

APPENDIX E – Documentation of Changes to

Soils Properties

London Avenue Outfall Canal

Reach 1

There were no changes made to the soil stratigraphy in Reach 1. At the toe, Black and Veatch used 425 psf for the fill layer, instead of the 650 psf shown in Appendix B. This was left as 425 psf.

The global stability FOS was 3.03 and the gap FOS was 3.65 with a slip surface at EL -6.5. For the global stability, there were two equally critical slip surfaces, at different elevations. For the gap stability, only the shallower slip surface is critical. No passive correction was required

Reach 2

Reach 2 is considered a Priority Reach. There were no changes to the soil stratification for Reach 2, except that Black and Veatch had the elevation of the clay-silt interface wrong (EL -41.5 instead of EL -30). This was slightly conservative due to the spatial function used for the clay's cohesion.

Water level on the Flood Side was changed from El +10 to El +9. However, an angled block search for global stability yielded a FOS=3.20. The gap stability FOS was 3.75 with the slip surface at El. -5.8. Corrected pressure needed in CWALSHT was 228 pounds. Only two iterations were done because the Slope/W Passive Force calculated from the factor of safety in the second iteration was greater than the CWALSHT Passive Force.

Reach 3

There were no changes to the soil stratification for Reach 3. Water level on the Flood Side was changed from El +10 to El +8. The global stability FOS was 3.17 and the gap FOS was 4.31 with a slip surface at El -5. The corrected pressure needed in CWALSHT was 208 pounds.

Reach 4

There were no changes to the soil stratification for Reach 4. Water level on the Flood Side was changed from El +10 to El +8. The global stability FOS was 2.86 and the gap FOS was 3.64 with a slip surface at EL -4.7. The corrected pressure needed in CWALSHT was 219 pounds.

Reach 5

There were no changes to the soil stratification for Reach 5. The global stability FOS was 3.23 and the gap FOS was 3.35 with a slip surface at EL -8.7. The corrected pressure needed in CWALSHT was 310 pounds.

Reach 6A

There were no changes to the soil stratification for Reach 6A. The global stability FOS was 1.91. The gap stability FOS was 1.34 with the slip surface at EL -7.2. Corrected pressure needed in CWALSHT was 155 pounds.

Reach 6B

There were no changes to the soil stratification for Reach 6B. Water level on the Flood Side was changed from El +10 to El +8. The global stability FOS=2.78. The gap stability FOS was 2.4 with the slip surface at El. -6.5. CWALSHT wall height was changed from 12.9 to 12.8 due to the program not running with 12.9 wall height. Corrected pressure needed in CWALSHT was 258 pounds.

Reach 7

There were changes made to the soil stratification for Reach 7. Black and Veatch had the unit weight at the toe as 104 pcf for the fill and 90 pcf for the lower marsh layer. These were both corrected to 96 pcf to match the B&V strength lines. Water level on the Flood Side was changed from El +10 to El +8. For the non-remediated case, the global stability FOS was 2.16, and the gap stability FOS was 1.91 with the slip surface at EL -10.5. Corrected pressure needed in CWALSHT was 224 pounds. For the remediated case, the global stability FOS was 2.61, and the gap stability FOS was 2.29 with the slip surface at EL -9.4. Corrected pressure needed in CWALSHT was 222 pounds.

Reach 8

There were no changes to the soil stratification for Reach 8. The global stability FOS was 2.87. The gap stability FOS was 2.55 with the slip surface at EL -7.0.

Reach 9

There were no changes to the soil stratification for Reach 9. Water level on the Flood Side was changed from El +10 to El +8. The global stability FOS was 2.73. The gap stability FOS was 2.39 with the slip surface at EL -11.0. Corrected pressure needed in CWALSHT was 355 pounds.

Reach 10

There were no changes made to the soil stratification for Reach 10. Water level on the Flood Side was changed from El +8.5 to El +8. The global stability FOS=2.05. The gap stability FOS was 1.34 with the slip surface at El. -11.5. Corrected pressure needed in CWALSHT was 543 pounds.

Reach 11

There were no changes made to the soil stratification for Reach 11. Water level on the Flood Side was changed from El +10 to El +8. The global stability FOS was 2.12. The gap stability FOS was 1.84 with the slip surface at EL -8.6. Corrected pressure needed in CWALSHT was 302 pounds.

Reach 12A

There were no changes to the soil stratification for Reach 12. The global stability FOS was 1.41. The gap stability FOS was 1.25 with the slip surface at EL -12.5. Corrected pressure needed in CWALSHT was 216 pounds.

Reach 12B

There were no changes to the soil stratification for Reach 12. The global stability FOS was 1.39. The gap stability FOS was 1.25 with the slip surface at EL -8.8. Corrected pressure needed in CWALSHT was 536 pounds.

Reach 13

There were no changes made to the soil stratification for Reach 13. The global stability FOS was 1.79. The gap stability FOS was 1.53 with the slip surface at EL -8.5. Corrected pressure needed in CWALSHT was 541 pounds.

Reach 14

There were no changes to the soil stratification for Reach 14. Water level on the Flood Side was changed from EL +10 to EL +8. The global stability FOS=2.08. The gap stability FOS was 1.49 with the slip surface at EL -10. Corrected pressure needed in CWALSHT was 472 pounds.

Reach 15

There were no changes to the soil stratification for Reach 15. Water level on the Flood Side was changed from EL +10 to EL +8. The global stability FOS was 2.11. The gap stability FOS was 1.77 with the slip surface at EL -11.0. Corrected pressure needed in CWALSHT was 192 pounds.

Reach 16

There were no changes made to the soil stratigraphy in Reach 16. The global stability FOS was 1.61. The gap stability FOS was 1.23 with the slip surface at EL -10.0. Corrected pressure needed in CWALSHT was 493 pounds.

Reach 17

There were no changes to the soil stratification for Reach 17. The global stability FOS was 2.20. The gap stability FOS was 1.86 with the slip surface at EL -3.5. Corrected pressure needed in CWALSHT was 484 pounds.

Reach 17 – Open Connection

In reviewing Black & Veatch's open connection analysis for Reach 17 an error in the stratification was found. The silty sand stratum above the beach sand was also changed to a beach sand. This was

corrected back to a silty sand and the reanalysis resulted in a 2.78 seepage factor of safety for water at EL 8.0.

Reach 20

There were no changes to the soil stratification for Reach 20. Water level on the Flood Side was changed from El +10 to El +9. The global stability FOS was 2.99. The gap stability FOS was 2.48 with the slip surface at EL -6.0. Passive correction was not required.

Reach 21

Reach 21 is considered a Priority Reach. There were no changes to the soil stratification for Reach 21. Water level on the Flood Side was changed from El +10 to El +9. The global stability FOS=2.16. The gap stability FOS was 3.31 with the slip surface at El. -8. No corrected pressure needed to be applied in CWALSHT because the Slope/W Passive Force calculated from the factor of safety was greater than the CWALSHT Passive Force

Reach 22

Reach 22 is considered a Priority Reach. There were no changes to the soil stratification for Reach 22. Water level on the Flood Side was changed from El +10 to El +9. The global stability FOS=2.51. The gap stability FOS was 3.67 with the slip surface at El. -6.5. No corrected pressure needed to be applied in CWALSHT because the Slope/W Passive Force calculated from the factor of safety was greater than the CWALSHT Passive Force.

Reach 23

The "PRODELTA" strata that goes from EL -17.5 to EL -41.5 has the linear function "MARSH1" as its cohesion value. This strata should have the linear function labeled "PRODELTA1" which has the proper strength values for that strata. The file was changed accordingly. Water level on the Flood Side was changed from El +10 to El +8. The global stability FOS=3.75. The gap stability FOS was 4.68 with the slip surface at El. -7. Corrected pressure needed in CWALSHT was 140 pounds.

Reach 24

There were no changes to the soil stratification for Reach 24. Water level on the Flood Side was changed from El +10 to El +8. The global stability FOS was 2.67. The gap stability FOS was 3.28 with the slip surface at EL -6.9. Corrected pressure needed in CWALSHT was 195 pounds.

Reach 25

There were no changes to the soil stratification for Reach 25. Water level on the Flood Side was changed from El +10 to El +8. The global stability FOS=2.60. The gap stability FOS was 3.17 with the slip surface at El. -8. Corrected pressure needed in CWALSHT was 440 pounds.

Reach 28

There were no changes to the soil stratification for Reach 28. Water level on the Flood Side was changed from El +10 to El +8. The global stability FOS=1.82. The gap stability FOS was 1.53 with the slip surface at El. -12.2. CWALSHT wall height was changed from 12.9 to 12.8 due to the program not running with 12.9 wall height. Corrected pressure needed in CWALSHT was 449 pounds.

Reach 29

Strata labeled "Fill -2.6 to -7 (protected)" had $c=220$ psf. The strengthline value has $c=400$ psf at this level. File was changed to match the strengthline. The cohesion spatial function labeled "clay cohesion" had a value of $c=554$ psf for the toe strengths at EL-49. This value was changed to $c=544$ psf to match the value on the strengthline in the appendices. Water level on the Flood Side was changed from El +10 to El +8. The global stability FOS=1.98. The gap stability FOS was 1.64 with the slip surface at El. -13. Corrected pressure needed in CWALSHT was 672 pounds.

Reach 30

There were no changes to the soil stratification for Reach 30. Water level on the Flood Side was changed from El +7.5 to El +8. The global stability FOS was 1.21. The gap stability FOS was 0.99 with the slip surface at EL -10.0. Corrected pressure needed in CWALSHT was 413 pounds.

Reach 31

There were no changes to the soil stratification for Reach 31. Water level on the Flood Side was changed from El +7 to El +8. The global stability FOS=1.26. The gap stability FOS was 1.04 with the slip surface at El. -12. Corrected pressure needed in CWALSHT was 508 pounds.

Reach 32

The cohesion spatial function labeled "clay cohesion" had a value of $c=870$ psf for the toe strengths at EL-70. This value was changed to $c=880$ psf to match the value on the strengthline in the appendices. Water level on the Flood Side was changed from El +10 to El +8. The global stability FOS was 1.70. The gap stability FOS was 1.34 with the slip surface at EL -11.0. Corrected pressure needed in CWALSHT was 328 pounds.

Reach 33

There were no changes to the soil stratification for Reach 33. Water level on the Flood Side was changed from El +10 to El +8. The global stability FOS=1.40. The gap stability FOS was 1.02 with the slip surface at El. -11. Corrected pressure needed in CWALSHT was 763 pounds.

Reach 34

There were no changes to the soil stratification for Reach 34. Water level on the Flood Side was changed from El +9 to El +8. The global stability FOS was 1.34. The gap stability FOS was 1.04 with the slip surface at EL -14.0. Corrected pressure needed in CWALSHT was 313 pounds.

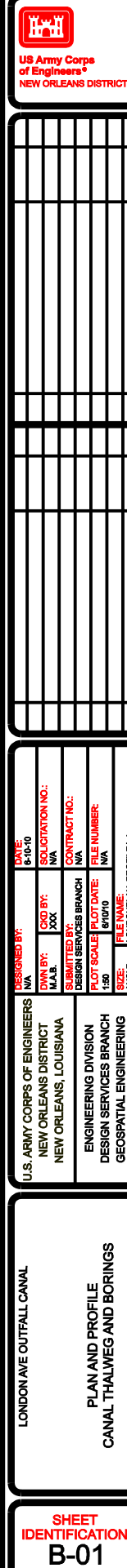
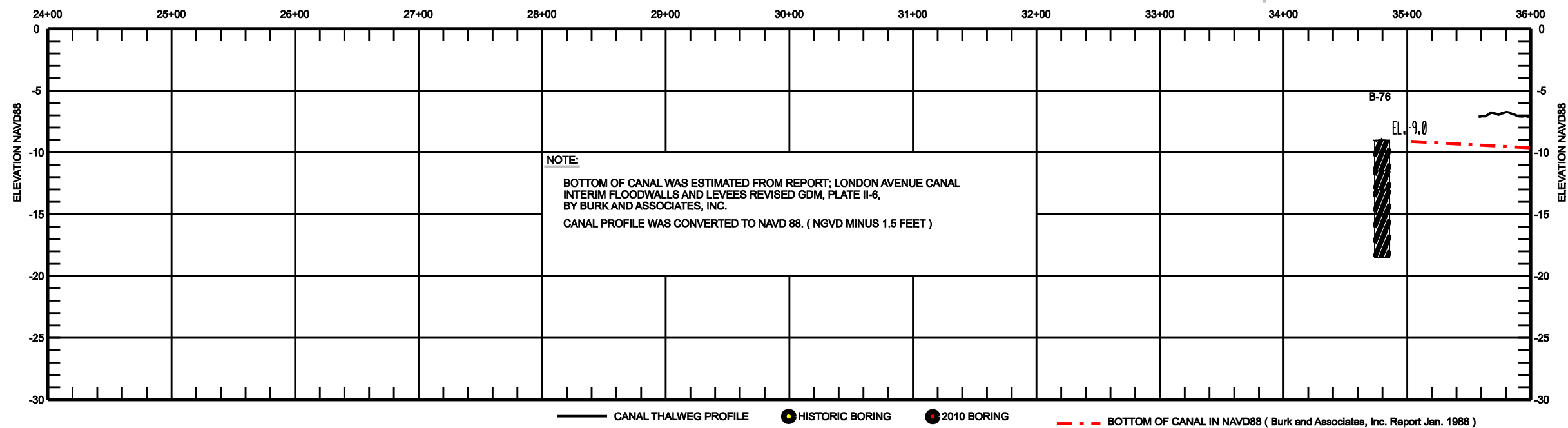
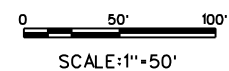
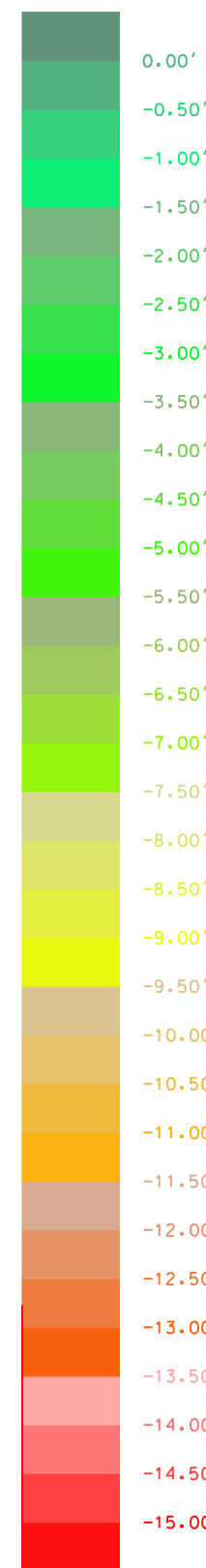
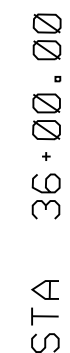
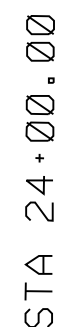
Reach 35A

There were no changes to the soil stratification for Reach 33. Water level on the Flood Side was changed from El +9 to El +8. The global stability FOS=1.46. The gap stability FOS was 1.08 with the slip surface at El. -12. Corrected pressure needed in CWALSHT was 443 pounds.

Reach 35B

There were no changes to the soil stratification for Reach 35B. Water level on the Flood Side was changed from El +10 to El +8. The global stability FOS was 1.26. The gap stability FOS was 0.82 with the slip surface at EL -12.0. Corrected pressure needed in CWALSHT was 407 pounds.

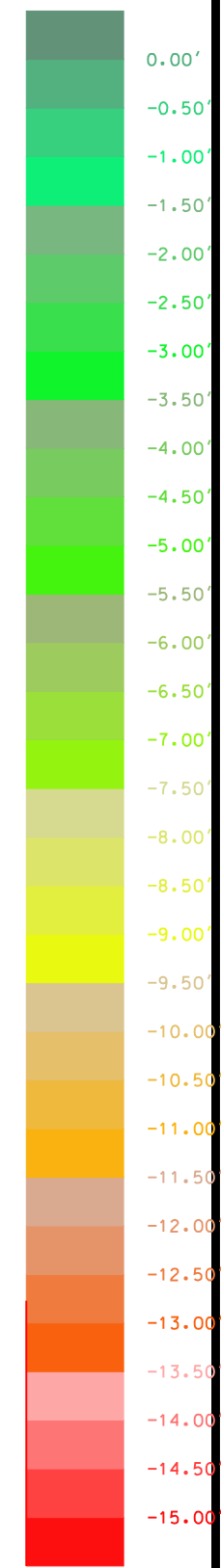
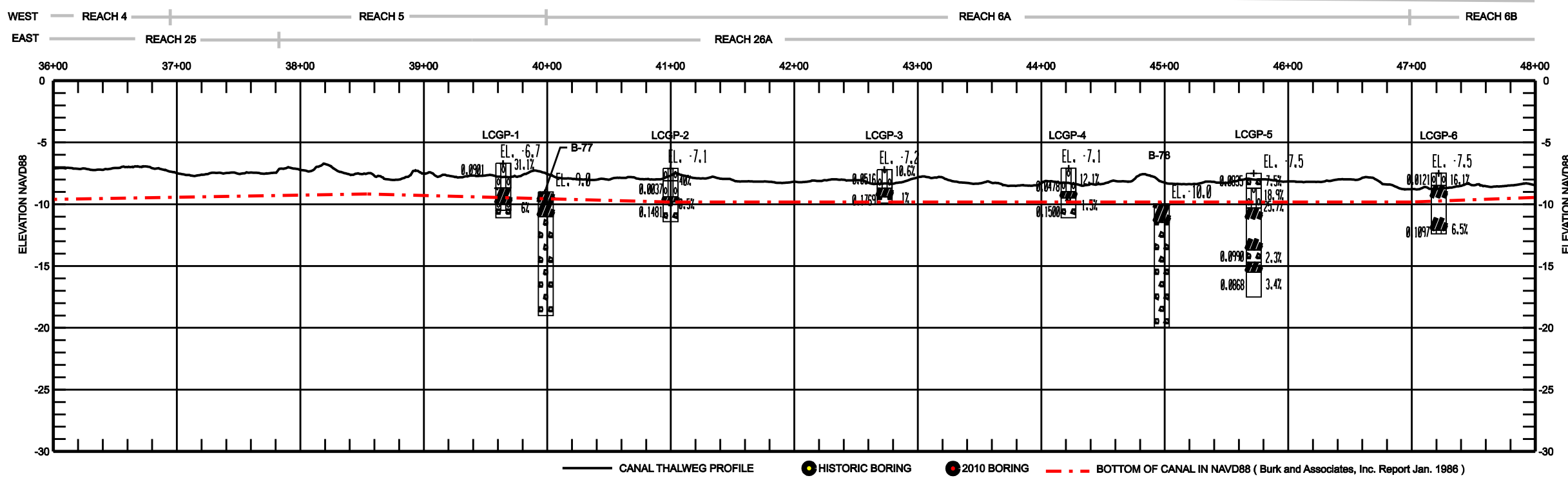
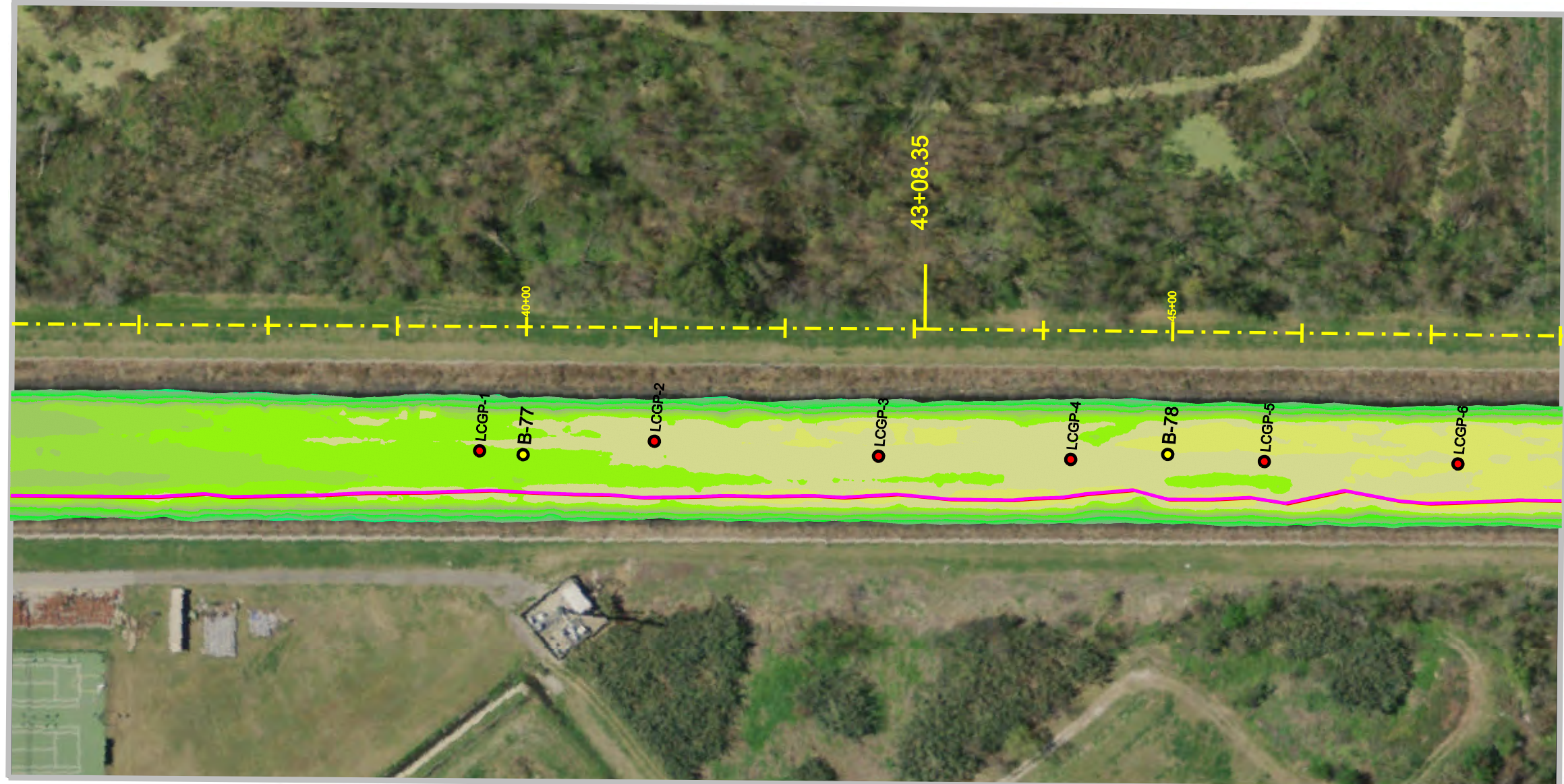
APPENDIX F THALWEG PROFILE



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US Army Corps of Engineers
NEW ORLEANS DISTRICT

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6/10/10	NA	NA	NA	NA						
SOLICITATION NO.	NA	NA	NA	NA	CONTRACT NO.	NA	NA	NA	NA	NA
DESIGNED BY	NA	DESIGNED BY	NA	DESIGNED BY	FILE NUMBER	NA	NA	NA	NA	NA
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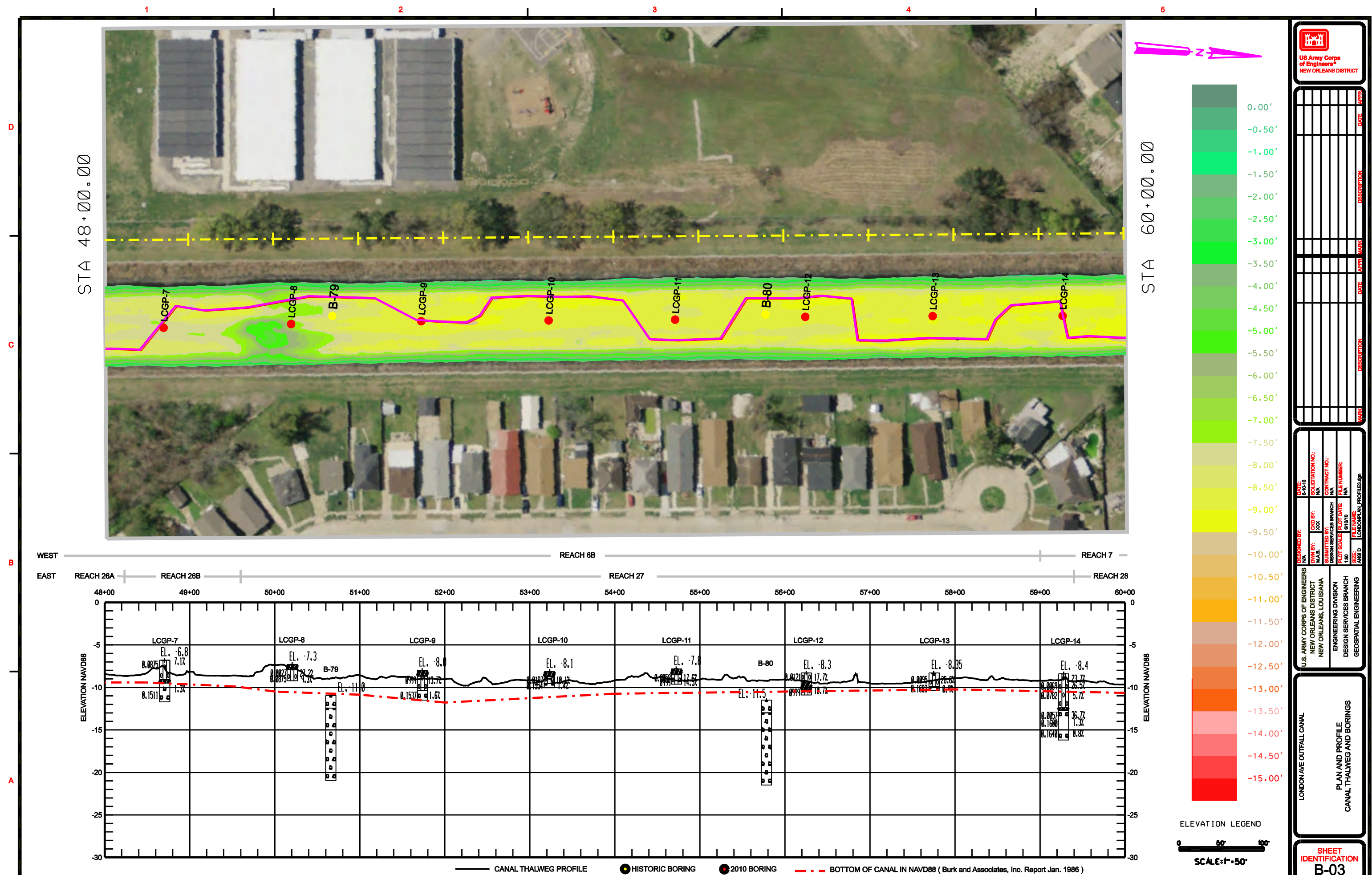
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NEW ORLEANS DISTRICT
NEW ORLEANS, LOUISIANA

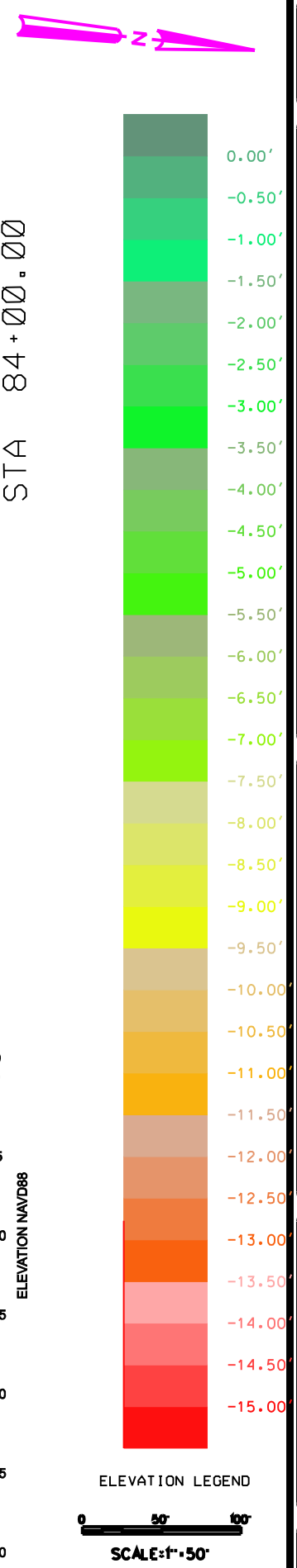
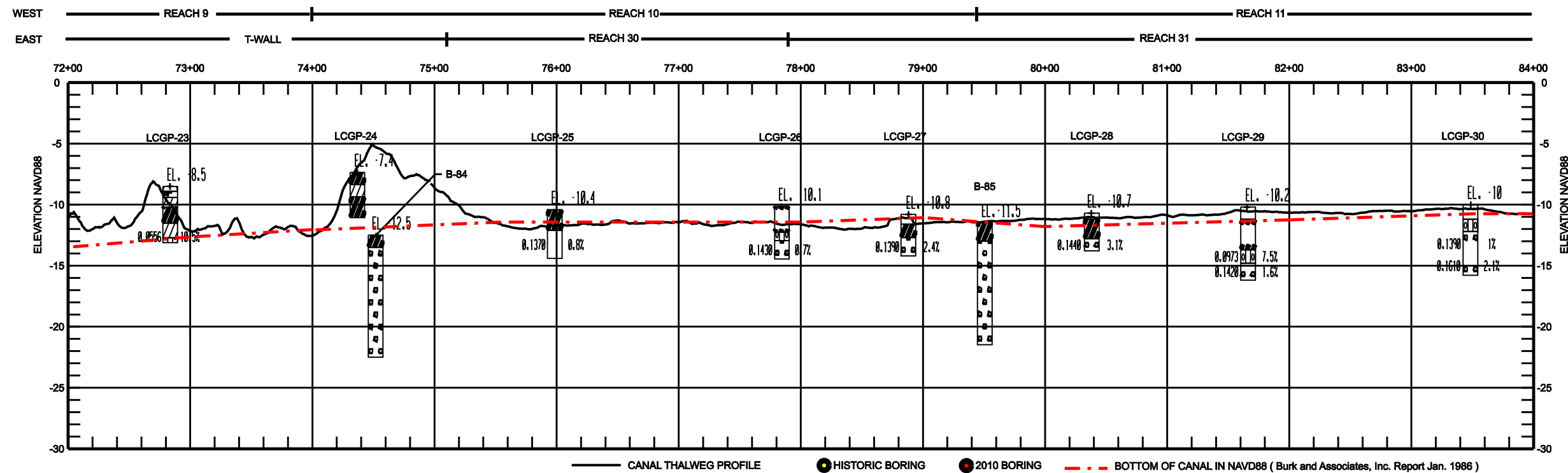
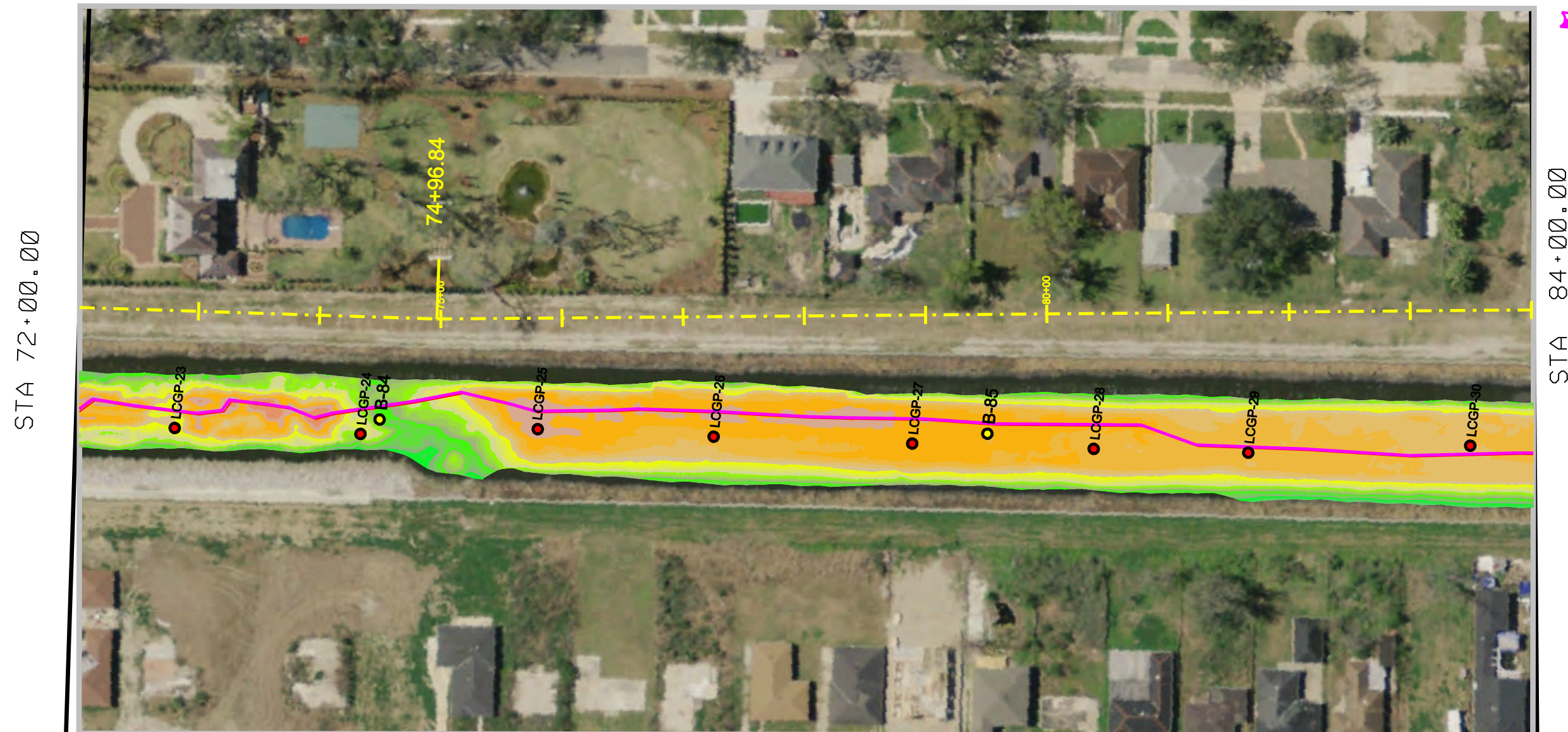
ENGINEERING DIVISION
DESIGN SERVICES BRANCH
GEOSPATIAL ENGINEERING

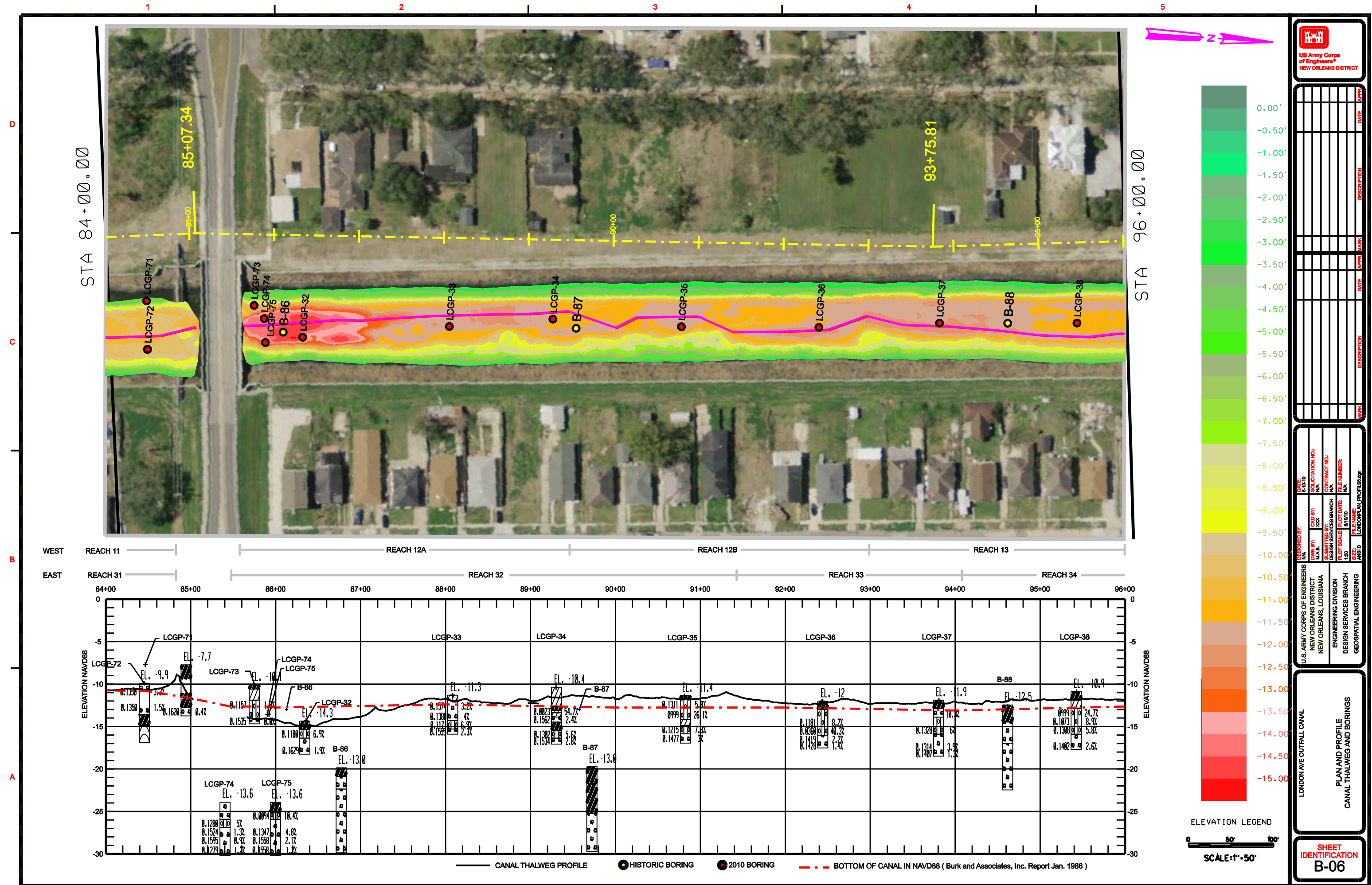
LONDON AVE OUTFALL CANAL

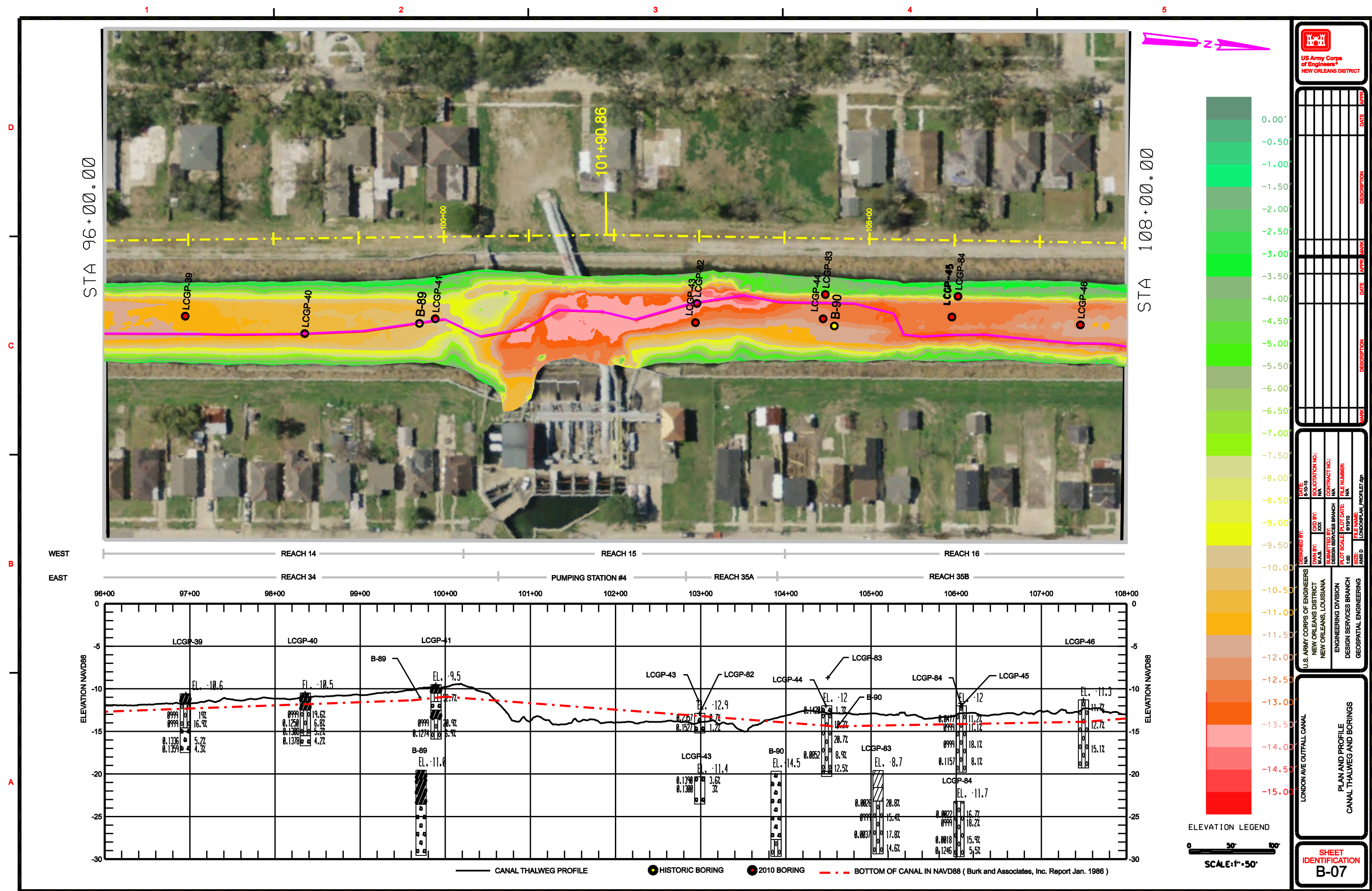
PLAN AND PROFILE
CANAL THALWEG AND BORINGS

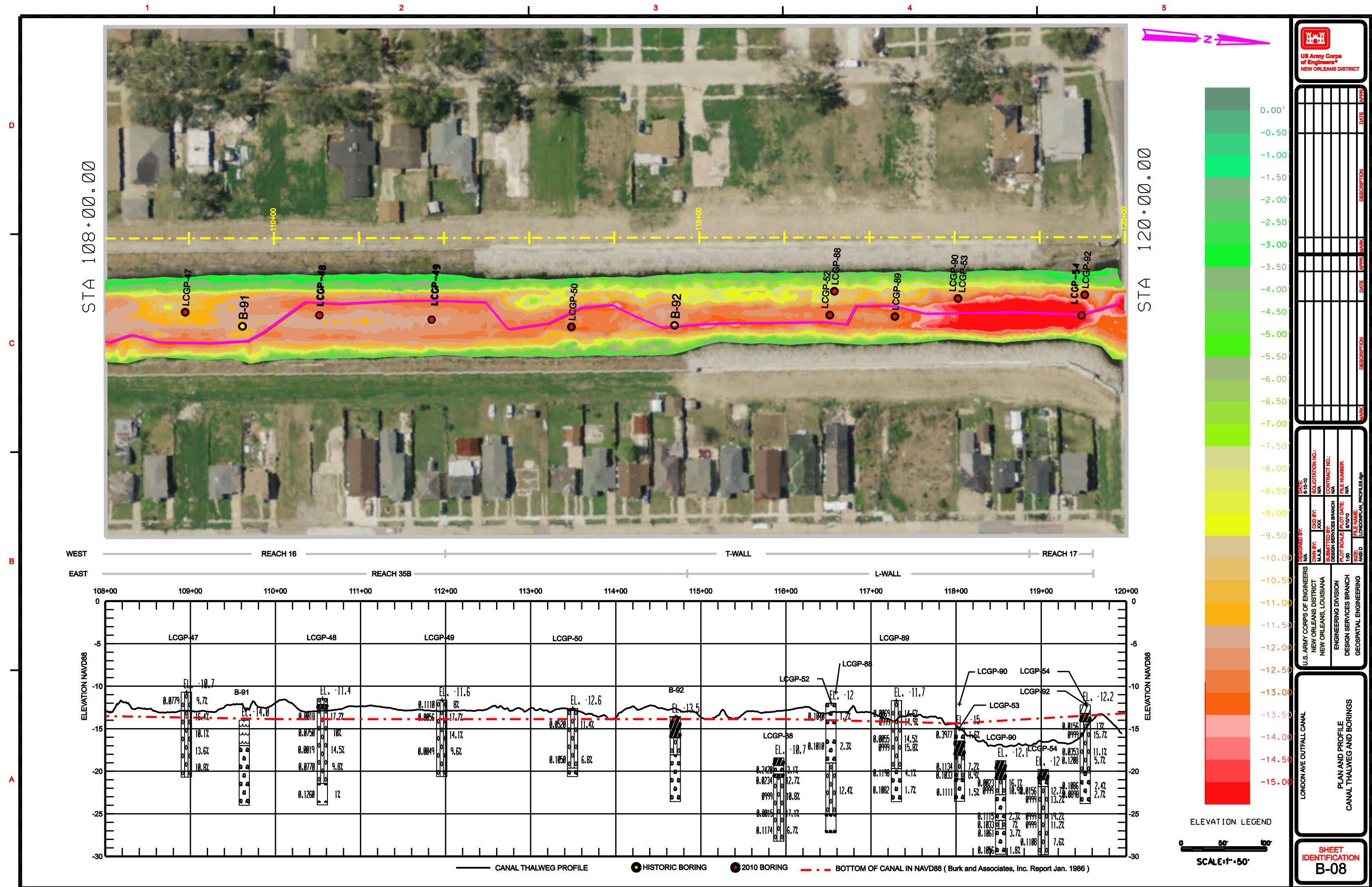
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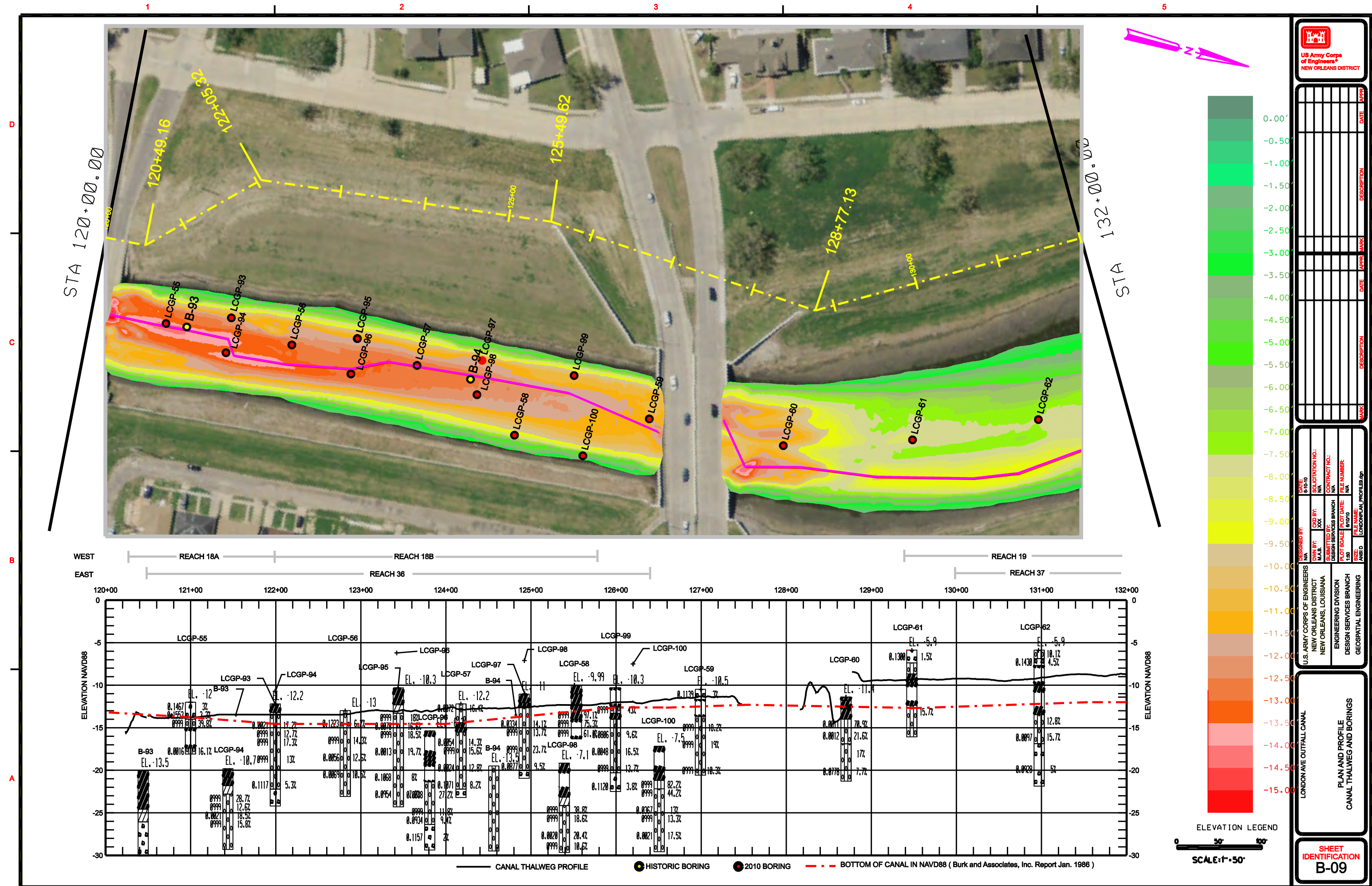












APPENDIX G MODIFICATION 11 REPORT



BLACK & VEATCH

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Overland Park, Kansas 66211 USA
Tel: (913) 458-2900
Fax: (913) 458-6633

Black & Veatch Special Projects Corp.

Anna Petkova
Room 179
Hurricane Protection Office
7400 Leake Ave
New Orleans, LA 70118

13 February, 2011

Subject: Modification 11. Open Canal
Assessment, London Canal, Rev 1

Dear Ms. Petkova,

Enclosed are the results of the assessment of the impacts of an open canal base for reaches 6A, 7, 8, 12B, 14, 17, 26A, 28 for London Canal. The pdf of the results and the calculation files have been transmitted by separate cover by FTP page. The summary tables of the results are provided below.

Table 1 - Stability (Spencer's) Analysis Results

Reach	Analyses Type	Original Analysis		Revised (OPEN) Analysis	
		SWE	FOS	SWE	FOS
6A	Gap	10	2.12	10	1.66
	Global	10	2.28	10	1.83
7	Gap	10	2.25	10	1.74
	Global	10	2.28	10	1.87
8	Gap	10	2.38	10	1.79
	Global	10	2.25	10	1.87
12B	Gap	10	2.15	10	1.45
	Global	8	1.45	8	1.45
14	Gap	10	2.92	10	2.03
	Global	10	1.57	10	1.55
17	Gap	10	3.50	10	2.06
	Global	10	2.59	10	1.87
26A	Gap	10	3.10	10	2.62
	Global	10	2.16	10	1.96
28	Gap	10	3.87	10	1.73
	Global	10	2.63	10	1.49

Table 2 - Seepage Analysis Results

Reach	FOS Closed Bottom Original SWE		FOS Open Bottom Original SWE		Revised SWE Open Bottom	
	SWE	FOS	SWE	FOS	SWE	FS
6A ⁽⁴⁾	10	2.62	10	1.19	7.5	1.75 ⁽²⁾
7 ⁽⁴⁾	10	1.96	10	1.16	7.0	1.67
8 ⁽⁴⁾	10	7.67	10	0.99	6.0	1.61
12B	10	NA ⁽¹⁾	10	1.53	9.5	1.61
14 ⁽³⁾	10	NA ⁽¹⁾	10	1.42	9.0	1.62
17 ⁽⁴⁾	10	NA ⁽¹⁾	10	2.67	7.0	1.63
26A ⁽⁴⁾	10	1.90	10	1.32	8.0	1.69
28	10	NA ⁽¹⁾	10	1.07	6.5	1.65

Note:

⁽¹⁾NA means piezometric level below ground surface

⁽²⁾FOS 1.59 at a canal water elevation of +8.0 ft

⁽³⁾Silty sand layer underlying canal at top of beach sand deposit

⁽⁴⁾Fully penetrating gap to top of beach sand deposit

If you have any questions, please contact me at 913 458-8034.

Very Truly Yours,
Black & Veatch
Special Projects Corp.

Larry Almaleh, P.E.
Task Manager


cc: Jim Waller

OWNER	USACE - LMVD- NEW ORLEANS	COMP'D BY	J. Higgins
PROJECT	OUTFALL CANAL STUDY - MODIFICATION NO. 11	DATE	22-Dec-10
PROJECT NO.	41752	FILE No.	03.10
TITLE	Calculation of I-Wall Stability of Reach 7 Based on Gap Condition Open Base	CKD BY	L.Almaleh
		DATE	28-Dec-10
TEMPLATE REV.			3.40

PURPOSE: Evaluate the stability of the Embankment at Reach 7 based on the presence of an open canal bottom

Depth to Gap Determined based on GCAT Method, dated April 1 2009

REFERENCES:

	1. "Stability Analysis of I-Walls Containing Gaps Between the I-wall and Backfill Soils", Thomas Brandon, April 1, 2009.
	2. "Analysis of the Stability of I-Walls with Gaps between the I-Wall and the Levee Fill", Brandon, Wright, Duncan, Jour Geo, ASCE, May 2008
	3. B&V Calculation, "Strength Lines"
	4. USACE Drawing H-4-40295, "Typical Sections, East Side", London Avenue, Outfall Canal, Parallel Protection, Dwg 16 Rev 1
	5. B&V Calculation, Calibration of London Avenue Load Test Seepage Model"
	6. USACE "Design Procedure for Earthen Embankments" June 12, 2008
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ASSUMPTIONS:

1. Active Earth Pressures are not corrected for sloping backfill
2. Passive Pressure are not included in gap depth analysis
3. Seepage analysis assumes a 4 feet separation between new and existing sheet pile walls
- 4.

DISCUSSION: See Page 2

RESULTS: See Slope Stability Analysis Outputs

Revision No.	List of Revisions	Description of Revision	Revision Date
0		Initial Issue	
1		Added Additional underseepage points	7/9/2010
2		Final Issue	10/25/2010

OWNER	USACE - LMVD- NEW ORLEANS		COMP'D BY	J. Higgins
PROJECT	OUTFALL CANAL STUDY - MODIFICATION NO. 11		DATE	22-Dec-10
PROJECT NO.	41752	FILE No. .03.10	CKD BY	L.Almaleh
TITLE	Calculation of I-Wall Stability of Reach 7 Based on Gap Condition Open Base		DATE	12/28/2010
			TEMPLATE REV.	3.40

Step 1: Gap Determination

The intent is to use excel spreadsheet for evaluating the gap depth between an I-wall and backfill using the GCAT method (Reference 1).

Depths are determined as the distance below the surface.

$$\begin{aligned}
 U &= \text{Hydrostatic Pressure} \quad \text{Assume water is 62.4 pounds per cubic foot} \\
 &= (\text{water elevation-flood side ground elevation}) * 62.4 \\
 \gamma'_t &= \text{Effective Unit Weight} \\
 \sigma_v &= \text{Total Unit Weight} - 62.4 \\
 &= \text{Overburden Pressure} \\
 &= \text{Total Unit Weight} * \text{Depth} + (\text{water elevation-flood side ground elevation}) * 62.4 \\
 \sigma'_v &= \text{Effective Overburden Pressure} \\
 &= (\text{Effective Unit Weight} * 0.1 \text{ feet}) + \text{Effective Unit Weight of 0.1 thick layer above} \\
 \sigma_{ha} &= \text{Total Lateral Pressure on Wall} \\
 &\quad \text{For } \phi=0 \text{ layers} \\
 &= \text{Overburden Pressure} - (\text{Undrained Shear Strength} * 2) \text{ (Eq 2 Ref 1)} \\
 &\quad \text{For } \phi \neq 0 \text{ layers} \\
 &= (\text{Effective Overburden Pressure} * \tan^2(45-\phi/2)) + \text{Water Pressure} - (\text{Undrained Shear Strength} * 2 / (\tan^2(45-\phi/2))) \text{ (Eq6 Ref 1)} \\
 \text{Gap} &= \text{If the Total Lateral Pressure on Wall greater than the hydrostatic water pressure} = \text{"No Gap"}
 \end{aligned}$$

Step 2: Seepage Analysis

The intent is to use Seep/w to evaluate the pore pressures within the embankment based on the depth of the gap from step 1.

The seep/w model is run using 1/2 the canal assuming a divide between the two sides at the center of the canal. Model geometry is based on Ref 3. Depth of the sheet piles are based on Ref 4. Permeability of soil layers and boundary conditions are based on Ref 5. Other soils properties are based on Ref 3.

Check the underseepage factor of safety based on the following formula from page 3-8 or ref 6

$$\begin{aligned}
 FS_g &= \text{Apparent underseepage factor of safety} \\
 &= \frac{\text{Average Effective Unit Weight of Soil} * \text{soil thickness}}{\text{Unit Weight Water} * \text{Excess Head @ Toe}}
 \end{aligned}$$

Adjust the water level of the canal to meet a minimum factor of safety of 1.6 per ref 6

Step 3: Determine Loads for Slope Stability Model

The intent is to determine the input loads for the slope/w model to use when evaluating stability based on the gap method. Since the gap method is completed by running a gap all the way to the bottom of the sheet pile, a load has to be replaced between the gap and the bottom of the sheet pile.

For $\phi=0$ layers

Based on Ref 1, the pore pressures within the clay below the gap are hydrostatic; therefore soil pressure on the wall is calculated based on:

$$\begin{aligned}
 \sigma'_{ha} &= \text{Effective Soil Pressure on Wall} \\
 &= \text{Total Lateral Pressure on Wall} - \text{Hydrostatic Pressure}
 \end{aligned}$$

Since the Slope/W model will use the pore pressures from the seepage model (not hydrostatic) an additional load is required to act on the wall

This load is calculated based on the difference between the hydrostatic and FEM pore water pressures.

For $\phi \neq 0$ layers

Effective stress is calculated based on the FEM pore water pressure as indicated below:

$$\begin{aligned}
 \sigma'_{ha} &= \text{Effective Soil Pressure on Wall} \\
 &= \text{Total Lateral Pressure on Wall} - \text{Pore Pressure (from FEM Model)}
 \end{aligned}$$

Soil pressures (and the additional water load for $\phi=0$ soils) are determined for each node along the wall and converted to a point load to be input into the slope/w model.

Step 4: Slope Stability of the Gap Model

The intent of the slope stability model is to check the stability of the embankment based on the gap method. Analysis is completed for both local and global failures assuming the gap is present. The local cases are analyzed by removing the soil from the flood side of the sheet pile wall. The active pressure from the removed soil is replaced by point loads determined from step 3.

Two slope stability runs are completed both using the pore pressures generated during the seepage analysis assuming the crack is present. The cases are run with block specified and entry/exit failure surfaces.

General Spreadsheet Information

All Elevations to be entered as NAVD.

Inputs are shown as	
Outputs are shown as	
Check points are shown as	

geotech

OWNER	USACE - LMVD- NEW ORLEANS			COMP'D BY	L. J. Almaleh
PROJECT	OUTFALL CANAL STUDY - MODIFICATION NO. 11			DATE	23-May-09
PROJECT NO.	41752	FILE No. .03.10		CKD BY	L. Almaleh
TITLE	Calculation of I-Wall Stability of Reach 7 Based on Gap Condition Open Base			DATE	12/28/2010
TEMPLATE REV.					3.40

Reach Number 7 Stations 59+00 to 66+00 West

Water Elevation 10 ft (NAVD)

Sheet Pile Tip Elevation -17.2 ft (NAVD)

Centerline Profile

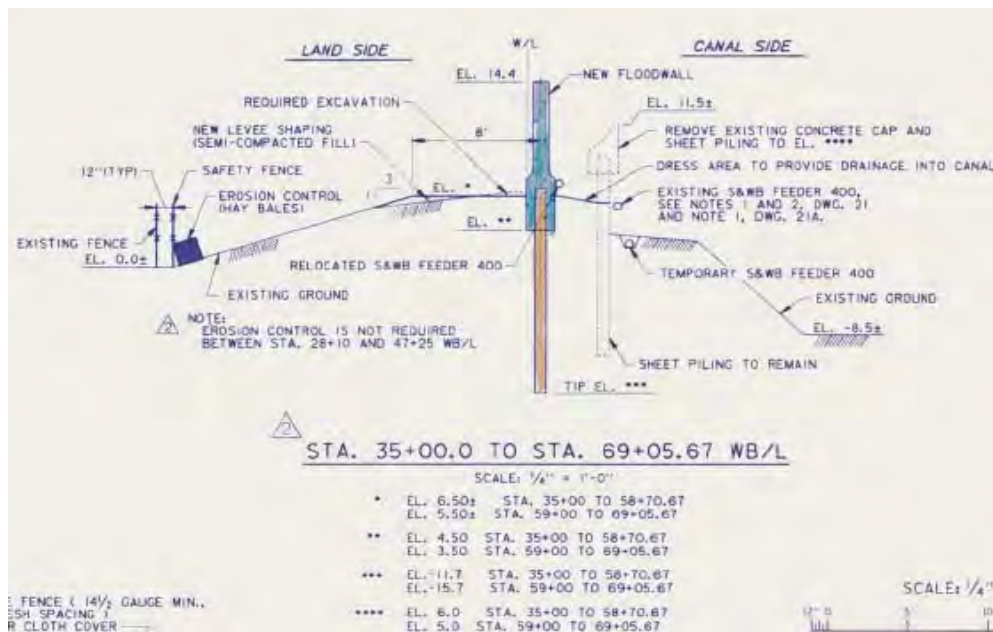
Layer Number	Soil Type	ELEVATION (NAVD)		Total Unit Weight (psf)	phi (degrees)	Undrained Shear Strength (psf)	Strength Increase w/Depth (psf/ft)
		Top	Bottom				
1	Fill	3.5	-1	105	0	650	
2	Fill	-1	-4	105	0	450	
3	Marsh	-4	-8	90	0	340	
4	Marsh	-8	-12	98	0	340	
5	Sand	-12	-45	122	30	0	
6	Clay	-45	-70	108	0	800	8
7							

If Non-uniform strength functions are used, the spreadsheets will have to be modified.

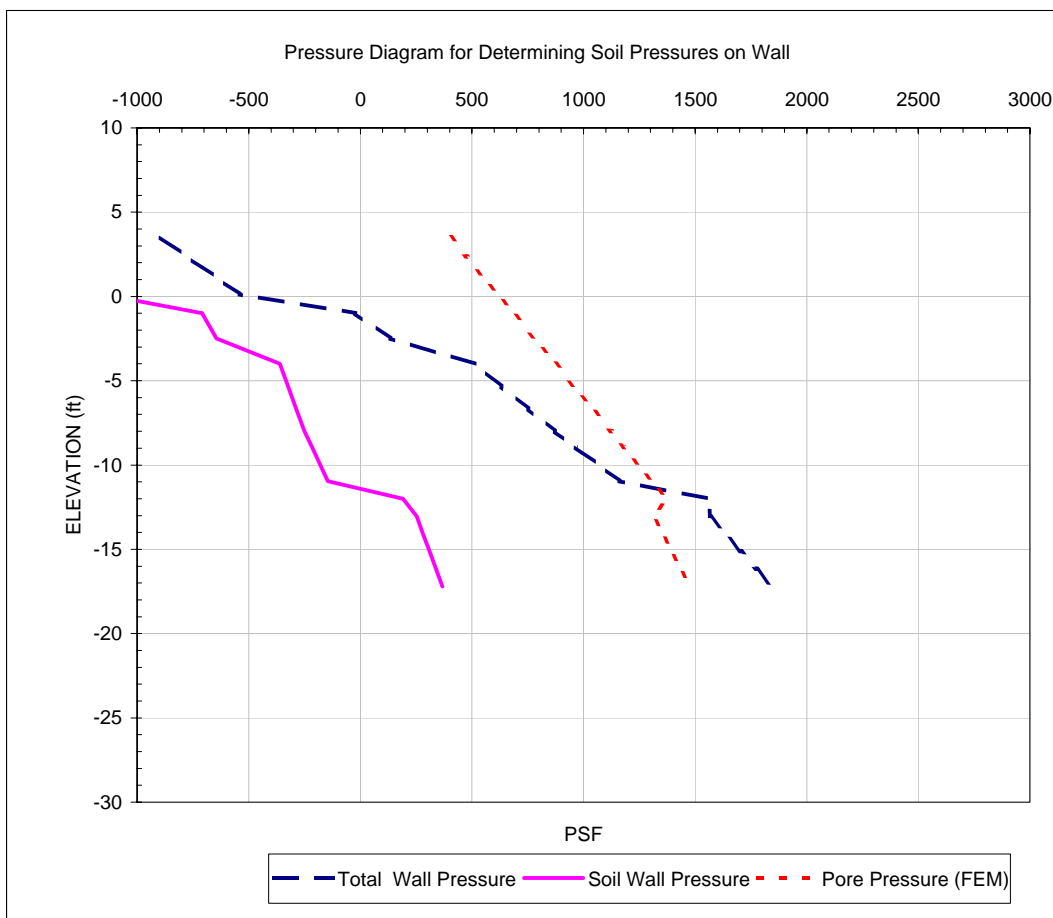
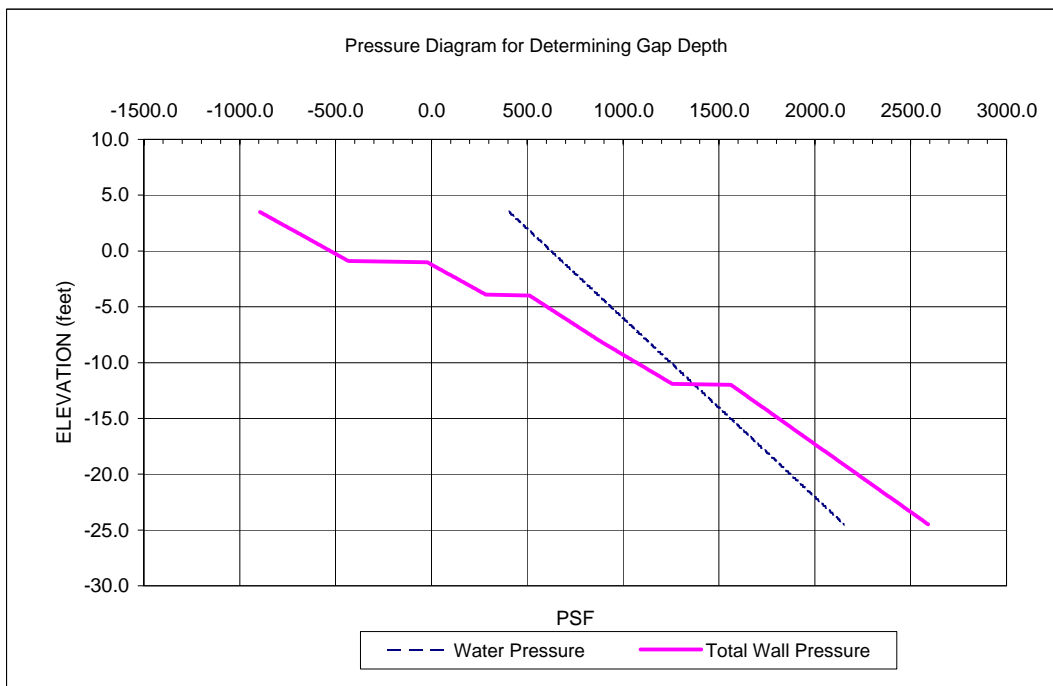
Toe Profile

Layer Number	Soil Type	ELEVATION (NAVD)		Total Unit Weight (psf)	phi (degrees)	Undrained Shear Strength (psf)	Strength Increase w/Depth (psf/ft)
		Top	Bottom				
1	Fill	-1.4	-6	96	0	600	
2	Marsh	-6	-10	104	0	320	
3	Marsh	-10	-12	96	0	300	
4	Sand	-12	-45	122	30	0	
5	Clay	-45	-70	111	0	790	6.4
6							
7							

Typical Section (Ref 4) (note elevations in NGVD need to subtract 1.5' to get NAVD)



OWNER	USACE - LMVD- NEW ORLEANS	COMP'D BY	J. Higgins
PROJECT	OUTFALL CANAL STUDY - MODIFICATION NO. 11	DATE	22-Dec-10
PROJECT NO.	41752	FILE NO.	.03.10
TITLE	Calculation of I-Wall Stability of Reach 7 Based on Gap Condition Open Base	CKD BY	L.Almaleh
		DATE	12/28/2010
		TEMPLATE REV.	3.40



OWNER	USACE - LMVD- NEW ORLEANS				COMP'D BY	J. Higgins	
PROJECT	OUTFALL CANAL STUDY - MODIFICATION NO. 11				DATE	12/22/2010	
PROJECT NO.	41752		FILE NO. .03.10		CKD BY	L.Almaleh	
TITLE	Calculation of I-Wall Stability of Reach 7 Based on Gap Condition Open Base				DATE	12/28/2010	
					TEMPLATE REV.	3.40	

Water
Elevation
10

Sheet Pile
Tip
Elevation
-17.2

Layer Number	Soil Type	ELEVATION		Depth (ft)	Total Unit Weight (psf)	phi	Undrained Shear Strength (psf)	Strength Increase w/Depth (psf/ft)
		Top	Bottom					
1	Fill	3.5	-1.0	0.0	105.0	0	650	0
2	Fill	-1.0	-4.0	4.5	105.0	0	450	0
3	Marsh	-4.0	-8.0	7.5	98.0	0	340	0
4	Marsh	-8.0	-12.0	11.5	98.0	0	340	0
5	Sand	-12.0	-45.0	15.5	122.0	30	0	0
6	Clay	-45.0	-70.0	48.5	108.0	0	800	8
7	0	0.0	0.0		0.0	0	0	0

GAP ELEVATION = -12.0

Flood Side Ground Elevation	Depth	Hydrostatic Water Pressure	Material Type	ϕ	Undrained Shear Strength	Total Unit Weight	γ'_t	σ_v	σ'_v	σ_{ha}	GAP?
ft	ft	psf	TYPE	phi	(psf)	psf	psf	psf	psf	psf	
3.5	0	405.6	Fill	0	650	105	42.6	405.6	0.0	-894.4	
3.4	0.1	411.8	Fill	0	650	105	42.6	416.1	4.3	-883.9	
3.3	0.2	418.1	Fill	0	650	105	42.6	426.6	8.5	-873.4	
3.2	0.3	424.3	Fill	0	650	105	42.6	437.1	12.8	-862.9	
3.1	0.4	430.6	Fill	0	650	105	42.6	447.6	17.0	-852.4	
3.0	0.5	436.8	Fill	0	650	105	42.6	458.1	21.3	-841.9	
2.9	0.6	443.0	Fill	0	650	105	42.6	468.6	25.6	-831.4	
2.8	0.7	449.3	Fill	0	650	105	42.6	479.1	29.8	-820.9	
2.7	0.8	455.5	Fill	0	650	105	42.6	489.6	34.1	-810.4	
2.6	0.9	461.8	Fill	0	650	105	42.6	500.1	38.3	-799.9	
2.5	1	468.0	Fill	0	650	105	42.6	510.6	42.6	-789.4	
2.4	1.1	474.2	Fill	0	650	105	42.6	521.1	46.9	-778.9	
2.3	1.2	480.5	Fill	0	650	105	42.6	531.6	51.1	-768.4	
2.2	1.3	486.7	Fill	0	650	105	42.6	542.1	55.4	-757.9	
2.1	1.4	493.0	Fill	0	650	105	42.6	552.6	59.6	-747.4	
2.0	1.5	499.2	Fill	0	650	105	42.6	563.1	63.9	-736.9	
1.9	1.6	505.4	Fill	0	650	105	42.6	573.6	68.2	-726.4	
1.8	1.7	511.7	Fill	0	650	105	42.6	584.1	72.4	-715.9	
1.7	1.8	517.9	Fill	0	650	105	42.6	594.6	76.7	-705.4	
1.6	1.9	524.2	Fill	0	650	105	42.6	605.1	80.9	-694.9	
1.5	2	530.4	Fill	0	650	105	42.6	615.6	85.2	-684.4	
1.4	2.1	536.6	Fill	0	650	105	42.6	626.1	89.5	-673.9	
1.3	2.2	542.9	Fill	0	650	105	42.6	636.6	93.7	-663.4	
1.2	2.3	549.1	Fill	0	650	105	42.6	647.1	98.0	-652.9	
1.1	2.4	555.4	Fill	0	650	105	42.6	657.6	102.2	-642.4	
1.0	2.5	561.6	Fill	0	650	105	42.6	668.1	106.5	-631.9	
0.9	2.6	567.8	Fill	0	650	105	42.6	678.6	110.8	-621.4	
0.8	2.7	574.1	Fill	0	650	105	42.6	689.1	115.0	-610.9	
0.7	2.8	580.3	Fill	0	650	105	42.6	699.6	119.3	-600.4	
0.6	2.9	586.6	Fill	0	650	105	42.6	710.1	123.5	-589.9	
0.5	3	592.8	Fill	0	650	105	42.6	720.6	127.8	-579.4	
0.4	3.1	599.0	Fill	0	650	105	42.6	731.1	132.1	-568.9	
0.3	3.2	605.3	Fill	0	650	105	42.6	741.6	136.3	-558.4	
0.2	3.3	611.5	Fill	0	650	105	42.6	752.1	140.6	-547.9	
0.1	3.4	617.8	Fill	0	650	105	42.6	762.6	144.8	-537.4	
0.0	3.5	624.0	Fill	0	650	105	42.6	773.1	149.1	-526.9	
-0.1	3.6	630.2	Fill	0	650	105	42.6	783.6	153.4	-516.4	
-0.2	3.7	636.5	Fill	0	650	105	42.6	794.1	157.6	-505.9	
-0.3	3.8	642.7	Fill	0	650	105	42.6	804.6	161.9	-495.4	
-0.4	3.9	649.0	Fill	0	650	105	42.6	815.1	166.1	-484.9	
-0.5	4	655.2	Fill	0	650	105	42.6	825.6	170.4	-474.4	
-0.6	4.1	661.4	Fill	0	650	105	42.6	836.1	174.7	-463.9	
-0.7	4.2	667.7	Fill	0	650	105	42.6	846.6	178.9	-453.4	
-0.8	4.3	673.9	Fill	0	650	105	42.6	857.1	183.2	-442.9	
-0.9	4.4	680.2	Fill	0	650	105	42.6	867.6	187.4	-432.4	
-1.0	4.5	686.4	Fill	0	450	105	42.6	878.1	191.7	-21.9	
-1.1	4.6	692.6	Fill	0	450	105	42.6	888.6	196.0	-11.4	
-1.2	4.7	698.9	Fill	0	450	105	42.6	899.1	200.2	-0.9	
-1.3	4.8	705.1	Fill	0	450	105	42.6	909.6	204.5	9.6	

Flood Side Ground Elevation	Depth	Hydrostatic Water Pressure	Material Type	ϕ	Undrained Shear Strength	Total Unit Weight	γ'_t	σ_v	σ'_v	σ_{ha}	GAP?
ft	ft	psf	TYPE	phi	(psf)	psf	psf	psf	psf	psf	
-1.4	4.9	711.4	FIII	0	450	105	42.6	920.1	208.7	20.1	
-1.5	5	717.6	FIII	0	450	105	42.6	930.6	213.0	30.6	
-1.6	5.1	723.8	FIII	0	450	105	42.6	941.1	217.3	41.1	
-1.7	5.2	730.1	FIII	0	450	105	42.6	951.6	221.5	51.6	
-1.8	5.3	736.3	FIII	0	450	105	42.6	962.1	225.8	62.1	
-1.9	5.4	742.6	FIII	0	450	105	42.6	972.6	230.0	72.6	
-2.0	5.5	748.8	FIII	0	450	105	42.6	983.1	234.3	83.1	
-2.1	5.6	755.0	FIII	0	450	105	42.6	993.6	238.6	93.6	
-2.2	5.7	761.3	FIII	0	450	105	42.6	1004.1	242.8	104.1	
-2.3	5.8	767.5	FIII	0	450	105	42.6	1014.6	247.1	114.6	
-2.4	5.9	773.8	FIII	0	450	105	42.6	1025.1	251.3	125.1	
-2.5	6	780.0	FIII	0	450	105	42.6	1035.6	255.6	135.6	
-2.6	6.1	786.2	FIII	0	450	105	42.6	1046.1	259.9	146.1	
-2.7	6.2	792.5	FIII	0	450	105	42.6	1056.6	264.1	156.6	
-2.8	6.3	798.7	FIII	0	450	105	42.6	1067.1	268.4	167.1	
-2.9	6.4	805.0	FIII	0	450	105	42.6	1077.6	272.6	177.6	
-3.0	6.5	811.2	FIII	0	450	105	42.6	1088.1	276.9	188.1	
-3.1	6.6	817.4	FIII	0	450	105	42.6	1098.6	281.2	198.6	
-3.2	6.7	823.7	FIII	0	450	105	42.6	1109.1	285.4	209.1	
-3.3	6.8	829.9	FIII	0	450	105	42.6	1119.6	289.7	219.6	
-3.4	6.9	836.2	FIII	0	450	105	42.6	1130.1	293.9	230.1	
-3.5	7	842.4	FIII	0	450	105	42.6	1140.6	298.2	240.6	
-3.6	7.1	848.6	FIII	0	450	105	42.6	1151.1	302.5	251.1	
-3.7	7.2	854.9	FIII	0	450	105	42.6	1161.6	306.7	261.6	
-3.8	7.3	861.1	FIII	0	450	105	42.6	1172.1	311.0	272.1	
-3.9	7.4	867.4	FIII	0	450	105	42.6	1182.6	315.2	282.6	
-4.0	7.5	873.6	Marsh	0	340	90	27.6	1193.1	319.5	513.1	
-4.1	7.6	879.8	Marsh	0	340	90	27.6	1202.1	322.3	522.1	
-4.2	7.7	886.1	Marsh	0	340	90	27.6	1211.1	325.0	531.1	
-4.3	7.8	892.3	Marsh	0	340	90	27.6	1220.1	327.8	540.1	
-4.4	7.9	898.6	Marsh	0	340	90	27.6	1229.1	330.5	549.1	
-4.5	8	904.8	Marsh	0	340	90	27.6	1238.1	333.3	558.1	
-4.6	8.1	911.0	Marsh	0	340	90	27.6	1247.1	336.1	567.1	
-4.7	8.2	917.3	Marsh	0	340	90	27.6	1256.1	338.8	576.1	
-4.8	8.3	923.5	Marsh	0	340	90	27.6	1265.1	341.6	585.1	
-4.9	8.4	929.8	Marsh	0	340	90	27.6	1274.1	344.3	594.1	
-5.0	8.5	936.0	Marsh	0	340	90	27.6	1283.1	347.1	603.1	
-5.1	8.6	942.2	Marsh	0	340	90	27.6	1292.1	349.9	612.1	
-5.2	8.7	948.5	Marsh	0	340	90	27.6	1301.1	352.6	621.1	
-5.3	8.8	954.7	Marsh	0	340	90	27.6	1310.1	355.4	630.1	
-5.4	8.9	961.0	Marsh	0	340	90	27.6	1319.1	358.1	639.1	
-5.5	9	967.2	Marsh	0	340	90	27.6	1328.1	360.9	648.1	
-5.6	9.1	973.4	Marsh	0	340	90	27.6	1337.1	363.7	657.1	
-5.7	9.2	979.7	Marsh	0	340	90	27.6	1346.1	366.4	666.1	
-5.8	9.3	985.9	Marsh	0	340	90	27.6	1355.1	369.2	675.1	
-5.9	9.4	992.2	Marsh	0	340	90	27.6	1364.1	371.9	684.1	
-6.0	9.5	998.4	Marsh	0	340	90	27.6	1373.1	374.7	693.1	
-6.1	9.6	1004.6	Marsh	0	340	90	27.6	1382.1	377.5	702.1	
-6.2	9.7	1010.9	Marsh	0	340	90	27.6	1391.1	380.2	711.1	
-6.3	9.8	1017.1	Marsh	0	340	90	27.6	1400.1	383.0	720.1	
-6.4	9.9	1023.4	Marsh	0	340	90	27.6	1409.1	385.7	729.1	
-6.5	10	1029.6	Marsh	0	340	90	27.6	1418.1	388.5	738.1	
-6.6	10.1	1035.8	Marsh	0	340	90	27.6	1427.1	391.3	747.1	
-6.7	10.2	1042.1	Marsh	0	340	90	27.6	1436.1	394.0	756.1	
-6.8	10.3	1048.3	Marsh	0	340	90	27.6	1445.1	396.8	765.1	
-6.9	10.4	1054.6	Marsh	0	340	90	27.6	1454.1	399.5	774.1	
-7.0	10.5	1060.8	Marsh	0	340	90	27.6	1463.1	402.3	783.1	
-7.1	10.6	1067.0	Marsh	0	340	90	27.6	1472.1	405.1	792.1	
-7.2	10.7	1073.3	Marsh	0	340	90	27.6	1481.1	407.8	801.1	
-7.3	10.8	1079.5	Marsh	0	340	90	27.6	1490.1	410.6	810.1	
-7.4	10.9	1085.8	Marsh	0	340	90	27.6	1499.1	413.3	819.1	
-7.5	11	1092.0	Marsh	0	340	90	27.6	1508.1	416.1	828.1	
-7.6	11.1	1098.2	Marsh	0	340	90	27.6	1517.1	418.9	837.1	
-7.7	11.2	1104.5	Marsh	0	340	90	27.6	1526.1	421.6	846.1	
-7.8	11.3	1110.7	Marsh	0	340	90	27.6	1535.1	424.4	855.1	
-7.9	11.4	1117.0	Marsh	0	340	90	27.6	1544.1	427.1	864.1	
-8.0	11.5	1123.2	Marsh	0	340	98	27.6	1553.1	429.9	873.1	
-8.1	11.6	1129.4	Marsh	0	340	98	35.6	1562.9	432.7	882.9	
-8.2	11.7	1135.7	Marsh	0	340	98	35.6	1572.7	436.2	892.7	
-8.3	11.8	1141.9	Marsh	0	340	98	35.6	1582.5	439.8	902.5	
-8.4	11.9	1148.2	Marsh	0	340	98	35.6	1592.3	443.3	912.3	
-8.5	12	1154.4	Marsh	0	340	98	35.6	1602.1	446.9	922.1	
-8.6	12.1	1160.6	Marsh	0	340	98	35.6	1611.9	450.5	931.9	
-8.7	12.2	1166.9	Marsh	0	340	98	35.6	1621.7	454.0	941.7	
-8.8	12.3	1173.1	Marsh	0	340	98	35.6	1631.5	457.6	951.5	
-8.9	12.4	1179.4	Marsh	0	340	98	35.6	1641.3	461.1	961.3	

Flood Side Ground Elevation	Depth	Hydrostatic Water Pressure	Material Type	ϕ	Undrained Shear Strength	Total Unit Weight	γ'_t	σ_v	σ'_v	σ_{ha}	GAP?
ft	ft	psf	TYPE	phi	(psf)	psf	psf	psf	psf	psf	
-9.0	12.5	1185.6	Marsh	0	340	98	35.6	1651.1	464.7	971.1	
-9.1	12.6	1191.8	Marsh	0	340	98	35.6	1660.9	468.3	980.9	
-9.2	12.7	1198.1	Marsh	0	340	98	35.6	1670.7	471.8	990.7	
-9.3	12.8	1204.3	Marsh	0	340	98	35.6	1680.5	475.4	1000.5	
-9.4	12.9	1210.6	Marsh	0	340	98	35.6	1690.3	478.9	1010.3	
-9.5	13	1216.8	Marsh	0	340	98	35.6	1700.1	482.5	1020.1	
-9.6	13.1	1223.0	Marsh	0	340	98	35.6	1709.9	486.1	1029.9	
-9.7	13.2	1229.3	Marsh	0	340	98	35.6	1719.7	489.6	1039.7	
-9.8	13.3	1235.5	Marsh	0	340	98	35.6	1729.5	493.2	1049.5	
-9.9	13.4	1241.8	Marsh	0	340	98	35.6	1739.3	496.7	1059.3	
-10.0	13.5	1248.0	Marsh	0	340	98	35.6	1749.1	500.3	1069.1	
-10.1	13.6	1254.2	Marsh	0	340	98	35.6	1758.9	503.9	1078.9	
-10.2	13.7	1260.5	Marsh	0	340	98	35.6	1768.7	507.4	1088.7	
-10.3	13.8	1266.7	Marsh	0	340	98	35.6	1778.5	511.0	1098.5	
-10.4	13.9	1273.0	Marsh	0	340	98	35.6	1788.3	514.5	1108.3	
-10.5	14	1279.2	Marsh	0	340	98	35.6	1798.1	518.1	1118.1	
-10.6	14.1	1285.4	Marsh	0	340	98	35.6	1807.9	521.7	1127.9	
-10.7	14.2	1291.7	Marsh	0	340	98	35.6	1817.7	525.2	1137.7	
-10.8	14.3	1297.9	Marsh	0	340	98	35.6	1827.5	528.8	1147.5	
-10.9	14.4	1304.2	Marsh	0	340	98	35.6	1837.3	532.3	1157.3	
-11.0	14.5	1310.4	Marsh	0	340	98	35.6	1847.1	535.9	1167.1	
-11.1	14.6	1316.6	Marsh	0	340	98	35.6	1856.9	539.5	1176.9	
-11.2	14.7	1322.9	Marsh	0	340	98	35.6	1866.7	543.0	1186.7	
-11.3	14.8	1329.1	Marsh	0	340	98	35.6	1876.5	546.6	1196.5	
-11.4	14.9	1335.4	Marsh	0	340	98	35.6	1886.3	550.1	1206.3	
-11.5	15	1341.6	Marsh	0	340	98	35.6	1896.1	553.7	1216.1	
-11.6	15.1	1347.8	Marsh	0	340	98	35.6	1905.9	557.3	1225.9	
-11.7	15.2	1354.1	Marsh	0	340	98	35.6	1915.7	560.8	1235.7	
-11.8	15.3	1360.3	Marsh	0	340	98	35.6	1925.5	564.4	1245.5	
-11.9	15.4	1366.6	Marsh	0	340	98	35.6	1935.3	567.9	1255.3	
-12.0	15.5	1372.8	Sand	30	0	122	59.6	1945.1	571.5	1563.3	NO GAP
-12.1	15.6	1379.0	Sand	30	0	122	59.6	1957.3	577.5	1571.5	NO GAP
-12.2	15.7	1385.3	Sand	30	0	122	59.6	1969.5	583.4	1579.8	NO GAP
-12.3	15.8	1391.5	Sand	30	0	122	59.6	1981.7	589.4	1588.0	NO GAP
-12.4	15.9	1397.8	Sand	30	0	122	59.6	1993.9	595.3	1596.2	NO GAP
-12.5	16	1404.0	Sand	30	0	122	59.6	2006.1	601.3	1604.4	NO GAP
-12.6	16.1	1410.2	Sand	30	0	122	59.6	2018.3	607.3	1612.7	NO GAP
-12.7	16.2	1416.5	Sand	30	0	122	59.6	2030.5	613.2	1620.9	NO GAP
-12.8	16.3	1422.7	Sand	30	0	122	59.6	2042.7	619.2	1629.1	NO GAP
-12.9	16.4	1429.0	Sand	30	0	122	59.6	2054.9	625.1	1637.3	NO GAP
-13.0	16.5	1435.2	Sand	30	0	122	59.6	2067.1	631.1	1645.6	NO GAP
-13.1	16.6	1441.4	Sand	30	0	122	59.6	2079.3	637.1	1653.8	NO GAP
-13.2	16.7	1447.7	Sand	30	0	122	59.6	2091.5	643.0	1662.0	NO GAP
-13.3	16.8	1453.9	Sand	30	0	122	59.6	2103.7	649.0	1670.2	NO GAP
-13.4	16.9	1460.2	Sand	30	0	122	59.6	2115.9	654.9	1678.5	NO GAP
-13.5	17	1466.4	Sand	30	0	122	59.6	2128.1	660.9	1686.7	NO GAP
-13.6	17.1	1472.6	Sand	30	0	122	59.6	2140.3	666.9	1694.9	NO GAP
-13.7	17.2	1478.9	Sand	30	0	122	59.6	2152.5	672.8	1703.2	NO GAP
-13.8	17.3	1485.1	Sand	30	0	122	59.6	2164.7	678.8	1711.4	NO GAP
-13.9	17.4	1491.4	Sand	30	0	122	59.6	2176.9	684.7	1719.6	NO GAP
-14.0	17.5	1497.6	Sand	30	0	122	59.6	2189.1	690.7	1727.8	NO GAP
-14.1	17.6	1503.8	Sand	30	0	122	59.6	2201.3	696.7	1736.1	NO GAP
-14.2	17.7	1510.1	Sand	30	0	122	59.6	2213.5	702.6	1744.3	NO GAP
-14.3	17.8	1516.3	Sand	30	0	122	59.6	2225.7	708.6	1752.5	NO GAP
-14.4	17.9	1522.6	Sand	30	0	122	59.6	2237.9	714.5	1760.7	NO GAP
-14.5	18	1528.8	Sand	30	0	122	59.6	2250.1	720.5	1769.0	NO GAP
-14.6	18.1	1535.0	Sand	30	0	122	59.6	2262.3	726.5	1777.2	NO GAP
-14.7	18.2	1541.3	Sand	30	0	122	59.6	2274.5	732.4	1785.4	NO GAP
-14.8	18.3	1547.5	Sand	30	0	122	59.6	2286.7	738.4	1793.6	NO GAP
-14.9	18.4	1553.8	Sand	30	0	122	59.6	2298.9	744.3	1801.9	NO GAP
-15.0	18.5	1560.0	Sand	30	0	122	59.6	2311.1	750.3	1810.1	NO GAP
-15.1	18.6	1566.2	Sand	30	0	122	59.6	2323.3	756.3	1818.3	NO GAP
-15.2	18.7	1572.5	Sand	30	0	122	59.6	2335.5	762.2	1826.6	NO GAP
-15.3	18.8	1578.7	Sand	30	0	122	59.6	2347.7	768.2	1834.8	NO GAP
-15.4	18.9	1585.0	Sand	30	0	122	59.6	2359.9	774.1	1843.0	NO GAP
-15.5	19	1591.2	Sand	30	0	122	59.6	2372.1	780.1	1851.2	NO GAP
-15.6	19.1	1597.4	Sand	30	0	122	59.6	2384.3	786.1	1859.5	NO GAP
-15.7	19.2	1603.7	Sand	30	0	122	59.6	2396.5	792.0	1867.7	NO GAP
-15.8	19.3	1609.9	Sand	30	0	122	59.6	2408.7	798.0	1875.9	NO GAP
-15.9	19.4	1616.2	Sand	30	0	122	59.6	2420.9	803.9	1884.1	NO GAP
-16.0	19.5	1622.4	Sand	30	0	122	59.6	2433.1	809.9	1892.4	NO GAP
-16.1	19.6	1628.6	Sand	30	0	122	59.6	2445.3	815.9	1900.6	NO GAP
-16.2	19.7	1634.9	Sand	30	0	122	59.6	2457.5	821.8	1908.8	NO GAP
-16.3	19.8	1641.1	Sand	30	0	122	59.6	2469.7	827.8	1917.0	NO GAP
-16.4	19.9	1647.4	Sand	30	0	122	59.6	2481.9	833.7	1925.3	NO GAP
-16.5	20	1653.6	Sand	30	0	122	59.6	2494.1	839.7	1933.5	NO GAP

Flood Side Ground Elevation	Depth	Hydrostatic Water Pressure	Material Type	ϕ	Undrained Shear Strength	Total Unit Weight	γ'_t	σ_v	σ'_v	σ_{ha}	GAP?
ft	ft	psf	TYPE	phi	(psf)	psf	psf	psf	psf	psf	
-16.6	20.1	1659.8	Sand	30	0	122	59.6	2506.3	845.7	1941.7	NO GAP
-16.7	20.2	1666.1	Sand	30	0	122	59.6	2518.5	851.6	1950.0	NO GAP
-16.8	20.3	1672.3	Sand	30	0	122	59.6	2530.7	857.6	1958.2	NO GAP
-16.9	20.4	1678.6	Sand	30	0	122	59.6	2542.9	863.5	1966.4	NO GAP
-17.0	20.5	1684.8	Sand	30	0	122	59.6	2555.1	869.5	1974.6	NO GAP
-17.1	20.6	1691.0	Sand	30	0	122	59.6	2567.3	875.5	1982.9	NO GAP
-17.2	20.7	1697.3	Sand	30	0	122	59.6	2579.5	881.4	1991.1	NO GAP
-17.3	20.8	1703.5	Sand	30	0	122	59.6	2591.7	887.4	1999.3	NO GAP
-17.4	20.9	1709.8	Sand	30	0	122	59.6	2603.9	893.3	2007.5	NO GAP
-17.5	21	1716.0	Sand	30	0	122	59.6	2616.1	899.3	2015.8	NO GAP
-17.6	21.1	1722.2	Sand	30	0	122	59.6	2628.3	905.3	2024.0	NO GAP

OWNER	USACE - LMVD- NEW ORLEANS			COMP'D BY	J. Higgins
PROJECT	OUTFALL CANAL STUDY - MODIFICATION NO. 11			DATE	22-Dec-10
PROJECT NO.	41752	FILE No. .03.10		CKD BY	L.Almaleh
TITLE	Calculation of I-Wall Stability of Reach 7 Based on Gap Condition Open Base			DATE	12/28/2010
TEMPLATE REV.					3.40

	@ Low Toe	@Toe	@Midslope	@Sheetpile
Total Head @ Toe, bottom of blanket	0.15 ft	1.57 ft	2.5 ft	3.1 ft
Elevation of Toe Ground Surface	-3 ft	-1.4 ft	1.54	3.7
Excess Head (Total Head - Toe Elevation)	3.15 ft	2.97 ft	0.94	none
Average Total Unit Weight of Soil Blanket	99.0 pcf	99.0 pcf	99	99
Blanket Thickness	9 ft	10.6 ft	13.54	15.7
Hw=7' FS_g	1.67	2.10	OK 8.47	Not Applicable

OWNER	USACE - LMVD- NEW ORLEANS			COMP'D BY	J. Higgins
PROJECT	OUTFALL CANAL STUDY - MODIFICATION NO. 11			DATE	22-Dec-10
PROJECT NO.	41752	FILE No. .03.10		CKD BY	L.Almaleh
TITLE	Calculation of I-Wall Stability of Reach 7 Based on Gap Condition Open Base			DATE	12/28/2010
				TEMPLATE REV.	3.40

	@ Low Toe	@ Toe	@ Midslope	@ Sheetpile
Total Head @ Toe, bottom of blanket	1.44 ft	3.21 ft	4.3 ft	3.1 ft
Elevation of Toe Ground Surface	-3 ft	-1.4 ft	1.54	3.7
Excess Head (Total Head - Toe Elevation)	4.44 ft	4.61 ft	2.81	none
Average Total Unit Weight of Soil Blanket	99.0 pcf	99.0 pcf	99	99
Blanket Thickness	9 ft	10.6 ft	13.54	15.7
Hw=10' FS_g 1.19 Decrease Canal Water Head		1.35 Decrease Canal Water Head	2.83	Not Applicable

X=value of Tension Crack	200.0	ft	Forces on Last Slice from Slope/W Model	
Orientation of Load	180.0	degrees	Water Force Against Soil	22299.4 lbs
			Total Point Loads on Soil	1521.8 lbs
Additional Load to Account	X (ft)	Y (ft)	Load (lbs)	Direction
for active earth load	200.0	-14.8	1521.8	180.0
	Addtl Load to account for			

[illegible][illegible]

Gap Analysis (Seepage) OPEN

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File Information

Created By: [Liljegren, James](#)
Revision Number: [265](#)
Last Edited By: [Higgins, James](#)
Date: [12/22/2010](#)
Time: [8:53:27 AM](#)
File Name: [Reach 7 OPEN.gsz](#)
Directory: [\\Kaci-fs-05\fsd-z\Projects\041752 - New Orleans Canals\Mod 11\Slope-W\](#)
Last Solved Date: [12/22/2010](#)
Last Solved Time: [8:54:12 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

Gap Analysis (Seepage) OPEN

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 CH, EL. +3.5 TO -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, MH, EL. -4 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 °

BEACH SAND SP, EL. -12 TO -45

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 CLAY CL, EL. -45 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 °

Boundary Conditions

Drainage

Review: true
 Type: Total Flux (Q) 0

Canal Water

Type: Head (H) 10

Curb

Type: Head (H) -5

Regions

	Material	Points	Area (ft ²)
Region 1	EMBANKMENT FILL CH, EL. +3.5 TO -1	4,38,5,18,39,40,6,13,19	57.67
Region 2	EMBANKMENT FILL CH, EL. +3.5 TO -1	3,4,19,13,14,20,55	71.37
Region 3	EMBANKMENT FILL CH, EL. +3.5 TO -1	13,8,27,25,14	106.55
Region 4	EMBANKMENT FILL CH, EL. +3.5 TO -1	8,41,9,10,28,25,27	258.75
Region 5	EMBANKMENT FILL CH, EL. +3.5 TO -1	6,32,42,7,8,13	83.54
Region 6	BEACH SAND SP, EL. -12 TO -45	11,24,17,16,26,29,12,52,33,53	6337.72
Region 7	BAY SOUND CLAY CL, EL. -45 TO -70	53,33,52,59,35,58	1285
Region 8	MARSH 1, MH, EL. -4 TO -8	2,3,55,20,14,15,21,56	136.07
Region 9	BEACH SAND SP, EL. -12 TO -45	16,17,24,50,51,49,57,23	532.945
Region 10	MARSH 1, MH, EL. -4 TO -8	15,44,16,23,57,49,37,2,56,21	155.01
Region 11	MARSH 1, MH, EL. -4 TO -8	45,46,29,26	164

Region 12	MARSH 1, MH, EL. -4 TO -8	25,28,46,45,54	328
Region 13	MARSH 1, MH, EL. -4 TO -8	45,26,16,44,15	84
Region 14	Sheet Pile	6,47,48,42,32	7.085
Region 15	BEACH SAND SP, EL. -12 TO -45	50,1,36,2,37,49,51	127.58
Region 16	MARSH 1, MH, EL. -4 TO -8	15,14,25,54,45	112
Region 17	BAY SOUND CLAY CL, EL. -45 TO -70	31,11,53,58	1848.795
Region 18	BAY SOUND CLAY CL, EL. -45 TO -70	59,52,12,30	2047.5

Lines

	Start Point	End Point	Hydraulic Boundary	Left Side Material
Line 1	5	18	Canal Water	
Line 2	6	13	Canal Water	Sheet Pile
Line 3	13	19		
Line 4	19	4		
Line 5	3	4	Canal Water	
Line 6	13	14	Canal Water	Sheet Pile
Line 7	14	20		
Line 8	14	15	Canal Water	Sheet Pile
Line 9	16	17		Sheet Pile
Line 10	17	24		
Line 11	8	13		
Line 12	18	19		Sheet Pile
Line 13	19	20		Sheet Pile
Line 14	20	21		Sheet Pile
Line 15	21	23		Sheet Pile
Line 16	23	22		Sheet Pile
Line 17	8	27		
Line 18	27	25		
Line 19	9	10	Curb	

Line 20	10	28	Curb	
Line 21	28	25		
Line 22	29	26		
Line 23	32	6		Sheet Pile
Line 24	7	8	Drainage	
Line 25	11	24		
Line 26	15	21		
Line 27	16	26		
Line 28	29	12	Curb	
Line 29	37	2		
Line 30	4	38	Canal Water	
Line 31	38	5	Canal Water	
Line 32	18	39	Canal Water	
Line 33	39	40	Canal Water	
Line 34	40	6	Canal Water	
Line 35	8	41	Drainage	
Line 36	41	9	Drainage	
Line 37	42	32		
Line 38	42	7	Drainage	
Line 39	23	16		
Line 40	15	44	Canal Water	Sheet Pile
Line 41	44	16	Canal Water	Sheet Pile
Line 42	45	46		
Line 43	46	29	Curb	
Line 44	26	45		
Line 45	28	46	Curb	
Line 46	47	6	Canal Water	
Line 47	47	48	Drainage	
Line 48	48	42	Drainage	
Line 49	49	37		
Line 50	50	1		
Line 51	1	36	Canal Water	
Line 52	36	2	Canal Water	
Line 53	50	51		
Line 54	51	49		
Line 55	24	50		

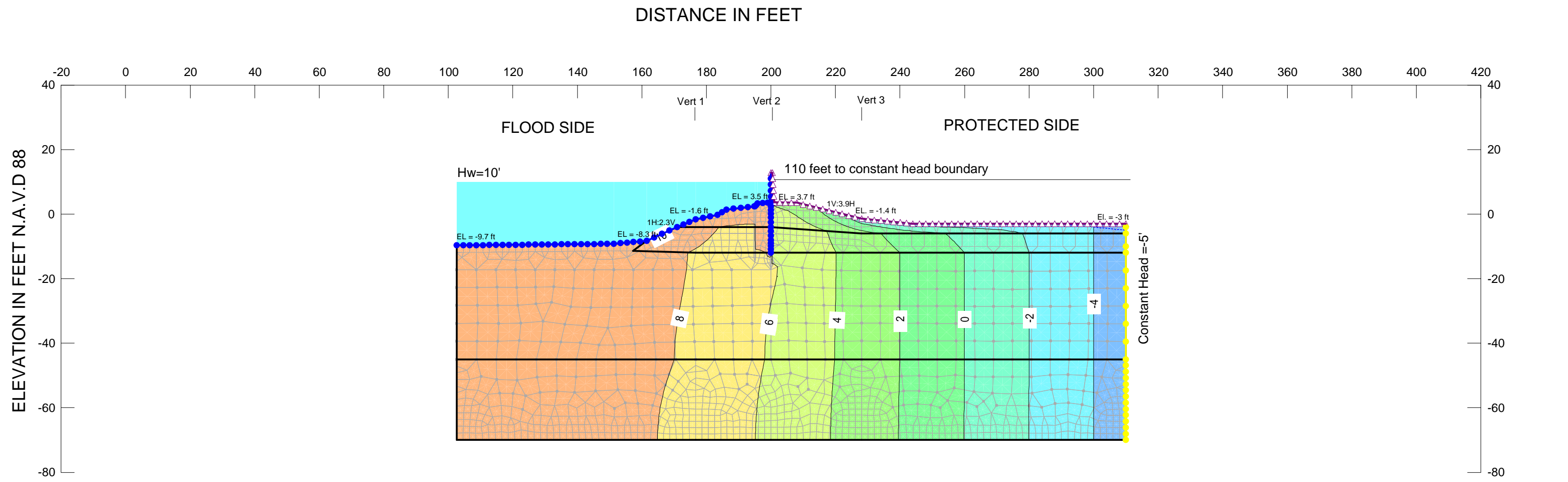
Line 56	12	52		
Line 57	52	33		
Line 58	33	53		
Line 59	53	11		
Line 60	45	54		
Line 61	54	25		
Line 62	20	55		
Line 63	55	3		
Line 64	21	56		
Line 65	56	2		
Line 66	57	23		
Line 67	57	49		
Line 68	57	56		
Line 69	56	55		
Line 70	55	4		
Line 71	35	58		
Line 72	59	35		
Line 73	52	59		
Line 74	58	53		
Line 75	31	11		
Line 76	58	31		
Line 77	12	30	Curb	
Line 78	30	59		
Line 79	14	25		
Line 80	3	2	Canal Water	
Line 81	15	45		

Points

	X (ft)	Y (ft)
Point 1	102.6	-9.7
Point 2	161.5	-8.3
Point 3	170.9	-4
Point 4	176.7	-1.6
Point 5	186.2	1.4
Point 6	200	3.5

Point 7	208	3.5
Point 8	228.1	-1.4
Point 9	310	-3
Point 10	310	-4
Point 11	102.6	-45
Point 12	310	-45
Point 13	200	-1
Point 14	200	-4
Point 15	200	-8
Point 16	200	-12
Point 17	200	-17.2
Point 18	195.1	2.4
Point 19	195	-1
Point 20	195	-4
Point 21	195	-8
Point 22	195	-15
Point 23	195	-12
Point 24	102.6	-17.2
Point 25	228	-6
Point 26	228	-12
Point 27	228	-4
Point 28	310	-6
Point 29	310	-12
Point 30	310	-70
Point 31	102.6	-69.9
Point 32	201	3.53
Point 33	200	-45
Point 34	200	-53
Point 35	200	-70
Point 36	151.3	-9.2
Point 37	160.5	-9
Point 38	183.4	-0.2
Point 39	195.9	3.3
Point 40	199	3.5
Point 41	244	-3
Point 42	201	3.7

Point 43	102.6	-12
Point 44	200	-9.9
Point 45	228	-10
Point 46	310	-10
Point 47	200	12.9
Point 48	200.5	12.9
Point 49	157.3	-11.4
Point 50	102.6	-11.9
Point 51	151.3	-11.4
Point 52	228.1	-45
Point 53	176.7	-45
Point 54	228	-8
Point 55	176.7	-4
Point 56	176.7	-8
Point 57	176.7	-12
Point 58	176.7	-70
Point 59	228.1	-70



Name: EMBANKMENT FILL CH, EL. +3.5 TO -1 Model: Saturated Only K-Sat: 3.28e-008 ft/sec K-Ratio: 1
Name: MARSH 1, MH, EL. -4 TO -8 Model: Saturated Only K-Sat: 3.28e-007 ft/sec K-Ratio: 1
Name: BEACH SAND SP, EL. -12 TO -45 Model: Saturated Only K-Sat: 0.000492 ft/sec K-Ratio: 1
Name: BAY SOUND CLAY CL, EL. -45 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



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 = CANAL WATER LEVEL

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

LONDON AVE OUTFALL CANAL, REACH 7,
PROTECTED SIDE STABILITY ANALYSIS,
CASE: Gap Analysis (Seepage) OPEN
STA. 59+00 TO 66+00
ORLEANS PARISH, LOUISIANA

Seepage Analysis (Gap) OPEN

Report generated using GeoStudio 2007, version 7.16. Copyright © 1991-2010 GEO-SLOPE International Ltd.

File Information

Created By: [Liljegren, James](#)
Revision Number: [275](#)
Last Edited By: [Higgins, James](#)
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Time: [10:01:05 AM](#)
File Name: [Reach 7 OPEN.gsz](#)
Directory: [\\Kaci-fs-05\fsd-z\Projects\041752 - New Orleans Canals\Mod 11\Slope-W\](#)
Last Solved Date: [12/22/2010](#)
Last Solved Time: [10:01:12 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

Seepage Analysis (Gap) OPEN

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 CH, EL. +3.5 TO -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, MH, EL. -4 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 °

BEACH SAND SP, EL. -12 TO -45

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 CLAY CL, EL. -45 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 °

Boundary Conditions

Drainage

Review: true
 Type: Total Flux (Q) 0

Curb

Type: Head (H) -5

Canal Water (Seepage)

Type: Head (H) 7

Regions

	Material	Points	Area (ft ²)
Region 1	EMBANKMENT FILL CH, EL. +3.5 TO -1	4,38,5,18,39,40,6,13,19	57.67
Region 2	EMBANKMENT FILL CH, EL. +3.5 TO -1	3,4,19,13,14,20,55	71.37
Region 3	EMBANKMENT FILL CH, EL. +3.5 TO -1	13,8,27,25,14	106.55
Region 4	EMBANKMENT FILL CH, EL. +3.5 TO -1	8,41,9,10,28,25,27	258.75
Region 5	EMBANKMENT FILL CH, EL. +3.5 TO -1	6,32,42,7,8,13	83.54
Region 6	BEACH SAND SP, EL. -12 TO -45	11,24,17,16,26,29,12,52,33,53	6337.72
Region 7	BAY SOUND CLAY CL, EL. -45 TO -70	53,33,52,59,35,58	1285
Region 8	MARSH 1, MH, EL. -4 TO -8	2,3,55,20,14,15,21,56	136.07
Region 9	BEACH SAND SP, EL. -12 TO -45	16,17,24,50,51,49,57,23	532.945
Region 10	MARSH 1, MH, EL. -4 TO -8	15,44,16,23,57,49,37,2,56,21	155.01
Region 11	MARSH 1, MH, EL. -4 TO -8	45,46,29,26	164

Region 12	MARSH 1, MH, EL. -4 TO -8	25,28,46,45,54	328
Region 13	MARSH 1, MH, EL. -4 TO -8	45,26,16,44,15	84
Region 14	Sheet Pile	6,47,48,42,32	7.085
Region 15	BEACH SAND SP, EL. -12 TO -45	50,1,36,2,37,49,51	127.58
Region 16	MARSH 1, MH, EL. -4 TO -8	15,14,25,54,45	112
Region 17	BAY SOUND CLAY CL, EL. -45 TO -70	31,11,53,58	1848.795
Region 18	BAY SOUND CLAY CL, EL. -45 TO -70	59,52,12,30	2047.5

Lines

	Start Point	End Point	Hydraulic Boundary	Left Side Material
Line 1	5	18	Canal Water (Seepage)	
Line 2	6	13	Canal Water (Seepage)	Sheet Pile
Line 3	13	19		
Line 4	19	4		
Line 5	3	4	Canal Water (Seepage)	
Line 6	13	14	Canal Water (Seepage)	Sheet Pile
Line 7	14	20		
Line 8	14	15	Canal Water (Seepage)	Sheet Pile
Line 9	16	17		Sheet Pile
Line 10	17	24		
Line 11	8	13		
Line 12	18	19		Sheet Pile
Line 13	19	20		Sheet Pile
Line 14	20	21		Sheet Pile
Line 15	21	23		Sheet Pile
Line 16	23	22		Sheet Pile
Line 17	8	27		
Line 18	27	25		
Line 19	9	10	Curb	

Line 20	10	28	Curb	
Line 21	28	25		
Line 22	29	26		
Line 23	32	6		Sheet Pile
Line 24	7	8	Drainage	
Line 25	11	24		
Line 26	15	21		
Line 27	16	26		
Line 28	29	12	Curb	
Line 29	37	2		
Line 30	4	38	Canal Water (Seepage)	
Line 31	38	5	Canal Water (Seepage)	
Line 32	18	39	Canal Water (Seepage)	
Line 33	39	40	Canal Water (Seepage)	
Line 34	40	6	Canal Water (Seepage)	
Line 35	8	41	Drainage	
Line 36	41	9	Drainage	
Line 37	42	32		
Line 38	42	7	Drainage	
Line 39	23	16		
Line 40	15	44	Canal Water (Seepage)	Sheet Pile
Line 41	44	16	Canal Water (Seepage)	Sheet Pile
Line 42	45	46		
Line 43	46	29	Curb	
Line 44	26	45		
Line 45	28	46	Curb	
Line 46	47	6	Canal Water (Seepage)	
Line 47	47	48	Drainage	
Line 48	48	42	Drainage	
Line 49	49	37		
Line 50	50	1		
Line 51	1	36	Canal Water (Seepage)	
Line 52	36	2	Canal Water (Seepage)	
Line 53	50	51		
Line 54	51	49		
Line 55	24	50		

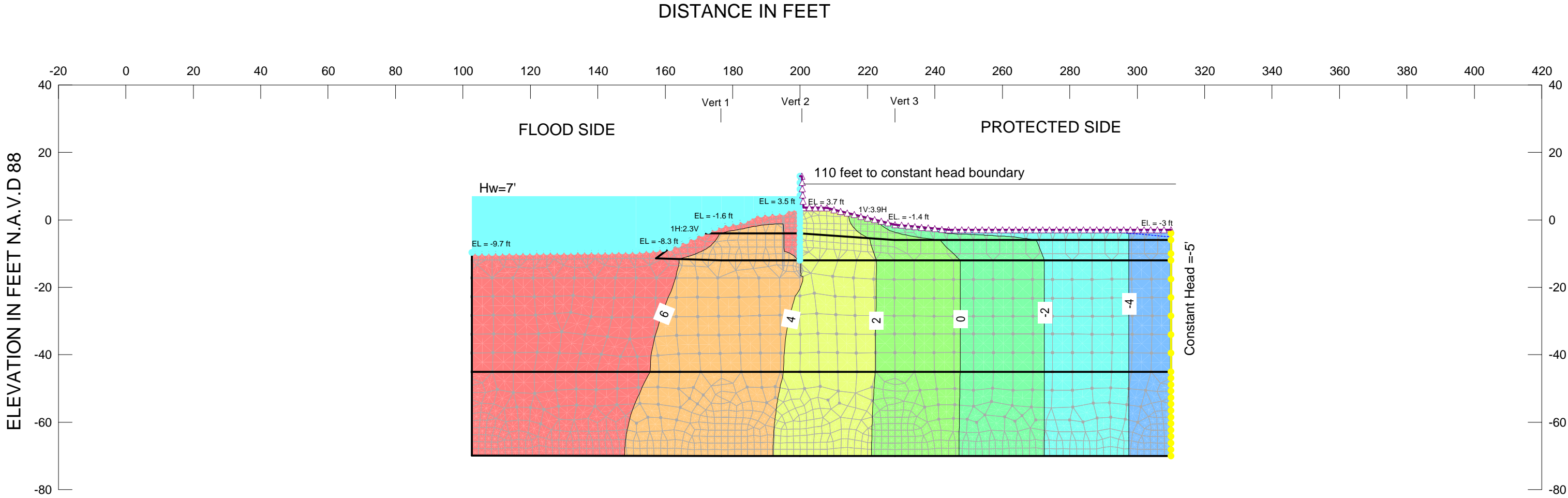
Line 56	12	52		
Line 57	52	33		
Line 58	33	53		
Line 59	53	11		
Line 60	45	54		
Line 61	54	25		
Line 62	20	55		
Line 63	55	3		
Line 64	21	56		
Line 65	56	2		
Line 66	57	23		
Line 67	57	49		
Line 68	57	56		
Line 69	56	55		
Line 70	55	4		
Line 71	35	58		
Line 72	59	35		
Line 73	52	59		
Line 74	58	53		
Line 75	31	11		
Line 76	58	31		
Line 77	12	30	Curb	
Line 78	30	59		
Line 79	14	25		
Line 80	3	2	Canal Water (Seepage)	
Line 81	15	45		

Points

	X (ft)	Y (ft)
Point 1	102.6	-9.7
Point 2	161.5	-8.3
Point 3	170.9	-4
Point 4	176.7	-1.6
Point 5	186.2	1.4
Point 6	200	3.5

Point 7	208	3.5
Point 8	228.1	-1.4
Point 9	310	-3
Point 10	310	-4
Point 11	102.6	-45
Point 12	310	-45
Point 13	200	-1
Point 14	200	-4
Point 15	200	-8
Point 16	200	-12
Point 17	200	-17.2
Point 18	195.1	2.4
Point 19	195	-1
Point 20	195	-4
Point 21	195	-8
Point 22	195	-15
Point 23	195	-12
Point 24	102.6	-17.2
Point 25	228	-6
Point 26	228	-12
Point 27	228	-4
Point 28	310	-6
Point 29	310	-12
Point 30	310	-70
Point 31	102.6	-69.9
Point 32	201	3.53
Point 33	200	-45
Point 34	200	-53
Point 35	200	-70
Point 36	151.3	-9.2
Point 37	160.5	-9
Point 38	183.4	-0.2
Point 39	195.9	3.3
Point 40	199	3.5
Point 41	244	-3
Point 42	201	3.7

Point 43	102.6	-12
Point 44	200	-9.9
Point 45	228	-10
Point 46	310	-10
Point 47	200	12.9
Point 48	200.5	12.9
Point 49	157.3	-11.4
Point 50	102.6	-11.9
Point 51	151.3	-11.4
Point 52	228.1	-45
Point 53	176.7	-45
Point 54	228	-8
Point 55	176.7	-4
Point 56	176.7	-8
Point 57	176.7	-12
Point 58	176.7	-70
Point 59	228.1	-70



Name: EMBANKMENT FILL CH, EL. +3.5 TO -1 Model: Saturated Only K-Sat: 3.28e-008 ft/sec K-Ratio: 1
Name: MARSH 1, MH, EL. -4 TO -8 Model: Saturated Only K-Sat: 3.28e-007 ft/sec K-Ratio: 1
Name: BEACH SAND SP, EL. -12 TO -45 Model: Saturated Only K-Sat: 0.000492 ft/sec K-Ratio: 1
Name: BAY SOUND CLAY CL, EL. -45 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



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 = CANAL WATER LEVEL

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

LONDON AVE OUTFALL CANAL, REACH 7,
PROTECTED SIDE STABILITY ANALYSIS,
CASE: Seepage Analysis (Gap) OPEN
STA. 59+00 TO 66+00
ORLEANS PARISH, LOUISIANA

GAP Stability (Block) OPEN

Report generated using GeoStudio 2007, version 7.16. Copyright © 1991-2010 GEO-SLOPE International Ltd.

File Information

Created By: [Liljegren, James](#)
Revision Number: [272](#)
Last Edited By: [Higgins, James](#)
Date: [12/22/2010](#)
Time: [9:28:53 AM](#)
File Name: [Reach 7 OPEN.gsz](#)
Directory: [\\Kaci-fs-05\fsd-z\Projects\041752 - New Orleans Canals\Mod 11\Slope-W\](#)
Last Solved Date: [12/22/2010](#)
Last Solved Time: [9:29:26 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

GAP Stability (Block) OPEN

Kind: [SLOPE/W](#)
Parent: [Gap Analysis \(Seepage\) OPEN](#)
Method: [Spencer](#)
Settings
 PWP Conditions Source: [Parent Analysis](#)
Slip Surface
 Direction of movement: [Left to Right](#)
 Use Passive Mode: [Yes](#)
 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: 4000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 8
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 10 °
Resisting Side Maximum Convex Angle: 1 °

Materials

EMBANKMENT FILL CH, EL. +3.5 TO -1

Model: Spatial Mohr-Coulomb
Unit Weight: 105 pcf
Cohesion: 650 psf
Phi: 0 °
Phi-B: 0 °

BEACH SAND SP, EL. -12 TO -45

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

BAY SOUND CLAY CL, EL. -45 TO -70

Model: Spatial Mohr-Coulomb
Unit Weight: 108 pcf
Cohesion Spatial Fn: Bay Sound
Phi: 0 °
Phi-B: 0 °

MARSH 1 Protected Toe MH, EL. -6 TO -10

Model: Spatial Mohr-Coulomb
Unit Weight: 104 pcf
Cohesion: 320 psf
Phi: 0 °
Phi-B: 0 °

Fill ,EL -1 to -6 (Protected Side toe) El. -1 to -6

Model: Undrained (Phi=0)
Unit Weight: 96 pcf
Cohesion: 600 psf

Fill 2, EL. -1 TO -4

Model: [Spatial Mohr-Coulomb](#)
Weight Fn: [fill](#)
Cohesion: [450 psf](#)
Phi: [0 °](#)
Phi-B: [0 °](#)

Sheet Pile

Model: [Undrained \(Phi=0\)](#)
Unit Weight: [0.1 pcf](#)
Cohesion: [0.1 psf](#)

MARSH 2 Protected Toe MH, EL. -10 to -12

Model: [Spatial Mohr-Coulomb](#)
Unit Weight: [96 pcf](#)
Cohesion: [300 psf](#)
Phi: [0 °](#)
Phi-B: [0 °](#)

MARSH 2, MH, EL. -8 TO -12

Model: [Spatial Mohr-Coulomb](#)
Weight Fn: [Marsh 3](#)
Cohesion Fn: [Marsh 3](#)
Phi: [0 °](#)
Phi-B: [0 °](#)

BAY SOUND CLAY CL, EL. -45 TO -70 (protected)

Model: [Spatial Mohr-Coulomb](#)
Unit Weight: [111 pcf](#)
Cohesion Fn: [Bay Sound](#)
Phi: [0 °](#)
Phi-B: [0 °](#)

Slip Surface Limits

Left Coordinate: [\(102.6, -17.2\) ft](#)
Right Coordinate: [\(310, -3\) ft](#)

Slip Surface Block

Left Grid
Upper Left: [\(200, -17.2\) ft](#)
Lower Left: [\(200, -17.2\) ft](#)
Lower Right: [\(200, -17.2\) ft](#)
X Increments: [0](#)
Y Increments: [0](#)
Starting Angle: [135 °](#)

Ending Angle: 135 °
Angle Increments: 1
Right Grid
Upper Left: (225, -4) ft
Lower Left: (225, -50) ft
Lower Right: (255, -50) ft
X Increments: 5
Y Increments: 12
Starting Angle: 25 °
Ending Angle: 45 °
Angle Increments: 4

Reinforcements

Reinforcement 1

Type: Pile
Outside Point: (200, 3.5) ft
Inside Point: (200, -17.2) ft
Slip Surface Intersection: (200, -17.2) ft
Total Length: 20.7 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

Point Loads

	Coordinate (ft)	Magnitude (lbs)	Direction (°)
Point Load 1	(200, -14.8)	1521.8	180

Cohesion Functions

Marsh 3

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: (176.6, 300)
Data Point: (200, 340)
Data Point: (228.1, 300)

Bay Sound

Model: Spline Data Point Function
Function: Cohesion vs. Y
Curve Fit to Data: 100 %
Segment Curvature: 100 %
Y-Intercept: 790
Data Points: Y (ft), Cohesion (psf)
Data Point: (-70, 950)
Data Point: (-45, 790)

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: (-100000, 0)
Data Point: (0, 0)
Data Point: (100000, 57735)
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 3

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 96
Data Points: X (ft), Unit Weight (pcf)
Data Point: (176.7, 96)
Data Point: (200, 98)

Data Point: (228, 96)

fill

Model: Spline Data Point Function

Function: Unit Weight vs. X

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 96

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

Data Point: (176.7, 96)

Data Point: (200, 105)

Data Point: (228.1, 96)

Spatial Functions

Bay Sound

Model: Linear Interpolation

Limit Range By: Data Values

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

Data Point: (200, -45, 800)

Data Point: (200, -70, 1000)

Data Point: (228.1, -45, 790)

Data Point: (228.1, -70, 950)

Data Point: (176.7, -45, 790)

Data Point: (176.7, -70, 950)

Regions

	Points	Area (ft ²)	Material
Region 1	4,38,5,18,39,40,6,13,19	57.67	
Region 2	3,4,19,13,14,20,55	71.37	
Region 3	13,8,27,25,14	106.55	Fill 2, EL. -1 TO -4
Region 4	8,41,9,10,28,25,27	258.75	Fill ,EL -1 to -6 (Protected Side toe) EL. -1 to -6
Region 5	6,32,42,7,8,13	83.54	EMBANKMENT FILL CH, EL. +3.5 TO -1
Region 6	11,24,17,16,26,29,12,52,33,53	6337.72	BEACH SAND SP, EL. -12 TO -45
Region	53,33,52,59,35,58	1285	BAY SOUND CLAY CL, EL. -45 TO -

7			70
Region 8	2,3,55,20,14,15,21,56	136.07	
Region 9	16,17,24,50,51,49,57,23	532.945	
Region 10	15,44,16,23,57,49,37,2,56,21	155.01	
Region 11	45,46,29,26	164	MARSH 2 Protected Toe MH, EL. -10 to -12
Region 12	25,28,46,45,54	328	MARSH 1 Protected Toe MH, EL. -6 TO -10
Region 13	45,26,16,44,15	84	MARSH 2, MH, EL. -8 TO -12
Region 14	6,47,48,42,32	7.085	Sheet Pile
Region 15	50,1,36,2,37,49,51	127.58	
Region 16	15,14,25,54,45	112	MARSH 2 Protected Toe MH, EL. -10 to -12
Region 17	31,11,53,58	1848.795	BAY SOUND CLAY CL, EL. -45 TO -70 (protected)
Region 18	59,52,12,30	2047.5	BAY SOUND CLAY CL, EL. -45 TO -70 (protected)

Points

	X (ft)	Y (ft)
Point 1	102.6	-9.7
Point 2	161.5	-8.3
Point 3	170.9	-4
Point 4	176.7	-1.6
Point 5	186.2	1.4
Point 6	200	3.5
Point 7	208	3.5
Point 8	228.1	-1.4
Point 9	310	-3
Point 10	310	-4

Point 11	102.6	-45
Point 12	310	-45
Point 13	200	-1
Point 14	200	-4
Point 15	200	-8
Point 16	200	-12
Point 17	200	-17.2
Point 18	195.1	2.4
Point 19	195	-1
Point 20	195	-4
Point 21	195	-8
Point 22	195	-15
Point 23	195	-12
Point 24	102.6	-17.2
Point 25	228	-6
Point 26	228	-12
Point 27	228	-4
Point 28	310	-6
Point 29	310	-12
Point 30	310	-70
Point 31	102.6	-69.9
Point 32	201	3.53
Point 33	200	-45
Point 34	200	-53
Point 35	200	-70
Point 36	151.3	-9.2
Point 37	160.5	-9
Point 38	183.4	-0.2
Point 39	195.9	3.3
Point 40	199	3.5
Point 41	244	-3
Point 42	201	3.7
Point 43	102.6	-12
Point 44	200	-9.9
Point 45	228	-10
Point 46	310	-10

Point 47	200	12.9
Point 48	200.5	12.9
Point 49	157.3	-11.4
Point 50	102.6	-11.9
Point 51	151.3	-11.4
Point 52	228.1	-45
Point 53	176.7	-45
Point 54	228	-8
Point 55	176.7	-4
Point 56	176.7	-8
Point 57	176.7	-12
Point 58	176.7	-70
Point 59	228.1	-70

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.74	(223.828, 0.55)	24.45209	(200, 12.9)	(252.447, -3)
2	139	1.78	(223.828, 0.55)	24.725	(200, 12.9)	(253.328, -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	200.25	-17.167	1469.7123	-4599.9023	0	0
2	Optimized	200.75	-17.101	1458.6077	2307.9801	490.38537	-9.914e-005
3	Optimized	201.875	-16.9525	1434.5846	2306.507	503.40464	-0.00010178
4	Optimized	203.625	-16.721505	1400.4804	2270.8732	502.52153	-0.0001016
5	Optimized	205.375	-16.49051	1374.3641	2234.2764	496.4706	-0.00010038
6	Optimized	207.125	-16.25951	1348.3611	2197.6229	490.32155	-3.4777e-005
7	Optimized	208.3556	-16.09707	1330.1658	2162.7636	480.7005	-9.718e-005

						5	
8	Optimized	209.60165	- 15.948215	1312.7468	2096.01	452.2172	-9.1424e-005
9	Optimized	211.3825	- 15.744385	1288.5348	2017.9068	421.1031 1	-8.5138e-005
10	Optimized	213.16335	-15.54055	1264.2671	1939.6921	389.9568 1	-7.8839e-005
11	Optimized	214.94425	- 15.336715	1240.0551	1861.4216	358.7460 9	-7.2528e-005
12	Optimized	216.72515	- 15.132885	1215.8989	1783.0395	327.4387 5	-6.62e-005
13	Optimized	218.40555	-14.92907	1192.4886	1714.1907	301.2048	-6.0896e-005
14	Optimized	219.9855	-14.72527	1169.7022	1641.0607	272.1389 5	-1.9303e-005
15	Optimized	221.5655	-14.52147	1146.9158	1567.868	243.0368 6	-1.29e-006
16	Optimized	223.14545	-14.31767	1124.1922	1494.5498	213.8260 5	-1.1351e-006
17	Optimized	224.95155	- 14.069885	1097.3045	1413.7494	182.6995 5	-9.6972e-007
18	Optimized	227.03385	-13.77094	1065.4793	1312.3518	142.5319 3	-7.5654e-007
19	Optimized	228.8991	- 13.503155	1037.0117	1273.3634	136.4577 2	-7.2419e-007
20	Optimized	230.49725	-13.27371	1012.6705	1226.8487	123.6558 7	-6.5649e-007
21	Optimized	232.0954	-13.04427	988.26727	1180.3959	110.9255 4	-5.8879e-007
22	Optimized	233.81655	- 12.813355	963.05008	1128.275	95.39267 6	-5.0633e-007
23	Optimized	235.66065	- 12.580965	937.01007	1079.2079	82.09796 2	2.2581e-006
24	Optimized	237.50475	-12.34858	910.91625	1030.1408	68.83431 1	1.8926e-006
25	Optimized	239.394	- 12.110505	884.23951	979.99793	55.28615	3.6704e-006
26	Optimized	241.10765	- 11.491465	831.33704	1119.4506	0	300

27	Optimized	242.60055	- 10.497155	752.84169	998.19539	0	300
28	Optimized	243.6735	-9.782551	696.23933	919.39689	0	320
29	Optimized	245.18555	-8.775511	616.63543	800.32378	0	320
30	Optimized	247.5812	-6.99296	477.90939	642.59999	0	320
31	Optimized	249.70535	-5.25	297.29093	619.65918	0	600
32	Optimized	251.5334	-3.75	96.998038	456.84693	0	600

Slices of Slip Surface: 139

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	139	200.25	-17.16783	1469.7609	-4470.5377	0	0
2	139	200.75	-17.10349	1458.7517	2302.4152	487.0893 4	-9.8476e-005
3	139	201.875	-16.95872	1434.9677	2301.3664	500.2155 7	-0.00010113
4	139	203.625	- 16.733525	1401.1891	2266.4543	499.5611 4	-0.000101
5	139	205.375	- 16.508335	1375.4584	2230.7487	493.8021 3	-9.9833e-005
6	139	207.125	-16.28314	1349.841	2194.8731	487.8795 1	-3.4606e-005
7	139	208.9091	-16.05356	1323.8241	2135.3129	468.5132 2	-9.472e-005
8	139	210.7273	- 15.819595	1297.4218	2052.0147	435.6643 9	-3.09e-005
9	139	212.54545	- 15.585625	1271.0741	1968.5529	402.6895 7	-8.1414e-005
10	139	214.3636	- 15.351655	1244.7264	1885.0366	369.6832 6	-7.474e-005
11	139	216.1818	- 15.117685	1218.3786	1801.4111	336.6139 6	-2.3875e-005
12	139	218	-14.88372	1192.1945	1717.6766	303.3871 9	-6.1335e-005
13	139	219.8182	- 14.649755	1166.0104	1633.8329	270.0974 3	-1.9158e-005
14	139	221.6364	-	1139.8263	1549.9347	236.7761	-1.2566e-006

			14.415785			8	
15	139	223.45455	- 14.181815	1113.7513	1465.8729	203.2974 5	-1.0792e-006
16	139	225.2727	-13.94785	1087.6218	1381.7565	169.8187 2	-9.0127e-007
17	139	227.0909	- 13.713885	1061.5468	1297.5309	136.2455 1	-7.2309e-007
18	139	228.05	- 13.590465	1047.7602	1288.6736	139.0914 3	-7.3831e-007
19	139	228.97925	- 13.470885	1034.5061	1262.7607	131.7828 6	-9.3491e-006
20	139	230.73775	- 13.244595	1009.2949	1215.4403	119.0181 3	3.2729e-006
21	139	232.4963	- 13.018305	984.14005	1168.0635	106.1882 7	-5.6366e-007
22	139	234.25485	- 12.792015	958.98523	1120.6867	93.35840 7	2.5683e-006
23	139	236.01335	- 12.565725	933.83041	1073.3663	80.56110 9	-4.2757e-007
24	139	237.77185	- 12.339435	908.67559	1025.9896	67.73124 7	1.8627e-006
25	139	239.53035	- 12.113145	883.52077	978.61276	54.90138 6	7.9594e-007
26	139	241.7048	- 11.833335	851.31637	964.34534	0	300
27	139	243.5	-11.24712	799.29095	1123.7874	0	300
28	139	244.49315	- 10.413785	735.11844	1027.7553	0	300
29	139	245.7808	- 9.3333335	651.88319	916.8403	0	320
30	139	247.3698	-8	549.29427	760.01616	0	320
31	139	248.9588	- 6.6666665	447.60203	603.14381	0	320
32	139	250.6471	-5.25	292.94828	617.33315	0	600
33	139	252.4347	-3.75	95.796769	454.40794	0	600

GAP Stability (Entry/Exit) OPEN

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File Information

Created By: [Liljegren, James](#)
Revision Number: [272](#)
Last Edited By: [Higgins, James](#)
Date: [12/22/2010](#)
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File Name: [Reach 7 OPEN.gsz](#)
Directory: [\\Kaci-fs-05\fsd-z\Projects\041752 - New Orleans Canals\Mod 11\Slope-W\](#)
Last Solved Date: [12/22/2010](#)
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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

GAP Stability (Entry/Exit) OPEN

Kind: [SLOPE/W](#)
Parent: [Gap Analysis \(Seepage\) OPEN](#)
Method: [Spencer](#)
Settings
 PWP Conditions Source: [Parent Analysis](#)
Slip Surface
 Direction of movement: [Left to Right](#)
 Use Passive Mode: [Yes](#)
 Slip Surface Option: [Entry and Exit](#)
 Critical slip surfaces saved: [1](#)
 Optimize Critical Slip Surface Location: [Yes](#)
 Tension Crack
 Tension Crack Option: [\(none\)](#)
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: 10
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 30 °
Resisting Side Maximum Convex Angle: 10 °

Materials

EMBANKMENT FILL CH, EL. +3.5 TO -1

Model: Spatial Mohr-Coulomb
Unit Weight: 105 pcf
Cohesion: 650 psf
Phi: 0 °
Phi-B: 0 °

MARSH 1, MH, EL. -4 TO -8

Model: Spatial Mohr-Coulomb
Unit Weight: 90 pcf
Cohesion Fn: Marsh 2
Phi: 0 °
Phi-B: 0 °

BEACH SAND SP, EL. -12 TO -45

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

BAY SOUND CLAY CL, EL. -45 TO -70

Model: Spatial Mohr-Coulomb
Unit Weight: 108 pcf
Cohesion Spatial Fn: Bay Sound
Phi: 0 °
Phi-B: 0 °

MARSH 1 Protected Toe MH, EL. -6 TO -10

Model: Spatial Mohr-Coulomb
Unit Weight: 104 pcf
Cohesion: 320 psf
Phi: 0 °
Phi-B: 0 °

Fill ,EL -1 to -6 (Protected Side toe) El. -1 to -6

Model: Undrained (Phi=0)

Unit Weight: 96 pcf

Cohesion: 600 psf

Fill 2, EL. -1 TO -4

Model: Spatial Mohr-Coulomb

Weight Fn: fill

Cohesion: 450 psf

Phi: 0 °

Phi-B: 0 °

Sheet Pile

Model: Undrained (Phi=0)

Unit Weight: 0.1 pcf

Cohesion: 0.1 psf

MARSH 2 Protected Toe MH, EL. -10 to -12

Model: Spatial Mohr-Coulomb

Unit Weight: 96 pcf

Cohesion: 300 psf

Phi: 0 °

Phi-B: 0 °

MARSH 2, MH, EL. -8 TO -12

Model: Spatial Mohr-Coulomb

Weight Fn: Marsh 3

Cohesion Fn: Marsh 3

Phi: 0 °

Phi-B: 0 °

BAY SOUND CLAY CL, EL. -45 TO -70 (protected)

Model: Spatial Mohr-Coulomb

Unit Weight: 111 pcf

Cohesion Fn: Bay Sound

Phi: 0 °

Phi-B: 0 °

Slip Surface Entry and Exit

Left Projection: Point

Left Coordinate: (200, -17.2) ft

Left-Zone Increment: 4

Right Projection: Range

Right-Zone Left Coordinate: (225.00477, -0.64544) ft

Right-Zone Right Coordinate: (275, -3) ft

Right-Zone Increment: 10

Radius Increments: 4

Slip Surface Limits

Left Coordinate: (102.6, -17.2) ft

Right Coordinate: (310, -3) ft

Reinforcements

Reinforcement 1

Type: Pile

Outside Point: (200, 3.5) ft

Inside Point: (200, -17.2) ft

Slip Surface Intersection: (200, -17.2) ft

Total Length: 20.7 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

Point Loads

	Coordinate (ft)	Magnitude (lbs)	Direction (°)
Point Load 1	(200, -14.8)	1521.8	180

Cohesion Functions

Marsh 3

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: (176.6, 300)

Data Point: (200, 340)

Data Point: (228.1, 300)

Marsh 2

Model: [Spline Data Point Function](#)

Function: [Cohesion vs. X](#)

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 320

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

Data Point: (176.7, 320)

Data Point: (200, 340)

Data Point: (228.1, 320)

Bay Sound

Model: [Spline Data Point Function](#)

Function: [Cohesion vs. Y](#)

Curve Fit to Data: 100 %

Segment Curvature: 100 %

Y-Intercept: 790

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

Data Point: (-70, 950)

Data Point: (-45, 790)

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: (-100000, 0)

Data Point: (0, 0)

Data Point: (100000, 57735)

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 3

Model: [Spline Data Point Function](#)

Function: [Unit Weight vs. X](#)
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
 Y-Intercept: 96
 Data Points: [X \(ft\), Unit Weight \(pcf\)](#)
 Data Point: (176.7, 96)
 Data Point: (200, 98)
 Data Point: (228, 96)

fill

Model: [Spline Data Point Function](#)
 Function: [Unit Weight vs. X](#)
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
 Y-Intercept: 96
 Data Points: [X \(ft\), Unit Weight \(pcf\)](#)
 Data Point: (176.7, 96)
 Data Point: (200, 105)
 Data Point: (228.1, 96)

Spatial Functions

Bay Sound

Model: [Linear Interpolation](#)
 Limit Range By: [Data Values](#)
 Data Points: [X \(ft\), Y \(ft\), Cohesion \(psf\)](#)
 Data Point: (200, -45, 800)
 Data Point: (200, -70, 1000)
 Data Point: (228.1, -45, 790)
 Data Point: (228.1, -70, 950)
 Data Point: (176.7, -45, 790)
 Data Point: (176.7, -70, 950)

Regions

	Points	Area (ft²)	Material
Region 1	4,38,5,18,39,40,6,13,19	57.67	
Region 2	3,4,19,13,14,20,55	71.37	
Region 3	13,8,27,25,14	106.55	Fill 2, EL. -1 TO -4
Region 4	8,41,9,10,28,25,27	258.75	Fill ,EL -1 to -6 (Protected Side toe) El. -1 to -6

Region 5	6,32,42,7,8,13	83.54	EMBANKMENT FILL CH, EL. +3.5 TO -1
Region 6	11,24,17,16,26,29,12,52,33,53	6337.72	BEACH SAND SP, EL. -12 TO -45
Region 7	53,33,52,59,35,58	1285	BAY SOUND CLAY CL, EL. -45 TO -70
Region 8	2,3,55,20,14,15,21,56	136.07	
Region 9	16,17,24,50,51,49,57,23	532.945	
Region 10	15,44,16,23,57,49,37,2,56,21	155.01	
Region 11	45,46,29,26	164	MARSH 2 Protected Toe MH, EL. -10 to -12
Region 12	25,28,46,45,54	328	MARSH 1 Protected Toe MH, EL. -6 TO -10
Region 13	45,26,16,44,15	84	MARSH 2, MH, EL. -8 TO -12
Region 14	6,47,48,42,32	7.085	Sheet Pile
Region 15	50,1,36,2,37,49,51	127.58	
Region 16	15,14,25,54,45	112	MARSH 1, MH, EL. -4 TO -8
Region 17	31,11,53,58	1848.795	BAY SOUND CLAY CL, EL. -45 TO -70 (protected)
Region 18	59,52,12,30	2047.5	BAY SOUND CLAY CL, EL. -45 TO -70 (protected)

Points

	X (ft)	Y (ft)
Point 1	102.6	-9.7
Point 2	161.5	-8.3
Point 3	170.9	-4
Point 4	176.7	-1.6
Point 5	186.2	1.4
Point 6	200	3.5

Point 7	208	3.5
Point 8	228.1	-1.4
Point 9	310	-3
Point 10	310	-4
Point 11	102.6	-45
Point 12	310	-45
Point 13	200	-1
Point 14	200	-4
Point 15	200	-8
Point 16	200	-12
Point 17	200	-17.2
Point 18	195.1	2.4
Point 19	195	-1
Point 20	195	-4
Point 21	195	-8
Point 22	195	-15
Point 23	195	-12
Point 24	102.6	-17.2
Point 25	228	-6
Point 26	228	-12
Point 27	228	-4
Point 28	310	-6
Point 29	310	-12
Point 30	310	-70
Point 31	102.6	-69.9
Point 32	201	3.53
Point 33	200	-45
Point 34	200	-53
Point 35	200	-70
Point 36	151.3	-9.2
Point 37	160.5	-9
Point 38	183.4	-0.2
Point 39	195.9	3.3
Point 40	199	3.5
Point 41	244	-3
Point 42	201	3.7

Point 43	102.6	-12
Point 44	200	-9.9
Point 45	228	-10
Point 46	310	-10
Point 47	200	12.9
Point 48	200.5	12.9
Point 49	157.3	-11.4
Point 50	102.6	-11.9
Point 51	151.3	-11.4
Point 52	228.1	-45
Point 53	176.7	-45
Point 54	228	-8
Point 55	176.7	-4
Point 56	176.7	-8
Point 57	176.7	-12
Point 58	176.7	-70
Point 59	228.1	-70

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.74	(211.552, 51.466)	25.39352	(200, 12.9)	(254.154, -3)
2	32	1.88	(211.552, 51.466)	69.631	(200, 12.9)	(254.934, -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	200.25	-17.201875	1471.7585	-4138.4833	0	0
2	Optimized	200.75	-17.205625	1464.8787	2205.3378	427.50427	-8.645e-005
3	Optimized	201.9527	-17.21465	1449.7705	2222.1243	445.91865	-9.0169e-005

4	Optimized	203.8581	-17.22895	1430.7726	2217.1911	454.0389 3	-3.2211e-005
5	Optimized	205.76355	-17.24325	1418.912	2211.8381	457.7960 8	-9.2569e-005
6	Optimized	206.8343	-17.25195	1412.343	2205.597	457.9854 3	-9.261e-005
7	Optimized	207.47615	- 17.264685	1408.8337	2199.9906	456.7746 5	-9.2361e-005
8	Optimized	209.1572	-17.30057	1400.026	2170.8827	445.0542 9	-8.9999e-005
9	Optimized	210.844	- 17.312305	1389.7554	2151.8367	439.9878 5	-8.8966e-005
10	Optimized	212.22875	- 17.256395	1377.3418	2120.6135	429.1281 1	-8.6771e-005
11	Optimized	213.939	-17.17051	1360.9323	2061.5161	404.4822 4	-8.1787e-005
12	Optimized	215.64925	- 17.084625	1344.4645	2002.302	379.8026 5	-7.6795e-005
13	Optimized	217.6232	- 16.914635	1321.3046	1956.8452	366.9295 5	-7.4191e-005
14	Optimized	219.86075	- 16.660545	1291.1972	1858.7521	327.6779 4	-6.6256e-005
15	Optimized	222.06745	- 16.336075	1256.856	1783.2215	303.8972 8	-6.1439e-005
16	Optimized	224.2433	- 15.941225	1218.5091	1665.2867	257.9471 8	-1.8296e-005
17	Optimized	226.7156	-15.37692	1167.6654	1547.5075	219.3019 5	-1.1639e-006
18	Optimized	228.17045	- 14.991375	1134.4164	1517.7478	221.3164 5	-1.1745e-006
19	Optimized	229.4333	- 14.683315	1107.2802	1454.0159	200.1879 1	-1.0625e-006
20	Optimized	231.53095	-14.19138	1063.4089	1359.0548	170.6912 4	-9.0601e-007
21	Optimized	233.34145	- 13.786295	1026.7564	1285.6419	149.4676 4	-7.9332e-007
22	Optimized	235.15195	-13.38121	990.10381	1212.1751	128.2129 2	-6.8053e-007

23	Optimized	236.87165	- 13.031335	957.47656	1136.5881	103.4101	2.8434e-006
24	Optimized	238.5006	- 12.736665	928.90329	1080.7101	87.64572 7	2.4105e-006
25	Optimized	240.12955	-12.442	900.33001	1024.8322	71.88135 4	1.9774e-006
26	Optimized	241.7808	- 12.143295	871.36234	968.31757	55.97712 8	3.7171e-006
27	Optimized	243.3088	- 11.504785	818.4178	1102.4781	0	300
28	Optimized	244.75215	-10.48754	738.65019	987.18528	0	300
29	Optimized	246.4443	-9.268255	643.29951	871.77465	0	320
30	Optimized	248.72415	-7.537385	509.34731	685.84681	0	320
31	Optimized	250.354	-6.247845	410.94865	558.53993	0	320
32	Optimized	251.52145	-5.25	290.99207	627.33524	0	600
33	Optimized	253.2764	-3.75	94.050473	464.94624	0	600

Slices of Slip Surface: 32

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	32	200.25	- 17.241125	1474.088	-4095.7523	0	0
2	32	200.75	-17.32151	1471.8216	2141.356	386.55582	-7.8152e-005
3	32	201.875	-17.48358	1467.3319	2183.0594	413.22547	-8.355e-005
4	32	203.625	-17.70667	1462.3706	2216.4631	435.37551	-8.8029e-005
5	32	205.375	-17.88489	1461.7551	2244.9399	452.17193	-9.143e-005
6	32	207.125	- 18.018585	1458.3567	2268.4852	467.7279	-9.4573e-005
7	32	208.9091	-18.10888	1452.0521	2266.1795	470.0367	-3.3344e-005
8	32	210.7273	- 18.154195	1442.9333	2237.0773	458.49926	-3.2526e-005
9	32	212.54545	-18.152	1431.0642	2201.3708	444.73669	-3.155e-005
10	32	214.3636	- 18.102295	1416.194	2158.9127	428.80885	-8.6706e-005
11	32	216.1818	-18.00498	1398.4087	2109.5766	410.59295	-2.9127e-005
12	32	218	-17.85985	1377.7992	2053.1449	389.91097	-7.8841e-005
13	32	219.8182	-	1354.1896	1989.4251	366.75337	-2.6018e-005

			17.666605				
14	32	221.6364	-17.42484	1327.5234	1918.1446	340.99527	-2.419e-005
15	32	223.45455	-17.13404	1297.9145	1839.0599	312.43046	-6.3178e-005
16	32	225.2727	-16.79358	1265.1607	1751.8564	280.99388	-1.9933e-005
17	32	227.0909	- 16.402715	1229.288	1656.1532	246.45072	-1.3082e-006
18	32	228.05	- 16.182385	1209.4533	1668.5968	265.08658	1.5991e-005
19	32	228.9641	- 15.947005	1189.0669	1632.3899	255.95263	-1.3587e-006
20	32	230.6923	-15.47676	1148.8402	1561.4212	238.20378	-1.2645e-006
21	32	232.4205	- 14.958225	1105.662	1482.754	217.7142	-1.1558e-006
22	32	234.14875	-14.39026	1059.375	1395.9712	194.33392	-1.0317e-006
23	32	235.877	- 13.771575	1009.9006	1300.5038	167.77987	-8.9059e-007
24	32	237.6052	-13.10071	957.23331	1195.8038	137.73875	-7.3118e-007
25	32	239.3334	-12.37602	901.18005	1081.2038	103.93678	-5.5166e-007
26	32	241.1481	- 11.553555	835.38128	1042.1437	0	300
27	32	243.04935	- 10.624885	758.90514	938.88654	0	300
28	32	244.1347	-10.07133	713.53362	878.59137	0	300
29	32	245.0949	-9.546177	670.96461	834.18082	0	320
30	32	246.74585	- 8.6087635	595.48541	739.36564	0	320
31	32	248.3968	- 7.6103405	516.25894	637.19048	0	320
32	32	250.04775	-6.547754	433.37405	527.11269	0	320
33	32	251.8883	-5.278447	293.20818	538.86518	0	600
34	32	253.91845	-3.778447	96.255547	402.79112	0	600

Global Stability (Block) OPEN

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File Information

Created By: [Liljegren, James](#)
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Last Edited By: [Higgins, James](#)
Date: [12/22/2010](#)
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File Name: [Reach 7 OPEN.gsz](#)
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Last Solved Date: [12/22/2010](#)
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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

Global Stability (Block) OPEN

Kind: [SLOPE/W](#)
Parent: [Gap Analysis \(Seepage\) OPEN](#)
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

EMBANKMENT FILL CH, EL. +3.5 TO -1

Model: Spatial Mohr-Coulomb
Unit Weight: 105 pcf
Cohesion: 650 psf
Phi: 0 °
Phi-B: 0 °

MARSH 1, MH, EL. -4 TO -8

Model: Spatial Mohr-Coulomb
Unit Weight: 90 pcf
Cohesion Fn: Marsh 2
Phi: 0 °
Phi-B: 0 °

BEACH SAND SP, EL. -12 TO -45

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

BAY SOUND CLAY CL, EL. -45 TO -70

Model: Spatial Mohr-Coulomb
Unit Weight: 108 pcf
Cohesion Spatial Fn: Bay Sound
Phi: 0 °
Phi-B: 0 °

MARSH 1 Protected Toe MH, EL. -6 TO -10

Model: Spatial Mohr-Coulomb
Unit Weight: 104 pcf
Cohesion: 320 psf
Phi: 0 °

Phi-B: 0 °

Fill ,EL -1 to -6 (Protected Side toe) El. -1 to -6

Model: Undrained (Phi=0)

Unit Weight: 96 pcf

Cohesion: 600 psf

Fill 2, EL. -1 TO -4

Model: Spatial Mohr-Coulomb

Weight Fn: fill

Cohesion: 450 psf

Phi: 0 °

Phi-B: 0 °

Sheet Pile

Model: Undrained (Phi=0)

Unit Weight: 0.1 pcf

Cohesion: 0.1 psf

MARSH 2 Protected Toe MH, EL. -10 to -12

Model: Spatial Mohr-Coulomb

Unit Weight: 96 pcf

Cohesion: 300 psf

Phi: 0 °

Phi-B: 0 °

MARSH 2, MH, EL. -8 TO -12

Model: Spatial Mohr-Coulomb

Weight Fn: Marsh 3

Cohesion Fn: Marsh 3

Phi: 0 °

Phi-B: 0 °

BAY SOUND CLAY CL, EL. -45 TO -70 (protected)

Model: Spatial Mohr-Coulomb

Unit Weight: 111 pcf

Cohesion Fn: Bay Sound

Phi: 0 °

Phi-B: 0 °

Slip Surface Limits

Left Coordinate: (102.6, -9.7) ft

Right Coordinate: (310, -3) ft

Slip Surface Block

Left Grid

Upper Left: (186.5, -5) ft
Lower Left: (186.5, -50) ft
Lower Right: (206.9, -50) ft
X Increments: 4
Y Increments: 14
Starting Angle: 125 °
Ending Angle: 145 °
Angle Increments: 4

Right Grid

Upper Left: (224.6, -5) ft
Lower Left: (224.6, -50) ft
Lower Right: (250.9, -50) ft
X Increments: 6
Y Increments: 14
Starting Angle: 25 °
Ending Angle: 45 °
Angle Increments: 4

Reinforcements

Reinforcement 1

Type: Pile
Outside Point: (200, 3.5) ft
Inside Point: (200, -12.2) ft
Slip Surface Intersection: (200, -14.452) ft
Total Length: 15.7 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

Reinforcement 2

Type: Pile
Outside Point: (195, 3.5) ft
Inside Point: (195, -12.2) ft
Slip Surface Intersection: (195, -12.203) ft
Total Length: 15.7 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

Cohesion Functions

Marsh 3

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: (176.6, 300)
Data Point: (200, 340)
Data Point: (228.1, 300)

Marsh 2

Model: Spline Data Point Function
Function: Cohesion vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 320
Data Points: X (ft), Cohesion (psf)
Data Point: (176.7, 320)
Data Point: (200, 340)
Data Point: (228.1, 320)

Bay Sound

Model: Spline Data Point Function
Function: Cohesion vs. Y
Curve Fit to Data: 100 %
Segment Curvature: 100 %
Y-Intercept: 790
Data Points: Y (ft), Cohesion (psf)
Data Point: (-70, 950)
Data Point: (-45, 790)

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: (-100000, 0)

Data Point: (0, 0)

Data Point: (100000, 57735)

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 3

Model: [Spline Data Point Function](#)

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

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 96

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

Data Point: (176.7, 96)

Data Point: (200, 98)

Data Point: (228, 96)

fill

Model: [Spline Data Point Function](#)

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

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 96

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

Data Point: (176.7, 96)

Data Point: (200, 105)

Data Point: (228.1, 96)

Spatial Functions

Bay Sound

Model: Linear Interpolation

Limit Range By: Data Values

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

Data Point: (200, -45, 800)

Data Point: (200, -70, 1000)

Data Point: (228.1, -45, 790)

Data Point: (228.1, -70, 950)

Data Point: (176.7, -45, 790)

Data Point: (176.7, -70, 950)

Regions

	Material	Points	Area (ft ²)
Region 1	EMBANKMENT FILL CH, EL. +3.5 TO -1	4,38,5,18,39,40,6,13,19	57.67
Region 2	Fill 2, EL. -1 TO -4	3,4,19,13,14,20,55	71.37
Region 3	Fill 2, EL. -1 TO -4	13,8,27,25,14	106.55
Region 4	Fill ,EL -1 to -6 (Protected Side toe) El. -1 to -6	8,41,9,10,28,25,27	258.75
Region 5	EMBANKMENT FILL CH, EL. +3.5 TO -1	6,32,42,7,8,13	83.54
Region 6	BEACH SAND SP, EL. -12 TO -45	11,24,17,16,26,29,12,52,33,53	6337.72
Region 7	BAY SOUND CLAY CL, EL. -45 TO -70	53,33,52,59,35,58	1285
Region 8	MARSH 1, MH, EL. -4 TO -8	2,3,55,20,14,15,21,56	136.07
Region 9	BEACH SAND SP, EL. -12 TO -45	16,17,24,50,51,49,57,23	532.945
Region 10	MARSH 2, MH, EL. -8 TO -12	15,44,16,23,57,49,37,2,56,21	155.01
Region 11	MARSH 2 Protected Toe MH, EL. -10 to -12	45,46,29,26	164
Region 12	MARSH 1 Protected Toe MH, EL. -6 TO -10	25,28,46,45,54	328

Region 13	MARSH 2, MH, EL. -8 TO -12	45,26,16,44,15	84
Region 14	Sheet Pile	6,47,48,42,32	7.085
Region 15	BEACH SAND SP, EL. -12 TO -45	50,1,36,2,37,49,51	127.58
Region 16	MARSH 2 Protected Toe MH, EL. -10 to -12	15,14,25,54,45	112
Region 17	BAY SOUND CLAY CL, EL. -45 TO -70 (protected)	31,11,53,58	1848.795
Region 18	BAY SOUND CLAY CL, EL. -45 TO -70 (protected)	59,52,12,30	2047.5

Points

	X (ft)	Y (ft)
Point 1	102.6	-9.7
Point 2	161.5	-8.3
Point 3	170.9	-4
Point 4	176.7	-1.6
Point 5	186.2	1.4
Point 6	200	3.5
Point 7	208	3.5
Point 8	228.1	-1.4
Point 9	310	-3
Point 10	310	-4
Point 11	102.6	-45
Point 12	310	-45
Point 13	200	-1
Point 14	200	-4
Point 15	200	-8
Point 16	200	-12
Point 17	200	-17.2
Point 18	195.1	2.4
Point 19	195	-1
Point 20	195	-4
Point 21	195	-8

Point 22	195	-15
Point 23	195	-12
Point 24	102.6	-17.2
Point 25	228	-6
Point 26	228	-12
Point 27	228	-4
Point 28	310	-6
Point 29	310	-12
Point 30	310	-70
Point 31	102.6	-69.9
Point 32	201	3.53
Point 33	200	-45
Point 34	200	-53
Point 35	200	-70
Point 36	151.3	-9.2
Point 37	160.5	-9
Point 38	183.4	-0.2
Point 39	195.9	3.3
Point 40	199	3.5
Point 41	244	-3
Point 42	201	3.7
Point 43	102.6	-12
Point 44	200	-9.9
Point 45	228	-10
Point 46	310	-10
Point 47	200	12.9
Point 48	200.5	12.9
Point 49	157.3	-11.4
Point 50	102.6	-11.9
Point 51	151.3	-11.4
Point 52	228.1	-45
Point 53	176.7	-45
Point 54	228	-8
Point 55	176.7	-4
Point 56	176.7	-8
Point 57	176.7	-12

Point 58	176.7	-70
Point 59	228.1	-70

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.89	(216.093, -0.974)	30.91781	(178.068, -1.31409)	(253.206, -3)
2	3133	2.06	(216.093, -0.974)	30.23	(177.757, -1.37906)	(254.378, -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	178.2524	-1.428575	707.90652	495.72136	0	650
2	Optimized	179.42435	-2.157298	720.11685	626.0241	0	450
3	Optimized	181.4	-3.385766	742.85557	756.69653	0	450
4	Optimized	182.8939	-4.3146915	771.76582	887.06883	0	325.32
5	Optimized	184.11235	-5.0723165	811.08855	953.79054	0	326.36
6	Optimized	185.51235	-5.963848	858.83458	1057.238	0	327.56
7	Optimized	187.4168	-7.206223	925.78348	1208.0958	0	329.2
8	Optimized	189.31275	-8.44304	993.85669	1328.3692	0	321.73
9	Optimized	191.08765	-9.60438	1058.3872	1442.8702	0	324.77
10	Optimized	193.27915	-11.040985	1138.6421	1586.0925	0	328.51
11	Optimized	194.5445	-11.879645	1186.0449	1653.1203	0	330.67
12	Optimized	194.85705	-12.10144	1199.1819	1691.7025	284.35691	-2.0182e-005
13	Optimized	195.05	-12.238365	1210.5574	1707.6982	287.02437	-2.037e-005
14	Optimized	195.5	-12.557705	1244.4833	1726.3535	278.20794	-1.9743e-005
15	Optimized	196.7186	-13.422465	1300.9105	1872.9605	330.27319	-6.6808e-005

16	Optimized	198.2686	- 14.136675	1347.2744	2140.6551	458.05857	-9.2644e-005
17	Optimized	199.5	-14.36111	1363.0452	2173.3955	467.85596	-9.4613e-005
18	Optimized	200.25	- 14.497805	1290.5795	1587.5277	171.44312	-9.1028e-007
19	Optimized	200.63645	-14.56824	1278.4735	1832.7562	320.0153	-2.2706e-005
20	Optimized	200.88645	- 14.596355	1279.9149	1889.6351	352.02208	-7.1188e-005
21	Optimized	201.95925	-14.62699	1274.9038	1908.0573	365.55131	-7.3918e-005
22	Optimized	203.87775	- 14.681775	1270.5272	1907.4842	367.74726	-7.4366e-005
23	Optimized	206.4185	- 14.858885	1265.2256	1894.6594	363.40379	-7.3493e-005
24	Optimized	209.56905	- 15.157135	1263.5623	1883.2405	357.77137	-2.5383e-005
25	Optimized	212.21495	-15.34338	1258.1015	1856.9898	345.7683	-6.9923e-005
26	Optimized	214.3686	- 15.418795	1248.9136	1808.1729	322.88854	-6.5297e-005
27	Optimized	216.52225	-15.49421	1239.7256	1759.2169	299.92841	-6.0653e-005
28	Optimized	218.94605	-15.45084	1221.5515	1718.4055	286.85876	1.7305e-005
29	Optimized	221.63995	-15.28868	1194.2799	1622.4362	247.19614	-1.3124e-006
30	Optimized	224.2402	- 14.974365	1158.1926	1544.6882	223.14336	-1.1845e-006
31	Optimized	226.7966	- 14.498615	1112.3735	1407.3945	170.33044	-9.0419e-007
32	Optimized	228.09985	- 14.256075	1088.9944	1369.409	161.89746	-8.5934e-007
33	Optimized	229.38275	- 14.036755	1067.2587	1327.9836	150.52961	-1.0679e-005
34	Optimized	231.94825	- 13.598165	1023.7661	1245.2247	127.85922	3.5167e-006
35	Optimized	234.5138	- 13.159575	980.2735	1162.4275	105.16665	-5.5824e-007
36	Optimized	237.2472	-12.70521	934.78072	1074.4841	80.657763	2.2182e-006
37	Optimized	240.2069	- 12.225595	886.32998	982.87781	55.741914	8.0823e-007
38	Optimized	242.858	- 11.175255	798.36385	1021.9859	0	300

39	Optimized	244.2618	-10.18473	720.62985	908.35564	0	300
40	Optimized	245.31615	-9.44078	662.23151	836.10144	0	320
41	Optimized	248.0198	-7.370105	501.69441	626.9128	0	320
42	Optimized	251.5684	-4.429325	184.85526	482.74918	0	600

Slices of Slip Surface: 3133

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	3133	177.8844	-1.468032	711.64432	483.19737	0	650
2	3133	179.75595	- 2.7785005	735.41324	673.9938	0	450
3	3133	182.4502	- 4.6650485	794.28087	900.83758	0	324.94
4	3133	184.8	- 6.3103875	881.37831	1062.9375	0	326.95
5	3133	186.7065	-7.645339	953.45142	1235.5003	0	328.59
6	3133	188.64115	-9	1027.5907	1369.0408	0	320.58
7	3133	191.49745	-11	1138.1476	1565.9208	0	325.47
8	3133	194.0128	- 12.761265	1240.4495	1765.1174	302.91716	-6.1278e-005
9	3133	195.5	-13.80261	1316.1725	1865.2091	316.98645	-6.4131e-005
10	3133	196.3	- 14.362775	1348.1194	1978.8665	364.16198	-7.3662e-005
11	3133	197.85	-14.64286	1368.5652	2283	527.94917	- 0.00010676
12	3133	199.5	-14.64286	1374.1	2291.2	529.48793	- 0.00010707
13	3133	200.25	-14.64286	1299.42	1645.62	199.87866	-1.0611e-006
14	3133	200.75	-14.64286	1283.22	1904.78	358.85783	-2.5459e-005
15	3133	202.16665	-14.64286	1275.1288	1918.9288	371.69816	-7.5161e-005
16	3133	204.5	-14.64286	1264.0716	1910.0146	372.93534	-7.5415e-005
17	3133	206.83335	-14.64286	1248.9859	1901.1003	376.49841	-7.6133e-

							005
18	3133	209.25	-14.64286	1233.48	1862.68	363.26879	-7.3459e-005
19	3133	211.75	-14.64286	1217.4	1794.72	333.31586	-6.7404e-005
20	3133	214.25	-14.64286	1201.28	1726.64	303.31674	-6.1337e-005
21	3133	216.75	-14.64286	1185.16	1658.36	273.20215	-1.9382e-005
22	3133	219.25	-14.64286	1169.24	1589.92	242.87971	-1.2895e-006
23	3133	221.75	-14.64286	1153.28	1521.28	212.4649	-1.128e-006
24	3133	224.25	-14.64286	1137.48	1452.52	181.88843	-9.6563e-007
25	3133	226.8	-14.64286	1121.3462	1382.1538	150.57739	-1.0683e-005
26	3133	229.30625	-14.64286	1105.5337	1367.3368	151.1521	-8.0247e-007
27	3133	231.71875	-14.64286	1090.4041	1343.8342	146.31791	-7.7684e-007
28	3133	234.13125	-14.64286	1075.2332	1320.2902	141.48372	-7.5119e-007
29	3133	236.54375	-14.64286	1060.1036	1296.7876	136.64954	-9.6938e-006
30	3133	239.6372	-13.32143	958.26946	1246.8528	166.61367	-8.8403e-007
31	3133	242.7622	-11.13328	796.05315	1007.7891	0	300
32	3133	244.19035	-10.13328	717.50845	892.12477	0	300
33	3133	245.80885	-9	628.46763	775.2745	0	320
34	3133	248.66515	-7	472.36882	552.4114	0	320
35	3133	251.1644	-5.25	290.99064	479.66289	0	600
36	3133	253.3066	-3.75	93.986242	325.37082	0	600

Global Stability (Entry/Exit) OPEN

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File Information

Created By: [Liljegren, James](#)
Revision Number: [272](#)
Last Edited By: [Higgins, James](#)
Date: [12/22/2010](#)
Time: [9:28:53 AM](#)
File Name: [Reach 7 OPEN.gsz](#)
Directory: [\\Kaci-fs-05\fsd-z\Projects\041752 - New Orleans Canals\Mod 11\Slope-W\](#)
Last Solved Date: [12/22/2010](#)
Last Solved Time: [9:32:28 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

Global Stability (Entry/Exit) OPEN

Kind: [SLOPE/W](#)
Parent: [Gap Analysis \(Seepage\) OPEN](#)
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: [\(none\)](#)
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 CH, EL. +3.5 TO -1

Model: Spatial Mohr-Coulomb
Unit Weight: 105 pcf
Cohesion: 650 psf
Phi: 0 °
Phi-B: 0 °

MARSH 1, MH, EL. -4 TO -8

Model: Spatial Mohr-Coulomb
Unit Weight: 90 pcf
Cohesion Fn: Marsh 2
Phi: 0 °
Phi-B: 0 °

BEACH SAND SP, EL. -12 TO -45

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

BAY SOUND CLAY CL, EL. -45 TO -70

Model: Spatial Mohr-Coulomb
Unit Weight: 108 pcf
Cohesion Spatial Fn: Bay Sound
Phi: 0 °
Phi-B: 0 °

MARSH 1 Protected Toe MH, EL. -6 TO -10

Model: Spatial Mohr-Coulomb
Unit Weight: 104 pcf
Cohesion: 320 psf
Phi: 0 °
Phi-B: 0 °

Fill ,EL -1 to -6 (Protected Side toe) El. -1 to -6

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

Unit Weight: [96 pcf](#)

Cohesion: [600 psf](#)

Fill 2, EL. -1 TO -4

Model: [Spatial Mohr-Coulomb](#)

Weight Fn: [fill](#)

Cohesion: [450 psf](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

Sheet Pile

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

Unit Weight: [0.1 pcf](#)

Cohesion: [0.1 psf](#)

MARSH 2 Protected Toe MH, EL. -10 to -12

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [96 pcf](#)

Cohesion: [300 psf](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

MARSH 2, MH, EL. -8 TO -12

Model: [Spatial Mohr-Coulomb](#)

Weight Fn: [Marsh 3](#)

Cohesion Fn: [Marsh 3](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

BAY SOUND CLAY CL, EL. -45 TO -70 (protected)

Model: [Spatial Mohr-Coulomb](#)

Unit Weight: [111 pcf](#)

Cohesion Fn: [Bay Sound](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

Slip Surface Entry and Exit

Left Projection: [Range](#)

Left-Zone Left Coordinate: [\(170, -4.4117\) ft](#)

Left-Zone Right Coordinate: [\(195, 2.38876\) ft](#)

Left-Zone Increment: [8](#)

Right Projection: [Range](#)

Right-Zone Left Coordinate: [\(225.00477, -0.64544\) ft](#)

Right-Zone Right Coordinate: [\(275, -3\) ft](#)

Right-Zone Increment: 10
Radius Increments: 4

Slip Surface Limits

Left Coordinate: (102.6, -9.7) ft
Right Coordinate: (310, -3) ft

Reinforcements

Reinforcement 1

Type: Pile
Outside Point: (200, 3.5) ft
Inside Point: (200, -12.2) ft
Slip Surface Intersection: (200, -14.744) ft
Total Length: 15.7 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

Reinforcement 2

Type: Pile
Outside Point: (195, 3.5) ft
Inside Point: (195, -12.2) ft
Slip Surface Intersection: (195, -12.2) ft
Total Length: 15.7 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

Cohesion Functions

Marsh 3

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: (176.6, 300)

Data Point: (200, 340)

Data Point: (228.1, 300)

Marsh 2

Model: [Spline Data Point Function](#)

Function: [Cohesion vs. X](#)

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 320

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

Data Point: (176.7, 320)

Data Point: (200, 340)

Data Point: (228.1, 320)

Bay Sound

Model: [Spline Data Point Function](#)

Function: [Cohesion vs. Y](#)

Curve Fit to Data: 100 %

Segment Curvature: 100 %

Y-Intercept: 790

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

Data Point: (-70, 950)

Data Point: (-45, 790)

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: (-100000, 0)

Data Point: (0, 0)

Data Point: (100000, 57735)

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 3

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 96
Data Points: X (ft), Unit Weight (pcf)
Data Point: (176.7, 96)
Data Point: (200, 98)
Data Point: (228, 96)

fill

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 96
Data Points: X (ft), Unit Weight (pcf)
Data Point: (176.7, 96)
Data Point: (200, 105)
Data Point: (228.1, 96)

Spatial Functions

Bay Sound

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (200, -45, 800)
Data Point: (200, -70, 1000)
Data Point: (228.1, -45, 790)
Data Point: (228.1, -70, 950)
Data Point: (176.7, -45, 790)
Data Point: (176.7, -70, 950)

Regions

	Material	Points	Area (ft ²)
Region 1	EMBANKMENT FILL CH, EL. +3.5 TO -1	4,38,5,18,39,40,6,13,19	57.67
Region 2	Fill 2, EL. -1 TO -4	3,4,19,13,14,20,55	71.37
Region 3	Fill 2, EL. -1 TO -4	13,8,27,25,14	106.55
Region 4	Fill ,EL -1 to -6 (Protected Side toe) El. -1 to -6	8,41,9,10,28,25,27	258.75
Region 5	EMBANKMENT FILL CH, EL. +3.5 TO -1	6,32,42,7,8,13	83.54
Region 6	BEACH SAND SP, EL. -12 TO -45	11,24,17,16,26,29,12,52,33,53	6337.72
Region 7	BAY SOUND CLAY CL, EL. -45 TO -70	53,33,52,59,35,58	1285
Region 8	MARSH 1, MH, EL. -4 TO -8	2,3,55,20,14,15,21,56	136.07
Region 9	BEACH SAND SP, EL. -12 TO -45	16,17,24,50,51,49,57,23	532.945
Region 10	MARSH 2, MH, EL. -8 TO -12	15,44,16,23,57,49,37,2,56,21	155.01
Region 11	MARSH 2 Protected Toe MH, EL. -10 to -12	45,46,29,26	164
Region 12	MARSH 1 Protected Toe MH, EL. -6 TO -10	25,28,46,45,54	328
Region 13	MARSH 2, MH, EL. -8 TO -12	45,26,16,44,15	84
Region 14	Sheet Pile	6,47,48,42,32	7.085
Region 15	BEACH SAND SP, EL. -12 TO -45	50,1,36,2,37,49,51	127.58
Region 16	MARSH 1, MH, EL. -4 TO -8	15,14,25,54,45	112
Region 17	BAY SOUND CLAY CL, EL. -45 TO -70 (protected)	31,11,53,58	1848.795
Region 18	BAY SOUND CLAY CL, EL. -45 TO -70 (protected)	59,52,12,30	2047.5

Points

	X (ft)	Y (ft)
Point 1	102.6	-9.7
Point 2	161.5	-8.3
Point 3	170.9	-4
Point 4	176.7	-1.6
Point 5	186.2	1.4
Point 6	200	3.5
Point 7	208	3.5
Point 8	228.1	-1.4
Point 9	310	-3
Point 10	310	-4
Point 11	102.6	-45
Point 12	310	-45
Point 13	200	-1
Point 14	200	-4
Point 15	200	-8
Point 16	200	-12
Point 17	200	-17.2
Point 18	195.1	2.4
Point 19	195	-1
Point 20	195	-4
Point 21	195	-8
Point 22	195	-15
Point 23	195	-12
Point 24	102.6	-17.2
Point 25	228	-6
Point 26	228	-12
Point 27	228	-4
Point 28	310	-6
Point 29	310	-12
Point 30	310	-70
Point 31	102.6	-69.9
Point 32	201	3.53
Point 33	200	-45

Point 34	200	-53
Point 35	200	-70
Point 36	151.3	-9.2
Point 37	160.5	-9
Point 38	183.4	-0.2
Point 39	195.9	3.3
Point 40	199	3.5
Point 41	244	-3
Point 42	201	3.7
Point 43	102.6	-12
Point 44	200	-9.9
Point 45	228	-10
Point 46	310	-10
Point 47	200	12.9
Point 48	200.5	12.9
Point 49	157.3	-11.4
Point 50	102.6	-11.9
Point 51	151.3	-11.4
Point 52	228.1	-45
Point 53	176.7	-45
Point 54	228	-8
Point 55	176.7	-4
Point 56	176.7	-8
Point 57	176.7	-12
Point 58	176.7	-70
Point 59	228.1	-70

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.87	(212.807, 23.811)	28.29793	(179.23, -1.07142)	(247.383, -3)
2	188	2.09	(212.807, 23.811)	41.818	(179.201, -1.07736)	(244.9, -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	179.5406	- 1.2840465	694.65911	468.24688	0	650
2	Optimized	180.7387	-2.103184	709.97058	613.28542	0	450
3	Optimized	182.5129	- 3.3162145	734.07207	740.35335	0	450
4	Optimized	184.74495	-4.84229	795.07781	931.70304	0	326.91
5	Optimized	186.14495	-5.802969	847.28923	1032.0901	0	328.11
6	Optimized	187.497	-6.813219	902.58215	1147.1042	0	329.27
7	Optimized	188.94685	-7.891175	962.58024	1254.7864	0	330.51
8	Optimized	190.00845	- 8.6469425	1004.3116	1330.8495	0	322.92
9	Optimized	191.8259	- 9.9408275	1077.015	1457.6996	0	326.03
10	Optimized	193.7265	- 11.293885	1152.9339	1590.8639	0	329.28
11	Optimized	194.8592	- 12.100245	1199.1019	1687.762	282.12805	-2.0038e-005
12	Optimized	195.05	- 12.236085	1210.4109	1703.6017	284.7438	-2.0222e-005
13	Optimized	195.10805	-12.27741	1216.3115	1672.112	263.15657	-1.8691e-005
14	Optimized	195.50805	-12.48517	1240.2635	1765.941	303.50009	-2.155e-005
15	Optimized	197.45	- 13.486145	1310.763	1938.3602	362.34344	-2.5726e-005
16	Optimized	199.43955	-14.51166	1368.8252	2059.2033	398.58997	-8.0668e-005
17	Optimized	199.93955	-14.74132	1379.1223	2280.9134	520.64929	- 0.00010529
18	Optimized	200.25	-14.7572	1306.4123	1618.4643	180.16336	-1.2783e-005
19	Optimized	200.75	- 14.782775	1292.3906	1880.2821	339.41932	-6.8638e-005
20	Optimized	202.13265	- 14.853495	1288.8842	1902.8401	354.46762	-7.168e-005

21	Optimized	204.20115	- 14.993555	1288.0989	1898.4051	352.36043	-2.5e-005
22	Optimized	206.07285	-15.1578	1286.2361	1911.0721	360.74924	-7.296e-005
23	Optimized	207.50435	-15.29119	1285.2579	1915.7959	364.04126	-7.3617e-005
24	Optimized	209.3152	-15.4785	1285.2845	1901.8717	355.98676	-7.1996e-005
25	Optimized	211.94555	- 15.750585	1285.2467	1865.4929	335.00527	-2.3769e-005
26	Optimized	214.5759	-16.02267	1285.2089	1828.8871	313.89277	-6.3482e-005
27	Optimized	216.532	- 16.155805	1280.8801	1830.1631	317.12866	-6.4117e-005
28	Optimized	218.1962	- 16.023705	1262.0428	1811.284	317.10455	-2.249e-005
29	Optimized	220.2428	-15.76532	1232.9083	1719.3722	280.86003	-1.9921e-005
30	Optimized	222.2894	- 15.506935	1203.7738	1627.3634	244.55954	-1.298e-006
31	Optimized	224.48455	-15.07083	1162.6745	1547.7424	222.31902	-1.1796e-006
32	Optimized	226.8782	-14.44391	1108.4442	1391.3351	163.32708	-8.6658e-007
33	Optimized	228.1086	- 14.121645	1080.5585	1375.8228	170.47093	-9.0455e-007
34	Optimized	229.14585	- 13.854465	1057.3859	1328.4284	156.48647	-8.3035e-007
35	Optimized	231.2031	-13.32462	1011.3962	1236.6373	130.04303	-6.9003e-007
36	Optimized	233.26035	- 12.794775	965.40654	1144.8463	103.59959	-5.4972e-007
37	Optimized	235.3603	- 12.253935	918.4558	1051.4717	76.796747	2.111e-006
38	Optimized	237.79585	- 10.965935	815.89318	1067.1161	0	300
39	Optimized	240.7394	-8.67124	637.72128	816.36385	0	320
40	Optimized	243.15935	- 6.6601945	481.5055	577.65378	0	320

41	Optimized	245.6917	- 4.4658795	203.96065	489.5136	0	600
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Slices of Slip Surface: 188

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	188	179.3626	- 1.2923855	696.15281	281.60035	0	650
2	188	180.55035	-2.753705	729.84766	551.49689	0	450
3	188	182.48835	-4.960683	811.46639	848.84202	0	324.97
4	188	184.53105	-6.960683	920.16073	1059.1223	0	326.72
5	188	185.93105	-8.225647	989.59943	1223.7013	0	315.95
6	188	187.4529	-9.407572	1053.8801	1384.1515	0	318.55
7	188	189.95865	- 11.181925	1150.929	1588.8053	0	322.84
8	188	192.15865	-12.53803	1228.0226	1766.5476	310.91759	-2.206e-005
9	188	194.0529	- 13.551475	1289.5095	1907.3946	356.73611	- 7.2146e-005
10	188	195.05	-14.05034	1322.5619	1978.9538	378.96807	- 7.6651e-005
11	188	195.5	- 14.255655	1340.3433	1987.0171	373.35731	- 2.6495e-005
12	188	197.45	-15.05006	1387.0089	2160.7794	446.73662	- 3.1698e-005
13	188	199.5	- 15.830445	1421.4465	2281.2917	496.43187	- 3.5227e-005
14	188	200.25	- 16.076995	1392.6582	1714.506	185.81894	- 1.3186e-005
15	188	200.75	- 16.230975	1395.7746	1968.6849	330.76991	- 6.6897e-005

16	188	202.16665	- 16.613345	1409.8061	2037.7037	362.51682	- 2.5725e-005
17	188	204.5	-17.15701	1421.9465	2114.0187	399.56806	- 8.0813e-005
18	188	206.83335	-17.56204	1431.7515	2175.7923	429.57216	- 3.0482e-005
19	188	209.1111	- 17.829125	1433.285	2197.1269	441.00434	- 3.1294e-005
20	188	211.3333	-17.96695	1427.3668	2177.1852	432.90787	- 8.7559e-005
21	188	213.55555	- 17.986255	1414.2136	2141.6121	419.96374	- 8.4943e-005
22	188	215.7778	- 17.887205	1393.673	2090.0382	402.04664	- 8.1314e-005
23	188	218	-17.66895	1365.8884	2021.7292	378.64984	- 7.6583e-005
24	188	220.2222	- 17.329585	1330.5852	1935.9805	349.5251	- 7.0692e-005
25	188	222.44445	- 16.866075	1287.5371	1831.6446	314.1406	- 6.3533e-005
26	188	224.6667	- 16.274095	1236.5795	1707.2279	271.72901	-1.928e-005
27	188	226.9389	-15.52826	1175.7182	1557.0333	220.15238	-1.169e-006
28	188	229.1505	- 14.664945	1107.9233	1478.0196	213.67521	- 1.1345e-006
29	188	231.25145	-13.70223	1034.647	1339.4499	175.97804	- 1.2487e-


							005
30	188	233.3524	- 12.592865	952.21831	1175.5577	128.94505	- 6.8467e- 007
31	188	235.9097	-11	830.27728	1054.2835	0	300
32	188	238.59605	- 9.0749975	679.92335	859.41057	0	320
33	188	240.95515	- 7.0749975	525.2448	639.34809	0	320
34	188	243.06735	- 5.0211495	300.54851	591.51881	0	600
35	188	244.45015	- 3.5211495	74.203905	461.27674	0	600

OWNER	USACE - LMVD- NEW ORLEANS	COMP'D BY	J. Higgins
PROJECT	OUTFALL CANAL STUDY - MODIFICATION NO. 11	DATE	22-Dec-10
PROJECT NO.	41752	FILE No.	03.10
TITLE	Calculation of I-Wall Stability of Reach 8 Based on Gap Condition Open Base	CKD BY	L. Almaleh
		DATE	28-Dec-10
TEMPLATE REV.			3.40

PURPOSE: Evaluate the stability of the Embankment at Reach 8 based on the presence of an open canal bottom.

Depth to Gap Determined based on GCAT Method, dated April 1 2009

REFERENCES:

	1. "Stability Analysis of I-Walls Containing Gaps Between the I-wall and Backfill Soils", Thomas Brandon, April 1, 2009.
	2. "Analysis of the Stability of I-Walls with Gaps between the I-Wall and the Levee Fill", Brandon, Wright, Duncan, Jour Geo, ASCE, May 2008
	3. B&V Calculation, "Strength Lines"
	4. USACE Drawing H-4-40295, "Typical Sections, East Side", London Avenue, Outfall Canal, Parallel Protection, Dwg 16 Rev 1
	5. B&V Calculation, Calibration of London Avenue Load Test Seepage Model"
	6. USACE "Design Procedure for Earthen Embankments" June 12, 2008
	7.
	8.
	9.
	10.
	11.
	12.
	13.
	14.
	15.
	16.
	17.
	18.
	19.
	20.
	21.
	22.
	23.
	24.
	25.

ASSUMPTIONS:

- Active Earth Pressures are not corrected for sloping backfill
- Passive Pressure are not included in gap depth analysis
- Seepage analysis assumes a 4 feet separation between new and existing sheet pile walls
-

DISCUSSION: See Page 2

RESULTS: See Slope Stability Analysis Outputs

Revision No.	List of Revisions	Description of Revision	Revision Date
0		Initial Issue	
1		Added additional underseepage check points	7/9/2010
2		Final Issue	10/25/2010

OWNER	USACE - LMVD- NEW ORLEANS		COMP'D BY	J. Higgins
PROJECT	OUTFALL CANAL STUDY - MODIFICATION NO. 11		DATE	22-Dec-10
PROJECT NO.	41752	FILE No. .03.10	CKD BY	L. Almaleh
TITLE	Calculation of I-Wall Stability of Reach 8 Based on Gap Condition Open Base		DATE	12/28/2010
			TEMPLATE REV.	3.40

Step 1: Gap Determination

The intent is to use excel spreadsheet for evaluating the gap depth between an I-wall and backfill using the GCAT method (Reference 1).

Depths are determined as the distance below the surface.

$$\begin{aligned}
 U &= \text{Hydrostatic Pressure} \quad \text{Assume water is 62.4 pounds per cubic foot} \\
 &= (\text{water elevation-flood side ground elevation}) * 62.4 \\
 \gamma_t &= \text{Effective Unit Weight} \\
 &= \text{Total Unit Weight} - 62.4 \\
 \sigma_v &= \text{Overburden Pressure} \\
 &= \text{Total Unit Weight} * \text{Depth} + (\text{water elevation-flood side ground elevation}) * 62.4 \\
 \sigma'_v &= \text{Effective Overburden Pressure} \\
 &= (\text{Effective Unit Weight} * 0.1 \text{ feet}) + \text{Effective Unit Weight of 0.1 thick layer above} \\
 \sigma_{ha} &= \text{Total Lateral Pressure on Wall} \\
 &\quad \text{For } \phi=0 \text{ layers} \\
 &= \text{Overburden Pressure} - (\text{Undrained Shear Strength} * 2) \text{ (Eq 2 Ref 1)} \\
 &\quad \text{For } \phi \neq 0 \text{ layers} \\
 &= (\text{Effective Overburden Pressure} * \tan^2(45-\phi/2)) + \text{Water Pressure} - (\text{Undrained Shear Strength} * 2 / (\tan^2(45-\phi/2))) \text{ (Eq 6 Ref 1)} \\
 \text{Gap} &= \text{If the Total Lateral Pressure on Wall greater than the hydrostatic water pressure} = \text{"No Gap"}
 \end{aligned}$$

Step 2: Seepage Analysis

The intent is to use Seep/w to evaluate the pore pressures within the embankment based on the depth of the gap from step 1.

The seep/w model is run using 1/2 the canal assuming a divide between the two sides at the center of the canal. Model geometry is based on Ref 3. Depth of the sheet piles are based on Ref 4. Permeability of soil layers and boundary conditions are based on Ref 5. Other soils properties are based on Ref 3.

Check the underseepage factor of safety based on the following formula from page 3-8 or ref 6

$$\begin{aligned}
 FS_g &= \text{Apparent underseepage factor of safety} \\
 &= \frac{\text{Average Effective Unit Weight of Soil} * \text{soil thickness}}{\text{Unit Weight Water} * \text{Excess Head @ Toe}}
 \end{aligned}$$

Adjust the water level of the canal to meet a minimum factor of safety of 1.6 per ref 6

Step 3: Determine Loads for Slope Stability Model

The intent is to determine the input loads for the slope/w model to use when evaluating stability based on the gap method. Since the gap method is completed by running a gap all the way to the bottom of the sheet pile, a load has to be replaced between the gap and the bottom of the sheet pile.

For $\phi=0$ layers

Based on Ref 1, the pore pressures within the clay below the gap are hydrostatic; therefore soil pressure on the wall is calculated based on:

$$\begin{aligned}
 \sigma'_{ha} &= \text{Effective Soil Pressure on Wall} \\
 &= \text{Total Lateral Pressure on Wall} - \text{Hydrostatic Pressure}
 \end{aligned}$$

Since the Slope/W model will use the pore pressures from the seepage model (not hydrostatic) an additional load is required to act on the wall. This load is calculated based on the difference between the hydrostatic and FEM pore water pressures.

For $\phi \neq 0$ layers

Effective stress is calculated based on the FEM pore water pressure as indicated below:

$$\begin{aligned}
 \sigma'_{ha} &= \text{Effective Soil Pressure on Wall} \\
 &= \text{Total Lateral Pressure on Wall} - \text{Pore Pressure (from FEM Model)}
 \end{aligned}$$

Soil pressures (and the additional water load for $\phi=0$ soils) are determined for each node along the wall and converted to a point load to be input into the slope/w model.

Step 4: Slope Stability of the Gap Model

The intent of the slope stability model is to check the stability of the embankment based on the gap method

Analysis is completed for both local and global failures assuming the gap is present. The local cases are analyzed by removing the soil from the flood side of the sheet pile wall. The active pressure from the removed soil is replaced by point loads determined from step 3.

Two slope stability runs are completed both using the pore pressures generated during the seepage analysis assuming the crack is present. The cases are run with block specified and entry/exit failure surfaces.

General Spreadsheet Information

All Elevations to be entered as NAVD.

Inputs are shown as
Outputs are shown as
Check points are shown as

geotech

OWNER	USACE - LMVD- NEW ORLEANS			COMP'D BY	J. Higgins
PROJECT	OUTFALL CANAL STUDY - MODIFICATION NO. 11			DATE	22-Dec-10
PROJECT NO.	41752	FILE No. .03.10		CKD BY	L. Almaleh
TITLE	Calculation of I-Wall Stability of Reach 8 Based on Gap Condition Open Base			DATE	12/28/2010
TEMPLATE REV.					3.40

Reach Number **8** Stations **66+00 to 69+06** **West**

Water Elevation **10** ft (NAVD)

Sheet Pile Tip Elevation **-17.2** ft (NAVD)

Centerline Profile

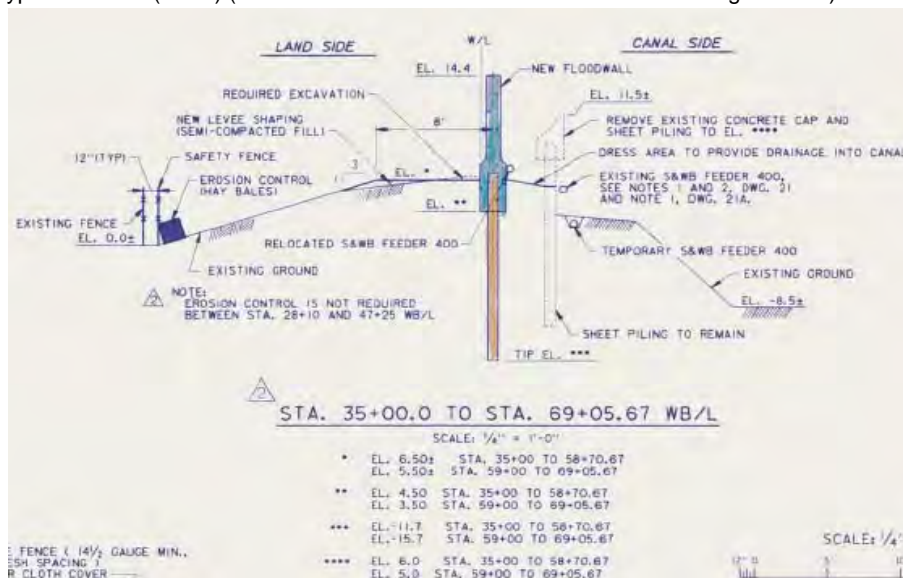
Layer Number	Soil Type	ELEVATION (NAVD)		Total Unit Weight (psf)	phi (degrees)	Undrained Shear Strength (psf)	Strength Increase w/Depth (psf/ft)
		Top	Bottom				
1	Fill	3.5	-1	106	0	900	
2	Fill2	-1	-4	101	0	500	
3	Marsh1	-4	-8	90	0	340	
4	Marsh2	-8	-10	98	0	340	
5	Sand	-10	-45	122	30	0	
6	Clay1	-45	-53	108	0	450	
7	Clay2	-53	-70	108	0	800	10.6

If Non-uniform strength functions are used, the spreadsheets will have to be modified.

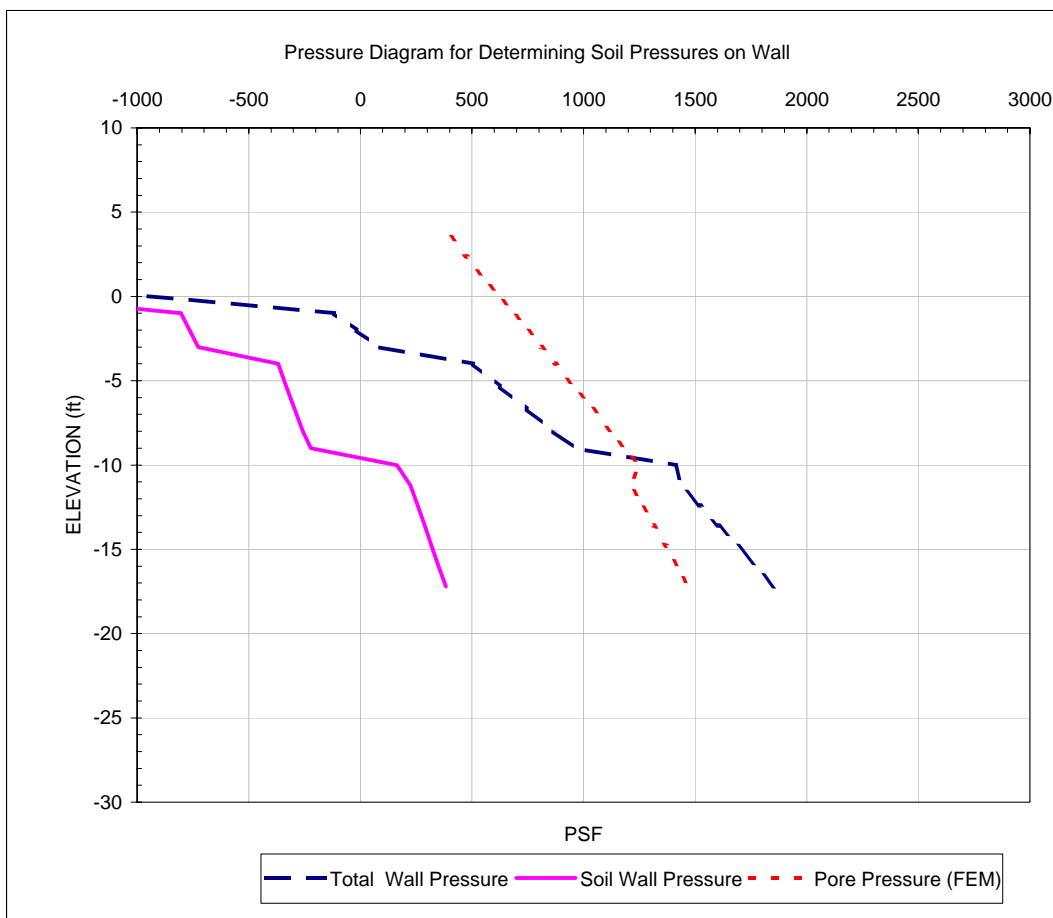
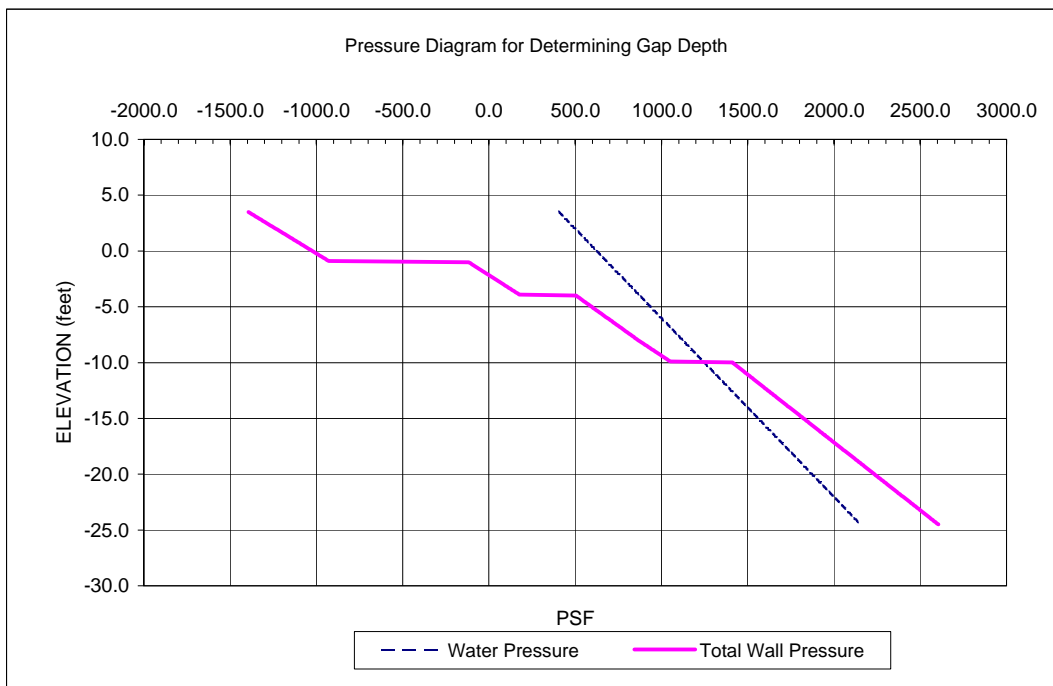
Toe Profile

Layer Number	Soil Type	ELEVATION (NAVD)		Total Unit Weight (psf)	phi (degrees)	Undrained Shear Strength (psf)	Strength Increase w/Depth (psf/ft)
		Top	Bottom				
1	Fill	-1.4	-6	106	0	600	
2	Marsh	-6	-10	101	0	320	
3	Sand	-10	-45	122	30	0	
4	Clay1	-45	-53	111	0	425	
5	Clay2	-53	-70	111	0	760	10
6							
7							

Typical Section (Ref 4) (note elevations in NGVD need to subtract 1.5' to get NAVD)



OWNER	USACE - LMVD- NEW ORLEANS	COMP'D BY	J. Higgins
PROJECT	OUTFALL CANAL STUDY - MODIFICATION NO. 11	DATE	22-Dec-10
PROJECT NO.	41752	FILE NO.	.03.10
TITLE	Calculation of I-Wall Stability of Reach 8 Based on Gap Condition Open Base	CKD BY	L. Almaleh
		DATE	12/28/2010
		TEMPLATE REV.	3.40



OWNER	USACE - LMVD- NEW ORLEANS			COMP'D BY	J. Higgins
PROJECT	OUTFALL CANAL STUDY - MODIFICATION NO. 11			DATE	12/22/2010
PROJECT NO.	41752	FILE No. .03.10		CKD BY	L. Almaleh
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TEMPLATE REV.					3.40

Water
Elevation
10

Sheet Pile
Tip
Elevation
-17.2

Layer Number	Soil Type	ELEVATION		Depth (ft)	Total Unit Weight (psf)	phi	Undrained Shear Strength (psf)	Strength Increase w/Depth (psf/ft)
		Top	Bottom					
1	Fill	3.5	-1.0	0.0	106.0	0	900	0
2	Fill2	-1.0	-4.0	4.5	101.0	0	500	0
3	Marsh1	-4.0	-8.0	7.5	90.0	0	340	0
4	Marsh2	-8.0	-10.0	11.5	98.0	0	340	0
5	Sand	-10.0	-45.0	13.5	122.0	30	0	0
6	Clay1	-45.0	-53.0	48.5	108.0	0	450	0
7	Clay2	-53.0	-70.0	56.5	108.0	0	800	10.6

GAP ELEVATION = -10.0

Flood Side Ground Elevation	Depth	Hydrostatic Water Pressure	Material Type	ϕ	Undrained Shear Strength	Total Unit Weight	γ'_t	σ_v	σ'_v	σ_{ha}	GAP?
ft	ft	psf	TYPE	phi	(psf)	psf	psf	psf	psf	psf	
3.5	0	405.6	Fill	0	900	106	43.6	405.6	0.0	-1394.4	
3.4	0.1	411.8	Fill	0	900	106	43.6	416.2	4.4	-1383.8	
3.3	0.2	418.1	Fill	0	900	106	43.6	426.8	8.7	-1373.2	
3.2	0.3	424.3	Fill	0	900	106	43.6	437.4	13.1	-1362.6	
3.1	0.4	430.6	Fill	0	900	106	43.6	448.0	17.4	-1352.0	
3.0	0.5	436.8	Fill	0	900	106	43.6	458.6	21.8	-1341.4	
2.9	0.6	443.0	Fill	0	900	106	43.6	469.2	26.2	-1330.8	
2.8	0.7	449.3	Fill	0	900	106	43.6	479.8	30.5	-1320.2	
2.7	0.8	455.5	Fill	0	900	106	43.6	490.4	34.9	-1309.6	
2.6	0.9	461.8	Fill	0	900	106	43.6	501.0	39.2	-1299.0	
2.5	1	468.0	Fill	0	900	106	43.6	511.6	43.6	-1288.4	
2.4	1.1	474.2	Fill	0	900	106	43.6	522.2	48.0	-1277.8	
2.3	1.2	480.5	Fill	0	900	106	43.6	532.8	52.3	-1267.2	
2.2	1.3	486.7	Fill	0	900	106	43.6	543.4	56.7	-1256.6	
2.1	1.4	493.0	Fill	0	900	106	43.6	554.0	61.0	-1246.0	
2.0	1.5	499.2	Fill	0	900	106	43.6	564.6	65.4	-1235.4	
1.9	1.6	505.4	Fill	0	900	106	43.6	575.2	69.8	-1224.8	
1.8	1.7	511.7	Fill	0	900	106	43.6	585.8	74.1	-1214.2	
1.7	1.8	517.9	Fill	0	900	106	43.6	596.4	78.5	-1203.6	
1.6	1.9	524.2	Fill	0	900	106	43.6	607.0	82.8	-1193.0	
1.5	2	530.4	Fill	0	900	106	43.6	617.6	87.2	-1182.4	
1.4	2.1	536.6	Fill	0	900	106	43.6	628.2	91.6	-1171.8	
1.3	2.2	542.9	Fill	0	900	106	43.6	638.8	95.9	-1161.2	
1.2	2.3	549.1	Fill	0	900	106	43.6	649.4	100.3	-1150.6	
1.1	2.4	555.4	Fill	0	900	106	43.6	660.0	104.6	-1140.0	
1.0	2.5	561.6	Fill	0	900	106	43.6	670.6	109.0	-1129.4	
0.9	2.6	567.8	Fill	0	900	106	43.6	681.2	113.4	-1118.8	
0.8	2.7	574.1	Fill	0	900	106	43.6	691.8	117.7	-1108.2	
0.7	2.8	580.3	Fill	0	900	106	43.6	702.4	122.1	-1097.6	
0.6	2.9	586.6	Fill	0	900	106	43.6	713.0	126.4	-1087.0	
0.5	3	592.8	Fill	0	900	106	43.6	723.6	130.8	-1076.4	
0.4	3.1	599.0	Fill	0	900	106	43.6	734.2	135.2	-1065.8	
0.3	3.2	605.3	Fill	0	900	106	43.6	744.8	139.5	-1055.2	
0.2	3.3	611.5	Fill	0	900	106	43.6	755.4	143.9	-1044.6	
0.1	3.4	617.8	Fill	0	900	106	43.6	766.0	148.2	-1034.0	
0.0	3.5	624.0	Fill	0	900	106	43.6	776.6	152.6	-1023.4	
-0.1	3.6	630.2	Fill	0	900	106	43.6	787.2	157.0	-1012.8	
-0.2	3.7	636.5	Fill	0	900	106	43.6	797.8	161.3	-1002.2	
-0.3	3.8	642.7	Fill	0	900	106	43.6	808.4	165.7	-991.6	
-0.4	3.9	649.0	Fill	0	900	106	43.6	819.0	170.0	-981.0	
-0.5	4	655.2	Fill	0	900	106	43.6	829.6	174.4	-970.4	
-0.6	4.1	661.4	Fill	0	900	106	43.6	840.2	178.8	-959.8	
-0.7	4.2	667.7	Fill	0	900	106	43.6	850.8	183.1	-949.2	
-0.8	4.3	673.9	Fill	0	900	106	43.6	861.4	187.5	-938.6	
-0.9	4.4	680.2	Fill	0	900	106	43.6	872.0	191.8	-928.0	
-1.0	4.5	686.4	Fill2	0	500	101	38.6	882.6	196.2	-117.4	
-1.1	4.6	692.6	Fill2	0	500	101	38.6	892.7	200.1	-107.3	
-1.2	4.7	698.9	Fill2	0	500	101	38.6	902.8	203.9	-97.2	
-1.3	4.8	705.1	Fill2	0	500	101	38.6	912.9	207.8	-87.1	

Flood Side Ground Elevation	Depth	Hydrostatic Water Pressure	Material Type	ϕ	Undrained Shear Strength	Total Unit Weight	γ'_t	σ_v	σ'_v	σ_{ha}	GAP?
ft	ft	psf	TYPE	phi	(psf)	psf	psf	psf	psf	psf	
-1.4	4.9	711.4	Fill2	0	500	101	38.6	923.0	211.6	-77.0	
-1.5	5	717.6	Fill2	0	500	101	38.6	933.1	215.5	-66.9	
-1.6	5.1	723.8	Fill2	0	500	101	38.6	943.2	219.4	-56.8	
-1.7	5.2	730.1	Fill2	0	500	101	38.6	953.3	223.2	-46.7	
-1.8	5.3	736.3	Fill2	0	500	101	38.6	963.4	227.1	-36.6	
-1.9	5.4	742.6	Fill2	0	500	101	38.6	973.5	230.9	-26.5	
-2.0	5.5	748.8	Fill2	0	500	101	38.6	983.6	234.8	-16.4	
-2.1	5.6	755.0	Fill2	0	500	101	38.6	993.7	238.7	-6.3	
-2.2	5.7	761.3	Fill2	0	500	101	38.6	1003.8	242.5	3.8	
-2.3	5.8	767.5	Fill2	0	500	101	38.6	1013.9	246.4	13.9	
-2.4	5.9	773.8	Fill2	0	500	101	38.6	1024.0	250.2	24.0	
-2.5	6	780.0	Fill2	0	500	101	38.6	1034.1	254.1	34.1	
-2.6	6.1	786.2	Fill2	0	500	101	38.6	1044.2	258.0	44.2	
-2.7	6.2	792.5	Fill2	0	500	101	38.6	1054.3	261.8	54.3	
-2.8	6.3	798.7	Fill2	0	500	101	38.6	1064.4	265.7	64.4	
-2.9	6.4	805.0	Fill2	0	500	101	38.6	1074.5	269.5	74.5	
-3.0	6.5	811.2	Fill2	0	500	101	38.6	1084.6	273.4	84.6	
-3.1	6.6	817.4	Fill2	0	500	101	38.6	1094.7	277.3	94.7	
-3.2	6.7	823.7	Fill2	0	500	101	38.6	1104.8	281.1	104.8	
-3.3	6.8	829.9	Fill2	0	500	101	38.6	1114.9	285.0	114.9	
-3.4	6.9	836.2	Fill2	0	500	101	38.6	1125.0	288.8	125.0	
-3.5	7	842.4	Fill2	0	500	101	38.6	1135.1	292.7	135.1	
-3.6	7.1	848.6	Fill2	0	500	101	38.6	1145.2	296.6	145.2	
-3.7	7.2	854.9	Fill2	0	500	101	38.6	1155.3	300.4	155.3	
-3.8	7.3	861.1	Fill2	0	500	101	38.6	1165.4	304.3	165.4	
-3.9	7.4	867.4	Fill2	0	500	101	38.6	1175.5	308.1	175.5	
-4.0	7.5	873.6	Marsh1	0	340	90	27.6	1185.6	312.0	505.6	
-4.1	7.6	879.8	Marsh1	0	340	90	27.6	1194.6	314.8	514.6	
-4.2	7.7	886.1	Marsh1	0	340	90	27.6	1203.6	317.5	523.6	
-4.3	7.8	892.3	Marsh1	0	340	90	27.6	1212.6	320.3	532.6	
-4.4	7.9	898.6	Marsh1	0	340	90	27.6	1221.6	323.0	541.6	
-4.5	8	904.8	Marsh1	0	340	90	27.6	1230.6	325.8	550.6	
-4.6	8.1	911.0	Marsh1	0	340	90	27.6	1239.6	328.6	559.6	
-4.7	8.2	917.3	Marsh1	0	340	90	27.6	1248.6	331.3	568.6	
-4.8	8.3	923.5	Marsh1	0	340	90	27.6	1257.6	334.1	577.6	
-4.9	8.4	929.8	Marsh1	0	340	90	27.6	1266.6	336.8	586.6	
-5.0	8.5	936.0	Marsh1	0	340	90	27.6	1275.6	339.6	595.6	
-5.1	8.6	942.2	Marsh1	0	340	90	27.6	1284.6	342.4	604.6	
-5.2	8.7	948.5	Marsh1	0	340	90	27.6	1293.6	345.1	613.6	
-5.3	8.8	954.7	Marsh1	0	340	90	27.6	1302.6	347.9	622.6	
-5.4	8.9	961.0	Marsh1	0	340	90	27.6	1311.6	350.6	631.6	
-5.5	9	967.2	Marsh1	0	340	90	27.6	1320.6	353.4	640.6	
-5.6	9.1	973.4	Marsh1	0	340	90	27.6	1329.6	356.2	649.6	
-5.7	9.2	979.7	Marsh1	0	340	90	27.6	1338.6	358.9	658.6	
-5.8	9.3	985.9	Marsh1	0	340	90	27.6	1347.6	361.7	667.6	
-5.9	9.4	992.2	Marsh1	0	340	90	27.6	1356.6	364.4	676.6	
-6.0	9.5	998.4	Marsh1	0	340	90	27.6	1365.6	367.2	685.6	
-6.1	9.6	1004.6	Marsh1	0	340	90	27.6	1374.6	370.0	694.6	
-6.2	9.7	1010.9	Marsh1	0	340	90	27.6	1383.6	372.7	703.6	
-6.3	9.8	1017.1	Marsh1	0	340	90	27.6	1392.6	375.5	712.6	
-6.4	9.9	1023.4	Marsh1	0	340	90	27.6	1401.6	378.2	721.6	
-6.5	10	1029.6	Marsh1	0	340	90	27.6	1410.6	381.0	730.6	
-6.6	10.1	1035.8	Marsh1	0	340	90	27.6	1419.6	383.8	739.6	
-6.7	10.2	1042.1	Marsh1	0	340	90	27.6	1428.6	386.5	748.6	
-6.8	10.3	1048.3	Marsh1	0	340	90	27.6	1437.6	389.3	757.6	
-6.9	10.4	1054.6	Marsh1	0	340	90	27.6	1446.6	392.0	766.6	
-7.0	10.5	1060.8	Marsh1	0	340	90	27.6	1455.6	394.8	775.6	
-7.1	10.6	1067.0	Marsh1	0	340	90	27.6	1464.6	397.6	784.6	
-7.2	10.7	1073.3	Marsh1	0	340	90	27.6	1473.6	400.3	793.6	
-7.3	10.8	1079.5	Marsh1	0	340	90	27.6	1482.6	403.1	802.6	
-7.4	10.9	1085.8	Marsh1	0	340	90	27.6	1491.6	405.8	811.6	
-7.5	11	1092.0	Marsh1	0	340	90	27.6	1500.6	408.6	820.6	
-7.6	11.1	1098.2	Marsh1	0	340	90	27.6	1509.6	411.4	829.6	
-7.7	11.2	1104.5	Marsh1	0	340	90	27.6	1518.6	414.1	838.6	
-7.8	11.3	1110.7	Marsh1	0	340	90	27.6	1527.6	416.9	847.6	
-7.9	11.4	1117.0	Marsh1	0	340	90	27.6	1536.6	419.6	856.6	
-8.0	11.5	1123.2	Marsh2	0	340	98	27.6	1545.6	422.4	865.6	
-8.1	11.6	1129.4	Marsh2	0	340	98	35.6	1555.4	425.2	875.4	
-8.2	11.7	1135.7	Marsh2	0	340	98	35.6	1565.2	428.7	885.2	
-8.3	11.8	1141.9	Marsh2	0	340	98	35.6	1575.0	432.3	895.0	
-8.4	11.9	1148.2	Marsh2	0	340	98	35.6	1584.8	435.8	904.8	
-8.5	12	1154.4	Marsh2	0	340	98	35.6	1594.6	439.4	914.6	
-8.6	12.1	1160.6	Marsh2	0	340	98	35.6	1604.4	443.0	924.4	
-8.7	12.2	1166.9	Marsh2	0	340	98	35.6	1614.2	446.5	934.2	
-8.8	12.3	1173.1	Marsh2	0	340	98	35.6	1624.0	450.1	944.0	
-8.9	12.4	1179.4	Marsh2	0	340	98	35.6	1633.8	453.6	953.8	

Flood Side Ground Elevation	Depth	Hydrostatic Water Pressure	Material Type	ϕ	Undrained Shear Strength	Total Unit Weight	γ'_t	σ_v	σ'_v	σ_{ha}	GAP?
ft	ft	psf	TYPE	phi	(psf)	psf	psf	psf	psf	psf	
-9.0	12.5	1185.6	Marsh2	0	340	98	35.6	1643.6	457.2	963.6	
-9.1	12.6	1191.8	Marsh2	0	340	98	35.6	1653.4	460.8	973.4	
-9.2	12.7	1198.1	Marsh2	0	340	98	35.6	1663.2	464.3	983.2	
-9.3	12.8	1204.3	Marsh2	0	340	98	35.6	1673.0	467.9	993.0	
-9.4	12.9	1210.6	Marsh2	0	340	98	35.6	1682.8	471.4	1002.8	
-9.5	13	1216.8	Marsh2	0	340	98	35.6	1692.6	475.0	1012.6	
-9.6	13.1	1223.0	Marsh2	0	340	98	35.6	1702.4	478.6	1022.4	
-9.7	13.2	1229.3	Marsh2	0	340	98	35.6	1712.2	482.1	1032.2	
-9.8	13.3	1235.5	Marsh2	0	340	98	35.6	1722.0	485.7	1042.0	
-9.9	13.4	1241.8	Marsh2	0	340	98	35.6	1731.8	489.2	1051.8	
-10.0	13.5	1248.0	Sand	30	0	122	35.6	1741.6	492.8	1412.3	NO GAP
-10.1	13.6	1254.2	Sand	30	0	122	59.6	1753.8	496.4	1419.7	NO GAP
-10.2	13.7	1260.5	Sand	30	0	122	59.6	1766.0	502.3	1427.9	NO GAP
-10.3	13.8	1266.7	Sand	30	0	122	59.6	1778.2	508.3	1436.1	NO GAP
-10.4	13.9	1273.0	Sand	30	0	122	59.6	1790.4	514.2	1444.4	NO GAP
-10.5	14	1279.2	Sand	30	0	122	59.6	1802.6	520.2	1452.6	NO GAP
-10.6	14.1	1285.4	Sand	30	0	122	59.6	1814.8	526.2	1460.8	NO GAP
-10.7	14.2	1291.7	Sand	30	0	122	59.6	1827.0	532.1	1469.1	NO GAP
-10.8	14.3	1297.9	Sand	30	0	122	59.6	1839.2	538.1	1477.3	NO GAP
-10.9	14.4	1304.2	Sand	30	0	122	59.6	1851.4	544.0	1485.5	NO GAP
-11.0	14.5	1310.4	Sand	30	0	122	59.6	1863.6	550.0	1493.7	NO GAP
-11.1	14.6	1316.6	Sand	30	0	122	59.6	1875.8	556.0	1502.0	NO GAP
-11.2	14.7	1322.9	Sand	30	0	122	59.6	1888.0	561.9	1510.2	NO GAP
-11.3	14.8	1329.1	Sand	30	0	122	59.6	1900.2	567.9	1518.4	NO GAP
-11.4	14.9	1335.4	Sand	30	0	122	59.6	1912.4	573.8	1526.6	NO GAP
-11.5	15	1341.6	Sand	30	0	122	59.6	1924.6	579.8	1534.9	NO GAP
-11.6	15.1	1347.8	Sand	30	0	122	59.6	1936.8	585.8	1543.1	NO GAP
-11.7	15.2	1354.1	Sand	30	0	122	59.6	1949.0	591.7	1551.3	NO GAP
-11.8	15.3	1360.3	Sand	30	0	122	59.6	1961.2	597.7	1559.5	NO GAP
-11.9	15.4	1366.6	Sand	30	0	122	59.6	1973.4	603.6	1567.8	NO GAP
-12.0	15.5	1372.8	Sand	30	0	122	59.6	1985.6	609.6	1576.0	NO GAP
-12.1	15.6	1379.0	Sand	30	0	122	59.6	1997.8	615.6	1584.2	NO GAP
-12.2	15.7	1385.3	Sand	30	0	122	59.6	2010.0	621.5	1592.5	NO GAP
-12.3	15.8	1391.5	Sand	30	0	122	59.6	2022.2	627.5	1600.7	NO GAP
-12.4	15.9	1397.8	Sand	30	0	122	59.6	2034.4	633.4	1608.9	NO GAP
-12.5	16	1404.0	Sand	30	0	122	59.6	2046.6	639.4	1617.1	NO GAP
-12.6	16.1	1410.2	Sand	30	0	122	59.6	2058.8	645.4	1625.4	NO GAP
-12.7	16.2	1416.5	Sand	30	0	122	59.6	2071.0	651.3	1633.6	NO GAP
-12.8	16.3	1422.7	Sand	30	0	122	59.6	2083.2	657.3	1641.8	NO GAP
-12.9	16.4	1429.0	Sand	30	0	122	59.6	2095.4	663.2	1650.0	NO GAP
-13.0	16.5	1435.2	Sand	30	0	122	59.6	2107.6	669.2	1658.3	NO GAP
-13.1	16.6	1441.4	Sand	30	0	122	59.6	2119.8	675.2	1666.5	NO GAP
-13.2	16.7	1447.7	Sand	30	0	122	59.6	2132.0	681.1	1674.7	NO GAP
-13.3	16.8	1453.9	Sand	30	0	122	59.6	2144.2	687.1	1682.9	NO GAP
-13.4	16.9	1460.2	Sand	30	0	122	59.6	2156.4	693.0	1691.2	NO GAP
-13.5	17	1466.4	Sand	30	0	122	59.6	2168.6	699.0	1699.4	NO GAP
-13.6	17.1	1472.6	Sand	30	0	122	59.6	2180.8	705.0	1707.6	NO GAP
-13.7	17.2	1478.9	Sand	30	0	122	59.6	2193.0	710.9	1715.9	NO GAP
-13.8	17.3	1485.1	Sand	30	0	122	59.6	2205.2	716.9	1724.1	NO GAP
-13.9	17.4	1491.4	Sand	30	0	122	59.6	2217.4	722.8	1732.3	NO GAP
-14.0	17.5	1497.6	Sand	30	0	122	59.6	2229.6	728.8	1740.5	NO GAP
-14.1	17.6	1503.8	Sand	30	0	122	59.6	2241.8	734.8	1748.8	NO GAP
-14.2	17.7	1510.1	Sand	30	0	122	59.6	2254.0	740.7	1757.0	NO GAP
-14.3	17.8	1516.3	Sand	30	0	122	59.6	2266.2	746.7	1765.2	NO GAP
-14.4	17.9	1522.6	Sand	30	0	122	59.6	2278.4	752.6	1773.4	NO GAP
-14.5	18	1528.8	Sand	30	0	122	59.6	2290.6	758.6	1781.7	NO GAP
-14.6	18.1	1535.0	Sand	30	0	122	59.6	2302.8	764.6	1789.9	NO GAP
-14.7	18.2	1541.3	Sand	30	0	122	59.6	2315.0	770.5	1798.1	NO GAP
-14.8	18.3	1547.5	Sand	30	0	122	59.6	2327.2	776.5	1806.3	NO GAP
-14.9	18.4	1553.8	Sand	30	0	122	59.6	2339.4	782.4	1814.6	NO GAP
-15.0	18.5	1560.0	Sand	30	0	122	59.6	2351.6	788.4	1822.8	NO GAP
-15.1	18.6	1566.2	Sand	30	0	122	59.6	2363.8	794.4	1831.0	NO GAP
-15.2	18.7	1572.5	Sand	30	0	122	59.6	2376.0	800.3	1839.3	NO GAP
-15.3	18.8	1578.7	Sand	30	0	122	59.6	2388.2	806.3	1847.5	NO GAP
-15.4	18.9	1585.0	Sand	30	0	122	59.6	2400.4	812.2	1855.7	NO GAP
-15.5	19	1591.2	Sand	30	0	122	59.6	2412.6	818.2	1863.9	NO GAP
-15.6	19.1	1597.4	Sand	30	0	122	59.6	2424.8	824.2	1872.2	NO GAP
-15.7	19.2	1603.7	Sand	30	0	122	59.6	2437.0	830.1	1880.4	NO GAP
-15.8	19.3	1609.9	Sand	30	0	122	59.6	2449.2	836.1	1888.6	NO GAP
-15.9	19.4	1616.2	Sand	30	0	122	59.6	2461.4	842.0	1896.8	NO GAP
-16.0	19.5	1622.4	Sand	30	0	122	59.6	2473.6	848.0	1905.1	NO GAP
-16.1	19.6	1628.6	Sand	30	0	122	59.6	2485.8	854.0	1913.3	NO GAP
-16.2	19.7	1634.9	Sand	30	0	122	59.6	2498.0	859.9	1921.5	NO GAP
-16.3	19.8	1641.1	Sand	30	0	122	59.6	2510.2	865.9	1929.7	NO GAP
-16.4	19.9	1647.4	Sand	30	0	122	59.6	2522.4	871.8	1938.0	NO GAP
-16.5	20	1653.6	Sand	30	0	122	59.6	2534.6	877.8	1946.2	NO GAP

Flood Side Ground Elevation	Depth	Hydrostatic Water Pressure	Material Type	ϕ	Undrained Shear Strength	Total Unit Weight	γ'_t	σ_v	σ'_v	σ_{ha}	GAP?
ft	ft	psf	TYPE	phi	(psf)	psf	psf	psf	psf	psf	
-16.6	20.1	1659.8	Sand	30	0	122	59.6	2546.8	883.8	1954.4	NO GAP
-16.7	20.2	1666.1	Sand	30	0	122	59.6	2559.0	889.7	1962.7	NO GAP
-16.8	20.3	1672.3	Sand	30	0	122	59.6	2571.2	895.7	1970.9	NO GAP
-16.9	20.4	1678.6	Sand	30	0	122	59.6	2583.4	901.6	1979.1	NO GAP
-17.0	20.5	1684.8	Sand	30	0	122	59.6	2595.6	907.6	1987.3	NO GAP
-17.1	20.6	1691.0	Sand	30	0	122	59.6	2607.8	913.6	1995.6	NO GAP
-17.2	20.7	1697.3	Sand	30	0	122	59.6	2620.0	919.5	2003.8	NO GAP
-17.3	20.8	1703.5	Sand	30	0	122	59.6	2632.2	925.5	2012.0	NO GAP
-17.4	20.9	1709.8	Sand	30	0	122	59.6	2644.4	931.4	2020.2	NO GAP
-17.5	21	1716.0	Sand	30	0	122	59.6	2656.6	937.4	2028.5	NO GAP
-17.6	21.1	1722.2	Sand	30	0	122	59.6	2668.8	943.4	2036.7	NO GAP
-17.7	21.2	1728.5	Sand	30	0	122	59.6	2681.0	949.3	2044.9	NO GAP
-17.8	21.3	1734.7	Sand	30	0	122	59.6	2693.2	955.3	2053.1	NO GAP
-17.9	21.4	1741.0	Sand	30	0	122	59.6	2705.4	961.2	2061.4	NO GAP
-18.0	21.5	1747.2	Sand	30	0	122	59.6	2717.6	967.2	2069.6	NO GAP
-18.1	21.6	1753.4	Sand	30	0	122	59.6	2729.8	973.2	2077.8	NO GAP
-18.2	21.7	1759.7	Sand	30	0	122	59.6	2742.0	979.1	2086.1	NO GAP
-18.3	21.8	1765.9	Sand	30	0	122	59.6	2754.2	985.1	2094.3	NO GAP
-18.4	21.9	1772.2	Sand	30	0	122	59.6	2766.4	991.0	2102.5	NO GAP
-18.5	22	1778.4	Sand	30	0	122	59.6	2778.6	997.0	2110.7	NO GAP
-18.6	22.1	1784.6	Sand	30	0	122	59.6	2790.8	1003.0	2119.0	NO GAP
-18.7	22.2	1790.9	Sand	30	0	122	59.6	2803.0	1008.9	2127.2	NO GAP
-18.8	22.3	1797.1	Sand	30	0	122	59.6	2815.2	1014.9	2135.4	NO GAP
-18.9	22.4	1803.4	Sand	30	0	122	59.6	2827.4	1020.8	2143.6	NO GAP
-19.0	22.5	1809.6	Sand	30	0	122	59.6	2839.6	1026.8	2151.9	NO GAP
-19.1	22.6	1815.8	Sand	30	0	122	59.6	2851.8	1032.8	2160.1	NO GAP
-19.2	22.7	1822.1	Sand	30	0	122	59.6	2864.0	1038.7	2168.3	NO GAP
-19.3	22.8	1828.3	Sand	30	0	122	59.6	2876.2	1044.7	2176.5	NO GAP
-19.4	22.9	1834.6	Sand	30	0	122	59.6	2888.4	1050.6	2184.8	NO GAP
-19.5	23	1840.8	Sand	30	0	122	59.6	2900.6	1056.6	2193.0	NO GAP
-19.6	23.1	1847.0	Sand	30	0	122	59.6	2912.8	1062.6	2201.2	NO GAP
-19.7	23.2	1853.3	Sand	30	0	122	59.6	2925.0	1068.5	2209.5	NO GAP
-19.8	23.3	1859.5	Sand	30	0	122	59.6	2937.2	1074.5	2217.7	NO GAP
-19.9	23.4	1865.8	Sand	30	0	122	59.6	2949.4	1080.4	2225.9	NO GAP
-20.0	23.5	1872.0	Sand	30	0	122	59.6	2961.6	1086.4	2234.1	NO GAP
-20.1	23.6	1878.2	Sand	30	0	122	59.6	2973.8	1092.4	2242.4	NO GAP
-20.2	23.7	1884.5	Sand	30	0	122	59.6	2986.0	1098.3	2250.6	NO GAP
-20.3	23.8	1890.7	Sand	30	0	122	59.6	2998.2	1104.3	2258.8	NO GAP
-20.4	23.9	1897.0	Sand	30	0	122	59.6	3010.4	1110.2	2267.0	NO GAP
-20.5	24	1903.2	Sand	30	0	122	59.6	3022.6	1116.2	2275.3	NO GAP
-20.6	24.1	1909.4	Sand	30	0	122	59.6	3034.8	1122.2	2283.5	NO GAP
-20.7	24.2	1915.7	Sand	30	0	122	59.6	3047.0	1128.1	2291.7	NO GAP
-20.8	24.3	1921.9	Sand	30	0	122	59.6	3059.2	1134.1	2299.9	NO GAP
-20.9	24.4	1928.2	Sand	30	0	122	59.6	3071.4	1140.0	2308.2	NO GAP
-21.0	24.5	1934.4	Sand	30	0	122	59.6	3083.6	1146.0	2316.4	NO GAP
-21.1	24.6	1940.6	Sand	30	0	122	59.6	3095.8	1152.0	2324.6	NO GAP
-21.2	24.7	1946.9	Sand	30	0	122	59.6	3108.0	1157.9	2332.9	NO GAP
-21.3	24.8	1953.1	Sand	30	0	122	59.6	3120.2	1163.9	2341.1	NO GAP
-21.4	24.9	1959.4	Sand	30	0	122	59.6	3132.4	1169.8	2349.3	NO GAP
-21.5	25	1965.6	Sand	30	0	122	59.6	3144.6	1175.8	2357.5	NO GAP
-21.6	25.1	1971.8	Sand	30	0	122	59.6	3156.8	1181.8	2365.8	NO GAP
-21.7	25.2	1978.1	Sand	30	0	122	59.6	3169.0	1187.7	2374.0	NO GAP
-21.8	25.3	1984.3	Sand	30	0	122	59.6	3181.2	1193.7	2382.2	NO GAP
-21.9	25.4	1990.6	Sand	30	0	122	59.6	3193.4	1199.6	2390.4	NO GAP
-22.0	25.5	1996.8	Sand	30	0	122	59.6	3205.6	1205.6	2398.7	NO GAP
-22.1	25.6	2003.0	Sand	30	0	122	59.6	3217.8	1211.6	2406.9	NO GAP
-22.2	25.7	2009.3	Sand	30	0	122	59.6	3230.0	1217.5	2415.1	NO GAP
-22.3	25.8	2015.5	Sand	30	0	122	59.6	3242.2	1223.5	2423.3	NO GAP
-22.4	25.9	2021.8	Sand	30	0	122	59.6	3254.4	1229.4	2431.6	NO GAP
-22.5	26	2028.0	Sand	30	0	122	59.6	3266.6	1235.4	2439.8	NO GAP
-22.6	26.1	2034.2	Sand	30	0	122	59.6	3278.8	1241.4	2448.0	NO GAP
-22.7	26.2	2040.5	Sand	30	0	122	59.6	3291.0	1247.3	2456.3	NO GAP
-22.8	26.3	2046.7	Sand	30	0	122	59.6	3303.2	1253.3	2464.5	NO GAP
-22.9	26.4	2053.0	Sand	30	0	122	59.6	3315.4	1259.2	2472.7	NO GAP
-23.0	26.5	2059.2	Sand	30	0	122	59.6	3327.6	1265.2	2480.9	NO GAP
-23.1	26.6	2065.4	Sand	30	0	122	59.6	3339.8	1271.2	2489.2	NO GAP
-23.2	26.7	2071.7	Sand	30	0	122	59.6	3352.0	1277.1	2497.4	NO GAP
-23.3	26.8	2077.9	Sand	30	0	122	59.6	3364.2	1283.1	2505.6	NO GAP
-23.4	26.9	2084.2	Sand	30	0	122	59.6	3376.4	1289.0	2513.8	NO GAP
-23.5	27	2090.4	Sand	30	0	122	59.6	3388.6	1295.0	2522.1	NO GAP
-23.6	27.1	2096.6	Sand	30	0	122	59.6	3400.8	1301.0	2530.3	NO GAP
-23.7	27.2	2102.9	Sand	30	0	122	59.6	3413.0	1306.9	2538.5	NO GAP
-23.8	27.3	2109.1	Sand	30	0	122	59.6	3425.2	1312.9	2546.7	NO GAP
-23.9	27.4	2115.4	Sand	30	0	122	59.6	3437.4	1318.8	2555.0	NO GAP
-24.0	27.5	2121.6	Sand	30	0	122	59.6	3449.6	1324.8	2563.2	NO GAP
-24.1	27.6	2127.8	Sand	30	0	122	59.6	3461.8	1330.8	2571.4	NO GAP

Flood Side Ground Elevation	Depth	Hydrostatic Water Pressure	Material Type	ϕ	Undrained Shear Strength	Total Unit Weight	γ'_t	σ_v	σ'_v	σ_{ha}	GAP?
ft	ft	psf	TYPE	phi	(psf)	psf	psf	psf	psf	psf	
-24.2	27.7	2134.1	Sand	30	0	122	59.6	3474.0	1336.7	2579.7	NO GAP
-24.3	27.8	2140.3	Sand	30	0	122	59.6	3486.2	1342.7	2587.9	NO GAP
-24.4	27.9	2146.6	Sand	30	0	122	59.6	3498.4	1348.6	2596.1	NO GAP
-24.5	28	2152.8	Sand	30	0	122	59.6	3510.6	1354.6	2604.3	NO GAP

OWNER	USACE - LMVD- NEW ORLEANS			COMP'D BY	J. Higgins
PROJECT	OUTFALL CANAL STUDY - MODIFICATION NO. 11			DATE	22-Dec-10
PROJECT NO.	41752	FILE No.	.03.10	CKD BY	L. Almaleh
TITLE	Calculation of I-Wall Stability of Reach 8 Based on Gap Condition Open Base			DATE	12/28/2010
TEMPLATE REV.					3.40

	@Low Toe	@Toe	@Midslope	@Sheetpile
Total Head @ Toe, bottom of blanket	-0.16302484	0.95368272 ft	1.6321878	6
Elevation of Toe Ground Surface	-3	-1.4 ft	1.05	3.7
Excess Head (Total Head - Toe Elevation)	2.83697516	2.35368272 ft	0.5821878	2.3
Average Total Unit Weight of Soil Blanket	103	98 pcf	98	99
Blanket Thickness	7	8.6 ft	11.1	13.7
Hw=6' FS _g	1.61	2.08	10.83	3.49

OWNER	USACE - LMVD- NEW ORLEANS			COMP'D BY	J. Higgins
PROJECT	OUTFALL CANAL STUDY - MODIFICATION NO. 11			DATE	22-Dec-10
PROJECT NO.	41752	FILE No. .03.10		CKD BY	L. Almaleh
TITLE	Calculation of I-Wall Stability of Reach 8 Based on Gap Condition Open Base			DATE	12/28/2010
TEMPLATE REV.					3.40

	@Low Toe	@Toe	@Midslope	@Sheetpile
Total Head @ Toe, bottom of blanket	1.5946478	3.1173975 ft	4.0426738	10
Elevation of Toe Ground Surface	-3	-1.4 ft	1.05	3.7
Excess Head (Total Head - Toe Elevation)	4.5946478	4.5173975 ft	2.9926738	6.3
Average Total Unit Weight of Soil Blanket	103	98 pcf	98	99
Blanket Thickness	7	8.6 ft	11.1	13.7
Hw=10' FS _g	0.99	1.09	2.11	1.28

COMP'D BY	J. Higgins
DATE	22-Dec-10
CKD BY	L. Almaleh
DATE	12/28/2010

TEMPLATE REV. 3.40

Forces on Last Slice from Slope/W Model	
Water Force Against Soil	22012.9 lbs
Total Point Loads on Soil	2056.3 lbs

Addtl Load to account for water above embankment 1318.2 lbs

[illegible]

Gap Analysis (Seepage) OPEN

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File Information

Created By: [Liljegren, James](#)
Revision Number: [299](#)
Last Edited By: [Higgins, James](#)
Date: [12/22/2010](#)
Time: [10:38:24 AM](#)
File Name: [Reach 8 OPEN.gsz](#)
Directory: [\\Kaci-fs-05\fsd-z\Projects\041752 - New Orleans Canals\Mod 11\Slope-W\](#)
Last Solved Date: [12/22/2010](#)
Last Solved Time: [10:40:16 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

Gap Analysis (Seepage) OPEN

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, EL. +3.5 TO -1.0

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 SP, EL. -12 TO -48/-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. -48 TO -53

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 °

Sheetpile

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 1, EL. -4 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 °

Boundary Conditions

Drainage

Review: true
 Type: Total Flux (Q) 0

Canal Water

Type: Head (H) 10

Curb

Type: Head (H) -5

Regions

	Material	Points	Area (ft²)
Region 1	FILL, EL. +3.5 TO-1.0	26,14,31,4,10,52,34,30	52.9145
Region 2	FILL, EL. +3.5 TO-1.0	6,44,7,8,19,37	258.42
Region 3	BEACH SAND SP, EL. -12 TO -48/-53	46,47,48,36,49,32,13,22,45	619.89152
Region 4	BEACH SAND SP, EL. -12 TO -48/-53	22,13,32,33,27,23,57,53,55,9	6541.735
Region 5	BAY SOUND CLAY, EL. -48 TO -53	54,58,28,59,41,56	821.95
Region 6	FILL, EL. +3.5 TO-1.0	4,40,24,5,6,10	83.525
Region 7	MARSH 1,EL. -4 TO -8	18,37,19,27,33	327.6
Region 8	MARSH 1,EL. -4 TO -8	32,12,18,33	56.2
Region 9	MARSH 1,EL. -4 TO -8	32,12,50,35,36,49	40.6
Region 10	FILL, EL. +3.5 TO-1.0	38,34,29,3,39	36.2
Region 11	FILL, EL. +3.5 TO-1.0	10,11,37,6	106.78
Region 12	MARSH 1,EL. -4 TO -8	11,12,18,37	84.3
Region	FILL, EL. +3.5 TO-1.0	10,52,34,38,51,11	81.199992

13			
Region 14	MARSH 1,EL. -4 TO -8	11,12,50,35,38,51	60.900009
Region 15	MARSH 1,EL. -4 TO -8	39,38,35,36,48	61.04348
Region 16	Sheetpile	4,42,43,24,40	8.96
Region 17	BEACH SAND SP, EL. -12 TO - 48/-53	1,2,25,39,48,47,46,45	141.31
Region 18	BAY SOUND CLAY, EL. -48 TO - 53	9,55,56,16	615.6
Region 19	BAY SOUND CLAY, EL. -48 TO - 53	55,53,57,58,54,56	387.2
Region 20	BAY SOUND CLAY, EL. -48 TO - 53	57,23,17,58	655.2
Region 21	BAY SOUND CLAY, EL. -48 TO - 53	16,56,41,21	1307.3
Region 22	BAY SOUND CLAY, EL. -48 TO - 53	58,17,20,28	1393.15

Lines

	Start Point	End Point	Left Side Material	Hydraulic Boundary	Right Side Material
Line 1	4	10	Sheetpile	Canal Water	
Line 2	6	10			
Line 3	8	19		Curb	
Line 4	13	22			
Line 5	9	22			
Line 6	24	5		Drainage	
Line 7	5	6		Drainage	
Line 8	27	23		Curb	
Line 9	14	31		Canal Water	
Line 10	31	4		Canal Water	
Line 11	13	32			Sheetpile
Line	32	33			

12					
Line 13	33	27			
Line 14	19	27		Curb	
Line 15	33	18			
Line 16	32	12		Canal Water	Sheetpile
Line 17	12	18			
Line 18	34	30		Canal Water	
Line 19	35	36			
Line 20	34	29		Canal Water	
Line 21	29	3		Canal Water	
Line 22	10	11	Sheetpile	Canal Water	
Line 23	11	37			
Line 24	37	6			
Line 25	11	12	Sheetpile	Canal Water	
Line 26	18	37			
Line 27	34	38			
Line 28	35	38			
Line 29	3	39		Canal Water	
Line 30	24	40			
Line	40	4			

31					
Line 32	4	42		Canal Water	
Line 33	42	43			
Line 34	43	24		Drainage	
Line 35	6	44		Drainage	FILL, EL. +3.5 TO- 1.0
Line 36	44	7		Drainage	FILL, EL. +3.5 TO- 1.0
Line 37	8	7		Curb	
Line 38	39	38			
Line 39	19	37			
Line 40	22	45			
Line 41	46	47			
Line 42	45	46			
Line 43	1	2		Canal Water	
Line 44	2	25		Canal Water	
Line 45	25	39		Canal Water	
Line 46	45	1			
Line 47	39	48			
Line 48	48	47			
Line 49	36	48			
Line	36	49			

50					
Line 51	49	32			
Line 52	15	49			Sheetpile
Line 53	35	50			
Line 54	50	12			
Line 55	49	50			Sheetpile
Line 56	38	51			
Line 57	51	11			
Line 58	50	51			Sheetpile
Line 59	34	52			
Line 60	52	10			
Line 61	51	52			Sheetpile
Line 62	52	14			Sheetpile
Line 63	26	30		Canal Water	
Line 64	14	26		Canal Water	
Line 65	9	55			
Line 66	55	53			
Line 67	54	56			
Line 68	56	16			
Line	53	57			

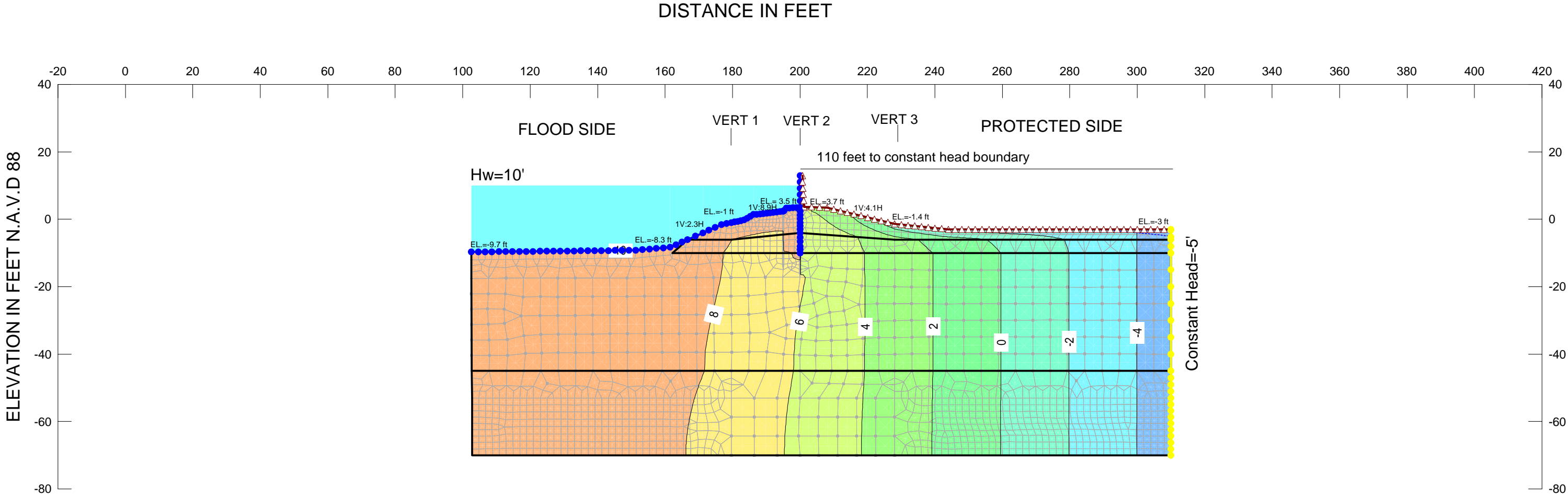
69					
Line 70	57	23			
Line 71	17	58			
Line 72	58	54			
Line 73	55	56			
Line 74	16	9			
Line 75	57	58			
Line 76	23	17		Curb	
Line 77	28	59			
Line 78	59	41			
Line 79	41	56			
Line 80	58	28			
Line 81	41	21			
Line 82	21	16			
Line 83	17	20		Curb	
Line 84	20	28			

Points

	X (ft)	Y (ft)
Point 1	102.6	-9.7
Point 2	151.3	-9.2
Point 3	171.2	-4

Point 4	200	3.5
Point 5	208	3.5
Point 6	228.1	-1.4
Point 7	310	-3
Point 8	310	-5.2
Point 9	102.7	-45
Point 10	200	-1
Point 11	200	-4
Point 12	200	-8
Point 13	200	-17.2
Point 14	195.1	2.4
Point 15	195	-15
Point 16	102.8	-53
Point 17	310	-53
Point 18	228.1	-8
Point 19	310	-6
Point 20	310	-70
Point 21	102.8	-70
Point 22	102.6	-17.5
Point 23	310	-45
Point 24	201.2	3.7
Point 25	161.5	-8.3
Point 26	186.2	1.4
Point 27	310	-10
Point 28	228	-70
Point 29	176.7	-1.6
Point 30	183.4	-0.2
Point 31	195.9	3.31
Point 32	200	-10
Point 33	228.1	-10
Point 34	179.7	-1
Point 35	179.7	-8
Point 36	179.7	-10
Point 37	228.1	-6
Point 38	179.7	-6
Point 39	166.7	-6

Point 40	201	3.5
Point 41	179.7	-70
Point 42	200	12.9
Point 43	200.7	12.9
Point 44	244	-3
Point 45	102.6	-12
Point 46	151.1	-11.5
Point 47	161.5	-10.6
Point 48	162.17826	-10
Point 49	195	-10
Point 50	195	-8
Point 51	195	-4.49261
Point 52	195	-1
Point 53	200	-45
Point 54	200	-53
Point 55	179.7	-45
Point 56	179.7	-53
Point 57	228.1	-45
Point 58	228.1	-53
Point 59	200	-70



Name: FILL, EL. +3.5 TO -1.0 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: BEACH SAND SP, EL. -12 TO -48/-53 Model: Saturated Only K-Sat: 0.00049 ft/sec Volumetric Water Content: 0 ft³/ft³ Mv: 0 /psf K-Ratio: 1 K-Direction: 0 °
Name: BAY SOUND CLAY, EL. -48 TO -53 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: Sheetpile Model: Saturated Only K-Sat: 1e-010 ft/sec Volumetric Water Content: 0 ft³/ft³ Mv: 0 /psf K-Ratio: 1 K-Direction: 0 °
Name: MARSH 1, EL. -4 TO -8 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 °



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
VERTICALSWERE ASSUMED TO VARY LINEARLY
BETWEENTHE VALUES INDICATED FOR THESE LOCATIONS.

Hw = CANAL WATER LEVEL

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

LONDON AVE OUTFALL CANAL, REACH 8,
PROTECTED SIDE STABILITY ANALYSIS,
CASE: Gap Analysis (Seepage) OPEN
STA. 66+00 TO 69+06
ORLEANS PARISH, LOUISIANA

Seepage Analysis (Gap) OPEN

Report generated using GeoStudio 2007, version 7.16. Copyright © 1991-2010 GEO-SLOPE International Ltd.

File Information

Created By: [Liljegren, James](#)
Revision Number: [304](#)
Last Edited By: [Higgins, James](#)
Date: [12/22/2010](#)
Time: [10:57:24 AM](#)
File Name: [Reach 8 OPEN.gsz](#)
Directory: [\\Kaci-fs-05\fsd-z\Projects\041752 - New Orleans Canals\Mod 11\Slope-W\](#)
Last Solved Date: [12/22/2010](#)
Last Solved Time: [10:57:36 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

Seepage Analysis (Gap) OPEN

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, EL. +3.5 TO -1.0

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 SP, EL. -12 TO -48/-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. -48 TO -53

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 °

Sheetpile

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 1, EL. -4 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 °

Boundary Conditions

Drainage

Review: true
 Type: Total Flux (Q) 0

Curb

Type: Head (H) -5

Canal Water (seepage)

Type: Head (H) 6

Regions

	Material	Points	Area (ft²)
Region 1	FILL, EL. +3.5 TO-1.0	26,14,31,4,10,52,34,30	52.9145
Region 2	FILL, EL. +3.5 TO-1.0	6,44,7,8,19,37	258.42
Region 3	BEACH SAND SP, EL. -12 TO -48/-53	46,47,48,36,49,32,13,22,45	619.89152
Region 4	BEACH SAND SP, EL. -12 TO -48/-53	22,13,32,33,27,23,57,53,55,9	6541.735
Region 5	BAY SOUND CLAY, EL. -48 TO -53	54,58,28,59,41,56	821.95
Region 6	FILL, EL. +3.5 TO-1.0	4,40,24,5,6,10	83.525
Region 7	MARSH 1,EL. -4 TO -8	18,37,19,27,33	327.6
Region 8	MARSH 1,EL. -4 TO -8	32,12,18,33	56.2
Region 9	MARSH 1,EL. -4 TO -8	32,12,50,35,36,49	40.6
Region 10	FILL, EL. +3.5 TO-1.0	38,34,29,3,39	36.2
Region 11	FILL, EL. +3.5 TO-1.0	10,11,37,6	106.78
Region 12	MARSH 1,EL. -4 TO -8	11,12,18,37	84.3
Region	FILL, EL. +3.5 TO-1.0	10,52,34,38,51,11	81.199992

13			
Region 14	MARSH 1,EL. -4 TO -8	11,12,50,35,38,51	60.900009
Region 15	MARSH 1,EL. -4 TO -8	39,38,35,36,48	61.04348
Region 16	Sheetpile	4,42,43,24,40	8.96
Region 17	BEACH SAND SP, EL. -12 TO -48/-53	1,2,25,39,48,47,46,45	141.31
Region 18	BAY SOUND CLAY, EL. -48 TO -53	9,55,56,16	615.6
Region 19	BAY SOUND CLAY, EL. -48 TO -53	55,53,57,58,54,56	387.2
Region 20	BAY SOUND CLAY, EL. -48 TO -53	57,23,17,58	655.2
Region 21	BAY SOUND CLAY, EL. -48 TO -53	16,56,41,21	1307.3
Region 22	BAY SOUND CLAY, EL. -48 TO -53	58,17,20,28	1393.15

Lines

	Start Point	End Point	Left Side Material	Hydraulic Boundary	Right Side Material
Line 1	4	10	Sheetpile	Canal Water (seepage)	
Line 2	6	10			
Line 3	8	19		Curb	
Line 4	13	22			
Line 5	9	22			
Line 6	24	5		Drainage	
Line 7	5	6		Drainage	
Line 8	27	23		Curb	
Line 9	14	31		Canal Water (seepage)	
Line 10	31	4		Canal Water (seepage)	
Line	13	32			Sheetpile

11					
Line 12	32	33			
Line 13	33	27			
Line 14	19	27		Curb	
Line 15	33	18			
Line 16	32	12		Canal Water (seepage)	Sheetpile
Line 17	12	18			
Line 18	34	30		Canal Water (seepage)	
Line 19	35	36			
Line 20	34	29		Canal Water (seepage)	
Line 21	29	3		Canal Water (seepage)	
Line 22	10	11	Sheetpile	Canal Water (seepage)	
Line 23	11	37			
Line 24	37	6			
Line 25	11	12	Sheetpile	Canal Water (seepage)	
Line 26	18	37			
Line 27	34	38			
Line 28	35	38			
Line 29	3	39		Canal Water (seepage)	
Line	24	40			

30					
Line 31	40	4			
Line 32	4	42		Canal Water (seepage)	
Line 33	42	43			
Line 34	43	24		Drainage	
Line 35	6	44		Drainage	FILL, EL. +3.5 TO- 1.0
Line 36	44	7		Drainage	FILL, EL. +3.5 TO- 1.0
Line 37	8	7		Curb	
Line 38	39	38			
Line 39	19	37			
Line 40	22	45			
Line 41	46	47			
Line 42	45	46			
Line 43	1	2		Canal Water (seepage)	
Line 44	2	25		Canal Water (seepage)	
Line 45	25	39		Canal Water (seepage)	
Line 46	45	1			
Line 47	39	48			
Line 48	48	47			
Line	36	48			

49					
Line 50	36	49			
Line 51	49	32			
Line 52	15	49			Sheetpile
Line 53	35	50			
Line 54	50	12			
Line 55	49	50			Sheetpile
Line 56	38	51			
Line 57	51	11			
Line 58	50	51			Sheetpile
Line 59	34	52			
Line 60	52	10			
Line 61	51	52			Sheetpile
Line 62	52	14			Sheetpile
Line 63	26	30		Canal Water (seepage)	
Line 64	14	26		Canal Water (seepage)	
Line 65	9	55			
Line 66	55	53			
Line 67	54	56			
Line	56	16			

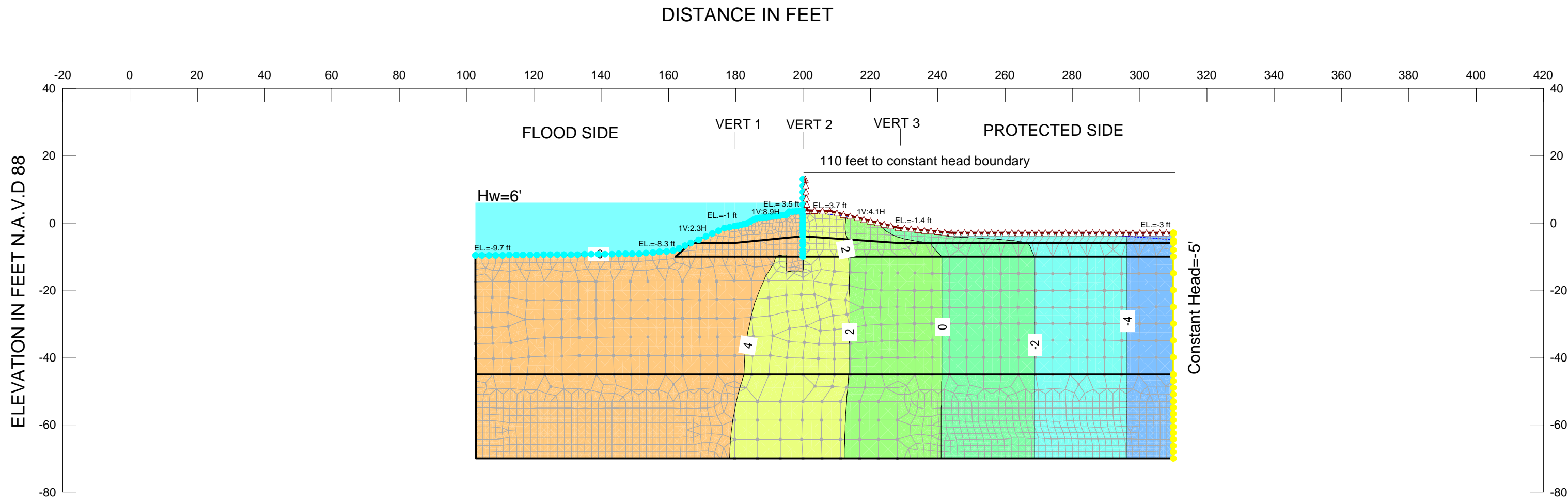
68					
Line 69	53	57			
Line 70	57	23			
Line 71	17	58			
Line 72	58	54			
Line 73	55	56			
Line 74	16	9			
Line 75	57	58			
Line 76	23	17		Curb	
Line 77	28	59			
Line 78	59	41			
Line 79	41	56			
Line 80	58	28			
Line 81	41	21			
Line 82	21	16			
Line 83	17	20		Curb	
Line 84	20	28			

Points

	X (ft)	Y (ft)
Point 1	102.6	-9.7

Point 2	151.3	-9.2
Point 3	171.2	-4
Point 4	200	3.5
Point 5	208	3.5
Point 6	228.1	-1.4
Point 7	310	-3
Point 8	310	-5.2
Point 9	102.7	-45
Point 10	200	-1
Point 11	200	-4
Point 12	200	-8
Point 13	200	-17.2
Point 14	195.1	2.4
Point 15	195	-15
Point 16	102.8	-53
Point 17	310	-53
Point 18	228.1	-8
Point 19	310	-6
Point 20	310	-70
Point 21	102.8	-70
Point 22	102.6	-17.5
Point 23	310	-45
Point 24	201.2	3.7
Point 25	161.5	-8.3
Point 26	186.2	1.4
Point 27	310	-10
Point 28	228	-70
Point 29	176.7	-1.6
Point 30	183.4	-0.2
Point 31	195.9	3.31
Point 32	200	-10
Point 33	228.1	-10
Point 34	179.7	-1
Point 35	179.7	-8
Point 36	179.7	-10
Point 37	228.1	-6

Point 38	179.7	-6
Point 39	166.7	-6
Point 40	201	3.5
Point 41	179.7	-70
Point 42	200	12.9
Point 43	200.7	12.9
Point 44	244	-3
Point 45	102.6	-12
Point 46	151.1	-11.5
Point 47	161.5	-10.6
Point 48	162.17826	-10
Point 49	195	-10
Point 50	195	-8
Point 51	195	-4.49261
Point 52	195	-1
Point 53	200	-45
Point 54	200	-53
Point 55	179.7	-45
Point 56	179.7	-53
Point 57	228.1	-45
Point 58	228.1	-53
Point 59	200	-70



Name: FILL, EL. +3.5 TO-1.0 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: BEACH SAND SP, EL. -12 TO -48/-53 Model: Saturated Only K-Sat: 0.00049 ft/sec Volumetric Water Content: 0 ft³/ft³ Mv: 0 /psf K-Ratio: 1 K-Direction: 0 °
Name: BAY SOUND CLAY, EL. -48 TO -53 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: Sheetpile Model: Saturated Only K-Sat: 1e-010 ft/sec Volumetric Water Content: 0 ft³/ft³ Mv: 0 /psf K-Ratio: 1 K-Direction: 0 °
Name: MARSH 1,EL. -4 TO -8 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 °



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
VERTICALSWERE ASSUMED TO VARY LINEARLY
BETWEENTHE VALUES INDICATED FOR THESE LOCATIONS.

Hw = CANAL WATER LEVEL

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

LONDON AVE OUTFALL CANAL, REACH 8,
PROTECTED SIDE STABILITY ANALYSIS,
CASE: Seepage Analysis (Gap) OPEN
STA. 66+00 TO 69+06
ORLEANS PARISH, LOUISIANA

GAP Stability (Block) OPEN

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File Information

Created By: [Liljegren, James](#)
Revision Number: [301](#)
Last Edited By: [Higgins, James](#)
Date: [12/22/2010](#)
Time: [10:49:30 AM](#)
File Name: [Reach 8 OPEN.gsz](#)
Directory: [\\Kaci-fs-05\fsd-z\Projects\041752 - New Orleans Canals\Mod 11\Slope-W\](#)
Last Solved Date: [12/22/2010](#)
Last Solved Time: [10:50:22 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

GAP Stability (Block) OPEN

Kind: [SLOPE/W](#)
Parent: [Gap Analysis \(Seepage\) OPEN](#)
Method: [Spencer](#)
Settings
 PWP Conditions Source: [Parent Analysis](#)
Slip Surface
 Direction of movement: [Left to Right](#)
 Use Passive Mode: [Yes](#)
 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: 4000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 8
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

FILL, EL. +3.5 TO -1.0

Model: Undrained (Phi=0)
Unit Weight: 106 pcf
Cohesion: 900 psf

Fill 2. -1 TO -4 (Flood Side)

Model: Spatial Mohr-Coulomb
Unit Weight: 101 pcf
Cohesion: 500 psf
Phi: 0 °
Phi-B: 0 °

BEACH SAND SP, EL. -12 TO -48/-53

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

BAY SOUND CLAY, EL. -48 TO -53

Model: Spatial Mohr-Coulomb
Unit Weight: 108 pcf
Cohesion: 450 psf
Phi: 0 °
Phi-B: 0 °

Fill (Protected)

Model: Undrained (Phi=0)
Unit Weight: 106 pcf
Cohesion: 600 psf

Sheetpile

Model: Mohr-Coulomb

Unit Weight: 0.1 pcf
Cohesion: 0.01 psf
Phi: 0 °
Phi-B: 0 °

MARSH 1, EL. -4 TO -8

Model: Spatial Mohr-Coulomb
Unit Weight: 90 pcf
Cohesion Fn: Marsh
Phi: 0 °
Phi-B: 0 °

BAY SOUND CLAY 2, EL. -53 TO -70

Model: Spatial Mohr-Coulomb
Unit Weight: 111 pcf
Cohesion Spatial Fn: Bay Sound 2
Phi: 0 °
Phi-B: 0 °

Marsh 2, EL. -8 to -10 (Flood)

Model: Spatial Mohr-Coulomb
Unit Weight: 98 pcf
Cohesion Fn: Marsh
Phi: 0 °
Phi-B: 0 °

Marsh (Protected)

Model: Spatial Mohr-Coulomb
Unit Weight: 101 pcf
Cohesion: 320 psf
Phi: 0 °
Phi-B: 0 °

BAY SOUND CLAY, EL. -48 TO -53 (protected side toe)

Model: Undrained (Phi=0)
Unit Weight: 111 pcf
Cohesion: 425 psf

Slip Surface Limits

Left Coordinate: (102.6, -17.5) ft
Right Coordinate: (310, -3) ft

Slip Surface Block

Left Grid
Upper Left: (200, -17.2) ft

Lower Left: (200, -17.2) ft
Lower Right: (200, -17.2) ft
X Increments: 0
Y Increments: 0
Starting Angle: 135 °
Ending Angle: 135 °
Angle Increments: 1

Right Grid

Upper Left: (210, -3) ft
Lower Left: (210, -50) ft
Lower Right: (265, -50) ft
X Increments: 11
Y Increments: 12
Starting Angle: 25 °
Ending Angle: 45 °
Angle Increments: 4

Reinforcements

Reinforcement 1

Type: Pile
Outside Point: (200, 3) ft
Inside Point: (200, -17.2) ft
Slip Surface Intersection: (200, -17.2) ft
Total Length: 20.2 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

Reinforcement 2

Type: Pile
Outside Point: (195, 3) ft
Inside Point: (195, -15) ft
Slip Surface Intersection: (0, 0) ft
Total Length: 18 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

Point Loads

	Coordinate (ft)	Magnitude (lbs)	Direction (°)
Point Load 1	(200, -14)	2056.3	180

Cohesion Functions

Marsh

Model: Spline Data Point Function
Function: Cohesion vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 320
Data Points: X (ft), Cohesion (psf)
Data Point: (179.9, 320)
Data Point: (200, 340)
Data Point: (228.1, 320)

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: (-100000, 0)
Data Point: (0, 0)
Data Point: (100000, 57735)
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 2

Model: Linear Interpolation

Limit Range By: Data Values

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

Data Point: (179.7, -53, 760)

Data Point: (179.7, -70, 930)

Data Point: (200, -53, 800)

Data Point: (200, -70, 980)

Data Point: (228.1, -53, 760)

Data Point: (228.1, -70, 930)

Regions

	Points	Area (ft ²)	Material
Region 1	26,14,31,4,10,52,34,30	52.9145	
Region 2	6,44,7,8,19,37	258.42	Fill (Protected)
Region 3	46,47,48,36,49,32,13,22,45	619.89152	
Region 4	22,13,32,33,27,23,57,53,55,9	6541.735	BEACH SAND SP, EL. -12 TO -48/-53
Region 5	54,58,28,59,41,56	821.95	BAY SOUND CLAY 2, EL. -53 TO -70
Region 6	4,40,24,5,6,10	83.525	FILL, EL. +3.5 TO-1.0
Region 7	18,37,19,27,33	327.6	Marsh (Protected)
Region 8	32,12,18,33	56.2	Marsh 2, EL. -8 to -10 (Flood)
Region 9	32,12,50,35,36,49	40.6	
Region 10	38,34,29,3,39	36.2	
Region 11	10,11,37,6	106.78	Fill 2. -1 TO -4 (Flood Side)
Region 12	11,12,18,37	84.3	MARSH 1,EL. -4 TO -8

Region 13	10,52,34,38,51,11	81.199992	
Region 14	11,12,50,35,38,51	60.900009	
Region 15	39,38,35,36,48	61.04348	
Region 16	4,42,43,24,40	8.96	Sheetpile
Region 17	1,2,25,39,48,47,46,45	141.31	
Region 18	9,55,56,16	615.6	BAY SOUND CLAY, EL. -48 TO - 53 (protected side toe)
Region 19	55,53,57,58,54,56	387.2	BAY SOUND CLAY, EL. -48 TO - 53
Region 20	57,23,17,58	655.2	BAY SOUND CLAY, EL. -48 TO - 53 (protected side toe)
Region 21	16,56,41,21	1307.3	BAY SOUND CLAY, EL. -48 TO - 53 (protected side toe)
Region 22	58,17,20,28	1393.15	BAY SOUND CLAY, EL. -48 TO - 53 (protected side toe)

Points

	X (ft)	Y (ft)
Point 1	102.6	-9.7
Point 2	151.3	-9.2
Point 3	171.2	-4
Point 4	200	3.5
Point 5	208	3.5
Point 6	228.1	-1.4
Point 7	310	-3
Point 8	310	-5.2
Point 9	102.7	-45
Point 10	200	-1
Point 11	200	-4
Point 12	200	-8
Point 13	200	-17.2

Point 14	195.1	2.4
Point 15	195	-15
Point 16	102.8	-53
Point 17	310	-53
Point 18	228.1	-8
Point 19	310	-6
Point 20	310	-70
Point 21	102.8	-70
Point 22	102.6	-17.5
Point 23	310	-45
Point 24	201.2	3.7
Point 25	161.5	-8.3
Point 26	186.2	1.4
Point 27	310	-10
Point 28	228	-70
Point 29	176.7	-1.6
Point 30	183.4	-0.2
Point 31	195.9	3.31
Point 32	200	-10
Point 33	228.1	-10
Point 34	179.7	-1
Point 35	179.7	-8
Point 36	179.7	-10
Point 37	228.1	-6
Point 38	179.7	-6
Point 39	166.7	-6
Point 40	201	3.5
Point 41	179.7	-70
Point 42	200	12.9
Point 43	200.7	12.9
Point 44	244	-3
Point 45	102.6	-12
Point 46	151.1	-11.5
Point 47	161.5	-10.6
Point 48	162.17826	-10
Point 49	195	-10

Point 50	195	-8
Point 51	195	-4.49261
Point 52	195	-1
Point 53	200	-45
Point 54	200	-53
Point 55	179.7	-45
Point 56	179.7	-53
Point 57	228.1	-45
Point 58	228.1	-53
Point 59	200	-70

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.79	(225.402, 0.55)	24.79134	(200, 12.9)	(254.116, -3)
2	338	1.82	(225.402, 0.55)	25.346	(200, 12.9)	(256.187, -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	200.35	-17.15021	1459.7312	-2815.2261	0	0
2	Optimized	200.85	-17.07908	1447.4914	2330.3351	509.71004	-0.00010305
3	Optimized	201.1	-17.04351	1441.5345	2337.7104	517.40743	-0.00010461
4	Optimized	202.05	-16.908355	1419.6462	2331.057	526.20331	-0.00010639
5	Optimized	203.75	-16.6665	1386.8587	2296.8719	525.39635	-0.00010623
6	Optimized	205.45	-16.42464	1360.1278	2262.0461	520.72272	-0.00010529
7	Optimized	207.15	-16.182785	1333.8047	2227.2203	515.81373	-0.00010429
8	Optimized	209.14435	-	1303.5225	2156.9504	492.7268	-3.4951e-005

			15.899055			3	
9	Optimized	211.1422	- 15.629965	1274.2993	2055.7378	451.1637 2	-9.1219e-005
10	Optimized	212.84915	- 15.417395	1250.5806	1981.4424	421.9632 7	-8.5318e-005
11	Optimized	214.5561	- 15.204825	1226.8619	1907.1471	392.7628 2	-7.9413e-005
12	Optimized	216.2631	- 14.992255	1203.0851	1832.8517	363.5959 3	-7.3517e-005
13	Optimized	217.9701	- 14.779685	1179.3082	1758.5563	334.4290 5	-6.7617e-005
14	Optimized	219.6531	-14.56619	1155.6699	1686.9959	306.7612 1	-6.2026e-005
15	Optimized	221.3121	-14.35177	1132.0567	1613.6457	278.0454 9	-1.9724e-005
16	Optimized	222.9711	-14.13735	1108.4436	1540.2954	249.3297 7	-1.7686e-005
17	Optimized	224.87545	- 13.814215	1076.4968	1473.3193	229.1055 8	-1.2161e-006
18	Optimized	227.02515	- 13.382365	1036.2718	1354.7879	183.8953 4	-9.7617e-007
19	Optimized	228.8107	-13.02367	1002.8439	1327.5145	187.4486 7	-9.9491e-007
20	Optimized	230.4263	-12.71427	973.50586	1261.9983	166.5612 1	-8.8398e-007
21	Optimized	232.2361	- 12.381005	941.49944	1196.79	147.3920 8	-7.822e-007
22	Optimized	234.04595	-12.04774	909.54737	1131.5817	128.1915 8	-6.8042e-007
23	Optimized	235.8558	- 11.714475	877.54095	1066.3734	109.0224 5	-5.7865e-007
24	Optimized	237.6656	-11.38121	845.53453	1001.1651	89.85332 3	2.471e-006
25	Optimized	239.4754	- 11.047945	813.52812	935.95674	70.68419 6	1.9437e-006
26	Optimized	241.28525	-10.71468	781.5217	870.74842	51.51506 9	3.4182e-006
27	Optimized	243.0951	-	749.56963	805.5401	32.31456	-1.2082e-006

			10.381415			8	
28	Optimized	244.61065	- 10.102335	722.74613	758.5561	20.67489 5	-7.7259e-007
29	Optimized	246.54875	-9.052195	637.99278	866.41868	0	320
30	Optimized	249.166	-7.05725	483.07977	676.87531	0	320
31	Optimized	251.3708	-5.25	298.54058	636.22501	0	600
32	Optimized	253.20075	-3.75	97.348259	455.84715	0	600

Slices of Slip Surface: 338

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	338	200.35	-17.15048	1459.7483	-2664.6064	0	0
2	338	200.85	-17.07974	1447.5505	2325.639	506.9646	-0.0001025
3	338	201.1	-17.04437	1441.6427	2333.0155	514.63434	-0.00010405
4	338	202.05	-16.90996	1419.7434	2326.4198	523.46989	-0.00010584
5	338	203.75	- 16.669445	1387.0688	2292.4056	522.69647	-0.00010569
6	338	205.45	-16.42893	1360.3933	2257.809	518.12322	-0.00010476
7	338	207.15	-16.18841	1334.1254	2223.2124	513.31457	-0.00010379
8	338	208.91365	- 15.938885	1307.4176	2163.9474	494.51769	-9.9982e-005
9	338	210.7409	-15.68036	1279.9449	2080.0121	461.91901	-3.2767e-005
10	338	212.56815	- 15.421835	1252.5806	1996.1311	429.28904	-3.0452e-005
11	338	214.39545	-15.16331	1225.2705	1912.1958	396.5965	-8.0191e-005
12	338	216.22275	- 14.904785	1197.852	1828.3147	363.99781	-2.5819e-005
13	338	218.05	-14.64626	1170.4877	1744.3795	331.33655	-2.3503e-005
14	338	219.87725	- 14.387735	1143.1234	1660.4984	298.70658	-2.1188e-005
15	338	221.70455	-14.12921	1115.7049	1576.5632	266.07661	1.6049e-005
16	338	223.53185	- 13.870685	1088.3406	1492.6821	233.44664	-1.2392e-006
17	338	225.3591	-13.61216	1060.868	1408.7468	200.84795	-1.0661e-006
18	338	227.18635	- 13.353635	1033.4495	1324.8658	168.24927	-1.1934e-005

19	338	229.09375	- 13.083775	1004.8359	1310.5212	176.4875	-9.3681e-007
20	338	231.08125	-12.80258	974.99468	1251.1875	159.46002	-8.465e-007
21	338	233.06875	- 12.521385	945.1535	1191.9037	142.46131	-7.5619e-007
22	338	235.05625	-12.24019	915.2625	1132.5701	125.46259	3.4504e-006
23	338	237.04375	- 11.958995	885.42131	1073.2364	108.43512	-5.7559e-007
24	338	239.03125	-11.6778	855.58013	1013.9526	91.436402	2.5146e-006
25	338	241.01875	- 11.396605	825.73894	954.61898	74.408925	-3.9499e-007
26	338	243.00625	-11.11541	795.89776	895.33516	57.410211	8.3227e-007
27	338	244.5	-10.90407	773.46704	856.72785	48.070649	6.9699e-007
28	338	245.59505	- 10.416665	736.26582	907.58167	98.909251	2.7168e-006
29	338	247.1422	- 9.3333335	654.00612	889.70298	0	320
30	338	249.0464	-8	549.55786	740.3437	0	320
31	338	250.9506	- 6.6666665	445.75488	591.02743	0	320
32	338	252.9738	-5.25	292.03455	571.5116	0	600
33	338	255.11605	-3.75	94.682181	395.19419	0	600

GAP Stability (Entry/Exit) OPEN

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File Information

Created By: [Liljegren, James](#)
Revision Number: [301](#)
Last Edited By: [Higgins, James](#)
Date: [12/22/2010](#)
Time: [10:49:30 AM](#)
File Name: [Reach 8 OPEN.gsz](#)
Directory: [\\Kaci-fs-05\fsd-z\Projects\041752 - New Orleans Canals\Mod 11\Slope-W\](#)
Last Solved Date: [12/22/2010](#)
Last Solved Time: [10:50:36 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

GAP Stability (Entry/Exit) OPEN

Kind: [SLOPE/W](#)
Parent: [Gap Analysis \(Seepage\) OPEN](#)
Method: [Spencer](#)
Settings
 PWP Conditions Source: [Parent Analysis](#)
Slip Surface
 Direction of movement: [Left to Right](#)
 Use Passive Mode: [Yes](#)
 Slip Surface Option: [Entry and Exit](#)
 Critical slip surfaces saved: [1](#)
 Optimize Critical Slip Surface Location: [Yes](#)
 Tension Crack
 Tension Crack Option: [\(none\)](#)
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: 10
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

FILL, EL. +3.5 TO -1.0

Model: Undrained (Phi=0)
Unit Weight: 106 pcf
Cohesion: 900 psf

Fill 2. -1 TO -4 (Flood Side)

Model: Spatial Mohr-Coulomb
Unit Weight: 101 pcf
Cohesion: 500 psf
Phi: 0 °
Phi-B: 0 °

BEACH SAND SP, EL. -12 TO -48/-53

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

BAY SOUND CLAY, EL. -48 TO -53

Model: Spatial Mohr-Coulomb
Unit Weight: 108 pcf
Cohesion: 450 psf
Phi: 0 °
Phi-B: 0 °

Fill (Protected)

Model: Undrained (Phi=0)
Unit Weight: 106 pcf
Cohesion: 600 psf

Sheetpile

Model: Mohr-Coulomb
Unit Weight: 0.1 pcf

Cohesion: 0.01 psf
Phi: 0 °
Phi-B: 0 °

MARSH 1, EL. -4 TO -8

Model: Spatial Mohr-Coulomb
Unit Weight: 90 pcf
Cohesion Fn: Marsh
Phi: 0 °
Phi-B: 0 °

BAY SOUND CLAY 2, EL. -53 TO -70

Model: Spatial Mohr-Coulomb
Unit Weight: 111 pcf
Cohesion Spatial Fn: Bay Sound 2
Phi: 0 °
Phi-B: 0 °

Marsh 2, EL. -8 to -10 (Flood)

Model: Spatial Mohr-Coulomb
Unit Weight: 98 pcf
Cohesion Fn: Marsh
Phi: 0 °
Phi-B: 0 °

Marsh (Protected)

Model: Spatial Mohr-Coulomb
Unit Weight: 101 pcf
Cohesion: 320 psf
Phi: 0 °
Phi-B: 0 °

BAY SOUND CLAY, EL. -48 TO -53 (protected side toe)

Model: Undrained (Phi=0)
Unit Weight: 111 pcf
Cohesion: 425 psf

BAY SOUND CLAY 2, EL. -53 TO -70 (protected side toe)

Model: Spatial Mohr-Coulomb
Unit Weight: 111 pcf
Cohesion Fn: Bay Sound
Phi: 0 °
Phi-B: 0 °

Slip Surface Entry and Exit

Left Projection: Point

Left Coordinate: (200, -17.2) ft
Left-Zone Increment: 6
Right Projection: Range
Right-Zone Left Coordinate: (213.64217, 2.12455) ft
Right-Zone Right Coordinate: (270, -3) ft
Right-Zone Increment: 10
Radius Increments: 4

Slip Surface Limits

Left Coordinate: (102.6, -17.5) ft
Right Coordinate: (310, -3) ft

Reinforcements

Reinforcement 1

Type: Pile
Outside Point: (200, 3) ft
Inside Point: (200, -17.2) ft
Slip Surface Intersection: (200, -17.2) ft
Total Length: 20.2 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

Reinforcement 2

Type: Pile
Outside Point: (195, 3) ft
Inside Point: (195, -15) ft
Slip Surface Intersection: (0, 0) ft
Total Length: 18 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

Point Loads

	Coordinate (ft)	Magnitude (lbs)	Direction (°)
Point Load 1	(200, -14)	2056.3	180

Cohesion Functions

Marsh

Model: [Spline Data Point Function](#)

Function: [Cohesion vs. X](#)

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 320

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

Data Point: (179.9, 320)

Data Point: (200, 340)

Data Point: (228.1, 320)

Bay Sound

Model: [Spline Data Point Function](#)

Function: [Cohesion vs. Y](#)

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 760

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

Data Point: (-70, 930)

Data Point: (-53, 760)

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: (-100000, 0)

Data Point: (0, 0)

Data Point: (100000, 57735)

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 2

Model: Linear Interpolation
 Limit Range By: Data Values
 Data Points: X (ft), Y (ft), Cohesion (psf)
 Data Point: (179.7, -53, 760)
 Data Point: (179.7, -70, 930)
 Data Point: (200, -53, 800)
 Data Point: (200, -70, 980)
 Data Point: (228.1, -53, 760)
 Data Point: (228.1, -70, 930)

Regions

	Points	Area (ft ²)	Material
Region 1	26,14,31,4,10,52,34,30	52.9145	
Region 2	6,44,7,8,19,37	258.42	Fill (Protected)
Region 3	46,47,48,36,49,32,13,22,45	619.89152	
Region 4	22,13,32,33,27,23,57,53,55,9	6541.735	BEACH SAND SP, EL. -12 TO -48/-53
Region 5	54,58,28,59,41,56	821.95	BAY SOUND CLAY 2, EL. -53 TO -70
Region 6	4,40,24,5,6,10	83.525	FILL, EL. +3.5 TO-1.0
Region 7	18,37,19,27,33	327.6	Marsh (Protected)
Region 8	32,12,18,33	56.2	Marsh 2, EL. -8 to -10 (Flood)
Region 9	32,12,50,35,36,49	40.6	
Region 10	38,34,29,3,39	36.2	

Region 11	10,11,37,6	106.78	Fill 2. -1 TO -4 (Flood Side)
Region 12	11,12,18,37	84.3	MARSH 1,EL. -4 TO -8
Region 13	10,52,34,38,51,11	81.199992	
Region 14	11,12,50,35,38,51	60.900009	
Region 15	39,38,35,36,48	61.04348	
Region 16	4,42,43,24,40	8.96	Sheetpile
Region 17	1,2,25,39,48,47,46,45	141.31	
Region 18	9,55,56,16	615.6	BAY SOUND CLAY, EL. -48 TO -53 (protected side toe)
Region 19	55,53,57,58,54,56	387.2	BAY SOUND CLAY, EL. -48 TO -53
Region 20	57,23,17,58	655.2	BAY SOUND CLAY, EL. -48 TO -53 (protected side toe)
Region 21	16,56,41,21	1307.3	BAY SOUND CLAY 2, EL. -53 TO -70 (protected side toe)
Region 22	58,17,20,28	1393.15	BAY SOUND CLAY 2, EL. -53 TO -70 (protected side toe)

Points

	X (ft)	Y (ft)
Point 1	102.6	-9.7
Point 2	151.3	-9.2
Point 3	171.2	-4
Point 4	200	3.5
Point 5	208	3.5
Point 6	228.1	-1.4
Point 7	310	-3
Point 8	310	-5.2
Point 9	102.7	-45
Point 10	200	-1

Point 11	200	-4
Point 12	200	-8
Point 13	200	-17.2
Point 14	195.1	2.4
Point 15	195	-15
Point 16	102.8	-53
Point 17	310	-53
Point 18	228.1	-8
Point 19	310	-6
Point 20	310	-70
Point 21	102.8	-70
Point 22	102.6	-17.5
Point 23	310	-45
Point 24	201.2	3.7
Point 25	161.5	-8.3
Point 26	186.2	1.4
Point 27	310	-10
Point 28	228	-70
Point 29	176.7	-1.6
Point 30	183.4	-0.2
Point 31	195.9	3.31
Point 32	200	-10
Point 33	228.1	-10
Point 34	179.7	-1
Point 35	179.7	-8
Point 36	179.7	-10
Point 37	228.1	-6
Point 38	179.7	-6
Point 39	166.7	-6
Point 40	201	3.5
Point 41	179.7	-70
Point 42	200	12.9
Point 43	200.7	12.9
Point 44	244	-3
Point 45	102.6	-12
Point 46	151.1	-11.5

Point 47	161.5	-10.6
Point 48	162.17826	-10
Point 49	195	-10
Point 50	195	-8
Point 51	195	-4.49261
Point 52	195	-1
Point 53	200	-45
Point 54	200	-53
Point 55	179.7	-45
Point 56	179.7	-53
Point 57	228.1	-45
Point 58	228.1	-53
Point 59	200	-70

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.88	(210.392, 49.847)	25.35005	(200, 12.9)	(254.11, -3)
2	37	2.05	(210.392, 49.847)	67.847	(200, 12.9)	(252.941, -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	200.35	-17.200195	1463.8569	-2619.4282	0	0
2	Optimized	200.85	-17.200475	1456.7333	2249.7	457.81952	-9.2578e-005
3	Optimized	201.1	-17.20062	1453.2	2260.65	466.18147	-9.4269e-005
4	Optimized	202.11865	-17.201195	1439.0392	2270.1878	479.86384	-9.7033e-005
5	Optimized	203.956	-17.20223	1419.7722	2266.8133	489.03942	-9.8893e-005
6	Optimized	205.79335	-17.20327	1407.4174	2263.1667	494.0671	-9.9907e-005

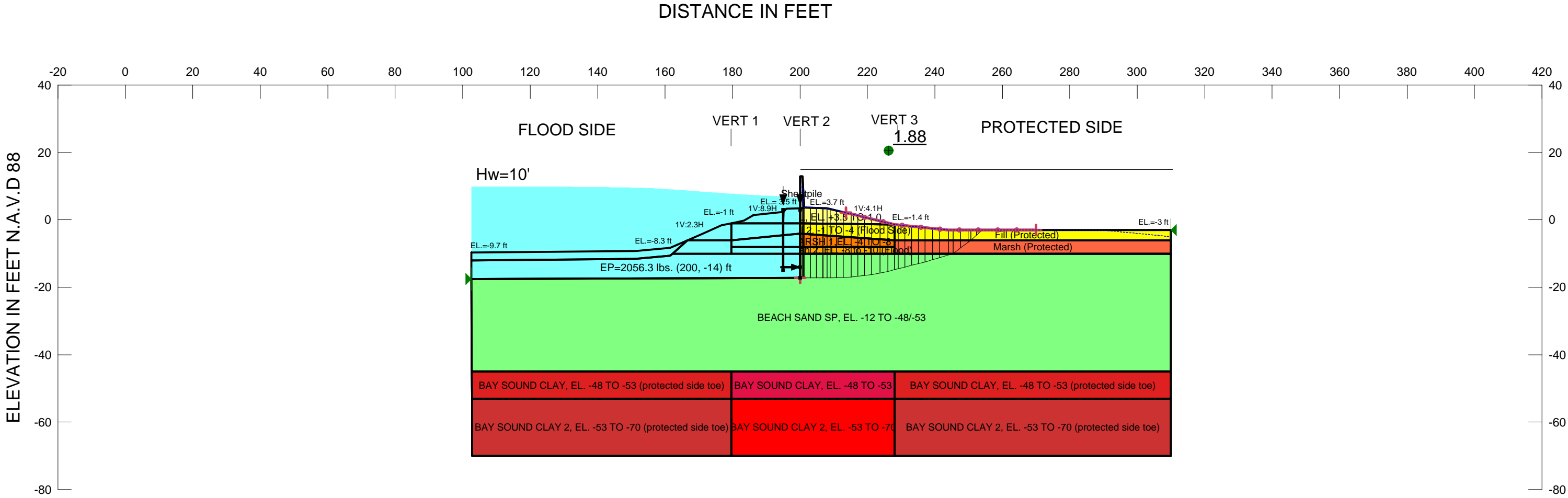
						4	
7	Optimized	206.77005	-17.20451	1401.0123	2254.1769	492.5748	-9.9602e-005
8	Optimized	207.41405	-17.2073	1396.9658	2258.4749	497.3925 5	-0.00010058
9	Optimized	208.4521	- 17.210965	1390.4225	2246.1096	494.0312 1	-9.9893e-005
10	Optimized	209.881	-17.18271	1379.7094	2226.097	488.6620 8	-3.4666e-005
11	Optimized	211.8346	- 17.123005	1363.7466	2167.5155	464.0561 7	-9.3832e-005
12	Optimized	213.98705	- 17.022975	1344.1058	2115.1017	445.1347 2	-9.001e-005
13	Optimized	216.14955	-16.83713	1319.1259	2066.4494	431.4674 4	-8.7242e-005
14	Optimized	218.12325	- 16.605785	1292.4556	1983.0165	398.6955 6	-8.0615e-005
15	Optimized	220.09695	-16.37444	1265.8355	1899.6339	365.9236 7	-7.3989e-005
16	Optimized	222.4244	-16.02513	1229.6556	1818.91	340.2061 8	-6.879e-005
17	Optimized	224.90915	-15.53514	1183.6787	1708.0145	302.7254 3	-6.1205e-005
18	Optimized	227.07665	-15.02363	1138.344	1588.571	259.9387 3	-1.8436e-005
19	Optimized	228.6019	- 14.643335	1105.1716	1562.1073	263.8119 6	-1.8711e-005
20	Optimized	230.1124	-14.25619	1071.6935	1496.1294	245.0481 9	-1.3007e-006
21	Optimized	232.1296	- 13.732165	1026.4958	1401.0799	216.2662 5	-1.534e-005
22	Optimized	234.1326	-13.21213	981.66233	1306.6768	187.6471 7	-9.9595e-007
23	Optimized	236.12145	-12.69609	937.12981	1213.0368	159.2949 7	-8.455e-007
24	Optimized	238.1922	- 12.135045	889.3289	1118.3239	132.2103 5	-7.0178e-007
25	Optimized	240.3448	- 11.528995	838.17282	1009.7067	99.03512 8	2.7234e-006

26	Optimized	242.71055	- 10.822665	779.45917	890.77876	64.27039 4	-3.4105e-007
27	Optimized	244.6918	-10.20299	728.51816	790.25699	35.64492 9	-1.3315e-006
28	Optimized	246.51075	-9.144215	644.70235	878.75517	0	320
29	Optimized	248.765	-7.459405	513.48069	688.62056	0	320
30	Optimized	250.25185	-6.3085	424.68181	589.86985	0	320
31	Optimized	251.4861	-5.25	298.07689	632.77487	0	600
32	Optimized	253.2351	-3.75	97.303242	451.96965	0	600

Slices of Slip Surface: 37

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	37	200.35	-17.25238	1467.0904	-2658.6775	0	0
2	37	200.85	- 17.326065	1464.5974	2186.913	417.0291	-2.9582e-005
3	37	201.1	- 17.361195	1463.3308	2203.1932	427.15977	-3.0303e-005
4	37	202.05	- 17.480335	1457.7358	2233.5098	447.8933	-9.056e-005
5	37	203.75	-17.66927	1450.9374	2266.5299	470.88255	-3.3403e-005
6	37	205.45	-17.81497	1448.5535	2294.8288	488.59729	-9.879e-005
7	37	207.15	- 17.917715	1443.5845	2318.4664	505.1133	-3.583e-005
8	37	208.91365	-17.97829	1435.8428	2316.3997	508.38976	-0.00010279
9	37	210.7409	-17.9935	1425.2746	2287.4224	497.76124	-0.00010065
10	37	212.56815	- 17.959475	1411.5962	2251.7605	485.06904	-9.808e-005
11	37	214.39545	-17.87614	1394.9476	2209.2225	470.12181	-3.3351e-005
12	37	216.22275	-17.74331	1375.3094	2159.6349	452.83053	-9.1567e-005
13	37	218.05	-17.56069	1352.5631	2102.8511	433.17901	-8.7586e-005
14	37	219.87725	-17.32788	1326.7584	2038.5824	410.97178	-8.31e-005
15	37	221.70455	- 17.044355	1297.7412	1966.5231	386.12141	-7.808e-005
16	37	223.53185	- 16.709465	1265.5271	1886.5058	358.52217	-7.2495e-005
17	37	225.3591	-	1230.0394	1798.0331	327.93136	-6.631e-005

			16.322425				
18	37	227.18635	- 15.882315	1191.2652	1700.8152	294.1888	-2.087e-005
19	37	228.9909	-15.39489	1149.7045	1671.8264	301.44722	-6.0956e-005
20	37	230.77275	- 14.860295	1105.277	1590.736	280.27987	-1.9884e-005
21	37	232.5546	- 14.271735	1057.5651	1500.8959	255.95715	-1.8158e-005
22	37	234.3364	- 13.627705	1006.3548	1401.5978	228.19366	-1.2116e-006
23	37	236.11825	- 12.926495	951.56639	1292.3314	196.74079	-1.0445e-006
24	37	237.9001	-12.16617	893.05135	1172.1812	161.15569	-8.5551e-007
25	37	239.6819	-11.34452	830.75121	1040.3753	121.02652	3.3282e-006
26	37	241.46375	- 10.459035	764.5028	895.66163	75.724584	-4.0196e-007
27	37	243.17735	- 9.5458765	693.42275	861.88319	0	320
28	37	244.81995	- 8.6088335	617.59564	760.25109	0	320
29	37	246.45985	-7.611208	537.7477	660.77065	0	320
30	37	248.09975	-6.548251	453.6042	553.40088	0	320
31	37	249.92515	- 5.2789365	308.32769	550.35713	0	600
32	37	251.93605	- 3.7789365	102.89456	395.55479	0	600



Name: FILL, EL. +3.5 TO-1.0 Model: Undrained (Phi=0) Unit Weight: 106 pcf Cohesion: 900 psf
Name: Fill 2. -1 TO -4 (Flood Side) Model: Spatial Mohr-Coulomb Unit Weight: 101 pcf Cohesion: 500 psf Phi: 0 °
Name: BEACH SAND SP, EL. -12 TO -48/-53 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand
Name: BAY SOUND CLAY, EL. -48 TO -53 Model: Spatial Mohr-Coulomb Unit Weight: 108 pcf Cohesion: 450 psf Phi: 0 °
Name: Fill (Protected) Model: Undrained (Phi=0) Unit Weight: 106 pcf Cohesion: 600 psf
Name: Sheetpile Model: Mohr-Coulomb Unit Weight: 0.1 pcf Cohesion: 0.01 psf Phi: 0 °
Name: MARSH 1,EL. -4 TO -8 Model: Spatial Mohr-Coulomb Unit Weight: 90 pcf Cohesion Fn: Marsh Phi: 0 °
Name: BAY SOUND CLAY 2, EL. -53 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 111 pcf Cohesion Spatial Fn: Bay Sound 2 Phi: 0 °
Name: Marsh 2, EL. -8 to -10 (Flood) Model: Spatial Mohr-Coulomb Unit Weight: 98 pcf Cohesion Fn: Marsh Phi: 0 °
Name: Marsh (Protected) Model: Spatial Mohr-Coulomb Unit Weight: 101 pcf Cohesion: 320 psf Phi: 0 °
Name: BAY SOUND CLAY, EL. -48 TO -53 (protected side toe) Model: Undrained (Phi=0) Unit Weight: 111 pcf Cohesion: 425 psf
Name: BAY SOUND CLAY 2, EL. -53 TO -70 (protected side toe) Model: Spatial Mohr-Coulomb Unit Weight: 111 pcf Cohesion Fn: Bay Sound Phi: 0 °



**US Army Corps
of Engineers®**
New Orleans District

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
VERTICALSWERE ASSUMED TO VARY LINEARLY
BETWEENTHE VALUES INDICATED FOR THESE LOCATIONS.

Hw = CANAL WATER LEVEL

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

LONDON AVE OUTFALL CANAL, REACH 8,
PROTECTED SIDE STABILITY ANALYSIS,
CASE: GAP Stability (Entry/Exit) OPEN
STA. 66+00 TO 69+06
ORLEANS PARISH, LOUISIANA

Global Stability (Block) OPEN

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File Information

Created By: [Liljegren, James](#)
Revision Number: [301](#)
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Date: [12/22/2010](#)
Time: [10:49:30 AM](#)
File Name: [Reach 8 OPEN.gsz](#)
Directory: [\\Kaci-fs-05\fsd-z\Projects\041752 - New Orleans Canals\Mod 11\Slope-W\](#)
Last Solved Date: [12/22/2010](#)
Last Solved Time: [10:52:20 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

Global Stability (Block) OPEN

Kind: [SLOPE/W](#)
Parent: [Gap Analysis \(Seepage\) OPEN](#)
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

FILL, EL. +3.5 TO -1.0

Model: Undrained (Phi=0)
Unit Weight: 106 pcf
Cohesion: 900 psf

Fill 2. -1 TO -4 (Flood Side)

Model: Spatial Mohr-Coulomb
Unit Weight: 101 pcf
Cohesion: 500 psf
Phi: 0 °
Phi-B: 0 °

BEACH SAND SP, EL. -12 TO -48/-53

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

BAY SOUND CLAY, EL. -48 TO -53

Model: Spatial Mohr-Coulomb
Unit Weight: 108 pcf
Cohesion: 450 psf
Phi: 0 °
Phi-B: 0 °

Fill (Protected)

Model: Undrained (Phi=0)
Unit Weight: 106 pcf
Cohesion: 600 psf

Sheetpile

Model: Mohr-Coulomb

Unit Weight: 0.1 pcf
Cohesion: 0.01 psf
Phi: 0 °
Phi-B: 0 °

MARSH 1, EL. -4 TO -8

Model: Spatial Mohr-Coulomb
Unit Weight: 90 pcf
Cohesion Fn: Marsh
Phi: 0 °
Phi-B: 0 °

BAY SOUND CLAY 2, EL. -53 TO -70

Model: Spatial Mohr-Coulomb
Unit Weight: 111 pcf
Cohesion Spatial Fn: Bay Sound 2
Phi: 0 °
Phi-B: 0 °

Marsh 2, EL. -8 to -10 (Flood)

Model: Spatial Mohr-Coulomb
Unit Weight: 98 pcf
Cohesion Fn: Marsh
Phi: 0 °
Phi-B: 0 °

Marsh (Protected)

Model: Spatial Mohr-Coulomb
Unit Weight: 101 pcf
Cohesion: 320 psf
Phi: 0 °
Phi-B: 0 °

BAY SOUND CLAY, EL. -48 TO -53 (protected side toe)

Model: Undrained (Phi=0)
Unit Weight: 111 pcf
Cohesion: 425 psf

BAY SOUND CLAY 2, EL. -53 TO -70 (protected side toe)

Model: Spatial Mohr-Coulomb
Unit Weight: 111 pcf
Cohesion Fn: Bay Sound
Phi: 0 °
Phi-B: 0 °

Slip Surface Limits

Left Coordinate: (102.6, -9.7) ft

Right Coordinate: (310, -3) ft

Slip Surface Block

Left Grid

Upper Left: (190, -5) ft

Lower Left: (190, -46) ft

Lower Right: (205, -46) ft

X Increments: 3

Y Increments: 9

Starting Angle: 125 °

Ending Angle: 145 °

Angle Increments: 4

Right Grid

Upper Left: (225, -5) ft

Lower Left: (225, -46) ft

Lower Right: (265, -46) ft

X Increments: 8

Y Increments: 9

Starting Angle: 25 °

Ending Angle: 45 °

Angle Increments: 4

Reinforcements

Reinforcement 1

Type: Pile

Outside Point: (200, 3) ft

Inside Point: (200, -12.2) ft

Slip Surface Intersection: (200, -12.742) ft

Total Length: 15.2 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

Reinforcement 2

Type: Pile

Outside Point: (195, 3) ft
Inside Point: (195, -10) ft
Slip Surface Intersection: (195, -10.002) ft
Total Length: 13 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

Cohesion Functions

Marsh

Model: Spline Data Point Function
Function: Cohesion vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 320
Data Points: X (ft), Cohesion (psf)
Data Point: (179.9, 320)
Data Point: (200, 340)
Data Point: (228.1, 320)

Bay Sound

Model: Spline Data Point Function
Function: Cohesion vs. Y
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 760
Data Points: Y (ft), Cohesion (psf)
Data Point: (-70, 930)
Data Point: (-53, 760)

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: [\(-100000, 0\)](#)

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

Data Point: [\(100000, 57735\)](#)

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 2

Model: [Linear Interpolation](#)

Limit Range By: [Data Values](#)

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

Data Point: [\(179.7, -53, 760\)](#)

Data Point: [\(179.7, -70, 930\)](#)

Data Point: [\(200, -53, 800\)](#)

Data Point: [\(200, -70, 980\)](#)

Data Point: [\(228.1, -53, 760\)](#)

Data Point: [\(228.1, -70, 930\)](#)

Regions

	Material	Points	Area (ft ²)
Region 1	FILL, EL. +3.5 TO-1.0	26,14,31,4,10,52,34,30	52.9145
Region 2	Fill (Protected)	6,44,7,8,19,37	258.42
Region 3	BEACH SAND SP, EL. -12 TO -48/-53	46,47,48,36,49,32,13,22,45	619.89152
Region 4	BEACH SAND SP, EL. -12 TO -48/-53	22,13,32,33,27,23,57,53,55,9	6541.735
Region 5	BAY SOUND CLAY 2, EL. -53 TO -70	54,58,28,59,41,56	821.95
Region 6	FILL, EL. +3.5 TO-1.0	4,40,24,5,6,10	83.525
Region 7	Marsh (Protected)	18,37,19,27,33	327.6

Region 8	Marsh 2, EL. -8 to -10 (Flood)	32,12,18,33	56.2
Region 9	Marsh 2, EL. -8 to -10 (Flood)	32,12,50,35,36,49	40.6
Region 10	Fill (Protected)	38,34,29,3,39	36.2
Region 11	Fill 2. -1 TO -4 (Flood Side)	10,11,37,6	106.78
Region 12	MARSH 1,EL. -4 TO -8	11,12,18,37	84.3
Region 13	Fill 2. -1 TO -4 (Flood Side)	10,52,34,38,51,11	81.199992
Region 14	MARSH 1,EL. -4 TO -8	11,12,50,35,38,51	60.900009
Region 15	Marsh (Protected)	39,38,35,36,48	61.04348
Region 16	Sheetpile	4,42,43,24,40	8.96
Region 17	BEACH SAND SP, EL. -12 TO -48/-53	1,2,25,39,48,47,46,45	141.31
Region 18	BAY SOUND CLAY, EL. -48 TO -53 (protected side toe)	9,55,56,16	615.6
Region 19	BAY SOUND CLAY, EL. -48 TO -53	55,53,57,58,54,56	387.2
Region 20	BAY SOUND CLAY, EL. -48 TO -53 (protected side toe)	57,23,17,58	655.2
Region 21	BAY SOUND CLAY 2, EL. -53 TO -70 (protected side toe)	16,56,41,21	1307.3
Region 22	BAY SOUND CLAY 2, EL. -53 TO -70 (protected side toe)	58,17,20,28	1393.15

Points

	X (ft)	Y (ft)
Point 1	102.6	-9.7
Point 2	151.3	-9.2
Point 3	171.2	-4
Point 4	200	3.5

Point 5	208	3.5
Point 6	228.1	-1.4
Point 7	310	-3
Point 8	310	-5.2
Point 9	102.7	-45
Point 10	200	-1
Point 11	200	-4
Point 12	200	-8
Point 13	200	-17.2
Point 14	195.1	2.4
Point 15	195	-15
Point 16	102.8	-53
Point 17	310	-53
Point 18	228.1	-8
Point 19	310	-6
Point 20	310	-70
Point 21	102.8	-70
Point 22	102.6	-17.5
Point 23	310	-45
Point 24	201.2	3.7
Point 25	161.5	-8.3
Point 26	186.2	1.4
Point 27	310	-10
Point 28	228	-70
Point 29	176.7	-1.6
Point 30	183.4	-0.2
Point 31	195.9	3.31
Point 32	200	-10
Point 33	228.1	-10
Point 34	179.7	-1
Point 35	179.7	-8
Point 36	179.7	-10
Point 37	228.1	-6
Point 38	179.7	-6
Point 39	166.7	-6
Point 40	201	3.5

Point 41	179.7	-70
Point 42	200	12.9
Point 43	200.7	12.9
Point 44	244	-3
Point 45	102.6	-12
Point 46	151.1	-11.5
Point 47	161.5	-10.6
Point 48	162.17826	-10
Point 49	195	-10
Point 50	195	-8
Point 51	195	-4.49261
Point 52	195	-1
Point 53	200	-45
Point 54	200	-53
Point 55	179.7	-45
Point 56	179.7	-53
Point 57	228.1	-45
Point 58	228.1	-53
Point 59	200	-70

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.87	(218.437, -0.175)	29.73371	(181.166, -0.683137)	(254.792, -3)
2	2448	2.01	(218.437, -0.175)	30.009	(180.904, -0.73974)	(255.868, -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	181.4022	-0.8415684	671.14765	372.28832	0	900
2	Optimized	182.51945	-1.5893695	692.01556	570.6474	0	500

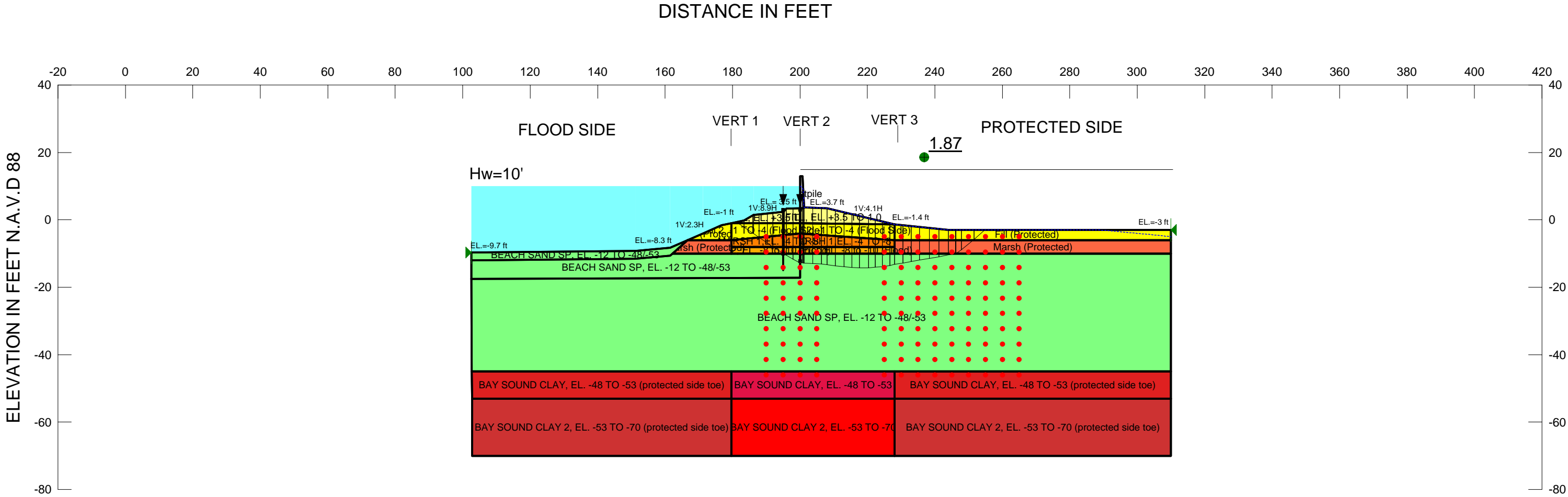
3	Optimized	184.67305	- 3.0308045	732.47149	728.5547	0	500
4	Optimized	186.07305	- 3.9701985	760.92039	847.32372	0	500
5	Optimized	187.02795	- 4.6269935	781.57264	937.95683	0	500
6	Optimized	189.0823	-6.039945	848.20406	1123.0222	0	329.14
7	Optimized	191.1486	-7.441715	928.46349	1255.0221	0	331.19
8	Optimized	193.54425	-9.03406	1019.8636	1406.0697	0	333.58
9	Optimized	195.2468	-10.16569	1118.6165	1515.9321	229.39023	-1.2195e-006
10	Optimized	195.6468	- 10.400605	1133.8074	1587.4796	261.92778	1.5819e-005
11	Optimized	196.915	-11.08851	1179.3753	1711.1485	307.01943	-2.1804e-005
12	Optimized	198.94505	-12.18963	1251.9469	1834.2951	336.2189	-6.806e-005
13	Optimized	199.98005	-12.74117	1278.6919	2075.4255	459.99436	-9.3027e-005
14	Optimized	200.35	- 12.759355	1141.9214	1499.9035	206.68106	-1.0975e-006
15	Optimized	200.85	-12.78393	1142.6538	1676.5092	308.22159	-2.1869e-005
16	Optimized	201.1	- 12.796215	1143.0204	1688.462	314.91088	-2.2343e-005
17	Optimized	202.48935	- 12.864505	1145.1278	1704.4645	322.9332	-6.531e-005
18	Optimized	205.06805	- 12.991255	1142.4552	1714.2251	330.11148	-6.6761e-005
19	Optimized	207.1787	- 13.164775	1142.0279	1702.6335	323.66577	-2.2969e-005
20	Optimized	209.263	-13.4443	1148.4214	1703.3864	320.40922	-6.4808e-005
21	Optimized	211.789	-13.78306	1154.5815	1682.1985	304.61982	-6.1616e-005
22	Optimized	214.209	- 14.034035	1155.7975	1672.4598	298.29512	-6.0327e-005
23	Optimized	216.52295	-14.19722	1151.8315	1634.5669	278.70745	1.6816e-005
24	Optimized	218.9949	- 14.254895	1140.2807	1605.6463	268.67895	1.6207e-005
25	Optimized	221.33195	- 14.149985	1119.3182	1549.9377	248.61831	-1.3196e-006
26	Optimized	223.37605	- 13.987995	1096.5924	1475.8595	218.96994	-1.1621e-006

27	Optimized	225.4954	-13.70893	1066.0714	1410.3227	198.75358	-1.0546e-006
28	Optimized	227.34635	- 13.375555	1033.8523	1316.4769	163.17339	-8.6587e-007
29	Optimized	229.33005	- 13.019405	999.32706	1292.5478	169.29108	-1.2004e-005
30	Optimized	231.7902	- 12.577715	956.5582	1207.4902	144.87565	-7.6879e-007
31	Optimized	234.25035	- 12.136025	913.78934	1122.4326	120.46023	-6.3929e-007
32	Optimized	236.90035	- 11.667515	868.13602	1030.9332	93.990998	-4.9879e-007
33	Optimized	239.7402	-11.17218	819.64029	934.77428	66.472645	-3.5271e-007
34	Optimized	242.58005	- 10.676845	771.17924	838.61537	38.934264	2.584e-006
35	Optimized	245.05265	-10.24557	728.97306	767.34253	22.152622	-8.2794e-007
36	Optimized	246.15195	-10.03098	708.75889	793.74422	49.066303	3.2498e-006
37	Optimized	247.0251	-9.45084	662.99111	847.15531	0	320
38	Optimized	249.7292	-7.378595	502.26345	660.08164	0	320
39	Optimized	253.19965	-4.427755	184.38019	509.7038	0	600

Slices of Slip Surface: 2448

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	2448	181.08955	- 0.86986995	673.93999	376.63945	0	900
2	2448	182.3377	-1.743833	698.81781	585.34908	0	500
3	2448	184.8	-3.4679565	748.55866	774.74227	0	500
4	2448	186.7705	-4.847719	791.36143	964.66693	0	500
5	2448	188.32385	-5.935393	843.44298	1115.8951	0	328.38
6	2448	190.28955	-7.3117975	922.03653	1239.0361	0	330.34
7	2448	192.70055	-9	1018.4422	1397.5475	0	332.74
8	2448	194.56435	-10.305035	1094.7406	1551.1959	263.53459	1.5913e-005
9	2448	195.05	-10.64508	1123.4667	1590.3012	269.52708	-1.9139e-005
10	2448	195.5	-10.960175	1166.1653	1609.9409	256.21397	-1.8196e-005
11	2448	196.925	-11.957975	1227.0897	1769.0487	312.90015	-2.222e-005
12	2448	198.975	-13.3934	1305.5285	1923.1292	356.57191	-7.2174e-005

13	2448	200.35	-14.11111	1232.5286	1679.8571	258.26527	-1.8323e-005
14	2448	200.85	-14.11111	1231.2	1855.2	360.26657	-7.2849e-005
15	2448	201.1	-14.11111	1230.55	1865.85	366.79063	-7.4168e-005
16	2448	202.33335	-14.11111	1227.7498	1874.0291	373.12954	-2.6471e-005
17	2448	204.6	-14.11111	1216.4116	1869.088	376.82288	-7.6194e-005
18	2448	206.86665	-14.11111	1203.3528	1864.1468	381.50961	-7.7145e-005
19	2448	209.25625	-14.11111	1190.2488	1829.6517	369.15949	-7.4646e-005
20	2448	211.76875	-14.11111	1175.2438	1765.6119	340.84922	-6.8923e-005
21	2448	214.28125	-14.11111	1160.1592	1701.5323	312.56192	-6.3202e-005
22	2448	216.79375	-14.11111	1144.796	1637.4925	284.45847	1.716e-005
23	2448	219.30625	-14.11111	1129.393	1573.4527	256.37799	1.5466e-005
24	2448	221.81875	-14.11111	1113.9104	1509.4129	228.34347	-1.62e-005
25	2448	224.33125	-14.11111	1098.3881	1445.3731	200.33193	-1.0635e-006
26	2448	226.84375	-14.11111	1082.8657	1381.3333	172.32038	-9.148e-007
27	2448	229.29	-14.11111	1067.7311	1388.8235	185.3828	-9.8419e-007
28	2448	231.67	-14.11111	1052.9832	1363.1513	179.07562	-9.5064e-007
29	2448	234.05	-14.11111	1038.2773	1337.479	172.74417	-9.1709e-007
30	2448	236.43	-14.11111	1023.5294	1311.8067	166.43698	-8.8355e-007
31	2448	238.81	-14.11111	1008.8235	1286.1345	160.10554	-8.5002e-007
32	2448	241	-13.410905	951.56804	1344.4743	226.84456	-1.2026e-006
33	2448	243	-12.01049	851.79532	1105.6096	146.53974	-7.7683e-007
34	2448	244.93565	-10.65514	755.25137	888.5027	76.93269	-4.0777e-007
35	2448	247.29945	-9	629.70082	797.2138	0	320
36	2448	250.15575	-7	473.42994	581.5204	0	320
37	2448	252.655	-5.25	293.37672	506.20036	0	600
38	2448	254.7972	-3.75	95.129571	336.42172	0	600



Name: FILL, EL. +3.5 TO-1.0 Model: Undrained (Phi=0) Unit Weight: 106 pcf Cohesion: 900 psf
Name: Fill 2. -1 TO -4 (Flood Side) Model: Spatial Mohr-Coulomb Unit Weight: 101 pcf Cohesion: 500 psf Phi: 0 °
Name: BEACH SAND SP, EL. -12 TO -48/-53 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand
Name: BAY SOUND CLAY, EL. -48 TO -53 Model: Spatial Mohr-Coulomb Unit Weight: 108 pcf Cohesion: 450 psf Phi: 0 °
Name: Fill (Protected) Model: Undrained (Phi=0) Unit Weight: 106 pcf Cohesion: 600 psf
Name: Sheetpile Model: Mohr-Coulomb Unit Weight: 0.1 pcf Cohesion: 0.01 psf Phi: 0 °
Name: MARSH 1,EL. -4 TO -8 Model: Spatial Mohr-Coulomb Unit Weight: 90 pcf Cohesion Fn: Marsh Phi: 0 °
Name: BAY SOUND CLAY 2, EL. -53 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 111 pcf Cohesion Spatial Fn: Bay Sound 2 Phi: 0 °
Name: Marsh 2, EL. -8 to -10 (Flood) Model: Spatial Mohr-Coulomb Unit Weight: 98 pcf Cohesion Fn: Marsh Phi: 0 °
Name: Marsh (Protected) Model: Spatial Mohr-Coulomb Unit Weight: 101 pcf Cohesion: 320 psf Phi: 0 °
Name: BAY SOUND CLAY, EL. -48 TO -53 (protected side toe) Model: Undrained (Phi=0) Unit Weight: 111 pcf Cohesion: 425 psf
Name: BAY SOUND CLAY 2, EL. -53 TO -70 (protected side toe) Model: Spatial Mohr-Coulomb Unit Weight: 111 pcf Cohesion Fn: Bay Sound Phi: 0 °



**US Army Corps
of Engineers®**
New Orleans District

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
VERTICALSWERE ASSUMED TO VARY LINEARLY
BETWEENTHE VALUES INDICATED FOR THESE LOCATIONS.

Hw = CANAL WATER LEVEL

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

LONDON AVE OUTFALL CANAL, REACH 8,
PROTECTED SIDE STABILITY ANALYSIS,
CASE: Global Stability (Block) OPEN
STA. 66+00 TO 69+06
ORLEANS PARISH, LOUISIANA

Name: Global Stability (Block) OPEN
File Name: Reach 8 OPEN.gsz Directory: \\Kaci-fs-05\fsd-z\Projects\041752 - New Orleans Canals\Mod 11\Slope-W\
Last Edited By: Higgins, James

Global Stability (Entry/Exit) OPEN

Report generated using GeoStudio 2007, version 7.16. Copyright © 1991-2010 GEO-SLOPE International Ltd.

File Information

Created By: [Liljegren, James](#)
Revision Number: [301](#)
Last Edited By: [Higgins, James](#)
Date: [12/22/2010](#)
Time: [10:49:30 AM](#)
File Name: [Reach 8 OPEN.gsz](#)
Directory: [\\Kaci-fs-05\fsd-z\Projects\041752 - New Orleans Canals\Mod 11\Slope-W\](#)
Last Solved Date: [12/22/2010](#)
Last Solved Time: [10:52:48 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

Global Stability (Entry/Exit) OPEN

Kind: [SLOPE/W](#)
Parent: [Gap Analysis \(Seepage\) OPEN](#)
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: [\(none\)](#)
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, EL. +3.5 TO -1.0

Model: Undrained (Phi=0)
Unit Weight: 106 pcf
Cohesion: 900 psf

Fill 2. -1 TO -4 (Flood Side)

Model: Spatial Mohr-Coulomb
Unit Weight: 101 pcf
Cohesion: 500 psf
Phi: 0 °
Phi-B: 0 °

BEACH SAND SP, EL. -12 TO -48/-53

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

BAY SOUND CLAY, EL. -48 TO -53

Model: Spatial Mohr-Coulomb
Unit Weight: 108 pcf
Cohesion: 450 psf
Phi: 0 °
Phi-B: 0 °

Fill (Protected)

Model: Undrained (Phi=0)
Unit Weight: 106 pcf
Cohesion: 600 psf

Sheetpile

Model: Mohr-Coulomb
Unit Weight: 0.1 pcf

Cohesion: 0.01 psf

Phi: 0 °

Phi-B: 0 °

MARSH 1, EL. -4 TO -8

Model: Spatial Mohr-Coulomb

Unit Weight: 90 pcf

Cohesion Fn: Marsh

Phi: 0 °

Phi-B: 0 °

BAY SOUND CLAY 2, EL. -53 TO -70

Model: Spatial Mohr-Coulomb

Unit Weight: 111 pcf

Cohesion Spatial Fn: Bay Sound 2

Phi: 0 °

Phi-B: 0 °

Marsh 2, EL. -8 to -10 (Flood)

Model: Spatial Mohr-Coulomb

Unit Weight: 98 pcf

Cohesion Fn: Marsh

Phi: 0 °

Phi-B: 0 °

Marsh (Protected)

Model: Spatial Mohr-Coulomb

Unit Weight: 101 pcf

Cohesion: 320 psf

Phi: 0 °

Phi-B: 0 °

BAY SOUND CLAY, EL. -48 TO -53 (protected side toe)

Model: Undrained (Phi=0)

Unit Weight: 111 pcf

Cohesion: 425 psf

BAY SOUND CLAY 2, EL. -53 TO -70 (protected side toe)

Model: Spatial Mohr-Coulomb

Unit Weight: 111 pcf

Cohesion Fn: Bay Sound

Phi: 0 °

Phi-B: 0 °

Slip Surface Entry and Exit

Left Projection: Range

Left-Zone Left Coordinate: (150.86238, -9.20449) ft
Left-Zone Right Coordinate: (190.00351, 1.82736) ft
Left-Zone Increment: 10
Right Projection: Range
Right-Zone Left Coordinate: (215.09147, 1.77123) ft
Right-Zone Right Coordinate: (281.49996, -3) ft
Right-Zone Increment: 8
Radius Increments: 4

Slip Surface Limits

Left Coordinate: (102.6, -9.7) ft
Right Coordinate: (310, -3) ft

Reinforcements

Reinforcement 1

Type: Pile
Outside Point: (200, 3) ft
Inside Point: (200, -12.2) ft
Slip Surface Intersection: (200, -13.324) ft
Total Length: 15.2 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

Reinforcement 2

Type: Pile
Outside Point: (195, 3) ft
Inside Point: (195, -10) ft
Slip Surface Intersection: (195, -10) ft
Total Length: 13 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

Cohesion Functions

Marsh

Model: Spline Data Point Function

Function: Cohesion vs. X

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 320

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

Data Point: (179.9, 320)

Data Point: (200, 340)

Data Point: (228.1, 320)

Bay Sound

Model: Spline Data Point Function

Function: Cohesion vs. Y

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 760

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

Data Point: (-70, 930)

Data Point: (-53, 760)

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: (-100000, 0)

Data Point: (0, 0)

Data Point: (100000, 57735)

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 2

Model: [Linear Interpolation](#)

Limit Range By: [Data Values](#)

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

Data Point: [\(179.7, -53, 760\)](#)

Data Point: [\(179.7, -70, 930\)](#)

Data Point: [\(200, -53, 800\)](#)

Data Point: [\(200, -70, 980\)](#)

Data Point: [\(228.1, -53, 760\)](#)

Data Point: [\(228.1, -70, 930\)](#)

Regions

	Material	Points	Area (ft ²)
Region 1	FILL, EL. +3.5 TO-1.0	26,14,31,4,10,52,34,30	52.9145
Region 2	Fill (Protected)	6,44,7,8,19,37	258.42
Region 3	BEACH SAND SP, EL. -12 TO -48/-53	46,47,48,36,49,32,13,22,45	619.89152
Region 4	BEACH SAND SP, EL. -12 TO -48/-53	22,13,32,33,27,23,57,53,55,9	6541.735
Region 5	BAY SOUND CLAY 2, EL. -53 TO -70	54,58,28,59,41,56	821.95
Region 6	FILL, EL. +3.5 TO-1.0	4,40,24,5,6,10	83.525
Region 7	Marsh (Protected)	18,37,19,27,33	327.6
Region 8	Marsh 2, EL. -8 to -10 (Flood)	32,12,18,33	56.2
Region 9	Marsh 2, EL. -8 to -10 (Flood)	32,12,50,35,36,49	40.6
Region 10	Fill (Protected)	38,34,29,3,39	36.2
Region 11	Fill 2. -1 TO -4 (Flood Side)	10,11,37,6	106.78
Region 12	MARSH 1,EL. -4 TO -8	11,12,18,37	84.3

Region 13	Fill 2. -1 TO -4 (Flood Side)	10,52,34,38,51,11	81.199992
Region 14	MARSH 1,EL. -4 TO -8	11,12,50,35,38,51	60.900009
Region 15	Marsh (Protected)	39,38,35,36,48	61.04348
Region 16	Sheetpile	4,42,43,24,40	8.96
Region 17	BEACH SAND SP, EL. -12 TO -48/-53	1,2,25,39,48,47,46,45	141.31
Region 18	BAY SOUND CLAY, EL. -48 TO -53 (protected side toe)	9,55,56,16	615.6
Region 19	BAY SOUND CLAY, EL. -48 TO -53	55,53,57,58,54,56	387.2
Region 20	BAY SOUND CLAY, EL. -48 TO -53 (protected side toe)	57,23,17,58	655.2
Region 21	BAY SOUND CLAY 2, EL. -53 TO -70 (protected side toe)	16,56,41,21	1307.3
Region 22	BAY SOUND CLAY 2, EL. -53 TO -70 (protected side toe)	58,17,20,28	1393.15

Points

	X (ft)	Y (ft)
Point 1	102.6	-9.7
Point 2	151.3	-9.2
Point 3	171.2	-4
Point 4	200	3.5
Point 5	208	3.5
Point 6	228.1	-1.4
Point 7	310	-3
Point 8	310	-5.2
Point 9	102.7	-45
Point 10	200	-1
Point 11	200	-4
Point 12	200	-8
Point 13	200	-17.2

Point 14	195.1	2.4
Point 15	195	-15
Point 16	102.8	-53
Point 17	310	-53
Point 18	228.1	-8
Point 19	310	-6
Point 20	310	-70
Point 21	102.8	-70
Point 22	102.6	-17.5
Point 23	310	-45
Point 24	201.2	3.7
Point 25	161.5	-8.3
Point 26	186.2	1.4
Point 27	310	-10
Point 28	228	-70
Point 29	176.7	-1.6
Point 30	183.4	-0.2
Point 31	195.9	3.31
Point 32	200	-10
Point 33	228.1	-10
Point 34	179.7	-1
Point 35	179.7	-8
Point 36	179.7	-10
Point 37	228.1	-6
Point 38	179.7	-6
Point 39	166.7	-6
Point 40	201	3.5
Point 41	179.7	-70
Point 42	200	12.9
Point 43	200.7	12.9
Point 44	244	-3
Point 45	102.6	-12
Point 46	151.1	-11.5
Point 47	161.5	-10.6
Point 48	162.17826	-10
Point 49	195	-10

Point 50	195	-8
Point 51	195	-4.49261
Point 52	195	-1
Point 53	200	-45
Point 54	200	-53
Point 55	179.7	-45
Point 56	179.7	-53
Point 57	228.1	-45
Point 58	228.1	-53
Point 59	200	-70

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.89	(216.172, 24.57)	29.07956	(180.111, -0.911048)	(252.061, -3)
2	383	2.12	(216.172, 24.57)	42.158	(182.242, -0.450387)	(248.065, -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	181.7557	-1.861295	706.77174	618.04681	0	500
2	Optimized	183.83655	-3.063826	738.8059	739.18273	0	500
3	Optimized	185.23655	-3.9613045	764.92133	830.93941	0	500
4	Optimized	186.6246	-4.8908245	793.74228	967.57338	0	500
5	Optimized	188.6364	-6.131765	854.54912	1150.2539	0	328.69
6	Optimized	190.98475	-7.54419	934.74535	1280.1041	0	331.03
7	Optimized	192.99605	-8.74865	1003.4786	1395.2282	0	333.03
8	Optimized	194.6229	-9.74865	1061.1526	1473.0625	0	334.65
9	Optimized	195.0498	-10.03349	1085.982	1524.6504	253.26535	-1.3462e-006
10	Optimized	195.5	-10.33387	1129.4262	1541.1853	237.72925	-1.6889e-005
11	Optimized	196.9198	-11.28118	1190.5228	1697.2393	292.55292	1.7672e-005

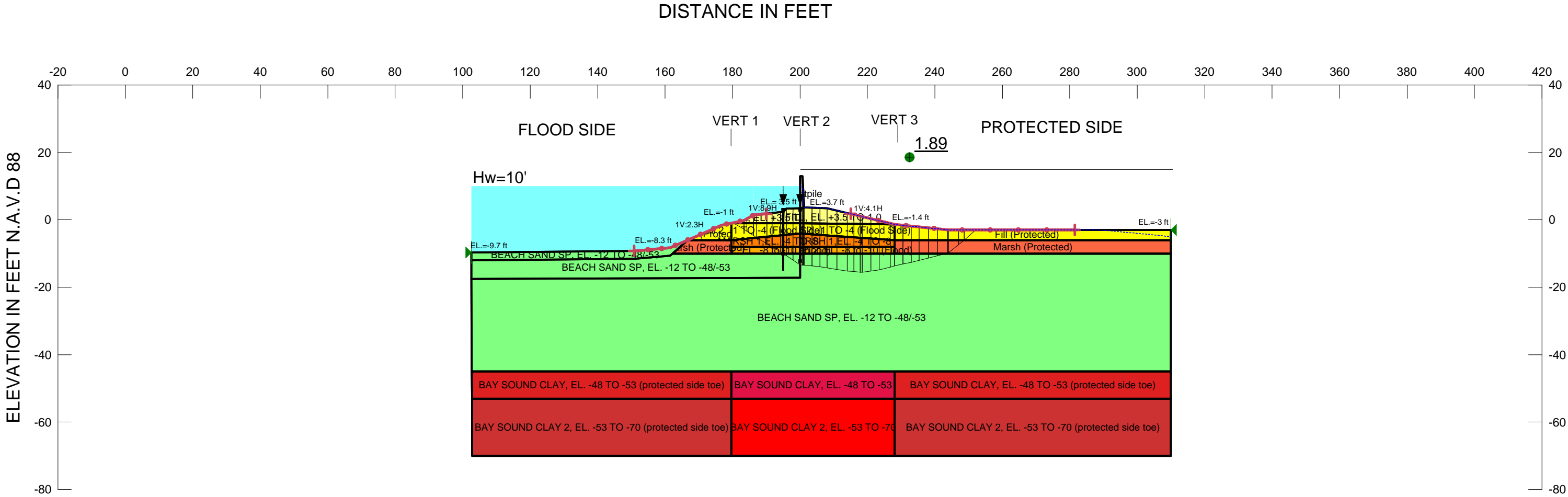
12	Optimized	198.95935	- 12.642015	1271.9303	1844.3927	330.51133	-2.348e-005
13	Optimized	199.98955	-13.32341	1303.2665	2126.7281	475.42581	-9.6154e-005
14	Optimized	200.35	- 13.357245	1181.6202	1553.5994	214.76227	-1.5241e-005
15	Optimized	200.85	-13.40418	1183.7632	1737.4959	319.69769	-2.2684e-005
16	Optimized	201.1	- 13.427645	1184.842	1750.5554	326.61479	-2.3176e-005
17	Optimized	202.37005	- 13.546855	1190.3779	1772.7603	336.2386	-6.8004e-005
18	Optimized	204.7101	- 13.766505	1193.6966	1794.0763	346.62937	-2.4597e-005
19	Optimized	206.94005	-14.04378	1198.6929	1800.0896	347.2165	-7.0237e-005
20	Optimized	209.49735	- 14.447775	1209.9083	1809.4531	346.14737	-7.0018e-005
21	Optimized	212.492	-14.92087	1221.6175	1793.1262	329.96069	-6.6745e-005
22	Optimized	214.96705	-15.25887	1227.7381	1791.2759	325.35867	-6.5805e-005
23	Optimized	216.92255	-15.46177	1228.3994	1767.42	311.2037	-6.2947e-005
24	Optimized	218.1893	- 15.531455	1224.957	1819.3368	343.1653	-6.937e-005
25	Optimized	219.7429	-15.31957	1202.1368	1762.946	323.78338	-6.5451e-005
26	Optimized	222.2721	- 14.959335	1164.0501	1648.7644	279.84991	1.6876e-005
27	Optimized	225.13835	-14.39369	1111.046	1528.3977	240.95812	-1.2785e-006
28	Optimized	227.42	- 13.849545	1062.937	1390.9695	189.38965	-1.0048e-006
29	Optimized	229.30425	- 13.410025	1023.9011	1358.4491	193.15135	-1.3696e-005
30	Optimized	231.7128	-12.84822	973.92515	1256.7989	163.31724	-8.665e-007
31	Optimized	234.12135	- 12.286415	923.94917	1155.1083	133.45979	-7.0813e-007
32	Optimized	236.707	-11.67126	869.56369	1045.9179	101.81814	2.7991e-006
33	Optimized	239.46985	- 11.002755	810.74378	925.8155	66.43669	1.8265e-006
34	Optimized	242.30105	-10.31772	750.48162	803.17758	30.424026	-3.4783e-007
35	Optimized	243.8754	- 9.8693835	711.75839	927.42169	0	320

36	Optimized	245.5222	- 8.5801035	611.31518	785.27464	0	320
37	Optimized	247.83795	-6.69419	465.34722	601.83857	0	320
38	Optimized	250.34625	-4.5	201.41021	508.04658	0	600

Slices of Slip Surface: 383

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	383	182.4481	- 0.72519365	660.84723	129.61938	0	900
2	383	183.0271	-1.4745455	684.46155	424.27371	0	500
3	383	184.8	-3.513029	750.27727	666.78609	0	500
4	383	186.3284	-5.205638	807.28884	910.44532	0	500
5	383	187.93105	-6.6671545	887.89677	1128.0287	0	327.99
6	383	190.7245	-9	1020.881	1376.2668	0	330.77
7	383	193.57185	-10.9717	1136.5494	1634.335	287.39668	1.734e-005
8	383	195.5	-12.16847	1234.4949	1771.3454	309.95082	-6.2685e-005
9	383	196.925	-12.919765	1277.5698	1925.2509	373.93882	-7.5635e-005
10	383	198.975	-13.904135	1328.5919	2057.7521	420.98082	-8.5145e-005
11	383	200.35	-14.504	1259.3468	1614.9172	205.28869	-1.0902e-006
12	383	200.85	-14.70424	1271.7167	1801.8057	306.04702	-6.1903e-005
13	383	201.1	-14.801045	1277.9589	1824.2013	315.37321	-6.3785e-005
14	383	202.33335	-15.233355	1302.9674	1891.1113	339.56502	-6.8682e-005
15	383	204.6	-15.95104	1335.3503	1988.6021	377.1551	-2.6765e-005
16	383	206.86665	-16.531285	1357.6841	2072.0033	412.41239	-8.342e-005
17	383	209.11665	-16.977495	1371.6034	2116.801	430.24007	-8.7028e-005
18	383	211.35	-17.295735	1377.609	2121.8826	429.70657	-3.0493e-005
19	383	213.58335	-17.49307	1376.0084	2111.8102	424.81538	-3.0147e-005
20	383	215.81665	-17.57121	1367.0557	2086.4927	415.36716	-8.4019e-005
21	383	218.05	-17.53082	1350.7166	2045.578	401.17837	-8.1148e-005
22	383	220.28335	-17.37155	1326.9389	1988.6036	382.01228	-7.7265e-005
23	383	222.51665	-17.09204	1295.6596	1914.8052	357.46386	-2.5365e-005
24	383	224.75	-16.689835	1256.7693	1823.2974	327.08518	-2.3211e-005
25	383	226.98335	-16.16129	1209.9547	1712.8402	290.3411	1.7519e-005
26	383	229.1167	-15.53676	1157.7732	1665.1472	292.93253	1.7675e-005
27	383	231.1501	-14.822045	1100.564	1563.9667	267.54564	-1.8983e-005

28	383	233.1835	-13.9869	1035.8981	1444.0841	235.66632	-1.2513e-006
29	383	235.2169	-13.023275	963.17348	1303.1248	196.27099	-1.0421e-006
30	383	237.2503	-11.92095	881.80635	1137.8696	147.83818	-7.8509e-007
31	383	239.2837	-10.66684	790.95139	943.96845	88.344441	2.4311e-006
32	383	241.2253	-9.3162035	689.51997	869.61587	0	320
33	383	243.0751	-7.8652765	576.25796	711.94842	0	320
34	383	244.60105	-6.549073	474.25256	575.65525	0	320
35	383	246.6336	-4.5	212.09804	535.60452	0	600



Name: FILL, EL. +3.5 TO-1.0 Model: Undrained (Phi=0) Unit Weight: 106 pcf Cohesion: 900 psf
Name: Fill 2. -1 TO -4 (Flood Side) Model: Spatial Mohr-Coulomb Unit Weight: 101 pcf Cohesion: 500 psf Phi: 0 °
Name: BEACH SAND SP, EL. -12 TO -48/-53 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand
Name: BAY SOUND CLAY, EL. -48 TO -53 Model: Spatial Mohr-Coulomb Unit Weight: 108 pcf Cohesion: 450 psf Phi: 0 °
Name: Fill (Protected) Model: Undrained (Phi=0) Unit Weight: 106 pcf Cohesion: 600 psf
Name: Sheetpile Model: Mohr-Coulomb Unit Weight: 0.1 pcf Cohesion: 0.01 psf Phi: 0 °
Name: MARSH 1,EL. -4 TO -8 Model: Spatial Mohr-Coulomb Unit Weight: 90 pcf Cohesion Fn: Marsh Phi: 0 °
Name: BAY SOUND CLAY 2, EL. -53 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 111 pcf Cohesion Spatial Fn: Bay Sound 2 Phi: 0 °
Name: Marsh 2, EL. -8 to -10 (Flood) Model: Spatial Mohr-Coulomb Unit Weight: 98 pcf Cohesion Fn: Marsh Phi: 0 °
Name: Marsh (Protected) Model: Spatial Mohr-Coulomb Unit Weight: 101 pcf Cohesion: 320 psf Phi: 0 °
Name: BAY SOUND CLAY, EL. -48 TO -53 (protected side toe) Model: Undrained (Phi=0) Unit Weight: 111 pcf Cohesion: 425 psf
Name: BAY SOUND CLAY 2, EL. -53 TO -70 (protected side toe) Model: Spatial Mohr-Coulomb Unit Weight: 111 pcf Cohesion Fn: Bay Sound Phi: 0 °



**US Army Corps
of Engineers®**
New Orleans District

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
VERTICALSWERE ASSUMED TO VARY LINEARLY
BETWEENTHE VALUES INDICATED FOR THESE LOCATIONS.

Hw = CANAL WATER LEVEL

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

LONDON AVE OUTFALL CANAL, REACH 8,
PROTECTED SIDE STABILITY ANALYSIS,
CASE: Global Stability (Entry/Exit) OPEN
STA. 66+00 TO 69+06
ORLEANS PARISH, LOUISIANA

Name: Global Stability (Entry/Exit) OPEN
File Name: Reach 8 OPEN.gsz Directory: \\Kaci-fs-05\fsd-z\Projects\041752 - New Orleans Canals\Mod 11\Slope-W\
Last Edited By: Higgins, James


OWNER	USACE - LMVD- NEW ORLEANS	COMP'D BY	L. Almaleh
PROJECT	OUTFALL CANAL STUDY - MODIFICATION NO.11	DATE	13-Feb-11
PROJECT NO.	41752	FILE No.	03.10
TITLE	Calculation of I-Wall Stability of Reach 17 Based on Gap Condition Open Base	CKD BY	
		DATE	
TEMPLATE REV.			3.40

PURPOSE: Evaluate the stability of the Embankment at Reach 17 based on the presence of an open canal bottom.

Depth to Gap Determined based on GCAT Method, dated April 1 2009

Rev 1 Open no Silty Sand

REFERENCES:

	1. "Stability Analysis of I-Walls Containing Gaps Between the I-wall and Backfill Soils", Thomas Brandon, April 1, 2009.
	2. "Analysis of the Stability of I-Walls with Gaps between the I-Wall and the Levee Fill", Brandon, Wright, Duncan, Jour Geo, ASCE, May 2008
	3. B&V Calculation, "Strength Lines"
	4. USACE Drawing H-4-40295, "Typical Sections, East Side", London Avenue, Outfall Canal, Parallel Protection, Dwg 16 Rev 1
	5. B&V Calculation, Calibration of London Avenue Load Test Seepage Model"
	6. USACE "Design Procedure for Earthen Embankments" June 12, 2008
	7.
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	25.

ASSUMPTIONS:

- Active Earth Pressures are not corrected for sloping backfill
- Passive Pressure are not included in gap depth analysis
- Seepage analysis assumes a 4 feet separation between new and existing sheet pile walls
-

DISCUSSION: See Page 2

RESULTS: See Slope Stability Analysis Outputs

Revision No.	List of Revisions	Description of Revision	Revision Date
0		Initial Issue	
rev 1		added additional underseepage points	7/9/2010
rev 2		Minor seep/w update	8/27/2010

OWNER	USACE - LMVD- NEW ORLEANS			COMP'D BY	L. Almaleh
PROJECT	OUTFALL CANAL STUDY - MODIFICATION NO.11			DATE	13-Feb-11
PROJECT NO.	41752	FILE No.	.03.10	CKD BY	0
TITLE	Calculation of I-Wall Stability of Reach 17 Based on Gap Condition Open Base			DATE	1/0/1900
TEMPLATE REV.					3.40

Step 1: Gap Determination

The intent is to use excel spreadsheet for evaluating the gap depth between an I-wall and backfill using the GCAT method (Reference 1).

Depths are determined as the distance below the surface.

U	Hydrostatic Pressure	Assume water is 62.4 pounds per cubic foot
=	(water elevation-flood side ground elevation)*62.4	
γ'_t	Effective Unit Weight	
=	Total Unit Weight - 62.4	
σ_v	Overburden Pressure	
=	Total Unit Weight * Depth +(water elevation-flood side ground elevation)*62.4	
σ'_v	Effective Overburden Pressure	
=	(Effective Unit Weight x 0.1 feet) + Effective Unit Weight of 0.1 thick layer above	
σ_{ha}	Total Lateral Pressure on Wall	
	For phi=0 layers	
=	Overburden Pressure -(Undrained Shear Strength x 2) (Eq 2 Ref 1)	
	For phi≠0 layers	
=	(Effective Overburden Pressure * $\tan^2(45-\phi/2)$)+Water Pressure-(Undrained Shear Strength*2*/($\tan^2(45-\phi/2)$)) (Eq6 Ref 1)	
Gap	If the Total Lateral Pressure on Wall greater than the hydrostatic water pressure = "No Gap"	

Step 2: Seepage Analysis

The intent is to use Seep/w to evaluate the pore pressures within the embankment based on the depth of the gap from step 1.

The seep/w model is run using 1/2 the canal assuming a divide between the two sides at the center of the canal. Model geometry is based on Ref 3. Depth of the sheet piles are based on Ref 4
Permeability of soil layers and boundary conditions are based on Ref 5. Other soils properties are based on Ref 3.

Check the underseepage factor of safety based on the following formula from page 3-8 or ref 6

$$FS_g = \frac{\text{Apparent underseepage factor of safety}}{\text{Average Effective Unit Weight of Soil * soil thickness}} = \frac{\text{Unit Weight Water * Excess Head @ Toe}}{\text{Unit Weight Water * Excess Head @ Toe}}$$

Adjust the water level of the canal to meet a minimum factor of safety of 1.6 per ref 6

Step 3: Determine Loads for Slope Stability Model

The intent is to determine the input loads for the slope/w model to use when evaluating stability based on the gap method. Since the gap method is completed by running a gap all the way to the bottom of the sheet pile, a load has to be replaced between the gap and the bottom of the sheet pile.

For phi=0 layers

Based on Ref 1, the pore pressures within the clay below the gap are hydrostatic; therefore soil pressure on the wall is calculated based on:

$$\sigma'_{ha} = \text{Effective Soil Pressure on Wall} = \text{Total Lateral Pressure on Wall - Hydrostatic Pressure}$$

Since the Slope/W model will use the pore pressures from the seepage model (not hydrostatic) an additional load is required to act on the wall
This load is calculated based on the difference between the hydrostatic and FEM pore water pressures.

For phi≠0 layers

Effective stress is calculated based on the FEM pore water pressure as indicated below:

$$\sigma'_{ha} = \text{Effective Soil Pressure on Wall} = \text{Total Lateral Pressure on Wall - Pore Pressure (from FEM Model)}$$

Soil pressures (and the additional water load for phi=0 soils) are determined for each node along the wall and converted to a point load to be input into the slope/w model.

Step 4: Slope Stability of the Gap Model

The intent of the slope stability model is to check the stability of the embankment based on the gap method
Analysis is completed for both local and global failures assuming the gap is present. The local cases are analyzed by removing the soil from the flood side of the sheet pile wall. The active pressure from the removed soil is replaced by point loads determined from step 3.

Two slope stability runs are completed both using the pore pressures generated during the seepage analysis assuming the crack is present. The cases are run with block specified and entry/exit failure surfaces.

General Spreadsheet Information

All Elevations to be entered as NAVD.

Inputs are shown as	
Outputs are shown as	
Check points are shown as	

geotech

OWNER	USACE - LMVD- NEW ORLEANS			COMP'D BY	L. Almaleh	
PROJECT	OUTFALL CANAL STUDY - MODIFICATION NO.11				DATE	13-Feb-11
PROJECT NO.	41752	FILE No.	.03.10	CKD BY	0	
TITLE	Calculation of I-Wall Stability of Reach 17 Based on Gap Condition Open Base				DATE	1/0/1900
					TEMPLATE REV.	3.40

Reach Number 17 Stations 118+90 to 119+63 West

Water Elevation 10 ft (NAVD)

Sheet Pile Tip Elevation -17.5 ft (NAVD)

Centerline Profile

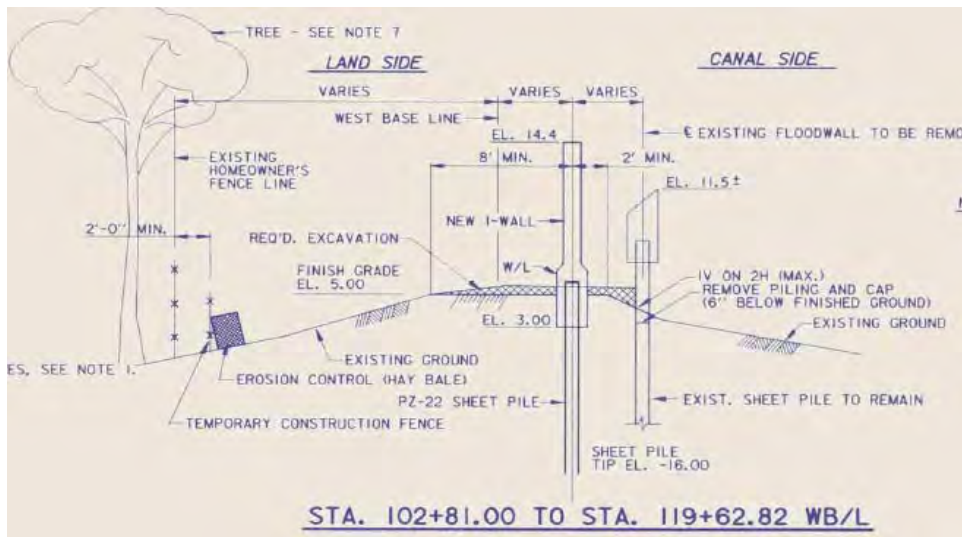
Layer Number	Soil Type	ELEVATION (NAVD)		Total Unit Weight (psf)	phi (degrees)	Undrained Shear Strength (psf)	Strength Increase w/Depth (psf/ft)
		Top	Bottom				
1	Fill	3.4	-3.5	110	0	520	
2	Marsh	-3.5	-12	90	0	320	
3	Sand	-12	-46.5	122	30	0	
4	Clay 1	-46.5	-61.5	110	0	750	
5	Clay 2	-61.5	-70	102	0	1050	
6							
7							

If Non-uniform strength functions are used, the spreadsheets will have to be modified.

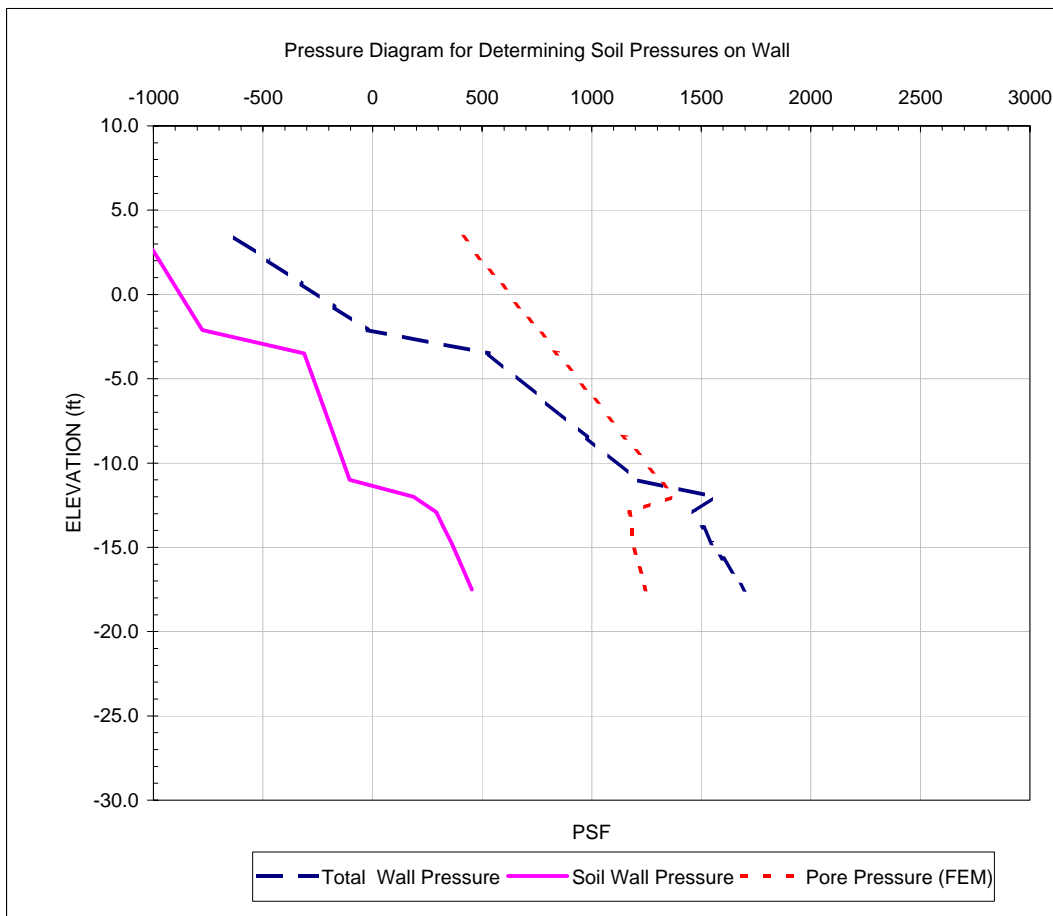
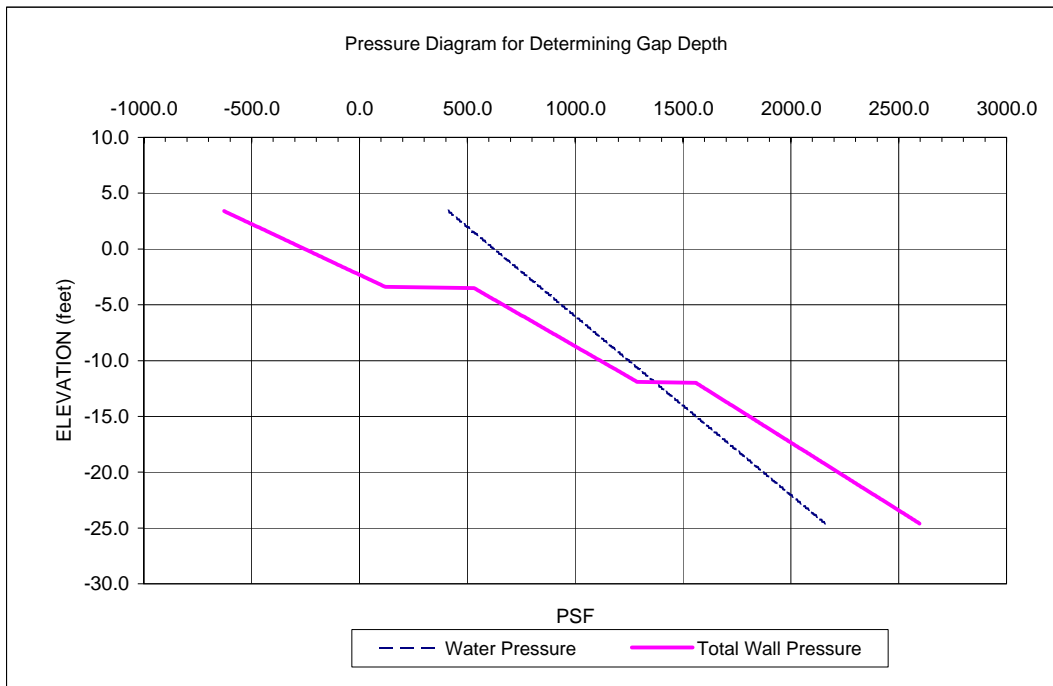
Toe Profile

Layer Number	Soil Type	ELEVATION (NAVD)		Total Unit Weight (psf)	phi (degrees)	Undrained Shear Strength (psf)	Strength Increase w/Depth (psf/ft)
		Top	Bottom				
1	Fill	-2.2	-7	100	0	600	
2	Marsh	-7	-11	85	0	200	
3	Marsh	-11	-14.5	116	0	300	
4	Sand	-14.5	-46.5	122	30		
5	Clay	-46.5	-61.5	109	0	750	
6	Clay	-61.5	-70	119.0	0	1050	
7							

Typical Section (Ref 4) (note elevations in NGVD need to subtract 1.5' to get NAVD)



OWNER	USACE - LMVD- NEW ORLEANS	COMP'D BY	L. Almaleh
PROJECT	OUTFALL CANAL STUDY - MODIFICATION NO.11	DATE	13-Feb-11
PROJECT NO.	41752	FILE NO.	.03.10
TITLE	Calculation of I-Wall Stability of Reach 17 Based on Gap Condition Open Base	CKD BY	0
		DATE	1/0/1900
		TEMPLATE REV.	3.40



OWNER	USACE - LMVD- NEW ORLEANS			COMP'D BY	L. Almaleh
PROJECT	OUTFALL CANAL STUDY - MODIFICATION NO.11			DATE	2/13/2011
PROJECT NO.	41752	FILE NO.	.03.10	CKD BY	0
TITLE	Calculation of I-Wall Stability of Reach 17 Based on Gap Condition Open Base			DATE	1/0/1900
				TEMPLATE REV.	3.40

Water
Elevation
10

Sheet Pile
Tip
Elevation
-17.5

Layer Number	Soil Type	ELEVATION		Depth (ft)	Total Unit Weight (psf)	phi	Undrained Shear Strength (psf)	Strength Increase w/Depth (psf/ft)
		Top	Bottom					
1	Fill	3.4	-3.5	0.0	110.0	0	520	0
2	Marsh	-3.5	-12.0	6.9	90.0	0	320	0
3	Sand	-12.0	-46.5	15.4	122.0	30	0	0
4	Clay 1	-46.5	-61.5	49.9	110.0	0	750	0
5	Clay 2	-61.5	-70.0	64.9	102.0	0	1050	0
6	0	0.0	0.0		0.0	0	0	0
7	0	0.0	0.0		0.0	0	0	0

GAP ELEVATION = -12.0

Flood Side Ground Elevation	Depth	Hydrostatic Water Pressure	Material Type	ϕ	Undrained Shear Strength	Total Unit Weight	γ'_t	σ_v	σ'_v	σ_{ha}	GAP?
ft	ft	psf	TYPE	phi	(psf)	psf	psf	psf	psf	psf	
3.4	0	411.8	Fill	0	520	110	47.6	411.8	0.0	-628.2	
3.3	0.1	418.1	Fill	0	520	110	47.6	422.8	4.8	-617.2	
3.2	0.2	424.3	Fill	0	520	110	47.6	433.8	9.5	-606.2	
3.1	0.3	430.6	Fill	0	520	110	47.6	444.8	14.3	-595.2	
3.0	0.4	436.8	Fill	0	520	110	47.6	455.8	19.0	-584.2	
2.9	0.5	443.0	Fill	0	520	110	47.6	466.8	23.8	-573.2	
2.8	0.6	449.3	Fill	0	520	110	47.6	477.8	28.6	-562.2	
2.7	0.7	455.5	Fill	0	520	110	47.6	488.8	33.3	-551.2	
2.6	0.8	461.8	Fill	0	520	110	47.6	499.8	38.1	-540.2	
2.5	0.9	468.0	Fill	0	520	110	47.6	510.8	42.8	-529.2	
2.4	1	474.2	Fill	0	520	110	47.6	521.8	47.6	-518.2	
2.3	1.1	480.5	Fill	0	520	110	47.6	532.8	52.4	-507.2	
2.2	1.2	486.7	Fill	0	520	110	47.6	543.8	57.1	-496.2	
2.1	1.3	493.0	Fill	0	520	110	47.6	554.8	61.9	-485.2	
2.0	1.4	499.2	Fill	0	520	110	47.6	565.8	66.6	-474.2	
1.9	1.5	505.4	Fill	0	520	110	47.6	576.8	71.4	-463.2	
1.8	1.6	511.7	Fill	0	520	110	47.6	587.8	76.2	-452.2	
1.7	1.7	517.9	Fill	0	520	110	47.6	598.8	80.9	-441.2	
1.6	1.8	524.2	Fill	0	520	110	47.6	609.8	85.7	-430.2	
1.5	1.9	530.4	Fill	0	520	110	47.6	620.8	90.4	-419.2	
1.4	2	536.6	Fill	0	520	110	47.6	631.8	95.2	-408.2	
1.3	2.1	542.9	Fill	0	520	110	47.6	642.8	100.0	-397.2	
1.2	2.2	549.1	Fill	0	520	110	47.6	653.8	104.7	-386.2	
1.1	2.3	555.4	Fill	0	520	110	47.6	664.8	109.5	-375.2	
1.0	2.4	561.6	Fill	0	520	110	47.6	675.8	114.2	-364.2	
0.9	2.5	567.8	Fill	0	520	110	47.6	686.8	119.0	-353.2	
0.8	2.6	574.1	Fill	0	520	110	47.6	697.8	123.8	-342.2	
0.7	2.7	580.3	Fill	0	520	110	47.6	708.8	128.5	-331.2	
0.6	2.8	586.6	Fill	0	520	110	47.6	719.8	133.3	-320.2	
0.5	2.9	592.8	Fill	0	520	110	47.6	730.8	138.0	-309.2	
0.4	3	599.0	Fill	0	520	110	47.6	741.8	142.8	-298.2	
0.3	3.1	605.3	Fill	0	520	110	47.6	752.8	147.6	-287.2	
0.2	3.2	611.5	Fill	0	520	110	47.6	763.8	152.3	-276.2	
0.1	3.3	617.8	Fill	0	520	110	47.6	774.8	157.1	-265.2	
0.0	3.4	624.0	Fill	0	520	110	47.6	785.8	161.8	-254.2	
-0.1	3.5	630.2	Fill	0	520	110	47.6	796.8	166.6	-243.2	
-0.2	3.6	636.5	Fill	0	520	110	47.6	807.8	171.4	-232.2	
-0.3	3.7	642.7	Fill	0	520	110	47.6	818.8	176.1	-221.2	
-0.4	3.8	649.0	Fill	0	520	110	47.6	829.8	180.9	-210.2	
-0.5	3.9	655.2	Fill	0	520	110	47.6	840.8	185.6	-199.2	
-0.6	4	661.4	Fill	0	520	110	47.6	851.8	190.4	-188.2	
-0.7	4.1	667.7	Fill	0	520	110	47.6	862.8	195.2	-177.2	
-0.8	4.2	673.9	Fill	0	520	110	47.6	873.8	199.9	-166.2	
-0.9	4.3	680.2	Fill	0	520	110	47.6	884.8	204.7	-155.2	
-1.0	4.4	686.4	Fill	0	520	110	47.6	895.8	209.4	-144.2	
-1.1	4.5	692.6	Fill	0	520	110	47.6	906.8	214.2	-133.2	
-1.2	4.6	698.9	Fill	0	520	110	47.6	917.8	219.0	-122.2	
-1.3	4.7	705.1	Fill	0	520	110	47.6	928.8	223.7	-111.2	
-1.4	4.8	711.4	Fill	0	520	110	47.6	939.8	228.5	-100.2	

Flood Side Ground Elevation	Depth	Hydrostatic Water Pressure	Material Type	ϕ	Undrained Shear Strength	Total Unit Weight	γ'_t	σ_v	σ'_v	σ_{ha}	GAP?
ft	ft	psf	TYPE	phi	(psf)	psf	psf	psf	psf	psf	
-1.5	4.9	717.6	Fill	0	520	110	47.6	950.8	233.2	-89.2	
-1.6	5	723.8	Fill	0	520	110	47.6	961.8	238.0	-78.2	
-1.7	5.1	730.1	Fill	0	520	110	47.6	972.8	242.8	-67.2	
-1.8	5.2	736.3	Fill	0	520	110	47.6	983.8	247.5	-56.2	
-1.9	5.3	742.6	Fill	0	520	110	47.6	994.8	252.3	-45.2	
-2.0	5.4	748.8	Fill	0	520	110	47.6	1005.8	257.0	-34.2	
-2.1	5.5	755.0	Fill	0	520	110	47.6	1016.8	261.8	-23.2	
-2.2	5.6	761.3	Fill	0	520	110	47.6	1027.8	266.6	-12.2	
-2.3	5.7	767.5	Fill	0	520	110	47.6	1038.8	271.3	-1.2	
-2.4	5.8	773.8	Fill	0	520	110	47.6	1049.8	276.1	9.8	
-2.5	5.9	780.0	Fill	0	520	110	47.6	1060.8	280.8	20.8	
-2.6	6	786.2	Fill	0	520	110	47.6	1071.8	285.6	31.8	
-2.7	6.1	792.5	Fill	0	520	110	47.6	1082.8	290.4	42.8	
-2.8	6.2	798.7	Fill	0	520	110	47.6	1093.8	295.1	53.8	
-2.9	6.3	805.0	Fill	0	520	110	47.6	1104.8	299.9	64.8	
-3.0	6.4	811.2	Fill	0	520	110	47.6	1115.8	304.6	75.8	
-3.1	6.5	817.4	Fill	0	520	110	47.6	1126.8	309.4	86.8	
-3.2	6.6	823.7	Fill	0	520	110	47.6	1137.8	314.2	97.8	
-3.3	6.7	829.9	Fill	0	520	110	47.6	1148.8	318.9	108.8	
-3.4	6.8	836.2	Fill	0	520	110	47.6	1159.8	323.7	119.8	
-3.5	6.9	842.4	Marsh	0	320	90	27.6	1170.8	328.4	530.8	
-3.6	7	848.6	Marsh	0	320	90	27.6	1179.8	331.2	539.8	
-3.7	7.1	854.9	Marsh	0	320	90	27.6	1188.8	334.0	548.8	
-3.8	7.2	861.1	Marsh	0	320	90	27.6	1197.8	336.7	557.8	
-3.9	7.3	867.4	Marsh	0	320	90	27.6	1206.8	339.5	566.8	
-4.0	7.4	873.6	Marsh	0	320	90	27.6	1215.8	342.2	575.8	
-4.1	7.5	879.8	Marsh	0	320	90	27.6	1224.8	345.0	584.8	
-4.2	7.6	886.1	Marsh	0	320	90	27.6	1233.8	347.8	593.8	
-4.3	7.7	892.3	Marsh	0	320	90	27.6	1242.8	350.5	602.8	
-4.4	7.8	898.6	Marsh	0	320	90	27.6	1251.8	353.3	611.8	
-4.5	7.9	904.8	Marsh	0	320	90	27.6	1260.8	356.0	620.8	
-4.6	8	911.0	Marsh	0	320	90	27.6	1269.8	358.8	629.8	
-4.7	8.1	917.3	Marsh	0	320	90	27.6	1278.8	361.6	638.8	
-4.8	8.2	923.5	Marsh	0	320	90	27.6	1287.8	364.3	647.8	
-4.9	8.3	929.8	Marsh	0	320	90	27.6	1296.8	367.1	656.8	
-5.0	8.4	936.0	Marsh	0	320	90	27.6	1305.8	369.8	665.8	
-5.1	8.5	942.2	Marsh	0	320	90	27.6	1314.8	372.6	674.8	
-5.2	8.6	948.5	Marsh	0	320	90	27.6	1323.8	375.4	683.8	
-5.3	8.7	954.7	Marsh	0	320	90	27.6	1332.8	378.1	692.8	
-5.4	8.8	961.0	Marsh	0	320	90	27.6	1341.8	380.9	701.8	
-5.5	8.9	967.2	Marsh	0	320	90	27.6	1350.8	383.6	710.8	
-5.6	9	973.4	Marsh	0	320	90	27.6	1359.8	386.4	719.8	
-5.7	9.1	979.7	Marsh	0	320	90	27.6	1368.8	389.2	728.8	
-5.8	9.2	985.9	Marsh	0	320	90	27.6	1377.8	391.9	737.8	
-5.9	9.3	992.2	Marsh	0	320	90	27.6	1386.8	394.7	746.8	
-6.0	9.4	998.4	Marsh	0	320	90	27.6	1395.8	397.4	755.8	
-6.1	9.5	1004.6	Marsh	0	320	90	27.6	1404.8	400.2	764.8	
-6.2	9.6	1010.9	Marsh	0	320	90	27.6	1413.8	403.0	773.8	
-6.3	9.7	1017.1	Marsh	0	320	90	27.6	1422.8	405.7	782.8	
-6.4	9.8	1023.4	Marsh	0	320	90	27.6	1431.8	408.5	791.8	
-6.5	9.9	1029.6	Marsh	0	320	90	27.6	1440.8	411.2	800.8	
-6.6	10	1035.8	Marsh	0	320	90	27.6	1449.8	414.0	809.8	
-6.7	10.1	1042.1	Marsh	0	320	90	27.6	1458.8	416.8	818.8	
-6.8	10.2	1048.3	Marsh	0	320	90	27.6	1467.8	419.5	827.8	
-6.9	10.3	1054.6	Marsh	0	320	90	27.6	1476.8	422.3	836.8	
-7.0	10.4	1060.8	Marsh	0	320	90	27.6	1485.8	425.0	845.8	
-7.1	10.5	1067.0	Marsh	0	320	90	27.6	1494.8	427.8	854.8	
-7.2	10.6	1073.3	Marsh	0	320	90	27.6	1503.8	430.6	863.8	
-7.3	10.7	1079.5	Marsh	0	320	90	27.6	1512.8	433.3	872.8	
-7.4	10.8	1085.8	Marsh	0	320	90	27.6	1521.8	436.1	881.8	
-7.5	10.9	1092.0	Marsh	0	320	90	27.6	1530.8	438.8	890.8	
-7.6	11	1098.2	Marsh	0	320	90	27.6	1539.8	441.6	899.8	
-7.7	11.1	1104.5	Marsh	0	320	90	27.6	1548.8	444.4	908.8	
-7.8	11.2	1110.7	Marsh	0	320	90	27.6	1557.8	447.1	917.8	
-7.9	11.3	1117.0	Marsh	0	320	90	27.6	1566.8	449.9	926.8	
-8.0	11.4	1123.2	Marsh	0	320	90	27.6	1575.8	452.6	935.8	
-8.1	11.5	1129.4	Marsh	0	320	90	27.6	1584.8	455.4	944.8	
-8.2	11.6	1135.7	Marsh	0	320	90	27.6	1593.8	458.2	953.8	
-8.3	11.7	1141.9	Marsh	0	320	90	27.6	1602.8	460.9	962.8	
-8.4	11.8	1148.2	Marsh	0	320	90	27.6	1611.8	463.7	971.8	
-8.5	11.9	1154.4	Marsh	0	320	90	27.6	1620.8	466.4	980.8	
-8.6	12	1160.6	Marsh	0	320	90	27.6	1629.8	469.2	989.8	
-8.7	12.1	1166.9	Marsh	0	320	90	27.6	1638.8	472.0	998.8	
-8.8	12.2	1173.1	Marsh	0	320	90	27.6	1647.8	474.7	1007.8	
-8.9	12.3	1179.4	Marsh	0	320	90	27.6	1656.8	477.5	1016.8	
-9.0	12.4	1185.6	Marsh	0	320	90	27.6	1665.8	480.2	1025.8	

Flood Side Ground Elevation	Depth	Hydrostatic Water Pressure	Material Type	ϕ	Undrained Shear Strength	Total Unit Weight	γ'_t	σ_v	σ'_v	σ_{ha}	GAP?
ft	ft	psf	TYPE	phi	(psf)	psf	psf	psf	psf	psf	
-9.1	12.5	1191.8	Marsh	0	320	90	27.6	1674.8	483.0	1034.8	
-9.2	12.6	1198.1	Marsh	0	320	90	27.6	1683.8	485.8	1043.8	
-9.3	12.7	1204.3	Marsh	0	320	90	27.6	1692.8	488.5	1052.8	
-9.4	12.8	1210.6	Marsh	0	320	90	27.6	1701.8	491.3	1061.8	
-9.5	12.9	1216.8	Marsh	0	320	90	27.6	1710.8	494.0	1070.8	
-9.6	13	1223.0	Marsh	0	320	90	27.6	1719.8	496.8	1079.8	
-9.7	13.1	1229.3	Marsh	0	320	90	27.6	1728.8	499.6	1088.8	
-9.8	13.2	1235.5	Marsh	0	320	90	27.6	1737.8	502.3	1097.8	
-9.9	13.3	1241.8	Marsh	0	320	90	27.6	1746.8	505.1	1106.8	
-10.0	13.4	1248.0	Marsh	0	320	90	27.6	1755.8	507.8	1115.8	
-10.1	13.5	1254.2	Marsh	0	320	90	27.6	1764.8	510.6	1124.8	
-10.2	13.6	1260.5	Marsh	0	320	90	27.6	1773.8	513.4	1133.8	
-10.3	13.7	1266.7	Marsh	0	320	90	27.6	1782.8	516.1	1142.8	
-10.4	13.8	1273.0	Marsh	0	320	90	27.6	1791.8	518.9	1151.8	
-10.5	13.9	1279.2	Marsh	0	320	90	27.6	1800.8	521.6	1160.8	
-10.6	14	1285.4	Marsh	0	320	90	27.6	1809.8	524.4	1169.8	
-10.7	14.1	1291.7	Marsh	0	320	90	27.6	1818.8	527.2	1178.8	
-10.8	14.2	1297.9	Marsh	0	320	90	27.6	1827.8	529.9	1187.8	
-10.9	14.3	1304.2	Marsh	0	320	90	27.6	1836.8	532.7	1196.8	
-11.0	14.4	1310.4	Marsh	0	320	90	27.6	1845.8	535.4	1205.8	
-11.1	14.5	1316.6	Marsh	0	320	90	27.6	1854.8	538.2	1214.8	
-11.2	14.6	1322.9	Marsh	0	320	90	27.6	1863.8	541.0	1223.8	
-11.3	14.7	1329.1	Marsh	0	320	90	27.6	1872.8	543.7	1232.8	
-11.4	14.8	1335.4	Marsh	0	320	90	27.6	1881.8	546.5	1241.8	
-11.5	14.9	1341.6	Marsh	0	320	90	27.6	1890.8	549.2	1250.8	
-11.6	15	1347.8	Marsh	0	320	90	27.6	1899.8	552.0	1259.8	
-11.7	15.1	1354.1	Marsh	0	320	90	27.6	1908.8	554.8	1268.8	
-11.8	15.2	1360.3	Marsh	0	320	90	27.6	1917.8	557.5	1277.8	
-11.9	15.3	1366.6	Marsh	0	320	90	27.6	1926.8	560.3	1286.8	
-12.0	15.4	1372.8	Sand	30	0	122	59.6	1935.8	563.0	1560.5	NO GAP
-12.1	15.5	1379.0	Sand	30	0	122	59.6	1948.0	569.0	1568.7	NO GAP
-12.2	15.6	1385.3	Sand	30	0	122	59.6	1960.2	575.0	1576.9	NO GAP
-12.3	15.7	1391.5	Sand	30	0	122	59.6	1972.4	580.9	1585.2	NO GAP
-12.4	15.8	1397.8	Sand	30	0	122	59.6	1984.6	586.9	1593.4	NO GAP
-12.5	15.9	1404.0	Sand	30	0	122	59.6	1996.8	592.8	1601.6	NO GAP
-12.6	16	1410.2	Sand	30	0	122	59.6	2009.0	598.8	1609.8	NO GAP
-12.7	16.1	1416.5	Sand	30	0	122	59.6	2021.2	604.8	1618.1	NO GAP
-12.8	16.2	1422.7	Sand	30	0	122	59.6	2033.4	610.7	1626.3	NO GAP
-12.9	16.3	1429.0	Sand	30	0	122	59.6	2045.6	616.7	1634.5	NO GAP
-13.0	16.4	1435.2	Sand	30	0	122	59.6	2057.8	622.6	1642.7	NO GAP
-13.1	16.5	1441.4	Sand	30	0	122	59.6	2070.0	628.6	1651.0	NO GAP
-13.2	16.6	1447.7	Sand	30	0	122	59.6	2082.2	634.6	1659.2	NO GAP
-13.3	16.7	1453.9	Sand	30	0	122	59.6	2094.4	640.5	1667.4	NO GAP
-13.4	16.8	1460.2	Sand	30	0	122	59.6	2106.6	646.5	1675.7	NO GAP
-13.5	16.9	1466.4	Sand	30	0	122	59.6	2118.8	652.4	1683.9	NO GAP
-13.6	17	1472.6	Sand	30	0	122	59.6	2131.0	658.4	1692.1	NO GAP
-13.7	17.1	1478.9	Sand	30	0	122	59.6	2143.2	664.4	1700.3	NO GAP
-13.8	17.2	1485.1	Sand	30	0	122	59.6	2155.4	670.3	1708.6	NO GAP
-13.9	17.3	1491.4	Sand	30	0	122	59.6	2167.6	676.3	1716.8	NO GAP
-14.0	17.4	1497.6	Sand	30	0	122	59.6	2179.8	682.2	1725.0	NO GAP
-14.1	17.5	1503.8	Sand	30	0	122	59.6	2192.0	688.2	1733.2	NO GAP
-14.2	17.6	1510.1	Sand	30	0	122	59.6	2204.2	694.2	1741.5	NO GAP
-14.3	17.7	1516.3	Sand	30	0	122	59.6	2216.4	700.1	1749.7	NO GAP
-14.4	17.8	1522.6	Sand	30	0	122	59.6	2228.6	706.1	1757.9	NO GAP
-14.5	17.9	1528.8	Sand	30	0	122	59.6	2240.8	712.0	1766.1	NO GAP
-14.6	18	1535.0	Sand	30	0	122	59.6	2253.0	718.0	1774.4	NO GAP
-14.7	18.1	1541.3	Sand	30	0	122	59.6	2265.2	724.0	1782.6	NO GAP
-14.8	18.2	1547.5	Sand	30	0	122	59.6	2277.4	729.9	1790.8	NO GAP
-14.9	18.3	1553.8	Sand	30	0	122	59.6	2289.6	735.9	1799.1	NO GAP
-15.0	18.4	1560.0	Sand	30	0	122	59.6	2301.8	741.8	1807.3	NO GAP
-15.1	18.5	1566.2	Sand	30	0	122	59.6	2314.0	747.8	1815.5	NO GAP
-15.2	18.6	1572.5	Sand	30	0	122	59.6	2326.2	753.8	1823.7	NO GAP
-15.3	18.7	1578.7	Sand	30	0	122	59.6	2338.4	759.7	1832.0	NO GAP
-15.4	18.8	1585.0	Sand	30	0	122	59.6	2350.6	765.7	1840.2	NO GAP
-15.5	18.9	1591.2	Sand	30	0	122	59.6	2362.8	771.6	1848.4	NO GAP
-15.6	19	1597.4	Sand	30	0	122	59.6	2375.0	777.6	1856.6	NO GAP
-15.7	19.1	1603.7	Sand	30	0	122	59.6	2387.2	783.6	1864.9	NO GAP
-15.8	19.2	1609.9	Sand	30	0	122	59.6	2399.4	789.5	1873.1	NO GAP
-15.9	19.3	1616.2	Sand	30	0	122	59.6	2411.6	795.5	1881.3	NO GAP
-16.0	19.4	1622.4	Sand	30	0	122	59.6	2423.8	801.4	1889.5	NO GAP
-16.1	19.5	1628.6	Sand	30	0	122	59.6	2436.0	807.4	1897.8	NO GAP
-16.2	19.6	1634.9	Sand	30	0	122	59.6	2448.2	813.4	1906.0	NO GAP
-16.3	19.7	1641.1	Sand	30	0	122	59.6	2460.4	819.3	1914.2	NO GAP
-16.4	19.8	1647.4	Sand	30	0	122	59.6	2472.6	825.3	1922.5	NO GAP
-16.5	19.9	1653.6	Sand	30	0	122	59.6	2484.8	831.2	1930.7	NO GAP
-16.6	20	1659.8	Sand	30	0	122	59.6	2497.0	837.2	1938.9	NO GAP

Flood Side Ground Elevation	Depth	Hydrostatic Water Pressure	Material Type	ϕ	Undrained Shear Strength	Total Unit Weight	γ'_t	σ_v	σ'_v	σ_{ha}	GAP?
ft	ft	psf	TYPE	phi	(psf)	psf	psf	psf	psf	psf	
-16.7	20.1	1666.1	Sand	30	0	122	59.6	2509.2	843.2	1947.1	NO GAP
-16.8	20.2	1672.3	Sand	30	0	122	59.6	2521.4	849.1	1955.4	NO GAP
-16.9	20.3	1678.6	Sand	30	0	122	59.6	2533.6	855.1	1963.6	NO GAP
-17.0	20.4	1684.8	Sand	30	0	122	59.6	2545.8	861.0	1971.8	NO GAP
-17.1	20.5	1691.0	Sand	30	0	122	59.6	2558.0	867.0	1980.0	NO GAP
-17.2	20.6	1697.3	Sand	30	0	122	59.6	2570.2	873.0	1988.3	NO GAP
-17.3	20.7	1703.5	Sand	30	0	122	59.6	2582.4	878.9	1996.5	NO GAP
-17.4	20.8	1709.8	Sand	30	0	122	59.6	2594.6	884.9	2004.7	NO GAP
-17.5	20.9	1716.0	Sand	30	0	122	59.6	2606.8	890.8	2012.9	NO GAP
-17.6	21	1722.2	Sand	30	0	122	59.6	2619.0	896.8	2021.2	NO GAP
-17.7	21.1	1728.5	Sand	30	0	122	59.6	2631.2	902.8	2029.4	NO GAP
-17.8	21.2	1734.7	Sand	30	0	122	59.6	2643.4	908.7	2037.6	NO GAP
-17.9	21.3	1741.0	Sand	30	0	122	59.6	2655.6	914.7	2045.9	NO GAP
-18.0	21.4	1747.2	Sand	30	0	122	59.6	2667.8	920.6	2054.1	NO GAP

OWNER	USACE - LMVD- NEW ORLEANS			COMP'D BY	L. Almaleh
PROJECT	OUTFALL CANAL STUDY - MODIFICATION NO.11			DATE	13-Feb-11
PROJECT NO.	41752	FILE No.	.03.10	CKD BY	0
TITLE	Calculation of I-Wall Stability of Reach 17 Based on Gap Condition Open Base			DATE	1/0/1900
TEMPLATE REV.					3.40

	@Toe	@Midslope	@Sheetpile
Total Head @ Toe, bottom of blanket	2.1 ft	4.0	5.9
Elevation of Toe Ground Surface	-2.2 ft	2.1	5.5
Excess Head (Total Head - Toe Elevation)	4.3 ft	1.9	0.4
Average Total Unit Weight of Soil Blanket	97.8 pcf	97.8	97.8
Blanket Thickness	12.3 ft	15.3	17.5
Hw=7 ft	FS_g 1.63	4.50	NA

OWNER	USACE - LMVD- NEW ORLEANS			COMP'D BY	L. Almaleh
PROJECT	OUTFALL CANAL STUDY - MODIFICATION NO.11			DATE	13-Feb-11
PROJECT NO.	41752	FILE No.	.03.10	CKD BY	0
TITLE	Calculation of I-Wall Stability of Reach 17 Based on Gap Condition Open Base			DATE	1/0/1900
TEMPLATE REV.					3.40

	@Toe	@Midslope	@Sheetpile
Total Head @ Toe, bottom of blanket	2.3 ft	4.3	5.9
Elevation of Toe Ground Surface	-2.2 ft	2.1	5.5
Excess Head (Total Head - Toe Elevation)	4.5 ft	2.2	0.4
Minimum Total Unit Weight of Soil Blanket	85.0 pcf	85.0	90.0
Blanket Thickness	12.3 ft	15.3	17.5
Hw=10 ft	FS_g 0.98	2.52	NA

COMP'D BY	L. Almaleh
DATE	13-Feb-11
CKD BY	0
DATE	1/0/1900
EMPLATE REV.	3.40

Reach	17	ft
Hw=	10	ft
Sheet Pile Wall Tip Elevation=	-17.5	ft
Gap Depth	-12	ft

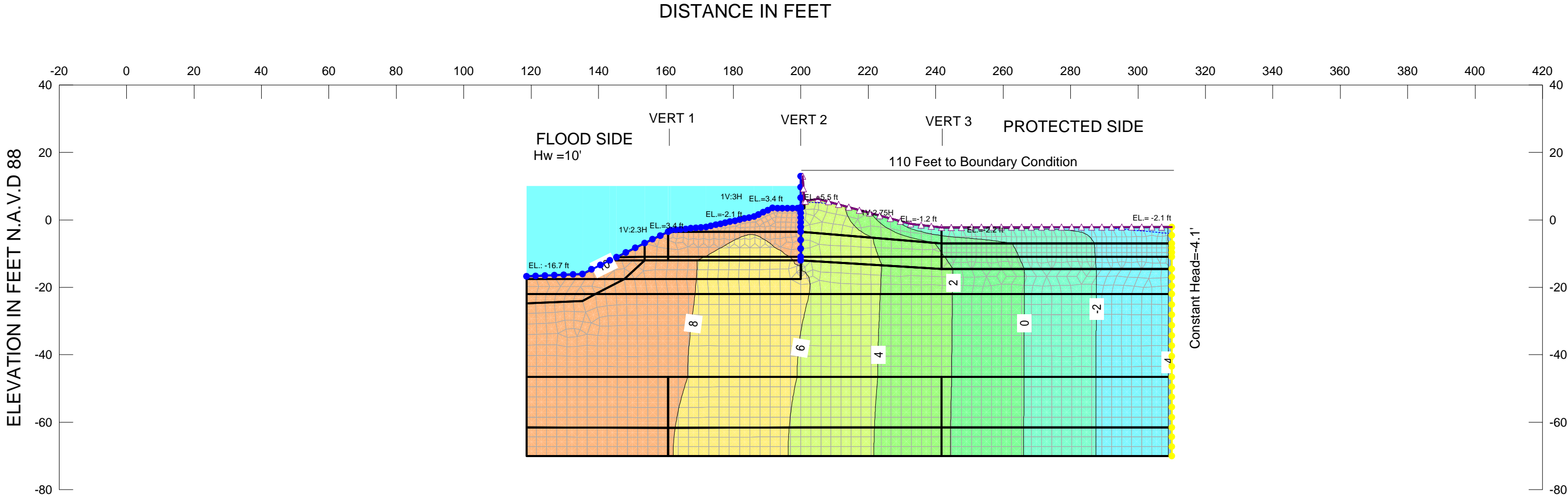
Layer Number	Material Type	Top (ft)	Bottom (ft)	Depth (ft)	Total Unit Weight (psf)	Phi	Undrained Shear Strength (psf)	Strength Increase w/Depth
1	Fill	3.4	-3.5	0.0	110.0	0.0	520.0	0
2	Marsh	-3.5	-12.0	6.9	90.0	0.0	320.0	0
3	Sand	-12	-46.5	15.4	122.0	30.0	0.0	0
4	Clay 1	-46.5	-61.5	49.9	110.0	0.0	750.0	0
5	Clay 2	-61.5	-70.0	64.9	102.0	0.0	1050.0	0
6	0	0	0.0		0.0	0.0	0.0	0
7	0	0	0.0		0.0	0.0	0.0	0

[illegible]

Forces on Last Slice from Slope/W Model		
Water Force Against Soil	21783.3	lbs
Total Point Loads on Soil	1936.6	lbs

Addtl Load to account for
water above embankment 1359.1 lbs

[illegible]



Name: EMBANKMENT FILL 1 CH, EL. +3.4 to -3.5 Model: Saturated Only K-Sat: 3.28e-008 ft/sec K-Ratio: 1
Name: MARSH 1, EL. -3.5 to -11 Model: Saturated Only K-Sat: 3.28e-007 ft/sec K-Ratio: 1
Name: BEACH SAND, EL. -22 TO -46.5 Model: Saturated Only K-Sat: 0.00049 ft/sec K-Ratio: 1
Name: BAY SOUND CLAY CL, EL. -46.5 TO -61.5 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: BEACH SAND, EL -12 TO -22 Model: Saturated Only K-Sat: 0.00049 ft/sec K-Ratio: 1
Name: BAY SOUND CLAY CL, EL. -61.5 TO -70 Model: Saturated Only K-Sat: 3.28e-008 ft/sec K-Ratio: 1
Name: BAY SOUND CLAY CL, EL. -61.5 TO -70 (protected) Model: Saturated Only K-Sat: 3.28e-008 ft/sec K-Ratio: 1
Name: BAY SOUND CLAY CL, EL. -46.5 TO -61.5 (protected) Model: Saturated Only K-Sat: 3.28e-008 ft/sec K-Ratio: 1



**US Army Corps
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New Orleans District

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=CANAL WATER LEVEL

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

LONDON AVE OUTFALL CANAL, REACH 17,
PROTECTED SIDE STABILITY ANALYSIS,
CASE: Gap Stability (Seepage) OPEN
STA. 118+90 TO 119+63
ORLEANS PARISH, LOUISIANA

Gap Stability (Seepage) OPEN

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File Information

Created By: [Liljegren, James](#)
Revision Number: [228](#)
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Last Solved Date: [2/13/2011](#)
Last Solved Time: [2:18:55 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

Gap Stability (Seepage) OPEN

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 1 CH, EL. +3.4 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 °

MARSH 1, EL. -3.5 to -11

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. -22 TO -46.5

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 CL, EL. -46.5 TO -61.5

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 °

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 °

BEACH SAND, EL -12 TO -22

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 CL, EL. -61.5 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 °

BAY SOUND CLAY CL, EL. -61.5 TO -70 (protected)

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 °

BAY SOUND CLAY CL, EL. -46.5 TO -61.5 (protected)

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) 10

Curb

Type: Head (H) -4.1

Regions

	Material	Points	Area (ft²)
Region 1	MARSH 1, EL. -3.5 to -11	47,46,42,45	40.034938
Region 2	EMBANKMENT FILL 1 CH, EL. +3.4 to -3.5	27,5,7,15	331.255
Region 3	MARSH 1, EL. -3.5 to -11	15,7,43,30	273.2
Region 4	BEACH SAND, EL -12 TO -22	40,17,2,58,21,39	87.864
Region 5	EMBANKMENT FILL 1 CH, EL. +3.4 to -3.5	10,28,3,25,20,24,6,42	141.455
Region 6	BEACH SAND, EL. -22 TO -46.5	8,22,1,56,55,53,54,23,9,35,14,33	4646.4685
Region 7	BEACH SAND, EL -12 TO -22	21,32,11,18,39	271.37
Region 8	Sheet Pile	28,37,38,19,29	7.65
Region 9	BEACH SAND, EL. -22 TO -46.5	56,1,22,57	42.83154
Region 10	EMBANKMENT FILL 1 CH, EL. +3.4 to -3.5	10,28,29,19,4,26,27,15	299.59
Region 11	MARSH 1, EL. -3.5 to -11	30,15,10,44	239.775
Region 12	MARSH 1, EL. -3.5 to -11	44,10,42,45	295.5
Region	MARSH 1, EL. -3.5 to -11	31,30,43,16	239.05

13			
Region 14	MARSH 1, EL. -3.5 to -11	11,32,45,44	39.4
Region 15	MARSH 1, EL. -3.5 to -11	44,30,31,11	93.825
Region 16	MARSH 1, EL. -3.5 to -11	21,47,45,32	6.9
Region 17	BAY SOUND CLAY CL, EL. - 46.5 TO -61.5 (protected)	8,33,49,48	632.1
Region 18	BAY SOUND CLAY CL, EL. - 61.5 TO -70 (protected)	48,49,34,13	354.9
Region 19	BAY SOUND CLAY CL, EL. - 46.5 TO -61.5	33,14,35,51,50,49	1218.47
Region 20	BAY SOUND CLAY CL, EL. - 61.5 TO -70	49,50,51,36,41,34	687.38
Region 21	BAY SOUND CLAY CL, EL. - 46.5 TO -61.5 (protected)	35,9,52,51	1024.5
Region 22	BAY SOUND CLAY CL, EL. - 61.5 TO -70 (protected)	51,52,12,36	580.55
Region 23	BEACH SAND, EL -12 TO - 22	56,39,18,11,31,16,23,54,53,55	1132.1815
Region 24	MARSH 1, EL. -3.5 to -11	47,46,59	17.238186
Region 25	BEACH SAND, EL -12 TO - 22	57,40,39,56	111.24347
Region 26	MARSH 1, EL. -3.5 to -11	58,59,47,21	9.2328574

Lines

	Start Point	End Point	Hydraulic Boundary	Left Side Material
Line 1	5	7	Curb	
Line 2	7	15		
Line 3	17	2	Canal Water	
Line 4	11	18		Sheet Pile
Line 5	8	22		
Line 6	23	9	Curb	
Line 7	20	24	Canal Water	

Line 8	5	27	Drainage	
Line 9	19	29		
Line 10	29	28		Sheet Pile
Line 11	16	31		
Line 12	21	32		
Line 13	32	11		
Line 14	31	30		
Line 15	30	15		
Line 16	37	28	Canal Water	
Line 17	37	38		
Line 18	38	19	Drainage	
Line 19	40	17		
Line 20	21	39		
Line 21	39	40		
Line 22	18	39		
Line 23	9	35		
Line 24	35	14		
Line 25	14	33		
Line 26	33	8		
Line 27	15	10		
Line 28	4	26	Drainage	
Line 29	6	24	Canal Water	
Line 30	28	10	Canal Water	Sheet Pile
Line 31	15	27		
Line 32	19	4	Drainage	
Line 33	26	27	Drainage	
Line 34	42	6	Canal Water	
Line 35	42	10		
Line 36	25	20	Canal Water	
Line 37	28	3		
Line 38	3	25	Canal Water	
Line 39	1	22		
Line 40	11	31		
Line 41	7	43	Curb	
Line 42	43	30		
Line 43	43	16	Curb	

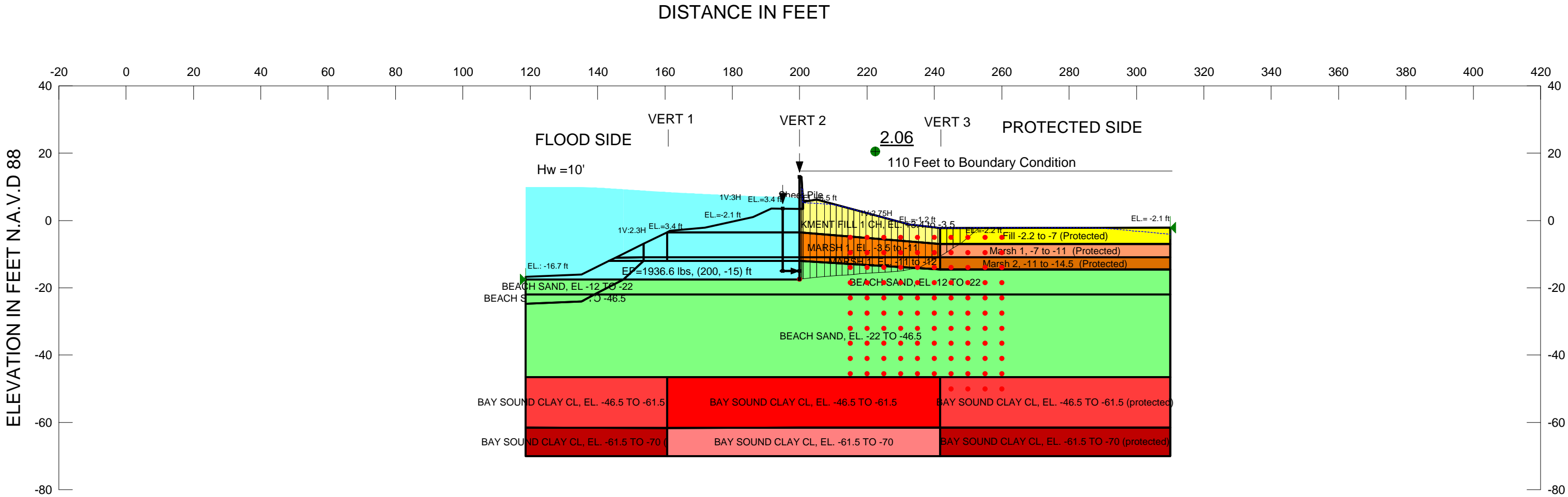
Line 44	10	44	Canal Water	Sheet Pile
Line 45	32	45		
Line 46	45	42		
Line 47	44	30		
Line 48	45	44		
Line 49	44	11	Canal Water	Sheet Pile
Line 50	46	42	Canal Water	
Line 51	21	47		
Line 52	47	46		
Line 53	45	47		
Line 54	33	49		
Line 55	49	48		
Line 56	48	8		
Line 57	49	34		
Line 58	34	13		
Line 59	13	48		
Line 60	35	51		
Line 61	51	50		
Line 62	50	49		
Line 63	51	36		
Line 64	36	41		
Line 65	41	34		
Line 66	9	52	Curb	
Line 67	52	51		
Line 68	52	12	Curb	
Line 69	12	36		
Line 70	1	56		
Line 71	56	39		
Line 72	56	55		
Line 73	55	53		
Line 74	53	54		
Line 75	54	23		
Line 76	16	23	Curb	
Line 77	22	57		
Line 78	2	58	Canal Water	
Line 79	58	21		

Line 80	57	56		
Line 81	57	40		
Line 82	46	59	Canal Water	
Line 83	59	47		
Line 84	58	59		

Points

	X (ft)	Y (ft)
Point 1	135.2	-24
Point 2	135.2	-16
Point 3	199	3.4
Point 4	205.1	6.2
Point 5	310	-2.1
Point 6	161.4	-3.1
Point 7	310	-7
Point 8	118.6	-46.5
Point 9	310	-46.5
Point 10	200	-3.5
Point 11	200	-12
Point 12	310	-70
Point 13	118.6	-70
Point 14	200	-46.5
Point 15	241.7	-7
Point 16	310	-14.5
Point 17	118.6	-16.7
Point 18	200	-17.5
Point 19	201	5.5
Point 20	186.1	1
Point 21	153.7	-12
Point 22	118.6	-24.7
Point 23	310	-22
Point 24	171.9	-2.1
Point 25	191.6	3.5
Point 26	232.6	-1.2
Point 27	241.7	-2.2

Point 28	200	3.4
Point 29	201	3.4
Point 30	241.7	-11
Point 31	241.7	-14.5
Point 32	160.6	-12
Point 33	160.6	-46.5
Point 34	160.6	-70
Point 35	241.7	-46.5
Point 36	241.7	-70
Point 37	200	12.9
Point 38	200.5	12.9
Point 39	147.62	-17.5
Point 40	118.6	-17.5
Point 41	200	-70
Point 42	160.6	-3.5
Point 43	310	-11
Point 44	200	-11
Point 45	160.6	-11
Point 46	153.7	-6.89567
Point 47	153.7	-11
Point 48	118.6	-61.5
Point 49	160.6	-61.6
Point 50	200	-61.5
Point 51	241.7	-61.5
Point 52	310	-61.5
Point 53	200	-22
Point 54	241.7	-22
Point 55	160.6	-22
Point 56	139.02154	-22
Point 57	118.6	-22
Point 58	143.328	-12
Point 59	145.3	-11.02953



Name: EMBANKMENT FILL 1 CH, EL. +3.4 to -3.5 Model: Spatial Mohr-Coulomb Weight Fn: Fill Cohesion Fn: FILL Phi: 0 °
Name: MARSH 1, EL. -3.5 to -11 Model: Spatial Mohr-Coulomb Weight Fn: Marsh 1 Cohesion Fn: Marsh 1 Phi: 0 °
Name: BEACH SAND, EL. -22 TO -46.5 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Beach Sand
Name: BAY SOUND CLAY CL, EL. -46.5 TO -61.5 Model: Spatial Mohr-Coulomb Weight Fn: Clay 1 Cohesion Fn: CLAY 1 Phi: 0 °
Name: Sheet Pile Model: Undrained (Phi=0) Unit Weight: 0.1 pcf Cohesion: 0.01 psf
Name: BEACH SAND, EL -12 TO -22 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Beach Sand
Name: Fill -2.2 to -7 (Protected) Model: Undrained (Phi=0) Unit Weight: 100 pcf Cohesion: 400 psf
Name: Marsh 1, -7 to -11 (Protected) Model: Undrained (Phi=0) Unit Weight: 85 pcf Cohesion: 200 psf
Name: Marsh 2, -11 to -14.5 (Protected) Model: Undrained (Phi=0) Unit Weight: 116 pcf Cohesion: 300 psf
Name: MARSH 1, EL. -11 to -12 Model: Spatial Mohr-Coulomb Weight Fn: Marsh 2 Cohesion Fn: Marsh 2 Phi: 0 °
Name: BAY SOUND CLAY CL, EL. -61.5 TO -70 Model: Spatial Mohr-Coulomb Weight Fn: Clay 2 Cohesion Fn: CLAY 2 Phi: 0 °
Name: BAY SOUND CLAY CL, EL. -61.5 TO -70 (protected) Model: Undrained (Phi=0) Unit Weight: 119 pcf Cohesion: 995 psf
Name: BAY SOUND CLAY CL, EL. -46.5 TO -61.5 (protected) Model: Undrained (Phi=0) Unit Weight: 109 pcf Cohesion: 710 psf



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BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

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LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

LONDON AVE OUTFALL CANAL, REACH 17,
PROTECTED SIDE STABILITY ANALYSIS,
CASE: GAP Stability (Block) OPEN
STA. 118+90 TO 119+63
ORLEANS PARISH, LOUISIANA

GAP Stability (Block) OPEN

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File Information

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Revision Number: [228](#)
Last Edited By: [Almaleh, Lawrence J. \(Larry\)](#)
Date: [2/13/2011](#)
Time: [2:18:39 PM](#)
File Name: [Reach 17 OPEN.gsz](#)
Directory: [Z:\Projects\041752 - New Orleans Canals\Mod 11\Results transmittal\Calculation Files\Slope-W\](#)
Last Solved Date: [2/13/2011](#)
Last Solved Time: [2:19:18 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

GAP Stability (Block) OPEN

Kind: [SLOPE/W](#)
Parent: [Gap Stability \(Seepage\) OPEN](#)
Method: [Spencer](#)
Settings
 PWP Conditions Source: [Parent Analysis](#)
Slip Surface
 Direction of movement: [Left to Right](#)
 Use Passive Mode: [Yes](#)
 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: [8](#)

Complete Passes per Insertion: [1](#)

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

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

Materials

EMBANKMENT FILL 1 CH, EL. +3.4 to -3.5

Model: [Spatial Mohr-Coulomb](#)

Weight Fn: [Fill](#)

Cohesion Fn: [FILL](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

MARSH 1, EL. -3.5 to -11

Model: [Spatial Mohr-Coulomb](#)

Weight Fn: [Marsh 1](#)

Cohesion Fn: [Marsh 1](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

BEACH SAND, EL. -22 TO -46.5

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

Unit Weight: [122 pcf](#)

Strength Function: [Beach Sand](#)

Phi-B: [0 °](#)

BAY SOUND CLAY CL, EL. -46.5 TO -61.5

Model: [Spatial Mohr-Coulomb](#)

Weight Fn: [Clay 1](#)

Cohesion Fn: [CLAY 1](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

Sheet Pile

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

Unit Weight: [0.1 pcf](#)

Cohesion: [0.01 psf](#)

BEACH SAND, EL -12 TO -22

Model: [Shear/Normal Fn.](#)
Unit Weight: [122 pcf](#)
Strength Function: [Beach Sand](#)
Phi-B: [0 °](#)

Fill -2.2 to -7 (Protected)

Model: [Undrained \(Phi=0\)](#)
Unit Weight: [100 pcf](#)
Cohesion: [400 psf](#)

Marsh 1, -7 to -11 (Protected)

Model: [Undrained \(Phi=0\)](#)
Unit Weight: [85 pcf](#)
Cohesion: [200 psf](#)

Marsh 2, -11 to -14.5 (Protected)

Model: [Undrained \(Phi=0\)](#)
Unit Weight: [116 pcf](#)
Cohesion: [300 psf](#)

MARSH 1, EL. -11 to -12

Model: [Spatial Mohr-Coulomb](#)
Weight Fn: [Marsh 2](#)
Cohesion Fn: [Marsh 2](#)
Phi: [0 °](#)
Phi-B: [0 °](#)

BAY SOUND CLAY CL, EL. -61.5 TO -70

Model: [Spatial Mohr-Coulomb](#)
Weight Fn: [Clay 2](#)
Cohesion Fn: [CLAY 2](#)
Phi: [0 °](#)
Phi-B: [0 °](#)

BAY SOUND CLAY CL, EL. -61.5 TO -70 (protected)

Model: [Undrained \(Phi=0\)](#)
Unit Weight: [119 pcf](#)
Cohesion: [995 psf](#)

BAY SOUND CLAY CL, EL. -46.5 TO -61.5 (protected)

Model: [Undrained \(Phi=0\)](#)
Unit Weight: [109 pcf](#)
Cohesion: [710 psf](#)

Slip Surface Limits

Left Coordinate: (118.6, -17.5) ft

Right Coordinate: (310, -2.1) ft

Slip Surface Block

Left Grid

Upper Left: (200, -17.4) ft

Lower Left: (200, -17.4) ft

Lower Right: (200, -17.4) ft

X Increments: 0

Y Increments: 0

Starting Angle: 135 °

Ending Angle: 135 °

Angle Increments: 0

Right Grid

Upper Left: (215, -5) ft

Lower Left: (215, -50) ft

Lower Right: (260, -50) ft

X Increments: 9

Y Increments: 10

Starting Angle: 30 °

Ending Angle: 45 °

Angle Increments: 4

Reinforcements

Reinforcement 1

Type: Pile

Outside Point: (195, 3.5) ft

Inside Point: (195, -15) ft

Slip Surface Intersection: (0, 0) ft

Total Length: 18.5 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

Reinforcement 2

Type: Pile

Outside Point: (200, 12.9) ft
Inside Point: (200, -17.4) ft
Slip Surface Intersection: (200, -17.4) ft
Total Length: 30.3 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

Point Loads

	Coordinate (ft)	Magnitude (lbs)	Direction (°)
Point Load 1	(200, -15)	1936.6	180

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: (160.6, 200)
Data Point: (200, 320)
Data Point: (241.7, 200)

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: (160.6, 300)
Data Point: (200, 320)
Data Point: (241.7, 300)

FILL

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: (160.6, 400)
Data Point: (200, 520)
Data Point: (241.7, 400)

CLAY 1

Model: Spline Data Point Function
Function: Cohesion vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 720
Data Points: X (ft), Cohesion (psf)
Data Point: (160.6, 720)
Data Point: (200, 750)
Data Point: (241.7, 720)

CLAY 2

Model: Spline Data Point Function
Function: Cohesion vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 995
Data Points: X (ft), Cohesion (psf)
Data Point: (160.6, 995)
Data Point: (200, 1050)
Data Point: (241.7, 995)

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: (-100000, 0)
Data Point: (0, 0)
Data Point: (100000, 57735)
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: 85
Data Points: X (ft), Unit Weight (pcf)
Data Point: (160.6, 85)
Data Point: (200, 90)
Data Point: (241.7, 85)

Fill

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: (160.6, 100)
Data Point: (200, 110)
Data Point: (241.7, 100)

Marsh 2

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 116
Data Points: X (ft), Unit Weight (pcf)
Data Point: (160.6, 116)
Data Point: (200, 90)
Data Point: (241.7, 116)

Clay 1

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 109

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

Data Point: (160.6, 109)

Data Point: (200, 110)

Data Point: (241.7, 109)

Clay 2

Model: Spline Data Point Function

Function: Unit Weight vs. X

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 119

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

Data Point: (160.6, 119)

Data Point: (200, 102)

Data Point: (241.7, 119)

Regions

	Points	Area (ft ²)	Material
Region 1	47,46,42,45	40.034938	
Region 2	27,5,7,15	331.255	Fill -2.2 to -7 (Protected)
Region 3	15,7,43,30	273.2	Marsh 1, -7 to -11 (Protected)
Region 4	40,17,2,58,21,39	87.864	
Region 5	10,28,3,25,20,24,6,42	141.455	
Region 6	8,22,1,56,55,53,54,23,9,35,14,33	4646.4685	BEACH SAND, EL. -22 TO -46.5
Region 7	21,32,11,18,39	271.37	
Region 8	28,37,38,19,29	7.65	Sheet Pile
Region 9	56,1,22,57	42.83154	BEACH SAND, EL. -22 TO -46.5
Region 10	10,28,29,19,4,26,27,15	299.59	EMBANKMENT FILL 1 CH, EL. +3.4 to -3.5
Region 11	30,15,10,44	239.775	MARSH 1, EL. -3.5 to -11

Region 12	44,10,42,45	295.5	
Region 13	31,30,43,16	239.05	Marsh 2, -11 to -14.5 (Protected)
Region 14	11,32,45,44	39.4	
Region 15	44,30,31,11	93.825	MARSH 1, EL. -11 to -12
Region 16	21,47,45,32	6.9	
Region 17	8,33,49,48	632.1	BAY SOUND CLAY CL, EL. - 46.5 TO -61.5 (protected)
Region 18	48,49,34,13	354.9	BAY SOUND CLAY CL, EL. - 61.5 TO -70 (protected)
Region 19	33,14,35,51,50,49	1218.47	BAY SOUND CLAY CL, EL. - 46.5 TO -61.5
Region 20	49,50,51,36,41,34	687.38	BAY SOUND CLAY CL, EL. - 61.5 TO -70
Region 21	35,9,52,51	1024.5	BAY SOUND CLAY CL, EL. - 46.5 TO -61.5 (protected)
Region 22	51,52,12,36	580.55	BAY SOUND CLAY CL, EL. - 61.5 TO -70 (protected)
Region 23	56,39,18,11,31,16,23,54,53,55	1132.1815	BEACH SAND, EL -12 TO - 22
Region 24	47,46,59	17.238186	
Region 25	57,40,39,56	111.24347	BEACH SAND, EL -12 TO - 22
Region 26	58,59,47,21	9.2328574	

Points

	X (ft)	Y (ft)
Point 1	135.2	-24
Point 2	135.2	-16
Point 3	199	3.4
Point 4	205.1	6.2

Point 5	310	-2.1
Point 6	161.4	-3.1
Point 7	310	-7
Point 8	118.6	-46.5
Point 9	310	-46.5
Point 10	200	-3.5
Point 11	200	-12
Point 12	310	-70
Point 13	118.6	-70
Point 14	200	-46.5
Point 15	241.7	-7
Point 16	310	-14.5
Point 17	118.6	-16.7
Point 18	200	-17.5
Point 19	201	5.5
Point 20	186.1	1
Point 21	153.7	-12
Point 22	118.6	-24.7
Point 23	310	-22
Point 24	171.9	-2.1
Point 25	191.6	3.5
Point 26	232.6	-1.2
Point 27	241.7	-2.2
Point 28	200	3.4
Point 29	201	3.4
Point 30	241.7	-11
Point 31	241.7	-14.5
Point 32	160.6	-12
Point 33	160.6	-46.5
Point 34	160.6	-70
Point 35	241.7	-46.5
Point 36	241.7	-70
Point 37	200	12.9
Point 38	200.5	12.9
Point 39	147.62	-17.5
Point 40	118.6	-17.5

Point 41	200	-70
Point 42	160.6	-3.5
Point 43	310	-11
Point 44	200	-11
Point 45	160.6	-11
Point 46	153.7	-6.89567
Point 47	153.7	-11
Point 48	118.6	-61.5
Point 49	160.6	-61.6
Point 50	200	-61.5
Point 51	241.7	-61.5
Point 52	310	-61.5
Point 53	200	-22
Point 54	241.7	-22
Point 55	160.6	-22
Point 56	139.02154	-22
Point 57	118.6	-22
Point 58	143.328	-12
Point 59	145.3	-11.02953

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	2.06	(223.046, 1.62)	25.91235	(200, 12.9)	(253.473, -2.18276)
2	122	2.10	(223.046, 1.62)	25.566	(200, 12.9)	(252.684, -2.18392)

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	200.25	-17.375705	1487.0934	-4977.7468	0	0
2	Optimized	200.75	-17.32711	1476.5232	2257.3642	450.81876	-9.116e-005

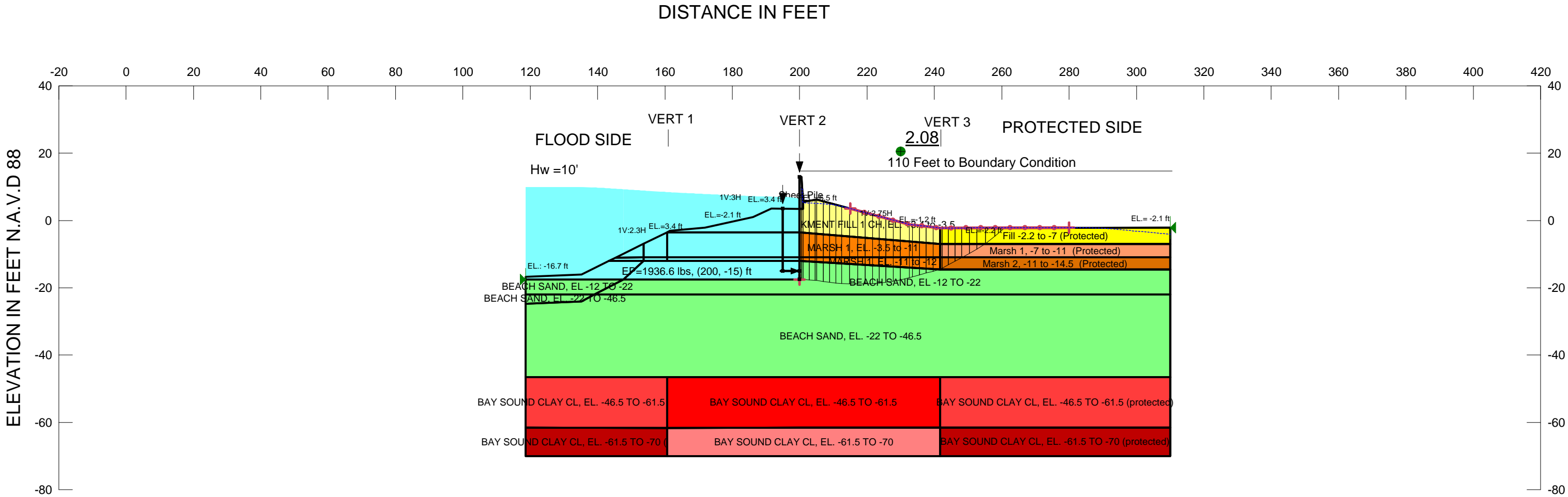
3	Optimized	202.025	- 17.203195	1450.3372	2510.6098	612.1486 7	-1.0181e-005
4	Optimized	204.075	- 17.003965	1423.7794	2521.9709	634.0411 6	-1.0545e-005
5	Optimized	206.21605	-16.79588	1398.163	2475.5457	622.0272 3	-1.0345e-005
6	Optimized	208.20235	-16.61784	1375.6642	2373.8354	576.2944 3	3.4765e-005
7	Optimized	209.9428	-16.4787	1357.1647	2298.2337	543.3264 8	3.2778e-005
8	Optimized	211.68325	- 16.339565	1338.6652	2223.2621	510.7222 6	-0.00010328
9	Optimized	213.4237	-16.20043	1320.1084	2148.9204	478.5148 5	-9.6761e-005
10	Optimized	215.1641	-16.06129	1301.6089	2075.1515	446.6050 4	-9.0312e-005
11	Optimized	216.90455	-15.92215	1283.0521	2002.0126	415.0920 4	-8.3937e-005
12	Optimized	218.72045	- 15.792925	1264.6525	1919.9331	378.3264 4	-7.6504e-005
13	Optimized	220.61175	-15.67361	1246.4474	1846.3737	346.3676 3	-7.0038e-005
14	Optimized	222.50305	- 15.554295	1228.2422	1773.5002	314.8048 8	-6.3658e-005
15	Optimized	224.39435	- 15.434985	1209.9842	1701.3128	283.6686 6	1.7113e-005
16	Optimized	226.28565	-15.31567	1191.6735	1629.8113	252.9589 6	-1.3429e-006
17	Optimized	228.17695	- 15.196355	1173.3628	1559.0486	222.6757 9	-1.5797e-005
18	Optimized	229.99195	-14.99109	1150.1431	1516.2422	211.3673 7	-1.4995e-005
19	Optimized	231.73065	- 14.699865	1121.9511	1425.9937	175.5390 6	-9.3187e-007
20	Optimized	233.96735	- 14.325225	1085.6511	1335.8309	144.4413 6	-7.6681e-007
21	Optimized	236.3281	- 13.583015	1023.0292	1371.7902	0	302.58

22	Optimized	238.31485	-12.55665	942.22257	1223.9503	0	301.62
23	Optimized	240.1568	- 11.521735	861.67304	1106.5675	0	300.74
24	Optimized	241.3527	- 10.786465	805.15353	965.50237	0	201
25	Optimized	242.66855	-9.97744	742.99106	885.47647	0	200
26	Optimized	244.60565	- 8.7864625	651.69485	774.69846	0	200
27	Optimized	246.58365	- 7.5703375	558.87161	661.19427	0	200
28	Optimized	248.57305	- 6.1552105	420.38272	659.16898	0	400
29	Optimized	250.533	- 4.5662315	246.58991	479.55415	0	400
30	Optimized	252.493	- 2.9772525	80.144992	299.95121	0	400

Slices of Slip Surface: 122

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	122	200.25	- 17.375715	1487.0999	-5180.0166	0	0
2	122	200.75	- 17.327145	1476.5297	2257.9713	451.16552	-9.1232e-005
3	122	202.025	- 17.203285	1450.3435	2511.2034	612.48772	-1.0187e-005
4	122	204.075	-17.00414	1423.8341	2522.5645	634.35227	4.2116e-005
5	122	205.95935	-16.82109	1401.2292	2488.0693	627.48741	-1.0436e-005
6	122	207.6781	- 16.654125	1380.903	2408.3862	593.21766	3.9384e-005
7	122	209.39685	-16.48716	1360.7506	2329.2822	559.18195	-0.00011307
8	122	211.1156	- 16.320195	1340.6561	2250.7573	525.44715	-0.00010625
9	122	212.83435	-16.15323	1320.5616	2172.8115	492.04669	-3.491e-005
10	122	214.5531	-15.98627	1300.4092	2095.5027	459.04743	-9.2825e-005
11	122	216.27185	- 15.819305	1280.2568	2018.773	426.38251	-8.6218e-005

12	122	217.9906	-15.65234	1260.1044	1942.6224	394.05193	-7.968e-005
13	122	219.70935	- 15.485375	1239.952	1867.0509	362.05569	-2.5686e-005
14	122	221.4281	-15.31841	1219.7417	1792.0584	330.42722	-6.682e-005
15	122	223.14685	- 15.151445	1199.5314	1717.703	299.16652	-6.0496e-005
16	122	224.8656	-14.98448	1179.3211	1643.9267	268.24017	-1.9031e-005
17	122	226.58435	-14.81752	1159.0529	1570.7294	237.68159	-1.6862e-005
18	122	228.3031	- 14.650555	1138.7846	1498.1692	207.49077	-1.1015e-006
19	122	230.02185	-14.48359	1118.4585	1426.1301	177.6343	-9.4306e-007
20	122	231.7406	- 14.316625	1098.1324	1354.7281	148.1456	-7.8656e-007
21	122	233.48705	-14.14697	1077.3759	1298.4725	127.65017	3.511e-006
22	122	234.68705	-14.0304	1062.914	1292.726	0	303.36
23	122	235.7483	-13.5	1021.1383	1427.8159	0	302.85
24	122	237.2449	-12.5	945.19187	1285.2565	0	302.14
25	122	238.7415	-11.5	869.07873	1140.7526	0	301.42
26	122	240.5949	- 10.261602	774.85814	941.77786	0	203.18
27	122	242.64405	- 8.8924025	670.63791	797.55225	0	200
28	122	244.53215	-7.630801	574.72555	678.82878	0	200
29	122	246.3772	- 6.3979895	456.60259	638.94093	0	400
30	122	248.17915	-5.193969	319.80269	505.58791	0	400
31	122	249.9811	- 3.9899485	187.7186	372.25334	0	400
32	122	251.78305	-2.785928	61.005546	238.91416	0	400



Name: EMBANKMENT FILL 1 CH, EL. +3.4 to -3.5 Model: Spatial Mohr-Coulomb Weight Fn: Fill Cohesion Fn: FILL Phi: 0 °
Name: MARSH 1, EL. -3.5 to -11 Model: Spatial Mohr-Coulomb Weight Fn: Marsh 1 Cohesion Fn: Marsh 1 Phi: 0 °
Name: BEACH SAND, EL. -22 TO -46.5 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Beach Sand
Name: BAY SOUND CLAY CL, EL. -46.5 TO -61.5 Model: Spatial Mohr-Coulomb Weight Fn: Clay 1 Cohesion Fn: CLAY 1 Phi: 0 °
Name: Sheet Pile Model: Undrained (Phi=0) Unit Weight: 0.1 pcf Cohesion: 0.01 psf
Name: BEACH SAND, EL -12 TO -22 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Beach Sand
Name: Fill -2.2 to -7 (Protected) Model: Undrained (Phi=0) Unit Weight: 100 pcf Cohesion: 400 psf
Name: Marsh 1, -7 to -11 (Protected) Model: Undrained (Phi=0) Unit Weight: 85 pcf Cohesion: 200 psf
Name: Marsh 2, -11 to -14.5 (Protected) Model: Undrained (Phi=0) Unit Weight: 116 pcf Cohesion: 300 psf
Name: MARSH 1, EL. -11 to -12 Model: Spatial Mohr-Coulomb Weight Fn: Marsh 2 Cohesion Fn: Marsh 2 Phi: 0 °
Name: BAY SOUND CLAY CL, EL. -61.5 TO -70 Model: Spatial Mohr-Coulomb Weight Fn: Clay 2 Cohesion Fn: CLAY 2 Phi: 0 °
Name: BAY SOUND CLAY CL, EL. -61.5 TO -70 (protected) Model: Undrained (Phi=0) Unit Weight: 119 pcf Cohesion: 995 psf
Name: BAY SOUND CLAY CL, EL. -46.5 TO -61.5 (protected) Model: Undrained (Phi=0) Unit Weight: 109 pcf Cohesion: 710 psf



**US Army Corps
of Engineers®**
New Orleans District

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=CANAL WATER LEVEL

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

LONDON AVE OUTFALL CANAL, REACH 17,
PROTECTED SIDE STABILITY ANALYSIS,
CASE: GAP Stability (Entry/Exit) OPEN
STA. 118+90 TO 119+63
ORLEANS PARISH, LOUISIANA

GAP Stability (Entry/Exit) OPEN

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File Information

Created By: [Liljegren, James](#)
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Last Solved Date: [2/13/2011](#)
Last Solved Time: [2:19:34 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

GAP Stability (Entry/Exit) OPEN

Kind: [SLOPE/W](#)
Parent: [Gap Stability \(Seepage\) OPEN](#)
Method: [Spencer](#)
Settings
 PWP Conditions Source: [Parent Analysis](#)
Slip Surface
 Direction of movement: [Left to Right](#)
 Use Passive Mode: [Yes](#)
 Slip Surface Option: [Entry and Exit](#)
 Critical slip surfaces saved: [1](#)
 Optimize Critical Slip Surface Location: [Yes](#)
 Tension Crack
 Tension Crack Option: [\(none\)](#)
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: 10
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

EMBANKMENT FILL 1 CH, EL. +3.4 to -3.5

Model: Spatial Mohr-Coulomb
Weight Fn: Fill
Cohesion Fn: FILL
Phi: 0 °
Phi-B: 0 °

MARSH 1, EL. -3.5 to -11

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

BEACH SAND, EL. -22 TO -46.5

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

BAY SOUND CLAY CL, EL. -46.5 TO -61.5

Model: Spatial Mohr-Coulomb
Weight Fn: Clay 1
Cohesion Fn: CLAY 1
Phi: 0 °
Phi-B: 0 °

Sheet Pile

Model: Undrained (Phi=0)
Unit Weight: 0.1 pcf
Cohesion: 0.01 psf

BEACH SAND, EL -12 TO -22

Model: [Shear/Normal Fn.](#)
Unit Weight: [122 pcf](#)
Strength Function: [Beach Sand](#)
Phi-B: [0 °](#)

Fill -2.2 to -7 (Protected)

Model: [Undrained \(Phi=0\)](#)
Unit Weight: [100 pcf](#)
Cohesion: [400 psf](#)

Marsh 1, -7 to -11 (Protected)

Model: [Undrained \(Phi=0\)](#)
Unit Weight: [85 pcf](#)
Cohesion: [200 psf](#)

Marsh 2, -11 to -14.5 (Protected)

Model: [Undrained \(Phi=0\)](#)
Unit Weight: [116 pcf](#)
Cohesion: [300 psf](#)

MARSH 1, EL. -11 to -12

Model: [Spatial Mohr-Coulomb](#)
Weight Fn: [Marsh 2](#)
Cohesion Fn: [Marsh 2](#)
Phi: [0 °](#)
Phi-B: [0 °](#)

BAY SOUND CLAY CL, EL. -61.5 TO -70

Model: [Spatial Mohr-Coulomb](#)
Weight Fn: [Clay 2](#)
Cohesion Fn: [CLAY 2](#)
Phi: [0 °](#)
Phi-B: [0 °](#)

BAY SOUND CLAY CL, EL. -61.5 TO -70 (protected)

Model: [Undrained \(Phi=0\)](#)
Unit Weight: [119 pcf](#)
Cohesion: [995 psf](#)

BAY SOUND CLAY CL, EL. -46.5 TO -61.5 (protected)

Model: [Undrained \(Phi=0\)](#)
Unit Weight: [109 pcf](#)
Cohesion: [710 psf](#)

Slip Surface Entry and Exit

Left Projection: [Point](#)
Left Coordinate: [\(200, -17.5\)](#) ft
Left-Zone Increment: [20](#)
Right Projection: [Range](#)
Right-Zone Left Coordinate: [\(215, 3.536\)](#) ft
Right-Zone Right Coordinate: [\(280, -2.14392\)](#) ft
Right-Zone Increment: [15](#)
Radius Increments: [4](#)

Slip Surface Limits

Left Coordinate: [\(118.6, -17.5\)](#) ft
Right Coordinate: [\(310, -2.1\)](#) ft

Reinforcements

Reinforcement 1

Type: [Pile](#)
Outside Point: [\(195, 3.5\)](#) ft
Inside Point: [\(195, -15\)](#) ft
Slip Surface Intersection: [\(0, 0\)](#) ft
Total Length: [18.5](#) 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

Reinforcement 2

Type: [Pile](#)
Outside Point: [\(200, 12.9\)](#) ft
Inside Point: [\(200, -17.4\)](#) ft
Slip Surface Intersection: [\(200, -17.5\)](#) ft
Total Length: [30.3](#) 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

Point Loads

	Coordinate (ft)	Magnitude (lbs)	Direction (°)
Point Load 1	(200, -15)	1936.6	180

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: (160.6, 200)
Data Point: (200, 320)
Data Point: (241.7, 200)

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: (160.6, 300)
Data Point: (200, 320)
Data Point: (241.7, 300)

FILL

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: (160.6, 400)
Data Point: (200, 520)
Data Point: (241.7, 400)

CLAY 1

Model: [Spline Data Point Function](#)

Function: [Cohesion vs. X](#)

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: [720](#)

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

Data Point: [\(160.6, 720\)](#)

Data Point: [\(200, 750\)](#)

Data Point: [\(241.7, 720\)](#)

CLAY 2

Model: [Spline Data Point Function](#)

Function: [Cohesion vs. X](#)

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: [995](#)

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

Data Point: [\(160.6, 995\)](#)

Data Point: [\(200, 1050\)](#)

Data Point: [\(241.7, 995\)](#)

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: [\(-100000, 0\)](#)

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

Data Point: [\(100000, 57735\)](#)

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: 85

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

Data Point: (160.6, 85)

Data Point: (200, 90)

Data Point: (241.7, 85)

Fill

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: (160.6, 100)

Data Point: (200, 110)

Data Point: (241.7, 100)

Marsh 2

Model: [Spline Data Point Function](#)

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

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 116

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

Data Point: (160.6, 116)

Data Point: (200, 90)

Data Point: (241.7, 116)

Clay 1

Model: [Spline Data Point Function](#)

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

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 109

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

Data Point: (160.6, 109)

Data Point: (200, 110)

Data Point: (241.7, 109)

Clay 2

Model: [Spline Data Point Function](#)

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

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 119

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

Data Point: (160.6, 119)

Data Point: (200, 102)

Data Point: (241.7, 119)

Regions

	Points	Area (ft ²)	Material
Region 1	47,46,42,45	40.034938	
Region 2	27,5,7,15	331.255	Fill -2.2 to -7 (Protected)
Region 3	15,7,43,30	273.2	Marsh 1, -7 to -11 (Protected)
Region 4	40,17,2,58,21,39	87.864	
Region 5	10,28,3,25,20,24,6,42	141.455	
Region 6	8,22,1,56,55,53,54,23,9,35,14,33	4646.4685	BEACH SAND, EL. -22 TO -46.5
Region 7	21,32,11,18,39	271.37	
Region 8	28,37,38,19,29	7.65	Sheet Pile
Region 9	56,1,22,57	42.83154	BEACH SAND, EL. -22 TO -46.5
Region 10	10,28,29,19,4,26,27,15	299.59	EMBANKMENT FILL 1 CH, EL. +3.4 to -3.5
Region 11	30,15,10,44	239.775	MARSH 1, EL. -3.5 to -11
Region 12	44,10,42,45	295.5	
Region 13	31,30,43,16	239.05	Marsh 2, -11 to -14.5 (Protected)

Region 14	11,32,45,44	39.4	
Region 15	44,30,31,11	93.825	MARSH 1, EL. -11 to -12
Region 16	21,47,45,32	6.9	
Region 17	8,33,49,48	632.1	BAY SOUND CLAY CL, EL. - 46.5 TO -61.5 (protected)
Region 18	48,49,34,13	354.9	BAY SOUND CLAY CL, EL. - 61.5 TO -70 (protected)
Region 19	33,14,35,51,50,49	1218.47	BAY SOUND CLAY CL, EL. - 46.5 TO -61.5
Region 20	49,50,51,36,41,34	687.38	BAY SOUND CLAY CL, EL. - 61.5 TO -70
Region 21	35,9,52,51	1024.5	BAY SOUND CLAY CL, EL. - 46.5 TO -61.5 (protected)
Region 22	51,52,12,36	580.55	BAY SOUND CLAY CL, EL. - 61.5 TO -70 (protected)
Region 23	56,39,18,11,31,16,23,54,53,55	1132.1815	BEACH SAND, EL -12 TO - 22
Region 24	47,46,59	17.238186	
Region 25	57,40,39,56	111.24347	BEACH SAND, EL -12 TO - 22
Region 26	58,59,47,21	9.2328574	

Points

	X (ft)	Y (ft)
Point 1	135.2	-24
Point 2	135.2	-16
Point 3	199	3.4
Point 4	205.1	6.2
Point 5	310	-2.1
Point 6	161.4	-3.1
Point 7	310	-7
Point 8	118.6	-46.5

Point 9	310	-46.5
Point 10	200	-3.5
Point 11	200	-12
Point 12	310	-70
Point 13	118.6	-70
Point 14	200	-46.5
Point 15	241.7	-7
Point 16	310	-14.5
Point 17	118.6	-16.7
Point 18	200	-17.5
Point 19	201	5.5
Point 20	186.1	1
Point 21	153.7	-12
Point 22	118.6	-24.7
Point 23	310	-22
Point 24	171.9	-2.1
Point 25	191.6	3.5
Point 26	232.6	-1.2
Point 27	241.7	-2.2
Point 28	200	3.4
Point 29	201	3.4
Point 30	241.7	-11
Point 31	241.7	-14.5
Point 32	160.6	-12
Point 33	160.6	-46.5
Point 34	160.6	-70
Point 35	241.7	-46.5
Point 36	241.7	-70
Point 37	200	12.9
Point 38	200.5	12.9
Point 39	147.62	-17.5
Point 40	118.6	-17.5
Point 41	200	-70
Point 42	160.6	-3.5
Point 43	310	-11
Point 44	200	-11

Point 45	160.6	-11
Point 46	153.7	-6.89567
Point 47	153.7	-11
Point 48	118.6	-61.5
Point 49	160.6	-61.6
Point 50	200	-61.5
Point 51	241.7	-61.5
Point 52	310	-61.5
Point 53	200	-22
Point 54	241.7	-22
Point 55	160.6	-22
Point 56	139.02154	-22
Point 57	118.6	-22
Point 58	143.328	-12
Point 59	145.3	-11.02953

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	2.08	(214.3, 59.222)	28.89365	(200, 12.9)	(261.019, -2.17171)
2	57	2.18	(214.3, 59.222)	78.043	(200, 12.9)	(262.485, -2.16957)

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	200.25	-17.5141	1497.3398	-3826.118	0	0
2	Optimized	200.75	-17.542305	1491.1094	2196.9074	407.49262	-2.8909e-005
3	Optimized	201.89955	-17.60715	1478.3861	2451.8234	562.01431	-0.00011365
4	Optimized	203.69865	-17.708635	1471.3937	2493.7221	590.24158	3.9188e-005
5	Optimized	204.8491	-17.795535	1469.367	2471.7273	578.71298	-9.6246e-006

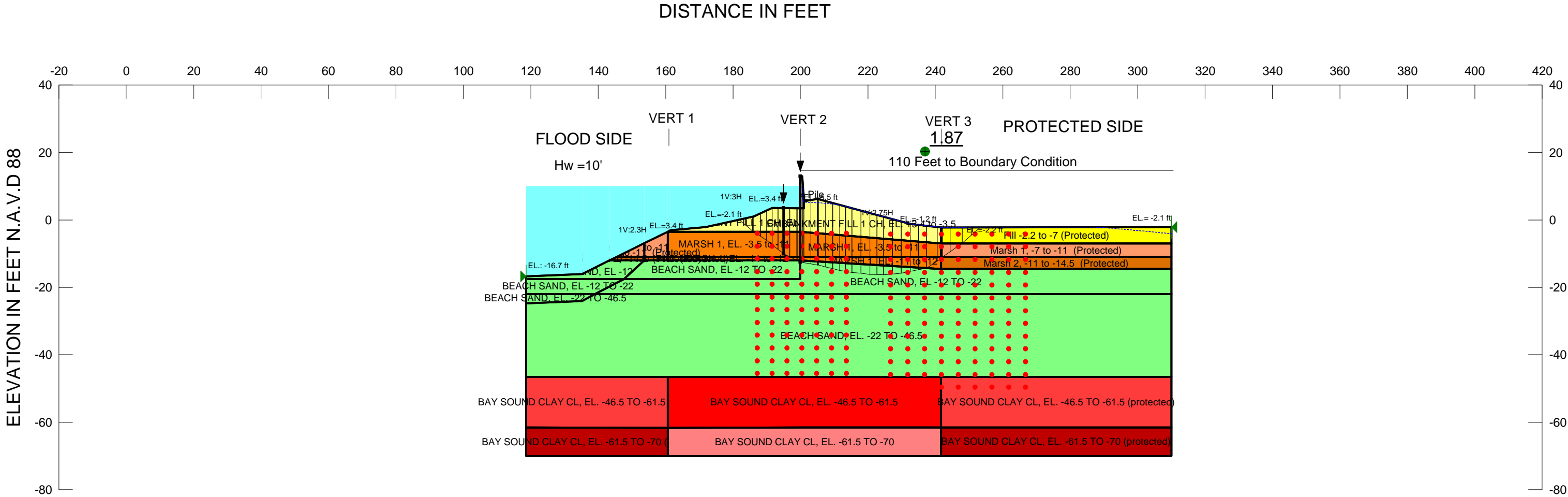
6	Optimized	206.0469	- 17.968145	1472.7595	2466.7768	573.89615	3.4624e-005
7	Optimized	207.9407	-18.24105	1478.5086	2441.115	555.76104	-0.00011239
8	Optimized	209.79115	-18.46206	1481.4574	2439.0136	552.84535	-0.0001118
9	Optimized	211.59825	- 18.631185	1481.5676	2404.0832	532.61465	-0.00010771
10	Optimized	213.6758	-18.75693	1477.4968	2388.1204	525.74879	-0.00010632
11	Optimized	216.02375	- 18.839285	1469.1968	2326.6148	495.03055	-0.00010011
12	Optimized	218.29765	- 18.845825	1456.6073	2293.8612	483.38876	-3.4294e-005
13	Optimized	220.4976	-18.77656	1439.7514	2218.3503	449.52427	-9.0904e-005
14	Optimized	222.59835	- 18.650005	1419.8497	2169.5272	432.82649	-8.7526e-005
15	Optimized	224.59985	-18.46616	1396.9634	2085.6437	397.60979	-8.0401e-005
16	Optimized	226.67815	-18.19373	1368.1165	2023.9393	378.63946	-7.6566e-005
17	Optimized	228.8333	-17.83271	1333.2455	1911.7296	333.98795	-6.7536e-005
18	Optimized	231.25545	-17.32267	1287.5385	1804.6053	298.52871	-6.0366e-005
19	Optimized	233.0403	-16.88523	1249.9563	1700.5053	260.12457	-1.8454e-005
20	Optimized	234.49615	- 16.491945	1217.0631	1644.9809	247.05846	-1.7527e-005
21	Optimized	236.52725	-15.92119	1169.6641	1545.3482	216.90134	-1.1514e-006
22	Optimized	238.55835	- 15.350435	1122.2177	1446.237	187.07262	-9.9313e-007
23	Optimized	240.63695	-14.76632	1073.352	1345.4369	157.08828	-8.3404e-007
24	Optimized	241.79225	- 14.441655	1045.8191	1322.8991	0	300
25	Optimized	242.0684	-14.32207	1036.1775	1382.6927	0	300
26	Optimized	243.2176	-13.70031	987.78335	1318.2259	0	300
27	Optimized	245.14825	- 12.644105	905.80887	1187.2213	0	300
28	Optimized	247.07895	-11.5879	824.0616	1056.2166	0	300
29	Optimized	249.2126	- 10.403408	732.97097	897.88478	0	200
30	Optimized	251.49605	- 9.1205225	635.04163	781.16571	0	200
31	Optimized	253.8787	-7.71176	528.94725	662.92126	0	200

32	Optimized	256.56145	-5.83047	354.31902	594.56841	0	400
33	Optimized	259.4979	-3.451582	119.77373	349.04453	0	400

Slices of Slip Surface: 57

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	57	200.25	- 17.545755	1499.1792	-3878.9718	0	0
2	57	200.75	- 17.635585	1496.7973	2154.1795	379.53982	-2.6926e-005
3	57	202.025	-17.84292	1492.4072	2425.0412	538.45652	-0.00010888
4	57	204.075	-18.14165	1496.5469	2507.7533	583.82032	-9.7102e-006
5	57	206.1577	-18.38808	1498.2647	2536.2554	599.28421	-9.9674e-006
6	57	208.2731	-18.58097	1497.6986	2509.4239	584.11992	3.878e-005
7	57	210.3885	-18.71598	1493.829	2475.6297	566.84289	-0.00011463
8	57	212.50385	-18.79341	1486.4753	2434.8459	547.54201	-0.00011073
9	57	214.6192	-18.81343	1475.6061	2387.0167	526.20321	-0.00010641
10	57	216.7346	- 18.776085	1461.1974	2331.9151	502.7091	-3.5665e-005
11	57	218.85	-18.68129	1443.2347	2269.5246	477.05869	-9.6468e-005
12	57	220.9654	- 18.528835	1421.6652	2199.6153	449.14968	-3.1863e-005
13	57	223.0808	-18.31838	1396.4926	2121.9829	418.86204	-2.9715e-005
14	57	225.19615	- 18.049455	1367.6835	2036.4057	386.08696	-7.8073e-005
15	57	227.3115	- 17.721445	1335.1238	1942.6042	350.72897	-2.4883e-005
16	57	229.4269	-17.33358	1298.8073	1840.3403	312.65422	-6.3221e-005
17	57	231.5423	- 16.884955	1258.6941	1729.1887	271.64019	1.6387e-005
18	57	233.5464	-16.40448	1217.1926	1633.2489	240.21022	-1.2753e-006
19	57	235.43915	-15.89731	1174.6008	1553.4879	218.75056	-1.1613e-006
20	57	237.3319	- 15.338645	1128.7642	1466.1669	194.7995	-1.0342e-006
21	57	239.2247	-14.72732	1079.5088	1370.8389	168.19956	-8.9302e-007
22	57	240.93555	- 14.130745	1030.5482	1317.0951	0	300.37

23	57	242.80885	-13.41797	971.47937	1231.9789	0	300
24	57	245.0265	-12.5078	897.46693	1131.823	0	300
25	57	247.24415	- 11.516405	818.35502	1021.1043	0	300
26	57	249.5602	- 10.388503	730.0214	882.72807	0	200
27	57	251.9746	- 9.1114255	631.832	776.26111	0	200
28	57	254.389	-7.722923	527.00084	658.75994	0	200
29	57	256.74435	-6.255738	394.95114	597.65229	0	400
30	57	259.04065	- 4.7079555	238.79913	442.9897	0	400
31	57	261.33695	- 3.0370015	79.107816	273.55036	0	400



Name: EMBANKMENT FILL 1 CH, EL. +3.4 to -3.5 Model: Spatial Mohr-Coulomb Weight Fn: Fill Cohesion Fn: FILL Phi: 0 °

Name: MARSH 1, EL. -3.5 to -11 Model: Spatial Mohr-Coulomb Weight Fn: Marsh 1 Cohesion Fn: Marsh 1 Phi: 0 °

Name: BEACH SAND, EL. -22 TO -46.5 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Beach Sand

Name: BAY SOUND CLAY CL, EL. -46.5 TO -61.5 Model: Spatial Mohr-Coulomb Weight Fn: Clay 1 Cohesion Fn: CLAY 1 Phi: 0 °

Name: Sheet Pile Model: Undrained (Phi=0) Unit Weight: 0.1 pcf Cohesion: 0.01 psf

Name: BEACH SAND, EL. -12 TO -22 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Beach Sand

Name: Fill -2.2 to -7 (Protected) Model: Undrained (Phi=0) Unit Weight: 100 pcf Cohesion: 400 psf

Name: Marsh 1, -7 to -11 (Protected) Model: Undrained (Phi=0) Unit Weight: 85 pcf Cohesion: 200 psf

Name: Marsh 2, -11 to -14.5 (Protected) Model: Undrained (Phi=0) Unit Weight: 116 pcf Cohesion: 300 psf

Name: MARSH 1, EL. -11 to -12 Model: Spatial Mohr-Coulomb Weight Fn: Marsh 2 Cohesion Fn: Marsh 2 Phi: 0 °

Name: BAY SOUND CLAY CL, EL. -61.5 TO -70 Model: Spatial Mohr-Coulomb Weight Fn: Clay 2 Cohesion Fn: CLAY 2 Phi: 0 °

Name: BAY SOUND CLAY CL, EL. -61.5 TO -70 (protected) Model: Undrained (Phi=0) Unit Weight: 119 pcf Cohesion: 995 psf

Name: BAY SOUND CLAY CL, EL. -46.5 TO -61.5 (protected) Model: Undrained (Phi=0) Unit Weight: 109 pcf Cohesion: 710 psf



**US Army Corps
of Engineers®**
New Orleans District

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=CANAL WATER LEVEL

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

LONDON AVE OUTFALL CANAL, REACH 17,
PROTECTED SIDE STABILITY ANALYSIS,
CASE: Global Stability (Block) OPEN
STA. 118+90 TO 119+63
ORLEANS PARISH, LOUISIANA

Global Stability (Block) OPEN

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File Information

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Last Solved Date: [2/13/2011](#)
Last Solved Time: [2:23:43 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

Global Stability (Block) OPEN

Kind: [SLOPE/W](#)
Parent: [Gap Stability \(Seepage\) OPEN](#)
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

EMBANKMENT FILL 1 CH, EL. +3.4 to -3.5

Model: [Spatial Mohr-Coulomb](#)

Weight Fn: [Fill](#)

Cohesion Fn: [FILL](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

MARSH 1, EL. -3.5 to -11

Model: [Spatial Mohr-Coulomb](#)

Weight Fn: [Marsh 1](#)

Cohesion Fn: [Marsh 1](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

BEACH SAND, EL. -22 TO -46.5

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

Unit Weight: [122 pcf](#)

Strength Function: [Beach Sand](#)

Phi-B: [0 °](#)

BAY SOUND CLAY CL, EL. -46.5 TO -61.5

Model: [Spatial Mohr-Coulomb](#)

Weight Fn: [Clay 1](#)

Cohesion Fn: [CLAY 1](#)

Phi: [0 °](#)

Phi-B: [0 °](#)

Sheet Pile

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

Unit Weight: [0.1 pcf](#)

Cohesion: [0.01 psf](#)

BEACH SAND, EL -12 TO -22

Model: [Shear/Normal Fn.](#)
Unit Weight: [122 pcf](#)
Strength Function: [Beach Sand](#)
Phi-B: [0 °](#)

Fill -2.2 to -7 (Protected)

Model: [Undrained \(Phi=0\)](#)
Unit Weight: [100 pcf](#)
Cohesion: [400 psf](#)

Marsh 1, -7 to -11 (Protected)

Model: [Undrained \(Phi=0\)](#)
Unit Weight: [85 pcf](#)
Cohesion: [200 psf](#)

Marsh 2, -11 to -14.5 (Protected)

Model: [Undrained \(Phi=0\)](#)
Unit Weight: [116 pcf](#)
Cohesion: [300 psf](#)

MARSH 1, EL. -11 to -12

Model: [Spatial Mohr-Coulomb](#)
Weight Fn: [Marsh 2](#)
Cohesion Fn: [Marsh 2](#)
Phi: [0 °](#)
Phi-B: [0 °](#)

BAY SOUND CLAY CL, EL. -61.5 TO -70

Model: [Spatial Mohr-Coulomb](#)
Weight Fn: [Clay 2](#)
Cohesion Fn: [CLAY 2](#)
Phi: [0 °](#)
Phi-B: [0 °](#)

BAY SOUND CLAY CL, EL. -61.5 TO -70 (protected)

Model: [Undrained \(Phi=0\)](#)
Unit Weight: [119 pcf](#)
Cohesion: [995 psf](#)

BAY SOUND CLAY CL, EL. -46.5 TO -61.5 (protected)

Model: [Undrained \(Phi=0\)](#)
Unit Weight: [109 pcf](#)
Cohesion: [710 psf](#)

Slip Surface Limits

Left Coordinate: (118.6, -16.7) ft

Right Coordinate: (310, -2.1) ft

Slip Surface Block

Left Grid

Upper Left: (187.147, -4.00063) ft

Lower Left: (187.147, -49.302) ft

Lower Right: (213.606, -49.302) ft

X Increments: 6

Y Increments: 12

Starting Angle: 125 °

Ending Angle: 145 °

Angle Increments: 4

Right Grid

Upper Left: (226.8, -4.20047) ft

Lower Left: (226.8, -49.6108) ft

Lower Right: (266.8, -49.6108) ft

X Increments: 8

Y Increments: 12

Starting Angle: 25 °

Ending Angle: 45 °

Angle Increments: 4

Reinforcements

Reinforcement 1

Type: Pile

Outside Point: (195, 3.5) ft

Inside Point: (195, -10) ft

Slip Surface Intersection: (195, -10.024) ft

Total Length: 13.5 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

Reinforcement 2

Type: Pile

Outside Point: (200, 12.9) ft
Inside Point: (200, -12.5) ft
Slip Surface Intersection: (200, -12.514) ft
Total Length: 25.4 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

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: (160.6, 200)
Data Point: (200, 320)
Data Point: (241.7, 200)

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: (160.6, 300)
Data Point: (200, 320)
Data Point: (241.7, 300)

FILL

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: (160.6, 400)

Data Point: (200, 520)

Data Point: (241.7, 400)

CLAY 1

Model: Spline Data Point Function

Function: Cohesion vs. X

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 720

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

Data Point: (160.6, 720)

Data Point: (200, 750)

Data Point: (241.7, 720)

CLAY 2

Model: Spline Data Point Function

Function: Cohesion vs. X

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 995

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

Data Point: (160.6, 995)

Data Point: (200, 1050)

Data Point: (241.7, 995)

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: (-100000, 0)

Data Point: (0, 0)

Data Point: (100000, 57735)

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: 85

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

Data Point: (160.6, 85)

Data Point: (200, 90)

Data Point: (241.7, 85)

Fill

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: (160.6, 100)

Data Point: (200, 110)

Data Point: (241.7, 100)

Marsh 2

Model: [Spline Data Point Function](#)

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

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 116

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

Data Point: (160.6, 116)

Data Point: (200, 90)

Data Point: (241.7, 116)

Clay 1

Model: [Spline Data Point Function](#)

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

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 109

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

Data Point: (160.6, 109)

Data Point: (200, 110)

Data Point: (241.7, 109)

Clay 2

Model: Spline Data Point Function

Function: Unit Weight vs. X

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 119

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

Data Point: (160.6, 119)

Data Point: (200, 102)

Data Point: (241.7, 119)

Regions

	Material	Points	Area (ft ²)
Region 1	Marsh 1, -7 to -11 (Protected)	47,46,42,45	40.034938
Region 2	Fill -2.2 to -7 (Protected)	27,5,7,15	331.255
Region 3	Marsh 1, -7 to -11 (Protected)	15,7,43,30	273.2
Region 4	BEACH SAND, EL -12 TO -22	40,17,2,58,21,39	87.864
Region 5	EMBANKMENT FILL 1 CH, EL. +3.4 to -3.5	10,28,3,25,20,24,6,42	141.455
Region 6	BEACH SAND, EL. -22 TO -46.5	8,22,1,56,55,53,54,23,9,35,14,33	4646.4685
Region 7	BEACH SAND, EL -12 TO -22	21,32,11,18,39	271.37
Region 8	Sheet Pile	28,37,38,19,29	7.65
Region 9	BEACH SAND, EL. -22 TO -46.5	56,1,22,57	42.83154
Region 10	EMBANKMENT FILL 1 CH, EL. +3.4 to -3.5	10,28,29,19,4,26,27,15	299.59
Region 11	MARSH 1, EL. -3.5 to -11	30,15,10,44	239.775
Region 12	MARSH 1, EL. -3.5 to -11	44,10,42,45	295.5
Region 13	Marsh 2, -11 to -14.5 (Protected)	31,30,43,16	239.05

Region 14	MARSH 1, EL. -11 to -12	11,32,45,44	39.4
Region 15	MARSH 1, EL. -11 to -12	44,30,31,11	93.825
Region 16	Marsh 2, -11 to -14.5 (Protected)	21,47,45,32	6.9
Region 17	BAY SOUND CLAY CL, EL. - 46.5 TO -61.5 (protected)	8,33,49,48	632.1
Region 18	BAY SOUND CLAY CL, EL. - 61.5 TO -70 (protected)	48,49,34,13	354.9
Region 19	BAY SOUND CLAY CL, EL. - 46.5 TO -61.5	33,14,35,51,50,49	1218.47
Region 20	BAY SOUND CLAY CL, EL. - 61.5 TO -70	49,50,51,36,41,34	687.38
Region 21	BAY SOUND CLAY CL, EL. - 46.5 TO -61.5 (protected)	35,9,52,51	1024.5
Region 22	BAY SOUND CLAY CL, EL. - 61.5 TO -70 (protected)	51,52,12,36	580.55
Region 23	BEACH SAND, EL -12 TO - 22	56,39,18,11,31,16,23,54,53,55	1132.1815
Region 24	Marsh 1, -7 to -11 (Protected)	47,46,59	17.238186
Region 25	BEACH SAND, EL -12 TO - 22	57,40,39,56	111.24347
Region 26	Marsh 2, -11 to -14.5 (Protected)	58,59,47,21	9.2328574

Points

	X (ft)	Y (ft)
Point 1	135.2	-24
Point 2	135.2	-16
Point 3	199	3.4
Point 4	205.1	6.2
Point 5	310	-2.1
Point 6	161.4	-3.1
Point 7	310	-7
Point 8	118.6	-46.5

Point 9	310	-46.5
Point 10	200	-3.5
Point 11	200	-12
Point 12	310	-70
Point 13	118.6	-70
Point 14	200	-46.5
Point 15	241.7	-7
Point 16	310	-14.5
Point 17	118.6	-16.7
Point 18	200	-17.5
Point 19	201	5.5
Point 20	186.1	1
Point 21	153.7	-12
Point 22	118.6	-24.7
Point 23	310	-22
Point 24	171.9	-2.1
Point 25	191.6	3.5
Point 26	232.6	-1.2
Point 27	241.7	-2.2
Point 28	200	3.4
Point 29	201	3.4
Point 30	241.7	-11
Point 31	241.7	-14.5
Point 32	160.6	-12
Point 33	160.6	-46.5
Point 34	160.6	-70
Point 35	241.7	-46.5
Point 36	241.7	-70
Point 37	200	12.9
Point 38	200.5	12.9
Point 39	147.62	-17.5
Point 40	118.6	-17.5
Point 41	200	-70
Point 42	160.6	-3.5
Point 43	310	-11
Point 44	200	-11

Point 45	160.6	-11
Point 46	153.7	-6.89567
Point 47	153.7	-11
Point 48	118.6	-61.5
Point 49	160.6	-61.6
Point 50	200	-61.5
Point 51	241.7	-61.5
Point 52	310	-61.5
Point 53	200	-22
Point 54	241.7	-22
Point 55	160.6	-22
Point 56	139.02154	-22
Point 57	118.6	-22
Point 58	143.328	-12
Point 59	145.3	-11.02953

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.87	(218.997, 0.673)	29.63202	(181.721, 0.044001)	(253.42, -2.18284)
2	5548	2.10	(218.997, 0.673)	30.194	(181.989, 0.10262)	(255.9, -2.17921)

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	182.7382	-0.77636702	640.19962	490.79548	0	467.43
2	Optimized	184.7728	-2.4171025	685.2313	669.69786	0	473.62
3	Optimized	185.94505	-3.3413115	715.32626	813.42631	0	477.19
4	Optimized	187.0969	-4.113134	758.01074	947.84676	0	280.7
5	Optimized	189.04975	-5.4216725	839.34516	1097.8358	0	286.65
6	Optimized	190.80285	-6.694591	918.30171	1210.4797	0	291.99
7	Optimized	192.4963	-8.037954	1003.9582	1355.5971	0	297.15

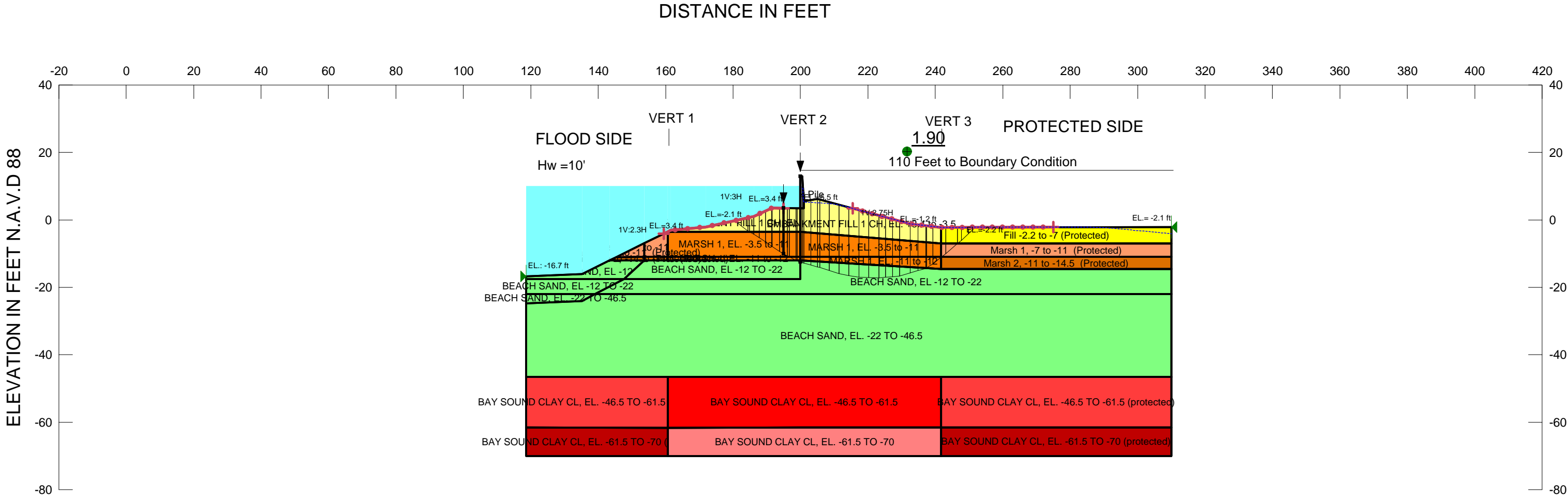
8	Optimized	194.28895	-9.459958	1087.4757	1474.8204	0	302.61
9	Optimized	196.02125	-10.58548	1160.2598	1657.9503	0	307.88
10	Optimized	197.8656	-11.5	1235.6395	1738.5135	0	318.92
11	Optimized	198.937	-12.031245	1283.6315	1792.4495	293.7661 8	-2.0852e-005
12	Optimized	199.43345	-12.277405	1308.338	1820.9659	295.9658 6	-5.9891e-005
13	Optimized	199.93345	-12.503365	1338.0771	1953.1777	355.1284 8	-2.5199e-005
14	Optimized	200.25	-12.555885	1182.775	1316.527	77.22176	-4.1002e-007
15	Optimized	200.75	-12.63883	1155.8826	1567.5167	237.6571 1	-1.2619e-006
16	Optimized	202.025	-12.85034	1167.3629	1829.5327	382.3038 8	-7.7326e-005
17	Optimized	204.075	-13.190425	1181.9441	1901.5725	415.4776 4	-8.403e-005
18	Optimized	205.2344	-13.38276	1188.9965	1936.0333	431.3018 8	-8.7233e-005
19	Optimized	206.4148	-13.66842	1201.2836	1901.3989	404.2117 5	-8.1761e-005
20	Optimized	208.50685	-14.19516	1223.0232	1901.0744	391.4730 8	-2.7779e-005
21	Optimized	210.5989	-14.7219	1244.2065	1901.4452	379.4569 9	-7.6752e-005
22	Optimized	212.55185	-15.13977	1259.1841	1922.9337	383.2160 3	-7.7502e-005
23	Optimized	214.36575	-15.44877	1268.0971	1906.5207	368.5940 2	-7.4548e-005
24	Optimized	216.6084	-15.73741	1273.2776	1900.7912	362.2951 5	-2.5707e-005
25	Optimized	219.27985	-16.005685	1274.6929	1855.3143	335.2219 3	-6.7798e-005
26	Optimized	221.63615	-16.1638	1271.0405	1832.8727	324.3739 4	-6.56e-005
27	Optimized	223.6773	-16.21176	1262.3224	1779.5351	298.6129 2	-6.0385e-005
28	Optimized	225.99755	-16.12549	1243.6025	1737.0414	284.8870 8	1.7184e-005

29	Optimized	228.59685	-15.904985	1214.9284	1633.0405	241.3970 9	-1.2814e-006
30	Optimized	231.24825	-15.518105	1175.5502	1540.4635	210.6828 4	-1.1183e-006
31	Optimized	233.8008	-14.99574	1128.2427	1418.6862	167.6876 6	-8.9007e-007
32	Optimized	236.20245	-14.50426	1083.6155	1328.2081	141.2156 2	-7.494e-007
33	Optimized	238.9641	-13.2227	982.55656	1307.2105	0	301.31
34	Optimized	241.11245	-11.77309	872.40267	1116.5418	0	300.28
35	Optimized	241.9551	-11.17965	827.62248	1035.9824	0	300
36	Optimized	243.28775	-10.24114	756.82016	899.4661	0	200
37	Optimized	246.1615	-8.18029	602.07048	715.30381	0	200
38	Optimized	249.3232	-5.704435	369.82522	602.56604	0	400
39	Optimized	252.0542	-3.3567055	118.93883	347.86172	0	400

Slices of Slip Surface: 5548

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	5548	183.01705	- 0.7596766	638.20564	499.40533	0	468.28
2	5548	185.07235	-2.48427	686.95721	685.95087	0	474.54
3	5548	186.19145	- 3.4232835	718.13992	777.37746	0	477.94
4	5548	187.61215	- 4.6154035	788.26804	969.65296	0	282.27
5	5548	190.2707	-6.846211	924.41479	1207.139	0	290.37
6	5548	193.4105	- 9.4808075	1081.6416	1470.3963	0	299.93
7	5548	195.8169	-11.5	1195.1991	1637.3084	0	317.88
8	5548	197.7064	- 13.085475	1304.4346	1812.9616	293.59818	1.7722e-005
9	5548	199.5	-14.5905	1382.6339	1969.8837	339.04883	-6.8599e-005
10	5548	200.18825	-15.16801	1352.9384	1427.1826	42.864944	2.8484e-006
11	5548	200.43825	- 15.326355	1331.796	1944.0108	353.46239	-7.1478e-005
12	5548	200.75	-15.3283	1331.3342	1943.2023	353.26223	-7.1434e-005

13	5548	202.025	-15.33625	1328.0716	2196.3474	501.29923	-0.00010137
14	5548	204.075	-15.34903	1318.3645	2231.9564	527.46255	-0.00010666
15	5548	206.35	- 15.363215	1307.4544	2210.1967	521.19851	-0.00010539
16	5548	208.85	-15.3788	1294.8546	2132.0782	483.37127	-3.4292e-005
17	5548	211.35	- 15.394385	1281.7749	2055.1197	446.49085	-3.1675e-005
18	5548	213.85	- 15.409975	1268.6151	1979.3612	410.34943	-8.2977e-005
19	5548	216.35	-15.42556	1255.3754	1904.7627	374.92392	-7.5815e-005
20	5548	218.85	- 15.441145	1242.0957	1831.3641	340.2143	-2.4136e-005
21	5548	221.35	-15.45673	1228.7759	1759.1255	306.19749	-6.1919e-005
22	5548	223.85	- 15.472315	1215.4162	1688.0869	272.89658	1.6463e-005
23	5548	226.35	- 15.487905	1202.0164	1618.2083	240.28847	-1.2757e-006
24	5548	228.85	-15.50349	1188.5367	1549.5296	208.41936	-1.1064e-006
25	5548	231.35	- 15.519075	1175.017	1482.011	177.24306	-9.4091e-007
26	5548	233.65	- 15.533415	1162.5011	1438.4005	159.29058	-8.4562e-007
27	5548	235.75	- 15.546505	1151.0251	1418.1628	154.23199	-8.1885e-007
28	5548	237.6859	- 14.932755	1101.4302	1510.8314	236.36789	-1.2541e-006
29	5548	240.1359	-13.21725	974.76223	1295.5107	0	300.75
30	5548	242.5012	-11.56102	849.65359	1072.3292	0	300
31	5548	244.73055	-10	732.02684	870.83232	0	200
32	5548	247.58685	-8	581.97926	688.83654	0	200
33	5548	250.1625	-6.196535	417.58326	593.30446	0	400
34	5548	252.45745	-4.589605	244.13576	421.18834	0	400
35	5548	254.75235	-2.982675	78.833608	249.07223	0	400



Name: EMBANKMENT FILL 1 CH, EL. +3.4 to -3.5 Model: Spatial Mohr-Coulomb Weight Fn: Fill Cohesion Fn: FILL Phi: 0 °
Name: MARSH 1, EL. -3.5 to -11 Model: Spatial Mohr-Coulomb Weight Fn: Marsh 1 Cohesion Fn: Marsh 1 Phi: 0 °
Name: BEACH SAND, EL. -22 TO -46.5 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Beach Sand
Name: BAY SOUND CLAY CL, EL. -46.5 TO -61.5 Model: Spatial Mohr-Coulomb Weight Fn: Clay 1 Cohesion Fn: CLAY 1 Phi: 0 °
Name: Sheet Pile Model: Undrained (Phi=0) Unit Weight: 0.1 pcf Cohesion: 0.01 psf
Name: BEACH SAND, EL -12 TO -22 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Beach Sand
Name: Fill -2.2 to -7 (Protected) Model: Undrained (Phi=0) Unit Weight: 100 pcf Cohesion: 400 psf
Name: Marsh 1, -7 to -11 (Protected) Model: Undrained (Phi=0) Unit Weight: 85 pcf Cohesion: 200 psf
Name: Marsh 2, -11 to -14.5 (Protected) Model: Undrained (Phi=0) Unit Weight: 116 pcf Cohesion: 300 psf
Name: MARSH 1, EL. -11 to -12 Model: Spatial Mohr-Coulomb Weight Fn: Marsh 2 Cohesion Fn: Marsh 2 Phi: 0 °
Name: BAY SOUND CLAY CL, EL. -61.5 TO -70 Model: Spatial Mohr-Coulomb Weight Fn: Clay 2 Cohesion Fn: CLAY 2 Phi: 0 °
Name: BAY SOUND CLAY CL, EL. -61.5 TO -70 (protected) Model: Undrained (Phi=0) Unit Weight: 119 pcf Cohesion: 995 psf
Name: BAY SOUND CLAY CL, EL. -46.5 TO -61.5 (protected) Model: Undrained (Phi=0) Unit Weight: 109 pcf Cohesion: 710 psf



**US Army Corps
of Engineers®**
New Orleans District

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=CANAL WATER LEVEL

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

LONDON AVE OUTFALL CANAL, REACH 17,
PROTECTED SIDE STABILITY ANALYSIS,
CASE: Global Stability (Entry/Exit) OPEN
STA. 118+90 TO 119+63
ORLEANS PARISH, LOUISIANA

Global Stability (Entry/Exit) OPEN

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File Information

Created By: [Liljegren, James](#)
Revision Number: [228](#)
Last Edited By: [Almaleh, Lawrence J. \(Larry\)](#)
Date: [2/13/2011](#)
Time: [2:18:39 PM](#)
File Name: [Reach 17 OPEN.gsz](#)
Directory: [Z:\Projects\041752 - New Orleans Canals\Mod 11\Results transmittal\Calculation Files\Slope-W\](#)
Last Solved Date: [2/13/2011](#)
Last Solved Time: [2:24:29 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

Global Stability (Entry/Exit) OPEN

Kind: [SLOPE/W](#)
Parent: [Gap Stability \(Seepage\) OPEN](#)
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: [\(none\)](#)
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 1 CH, EL. +3.4 to -3.5

Model: Spatial Mohr-Coulomb
Weight Fn: Fill
Cohesion Fn: FILL
Phi: 0 °
Phi-B: 0 °

MARSH 1, EL. -3.5 to -11

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

BEACH SAND, EL. -22 TO -46.5

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

BAY SOUND CLAY CL, EL. -46.5 TO -61.5

Model: Spatial Mohr-Coulomb
Weight Fn: Clay 1
Cohesion Fn: CLAY 1
Phi: 0 °
Phi-B: 0 °

Sheet Pile

Model: Undrained (Phi=0)
Unit Weight: 0.1 pcf
Cohesion: 0.01 psf

BEACH SAND, EL -12 TO -22

Model: [Shear/Normal Fn.](#)
Unit Weight: [122 pcf](#)
Strength Function: [Beach Sand](#)
Phi-B: [0 °](#)

Fill -2.2 to -7 (Protected)

Model: [Undrained \(Phi=0\)](#)
Unit Weight: [100 pcf](#)
Cohesion: [400 psf](#)

Marsh 1, -7 to -11 (Protected)

Model: [Undrained \(Phi=0\)](#)
Unit Weight: [85 pcf](#)
Cohesion: [200 psf](#)

Marsh 2, -11 to -14.5 (Protected)

Model: [Undrained \(Phi=0\)](#)
Unit Weight: [116 pcf](#)
Cohesion: [300 psf](#)

MARSH 1, EL. -11 to -12

Model: [Spatial Mohr-Coulomb](#)
Weight Fn: [Marsh 2](#)
Cohesion Fn: [Marsh 2](#)
Phi: [0 °](#)
Phi-B: [0 °](#)

BAY SOUND CLAY CL, EL. -61.5 TO -70

Model: [Spatial Mohr-Coulomb](#)
Weight Fn: [Clay 2](#)
Cohesion Fn: [CLAY 2](#)
Phi: [0 °](#)
Phi-B: [0 °](#)

BAY SOUND CLAY CL, EL. -61.5 TO -70 (protected)

Model: [Undrained \(Phi=0\)](#)
Unit Weight: [119 pcf](#)
Cohesion: [995 psf](#)

BAY SOUND CLAY CL, EL. -46.5 TO -61.5 (protected)

Model: [Undrained \(Phi=0\)](#)
Unit Weight: [109 pcf](#)
Cohesion: [710 psf](#)

Slip Surface Entry and Exit

Left Projection: [Range](#)
Left-Zone Left Coordinate: [\(159.42992, -4.07583\)](#) ft
Left-Zone Right Coordinate: [\(195.00884, 3.45393\)](#) ft
Left-Zone Increment: [10](#)
Right Projection: [Range](#)
Right-Zone Left Coordinate: [\(215.52867, 3.39374\)](#) ft
Right-Zone Right Coordinate: [\(274.9963, -2.15125\)](#) ft
Right-Zone Increment: [20](#)
Radius Increments: [4](#)

Slip Surface Limits

Left Coordinate: [\(118.6, -16.7\)](#) ft
Right Coordinate: [\(310, -2.1\)](#) ft

Reinforcements

Reinforcement 1

Type: [Pile](#)
Outside Point: [\(195, 3.5\)](#) ft
Inside Point: [\(195, -10\)](#) ft
Slip Surface Intersection: [\(195, -10.001\)](#) ft
Total Length: [13.5](#) 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

Reinforcement 2

Type: [Pile](#)
Outside Point: [\(200, 12.9\)](#) ft
Inside Point: [\(200, -12.5\)](#) ft
Slip Surface Intersection: [\(200, -12.586\)](#) ft
Total Length: [25.4](#) 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

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: (160.6, 200)
Data Point: (200, 320)
Data Point: (241.7, 200)

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: (160.6, 300)
Data Point: (200, 320)
Data Point: (241.7, 300)

FILL

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: (160.6, 400)
Data Point: (200, 520)
Data Point: (241.7, 400)

CLAY 1

Model: Spline Data Point Function
Function: Cohesion vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 720

Data Points: [X \(ft\)](#), [Cohesion \(psf\)](#)
Data Point: [\(160.6, 720\)](#)
Data Point: [\(200, 750\)](#)
Data Point: [\(241.7, 720\)](#)

CLAY 2

Model: [Spline Data Point Function](#)
Function: [Cohesion vs. X](#)
Curve Fit to Data: [100 %](#)
Segment Curvature: [0 %](#)
Y-Intercept: [995](#)
Data Points: [X \(ft\)](#), [Cohesion \(psf\)](#)
Data Point: [\(160.6, 995\)](#)
Data Point: [\(200, 1050\)](#)
Data Point: [\(241.7, 995\)](#)

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: [\(-100000, 0\)](#)
Data Point: [\(0, 0\)](#)
Data Point: [\(100000, 57735\)](#)
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: [85](#)
Data Points: [X \(ft\)](#), [Unit Weight \(pcf\)](#)

Data Point: (160.6, 85)
Data Point: (200, 90)
Data Point: (241.7, 85)

Fill

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: (160.6, 100)
Data Point: (200, 110)
Data Point: (241.7, 100)

Marsh 2

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 116
Data Points: X (ft), Unit Weight (pcf)
Data Point: (160.6, 116)
Data Point: (200, 90)
Data Point: (241.7, 116)

Clay 1

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 109
Data Points: X (ft), Unit Weight (pcf)
Data Point: (160.6, 109)
Data Point: (200, 110)
Data Point: (241.7, 109)

Clay 2

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 119
Data Points: X (ft), Unit Weight (pcf)
Data Point: (160.6, 119)
Data Point: (200, 102)
Data Point: (241.7, 119)

Regions

	Material	Points	Area (ft²)
Region 1	Marsh 1, -7 to -11 (Protected)	47,46,42,45	40.034938
Region 2	Fill -2.2 to -7 (Protected)	27,5,7,15	331.255
Region 3	Marsh 1, -7 to -11 (Protected)	15,7,43,30	273.2
Region 4	BEACH SAND, EL -12 TO -22	40,17,2,58,21,39	87.864
Region 5	EMBANKMENT FILL 1 CH, EL. +3.4 to -3.5	10,28,3,25,20,24,6,42	141.455
Region 6	BEACH SAND, EL. -22 TO -46.5	8,22,1,56,55,53,54,23,9,35,14,33	4646.4685
Region 7	BEACH SAND, EL -12 TO -22	21,32,11,18,39	271.37
Region 8	Sheet Pile	28,37,38,19,29	7.65
Region 9	BEACH SAND, EL. -22 TO -46.5	56,1,22,57	42.83154
Region 10	EMBANKMENT FILL 1 CH, EL. +3.4 to -3.5	10,28,29,19,4,26,27,15	299.59
Region 11	MARSH 1, EL. -3.5 to -11	30,15,10,44	239.775
Region 12	MARSH 1, EL. -3.5 to -11	44,10,42,45	295.5
Region 13	Marsh 2, -11 to -14.5 (Protected)	31,30,43,16	239.05
Region 14	MARSH 1, EL. -11 to -12	11,32,45,44	39.4
Region 15	MARSH 1, EL. -11 to -12	44,30,31,11	93.825
Region 16	Marsh 2, -11 to -14.5 (Protected)	21,47,45,32	6.9
Region 17	BAY SOUND CLAY CL, EL. -46.5 TO -61.5 (protected)	8,33,49,48	632.1
Region 18	BAY SOUND CLAY CL, EL. -61.5 TO -70 (protected)	48,49,34,13	354.9

Region 19	BAY SOUND CLAY CL, EL. - 46.5 TO -61.5	33,14,35,51,50,49	1218.47
Region 20	BAY SOUND CLAY CL, EL. - 61.5 TO -70	49,50,51,36,41,34	687.38
Region 21	BAY SOUND CLAY CL, EL. - 46.5 TO -61.5 (protected)	35,9,52,51	1024.5
Region 22	BAY SOUND CLAY CL, EL. - 61.5 TO -70 (protected)	51,52,12,36	580.55
Region 23	BEACH SAND, EL -12 TO - 22	56,39,18,11,31,16,23,54,53,55	1132.1815
Region 24	Marsh 1, -7 to -11 (Protected)	47,46,59	17.238186
Region 25	BEACH SAND, EL -12 TO - 22	57,40,39,56	111.24347
Region 26	Marsh 2, -11 to -14.5 (Protected)	58,59,47,21	9.2328574

Points

	X (ft)	Y (ft)
Point 1	135.2	-24
Point 2	135.2	-16
Point 3	199	3.4
Point 4	205.1	6.2
Point 5	310	-2.1
Point 6	161.4	-3.1
Point 7	310	-7
Point 8	118.6	-46.5
Point 9	310	-46.5
Point 10	200	-3.5
Point 11	200	-12
Point 12	310	-70
Point 13	118.6	-70
Point 14	200	-46.5
Point 15	241.7	-7
Point 16	310	-14.5
Point 17	118.6	-16.7

Point 18	200	-17.5
Point 19	201	5.5
Point 20	186.1	1
Point 21	153.7	-12
Point 22	118.6	-24.7
Point 23	310	-22
Point 24	171.9	-2.1
Point 25	191.6	3.5
Point 26	232.6	-1.2
Point 27	241.7	-2.2
Point 28	200	3.4
Point 29	201	3.4
Point 30	241.7	-11
Point 31	241.7	-14.5
Point 32	160.6	-12
Point 33	160.6	-46.5
Point 34	160.6	-70
Point 35	241.7	-46.5
Point 36	241.7	-70
Point 37	200	12.9
Point 38	200.5	12.9
Point 39	147.62	-17.5
Point 40	118.6	-17.5
Point 41	200	-70
Point 42	160.6	-3.5
Point 43	310	-11
Point 44	200	-11
Point 45	160.6	-11
Point 46	153.7	-6.89567
Point 47	153.7	-11
Point 48	118.6	-61.5
Point 49	160.6	-61.6
Point 50	200	-61.5
Point 51	241.7	-61.5
Point 52	310	-61.5
Point 53	200	-22

Point 54	241.7	-22
Point 55	160.6	-22
Point 56	139.02154	-22
Point 57	118.6	-22
Point 58	143.328	-12
Point 59	145.3	-11.02953

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.90	(216.776, -26.389)	29.55256	(180.468, -0.229533)	(251.938, -2.18501)
2	693	2.10	(216.776, -26.389)	44.543	(180.979, -0.118002)	(250.944, -2.18647)

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	181.46745	-0.9901968	653.48654	515.791	0	463.56
2	Optimized	183.4665	-2.5115255	691.14481	682.66573	0	469.64
3	Optimized	184.6518	-3.386095	717.19022	824.80087	0	473.25
4	Optimized	185.4688	-3.8868885	743.5238	927.76696	0	275.74
5	Optimized	186.91145	-4.7711685	796.50885	1012.578	0	280.14
6	Optimized	188.66495	-5.90317	865.96589	1129.3389	0	285.48
7	Optimized	190.549	-7.17239	943.57355	1275.31	0	291.22
8	Optimized	191.5455	-7.841074	986.42441	1365.7286	0	294.25
9	Optimized	192.7184	-8.574566	1032.5777	1446.3896	0	297.82
10	Optimized	194.95515	-9.973402	1120.2147	1566.4356	0	304.63
11	Optimized	196.3997	-10.83641	1175.0511	1678.3117	0	309.03
12	Optimized	197.7229	-11.5	1230.6451	1736.6746	0	318.84
13	Optimized	198.85995	-12.07023	1283.08	1794.8502	295.47068	-2.0973e-005

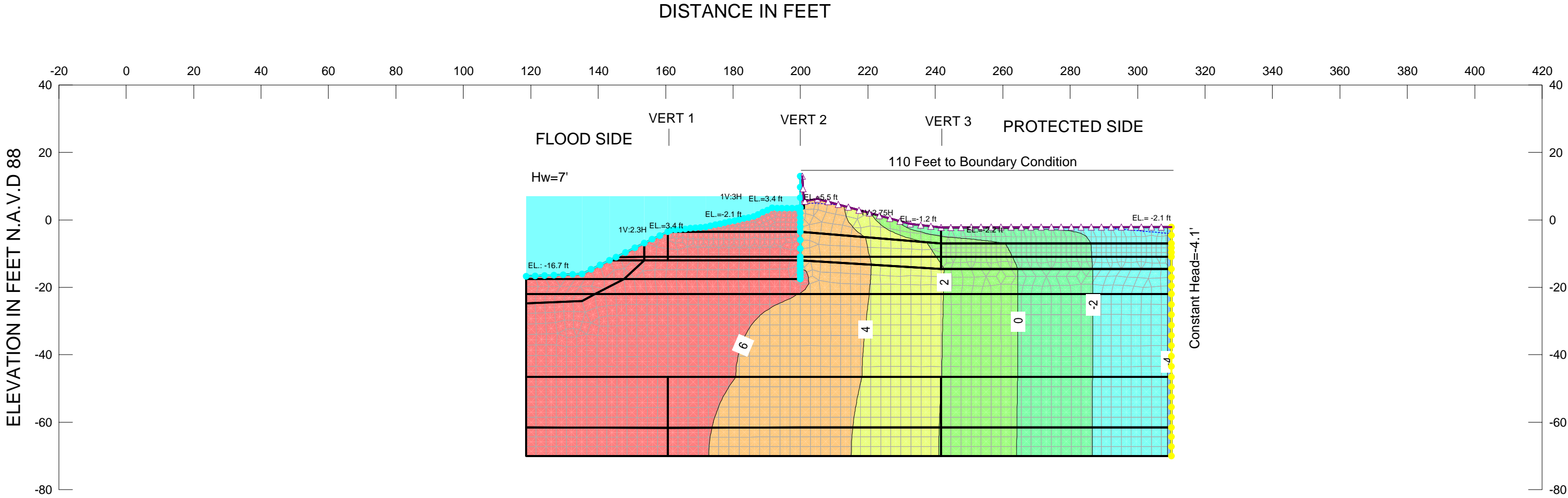
14	Optimized	199.38365	-12.33287	1309.0356	1825.2176	298.0178	-6.0304e-005
15	Optimized	199.88365	- 12.555515	1332.9113	1926.3839	342.64161	-6.931e-005
16	Optimized	200.25	-12.65072	1186.6818	1309.9279	71.156174	1.958e-006
17	Optimized	200.75	-12.78066	1164.789	1560.2141	228.29878	-1.6201e-005
18	Optimized	202.025	- 13.112005	1184.0357	1827.5384	371.5265	-7.5146e-005
19	Optimized	204.075	-13.64476	1210.5689	1919.8856	409.52415	-8.2836e-005
20	Optimized	205.4431	-14.0003	1226.7604	1966.0833	426.8483	-3.0293e-005
21	Optimized	207.19145	-14.56312	1252.9725	1951.4435	403.26241	-8.1576e-005
22	Optimized	210.002	-15.51044	1296.568	1979.5968	394.34688	-2.7987e-005
23	Optimized	212.88265	- 16.226755	1324.8353	2044.7214	415.62646	-8.4059e-005
24	Optimized	215.83335	- 16.712065	1338.1783	2016.3299	391.53105	-7.9186e-005
25	Optimized	218.7952	-17.02161	1340.5228	2013.6068	388.60523	-7.8585e-005
26	Optimized	221.7682	-17.15539	1331.8199	1942.9416	352.83128	-2.5032e-005
27	Optimized	224.27435	-17.12171	1315.3516	1919.5203	348.81697	-2.4743e-005
28	Optimized	226.3137	-16.92057	1291.1477	1833.1965	312.95202	-2.2199e-005
29	Optimized	228.3531	-16.71943	1266.8951	1747.7023	277.59419	-1.9691e-005
30	Optimized	230.9864	-16.16077	1216.9516	1658.1137	254.70505	-1.8062e-005
31	Optimized	233.75785	- 15.373985	1151.9608	1490.3207	195.35219	-1.0366e-006
32	Optimized	236.07355	-14.71659	1097.5823	1376.4955	161.03065	-8.5455e-007
33	Optimized	237.3337	-14.31613	1065.2466	1427.7833	209.31066	-1.1099e-

							006
34	Optimized	238.33885	- 13.611215	1012.3741	1372.2165	0	301.61
35	Optimized	240.47085	- 12.013795	892.45737	1176.181	0	300.59
36	Optimized	242.37825	- 10.517435	780.84763	940.69432	0	200
37	Optimized	244.84295	-8.49267	630.63961	765.028	0	200
38	Optimized	247.1712	-6.54729	468.74657	684.44888	0	400
39	Optimized	248.7692	- 5.1171875	310.00674	555.0477	0	400
40	Optimized	250.88165	- 3.1624025	100.35332	341.25966	0	400

Slices of Slip Surface: 693

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	693	182.3645	- 1.8090011	673.30704	502.21295	0	466.29
2	693	184.9251	-4.703556	791.43209	912.48199	0	274.09
3	693	187.475	- 7.1097985	931.64565	1165.6108	0	281.85
4	693	190.225	- 9.3344275	1059.6948	1438.055	0	290.23
5	693	192.0831	- 10.678185	1135.7284	1618.1007	0	295.89
6	693	193.3758	-11.5	1179.1325	1700.9144	0	316.64
7	693	195.38905	- 12.659245	1250.792	1840.7566	340.61622	-2.4166e-005
8	693	197.79635	- 13.885715	1343.8513	2004.8233	381.6124	-7.7178e-005
9	693	199.5	-14.66335	1385.5157	2110.5334	418.58918	-8.4655e-005
10	693	200.25	- 14.973645	1322.8644	1552.4021	132.52365	-7.0368e-007
11	693	200.75	- 15.169935	1320.6884	1805.1	279.67519	-1.9844e-005
12	693	202.025	-15.6262	1347.0056	2089.5018	428.68039	-3.0417e-005

13	693	204.075	-16.29108	1378.4081	2216.1504	483.67072	-9.7823e-005
14	693	206.24585	- 16.874985	1402.9699	2287.7441	510.82459	-0.00010331
15	693	208.5375	- 17.369595	1420.6277	2301.2727	508.44066	-0.00010283
16	693	210.82915	-17.73973	1430.5601	2300.1832	502.07715	-0.00010155
17	693	213.12085	- 17.988515	1432.9228	2284.4832	491.64859	-3.4886e-005
18	693	215.4125	-18.11799	1427.8973	2254.1132	477.016	-9.648e-005
19	693	217.70415	- 18.129195	1415.5176	2208.916	458.06877	-9.2646e-005
20	693	219.99585	- 18.022225	1395.7545	2148.4696	434.58028	-8.7893e-005
21	693	222.2875	-17.79622	1368.6512	2072.2889	406.24544	-8.2164e-005
22	693	224.57915	-17.44933	1333.9411	1979.56	372.74824	-2.6448e-005
23	693	226.87085	- 16.978645	1291.5364	1869.3257	333.58679	-2.3669e-005
24	693	229.1625	-16.38007	1241.1556	1740.2249	288.1378	1.7384e-005
25	693	231.45415	- 15.648125	1182.4408	1590.4986	235.5923	-1.2509e-006
26	693	233.95265	- 14.682325	1107.9123	1426.802	184.11105	-9.7764e-007
27	693	236.72535	- 13.404715	1008.6751	1295.7663	0	302.39
28	693	239.5655	- 11.846405	886.99126	1102.6977	0	301.02
29	693	241.3428	-10.76379	803.70622	934.90187	0	201.03
30	693	242.8396	-9.704656	723.74559	845.71559	0	200
31	693	245.1188	-7.940866	592.08995	703.16602	0	200
32	693	247.4299	- 5.8873875	396.55903	625.01219	0	400
33	693	249.7729	-3.48062	134.77884	399.93985	0	400



Name: EMBANKMENT FILL 1 CH, EL. +3.4 to -3.5 Model: Saturated Only K-Sat: 3.28e-008 ft/sec K-Ratio: 1
Name: MARSH 1, EL. -3.5 to -11 Model: Saturated Only K-Sat: 3.28e-007 ft/sec K-Ratio: 1
Name: BEACH SAND, EL. -22 TO -46.5 Model: Saturated Only K-Sat: 0.00049 ft/sec K-Ratio: 1
Name: BAY SOUND CLAY CL, EL. -46.5 TO -61.5 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: BEACH SAND, EL -12 TO -22 Model: Saturated Only K-Sat: 0.00049 ft/sec K-Ratio: 1
Name: BAY SOUND CLAY CL, EL. -61.5 TO -70 Model: Saturated Only K-Sat: 3.28e-008 ft/sec K-Ratio: 1
Name: BAY SOUND CLAY CL, EL. -61.5 TO -70 (protected) Model: Saturated Only K-Sat: 3.28e-008 ft/sec K-Ratio: 1
Name: BAY SOUND CLAY CL, EL. -46.5 TO -61.5 (protected) Model: Saturated Only K-Sat: 3.28e-008 ft/sec K-Ratio: 1



**US Army Corps
of Engineers®**
New Orleans District

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=CANAL WATER LEVEL

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

LONDON AVE OUTFALL CANAL, REACH 17,
PROTECTED SIDE STABILITY ANALYSIS,
CASE: Steady-State Seepage w/ 9
STA. 118+90 TO 119+63
ORLEANS PARISH, LOUISIANA

Steady-State Seepage wl 9

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File Information

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Time: [2:18:39 PM](#)
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Directory: [Z:\Projects\041752 - New Orleans Canals\Mod 11\Results transmittal\Calculation Files\Slope-W\](#)
Last Solved Date: [2/13/2011](#)
Last Solved Time: [2:24:37 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

Steady-State Seepage wl 9

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 1 CH, EL. +3.4 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 °

MARSH 1, EL. -3.5 to -11

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. -22 TO -46.5

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 CL, EL. -46.5 TO -61.5

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 °

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 °

BEACH SAND, EL -12 TO -22

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 CL, EL. -61.5 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 °

BAY SOUND CLAY CL, EL. -61.5 TO -70 (protected)

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 °

BAY SOUND CLAY CL, EL. -46.5 TO -61.5 (protected)

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) -4.1

Canal Water (Seepage)

Type: Head (H) 7

Regions

	Material	Points	Area (ft²)
Region 1	MARSH 1, EL. -3.5 to -11	47,46,42,45	40.034938
Region 2	EMBANKMENT FILL 1 CH, EL. +3.4 to -3.5	27,5,7,15	331.255
Region 3	MARSH 1, EL. -3.5 to -11	15,7,43,30	273.2
Region 4	BEACH SAND, EL -12 TO -22	40,17,2,58,21,39	87.864
Region 5	EMBANKMENT FILL 1 CH, EL. +3.4 to -3.5	10,28,3,25,20,24,6,42	141.455
Region 6	BEACH SAND, EL. -22 TO -46.5	8,22,1,56,55,53,54,23,9,35,14,33	4646.4685
Region 7	BEACH SAND, EL -12 TO -22	21,32,11,18,39	271.37
Region 8	Sheet Pile	28,37,38,19,29	7.65
Region 9	BEACH SAND, EL. -22 TO -46.5	56,1,22,57	42.83154
Region 10	EMBANKMENT FILL 1 CH, EL. +3.4 to -3.5	10,28,29,19,4,26,27,15	299.59
Region 11	MARSH 1, EL. -3.5 to -11	30,15,10,44	239.775
Region 12	MARSH 1, EL. -3.5 to -11	44,10,42,45	295.5
Region	MARSH 1, EL. -3.5 to -11	31,30,43,16	239.05

13			
Region 14	MARSH 1, EL. -3.5 to -11	11,32,45,44	39.4
Region 15	MARSH 1, EL. -3.5 to -11	44,30,31,11	93.825
Region 16	MARSH 1, EL. -3.5 to -11	21,47,45,32	6.9
Region 17	BAY SOUND CLAY CL, EL. - 46.5 TO -61.5 (protected)	8,33,49,48	632.1
Region 18	BAY SOUND CLAY CL, EL. - 61.5 TO -70 (protected)	48,49,34,13	354.9
Region 19	BAY SOUND CLAY CL, EL. - 46.5 TO -61.5	33,14,35,51,50,49	1218.47
Region 20	BAY SOUND CLAY CL, EL. - 61.5 TO -70	49,50,51,36,41,34	687.38
Region 21	BAY SOUND CLAY CL, EL. - 46.5 TO -61.5 (protected)	35,9,52,51	1024.5
Region 22	BAY SOUND CLAY CL, EL. - 61.5 TO -70 (protected)	51,52,12,36	580.55
Region 23	BEACH SAND, EL -12 TO - 22	56,39,18,11,31,16,23,54,53,55	1132.1815
Region 24	MARSH 1, EL. -3.5 to -11	47,46,59	17.238186
Region 25	BEACH SAND, EL -12 TO - 22	57,40,39,56	111.24347
Region 26	MARSH 1, EL. -3.5 to -11	58,59,47,21	9.2328574

Lines

	Start Point	End Point	Hydraulic Boundary	Left Side Material
Line 1	5	7	Curb	
Line 2	7	15		
Line 3	17	2	Canal Water (Seepage)	
Line 4	11	18	Canal Water (Seepage)	Sheet Pile
Line 5	8	22		
Line 6	23	9	Curb	
Line 7	20	24	Canal Water (Seepage)	

Line 8	5	27	Drainage	
Line 9	19	29		
Line 10	29	28		Sheet Pile
Line 11	16	31		
Line 12	21	32		
Line 13	32	11		
Line 14	31	30		
Line 15	30	15		
Line 16	37	28	Canal Water (Seepage)	
Line 17	37	38		
Line 18	38	19	Drainage	
Line 19	40	17		
Line 20	21	39		
Line 21	39	40		
Line 22	18	39		
Line 23	9	35		
Line 24	35	14		
Line 25	14	33		
Line 26	33	8		
Line 27	15	10		
Line 28	4	26	Drainage	
Line 29	6	24	Canal Water (Seepage)	
Line 30	28	10	Canal Water (Seepage)	Sheet Pile
Line 31	15	27		
Line 32	19	4	Drainage	
Line 33	26	27	Drainage	
Line 34	42	6	Canal Water (Seepage)	
Line 35	42	10		
Line 36	25	20	Canal Water (Seepage)	
Line 37	28	3		
Line 38	3	25	Canal Water (Seepage)	
Line 39	1	22		
Line 40	11	31		
Line 41	7	43	Curb	
Line 42	43	30		
Line 43	43	16	Curb	

Line 44	10	44	Canal Water (Seepage)	Sheet Pile
Line 45	32	45		
Line 46	45	42		
Line 47	44	30		
Line 48	45	44		
Line 49	44	11	Canal Water (Seepage)	Sheet Pile
Line 50	46	42	Canal Water (Seepage)	
Line 51	21	47		
Line 52	47	46		
Line 53	45	47		
Line 54	33	49		
Line 55	49	48		
Line 56	48	8		
Line 57	49	34		
Line 58	34	13		
Line 59	13	48		
Line 60	35	51		
Line 61	51	50		
Line 62	50	49		
Line 63	51	36		
Line 64	36	41		
Line 65	41	34		
Line 66	9	52	Curb	
Line 67	52	51		
Line 68	52	12	Curb	
Line 69	12	36		
Line 70	1	56		
Line 71	56	39		
Line 72	56	55		
Line 73	55	53		
Line 74	53	54		
Line 75	54	23		
Line 76	16	23	Curb	
Line 77	22	57		
Line 78	2	58	Canal Water (Seepage)	
Line 79	58	21		

Line 80	57	56		
Line 81	57	40		
Line 82	46	59	Canal Water (Seepage)	
Line 83	59	47		
Line 84	58	59	Canal Water (Seepage)	

Points

	X (ft)	Y (ft)	Hydraulic Boundary
Point 1	135.2	-24	
Point 2	135.2	-16	Canal Water (Seepage)
Point 3	199	3.4	
Point 4	205.1	6.2	
Point 5	310	-2.1	
Point 6	161.4	-3.1	
Point 7	310	-7	
Point 8	118.6	-46.5	
Point 9	310	-46.5	
Point 10	200	-3.5	
Point 11	200	-12	
Point 12	310	-70	
Point 13	118.6	-70	
Point 14	200	-46.5	
Point 15	241.7	-7	
Point 16	310	-14.5	
Point 17	118.6	-16.7	
Point 18	200	-17.5	
Point 19	201	5.5	
Point 20	186.1	1	
Point 21	153.7	-12	
Point 22	118.6	-24.7	
Point 23	310	-22	
Point 24	171.9	-2.1	
Point 25	191.6	3.5	
Point 26	232.6	-1.2	
Point 27	241.7	-2.2	

Point 28	200	3.4	
Point 29	201	3.4	
Point 30	241.7	-11	
Point 31	241.7	-14.5	
Point 32	160.6	-12	
Point 33	160.6	-46.5	
Point 34	160.6	-70	
Point 35	241.7	-46.5	
Point 36	241.7	-70	
Point 37	200	12.9	
Point 38	200.5	12.9	
Point 39	147.62	-17.5	
Point 40	118.6	-17.5	
Point 41	200	-70	
Point 42	160.6	-3.5	
Point 43	310	-11	
Point 44	200	-11	
Point 45	160.6	-11	
Point 46	153.7	-6.89567	
Point 47	153.7	-11	
Point 48	118.6	-61.5	
Point 49	160.6	-61.6	
Point 50	200	-61.5	
Point 51	241.7	-61.5	
Point 52	310	-61.5	
Point 53	200	-22	
Point 54	241.7	-22	
Point 55	160.6	-22	
Point 56	139.02154	-22	
Point 57	118.6	-22	
Point 58	143.328	-12	
Point 59	145.3	-11.02953	

APPENDIX H SEEPAGE AND STABILITY WITH POTENTIAL CANAL EROSION

Slope Stability (Entry/Exit)

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File Information

Revision Number: 367
Last Edited By: Haggerty, Daniel R MVN
Date: 2/16/2012
Time: 8:48:22 AM
File Name: Reach 5.gsz
Last Solved Date: 2/16/2012
Last Solved Time: 8:50:10 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

Slope Stability (Entry/Exit)

Kind: [SLOPE/W](#)
Parent: [Gap Analysis \(See page\)](#)
Method: [Spencer](#)
Settings
 PWP Conditions Source: [Parent Analysis](#)
SlipSurface
 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: [\(none\)](#)
FOS Distribution
 FOS Calculation Option: [Constant](#)
Advanced
 Number of Slices: 30
 Optimization Tolerance: 0.01
 Minimum Slip Surface Depth: 0.1 ft

MARSH 3 EL. -7 TO -13

Model: [Spatial Mohr-Coulomb](#)
Unit Weight: 111 pcf
Cohesion Fn: [Marsh 3](#)
Phi: 0 °
Phi-B: 0 °

Fill (Protected)

Model: [Spatial Mohr-Coulomb](#)
Unit Weight: 112 pcf
Cohesion: 500 psf
Phi: 0 °
Phi-B: 0 °

Marsh 1 EL. -4 to -13 (Protected)

Model: [Undrained \(Phi=0\)](#)
Unit Weight: 112 pcf
Cohesion: 450 psf

Marsh 2 EL. -13 to -17 (Protected)

Model: [Undrained \(Phi=0\)](#)
Unit Weight: 100 pcf
Cohesion: 300 psf

MARSH 4 EL. -13 TO -17

Model: [Spatial Mohr-Coulomb](#)
Unit Weight: 99 pcf
Cohesion Fn: [Marsh 4](#)
Phi: 0 °
Phi-B: 0 °

Slip Surface Entry and Exit

Left Projection: [Range](#)
Left-Zone Left Coordinate: (161.99568, -7.0002) ft
Left-Zone Right Coordinate: (199, 4.1) ft
Left-Zone Increment: 20
Right Projection: [Range](#)
Right-Zone Left Coordinate: (210, 3.70172) ft
Right-Zone Right Coordinate: (275, -1.89708) ft
Right-Zone Increment: 30
Radius Increments: 30

Slip Surface Limits

Left Coordinate: (103.3, -7.9) ft
Right Coordinate: (310, -2) ft

Optimization Maximum Iterations: 5000
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. +4.1 TO 0

Model: [Spatial Mohr-Coulomb](#)
Unit Weight: 105 pcf
Cohesion Fn: [Fill1](#)
Phi: 0 °
Phi-B: 0 °

MARSH 1 EL. 0 TO -4

Model: [Undrained \(Phi=0\)](#)
Unit Weight: 107 pcf
Cohesion: 475 psf

BEACH SAND, EL. -17 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: 111 pcf
Cohesion Spatial Fn: [Clay](#)
Phi: 0 °
Phi-B: 0 °

SheetPile

Model: [Undrained \(Phi=0\)](#)
Unit Weight: 0.1 pcf
Cohesion: 0.1 psf

MARSH 2 EL. -4 TO -7

Model: [Spatial Mohr-Coulomb](#)
Unit Weight: 104 pcf
Cohesion Fn: [Marsh 2](#)
Phi: 0 °
Phi-B: 0 °

Cohesion Functions

Marsh 3

Model: [Spline Data Point Function](#)
Function: [Cohesion vs. X](#)
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 450
Data Points: X (ft), Cohesion (psf)
 Data Point: (181.8, 450)
 Data Point: (200, 475)
 Data Point: (229.6, 450)

Marsh 4

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: (181.8, 300)
 Data Point: (200, 330)
 Data Point: (229.6, 300)

Marsh 2

Model: [Spline Data Point Function](#)
Function: [Cohesion vs. X](#)
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 450
Data Points: X (ft), Cohesion (psf)
 Data Point: (181.8, 450)
 Data Point: (200, 475)
 Data Point: (229.6, 450)

Fill1

Model: [Spline Data Point Function](#)
Function: [Cohesion vs. X](#)
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 500
Data Points: X (ft), Cohesion (psf)
 Data Point: (181.8, 500)
 Data Point: (200, 625)
 Data Point: (229.6, 500)

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: (-100000, 0)
Data Point: (0, 0)
Data Point: (100000, 57735)
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: (103.3, -48, 503)
Data Point: (181.8, -48, 503)
Data Point: (200, -48, 595)
Data Point: (229.6, -48, 503)
Data Point: (310, -48, 503)
Data Point: (103.3, -70, 802)
Data Point: (181.8, -70, 802)
Data Point: (200, -70, 895)
Data Point: (229.6, -70, 802)
Data Point: (310, -70, 802)

Regions

	Material	Points	Area (ft²)
Region 1	Marsh 1 EL -4 to -13 (Protected)	5,6,18,17,54	723.6
Region 2	Fill (Protected)	34,35,36,6,5	206.4
Region 3	Marsh 2 EL -13 to -17 (Protected)	17,18,23,19	321.6

Region 4	BAY SOUND CLAY, EL -48 TO -70	7,40,21,42,24,11,43,22,41,10	4547.4
Region 5	EMBANKMENT FILL, EL +4.1 TO 0	30,31,3,14,32,4,8,15	46.405
Region 6	MARSH 1 EL 0 TO -4	37,30,15,8,27,29	72.8
Region 7	MARSH 2 EL -4 TO -7	38,37,29,27,28,57	54.6
Region 8	MARSH 4 EL -13 TO -17	39,56,55,20,16,49	5.46
Region 9	EMBANKMENT FILL, EL +4.1 TO 0	8,4,44,25,33,34,5	137.48
Region 10	MARSH 2 EL -4 TO -7	27,5,54,28	88.8
Region 11	MARSH 1 EL 0 TO -4	8,5,27	59.2
Region 12	MARSH 1 EL 0 TO -4	30,2,1,37	21.95
Region 13	Marsh 1 EL -4 to -13 (Protected)	51,53,39,38,37,1,26	156.24
Region 14	SheetPile	4,45,46,25,44	6.65
Region 15	MARSH 4 EL -13 TO -17	20,55,17,19	63.64
Region 16	Marsh 2 EL -13 to -17 (Protected)	49,39,53,52	3.58125
Region 17	Marsh 2 EL -13 to -17 (Protected)	48,52,49	21.275
Region 18	BEACH SAND, EL -17 TO -48	20,48,52,50,7,40,21,42,24,23,19	6765.305
Region 19	BEACH SAND, EL -17 TO -48	52,53,51,47,50	169.75875
Region 20	MARSH 3 EL -7 TO -13	28,55,56,39,38,57	109.2
Region 21	MARSH 3 EL -7 TO -13	55,28,54,17	177.6
Region 22	MARSH 4 EL -13 TO -17	48,49,16,20	33.67
Region 23	BEACH SAND, EL -17 TO -48	47,13,12,26,51	177.035

Points

	X (ft)	Y (ft)
Point 1	170.7	-4
Point 2	173.6	-3
Point 3	193.6	3.1
Point 4	200	4.1
Point 5	229.6	-4
Point 6	310	-4
Point 7	103.3	-48
Point 8	200	0
Point 9	200	-13.35
Point 10	103.3	-70
Point 11	310	-70
Point 12	153.4	-7.4

Point 13	103.3	-7.9
Point 14	196	3.5
Point 15	196	0
Point 16	196	-13.3
Point 17	229.6	-13
Point 18	310	-13
Point 19	229.6	-17
Point 20	200	-13.3
Point 21	200.05	-48
Point 22	200	-70
Point 23	310	-17
Point 24	310	-48
Point 25	201	4.6
Point 26	162	-7
Point 27	200	-4
Point 28	200	-7
Point 29	196	-4
Point 30	181.8	0
Point 31	184.1	1.4
Point 32	199	4.1
Point 33	206.4	4.4
Point 34	229.6	-0.1
Point 35	277.6	-2
Point 36	310	-2
Point 37	181.8	-4
Point 38	181.8	-7
Point 39	181.8	-13
Point 40	181.8	-48
Point 41	181.8	-70
Point 42	229.6	-48
Point 43	229.6	-70
Point 44	201	4.1
Point 45	200	12.8
Point 46	200.5	12.8
Point 47	103.3	-10.6
Point 48	181.8	-17

Point 49	181.8	-13.3
Point 50	103.3	-13.3
Point 51	162	-10.6
Point 52	170.3	-13.3
Point 53	169.425	-13
Point 54	229.6	-7
Point 55	200	-13
Point 56	196	-13
Point 57	196	-7

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	3.14	(220.433, 31.674)	32.29467	(181.819, 0.0113059)	(258.552, -1.246)
2	11268	3.21	(220.433, 31.674)	49.604	(182.105, 0.185636)	(257.573, -1.20728)

Slices of Slip Surface: Optimized

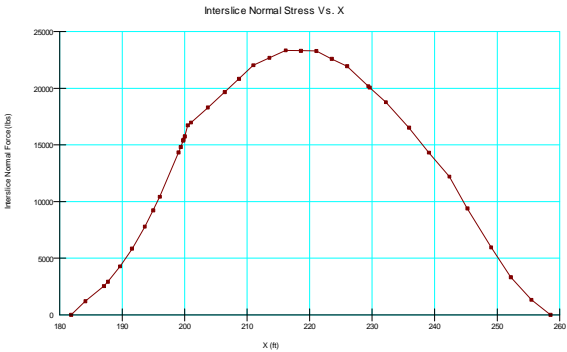
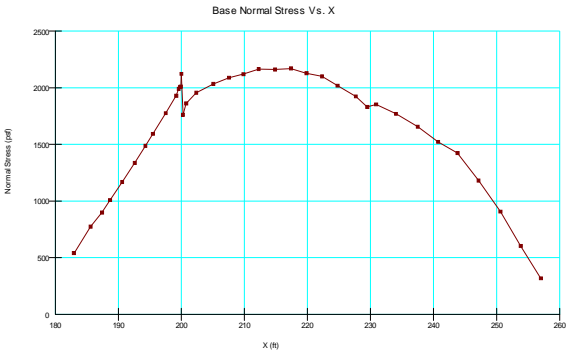
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	182.9593	-0.75397507	593.24218	540.17143	0	475
2	Optimized	185.58795	-2.517478	684.97126	774.24133	0	475
3	Optimized	187.3941	-3.75785	753.09319	897.73269	0	475
4	Optimized	188.6771	-4.7340925	807.8905	1008.4608	0	459.45
5	Optimized	190.60665	-6.2022775	891.36867	1168.3232	0	462.1
6	Optimized	192.5857	-7.7246895	978.76508	1335.5218	0	464.82
7	Optimized	194.274	-9.0368595	1054.8739	1486.4878	0	467.13
8	Optimized	195.474	-9.97103	1109.2148	1592.8802	0	468.78
9	Optimized	197.5	-11.551525	1250.888	1775.4226	0	471.57
10	Optimized	199.17835	-12.86085	1347.669	1929.747	0	473.87
11	Optimized	199.549	-13.15	1372.3456	1990.4075	0	329.26
12	Optimized	199.76805	-13.32086	1387.1124	2006.4833	0	329.62
13	Optimized	199.89385	-13.419005	1380.4924	2010.4706	363.7181	-2.5816e-005
14	Optimized	199.99645	-13.49738	1376.0005	2123.5192	431.5801	-8.7293e-005

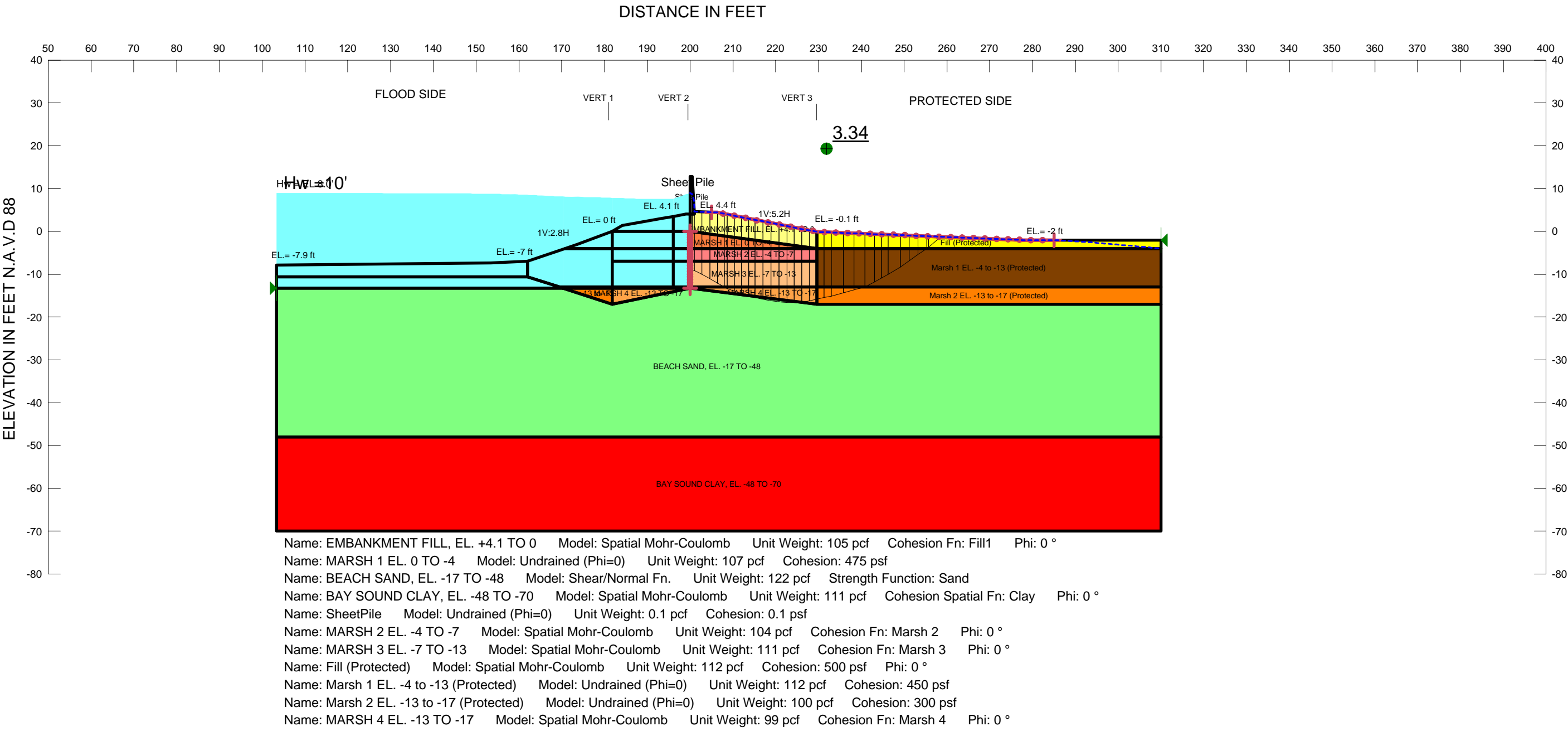
15	Optimized	200.25	-13.575375	1380.2506	1762.5321	220.71031	-1.172e-006
16	Optimized	200.75	-13.729185	1380.1359	1861.075	277.6703	-1.9703e-005
17	Optimized	202.35	-14.22137	1358.4739	1955.8484	344.89434	-6.9758e-005
18	Optimized	205.05	-15.051935	1371.9967	2033.8346	382.11228	-7.7287e-005
19	Optimized	207.5427	-15.81874	1394.8606	2088.5897	400.5247	-2.8421e-005
20	Optimized	209.82815	-16.52178	1419.1587	2119.7465	404.48455	-8.1808e-005
21	Optimized	212.2657	-17.10464	1436.6961	2165.0798	420.53253	-8.5051e-005
22	Optimized	214.8553	-17.567325	1446.8838	2161.0123	412.30228	-8.3381e-005
23	Optimized	217.37775	-17.86619	1448.2133	2170.0427	416.74836	-8.4274e-005
24	Optimized	219.8331	-18.001225	1440.324	2128.8882	397.54272	-8.0395e-005
25	Optimized	222.2934	-17.97725	1422.6936	2100.2419	391.18268	-2.775e-005
26	Optimized	224.7586	-17.79427	1395.226	2018.2435	359.69935	-7.2734e-005
27	Optimized	227.67475	-17.336285	1347.5044	1923.6216	332.62144	-2.3595e-005
28	Optimized	229.47915	-16.943485	1310.4051	1830.2005	0	300.12
29	Optimized	230.88965	-16.636435	1278.1144	1852.7905	0	300
30	Optimized	234.0409	-15.819085	1196.6763	1770.1095	0	300
31	Optimized	237.48635	-14.71186	1091.518	1656.0471	0	300
32	Optimized	240.71645	-13.54816	984.05982	1522.2381	0	300
33	Optimized	243.79955	-12.111355	858.45152	1423.8508	0	450
34	Optimized	247.1412	-10.041625	686.74448	1180.8173	0	450
35	Optimized	250.6224	-7.611715	490.96787	906.41386	0	450
36	Optimized	253.8405	-5.15399	298.07287	603.28594	0	450
37	Optimized	257.0169	-2.5730865	100.10089	318.37402	0	500

Slices of Slip Surface: 11268

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	11268	182.1816	0.09281795	553.35784	339.08901	0	502.62
2	11268	183.1791	-1.0484025	608.96103	499.8891	0	475
3	11268	185.0334	-3.0484025	718.1043	763.4547	0	475
4	11268	187.6687	-5.5	855.16408	1057.7366	0	458.06
5	11268	190.42795	-7.803648	985.50264	1336.0399	0	461.85
6	11268	192.54265	-9.326558	1072.6013	1530.88	0	464.76
7	11268	194.8	-10.770525	1155.9696	1718.9385	0	467.86

8	11268	197.5	-12.27789	1287.1536	1920.6678	0	471.57
9	11268	199.25355	-13.180275	1368.2491	2062.4487	0	328.77
10	11268	199.58225	-13.33482	1383.5121	2079.2517	0	329.31
11	11268	199.8287	-13.447855	1382.6314	2084.8475	405.42463	-2.8765e-005
12	11268	200.25	-13.63743	1380.6656	1752.5603	214.71352	-1.14e-006
13	11268	200.75	-13.856865	1384.5245	1855.0771	271.67364	-1.9275e-005
14	11268	202.35	-14.49371	1372.372	1971.8773	346.12456	-6.9997e-005
15	11268	205.05	-15.46305	1396.4438	2079.4375	394.32664	-2.7978e-005
16	11268	207.6889	-16.2464	1419.4828	2147.0507	420.06151	-8.495e-005
17	11268	210.2667	-16.85917	1436.4435	2174.8268	426.30579	-8.6213e-005
18	11268	212.84445	-17.32876	1446.3451	2185.3505	426.66496	-8.6288e-005
19	11268	215.4222	-17.65928	1448.7227	2178.854	421.54147	-2.9909e-005
20	11268	218	-17.85352	1443.3022	2155.3443	411.09765	-2.9166e-005
21	11268	220.5778	-17.91308	1429.9852	2114.6804	395.30901	-7.9948e-005
22	11268	212.15555	-17.838455	1408.5064	2056.6912	374.22969	-7.5685e-005
23	11268	225.7333	-17.629035	1378.6001	1980.9614	347.77346	-7.033e-005
24	11268	228.3111	-17.28308	1339.825	1886.9081	315.85856	-6.3874e-005
25	11268	229.79685	-17.03784	1314.3823	1895.1158	335.28666	-6.7808e-005
26	11268	231.1936	-16.733285	1282.8748	1860.5081	0	300
27	11268	233.59335	-16.1363	1222.9895	1799.7311	0	300
28	11268	235.99305	-15.40951	1153.211	1725.8202	0	300
29	11268	238.3928	-14.546775	1073.2478	1638.0905	0	300
30	11268	240.79255	-13.54028	982.98042	1535.6837	0	300
31	11268	243.28315	-12.329765	877.70023	1431.8237	0	450
32	11268	245.8646	-10.88832	756.09596	1270.8012	0	450
33	11268	248.44605	-9.2332395	620.41624	1085.3049	0	450
34	11268	251.0275	-7.3371315	469.05896	872.09364	0	450
35	11268	253.60895	-5.162447	299.56365	626.61681	0	450
36	11268	256.23655	-2.6036405	104.78276	354.73329	0	500





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
VERTICALSWERE ASSUMED TO VARY LINEARLY
BETWEENTHE VALUES INDICATED FOR THESE LOCATIONS.

Hw = CANAL WATER LEVEL

LONDON AVE CANAL
OUTFALL CANAL REEVALUATION REPORT
REACH 5, STA. 37+00 TO 40+00
OPEN CONNECTION
PROTECTED SIDE STABILITY ANALYSIS
CASE: GAP Stability (Entry/Exit)
MARCH 2012

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

GAP Stability (Entry/Exit)

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File Information

Revision Number: 373
Last Edited By: Haggerty, Daniel R MVN
Date: 2/16/2012
Time: 11:03:30 AM
File Name: Reach 5.gsz
Last Solved Date: 2/16/2012
Last Solved Time: 11:04:10 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

GAP Stability (Entry/Exit)

Kind: [SLOPE/W](#)
Parent: [Gap Analysis \(Seepage\)](#)
Method: [Spencer](#)
Settings
 PWP Conditions Source: [Parent Analysis](#)
SlipSurface
 Direction of movement: [Left to Right](#)
 Use Passive Mode: [Yes](#)
 Slip Surface Option: [Entry and Exit](#)
 Critical slip surfaces saved: 1
 Optimize Critical Slip Surface Location: [Yes](#)
 Tension Crack
 Tension Crack Option: [\(none\)](#)
FOS Distribution
 FOS Calculation Option: [Constant](#)
Advanced
 Number of Slices: 30
 Optimization Tolerance: 0.01
 Minimum Slip Surface Depth: 0.1 ft

MARSH 3 EL. -7 TO -13

Model: [Spatial Mohr-Coulomb](#)
Unit Weight: 111 pcf
Cohesion Fn: [Marsh 3](#)
Phi: 0 °
Phi-B: 0 °

Fill (Protected)

Model: [Spatial Mohr-Coulomb](#)
Unit Weight: 112 pcf
Cohesion: 500 psf
Phi: 0 °
Phi-B: 0 °

Marsh 1 EL. -4 to -13 (Protected)

Model: [Undrained \(Phi=0\)](#)
Unit Weight: 112 pcf
Cohesion: 450 psf

Marsh 2 EL. -13 to -17 (Protected)

Model: [Undrained \(Phi=0\)](#)
Unit Weight: 100 pcf
Cohesion: 300 psf

MARSH 4 EL. -13 TO -17

Model: [Spatial Mohr-Coulomb](#)
Unit Weight: 99 pcf
Cohesion Fn: [Marsh 4](#)
Phi: 0 °
Phi-B: 0 °

Slip Surface Entry and Exit

Left Projection: [Range](#)
Left-Zone Left Coordinate: (200, -13.3) ft
Left-Zone Right Coordinate: (200, 0) ft
Left-Zone Increment: 20
Right Projection: [Range](#)
Right-Zone Left Coordinate: (205, 4.45185) ft
Right-Zone Right Coordinate: (285, -2) ft
Right-Zone Increment: 30
Radius Increments: 4

Slip Surface Limits

Left Coordinate: (103.3, -13.3) ft
Right Coordinate: (310, -2) ft

Optimization Maximum Iterations: 5000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 10
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. +4.1 TO 0

Model: [Spatial Mohr-Coulomb](#)
Unit Weight: 105 pcf
Cohesion Fn: [Fill1](#)
Phi: 0 °
Phi-B: 0 °

MARSH 1 EL. 0 TO -4

Model: [Undrained \(Phi=0\)](#)
Unit Weight: 107 pcf
Cohesion: 475 psf

BEACH SAND, EL. -17 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: 111 pcf
Cohesion Spatial Fn: [Clay](#)
Phi: 0 °
Phi-B: 0 °

SheetPile

Model: [Undrained \(Phi=0\)](#)
Unit Weight: 0.1 pcf
Cohesion: 0.1 psf

MARSH 2 EL. -4 TO -7

Model: [Spatial Mohr-Coulomb](#)
Unit Weight: 104 pcf
Cohesion Fn: [Marsh 2](#)
Phi: 0 °
Phi-B: 0 °

Cohesion Functions

Marsh 3

Model: [Spline Data Point Function](#)
Function: [Cohesion vs. X](#)
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 450
Data Points: X (ft), Cohesion (psf)
 Data Point: (181.8, 450)
 Data Point: (200, 475)
 Data Point: (229.6, 450)

Marsh 4

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: (181.8, 300)
 Data Point: (200, 330)
 Data Point: (229.6, 300)

Marsh 2

Model: [Spline Data Point Function](#)
Function: [Cohesion vs. X](#)
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 450
Data Points: X (ft), Cohesion (psf)
 Data Point: (181.8, 450)
 Data Point: (200, 475)
 Data Point: (229.6, 450)

Fill1

Model: [Spline Data Point Function](#)
Function: [Cohesion vs. X](#)
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 500
Data Points: X (ft), Cohesion (psf)
 Data Point: (181.8, 500)
 Data Point: (200, 625)
 Data Point: (229.6, 500)

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: (-100000, 0)
Data Point: (0, 0)
Data Point: (100000, 57735)
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: (103.3, -48, 503)
Data Point: (181.8, -48, 503)
Data Point: (200, -48, 595)
Data Point: (229.6, -48, 503)
Data Point: (310, -48, 503)
Data Point: (103.3, -70, 802)
Data Point: (181.8, -70, 802)
Data Point: (200, -70, 895)
Data Point: (229.6, -70, 802)
Data Point: (310, -70, 802)

Regions

	Material	Points	Area (ft²)
Region 1	Marsh 1 EL -4 to -13 (Protected)	5,6,18,17,54	723.6
Region 2	Fill (Protected)	34,35,36,6,5	206.4
Region 3	Marsh 2 EL -13 to -17 (Protected)	17,18,23,19	321.6

Region 4	BAY SOUND CLAY, EL. -48 TO -70	7,40,21,42,24,11,43,22,41,10	4547.4
Region 5		30,31,3,14,32,4,8,15	46.405
Region 6		37,30,15,8,27,29	72.8
Region 7		38,37,29,27,28,57	54.6
Region 8		39,56,55,20,16,49	5.46
Region 9	EMBANKMENT FILL, EL. +4.1 TO 0	8,4,44,25,33,34,5	137.48
Region 10	MARSH 2 EL. -4 TO -7	27,5,54,28	88.8
Region 11	MARSH 1 EL. 0 TO -4	8,5,27	59.2
Region 12		30,2,1,37	21.95
Region 13		51,53,39,38,37,1,26	156.24
Region 14	SheetPile	4,45,46,25,44	6.65
Region 15	MARSH 4 EL. -13 TO -17	20,55,17,19	63.64
Region 16		49,39,53,52	3.58125
Region 17	Marsh 2 EL. -13 to -17 (Protected)	48,52,49	21.275
Region 18	BEACH SAND, EL. -17 TO -48	20,48,52,50,7,40,21,42,24,23,19	6765.305
Region 19		52,53,51,47,50	169.75875
Region 20		28,55,56,39,38,57	109.2
Region 21	MARSH 3 EL. -7 TO -13	55,28,54,17	177.6
Region 22	MARSH 4 EL. -13 TO -17	48,49,16,20	33.67
Region 23		47,13,12,26,51	177.035

Points

	X (ft)	Y (ft)
Point 1	170.7	-4
Point 2	173.6	-3
Point 3	193.6	3.1
Point 4	200	4.1
Point 5	229.6	-4
Point 6	310	-4
Point 7	103.3	-48
Point 8	200	0
Point 9	200	-13.35
Point 10	103.3	-70
Point 11	310	-70
Point 12	153.4	-7.4

Point 13	103.3	-7.9
Point 14	196	3.5
Point 15	196	0
Point 16	196	-13.3
Point 17	229.6	-13
Point 18	310	-13
Point 19	229.6	-17
Point 20	200	-13.3
Point 21	200.05	-48
Point 22	200	-70
Point 23	310	-17
Point 24	310	-48
Point 25	201	4.6
Point 26	162	-7
Point 27	200	-4
Point 28	200	-7
Point 29	196	-4
Point 30	181.8	0
Point 31	184.1	1.4
Point 32	199	4.1
Point 33	206.4	4.4
Point 34	229.6	-0.1
Point 35	277.6	-2
Point 36	310	-2
Point 37	181.8	-4
Point 38	181.8	-7
Point 39	181.8	-13
Point 40	181.8	-48
Point 41	181.8	-70
Point 42	229.6	-48
Point 43	229.6	-70
Point 44	201	4.1
Point 45	200	12.8
Point 46	200.5	12.8
Point 47	103.3	-10.6
Point 48	181.8	-17

Point 49	181.8	-13.3
Point 50	103.3	-13.3
Point 51	162	-10.6
Point 52	170.3	-13.3
Point 53	169.425	-13
Point 54	229.6	-7
Point 55	200	-13
Point 56	196	-13
Point 57	196	-7

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	3.34	(224.637, 20.706)	25.8204	(200, 12.8)	(258.566, -1.24656)
2	1338	3.49	(224.637, 20.706)	37.813	(200, 12.8)	(255.511, -1.12566)

Slices of Slip Surface: Optimized

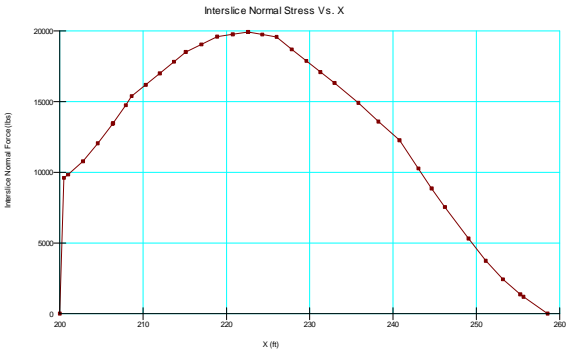
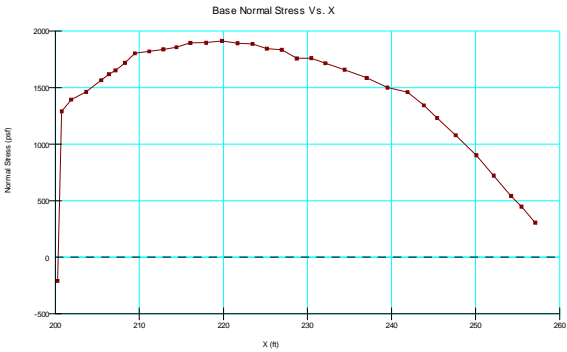
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	200.25	-8.778167	995.01858	-208.6609	0	474.79
2	Optimized	200.75	-9.015755	988.94897	1290.063	0	474.37
3	Optimized	201.8913	-9.5580645	1025.2481	1394.7307	0	473.4
4	Optimized	203.6717	-10.502635	1082.8088	1461.4862	0	471.9
5	Optimized	205.44995	-11.544745	1138.167	1565.2162	0	470.4
6	Optimized	206.36955	-12.083765	1165.6668	1617.8072	0	469.62
7	Optimized	207.16135	-12.550865	1190.0762	1652.3839	0	468.95
8	Optimized	208.2714	-13.205735	1223.7194	1719.1691	0	321.62
9	Optimized	209.4671	-13.67835	1244.3612	1802.8345	0	320.4
10	Optimized	211.1611	-14.212115	1265.4187	1820.4012	0	318.69
11	Optimized	212.8551	-14.74588	1287.1518	1837.9679	0	316.97
12	Optimized	214.4069	-15.23484	1306.8331	1856.929	317.59804	-2.2538e-005
13	Optimized	216.0564	-15.64953	1320.9899	1894.411	331.06488	-6.6963e-005
14	Optimized	217.9458	-16.03475	1331.8287	1897.1078	326.36404	-2.3159e-005

15	Optimized	219.8207	-16.318605	1336.8333	1913.6135	333.00419	-6.7341e-005
16	Optimized	221.6811	-16.50109	1335.8169	1892.3761	321.32959	-6.4983e-005
17	Optimized	223.46365	-16.58868	1329.5	1886.1959	321.40851	-2.2802e-005
18	Optimized	225.16835	-16.581385	1317.7677	1844.781	304.27124	-2.1586e-005
19	Optimized	226.93405	-16.382315	1291.0319	1834.6807	0	302.7
20	Optimized	228.7237	-15.999405	1249.2321	1758.4327	0	300.89
21	Optimized	230.4425	-15.631655	1209.336	1760.063	0	300
22	Optimized	232.12755	-15.27113	1170.5124	1715.7843	0	300
23	Optimized	234.4046	-14.742775	1115.1877	1658.2168	0	300
24	Optimized	237.04445	-14.04601	1045.1389	1585.4407	0	300
25	Optimized	239.51495	-13.33138	975.60105	1500.8926	0	300
26	Optimized	241.9122	-12.385965	890.04719	1459.6003	0	450
27	Optimized	243.8377	-11.361145	802.43423	1343.5086	0	450
28	Optimized	245.4245	-10.47042	727.53231	1231.7877	0	450
29	Optimized	247.63665	-9.168665	619.63641	1078.699	0	450
30	Optimized	250.09035	-7.5935585	492.02069	901.66094	0	450
31	Optimized	252.1602	-6.156135	377.78728	721.70177	0	450
32	Optimized	254.23005	-4.7187115	264.97848	541.70291	0	450
33	Optimized	255.4563	-3.867155	198.81106	447.30074	0	500
34	Optimized	257.1066	-2.4904325	93.85931	305.48414	0	500

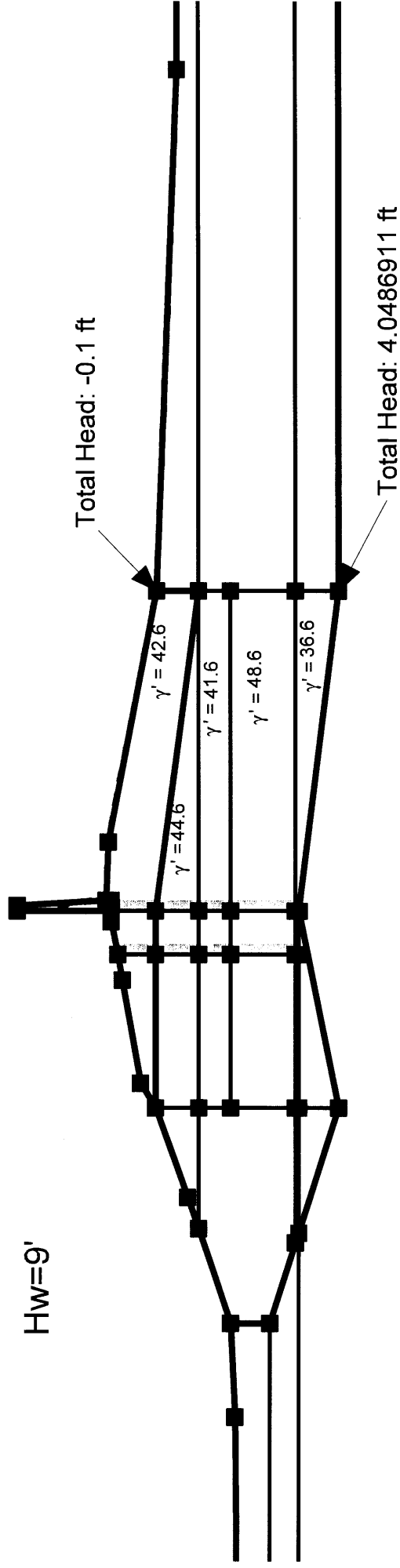
Slices of Slip Surface: 1338

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	1338	200.25	-8.1909805	952.91416	-145.52097	0	474.79
2	1338	200.75	-8.605692	958.1856	1176.2475	0	474.37
3	1338	201.9	-9.4871615	1020.0183	1327.79	0	473.4
4	1338	203.7	-10.763675	1101.1726	1475.5538	0	471.88
5	1338	205.5	-11.890815	1161.3261	1606.8844	0	470.35
6	1338	206.94865	-12.70959	1202.661	1694.1644	0	469.13
7	1338	208.48305	-13.466	1239.013	1769.8352	0	321.4
8	1338	210.4546	-14.331025	1279.19	1828.4687	0	319.4
9	1338	212.3995	-15.058225	1310.3469	1877.5753	327.48947	-6.6229e-005
10	1338	214.3177	-15.658565	1333.4804	1917.9971	337.47088	-6.8247e-005

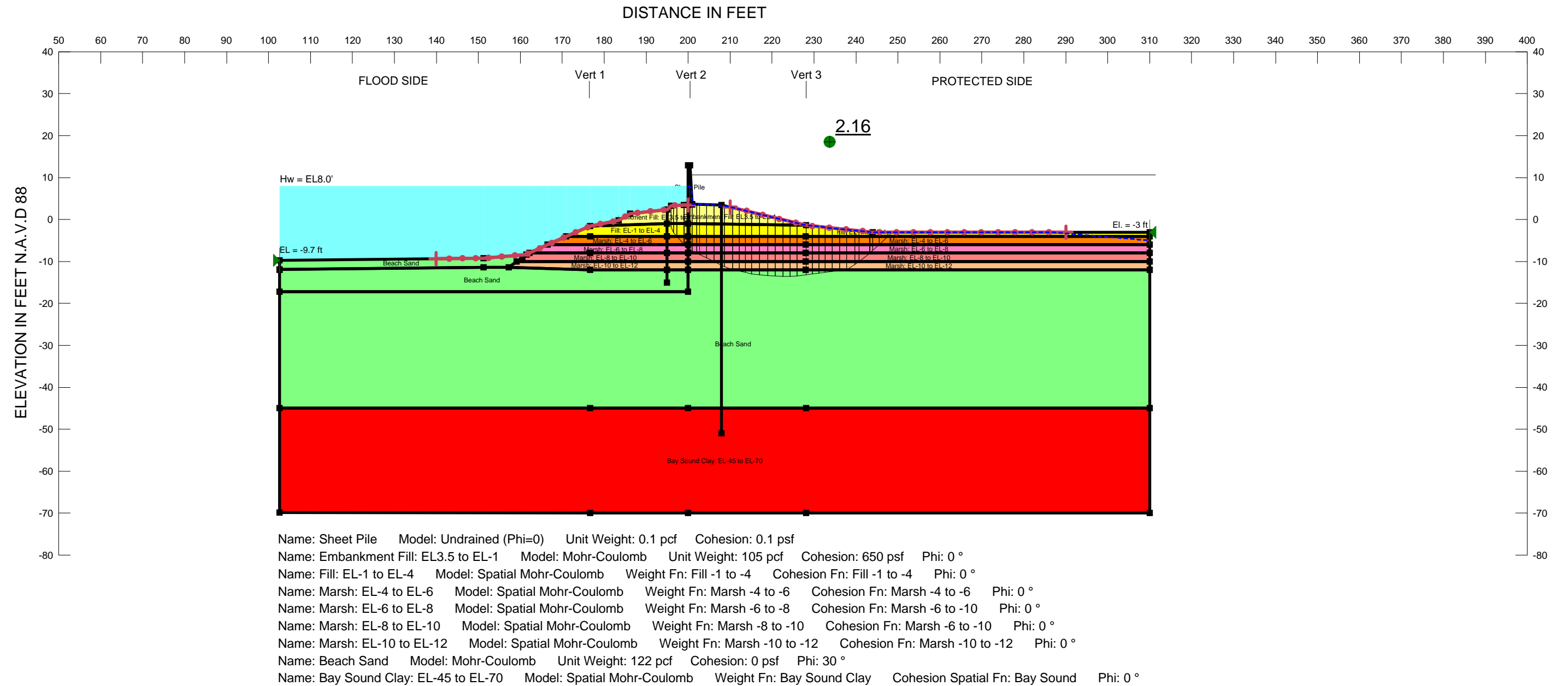
11	1338	216.23595	-16.14935	1350.4481	1945.4911	343.54821	-6.9476e-005
12	1338	218.1542	-16.53492	1361.2283	1960.3865	345.92416	-6.9956e-005
13	1338	220.0724	-16.818535	1365.9477	1962.7833	344.58318	-6.9686e-005
14	1338	221.9906	-17.002505	1364.6313	1952.8981	339.636	-2.4095e-005
15	1338	223.9088	-17.088285	1357.3095	1930.5474	330.95908	-6.693e-005
16	1338	225.82705	-17.07654	1343.9657	1895.7665	318.58231	-6.4429e-005
17	1338	227.7453	-16.967185	1324.2322	1848.2516	302.54273	-6.1182e-005
18	1338	229.1522	-16.834185	1305.2185	1809.5024	0	300.45
19	1338	230.46975	-16.644495	1281.7556	1846.9754	0	300
20	1338	232.2092	-16.330845	1246.7783	1818.3498	0	300
21	1338	233.94865	-15.93197	1205.6114	1781.1156	0	300
22	1338	235.68815	-15.44504	1157.8754	1734.9713	0	300
23	1338	237.42765	-14.86643	1103.3793	1679.5753	0	300
24	1338	239.1671	-14.191565	1041.8054	1614.4004	0	300
25	1338	240.90655	-13.414715	972.91216	1538.8399	0	300
26	1338	242.73355	-12.47797	891.97725	1468.408	0	450
27	1338	244.64805	-11.358535	797.66033	1347.7052	0	450
28	1338	246.5625	-10.079372	692.5612	1208.8124	0	450
29	1338	248.47695	-8.619422	575.00148	1049.245	0	450
30	1338	250.39145	-6.949792	443.41135	865.45485	0	450
31	1338	252.30595	-5.029177	294.83205	652.60126	0	450
32	1338	254.38725	-2.5628275	107.73904	398.29054	0	500



REACH 5



$$FS_{\text{Settling}} = \frac{3.9'(42.6 \text{ pcf}) + 3'(41.6 \text{ pcf}) + 6'(48.6 \text{ pcf}) + 4'(36.6 \text{ pcf})}{(4.05' - -0.1') \times 62.4 \text{ pcf}} = \boxed{2.81}$$



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 = CANAL WATER LEVEL

LONDON AVE CANAL
OUTFALL CANAL REEVALUATION REPORT
REACH 7: NON-REMEDiated, STA. 59+00 TO 64+00
PROTECTED SIDE STABILITY ANALYSIS
CASE: Non-Rem: Global Stability (Entry/Exit)
MARCH 2012

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

Non-Rem: Global Stability (Entry/Exit)

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File Name: Reach 7.gsz
Last Solved Date: 12/21/2011
Last Solved Time: 8:04:44 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

Non-Rem: Global Stability (Entry/Exit)

Kind: SLOPE/W
Parent: Gap Analysis (Seepage) Non-Remediated Reach
Method: Spencer
Settings
 PWP Conditions Source: Parent Analysis
SlipSurface
 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: 1
 Tension Crack Fluid Unit Weight: 62.4 pcf
FOS Distribution
 FOS Calculation Option: Constant
Advanced
 Number of Slices: 30

Marsh: EL-8 to EL-10

Model: Spatial Mohr-Coulomb
Weight Fn: Marsh -8 to -10
Cohesion Fn: Marsh -6 to -10
Phi: 0 °
Phi-B: 0 °

Marsh: EL-10 to EL-12

Model: Spatial Mohr-Coulomb
Weight Fn: Marsh -10 to -12
Cohesion Fn: Marsh -10 to -12
Phi: 0 °
Phi-B: 0 °

Beach Sand

Model: Mohr-Coulomb
Unit Weight: 122 pcf
Cohesion: 0 psf
Phi: 30 °
Phi-B: 0 °

Bay Sound Clay: EL-45 to EL-70

Model: Spatial Mohr-Coulomb
Weight Fn: Bay Sound Clay
Cohesion Spatial Fn: Bay Sound
Phi: 0 °
Phi-B: 0 °

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (139.97742, -9.31625) ft
Left-Zone Right Coordinate: (199.99, 3.5) ft
Left-Zone Increment: 20
Right Projection: Range
Right-Zone Left Coordinate: (210, 3.01244) ft
Right-Zone Right Coordinate: (290, -3) ft
Right-Zone Increment: 20
Radius Increments: 20

Slip Surface Limits

Left Coordinate: (102.6, -9.7) ft
Right Coordinate: (310, -3) ft

Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 5000
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: 0.1 psf

Embankment Fill: EL3.5 to EL-1

Model: Mohr-Coulomb
Unit Weight: 105 pcf
Cohesion: 650 psf
Phi: 0 °
Phi-B: 0 °

Fill: EL-1 to EL-4

Model: Spatial Mohr-Coulomb
Weight Fn: Fill -1 to -4
Cohesion Fn: Fill -1 to -4
Phi: 0 °
Phi-B: 0 °

Marsh: EL-4 to EL-6

Model: Spatial Mohr-Coulomb
Weight Fn: Marsh -4 to -6
Cohesion Fn: Marsh -4 to -6
Phi: 0 °
Phi-B: 0 °

Marsh: EL-6 to EL-8

Model: Spatial Mohr-Coulomb
Weight Fn: Marsh -6 to -8
Cohesion Fn: Marsh -6 to -10
Phi: 0 °
Phi-B: 0 °

Cohesion Functions

Fill -1 to -4

Model: Spline Data Point Function
Function: Cohesion vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 600
Data Points: X (ft), Cohesion (psf)
 Data Point: (0, 600)
 Data Point: (176.6, 600)
 Data Point: (200, 450)
 Data Point: (228.1, 600)
 Data Point: (400, 600)

Marsh -4 to -6

Model: Spline Data Point Function
Function: Cohesion vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 600
Data Points: X (ft), Cohesion (psf)
 Data Point: (0, 600)
 Data Point: (176.6, 600)
 Data Point: (200, 340)
 Data Point: (228.1, 600)
 Data Point: (400, 600)

Marsh -6 to -10

Model: Spline Data Point Function
Function: Cohesion vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 320
Data Points: X (ft), Cohesion (psf)
 Data Point: (0, 320)
 Data Point: (176.6, 320)
 Data Point: (200, 340)
 Data Point: (228.1, 320)
 Data Point: (400, 320)

Marsh -10 to -12

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: (0, 300)
Data Point: (176.6, 300)
Data Point: (200, 340)
Data Point: (228.1, 300)
Data Point: (400, 300)

Unit Weight Functions

Fill -1 to -4

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %

Y-Intercept: 96
Data Points: X (ft), Unit Weight (pcf)
Data Point: (0, 96)
Data Point: (176.6, 96)
Data Point: (200, 105)
Data Point: (228.1, 96)
Data Point: (400, 96)

Marsh -4 to -6

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %

Y-Intercept: 96
Data Points: X (ft), Unit Weight (pcf)
Data Point: (0, 96)
Data Point: (176.6, 96)
Data Point: (200, 90)
Data Point: (228.1, 96)
Data Point: (400, 96)

Marsh -6 to -8

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: (0, 104)
Data Point: (176.6, 104)
Data Point: (200, 90)
Data Point: (228.1, 104)

Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (0, -45, 790)
Data Point: (0, -70, 950)
Data Point: (176.6, -45, 790)
Data Point: (176.6, -70, 950)
Data Point: (200, -45, 800)
Data Point: (200, -70, 1000)
Data Point: (228.1, -45, 790)
Data Point: (228.1, -70, 950)
Data Point: (400, -45, 790)
Data Point: (400, -70, 950)

Regions

	Material	Points	Area (ft²)
Region 1	Sheet Pile	6,46,47,41,32	7.085
Region 2	Bay Sound Clay: EL-45 to EL-70	31,11,52,33,51,12,30,58,34,57	5181.295
Region 3	Beach Sand	11,24,17,16,26,29,12,51,33,52	6337.72
Region 4	Beach Sand	24,42,49,50,48,56,23,16,17	532.945
Region 5	Marsh: EL-10 to EL-12	48,63,43,16,23,56	78.271
Region 6	Marsh: EL-8 to EL-10	63,36,2,62,55,21,15,43	78.9175
Region 7	Marsh: EL-6 to EL-8	62,61,60,15,21,55	71.35
Region 8	Marsh: EL-4 to EL-6	61,3,54,20,14,60	62.6
Region 9	Fill: EL-1 to EL-4	3,4,19,13,14,20,54	71.37
Region 10	Embankment Fill: EL3.5 to EL-1	4,37,5,18,38,39,6,13,19	57.67
Region 11	Beach Sand	49,1,35,2,36,63,48,50	127.584
Region 12	Marsh: EL-10 to EL-12	16,43,44,45,29,26	220
Region 13	Marsh: EL-8 to EL-10	43,15,53,59,45,44	220
Region 14	Marsh: EL-6 to EL-8	15,60,25,28,59,53	220
Region 15	Marsh: EL-4 to EL-6	60,14,27,10,28,25	220
Region 16	Fill: EL-1 to EL-4	14,13,8,40,9,10,27	173.3
Region 17	Embankment Fill: EL3.5 to EL-1	13,6,32,41,7,8	83.54

Points

	X (ft)	Y (ft)
Point 1	102.6	-9.7
Point 2	161.5	-8.3
Point 3	170.9	-4

Data Point: (400, 104)

Marsh -8 to -10

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: (0, 104)
Data Point: (176.6, 104)
Data Point: (200, 98)
Data Point: (228.1, 104)
Data Point: (400, 104)

Marsh -10 to -12

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %

Y-Intercept: 96
Data Points: X (ft), Unit Weight (pcf)
Data Point: (0, 96)
Data Point: (176.6, 96)
Data Point: (200, 98)
Data Point: (228.1, 96)
Data Point: (400, 96)

Bay Sound Clay

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: (0, 111)
Data Point: (176.6, 111)
Data Point: (200, 108)
Data Point: (228.1, 111)
Data Point: (400, 111)

Spatial Functions

Bay Sound

Model: Linear Interpolation
Limit Range By: Data Values

Point 4	176.7	-1.6
Point 5	186.2	1.4
Point 6	200	3.5
Point 7	208	3.5
Point 8	228.1	-1.4
Point 9	310	-3
Point 10	310	-4
Point 11	102.6	-45
Point 12	310	-45
Point 13	200	-1
Point 14	200	-4
Point 15	200	-8
Point 16	200	-12
Point 17	200	-17.2
Point 18	195.1	2.4
Point 19	195	-1
Point 20	195	-4
Point 21	195	-8
Point 22	195	-15
Point 23	195	-12
Point 24	102.6	-17.2
Point 25	228	-6
Point 26	228	-12
Point 27	228	-4
Point 28	310	-6
Point 29	310	-12
Point 30	310	-70
Point 31	102.6	-69.9
Point 32	201	3.53
Point 33	200	-45
Point 34	200	-70
Point 35	151.3	-9.2
Point 36	160.5	-9
Point 37	183.4	-0.2
Point 38	195.9	3.3
Point 39	199	3.5

Point 40	244	-3
Point 41	201	3.7
Point 42	102.6	-12
Point 43	200	-10
Point 44	228	-10
Point 45	310	-10
Point 46	200	12.9
Point 47	200.5	12.9
Point 48	157.3	-11.4
Point 49	102.6	-11.9
Point 50	151.3	-11.4
Point 51	228.1	-45
Point 52	176.7	-45
Point 53	228	-8
Point 54	176.7	-4
Point 55	176.7	-8
Point 56	176.7	-12
Point 57	176.7	-70
Point 58	228.1	-70
Point 59	310	-8
Point 60	200	-6
Point 61	166.5	-6
Point 62	162.15	-8
Point 63	159.17	-10
Point 64	208	-51

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	2.16	(221.255, 12.727)	21.69496	(195.9, 3.3)	(248.657, -3)
2	8142	2.39	(221.255, 12.727)	29.038	(195.9, 3.3)	(245.664, -3)

29	Optimized	233.52115	-12.489175	882.40158	1079.3349	113.69951	0
30	Optimized	235.2214	-12.295705	861.01357	1037.7276	102.02591	0
31	Optimized	236.92165	-12.102235	839.684	996.12035	90.318574	0
32	Optimized	238.76905	-11.35568	776.80637	1052.2088	0	300
33	Optimized	240.22805	-10.35293	695.91498	962.08691	0	300
34	Optimized	241.9719	-9.020055	588.36269	806.21398	0	320
35	Optimized	243.2762	-8.020055	507.28965	712.41641	0	320
36	Optimized	243.6492	-7.683591	480.16115	670.25272	0	320
37	Optimized	244.78875	-6.655721	397.4399	550.02549	0	320
38	Optimized	246.59435	-4.97213	262.21836	527.27301	0	600
39	Optimized	248.1342	-3.5	91.528073	372.03449	0	600

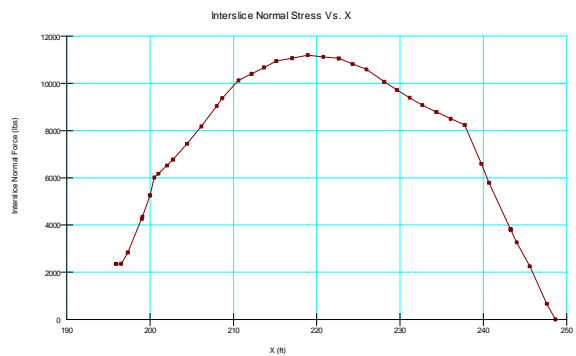
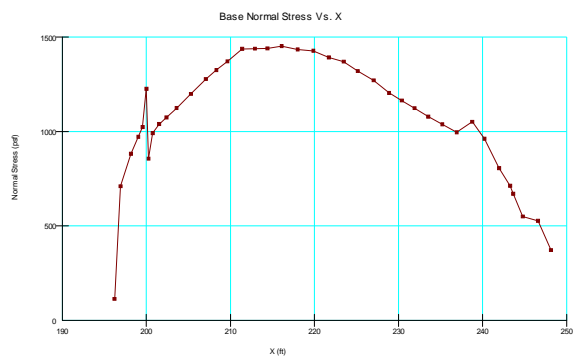
Slices of Slip Surface: 8142

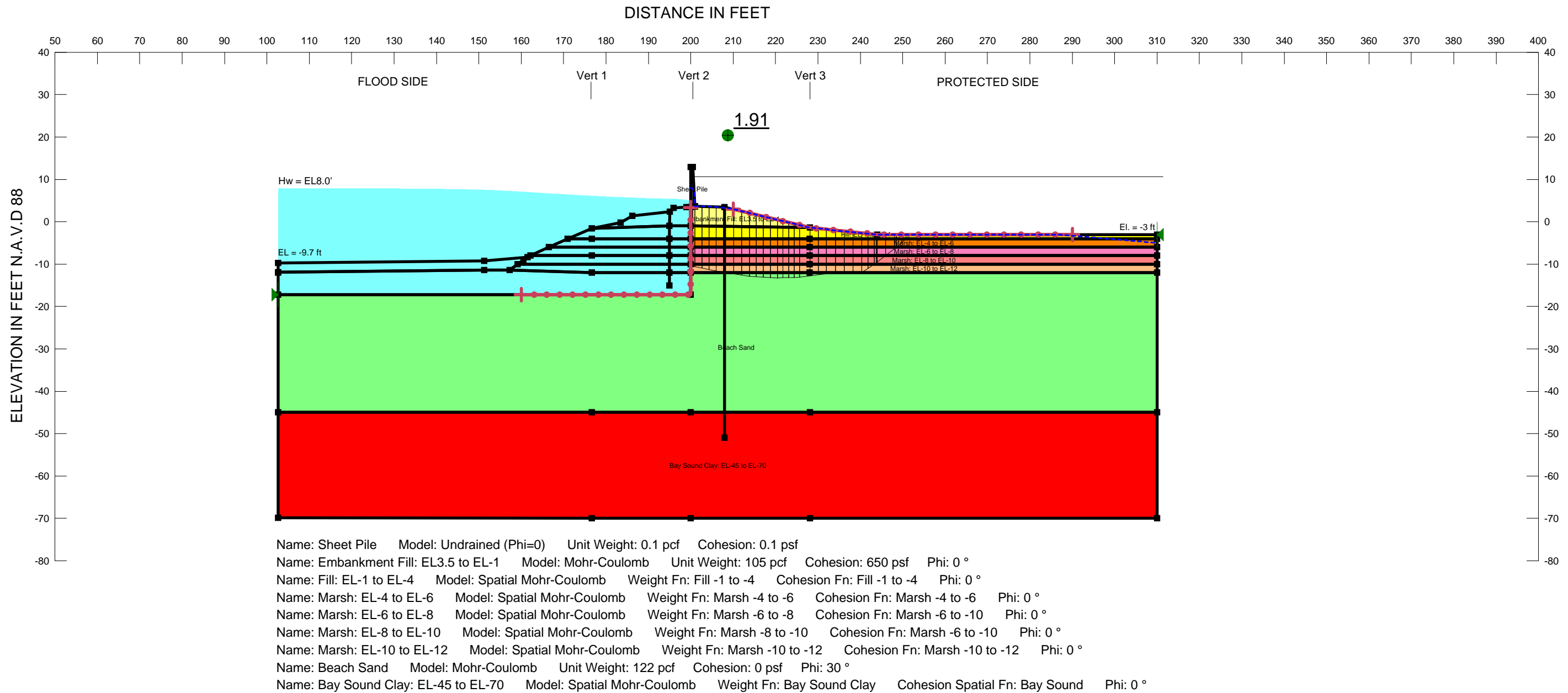
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	8142	196.70955	-2.713054	656.89777	439.88308	0	471.09
2	8142	198.25955	-4.962494	797.71367	862.02815	0	359.34
3	8142	199.03155	-5.962494	864.02577	973.81702	0	350.76
4	8142	199.53155	-6.528483	902.12745	1037.7793	0	339.6
5	8142	200.25	-7.3189185	709.75466	757.54479	0	339.82
6	8142	200.7093	-7.7904355	739.76245	915.84411	0	339.5
7	8142	200.9593	-8.039793	755.67507	942.2446	0	339.32
8	8142	202.09065	-9.039793	820.00974	1068.0669	0	338.51
9	8142	203.8939	-10.531895	914.16426	1232.8679	0	334.46
10	8142	205.3191	-11.531895	975.18838	1343.9995	0	332.43
11	8142	207.01585	-12.55428	1032.1363	1485.035	261.48119	0
12	8142	208.83335	-13.50318	1081.6694	1590.5371	293.79494	0
13	8142	210.5	-14.23026	1117.9199	1653.9754	309.49174	0
14	8142	212.16665	-14.837465	1146.5526	1703.9021	321.78592	0
15	8142	213.83335	-15.33261	1168.1731	1740.8035	330.60834	0
16	8142	215.5	-15.72158	1183.1762	1765.2078	336.03613	0
17	8142	217.16665	-16.0087	1191.8403	1777.3651	338.05291	0
18	8142	218.83335	-16.19701	1194.3227	1777.3436	336.60723	0
19	8142	220.5	-16.288445	1190.8375	1765.0834	331.54103	0

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	196.21315	-2.484212	642.56486	113.74566	0	474.27
2	Optimized	196.9227	-3.55119	706.70661	710.34706	0	469.73
3	Optimized	198.15955	-4.9514625	796.49845	881.96557	0	360.45
4	Optimized	199.04285	-5.9514625	863.40278	972.18705	0	350.63
5	Optimized	199.5409	-6.515285	901.42636	1023.2407	0	339.61
6	Optimized	199.99805	-7.0315065	937.95264	1226.5658	0	340
7	Optimized	200.25	-7.1512955	698.95321	856.26104	0	339.82
8	Optimized	200.75	-7.389001	713.85492	991.47821	0	339.47
9	Optimized	201.5176	-7.753927	736.70821	1039.3166	0	338.92
10	Optimized	202.38665	-8.16708	762.05623	1074.439	0	338.3
11	Optimized	203.5921	-8.75062	797.73798	1123.8533	0	337.44
12	Optimized	205.30005	-9.58354	846.57371	1199.2119	0	336.23
13	Optimized	207.077	-10.450105	895.62646	1278.2421	0	329.93
14	Optimized	208.33085	-11.061545	929.30082	1325.8746	0	328.14
15	Optimized	209.63765	-11.60399	957.60912	1371.7491	0	326.28
16	Optimized	211.3945	-12.14735	982.90834	1438.034	262.7669	0
17	Optimized	212.92045	-12.4644	994.27105	1439.0385	256.78659	0
18	Optimized	214.41055	-12.774	1005.3097	1440.2869	251.13418	0
19	Optimized	216.1003	-13.047025	1012.9623	1452.3555	253.68378	0
20	Optimized	217.98975	-13.28347	1017.2685	1434.973	241.1618	0
21	Optimized	219.8613	-13.446765	1017.0947	1427.4352	236.91018	0
22	Optimized	221.7149	-13.536915	1012.5144	1392.5172	219.3947	0
23	Optimized	223.47495	-13.55204	1003.7263	1370.0643	211.5053	0
24	Optimized	225.14145	-13.49214	990.83346	1320.2917	190.21282	0
25	Optimized	227.03735	-13.32313	969.89857	1270.7729	173.70986	0
26	Optimized	228.86185	-13.08438	944.97095	1204.8851	150.06153	0
27	Optimized	230.3855	-12.884995	924.21165	1164.1475	138.527	0
28	Optimized	231.90915	-12.685605	903.45236	1123.4098	126.99248	0

20	8142	222.16665	-16.28392	1181.3564	1740.4602	322.79873	0
21	8142	223.83335	-16.183395	1165.9116	1703.1787	310.19134	0
22	8142	225.5	-15.98586	1144.4784	1652.7331	293.44102	0
23	8142	227.16665	-15.689275	1116.8065	1588.3888	272.26816	0
24	8142	228.05	-15.503865	1100.3723	1550.0296	259.60978	0
25	8142	228.93775	-15.26186	1080.4567	1517.8653	252.53795	0
26	8142	230.6133	-14.74652	1039.1132	1450.3971	237.45485	0
27	8142	232.28885	-14.11679	990.64282	1366.4534	216.97433	0
28	8142	233.96435	-13.36434	934.57242	1263.9639	190.17424	0
29	8142	235.63985	-12.478125	870.1025	1140.0592	155.8596	0
30	8142	237.1902	-11.531895	798.31856	1078.2842	0	300
31	8142	238.61545	-10.531895	718.37634	982.08839	0	300
32	8142	240.45945	-9	596.31054	835.2255	0	320
33	8142	242.5185	-7	436.85281	627.49482	0	320
34	8142	243.7231	-5.661699	329.92486	666.17463	0	600
35	8142	244.4951	-4.661699	250.16381	594.49903	0	600
36	8142	245.32725	-3.5	97.936217	517.37619	0	600





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 = CANAL WATER LEVEL

LONDON AVE CANAL
OUTFALL CANAL REEVALUATION REPORT
REACH 7: NON-REMEDiated, STA. 59+00 TO 64+00
PROTECTED SIDE STABILITY ANALYSIS
CASE: Non-Rem: GAP Stability (Entry/Exit)
MARCH 2012

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

Non-Rem: GAP Stability (Entry/Exit)

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File Information

Revision Number: 348
Last Edited By: Haggerty, Daniel R MVN
Date: 12/21/2011
Time: 9:49:31 AM
File Name: Reach 7.gsz
Last Solved Date: 12/21/2011
Last Solved Time: 9:50:32 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

Non-Rem: GAP Stability (Entry/Exit)
Kind: SLOPE/W
Parent: Gap Analysis (Seepage) Non-Remediated Reach
Method: Spencer
Settings
PWP Conditions Source: Parent Analysis
SlipSurface
Direction of movement: Left to Right
Use Passive Mode: Yes
Slip Surface Option: Entry and Exit
Critical slip surfaces saved: 1
Optimize Critical Slip Surface Location: Yes
Tension Crack
Tension Crack Option: (none)
FOS Distribution
FOS Calculation Option: Constant
Advanced
Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft

Cohesion Fn: Marsh -6 to -10
Phi: 0 °
Phi-B: 0 °

Marsh: EL-10 to EL-12
Model: Spatial Mohr-Coulomb
Weight Fn: Marsh -10 to -12
Cohesion Fn: Marsh -10 to -12
Phi: 0 °
Phi-B: 0 °

Beach Sand
Model: Mohr-Coulomb
Unit Weight: 122 pcf
Cohesion: 0 psf
Phi: 30 °
Phi-B: 0 °

Bay Sound Clay: EL-45 to EL-70
Model: Spatial Mohr-Coulomb
Weight Fn: Bay Sound Clay
Cohesion Spatial Fn: Bay Sound
Phi: 0 °
Phi-B: 0 °

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (160, -17.2) ft
Left-Zone Right Coordinate: (200, 3.4) ft
Left-Zone Increment: 20
Right Projection: Range
Right-Zone Left Coordinate: (210, 3.01244) ft
Right-Zone Right Coordinate: (290, -3) ft
Right-Zone Increment: 20
Radius Increments: 20

Slip Surface Limits

Left Coordinate: (102.6, -17.2) ft
Right Coordinate: (310, -3) ft

Optimization Maximum Iterations: 5000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 10
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 30 °
Resisting Side Maximum Convex Angle: 10 °

Materials

Sheet Pile

Model: Undrained (Phi=0)
Unit Weight: 0.1 pcf
Cohesion: 0.1 psf

Embankment Fill: EL3.5 to EL-1

Model: Mohr-Coulomb
Unit Weight: 105 pcf
Cohesion: 650 psf
Phi: 0 °
Phi-B: 0 °

Fill: EL-1 to EL-4

Model: Spatial Mohr-Coulomb
Weight Fn: Fill -1 to -4
Cohesion Fn: Fill -1 to -4
Phi: 0 °
Phi-B: 0 °

Marsh: EL-4 to EL-6

Model: Spatial Mohr-Coulomb
Weight Fn: Marsh -4 to -6
Cohesion Fn: Marsh -4 to -6
Phi: 0 °
Phi-B: 0 °

Marsh: EL-6 to EL-8

Model: Spatial Mohr-Coulomb
Weight Fn: Marsh -6 to -8
Cohesion Fn: Marsh -6 to -10
Phi: 0 °
Phi-B: 0 °

Marsh: EL-8 to EL-10

Model: Spatial Mohr-Coulomb
Weight Fn: Marsh -8 to -10

Cohesion Functions

Fill -1 to -4

Model: Spline Data Point Function
Function: Cohesion vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 600
Data Points: X (ft), Cohesion (psf)
Data Point: (0, 600)
Data Point: (176.6, 600)
Data Point: (200, 450)
Data Point: (228.1, 600)
Data Point: (400, 600)

Marsh -4 to -6

Model: Spline Data Point Function
Function: Cohesion vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 600
Data Points: X (ft), Cohesion (psf)
Data Point: (0, 600)
Data Point: (176.6, 600)
Data Point: (200, 340)
Data Point: (228.1, 600)
Data Point: (400, 600)

Marsh -6 to -10

Model: Spline Data Point Function
Function: Cohesion vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 320
Data Points: X (ft), Cohesion (psf)
Data Point: (0, 320)
Data Point: (176.6, 320)
Data Point: (200, 340)
Data Point: (228.1, 320)
Data Point: (400, 320)

Marsh -10 to -12

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: (0, 300)
Data Point: (176.6, 300)
Data Point: (200, 340)
Data Point: (228.1, 300)
Data Point: (400, 300)

Unit Weight Functions

Fill -1 to -4

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 96
Data Points: X (ft), Unit Weight (pcf)
Data Point: (0, 96)
Data Point: (176.6, 96)
Data Point: (200, 105)
Data Point: (228.1, 96)
Data Point: (400, 96)

Marsh -4 to -6

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 96
Data Points: X (ft), Unit Weight (pcf)
Data Point: (0, 96)
Data Point: (176.6, 96)
Data Point: (200, 90)
Data Point: (228.1, 96)
Data Point: (400, 96)

Marsh -6 to -8

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: (0, 104)
Data Point: (176.6, 104)
Data Point: (200, 90)
Data Point: (228.1, 104)

Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (0, -45, 790)
Data Point: (0, -70, 950)
Data Point: (176.6, -45, 790)
Data Point: (176.6, -70, 950)
Data Point: (200, -45, 800)
Data Point: (200, -70, 1000)
Data Point: (228.1, -45, 790)
Data Point: (228.1, -70, 950)
Data Point: (400, -45, 790)
Data Point: (400, -70, 950)

Regions

	Material	Points	Area (ft²)
Region 1	Sheet Pile	6,46,47,41,32	7.085
Region 2	Bay Sound Clay: EL-45 to EL-70	31,11,52,33,51,12,30,58,34,57	5181.295
Region 3	Beach Sand	11,24,17,16,26,29,12,51,33,52	6337.72
Region 4		24,42,49,50,48,56,23,16,17	532.945
Region 5		48,63,43,16,23,56	78.271
Region 6		63,36,2,62,55,21,15,43	78.9175
Region 7		62,61,60,15,21,55	71.35
Region 8		61,3,54,20,14,60	62.6
Region 9		3,4,19,13,14,20,54	71.37
Region 10		4,37,5,18,38,39,6,13,19	57.67
Region 11		49,1,35,2,36,63,48,50	127.584
Region 12	Marsh: EL-10 to EL-12	16,43,44,45,29,26	220
Region 13	Marsh: EL-8 to EL-10	43,15,53,59,45,44	220
Region 14	Marsh: EL-6 to EL-8	15,60,25,28,59,53	220
Region 15	Marsh: EL-4 to EL-6	60,14,27,10,28,25	220
Region 16	Fill: EL-1 to EL-4	14,13,8,40,9,10,27	173.3
Region 17	Embankment Fill: EL3.5 to EL-1	13,6,32,41,7,8	83.54

Points

	X (ft)	Y (ft)
Point 1	102.6	-9.7
Point 2	161.5	-8.3
Point 3	170.9	-4

Data Point: (400, 104)

Marsh -8 to -10

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: (0, 104)
Data Point: (176.6, 104)
Data Point: (200, 98)
Data Point: (228.1, 104)
Data Point: (400, 104)

Marsh -10 to -12

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 96
Data Points: X (ft), Unit Weight (pcf)
Data Point: (0, 96)
Data Point: (176.6, 96)
Data Point: (200, 98)
Data Point: (228.1, 96)
Data Point: (400, 96)

Bay Sound Clay

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: (0, 111)
Data Point: (176.6, 111)
Data Point: (200, 108)
Data Point: (228.1, 111)
Data Point: (400, 111)

Spatial Functions

Bay Sound

Model: Linear Interpolation
Limit Range By: Data Values

Point 4	176.7	-1.6
Point 5	186.2	1.4
Point 6	200	3.5
Point 7	208	3.5
Point 8	228.1	-1.4
Point 9	310	-3
Point 10	310	-4
Point 11	102.6	-45
Point 12	310	-45
Point 13	200	-1
Point 14	200	-4
Point 15	200	-8
Point 16	200	-12
Point 17	200	-17.2
Point 18	195.1	2.4
Point 19	195	-1
Point 20	195	-4
Point 21	195	-8
Point 22	195	-15
Point 23	195	-12
Point 24	102.6	-17.2
Point 25	228	-6
Point 26	228	-12
Point 27	228	-4
Point 28	310	-6
Point 29	310	-12
Point 30	310	-70
Point 31	102.6	-69.9
Point 32	201	3.53
Point 33	200	-45
Point 34	200	-70
Point 35	151.3	-9.2
Point 36	160.5	-9
Point 37	183.4	-0.2
Point 38	195.9	3.3
Point 39	199	3.5

Point 40	244	-3
Point 41	201	3.7
Point 42	102.6	-12
Point 43	200	-10
Point 44	228	-10
Point 45	310	-10
Point 46	200	12.9
Point 47	200.5	12.9
Point 48	157.3	-11.4
Point 49	102.6	-11.9
Point 50	151.3	-11.4
Point 51	228.1	-45
Point 52	176.7	-45
Point 53	228	-8
Point 54	176.7	-4
Point 55	176.7	-8
Point 56	176.7	-12
Point 57	176.7	-70
Point 58	228.1	-70
Point 59	310	-8
Point 60	200	-6
Point 61	166.5	-6
Point 62	162.15	-8
Point 63	159.17	-10
Point 64	208	-51

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.91	(222.304, 36.954)	21.85163	(200, 12.9)	(251.893, -3)
2	7294	2.07	(222.304, 36.954)	50.829	(200, 12.9)	(253.725, -3)

Slices of Slip Surface: Optimized

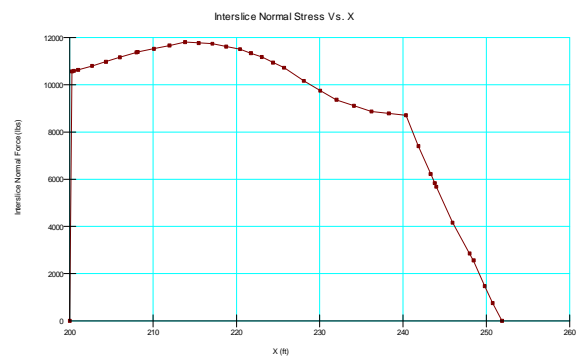
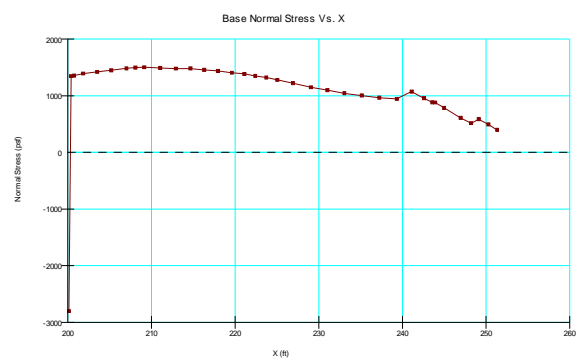
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	200.13035	-10.449235	997.84808	-2800.8344	0	339.81
2	Optimized	200.38035	-10.473235	917.28341	1347.8492	0	339.46
3	Optimized	200.75	-10.54631	921.84289	1355.8844	0	338.93
4	Optimized	201.83545	-10.76087	935.0409	1392.8152	0	337.39
5	Optimized	203.50635	-11.091155	952.94794	1421.0555	0	335.01
6	Optimized	205.17725	-11.421445	968.50651	1449.2371	0	332.63
7	Optimized	207.00635	-11.77187	982.52605	1482.5943	0	330.03
8	Optimized	208.0779	-11.971675	989.93405	1497.7754	0	328.5
9	Optimized	209.13475	-12.131535	994.29321	1503.7415	294.13013	0
10	Optimized	211.0462	-12.415305	1001.58	1491.338	282.76191	0
11	Optimized	212.9112	-12.692175	1008.5281	1479.4043	271.86054	0
12	Optimized	214.6604	-12.89622	1011.5508	1481.1994	271.15174	0
13	Optimized	216.2938	-13.027435	1010.6965	1456.8504	257.58711	0
14	Optimized	217.94555	-13.125565	1007.6576	1439.6904	249.43423	0
15	Optimized	219.6157	-13.190615	1002.4524	1406.0061	232.99182	0
16	Optimized	221.10335	-13.21669	995.84439	1385.0496	224.70774	0
17	Optimized	222.4085	-13.203785	987.87641	1350.3429	209.27014	0
18	Optimized	223.7246	-13.16104	977.96954	1322.8962	199.14352	0
19	Optimized	225.0516	-13.08846	966.15595	1279.6299	180.98428	0
20	Optimized	226.90755	-12.90539	944.51397	1224.0894	161.41297	0
21	Optimized	229.0781	-12.63822	915.95284	1148.5307	134.27888	0
22	Optimized	231.0343	-12.397435	890.22924	1097.946	119.92534	0
23	Optimized	233.06245	-12.20804	867.32008	1043.1218	101.49916	0
24	Optimized	235.16255	-12.07004	847.26918	1004.778	90.937762	0
25	Optimized	237.25145	-12.001355	831.58462	965.48139	77.305337	0
26	Optimized	239.3292	-12.001985	820.32228	945.2188	72.10904	0
27	Optimized	241.10695	-11.50115	774.26169	1074.4456	0	300
28	Optimized	242.58295	-10.5	692.9651	955.72489	0	300
29	Optimized	243.5689	-9.83126	638.39378	883.83133	0	320

30	Optimized	243.90885	-9.591403	618.80091	881.84535	0	320
31	Optimized	244.9745	-8.760143	551.74545	786.83805	0	320
32	Optimized	246.96745	-7.20557	426.31782	611.00522	0	320
33	Optimized	248.22635	-6.20557	346.24	515.88306	0	320
34	Optimized	249.1354	-5.428475	284.85478	586.70647	0	600
35	Optimized	250.28615	-4.428475	206.5666	495.01412	0	600
36	Optimized	251.3309	-3.5	85.725294	396.86726	0	600

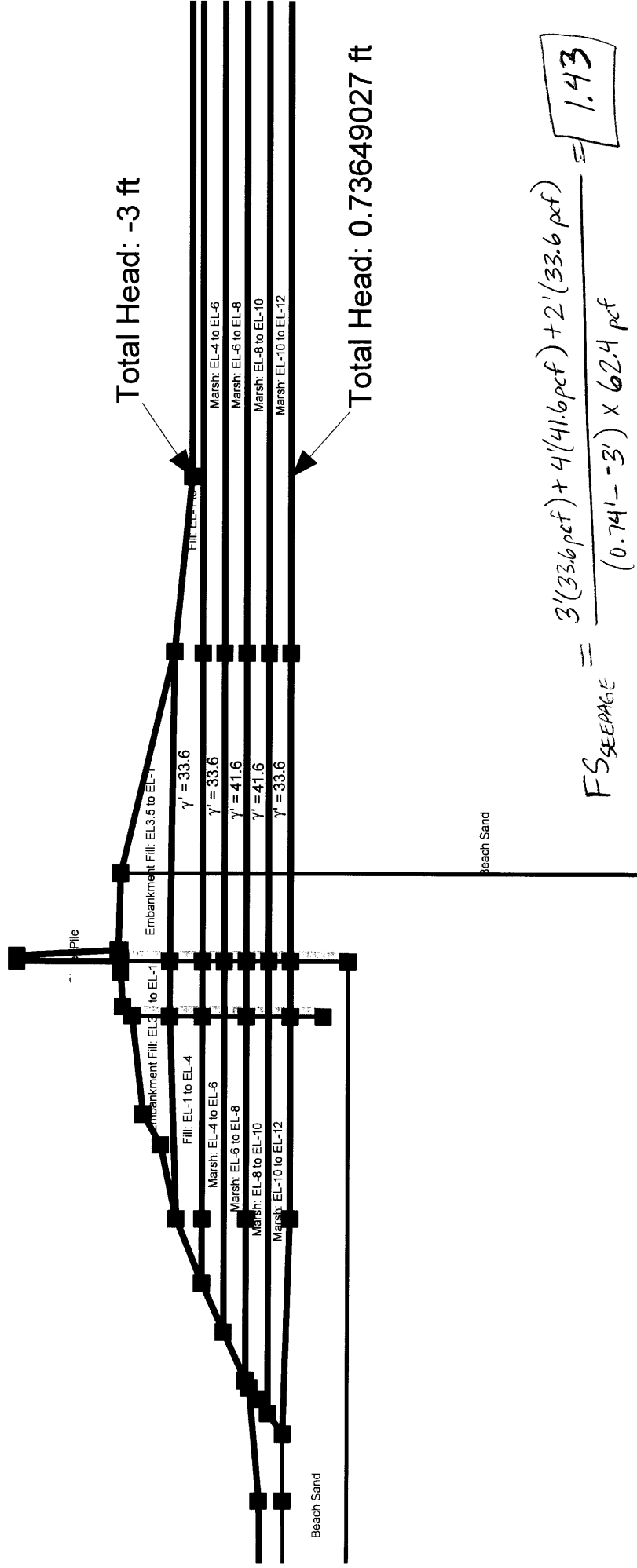
24	7294	236.94745	-11.709765	812.3939	1025.8421	0	300
25	7294	238.87655	-11.0868	756.81657	955.9195	0	300
26	7294	240.80565	-10.377035	694.26976	877.15529	0	300
27	7294	242.8851	-9.5061295	618.55028	782.6906	0	320
28	7294	245.0132	-8.5061295	532.84996	675.75263	0	320
29	7294	246.89	-7.5226425	450.1376	579.95147	0	320
30	7294	248.61715	-6.5226425	367.85955	481.09435	0	320
31	7294	250.2131	-5.5187365	287.01623	494.58625	0	600
32	7294	251.6779	-4.5187365	208.16632	409.90369	0	600
33	7294	253.0678	-3.5	82.818718	322.6855	0	600

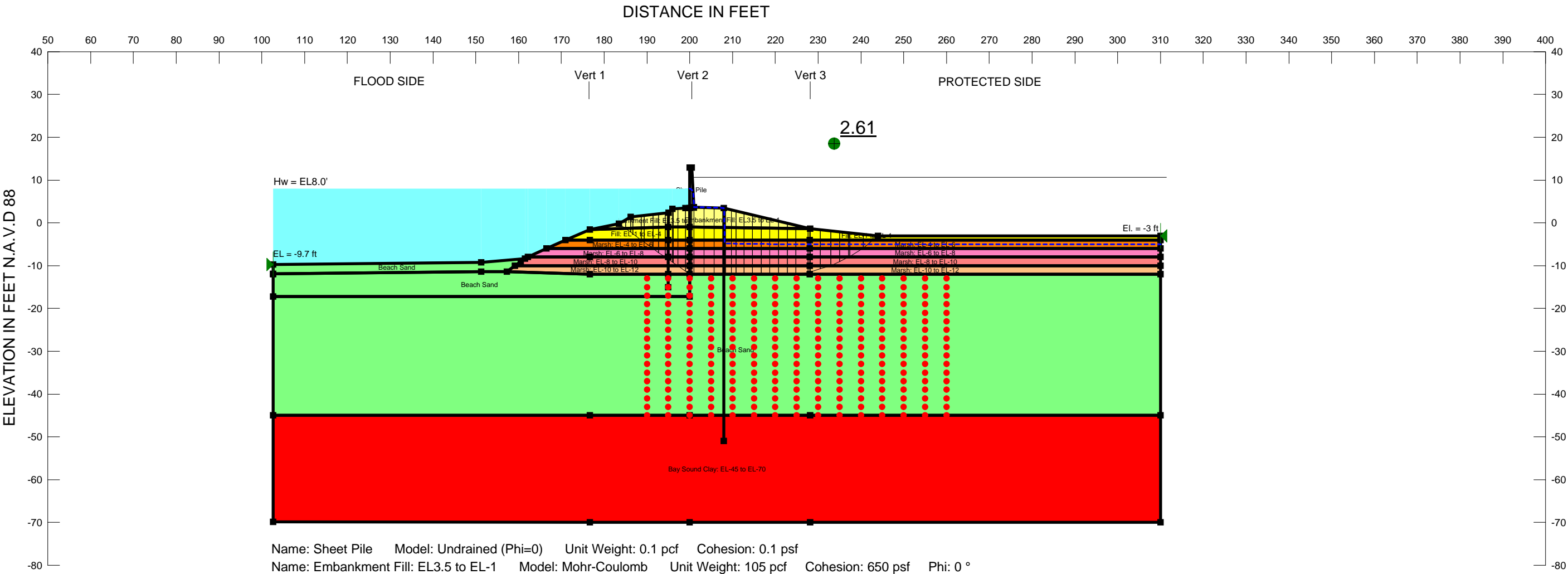
Slices of Slip Surface: 7294

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	7294	200.25	-8.8403985	809.04609	-570.02081	0	339.82
2	7294	200.75	-9.0778585	824.23564	1142.1494	0	339.47
3	7294	201.91925	-9.59746	857.03495	1214.8761	0	338.63
4	7294	203.69875	-10.338435	901.90663	1294.04	0	334.73
5	7294	205.41925	-10.9799	938.14688	1362.9526	0	332.29
6	7294	207.13975	-11.551875	967.42251	1425.1439	0	329.84
7	7294	208.3129	-11.91041	984.69307	1457.6905	0	328.17
8	7294	209.50645	-12.22915	998.38292	1476.31	275.93131	0
9	7294	211.26775	-12.654225	1015.267	1494.774	276.84353	0
10	7294	213.02905	-13.01362	1027.9226	1505.4316	275.68993	0
11	7294	214.79035	-13.30874	1036.5749	1508.2558	272.32509	0
12	7294	216.5516	-13.54072	1041.3012	1503.2555	266.70947	0
13	7294	218.31285	-13.71043	1042.1395	1490.3637	258.78233	0
14	7294	220.07415	-13.81849	1039.087	1469.4922	248.49454	0
15	7294	221.83545	-13.865295	1032.3232	1440.5856	235.71043	0
16	7294	223.59675	-13.85102	1021.7032	1403.4016	220.3737	0
17	7294	225.35805	-13.77561	1007.3223	1357.7938	202.34483	0
18	7294	227.11935	-13.638785	989.11912	1303.4329	181.46916	0
19	7294	228.05	-13.549285	978.44803	1272.0937	169.53642	0
20	7294	229.08535	-13.41093	964.13898	1247.9193	163.84064	0
21	7294	231.0561	-13.105995	934.3113	1197.48	151.94051	0
22	7294	233.02685	-12.72104	899.55141	1135.6985	136.33961	0
23	7294	234.99755	-12.254175	859.65461	1061.9899	116.81832	0



REACH 7 Non-Remediated





Name: Sheet Pile Model: Undrained (Phi=0) Unit Weight: 0.1 pcf Cohesion: 0.1 psf
Name: Embankment Fill: EL3.5 to EL-1 Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion: 650 psf Phi: 0 °
Name: Fill: EL-1 to EL-4 Model: Spatial Mohr-Coulomb Weight Fn: Fill -1 to -4 Cohesion Fn: Fill -1 to -4 Phi: 0 °
Name: Marsh: EL-4 to EL-6 Model: Spatial Mohr-Coulomb Weight Fn: Marsh -4 to -6 Cohesion Fn: Marsh -4 to -6 Phi: 0 °
Name: Marsh: EL-6 to EL-8 Model: Spatial Mohr-Coulomb Weight Fn: Marsh -6 to -8 Cohesion Fn: Marsh -6 to -10 Phi: 0 °
Name: Marsh: EL-8 to EL-10 Model: Spatial Mohr-Coulomb Weight Fn: Marsh -8 to -10 Cohesion Fn: Marsh -6 to -10 Phi: 0 °
Name: Marsh: EL-10 to EL-12 Model: Spatial Mohr-Coulomb Weight Fn: Marsh -10 to -12 Cohesion Fn: Marsh -10 to -12 Phi: 0 °
Name: Beach Sand Model: Mohr-Coulomb Unit Weight: 122 pcf Cohesion: 0 psf Phi: 30 °
Name: Bay Sound Clay: EL-45 to EL-70 Model: Spatial Mohr-Coulomb Weight Fn: Bay Sound Clay 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.

Hw = CANAL WATER LEVEL

LONDON AVE CANAL
OUTFALL CANAL REEVALUATION REPORT
REACH 7: REMEDIATED, STA. 64+00 TO 66+00
PROTECTED SIDE STABILITY ANALYSIS
CASE: Rem: Global Stability (Block) EL-13 to EL-45
MARCH 2012

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

Rem: Global Stability (Block) EL-13 to EL-45

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File Information

Revision Number: 324
Last Edited By: Haggerty, Daniel R MVN
Date: 12/21/2011
Time: 8:07:38 AM
File Name: Reach 7.gsz
Last Solved Date: 12/21/2011
Last Solved Time: 8:09:04 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

Rem: Global Stability (Block) EL-13 to EL-45
Kind: SLOPE/W
Parent: Gap Analysis (Seepage) Remediated Reach
Method: Spencer
Settings
 PWP Conditions Source: Parent Analysis
SlipSurface
 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: 1
 Tension Crack Fluid Unit Weight: 62.4 pcf
FOS Distribution
 FOS Calculation Option: Constant
Restrict Block Crossing: Yes
Advanced

Marsh: EL-8 to EL-10

Model: Spatial Mohr-Coulomb
Weight Fn: Marsh -8 to -10
Cohesion Fn: Marsh -6 to -10
Phi: 0 °
Phi-B: 0 °

Marsh: EL-10 to EL-12

Model: Spatial Mohr-Coulomb
Weight Fn: Marsh -10 to -12
Cohesion Fn: Marsh -10 to -12
Phi: 0 °
Phi-B: 0 °

Beach Sand

Model: Mohr-Coulomb
Unit Weight: 122 pcf
Cohesion: 0 psf
Phi: 30 °
Phi-B: 0 °

Bay Sound Clay: EL-45 to EL-70

Model: Spatial Mohr-Coulomb
Weight Fn: Bay Sound Clay
Cohesion Spatial Fn: Bay Sound
Phi: 0 °
Phi-B: 0 °

Slip Surface Limits

Left Coordinate: (102.6, -9.7) ft
Right Coordinate: (310, -3) ft

Slip Surface Block

Left Grid
 Upper Left: (190, -13) ft
 Lower Left: (190, -45) ft
 Lower Right: (210, -45) ft
 X Increments: 4
 Y Increments: 16
 Starting Angle: 120 °
 Ending Angle: 150 °
 Angle Increments: 6
Right Grid
 Upper Left: (215, -13) ft
 Lower Left: (215, -45) ft

Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 5000
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: 0.1 psf

Embankment Fill: EL3.5 to EL-1

Model: Mohr-Coulomb
Unit Weight: 105 pcf
Cohesion: 650 psf
Phi: 0 °
Phi-B: 0 °

Fill: EL-1 to EL-4

Model: Spatial Mohr-Coulomb
Weight Fn: Fill -1 to -4
Cohesion Fn: Fill -1 to -4
Phi: 0 °
Phi-B: 0 °

Marsh: EL-4 to EL-6

Model: Spatial Mohr-Coulomb
Weight Fn: Marsh -4 to -6
Cohesion Fn: Marsh -4 to -6
Phi: 0 °
Phi-B: 0 °

Marsh: EL-6 to EL-8

Model: Spatial Mohr-Coulomb
Weight Fn: Marsh -6 to -8
Cohesion Fn: Marsh -6 to -10
Phi: 0 °
Phi-B: 0 °

Lower Right: (260, -45) ft
X Increments: 9
Y Increments: 16
Starting Angle: 20 °
Ending Angle: 45 °
Angle Increments: 5

Cohesion Functions

Fill -1 to -4

Model: Spline Data Point Function
Function: Cohesion vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 600
Data Points: X (ft), Cohesion (psf)
 Data Point: (0, 600)
 Data Point: (176.6, 600)
 Data Point: (200, 450)
 Data Point: (228.1, 600)
 Data Point: (400, 600)

Marsh -4 to -6

Model: Spline Data Point Function
Function: Cohesion vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 600
Data Points: X (ft), Cohesion (psf)
 Data Point: (0, 600)
 Data Point: (176.6, 600)
 Data Point: (200, 340)
 Data Point: (228.1, 600)
 Data Point: (400, 600)

Marsh -6 to -10

Model: Spline Data Point Function
Function: Cohesion vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 320
Data Points: X (ft), Cohesion (psf)
 Data Point: (0, 320)
 Data Point: (176.6, 320)
 Data Point: (200, 340)
 Data Point: (228.1, 320)

Data Point: (400, 320)

Marsh -10 to -12

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: (0, 300)
Data Point: (176.6, 300)
Data Point: (200, 340)
Data Point: (228.1, 300)
Data Point: (400, 300)

Unit Weight Functions

Fill -1 to -4

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 96
Data Points: X (ft), Unit Weight (pcf)
Data Point: (0, 96)
Data Point: (176.6, 96)
Data Point: (200, 105)
Data Point: (228.1, 96)
Data Point: (400, 96)

Marsh -4 to -6

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 96
Data Points: X (ft), Unit Weight (pcf)
Data Point: (0, 96)
Data Point: (176.6, 96)
Data Point: (200, 90)
Data Point: (228.1, 96)
Data Point: (400, 96)

Marsh -6 to -8

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: (0, 104)
Data Point: (176.6, 104)
Data Point: (200, 90)
Data Point: (228.1, 104)
Data Point: (400, 104)

Marsh -8 to -10

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: (0, 104)
Data Point: (176.6, 104)
Data Point: (200, 98)
Data Point: (228.1, 104)
Data Point: (400, 104)

Marsh -10 to -12

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 96
Data Points: X (ft), Unit Weight (pcf)
Data Point: (0, 96)
Data Point: (176.6, 96)
Data Point: (200, 98)
Data Point: (228.1, 96)
Data Point: (400, 96)

Bay Sound Clay

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: (0, 111)
Data Point: (176.6, 111)
Data Point: (200, 108)
Data Point: (228.1, 111)
Data Point: (400, 111)

Spatial Functions

Bay Sound

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (0, -45, 790)
Data Point: (0, -70, 950)
Data Point: (176.6, -45, 790)
Data Point: (176.6, -70, 950)
Data Point: (200, -45, 800)
Data Point: (200, -70, 1000)
Data Point: (228.1, -45, 790)
Data Point: (228.1, -70, 950)
Data Point: (400, -45, 790)
Data Point: (400, -70, 950)

Regions

	Material	Points	Area (ft²)
Region 1	Sheet Pile	6,46,47,41,32	7.085
Region 2	Bay Sound Clay: EL-45 to EL-70	31,11,52,33,51,12,30,58,34,57	5181.295
Region 3	Beach Sand	11,24,17,16,26,29,12,51,33,52	6337.72
Region 4	Beach Sand	24,42,49,50,48,56,23,16,17	532.945
Region 5	Marsh: EL-10 to EL-12	48,63,43,16,23,56	78.271
Region 6	Marsh: EL-8 to EL-10	63,36,2,62,55,21,15,43	78.9175
Region 7	Marsh: EL-6 to EL-8	62,61,60,15,21,55	71.35
Region 8	Marsh: EL-4 to EL-6	61,3,54,20,14,60	62.6
Region 9	Fill: EL-1 to EL-4	3,4,19,13,14,20,54	71.37
Region 10	Embankment Fill: EL3.5 to EL-1	4,37,5,18,38,39,6,13,19	57.67
Region 11	Beach Sand	49,1,35,2,36,63,48,50	127.584
Region 12	Marsh: EL-10 to EL-12	16,43,44,45,29,26	220
Region 13	Marsh: EL-8 to EL-10	43,15,53,59,45,44	220
Region 14	Marsh: EL-6 to EL-8	15,60,25,28,59,53	220
Region 15	Marsh: EL-4 to EL-6	60,14,27,10,28,25	220
Region 16	Fill: EL-1 to EL-4	14,13,8,40,9,10,27	173.3
Region 17	Embankment Fill: EL3.5 to EL-1	13,6,32,41,7,8	83.54

Points

	X (ft)	Y (ft)
Point 1	102.6	-9.7
Point 2	161.5	-8.3
Point 3	170.9	-4
Point 4	176.7	-1.6
Point 5	186.2	1.4
Point 6	200	3.5
Point 7	208	3.5
Point 8	228.1	-1.4
Point 9	310	-3
Point 10	310	-4
Point 11	102.6	-45
Point 12	310	-45
Point 13	200	-1
Point 14	200	-4
Point 15	200	-8
Point 16	200	-12
Point 17	200	-17.2
Point 18	195.1	2.4
Point 19	195	-1
Point 20	195	-4
Point 21	195	-8
Point 22	195	-15
Point 23	195	-12
Point 24	102.6	-17.2
Point 25	228	-6
Point 26	228	-12
Point 27	228	-4
Point 28	310	-6
Point 29	310	-12
Point 30	310	-70
Point 31	102.6	-69.9
Point 32	201	3.53
Point 33	200	-45

Point 34	200	-70
Point 35	151.3	-9.2
Point 36	160.5	-9
Point 37	183.4	-0.2
Point 38	195.9	3.3
Point 39	199	3.5
Point 40	244	-3
Point 41	201	3.7
Point 42	102.6	-12
Point 43	200	-10
Point 44	228	-10
Point 45	310	-10
Point 46	200	12.9
Point 47	200.5	12.9
Point 48	157.3	-11.4
Point 49	102.6	-11.9
Point 50	151.3	-11.4
Point 51	228.1	-45
Point 52	176.7	-45
Point 53	228	-8
Point 54	176.7	-4
Point 55	176.7	-8
Point 56	176.7	-12
Point 57	176.7	-70
Point 58	228.1	-70
Point 59	310	-8
Point 60	200	-6
Point 61	166.5	-6
Point 62	162.15	-8
Point 63	159.17	-10
Point 64	208	-51

1	Optimized	2.61	(214.35, 0.162)	24.8369	(183.401, -0.199632)	(244.008, -3)
2	1154	3.08	(214.35, 0.162)	25.888	(182.106, -0.470411)	(246.445, -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	184.2093	-0.7634558	546.80895	390.36914	0	650
2	Optimized	185.609	-1.7393615	607.70467	542.61774	0	542.25
3	Optimized	186.4477	-2.3241415	644.19158	630.33176	0	536.87
4	Optimized	187.68125	-3.24842	701.84878	708.9072	0	528.97
5	Optimized	189.03	-4.27669	766.00895	826.94609	0	461.89
6	Optimized	190.38635	-5.27669	828.41749	932.58	0	446.82
7	Optimized	192.0532	-6.49033	904.1053	1073.4262	0	333.21
8	Optimized	193.4902	-7.49033	966.52194	1181.4377	0	334.44
9	Optimized	194.6269	-8.249055	1013.8744	1254.219	0	335.41
10	Optimized	195.05	-8.5314845	1031.5161	1282.2837	0	335.77
11	Optimized	195.5	-8.831856	1050.2712	1301.1428	0	336.15
12	Optimized	196.0417	-9.1934365	1072.8304	1381.8102	0	336.62
13	Optimized	196.68385	-9.64401	1100.94	1414.2963	0	337.17
14	Optimized	198.09215	-10.64577	1163.4629	1509.1267	0	336.74
15	Optimized	199.49975	-11.647025	1225.937	1603.3303	0	339.14
16	Optimized	199.99975	-12.00251	1248.1535	1831.1905	336.61655	0
17	Optimized	200.25	-12.003325	1248.0733	1431.7323	106.03558	0
18	Optimized	200.75	-12.004955	1248.1733	1548.7916	173.5621	0
19	Optimized	202.16665	-12.009565	1248.4647	1565.3915	182.9778	0
20	Optimized	204.5	-12.01716	1248.9361	1561.063	180.20654	0
21	Optimized	206.83335	-12.02476	1249.4075	1556.7344	177.43527	0
22	Optimized	208.094	-12.028865	868.48081	1559.713	399.08311	0
23	Optimized	208.2432	-12.033585	439.12405	1535.1866	632.81198	0
24	Optimized	209.0216	-12.019	438.21369	1555.0076	644.78124	0
25	Optimized	210.26415	-11.986355	436.2015	1506.3267	0	325.39
26	Optimized	211.71245	-11.96253	434.74189	1464.0838	0	323.33

Critical Slip Surfaces

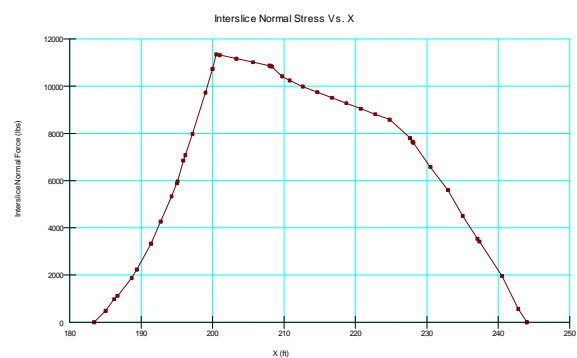
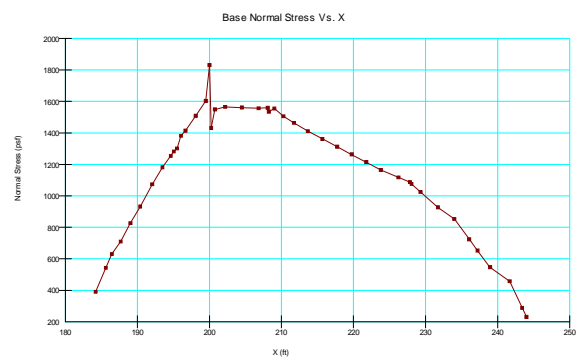
	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
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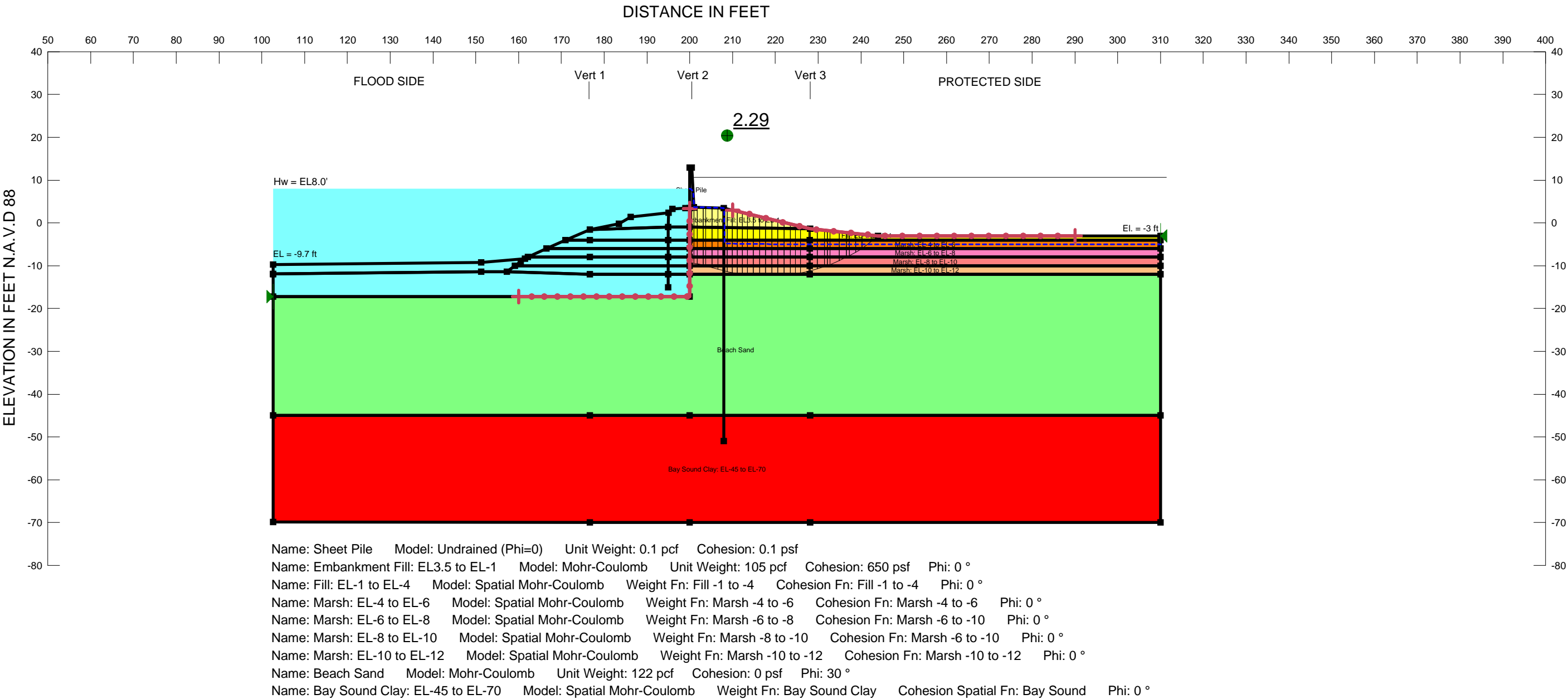
27	Optimized	213.6551	-11.95626	434.3404	1411.5964	0	320.56
28	Optimized	215.68245	-11.964085	434.80405	1362.1723	0	317.68
29	Optimized	217.70975	-11.97191	435.27758	1312.7975	0	314.79
30	Optimized	219.7371	-11.97973	435.75604	1263.4227	0	311.9
31	Optimized	221.76445	-11.987555	436.23449	1214.0972	0	309.02
32	Optimized	223.79175	-11.99538	436.71788	1164.8211	0	306.13
33	Optimized	226.2312	-11.97931	424.36321	1117.0523	0	302.66
34	Optimized	227.8285	-11.542965	408.51156	1087.5237	0	300.39
35	Optimized	228.05	-11.47533	404.29921	1075.1855	0	300.07
36	Optimized	229.2953	-11.095045	380.58676	1024.5182	0	300
37	Optimized	231.7264	-10.352665	334.26773	927.02305	0	300
38	Optimized	233.99475	-9.481475	279.89825	852.7911	0	320
39	Optimized	236.0599	-8.493825	218.25633	724.62344	0	320
40	Optimized	237.22655	-7.935895	183.43564	652.22607	0	320
41	Optimized	238.9467	-6.89099	118.21755	546.79503	0	320
42	Optimized	241.6734	-4.955095	-2.6029382	457.22659	0	600
43	Optimized	243.407	-3.503433	-93.198458	288.47111	0	600
44	Optimized	244.0041	-3.003433	-124.40393	230.38803	0	600

Slices of Slip Surface: **1154**

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	1154	182.75295	-0.9234828	556.81871	416.68829	0	650
2	1154	184.8	-2.3568455	646.22317	594.9384	0	547.44
3	1154	186.67335	-3.668568	728.06377	773.78624	0	535.43
4	1154	188.57485	-5	811.1517	914.96902	0	466.95
5	1154	191.43115	-7	935.93324	1130.433	0	332.68
6	1154	193.97965	-8.7844915	1047.2911	1302.6067	0	334.85
7	1154	195.4078	-9.7844915	1109.7137	1384.3808	0	336.08
8	1154	195.8078	-10.064575	1127.1754	1431.2641	0	332.83
9	1154	197.23595	-11.064575	1189.5838	1556.751	0	335.28
10	1154	198.78595	-12.149895	1257.3081	1679.3508	243.66648	0
11	1154	199.5	-12.649895	1288.5257	1735.4549	258.0347	0
12	1154	200.25	-13	1310.28	1549.22	137.95207	0

13	1154	200.75	-13	1310.28	1671.24	208.40035	0
14	1154	202.16665	-13	1310.2716	1687.2431	217.64459	0
15	1154	204.5	-13	1310.2716	1681.9717	214.60113	0
16	1154	206.83335	-13	1310.2716	1676.7431	211.58241	0
17	1154	209.0625	-13	499.43529	1661.8824	671.13912	0
18	1154	211.1875	-13	499.43529	1608.3294	640.22032	0
19	1154	213.3125	-13	499.43529	1554.8235	609.32868	0
20	1154	215.4375	-13	499.43529	1501.3176	578.43705	0
21	1154	217.5625	-13	499.43529	1447.9059	547.59975	0
22	1154	219.6875	-13	499.38824	1394.5412	516.81679	0
23	1154	221.8125	-13	499.38824	1341.1765	486.00666	0
24	1154	223.9375	-13	499.38824	1287.9059	455.25088	0
25	1154	226.07225	-12.5	468.21869	1305.214	483.23947	0
26	1154	227.57225	-11.80054	424.56439	1148.1757	0	300.75
27	1154	228.05	-11.577765	410.68428	1113.399	0	300.07
28	1154	228.9334	-11.165835	385.00501	1062.3321	0	300
29	1154	230.60015	-10.38861	336.52934	967.44708	0	300
30	1154	232.50575	-9.5	281.07913	858.63337	0	320
31	1154	234.65025	-8.5	218.66688	728.2134	0	320
32	1154	236.79475	-7.5	156.24617	597.79343	0	320
33	1154	238.93925	-6.5	93.825464	467.37345	0	320
34	1154	241.00865	-5.5350385	33.59094	398.5757	0	600
35	1154	243.0029	-4.6051155	-24.452085	285.07738	0	600
36	1154	244.1503	-4.070077	-57.846938	221.2953	0	600
37	1154	245.37285	-3.5	-93.423976	164.06461	0	600





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 = CANAL WATER LEVEL

LONDON AVE CANAL
OUTFALL CANAL REEVALUATION REPORT
REACH 7: REMEDIATED, STA. 64+00 TO 66+00
PROTECTED SIDE STABILITY ANALYSIS
CASE: Rem: Gap Stability (Entry/Exit)
MARCH 2012

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

Rem: Gap Stability (Entry/Exit)

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File Information

Revision Number: 316
Last Edited By: Haggerty, Daniel R MVN
Date: 12/20/2011
Time: 4:10:50 PM
File Name: Reach 7.gsz
Last Solved Date: 12/20/2011
Last Solved Time: 4:42:58 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

Rem: Gap Stability (Entry/Exit)
Kind: SLOPE/W
Parent: Gap Analysis (Seepage) Remediated Reach
Method: Spencer
Settings
 PWP Conditions Source: Parent Analysis
SlipSurface
 Direction of movement: Left to Right
 Use Passive Mode: Yes
 Slip Surface Option: Entry and Exit
 Critical slip surfaces saved: 1
 Optimize Critical Slip Surface Location: Yes
 Tension Crack
 Tension Crack Option: (none)
FOS Distribution
 FOS Calculation Option: Constant
Advanced
 Number of Slices: 30
 Optimization Tolerance: 0.01
 Minimum Slip Surface Depth: 0.1 ft

Cohesion Fn: Marsh -6 to -10
Phi: 0 °
Phi-B: 0 °

Marsh: EL-10 to EL-12
Model: Spatial Mohr-Coulomb
Weight Fn: Marsh -10 to -12
Cohesion Fn: Marsh -10 to -12
Phi: 0 °
Phi-B: 0 °

Beach Sand
Model: Mohr-Coulomb
Unit Weight: 122 pcf
Cohesion: 0 psf
Phi: 30 °
Phi-B: 0 °

Bay Sound Clay: EL-45 to EL-70
Model: Spatial Mohr-Coulomb
Weight Fn: Bay Sound Clay
Cohesion Spatial Fn: Bay Sound
Phi: 0 °
Phi-B: 0 °

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (160, -17.2) ft
Left-Zone Right Coordinate: (200, 3.4) ft
Left-Zone Increment: 20
Right Projection: Range
Right-Zone Left Coordinate: (210, 3.01244) ft
Right-Zone Right Coordinate: (290, -3) ft
Right-Zone Increment: 20
Radius Increments: 20

Slip Surface Limits

Left Coordinate: (102.6, -17.2) ft
Right Coordinate: (310, -3) ft

Optimization Maximum Iterations: 5000
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: 0.1 psf

Embankment Fill: EL3.5 to EL-1

Model: Mohr-Coulomb
Unit Weight: 105 pcf
Cohesion: 650 psf
Phi: 0 °
Phi-B: 0 °

Fill: EL-1 to EL-4

Model: Spatial Mohr-Coulomb
Weight Fn: Fill -1 to -4
Cohesion Fn: Fill -1 to -4
Phi: 0 °
Phi-B: 0 °

Marsh: EL-4 to EL-6

Model: Spatial Mohr-Coulomb
Weight Fn: Marsh -4 to -6
Cohesion Fn: Marsh -4 to -6
Phi: 0 °
Phi-B: 0 °

Marsh: EL-6 to EL-8

Model: Spatial Mohr-Coulomb
Weight Fn: Marsh -6 to -8
Cohesion Fn: Marsh -6 to -10
Phi: 0 °
Phi-B: 0 °

Marsh: EL-8 to EL-10

Model: Spatial Mohr-Coulomb
Weight Fn: Marsh -8 to -10

Cohesion Functions

Fill -1 to -4

Model: Spline Data Point Function
Function: Cohesion vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 600
Data Points: X (ft), Cohesion (psf)
 Data Point: (0, 600)
 Data Point: (176.6, 600)
 Data Point: (200, 450)
 Data Point: (228.1, 600)
 Data Point: (400, 600)

Marsh -4 to -6

Model: Spline Data Point Function
Function: Cohesion vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 600
Data Points: X (ft), Cohesion (psf)
 Data Point: (0, 600)
 Data Point: (176.6, 600)
 Data Point: (200, 340)
 Data Point: (228.1, 600)
 Data Point: (400, 600)

Marsh -6 to -10

Model: Spline Data Point Function
Function: Cohesion vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 320
Data Points: X (ft), Cohesion (psf)
 Data Point: (0, 320)
 Data Point: (176.6, 320)
 Data Point: (200, 340)
 Data Point: (228.1, 320)
 Data Point: (400, 320)

Marsh -10 to -12

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: (0, 300)
Data Point: (176.6, 300)
Data Point: (200, 340)
Data Point: (228.1, 300)
Data Point: (400, 300)

Unit Weight Functions

Fill -1 to -4

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 96
Data Points: X (ft), Unit Weight (pcf)
Data Point: (0, 96)
Data Point: (176.6, 96)
Data Point: (200, 105)
Data Point: (228.1, 96)
Data Point: (400, 96)

Marsh -4 to -6

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 96
Data Points: X (ft), Unit Weight (pcf)
Data Point: (0, 96)
Data Point: (176.6, 96)
Data Point: (200, 90)
Data Point: (228.1, 96)
Data Point: (400, 96)

Marsh -6 to -8

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: (0, 104)
Data Point: (176.6, 104)
Data Point: (200, 90)
Data Point: (228.1, 104)

Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (0, -45, 790)
Data Point: (0, -70, 950)
Data Point: (176.6, -45, 790)
Data Point: (176.6, -70, 950)
Data Point: (200, -45, 800)
Data Point: (200, -70, 1000)
Data Point: (228.1, -45, 790)
Data Point: (228.1, -70, 950)
Data Point: (400, -45, 790)
Data Point: (400, -70, 950)

Regions

	Material	Points	Area (ft²)
Region 1	Sheet Pile	6,46,47,41,32	7.085
Region 2	Bay Sound Clay: EL-45 to EL-70	31,11,52,33,51,12,30,58,34,57	5181.295
Region 3	Beach Sand	11,24,17,16,26,29,12,51,33,52	6337.72
Region 4		24,42,49,50,48,56,23,16,17	532.945
Region 5		48,63,43,16,23,56	78.271
Region 6		63,36,2,62,55,21,15,43	78.9175
Region 7		62,61,60,15,21,55	71.35
Region 8		61,3,54,20,14,60	62.6
Region 9		3,4,19,13,14,20,54	71.37
Region 10		4,37,5,18,38,39,6,13,19	57.67
Region 11		49,1,35,2,36,63,48,50	127.584
Region 12	Marsh: EL-10 to EL-12	16,43,44,45,29,26	220
Region 13	Marsh: EL-8 to EL-10	43,15,53,59,45,44	220
Region 14	Marsh: EL-6 to EL-8	15,60,25,28,59,53	220
Region 15	Marsh: EL-4 to EL-6	60,14,27,10,28,25	220
Region 16	Fill: EL-1 to EL-4	14,13,8,40,9,10,27	173.3
Region 17	Embankment Fill: EL3.5 to EL-1	13,6,32,41,7,8	83.54

Points

	X (ft)	Y (ft)
Point 1	102.6	-9.7
Point 2	161.5	-8.3
Point 3	170.9	-4

Data Point: (400, 104)

Marsh -8 to -10

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: (0, 104)
Data Point: (176.6, 104)
Data Point: (200, 98)
Data Point: (228.1, 104)
Data Point: (400, 104)

Marsh -10 to -12

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 96
Data Points: X (ft), Unit Weight (pcf)
Data Point: (0, 96)
Data Point: (176.6, 96)
Data Point: (200, 98)
Data Point: (228.1, 96)
Data Point: (400, 96)

Bay Sound Clay

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: (0, 111)
Data Point: (176.6, 111)
Data Point: (200, 108)
Data Point: (228.1, 111)
Data Point: (400, 111)

Spatial Functions

Bay Sound

Model: Linear Interpolation
Limit Range By: Data Values

Point 4	176.7	-1.6
Point 5	186.2	1.4
Point 6	200	3.5
Point 7	208	3.5
Point 8	228.1	-1.4
Point 9	310	-3
Point 10	310	-4
Point 11	102.6	-45
Point 12	310	-45
Point 13	200	-1
Point 14	200	-4
Point 15	200	-8
Point 16	200	-12
Point 17	200	-17.2
Point 18	195.1	2.4
Point 19	195	-1
Point 20	195	-4
Point 21	195	-8
Point 22	195	-15
Point 23	195	-12
Point 24	102.6	-17.2
Point 25	228	-6
Point 26	228	-12
Point 27	228	-4
Point 28	310	-6
Point 29	310	-12
Point 30	310	-70
Point 31	102.6	-69.9
Point 32	201	3.53
Point 33	200	-45
Point 34	200	-70
Point 35	151.3	-9.2
Point 36	160.5	-9
Point 37	183.4	-0.2
Point 38	195.9	3.3
Point 39	199	3.5

Point 40	244	-3
Point 41	201	3.7
Point 42	102.6	-12
Point 43	200	-10
Point 44	228	-10
Point 45	310	-10
Point 46	200	12.9
Point 47	200.5	12.9
Point 48	157.3	-11.4
Point 49	102.6	-11.9
Point 50	151.3	-11.4
Point 51	228.1	-45
Point 52	176.7	-45
Point 53	228	-8
Point 54	176.7	-4
Point 55	176.7	-8
Point 56	176.7	-12
Point 57	176.7	-70
Point 58	228.1	-70
Point 59	310	-8
Point 60	200	-6
Point 61	166.5	-6
Point 62	162.15	-8
Point 63	159.17	-10
Point 64	208	-51

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	2.29	(217.287, 38.407)	18.76538	(200, 12.9)	(244.005, -3)
2	7251	2.42	(217.287, 38.407)	50.197	(200, 12.9)	(245.664, -3)

Slices of Slip Surface: Optimized

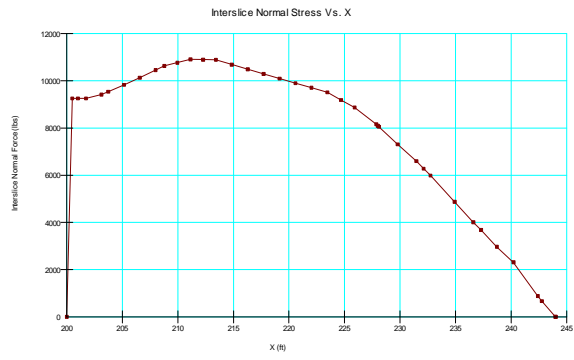
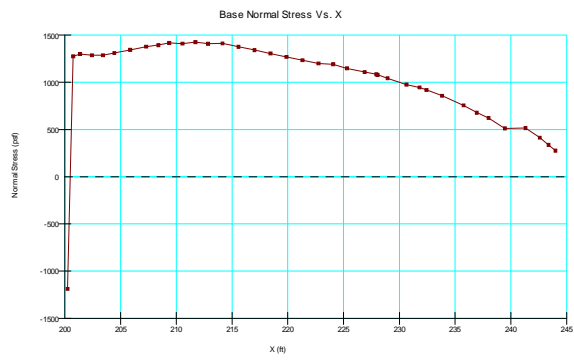
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	200.25	-9.3851105	1074.0469	-1188.1994	0	339.82
2	Optimized	200.75	-9.442424	1077.8222	1275.5673	0	339.47
3	Optimized	201.36775	-9.5132355	1082.4686	1299.6972	0	339.03
4	Optimized	202.42695	-9.696245	1094.4175	1287.2249	0	338.27
5	Optimized	203.4225	-9.91855	1109.018	1286.6781	0	337.56
6	Optimized	204.4388	-10.19077	1126.8778	1310.6448	0	333.68
7	Optimized	205.86325	-10.57231	1151.9	1343.8042	0	331.65
8	Optimized	207.28775	-10.95385	1176.7865	1376.9636	0	329.63
9	Optimized	208.38775	-11.24847	392.22506	1394.1129	0	328.06
10	Optimized	209.36525	-11.460545	404.75249	1417.6928	0	326.67
11	Optimized	210.54475	-11.677	417.41091	1409.8542	0	324.99
12	Optimized	211.7066	-11.838515	427.17178	1426.2555	0	323.34
13	Optimized	212.8508	-11.94509	433.66346	1408.5034	0	321.71
14	Optimized	214.13965	-11.998395	436.92361	1412.2079	0	319.87
15	Optimized	215.57315	-11.99843	436.92361	1376.6306	0	317.83
16	Optimized	217.00665	-11.998465	436.92361	1341.1231	0	315.79
17	Optimized	218.44015	-11.998495	436.92361	1305.6156	0	313.75
18	Optimized	219.87365	-11.998525	436.91664	1270.1081	0	311.71
19	Optimized	221.30715	-11.99856	436.91664	1234.6704	0	309.67
20	Optimized	222.74065	-11.998595	436.91664	1199.2326	0	307.63
21	Optimized	224.0713	-11.93068	432.68943	1192.0432	0	305.73
22	Optimized	225.2991	-11.794815	424.22977	1147.9235	0	303.99
23	Optimized	226.8901	-11.522055	407.22701	1109.3944	0	301.72
24	Optimized	227.9336	-11.29743	393.21705	1085.6447	0	300.24
25	Optimized	228.05	-11.26272	391.05085	1079.1608	0	300.07
26	Optimized	228.94425	-10.996115	374.42952	1042.7338	0	300
27	Optimized	230.6327	-10.492725	343.02038	975.42038	0	300
28	Optimized	231.804	-10.120515	319.79239	945.20496	0	300
29	Optimized	232.4396	-9.88633	305.18124	918.75262	0	320

30	Optimized	233.8348	-9.30037	268.60517	858.13221	0	320
31	Optimized	235.7579	-8.41404	213.2846	755.98679	0	320
32	Optimized	236.9406	-7.828575	176.74351	678.59725	0	320
33	Optimized	238.0008	-7.2428625	140.18454	622.71932	0	320
34	Optimized	239.4626	-6.3945625	87.237239	512.015	0	320
35	Optimized	241.30845	-5.127045	8.1301196	515.64995	0	600
36	Optimized	242.5878	-4.14677	-53.049545	414.83125	0	600
37	Optimized	243.3846	-3.502104	-93.279552	336.88774	0	600
38	Optimized	244.0026	-3.002104	-124.48564	276.44873	0	600

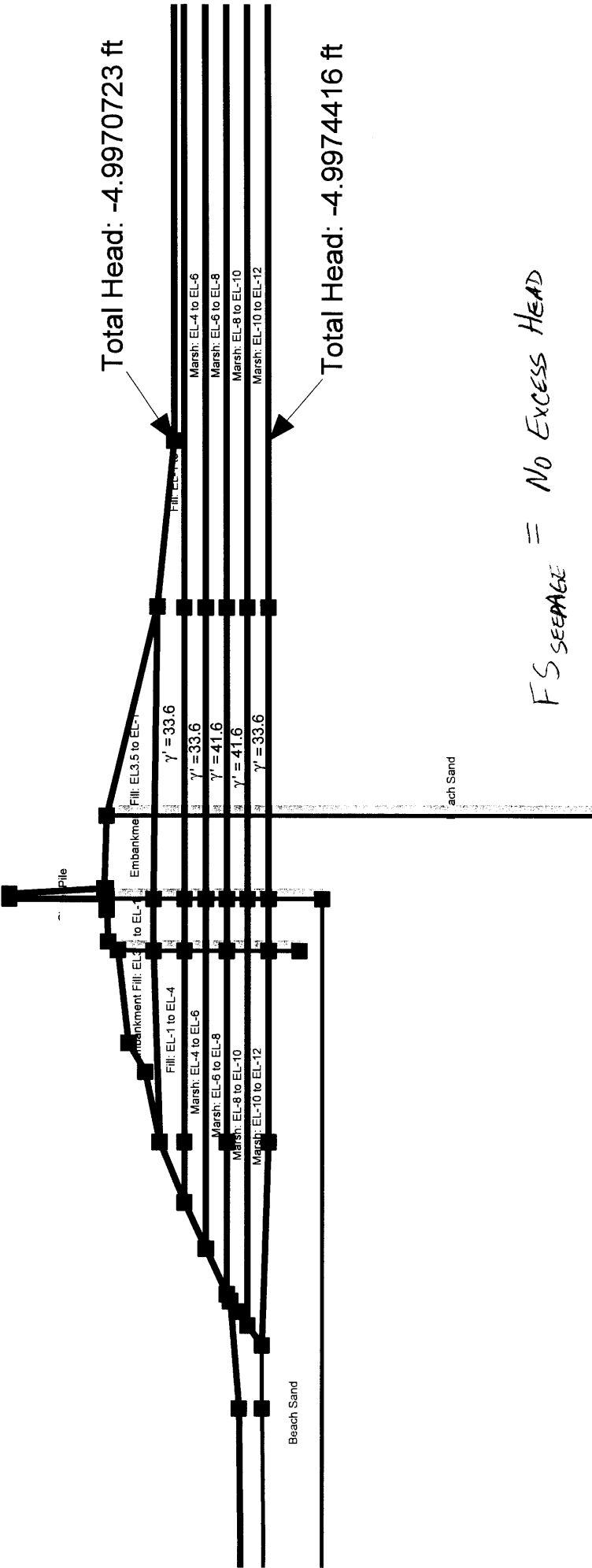
22	7251	228.71875	-10.467525	341.49216	972.30845	0	300
23	7251	229.95625	-10.1614	322.3781	936.58466	0	300
24	7251	231.30605	-9.7873515	299.02324	895.25715	0	320
25	7251	232.76815	-9.3376645	270.9513	840.38753	0	320
26	7251	234.23025	-8.8384595	239.78507	779.84067	0	320
27	7251	235.6923	-8.2881465	205.4319	713.42806	0	320
28	7251	237.1349	-7.6936485	168.32105	641.81436	0	320
29	7251	238.55805	-7.054362	128.41752	564.93018	0	320
30	7251	239.98115	-6.3607135	85.118411	481.51663	0	320
31	7251	241.51955	-5.544134	34.153639	472.71119	0	600
32	7251	243.1732	-4.590493	-25.365431	372.95888	0	600
33	7251	244.07345	-4.046359	-59.325355	316.6206	0	600
34	7251	244.9056	-3.5	-93.42215	268.06109	0	600

Slices of Slip Surface: 7251

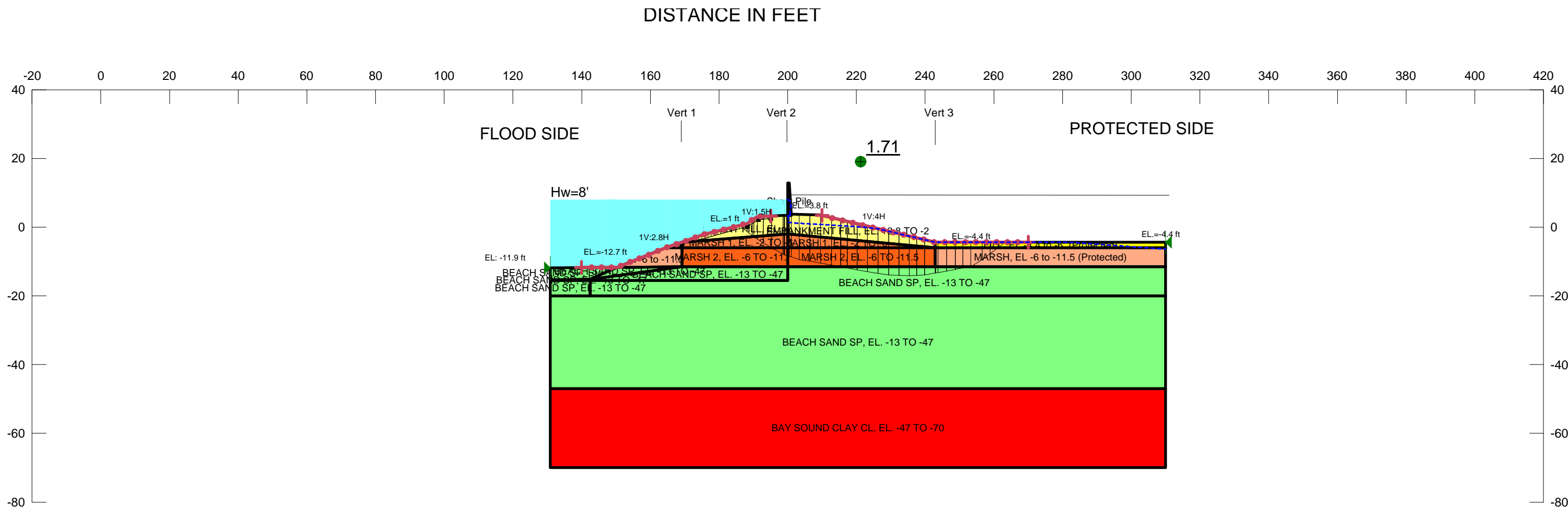
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	7251	200.25	-8.810207	1035.9066	-1072.6668	0	339.82
2	7251	200.75	-8.987646	1047.636	1163.335	0	339.47
3	7251	201.74985	-9.318999	1069.5584	1217.1624	0	338.75
4	7251	203.24955	-9.78156	1099.9599	1267.8795	0	337.69
5	7251	204.6662	-10.173225	1125.6441	1311.8845	0	333.36
6	7251	205.99975	-10.500335	1146.9586	1348.9934	0	331.46
7	7251	207.33325	-10.789125	1165.6375	1382.5362	0	329.56
8	7251	208.76925	-11.0565	380.62734	1397.5339	0	327.52
9	7251	210.3077	-11.296985	394.36622	1393.2552	0	325.33
10	7251	211.84615	-11.488885	405.81371	1384.0301	0	323.14
11	7251	213.3846	-11.632765	414.49441	1369.9402	0	320.95
12	7251	214.92305	-11.72903	420.33644	1351.0188	0	318.76
13	7251	216.46155	-11.777955	423.30714	1327.3151	0	316.57
14	7251	218	-11.779685	423.38022	1298.7638	0	314.38
15	7251	219.53845	-11.734225	420.53596	1265.3806	0	312.19
16	7251	221.07695	-11.64144	414.74114	1227.067	0	310
17	7251	222.6154	-11.50107	405.99042	1183.8775	0	307.81
18	7251	224.15385	-11.31271	394.24003	1135.6905	0	305.62
19	7251	225.6923	-11.07581	379.45579	1082.475	0	303.43
20	7251	227.23075	-10.789675	361.60176	1024.0371	0	301.24
21	7251	228.05	-10.623225	351.20774	991.39489	0	300.07



REACH 7 Remediated



$FS_{SEEPAGE} = \text{No Excess Head}$



Name: EMBANKMENT FILL, EL. +3.8 TO -2	Model: Spatial Mohr-Coulomb	Unit Weight: 107 pcf	Cohesion Fn: Fill	Phi: 0 °
Name: MARSH 1, EL. -2 TO -6	Model: Spatial Mohr-Coulomb	Unit Weight: 80 pcf	Cohesion Fn: Marsh 1&2	Phi: 0 °
Name: BEACH SAND SP, EL. -13 TO -47	Model: Shear/Normal Fn.	Unit Weight: 122 pcf	Strength Function: Sand	
Name: BAY SOUND CLAY CL, EL. -47 TO -70	Model: Spatial Mohr-Coulomb	Unit Weight: 108 pcf	Cohesion Spatial Fn: Clay Cohesion	Phi: 0 °
Name: MARSH 2, EL. -6 TO -11.5	Model: Spatial Mohr-Coulomb	Weight Fn: Marsh 2	Cohesion Fn: Marsh 1&2	Phi: 0 °
Name: Sheet Pile	Model: Undrained (Phi=0)	Unit Weight: 0.1 pcf	Cohesion: 0.01 psf	
Name: FILL, EL -4.4 to -6 (Protected)	Model: Undrained (Phi=0)	Unit Weight: 107 pcf	Cohesion: 600 psf	
Name: MARSH, EL -6 to -11.5 (Protected)	Model: Spatial Mohr-Coulomb	Unit Weight: 80 pcf	Cohesion: 220 psf	Phi: 0 °

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.

 $H_w = \text{CANAL WATER LEVEL}$ LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

LONDON AVE OUTFALL CANAL, REACH 14,
PROTECTED SIDE STABILITY ANALYSIS,
CASE: Global Stability (Entry/Exit) OPEN
STA. 96+00 TO 100+28
ORLEANS PARISH, LOUISIANA

Name: Global Stability (Entry/Exit) OPEN
File Name: Reach 14 OPEN-SP.gsz Directory: Y:\Middleton\London Ave Canal\seepage test\14 and 15\
Last Edited By: Middleton, Mark C MVN

Global Stability (Entry/Exit) OPEN

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File Information

Created By: Liljegren, James
Revision Number: 293
Last Edited By: Middleton, Mark C MVN
Date: 6/27/2013
Time: 10:59:15 AM
File Name: Reach 14 OPEN-SP.gsz
Directory: Y:\Middleton\London Ave Canal\seepage test\14 and 15\
Last Solved Date: 6/27/2013
Last Solved Time: 11:00:08 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

Global Stability (Entry/Exit) OPEN

Kind: SLOPE/W
Parent: Gap Analysis (seepage) OPEN
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: 1
Tension Crack Fluid Unit Weight: 62.4 pcf
FOS Distribution

Phi: 0 °
Phi-B: 0 °

Sheet Pile

Model: Undrained (Phi=0)
Unit Weight: 0.1 pcf
Cohesion: 0.01 psf

FILL, EL -4.4 to -6 (Protected)

Model: Undrained (Phi=0)
Unit Weight: 107 pcf
Cohesion: 600 psf

MARSH, EL -6 to -11.5 (Protected)

Model: Spatial Mohr-Coulomb
Unit Weight: 80 pcf
Cohesion: 220 psf
Phi: 0 °
Phi-B: 0 °

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (139.98064, -11.78207) ft
Left-Zone Right Coordinate: (195, 3.25) ft
Left-Zone Increment: 20
Right Projection: Range
Right-Zone Left Coordinate: (210.00041, 3.38172) ft
Right-Zone Right Coordinate: (270, -4.4) ft
Right-Zone Increment: 20
Radius Increments: 10

Slip Surface Limits

Left Coordinate: (130.9, -11.9) ft
Right Coordinate: (310, -4.4) ft

Tension Crack Line

	X (ft)	Y (ft)
	169.20482	-5.1
	188.3	0.2
	191.5	2.2
	195	2.5

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. +3.8 TO -2

Model: Spatial Mohr-Coulomb
Unit Weight: 107 pcf
Cohesion Fn: Fill
Phi: 0 °
Phi-B: 0 °

MARSH 1, EL. -2 TO -6

Model: Spatial Mohr-Coulomb
Unit Weight: 80 pcf
Cohesion Fn: Marsh 1&2
Phi: 0 °
Phi-B: 0 °

BEACH SAND SP, EL. -13 TO -47

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

BAY SOUND CLAY CL, EL. -47 TO -70

Model: Spatial Mohr-Coulomb
Unit Weight: 108 pcf
Cohesion Spatial Fn: Clay Cohesion
Phi: 0 °
Phi-B: 0 °

MARSH 2, EL. -6 TO -11.5

Model: Spatial Mohr-Coulomb
Weight Fn: Marsh 2
Cohesion Fn: Marsh 1&2

Cohesion Functions

Marsh 1&2

Model: Spline Data Point Function
Function: Cohesion vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 220
Data Points: X (ft), Cohesion (psf)
Data Point: (169.2, 220)
Data Point: (200, 250)
Data Point: (242.9, 220)

Fill

Model: Spline Data Point Function
Function: Cohesion vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 600
Data Points: X (ft), Cohesion (psf)
Data Point: (169.2, 600)
Data Point: (200, 700)
Data Point: (242.9, 600)

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: (-100000, 0)
Data Point: (0, 0)
Data Point: (100000, 57735)
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 2
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: (169.2, 80)
Data Point: (200, 109)
Data Point: (242.9, 80)

Spatial Functions

Clay Cohesion
Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (100.5, -47, 630)
Data Point: (100.5, -70, 900)
Data Point: (169.2, -47, 630)
Data Point: (169.2, -70, 900)
Data Point: (200, -47, 705)
Data Point: (200, -70, 935)
Data Point: (242.9, -47, 630)
Data Point: (242.9, -70, 900)
Data Point: (310, -47, 630)
Data Point: (310, -70, 900)

Regions

	Material	Points	Area (ft²)
Region 1	MARSH 1, EL. -2 TO -6	3,28,34	3.76
Region 2	MARSH 1, EL. -2 TO -6	12,32,13	85.8
Region 3	BEACH SAND SP, EL. -13 TO -47	29,35,14,15,48	180.605
Region 4	BAY SOUND CLAY CL, EL. -47 TO -70	10,11,17,18	4119.3
Region 5	FILL, EL. -4.4 to -6 (Protected)	27,25,19,7,32	107.34186
Region 6	BEACH SAND SP, EL. -13 TO -47	36,11,10,37,49	4835.7
Region 7	EMBANKMENT FILL, EL. +3.8 TO -2	24,23,4,26,5,31,12,28	105.99085
Region 8	EMBANKMENT FILL, EL. +3.8 TO -2	31,30,20,6,27,32,12	191.10273
Region 9	MARSH, EL.-6 to -11.5 (Protected)	16,3,34,35	65.37

Region 10	BEACH SAND SP, EL. -13 TO -47	1,21,22,16,2,29	53.34
Region 11	MARSH 1, EL. -2 TO -6	12,13,34,28	86.22286
Region 12	MARSH, EL.-6 to -11.5 (Protected)	32,7,9,33	369.05
Region 13	BEACH SAND SP, EL. -13 TO -47	15,14,33,9,36,49,48	1193.75
Region 14	Sheet Pile	31,44,45,20,30	7.225
Region 15	MARSH 2, EL. -6 TO -11.5	34,13,46,47,14,35	169.4
Region 16	MARSH 2, EL. -6 TO -11.5	13,32,33,14,47,46	235.95
Region 17	BEACH SAND SP, EL. -13 TO -47	29,2,16,35	32.245
Region 18	BEACH SAND SP, EL. -13 TO -47	8,48,49,37	52.2
Region 19	BEACH SAND SP, EL. -13 TO -47	1,29,48,8	2.9

Points

	X (ft)	Y (ft)
Point 1	130.9	-15.3
Point 2	148.1	-12.7
Point 3	164.5	-6
Point 4	191.1	3.1
Point 5	198.9	3.4
Point 6	209.5	3.5
Point 7	310	-6
Point 8	130.9	-15.5
Point 9	310	-11.5
Point 10	130.9	-47
Point 11	310	-47
Point 12	200	-2
Point 13	200	-6
Point 14	200	-11.5
Point 15	200	-15.5
Point 16	150.3	-11.7
Point 17	310	-70
Point 18	130.9	-70
Point 19	310	-4.4
Point 20	201	3.8
Point 21	130.9	-11.9
Point 22	146.3	-11.7

Point 23	188.1	1
Point 24	175.3	-2.2
Point 25	243.1	-4.4
Point 26	198.6	3.38846
Point 27	242.92268	-4.4
Point 28	169.20857	-4.4
Point 29	142.5	-15.2
Point 30	201	3.4
Point 31	200	3.4
Point 32	242.9	-6
Point 33	242.9	-11.5
Point 34	169.2	-6
Point 35	169.2	-11.5
Point 36	310	-20
Point 37	130.9	-20
Point 38	169.2	-47
Point 39	200	-47
Point 40	242.9	-47
Point 41	169.2	-70
Point 42	200	-70
Point 43	242.9	-70
Point 44	200	12.9
Point 45	200.5	12.9
Point 46	200	-6.9
Point 47	200	-10.3
Point 48	142.5	-15.5
Point 49	142.5	-20

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.71	(230.878, 58.751)	30.34812	(186.735, 0.658723)	(263.27, -4.4)
2	4140	1.84	(230.878, 58.751)	72.73	(187.89, 0.94746)	(266.955, -4.4)

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	187.41745	0.76269705	449.71861	295.62024	0	659.15
2	Optimized	188.8683	1.8856585	440.25627	448.16099	0	663.86
3	Optimized	189.85645	2.6269095	443.10779	596.85953	0	667.07
4	Optimized	190.58815	3.114764	467.95019	794.93419	0	240.83
5	Optimized	191.9679	4.0347195	529.94328	896.24453	0	242.18
6	Optimized	194.0773	-5.3067	621.53756	1014.6928	0	244.23
7	Optimized	196.9594	6.916185	748.20632	1158.2976	0	247.04
8	Optimized	198.75	7.916136	815.43266	1261.3174	0	248.78
9	Optimized	198.9593	8.033026	819.87483	1274.4123	0	248.99
10	Optimized	199.5093	8.2146135	829.92785	1358.2287	0	249.52
11	Optimized	200.25	8.4387175	598.31339	987.64302	0	249.83
12	Optimized	200.75	8.589999	607.69344	1119.7103	0	249.48
13	Optimized	202.17785	-9.02201	634.01668	1202.9414	0	248.48
14	Optimized	204.89175	-9.6502	668.48404	1290.9088	0	246.58

15	Optimiz ed	207.9639	- 10.19384	693.26051	1335.2052	0	244.43
16	Optimiz ed	211.129	- 10.75392	716.1648	1344.0142	0	242.22
17	Optimiz ed	214.0587	- 11.27109	736.22832	1320.0774	0	240.17
18	Optimiz ed	216.31255	11.66773 5	751.16532	1300.06	316.90451	-2.2487e- 005
19	Optimiz ed	218.74315	- 12.13712	769.61667	1285.9439	298.10165	-6.0288e- 005
20	Optimiz ed	221.6981	12.74041 5	794.05368	1282.396	281.94459	1.7012e- 005
21	Optimiz ed	224.72745	- 13.25329 5	812.43529	1284.036	272.27878	-1.9319e- 005
22	Optimiz ed	227.83115	- 13.67576 5	824.75846	1254.3454	248.02215	-1.3169e- 006
23	Optimiz ed	230.8626	- 13.96417 5	829.0537	1230.6387	231.85521	-1.645e- 005
24	Optimiz ed	233.8218	- 14.11852 5	825.24033	1170.6372	199.41497	-1.0587e- 006
25	Optimiz ed	236.4345	14.12922 5	814.07289	1125.3853	179.7363	-1.2751e- 005
26	Optimiz ed	238.7007	- 13.99627	795.48313	1045.652	144.43504	-7.6674e- 007
27	Optimiz ed	241.37825	- 13.64170 5	761.16042	946.5415	107.02982	2.9438e- 006
28	Optimiz ed	243.01135	- 13.33708 5	734.73361	861.63358	73.265729	-3.8897e- 007
29	Optimiz ed	243.39775	- 13.26501	728.47614	852.42572	71.56232	-3.7987e- 007

			5				
30	Optimiz ed	244.96845	- 12.97664	703.35981	815.06127	64.490863	-3.4244e- 007
31	Optimiz ed	247.51435	- 12.51096	662.713	755.55928	53.604823	7.7703e- 007
32	Optimiz ed	249.8947	- 12.08359	625.29322	700.22524	43.26202	2.8719e- 006
33	Optimiz ed	252.12325	11.69211 5	590.78784	650.39372	34.413471	4.9913e- 007
34	Optimiz ed	254.91905	-10.4589	495.31659	655.42047	0	220
35	Optimiz ed	257.73105	8.566972 5	355.48021	519.88848	0	220
36	Optimiz ed	260.00575	6.855657 5	231.87539	373.01006	0	220
37	Optimiz ed	262.2065	-5.2	84.158302	407.86605	0	600

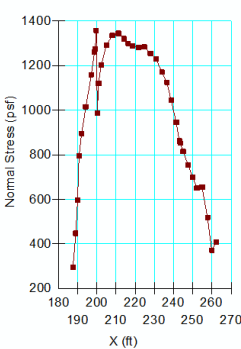
Slices of Slip Surface: 4140

	Slip Surfa ce	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	4140	187.9949	0.009445705	441.61555	124.17195	0	661.02
2	4140	189.6	-1.1017514	430.43008	440.44583	0	666.23
3	4140	191.4859	-2.3848895	446.30964	651.47179	0	672.36
4	4140	193.34365	-3.520704	521.51447	875.2133	0	243.52
5	4140	196.28735	-5.203933	666.09038	1014.3745	0	246.38
6	4140	198.1796	-6.2115935	769.76018	1104.0588	0	248.23
7	4140	198.75	-6.497047	807.36515	1135.7778	0	248.78
8	4140	199.45	-6.834462	863.84926	1173.825	0	249.46
9	4140	200.25	-7.2140935	519.85727	830.08823	0	249.83
10	4140	200.75	-7.443955	534.11971	968.13976	0	249.48
11	4140	202.41665	-8.160332	578.04463	1086.9435	0	248.31
12	4140	205.25	-9.296469	644.83078	1206.6259	0	246.33

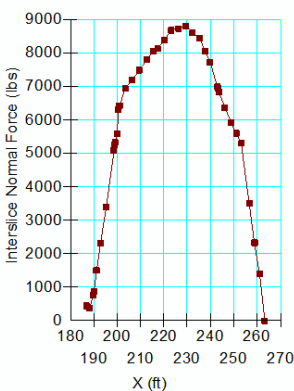
13	4140	208.08335	-10.297692	699.42562	1308.8968	0	244.35
14	4140	210.777	-11.132685	741.53762	1364.4714	0	242.46
15	4140	213.33925	-11.81942	773.6643	1373.5071	346.3194	-7.0027e- 005
16	4140	215.90975	-12.40919	799.20084	1389.2839	340.68459	-6.8883e- 005
17	4140	218.48025	-12.90192	818.53281	1393.1503	331.75555	-6.7078e- 005
18	4140	221.05075	-13.299605	831.8628	1385.1146	319.42007	-6.4584e- 005
19	4140	223.62125	-13.603815	839.28352	1365.1034	303.58227	-6.138e- 005
20	4140	226.19175	-13.81572	840.92564	1332.9958	284.09686	-2.0152e- 005
21	4140	228.76225	-13.936135	836.79877	1288.5822	260.8373	1.5734e- 005
22	4140	231.33275	-13.965515	826.9832	1231.6829	233.65348	-1.2403e- 006
23	4140	233.90325	-13.90397	811.47453	1161.9591	202.35235	-1.0741e- 006
24	4140	236.47375	-13.751265	790.29813	1078.9945	166.67894	-8.8488e- 007
25	4140	239.04425	-13.506825	763.35789	982.38791	126.45704	3.4784e- 006
26	4140	241.6261	-13.16781	730.44175	870.90838	81.098448	2.2308e- 006
27	4140	243.01135	-12.95904	711.13133	809.21841	56.630602	3.7589e- 006
28	4140	244.2004	-12.738985	691.96996	783.05038	52.585304	7.6254e- 007
29	4140	246.4012	-12.293495	654.18839	729.29776	43.364414	2.8782e- 006
30	4140	248.602	-11.77653	611.92752	665.38194	30.861924	-3.5293e- 007
31	4140	251.13185	-11.08543	554.73046	639.68857	0	220
32	4140	253.9908	-10.191641	481.07408	574.19803	0	220
33	4140	256.8498	-9.165788	399.46277	497.60509	0	220
34	4140	259.70875	-8.0017675	309.86019	409.22083	0	220

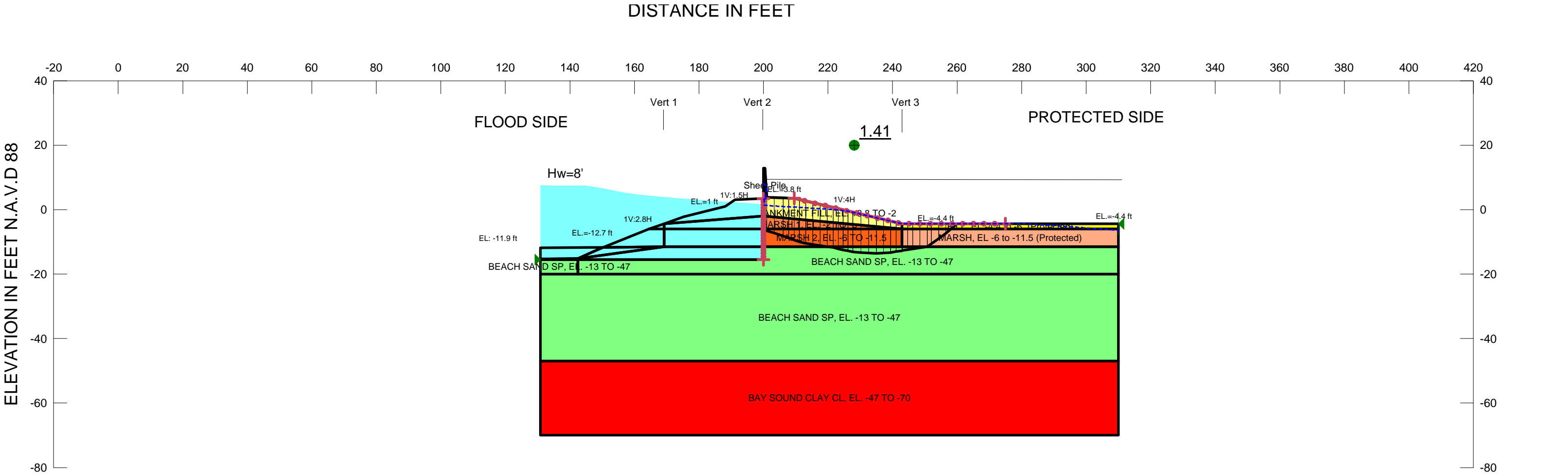
35	4140	262.5677	-6.69219	211.95662	308.30483	0	220
36	4140	265.47595	-5.2	78.75868	305.7501	0	600

Base Normal Stress Vs. X



Interslice Normal Stress Vs. X





Name: EMBANKMENT FILL, EL. +3.8 TO -2 Model: Spatial Mohr-Coulomb Unit Weight: 107 pcf Cohesion Fn: Fill Phi: 0 °
Name: MARSH 1, EL. -2 TO -6 Model: Spatial Mohr-Coulomb Unit Weight: 80 pcf Cohesion Fn: Marsh 1&2 Phi: 0 °
Name: BEACH SAND SP, EL. -13 TO -47 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand
Name: BAY SOUND CLAY CL, EL. -47 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 108 pcf Cohesion Spatial Fn: Clay Cohesion Phi: 0 °
Name: MARSH 2, EL. -6 TO -11.5 Model: Spatial Mohr-Coulomb Weight Fn: Marsh 2 Cohesion Fn: Marsh 1&2 Phi: 0 °
Name: Sheet Pile Model: Undrained (Phi=0) Unit Weight: 0.1 pcf Cohesion: 0.01 psf
Name: FILL, EL -4.4 to -6 (Protected) Model: Undrained (Phi=0) Unit Weight: 107 pcf Cohesion: 600 psf
Name: MARSH, EL -6 to -11.5 (Protected) Model: Spatial Mohr-Coulomb Unit Weight: 80 pcf Cohesion: 220 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=CANAL WATER LEVEL

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

LONDON AVE OUTFALL CANAL, REACH 14,
PROTECTED SIDE STABILITY ANALYSIS,
CASE: GAP Stability (Entry/Exit) OPEN
STA. 96+00 TO 100+28
ORLEANS PARISH, LOUISIANA

GAP Stability (Entry/Exit) OPEN

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File Information

Created By: Liljegren, James
Revision Number: 280
Last Edited By: Middleton, Mark C MVN
Date: 6/18/2013
Time: 11:48:46 AM
File Name: Reach 14 OPEN-SP.gsz
Directory: Y:\Middleton\London Ave Canal\seepage test\14 and 15\
Last Solved Date: 6/18/2013
Last Solved Time: 11:50:20 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

GAP Stability (Entry/Exit) OPEN

Kind: SLOPE/W
Parent: GAP Analysis (seepage) OPEN
Method: Spencer
Settings
 PWP Conditions Source: Parent Analysis
Slip Surface
 Direction of Movement: Left to Right
 Use Passive Mode: Yes
 Slip Surface Option: Entry and Exit
 Critical slip surfaces saved: 1
 Optimize Critical Slip Surface Location: Yes
 Tension Crack
 Tension Crack Option: (none)
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: 10
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. +3.8 TO -2

Model: Spatial Mohr-Coulomb
Unit Weight: 107 pcf
Cohesion Fn: Fill
Phi: 0 °
Phi-B: 0 °

MARSH 1, EL. -2 TO -6

Model: Spatial Mohr-Coulomb
Unit Weight: 80 pcf
Cohesion Fn: Marsh 1&2
Phi: 0 °
Phi-B: 0 °

BEACH SAND SP, EL. -13 TO -47

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

BAY SOUND CLAY CL, EL. -47 TO -70

Model: Spatial Mohr-Coulomb
Unit Weight: 108 pcf
Cohesion Spatial Fn: Clay Cohesion
Phi: 0 °
Phi-B: 0 °

MARSH 2, EL. -6 TO -11.5

Model: Spatial Mohr-Coulomb
Weight Fn: Marsh 2
Cohesion Fn: Marsh 1&2
Phi: 0 °
Phi-B: 0 °

Sheet Pile

Model: Undrained (Phi=0)
Unit Weight: 0.1 pcf
Cohesion: 0.01 psf

FILL, EL. -4.4 to -6 (Protected)

Model: Undrained (Phi=0)
Unit Weight: 107 pcf
Cohesion: 600 psf

MARSH, EL. -6 to -11.5 (Protected)

Model: Spatial Mohr-Coulomb
Unit Weight: 80 pcf
Cohesion: 220 psf
Phi: 0 °
Phi-B: 0 °

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (200, -15.5) ft
Left-Zone Right Coordinate: (200, 3.4) ft
Left-Zone Increment: 20
Right Projection: Range
Right-Zone Left Coordinate: (209.5, 3.5) ft
Right-Zone Right Coordinate: (275, -4.4) ft
Right-Zone Increment: 20
Radius Increments: 20

Slip Surface Limits

Left Coordinate: (130.9, -15.5) ft
Right Coordinate: (310, -4.4) ft

Cohesion Functions

Marsh 1&2

Model: Spline Data Point Function
Function: Cohesion vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 220
Data Points: X (ft), Cohesion (psf)
 Data Point: (169.2, 220)
 Data Point: (200, 250)

Data Point: (242.9, 220)

Fill

Model: Spline Data Point Function
Function: Cohesion vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 600
Data Points: X (ft), Cohesion (psf)
 Data Point: (169.2, 600)
 Data Point: (200, 700)
 Data Point: (242.9, 600)

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: (-100000, 0)
 Data Point: (0, 0)
 Data Point: (100000, 57735)
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 2

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: (169.2, 80)
 Data Point: (200, 109)
 Data Point: (242.9, 80)

Spatial Functions

Clay Cohesion

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (100.5, -47, 630)
Data Point: (100.5, -70, 900)
Data Point: (169.2, -47, 630)
Data Point: (169.2, -70, 900)
Data Point: (200, -47, 705)
Data Point: (200, -70, 935)
Data Point: (242.9, -47, 630)
Data Point: (242.9, -70, 900)
Data Point: (310, -47, 630)
Data Point: (310, -70, 900)

Regions

	Points	Area (ft²)	Material
Region 1	3,28,34	3.76	
Region 2	12,32,13	85.8	MARSH 1, EL. -2 TO -6
Region 3	29,35,14,15,48	180.605	
Region 4	10,11,17,18	4119.3	BAY SOUND CLAY CL. -47 TO -70
Region 5	27,25,19,7,32	107.34186	FILL, EL.-4.4 to -6 (Protected)
Region 6	36,11,10,37,49	4835.7	BEACH SAND SP, EL. -13 TO -47
Region 7	24,23,4,26,5,31,12,28	105.99085	
Region 8	31,30,20,6,27,32,12	191.10273	EMBANKMENT FILL, EL. +3.8 TO -2
Region 9	16,3,34,35	65.37	
Region 10	1,21,22,16,2,29	53.34	
Region 11	12,13,34,28	86.22286	
Region 12	32,7,9,33	369.05	MARSH, EL -6 to -11.5 (Protected)
Region 13	15,14,33,9,36,49,48	1193.75	BEACH SAND SP, EL. -13 TO -47
Region 14	31,44,45,20,30	7.225	Sheet Pile
Region 15	34,13,46,47,14,35	169.4	
Region 16	13,32,33,14,47,46	235.95	MARSH 2, EL. -6 TO -11.5
Region 17	29,2,16,35	32.245	
Region 18	8,48,49,37	52.2	BEACH SAND SP, EL. -13 TO -47
Region 19	1,29,48,8	2.9	

Points

	X (ft)	Y (ft)
Point 1	130.9	-15.3
Point 2	148.1	-12.7
Point 3	164.5	-6
Point 4	191.1	3.1
Point 5	198.9	3.4
Point 6	209.5	3.5
Point 7	310	-6
Point 8	130.9	-15.5
Point 9	310	-11.5
Point 10	130.9	-47
Point 11	310	-47
Point 12	200	-2
Point 13	200	-6
Point 14	200	-11.5
Point 15	200	-15.5
Point 16	150.3	-11.7
Point 17	310	-70
Point 18	130.9	-70
Point 19	310	-4.4
Point 20	201	3.8
Point 21	130.9	-11.9
Point 22	146.3	-11.7
Point 23	188.1	1
Point 24	175.3	-2.2
Point 25	243.1	-4.4
Point 26	198.6	3.38846
Point 27	242.92268	-4.4
Point 28	169.20857	-4.4
Point 29	142.5	-15.2
Point 30	201	3.4
Point 31	200	3.4
Point 32	242.9	-6
Point 33	242.9	-11.5

Point 34	169.2	-6
Point 35	169.2	-11.5
Point 36	310	-20
Point 37	130.9	-20
Point 38	169.2	-47
Point 39	200	-47
Point 40	242.9	-47
Point 41	169.2	-70
Point 42	200	-70
Point 43	242.9	-70
Point 44	200	12.9
Point 45	200.5	12.9
Point 46	200	-6.9
Point 47	200	-10.3
Point 48	142.5	-15.5
Point 49	142.5	-20

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.41	(231.918, 50.593)	23.1711	(200, 12.9)	(259.929, -4.4)
2	5214	1.56	(231.918, 50.593)	64.196	(200, 12.9)	(265.037, -4.4)

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	200.25	-6.4085625	468.57112	-606.52282	0	249.83
2	Optimized	200.75	-6.538011	476.39322	905.89254	0	249.48
3	Optimized	202.16395	-6.9040725	498.25128	983.90176	0	248.49

4	Optimized	204.7171	-7.692135	543.59917	1033.7351	0	246.7
5	Optimized	206.95475	-8.482088	587.75411	1105.8057	0	245.14
6	Optimized	208.6516	-9.088544	620.55203	1161.1904	0	243.95
7	Optimized	210.30535	-9.679616	651.67089	1197.2925	0	242.79
8	Optimized	212.08255	-10.21736	678.37893	1237.2169	0	241.55
9	Optimized	214.1739	-10.639385	696.08969	1258.338	0	240.09
10	Optimized	216.41295	-10.98363	707.91999	1234.5009	0	238.52
11	Optimized	218.652	-11.327875	719.52958	1209.6484	0	236.96
12	Optimized	220.688	-11.640905	729.95613	1189.2186	265.15532	-1.8812e-005
13	Optimized	222.37575	-11.95707	742.10623	1161.236	241.98468	-1.2848e-006
14	Optimized	223.91825	-12.30759	757.02548	1163.6382	234.75799	-1.2463e-006
15	Optimized	225.44545	-12.62468	769.97838	1173.8205	233.15834	-1.238e-006
16	Optimized	226.9573	-12.908335	780.83505	1168.9447	224.07522	-1.1897e-006

17	Optimiz ed	228.9762	13.2203 45	791.16004	1169.4181	218.3874	-1.1594e- 006
18	Optimiz ed	231.43125	13.4252 55	792.82358	1160.2225	212.11785	-1.1262e- 006
19	Optimiz ed	233.8154	13.4947 05	786.32503	1103.8737	183.33682	-9.7326e- 007
20	Optimiz ed	236.10085	13.4738 55	774.6383	1059.2189	164.30268	-8.7217e- 007
21	Optimiz ed	238.28755	-13.3627	757.78543	983.0841	130.07625	-6.9056e- 007
22	Optimiz ed	240.26065	13.1606 65	736.19439	925.06425	109.04406	-5.7887e- 007
23	Optimiz ed	242.03155	12.8658 7	709.72348	832.54002	70.908159	-3.7633e- 007
24	Optimiz ed	243.01135	12.7027 7	695.09307	784.10059	51.388513	7.4535e- 007
25	Optimiz ed	243.8795	12.5582 55	682.15483	765.42315	48.074987	6.9753e- 007
26	Optimiz ed	245.4385	12.2987 4	658.87007	731.88803	42.156941	2.8001e- 006
27	Optimiz ed	247.32145	12.0017 35	631.75654	691.6977	34.607045	-1.2938e- 006
28	Optimiz ed	249.58225	11.6590 85	600.14549	648.11441	27.694871	-1.0354e- 006
29	Optimiz ed	251.3773	11.0419 9	550.65114	765.41991	0	220
30	Optimiz	253.13015	-9.78205	456.71773	666.06176	0	220

	ed						
31	Optimiz ed	255.3604	-8.14555	336.10362	522.43824	0	220
32	Optimiz ed	257.25845	-6.66365	228.61552	418.21909	0	220
33	Optimiz ed	258.98515	-5.2	89.486842	554.71092	0	600

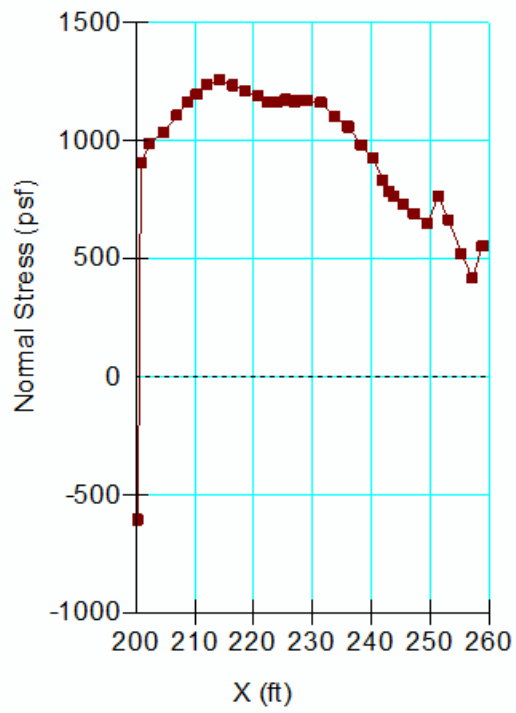
Slices of Slip Surface: 5214

	Slip Surfac e	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	5214	200.25	- 5.246782	451.46935	- 369.56431	0	249.83
2	5214	200.75	-5.52741	412.33512	746.11273	0	249.48
3	5214	201.3076	5.833128	431.13259	812.42953	0	249.09
4	5214	202.6008	- 6.506057	472.23371	881.96324	0	248.18
5	5214	204.572	- 7.476259	530.23603	987.35979	0	246.8
6	5214	206.5432	8.364603 5	581.58797	1082.4218	0	245.42
7	5214	208.5144	9.174746 15	626.47028	1167.676	0	244.05
8	5214	210.52065	-9.92159	666.09488	1223.7912	0	242.64
9	5214	212.56195	- 10.60531	700.8022	1250.6451	0	241.22
10	5214	214.60325	11.21406 5	730.27271	1268.2244	0	239.79
11	5214	216.673	- 11.75651 5	755.10203	1277.7475	301.74948	-2.1415e- 005
12	5214	218.77115	- 12.23257	775.46719	1291.8389	298.12732	-6.0307e- 005
13	5214	220.8693	-	791.237	1296.9751	291.98806	1.7622e-

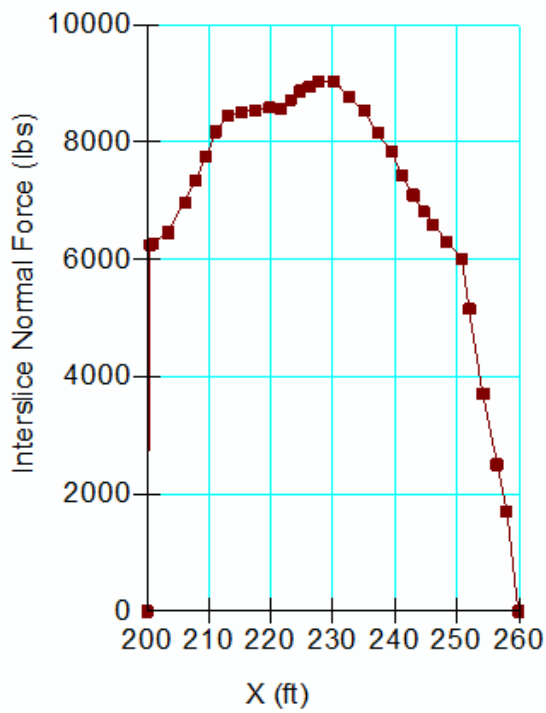
			12.63543 5				005
14	5214	222.9675	-12.9665	802.45792	1293.1452	283.2984	1.7096e- 005
15	5214	225.06565	- 13.22689	809.25135	1280.2444	271.92799	-1.9298e- 005
16	5214	227.1638	- 13.41746 5	811.66725	1258.1151	257.7568	1.5555e- 005
17	5214	229.26195	- 13.53884 5	809.72971	1226.6424	240.70466	-1.2783e- 006
18	5214	231.3601	- 13.59142 5	803.53058	1185.6604	220.62273	-1.1716e- 006
19	5214	233.4583	- 13.57537 5	792.99016	1134.8102	197.34991	-1.048e- 006
20	5214	235.55645	- 13.49064 5	778.1916	1073.8797	170.71558	-9.0656e- 007
21	5214	237.6546	- 13.33696 5	759.04661	1002.4257	140.51499	-7.4621e- 007
22	5214	239.75275	- 13.11383	735.58421	920.07156	106.51383	2.9313e- 006
23	5214	241.86225	- 12.81853	707.53168	825.70983	68.230185	1.8774e- 006
24	5214	243.01135	- 12.63669	690.94769	773.21263	47.495683	3.1531e- 006
25	5214	244.37825	- 12.36817 5	668.00813	741.29755	42.313667	6.1411e- 007
26	5214	246.9348	- 11.80760 5	621.40902	672.90155	29.729222	-1.113e- 006
27	5214	249.38045	- 11.16995	568.35441	660.18135	0	220
28	5214	251.7152	-	509.27865	610.60473	0	220

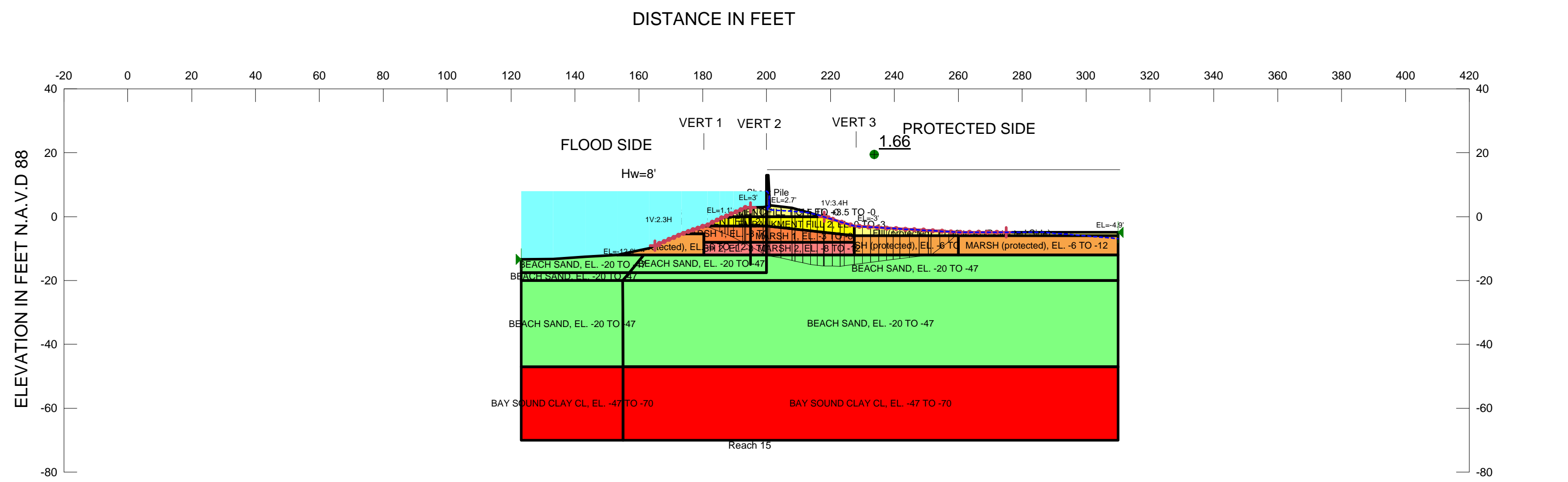
			10.46137 5				
29	5214	254.05	- 9.654016	444.13068	552.64056	0	220
30	5214	256.3848	- 8.743834	372.7425	485.88976	0	220
31	5214	258.7196	- 7.726001	295.02683	409.84165	0	220
32	5214	261.0544	- 6.594758	210.73252	323.87831	0	220
33	5214	263.62935	-5.2	81.806115	368.95982	0	600

Base Normal Stress Vs. X



Interslice Normal Stress
Vs. X





Name: EMBANKMENT FILL 1 CH, EL. +3.5 TO -0 Model: Undrained (Phi=0) Unit Weight: 113 pcf Cohesion: 1000 psf
Name: MARSH 1, EL. -3 TO -8 Model: Spatial Mohr-Coulomb Unit Weight: 87 pcf Cohesion Fn: Marsh 1 Phi: 0 °
Name: BEACH SAND, EL. -20 TO -47 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Beach Sand
Name: BAY SOUND CLAY CL, EL. -47 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 104 pcf Cohesion Spatial Fn: Bay Sound Phi: 0 °
Name: MARSH 2, EL. -8 TO -12 Model: Spatial Mohr-Coulomb Weight Fn: Marsh 2 Cohesion Fn: Marsh 2 Phi: 0 °
Name: Fill (protected) ,EL -3 to -6 (Protected Side) Model: Undrained (Phi=0) Unit Weight: 100 pcf Cohesion: 600 psf
Name: Sheet Pile Model: Undrained (Phi=0) Unit Weight: 0.1 pcf Cohesion: 0.01 psf
Name: EMBANKMENT FILL 2, EL. 0 TO -3 Model: Undrained (Phi=0) Unit Weight: 100 pcf Cohesion: 500 psf
Name: MARSH (protected), EL. -6 TO -12 Model: Undrained (Phi=0) Unit Weight: 87 pcf Cohesion: 250 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=CANAL WATER LEVEL

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

LONDON AVE OUTFALL CANAL, REACH 15,
PROTECTED SIDE STABILITY ANALYSIS,
CASE: Global Stability (Entry/Exit)
STA. 100+28 TO 104+00
ORLEANS PARISH, LOUISIANA

Global Stability (Entry/Exit)

Report generated using GeoStudio 2007, version 7.19. Copyright © 1991-2012 GEO-SLOPE International Ltd.

File Information

Created By: Liljegren, James
Revision Number: 202
Last Edited By: Middleton, Mark C MVN
Date: 6/27/2013
Time: 9:01:54 AM
File Name: Reach 15 OPEN-SP.gsz
Directory: Y:\Middleton\London Ave Canal\seepage test\14 and 15\
Last Solved Date: 6/27/2013
Last Solved Time: 9:04:31 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

Global Stability (Entry/Exit)

Kind: [SLOPE/W](#)
Parent: [Gap Stability \(Seepage\)](#)
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: [\(none\)](#)
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 1 CH, EL. +3.5 TO -0

Model: [Undrained \(Phi=0\)](#)
Unit Weight: 113 pcf
Cohesion: 1000 psf

MARSH 1, EL. -3 TO -8

Model: [Spatial Mohr-Coulomb](#)
Unit Weight: 87 pcf
Cohesion Fn: [Marsh 1](#)
Phi: 0 °
Phi-B: 0 °

BEACH SAND, EL. -20 TO -47

Model: [Shear/Normal Fn.](#)
Unit Weight: 122 pcf
Strength Function: [Beach Sand](#)
Phi-B: 0 °

BAY SOUND CLAY CL, EL. -47 TO -70

Model: [Spatial Mohr-Coulomb](#)
Unit Weight: 104 pcf
Cohesion Spatial Fn: [Bay Sound](#)
Phi: 0 °
Phi-B: 0 °

MARSH 2, EL. -8 TO -12

Model: [Spatial Mohr-Coulomb](#)
Weight Fn: [Marsh 2](#)
Cohesion Fn: [Marsh 2](#)
Phi: 0 °
Phi-B: 0 °

FILL (protected) ,EL -3 to -6 (Protected Side)

Model: [Undrained \(Phi=0\)](#)
Unit Weight: 100 pcf
Cohesion: 600 psf

Sheet Pile

Model: [Undrained \(Phi=0\)](#)
Unit Weight: 0.1 pcf
Cohesion: 0.01 psf

EMBANKMENT FILL 2, EL. 0 TO -3

Model: [Undrained \(Phi=0\)](#)
Unit Weight: 100 pcf
Cohesion: 500 psf

MARSH (protected), EL. -6 TO -12

Model: [Undrained \(Phi=0\)](#)
Unit Weight: 87 pcf
Cohesion: 250 psf

Slip Surface Entry and Exit

Left Projection: [Range](#)
Left-Zone Left Coordinate: (165, -9.10588) ft
Left-Zone Right Coordinate: (195, 2.9) ft
Left-Zone Increment: 20
Right Projection: [Range](#)
Right-Zone Left Coordinate: (218, -0.06186) ft
Right-Zone Right Coordinate: (275, -4.9) ft
Right-Zone Increment: 20
Radius Increments: 20

Slip Surface Limits

Left Coordinate: (123.2, -13.4) ft
Right Coordinate: (310, -4.9) ft

Cohesion Functions

Marsh 1

Model: [Spline Data Point Function](#)
Function: [Cohesion vs. X](#)
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 250

Data Points: X (ft), Cohesion (psf)
Data Point: (180.3, 250)
Data Point: (200, 400)
Data Point: (227.5, 250)

Marsh 2

Model: [Spline Data Point Function](#)
Function: [Cohesion vs. X](#)
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 250
Data Points: X (ft), Cohesion (psf)
Data Point: (180.3, 250)
Data Point: (200, 400)
Data Point: (227.5, 250)

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: (-100000, 0)
Data Point: (0, 0)
Data Point: (100000, 57735)
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 2

Model: [Spline Data Point Function](#)
Function: [Unit Weight vs. X](#)
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 88
Data Points: X (ft), Unit Weight (pcf)

Data Point: (180.3, 88)
Data Point: (200, 109)
Data Point: (227.5, 88)

Spatial Functions

Bay Sound

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (0, -47, 640)
Data Point: (0, -70, 850)
Data Point: (180.3, -47, 640)
Data Point: (180.3, -70, 850)
Data Point: (400, -47, 640)
Data Point: (400, -70, 850)
Data Point: (200, -47, 680)
Data Point: (200, -70, 890)
Data Point: (227.5, -47, 640)
Data Point: (227.5, -70, 850)

Regions

	Material	Points	Area (ft²)
Region 1	EMBANKMENT FILL 1 CH, EL. +3.5 TO -0	30,36,50,3,41,4,28,20	28.44
Region 2	MARSH 1, EL. -3 TO -8	47,46,45,21,11,12,22,31	106.78
Region 3	Fill (protected) ,EL -3 to -6 (Protected Side)	15,37,6,7,58,16	121.625
Region 4	MARSH 2, EL. -8 TO -12	31,22,12,13,23,48	78.8
Region 5	BEACH SAND, EL. -20 TO -47	27,24,13,17,59,8,34,33,32	989.9375
Region 6	MARSH (protected), EL. -6 TO -12	16,58,59,17,44	195
Region 7	BEACH SAND, EL. -20 TO -47	13,24,27,57,48,23	223.7125
Region 8	EMBANKMENT FILL 2, EL. 0 TO -3	21,11,28,20,30,51,35,45	48.875
Region 9	EMBANKMENT FILL 1 CH, EL. +3.5 TO -0	28,4,26,38,5,29	38.03
Region 10	EMBANKMENT FILL 2, EL. 0 TO -3	11,28,29,15,16	109.2
Region 11	BEACH SAND, EL. -20 TO -47	9,32,33,34,10,18,14	4183.65
Region 12	BAY SOUND CLAY CL, EL. -47 TO -70	9,14,18,10,40,39	3562.7
Region 13	MARSH 2, EL. -8 TO -12	12,44,17,13	110
Region 14	Sheet Pile	4,42,43,38,26	7.45
Region 15	MARSH 1, EL. -3 TO -8	12,11,16,44	96.25
Region 16	MARSH (protected), EL. -6 TO -12	49,2,46,47,31,48,57	100.41

Region 17	BAY SOUND CLAY CL, EL. -47 TO -70	55,9,39,56	733.7
Region 18	BEACH SAND, EL. -20 TO -47	54,32,9,55	859.95
Region 19	BEACH SAND, EL. -20 TO -47	53,27,32,54	82.0625
Region 20	BEACH SAND, EL. -20 TO -47	52,1,19,49,57,27,53	172.6875
Region 21	MARSH (protected), EL. -6 TO -12	58,7,8,59	300

Points

	X (ft)	Y (ft)
Point 1	133.2	-13.3
Point 2	163.2	-9.9
Point 3	195	2.9
Point 4	200	3.1
Point 5	208	2.7
Point 6	310	-4.9
Point 7	310	-6
Point 8	310	-12
Point 9	155.1	-47
Point 10	310	-47
Point 11	200	-3
Point 12	200	-8
Point 13	200	-12
Point 14	200	-47
Point 15	227.5	-3
Point 16	227.5	-6
Point 17	227.5	-12
Point 18	231.5	-47
Point 19	143.2	-12.6
Point 20	195	0
Point 21	195	-3
Point 22	195	-8
Point 23	195	-12
Point 24	200	-17.5
Point 25	195	-15
Point 26	201	3.1
Point 27	157.05	-17.5

Point 28	200	0
Point 29	217.8	0
Point 30	187	0
Point 31	180.3	-8
Point 32	155	-20
Point 33	200	-20
Point 34	310	-20
Point 35	181.5	-2.6
Point 36	189.6	1.1
Point 37	260	-4.9
Point 38	201	3.5
Point 39	155.1	-70
Point 40	310	-70
Point 41	198.9	3
Point 42	200	12.9
Point 43	200.5	12.9
Point 44	227.5	-8
Point 45	180.3	-3
Point 46	173.4	-5.4
Point 47	180.3	-5.4
Point 48	180.3	-12
Point 49	153.2	-12
Point 50	193.5	2.9
Point 51	185.3	-0.7
Point 52	123.2	-13.4
Point 53	123.2	-17.5
Point 54	123.2	-20
Point 55	123.2	-47
Point 56	123.2	-70
Point 57	161.6	-12
Point 58	260	-6
Point 59	260	-12

Critical Slip Surfaces

	Slip	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
--	------	-----	-------------	-------------	------------	-----------

	Surface					
1	Optimized	1.66	(222.812, -53.74)	31.15991	(180.699, -2.86691)	(260.404, -4.9)
2	5173	1.76	(222.812, 53.74)	69.774	(181.589, -2.55536)	(260.625, -4.9)

Slices of Slip Surface: Optimized

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimiz ed	180.8676	- 2.93345 25	667.18693	552.90437	0	500
2	Optimiz ed	181.26795	3.09173 8	650.96704	612.51219	0	257.37
3	Optimiz ed	183.4	- 3.93465 9	638.19545	709.21482	0	273.6
4	Optimiz ed	186.15	- 5.02189 75	656.33101	852.22377	0	294.54
5	Optimiz ed	187.42075	- 5.52430 65	671.29142	914.66302	0	304.22
6	Optimiz ed	188.72075	- 6.12488 25	693.13751	963.83539	0	314.12
7	Optimiz ed	191.0588	- 7.27955 25	743.26845	1106.8818	0	331.92
8	Optimiz ed	192.8306	- 8.15458 5	785.44222	1220.0421	0	345.41
9	Optimiz ed	193.3218	- 8.40964 55	798.22903	1232.8823	0	349.15
10	Optimiz ed	194.25	-	824.89996	1301.083	0	356.22

	ed		8.933021				
11	Optimiz ed	196.95	10.455461	1022.9892	1451.7772	0	376.78
12	Optimiz ed	199.2946	-11.7775	1139.3989	1590.0592	0	394.63
13	Optimiz ed	199.8393	12.084645	1203.0348	1660.922	264.36133	1.5958e-005
14	Optimiz ed	199.9947	12.170135	1230.808	1803.6046	330.70427	-2.3464e-005
15	Optimiz ed	200.25	12.21091	960.1501	1358.185	229.80556	-1.2203e-006
16	Optimiz ed	200.75	12.29077	910.79566	1518.9671	351.12794	-7.1018e-005
17	Optimiz ed	202.715	12.604625	927.2449	1574.8884	373.91714	-7.5629e-005
18	Optimiz ed	206.215	13.31312	957.85847	1578.7763	358.48709	-7.2515e-005
19	Optimiz ed	208.4725	13.86273	981.20146	1603.6863	359.3918	-7.2694e-005
20	Optimiz ed	210.1618	14.221415	995.03109	1608.9324	354.43611	-2.5152e-005
21	Optimiz ed	212.59535	-14.7087	1012.8002	1590.2366	333.38303	-2.3656e-005
22	Optimiz ed	214.80905	15.069285	1023.5945	1592.2747	328.32767	-6.6401e-005
23	Optimiz ed	216.803	15.303175	1027.5295	1556.0628	305.14889	-2.1652e-005

24	Optimiz ed	217.94705	15.43737	1029.764	1535.3422	291.89572	-2.0711e-005
25	Optimiz ed	219.32845	-15.4801	1024.9854	1528.1836	290.52161	1.7527e-005
26	Optimiz ed	221.79715	15.53106	1014.8606	1452.2482	252.52583	-1.7917e-005
27	Optimiz ed	223.6962	15.46482	1000.4352	1429.7892	247.88767	-1.3159e-006
28	Optimiz ed	225.93045	15.17063	969.94406	1309.5193	196.05383	-1.0406e-006
29	Optimiz ed	228.76075	14.805525	931.80736	1194.6722	151.7651	-8.0558e-007
30	Optimiz ed	231.28225	14.480255	897.82333	1137.5602	138.41213	-7.348e-007
31	Optimiz ed	233.8037	14.154985	863.79997	1080.4875	125.10458	-6.6402e-007
32	Optimiz ed	236.32515	13.829715	829.81595	1023.4148	111.77433	-5.9323e-007
33	Optimiz ed	238.6183	13.54226	799.43611	971.13193	99.128626	-5.261e-007
34	Optimiz ed	240.6831	13.29262	772.65522	926.60929	88.885427	2.4449e-006
35	Optimiz ed	243.209	12.98845	739.96218	872.22531	76.362153	2.1002e-006
36	Optimiz ed	246.19595	12.629755	701.40344	808.2045	61.661623	-3.2734e-007
37	Optimiz ed	249.18285	-	662.81146	744.15046	46.961093	6.8112e-

	ed		12.27106				007
38	Optimiz ed	251.0793	12.049235	638.6754	702.71198	36.971535	2.4541e-006
39	Optimiz ed	252.8679	10.978427	554.65115	772.96481	0	250
40	Optimiz ed	255.63455	8.9251425	395.70829	561.5098	0	250
41	Optimiz ed	258.0886	6.950095	243.23073	389.20266	0	250
42	Optimiz ed	259.5808	5.6288335	112.07509	477.27019	0	600
43	Optimiz ed	260.20195	5.0788335	26.797487	413.86159	0	600

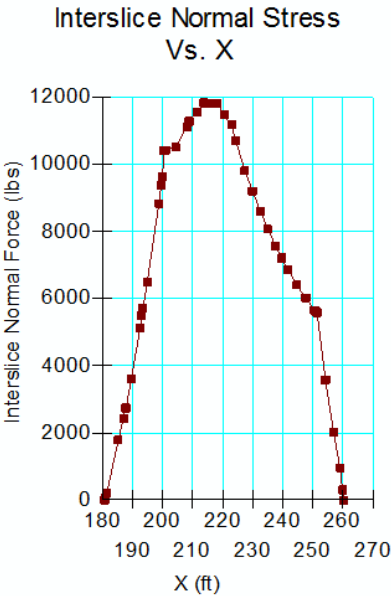
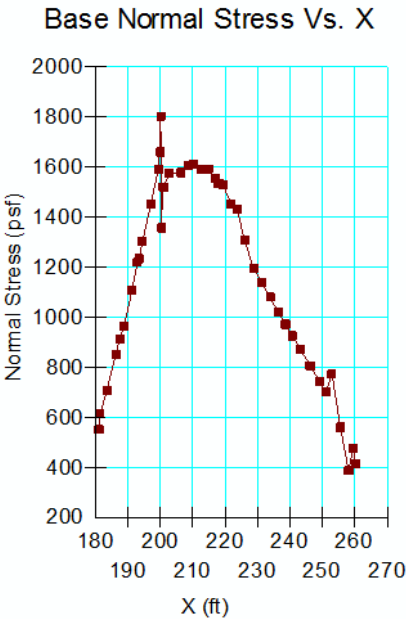
Slices of Slip Surface: 5173

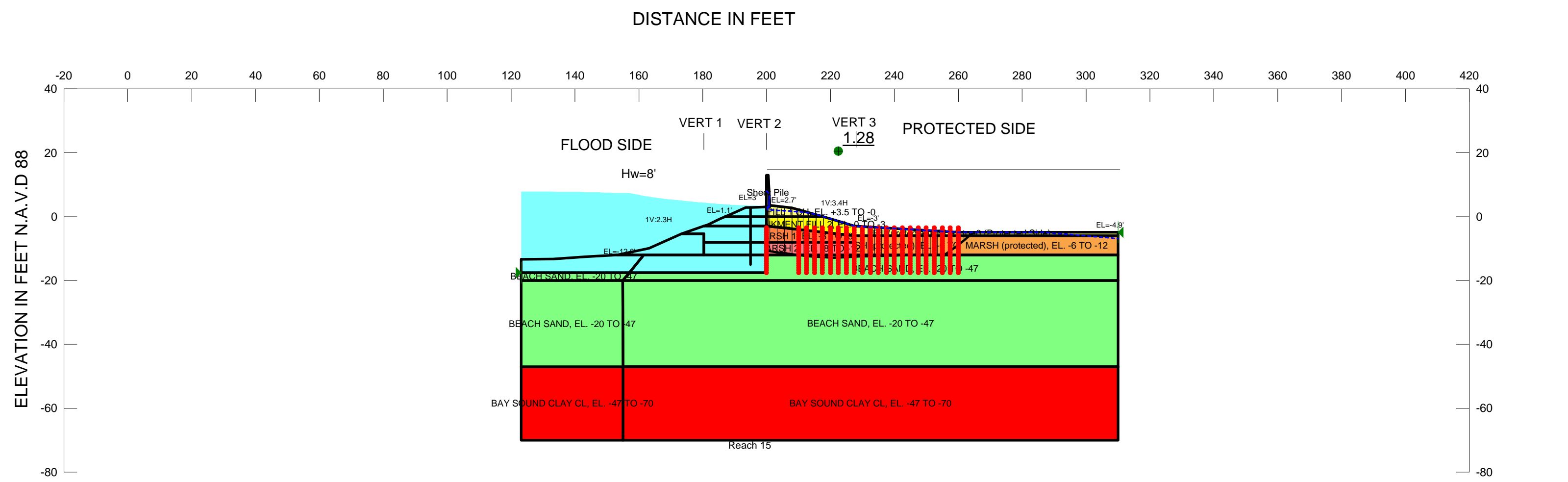
	Slip Surfac e	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	5173	181.8964	2.7776805	635.23171	441.96913	0	500
2	5173	183.75175	4.0465375	638.00709	665.43128	0	276.28
3	5173	186.15	5.6180715	687.64639	848.99806	0	294.54
4	5173	188.3	6.883143	735.64508	1000.9038	0	310.91
5	5173	189.9529	7.811609	775.86477	1118.3382	0	323.5
6	5173	191.9029	-	819.80763	1263.3474	0	338.35

			8.7894715				
7	5173	194.25	9.9154665	876.2358	1439.5302	0	356.22
8	5173	196.95	-11.0306	1029.1956	1573.1072	0	376.78
9	5173	199.1648	11.904605	1130.1244	1684.573	0	393.64
10	5173	199.7148	12.100045	1174.1464	1724.7395	317.88508	-6.4273e-005
11	5173	200.25	12.28552	962.87417	1320.1882	206.29533	-1.0949e-006
12	5173	200.75	12.45427	921.08793	1481.4631	323.53274	-6.5405e-005
13	5173	202.16665	12.899035	947.00761	1564.5091	356.51467	-7.2071e-005
14	5173	204.5	13.57784	981.79496	1624.277	370.93719	-7.4987e-005
15	5173	206.83335	14.16971	1008.5301	1674.4311	384.45812	-7.7719e-005
16	5173	209.225	14.687455	1029.0128	1694.6703	384.31755	-7.7686e-005
17	5173	211.675	15.12879	1043.9478	1683.6373	369.32492	-7.4656e-005
18	5173	214.125	15.480625	1052.9649	1660.9307	351.0092	-7.0952e-005
19	5173	216.575	15.74432	1056.3246	1626.4	329.13319	-6.6533e-005
20	5173	219.0125	15.92041	1054.1859	1580.4964	303.86556	-6.1424e-005
21	5173	221.4375	16.010435	1046.7245	1523.1268	275.051	-1.9507e-005
22	5173	223.8625	-	1033.9446	1453.5671	242.26917	-1.2858e-

			16.01607				006
23	5173	226.2875	- 15.93733	1015.8916	1371.4907	205.30525	-1.0896e- 006
24	5173	228.8353	- 15.76112 5	991.07041	1305.1375	181.32675	-9.6231e- 007
25	5173	231.50595	- 15.47768 5	958.90564	1263.073	175.61113	-1.2455e- 005
26	5173	234.1766	- 15.08949	920.16913	1206.8561	165.5188	-8.7837e- 007
27	5173	236.8472	- 14.59475 5	874.78827	1135.6476	150.60718	-7.9927e- 007
28	5173	239.5178	- 13.99114 5	822.63833	1048.6203	130.47075	-6.9239e- 007
29	5173	242.18845	- 13.27570 5	763.44912	944.56325	104.56629	2.8751e- 006
30	5173	244.8591	- 12.44481	697.07578	822.19559	72.237955	1.9855e- 006
31	5173	247.46115	- 11.52154	622.02529	763.44503	0	250
32	5173	249.9947	- 10.50710 9	537.69636	666.12262	0	250
33	5173	252.5283	- 9.374700 5	444.66124	557.50493	0	250
34	5173	255.06185	- 8.117821 5	342.40045	436.78974	0	250
35	5173	257.5954	- -6.72869	230.38025	303.04637	0	250
36	5173	259.4311	- 5.649211 5	115.96183	347.90792	0	600
37	5173	260.31255	- 5.099211	29.766454	293.72553	0	600

			5				
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Name: EMBANKMENT FILL 1 CH, EL. +3.5 TO -0 Model: Undrained (Phi=0) Unit Weight: 113 pcf Cohesion: 1000 psf
Name: MARSH 1, EL. -3 TO -8 Model: Spatial Mohr-Coulomb Unit Weight: 87 pcf Cohesion Fn: Marsh 1 Phi: 0 °
Name: BEACH SAND, EL. -20 TO -47 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Beach Sand
Name: BAY SOUND CLAY CL, EL. -47 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 104 pcf Cohesion Spatial Fn: Bay Sound Phi: 0 °
Name: MARSH 2, EL. -8 TO -12 Model: Spatial Mohr-Coulomb Weight Fn: Marsh 2 Cohesion Fn: Marsh 2 Phi: 0 °
Name: Flll (protected) ,EL -3 to -6 (Protected Side) Model: Undrained (Phi=0) Unit Weight: 100 pcf Cohesion: 600 psf
Name: Sheet Pile Model: Undrained (Phi=0) Unit Weight: 0.1 pcf Cohesion: 0.01 psf
Name: EMBANKMENT FILL 2, EL. 0 TO -3 Model: Undrained (Phi=0) Unit Weight: 100 pcf Cohesion: 500 psf
Name: MARSH (protected), EL. -6 TO -12 Model: Undrained (Phi=0) Unit Weight: 87 pcf Cohesion: 250 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 HE VALUES INDICATED FOR THESE LOCATIONS.

Hw=CANAL WATER LEVEL

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

LONDON AVE OUTFALL CANAL, REACH 15,
PROTECTED SIDE STABILITY ANALYSIS,
CASE: GAP Stability (Block)
STA. 100+28 TO 104+00
ORLEANS PARISH, LOUISIANA

GAP Stability (Block)

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File Information

Created By: Liljegren, James
Revision Number: 198
Last Edited By: Middleton, Mark C MVN
Date: 6/19/2013
Time: 1:48:29 PM
File Name: Reach 15 OPEN-SP.gsz
Directory: Y:\Middleton\London Ave Canal\seepage test\14 and 15\
Last Solved Date: 6/19/2013
Last Solved Time: 1:49:24 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

GAP Stability (Block)

Kind: SLOPE/W
Parent: Gap Stability (Seepage)
Method: Spencer
Settings
 PWP Conditions Source: Parent Analysis
Slip Surface
 Direction of movement: Left to Right
 Use Passive Mode: Yes
 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

FILL (protected) ,EL -3 to -6 (Protected Side)

Model: Undrained (Phi=0)
Unit Weight: 100 pcf
Cohesion: 600 psf

Sheet Pile

Model: Undrained (Phi=0)
Unit Weight: 0.1 pcf
Cohesion: 0.01 psf

EMBANKMENT FILL 2, EL. 0 TO -3

Model: Undrained (Phi=0)
Unit Weight: 100 pcf
Cohesion: 500 psf

MARSH (protected), EL. -6 TO -12

Model: Undrained (Phi=0)
Unit Weight: 87 pcf
Cohesion: 250 psf

Slip Surface Limits

Left Coordinate: (123.2, -17.5) ft
Right Coordinate: (310, -4.9) ft

Slip Surface Block

Left Grid
 Upper Left: (200, -3.5) ft
 Lower Left: (200, -17.5) ft
 Lower Right: (200, -17.5) ft
 X Increments: 0
 Y Increments: 20
 Starting Angle: 135 °
 Ending Angle: 135 °
 Angle Increments: 0
Right Grid
 Upper Left: (210, -3.5) ft
 Lower Left: (210, -17.5) ft
 Lower Right: (260, -17.5) ft
 X Increments: 20
 Y Increments: 20
 Starting Angle: 30 °
 Ending Angle: 45 °
 Angle Increments: 3

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: 8
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

EMBANKMENT FILL 1 CH, EL. +3.5 TO -0

Model: Undrained (Phi=0)
Unit Weight: 113 pcf
Cohesion: 1000 psf

MARSH 1, EL. -3 TO -8

Model: Spatial Mohr-Coulomb
Unit Weight: 87 pcf
Cohesion Fn: Marsh 1
Phi: 0 °
Phi-B: 0 °

BEACH SAND, EL. -20 TO -47

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

BAY SOUND CLAY CL, EL. -47 TO -70

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

MARSH 2, EL. -8 TO -12

Model: Spatial Mohr-Coulomb
Weight Fn: Marsh 2
Cohesion Fn: Marsh 2
Phi: 0 °
Phi-B: 0 °

Cohesion Functions

Marsh 1

Model: Spline Data Point Function
Function: Cohesion vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 250
Data Points: X (ft), Cohesion (psf)
 Data Point: (180.3, 250)
 Data Point: (200, 400)
 Data Point: (227.5, 250)

Marsh 2

Model: Spline Data Point Function
Function: Cohesion vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 250
Data Points: X (ft), Cohesion (psf)
 Data Point: (180.3, 250)
 Data Point: (200, 400)
 Data Point: (227.5, 250)

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: (-100000, 0)
 Data Point: (0, 0)
 Data Point: (100000, 57735)
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 2
Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 88
Data Points: X (ft), Unit Weight (pcf)
Data Point: (180.3, 88)
Data Point: (200, 109)
Data Point: (227.5, 88)

Spatial Functions

Bay Sound
Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (0, -47, 640)
Data Point: (0, -70, 850)
Data Point: (180.3, -47, 640)
Data Point: (180.3, -70, 850)
Data Point: (400, -47, 640)
Data Point: (400, -70, 850)
Data Point: (200, -47, 680)
Data Point: (200, -70, 890)
Data Point: (227.5, -47, 640)
Data Point: (227.5, -70, 850)

Regions

	Points	Area (ft²)	Material
Region 1	30,36,50,3,41,4,28,20	28.44	
Region 2	47,46,45,21,11,12,22,31	106.78	
Region 3	15,37,6,7,58,16	121.625	Fill (protected) ,EL -3 to -6 (Protected Side)
Region 4	31,22,12,13,23,48	78.8	
Region 5	27,24,13,17,59,8,34,33,32	989.9375	BEACH SAND, EL. -20 TO -47
Region 6	16,58,59,17,44	195	MARSH (protected), EL. -6 TO -12
Region 7	13,24,27,57,48,23	223.7125	
Region 8	21,11,28,20,30,51,35,45	48.875	
Region 9	28,4,26,38,5,29	38.03	EMBANKMENT FILL 1 CH, EL. +3.5 TO -0

Region 10	11,28,29,15,16	109.2	EMBANKMENT FILL 2, EL. 0 TO -3
Region 11	9,32,33,34,10,18,14	4183.65	BEACH SAND, EL. -20 TO -47
Region 12	9,14,18,10,40,39	3562.7	BAY SOUND CLAY CL, EL. -47 TO -70
Region 13	12,44,17,13	110	MARSH 2, EL. -8 TO -12
Region 14	4,42,43,38,26	7.45	Sheet Pile
Region 15	12,11,16,44	96.25	MARSH 1, EL. -3 TO -8
Region 16	49,2,46,47,31,48,57	100.41	
Region 17	55,9,39,56	733.7	BAY SOUND CLAY CL, EL. -47 TO -70
Region 18	54,32,9,55	859.95	BEACH SAND, EL. -20 TO -47
Region 19	53,27,32,54	82.0625	BEACH SAND, EL. -20 TO -47
Region 20	52,1,19,49,57,27,53	172.6875	
Region 21	58,7,8,59	300	MARSH (protected), EL. -6 TO -12

Points

	X (ft)	Y (ft)
Point 1	133.2	-13.3
Point 2	163.2	-9.9
Point 3	195	2.9
Point 4	200	3.1
Point 5	208	2.7
Point 6	310	-4.9
Point 7	310	-6
Point 8	310	-12
Point 9	155.1	-47
Point 10	310	-47
Point 11	200	-3
Point 12	200	-8
Point 13	200	-12
Point 14	200	-47
Point 15	227.5	-3
Point 16	227.5	-6
Point 17	227.5	-12
Point 18	231.5	-47
Point 19	143.2	-12.6
Point 20	195	0

Point 21	195	-3
Point 22	195	-8
Point 23	195	-12
Point 24	200	-17.5
Point 25	195	-15
Point 26	201	3.1
Point 27	157.05	-17.5
Point 28	200	0
Point 29	217.8	0
Point 30	187	0
Point 31	180.3	-8
Point 32	155	-20
Point 33	200	-20
Point 34	310	-20
Point 35	181.5	-2.6
Point 36	189.6	1.1
Point 37	260	-4.9
Point 38	201	3.5
Point 39	155.1	-70
Point 40	310	-70
Point 41	198.9	3
Point 42	200	12.9
Point 43	200.5	12.9
Point 44	227.5	-8
Point 45	180.3	-3
Point 46	173.4	-5.4
Point 47	180.3	-5.4
Point 48	180.3	-12
Point 49	153.2	-12
Point 50	193.5	2.9
Point 51	185.3	-0.7
Point 52	123.2	-13.4
Point 53	123.2	-17.5
Point 54	123.2	-20
Point 55	123.2	-47
Point 56	123.2	-70

Point 57	161.6	-12
Point 58	260	-6
Point 59	260	-12

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.28	(232.325, -2.975)	24.90874	(200, 12.9)	(264.796, -4.9)
2	1166	1.38	(232.325, -2.975)	25.914	(200, 12.9)	(265.997, -4.9)

Slices of Slip Surface: Optimized

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimiz ed	200.25	-10.707975	866.76445	1377.5272	0	398.64
2	Optimiz ed	200.75	-10.77536	810.81028	1361.8291	0	395.91
3	Optimiz ed	202.16665	-10.966275	821.64365	1410.152	0	388.18
4	Optimiz ed	204.5	-11.28073	835.57486	1411.2988	0	375.45
5	Optimiz ed	206.83335	-11.595185	846.40552	1411.3413	0	362.73
6	Optimiz ed	208.9186	-11.876205	854.56899	1394.0015	0	351.35
7	Optimiz ed	210.65845	-12.11068	860.56318	1364.0617	290.69502	-2.0622e-005
8	Optimiz ed	212.301	-12.33204	865.87269	1337.8158	272.47651	-1.9328e-005

9	Optimiz ed	214.29175	- 12.5151 35	866.80066	1322.5623	263.13412	1.5874e- 005
10	Optimiz ed	216.6306	- 12.6599 7	863.38672	1262.4342	230.39019	-1.6344e- 005
11	Optimiz ed	219.1783	- 12.8177 4	859.54698	1197.1744	194.9293	-1.3829e- 005
12	Optimiz ed	221.71385	- 12.8528 95	848.04257	1147.9179	173.13313	-1.2284e- 005
13	Optimiz ed	224.0283	- 12.7525 1	829.22212	1053.9884	129.76885	-6.8898e- 007
14	Optimiz ed	226.34275	- 12.6521 25	810.40167	960.05878	86.404572	2.3774e- 006
15	Optimiz ed	228.57395	- 12.5553 45	792.25098	896.43945	60.153241	6.6791e- 007
16	Optimiz ed	230.7219	- 12.4621 8	774.7622	871.83423	56.04456	8.129e-007
17	Optimiz ed	232.83225	- 12.3876 55	758.65977	847.20464	51.121404	3.3937e- 006
18	Optimiz ed	234.905	- 12.3317 65	743.95052	827.86559	48.44839	7.0286e- 007
19	Optimiz ed	236.9778	- 12.2758 7	729.19304	808.52654	45.803219	6.6439e- 007
20	Optimiz ed	239.05055	- 12.2199 75	714.48379	789.23572	43.158048	2.8654e- 006
21	Optimiz ed	241.1233	- 12.1640 85	699.77454	769.89667	40.485034	2.6891e- 006

22	Optimiz ed	243.28605	- 12.1251 1	685.58731	749.86251	37.109302	2.464e-006
23	Optimiz ed	245.53875	- 12.1030 5	672.04868	733.83809	35.674136	5.1764e- 007
24	Optimiz ed	247.79145	- 12.0809 9	658.46566	717.81368	34.264598	-1.2815e- 006
25	Optimiz ed	250.04415	- 12.0589 3	644.88264	701.78927	32.855059	-1.2284e- 006
26	Optimiz ed	252.29685	- 12.0368 7	631.29962	685.76486	31.445521	-1.1751e- 006
27	Optimiz ed	254.5496	- 12.0148 1	617.76099	669.69606	29.984726	-1.1217e- 006
28	Optimiz ed	256.7583	- 11.2244 3	550.5641	825.20883	0	250
29	Optimiz ed	258.9203	- 9.66761 55	429.80454	662.12523	0	250
30	Optimiz ed	260.0059	- 8.88589 55	369.26298	580.28217	0	250
31	Optimiz ed	260.87745	- 8.16123	314.10484	543.60542	0	250
32	Optimiz ed	262.6087	- 6.72041	205.01525	403.33089	0	250
33	Optimiz ed	264.13515	- -5.45	74.32043	565.80644	0	600

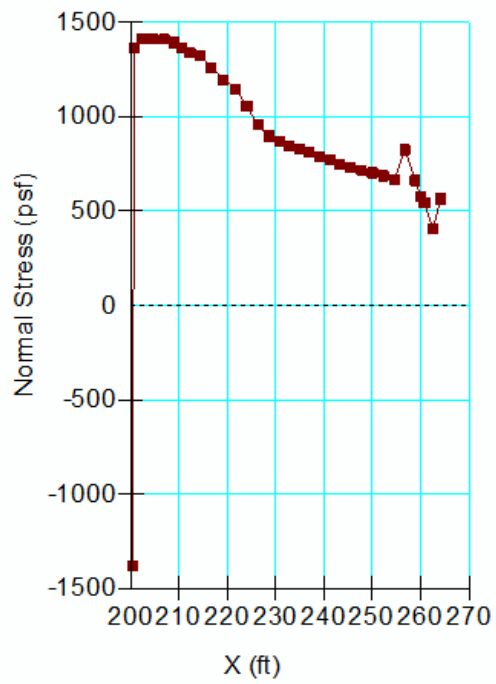
Slices of Slip Surface: **1166**

	Slip Surfac e	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	1166	200.25	-12.6	974.34	-1843.48	0	0

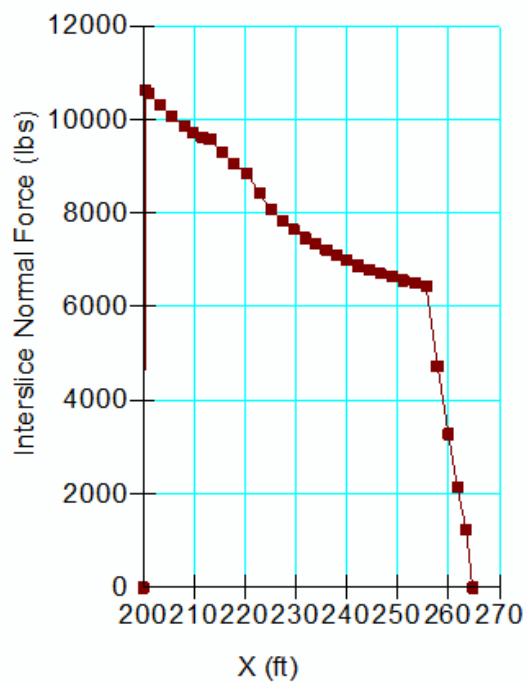
2	1166	200.75	-12.6	930.26	1631.9	405.09204	-8.1918e- 005
3	1166	202.16665	-12.6	927.98585	1660.886	423.14007	-8.5571e- 005
4	1166	204.5	-12.6	920.2287	1625.4431	407.15572	-8.2335e- 005
5	1166	206.83335	-12.6	910.15727	1590.1288	392.58174	-7.9389e- 005
6	1166	209.225	-12.6	898.4898	1530.3673	364.81467	-7.3774e- 005
7	1166	211.675	-12.6	885.87755	1446.2041	323.50467	-6.5421e- 005
8	1166	214.125	-12.6	872.97959	1362.0816	282.38319	1.7035e- 005
9	1166	216.575	-12.6	859.91837	1277.9184	241.33241	-1.2812e- 006
10	1166	219.0125	-12.6	846.84536	1194.4742	200.70362	-1.4239e- 005
11	1166	221.4375	-12.6	833.73196	1111.7113	160.49147	-8.5203e- 007
12	1166	223.8625	-12.6	820.61856	1028.9897	120.30313	-6.3867e- 007
13	1166	226.2875	-12.6	807.46392	946.2268	80.11479	-4.2536e- 007
14	1166	228.5577	-12.6	795.12713	894.39984	57.315125	8.3127e- 007
15	1166	230.6731	-12.6	783.63986	882.01439	56.79656	8.2343e- 007
16	1166	232.7885	-12.6	772.15259	869.58166	56.250702	8.1555e- 007
17	1166	234.90385	-12.6	760.71259	857.14894	55.67755	3.6974e- 006
18	1166	237.0192	-12.6	749.22532	844.71621	55.131692	7.9966e- 007
19	1166	239.1346	-12.6	737.78532	832.33076	54.585834	7.9165e- 007
20	1166	241.25	-12.6	726.29805	819.89803	54.039975	3.5875e- 006

21	1166	243.3654	-12.6	714.85805	807.46531	53.466824	7.7555e- 007
22	1166	245.4808	-12.6	703.41805	795.07986	52.920966	7.6746e- 007
23	1166	247.59615	-12.6	691.93078	782.64713	52.375107	7.5936e- 007
24	1166	249.7115	-12.6	680.49079	770.21441	51.801956	7.5123e- 007
25	1166	251.8269	-12.6	669.05079	757.78168	51.228805	7.4306e- 007
26	1166	253.9423	-12.6	657.61079	745.39623	50.682947	3.3643e- 006
27	1166	255.42845	-12.3	630.82897	848.05194	125.41374	-6.6618e- 007
28	1166	256.89265	- 11.27474	553.36268	811.45889	0	250
29	1166	258.9642	- 9.824221	440.58647	659.25844	0	250
30	1166	261.10645	- 8.324221 5	324.42351	509.02519	0	250
31	1166	263.31935	- 6.774740 5	205.77189	360.70789	0	250
32	1166	265.21125	- -5.45	72.301935	457.76104	0	600

Base Normal Stress Vs. X



Interslice Normal Stress
Vs. X



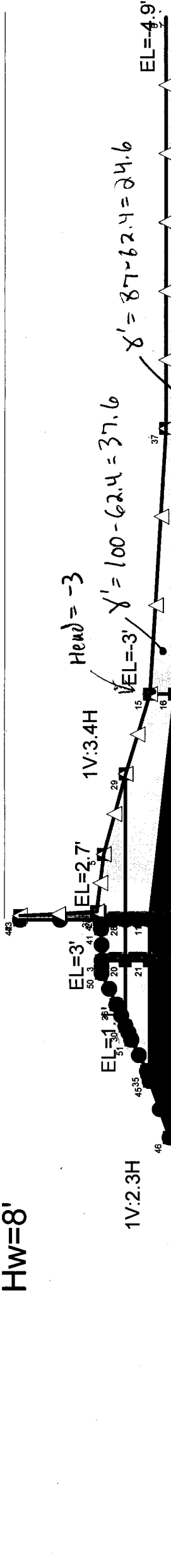
100 120 140 160 180 200 220 240 260 280 300 320

VERT 1 VERT 2 VERT 3 PROTECTED SIDE

FLOOD SIDE

110 feet to constant head boundary

HW=8'



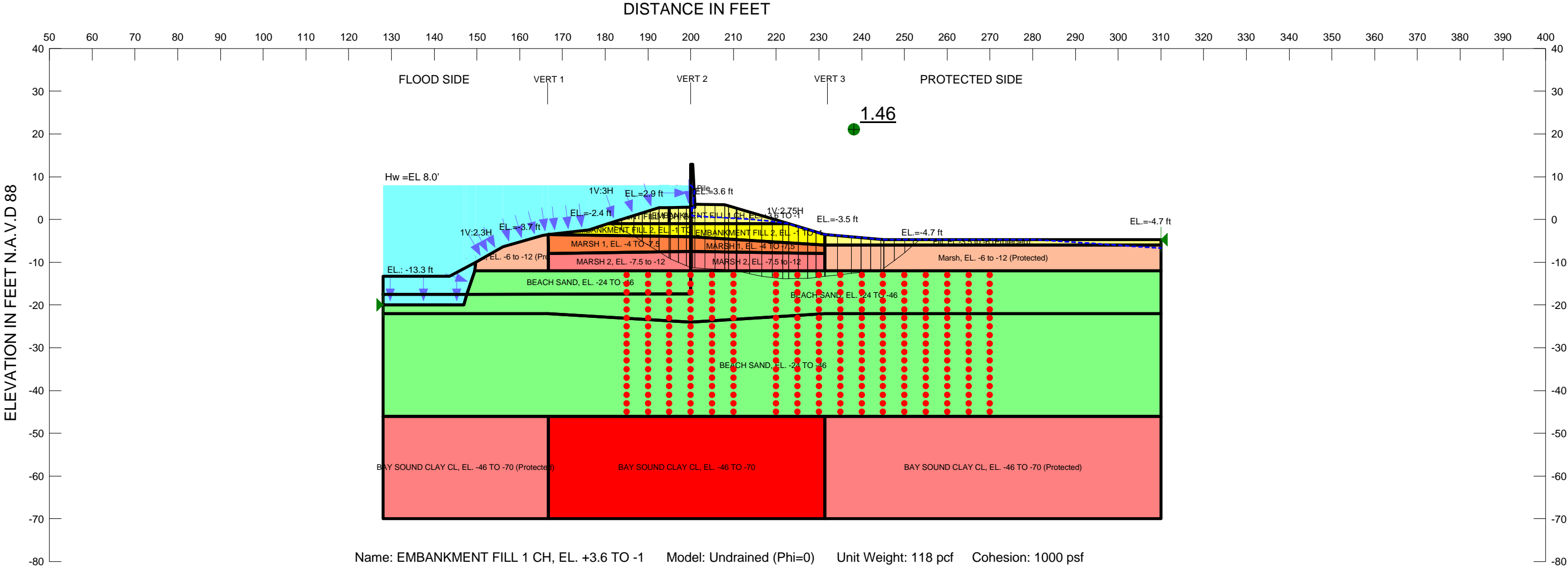
Constant Head=-6.9'

Reach 15

$$\text{Excess Head} : -3 - (0.24) = 3.24'$$

$$\text{F.S. Seepage} = \frac{3' (100 - 62.4 \text{ pcf}) + 6' (87 - 62.4 \text{ pcf})}{3.24' (62.4 \text{ pcf})} = \frac{260.4}{202.18}$$

$$\text{F.S.} = 1.29$$



Name: EMBANKMENT FILL 1 CH, EL. +3.6 TO -1 Model: Undrained (Phi=0) Unit Weight: 118 pcf Cohesion: 1000 psf
Name: MARSH 1, EL. -4 TO -7.5 Model: Spatial Mohr-Coulomb Unit Weight: 80 pcf Cohesion Fn: Marsh 1 Phi: 0 °
Name: BEACH SAND, EL. -24 TO -46 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Beach Sand
Name: BAY SOUND CLAY CL, EL. -46 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 104 pcf Cohesion Spatial Fn: Clay 1 Cohesion Phi: 0 °
Name: MARSH 2, EL. -7.5 to -12 Model: Spatial Mohr-Coulomb Weight Fn: Marsh 2 Cohesion Fn: Marsh 2 Phi: 0 °
Name: Sheet Pile Model: Undrained (Phi=0) Unit Weight: 0.1 pcf Cohesion: 0.01 psf
Name: EMBANKMENT FILL 2, EL. -1 TO -4 Model: Undrained (Phi=0) Unit Weight: 90 pcf Cohesion: 300 psf
Name: Fill, El. -3.5 to -6 (Protected) Model: Undrained (Phi=0) Unit Weight: 90 pcf Cohesion: 600 psf
Name: Marsh, EL. -6 to -12 (Protected) Model: Undrained (Phi=0) Unit Weight: 80 pcf Cohesion: 200 psf
Name: BAY SOUND CLAY CL, EL. -46 TO -70 (Protected) Model: Spatial Mohr-Coulomb Unit Weight: 104 pcf Cohesion Fn: Clay 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=CANAL WATER LEVEL

LONDON AVE CANAL
OUTFALL CANAL REEVALUATION REPORT
REACH 16, STA. 104+00 TO 112+50
OPEN CONNECTION
PROTECTED SIDE STABILITY ANALYSIS
CASE: Global Stability (Block) EL-13 to EL-46
MARCH 2012

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

Global Stability (Block) EL-13 to EL-46

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File Information

Revision Number: 257
Last Edited By: Haggerty, Daniel R MVN
Date: 2/16/2012
Time: 3:30:30 PM
File Name: Reach 16.gsz
Last Solved Date: 2/16/2012
Last Solved Time: 3:41:32 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

Global Stability (Block) EL-13 to EL-46
Kind: SLOPE/W
Parent: Gap Stability (Seepage) - no material
Method: Spencer
Settings
 PWP Conditions Source: Parent Analysis
SlipSurface
 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

Cohesion: 0.01 psf

EMBANKMENT FILL 2, EL. -1 TO -4

Model: Undrained (Phi=0)
Unit Weight: 90 pcf
Cohesion: 300 psf

Fill, EL. -3.5 to -6 (Protected)

Model: Undrained (Phi=0)
Unit Weight: 90 pcf
Cohesion: 600 psf

Marsh, EL. -6 to -12 (Protected)

Model: Undrained (Phi=0)
Unit Weight: 80 pcf
Cohesion: 200 psf

BAY SOUND CLAY CL, EL. -46 TO -70 (Protected)

Model: Spatial Mohr-Coulomb
Unit Weight: 104 pcf
Cohesion Fn: Clay 2
Phi: 0 °
Phi-B: 0 °

Slip Surface Limits

Left Coordinate: (128, -20) ft
Right Coordinate: (310, -4.7) ft

Slip Surface Block

Left Grid
 Upper Left: (185, -13) ft
 Lower Left: (185, -45) ft
 Lower Right: (210, -45) ft
 X Increments: 5
 Y Increments: 16
 Starting Angle: 125 °
 Ending Angle: 145 °
 Angle Increments: 4
Right Grid
 Upper Left: (220, -13) ft
 Lower Left: (220, -45) ft
 Lower Right: (270, -45) ft
 X Increments: 10
 Y Increments: 16
 Starting Angle: 20 °

Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 5000
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 1 CH, EL. +3.6 TO -1

Model: Undrained (Phi=0)
Unit Weight: 118 pcf
Cohesion: 1000 psf

MARSH 1, EL. -4 TO -7.5

Model: Spatial Mohr-Coulomb
Unit Weight: 80 pcf
Cohesion Fn: Marsh 1
Phi: 0 °
Phi-B: 0 °

BEACH SAND, EL. -24 TO -46

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

BAY SOUND CLAY CL, EL. -46 TO -70

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

MARSH 2, EL. -7.5 to -12

Model: Spatial Mohr-Coulomb
Weight Fn: Marsh 2
Cohesion Fn: Marsh 2
Phi: 0 °
Phi-B: 0 °

Sheet Pile

Model: Undrained (Phi=0)
Unit Weight: 0.1 pcf

Ending Angle: 45 °
Angle Increments: 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: (166.6, 200)
 Data Point: (200, 450)
 Data Point: (231.4, 200)

Marsh 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: (166.6, 200)
 Data Point: (200, 250)
 Data Point: (231.4, 200)

Clay 2

Model: Spline Data Point Function
Function: Cohesion vs. Y
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 650
Data Points: Y (ft), Cohesion (psf)
 Data Point: (-70, 865)
 Data Point: (-46, 650)

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: (-100000, 0)
Data Point: (0, 0)
Data Point: (100000, 57735)
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 2
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: (166.7, 80)
Data Point: (200, 97)
Data Point: (231.4, 80)

Spatial Functions

Clay 1 Cohesion
Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (166.7, -46, 650)
Data Point: (166.7, -70, 865)
Data Point: (200, -46, 665)
Data Point: (200, -70, 885)
Data Point: (231.4, -46, 650)
Data Point: (231.4, -70, 865)
Data Point: (310, -46, 650)
Data Point: (310, -70, 865)
Data Point: (143.6, -46, 650)
Data Point: (143.6, -70, 865)

Regions

	Material	Points	Area (ft²)
Region 1	EMBANKMENT FILL 1 CH, EL. +3.6 TO -1	55,30,4,5,33,24,21	50.995458
Region 2	Marsh, EL. -6 to -12 (Protected)	25,3,8,28,35,41,42,43	100.17577
Region 3	Fill, EL. -3.5 to -6 (Protected)	36,31,32,7,9,18	110.58019
Region 4	Marsh, EL. -6 to -12 (Protected)	18,9,19,38,37	471.6
Region 5		52,57,20,3,25,51	94.735
Region 6	EMBANKMENT FILL 2, EL. -1 TO -4	35,12,24,21,55,29	69.918042
Region 7	EMBANKMENT FILL 1 CH, EL. +3.6 TO -1	24,33,34,23,6,56	69.275
Region 8	EMBANKMENT FILL 2, EL. -1 TO -4	12,24,56,36,18	114.85463
Region 9	BEACH SAND, EL. -24 TO -46	10,26,44,39,40,27,11,47,17,45	4303.3
Region 10	MARSH 1, EL. -4 TO -7.5	35,12,13,42,41	133.23846
Region 11	MARSH 2, EL. -7.5 to -12	42,43,14,54,13	141.525
Region 12	BEACH SAND, EL. -24 TO -46	25,43,14,22,51	280.301
Region 13	Sheet Pile	33,49,50,23,34	7.675
Region 14	MARSH 1, EL. -4 TO -7.5	12,18,37,13	86.35
Region 15	MARSH 2, EL. -7.5 to -12	14,54,13,37,38	133.45
Region 16	BEACH SAND, EL. -24 TO -46	39,44,26,1,2,51,22,14,38,19,27,40	1443.169
Region 17		52,51,2,1	48.15
Region 18	BAY SOUND CLAY CL, EL. -46 TO -70	45,17,47,48,53,46	1552.8
Region 19	BAY SOUND CLAY CL, EL. -46 TO -70 (Protected)	47,48,15,11	1886.4
Region 20	BAY SOUND CLAY CL, EL. -46 TO -70 (Protected)	10,16,46,45	928.8

Points

	X (ft)	Y (ft)
Point 1	128	-20
Point 2	146.9	-20
Point 3	149.7	-10
Point 4	195	2.8
Point 5	199	2.9
Point 6	208	3.5
Point 7	310	-4.7
Point 8	156.1	-6.4
Point 9	310	-6
Point 10	128	-46
Point 11	310	-46
Point 12	200	-4
Point 13	200	-7.5
Point 14	200	-12
Point 15	310	-70
Point 16	128	-70
Point 17	200	-46
Point 18	231.4	-6
Point 19	310	-12
Point 20	143.6	-13.3
Point 21	195	-1
Point 22	200	-17.4
Point 23	201	3.6
Point 24	200	-1
Point 25	149.5	-12
Point 26	128	-22
Point 27	310	-22
Point 28	165.3	-3.7
Point 29	176.2	-2.4
Point 30	192.6	2.8
Point 31	231.5	-3.5
Point 32	245.2	-4.7
Point 33	200	2.9

Point 34	201	2.9
Point 35	166.66154	-3.5
Point 36	231.35185	-3.5
Point 37	231.4	-8
Point 38	231.4	-12
Point 39	200	-24
Point 40	231.4	-22
Point 41	166.7	-6
Point 42	166.7	-8
Point 43	166.7	-12
Point 44	166.7	-22
Point 45	166.7	-46
Point 46	166.7	-70
Point 47	231.4	-46
Point 48	231.4	-70
Point 49	200	12.9
Point 50	200.5	12.9
Point 51	147.62	-17.5
Point 52	128	-17.5
Point 53	200	-70
Point 54	200	-11.6
Point 55	180.71818	-1
Point 56	222.9	-1
Point 57	128	-13.3

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.46	(219.697, 0.513)	28.76721	(180.936, -0.93028)	(253.574, -4.7)
2	1288	1.73	(219.697, 0.513)	29.557	(182.19, -0.529293)	(256.854, -4.7)

Slices of Slip Surface: **Optimized**

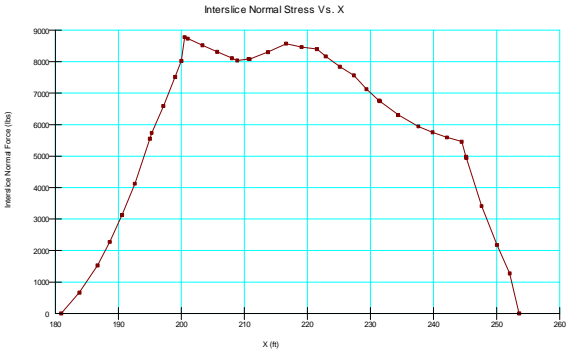
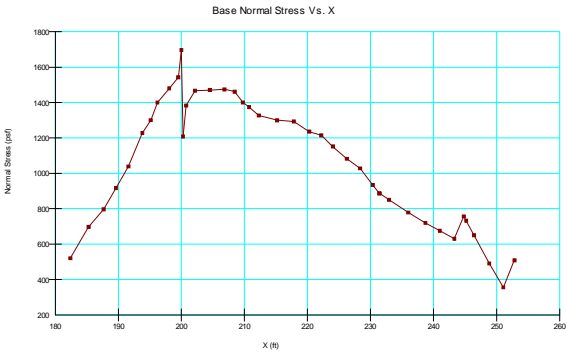
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	182.3754	-1.6647345	517.91874	520.23958	0	300
2	Optimized	185.2529	-3.1331645	487.10613	696.79927	0	300
3	Optimized	187.66235	-4.4713075	529.21895	796.75736	0	357.65
4	Optimized	189.6047	-5.6796425	608.21273	916.40649	0	372.19
5	Optimized	191.58795	-6.912238	691.59945	1038.9101	0	387.04
6	Optimized	193.8	-8.2857935	788.23635	1227.9114	0	240.72
7	Optimized	195.13635	-9.1155705	852.84784	1300.5376	0	242.72
8	Optimized	196.2045	-9.61355	902.44925	1399.9024	0	244.32
9	Optimized	198.06815	-10.440205	991.17857	1480.0482	0	247.11
10	Optimized	199.4961	-11.073585	1132.5382	1542.6952	0	249.25
11	Optimized	199.9961	-11.293845	1203.3312	1696.2445	0	249.99
12	Optimized	200.25	-11.307195	835.82522	1207.4118	0	249.6
13	Optimized	200.75	-11.333485	763.48517	1382.8894	0	248.81
14	Optimized	202.16665	-11.40798	765.69927	1467.1587	0	246.55
15	Optimized	204.5	-11.530675	765.91326	1470.711	0	242.83
16	Optimized	206.83335	-11.65337	763.17419	1474.092	0	239.12
17	Optimized	208.43015	-11.737335	760.36769	1461.741	0	236.58
18	Optimized	209.75145	-11.879975	762.58926	1400.0171	0	234.47
19	Optimized	210.7348	-12.012415	765.84916	1373.8733	351.0429	-7.1e-005
20	Optimized	212.27425	-12.346315	778.71575	1326.7072	316.38299	-6.3995e-005
21	Optimized	215.1687	-12.98929	804.38177	1299.7258	285.98701	1.7257e-005
22	Optimized	217.83715	-13.445475	819.97301	1293.2206	273.22964	1.6485e-005
23	Optimized	220.2796	-13.71486	825.30412	1235.5551	236.85854	-1.2576e-006
24	Optimized	222.2004	-13.841535	824.36902	1214.2916	225.12193	-1.1953e-006
25	Optimized	224.01415	-13.820755	814.81694	1151.5493	194.41252	-1.0321e-006
26	Optimized	226.2425	-13.795225	803.23952	1082.6682	161.3282	-8.5648e-007
27	Optimized	228.3555	-13.66123	785.48693	1027.6034	139.78599	-7.4193e-007
28	Optimized	230.3531	-13.418775	761.63309	934.17584	99.6176	2.7405e-006
29	Optimized	231.37595	-13.29463	749.39138	887.1138	79.514075	-4.2204e-007
30	Optimized	231.45	-13.28564	748.50671	885.92817	79.340319	-4.2115e-007

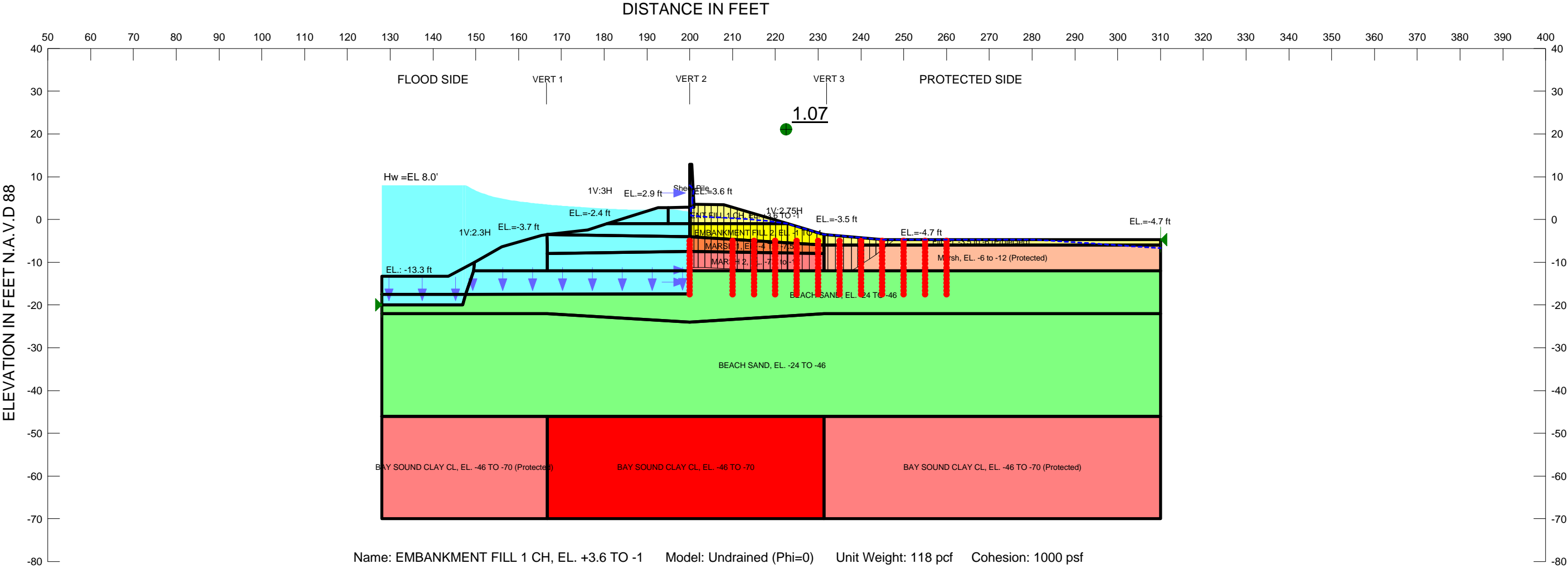
31	Optimized	232.9376	-13.105085	730.77003	850.51066	69.132286	1.9016e-006
32	Optimized	235.98005	-12.76417	696.26269	778.50771	47.484186	6.8853e-007
33	Optimized	238.7208	-12.498115	667.82399	719.69765	29.949269	-3.4266e-007
34	Optimized	240.9926	-12.29887	645.54858	675.32222	17.189817	-1.9668e-007
35	Optimized	243.29305	-12.097115	623.05416	630.53919	4.3214859	1.1912e-007
36	Optimized	244.8019	-11.73869	592.36849	756.89523	0	200
37	Optimized	245.1731	-11.46201	571.5915	732.66158	0	200
38	Optimized	246.41265	-10.52332	501.14768	650.64392	0	200
39	Optimized	248.83795	-8.68672	363.64927	490.62904	0	200
40	Optimized	251.0659	-6.88421	230.59686	355.27803	0	200
41	Optimized	252.82755	-5.35	81.405958	508.72409	0	600

Slices of Slip Surface: **1288**

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	1288	182.5261	-0.76464645	523.25417	192.38343	0	1000
2	1288	183.863	-1.7007525	497.77978	519.26579	0	300
3	1288	185.86455	-3.1022575	485.95224	670.40455	0	300
4	1288	188.2265	-4.7561235	547.78157	820.66435	0	361.88
5	1288	190.9489	-6.6623505	669.82507	1002.526	0	382.25
6	1288	192.45505	-7.716964	746.41204	1153.0578	0	238.71
7	1288	193.8	-8.658713	801.33549	1248.1829	0	240.72
8	1288	196.78595	-10.749481	962.31423	1435.4561	0	245.19
9	1288	198.78595	-12.149895	1073.5601	1559.2947	280.43903	-1.9903e-005
10	1288	199.5	-12.649895	1115.439	1616.0226	289.0121	1.744e-005
11	1288	200.25	-13	909.42	1403.12	285.03783	1.7196e-005
12	1288	200.75	-13	871.28	1595.2	417.95541	-8.4517e-005
13	1288	202.16665	-13	868.88584	1675.5431	465.72379	-9.4177e-005
14	1288	204.5	-13	859.24298	1666.9717	466.34237	-9.4301e-005
15	1288	206.83335	-13	847.80012	1658.5288	468.07443	-9.4652e-005
16	1288	209.24165	-13	835.12763	1606.1479	445.14874	-9.0019e-005
17	1288	211.725	-13	822.28199	1509.7854	396.9303	-8.0267e-005
18	1288	214.20835	-13	809.83903	1413.5035	348.52587	-2.4728e-005
19	1288	216.69165	-13	797.67796	1317.3425	300.02844	-2.1285e-005

20	1288	219.175	-13	785.8793	1221.2619	251.36827	-1.3345e-006
21	1288	221.65835	-13	774.36252	1125.3022	202.6151	-1.0756e-006
22	1288	224.30865	-13	762.33023	1036.1756	158.10472	-8.3943e-007
23	1288	227.12595	-13	749.72944	953.96877	117.91763	-6.2602e-007
24	1288	229.94325	-13	737.27063	871.86839	77.710057	2.1376e-006
25	1288	231.37595	-13	730.9865	830.82035	57.639102	3.8269e-006
26	1288	231.45	-13	730.67	830.81	57.815856	-3.0693e-007
27	1288	232.85	-13	724.55556	820	55.104876	7.9885e-007
28	1288	235.55	-13	712.85185	798.33333	49.352756	7.1549e-007
29	1288	238.25	-13	701.18519	776.66667	43.579254	6.3179e-007
30	1288	240.95	-13	689.55556	755	37.784368	2.5083e-006
31	1288	243.65	-13	677.92593	733.33333	31.989482	-3.6598e-007
32	1288	245.1	-12.92998	667.32226	817.14518	86.500303	-4.5884e-007
33	1288	245.81405	-12.42998	632.99878	736.21416	59.59143	-3.1615e-007
34	1288	247.85625	-11	528.06308	664.1154	0	200
35	1288	250.71255	-9	378.10154	490.23572	0	200
36	1288	253.56885	-7	230.35687	316.35605	0	200
37	1288	255.9253	-5.35	78.182875	370.44652	0	600





Name: EMBANKMENT FILL 1 CH, EL. +3.6 TO -1 Model: Undrained (Phi=0) Unit Weight: 118 pcf Cohesion: 1000 psf
Name: MARSH 1, EL. -4 TO -7.5 Model: Spatial Mohr-Coulomb Unit Weight: 80 pcf Cohesion Fn: Marsh 1 Phi: 0 °
Name: BEACH SAND, EL. -24 TO -46 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Beach Sand
Name: BAY SOUND CLAY CL, EL. -46 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 104 pcf Cohesion Spatial Fn: Clay 1 Cohesion Phi: 0 °
Name: MARSH 2, EL. -7.5 to -12 Model: Spatial Mohr-Coulomb Weight Fn: Marsh 2 Cohesion Fn: Marsh 2 Phi: 0 °
Name: Sheet Pile Model: Undrained (Phi=0) Unit Weight: 0.1 pcf Cohesion: 0.01 psf
Name: EMBANKMENT FILL 2, EL. -1 TO -4 Model: Undrained (Phi=0) Unit Weight: 90 pcf Cohesion: 300 psf
Name: Fill, El. -3.5 to -6 (Protected) Model: Undrained (Phi=0) Unit Weight: 90 pcf Cohesion: 600 psf
Name: Marsh, EL. -6 to -12 (Protected) Model: Undrained (Phi=0) Unit Weight: 80 pcf Cohesion: 200 psf
Name: BAY SOUND CLAY CL, EL. -46 TO -70 (Protected) Model: Spatial Mohr-Coulomb Unit Weight: 104 pcf Cohesion Fn: Clay 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
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CASE: GAP Stability (Block)
MARCH 2012

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

GAP Stability (Block)

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View: 2D

Analysis Settings

GAP Stability (Block)

Kind: SLOPE/W
Parent: Gap Stability (Seepage) - no material
Method: Spencer
Settings
 PWP Conditions Source: Parent Analysis
SlipSurface
 Direction of movement: Left to Right
 Use Passive Mode: Yes
 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

Cohesion: 0.01 psf

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Model: Undrained (Phi=0)
Unit Weight: 90 pcf
Cohesion: 300 psf

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Model: Undrained (Phi=0)
Unit Weight: 90 pcf
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Model: Undrained (Phi=0)
Unit Weight: 80 pcf
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Model: Spatial Mohr-Coulomb
Unit Weight: 104 pcf
Cohesion Fn: Clay 2
Phi: 0 °
Phi-B: 0 °

Slip Surface Limits

Left Coordinate: (128, -20) ft
Right Coordinate: (310, -4.7) ft

Slip Surface Block

Left Grid
 Upper Left: (200, -5) ft
 Lower Left: (200, -17.5) ft
 Lower Right: (200, -17.5) ft
 X Increments: 0
 Y Increments: 14
 Starting Angle: 135 °
 Ending Angle: 135 °
 Angle Increments: 0
Right Grid
 Upper Left: (210, -5) ft
 Lower Left: (210, -17.5) ft
 Lower Right: (260, -17.5) ft
 X Increments: 10
 Y Increments: 14
 Starting Angle: 20 °

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

Materials

EMBANKMENT FILL 1 CH, EL. +3.6 TO -1

Model: Undrained (Phi=0)
Unit Weight: 118 pcf
Cohesion: 1000 psf

MARSH 1, EL. -4 TO -7.5

Model: Spatial Mohr-Coulomb
Unit Weight: 80 pcf
Cohesion Fn: Marsh 1
Phi: 0 °
Phi-B: 0 °

BEACH SAND, EL. -24 TO -46

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

BAY SOUND CLAY CL, EL. -46 TO -70

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

MARSH 2, EL. -7.5 to -12

Model: Spatial Mohr-Coulomb
Weight Fn: Marsh 2
Cohesion Fn: Marsh 2
Phi: 0 °
Phi-B: 0 °

Sheet Pile

Model: Undrained (Phi=0)
Unit Weight: 0.1 pcf

Ending Angle: 45 °
Angle Increments: 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: (166.6, 200)
 Data Point: (200, 450)
 Data Point: (231.4, 200)

Marsh 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: (166.6, 200)
 Data Point: (200, 250)
 Data Point: (231.4, 200)

Clay 2

Model: Spline Data Point Function
Function: Cohesion vs. Y
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 650
Data Points: Y (ft), Cohesion (psf)
 Data Point: (-70, 865)
 Data Point: (-46, 650)

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: (-100000, 0)
Data Point: (0, 0)
Data Point: (100000, 57735)
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 2
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: (166.7, 80)
Data Point: (200, 97)
Data Point: (231.4, 80)

Spatial Functions

Clay 1 Cohesion
Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (166.7, -46, 650)
Data Point: (166.7, -70, 865)
Data Point: (200, -46, 665)
Data Point: (200, -70, 885)
Data Point: (231.4, -46, 650)
Data Point: (231.4, -70, 865)
Data Point: (310, -46, 650)
Data Point: (310, -70, 865)
Data Point: (143.6, -46, 650)
Data Point: (143.6, -70, 865)

Regions

	Points	Area (ft²)	Material
Region 1	55,30,4,5,33,24,21	50.995458	
Region 2	25,3,8,28,35,41,42,43	100.17577	
Region 3	36,31,32,7,9,18	110.58019	Fill, EL. -3.5 to -6 (Protected)
Region 4	18,9,19,38,37	471.6	Marsh, EL. -6 to -12 (Protected)
Region 5	52,57,20,3,25,51	94.735	
Region 6	35,12,24,21,55,29	69.918042	
Region 7	24,33,34,23,6,56	69.275	EMBANKMENT FILL 1 CH, EL. +3.6 TO -1
Region 8	12,24,56,36,18	114.85463	EMBANKMENT FILL 2, EL. -1 TO -4
Region 9	10,26,44,39,40,27,11,47,17,45	4303.3	BEACH SAND, EL. -24 TO -46
Region 10	35,12,13,42,41	133.23846	
Region 11	42,43,14,54,13	141.525	
Region 12	25,43,14,22,51	280.301	
Region 13	33,49,50,23,34	7.675	Sheet Pile
Region 14	12,18,37,13	86.35	MARSH 1, EL. -4 TO -7.5
Region 15	14,54,13,37,38	133.45	MARSH 2, EL. -7.5 to -12
Region 16	39,44,26,1,2,51,22,14,38,19,27,40	1443.169	BEACH SAND, EL. -24 TO -46
Region 17	52,51,2,1	48.15	
Region 18	45,17,47,48,53,46	1552.8	BAY SOUND CLAY CL, EL. -46 TO -70
Region 19	47,48,15,11	1886.4	BAY SOUND CLAY CL, EL. -46 TO -70 (Protected)
Region 20	10,16,46,45	928.8	BAY SOUND CLAY CL, EL. -46 TO -70 (Protected)

Points

	X (ft)	Y (ft)
Point 1	128	-20
Point 2	146.9	-20
Point 3	149.7	-10
Point 4	195	2.8
Point 5	199	2.9
Point 6	208	3.5
Point 7	310	-4.7
Point 8	156.1	-6.4
Point 9	310	-6
Point 10	128	-46
Point 11	310	-46
Point 12	200	-4
Point 13	200	-7.5
Point 14	200	-12
Point 15	310	-70
Point 16	128	-70
Point 17	200	-46
Point 18	231.4	-6
Point 19	310	-12
Point 20	143.6	-13.3
Point 21	195	-1
Point 22	200	-17.4
Point 23	201	3.6
Point 24	200	-1
Point 25	149.5	-12
Point 26	128	-22
Point 27	310	-22
Point 28	165.3	-3.7
Point 29	176.2	-2.4
Point 30	192.6	2.8
Point 31	231.5	-3.5
Point 32	245.2	-4.7
Point 33	200	2.9

Point 34	201	2.9
Point 35	166.66154	-3.5
Point 36	231.35185	-3.5
Point 37	231.4	-8
Point 38	231.4	-12
Point 39	200	-24
Point 40	231.4	-22
Point 41	166.7	-6
Point 42	166.7	-8
Point 43	166.7	-12
Point 44	166.7	-22
Point 45	166.7	-46
Point 46	166.7	-70
Point 47	231.4	-46
Point 48	231.4	-70
Point 49	200	12.9
Point 50	200.5	12.9
Point 51	147.62	-17.5
Point 52	128	-17.5
Point 53	200	-70
Point 54	200	-11.6
Point 55	180.71818	-1
Point 56	222.9	-1
Point 57	128	-13.3

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.07	(220.087, -2.696)	19.49976	(200, 12.9)	(247.828, -4.7)
2	489	1.32	(220.087, -2.696)	17.448	(200, 12.9)	(241.853, -4.40681)

Slices of Slip Surface: **Optimized**

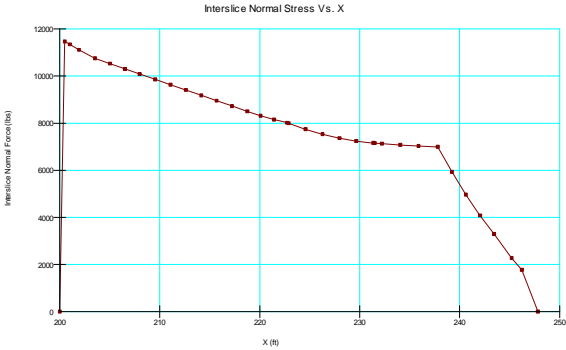
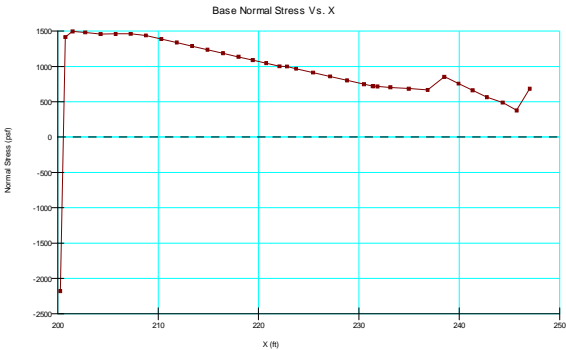
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	200.25	-11.25433	832.34844	-2178.7603	0	249.6
2	Optimized	200.75	-11.246915	757.71665	1415.3843	0	248.81
3	Optimized	201.462	-11.23636	755.87719	1494.4841	0	247.67
4	Optimized	202.7248	-11.231405	752.99512	1481.5772	0	245.66
5	Optimized	204.27135	-11.270825	750.06161	1458.2039	0	243.2
6	Optimized	205.7628	-11.345875	748.52144	1460.0789	0	240.82
7	Optimized	207.25425	-11.420925	746.24467	1461.9538	0	238.45
8	Optimized	208.76875	-11.49713	743.46762	1437.8254	0	236.04
9	Optimized	210.3062	-11.574495	740.54442	1387.7413	0	233.59
10	Optimized	211.84365	-11.65186	737.55626	1337.5921	0	231.14
11	Optimized	213.38115	-11.729225	734.69801	1287.313	0	228.69
12	Optimized	214.9186	-11.80659	731.90473	1236.969	0	226.24
13	Optimized	216.45605	-11.883955	729.24137	1186.56	0	223.8
14	Optimized	217.9935	-11.96132	726.70793	1136.0211	0	221.35
15	Optimized	219.42785	-12.033495	724.4611	1089.1975	210.58063	-1.1179e-006
16	Optimized	220.7591	-12.10048	722.45796	1045.6836	186.61439	-9.906e-007
17	Optimized	222.0903	-12.167465	720.46983	1002.1697	162.63949	-8.6335e-007
18	Optimized	222.82795	-12.199915	719.12742	998.29847	161.17948	-8.5568e-007
19	Optimized	223.7452	-12.186595	714.14713	967.67439	146.37403	-7.7714e-007
20	Optimized	225.43555	-12.16205	704.9785	912.60349	119.87234	3.2981e-006
21	Optimized	227.1259	-12.137505	695.86903	857.59174	93.370649	2.5681e-006
22	Optimized	228.8163	-12.11296	686.87786	802.57999	66.800654	1.8384e-006
23	Optimized	230.5067	-12.088415	677.8867	747.68655	40.298963	2.6752e-006
24	Optimized	231.37595	-12.07579	673.28307	720.15247	27.060064	-3.0975e-007
25	Optimized	231.45	-12.074715	672.88935	720.0144	27.207661	-1.0173e-006
26	Optimized	231.8596	-12.06877	670.73495	716.30983	26.312672	-3.0111e-007
27	Optimized	233.13805	-12.05296	664.19604	703.31761	22.586847	-2.5845e-007
28	Optimized	234.9758	-12.031775	654.89175	685.41636	17.623395	-2.0187e-007
29	Optimized	236.8517	-12.01015	645.38374	667.22042	12.607416	-1.4409e-007
30	Optimized	238.51425	-11.530255	605.58663	852.83832	0	200

31	Optimized	239.9253	-10.592525	535.08831	756.80621	0	200
32	Optimized	241.33635	-9.654795	464.01157	660.7741	0	200
33	Optimized	242.7474	-8.717065	392.44492	564.73609	0	200
34	Optimized	244.32645	-7.539739	302.9938	488.70397	0	200
35	Optimized	245.7125	-6.415639	217.77908	377.95354	0	200
36	Optimized	247.02645	-5.35	91.089209	685.19203	0	600

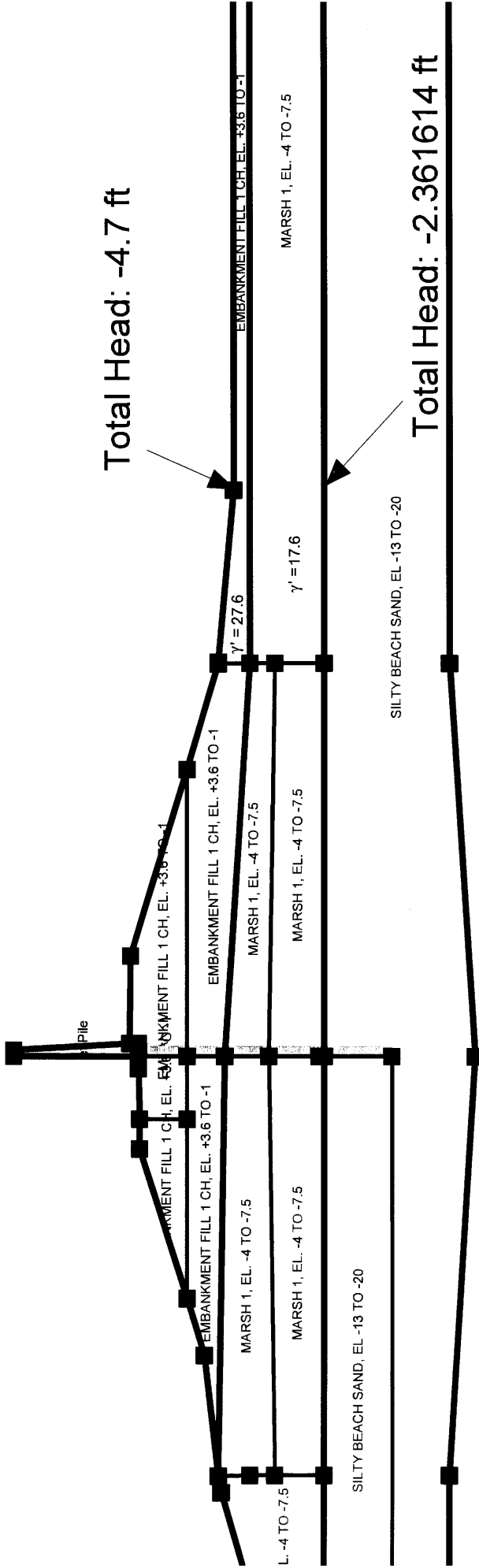
Slices of Slip Surface: **489**

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	489	200.25	-11.25	832.06	-2556.4	0	249.6
2	489	200.75	-11.25	757.92	1405.46	0	248.81
3	489	201.7	-11.25	756.28571	1484.5714	0	247.29
4	489	203.1	-11.25	753.57143	1479.6429	0	245.06
5	489	204.5	-11.25	747.71429	1474.7857	0	242.83
6	489	205.9	-11.25	741.78571	1469.9286	0	240.61
7	489	207.3	-11.25	735.14286	1465.1429	0	238.38
8	489	208.67725	-11.25	728.28145	1437.383	0	236.18
9	489	210.0318	-11.25	721.51165	1386.8125	0	234.03
10	489	211.38635	-11.25	714.68279	1336.2421	0	231.87
11	489	212.7409	-11.25	707.88346	1285.7454	0	229.71
12	489	214.09545	-11.25	701.20225	1235.2487	0	227.56
13	489	215.45	-11.25	694.52104	1184.7521	0	225.4
14	489	216.80455	-11.25	687.97271	1134.3292	0	223.24
15	489	218.1591	-11.25	681.44654	1083.9802	0	221.08
16	489	219.51365	-11.25	674.97204	1033.5574	0	218.93
17	489	220.8682	-11.25	668.53445	983.28221	0	216.77
18	489	222.22275	-11.25	662.10425	932.9332	0	214.61
19	489	223.61	-11.25	655.54225	887.88732	0	212.4
20	489	225.03	-11.25	648.8169	848.02817	0	210.14
21	489	226.45	-11.25	642.12676	808.16901	0	207.88
22	489	227.87	-11.25	635.42958	768.38028	0	205.62
23	489	229.29	-11.25	628.64085	728.66197	0	203.36
24	489	230.67595	-10.859755	596.65646	828.70911	0	201.15

25	489	231.37595	-10.45561	566.59466	771.41911	0	200.04
26	489	231.45	-10.41284	563.40126	767.58399	0	200
27	489	232.25935	-9.945575	528.47017	719.43841	0	200
28	489	233.778	-9.0687825	462.2004	628.31106	0	200
29	489	235.29665	-8.1919875	395.15508	537.18372	0	200
30	489	236.8153	-7.3151925	327.5224	446.05067	0	200
31	489	238.33395	-6.4383975	259.30805	354.91192	0	200
32	489	239.78315	-5.6017025	171.39826	515.66354	0	600
33	489	241.1629	-4.8051075	59.193191	424.02978	0	600



REACH 16



BEACH SAND, EL. -24 TO -46

$$FS_{SEAGE} = \frac{1.3'(27.6 \text{ pcf}) + 6'(17.6 \text{ pcf})}{(-2.36' - 4.17') \times 62.4 \text{ pcf}} = \boxed{0.97}$$

Global Stability (Block) OPEN

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File Information

Revision Number: 245
Last Edited By: Haggerty, Daniel R MVN
Date: 2/17/2012
Time: 12:04:08 PM
File Name: Reach 17.gsz
Last Solved Date: 2/17/2012
Last Solved Time: 12:07:50 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

Global Stability (Block) OPEN
Kind: SLOPE/W
Parent: Gap Stability (Seepage) OPEN
Method: Spencer
Settings
 PWP Conditions Source: Parent Analysis
SlipSurface
 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

Strength Function: Beach Sand
Phi-B: 0 °

Fill -2.2 to -7 (Protected)

Model: Undrained (Phi=0)
Unit Weight: 100 pcf
Cohesion: 400 psf

Marsh 1, -7 to -11 (Protected)

Model: Undrained (Phi=0)
Unit Weight: 85 pcf
Cohesion: 200 psf

Marsh 2, -11 to -14.5 (Protected)

Model: Undrained (Phi=0)
Unit Weight: 116 pcf
Cohesion: 300 psf

MARSH 1, EL. -11 to -12

Model: Spatial Mohr-Coulomb
Weight Fn: Marsh 2
Cohesion Fn: Marsh 2
Phi: 0 °
Phi-B: 0 °

BAY SOUND CLAY CL, EL. -61.5 TO -70

Model: Spatial Mohr-Coulomb
Weight Fn: Clay 2
Cohesion Fn: CLAY 2
Phi: 0 °
Phi-B: 0 °

BAY SOUND CLAY CL, EL. -61.5 TO -70 (protected)

Model: Undrained (Phi=0)
Unit Weight: 119 pcf
Cohesion: 995 psf

BAY SOUND CLAY CL, EL. -46.5 TO -61.5 (protected)

Model: Undrained (Phi=0)
Unit Weight: 109 pcf
Cohesion: 710 psf

Slip Surface Limits

Left Coordinate: (118.6, -16.7) ft
Right Coordinate: (310, -2.1) ft

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 1 CH, EL. +3.4 to -3.5

Model: Spatial Mohr-Coulomb
Weight Fn: FILL
Cohesion Fn: FILL
Phi: 0 °
Phi-B: 0 °

MARSH 1, EL. -3.5 to -11

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

BEACH SAND, EL. -22 TO -46.5

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

BAY SOUND CLAY CL, EL. -46.5 TO -61.5

Model: Spatial Mohr-Coulomb
Weight Fn: Clay 1
Cohesion Fn: CLAY 1
Phi: 0 °
Phi-B: 0 °

Sheet Pile

Model: Undrained (Phi=0)
Unit Weight: 0.1 pcf
Cohesion: 0.01 psf

SILTY BEACH SAND, EL -12 TO -22

Model: Shear/Normal Fn.
Unit Weight: 122 pcf

Slip Surface Block

Left Grid
 Upper Left: (187.147, -4) ft
 Lower Left: (187.147, -22) ft
 Lower Right: (213.606, -22) ft
 X Increments: 6
 Y Increments: 9
 Starting Angle: 125 °
 Ending Angle: 145 °
 Angle Increments: 4
Right Grid
 Upper Left: (226.8, -4) ft
 Lower Left: (226.8, -22) ft
 Lower Right: (266.8, -22) ft
 X Increments: 8
 Y Increments: 9
 Starting Angle: 25 °
 Ending Angle: 45 °
 Angle Increments: 4

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: (160.6, 200)
 Data Point: (200, 320)
 Data Point: (241.7, 200)

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: (160.6, 300)
 Data Point: (200, 320)
 Data Point: (241.7, 300)

FILL

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: (160.6, 400)
Data Point: (200, 520)
Data Point: (241.7, 400)

CLAY 1

Model: Spline Data Point Function
Function: Cohesion vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 720
Data Points: X (ft), Cohesion (psf)
Data Point: (160.6, 720)
Data Point: (200, 750)
Data Point: (241.7, 720)

CLAY 2

Model: Spline Data Point Function
Function: Cohesion vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 995
Data Points: X (ft), Cohesion (psf)
Data Point: (160.6, 995)
Data Point: (200, 1050)
Data Point: (241.7, 995)

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: (-100000, 0)
Data Point: (0, 0)
Data Point: (100000, 57735)
Estimation Properties
Intact Rock Param.: 10
Geological Strength: 100

Data Points: X (ft), Unit Weight (pcf)
Data Point: (160.6, 109)
Data Point: (200, 110)
Data Point: (241.7, 109)

Clay 2

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 119
Data Points: X (ft), Unit Weight (pcf)
Data Point: (160.6, 119)
Data Point: (200, 102)
Data Point: (241.7, 119)

Regions

	Material	Points	Area (ft²)
Region 1	Marsh 1, -7 to -11 (Protected)	47,46,42,45	40.034938
Region 2	Fill -2.2 to -7 (Protected)	27,5,7,15	331.255
Region 3	Marsh 1, -7 to -11 (Protected)	15,7,43,30	273.2
Region 4	BEACH SAND, EL. -22 TO -46.5	40,17,2,58,21,39	87.864
Region 5	EMBANKMENT FILL 1 CH, EL. +3.4 to -3.5	10,28,3,25,20,24,6,42	141.455
Region 6	BEACH SAND, EL. -22 TO -46.5	8,22,1,56,55,53,54,23,9,35,14,33	4646.4685
Region 7	SILTY BEACH SAND, EL -12 TO -22	21,32,11,18,39	271.37
Region 8	Sheet Pile	28,37,38,19,29	7.65
Region 9	BEACH SAND, EL. -22 TO -46.5	56,1,22,57	42.83154
Region 10	EMBANKMENT FILL 1 CH, EL. +3.4 to -3.5	10,28,29,19,4,26,27,15	299.59
Region 11	MARSH 1, EL -3.5 to -11	30,15,10,44	239.775

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: 85
Data Points: X (ft), Unit Weight (pcf)
Data Point: (160.6, 85)
Data Point: (200, 90)
Data Point: (241.7, 85)

Fill

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: (160.6, 100)
Data Point: (200, 110)
Data Point: (241.7, 100)

Marsh 2

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 116
Data Points: X (ft), Unit Weight (pcf)
Data Point: (160.6, 116)
Data Point: (200, 90)
Data Point: (241.7, 116)

Clay 1

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 109

Region 12	MARSH 1, EL. -3.5 to -11	44,10,42,45	295.5
Region 13	Marsh 2, -11 to -14.5 (Protected)	31,30,43,16	239.05
Region 14	MARSH 1, EL. -11 to -12	11,32,45,44	39.4
Region 15	MARSH 1, EL. -11 to -12	44,30,31,11	93.825
Region 16	Marsh 2, -11 to -14.5 (Protected)	21,47,45,32	6.9
Region 17	BAY SOUND CLAY CL, EL. -46.5 TO -61.5 (protected)	8,33,49,48	632.1
Region 18	BAY SOUND CLAY CL, EL. -61.5 TO -70 (protected)	48,49,34,13	354.9
Region 19	BAY SOUND CLAY CL, EL. -46.5 TO -61.5	33,14,35,51,50,49	1218.47
Region 20	BAY SOUND CLAY CL, EL. -61.5 TO -70	49,50,51,36,41,34	687.38
Region 21	BAY SOUND CLAY CL, EL. -46.5 TO -61.5 (protected)	35,9,52,51	1024.5
Region 22	BAY SOUND CLAY CL, EL. -61.5 TO -70 (protected)	51,52,12,36	580.55
Region 23	SILTY BEACH SAND, EL -12 TO -22	56,39,18,11,31,16,23,54,53,55	1132.1815
Region 24	Marsh 1, -7 to -11 (Protected)	47,46,59	17.238186
Region 25	BEACH SAND, EL. -22 TO -46.5	57,40,39,56	111.24347
Region 26	Marsh 2, -11 to -14.5 (Protected)	58,59,47,21	9.2328574

Points

	X (ft)	Y (ft)
Point 1	135.2	-24
Point 2	135.2	-16
Point 3	199	3.4
Point 4	205.1	6.2

Point 5	310	-2.1
Point 6	161.4	-3.1
Point 7	310	-7
Point 8	118.6	-46.5
Point 9	310	-46.5
Point 10	200	-3.5
Point 11	200	-12
Point 12	310	-70
Point 13	118.6	-70
Point 14	200	-46.5
Point 15	241.7	-7
Point 16	310	-14.5
Point 17	118.6	-16.7
Point 18	200	-17.5
Point 19	201	5.5
Point 20	186.1	1
Point 21	153.7	-12
Point 22	118.6	-24.7
Point 23	310	-22
Point 24	171.9	-2.1
Point 25	191.6	3.5
Point 26	232.6	-1.2
Point 27	241.7	-2.2
Point 28	200	3.4
Point 29	201	3.4
Point 30	241.7	-11
Point 31	241.7	-14.5
Point 32	160.6	-12
Point 33	160.6	-46.5
Point 34	160.6	-70
Point 35	241.7	-46.5
Point 36	241.7	-70
Point 37	200	12.9
Point 38	200.5	12.9
Point 39	147.62	-17.5
Point 40	118.6	-17.5

Point 41	200	-70
Point 42	160.6	-3.5
Point 43	310	-11
Point 44	200	-11
Point 45	160.6	-11
Point 46	153.7	-6.89567
Point 47	153.7	-11
Point 48	118.6	-61.5
Point 49	160.6	-61.6
Point 50	200	-61.5
Point 51	241.7	-61.5
Point 52	310	-61.5
Point 53	200	-22
Point 54	241.7	-22
Point 55	160.6	-22
Point 56	139.02154	-22
Point 57	118.6	-22
Point 58	143.328	-12
Point 59	145.3	-11.02953

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	2.17	(219.53, 3.893)	25.47252	(188.011, 1.86877)	(248.073, -2.19067)
2	9413	2.33	(219.53, 3.893)	25.852	(189.789, 2.67683)	(248.667, -2.1898)

Slices of Slip Surface: Optimized

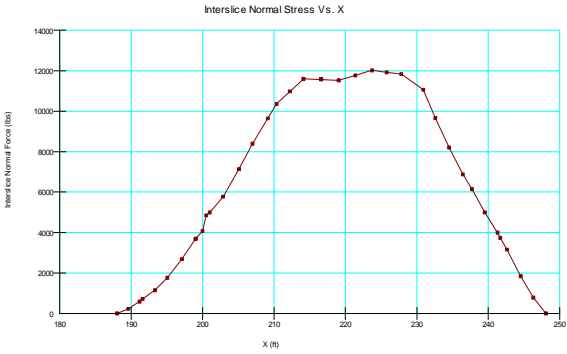
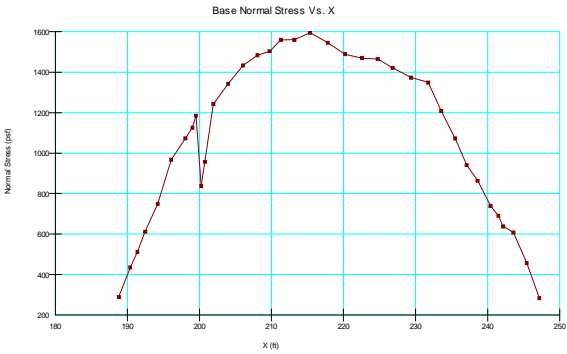
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	188.80255	1.3046001	397.27548	288.17548	0	485.9
2	Optimized	190.385	0.1762601	435.13428	434.33162	0	490.72
3	Optimized	191.3881	-0.55420635	465.40897	511.0737	0	493.77
4	Optimized	192.46815	-1.4018494	504.4423	611.00313	0	497.06

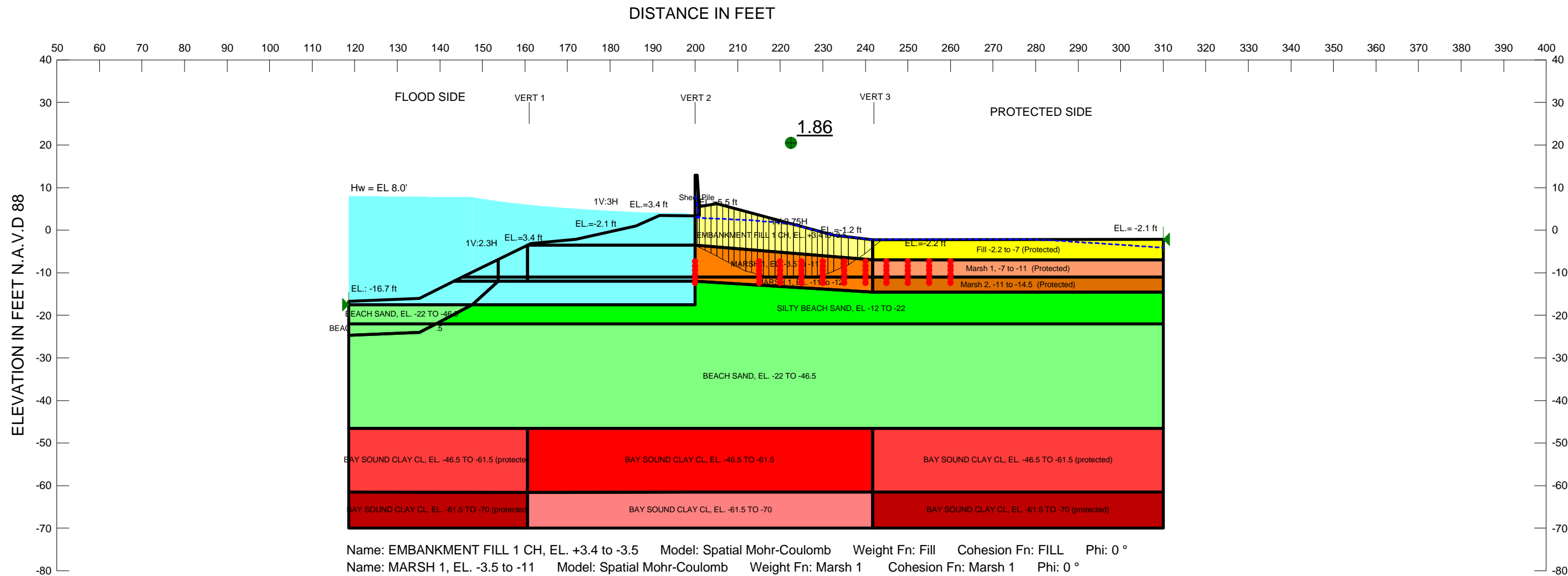
5	Optimized	194.20445	-2.764543	577.61226	749.59564	0	502.35
6	Optimized	196.0762	-4.0701425	672.81325	967.12674	0	308.05
7	Optimized	198.0399	-5.2915925	784.92623	1072.9389	0	314.03
8	Optimized	199.0229	-5.903025	844.10738	1125.5631	0	317.02
9	Optimized	199.5229	-6.13303	870.02147	1184.6004	0	318.55
10	Optimized	200.25	-6.46186	634.20131	836.80605	0	319.28
11	Optimized	200.75	-6.6879795	594.58423	957.33383	0	317.84
12	Optimized	201.93535	-7.2240295	627.65154	1242.298	0	314.43
13	Optimized	203.98535	-8.272616	691.3469	1342.5602	0	308.53
14	Optimized	206.0482	-9.430376	760.35014	1433.5141	0	302.6
15	Optimized	208.06545	-10.48127	820.36436	1483.8597	0	296.79
16	Optimized	209.74615	-11.29678	865.65441	1503.0908	0	315.33
17	Optimized	211.29995	-11.879685	896.19267	1559.5652	0	314.58
18	Optimized	213.1843	-12.451935	924.37483	1560.0729	0	313.68
19	Optimized	215.35655	-12.83887	939.48524	1594.8157	0	312.63
20	Optimized	217.81665	-13.040495	941.79445	1545.3499	0	311.45
21	Optimized	220.21895	-13.334935	950.10207	1488.9716	311.11646	-2.2075e-005
22	Optimized	222.5607	-13.72173	964.36181	1469.6584	291.73311	-2.0697e-005
23	Optimized	224.7538	-13.971685	970.76251	1465.2642	285.50067	1.7223e-005
24	Optimized	226.801	-14.08525	969.29934	1421.6618	261.17158	-1.8528e-005
25	Optimized	229.3675	-13.98601	952.46632	1373.3235	242.98202	-1.29e-006
26	Optimized	231.7552	-13.399105	905.05897	1349.0472	0	304.77
27	Optimized	233.5647	-12.476165	837.84026	1208.5824	0	303.9
28	Optimized	235.49415	-11.492055	765.81564	1071.8741	0	302.98
29	Optimized	237.0937	-10.676215	705.84752	940.89615	0	213.26
30	Optimized	238.62385	-9.78633	641.33518	863.18513	0	208.85
31	Optimized	240.4145	-8.65413	559.86432	738.66595	0	203.7
32	Optimized	241.5049	-7.926527	507.74499	689.937	0	200.56
33	Optimized	242.1621	-7.382512	469.43152	637.97511	0	200
34	Optimized	243.5842	-6.205335	366.13123	607.67103	0	400
35	Optimized	245.4264	-4.60567	216.34965	456.72233	0	400
36	Optimized	247.1908	-2.9956695	70.683317	283.42825	0	400

Slices of Slip Surface: 9413

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	9413	190.6945	2.0427975	354.94892	261.98697	0	491.66
2	9413	192.4763	0.79517115	409.71815	417.00474	0	497.09
3	9413	194.2289	-0.43202035	472.95125	541.65747	0	502.42
4	9413	195.9815	-1.659212	548.06071	667.33846	0	507.76
5	9413	197.7341	-2.886404	637.14511	794.0477	0	513.1
6	9413	198.8052	-3.6363845	700.39871	919.50987	0	316.36
7	9413	199.5	-4.1228725	745.52641	960.86502	0	318.48
8	9413	200.25	-4.648028	520.37452	632.68027	0	319.28
9	9413	200.75	-4.998132	488.11632	765.66141	0	317.84
10	9413	202.025	-5.8908965	542.99789	1077.045	0	314.17
11	9413	204.075	-7.326322	630.74705	1234.3622	0	308.27
12	9413	206.1554	-8.783026	718.72536	1345.2816	0	302.29
13	9413	208.2662	-10.261008	805.69423	1410.4791	0	296.21
14	9413	210.53895	-11.852405	897.60252	1480.3259	0	314.95
15	9413	212.68115	-13.352405	982.68891	1566.9437	337.31969	-6.8243e-005
16	9413	214.6168	-14	1014.8124	1783.2798	443.67489	-3.1482e-005
17	9413	216.63835	-14	1006.3535	1721.7431	413.03034	-8.3536e-005
18	9413	218.6599	-14	997.94416	1660.9978	382.81418	-7.7422e-005
19	9413	220.68145	-14	989.48533	1600.9945	353.05497	-7.1404e-005
20	9413	222.703	-14	981.07596	1541.7827	323.72417	-2.2969e-005
21	9413	224.72455	-14	972.6666	1483.3129	294.82175	1.7788e-005
22	9413	226.7461	-14	964.25724	1425.585	266.34773	-1.89e-005
23	9413	228.76765	-14	955.84787	1368.6487	238.33067	-1.2656e-006
24	9413	230.7892	-14	947.38904	1312.5038	210.79912	-1.4957e-005
25	9413	231.8615	-13.956925	940.23621	1455.0292	297.21586	-6.0052e-005
26	9413	232.2615	-13.67684	920.66609	1413.1981	0	304.53
27	9413	233.4711	-12.829875	860.98756	1294.6315	0	303.95
28	9413	235.2133	-11.60996	774.66312	1130.0227	0	303.11
29	9413	237.02035	-10.344658	684.78134	943.8937	0	213.47
30	9413	238.8922	-9.0339725	591.39411	800.5745	0	208.08

31	9413	240.76405	-7.7232875	497.91936	657.99925	0	202.69
32	9413	241.7485	-7.0339725	448.69495	583.94838	0	200
33	9413	242.65575	-6.398725	387.83124	588.52933	0	400
34	9413	244.3732	-5.196175	272.21449	461.16012	0	400
35	9413	246.0906	-3.993625	160.04144	333.77182	0	400
36	9413	247.808	-2.791075	52.261252	206.3883	0	400





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=CANAL WATER LEVEL

LONDON AVE CANAL
OUTFALL CANAL REEVALUATION REPORT
REACH 17, STA. 118+90 TO 119+63
OPEN CONNECTION
PROTECTED SIDE STABILITY ANALYSIS
CASE: GAP Stability (Block) OPEN (2)
MARCH 2012

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

GAP Stability (Block) OPEN (2)

Report generated using GeoStudio 2007, version 7.15. Copyright © 1991-2009 GEO-SLOPE International Ltd.

File Information

Revision Number: 245
Last Edited By: Haggerty, Daniel R MVN
Date: 2/17/2012
Time: 12:04:08 PM
File Name: Reach 17.gsz
Last Solved Date: 2/17/2012
Last Solved Time: 12:05:16 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

GAP Stability (Block) OPEN (2)
Kind: SLOPE/W
Parent: Gap Stability (Seepage) OPEN
Method: Spencer
Settings
 PWP Conditions Source: Parent Analysis
SlipSurface
 Direction of movement: Left to Right
 Use Passive Mode: Yes
 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

Strength Function: Beach Sand
Phi-B: 0 °

Fill -2.2 to -7 (Protected)

Model: Undrained (Phi=0)
Unit Weight: 100 pcf
Cohesion: 400 psf

Marsh 1, -7 to -11 (Protected)

Model: Undrained (Phi=0)
Unit Weight: 85 pcf
Cohesion: 200 psf

Marsh 2, -11 to -14.5 (Protected)

Model: Undrained (Phi=0)
Unit Weight: 116 pcf
Cohesion: 300 psf

MARSH 1, EL. -11 to -12

Model: Spatial Mohr-Coulomb
Weight Fn: Marsh 2
Cohesion Fn: Marsh 2
Phi: 0 °
Phi-B: 0 °

BAY SOUND CLAY CL, EL. -61.5 TO -70

Model: Spatial Mohr-Coulomb
Weight Fn: Clay 2
Cohesion Fn: CLAY 2
Phi: 0 °
Phi-B: 0 °

BAY SOUND CLAY CL, EL. -61.5 TO -70 (protected)

Model: Undrained (Phi=0)
Unit Weight: 119 pcf
Cohesion: 995 psf

BAY SOUND CLAY CL, EL. -46.5 TO -61.5 (protected)

Model: Undrained (Phi=0)
Unit Weight: 109 pcf
Cohesion: 710 psf

Slip Surface Limits

Left Coordinate: (118.6, -17.5) ft
Right Coordinate: (310, -2.1) ft

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

Materials

EMBANKMENT FILL 1 CH, EL. +3.4 to -3.5

Model: Spatial Mohr-Coulomb
Weight Fn: Fill
Cohesion Fn: FILL
Phi: 0 °
Phi-B: 0 °

MARSH 1, EL. -3.5 to -11

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

BEACH SAND, EL. -22 TO -46.5

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

BAY SOUND CLAY CL, EL. -46.5 TO -61.5

Model: Spatial Mohr-Coulomb
Weight Fn: Clay 1
Cohesion Fn: CLAY 1
Phi: 0 °
Phi-B: 0 °

Sheet Pile

Model: Undrained (Phi=0)
Unit Weight: 0.1 pcf
Cohesion: 0.01 psf

SILTY BEACH SAND, EL -12 TO -22

Model: Shear/Normal Fn.
Unit Weight: 122 pcf

Slip Surface Block

Left Grid
 Upper Left: (200, -7.4) ft
 Lower Left: (200, -12.4) ft
 Lower Right: (200, -12.4) ft
 X Increments: 0
 Y Increments: 5
 Starting Angle: 135 °
 Ending Angle: 135 °
 Angle Increments: 0

Right Grid
 Upper Left: (215, -7.4) ft
 Lower Left: (215, -12.4) ft
 Lower Right: (260, -12.4) ft
 X Increments: 9
 Y Increments: 5
 Starting Angle: 30 °
 Ending Angle: 45 °
 Angle Increments: 4

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: (160.6, 200)
 Data Point: (200, 320)
 Data Point: (241.7, 200)

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: (160.6, 300)
 Data Point: (200, 320)
 Data Point: (241.7, 300)

FILL

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: (160.6, 400)
Data Point: (200, 520)
Data Point: (241.7, 400)

CLAY 1

Model: Spline Data Point Function
Function: Cohesion vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 720
Data Points: X (ft), Cohesion (psf)
Data Point: (160.6, 720)
Data Point: (200, 750)
Data Point: (241.7, 720)

CLAY 2

Model: Spline Data Point Function
Function: Cohesion vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 995
Data Points: X (ft), Cohesion (psf)
Data Point: (160.6, 995)
Data Point: (200, 1050)
Data Point: (241.7, 995)

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: (-100000, 0)
Data Point: (0, 0)
Data Point: (100000, 57735)
Estimation Properties
Intact Rock Param.: 10
Geological Strength: 100

Data Points: X (ft), Unit Weight (pcf)
Data Point: (160.6, 109)
Data Point: (200, 110)
Data Point: (241.7, 109)

Clay 2

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 119
Data Points: X (ft), Unit Weight (pcf)
Data Point: (160.6, 119)
Data Point: (200, 102)
Data Point: (241.7, 119)

Regions

	Points	Area (ft²)	Material
Region 1	47,46,42,45	40.034938	
Region 2	27,5,7,15	331.255	Fill -2.2 to -7 (Protected)
Region 3	15,7,43,30	273.2	Marsh 1, -7 to -11 (Protected)
Region 4	40,17,2,58,21,39	87.864	
Region 5	10,28,3,25,20,24,6,42	141.455	
Region 6	8,22,1,56,55,53,54,23,9,35,14,33	4646.4685	BEACH SAND, EL. -22 TO -46.5
Region 7	21,32,11,18,39	271.37	
Region 8	28,37,38,19,29	7.65	Sheet Pile
Region 9	56,1,22,57	42.83154	BEACH SAND, EL. -22 TO -46.5
Region 10	10,28,29,19,4,26,27,15	299.59	EMBANKMENT FILL 1 CH, EL. +3.4 to -3.5
Region 11	30,15,10,44	239.775	MARSH 1, EL. -3.5 to -11

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: 85
Data Points: X (ft), Unit Weight (pcf)
Data Point: (160.6, 85)
Data Point: (200, 90)
Data Point: (241.7, 85)

Fill

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: (160.6, 100)
Data Point: (200, 110)
Data Point: (241.7, 100)

Marsh 2

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 116
Data Points: X (ft), Unit Weight (pcf)
Data Point: (160.6, 116)
Data Point: (200, 90)
Data Point: (241.7, 116)

Clay 1

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 109

Region 12	44,10,42,45	295.5	
Region 13	31,30,43,16	239.05	Marsh 2, -11 to -14.5 (Protected)
Region 14	11,32,45,44	39.4	
Region 15	44,30,31,11	93.825	MARSH 1, EL. -11 to -12
Region 16	21,47,45,32	6.9	
Region 17	8,33,49,48	632.1	BAY SOUND CLAY CL, EL. -46.5 TO -61.5 (protected)
Region 18	48,49,34,13	354.9	BAY SOUND CLAY CL, EL. -61.5 TO -70 (protected)
Region 19	33,14,35,51,50,49	1218.47	BAY SOUND CLAY CL, EL. -46.5 TO -61.5
Region 20	49,50,51,36,41,34	687.38	BAY SOUND CLAY CL, EL. -61.5 TO -70
Region 21	35,9,52,51	1024.5	BAY SOUND CLAY CL, EL. -46.5 TO -61.5 (protected)
Region 22	51,52,12,36	580.55	BAY SOUND CLAY CL, EL. -61.5 TO -70 (protected)
Region 23	56,39,18,11,31,16,23,54,53,55	1132.1815	SILTY BEACH SAND, EL. -12 TO -22
Region 24	47,46,59	17.238186	
Region 25	57,40,39,56	111.24347	BEACH SAND, EL. -22 TO -46.5
Region 26	58,59,47,21	9.2328574	

Points

	X (ft)	Y (ft)
Point 1	135.2	-24
Point 2	135.2	-16
Point 3	199	3.4
Point 4	205.1	6.2

Point 5	310	-2.1
Point 6	161.4	-3.1
Point 7	310	-7
Point 8	118.6	-46.5
Point 9	310	-46.5
Point 10	200	-3.5
Point 11	200	-12
Point 12	310	-70
Point 13	118.6	-70
Point 14	200	-46.5
Point 15	241.7	-7
Point 16	310	-14.5
Point 17	118.6	-16.7
Point 18	200	-17.5
Point 19	201	5.5
Point 20	186.1	1
Point 21	153.7	-12
Point 22	118.6	-24.7
Point 23	310	-22
Point 24	171.9	-2.1
Point 25	191.6	3.5
Point 26	232.6	-1.2
Point 27	241.7	-2.2
Point 28	200	3.4
Point 29	201	3.4
Point 30	241.7	-11
Point 31	241.7	-14.5
Point 32	160.6	-12
Point 33	160.6	-46.5
Point 34	160.6	-70
Point 35	241.7	-46.5
Point 36	241.7	-70
Point 37	200	12.9
Point 38	200.5	12.9
Point 39	147.62	-17.5
Point 40	118.6	-17.5

Point 41	200	-70
Point 42	160.6	-3.5
Point 43	310	-11
Point 44	200	-11
Point 45	160.6	-11
Point 46	153.7	-6.89567
Point 47	153.7	-11
Point 48	118.6	-61.5
Point 49	160.6	-61.6
Point 50	200	-61.5
Point 51	241.7	-61.5
Point 52	310	-61.5
Point 53	200	-22
Point 54	241.7	-22
Point 55	160.6	-22
Point 56	139.02154	-22
Point 57	118.6	-22
Point 58	143.328	-12
Point 59	145.3	-11.02953

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.86	(220.963, -0.145)	17.72992	(200, 12.9)	(243.852, -2.19685)
2	166	2.29	(220.963, -0.145)	19.023	(200, 12.9)	(244.209, -2.19633)

Slices of Slip Surface: Optimized

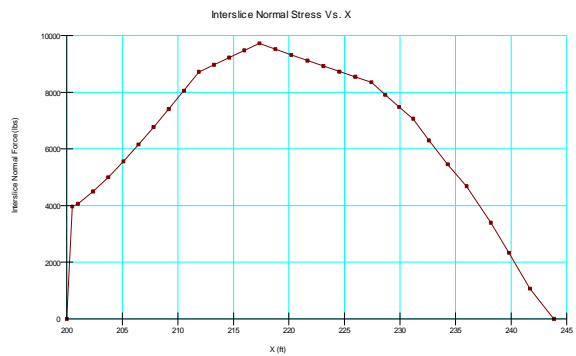
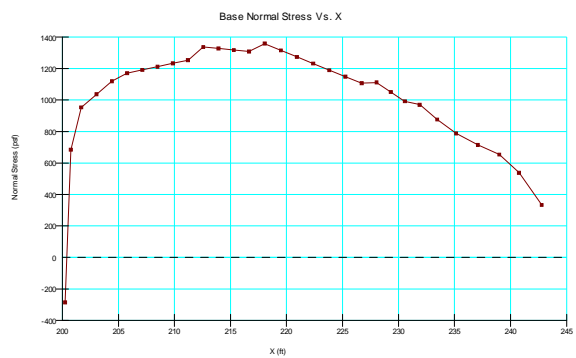
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	200.25	-3.6308645	456.80799	-285.30932	0	319.28
2	Optimized	200.75	-3.8878195	418.65171	684.26919	0	317.84
3	Optimized	201.68335	-4.367469	447.81384	953.35343	0	315.16
4	Optimized	203.05	-5.069813	490.43458	1036.5254	0	311.22

5	Optimized	204.41665	-5.772157	532.07261	1119.3068	0	307.29
6	Optimized	205.77955	-6.472553	573.41597	1170.9018	0	303.37
7	Optimized	207.13865	-7.171001	613.4604	1191.5817	0	299.46
8	Optimized	208.49775	-7.8694495	653.63571	1212.2616	0	295.55
9	Optimized	209.8568	-8.567898	693.03879	1232.9415	0	291.64
10	Optimized	211.21585	-9.266346	731.97723	1253.556	0	287.72
11	Optimized	212.57565	-9.9783565	759.42331	1337.1152	0	283.81
12	Optimized	213.9361	-10.130926	775.52969	1327.4229	0	279.9
13	Optimized	215.29655	-10.4745	791.42228	1317.7306	0	275.98
14	Optimized	216.65705	-10.818075	807.2436	1308.1808	0	272.07
15	Optimized	218.0573	-10.990355	812.11048	1358.8181	0	268.04
16	Optimized	219.49735	-10.991345	805.99969	1316.2509	0	263.89
17	Optimized	220.93745	-10.992335	799.81945	1273.892	0	259.75
18	Optimized	222.37755	-10.99332	793.50034	1231.8108	0	255.6
19	Optimized	223.8176	-10.994305	787.25066	1189.938	0	251.46
20	Optimized	225.25765	-10.995295	780.79267	1148.2735	0	247.32
21	Optimized	226.69775	-10.996285	774.33467	1106.8174	0	243.17
22	Optimized	228.04555	-10.867525	759.97881	1111.639	0	239.29
23	Optimized	229.3011	-10.60901	737.70703	1051.5715	0	235.68
24	Optimized	230.55665	-10.350495	715.32603	991.73799	0	232.07
25	Optimized	231.8922	-9.915754	681.15897	970.17481	0	228.22
26	Optimized	233.448	-9.244251	630.60147	876.69248	0	223.75
27	Optimized	235.14405	-8.512217	575.33113	788.45483	0	218.87
28	Optimized	237.08005	-7.4248735	495.76989	714.90761	0	213.29
29	Optimized	238.9893	-6.1590035	388.57656	653.62329	0	407.8
30	Optimized	240.7553	-4.815558	254.80927	537.77846	0	402.72
31	Optimized	242.77595	-3.1067525	85.017539	333.5661	0	400

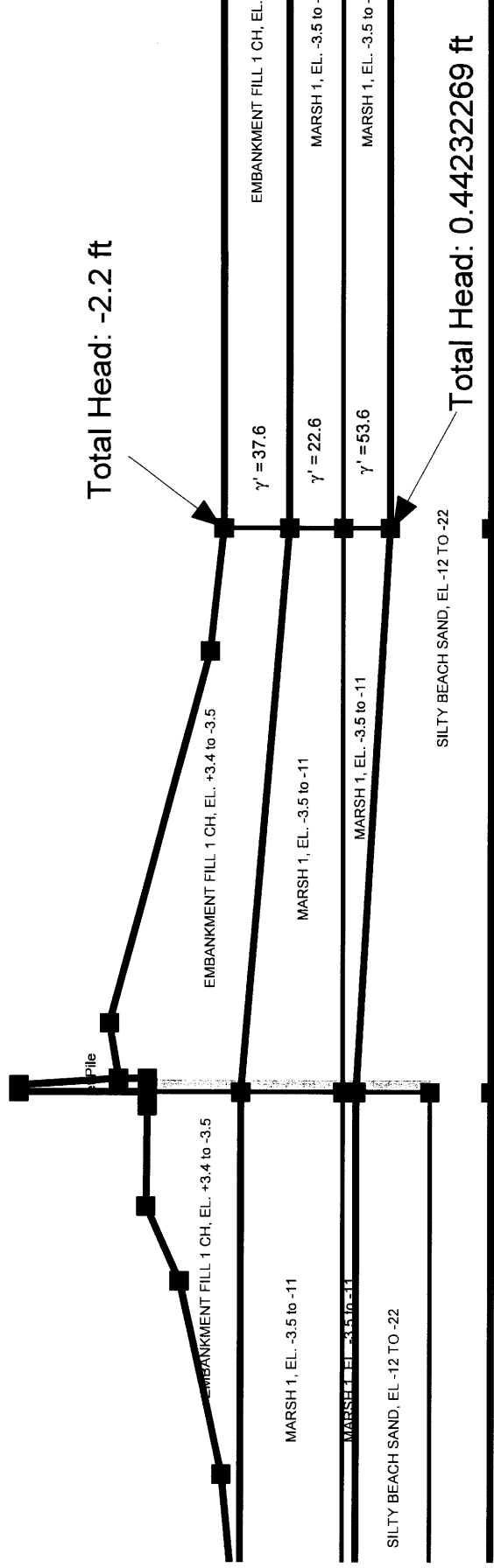
4	166	203.05	-10.4	830.63394	1663.463	0	311.22
5	166	204.41665	-10.4	826.97541	1686.6581	0	307.29
6	166	205.83235	-10.4	823.03206	1675.4898	0	303.22
7	166	207.29705	-10.4	817.91158	1630.293	0	299
8	166	208.76175	-10.4	812.7911	1585.3694	0	294.79
9	166	210.22645	-10.4	807.12443	1540.6505	0	290.57
10	166	211.69115	-10.4	801.45777	1496.1364	0	286.36
11	166	213.15585	-10.4	795.51801	1451.8955	0	282.14
12	166	214.62055	-10.4	789.57825	1407.8593	0	277.93
13	166	216.08525	-10.4	783.43367	1364.028	0	273.71
14	166	217.55	-10.4	777.28909	1320.4698	0	269.5
15	166	219.01475	-10.4	771.00797	1277.1164	0	265.28
16	166	220.47945	-10.4	764.65857	1234.036	0	261.07
17	166	221.94415	-10.4	758.10436	1191.1605	0	256.85
18	166	223.40885	-10.4	751.61841	1148.5581	0	252.64
19	166	224.87355	-10.4	744.92765	1106.1606	0	248.42
20	166	226.33825	-10.4	738.16862	1064.0361	0	244.21
21	166	227.80295	-10.4	731.40958	1022.0481	0	239.99
22	166	229.26765	-10.4	724.514	980.40153	0	235.78
23	166	230.65	-10.024722	694.08591	1049.2895	0	231.8
24	166	231.95	-9.274167	639.77281	938.50488	0	228.06
25	166	233.2711	-8.511436	584.36728	838.16564	0	224.26
26	166	234.6133	-7.7365295	527.9024	748.2193	0	220.39
27	166	235.95545	-6.9616225	471.17297	658.59559	0	216.53
28	166	237.4721	-6.0859745	392.93765	615.89182	0	412.17
29	166	239.16325	-5.1095855	291.94307	485.47761	0	407.3
30	166	240.8544	-4.1331965	190.90752	356.10807	0	402.43
31	166	242.3273	-3.282833	102.21057	252.61687	0	400
32	166	243.5819	-2.558495	33.436048	174.24876	0	400

Slices of Slip Surface: 166

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	166	200.25	-10.4	886.68	-1457.98	0	319.28
2	166	200.75	-10.4	833.8	1398.7	0	317.84
3	166	201.68335	-10.4	832.60955	1640.1216	0	315.16

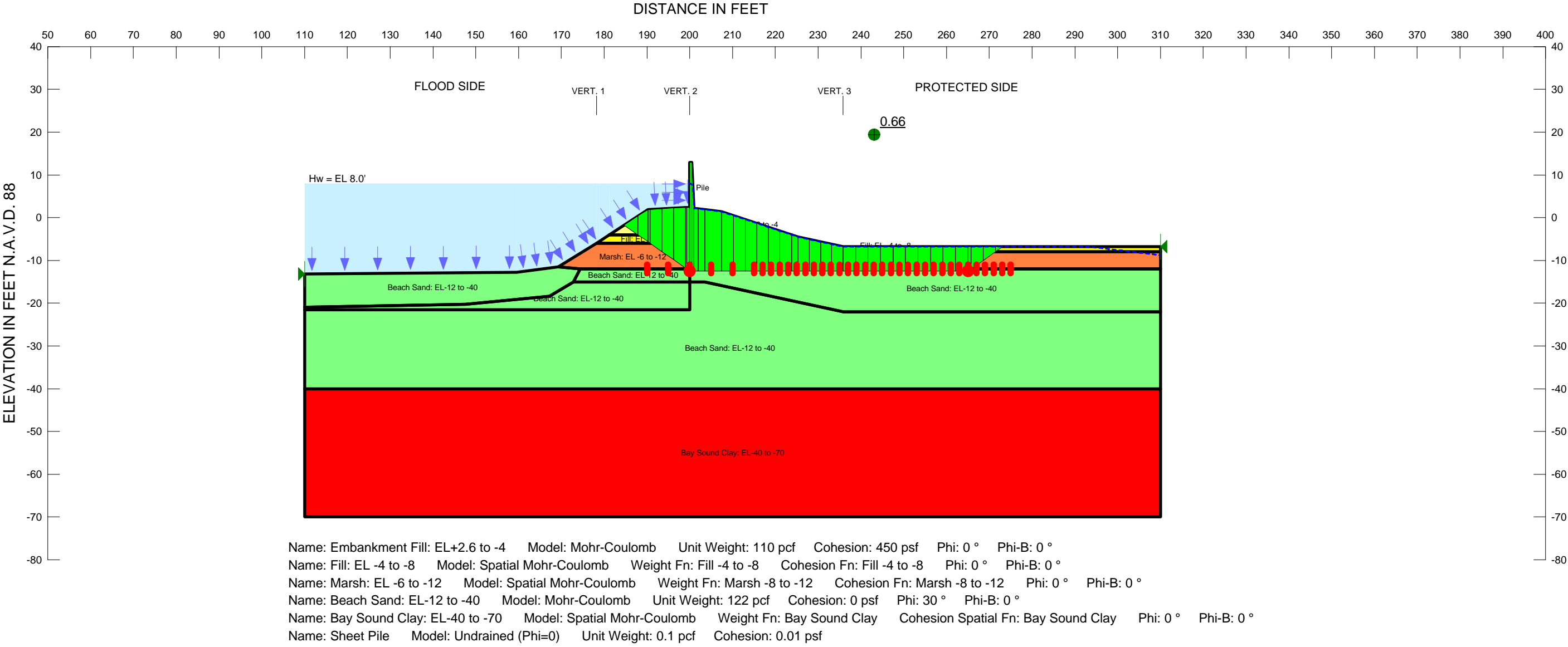


REACH 17



BEACH SAND, EL. -22 TO -46.5

$$FS_{SEEPAGE} = \frac{4.8'(37.6 \text{ pcf}) + 4'(22.6 \text{ pcf}) + 3.5'(53.6 \text{ pcf})}{(0.44' - -2.2') \times 62.4 \text{ pcf}} = 2.78$$



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=CANAL WATER LEVEL

LONDON AVE CANAL
OUTFALL CANAL REEVALUATION REPORT
REACH 35B, STA. 103+50 TO 114+66
PROTECTED SIDE STABILITY ANALYSIS
OPEN CONNECTION
CASE: Global Stability (Block) EL-12
MARCH 2012

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

Global Stability (Block) EL-12

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File Information

Revision Number: 59
Last Edited By: Haggerty, Daniel R MVN
Date: 2/15/2012
Time: 10:59:30 AM
File Name: Reach 35B.gsz
Last Solved Date: 2/15/2012
Last Solved Time: 11:01:00 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

Global Stability (Block) EL-12
Kind: SLOPE/W
Parent: Steady-State Seepage
Method: Spencer
Settings
 PWP Conditions Source: Parent Analysis
SlipSurface
 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: 1
 Tension Crack Fluid Unit Weight: 62.4 pcf
FOS Distribution
 FOS Calculation Option: Constant
Restrict Block Crossing: Yes
Advanced

Phi-B: 0 °

Sheet Pile

Model: Undrained (Phi=0)
Unit Weight: 0.1 pcf
Cohesion: 0.01 psf

Slip Surface Limits

Left Coordinate: (110, -13.2) ft
Right Coordinate: (310, -6.8) ft

Slip Surface Block

Left Grid
 Upper Left: (190, -11) ft
 Lower Left: (190, -13) ft
 Lower Right: (210, -13) ft
 X Increments: 4
 Y Increments: 4
 Starting Angle: 125 °
 Ending Angle: 145 °
 Angle Increments: 4
Right Grid
 Upper Left: (215, -11) ft
 Lower Left: (215, -13) ft
 Lower Right: (275, -13) ft
 X Increments: 30
 Y Increments: 4
 Starting Angle: 20 °
 Ending Angle: 45 °
 Angle Increments: 5

Cohesion Functions

Fill -4 to -8
Model: Spline Data Point Function
Function: Cohesion vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 600
Data Points: X (ft), Cohesion (psf)
 Data Point: (110, 600)
 Data Point: (178.1, 600)
 Data Point: (178.3, 450)

Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 5000
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+2.6 to -4

Model: Mohr-Coulomb
Unit Weight: 110 pcf
Cohesion: 450 psf
Phi: 0 °
Phi-B: 0 °

Fill: EL -4 to -8

Model: Spatial Mohr-Coulomb
Weight Fn: Fill -4 to -8
Cohesion Fn: Fill -4 to -8
Phi: 0 °
Phi-B: 0 °

Marsh: EL -6 to -12

Model: Spatial Mohr-Coulomb
Weight Fn: Marsh -8 to -12
Cohesion Fn: Marsh -8 to -12
Phi: 0 °
Phi-B: 0 °

Beach Sand: EL-12 to -40

Model: Mohr-Coulomb
Unit Weight: 122 pcf
Cohesion: 0 psf
Phi: 30 °
Phi-B: 0 °

Bay Sound Clay: EL-40 to -70

Model: Spatial Mohr-Coulomb
Weight Fn: Bay Sound Clay
Cohesion Spatial Fn: Bay Sound Clay
Phi: 0 °

Data Point: (200, 450)
Data Point: (235.7, 450)
Data Point: (235.9, 600)
Data Point: (310, 600)

Marsh -8 to -12

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: (110, 150)
 Data Point: (178.2, 150)
 Data Point: (200, 275)
 Data Point: (235.8, 150)
 Data Point: (310, 150)

Unit Weight Functions

Fill -4 to -8

Model: Spline Data Point Function
Function: Unit Weight vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 96
Data Points: X (ft), Unit Weight (pcf)
 Data Point: (110, 96)
 Data Point: (178.1, 96)
 Data Point: (178.3, 88)
 Data Point: (200, 88)
 Data Point: (235.7, 88)
 Data Point: (235.9, 96)
 Data Point: (310, 96)

Marsh -8 to -12

Model: Spline Data Point Function
Function: Unit Weight vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 96
Data Points: X (ft), Unit Weight (pcf)
 Data Point: (110, 96)
 Data Point: (178.2, 96)
 Data Point: (200, 88)
 Data Point: (235.8, 96)

Data Point: (310, 96)

Bay Sound Clay

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 107
Data Points: X (ft), Unit Weight (pcf)
Data Point: (110, 107)
Data Point: (178.2, 107)
Data Point: (200, 108)
Data Point: (235.8, 107)
Data Point: (310, 107)

Spatial Functions

Bay Sound Clay

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (110, -40, 400)
Data Point: (110, -70, 700)
Data Point: (178.2, -40, 400)
Data Point: (178.2, -70, 700)
Data Point: (200, -40, 600)
Data Point: (200, -70, 900)
Data Point: (235.8, -40, 400)
Data Point: (235.8, -70, 700)
Data Point: (310, -40, 400)
Data Point: (310, -70, 700)

Regions

	Material	Points	Area (ft²)
Region 1	Bay Sound Clay: EL-40 to -70	1,3,4,2	6000
Region 2	Beach Sand: EL-12 to -40	3,9,7,14,15,5,6,4	3782.9
Region 3	Beach Sand: EL-12 to -40	9,10,11,12,13,14,7	279.66
Region 4	Beach Sand: EL-12 to -40	13,18,20,14	79.2
Region 5	Beach Sand: EL-12 to -40	14,20,22,19,21,6,5,15	962.1
Region 6	Beach Sand: EL-12 to -40	10,16,17,23,18,13,12,11	446.445
Region 7	Marsh: EL -6 to -12	23,32,31,27,24,20,18	158.45
Region 8	Marsh: EL -6 to -12	20,24,27,31,30,25,26,21,19,22	479.3

Region 9	Fill: EL -4 to -8	32,33,37,35,31	40.6
Region 10	Fill: EL -4 to -8	31,35,38,36,34,28,29,26,25,30	175.24
Region 11	Embankment Fill: EL+2.6 to -4	37,41,46,45,43,35	87.07
Region 12	Embankment Fill: EL+2.6 to -4	43,44,42,40,39,36,38,35	87.9045
Region 13	Sheet Pile	43,45,47,48,44	8.025

Points

	X (ft)	Y (ft)
Point 1	110	-70
Point 2	310	-70
Point 3	110	-40
Point 4	310	-40
Point 5	235.9	-22
Point 6	310	-22
Point 7	200	-21.5
Point 8	203.5	-21.5
Point 9	110	-21.5
Point 10	110	-20.9
Point 11	147.6	-20.3
Point 12	167.2	-18.4
Point 13	172.8	-15
Point 14	200	-15
Point 15	203.5	-15
Point 16	110	-13.2
Point 17	159.5	-12.8
Point 18	174.4	-12
Point 19	235.8	-12
Point 20	200	-12
Point 21	310	-12
Point 22	203.5	-12
Point 23	169.3	-11.5
Point 24	200	-10
Point 25	235.8	-8
Point 26	310	-8
Point 27	200	-7

Point 28	235.8	-6.8
Point 29	310	-6.8
Point 30	203.5	-6
Point 31	200	-6
Point 32	178.2	-6
Point 33	178.8	-5.6
Point 34	225.3	-4.5
Point 35	200	-4
Point 36	223.8	-4
Point 37	181.2	-4
Point 38	203.5	-4
Point 39	207.5	1.4
Point 40	203.5	1.89
Point 41	190.2	1.9
Point 42	201.9	2.09
Point 43	200	2.2
Point 44	201	2.2
Point 45	200	2.4
Point 46	199	2.4
Point 47	200	12.9
Point 48	200.5	12.9

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	0.66	(229.107, -0.481)	33.85894	(184.64, -1.74485)	(273.14, -6.8)
2	16708	0.66	(229.107, -0.481)	33.859	(184.64, -1.74485)	(273.14, -6.8)

Slices of Slip Surface: Optimized

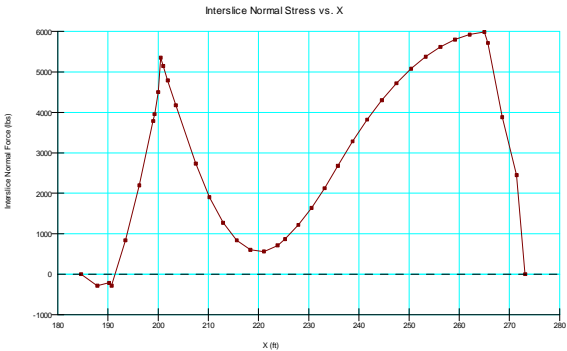
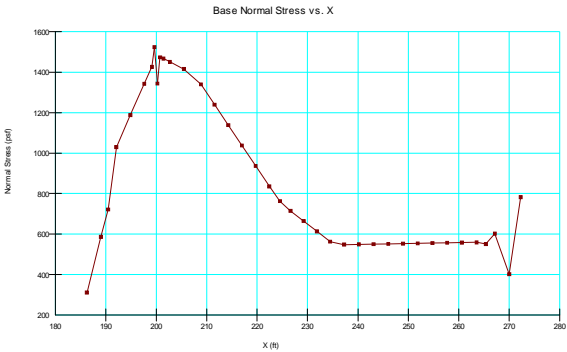
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	186.2504	-2.872426	637.30199	310.34677	0	450
2	Optimized	189.03035	-4.818983	702.10284	585.91445	0	450

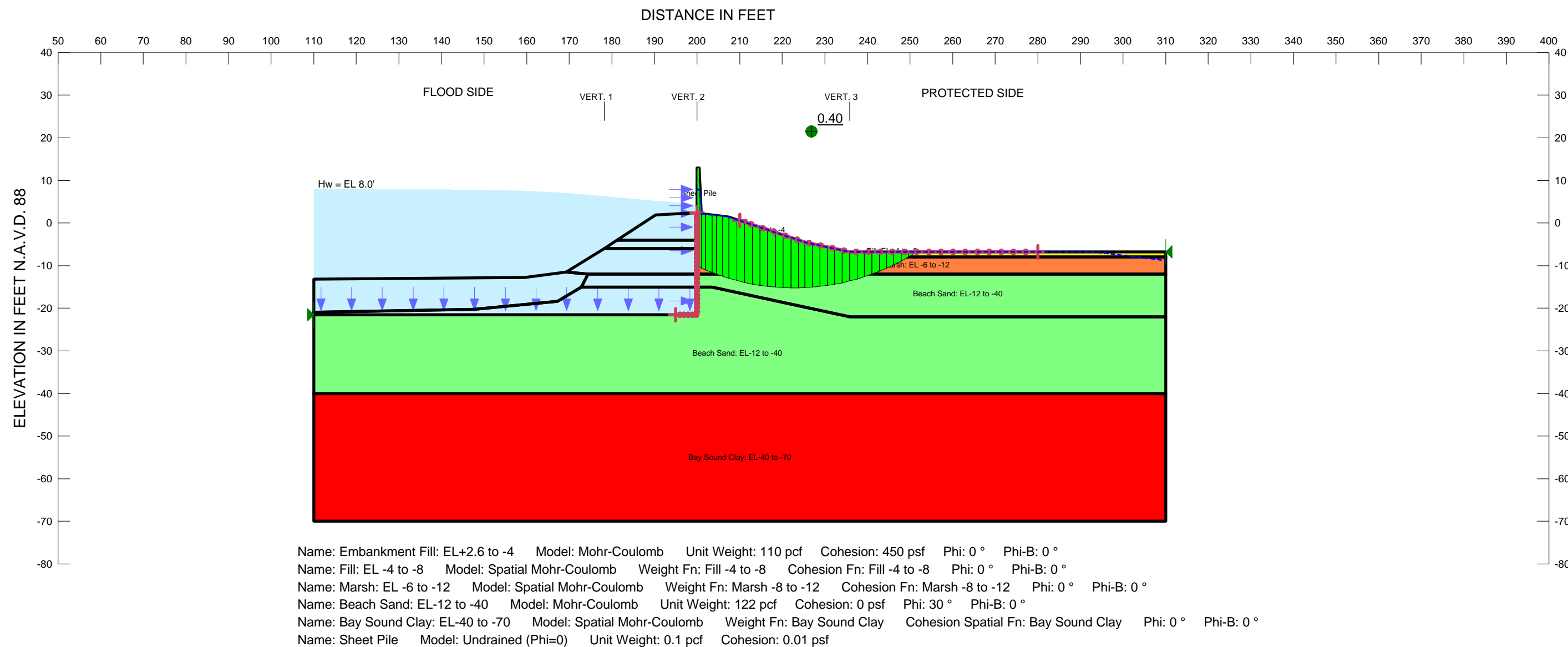
3	Optimized	190.4585	-5.818983	739.92359	721.24449	0	450
4	Optimized	192.0975	-6.966632	808.23772	1029.9527	0	229.69
5	Optimized	194.8585	-8.899896	937.11903	1188.0578	0	245.52
6	Optimized	197.6195	-10.833159	1057.0997	1342.4246	0	261.35
7	Optimized	199.14295	-11.899895	1144.7031	1426.7821	0	270.09
8	Optimized	199.64295	-12.25	1167.4575	1523.5337	205.58072	0
9	Optimized	200.25	-12.5	1035.18	1344	178.29731	0
10	Optimized	200.75	-12.5	1003.2	1473.32	271.42391	0
11	Optimized	201.45	-12.5	1002.8556	1467.3333	268.16637	0
12	Optimized	202.7	-12.5	1001.1875	1451.25	259.84371	0
13	Optimized	205.5	-12.5	994.35	1415.375	243.0789	0
14	Optimized	208.85835	-12.5	980.94466	1339.6195	207.08099	0
15	Optimized	211.575	-12.5	967.43546	1239.0551	156.81965	0
16	Optimized	214.29165	-12.5	952.26982	1138.3434	107.42964	0
17	Optimized	217.00835	-12.5	935.88946	1037.4845	58.655947	0
18	Optimized	219.725	-12.5	918.47841	936.47841	10.392304	0
19	Optimized	222.44165	-12.5	900.07351	835.28824	-37.403792	0
20	Optimized	224.55	-12.5	885.26667	762.26667	-71.014083	0
21	Optimized	226.6125	-12.5	870.3619	714.66667	-89.890688	0
22	Optimized	229.2375	-12.5	850.78095	664.0381	-107.81604	0
23	Optimized	231.8625	-12.5	830.59048	613.25714	-125.47746	0
24	Optimized	234.4875	-12.5	810.01905	562.28571	-143.02891	0
25	Optimized	237.26	-12.5	788.08219	547.5	-138.90019	0
26	Optimized	240.18	-12.5	764.93151	548.80137	-124.78279	0
27	Optimized	243.1	-12.5	741.91781	550.06849	-110.76425	0
28	Optimized	246.02	-12.5	719.10959	551.36986	-96.844576	0
29	Optimized	248.94	-12.5	696.4726	552.60274	-83.063304	0
30	Optimized	251.86	-12.5	673.93836	553.86986	-69.321577	0
31	Optimized	254.78	-12.5	651.5411	555.10274	-55.678711	0
32	Optimized	257.7	-12.5	629.21233	556.36986	-42.055617	0
33	Optimized	260.62	-12.5	606.91781	557.60274	-28.472068	0
34	Optimized	263.54	-12.5	584.65753	558.83562	-14.908291	0
35	Optimized	265.35705	-12.25	555.18757	550.51866	-2.6955977	0
36	Optimized	267.14225	-11	450.97442	601.93972	0	150
37	Optimized	269.99855	-9	283.35533	401.27403	0	150
38	Optimized	272.28355	-7.4	98.349247	782.31052	0	600

Slices of Slip Surface: 16708

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	16708	186.2504	-2.872426	637.30199	310.34677	0	450
2	16708	189.03035	-4.818983	702.10284	585.91445	0	450
3	16708	190.4585	-5.818983	739.92359	721.24449	0	450
4	16708	192.0975	-6.966632	808.23772	1029.9527	0	229.69
5	16708	194.8585	-8.899896	937.11903	1188.0578	0	245.52
6	16708	197.6195	-10.833159	1057.0997	1342.4246	0	261.35
7	16708	199.14295	-11.899895	1144.7031	1426.7821	0	270.09
8	16708	199.64295	-12.25	1167.4575	1523.5337	205.58072	0
9	16708	200.25	-12.5	1035.18	1344	178.29731	0
10	16708	200.75	-12.5	1003.2	1473.32	271.42391	0
11	16708	201.45	-12.5	1002.8556	1467.3333	268.16637	0
12	16708	202.7	-12.5	1001.1875	1451.25	259.84371	0
13	16708	205.5	-12.5	994.35	1415.375	243.0789	0
14	16708	208.85835	-12.5	980.94466	1339.6195	207.08099	0
15	16708	211.575	-12.5	967.43546	1239.0551	156.81965	0
16	16708	214.29165	-12.5	952.26982	1138.3434	107.42964	0
17	16708	217.00835	-12.5	935.88946	1037.4845	58.655947	0
18	16708	219.725	-12.5	918.47841	936.47841	10.392304	0
19	16708	222.44165	-12.5	900.07351	835.28824	-37.403792	0
20	16708	224.55	-12.5	885.26667	762.26667	-71.014083	0
21	16708	226.6125	-12.5	870.3619	714.66667	-89.890688	0
22	16708	229.2375	-12.5	850.78095	664.0381	-107.81604	0
23	16708	231.8625	-12.5	830.59048	613.25714	-125.47746	0
24	16708	234.4875	-12.5	810.01905	562.28571	-143.02891	0
25	16708	237.26	-12.5	788.08219	547.5	-138.90019	0
26	16708	240.18	-12.5	764.93151	548.80137	-124.78279	0
27	16708	243.1	-12.5	741.91781	550.06849	-110.76425	0
28	16708	246.02	-12.5	719.10959	551.36986	-96.844576	0
29	16708	248.94	-12.5	696.4726	552.60274	-83.063304	0
30	16708	251.86	-12.5	673.93836	553.86986	-69.321577	0
31	16708	254.78	-12.5	651.5411	555.10274	-55.678711	0
32	16708	257.7	-12.5	629.21233	556.36986	-42.055617	0

33	16708	260.62	-12.5	606.91781	557.60274	-28.472068	0
34	16708	263.54	-12.5	584.65753	558.83562	-14.908291	0
35	16708	265.35705	-12.25	555.18757	550.51866	-2.6955977	0
36	16708	267.14225	-11	450.97442	601.93972	0	150
37	16708	269.99855	-9	283.35533	401.27403	0	150
38	16708	272.28355	-7.4	98.349247	782.31052	0	600





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=CANAL WATER LEVEL

LONDON AVE CANAL
OUTFALL CANAL REEVALUATION REPORT
REACH 35B, STA. 103+50 TO 114+66
PROTECTED SIDE STABILITY ANALYSIS
OPEN CONNECTION
CASE: GAP Stability (Entry/Exit) (2)
MARCH 2012

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

GAP Stability (Entry/Exit) (2)

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File Information

Revision Number: 55
Last Edited By: Haggerty, Daniel R MVN
Date: 2/15/2012
Time: 10:38:40 AM
File Name: Reach 35B.gsz
Last Solved Date: 2/15/2012
Last Solved Time: 10:40:02 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

GAP Stability (Entry/Exit) (2)
Kind: SLOPE/W
Parent: Steady-State Seepage
Method: Spencer
Settings
PWP Conditions Source: Parent Analysis
SlipSurface
Direction of movement: Left to Right
Use Passive Mode: Yes
Slip Surface Option: Entry and Exit
Critical slip surfaces saved: 1
Optimize Critical Slip Surface Location: Yes
Tension Crack
Tension Crack Option: (none)
FOS Distribution
FOS Calculation Option: Constant
Advanced
Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft

Sheet Pile

Model: Undrained (Phi=0)
Unit Weight: 0.1 pcf
Cohesion: 0.01 psf

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (195, -21.5) ft
Left-Zone Right Coordinate: (200, 2.4) ft
Left-Zone Increment: 30
Right Projection: Range
Right-Zone Left Coordinate: (210, 0.57178) ft
Right-Zone Right Coordinate: (280, -6.8) ft
Right-Zone Increment: 25
Radius Increments: 20

Slip Surface Limits

Left Coordinate: (110, -21.5) ft
Right Coordinate: (310, -6.8) ft

Cohesion Functions

Fill -4 to -8
Model: Spline Data Point Function
Function: Cohesion vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 600
Data Points: X (ft), Cohesion (psf)
Data Point: (110, 600)
Data Point: (178.1, 600)
Data Point: (178.3, 450)
Data Point: (200, 450)
Data Point: (235.7, 450)
Data Point: (235.9, 600)
Data Point: (310, 600)

Marsh -8 to -12

Model: Spline Data Point Function
Function: Cohesion vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 150

Optimization Maximum Iterations: 5000
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+2.6 to -4

Model: Mohr-Coulomb
Unit Weight: 110 pcf
Cohesion: 450 psf
Phi: 0 °
Phi-B: 0 °

Fill: EL -4 to -8

Model: Spatial Mohr-Coulomb
Weight Fn: Fill -4 to -8
Cohesion Fn: Fill -4 to -8
Phi: 0 °
Phi-B: 0 °

Marsh: EL -6 to -12

Model: Spatial Mohr-Coulomb
Weight Fn: Marsh -8 to -12
Cohesion Fn: Marsh -8 to -12
Phi: 0 °
Phi-B: 0 °

Beach Sand: EL-12 to -40

Model: Mohr-Coulomb
Unit Weight: 122 pcf
Cohesion: 0 psf
Phi: 30 °
Phi-B: 0 °

Bay Sound Clay: EL-40 to -70

Model: Spatial Mohr-Coulomb
Weight Fn: Bay Sound Clay
Cohesion Spatial Fn: Bay Sound Clay
Phi: 0 °
Phi-B: 0 °

Data Points: X (ft), Cohesion (psf)
Data Point: (110, 150)
Data Point: (178.2, 150)
Data Point: (200, 275)
Data Point: (235.8, 150)
Data Point: (310, 150)

Unit Weight Functions

Fill -4 to -8

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 96

Data Points: X (ft), Unit Weight (pcf)
Data Point: (110, 96)
Data Point: (178.1, 96)
Data Point: (178.3, 88)
Data Point: (200, 88)
Data Point: (235.7, 88)
Data Point: (235.9, 96)
Data Point: (310, 96)

Marsh -8 to -12

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 96

Data Points: X (ft), Unit Weight (pcf)
Data Point: (110, 96)
Data Point: (178.2, 96)
Data Point: (200, 88)
Data Point: (235.8, 96)
Data Point: (310, 96)

Bay Sound Clay

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 107

Data Points: X (ft), Unit Weight (pcf)
Data Point: (110, 107)
Data Point: (178.2, 107)

Data Point: (200, 108)
Data Point: (235.8, 107)
Data Point: (310, 107)

Spatial Functions

Bay Sound Clay

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (110, -40, 400)
Data Point: (110, -70, 700)
Data Point: (178.2, -40, 400)
Data Point: (178.2, -70, 700)
Data Point: (200, -40, 600)
Data Point: (200, -70, 900)
Data Point: (235.8, -40, 400)
Data Point: (235.8, -70, 700)
Data Point: (310, -40, 400)
Data Point: (310, -70, 700)

Regions

	Material	Points	Area (ft²)
Region 1	Bay Sound Clay: EL-40 to -70	1,3,4,2	6000
Region 2	Beach Sand: EL-12 to -40	3,9,7,14,15,5,6,4	3782.9
Region 3		9,10,11,12,13,14,7	279.66
Region 4		13,18,20,14	79.2
Region 5	Beach Sand: EL-12 to -40	14,20,22,19,21,6,5,15	962.1
Region 6		10,16,17,23,18,13,12,11	446.445
Region 7		23,32,31,27,24,20,18	158.45
Region 8	Marsh: EL -6 to -12	20,24,27,31,30,25,26,21,19,22	479.3
Region 9		32,33,37,35,31	40.6
Region 10	Fill: EL -4 to -8	31,35,38,36,34,28,29,26,25,30	175.24
Region 11		37,41,46,45,43,35	87.07
Region 12	Embankment Fill: EL+2.6 to -4	43,44,42,40,39,36,38,35	87.9045
Region 13	Sheet Pile	43,45,47,48,44	8.025

Points

	X (ft)	Y (ft)
Point 1	110	-70
Point 2	310	-70
Point 3	110	-40
Point 4	310	-40
Point 5	235.9	-22
Point 6	310	-22
Point 7	200	-21.5
Point 8	203.5	-21.5
Point 9	110	-21.5
Point 10	110	-20.9
Point 11	147.6	-20.3
Point 12	167.2	-18.4
Point 13	172.8	-15
Point 14	200	-15
Point 15	203.5	-15
Point 16	110	-13.2
Point 17	159.5	-12.8
Point 18	174.4	-12
Point 19	235.8	-12
Point 20	200	-12
Point 21	310	-12
Point 22	203.5	-12
Point 23	169.3	-11.5
Point 24	200	-10
Point 25	235.8	-8
Point 26	310	-8
Point 27	200	-7
Point 28	235.8	-6.8
Point 29	310	-6.8
Point 30	203.5	-6
Point 31	200	-6
Point 32	178.2	-6
Point 33	178.8	-5.6

Point 34	225.3	-4.5
Point 35	200	-4
Point 36	223.8	-4
Point 37	181.2	-4
Point 38	203.5	-4
Point 39	207.5	1.4
Point 40	203.5	1.89
Point 41	190.2	1.9
Point 42	201.9	2.09
Point 43	200	2.2
Point 44	201	2.2
Point 45	200	2.4
Point 46	199	2.4
Point 47	200	12.9
Point 48	200.5	12.9

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	0.40	(222.779, 38.217)	53.43806	(200, 12.9)	(251.573, -6.8)
2	9603	0.40	(222.779, 38.217)	53.438	(200, 12.9)	(251.573, -6.8)

Slices of Slip Surface: Optimized

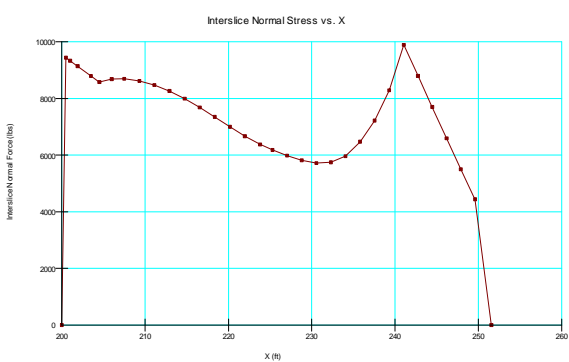
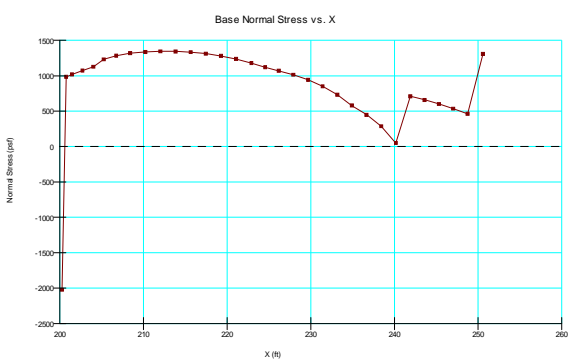
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	200.25	-10.239565	902.32627	-2022.1365	0	274.13
2	Optimized	200.75	-10.468915	870.11725	984.00217	0	272.38
3	Optimized	201.45	-10.777925	890.10529	1018.867	0	269.94
4	Optimized	202.7	-11.298225	923.00047	1073.0691	0	265.57
5	Optimized	204.00275	-11.811315	954.56416	1126.5384	0	261.02
6	Optimized	205.25415	-12.259905	979.92946	1231.8681	145.45682	0
7	Optimized	206.7514	-12.7552	1005.854	1283.5837	160.34728	0
8	Optimized	208.40555	-13.243515	1029.7661	1319.2216	167.11723	0
9	Optimized	210.21665	-13.715485	1050.8532	1335.8249	164.52848	0
10	Optimized	212.02775	-14.12054	1066.6733	1343.8072	160.00331	0

11	Optimized	213.83885	-14.46023	1077.7319	1342.8372	153.05861	0
12	Optimized	215.65	-14.735815	1084.4078	1332.4585	143.21214	0
13	Optimized	217.46115	-14.948295	1086.6155	1311.8721	130.05192	0
14	Optimized	219.27225	-15.09842	1084.3934	1280.3136	113.11462	0
15	Optimized	221.08335	-15.186715	1077.9113	1236.4633	91.540081	0
16	Optimized	222.89445	-15.2135	1067.1879	1178.7766	64.425776	0
17	Optimized	224.55	-15.18666	1053.8204	1119.8507	38.12264	0
18	Optimized	226.175	-15.106045	1037.0985	1069.5471	18.734171	0
19	Optimized	227.925	-14.965635	1015.3711	1013.8922	-0.85378913	0
20	Optimized	229.675	-14.76707	989.70853	942.16671	-27.448283	0
21	Optimized	231.425	-14.50969	960.09076	850.35644	-63.355142	0
22	Optimized	233.175	-14.192625	926.57362	732.58225	-112.00097	0
23	Optimized	234.925	-13.81479	889.06721	579.5603	-178.69389	0
24	Optimized	236.67525	-13.37477	847.58805	447.51833	-230.98036	0
25	Optimized	238.42575	-12.87093	802.11582	286.27642	-297.82002	0
26	Optimized	240.1763	-12.301425	752.50511	49.92557	-405.63449	0
27	Optimized	241.9069	-11.67206	691.47113	708.39219	0	150
28	Optimized	243.6175	-10.98184	618.81974	658.00735	0	150
29	Optimized	245.3281	-10.22139	541.36787	600.56591	0	150
30	Optimized	247.0387	-9.3873365	458.91137	535.64313	0	150
31	Optimized	248.7493	-8.475727	371.43016	462.8317	0	150
32	Optimized	250.58875	-7.4	160.45242	1307.7291	0	600

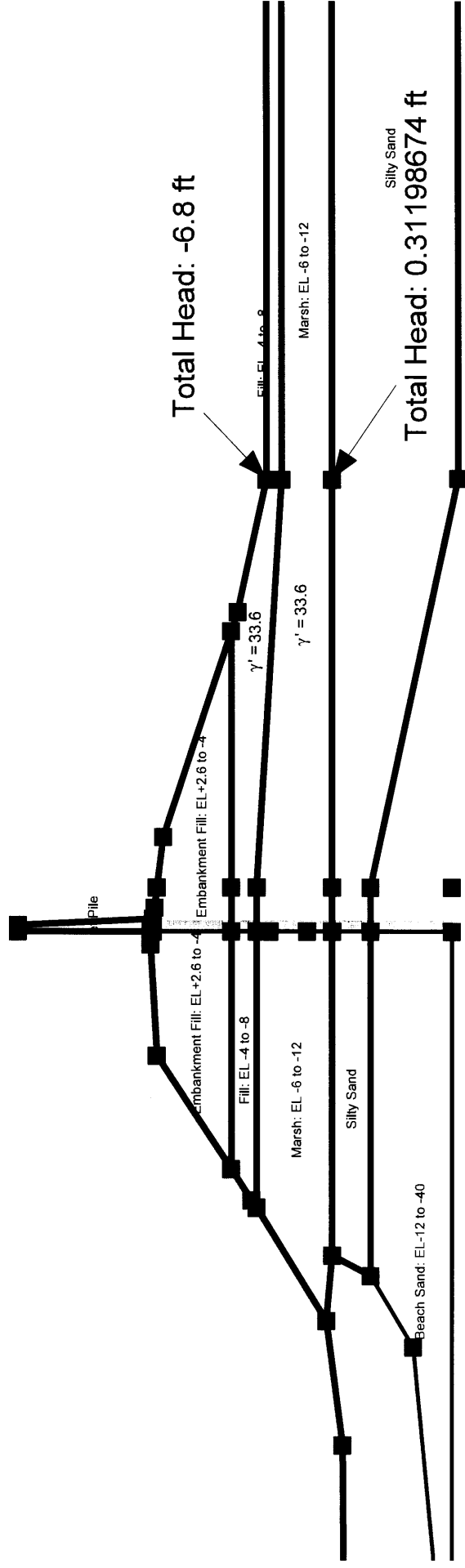
Slices of Slip Surface: 9603

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	9603	200.25	-10.239565	902.32627	-2022.1365	0	274.13
2	9603	200.75	-10.468915	870.11725	984.00217	0	272.38
3	9603	201.45	-10.777925	890.10529	1018.867	0	269.94
4	9603	202.7	-11.298225	923.00047	1073.0691	0	265.57
5	9603	204.00275	-11.811315	954.56416	1126.5384	0	261.02
6	9603	205.25415	-12.259905	979.92946	1231.8681	145.45682	0
7	9603	206.7514	-12.7552	1005.854	1283.5837	160.34728	0
8	9603	208.40555	-13.243515	1029.7661	1319.2216	167.11723	0

9	9603	210.21665	-13.715485	1050.8532	1335.8249	164.52848	0
10	9603	212.02775	-14.12054	1066.6733	1343.8072	160.00331	0
11	9603	213.83885	-14.46023	1077.7319	1342.8372	153.05861	0
12	9603	215.65	-14.735815	1084.4078	1332.4585	143.21214	0
13	9603	217.46115	-14.948295	1086.6155	1311.8721	130.05192	0
14	9603	219.27225	-15.09842	1084.3934	1280.3136	113.11462	0
15	9603	221.08335	-15.186715	1077.9113	1236.4633	91.540081	0
16	9603	222.89445	-15.2135	1067.1879	1178.7766	64.425776	0
17	9603	224.55	-15.18666	1053.8204	1119.8507	38.12264	0
18	9603	226.175	-15.106045	1037.0985	1069.5471	18.734171	0
19	9603	227.925	-14.965635	1015.3711	1013.8922	-0.85378913	0
20	9603	229.675	-14.76707	989.70853	942.16671	-27.448283	0
21	9603	231.425	-14.50969	960.09076	850.35644	-63.355142	0
22	9603	233.175	-14.192625	926.57362	732.58225	-112.00097	0
23	9603	234.925	-13.81479	889.06721	579.5603	-178.69389	0
24	9603	236.67525	-13.37477	847.58805	447.51833	-230.98036	0
25	9603	238.42575	-12.87093	802.11582	286.27642	-297.82002	0
26	9603	240.1763	-12.301425	752.50511	49.92557	-405.63449	0
27	9603	241.9069	-11.67206	691.47113	708.39219	0	150
28	9603	243.6175	-10.98184	618.81974	658.00735	0	150
29	9603	245.3281	-10.22139	541.36787	600.56591	0	150
30	9603	247.0387	-9.3873365	458.91137	535.64313	0	150
31	9603	248.7493	-8.475727	371.43016	462.8317	0	150
32	9603	250.58875	-7.4	160.45242	1307.7291	0	600



REACH 35B



Beach Sand: EL-12 to -40

$$FS_{SEEPAGE} = \frac{5.2'(33.6 \text{ pcf})}{(0.31' - 0.8') \times 62.4 \text{ pcf}} = \boxed{0.39}$$

APPENDIX I SCOUR REPORT

Memo¹

To : Dan Bradley
From : Maartje Wise, Tjeerd Driessen
Date : 5 October 2011

Subject : Hydrodynamic changes in London Avenue Canal due to the PPS and the effects on scour - DRAFT

1. Background

After hurricane Katrina, three Interim Control Structures (ICS) were constructed at the lakeside of London Avenue Canal, Orleans Avenue Canal and 17th Street Canal to prevent a storm surge from entering. These structures encompass pumps and gates to close off the connection with Lake Pontchartrain in storm situations, while drainage water can be pumped into the lake. The canals have always been used for urban drainage of the city of New Orleans. In the near future, the ICS will be replaced by Permanent Pumping Stations (PPS) which have a larger pumping capacity than the current ICS.

This memo describes the impact of this replacement on the hydraulics and morphology of London Avenue Canal (see figure 1). It explains how the velocities in the London Avenue Canal change dependent on different operation strategies before the ICS (pre-Katrina) and with the future PPS. Finally, it addresses how this influences the potential for scour in the canal.



Figure 1: London Avenue Canal with the ICS in the front and the New Orleans skyline in the back.

¹ This message is not intended to provide construction, engineering or architectural advice. If such advice is required, it should be obtained in the form of complete plans and drawings. Unless complete drawings and plans are prepared and contracted for that enable construction, Haskoning Inc. does not guarantee the accuracy, completeness, efficacy, timeliness or correct sequencing of any information contained herein.

2. Context

The presence of the ICS and the future PPS influences the hydrodynamics in the canal in open as well as closed situations. During normal weather conditions, the gates are open, but the cross-sectional area at these structures is strongly reduced compared to the reference situation (pre-katrina) when no structure was present. During certain storm conditions, the ICS or PPS gates are closed to prevent intrusion of storm surge into the outfall canal. In this case, the hydrodynamics also change, as the water levels and velocities in the outfall canal are regulated by the pumping strategy of the ICS or PPS.

Scour may pose a serious threat to the canal. At many locations, the geological profile along the canal consists of a thick layer (>20 ft) of (silty) beach sand with shell fragments. This layer is covered by marsh deposits that consist predominantly of fat and organic clays. In the thalweg of the canal, this marsh layer is thin (0 - 3 ft) and may be covered by silty sand deposits (see figure 2).

If scour would occur, this may locally erode the clay layer completely which could cause seepage along the canal. To prevent this phenomenon, the USACE has constructed cut-off sheet piles along the canal for sections where the clay layer is 2ft or less. Besides scour in the thalweg, erosion of the banks of the floodwalls may take place, which may jeopardize the stability of the flood walls.

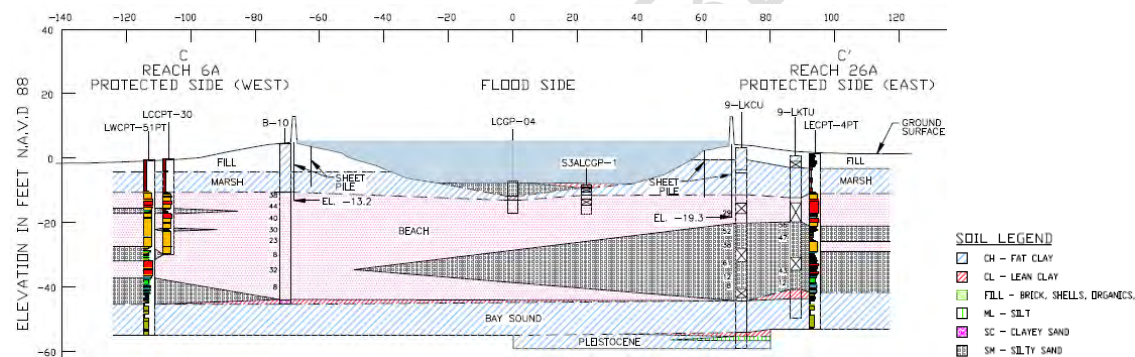


Figure 2: A cross-sectional profile of London Avenue Canal

The question that is addressed in this memo is how the velocities in the London Avenue Canal change between the situation before the ICS (pre-Katrina) and with the future PPS in place and how this influences the potential for scour in the canal.

A hydrodynamic model is used to assess these velocities in the London Avenue Canal.

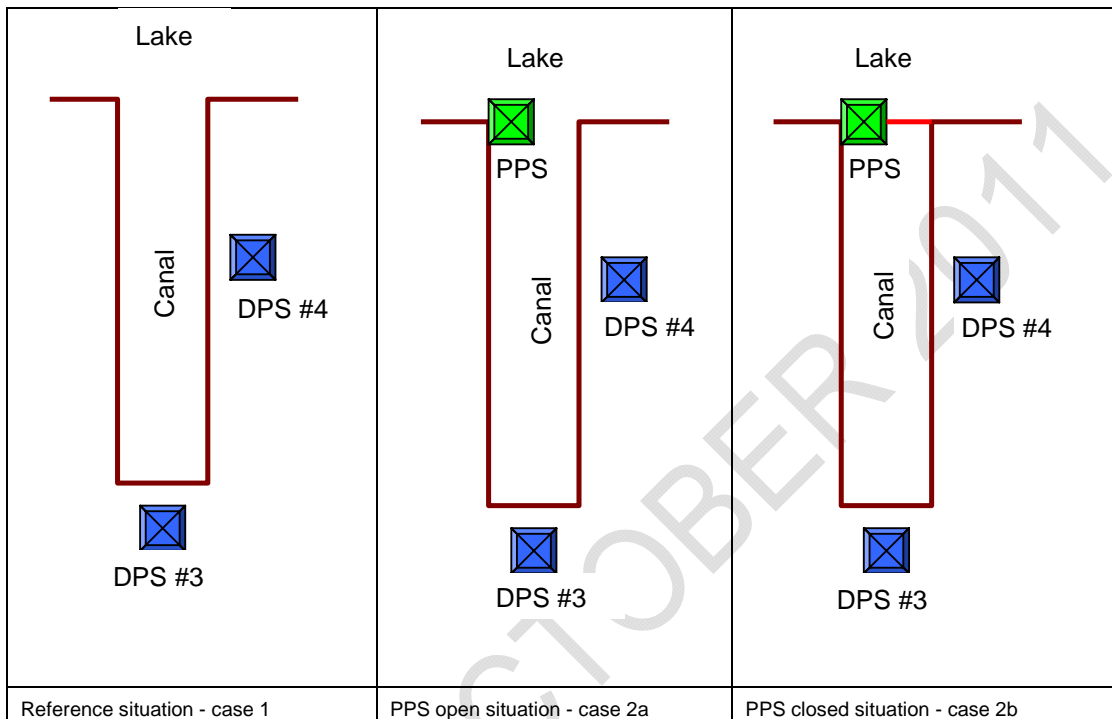
3. Hydrodynamic model

3.1. Model schematizations

The hydrodynamics of London Avenue Canal are simulated in one dimension by HEC-RAS software using schematizations that were provided by the USACE New Orleans District. The provided schematizations include the two pump stations DPS #3 and DPS #4. DPS #3 is located at the upstream side of the canal about 15,300 ft from the lake. DPS #4 is located halfway on a distance of about 5,900 ft from the lake.

Case 1: Reference Situation

For the reference situation the ICS schematization is used as starting point. In this schematization the ICS inline structure was removed as well as the 10 cross-sections that were needed to model the ICS accordingly. The obtained schematization is used for Case 1: The Reference situation. The lake level is used as downstream boundary condition (see table 1).



Case 2a: PPS open situation

The different PPS situations are translated into two schematizations. The first schematization (#2a in table 1) contains the PPS with open gates and, thus, the lake level can be used as downstream boundary condition.

Case 2b: PPS closed situation

Additionally, a PPS schematization is modeled for situations when the PPS gates are closed. It is assumed that the PPS pumping rate is regulated in order to maintain a certain water level at the intake side of the PPS. Hence, a fixed water level boundary can be used depending on the operating strategy of the PPS. The downstream boundary of this schematization is set just upstream of the PPS location which is 1,573 ft from the lake. All schematization components downstream of this location are removed.

The presence of larger cross-sections near the former ICS location is explained in technical appendix A as well as other technical details of the hydraulic modeling.

Table 1: Five different schematizations of the London Avenue Canal

#	Situation	Downstream boundary	PPS gates
Case 1	Reference	Lake level	n/a
Case 2a	PPS open	Lake level	Open
Case 2b	PPS closed	PPS level	Closed

3.2 Hydrodynamic modeling with schematized pump stations

First, model runs are performed where DPS #3 and #4 are schematized with the use of the pump curves. The flow in the canal is calculated based on the pump logs and the initial water elevations near the inlets of the two pump stations. The initial elevation of DPS #3 and DPS #4 is respectively set to NAVD88 -8.7 ft and NAVD88 -9.2 ft.

In figure 3 the longitudinal profile of the velocities are shown for the reference and PPS situation. In the PPS situation it is assumed that the PPS gates are closed. Also, the minimum canal depth of the canal is given for both reference and PPS situation. The effect of the (shallow) ICS cross-sections in the PPS schematization on the velocities shows between 2,500 and 3,000 ft on the x-axis of Figure 3. Because these cross-sections have a larger cross-sectional area than the surrounding cross-sections, the velocities are relatively lower in the PPS situation than in the reference situation. The addition of flow at DPS #4 can clearly be seen in the figure, since the increase in discharge is not compensated by larger cross-sectional flow area and therefore creates larger velocities downstream of DPS #4.

The velocity profile of the PPS situation with a fixed water level at the PPS intake side shows higher velocities than the velocity profile of the reference situation with a similar fixed water level at the lake. This is caused by the downstream boundary in the PPS situation, which is located more upstream and shortens the length of the canal. This causes the water level gradient to become steeper and as a result the velocities will be higher.

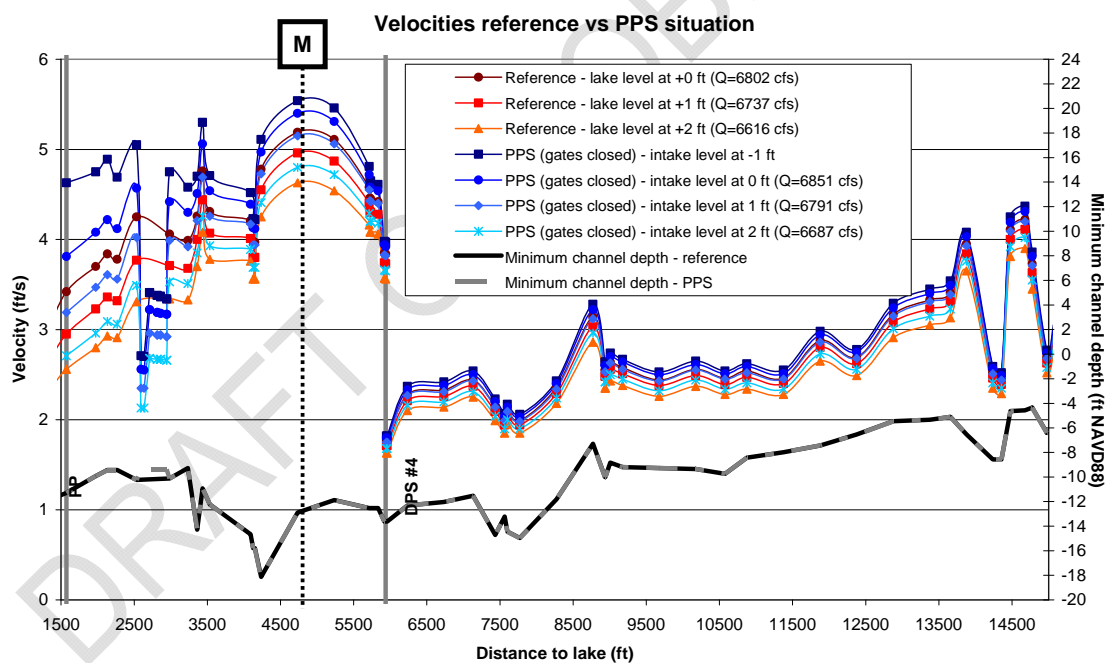


Figure 3: Longitudinal profile of the velocities in the London Avenue Canal in the reference and PPS situation
The highest velocities can be expected at the location approximately 4,733 ft from the lake. Therefore, this designated location M, referring to maximum canal velocities, will be investigated in more detail. The next paragraph will show the modeled velocities for different PPS and reference situations for this location.

3.3. Hydrodynamic modeling at location M

For the assigned location “M” different model runs were performed to obtain a good overview of the changes in velocities during different flow conditions. Therefore, the pump stations are schematized as fixed lateral inflow stations. The canal flow is defined by upstream inflow and lateral inflow. To investigate flow velocities nine total flow scenarios are modeled (1,000 cfs with increments of 1000 cfs up to 9,000 cfs). A fixed ratio of 60%-40% is used to divide the total discharge for each scenario between the two pump stations. This is not valid for the 8,000 and 9,000 cfs model runs, since they fixate the maximum pump capacity of DPS #3 at 4,260 cfs, but account for the future added pump capacity at DPS #4. Future name plate drainage pump capacity of London Avenue Canal is expected to be 8,980 cfs. The future PPS is expected to have a name plate pump capacity of 9,000 cfs. In table 2 an overview of the different flow scenarios is shown.

Table 2: Overview of different flow scenarios for the upstream boundary conditions

Q_{total} (cfs)	1,000	2,000	3,000	4,000	5,000	6,000	7,000	8,000	9,000
Q_{DPS #3} (cfs)	600	1,200	1,800	2,400	3,000	3,600	4,200	4,260	4,260
Q_{DPS #4} (cfs)	400	800	1,200	1,600	2,000	2,400	2,800	3,740	4,740

The three different cases are modeled; the reference situation, the PPS situation with open gates and the PPS situation with closed gates. In table 3, the different downstream boundary conditions are given for the three situations. With 15 different downstream boundary conditions and schematizations and 9 different canal flows, a total of 135 model runs were developed.

Table 3: Overview of the downstream boundary conditions

Boundary condition →	Lake water level	PPS intake
Model situation ↓		
Reference	NAVD88 -1 ft	
Case 1	NAVD88 +0 ft	
	NAVD88 +1 ft	
	NAVD88 +2 ft	
	NAVD88 +3 ft	
	NAVD88 +4 ft	
PPS with gates open	NAVD88 -1 ft	
Case 2a	NAVD88 +0 ft	
	NAVD88 +1 ft	
	NAVD88 +2 ft	
	NAVD88 +3 ft	
PPS with gates closed		NAVD88 -1 ft
Case 2b		NAVD88 +0 ft
		NAVD88 +1 ft
		NAVD88 +2 ft

Table 4 shows the velocities at location M of the 135 model runs. Generally, for the same discharge the velocity increases with decreasing water level applied as downstream boundary conditions. This is logical, since the velocity is proportional to the gradient of the water profile. The exception to this generalization is explained in the technical appendix A.

When the case 1 and 2a are compared, the main difference in schematization is the presence of the PPS (see figure 4). The presence of this structure decreases the flow area and creates a backwater effect which was not present in the reference situation. As a result, the water levels

are higher and the velocities are lower for the PPS case with open gates compared to the reference situation. For location M this effect is small and can be seen in figures A-1 and A-2 (see Technical Appendix A) which show the velocity relative to the discharge for different downstream boundary water levels.

Table 4: Velocities at location M for the 135 model runs [ft/sec]

		DPS3	600	1200	1800	2400	3000	3600	4200	4260	4260
		DPS4	400	800	1200	1600	2000	2400	2800	3740	4740
		Q_Total	1000	2000	3000	4000	5000	6000	7000	8000	9000
REF	Case 1	lake at -1	1.24	2.31	3.17	3.86	4.41	4.85	5.18	5.4	5.63
		lake at 0	1.08	2.06	2.92	3.63	4.23	4.74	5.16	5.4	5.63
		lake at 1	0.95	1.84	2.66	3.37	4	4.54	5.01	5.34	5.63
		lake at 2	0.84	1.66	2.41	3.11	3.73	4.29	4.74	5.15	5.46
		lake at 3	0.76	1.49	2.2	2.85	3.45	3.99	4.45	4.85	5.21
		lake at 4	0.68	1.35	1.99	2.6	3.17	3.69	4.16	4.58	4.95
PPS	Case 2a (open PPS)	lake at -1	1.23	2.31	3.19	3.87	4.41	4.83	5.13	5.33	5.49
		lake at 0	1.07	2.06	2.91	3.63	4.22	4.71	5.11	5.33	5.49
		lake at 1	0.94	1.84	2.65	3.36	3.97	4.49	4.95	5.26	5.49
		lake at 2	0.84	1.65	2.4	3.09	3.71	4.24	4.67	5.03	5.31
		lake at 3	0.75	1.49	2.18	2.83	3.41	3.92	4.36	4.75	5.08
	Case 2b (closed PPS)	PPS at -1	1.24	2.36	3.29	4.03	4.65	5.17	5.63	6.03	6.4
		PPS at 0	1.08	2.09	2.99	3.76	4.42	4.98	5.47	5.91	6.3
		PPS at 1	0.95	1.86	2.7	3.46	4.13	4.73	5.26	5.73	6.14
		PPS at 2	0.84	1.66	2.44	3.17	3.83	4.44	4.98	5.41	5.83

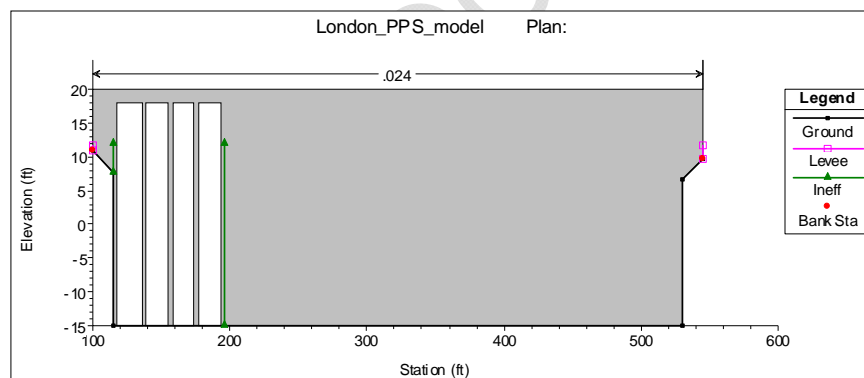


Figure 4: Schematization of the PPS in HEC-RAS

Table 4 can also be presented as iso-surface plots (see figures 5, 6 and 7). This allows one to relate the downstream water level to a velocity in the canal, depended on the discharge. E.g. For a lake level of NAVD88 +1 ft and a total flow of 5,000 cfs, for the reference situation one finds the velocity to be exactly on the isoline between the [3.5-4 fps] and [4-4.5 fps] bins (see figure 5). This means that at location M the velocity is approximately 4 fps with those boundary conditions. For the PPS situation with open gates that has the same boundary conditions one finds a velocity just below 4 fps (see figure 6). Finally for the PPS closed case with an intake water level of +1 ft and a flow of 5,000 cfs the velocity at location M is between 4 and 4.5 fps (see figure 7).

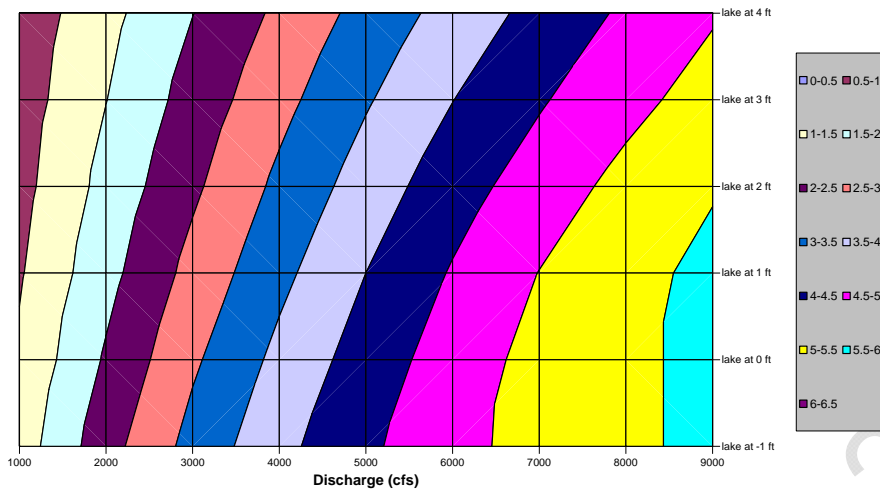


Figure 5: Velocity iso-surface plot at location M for different discharges and lake levels in reference situation (case 1)

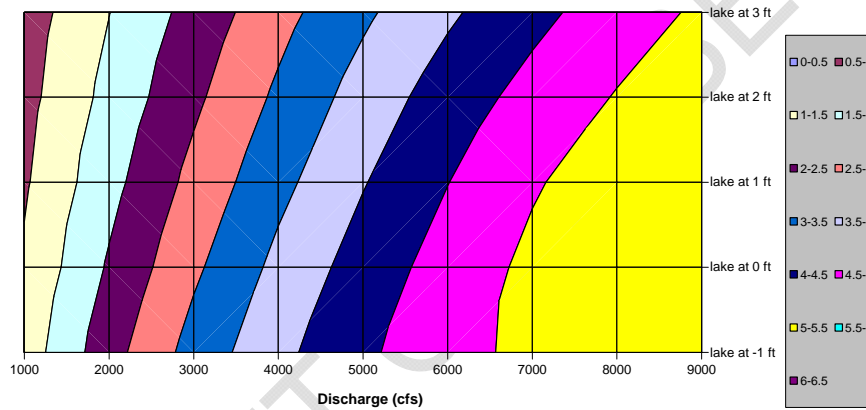


Figure 6: Velocity iso-surface plot at location M for different discharges and lake levels with open PPS gates (case 2a)

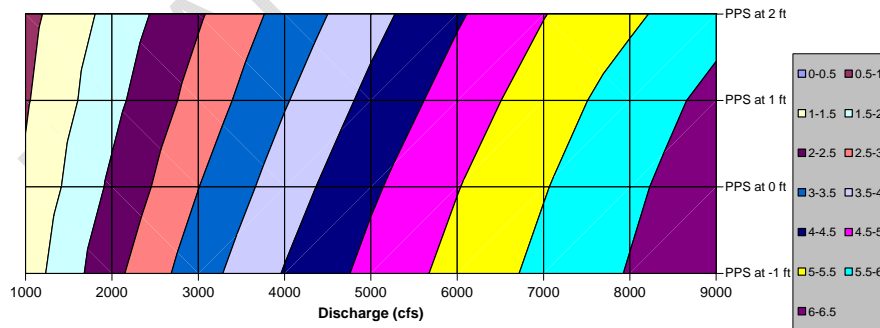


Figure 7: Velocity iso-surface plot at location M for different discharges and lake levels with closed PPS gates (case 2b)

4. Erosion assessment

There is no historical record of the thickness of the fat clay layer in London Avenue Canal which makes it difficult to indicate the amount of scour that has occurred in the past. Consolidated clay may tolerate 3 to 5 ft/s for several hours. However, at some locations in the channel this clay layer is not present and (silty) beach sands are present at the channel bottom's surface. At the specified location (4,733 ft distance from the lake) a part of the bottom still has some fat clay. Another part has no fat clay, but solely (silty) beach sand. The rate of consolidation of the surface mud is unknown, but may be important to derive the critical velocity. The critical velocity of this material is estimated to be circa 2 ft/s.

Figure 3 shows that in the reference situation, velocities could go up as high as 5.5 ft/s for extreme situations. The PPS operation of the London Avenue Canal has a significant impact on the velocities in the canal. Maintaining a water level of -1 or +2 ft may make a difference of 1 ft/s in velocity. As the velocities are already high (especially downstream of DPS #4) there is potential for erosion.

In the assessment below every comparison with case 2b (PPS with closed gates) assumes that a similar lake level (case 1 or 2a) as the fixed water level at the pump intake of the PPS (case 2b) is used. Figure 3 furthermore shows that in the PPS situation (case 2a and 2b) velocities drop at the former ICS location. This is caused by the relative large cross-sectional area. It is expected that sedimentation may occur in this area.

When the PPS is not pumping and the gates are open (case 2a), the backwater effect will cause lower velocities in the canal relative to the reference situation (case 1). The river length over which this lower velocity occurs as well as the magnitude of this velocity difference is strongly dependent on the present lake level and discharge. In open situations, sedimentation could be expected upstream of the PPS compared to the reference situation. This is not the case near the PPS. Due to the smaller cross-sectional area, the flow near the structure is constricted and higher velocities will occur here. This section is sensitive to erosion.

When the PPS gates are closed (case 2b) and the PPS is operated by maintaining a fixed water level at the pump intake, velocities are likely to be higher compared to the reference with similar lake levels. It should be noted that these increased velocities are dependent on the fixed water level that is maintained at the PPS intake (according with operation procedures).

5. Conclusions and Recommendations

This memo has indicated that the flow velocities in London Avenue Canal are directly proportional to the operation of the PPS. If the PPS maintains a low water level at the water inlet, the velocity in the canal will be high and scour may occur. Hence, there is a trade-off to be made in the operation strategy. When the pump intake level is high, morphological effects are reduced velocities are lower. On the other hand, water levels should not become too high with regard to floodwall overtopping (see figures 5, 6 and 7).

The high velocities downstream of DPS #4 relative to the velocities in the upstream reach are caused because the discharge is almost doubled, but the cross-sectional area remains more or less the same. Reduction of the flow velocity in order to reduce scour potential can be achieved by increasing the cross-sectional area in the reach downstream of DPS #4.

It should be taken into account that high velocities are not occurring frequently and if they occur that the duration will not be long. At this stage it is recommended to monitor the canal yearly after gate closure. In case scour would occur, it is recommended to apply bed protection such as tout venant materials. Tout-venant is unsorted material ranging from very fine to very coarse and offers bed protection up to velocities of 4-6 ft/s.

DRAFT OCTOBER 2011

Technical appendix A

Technical background information of the hydraulic models is summarized as follows:

- The upstream boundaries are located at 15,300 ft from the lake (DPS #3) and 5,833 ft from the lake (DPS #4). Downstream boundaries are used at -4,340 ft from the lake shore (case 1 and 2a) and by using the PPS intake level at 1,573 ft from lake (case 2b).
- In the model runs of paragraph 3.2 DPS #3 and #4 are schematized explicitly using the observed pump logs (discharge - differential head relationship). These model runs were unsteady calculations.
- The model runs in paragraph 3.3 did not include the HEC-RAS pump structures in the schematization, but used upstream inflow (15,300 ft from the lake) and lateral inflow (5,833 ft from the lake) to account for DPS #3 and #4 respectively. These model runs were steady calculations with a mixed regime to enable the possibility of supercritical flow.
- In both PPS schematizations (case 2a and 2b) the ICS inline structure is removed. However, the ten cross-sections that were needed for the ICS, are remained in the schematization, since it would be logical that the concrete reinforced canal bottom will remain at its place after removal of the ICS. The minimum depth of these cross-sections is shallower, but the cross-sectional area is relatively larger.
- In table 4 some exceptions are presented for the reference situation and the PPS situation with open gates when the flow is 8,000 or 9,000 cfs and the lake level is relatively low. In these exceptional situations, the water level gradient is relatively steep and relative high velocities (9.5 to 10 ft/s) are modeled at the Lakeshore Drive Bridge. The critical depth is close to the simulated water depth and the Froude number is approaching 0.7. It is concluded that in these situations the water level gradient is too steep and the Froude number too high for the downstream boundary (lake level) to have a significant effect on the water level and velocity at location M. Therefore, the same velocities are presented in table 4.

Three figures are presented on the next page which display the velocity - discharge relationship for different downstream boundary conditions using the data in table 4.

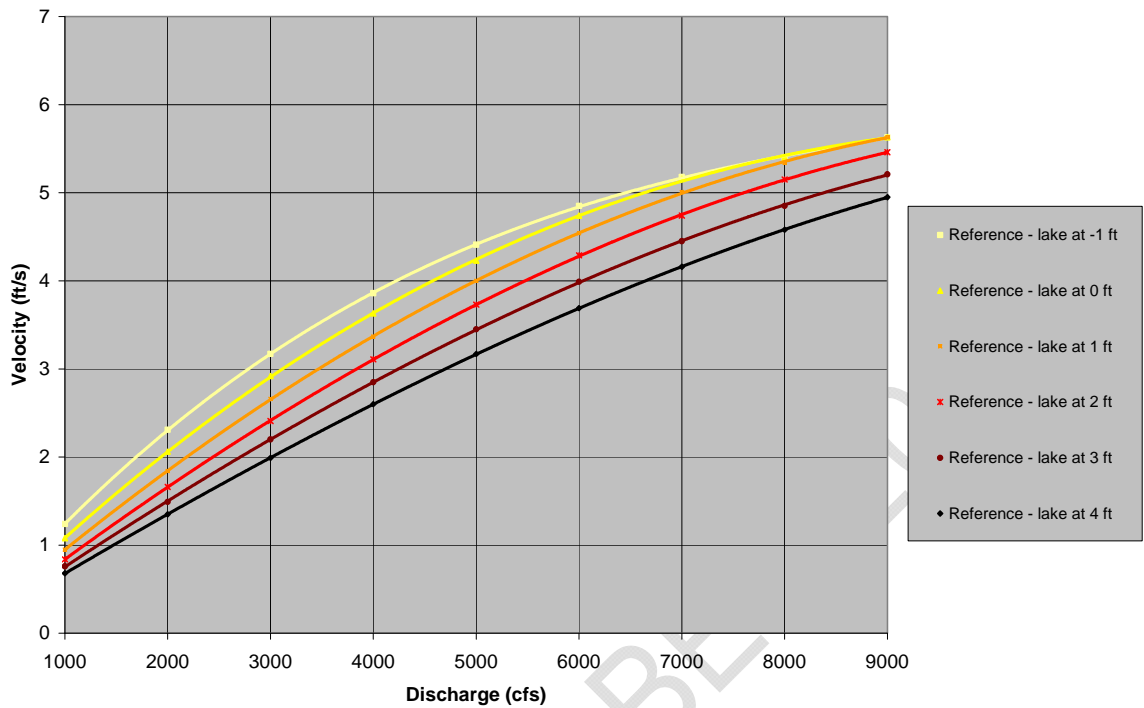


Figure A-1: Q-v relation at location M for different discharges and lake levels in reference situation (case 1)

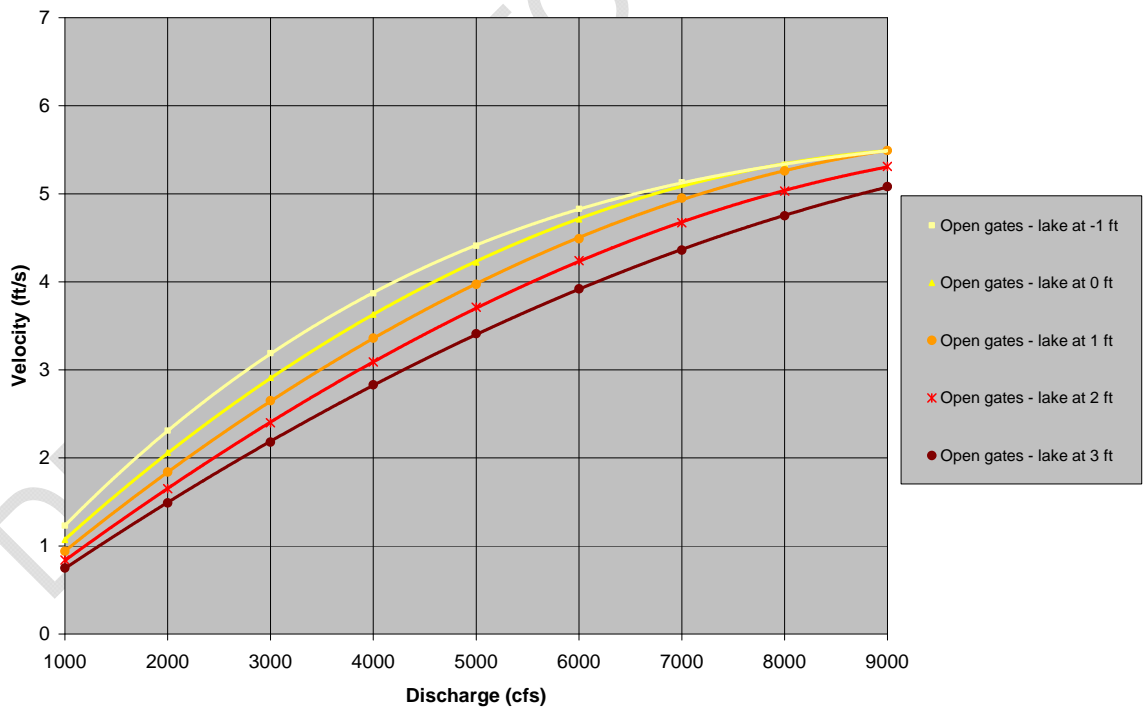


Figure A-2: Q-v relation at location M for different discharges and lake levels with open PPS gates (case 2a)

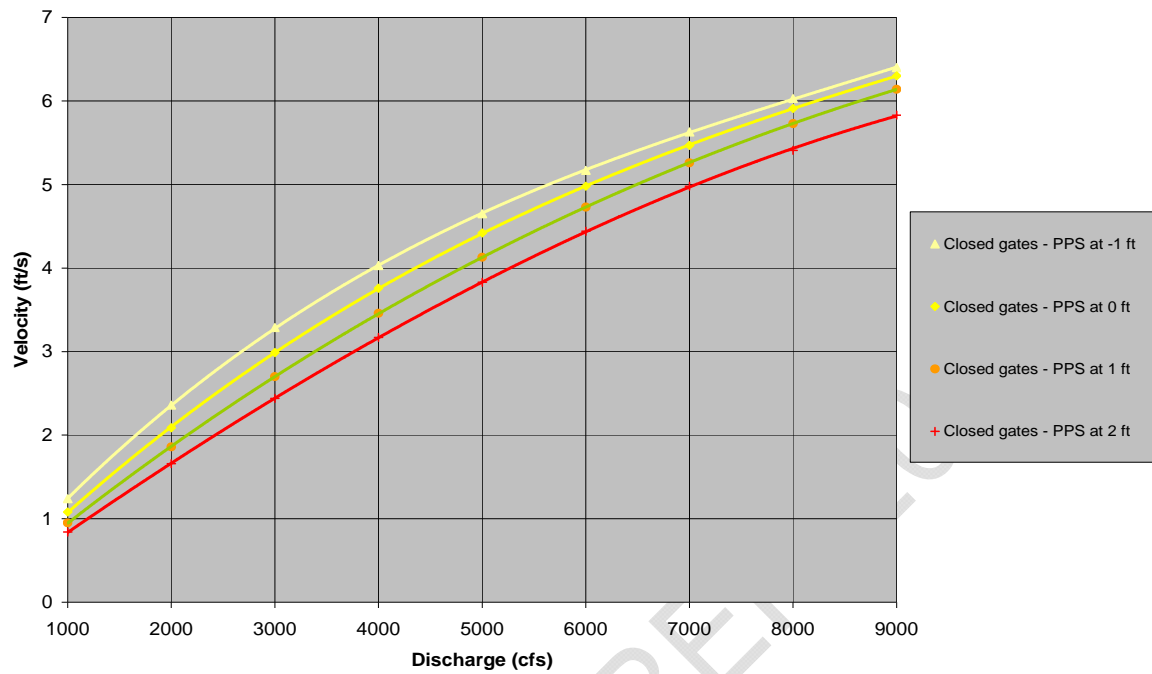
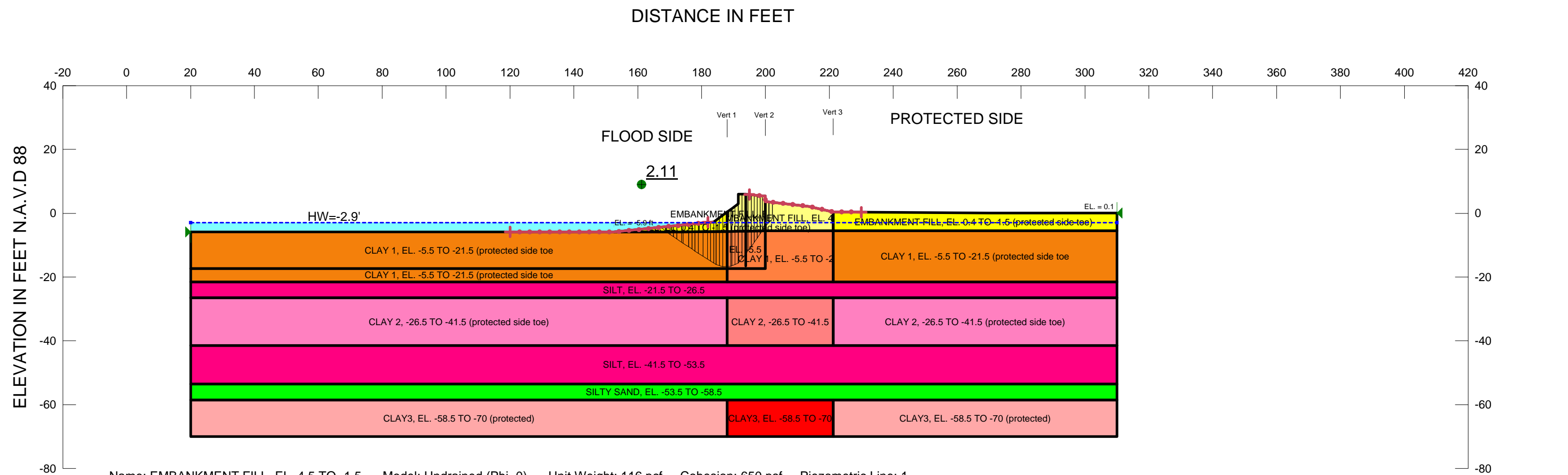


Figure 7: Q-v relation at location M for different discharges and lake levels with closed PPS gates (case 2b)

APPENDIX J FLOODSIDE STABILITY ANALYSES

APPENDIX J.1 FLOODSIDE STABILITY ANALYSES WATER AT ELEVATION -2.9 RESULTS



Name: EMBANKMENT FILL, EL. 4.5 TO -1.5 Model: Undrained (Phi=0) Unit Weight: 116 pcf Cohesion: 650 psf Piezometric Line: 1

Name: SILTY SAND, EL. -53.5 TO -58.5 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Beach Sand Piezometric Line: 1

Name: CLAY3, EL. -58.5 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 112 pcf Cohesion Spatial Fn: Bay Sound Phi: 0 ° Piezometric Line: 1

Name: CLAY 1, EL. -5.5 TO -21.5 Model: Mohr-Coulomb Unit Weight: 112 pcf Cohesion: 425 psf Phi: 0 ° Piezometric Line: 1

Name: SILT, EL. -21.5 TO -26.5 Model: Mohr-Coulomb Unit Weight: 117 pcf Cohesion: 200 psf Phi: 15 ° Piezometric Line: 1

Name: CLAY 2, -26.5 TO -41.5 Model: Spatial Mohr-Coulomb Unit Weight: 101 pcf Cohesion Spatial Fn: clay2 Phi: 0 ° Piezometric Line: 1

Name: CLAY3, EL. -58.5 TO -70 (protected) Model: Spatial Mohr-Coulomb Unit Weight: 112 pcf Cohesion Fn: bay sound Phi: 0 ° Piezometric Line: 1

Name: SILT, EL. -41.5 TO -53.5 Model: Mohr-Coulomb Unit Weight: 117 pcf Cohesion: 200 psf Phi: 15 ° Piezometric Line: 1

Name: EMBANKMENT FILL, EL. 0.4 TO -1.5 (protected side toe) Model: Undrained (Phi=0) Unit Weight: 118 pcf Cohesion: 650 psf Piezometric Line: 1

Name: CLAY 1, EL. -5.5 TO -21.5 (protected side toe) Model: Spatial Mohr-Coulomb Weight Fn: clay1 Cohesion Fn: clay1 Phi: 0 ° Piezometric Line: 1

Name: CLAY 2, -26.5 TO -41.5 (protected side toe) Model: Spatial Mohr-Coulomb Weight Fn: clay2 Cohesion Fn: clay2 Phi: 0 ° Piezometric Line: 1



**US Army Corps
of Engineers®**
New Orleans District

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
VERTICALSWERE ASSUMED TO VARY LINEARLY
BETWEENTHE VALUES INDICATED FOR THESE LOCATIONS.

Hw = CANAL WATER LEVEL

LONDON AVE CANAL
OUTFALL CANAL REEVALUATION REPORT
REACH 1, STA. 2+44 TO 10+00
FLOOD SIDE STABILITY ANALYSIS,
CASE: FS Global Stability (Entry/Exit)
APRIL 2013

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

FS Global Stability (Entry/Exit)

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File Information

Created By: Lijegren, James
Revision Number: 194
Last Edited By: Schroeder, Danielle MVN
Date: 6/14/2013
Time: 10:47:26 AM
File Name: Reach 1.gsz
Directory: c:\documents and settings\b2edfdvs\my documents\pw_working\cemvn\d0441022\
Last Solved Date: 6/14/2013
Last Solved Time: 10:50:34 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

FS Global Stability (Entry/Exit)

Kind: SLOPE/W
Parent: Gap Analysis (Seepage)
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: 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: 6000
 Optimization Convergence Tolerance: 1e-007
 Starting Optimization Points: 16
 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. 4.5 TO -1.5

Model: Undrained (Phi=0)
Unit Weight: 116 pcf
Cohesion: 650 psf
Pore Water Pressure
 Piezometric Line: 1

SILTY SAND, EL. -53.5 TO -58.5

Model: Shear/Normal Fn.
Unit Weight: 122 pcf
Strength Function: Beach Sand
Phi-B: 0 °
Pore Water Pressure
 Piezometric Line: 1

CLAY3, EL. -58.5 TO -70

Model: Spatial Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion Spatial Fn: Bay Sound
Phi: 0 °
Phi-B: 0 °
Pore Water Pressure
 Piezometric Line: 1

CLAY 1, EL. -5.5 TO -21.5

Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion: 425 psf
Phi: 0 °
Phi-B: 0 °
Pore Water Pressure
 Piezometric Line: 1

SILT, EL. -21.5 TO -26.5

Model: Mohr-Coulomb

CLAY 2, -26.5 TO -41.5 (protected side toe)

Model: Spatial Mohr-Coulomb
Weight Fn: clay2
Cohesion Fn: clay2
Phi: 0 °
Phi-B: 0 °
Pore Water Pressure
 Piezometric Line: 1

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (120, -5.9) ft
Left-Zone Right Coordinate: (182, -2.88403) ft
Left-Zone Increment: 20
Right Projection: Range
Right-Zone Left Coordinate: (195, 5.86154) ft
Right-Zone Right Coordinate: (230, 0.34634) ft
Right-Zone Increment: 12
Radius Increments: 10

Slip Surface Limits

Left Coordinate: (20, -5.9) ft
Right Coordinate: (310, 0.1) ft

Piezometric Lines

Piezometric Line 1

Coordinates	
X (ft)	Y (ft)
20	-2.9
310	-2.9

Cohesion Functions

bay sound
Model: Spline Data Point Function
Function: Cohesion vs. Y
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 645
Data Points: Y (ft), Cohesion (psf)
 Data Point: (-70, 775)

Unit Weight: 117 pcf
Cohesion: 200 psf
Phi: 15 °
Phi-B: 0 °
Pore Water Pressure
 Piezometric Line: 1

CLAY 2, -26.5 TO -41.5

Model: Spatial Mohr-Coulomb
Unit Weight: 101 pcf
Cohesion Spatial Fn: clay2
Phi: 0 °
Phi-B: 0 °
Pore Water Pressure
 Piezometric Line: 1

CLAY3, EL. -58.5 TO -70 (protected)

Model: Spatial Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion Fn: bay sound
Phi: 0 °
Phi-B: 0 °
Pore Water Pressure
 Piezometric Line: 1

SILT, EL. -41.5 TO -53.5

Model: Mohr-Coulomb
Unit Weight: 117 pcf
Cohesion: 200 psf
Phi: 15 °
Phi-B: 0 °
Pore Water Pressure
 Piezometric Line: 1

EMBANKMENT FILL, EL. 0.4 TO -1.5 (protected side toe)

Model: Undrained (Phi=0)
Unit Weight: 118 pcf
Cohesion: 650 psf
Pore Water Pressure
 Piezometric Line: 1

CLAY 1, EL. -5.5 TO -21.5 (protected side toe)

Model: Spatial Mohr-Coulomb
Weight Fn: clay1
Cohesion Fn: clay1
Phi: 0 °
Phi-B: 0 °
Pore Water Pressure
 Piezometric Line: 1

Data Point: (-58.5, 645)

clay1

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: (188, 400)
Data Point: (200, 425)
Data Point: (221.6, 400)

clay2

Model: Spline Data Point Function
Function: Cohesion vs. Y
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 405
Data Points: Y (ft), Cohesion (psf)
Data Point: (-41.5, 560)
Data Point: (-26.5, 405)

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: (-100000, 0)
Data Point: (0, 0)
Data Point: (100000, 57735)
Estimation Properties
Intact Rock Param.: 10
Geological Strength: 100
Disturbance Factor: 0
SigmaC: 600000 psf
Sigma3: 300000 psf
Num. Points: 20

Unit Weight Functions

clay1

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: (188, 111)
Data Point: (200, 112)
Data Point: (221.6, 111)

clay2

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: (188, 101)
Data Point: (200, 102)
Data Point: (221.6, 101)

Spatial Functions

Bay Sound

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (188, -58.5, 645)
Data Point: (188, -70, 775)
Data Point: (200, -58.5, 725)
Data Point: (200, -70, 850)
Data Point: (221.2, -58.5, 645)
Data Point: (221.2, -70, 775)

clay2

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (188, -26.5, 405)
Data Point: (188, -41.5, 560)
Data Point: (200, -26.5, 430)
Data Point: (200, -41.5, 590)
Data Point: (221.2, -26.5, 405)
Data Point: (221.2, -41.5, 560)

Regions

	Material	Points	Area (ft²)
Region 1	EMBANKMENT FILL, EL. 4.5 TO -1.5	27,43,14,4,44,3,46,47,28,21,13,25	121.83862
Region 2	EMBANKMENT FILL, EL. 4.5 TO -1.5	25,17,5,22,52,28,21,13	166.3

Region 3	CLAY 1, EL. -5.5 TO -21.5	47,28,35,45,34,18,57	140.50074
Region 4	CLAY 1, EL. -5.5 TO -21.5	28,52,53,48,57,18,34,45,35	389.6
Region 5	SILT, EL. -21.5 TO -26.5	7,48,53,8,31,54,49,30	1450
Region 6	CLAY 2, -26.5 TO -41.5	49,54,55,50	498
Region 7	SILTY SAND, EL. -53.5 TO -58.5	42,10,37,38,9,41,51,56	1450
Region 8	CLAY3, EL. -58.5 TO -70	38,37,40,39	381.8
Region 9	CLAY3, EL. -58.5 TO -70 (protected)	11,9,38,39	1932
Region 10	CLAY3, EL. -58.5 TO -70 (protected)	37,10,12,40	1021.2
Region 11	SILT, EL. -41.5 TO -53.5	41,32,50,55,33,42,56,51	3480
Region 12	EMBANKMENT FILL, EL. 0.4 TO -1.5 (protected side toe)	46,24,1,2,47	68.501441
Region 13	EMBANKMENT FILL, EL. 0.4 TO -1.5 (protected side toe)	22,36,6,29,52	504.66
Region 14	CLAY 1, EL. -5.5 TO -21.5 (protected side toe	52,29,8,53	1420.8
Region 15	CLAY 1, EL. -5.5 TO -21.5 (protected side toe	1,2,47,57,20,58	1916.7392
Region 16	CLAY 1, EL. -5.5 TO -21.5 (protected side toe	20,57,48,7	705.6
Region 17	CLAY 2, -26.5 TO -41.5 (protected side toe)	54,31,33,55	1332
Region 18	CLAY 2, -26.5 TO -41.5 (protected side toe)	30,49,50,32	2520

Points

	X (ft)	Y (ft)
Point 1	152.5	-5.9
Point 2	173.8	-5.9
Point 3	189.5	1.5
Point 4	191.5	6
Point 5	213.4	2.2
Point 6	310	0.1
Point 7	20	-21.5
Point 8	310	-21.5
Point 9	20	-58.5
Point 10	310	-58.5
Point 11	20	-70
Point 12	310	-70
Point 13	200	1.5
Point 14	193.8	6
Point 15	193.8	1.5
Point 16	200.5	12.8

Point 17	201	3.6
Point 18	200	-17.3
Point 19	193.8	-16.5
Point 20	20	-17.3
Point 21	200	-4.9
Point 22	221.2	0.4
Point 23	201	6
Point 24	183.8	-2.7
Point 25	200	3.6
Point 26	200	12.8
Point 27	200	5.4
Point 28	200	-5.5
Point 29	310	-5.5
Point 30	20	-26.5
Point 31	310	-26.5
Point 32	20	-41.5
Point 33	310	-41.5
Point 34	200	-12.5
Point 35	200	-7.2
Point 36	270.4	0.1
Point 37	221.2	-58.5
Point 38	188	-58.5
Point 39	188	-70
Point 40	221.2	-70
Point 41	20	-53.5
Point 42	310	-53.5
Point 43	199	5.4
Point 44	191.5	3
Point 45	200	-10.9
Point 46	188.00714	0.4
Point 47	188	-5.68321
Point 48	188	-21.5
Point 49	188	-26.5
Point 50	188	-41.5
Point 51	188	-53.5
Point 52	221.2	-5.5
Point 53	221.2	-21.5
Point 54	221.2	-26.5
Point 55	221.2	-41.5
Point 56	221.2	-53.5
Point 57	188	-17.3
Point 58	20	-5.9

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	2.11	(183.414, 4.386)	17.19568	(202.214, 3.46297)	(167.271, -4.38992)
2	2189	2.55	(183.414, 4.386)	19.052	(201.018, 3.59803)	(166.542, -4.46438)

Slices of Slip Surface: **Optimized**

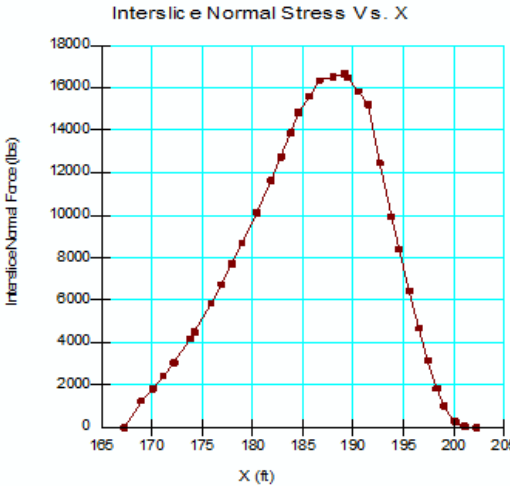
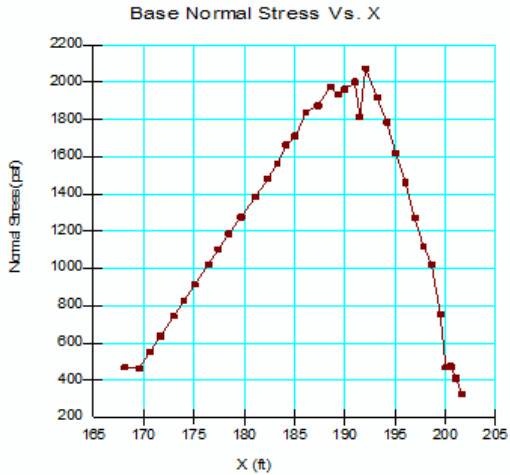
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	168.1357	-5.1306595	139.19429	467.30264	0	650
2	Optimized	169.55105	-6.2402635	208.43272	461.9534	0	400
3	Optimized	170.63005	-6.96369	253.5757	550.02132	0	400
4	Optimized	171.68775	-7.6728165	297.81991	636.2402	0	400
5	Optimized	173.0083	-8.5572025	353.0104	743.50574	0	400
6	Optimized	174.02595	-9.2382475	395.50411	826.31452	0	400
7	Optimized	175.08505	-9.94811	439.80161	912.77041	0	400
8	Optimized	176.4294	-10.847325	495.91728	1021.1067	0	400
9	Optimized	177.45175	-11.52848	538.41727	1103.8112	0	400
10	Optimized	178.4741	-12.209635	580.92539	1186.5156	0	400
11	Optimized	179.6999	-13.000525	630.24464	1274.6368	0	400
12	Optimized	181.12915	-13.90115	686.47949	1384.3835	0	400
13	Optimized	182.33285	-14.659635	733.79736	1479.9463	0	400
14	Optimized	183.31095	-15.27599	772.26212	1561.4256	0	400
15	Optimized	184.1831	-15.825585	806.55401	1663.1926	0	400
16	Optimized	185.09075	-16.22336	831.37913	1709.3119	0	400
17	Optimized	186.1398	-16.536085	850.8922	1836.1103	0	400
18	Optimized	187.3357	-16.66708	859.05129	1874.747	0	400
19	Optimized	188.5721	-16.620365	856.15415	1974.6791	0	425
20	Optimized	189.31855	-16.524255	850.16409	1933.4743	0	425
21	Optimized	189.99615	-16.24505	832.72613	1960.5231	0	425
22	Optimized	190.98845	-15.83617	807.21446	2000.5889	0	425

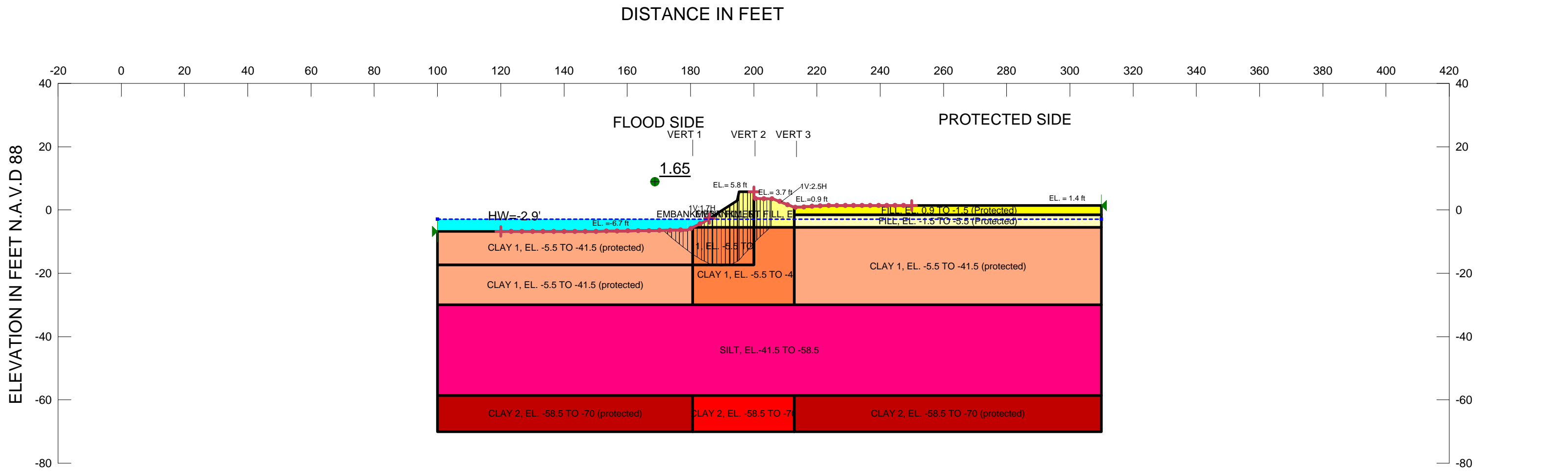
23	Optimized	191.4923	-15.622135	793.84332	1815.3117	0	425
24	Optimized	192.075	-14.896535	748.60504	2074.2496	0	425
25	Optimized	193.225	-13.464525	659.20149	1918.8551	0	425
26	Optimized	194.1802	-12.27509	585.00345	1784.8526	0	425
27	Optimized	195.05055	-11.12893	513.48528	1619.2309	0	425
28	Optimized	196.0309	-9.783465	429.52627	1461.0681	0	425
29	Optimized	196.9623	-8.4414225	345.78338	1271.201	0	425
30	Optimized	197.8447	-7.1028075	262.25498	1115.5832	0	425
31	Optimized	198.64295	-5.9569355	190.75304	1021.6934	0	425
32	Optimized	199.5	-4.813007	119.37404	756.21349	0	650
33	Optimized	200.06435	-4.0597265	72.367278	470.02869	0	650
34	Optimized	200.56435	-3.486776	36.61505	472.76425	0	650
35	Optimized	201.0446	-2.949871	3.1119437	411.68765	0	650
36	Optimized	201.65145	-2.27143	39.222627	327.51234	0	650

Slices of Slip Surface: **2189**

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	2189	166.9595	-5.1821915	142.41163	668.28087	0	650
2	2189	167.91215	-6.6517515	234.10922	611.15786	0	400
3	2189	168.98265	-8.0258585	319.85596	731.54137	0	400
4	2189	170.0532	-9.175554	391.59398	836.51577	0	400
5	2189	171.12375	-10.155297	452.73203	928.10851	0	400
6	2189	172.19425	-10.99807	505.32274	1007.9435	0	400
7	2189	173.26475	-11.725615	550.71534	1077.3714	0	400
8	2189	174.37455	-12.372695	591.0958	1139.1619	0	400
9	2189	175.52365	-12.94419	626.75382	1193.5679	0	400
10	2189	176.67275	-13.42326	656.65206	1238.7358	0	400
11	2189	177.82185	-13.81724	681.23776	1275.1787	0	400
12	2189	178.97095	-14.13159	700.85249	1303.4413	0	400
13	2189	180.12005	-14.370335	715.7514	1323.6592	0	400

14	2189	181.2692	-14.536345	726.10994	1336.1419	0	400
15	2189	182.33285	-14.62926	731.90466	1344.2834	0	400
16	2189	183.31095	-14.6597	733.80149	1349.0922	0	400
17	2189	184.325	-14.63719	732.39828	1387.2664	0	400
18	2189	185.375	-14.557685	727.43515	1458.2996	0	400
19	2189	186.425	-14.41926	718.80434	1522.2259	0	400
20	2189	187.47855	-14.21971	706.34595	1579.2791	0	400
21	2189	188.75355	-13.886085	685.52426	1629.6472	0	425
22	2189	190	-13.48365	660.41825	1674.5734	0	425
23	2189	191	-13.08221	635.36586	1701.7385	0	425
24	2189	192.075	-12.57136	603.49314	2014.1219	0	425
25	2189	193.225	-11.93193	563.59283	1923.2819	0	425
26	2189	194.32	-11.22285	519.34489	1817.0096	0	425
27	2189	195.36	-10.440505	470.52939	1694.5168	0	425
28	2189	196.4	-9.5364605	414.11489	1555.3918	0	425
29	2189	197.44	-8.484704	348.48601	1395.2182	0	425
30	2189	198.48	-7.244349	271.0868	1206.6385	0	425
31	2189	199.34865	-6.037661	195.79352	1025.4393	0	425
32	2189	199.84865	-5.246403	146.41525	766.38178	0	650
33	2189	200.5	-3.9651405	66.466583	341.43107	0	650
34	2189	201.00875	-2.921048	1.3133773	139.2621	0	650





Name: EMBANKMENT FILL, EL. 5.8 TO -5.5 Model: Undrained (Phi=0) Unit Weight: 116 pcf Cohesion: 825 psf Piezometric Line: 1

Name: CLAY 1, EL. -5.5 TO -41.5 Model: Spatial Mohr-Coulomb Unit Weight: 117 pcf Cohesion Spatial Fn: Clay Phi: 0 ° Piezometric Line: 1

Name: SILT, EL.-41.5 TO -58.5 Model: Mohr-Coulomb Unit Weight: 117 pcf Cohesion: 200 psf Phi: 15 ° Piezometric Line: 1

Name: CLAY 2, EL. -58.5 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 105 pcf Cohesion Spatial Fn: Bay sound Phi: 0 ° Piezometric Line: 1

Name: FILL, EL. 0.9 TO -1.5 (Protected) Model: Undrained (Phi=0) Unit Weight: 116 pcf Cohesion: 900 psf Piezometric Line: 1

Name: FILL, EL. -1.5 TO -5.5 (Protected) Model: Undrained (Phi=0) Unit Weight: 116 pcf Cohesion: 500 psf Piezometric Line: 1

Name: CLAY 1, EL. -5.5 TO -41.5 (protected) Model: Spatial Mohr-Coulomb Unit Weight: 117 pcf Cohesion Fn: Clay (protected) Phi: 0 ° Piezometric Line: 1

Name: CLAY 2, EL. -58.5 TO -70 (protected) Model: Spatial Mohr-Coulomb Unit Weight: 105 pcf Cohesion Fn: Clay 2 (protected) Phi: 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
VERTICALSWERE ASSUMED TO VARY LINEARLY
BETWEENTHE VALUES INDICATED FOR THESE LOCATIONS.

Hw = CANAL WATER LEVEL



**US Army Corps
of Engineers®**
New Orleans District
LONDON AVE CANAL
OUTFALL CANAL REEVALUATION REPORT
REACH 2, STA. 10+00 TO 12+21, 13+88 TO 21+00
FLOOD SIDE STABILITY ANALYSIS,
CASE: FS Global Stability (Entry/Exit)
APRIL 2013

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

FS Global Stability (Entry/Exit)

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File Information

Created By: Liljegren, James
Revision Number: 194
Last Edited By: Schroeder, Danielle MVN
Date: 6/14/2013
Time: 5:54:59 PM
File Name: Reach 2.gsz
Directory: c:\documents and settings\b2edfdvs\my documents\pw_working\cemvn\d0441022\
Last Solved Date: 6/14/2013
Last Solved Time: 12:56:30 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

FS Global Stability (Entry/Exit)

Kind: [SLOPE/W](#)
Parent: [Gap Analysis \(Seepage\)](#)
Method: [Spencer](#)
Settings
 Apply Pheatic 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: [Search for Tension Crack](#)
 Percentage Wet: 0

Phi: 0 °
Phi-B: 0 °
Pore Water Pressure
 Piezometric Line: 1

FILL, EL. 0.9 TO -1.5 (Protected)
Model: [Undrained \(Phi=0\)](#)
Unit Weight: [116 pcf](#)
Cohesion: [900 psf](#)
Pore Water Pressure
 Piezometric Line: 1

FILL, EL. -1.5 TO -5.5 (Protected)
Model: [Undrained \(Phi=0\)](#)
Unit Weight: [116 pcf](#)
Cohesion: [500 psf](#)
Pore Water Pressure
 Piezometric Line: 1

CLAY 1, EL. -5.5 TO -41.5 (protected)
Model: [Spatial Mohr-Coulomb](#)
Unit Weight: [117 pcf](#)
Cohesion Fn: [Clay \(protected\)](#)
Phi: 0 °
Phi-B: 0 °
Pore Water Pressure
 Piezometric Line: 1

CLAY 2, EL. -58.5 TO -70 (protected)
Model: [Spatial Mohr-Coulomb](#)
Unit Weight: [105 pcf](#)
Cohesion Fn: [Clay 2 \(protected\)](#)
Phi: 0 °
Phi-B: 0 °
Pore Water Pressure
 Piezometric Line: 1

Slip Surface Entry and Exit

Left Projection: [Range](#)
Left-Zone Left Coordinate: (120, -6.7) ft
Left-Zone Right Coordinate: (186, -2.61524) ft
Left-Zone Increment: 20
Right Projection: [Range](#)
Right-Zone Left Coordinate: (200, 5.8) ft
Right-Zone Right Coordinate: (250, 1.4) ft
Right-Zone Increment: 20

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. 5.8 TO -5.5

Model: [Undrained \(Phi=0\)](#)
Unit Weight: [116 pcf](#)
Cohesion: [825 psf](#)
Pore Water Pressure
 Piezometric Line: 1

CLAY 1, EL. -5.5 TO -41.5

Model: [Spatial Mohr-Coulomb](#)
Unit Weight: [117 pcf](#)
Cohesion Spatial Fn: [Clay](#)
Phi: 0 °
Phi-B: 0 °
Pore Water Pressure
 Piezometric Line: 1

SILT, EL.-41.5 TO -58.5

Model: [Mohr-Coulomb](#)
Unit Weight: [117 pcf](#)
Cohesion: [200 psf](#)
Phi: 15 °
Phi-B: 0 °
Pore Water Pressure
 Piezometric Line: 1

CLAY 2, EL. -58.5 TO -70

Model: [Spatial Mohr-Coulomb](#)
Unit Weight: [105 pcf](#)
Cohesion Spatial Fn: [Bay sound](#)

Radius Increments: 20

Slip Surface Limits

Left Coordinate: (100, -6.7) ft
Right Coordinate: (310, 1.4) ft

Piezometric Lines

Piezometric Line 1

Coordinates	
X (ft)	Y (ft)
100	-2.9
310	-2.9

Cohesion Functions

Clay (protected)

Model: [Spline Data Point Function](#)
Function: [Cohesion vs. Y](#)
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 285
Data Points: Y (ft), Cohesion (psf)
 Data Point: (-30, 400)
 Data Point: (-5.5, 285)

Clay 2 (protected)

Model: [Spline Data Point Function](#)
Function: [Cohesion vs. Y](#)
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 710
Data Points: Y (ft), Cohesion (psf)
 Data Point: (-70, 820)
 Data Point: (-58.5, 710)

Spatial Functions

Bay sound

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (180.7, -58.5, 710)
Data Point: (180.7, -70, 820)
Data Point: (200, -58.5, 780)
Data Point: (200, -70, 890)
Data Point: (212.8, -58.5, 710)
Data Point: (212.8, -70, 820)

Clay

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (180.7, -5.5, 285)
Data Point: (180.7, -30, 400)
Data Point: (200, -5.5, 300)
Data Point: (200, -30, 425)
Data Point: (212.8, -5.5, 285)
Data Point: (212.8, -30, 400)

Regions

	Material	Points	Area (ft²)
Region 1	EMBANKMENT FILL, EL. 5.8 TO -5.5	3,4,14,21,15,41,23	115.235
Region 2	EMBANKMENT FILL, EL. 5.8 TO -5.5	15,21,19,5,24,31,32	107.48
Region 3	CLAY 1, EL. -5.5 TO -41.5	41,15,16,17,35	227.74
Region 4	CLAY 1, EL. -5.5 TO -41.5	35,17,16,15,32,34,28,36	558.71
Region 5	CLAY 2, EL. -58.5 TO -70	37,29,39,40,30,38	369.15
Region 6	SILT, EL.-41.5 TO -58.5	10,8,36,28,34,9,11,39,29,37	5985
Region 7	FILL, EL. 0.9 TO -1.5 (Protected)	26,6,31,24,25	279.18
Region 8	FILL, EL. -1.5 TO -5.5 (Protected)	32,31,6,33	388.8
Region 9	CLAY 1, EL. -5.5 TO -41.5 (protected)	20,7,1,2,41,35	862.4
Region 10	CLAY 1, EL. -5.5 TO -41.5 (protected)	8,36,35,20	1024.89
Region 11	CLAY 1, EL. -5.5 TO -41.5 (protected)	32,33,9,34	2381.4
Region 12	CLAY 2, EL. -58.5 TO -70 (protected)	12,38,37,10	928.05
Region 13	CLAY 2, EL. -58.5 TO -70 (protected)	40,13,11,39	1117.8

Points

	X (ft)	Y (ft)
Point 1	150.6	-6.7
Point 2	179.1	-6.3
Point 3	194.8	3
Point 4	195.4	5.8
Point 5	206.3	3.5
Point 6	310	-1.5
Point 7	100	-6.7
Point 8	100	-30
Point 9	310	-30
Point 10	100	-58.5
Point 11	310	-58.5
Point 12	100	-70
Point 13	310	-70
Point 14	200	5.8
Point 15	200	-5.5
Point 16	200	-9.5
Point 17	200	-17.3
Point 18	200.5	12.8
Point 19	201	3.7
Point 20	100	-17.3
Point 21	200	3.7
Point 22	201	6
Point 23	184.3	-3.7
Point 24	212.8	0.9
Point 25	223.6	1.4
Point 26	310	1.4
Point 27	200	12.8
Point 28	200	-30
Point 29	200	-58.5
Point 30	200	-70
Point 31	212.8	-1.5
Point 32	212.8	-5.5
Point 33	310	-5.5

Point 34	212.8	-30
Point 35	180.7	-17.3
Point 36	180.7	-30
Point 37	180.7	-58.5
Point 38	180.7	-70
Point 39	212.8	-58.5
Point 40	212.8	-70
Point 41	180.7	-5.5

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.65	(187.894, 3.723)	15.85657	(205.601, 3.52637)	(171.285, -6.40969)
2	6720	1.87	(187.894, 3.723)	20.399	(206.3, 3.5)	(170.198, -6.42494)

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	171.98685	-6.99781	255.70232	461.64547	0	292.03
2	Optimized	173.3909	-8.1740565	329.10175	608.69546	0	297.55
3	Optimized	174.69815	-9.2503865	396.26236	736.3007	0	302.6
4	Optimized	175.90865	-10.226802	457.19316	858.08513	0	307.19
5	Optimized	177.1191	-11.203215	518.11752	979.93386	0	311.77
6	Optimized	178.41215	-12.22065	581.60001	1097.6368	0	316.55

7	Optimized	179.88635	-13.35492	652.40277	1264.591	0	321.87
8	Optimized	180.68635	-13.968535	690.68755	1325.0766	0	324.75
9	Optimized	181.41355	-14.42531	719.17644	1400.7326	0	327.58
10	Optimized	182.84065	-15.32171	775.13216	1549.2556	0	333.21
11	Optimized	183.9271	-15.940215	813.70986	1606.0031	0	337.23
12	Optimized	184.92685	-16.396795	842.20791	1692.9772	0	340.41
13	Optimized	186.2091	-16.982365	878.72401	1834.8274	0	344.52
14	Optimized	186.92785	-17.29083	897.99476	1834.0276	0	346.74
15	Optimized	187.6806	-17.399785	904.76594	1903.1308	0	348.04
16	Optimized	189.0594	-17.599355	917.25537	2029.6043	0	350.43
17	Optimized	190.3791	-17.599355	917.22634	2035.7301	0	351.79
18	Optimized	191.63975	-17.399785	904.76892	2105.2252	0	352.11
19	Optimized	192.4112	-17.277665	897.17225	2147.7389	0	352.3
20	Optimized	193.1142	-17.001905	879.97781	2078.8857	0	351.66
21	Optimized	194.23805	-16.49505	848.34435	2102.6514	0	350.28

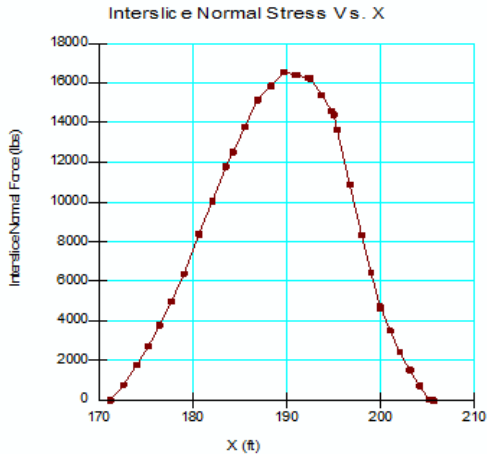
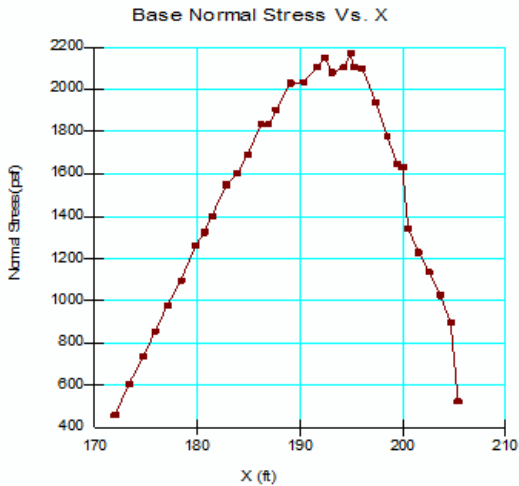
	d						
22	Optimize d	194.9208	-16.187135	829.11301	2172.4745	0	349.43
23	Optimize d	195.2208	-15.933995	813.31658	2107.0688	0	348.47
24	Optimize d	196.05175	-15.012795	755.82477	2099.085	0	344.67
25	Optimize d	197.3552	-13.56771	665.64376	1941.538	0	338.65
26	Optimize d	198.49475	-12.26139	584.15393	1775.6881	0	333.11
27	Optimize d	199.4704	-11.093835	511.29407	1649.2382	0	328.07
28	Optimize d	199.9791	-10.48909	473.55863	1632.9544	0	325.44
29	Optimize d	200.5	-9.9660225	440.92307	1342.8019	0	322.13
30	Optimize d	201.5209	-8.9408225	376.94713	1229.4213	0	315.61
31	Optimize d	202.57005	-7.935775	314.23593	1136.7959	0	309.22
32	Optimize d	203.6265	-6.971885	254.08511	1027.0112	0	303.09
33	Optimize d	204.6532	-5.99497	193.12785	898.87656	0	297
34	Optimize d	205.37645	-5.27679	148.31201	523.81439	0	825

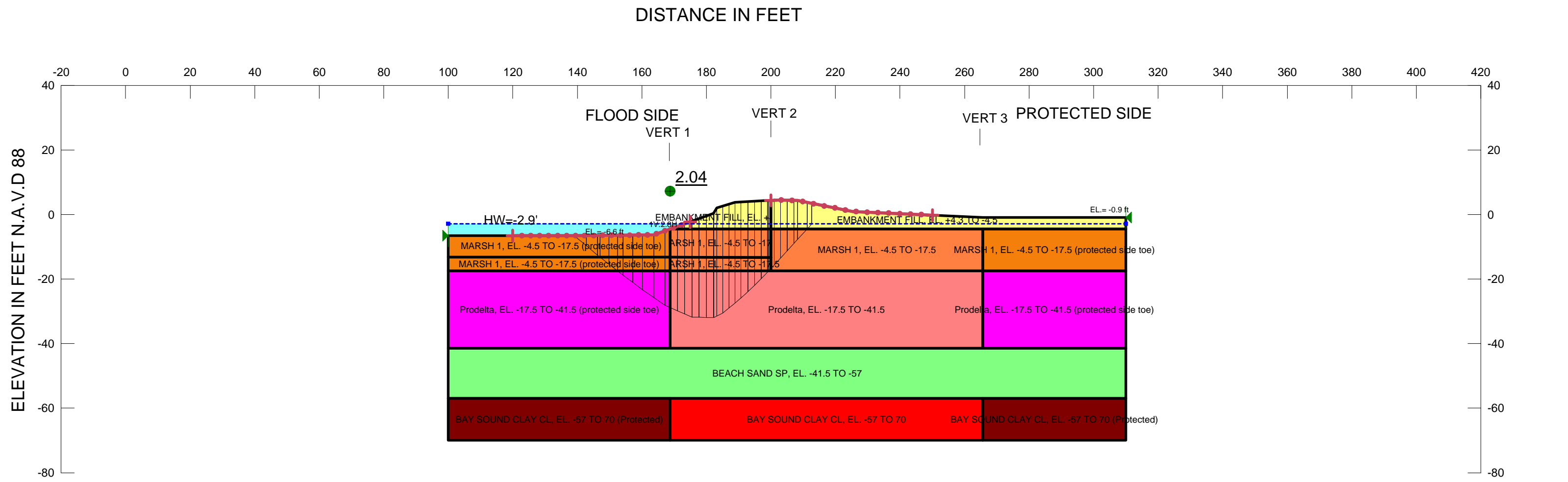
Slices of Slip Surface: 6720

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	6720	170.83385	-	280.80958	612.91673	0	293.92

			7.4001405				
2	6720	172.10555	-9.154873	390.30216	776.85673	0	302.16
3	6720	173.37725	-10.579748	479.21538	913.32996	0	308.84
4	6720	174.64895	-11.768705	553.40755	1028.0164	0	314.42
5	6720	175.9207	-12.7738	616.12783	1124.7046	0	319.14
6	6720	177.19245	-13.62745	669.41384	1205.9087	0	323.15
7	6720	178.46415	-14.35135	714.59546	1273.444	0	326.55
8	6720	179.9	-15.024185	756.53698	1358.823	0	329.71
9	6720	181.3	-15.570345	790.60547	1442.6618	0	332.86
10	6720	182.5	-15.93998	813.69352	1503.1431	0	335.8
11	6720	183.7	-16.23066	831.82735	1554.6201	0	338.38
12	6720	184.92685	-16.448955	845.4741	1602.7234	0	340.66
13	6720	186.1316	-16.591275	854.33183	1669.1334	0	342.56
14	6720	187.2874	-16.65859	858.53524	1749.0346	0	344.05
15	6720	188.4432	-16.6602	858.63815	1820.874	0	345.23
16	6720	189.599	-16.59612	854.63859	1884.6451	0	346.09
17	6720	190.75475	-16.465725	846.50297	1940.2364	0	346.62
18	6720	191.9105	-16.267715	834.14484	1987.3881	0	346.81
19	6720	193.0663	-16.000045	817.44458	2025.7434	0	346.64
20	6720	194.2221	-15.659815	796.20834	2054.9832	0	346.1
21	6720	195.1	-15.35784	777.3752	2209.8236	0	345.47
22	6720	195.975	-14.99631	754.80706	2314.5735	0	344.51
23	6720	197.125	-14.456105	721.09812	2233.1906	0	342.92
24	6720	198.275	-13.82395	681.65762	2139.9747	0	340.82
25	6720	199.425	-13.089395	635.82111	2033.3511	0	338.18

26	6720	200.5	-12.30169	586.66199	1683.5202	0	334.01
27	6720	201.6361	-11.327585	525.88072	1544.3451	0	327.51
28	6720	202.90825	-10.053591	446.3853	1360.8815	0	319.4
29	6720	204.1804	-8.513802	350.30055	1139.3373	0	310.08
30	6720	205.45255	-6.583616	229.85862	858.05024	0	298.95
31	6720	206.1943	-5.285321	148.84442	130.83205	0	825





Name: EMBANKMENT FILL, EL. +4.3 TO -4.5 Model: Undrained (Phi=0) Unit Weight: 117 pcf Cohesion: 760 psf Piezometric Line: 1
Name: MARSH 1, EL. -4.5 TO -17.5 Model: Spatial Mohr-Coulomb Unit Weight: 114 pcf Cohesion Fn: Marsh 1 Phi: 0 ° Piezometric Line: 1
Name: BEACH SAND SP, EL. -41.5 TO -57 Model: Mohr-Coulomb Unit Weight: 122 pcf Cohesion: 0 psf Phi: 30 ° Piezometric Line: 1
Name: BAY SOUND CLAY CL, EL. -57 TO 70 Model: Spatial Mohr-Coulomb Unit Weight: 112 pcf Cohesion Spatial Fn: Bay Sound Phi: 0 ° Piezometric Line: 1
Name: Prodelta, EL. -17.5 TO -41.5 Model: Spatial Mohr-Coulomb Unit Weight: 98 pcf Cohesion Fn: Prodelta Phi: 0 ° Piezometric Line: 1
Name: BAY SOUND CLAY CL, EL. -57 TO 70 (Protected) Model: Spatial Mohr-Coulomb Unit Weight: 112 pcf Cohesion Fn: Bay Sound (Protected) Phi: 0 ° Piezometric Line: 1
Name: MARSH 1, EL. -4.5 TO -17.5 (protected side toe) Model: Undrained (Phi=0) Unit Weight: 114 pcf Cohesion: 475 psf Piezometric Line: 1
Name: Prodelta, EL. -17.5 TO -41.5 (protected side toe) Model: Undrained (Phi=0) Unit Weight: 98 pcf Cohesion: 380 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
VERTICALSWERE ASSUMED TO VARY LINEARLY
BETWEENTHE VALUES INDICATED FOR THESE LOCATIONS.

Hw = CANAL WATER LEVEL



**US Army Corps
of Engineers®**
New Orleans District

LONDON AVE CANAL
OUTFALL CANAL REEVALUATION REPORT
REACH 3, STA. 21+00 TO 33+00
FLOOD SIDE STABILITY ANALYSIS,
CASE: FS Global Stability (Entry/Exit)
APRIL 2013

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

FS Global Stability (Entry/Exit)

Report generated using GeoStudio 2007, version 7.19. Copyright © 1991-2012 GEO-SLOPE International Ltd.

File Information

Created By: Lijegren, James
Revision Number: 160
Last Edited By: Schroeder, Danielle MVN
Date: 6/14/2013
Time: 4:27:50 PM
File Name: Reach 3.gsz
Directory: c:\documents and settings\b2edfdvs\my documents\pw_working\cemvn\d0441022\
Last Solved Date: 6/14/2013
Last Solved Time: 4:28:54 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

FS Global Stability (Entry/Exit)

Kind: [SLOPE/W](#)
Parent: [Gap Analysis \(Seepage\)](#)
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: [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: 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. +4.3 TO -4.5

Model: [Undrained \(Phi=0\)](#)
Unit Weight: 117 pcf
Cohesion: 760 psf
Pore Water Pressure
 Piezometric Line: 1

MARSH 1, EL. -4.5 TO -17.5

Model: [Spatial Mohr-Coulomb](#)
Unit Weight: 114 pcf
Cohesion Fn: [Marsh 1](#)
Phi: 0 °
Phi-B: 0 °
Pore Water Pressure
 Piezometric Line: 1

BEACH SAND SP, EL. -41.5 TO -57

Model: [Mohr-Coulomb](#)
Unit Weight: 122 pcf
Cohesion: 0 psf
Phi: 30 °
Phi-B: 0 °
Pore Water Pressure
 Piezometric Line: 1

BAY SOUND CLAY CL, EL. -57 TO 70

Model: [Spatial Mohr-Coulomb](#)
Unit Weight: 112 pcf
Cohesion Spatial Fn: [Bay Sound](#)
Phi: 0 °
Phi-B: 0 °
Pore Water Pressure
 Piezometric Line: 1

Prodelta, EL. -17.5 TO -41.5

Piezometric Lines

Piezometric Line 1

Coordinates	
X (ft)	Y (ft)
100	-2.9
310	-2.9

Cohesion Functions

Bay Sound (Protected)

Model: [Spline Data Point Function](#)
Function: [Cohesion vs. Y](#)
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 580
Data Points: Y (ft), Cohesion (psf)
 Data Point: (-70, 720)
 Data Point: (-57, 580)

Marsh 1

Model: [Spline Data Point Function](#)
Function: [Cohesion vs. X](#)
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 475
Data Points: X (ft), Cohesion (psf)
 Data Point: (168.8, 475)
 Data Point: (200, 500)
 Data Point: (230, 475)
 Data Point: (265.7, 475)

Prodelta

Model: [Spline Data Point Function](#)
Function: [Cohesion vs. X](#)
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 380
Data Points: X (ft), Cohesion (psf)
 Data Point: (168.8, 380)
 Data Point: (200, 400)
 Data Point: (230, 380)
 Data Point: (265.7, 380)

Model: [Spatial Mohr-Coulomb](#)
Unit Weight: 98 pcf
Cohesion Fn: [Prodelta](#)
Phi: 0 °
Phi-B: 0 °
Pore Water Pressure
 Piezometric Line: 1

BAY SOUND CLAY CL, EL. -57 TO 70 (Protected)

Model: [Spatial Mohr-Coulomb](#)
Unit Weight: 112 pcf
Cohesion Fn: [Bay Sound \(Protected\)](#)
Phi: 0 °
Phi-B: 0 °
Pore Water Pressure
 Piezometric Line: 1

MARSH 1, EL. -4.5 TO -17.5 (protected side toe)

Model: [Undrained \(Phi=0\)](#)
Unit Weight: 114 pcf
Cohesion: 475 psf
Pore Water Pressure
 Piezometric Line: 1

Prodelta, EL. -17.5 TO -41.5 (protected side toe)

Model: [Undrained \(Phi=0\)](#)
Unit Weight: 98 pcf
Cohesion: 380 psf
Pore Water Pressure
 Piezometric Line: 1

Slip Surface Entry and Exit

Left Projection: [Range](#)
Left-Zone Left Coordinate: (120, -6.6) ft
Left-Zone Right Coordinate: (175, -2.2791) ft
Left-Zone Increment: 20
Right Projection: [Range](#)
Right-Zone Left Coordinate: (200, 4.3) ft
Right-Zone Right Coordinate: (250, -0.19876) ft
Right-Zone Increment: 15
Radius Increments: 20

Slip Surface Limits

Left Coordinate: (100, -6.6) ft
Right Coordinate: (310, -0.9) ft

Spatial Functions

Bay Sound

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (168.8, -57, 580)
Data Point: (168.8, -70, 720)
Data Point: (200, -57, 715)
Data Point: (200, -70, 860)
Data Point: (265.7, -57, 580)
Data Point: (265.7, -70, 720)

Regions

	Material	Points	Area (ft²)
Region 1	EMBANKMENT FILL, EL. +4.3 TO -4.5	31,27,28,7,26,1,17	175.48
Region 2	EMBANKMENT FILL, EL. +4.3 TO -4.5	1,29,23,2,3,30,4,8,24,17	536.01
Region 3	MARSH 1, EL. -4.5 TO -17.5	31,17,18,36	273.76081
Region 4	MARSH 1, EL. -4.5 TO -17.5	18,17,24,25,19	854.1
Region 5	MARSH 1, EL. -4.5 TO -17.5	36,18,19,37	131.83919
Region 6	Prodelta, EL. -17.5 TO -41.5	37,19,25,39,38	2325.6
Region 7	BEACH SAND SP, EL. -41.5 TO -57	13,11,38,39,12,14,33,32	3255
Region 8	BAY SOUND CLAY CL, EL. -57 TO 70 (Protected)	13,15,34,32	894.4
Region 9	BAY SOUND CLAY CL, EL. -57 TO 70	32,34,35,33	1259.7
Region 10	BAY SOUND CLAY CL, EL. -57 TO 70 (Protected)	33,35,16,14	575.9
Region 11	MARSH 1, EL. -4.5 TO -17.5 (protected side toe)	25,24,8,10	575.9
Region 12	MARSH 1, EL. -4.5 TO -17.5 (protected side toe)	5,6,31,36,9,40	465.56769
Region 13	MARSH 1, EL. -4.5 TO -17.5 (protected side toe)	9,36,37,20	294.16231
Region 14	Prodelta, EL. -17.5 TO -41.5 (protected side toe)	20,37,38,11	1651.2
Region 15	Prodelta, EL. -17.5 TO -41.5 (protected side toe)	25,39,12,10	1063.2

Points

	X (ft)	Y (ft)
Point 1	200	4.3
Point 2	208.3	4.3
Point 3	225.4	0.9
Point 4	310	-0.9
Point 5	139.1	-6.6
Point 6	163.7	-6.3
Point 7	188.9	3.8
Point 8	310	-4.5

Point 9	100	-13.2
Point 10	310	-17.5
Point 11	100	-41.5
Point 12	310	-41.5
Point 13	100	-57
Point 14	310	-57
Point 15	100	-70
Point 16	310	-70
Point 17	200	-4.5
Point 18	200	-13.3
Point 19	200	-17.5
Point 20	100	-17.5
Point 21	200	12.8
Point 22	200.5	12.8
Point 23	201	4.5
Point 24	265.7	-4.5
Point 25	265.7	-17.5
Point 26	199	4.3
Point 27	182.2	0.3
Point 28	183.2	2.1
Point 29	201	4.3
Point 30	265.7	-0.9
Point 31	168.8	-4.5
Point 32	168.8	-57
Point 33	265.7	-57
Point 34	168.8	-70
Point 35	265.7	-70
Point 36	168.8	-13.24877
Point 37	168.8	-17.5
Point 38	168.8	-41.5
Point 39	265.7	-41.5
Point 40	100	-6.6

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	2.04	(174.905, 9.014)	34.75312	(212.665, 3.4321)	(138.959, -6.6)
2	2455	2.33	(174.905, 9.014)	38.699	(211.168, 3.72966)	(139.494, -6.5952)

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	139.02965	-6.65763	234.47744	441.49994	0	475

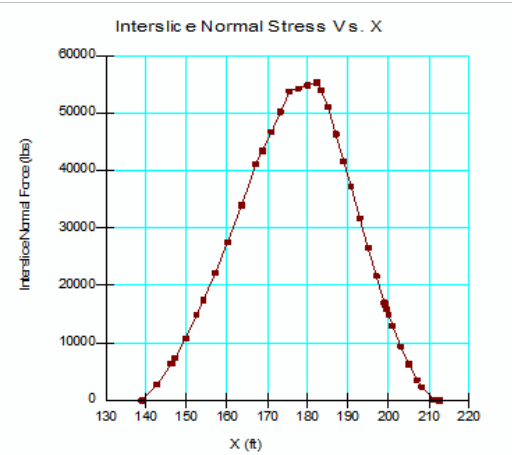
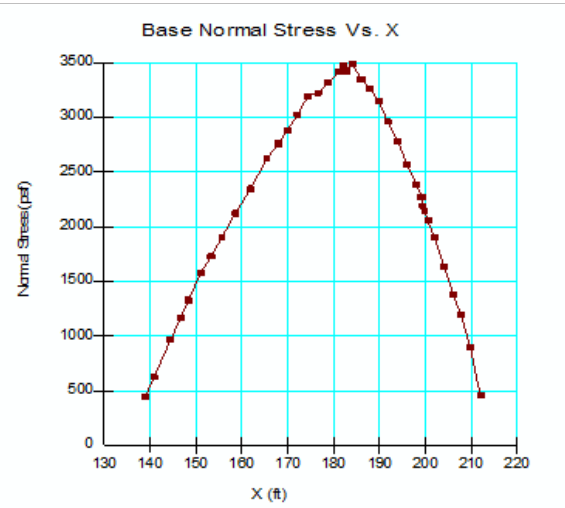
2	Optimized	140.93265	-8.216325	331.7345	623.83056	0	475
3	Optimized	144.5243	-11.168255	515.94996	970.56658	0	475
4	Optimized	146.67205	-12.92624	625.63424	1166.9773	0	475
5	Optimized	148.41095	-14.30002	711.35308	1327.5976	0	475
6	Optimized	151.11125	-16.43334	844.47026	1577.007	0	475
7	Optimized	153.30695	-18.168	952.74288	1730.4164	0	380
8	Optimized	155.6421	-19.94767	1063.784	1899.3165	0	380
9	Optimized	158.6213	-22.171015	1202.5104	2122.8873	0	380
10	Optimized	161.90545	-24.519255	1349.0422	2345.2226	0	380
11	Optimized	165.43685	-26.952635	1500.8793	2622.0053	0	380
12	Optimized	167.98685	-28.50837	1597.9735	2761.0004	0	380
13	Optimized	169.91665	-29.360175	1651.1041	2882.1714	0	380.72
14	Optimized	172.15	-30.34595	1712.6308	3023.8222	0	382.15
15	Optimized	174.39465	-31.33672	1774.4473	3191.8315	0	383.59
16	Optimized	176.6355	-31.84811	1806.3716	3223.966	0	385.02
17	Optimized	178.8613	-31.87513	1808.0338	3319.9698	0	386.45
18	Optimized	181.0871	-31.902155	1809.7409	3415.9286	0	387.88
19	Optimized	182.2496	-31.91627	1810.5902	3474.4467	0	388.62
20	Optimized	182.7496	-31.69236	1796.6398	3420.6003	0	388.94
21	Optimized	184.1279	-31.005315	1753.7743	3479.6259	0	389.83
22	Optimized	186.01685	-29.765625	1676.3953	3342.232	0	391.04
23	Optimized	187.93895	-28.211315	1579.4258	3258.0866	0	392.27
24	Optimized	189.8186	-26.691335	1484.5994	3149.5413	0	393.47
25	Optimized	191.79915	-24.94946	1375.8934	2958.8463	0	394.74
26	Optimized	193.9231	-22.95136	1251.205	2778.6037	0	396.1
27	Optimized	195.9888	-20.90884	1123.7577	2569.2649	0	397.43
28	Optimized	197.99625	-18.821905	993.53151	2380.228	0	398.72
29	Optimized	199.1339	-17.63922	919.71892	2272.3396	0	399.44
30	Optimized	199.435	-17.32619	900.19376	2190.9829	0	499.55
31	Optimized	199.8011	-16.940645	876.13114	2140.801	0	499.84
32	Optimized	200.5	-16.196615	829.72751	2058.0583	0	499.58
33	Optimized	202.00345	-14.596055	729.81794	1900.2626	0	498.33

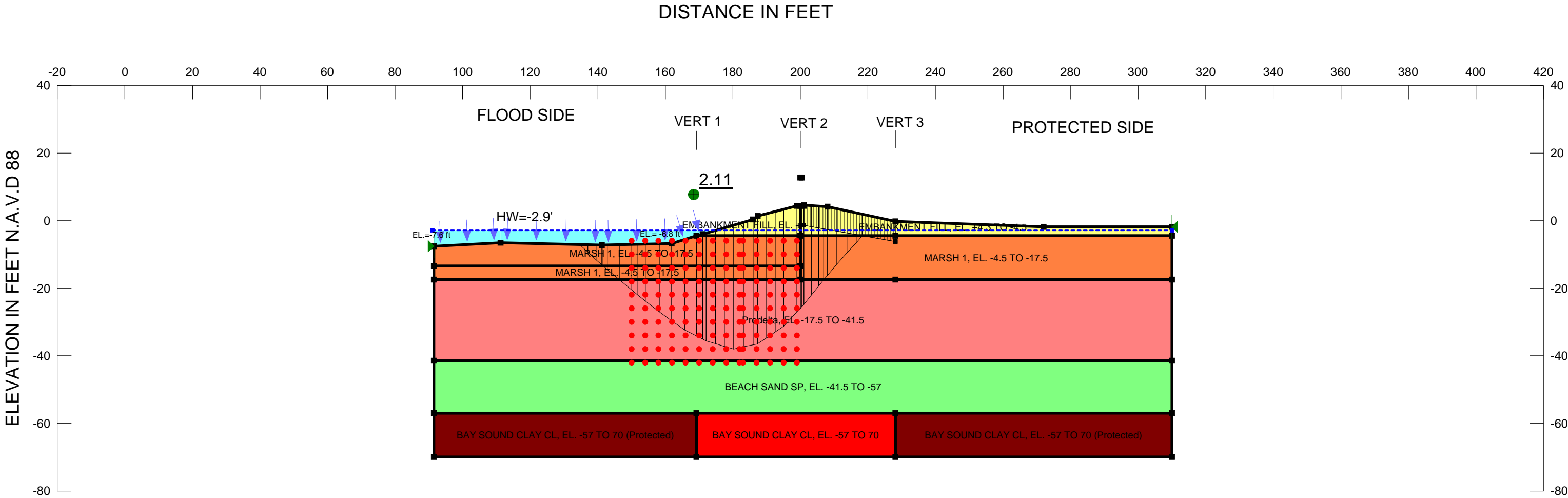
34	Optimized	204.01925	-12.402425	592.94693	1637.7636	0	496.65
35	Optimized	206.04395	-10.15169	452.49736	1382.0674	0	494.96
36	Optimized	207.67815	-8.3619675	340.82498	1190.0412	0	493.6
37	Optimized	209.7965	-6.0988075	199.6051	903.16951	0	491.84
38	Optimized	211.979	-3.767065	54.103644	457.93607	0	760

Slices of Slip Surface: 2455

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	2455	140.42965	-8.4438555	345.94395	878.43269	0	475
2	2455	142.3019	-11.76158	552.96304	1177.0234	0	475
3	2455	144.9769	-15.365325	777.83801	1520.1183	0	475
4	2455	147.92895	-18.68166	984.77183	1786.7313	0	380
5	2455	150.35525	-20.860275	1120.715	1974.8798	0	380
6	2455	152.78155	-22.703445	1235.7231	2134.4246	0	380
7	2455	155.20785	-24.26766	1333.3593	2269.4739	0	380
8	2455	157.6342	-25.59114	1415.9253	2382.9112	0	380
9	2455	160.06055	-26.70087	1485.1773	2476.8179	0	380
10	2455	162.48685	-27.61641	1542.2927	2552.7281	0	380
11	2455	164.975	-28.36641	1589.116	2636.4742	0	380
12	2455	167.525	-28.95297	1625.6873	2725.4544	0	380
13	2455	169.91665	-29.34604	1650.2526	2795.4301	0	380.72
14	2455	172.15	-29.571	1664.2549	2848.523	0	382.15
15	2455	174.38335	-29.66581	1670.176	2913.988	0	383.58
16	2455	176.61665	-29.631435	1668.0221	2991.7397	0	385.01
17	2455	178.85	-29.46752	1657.8353	3056.4766	0	386.44
18	2455	181.08335	-29.17239	1639.3848	3107.9314	0	387.87
19	2455	182.7	-28.888905	1621.6634	3222.0717	0	388.91
20	2455	184.625	-28.416045	1592.2109	3318.1956	0	390.14
21	2455	187.475	-27.556215	1538.533	3314.2535	0	391.97
22	2455	190.1625	-26.52441	1474.1659	3251.0402	0	393.69
23	2455	192.6875	-25.328695	1399.5544	3129.3115	0	395.31
24	2455	195.2125	-23.89596	1310.1383	2982.4588	0	396.93

25	2455	197.7375	-22.193245	1203.9089	2806.4892	0	398.55
26	2455	199.5	-20.85789	1120.5604	2664.4093	0	399.68
27	2455	200.5	-20.005225	1067.3602	2569.5543	0	399.67
28	2455	202.04745	-18.532115	975.43162	2425.7605	0	398.64
29	2455	204.3962	-15.9636	815.16057	2058.8982	0	496.34
30	2455	206.99875	-12.484655	598.08889	1589.7428	0	494.17
31	2455	209.73425	-7.521055	288.34813	867.46646	0	491.89





Name: EMBANKMENT FILL, EL. +4.3 TO -4.5 Model: Undrained (Phi=0) Unit Weight: 117 pcf Cohesion: 760 psf Piezometric Line: 1
Name: MARSH 1, EL. -4.5 TO -17.5 Model: Spatial Mohr-Coulomb Unit Weight: 114 pcf Cohesion Fn: MARSH 1 Phi: 0 ° Piezometric Line: 1
Name: BEACH SAND SP, EL. -41.5 TO -57 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: SAND Piezometric Line: 1
Name: BAY SOUND CLAY CL, EL. -57 TO 70 Model: Spatial Mohr-Coulomb Unit Weight: 112 pcf Cohesion Spatial Fn: Bay Sound Phi: 0 ° Piezometric Line: 1
Name: Prodelta, EL. -17.5 TO -41.5 Model: Spatial Mohr-Coulomb Unit Weight: 98 pcf Cohesion Fn: PRODELTA Phi: 0 ° Piezometric Line: 1
Name: BAY SOUND CLAY CL, EL. -57 TO 70 (Protected) Model: Spatial Mohr-Coulomb Unit Weight: 112 pcf Cohesion Fn: Bay Sound Phi: 0 ° Piezometric Line: 1



**US Army Corps
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New Orleans District

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
VERTICALSWERE ASSUMED TO VARY LINEARLY
BETWEENTHE VALUES INDICATED FOR THESE LOCATIONS.

Hw = CANAL WATER LEVEL

LONDON AVE CANAL
OUTFALL CANAL REEVALUATION REPORT
REACH 4, STA. 33+00 TO 37+00
FLOOD SIDE STABILITY ANALYSIS,
CASE: FS Global Stability (Block)
APRIL 2013

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

FS Global Stability (Block)

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File Information

Created By: Liljegren, James
Revision Number: 158
Last Edited By: Schroeder, Danielle MVN
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Time: 9:06:42 AM
File Name: Reach 4.gsz
Directory: c:\documents and settings\b2edfdvs\my documents\pw_working\cemvn\d0441022\
Last Solved Date: 6/17/2013
Last Solved Time: 9:07:08 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

FS Global Stability (Block)

Kind: SLOPE/W
Parent: Gap Analysis (Seepage)
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

Phi: 0 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Prodelta, EL. -17.5 TO -41.5

Model: Spatial Mohr-Coulomb
Unit Weight: 98 pcf
Cohesion Fn: PRODELTA
Phi: 0 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

BAY SOUND CLAY CL, EL. -57 TO 70 (Protected)

Model: Spatial Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion Fn: Bay Sound
Phi: 0 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Slip Surface Limits

Left Coordinate: (91.5, -7.6) ft
Right Coordinate: (310, -1.8) ft

Slip Surface Block

Left Grid
 Upper Left: (150, -6) ft
 Lower Left: (150, -42) ft
 Lower Right: (182, -42) ft
 X Increments: 8
 Y Increments: 9
 Starting Angle: 135 °
 Ending Angle: 155 °
 Angle Increments: 4
Right Grid
 Upper Left: (183, -6) ft
 Lower Left: (183, -42) ft
 Lower Right: (199, -42) ft
 X Increments: 4
 Y Increments: 9
 Starting Angle: 25 °
 Ending Angle: 45 °

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. +4.3 TO -4.5

Model: Undrained (Phi=0)
Unit Weight: 117 pcf
Cohesion: 760 psf
Pore Water Pressure
Piezometric Line: 1

MARSH 1, EL. -4.5 TO -17.5

Model: Spatial Mohr-Coulomb
Unit Weight: 114 pcf
Cohesion Fn: MARSH 1
Phi: 0 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

BEACH SAND SP, EL. -41.5 TO -57

Model: Shear/Normal Fn.
Unit Weight: 122 pcf
Strength Function: SAND
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

BAY SOUND CLAY CL, EL. -57 TO 70

Model: Spatial Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion Spatial Fn: Bay Sound

Angle Increments: 4

Piezometric Lines

Piezometric Line 1

Coordinates	
X (ft)	Y (ft)
91	-2.9
310	-2.9

Tension Crack Line

X (ft)	Y (ft)
201	-1.4
228.1	-6.2

Cohesion Functions

Bay Sound

Model: Spline Data Point Function
Function: Cohesion vs. Y
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 580
Data Points: Y (ft), Cohesion (psf)
 Data Point: (-70, 720)
 Data Point: (-57, 580)

MARSH 1

Model: Spline Data Point Function
Function: Cohesion vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 475
Data Points: X (ft), Cohesion (psf)
 Data Point: (169.2, 475)
 Data Point: (200, 500)
 Data Point: (228.1, 475)

PRODELTA

Model: Spline Data Point Function

Function: Cohesion vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 380
Data Points: X (ft), Cohesion (psf)
Data Point: (169.2, 380)
Data Point: (200, 400)
Data Point: (228.1, 380)

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: (-100000, 0)
Data Point: (0, 0)
Data Point: (100000, 57735)
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: (169.2, -57, 580)
Data Point: (169.2, -70, 720)
Data Point: (200, -57, 715)
Data Point: (200, -70, 860)
Data Point: (228.1, -57, 580)
Data Point: (228.1, -70, 720)

Regions

	Material	Points	Area (ft²)
Region 1	EMBANKMENT FILL, EL. +4.3 TO -4.5	7,28,25,26,24,1,15	141.75
Region 2	EMBANKMENT FILL, EL. +4.3 TO -4.5	1,29,21,2,3,37,4,8,22,15	456.645
Region 3	MARSH 1, EL. -4.5 TO -17.5	5,27,30,6,7,15,16,9	779.75
Region 4	MARSH 1, EL. -4.5 TO -17.5	16,15,22,8,10,17	1430
Region 5	MARSH 1, EL. -4.5 TO -17.5	9,16,17,18	444.85
Region 6	Prodelta, EL. -17.5 TO -41.5	18,17,10,12,11	5244
Region 7	BEACH SAND SP, EL. -41.5 TO -57	31,11,12,32,34,33	3386.75
Region 8	BAY SOUND CLAY CL, EL. -57 TO 70 (Protected)	31,13,35,33	1010.1
Region 9	BAY SOUND CLAY CL, EL. -57 TO 70	33,35,36,34	765.7
Region 10	BAY SOUND CLAY CL, EL. -57 TO 70 (Protected)	34,36,14,32	1064.7

Points

	X (ft)	Y (ft)
Point 1	200	4.3
Point 2	208	4.1
Point 3	228.1	-0.2
Point 4	310	-1.8
Point 5	91.5	-7.6
Point 6	161.9	-6.8
Point 7	169.2	-4.5
Point 8	310	-4.5
Point 9	91.5	-13.4
Point 10	310	-17.5
Point 11	91.5	-41.5
Point 12	310	-41.5
Point 13	91.5	-70
Point 14	310	-70
Point 15	200	-4.5
Point 16	200	-13.4
Point 17	200	-17.5
Point 18	91.5	-17.5
Point 19	200	12.7
Point 20	200.5	12.7

Point 21	201	4.6
Point 22	228.1	-4.5
Point 23	228.1	-17.5
Point 24	199	4.3
Point 25	186	0.3
Point 26	187.4	1.4
Point 27	111.2	-6.6
Point 28	171	-4
Point 29	201	4.3
Point 30	141.2	-7.3
Point 31	91.5	-57
Point 32	310	-57
Point 33	169.2	-57
Point 34	228.1	-57
Point 35	169.2	-70
Point 36	228.1	-70
Point 37	272	-1.8

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	2.11	(174.946, -4.242)	39.33703	(218.204, 1.9171)	(134.611, -7.14626)
2	9810	2.19	(174.946, -4.242)	41.571	(220.199, 1.49018)	(129.775, -7.03342)

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	135.8283	-8.2592935	334.42768	609.80305	0	475
2	Optimized	138.2627	-10.485364	473.32794	864.80719	0	475

3	Optimized	140.33995	-12.342505	589.22737	1065.3312	0	475
4	Optimized	141.3811	-13.243305	645.42355	1169.0446	0	475
5	Optimized	142.15985	-13.91708	687.47829	1248.0395	0	475
6	Optimized	144.58035	-15.96708	815.39401	1482.2826	0	475
7	Optimized	148.0936	-18.92151	999.73649	1766.4102	0	380
8	Optimized	150.8553	-21.192265	1141.4412	1985.2789	0	380
9	Optimized	152.9979	-22.89075	1247.433	2156.848	0	380
10	Optimized	156.11435	-25.349115	1400.8166	2403.8318	0	380
11	Optimized	160.02975	-28.30423	1585.2198	2687.0229	0	380
12	Optimized	163.8217	-31.033255	1755.5178	2993.0534	0	380
13	Optimized	167.4717	-33.28077	1895.7668	3223.1322	0	380
14	Optimized	170.1	-34.595425	1977.7732	3394.9828	0	380.58
15	Optimized	171.5305	-35.310945	2022.4346	3488.0084	0	381.51
16	Optimized	173.4491	-35.98619	2064.5644	3534.6736	0	382.76
17	Optimized	176.18335	-36.793605	2114.9486	3681.5323	0	384.53
18	Optimized	178.8757	-37.58863	2164.57	3851.093	0	386.28

	d						
19	Optimize d	181.6664	- 37.68014 5	2170.2729	3825.7104	0	388.1
20	Optimize d	184.55545	- 37.06815 5	2132.0767	3862.2812	0	389.97
21	Optimize d	186.64395	- 36.62575 5	2104.5107	3926.2931	0	391.33
22	Optimize d	187.34395	-36.45202	2093.6337	3858.2488	0	391.78
23	Optimize d	188.679	- 35.56299 5	2038.1767	3813.8331	0	392.65
24	Optimize d	191.23705	- 33.85960 5	1931.8736	3722.4001	0	394.31
25	Optimize d	193.7951	- 32.15621 5	1825.603	3630.967	0	395.97
26	Optimize d	197.03705	-29.16846	1639.1487	3331.0721	0	398.08
27	Optimize d	199.5	- 26.48830 5	1471.8947	3128.9858	0	399.68
28	Optimize d	200.23335	- 25.69028 5	1422.1199	3052.2672	0	399.83
29	Optimize d	200.73335	-25.10875	1385.8516	2963.1041	0	399.48
30	Optimize d	202.0864	-23.44643	1282.1064	2829.7627	0	398.52
31	Optimize d	204.25915	- 20.77700 5	1115.5131	2556.8913	0	396.97
32	Optimize d	206.13805	- 18.47114 5	971.62045	2321.8689	0	395.63

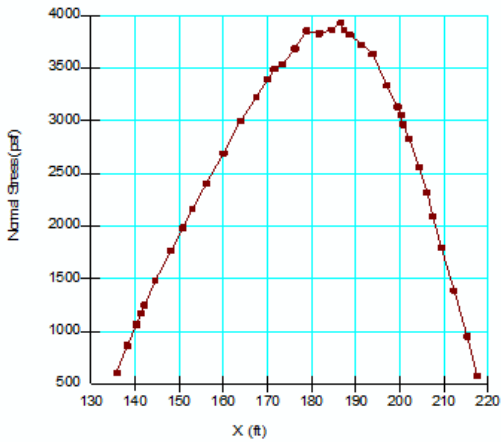
33	Optimize d	207.4653	-16.84475	870.12506	2090.121	0	493.36
34	Optimize d	209.3701	- 14.51060 5	724.51094	1792.7954	0	491.66
35	Optimize d	212.2349	- 11.20272 5	518.08187	1389.0601	0	489.11
36	Optimize d	215.22435	-7.944755	314.78879	952.71157	0	486.46
37	Optimize d	217.46145	-5.38147	154.84209	572.39826	0	484.46

Slices of Slip Surface: 9810

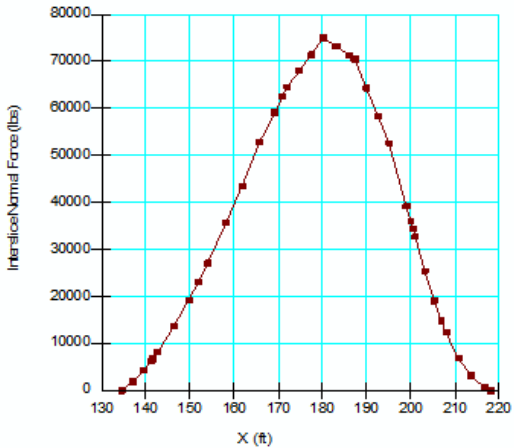
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	9810	131.2905	- 8.0945165	324.14118	538.44247	0	475
2	9810	134.32135	- 10.216712	456.57608	779.36589	0	475
3	9810	137.3522	- 12.338905	588.98396	1020.3163	0	475
4	9810	140.0338	- 14.216595	706.1567	1233.5178	0	475
5	9810	142.9615	- 16.266595	834.06441	1470.8143	0	475
6	9810	146.1544	-18.50229	973.59538	1684.8928	0	380
7	9810	149.0172	-20.50687	1098.664	1887.1315	0	380
8	9810	151.88005	-22.51145	1223.7613	2089.3988	0	380
9	9810	154.7429	-24.516035	1348.8299	2291.6374	0	380
10	9810	157.60575	-26.52062	1473.9272	2493.9047	0	380
11	9810	160.4686	-28.5252	1599.0244	2696.1433	0	380
12	9810	163.725	-30.80537	1741.2929	2954.7826	0	380
13	9810	167.375	- 33.361125	1900.7695	3267.8558	0	380
14	9810	170.1	-35.26919	2019.8471	3500.5101	0	380.58

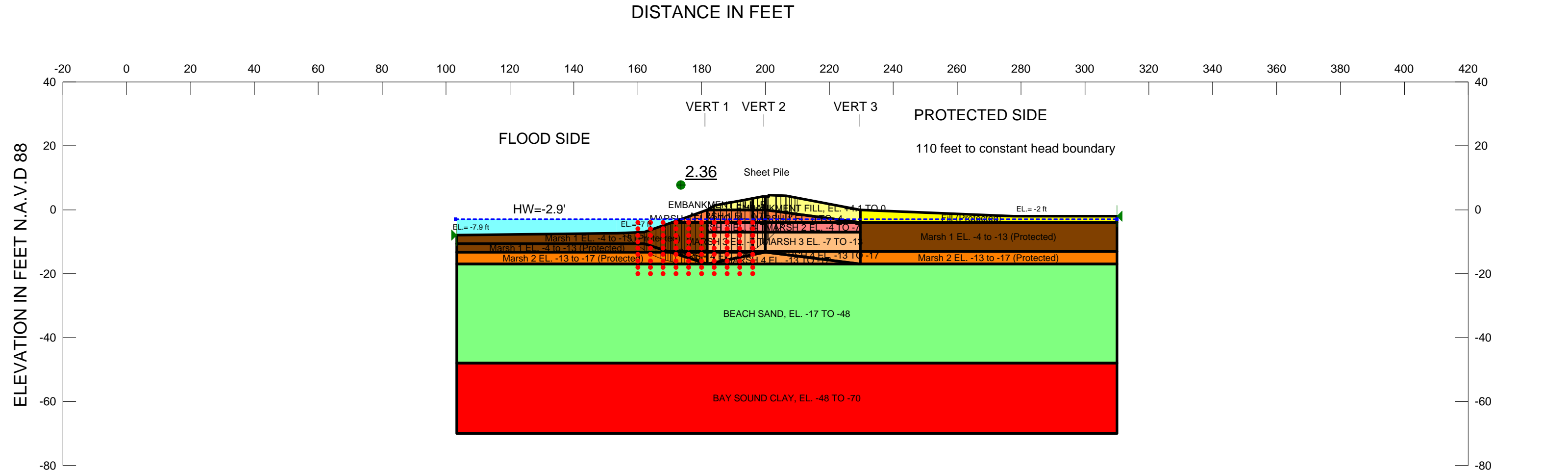
15	9810	172.5	-36.94969	2124.6891	3705.0245	0	382.14
16	9810	174.4186	-38	2190.2528	3674.4695	0	383.39
17	9810	176.23255	-38	2190.2406	3727.7412	0	384.57
18	9810	179.02325	-38	2190.2406	3821.2662	0	386.38
19	9810	181.81395	-38	2190.2406	3915.1495	0	388.19
20	9810	184.60465	-38	2190.2406	4008.6745	0	390
21	9810	186.5	-38	2190.2	4101.4	0	391.23
22	9810	187.2	-37.8	2177.7122	3905.3509	0	391.69
23	9810	188.85	-36.15	2074.7978	3805.6978	0	392.76
24	9810	191.75	-33.25	1893.8516	3608.4393	0	394.64
25	9810	194.65	-30.35	1712.881	3411.4247	0	396.53
26	9810	197.55	-27.45	1531.9104	3214.1663	0	398.41
27	9810	199.5	-25.5	1410.2533	3067.3576	0	399.68
28	9810	200.5	-24.5	1347.8158	2970.9082	0	399.64
29	9810	202.625	-22.375	1215.2446	2787.7413	0	398.13
30	9810	205.875	-19.125	1012.4464	2448.5476	0	395.82
31	9810	207.75	-17.25	895.43758	2205.0417	0	493.1
32	9810	209.5249	-15.47508	784.67378	1966.9474	0	491.53
33	9810	212.57475	- 12.425235	594.37114	1550.73	0	488.81
34	9810	215.6246	-9.37539	404.06851	1134.4893	0	486.1
35	9810	218.67445	- 6.3255485	213.75428	718.27188	0	483.39

Base Normal Stress Vs. X



Interslice Normal Stress Vs. X





Name: EMBANKMENT FILL, EL. +4.1 TO 0 Model: Spatial Mohr-Coulomb Unit Weight: 105 pcf Cohesion Fn: Fill1 Phi: 0 ° Piezometric Line: 1

Name: MARSH 1 EL. 0 TO -4 Model: Undrained (Phi=0) Unit Weight: 107 pcf Cohesion: 475 psf Piezometric Line: 1

Name: BEACH SAND, EL. -17 TO -48 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand Piezometric Line: 1

Name: BAY SOUND CLAY, EL. -48 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 111 pcf Cohesion Spatial Fn: Clay Phi: 0 ° Piezometric Line: 1

Name: MARSH 2 EL. -4 TO -7 Model: Spatial Mohr-Coulomb Unit Weight: 104 pcf Cohesion Fn: Marsh 2 Phi: 0 ° Piezometric Line: 1

Name: MARSH 3 EL. -7 TO -13 Model: Spatial Mohr-Coulomb Unit Weight: 111 pcf Cohesion Fn: Marsh 3 Phi: 0 ° Piezometric Line: 1

Name: Fill (Protected) Model: Spatial Mohr-Coulomb Unit Weight: 112 pcf Cohesion: 500 psf Phi: 0 ° Piezometric Line: 1

Name: Marsh 1 EL. -4 to -13 (Protected) Model: Undrained (Phi=0) Unit Weight: 112 pcf Cohesion: 450 psf Piezometric Line: 1

Name: Marsh 2 EL. -13 to -17 (Protected) Model: Undrained (Phi=0) Unit Weight: 100 pcf Cohesion: 300 psf Piezometric Line: 1

Name: MARSH 4 EL. -13 TO -17 Model: Spatial Mohr-Coulomb Unit Weight: 99 pcf Cohesion Fn: Marsh 4 Phi: 0 ° Piezometric Line: 1



**US Army Corps
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New Orleans District

GENERAL NOTES

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SHEAR STRENGTHS AND UNIT WEIGHTS OF
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BOTH BORING AND CPT DATA PLATES.

WHERE INDICATED, SHEAR STRENGTHS BETWEEN
VERTICALSWERE ASSUMED TO VARY LINEARLY
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Hw = CANAL WATER LEVEL

LONDON AVE CANAL
OUTFALL CANAL REEVALUATION REPORT
REACH 5, STA. 37+00 TO 40+00
FLOOD SIDE STABILITY ANALYSIS,
CASE: FS Stability (Block)
APRIL 2013

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

FS Stability (Block)

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File Information

Created By: Liljegren, James
Revision Number: 340
Last Edited By: Curran, Matthew MVN
Date: 11/2/2011
Time: 2:06:55 PM
File Name: Reach 5.gsz
Directory: c:\documents and settings\b2edfdvs\my documents\pw_working\cemvn\d0441022\
Last Solved Date: 11/2/2011
Last Solved Time: 2:09:48 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

FS Stability (Block)

Kind: [SLOPE/W](#)
Parent: [Gap Analysis \(Seepage\)](#)
Method: [Spencer](#)
Settings
 Apply Porewater 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: [Search for Tension Crack](#)
 Percentage Wet: 0

Phi: 0 °
Phi-B: 0 °
Pore Water Pressure
 Piezometric Line: 1

MARSH 2 EL. -4 TO -7
Model: [Spatial Mohr-Coulomb](#)
Unit Weight: 104 pcf
Cohesion Fn: [Marsh 2](#)
Phi: 0 °
Phi-B: 0 °
Pore Water Pressure
 Piezometric Line: 1

MARSH 3 EL. -7 TO -13
Model: [Spatial Mohr-Coulomb](#)
Unit Weight: 111 pcf
Cohesion Fn: [Marsh 3](#)
Phi: 0 °
Phi-B: 0 °
Pore Water Pressure
 Piezometric Line: 1

Fill (Protected)
Model: [Spatial Mohr-Coulomb](#)
Unit Weight: 112 pcf
Cohesion: 500 psf
Phi: 0 °
Phi-B: 0 °
Pore Water Pressure
 Piezometric Line: 1

Marsh 1 EL. -4 to -13 (Protected)
Model: [Undrained \(Phi=0\)](#)
Unit Weight: 112 pcf
Cohesion: 450 psf
Pore Water Pressure
 Piezometric Line: 1

Marsh 2 EL. -13 to -17 (Protected)
Model: [Undrained \(Phi=0\)](#)
Unit Weight: 100 pcf
Cohesion: 300 psf
Pore Water Pressure
 Piezometric Line: 1

MARSH 4 EL. -13 TO -17
Model: [Spatial Mohr-Coulomb](#)

Tension Crack Fluid Unit Weight: 9.807 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. +4.1 TO 0

Model: [Spatial Mohr-Coulomb](#)
Unit Weight: 105 pcf
Cohesion Fn: [Fill1](#)
Phi: 0 °
Phi-B: 0 °
Pore Water Pressure
 Piezometric Line: 1

MARSH 1 EL. 0 TO -4

Model: [Undrained \(Phi=0\)](#)
Unit Weight: 107 pcf
Cohesion: 475 psf
Pore Water Pressure
 Piezometric Line: 1

BEACH SAND, EL. -17 TO -48

Model: [Shear/Normal Fn.](#)
Unit Weight: 122 pcf
Strength Function: [Sand](#)
Phi-B: 0 °
Pore Water Pressure
 Piezometric Line: 1

BAY SOUND CLAY, EL. -48 TO -70

Model: [Spatial Mohr-Coulomb](#)
Unit Weight: 111 pcf
Cohesion Spatial Fn: [Clay](#)

Unit Weight: 99 pcf
Cohesion Fn: [Marsh 4](#)
Phi: 0 °
Phi-B: 0 °
Pore Water Pressure
 Piezometric Line: 1

Slip Surface Limits

Left Coordinate: (103.3, -7.9) ft
Right Coordinate: (310, -2) ft

Slip Surface Block

Left Grid
 Upper Left: (160, -4) ft
 Lower Left: (160, -20) ft
 Lower Right: (176, -20) ft
 X Increments: 4
 Y Increments: 8
 Starting Angle: 135 °
 Ending Angle: 180 °
 Angle Increments: 9
Right Grid
 Upper Left: (180, -4) ft
 Lower Left: (180, -20) ft
 Lower Right: (196, -20) ft
 X Increments: 4
 Y Increments: 8
 Starting Angle: 20 °
 Ending Angle: 60 °
 Angle Increments: 8

Piezometric Lines

Piezometric Line 1

Coordinates	
X (ft)	Y (ft)
103	-2.9
310	-2.9