246.23755	-4.4086365	175.35125	488.86288	139.58437	0
37	Optimized	247.6822	-3.8304125	137.5651	421.31116	126.33188	0
38	Optimized	249.01755	-3.211896	97.399211	330.51389	103.78934	0
39	Optimized	250.05265	-2.7324385	66.271962	270.55434	90.952373	0
40	Optimized	251.1984	-2.097799	25.333968	208.00875	81.332055	0
41	Optimized	252.65495	-1.1821291	-33.50328	123.21636	54.859458	75

Slices of Slip Surface: 3258

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	3258	209.2573	6.2195785	-441.51811	126.65521	61.773874	75
2	3258	210.2409	4.755555	-351.8307	248.44503	121.17474	75
3	3258	211.22455	3.463906	-272.91024	364.69442	177.87335	75
4	3258	212.2082	2.3094295	-202.50515	475.55894	231.94559	75
5	3258	213.2083	1.2526993	-138.18631	568.59368	277.32167	75
6	3258	214.2249	0.27972725	-79.073351	642.7274	313.4791	75
7	3258	215.2415	-0.60384355	-25.493149	710.39576	346.48316	75
8	3258	216.07685	-1.275616	15.180233	783.10304	374.54098	0
9	3258	216.91885	-1.8926285	52.600968	836.89292	349.18928	0
10	3258	217.94875	-2.5923315	95.060133	883.6966	351.12358	0
11	3258	218.9787	-3.229481	133.62519	924.31893	352.03954	0
12	3258	220.00865	-3.8088065	168.58058	959.01339	351.92336	0
13	3258	221.03855	-4.334201	200.16897	988.22016	350.863	0
14	3258	222.0685	-4.8088965	228.59817	1012.1168	348.84495	0
15	3258	223.09845	-5.2355945	254.03134	1030.844	345.85926	0
16	3258	224.12835	-5.6165605	276.61403	1044.7642	342.0025	0
17	3258	225.1583	-5.9536985	296.45782	1053.7319	337.16013	0
18	3258	226.18825	-6.248606	313.67166	1058.1762	331.47479	0
19	3258	227.22175	-6.503361	328.36815	1057.8568	324.78926	0
20	3258	228.25885	-6.718796	340.6104	1052.9956	317.17434	0
21	3258	229.29595	-6.894803	350.39563	1043.4355	308.56122	0
22	3258	230.33305	-7.0321115	357.75805	1029.31	298.99421	0
23	3258	231.37015	-7.131278	362.73828	1010.5759	288.43587	0
24	3258	232.40725	-7.1926975	365.36455	987.20877	276.86289	0
25	3258	233.44435	-7.2166125	365.63965	959.0074	264.18434	0
26	3258	234.48145	-7.2031165	363.5887	926.00142	250.40228	0
27	3258	235.51925	-7.1520985	359.19243	902.04044	241.6915	0
28	3258	236.5577	-7.0633085	352.43038	887.61307	238.27869	0
29	3258	237.59615	-6.936401	343.2966	868.79282	233.96599	0
30	3258	238.6346	-6.7708635	331.73684	845.41132	228.70261	0
31	3258	239.67305	-6.566013	317.73386	817.26656	222.40629	0
32	3258	240.71155	-6.3209815	301.21381	784.10755	214.99815	0
33	3258	241.75	-6.0346965	282.12778	745.63068	206.36479	0
34	3258	242.78845	-5.705856	260.37195	701.49971	196.40273	0

35	3258	243.82695	-5.3328955	235.87864	651.2558	184.93782	0
36	3258	244.8654	-4.9139465	208.50664	594.38035	171.80204	0
37	3258	245.90385	-4.446782	178.12774	530.20592	156.7553	0
38	3258	246.9423	-3.928744	144.5735	457.89286	139.49877	0
39	3258	247.98075	-3.356651	107.65195	376.37744	119.64429	0
40	3258	249.01665	-2.728378	67.232554	293.83969	100.892	0
41	3258	250.05	-2.039607	23.045275	209.54795	83.036342	0
42	3258	251.23425	-1.1605046	-33.184261	142.57568	63.478784	75



Name: EMBANKMENT FILL (S-Case) AWT Model: Saturated Only K-Sat: 3.28e-008 ft/sec K-Ratio: 1
Name: MARSH, CL (S-Case) Model: Saturated Only K-Sat: 3.28e-007 ft/sec K-Ratio: 1
Name: BEACH SAND, EL. -6.0/-5.0 TO -50.0/-48.0 Model: Saturated Only K-Sat: 0.00049 ft/sec K-Ratio: 1
Name: BAY SOUND CLAY (S-Case) Model: Saturated Only K-Sat: 3.28e-008 ft/sec K-Ratio: 1
Name: Sheet Pile Model: Saturated Only K-Sat: 1e-010 ft/sec K-Ratio: 1

GENERAL NOTES

CLASSIFICATION STRATIFICATION
SHEAR STRENGTHS AND UNIT WEIGHTS OF
THE SOIL WERE BASED ON THE RESULTS OF
UNDISTURBED BORINGS AND CPT DATA. SEE
BOTH BORING AND CPT DATA PLATES.

WHERE INDICATED, SHEAR STRENGTHS BETWEEN
VERTICALS WERE ASSUMED TO VARY LINEARLY
BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

Hw IS CANAL WATER LEVEL

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 13A,
PROTECTED SIDE STABILITY ANALYSIS,
CASE: Normal Water Level at +0.40ft (seepage)
STA. 4+70 TO 7+00 EAST
ORLEANS PARISH, LOUISIANA

Normal Water Level at +0.40ft (seepage)

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File Information

Created By: [Liljegren, James](#)
Revision Number: [377](#)
Last Edited By: [Higgins, James](#)
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Time: [9:58:41 PM](#)
File Name: [Reach 13A.gsz](#)
Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix F NWL\](#)
Last Solved Date: [7/7/2013](#)
Last Solved Time: [9:58:58 PM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Mass(M) Units: [lbs](#)
Mass Flux Units: [lbs/sec](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

Normal Water Level at +0.40ft (seepage)

Kind: [SEEP/W](#)
Method: [Steady-State](#)
Settings
 Include Air Flow: [No](#)
Control
 Apply Runoff: [No](#)
Convergence
 Convergence Type: [Head Vector Norm](#)
 Maximum Number of Iterations: [500](#)
 Tolerance: [0.001](#)
 Maximum Change in K: [0.1](#)
 Rate of Change in K: [1.02](#)
 Minimum Change in K: [1e-005](#)
 Equation Solver: [Parallel Direct](#)
 Potential Seepage Max # of Reviews: [10](#)
Time

Starting Time: 0 sec

Duration: 0 sec

Ending Time: 0 sec

Materials

EMBANKMENT FILL (S-Case) AWT

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-008 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

MARSH, CL (S-Case)

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-007 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

BEACH SAND, EL. -6.0/-5.0 TO -50.0/-48.0

Model: Saturated Only

Hydraulic

K-Sat: 0.00049 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

BAY SOUND CLAY (S-Case)

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-008 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

Sheet Pile

Model: Saturated Only

Hydraulic

K-Sat: 1e-010 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

Boundary Conditions

Drainage

Review: true
Type: Total Flux (Q) 0

Canal Water

Type: Head (H) 0.4

Curb

Type: Head (H) -2.8

Regions

	Material	Points	Area (ft²)
Region 1	Sheet Pile	6,14,15,16	4.05
Region 2	EMBANKMENT FILL (S-Case) AWT	44,43,5,6,54,53,52,51,50,49,48,47,46,45	127.44668
Region 3	EMBANKMENT FILL (S-Case) AWT	6,16,13,7,62,61,60,59,58,57,56,55,54	207.17695
Region 4	MARSH, CL (S-Case)	29,17,20,21,19,30	205
Region 5	BEACH SAND, EL. -6.0/-5.0 TO -50.0/-48.0	11,1,2,35,26,36,27,30,19,21,23,9,24,25,31	9434.65
Region 6	BAY SOUND CLAY (S-Case)	9,10,33,28,32,12,11,31,25,24	4800.4
Region 7	MARSH, CL (S-Case)	21,20,22,23	148.2
Region 8	EMBANKMENT FILL (S-Case) AWT	62,7,40,41,8,64,63	84.224419
Region 9	MARSH, CL (S-Case)	27,3,39,29,30	86.7075
Region 10	EMBANKMENT FILL (S-Case) AWT	34,4,38	4.6
Region 11	EMBANKMENT FILL (S-Case) AWT	37,38,34,29,39	8.5825
Region 12	EMBANKMENT FILL (S-Case) AWT	4,42,44,45,46,47,48,49,50,51,52,53,54,18,17,29,34	47.633345
Region 13	EMBANKMENT FILL (S-Case) AWT	17,18,54,55,56,57,58,59,60,61,62,20	43.493047
Region 14	EMBANKMENT FILL (S-Case) AWT	62,20,22,64,63	58.015581

Lines

	Start Point	End Point	Hydraulic Boundary	Left Side Material
Line 1	6	14	Canal Water	
Line 2	14	15		
Line 3	15	16	Drainage	
Line 4	16	6		Sheet Pile

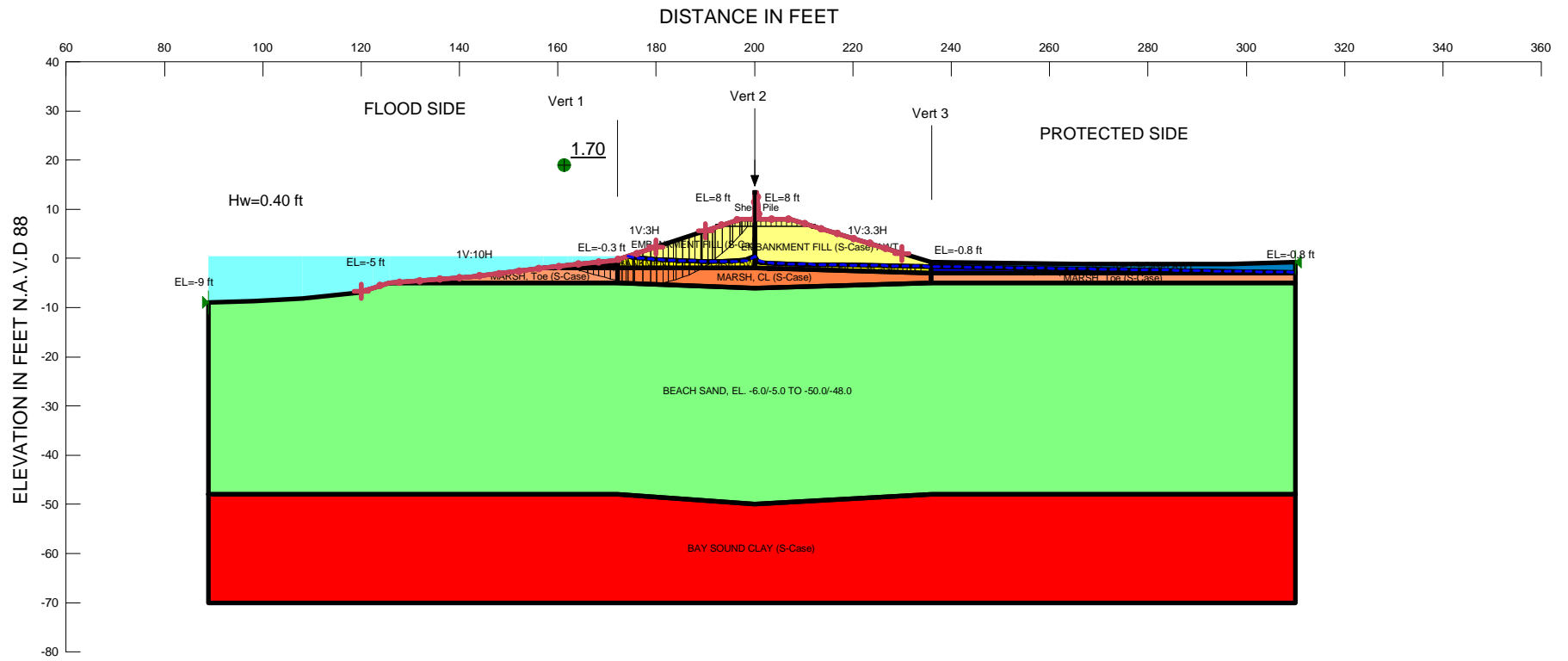
Line 5	5	6	Canal Water	
Line 6	16	13	Drainage	
Line 7	9	10	Curb	
Line 8	12	11		
Line 9	1	11		
Line 10	19	21		
Line 11	21	23		
Line 12	21	20		
Line 13	20	22		
Line 14	22	23	Curb	
Line 15	13	7	Drainage	
Line 16	17	20		
Line 17	9	23	Curb	
Line 18	9	24		
Line 19	24	25		
Line 20	17	29		
Line 21	19	30		
Line 22	25	31		
Line 23	31	11		
Line 24	28	32		
Line 25	32	12		
Line 26	10	33		
Line 27	33	28		
Line 28	30	29		
Line 29	34	4		
Line 30	29	34		
Line 31	36	27	Canal Water	
Line 32	1	2	Canal Water	
Line 33	2	35	Canal Water	
Line 34	35	26	Canal Water	
Line 35	26	36	Canal Water	
Line 36	4	38	Canal Water	
Line 37	38	37	Canal Water	
Line 38	38	34		
Line 39	27	3	Canal Water	
Line 40	18	17		
Line 41	39	3	Canal Water	
Line 42	39	29		
Line 43	39	37	Canal Water	
Line 44	7	40	Drainage	
Line 45	40	41	Drainage	
Line 46	41	8	Drainage	
Line 47	30	27		
Line 48	43	5	Canal Water	
Line 49	44	43	Canal Water	
Line 50	6	54	Canal Water	Sheet Pile
Line 51	7	62		
Line 52	8	64	Curb	

Line 53	54	53		
Line 54	53	52		
Line 55	52	51		
Line 56	51	50		
Line 57	50	49		
Line 58	49	48		
Line 59	48	47		
Line 60	47	46		
Line 61	46	45		
Line 62	45	44		
Line 63	62	61		
Line 64	61	60		
Line 65	60	59		
Line 66	59	58		
Line 67	58	57		
Line 68	57	56		
Line 69	56	55		
Line 70	55	54		
Line 71	64	63		
Line 72	63	62		
Line 73	4	42	Canal Water	
Line 74	42	44	Canal Water	
Line 75	54	18		
Line 76	62	20		
Line 77	22	64	Curb	

Points

	X (ft)	Y (ft)
Point 1	88.9	-9
Point 2	98.2	-8.7
Point 3	142.1	-3.8
Point 4	172.2	-0.3
Point 5	197	8
Point 6	200	8
Point 7	235.9	-0.8
Point 8	310	-0.8
Point 9	310	-48
Point 10	310	-70
Point 11	88.9	-48
Point 12	88.9	-70
Point 13	207.2	8
Point 14	200	13.4
Point 15	200.5	13.4
Point 16	201	8
Point 17	200	-2
Point 18	200	-1.3
Point 19	200	-6

Point 20	235.9	-3
Point 21	235.9	-5
Point 22	310	-3
Point 23	310	-5
Point 24	236	-48
Point 25	200	-50
Point 26	119.3	-6.9
Point 27	125.7	-5
Point 28	200	-70
Point 29	172.2	-2
Point 30	172.2	-5
Point 31	172.2	-48
Point 32	172.2	-70
Point 33	236	-70
Point 34	172.2	-1.3
Point 35	108.1	-8.2
Point 36	122.33158	-6
Point 37	162	-1.4
Point 38	163	-1.3
Point 39	157.025	-2
Point 40	266.9	-1.2
Point 41	296.7	-1.2
Point 42	173.09639	0
Point 43	195.50602	7.5
Point 44	174.3172	0.40858
Point 45	175.33168	0.21246
Point 46	177.33472	-0.01171
Point 47	180.04774	-0.21104
Point 48	183.4939	-0.37706
Point 49	189.23403	-0.55125
Point 50	193.06346	-0.59037
Point 51	195.93952	-0.53966
Point 52	197.56531	-0.367
Point 53	198.38534	-0.19092
Point 54	200	0.38764
Point 55	200.70332	-0.70463
Point 56	201.01775	-0.75703
Point 57	201.18545	-0.83739
Point 58	203.67721	-1.01721
Point 59	211.3552	-1.21542
Point 60	218.25485	-1.33628
Point 61	229.98437	-1.5241
Point 62	235.9	-1.62754
Point 63	267.81929	-2.14069
Point 64	310	-2.79734



Name: EMBANKMENT FILL (S-Case) AWT Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion: 75 psf Phi: 26 °
Name: MARSH, CL (S-Case) Model: Spatial Mohr-Coulomb Unit Weight: 94 pcf Cohesion: 0 psf Phi: 24 °
Name: BEACH SAND, EL. -6.0/-5.0 TO -50.0/-48.0 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand
Name: BAY SOUND CLAY (S-Case) Model: Spatial Mohr-Coulomb Unit Weight: 102 pcf Cohesion: 0 psf Phi: 26 °
Name: Sheet Pile Model: Undrained (Phi=0) Unit Weight: 0.1 pcf Cohesion: 1e+005 psf
Name: FILL, Toe (S-Case) AWT Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion: 75 psf Phi: 26 °
Name: MARSH, Toe (S-Case) Model: Mohr-Coulomb Unit Weight: 94 pcf Cohesion: 0 psf Phi: 24 °
Name: EMBANKMENT FILL (S-Case) BWT Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion: 0 psf Phi: 26 °
Name: FILL, Toe (S-Case) BWT Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion: 0 psf Phi: 26 °

GENERAL NOTES

CLASSIFICATION STRATIFICATION
SHEAR STRENGTHS AND UNIT WEIGHTS OF
THE SOIL WERE BASED ON THE RESULTS OF
UNDISTURBED BORINGS AND CPT DATA. SEE
BOTH BORING AND CPT DATA PLATES.

WHERE INDICATED, SHEAR STRENGTHS BETWEEN
VERTICALS WERE ASSUMED TO VARY LINEARLY
BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

Hw IS CANAL WATER LEVEL

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 13A,
PROTECTED SIDE STABILITY ANALYSIS,
CASE: NWL S-Case F/S (Entry/Exit)
STA. 4+70 TO 7+00 EAST
ORLEANS PARISH, LOUISIANA

NWL S-Case F/S (Entry/Exit)

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File Information

Created By: [Liljegren, James](#)
Revision Number: [379](#)
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Time: [10:20:38 PM](#)
File Name: [Reach 13A.gsz](#)
Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix F NWL\](#)
Last Solved Date: [7/7/2013](#)
Last Solved Time: [10:23:22 PM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Strength Units: [psf](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

NWL S-Case F/S (Entry/Exit)

Kind: [SLOPE/W](#)
Parent: [Normal Water Level at +0.40ft \(seepage\)](#)
Method: [Spencer](#)
Settings
 PWP Conditions Source: [Parent Analysis](#)
Slip Surface
 Direction of movement: [Right to Left](#)
 Use Passive Mode: [No](#)
 Slip Surface Option: [Entry and Exit](#)
 Critical slip surfaces saved: [1](#)
 Optimize Critical Slip Surface Location: [Yes](#)
 Tension Crack
 Tension Crack Option: [Tension Crack Line](#)
 Percentage Wet: [0](#)
 Tension Crack Fluid Unit Weight: [62.4 pcf](#)
FOS Distribution
 FOS Calculation Option: [Constant](#)

Advanced

Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 2000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

EMBANKMENT FILL (S-Case) AWT

Model: Mohr-Coulomb
Unit Weight: 105 pcf
Cohesion: 75 psf
Phi: 26 °
Phi-B: 0 °

MARSH, CL (S-Case)

Model: Spatial Mohr-Coulomb
Unit Weight: 94 pcf
Cohesion: 0 psf
Phi: 24 °
Phi-B: 0 °

BEACH SAND, EL. -6.0/-5.0 TO -50.0/-48.0

Model: Shear/Normal Fn.
Unit Weight: 122 pcf
Strength Function: Sand
Phi-B: 0 °

BAY SOUND CLAY (S-Case)

Model: Spatial Mohr-Coulomb
Unit Weight: 102 pcf
Cohesion: 0 psf
Phi: 26 °
Phi-B: 0 °

Sheet Pile

Model: Undrained (Phi=0)
Unit Weight: 0.1 pcf
Cohesion: 1e+005 psf

FILL, Toe (S-Case) AWT

Model: [Mohr-Coulomb](#)
Unit Weight: [105 pcf](#)
Cohesion: [75 psf](#)
Phi: [26 °](#)
Phi-B: [0 °](#)

MARSH, Toe (S-Case)

Model: [Mohr-Coulomb](#)
Unit Weight: [94 pcf](#)
Cohesion: [0 psf](#)
Phi: [24 °](#)
Phi-B: [0 °](#)

EMBANKMENT FILL (S-Case) BWT

Model: [Mohr-Coulomb](#)
Unit Weight: [105 pcf](#)
Cohesion: [0 psf](#)
Phi: [26 °](#)
Phi-B: [0 °](#)

FILL, Toe (S-Case) BWT

Model: [Mohr-Coulomb](#)
Unit Weight: [105 pcf](#)
Cohesion: [0 psf](#)
Phi: [26 °](#)
Phi-B: [0 °](#)

Slip Surface Entry and Exit

Left Projection: [Range](#)
Left-Zone Left Coordinate: [\(120, -6.69219\) ft](#)
Left-Zone Right Coordinate: [\(180, 2.31048\) ft](#)
Left-Zone Increment: [15](#)
Right Projection: [Range](#)
Right-Zone Left Coordinate: [\(190, 5.65726\) ft](#)
Right-Zone Right Coordinate: [\(230, 1.00906\) ft](#)
Right-Zone Increment: [15](#)
Radius Increments: [15](#)

Slip Surface Limits

Left Coordinate: [\(88.9, -9\) ft](#)
Right Coordinate: [\(310, -0.8\) ft](#)

Reinforcements

Reinforcement 1

Type: [Pile](#)

Outside Point: [\(200, 13.4\)](#) ft

Inside Point: [\(200, 3.7\)](#) ft

Slip Surface Intersection: [\(0, 0\)](#) ft

Total Length: [9.7](#) ft

Reinforcement Direction: [90 °](#)

Applied Load Option: [Variable](#)

F of S Dependent: [No](#)

Pile Spacing: [1](#) ft

Shear Capacity: [0.0001](#) lbs

Shear Safety Factor: [1](#)

Shear Load Used: [0.0001](#) lbs

Shear Option: [Parallel to Slip](#)

Resisting Force Used: [0](#) lbs/ft

Tension Crack Line

	X (ft)	Y (ft)
	192.5	6.5
	212	6.5

Shear/Normal Strength Functions

Sand

Model: [Spline Data Point Function](#)

Function: [Shear Stress vs. Normal Stress](#)

Curve Fit to Data: [100](#) %

Segment Curvature: [0](#) %

Y-Intercept: [0](#)

Data Points: [Normal Stress \(psf\), Shear Stress \(psf\)](#)

Data Point: [\(-10000, 0\)](#)

Data Point: [\(0, 0\)](#)

Data Point: [\(10000, 6494\)](#)

Estimation Properties

Intact Rock Param.: [10](#)

Geological Strength: [100](#)

Disturbance Factor: [0](#)

SigmaC: [600000](#) psf

Sigma3: [300000](#) psf

Num. Points: [20](#)

Regions

	Material	Points	Area (ft ²)
Region 1	Sheet Pile	6,14,15,16	4.05
Region 2	EMBANKMENT FILL (S-Case) AWT	44,43,5,6,54,53,52,51,50,49,48,47,46,45	127.44668

Region 3	EMBANKMENT FILL (S-Case) AWT	6,16,13,7,62,61,60,59,58,57,56,55,54	207.17695
Region 4	MARSH, CL (S-Case)	29,17,20,21,19,30	205
Region 5	BEACH SAND, EL. -6.0/-5.0 TO -50.0/-48.0	11,1,2,35,26,36,27,30,19,21,23,9,24,25,31	9434.65
Region 6	BAY SOUND CLAY (S-Case)	9,10,33,28,32,12,11,31,25,24	4800.4
Region 7	MARSH, Toe (S-Case)	21,20,22,23	148.2
Region 8	FILL, Toe (S-Case) AWT	62,7,40,41,8,64,63	84.224419
Region 9	MARSH, Toe (S-Case)	27,3,39,29,30	86.7075
Region 10	FILL, Toe (S-Case) BWT	34,4,38	4.6
Region 11	FILL, Toe (S-Case) BWT	37,38,34,29,39	8.5825
Region 12	EMBANKMENT FILL (S-Case) BWT	4,42,44,45,46,47,48,49,50,51,52,53,54,18,17,29,34	47.633345
Region 13	EMBANKMENT FILL (S-Case) BWT	17,18,54,55,56,57,58,59,60,61,62,20	43.493047
Region 14	FILL, Toe (S-Case) BWT	62,20,22,64,63	58.015581

Points

	X (ft)	Y (ft)
Point 1	88.9	-9
Point 2	98.2	-8.7
Point 3	142.1	-3.8
Point 4	172.2	-0.3
Point 5	197	8
Point 6	200	8
Point 7	235.9	-0.8
Point 8	310	-0.8
Point 9	310	-48
Point 10	310	-70
Point 11	88.9	-48
Point 12	88.9	-70
Point 13	207.2	8
Point 14	200	13.4
Point 15	200.5	13.4
Point 16	201	8
Point 17	200	-2
Point 18	200	-1.3
Point 19	200	-6
Point 20	235.9	-3
Point 21	235.9	-5
Point 22	310	-3
Point 23	310	-5
Point 24	236	-48
Point 25	200	-50
Point 26	119.3	-6.9
Point 27	125.7	-5

Point 28	200	-70
Point 29	172.2	-2
Point 30	172.2	-5
Point 31	172.2	-48
Point 32	172.2	-70
Point 33	236	-70
Point 34	172.2	-1.3
Point 35	108.1	-8.2
Point 36	122.33158	-6
Point 37	162	-1.4
Point 38	163	-1.3
Point 39	157.025	-2
Point 40	266.9	-1.2
Point 41	296.7	-1.2
Point 42	173.09639	0
Point 43	195.50602	7.5
Point 44	174.3172	0.40858
Point 45	175.33168	0.21246
Point 46	177.33472	-0.01171
Point 47	180.04774	-0.21104
Point 48	183.4939	-0.37706
Point 49	189.23403	-0.55125
Point 50	193.06346	-0.59037
Point 51	195.93952	-0.53966
Point 52	197.56531	-0.367
Point 53	198.38534	-0.19092
Point 54	200	0.38764
Point 55	200.70332	-0.70463
Point 56	201.01775	-0.75703
Point 57	201.18545	-0.83739
Point 58	203.67721	-1.01721
Point 59	211.3552	-1.21542
Point 60	218.25485	-1.33628
Point 61	229.98437	-1.5241
Point 62	235.9	-1.62754
Point 63	267.81929	-2.14069
Point 64	310	-2.79734

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.70	(177.287, 22.97)	17.98778	(198.616, 8)	(161.175, -1.49951)
2	2921	1.74	(177.287, 22.97)	27.443	(199.238, 8)	(164.227, -1.1666)

Slices of Slip Surface: Optimized

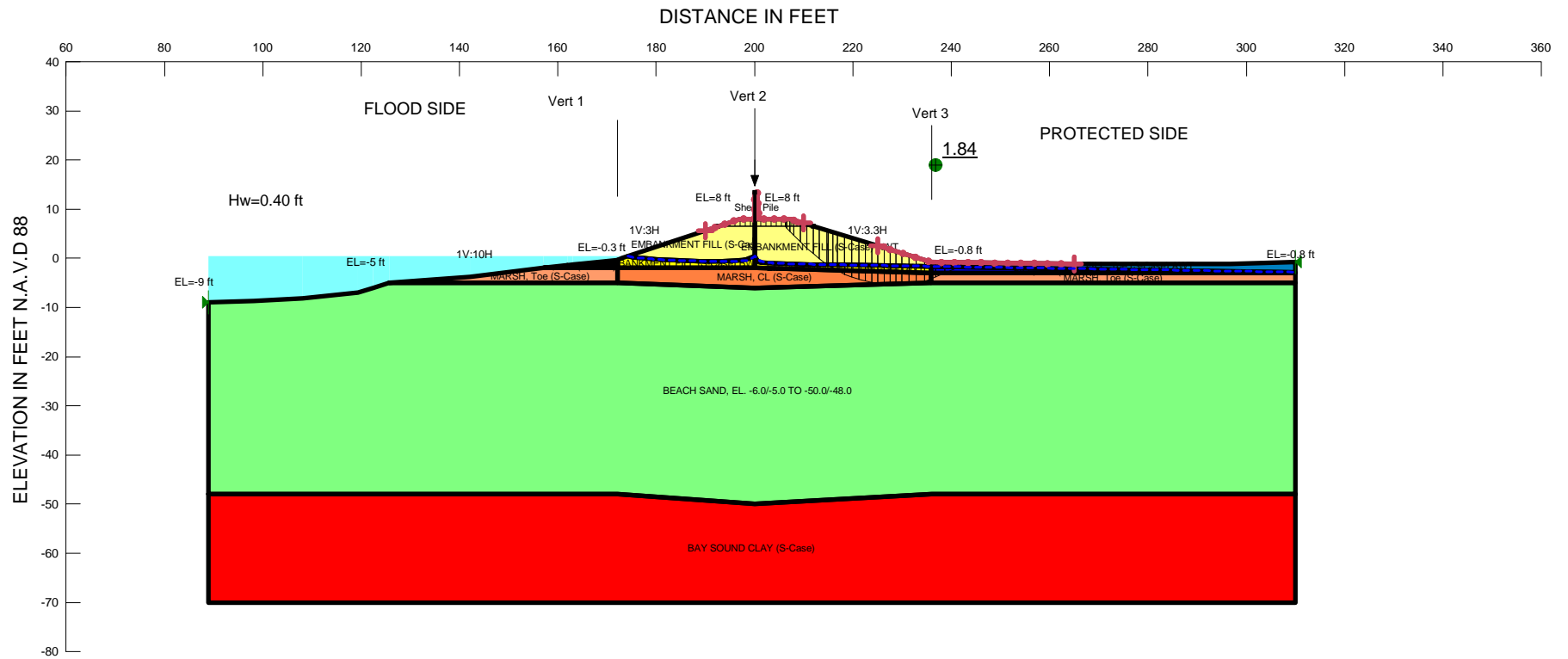
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	161.58745	-1.619625	116.70199	147.13131	14.841373	0

2	Optimized	162.44695	-1.8698695	113.89551	184.05446	34.218805	0
3	Optimized	162.94695	-2.0154435	113.59121	203.87772	40.198143	0
4	Optimized	163.7618	-2.252678	125.1937	233.69996	48.310096	0
5	Optimized	165.28535	-2.6962595	147.6411	289.03701	62.953515	0
6	Optimized	166.62535	-3.068564	166.94477	332.0067	73.490307	0
7	Optimized	167.78185	-3.3695915	182.85264	369.67178	83.177243	0
8	Optimized	168.9383	-3.6706185	198.93624	407.31176	92.77476	0
9	Optimized	170.09475	-3.971646	215.31273	444.91827	102.22697	0
10	Optimized	171.4365	-4.29739	232.99915	480.67883	110.2741	0
11	Optimized	172.6482	-4.5754845	248.16912	522.249	122.02822	0
12	Optimized	173.492	-4.7691395	258.91302	555.09167	131.86723	0
13	Optimized	174.1024	-4.8910325	265.64096	559.75332	130.94726	0
14	Optimized	174.82445	-4.995575	271.23343	594.02492	143.71603	0
15	Optimized	175.47315	-5.0894925	276.27936	628.99859	157.04072	0
16	Optimized	176.47465	-5.143567	278.62621	649.14998	164.96781	0
17	Optimized	178.08985	-5.206662	280.955	715.86792	193.63571	0
18	Optimized	179.44635	-5.173751	277.69255	726.5591	199.84826	0
19	Optimized	180.73935	-5.039566	268.30445	759.56795	218.7246	0
20	Optimized	181.9467	-4.8445925	255.26032	748.93964	219.80019	0
21	Optimized	182.97815	-4.5981975	239.22051	761.03786	232.32806	0
22	Optimized	183.79295	-4.40356	226.51924	770.58821	242.23511	0
23	Optimized	184.7469	-4.088945	206.34273	740.48626	237.81602	0
24	Optimized	186.0567	-3.602595	175.26607	739.34111	251.14239	0
25	Optimized	187.31535	-3.05969	140.75605	701.55488	249.68372	0
26	Optimized	188.52285	-2.46023	102.82054	686.92664	260.06079	0
27	Optimized	189.1803	-2.1263145	81.709148	647.27432	251.80584	0
28	Optimized	189.3064	-2.0460645	76.672577	644.25008	252.70179	0
29	Optimized	189.98105	-1.61682	53.472977	619.70935	276.17193	0
30	Optimized	191.02315	-0.9038301	15.706387	561.70639	266.302	0
31	Optimized	191.75235	-0.3570251	-13.192472	515.52577	251.43872	75
32	Optimized	192.7709	0.51115	-58.643257	445.27141	217.17338	75
33	Optimized	194.22925	1.81351	-126.36993	382.44958	186.53312	75
34	Optimized	195.2322	2.7561605	-174.76334	311.99344	152.16937	75
35	Optimized	196.253	3.8427875	-232.45774	257.66411	125.67118	75
36	Optimized	197.20715	4.858467	-287.5381	201.822	98.435167	75
37	Optimized	198.01505	5.789495	-341.00405	125.56378	61.241546	75

Slices of Slip Surface: 2921

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	2921	164.3521	-1.2332985	98.352802	123.26517	12.150574	0
2	2921	165.1892	-1.65	101.64037	185.85452	41.073984	0
3	2921	166.53135	-2.2684145	120.55645	263.74463	63.751482	0
4	2921	167.79105	-2.7691955	147.74807	319.2395	76.352904	0
5	2921	169.05075	-3.1997865	171.11763	365.37605	86.489421	0
6	2921	170.31045	-3.5636145	191.02305	403.12841	94.435394	0
7	2921	171.57015	-3.8634025	207.15561	433.33341	100.70085	0
8	2921	172.6482	-4.07446	218.35569	460.24132	107.69442	0

9	2921	173.7068	-4.231667	226.61546	485.0906	115.08055	0
10	2921	174.82445	-4.3577045	232.9691	519.54172	127.59035	0
11	2921	175.83245	-4.4299865	236.25776	558.13467	143.30883	0
12	2921	176.83395	-4.464829	237.317	591.78001	157.8171	0
13	2921	178.01295	-4.4551315	235.52196	625.21647	173.50318	0
14	2921	179.36945	-4.3855285	229.91159	656.58362	189.96663	0
15	2921	180.6221	-4.263542	221.20395	678.81099	203.73978	0
16	2921	181.77085	-4.098047	209.94078	693.19533	215.15879	0
17	2921	182.91955	-3.8824115	195.59998	702.07426	225.49688	0
18	2921	184.14115	-3.594916	176.77436	705.30974	235.31911	0
19	2921	185.43565	-3.226563	152.89642	702.0563	244.50173	0
20	2921	186.73015	-2.787919	124.71333	691.62045	252.40331	0
21	2921	188.02465	-2.275309	91.992834	673.799	259.03679	0
22	2921	188.95295	-1.8679855	67.428883	652.21294	285.21824	0
23	2921	189.77245	-1.4608005	45.647254	629.03275	284.53612	0
24	2921	190.8493	-0.87944055	14.600632	594.05125	282.61695	0
25	2921	191.9025	-0.24920096	-18.87174	539.98049	263.36608	75
26	2921	192.9321	0.4322142	-54.616247	497.34909	242.57336	75
27	2921	193.96165	1.1835976	-93.317023	449.72496	219.34552	75
28	2921	194.9912	2.01251	-135.49488	396.90607	193.58402	75
29	2921	196.253	3.162691	-194.38635	323.55503	157.80833	75
30	2921	197.5595	4.4918105	-265.2643	226.97637	110.70377	75
31	2921	198.67845	5.8028215	-340.48635	121.75688	59.3848	75



Name: EMBANKMENT FILL (S-Case) AWT Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion: 75 psf Phi: 26 °
Name: MARSH, CL (S-Case) Model: Spatial Mohr-Coulomb Unit Weight: 94 pcf Cohesion: 0 psf Phi: 24 °
Name: BEACH SAND, EL. -6.0/-5.0 TO -50.0/-48.0 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand
Name: BAY SOUND CLAY (S-Case) Model: Spatial Mohr-Coulomb Unit Weight: 102 pcf Cohesion: 0 psf Phi: 26 °
Name: Sheet Pile Model: Undrained (Phi=0) Unit Weight: 0.1 pcf Cohesion: 1e+005 psf
Name: FILL, Toe (S-Case) AWT Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion: 75 psf Phi: 26 °
Name: MARSH, Toe (S-Case) Model: Mohr-Coulomb Unit Weight: 94 pcf Cohesion: 0 psf Phi: 24 °
Name: EMBANKMENT FILL (S-Case) BWT Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion: 0 psf Phi: 26 °
Name: FILL, Toe (S-Case) BWT Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion: 0 psf Phi: 26 °

GENERAL NOTES

CLASSIFICATION STRATIFICATION
SHEAR STRENGTHS AND UNIT WEIGHTS OF
THE SOIL WERE BASED ON THE RESULTS OF
UNDISTURBED BORINGS AND CPT DATA. SEE
BOTH BORING AND CPT DATA PLATES.

WHERE INDICATED, SHEAR STRENGTHS BETWEEN
VERTICALS WERE ASSUMED TO VARY LINEARLY
BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

Hw IS CANAL WATER LEVEL

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 13A,
PROTECTED SIDE STABILITY ANALYSIS,
CASE: NWL S-Case P/S (Entry/Exit)
STA. 4+70 TO 7+00 EAST
ORLEANS PARISH, LOUISIANA

NWL S-Case P/S (Entry/Exit)

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File Information

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Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix F NWL\](#)
Last Solved Date: [7/7/2013](#)
Last Solved Time: [10:25:22 PM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Strength Units: [psf](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

NWL S-Case P/S (Entry/Exit)

Kind: [SLOPE/W](#)
Parent: [Normal Water Level at +0.40ft \(seepage\)](#)
Method: [Spencer](#)
Settings
 PWP Conditions Source: [Parent Analysis](#)
Slip Surface
 Direction of movement: [Left to Right](#)
 Use Passive Mode: [No](#)
 Slip Surface Option: [Entry and Exit](#)
 Critical slip surfaces saved: [1](#)
 Optimize Critical Slip Surface Location: [Yes](#)
 Tension Crack
 Tension Crack Option: [Tension Crack Line](#)
 Percentage Wet: [0](#)
 Tension Crack Fluid Unit Weight: [62.4 pcf](#)
FOS Distribution
 FOS Calculation Option: [Constant](#)

Advanced

Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 2000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

EMBANKMENT FILL (S-Case) AWT

Model: Mohr-Coulomb
Unit Weight: 105 pcf
Cohesion: 75 psf
Phi: 26 °
Phi-B: 0 °

MARSH, CL (S-Case)

Model: Spatial Mohr-Coulomb
Unit Weight: 94 pcf
Cohesion: 0 psf
Phi: 24 °
Phi-B: 0 °

BEACH SAND, EL. -6.0/-5.0 TO -50.0/-48.0

Model: Shear/Normal Fn.
Unit Weight: 122 pcf
Strength Function: Sand
Phi-B: 0 °

BAY SOUND CLAY (S-Case)

Model: Spatial Mohr-Coulomb
Unit Weight: 102 pcf
Cohesion: 0 psf
Phi: 26 °
Phi-B: 0 °

Sheet Pile

Model: Undrained (Phi=0)
Unit Weight: 0.1 pcf
Cohesion: 1e+005 psf

FILL, Toe (S-Case) AWT

Model: [Mohr-Coulomb](#)
Unit Weight: [105 pcf](#)
Cohesion: [75 psf](#)
Phi: [26 °](#)
Phi-B: [0 °](#)

MARSH, Toe (S-Case)

Model: [Mohr-Coulomb](#)
Unit Weight: [94 pcf](#)
Cohesion: [0 psf](#)
Phi: [24 °](#)
Phi-B: [0 °](#)

EMBANKMENT FILL (S-Case) BWT

Model: [Mohr-Coulomb](#)
Unit Weight: [105 pcf](#)
Cohesion: [0 psf](#)
Phi: [26 °](#)
Phi-B: [0 °](#)

FILL, Toe (S-Case) BWT

Model: [Mohr-Coulomb](#)
Unit Weight: [105 pcf](#)
Cohesion: [0 psf](#)
Phi: [26 °](#)
Phi-B: [0 °](#)

Slip Surface Entry and Exit

Left Projection: [Range](#)
Left-Zone Left Coordinate: [\(190, 5.65726\) ft](#)
Left-Zone Right Coordinate: [\(210, 7.14146\) ft](#)
Left-Zone Increment: [15](#)
Right Projection: [Range](#)
Right-Zone Left Coordinate: [\(225, 2.54216\) ft](#)
Right-Zone Right Coordinate: [\(265, -1.17548\) ft](#)
Right-Zone Increment: [15](#)
Radius Increments: [15](#)

Slip Surface Limits

Left Coordinate: [\(88.9, -9\) ft](#)
Right Coordinate: [\(310, -0.8\) ft](#)

Reinforcements

Reinforcement 1

Type: [Pile](#)

Outside Point: [\(200, 13.4\)](#) ft

Inside Point: [\(200, 3.7\)](#) ft

Slip Surface Intersection: [\(0, 0\)](#) ft

Total Length: [9.7](#) ft

Reinforcement Direction: [90 °](#)

Applied Load Option: [Variable](#)

F of S Dependent: [No](#)

Pile Spacing: [1](#) ft

Shear Capacity: [0.0001](#) lbs

Shear Safety Factor: [1](#)

Shear Load Used: [0.0001](#) lbs

Shear Option: [Parallel to Slip](#)

Resisting Force Used: [0](#) lbs/ft

Tension Crack Line

	X (ft)	Y (ft)
	192.5	6.5
	212	6.5

Shear/Normal Strength Functions

Sand

Model: [Spline Data Point Function](#)

Function: [Shear Stress vs. Normal Stress](#)

Curve Fit to Data: [100](#) %

Segment Curvature: [0](#) %

Y-Intercept: [0](#)

Data Points: [Normal Stress \(psf\), Shear Stress \(psf\)](#)

Data Point: [\(-10000, 0\)](#)

Data Point: [\(0, 0\)](#)

Data Point: [\(10000, 6494\)](#)

Estimation Properties

Intact Rock Param.: [10](#)

Geological Strength: [100](#)

Disturbance Factor: [0](#)

SigmaC: [600000](#) psf

Sigma3: [300000](#) psf

Num. Points: [20](#)

Regions

	Material	Points	Area (ft ²)
Region 1	Sheet Pile	6,14,15,16	4.05
Region 2	EMBANKMENT FILL (S-Case) AWT	44,43,5,6,54,53,52,51,50,49,48,47,46,45	127.44668

Region 3	EMBANKMENT FILL (S-Case) AWT	6,16,13,7,62,61,60,59,58,57,56,55,54	207.17695
Region 4	MARSH, CL (S-Case)	29,17,20,21,19,30	205
Region 5	BEACH SAND, EL. -6.0/-5.0 TO -50.0/-48.0	11,1,2,35,26,36,27,30,19,21,23,9,24,25,31	9434.65
Region 6	BAY SOUND CLAY (S-Case)	9,10,33,28,32,12,11,31,25,24	4800.4
Region 7	MARSH, Toe (S-Case)	21,20,22,23	148.2
Region 8	FILL, Toe (S-Case) AWT	62,7,40,41,8,64,63	84.224419
Region 9	MARSH, Toe (S-Case)	27,3,39,29,30	86.7075
Region 10	FILL, Toe (S-Case) BWT	34,4,38	4.6
Region 11	FILL, Toe (S-Case) BWT	37,38,34,29,39	8.5825
Region 12	EMBANKMENT FILL (S-Case) BWT	4,42,44,45,46,47,48,49,50,51,52,53,54,18,17,29,34	47.633345
Region 13	EMBANKMENT FILL (S-Case) BWT	17,18,54,55,56,57,58,59,60,61,62,20	43.493047
Region 14	FILL, Toe (S-Case) BWT	62,20,22,64,63	58.015581

Points

	X (ft)	Y (ft)
Point 1	88.9	-9
Point 2	98.2	-8.7
Point 3	142.1	-3.8
Point 4	172.2	-0.3
Point 5	197	8
Point 6	200	8
Point 7	235.9	-0.8
Point 8	310	-0.8
Point 9	310	-48
Point 10	310	-70
Point 11	88.9	-48
Point 12	88.9	-70
Point 13	207.2	8
Point 14	200	13.4
Point 15	200.5	13.4
Point 16	201	8
Point 17	200	-2
Point 18	200	-1.3
Point 19	200	-6
Point 20	235.9	-3
Point 21	235.9	-5
Point 22	310	-3
Point 23	310	-5
Point 24	236	-48
Point 25	200	-50
Point 26	119.3	-6.9
Point 27	125.7	-5

Point 28	200	-70
Point 29	172.2	-2
Point 30	172.2	-5
Point 31	172.2	-48
Point 32	172.2	-70
Point 33	236	-70
Point 34	172.2	-1.3
Point 35	108.1	-8.2
Point 36	122.33158	-6
Point 37	162	-1.4
Point 38	163	-1.3
Point 39	157.025	-2
Point 40	266.9	-1.2
Point 41	296.7	-1.2
Point 42	173.09639	0
Point 43	195.50602	7.5
Point 44	174.3172	0.40858
Point 45	175.33168	0.21246
Point 46	177.33472	-0.01171
Point 47	180.04774	-0.21104
Point 48	183.4939	-0.37706
Point 49	189.23403	-0.55125
Point 50	193.06346	-0.59037
Point 51	195.93952	-0.53966
Point 52	197.56531	-0.367
Point 53	198.38534	-0.19092
Point 54	200	0.38764
Point 55	200.70332	-0.70463
Point 56	201.01775	-0.75703
Point 57	201.18545	-0.83739
Point 58	203.67721	-1.01721
Point 59	211.3552	-1.21542
Point 60	218.25485	-1.33628
Point 61	229.98437	-1.5241
Point 62	235.9	-1.62754
Point 63	267.81929	-2.14069
Point 64	310	-2.79734

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.84	(229.09, 21.961)	17.36435	(206.327, 8)	(242.696, -0.887691)
2	3449	1.86	(229.09, 21.961)	26.968	(206.995, 8)	(243.4, -0.896775)

Slices of Slip Surface: Optimized

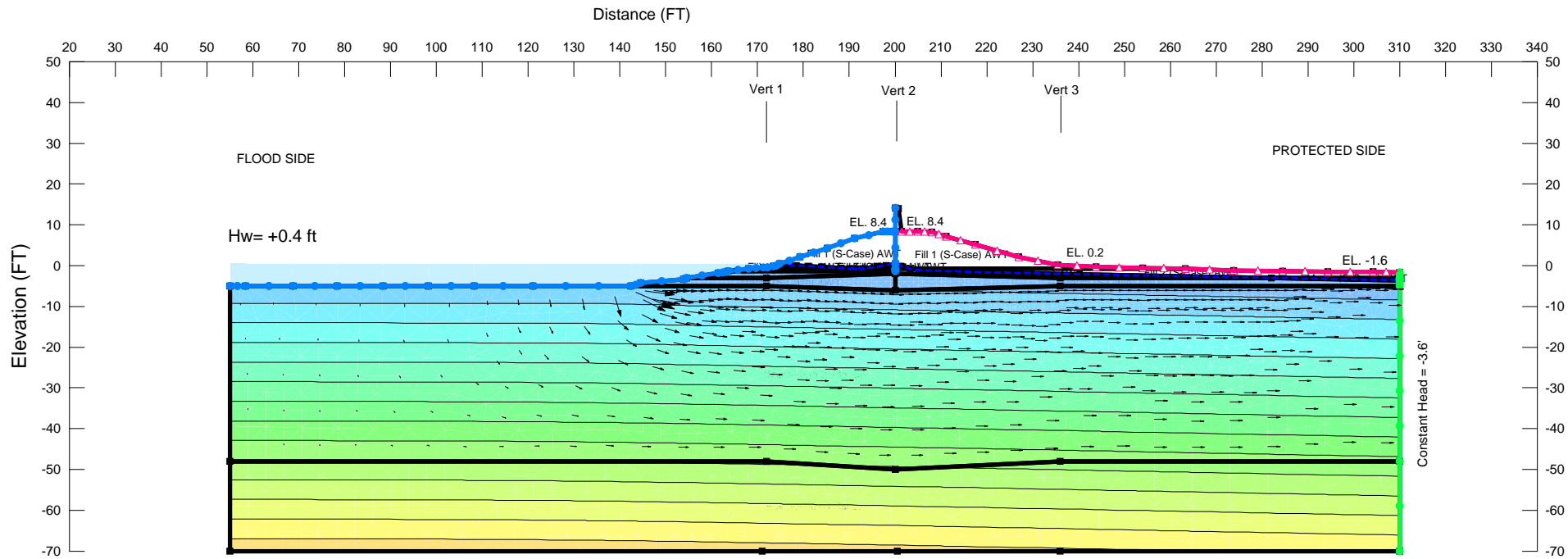
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	206.4566	6.336365	-452.65271	86.203238	42.044129	75

2	Optimized	206.89295	5.827861	-422.17354	130.75501	63.773478	75
3	Optimized	207.5826	5.053241	-375.85877	178.34891	86.986575	75
4	Optimized	208.6253	3.9787325	-312.10342	248.2067	121.0585	75
5	Optimized	209.9455	2.6892175	-235.80341	315.25708	153.76115	75
6	Optimized	211.2527	1.50779	-165.7916	397.48708	193.8674	75
7	Optimized	212.54695	0.43445	-102.02285	451.29381	220.1107	75
8	Optimized	213.9648	-0.688426	-35.012857	520.12227	253.68058	75
9	Optimized	214.87225	-1.378646	6.3445779	572.82209	276.28954	0
10	Optimized	215.4711	-1.7293865	27.247051	637.24082	297.51384	0
11	Optimized	216.3953	-2.2228395	56.668445	658.11565	293.3454	0
12	Optimized	217.55615	-2.8426355	93.942353	685.15677	263.22562	0
13	Optimized	218.2907	-3.2348275	117.6355	698.26872	258.51457	0
14	Optimized	219.0642	-3.512415	134.1565	744.21229	271.61434	0
15	Optimized	220.53965	-4.029345	164.89083	746.77082	259.06966	0
16	Optimized	221.9167	-4.438025	188.98996	771.78071	259.47516	0
17	Optimized	223.19535	-4.738455	206.45534	760.12444	246.50937	0
18	Optimized	224.45675	-4.9670575	219.45246	770.45215	245.32087	0
19	Optimized	225.70085	-5.1238325	228.00152	745.65031	230.47209	0
20	Optimized	226.94535	-5.201019	231.59405	746.08595	229.06655	0
21	Optimized	228.19455	-5.198609	230.21729	704.24614	211.05124	0
22	Optimized	229.40285	-5.17737	227.70627	669.67124	196.77549	0
23	Optimized	230.6947	-5.132875	223.67033	621.73797	177.23113	0
24	Optimized	232.1153	-5.083945	219.23829	569.03185	155.73813	0
25	Optimized	233.7287	-4.878675	204.87367	524.79233	142.43696	0
26	Optimized	235.2659	-4.457635	177.1368	456.67552	124.45865	0
27	Optimized	236.38805	-4.032495	149.53242	385.07856	104.8719	0
28	Optimized	237.7842	-3.423795	110.19901	329.93844	97.834297	0
29	Optimized	239.59275	-2.5798	55.784763	230.96381	85.440532	0
30	Optimized	240.87925	-1.9366975	14.406156	157.36404	69.725217	0
31	Optimized	241.98065	-1.3007427	-26.34736	107.65562	52.507153	75

Slices of Slip Surface: 3449

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	3449	207.0973	6.3553025	-455.31864	78.275239	38.177385	75
2	3449	207.78735	5.4526895	-401.0185	134.02395	65.367846	75
3	3449	208.96205	4.035276	-316.34784	222.25594	108.40147	75
4	3449	210.13675	2.794956	-242.6784	302.1616	147.37406	75
5	3449	211.31145	1.6987845	-177.58257	374.28508	182.55103	75
6	3449	212.4861	0.72422275	-119.70972	439.11	214.16826	75
7	3449	213.66075	-0.14493615	-67.993324	497.03914	242.42219	75
8	3449	214.83545	-0.9207774	-21.76976	548.40229	267.47367	75
9	3449	215.9978	-1.606086	19.093483	607.36996	286.92161	0
10	3449	217.14775	-2.2095845	55.082879	646.16275	288.28891	0
11	3449	217.9888	-2.61386	79.25039	673.06744	264.38438	0
12	3449	218.84135	-2.9750925	100.89453	689.56027	262.09088	0
13	3449	220.0143	-3.4257995	127.80435	707.79687	258.22931	0
14	3449	221.18725	-3.815275	150.90765	720.10029	253.42089	0

15	3449	222.3602	-4.1462665	170.3711	726.62609	247.66068	0
16	3449	223.53315	-4.4209805	186.32841	727.46915	240.93138	0
17	3449	224.7061	-4.641164	198.89415	722.67792	233.20356	0
18	3449	225.87905	-4.8081655	208.14975	712.27169	224.44955	0
19	3449	227.052	-4.9229785	214.15128	696.2233	214.63229	0
20	3449	228.22495	-4.9862715	216.94747	674.46291	203.699	0
21	3449	229.3979	-4.9984075	216.5592	646.87288	191.588	0
22	3449	230.57595	-4.9590635	212.94983	613.11794	178.16632	0
23	3449	231.75905	-4.8675665	206.09504	572.91798	163.32009	0
24	3449	232.94215	-4.7233245	195.95295	526.10489	146.99312	0
25	3449	234.1253	-4.525473	182.46902	472.30207	129.04199	0
26	3449	235.30845	-4.2727975	165.56351	411.03439	109.29067	0
27	3449	236.4663	-3.9714995	145.649	363.93992	97.189379	0
28	3449	237.59895	-3.6220685	122.7513	332.22942	93.265669	0
29	3449	238.7316	-3.2168585	96.361164	293.89042	87.945691	0
30	3449	239.969	-2.7040005	63.162631	242.29452	87.368459	0
31	3449	241.3112	-2.066662	22.09109	166.58963	70.476649	0
32	3449	242.69115	-1.3110488	-26.398484	107.71809	52.537624	75



Name: Fill 2 (S-Case) AWT	Model: Saturated Only	K-Sat: 3.28e-008 ft/sec	Volumetric Water Content: 0 ft ³ /ft ³	Mv: 0 /psf	K-Ratio: 1	K-Direction: 0 °
Name: Marsh (S-Case) AWT	Model: Saturated Only	K-Sat: 3.28e-007 ft/sec	Volumetric Water Content: 0 ft ³ /ft ³	Mv: 0 /psf	K-Ratio: 1	K-Direction: 0 °
Name: Beach -5, -6 to -48, -50	Model: Saturated Only	K-Sat: 0.000492 ft/sec	Volumetric Water Content: 0 ft ³ /ft ³	Mv: 0 /psf	K-Ratio: 1	K-Direction: 0 °
Name: Bay Sound (S-Case)	Model: Saturated Only	K-Sat: 3.28e-008 ft/sec	Volumetric Water Content: 0 ft ³ /ft ³	Mv: 0 /psf	K-Ratio: 1	K-Direction: 0 °
Name: Fill 1 (S-Case) AWT	Model: Saturated Only	K-Sat: 3.28e-008 ft/sec	Volumetric Water Content: 0 ft ³ /ft ³	Mv: 0 /psf	K-Ratio: 1	K-Direction: 0 °

Existing Condition

Cross Section at Sta 11+00

GENERAL NOTES

CLASSIFICATION STRATIFICATION
SHEAR STRENGTHS AND UNIT WEIGHTS OF
THE SOIL WERE BASED ON THE RESULTS OF
UNDISTURBED BORINGS AND CPT DATA. SEE
BOTH BORING AND CPT DATA PLATES.

WHERE INDICATED, SHEAR STRENGTHS BETWEEN
VERTICALS WERE ASSUMED TO VARY LINEARLY
BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL,
REMEDICATION OF CANAL WALLS AND LEVEES
PROTECTED SIDE STABILITY ANALYSIS
CASE: Name: Normal Water Level at +0.40ft (seepage)
REACH 13B, STA. 7+00 TO STA. 11+20
ORLEANS PARISH, LOUISIANA

Normal Water Level at +0.40ft (seepage)

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File Information

Created By: [Vicky Curtis](#)
Revision Number: [357](#)
Last Edited By: [Vicky Curtis](#)
Date: [7/7/2013](#)
Time: [11:05:16 PM](#)
File Name: [Reach 13B.gsz](#)
Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix F NWL\](#)
Last Solved Date: [7/7/2013](#)
Last Solved Time: [11:05:30 PM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Mass(M) Units: [lbs](#)
Mass Flux Units: [lbs/sec](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

Normal Water Level at +0.40ft (seepage)

Kind: [SEEP/W](#)
Method: [Steady-State](#)
Settings
 Include Air Flow: [No](#)
Control
 Apply Runoff: [No](#)
Convergence
 Convergence Type: [Head Vector Norm](#)
 Maximum Number of Iterations: [500](#)
 Tolerance: [0.001](#)
 Maximum Change in K: [0.1](#)
 Rate of Change in K: [1.02](#)
 Minimum Change in K: [1e-005](#)
 Equation Solver: [Parallel Direct](#)
 Potential Seepage Max # of Reviews: [10](#)
Time

Starting Time: 0 sec

Duration: 0 sec

Ending Time: 0 sec

Materials

Fill 2 (S-Case) AWT

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-008 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

Marsh (S-Case) AWT

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-007 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

Beach -5,-6 to -48,-50

Model: Saturated Only

Hydraulic

K-Sat: 0.000492 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

Bay Sound (S-Case)

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-008 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

Fill 1 (S-Case) AWT

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-008 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

Boundary Conditions

Potential Seepage Face

Review: true
Type: Total Flux (Q) 0

Canal Water

Type: Head (H) 0.4

Constant head boundary

Type: Head (H) -3.6

Regions

	Material	Points	Area (ft²)
Region 1	Beach -5,-6 to -48,-50	1,2,3,4,5,6,7,55,60,15,14,13,12,16,17,18,19,20	10997
Region 2	Bay Sound (S-Case)	20,19,18,17,16,21,22,23,24,25	5546
Region 3	Fill 1 (S-Case) AWT	61,33,34,35,36,37,38,75,74,73,72,70,69,68,67,66,64,63,62	132.77081
Region 4	Fill 2 (S-Case) AWT	30,70,71,72,57,65,58,29	17.003985
Region 5	Fill 2 (S-Case) AWT	56,28,29,58,10,11	55.21
Region 6	Marsh (S-Case) AWT	10,9,84,85,12,13,14	247.63184
Region 7		38,39,40,41	6.2
Region 8	Fill 1 (S-Case) AWT	75,38,41,42,43,44,45,46,47,48,49,50,78,77,76	212.20396
Region 9	Fill 2 (S-Case) AWT	83,82,81,80,79,78,50,51,52,53,54,59,8,84	140.41886
Region 10	Marsh (S-Case) AWT	60,26,27,56,11,10,14,15	132.78552
Region 11	Fill 1 (S-Case) AWT	30,31,32,61,62,63,64,66,67,68,69,70	11.527954
Region 12	Fill 1 (S-Case) AWT	72,73,74,75,57	4.2862218
Region 13	Fill 1 (S-Case) AWT	75,76,77,78,57	1.7910415
Region 14		70,72,71	0.071015462
Region 15	Fill 2 (S-Case) AWT	57,65,58,10,9,84,83,82,81,80,79,78	59.506141
Region 16	Marsh (S-Case) AWT	84,8,85	8.3681627

Lines

	Start Point	End Point	Hydraulic Boundary
Line 1	12	13	
Line 2	13	14	
Line 3	14	15	
Line 4	1	2	Canal Water
Line 5	12	16	Constant head boundary
Line 6	16	17	
Line 7	17	18	
Line 8	18	19	

Line 9	19	20	
Line 10	20	1	
Line 11	16	21	Constant head boundary
Line 12	21	22	
Line 13	22	23	
Line 14	23	24	
Line 15	24	25	
Line 16	25	20	
Line 17	2	3	Canal Water
Line 18	3	4	Canal Water
Line 19	4	5	Canal Water
Line 20	5	6	Canal Water
Line 21	6	7	Canal Water
Line 22	7	55	Canal Water
Line 23	33	34	Canal Water
Line 24	34	35	Canal Water
Line 25	35	36	Canal Water
Line 26	36	37	Canal Water
Line 27	37	38	Canal Water
Line 28	58	29	
Line 29	29	30	Canal Water
Line 30	56	28	Canal Water
Line 31	28	29	Canal Water
Line 32	58	10	
Line 33	10	11	
Line 34	11	56	
Line 35	10	14	
Line 36	10	9	
Line 37	38	39	Canal Water
Line 38	39	40	
Line 39	40	41	
Line 40	41	38	
Line 41	41	42	Potential Seepage Face
Line 42	42	43	Potential Seepage Face
Line 43	43	44	Potential Seepage Face
Line 44	44	45	Potential Seepage Face
Line 45	45	46	Potential Seepage Face
Line 46	46	47	Potential Seepage Face
Line 47	47	48	Potential Seepage Face
Line 48	48	49	Potential Seepage Face
Line 49	49	50	Potential Seepage Face
Line 50	50	51	Potential Seepage Face
Line 51	51	52	Potential Seepage Face
Line 52	52	53	Potential Seepage Face
Line 53	53	54	Potential Seepage Face
Line 54	54	59	Potential Seepage Face
Line 55	59	8	Constant head boundary
Line 56	15	60	

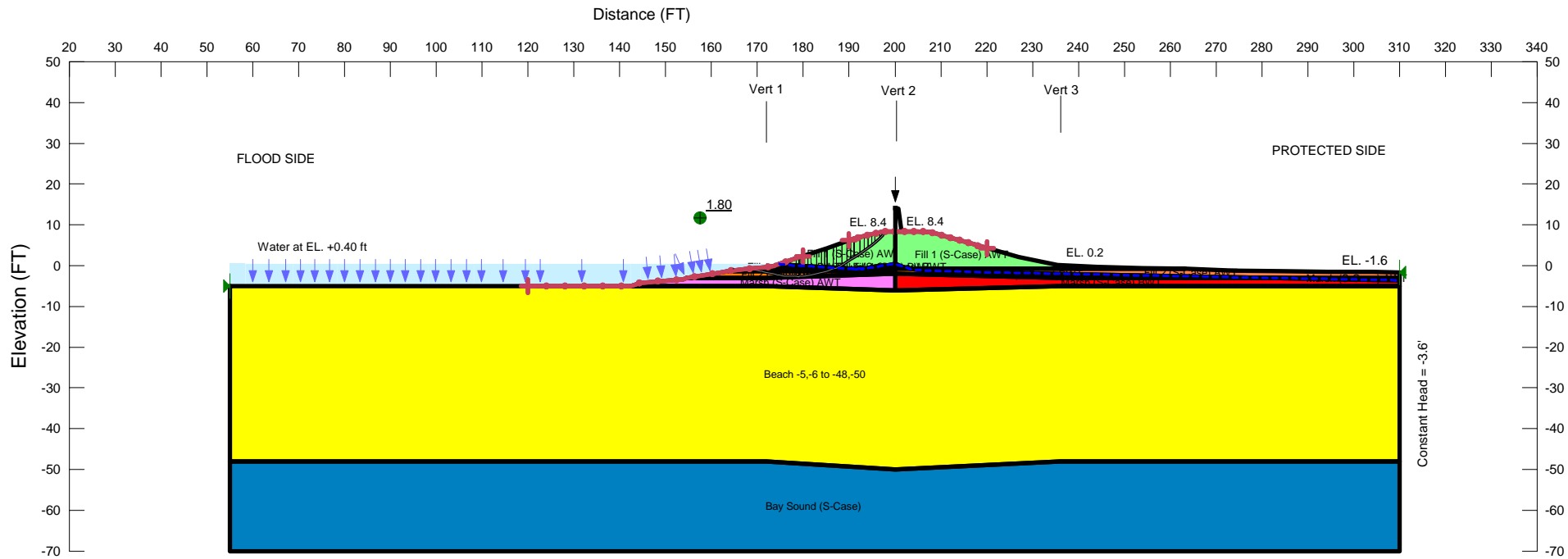
Line 57	60	55	Canal Water
Line 58	60	26	Canal Water
Line 59	26	27	Canal Water
Line 60	27	56	Canal Water
Line 61	61	33	Canal Water
Line 62	57	65	Canal Water
Line 63	65	58	Canal Water
Line 64	30	70	
Line 65	72	57	
Line 66	70	72	
Line 67	38	75	Canal Water
Line 68	50	78	
Line 69	9	84	
Line 70	84	8	
Line 71	85	12	Constant head boundary
Line 72	75	74	
Line 73	74	73	
Line 74	73	72	
Line 75	70	69	
Line 76	69	68	
Line 77	68	67	
Line 78	67	66	
Line 79	66	64	
Line 80	64	63	
Line 81	63	62	
Line 82	62	61	
Line 83	78	77	
Line 84	77	76	
Line 85	76	75	
Line 86	83	82	
Line 87	82	81	
Line 88	81	80	
Line 89	80	79	
Line 90	79	78	
Line 91	84	83	
Line 92	84	85	
Line 93	30	31	Canal Water
Line 94	31	32	Canal Water
Line 95	32	61	Canal Water
Line 96	75	57	
Line 97	78	57	
Line 98	70	71	
Line 99	71	72	
Line 100	8	85	Constant head boundary

Points

	X (ft)	Y (ft)

Point 1	55	-5
Point 2	58.4	-5
Point 3	68.7	-5
Point 4	78.4	-5
Point 5	88.3	-5
Point 6	98.2	-5
Point 7	108.2	-5
Point 8	310	-3
Point 9	236	-3
Point 10	200	-2
Point 11	172	-3
Point 12	310	-5
Point 13	236	-5
Point 14	200	-6
Point 15	172	-5
Point 16	310	-48
Point 17	236	-48
Point 18	200	-50
Point 19	172	-48
Point 20	55	-48
Point 21	310	-70
Point 22	236	-70
Point 23	200.5	-70
Point 24	171	-70
Point 25	55	-70
Point 26	144.5	-4.2
Point 27	153.8	-3.3
Point 28	161.4	-1.8
Point 29	163.6	-1.3
Point 30	168.1	-0.8
Point 31	171.3	-0.4
Point 32	173.4	-0.1
Point 33	179.3	2.1
Point 34	185.2	4.2
Point 35	191.2	6.7
Point 36	197.3	8.3
Point 37	199.4	8.4
Point 38	200	8.4
Point 39	200	14.1
Point 40	200.8	14
Point 41	201.4	8.4
Point 42	204.9	8.4
Point 43	208	8.2
Point 44	211.1	7.2
Point 45	217.5	5.1
Point 46	227	2.2
Point 47	235.4	0.2
Point 48	243.8	-0.3

Point 49	254	-0.6
Point 50	263.3	-0.8
Point 51	273.8	-1.2
Point 52	284.5	-1.3
Point 53	294.3	-1.5
Point 54	304.2	-1.5
Point 55	121	-5
Point 56	154.5	-3
Point 57	200	-0.8
Point 58	200	-1.3
Point 59	310	-1.6
Point 60	142.33621	-5
Point 61	174.74489	0.40148
Point 62	175.80857	0.25834
Point 63	177.1581	0.10667
Point 64	178.41491	-0.01435
Point 65	200	-1.07525
Point 66	180.99552	-0.19605
Point 67	184.04028	-0.35899
Point 68	188.1986	-0.6308
Point 69	190.02751	-0.75441
Point 70	190.64581	-0.8
Point 71	192.15393	-0.85346
Point 72	193.30258	-0.8
Point 73	196.04624	-0.22099
Point 74	198.02182	0.07756
Point 75	200	0.39822
Point 76	201.27515	-0.11042
Point 77	201.62898	-0.34815
Point 78	203.33526	-0.8
Point 79	205.28135	-1.07351
Point 80	208.3727	-1.25397
Point 81	212.57627	-1.42116
Point 82	220.03513	-1.62815
Point 83	240.2361	-2.07609
Point 84	282.00628	-3
Point 85	310	-3.59786



Name: Fill 2 (S-Case) AWT	Model: Spatial Mohr-Coulomb	Unit Weight: 109 pcf	Cohesion: 75 psf	Phi: 26 °	Phi-B: 0 °
Name: Marsh (S-Case) AWT	Model: Spatial Mohr-Coulomb	Unit Weight: 101 pcf	Cohesion: 75 psf	Phi: 24 °	Phi-B: 0 °
Name: Beach -5,-6 to -48,-50	Model: Shear/Normal Fn.	Unit Weight: 122 pcf	Strength Function: Beach Sand		Phi-B: 0 °
Name: Bay Sound (S-Case)	Model: Spatial Mohr-Coulomb	Unit Weight: 102 pcf	Cohesion: 0 psf	Phi: 26 °	Phi-B: 0 °
Name: Fill 1 (S-Case) AWT	Model: Spatial Mohr-Coulomb	Unit Weight: 109 pcf	Cohesion: 75 psf	Phi: 26 °	Phi-B: 0 °
Name: Fill 1 (S-Case) BWT	Model: Spatial Mohr-Coulomb	Unit Weight: 109 pcf	Cohesion: 0 psf	Phi: 26 °	Phi-B: 0 °
Name: Fill 2 (S-Case) BWT	Model: Spatial Mohr-Coulomb	Unit Weight: 109 pcf	Cohesion: 0 psf	Phi: 26 °	Phi-B: 0 °
Name: Marsh (S-Case) BWT	Model: Spatial Mohr-Coulomb	Unit Weight: 101 pcf	Cohesion: 0 psf	Phi: 24 °	Phi-B: 0 °

Existing Condition

Cross Section at Sta 11+00

GENERAL NOTES

CLASSIFICATION STRATIFICATION SHEAR STRENGTHS AND UNIT WEIGHTS OF THE SOIL WERE BASED ON THE RESULTS OF UNDISTURBED BORINGS AND CPT DATA. SEE BOTH BORING AND CPT DATA PLATES.

WHERE INDICATED, SHEAR STRENGTHS BETWEEN VERTICALS WERE ASSUMED TO VARY LINEARLY BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

LAKE PONTCHARTRAIN, LA. AND VICINITY HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REMEDIATION OF CANAL WALLS AND LEVEES PROTECTED SIDE STABILITY ANALYSIS
CASE: Name: NWL S-Case F/S (Entry/Exit)
REACH 13B, STA. 7+00 TO STA. 11+20
ORLEANS PARISH, LOUISIANA

NWL S-Case F/S (Entry/Exit)

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File Information

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Revision Number: [357](#)
Last Edited By: [Vicky Curtis](#)
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File Name: [Reach 13B.gsz](#)
Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix F NWL\](#)
Last Solved Date: [7/7/2013](#)
Last Solved Time: [11:12:44 PM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Strength Units: [psf](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

NWL S-Case F/S (Entry/Exit)

Kind: [SLOPE/W](#)
Parent: [Normal Water Level at +0.40ft \(seepage\)](#)
Method: [Spencer](#)
Settings
 PWP Conditions Source: [Parent Analysis](#)
Slip Surface
 Direction of movement: [Right to Left](#)
 Use Passive Mode: [No](#)
 Slip Surface Option: [Entry and Exit](#)
 Critical slip surfaces saved: [1](#)
 Optimize Critical Slip Surface Location: [Yes](#)
Tension Crack
 Tension Crack Option: [Search for Tension Crack](#)
 Percentage Wet: [0](#)
 Tension Crack Fluid Unit Weight: [62.4 pcf](#)
FOS Distribution
 FOS Calculation Option: [Constant](#)

Advanced

Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 2000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

Fill 2 (S-Case) AWT

Model: Spatial Mohr-Coulomb
Unit Weight: 109 pcf
Cohesion: 75 psf
Phi: 26 °
Phi-B: 0 °

Marsh (S-Case) AWT

Model: Spatial Mohr-Coulomb
Unit Weight: 101 pcf
Cohesion: 75 psf
Phi: 24 °
Phi-B: 0 °

Beach -5,-6 to -48,-50

Model: Shear/Normal Fn.
Unit Weight: 122 pcf
Strength Function: Beach Sand
Phi-B: 0 °

Bay Sound (S-Case)

Model: Spatial Mohr-Coulomb
Unit Weight: 102 pcf
Cohesion: 0 psf
Phi: 26 °
Phi-B: 0 °

Fill 1 (S-Case) AWT

Model: Spatial Mohr-Coulomb
Unit Weight: 109 pcf
Cohesion: 75 psf
Phi: 26 °
Phi-B: 0 °

Fill 1 (S-Case) BWT

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [109 pcf](#)

Cohesion: [0 psf](#)

Phi: [26 °](#)

Phi-B: [0 °](#)

Fill 2 (S-Case) BWT

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [109 pcf](#)

Cohesion: [0 psf](#)

Phi: [26 °](#)

Phi-B: [0 °](#)

Marsh (S-Case) BWT

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [101 pcf](#)

Cohesion: [0 psf](#)

Phi: [24 °](#)

Phi-B: [0 °](#)

Slip Surface Entry and Exit

Left Projection: [Range](#)

Left-Zone Left Coordinate: [\(120, -5\) ft](#)

Left-Zone Right Coordinate: [\(180, 2.34915\) ft](#)

Left-Zone Increment: [15](#)

Right Projection: [Range](#)

Right-Zone Left Coordinate: [\(190, 6.2\) ft](#)

Right-Zone Right Coordinate: [\(220, 4.33684\) ft](#)

Right-Zone Increment: [15](#)

Radius Increments: [15](#)

Slip Surface Limits

Left Coordinate: [\(55, -5\) ft](#)

Right Coordinate: [\(310, -1.6\) ft](#)

Reinforcements

Reinforcement 1

Type: [Pile](#)

Outside Point: [\(200, 14.1\) ft](#)

Inside Point: [\(200, 3.7\) ft](#)

Slip Surface Intersection: [\(0, 0\) ft](#)

Total Length: [10.4 ft](#)

Reinforcement Direction: 90 °
Applied Load Option: Variable
F of S Dependent: No
Pile Spacing: 1 ft
Shear Capacity: 0.1 lbs
Shear Safety Factor: 1
Shear Load Used: 0.1 lbs
Shear Option: Parallel to Slip
Resisting Force Used: 0 lbs/ft

Shear/Normal Strength Functions

Beach Sand

Model: Spline Data Point Function
Function: Shear Stress vs. Normal Stress
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
Data Point: (-10000, 0)
Data Point: (0, 0)
Data Point: (10000, 6494)
Estimation Properties
Intact Rock Param.: 10
Geological Strength: 100
Disturbance Factor: 0
SigmaC: 600000 psf
Sigma3: 300000 psf
Num. Points: 20

Regions

	Material	Points	Area (ft²)
Region 1	Beach -5,-6 to -48,-50	1,2,3,4,5,6,7,55,60,15,14,13,12,16,17,18,19,20	10997
Region 2	Bay Sound (S-Case)	20,19,18,17,16,21,22,23,24,25	5546
Region 3	Fill 1 (S-Case) AWT	61,33,34,35,36,37,38,75,74,73,72,70,69,68,67,66,64,63,62	132.77081
Region 4	Fill 2 (S-Case) BWT	30,70,71,72,57,65,58,29	17.003985
Region 5	Fill 2 (S-Case) BWT	56,28,29,58,10,11	55.21
Region 6	Marsh (S-Case) BWT	10,9,84,85,12,13,14	247.63184
Region 7		38,39,40,41	6.2
Region 8	Fill 1 (S-Case) AWT	75,38,41,42,43,44,45,46,47,48,49,50,78,77,76	212.20396
Region 9	Fill 2 (S-Case) AWT	83,82,81,80,79,78,50,51,52,53,54,59,8,84	140.41886
Region 10	Marsh (S-Case) AWT	60,26,27,56,11,10,14,15	132.78552
Region 11	Fill 1 (S-Case) BWT	30,31,32,61,62,63,64,66,67,68,69,70	11.527954
Region 12	Fill 1 (S-Case) BWT	72,73,74,75,57	4.2862218
Region 13	Fill 1 (S-Case) BWT	75,76,77,78,57	1.7910415
Region 14		70,72,71	0.071015462

Region 15	Fill 2 (S-Case) BWT	57,65,58,10,9,84,83,82,81,80,79,78	59.506141
Region 16	Marsh (S-Case) AWT	84,8,85	8.3681627

Points

	X (ft)	Y (ft)
Point 1	55	-5
Point 2	58.4	-5
Point 3	68.7	-5
Point 4	78.4	-5
Point 5	88.3	-5
Point 6	98.2	-5
Point 7	108.2	-5
Point 8	310	-3
Point 9	236	-3
Point 10	200	-2
Point 11	172	-3
Point 12	310	-5
Point 13	236	-5
Point 14	200	-6
Point 15	172	-5
Point 16	310	-48
Point 17	236	-48
Point 18	200	-50
Point 19	172	-48
Point 20	55	-48
Point 21	310	-70
Point 22	236	-70
Point 23	200.5	-70
Point 24	171	-70
Point 25	55	-70
Point 26	144.5	-4.2
Point 27	153.8	-3.3
Point 28	161.4	-1.8
Point 29	163.6	-1.3
Point 30	168.1	-0.8
Point 31	171.3	-0.4
Point 32	173.4	-0.1
Point 33	179.3	2.1
Point 34	185.2	4.2
Point 35	191.2	6.7
Point 36	197.3	8.3
Point 37	199.4	8.4
Point 38	200	8.4
Point 39	200	14.1
Point 40	200.8	14
Point 41	201.4	8.4
Point 42	204.9	8.4

Point 43	208	8.2
Point 44	211.1	7.2
Point 45	217.5	5.1
Point 46	227	2.2
Point 47	235.4	0.2
Point 48	243.8	-0.3
Point 49	254	-0.6
Point 50	263.3	-0.8
Point 51	273.8	-1.2
Point 52	284.5	-1.3
Point 53	294.3	-1.5
Point 54	304.2	-1.5
Point 55	121	-5
Point 56	154.5	-3
Point 57	200	-0.8
Point 58	200	-1.3
Point 59	310	-1.6
Point 60	142.33621	-5
Point 61	174.74489	0.40148
Point 62	175.80857	0.25834
Point 63	177.1581	0.10667
Point 64	178.41491	-0.01435
Point 65	200	-1.07525
Point 66	180.99552	-0.19605
Point 67	184.04028	-0.35899
Point 68	188.1986	-0.6308
Point 69	190.02751	-0.75441
Point 70	190.64581	-0.8
Point 71	192.15393	-0.85346
Point 72	193.30258	-0.8
Point 73	196.04624	-0.22099
Point 74	198.02182	0.07756
Point 75	200	0.39822
Point 76	201.27515	-0.11042
Point 77	201.62898	-0.34815
Point 78	203.33526	-0.8
Point 79	205.28135	-1.07351
Point 80	208.3727	-1.25397
Point 81	212.57627	-1.42116
Point 82	220.03513	-1.62815
Point 83	240.2361	-2.07609
Point 84	282.00628	-3
Point 85	310	-3.59786

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.80	(177.355, 22.54)	14.84196	(197.3, 8.3)	(168.297, -0.775421)

2	3144	1.81	(177.355, 22.54)	25.012	(197.3, 8.3)	(168.3, -0.774977)
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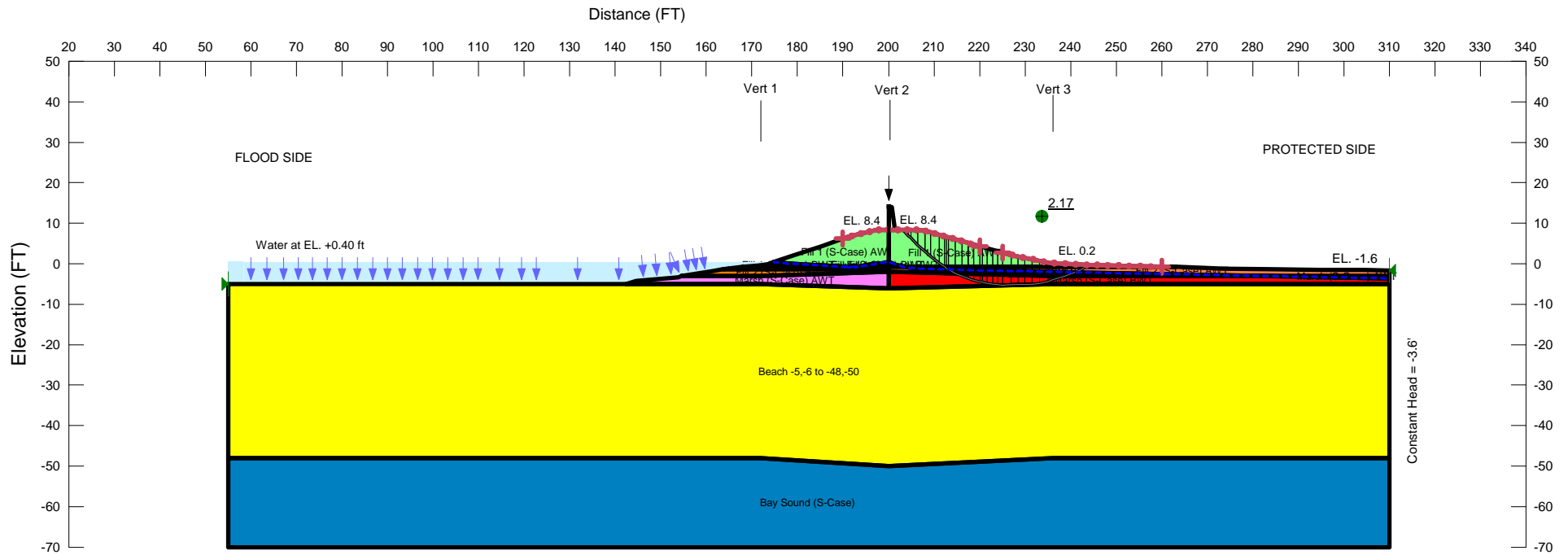
Slices of Slip Surface: **Optimized**

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	168.3504	-0.78771055	73.607654	83.258859	4.7072069	0
2	Optimized	168.9512	-0.925	77.215501	105.20556	13.651666	0
3	Optimized	170.0452	-1.175	83.822261	145.15445	29.913707	0
4	Optimized	170.8003	-1.34756	88.360107	172.73397	41.151884	0
5	Optimized	171.1542	-1.4310785	91.057919	187.54289	47.058864	0
6	Optimized	171.90345	-1.6158585	96.674205	217.69998	59.028214	0
7	Optimized	172.95345	-1.882848	104.965	263.21079	77.181627	0
8	Optimized	173.879	-2.127773	112.78338	310.40909	96.388497	0
9	Optimized	174.55145	-2.2916405	117.94955	331.98301	104.39109	0
10	Optimized	175.27675	-2.43079	122.02238	379.22406	125.44564	0
11	Optimized	176.03725	-2.5766995	126.49545	434.82276	150.38127	0
12	Optimized	176.712	-2.62654	127.24564	433.24485	149.24578	0
13	Optimized	177.7865	-2.640919	125.71176	482.24116	173.89101	0
14	Optimized	178.6952	-2.653079	124.46037	523.68787	194.71626	0
15	Optimized	179.13775	-2.636251	122.82052	506.38971	187.07919	0
16	Optimized	179.7239	-2.561912	118.27264	521.49023	196.66236	0
17	Optimized	180.57165	-2.4543925	111.57672	542.91669	210.37856	0
18	Optimized	181.33795	-2.3572015	105.40049	562.28755	222.83871	0
19	Optimized	182.27035	-2.159129	93.28609	542.46776	219.08054	0
20	Optimized	183.4503	-1.8498475	75.146172	553.69914	233.40588	0
21	Optimized	184.36615	-1.6097985	61.06916	562.40567	244.51815	0
22	Optimized	184.946	-1.4253095	50.601602	533.04609	235.3039	0
23	Optimized	185.2336	-1.3131145	44.42003	532.09272	237.85386	0
24	Optimized	185.90815	-1.05	28.601372	533.27597	246.14625	0
25	Optimized	186.866	-0.676405	6.1550236	534.97209	257.92131	0
26	Optimized	187.7842	-0.1782825	-22.166716	460.75319	224.72435	75
27	Optimized	188.98685	0.5707725	-63.652995	439.2478	214.23547	75
28	Optimized	189.9519	1.198275	-97.483397	405.0663	197.56403	75
29	Optimized	190.67925	1.704225	-123.98031	387.9788	189.2299	75
30	Optimized	191.12145	2.015616	-139.71854	368.57457	179.76583	75
31	Optimized	191.76655	2.495411	-164.22001	343.92018	167.74108	75
32	Optimized	192.7923	3.28749	-206.86798	291.41299	142.13161	75
33	Optimized	193.7107	4.02889	-246.34039	251.0764	122.45814	75
34	Optimized	194.5355	4.7202175	-283.01923	205.14421	100.05552	75
35	Optimized	195.26675	5.3614725	-319.21147	169.87734	82.854715	75
36	Optimized	196.17425	6.213195	-367.98451	114.19323	55.695758	75
37	Optimized	197.00805	7.1224075	-421.74808	47.503176	23.168847	75

Slices of Slip Surface: **3144**

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	3144	169.04495	-1.0374884	81.323875	126.89285	22.225475	0
2	3144	170.1673	-1.413303	92.621425	182.54626	43.859272	0
3	3144	170.92245	-1.6271095	99.532946	212.99421	55.338755	0

4	3144	171.825	-1.846672	106.68158	244.1249	67.035586	0
5	3144	172.875	-2.061344	112.82046	273.91356	78.570357	0
6	3144	174.07245	-2.246024	117.31223	308.01188	93.01043	0
7	3144	175.27675	-2.379455	119.78931	352.96906	113.72936	0
8	3144	176.48335	-2.447369	119.59104	406.68655	140.02584	0
9	3144	177.7865	-2.4600835	117.47045	454.64707	164.45203	0
10	3144	178.85745	-2.4226195	113.636	486.67472	181.94314	0
11	3144	179.7239	-2.3556655	108.84962	506.60666	193.99907	0
12	3144	180.57165	-2.26037	102.69998	521.24385	204.13749	0
13	3144	181.50295	-2.120051	93.590497	532.69852	214.16729	0
14	3144	182.5179	-1.927633	81.509547	540.1609	223.69921	0
15	3144	183.53285	-1.691195	67.324116	542.26685	231.64505	0
16	3144	184.4807	-1.430913	52.188811	539.57167	237.7125	0
17	3144	185.06055	-1.254848	42.004752	535.9674	240.92168	0
18	3144	185.773	-1.004848	26.677765	531.27922	246.11057	0
19	3144	186.65745	-0.67520895	6.7706019	524.11698	252.32669	0
20	3144	187.49775	-0.31572122	-14.250113	506.00819	246.79668	75
21	3144	188.5555	0.18394213	-42.949732	486.04349	237.05925	75
22	3144	189.6133	0.7463839	-73.830359	460.47362	224.58799	75
23	3144	190.6711	1.376628	-107.25439	429.21762	209.34342	75
24	3144	191.70835	2.065747	-141.94668	386.38266	188.45141	75
25	3144	192.725	2.818249	-181.4675	332.60767	162.2236	75
26	3144	193.74165	3.655482	-225.61753	273.95194	133.61529	75
27	3144	194.75835	4.589382	-275.19521	210.28056	102.56068	75
28	3144	195.775	5.636109	-334.48655	141.4455	68.98758	75
29	3144	196.79165	6.818454	-403.60439	67.345753	32.846719	75



Name: Fill 2 (S-Case) AWT	Model: Spatial Mohr-Coulomb	Unit Weight: 109 pcf	Cohesion: 75 psf	Phi: 26 °	Phi-B: 0 °
Name: Marsh (S-Case) AWT	Model: Spatial Mohr-Coulomb	Unit Weight: 101 pcf	Cohesion: 75 psf	Phi: 24 °	Phi-B: 0 °
Name: Beach -5,-6 to -48,-50	Model: Shear/Normal Fn.	Unit Weight: 122 pcf	Strength Function: Beach Sand		Phi-B: 0 °
Name: Bay Sound (S-Case)	Model: Spatial Mohr-Coulomb	Unit Weight: 102 pcf	Cohesion: 0 psf	Phi: 26 °	Phi-B: 0 °
Name: Fill 1 (S-Case) AWT	Model: Spatial Mohr-Coulomb	Unit Weight: 109 pcf	Cohesion: 75 psf	Phi: 26 °	Phi-B: 0 °
Name: Fill 1 (S-Case) BWT	Model: Spatial Mohr-Coulomb	Unit Weight: 109 pcf	Cohesion: 0 psf	Phi: 26 °	Phi-B: 0 °
Name: Fill 2 (S-Case) BWT	Model: Spatial Mohr-Coulomb	Unit Weight: 109 pcf	Cohesion: 0 psf	Phi: 26 °	Phi-B: 0 °
Name: Marsh (S-Case) BWT	Model: Spatial Mohr-Coulomb	Unit Weight: 101 pcf	Cohesion: 0 psf	Phi: 24 °	Phi-B: 0 °

Existing Condition

Cross Section at Sta 11+00

GENERAL NOTES

CLASSIFICATION STRATIFICATION SHEAR STRENGTHS AND UNIT WEIGHTS OF THE SOIL WERE BASED ON THE RESULTS OF UNDISTURBED BORINGS AND CPT DATA. SEE BOTH BORING AND CPT DATA PLATES.

WHERE INDICATED, SHEAR STRENGTHS BETWEEN VERTICALS WERE ASSUMED TO VARY LINEARLY BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

LAKE PONTCHARTRAIN, LA. AND VICINITY HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REMEDIATION OF CANAL WALLS AND LEVEES PROTECTED SIDE STABILITY ANALYSIS CASE: Name: NWL S-Case P/S (Entry/Exit) REACH 13B, STA. 7+00 TO STA. 11+20 ORLEANS PARISH, LOUISIANA

NWL S-Case P/S (Entry/Exit)

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File Information

Created By: [Vicky Curtis](#)
Revision Number: [357](#)
Last Edited By: [Vicky Curtis](#)
Date: [7/7/2013](#)
Time: [11:05:16 PM](#)
File Name: [Reach 13B.gsz](#)
Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix F NWL\](#)
Last Solved Date: [7/7/2013](#)
Last Solved Time: [11:15:52 PM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Strength Units: [psf](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

NWL S-Case P/S (Entry/Exit)

Kind: [SLOPE/W](#)
Parent: [Normal Water Level at +0.40ft \(seepage\)](#)
Method: [Spencer](#)
Settings
 PWP Conditions Source: [Parent Analysis](#)
Slip Surface
 Direction of movement: [Left to Right](#)
 Use Passive Mode: [No](#)
 Slip Surface Option: [Entry and Exit](#)
 Critical slip surfaces saved: [1](#)
 Optimize Critical Slip Surface Location: [Yes](#)
Tension Crack
 Tension Crack Option: [Search for Tension Crack](#)
 Percentage Wet: [0](#)
 Tension Crack Fluid Unit Weight: [62.4 pcf](#)
FOS Distribution
 FOS Calculation Option: [Constant](#)

Advanced

Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 2000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

Fill 2 (S-Case) AWT

Model: Spatial Mohr-Coulomb
Unit Weight: 109 pcf
Cohesion: 75 psf
Phi: 26 °
Phi-B: 0 °

Marsh (S-Case) AWT

Model: Spatial Mohr-Coulomb
Unit Weight: 101 pcf
Cohesion: 75 psf
Phi: 24 °
Phi-B: 0 °

Beach -5,-6 to -48,-50

Model: Shear/Normal Fn.
Unit Weight: 122 pcf
Strength Function: Beach Sand
Phi-B: 0 °

Bay Sound (S-Case)

Model: Spatial Mohr-Coulomb
Unit Weight: 102 pcf
Cohesion: 0 psf
Phi: 26 °
Phi-B: 0 °

Fill 1 (S-Case) AWT

Model: Spatial Mohr-Coulomb
Unit Weight: 109 pcf
Cohesion: 75 psf
Phi: 26 °
Phi-B: 0 °

Fill 1 (S-Case) BWT

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [109 pcf](#)

Cohesion: [0 psf](#)

Phi: [26 °](#)

Phi-B: [0 °](#)

Fill 2 (S-Case) BWT

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [109 pcf](#)

Cohesion: [0 psf](#)

Phi: [26 °](#)

Phi-B: [0 °](#)

Marsh (S-Case) BWT

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [101 pcf](#)

Cohesion: [0 psf](#)

Phi: [24 °](#)

Phi-B: [0 °](#)

Slip Surface Entry and Exit

Left Projection: [Range](#)

Left-Zone Left Coordinate: [\(190, 6.2\) ft](#)

Left-Zone Right Coordinate: [\(220, 4.33684\) ft](#)

Left-Zone Increment: [15](#)

Right Projection: [Range](#)

Right-Zone Left Coordinate: [\(225, 2.81053\) ft](#)

Right-Zone Right Coordinate: [\(260, -0.72903\) ft](#)

Right-Zone Increment: [15](#)

Radius Increments: [15](#)

Slip Surface Limits

Left Coordinate: [\(55, -5\) ft](#)

Right Coordinate: [\(310, -1.6\) ft](#)

Reinforcements

Reinforcement 1

Type: [Pile](#)

Outside Point: [\(200, 14.1\) ft](#)

Inside Point: [\(200, 3.7\) ft](#)

Slip Surface Intersection: [\(0, 0\) ft](#)

Total Length: [10.4 ft](#)

Reinforcement Direction: 90 °
Applied Load Option: Variable
F of S Dependent: No
Pile Spacing: 1 ft
Shear Capacity: 0.1 lbs
Shear Safety Factor: 1
Shear Load Used: 0.1 lbs
Shear Option: Parallel to Slip
Resisting Force Used: 0 lbs/ft

Shear/Normal Strength Functions

Beach Sand

Model: Spline Data Point Function
Function: Shear Stress vs. Normal Stress
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
Data Point: (-10000, 0)
Data Point: (0, 0)
Data Point: (10000, 6494)
Estimation Properties
Intact Rock Param.: 10
Geological Strength: 100
Disturbance Factor: 0
SigmaC: 600000 psf
Sigma3: 300000 psf
Num. Points: 20

Regions

	Material	Points	Area (ft²)
Region 1	Beach -5,-6 to -48,-50	1,2,3,4,5,6,7,55,60,15,14,13,12,16,17,18,19,20	10997
Region 2	Bay Sound (S-Case)	20,19,18,17,16,21,22,23,24,25	5546
Region 3	Fill 1 (S-Case) AWT	61,33,34,35,36,37,38,75,74,73,72,70,69,68,67,66,64,63,62	132.77081
Region 4	Fill 2 (S-Case) BWT	30,70,71,72,57,65,58,29	17.003985
Region 5	Fill 2 (S-Case) BWT	56,28,29,58,10,11	55.21
Region 6	Marsh (S-Case) BWT	10,9,84,85,12,13,14	247.63184
Region 7		38,39,40,41	6.2
Region 8	Fill 1 (S-Case) AWT	75,38,41,42,43,44,45,46,47,48,49,50,78,77,76	212.20396
Region 9	Fill 2 (S-Case) AWT	83,82,81,80,79,78,50,51,52,53,54,59,8,84	140.41886
Region 10	Marsh (S-Case) AWT	60,26,27,56,11,10,14,15	132.78552
Region 11	Fill 1 (S-Case) BWT	30,31,32,61,62,63,64,66,67,68,69,70	11.527954
Region 12	Fill 1 (S-Case) BWT	72,73,74,75,57	4.2862218
Region 13	Fill 1 (S-Case) BWT	75,76,77,78,57	1.7910415
Region 14		70,72,71	0.071015462

Region 15	Fill 2 (S-Case) BWT	57,65,58,10,9,84,83,82,81,80,79,78	59.506141
Region 16	Marsh (S-Case) AWT	84,8,85	8.3681627

Points

	X (ft)	Y (ft)
Point 1	55	-5
Point 2	58.4	-5
Point 3	68.7	-5
Point 4	78.4	-5
Point 5	88.3	-5
Point 6	98.2	-5
Point 7	108.2	-5
Point 8	310	-3
Point 9	236	-3
Point 10	200	-2
Point 11	172	-3
Point 12	310	-5
Point 13	236	-5
Point 14	200	-6
Point 15	172	-5
Point 16	310	-48
Point 17	236	-48
Point 18	200	-50
Point 19	172	-48
Point 20	55	-48
Point 21	310	-70
Point 22	236	-70
Point 23	200.5	-70
Point 24	171	-70
Point 25	55	-70
Point 26	144.5	-4.2
Point 27	153.8	-3.3
Point 28	161.4	-1.8
Point 29	163.6	-1.3
Point 30	168.1	-0.8
Point 31	171.3	-0.4
Point 32	173.4	-0.1
Point 33	179.3	2.1
Point 34	185.2	4.2
Point 35	191.2	6.7
Point 36	197.3	8.3
Point 37	199.4	8.4
Point 38	200	8.4
Point 39	200	14.1
Point 40	200.8	14
Point 41	201.4	8.4
Point 42	204.9	8.4

Point 43	208	8.2
Point 44	211.1	7.2
Point 45	217.5	5.1
Point 46	227	2.2
Point 47	235.4	0.2
Point 48	243.8	-0.3
Point 49	254	-0.6
Point 50	263.3	-0.8
Point 51	273.8	-1.2
Point 52	284.5	-1.3
Point 53	294.3	-1.5
Point 54	304.2	-1.5
Point 55	121	-5
Point 56	154.5	-3
Point 57	200	-0.8
Point 58	200	-1.3
Point 59	310	-1.6
Point 60	142.33621	-5
Point 61	174.74489	0.40148
Point 62	175.80857	0.25834
Point 63	177.1581	0.10667
Point 64	178.41491	-0.01435
Point 65	200	-1.07525
Point 66	180.99552	-0.19605
Point 67	184.04028	-0.35899
Point 68	188.1986	-0.6308
Point 69	190.02751	-0.75441
Point 70	190.64581	-0.8
Point 71	192.15393	-0.85346
Point 72	193.30258	-0.8
Point 73	196.04624	-0.22099
Point 74	198.02182	0.07756
Point 75	200	0.39822
Point 76	201.27515	-0.11042
Point 77	201.62898	-0.34815
Point 78	203.33526	-0.8
Point 79	205.28135	-1.07351
Point 80	208.3727	-1.25397
Point 81	212.57627	-1.42116
Point 82	220.03513	-1.62815
Point 83	240.2361	-2.07609
Point 84	282.00628	-3
Point 85	310	-3.59786

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	2.17	(227.989, 22.986)	19.92723	(203.171, 8.4)	(244.181, -0.311217)

2	1929	2.19	(227.989, 22.986)	27.971	(204.122, 8.4)	(243.511, -0.282811)
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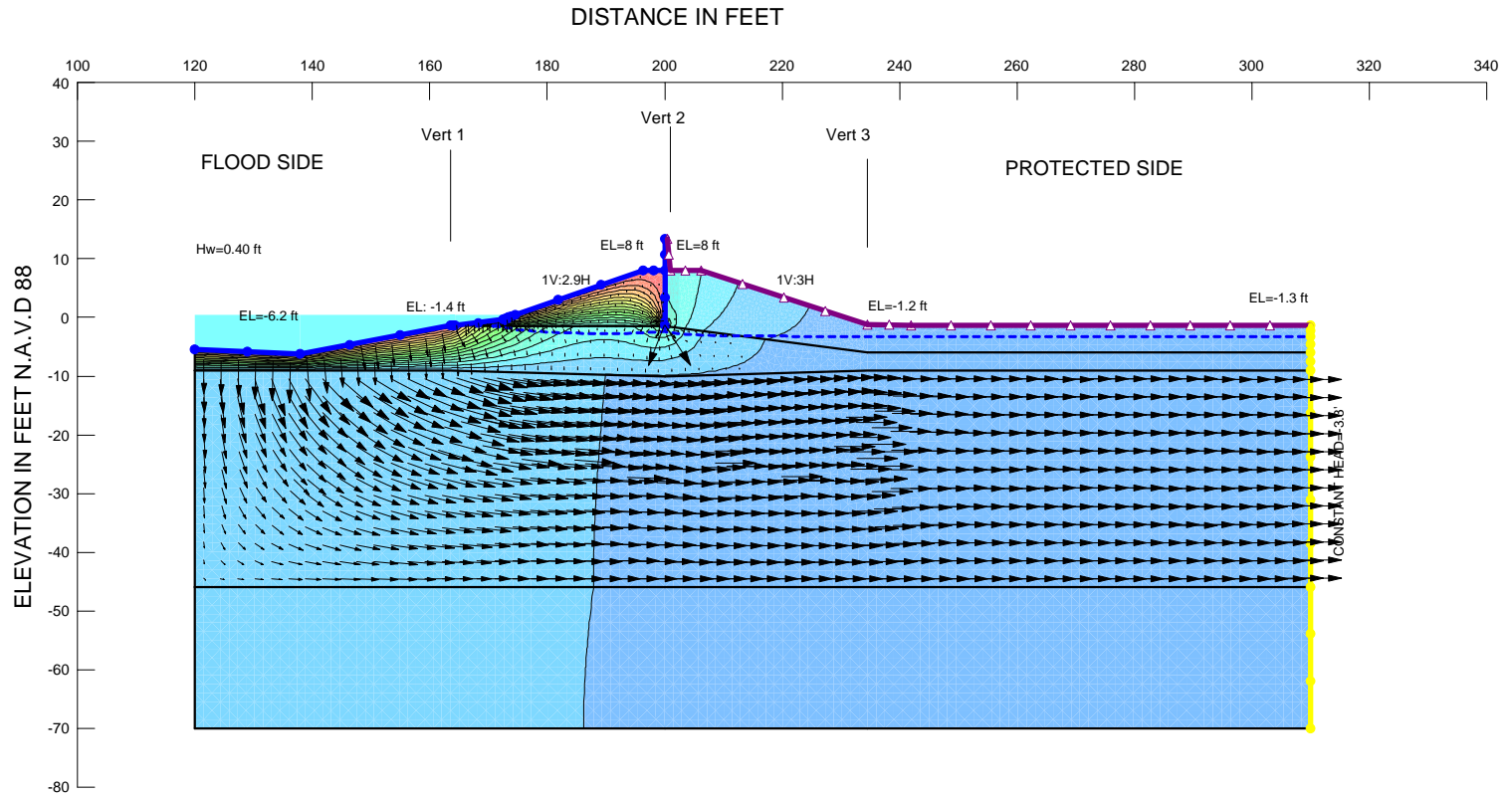
Slices of Slip Surface: **Optimized**

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	203.81145	7.606935	-486.15968	34.108088	16.635626	75
2	Optimized	204.67595	6.564475	-429.45479	119.88673	58.472664	75
3	Optimized	205.6623	5.46659	-371.11622	201.85836	98.452903	75
4	Optimized	207.2123	3.830877	-285.55406	335.30524	163.53929	75
5	Optimized	208.60885	2.435162	-212.30795	428.00808	208.75349	75
6	Optimized	210.15885	1.027597	-136.95862	527.8605	257.45477	75
7	Optimized	211.7057	-0.285738	-65.319211	596.28008	290.82523	75
8	Optimized	212.5511	-1.00351	-25.296347	633.42638	308.94269	75
9	Optimized	212.97715	-1.322238	-7.4990313	703.35081	343.04711	75
10	Optimized	213.932	-1.912558	26.295707	743.8349	349.96725	0
11	Optimized	215.4049	-2.7031785	71.819461	819.76664	333.00754	0
12	Optimized	216.78915	-3.3231885	108.29794	833.61358	322.93133	0
13	Optimized	217.4845	-3.632401	126.51558	877.97837	334.57279	0
14	Optimized	218.1338	-3.829973	137.87711	876.8646	329.01843	0
15	Optimized	219.40135	-4.2156755	160.1044	874.75131	318.18131	0
16	Optimized	220.2853	-4.4846485	175.63001	873.24546	310.59841	0
17	Optimized	221.11025	-4.6837425	186.9019	891.12701	313.54122	0
18	Optimized	222.2598	-4.9296875	200.64819	878.70771	301.89155	0
19	Optimized	223.38185	-5.1068075	210.16453	891.72171	303.44881	0
20	Optimized	224.4763	-5.2151025	215.43819	866.48997	289.86693	0
21	Optimized	226.01175	-5.2491095	215.49614	851.29092	283.07408	0
22	Optimized	227.7107	-5.214485	211.06814	794.67068	259.8366	0
23	Optimized	229.16675	-5.1848105	207.27505	752.64216	242.81308	0
24	Optimized	230.7208	-5.0847385	198.96328	720.47864	232.1936	0
25	Optimized	232.3349	-4.9153235	186.26169	658.0625	210.05925	0
26	Optimized	234.0867	-4.58643	163.44286	606.31203	197.17806	0
27	Optimized	235.21655	-4.2777155	142.70939	557.89462	184.85237	0
28	Optimized	235.7	-4.108109	131.49692	530.98567	177.86385	0
29	Optimized	236.7146	-3.752143	107.96015	483.25898	167.09381	0
30	Optimized	238.1644	-3.2435045	74.310578	414.87238	151.62789	0
31	Optimized	239.56785	-2.7012615	38.637232	355.61813	154.60191	0
32	Optimized	240.63545	-2.2470415	8.9119429	289.88326	137.03887	0
33	Optimized	241.6037	-1.757855	-22.875384	265.51908	129.50231	75
34	Optimized	242.7415	-1.119285	-64.198534	162.3664	79.191386	75
35	Optimized	243.5552	-0.66262325	-93.754253	88.597439	43.211858	75
36	Optimized	243.9907	-0.41823155	-109.57902	49.958943	24.366605	75

Slices of Slip Surface: **1929**

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	1929	204.5108	7.7983525	-503.96755	11.735867	5.7239649	75
2	1929	205.675	6.168449	-413.47988	133.8179	65.267351	75
3	1929	207.225	4.27996	-311.98666	286.93169	139.94593	75
4	1929	208.775	2.6862045	-227.80189	410.76217	200.3421	75

5	1929	210.325	1.3208312	-154.80084	504.3353	245.98076	75
6	1929	211.64275	0.29795249	-99.380888	574.07113	279.9932	75
7	1929	212.72825	-0.44653776	-58.51706	623.54485	304.12314	75
8	1929	213.84425	-1.136128	-20.149024	668.23822	325.92156	75
9	1929	215.3901	-1.963388	27.004306	730.7366	343.23317	0
10	1929	216.93135	-2.6993095	69.315255	775.04767	314.21232	0
11	1929	218.1338	-3.182773	97.617735	796.40183	311.11872	0
12	1929	219.40135	-3.6259585	123.41545	813.40977	307.20527	0
13	1929	220.7316	-4.0176455	145.95823	823.69719	301.74883	0
14	1929	222.1246	-4.3542065	165.00837	826.65628	294.58463	0
15	1929	223.5176	-4.616411	179.44484	821.54018	285.87926	0
16	1929	224.91055	-4.8063695	189.39816	808.42417	275.60814	0
17	1929	226.3035	-4.92556	194.94651	787.16685	263.67348	0
18	1929	227.7	-4.9748395	196.14664	762.95913	252.36118	0
19	1929	229.1	-4.9542275	192.99026	735.84673	241.69527	0
20	1929	230.5	-4.863266	185.45473	700.41546	229.27529	0
21	1929	231.9	-4.7012605	173.49176	656.30525	214.96242	0
22	1929	233.3	-4.46695	157.03116	603.04679	198.57895	0
23	1929	234.7	-4.158457	135.95635	540.02555	179.90319	0
24	1929	235.7	-3.899345	118.47808	496.25804	168.19847	0
25	1929	236.58455	-3.62448	100.16474	465.74245	162.76568	0
26	1929	237.75365	-3.21783	73.252369	419.66702	154.23374	0
27	1929	239.28715	-2.5806445	31.492549	346.06815	153.42877	0
28	1929	240.3191	-2.1205255	1.4474095	286.23228	138.89886	0
29	1929	240.9782	-1.777586	-20.809218	267.68215	130.55731	75
30	1929	242.1304	-1.137705	-62.229886	174.16072	84.943858	75
31	1929	243.10885	-0.54140575	-100.70937	82.096192	40.040988	75



Name: Fill 1 (S-Case) AWT Model: Saturated Only K-Sat: 3.28e-008 ft/sec K-Ratio: 1
 Name: MARSH (S-Case) AWT Model: Saturated Only K-Sat: 3.28e-007 ft/sec K-Ratio: 1
 Name: BEACH SAND, EL. -10/-9 TO -46 Model: Saturated Only K-Sat: 0.00049 ft/sec K-Ratio: 1
 Name: BAY SOUND CLAY (S-Case) Model: Saturated Only K-Sat: 3.28e-008 ft/sec K-Ratio: 1
 Name: Sheet Pile Model: Saturated Only K-Sat: 1e-010 ft/sec K-Ratio: 1

GENERAL NOTES

CLASSIFICATION STRATIFICATION
 SHEAR STRENGTHS AND UNIT WEIGHTS OF
 THE SOIL WERE BASED ON THE RESULTS OF
 UNDISTURBED BORINGS AND CPT DATA. SEE
 BOTH BORING AND CPT DATA PLATES.

WHERE INDICATED, SHEAR STRENGTHS BETWEEN
 VERTICALS WERE ASSUMED TO VARY LINEARLY
 BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

Hw IS CANAL WATER LEVEL

LAKE PONTCHARTRAIN, LA. AND VICINITY
 HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 14,
 PROTECTED SIDE STABILITY ANALYSIS,
 CASE: Normal Water Level at +0.40ft (seepage)
 STA. 11+20 TO 20+50 EAST
 ORLEANS PARISH, LOUISIANA

Normal Water Level at +0.40ft (seepage)

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File Information

Created By: [Liljegren, James](#)
Revision Number: [385](#)
Last Edited By: [Higgins, James](#)
Date: [7/7/2013](#)
Time: [11:36:36 PM](#)
File Name: [Reach 14.gsz](#)
Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix F NWL\](#)
Last Solved Date: [7/7/2013](#)
Last Solved Time: [11:36:54 PM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Mass(M) Units: [lbs](#)
Mass Flux Units: [lbs/sec](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

Normal Water Level at +0.40ft (seepage)

Kind: [SEEP/W](#)
Method: [Steady-State](#)
Settings
 Include Air Flow: [No](#)
Control
 Apply Runoff: [No](#)
Convergence
 Convergence Type: [Head Vector Norm](#)
 Maximum Number of Iterations: [500](#)
 Tolerance: [0.001](#)
 Maximum Change in K: [0.1](#)
 Rate of Change in K: [1.02](#)
 Minimum Change in K: [1e-005](#)
 Equation Solver: [Parallel Direct](#)
 Potential Seepage Max # of Reviews: [10](#)
Time

Starting Time: 0 sec

Duration: 0 sec

Ending Time: 0 sec

Materials

Fill 1 (S-Case) AWT

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-008 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

MARSH (S-Case) AWT

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-007 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

BEACH SAND, EL. -10/-9 TO -46

Model: Saturated Only

Hydraulic

K-Sat: 0.00049 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

BAY SOUND CLAY (S-Case)

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-008 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

Sheet Pile

Model: Saturated Only

Hydraulic

K-Sat: 1e-010 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

Boundary Conditions

Drainage

Review: true
Type: Total Flux (Q) 0

Canal Water

Type: Head (H) 0.4

Curb

Type: Head (H) -3.3

Regions

	Points	Area (ft²)	Material
Region 1	4,11,12,13	4.05	
Region 2	35,3,4,22,52,37,36	155.3717	Fill 1 (S-Case) AWT
Region 3	19,31,16,24,17,8,25,29,32,20	6994.5	BEACH SAND, EL. -10/-9 TO -46
Region 4	26,30,33,32,29,25	1704	BAY SOUND CLAY (S-Case)
Region 5	23,50,51,7	206.28563	Fill 1 (S-Case) AWT
Region 6	24,23,7,17	226.5	MARSH (S-Case) AWT
Region 7	22,4,13,10,5,50,49,14	245.06677	Fill 1 (S-Case) AWT
Region 8	16,31,27,38,39,40,41,42,43,44,45,46,47,48,49,23,24	456.15178	MARSH (S-Case) AWT
Region 9	26,25,8,9	1812	BAY SOUND CLAY (S-Case)
Region 10	52,22,14,38	4.6138312	Fill 1 (S-Case) AWT
Region 11	27,15,1,19,31	189.505	MARSH (S-Case) AWT
Region 12	21,33,32,20	1044	BAY SOUND CLAY (S-Case)
Region 13	27,28,52,38	0.82123384	Fill 1 (S-Case) AWT
Region 14	28,2,34,35,36,37,52	5.293254	Fill 1 (S-Case) AWT
Region 15	38,39,40,41,42,43,44,45,46,47,48,49,14	36.048225	MARSH (S-Case) AWT
Region 16	49,50,23	30.128158	Fill 1 (S-Case) AWT
Region 17	5,18,6,51,50	148.93937	Fill 1 (S-Case) AWT

Lines

	Start Point	End Point	Hydraulic Boundary	Left Side Material
Line 1	4	11	Canal Water	
Line 2	11	12		
Line 3	12	13	Drainage	
Line 4	13	4		Sheet Pile
Line 5	3	4	Canal Water	
Line 6	17	8	Curb	
Line 7	19	20		

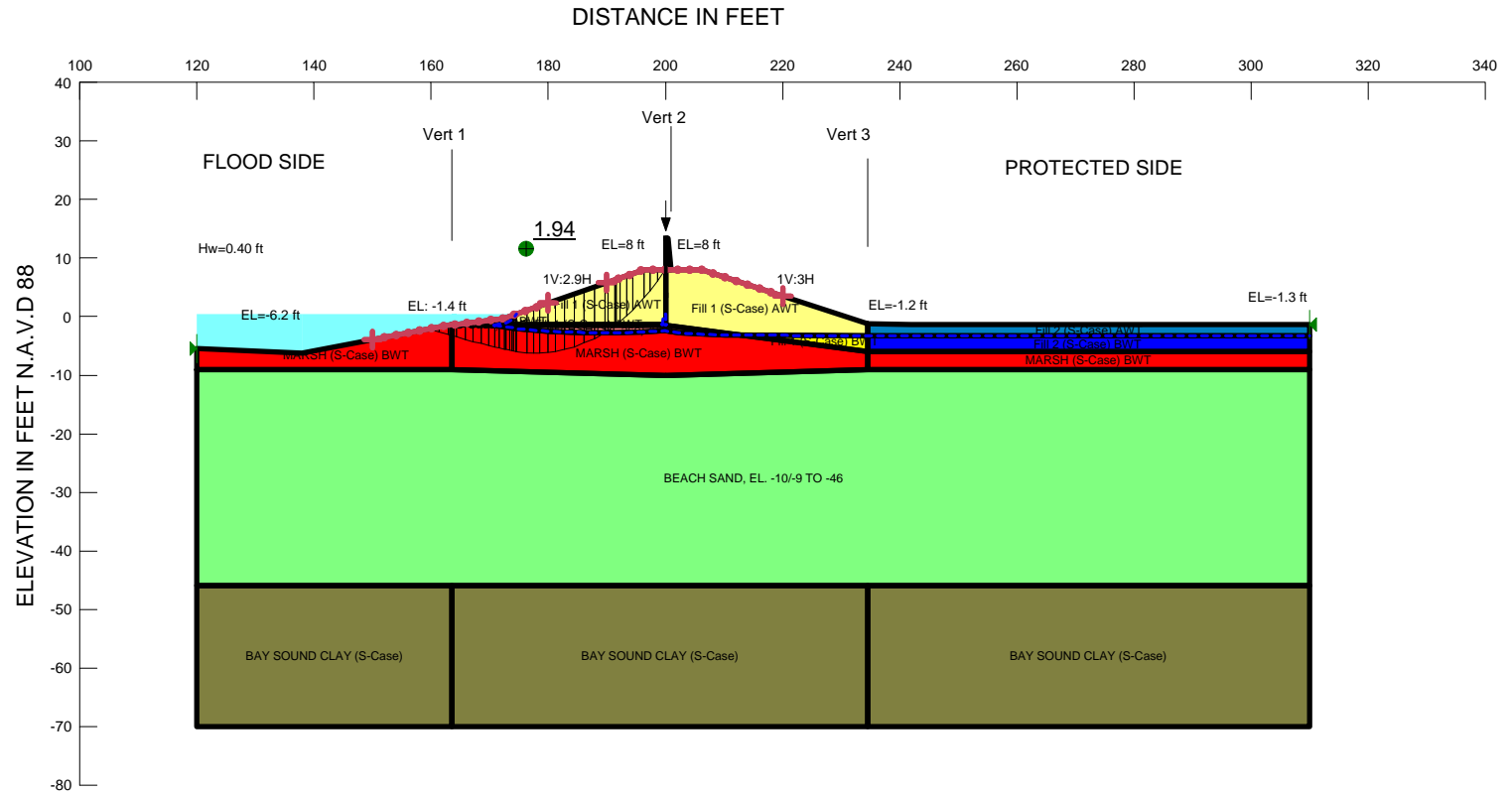
Line 8	4	22	Canal Water	Sheet Pile
Line 9	7	23		
Line 10	16	24		
Line 11	24	17		
Line 12	23	24		
Line 13	7	17	Curb	
Line 14	13	10	Drainage	
Line 15	10	5	Drainage	
Line 16	22	14		
Line 17	8	25		
Line 18	25	26		
Line 19	8	9	Curb	
Line 20	9	26		
Line 21	1	15	Canal Water	
Line 22	15	27	Canal Water	
Line 23	25	29		
Line 24	26	30		
Line 25	19	31		
Line 26	31	16		
Line 27	29	32		
Line 28	32	20		
Line 29	30	33		
Line 30	33	21		
Line 31	31	27		
Line 32	1	19		
Line 33	33	32		
Line 34	20	21		
Line 35	3	35	Canal Water	
Line 36	27	38		
Line 37	38	14		
Line 38	14	49		
Line 39	49	23		
Line 40	5	50		
Line 41	50	23		
Line 42	51	7	Curb	
Line 43	22	52		
Line 44	52	37		
Line 45	37	36		
Line 46	36	35		
Line 47	38	52		
Line 48	50	49		
Line 49	50	51		
Line 50	38	39		
Line 51	39	40		
Line 52	40	41		
Line 53	41	42		
Line 54	42	43		
Line 55	43	44		

Line 56	44	45		
Line 57	45	46		
Line 58	46	47		
Line 59	47	48		
Line 60	48	49		
Line 61	27	28	Canal Water	
Line 62	28	52		
Line 63	28	2	Canal Water	
Line 64	2	34	Canal Water	
Line 65	34	35	Canal Water	
Line 66	5	18	Drainage	
Line 67	18	6	Drainage	
Line 68	6	51	Curb	

Points

	X (ft)	Y (ft)
Point 1	120	-5.5
Point 2	172.5	-0.3
Point 3	196.4	8
Point 4	200	8
Point 5	234.5	-1.2
Point 6	310	-1.3
Point 7	310	-6
Point 8	310	-46
Point 9	310	-70
Point 10	206.2	8
Point 11	200	13.4
Point 12	200.5	13.4
Point 13	201	8
Point 14	200	-1.5
Point 15	137.9	-6.2
Point 16	200	-10
Point 17	310	-9
Point 18	242	-1.3
Point 19	120	-9
Point 20	120	-46
Point 21	120	-70
Point 22	200	-1.3
Point 23	234.5	-6
Point 24	234.5	-9
Point 25	234.5	-46
Point 26	234.5	-70
Point 27	163.5	-1.4
Point 28	164.3	-1.3
Point 29	200	-46
Point 30	200	-70
Point 31	163.5	-9

Point 32	163.5	-46
Point 33	163.5	-70
Point 34	173.36386	0
Point 35	174.51003	0.39804
Point 36	173.7675	-0.54028
Point 37	172.71215	-1.10516
Point 38	170.90455	-1.42029
Point 39	173.99896	-1.94007
Point 40	179.99562	-2.49161
Point 41	186.10557	-2.70112
Point 42	190.78472	-2.74114
Point 43	196.12226	-2.61793
Point 44	199.95662	-2.33197
Point 45	200.7052	-2.51873
Point 46	202.34527	-2.73696
Point 47	205.01699	-2.93536
Point 48	210.16602	-3.11458
Point 49	212.71213	-3.1581
Point 50	234.5	-3.23441
Point 51	310	-3.30107
Point 52	171.66371	-1.3



Name: Fill 1 (S-Case) AWT Model: Mohr-Coulomb Unit Weight: 110 pcf Cohesion: 75 psf Phi: 26 °
 Name: MARSH (S-Case) AWT Model: Spatial Mohr-Coulomb Unit Weight: 96 pcf Cohesion: 75 psf Phi: 24 °
 Name: BEACH SAND, EL. -10/-9 TO -46 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand
 Name: BAY SOUND CLAY (S-Case) Model: Spatial Mohr-Coulomb Unit Weight: 105 pcf Cohesion: 0 psf Phi: 26 °
 Name: Fill 2 (S-Case) BWT Model: Mohr-Coulomb Unit Weight: 110 pcf Cohesion: 0 psf Phi: 26 °
 Name: Fill 1 (S-Case) BWT Model: Mohr-Coulomb Unit Weight: 110 pcf Cohesion: 0 psf Phi: 26 °
 Name: Fill 2 (S-Case) AWT Model: Mohr-Coulomb Unit Weight: 110 pcf Cohesion: 75 psf Phi: 26 °
 Name: MARSH (S-Case) BWT Model: Spatial Mohr-Coulomb Unit Weight: 96 pcf Cohesion: 0 psf Phi: 24 °

GENERAL NOTES

CLASSIFICATION STRATIFICATION
 SHEAR STRENGTHS AND UNIT WEIGHTS OF
 THE SOIL WERE BASED ON THE RESULTS OF
 UNDISTURBED BORINGS AND CPT DATA. SEE
 BOTH BORING AND CPT DATA PLATES.

WHERE INDICATED, SHEAR STRENGTHS BETWEEN
 VERTICALS WERE ASSUMED TO VARY LINEARLY
 BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

Hw IS CANAL WATER LEVEL

LAKE PONTCHARTRAIN, LA. AND VICINITY
 HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 14,
 PROTECTED SIDE STABILITY ANALYSIS,
 CASE: NWL S-Case F/S (Entry/Exit)
 STA. 11+20 to 20+50 EAST
 ORLEANS PARISH, LOUISIANA

NWL S-Case F/S (Entry/Exit)

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File Information

Created By: [Liljegren, James](#)
Revision Number: [385](#)
Last Edited By: [Higgins, James](#)
Date: [7/7/2013](#)
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File Name: [Reach 14.gsz](#)
Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix F NWL\](#)
Last Solved Date: [7/7/2013](#)
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Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Strength Units: [psf](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

NWL S-Case F/S (Entry/Exit)

Kind: [SLOPE/W](#)
Parent: [Normal Water Level at +0.40ft \(seepage\)](#)
Method: [Spencer](#)
Settings
 PWP Conditions Source: [Parent Analysis](#)
Slip Surface
 Direction of movement: [Right to Left](#)
 Use Passive Mode: [No](#)
 Slip Surface Option: [Entry and Exit](#)
 Critical slip surfaces saved: [1](#)
 Optimize Critical Slip Surface Location: [Yes](#)
Tension Crack
 Tension Crack Option: [Search for Tension Crack](#)
 Percentage Wet: [0](#)
 Tension Crack Fluid Unit Weight: [62.4 pcf](#)
FOS Distribution
 FOS Calculation Option: [Constant](#)

Advanced

Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 2000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

Fill 1 (S-Case) AWT

Model: Mohr-Coulomb
Unit Weight: 110 pcf
Cohesion: 75 psf
Phi: 26 °
Phi-B: 0 °

MARSH (S-Case) AWT

Model: Spatial Mohr-Coulomb
Unit Weight: 96 pcf
Cohesion: 75 psf
Phi: 24 °
Phi-B: 0 °

BEACH SAND, EL. -10/-9 TO -46

Model: Shear/Normal Fn.
Unit Weight: 122 pcf
Strength Function: Sand
Phi-B: 0 °

BAY SOUND CLAY (S-Case)

Model: Spatial Mohr-Coulomb
Unit Weight: 105 pcf
Cohesion: 0 psf
Phi: 26 °
Phi-B: 0 °

Fill 2 (S-Case) BWT

Model: Mohr-Coulomb
Unit Weight: 110 pcf
Cohesion: 0 psf
Phi: 26 °
Phi-B: 0 °

Fill 1 (S-Case) BWT

Model: [Mohr-Coulomb](#)

Unit Weight: [110 pcf](#)

Cohesion: [0 psf](#)

Phi: [26 °](#)

Phi-B: [0 °](#)

Fill 2 (S-Case) AWT

Model: [Mohr-Coulomb](#)

Unit Weight: [110 pcf](#)

Cohesion: [75 psf](#)

Phi: [26 °](#)

Phi-B: [0 °](#)

MARSH (S-Case) BWT

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [96 pcf](#)

Cohesion: [0 psf](#)

Phi: [24 °](#)

Phi-B: [0 °](#)

Slip Surface Entry and Exit

Left Projection: [Range](#)

Left-Zone Left Coordinate: [\(150, -3.93125\) ft](#)

Left-Zone Right Coordinate: [\(180, 2.3046\) ft](#)

Left-Zone Increment: [15](#)

Right Projection: [Range](#)

Right-Zone Left Coordinate: [\(190, 5.7774\) ft](#)

Right-Zone Right Coordinate: [\(220, 3.51378\) ft](#)

Right-Zone Increment: [15](#)

Radius Increments: [15](#)

Slip Surface Limits

Left Coordinate: [\(120, -5.5\) ft](#)

Right Coordinate: [\(310, -1.3\) ft](#)

Reinforcements

Reinforcement 1

Type: [Pile](#)

Outside Point: [\(200, 13.4\) ft](#)

Inside Point: [\(200, 3.7\) ft](#)

Slip Surface Intersection: [\(0, 0\) ft](#)

Total Length: [9.7 ft](#)

Reinforcement Direction: 90 °
 Applied Load Option: Variable
 F of S Dependent: No
 Pile Spacing: 1 ft
 Shear Capacity: 81201 lbs
 Shear Safety Factor: 1
 Shear Load Used: 81201 lbs
 Shear Option: Parallel to Slip
 Resisting Force Used: 0 lbs/ft

Shear/Normal Strength Functions

Sand

Model: Spline Data Point Function
 Function: Shear Stress vs. Normal Stress
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
 Y-Intercept: 0
 Data Points: Normal Stress (psf), Shear Stress (psf)
 Data Point: (-10000, 0)
 Data Point: (0, 0)
 Data Point: (10000, 6494)
 Estimation Properties
 Intact Rock Param.: 10
 Geological Strength: 100
 Disturbance Factor: 0
 SigmaC: 600000 psf
 Sigma3: 300000 psf
 Num. Points: 20

Regions

	Points	Area (ft²)	Material
Region 1	4,11,12,13	4.05	
Region 2	35,3,4,22,52,37,36	155.3717	Fill 1 (S-Case) AWT
Region 3	19,31,16,24,17,8,25,29,32,20	6994.5	BEACH SAND, EL. -10/-9 TO -46
Region 4	26,30,33,32,29,25	1704	BAY SOUND CLAY (S-Case)
Region 5	23,50,51,7	206.28563	Fill 2 (S-Case) BWT
Region 6	24,23,7,17	226.5	MARSH (S-Case) BWT
Region 7	22,4,13,10,5,50,49,14	245.06677	Fill 1 (S-Case) AWT
Region 8	16,31,27,38,39,40,41,42,43,44,45,46,47,48,49,23,24	456.15178	MARSH (S-Case) BWT
Region 9	26,25,8,9	1812	BAY SOUND CLAY (S-Case)
Region 10	52,22,14,38	4.6138312	Fill 1 (S-Case) AWT
Region 11	27,15,1,19,31	189.505	MARSH (S-Case) BWT
Region 12	21,33,32,20	1044	BAY SOUND CLAY (S-Case)
Region 13	27,28,52,38	0.82123384	Fill 1 (S-Case) BWT
Region 14	28,2,34,35,36,37,52	5.293254	Fill 1 (S-Case) BWT

Region 15	38,39,40,41,42,43,44,45,46,47,48,49,14	36.048225	MARSH (S-Case) AWT
Region 16	49,50,23	30.128158	Fill 1 (S-Case) BWT
Region 17	5,18,6,51,50	148.93937	Fill 2 (S-Case) AWT

Points

	X (ft)	Y (ft)
Point 1	120	-5.5
Point 2	172.5	-0.3
Point 3	196.4	8
Point 4	200	8
Point 5	234.5	-1.2
Point 6	310	-1.3
Point 7	310	-6
Point 8	310	-46
Point 9	310	-70
Point 10	206.2	8
Point 11	200	13.4
Point 12	200.5	13.4
Point 13	201	8
Point 14	200	-1.5
Point 15	137.9	-6.2
Point 16	200	-10
Point 17	310	-9
Point 18	242	-1.3
Point 19	120	-9
Point 20	120	-46
Point 21	120	-70
Point 22	200	-1.3
Point 23	234.5	-6
Point 24	234.5	-9
Point 25	234.5	-46
Point 26	234.5	-70
Point 27	163.5	-1.4
Point 28	164.3	-1.3
Point 29	200	-46
Point 30	200	-70
Point 31	163.5	-9
Point 32	163.5	-46
Point 33	163.5	-70
Point 34	173.36386	0
Point 35	174.51003	0.39804
Point 36	173.7675	-0.54028
Point 37	172.71215	-1.10516
Point 38	170.90455	-1.42029
Point 39	173.99896	-1.94007
Point 40	179.99562	-2.49161
Point 41	186.10557	-2.70112

Point 42	190.78472	-2.74114
Point 43	196.12226	-2.61793
Point 44	199.95662	-2.33197
Point 45	200.7052	-2.51873
Point 46	202.34527	-2.73696
Point 47	205.01699	-2.93536
Point 48	210.16602	-3.11458
Point 49	212.71213	-3.1581
Point 50	234.5	-3.23441
Point 51	310	-3.30107
Point 52	171.66371	-1.3

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.94	(176.873, 19.493)	20.4022	(199.992, 8)	(159.65, -2.12187)
2	1626	1.97	(176.873, 19.493)	25.813	(199.987, 8)	(162.086, -1.66512)

Slices of Slip Surface: Optimized

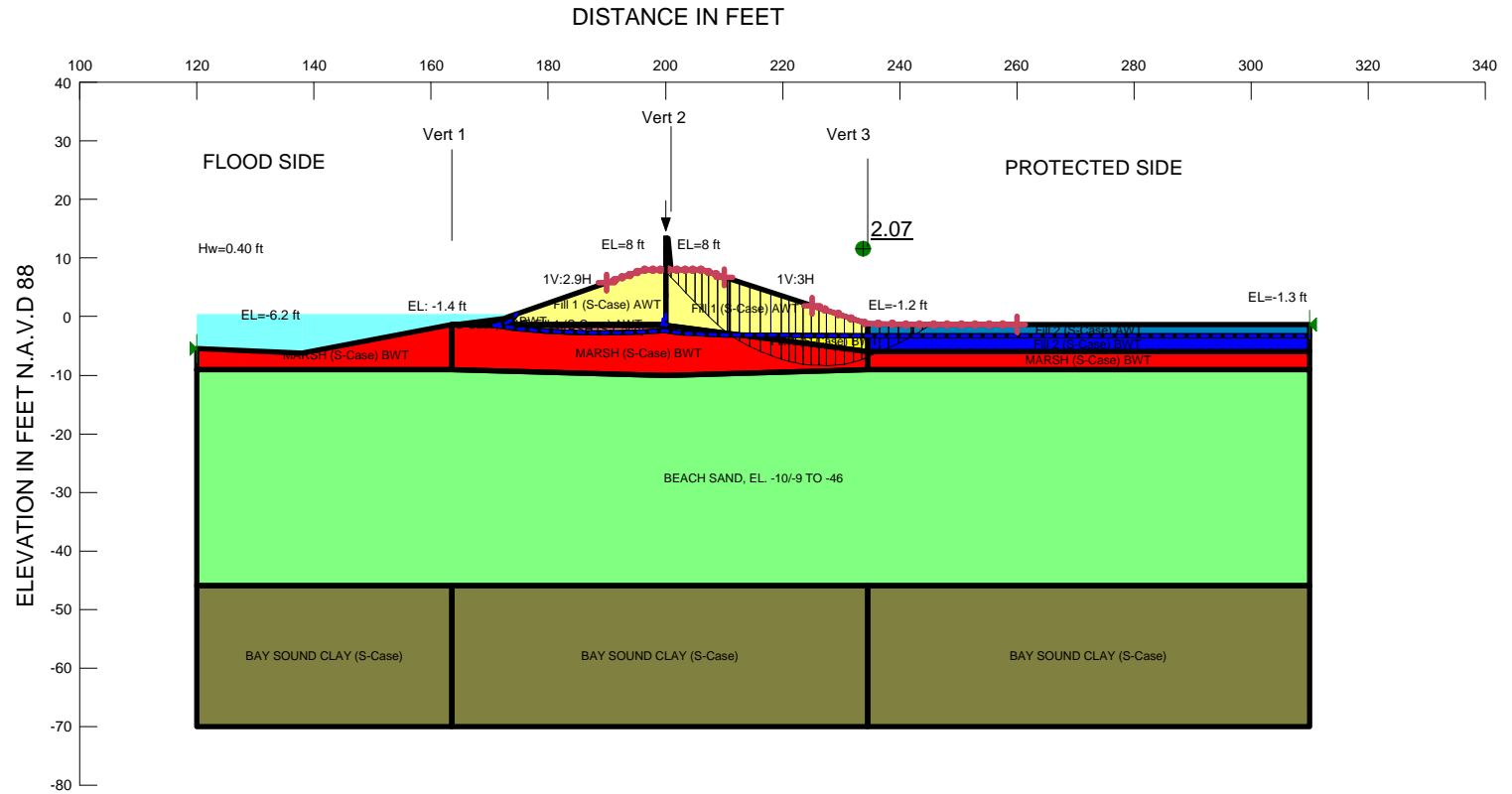
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	160.4772	-2.359146	159.59187	206.21552	20.758186	0
2	Optimized	162.13145	-2.8337085	163.32804	271.57811	48.196038	0
3	Optimized	163.2293	-3.1489545	164.92213	315.22862	66.920759	0
4	Optimized	163.9	-3.342132	163.86316	340.59082	78.684223	0
5	Optimized	165.0715	-3.6795675	162.50128	387.24676	100.06313	0
6	Optimized	166.5055	-4.0711265	164.6714	435.9478	120.78003	0
7	Optimized	167.8305	-4.4098	167.38424	482.55595	140.32348	0
8	Optimized	169.1555	-4.7484735	173.05853	528.81311	158.39214	0
9	Optimized	170.3613	-5.040562	179.32115	562.34453	170.533	0
10	Optimized	171.28415	-5.249076	184.78833	590.94491	180.83256	0
11	Optimized	172.08185	-5.4293135	190.19793	615.5802	189.39239	0
12	Optimized	172.6061	-5.5477555	193.86881	634.99551	196.40226	0
13	Optimized	173.03805	-5.6453455	196.96547	653.08423	203.07715	0
14	Optimized	173.5657	-5.764568	201.28831	675.10942	210.95875	0
15	Optimized	173.88325	-5.836315	203.98299	688.34355	215.65122	0
16	Optimized	174.19875	-5.9075965	206.69425	701.50553	220.30418	0
17	Optimized	174.45425	-5.9601245	208.64511	686.3125	212.67122	0
18	Optimized	175.4219	-6.0884095	212.50238	739.03474	234.42731	0
19	Optimized	176.88905	-6.21931	216.19091	780.28424	251.15053	0
20	Optimized	177.99955	-6.23933	214.97544	827.03017	272.50432	0
21	Optimized	179.2752	-6.171522	208.96054	832.72324	277.71705	0
22	Optimized	180.6088	-6.027467	198.84982	869.93249	298.78525	0
23	Optimized	182.01965	-5.76441	181.92574	855.92064	300.08186	0
24	Optimized	183.61495	-5.37077	157.57606	877.46471	320.51508	0
25	Optimized	185.2591	-4.8265695	124.56522	838.15811	317.71202	0
26	Optimized	186.97185	-4.1236845	82.188899	834.43732	334.92258	0
27	Optimized	188.7446	-3.249812	30.039014	773.19242	330.87321	0

28	Optimized	189.9411	-2.565607	-10.316069	741.65781	330.20733	75
29	Optimized	190.81925	-1.938115	-47.507879	663.6605	295.48069	75
30	Optimized	191.5198	-1.38823	-77.364444	635.88605	310.14235	75
31	Optimized	191.9667	-1.037425	-89.010127	619.24382	302.02539	75
32	Optimized	192.82705	-0.3016325	-113.29999	557.21968	271.7742	75
33	Optimized	193.87875	0.6448025	-143.83374	509.65912	248.57736	75
34	Optimized	195.4023	2.2065995	-194.24955	395.29158	192.79659	75
35	Optimized	196.9161	3.8582545	-254.0004	294.69179	143.73079	75
36	Optimized	198.0736	5.242125	-316.70468	173.01113	84.383165	75
37	Optimized	199.35335	7.03146	-415.41575	34.151808	16.65695	75

Slices of Slip Surface: 1626

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	1626	162.793	-2.1255865	137.99684	223.44038	38.041917	0
2	1626	163.9	-2.8186405	147.59919	314.48709	74.303281	0
3	1626	164.96045	-3.394989	153.2176	387.52313	104.31955	0
4	1626	166.28135	-4.0360685	165.25805	463.05251	132.58664	0
5	1626	167.60225	-4.5876645	176.89362	524.24463	154.65063	0
6	1626	168.92315	-5.0558345	188.40393	573.26391	171.3507	0
7	1626	170.2441	-5.4452945	199.12422	611.80069	183.7354	0
8	1626	171.28415	-5.7050595	206.96705	636.20442	191.10879	0
9	1626	172.08185	-5.868257	211.94123	650.78106	195.38408	0
10	1626	172.6061	-5.9650385	214.78798	662.26643	199.23024	0
11	1626	173.03805	-6.0317825	216.53157	672.31004	202.92565	0
12	1626	173.5657	-6.106823	218.84523	683.76694	206.99648	0
13	1626	173.88325	-6.146397	219.98139	690.00055	209.26601	0
14	1626	174.2545	-6.185955	220.97598	696.58433	211.75448	0
15	1626	175.1957	-6.2566915	222.01767	726.78918	224.73875	0
16	1626	176.5671	-6.3095055	221.78734	773.4631	245.62188	0
17	1626	177.9385	-6.289316	217.81815	811.03509	264.1172	0
18	1626	179.3099	-6.1959505	210.25704	839.75051	280.26855	0
19	1626	180.6066	-6.041583	199.6468	859.28447	293.68962	0
20	1626	181.8286	-5.832705	186.04823	870.48984	304.73304	0
21	1626	183.0506	-5.562521	169.23835	875.03377	314.24037	0
22	1626	184.2726	-5.229015	148.69676	872.72226	322.35692	0
23	1626	185.4946	-4.829575	124.51368	863.48925	329.01312	0
24	1626	186.75445	-4.3440365	95.18874	846.39106	334.45682	0
25	1626	188.05215	-3.7631745	60.431379	820.64218	338.46766	0
26	1626	189.34985	-3.092849	20.774384	786.14708	340.76588	0
27	1626	190.4803	-2.4355785	-18.068707	736.46611	327.89584	75
28	1626	191.4435	-1.807309	-54.837272	700.22622	311.7608	75
29	1626	192.0475	-1.388939	-76.98208	668.3964	325.99871	75
30	1626	192.8749	-0.74248975	-98.134603	621.81769	303.28075	75
31	1626	194.28495	0.45998475	-135.22897	535.62038	261.23951	75
32	1626	195.695	1.8573895	-177.3305	436.05264	212.67708	75
33	1626	196.99785	3.3553665	-227.67168	316.27287	154.25659	75
34	1626	198.1935	4.9790975	-301.06742	179.06662	87.336624	75

35	1626	199.38915	6.928646	-409.09063	32.803461	15.999317	75
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Name: Fill 1 (S-Case) AWT Model: Mohr-Coulomb Unit Weight: 110 pcf Cohesion: 75 psf Phi: 26 °
 Name: MARSH (S-Case) AWT Model: Spatial Mohr-Coulomb Unit Weight: 96 pcf Cohesion: 75 psf Phi: 24 °
 Name: BEACH SAND, EL. -10/-9 TO -46 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand
 Name: BAY SOUND CLAY (S-Case) Model: Spatial Mohr-Coulomb Unit Weight: 105 pcf Cohesion: 0 psf Phi: 26 °
 Name: Fill 2 (S-Case) BWT Model: Mohr-Coulomb Unit Weight: 110 pcf Cohesion: 0 psf Phi: 26 °
 Name: Fill 1 (S-Case) BWT Model: Mohr-Coulomb Unit Weight: 110 pcf Cohesion: 0 psf Phi: 26 °
 Name: Fill 2 (S-Case) AWT Model: Mohr-Coulomb Unit Weight: 110 pcf Cohesion: 75 psf Phi: 26 °
 Name: MARSH (S-Case) BWT Model: Spatial Mohr-Coulomb Unit Weight: 96 pcf Cohesion: 0 psf Phi: 24 °

GENERAL NOTES

CLASSIFICATION STRATIFICATION
 SHEAR STRENGTHS AND UNIT WEIGHTS OF
 THE SOIL WERE BASED ON THE RESULTS OF
 UNDISTURBED BORINGS AND CPT DATA. SEE
 BOTH BORING AND CPT DATA PLATES.

WHERE INDICATED, SHEAR STRENGTHS BETWEEN
 VERTICALS WERE ASSUMED TO VARY LINEARLY
 BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

Hw IS CANAL WATER LEVEL

LAKE PONTCHARTRAIN, LA. AND VICINITY
 HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 14,
 PROTECTED SIDE STABILITY ANALYSIS,
 CASE: NWL S-Case P/S (Entry/Exit)
 STA. 11+20 to 20+50 EAST
 ORLEANS PARISH, LOUISIANA

NWL S-Case P/S (Entry/Exit)

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File Information

Created By: [Liljegren, James](#)
Revision Number: [385](#)
Last Edited By: [Higgins, James](#)
Date: [7/7/2013](#)
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File Name: [Reach 14.gsz](#)
Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix F NWL\](#)
Last Solved Date: [7/7/2013](#)
Last Solved Time: [11:45:18 PM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Strength Units: [psf](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

NWL S-Case P/S (Entry/Exit)

Kind: [SLOPE/W](#)
Parent: [Normal Water Level at +0.40ft \(seepage\)](#)
Method: [Spencer](#)
Settings
 PWP Conditions Source: [Parent Analysis](#)
Slip Surface
 Direction of movement: [Left to Right](#)
 Use Passive Mode: [No](#)
 Slip Surface Option: [Entry and Exit](#)
 Critical slip surfaces saved: [1](#)
 Optimize Critical Slip Surface Location: [Yes](#)
Tension Crack
 Tension Crack Option: [Search for Tension Crack](#)
 Percentage Wet: [0](#)
 Tension Crack Fluid Unit Weight: [62.4 pcf](#)
FOS Distribution
 FOS Calculation Option: [Constant](#)

Advanced

Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 2000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

Fill 1 (S-Case) AWT

Model: Mohr-Coulomb
Unit Weight: 110 pcf
Cohesion: 75 psf
Phi: 26 °
Phi-B: 0 °

MARSH (S-Case) AWT

Model: Spatial Mohr-Coulomb
Unit Weight: 96 pcf
Cohesion: 75 psf
Phi: 24 °
Phi-B: 0 °

BEACH SAND, EL. -10/-9 TO -46

Model: Shear/Normal Fn.
Unit Weight: 122 pcf
Strength Function: Sand
Phi-B: 0 °

BAY SOUND CLAY (S-Case)

Model: Spatial Mohr-Coulomb
Unit Weight: 105 pcf
Cohesion: 0 psf
Phi: 26 °
Phi-B: 0 °

Fill 2 (S-Case) BWT

Model: Mohr-Coulomb
Unit Weight: 110 pcf
Cohesion: 0 psf
Phi: 26 °
Phi-B: 0 °

Fill 1 (S-Case) BWT

Model: [Mohr-Coulomb](#)

Unit Weight: [110 pcf](#)

Cohesion: [0 psf](#)

Phi: [26 °](#)

Phi-B: [0 °](#)

Fill 2 (S-Case) AWT

Model: [Mohr-Coulomb](#)

Unit Weight: [110 pcf](#)

Cohesion: [75 psf](#)

Phi: [26 °](#)

Phi-B: [0 °](#)

MARSH (S-Case) BWT

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [96 pcf](#)

Cohesion: [0 psf](#)

Phi: [24 °](#)

Phi-B: [0 °](#)

Slip Surface Entry and Exit

Left Projection: [Range](#)

Left-Zone Left Coordinate: [\(190, 5.7774\) ft](#)

Left-Zone Right Coordinate: [\(210, 6.76466\) ft](#)

Left-Zone Increment: [15](#)

Right Projection: [Range](#)

Right-Zone Left Coordinate: [\(225, 1.88834\) ft](#)

Right-Zone Right Coordinate: [\(260, -1.3\) ft](#)

Right-Zone Increment: [15](#)

Radius Increments: [15](#)

Slip Surface Limits

Left Coordinate: [\(120, -5.5\) ft](#)

Right Coordinate: [\(310, -1.3\) ft](#)

Reinforcements

Reinforcement 1

Type: [Pile](#)

Outside Point: [\(200, 13.4\) ft](#)

Inside Point: [\(200, 3.7\) ft](#)

Slip Surface Intersection: [\(0, 0\) ft](#)

Total Length: [9.7 ft](#)

Reinforcement Direction: 90 °
 Applied Load Option: Variable
 F of S Dependent: No
 Pile Spacing: 1 ft
 Shear Capacity: 81201 lbs
 Shear Safety Factor: 1
 Shear Load Used: 81201 lbs
 Shear Option: Parallel to Slip
 Resisting Force Used: 0 lbs/ft

Shear/Normal Strength Functions

Sand

Model: Spline Data Point Function
 Function: Shear Stress vs. Normal Stress
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
 Y-Intercept: 0
 Data Points: Normal Stress (psf), Shear Stress (psf)
 Data Point: (-10000, 0)
 Data Point: (0, 0)
 Data Point: (10000, 6494)
 Estimation Properties
 Intact Rock Param.: 10
 Geological Strength: 100
 Disturbance Factor: 0
 SigmaC: 600000 psf
 Sigma3: 300000 psf
 Num. Points: 20

Regions

	Points	Area (ft²)	Material
Region 1	4,11,12,13	4.05	
Region 2	35,3,4,22,52,37,36	155.3717	Fill 1 (S-Case) AWT
Region 3	19,31,16,24,17,8,25,29,32,20	6994.5	BEACH SAND, EL. -10/-9 TO -46
Region 4	26,30,33,32,29,25	1704	BAY SOUND CLAY (S-Case)
Region 5	23,50,51,7	206.28563	Fill 2 (S-Case) BWT
Region 6	24,23,7,17	226.5	MARSH (S-Case) BWT
Region 7	22,4,13,10,5,50,49,14	245.06677	Fill 1 (S-Case) AWT
Region 8	16,31,27,38,39,40,41,42,43,44,45,46,47,48,49,23,24	456.15178	MARSH (S-Case) BWT
Region 9	26,25,8,9	1812	BAY SOUND CLAY (S-Case)
Region 10	52,22,14,38	4.6138312	Fill 1 (S-Case) AWT
Region 11	27,15,1,19,31	189.505	MARSH (S-Case) BWT
Region 12	21,33,32,20	1044	BAY SOUND CLAY (S-Case)
Region 13	27,28,52,38	0.82123384	Fill 1 (S-Case) BWT
Region 14	28,2,34,35,36,37,52	5.293254	Fill 1 (S-Case) BWT

Region 15	38,39,40,41,42,43,44,45,46,47,48,49,14	36.048225	MARSH (S-Case) AWT
Region 16	49,50,23	30.128158	Fill 1 (S-Case) BWT
Region 17	5,18,6,51,50	148.93937	Fill 2 (S-Case) AWT

Points

	X (ft)	Y (ft)
Point 1	120	-5.5
Point 2	172.5	-0.3
Point 3	196.4	8
Point 4	200	8
Point 5	234.5	-1.2
Point 6	310	-1.3
Point 7	310	-6
Point 8	310	-46
Point 9	310	-70
Point 10	206.2	8
Point 11	200	13.4
Point 12	200.5	13.4
Point 13	201	8
Point 14	200	-1.5
Point 15	137.9	-6.2
Point 16	200	-10
Point 17	310	-9
Point 18	242	-1.3
Point 19	120	-9
Point 20	120	-46
Point 21	120	-70
Point 22	200	-1.3
Point 23	234.5	-6
Point 24	234.5	-9
Point 25	234.5	-46
Point 26	234.5	-70
Point 27	163.5	-1.4
Point 28	164.3	-1.3
Point 29	200	-46
Point 30	200	-70
Point 31	163.5	-9
Point 32	163.5	-46
Point 33	163.5	-70
Point 34	173.36386	0
Point 35	174.51003	0.39804
Point 36	173.7675	-0.54028
Point 37	172.71215	-1.10516
Point 38	170.90455	-1.42029
Point 39	173.99896	-1.94007
Point 40	179.99562	-2.49161
Point 41	186.10557	-2.70112

Point 42	190.78472	-2.74114
Point 43	196.12226	-2.61793
Point 44	199.95662	-2.33197
Point 45	200.7052	-2.51873
Point 46	202.34527	-2.73696
Point 47	205.01699	-2.93536
Point 48	210.16602	-3.11458
Point 49	212.71213	-3.1581
Point 50	234.5	-3.23441
Point 51	310	-3.30107
Point 52	171.66371	-1.3

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	2.07	(226.916, 21.412)	21.75962	(200.5, 8)	(245.466, -1.3)
2	2202	2.08	(226.916, 21.412)	29.54	(201, 8)	(245.804, -1.3)

Slices of Slip Surface: Optimized

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	200.75	7.0454325	-603.04876	51.394443	25.066745	75
2	Optimized	201.6277	6.095262	-545.69817	126.58187	61.738102	75
3	Optimized	202.88305	4.7362205	-463.63264	234.127	114.19137	75
4	Optimized	204.26575	3.270525	-375.80972	355.36998	173.32552	75
5	Optimized	205.6104	1.8806515	-293.74941	469.45631	228.96914	75
6	Optimized	206.80145	0.6611365	-222.45341	551.86126	269.16072	75
7	Optimized	208.17885	-0.6454575	-146.45552	649.64067	316.85093	75
8	Optimized	209.73075	-2.0270125	-65.613804	723.03688	352.64865	75
9	Optimized	210.64525	-2.8121855	-19.331124	821.28126	400.56564	75
10	Optimized	210.94835	-3.018673	-6.9325627	837.18134	372.73715	75
11	Optimized	211.87805	-3.6520025	31.338216	879.60005	377.6705	0
12	Optimized	213.5536	-4.642492	91.488195	962.77156	387.92035	0
13	Optimized	215.33995	-5.563232	147.77408	990.40344	375.16276	0
14	Optimized	217.09985	-6.3374425	195.2714	1051.8088	381.35503	0
15	Optimized	218.8677	-6.9828875	235.02707	1055.2095	365.16873	0
16	Optimized	220.38415	-7.447675	263.72801	1095.094	370.148	0
17	Optimized	221.64925	-7.731805	281.27388	1080.4403	355.81182	0
18	Optimized	222.91435	-8.015935	298.85832	1065.7866	341.45848	0
19	Optimized	224.20555	-8.1998565	310.22798	1093.4873	348.72953	0
20	Optimized	225.5229	-8.28357	315.3492	1056.366	329.92195	0
21	Optimized	226.84025	-8.3672835	320.49315	1019.2447	311.10425	0
22	Optimized	228.27275	-8.334685	318.37114	1017.3316	311.19723	0
23	Optimized	229.82045	-8.185775	308.99404	946.00644	283.61619	0
24	Optimized	231.3384	-7.9142975	291.97445	914.20242	277.03374	0
25	Optimized	232.8266	-7.5202525	267.31035	814.88343	243.79524	0
26	Optimized	234.03535	-7.116668	242.06149	774.82883	237.2033	0
27	Optimized	235.54145	-6.447108	200.20724	679.45082	213.37299	0

28	Optimized	237.3811	-5.6209525	148.56227	588.20511	214.42814	0
29	Optimized	238.97745	-4.8946375	103.15827	491.54697	189.42983	0
30	Optimized	240.8878	-3.9598925	44.731127	377.88946	162.49218	0
31	Optimized	242.14305	-3.3147945	4.4114469	290.76873	139.66578	0
32	Optimized	242.2978	-3.235277	-0.55866304	312.2829	152.31055	75
33	Optimized	243.0987	-2.7469525	-31.073649	259.31558	126.47666	75
34	Optimized	244.6771	-1.7823175	-91.348885	112.23728	54.741779	75

Slices of Slip Surface: 2202

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	2202	201.86665	5.8410115	-530.3525	116.37724	56.760973	75
2	2202	203.6	3.3292885	-377.6755	322.58692	157.33615	75
3	2202	205.33335	1.2825632	-256.2242	511.03183	249.24688	75
4	2202	206.8331	-0.2340582	-168.20948	645.47654	314.81994	75
5	2202	208.0993	-1.3449304	-104.04741	727.87539	355.00855	75
6	2202	209.3655	-2.3362925	-46.475499	801.28857	390.81455	75
7	2202	210.229	-2.9618815	-9.6965959	853.53398	380.01781	75
8	2202	211.0226	-3.479195	21.492784	902.19859	392.11549	0
9	2202	212.14895	-4.163965	62.765302	945.689	393.10296	0
10	2202	213.4384	-4.861679	105.15909	987.33276	392.76903	0
11	2202	214.89095	-5.558035	147.61447	1025.4288	390.82814	0
12	2202	216.34345	-6.1603235	184.47034	1054.2907	387.26899	0
13	2202	217.79595	-6.6746195	216.08497	1074.3352	382.11762	0
14	2202	219.2485	-7.1056995	242.60923	1085.8277	375.42506	0
15	2202	220.70105	-7.457303	264.28878	1089.111	367.2345	0
16	2202	222.15355	-7.7323145	281.26353	1084.3281	357.54738	0
17	2202	223.60605	-7.932894	293.63092	1071.4679	346.31534	0
18	2202	225.0586	-8.060565	301.48309	1050.6354	333.54409	0
19	2202	226.51115	-8.116275	304.86122	1021.7112	319.16217	0
20	2202	227.96365	-8.100433	303.78275	984.56077	303.1019	0
21	2202	229.41615	-8.012923	298.23839	938.97487	285.27426	0
22	2202	230.8687	-7.8531005	288.1866	884.61824	265.54848	0
23	2202	232.32125	-7.619768	273.545	821.05463	243.76699	0
24	2202	233.77375	-7.31113	254.21266	747.71187	219.72	0
25	2202	235.35605	-6.8823435	227.37411	687.91512	205.04607	0
26	2202	237.0682	-6.313483	191.78129	640.69692	199.87012	0
27	2202	238.6036	-5.707235	153.87548	588.79475	212.1243	0
28	2202	239.96215	-5.0799365	114.66693	519.90708	197.64882	0
29	2202	241.3207	-4.365801	70.030945	437.55365	179.2528	0
30	2202	242.5939	-3.61414	23.064953	347.70802	158.33901	0
31	2202	243.84185	-2.7845445	-28.768443	280.58096	136.84848	75
32	2202	245.14995	-1.813504	-89.429648	137.17196	66.903235	75

Normal Water Level at +0.40ft (seepage)

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File Information

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Revision Number: [359](#)
Last Edited By: [Higgins, James](#)
Date: [7/8/2013](#)
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File Name: [Reach 15.gsz](#)
Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix F NWL\](#)
Last Solved Date: [7/8/2013](#)
Last Solved Time: [12:42:54 AM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Mass(M) Units: [lbs](#)
Mass Flux Units: [lbs/sec](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

Normal Water Level at +0.40ft (seepage)

Kind: [SEEP/W](#)
Method: [Steady-State](#)
Settings
 Include Air Flow: [No](#)
Control
 Apply Runoff: [No](#)
Convergence
 Convergence Type: [Head Vector Norm](#)
 Maximum Number of Iterations: [500](#)
 Tolerance: [0.001](#)
 Maximum Change in K: [0.1](#)
 Rate of Change in K: [1.02](#)
 Minimum Change in K: [1e-005](#)
 Equation Solver: [Parallel Direct](#)
 Potential Seepage Max # of Reviews: [10](#)
Time

Starting Time: 0 sec

Duration: 0 sec

Ending Time: 0 sec

Materials

Fill 1 (S-Case) AWT

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-008 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

BEACH SAND, EL. -14/15 TO -48

Model: Saturated Only

Hydraulic

K-Sat: 0.00049 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

BAY SOUND CLAY (S-Case)

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-008 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

Sheet Pile

Model: Saturated Only

Hydraulic

K-Sat: 1e-010 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

MARSH, EL. -1.5 TO -14/-15

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-007 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

Boundary Conditions

Drainage

Review: true
Type: Total Flux (Q) 0

Canal Water

Type: Head (H) 0.4

Curb

Type: Head (H) -4

Regions

	Points	Area (ft²)	Material
Region 1	3,11,12,13	4.05	
Region 2	2,3,22,45,44,43,42,41	154.21186	Fill 1 (S-Case) AWT
Region 3	3,13,9,4,24,14,46,45,22	244.20126	Fill 1 (S-Case) AWT
Region 4	60,25,10,30,1,38,46,47,48,49,50,51,52,53,54,55,56,57,58,59	313.7886	MARSH, EL. -1.5 TO -14/-15
Region 5	19,31,15,26,16,7,34,28,32,20	6424.2	BEACH SAND, EL. -14/15 TO -48
Region 6	7,8,35,29,33,21,20,32,28,34	4180	BAY SOUND CLAY (S-Case)
Region 7	30,10,25,26,15,31	501.2	MARSH, EL. -1.5 TO -14/-15
Region 8	24,4,17,5,27	71.43	Fill 1 (S-Case) AWT
Region 9	25,60,61,6	250.4099	MARSH, EL. -1.5 TO -14/-15
Region 10	26,25,6,16	461.5	MARSH, EL. -1.5 TO -14/-15
Region 11	19,31,30,18	308.1	MARSH, EL. -1.5 TO -14/-15
Region 12	18,23,36,37,1,30	150.215	MARSH, EL. -1.5 TO -14/-15
Region 13	38,39,45,46	0.995037	Fill 1 (S-Case) AWT
Region 14	39,40,42,43,44,45	4.1811208	Fill 1 (S-Case) AWT
Region 15	46,47,48,49,50,51,52,53,54,55,56,57,58,59,60,24,14	86.186402	MARSH, EL. -1.5 TO -14/-15
Region 16	24,27,61,60	69.0901	MARSH, EL. -1.5 TO -14/-15

Lines

	Start Point	End Point	Hydraulic Boundary	Left Side Material
Line 1	3	11	Canal Water	

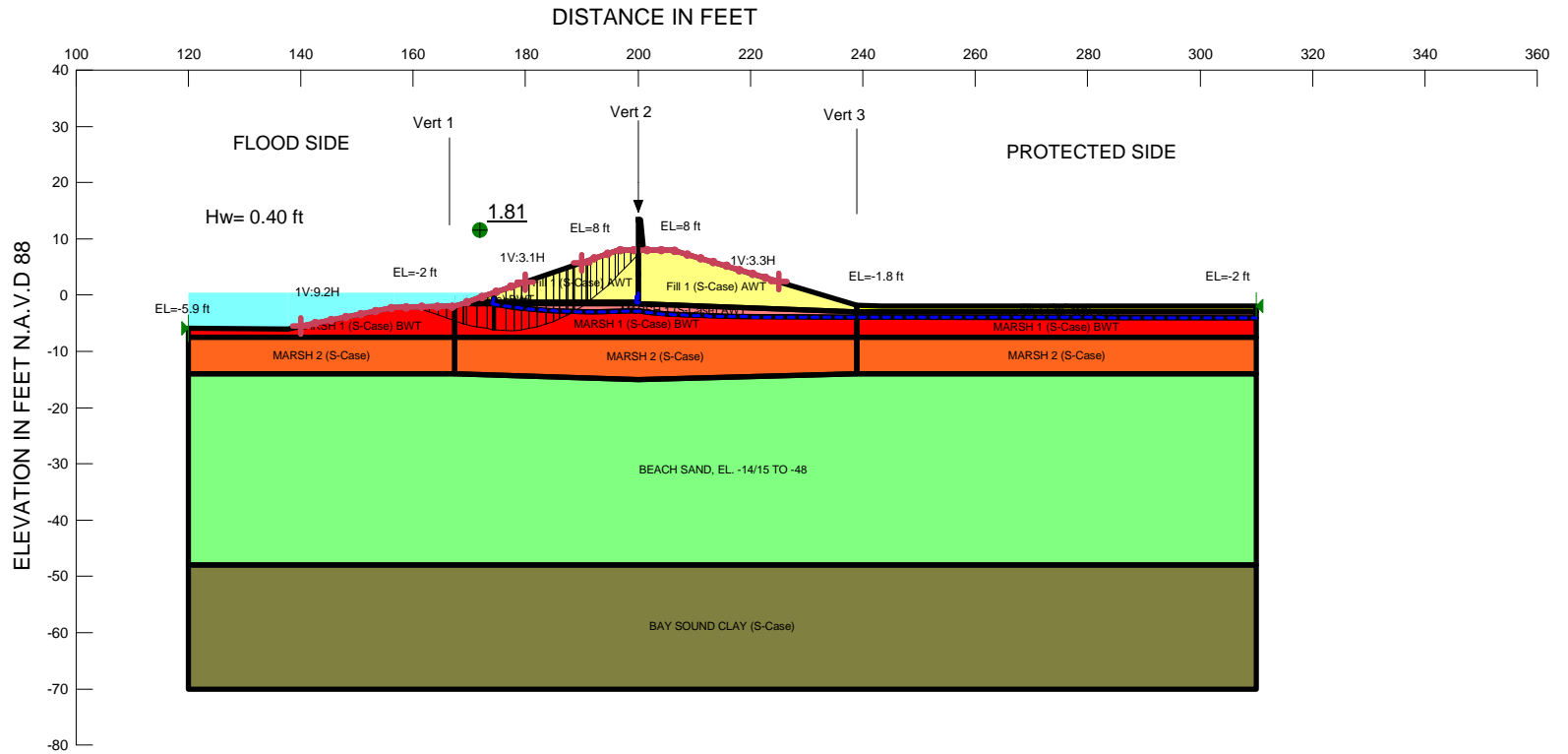
Line 2	11	12		
Line 3	12	13	Drainage	
Line 4	13	3		Sheet Pile
Line 5	2	3	Canal Water	
Line 6	13	9	Drainage	
Line 7	7	8	Curb	
Line 8	16	7	Curb	
Line 9	4	9	Drainage	
Line 10	20	21		
Line 11	19	20		
Line 12	3	22	Canal Water	Sheet Pile
Line 13	25	10		
Line 14	15	26		
Line 15	26	16		
Line 16	24	4		
Line 17	4	17	Drainage	
Line 18	17	5	Drainage	
Line 19	5	27	Curb	
Line 20	27	24		
Line 21	24	14		
Line 22	25	26		
Line 23	6	25		
Line 24	6	16	Curb	
Line 25	22	14		
Line 26	10	30		
Line 27	30	18		
Line 28	19	31		
Line 29	31	15		
Line 30	28	32		
Line 31	32	20		
Line 32	29	33		
Line 33	33	21		
Line 34	7	34		
Line 35	34	28		
Line 36	8	35		
Line 37	35	29		
Line 38	1	38	Canal Water	
Line 39	31	30		
Line 40	18	19		
Line 41	30	1		
Line 42	18	23		
Line 43	23	36	Canal Water	
Line 44	36	37	Canal Water	
Line 45	37	1	Canal Water	
Line 46	41	2	Canal Water	
Line 47	42	41	Canal Water	
Line 48	14	46		
Line 49	46	38		

Line 50	25	60		
Line 51	61	6	Curb	
Line 52	45	22		
Line 53	45	44		
Line 54	44	43		
Line 55	43	42		
Line 56	46	45		
Line 57	46	47		
Line 58	47	48		
Line 59	48	49		
Line 60	49	50		
Line 61	50	51		
Line 62	51	52		
Line 63	52	53		
Line 64	53	54		
Line 65	54	55		
Line 66	55	56		
Line 67	56	57		
Line 68	57	58		
Line 69	58	59		
Line 70	59	60		
Line 71	60	61		
Line 72	38	39	Canal Water	
Line 73	39	45		
Line 74	39	40	Canal Water	
Line 75	40	42	Canal Water	
Line 76	60	24		
Line 77	27	61	Curb	

Points

	X (ft)	Y (ft)
Point 1	167.4	-2
Point 2	196.5	8
Point 3	200	8
Point 4	239	-1.8
Point 5	310	-2
Point 6	310	-7.5
Point 7	310	-48
Point 8	310	-70
Point 9	206.2	8
Point 10	200	-7.5
Point 11	200	13.4
Point 12	200.5	13.4
Point 13	201	8
Point 14	200	-1.5
Point 15	200	-15
Point 16	310	-14

Point 17	243.3	-2
Point 18	120	-7.5
Point 19	120	-14
Point 20	120	-48
Point 21	120	-70
Point 22	200	-1.3
Point 23	120	-5.9
Point 24	239	-3
Point 25	239	-7.5
Point 26	239	-14
Point 27	310	-3
Point 28	200	-48
Point 29	200	-70
Point 30	167.4	-7.5
Point 31	167.4	-14
Point 32	167.4	-48
Point 33	167.4	-70
Point 34	239	-48
Point 35	239	-70
Point 36	137.7	-6
Point 37	156.5	-2.2
Point 38	168.9	-1.5
Point 39	169.437	-1.3
Point 40	173.22	0
Point 41	187.188	4.8
Point 42	174.38329	0.39976
Point 43	174.42687	-0.42973
Point 44	174.3079	-1.08898
Point 45	174.17232	-1.3
Point 46	174.11505	-1.5
Point 47	177.94873	-2.17277
Point 48	183.65644	-2.71481
Point 49	187.54754	-2.90069
Point 50	192.00321	-2.98248
Point 51	196.62137	-2.90754
Point 52	198.83543	-2.78793
Point 53	199.41785	-2.79619
Point 54	199.99615	-2.76727
Point 55	200.53069	-2.90257
Point 56	201.22089	-2.96968
Point 57	202.46422	-3.15762
Point 58	205.93234	-3.45586
Point 59	216.59977	-3.81938
Point 60	239	-3.94658
Point 61	310	-3.99962



Name: Fill 1 (S-Case) AWT Model: Mohr-Coulomb Unit Weight: 111 pcf Cohesion: 75 psf Phi: 26 °
Name: MARSH 1 (S-Case) AWT Model: Spatial Mohr-Coulomb Unit Weight: 93 pcf Cohesion: 75 psf Phi: 24 °
Name: BEACH SAND, EL. -14/15 TO -48 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand
Name: BAY SOUND CLAY (S-Case) Model: Spatial Mohr-Coulomb Unit Weight: 105 pcf Cohesion: 0 psf Phi: 26 °
Name: MARSH 2 (S-Case) Model: Spatial Mohr-Coulomb Unit Weight: 93 pcf Cohesion: 0 psf Phi: 24 °
Name: Fill 2 (S-Case) Model: Spatial Mohr-Coulomb Unit Weight: 111 pcf Cohesion: 75 psf Phi: 26 °
Name: Fill 1 (S-Case) BWT Model: Mohr-Coulomb Unit Weight: 111 pcf Cohesion: 0 psf Phi: 26 °
Name: MARSH 1 (S-Case) BWT Model: Spatial Mohr-Coulomb Unit Weight: 93 pcf Cohesion: 0 psf Phi: 24 °

GENERAL NOTES

CLASSIFICATION STRATIFICATION
SHEAR STRENGTHS AND UNIT WEIGHTS OF
THE SOIL WERE BASED ON THE RESULTS OF
UNDISTURBED BORINGS AND CPT DATA. SEE
BOTH BORING AND CPT DATA PLATES.

WHERE INDICATED, SHEAR STRENGTHS BETWEEN
VERTICALS WERE ASSUMED TO VARY LINEARLY
BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

Hw IS CANAL WATER LEVEL

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 15,
PROTECTED SIDE STABILITY ANALYSIS,
CASE: NWL S-Case F/S (Entry/Exit)
STA. 20+50 TO 30+00 EAST
ORLEANS PARISH, LOUISIANA

NWL S-Case F/S (Entry/Exit)

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File Information

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Revision Number: [360](#)
Last Edited By: [Higgins, James](#)
Date: [7/8/2013](#)
Time: [12:52:51 AM](#)
File Name: [Reach 15.gsz](#)
Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix F NWL\](#)
Last Solved Date: [7/8/2013](#)
Last Solved Time: [12:56:46 AM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Strength Units: [psf](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

NWL S-Case F/S (Entry/Exit)

Kind: [SLOPE/W](#)
Parent: [Normal Water Level at +0.40ft \(seepage\)](#)
Method: [Spencer](#)
Settings
 PWP Conditions Source: [Parent Analysis](#)
Slip Surface
 Direction of movement: [Right to Left](#)
 Use Passive Mode: [No](#)
 Slip Surface Option: [Entry and Exit](#)
 Critical slip surfaces saved: [1](#)
 Optimize Critical Slip Surface Location: [Yes](#)
Tension Crack
 Tension Crack Option: [Search for Tension Crack](#)
 Percentage Wet: [0](#)
 Tension Crack Fluid Unit Weight: [62.4 pcf](#)
FOS Distribution
 FOS Calculation Option: [Constant](#)

Advanced

Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 2000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

Fill 1 (S-Case) AWT

Model: Mohr-Coulomb
Unit Weight: 111 pcf
Cohesion: 75 psf
Phi: 26 °
Phi-B: 0 °

MARSH 1 (S-Case) AWT

Model: Spatial Mohr-Coulomb
Unit Weight: 93 pcf
Cohesion: 75 psf
Phi: 24 °
Phi-B: 0 °

BEACH SAND, EL. -14/15 TO -48

Model: Shear/Normal Fn.
Unit Weight: 122 pcf
Strength Function: Sand
Phi-B: 0 °

BAY SOUND CLAY (S-Case)

Model: Spatial Mohr-Coulomb
Unit Weight: 105 pcf
Cohesion: 0 psf
Phi: 26 °
Phi-B: 0 °

MARSH 2 (S-Case)

Model: Spatial Mohr-Coulomb
Unit Weight: 93 pcf
Cohesion: 0 psf
Phi: 24 °
Phi-B: 0 °

Fill 2 (S-Case)

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [111 pcf](#)

Cohesion: [75 psf](#)

Phi: [26 °](#)

Phi-B: [0 °](#)

Fill 1 (S-Case) BWT

Model: [Mohr-Coulomb](#)

Unit Weight: [111 pcf](#)

Cohesion: [0 psf](#)

Phi: [26 °](#)

Phi-B: [0 °](#)

MARSH 1 (S-Case) BWT

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [93 pcf](#)

Cohesion: [0 psf](#)

Phi: [24 °](#)

Phi-B: [0 °](#)

Slip Surface Entry and Exit

Left Projection: [Range](#)

Left-Zone Left Coordinate: [\(140, -5.53511\) ft](#)

Left-Zone Right Coordinate: [\(180, 2.3299\) ft](#)

Left-Zone Increment: [15](#)

Right Projection: [Range](#)

Right-Zone Left Coordinate: [\(190, 5.76632\) ft](#)

Right-Zone Right Coordinate: [\(225, 2.38293\) ft](#)

Right-Zone Increment: [15](#)

Radius Increments: [15](#)

Slip Surface Limits

Left Coordinate: [\(120, -5.9\) ft](#)

Right Coordinate: [\(310, -2\) ft](#)

Reinforcements

Reinforcement 1

Type: [Pile](#)

Outside Point: [\(200, 13.4\) ft](#)

Inside Point: [\(200, 3.7\) ft](#)

Slip Surface Intersection: [\(200, 7.391\) ft](#)

Total Length: [9.7 ft](#)

Reinforcement Direction: 90 °
Applied Load Option: Variable
F of S Dependent: No
Pile Spacing: 1 ft
Shear Capacity: 1e-007 lbs
Shear Safety Factor: 1
Shear Load Used: 1e-007 lbs
Shear Option: Parallel to Slip
Resisting Force Used: 0 lbs/ft

Shear/Normal Strength Functions

Sand

Model: Spline Data Point Function
Function: Shear Stress vs. Normal Stress
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
Data Point: (-10000, 0)
Data Point: (0, 0)
Data Point: (10000, 6494)
Estimation Properties
Intact Rock Param.: 10
Geological Strength: 100
Disturbance Factor: 0
SigmaC: 600000 psf
Sigma3: 300000 psf
Num. Points: 20

Regions

	Points	Area (ft²)	Material
Region 1	3,11,12,13	4.05	
Region 2	2,3,22,45,44,43,42,41	154.21186	Fill 1 (S-Case) AWT
Region 3	3,13,9,4,24,14,46,45,22	244.20126	Fill 1 (S-Case) AWT
Region 4	60,25,10,30,1,38,46,47,48,49,50,51,52,53,54,55,56,57,58,59	313.7886	MARSH 1 (S-Case) BWT
Region 5	19,31,15,26,16,7,34,28,32,20	6424.2	BEACH SAND, EL. -14/15 TO -48
Region 6	7,8,35,29,33,21,20,32,28,34	4180	BAY SOUND CLAY (S-Case)
Region 7	30,10,25,26,15,31	501.2	MARSH 2 (S-Case)
Region 8	24,4,17,5,27	71.43	Fill 2 (S-Case)
Region 9	25,60,61,6	250.4099	MARSH 1 (S-Case) BWT
Region 10	26,25,6,16	461.5	MARSH 2 (S-Case)
Region 11	19,31,30,18	308.1	MARSH 2 (S-Case)

Region 12	18,23,36,37,1,30	150.215	MARSH 1 (S-Case) BWT
Region 13	38,39,45,46	0.995037	Fill 1 (S-Case) BWT
Region 14	39,40,42,43,44,45	4.1811208	Fill 1 (S-Case) BWT
Region 15	46,47,48,49,50,51,52,53,54,55,56,57,58,59,60,24,14	86.186402	MARSH 1 (S-Case) AWT
Region 16	24,27,61,60	69.0901	MARSH 1 (S-Case) AWT

Points

	X (ft)	Y (ft)
Point 1	167.4	-2
Point 2	196.5	8
Point 3	200	8
Point 4	239	-1.8
Point 5	310	-2
Point 6	310	-7.5
Point 7	310	-48
Point 8	310	-70
Point 9	206.2	8
Point 10	200	-7.5
Point 11	200	13.4
Point 12	200.5	13.4
Point 13	201	8
Point 14	200	-1.5
Point 15	200	-15
Point 16	310	-14
Point 17	243.3	-2
Point 18	120	-7.5
Point 19	120	-14
Point 20	120	-48
Point 21	120	-70
Point 22	200	-1.3
Point 23	120	-5.9
Point 24	239	-3
Point 25	239	-7.5
Point 26	239	-14
Point 27	310	-3
Point 28	200	-48
Point 29	200	-70
Point 30	167.4	-7.5
Point 31	167.4	-14
Point 32	167.4	-48
Point 33	167.4	-70
Point 34	239	-48
Point 35	239	-70

Point 36	137.7	-6
Point 37	156.5	-2.2
Point 38	168.9	-1.5
Point 39	169.437	-1.3
Point 40	173.22	0
Point 41	187.188	4.8
Point 42	174.38329	0.39976
Point 43	174.42687	-0.42973
Point 44	174.3079	-1.08898
Point 45	174.17232	-1.3
Point 46	174.11505	-1.5
Point 47	177.94873	-2.17277
Point 48	183.65644	-2.71481
Point 49	187.54754	-2.90069
Point 50	192.00321	-2.98248
Point 51	196.62137	-2.90754
Point 52	198.83543	-2.78793
Point 53	199.41785	-2.79619
Point 54	199.99615	-2.76727
Point 55	200.53069	-2.90257
Point 56	201.22089	-2.96968
Point 57	202.46422	-3.15762
Point 58	205.93234	-3.45586
Point 59	216.59977	-3.81938
Point 60	239	-3.94658
Point 61	310	-3.99962

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.81	(175.984, 19.506)	19.70756	(200, 8)	(160.388, -2.12866)
2	2122	1.83	(175.984, 19.506)	25.982	(199.279, 8)	(161.564, -2.10709)

Slices of Slip Surface: Optimized

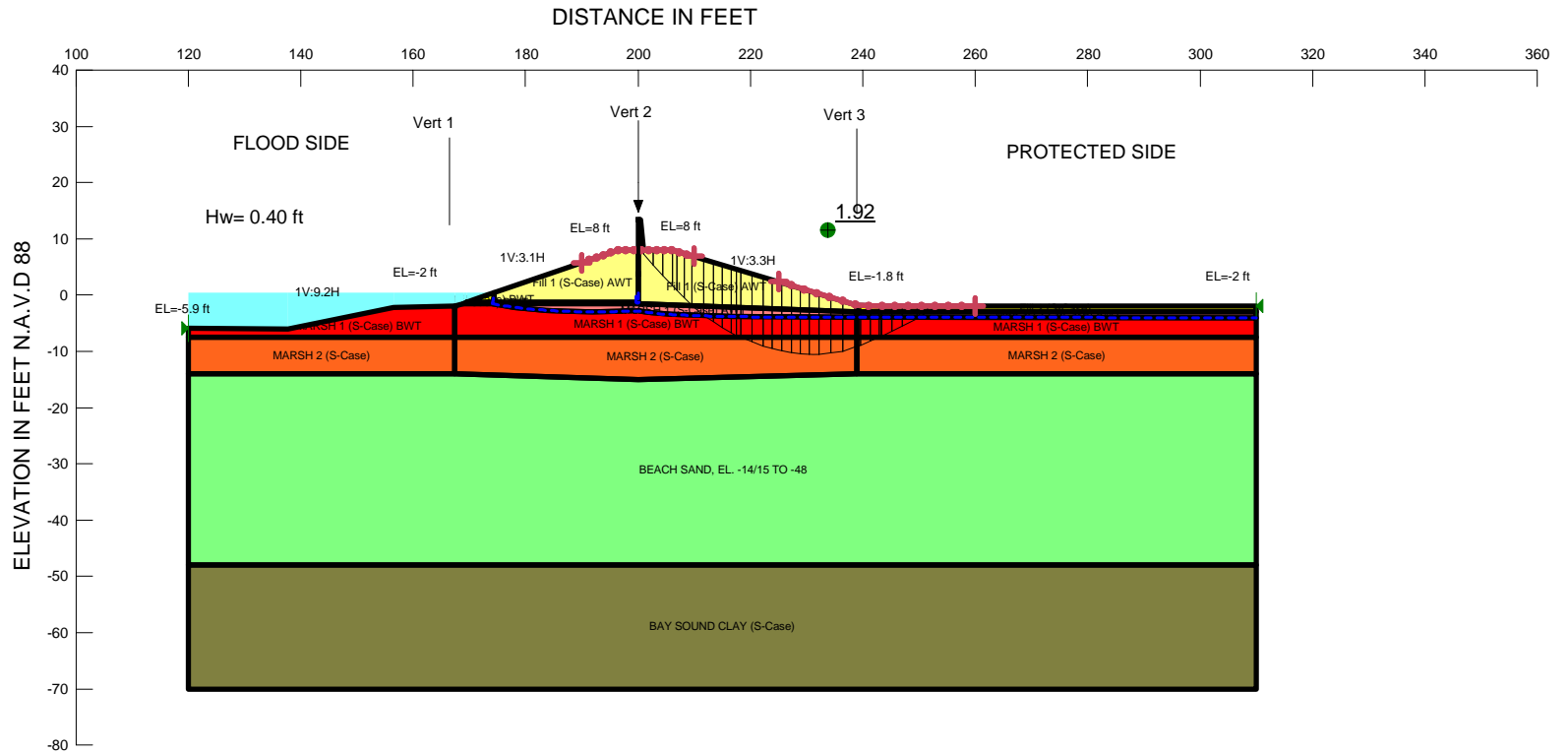
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	161.018	-2.336702	165.70044	194.09202	12.640746	0
2	Optimized	162.27825	-2.7527805	181.16963	240.41671	26.3785	0
3	Optimized	163.657	-3.222063	197.80408	294.65348	43.120131	0
4	Optimized	165.1542	-3.744549	214.78016	353.66616	61.836031	0
5	Optimized	166.6514	-4.2670345	227.14016	413.44818	82.949677	0
6	Optimized	168.15	-4.7900065	236.47443	493.00283	114.2138	0
7	Optimized	168.90495	-5.053458	240.87096	532.46066	129.8241	0
8	Optimized	169.17345	-5.120386	240.96612	524.02995	126.02814	0
9	Optimized	170.3703	-5.416486	242.23087	577.84469	149.4249	0
10	Optimized	172.2618	-5.8080895	242.50633	634.51809	174.53488	0
11	Optimized	173.66755	-6.0438565	242.28939	683.92843	196.63037	0
12	Optimized	174.1437	-6.1237165	242.62148	700.62139	203.9147	0

13	Optimized	174.2401	-6.1398885	242.70114	704.00426	205.38538	0
14	Optimized	174.3456	-6.15758	242.79541	707.70415	206.99071	0
15	Optimized	174.4051	-6.1675565	242.845	710.3403	208.14232	0
16	Optimized	174.54145	-6.1904255	242.96024	718.6754	211.80204	0
17	Optimized	175.6105	-6.271415	239.74042	742.62498	223.89863	0
18	Optimized	177.25685	-6.289089	230.61645	773.62562	241.76326	0
19	Optimized	178.5917	-6.204004	219.02064	817.86435	266.6224	0
20	Optimized	179.9256	-6.0345025	203.40266	815.73091	272.6261	0
21	Optimized	181.3074	-5.7774675	183.48076	843.62157	293.91363	0
22	Optimized	182.82735	-5.380582	155.59518	821.12349	296.31229	0
23	Optimized	184.3089	-4.901007	123.64815	831.0526	314.95675	0
24	Optimized	185.51805	-4.43326	93.593194	791.87527	310.89521	0
25	Optimized	186.63135	-3.92018	61.225106	785.48779	322.46252	0
26	Optimized	187.36775	-3.58079	39.955977	781.26085	330.0502	0
27	Optimized	187.96815	-3.304095	22.763626	777.8391	336.18126	0
28	Optimized	188.53285	-3.015836	5.0413212	719.26409	317.99247	0
29	Optimized	189.33215	-2.492086	-26.944879	688.70128	306.62956	75
30	Optimized	190.36095	-1.781375	-69.908971	641.48353	285.60687	75
31	Optimized	190.86725	-1.4	-90.129876	621.13203	302.94633	75
32	Optimized	191.32275	-1.056865	-101.16518	605.15737	295.15497	75
33	Optimized	192.1696	-0.3795625	-123.10532	554.78943	270.58889	75
34	Optimized	193.21775	0.4887725	-150.15675	512.42698	249.92734	75
35	Optimized	194.2894	1.4346525	-179.21212	444.5712	216.83186	75
36	Optimized	195.3846	2.4580775	-211.00771	392.54145	191.45526	75
37	Optimized	196.2161	3.2682825	-235.55832	333.75314	162.78228	75
38	Optimized	197.0473	4.142209	-269.94338	273.68962	133.48735	75
39	Optimized	198.14185	5.2930765	-320.38855	184.64873	90.059201	75
40	Optimized	199.34455	6.629738	-391.2412	75.374233	36.76247	75

Slices of Slip Surface: 2122

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	2122	162.14725	-2.47449	170.47003	230.49306	26.723973	0
2	2122	163.31455	-3.168005	196.13459	309.49569	50.471613	0
3	2122	164.4818	-3.7823775	217.80642	375.07009	70.018297	0
4	2122	165.64905	-4.323754	233.61078	429.88847	87.38846	0
5	2122	166.81635	-4.797029	245.82247	475.02058	102.04557	0
6	2122	168.15	-5.2544705	255.09731	534.1954	124.26248	0
7	2122	169.1685	-5.5647445	259.61046	573.41799	139.71611	0
8	2122	170.0675	-5.785221	261.11915	604.93065	153.07475	0
9	2122	171.3285	-6.047569	261.89893	643.13433	169.73694	0
10	2122	172.5895	-6.245531	260.76613	673.31234	183.67741	0
11	2122	173.66755	-6.3686915	258.33809	693.59021	193.78673	0
12	2122	174.1437	-6.410783	256.95761	701.09907	197.74452	0
13	2122	174.2401	-6.4173755	256.58952	702.41077	198.49241	0
14	2122	174.3456	-6.424316	256.18124	703.82327	199.30307	0
15	2122	174.99205	-6.4499525	252.90109	725.50457	210.41662	0
16	2122	176.1878	-6.4685925	246.20312	763.17515	230.17078	0

17	2122	177.36175	-6.4327895	237.63003	793.43557	247.46057	0
18	2122	178.5195	-6.3456105	226.99672	817.03822	262.7034	0
19	2122	179.66105	-6.207989	214.07319	834.32698	276.15478	0
20	2122	180.8026	-6.0185965	198.81037	845.77907	288.04902	0
21	2122	181.94415	-5.776266	180.98818	851.43826	298.50361	0
22	2122	183.08565	-5.479454	160.3266	851.2216	307.60627	0
23	2122	184.245	-5.1197445	136.30052	844.99238	315.52994	0
24	2122	185.4222	-4.692695	108.69221	832.3256	322.18234	0
25	2122	186.5994	-4.199521	77.497984	813.04658	327.48733	0
26	2122	187.36775	-3.8482995	55.509873	797.50909	330.35934	0
27	2122	188.3179	-3.3448205	24.56083	771.82369	332.70286	0
28	2122	189.63485	-2.5913395	-21.420455	718.07285	319.70663	75
29	2122	190.7279	-1.876853	-64.664311	678.20137	301.95471	75
30	2122	191.4099	-1.4	-90.277363	643.24366	313.73089	75
31	2122	192.16475	-0.80663265	-109.41318	600.05809	292.66789	75
32	2122	193.4034	0.2469247	-141.74546	523.98039	255.56231	75
33	2122	194.64205	1.4470119	-177.49712	438.10284	213.67703	75
34	2122	195.8807	2.8256885	-220.68815	341.48834	166.55499	75
35	2122	197.1947	4.549699	-288.52862	208.51289	101.69853	75
36	2122	198.58405	6.767465	-402.13511	40.761283	19.880606	75



Name: Fill 1 (S-Case) AWT Model: Mohr-Coulomb Unit Weight: 111 pcf Cohesion: 75 psf Phi: 26 °
Name: MARSH 1 (S-Case) AWT Model: Spatial Mohr-Coulomb Unit Weight: 93 pcf Cohesion: 75 psf Phi: 24 °
Name: BEACH SAND, EL. -14/15 TO -48 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand
Name: BAY SOUND CLAY (S-Case) Model: Spatial Mohr-Coulomb Unit Weight: 105 pcf Cohesion: 0 psf Phi: 26 °
Name: MARSH 2 (S-Case) Model: Spatial Mohr-Coulomb Unit Weight: 93 pcf Cohesion: 0 psf Phi: 24 °
Name: Fill 2 (S-Case) Model: Spatial Mohr-Coulomb Unit Weight: 111 pcf Cohesion: 75 psf Phi: 26 °
Name: Fill 1 (S-Case) BWT Model: Mohr-Coulomb Unit Weight: 111 pcf Cohesion: 0 psf Phi: 26 °
Name: MARSH 1 (S-Case) BWT Model: Spatial Mohr-Coulomb Unit Weight: 93 pcf Cohesion: 0 psf Phi: 24 °

GENERAL NOTES

CLASSIFICATION STRATIFICATION
SHEAR STRENGTHS AND UNIT WEIGHTS OF
THE SOIL WERE BASED ON THE RESULTS OF
UNDISTURBED BORINGS AND CPT DATA. SEE
BOTH BORING AND CPT DATA PLATES.

WHERE INDICATED, SHEAR STRENGTHS BETWEEN
VERTICALS WERE ASSUMED TO VARY LINEARLY
BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

Hw IS CANAL WATER LEVEL

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 15,
PROTECTED SIDE STABILITY ANALYSIS,
CASE: NWL S-Case P/S (Entry/Exit)
STA. 20+50 TO 30+00 EAST
ORLEANS PARISH, LOUISIANA

NWL S-Case P/S (Entry/Exit)

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File Information

Created By: [Liljegren, James](#)
Revision Number: [360](#)
Last Edited By: [Higgins, James](#)
Date: [7/8/2013](#)
Time: [12:52:51 AM](#)
File Name: [Reach 15.gsz](#)
Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix F NWL\](#)
Last Solved Date: [7/8/2013](#)
Last Solved Time: [12:59:24 AM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Strength Units: [psf](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

NWL S-Case P/S (Entry/Exit)

Kind: [SLOPE/W](#)
Parent: [Normal Water Level at +0.40ft \(seepage\)](#)
Method: [Spencer](#)
Settings
 PWP Conditions Source: [Parent Analysis](#)
Slip Surface
 Direction of movement: [Left to Right](#)
 Use Passive Mode: [No](#)
 Slip Surface Option: [Entry and Exit](#)
 Critical slip surfaces saved: [1](#)
 Optimize Critical Slip Surface Location: [Yes](#)
 Tension Crack
 Tension Crack Option: [Search for Tension Crack](#)
 Percentage Wet: [0](#)
 Tension Crack Fluid Unit Weight: [62.4 pcf](#)
FOS Distribution
 FOS Calculation Option: [Constant](#)

Advanced

Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 2000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

Fill 1 (S-Case) AWT

Model: Mohr-Coulomb
Unit Weight: 111 pcf
Cohesion: 75 psf
Phi: 26 °
Phi-B: 0 °

MARSH 1 (S-Case) AWT

Model: Spatial Mohr-Coulomb
Unit Weight: 93 pcf
Cohesion: 75 psf
Phi: 24 °
Phi-B: 0 °

BEACH SAND, EL. -14/15 TO -48

Model: Shear/Normal Fn.
Unit Weight: 122 pcf
Strength Function: Sand
Phi-B: 0 °

BAY SOUND CLAY (S-Case)

Model: Spatial Mohr-Coulomb
Unit Weight: 105 pcf
Cohesion: 0 psf
Phi: 26 °
Phi-B: 0 °

MARSH 2 (S-Case)

Model: Spatial Mohr-Coulomb
Unit Weight: 93 pcf
Cohesion: 0 psf
Phi: 24 °
Phi-B: 0 °

Fill 2 (S-Case)

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [111 pcf](#)

Cohesion: [75 psf](#)

Phi: [26 °](#)

Phi-B: [0 °](#)

Fill 1 (S-Case) BWT

Model: [Mohr-Coulomb](#)

Unit Weight: [111 pcf](#)

Cohesion: [0 psf](#)

Phi: [26 °](#)

Phi-B: [0 °](#)

MARSH 1 (S-Case) BWT

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [93 pcf](#)

Cohesion: [0 psf](#)

Phi: [24 °](#)

Phi-B: [0 °](#)

Slip Surface Entry and Exit

Left Projection: [Range](#)

Left-Zone Left Coordinate: [\(190, 5.76632\) ft](#)

Left-Zone Right Coordinate: [\(210, 6.86463\) ft](#)

Left-Zone Increment: [15](#)

Right Projection: [Range](#)

Right-Zone Left Coordinate: [\(225, 2.38293\) ft](#)

Right-Zone Right Coordinate: [\(260, -2\) ft](#)

Right-Zone Increment: [15](#)

Radius Increments: [15](#)

Slip Surface Limits

Left Coordinate: [\(120, -5.9\) ft](#)

Right Coordinate: [\(310, -2\) ft](#)

Reinforcements

Reinforcement 1

Type: [Pile](#)

Outside Point: [\(200, 13.4\) ft](#)

Inside Point: [\(200, 3.7\) ft](#)

Slip Surface Intersection: [\(0, 0\) ft](#)

Total Length: [9.7 ft](#)

Reinforcement Direction: 90 °
Applied Load Option: Variable
F of S Dependent: No
Pile Spacing: 1 ft
Shear Capacity: 1e-007 lbs
Shear Safety Factor: 1
Shear Load Used: 1e-007 lbs
Shear Option: Parallel to Slip
Resisting Force Used: 0 lbs/ft

Shear/Normal Strength Functions

Sand

Model: Spline Data Point Function
Function: Shear Stress vs. Normal Stress
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
Data Point: (-10000, 0)
Data Point: (0, 0)
Data Point: (10000, 6494)
Estimation Properties
Intact Rock Param.: 10
Geological Strength: 100
Disturbance Factor: 0
SigmaC: 600000 psf
Sigma3: 300000 psf
Num. Points: 20

Regions

	Points	Area (ft²)	Material
Region 1	3,11,12,13	4.05	
Region 2	2,3,22,45,44,43,42,41	154.21186	Fill 1 (S-Case) AWT
Region 3	3,13,9,4,24,14,46,45,22	244.20126	Fill 1 (S-Case) AWT
Region 4	60,25,10,30,1,38,46,47,48,49,50,51,52,53,54,55,56,57,58,59	313.7886	MARSH 1 (S-Case) BWT
Region 5	19,31,15,26,16,7,34,28,32,20	6424.2	BEACH SAND, EL. -14/15 TO -48
Region 6	7,8,35,29,33,21,20,32,28,34	4180	BAY SOUND CLAY (S-Case)
Region 7	30,10,25,26,15,31	501.2	MARSH 2 (S-Case)
Region 8	24,4,17,5,27	71.43	Fill 2 (S-Case)
Region 9	25,60,61,6	250.4099	MARSH 1 (S-Case) BWT
Region 10	26,25,6,16	461.5	MARSH 2 (S-Case)
Region 11	19,31,30,18	308.1	MARSH 2 (S-Case)

Region 12	18,23,36,37,1,30	150.215	MARSH 1 (S-Case) BWT
Region 13	38,39,45,46	0.995037	Fill 1 (S-Case) BWT
Region 14	39,40,42,43,44,45	4.1811208	Fill 1 (S-Case) BWT
Region 15	46,47,48,49,50,51,52,53,54,55,56,57,58,59,60,24,14	86.186402	MARSH 1 (S-Case) AWT
Region 16	24,27,61,60	69.0901	MARSH 1 (S-Case) AWT

Points

	X (ft)	Y (ft)
Point 1	167.4	-2
Point 2	196.5	8
Point 3	200	8
Point 4	239	-1.8
Point 5	310	-2
Point 6	310	-7.5
Point 7	310	-48
Point 8	310	-70
Point 9	206.2	8
Point 10	200	-7.5
Point 11	200	13.4
Point 12	200.5	13.4
Point 13	201	8
Point 14	200	-1.5
Point 15	200	-15
Point 16	310	-14
Point 17	243.3	-2
Point 18	120	-7.5
Point 19	120	-14
Point 20	120	-48
Point 21	120	-70
Point 22	200	-1.3
Point 23	120	-5.9
Point 24	239	-3
Point 25	239	-7.5
Point 26	239	-14
Point 27	310	-3
Point 28	200	-48
Point 29	200	-70
Point 30	167.4	-7.5
Point 31	167.4	-14
Point 32	167.4	-48
Point 33	167.4	-70
Point 34	239	-48
Point 35	239	-70

Point 36	137.7	-6
Point 37	156.5	-2.2
Point 38	168.9	-1.5
Point 39	169.437	-1.3
Point 40	173.22	0
Point 41	187.188	4.8
Point 42	174.38329	0.39976
Point 43	174.42687	-0.42973
Point 44	174.3079	-1.08898
Point 45	174.17232	-1.3
Point 46	174.11505	-1.5
Point 47	177.94873	-2.17277
Point 48	183.65644	-2.71481
Point 49	187.54754	-2.90069
Point 50	192.00321	-2.98248
Point 51	196.62137	-2.90754
Point 52	198.83543	-2.78793
Point 53	199.41785	-2.79619
Point 54	199.99615	-2.76727
Point 55	200.53069	-2.90257
Point 56	201.22089	-2.96968
Point 57	202.46422	-3.15762
Point 58	205.93234	-3.45586
Point 59	216.59977	-3.81938
Point 60	239	-3.94658
Point 61	310	-3.99962

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.92	(230.634, 23.42)	25.01311	(201, 8)	(253.229, -2)
2	2250	1.94	(230.634, 23.42)	33.777	(201, 8)	(252.877, -2)

Slices of Slip Surface: **Optimized**

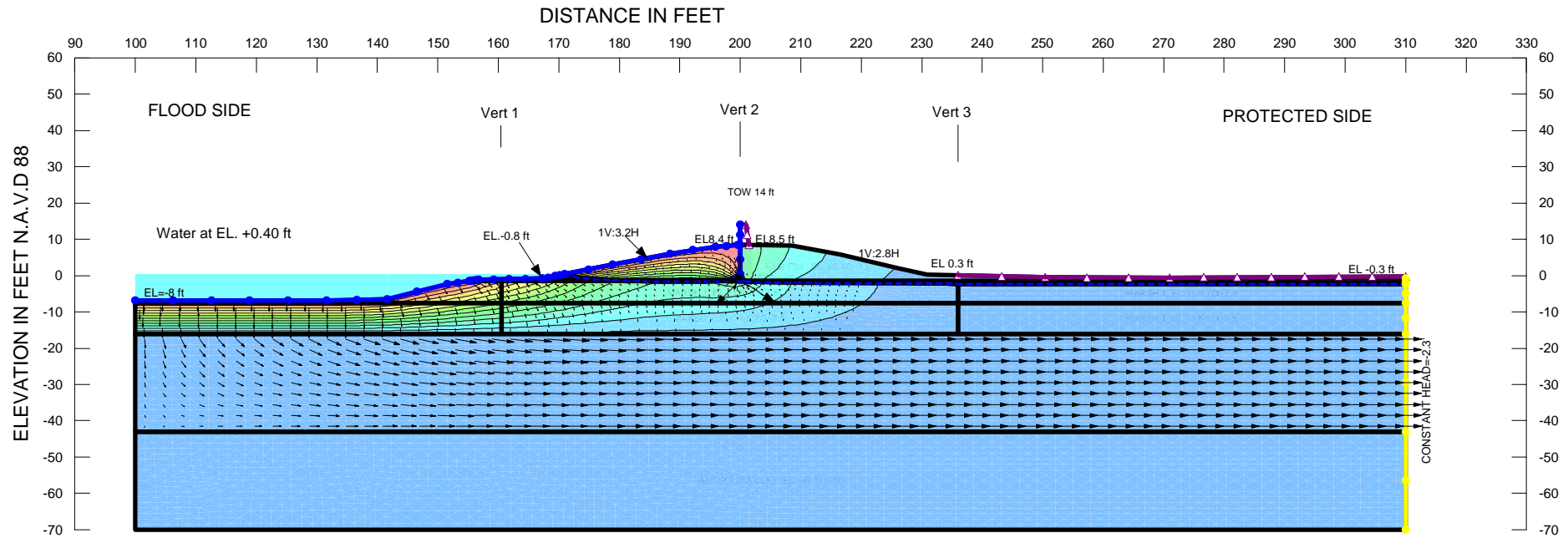
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	201.84285	6.3701875	-591.19511	98.347445	47.967254	75
2	Optimized	203.5643	4.431338	-474.64742	256.71148	125.20655	75
3	Optimized	205.32145	2.5246535	-361.87671	407.77177	198.88358	75
4	Optimized	206.5437	1.1983655	-284.87855	504.73861	246.17747	75
5	Optimized	207.5643	0.15462	-225.05123	581.75225	283.73953	75
6	Optimized	208.9181	-1.18698	-148.16634	658.03902	320.94707	75
7	Optimized	210.67115	-2.731785	-57.892924	785.58664	349.76571	75
8	Optimized	212.56485	-4.1509845	26.40012	903.05353	390.31125	0
9	Optimized	214.16185	-5.2159595	89.85334	947.90043	382.02718	0
10	Optimized	215.77055	-6.191099	148.20347	1019.4703	387.91299	0
11	Optimized	217.0696	-6.904444	191.07092	1043.4177	379.48926	0
12	Optimized	217.94745	-7.331215	216.76139	1097.5414	392.14852	0

13	Optimized	219.32475	-7.9009125	251.09018	1106.7722	380.97418	0
14	Optimized	221.2633	-8.7027375	299.73134	1119.7381	365.09053	0
15	Optimized	223.0671	-9.302055	336.18961	1177.4855	374.56908	0
16	Optimized	224.7361	-9.698865	360.29892	1161.572	356.74976	0
17	Optimized	226.4051	-10.095675	384.5423	1145.6585	338.87075	0
18	Optimized	228.06435	-10.344815	399.71125	1176.5218	345.85836	0
19	Optimized	229.71385	-10.44628	405.76208	1131.7458	323.22876	0
20	Optimized	231.3634	-10.547745	411.86131	1086.9697	300.57761	0
21	Optimized	233.2455	-10.452585	405.72706	1080.7458	300.53771	0
22	Optimized	235.3601	-10.160795	387.34923	977.12164	262.58359	0
23	Optimized	237.7087	-9.566363	350.09958	895.58572	242.86607	0
24	Optimized	239.32645	-9.004438	314.94598	785.28865	209.41005	0
25	Optimized	240.46515	-8.5432875	286.10781	752.16477	207.50192	0
26	Optimized	242.08965	-7.8477625	242.61445	668.24509	189.50297	0
27	Optimized	243.10095	-7.414789	215.54565	616.02288	178.30395	0
28	Optimized	243.3192	-7.321349	209.70276	604.88008	175.94428	0
29	Optimized	244.2651	-6.8649925	181.17116	568.81633	172.59075	0
30	Optimized	246.11845	-5.9687375	125.14445	472.55473	154.67702	0
31	Optimized	248.3219	-4.857225	55.676466	358.86335	134.9875	0
32	Optimized	249.7965	-4.0743165	6.7540889	285.6717	124.18212	0
33	Optimized	250.7843	-3.4773965	-30.541562	251.78481	112.10182	75
34	Optimized	252.40175	-2.5	-91.603527	118.40397	57.749476	75

Slices of Slip Surface: 2250

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	2250	201.86665	5.7949295	-555.26052	115.80511	56.481925	75
2	2250	203.6	3.2204545	-399.01874	323.22071	157.64528	75
3	2250	205.33335	1.079065	-272.93497	515.55742	251.45415	75
4	2250	207.19015	-0.85852299	-162.63972	680.9712	332.13185	75
5	2250	209.27695	-2.7109165	-55.969148	819.94414	365.06265	75
6	2250	211.15185	-4.157025	29.234519	931.63221	401.77334	0
7	2250	212.7084	-5.194393	90.518382	998.39173	404.21126	0
8	2250	214.26495	-6.1133015	145.06272	1054.3682	404.84887	0
9	2250	215.8215	-6.924565	193.39575	1100.2854	403.7733	0
10	2250	216.8179	-7.4022345	222.01368	1125.7158	402.35413	0
11	2250	217.88075	-7.844586	248.51317	1146.5497	399.83161	0
12	2250	219.5703	-8.4821315	286.87791	1173.1568	394.59679	0
13	2250	221.25985	-9.0192015	319.32744	1189.8798	387.59489	0
14	2250	222.94935	-9.460736	346.0562	1197.0157	378.87157	0
15	2250	224.6389	-9.810555	367.2565	1194.7733	368.43423	0
16	2250	226.32845	-10.07154	383.05994	1183.3694	356.32074	0
17	2250	228.018	-10.245765	393.5606	1162.672	342.43045	0
18	2250	229.70755	-10.334575	398.81669	1132.7821	326.78246	0
19	2250	231.39705	-10.338645	398.84093	1093.4501	309.25991	0
20	2250	233.0866	-10.258005	393.62674	1044.5002	289.78752	0
21	2250	234.77615	-10.092045	383.11795	985.54981	268.21995	0
22	2250	236.4657	-9.839485	367.22615	916.15612	244.39937	0

23	2250	238.15525	-9.498323	345.82262	835.61972	218.07172	0
24	2250	240.075	-8.992151	314.12532	763.16413	199.92496	0
25	2250	242.225	-8.2859915	269.93509	696.14447	189.76064	0
26	2250	243.7656	-7.696488	233.07127	641.34175	181.77373	0
27	2250	245.0049	-7.136092	198.03902	593.13465	175.90791	0
28	2250	246.55235	-6.358566	149.44537	523.45488	166.51976	0
29	2250	248.0998	-5.4772825	94.371971	440.71777	154.20308	0
30	2250	249.64725	-4.4823645	32.221148	342.57899	138.18022	0
31	2250	251.0501	-3.477556	-30.54402	280.51807	124.89469	75
32	2250	252.278	-2.5	-91.594109	148.74268	72.546652	75



Name: EMB FILL, EL. +8 TO -1.5 Model: Saturated Only K-Sat: 3.28e-008 ft/sec K-Ratio: 1
Name: MARSH 1, EL. -1.5 TO -7.5 Model: Saturated Only K-Sat: 3.28e-007 ft/sec K-Ratio: 1
Name: BEACH SAND, EL. -16 TO -43 Model: Saturated Only K-Sat: 0.00049 ft/sec K-Ratio: 1
Name: BAY SOUND CLAY, EL. -43 TO -70 Model: Saturated Only K-Sat: 3.28e-008 ft/sec K-Ratio: 1
Name: SP Model: Saturated Only K-Sat: 1e-010 ft/sec K-Ratio: 1

REACH 16 CROSS-SECTION AT STA 30+00

GENERAL NOTES

CLASSIFICATION STRATIFICATION
SHEAR STRENGTHS AND UNIT WEIGHTS OF
THE SOIL WERE BASED ON THE RESULTS OF
UNDISTURBED BORINGS AND CPT DATA. SEE
BOTH BORING AND CPT DATA PLATES.

WHERE INDICATED, SHEAR STRENGTHS BETWEEN
VERTICALS WERE ASSUMED TO VARY LINEARLY
BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL
REMEDICATION OF CANAL WALLS AND LEVEES
PROTECTED SIDE STABILITY ANALYSIS
CASE: Normal Water Level at +0.40ft (seepage)
REACH 16, STA. 30+00 TO 36+40 EAST
ORLEANS PARISH, LOUISIANA

Normal Water Level at +0.40ft (seepage)

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File Information

Created By: [Liljegren, James](#)
Revision Number: [439](#)
Last Edited By: [Vicky Curtis](#)
Date: [9/30/2013](#)
Time: [11:21:18 AM](#)
File Name: [Reach 16.gsz](#)
Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix F NWL\](#)
Last Solved Date: [9/30/2013](#)
Last Solved Time: [11:21:22 AM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Mass(M) Units: [lbs](#)
Mass Flux Units: [lbs/sec](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

Normal Water Level at +0.40ft (seepage)

Kind: [SEEP/W](#)
Method: [Steady-State](#)
Settings
 Include Air Flow: [No](#)
Control
 Apply Runoff: [No](#)
Convergence
 Convergence Type: [Head Vector Norm](#)
 Maximum Number of Iterations: [500](#)
 Tolerance: [0.001](#)
 Maximum Change in K: [0.1](#)
 Rate of Change in K: [1.02](#)
 Minimum Change in K: [1e-005](#)
 Equation Solver: [Parallel Direct](#)
 Potential Seepage Max # of Reviews: [10](#)
Time

Starting Time: 0 sec

Duration: 0 sec

Ending Time: 0 sec

Materials

EMB FILL, EL. +8 TO -1.5

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-008 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

MARSH 1, EL. -1.5 TO -7.5

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-007 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

BEACH SAND, EL. -16 TO -43

Model: Saturated Only

Hydraulic

K-Sat: 0.00049 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

BAY SOUND CLAY, EL. -43 TO -70

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-008 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

SP

Model: Saturated Only

Hydraulic

K-Sat: 1e-010 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

Boundary Conditions

Drainage

Review: true
Type: Total Flux (Q) 0

Canal Water

Type: Head (H) 0.4

Curb

Type: Head (H) -2.3

Regions

	Points	Area (ft²)	Material
Region 1	4,12,13,14	6.675	
Region 2	53,43,44,3,45,4,64,63,57,56,55,54	176.04353	EMB FILL, EL. +8 TO -1.5
Region 3	58,23,29,41,28,24,57	5.016438	EMB FILL, EL. +8 TO -1.5
Region 4	23,58,59,60,61,62,16,65,66,67,68,69,70,25,11,19,33,29	431.67473	MARSH 1, EL. -1.5 TO -7.5
Region 5	20,34,17,26,18,8,31,21	5670	BEACH SAND, EL. -16 TO -43
Region 6	8,9,32,22,21,31	5670	BAY SOUND CLAY, EL. -43 TO -70
Region 7	19,11,25,26,17,34,33	641.75	MARSH 1, EL. -1.5 TO -7.5
Region 8	25,70,71,7	386.502	MARSH 1, EL. -1.5 TO -7.5
Region 9	26,25,7,18	629	MARSH 1, EL. -1.5 TO -7.5
Region 10	29,33,30,42,40,39,38,41	109.92	MARSH 1, EL. -1.5 TO -7.5
Region 11	27,30,33,34,20	514.25	MARSH 1, EL. -1.5 TO -7.5
Region 12	52,49,50,51,6,5	79.173544	MARSH 1, EL. -1.5 TO -7.5
Region 13	28,37,1,2,36,53,54,55,56,57,24	11.919523	EMB FILL, EL. +8 TO -1.5
Region 14	63,15,64	1.2869728	EMB FILL, EL. +8 TO -1.5
Region 15	57,63,62,58	3.455002	EMB FILL, EL. +8 TO -1.5
Region 16	63,15,16,62	0.40856	EMB FILL, EL. +8 TO -1.5
Region 17	52,5,65,73,72,64,4,14,10,47,48,46	224.13344	EMB FILL, EL. +8 TO -1.5
Region 18	5,65,66,67,68,69,70	20.03593	MARSH 1, EL. -1.5 TO -7.5
Region 19	58,59,60,61,62	1.2893396	MARSH 1, EL. -1.5 TO -7.5
Region 20	64,72,73,65,16,15	0.56801965	EMB FILL, EL. +8 TO -1.5
Region 21	5,70,71,6	57.498	MARSH 1, EL. -1.5 TO -7.5

Lines

	Start Point	End Point	Hydraulic Boundary	Left Side Material	Right Side Material
Line 1	4	12	Canal Water		
Line 2	12	13			
Line 3	13	14	Drainage		

Line 4	14	4		SP	
Line 5	8	9	Curb		
Line 6	18	8	Curb		
Line 7	11	19			
Line 8	20	21			
Line 9	21	22			
Line 10	25	11			
Line 11	17	26			
Line 12	26	18			
Line 13	25	26			
Line 14	5	6			
Line 15	7	25			
Line 16	7	18	Curb		
Line 17	15	16			
Line 18	24	28			
Line 19	23	29			
Line 20	8	31			
Line 21	31	21			
Line 22	9	32			
Line 23	32	22			
Line 24	19	33			
Line 25	33	30			
Line 26	20	34			
Line 27	34	17			
Line 28	33	29			
Line 29	34	33			
Line 30	27	30			
Line 31	20	27			
Line 32	39	38	Canal Water		
Line 33	40	39	Canal Water		
Line 34	29	41			
Line 35	41	28	Canal Water		
Line 36	38	41	Canal Water		
Line 37	30	42			
Line 38	42	40	Canal Water		
Line 39	3	44	Canal Water		
Line 40	3	45	Canal Water		
Line 41	45	4	Canal Water		
Line 42	50	49	Drainage		
Line 43	51	50	Drainage		
Line 44	51	6	Curb		
Line 45	49	52	Drainage		
Line 46	5	52			
Line 47	24	57			
Line 48	23	58			
Line 49	58	62			
Line 50	62	16			
Line 51	57	63			

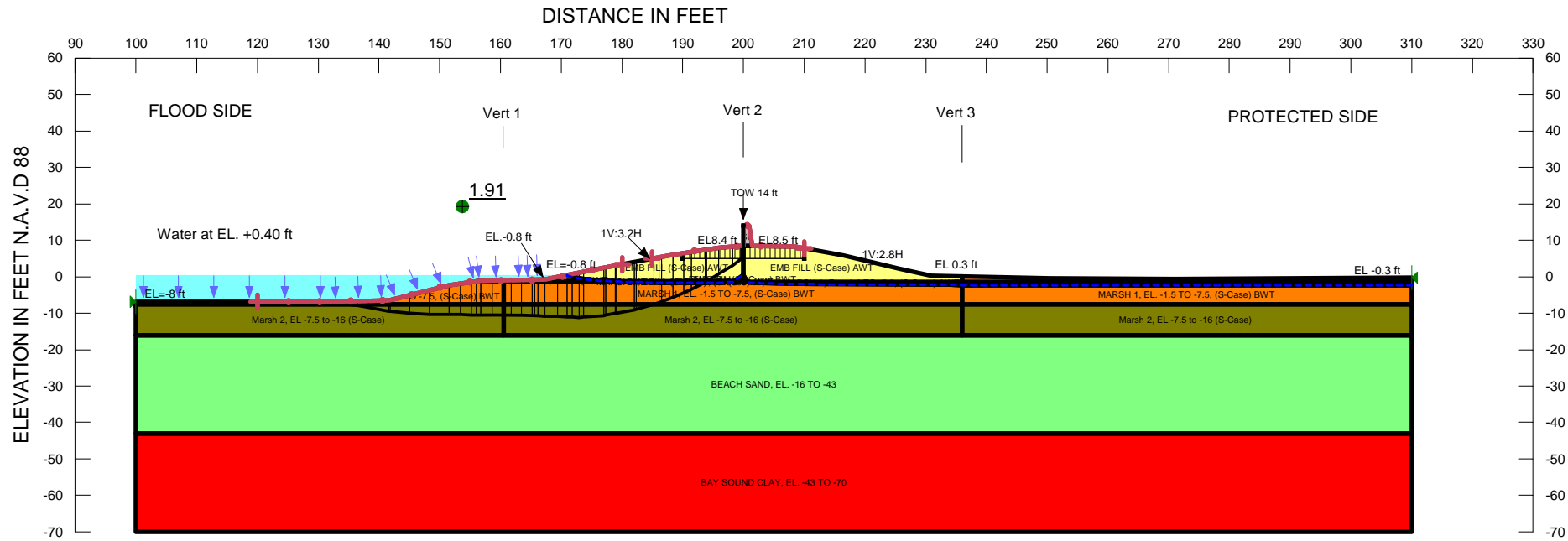
Line 52	63	15			
Line 53	15	64	Canal Water		SP
Line 54	64	4	Canal Water		SP
Line 55	5	65			
Line 56	65	16			
Line 57	70	25			
Line 58	71	7	Curb		
Line 59	53	43	Canal Water		
Line 60	43	44	Canal Water		
Line 61	64	63			
Line 62	57	56			
Line 63	56	55			
Line 64	55	54			
Line 65	54	53			
Line 66	28	37	Canal Water		
Line 67	37	1	Canal Water		
Line 68	1	2	Canal Water		
Line 69	2	36	Canal Water		
Line 70	36	53	Canal Water		
Line 71	57	58			
Line 72	63	62			
Line 73	65	73			
Line 74	73	72			
Line 75	72	64			
Line 76	14	10			
Line 77	10	47			
Line 78	47	48			
Line 79	48	46			
Line 80	46	52			
Line 81	58	59			
Line 82	59	60			
Line 83	60	61			
Line 84	61	62			
Line 85	65	66			
Line 86	66	67			
Line 87	67	68			
Line 88	68	69			
Line 89	69	70			
Line 90	70	71			
Line 91	70	5			
Line 92	71	6			

Points

	X (ft)	Y (ft)
Point 1	161.8	-1
Point 2	167.3	-0.8
Point 3	195.9	8

Point 4	200	8.4
Point 5	236	-1.5
Point 6	310	-1.5
Point 7	310	-7.5
Point 8	310	-43
Point 9	310	-70
Point 10	208.5	8.2
Point 11	200	-7.5
Point 12	200	14
Point 13	200.9	14
Point 14	201.5	8.5
Point 15	200	-1.3
Point 16	200	-1.5
Point 17	200	-16
Point 18	310	-16
Point 19	165.6	-7.5
Point 20	100	-16
Point 21	100	-43
Point 22	100	-70
Point 23	165.6	-1.5
Point 24	165.6	-1.3
Point 25	236	-7.5
Point 26	236	-16
Point 27	100	-8
Point 28	156	-1.3
Point 29	160.5	-1.5
Point 30	100	-7.5
Point 31	200	-43
Point 32	200	-70
Point 33	160.5	-7.5
Point 34	160.5	-16
Point 35	100	8
Point 36	169.4	-0.1
Point 37	156.8	-1.2
Point 38	151.6	-2.3
Point 39	141.6	-6.5
Point 40	131.6	-6.9
Point 41	155.2	-1.5
Point 42	100	-6.9
Point 43	178.9	3.1
Point 44	188.4	6.1
Point 45	199.6	8.4
Point 46	230.9	0.3
Point 47	216.5	5.8
Point 48	225.7	2.1
Point 49	250.4	-0.5
Point 50	271	-0.6
Point 51	310	-0.3

Point 52	236	0.09077
Point 53	171	0.42211
Point 54	171.77043	-0.05919
Point 55	173.70134	-0.64615
Point 56	177.00859	-1.11168
Point 57	179.065	-1.3
Point 58	182.29938	-1.5
Point 59	186.54136	-1.59324
Point 60	191.38723	-1.63118
Point 61	194.01441	-1.62443
Point 62	197.42286	-1.5
Point 63	198.49154	-1.3
Point 64	200	0.40634
Point 65	200.80297	-1.5
Point 66	201.64091	-1.63792
Point 67	205.5918	-1.8943
Point 68	211.13761	-2.04947
Point 69	233.88355	-2.24513
Point 70	236	-2.25393
Point 71	310	-2.30007
Point 72	200.41802	-0.84131
Point 73	200.41802	-1.33425



Name: EMB FILL (S-Case) AWT Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion: 75 psf Phi: 26 °
Name: MARSH 1, EL. -1.5 TO -7.5, (S-Case) AWT Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion: 75 psf Phi: 24 °
Name: BEACH SAND, EL. -16 TO -43 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand
Name: BAY SOUND CLAY, EL. -43 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 105 pcf Cohesion: 0 psf Phi: 26 °
Name: SP Model: Undrained (Phi=0) Unit Weight: 0.1 pcf Cohesion: 0.01 psf
Name: Marsh 2, EL. -7.5 to -16 (S-Case) Model: Mohr-Coulomb Unit Weight: 93 pcf Cohesion: 0 psf Phi: 24 °
Name: EMB FILL (S-Case) BWT Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion: 0 psf Phi: 26 °
Name: MARSH 1, EL. -1.5 TO -7.5, (S-Case) BWT Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion: 0 psf Phi: 24 °

REACH 16 CROSS-SECTION AT STA 30+00

GENERAL NOTES

CLASSIFICATION STRATIFICATION
SHEAR STRENGTHS AND UNIT WEIGHTS OF
THE SOIL WERE BASED ON THE RESULTS OF
UNDISTURBED BORINGS AND CPT DATA. SEE
BOTH BORING AND CPT DATA PLATES.

WHERE INDICATED, SHEAR STRENGTHS BETWEEN
VERTICALS WERE ASSUMED TO VARY LINEARLY
BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL
REMEDICATION OF CANAL WALLS AND LEVEES
PROTECTED SIDE STABILITY ANALYSIS
CASE: NWL S-Case F/S (EE)
REACH 16, STA. 30+00 TO 36+40 EAST
ORLEANS PARISH, LOUISIANA

NWL S-Case F/S (EE)

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File Information

Created By: [Liljegren, James](#)
Revision Number: [443](#)
Last Edited By: [Vicky Curtis](#)
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Time: [11:56:15 AM](#)
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Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix F NWL\](#)
Last Solved Date: [9/30/2013](#)
Last Solved Time: [11:58:48 AM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Strength Units: [psf](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

NWL S-Case F/S (EE)

Kind: [SLOPE/W](#)
Parent: [Normal Water Level at +0.40ft \(seepage\)](#)
Method: [Spencer](#)
Settings
 PWP Conditions Source: [Parent Analysis](#)
Slip Surface
 Direction of movement: [Right to Left](#)
 Use Passive Mode: [No](#)
 Slip Surface Option: [Entry and Exit](#)
 Critical slip surfaces saved: [1](#)
 Optimize Critical Slip Surface Location: [Yes](#)
 Tension Crack
 Tension Crack Option: [Tension Crack Line](#)
 Percentage Wet: [0](#)
 Tension Crack Fluid Unit Weight: [62.4 pcf](#)
FOS Distribution
 FOS Calculation Option: [Constant](#)

Advanced

Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 7000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

EMB FILL (S-Case) AWT

Model: Mohr-Coulomb
Unit Weight: 105 pcf
Cohesion: 75 psf
Phi: 26 °
Phi-B: 0 °

MARSH 1, EL. -1.5 TO -7.5, (S-Case) AWT

Model: Mohr-Coulomb
Unit Weight: 105 pcf
Cohesion: 75 psf
Phi: 24 °
Phi-B: 0 °

BEACH SAND, EL. -16 TO -43

Model: Shear/Normal Fn.
Unit Weight: 122 pcf
Strength Function: Sand
Phi-B: 0 °

BAY SOUND CLAY, EL. -43 TO -70

Model: Spatial Mohr-Coulomb
Unit Weight: 105 pcf
Cohesion: 0 psf
Phi: 26 °
Phi-B: 0 °

SP

Model: Undrained (Phi=0)
Unit Weight: 0.1 pcf
Cohesion: 0.01 psf

Marsh 2, EL -7.5 to -16 (S-Case)

Model: [Mohr-Coulomb](#)
Unit Weight: [93 pcf](#)
Cohesion: [0 psf](#)
Phi: [24 °](#)
Phi-B: [0 °](#)

EMB FILL (S-Case) BWT

Model: [Mohr-Coulomb](#)
Unit Weight: [105 pcf](#)
Cohesion: [0 psf](#)
Phi: [26 °](#)
Phi-B: [0 °](#)

MARSH 1, EL. -1.5 TO -7.5, (S-Case) BWT

Model: [Mohr-Coulomb](#)
Unit Weight: [105 pcf](#)
Cohesion: [0 psf](#)
Phi: [24 °](#)
Phi-B: [0 °](#)

Slip Surface Entry and Exit

Left Projection: [Range](#)
Left-Zone Left Coordinate: [\(120, -6.9\) ft](#)
Left-Zone Right Coordinate: [\(180, 3.44737\) ft](#)
Left-Zone Increment: [12](#)
Right Projection: [Range](#)
Right-Zone Left Coordinate: [\(185, 5.02632\) ft](#)
Right-Zone Right Coordinate: [\(210, 7.75\) ft](#)
Right-Zone Increment: [5](#)
Radius Increments: [10](#)

Slip Surface Limits

Left Coordinate: [\(100, -6.9\) ft](#)
Right Coordinate: [\(310, -0.3\) ft](#)

Reinforcements

Reinforcement 1

Type: [Pile](#)
Outside Point: [\(200, 14\) ft](#)
Inside Point: [\(200, -1.3\) ft](#)
Slip Surface Intersection: [\(0, 0\) ft](#)
Total Length: [15.3 ft](#)
Reinforcement Direction: [90 °](#)
Applied Load Option: [Variable](#)

F of S Dependent: No
Pile Spacing: 1 ft
Shear Capacity: 0 lbs
Shear Safety Factor: 1
Shear Load Used: 0 lbs
Shear Option: Parallel to Slip
Resisting Force Used: 0 lbs/ft

Tension Crack Line

	X (ft)	Y (ft)
	190	5
	210	5

Shear/Normal Strength Functions

Sand

Model: Spline Data Point Function
Function: Shear Stress vs. Normal Stress
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
Data Point: (-10000, 0)
Data Point: (0, 0)
Data Point: (10000, 6494)
Estimation Properties
Intact Rock Param.: 10
Geological Strength: 100
Disturbance Factor: 0
SigmaC: 600000 psf
Sigma3: 300000 psf
Num. Points: 20

Regions

	Material	Points	Area (ft²)
Region 1	SP	4,12,13,14	6.675
Region 2	EMB FILL (S-Case) AWT	53,43,44,3,45,4,64,63,57,56,55,54	176.04353
Region 3	EMB FILL (S-Case) BWT	58,23,29,41,28,24,57	5.016438
Region 4	MARSH 1, EL. -1.5 TO -7.5, (S-Case) BWT	23,58,59,60,61,62,16,65,66,67,68,69,70,25,11,19,33,29	431.67473
Region 5	BEACH SAND, EL. -16 TO -43	20,34,17,26,18,8,31,21	5670
Region 6	BAY SOUND CLAY, EL. -43 TO -70	8,9,32,22,21,31	5670
Region 7	Marsh 2, EL -7.5 to -16 (S-Case)	19,11,25,26,17,34,33	641.75
Region 8	MARSH 1, EL. -1.5 TO -7.5, (S-Case) BWT	25,70,71,7	386.502

Region 9	Marsh 2, EL -7.5 to -16 (S-Case)	26,25,7,18	629
Region 10	MARSH 1, EL. -1.5 TO -7.5, (S-Case) BWT	29,33,30,42,40,39,38,41	109.92
Region 11	Marsh 2, EL -7.5 to -16 (S-Case)	27,30,33,34,20	514.25
Region 12	MARSH 1, EL. -1.5 TO -7.5, (S-Case) AWT	52,49,50,51,6,5	79.173544
Region 13	EMB FILL (S-Case) BWT	28,37,1,2,36,53,54,55,56,57,24	11.919523
Region 14	EMB FILL (S-Case) BWT	63,15,64	1.2869728
Region 15	EMB FILL (S-Case) AWT	57,63,62,58	3.455002
Region 16	EMB FILL (S-Case) BWT	63,15,16,62	0.40856
Region 17	EMB FILL (S-Case) AWT	52,5,65,73,72,64,4,14,10,47,48,46	224.13344
Region 18	MARSH 1, EL. -1.5 TO -7.5, (S-Case) AWT	5,65,66,67,68,69,70	20.03593
Region 19	MARSH 1, EL. -1.5 TO -7.5, (S-Case) AWT	58,59,60,61,62	1.2893396
Region 20	EMB FILL (S-Case) BWT	64,72,73,65,16,15	0.56801965
Region 21	MARSH 1, EL. -1.5 TO -7.5, (S-Case) AWT	5,70,71,6	57.498

Points

	X (ft)	Y (ft)
Point 1	161.8	-1
Point 2	167.3	-0.8
Point 3	195.9	8
Point 4	200	8.4
Point 5	236	-1.5
Point 6	310	-1.5
Point 7	310	-7.5
Point 8	310	-43
Point 9	310	-70
Point 10	208.5	8.2
Point 11	200	-7.5
Point 12	200	14
Point 13	200.9	14
Point 14	201.5	8.5
Point 15	200	-1.3
Point 16	200	-1.5
Point 17	200	-16
Point 18	310	-16
Point 19	165.6	-7.5
Point 20	100	-16
Point 21	100	-43

Point 22	100	-70
Point 23	165.6	-1.5
Point 24	165.6	-1.3
Point 25	236	-7.5
Point 26	236	-16
Point 27	100	-8
Point 28	156	-1.3
Point 29	160.5	-1.5
Point 30	100	-7.5
Point 31	200	-43
Point 32	200	-70
Point 33	160.5	-7.5
Point 34	160.5	-16
Point 35	100	8
Point 36	169.4	-0.1
Point 37	156.8	-1.2
Point 38	151.6	-2.3
Point 39	141.6	-6.5
Point 40	131.6	-6.9
Point 41	155.2	-1.5
Point 42	100	-6.9
Point 43	178.9	3.1
Point 44	188.4	6.1
Point 45	199.6	8.4
Point 46	230.9	0.3
Point 47	216.5	5.8
Point 48	225.7	2.1
Point 49	250.4	-0.5
Point 50	271	-0.6
Point 51	310	-0.3
Point 52	236	0.09077
Point 53	171	0.42211
Point 54	171.77043	-0.05919
Point 55	173.70134	-0.64615
Point 56	177.00859	-1.11168
Point 57	179.065	-1.3
Point 58	182.29938	-1.5
Point 59	186.54136	-1.59324
Point 60	191.38723	-1.63118
Point 61	194.01441	-1.62443
Point 62	197.42286	-1.5
Point 63	198.49154	-1.3
Point 64	200	0.40634
Point 65	200.80297	-1.5
Point 66	201.64091	-1.63792
Point 67	205.5918	-1.8943
Point 68	211.13761	-2.04947
Point 69	233.88355	-2.24513

Point 70	236	-2.25393
Point 71	310	-2.30007
Point 72	200.41802	-0.84131
Point 73	200.41802	-1.33425

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.91	(158.806, 46.737)	30.38133	(199.846, 8.4)	(132.427, -6.86693)
2	247	1.98	(158.806, 46.737)	58.376	(199.62, 8.4)	(135.415, -6.7474)

Slices of Slip Surface: Optimized

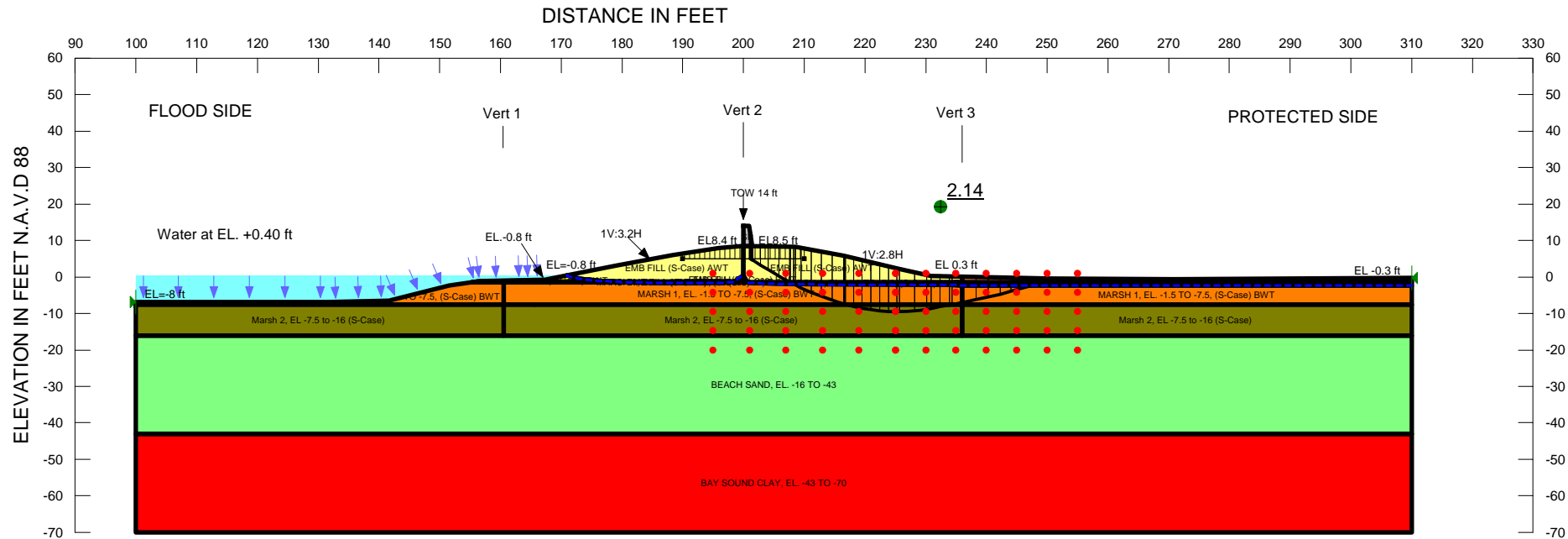
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	133.58785	-7.1834645	466.71309	510.79593	19.626947	0
2	Optimized	135.64785	-7.74508	490.23696	576.1717	38.260614	0
3	Optimized	137.4457	-8.23524	510.76814	629.45833	52.844277	0
4	Optimized	139.9723	-8.952942	539.94081	709.77304	75.614179	0
5	Optimized	141.7284	-9.462847	559.41028	789.32233	102.36344	0
6	Optimized	143.4574	-9.77937	569.52133	833.95624	117.73401	0
7	Optimized	146.6839	-10.190625	580.45476	915.0814	148.98538	0
8	Optimized	149.9549	-10.35277	580.31623	974.99325	175.72153	0
9	Optimized	152.5	-10.39938	576.90321	1012.3857	193.8893	0
10	Optimized	154.3	-10.432345	574.73691	1032.6045	203.8558	0
11	Optimized	155.6	-10.456155	573.34139	1048.0243	211.34246	0
12	Optimized	156.4	-10.470805	572.50403	1054.2608	214.49192	0
13	Optimized	157.725	-10.49507	571.14754	1059.39	217.37957	0
14	Optimized	159.575	-10.52895	569.47214	1065.9835	221.06112	0
15	Optimized	161.15	-10.557795	568.24317	1071.5126	224.07	0
16	Optimized	162.6186	-10.58469	567.00002	1076.5684	226.87446	0
17	Optimized	164.3357	-10.630705	566.53269	1087.9074	232.13097	0
18	Optimized	165.4171	-10.670775	566.87336	1097.3768	236.19536	0
19	Optimized	165.87805	-10.69357	567.31604	1100.3097	237.30407	0
20	Optimized	166.72805	-10.7431	568.70214	1109.9032	240.95823	0
21	Optimized	168.35	-10.844565	571.78705	1138.1561	252.16376	0
22	Optimized	170.2	-10.960295	575.60594	1175.0777	266.90203	0
23	Optimized	171.3852	-11.034435	578.0531	1209.2065	281.00758	0
24	Optimized	172.3797	-11.096645	580.25476	1252.4244	299.26921	0
25	Optimized	173.34515	-11.087855	578.47288	1227.8544	289.1233	0
26	Optimized	175.35495	-10.8232	560.79484	1273.817	317.45791	0
27	Optimized	177.1705	-10.58413	544.81954	1315.3689	343.07066	0
28	Optimized	178.1162	-10.319395	528.3358	1268.1278	329.3766	0
29	Optimized	178.9825	-10.050355	511.6233	1272.6481	338.83009	0
30	Optimized	180.52445	-9.571495	481.97446	1277.4892	354.18597	0
31	Optimized	182.14165	-9.0409275	449.1153	1226.3941	346.06683	0
32	Optimized	183.79225	-8.2317975	399.65547	1204.6504	358.40685	0
33	Optimized	185.6912	-7.30091	342.79678	1177.6247	371.68932	0
34	Optimized	186.31935	-6.95664	321.78596	1117.5427	354.29374	0

35	Optimized	187.4707	-6.203759	276.07753	1078.7332	357.36533	0
36	Optimized	189.30585	-5.003714	203.22623	1011.9041	360.04659	0
37	Optimized	190.79945	-3.92709	138.11975	903.96942	340.97824	0
38	Optimized	192.53585	-2.49643	52.026133	810.1241	337.52696	0
39	Optimized	193.7088	-1.525025	-5.9278592	679.71237	302.62745	75
40	Optimized	193.83015	-1.4	-11.780459	662.14402	322.94922	75
41	Optimized	194.9136	-0.28372425	-57.729493	596.81817	291.08767	75
42	Optimized	197.0351	1.9020308	-140.91326	456.10968	222.45956	75
43	Optimized	198.8851	3.894059	-228.87112	303.52664	148.03983	75
44	Optimized	199.72315	4.858304	-280.10257	236.89801	115.54288	75

Slices of Slip Surface: 247

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	247	136.31615	-7.1237	462.0896	519.97495	25.772221	0
2	247	138.313	-7.910885	495.65342	607.60273	49.843043	0
3	247	140.50435	-8.6836035	526.83875	686.69301	71.171704	0
4	247	142.6	-9.3344705	551.71685	789.5805	105.90372	0
5	247	144.6	-9.874452	570.84994	875.60069	135.68377	0
6	247	146.6	-10.339265	587.8079	952.21751	162.24561	0
7	247	148.6	-10.73073	601.97962	1019.9882	186.10941	0
8	247	150.6	-11.050345	613.54401	1079.3206	207.37712	0
9	247	152.5	-11.29017	621.89364	1117.2546	220.54889	0
10	247	154.3	-11.457675	627.17785	1142.967	229.64411	0
11	247	155.6	-11.549375	629.77278	1159.3595	235.78722	0
12	247	156.4	-11.587885	630.48853	1164.4092	237.71681	0
13	247	157.725	-11.62153	630.16195	1164.6106	237.95188	0
14	247	159.575	-11.62649	627.62139	1160.278	237.15401	0
15	247	161.15	-11.588195	623.39697	1152.6084	235.62011	0
16	247	162.75	-11.497745	616.16792	1140.0209	233.23439	0
17	247	164.65	-11.33782	604.63114	1120.2381	229.56302	0
18	247	166.45	-11.129955	590.45957	1096.5345	225.31905	0
19	247	168.35	-10.843655	571.72413	1080.1217	226.35319	0
20	247	170.2	-10.51041	550.23967	1066.0913	229.67193	0
21	247	171.3852	-10.266185	534.48512	1063.7482	235.64311	0
22	247	172.73585	-9.9439165	513.99065	1074.6529	249.6229	0
23	247	174.52815	-9.4754065	484.21072	1084.7466	267.37581	0
24	247	176.1818	-8.9863475	453.3672	1088.2429	282.66489	0
25	247	177.9543	-8.4001125	416.44816	1085.7459	297.99056	0
26	247	178.9825	-8.0413035	393.92321	1082.1429	306.41514	0
27	247	179.7303	-7.7554585	376.10117	1075.6272	311.44904	0
28	247	181.3475	-7.1014605	335.30903	1053.8214	319.90234	0
29	247	183.3599	-6.2111405	280.02785	1015.1646	327.30396	0
30	247	185.4809	-5.1744285	215.9634	964.4316	333.23951	0
31	247	187.4707	-4.1055595	150.27096	907.16551	336.99116	0
32	247	189.94555	-2.6062675	58.673298	810.80009	334.86842	0
33	247	191.58755	-1.5654565	-4.5880729	721.96947	321.44152	75
34	247	191.82975	-1.4	-12.845473	704.02038	343.37368	75

35	247	192.95665	-0.59207395	-48.224747	651.06922	317.54768	75
36	247	194.9189	0.88863155	-109.38725	554.44281	270.41983	75
37	247	196.825	2.4555885	-170.43751	441.37073	215.27089	75
38	247	198.675	4.115013	-243.52184	312.57278	152.45193	75
39	247	199.6101	4.99013	-288.93569	246.23113	120.09495	75



Name: EMB FILL (S-Case) AWT Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion: 75 psf Phi: 26 °
Name: MARSH 1, EL. -1.5 TO -7.5, (S-Case) AWT Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion: 75 psf Phi: 24 °
Name: BEACH SAND, EL. -16 TO -43 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand
Name: BAY SOUND CLAY, EL. -43 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 105 pcf Cohesion: 0 psf Phi: 26 °
Name: SP Model: Undrained (Phi=0) Unit Weight: 0.1 pcf Cohesion: 0.01 psf
Name: Marsh 2, EL. -7.5 to -16 (S-Case) Model: Mohr-Coulomb Unit Weight: 93 pcf Cohesion: 0 psf Phi: 24 °
Name: EMB FILL (S-Case) BWT Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion: 0 psf Phi: 26 °
Name: MARSH 1, EL. -1.5 TO -7.5, (S-Case) BWT Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion: 0 psf Phi: 24 °

REACH 16 CROSS-SECTION AT STA 30+00

GENERAL NOTES

CLASSIFICATION STRATIFICATION
SHEAR STRENGTHS AND UNIT WEIGHTS OF
THE SOIL WERE BASED ON THE RESULTS OF
UNDISTURBED BORINGS AND CPT DATA. SEE
BOTH BORING AND CPT DATA PLATES.

WHERE INDICATED, SHEAR STRENGTHS BETWEEN
VERTICALS WERE ASSUMED TO VARY LINEARLY
BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL
REMEDICATION OF CANAL WALLS AND LEVEES
PROTECTED SIDE STABILITY ANALYSIS
CASE: NWL S-Case P/S (Block)
REACH 16, STA. 30+00 TO 36+40 EAST
ORLEANS PARISH, LOUISIANA

NWL S-Case P/S (Block)

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File Information

Created By: [Liljegren, James](#)
Revision Number: [444](#)
Last Edited By: [Vicky Curtis](#)
Date: [9/30/2013](#)
Time: [12:07:15 PM](#)
File Name: [Reach 16.gsz](#)
Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix F NWL\](#)
Last Solved Date: [9/30/2013](#)
Last Solved Time: [12:09:02 PM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Strength Units: [psf](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

NWL S-Case P/S (Block)

Kind: [SLOPE/W](#)
Parent: [Normal Water Level at +0.40ft \(seepage\)](#)
Method: [Spencer](#)
Settings
 PWP Conditions Source: [Parent Analysis](#)
Slip Surface
 Direction of movement: [Left to Right](#)
 Use Passive Mode: [No](#)
 Slip Surface Option: [Block](#)
 Critical slip surfaces saved: [1](#)
 Optimize Critical Slip Surface Location: [Yes](#)
Tension Crack
 Tension Crack Option: [Tension Crack Line](#)
 Percentage Wet: [0](#)
 Tension Crack Fluid Unit Weight: [62.4 pcf](#)
FOS Distribution
 FOS Calculation Option: [Constant](#)

Restrict Block Crossing: [Yes](#)

Advanced

Number of Slices: [30](#)

Optimization Tolerance: [0.01](#)

Minimum Slip Surface Depth: [0.1 ft](#)

Optimization Maximum Iterations: [7000](#)

Optimization Convergence Tolerance: [1e-007](#)

Starting Optimization Points: [8](#)

Ending Optimization Points: [16](#)

Complete Passes per Insertion: [1](#)

Driving Side Maximum Convex Angle: [5 °](#)

Resisting Side Maximum Convex Angle: [1 °](#)

Materials

EMB FILL (S-Case) AWT

Model: [Mohr-Coulomb](#)

Unit Weight: [105 pcf](#)

Cohesion: [75 psf](#)

Phi: [26 °](#)

Phi-B: [0 °](#)

MARSH 1, EL. -1.5 TO -7.5, (S-Case) AWT

Model: [Mohr-Coulomb](#)

Unit Weight: [105 pcf](#)

Cohesion: [75 psf](#)

Phi: [24 °](#)

Phi-B: [0 °](#)

BEACH SAND, EL. -16 TO -43

Model: [Shear/Normal Fn.](#)

Unit Weight: [122 pcf](#)

Strength Function: [Sand](#)

Phi-B: [0 °](#)

BAY SOUND CLAY, EL. -43 TO -70

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [105 pcf](#)

Cohesion: [0 psf](#)

Phi: [26 °](#)

Phi-B: [0 °](#)

SP

Model: [Undrained \(Phi=0\)](#)

Unit Weight: [0.1 pcf](#)

Cohesion: [0.01 psf](#)

Marsh 2, EL -7.5 to -16 (S-Case)

Model: [Mohr-Coulomb](#)

Unit Weight: [93 pcf](#)

Cohesion: [0 psf](#)

Phi: [24 °](#)

Phi-B: [0 °](#)

EMB FILL (S-Case) BWT

Model: [Mohr-Coulomb](#)

Unit Weight: [105 pcf](#)

Cohesion: [0 psf](#)

Phi: [26 °](#)

Phi-B: [0 °](#)

MARSH 1, EL. -1.5 TO -7.5, (S-Case) BWT

Model: [Mohr-Coulomb](#)

Unit Weight: [105 pcf](#)

Cohesion: [0 psf](#)

Phi: [24 °](#)

Phi-B: [0 °](#)

Slip Surface Limits

Left Coordinate: [\(100, -6.9\) ft](#)

Right Coordinate: [\(310, -0.3\) ft](#)

Slip Surface Block

Left Grid

Upper Left: [\(195, 1\) ft](#)

Lower Left: [\(195, -20\) ft](#)

Lower Right: [\(225, -20\) ft](#)

X Increments: [5](#)

Y Increments: [4](#)

Starting Angle: [135 °](#)

Ending Angle: [155 °](#)

Angle Increments: [4](#)

Right Grid

Upper Left: [\(225, 1\) ft](#)

Lower Left: [\(225, -20\) ft](#)

Lower Right: [\(255, -20\) ft](#)

X Increments: [6](#)

Y Increments: [4](#)

Starting Angle: [15 °](#)

Ending Angle: [45 °](#)

Angle Increments: [4](#)

Reinforcements

Reinforcement 1

Type: [Pile](#)
Outside Point: [\(200, 14\) ft](#)
Inside Point: [\(200, -1.3\) ft](#)
Slip Surface Intersection: [\(0, 0\) ft](#)
Total Length: [15.3 ft](#)
Reinforcement Direction: [90 °](#)
Applied Load Option: [Variable](#)
F of S Dependent: [No](#)
Pile Spacing: [1 ft](#)
Shear Capacity: [0 lbs](#)
Shear Safety Factor: [1](#)
Shear Load Used: [0 lbs](#)
Shear Option: [Parallel to Slip](#)
Resisting Force Used: [0 lbs/ft](#)

Tension Crack Line

	X (ft)	Y (ft)
	190	5
	210	5

Shear/Normal Strength Functions

Sand

Model: [Spline Data Point Function](#)
Function: [Shear Stress vs. Normal Stress](#)
Curve Fit to Data: [100 %](#)
Segment Curvature: [0 %](#)
Y-Intercept: [0](#)
Data Points: [Normal Stress \(psf\), Shear Stress \(psf\)](#)
Data Point: [\(-10000, 0\)](#)
Data Point: [\(0, 0\)](#)
Data Point: [\(10000, 6494\)](#)
Estimation Properties
Intact Rock Param.: [10](#)
Geological Strength: [100](#)
Disturbance Factor: [0](#)
SigmaC: [600000 psf](#)
Sigma3: [300000 psf](#)
Num. Points: [20](#)

Regions



	Material	Points	Area (ft²)
Region 1	SP	4,12,13,14	6.675
Region 2	EMB FILL (S-Case) AWT	53,43,44,3,45,4,64,63,57,56,55,54	176.04353
Region 3	EMB FILL (S-Case) BWT	58,23,29,41,28,24,57	5.016438
Region 4	MARSH 1, EL. -1.5 TO -7.5, (S-Case) BWT	23,58,59,60,61,62,16,65,66,67,68,69,70,25,11,19,33,29	431.67473
Region 5	BEACH SAND, EL. -16 TO -43	20,34,17,26,18,8,31,21	5670
Region 6	BAY SOUND CLAY, EL. -43 TO -70	8,9,32,22,21,31	5670
Region 7	Marsh 2, EL -7.5 to -16 (S-Case)	19,11,25,26,17,34,33	641.75
Region 8	MARSH 1, EL. -1.5 TO -7.5, (S-Case) BWT	25,70,71,7	386.502
Region 9	Marsh 2, EL -7.5 to -16 (S-Case)	26,25,7,18	629
Region 10	MARSH 1, EL. -1.5 TO -7.5, (S-Case) BWT	29,33,30,42,40,39,38,41	109.92
Region 11	Marsh 2, EL -7.5 to -16 (S-Case)	27,30,33,34,20	514.25
Region 12	MARSH 1, EL. -1.5 TO -7.5, (S-Case) AWT	52,49,50,51,6,5	79.173544
Region 13	EMB FILL (S-Case) BWT	28,37,1,2,36,53,54,55,56,57,24	11.919523
Region 14	EMB FILL (S-Case) BWT	63,15,64	1.2869728
Region 15	EMB FILL (S-Case) AWT	57,63,62,58	3.455002
Region 16	EMB FILL (S-Case) BWT	63,15,16,62	0.40856
Region 17	EMB FILL (S-Case) AWT	52,5,65,73,72,64,4,14,10,47,48,46	224.13344
Region 18	MARSH 1, EL. -1.5 TO -7.5, (S-Case) AWT	5,65,66,67,68,69,70	20.03593
Region 19	MARSH 1, EL. -1.5 TO -7.5, (S-Case) AWT	58,59,60,61,62	1.2893396
Region 20	EMB FILL (S-Case) BWT	64,72,73,65,16,15	0.56801965
Region 21	MARSH 1, EL. -1.5 TO -7.5, (S-Case) AWT	5,70,71,6	57.498

Points

	X (ft)	Y (ft)
Point 1	161.8	-1
Point 2	167.3	-0.8
Point 3	195.9	8
Point 4	200	8.4
Point 5	236	-1.5
Point 6	310	-1.5
Point 7	310	-7.5
Point 8	310	-43
Point 9	310	-70
Point 10	208.5	8.2

Point 11	200	-7.5
Point 12	200	14
Point 13	200.9	14
Point 14	201.5	8.5
Point 15	200	-1.3
Point 16	200	-1.5
Point 17	200	-16
Point 18	310	-16
Point 19	165.6	-7.5
Point 20	100	-16
Point 21	100	-43
Point 22	100	-70
Point 23	165.6	-1.5
Point 24	165.6	-1.3
Point 25	236	-7.5
Point 26	236	-16
Point 27	100	-8
Point 28	156	-1.3
Point 29	160.5	-1.5
Point 30	100	-7.5
Point 31	200	-43
Point 32	200	-70
Point 33	160.5	-7.5
Point 34	160.5	-16
Point 35	100	8
Point 36	169.4	-0.1
Point 37	156.8	-1.2
Point 38	151.6	-2.3
Point 39	141.6	-6.5
Point 40	131.6	-6.9
Point 41	155.2	-1.5
Point 42	100	-6.9
Point 43	178.9	3.1
Point 44	188.4	6.1
Point 45	199.6	8.4
Point 46	230.9	0.3
Point 47	216.5	5.8
Point 48	225.7	2.1
Point 49	250.4	-0.5
Point 50	271	-0.6
Point 51	310	-0.3
Point 52	236	0.09077
Point 53	171	0.42211
Point 54	171.77043	-0.05919
Point 55	173.70134	-0.64615
Point 56	177.00859	-1.11168
Point 57	179.065	-1.3
Point 58	182.29938	-1.5

Point 59	186.54136	-1.59324
Point 60	191.38723	-1.63118
Point 61	194.01441	-1.62443
Point 62	197.42286	-1.5
Point 63	198.49154	-1.3
Point 64	200	0.40634
Point 65	200.80297	-1.5
Point 66	201.64091	-1.63792
Point 67	205.5918	-1.8943
Point 68	211.13761	-2.04947
Point 69	233.88355	-2.24513
Point 70	236	-2.25393
Point 71	310	-2.30007
Point 72	200.41802	-0.84131
Point 73	200.41802	-1.33425

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	2.14	(225.428, 6.377)	22.20369	(201.093, 12.2316)	(250.591, -0.500928)
2	2877	2.25	(225.428, 6.377)	23.427	(198.292, 8.25858)	(251.713, -0.506372)

Slices of Slip Surface: Optimized

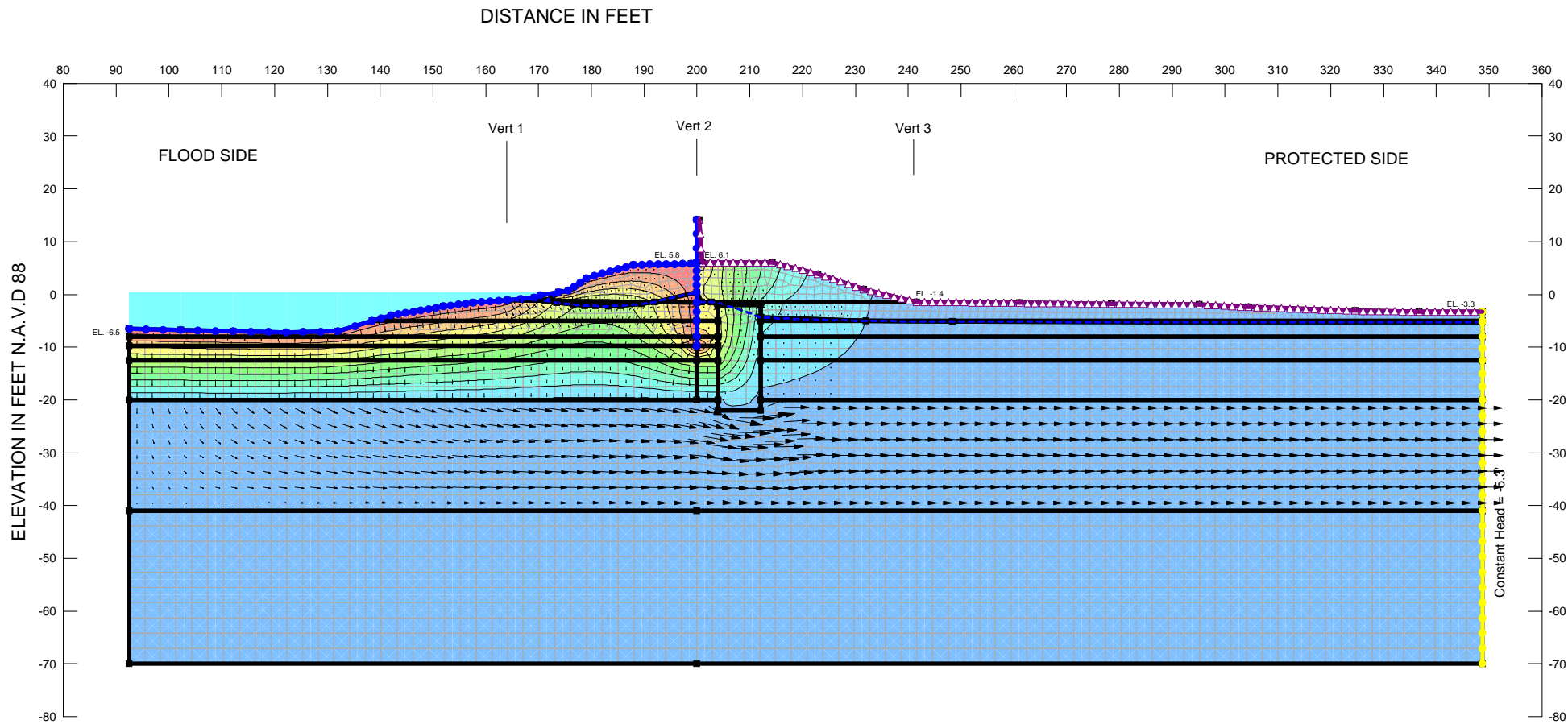
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	201.29645	4.817341	-394.04557	278.33479	135.75295	75
2	Optimized	201.51595	4.620346	-382.60921	295.30209	144.02846	75
3	Optimized	202.1711	3.960045	-344.05255	333.53801	162.67736	75
4	Optimized	203.44945	2.668115	-269.18531	431.4701	210.44203	75
5	Optimized	204.97205	1.1595175	-182.42058	551.60673	269.03658	75
6	Optimized	206.73895	-0.5657475	-84.186639	683.3736	333.30358	75
7	Optimized	207.66405	-1.46419	-31.69015	779.1497	380.0167	75
8	Optimized	207.97805	-1.734344	-15.547667	809.66708	360.48701	75
9	Optimized	208.3752	-2.0760405	4.9261637	857.98542	379.80645	0
10	Optimized	209.00625	-2.6189565	37.547195	894.15196	381.38501	0
11	Optimized	210.32505	-3.6260885	98.063048	990.79715	397.47083	0
12	Optimized	211.9632	-4.7784085	167.48497	1055.2762	395.27011	0
13	Optimized	213.7166	-5.8633665	233.01799	1154.5544	410.29445	0
14	Optimized	215.5722	-6.871779	294.10999	1200.3426	403.48077	0
15	Optimized	216.52915	-7.3918375	325.7461	1223.6601	399.77708	0
16	Optimized	216.6743	-7.453845	329.51897	1268.4223	418.02669	0
17	Optimized	217.46515	-7.768625	348.60973	1266.1574	408.51853	0
18	Optimized	218.81485	-8.305875	381.29964	1261.5454	391.91067	0
19	Optimized	220.227	-8.7499625	408.31878	1295.9904	395.21686	0
20	Optimized	221.7016	-9.1008875	429.62173	1268.4133	373.45407	0
21	Optimized	223.14155	-9.3345725	443.74286	1280.2975	372.45812	0
22	Optimized	224.54685	-9.4510175	450.6287	1231.8626	347.82776	0
23	Optimized	225.47475	-9.493892	453.10723	1244.417	352.31381	0

24	Optimized	226.91975	-9.395427	446.68071	1178.5386	325.8441	0
25	Optimized	229.1657	-9.097585	427.77655	1105.4364	301.71359	0
26	Optimized	230.54595	-8.7650125	406.85538	1053.389	287.8553	0
27	Optimized	231.6459	-8.398906	383.89299	997.94242	273.39242	0
28	Optimized	233.1377	-7.9023885	352.75897	940.50826	261.68284	0
29	Optimized	234.1151	-7.577065	332.36001	902.91035	254.02537	0
30	Optimized	235.1733	-7.2248485	310.28718	858.34127	244.0094	0
31	Optimized	237.1509	-6.5666435	269.03874	773.11641	224.42984	0
32	Optimized	239.2819	-5.8102625	221.66902	685.85392	206.66844	0
33	Optimized	241.24215	-5.0636075	174.94114	589.31857	184.49272	0
34	Optimized	243.14595	-4.285444	126.26453	498.77142	165.85075	0
35	Optimized	244.9933	-3.4757725	75.628819	393.88068	141.69486	0
36	Optimized	246.8857	-2.6463585	23.770433	286.42043	116.93931	0
37	Optimized	248.4283	-1.86089	-25.324773	231.64656	103.1357	75
38	Optimized	249.7011	-1.0605428	-75.329772	114.95088	51.17943	75
39	Optimized	250.49555	-0.56100655	-106.54317	42.585814	18.960426	75

Slices of Slip Surface: 2877

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	2877	198.94595	4.542013	-266.5891	313.01504	152.66764	75
2	2877	199.8	3.9439845	-223.0756	371.11686	181.00579	75
3	2877	200.45	3.4888495	-308.73844	413.72644	201.78787	75
4	2877	201.2	2.963694	-278.92125	463.46254	226.04579	75
5	2877	202.51245	2.0446935	-227.17693	541.06118	263.89317	75
6	2877	204.5374	0.62681615	-149.14276	656.67635	320.28246	75
7	2877	206.56235	-0.79106135	-70.178164	772.33197	376.69147	75
8	2877	207.90935	-1.7342525	-15.431912	857.04957	381.58305	75
9	2877	208.37195	-2.058163	3.824682	900.24128	399.11038	0
10	2877	209.8188	-3.071258	64.386553	959.7112	398.62421	0
11	2877	211.97195	-4.5789125	155.13199	1043.982	395.74154	0
12	2877	213.64065	-5.7473475	225.8893	1109.3199	393.32864	0
13	2877	215.30935	-6.9157825	296.99515	1174.7068	390.78242	0
14	2877	216.32185	-7.6247405	340.28643	1213.1081	388.60526	0
15	2877	217.75	-8.6247405	401.51563	1247.8964	376.83301	0
16	2877	219.8375	-9.5	454.96716	1465.1343	449.7554	0
17	2877	221.5125	-9.5	454.44776	1392.7164	417.74412	0
18	2877	223.1875	-9.5	454.00597	1320.2985	385.69829	0
19	2877	224.8625	-9.5	453.6	1247.8806	353.63651	0
20	2877	226.775	-9.5	453.22791	1171.6744	319.873	0
21	2877	228.925	-9.5	452.86512	1091.6744	284.41623	0
22	2877	230.45	-9.313604	441.03955	1131.9577	307.61658	0
23	2877	231.6459	-8.818251	410.0178	1058.2243	288.60014	0
24	2877	233.1377	-8.2003375	371.32297	987.4985	274.33902	0
25	2877	234.356	-7.6956905	339.72865	929.76823	262.70255	0
26	2877	235.4142	-7.2573595	312.28585	876.19204	251.06721	0
27	2877	236.95635	-6.6185825	272.29778	793.98852	232.27168	0
28	2877	238.86905	-5.82631	222.70127	692.07127	208.97699	0

29	2877	240.78175	-5.034038	173.13374	590.20232	185.6909	0
30	2877	242.6945	-4.241766	123.57105	488.28507	162.38115	0
31	2877	244.60725	-3.449494	74.013178	386.35816	139.06495	0
32	2877	246.51995	-2.657222	24.469801	284.44574	115.74874	0
33	2877	248.395	-1.880543	-24.096785	202.46247	90.142101	75
34	2877	249.85685	-1.2750215	-61.956484	119.86804	53.368689	75
35	2877	251.05625	-0.7782073	-93.01864	55.05169	24.510592	75



Name: EMB FILL (S-Case) AWT Model: Saturated Only K-Sat: 3.28e-008 ft/sec K-Ratio: 1
Name: MARSH 1, EL. -1.5 TO -5 (S-Case) AWT Model: Saturated Only K-Sat: 3.28e-007 ft/sec K-Ratio: 1
Name: BEACH SAND, EL. -20 TO -41 Model: Saturated Only K-Sat: 0.00049 ft/sec K-Ratio: 1
Name: Sheet Pile Model: Saturated Only K-Sat: 1e-010 ft/sec K-Ratio: 1
Name: MARSH 2, EL. -5 to -8 (S-Case) AWT Model: Saturated Only K-Sat: 3.28e-007 ft/sec K-Ratio: 1
Name: MARSH 3, EL. -8 to -12.5 (S-Case) Model: Saturated Only K-Sat: 3.28e-007 ft/sec K-Ratio: 1
Name: MARSH 4, EL. -12.5 to -20 (S-Case) Model: Saturated Only K-Sat: 3.28e-007 ft/sec K-Ratio: 1
Name: BAY SOUND CLAY, EL. -41 to -70 (S-Case) Model: Saturated Only K-Sat: 3.28e-008 ft/sec K-Ratio: 1
Name: DSM1 Model: Saturated Only K-Sat: 3.28e-008 ft/sec K-Ratio: 1

GENERAL NOTES

With DSM
Sta 37+29 to 47+00

Cross Section at Sta 42+00

CLASSIFICATION STRATIFICATION
SHEAR STRENGTHS AND UNIT WEIGHTS OF
THE SOIL WERE BASED ON THE RESULTS OF
UNDISTURBED BORINGS AND CPT DATA. SEE
BOTH BORING AND CPT DATA PLATES.

WHERE INDICATED, SHEAR STRENGTHS BETWEEN
VERTICALS WERE ASSUMED TO VARY LINEARLY
BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL
REMEDATION OF CANAL WALLS AND LEVEES
PROTECTED SIDE STABILITY ANALYSIS,
CASE: Name: Normal Water Level at +0.40ft (seepage)
REACH 17, STA. 37+29 TO 50+00 EAST
ORLEANS PARISH, LOUISIANA

Normal Water Level at +0.40ft (seepage)

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File Information

Created By: [Liljegren, James](#)
Revision Number: [574](#)
Last Edited By: [Vicky Curtis](#)
Date: [9/30/2013](#)
Time: [12:22:48 PM](#)
File Name: [Reach 17A.gsz](#)
Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix F NWL\](#)
Last Solved Date: [9/30/2013](#)
Last Solved Time: [12:23:34 PM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Mass(M) Units: [lbs](#)
Mass Flux Units: [lbs/sec](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

Normal Water Level at +0.40ft (seepage)

Kind: [SEEP/W](#)
Method: [Steady-State](#)
Settings
 Include Air Flow: [No](#)
Control
 Apply Runoff: [No](#)
Convergence
 Convergence Type: [Head Vector Norm](#)
 Maximum Number of Iterations: [500](#)
 Tolerance: [0.001](#)
 Maximum Change in K: [0.1](#)
 Rate of Change in K: [1.02](#)
 Minimum Change in K: [1e-005](#)
 Equation Solver: [Parallel Direct](#)
 Potential Seepage Max # of Reviews: [10](#)
Time

Starting Time: 0 sec

Duration: 0 sec

Ending Time: 0 sec

Materials

EMB FILL (S-Case) AWT

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-008 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

MARSH 1, EL. -1.5 TO -5 (S-Case) AWT

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-007 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

BEACH SAND, EL. -20 TO -41

Model: Saturated Only

Hydraulic

K-Sat: 0.00049 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

Sheet Pile

Model: Saturated Only

Hydraulic

K-Sat: 1e-010 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

MARSH 2, EL. -5 to -8 (S-Case) AWT

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-007 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

MARSH 3, EL. -8 to -12.5 (S-Case)

Model: Saturated Only
Hydraulic
K-Sat: 3.28e-007 ft/sec
Volumetric Water Content: 0 ft³/ft³
Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

MARSH 4, EL. -12.5 to -20 (S-Case)

Model: Saturated Only
Hydraulic
K-Sat: 3.28e-007 ft/sec
Volumetric Water Content: 0 ft³/ft³
Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

BAY SOUND CLAY, EL. -41 to -70 (S-Case)

Model: Saturated Only
Hydraulic
K-Sat: 3.28e-008 ft/sec
Volumetric Water Content: 0 ft³/ft³
Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

DSM1

Model: Saturated Only
Hydraulic
K-Sat: 3.28e-008 ft/sec
Volumetric Water Content: 0 ft³/ft³
Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

Boundary Conditions

Drainage

Review: true
Type: Total Flux (Q) 0

Canal Water

Type: Head (H) 0.4

Curb

Type: Head (H) -5.3

Regions

	Material	Points	Area (ft²)
Region 1	EMB FILL (S-Case) AWT	67,66,12,13,14,15,30,77,76,68	144.59694
Region 2		65,16,17,18	5.6
Region 3	EMB FILL (S-Case) AWT	78,79,22,21,20,19,18,65,30,77	208.66058
Region 4	MARSH 1, EL. -1.5 TO -5 (S-Case) AWT	51,6,7,8,9,68,69,70,71,72,73,74,75,76,43,44	181.53211
Region 5	MARSH 2, EL. -5 to -8 (S-Case) AWT	37,1,2,3,4,5,51,44,45	239.55
Region 6	MARSH 3, EL. -8 to -12.5 (S-Case)	31,37,45,46	193.68
Region 7	MARSH 3, EL. -8 to -12.5 (S-Case)	32,31,46,47	290.52
Region 8	MARSH 1, EL. -1.5 TO -5 (S-Case) AWT	81,54,82,83,36,29,28,27,26,25,24,23,22,79,80	395.23978
Region 9	MARSH 2, EL. -5 to -8 (S-Case) AWT	44,56,57,45	12
Region 10	MARSH 3, EL. -8 to -12.5 (S-Case)	45,57,58,46	7.2
Region 11	MARSH 3, EL. -8 to -12.5 (S-Case)	46,58,59,47	10.8
Region 12	MARSH 2, EL. -5 to -8 (S-Case) AWT	61,83,84,85,86,38,62	385.96664
Region 13	MARSH 3, EL. -8 to -12.5 (S-Case)	63,62,38,39	615.15
Region 14	MARSH 4, EL. -12.5 to -20 (S-Case)	32,47,48,33	807
Region 15	BEACH SAND, EL. -20 TO -41	33,48,60,53,55,64,40,41,49,34	5366.3
Region 16	MARSH 4, EL. -12.5 to -20 (S-Case)	47,59,60,48	30
Region 17	DSM1	52,81,54,82,61,62,63,64,55,53,60,59,58,57,56	160
Region 18	MARSH 4, EL. -12.5 to -20 (S-Case)	63,64,40,39	1025.25
Region 19	BAY SOUND CLAY, EL. -41 to -70 (S-Case)	34,49,41,42,50,35	7432.7
Region 20	EMB FILL (S-Case) AWT	9,10,11,66,67,68	4.9485279
Region 21	MARSH 1, EL. -1.5 TO -5 (S-Case) AWT	68,69,70,71,72,73,74,75,76	12.352968
Region 22	EMB FILL (S-Case) AWT	76,43,77	7.5494544
Region 23	EMB FILL (S-Case) AWT	77,43,79,78	0.93939808
Region 24	MARSH 1, EL. -1.5 TO -5 (S-Case) AWT	43,79,80,81,52,56,44	14.143032
Region 25	MARSH 1, EL. -1.5 TO -5 (S-Case) AWT	82,61,83	6.4522084
Region 26	MARSH 2, EL. -5 to -8 (S-Case) AWT	86,85,84,83,36	24.133355

Lines

	Start Point	End Point	Hydraulic Boundary	Left Side Material
Line 1	12	13	Canal Water	
Line 2	13	14	Canal Water	
Line 3	14	15	Canal Water	
Line 4	15	30		
Line 5	65	16	Canal Water	
Line 6	16	17		
Line 7	17	18	Drainage	
Line 8	18	65		
Line 9	22	21	Drainage	
Line 10	21	20	Drainage	

Line 11	20	19	Drainage	
Line 12	19	18	Drainage	
Line 13	65	30		
Line 14	51	6	Canal Water	
Line 15	6	7	Canal Water	
Line 16	7	8	Canal Water	
Line 17	8	9	Canal Water	
Line 18	43	44	Canal Water	Sheet Pile
Line 19	44	51		
Line 20	37	1		
Line 21	1	2	Canal Water	
Line 22	2	3	Canal Water	
Line 23	3	4	Canal Water	
Line 24	4	5	Canal Water	
Line 25	5	51	Canal Water	
Line 26	44	45	Canal Water	Sheet Pile
Line 27	45	37		
Line 28	31	37		
Line 29	45	46	Canal Water	Sheet Pile
Line 30	46	31		
Line 31	32	31		
Line 32	46	47		
Line 33	47	32		
Line 34	44	56		
Line 35	56	52		
Line 36	36	29	Curb	
Line 37	29	28	Drainage	
Line 38	28	27	Drainage	
Line 39	27	26	Drainage	
Line 40	26	25	Drainage	
Line 41	25	24	Drainage	
Line 42	24	23	Drainage	
Line 43	23	22	Drainage	
Line 44	56	57		
Line 45	57	45		
Line 46	57	58		
Line 47	58	46		
Line 48	58	59		
Line 49	59	47		
Line 50	38	62		
Line 51	62	61		
Line 52	63	62		
Line 53	38	39	Curb	
Line 54	39	63		
Line 55	47	48		
Line 56	48	33		
Line 57	33	32		
Line 58	48	60		

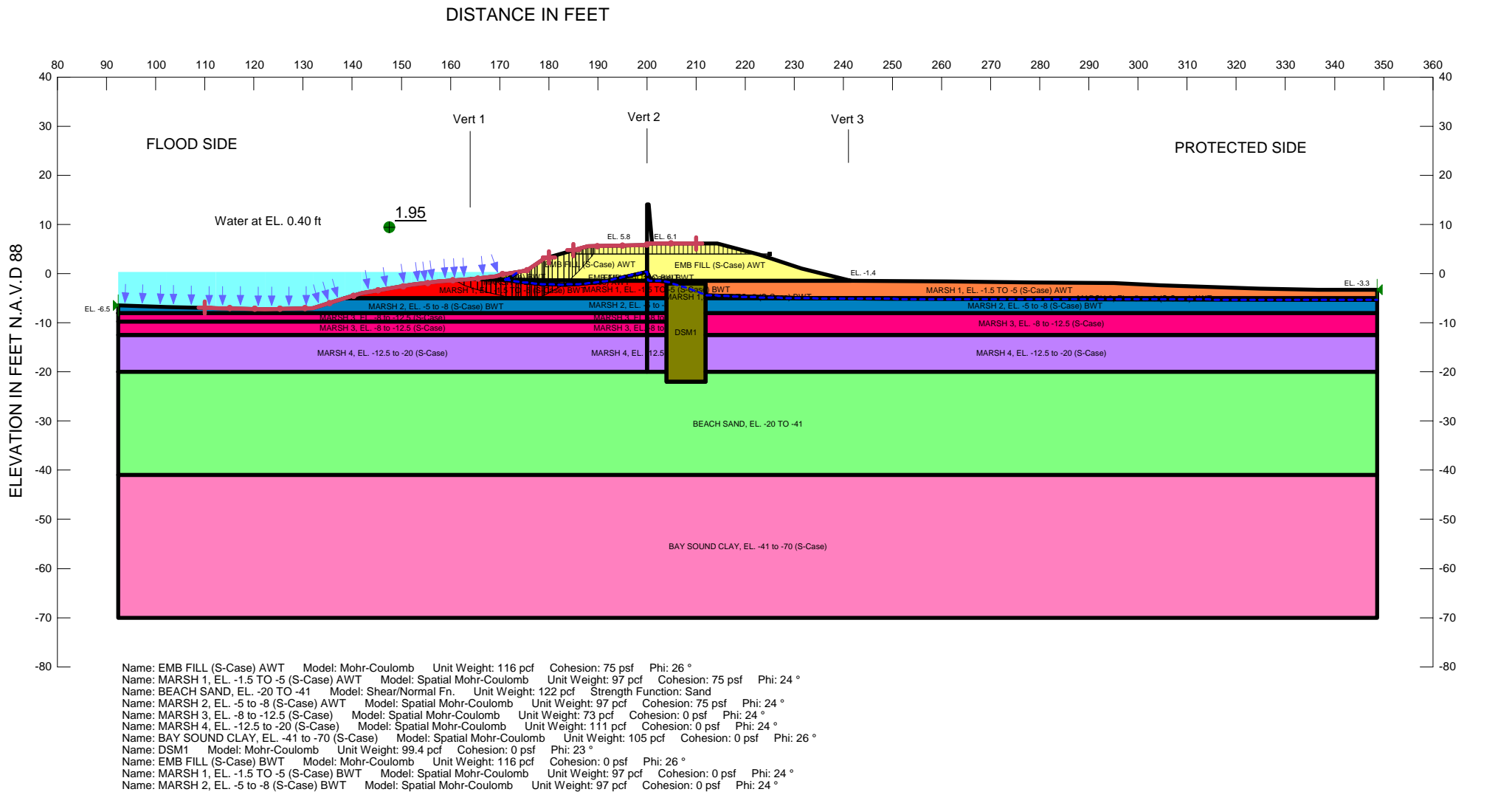
Line 59	60	53		
Line 60	53	55		
Line 61	55	64		
Line 62	64	40		
Line 63	40	41	Curb	
Line 64	41	49		
Line 65	49	34		
Line 66	34	33		
Line 67	59	60		
Line 68	63	64		
Line 69	40	39	Curb	
Line 70	41	42	Curb	
Line 71	42	50		
Line 72	50	35		
Line 73	35	34		
Line 74	66	12	Canal Water	
Line 75	68	9		
Line 76	43	76		
Line 77	76	68		
Line 78	30	77	Canal Water	Sheet Pile
Line 79	77	43	Canal Water	Sheet Pile
Line 80	43	79		
Line 81	79	22		
Line 82	52	81		
Line 83	81	54		
Line 84	54	82		
Line 85	82	61		
Line 86	61	83		
Line 87	83	36		
Line 88	86	38	Curb	
Line 89	67	66		
Line 90	68	67		
Line 91	9	10	Canal Water	
Line 92	10	11	Canal Water	
Line 93	11	66	Canal Water	
Line 94	68	69		
Line 95	69	70		
Line 96	70	71		
Line 97	71	72		
Line 98	72	73		
Line 99	73	74		
Line 100	74	75		
Line 101	75	76		
Line 102	77	76		
Line 103	78	79		
Line 104	77	78		
Line 105	82	83		
Line 106	79	80		

Line 107	80	81		
Line 108	83	84		
Line 109	84	85		
Line 110	85	86		
Line 111	36	86		

Points

	X (ft)	Y (ft)
Point 1	92.4	-6.5
Point 2	102.2	-6.8
Point 3	112.2	-7
Point 4	122.2	-7.2
Point 5	132	-7
Point 6	142	-4
Point 7	152	-2.3
Point 8	157.6	-1.6
Point 9	164.1	-1.1
Point 10	169.2	-0.6
Point 11	170.3	-0.2
Point 12	175.6	0.7
Point 13	179.1	3.1
Point 14	188	5.6
Point 15	198.9	5.8
Point 16	200	14.1
Point 17	200.4	14.1
Point 18	201	6.1
Point 19	214.3	6.1
Point 20	222.9	3.9
Point 21	231.5	1
Point 22	241.6	-1.4
Point 23	261.1	-1.6
Point 24	278.5	-1.8
Point 25	295.1	-1.9
Point 26	304.5	-2.4
Point 27	324.6	-3.1
Point 28	336.7	-3.3
Point 29	348.7	-3.3
Point 30	200	5.8
Point 31	92.4	-9.8
Point 32	92.4	-12.5
Point 33	92.4	-20
Point 34	92.4	-41
Point 35	92.4	-70
Point 36	348.7	-5
Point 37	92.4	-8
Point 38	348.7	-8
Point 39	348.7	-12.5

Point 40	348.7	-20
Point 41	348.7	-41
Point 42	348.7	-70
Point 43	200	-1.5
Point 44	200	-5
Point 45	200	-8
Point 46	200	-9.8
Point 47	200	-12.5
Point 48	200	-20
Point 49	200	-41
Point 50	200	-70
Point 51	138.5	-5
Point 52	204	-2
Point 53	204	-22
Point 54	212	-2
Point 55	212	-22
Point 56	204	-5
Point 57	204	-8
Point 58	204	-9.8
Point 59	204	-12.5
Point 60	204	-20
Point 61	212	-5
Point 62	212	-8
Point 63	212	-12.5
Point 64	212	-20
Point 65	200	6.1
Point 66	173.80896	0.39586
Point 67	172.50066	-0.58752
Point 68	171.24886	-1.17965
Point 69	173.36112	-1.53824
Point 70	176.47501	-1.92033
Point 71	178.71286	-2.08782
Point 72	180.77161	-2.1866
Point 73	183.25665	-2.20739
Point 74	185.55454	-2.11901
Point 75	189.44784	-1.77818
Point 76	192.02323	-1.41112
Point 77	200	0.39286
Point 78	200.84456	-1.39683
Point 79	202.77006	-1.49334
Point 80	204.23524	-1.69418
Point 81	205.23951	-2
Point 82	212	-4.35452
Point 83	231.99197	-5
Point 84	248.36872	-5.13901
Point 85	285.52435	-5.21799
Point 86	348.7	-5.30002



GENERAL NOTES

With DSM
Sta 37+29 to 47+00

Cross Section at Sta 42+00

CLASSIFICATION STRATIFICATION
SHEAR STRENGTHS AND UNIT WEIGHTS OF
THE SOIL WERE BASED ON THE RESULTS OF
UNDISTURBED BORINGS AND CPT DATA. SEE
BOTH BORING AND CPT DATA PLATES.

WHERE INDICATED, SHEAR STRENGTHS BETWEEN
VERTICALS WERE ASSUMED TO VARY LINEARLY
BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL
REMEDICATION OF CANAL WALLS AND LEVEES
PROTECTED SIDE STABILITY ANALYSIS,
CASE: Name: NWL S-Case F/S (EE)
REACH 17, STA. 37+29 TO 50+00 EAST
ORLEANS PARISH, LOUISIANA

NWL S-Case F/S (EE)

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File Information

Created By: [Liljegren, James](#)
Revision Number: [575](#)
Last Edited By: [Vicky Curtis](#)
Date: [9/30/2013](#)
Time: [12:40:10 PM](#)
File Name: [Reach 17A.gsz](#)
Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix F NWL\](#)
Last Solved Date: [9/30/2013](#)
Last Solved Time: [12:40:56 PM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Strength Units: [psf](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

NWL S-Case F/S (EE)

Kind: [SLOPE/W](#)
Parent: [Normal Water Level at +0.40ft \(seepage\)](#)
Method: [Spencer](#)
Settings
 PWP Conditions Source: [Parent Analysis](#)
Slip Surface
 Direction of movement: [Right to Left](#)
 Use Passive Mode: [No](#)
 Slip Surface Option: [Entry and Exit](#)
 Critical slip surfaces saved: [1](#)
 Optimize Critical Slip Surface Location: [Yes](#)
Tension Crack
 Tension Crack Option: [Tension Crack Line](#)
 Percentage Wet: [0](#)
 Tension Crack Fluid Unit Weight: [62.4 pcf](#)
FOS Distribution
 FOS Calculation Option: [Constant](#)

Advanced

Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 2000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

EMB FILL (S-Case) AWT

Model: Mohr-Coulomb
Unit Weight: 116 pcf
Cohesion: 75 psf
Phi: 26 °
Phi-B: 0 °

MARSH 1, EL. -1.5 TO -5 (S-Case) AWT

Model: Spatial Mohr-Coulomb
Unit Weight: 97 pcf
Cohesion: 75 psf
Phi: 24 °
Phi-B: 0 °

BEACH SAND, EL. -20 TO -41

Model: Shear/Normal Fn.
Unit Weight: 122 pcf
Strength Function: Sand
Phi-B: 0 °

MARSH 2, EL. -5 to -8 (S-Case) AWT

Model: Spatial Mohr-Coulomb
Unit Weight: 97 pcf
Cohesion: 75 psf
Phi: 24 °
Phi-B: 0 °

MARSH 3, EL. -8 to -12.5 (S-Case)

Model: Spatial Mohr-Coulomb
Unit Weight: 73 pcf
Cohesion: 0 psf
Phi: 24 °
Phi-B: 0 °

MARSH 4, EL. -12.5 to -20 (S-Case)

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [111 pcf](#)

Cohesion: [0 psf](#)

Phi: [24 °](#)

Phi-B: [0 °](#)

BAY SOUND CLAY, EL. -41 to -70 (S-Case)

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [105 pcf](#)

Cohesion: [0 psf](#)

Phi: [26 °](#)

Phi-B: [0 °](#)

DSM1

Model: [Mohr-Coulomb](#)

Unit Weight: [99.4 pcf](#)

Cohesion: [0 psf](#)

Phi: [23 °](#)

Phi-B: [0 °](#)

EMB FILL (S-Case) BWT

Model: [Mohr-Coulomb](#)

Unit Weight: [116 pcf](#)

Cohesion: [0 psf](#)

Phi: [26 °](#)

Phi-B: [0 °](#)

MARSH 1, EL. -1.5 TO -5 (S-Case) BWT

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [97 pcf](#)

Cohesion: [0 psf](#)

Phi: [24 °](#)

Phi-B: [0 °](#)

MARSH 2, EL. -5 to -8 (S-Case) BWT

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [97 pcf](#)

Cohesion: [0 psf](#)

Phi: [24 °](#)

Phi-B: [0 °](#)

Slip Surface Entry and Exit

Left Projection: [Range](#)

Left-Zone Left Coordinate: [\(110, -6.956\) ft](#)

Left-Zone Right Coordinate: [\(180, 3.35281\) ft](#)

Left-Zone Increment: [14](#)

Right Projection: [Range](#)
Right-Zone Left Coordinate: [\(185, 4.7573\)](#) ft
Right-Zone Right Coordinate: [\(210, 6.1\)](#) ft
Right-Zone Increment: [5](#)
Radius Increments: [25](#)

Slip Surface Limits

Left Coordinate: [\(92.4, -6.5\)](#) ft
Right Coordinate: [\(348.7, -3.3\)](#) ft

Tension Crack Line

	X (ft)	Y (ft)
	185	4
	225	4

Shear/Normal Strength Functions

Sand

Model: [Spline Data Point Function](#)
Function: [Shear Stress vs. Normal Stress](#)
Curve Fit to Data: [100 %](#)
Segment Curvature: [0 %](#)
Y-Intercept: [0](#)
Data Points: [Normal Stress \(psf\), Shear Stress \(psf\)](#)
Data Point: [\(-10000, 0\)](#)
Data Point: [\(0, 0\)](#)
Data Point: [\(10000, 6494\)](#)
Estimation Properties
Intact Rock Param.: [10](#)
Geological Strength: [100](#)
Disturbance Factor: [0](#)
SigmaC: [600000 psf](#)
Sigma3: [300000 psf](#)
Num. Points: [20](#)

Regions

	Material	Points	Area (ft²)
Region 1	EMB FILL (S-Case) AWT	67,66,12,13,14,15,30,77,76,68	144.59694
Region 2		65,16,17,18	5.6
Region 3	EMB FILL (S-Case) AWT	78,79,22,21,20,19,18,65,30,77	208.66058
Region 4	MARSH 1, EL. -1.5 TO -5 (S-Case) BWT	51,6,7,8,9,68,69,70,71,72,73,74,75,76,43,44	181.53211
Region 5	MARSH 2, EL. -5 to -8 (S-Case) BWT	37,1,2,3,4,5,51,44,45	239.55
Region 6	MARSH 3, EL. -8 to -12.5 (S-Case)	31,37,45,46	193.68

Region 7	MARSH 3, EL. -8 to -12.5 (S-Case)	32,31,46,47	290.52
Region 8	MARSH 1, EL. -1.5 TO -5 (S-Case) AWT	81,54,82,83,36,29,28,27,26,25,24,23,22,79,80	395.23978
Region 9	MARSH 2, EL. -5 to -8 (S-Case) BWT	44,56,57,45	12
Region 10	MARSH 3, EL. -8 to -12.5 (S-Case)	45,57,58,46	7.2
Region 11	MARSH 3, EL. -8 to -12.5 (S-Case)	46,58,59,47	10.8
Region 12	MARSH 2, EL. -5 to -8 (S-Case) BWT	61,83,84,85,86,38,62	385.96664
Region 13	MARSH 3, EL. -8 to -12.5 (S-Case)	63,62,38,39	615.15
Region 14	MARSH 4, EL. -12.5 to -20 (S-Case)	32,47,48,33	807
Region 15	BEACH SAND, EL. -20 TO -41	33,48,60,53,55,64,40,41,49,34	5366.3
Region 16	MARSH 4, EL. -12.5 to -20 (S-Case)	47,59,60,48	30
Region 17	DSM1	52,81,54,82,61,62,63,64,55,53,60,59,58,57,56	160
Region 18	MARSH 4, EL. -12.5 to -20 (S-Case)	63,64,40,39	1025.25
Region 19	BAY SOUND CLAY, EL. -41 to -70 (S-Case)	34,49,41,42,50,35	7432.7
Region 20	EMB FILL (S-Case) BWT	9,10,11,66,67,68	4.9485279
Region 21	MARSH 1, EL. -1.5 TO -5 (S-Case) AWT	68,69,70,71,72,73,74,75,76	12.352968
Region 22	EMB FILL (S-Case) BWT	76,43,77	7.5494544
Region 23	EMB FILL (S-Case) BWT	77,43,79,78	0.93939808
Region 24	MARSH 1, EL. -1.5 TO -5 (S-Case) BWT	43,79,80,81,52,56,44	14.143032
Region 25	MARSH 1, EL. -1.5 TO -5 (S-Case) BWT	82,61,83	6.4522084
Region 26	MARSH 2, EL. -5 to -8 (S-Case) AWT	86,85,84,83,36	24.133355

Points

	X (ft)	Y (ft)
Point 1	92.4	-6.5
Point 2	102.2	-6.8
Point 3	112.2	-7
Point 4	122.2	-7.2
Point 5	132	-7
Point 6	142	-4
Point 7	152	-2.3
Point 8	157.6	-1.6
Point 9	164.1	-1.1
Point 10	169.2	-0.6
Point 11	170.3	-0.2
Point 12	175.6	0.7
Point 13	179.1	3.1
Point 14	188	5.6
Point 15	198.9	5.8
Point 16	200	14.1
Point 17	200.4	14.1
Point 18	201	6.1
Point 19	214.3	6.1
Point 20	222.9	3.9
Point 21	231.5	1
Point 22	241.6	-1.4
Point 23	261.1	-1.6
Point 24	278.5	-1.8

Point 25	295.1	-1.9
Point 26	304.5	-2.4
Point 27	324.6	-3.1
Point 28	336.7	-3.3
Point 29	348.7	-3.3
Point 30	200	5.8
Point 31	92.4	-9.8
Point 32	92.4	-12.5
Point 33	92.4	-20
Point 34	92.4	-41
Point 35	92.4	-70
Point 36	348.7	-5
Point 37	92.4	-8
Point 38	348.7	-8
Point 39	348.7	-12.5
Point 40	348.7	-20
Point 41	348.7	-41
Point 42	348.7	-70
Point 43	200	-1.5
Point 44	200	-5
Point 45	200	-8
Point 46	200	-9.8
Point 47	200	-12.5
Point 48	200	-20
Point 49	200	-41
Point 50	200	-70
Point 51	138.5	-5
Point 52	204	-2
Point 53	204	-22
Point 54	212	-2
Point 55	212	-22
Point 56	204	-5
Point 57	204	-8
Point 58	204	-9.8
Point 59	204	-12.5
Point 60	204	-20
Point 61	212	-5
Point 62	212	-8
Point 63	212	-12.5
Point 64	212	-20
Point 65	200	6.1
Point 66	173.80896	0.39586
Point 67	172.50066	-0.58752
Point 68	171.24886	-1.17965
Point 69	173.36112	-1.53824
Point 70	176.47501	-1.92033
Point 71	178.71286	-2.08782
Point 72	180.77161	-2.1866

Point 73	183.25665	-2.20739
Point 74	185.55454	-2.11901
Point 75	189.44784	-1.77818
Point 76	192.02323	-1.41112
Point 77	200	0.39286
Point 78	200.84456	-1.39683
Point 79	202.77006	-1.49334
Point 80	204.23524	-1.69418
Point 81	205.23951	-2
Point 82	212	-4.35452
Point 83	231.99197	-5
Point 84	248.36872	-5.13901
Point 85	285.52435	-5.21799
Point 86	348.7	-5.30002

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.95	(172.29, 14.502)	13.58414	(189.084, 5.6199)	(160.675, -1.36348)
2	1602	2.01	(172.29, 14.502)	19.776	(189.047, 5.61921)	(160.503, -1.37672)

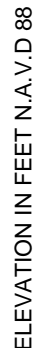
Slices of Slip Surface: **Optimized**

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	161.1945	-1.6021995	118.95969	151.74812	14.598351	0
2	Optimized	162.23415	-2.079633	135.77785	211.17989	33.571148	0
3	Optimized	163.427	-2.5542935	148.59409	262.07805	50.526314	0
4	Optimized	164.80645	-3.0379035	157.70361	324.60415	74.308909	0
5	Optimized	165.9738	-3.403511	163.10548	362.42859	88.744367	0
6	Optimized	166.8956	-3.639393	165.39667	394.38965	101.95425	0
7	Optimized	167.81735	-3.875275	168.23438	426.29816	114.8974	0
8	Optimized	168.7391	-4.1111565	171.7027	458.13311	127.52704	0
9	Optimized	169.2129	-4.2324035	173.73595	477.75512	135.35806	0
10	Optimized	169.7629	-4.332103	174.21973	487.3351	139.40794	0
11	Optimized	170.77445	-4.5136455	175.69118	521.45124	153.9423	0
12	Optimized	171.2805	-4.6044725	176.72424	536.33317	160.10821	0
13	Optimized	171.9064	-4.688069	176.83279	542.47799	162.79573	0
14	Optimized	172.9309	-4.822399	177.15553	566.87696	173.51516	0
15	Optimized	173.58505	-4.90817	178.04687	582.3901	180.0252	0
16	Optimized	174.05885	-4.97029	178.78789	596.31678	185.89584	0
17	Optimized	174.95435	-5.047776	178.42534	610.78386	192.49842	0
18	Optimized	175.91035	-5.114001	177.6417	657.85128	213.80308	0
19	Optimized	176.34785	-5.118125	176.10903	648.96836	210.53053	0
20	Optimized	176.84365	-5.050375	170.67688	681.41736	227.39631	0
21	Optimized	177.41695	-4.97203	164.3734	718.96266	246.91905	0
22	Optimized	178.16725	-4.753846	150.42356	706.9146	247.76577	0
23	Optimized	178.86535	-4.510486	135.10839	735.49929	267.31125	0
24	Optimized	179.0589	-4.4356355	130.51453	703.04929	254.9089	0

25	Optimized	179.5179	-4.1933465	116.26374	696.45027	258.31569	0
26	Optimized	180.3537	-3.7521775	90.156245	681.41471	263.24523	0
27	Optimized	181.32165	-3.2412615	60.062399	664.01216	268.89576	0
28	Optimized	182.4688	-2.572315	21.316349	616.56313	265.02094	0
29	Optimized	183.5806	-1.7582435	-25.430108	522.25496	232.52289	75
30	Optimized	184.43485	-1.0355535	-59.469248	479.85764	234.04221	75
31	Optimized	185.13465	-0.4096675	-79.41468	426.41564	207.97681	75
32	Optimized	185.8551	0.2676375	-102.3616	385.46898	188.00578	75
33	Optimized	186.5722	0.987355	-128.43288	324.55375	158.29544	75
34	Optimized	187.28605	1.749485	-157.59388	277.95362	135.56704	75
35	Optimized	187.8215	2.3550665	-182.05094	222.59579	108.56722	75
36	Optimized	188.38015	3.0576415	-211.08635	171.85712	83.820317	75
37	Optimized	188.9224	3.76785	-241.75322	107.1353	52.253375	75

Slices of Slip Surface: 1602

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	1602	160.95235	-1.691555	123.13057	171.10576	21.359933	0
2	1602	161.85165	-2.2859905	145.14445	243.76448	43.908469	0
3	1602	162.751	-2.813319	163.12097	304.92294	63.134307	0
4	1602	163.65035	-3.2795385	176.42124	356.68294	80.257681	0
5	1602	164.5911	-3.7056935	187.64722	403.79177	96.233751	0
6	1602	165.5733	-4.0907775	197.14768	445.6769	110.65234	0
7	1602	166.5555	-4.4170605	203.88856	479.79968	122.84355	0
8	1602	167.53775	-4.687551	208.74861	506.87478	132.73432	0
9	1602	168.52	-4.904589	211.74761	527.54508	140.60209	0
10	1602	169.10555	-5.015414	212.73473	537.68749	144.67829	0
11	1602	169.75	-5.102095	212.2889	555.57359	152.84019	0
12	1602	170.77445	-5.209844	210.69473	572.0208	160.87273	0
13	1602	171.8748	-5.259484	206.20138	577.87979	165.48189	0
14	1602	172.9309	-5.258693	199.95073	578.44465	168.51635	0
15	1602	173.58505	-5.23005	194.82259	575.954	169.69064	0
16	1602	174.24905	-5.1715365	188.25596	575.0557	172.21434	0
17	1602	175.14455	-5.061268	178.27343	574.20124	176.27842	0
18	1602	176.0375	-4.910364	166.07495	594.40244	190.70369	0
19	1602	177.03445	-4.6875915	150.26713	639.31203	217.73682	0
20	1602	178.1534	-4.375509	129.65443	681.1061	245.5221	0
21	1602	178.90645	-4.133018	114.06788	704.59631	262.9202	0
22	1602	179.5179	-3.900154	99.969765	701.76728	267.93752	0
23	1602	180.3537	-3.5493385	78.717191	683.28331	269.17018	0
24	1602	181.2968	-3.093826	51.620765	656.59403	269.35145	0
25	1602	182.3472	-2.5145835	17.95012	619.95199	268.0285	0
26	1602	183.51085	-1.7637815	-25.198918	555.12147	247.156	75
27	1602	184.6306	-0.93868925	-62.467441	488.58703	238.29982	75
28	1602	185.59325	-0.11594145	-88.940345	420.84755	205.26106	75
29	1602	186.55595	0.8241448	-122.22002	344.67612	168.10978	75
30	1602	187.51865	1.908228	-163.71098	259.14395	126.39295	75
31	1602	188.52345	3.2451375	-219.06257	147.66557	72.02131	75



With DSM
Sta 37+29 to 47+00

Cross Section at Sta 42+00

ORLEANS AVE OUTFALL CANAL
REMEDICATION OF CANAL WALLS AND LEVEES
PROTECTED SIDE STABILITY ANALYSIS,
CASE: Name: NWL S-Case P/S (Block)
REACH 17, STA. 37+29 TO 50+00 EAST
ORLEANS PARISH, LOUISIANA

NWL S-Case P/S (Block)

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File Information

Created By: [Liljegren, James](#)
Revision Number: [574](#)
Last Edited By: [Vicky Curtis](#)
Date: [9/30/2013](#)
Time: [12:22:48 PM](#)
File Name: [Reach 17A.gsz](#)
Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix F NWL\](#)
Last Solved Date: [9/30/2013](#)
Last Solved Time: [12:29:32 PM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Strength Units: [psf](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

NWL S-Case P/S (Block)

Kind: [SLOPE/W](#)
Parent: [Normal Water Level at +0.40ft \(seepage\)](#)
Method: [Spencer](#)
Settings
 PWP Conditions Source: [Parent Analysis](#)
Slip Surface
 Direction of movement: [Left to Right](#)
 Use Passive Mode: [No](#)
 Slip Surface Option: [Block](#)
 Critical slip surfaces saved: [1](#)
 Optimize Critical Slip Surface Location: [Yes](#)
Tension Crack
 Tension Crack Option: [Search for Tension Crack](#)
 Percentage Wet: [0](#)
 Tension Crack Fluid Unit Weight: [62.4 pcf](#)
FOS Distribution
 FOS Calculation Option: [Constant](#)

Restrict Block Crossing: [Yes](#)

Advanced

Number of Slices: [30](#)

Optimization Tolerance: [0.01](#)

Minimum Slip Surface Depth: [0.1 ft](#)

Optimization Maximum Iterations: [2000](#)

Optimization Convergence Tolerance: [1e-007](#)

Starting Optimization Points: [8](#)

Ending Optimization Points: [16](#)

Complete Passes per Insertion: [1](#)

Driving Side Maximum Convex Angle: [5 °](#)

Resisting Side Maximum Convex Angle: [1 °](#)

Materials

EMB FILL (S-Case) AWT

Model: [Mohr-Coulomb](#)

Unit Weight: [116 pcf](#)

Cohesion: [75 psf](#)

Phi: [26 °](#)

Phi-B: [0 °](#)

MARSH 1, EL. -1.5 TO -5 (S-Case) AWT

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [97 pcf](#)

Cohesion: [75 psf](#)

Phi: [24 °](#)

Phi-B: [0 °](#)

BEACH SAND, EL. -20 TO -41

Model: [Shear/Normal Fn.](#)

Unit Weight: [122 pcf](#)

Strength Function: [Sand](#)

Phi-B: [0 °](#)

MARSH 2, EL. -5 to -8 (S-Case) AWT

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [97 pcf](#)

Cohesion: [75 psf](#)

Phi: [24 °](#)

Phi-B: [0 °](#)

MARSH 3, EL. -8 to -12.5 (S-Case)

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [73 pcf](#)

Cohesion: [0 psf](#)

Phi: [24 °](#)

Phi-B: 0 °

MARSH 4, EL. -12.5 to -20 (S-Case)

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: 111 pcf

Cohesion: 0 psf

Phi: 24 °

Phi-B: 0 °

BAY SOUND CLAY, EL. -41 to -70 (S-Case)

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: 105 pcf

Cohesion: 0 psf

Phi: 26 °

Phi-B: 0 °

DSM1

Model: [Mohr-Coulomb](#)

Unit Weight: 99.4 pcf

Cohesion: 0 psf

Phi: 23 °

Phi-B: 0 °

EMB FILL (S-Case) BWT

Model: [Mohr-Coulomb](#)

Unit Weight: 116 pcf

Cohesion: 0 psf

Phi: 26 °

Phi-B: 0 °

MARSH 1, EL. -1.5 TO -5 (S-Case) BWT

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: 97 pcf

Cohesion: 0 psf

Phi: 24 °

Phi-B: 0 °

MARSH 2, EL. -5 to -8 (S-Case) BWT

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: 97 pcf

Cohesion: 0 psf

Phi: 24 °

Phi-B: 0 °

Slip Surface Limits

Left Coordinate: (92.4, -6.5) ft

Right Coordinate: (348.7, -3.3) ft

Slip Surface Block

Left Grid

Upper Left: (190, 1) ft
Lower Left: (190, -22) ft
Lower Right: (225, -22) ft
X Increments: 7
Y Increments: 5
Starting Angle: 135 °
Ending Angle: 180 °
Angle Increments: 4

Right Grid

Upper Left: (230, 1) ft
Lower Left: (230, -22) ft
Lower Right: (260, -22) ft
X Increments: 6
Y Increments: 5
Starting Angle: 30 °
Ending Angle: 45 °
Angle Increments: 4

Shear/Normal Strength Functions

Sand

Model: Spline Data Point Function
Function: Shear Stress vs. Normal Stress
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
Data Point: (-10000, 0)
Data Point: (0, 0)
Data Point: (10000, 6494)
Estimation Properties
Intact Rock Param.: 10
Geological Strength: 100
Disturbance Factor: 0
SigmaC: 600000 psf
Sigma3: 300000 psf
Num. Points: 20

Regions

	Material	Points	Area (ft²)
Region 1	EMB FILL (S-Case) AWT	67,66,12,13,14,15,30,77,76,68	144.59694
Region 2		65,16,17,18	5.6

Region 3	EMB FILL (S-Case) AWT	78,79,22,21,20,19,18,65,30,77	208.66058
Region 4	MARSH 1, EL. -1.5 TO -5 (S-Case) BWT	51,6,7,8,9,68,69,70,71,72,73,74,75,76,43,44	181.53211
Region 5	MARSH 2, EL. -5 to -8 (S-Case) BWT	37,1,2,3,4,5,51,44,45	239.55
Region 6	MARSH 3, EL. -8 to -12.5 (S-Case)	31,37,45,46	193.68
Region 7	MARSH 3, EL. -8 to -12.5 (S-Case)	32,31,46,47	290.52
Region 8	MARSH 1, EL. -1.5 TO -5 (S-Case) AWT	81,54,82,83,36,29,28,27,26,25,24,23,22,79,80	395.23978
Region 9	MARSH 2, EL. -5 to -8 (S-Case) BWT	44,56,57,45	12
Region 10	MARSH 3, EL. -8 to -12.5 (S-Case)	45,57,58,46	7.2
Region 11	MARSH 3, EL. -8 to -12.5 (S-Case)	46,58,59,47	10.8
Region 12	MARSH 2, EL. -5 to -8 (S-Case) BWT	61,83,84,85,86,38,62	385.96664
Region 13	MARSH 3, EL. -8 to -12.5 (S-Case)	63,62,38,39	615.15
Region 14	MARSH 4, EL. -12.5 to -20 (S-Case)	32,47,48,33	807
Region 15	BEACH SAND, EL. -20 TO -41	33,48,60,53,55,64,40,41,49,34	5366.3
Region 16	MARSH 4, EL. -12.5 to -20 (S-Case)	47,59,60,48	30
Region 17	DSM1	52,81,54,82,61,62,63,64,55,53,60,59,58,57,56	160
Region 18	MARSH 4, EL. -12.5 to -20 (S-Case)	63,64,40,39	1025.25
Region 19	BAY SOUND CLAY, EL. -41 to -70 (S-Case)	34,49,41,42,50,35	7432.7
Region 20	EMB FILL (S-Case) BWT	9,10,11,66,67,68	4.9485279
Region 21	MARSH 1, EL. -1.5 TO -5 (S-Case) AWT	68,69,70,71,72,73,74,75,76	12.352968
Region 22	EMB FILL (S-Case) BWT	76,43,77	7.5494544
Region 23	EMB FILL (S-Case) BWT	77,43,79,78	0.93939808
Region 24	MARSH 1, EL. -1.5 TO -5 (S-Case) BWT	43,79,80,81,52,56,44	14.143032
Region 25	MARSH 1, EL. -1.5 TO -5 (S-Case) BWT	82,61,83	6.4522084
Region 26	MARSH 2, EL. -5 to -8 (S-Case) AWT	86,85,84,83,36	24.133355

Points

	X (ft)	Y (ft)
Point 1	92.4	-6.5
Point 2	102.2	-6.8
Point 3	112.2	-7
Point 4	122.2	-7.2
Point 5	132	-7
Point 6	142	-4
Point 7	152	-2.3
Point 8	157.6	-1.6
Point 9	164.1	-1.1
Point 10	169.2	-0.6
Point 11	170.3	-0.2
Point 12	175.6	0.7
Point 13	179.1	3.1
Point 14	188	5.6
Point 15	198.9	5.8
Point 16	200	14.1
Point 17	200.4	14.1
Point 18	201	6.1
Point 19	214.3	6.1
Point 20	222.9	3.9

Point 21	231.5	1
Point 22	241.6	-1.4
Point 23	261.1	-1.6
Point 24	278.5	-1.8
Point 25	295.1	-1.9
Point 26	304.5	-2.4
Point 27	324.6	-3.1
Point 28	336.7	-3.3
Point 29	348.7	-3.3
Point 30	200	5.8
Point 31	92.4	-9.8
Point 32	92.4	-12.5
Point 33	92.4	-20
Point 34	92.4	-41
Point 35	92.4	-70
Point 36	348.7	-5
Point 37	92.4	-8
Point 38	348.7	-8
Point 39	348.7	-12.5
Point 40	348.7	-20
Point 41	348.7	-41
Point 42	348.7	-70
Point 43	200	-1.5
Point 44	200	-5
Point 45	200	-8
Point 46	200	-9.8
Point 47	200	-12.5
Point 48	200	-20
Point 49	200	-41
Point 50	200	-70
Point 51	138.5	-5
Point 52	204	-2
Point 53	204	-22
Point 54	212	-2
Point 55	212	-22
Point 56	204	-5
Point 57	204	-8
Point 58	204	-9.8
Point 59	204	-12.5
Point 60	204	-20
Point 61	212	-5
Point 62	212	-8
Point 63	212	-12.5
Point 64	212	-20
Point 65	200	6.1
Point 66	173.80896	0.39586
Point 67	172.50066	-0.58752
Point 68	171.24886	-1.17965

Point 69	173.36112	-1.53824
Point 70	176.47501	-1.92033
Point 71	178.71286	-2.08782
Point 72	180.77161	-2.1866
Point 73	183.25665	-2.20739
Point 74	185.55454	-2.11901
Point 75	189.44784	-1.77818
Point 76	192.02323	-1.41112
Point 77	200	0.39286
Point 78	200.84456	-1.39683
Point 79	202.77006	-1.49334
Point 80	204.23524	-1.69418
Point 81	205.23951	-2
Point 82	212	-4.35452
Point 83	231.99197	-5
Point 84	248.36872	-5.13901
Point 85	285.52435	-5.21799
Point 86	348.7	-5.30002

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	2.27	(228.971, 7.607)	25.88562	(202.405, 6.1)	(257.629, -1.5644)
2	5471	2.38	(228.971, 7.607)	28.038	(197.21, 5.76898)	(259.429, -1.58286)

Slices of Slip Surface: **Optimized**

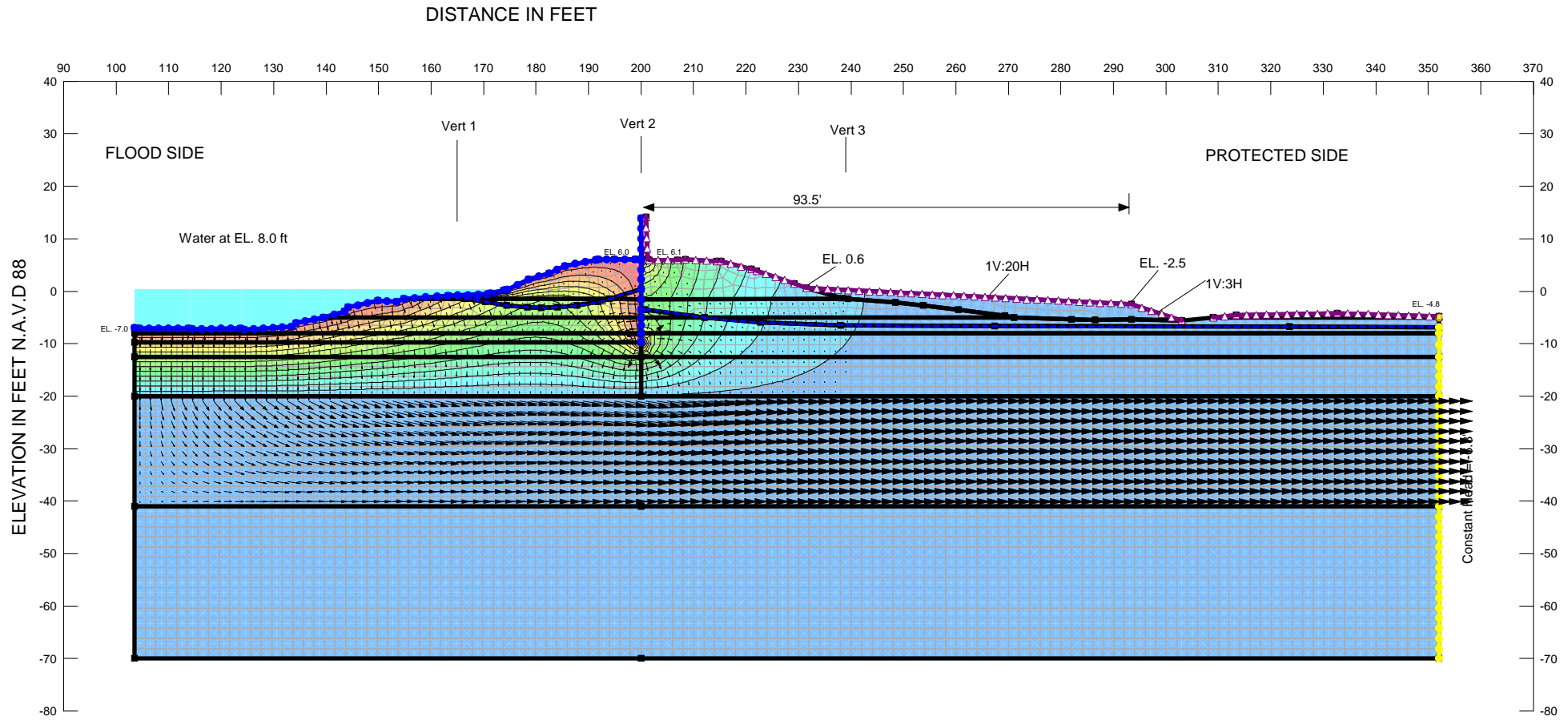
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	203.3847	5.0129975	-413.45442	69.638026	33.964735	75
2	Optimized	205.3439	2.8389925	-310.16599	258.60378	126.12949	75
3	Optimized	207.0808	0.9446134	-217.96907	428.85573	209.16692	75
4	Optimized	208.59545	-0.6701396	-145.04923	570.70252	278.35022	75
5	Optimized	209.5652	-1.703983	-101.5454	667.33977	297.11881	75
6	Optimized	210.8888	-2.998012	-52.633919	814.802	345.86293	0
7	Optimized	212.1556	-4.215071	-8.2834785	878.51354	391.13943	75
8	Optimized	212.34115	-4.393344	1.6301786	914.5348	406.45132	0
9	Optimized	212.7589	-4.71106	19.300045	991.56348	432.87957	0
10	Optimized	213.72335	-5.429655	59.495352	1053.5172	442.56703	0
11	Optimized	215.01825	-6.3944825	114.04233	1119.1555	447.50523	0
12	Optimized	216.4548	-7.4648275	175.22217	1176.2046	445.6661	0
13	Optimized	217.2112	-8.02841	207.70805	1205.7855	444.37273	0
14	Optimized	218.0099	-8.51009	235.22263	1259.6896	456.1221	0
15	Optimized	219.5311	-9.41663	287.63864	1282.1085	442.7665	0
16	Optimized	221.59585	-10.45271	347.67104	1342.961	443.13166	0
17	Optimized	223.4453	-11.27921	395.85179	1346.0434	423.05257	0
18	Optimized	224.80545	-11.748955	423.22058	1381.7831	426.77951	0
19	Optimized	226.4352	-12.201065	449.47859	1353.6389	402.55811	0
20	Optimized	227.62585	-12.46356	464.69727	1384.013	409.30574	0

21	Optimized	228.82535	-12.579885	471.00766	1348.9037	390.8645	0
22	Optimized	230.4728	-12.73965	479.78004	1302.5044	366.30047	0
23	Optimized	231.39825	-12.811415	483.69008	1328.428	376.10157	0
24	Optimized	231.746	-12.783685	481.79266	1313.9984	370.52187	0
25	Optimized	232.81985	-12.698055	475.90521	1273.1786	354.96898	0
26	Optimized	234.47555	-12.56602	466.97665	1210.3234	330.95931	0
27	Optimized	235.77685	-12.462245	459.9395	1162.3503	312.73342	0
28	Optimized	237.054	-12.219345	444.38591	1155.8868	316.7806	0
29	Optimized	238.66145	-11.809055	418.29166	1075.5365	292.62426	0
30	Optimized	240.5326	-11.11379	374.47874	1018.6316	286.79531	0
31	Optimized	242.8659	-10.042415	307.11981	897.80166	262.9885	0
32	Optimized	245.5123	-8.73058	224.66896	808.31143	259.85437	0
33	Optimized	247.25415	-7.80876	166.77282	727.19895	249.51779	0
34	Optimized	247.9921	-7.4138175	141.95432	685.84397	242.15527	0
35	Optimized	249.32225	-6.6943655	96.788655	605.63823	226.55443	0
36	Optimized	251.2735	-5.638948	30.519122	487.9498	203.66126	0
37	Optimized	252.34895	-5.04964	-6.450151	468.50463	208.5917	75
38	Optimized	253.7559	-4.151275	-62.781736	355.75895	158.39409	75
39	Optimized	256.35715	-2.433476	-170.45786	144.68196	64.416558	75

Slices of Slip Surface: 5471

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	5471	198.0548	5.2042225	-302.1126	41.782357	20.378617	75
2	5471	199.45	4.271964	-243.25017	134.69049	65.692943	75
3	5471	200.2	3.77083	-275.00858	213.23039	103.99941	75
4	5471	200.7	3.4367405	-292.89901	245.97641	119.97071	75
5	5471	202.17655	2.450135	-248.87697	342.70141	167.14664	75
6	5471	204.52965	0.87783088	-176.77283	496.84231	242.32618	75
7	5471	206.8828	-0.69447362	-112.86988	650.97261	317.50055	75
8	5471	208.44805	-1.740313	-77.654219	755.77949	336.49471	75
9	5471	209.6275	-2.5284195	-53.031657	840.73681	356.8716	0
10	5471	211.20915	-3.5852585	-26.235636	930.62988	395.02895	0
11	5471	212.18935	-4.2402135	-6.9126063	962.33806	428.46051	75
12	5471	212.8526	-4.6833745	17.396576	1015.7726	444.50566	0
13	5471	213.81325	-5.3252445	53.001711	1072.0426	453.70623	0
14	5471	215.17905	-6.2378665	104.22775	1129.8158	456.62121	0
15	5471	216.9372	-7.412622	170.99518	1188.4584	453.0038	0
16	5471	219.0872	-8.849206	253.917	1242.8927	440.32035	0
17	5471	221.62905	-10.547616	353.41122	1293.1697	418.40744	0
18	5471	223.7255	-11.94841	436.4235	1328.0703	396.98672	0
19	5471	224.7755	-12.65	478.38304	1345.3504	385.99876	0
20	5471	226.08335	-12.8	486.46146	1512.1844	456.68127	0
21	5471	228.25	-12.8	484.93839	1425.7382	418.87108	0
22	5471	230.41665	-12.8	483.50762	1339.2921	381.0198	0
23	5471	231.746	-12.8	482.79367	1289.164	359.01919	0
24	5471	232.993	-12.8	482.1162	1254.0915	343.70556	0
25	5471	234.995	-12.8	481.19688	1197.7974	319.05111	0

26	5471	236.997	-12.8	480.37794	1141.4546	294.33027	0
27	5471	238.999	-12.8	479.63369	1085.161	269.59815	0
28	5471	240.2598	-12.65	469.93333	1180.6667	316.43887	0
29	5471	241.0598	-12.18812	441.0026	1109.7208	297.73253	0
30	5471	242.71895	-11.2302	380.97873	1013.6369	281.67758	0
31	5471	244.9569	-9.93812	299.96595	907.83852	270.64231	0
32	5471	247.2223	-8.6301985	217.92806	800.25684	259.26948	0
33	5471	249.58935	-7.263585	132.19205	667.1328	238.17097	0
34	5471	252.0306	-5.854121	43.764848	510.22924	207.68333	0
35	5471	253.3806	-5.0746945	-5.1111682	448.79611	199.8169	75
36	5471	254.49645	-4.4304765	-45.529269	370.82299	165.10103	75
37	5471	256.46935	-3.291429	-116.95298	232.94024	103.71168	75
38	5471	258.44225	-2.1523815	-188.36352	95.061883	42.324277	75



Name: EMB FILL to EL. -1.5 (S-Case) AWT Model: Saturated Only K-Sat: 3.28e-008 ft/sec K-Ratio: 1
 Name: MARSH 1, EL. -1.5 TO -5 (S-Case) AWT Model: Saturated Only K-Sat: 3.28e-007 ft/sec K-Ratio: 1
 Name: BEACH SAND, EL. -20 TO -41 Model: Saturated Only K-Sat: 0.00049 ft/sec K-Ratio: 1
 Name: Sheet Pile Model: Saturated Only K-Sat: 1e-010 ft/sec K-Ratio: 1
 Name: Berm Model: Saturated Only K-Sat: 3.28e-008 ft/sec K-Ratio: 1
 Name: MARSH 2, EL. -5 to -8 (S-Case) AWT Model: Saturated Only K-Sat: 3.28e-007 ft/sec K-Ratio: 1
 Name: MARSH 3, EL. -8 to -12.5 (S-Case) Model: Saturated Only K-Sat: 3.28e-007 ft/sec K-Ratio: 1
 Name: MARSH 4, EL. -12.5 to -20 (S-Case) Model: Saturated Only K-Sat: 3.28e-007 ft/sec K-Ratio: 1
 Name: BAY SOUND CLAY, EL. -41 to -70 (S-Case) Model: Saturated Only K-Sat: 3.28e-008 ft/sec K-Ratio: 1

GENERAL NOTES

CLASSIFICATION STRATIFICATION
 SHEAR STRENGTHS AND UNIT WEIGHTS OF
 THE SOIL WERE BASED ON THE RESULTS OF
 UNDISTURBED BORINGS AND CPT DATA. SEE
 BOTH BORING AND CPT DATA PLATES.

WHERE INDICATED, SHEAR STRENGTHS BETWEEN
 VERTICALS WERE ASSUMED TO VARY LINEARLY
 BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

LAKE PONTCHARTRAIN, LA. AND VICINITY
 HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL
 REMEDIATION OF CANAL WALLS AND LEVEES
 PROTECTED SIDE STABILITY ANALYSIS,
 CASE: Name: Normal Water Level at +0.40ft (seepage)
 REACH 17, STA. 37+29 TO 50+00 EAST
 ORLEANS PARISH, LOUISIANA

Existing Condition
 Sta 47+00 to 50+00

Cross Section at Sta 50+00

Normal Water Level at +0.40ft (seepage)

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File Information

Created By: [Liljegren, James](#)
Revision Number: [693](#)
Last Edited By: [Vicky Curtis](#)
Date: [9/30/2013](#)
Time: [2:15:32 PM](#)
File Name: [Reach 17B.gsz](#)
Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix F NWL\](#)
Last Solved Date: [9/30/2013](#)
Last Solved Time: [2:16:04 PM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Mass(M) Units: [lbs](#)
Mass Flux Units: [lbs/sec](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

Normal Water Level at +0.40ft (seepage)

Kind: [SEEP/W](#)
Method: [Steady-State](#)
Settings
 Include Air Flow: [No](#)
Control
 Apply Runoff: [No](#)
Convergence
 Convergence Type: [Head Vector Norm](#)
 Maximum Number of Iterations: [500](#)
 Tolerance: [0.001](#)
 Maximum Change in K: [0.1](#)
 Rate of Change in K: [1.02](#)
 Minimum Change in K: [1e-005](#)
 Equation Solver: [Parallel Direct](#)
 Potential Seepage Max # of Reviews: [10](#)
Time

Starting Time: 0 sec

Duration: 0 sec

Ending Time: 0 sec

Materials

EMB FILL to EL. -1.5 (S-Case) AWT

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-008 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

MARSH 1, EL. -1.5 TO -5 (S-Case) AWT

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-007 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

BEACH SAND, EL. -20 TO -41

Model: Saturated Only

Hydraulic

K-Sat: 0.00049 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

Sheet Pile

Model: Saturated Only

Hydraulic

K-Sat: 1e-010 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

Berm

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-008 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

MARSH 2, EL. -5 to -8 (S-Case) AWT

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-007 ft/sec
Volumetric Water Content: 0 ft³/ft³
Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

MARSH 3, EL. -8 to -12.5 (S-Case)

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-007 ft/sec
Volumetric Water Content: 0 ft³/ft³
Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

MARSH 4, EL. -12.5 to -20 (S-Case)

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-007 ft/sec
Volumetric Water Content: 0 ft³/ft³
Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

BAY SOUND CLAY, EL. -41 to -70 (S-Case)

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-008 ft/sec
Volumetric Water Content: 0 ft³/ft³
Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

Boundary Conditions

Drainage

Review: true
Type: Total Flux (Q) 0

Canal Water

Type: Head (H) 0.4

Curb

Type: Head (H) -6.8

Regions

	Material	Points	Area (ft²)
Region 1	MARSH 3, EL. -8 to -12.5 (S-Case)	1,7,15,16	173.7
Region 2	MARSH 3, EL. -8 to -12.5 (S-Case)	2,1,16,17	260.55
Region 3	MARSH 4, EL. -12.5 to -20 (S-Case)	2,17,18,3	723.75
Region 4	BAY SOUND CLAY, EL. -41 to -70 (S-Case)	4,19,11,12,20,5	7209.4
Region 5	MARSH 3, EL. -8 to -12.5 (S-Case)	15,8,9,17,16	684.45
Region 6	MARSH 4, EL. -12.5 to -20 (S-Case)	17,9,10,18	1140.75
Region 7	BEACH SAND, EL. -20 TO -41	3,18,10,11,19,4	5220.6
Region 8	EMB FILL to EL. -1.5 (S-Case) AWT	78,37,77,39,40,41,42,43,44,45,46,88,87,79	149.38546
Region 9	MARSH 1, EL. -1.5 TO -5 (S-Case) AWT	73,29,30,31,32,33,79,80,81,82,83,84,85,86,87,13,90,14	164.29393
Region 10	MARSH 2, EL. -5 to -8 (S-Case) AWT	21,22,23,24,25,26,27,28,73,14,15,7	222.71
Region 11	EMB FILL to EL. -1.5 (S-Case) AWT	59,60,13,88,46,49,50,51,52,53,54,55,56,57,58	198.42
Region 12	MARSH 1, EL. -1.5 TO -5 (S-Case) AWT	65,91,89,90,13,60,61,62,63,64	194.69564
Region 13	MARSH 1, EL. -1.5 TO -5 (S-Case) AWT	74,70,71,72,6	22.16
Region 14	MARSH 2, EL. -5 to -8 (S-Case) AWT	14,91,92,93,94,95,96,8,15	240.09447
Region 15	Sheet Pile	46,75,47,48,49	8.775
Region 16	Berm	58,76,69,68,67,66,65,64,63,62,61,60,59	172.285
Region 17	EMB FILL to EL. -1.5 (S-Case) AWT	37,78,79,33,34,35,36,38	7.855659
Region 18	MARSH 1, EL. -1.5 TO -5 (S-Case) AWT	79,80,81,82,83,84,85,86,87	29.475976
Region 19	EMB FILL to EL. -1.5 (S-Case) AWT	87,88,13	5.6139663
Region 20	MARSH 1, EL. -1.5 TO -5 (S-Case) AWT	90,89,91,14	9.4793627
Region 21	MARSH 2, EL. -5 to -8 (S-Case) AWT	91,65,66,67,68,69,74,6,96,95,94,93,92	202.29553

Lines

	Start Point	End Point	Left Side Material	Hydraulic Boundary
Line 1	14	15	Sheet Pile	Canal Water
Line 2	15	7		
Line 3	1	7		

Line 4	15	16	Sheet Pile	Canal Water
Line 5	16	1		
Line 6	2	1		
Line 7	16	17		
Line 8	17	2		
Line 9	17	18		
Line 10	18	3		
Line 11	3	2		
Line 12	11	19		
Line 13	19	4		
Line 14	11	12		Curb
Line 15	12	20		
Line 16	20	5		
Line 17	5	4		
Line 18	8	15		
Line 19	8	9		Curb
Line 20	9	17		
Line 21	9	10		Curb
Line 22	10	18		
Line 23	10	11		Curb
Line 24	4	3		
Line 25	39	40		Canal Water
Line 26	40	41		Canal Water
Line 27	41	42		Canal Water
Line 28	42	43		Canal Water
Line 29	43	44		Canal Water
Line 30	44	45		Canal Water
Line 31	45	46		Canal Water
Line 32	73	29		Canal Water
Line 33	29	30		Canal Water
Line 34	30	31		Canal Water
Line 35	31	32		Canal Water
Line 36	32	33		Canal Water
Line 37	14	73		
Line 38	21	22		Canal Water
Line 39	22	23		Canal Water
Line 40	23	24		Canal Water
Line 41	24	25		Canal Water
Line 42	25	26		Canal Water
Line 43	26	27		Canal Water
Line 44	27	28		Canal Water
Line 45	28	73		Canal Water
Line 46	7	21		
Line 47	50	49		
Line 48	49	46		
Line 49	59	60		
Line 50	60	13		
Line 51	50	51		Drainage

Line 52	51	52		Drainage
Line 53	52	53		Drainage
Line 54	53	54		
Line 55	54	55		Drainage
Line 56	55	56		Drainage
Line 57	56	57		Drainage
Line 58	57	58		Drainage
Line 59	58	59		
Line 60	60	61		
Line 61	61	62		
Line 62	62	63		
Line 63	63	64		
Line 64	64	65		
Line 65	74	70		Drainage
Line 66	70	71		Drainage
Line 67	71	72		Drainage
Line 68	72	6		Curb
Line 69	6	74		
Line 70	65	66		
Line 71	66	67		
Line 72	67	68		
Line 73	68	69		
Line 74	46	75		
Line 75	75	47		Canal Water
Line 76	47	48		
Line 77	48	49		Drainage
Line 78	58	76		Drainage
Line 79	76	69		Drainage
Line 80	77	39		Canal Water
Line 81	79	33		
Line 82	13	87		
Line 83	87	79		
Line 84	46	88	Sheet Pile	Canal Water
Line 85	88	13	Sheet Pile	Canal Water
Line 86	13	90	Sheet Pile	Canal Water
Line 87	90	14	Sheet Pile	Canal Water
Line 88	65	91		
Line 89	91	14		
Line 90	96	8		Curb
Line 91	79	78		
Line 92	78	37		
Line 93	37	77		Canal Water
Line 94	33	34		Canal Water
Line 95	34	35		Canal Water
Line 96	35	36		
Line 97	36	38		Canal Water
Line 98	38	37		Canal Water
Line 99	79	80		

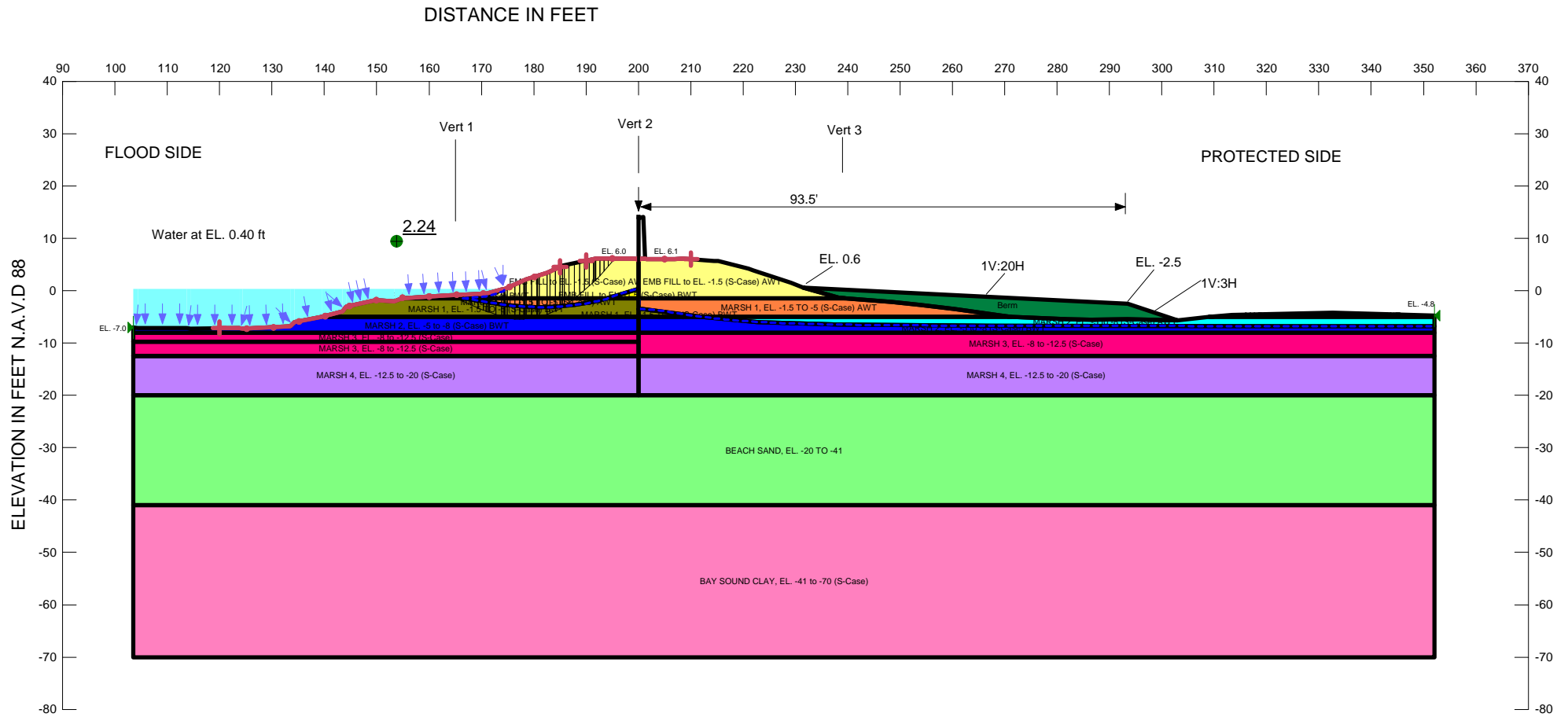
Line 100	80	81		
Line 101	81	82		
Line 102	82	83		
Line 103	83	84		
Line 104	84	85		
Line 105	85	86		
Line 106	86	87		
Line 107	88	87		
Line 108	91	89		
Line 109	89	90		
Line 110	91	92		
Line 111	92	93		
Line 112	93	94		
Line 113	94	95		
Line 114	95	96		
Line 115	69	74		
Line 116	6	96		

Points

	X (ft)	Y (ft)
Point 1	103.5	-9.8
Point 2	103.5	-12.5
Point 3	103.5	-20
Point 4	103.5	-41
Point 5	103.5	-70
Point 6	352.1	-5
Point 7	103.5	-8
Point 8	352.1	-8
Point 9	352.1	-12.5
Point 10	352.1	-20
Point 11	352.1	-41
Point 12	352.1	-70
Point 13	200	-1.5
Point 14	200	-5
Point 15	200	-8
Point 16	200	-9.8
Point 17	200	-12.5
Point 18	200	-20
Point 19	200	-41
Point 20	200	-70
Point 21	103.5	-7
Point 22	104.4	-7.1
Point 23	113.7	-7.1
Point 24	114.4	-7.2
Point 25	123.7	-7.1
Point 26	124.4	-7.3
Point 27	133.5	-6.8

Point 28	134.3	-6
Point 29	143.5	-3.9
Point 30	144.2	-3.1
Point 31	149.8	-1.8
Point 32	153.4	-2
Point 33	154.8	-1.4
Point 34	163.2	-0.9
Point 35	170.9	-0.5
Point 36	171.3	-0.4
Point 37	174.2	0.2
Point 38	173.9	0.2
Point 39	178.6	2.2
Point 40	182.5	3.4
Point 41	185.5	4.8
Point 42	191.4	6
Point 43	191.8	6.1
Point 44	195	6.1
Point 45	198.9	6.1
Point 46	200	6
Point 47	200	13.9
Point 48	200.9	14.1
Point 49	201.3	6.1
Point 50	201.5	6
Point 51	206.9	6
Point 52	208.4	6.1
Point 53	214.5	5.7
Point 54	215.2	5.7
Point 55	221	4.2
Point 56	222	3.9
Point 57	229.2	1.5
Point 58	231.5	0.6
Point 59	238.3	-1.3
Point 60	239.5	-1.4
Point 61	248.5	-2.1
Point 62	253.8	-2.7
Point 63	260.5	-3.5
Point 64	269.3	-4.7
Point 65	271.1	-5
Point 66	282	-5.4
Point 67	286.5	-5.5
Point 68	293.4	-5.4
Point 69	303	-5.6
Point 70	313.4	-4.6
Point 71	332.7	-4.2
Point 72	352.1	-4.8
Point 73	139.5	-5
Point 74	309	-5
Point 75	200	6.1

Point 76	293.5	-2.5
Point 77	174.5	0.33636
Point 78	171	-1
Point 79	166.57327	-1.42605
Point 80	170.40169	-2.0367
Point 81	174.40046	-2.66922
Point 82	178.36458	-3.04181
Point 83	181.02898	-3.12412
Point 84	184.11709	-3.06832
Point 85	187.79787	-2.75327
Point 86	191.85556	-2.05692
Point 87	194.05067	-1.48684
Point 88	200	0.38726
Point 89	200.79089	-3.53148
Point 90	200	-3.53148
Point 91	212.1192	-5
Point 92	222.79653	-5.95604
Point 93	238.10285	-6.46832
Point 94	267.43671	-6.6479
Point 95	323.53374	-6.76407
Point 96	352.1	-6.81648



Name: EMB FILL to EL. -1.5 (S-Case) AWT Model: Mohr-Coulomb Unit Weight: 116 pcf Cohesion: 75 psf Phi: 26 °
Name: MARSH 1, EL. -1.5 TO -5 (S-Case) AWT Model: Spatial Mohr-Coulomb Unit Weight: 97 pcf Cohesion: 75 psf Phi: 24 °
Name: BEACH SAND, EL. -20 TO -41 Model: Shear/Normal Fr. Unit Weight: 122 pcf Strength Function: Sand
Name: Berm Model: Mohr-Coulomb Unit Weight: 110 pcf Cohesion: 75 psf Phi: 26 °
Name: MARSH 2, EL. -5 to -8 (S-Case) AWT Model: Spatial Mohr-Coulomb Unit Weight: 97 pcf Cohesion: 75 psf Phi: 24 °
Name: MARSH 3, EL. -8 to -12.5 (S-Case) Model: Spatial Mohr-Coulomb Unit Weight: 73 pcf Cohesion: 0 psf Phi: 24 °
Name: MARSH 4, EL. -12.5 to -20 (S-Case) Model: Spatial Mohr-Coulomb Unit Weight: 111 pcf Cohesion: 0 psf Phi: 24 °
Name: BAY SOUND CLAY, EL. -41 to -70 (S-Case) Model: Spatial Mohr-Coulomb Unit Weight: 105 pcf Cohesion: 0 psf Phi: 26 °
Name: EMB FILL to EL. -1.5 (S-Case) BWT Model: Mohr-Coulomb Unit Weight: 116 pcf Cohesion: 0 psf Phi: 26 °
Name: MARSH 1, EL. -1.5 TO -5 (S-Case) BWT Model: Spatial Mohr-Coulomb Unit Weight: 97 pcf Cohesion: 0 psf Phi: 24 °
Name: MARSH 2, EL. -5 to -8 (S-Case) BWT Model: Spatial Mohr-Coulomb Unit Weight: 97 pcf Cohesion: 0 psf Phi: 24 °

GENERAL NOTES

CLASSIFICATION STRATIFICATION
SHEAR STRENGTHS AND UNIT WEIGHTS OF
THE SOIL WERE BASED ON THE RESULTS OF
UNDISTURBED BORINGS AND CPT DATA. SEE
BOTH BORING AND CPT DATA PLATES.

WHERE INDICATED, SHEAR STRENGTHS BETWEEN
VERTICALS WERE ASSUMED TO VARY LINEARLY
BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL
REMEDICATION OF CANAL WALLS AND LEVEES
PROTECTED SIDE STABILITY ANALYSIS,
CASE: Name: NWL S-Case F/S (EE)
REACH 17, STA. 37+29 TO 50+00 EAST
ORLEANS PARISH, LOUISIANA

Existing Condition
Sta 47+00 to 50+00

Cross Section at Sta 50+00

NWL S-Case F/S (EE)

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File Information

Created By: [Liljegren, James](#)
Revision Number: [695](#)
Last Edited By: [Vicky Curtis](#)
Date: [9/30/2013](#)
Time: [2:48:33 PM](#)
File Name: [Reach 17B.gsz](#)
Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix F NWL\](#)
Last Solved Date: [9/30/2013](#)
Last Solved Time: [2:51:58 PM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Strength Units: [psf](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

NWL S-Case F/S (EE)

Kind: [SLOPE/W](#)
Parent: [Normal Water Level at +0.40ft \(seepage\)](#)
Method: [Spencer](#)
Settings
 PWP Conditions Source: [Parent Analysis](#)
Slip Surface
 Direction of movement: [Right to Left](#)
 Use Passive Mode: [No](#)
 Slip Surface Option: [Entry and Exit](#)
 Critical slip surfaces saved: [1](#)
 Optimize Critical Slip Surface Location: [Yes](#)
Tension Crack
 Tension Crack Option: [Search for Tension Crack](#)
 Percentage Wet: [0](#)
 Tension Crack Fluid Unit Weight: [62.4 pcf](#)
FOS Distribution
 FOS Calculation Option: [Constant](#)

Advanced

Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 2000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

EMB FILL to EL. -1.5 (S-Case) AWT

Model: Mohr-Coulomb
Unit Weight: 116 pcf
Cohesion: 75 psf
Phi: 26 °
Phi-B: 0 °

MARSH 1, EL. -1.5 TO -5 (S-Case) AWT

Model: Spatial Mohr-Coulomb
Unit Weight: 97 pcf
Cohesion: 75 psf
Phi: 24 °
Phi-B: 0 °

BEACH SAND, EL. -20 TO -41

Model: Shear/Normal Fn.
Unit Weight: 122 pcf
Strength Function: Sand
Phi-B: 0 °

Berm

Model: Mohr-Coulomb
Unit Weight: 110 pcf
Cohesion: 75 psf
Phi: 26 °
Phi-B: 0 °

MARSH 2, EL. -5 to -8 (S-Case) AWT

Model: Spatial Mohr-Coulomb
Unit Weight: 97 pcf
Cohesion: 75 psf
Phi: 24 °
Phi-B: 0 °

MARSH 3, EL. -8 to -12.5 (S-Case)

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [73 pcf](#)

Cohesion: [0 psf](#)

Phi: [24 °](#)

Phi-B: [0 °](#)

MARSH 4, EL. -12.5 to -20 (S-Case)

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [111 pcf](#)

Cohesion: [0 psf](#)

Phi: [24 °](#)

Phi-B: [0 °](#)

BAY SOUND CLAY, EL. -41 to -70 (S-Case)

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [105 pcf](#)

Cohesion: [0 psf](#)

Phi: [26 °](#)

Phi-B: [0 °](#)

EMB FILL to EL. -1.5 (S-Case) BWT

Model: [Mohr-Coulomb](#)

Unit Weight: [116 pcf](#)

Cohesion: [0 psf](#)

Phi: [26 °](#)

Phi-B: [0 °](#)

MARSH 1, EL. -1.5 TO -5 (S-Case) BWT

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [97 pcf](#)

Cohesion: [0 psf](#)

Phi: [24 °](#)

Phi-B: [0 °](#)

MARSH 2, EL. -5 to -8 (S-Case) BWT

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [97 pcf](#)

Cohesion: [0 psf](#)

Phi: [24 °](#)

Phi-B: [0 °](#)

Slip Surface Entry and Exit

Left Projection: [Range](#)

Left-Zone Left Coordinate: [\(120, -7.13978\) ft](#)

Left-Zone Right Coordinate: [\(185, 4.56667\) ft](#)

Left-Zone Increment: [13](#)

Right Projection: [Range](#)
Right-Zone Left Coordinate: [\(190, 5.71525\)](#) ft
Right-Zone Right Coordinate: [\(210, 5.99508\)](#) ft
Right-Zone Increment: [4](#)
Radius Increments: [25](#)

Slip Surface Limits

Left Coordinate: [\(103.5, -7\)](#) ft
Right Coordinate: [\(352.1, -4.8\)](#) ft

Reinforcements

Reinforcement 1

Type: [Pile](#)
Outside Point: [\(200, 14.1\)](#) ft
Inside Point: [\(200, -4.8\)](#) ft
Slip Surface Intersection: [\(0, 0\)](#) ft
Total Length: [18.9](#) ft
Reinforcement Direction: [90 °](#)
Applied Load Option: [Variable](#)
F of S Dependent: [No](#)
Pile Spacing: [1](#) ft
Shear Capacity: [0](#) lbs
Shear Safety Factor: [1](#)
Shear Load Used: [0](#) lbs
Shear Option: [Parallel to Slip](#)
Resisting Force Used: [0](#) lbs/ft

Shear/Normal Strength Functions

Sand

Model: [Spline Data Point Function](#)
Function: [Shear Stress vs. Normal Stress](#)
Curve Fit to Data: [100](#) %
Segment Curvature: [0](#) %
Y-Intercept: [0](#)
Data Points: [Normal Stress \(psf\), Shear Stress \(psf\)](#)
Data Point: [\(-10000, 0\)](#)
Data Point: [\(0, 0\)](#)
Data Point: [\(10000, 6494\)](#)
Estimation Properties
Intact Rock Param.: [10](#)
Geological Strength: [100](#)
Disturbance Factor: [0](#)
SigmaC: [600000](#) psf

Sigma3: 300000 psf

Num. Points: 20

Regions

	Material	Points	Area (ft ²)
Region 1	MARSH 3, EL. -8 to -12.5 (S-Case)	1,7,15,16	173.7
Region 2	MARSH 3, EL. -8 to -12.5 (S-Case)	2,1,16,17	260.55
Region 3	MARSH 4, EL. -12.5 to -20 (S-Case)	2,17,18,3	723.75
Region 4	BAY SOUND CLAY, EL. -41 to -70 (S-Case)	4,19,11,12,20,5	7209.4
Region 5	MARSH 3, EL. -8 to -12.5 (S-Case)	15,8,9,17,16	684.45
Region 6	MARSH 4, EL. -12.5 to -20 (S-Case)	17,9,10,18	1140.75
Region 7	BEACH SAND, EL. -20 TO -41	3,18,10,11,19,4	5220.6
Region 8	EMB FILL to EL. -1.5 (S-Case) AWT	78,37,77,39,40,41,42,43,44,45,46,88,87,79	149.38546
Region 9	MARSH 1, EL. -1.5 TO -5 (S-Case) BWT	73,29,30,31,32,33,79,80,81,82,83,84,85,86,87,13,90,14	164.29393
Region 10	MARSH 2, EL. -5 to -8 (S-Case) BWT	21,22,23,24,25,26,27,28,73,14,15,7	222.71
Region 11	EMB FILL to EL. -1.5 (S-Case) AWT	59,60,13,88,46,49,50,51,52,53,54,55,56,57,58	198.42
Region 12	MARSH 1, EL. -1.5 TO -5 (S-Case) AWT	65,91,89,90,13,60,61,62,63,64	194.69564
Region 13	MARSH 1, EL. -1.5 TO -5 (S-Case) AWT	74,70,71,72,6	22.16
Region 14	MARSH 2, EL. -5 to -8 (S-Case) BWT	14,91,92,93,94,95,96,8,15	240.09447
Region 15		46,75,47,48,49	8.775
Region 16	Berm	58,76,69,68,67,66,65,64,63,62,61,60,59	172.285
Region 17	EMB FILL to EL. -1.5 (S-Case) BWT	37,78,79,33,34,35,36,38	7.855659
Region 18	MARSH 1, EL. -1.5 TO -5 (S-Case) AWT	79,80,81,82,83,84,85,86,87	29.475976
Region 19	EMB FILL to EL. -1.5 (S-Case) BWT	87,88,13	5.6139663
Region 20	MARSH 1, EL. -1.5 TO -5 (S-Case) BWT	90,89,91,14	9.4793627
Region 21	MARSH 2, EL. -5 to -8 (S-Case) AWT	91,65,66,67,68,69,74,6,96,95,94,93,92	202.29553

Points

	X (ft)	Y (ft)
Point 1	103.5	-9.8
Point 2	103.5	-12.5
Point 3	103.5	-20
Point 4	103.5	-41
Point 5	103.5	-70

Point 6	352.1	-5
Point 7	103.5	-8
Point 8	352.1	-8
Point 9	352.1	-12.5
Point 10	352.1	-20
Point 11	352.1	-41
Point 12	352.1	-70
Point 13	200	-1.5
Point 14	200	-5
Point 15	200	-8
Point 16	200	-9.8
Point 17	200	-12.5
Point 18	200	-20
Point 19	200	-41
Point 20	200	-70
Point 21	103.5	-7
Point 22	104.4	-7.1
Point 23	113.7	-7.1
Point 24	114.4	-7.2
Point 25	123.7	-7.1
Point 26	124.4	-7.3
Point 27	133.5	-6.8
Point 28	134.3	-6
Point 29	143.5	-3.9
Point 30	144.2	-3.1
Point 31	149.8	-1.8
Point 32	153.4	-2
Point 33	154.8	-1.4
Point 34	163.2	-0.9
Point 35	170.9	-0.5
Point 36	171.3	-0.4
Point 37	174.2	0.2
Point 38	173.9	0.2
Point 39	178.6	2.2
Point 40	182.5	3.4
Point 41	185.5	4.8
Point 42	191.4	6
Point 43	191.8	6.1
Point 44	195	6.1
Point 45	198.9	6.1
Point 46	200	6
Point 47	200	13.9
Point 48	200.9	14.1
Point 49	201.3	6.1
Point 50	201.5	6
Point 51	206.9	6
Point 52	208.4	6.1
Point 53	214.5	5.7

Point 54	215.2	5.7
Point 55	221	4.2
Point 56	222	3.9
Point 57	229.2	1.5
Point 58	231.5	0.6
Point 59	238.3	-1.3
Point 60	239.5	-1.4
Point 61	248.5	-2.1
Point 62	253.8	-2.7
Point 63	260.5	-3.5
Point 64	269.3	-4.7
Point 65	271.1	-5
Point 66	282	-5.4
Point 67	286.5	-5.5
Point 68	293.4	-5.4
Point 69	303	-5.6
Point 70	313.4	-4.6
Point 71	332.7	-4.2
Point 72	352.1	-4.8
Point 73	139.5	-5
Point 74	309	-5
Point 75	200	6.1
Point 76	293.5	-2.5
Point 77	174.5	0.33636
Point 78	171	-1
Point 79	166.57327	-1.42605
Point 80	170.40169	-2.0367
Point 81	174.40046	-2.66922
Point 82	178.36458	-3.04181
Point 83	181.02898	-3.12412
Point 84	184.11709	-3.06832
Point 85	187.79787	-2.75327
Point 86	191.85556	-2.05692
Point 87	194.05067	-1.48684
Point 88	200	0.38726
Point 89	200.79089	-3.53148
Point 90	200	-3.53148
Point 91	212.1192	-5
Point 92	222.79653	-5.95604
Point 93	238.10285	-6.46832
Point 94	267.43671	-6.6479
Point 95	323.53374	-6.76407
Point 96	352.1	-6.81648

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	2.24	(177.519, 13.891)	15.17758	(195, 6.1)	(163.972, -0.8599)

2	1213	2.29	(177.519, 13.891)	19.12	(194.979, 6.1)	(165.273, -0.792328)
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Slices of Slip Surface: **Optimized**

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	164.57645	-1.1414343	43.537394	137.27223	45.717537	0
2	Optimized	165.82725	-1.7239295	18.647075	221.84738	90.470606	0
3	Optimized	166.5234	-2.0465915	28.362013	258.6581	102.53442	0
4	Optimized	167.2665	-2.3699765	38.045283	298.66126	116.03371	0
5	Optimized	168.6375	-2.96037	55.963396	370.26606	139.93656	0
6	Optimized	169.8585	-3.4596995	71.045188	425.36483	157.75327	0
7	Optimized	170.65085	-3.7669275	80.260675	462.95456	170.3863	0
8	Optimized	170.95	-3.8829235	83.843803	480.00917	176.38419	0
9	Optimized	171.15	-3.960473	86.265464	491.91547	180.60702	0
10	Optimized	171.424	-4.0667075	89.622952	507.88219	186.22101	0
11	Optimized	172.136	-4.2927275	96.199861	525.89258	191.31152	0
12	Optimized	173.312	-4.6486225	107.14646	581.32551	211.11811	0
13	Optimized	174.05	-4.871964	114.53357	613.42569	222.12108	0
14	Optimized	174.30025	-4.94769	117.25172	625.43479	226.25768	0
15	Optimized	174.4368	-4.989011	118.74234	633.50072	229.1852	0
16	Optimized	174.48655	-5.004073	119.27947	636.45347	230.2607	0
17	Optimized	174.7277	-5.077048	121.80011	653.84508	236.88168	0
18	Optimized	175.68725	-5.260775	126.69018	694.2954	252.71412	0
19	Optimized	176.84015	-5.3771025	128.76942	732.49186	268.79455	0
20	Optimized	177.68225	-5.3801075	126.26386	778.91012	290.57684	0
21	Optimized	178.23395	-5.3614555	124.24546	765.44008	285.47824	0
22	Optimized	178.4823	-5.323138	121.77695	774.62365	290.66608	0
23	Optimized	179.09415	-5.2287315	115.69629	789.00292	299.77542	0
24	Optimized	180.0824	-5.076244	106.38579	809.08401	312.86141	0
25	Optimized	180.63755	-4.99058	101.68822	820.35351	319.9704	0
26	Optimized	180.8638	-4.9340245	98.542757	788.40609	307.14695	0
27	Optimized	181.7645	-4.6770175	84.348053	794.90996	316.36254	0
28	Optimized	182.8307	-4.372788	69.080031	808.26733	329.10739	0
29	Optimized	183.63925	-4.0647685	53.565612	779.38453	323.1554	0
30	Optimized	184.5658	-3.6504885	33.437552	787.25603	335.62161	0
31	Optimized	185.25725	-3.288854	15.97033	737.43014	321.2146	0
32	Optimized	185.65395	-3.0257165	2.8377569	729.14062	323.37087	0
33	Optimized	186.30245	-2.5955875	-18.61805	693.37638	308.71106	75
34	Optimized	187.28855	-1.8702735	-54.607306	623.07312	277.41003	75
35	Optimized	188.272	-1.0753378	-83.696164	568.94894	277.49494	75
36	Optimized	189.2558	-0.2800793	-102.312	514.80888	251.08907	75
37	Optimized	190.1608	0.5035748	-124.15752	440.145	214.67306	75
38	Optimized	190.98695	1.2756243	-148.23023	387.21511	188.85743	75
39	Optimized	191.49405	1.7495595	-164.56284	355.11337	173.20036	75
40	Optimized	191.69405	1.9474445	-171.68623	329.58019	160.747	75
41	Optimized	192.19915	2.4718315	-190.86102	287.22133	140.0872	75
42	Optimized	192.9975	3.300657	-224.16003	216.73032	105.70644	75
43	Optimized	193.7975	4.1750365	-262.43714	135.47601	66.076067	75

44	Optimized	194.59915	5.0949695	-305.8311	59.582074	29.060119	75
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Slices of Slip Surface: 1213

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	1213	165.67325	-1.1086366	38.306035	156.90378	57.843983	0
2	1213	166.32355	-1.605372	9.573449	235.06417	100.39494	0
3	1213	167.05185	-2.099047	27.062278	291.63829	117.79683	0
4	1213	168.00895	-2.6868085	47.493418	355.48466	137.12654	0
5	1213	168.96605	-3.2007825	65.003116	408.22581	152.81259	0
6	1213	169.92315	-3.6474895	79.466694	451.69573	165.72704	0
7	1213	170.65085	-3.950642	89.056728	479.87478	174.00341	0
8	1213	170.95	-4.0648385	92.602436	492.88605	178.21775	0
9	1213	171.15	-4.1361205	94.75746	501.52403	181.10414	0
10	1213	171.73335	-4.326721	100.32043	523.9321	188.60407	0
11	1213	172.6	-4.5797215	107.74161	553.28097	198.36691	0
12	1213	173.46665	-4.789107	113.36003	577.38855	206.59881	0
13	1213	174.05	-4.910773	116.5205	588.83074	210.28607	0
14	1213	174.30025	-4.955561	117.65238	594.16272	212.15607	0
15	1213	174.45025	-4.980769	118.25823	598.79759	213.9499	0
16	1213	174.53525	-4.9944305	118.56573	601.34546	214.94738	0
17	1213	175.04475	-5.0619015	119.59497	628.38582	226.52828	0
18	1213	175.99325	-5.1617705	120.61358	681.11942	249.55328	0
19	1213	176.9418	-5.2140555	120.09079	727.27851	270.33739	0
20	1213	177.89035	-5.2191475	117.47704	767.15829	289.25673	0
21	1213	178.4823	-5.2039815	115.56527	789.49735	300.05389	0
22	1213	179.06665	-5.1601205	112.17381	800.2422	306.34779	0
23	1213	180	-5.0611	105.60043	810.77793	313.96525	0
24	1213	180.74785	-4.9518155	99.542069	815.88354	318.93577	0
25	1213	181.7645	-4.7359775	87.555866	815.77411	324.22365	0
26	1213	182.90425	-4.449611	73.446283	817.68502	331.35643	0
27	1213	183.7128	-4.192421	60.731554	822.1371	338.99959	0
28	1213	184.80855	-3.768509	40.888814	819.92853	346.85083	0
29	1213	186.13515	-3.162148	12.610539	789.80983	346.03142	0
30	1213	187.3016	-2.5245895	-16.61606	726.41302	323.41991	75
31	1213	188.3642	-1.841696	-48.773892	670.09962	298.34757	75
32	1213	189.3129	-1.1480835	-72.766415	602.91499	294.06129	75
33	1213	190.14775	-0.45323025	-90.355028	536.6729	261.75286	75
34	1213	190.9826	0.3286531	-111.38758	463.94631	226.28174	75
35	1213	191.6	0.9608394	-131.40312	407.45585	198.7295	75
36	1213	192.32985	1.829236	-162.5432	322.80402	157.44204	75
37	1213	193.3895	3.2716565	-221.34125	186.27911	90.854392	75
38	1213	194.44915	5.0817425	-305.37038	35.752431	17.437626	75

NWL S-Case P/S (Block)

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File Information

Created By: [Liljegren, James](#)
Revision Number: [695](#)
Last Edited By: [Vicky Curtis](#)
Date: [9/30/2013](#)
Time: [2:48:33 PM](#)
File Name: [Reach 17B.gsz](#)
Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix F NWL\](#)
Last Solved Date: [9/30/2013](#)
Last Solved Time: [2:55:58 PM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Strength Units: [psf](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

NWL S-Case P/S (Block)

Kind: [SLOPE/W](#)
Parent: [Normal Water Level at +0.40ft \(seepage\)](#)
Method: [Spencer](#)
Settings
 PWP Conditions Source: [Parent Analysis](#)
Slip Surface
 Direction of movement: [Left to Right](#)
 Use Passive Mode: [No](#)
 Slip Surface Option: [Block](#)
 Critical slip surfaces saved: [1](#)
 Optimize Critical Slip Surface Location: [Yes](#)
Tension Crack
 Tension Crack Option: [Search for Tension Crack](#)
 Percentage Wet: [0](#)
 Tension Crack Fluid Unit Weight: [62.4 pcf](#)
FOS Distribution
 FOS Calculation Option: [Constant](#)

Restrict Block Crossing: [Yes](#)

Advanced

Number of Slices: [30](#)

Optimization Tolerance: [0.01](#)

Minimum Slip Surface Depth: [0.1 ft](#)

Optimization Maximum Iterations: [2000](#)

Optimization Convergence Tolerance: [1e-007](#)

Starting Optimization Points: [8](#)

Ending Optimization Points: [16](#)

Complete Passes per Insertion: [1](#)

Driving Side Maximum Convex Angle: [5 °](#)

Resisting Side Maximum Convex Angle: [1 °](#)

Materials

EMB FILL to EL. -1.5 (S-Case) AWT

Model: [Mohr-Coulomb](#)

Unit Weight: [116 pcf](#)

Cohesion: [75 psf](#)

Phi: [26 °](#)

Phi-B: [0 °](#)

MARSH 1, EL. -1.5 TO -5 (S-Case) AWT

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [97 pcf](#)

Cohesion: [75 psf](#)

Phi: [24 °](#)

Phi-B: [0 °](#)

BEACH SAND, EL. -20 TO -41

Model: [Shear/Normal Fn.](#)

Unit Weight: [122 pcf](#)

Strength Function: [Sand](#)

Phi-B: [0 °](#)

Berm

Model: [Mohr-Coulomb](#)

Unit Weight: [110 pcf](#)

Cohesion: [75 psf](#)

Phi: [26 °](#)

Phi-B: [0 °](#)

MARSH 2, EL. -5 to -8 (S-Case) AWT

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [97 pcf](#)

Cohesion: [75 psf](#)

Phi: [24 °](#)

Phi-B: 0 °

MARSH 3, EL. -8 to -12.5 (S-Case)

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: 73 pcf

Cohesion: 0 psf

Phi: 24 °

Phi-B: 0 °

MARSH 4, EL. -12.5 to -20 (S-Case)

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: 111 pcf

Cohesion: 0 psf

Phi: 24 °

Phi-B: 0 °

BAY SOUND CLAY, EL. -41 to -70 (S-Case)

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: 105 pcf

Cohesion: 0 psf

Phi: 26 °

Phi-B: 0 °

EMB FILL to EL. -1.5 (S-Case) BWT

Model: [Mohr-Coulomb](#)

Unit Weight: 116 pcf

Cohesion: 0 psf

Phi: 26 °

Phi-B: 0 °

MARSH 1, EL. -1.5 TO -5 (S-Case) BWT

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: 97 pcf

Cohesion: 0 psf

Phi: 24 °

Phi-B: 0 °

MARSH 2, EL. -5 to -8 (S-Case) BWT

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: 97 pcf

Cohesion: 0 psf

Phi: 24 °

Phi-B: 0 °

Slip Surface Limits

Left Coordinate: (103.5, -7) ft

Right Coordinate: (352.1, -4.8) ft

Slip Surface Block

Left Grid

Upper Left: (200, 1) ft
Lower Left: (200, -24) ft
Lower Right: (230, -24) ft
X Increments: 7
Y Increments: 5
Starting Angle: 135 °
Ending Angle: 155 °
Angle Increments: 4

Right Grid

Upper Left: (240, 1) ft
Lower Left: (240, -24) ft
Lower Right: (310, -24) ft
X Increments: 14
Y Increments: 5
Starting Angle: 0 °
Ending Angle: 45 °
Angle Increments: 4

Reinforcements

Reinforcement 1

Type: Pile
Outside Point: (200, 14.1) ft
Inside Point: (200, -4.8) ft
Slip Surface Intersection: (200, 5.6027) ft
Total Length: 18.9 ft
Reinforcement Direction: 90 °
Applied Load Option: Variable
F of S Dependent: No
Pile Spacing: 1 ft
Shear Capacity: 0 lbs
Shear Safety Factor: 1
Shear Load Used: 0 lbs
Shear Option: Parallel to Slip
Resisting Force Used: 0 lbs/ft

Shear/Normal Strength Functions

Sand

Model: Spline Data Point Function
Function: Shear Stress vs. Normal Stress
Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 0

Data Points: Normal Stress (psf), Shear Stress (psf)

Data Point: (-10000, 0)

Data Point: (0, 0)

Data Point: (10000, 6494)

Estimation Properties

Intact Rock Param.: 10

Geological Strength: 100

Disturbance Factor: 0

SigmaC: 600000 psf

Sigma3: 300000 psf

Num. Points: 20

Regions

	Material	Points	Area (ft²)
Region 1	MARSH 3, EL. -8 to -12.5 (S-Case)	1,7,15,16	173.7
Region 2	MARSH 3, EL. -8 to -12.5 (S-Case)	2,1,16,17	260.55
Region 3	MARSH 4, EL. -12.5 to -20 (S-Case)	2,17,18,3	723.75
Region 4	BAY SOUND CLAY, EL. -41 to -70 (S-Case)	4,19,11,12,20,5	7209.4
Region 5	MARSH 3, EL. -8 to -12.5 (S-Case)	15,8,9,17,16	684.45
Region 6	MARSH 4, EL. -12.5 to -20 (S-Case)	17,9,10,18	1140.75
Region 7	BEACH SAND, EL. -20 TO -41	3,18,10,11,19,4	5220.6
Region 8	EMB FILL to EL. -1.5 (S-Case) AWT	78,37,77,39,40,41,42,43,44,45,46,88,87,79	149.38546
Region 9	MARSH 1, EL. -1.5 TO -5 (S-Case) BWT	73,29,30,31,32,33,79,80,81,82,83,84,85,86,87,13,90,14	164.29393
Region 10	MARSH 2, EL. -5 to -8 (S-Case) BWT	21,22,23,24,25,26,27,28,73,14,15,7	222.71
Region 11	EMB FILL to EL. -1.5 (S-Case) AWT	59,60,13,88,46,49,50,51,52,53,54,55,56,57,58	198.42
Region 12	MARSH 1, EL. -1.5 TO -5 (S-Case) AWT	65,91,89,90,13,60,61,62,63,64	194.69564
Region 13	MARSH 1, EL. -1.5 TO -5 (S-Case) AWT	74,70,71,72,6	22.16
Region 14	MARSH 2, EL. -5 to -8 (S-Case) BWT	14,91,92,93,94,95,96,8,15	240.09447
Region 15		46,75,47,48,49	8.775
Region 16	Berm	58,76,69,68,67,66,65,64,63,62,61,60,59	172.285
Region 17	EMB FILL to EL. -1.5 (S-Case) BWT	37,78,79,33,34,35,36,38	7.855659
Region 18	MARSH 1, EL. -1.5 TO -5 (S-Case) AWT	79,80,81,82,83,84,85,86,87	29.475976
Region 19	EMB FILL to EL. -1.5 (S-Case) BWT	87,88,13	5.6139663
Region 20	MARSH 1, EL. -1.5 TO -5 (S-Case) BWT	90,89,91,14	9.4793627

Region 21	MARSH 2, EL. -5 to -8 (S-Case) AWT	91,65,66,67,68,69,74,6,96,95,94,93,92	202.29553
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Points

	X (ft)	Y (ft)
Point 1	103.5	-9.8
Point 2	103.5	-12.5
Point 3	103.5	-20
Point 4	103.5	-41
Point 5	103.5	-70
Point 6	352.1	-5
Point 7	103.5	-8
Point 8	352.1	-8
Point 9	352.1	-12.5
Point 10	352.1	-20
Point 11	352.1	-41
Point 12	352.1	-70
Point 13	200	-1.5
Point 14	200	-5
Point 15	200	-8
Point 16	200	-9.8
Point 17	200	-12.5
Point 18	200	-20
Point 19	200	-41
Point 20	200	-70
Point 21	103.5	-7
Point 22	104.4	-7.1
Point 23	113.7	-7.1
Point 24	114.4	-7.2
Point 25	123.7	-7.1
Point 26	124.4	-7.3
Point 27	133.5	-6.8
Point 28	134.3	-6
Point 29	143.5	-3.9
Point 30	144.2	-3.1
Point 31	149.8	-1.8
Point 32	153.4	-2
Point 33	154.8	-1.4
Point 34	163.2	-0.9
Point 35	170.9	-0.5
Point 36	171.3	-0.4
Point 37	174.2	0.2
Point 38	173.9	0.2
Point 39	178.6	2.2
Point 40	182.5	3.4
Point 41	185.5	4.8
Point 42	191.4	6

Point 43	191.8	6.1
Point 44	195	6.1
Point 45	198.9	6.1
Point 46	200	6
Point 47	200	13.9
Point 48	200.9	14.1
Point 49	201.3	6.1
Point 50	201.5	6
Point 51	206.9	6
Point 52	208.4	6.1
Point 53	214.5	5.7
Point 54	215.2	5.7
Point 55	221	4.2
Point 56	222	3.9
Point 57	229.2	1.5
Point 58	231.5	0.6
Point 59	238.3	-1.3
Point 60	239.5	-1.4
Point 61	248.5	-2.1
Point 62	253.8	-2.7
Point 63	260.5	-3.5
Point 64	269.3	-4.7
Point 65	271.1	-5
Point 66	282	-5.4
Point 67	286.5	-5.5
Point 68	293.4	-5.4
Point 69	303	-5.6
Point 70	313.4	-4.6
Point 71	332.7	-4.2
Point 72	352.1	-4.8
Point 73	139.5	-5
Point 74	309	-5
Point 75	200	6.1
Point 76	293.5	-2.5
Point 77	174.5	0.33636
Point 78	171	-1
Point 79	166.57327	-1.42605
Point 80	170.40169	-2.0367
Point 81	174.40046	-2.66922
Point 82	178.36458	-3.04181
Point 83	181.02898	-3.12412
Point 84	184.11709	-3.06832
Point 85	187.79787	-2.75327
Point 86	191.85556	-2.05692
Point 87	194.05067	-1.48684
Point 88	200	0.38726
Point 89	200.79089	-3.53148
Point 90	200	-3.53148

Point 91	212.1192	-5
Point 92	222.79653	-5.95604
Point 93	238.10285	-6.46832
Point 94	267.43671	-6.6479
Point 95	323.53374	-6.76407
Point 96	352.1	-6.81648

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	2.82	(256.516, 8.771)	46.34368	(200, 6)	(311.234, -4.79689)
2	11014	2.91	(256.516, 8.771)	48.877	(197.474, 6.1)	(314.089, -4.58571)

Slices of Slip Surface: Optimized

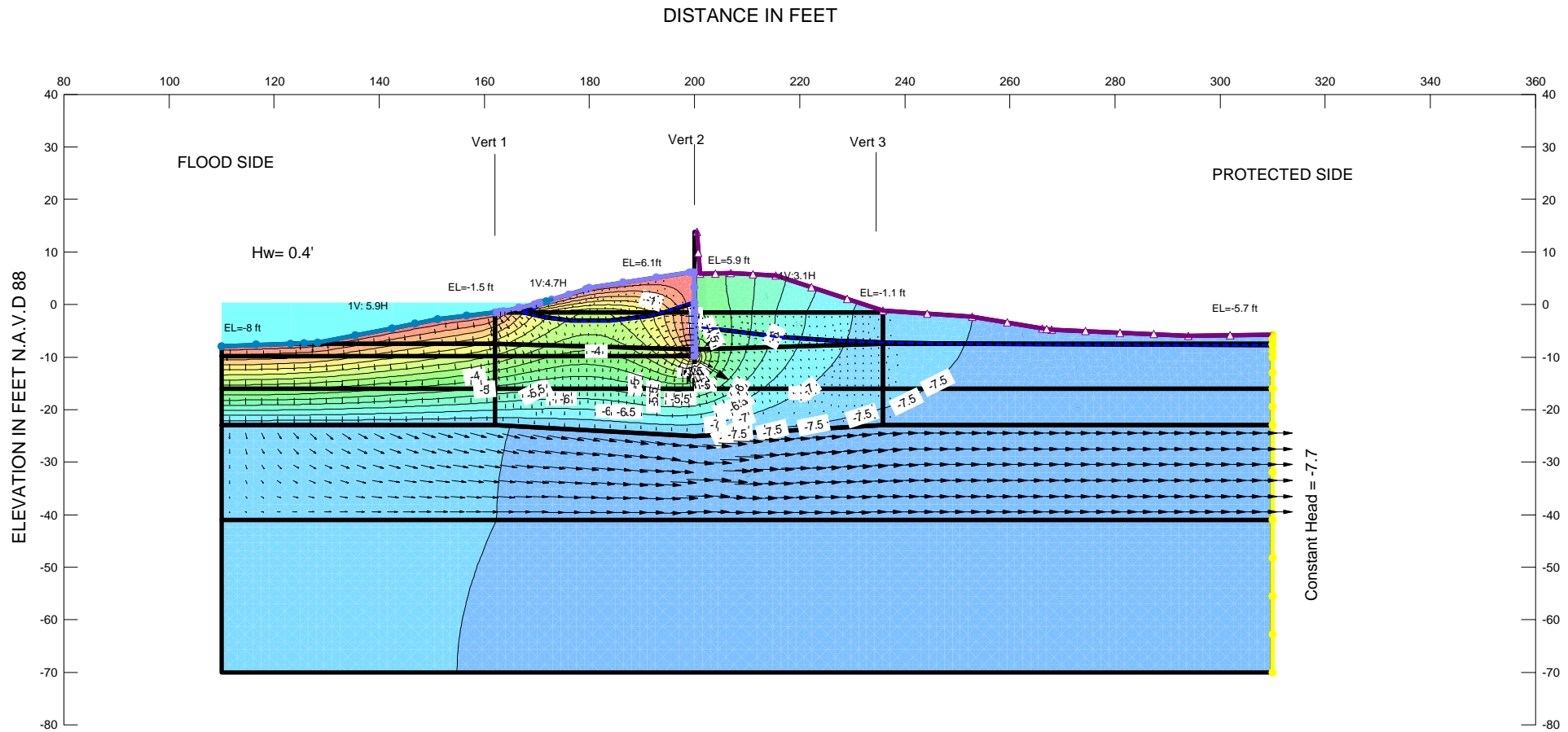
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	200.45	5.1528795	-395.9222	62.552454	30.50887	75
2	Optimized	201.1	4.503129	-409.06904	127.43272	62.153088	75
3	Optimized	201.4	4.203244	-401.04177	152.02881	74.149407	75
4	Optimized	202.8656	2.738211	-361.41692	283.21394	138.13267	75
5	Optimized	205.5656	0.093829	-246.94807	533.94836	260.42402	75
6	Optimized	207.0545	-1.3336155	-179.30527	668.43836	326.01917	75
7	Optimized	207.8045	-2.05265	-142.37936	739.32291	329.16777	75
8	Optimized	209.5424	-3.718806	-55.550009	867.63914	386.29783	75
9	Optimized	210.7818	-4.9070305	5.7581531	973.16547	430.71749	0
10	Optimized	211.0024	-5.11852	16.557301	989.69519	433.2689	0
11	Optimized	211.6226	-5.6181165	40.970656	1069.0984	457.75196	0
12	Optimized	213.3096	-6.9127085	105.13348	1170.4601	474.31398	0
13	Optimized	214.6132	-7.913112	155.96585	1249.6116	486.92245	0
14	Optimized	214.9632	-8.181703	169.6369	1269.2278	489.56941	0
15	Optimized	216.39555	-9.280858	226.00387	1311.8888	483.46712	0
16	Optimized	219.29555	-11.06047	318.27927	1425.2021	492.83382	0
17	Optimized	221.5	-12.175545	377.32532	1440.1451	473.19783	0
18	Optimized	222.0707	-12.46423	392.94783	1441.8518	467.00214	0
19	Optimized	222.47455	-12.668495	404.12531	1447.6291	464.5978	0
20	Optimized	225.4885	-13.49769	447.60137	1499.8096	468.47328	0
21	Optimized	228.68465	-14.146805	482.23449	1531.0448	466.96043	0
22	Optimized	230.35	-14.10937	478.14009	1453.1112	434.0851	0
23	Optimized	233.1507	-14.04641	471.7074	1380.5701	404.65174	0
24	Optimized	236.4521	-13.97219	464.6819	1347.9258	393.2455	0
25	Optimized	238.2014	-13.932865	461.17187	1330.6302	387.10777	0
26	Optimized	238.9	-13.91716	459.81723	1324.4989	384.98108	0
27	Optimized	240.82815	-13.873815	456.11918	1309.8325	380.09765	0
28	Optimized	244.75005	-13.791815	449.33833	1282.0617	370.75231	0
29	Optimized	247.9219	-13.737425	444.84267	1257.3634	361.75752	0
30	Optimized	251.15	-13.724895	443.12873	1242.5001	355.90304	0
31	Optimized	255.475	-13.708105	441.04148	1223.0655	348.17952	0
32	Optimized	258.825	-13.6951	439.57881	1208.1701	342.19888	0

33	Optimized	262.2342	-13.68187	438.15832	1193.4387	336.27248	0
34	Optimized	265.70255	-13.668405	436.77439	1178.7921	330.36755	0
35	Optimized	268.1427	-13.65893	435.85445	1168.4588	326.17645	0
36	Optimized	269.07435	-13.65778	435.64855	1162.3351	323.54172	0
37	Optimized	270.2	-13.665715	436.00577	1159.3599	322.05801	0
38	Optimized	272.7038	-13.68336	436.79816	1150.0907	317.57831	0
39	Optimized	276.00615	-13.71026	438.0944	1135.8428	310.65761	0
40	Optimized	279.85235	-13.79895	443.22295	1120.7963	301.67511	0
41	Optimized	282.4985	-13.889005	448.56782	1117.3849	297.77653	0
42	Optimized	284.7485	-14.00369	455.50315	1113.6897	293.04352	0
43	Optimized	288.225	-14.19765	467.27336	1116.2062	288.92354	0
44	Optimized	291.725	-14.392925	479.11403	1117.9234	284.41624	0
45	Optimized	295.127	-14.582735	490.65678	1070.8475	258.31753	0
46	Optimized	298.92945	-13.94449	450.47568	928.58443	212.86773	0
47	Optimized	301.54475	-12.857735	382.42658	767.1461	171.28816	0
48	Optimized	302.4923	-12.087095	334.25709	643.10126	137.50628	0
49	Optimized	304.21605	-10.68516	246.61653	519.84913	121.65099	0
50	Optimized	306.43645	-8.848065	131.77103	399.76721	119.31959	0
51	Optimized	308.2204	-7.3417285	37.606877	277.297	106.71692	0
52	Optimized	309.99685	-5.8417285	-56.162637	149.49111	66.557729	75
53	Optimized	311.114	-4.898443	-115.12562	43.702951	19.457807	75

Slices of Slip Surface: 11014

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	11014	198.18715	5.501858	-321.40339	41.728279	20.352242	75
2	11014	199.45	4.442211	-254.30587	139.03707	67.812909	75
3	11014	200.45	3.6031115	-370.23765	218.42472	106.53286	75
4	11014	201.1	3.057697	-356.17237	275.81431	134.52363	75
5	11014	201.4	2.805967	-349.64178	296.73876	144.72916	75
6	11014	204.006	0.6192715	-261.87937	502.66656	245.16686	75
7	11014	206.706	-1.6462975	-157.47515	724.98591	322.78452	75
8	11014	207.65	-2.438406	-117.15883	794.23485	353.61614	75
9	11014	209.422	-3.925284	-41.791718	913.41383	406.67804	75
10	11014	210.5734	-4.8914185	6.5749028	1001.3163	442.8874	0
11	11014	211.411	-5.594255	41.34629	1056.4129	451.93676	0
12	11014	213.1986	-7.094255	116.7208	1174.1274	470.78775	0
13	11014	214.389	-8.093119	167.91188	1250.7278	482.10072	0
14	11014	214.85	-8.479923	187.71372	1275.5734	484.34635	0
15	11014	217.42045	-10.636804	300.74672	1362.3904	472.67422	0
16	11014	220.32045	-13.070195	433.04164	1469.0622	461.26608	0
17	11014	221.2143	-13.820195	474.90412	1519.4644	465.06819	0
18	11014	221.7143	-14	484.36498	1779.3999	576.5867	0
19	11014	222.39825	-14	482.98244	1753.7318	565.77407	0
20	11014	224.3974	-14	479.36509	1675.2167	532.42745	0
21	11014	227.59915	-14	474.68013	1549.5036	478.54225	0
22	11014	230.35	-14	471.47826	1433.6522	428.38743	0
23	11014	233.1507	-14	468.88843	1368.5908	400.57332	0

24	11014	236.4521	-14	466.40466	1344.4195	390.91737	0
25	11014	238.2014	-14	465.30053	1331.6257	385.7128	0
26	11014	238.9	-14	464.91667	1327.25	383.93554	0
27	11014	241.75	-14	463.46667	1313.3111	378.37512	0
28	11014	246.25	-14	461.66667	1292.8444	370.06419	0
29	11014	251.15	-14	460.20755	1271.7925	361.34088	0
30	11014	255.475	-14	459.19403	1254.2687	353.99003	0
31	11014	258.825	-14	458.53731	1240.8657	348.31503	0
32	11014	262.2342	-14	457.96927	1227.5848	342.65493	0
33	11014	265.70255	-14	457.45029	1214.4951	337.05805	0
34	11014	268.36835	-14	457.08398	1204.4287	332.73932	0
35	11014	270.2	-14	456.84444	1197.8333	329.90951	0
36	11014	272.91665	-14	456.52298	1185.5506	324.584	0
37	11014	276.55	-14	456.11013	1167.0276	316.52086	0
38	11014	280.18335	-14	455.72481	1148.5322	308.45773	0
39	11014	284.25	-14	455.31111	1127.3778	299.22336	0
40	11014	288.225	-14	454.92754	1105.5362	289.66965	0
41	11014	291.725	-14	454.59155	1085.3521	280.8327	0
42	11014	295.125	-14	454.27692	1016.4	250.27332	0
43	11014	298.375	-14	454	898.95385	198.10622	0
44	11014	301.12245	-13.25	406.93663	809.13239	179.06909	0
45	11014	302.62245	-12.24773	344.26383	629.03248	126.78717	0
46	11014	304.4949	-10.996596	266.02533	530.11508	117.58033	0
47	11014	307.4949	-8.992062	140.66175	404.85416	117.62604	0
48	11014	309.9343	-7.362117	38.726383	283.71878	109.07764	0
49	11014	312.1343	-5.892124	-53.200784	162.99864	72.571669	75
50	11014	313.43475	-5.023203	-107.53624	73.98863	32.941861	75
51	11014	313.7795	-4.792855	-121.94016	47.608843	21.196823	75



Normal Water Level at +0.40ft (seepage)

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File Information

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Revision Number: [446](#)
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Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix F NWL\](#)
Last Solved Date: [9/30/2013](#)
Last Solved Time: [3:37:50 PM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Mass(M) Units: [lbs](#)
Mass Flux Units: [lbs/sec](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

Normal Water Level at +0.40ft (seepage)

Kind: [SEEP/W](#)
Method: [Steady-State](#)
Settings
 Include Air Flow: [No](#)
Control
 Apply Runoff: [No](#)
Convergence
 Convergence Type: [Head Vector Norm](#)
 Maximum Number of Iterations: [500](#)
 Tolerance: [0.001](#)
 Maximum Change in K: [0.1](#)
 Rate of Change in K: [1.02](#)
 Minimum Change in K: [1e-005](#)
 Equation Solver: [Parallel Direct](#)
 Potential Seepage Max # of Reviews: [10](#)
Time

Starting Time: 0 sec

Duration: 0 sec

Ending Time: 0 sec

Materials

EMB FILL, EL. +5.4 TO -1.5 (S-Case) AWT

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-008 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

BEACH SAND, EL. -23/-25 TO -41

Model: Saturated Only

Hydraulic

K-Sat: 0.00049 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

BAY SOUND CLAY, EL. -41 TO -70 (S-Case)

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-008 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

Sheet Pile

Model: Saturated Only

Hydraulic

K-Sat: 1e-010 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

LACUSTRINE, EL. -16 TO -23/-25

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-007 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

MARSH, EL. -1.5 TO -16

Model: Saturated Only
Hydraulic
K-Sat: 3.28e-007 ft/sec
Volumetric Water Content: 0 ft³/ft³
Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

Boundary Conditions

Drainage

Review: true
Type: Total Flux (Q) 0

Canal Water

Type: Head (H) 0.4

Curb

Type: Head (H) -7.7

Canal Water (Global)

Type: Head (H) 0.4

Regions

	Points	Area (ft²)	Material
Region 1	6,21,22,23	5.825	
Region 2	59,58,50,55,4,5,6,70,69,60	151.92934	EMB FILL, EL. +5.4 TO -1.5 (S-Case) AWT
Region 3	6,23,49,7,8,40,26,70	188.56	EMB FILL, EL. +5.4 TO -1.5 (S-Case) AWT
Region 4	20,19,53,15,16,54	5800	BAY SOUND CLAY, EL. -41 TO -70 (S-Case)
Region 5	18,45,29,35,14,15,53,19	3526.2	BEACH SAND, EL. -23/-25 TO -41
Region 6	41,10,31,11,12,78,77,39,40,8,9	237.39074	MARSH, EL. -1.5 TO -16
Region 7	34,33,78,67,30,13	624.80023	MARSH, EL. -1.5 TO -16
Region 8	24,65,48,68,71,72,73,74,75,76,77,33	69.325054	MARSH, EL. -1.5 TO -16
Region 9	35,34,13,14	519.4	LACUSTRINE, EL. -16 TO -23/-25
Region 10	18,17,44,45	364	LACUSTRINE, EL. -16 TO -23/-25
Region 11	45,44,28,34,35,29	590.4	LACUSTRINE, EL. -16 TO -23/-25
Region 12	28,34,33,24,25,47,44	522	MARSH, EL. -1.5 TO -16
Region 13	17,36,47,44	322.4	MARSH, EL. -1.5 TO -16
Region 14	43,42,38,32,46,1,57	114.65366	MARSH, EL. -1.5 TO -16
Region 15	43,42,38,60,61,62,63,64,69,26,71,68,48,65,24	217.7874	MARSH, EL. -1.5 TO -16
Region 16	47,43,24,25	68.4	MARSH, EL. -1.5 TO -16

Region 17	36,37,27,57,43,47	116.33214	MARSH, EL. -1.5 TO -16
Region 18	58,3,2,38,60,59	4.7531083	EMB FILL, EL. +5.4 TO -1.5 (S-Case) AWT
Region 19	40,39,77,76,75,74,73,72,71,26	163.35801	MARSH, EL. -1.5 TO -16
Region 20	60,61,62,63,64,69	29.030286	MARSH, EL. -1.5 TO -16
Region 21	69,70,26	5.4717935	EMB FILL, EL. +5.4 TO -1.5 (S-Case) AWT
Region 22	77,33,78	2.1117397	MARSH, EL. -1.5 TO -16
Region 23	12,78,67	5.8997668	MARSH, EL. -1.5 TO -16

Lines

	Start Point	End Point	Hydraulic Boundary	Left Side Material	Right Side Material
Line 1	6	21			
Line 2	21	22			
Line 3	22	23	Drainage		
Line 4	23	6		Sheet Pile	
Line 5	5	6	Canal Water		
Line 6	7	8	Drainage		
Line 7	24	25	Canal Water	Sheet Pile	
Line 8	20	19			
Line 9	15	16	Curb		
Line 10	14	15	Curb		
Line 11	19	18			
Line 12	5	4	Canal Water		
Line 13	29	35			
Line 14	35	14			
Line 15	8	40			
Line 16	40	26			
Line 17	40	39			
Line 18	41	10	Drainage		
Line 19	10	31	Drainage		
Line 20	31	11	Drainage		
Line 21	11	12	Curb		
Line 22	30	13	Curb		
Line 23	13	34			
Line 24	28	34			
Line 25	34	35			
Line 26	13	14	Curb		
Line 27	29	45			
Line 28	45	18			
Line 29	18	17			
Line 30	17	44			
Line 31	44	45			
Line 32	44	28			
Line 33	24	43			
Line 34	17	36			
Line 35	43	42			
Line 36	46	1	Canal Water (Global)		
Line 37	42	38			

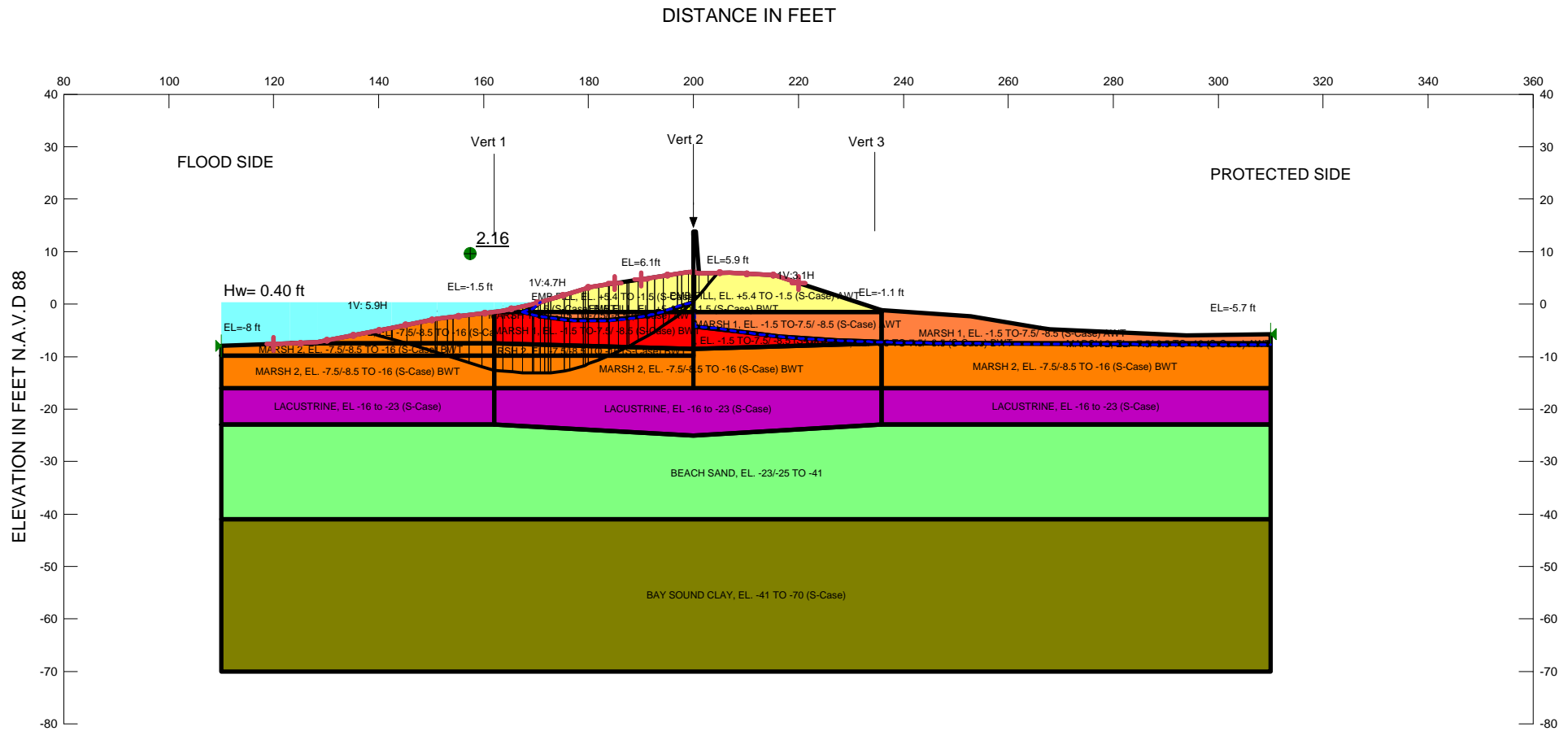
Line 38	43	47			
Line 39	47	44			
Line 40	25	47			
Line 41	36	47			
Line 42	36	37			
Line 43	23	49	Drainage		
Line 44	49	7	Drainage		
Line 45	8	9	Drainage		
Line 46	9	41	Drainage		
Line 47	38	32	Canal Water (Global)		
Line 48	32	46	Canal Water (Global)		
Line 49	19	53			
Line 50	53	15			
Line 51	16	54			
Line 52	54	20			
Line 53	25	28			
Line 54	50	55	Canal Water		
Line 55	55	4	Canal Water		
Line 56	1	57	Canal Water (Global)		
Line 57	57	27	Canal Water (Global)		
Line 58	57	43			
Line 59	37	27			
Line 60	58	50	Canal Water (Global)		
Line 61	38	60			
Line 62	65	24	Canal Water	Sheet Pile	
Line 63	67	30	Curb		
Line 64	59	58			
Line 65	60	59			
Line 66	58	3	Canal Water		
Line 67	3	2	Canal Water		
Line 68	2	38	Canal Water		
Line 69	60	61			
Line 70	61	62			
Line 71	62	63			
Line 72	63	64			
Line 73	65	48	Canal Water		Sheet Pile
Line 74	48	68	Canal Water		Sheet Pile
Line 75	60	69			
Line 76	69	26			
Line 77	6	70	Canal Water	Sheet Pile	
Line 78	70	26	Canal Water	Sheet Pile	
Line 79	64	69			
Line 80	68	71	Canal Water		Sheet Pile
Line 81	71	26	Canal Water		Sheet Pile
Line 82	33	77			
Line 83	77	39			
Line 84	70	69			
Line 85	77	76			

Line 86	76	75			
Line 87	75	74			
Line 88	74	73			
Line 89	73	72			
Line 90	72	71			
Line 91	33	24			
Line 92	12	78			
Line 93	78	33			
Line 94	78	77			
Line 95	34	33			
Line 96	78	67			
Line 97	67	12			

Points

	X (ft)	Y (ft)
Point 1	128.3	-7.3
Point 2	163.7	-1.3
Point 3	169.5	0
Point 4	180	3.2
Point 5	199.1	6.1
Point 6	200	6.1
Point 7	215.4	5.5
Point 8	235.8	-1.1
Point 9	252.8	-2.3
Point 10	267.9	-4.8
Point 11	310	-5.7
Point 12	310	-7.5
Point 13	310	-16
Point 14	310	-23
Point 15	310	-41
Point 16	310	-70
Point 17	110	-16
Point 18	110	-23
Point 19	110	-41
Point 20	110	-70
Point 21	200	13.8
Point 22	200.5	13.8
Point 23	201	5.9
Point 24	200	-8.5
Point 25	200	-9.8
Point 26	200	-1.5
Point 27	110	-8
Point 28	200	-16
Point 29	200	-25
Point 30	310	-10
Point 31	294	-6
Point 32	151.1	-2.8

Point 33	235.8	-7.5
Point 34	235.8	-16
Point 35	235.8	-23
Point 36	110	-9.8
Point 37	110	-8.5
Point 38	162	-1.5
Point 39	235.8	-4.5
Point 40	235.8	-1.5
Point 41	266.12598	-4.5
Point 42	162	-4.5
Point 43	162	-7.5
Point 44	162	-16
Point 45	162	-23
Point 46	142.50631	-4.5
Point 47	162	-9.8
Point 48	200	-6.6
Point 49	206.9	6
Point 50	172.78125	1
Point 51	110	-150
Point 52	310	-150
Point 53	200	-41
Point 54	200	-70
Point 55	179.34375	3
Point 56	110	0
Point 57	123.07143	-7.5
Point 58	170.82144	0.40272
Point 59	169.33937	-0.77371
Point 60	167.45185	-1.51049
Point 61	171.63327	-2.48654
Point 62	176.42613	-3.05241
Point 63	183.96487	-3.07182
Point 64	191.16553	-2.1979
Point 65	200	-6.87711
Point 66	212.26573	-7.4857
Point 67	310	-7.70202
Point 68	200.00664	-4.75711
Point 69	194.2483	-1.50185
Point 70	200	0.40267
Point 71	200.00578	-4.33351
Point 72	200.53669	-4.32722
Point 73	207.91106	-5.13146
Point 74	216.53874	-6.22013
Point 75	227.25795	-6.92436
Point 76	234.17552	-7.17007
Point 77	235.8	-7.23256
Point 78	251.59225	-7.5



Name: EMB FILL, EL. +5.4 TO -1.5 (S-Case) AWT Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion: 75 psf Phi: 26 °
Name: MARSH 1, EL. -1.5 TO -7.5/-8.5 (S-Case) AWT Model: Spatial Mohr-Coulomb Unit Weight: 102 pcf Cohesion: 75 psf Phi: 24 °
Name: BEACH SAND, EL. -23/-25 TO -41 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand
Name: BAY SOUND CLAY, EL. -41 TO -70 (S-Case) Model: Spatial Mohr-Coulomb Unit Weight: 103 pcf Cohesion: 0 psf Phi: 26 °
Name: MARSH 2, EL. -7.5/-8.5 TO -16 (S-Case) AWT Model: Spatial Mohr-Coulomb Unit Weight: 80 pcf Cohesion: 75 psf Phi: 24 °
Name: LACUSTRINE, EL. -16 to -23 (S-Case) Model: Spatial Mohr-Coulomb Unit Weight: 108 pcf Cohesion: 0 psf Phi: 26 °
Name: EMB FILL, EL. +5.4 TO -1.5 (S-Case) BWT Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion: 0 psf Phi: 26 °
Name: MARSH 1, EL. -1.5 TO -7.5/-8.5 (S-Case) BWT Model: Spatial Mohr-Coulomb Unit Weight: 102 pcf Cohesion: 0 psf Phi: 24 °
Name: MARSH 2, EL. -7.5/-8.5 TO -16 (S-Case) BWT Model: Spatial Mohr-Coulomb Unit Weight: 80 pcf Cohesion: 0 psf Phi: 24 °

GENERAL NOTES

CLASSIFICATION STRATIFICATION
SHEAR STRENGTHS AND UNIT WEIGHTS OF
THE SOIL WERE BASED ON THE RESULTS OF
UNDISTURBED BORINGS AND CPT DATA. SEE
BOTH BORING AND CPT DATA PLATES.

WHERE INDICATED, SHEAR STRENGTHS BETWEEN
VERTICALS WERE ASSUMED TO VARY LINEARLY
BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

Hw IS CANAL WATER LEVEL

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 18A,
PROTECTED SIDE STABILITY ANALYSIS,
CASE: NWL S-Case F/S (EE)
STA. 50+00 TO 61+00 EAST
ORLEANS PARISH, LOUISIANA

NWL S-Case F/S (EE)

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File Information

Created By: [Liljegren, James](#)
Revision Number: [446](#)
Last Edited By: [Higgins, James](#)
Date: [9/30/2013](#)
Time: [3:37:22 PM](#)
File Name: [Reach 18A.gsz](#)
Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix F NWL\](#)
Last Solved Date: [9/30/2013](#)
Last Solved Time: [3:41:38 PM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Strength Units: [psf](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

NWL S-Case F/S (EE)

Kind: [SLOPE/W](#)
Parent: [Normal Water Level at +0.40ft \(seepage\)](#)
Method: [Spencer](#)

Settings

PWP Conditions Source: [Parent Analysis](#)

Slip Surface

Direction of movement: [Right to Left](#)
Use Passive Mode: [No](#)
Slip Surface Option: [Entry and Exit](#)
Critical slip surfaces saved: [1](#)
Optimize Critical Slip Surface Location: [Yes](#)

Tension Crack

Tension Crack Option: [Search for Tension Crack](#)
Percentage Wet: [0](#)
Tension Crack Fluid Unit Weight: [62.4 pcf](#)

FOS Distribution

FOS Calculation Option: [Constant](#)

Advanced

Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 2000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

EMB FILL, EL. +5.4 TO -1.5 (S-Case) AWT

Model: Mohr-Coulomb
Unit Weight: 115 pcf
Cohesion: 75 psf
Phi: 26 °
Phi-B: 0 °

MARSH 1, EL. -1.5 TO-7.5/ -8.5 (S-Case) AWT

Model: Spatial Mohr-Coulomb
Unit Weight: 102 pcf
Cohesion: 75 psf
Phi: 24 °
Phi-B: 0 °

BEACH SAND, EL. -23/-25 TO -41

Model: Shear/Normal Fn.
Unit Weight: 122 pcf
Strength Function: Sand
Phi-B: 0 °

BAY SOUND CLAY, EL. -41 TO -70 (S-Case)

Model: Spatial Mohr-Coulomb
Unit Weight: 103 pcf
Cohesion: 0 psf
Phi: 26 °
Phi-B: 0 °

MARSH 2, EL. -7.5/-8.5 TO -16 (S-Case) AWT

Model: Spatial Mohr-Coulomb
Unit Weight: 80 pcf
Cohesion: 75 psf
Phi: 24 °
Phi-B: 0 °

LACUSTRINE, EL -16 to -23 (S-Case)

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [108 pcf](#)

Cohesion: [0 psf](#)

Phi: [26 °](#)

Phi-B: [0 °](#)

EMB FILL, EL. +5.4 TO -1.5 (S-Case) BWT

Model: [Mohr-Coulomb](#)

Unit Weight: [115 pcf](#)

Cohesion: [0 psf](#)

Phi: [26 °](#)

Phi-B: [0 °](#)

MARSH 1, EL. -1.5 TO-7.5/ -8.5 (S-Case) BWT

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [102 pcf](#)

Cohesion: [0 psf](#)

Phi: [24 °](#)

Phi-B: [0 °](#)

MARSH 2, EL. -7.5/-8.5 TO -16 (S-Case) BWT

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [80 pcf](#)

Cohesion: [0 psf](#)

Phi: [24 °](#)

Phi-B: [0 °](#)

Slip Surface Entry and Exit

Left Projection: [Range](#)

Left-Zone Left Coordinate: [\(120, -7.61749\) ft](#)

Left-Zone Right Coordinate: [\(185, 3.95916\) ft](#)

Left-Zone Increment: [13](#)

Right Projection: [Range](#)

Right-Zone Left Coordinate: [\(190, 4.71832\) ft](#)

Right-Zone Right Coordinate: [\(220, 4.01176\) ft](#)

Right-Zone Increment: [6](#)

Radius Increments: [15](#)

Slip Surface Limits

Left Coordinate: [\(110, -8\) ft](#)

Right Coordinate: [\(310, -5.7\) ft](#)

Reinforcements

Reinforcement 1

Type: [Pile](#)
Outside Point: [\(200, 13.5\) ft](#)
Inside Point: [\(200, -9.8\) ft](#)
Slip Surface Intersection: [\(200, 0.52191\) ft](#)
Total Length: [23.3 ft](#)
Reinforcement Direction: [90 °](#)
Applied Load Option: [Variable](#)
F of S Dependent: [No](#)
Pile Spacing: [1 ft](#)
Shear Capacity: [1e-008 lbs](#)
Shear Safety Factor: [1](#)
Shear Load Used: [1e-008 lbs](#)
Shear Option: [Parallel to Slip](#)
Resisting Force Used: [0 lbs/ft](#)

Shear/Normal Strength Functions

Sand

Model: [Spline Data Point Function](#)
Function: [Shear Stress vs. Normal Stress](#)
 Curve Fit to Data: [100 %](#)
 Segment Curvature: [0 %](#)
Y-Intercept: [0](#)
Data Points: [Normal Stress \(psf\), Shear Stress \(psf\)](#)
 Data Point: [\(-10000, 0\)](#)
 Data Point: [\(0, 0\)](#)
 Data Point: [\(10000, 6494\)](#)
Estimation Properties
 Intact Rock Param.: [10](#)
 Geological Strength: [100](#)
 Disturbance Factor: [0](#)
 SigmaC: [600000 psf](#)
 Sigma3: [300000 psf](#)
 Num. Points: [20](#)

Regions

	Points	Area (ft²)	Material
Region 1	6,21,22,23	5.825	
Region 2	59,58,50,55,4,5,6,70,69,60	151.92934	EMB FILL, EL. +5.4 TO -1.5 (S-Case) AWT
Region 3	6,23,49,7,8,40,26,70	188.56	EMB FILL, EL. +5.4 TO -1.5 (S-Case) AWT
Region 4	20,19,53,15,16,54	5800	BAY SOUND CLAY, EL. -41 TO -70 (S-Case)
Region 5	18,45,29,35,14,15,53,19	3526.2	BEACH SAND, EL. -23/-25 TO -41
Region 6	41,10,31,11,12,78,77,39,40,8,9	237.39074	MARSH 1, EL. -1.5 TO -7.5/ -8.5 (S-Case) AWT
			MARSH 2, EL. -7.5/-8.5 TO -16 (S-Case)

Region 7	34,33,78,67,30,13	624.80023	BWT
Region 8	24,65,48,68,71,72,73,74,75,76,77,33	69.325054	MARSH 1, EL. -1.5 TO-7.5/ -8.5 (S-Case) BWT
Region 9	35,34,13,14	519.4	LACUSTRINE, EL -16 to -23 (S-Case)
Region 10	18,17,44,45	364	LACUSTRINE, EL -16 to -23 (S-Case)
Region 11	45,44,28,34,35,29	590.4	LACUSTRINE, EL -16 to -23 (S-Case)
Region 12	28,34,33,24,25,47,44	522	MARSH 2, EL. -7.5/-8.5 TO -16 (S-Case) BWT
Region 13	17,36,47,44	322.4	MARSH 2, EL. -7.5/-8.5 TO -16 (S-Case) BWT
Region 14	43,42,38,32,46,1,57	114.65366	MARSH 2, EL. -7.5/-8.5 TO -16 (S-Case) BWT
Region 15	43,42,38,60,61,62,63,64,69,26,71,68,48,65,24	217.7874	MARSH 1, EL. -1.5 TO-7.5/ -8.5 (S-Case) BWT
Region 16	47,43,24,25	68.4	MARSH 2, EL. -7.5/-8.5 TO -16 (S-Case) BWT
Region 17	36,37,27,57,43,47	116.33214	MARSH 2, EL. -7.5/-8.5 TO -16 (S-Case) BWT
Region 18	58,3,2,38,60,59	4.7531083	EMB FILL, EL. +5.4 TO -1.5 (S-Case) BWT
Region 19	40,39,77,76,75,74,73,72,71,26	163.35801	MARSH 1, EL. -1.5 TO-7.5/ -8.5 (S-Case) AWT
Region 20	60,61,62,63,64,69	29.030286	MARSH 1, EL. -1.5 TO-7.5/ -8.5 (S-Case) AWT
Region 21	69,70,26	5.4717935	EMB FILL, EL. +5.4 TO -1.5 (S-Case) BWT
Region 22	77,33,78	2.1117397	MARSH 1, EL. -1.5 TO-7.5/ -8.5 (S-Case) BWT
Region 23	12,78,67	5.8997668	MARSH 2, EL. -7.5/-8.5 TO -16 (S-Case) AWT

Points

	X (ft)	Y (ft)
Point 1	128.3	-7.3
Point 2	163.7	-1.3
Point 3	169.5	0
Point 4	180	3.2
Point 5	199.1	6.1
Point 6	200	6.1
Point 7	215.4	5.5
Point 8	235.8	-1.1
Point 9	252.8	-2.3
Point 10	267.9	-4.8
Point 11	310	-5.7
Point 12	310	-7.5
Point 13	310	-16
Point 14	310	-23

Point 15	310	-41
Point 16	310	-70
Point 17	110	-16
Point 18	110	-23
Point 19	110	-41
Point 20	110	-70
Point 21	200	13.8
Point 22	200.5	13.8
Point 23	201	5.9
Point 24	200	-8.5
Point 25	200	-9.8
Point 26	200	-1.5
Point 27	110	-8
Point 28	200	-16
Point 29	200	-25
Point 30	310	-10
Point 31	294	-6
Point 32	151.1	-2.8
Point 33	235.8	-7.5
Point 34	235.8	-16
Point 35	235.8	-23
Point 36	110	-9.8
Point 37	110	-8.5
Point 38	162	-1.5
Point 39	235.8	-4.5
Point 40	235.8	-1.5
Point 41	266.12598	-4.5
Point 42	162	-4.5
Point 43	162	-7.5
Point 44	162	-16
Point 45	162	-23
Point 46	142.50631	-4.5
Point 47	162	-9.8
Point 48	200	-6.6
Point 49	206.9	6
Point 50	172.78125	1
Point 51	110	-150
Point 52	310	-150
Point 53	200	-41
Point 54	200	-70
Point 55	179.34375	3
Point 56	110	0
Point 57	123.07143	-7.5
Point 58	170.82144	0.40272
Point 59	169.33937	-0.77371
Point 60	167.45185	-1.51049
Point 61	171.63327	-2.48654
Point 62	176.42613	-3.05241

Point 63	183.96487	-3.07182
Point 64	191.16553	-2.1979
Point 65	200	-6.87711
Point 66	212.26573	-7.4857
Point 67	310	-7.70202
Point 68	200.00664	-4.75711
Point 69	194.2483	-1.50185
Point 70	200	0.40267
Point 71	200.00578	-4.33351
Point 72	200.53669	-4.32722
Point 73	207.91106	-5.13146
Point 74	216.53874	-6.22013
Point 75	227.25795	-6.92436
Point 76	234.17552	-7.17007
Point 77	235.8	-7.23256
Point 78	251.59225	-7.5

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	2.16	(166.809, 34.887)	30.70986	(204.682, 5.9624)	(137.945, -5.39908)
2	504	2.20	(166.809, 34.887)	47.954	(205.063, 5.96886)	(140.139, -4.96652)

Slices of Slip Surface: Optimized

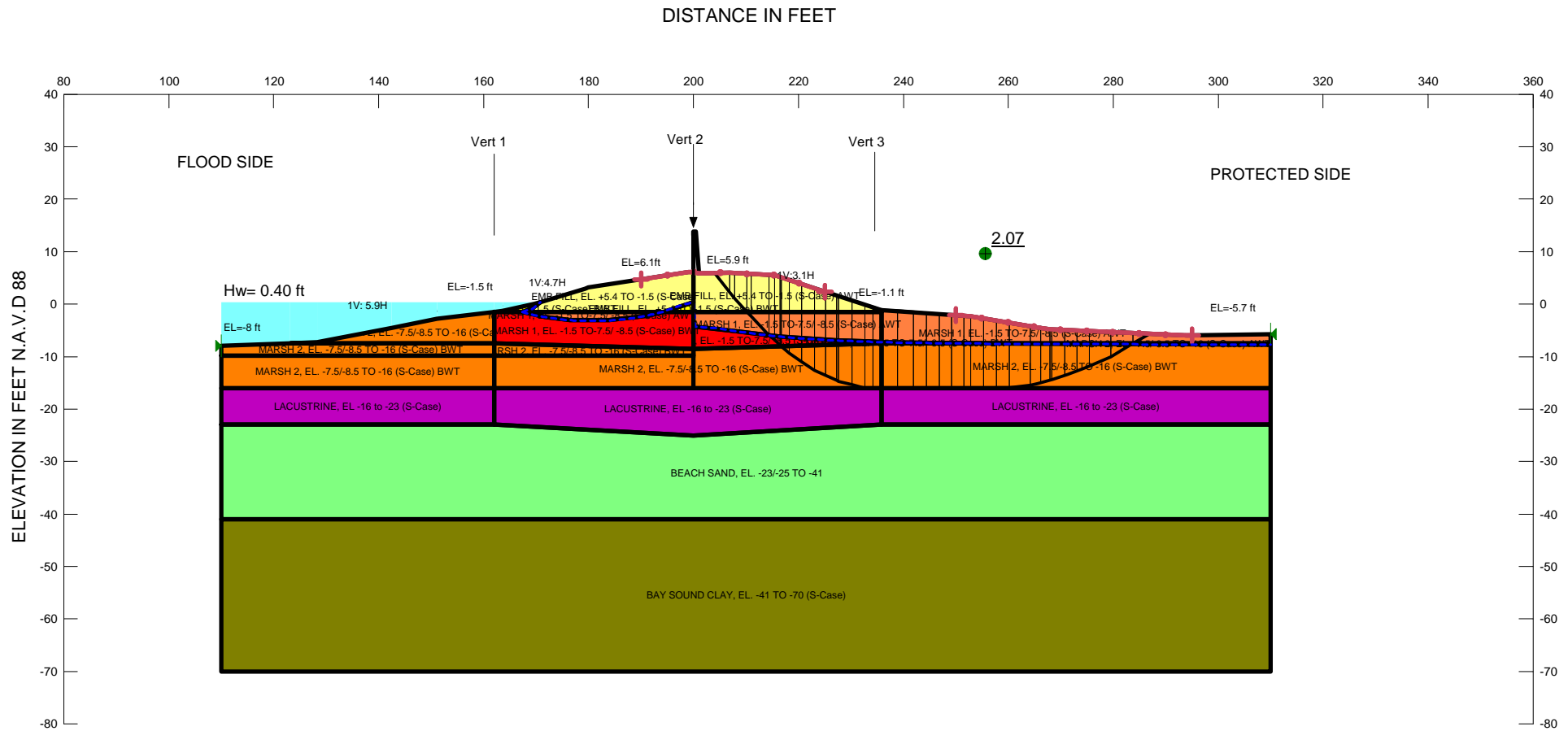
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	139.0851	-5.7158445	367.05073	414.04785	20.924469	0
2	Optimized	141.3659	-6.349381	378.30469	478.08223	44.423823	0
3	Optimized	142.5298	-6.6726795	384.48605	510.756	56.219003	0
4	Optimized	143.9434	-7.089605	393.16554	554.26785	71.727371	0
5	Optimized	146.67865	-7.89713	411.36038	635.38227	99.740972	0
6	Optimized	149.3689	-8.69139	430.86069	715.02341	126.51739	0
7	Optimized	150.907	-9.1462985	442.5407	761.24744	141.89739	0
8	Optimized	152.09515	-9.5020385	451.87698	793.64736	152.16598	0
9	Optimized	153.643	-9.96548	464.04324	837.85873	166.43338	0
10	Optimized	155.72665	-10.616995	481.80845	903.47644	187.73869	0
11	Optimized	158.4432	-11.497085	505.89274	990.77499	215.88349	0
12	Optimized	160.8144	-12.285195	527.98378	1065.9726	239.52804	0
13	Optimized	162.002	-12.67992	539.72886	1254.3674	318.1776	0
14	Optimized	162.852	-12.739375	538.81085	1188.7956	289.39184	0
15	Optimized	164.63565	-12.863015	537.01014	1218.1222	303.25062	0
16	Optimized	166.5069	-12.99273	535.41079	1252.6683	319.3436	0
17	Optimized	168.39095	-13.07229	532.13696	1267.166	327.256	0
18	Optimized	169.4197	-13.088235	529.3954	1281.2381	334.74193	0
19	Optimized	170.1607	-13.09972	527.63357	1294.3412	341.36022	0
20	Optimized	171.22735	-13.11625	525.24394	1321.6697	354.59161	0
21	Optimized	171.9718	-13.127785	523.87322	1349.8475	367.74744	0
22	Optimized	172.5458	-13.102555	521.20776	1323.6133	357.25398	0

23	Optimized	174.10065	-12.901345	508.41986	1362.1127	380.08855	0
24	Optimized	175.92305	-12.59899	491.01021	1360.2472	387.00926	0
25	Optimized	177.69915	-12.13428	466.79256	1384.153	408.43518	0
26	Optimized	179.158	-11.726775	446.50576	1358.5308	406.05971	0
27	Optimized	179.6719	-11.52092	436.5263	1359.6394	410.99643	0
28	Optimized	180.9639	-11.00336	411.71854	1347.0826	416.45093	0
29	Optimized	182.8917	-10.23112	376.22008	1320.6466	420.48578	0
30	Optimized	183.9023	-9.8225	358.53631	1282.7249	411.47527	0
31	Optimized	184.8009	-9.389809	339.3068	1265.063	412.17322	0
32	Optimized	186.49675	-8.573239	305.61061	1231.9332	412.4254	0
33	Optimized	187.5057	-8.087415	287.07912	1210.7072	411.2257	0
34	Optimized	188.5444	-7.5213965	265.36749	1153.8238	395.56626	0
35	Optimized	190.2918	-6.5482495	231.00475	1091.328	383.04058	0
36	Optimized	191.86655	-5.671263	203.07181	1035.2363	370.5035	0
37	Optimized	193.40795	-4.7073045	173.3222	942.73556	342.5649	0
38	Optimized	195.6081	-3.2056595	127.67614	841.80003	317.94844	0
39	Optimized	197.3886	-1.8891325	85.365896	709.81359	278.02202	0
40	Optimized	198.45465	-0.90487635	50.804367	627.09915	281.07775	0
41	Optimized	199.4493	0.0134722	14.886303	548.30603	260.16618	0
42	Optimized	199.8993	0.42895325	-3.3277497	486.65671	237.35834	75
43	Optimized	200.0239	0.5439672	-33.450979	475.9178	232.12062	75
44	Optimized	200.2739	0.829332	-307.84382	413.55573	201.70461	75
45	Optimized	200.75	1.3837705	-371.85566	358.66957	174.93484	75
46	Optimized	201.92045	2.7467735	-463.17563	240.62271	117.35954	75
47	Optimized	203.76135	4.890527	-606.39627	62.161368	30.318125	75

Slices of Slip Surface: 504

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	504	141.32285	-5.7095005	355.5608	445.76597	40.16193	0
2	504	143.44475	-6.9762425	391.27427	567.9225	78.648859	0
3	504	145.64045	-8.1188565	423.67575	674.44155	111.64813	0
4	504	148.15495	-9.2688565	456.86624	778.1856	143.0606	0
5	504	150.2561	-10.110445	481.17617	851.93104	165.0707	0
6	504	152.19	-10.769905	499.77567	905.05704	180.44289	0
7	504	154.37	-11.41177	517.16401	955.78323	195.28586	0
8	504	156.55	-11.94341	530.44812	996.19214	207.3626	0
9	504	158.73	-12.368555	539.51134	1027.0249	217.055	0
10	504	160.91	-12.69006	544.18139	1048.7123	224.63163	0
11	504	162.85	-12.89564	545.36043	1203.5225	293.03264	0
12	504	164.63795	-13.00859	543.22705	1221.8748	302.15344	0
13	504	166.5139	-13.056885	538.1775	1238.7784	311.92763	0
14	504	168.39565	-13.031415	530.2999	1249.2627	320.10285	0
15	504	169.4197	-12.99579	525.19915	1253.011	324.04271	0
16	504	170.1607	-12.945115	520.55591	1256.5299	327.67672	0
17	504	171.22735	-12.86126	513.43184	1268.7384	336.28414	0
18	504	172.2073	-12.75867	505.97062	1289.4218	348.81496	0
19	504	173.6925	-12.56145	493.05545	1316.6319	366.67985	0

20	504	175.5149	-12.261005	475.17142	1344.4511	387.02826	0
21	504	177.88495	-11.74627	447.71496	1369.2888	410.31111	0
22	504	179.6719	-11.308425	426.04776	1383.0441	426.08224	0
23	504	180.9912	-10.910105	407.07575	1370.5396	428.96174	0
24	504	182.97365	-10.248162	377.24577	1338.5344	427.99326	0
25	504	184.0855	-9.8465865	360.32281	1318.2372	426.49097	0
26	504	185.12875	-9.418494	342.22019	1295.1945	424.29148	0
27	504	186.9741	-8.609241	310.29834	1250.6035	418.65083	0
28	504	188.71395	-7.7617745	279.08037	1193.7806	407.25079	0
29	504	190.3483	-6.881514	248.73352	1124.855	390.07442	0
30	504	192.7069	-5.4308775	201.60138	1010.0266	359.93409	0
31	504	195.19685	-3.7437435	151.07687	877.27123	323.32256	0
32	504	197.09395	-2.2736675	102.48412	760.91833	293.1538	0
33	504	198.57125	-1.0330775	60.368986	651.05989	288.09921	0
34	504	199.55	-0.14495375	26.223397	565.71395	263.12712	0
35	504	200.25	0.5188731	-263.47626	469.83089	229.15183	75
36	504	200.75	1.0126203	-347.99275	413.18046	201.52158	75
37	504	202.01565	2.3624935	-439.09627	283.0975	138.07588	75
38	504	204.0469	4.7153655	-596.75764	75.289709	36.721245	75



Name: EMB FILL, EL. +5.4 TO -1.5 (S-Case) AWT Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion: 75 psf Phi: 26 °
Name: MARSH 1, EL. -1.5 TO -7.5/ -8.5 (S-Case) AWT Model: Spatial Mohr-Coulomb Unit Weight: 102 pcf Cohesion: 75 psf Phi: 24 °
Name: BEACH SAND, EL. -23/-25 TO -41 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand
Name: BAY SOUND CLAY, EL. -41 TO -70 (S-Case) Model: Spatial Mohr-Coulomb Unit Weight: 103 pcf Cohesion: 0 psf Phi: 26 °
Name: MARSH 2, EL. -7.5/-8.5 TO -16 (S-Case) AWT Model: Spatial Mohr-Coulomb Unit Weight: 80 pcf Cohesion: 75 psf Phi: 24 °
Name: LACUSTRINE, EL. -16 to -23 (S-Case) Model: Spatial Mohr-Coulomb Unit Weight: 108 pcf Cohesion: 0 psf Phi: 26 °
Name: EMB FILL, EL. +5.4 TO -1.5 (S-Case) BWT Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion: 0 psf Phi: 26 °
Name: MARSH 1, EL. -1.5 TO -7.5/ -8.5 (S-Case) BWT Model: Spatial Mohr-Coulomb Unit Weight: 102 pcf Cohesion: 0 psf Phi: 24 °
Name: MARSH 2, EL. -7.5/-8.5 TO -16 (S-Case) BWT Model: Spatial Mohr-Coulomb Unit Weight: 80 pcf Cohesion: 0 psf Phi: 24 °

GENERAL NOTES

CLASSIFICATION STRATIFICATION
SHEAR STRENGTHS AND UNIT WEIGHTS OF
THE SOIL WERE BASED ON THE RESULTS OF
UNDISTURBED BORINGS AND CPT DATA. SEE
BOTH BORING AND CPT DATA PLATES.

WHERE INDICATED, SHEAR STRENGTHS BETWEEN
VERTICALS WERE ASSUMED TO VARY LINEARLY
BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

Hw IS CANAL WATER LEVEL

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 18A,
PROTECTED SIDE STABILITY ANALYSIS,
CASE: NWL S-Case P/S (EE)
STA. 50+00 TO 61+00 EAST
ORLEANS PARISH, LOUISIANA

NWL S-Case P/S (EE)

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File Information

Created By: [Liljegren, James](#)
Revision Number: [448](#)
Last Edited By: [Higgins, James](#)
Date: [9/30/2013](#)
Time: [3:57:23 PM](#)
File Name: [Reach 18A.gsz](#)
Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix F NWL\](#)
Last Solved Date: [9/30/2013](#)
Last Solved Time: [4:01:14 PM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Strength Units: [psf](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

NWL S-Case P/S (EE)

Kind: [SLOPE/W](#)
Parent: [Normal Water Level at +0.40ft \(seepage\)](#)
Method: [Spencer](#)
Settings
 PWP Conditions Source: [Parent Analysis](#)
Slip Surface
 Direction of movement: [Left to Right](#)
 Use Passive Mode: [No](#)
 Slip Surface Option: [Entry and Exit](#)
 Critical slip surfaces saved: [1](#)
 Optimize Critical Slip Surface Location: [Yes](#)
 Tension Crack
 Tension Crack Option: [Search for Tension Crack](#)
 Percentage Wet: [0](#)
 Tension Crack Fluid Unit Weight: [62.4 pcf](#)
FOS Distribution
 FOS Calculation Option: [Constant](#)

Advanced

Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 2000
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Materials

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Unit Weight: 115 pcf
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Phi: 26 °
Phi-B: 0 °

MARSH 1, EL. -1.5 TO-7.5/ -8.5 (S-Case) AWT

Model: Spatial Mohr-Coulomb
Unit Weight: 102 pcf
Cohesion: 75 psf
Phi: 24 °
Phi-B: 0 °

BEACH SAND, EL. -23/-25 TO -41

Model: Shear/Normal Fn.
Unit Weight: 122 pcf
Strength Function: Sand
Phi-B: 0 °

BAY SOUND CLAY, EL. -41 TO -70 (S-Case)

Model: Spatial Mohr-Coulomb
Unit Weight: 103 pcf
Cohesion: 0 psf
Phi: 26 °
Phi-B: 0 °

MARSH 2, EL. -7.5/-8.5 TO -16 (S-Case) AWT

Model: Spatial Mohr-Coulomb
Unit Weight: 80 pcf
Cohesion: 75 psf
Phi: 24 °
Phi-B: 0 °

LACUSTRINE, EL -16 to -23 (S-Case)

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [108 pcf](#)

Cohesion: [0 psf](#)

Phi: [26 °](#)

Phi-B: [0 °](#)

EMB FILL, EL. +5.4 TO -1.5 (S-Case) BWT

Model: [Mohr-Coulomb](#)

Unit Weight: [115 pcf](#)

Cohesion: [0 psf](#)

Phi: [26 °](#)

Phi-B: [0 °](#)

MARSH 1, EL. -1.5 TO-7.5/ -8.5 (S-Case) BWT

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [102 pcf](#)

Cohesion: [0 psf](#)

Phi: [24 °](#)

Phi-B: [0 °](#)

MARSH 2, EL. -7.5/-8.5 TO -16 (S-Case) BWT

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [80 pcf](#)

Cohesion: [0 psf](#)

Phi: [24 °](#)

Phi-B: [0 °](#)

Slip Surface Entry and Exit

Left Projection: [Range](#)

Left-Zone Left Coordinate: [\(190, 4.71832\) ft](#)

Left-Zone Right Coordinate: [\(225, 2.39412\) ft](#)

Left-Zone Increment: [7](#)

Right Projection: [Range](#)

Right-Zone Left Coordinate: [\(250, -2.10235\) ft](#)

Right-Zone Right Coordinate: [\(295, -5.98125\) ft](#)

Right-Zone Increment: [9](#)

Radius Increments: [15](#)

Slip Surface Limits

Left Coordinate: [\(110, -8\) ft](#)

Right Coordinate: [\(310, -5.7\) ft](#)

Reinforcements

Reinforcement 1

Type: [Pile](#)
Outside Point: [\(200, 13.5\) ft](#)
Inside Point: [\(200, -9.8\) ft](#)
Slip Surface Intersection: [\(0, 0\) ft](#)
Total Length: [23.3 ft](#)
Reinforcement Direction: [90 °](#)
Applied Load Option: [Variable](#)
F of S Dependent: [No](#)
Pile Spacing: [1 ft](#)
Shear Capacity: [1e-008 lbs](#)
Shear Safety Factor: [1](#)
Shear Load Used: [1e-008 lbs](#)
Shear Option: [Parallel to Slip](#)
Resisting Force Used: [0 lbs/ft](#)

Shear/Normal Strength Functions

Sand

Model: [Spline Data Point Function](#)
Function: [Shear Stress vs. Normal Stress](#)
 Curve Fit to Data: [100 %](#)
 Segment Curvature: [0 %](#)
Y-Intercept: [0](#)
Data Points: [Normal Stress \(psf\), Shear Stress \(psf\)](#)
 Data Point: [\(-10000, 0\)](#)
 Data Point: [\(0, 0\)](#)
 Data Point: [\(10000, 6494\)](#)
Estimation Properties
 Intact Rock Param.: [10](#)
 Geological Strength: [100](#)
 Disturbance Factor: [0](#)
 SigmaC: [600000 psf](#)
 Sigma3: [300000 psf](#)
 Num. Points: [20](#)

Regions

	Points	Area (ft²)	Material
Region 1	6,21,22,23	5.825	
Region 2	59,58,50,55,4,5,6,70,69,60	151.92934	EMB FILL, EL. +5.4 TO -1.5 (S-Case) AWT
Region 3	6,23,49,7,8,40,26,70	188.56	EMB FILL, EL. +5.4 TO -1.5 (S-Case) AWT
Region 4	20,19,53,15,16,54	5800	BAY SOUND CLAY, EL. -41 TO -70 (S-Case)
Region 5	18,45,29,35,14,15,53,19	3526.2	BEACH SAND, EL. -23/-25 TO -41
Region 6	41,10,31,11,12,78,77,39,40,8,9	237.39074	MARSH 1, EL. -1.5 TO -7.5/ -8.5 (S-Case) AWT
			MARSH 2, EL. -7.5/-8.5 TO -16 (S-Case)

Region 7	34,33,78,67,30,13	624.80023	BWT
Region 8	24,65,48,68,71,72,73,74,75,76,77,33	69.325054	MARSH 1, EL. -1.5 TO-7.5/ -8.5 (S-Case) BWT
Region 9	35,34,13,14	519.4	LACUSTRINE, EL -16 to -23 (S-Case)
Region 10	18,17,44,45	364	LACUSTRINE, EL -16 to -23 (S-Case)
Region 11	45,44,28,34,35,29	590.4	LACUSTRINE, EL -16 to -23 (S-Case)
Region 12	28,34,33,24,25,47,44	522	MARSH 2, EL. -7.5/-8.5 TO -16 (S-Case) BWT
Region 13	17,36,47,44	322.4	MARSH 2, EL. -7.5/-8.5 TO -16 (S-Case) BWT
Region 14	43,42,38,32,46,1,57	114.65366	MARSH 2, EL. -7.5/-8.5 TO -16 (S-Case) BWT
Region 15	43,42,38,60,61,62,63,64,69,26,71,68,48,65,24	217.7874	MARSH 1, EL. -1.5 TO-7.5/ -8.5 (S-Case) BWT
Region 16	47,43,24,25	68.4	MARSH 2, EL. -7.5/-8.5 TO -16 (S-Case) BWT
Region 17	36,37,27,57,43,47	116.33214	MARSH 2, EL. -7.5/-8.5 TO -16 (S-Case) BWT
Region 18	58,3,2,38,60,59	4.7531083	EMB FILL, EL. +5.4 TO -1.5 (S-Case) BWT
Region 19	40,39,77,76,75,74,73,72,71,26	163.35801	MARSH 1, EL. -1.5 TO-7.5/ -8.5 (S-Case) AWT
Region 20	60,61,62,63,64,69	29.030286	MARSH 1, EL. -1.5 TO-7.5/ -8.5 (S-Case) AWT
Region 21	69,70,26	5.4717935	EMB FILL, EL. +5.4 TO -1.5 (S-Case) BWT
Region 22	77,33,78	2.1117397	MARSH 1, EL. -1.5 TO-7.5/ -8.5 (S-Case) BWT
Region 23	12,78,67	5.8997668	MARSH 2, EL. -7.5/-8.5 TO -16 (S-Case) AWT

Points

	X (ft)	Y (ft)
Point 1	128.3	-7.3
Point 2	163.7	-1.3
Point 3	169.5	0
Point 4	180	3.2
Point 5	199.1	6.1
Point 6	200	6.1
Point 7	215.4	5.5
Point 8	235.8	-1.1
Point 9	252.8	-2.3
Point 10	267.9	-4.8
Point 11	310	-5.7
Point 12	310	-7.5
Point 13	310	-16
Point 14	310	-23

Point 15	310	-41
Point 16	310	-70
Point 17	110	-16
Point 18	110	-23
Point 19	110	-41
Point 20	110	-70
Point 21	200	13.8
Point 22	200.5	13.8
Point 23	201	5.9
Point 24	200	-8.5
Point 25	200	-9.8
Point 26	200	-1.5
Point 27	110	-8
Point 28	200	-16
Point 29	200	-25
Point 30	310	-10
Point 31	294	-6
Point 32	151.1	-2.8
Point 33	235.8	-7.5
Point 34	235.8	-16
Point 35	235.8	-23
Point 36	110	-9.8
Point 37	110	-8.5
Point 38	162	-1.5
Point 39	235.8	-4.5
Point 40	235.8	-1.5
Point 41	266.12598	-4.5
Point 42	162	-4.5
Point 43	162	-7.5
Point 44	162	-16
Point 45	162	-23
Point 46	142.50631	-4.5
Point 47	162	-9.8
Point 48	200	-6.6
Point 49	206.9	6
Point 50	172.78125	1
Point 51	110	-150
Point 52	310	-150
Point 53	200	-41
Point 54	200	-70
Point 55	179.34375	3
Point 56	110	0
Point 57	123.07143	-7.5
Point 58	170.82144	0.40272
Point 59	169.33937	-0.77371
Point 60	167.45185	-1.51049
Point 61	171.63327	-2.48654
Point 62	176.42613	-3.05241

Point 63	183.96487	-3.07182
Point 64	191.16553	-2.1979
Point 65	200	-6.87711
Point 66	212.26573	-7.4857
Point 67	310	-7.70202
Point 68	200.00664	-4.75711
Point 69	194.2483	-1.50185
Point 70	200	0.40267
Point 71	200.00578	-4.33351
Point 72	200.53669	-4.32722
Point 73	207.91106	-5.13146
Point 74	216.53874	-6.22013
Point 75	227.25795	-6.92436
Point 76	234.17552	-7.17007
Point 77	235.8	-7.23256
Point 78	251.59225	-7.5

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	2.07	(249.633, 52.024)	36.9289	(203.919, 5.94948)	(286.81, -5.66944)
2	439	2.17	(249.633, 52.024)	67.576	(200.5, 6)	(284.956, -5.5842)

Slices of Slip Surface: Optimized

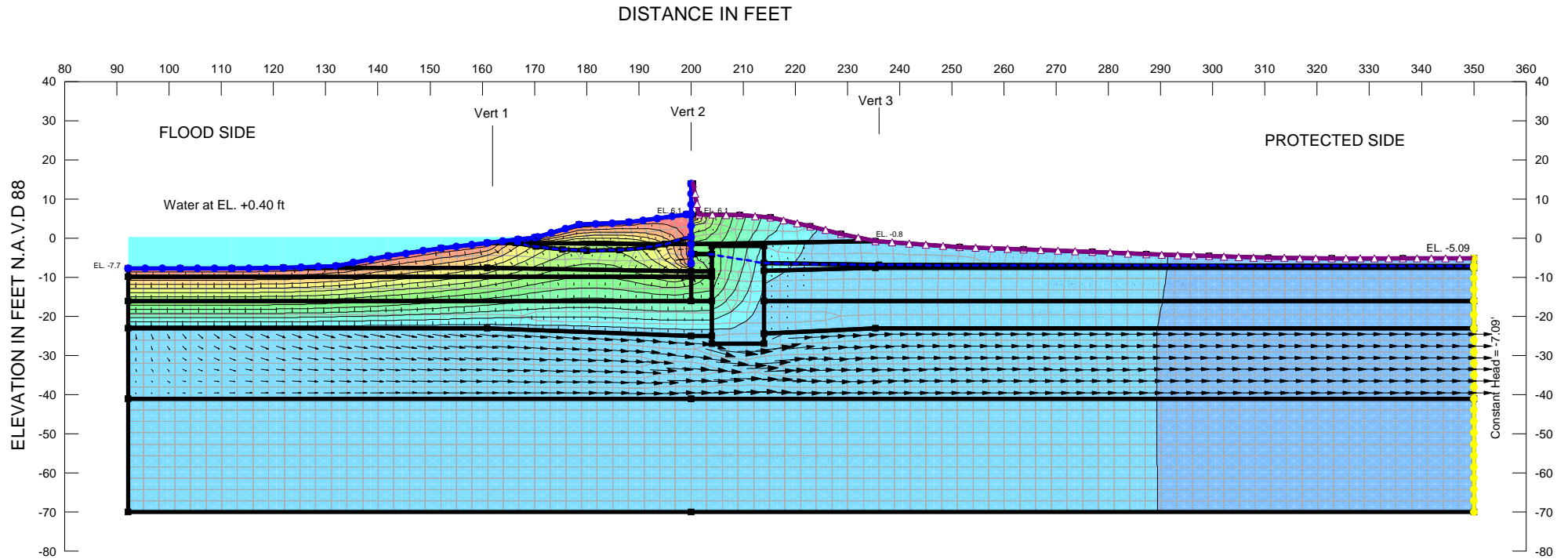
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	205.4096	4.11014	-565.41731	123.46208	60.216481	75
2	Optimized	207.3826	1.675191	-423.16264	321.85772	156.9805	75
3	Optimized	209.02695	-0.21021	-315.60889	486.13043	237.10165	75
4	Optimized	210.5822	-1.93689	-219.86993	629.05623	280.07388	75
5	Optimized	212.68755	-4.150905	-98.622527	802.65809	357.3664	75
6	Optimized	214.8997	-6.38134	21.932586	1025.7918	446.94692	0
7	Optimized	215.96935	-7.3505215	73.719907	1090.8308	452.84693	0
8	Optimized	216.6306	-7.949642	105.92261	1123.7088	453.1476	0
9	Optimized	217.47	-8.7101355	146.79464	1153.3687	448.15567	0
10	Optimized	219.4196	-10.195015	225.83004	1267.9419	463.97811	0
11	Optimized	221.8238	-11.81028	312.50928	1308.4747	443.43235	0
12	Optimized	224.0839	-13.09952	382.1667	1399.7696	453.06601	0
13	Optimized	226.1999	-14.062735	434.4172	1400.5008	430.12814	0
14	Optimized	227.4299	-14.62262	465.2993	1400.9259	416.56779	0
15	Optimized	228.8835	-15.02481	486.71371	1450.3448	429.03622	0
16	Optimized	231.44675	-15.672625	521.77616	1408.6633	394.86758	0
17	Optimized	233.45195	-15.994965	538.77936	1450.6714	406.00051	0
18	Optimized	234.98775	-15.991645	536.91511	1390.7801	380.16518	0
19	Optimized	237.3438	-15.98655	534.42423	1342.1008	359.60079	0
20	Optimized	240.4314	-15.979875	531.54175	1318.7819	350.5019	0
21	Optimized	243.20565	-15.981515	529.81047	1296.4062	341.31039	0
22	Optimized	245.66655	-15.991465	529.03839	1279.0953	333.94684	0

23	Optimized	248.0708	-15.993585	528.0158	1263.6003	327.5033	0
24	Optimized	250.41845	-15.98788	526.69534	1245.7953	320.16392	0
25	Optimized	252.19615	-15.98356	525.7776	1232.2874	314.55842	0
26	Optimized	254.03045	-15.9791	524.85567	1206.2415	303.37253	0
27	Optimized	256.4913	-15.97312	523.7585	1163.2079	284.70123	0
28	Optimized	258.95215	-15.96714	522.70196	1120.1743	266.01183	0
29	Optimized	262.20665	-15.71747	506.41689	1074.4807	252.9183	0
30	Optimized	265.17835	-15.23048	475.46156	1014.2287	239.87457	0
31	Optimized	267.013	-14.76524	446.13888	939.91269	219.84226	0
32	Optimized	268.1224	-14.483915	428.40179	897.83931	209.00705	0
33	Optimized	269.532	-13.999815	397.96595	874.38397	212.11497	0
34	Optimized	271.90645	-13.144405	344.26194	787.69047	197.4271	0
35	Optimized	274.2809	-12.288995	290.52624	700.99698	182.75335	0
36	Optimized	277.47675	-10.97626	208.16144	584.58418	167.5942	0
37	Optimized	281.63165	-8.795615	71.532895	392.84655	143.05806	0
38	Optimized	285.29405	-6.5847175	-66.898867	163.95812	72.998859	75

Slices of Slip Surface: 439

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	439	200.75	5.3680275	-623.03717	26.192445	12.774909	75
2	439	202.475	3.667653	-523.66745	175.57348	85.632907	75
3	439	205.425	0.9524422	-365.5355	433.60886	211.48517	75
4	439	207.64105	-0.9121633	-261.27898	614.50355	299.71341	75
5	439	210.04935	-2.7058475	-167.90977	778.59258	346.65175	75
6	439	213.38385	-4.9720555	-53.406543	976.24782	434.65353	75
7	439	215.22555	-6.1356165	5.0687452	1094.8855	485.21767	0
8	439	215.96935	-6.565955	26.47569	1120.3684	487.03242	0
9	439	217.5474	-7.437383	70.020154	1160.7353	485.61768	0
10	439	220.0064	-8.6893815	133.23811	1198.9664	474.4928	0
11	439	222.907	-10.0218	201.74729	1218.7731	452.80908	0
12	439	225.8076	-11.1931	263.15161	1224.6707	428.09589	0
13	439	228.9873	-12.294805	321.97307	1215.107	397.64883	0
14	439	232.4461	-13.30489	376.93528	1187.5936	360.92833	0
15	439	234.98775	-13.94019	412.02859	1157.2473	331.79274	0
16	439	237.116	-14.368625	435.78126	1156.3586	320.82168	0
17	439	239.74805	-14.81137	460.44759	1184.0618	322.17379	0
18	439	242.3801	-15.148105	479.04689	1203.5099	322.55173	0
19	439	245.01215	-15.380415	491.69534	1214.6831	321.89488	0
20	439	247.6442	-15.509385	498.29427	1217.5758	320.24479	0
21	439	250.27625	-15.53561	498.75369	1212.1219	317.61199	0
22	439	252.19615	-15.500155	495.82995	1203.6041	315.12136	0
23	439	254.1326	-15.38828	488.18345	1175.2717	305.9114	0
24	439	256.7978	-15.15721	473.00499	1120.6913	288.36851	0
25	439	259.463	-14.819115	451.24806	1056.1788	269.33253	0
26	439	262.1282	-14.37236	422.79057	981.27531	248.65343	0
27	439	264.7934	-13.814725	387.46723	895.59519	226.23315	0
28	439	267.013	-13.27177	353.16169	815.88942	206.01966	0

29	439	269.253	-12.62506	312.41513	744.45513	192.3566	0
30	439	271.95895	-11.74073	256.77693	663.4715	181.07209	0
31	439	274.6649	-10.72729	193.11288	569.96789	167.78666	0
32	439	277.3709	-9.5783575	121.00557	462.89432	152.21868	0
33	439	280.07685	-8.2861735	39.984389	340.95599	134.00119	0
34	439	281.5262	-7.551601	-6.0503814	298.00987	132.68254	75
35	439	283.28945	-6.5420995	-69.282491	164.67693	73.318893	75



Name: EMB FILL to EL. -1.5 (S-Case) AWT Model: Saturated Only K-Sat: 3.28e-008 ft/sec K-Ratio: 1
Name: MARSH 1, EL. -1.5 TO -7.5,-8.5 (S-Case) AWT Model: Saturated Only K-Sat: 3.28e-007 ft/sec K-Ratio: 1
Name: BEACH SAND, EL. -23,-25 TO -41 Model: Saturated Only K-Sat: 0.00049 ft/sec K-Ratio: 1
Name: Sheet Pile Model: Saturated Only K-Sat: 1e-010 ft/sec K-Ratio: 1
Name: DSM1 Model: Saturated Only K-Sat: 3.28e-008 ft/sec K-Ratio: 1
Name: MARSH 2, EL. -7.5,-8.5 to -16 (S-Case) Model: Saturated Only K-Sat: 3.28e-007 ft/sec K-Ratio: 1
Name: LACUSTRINE, EL. -16 to -23,-25 (S-Case) Model: Saturated Only K-Sat: 3.28e-007 ft/sec K-Ratio: 1
Name: BAY SOUND CLAY, EL. -41 to -70 (S-Case) Model: Saturated Only K-Sat: 3.28e-008 ft/sec K-Ratio: 1

GENERAL NOTES

With DSM

Cross Section at Sta 62+00

CLASSIFICATION STRATIFICATION
SHEAR STRENGTHS AND UNIT WEIGHTS OF
THE SOIL WERE BASED ON THE RESULTS OF
UNDISTURBED BORINGS AND CPT DATA. SEE
BOTH BORING AND CPT DATA PLATES.

WHERE INDICATED, SHEAR STRENGTHS BETWEEN
VERTICALS WERE ASSUMED TO VARY LINEARLY
BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL
REMEDATION OF CANAL WALLS AND LEVEES
PROTECTED SIDE STABILITY ANALYSIS,
CASE: Name: Normal Water Level at +0.40ft (seepage)
REACH 18B, STA. 60+00 TO 64+00 EAST
ORLEANS PARISH, LOUISIANA

Normal Water Level at +0.40ft (seepage)

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File Information

Created By: [Liljegren, James](#)
Revision Number: [740](#)
Last Edited By: [Vicky Curtis](#)
Date: [9/30/2013](#)
Time: [4:03:48 PM](#)
File Name: [Reach 18B.gsz](#)
Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix F NWL\](#)
Last Solved Date: [9/30/2013](#)
Last Solved Time: [4:04:22 PM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Mass(M) Units: [lbs](#)
Mass Flux Units: [lbs/sec](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

Normal Water Level at +0.40ft (seepage)

Kind: [SEEP/W](#)
Method: [Steady-State](#)
Settings
 Include Air Flow: [No](#)
Control
 Apply Runoff: [No](#)
Convergence
 Convergence Type: [Head Vector Norm](#)
 Maximum Number of Iterations: [500](#)
 Tolerance: [0.001](#)
 Maximum Change in K: [0.1](#)
 Rate of Change in K: [1.02](#)
 Minimum Change in K: [1e-005](#)
 Equation Solver: [Parallel Direct](#)
 Potential Seepage Max # of Reviews: [10](#)
Time

Starting Time: 0 sec

Duration: 0 sec

Ending Time: 0 sec

Materials

EMB FILL to EL. -1.5 (S-Case) AWT

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-008 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

MARSH 1, EL. -1.5 TO -7.5,-8.5 (S-Case) AWT

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-007 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

BEACH SAND, EL. -23,-25 TO -41

Model: Saturated Only

Hydraulic

K-Sat: 0.00049 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

Sheet Pile

Model: Saturated Only

Hydraulic

K-Sat: 1e-010 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

DSM1

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-008 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

MARSH 2, EL. -7.5,-8.5 to -16 (S-Case)

Model: Saturated Only
Hydraulic
K-Sat: 3.28e-007 ft/sec
Volumetric Water Content: 0 ft³/ft³
Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

LACUSTRINE, EL. -16 to -23,-25 (S-Case)

Model: Saturated Only
Hydraulic
K-Sat: 3.28e-007 ft/sec
Volumetric Water Content: 0 ft³/ft³
Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

BAY SOUND CLAY, EL. -41 to -70 (S-Case)

Model: Saturated Only
Hydraulic
K-Sat: 3.28e-008 ft/sec
Volumetric Water Content: 0 ft³/ft³
Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

Boundary Conditions

Drainage

Review: true
Type: Total Flux (Q) 0

Canal Water

Type: Head (H) 0.4

Curb

Type: Head (H) -7.09

Regions

	Material	Points	Area (ft²)
Region	BAY SOUND CLAY, EL. -41 to -70 (S-	1,5,3,4,6,2	7482

1	Case)		
Region 2	EMB FILL to EL. -1.5 (S-Case) AWT	66,65,17,18,19,20,74,73,67	151.40878
Region 3	EMB FILL to EL. -1.5 (S-Case) AWT	20,23,24,25,26,27,28,52,74	176.0595
Region 4	MARSH 1, EL. -1.5 TO -7.5,-8.5 (S-Case) AWT	10,11,12,13,14,67,68,70,69,71,72,73,52,75,53,38,42	336.376
Region 5	MARSH 2, EL. -7.5,-8.5 to -16 (S-Case)	7,8,9,10,42,38,39,46	220.4075
Region 6		20,21,22,23	7.421
Region 7	DSM1	54,59,78,60,61,62,63,58,57,64,56,55,77	250
Region 8	MARSH 1, EL. -1.5 TO -7.5,-8.5 (S-Case) AWT	75,52,28,29,30,31,32,33,34,35,36,37,79,80,78,59,54,77	487.85322
Region 9	MARSH 2, EL. -7.5,-8.5 to -16 (S-Case)	38,55,56,39	5.2
Region 10	MARSH 2, EL. -7.5,-8.5 to -16 (S-Case)	39,56,64,40	24.8
Region 11	MARSH 2, EL. -7.5,-8.5 to -16 (S-Case)	46,39,40,47	668.98
Region 12	LACUSTRINE, EL. -16 to -23,-25 (S-Case)	47,40,64,57,41,43,48	830.3
Region 13	MARSH 2, EL. -7.5,-8.5 to -16 (S-Case)	60,44,49,50,61	1148.33
Region 14	LACUSTRINE, EL. -16 to -23,-25 (S-Case)	61,50,51,45,62	967.61
Region 15	BEACH SAND, EL. -23,-25 TO -41	48,43,41,57,58,63,62,45,51,3,5,1	4542.09
Region 16	EMB FILL to EL. -1.5 (S-Case) AWT	65,16,15,14,67,66	4.8028083
Region 17	MARSH 1, EL. -1.5 TO -7.5,-8.5 (S-Case) AWT	67,68,70,69,71,72,73	34.235059
Region 18	EMB FILL to EL. -1.5 (S-Case) AWT	73,74,52	4.6323581
Region 19	MARSH 1, EL. -1.5 TO -7.5,-8.5 (S-Case) AWT	75,53,38,55,77,76	17.723946
Region 20	MARSH 1, EL. -1.5 TO -7.5,-8.5 (S-Case) AWT	78,60,44,49,79,80	93.289955

Lines

	Start Point	End Point	Hydraulic Boundary	Left Side Material
Line 1	3	5		
Line 2	5	1		
Line 3	3	4	Curb	
Line 4	4	6		
Line 5	6	2		
Line 6	2	1		
Line 7	17	18	Canal Water	
Line 8	18	19	Canal Water	

Line 9	19	20	Canal Water	
Line 10	20	23		
Line 11	23	24	Drainage	
Line 12	24	25	Drainage	
Line 13	25	26	Drainage	
Line 14	26	27	Drainage	
Line 15	27	28	Drainage	
Line 16	28	52		
Line 17	10	11	Canal Water	
Line 18	11	12	Canal Water	
Line 19	12	13	Canal Water	
Line 20	13	14	Canal Water	
Line 21	38	42		
Line 22	42	10		
Line 23	7	8	Canal Water	
Line 24	8	9	Canal Water	
Line 25	9	10	Canal Water	
Line 26	38	39		Sheet Pile
Line 27	39	46		
Line 28	46	7		
Line 29	53	38		Sheet Pile
Line 30	20	21	Canal Water	
Line 31	21	22		
Line 32	22	23	Drainage	
Line 33	54	59		
Line 34	61	62		
Line 35	62	63		
Line 36	63	58		
Line 37	58	57		
Line 38	57	64		
Line 39	64	56		
Line 40	56	55		
Line 41	28	29	Drainage	
Line 42	29	30	Drainage	
Line 43	30	31	Drainage	
Line 44	31	32	Drainage	
Line 45	32	33	Drainage	
Line 46	33	34	Drainage	
Line 47	34	35	Drainage	
Line 48	35	36	Drainage	
Line 49	36	37	Drainage	
Line 50	49	44		
Line 51	44	60		
Line 52	55	38		
Line 53	56	39		
Line 54	64	40		
Line 55	40	39		
Line 56	40	47		

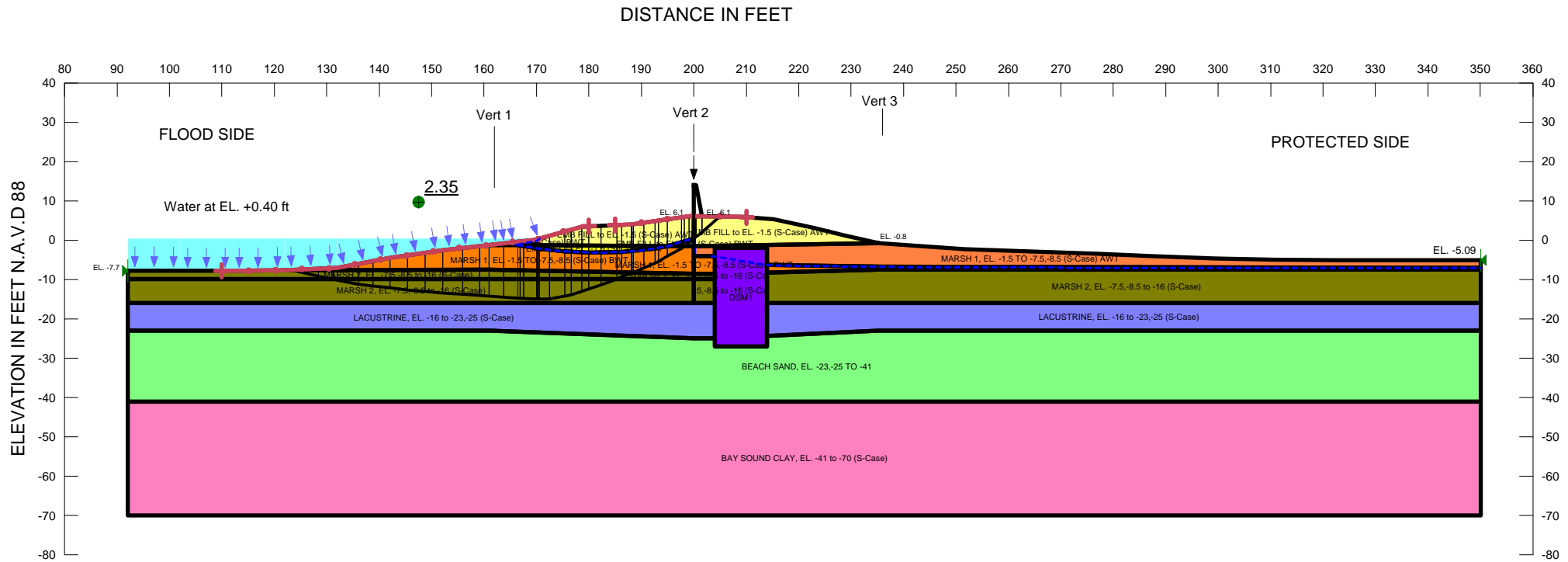
Line 57	47	46		
Line 58	57	41		
Line 59	41	43		
Line 60	43	48		
Line 61	48	47		
Line 62	49	50	Curb	
Line 63	50	61		
Line 64	61	60		
Line 65	50	51	Curb	
Line 66	51	45		
Line 67	45	62		
Line 68	51	3	Curb	
Line 69	1	48		
Line 70	65	17	Canal Water	
Line 71	67	14		
Line 72	52	73		
Line 73	73	67		
Line 74	20	74	Canal Water	Sheet Pile
Line 75	74	52	Canal Water	Sheet Pile
Line 76	52	75	Canal Water	Sheet Pile
Line 77	75	53	Canal Water	Sheet Pile
Line 78	55	77		
Line 79	77	54		
Line 80	59	78		
Line 81	78	60		
Line 82	37	79	Curb	
Line 83	66	65		
Line 84	67	66		
Line 85	65	16	Canal Water	
Line 86	16	15	Canal Water	
Line 87	15	14	Canal Water	
Line 88	67	68		
Line 89	68	70		
Line 90	70	69		
Line 91	72	73		
Line 92	69	71		
Line 93	71	72		
Line 94	74	73		
Line 95	79	80		
Line 96	80	78		
Line 97	77	75		
Line 98	77	76		
Line 99	76	75		
Line 100	49	79		

Points

	X (ft)	Y (ft)

Point 1	92.1	-41
Point 2	92.1	-70
Point 3	350.1	-41
Point 4	350.1	-70
Point 5	200	-41
Point 6	200	-70
Point 7	92.1	-7.71
Point 8	102.1	-7.71
Point 9	112	-7.77
Point 10	121.9	-7.6
Point 11	132	-7.02
Point 12	142	-4.56
Point 13	152.1	-2.51
Point 14	161	-1.2
Point 15	166.9	-0.26
Point 16	170	0.16
Point 17	178.6	3.46
Point 18	188.1	4.06
Point 19	199.1	6.1
Point 20	200	6.1
Point 21	200	13.92
Point 22	200.4	13.92
Point 23	201.5	6.14
Point 24	209.3	5.93
Point 25	215.2	5.35
Point 26	222.9	3.06
Point 27	228.8	1.15
Point 28	235.3	-0.8
Point 29	251.5	-2.27
Point 30	263.7	-2.83
Point 31	276.9	-3.51
Point 32	287.2	-4.03
Point 33	299.3	-4.58
Point 34	310.6	-5.02
Point 35	322.8	-5.12
Point 36	336.4	-5.07
Point 37	350.1	-5.09
Point 38	200	-8.5
Point 39	200	-9.8
Point 40	200	-16
Point 41	200	-25
Point 42	161	-7.5
Point 43	161	-23
Point 44	235.3	-7.5
Point 45	235.3	-23
Point 46	92.1	-9.8
Point 47	92.1	-16
Point 48	92.1	-23

Point 49	350.1	-7.5
Point 50	350.1	-16
Point 51	350.1	-23
Point 52	200	-1.5
Point 53	200	-6.5
Point 54	204	-2
Point 55	204	-8.5
Point 56	204	-9.8
Point 57	204	-25
Point 58	204	-27
Point 59	214	-2
Point 60	214	-8.3
Point 61	214	-16
Point 62	214	-24.4
Point 63	214	-27
Point 64	204	-16
Point 65	170.58769	0.38551
Point 66	170.14981	-0.13257
Point 67	166.38493	-1.24142
Point 68	170.29384	-2.1116
Point 69	180.0214	-3.12533
Point 70	175.35047	-2.82269
Point 71	186.26921	-3.01383
Point 72	192.56481	-2.18557
Point 73	195.00549	-1.46158
Point 74	200	0.35498
Point 75	200	-3.9786
Point 76	200.64174	-4.04261
Point 77	204	-4.11774
Point 78	214	-6.34663
Point 79	350.1	-7.06524
Point 80	236.02665	-6.80536



Name: EMB FILL to EL. -1.5 (S-Case) AWT Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion: 75 psf Phi: 26 °
Name: MARSH 1, EL. -1.5 TO -7.5, -8.5 (S-Case) AWT Model: Spatial Mohr-Coulomb Unit Weight: 102 pcf Cohesion: 75 psf Phi: 24 °
Name: BEACH SAND, EL. -23, -25 TO -41 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand
Name: DSM1 Model: Mohr-Coulomb Unit Weight: 99.2 pcf Cohesion: 0 psf Phi: 23 °
Name: MARSH 2, EL. -7.5, -8.5 to -16 (S-Case) Model: Spatial Mohr-Coulomb Unit Weight: 80 pcf Cohesion: 0 psf Phi: 24 °
Name: LACUSTRINE, EL. -16 to -23, -25 (S-Case) Model: Spatial Mohr-Coulomb Unit Weight: 108 pcf Cohesion: 0 psf Phi: 26 °
Name: BAY SOUND CLAY, EL. -41 to -70 (S-Case) Model: Spatial Mohr-Coulomb Unit Weight: 103 pcf Cohesion: 0 psf Phi: 26 °
Name: EMB FILL to EL. -1.5 (S-Case) BWT Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion: 0 psf Phi: 26 °
Name: MARSH 1, EL. -1.5 TO -7.5, -8.5 (S-Case) BWT Model: Spatial Mohr-Coulomb Unit Weight: 102 pcf Cohesion: 0 psf Phi: 24 °

GENERAL NOTES

With DSM

Cross Section at Sta 62+00

CLASSIFICATION STRATIFICATION
SHEAR STRENGTHS AND UNIT WEIGHTS OF
THE SOIL WERE BASED ON THE RESULTS OF
UNDISTURBED BORINGS AND CPT DATA. SEE
BOTH BORING AND CPT DATA PLATES.

WHERE INDICATED, SHEAR STRENGTHS BETWEEN
VERTICALS WERE ASSUMED TO VARY LINEARLY
BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL
REMEDICATION OF CANAL WALLS AND LEVEES
PROTECTED SIDE STABILITY ANALYSIS,
CASE: Name: NWL S-Case F/S (EE)
REACH 18B, STA. 60+00 TO 64+00 EAST
ORLEANS PARISH, LOUISIANA

NWL S-Case F/S (EE)

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File Information

Created By: [Liljegren, James](#)
Revision Number: [740](#)
Last Edited By: [Vicky Curtis](#)
Date: [9/30/2013](#)
Time: [4:03:48 PM](#)
File Name: [Reach 18B.gsz](#)
Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix F NWL\](#)
Last Solved Date: [9/30/2013](#)
Last Solved Time: [4:09:08 PM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Strength Units: [psf](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

NWL S-Case F/S (EE)

Kind: [SLOPE/W](#)
Parent: [Normal Water Level at +0.40ft \(seepage\)](#)
Method: [Spencer](#)
Settings
 PWP Conditions Source: [Parent Analysis](#)
Slip Surface
 Direction of movement: [Right to Left](#)
 Use Passive Mode: [No](#)
 Slip Surface Option: [Entry and Exit](#)
 Critical slip surfaces saved: [1](#)
 Optimize Critical Slip Surface Location: [Yes](#)
Tension Crack
 Tension Crack Option: [Search for Tension Crack](#)
 Percentage Wet: [0](#)
 Tension Crack Fluid Unit Weight: [62.4 pcf](#)
FOS Distribution
 FOS Calculation Option: [Constant](#)

Advanced

Number of Slices: 30

Optimization Tolerance: 0.01

Minimum Slip Surface Depth: 0.1 ft

Optimization Maximum Iterations: 2000

Optimization Convergence Tolerance: 1e-007

Starting Optimization Points: 8

Ending Optimization Points: 16

Complete Passes per Insertion: 1

Driving Side Maximum Convex Angle: 5 °

Resisting Side Maximum Convex Angle: 1 °

Materials

EMB FILL to EL. -1.5 (S-Case) AWT

Model: Mohr-Coulomb

Unit Weight: 115 pcf

Cohesion: 75 psf

Phi: 26 °

Phi-B: 0 °

MARSH 1, EL. -1.5 TO -7.5,-8.5 (S-Case) AWT

Model: Spatial Mohr-Coulomb

Unit Weight: 102 pcf

Cohesion: 75 psf

Phi: 24 °

Phi-B: 0 °

BEACH SAND, EL. -23,-25 TO -41

Model: Shear/Normal Fn.

Unit Weight: 122 pcf

Strength Function: Sand

Phi-B: 0 °

DSM1

Model: Mohr-Coulomb

Unit Weight: 99.2 pcf

Cohesion: 0 psf

Phi: 23 °

Phi-B: 0 °

MARSH 2, EL. -7.5,-8.5 to -16 (S-Case)

Model: Spatial Mohr-Coulomb

Unit Weight: 80 pcf

Cohesion: 0 psf

Phi: 24 °

Phi-B: 0 °

LACUSTRINE, EL. -16 to -23,-25 (S-Case)

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [108 pcf](#)

Cohesion: [0 psf](#)

Phi: [26 °](#)

Phi-B: [0 °](#)

BAY SOUND CLAY, EL. -41 to -70 (S-Case)

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [103 pcf](#)

Cohesion: [0 psf](#)

Phi: [26 °](#)

Phi-B: [0 °](#)

EMB FILL to EL. -1.5 (S-Case) BWT

Model: [Mohr-Coulomb](#)

Unit Weight: [115 pcf](#)

Cohesion: [0 psf](#)

Phi: [26 °](#)

Phi-B: [0 °](#)

MARSH 1, EL. -1.5 TO -7.5,-8.5 (S-Case) BWT

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [102 pcf](#)

Cohesion: [0 psf](#)

Phi: [24 °](#)

Phi-B: [0 °](#)

Slip Surface Entry and Exit

Left Projection: [Range](#)

Left-Zone Left Coordinate: [\(110, -7.75788\) ft](#)

Left-Zone Right Coordinate: [\(180, 3.54842\) ft](#)

Left-Zone Increment: [14](#)

Right Projection: [Range](#)

Right-Zone Left Coordinate: [\(185, 3.86421\) ft](#)

Right-Zone Right Coordinate: [\(210, 5.86119\) ft](#)

Right-Zone Increment: [5](#)

Radius Increments: [25](#)

Slip Surface Limits

Left Coordinate: [\(92.1, -7.71\) ft](#)

Right Coordinate: [\(350.1, -5.09\) ft](#)

Reinforcements

Reinforcement 1

Type: [Pile](#)
Outside Point: [\(200, 13.92\)](#) ft
Inside Point: [\(200, -9.8\)](#) ft
Slip Surface Intersection: [\(200, 0.38004\)](#) ft
Total Length: [23.72](#) ft
Reinforcement Direction: [90 °](#)
Applied Load Option: [Variable](#)
F of S Dependent: [No](#)
Pile Spacing: [1](#) ft
Shear Capacity: [1e-011](#) lbs
Shear Safety Factor: [1](#)
Shear Load Used: [1e-011](#) lbs
Shear Option: [Parallel to Slip](#)
Resisting Force Used: [0](#) lbs/ft

Shear/Normal Strength Functions

Sand

Model: [Spline Data Point Function](#)
Function: [Shear Stress vs. Normal Stress](#)
 Curve Fit to Data: [100 %](#)
 Segment Curvature: [0 %](#)
Y-Intercept: [0](#)
Data Points: [Normal Stress \(psf\), Shear Stress \(psf\)](#)
 Data Point: [\(-10000, 0\)](#)
 Data Point: [\(0, 0\)](#)
 Data Point: [\(10000, 6494\)](#)
Estimation Properties
 Intact Rock Param.: [10](#)
 Geological Strength: [100](#)
 Disturbance Factor: [0](#)
 SigmaC: [600000](#) psf
 Sigma3: [300000](#) psf
 Num. Points: [20](#)

Regions

	Material	Points	Area (ft²)
Region 1	BAY SOUND CLAY, EL. -41 to -70 (S-Case)	1,5,3,4,6,2	7482
Region 2	EMB FILL to EL. -1.5 (S-Case) AWT	66,65,17,18,19,20,74,73,67	151.40878
Region 3	EMB FILL to EL. -1.5 (S-Case) AWT	20,23,24,25,26,27,28,52,74	176.0595
Region 4	MARSH 1, EL. -1.5 TO -7.5,-8.5 (S-Case) BWT	10,11,12,13,14,67,68,70,69,71,72,73,52,75,53,38,42	336.376

Region 5	MARSH 2, EL. -7.5,-8.5 to -16 (S-Case)	7,8,9,10,42,38,39,46	220.4075
Region 6		20,21,22,23	7.421
Region 7	DSM1	54,59,78,60,61,62,63,58,57,64,56,55,77	250
Region 8	MARSH 1, EL. -1.5 TO -7.5,-8.5 (S-Case) AWT	75,52,28,29,30,31,32,33,34,35,36,37,79,80,78,59,54,77	487.85322
Region 9	MARSH 2, EL. -7.5,-8.5 to -16 (S-Case)	38,55,56,39	5.2
Region 10	MARSH 2, EL. -7.5,-8.5 to -16 (S-Case)	39,56,64,40	24.8
Region 11	MARSH 2, EL. -7.5,-8.5 to -16 (S-Case)	46,39,40,47	668.98
Region 12	LACUSTRINE, EL. -16 to -23,-25 (S-Case)	47,40,64,57,41,43,48	830.3
Region 13	MARSH 2, EL. -7.5,-8.5 to -16 (S-Case)	60,44,49,50,61	1148.33
Region 14	LACUSTRINE, EL. -16 to -23,-25 (S-Case)	61,50,51,45,62	967.61
Region 15	BEACH SAND, EL. -23,-25 TO -41	48,43,41,57,58,63,62,45,51,3,5,1	4542.09
Region 16	EMB FILL to EL. -1.5 (S-Case) BWT	65,16,15,14,67,66	4.8028083
Region 17	EMB FILL to EL. -1.5 (S-Case) BWT	67,68,70,69,71,72,73	34.235059
Region 18	EMB FILL to EL. -1.5 (S-Case) BWT	73,74,52	4.6323581
Region 19	MARSH 1, EL. -1.5 TO -7.5,-8.5 (S-Case) BWT	75,53,38,55,77,76	17.723946
Region 20	MARSH 1, EL. -1.5 TO -7.5,-8.5 (S-Case) BWT	78,60,44,49,79,80	93.289955

Points

	X (ft)	Y (ft)
Point 1	92.1	-41
Point 2	92.1	-70
Point 3	350.1	-41
Point 4	350.1	-70
Point 5	200	-41
Point 6	200	-70
Point 7	92.1	-7.71
Point 8	102.1	-7.71
Point 9	112	-7.77
Point 10	121.9	-7.6
Point 11	132	-7.02
Point 12	142	-4.56
Point 13	152.1	-2.51
Point 14	161	-1.2

Point 15	166.9	-0.26
Point 16	170	0.16
Point 17	178.6	3.46
Point 18	188.1	4.06
Point 19	199.1	6.1
Point 20	200	6.1
Point 21	200	13.92
Point 22	200.4	13.92
Point 23	201.5	6.14
Point 24	209.3	5.93
Point 25	215.2	5.35
Point 26	222.9	3.06
Point 27	228.8	1.15
Point 28	235.3	-0.8
Point 29	251.5	-2.27
Point 30	263.7	-2.83
Point 31	276.9	-3.51
Point 32	287.2	-4.03
Point 33	299.3	-4.58
Point 34	310.6	-5.02
Point 35	322.8	-5.12
Point 36	336.4	-5.07
Point 37	350.1	-5.09
Point 38	200	-8.5
Point 39	200	-9.8
Point 40	200	-16
Point 41	200	-25
Point 42	161	-7.5
Point 43	161	-23
Point 44	235.3	-7.5
Point 45	235.3	-23
Point 46	92.1	-9.8
Point 47	92.1	-16
Point 48	92.1	-23
Point 49	350.1	-7.5
Point 50	350.1	-16
Point 51	350.1	-23
Point 52	200	-1.5
Point 53	200	-6.5
Point 54	204	-2
Point 55	204	-8.5
Point 56	204	-9.8
Point 57	204	-25
Point 58	204	-27
Point 59	214	-2
Point 60	214	-8.3
Point 61	214	-16
Point 62	214	-24.4

Point 63	214	-27
Point 64	204	-16
Point 65	170.58769	0.38551
Point 66	170.14981	-0.13257
Point 67	166.38493	-1.24142
Point 68	170.29384	-2.1116
Point 69	180.0214	-3.12533
Point 70	175.35047	-2.82269
Point 71	186.26921	-3.01383
Point 72	192.56481	-2.18557
Point 73	195.00549	-1.46158
Point 74	200	0.35498
Point 75	200	-3.9786
Point 76	200.64174	-4.04261
Point 77	204	-4.11774
Point 78	214	-6.34663
Point 79	350.1	-7.06524
Point 80	236.02665	-6.80536

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	2.35	(160.104, 42.326)	37.30448	(204.991, 6.046)	(123.102, -7.53098)
2	740	2.42	(160.104, 42.326)	57.694	(204.965, 6.04672)	(130.366, -7.11383)

Slices of Slip Surface: **Optimized**

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	123.21465	-7.563666	495.79127	516.5273	9.2322759	0
2	Optimized	124.59485	-7.9636245	506.67214	555.36147	21.677886	0
3	Optimized	127.12975	-8.698175	526.79201	625.19372	43.81126	0
4	Optimized	129.66465	-9.432725	546.19196	695.06385	66.282034	0
5	Optimized	131.11465	-9.8529	556.5973	735.11461	79.481028	0
6	Optimized	131.6486	-10.000215	559.78684	746.79014	83.259233	0
7	Optimized	133.9788	-10.62634	573.66994	831.18574	114.65342	0
8	Optimized	137.3797	-11.428935	589.74687	922.97543	148.36292	0
9	Optimized	140.4009	-11.934625	597.9575	988.64534	173.94543	0
10	Optimized	143.68005	-12.416125	605.8643	1057.583	201.11813	0
11	Optimized	147.0451	-12.84054	612.51766	1112.3056	222.51994	0
12	Optimized	150.41505	-13.195975	617.20981	1169.3787	245.84144	0
13	Optimized	154.00265	-13.574365	622.52099	1224.9185	268.20465	0
14	Optimized	157.5201	-13.94071	627.55037	1275.6146	288.53677	0
15	Optimized	160.06745	-14.184735	630.242	1306.2188	300.96424	0
16	Optimized	162.34625	-14.376205	631.65421	1340.2528	315.4884	0
17	Optimized	165.0387	-14.602435	633.7638	1384.0359	334.04267	0
18	Optimized	166.64245	-14.73719	635.34442	1410.8748	345.28835	0
19	Optimized	167.2273	-14.78633	636.02225	1421.5741	349.75023	0
20	Optimized	168.7773	-14.8437	634.80383	1425.774	352.1626	0

21	Optimized	170.0749	-14.8754	633.09993	1443.6651	360.88686	0
22	Optimized	170.2218	-14.87899	632.97079	1447.3913	362.60335	0
23	Optimized	170.44075	-14.88434	632.78715	1452.7908	365.08917	0
24	Optimized	171.51555	-14.9106	631.87417	1501.5429	387.20147	0
25	Optimized	173.89695	-14.59271	611.98961	1507.2501	398.59564	0
26	Optimized	175.95795	-14.10982	584.90775	1560.5767	434.39582	0
27	Optimized	177.5827	-13.503215	553.24657	1515.537	428.4393	0
28	Optimized	179.3107	-12.714585	512.1173	1503.4225	441.35753	0
29	Optimized	181.16605	-11.867835	468.56695	1453.1497	438.36447	0
30	Optimized	183.83445	-10.57272	404.12264	1360.1277	425.64089	0
31	Optimized	185.8137	-9.569018	356.27817	1298.7789	419.62834	0
32	Optimized	187.1846	-8.873835	324.31366	1255.2034	414.45883	0
33	Optimized	188.114	-8.402527	303.18766	1225.4654	410.6245	0
34	Optimized	188.2918	-8.299705	298.86506	1201.6278	401.93588	0
35	Optimized	189.4829	-7.6036335	269.13978	1159.6274	396.47061	0
36	Optimized	191.5375	-6.402921	221.69742	1084.1566	383.99157	0
37	Optimized	192.8938	-5.6102975	196.39877	1034.2295	373.02628	0
38	Optimized	194.11415	-4.751548	166.2994	940.68758	344.77983	0
39	Optimized	196.30695	-3.111913	119.28691	832.08544	317.35835	0
40	Optimized	197.91815	-1.812564	82.563703	699.56165	274.70518	0
41	Optimized	198.66395	-1.0271069	56.453364	633.20551	281.30082	0
42	Optimized	199.55	-0.09390485	21.69632	552.3117	258.79841	0
43	Optimized	200.2	0.5906765	-181.14115	465.10051	226.84467	75
44	Optimized	200.95	1.380578	-306.90688	396.86946	193.56617	75
45	Optimized	201.54955	2.0120095	-339.9258	342.0873	166.84713	75
46	Optimized	203.29525	4.05509	-454.61992	149.68372	73.005628	75

Slices of Slip Surface: 740

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	740	130.7574	-7.34509	475.95465	531.25319	24.6205	0
2	740	131.5744	-7.8184875	488.34588	582.0449	41.71749	0
3	740	133.68745	-8.9303145	516.44414	708.82011	85.6513	0
4	740	136.47905	-10.29574	552.22897	854.36861	134.52123	0
5	740	138.6874	-11.23302	577.86966	953.71198	167.33578	0
6	740	140.8958	-12.06451	601.22645	1041.696	196.10969	0
7	740	143.2625	-12.839895	623.35941	1120.5091	221.3453	0
8	740	145.7875	-13.54882	643.68116	1192.2565	244.24147	0
9	740	148.3125	-14.13598	660.2111	1252.4239	263.67015	0
10	740	150.8375	-14.605145	672.73049	1301.7198	280.04409	0
11	740	153.2125	-14.94452	680.75172	1335.4442	291.48789	0
12	740	155.4375	-15.1687	684.57989	1357.1991	299.46937	0
13	740	157.6625	-15.306135	684.82386	1371.5786	305.7629	0
14	740	159.8875	-15.35745	681.34342	1378.7317	310.49725	0
15	740	162.34625	-15.30926	672.85186	1382.5565	315.98089	0
16	740	165.0387	-15.141295	658.23654	1381.046	321.8155	0
17	740	166.64245	-14.996325	647.2874	1377.1736	324.96626	0
18	740	168.45	-14.74027	630.77406	1367.5496	328.03359	0

19	740	170.0749	-14.500445	615.22632	1359.1193	331.20247	0
20	740	170.2218	-14.474475	613.6622	1359.6305	332.12649	0
21	740	170.44075	-14.434895	611.28415	1360.206	333.44149	0
22	740	171.7784	-14.162065	595.1769	1388.1567	353.05734	0
23	740	174.1598	-13.61683	563.65493	1439.56	389.97807	0
24	740	176.97525	-12.820605	519.74636	1484.4935	429.53312	0
25	740	179.3107	-12.07261	479.22473	1487.8668	449.07638	0
26	740	181.22445	-11.348285	441.85173	1435.0029	442.1794	0
27	740	183.6306	-10.337445	391.79392	1360.3692	431.2375	0
28	740	185.55145	-9.4472055	349.13693	1294.8456	421.05661	0
29	740	187.1208	-8.643006	312.15406	1234.6825	410.73614	0
30	740	188.0362	-8.1563095	290.02317	1197.1867	403.89521	0
31	740	189.2162	-7.4684365	260.48565	1145.3866	393.98331	0
32	740	191.4486	-6.0932765	205.03553	1043.0016	373.08652	0
33	740	193.78515	-4.492797	146.91585	920.46914	344.40811	0
34	740	196.3267	-2.5484015	87.590583	774.13644	305.66991	0
35	740	198.37395	-0.83820445	39.393811	635.58187	290.78034	0
36	740	199.29765	-0.01155245	11.573964	562.74056	268.82191	0
37	740	199.74765	0.4100895	-4.851145	498.97574	243.36673	75
38	740	200.2	0.84209	-194.30087	457.26945	223.02521	75
39	740	200.95	1.586839	-316.581	387.2248	188.86215	75
40	740	203.2324	4.092498	-455.51257	150.93257	73.614735	75

NWL S-Case P/S (EE)

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File Information

Created By: [Liljegren, James](#)
Revision Number: [740](#)
Last Edited By: [Vicky Curtis](#)
Date: [9/30/2013](#)
Time: [4:03:48 PM](#)
File Name: [Reach 18B.gsz](#)
Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix F NWL\](#)
Last Solved Date: [9/30/2013](#)
Last Solved Time: [4:13:56 PM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Strength Units: [psf](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

NWL S-Case P/S (EE)

Kind: [SLOPE/W](#)
Parent: [Normal Water Level at +0.40ft \(seepage\)](#)
Method: [Spencer](#)
Settings
 PWP Conditions Source: [Parent Analysis](#)
Slip Surface
 Direction of movement: [Left to Right](#)
 Use Passive Mode: [No](#)
 Slip Surface Option: [Entry and Exit](#)
 Critical slip surfaces saved: [1](#)
 Optimize Critical Slip Surface Location: [Yes](#)
 Tension Crack
 Tension Crack Option: [Search for Tension Crack](#)
 Percentage Wet: [0](#)
 Tension Crack Fluid Unit Weight: [62.4 pcf](#)
FOS Distribution
 FOS Calculation Option: [Constant](#)

Advanced

Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 2000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

EMB FILL to EL. -1.5 (S-Case) AWT

Model: Mohr-Coulomb
Unit Weight: 115 pcf
Cohesion: 75 psf
Phi: 26 °
Phi-B: 0 °

MARSH 1, EL. -1.5 TO -7.5,-8.5 (S-Case) AWT

Model: Spatial Mohr-Coulomb
Unit Weight: 102 pcf
Cohesion: 75 psf
Phi: 24 °
Phi-B: 0 °

BEACH SAND, EL. -23,-25 TO -41

Model: Shear/Normal Fn.
Unit Weight: 122 pcf
Strength Function: Sand
Phi-B: 0 °

DSM1

Model: Mohr-Coulomb
Unit Weight: 99.2 pcf
Cohesion: 0 psf
Phi: 23 °
Phi-B: 0 °

MARSH 2, EL. -7.5,-8.5 to -16 (S-Case)

Model: Spatial Mohr-Coulomb
Unit Weight: 80 pcf
Cohesion: 0 psf
Phi: 24 °
Phi-B: 0 °

LACUSTRINE, EL. -16 to -23,-25 (S-Case)

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [108 pcf](#)

Cohesion: [0 psf](#)

Phi: [26 °](#)

Phi-B: [0 °](#)

BAY SOUND CLAY, EL. -41 to -70 (S-Case)

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [103 pcf](#)

Cohesion: [0 psf](#)

Phi: [26 °](#)

Phi-B: [0 °](#)

EMB FILL to EL. -1.5 (S-Case) BWT

Model: [Mohr-Coulomb](#)

Unit Weight: [115 pcf](#)

Cohesion: [0 psf](#)

Phi: [26 °](#)

Phi-B: [0 °](#)

MARSH 1, EL. -1.5 TO -7.5,-8.5 (S-Case) BWT

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [102 pcf](#)

Cohesion: [0 psf](#)

Phi: [24 °](#)

Phi-B: [0 °](#)

Slip Surface Entry and Exit

Left Projection: [Range](#)

Left-Zone Left Coordinate: [\(190, 4.41236\) ft](#)

Left-Zone Right Coordinate: [\(235, -0.71\) ft](#)

Left-Zone Increment: [9](#)

Right Projection: [Range](#)

Right-Zone Left Coordinate: [\(240, -1.22648\) ft](#)

Right-Zone Right Coordinate: [\(300, -4.60726\) ft](#)

Right-Zone Increment: [12](#)

Radius Increments: [25](#)

Slip Surface Limits

Left Coordinate: [\(92.1, -7.71\) ft](#)

Right Coordinate: [\(350.1, -5.09\) ft](#)

Reinforcements

Reinforcement 1

Type: [Pile](#)
Outside Point: [\(200, 13.92\) ft](#)
Inside Point: [\(200, -9.8\) ft](#)
Slip Surface Intersection: [\(0, 0\) ft](#)
Total Length: [23.72 ft](#)
Reinforcement Direction: [90 °](#)
Applied Load Option: [Variable](#)
F of S Dependent: [No](#)
Pile Spacing: [1 ft](#)
Shear Capacity: [1e-011 lbs](#)
Shear Safety Factor: [1](#)
Shear Load Used: [1e-011 lbs](#)
Shear Option: [Parallel to Slip](#)
Resisting Force Used: [0 lbs/ft](#)

Shear/Normal Strength Functions

Sand

Model: [Spline Data Point Function](#)
Function: [Shear Stress vs. Normal Stress](#)
 Curve Fit to Data: [100 %](#)
 Segment Curvature: [0 %](#)
Y-Intercept: [0](#)
Data Points: [Normal Stress \(psf\), Shear Stress \(psf\)](#)
 Data Point: [\(-10000, 0\)](#)
 Data Point: [\(0, 0\)](#)
 Data Point: [\(10000, 6494\)](#)
Estimation Properties
 Intact Rock Param.: [10](#)
 Geological Strength: [100](#)
 Disturbance Factor: [0](#)
 SigmaC: [600000 psf](#)
 Sigma3: [300000 psf](#)
 Num. Points: [20](#)

Regions

	Material	Points	Area (ft²)
Region 1	BAY SOUND CLAY, EL. -41 to -70 (S-Case)	1,5,3,4,6,2	7482
Region 2	EMB FILL to EL. -1.5 (S-Case) AWT	66,65,17,18,19,20,74,73,67	151.40878
Region 3	EMB FILL to EL. -1.5 (S-Case) AWT	20,23,24,25,26,27,28,52,74	176.0595
Region 4	MARSH 1, EL. -1.5 TO -7.5,-8.5 (S-Case) BWT	10,11,12,13,14,67,68,70,69,71,72,73,52,75,53,38,42	336.376

Region 5	MARSH 2, EL. -7.5,-8.5 to -16 (S-Case)	7,8,9,10,42,38,39,46	220.4075
Region 6		20,21,22,23	7.421
Region 7	DSM1	54,59,78,60,61,62,63,58,57,64,56,55,77	250
Region 8	MARSH 1, EL. -1.5 TO -7.5,-8.5 (S-Case) AWT	75,52,28,29,30,31,32,33,34,35,36,37,79,80,78,59,54,77	487.85322
Region 9	MARSH 2, EL. -7.5,-8.5 to -16 (S-Case)	38,55,56,39	5.2
Region 10	MARSH 2, EL. -7.5,-8.5 to -16 (S-Case)	39,56,64,40	24.8
Region 11	MARSH 2, EL. -7.5,-8.5 to -16 (S-Case)	46,39,40,47	668.98
Region 12	LACUSTRINE, EL. -16 to -23,-25 (S-Case)	47,40,64,57,41,43,48	830.3
Region 13	MARSH 2, EL. -7.5,-8.5 to -16 (S-Case)	60,44,49,50,61	1148.33
Region 14	LACUSTRINE, EL. -16 to -23,-25 (S-Case)	61,50,51,45,62	967.61
Region 15	BEACH SAND, EL. -23,-25 TO -41	48,43,41,57,58,63,62,45,51,3,5,1	4542.09
Region 16	EMB FILL to EL. -1.5 (S-Case) BWT	65,16,15,14,67,66	4.8028083
Region 17	EMB FILL to EL. -1.5 (S-Case) BWT	67,68,70,69,71,72,73	34.235059
Region 18	EMB FILL to EL. -1.5 (S-Case) BWT	73,74,52	4.6323581
Region 19	MARSH 1, EL. -1.5 TO -7.5,-8.5 (S-Case) BWT	75,53,38,55,77,76	17.723946
Region 20	MARSH 1, EL. -1.5 TO -7.5,-8.5 (S-Case) BWT	78,60,44,49,79,80	93.289955

Points

	X (ft)	Y (ft)
Point 1	92.1	-41
Point 2	92.1	-70
Point 3	350.1	-41
Point 4	350.1	-70
Point 5	200	-41
Point 6	200	-70
Point 7	92.1	-7.71
Point 8	102.1	-7.71
Point 9	112	-7.77
Point 10	121.9	-7.6
Point 11	132	-7.02
Point 12	142	-4.56
Point 13	152.1	-2.51
Point 14	161	-1.2

Point 15	166.9	-0.26
Point 16	170	0.16
Point 17	178.6	3.46
Point 18	188.1	4.06
Point 19	199.1	6.1
Point 20	200	6.1
Point 21	200	13.92
Point 22	200.4	13.92
Point 23	201.5	6.14
Point 24	209.3	5.93
Point 25	215.2	5.35
Point 26	222.9	3.06
Point 27	228.8	1.15
Point 28	235.3	-0.8
Point 29	251.5	-2.27
Point 30	263.7	-2.83
Point 31	276.9	-3.51
Point 32	287.2	-4.03
Point 33	299.3	-4.58
Point 34	310.6	-5.02
Point 35	322.8	-5.12
Point 36	336.4	-5.07
Point 37	350.1	-5.09
Point 38	200	-8.5
Point 39	200	-9.8
Point 40	200	-16
Point 41	200	-25
Point 42	161	-7.5
Point 43	161	-23
Point 44	235.3	-7.5
Point 45	235.3	-23
Point 46	92.1	-9.8
Point 47	92.1	-16
Point 48	92.1	-23
Point 49	350.1	-7.5
Point 50	350.1	-16
Point 51	350.1	-23
Point 52	200	-1.5
Point 53	200	-6.5
Point 54	204	-2
Point 55	204	-8.5
Point 56	204	-9.8
Point 57	204	-25
Point 58	204	-27
Point 59	214	-2
Point 60	214	-8.3
Point 61	214	-16
Point 62	214	-24.4

Point 63	214	-27
Point 64	204	-16
Point 65	170.58769	0.38551
Point 66	170.14981	-0.13257
Point 67	166.38493	-1.24142
Point 68	170.29384	-2.1116
Point 69	180.0214	-3.12533
Point 70	175.35047	-2.82269
Point 71	186.26921	-3.01383
Point 72	192.56481	-2.18557
Point 73	195.00549	-1.46158
Point 74	200	0.35498
Point 75	200	-3.9786
Point 76	200.64174	-4.04261
Point 77	204	-4.11774
Point 78	214	-6.34663
Point 79	350.1	-7.06524
Point 80	236.02665	-6.80536

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	2.39	(238.679, 28.985)	32.64936	(200.4, 6.11067)	(272.513, -3.28399)
2	847	2.45	(238.679, 28.985)	44.865	(200.4, 6.11067)	(269.983, -3.15369)

Slices of Slip Surface: Optimized

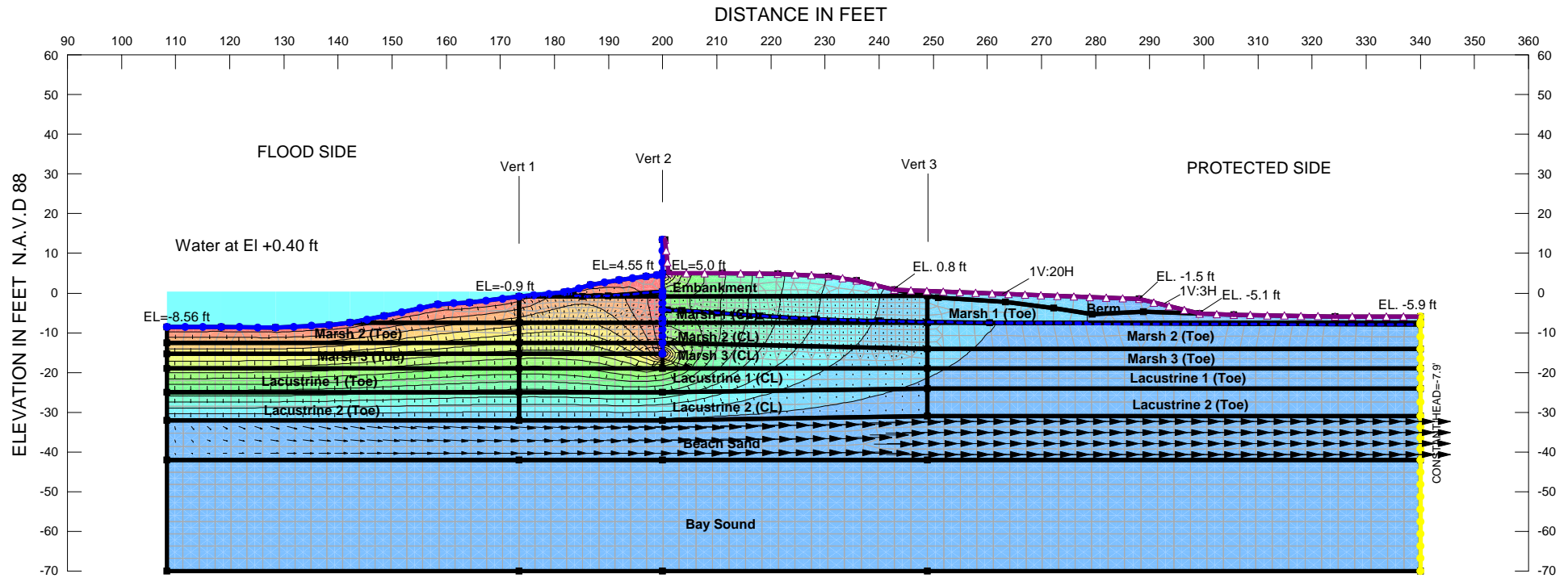
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	200.95	4.889786	-414.82921	78.952978	38.50794	75
2	Optimized	202.145	3.424627	-408.68613	203.17449	99.094822	75
3	Optimized	203.8206	1.49984	-336.08565	376.44855	183.60623	75
4	Optimized	205.71385	-0.501864	-244.8812	561.56152	273.89185	75
5	Optimized	206.88985	-1.684794	-189.19484	669.55037	298.10303	75
6	Optimized	208.24935	-3.05233	-121.53775	800.64831	339.85504	0
7	Optimized	209.29775	-4.106723	-71.10134	898.79122	381.51424	0
8	Optimized	210.29275	-5.0169995	-29.21617	962.48891	408.5523	0
9	Optimized	212.2783	-6.8334265	52.827081	1095.7086	442.67693	0
10	Optimized	213.63555	-8.0311035	106.64721	1216.6	471.14702	0
11	Optimized	214.6	-8.7970825	147.46092	1275.3148	502.15288	0
12	Optimized	216.4605	-10.274694	234.81843	1339.419	491.79985	0
13	Optimized	219.01575	-11.989075	336.21259	1461.085	500.82548	0
14	Optimized	221.60525	-13.41564	420.77734	1487.2314	474.81594	0
15	Optimized	222.9729	-14.16908	465.63589	1500.8729	460.91723	0
16	Optimized	224.2594	-14.5803	489.8496	1565.6039	478.95668	0
17	Optimized	226.6866	-15.322415	533.66145	1535.7	446.13629	0
18	Optimized	228.3501	-15.7183	557.01596	1589.5084	459.69527	0
19	Optimized	229.96365	-15.807345	561.59071	1537.7461	434.61236	0
20	Optimized	232.3206	-15.937415	568.44069	1464.0475	398.74984	0

21	Optimized	234.40695	-15.926245	566.79837	1432.1407	385.27521	0
22	Optimized	235.6633	-15.817885	559.59585	1386.5813	368.19763	0
23	Optimized	237.47085	-15.661985	549.26558	1356.4349	359.37492	0
24	Optimized	240.0856	-15.32945	527.73977	1331.3779	357.80276	0
25	Optimized	242.4266	-14.91351	501.20138	1273.7589	343.96477	0
26	Optimized	244.7676	-14.49757	474.66298	1216.1399	330.12679	0
27	Optimized	247.32095	-13.92877	438.61613	1166.5643	324.10339	0
28	Optimized	250.0867	-13.207105	393.06471	1077.9804	304.94411	0
29	Optimized	251.4848	-12.841085	369.96267	1053.7144	304.42587	0
30	Optimized	252.98315	-12.33069	337.81584	1002.47	295.92308	0
31	Optimized	255.94945	-11.32027	274.25758	901.11882	279.09661	0
32	Optimized	258.6387	-10.33236	212.17095	816.32339	268.98599	0
33	Optimized	261.0509	-9.36696	151.54133	720.60456	253.36327	0
34	Optimized	262.9785	-8.550159	100.27198	652.5068	245.87078	0
35	Optimized	264.47315	-7.858029	56.862368	583.81679	234.61522	0
36	Optimized	265.92955	-7.183615	14.561827	508.17642	219.77138	0
37	Optimized	268.08775	-5.971419	-61.386755	396.36136	176.47145	75
38	Optimized	271.0377	-4.179797	-173.58773	150.48114	66.99852	75

Slices of Slip Surface: 847

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	847	200.95	4.7287865	-412.04337	80.104932	39.069786	75
2	847	202.53955	2.4570735	-366.2619	274.53847	133.90136	75
3	847	204.61865	-0.1734705	-253.76246	513.4116	250.40757	75
4	847	205.9451	-1.6938985	-179.34605	664.50287	295.85574	75
5	847	207.766	-3.4615	-90.435142	846.0861	359.14224	0
6	847	210.475	-5.8736895	19.894345	1058.9278	441.04353	0
7	847	212.825	-7.65352	94.743788	1217.8662	476.73718	0
8	847	214.6	-8.864369	151.54125	1328.4556	523.99604	0
9	847	216.48335	-9.9771585	216.6979	1385.4095	520.34394	0
10	847	219.05	-11.333035	296.15825	1432.5548	505.95636	0
11	847	221.61665	-12.48583	363.87377	1461.7644	488.81241	0
12	847	223.88335	-13.357435	415.17802	1471.6732	470.38196	0
13	847	225.85	-13.994555	452.66806	1466.3744	451.33114	0
14	847	227.81665	-14.53351	484.43417	1452.0938	430.82984	0
15	847	229.88335	-14.995605	511.59275	1430.233	409.005	0
16	847	232.05	-15.37415	533.79565	1400.1295	385.71666	0
17	847	234.21665	-15.644355	549.49092	1359.881	360.80889	0
18	847	235.6633	-15.77715	557.08035	1337.9018	347.64411	0
19	847	237.13185	-15.839775	560.40456	1338.4152	346.39265	0
20	847	239.34235	-15.861565	560.9937	1333.276	343.84225	0
21	847	241.55285	-15.774245	554.84551	1319.1689	340.2987	0
22	847	243.76335	-15.577175	542.02138	1295.9251	335.65955	0
23	847	245.9738	-15.26888	522.29379	1263.2627	329.9006	0
24	847	248.18425	-14.847005	495.5216	1220.9426	322.97823	0
25	847	250.39475	-14.30822	461.48673	1168.433	314.75278	0
26	847	252.72	-13.606925	417.33306	1107.6725	307.35891	0

27	847	255.16	-12.722635	361.77417	1036.8967	300.5839	0
28	847	257.6	-11.67278	295.89222	951.44177	291.86946	0
29	847	260.04	-10.44407	218.86631	849.74341	280.88458	0
30	847	262.48	-9.019056	129.5891	729.55305	267.12116	0
31	847	264.2443	-7.877496	58.114696	631.13209	255.12378	0
32	847	265.21605	-7.1864165	14.855085	561.35244	243.3163	0
33	847	266.7285	-6.002996	-59.207297	444.76484	198.02207	75
34	847	268.89845	-4.143426	-175.54468	190.52492	84.827162	75



Name: EMBANKMENT FILL, EL. +4 TO -1.5 (S-Case) AWT Model: Saturated Only K-Sat: 3.28e-008 ft/sec K-Ratio: 1
 Name: MARSH1, EL. -1.5 TO -7.5 (S-Case) AWT Model: Saturated Only K-Sat: 3.28e-007 ft/sec K-Ratio: 1
 Name: BEACH SAND, EL. -32/-31 TO -42 Model: Saturated Only K-Sat: 0.00049 ft/sec K-Ratio: 1
 Name: BAY SOUND CLAY, EL. -42 TO -70 Model: Saturated Only K-Sat: 3.28e-008 ft/sec K-Ratio: 1
 Name: Sheet Pile Model: Saturated Only K-Sat: 1e-010 ft/sec K-Ratio: 1
 Name: Berm Model: Saturated Only K-Sat: 3.28e-008 ft/sec K-Ratio: 1

GENERAL NOTES

CLASSIFICATION STRATIFICATION
 SHEAR STRENGTHS AND UNIT WEIGHTS OF
 THE SOIL WERE BASED ON THE RESULTS OF
 UNDISTURBED BORINGS AND CPT DATA. SEE
 BOTH BORING AND CPT DATA PLATES.

WHERE INDICATED, SHEAR STRENGTHS
 BETWEEN VERTICALS WERE ASSUMED TO
 VARY LINEARLY BETWEEN THE VALUES
 INDICATED FOR THESE LOCATIONS.

LAKE PONTCHARTRAIN, LA. AND VICINITY HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 19
 REMEDIATION OF CANAL WALLS AND LEVEES
 PROTECTED SIDE STABILITY ANALYSIS
 CASE: Normal Water Level at +0.40ft (seepage)
 STA. 65+00 TO 90+62 EAST
 ORLEANS PARISH, LOUISIANA

ETL 1110-2-575 ANALYSIS

Normal Water Level at +0.40ft (seepage)

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File Information

Created By: [Liljegren, James](#)
Revision Number: [588](#)
Last Edited By: [Reves, Ryan D MVK](#)
Date: [9/30/2013](#)
Time: [4:58:52 PM](#)
File Name: [Reach 19.gsz](#)
Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix F NWL\](#)
Last Solved Date: [9/30/2013](#)
Last Solved Time: [4:59:20 PM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Mass(M) Units: [lbs](#)
Mass Flux Units: [lbs/sec](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

Normal Water Level at +0.40ft (seepage)

Kind: [SEEP/W](#)
Method: [Steady-State](#)
Settings
 Include Air Flow: [No](#)
Control
 Apply Runoff: [No](#)
Convergence
 Convergence Type: [Head Vector Norm](#)
 Maximum Number of Iterations: [500](#)
 Tolerance: [0.001](#)
 Maximum Change in K: [0.1](#)
 Rate of Change in K: [1.02](#)
 Minimum Change in K: [1e-005](#)
 Equation Solver: [Parallel Direct](#)
 Potential Seepage Max # of Reviews: [10](#)
Time

Starting Time: 0 sec

Duration: 0 sec

Ending Time: 0 sec

Materials

EMBANKMENT FILL, EL. +4 TO -1.5 (S-Case) AWT

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-008 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

MARSH1, EL. -1.5 TO -7.5 (S-Case) AWT

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-007 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

BEACH SAND, EL. -32/-31 TO -42

Model: Saturated Only

Hydraulic

K-Sat: 0.00049 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

BAY SOUND CLAY, EL. -42 TO -70

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-008 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

Sheet Pile

Model: Saturated Only

Hydraulic

K-Sat: 1e-010 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

Berm

Model: Saturated Only
Hydraulic
K-Sat: 3.28e-008 ft/sec
Volumetric Water Content: 0 ft³/ft³
Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

Boundary Conditions

Drainage

Review: true
Type: Total Flux (Q) 0

Canal Water

Type: Head (H) 0.4

Curb

Type: Head (H) -7.9

Regions

	Material	Points	Area (ft²)
Region 1	MARSH1, EL. -1.5 TO -7.5 (S-Case) AWT	7,81,30,8,39,1	175.56
Region 2	MARSH1, EL. -1.5 TO -7.5 (S-Case) AWT	8,9,40,39	133
Region 3	BEACH SAND, EL. -32/-31 TO -42	21,43,24,16,2,3,37,31,44,22	2431.55
Region 4	MARSH1, EL. -1.5 TO -7.5 (S-Case) AWT	42,28,9,14,15,23,41	379.595
Region 5	MARSH1, EL. -1.5 TO -7.5 (S-Case) AWT	35,15,23,41,46,33	428.55
Region 6	MARSH1, EL. -1.5 TO -7.5 (S-Case) AWT	13,89,90,11,14	576.1275
Region 7	MARSH1, EL. -1.5 TO -7.5 (S-Case) AWT	14,11,12,15	455.5
Region 8	MARSH1, EL. -1.5 TO -7.5 (S-Case) AWT	15,12,36,35	455.5
Region 9	BAY SOUND CLAY, EL. -42 TO -70	25,22,44,31,37,3,26,38,32,45	6484.8
Region 10	MARSH1, EL. -1.5 TO -7.5 (S-Case) AWT	40,9,28,42	74.48
Region 11	MARSH1, EL. -1.5 TO -7.5 (S-Case) AWT	81,7,10,88,87,86,85,84,83,82	254.82595
Region 12	MARSH1, EL. -1.5 TO -7.5 (S-Case) AWT	9,8,13,14	281.175
Region 13	MARSH1, EL. -1.5 TO -7.5 (S-Case) AWT	29,19,40,42	182
Region 14	MARSH1, EL. -1.5 TO -7.5 (S-Case) AWT	20,29,42,41	240.5
Region 15	MARSH1, EL. -1.5 TO -7.5 (S-Case) AWT	21,34,46,43	455
Region 16	MARSH1, EL. -1.5 TO -7.5 (S-Case) AWT	34,46,41,20	390
Region 17	MARSH1, EL. -1.5 TO -7.5 (S-Case) AWT	16,24,43,46,33,35	528.5
Region 18	MARSH1, EL. -1.5 TO -7.5 (S-Case) AWT	16,35,36,2	637.7
Region 19	MARSH1, EL. -1.5 TO -7.5 (S-Case) AWT	58,50,51,52,1,39	118.991

Region 20	MARSH1, EL. -1.5 TO -7.5 (S-Case) AWT	18,47,48,49,58,39,40,19	293.6835
Region 21	EMBANKMENT FILL, EL. +4 TO -1.5 (S-Case) AWT	75,54,55,56,57,4,80,79,78,77,76	58.331673
Region 22		71,5,6,59	6.36
Region 23	EMBANKMENT FILL, EL. +4 TO -1.5 (S-Case) AWT	7,80,4,71,59,60,61,62,63,64,10	220.1
Region 24	MARSH1, EL. -1.5 TO -7.5 (S-Case) AWT	10,65,66,67,17,68,74,69,70,72,27,89,88	270.89432
Region 25	Berm	64,73,74,68,17,67,66,65,10	125.82563
Region 26	EMBANKMENT FILL, EL. +4 TO -1.5 (S-Case) AWT	1,53,75,76,77,78,79,80,7	14.520317
Region 27	MARSH1, EL. -1.5 TO -7.5 (S-Case) AWT	81,30,8,13,88,87,86,85,84,83,82	72.804053
Region 28	MARSH1, EL. -1.5 TO -7.5 (S-Case) AWT	88,13,89	1.1806667
Region 29		27,89,90	16.022498

Lines

	Start Point	End Point	Hydraulic Boundary	Right Side Material	Left Side Material
Line 1	7	1			
Line 2	14	15			
Line 3	11	14			
Line 4	11	12	Curb		
Line 5	12	15			
Line 6	2	16			
Line 7	2	3	Curb		
Line 8	21	22			
Line 9	9	8	Canal Water	Sheet Pile	
Line 10	25	22			
Line 11	3	26	Curb		
Line 12	16	24			
Line 13	7	10			
Line 14	9	28	Canal Water		Sheet Pile
Line 15	13	8			
Line 16	14	9			
Line 17	15	23			
Line 18	13	14			
Line 19	30	8	Canal Water		Sheet Pile
Line 20	28	23			
Line 21	31	37			
Line 22	37	3			
Line 23	26	38			
Line 24	38	32			
Line 25	8	39			
Line 26	9	40			
Line 27	41	23			
Line 28	42	28			
Line 29	24	43			
Line 30	43	21			
Line 31	22	44			
Line 32	44	31			
Line 33	32	45			
Line 34	45	25			

Line 35	41	42			
Line 36	40	39			
Line 37	42	40			
Line 38	39	1			
Line 39	40	19			
Line 40	29	19			
Line 41	42	29			
Line 42	20	29			
Line 43	41	20			
Line 44	41	46			
Line 45	46	43			
Line 46	21	34			
Line 47	34	46			
Line 48	20	34			
Line 49	12	36	Curb		
Line 50	36	35			
Line 51	35	15			
Line 52	46	33			
Line 53	33	35			
Line 54	35	16			
Line 55	36	2	Curb		
Line 56	58	50	Canal Water		
Line 57	50	51	Canal Water		
Line 58	51	52	Canal Water		
Line 59	52	1	Canal Water		
Line 60	39	58			
Line 61	18	47	Canal Water		
Line 62	47	48	Canal Water		
Line 63	48	49	Canal Water		
Line 64	49	58	Canal Water		
Line 65	19	18			
Line 66	54	55	Canal Water		
Line 67	55	56	Canal Water		
Line 68	56	57	Canal Water		
Line 69	57	4	Canal Water		
Line 70	71	5	Canal Water		
Line 71	5	6			
Line 72	6	59	Drainage		
Line 73	59	71			
Line 74	4	71		Sheet Pile	
Line 75	59	60	Drainage		
Line 76	60	61	Drainage		
Line 77	61	62	Drainage		
Line 78	62	63	Drainage		
Line 79	63	64	Drainage		
Line 80	64	10			
Line 81	10	65			
Line 82	65	66			

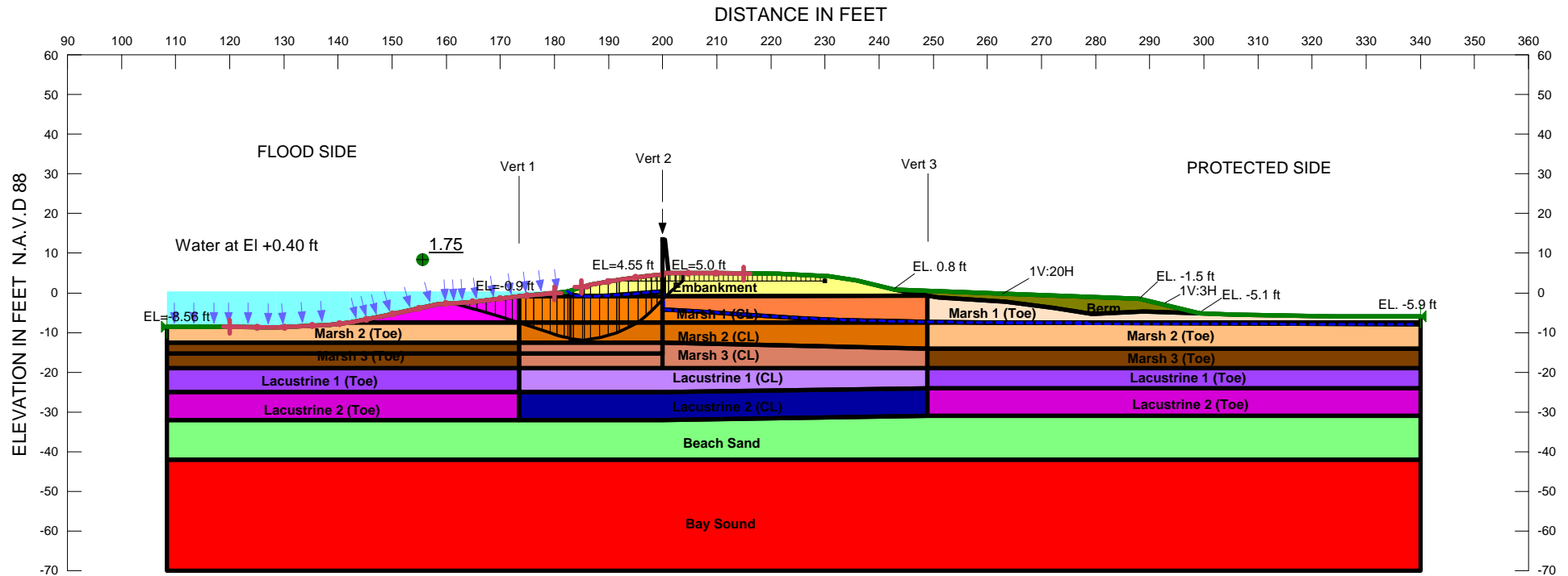
Line 83	66	67			
Line 84	67	17			
Line 85	17	68			
Line 86	70	72	Drainage		
Line 87	72	27	Curb		
Line 88	70	69	Drainage		
Line 89	69	74	Drainage		
Line 90	74	68			
Line 91	64	73	Drainage		
Line 92	73	74	Drainage		
Line 93	75	54	Canal Water		
Line 94	4	80	Canal Water		Sheet Pile
Line 95	80	7	Canal Water		Sheet Pile
Line 96	7	81	Canal Water		Sheet Pile
Line 97	81	30	Canal Water		Sheet Pile
Line 98	10	88			
Line 99	88	13			
Line 100	13	89			
Line 101	89	27			
Line 102	90	11	Curb		
Line 103	80	79			
Line 104	79	78			
Line 105	78	77			
Line 106	77	76			
Line 107	76	75			
Line 108	1	53	Canal Water		
Line 109	53	75	Canal Water		
Line 110	88	87			
Line 111	87	86			
Line 112	86	85			
Line 113	85	84			
Line 114	84	83			
Line 115	83	82			
Line 116	82	81			
Line 117	89	88			
Line 118	89	90			
Line 119	90	27	Curb		

Points

	X (ft)	Y (ft)
Point 1	173.4	-0.9
Point 2	340	-31
Point 3	340	-42
Point 4	200	4.55
Point 5	200	13.48
Point 6	200.4	13.48
Point 7	200	-0.9

Point 8	200	-7.5
Point 9	200	-12.5
Point 10	248.9	-0.7
Point 11	340	-14
Point 12	340	-19
Point 13	248.9	-7.5
Point 14	248.9	-14
Point 15	248.9	-19
Point 16	248.9	-31
Point 17	279.3	-5.3
Point 18	108.4	-8.56
Point 19	108.4	-12.5
Point 20	108.4	-19
Point 21	108.4	-32
Point 22	108.4	-42
Point 23	200	-19
Point 24	200	-32
Point 25	108.4	-70
Point 26	340	-70
Point 27	340	-7.5
Point 28	200	-15.3
Point 29	108.4	-15.3
Point 30	200	-6.5
Point 31	200	-42
Point 32	200	-70
Point 33	200	-25
Point 34	108.4	-25
Point 35	248.9	-24
Point 36	340	-24
Point 37	248.9	-42
Point 38	248.9	-70
Point 39	173.4	-7.5
Point 40	173.4	-12.5
Point 41	173.4	-19
Point 42	173.4	-15.3
Point 43	173.4	-32
Point 44	173.4	-42
Point 45	173.4	-70
Point 46	173.4	-25
Point 47	118.4	-8.48
Point 48	128.5	-8.74
Point 49	138.4	-8.05
Point 50	148.5	-5.84
Point 51	158.5	-2.78
Point 52	164.3	-2.38
Point 53	181.8	0.16
Point 54	186.7	2.06
Point 55	191.9	3.3

Point 56	196.9	4.24
Point 57	198.9	4.55
Point 58	142.2	-7.5
Point 59	201.1	5
Point 60	211	5
Point 61	221.3	4.8
Point 62	230.6	4.3
Point 63	235.8	3.1
Point 64	242.8	0.8
Point 65	250.9	-1.1
Point 66	263.3	-2.2
Point 67	272.2	-3.7
Point 68	288.8	-4.7
Point 69	305.5	-5.4
Point 70	324.2	-5.9
Point 71	200	5
Point 72	340	-5.9
Point 73	288	-1.5
Point 74	299.2	-5.13593
Point 75	182.42605	0.40275
Point 76	182.84713	-0.2521
Point 77	183.50237	-0.58951
Point 78	185.18235	-0.82951
Point 79	189.88162	-0.68698
Point 80	200	0.39273
Point 81	200	-4.28282
Point 82	200.81165	-4.2915
Point 83	203.47591	-4.41976
Point 84	210.15667	-4.96337
Point 85	217.9723	-5.75434
Point 86	228.16782	-6.4654
Point 87	239.98923	-7.00647
Point 88	248.9	-7.29401
Point 89	260.36334	-7.5
Point 90	340	-7.90239



Name: EMBANKMENT FILL, EL. +4 TO -1.5 (S-Case) AWT Model: Mohr-Coulomb Unit Weight: 117 pcf Cohesion: 75 psf Phi: 26 °
 Name: MARSH1, EL. -1.5 TO -7.5 (S-Case) AWT Model: Mohr-Coulomb Unit Weight: 103 pcf Cohesion: 75 psf Phi: 24 °
 Name: BEACH SAND, EL. -32/-31 TO -42 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand
 Name: BAY SOUND CLAY, EL. -42 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 105 pcf Cohesion: 0 psf Phi: 26 °
 Name: Marsh2, EL. -7.5 to -14 (Protected) (S-Case) BWT Model: Mohr-Coulomb Unit Weight: 80 pcf Cohesion: 0 psf Phi: 24 °
 Name: MARSH2, EL. -7.5 TO -12.5 Model: Spatial Mohr-Coulomb Weight Fn: Marsh2 Cohesion Spatial Fn: Marsh 2 (2) Phi: 0 °
 Name: MARSH3, EL. -12.5 TO -17 Model: Spatial Mohr-Coulomb Unit Weight: 77 pcf Cohesion: 0 psf Phi: 24 °
 Name: Marsh3, EL. -14 to -19 (Protected) Model: Mohr-Coulomb Unit Weight: 106 pcf Cohesion: 0 psf Phi: 24 °
 Name: Marsh1, EL. -2 to -7.5 (Protected) (S-Case) AWT Model: Mohr-Coulomb Unit Weight: 110 pcf Cohesion: 75 psf Phi: 24 °
 Name: Lacustrine1, EL. -19 to -24 (Protected) Model: Spatial Mohr-Coulomb Unit Weight: 100 pcf Cohesion: 0 psf Phi: 26 °
 Name: Lacustrine1, EL. -19 to -25 Model: Spatial Mohr-Coulomb Weight Fn: Lacustrine1 Cohesion: 0 psf Phi: 26 °
 Name: Lacustrine2, EL. -25 to -32 Model: Spatial Mohr-Coulomb Weight Fn: Lacustrine2 Cohesion: 0 psf Phi: 26 °
 Name: Lacustrine2, EL. -24 to -31 (Protected) Model: Spatial Mohr-Coulomb Unit Weight: 98 pcf Cohesion: 0 psf Phi: 26 °
 Name: Berm Model: Mohr-Coulomb Unit Weight: 110 pcf Cohesion: 75 psf Phi: 26 °
 Name: EMBANKMENT FILL, EL. +4 TO -1.5 (S-Case) BWT Model: Mohr-Coulomb Unit Weight: 117 pcf Cohesion: 0 psf Phi: 26 °
 Name: Marsh1, EL. -2 to -7.5 (Protected) (S-Case) BWT Model: Mohr-Coulomb Unit Weight: 110 pcf Cohesion: 0 psf Phi: 24 °
 Name: MARSH1, EL. -1.5 TO -7.5 (S-Case) BWT Model: Mohr-Coulomb Unit Weight: 103 pcf Cohesion: 0 psf Phi: 24 °

GENERAL NOTES

CLASSIFICATION STRATIFICATION
 SHEAR STRENGTHS AND UNIT WEIGHTS OF
 THE SOIL WERE BASED ON THE RESULTS OF
 UNDISTURBED BORINGS AND CPT DATA. SEE
 BOTH BORING AND CPT DATA PLATES.

WHERE INDICATED, SHEAR STRENGTHS
 BETWEEN VERTICALS WERE ASSUMED TO
 VARY LINEARLY BETWEEN THE VALUES
 INDICATED FOR THESE LOCATIONS.

LAKE PONTCHARTRAIN, LA. AND VICINITY HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 19
 REMEDIATION OF CANAL WALLS AND LEVEES
 PROTECTED SIDE STABILITY ANALYSIS
 CASE: NWL S-Case F/S (EE)
 STA. 65+00 TO 90+62 EAST
 ORLEANS PARISH, LOUISIANA

ETL 1110-2-575 ANALYSIS

NWL S-Case F/S (EE)

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File Information

Created By: [Liljegren, James](#)
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Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix F NWL\](#)
Last Solved Date: [9/30/2013](#)
Last Solved Time: [5:34:24 PM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Strength Units: [psf](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

NWL S-Case F/S (EE)

Kind: [SLOPE/W](#)
Parent: [Normal Water Level at +0.40ft \(seepage\)](#)
Method: [Spencer](#)
Settings
 PWP Conditions Source: [Parent Analysis](#)
Slip Surface
 Direction of movement: [Right to Left](#)
 Use Passive Mode: [No](#)
 Slip Surface Option: [Entry and Exit](#)
 Critical slip surfaces saved: [1](#)
 Optimize Critical Slip Surface Location: [Yes](#)
 Tension Crack
 Tension Crack Option: [Tension Crack Line](#)
 Percentage Wet: [0](#)
 Tension Crack Fluid Unit Weight: [62.4 pcf](#)
FOS Distribution
 FOS Calculation Option: [Constant](#)

Advanced

Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 9000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

EMBANKMENT FILL, EL. +4 TO -1.5 (S-Case) AWT

Model: Mohr-Coulomb
Unit Weight: 117 pcf
Cohesion: 75 psf
Phi: 26 °
Phi-B: 0 °

MARSH1, EL. -1.5 TO -7.5 (S-Case) AWT

Model: Mohr-Coulomb
Unit Weight: 103 pcf
Cohesion: 75 psf
Phi: 24 °
Phi-B: 0 °

BEACH SAND, EL. -32/-31 TO -42

Model: Shear/Normal Fn.
Unit Weight: 122 pcf
Strength Function: Sand
Phi-B: 0 °

BAY SOUND CLAY, EL. -42 TO -70

Model: Spatial Mohr-Coulomb
Unit Weight: 105 pcf
Cohesion: 0 psf
Phi: 26 °
Phi-B: 0 °

Marsh2, EL -7.5 to -14 (Protected) (S-Case) BWT

Model: Mohr-Coulomb
Unit Weight: 80 pcf
Cohesion: 0 psf
Phi: 24 °
Phi-B: 0 °

MARSH2, EL. -7.5 TO -12.5

Model: [Spatial Mohr-Coulomb](#)

Weight Fn: [Marsh2](#)

Cohesion Spatial Fn: [Marsh 2 \(2\)](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

MARSH3, EL. -12.5 TO -17

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [77 pcf](#)

Cohesion: [0 psf](#)

Phi: [24 °](#)

Phi-B: [0 °](#)

Marsh3, EL -14 to -19 (Protected)

Model: [Mohr-Coulomb](#)

Unit Weight: [106 pcf](#)

Cohesion: [0 psf](#)

Phi: [24 °](#)

Phi-B: [0 °](#)

Marsh1, EL -2 to -7.5 (Protected) (S-Case) AWT

Model: [Mohr-Coulomb](#)

Unit Weight: [110 pcf](#)

Cohesion: [75 psf](#)

Phi: [24 °](#)

Phi-B: [0 °](#)

Lacustrine1, EL -19 to -24 (Protected)

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [100 pcf](#)

Cohesion: [0 psf](#)

Phi: [26 °](#)

Phi-B: [0 °](#)

Lacustrine1, EL -19 to -25

Model: [Spatial Mohr-Coulomb](#)

Weight Fn: [Lacustrine1](#)

Cohesion: [0 psf](#)

Phi: [26 °](#)

Phi-B: [0 °](#)

Lacustrine2, EL -25 to -32

Model: [Spatial Mohr-Coulomb](#)

Weight Fn: [Lacustrine2](#)

Cohesion: [0 psf](#)

Phi: [26 °](#)

Phi-B: [0 °](#)

Lacustrine2, EL -24 to -31 (Protected)

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: 98 pcf

Cohesion: 0 psf

Phi: 26 °

Phi-B: 0 °

Berm

Model: [Mohr-Coulomb](#)

Unit Weight: 110 pcf

Cohesion: 75 psf

Phi: 26 °

Phi-B: 0 °

EMBANKMENT FILL, EL. +4 TO -1.5 (S-Case) BWT

Model: [Mohr-Coulomb](#)

Unit Weight: 117 pcf

Cohesion: 0 psf

Phi: 26 °

Phi-B: 0 °

Marsh1, EL -2 to -7.5 (Protected) (S-Case) BWT

Model: [Mohr-Coulomb](#)

Unit Weight: 110 pcf

Cohesion: 0 psf

Phi: 24 °

Phi-B: 0 °

MARSH1, EL. -1.5 TO -7.5 (S-Case) BWT

Model: [Mohr-Coulomb](#)

Unit Weight: 103 pcf

Cohesion: 0 psf

Phi: 24 °

Phi-B: 0 °

Slip Surface Entry and Exit

Left Projection: [Range](#)

Left-Zone Left Coordinate: (120, -8.52119) ft

Left-Zone Right Coordinate: (180, -0.06714) ft

Left-Zone Increment: 12

Right Projection: [Range](#)

Right-Zone Left Coordinate: (185, 1.40081) ft

Right-Zone Right Coordinate: (215, 4.92233) ft

Right-Zone Increment: 6

Radius Increments: 15

Slip Surface Limits

Left Coordinate: (108.4, -8.56) ft
Right Coordinate: (340, -5.9) ft

Reinforcements

Reinforcement 1

Type: [Pile](#)
Outside Point: (200, 13.48) ft
Inside Point: (200, -15.3) ft
Slip Surface Intersection: (200, -1.6064) ft
Total Length: 28.78 ft
Reinforcement Direction: 90 °
Applied Load Option: [Variable](#)
F of S Dependent: [No](#)
Pile Spacing: 1 ft
Shear Capacity: 0 lbs
Shear Safety Factor: 1
Shear Load Used: 0 lbs
Shear Option: [Parallel to Slip](#)
Resisting Force Used: 0 lbs/ft

Tension Crack Line

	X (ft)	Y (ft)
	190	3
	230	3

Shear/Normal Strength Functions

Sand

Model: [Spline Data Point Function](#)
Function: [Shear Stress vs. Normal Stress](#)
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 0
Data Points: [Normal Stress \(psf\), Shear Stress \(psf\)](#)
Data Point: (-10000, 0)
Data Point: (0, 0)
Data Point: (10000, 6494)
Estimation Properties
Intact Rock Param.: 10
Geological Strength: 100
Disturbance Factor: 0
SigmaC: 600000 psf

Sigma3: 300000 psf

Num. Points: 20

Unit Weight Functions

Lacustrine1

Model: Spline Data Point Function

Function: Unit Weight vs. X

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 100

Data Points: X (ft), Unit Weight (pcf)

Data Point: (173.4, 100)

Data Point: (200, 105)

Data Point: (248.9, 100)

Marsh2

Model: Spline Data Point Function

Function: Unit Weight vs. X

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 80

Data Points: X (ft), Unit Weight (pcf)

Data Point: (173.4, 80)

Data Point: (200, 92)

Data Point: (248.9, 80)

Lacustrine2

Model: Spline Data Point Function

Function: Unit Weight vs. X

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 98

Data Points: X (ft), Unit Weight (pcf)

Data Point: (173.4, 98)

Data Point: (200, 102)

Data Point: (248.9, 98)

Spatial Functions

Marsh 2 (2)

Model: Linear Interpolation

Limit Range By: Data Values

Data Points: X (ft), Y (ft), Cohesion (psf)

Data Point: (200, -7.5, 225)

Data Point: (200, -12.5, 225)

Data Point: (248.9, -7.5, 125)

Data Point: (248.9, -14, 125)

Data Point: (173.4, -7.5, 125)

Data Point: (173.4, -12.5, 125)

Regions

	Material	Points	Area (ft ²)
Region 1	MARSH1, EL. -1.5 TO -7.5 (S-Case) BWT	7,81,30,8,39,1	175.56
Region 2	MARSH2, EL. -7.5 TO -12.5	8,9,40,39	133
Region 3	BEACH SAND, EL. -32/-31 TO -42	21,43,24,16,2,3,37,31,44,22	2431.55
Region 4	MARSH3, EL. -12.5 TO -17	42,28,9,14,15,23,41	379.595
Region 5	Lacustrine1, EL -19 to -25	35,15,23,41,46,33	428.55
Region 6	Marsh2, EL -7.5 to -14 (Protected) (S-Case) BWT	13,89,90,11,14	576.1275
Region 7	Marsh3, EL -14 to -19 (Protected)	14,11,12,15	455.5
Region 8	Lacustrine1, EL -19 to -24 (Protected)	15,12,36,35	455.5
Region 9	BAY SOUND CLAY, EL. -42 TO -70	25,22,44,31,37,3,26,38,32,45	6484.8
Region 10	MARSH3, EL. -12.5 TO -17	40,9,28,42	74.48
Region 11	MARSH1, EL. -1.5 TO -7.5 (S-Case) AWT	81,7,10,88,87,86,85,84,83,82	254.82595
Region 12	MARSH2, EL. -7.5 TO -12.5	9,8,13,14	281.175
Region 13	Marsh3, EL -14 to -19 (Protected)	29,19,40,42	182
Region 14	Marsh3, EL -14 to -19 (Protected)	20,29,42,41	240.5
Region 15	Lacustrine2, EL -24 to -31 (Protected)	21,34,46,43	455
Region 16	Lacustrine1, EL -19 to -24 (Protected)	34,46,41,20	390
Region 17	Lacustrine2, EL -25 to -32	16,24,43,46,33,35	528.5
Region 18	Lacustrine2, EL -24 to -31 (Protected)	16,35,36,2	637.7
Region 19	Marsh1, EL -2 to -7.5 (Protected) (S-Case) BWT	58,50,51,52,1,39	118.991
Region 20	Marsh2, EL -7.5 to -14 (Protected) (S-Case) BWT	18,47,48,49,58,39,40,19	293.6835
Region 21	EMBANKMENT FILL, EL. +4 TO -1.5 (S-Case) AWT	75,54,55,56,57,4,80,79,78,77,76	58.331673
Region 22		71,5,6,59	6.36
Region 23	EMBANKMENT FILL, EL. +4 TO -1.5 (S-Case) AWT	7,80,4,71,59,60,61,62,63,64,10	220.1
Region 24	Marsh1, EL -2 to -7.5 (Protected) (S-Case) AWT	10,65,66,67,17,68,74,69,70,72,27,89,88	270.89432
Region 25	Berm	64,73,74,68,17,67,66,65,10	125.82563
Region 26	EMBANKMENT FILL, EL. +4 TO -1.5 (S-Case) BWT	1,53,75,76,77,78,79,80,7	14.520317
Region 27	MARSH1, EL. -1.5 TO -7.5 (S-Case) BWT	81,30,8,13,88,87,86,85,84,83,82	72.804053
Region 28	Marsh1, EL -2 to -7.5 (Protected) (S-Case) BWT	88,13,89	1.1806667
Region 29	EMBANKMENT FILL, EL. +4 TO -1.5 (S-Case) AWT	27,89,90	16.022498

Points

	X (ft)	Y (ft)
Point 1	173.4	-0.9
Point 2	340	-31
Point 3	340	-42
Point 4	200	4.55
Point 5	200	13.48
Point 6	200.4	13.48
Point 7	200	-0.9

Point 8	200	-7.5
Point 9	200	-12.5
Point 10	248.9	-0.7
Point 11	340	-14
Point 12	340	-19
Point 13	248.9	-7.5
Point 14	248.9	-14
Point 15	248.9	-19
Point 16	248.9	-31
Point 17	279.3	-5.3
Point 18	108.4	-8.56
Point 19	108.4	-12.5
Point 20	108.4	-19
Point 21	108.4	-32
Point 22	108.4	-42
Point 23	200	-19
Point 24	200	-32
Point 25	108.4	-70
Point 26	340	-70
Point 27	340	-7.5
Point 28	200	-15.3
Point 29	108.4	-15.3
Point 30	200	-6.5
Point 31	200	-42
Point 32	200	-70
Point 33	200	-25
Point 34	108.4	-25
Point 35	248.9	-24
Point 36	340	-24
Point 37	248.9	-42
Point 38	248.9	-70
Point 39	173.4	-7.5
Point 40	173.4	-12.5
Point 41	173.4	-19
Point 42	173.4	-15.3
Point 43	173.4	-32
Point 44	173.4	-42
Point 45	173.4	-70
Point 46	173.4	-25
Point 47	118.4	-8.48
Point 48	128.5	-8.74
Point 49	138.4	-8.05
Point 50	148.5	-5.84
Point 51	158.5	-2.78
Point 52	164.3	-2.38
Point 53	181.8	0.16
Point 54	186.7	2.06
Point 55	191.9	3.3

Point 56	196.9	4.24
Point 57	198.9	4.55
Point 58	142.2	-7.5
Point 59	201.1	5
Point 60	211	5
Point 61	221.3	4.8
Point 62	230.6	4.3
Point 63	235.8	3.1
Point 64	242.8	0.8
Point 65	250.9	-1.1
Point 66	263.3	-2.2
Point 67	272.2	-3.7
Point 68	288.8	-4.7
Point 69	305.5	-5.4
Point 70	324.2	-5.9
Point 71	200	5
Point 72	340	-5.9
Point 73	288	-1.5
Point 74	299.2	-5.13593
Point 75	182.42605	0.40275
Point 76	182.84713	-0.2521
Point 77	183.50237	-0.58951
Point 78	185.18235	-0.82951
Point 79	189.88162	-0.68698
Point 80	200	0.39273
Point 81	200	-4.28282
Point 82	200.81165	-4.2915
Point 83	203.47591	-4.41976
Point 84	210.15667	-4.96337
Point 85	217.9723	-5.75434
Point 86	228.16782	-6.4654
Point 87	239.98923	-7.00647
Point 88	248.9	-7.29401
Point 89	260.36334	-7.5
Point 90	340	-7.90239

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.75	(182.831, 12.279)	20.12468	(203.685, 5)	(161.188, -2.59459)
2	1084	1.95	(182.831, 12.279)	23.071	(203.954, 5)	(164.932, -2.27715)

Slices of Slip Surface: Optimized

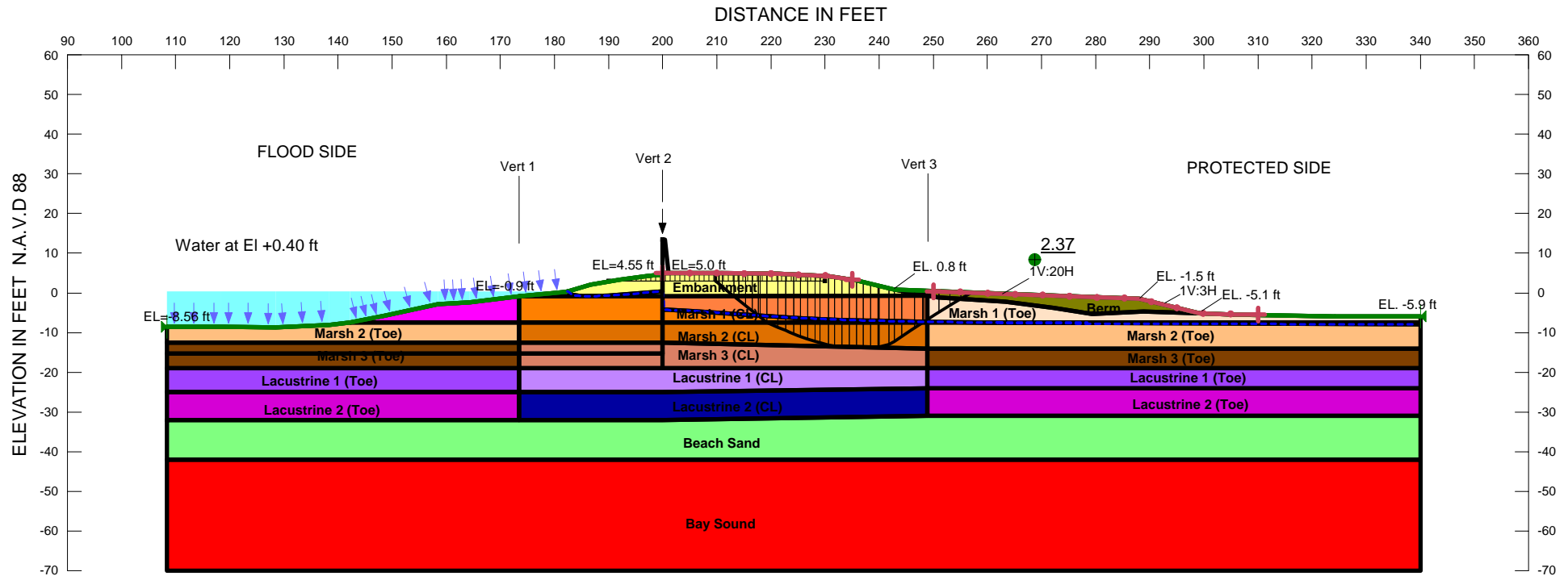
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	161.9663	-2.889084	199.65015	233.25879	14.963534	0
2	Optimized	163.5221	-3.478064	224.56659	311.49463	38.702854	0
3	Optimized	164.9823	-4.030857	246.76128	389.98234	63.766122	0

4	Optimized	166.5169	-4.626095	270.28752	478.68405	92.784113	0
5	Optimized	168.22145	-5.299965	296.912	577.33646	124.85302	0
6	Optimized	170.02345	-6.031545	325.75659	687.4588	161.0402	0
7	Optimized	171.5799	-6.689953	351.85629	787.31945	193.88069	0
8	Optimized	172.7933	-7.217479	373.05655	864.33572	218.73158	0
9	Optimized	174.05335	-7.765296	395.65354	852.14014	0	127.46
10	Optimized	175.45445	-8.3898065	422.21216	919.35011	0	132.72
11	Optimized	176.95	-9.07072	452.50014	989.76039	0	138.35
12	Optimized	178.44555	-9.7516335	483.95656	1061.2052	0	143.97
13	Optimized	179.84495	-10.35084	512.79711	1115.415	0	149.23
14	Optimized	181.1483	-10.86834	538.78923	1172.2483	0	154.13
15	Optimized	182.11305	-11.251375	558.45353	1219.3726	0	157.76
16	Optimized	182.6366	-11.459255	569.4649	1255.4935	0	159.72
17	Optimized	182.9613	-11.58818	576.38436	1282.8215	0	160.94
18	Optimized	183.28895	-11.655145	580.21765	1248.1543	0	162.18
19	Optimized	184.3424	-11.761925	587.75142	1307.8383	0	166.14
20	Optimized	185.35375	-11.86444	595.58836	1365.2432	0	169.94
21	Optimized	186.11255	-11.768415	593.301	1334.4175	0	172.79
22	Optimized	187.543	-11.492305	585.33375	1362.7311	0	178.17
23	Optimized	189.1338	-11.020405	570.00335	1323.9668	0	184.15
24	Optimized	190.6916	-10.376315	547.25278	1312.5852	0	190.01
25	Optimized	191.7008	-9.9110665	531.00765	1252.7622	0	193.8
26	Optimized	192.7713	-9.2105425	503.5605	1216.9099	0	197.82
27	Optimized	194.5568	-8.042111	457.2204	1153.451	0	204.54
28	Optimized	196.1855	-6.6142665	392.75529	940.7531	243.98435	0
29	Optimized	197.40785	-5.1950465	321.26096	837.35132	229.77823	0
30	Optimized	198.40785	-3.8972745	252.16725	704.38459	201.34013	0
31	Optimized	199.45	-2.3977845	169.45028	584.61904	184.84504	0
32	Optimized	200.05195	-1.531665	69.69481	495.45196	189.5593	75
33	Optimized	200.25195	-1.273506	-141.93075	488.57578	217.52795	75
34	Optimized	200.47765	-0.9939254	-206.34372	467.82136	208.28749	75
35	Optimized	200.82765	-0.5603346	-229.54344	423.66251	206.63401	75
36	Optimized	201.7792	0.6184548	-285.17645	326.37174	159.18213	75
37	Optimized	203.05455	2.20868	-368.42364	193.77136	94.508606	75
38	Optimized	203.6681	2.978755	-414.59652	132.76299	64.752837	75

Slices of Slip Surface: 1084

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	1084	165.53465	-2.9607105	196.59143	300.47973	46.254054	0
2	1084	166.73915	-4.2312875	251.68458	485.59891	104.14537	0
3	1084	167.94365	-5.3275665	298.98188	633.8071	149.07379	0
4	1084	169.1482	-6.2808475	339.70248	756.03781	185.36443	0
5	1084	170.35275	-7.112433	375.17462	858.29599	215.09949	0
6	1084	171.56625	-7.842226	405.99453	932.49626	234.41368	0
7	1084	172.78875	-8.480163	433.0666	983.6097	245.11758	0
8	1084	174.1	-9.0622695	457.85423	949.59617	0	127.63
9	1084	175.5	-9.5834075	480.03451	994.83754	0	132.89

10	1084	176.9	-10.00448	498.22329	1032.2706	0	138.16
11	1084	178.3	-10.3311	512.67649	1062.0938	0	143.42
12	1084	179.7	-10.567335	523.59722	1084.5028	0	148.68
13	1084	181.1	-10.715985	531.13935	1099.6016	0	153.95
14	1084	182.11305	-10.778445	534.90535	1111.209	0	157.76
15	1084	182.6366	-10.78998	536.12605	1125.6367	0	159.72
16	1084	183.17475	-10.78688	536.73621	1146.9183	0	161.75
17	1084	184.3424	-10.726835	535.88176	1188.1689	0	166.14
18	1084	185.9412	-10.568385	532.1798	1237.1021	0	172.15
19	1084	187.4954	-10.3008	524.40544	1259.856	0	177.99
20	1084	189.0862	-9.912307	512.42321	1258.475	0	183.97
21	1084	190.3862	-9.5131815	499.97425	1249.0228	0	188.86
22	1084	191.3954	-9.1364605	487.64645	1234.895	0	192.65
23	1084	192.60195	-8.606277	468.84436	1205.9021	0	197.19
24	1084	194.00585	-7.888941	442.76596	1158.1135	0	202.47
25	1084	195.25585	-7.1495275	413.9147	1075.754	294.66982	0
26	1084	196.35195	-6.4024115	382.12041	1011.9517	280.41896	0
27	1084	197.4	-5.5983025	345.47928	940.69403	265.00668	0
28	1084	198.4	-4.7332615	303.43515	861.7936	248.5972	0
29	1084	199.45	-3.7038	250.59094	759.72548	226.6813	0
30	1084	200.2	-2.903107	10.228022	648.16689	284.02868	75
31	1084	200.75	-2.242414	-129.37555	580.51703	258.46284	75
32	1084	201.4362	-1.3516395	-185.12333	494.58218	220.20218	75
33	1084	202.31775	-0.029356	-257.97051	356.67282	173.96096	75
34	1084	203.40845	1.9170195	-359.57621	177.75106	86.694983	75



Name: EMBANKMENT FILL, EL. +4 TO -1.5 (S-Case) AWT Model: Mohr-Coulomb Unit Weight: 117 pcf Cohesion: 75 psf Phi: 26 °
 Name: MARSH1, EL. -1.5 TO -7.5 (S-Case) AWT Model: Mohr-Coulomb Unit Weight: 103 pcf Cohesion: 75 psf Phi: 24 °
 Name: BEACH SAND, EL. -32/-31 TO -42 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand
 Name: BAY SOUND CLAY, EL. -42 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 105 pcf Cohesion: 0 psf Phi: 26 °
 Name: Marsh2, EL. -7.5 to -14 (Protected) (S-Case) BWT Model: Mohr-Coulomb Unit Weight: 80 pcf Cohesion: 0 psf Phi: 24 °
 Name: MARSH2, EL. -7.5 TO -12.5 Model: Spatial Mohr-Coulomb Weight Fn: Marsh2 Cohesion Spatial Fn: Marsh 2 (2) Phi: 0 °
 Name: MARSH3, EL. -12.5 TO -17 Model: Spatial Mohr-Coulomb Unit Weight: 77 pcf Cohesion: 0 psf Phi: 24 °
 Name: Marsh3, EL. -14 to -19 (Protected) Model: Mohr-Coulomb Unit Weight: 106 pcf Cohesion: 0 psf Phi: 24 °
 Name: Marsh1, EL. -2 to -7.5 (Protected) (S-Case) AWT Model: Mohr-Coulomb Unit Weight: 110 pcf Cohesion: 75 psf Phi: 24 °
 Name: Lacustrine1, EL. -19 to -24 (Protected) Model: Spatial Mohr-Coulomb Unit Weight: 100 pcf Cohesion: 0 psf Phi: 26 °
 Name: Lacustrine1, EL. -19 to -25 Model: Spatial Mohr-Coulomb Weight Fn: Lacustrine1 Cohesion: 0 psf Phi: 26 °
 Name: Lacustrine2, EL. -25 to -32 Model: Spatial Mohr-Coulomb Weight Fn: Lacustrine2 Cohesion: 0 psf Phi: 26 °
 Name: Lacustrine2, EL. -24 to -31 (Protected) Model: Spatial Mohr-Coulomb Unit Weight: 98 pcf Cohesion: 0 psf Phi: 26 °
 Name: Berm Model: Mohr-Coulomb Unit Weight: 110 pcf Cohesion: 75 psf Phi: 26 °
 Name: EMBANKMENT FILL, EL. +4 TO -1.5 (S-Case) BWT Model: Mohr-Coulomb Unit Weight: 117 pcf Cohesion: 0 psf Phi: 26 °
 Name: Marsh1, EL. -2 to -7.5 (Protected) (S-Case) BWT Model: Mohr-Coulomb Unit Weight: 110 pcf Cohesion: 0 psf Phi: 24 °
 Name: MARSH1, EL. -1.5 TO -7.5 (S-Case) BWT Model: Mohr-Coulomb Unit Weight: 103 pcf Cohesion: 0 psf Phi: 24 °

GENERAL NOTES

CLASSIFICATION STRATIFICATION
 SHEAR STRENGTHS AND UNIT WEIGHTS OF
 THE SOIL WERE BASED ON THE RESULTS OF
 UNDISTURBED BORINGS AND CPT DATA. SEE
 BOTH BORING AND CPT DATA PLATES.

WHERE INDICATED, SHEAR STRENGTHS
 BETWEEN VERTICALS WERE ASSUMED TO
 VARY LINEARLY BETWEEN THE VALUES
 INDICATED FOR THESE LOCATIONS.

LAKE PONTCHARTRAIN, LA. AND VICINITY HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 19
 REMEDIATION OF CANAL WALLS AND LEVEES
 PROTECTED SIDE STABILITY ANALYSIS
 CASE: NWL S-Case P/S (EE)
 STA. 65+00 TO 90+62 EAST
 ORLEANS PARISH, LOUISIANA

ETL 1110-2-575 ANALYSIS

NWL S-Case P/S (EE)

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Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Strength Units: [psf](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

NWL S-Case P/S (EE)

Kind: [SLOPE/W](#)
Parent: [Normal Water Level at +0.40ft \(seepage\)](#)
Method: [Spencer](#)
Settings
 PWP Conditions Source: [Parent Analysis](#)
Slip Surface
 Direction of movement: [Left to Right](#)
 Use Passive Mode: [No](#)
 Slip Surface Option: [Entry and Exit](#)
 Critical slip surfaces saved: [1](#)
 Optimize Critical Slip Surface Location: [Yes](#)
 Tension Crack
 Tension Crack Option: [Tension Crack Line](#)
 Percentage Wet: [0](#)
 Tension Crack Fluid Unit Weight: [62.4 pcf](#)
FOS Distribution
 FOS Calculation Option: [Constant](#)

Advanced

Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 9000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

EMBANKMENT FILL, EL. +4 TO -1.5 (S-Case) AWT

Model: Mohr-Coulomb
Unit Weight: 117 pcf
Cohesion: 75 psf
Phi: 26 °
Phi-B: 0 °

MARSH1, EL. -1.5 TO -7.5 (S-Case) AWT

Model: Mohr-Coulomb
Unit Weight: 103 pcf
Cohesion: 75 psf
Phi: 24 °
Phi-B: 0 °

BEACH SAND, EL. -32/-31 TO -42

Model: Shear/Normal Fn.
Unit Weight: 122 pcf
Strength Function: Sand
Phi-B: 0 °

BAY SOUND CLAY, EL. -42 TO -70

Model: Spatial Mohr-Coulomb
Unit Weight: 105 pcf
Cohesion: 0 psf
Phi: 26 °
Phi-B: 0 °

Marsh2, EL -7.5 to -14 (Protected) (S-Case) BWT

Model: Mohr-Coulomb
Unit Weight: 80 pcf
Cohesion: 0 psf
Phi: 24 °
Phi-B: 0 °

MARSH2, EL. -7.5 TO -12.5

Model: [Spatial Mohr-Coulomb](#)

Weight Fn: [Marsh2](#)

Cohesion Spatial Fn: [Marsh 2 \(2\)](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

MARSH3, EL. -12.5 TO -17

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [77 pcf](#)

Cohesion: [0 psf](#)

Phi: [24 °](#)

Phi-B: [0 °](#)

Marsh3, EL -14 to -19 (Protected)

Model: [Mohr-Coulomb](#)

Unit Weight: [106 pcf](#)

Cohesion: [0 psf](#)

Phi: [24 °](#)

Phi-B: [0 °](#)

Marsh1, EL -2 to -7.5 (Protected) (S-Case) AWT

Model: [Mohr-Coulomb](#)

Unit Weight: [110 pcf](#)

Cohesion: [75 psf](#)

Phi: [24 °](#)

Phi-B: [0 °](#)

Lacustrine1, EL -19 to -24 (Protected)

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [100 pcf](#)

Cohesion: [0 psf](#)

Phi: [26 °](#)

Phi-B: [0 °](#)

Lacustrine1, EL -19 to -25

Model: [Spatial Mohr-Coulomb](#)

Weight Fn: [Lacustrine1](#)

Cohesion: [0 psf](#)

Phi: [26 °](#)

Phi-B: [0 °](#)

Lacustrine2, EL -25 to -32

Model: [Spatial Mohr-Coulomb](#)

Weight Fn: [Lacustrine2](#)

Cohesion: [0 psf](#)

Phi: [26 °](#)

Phi-B: [0 °](#)

Lacustrine2, EL -24 to -31 (Protected)

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: 98 pcf

Cohesion: 0 psf

Phi: 26 °

Phi-B: 0 °

Berm

Model: [Mohr-Coulomb](#)

Unit Weight: 110 pcf

Cohesion: 75 psf

Phi: 26 °

Phi-B: 0 °

EMBANKMENT FILL, EL. +4 TO -1.5 (S-Case) BWT

Model: [Mohr-Coulomb](#)

Unit Weight: 117 pcf

Cohesion: 0 psf

Phi: 26 °

Phi-B: 0 °

Marsh1, EL -2 to -7.5 (Protected) (S-Case) BWT

Model: [Mohr-Coulomb](#)

Unit Weight: 110 pcf

Cohesion: 0 psf

Phi: 24 °

Phi-B: 0 °

MARSH1, EL. -1.5 TO -7.5 (S-Case) BWT

Model: [Mohr-Coulomb](#)

Unit Weight: 103 pcf

Cohesion: 0 psf

Phi: 24 °

Phi-B: 0 °

Slip Surface Entry and Exit

Left Projection: [Range](#)

Left-Zone Left Coordinate: (200, 5) ft

Left-Zone Right Coordinate: (235, 3.28462) ft

Left-Zone Increment: 7

Right Projection: [Range](#)

Right-Zone Left Coordinate: (250, 0.43363) ft

Right-Zone Right Coordinate: (310, -5.52032) ft

Right-Zone Increment: 12

Radius Increments: 15

Slip Surface Limits

Left Coordinate: (108.4, -8.56) ft
Right Coordinate: (340, -5.9) ft

Reinforcements

Reinforcement 1

Type: [Pile](#)
Outside Point: (200, 13.48) ft
Inside Point: (200, -15.3) ft
Slip Surface Intersection: (0, 0) ft
Total Length: 28.78 ft
Reinforcement Direction: 90 °
Applied Load Option: [Variable](#)
F of S Dependent: [No](#)
Pile Spacing: 1 ft
Shear Capacity: 0 lbs
Shear Safety Factor: 1
Shear Load Used: 0 lbs
Shear Option: [Parallel to Slip](#)
Resisting Force Used: 0 lbs/ft

Tension Crack Line

	X (ft)	Y (ft)
	190	3
	230	3

Shear/Normal Strength Functions

Sand

Model: [Spline Data Point Function](#)
Function: [Shear Stress vs. Normal Stress](#)
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 0
Data Points: [Normal Stress \(psf\), Shear Stress \(psf\)](#)
Data Point: (-10000, 0)
Data Point: (0, 0)
Data Point: (10000, 6494)
Estimation Properties
Intact Rock Param.: 10
Geological Strength: 100
Disturbance Factor: 0
SigmaC: 600000 psf

Sigma3: 300000 psf

Num. Points: 20

Unit Weight Functions

Lacustrine1

Model: Spline Data Point Function

Function: Unit Weight vs. X

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 100

Data Points: X (ft), Unit Weight (pcf)

Data Point: (173.4, 100)

Data Point: (200, 105)

Data Point: (248.9, 100)

Marsh2

Model: Spline Data Point Function

Function: Unit Weight vs. X

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 80

Data Points: X (ft), Unit Weight (pcf)

Data Point: (173.4, 80)

Data Point: (200, 92)

Data Point: (248.9, 80)

Lacustrine2

Model: Spline Data Point Function

Function: Unit Weight vs. X

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 98

Data Points: X (ft), Unit Weight (pcf)

Data Point: (173.4, 98)

Data Point: (200, 102)

Data Point: (248.9, 98)

Spatial Functions

Marsh 2 (2)

Model: Linear Interpolation

Limit Range By: Data Values

Data Points: X (ft), Y (ft), Cohesion (psf)

Data Point: (200, -7.5, 225)

Data Point: (200, -12.5, 225)

Data Point: (248.9, -7.5, 125)

Data Point: (248.9, -14, 125)

Data Point: (173.4, -7.5, 125)

Data Point: (173.4, -12.5, 125)

Regions

	Material	Points	Area (ft ²)
Region 1	MARSH1, EL. -1.5 TO -7.5 (S-Case) BWT	7,81,30,8,39,1	175.56
Region 2	MARSH2, EL. -7.5 TO -12.5	8,9,40,39	133
Region 3	BEACH SAND, EL. -32/-31 TO -42	21,43,24,16,2,3,37,31,44,22	2431.55
Region 4	MARSH3, EL. -12.5 TO -17	42,28,9,14,15,23,41	379.595
Region 5	Lacustrine1, EL -19 to -25	35,15,23,41,46,33	428.55
Region 6	Marsh2, EL -7.5 to -14 (Protected) (S-Case) BWT	13,89,90,11,14	576.1275
Region 7	Marsh3, EL -14 to -19 (Protected)	14,11,12,15	455.5
Region 8	Lacustrine1, EL -19 to -24 (Protected)	15,12,36,35	455.5
Region 9	BAY SOUND CLAY, EL. -42 TO -70	25,22,44,31,37,3,26,38,32,45	6484.8
Region 10	MARSH3, EL. -12.5 TO -17	40,9,28,42	74.48
Region 11	MARSH1, EL. -1.5 TO -7.5 (S-Case) AWT	81,7,10,88,87,86,85,84,83,82	254.82595
Region 12	MARSH2, EL. -7.5 TO -12.5	9,8,13,14	281.175
Region 13	Marsh3, EL -14 to -19 (Protected)	29,19,40,42	182
Region 14	Marsh3, EL -14 to -19 (Protected)	20,29,42,41	240.5
Region 15	Lacustrine2, EL -24 to -31 (Protected)	21,34,46,43	455
Region 16	Lacustrine1, EL -19 to -24 (Protected)	34,46,41,20	390
Region 17	Lacustrine2, EL -25 to -32	16,24,43,46,33,35	528.5
Region 18	Lacustrine2, EL -24 to -31 (Protected)	16,35,36,2	637.7
Region 19	Marsh1, EL -2 to -7.5 (Protected) (S-Case) BWT	58,50,51,52,1,39	118.991
Region 20	Marsh2, EL -7.5 to -14 (Protected) (S-Case) BWT	18,47,48,49,58,39,40,19	293.6835
Region 21	EMBANKMENT FILL, EL. +4 TO -1.5 (S-Case) AWT	75,54,55,56,57,4,80,79,78,77,76	58.331673
Region 22		71,5,6,59	6.36
Region 23	EMBANKMENT FILL, EL. +4 TO -1.5 (S-Case) AWT	7,80,4,71,59,60,61,62,63,64,10	220.1
Region 24	Marsh1, EL -2 to -7.5 (Protected) (S-Case) AWT	10,65,66,67,17,68,74,69,70,72,27,89,88	270.89432
Region 25	Berm	64,73,74,68,17,67,66,65,10	125.82563
Region 26	EMBANKMENT FILL, EL. +4 TO -1.5 (S-Case) BWT	1,53,75,76,77,78,79,80,7	14.520317
Region 27	MARSH1, EL. -1.5 TO -7.5 (S-Case) BWT	81,30,8,13,88,87,86,85,84,83,82	72.804053
Region 28	Marsh1, EL -2 to -7.5 (Protected) (S-Case) BWT	88,13,89	1.1806667
Region 29	EMBANKMENT FILL, EL. +4 TO -1.5 (S-Case) AWT	27,89,90	16.022498

Points

	X (ft)	Y (ft)
Point 1	173.4	-0.9
Point 2	340	-31
Point 3	340	-42
Point 4	200	4.55
Point 5	200	13.48
Point 6	200.4	13.48
Point 7	200	-0.9

Point 8	200	-7.5
Point 9	200	-12.5
Point 10	248.9	-0.7
Point 11	340	-14
Point 12	340	-19
Point 13	248.9	-7.5
Point 14	248.9	-14
Point 15	248.9	-19
Point 16	248.9	-31
Point 17	279.3	-5.3
Point 18	108.4	-8.56
Point 19	108.4	-12.5
Point 20	108.4	-19
Point 21	108.4	-32
Point 22	108.4	-42
Point 23	200	-19
Point 24	200	-32
Point 25	108.4	-70
Point 26	340	-70
Point 27	340	-7.5
Point 28	200	-15.3
Point 29	108.4	-15.3
Point 30	200	-6.5
Point 31	200	-42
Point 32	200	-70
Point 33	200	-25
Point 34	108.4	-25
Point 35	248.9	-24
Point 36	340	-24
Point 37	248.9	-42
Point 38	248.9	-70
Point 39	173.4	-7.5
Point 40	173.4	-12.5
Point 41	173.4	-19
Point 42	173.4	-15.3
Point 43	173.4	-32
Point 44	173.4	-42
Point 45	173.4	-70
Point 46	173.4	-25
Point 47	118.4	-8.48
Point 48	128.5	-8.74
Point 49	138.4	-8.05
Point 50	148.5	-5.84
Point 51	158.5	-2.78
Point 52	164.3	-2.38
Point 53	181.8	0.16
Point 54	186.7	2.06
Point 55	191.9	3.3

Point 56	196.9	4.24
Point 57	198.9	4.55
Point 58	142.2	-7.5
Point 59	201.1	5
Point 60	211	5
Point 61	221.3	4.8
Point 62	230.6	4.3
Point 63	235.8	3.1
Point 64	242.8	0.8
Point 65	250.9	-1.1
Point 66	263.3	-2.2
Point 67	272.2	-3.7
Point 68	288.8	-4.7
Point 69	305.5	-5.4
Point 70	324.2	-5.9
Point 71	200	5
Point 72	340	-5.9
Point 73	288	-1.5
Point 74	299.2	-5.13593
Point 75	182.42605	0.40275
Point 76	182.84713	-0.2521
Point 77	183.50237	-0.58951
Point 78	185.18235	-0.82951
Point 79	189.88162	-0.68698
Point 80	200	0.39273
Point 81	200	-4.28282
Point 82	200.81165	-4.2915
Point 83	203.47591	-4.41976
Point 84	210.15667	-4.96337
Point 85	217.9723	-5.75434
Point 86	228.16782	-6.4654
Point 87	239.98923	-7.00647
Point 88	248.9	-7.29401
Point 89	260.36334	-7.5
Point 90	340	-7.90239

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	2.37	(233.45, 11.066)	21.56984	(209.81, 5)	(256.974, 0.0787543)
2	445	2.62	(233.45, 11.066)	24.186	(210.649, 5)	(255.046, 0.176857)

Slices of Slip Surface: Optimized

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	210.11375	2.63129	-466.04665	188.63843	92.005109	75
2	Optimized	210.70895	1.934996	-428.22692	258.96718	126.30673	75
3	Optimized	212.08995	0.3806587	-342.29056	402.49762	196.31121	75

4	Optimized	213.62725	-1.3495923	-245.36799	564.9655	251.53885	75
5	Optimized	214.68065	-2.52061	-178.83594	664.36818	295.79577	75
6	Optimized	215.89275	-3.85565	-103.19889	774.28285	344.73294	75
7	Optimized	217.0564	-5.120623	-31.881607	883.67631	393.43804	75
8	Optimized	217.79315	-5.910057	12.474081	978.28798	430.00805	0
9	Optimized	218.59765	-6.772114	60.820667	1057.4471	443.72669	0
10	Optimized	220.2615	-8.052082	130.03274	1335.8237	0	183.57
11	Optimized	222.01425	-9.081423	183.84987	1418.1118	0	179.98
12	Optimized	223.4427	-9.920321	228.06777	1480.8318	0	177.06
13	Optimized	224.8254	-10.64715	266.12275	1546.8839	0	174.23
14	Optimized	226.16235	-11.26191	297.95337	1590.104	0	171.5
15	Optimized	227.4993	-11.87667	330.21211	1632.9163	0	168.76
16	Optimized	228.62075	-12.39231	357.4641	1668.4667	0	166.47
17	Optimized	229.83685	-12.844875	380.89914	1712.1243	0	163.98
18	Optimized	231.20365	-13.28241	403.31367	1726.3346	0	161.19
19	Optimized	232.47275	-13.49604	412.78458	1737.8348	0	158.59
20	Optimized	233.80365	-13.53684	411.87586	1703.3635	0	155.87
21	Optimized	235.13455	-13.577645	411.17742	1668.8171	0	153.15
22	Optimized	236.45735	-13.6182	410.69551	1626.8767	0	150.45
23	Optimized	237.772	-13.658505	410.4066	1577.6857	0	147.76
24	Optimized	239.08665	-13.69881	410.29255	1528.4186	0	145.07
25	Optimized	239.8666	-13.675665	407.41671	1530.3504	0	143.47
26	Optimized	240.89095	-13.313985	383.49668	1458.8633	0	141.38
27	Optimized	242.29635	-12.582275	336.33572	1382.3477	0	138.5
28	Optimized	243.50305	-11.59201	273.62037	1273.0173	0	136.04
29	Optimized	245.37735	-9.9194	167.82797	1127.3014	0	132.2
30	Optimized	247.28085	-8.161865	56.589532	963.86091	0	128.31
31	Optimized	248.1384	-7.386738	7.5063327	1019.0993	450.39021	0
32	Optimized	248.58185	-6.985898	-17.918567	1001.7212	445.99501	75
33	Optimized	249.94825	-5.7832	-94.141455	874.18605	389.21271	75
34	Optimized	252.0448	-3.9818	-208.43524	611.26435	272.15242	75
35	Optimized	254.08635	-2.2831435	-316.36585	366.02487	162.96477	75
36	Optimized	256.0268	-0.69600634	-416.91999	144.22228	70.341908	75

Slices of Slip Surface: 445

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	445	210.8245	2.5345835	-465.6684	138.48923	67.545711	75
2	445	211.70155	0.60994765	-353.83888	318.6341	155.40824	75
3	445	213.2692	-2.1698393	-192.1422	601.33089	267.72976	75
4	445	215.0014	-4.515865	-57.060076	835.74871	372.0993	75
5	445	216.9087	-6.5206615	55.061044	1076.2106	454.64509	0
6	445	218.793	-8.1433325	143.48809	1335.6862	0	186.57
7	445	220.46805	-9.3165405	205.78086	1445.1906	0	183.14
8	445	221.9868	-10.216343	252.7132	1525.4322	0	180.04
9	445	223.36035	-10.901715	287.74989	1582.5781	0	177.23
10	445	224.7339	-11.48264	316.93938	1629.7528	0	174.42
11	445	226.1075	-11.96706	340.75018	1667.7857	0	171.61

12	445	227.48105	-12.36099	359.46216	1697.4837	0	168.8
13	445	228.77585	-12.655795	372.85948	1718.3888	0	166.15
14	445	229.99195	-12.863485	381.55843	1731.7966	0	163.67
15	445	231.25	-13.01076	386.74232	1726.1917	0	161.09
16	445	232.55	-13.09438	388.22294	1701.358	0	158.44
17	445	233.85	-13.10785	385.70873	1670.4636	0	155.78
18	445	235.15	-13.05129	379.13637	1633.4862	0	153.12
19	445	236.4982	-12.916745	367.89894	1580.7997	0	150.36
20	445	237.8946	-12.697425	351.55703	1511.7311	0	147.51
21	445	239.291	-12.393	330.18494	1435.6773	0	144.65
22	445	240.6919	-11.998535	303.40883	1352.1798	0	141.79
23	445	242.0973	-11.508745	270.87135	1260.899	0	138.91
24	445	243.5625	-10.88837	230.32826	1181.0637	0	135.92
25	445	245.0875	-10.11829	180.52233	1111.3531	0	132.8
26	445	246.6125	-9.204298	121.92721	1030.8541	0	129.68
27	445	248.1628	-8.104588	51.82075	936.46923	0	126.51
28	445	249.0693	-7.3995925	7.0206819	1033.7264	457.11882	0
29	445	250.044	-6.490091	-50.497697	963.4295	428.94645	75
30	445	251.7203	-4.7323245	-161.49892	760.15204	338.44149	75
31	445	253.36095	-2.587367	-296.64056	492.54529	219.29529	75
32	445	254.6137	-0.60711245	-421.19301	225.36786	109.91925	75

Normal Water Level at +0.40ft (seepage)

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Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix F NWL\](#)
Last Solved Date: [10/1/2013](#)
Last Solved Time: [10:16:06 AM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Mass(M) Units: [lbs](#)
Mass Flux Units: [lbs/sec](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

Normal Water Level at +0.40ft (seepage)

Kind: [SEEP/W](#)
Method: [Steady-State](#)
Settings
 Include Air Flow: [No](#)
Control
 Apply Runoff: [No](#)
Convergence
 Convergence Type: [Head Vector Norm](#)
 Maximum Number of Iterations: [500](#)
 Tolerance: [0.001](#)
 Maximum Change in K: [0.1](#)
 Rate of Change in K: [1.02](#)
 Minimum Change in K: [1e-005](#)
 Equation Solver: [Parallel Direct](#)
 Potential Seepage Max # of Reviews: [10](#)
Time

Starting Time: 0 sec

Duration: 0 sec

Ending Time: 0 sec

Materials

BEACH SAND, EL. -33 TO -41

Model: Saturated Only

Hydraulic

K-Sat: 2.3e-005 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

BAY SOUND CLAY (S-Case)

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-008 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

Sheet Pile

Model: Saturated Only

Hydraulic

K-Sat: 1e-010 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

Lacustrine (S-Case)

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-007 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

FILL, EL. -6 TO -10/-15 (S-Case)

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-007 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

FILL (Hydraulic), EL. -10/-15 TO -18/-19

Model: Saturated Only
Hydraulic
K-Sat: 3.28e-007 ft/sec
Volumetric Water Content: 0 ft³/ft³
Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

EMBANKMENT FILL, EL. +6.5 TO -6

Model: Saturated Only
Hydraulic
K-Sat: 3.28e-008 ft/sec
Volumetric Water Content: 0 ft³/ft³
Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

Boundary Conditions

Drainage

Review: true
Type: Total Flux (Q) 0

Canal Water

Type: Head (H) 0.4

Curb

Type: Head (H) -1.5

Regions

	Material	Points	Area (ft²)
Region 1	Sheet Pile	7,18,19,20	4.8
Region 2	EMBANKMENT FILL, EL. +6.5 TO -6	7,20,8,9,21	102.9
Region 3	Lacustrine (S-Case)	12,11,39,44,35,15,16,46	3091.25
Region 4	BEACH SAND, EL. -33 TO -41	13,12,46,16,17,47	1700
Region 5	BAY SOUND CLAY (S-Case)	25,13,47,17,26,48	6162.5
Region 6	EMBANKMENT FILL, EL. +6.5 TO -6	7,27,6,23,24,5,4,29,21	144.9
Region 7	FILL (Hydraulic), EL. -10/-15 TO -18/-19	38,40,31,28,1,42,11,39	428.68444
Region 8	FILL, EL. -6 TO -10/-15 (S-Case)	34,33,32,14	742.5
Region 9	EMBANKMENT FILL, EL. +6.5 TO -6	41,36,3,30,37	47.411173
Region 10	EMBANKMENT FILL, EL. +6.5 TO -6	36,41,53,52,51	4.9451195

Region 11	EMBANKMENT FILL, EL. +6.5 TO -6	64,33,32,66,65	391.475
Region 12	FILL (Hydraulic), EL. -10/-15 TO -18/-19	35,34,14,15	330
Region 13	EMBANKMENT FILL, EL. +6.5 TO -6	59,22,41,37,49,33,64,63,62,61,60	344.925
Region 14	FILL, EL. -6 TO -10/-15 (S-Case)	40,37,49,33,34,43	356.75
Region 15	FILL (Hydraulic), EL. -10/-15 TO -18/-19	39,38,40,43,34,35,44	521
Region 16	EMBANKMENT FILL, EL. +6.5 TO -6	41,53,54,55,56,57,58,59,22	71.98
Region 17	FILL, EL. -6 TO -10/-15 (S-Case)	31,2,30,37,40	98.734098
Region 18	EMBANKMENT FILL, EL. +6.5 TO -6	52,53,29	0.012394
Region 19	EMBANKMENT FILL, EL. +6.5 TO -6	29,53,54,55,56,57,58,59,21	17.02
Region 20	EMBANKMENT FILL, EL. +6.5 TO -6	21,59,60,61,62,63,64,9	34.075
Region 21	EMBANKMENT FILL, EL. +6.5 TO -6	9,64,65,66,10	144.775

Lines

	Start Point	End Point	Hydraulic Boundary	Left Side Material
Line 1	7	18	Canal Water	
Line 2	18	19		
Line 3	19	20	Drainage	
Line 4	20	7		Sheet Pile
Line 5	7	21	Canal Water	Sheet Pile
Line 6	20	8	Drainage	
Line 7	8	9	Drainage	
Line 8	9	21		
Line 9	12	11		
Line 10	15	16	Curb	
Line 11	13	12		
Line 12	16	17	Curb	
Line 13	25	13		
Line 14	17	26	Curb	
Line 15	7	27	Canal Water	
Line 16	27	6	Canal Water	
Line 17	6	23	Canal Water	
Line 18	23	24	Canal Water	
Line 19	24	5	Canal Water	
Line 20	5	4	Canal Water	
Line 21	4	29	Canal Water	
Line 22	29	21		
Line 23	15	35		
Line 24	32	33		
Line 25	32	14	Curb	
Line 26	14	34		
Line 27	36	3	Canal Water	
Line 28	3	30	Canal Water	
Line 29	37	30		
Line 30	39	11		
Line 31	35	34		
Line 32	14	15	Curb	
Line 33	39	38		

Line 34	37	40		
Line 35	41	36		
Line 36	37	41		
Line 37	22	41		
Line 38	42	11		
Line 39	40	38		
Line 40	31	2	Canal Water	
Line 41	2	30	Canal Water	
Line 42	34	43		
Line 43	43	40		
Line 44	40	31		
Line 45	31	28	Canal Water	
Line 46	28	1	Canal Water	
Line 47	1	42		
Line 48	35	44		
Line 49	44	39		
Line 50	33	34		
Line 51	12	46		
Line 52	46	16		
Line 53	17	47		
Line 54	47	13		
Line 55	26	48		
Line 56	48	25		
Line 57	33	49		
Line 58	49	37		
Line 59	51	36	Canal Water	
Line 60	52	51	Canal Water	
Line 61	41	53		
Line 62	53	29		
Line 63	21	59	Canal Water	Sheet Pile
Line 64	59	22	Canal Water	Sheet Pile
Line 65	9	64		
Line 66	64	33		
Line 67	66	32	Curb	
Line 68	53	52		
Line 69	29	52	Canal Water	
Line 70	53	54		
Line 71	54	55		
Line 72	55	56		
Line 73	56	57		
Line 74	57	58		
Line 75	58	59		
Line 76	64	63		
Line 77	63	62		
Line 78	62	61		
Line 79	61	60		
Line 80	60	59		
Line 81	66	65		

Line 82	65	64		
Line 83	66	10	Curb	
Line 84	10	9	Drainage	

Points

	X (ft)	Y (ft)
Point 1	97.5	-12.5
Point 2	128.9	-8.5
Point 3	140.7	-5.5
Point 4	157.9	1.5
Point 5	172.9	2.5
Point 6	187.9	5.5
Point 7	200	6.5
Point 8	206.8	6.5
Point 9	227.5	0.5
Point 10	310	0.5
Point 11	97.5	-18
Point 12	97.5	-33
Point 13	97.5	-41
Point 14	310	-15
Point 15	310	-19
Point 16	310	-33
Point 17	310	-41
Point 18	200	12.9
Point 19	200.5	12.9
Point 20	201	6.5
Point 21	200	0.5
Point 22	200	-1.5
Point 23	182.9	4.5
Point 24	177.9	3.5
Point 25	97.5	-70
Point 26	310	-70
Point 27	195.7	6.5
Point 28	120.7	-10.5
Point 29	155.5	0.5
Point 30	138.71539	-6
Point 31	122.76222	-10
Point 32	310	-6
Point 33	227.5	-6
Point 34	227.5	-15
Point 35	227.5	-19
Point 36	150.54249	-1.5
Point 37	155.5	-6
Point 38	155.5	-14
Point 39	155.5	-18
Point 40	155.5	-10
Point 41	155.5	-1.5

Point 42	97.5	-14
Point 43	200	-10
Point 44	200	-18
Point 45	310	-150
Point 46	200	-33
Point 47	200	-41
Point 48	200	-70
Point 49	200	-6
Point 50	97.5	0
Point 51	154.26062	0
Point 52	155.25212	0.4
Point 53	155.5	0.4
Point 54	160	0.3
Point 55	173.2	0.1
Point 56	184	0
Point 57	192	-0.1
Point 58	196.5	0.1
Point 59	200	0.4
Point 60	200.6	-0.2
Point 61	203.8	-0.5
Point 62	208.5	-0.7
Point 63	219.2	-0.9
Point 64	227.5	-1
Point 65	258.9	-1.2
Point 66	310	-1.5

NWL S-Case F/S (EE)

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File Information

Created By: [Liljegren, James](#)
Revision Number: [340](#)
Last Edited By: [Higgins, James](#)
Date: [10/1/2013](#)
Time: [11:11:14 AM](#)
File Name: [Reach 20A.gsz](#)
Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix F NWL\](#)
Last Solved Date: [10/1/2013](#)
Last Solved Time: [11:15:46 AM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Strength Units: [psf](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

NWL S-Case F/S (EE)

Kind: [SLOPE/W](#)
Parent: [Normal Water Level at +0.40ft \(seepage\)](#)
Method: [Spencer](#)
Settings
 PWP Conditions Source: [Parent Analysis](#)
Slip Surface
 Direction of movement: [Right to Left](#)
 Use Passive Mode: [No](#)
 Slip Surface Option: [Entry and Exit](#)
 Critical slip surfaces saved: [1](#)
 Optimize Critical Slip Surface Location: [Yes](#)
Tension Crack
 Tension Crack Option: [Search for Tension Crack](#)
 Percentage Wet: [0](#)
 Tension Crack Fluid Unit Weight: [62.4 pcf](#)
FOS Distribution
 FOS Calculation Option: [Constant](#)

Advanced

Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 2000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

EMB FILL1 (S-Case) AWT

Model: Mohr-Coulomb
Unit Weight: 111 pcf
Cohesion: 75 psf
Phi: 26 °
Phi-B: 0 °

BEACH SAND, EL. -33 TO -41

Model: Shear/Normal Fn.
Unit Weight: 122 pcf
Strength Function: Sand
Phi-B: 0 °

BAY SOUND CLAY (S-Case)

Model: Spatial Mohr-Coulomb
Unit Weight: 106 pcf
Cohesion: 0 psf
Phi: 26 °
Phi-B: 0 °

Lacustrine (S-Case)

Model: Spatial Mohr-Coulomb
Unit Weight: 103 pcf
Cohesion: 0 psf
Phi: 26 °
Phi-B: 0 °

EMB FILL2 (S-Case) AWT

Model: Spatial Mohr-Coulomb
Unit Weight: 101 pcf
Cohesion: 75 psf
Phi: 26 °
Phi-B: 0 °

FILL, EL. +0.5 TO -6 (Protected)

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [101 pcf](#)

Cohesion: [0 psf](#)

Phi: [23 °](#)

Phi-B: [0 °](#)

FILL, EL. -6 TO -10/-15 (S-Case)

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [92 pcf](#)

Cohesion: [0 psf](#)

Phi: [26 °](#)

Phi-B: [0 °](#)

FILL (Hydraulic) (S-Case)

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [82 pcf](#)

Cohesion: [0 psf](#)

Phi: [26 °](#)

Phi-B: [0 °](#)

EMB FILL2 (S-Case) BWT

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [101 pcf](#)

Cohesion: [0 psf](#)

Phi: [26 °](#)

Phi-B: [0 °](#)

Slip Surface Entry and Exit

Left Projection: [Range](#)

Left-Zone Left Coordinate: [\(105, -11.85345\) ft](#)

Left-Zone Right Coordinate: [\(140, -5.67636\) ft](#)

Left-Zone Increment: [7](#)

Right Projection: [Range](#)

Right-Zone Left Coordinate: [\(145, -3.75247\) ft](#)

Right-Zone Right Coordinate: [\(195, 6.41026\) ft](#)

Right-Zone Increment: [10](#)

Radius Increments: [15](#)

Slip Surface Limits

Left Coordinate: [\(97.5, -12.5\) ft](#)

Right Coordinate: [\(310, 0.5\) ft](#)

Reinforcements

Reinforcement 1

Type: [Pile](#)
Outside Point: [\(200, 12.9\) ft](#)
Inside Point: [\(200, 3.5\) ft](#)
Slip Surface Intersection: [\(0, 0\) ft](#)
Total Length: [9.4 ft](#)
Reinforcement Direction: [90 °](#)
Applied Load Option: [Variable](#)
F of S Dependent: [No](#)
Pile Spacing: [1 ft](#)
Shear Capacity: [0 lbs](#)
Shear Safety Factor: [1](#)
Shear Load Used: [0 lbs](#)
Shear Option: [Parallel to Slip](#)
Resisting Force Used: [0 lbs/ft](#)

Shear/Normal Strength Functions

Sand

Model: [Spline Data Point Function](#)
Function: [Shear Stress vs. Normal Stress](#)
 Curve Fit to Data: [100 %](#)
 Segment Curvature: [0 %](#)
Y-Intercept: [0](#)
Data Points: [Normal Stress \(psf\), Shear Stress \(psf\)](#)
 Data Point: [\(-10000, 0\)](#)
 Data Point: [\(0, 0\)](#)
 Data Point: [\(10000, 6494\)](#)
Estimation Properties
 Intact Rock Param.: [10](#)
 Geological Strength: [100](#)
 Disturbance Factor: [0](#)
 SigmaC: [600000 psf](#)
 Sigma3: [300000 psf](#)
 Num. Points: [20](#)

Regions

	Points	Area (ft²)	Material
Region 1	7,18,19,20	4.8	
Region 2	7,20,8,9,21	102.9	EMB FILL1 (S-Case) AWT
Region 3	12,11,39,44,35,15,16,46	3091.25	Lacustrine (S-Case)
Region 4	13,12,46,16,17,47	1700	BEACH SAND, EL. -33 TO -41
Region 5	25,13,47,17,26,48	6162.5	BAY SOUND CLAY (S-Case)
Region 6	7,27,6,23,24,5,4,29,21	144.9	EMB FILL1 (S-Case) AWT
Region 7	38,40,31,28,1,42,11,39	428.68444	FILL (Hydraulic) (S-Case)
Region 8	34,33,32,14	742.5	FILL, EL. -6 TO -10/-15 (S-Case)

Region 9	41,36,3,30,37	47.411173	EMB FILL2 (S-Case) BWT
Region 10	36,41,53,52,51	4.9451195	EMB FILL2 (S-Case) BWT
Region 11	64,33,32,66,65	391.475	EMB FILL2 (S-Case) BWT
Region 12	35,34,14,15	330	FILL (Hydraulic) (S-Case)
Region 13	59,22,41,37,49,33,64,63,62,61,60	344.925	EMB FILL2 (S-Case) BWT
Region 14	40,37,49,33,34,43	356.75	FILL, EL. -6 TO -10/-15 (S-Case)
Region 15	39,38,40,43,34,35,44	521	FILL (Hydraulic) (S-Case)
Region 16	41,53,54,55,56,57,58,59,22	71.98	EMB FILL2 (S-Case) BWT
Region 17	31,2,30,37,40	98.734098	FILL, EL. -6 TO -10/-15 (S-Case)
Region 18	52,53,29	0.012394	FILL, EL. +0.5 TO -6 (Protected)
Region 19	29,53,54,55,56,57,58,59,21	17.02	EMB FILL2 (S-Case) AWT
Region 20	21,59,60,61,62,63,64,9	34.075	EMB FILL2 (S-Case) AWT
Region 21	9,64,65,66,10	144.775	FILL, EL. +0.5 TO -6 (Protected)

Points

	X (ft)	Y (ft)
Point 1	97.5	-12.5
Point 2	128.9	-8.5
Point 3	140.7	-5.5
Point 4	157.9	1.5
Point 5	172.9	2.5
Point 6	187.9	5.5
Point 7	200	6.5
Point 8	206.8	6.5
Point 9	227.5	0.5
Point 10	310	0.5
Point 11	97.5	-18
Point 12	97.5	-33
Point 13	97.5	-41
Point 14	310	-15
Point 15	310	-19
Point 16	310	-33
Point 17	310	-41
Point 18	200	12.9
Point 19	200.5	12.9
Point 20	201	6.5
Point 21	200	0.5
Point 22	200	-1.5
Point 23	182.9	4.5
Point 24	177.9	3.5
Point 25	97.5	-70
Point 26	310	-70
Point 27	195.7	6.5
Point 28	120.7	-10.5
Point 29	155.5	0.5
Point 30	138.71539	-6
Point 31	122.76222	-10

Point 32	310	-6
Point 33	227.5	-6
Point 34	227.5	-15
Point 35	227.5	-19
Point 36	150.54249	-1.5
Point 37	155.5	-6
Point 38	155.5	-14
Point 39	155.5	-18
Point 40	155.5	-10
Point 41	155.5	-1.5
Point 42	97.5	-14
Point 43	200	-10
Point 44	200	-18
Point 45	310	-150
Point 46	200	-33
Point 47	200	-41
Point 48	200	-70
Point 49	200	-6
Point 50	97.5	0
Point 51	154.26062	0
Point 52	155.25212	0.4
Point 53	155.5	0.4
Point 54	160	0.3
Point 55	173.2	0.1
Point 56	184	0
Point 57	192	-0.1
Point 58	196.5	0.1
Point 59	200	0.4
Point 60	200.6	-0.2
Point 61	203.8	-0.5
Point 62	208.5	-0.7
Point 63	219.2	-0.9
Point 64	227.5	-1
Point 65	258.9	-1.2
Point 66	310	-1.5

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.42	(127.986, 45.64)	7.355974	(155.5, 0.5)	(141.717, -5.08654)
2	1266	1.51	(127.986, 45.64)	52.704	(154.531, 0.109011)	(140, -5.67636)

Slices of Slip Surface: Optimized

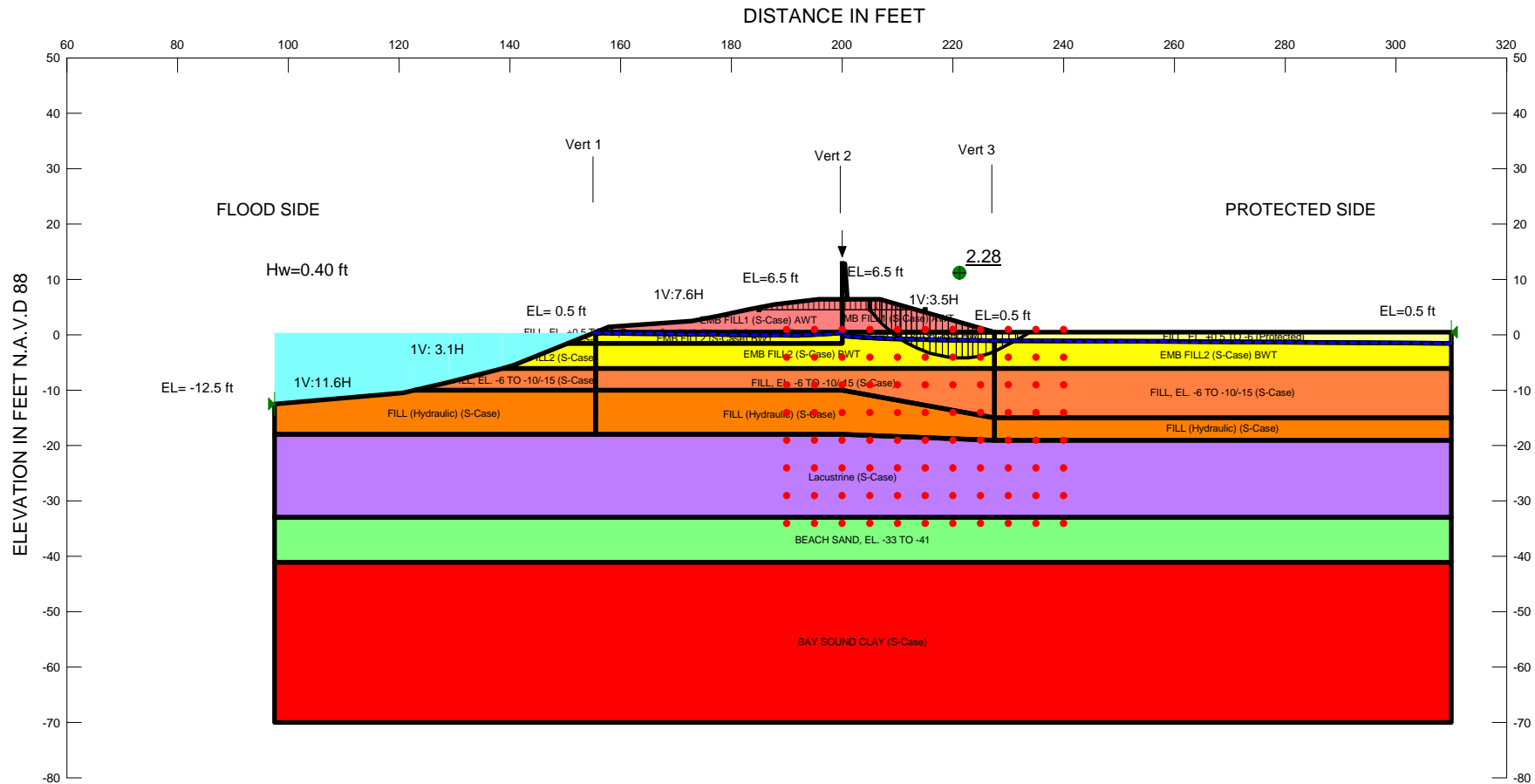
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	141.72045	-5.0854835	342.28546	342.59288	0.14994052	0
2	Optimized	141.9331	-4.999275	336.90564	336.92774	0.010779314	0
3	Optimized	142.3523	-4.828965	326.27513	326.29723	0.010779314	0

4	Optimized	142.8248	-4.639505	314.43161	314.60839	0.086224301	0
5	Optimized	143.3506	-4.430895	301.36712	301.75605	0.18969346	0
6	Optimized	143.8764	-4.222285	288.30264	288.88603	0.28454019	0
7	Optimized	144.37205	-4.018685	275.63205	276.00746	0.18310107	0
8	Optimized	144.7429	-3.86486	266.0562	266.42329	0.17903959	0
9	Optimized	145.1446	-3.7013025	255.86354	256.14398	0.13677817	0
10	Optimized	145.6718	-3.4832475	242.27988	242.4201	0.068389087	0
11	Optimized	146.18605	-3.27445	229.24515	229.44902	0.099435171	0
12	Optimized	146.68735	-3.07491	216.77187	217.12401	0.17175166	0
13	Optimized	147.18865	-2.87537	204.28006	204.81754	0.26214727	0
14	Optimized	147.6878	-2.67165	191.56558	192.01113	0.21730659	0
15	Optimized	148.18475	-2.46375	178.65779	178.85086	0.094166187	0
16	Optimized	148.65385	-2.279295	167.10319	167.66937	0.27614664	0
17	Optimized	149.0952	-2.118285	156.92464	158.22516	0.63430676	0
18	Optimized	149.5366	-1.957275	146.74609	148.78308	0.99350503	0
19	Optimized	149.87505	-1.828395	138.64037	140.90602	1.1050303	0
20	Optimized	150.26765	-1.6818105	129.40233	132.32339	1.4246986	0
21	Optimized	150.65945	-1.5418005	120.57063	124.2094	1.7747488	0
22	Optimized	151.0061	-1.4179185	112.77493	117.00994	2.0655498	0
23	Optimized	151.4655	-1.253755	102.39651	107.4658	2.4724611	0
24	Optimized	151.9249	-1.0895915	92.018082	97.92372	2.8803722	0
25	Optimized	152.19215	-0.997365	86.16538	92.972781	3.3201917	0
26	Optimized	152.4696	-0.881945	78.984093	85.118224	2.9918156	0
27	Optimized	152.9494	-0.671395	65.954314	71.435715	2.6734581	0
28	Optimized	153.4292	-0.460845	52.922625	57.753206	2.3560315	0
29	Optimized	153.90895	-0.250295	39.892845	44.070696	2.037674	0
30	Optimized	154.2047	-0.1251095	32.124233	36.212342	1.9939043	0
31	Optimized	154.5085	-0.01689495	25.308374	29.93719	2.2576244	0
32	Optimized	155.00425	0.15971315	14.177934	19.69527	2.6909844	0
33	Optimized	155.29785	0.2643136	7.582926	14.659891	3.4516665	0
34	Optimized	155.3914	0.340305	3.0602853	9.0142211	2.9039286	0
35	Optimized	155.4696	0.4379251	-2.6522961	3.6264304	1.5393284	0

Slices of Slip Surface: 1266

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	1266	140.35	-5.591889	373.82438	374.07434	0.12191664	0
2	1266	140.94605	-5.444995	364.10198	367.09579	1.4601768	0
3	1266	141.43815	-5.317611	355.27632	361.56336	3.066391	0
4	1266	141.9303	-5.185143	346.31843	355.5285	4.4920539	0
5	1266	142.42245	-5.0475505	337.15338	348.9768	5.7666715	0
6	1266	142.91455	-4.904792	327.7656	341.91375	6.9005164	0
7	1266	143.40665	-4.7568235	318.12053	334.34522	7.9133106	0
8	1266	143.8988	-4.603599	308.28115	326.27745	8.7773841	0
9	1266	144.39095	-4.4450705	298.15526	317.67825	9.5219985	0
10	1266	144.88305	-4.2811875	287.74846	308.55489	10.147973	0
11	1266	145.37515	-4.111897	277.04737	298.8958	10.656194	0
12	1266	145.8673	-3.937143	266.0581	288.72819	11.056939	0

13	1266	146.35945	-3.756868	254.63485	278.00336	11.397583	0
14	1266	146.85155	-3.5710115	242.91877	266.74959	11.623067	0
15	1266	147.34365	-3.3795095	230.89821	254.95759	11.734543	0
16	1266	147.8358	-3.182296	218.58096	242.61885	11.724059	0
17	1266	148.32795	-2.9793015	206.34991	229.78172	11.428458	0
18	1266	148.82005	-2.770453	193.74195	216.40117	11.051641	0
19	1266	149.31215	-2.5556745	180.45284	202.41504	10.711685	0
20	1266	149.8043	-2.334886	166.82442	187.8555	10.257546	0
21	1266	150.29645	-2.1080045	152.8598	172.74024	9.6963408	0
22	1266	150.79575	-1.8714465	138.46304	156.799	8.9430464	0
23	1266	151.30225	-1.6249315	123.54611	140.01455	8.0321982	0
24	1266	151.7809	-1.3859335	109.00338	123.58716	7.1129887	0
25	1266	152.23175	-1.155066	94.907243	107.57808	6.1799824	0
26	1266	152.68265	-0.9186878	80.50233	91.069424	5.1539162	0
27	1266	153.1335	-0.67671445	65.782485	74.053051	4.0338249	0
28	1266	153.58435	-0.42905795	50.744307	56.527758	2.8207776	0
29	1266	154.0352	-0.17562605	35.383266	38.483712	1.5121887	0
30	1266	154.3957	0.03077845	22.893023	23.724425	0.40550192	0



Name: EMB FILL1 (S-Case) AWT Model: Mohr-Coulomb Unit Weight: 111 pcf Cohesion: 75 psf Phi: 26 °
Name: BEACH SAND, EL. -33 TO -41 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand
Name: BAY SOUND CLAY (S-Case) Model: Spatial Mohr-Coulomb Unit Weight: 106 pcf Cohesion: 0 psf Phi: 26 °
Name: Lacustrine (S-Case) Model: Spatial Mohr-Coulomb Unit Weight: 103 pcf Cohesion: 0 psf Phi: 26 °
Name: EMB FILL2 (S-Case) AWT Model: Spatial Mohr-Coulomb Unit Weight: 101 pcf Cohesion: 75 psf Phi: 26 °
Name: FILL, EL. +0.5 TO -6 (Protected) Model: Spatial Mohr-Coulomb Unit Weight: 101 pcf Cohesion: 0 psf Phi: 23 °
Name: FILL, EL. -6 TO -10/-15 (S-Case) Model: Spatial Mohr-Coulomb Unit Weight: 92 pcf Cohesion: 0 psf Phi: 26 °
Name: FILL (Hydraulic) (S-Case) Model: Spatial Mohr-Coulomb Unit Weight: 82 pcf Cohesion: 0 psf Phi: 26 °
Name: EMB FILL2 (S-Case) BWT Model: Spatial Mohr-Coulomb Unit Weight: 101 pcf Cohesion: 0 psf Phi: 26 °

GENERAL NOTES

CLASSIFICATION STRATIFICATION
SHEAR STRENGTHS AND UNIT WEIGHTS OF
THE SOIL WERE BASED ON THE RESULTS OF
UNDISTURBED BORINGS AND CPT DATA. SEE
BOTH BORING AND CPT DATA PLATES.

WHERE INDICATED, SHEAR STRENGTHS BETWEEN
VERTICALS WERE ASSUMED TO VARY LINEARLY
BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

Hw IS CANAL WATER LEVEL

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 20A,
PROTECTED SIDE STABILITY ANALYSIS,
CASE: NWL S-Case P/S (Block)
STA. 92+20 TO 93+46 EAST
ORLEANS PARISH, LOUISIANA

NWL S-Case P/S (Block)

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File Information

Created By: [Liljegren, James](#)
Revision Number: [339](#)
Last Edited By: [Higgins, James](#)
Date: [10/1/2013](#)
Time: [10:35:30 AM](#)
File Name: [Reach 20A.gsz](#)
Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix F NWL\](#)
Last Solved Date: [10/1/2013](#)
Last Solved Time: [10:41:56 AM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Strength Units: [psf](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

NWL S-Case P/S (Block)

Kind: [SLOPE/W](#)
Parent: [Normal Water Level at +0.40ft \(seepage\)](#)
Method: [Spencer](#)
Settings
 PWP Conditions Source: [Parent Analysis](#)
Slip Surface
 Direction of movement: [Left to Right](#)
 Use Passive Mode: [No](#)
 Slip Surface Option: [Block](#)
 Critical slip surfaces saved: [1](#)
 Optimize Critical Slip Surface Location: [Yes](#)
 Tension Crack
 Tension Crack Option: [Tension Crack Line](#)
 Percentage Wet: [0](#)
 Tension Crack Fluid Unit Weight: [62.4 pcf](#)
FOS Distribution
 FOS Calculation Option: [Constant](#)

Restrict Block Crossing: [Yes](#)

Advanced

Number of Slices: [30](#)

Optimization Tolerance: [0.01](#)

Minimum Slip Surface Depth: [0.1 ft](#)

Optimization Maximum Iterations: [2000](#)

Optimization Convergence Tolerance: [1e-007](#)

Starting Optimization Points: [8](#)

Ending Optimization Points: [16](#)

Complete Passes per Insertion: [1](#)

Driving Side Maximum Convex Angle: [5 °](#)

Resisting Side Maximum Convex Angle: [1 °](#)

Materials

EMB FILL1 (S-Case) AWT

Model: [Mohr-Coulomb](#)

Unit Weight: [111 pcf](#)

Cohesion: [75 psf](#)

Phi: [26 °](#)

Phi-B: [0 °](#)

BEACH SAND, EL. -33 TO -41

Model: [Shear/Normal Fn.](#)

Unit Weight: [122 pcf](#)

Strength Function: [Sand](#)

Phi-B: [0 °](#)

BAY SOUND CLAY (S-Case)

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [106 pcf](#)

Cohesion: [0 psf](#)

Phi: [26 °](#)

Phi-B: [0 °](#)

Lacustrine (S-Case)

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [103 pcf](#)

Cohesion: [0 psf](#)

Phi: [26 °](#)

Phi-B: [0 °](#)

EMB FILL2 (S-Case) AWT

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [101 pcf](#)

Cohesion: [75 psf](#)

Phi: [26 °](#)

Phi-B: 0 °

FILL, EL. +0.5 TO -6 (Protected)

Model: Spatial Mohr-Coulomb

Unit Weight: 101 pcf

Cohesion: 0 psf

Phi: 23 °

Phi-B: 0 °

FILL, EL. -6 TO -10/-15 (S-Case)

Model: Spatial Mohr-Coulomb

Unit Weight: 92 pcf

Cohesion: 0 psf

Phi: 26 °

Phi-B: 0 °

FILL (Hydraulic) (S-Case)

Model: Spatial Mohr-Coulomb

Unit Weight: 82 pcf

Cohesion: 0 psf

Phi: 26 °

Phi-B: 0 °

EMB FILL2 (S-Case) BWT

Model: Spatial Mohr-Coulomb

Unit Weight: 101 pcf

Cohesion: 0 psf

Phi: 26 °

Phi-B: 0 °

Slip Surface Limits

Left Coordinate: (97.5, -12.5) ft

Right Coordinate: (310, 0.5) ft

Slip Surface Block

Left Grid

Upper Left: (190, 1) ft

Lower Left: (190, -34) ft

Lower Right: (215, -34) ft

X Increments: 5

Y Increments: 7

Starting Angle: 135 °

Ending Angle: 155 °

Angle Increments: 4

Right Grid

Upper Left: (220, 1) ft

Lower Left: (220, -34) ft
Lower Right: (240, -34) ft
X Increments: 4
Y Increments: 7
Starting Angle: 25 °
Ending Angle: 45 °
Angle Increments: 4

Reinforcements

Reinforcement 1

Type: [Pile](#)
Outside Point: (200, 12.9) ft
Inside Point: (200, 3.5) ft
Slip Surface Intersection: (0, 0) ft
Total Length: 9.4 ft
Reinforcement Direction: 90 °
Applied Load Option: [Variable](#)
F of S Dependent: [No](#)
Pile Spacing: 1 ft
Shear Capacity: 0 lbs
Shear Safety Factor: 1
Shear Load Used: 0 lbs
Shear Option: [Parallel to Slip](#)
Resisting Force Used: 0 lbs/ft

Tension Crack Line

	X (ft)	Y (ft)
	185	4.5
	215	4.5

Shear/Normal Strength Functions

Sand

Model: [Spline Data Point Function](#)
Function: [Shear Stress vs. Normal Stress](#)
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 0
Data Points: [Normal Stress \(psf\), Shear Stress \(psf\)](#)
Data Point: (-10000, 0)
Data Point: (0, 0)
Data Point: (10000, 6494)
Estimation Properties
Intact Rock Param.: 10

Geological Strength: 100

Disturbance Factor: 0

SigmaC: 600000 psf

Sigma3: 300000 psf

Num. Points: 20

Regions

	Points	Area (ft²)	Material
Region 1	7,18,19,20	4.8	
Region 2	7,20,8,9,21	102.9	EMB FILL1 (S-Case) AWT
Region 3	12,11,39,44,35,15,16,46	3091.25	Lacustrine (S-Case)
Region 4	13,12,46,16,17,47	1700	BEACH SAND, EL. -33 TO -41
Region 5	25,13,47,17,26,48	6162.5	BAY SOUND CLAY (S-Case)
Region 6	7,27,6,23,24,5,4,29,21	144.9	EMB FILL1 (S-Case) AWT
Region 7	38,40,31,28,1,42,11,39	428.68444	FILL (Hydraulic) (S-Case)
Region 8	34,33,32,14	742.5	FILL, EL. -6 TO -10/-15 (S-Case)
Region 9	41,36,3,30,37	47.411173	EMB FILL2 (S-Case) BWT
Region 10	36,41,53,52,51	4.9451195	EMB FILL2 (S-Case) BWT
Region 11	64,33,32,66,65	391.475	EMB FILL2 (S-Case) BWT
Region 12	35,34,14,15	330	FILL (Hydraulic) (S-Case)
Region 13	59,22,41,37,49,33,64,63,62,61,60	344.925	EMB FILL2 (S-Case) BWT
Region 14	40,37,49,33,34,43	356.75	FILL, EL. -6 TO -10/-15 (S-Case)
Region 15	39,38,40,43,34,35,44	521	FILL (Hydraulic) (S-Case)
Region 16	41,53,54,55,56,57,58,59,22	71.98	EMB FILL2 (S-Case) BWT
Region 17	31,2,30,37,40	98.734098	FILL, EL. -6 TO -10/-15 (S-Case)
Region 18	52,53,29	0.012394	FILL, EL. +0.5 TO -6 (Protected)
Region 19	29,53,54,55,56,57,58,59,21	17.02	EMB FILL2 (S-Case) AWT
Region 20	21,59,60,61,62,63,64,9	34.075	EMB FILL2 (S-Case) AWT
Region 21	9,64,65,66,10	144.775	FILL, EL. +0.5 TO -6 (Protected)

Points

	X (ft)	Y (ft)
Point 1	97.5	-12.5
Point 2	128.9	-8.5
Point 3	140.7	-5.5
Point 4	157.9	1.5
Point 5	172.9	2.5
Point 6	187.9	5.5
Point 7	200	6.5
Point 8	206.8	6.5
Point 9	227.5	0.5
Point 10	310	0.5
Point 11	97.5	-18
Point 12	97.5	-33
Point 13	97.5	-41
Point 14	310	-15

Point 15	310	-19
Point 16	310	-33
Point 17	310	-41
Point 18	200	12.9
Point 19	200.5	12.9
Point 20	201	6.5
Point 21	200	0.5
Point 22	200	-1.5
Point 23	182.9	4.5
Point 24	177.9	3.5
Point 25	97.5	-70
Point 26	310	-70
Point 27	195.7	6.5
Point 28	120.7	-10.5
Point 29	155.5	0.5
Point 30	138.71539	-6
Point 31	122.76222	-10
Point 32	310	-6
Point 33	227.5	-6
Point 34	227.5	-15
Point 35	227.5	-19
Point 36	150.54249	-1.5
Point 37	155.5	-6
Point 38	155.5	-14
Point 39	155.5	-18
Point 40	155.5	-10
Point 41	155.5	-1.5
Point 42	97.5	-14
Point 43	200	-10
Point 44	200	-18
Point 45	310	-150
Point 46	200	-33
Point 47	200	-41
Point 48	200	-70
Point 49	200	-6
Point 50	97.5	0
Point 51	154.26062	0
Point 52	155.25212	0.4
Point 53	155.5	0.4
Point 54	160	0.3
Point 55	173.2	0.1
Point 56	184	0
Point 57	192	-0.1
Point 58	196.5	0.1
Point 59	200	0.4
Point 60	200.6	-0.2
Point 61	203.8	-0.5
Point 62	208.5	-0.7

Point 63	219.2	-0.9
Point 64	227.5	-1
Point 65	258.9	-1.2
Point 66	310	-1.5

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	2.28	(219.133, 5.5)	13.17032	(204.891, 6.5)	(234.001, 0.5)
2	1431	2.42	(219.133, 5.5)	14.035	(202.861, 6.5)	(234.65, 0.5)

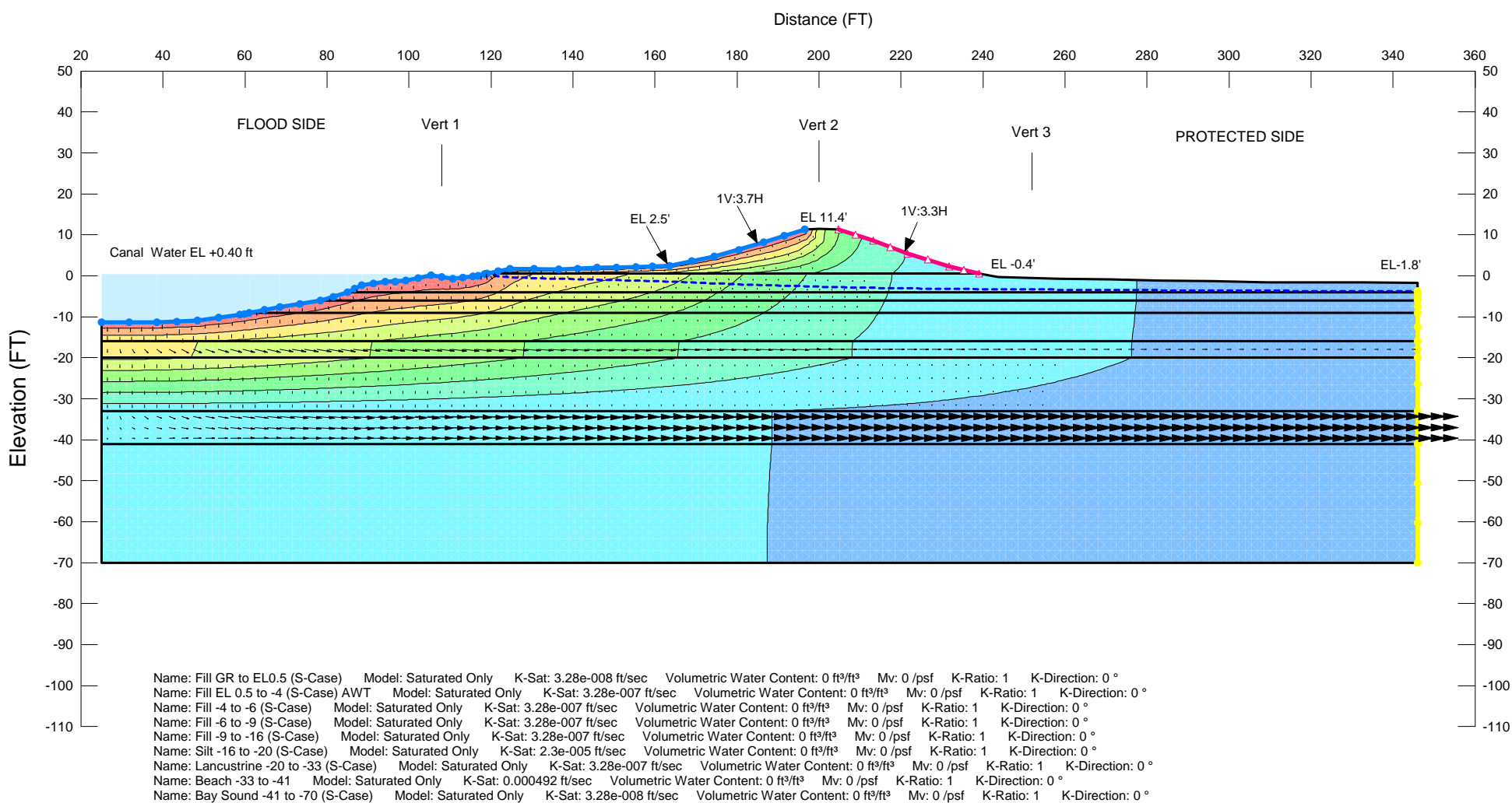
Slices of Slip Surface: **Optimized**

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	205.05765	4.31519	-300.36214	153.53493	74.883989	75
2	Optimized	205.6185	3.7123055	-263.87517	205.70633	100.32968	75
3	Optimized	206.40615	2.876156	-213.57592	273.95591	133.61722	75
4	Optimized	206.97595	2.2712805	-177.31821	319.15368	155.66165	75
5	Optimized	207.5857	1.68836	-142.69445	370.91195	180.90585	75
6	Optimized	208.47215	0.87891	-94.67891	417.91028	203.82846	75
7	Optimized	209.31255	0.16495235	-52.499451	477.52529	232.90465	75
8	Optimized	210.08805	-0.436303	-17.062627	506.05982	246.82186	75
9	Optimized	210.53655	-0.78403535	3.5346394	539.11934	261.22211	0
10	Optimized	211.08055	-1.09123	21.47576	592.46713	278.4911	0
11	Optimized	212.047	-1.61141	51.954193	612.98531	273.63316	0
12	Optimized	213.01345	-2.13159	82.629425	633.51261	268.68368	0
13	Optimized	214.07805	-2.6108675	110.85582	679.15387	277.17748	0
14	Optimized	215.24075	-3.0492425	136.60013	686.45306	268.18119	0
15	Optimized	216.39015	-3.4124725	157.88616	712.81271	270.65576	0
16	Optimized	217.52625	-3.7005575	174.68583	706.1065	259.19118	0
17	Optimized	218.64715	-3.9183525	187.23526	718.74818	259.23617	0
18	Optimized	219.90965	-4.0867775	196.69477	695.46076	243.26443	0
19	Optimized	221.1433	-4.17923	201.55369	694.60733	240.47833	0
20	Optimized	222.19125	-4.17479	200.57082	659.22426	223.70023	0
21	Optimized	223.17425	-4.1137475	196.13711	645.56487	219.20057	0
22	Optimized	224.09235	-3.9961025	188.25014	601.00888	201.31589	0
23	Optimized	225.2354	-3.774565	173.77996	557.85815	187.32745	0
24	Optimized	226.6082	-3.353335	146.75071	484.93518	164.94359	0
25	Optimized	227.3985	-3.0443535	127.04889	439.17286	152.23303	0
26	Optimized	228.2204	-2.6357035	101.14689	386.85656	139.34992	0
27	Optimized	229.53955	-1.964248	58.542328	311.1756	123.21748	0
28	Optimized	230.7371	-1.337704	18.771013	236.74265	106.31187	0
29	Optimized	231.48915	-0.944251	-6.1576647	184.33101	78.243872	0
30	Optimized	232.232	-0.5230525	-32.835251	133.77379	56.783605	0
31	Optimized	233.4112	0.1589825	-76.030024	44.591018	18.927764	0

Slices of Slip Surface: **1431**

	Slip	X (ft)	Y (ft)	PWP (psf)	Base Normal	Frictional	Cohesive
--	------	--------	--------	-----------	-------------	------------	----------

	Surface				Stress (psf)	Strength (psf)	Strength (psf)
1	1431	203.35315	4.1552125	-287.14804	199.59459	97.348786	75
2	1431	204.338	3.465638	-245.82507	262.3526	127.95791	75
3	1431	205.3228	2.7760635	-204.85146	325.10229	158.56298	75
4	1431	206.3076	2.086489	-164.34364	387.8603	189.17211	75
5	1431	207.24335	1.4312765	-126.05077	435.79162	212.54977	75
6	1431	208.13	0.8104255	-89.756204	468.90258	228.69907	75
7	1431	209.014	0.19141995	-53.579693	499.38382	243.56576	75
8	1431	209.8954	-0.4257401	-17.352456	527.23734	257.15083	75
9	1431	210.9191	-1.1425301	24.864671	575.60674	268.61485	0
10	1431	212.0851	-1.95895	73.205774	616.78323	265.12044	0
11	1431	213.25105	-2.77537	121.84335	657.99485	261.49856	0
12	1431	214.417	-3.59179	170.74087	699.22052	257.75675	0
13	1431	215.525	-4	194.80952	860.99048	324.91816	0
14	1431	216.575	-4	193.91429	826.12381	308.34919	0
15	1431	217.625	-4	193.06667	791.25714	291.75699	0
16	1431	218.675	-4	192.24762	756.39048	275.15086	0
17	1431	219.78	-4	191.43103	719.69828	257.65315	0
18	1431	220.94	-4	190.60345	681.17241	239.26647	0
19	1431	222.1	-4	189.80172	642.65517	220.87138	0
20	1431	223.26	-4	189.02586	604.12931	202.45948	0
21	1431	224.42	-4	188.28448	565.60345	184.03076	0
22	1431	225.625	-3.7085575	169.4361	579.58762	200.04426	0
23	1431	226.875	-3.125673	132.43698	461.64432	160.56515	0
24	1431	227.98505	-2.6080415	99.559145	376.40401	135.02626	0
25	1431	228.9552	-2.155663	70.8218	323.85449	123.41229	0
26	1431	229.92535	-1.7032845	42.047086	271.31432	111.8211	0
27	1431	230.89545	-1.250906	13.277044	218.77414	100.22763	0
28	1431	231.92545	-0.7705974	-17.226068	157.06854	66.67164	0
29	1431	233.0154	-0.26235834	-49.524529	94.246114	40.005102	0
30	1431	234.10535	0.24588056	-81.789728	31.41454	13.334681	0



CROSS SECTION AT STA 95+00 EAST

GENERAL NOTES

CLASSIFICATION STRATIFICATION
 SHEAR STRENGTHS AND UNIT WEIGHTS OF
 THE SOIL WERE BASED ON THE RESULTS OF
 UNDISTURBED BORINGS AND CPT DATA. SEE
 BOTH BORING AND CPT DATA PLATES.

WHERE INDICATED, SHEAR STRENGTHS BETWEEN
 VERTICALS WERE ASSUMED TO VARY LINEARLY
 BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

LAKE PONTCHARTRAIN, LA. AND VICINITY
 HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL,
 REMEDIATION OF CANAL WALLS AND LEVEES
 FLOOD SIDE STABILITY ANALYSIS,
 CASE: Name: Normal Water Level at +0.40ft (seepage)
 REACH 20B, STA. 93+46 TO STA. 103+00 EAST
 ORLEANS PARISH, LOUISIANA

Normal Water Level at +0.40ft (seepage)

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File Information

Created By: [Vicky Curtis](#)
Revision Number: [145](#)
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Time: [10:55:34 AM](#)
File Name: [Reach 20B.gsz](#)
Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix F NWL\](#)
Last Solved Date: [10/1/2013](#)
Last Solved Time: [10:56:06 AM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Mass(M) Units: [lbs](#)
Mass Flux Units: [lbs/sec](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

Normal Water Level at +0.40ft (seepage)

Kind: [SEEP/W](#)
Method: [Steady-State](#)
Settings
 Include Air Flow: [No](#)
Control
 Apply Runoff: [Yes](#)
Convergence
 Convergence Type: [Gauss Point K](#)
 Convergence Settings
 Maximum Number of Iterations: [500](#)
 Tolerance: [0.01](#)
 Maximum Change in K: [0.1](#)
 Rate of Change in K: [1.02](#)
 Minimum Change in K: [0.0001](#)
Equation Solver: [Parallel Direct](#)
Potential Seepage Max # of Reviews: [10](#)

Time

Starting Time: 0 sec

Duration: 0 sec

Ending Time: 0 sec

Materials

Fill GR to EL0.5 (S-Case)

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-008 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

Fill EL 0.5 to -4 (S-Case) AWT

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-007 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

Fill -4 to -6 (S-Case)

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-007 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

Fill -6 to -9 (S-Case)

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-007 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

Fill -9 to -16 (S-Case)

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-007 ft/sec

Volumetric Water Content: 0 ft³/ft³
Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

Silt -16 to -20 (S-Case)

Model: Saturated Only

Hydraulic

K-Sat: 2.3e-005 ft/sec
Volumetric Water Content: 0 ft³/ft³
Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

Lancustrine -20 to -33 (S-Case)

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-007 ft/sec
Volumetric Water Content: 0 ft³/ft³
Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

Beach -33 to -41

Model: Saturated Only

Hydraulic

K-Sat: 0.000492 ft/sec
Volumetric Water Content: 0 ft³/ft³
Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

Bay Sound -41 to -70 (S-Case)

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-008 ft/sec
Volumetric Water Content: 0 ft³/ft³
Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

Boundary Conditions

Potential Seepage Face

Review: true

Type: Total Flux (Q) 0

Canal Water

Type: Head (H) 0.4

Protected Side Boundary Condition = -3.8 ft

Type: Head (H) -3.8

Regions

	Material	Points	Area (ft²)
Region 1	Fill GR to EL0.5 (S-Case)	35,13,14,15,16,17,18,19,20,21,22,23,24,25,36	520.247
Region 2	Fill EL 0.5 to -4 (S-Case) AWT	37,7,8,9,10,11,12,52,53,54,55,56,57,58,59,60,61,62,38	403.62472
Region 3	Fill -4 to -6 (S-Case)	6,37,38,39	529.805
Region 4	Fill -6 to -9 (S-Case)	40,5,6,39,41	827.8375
Region 5	Fill -9 to -16 (S-Case)	1,2,3,4,40,41,42,43	2180.9675
Region 6	Silt -16 to -20 (S-Case)	43,42,44,45	1284
Region 7	Lancustrine -20 to -33 (S-Case)	45,44,46,47	4173
Region 8	Beach -33 to -41	47,46,50,51	2568
Region 9	Bay Sound -41 to -70 (S-Case)	51,50,48,49	9309
Region 10	Fill EL 0.5 to -4 (S-Case) AWT	35,52,53,54,55,56,57,58,59,60,61,62,34,33,32,31,30,29,28,27,26,36	539.23777

Lines

	Start Point	End Point	Hydraulic Boundary
Line 1	35	13	Canal Water
Line 2	13	14	Canal Water
Line 3	14	15	Canal Water
Line 4	15	16	Canal Water
Line 5	16	17	Canal Water
Line 6	17	18	Canal Water
Line 7	18	19	Canal Water
Line 8	19	20	Canal Water
Line 9	20	21	
Line 10	21	22	
Line 11	22	23	Potential Seepage Face
Line 12	23	24	Potential Seepage Face
Line 13	24	25	Potential Seepage Face
Line 14	25	36	Potential Seepage Face
Line 15	36	35	
Line 16	37	7	Canal Water

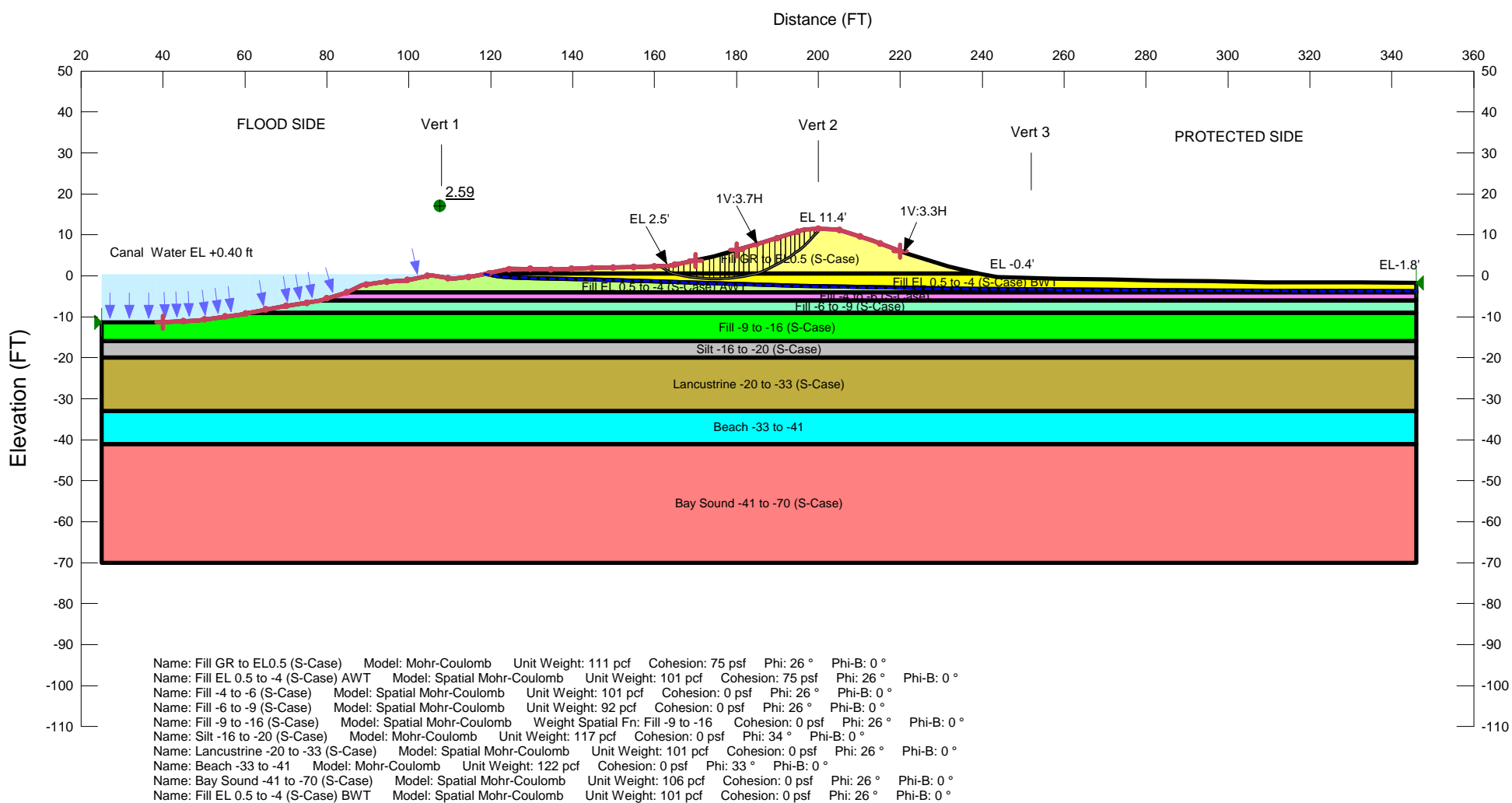
Line 17	7	8	Canal Water
Line 18	8	9	Canal Water
Line 19	9	10	Canal Water
Line 20	10	11	Canal Water
Line 21	11	12	Canal Water
Line 22	38	37	
Line 23	6	37	Canal Water
Line 24	38	39	Protected Side Boundary Condition = -3.8 ft
Line 25	39	6	
Line 26	40	5	Canal Water
Line 27	5	6	Canal Water
Line 28	39	41	Protected Side Boundary Condition = -3.8 ft
Line 29	41	40	
Line 30	1	2	Canal Water
Line 31	2	3	Canal Water
Line 32	3	4	Canal Water
Line 33	4	40	Canal Water
Line 34	41	42	Protected Side Boundary Condition = -3.8 ft
Line 35	42	43	
Line 36	43	1	
Line 37	42	44	Protected Side Boundary Condition = -3.8 ft
Line 38	44	45	
Line 39	45	43	
Line 40	44	46	Protected Side Boundary Condition = -3.8 ft
Line 41	46	47	
Line 42	47	45	
Line 43	46	50	Protected Side Boundary Condition = -3.8 ft
Line 44	50	51	
Line 45	51	47	
Line 46	50	48	Protected Side Boundary Condition = -3.8 ft
Line 47	48	49	
Line 48	49	51	
Line 49	12	52	Canal Water
Line 50	62	38	Protected Side Boundary Condition = -3.8 ft
Line 51	52	53	
Line 52	53	54	
Line 53	54	55	
Line 54	55	56	
Line 55	56	57	
Line 56	57	58	
Line 57	58	59	
Line 58	59	60	
Line 59	60	61	
Line 60	61	62	
Line 61	35	52	
Line 62	62	34	
Line 63	34	33	
Line 64	33	32	

Line 65	32	31	
Line 66	31	30	
Line 67	30	29	
Line 68	29	28	
Line 69	28	27	
Line 70	27	26	
Line 71	26	36	

Points

	X (ft)	Y (ft)
Point 1	25	-11.39
Point 2	38.5	-11.38
Point 3	48.5	-10.85
Point 4	58.7	-9.52
Point 5	68.5	-7.66
Point 6	78.5	-6.01
Point 7	88.5	-2.35
Point 8	94.2	-1.45
Point 9	99.2	-1.16
Point 10	105.4	0.15
Point 11	110.8	-0.8
Point 12	115.6	-0.17
Point 13	124.7	1.67
Point 14	136.6	1.63
Point 15	145.9	1.96
Point 16	155.4	2.16
Point 17	163.6	2.46
Point 18	174.4	4.66
Point 19	186.5	8.15
Point 20	196.5	11.29
Point 21	200	11.41
Point 22	204.7	11.33
Point 23	213.2	8.59
Point 24	221.6	5.47
Point 25	231.7	2.27
Point 26	243.7	-0.37
Point 27	258.3	-0.74
Point 28	271	-0.92
Point 29	283.3	-1.16
Point 30	296.1	-1.36
Point 31	309.2	-1.53
Point 32	319.4	-1.59
Point 33	332.4	-1.62
Point 34	346	-1.77
Point 35	119	0.5
Point 36	239	0.5
Point 37	85	-4

Point 38	346	-4
Point 39	346	-6
Point 40	61	-9
Point 41	346	-9
Point 42	346	-16
Point 43	25	-16
Point 44	346	-20
Point 45	25	-20
Point 46	346	-33
Point 47	25	-33
Point 48	346	-70
Point 49	25	-70
Point 50	346	-41
Point 51	25	-41
Point 52	118.52925	0.40723
Point 53	119.00651	0.36065
Point 54	121.86834	-0.11052
Point 55	125.6525	-0.40297
Point 56	130.81648	-0.60281
Point 57	143.88522	-0.8886
Point 58	158.12089	-1.23232
Point 59	195.28542	-2.50694
Point 60	237.19996	-3.22302
Point 61	297.40255	-3.64333
Point 62	346	-3.80224



CROSS SECTION AT STA 95+00 EAST

GENERAL NOTES

CLASSIFICATION STRATIFICATION
SHEAR STRENGTHS AND UNIT WEIGHTS OF
THE SOIL WERE BASED ON THE RESULTS OF
UNDISTURBED BORINGS AND CPT DATA. SEE
BOTH BORING AND CPT DATA PLATES.

WHERE INDICATED, SHEAR STRENGTHS BETWEEN
VERTICALS WERE ASSUMED TO VARY LINEARLY
BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL,
REMEDIATION OF CANAL WALLS AND LEVEES
FLOOD SIDE STABILITY ANALYSIS,
CASE: Name: NWL S-Case F/S (EE)
REACH 20B, STA. 93+46 TO STA. 103+00 EAST
ORLEANS PARISH, LOUISIANA

NWL S-Case F/S (EE)

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File Information

Created By: [Vicky Curtis](#)
Revision Number: [149](#)
Last Edited By: [Vicky Curtis](#)
Date: [10/1/2013](#)
Time: [12:26:19 PM](#)
File Name: [Reach 20B.gsz](#)
Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix F NWL\](#)
Last Solved Date: [10/1/2013](#)
Last Solved Time: [12:28:20 PM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Strength Units: [psf](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

NWL S-Case F/S (EE)

Kind: [SLOPE/W](#)
Parent: [Normal Water Level at +0.40ft \(seepage\)](#)
Method: [Spencer](#)
Settings
 PWP Conditions Source: [Parent Analysis](#)
Slip Surface
 Direction of movement: [Right to Left](#)
 Use Passive Mode: [No](#)
 Slip Surface Option: [Entry and Exit](#)
 Critical slip surfaces saved: [1](#)
 Optimize Critical Slip Surface Location: [Yes](#)
Tension Crack
 Tension Crack Option: [Search for Tension Crack](#)
 Percentage Wet: [0](#)
 Tension Crack Fluid Unit Weight: [62.4 pcf](#)
FOS Distribution
 FOS Calculation Option: [Constant](#)

Advanced

Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 9000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

Fill GR to EL0.5 (S-Case)

Model: Mohr-Coulomb
Unit Weight: 111 pcf
Cohesion: 75 psf
Phi: 26 °
Phi-B: 0 °

Fill EL 0.5 to -4 (S-Case) AWT

Model: Spatial Mohr-Coulomb
Unit Weight: 101 pcf
Cohesion: 75 psf
Phi: 26 °
Phi-B: 0 °

Fill -4 to -6 (S-Case)

Model: Spatial Mohr-Coulomb
Unit Weight: 101 pcf
Cohesion: 0 psf
Phi: 26 °
Phi-B: 0 °

Fill -6 to -9 (S-Case)

Model: Spatial Mohr-Coulomb
Unit Weight: 92 pcf
Cohesion: 0 psf
Phi: 26 °
Phi-B: 0 °

Fill -9 to -16 (S-Case)

Model: Spatial Mohr-Coulomb
Weight Spatial Fn: Fill -9 to -16
Cohesion: 0 psf
Phi: 26 °

Phi-B: 0 °

Silt -16 to -20 (S-Case)

Model: [Mohr-Coulomb](#)

Unit Weight: 117 pcf

Cohesion: 0 psf

Phi: 34 °

Phi-B: 0 °

Lancustrine -20 to -33 (S-Case)

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: 101 pcf

Cohesion: 0 psf

Phi: 26 °

Phi-B: 0 °

Beach -33 to -41

Model: [Mohr-Coulomb](#)

Unit Weight: 122 pcf

Cohesion: 0 psf

Phi: 33 °

Phi-B: 0 °

Bay Sound -41 to -70 (S-Case)

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: 106 pcf

Cohesion: 0 psf

Phi: 26 °

Phi-B: 0 °

Fill EL 0.5 to -4 (S-Case) BWT

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: 101 pcf

Cohesion: 0 psf

Phi: 26 °

Phi-B: 0 °

Slip Surface Entry and Exit

Left Projection: [Range](#)

Left-Zone Left Coordinate: (40, -11.3005) ft

Left-Zone Right Coordinate: (170, 3.7637) ft

Left-Zone Increment: 26

Right Projection: [Range](#)

Right-Zone Left Coordinate: (180, 6.27521) ft

Right-Zone Right Coordinate: (220, 6.06429) ft

Right-Zone Increment: 8

Radius Increments: 15

Slip Surface Limits

Left Coordinate: (25, -11.39) ft
Right Coordinate: (346, -1.77) ft

Spatial Functions

Fill -9 to -16

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Unit Weight (pcf)
Data Point: (108, -9, 92)
Data Point: (108, -16, 92)
Data Point: (200, -9, 82)
Data Point: (200, -16, 82)
Data Point: (252, -9, 92)
Data Point: (252, -16, 92)

Regions

	Material	Points	Area (ft²)
Region 1	Fill GR to EL0.5 (S-Case)	35,13,14,15,16,17,18,19,20,21,22,23,24,25,36	520.247
Region 2	Fill EL 0.5 to -4 (S-Case) AWT	37,7,8,9,10,11,12,52,53,54,55,56,57,58,59,60,61,62,38	403.62472
Region 3	Fill -4 to -6 (S-Case)	6,37,38,39	529.805
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Region 6	Silt -16 to -20 (S-Case)	43,42,44,45	1284
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Region 8	Beach -33 to -41	47,46,50,51	2568
Region 9	Bay Sound -41 to -70 (S-Case)	51,50,48,49	9309
Region 10	Fill EL 0.5 to -4 (S-Case) BWT	35,52,53,54,55,56,57,58,59,60,61,62,34,33,32,31,30,29,28,27,26,36	539.23777

Points

	X (ft)	Y (ft)
Point 1	25	-11.39
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Point 5	68.5	-7.66
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Point 7	88.5	-2.35
Point 8	94.2	-1.45
Point 9	99.2	-1.16
Point 10	105.4	0.15
Point 11	110.8	-0.8
Point 12	115.6	-0.17
Point 13	124.7	1.67
Point 14	136.6	1.63
Point 15	145.9	1.96
Point 16	155.4	2.16
Point 17	163.6	2.46
Point 18	174.4	4.66
Point 19	186.5	8.15
Point 20	196.5	11.29
Point 21	200	11.41
Point 22	204.7	11.33
Point 23	213.2	8.59
Point 24	221.6	5.47
Point 25	231.7	2.27
Point 26	243.7	-0.37
Point 27	258.3	-0.74
Point 28	271	-0.92
Point 29	283.3	-1.16
Point 30	296.1	-1.36
Point 31	309.2	-1.53
Point 32	319.4	-1.59
Point 33	332.4	-1.62
Point 34	346	-1.77
Point 35	119	0.5
Point 36	239	0.5
Point 37	85	-4
Point 38	346	-4
Point 39	346	-6
Point 40	61	-9
Point 41	346	-9
Point 42	346	-16
Point 43	25	-16
Point 44	346	-20
Point 45	25	-20
Point 46	346	-33
Point 47	25	-33
Point 48	346	-70
Point 49	25	-70
Point 50	346	-41

Point 51	25	-41
Point 52	118.52925	0.40723
Point 53	119.00651	0.36065
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Point 59	195.28542	-2.50694
Point 60	237.19996	-3.22302
Point 61	297.40255	-3.64333
Point 62	346	-3.80224

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	2.59	(174.839, 29.792)	18.46999	(200, 11.41)	(161.131, 2.36966)
2	3528	2.61	(174.839, 29.792)	31.217	(200, 11.41)	(159.999, 2.32826)

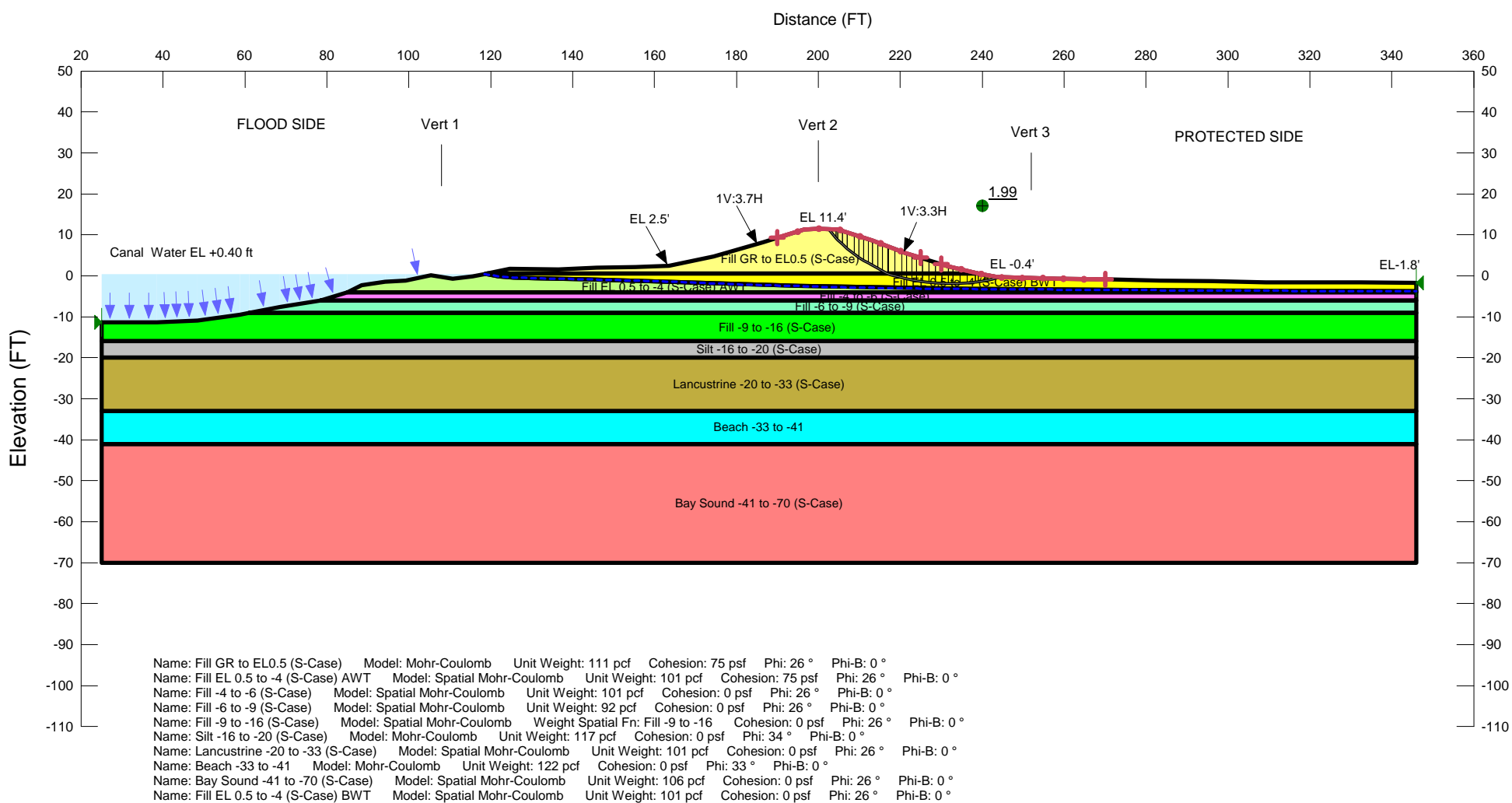
Slices of Slip Surface: Optimized

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	161.748	2.036577	-120.96182	80.710118	39.364955	75
2	Optimized	162.98265	1.370415	-117.25527	185.39876	90.425017	75
3	Optimized	164.08625	0.774972	-114.3381	290.93548	141.89872	75
4	Optimized	165.2204	0.37063	-107.19347	304.35438	148.44355	0
5	Optimized	166.4874	0.092975	-94.440246	369.0041	179.97532	0
6	Optimized	167.9075	-0.1456875	-84.262689	416.43475	203.1088	0
7	Optimized	169.5095	-0.3516625	-76.381249	478.9043	233.57723	0
8	Optimized	171.10825	-0.507325	-71.269811	521.9094	254.55222	0
9	Optimized	172.70375	-0.612675	-68.99338	571.76575	278.86879	0
10	Optimized	173.95075	-0.67279805	-68.45171	596.18298	290.77787	0
11	Optimized	175.1954	-0.69343305	-70.185958	635.61439	310.00985	0
12	Optimized	176.55385	-0.6793225	-74.224339	662.20919	322.981	0
13	Optimized	177.67995	-0.6247275	-80.005819	693.33409	338.16163	0
14	Optimized	178.83025	-0.5315	-88.171663	703.5965	343.16694	0
15	Optimized	180.00475	-0.39964	-98.620948	727.74408	354.9445	0
16	Optimized	181.1959	-0.2320125	-111.20038	733.02439	357.51988	0
17	Optimized	182.4037	-0.0286175	-125.98627	750.65969	366.12119	0
18	Optimized	184.0151	0.29465	-148.76201	754.40091	367.94591	0
19	Optimized	185.7613	0.835136	-178.39665	692.07313	337.54662	75
20	Optimized	187.28445	1.492706	-209.28465	672.56898	328.03381	75
21	Optimized	188.75585	2.185945	-242.91765	629.4969	307.02615	75
22	Optimized	190.1298	2.895115	-277.93246	602.9674	294.08685	75
23	Optimized	191.41845	3.6186775	-314.5678	552.23291	269.34198	75
24	Optimized	192.6217	4.3566325	-352.82432	518.90722	253.08796	75
25	Optimized	193.7788	5.1381725	-393.57362	457.98774	223.37555	75
26	Optimized	194.88975	5.9632975	-438.97568	415.67849	202.73994	75

27	Optimized	195.9726	6.862758	-490.72789	342.65131	167.12221	75
28	Optimized	197.23875	8.031683	-553.6973	260.36305	126.98754	75
29	Optimized	198.4831	9.2715495	-632.86213	147.87547	72.123687	75
30	Optimized	199.49435	10.38723	-713.57702	61.481849	29.986702	75

Slices of Slip Surface: 3528

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	3528	160.5992	2.0205295	-118.54748	74.504545	36.338294	75
2	3528	161.79955	1.436815	-115.39894	159.27718	77.684671	75
3	3528	162.99985	0.9147768	-113.05175	231.71523	113.01507	75
4	3528	163.8237	0.5843628	-111.78867	280.99839	137.05207	75
5	3528	164.69445	0.27760775	-100.42525	318.74164	155.46068	0
6	3528	165.9885	-0.1361248	-79.868215	395.48031	192.88864	0
7	3528	167.28255	-0.48892455	-62.670337	462.22813	225.44372	0
8	3528	168.57665	-0.78290535	-48.80619	519.90289	253.57358	0
9	3528	169.87075	-1.0197543	-38.171666	569.26019	277.64675	0
10	3528	171.1648	-1.2007835	-30.672163	610.88789	297.94993	0
11	3528	172.45885	-1.3269685	-26.312647	645.2801	314.72413	0
12	3528	173.75295	-1.3989765	-25.099239	672.85266	328.17217	0
13	3528	175.1019	-1.4155835	-27.182953	701.39284	342.09215	0
14	3528	176.50565	-1.3721245	-32.968221	730.27178	356.17734	0
15	3528	177.9094	-1.265187	-42.375813	751.58654	366.57325	0
16	3528	179.3132	-1.0941103	-55.656802	765.70844	373.46096	0
17	3528	180.717	-0.8578183	-72.725161	772.65674	376.84987	0
18	3528	182.12075	-0.554784	-93.833557	772.71027	376.87598	0
19	3528	183.5245	-0.18297859	-119.03385	765.77967	373.4957	0
20	3528	184.9283	0.26020192	-148.60085	751.96992	366.76023	0
21	3528	186.0651	0.6676428	-172.22442	729.88613	355.98925	75
22	3528	187.2143	1.1438443	-194.54235	704.68106	343.69592	75
23	3528	188.64285	1.8047075	-226.29352	668.28344	325.94361	75
24	3528	190.0714	2.556507	-262.99053	623.70672	304.20209	75
25	3528	191.5	3.407049	-305.54827	570.58287	278.29186	75
26	3528	192.9286	4.366293	-354.7306	508.67363	248.0967	75
27	3528	194.35715	5.4471645	-411.05459	437.52069	213.3931	75
28	3528	195.7857	6.6668435	-479.71341	356.61127	173.93094	75
29	3528	197.08335	7.9067575	-547.04679	261.44054	127.51307	75
30	3528	198.25	9.1616295	-623.0233	154.17475	75.196049	75
31	3528	199.41665	10.569436	-722.22087	41.15925	20.074707	75



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ORLEANS PARISH, LOUISIANA

NWL S-Case P/S (EE)

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File Information

Created By: [Vicky Curtis](#)
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Last Solved Date: [10/1/2013](#)
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Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Strength Units: [psf](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

NWL S-Case P/S (EE)

Kind: [SLOPE/W](#)
Parent: [Normal Water Level at +0.40ft \(seepage\)](#)
Method: [Spencer](#)
Settings
 PWP Conditions Source: [Parent Analysis](#)
Slip Surface
 Direction of movement: [Left to Right](#)
 Use Passive Mode: [No](#)
 Slip Surface Option: [Entry and Exit](#)
 Critical slip surfaces saved: [1](#)
 Optimize Critical Slip Surface Location: [Yes](#)
Tension Crack
 Tension Crack Option: [Search for Tension Crack](#)
 Percentage Wet: [0](#)
 Tension Crack Fluid Unit Weight: [62.4 pcf](#)
FOS Distribution
 FOS Calculation Option: [Constant](#)

Advanced

Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 9000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

Fill GR to EL0.5 (S-Case)

Model: Mohr-Coulomb
Unit Weight: 111 pcf
Cohesion: 75 psf
Phi: 26 °
Phi-B: 0 °

Fill EL 0.5 to -4 (S-Case) AWT

Model: Spatial Mohr-Coulomb
Unit Weight: 101 pcf
Cohesion: 75 psf
Phi: 26 °
Phi-B: 0 °

Fill -4 to -6 (S-Case)

Model: Spatial Mohr-Coulomb
Unit Weight: 101 pcf
Cohesion: 0 psf
Phi: 26 °
Phi-B: 0 °

Fill -6 to -9 (S-Case)

Model: Spatial Mohr-Coulomb
Unit Weight: 92 pcf
Cohesion: 0 psf
Phi: 26 °
Phi-B: 0 °

Fill -9 to -16 (S-Case)

Model: Spatial Mohr-Coulomb
Weight Spatial Fn: Fill -9 to -16
Cohesion: 0 psf
Phi: 26 °

Phi-B: 0 °

Silt -16 to -20 (S-Case)

Model: [Mohr-Coulomb](#)

Unit Weight: 117 pcf

Cohesion: 0 psf

Phi: 34 °

Phi-B: 0 °

Lancustrine -20 to -33 (S-Case)

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: 101 pcf

Cohesion: 0 psf

Phi: 26 °

Phi-B: 0 °

Beach -33 to -41

Model: [Mohr-Coulomb](#)

Unit Weight: 122 pcf

Cohesion: 0 psf

Phi: 33 °

Phi-B: 0 °

Bay Sound -41 to -70 (S-Case)

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: 106 pcf

Cohesion: 0 psf

Phi: 26 °

Phi-B: 0 °

Fill EL 0.5 to -4 (S-Case) BWT

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: 101 pcf

Cohesion: 0 psf

Phi: 26 °

Phi-B: 0 °

Slip Surface Entry and Exit

Left Projection: [Range](#)

Left-Zone Left Coordinate: (190, 9.249) ft

Left-Zone Right Coordinate: (225, 4.39277) ft

Left-Zone Increment: 7

Right Projection: [Range](#)

Right-Zone Left Coordinate: (230, 2.80861) ft

Right-Zone Right Coordinate: (270, -0.90583) ft

Right-Zone Increment: 8

Radius Increments: 15

Slip Surface Limits

Left Coordinate: (25, -11.39) ft
Right Coordinate: (346, -1.77) ft

Spatial Functions

Fill -9 to -16

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Unit Weight (pcf)
Data Point: (108, -9, 92)
Data Point: (108, -16, 92)
Data Point: (200, -9, 82)
Data Point: (200, -16, 82)
Data Point: (252, -9, 92)
Data Point: (252, -16, 92)

Regions

	Material	Points	Area (ft²)
Region 1	Fill GR to EL0.5 (S-Case)	35,13,14,15,16,17,18,19,20,21,22,23,24,25,36	520.247
Region 2	Fill EL 0.5 to -4 (S-Case) AWT	37,7,8,9,10,11,12,52,53,54,55,56,57,58,59,60,61,62,38	403.62472
Region 3	Fill -4 to -6 (S-Case)	6,37,38,39	529.805
Region 4	Fill -6 to -9 (S-Case)	40,5,6,39,41	827.8375
Region 5	Fill -9 to -16 (S-Case)	1,2,3,4,40,41,42,43	2180.9675
Region 6	Silt -16 to -20 (S-Case)	43,42,44,45	1284
Region 7	Lancustrine -20 to -33 (S-Case)	45,44,46,47	4173
Region 8	Beach -33 to -41	47,46,50,51	2568
Region 9	Bay Sound -41 to -70 (S-Case)	51,50,48,49	9309
Region 10	Fill EL 0.5 to -4 (S-Case) BWT	35,52,53,54,55,56,57,58,59,60,61,62,34,33,32,31,30,29,28,27,26,36	539.23777

Points

	X (ft)	Y (ft)
Point 1	25	-11.39
Point 2	38.5	-11.38

Point 3	48.5	-10.85
Point 4	58.7	-9.52
Point 5	68.5	-7.66
Point 6	78.5	-6.01
Point 7	88.5	-2.35
Point 8	94.2	-1.45
Point 9	99.2	-1.16
Point 10	105.4	0.15
Point 11	110.8	-0.8
Point 12	115.6	-0.17
Point 13	124.7	1.67
Point 14	136.6	1.63
Point 15	145.9	1.96
Point 16	155.4	2.16
Point 17	163.6	2.46
Point 18	174.4	4.66
Point 19	186.5	8.15
Point 20	196.5	11.29
Point 21	200	11.41
Point 22	204.7	11.33
Point 23	213.2	8.59
Point 24	221.6	5.47
Point 25	231.7	2.27
Point 26	243.7	-0.37
Point 27	258.3	-0.74
Point 28	271	-0.92
Point 29	283.3	-1.16
Point 30	296.1	-1.36
Point 31	309.2	-1.53
Point 32	319.4	-1.59
Point 33	332.4	-1.62
Point 34	346	-1.77
Point 35	119	0.5
Point 36	239	0.5
Point 37	85	-4
Point 38	346	-4
Point 39	346	-6
Point 40	61	-9
Point 41	346	-9
Point 42	346	-16
Point 43	25	-16
Point 44	346	-20
Point 45	25	-20
Point 46	346	-33
Point 47	25	-33
Point 48	346	-70
Point 49	25	-70
Point 50	346	-41

Point 51	25	-41
Point 52	118.52925	0.40723
Point 53	119.00651	0.36065
Point 54	121.86834	-0.11052
Point 55	125.6525	-0.40297
Point 56	130.81648	-0.60281
Point 57	143.88522	-0.8886
Point 58	158.12089	-1.23232
Point 59	195.28542	-2.50694
Point 60	237.19996	-3.22302
Point 61	297.40255	-3.64333
Point 62	346	-3.80224

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.99	(232.592, 43.926)	20.82469	(202.531, 11.3669)	(244.095, -0.380006)
2	342	2.01	(232.592, 43.926)	45.964	(200.106, 11.4082)	(244.768, -0.397058)

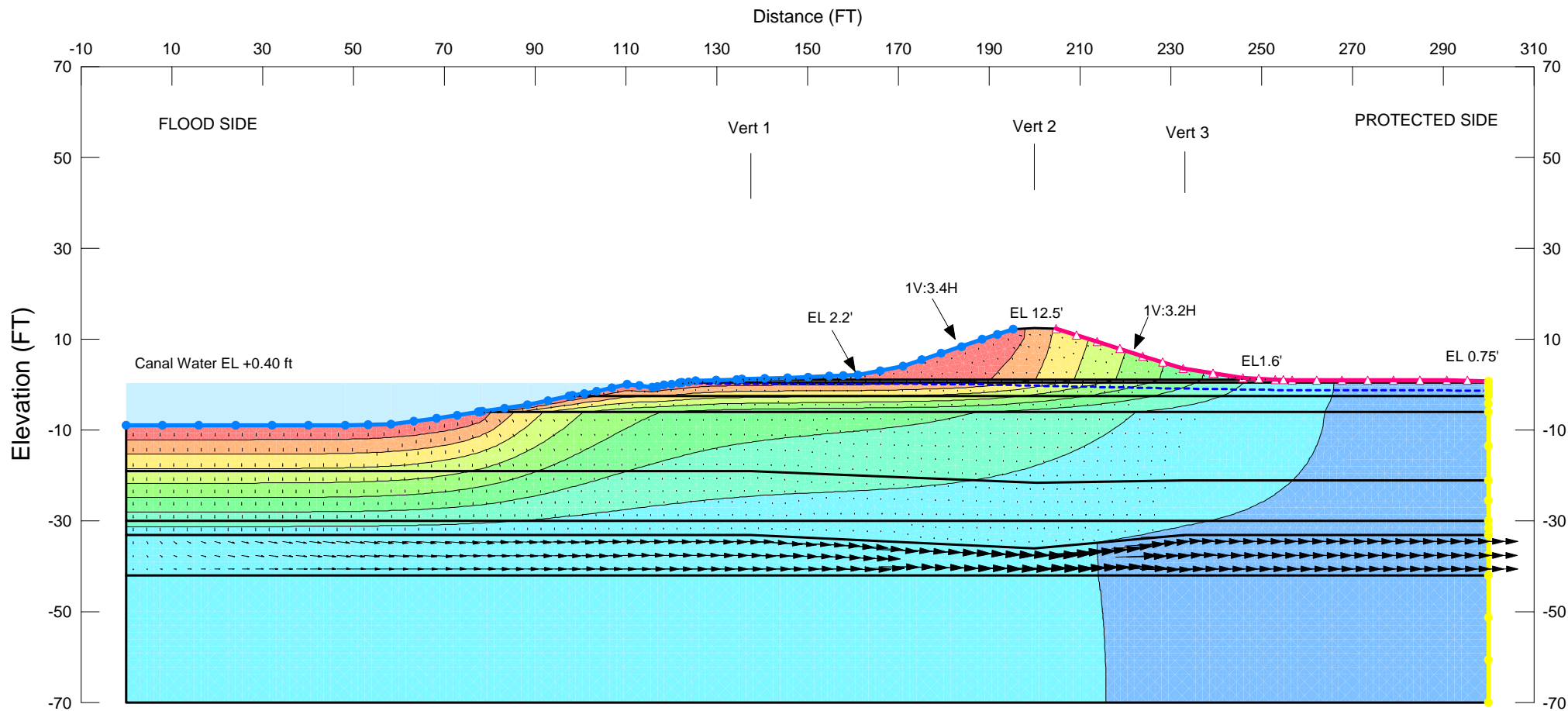
Slices of Slip Surface: Optimized

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	203.4183	10.276395	-754.65054	53.270496	25.981757	75
2	Optimized	204.5027	8.996383	-686.02252	164.08136	80.027829	75
3	Optimized	205.2767	8.2529745	-646.60347	207.38707	101.14943	75
4	Optimized	206.43015	7.1451515	-587.66445	264.91296	129.20668	75
5	Optimized	207.8963	5.919745	-522.19309	355.09041	173.18916	75
6	Optimized	209.36065	4.8660175	-465.68386	421.23887	205.45192	75
7	Optimized	210.51055	4.1015525	-423.22321	455.62453	222.22293	75
8	Optimized	211.6141	3.416484	-385.05131	505.52295	246.56002	75
9	Optimized	212.67135	2.8108125	-351.14788	529.52864	258.26838	75
10	Optimized	213.81935	2.1531635	-313.63981	552.83264	269.63449	75
11	Optimized	215.07835	1.4737625	-274.44586	589.89479	287.71091	75
12	Optimized	216.3576	0.8245875	-236.5379	606.09525	295.6124	75
13	Optimized	217.0376	0.479505	-216.23252	622.35574	303.54318	0
14	Optimized	217.89	0.2290475	-201.54384	678.36938	330.86285	0
15	Optimized	219.514	-0.2308775	-174.46831	659.35134	321.58713	0
16	Optimized	220.963	-0.5907042	-153.40304	662.20337	322.97816	0
17	Optimized	222.20095	-0.8430838	-138.75109	641.11647	312.69339	0
18	Optimized	223.4029	-1.0881146	-124.46837	624.25764	304.47079	0
19	Optimized	224.74	-1.3143275	-111.45145	619.91087	302.35073	0
20	Optimized	226.2122	-1.5217225	-99.606792	589.31384	287.42757	0
21	Optimized	227.73685	-1.6886425	-90.318935	570.11537	278.06384	0
22	Optimized	229.31395	-1.8150875	-83.486551	526.4096	256.74712	0
23	Optimized	230.90125	-1.8836665	-80.261605	495.10305	241.47789	0
24	Optimized	232.2896	-1.8929765	-80.524124	449.33501	219.15533	0
25	Optimized	233.741	-1.8616625	-83.358308	414.99452	202.40635	0
26	Optimized	235.4646	-1.7911275	-88.726166	356.56255	173.90718	0

27	Optimized	237.3634	-1.65115	-98.49473	295.06682	143.9137	0
28	Optimized	238.7002	-1.495339	-108.90099	246.40078	120.17769	0
29	Optimized	239.839	-1.3012385	-121.58426	195.43013	95.317645	0
30	Optimized	241.517	-1.0152395	-140.25428	124.59214	60.767649	0
31	Optimized	243.028	-0.6820083	-161.81721	55.51455	27.076255	0
32	Optimized	243.8974	-0.43589135	-177.61624	7.7458079	3.7778829	0

Slices of Slip Surface: 342

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	342	200.87175	10.677707	-753.19556	37.915868	18.492804	75
2	342	202.40305	9.280049	-686.17652	152.14833	74.2077	75
3	342	203.93435	8.0020715	-622.75159	262.35817	127.96063	75
4	342	205.40835	6.871613	-566.31715	346.30246	168.90299	75
5	342	206.825	5.872317	-515.10467	402.81841	196.46766	75
6	342	208.24165	4.9501325	-466.52143	454.16531	221.51122	75
7	342	209.65835	4.0996895	-420.87929	500.38905	244.05604	75
8	342	211.075	3.3164705	-377.79534	541.5316	264.12261	75
9	342	212.49165	2.5966465	-337.96664	577.63025	281.7291	75
10	342	213.9212	1.931485	-300.43204	605.53923	295.34121	75
11	342	215.3636	1.319193	-265.42501	625.00241	304.83404	75
12	342	216.80605	0.7637795	-233.34067	639.01408	311.66799	75
13	342	218.20605	0.2762787	-204.80363	647.85808	315.9815	0
14	342	219.5636	-0.14810115	-179.6691	645.92578	315.03905	0
15	342	220.9212	-0.5269777	-157.33171	639.35109	311.83236	0
16	342	222.32145	-0.87060485	-137.13474	631.73852	308.11946	0
17	342	223.7643	-1.17722	-119.21215	622.87959	303.79868	0
18	342	225.20715	-1.4358795	-104.22381	608.78857	296.92602	0
19	342	226.65	-1.647401	-92.098599	589.33207	287.43645	0
20	342	228.09285	-1.812439	-82.844653	564.36583	275.25961	0
21	342	229.5357	-1.9314955	-76.380009	533.70575	260.30569	0
22	342	230.97855	-2.004929	-72.748203	497.15082	242.47665	0
23	342	232.43	-2.0328535	-71.889968	460.59305	224.64624	0
24	342	233.89	-2.0148105	-73.895201	423.99537	206.79636	0
25	342	235.35	-1.950308	-78.734613	380.95629	185.8048	0
26	342	236.81	-1.839149	-86.48965	331.13102	161.50339	0
27	342	238.27	-1.680992	-97.106581	274.11012	133.69244	0
28	342	239.78335	-1.4660145	-111.28448	214.27243	104.50765	0
29	342	241.35	-1.189858	-129.28666	150.79162	73.545986	0
30	342	242.91665	-0.85720655	-150.837	77.648309	37.871611	0
31	342	244.23385	-0.53683615	-171.49681	19.194632	9.3618475	0



Name: Fill 1.2 to EL0.5 (S-Case) Model: Saturated Only K-Sat: 3.28e-008 ft/sec Volumetric Water Content: 0 ft³/ft³ Mv: 0 /psf K-Ratio: 1 K-Direction: 0 °
 Name: Fill EL0.5to-2.5 (S-Case) AWT Model: Saturated Only K-Sat: 3.28e-008 ft/sec Volumetric Water Content: 0 ft³/ft³ Mv: 0 /psf K-Ratio: 1 K-Direction: 0 °
 Name: Fill -2.5 to -6 (S-Case) Model: Saturated Only K-Sat: 3.28e-008 ft/sec Volumetric Water Content: 0 ft³/ft³ Mv: 0 /psf K-Ratio: 1 K-Direction: 0 °
 Name: Silt-6 to -19,21,21.5 (S-Case) Model: Saturated Only K-Sat: 3.28e-007 ft/sec Volumetric Water Content: 0 ft³/ft³ Mv: 0 /psf K-Ratio: 1 K-Direction: 0 °
 Name: Lancs -19,21,21.5 to -30 (S-Case) Model: Saturated Only K-Sat: 3.28e-007 ft/sec Volumetric Water Content: 0 ft³/ft³ Mv: 0 /psf K-Ratio: 1 K-Direction: 0 °
 Name: Lancustrine-30 to-33,-36 (S-Case) Model: Saturated Only K-Sat: 3.28e-007 ft/sec Volumetric Water Content: 0 ft³/ft³ Mv: 0 /psf K-Ratio: 1 K-Direction: 0 °
 Name: Beach -33,-36 to -42 Model: Saturated Only K-Sat: 0.000492 ft/sec Volumetric Water Content: 0 ft³/ft³ Mv: 0 /psf K-Ratio: 1 K-Direction: 0 °
 Name: Bay Sound -41 to -70 (S-Case) Model: Saturated Only K-Sat: 3.28e-008 ft/sec Volumetric Water Content: 0 ft³/ft³ Mv: 0 /psf K-Ratio: 1 K-Direction: 0 °
 Name: Fill GR to 1.2 (S-Case) Model: Saturated Only K-Sat: 3.28e-007 ft/sec Volumetric Water Content: 0 ft³/ft³ Mv: 0 /psf K-Ratio: 1 K-Direction: 0 °

CROSS SECTION AT STA 103+00 EAST

GENERAL NOTES

CLASSIFICATION STRATIFICATION
 SHEAR STRENGTHS AND UNIT WEIGHTS OF
 THE SOIL WERE BASED ON THE RESULTS OF
 UNDISTURBED BORINGS AND CPT DATA. SEE
 BOTH BORING AND CPT DATA PLATES.

WHERE INDICATED, SHEAR STRENGTHS BETWEEN
 VERTICALS WERE ASSUMED TO VARY LINEARLY
 BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

LAKE PONTCHARTRAIN, LA. AND VICINITY
 HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL,
 REMEDIATION OF CANAL WALLS AND LEVEES
 FLOOD SIDE STABILITY ANALYSIS,
 CASE: Name: Normal Water Level at +0.40ft (seepage)
 REACH 21, STA. 103+00 TO STA. 113+05 EAST
 ORLEANS PARISH, LOUISIANA

Normal Water Level at +0.40ft (seepage)

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Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Mass(M) Units: [lbs](#)
Mass Flux Units: [lbs/sec](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

Normal Water Level at +0.40ft (seepage)

Kind: [SEEP/W](#)
Method: [Steady-State](#)
Settings
 Include Air Flow: [No](#)
Control
 Apply Runoff: [Yes](#)
Convergence
 Convergence Type: [Gauss Point K](#)
 Convergence Settings
 Maximum Number of Iterations: [500](#)
 Tolerance: [0.01](#)
 Maximum Change in K: [0.1](#)
 Rate of Change in K: [1.02](#)
 Minimum Change in K: [0.0001](#)
Equation Solver: [Parallel Direct](#)
Potential Seepage Max # of Reviews: [10](#)

Time

Starting Time: 0 sec

Duration: 0 sec

Ending Time: 0 sec

Materials

Fill 1.2 to EL0.5 (S-Case)

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-008 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

Fill EL0.5to-2.5 (S-Case) AWT

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-008 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

Fill -2.5 to -6 (S-Case)

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-008 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

Silt-6 to -19,21,21.5 (S-Case)

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-007 ft/sec

Volumetric Water Content: 0 ft³/ft³

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

Lancs -19,21,21.5 to -30 (S-Case)

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-007 ft/sec

Volumetric Water Content: 0 ft³/ft³
Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

Lancustrine-30 to-33,-36 (S-Case)

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-007 ft/sec
Volumetric Water Content: 0 ft³/ft³
Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

Beach -33,-36 to -42

Model: Saturated Only

Hydraulic

K-Sat: 0.000492 ft/sec
Volumetric Water Content: 0 ft³/ft³
Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

Bay Sound -41 to -70 (S-Case)

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-008 ft/sec
Volumetric Water Content: 0 ft³/ft³
Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

Fill GR to 1.2 (S-Case)

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-007 ft/sec
Volumetric Water Content: 0 ft³/ft³
Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

Boundary Conditions

Potential Seepage Face

Review: true
Type: Total Flux (Q) 0

Canal Water

Type: Head (H) 0.4

Protected Side Boundary Condition = -1.25 ft

Type: Head (H) -1.25

Regions

	Material	Points	Area (ft²)
Region 1	Fill GR to 1.2 (S-Case)	54,13,14,15,16,17,18,19,20,21,22,23,24,25,26,55	515.15788
Region 2	Fill EL0.5to-2.5 (S-Case) AWT	34,7,8,9,10,11,56,57,58,59,60,61,62,63,64,65,66,35	410.24005
Region 3	Fill -2.5 to -6 (S-Case)	36,5,6,34,35,37	740.68609
Region 4	Silt-6 to -19,21,21.5 (S-Case)	1,2,3,4,36,37,38,39,40,41,42	3991.8145
Region 5	Lancs -19,21,21.5 to -30 (S-Case)	42,41,40,39,38,43,44	3014.125
Region 6	Lancustrine-30 to-33,-36 (S-Case)	44,43,45,46,47,48,49	1043.25
Region 7	Beach -33,-36 to -42	49,48,47,46,45,50,51	2556.75
Region 8	Bay Sound -41 to -70 (S-Case)	51,50,52,53	8400
Region 9	Fill 1.2 to EL0.5 (S-Case)	33,12,54,55,27,28,29,30,31,32	112.9874
Region 10	Fill EL0.5to-2.5 (S-Case) AWT	66,32,33,56,57,58,59,60,61,62,63,64,65	165.97255

Lines

	Start Point	End Point	Hydraulic Boundary
Line 1	33	12	Canal Water
Line 2	13	14	Canal Water
Line 3	14	15	Canal Water
Line 4	15	16	Canal Water
Line 5	16	17	Canal Water
Line 6	17	18	Canal Water
Line 7	18	19	Canal Water
Line 8	19	20	Canal Water
Line 9	20	21	
Line 10	21	22	
Line 11	22	23	Potential Seepage Face
Line 12	23	24	Potential Seepage Face
Line 13	24	25	Potential Seepage Face
Line 14	25	26	Potential Seepage Face
Line 15	27	28	Potential Seepage Face
Line 16	28	29	Potential Seepage Face
Line 17	29	30	Potential Seepage Face
Line 18	30	31	Potential Seepage Face
Line 19	32	33	
Line 20	34	7	Canal Water
Line 21	7	8	Canal Water
Line 22	8	9	Canal Water
Line 23	9	10	Canal Water
Line 24	10	11	Canal Water

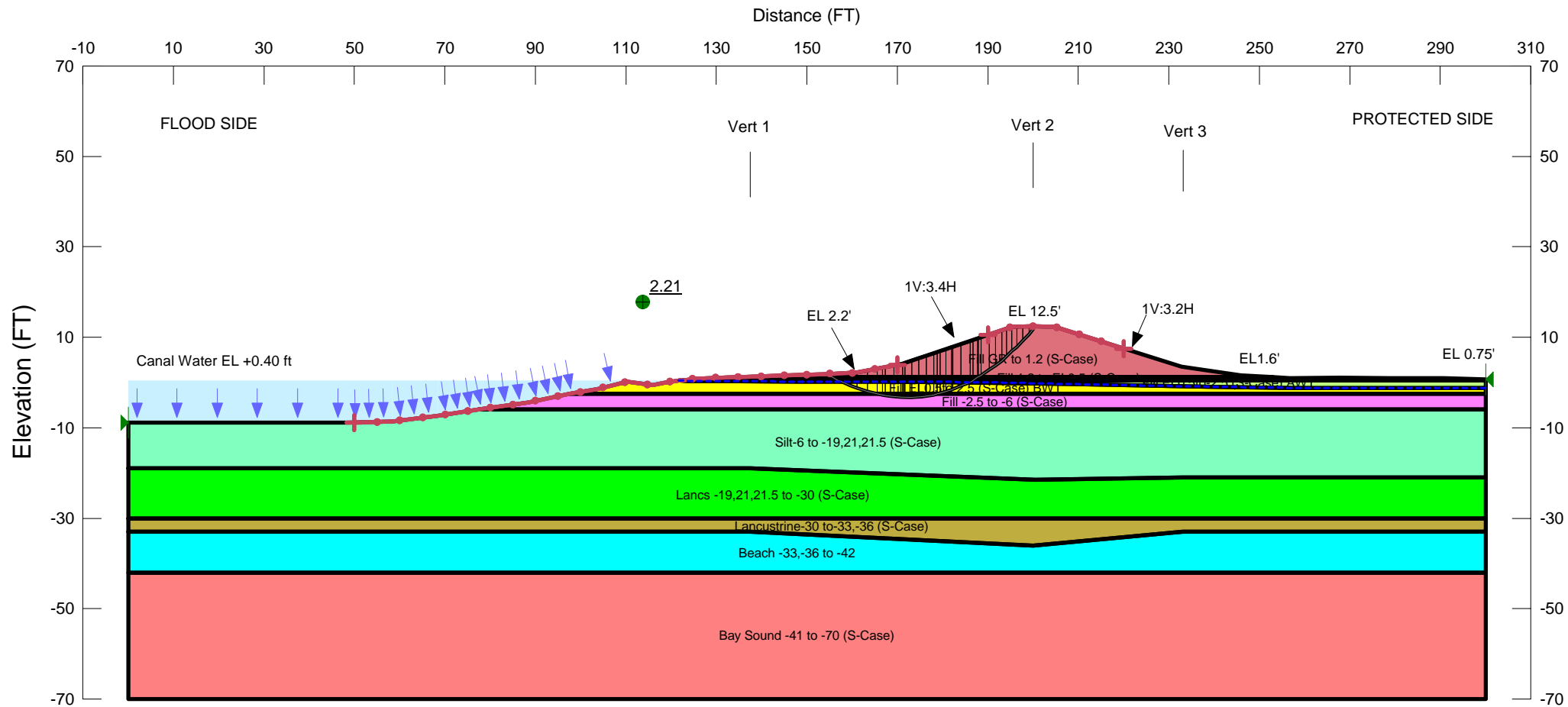
Line 25	35	34	
Line 26	36	5	Canal Water
Line 27	5	6	Canal Water
Line 28	6	34	Canal Water
Line 29	35	37	Protected Side Boundary Condition = -1.25 ft
Line 30	37	36	
Line 31	1	2	Canal Water
Line 32	2	3	Canal Water
Line 33	3	4	Canal Water
Line 34	4	36	Canal Water
Line 35	37	38	Protected Side Boundary Condition = -1.25 ft
Line 36	38	39	
Line 37	39	40	
Line 38	40	41	
Line 39	41	42	
Line 40	42	1	
Line 41	38	43	Protected Side Boundary Condition = -1.25 ft
Line 42	43	44	
Line 43	44	42	
Line 44	43	45	Protected Side Boundary Condition = -1.25 ft
Line 45	45	46	
Line 46	46	47	
Line 47	47	48	
Line 48	48	49	
Line 49	49	44	
Line 50	45	50	Protected Side Boundary Condition = -1.25 ft
Line 51	50	51	
Line 52	51	49	
Line 53	50	52	Protected Side Boundary Condition = -1.25 ft
Line 54	52	53	
Line 55	53	51	
Line 56	32	31	Protected Side Boundary Condition = -1.25 ft
Line 57	12	54	Canal Water
Line 58	54	13	
Line 59	26	55	Potential Seepage Face
Line 60	55	27	Potential Seepage Face
Line 61	55	54	
Line 62	11	56	Canal Water
Line 63	66	35	Protected Side Boundary Condition = -1.25 ft
Line 64	56	57	
Line 65	57	58	
Line 66	58	59	
Line 67	59	60	
Line 68	60	61	
Line 69	61	62	
Line 70	62	63	
Line 71	63	64	
Line 72	64	65	

Line 73	65	66	
Line 74	66	32	Protected Side Boundary Condition = -1.25 ft
Line 75	33	56	Canal Water

Points

	X (ft)	Y (ft)
Point 1	0	-8.9
Point 2	48.27777	-8.9
Point 3	58.33585	-8.6
Point 4	68.39447	-7.39
Point 5	78.43568	-5.8
Point 6	88.42691	-4.43
Point 7	98.30442	-2.34
Point 8	103.64343	-1.43
Point 9	110.26068	0.16
Point 10	115.91608	-0.54
Point 11	118.42632	-0.02
Point 12	125.39055	0.87
Point 13	135.5655	1.24
Point 14	145.62969	1.59
Point 15	154.84688	1.9
Point 16	161.11587	2.21
Point 17	171.09548	4.16
Point 18	179.42154	6.95
Point 19	188.55592	10.03
Point 20	195.33167	12.26
Point 21	200	12.48
Point 22	204.77923	12.31
Point 23	213.80464	9.5
Point 24	223.81999	6.27
Point 25	232.81486	3.55
Point 26	245.87715	1.56
Point 27	256.78921	1
Point 28	267.70177	1.02
Point 29	279.07955	1.01
Point 30	290.76907	0.98
Point 31	300	0.75
Point 32	300	0.48
Point 33	122.5	0.5
Point 34	97.5	-2.5
Point 35	300	-2.5
Point 36	77.5	-6
Point 37	300	-6
Point 38	300	-21
Point 39	233	-21
Point 40	200.5	-21.5
Point 41	137.5	-19

Point 42	0	-19
Point 43	300	-30
Point 44	0	-30
Point 45	300	-33
Point 46	233	-33
Point 47	200	-36
Point 48	137.5	-33
Point 49	0	-33
Point 50	300	-42
Point 51	0	-42
Point 52	300	-70
Point 53	0	-70
Point 54	134.5	1.2
Point 55	253	1.2
Point 56	121.73752	0.40267
Point 57	123.50504	0.35789
Point 58	129.24804	0.2888
Point 59	148.57257	0.24324
Point 60	166.74281	0.21135
Point 61	182.22022	0.12041
Point 62	208.21927	-0.33691
Point 63	238.9764	-0.91953
Point 64	257.66001	-1.16535
Point 65	272.59266	-1.21627
Point 66	300	-1.23749



Name: Fill 1.2 to EL0.5 (S-Case) Model: Spatial Mohr-Coulomb Unit Weight: 111 pcf Cohesion: 75 psf Phi: 26 ° Phi-B: 0 °
 Name: Fill EL0.5to-2.5 (S-Case) AWT Model: Mohr-Coulomb Unit Weight: 111 pcf Cohesion: 75 psf Phi: 26 ° Phi-B: 0 °
 Name: Fill -2.5 to -6 (S-Case) Model: Spatial Mohr-Coulomb Unit Weight: 102 pcf Cohesion: 0 psf Phi: 26 ° Phi-B: 0 °
 Name: Silt-6 to -19,21,21.5 (S-Case) Model: Mohr-Coulomb Unit Weight: 117 pcf Cohesion: 0 psf Phi: 34 ° Phi-B: 0 °
 Name: Lancs -19,21,21.5 to -30 (S-Case) Model: Spatial Mohr-Coulomb Weight Spatial Fn: Lanc -19,21,21.5 to -30 Cohesion: 0 psf Phi: 26 ° Phi-B: 0 °
 Name: Lancustrine-30 to -33,-36 (S-Case) Model: Spatial Mohr-Coulomb Weight Spatial Fn: Lanc -30 to -33, -36 Cohesion: 0 psf Phi: 26 ° Phi-B: 0 °
 Name: Beach -33,-36 to -42 Model: Mohr-Coulomb Unit Weight: 122 pcf Cohesion: 0 psf Phi: 33 ° Phi-B: 0 °
 Name: Bay Sound -41 to -70 (S-Case) Model: Mohr-Coulomb Unit Weight: 106 pcf Cohesion: 0 psf Phi: 26 ° Phi-B: 0 °
 Name: Fill GR to 1.2 (S-Case) Model: Mohr-Coulomb Unit Weight: 111 pcf Cohesion: 75 psf Phi: 26 ° Phi-B: 0 °
 Name: Fill EL0.5to-2.5 (S-Case) BWT Model: Mohr-Coulomb Unit Weight: 111 pcf Cohesion: 0 psf Phi: 26 ° Phi-B: 0 °

CROSS SECTION AT STA 103+00 EAST

GENERAL NOTES

CLASSIFICATION STRATIFICATION
 SHEAR STRENGTHS AND UNIT WEIGHTS OF
 THE SOIL WERE BASED ON THE RESULTS OF
 UNDISTURBED BORINGS AND CPT DATA. SEE
 BOTH BORING AND CPT DATA PLATES.

WHERE INDICATED, SHEAR STRENGTHS BETWEEN
 VERTICALS WERE ASSUMED TO VARY LINEARLY
 BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

LAKE PONTCHARTRAIN, LA. AND VICINITY
 HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL,
 REMEDIATION OF CANAL WALLS AND LEVEES
 FLOOD SIDE STABILITY ANALYSIS,
 CASE: Name: NWL S-Case F/S (EE)
 REACH 21, STA. 103+00 TO STA. 113+05 EAST
 ORLEANS PARISH, LOUISIANA

NWL S-Case F/S (EE)

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File Information

Created By: [Vicky Curtis](#)
Revision Number: [209](#)
Last Edited By: [Vicky Curtis](#)
Date: [10/1/2013](#)
Time: [12:46:44 PM](#)
File Name: [Reach 21.gsz](#)
Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix F NWL\](#)
Last Solved Date: [10/1/2013](#)
Last Solved Time: [12:52:00 PM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Strength Units: [psf](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

NWL S-Case F/S (EE)

Kind: [SLOPE/W](#)
Parent: [Normal Water Level at +0.40ft \(seepage\)](#)
Method: [Spencer](#)
Settings
 PWP Conditions Source: [Parent Analysis](#)
Slip Surface
 Direction of movement: [Right to Left](#)
 Use Passive Mode: [No](#)
 Slip Surface Option: [Entry and Exit](#)
 Critical slip surfaces saved: [1](#)
 Optimize Critical Slip Surface Location: [Yes](#)
Tension Crack
 Tension Crack Option: [Search for Tension Crack](#)
 Percentage Wet: [0](#)
 Tension Crack Fluid Unit Weight: [62.4 pcf](#)
FOS Distribution
 FOS Calculation Option: [Constant](#)

Advanced

Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 9000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

Fill 1.2 to EL0.5 (S-Case)

Model: Spatial Mohr-Coulomb
Unit Weight: 111 pcf
Cohesion: 75 psf
Phi: 26 °
Phi-B: 0 °

Fill EL0.5to-2.5 (S-Case) AWT

Model: Mohr-Coulomb
Unit Weight: 111 pcf
Cohesion: 75 psf
Phi: 26 °
Phi-B: 0 °

Fill -2.5 to -6 (S-Case)

Model: Spatial Mohr-Coulomb
Unit Weight: 102 pcf
Cohesion: 0 psf
Phi: 26 °
Phi-B: 0 °

Silt-6 to -19,21,21.5 (S-Case)

Model: Mohr-Coulomb
Unit Weight: 117 pcf
Cohesion: 0 psf
Phi: 34 °
Phi-B: 0 °

Lancs -19,21,21.5 to -30 (S-Case)

Model: Spatial Mohr-Coulomb
Weight Spatial Fn: Lanc -19,21,21.5 to -30
Cohesion: 0 psf
Phi: 26 °

Phi-B: 0 °

Lancustrine-30 to-33,-36 (S-Case)

Model: [Spatial Mohr-Coulomb](#)

Weight Spatial Fn: [Lanc -30 to -33, -36](#)

Cohesion: [0 psf](#)

Phi: [26 °](#)

Phi-B: [0 °](#)

Beach -33,-36 to -42

Model: [Mohr-Coulomb](#)

Unit Weight: [122 pcf](#)

Cohesion: [0 psf](#)

Phi: [33 °](#)

Phi-B: [0 °](#)

Bay Sound -41 to -70 (S-Case)

Model: [Mohr-Coulomb](#)

Unit Weight: [106 pcf](#)

Cohesion: [0 psf](#)

Phi: [26 °](#)

Phi-B: [0 °](#)

Fill GR to 1.2 (S-Case)

Model: [Mohr-Coulomb](#)

Unit Weight: [111 pcf](#)

Cohesion: [75 psf](#)

Phi: [26 °](#)

Phi-B: [0 °](#)

Fill EL0.5to-2.5 (S-Case) BWT

Model: [Mohr-Coulomb](#)

Unit Weight: [111 pcf](#)

Cohesion: [0 psf](#)

Phi: [26 °](#)

Phi-B: [0 °](#)

Slip Surface Entry and Exit

Left Projection: [Range](#)

Left-Zone Left Coordinate: [\(50, -8.84863\) ft](#)

Left-Zone Right Coordinate: [\(170, 3.94594\) ft](#)

Left-Zone Increment: [24](#)

Right Projection: [Range](#)

Right-Zone Left Coordinate: [\(190, 10.50527\) ft](#)

Right-Zone Right Coordinate: [\(220, 7.50197\) ft](#)

Right-Zone Increment: [6](#)

Radius Increments: [15](#)

Slip Surface Limits

Left Coordinate: (0, -8.9) ft
Right Coordinate: (300, 0.75) ft

Spatial Functions

Lanc -19,21,21.5 to -30

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Unit Weight (pcf)
Data Point: (85, -19, 101)
Data Point: (85, -30, 101)
Data Point: (200, -21.5, 105)
Data Point: (200, -30, 105)
Data Point: (233, -21, 101)
Data Point: (233, -30, 101)
Data Point: (50, -19, 101)
Data Point: (50, -30, 101)
Data Point: (310, -21, 101)
Data Point: (310, -30, 101)

Lanc -30 to -33, -36

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Unit Weight (pcf)
Data Point: (85, -30, 101)
Data Point: (85, -33, 101)
Data Point: (200, -30, 105)
Data Point: (200, -36, 105)
Data Point: (233, -30, 101)
Data Point: (233, -33, 101)
Data Point: (310, -30, 101)
Data Point: (310, -33, 101)
Data Point: (50, -30, 101)
Data Point: (50, -33, 101)

Regions

	Material	Points	Area (ft²)
Region 1	Fill GR to 1.2 (S-Case)	54,13,14,15,16,17,18,19,20,21,22,23,24,25,26,55	515.15788
Region 2	Fill EL0.5to-2.5 (S-Case) BWT	34,7,8,9,10,11,56,57,58,59,60,61,62,63,64,65,66,35	410.24005
Region 3	Fill -2.5 to -6 (S-Case)	36,5,6,34,35,37	740.68609
Region 4	Silt-6 to -19,21,21.5 (S-Case)	1,2,3,4,36,37,38,39,40,41,42	3991.8145
Region 5	Lancs -19,21,21.5 to -30 (S-Case)	42,41,40,39,38,43,44	3014.125
Region 6	Lancustrine-30 to-33,-36 (S-Case)	44,43,45,46,47,48,49	1043.25

Region 7	Beach -33,-36 to -42	49,48,47,46,45,50,51	2556.75
Region 8	Bay Sound -41 to -70 (S-Case)	51,50,52,53	8400
Region 9	Fill 1.2 to EL0.5 (S-Case)	33,12,54,55,27,28,29,30,31,32	112.9874
Region 10	Fill EL0.5to-2.5 (S-Case) AWT	66,32,33,56,57,58,59,60,61,62,63,64,65	165.97255

Points

	X (ft)	Y (ft)
Point 1	0	-8.9
Point 2	48.27777	-8.9
Point 3	58.33585	-8.6
Point 4	68.39447	-7.39
Point 5	78.43568	-5.8
Point 6	88.42691	-4.43
Point 7	98.30442	-2.34
Point 8	103.64343	-1.43
Point 9	110.26068	0.16
Point 10	115.91608	-0.54
Point 11	118.42632	-0.02
Point 12	125.39055	0.87
Point 13	135.5655	1.24
Point 14	145.62969	1.59
Point 15	154.84688	1.9
Point 16	161.11587	2.21
Point 17	171.09548	4.16
Point 18	179.42154	6.95
Point 19	188.55592	10.03
Point 20	195.33167	12.26
Point 21	200	12.48
Point 22	204.77923	12.31
Point 23	213.80464	9.5
Point 24	223.81999	6.27
Point 25	232.81486	3.55
Point 26	245.87715	1.56
Point 27	256.78921	1
Point 28	267.70177	1.02
Point 29	279.07955	1.01
Point 30	290.76907	0.98
Point 31	300	0.75
Point 32	300	0.48
Point 33	122.5	0.5
Point 34	97.5	-2.5
Point 35	300	-2.5
Point 36	77.5	-6
Point 37	300	-6
Point 38	300	-21
Point 39	233	-21
Point 40	200.5	-21.5

Point 41	137.5	-19
Point 42	0	-19
Point 43	300	-30
Point 44	0	-30
Point 45	300	-33
Point 46	233	-33
Point 47	200	-36
Point 48	137.5	-33
Point 49	0	-33
Point 50	300	-42
Point 51	0	-42
Point 52	300	-70
Point 53	0	-70
Point 54	134.5	1.2
Point 55	253	1.2
Point 56	121.73752	0.40267
Point 57	123.50504	0.35789
Point 58	129.24804	0.2888
Point 59	148.57257	0.24324
Point 60	166.74281	0.21135
Point 61	182.22022	0.12041
Point 62	208.21927	-0.33691
Point 63	238.9764	-0.91953
Point 64	257.66001	-1.16535
Point 65	272.59266	-1.21627
Point 66	300	-1.23749

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	2.21	(172.365, 29.266)	22.05173	(200, 12.48)	(154.416, 1.88551)
2	2393	2.22	(172.365, 29.266)	32.384	(200, 12.48)	(155.035, 1.90928)

Slices of Slip Surface: **Optimized**

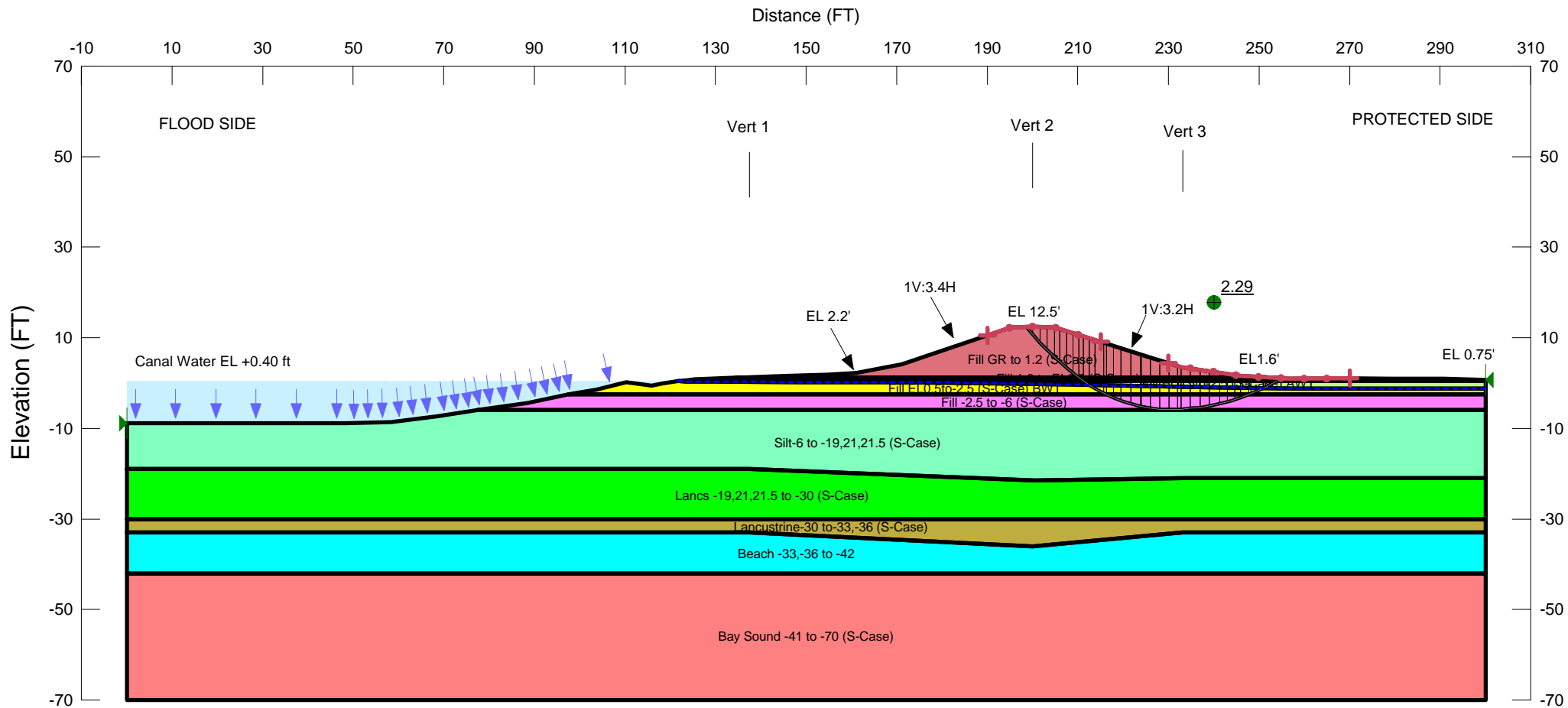
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	154.6315	1.7659725	-85.360462	54.128946	26.400451	75
2	Optimized	155.2491	1.4232165	-64.330128	110.52495	53.906618	75
3	Optimized	156.2854	0.84806085	-32.11382	206.02593	100.48556	75
4	Optimized	157.1209	0.38434585	-7.71233	283.0177	138.03696	75
5	Optimized	158.51375	-0.24158	25.183095	326.5333	146.97832	0
6	Optimized	160.41055	-1.0028425	65.14546	424.51789	175.27764	0
7	Optimized	162.23815	-1.6431175	98.661444	541.74652	216.10703	0
8	Optimized	164.4592	-2.26814	131.31591	641.1301	248.65299	0
9	Optimized	166.1504	-2.625003	149.8959	725.62137	280.80007	0
10	Optimized	167.0685	-2.818728	159.96383	770.18174	297.62316	0
11	Optimized	168.3195	-2.9781005	168.18418	782.0344	299.39475	0
12	Optimized	170.17015	-3.1594015	177.43931	845.33068	325.75238	0

13	Optimized	171.39375	-3.279271	183.56075	892.21003	345.63135	0
14	Optimized	172.4529	-3.285315	183.67321	889.95961	344.47889	0
15	Optimized	173.97475	-3.238965	180.91467	943.55423	371.96417	0
16	Optimized	175.558	-3.09071	172.72274	944.76347	376.54942	0
17	Optimized	177.20265	-2.84055	159.08357	979.86825	400.32343	0
18	Optimized	178.41195	-2.607735	146.42307	955.83319	394.77569	0
19	Optimized	179.1102	-2.413311	135.90907	960.64768	402.2519	0
20	Optimized	180.0583	-2.1493165	121.60963	966.09953	411.88524	0
21	Optimized	181.3319	-1.7947055	102.37387	973.51244	424.88267	0
22	Optimized	182.09445	-1.5645535	89.846443	927.96854	408.77946	0
23	Optimized	183.15225	-1.1200724	65.796925	918.30825	415.79756	0
24	Optimized	185.05775	-0.31941385	22.348194	900.86037	428.47902	0
25	Optimized	186.36905	0.2911877	-10.926259	818.47491	399.19688	75
26	Optimized	187.25705	0.8210477	-39.706027	797.21105	388.82581	75
27	Optimized	187.8461	1.174665	-58.896527	766.91554	374.0497	75
28	Optimized	188.22045	1.418625	-73.995095	756.27082	368.85793	75
29	Optimized	189.45065	2.22034	-124.27152	720.61005	351.465	75
30	Optimized	191.0191	3.3058975	-192.35632	645.98691	315.06887	75
31	Optimized	192.36645	4.3108325	-255.5569	596.7258	291.04262	75
32	Optimized	193.613	5.3340895	-319.43618	511.33813	249.39627	75
33	Optimized	194.7588	6.3756685	-384.77907	456.01819	222.41493	75
34	Optimized	195.8632	7.379624	-448.01511	390.21816	190.32212	75
35	Optimized	197.06275	8.5541475	-521.95123	282.89694	137.97806	75
36	Optimized	198.39885	9.9368625	-609.42851	177.15449	86.404019	75
37	Optimized	199.53345	11.225215	-692.24749	67.304405	32.826552	75

Slices of Slip Surface: 2393

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	2393	155.6215	1.55464	-72.420561	98.471957	48.027982	75
2	2393	156.8533	0.84802825	-32.140672	209.12127	101.99526	75
3	2393	157.7648	0.3613477	-6.5344176	281.52148	137.3072	75
4	2393	158.8026	-0.1291145	19.232366	318.91436	146.16467	0
5	2393	160.3448	-0.79320195	54.104125	407.08295	172.15928	0
6	2393	161.9413	-1.3822565	84.945707	498.39938	201.65483	0
7	2393	163.59215	-1.895347	111.78354	592.35772	234.39169	0
8	2393	165.243	-2.3138585	133.61713	670.92202	262.06111	0
9	2393	166.4056	-2.563131	146.58985	718.31649	278.84971	0
10	2393	167.46825	-2.737251	155.61	753.04611	291.38906	0
11	2393	168.91915	-2.9258825	165.33304	793.87271	306.55928	0
12	2393	170.37005	-3.0483015	171.53361	826.40194	319.40062	0
13	2393	171.852	-3.1050565	174.26892	863.77802	336.29606	0
14	2393	173.36505	-3.093645	173.35527	905.22338	356.95593	0
15	2393	174.8781	-3.0113415	168.6844	937.71394	375.08077	0
16	2393	176.39115	-2.8576	160.18236	961.44829	390.80351	0
17	2393	177.9042	-2.631386	147.82883	976.69134	404.26325	0
18	2393	179.0411	-2.419842	136.27695	982.58045	412.7698	0
19	2393	180.1212	-2.1670275	122.53377	981.11658	418.75882	0

20	2393	181.52055	-1.7880795	101.94695	973.33874	425.00617	0
21	2393	182.9052	-1.34593	77.901283	957.97803	429.24211	0
22	2393	184.27515	-0.83907265	50.364293	934.99748	431.46444	0
23	2393	185.6451	-0.25997741	18.842376	904.23967	431.83711	0
24	2393	186.7773	0.27041279	-10.084848	865.15639	421.96496	75
25	2393	187.8902	0.85652105	-42.012376	828.97743	404.31931	75
26	2393	189.2335	1.633986	-88.094767	778.72575	379.80992	75
27	2393	190.58865	2.509135	-142.97834	719.98434	351.15982	75
28	2393	191.9438	3.4852195	-204.38926	653.2464	318.60956	75
29	2393	193.29895	4.574277	-272.698	578.10919	281.96269	75
30	2393	194.6541	5.79214	-348.9382	494.06155	240.96992	75
31	2393	196.10975	7.2756805	-442.06345	375.24305	183.01826	75
32	2393	197.66585	9.0916145	-556.04545	221.98549	108.26956	75
33	2393	199.22195	11.225735	-691.49275	58.037663	28.306859	75



Name: Fill 1.2 to EL0.5 (S-Case) Model: Spatial Mohr-Coulomb Unit Weight: 111 pcf Cohesion: 75 psf Phi: 26 ° Phi-B: 0 °
 Name: Fill EL0.5to-2.5 (S-Case) AWT Model: Mohr-Coulomb Unit Weight: 111 pcf Cohesion: 75 psf Phi: 26 ° Phi-B: 0 °
 Name: Fill -2.5 to -6 (S-Case) Model: Spatial Mohr-Coulomb Unit Weight: 102 pcf Cohesion: 0 psf Phi: 26 ° Phi-B: 0 °
 Name: Silt-6 to -19,21,21.5 (S-Case) Model: Mohr-Coulomb Unit Weight: 117 pcf Cohesion: 0 psf Phi: 34 ° Phi-B: 0 °
 Name: Lancs -19,21,21.5 to -30 (S-Case) Model: Spatial Mohr-Coulomb Weight Spatial Fn: Lanc -19,21,21.5 to -30 Cohesion: 0 psf Phi: 26 ° Phi-B: 0 °
 Name: Lancustrine-30 to -33,-36 (S-Case) Model: Spatial Mohr-Coulomb Weight Spatial Fn: Lanc -30 to -33, -36 Cohesion: 0 psf Phi: 26 ° Phi-B: 0 °
 Name: Beach -33,-36 to -42 Model: Mohr-Coulomb Unit Weight: 122 pcf Cohesion: 0 psf Phi: 33 ° Phi-B: 0 °
 Name: Bay Sound -41 to -70 (S-Case) Model: Mohr-Coulomb Unit Weight: 106 pcf Cohesion: 0 psf Phi: 26 ° Phi-B: 0 °
 Name: Fill GR to 1.2 (S-Case) Model: Mohr-Coulomb Unit Weight: 111 pcf Cohesion: 75 psf Phi: 26 ° Phi-B: 0 °
 Name: Fill EL0.5to-2.5 (S-Case) BWT Model: Mohr-Coulomb Unit Weight: 111 pcf Cohesion: 0 psf Phi: 26 ° Phi-B: 0 °

CROSS SECTION AT STA 103+00 EAST

GENERAL NOTES

CLASSIFICATION STRATIFICATION
 SHEAR STRENGTHS AND UNIT WEIGHTS OF
 THE SOIL WERE BASED ON THE RESULTS OF
 UNDISTURBED BORINGS AND CPT DATA. SEE
 BOTH BORING AND CPT DATA PLATES.

WHERE INDICATED, SHEAR STRENGTHS BETWEEN
 VERTICALS WERE ASSUMED TO VARY LINEARLY
 BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

LAKE PONTCHARTRAIN, LA. AND VICINITY
 HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL,
 REMEDIATION OF CANAL WALLS AND LEVEES
 FLOOD SIDE STABILITY ANALYSIS,
 CASE: Name: NWL S-Case P/S (EE)
 REACH 21, STA. 103+00 TO STA. 113+05 EAST
 ORLEANS PARISH, LOUISIANA

NWL S-Case P/S (EE)

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File Information

Created By: [Vicky Curtis](#)
Revision Number: [209](#)
Last Edited By: [Vicky Curtis](#)
Date: [10/1/2013](#)
Time: [12:46:44 PM](#)
File Name: [Reach 21.gsz](#)
Directory: [C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix F NWL\](#)
Last Solved Date: [10/1/2013](#)
Last Solved Time: [12:53:54 PM](#)

Project Settings

Length(L) Units: [feet](#)
Time(t) Units: [Seconds](#)
Force(F) Units: [lbf](#)
Pressure(p) Units: [psf](#)
Strength Units: [psf](#)
Unit Weight of Water: [62.4 pcf](#)
View: [2D](#)

Analysis Settings

NWL S-Case P/S (EE)

Kind: [SLOPE/W](#)
Parent: [Normal Water Level at +0.40ft \(seepage\)](#)
Method: [Spencer](#)
Settings
 PWP Conditions Source: [Parent Analysis](#)
Slip Surface
 Direction of movement: [Left to Right](#)
 Use Passive Mode: [No](#)
 Slip Surface Option: [Entry and Exit](#)
 Critical slip surfaces saved: [1](#)
 Optimize Critical Slip Surface Location: [Yes](#)
Tension Crack
 Tension Crack Option: [Search for Tension Crack](#)
 Percentage Wet: [0](#)
 Tension Crack Fluid Unit Weight: [62.4 pcf](#)
FOS Distribution
 FOS Calculation Option: [Constant](#)

Advanced

Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 9000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

Fill 1.2 to EL0.5 (S-Case)

Model: Spatial Mohr-Coulomb
Unit Weight: 111 pcf
Cohesion: 75 psf
Phi: 26 °
Phi-B: 0 °

Fill EL0.5to-2.5 (S-Case) AWT

Model: Mohr-Coulomb
Unit Weight: 111 pcf
Cohesion: 75 psf
Phi: 26 °
Phi-B: 0 °

Fill -2.5 to -6 (S-Case)

Model: Spatial Mohr-Coulomb
Unit Weight: 102 pcf
Cohesion: 0 psf
Phi: 26 °
Phi-B: 0 °

Silt-6 to -19,21,21.5 (S-Case)

Model: Mohr-Coulomb
Unit Weight: 117 pcf
Cohesion: 0 psf
Phi: 34 °
Phi-B: 0 °

Lancs -19,21,21.5 to -30 (S-Case)

Model: Spatial Mohr-Coulomb
Weight Spatial Fn: Lanc -19,21,21.5 to -30
Cohesion: 0 psf
Phi: 26 °

Phi-B: 0 °

Lancustrine-30 to-33,-36 (S-Case)

Model: [Spatial Mohr-Coulomb](#)

Weight Spatial Fn: [Lanc -30 to -33, -36](#)

Cohesion: [0 psf](#)

Phi: [26 °](#)

Phi-B: [0 °](#)

Beach -33,-36 to -42

Model: [Mohr-Coulomb](#)

Unit Weight: [122 pcf](#)

Cohesion: [0 psf](#)

Phi: [33 °](#)

Phi-B: [0 °](#)

Bay Sound -41 to -70 (S-Case)

Model: [Mohr-Coulomb](#)

Unit Weight: [106 pcf](#)

Cohesion: [0 psf](#)

Phi: [26 °](#)

Phi-B: [0 °](#)

Fill GR to 1.2 (S-Case)

Model: [Mohr-Coulomb](#)

Unit Weight: [111 pcf](#)

Cohesion: [75 psf](#)

Phi: [26 °](#)

Phi-B: [0 °](#)

Fill EL0.5to-2.5 (S-Case) BWT

Model: [Mohr-Coulomb](#)

Unit Weight: [111 pcf](#)

Cohesion: [0 psf](#)

Phi: [26 °](#)

Phi-B: [0 °](#)

Slip Surface Entry and Exit

Left Projection: [Range](#)

Left-Zone Left Coordinate: [\(190, 10.50527\) ft](#)

Left-Zone Right Coordinate: [\(215, 9.11449\) ft](#)

Left-Zone Increment: [5](#)

Right Projection: [Range](#)

Right-Zone Left Coordinate: [\(230, 4.4012\) ft](#)

Right-Zone Right Coordinate: [\(270, 1.01798\) ft](#)

Right-Zone Increment: [8](#)

Radius Increments: [15](#)

Slip Surface Limits

Left Coordinate: (0, -8.9) ft
Right Coordinate: (300, 0.75) ft

Spatial Functions

Lanc -19,21,21.5 to -30

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Unit Weight (pcf)
Data Point: (85, -19, 101)
Data Point: (85, -30, 101)
Data Point: (200, -21.5, 105)
Data Point: (200, -30, 105)
Data Point: (233, -21, 101)
Data Point: (233, -30, 101)
Data Point: (50, -19, 101)
Data Point: (50, -30, 101)
Data Point: (310, -21, 101)
Data Point: (310, -30, 101)

Lanc -30 to -33, -36

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Unit Weight (pcf)
Data Point: (85, -30, 101)
Data Point: (85, -33, 101)
Data Point: (200, -30, 105)
Data Point: (200, -36, 105)
Data Point: (233, -30, 101)
Data Point: (233, -33, 101)
Data Point: (310, -30, 101)
Data Point: (310, -33, 101)
Data Point: (50, -30, 101)
Data Point: (50, -33, 101)

Regions

	Material	Points	Area (ft²)
Region 1	Fill GR to 1.2 (S-Case)	54,13,14,15,16,17,18,19,20,21,22,23,24,25,26,55	515.15788
Region 2	Fill EL0.5to-2.5 (S-Case) BWT	34,7,8,9,10,11,56,57,58,59,60,61,62,63,64,65,66,35	410.24005
Region 3	Fill -2.5 to -6 (S-Case)	36,5,6,34,35,37	740.68609
Region 4	Silt-6 to -19,21,21.5 (S-Case)	1,2,3,4,36,37,38,39,40,41,42	3991.8145
Region 5	Lancs -19,21,21.5 to -30 (S-Case)	42,41,40,39,38,43,44	3014.125
Region 6	Lancustrine-30 to-33,-36 (S-Case)	44,43,45,46,47,48,49	1043.25

Region 7	Beach -33,-36 to -42	49,48,47,46,45,50,51	2556.75
Region 8	Bay Sound -41 to -70 (S-Case)	51,50,52,53	8400
Region 9	Fill 1.2 to EL0.5 (S-Case)	33,12,54,55,27,28,29,30,31,32	112.9874
Region 10	Fill EL0.5to-2.5 (S-Case) AWT	66,32,33,56,57,58,59,60,61,62,63,64,65	165.97255

Points

	X (ft)	Y (ft)
Point 1	0	-8.9
Point 2	48.27777	-8.9
Point 3	58.33585	-8.6
Point 4	68.39447	-7.39
Point 5	78.43568	-5.8
Point 6	88.42691	-4.43
Point 7	98.30442	-2.34
Point 8	103.64343	-1.43
Point 9	110.26068	0.16
Point 10	115.91608	-0.54
Point 11	118.42632	-0.02
Point 12	125.39055	0.87
Point 13	135.5655	1.24
Point 14	145.62969	1.59
Point 15	154.84688	1.9
Point 16	161.11587	2.21
Point 17	171.09548	4.16
Point 18	179.42154	6.95
Point 19	188.55592	10.03
Point 20	195.33167	12.26
Point 21	200	12.48
Point 22	204.77923	12.31
Point 23	213.80464	9.5
Point 24	223.81999	6.27
Point 25	232.81486	3.55
Point 26	245.87715	1.56
Point 27	256.78921	1
Point 28	267.70177	1.02
Point 29	279.07955	1.01
Point 30	290.76907	0.98
Point 31	300	0.75
Point 32	300	0.48
Point 33	122.5	0.5
Point 34	97.5	-2.5
Point 35	300	-2.5
Point 36	77.5	-6
Point 37	300	-6
Point 38	300	-21
Point 39	233	-21
Point 40	200.5	-21.5

Point 41	137.5	-19
Point 42	0	-19
Point 43	300	-30
Point 44	0	-30
Point 45	300	-33
Point 46	233	-33
Point 47	200	-36
Point 48	137.5	-33
Point 49	0	-33
Point 50	300	-42
Point 51	0	-42
Point 52	300	-70
Point 53	0	-70
Point 54	134.5	1.2
Point 55	253	1.2
Point 56	121.73752	0.40267
Point 57	123.50504	0.35789
Point 58	129.24804	0.2888
Point 59	148.57257	0.24324
Point 60	166.74281	0.21135
Point 61	182.22022	0.12041
Point 62	208.21927	-0.33691
Point 63	238.9764	-0.91953
Point 64	257.66001	-1.16535
Point 65	272.59266	-1.21627
Point 66	300	-1.23749

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	2.29	(232.827, 32.672)	27.01789	(198.535, 12.411)	(255.034, 1.09264)
2	377	2.30	(232.827, 32.672)	38.52	(200.024, 12.4791)	(254.893, 1.10006)

Slices of Slip Surface: Optimized

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	199.26735	11.58773	-714.09094	45.93793	22.405426	75
2	Optimized	200.844	9.81616	-607.46532	187.70615	91.550408	75
3	Optimized	202.4608	8.108455	-504.82768	335.66264	163.71361	75
4	Optimized	204.0064	6.5897445	-413.40122	457.17387	222.97859	75
5	Optimized	205.41095	5.2096495	-330.32279	553.13302	269.781	75
6	Optimized	206.759	3.9857525	-256.69502	649.21266	316.64217	75
7	Optimized	208.19165	2.7794375	-184.25594	714.99356	348.72566	75
8	Optimized	209.5789	1.68814	-118.76546	802.03446	391.17835	75
9	Optimized	210.73775	0.84500135	-70.111924	845.21117	412.23703	75
10	Optimized	211.8344	0.04710635	-26.450549	886.02433	432.14294	75
11	Optimized	213.12385	-0.7783645	18.920054	990.15099	473.70098	0
12	Optimized	214.71745	-1.6739445	68.239552	1030.3977	469.27587	0

13	Optimized	215.98385	-2.343475	105.35236	1097.5191	483.91203	0
14	Optimized	217.12335	-2.847975	133.27051	1109.618	476.19651	0
15	Optimized	218.69525	-3.543925	172.02425	1124.6262	464.61504	0
16	Optimized	220.5659	-4.207318	209.02742	1181.3092	474.21351	0
17	Optimized	222.7353	-4.8381545	244.32638	1169.8011	451.38417	0
18	Optimized	223.9011	-5.1771615	263.45273	1163.7659	439.11206	0
19	Optimized	224.99975	-5.350285	273.0241	1199.1416	451.69769	0
20	Optimized	227.0348	-5.649355	289.63172	1162.0467	425.50524	0
21	Optimized	229.05305	-5.815595	298.58165	1160.2766	420.27673	0
22	Optimized	231.05455	-5.849005	299.76561	1094.5346	387.63475	0
23	Optimized	232.4351	-5.8282905	298.00421	1086.0135	384.33781	0
24	Optimized	233.84415	-5.6894605	289.18366	1038.7485	365.58718	0
25	Optimized	235.9027	-5.48664	276.23254	979.67317	343.09092	0
26	Optimized	237.9542	-5.1915125	257.64525	940.51812	333.05935	0
27	Optimized	240.1648	-4.7725825	231.37461	853.01588	303.1947	0
28	Optimized	242.1777	-4.323605	203.19265	789.5011	285.96174	0
29	Optimized	243.8267	-3.876075	175.10654	707.15654	259.49812	0
30	Optimized	245.2642	-3.4239035	146.71126	653.95587	247.39972	0
31	Optimized	246.8104	-2.8477485	110.51965	568.66361	223.45174	0
32	Optimized	247.9959	-2.406005	82.66466	508.71846	207.80032	0
33	Optimized	249.65675	-1.6952965	37.77498	419.79426	186.32325	0
34	Optimized	251.21165	-1.0144915	-5.5337819	345.11825	168.32542	75
35	Optimized	252.179	-0.49410877	-38.512397	286.86535	139.91358	75
36	Optimized	253.4705	0.22368609	-84.007067	171.43048	83.612233	75
37	Optimized	254.4875	0.78891685	-119.95179	80.30908	39.169356	75

Slices of Slip Surface: 377

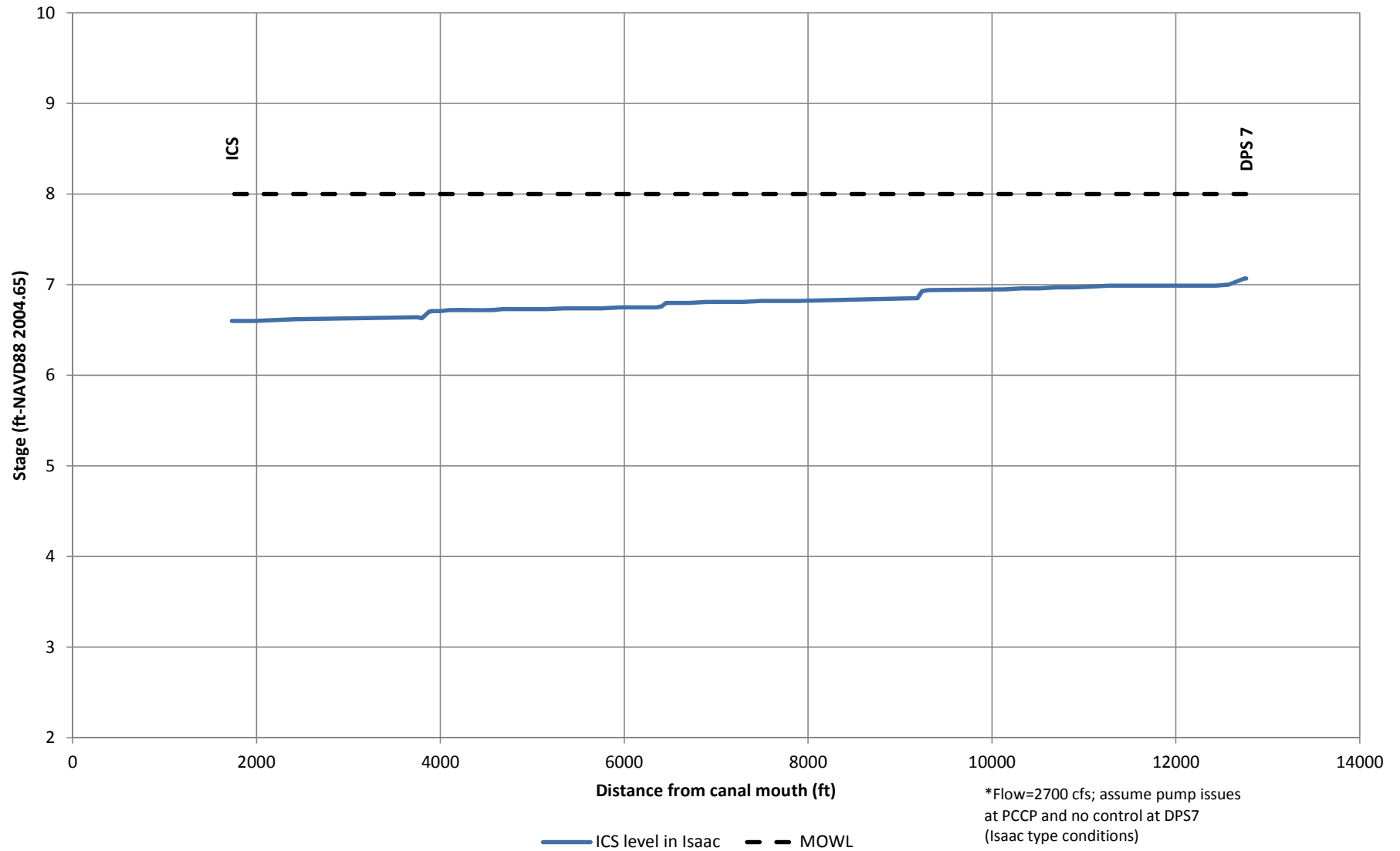
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	377	200.81695	11.29265	-699.12278	55.432202	27.036091	75
2	377	202.40185	9.084032	-565.08139	227.08795	110.7582	75
3	377	203.98675	7.1658645	-449.01025	388.76045	189.61114	75
4	377	205.75225	5.3071165	-336.86301	534.21906	260.55604	75
5	377	207.6984	3.5060555	-228.4429	660.23508	322.01817	75
6	377	209.64455	1.9338565	-134.04963	770.32898	375.71455	75
7	377	211.1386	0.84497695	-70.647734	846.28818	412.76232	75
8	377	212.39435	0.03001915	-26.157095	901.81962	439.84682	75
9	377	213.46685	-0.62628545	9.907996	958.25457	462.53953	0
10	377	214.6338	-1.2671192	45.122976	1000.1876	465.81615	0
11	377	216.29215	-2.1057915	91.460625	1051.9551	468.46447	0
12	377	217.95865	-2.850469	132.75496	1090.9141	467.32543	0
13	377	219.6333	-3.506294	169.19506	1117.5513	462.54424	0
14	377	221.30795	-4.0741265	200.8687	1135.0253	455.6186	0
15	377	222.98265	-4.5580035	227.92021	1143.6132	446.61333	0
16	377	224.7195	-4.9731155	251.14959	1144.973	435.94682	0
17	377	226.51845	-5.3161935	270.32659	1138.6761	423.52236	0
18	377	228.3174	-5.571617	284.51461	1122.4796	408.70285	0
19	377	230.1164	-5.741139	293.75984	1096.401	391.47425	0

20	377	231.9154	-5.8258965	298.06422	1060.2519	371.74378	0
21	377	233.8418	-5.8201085	296.96855	1027.7621	356.43185	0
22	377	235.89565	-5.710921	289.65235	997.91254	345.44157	0
23	377	237.9495	-5.490967	275.64002	955.28185	331.48347	0
24	377	239.839	-5.1933775	256.91343	904.57737	315.88681	0
25	377	241.5642	-4.8326785	234.33076	847.3031	298.96658	0
26	377	243.2894	-4.3882005	206.51349	779.13935	279.28829	0
27	377	245.0146	-3.8568775	173.24672	699.29916	256.57292	0
28	377	247.20465	-3.034538	121.68113	595.91503	231.29933	0
29	377	249.2449	-2.1640665	66.892306	491.3875	207.04014	0
30	377	250.6705	-1.45545	22.18969	398.31538	183.44876	0
31	377	252.19165	-0.61247135	-31.184005	310.19336	151.29141	75
32	377	253.4933	0.17150445	-80.786163	190.60481	92.964178	75
33	377	254.44005	0.7926203	-120.14953	91.300864	44.530407	75

APPENDIX G EXTREME CANAL WATER LEVEL PROFILE

Orleans Ave. Outfall Canal

S&WB Input - 2700 cfs*



Hydraulic Information (Flowline)		Geotechnical Information		Geotechnical Information	
W.S. Elev.	Distance from DPS 7	Distance from DPS 7 (East Side)	Reach	Distance from DPS 7 (West Side)	Reach
(ft)	(ft)	(ft)		(ft)	
7.1	0.0				
7.1	20.0	245.0	12A	245.0	1A
7.1	40.0	370.0		700.0	
7.0	190.0	370.0	12B	700.0	1B
7.0	330.0	470.0		925.0	
7.0	730.0	470.0	13A	925.0	1C
7.0	920.0	700.0		1100.0	
7.0	1110.0	700.0	13B	1100.0	1D
7.0	1300.0	1450.0		1420.0	
7.0	1490.0	1450.0	14	1420.0	2
7.0	1680.0	2050.0		2175.0	
7.0	1870.0	2050.0	15	2175.0	3
7.0	2060.0	3000.0		2487.0	
7.0	2250.0	3000.0	16	2487.0	4
7.0	2440.0	3640.0		2916.0	
7.0	2630.0		Harrison	2916.0	5
6.9	3455.0	3744.0		3626.0	
6.9	3523.0	3744.0	17		Harrison
6.9	3574.0	5000.0			
6.9	3624.0	5000.0	18A	3727.0	5
6.8	4884.0	6100.0		4200.0	
6.8	5080.4	6100.0	18B	4200.0	6
6.8	5276.9	6400.0		5000.0	
6.8	5473.3		Filmore	5000.0	7
6.8	5669.7			5900.0	
6.8	5866.2	6500.0	19	5900.0	8
6.8	6062.6	9062.0		6358.0	
6.8	6259.0		Robert E. Lee		Filmore
6.8	6309.0				
6.8	6359.0	9220.0	20A	6500.0	9
6.8	6409.0	9346.0		9042.0	
6.8	6609.0	9346.0	20B		Robert E. Lee
6.8	6809.0	10150.0			
6.7	7009.0	10150.0	21	9188.0	10A
6.7	7209.0	11305.0		9353.0	
6.7	7409.0			9353.0	10B
6.7	7609.0			9870.0	
6.7	7705.2			9870.0	11
6.7	7801.3			11250.0	
6.7	7897.5				
6.7	7993.6				
6.7	8089.8				
6.7	8185.9				
6.7	8282.1				
6.7	8378.2				
6.7	8474.4				
6.7	8570.5				
6.7	8666.7				
6.7	8762.8				
6.7	8859.0				
6.7	8889.0				
6.6	8968.0				
6.6	9014.0				
6.6	10344.0				
6.6	10794.0				
6.6	10814.0				
6.6	10834.0				
6.6	10854.0				
6.6	10874.0				
6.6	10894.0				
6.6	10914.0				
6.6	10934.0				
6.6	10959.0				
6.6	10984.0				
6.6	11009.0				
6.6	11034.0				