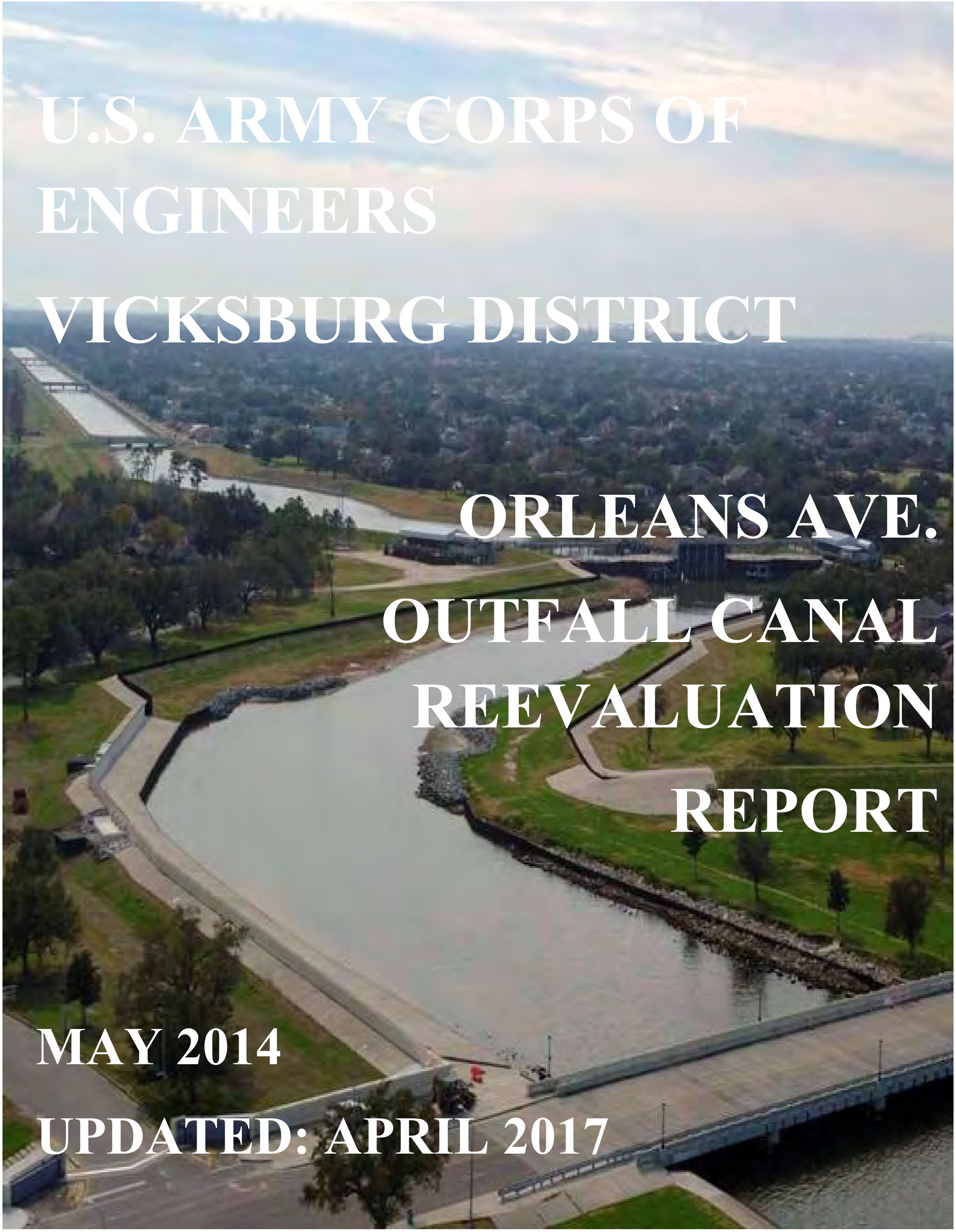

U.S. ARMY CORPS OF ENGINEERS

VICKSBURG DISTRICT

ORLEANS AVE. OUTFALL CANAL REEVALUATION REPORT

MAY 2014

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Executive Summary

Orleans Avenue Canal is located between the 17th Street and the London Avenue Canals in Orleans Parish, Louisiana. The canal extends north about 2.4 miles from Drainage Pump Station No.7 (DPS 7), located near interstate I-610, to Lake Pontchartrain. The Orleans Avenue Canal parallel protection system consists of earthen levee, earthen levee with I-wall, and T-walls section along both sides of the canal. Orleans Avenue Canal has a closure structure located near the outlet of the canal at Lake Pontchartrain.

The original Maximum Operating Water Level (MOWL) study for Orleans Avenue Canal was initiated by Black & Veatch in 2007 and was finalized in March 2011 (Hurricane Protection Office 2011). The study was initiated to determine the maximum operating water levels that each reach of the canal can sustain under the current operating conditions and Hurricane Storm Damage Risk Reduction System (HSDRRS) design guidelines. The results of this study indentified several reaches that fell below a MOWL of EL +8.0. These reaches include: reaches 1A, 1B, 1C, and 10B on the west side; reaches 13A, 13B, 16, 17A, 17B, 18A, 18B, 19, and 20B on the east side. Reaches 1A, 1B, 1C, 17A, 17B, 18A, 18B, and 19 were remediated in 2011. The other reaches were not remediated as additional data collected and analyses performed after the study indicated that remediation was not necessary.

This report provides the summary of results for the reevaluation of the MOWL for Orleans Avenue Canal using the guidelines from Engineering Technical Letter (ETL) 1110-2-575, Evaluation of I-Walls, dated 1 September 2011 (USACE 2011) as well as the concerns noted for further evaluation in the report, *Summary of Engineering Analyses and Construction to Obtain Maximum Operating Water Level at Orleans Avenue Canal*, 30 September 2011 (New Orleans District 2011).

While the analyses and methods used to evaluate the I-wall levees in the MOWL Report were conservative, non-hurricane loading cases were not fully considered due to the past performance of the projects with regards to the acceptable non-hurricane performance history. The non-hurricane loading cases are evaluated in this report and include flood side (F/S) stability analyses with a low water condition

and S-case analyses for both flood side and protected side (P/S). In September 2011, ETL 1110-2-575 *Evaluation of I-Walls* was completed and approved. This technical letter presented a new method of analysis for evaluating I-Wall stability for I-Walls. Each reach was evaluated with this new method to determine the effect of the change. For select reaches, the Fast Lagrangian Analysis of Continua (FLAC) was used to fully evaluate the factor of safety and wall/embankment deformations and to compare the results from the new ETL 1110-2-575 (ETL) method.

Based on the analyses performed for this report, no reaches along Orleans Avenue Canal are recommended for remediation.

Introduction.

This report provides the summary of results for the reevaluation of the Maximum Operating Water Level (MOWL) for Orleans Avenue Canal using the guidelines from Engineering Technical Letter (ETL) 1110-2-575, Evaluation of I-Walls, dated 1 September 2011 (USACE 2011) as well as the concerns noted for further evaluation in the report, *Summary of Engineering Analyses and Construction to Obtain Maximum Operating Water Level at Orleans Avenue Canal*, 30 September 2011 (New Orleans District 2011).

Orleans Avenue Canal is located between the 17th Street and the London Avenue Canals in Orleans Parish, Louisiana. The canal extends north about 2.4 miles from Drainage Pump Station No.7 (DPS 7), located near interstate I-610, to Lake Pontchartrain. The Orleans Avenue Canal parallel protection system consists of earthen levees, earthen levee with I-wall, and T-walls section along both sides of the canal. Orleans Avenue Canal has a closure structure located near the outlet of the canal at Lake Pontchartrain. The closure structure remains open under normal weather conditions, but will be closed during tropical events. When the canal is closed during tropical events, the canal will function as conduits for the flow of runoff that is pumped from the city. Subsequently, a pump station will be located in conjunction with the closure structure and will evacuate water from the canal into Lake Pontchartrain. The tables below summarize the levee types for reaches along Orleans Ave. Canal.

Table 1: Summary of Levee Types along Orleans Ave. Canal (West Bank).

Bank	Reach	Baseline Approximate Station	Levee Type	Embankment Crest Elevation NAVD 88		Sheet pile Tip Elevation NAVD 88
				Protected Side	Flood Side	
WEST BANK	1A	2+45 to 7+00	I-wall	3.60	-1.60	-28.5
	1B	7+00 to 9+25	I-wall	3.60	-1.60	-28.5
	1C	9+25 to 11+00	I-wall	3.60	-1.60	-28.5
	1D	11+00 to 14+20	I-wall	3.60	-1.60	-28.5
	2	14+20 to 21+75	I-wall	3.20	-2.30	-28.5
	3	21+75 to 24+87	T-wall	3.40	-1.20	-21.5
	4	24+87 to 29+16	I-wall	3.30	-1.80	-28.5
	5	29+16 to 36+26	T-wall	2.80	0.50	-26.5
	Harrison Avenue					
	5	37+27 to 42+00	T-wall	2.80	0.50	-27.5
	6	42+00 to 50+00	T-wall	2.80	0.50	-27.5
	7	50+00 to 59+00	T-wall	2.80	0.50	-35.5
	8	59+00 to 63+58	T-wall	2.80	0.50	-35.5
	Filmore Avenue					
	9	65+00 to 90+27	T-wall	3.00	0.50	-40.0
	Robert E. Lee Avenue					
	10A	91+88 to 93+53	I-wall	7.50	7.50	-9.5
	10B	93+53 to 98+70	Levee	10.70	10.70	N/A
	11	98+70 to 112+50	Levee	13.20	13.20	N/A

Table 2: Summary of Levee Types along Orleans Ave. Canal (East Bank).

Bank	Reach	Baseline Approximate Station	Levee Type	Embankment Crest Elevation NAVD 88		Sheet pile Tip Elevation NAVD 88
				Protected Side	Flood Side	
EAST BANK	12A	2+45 to 3+70	Levee w/wall	7.6	7.6	N/A
	12B	3+70 to 4+70	Levee	8.5	8.5	N/A
	13A	4+70 to 7+00	I-wall	9.42	8.34	-1.3
	13B	7+00 to 11+20	I-wall	8.40	8.40	-1.3
	14	11+20 to 20+50	I-wall	8.00	8.00	-1.3
	15	20+50 to 30+00	I-wall	8.00	8.00	-1.3
	16	30+00 to 36+40	I-wall	8.50	8.40	-1.3
	Harrison Avenue					
	17A	37+29 to 47+00	I-wall	5.80	6.10	-9.8
	17B	47+00 to 50+00	I-wall	6.10	6.10	-9.8
	18A	50+00 to 61+00	I-wall	5.90	6.10	-9.8
	18B	61+00 to 64+00	I-wall	6.10	6.10	-9.8
	Filmore Avenue					
	19	65+00 to 90+62	I-wall	5.50	4.55	-15.3
	Robert E. Lee Avenue					
	20A	92+20 to 93+46	I-wall	6.50	6.50	-1.5
	20B	93+46 to 101+50	Levee	11.40	11.40	N/A
	21	101+50 to 113+50	Levee	12.50	12.50	N/A

The original MOWL study for Orleans Canal was initiated by Black & Veatch in 2007 and was finalized in March 2011 (Hurricane Protection Office 2011). The study was initiated to determine the maximum operating water levels that each reach of the canal can sustain under the current operating conditions and Hurricane Storm Damage Risk Reduction System (HSDRRS) design guidelines. The results of the study indentified several reaches that fell below a MOWL of EL +8.0. These reaches include: reaches 1A, 1B, 1C, and 10B on the west side; reaches 13A, 13B, 16, 17A, 17B, 18A, 18B, 19, and 20B on the east side. Further investigations were conducted on these reaches to identify if remediation measures were necessary after additional information was collected and to recommend remediation measures as necessary. Also note that Reaches 11 and 21 were limited on the subsurface information and additional data was collected and additional analyses were performed based on the updated subsurface information.

For reaches 1A, 1B, and 1C, remediation measures are outlined in Volume III of report *Remediation of Canal Walls and Levees for the Orleans Avenue Canal*, OFC-04A Rev. 4, MOL at the Outfall Canal in Orleans Parish, LA, Contract No. W912P8-07-D-0031, Task Order No. 0052, dated January 2011, prepared by Black and Veatch (Black and Veatch 2011). For reaches 10B, 13A, 13B, 16, 17A, 17B, 18B, 19, and 20B, remediation measures are outlined in Volume 1 of report *Remediation of Canal Walls and Levees for the Orleans Avenue Canal*, OFC-04A Rev. 4, MOL at the Outfall Canal in Orleans Parish, LA, Contract No. W912P8-07-D-0331, Task Order No. 0052 dated January 2011, prepared by Burns Cooley Dennis, Inc (Burns Cooley Dennis 2011). Note that the further investigations by Burns Cooley Dennis, Inc. determined remediations of reaches 10B, 13A, 13B, 16, and 20B were not necessary. In addition, additional investigations were performed on Reaches 11 and 21 as subsurface information in the B&V study was limited. These additional investigations found that these reaches did not require remediations. For reach 18A, the remediation is outlined in Appendix C of report Preparation of Design Documentation Report (DDR) for the *Remediation of Canal Walls for the Orleans Avenue Canal OCF-06*, Orleans Parish, Louisiana, Contract No. W912P8-09-D-0014, Final Geotechnical Report, dated February 2011, prepared by URS Group, Inc (URS Group 2011). Table 3 below summarizes the recommended and completed major remediations to Orleans Ave. Canal since Hurricane Katrina as noted above.

Table 3: Summary of Major Remediations to Orleans Avenue Canal post Hurricane Katrina.

Target Reach	From Sta.	To Sta.	Type	Deficiency	Remediation	Completed
1A, 1B, and 1C (West)	2+00	12+10	I-wall	Seepage	Sheet-pile cutoff	2011
17A (East)	37+29	47+25	I-wall	Global Stability	Deep-mixed shear walls	2011
17B (East)	47+00	50+00	I-wall	Global Stability	Stability berm	2011
18A (East)	50+00	61+00	I-wall	Global Stability	Stability berm	2011
18B (East)	60+00	64+00	I-wall	Global Stability	Deep-mixed shear walls	2011
19 (East)	65+00	90+00	I-wall	Global Stability	Stability berm	2011

While the analyses and methods used to evaluate the I-Wall Levees in the MOWL Report were conservative, non-hurricane loading cases were not fully considered due to the past performance of the projects with regards to the acceptable non-hurricane performance history. The non-hurricane loading cases are evaluated in this report and include flood side (F/S) stability analyses with a low water condition and S-case analyses for both flood side and protected side (P/S). In September 2011, ETL 1110-2-575 *Evaluation of I-Walls* was completed and approved. This technical letter presented a new method of analyses for evaluating I-Wall stability for I-Walls. Each reach was evaluated with this new method to determine the effect of the change. The method of analysis involved conservatively neglecting the sheet pile with regards to translational stability and the utilization of reduced passive pressures on the protected side of the embankment in a combined translation-rotation mode of failure for wall stability. For select reaches, the Fast Lagrangian Analysis of Continua (FLAC) was used to fully evaluate the factor of safety and wall/embankment deformations and to compare the results from the new ETL 1110-2-575 (ETL) method.

Objective and Purpose.

This report was prepared to reevaluate existing conditions and to fully evaluate the Orleans Ave. Canal risk reduction measures according to all HSDRRS criteria and the new ETL 1110-2-575. This report and the subsequent report is intended to identify any areas along the Orleans Ave. Canal, which may require additional remedial measures based on the HSDRRS, ETL 1110-2-575 criteria, and Permanent Pump Station requirements. The report scope includes all reaches that were evaluated in the prior MOWL Report dated March 2011.

Existing Reports.

The following are several major design reports in chronological order that pertain to Orleans Ave. Canal:

- Lake Pontchartrain, La. And Vicinity, Lake Pontchartrain High Level Plan, Design Memorandum No. 19, General Design, Orleans Avenue Outfall Canal, New Orleans District, dated August 1988, Volumes 1 thru 3.

- Remediation of Canal Walls and Levees for the Orleans Avenue Canal, OFC-04A Rev. 4, MOL at the Outfall Canal in Orleans Parish, LA, Contract No. W912P8-07-D-0031, Task Order No. 0052, Burns Cooley Dennis, Inc., dated January 2011, Vol I.

- Remediation of Canal Walls and Levees for the Orleans Avenue Canal, OFC-04A Rev. 4, MOL at the Outfall Canal in Orleans Parish, LA, Contract No. W912P8-07-D-0031, Task Order No. 0052, Black & Veatch, dated January 2011, Vol III.

- Preparation of Design Documentation Report (DDR) for the Remediation of Canal Walls for the Orleans Avenue Canal OCF-06, Orleans Parish, Louisiana, Contract No. W912P8-09-D-0014, Final Geotechnical Report, URS Group Inc., dated February 2011, Appendix C.

- Maximum Operating Water Level for Orleans Avenue Canal, Lake Pontchartrain and Vicinity, Hurricane Protection Project, Orleans Avenue Canal, Orleans Parish, Louisiana, Revised Final, Hurricane Protection Office, March 2011.

- Summary of Engineering Analyses and Construction to Obtain Maximum Operating Water Level at Orleans Avenue Canal, Draft, New Orleans District, 30 September 2011.

These reports covered the detailed designs, geotechnical subsurface investigations and laboratory testing, and analyses of Orleans Ave. Canal. These documents were reviewed in the preparation of this effort. A complete list of all referenced reports is included at the end of this report.

Hydraulic Analyses of Water Surface Profiles

To provide the "Usual" water surface profile along Orleans Avenue outfall canal, a hydraulic analysis was performed. The Permanent Canal Closure and Pumps (PCCP) project is providing the same nominal capacity at its pumping stations as the combination of nominal capacities delivered by the last upstream Sewage & Water Board New Orleans (S&WBNO) pumping stations and any upgrades per the 2010 capital improvement plan. Orleans Avenue nominal discharge is delivered by DPS7 for a total of 2700 cfs.

The PCCP project is planned to isolate the outfall canals from Lake Pontchartrain's surge during tropical storm events. This will be accomplished by providing a set of closure gates capable of passing the total outfall canal's discharge with Lake Pontchartrain's stage at 4 ft for Orleans Avenue canal without violating the prescribed maximum operating water level (MOWL). Orleans Avenue canal prescribed MOWL is +8' from DPS7 to the current location of the Interim Control Structure (ICS). All elevations referenced are to NAVD88 datum 2004.65 Epoch.

The Hydrologic Engineering Center's River Analysis System (HEC-RAS) was used to perform the hydraulic analysis. The geometry of the canal, including all crossings, was provided by recent hydrographic and topographic surveys. Calibration and verification of the models were performed by using the S&WBNO pumping records for recent rainfall events, with associated lake stages. The canal has a series of stage recording gages located from the ICS to the last upstream pumping station. The computed hydrographs were plotted against the gage records and compared for reasonableness. Once it was determined the models reproduced the historical events, the models were calibrated.

To create the "usual" water surface profiles, the canal's HEC-RAS model was run using its maximum nominal discharge and its appropriate lake stage. The usual water surface profile for the outfall canal is shown in Figure 1.

The extreme water surface profile for Orleans Avenue canal is shown in Figure 2. The extreme water surface profile is based on a downstream stage of 6 ft at the PCCP, with the S&WBNO pumps operating at existing peak capacity. The profile has been adjusted to reflect model uncertainty. The profile represents a condition at the PCCP similar to what happened in 2012 during Hurricane Isaac, where several pumps at one of the ICS' had operational issues and the peak stage at the ICS rose to 6.5 ft. More information on the extreme water surface profile is provided in Appendix G.

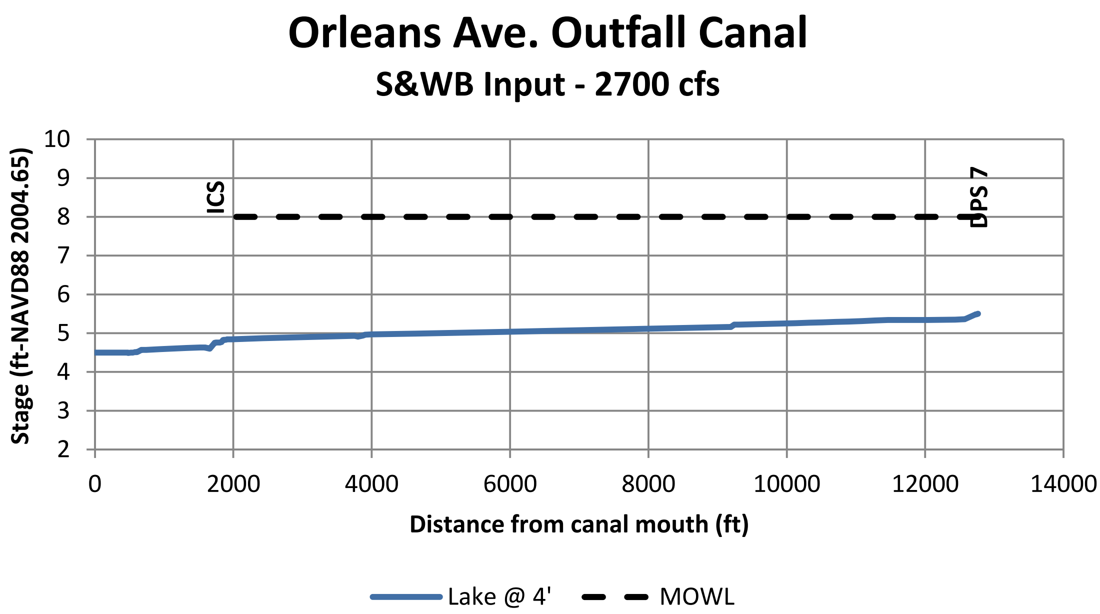


Figure 1. Orleans Avenue Canal – Usual Water Surface Profile.

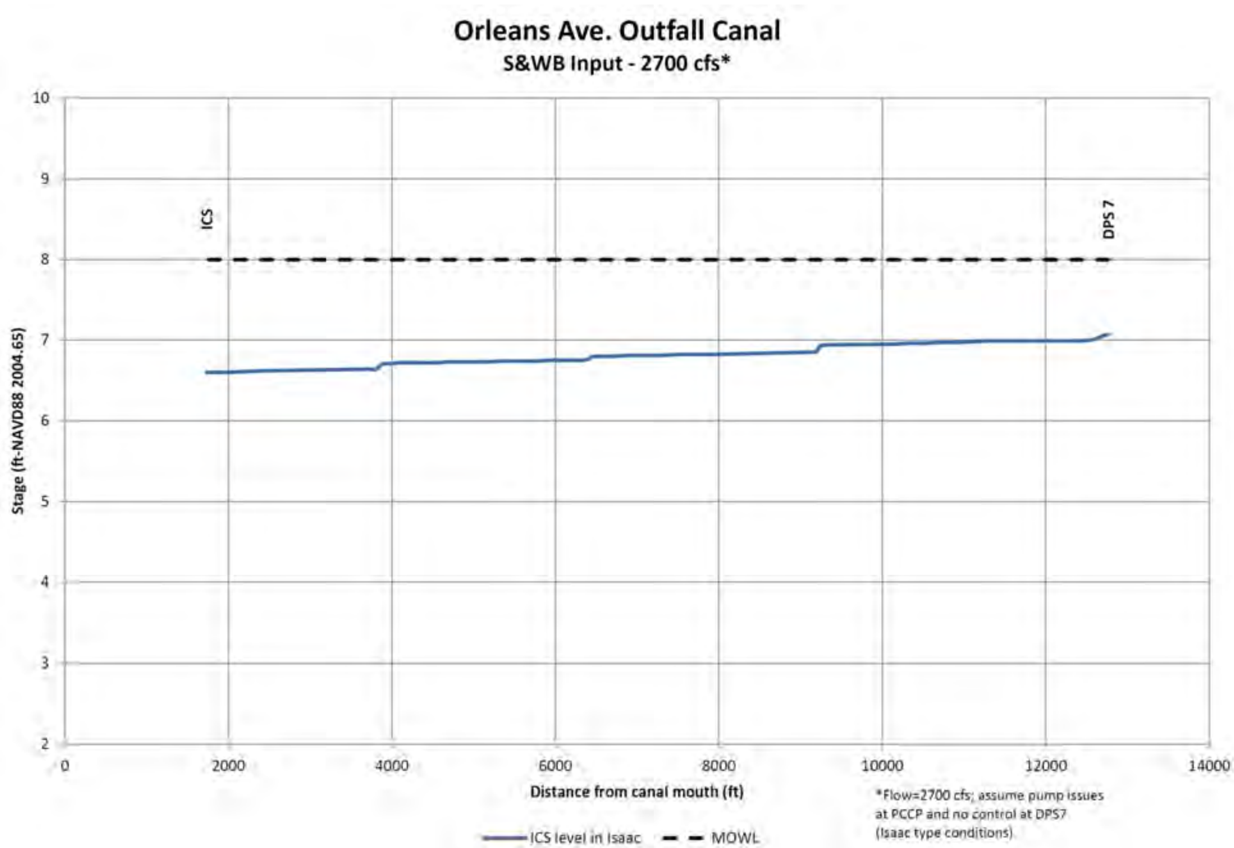


Figure 2. Orleans Avenue Canal – Extreme Water Surface Profile.

Geotechnical Analyses

The geotechnical analysis conducted for this study includes the following analysis with a brief description:

- Global Stability Analysis - global stability analysis of I-wall reaches was conducted using Spencer's Method and neglected any beneficial effects from the sheet pile walls (both I-wall and remedial cut-off, if any). The canal water level used for these analyses was elevation +8.0 ft.
- Gap Stability Analysis – gap stability analysis of I-wall reaches was performed using Spencer's Method and neglected the sheet pile wall strength characteristics. The canal water level used for these analyses was elevation +8.0 ft.
- Rotational Analysis Using Corrected Passive Pressures – Based on the ETL 1110-2-575 approach, the rotational analysis was conducted, which the passive resistance computed from a CWALSHT analysis of the I-wall was adjusted based on the results of a SLOPE/W analysis using Spencer's method. The canal water level used for these analyses was elevation +8.0 ft.
- Numerical Soil Structure Interaction Analysis – Numerical soil structure interaction (SSI) analysis was conducted using FLAC (Fast Lagrangian Analysis of Continua) v 7.0 finite difference code (Itasca 2011) to evaluate selected I-wall Reaches and T-wall reaches along Orleans Avenue Canal. The canal water level used for these analyses was varied from the normal water level (+0.40 ft) to the top of wall.
- Low Water Level Undrained (Q-Case) Stability Analysis – Low water level (LWL) undrained (Q-case) stability analysis was conducted on all using Spencer's Method and undrained strengths for clays. The canal water level used for these analyses was elevation -2.6 ft (worst case scenario) and -1.0 ft (average low water level).
- Normal Water Level Drained (S-Case) Stability Analysis – Normal water level (NWL) drained (S-case) stability analysis was conducted on all using Spencer's Method and drained strengths for clays. The canal water level used for these analyses was elevation +0.4 ft.

The HSDRRS guidance was used to define the required factors of safety for the LWL and NWL stability analyses. The target factor of safety and displacements required for the global, gap, and rotational analysis was based on the ETL 1110-2-575 guidance. In the ETL, the required factors of safety are based upon frequency intervals of occurrence. However, the Orleans Ave. Canal represents a more controlled environment with the gated closure at the Lake Pontchartrain end essentially acting now as a conveyance flow channel with pumping stations at both ends. Discussion on the canal water surface profile is provided in the previous section. The extreme water surface profile was provided in April 2013 and indicates that the extreme canal water level for the Orleans Avenue Canal reaches range from EL +6.7 (at the northern end of the canal) to EL +7.1 (at the southern end of the canal). However, as noted previously, the analyses performed in this report were done using a canal water level of EL +8.0.

The geotechnical data used in this study were obtained from several references. The representative levee cross sections with soil stratigraphy, strength lines, water contents, unit weights, and computer geotechnical modes developed in these references were used to complete the reevaluation analyses. The analyses performed for this study used the most up to date geotechnical data for the reaches. The January 2011 Black and Veatch (Black and Veatch 2011) report *Remediation of Canal Walls and Levees for the Orleans Avenue Canal*, was used to represent the critical levee cross sections for reaches 1A, 1B, and 1C. The January 2011 Burns Cooley Dennis, Inc. (Burns Cooley Dennis, Inc. 2011), Volume 1 report *Remediation of Canal Walls and Levees for the Orleans Avenue Canal*, was used to represent the critical levee cross sections for reaches 10B, 11, 13A, 13B, 16, 17, 18B, 19, 20B, and 21. The February 2011 URS Group, Inc., report *Remediation of Canal Walls for the Orleans Avenue Canal OCF-06*, was used to represent the critical levee cross section for reach 18A. The March 2011 report *Maximum Operating Water Level for Orleans Avenue Canal* was used to represent the critical levee cross sections for the remainder of the reaches. No additional subsurface investigations and laboratory investigations were conducted for the analyses performed in this report. Also, no additional surveys were conducted for the analyses performed in this report.

The pore pressures defined in stability analyses (i.e. global, gap, rotational, SSI, LWL, and NWL analysis) were based on finite element seepage analysis performed using SEEP/W. The boundary conditions used in the analyses were consistent and include the following: constant head boundary along the flood side ground surface equal to the canal water level, potential seepage exit face along the protected side levee slope landward to the protected side vertical boundary, and constant head boundary along the protected side vertical boundary equal to two feet below the ground surface. Also, for I-walls it was assumed that a gap was formed in the seepage analysis for all canal water levels and the flood side boundary condition was assigned in the gap adjacent to the I-wall. The permeability values used in the seepage analyses were consistent with the values used in the March 2011 report *Maximum Operating Water Level for Orleans Avenue Canal* and the other remediation efforts and analyses conducted in 2011. The permeability values are listed in the table below.

Table 4: Permeability Values Used in the Seepage Analyses.

Soil Layer	Soil Classification	Permeability (Kh) (cm/sec)	Permeability Ratio (Kv/Kh)
Fill clay (levee)	CH, CL	1×10^{-6}	1
Marsh clay	CH with roots, wood	1×10^{-5}	1
Beach silty sand	SP-SM (10% to 15% fines)	7×10^{-4}	1
Beach sand	SP (5% or less fines)	1.5×10^{-2}	1
Bay sound clay	CH, CL	1×10^{-6}	1
Canal sediments	SM, ML	1×10^{-5}	1

Global Stability Analyses P/S (based on ETL 1110-2-575).

Global stability analyses of levee with I-wall sections were performed using Spencer's method via GEO-SLOPE program SLOPE/W, Version 7.21. Based on ETL 1110-2-575, global stability analysis of the I-wall is conducted neglecting any beneficial effects from the sheet pile (both I-wall and remedial cut-off, if any). This analysis is conservative as the sheet pile can add resistance to the analyses. However, these analyses serve as a screening to identify reaches dependent on sheet pile embedment for additional resistance below the critical failure plane to achieve an acceptable factor of safety. Therefore, the factors of safety identified are not true system factors of safety in most cases. The analysis was conducted using both the Entry/Exit and Block search routines with optimization to determine the critical failure surface for the analyses. Pore-water pressures were determined from SEEP/W analysis assuming the gap along the flood side of the I-wall is fully developed. If tension was present in the failure surface, a tension crack was used to remove the tension. The tension crack was specified in SLOPE/W using a tension crack line and the tension crack was assumed to be filled with water. A canal water level of EL +8.0 was used in the analyses.

The global stability analyses conducted in this report were only performed for reaches containing I-walls. Orleans Avenue Canal has a total of 30 levee reaches, but only 18 reaches contain I-walls. The 12 reaches not containing I-walls were evaluated for global stability in the March 2011 report, *Maximum Operating Water Level for Orleans Avenue Canal,* and summarized in the September 2011 report, *Summary of Engineering Analyses and Construction to Obtain Maximum Operating Water Level at Orleans Avenue Canal*. Global stability analyses were not completed for reaches 17A and 18B as these I-wall reaches were remediated with deep soil mixing and the global analyses are documented in the design documentation report (DDR) for that effort. Out of 18 total I-wall reaches, two reaches were found to be below a factor of safety of 1.4 for canal water level EL +8.0. Reach 2 and Reach 19 had factors of safety 1.38 and 1.39 respectively. Factors of Safety are not the true system Global Stability Factors of Safety since failure surfaces are allowed to pass through sheet pile. Results for all reaches are shown in Table **5**. Graphical plots and output reports for these analyses are presented in Appendix A.

Table 5: **Factor of Safety Global Stability Analysis (WL +8.0)**.

Reach	Block Failure	Entry/ Exit Failure
1A	2.06	1.64
1B	2.02	1.69
1C	1.96	1.75
1D	2.88	1.82
2	**1.38**[3]	1.46
3	N/A[2]	N/A[2]
4	1.62	1.63
5	N/A[2]	N/A[2]
6	N/A[2]	N/A[2]
7	N/A[2]	N/A[2]
8	N/A[2]	N/A[2]
9	N/A[2]	N/A[2]
10A	3.23	3.25
10B	N/A[2]	N/A[2]
11	N/A[2]	N/A[2]
12A	N/A[2]	N/A[2]
12B	N/A[2]	N/A[2]
13A	2.02	2.28
13B	2.20	2.25
14	1.92	1.91
15	1.54	1.54
16	1.64	1.64
17A	N/A[1]	N/A[1]
17B	1.58	1.45
18A	1.45	1.46
18B	N/A[1]	N/A[1]
19	1.40	**1.39**[3]
20A	2.18	2.24
20B	N/A[2]	N/A[2]
21	N/A[2]	N/A[2]

Notes:
1. Not analyzed because deep soil mixing was installed.
2. Not analyzed as no I-Wall exist in this reach.
3. Factors of Safety are not the true system Global Stability Factors of Safety. These values are conservative with failure surfaces going through the sheet pile.

Gap Stability Analyses P/S (based on ETL 1110-2-575).

The gap stability analyses conducted in this report were only performed for reaches containing I-walls.

Gap stability analyses were performed on all reaches neglecting the sheet pile wall strength characteristics using Spencer's Method. Neglecting the sheet pile strength characteristics allows the analyses to examine potential critical failure surfaces located above the sheet pile tip. Critical failure surfaces located above the sheet pile tip in the gap analyses may give indication that excessive deformations and I-wall movement could occur in a developed gap condition.

The gap stability analyses were performed by removing the flood side soil down to the sheet pile tip regardless of soil type (i.e. sand) and the flood side water pressures acting on the wall were determined from the SEEP/W seepage analyses. No soil pressures (i.e. active earth pressures) were applied to the wall. The seepage analyses were conducted in the same manner as in the global stability analyses by assuming the gap is fully developed. The slip surfaces for both the Block and Entry/Exit search routines were allowed to pass through the sheet pile from the sheet pile tip to the top of the levee. The sheet pile strength properties were also neglected in the analyses.

Out of 18 total I-wall reaches, five reaches were determined to be below a factor of safety of 1.4 at canal water level EL +8.0. These reaches include Reaches 1A, 1B, 2, 4, and 19. The results of the full gap analyses for the ETL do not reflect the true global factor of safety since the sheet pile was neglected for this intermediate step. Reach 2 had the lowest factor of safety of all reaches with a gap stability analysis factor of safety of 1.08. For Reaches 1A and 1B, a fully penetrating sheet pile cutoff was installed in 2011. The sheet pile cutoff was installed on the protected side of the existing I-wall on the levee crest and was embedded 5 ft into the Bay Sound clay layer beneath the levee (tip elevation -61.5 ft). The sheet pile cutoff will resist the development of a failure surface as modeled in the gap analysis. The rotational analysis for these reaches will be important to assess the potential for excessive wall displacements.

Results for all reaches are shown on Table 6 for the west and east sides. Gap stability analyses were not completed for reaches 17A and 18B as these I-wall reaches were remediated with deep soil mixing and the gap analyses are documented in the design documentation report (DDR) for that effort. Graphical plots and output reports are presented in Appendix B.

Table 6: Factor of Safety Gap Stability Analysis (WL +8.0).

Reach	Block Failure	Entry/ Exit Failure
1A	1.62	**1.33**[4]
1B	1.42	**1.39**[4]
1C	1.64	1.49
1D	3.40	1.51
2	**1.18**[4]	**1.08**[4]
3	N/A[2]	N/A[2]
4	**1.38**[4]	**1.38**[4]
5	N/A[2]	N/A[2]
6	N/A[2]	N/A[2]
7	N/A[2]	N/A[2]
8	N/A[2]	N/A[2]
9	N/A[2]	N/A[2]
10A	3.27	3.23
10B	N/A[2]	N/A[2]
11	N/A[2]	N/A[2]
12A	N/A[2]	N/A[2]
12B	N/A[2]	N/A[2]
13A	N/A[3]	N/A[3]
13B	N/A[3]	N/A[3]
14	N/A[3]	N/A[3]
15	N/A[3]	N/A[3]
16	N/A[3]	N/A[3]
17A	N/A[1]	N/A[1]
17B	1.91	1.43
18A	2.32	1.43
18B	N/A[1]	N/A[1]
19	**1.35**[4]	**1.32**[4]
20A	4.16	2.25
20B	N/A[2]	N/A[2]
21	N/A[2]	N/A[2]

Notes:
1. Not analyzed because deep soil mixing was installed.
2. Not analyzed because there is not an I-Wall in this reach.
3. Not analyzed as the flood side levee crest elevation is higher than El +8.0.
4. Factors of Safety are not the true system Global Stability Factors of Safety. These values are conservative with failure surfaces going through the sheet pile.

Partial Gap Stability Analyses P/S (based on ETL 1110-2-575).

For reaches found to be deficient in the initial global or full-gap stability analyses when neglecting the sheet pile reinforcement, the partial gap analysis is required as specified in ETL 1110-2-575 Appendix C to more accurately determine the system global stability factor of safety. The partial gap cases were evaluated in the MOWL Report and do not include the reinforcing effect of the sheet pile installed during remediation. For the partial gap analysis, the potential slip surface starts at the tip of the sheet pile. This analysis is in accordance with HSDRRS guidelines. All reaches checked for partial gap analysis were checked before remediation was in place. All reaches that were deficient in the initial global or full-gap analyses met or exceeded the minimum required factor of safety for Spencer's Method and the Method of Planes performed for the MOWL Report. The 2011 Design Documentation Report from Burns Cooley Dennis, Inc. contains the partial gap calculations for these remediated areas. A summary of the partial gap calculations can be found in table 7.

Table 7: **Factor of Safety Partial Gap Stability Analysis**.

Reach	MOWL Spencer's Method	MOWL Method of Planes
1A	5.35	4.49
1B	4.94	5.09
2	4.54	4.42
4	5.05	4.59
19	1.48	1.48
20A	2.09	1.86

Rotational Analyses Using Corrected Passive Pressures (based upon ETL 1110-2-575).

This failure mechanism was evaluated utilizing the method outlined in the ETL. The ETL method is an approach in which the passive resistance computed from a CWALSHT analysis of the I-wall is adjusted based on the results of a SLOPE/W analysis using Spencer's method. Typically, due to the computation methods and failure surface assumptions (i.e. fixed wedge) utilized in CWALSHT, the passive resistance determined in the CWALSHT analyses of the I-wall are over estimated compared to the passive resistance estimated in the SLOPE/W analyses. The ETL method was slightly adjusted for the analyses conducted on the I-walls along Orleans Avenue Canal. The adjustment was made so the analyses could be conducted in an efficient manner and produce reliable results. The following steps outline the procedures taken:

1. A SLOPE/W analysis (Spencer's Method) was performed by removing flood side soil down to the sheet pile tip and a triangular distributed load was applied normal to the I-wall. The critical failure surface was determined by allowing the failure surfaces to pass through the sheet pile from the sheet pile tip to the levee crest. The intersection point of the critical failure surface at the sheet pile was allowed to vary as the magnitude of the distributed load was varied to determine the distribution of factors of safety versus distributed load. For each distributed load, the passive resistance (side force of the flood side slice) versus factor of safety was plotted. A polynomial trend line (2nd order or 3rd order) was applied to the passive resistance versus factor of safety plot to match the data.
2. The CWALSHT analysis of the I-wall was conducted using design analysis, no seepage, and fixed wedge options. A triangular horizontal loading acting towards the protected side was applied to the I-wall from the protected side crest elevation down to the critical failure surface elevation. The triangular loading was applied such that the maximum loading is applied at the ground surface to zero loading at the critical failure surface elevation. The triangular loading was varied to determine the CWALSHT passive resistance versus CWALSHT passive factor of safety. The triangular loading approach allowed the analysis to be conducted without having to reduce the shear strengths as with some I-walls the analysis could not be conducted due to clockwise rotation in CWALSHT.
3. Plot the CWALSHT applied resultant horizontal loading versus factor of safety and passive resistance difference between CWALSHT analysis and SLOPE/W analysis versus factor of

safety. At the intersection of the two curves, the factor of safety for the rotational analysis was determined.

Rotational stability analysis evaluates the potential for the I-wall to rotate about a point near the tip of the wall. In this analysis, it is assumed that the sheet pile acts as a short pile (i.e. negligible bending of the wall above the point of rotation and/or translation). In Reaches 1A, 1B, 1C, 1D, 2, and 4, the sheet pile tip is Elevation -28.5 and the sheet pile penetrates 15 ft or more into sand. The I-wall penetration to stick up ratio of these reaches exceeds the recommended 2.5. EM 1110-2-2906 (Design of Pile Foundations, pg 4-38), provides guidance on whether piles will behave as short piles or long piles, which is based on the ratio of the pile penetration and R factor. The R factor is based on an equation containing stiffness of the pile and the stiffness of the soil. The ratio of the pile penetration to R exceeded the short pile threshold of 2.0. Therefore, a pile penetration was determined to meet the short pile threshold and the truncated pile penetration was used in the analysis of these reaches. Thus, by using the truncated pile penetration the rotational analysis assumes that the pile will rotate at this point and not at the actual pile tip. Reaches with the truncated pile penetration are noted in Table 8.

As noted in Step 1, the slope stability analysis was allowed to search for the critical failure surface for each distributed load. By allowing the critical failure surface to search, the slope stability analysis was able to find the lowest factor safety for each distributed load. This was important so that the passive forces from stability analyses could be more accurately determined. It was discovered that the elevation of the critical failure surface would vary as the distributed loads increased. The elevation of the critical failure surface was noted in the spreadsheet. The critical failure surface elevation used in CWALSHT was estimated based on the critical failure surface elevation determined in the slope stability analysis that corresponded to the factor of safety used in CWALSHT.

As outlined in the steps above, the passive pressures in CWALSHT were corrected with a triangular loading with the maximum load at the protected side crest and zero load at the critical failure surface elevation. This loading distribution was used in lieu of a uniform distribution for several reasons. For several of the analysis reaches, using a uniform distribution caused difficulties in getting CWALSHT to converge on a solution and CWALSHT was very sensitive to changes in the uniform distribution load. For example, in Reach 19 a change in the uniform distribution load of 0.1 psf caused the design sheet pile tip depth to change by approximately 12 ft. A triangular distribution in most reaches produced a net soil pressure distribution where transition point was clear. To examine the impacts on using a triangular distribution for the passive pressure correction, a comparison was performed for Reaches 17B, 18A, and 19. Using a uniform distribution, the solution did not converge for Reach 17B and 18A. For Reach 19, the triangular distribution produced a slightly lower rotational stability factor of safety. A summary of the comparison analysis is shown in Table 8.

Table 8: Comparison of Uniform and Triangular Passive Pressure Correction for Reach 17B, 18A, and 19

Reach	CWALSHT Passive Pressure Shape	FoS	Resultant Applied Horizontal Load (lbs)
17B	Uniform	Solution Did Not Converge	
	Triangular	1.16	15,792
18A	Uniform	Solution Did Not Converge	
	Triangular	1.24	12,956
19*	Uniform	1.42	16,090
	Triangular	1.23	14,005

* Reach 19 has a higher factor of safety with a higher resultant load because of the location of the resultant load.

For reaches 1A, 1B, 1C, and 1D, the fully penetrating sheet pile remediation completed in 2011 was not considered in the analyses. For reaches 17B, 18A, and 19, the stability berm completed in 2011 was included in the analyses. Reaches 2 and 4 had the lowest factor of safety at 0.85 and 0.60 respectively. Reaches 17B, 18A, and 19 had factors of safety less than 1.4 at a canal water level of EL +8.0. Plots, output reports, analyses and results are shown in Appendix C.

Table 9: Factor of Safety Rotation Stability Results (WL EL +8.0)

Reach	FoS	RESULTANT APPLIED HORIZONTAL LOAD (lbs)
1A[1]	1.89	5412
1B[1]	1.95	4088
1C[1]	2.05	6501
1D[1]	1.91	4106
2[1,2,3]	**0.85**	4759
4[1,2]	**0.60**	12791
10A	2.86	10947
17B[2]	**1.16**	15792
18A[2]	**1.24**	12956
19[2]	**1.23**	14005
20A	1.97	4666

Notes:
1. Existing sheet pile did not meet the requirements for a short pile analysis and was truncated. Truncated tip elevations can be found in rotational analyses in Appendix C.
2. FoS below criteria.
3. Solution did not converge and landside levee crown was lowered to get the solution to converge.

Numerical Soil Structure Interaction Analyses.

Numerical soil structure interaction analyses were conducted using FLAC (Fast Lagrangian Analysis of Continua) v 7.0 finite difference code (Itasca 2011) to evaluate selected I-wall Reaches and T-wall reaches along Orleans Canal. Reaches 2, 4, 17B, and 19 were the I-wall reaches selected for FLAC analysis. These I-wall reaches were selected due to concerns with low factors of safety from either the global, gap, or rotational stability analyses. Reach 18A, which had a low rotational factor of safety, was not analyzed with the numerical soil structure interaction analyses as this reach was covered in the Reach 17B analysis. Reach 18A has a very similar cross section (stratigraphy, ground surface profile, sheet pile tip elevation, and wall height) to Reach 17B. However, the shear strengths and unit weight profiles slightly vary between the two reaches. Reach 17B was considered the more critical of the two reaches as this reach had a lower rotational factor of safety. The T-wall Reach 8 was selected due to concerns expressed in the 2011 MOWL Black and Veatch report that the estimated wall displacements were greater than the allowable.

For the I-wall reaches, the FLAC analysis was performed to estimate the gap initiation and gap propagation. The current I-wall structure was modeled as two beam elements: (1) the upper concrete portion of the I-wall and (2) the supporting sheet pile beneath the concrete. Interface elements were applied to the wall below the ground surface. These elements allow slip and separation between the soil and wall. The soil parameters used for all reaches were the same used for the global and gap stability analyses.

Canal water loadings were modeled as mechanical pressures acting normal to the ground surface and normal to the wall face. When a gap was included between the soil and I-wall a horizontal mechanical pressure was added to both the soil and the wall to the depth of the gap. The total horizontal stress in the element adjacent to the wall is compared to the hydrostatic pressure that would exist if a gap were present. If the hydrostatic water pressure exceeds the total horizontal stress it was assumed that a gap would form. Each zone was checked as canal water levels are raised from the normal pool elevation of 0.4ft to the maximum operating level in 1 ft increments. Gaps were deepened in 1ft increments as they developed. Once the gaps were fully developed they were utilized at this depth throughout the remainder of the analyses.

The T-wall FLAC model for Reach 8 was constructed in steps by first installing the foundation soil layers and then adding the T-wall, embankment fill, and piles. The Sheet-pile and precast piles were modeled as two different types of structural elements in the FLAC model. The sheet-pile was modeled as a beam element, which is directly attached to the mesh. The precast piles were modeled as pile elements, which are attached to the mesh with springs. The top of precast piles are pinned and embedded 0.75 ft in the concrete, which allows for some moment capacity. In addition to the properties required for beam elements, pile elements require both normal and longitudinal spring properties. Spring cohesion and stiffness were determined in a similar manner used by GeoMatrix in their FLAC analysis of an example pile founded T-Wall for New Orleans. A complete summary of the FLAC model analysis can be found in Appendix D.

Summary of the results for the I-wall reaches at a canal water level of EL +8.0 are provided in Table 10 on page 25. FLAC analyses were conducted at canal water levels up to EL 13.0 and these results are summarized in Appendix D. Reaches 2, 4, and 17B had maximum P/S ground displacements less than 1.5 inches for a canal water level EL+8.0. Reach 19 had a maximum P/S ground displacement of 1.67 inches for a canal water level EL +8.0. The controlling failure mode for reaches 2, 4, and 19 was the rotational failure mode. This failure mode is represented by failure of the I-wall by rotation either at the tip of the sheet pile (Reach 19) or bending of the sheet pile for I-wall reaches with long embedment (Reaches 2 and 4). The controlling failure mode for Reach 17B was global failure of the I-wall and levee.

A factor of safety in the FLAC analysis for the I-wall reaches was computed with the automated FLAC Factor of Safety (FOS) routine. This factor of safety represents the factor of safety against levee and wall collapse. The I-wall reaches analyzed the automated FLAC Factor of Safety (FOS) routine had factors of safety above 1.4 for a canal water level of +8.0 ft. A manual shear strength reduction approach was utilized for Reaches 2 and 4 to provide more information on the behavior of the I-walls in these reaches. The manual shear strength reduction approach can demonstrate the maximum shear strength reduction where elastic behavior of the I-wall under loading is maintained. For Reach 2, elastic behavior of the I-wall is maintained between a shear strength reduction of 1.0 to 1.38 at a canal water level of +8.0 ft. For Reach 4, elastic behavior of the I-wall is maintained between a shear strength reduction of 1.0 to 1.52 at a canal water level of +8.0 ft.

In all I-wall reaches analyzed, the maximum gap depth was reached at canal water levels greater than EL +8.0. This was especially important for Reaches 2 and 4 where at canal water level EL +8.0, the gap did not extend to the top of the underlying beach sand layer. When the gap did extend to the underlying beach sand layer, a hydraulic connection to the sand layer was provided via the gap and pore pressures and wall displacements drastically increased. A gap did not form in Reach 17B. Graphs of the Top of Protected Side Ground Displacement, Gap Propagation and Factor of Safety versus Canal Water

Elevation and Top of Protected Side Ground Displacement versus Factor of Safety, can be found in Appendix D.

Table 10: **Factor of Safety FLAC Numerical Model Results (I-wall Reaches)**

Reach	FoS	Maximum PS Ground Displacements (in)	Canal Water Elevation (ft NAVD88)	Gap Tip Depth (ft NAVD88)	Gap Tip Elevation (ft NAVD88)	Controlling Failure Mode
2	1.97	1.12	8	5	-7.8	Rotational
4	1.97	0.89	8	4	-5.8	Rotational
17B	1.60	0.90	8	0	6	Global
19	1.44	1.67	8	11	-7	Rotational

For Reach 8, the FLAC model estimated T-wall displacements less than the values estimated in the Black and Veatch report. The results from the FLAC model indicate that the top of wall displacements and protected side ground displacements are 0.96 inches and 0.75 inches respectively for a canal water level of EL +8.0. At a canal water level of EL +7.4, the top of wall displacement is 0.70 inches which is less than the 0.75 inch recommended allowable. The maximum and minimum displacements, shear forces, axial loads, moment, and strain for the battered precast piles are summarized in Table 11. The maximum and minimum values indicate that the pile loads are within the allowable for the pile given its design.

Table 11: Maximum and Minimum displacements, forces, and strain for the Precast Concrete Piles (T-wall Reach 8)

Water Level (EL +)		Displacement (ft)	Shear Force (kips)	Axial Load (kips)	Moment (kip-ft/ft)	Strain[1] (%)
+8.0	**Min**	0.013[FS]	-3.7[FS]	1.1[FS]	-11.7[FS]	-2.2E-02[FS]
	Max	0.085[FS]	2.2[FS]	97.4[PS]	19.8[FS]	-2.8E-03[PS]

Notes:
1 – Negative strain represents compression
FS – Flood side precast pile
PS – Protected side precast pile

Low Water Level (LWL) Undrained (Q-Case) Stability Analyses.

LWL undrained (Q-case) stability on all reaches along the Orleans Avenue Canal were analyzed for the low canal water condition detailed in the hydraulic analysis section of this report. These analyses were conducted using Spencer's Method and utilized the pore pressures developed from SEEP/W analyses. New Orleans District's Hydraulics and Hydrology (H&H) branch determined the extreme low lake water elevation as -2.6 ft based on their analyses. Thus, the low water level stability analysis was initially conducted using the extreme low lake elevation. Only an F/S failure analysis was examined due to the fact that this type of failure would be more critical and prone to occur during undrained soil conditions. The average low water in Lake Pontchartrain along the south shore is -0.8', which is near the minimum operating water elevation of EL -1.0 with the PCCP gates closed. The extreme low water for Orleans Ave. Canal is -2.6, which would occur in a non-tropical event with the gates open (very unusual). The initial analyses were performed with the extreme low water condition of -2.6 to determine the factor of safety for the extreme event. Reaches that did not achieve stability at the required factor of safety of 1.3 were then checked with the water elevation at the average low water condition at EL -1. In addition, when tension cracks were required they were assumed to be filled with water according to Corps criteria. However, this is a very conservative assumption and reaches 1A, 1B, 1C, 16, 17B, and 19 were analyzed with the tension cracks half filled to determine factors of safety using a more realistic assumption.

Process:

1. A Spencer's method model used pore- water pressures developed from SEEP/W parent analyses.
2. Tension crack was varied in depth to remove tension from slices in the failure mass.

The subsurface conditions at each reach of the Orleans Avenue Canal were evaluated for both a block and a circular failure. The critical failure surface identified was further optimized by the internal methodology included in the SLOPE/W software.

Table 12 shows the factor of safety results. At the average low canal water level of EL -1.0, all reaches meet criteria having a factor of safety greater than 1.3.

Table 12: Factor of Safety LWL-Q case Stability Results

Reach	Canal Water Level = -1.0 ft		Canal Water Level = -2.6 ft	
	Block Failure	Entry/ Exit Failure	Block Failure	Entry/ Exit Failure
1A	1.75[1]	1.57[1]	1.61	**1.24**
1B	1.51[1]	1.52[1]	1.25	**1.24**
1C	1.52[1]	2.01[1]	**1.07**	1.24
1D	1.31	1.37	**1.18**	1.22
2	> 1.3	> 1.3	1.41	1.38
3	> 1.3	> 1.3	1.49	1.50
4	> 1.3	> 1.3	1.35	1.35
5	> 1.3	> 1.3	2.14	2.22
6	> 1.3	> 1.3	1.96	2.06
7	> 1.3	> 1.3	2.50	2.59
8	> 1.3	> 1.3	1.84	1.96
9	> 1.3	> 1.3	1.54	1.67
10A	> 1.3	> 1.3	1.42	1.51
10B	> 1.3	> 1.3	1.63	1.62
11	> 1.3	> 1.3	1.86	1.86
12A	> 1.3	> 1.3	2.03	2.04
12B	> 1.3	> 1.3	1.53	1.42
13A	> 1.3	> 1.3	1.94	1.95
13B	> 1.3	> 1.3	1.89	1.94
14	> 1.3	> 1.3	1.34	1.32
15	> 1.3	> 1.3	1.45	1.41
16	1.33[1]	1.32[1]	**1.15[1]**	1.17[1]
17A	1.34	1.34	**1.23**	1.23
17B	1.36[1]	1.36[1]	1.18[1]	**1.01[1]**
18A	> 1.3	> 1.3	1.31	1.31
18B	> 1.3	> 1.3	1.36	1.34
19	> 1.3	> 1.3	1.34[1]	1.34[1]
20A	> 1.3	> 1.3	1.52	1.52
20B	> 1.3	> 1.3	1.88	1.87
21	> 1.3	> 1.3	1.67	1.72
1 The tension crack was only assumed to be half full.				

Normal Water Level (NWL) Drained (S-Case) Stability.

NWL drained (S-case) stability analyses were performed on the Orleans Avenue Canal reaches at a canal water level of EL +0.40 ft to account for the soil conditions experienced at steady state long term conditions. Both a flood side and protected side analysis was evaluated to determine the corresponding critical factor of safety that can be no less than 1.3. The GEO-STUDIO programs SLOPE/W and SEEP/W were utilized as the stability analysis software for this evaluation.

The shear strengths for the S-case analysis was first evaluated using recommended values presented in the HSDRRS Geotechnical Criteria (June 2008) with clays having a drained cohesion of 0 psf and drained friction angle of 23 degrees and silts having a drained cohesion of 0 psf and drained friction angle of 28 degrees. These values are considered conservative and not consistent with values measured from samples collected near the canal. A report by the Geotechnical Criteria Analysis Team (GCAT), *S-case Analysis Parameters for Outfall Canals,* listed recommended shear strength values for the S-Case analysis of the outfall canals. The shear strength values listed in the GCAT report are based on laboratory test results and literature published by Brandon et al. (2011). For cohesive materials above the phreatic surface; a drained cohesive strength of 75 psf was used to account for negative pore pressures that exist in partially saturated materials. Based on the soil type, the friction angles used in the analyses are given in Table 13 below.

Table 13: Recommended S-case design friction angles

Soil Type	Design Cohesion	Design Friction Angle
CH	0	26
CHO	0	24
CL	0	32
ML	0	34
PT	0	30
SC	0	33
SM	0	33

A water elevation of 0.4 ft was used to represent normal steady-state pool conditions of the canal. The following process was used to perform these stability analyses:

Process:

1. A Spencer's method model used pore- water pressures developed from SEEP/W parent analyses.
2. Tension crack options were used whenever a slice in the failure mass was in tension.
3. The use of passive mode was incorporated when the entrance elevation of the active wedge was lower than the exit elevation of the passive wedge.
4. Failure surfaces were allowed to pass through the sheet pile. The sheet pile properties were not incorporated in the analyses.
5. The critical failure surfaces were searched for both the entry/exit and block search routines. The search routines were limited to prevent finding shallow, insignificant failures surfaces. Often, the failure surfaces start at the I-wall.

The results of the analyses are provided in Table 13 for both the flood side slope (F/S) and protected side slope (P/S). Both block and entry/exit search routines were used in the analyses. For the flood side slope (F/S), six reaches had a factor of safety below 1.3. For the protected side slope (P/S), no reaches had a factor of safety below 1.3.

The reaches on the flood side slope with factors of safety below the 1.3 criteria are Reaches 1A, 1B, 1C, 4, 12A, and 12B. Further examinations of these reaches were preformed to evaluate the nature of the critical failure surface and to determine if these reaches require remediation.

The critical failure surfaces for reaches 1A, 1B, 1C, and 4 pass through the sheet pile and these reaches have an unbalanced levee where the flood side crown of the levee is 5 ft lower than the land side crown of the levee. An example of the critical failure surface and levee cross section for these reaches is provided in Figure 3. Figure 3 depicts the factor of safety and critical failure surface for Reach 1C. The 5ft vertical face between the land side crown and the flood side crown is supported by the sheet pile. The sheet pile for all four reaches has a tip elevation of -28.5 ft and is embedded into the Beach Sand unit 21 ft for Reaches 1A, 1B, and 1C and 15 ft for Reach 4. Due to the shallow nature of the critical failure surface for these reaches and the embedment of the sheet pile into sand, the stability analysis was performed to include the sheet pile properties in the analysis. The sheet pile properties were only included to the top of the Beach Sand unit to ensure adequate embedment of the sheet pile to resist the loads.

Figure 4 shows the results of this analysis for Reach 1C, which includes the sheet pile properties to the top of the Beach Sand unit. The results of similar analysis for Reaches 1A, 1B, and 4 are shown in Table 14 in the parentheses. Reaches 1A, 1B, 1C, and 4 were found to have a factor of safety above 1.3 when the sheet pile properties were included.

Figure 3. Stability Analysis of Reach 1C (without sheetpile).

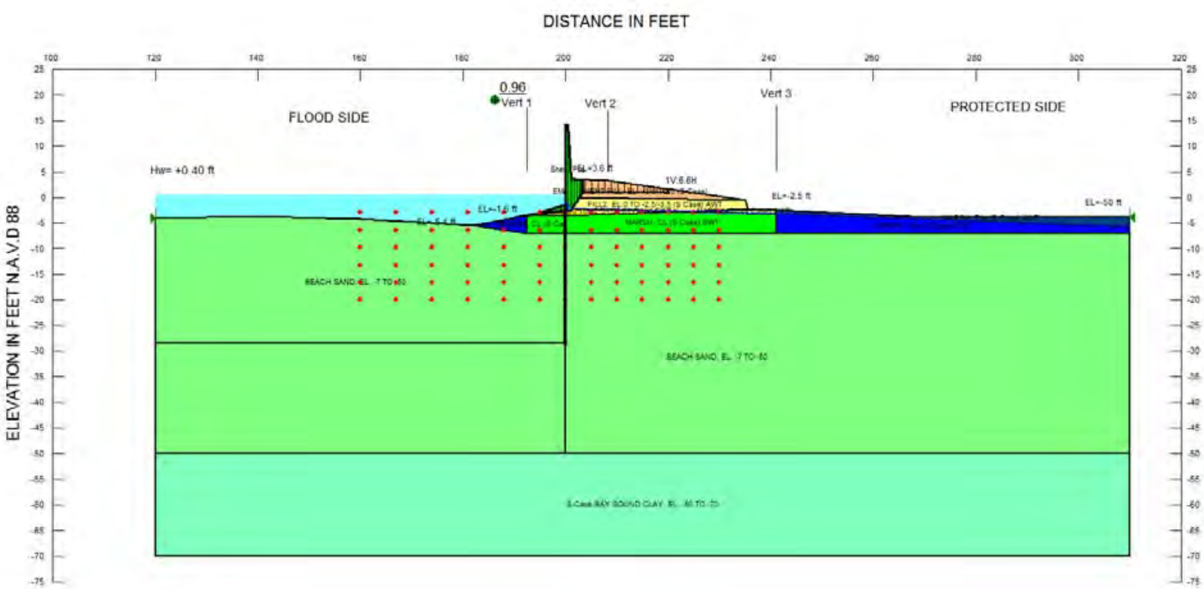
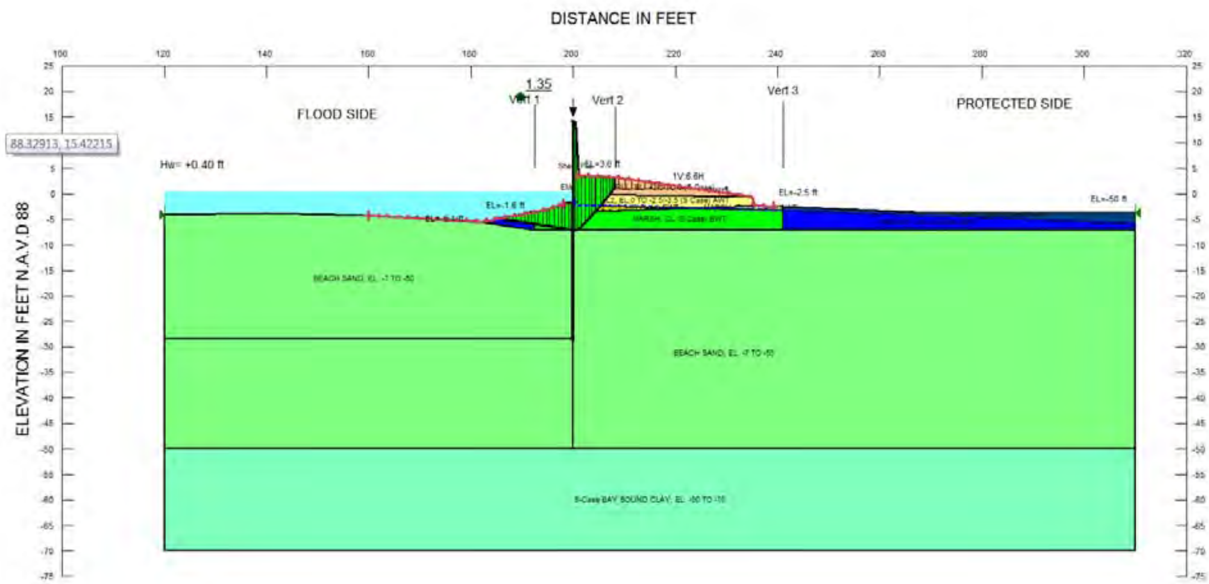


Figure 4. Stability Analysis of Reach 1C (with sheetpile).



For reaches 12A and 12B, the critical failure surface occurs along the flood side slope along the canal bank and has a very minimal impact on the levee. Figure 5 shows the results of the stability analysis of Reach 12B. The critical failure surface impacts a very small portion of the levee. In addition, the levee cross section for Reach 12A and Reach 12B consist of a wide levee footprint. The analysis parameters were changed to examine failure surfaces that impact at least half the levee cross section and considered to greatly impact the levee performance. The results of these failure surfaces for Reach 12B are shown in Figure 6. The failure surfaces that are considered to greatly impact the levee cross section had factors of safety greater than 1.3 for both reaches. These results were included in Table 14, noted in the parentheses.

Figure 5. Stability Analysis of Reach 12B (failure surface not significantly impacting the levee).

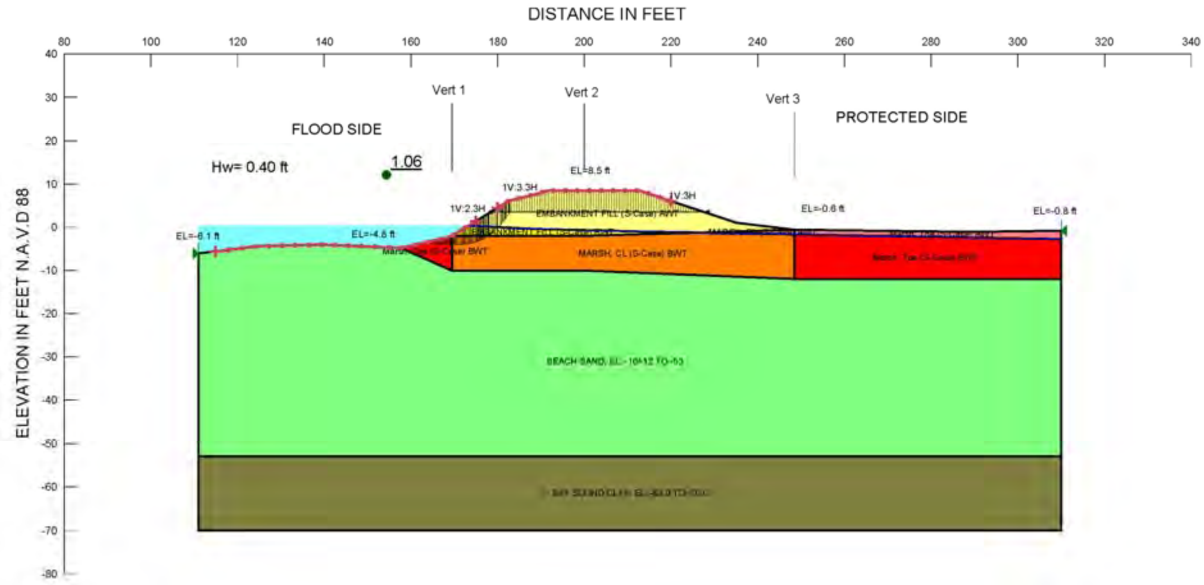


Figure 6. Stability Analysis of Reach 12B (failure surface significantly impacting the levee).

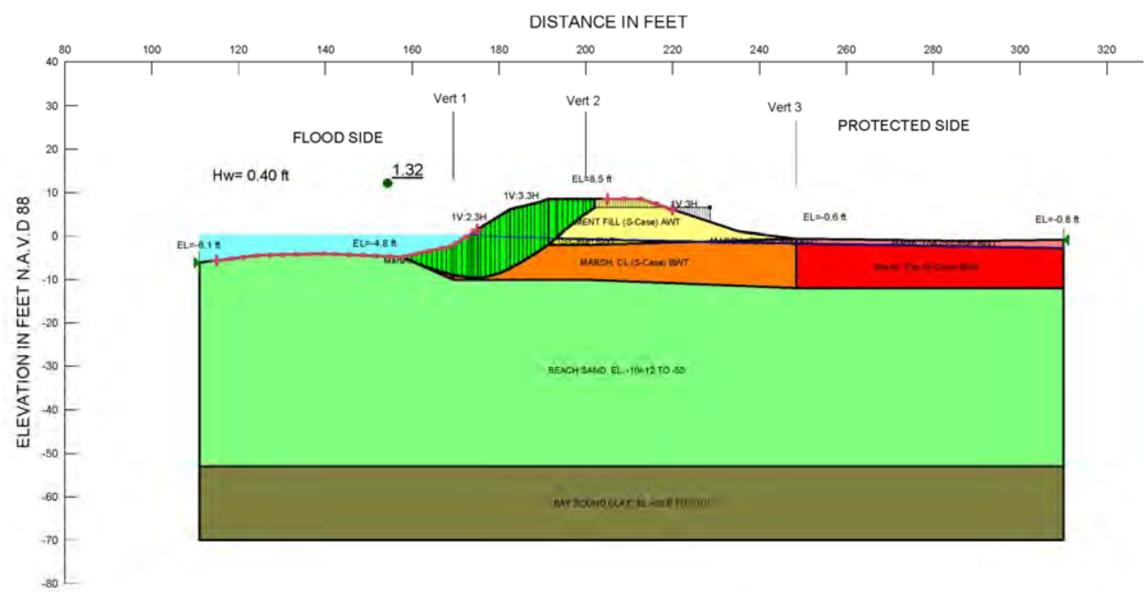


Table 14: Factor of Safety NWL S-Case Stability Results

Reach	Block Failure FS	Entry/ Exit Failure FS	Block Failure PS	Entry/ Exit Failure PS
1A	**1.18**[2] (2.18)	**1.03**[2] (1.61)	1.96	1.95
1B	**1.16**[2] (1.95)	**1.19**[2] (1.45)	1.56	1.55
1C	**0.96**[2] (1.53)	**0.96**[2] (1.35)	2.19	2.18
1D	1.61	1.34	2.80	2.79
2	1.99	1.34	1.91	1.90
3	T-wall	T-wall	T-wall	T-wall
4	1.47 (2.53)	**1.19**[2] (2.03)	2.23	2.27
5	T-wall	T-wall	T-wall	T-wall
6	T-wall	T-wall	T-wall	T-wall
7	T-wall	T-wall	T-wall	T-wall
8	T-wall	T-wall	T-wall	T-wall
9	T-wall	T-wall	T-wall	T-wall
10A	1.37	1.37	3.28	3.31
10B	2.37	2.31	1.90	1.90
11	2.35	2.34	2.56	2.55
12A	**1.17**[1] (2.09)	**1.19**[1] (1.80)	1.66	1.65
12B	**1.07**[1] (1.31)	**1.06**[1] (1.32)	1.84	1.84
13A	1.76	1.70	1.87	1.84
13B	1.87	1.80	2.18	2.17
14	1.94	1.94	2.09	2.07
15	1.81	1.81	1.92	1.92
16	1.91	1.91	2.14	2.16
17A	2.05	1.95	2.27	2.28
17B	2.35	2.24	2.82	3.04
18A	2.51	2.16	2.08	2.07
18B	2.35	2.35	2.41	2.39
19	1.87	1.75	2.44	2.37
20A	1.50	1.42	2.28	2.29
20B	2.76	2.59	2.02	1.99
21	2.22	2.21	2.30	2.29

[1] Failure developed on flood side of sheet pile or levee. The values listed in parentheses indicate the factor of safety passing through the levee centerline.
[2] Failure surface passed through the sheet pile. The values listed in parentheses indicate the factor of safety with the sheet pile included in the analysis.

Conclusions

The reevaluation report analyzed all I-wall levee reaches in accordance to the new ETL 1110-2-575 entitled *Evaluation of I-Walls*. Additional analyses were performed on levees evaluating the low canal water level and normal canal water level stability and T-walls (Reach 8) evaluating wall displacements at the MOWL.

The analysis of the 18 total I-wall reaches along Orleans Canal include global stability (no sheet pile), gap stability (no sheet pile), and rotational analysis. For the global stability analysis, Reach 2 and 19 were found to be below a factor of safety of 1.4 for canal water level EL +8.0. For the gap analysis, five reaches (Reaches 1A, 1B, 2, 4, and 19) were determined to be below a factor of safety of 1.4 at canal water level EL +8.0. For the rotational analysis, five reaches (Reaches 2, 4, 17B, 18A, and 19) had factors of safety less than 1.4 at a canal water level of EL +8.0. Table 15 provides a summary of the analyses completed for this report. Factors of Safety are not the true system Global Stability Factors of Safety since failure surfaces are allowed to pass through sheet pile. These values are conservative and the intermediate step as part of ETL 1110-2-575.

For Reach 1A and 1B, a fully penetrating sheet pile cutoff was installed in 2011. The sheet pile cutoff was installed on the protected side of the existing I-wall on the levee crest and was embedded 5 ft into the Bay Sound clay layer beneath the levee (tip elevation -61.5 ft). The sheet pile cutoff will resist the development of a failure surface as modeled in the gap analysis. This remediation was not included in the analyses presented in this report. The factor of safety for the rotational analysis is adequate for these reaches. Thus, these reaches do not require additional remediation.

Numerical soil structure analysis utilizing FLAC was performed on I-wall Reaches 2, 4, 17B, and 19 and T-wall Reach 8. Reach 18A was not analyzed with FLAC due to similarities with Reach 17B and Reach 17B is more critical (lower factor of safety for the rotational analysis) of the two reaches. The numerical soil structure analysis allows a more accurate evaluation of the failure mode for these reaches and will determine if the displacements are acceptable.

For Reaches 2 and 4, the FLAC analysis indicated that the controlling failure mode is rotational. In both reaches, the sheet pile tips 16 ft into a beach sand layer. In the FLAC analysis, the gap did not propagate to the underlying beach sand layer. Factor of safety determined the FLAC analysis was 1.97 for Reach 2 and 1.97 for Reach 4 both at a canal water level EL +8.0. Ground displacements at a canal water level of EL +8.0 were estimated to be less than 1.5 inches for both reaches. Thus, these reaches were not deemed to require remediation.

Reaches 17B, 18A, and 19 were remediated with a stability berm in 2011 for gap stability concerns. The design of the stability berm for these reaches was to achieve a factor of safety of 1.4 at a canal water level of EL +8.0 with a gap extending down the sheet pile tip and failure surface starting at the sheet pile tip. FLAC analysis was performed on Reaches 17B and 19 to evaluate the controlling failure mode for these reaches and estimate displacements. As mentioned previously, a FLAC analysis was not performed for Reach 18A as this was covered by the Reach 17B analysis. The analysis for Reach 17B and 19 included the stability berm in the reach cross section. The controlling failure mode for Reach 17B was global failure of the levee and I-wall and for Reach 19 was rotational failure of the I-wall. Factors of safety computed in the FLAC analysis resulted in 1.60 for Reach 17 and 1.44 for Reach 19 for canal water level EL +8.0. The estimated ground displacements did exceed 1.5 inches for Reach 19 at a canal water level of EL +8.0. However, the estimated extreme canal water level is around EL +6.8 for Reach 19. The estimated ground displacements at the extreme canal water level are less than 1.5 inches for Reach 19. Given the results from the FLAC analyses, 17B, 18A, and 19 reaches were not deemed to require remediation.

For Reach 8 (T-wall), a FLAC analysis was performed to evaluate the T-wall displacements at the MOWL. Reach 8 was of concern due to estimated T-wall displacements greater than the allowable in the

Black and Veatch report. The results from the FLAC model indicate that the top of wall displacements and protected side ground displacements are 0.96 inches and 0.75 inches respectively for a canal water level of EL +8.0. At a canal water level of EL +7.4, the top of wall displacement is 0.70 inches which is less than the 0.75 inch recommended allowable. The shear forces, axial forces, and moment forces estimated in the piles are within the allowable limits for canal water levels up to elevation +12.0 ft.

Low water stability analysis and normal water stability analyses were performed on all 30 reaches along Orleans Avenue Canal. The low water stability analyses were performed using undrained strengths for clays to evaluate the flood side stability. An extreme canal water level of EL -2.6 was used for all the reaches. At this extreme low water level, seven reaches were identified as either having a factor of safety at 1.3 or below. These reaches were again evaluated using an average low canal water level of EL -1.0. At a canal water level of EL -1.0, all reaches meet criteria having a factor of safety greater than 1.3.

The normal water stability analyses was performed using a canal water level of EL +0.40 using drained strengths for all soil layers. These analyses examined both the flood side stability and protected side stability. Six reaches (Reaches 1A, 1B, 1C, 4, 12A, and 12B) fell below criteria for the flood side stability. The critical failure surfaces for reaches 1A, 1B, 1C, and 4 pass through the sheet pile. Incorporating the sheet pile properties of these five reaches resulted in factors of safety well above 1.3. Thus, Reaches 1A, 1B, 1C, and 4 are not of concern for flood side stability. For reaches 12A and 12B, the critical failure surface occurs along the flood side slope along the canal bank and impacts a very small portion of the levee. In addition, the levee cross section for Reach 12A and Reach 12B consist of a wide levee footprint. The analysis parameters were changed to examine failure surfaces that impact at least half the levee cross section and considered to greatly impact the levee performance. The failure surfaces that are considered to greatly impact the levee cross section had factors of safety greater than 1.3 for both reaches.

All reaches has a factor of safety above the 1.3 criteria for protected side slope. Thus, these reaches do not require remediation for the normal water stability case.

In summary, based on the results analyses performed for this report, no reaches along Orleans Avenue Canal are recommended for remediation.

Table 15: Factor of Safety Summary

	Reach	Remediated	Non – Remediated	Global Stability Analysis 2, 5	Full Gap Stability Analysis 2, 5	Rotational Analysis CWALSHT 5	Numerical Model FLAC5	LWL-Q Stability Analysis2,4 (Flood side)	NWL-S Stability Analysis2,6 (Flood side)	NWL-S Stability Analysis2,6 (Protected Side)
WEST	1A	X		1.64	**1.33**3	1.89	N/A	1.574	**1.03**3 **(1.61)**7	1.95
	1B	X		1.69	**1.39**3	1.95	N/A	1.514	**1.16**3 **(1.45)**7	1.55
	1C	X		1.75	1.49	2.05	N/A	1.524	**0.96**3 **(1.35)**7	2.18
	1D	X		1.82	1.51	1.91	N/A	1.314	1.34	2.79
	2		X	**1.38**3	**1.08**3	**0.85**3	1.97	1.38	1.34	1.90
	3		X	T-wall	T-wall	T-wall	N/A	1.49	T-wall	T-wall
	4		X	1.62	**1.38**3	**0.60**3	1.97	1.35	**1.19**3 **(2.03)**7	2.23
	5		X	T-wall	T-wall	T-wall	N/A	2.14	T-wall	T-wall
	6		X	T-wall	T-wall	T-wall	N/A	1.96	T-wall	T-wall
	7		X	T-wall	T-wall	T-wall	N/A	2.50	T-wall	T-wall
	8		X	T-wall	T-wall	T-wall	T-wall	1.84	T-wall	T-wall
	9		X	T-wall	T-wall	T-wall	N/A	1.54	T-wall	T-wall
	10A		X	3.23	3.23	2.86	N/A	1.42	1.37	3.28
	10B		X	Levee	Levee	Levee	Levee	1.62	2.31	1.90
	11		X	Levee	Levee	Levee	Levee	1.86	2.34	2.55
EAST	12A		X	Levee	Levee	Levee	Levee	2.03	**1.17**3 **(1.80)**7	1.65
	12B		X	Levee	Levee	Levee	Levee	1.42	**1.06**3 **(1.31)**7	1.84
	13A		X	2.02	N/A1	N/A1	N/A	1.94	1.70	1.84
	13B		X	2.20	N/A1	N/A1	N/A	1.89	1.80	2.17
	14		X	1.91	N/A1	N/A1	N/A	1.32	1.94	2.07
	15		X	1.54	N/A1	N/A1	N/A	1.41	1.81	1.92
	16		X	1.64	N/A1	N/A1	N/A	1.324	1.91	2.14
	17A	X		N/A	N/A	N/A	N/A	1.344	1.958	2.278
	17B	X		1.45	1.43	**1.16**3	1.60	1.364	2.24	2.82
	18A	X		1.45	1.43	**1.24**3	N/A	1.31	2.16	2.07
	18B	X		N/A	N/A	N/A	N/A	1.344	2.35	2.398
	19	X		**1.39**3	**1.32**3	**1.23**3	1.44	1.34	1.75	2.37
	20A		X	2.18	2.25	1.97	N/A	1.52	1.42	2.28
	20B		X	N/A	N/A	N/A	N/A	1.87	2.59	1.99
	21		X	N/A	N/A	N/A	N/A	1.67	2.21	2.29

1 A gap and rotational analysis was not performed because the flood side crest of the earth is higher than the water elevation.
2 Spencer's method used.
3 Factor of Safety below criteria. Factors of Safety are not the true system Global Stability Factors of Safety. These values are conservative with failure surfaces going through the sheet pile.
4 Where noted a Canal water EL = -1.0ft otherwise a Canal water EL = -2.6 ft was used
5 Canal water EL = +8.0ft
6 Canal water EL = +0.4ft
7 With Sheet pile included or failure surface passing through the levee centerline
8 Critical factors of safety are local and do not pass through the sheet pile.

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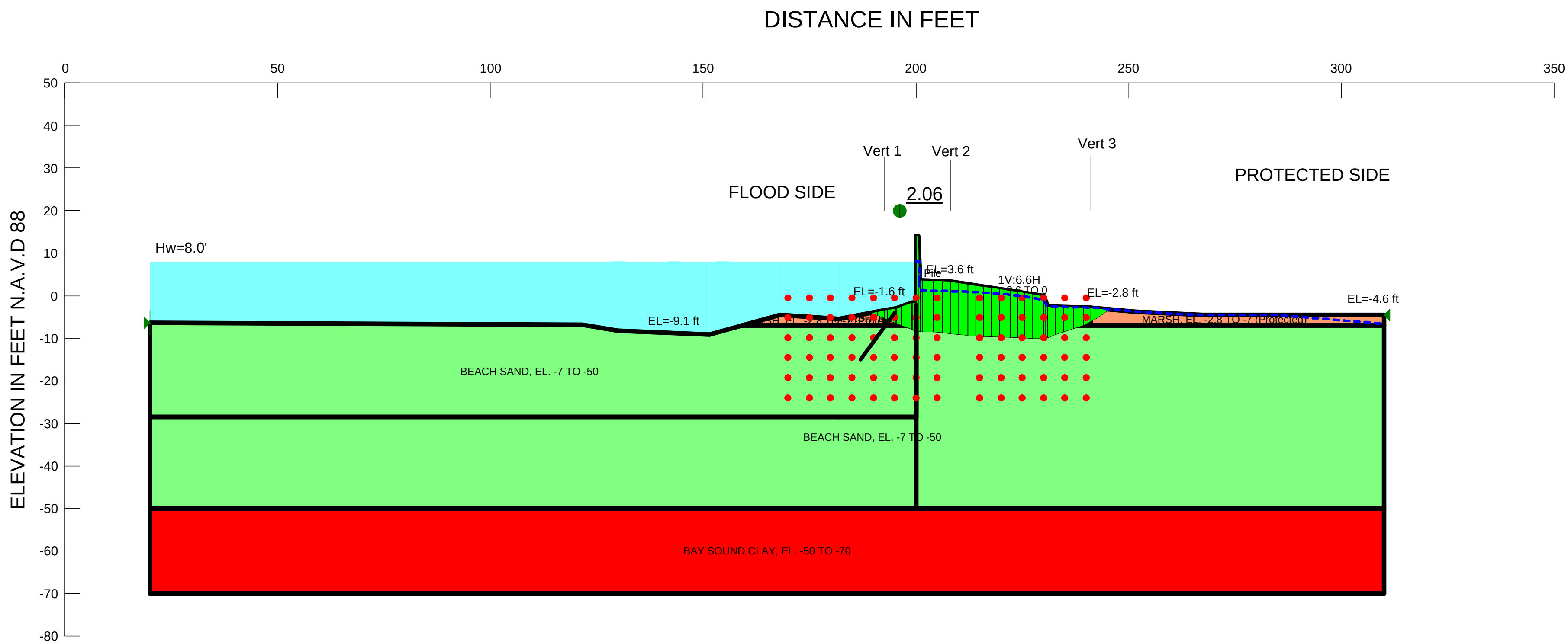
Appendices

APPENDIX A GLOBAL STABILITY ANALYSIS



Name: EMBANKMENT FILL, EL. +3.6 TO 0 Model: Undrained (Phi=0) Unit Weight: 110 pcf Cohesion: 580 psf
Name: FILL2, EL.0 TO -2.5/-3.5 Model: Undrained (Phi=0) Unit Weight: 94 pcf Cohesion: 400 psf
Name: BEACH SAND, EL. -7 TO -50 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand
Name: BAY SOUND CLAY, EL. -50 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 102 pcf Cohesion Spatial Fn: Bay Sound Phi: 0 °
Name: Sheet Pile Model: Undrained (Phi=0) Unit Weight: 0.1 pcf Cohesion: 0.01 psf
Name: MARSH, EL. -2.5/-3.5 TO -7 Model: Spatial Mohr-Coulomb Weight Fn: Marsh Cohesion Spatial Fn: Marsh Phi: 0 °
Name: MARSH, EL. -2.8 TO -7 (Protected) Model: Spatial Mohr-Coulomb Unit Weight: 100 pcf Cohesion Fn: Marsh 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 VERTICALSWERE ASSUMED TO VARY LINEARLY BETWEENTHE VALUES INDICATED FOR THESE LOCATIONS.

GENERAL NOTES

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 1A,
PROTECTED SIDE STABILITY ANALYSIS,
CASE: Global P/S Stability Analysis Block
STA. 2+45 TO 7+00 WEST
ORLEANS PARISH, LOUISIANA

Name: Global P/S Stability Analysis Block
File Name: Orleans Canal Reach 1A.gsz Directory: Y:\F&MHOME\Middleton\Outfall Canals\Orleans final edits\final\Appendix A and Appendix B\
Last Edited By: Hendrix, Joshua M MVR

Global P/S Stability Analysis Block

File Information

- Created By: Liljegren, James
- Revision Number: 583
- Last Edited By: Hendrix, Joshua M MVR
- Date: 6/10/2013
- Time: 10:35:24 AM
- File Name: Orleans Canal Reach 1A.gsz
- Directory: Y:\F&MHOME\Middleton\Outfall Canals\Orleans final edits\final\Appendix A and Appendix B\
- Last Solved Date: 6/10/2013
- Last Solved Time: 10:39:40 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 P/S Stability Analysis Block

- Kind: SLOPE/W
- Parent: 1 - Global Stability Analysis 8ft
- 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: 16
    - Complete Passes per Insertion: 1
    - Driving Side Maximum Convex Angle: 5 °
    - Resisting Side Maximum Convex Angle: 1 °

Materials

EMBANKMENT FILL, EL. +3.6 TO 0

- Model: Undrained (Phi=0)
- Unit Weight: 110 pcf
- Cohesion: 580 psf

FILL2, EL.0 TO -2.5/-3.5

- Model: Undrained (Phi=0)
- Unit Weight: 94 pcf
- Cohesion: 400 psf

BEACH SAND, EL. -7 TO -50

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

BAY SOUND CLAY, EL. -50 TO -70

- Model: Spatial Mohr-Coulomb
- Unit Weight: 102 pcf
- Cohesion Spatial Fn: Bay Sound
- Phi: 0 °
- Phi-B: 0 °

Sheet Pile

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

MARSH, EL. -2.5/-3.5 TO -7

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

MARSH, EL. -2.8 TO -7 (Protected)

- Model: Spatial Mohr-Coulomb
- Unit Weight: 100 pcf
- Cohesion Fn: Marsh
- Phi: 0 °
- Phi-B: 0 °

Slip Surface Limits

- Left Coordinate: (20, -6.4) ft
- Right Coordinate: (310, -4.6) ft

Slip Surface Block

- Left Grid
    - Upper Left: (170, -0.5) ft
    - Lower Left: (170, -24) ft
    - Lower Right: (205, -24) ft
    - X Increments: 7
    - Y Increments: 5
    - Starting Angle: 115 °
    - Ending Angle: 135 °
    - Angle Increments: 2
- Right Grid
    - Upper Left: (215, -0.5) ft
    - Lower Left: (215, -24) ft
    - Lower Right: (240, -24) ft
    - X Increments: 5
    - Y Increments: 5
    - Starting Angle: 0 °
    - Ending Angle: 45 °
    - Angle Increments: 2

Cohesion Functions

Marsh

- Model: Spline Data Point Function
- Function: Cohesion vs. Y
    - Curve Fit to Data: 100 %
    - Segment Curvature: 0 %
- Y-Intercept: 150
- Data Points: Y (ft), Cohesion (psf)
    - Data Point: (-7, 180)
    - Data Point: (-2.8, 150)

Shear/Normal Strength Functions

Sand

- Model: Spline Data Point Function
- Function: Shear Stress vs. Normal Stress
    - Curve Fit to Data: 100 %
    - Segment Curvature: 0 %
- Y-Intercept: 0
- Data Points: Normal Stress (psf), Shear Stress (psf)
    - Data Point: (-10000, 0)
    - Data Point: (0, 0)
    - Data Point: (10000, 6494)
- Estimation Properties
    - Intact Rock Param.: 10
    - Geological Strength: 100
    - Disturbance Factor: 0
    - SigmaC: 600000 psf
    - Sigma3: 300000 psf
    - Num. Points: 20

Unit Weight Functions

Marsh

- Model: Spline Data Point Function
- Function: Unit Weight vs. X
    - Curve Fit to Data: 100 %
    - Segment Curvature: 0 %
- Y-Intercept: 100
- Data Points: X (ft), Unit Weight (pcf)
    - Data Point: (192.5, 100)
    - Data Point: (208.3, 94)
    - Data Point: (241.1, 100)

Spatial Functions

Marsh

- Model: Linear Interpolation
- Limit Range By: Data Values
- Data Points: X (ft), Y (ft), Cohesion (psf)

Data Point: (192.53, -3.5, 150)
Data Point: (192.53, -7, 180)
Data Point: (200, -3.5, 160)
Data Point: (200, -7, 190)
Data Point: (241.1, -2.8, 150)
Data Point: (241.1, -7, 180)

Bay Sound

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (120, -50, 600)
Data Point: (120, -70, 770)
Data Point: (192.53, -50, 600)
Data Point: (192.53, -70, 770)
Data Point: (200, -50, 750)
Data Point: (200, -70, 925)
Data Point: (241.1, -50, 600)
Data Point: (241.1, -70, 770)
Data Point: (310, -50, 600)
Data Point: (310, -70, 770)

Regions

	Material	Points	Area (ft²)
Region 1	EMBANKMENT FILL, EL. +3.6 TO 0	21,4,5,26	60.99
Region 2	MARSH, EL. -2.5/-3.5 TO -7	6,7,29,46,18,27	167.935
Region 3	BEACH SAND, EL. -7 TO -50	18,47,23,19,20,36,33,32,37,38,40,42,16,31	3858.445
Region 4	BEACH SAND, EL. -7 TO -50	20,36,34,15,28,43,12,11,29,46,18,47,23,19	8599.1
Region 5	BAY SOUND CLAY, EL. -50 TO -70	15,34,35,14,30,44,13,12,43,28	5800
Region 6	Sheet Pile	17,22,21,26,25,3	13.075
Region 7	FILL2, EL.0 TO -2.5/-3.5	27,3,25,26,5,6	90.15
Region 8	MARSH, EL. -2.8 TO -7 (Protected)	16,42,41,1,39,31	66.5965
Region 9	MARSH, EL. -2.8 TO -7 (Protected)	29,7,8,9,10,11	186.6
Region 10	MARSH, EL. -2.5/-3.5 TO -7	31,39,27,18	26.145
Region 11	FILL2, EL.0 TO -2.5/-3.5	2,24,3,27,39	6.9625

Points

	X (ft)	Y (ft)
Point 1	182	-5.4
Point 2	195.3	-3
Point 3	200	-1.6
Point 4	208.3	3.3
Point 5	230	0
Point 6	231	-2.5
Point 7	241.1	-2.8
Point 8	251.6	-3.7
Point 9	267.3	-4.6
Point 10	310	-4.6
Point 11	310	-7
Point 12	310	-50
Point 13	310	-70
Point 14	182	-70
Point 15	182	-50
Point 16	182	-7
Point 17	200	14.1
Point 18	200	-7
Point 19	200	-28.6
Point 20	182	-28.5
Point 21	201	3.6
Point 22	200.5	14.1
Point 23	200	-23.5
Point 24	199.1	-1.6
Point 25	201	-1.6
Point 26	201	0
Point 27	200	-3.5
Point 28	200	-50
Point 29	241.1	-7
Point 30	200	-70
Point 31	192.53	-7
Point 32	20	-6.4
Point 33	20	-7
Point 34	20	-50
Point 35	20	-70
Point 36	20	-28.5
Point 37	121.6	-6.9
Point 38	130	-8.2
Point 39	192.53	-3.5
Point 40	151.4	-9.1
Point 41	168.1	-4.5
Point 42	159.1	-7
Point 43	241.1	-50
Point 44	241.1	-70
Point 45	199	0
Point 46	201.6	-7
Point 47	200	-21.3

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	2.06	(217.643, -3.011)	21.18202	(189.342, -4.07521)	(245.555, -3.18185)
2	1181	2.53	(217.643, -3.011)	21.54	(189.201, -4.10072)	(246.105, -3.22902)

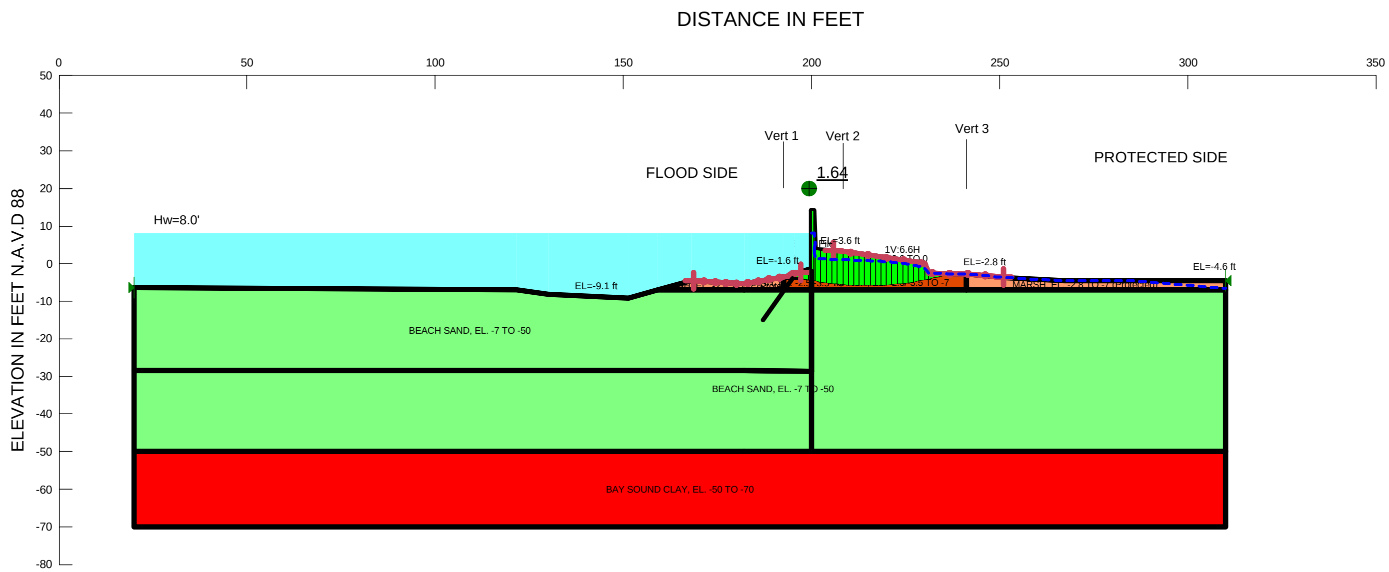
Slices of Slip Surface: Optimized

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	190.1391	-4.396087	755.1169	698.665	0	161.4
2	Optimized	191.73305	-5.037843	762.50802	768.67699	0	165.98
3	Optimized	192.8876	-5.5027055	771.27171	818.8966	0	167.64
4	Optimized	194.2726	-6.075404	790.75101	874.78458	0	174.41
5	Optimized	195.3903	-6.541799	813.00771	901.36034	0	179.9
6	Optimized	196.014	-6.78974	828.56894	936.33906	0	182.86
7	Optimized	197.7896	-7.48966	887.25955	1039.2553	98.707172	-4.2713e-007
8	Optimized	199.0659	-7.995061	936.0155	1094.8681	103.16005	-4.4647e-007
9	Optimized	199.5495	-8.218381	956.70103	1153.4099	127.74422	3.1768e-006
10	Optimized	199.9995	-8.4259735	975.25621	1301.4951	211.862	5.2653e-006
11	Optimized	200.25	-8.432395	666.40115	-340.10831	0	0
12	Optimized	200.75	-8.445211	605.30122	696.29134	59.089674	1.9183e-006
13	Optimized	201.3	-8.459309	606.06757	1266.434	428.84696	-8.9446e-005
14	Optimized	202.8451	-8.4989145	607.81403	1262.034	424.85544	-8.8612e-005
15	Optimized	205.14265	-8.6421775	614.42067	1231.0146	400.42079	-8.3522e-005
16	Optimized	207.24755	-8.8648725	625.19252	1245.5661	402.87529	-8.404e-005
17	Optimized	209.17335	-9.0686175	634.19386	1249.9979	399.9078	-8.3415e-005
18	Optimized	210.92	-9.2534125	641.59535	1244.3613	391.44081	-8.1649e-005
19	Optimized	212.0378	-9.364665	645.59422	1251.9373	393.76382	-8.2134e-005
20	Optimized	213.20015	-9.427459	646.16461	1253.2057	394.21706	-8.2229e-005
21	Optimized	215.0358	-9.5153365	645.89254	1233.9976	381.91987	-3.5083e-005
22	Optimized	216.87145	-9.603214	645.18516	1214.8439	369.9407	-7.7161e-005
23	Optimized	218.70715	-9.6910915	643.98806	1195.7446	358.3149	-7.4737e-005
24	Optimized	220.88915	-9.778605	641.03578	1176.2929	347.60007	-7.2503e-005
25	Optimized	223.0287	-9.8514875	636.87578	1150.7946	333.7428	-6.9603e-005
26	Optimized	224.77955	-9.9101025	633.16538	1129.5026	322.32519	-2.9608e-005
27	Optimized	226.5304	-9.9687175	629.22664	1108.2107	311.05585	7.7308e-006
28	Optimized	228.28125	-10.027333	625.11666	1087.0328	299.97187	7.4552e-006

29	Optimized	229.57835	-10.044975	620.32642	1090.1051	305.07784	-2.8023e-005
30	Optimized	230.2679	-10.0259	615.9759	1013.293	258.02077	-2.3699e-005
31	Optimized	230.7679	-9.9361095	608.06107	979.53214	241.23613	5.9918e-006
32	Optimized	231.9072	-9.5317345	577.51409	848.68965	176.10347	4.3739e-006
33	Optimized	233.72165	-8.887745	528.743	752.03044	145.00456	3.6012e-006
34	Optimized	235.7875	-8.1743125	474.38125	641.06679	108.24686	-4.6802e-007
35	Optimized	238.15975	-7.3728475	412.94509	521.91888	70.768406	1.7575e-006
36	Optimized	240.2367	-6.5059445	334.8996	479.08836	0	176.67
37	Optimized	241.9441	-5.6023595	244.60043	366.48965	0	170.02
38	Optimized	244.17155	-4.1687485	100.84123	206.36966	0	159.78

Slices of Slip Surface: 1181

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	1181	189.92555	-4.825543	765.96338	638.99384	0	164.47
2	1181	191.3752	-6.275181	796.49851	767.67062	0	174.82
3	1181	192.315	-7.215	831.06429	893.73369	40.697982	-2.4345e-006
4	1181	193.765	-8.665	925.19353	1040.3632	74.792062	-3.2361e-007
5	1181	195.15	-9.9	1004.2333	1430.1333	276.58269	6.8733e-006
6	1181	196.25	-9.9	1009.3158	1417.9474	265.36845	-2.4376e-005
7	1181	198.15	-9.9	1019.3158	1441.0526	273.87911	6.8064e-006
8	1181	199.55	-9.9	1021.3111	1494.1111	307.03991	-2.8201e-005
9	1181	200.25	-9.9	750.14	-167.986	0	0
10	1181	200.75	-9.9	696.7	881.14	119.77674	-5.1812e-007
11	1181	201.3	-9.9	696.61667	1450.9667	489.88062	1.2174e-005
12	1181	202.4375	-9.9	696.23881	1444.0597	485.64057	-0.00010129
13	1181	204.1125	-9.9	694.92537	1433.9104	479.90252	-0.00010009
14	1181	205.7875	-9.9	692.83582	1423.7015	474.62972	-9.8988e-005
15	1181	207.4625	-9.9	690.02985	1413.4328	469.78339	-9.7982e-005
16	1181	209.28635	-9.9	686.25816	1391.8297	458.20351	-9.5564e-005
17	1181	211.2591	-9.9	681.34111	1358.9311	440.03206	-9.1775e-005
18	1181	213.23185	-9.9	675.71438	1326.1338	422.38733	-8.809e-005
19	1181	215.20455	-9.9	669.53005	1293.3873	405.13762	-8.4499e-005
20	1181	217.17725	-9.9	662.68673	1260.7421	388.38171	-8.1e-005
21	1181	219.15	-9.9	655.38719	1228.1476	371.95498	-7.7574e-005
22	1181	221.12275	-9.9	647.73281	1195.6039	355.79162	-7.421e-005
23	1181	223.09545	-9.9	639.6729	1163.1615	339.95744	-7.0905e-005
24	1181	225.06815	-9.9	631.30884	1130.7697	324.3537	8.0608e-006
25	1181	227.0409	-9.9	622.69133	1098.4287	308.94748	7.678e-006
26	1181	229.01365	-9.9	613.82036	1066.1384	293.73877	-2.6982e-005
27	1181	230.5	-9.692893	594.10084	1031.6041	284.11792	-2.6093e-005
28	1181	232.0002	-9.0714885	548.30355	788.14016	155.75172	3.8699e-006
29	1181	234.0006	-8.242893	487.15514	663.81123	114.7218	-4.9629e-007
30	1181	236.001	-7.4142975	425.90974	539.48229	73.754873	-3.1905e-007
31	1181	238.0259	-6.5755575	351.6926	460.95019	0	177.68
32	1181	240.0753	-5.726672	265.18724	362.67877	0	171.12
33	1181	241.9342	-4.9566935	186.35484	267.55732	0	165.4
34	1181	243.6026	-4.2656225	114.0844	176.127	0	160.47
35	1181	245.271	-3.5745515	38.042347	84.691138	0	155.53



Name: EMBANKMENT FILL, EL. +3.6 TO 0 Model: Undrained (Phi=0) Unit Weight: 110 pcf Cohesion: 580 psf
Name: FILL2, EL.0 TO -2.5/-3.5 Model: Undrained (Phi=0) Unit Weight: 94 pcf Cohesion: 400 psf
Name: BEACH SAND, EL. -7 TO -50 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand
Name: BAY SOUND CLAY, EL. -50 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 102 pcf Cohesion Spatial Fn: Bay Sound Phi: 0 °
Name: Sheet Pile Model: Undrained (Phi=0) Unit Weight: 0.1 pcf Cohesion: 0.01 psf
Name: MARSH, EL. -2.5/-3.5 TO -7 Model: Spatial Mohr-Coulomb Weight Fn: Marsh Cohesion Spatial Fn: Marsh Phi: 0 °
Name: MARSH, EL. -2.8 TO -7 (Protected) Model: Spatial Mohr-Coulomb Unit Weight: 100 pcf Cohesion Fn: Marsh 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 VERTICALSWERE ASSUMED TO VARY LINEARLY BETWEENTHE VALUES INDICATED FOR THESE LOCATIONS.

GENERAL NOTES

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 1A,
PROTECTED SIDE STABILITY ANALYSIS,
CASE: Global P/S Stability Analysis Entry Exit
STA. 2+45 TO 7+00 WEST
ORLEANS PARISH, LOUISIANA

Name: Global P/S Stability Analysis Entry Exit
File Name: Orleans Canal Reach 1A.gsz Directory: Y:\F&MHOME\Middleton\Outfall Canals\Orleans final edits\final\Appendix A and Appendix B\
Last Edited By: Hendrix, Joshua M MVR

Global P/S Stability Analysis Entry Exit

File Information

- Created By: Liljegren, James
- Revision Number: 583
- Last Edited By: Hendrix, Joshua M MVR
- Date: 6/10/2013
- Time: 10:35:24 AM
- File Name: Orleans Canal Reach 1A.gsz
- Directory: Y:\F&MHOME\Middleton\Outfall Canals\Orleans final edits\final\Appendix A and Appendix B\
- Last Solved Date: 6/10/2013
- Last Solved Time: 10:41:22 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

Global P/S Stability Analysis Entry Exit

- Kind: SLOPE/W
- Parent: 1 - Global Stability Analysis 8ft
- 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: 4000
  - Optimization Convergence Tolerance: 1e-007
  - Starting Optimization Points: 8
  - Ending Optimization Points: 16
  - Complete Passes per Insertion: 1
  - Driving Side Maximum Convex Angle: 5 °
  - Resisting Side Maximum Convex Angle: 1 °

Materials

EMBANKMENT FILL, EL. +3.6 TO 0

- Model: Undrained (Phi=0)
- Unit Weight: 110 pcf
- Cohesion: 580 psf

FILL2, EL.0 TO -2.5/-3.5

- Model: Undrained (Phi=0)
- Unit Weight: 94 pcf
- Cohesion: 400 psf

BEACH SAND, EL. -7 TO -50

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

BAY SOUND CLAY, EL. -50 TO -70

- Model: Spatial Mohr-Coulomb
- Unit Weight: 102 pcf
- Cohesion Spatial Fn: Bay Sound
- Phi: 0 °
- Phi-B: 0 °

Sheet Pile

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

MARSH, EL. -2.5/-3.5 TO -7

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

MARSH, EL. -2.8 TO -7 (Protected)

- Model: Spatial Mohr-Coulomb
- Unit Weight: 100 pcf
- Cohesion Fn: Marsh
- Phi: 0 °
- Phi-B: 0 °

Slip Surface Entry and Exit

- Left Projection: Range
- Left-Zone Left Coordinate: (168.5491, -4.52908) ft
- Left-Zone Right Coordinate: (197.2, -2.3) ft
- Left-Zone Increment: 10
- Right Projection: Range
- Right-Zone Left Coordinate: (205.75135, 3.40474) ft
- Right-Zone Right Coordinate: (250.9, -3.64) ft
- Right-Zone Increment: 10
- Radius Increments: 10

Slip Surface Limits

- Left Coordinate: (20, -6.4) ft
- Right Coordinate: (310, -4.6) ft

Cohesion Functions

Marsh

- Model: Spline Data Point Function
- Function: Cohesion vs. Y
  - Curve Fit to Data: 100 %
  - Segment Curvature: 0 %
- Y-Intercept: 150
- Data Points: Y (ft), Cohesion (psf)
  - Data Point: (-7, 180)
  - Data Point: (-2.8, 150)

Shear/Normal Strength Functions

Sand

- Model: Spline Data Point Function
- Function: Shear Stress vs. Normal Stress
  - Curve Fit to Data: 100 %
  - Segment Curvature: 0 %
- Y-Intercept: 0
- Data Points: Normal Stress (psf), Shear Stress (psf)
  - Data Point: (-10000, 0)
  - Data Point: (0, 0)
  - Data Point: (10000, 6494)
- Estimation Properties
  - Intact Rock Param.: 10
  - Geological Strength: 100
  - Disturbance Factor: 0
  - SigmaC: 600000 psf
  - Sigma3: 300000 psf
  - Num. Points: 20

Unit Weight Functions

Marsh

- Model: Spline Data Point Function
- Function: Unit Weight vs. X
  - Curve Fit to Data: 100 %
  - Segment Curvature: 0 %
- Y-Intercept: 100
- Data Points: X (ft), Unit Weight (pcf)
  - Data Point: (192.5, 100)
  - Data Point: (208.3, 94)
  - Data Point: (241.1, 100)

Spatial Functions

Marsh

- Model: Linear Interpolation
- Limit Range By: Data Values
- Data Points: X (ft), Y (ft), Cohesion (psf)
  - Data Point: (192.53, -3.5, 150)
  - Data Point: (192.53, -7, 180)
  - Data Point: (200, -3.5, 160)
  - Data Point: (200, -7, 190)
  - Data Point: (241.1, -2.8, 150)
  - Data Point: (241.1, -7, 180)

Bay Sound

- Model: Linear Interpolation
- Limit Range By: Data Values
- Data Points: X (ft), Y (ft), Cohesion (psf)

Data Point: (120, -50, 600)
Data Point: (120, -70, 770)
Data Point: (192.53, -50, 600)
Data Point: (192.53, -70, 770)
Data Point: (200, -50, 750)
Data Point: (200, -70, 925)
Data Point: (241.1, -50, 600)
Data Point: (241.1, -70, 770)
Data Point: (310, -50, 600)
Data Point: (310, -70, 770)

Regions

	Material	Points	Area (ft²)
Region 1	EMBANKMENT FILL, EL. +3.6 TO 0	21,4,5,26	60.99
Region 2	MARSH, EL. -2.5/-3.5 TO -7	6,7,29,46,18,27	167.935
Region 3	BEACH SAND, EL. -7 TO -50	18,47,23,19,20,36,33,32,37,38,40,42,16,31	3858.445
Region 4	BEACH SAND, EL. -7 TO -50	20,36,34,15,28,43,12,11,29,46,18,47,23,19	8599.1
Region 5	BAY SOUND CLAY, EL. -50 TO -70	15,34,35,14,30,44,13,12,43,28	5800
Region 6	Sheet Pile	17,22,21,26,25,3	13.075
Region 7	FILL2, EL.0 TO -2.5/-3.5	27,3,25,26,5,6	90.15
Region 8	MARSH, EL. -2.8 TO -7 (Protected)	16,42,41,1,39,31	66.5965
Region 9	MARSH, EL. -2.8 TO -7 (Protected)	29,7,8,9,10,11	186.6
Region 10	MARSH, EL. -2.5/-3.5 TO -7	31,39,27,18	26.145
Region 11	FILL2, EL.0 TO -2.5/-3.5	2,24,3,27,39	6.9625

Points

	X (ft)	Y (ft)
Point 1	182	-5.4
Point 2	195.3	-3
Point 3	200	-1.6
Point 4	208.3	3.3
Point 5	230	0
Point 6	231	-2.5
Point 7	241.1	-2.8
Point 8	251.6	-3.7
Point 9	267.3	-4.6
Point 10	310	-4.6
Point 11	310	-7
Point 12	310	-50
Point 13	310	-70
Point 14	182	-70
Point 15	182	-50
Point 16	182	-7
Point 17	200	14.1
Point 18	200	-7
Point 19	200	-28.6
Point 20	182	-28.5
Point 21	201	3.6
Point 22	200.5	14.1
Point 23	200	-23.5
Point 24	199.1	-1.6
Point 25	201	-1.6
Point 26	201	0
Point 27	200	-3.5
Point 28	200	-50
Point 29	241.1	-7
Point 30	200	-70
Point 31	192.53	-7
Point 32	20	-6.4
Point 33	20	-7
Point 34	20	-50
Point 35	20	-70
Point 36	20	-28.5
Point 37	121.6	-6.9
Point 38	130	-8.2
Point 39	192.53	-3.5
Point 40	151.4	-9.1
Point 41	168.1	-4.5
Point 42	159.1	-7
Point 43	241.1	-50
Point 44	241.1	-70
Point 45	199	0
Point 46	201.6	-7
Point 47	200	-21.3

Critical Slip Surfaces

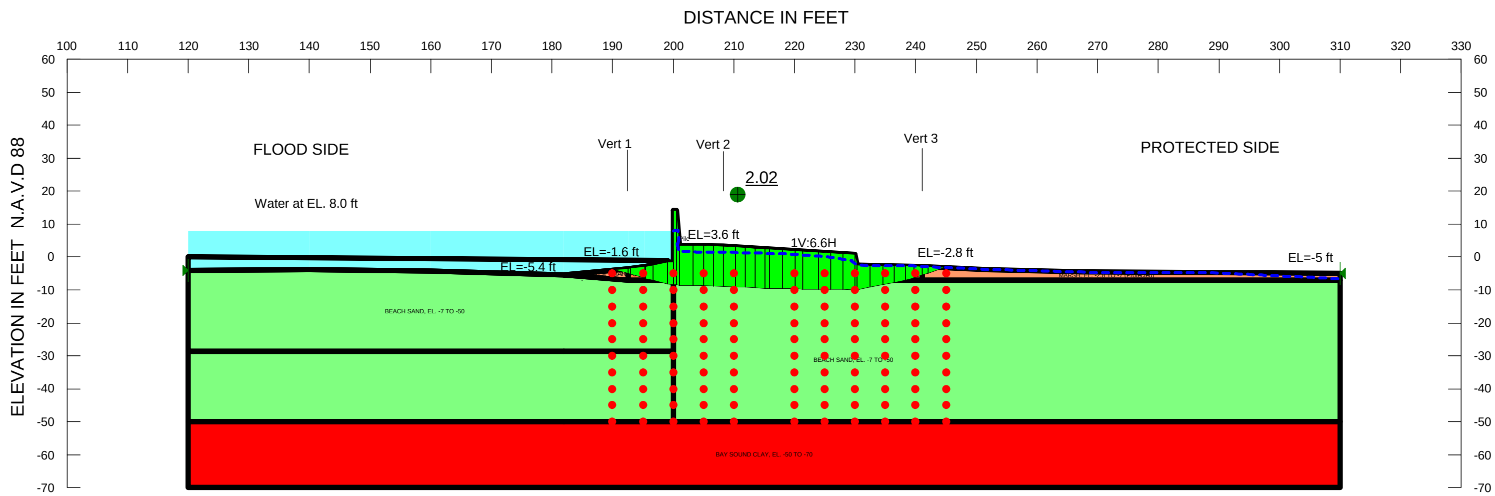
	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.64	(214.761, 72.133)	77.98386	(194.437, -3.15579)	(236.798, -2.67221)
2	1168	1.64	(214.761, 72.133)	77.984	(194.437, -3.15579)	(236.798, -2.67221)

Slices of Slip Surface: Optimized

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	194.86845	-3.2696355	685.01584	632.91005	0	400
2	Optimized	195.52895	-3.4417405	674.02337	627.54484	0	400
3	Optimized	196.5934	-3.7001665	686.12611	670.3551	0	157.16
4	Optimized	198.26445	-4.081179	724.02229	733.20489	0	162.66
5	Optimized	199.55	-4.3515175	761.98883	824.94483	0	166.7
6	Optimized	200.25	-4.488355	428.16946	-1069.3527	0	168.44
7	Optimized	200.75	-4.5813585	363.5073	278.21805	0	169.16
8	Optimized	201.73	-4.750741	373.42798	816.37146	0	170.46
9	Optimized	203.19	-4.9839945	386.80062	836.79798	0	172.21
10	Optimized	204.65	-5.188979	398.02938	854.37057	0	173.69
11	Optimized	206.11	-5.365919	407.1768	869.32727	0	174.91
12	Optimized	207.57	-5.515006	414.03665	881.50223	0	175.88
13	Optimized	209.02335	-5.6359715	418.72386	883.29089	0	176.6
14	Optimized	210.47	-5.729195	421.26165	874.68648	0	177.09
15	Optimized	211.91665	-5.795453	421.70997	863.61847	0	177.34
16	Optimized	213.36335	-5.8348145	420.11917	849.88655	0	177.37
17	Optimized	214.81	-5.8473205	416.40543	833.50211	0	177.18
18	Optimized	216.25665	-5.832984	410.63408	814.34317	0	176.77
19	Optimized	217.70335	-5.79179	402.83263	792.43047	0	176.16
20	Optimized	219.15	-5.7236955	392.94972	767.65192	0	175.33
21	Optimized	220.59665	-5.6286305	380.88279	739.90081	0	174.3
22	Optimized	222.04335	-5.5064955	366.51326	709.214	0	173.08
23	Optimized	223.49	-5.357162	349.48074	675.39395	0	171.65
24	Optimized	224.93665	-5.1804735	328.89831	638.43596	0	170.02
25	Optimized	226.38335	-4.9762415	303.88761	598.21272	0	168.21
26	Optimized	227.83	-4.7442455	272.90018	554.63217	0	166.2
27	Optimized	229.27665	-4.484234	231.55361	507.59236	0	164
28	Optimized	230.5	-4.244154	191.9664	350.3191	0	162.01
29	Optimized	231.72475	-3.9795885	149.1284	199.45065	0	159.85
30	Optimized	233.1742	-3.641949	103.0406	162.25711	0	157.15
31	Optimized	234.62365	-3.274939	62.330209	121.26194	0	154.25
32	Optimized	236.07315	-2.8781265	20.967154	76.312372	0	151.17

Slices of Slip Surface: **1168**

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	1168	194.86845	-3.2696355	685.01584	632.91005	0	400
2	1168	195.52895	-3.4417405	674.02337	627.54484	0	400
3	1168	196.5934	-3.7001665	686.12611	670.3551	0	157.16
4	1168	198.26445	-4.081179	724.02229	733.20489	0	162.66
5	1168	199.55	-4.3515175	761.98883	824.94483	0	166.7
6	1168	200.25	-4.488355	428.16946	-1069.3527	0	168.44
7	1168	200.75	-4.5813585	363.5073	278.21805	0	169.16
8	1168	201.73	-4.750741	373.42798	816.37146	0	170.46
9	1168	203.19	-4.9839945	386.80062	836.79798	0	172.21
10	1168	204.65	-5.188979	398.02938	854.37057	0	173.69
11	1168	206.11	-5.365919	407.1768	869.32727	0	174.91
12	1168	207.57	-5.515006	414.03665	881.50223	0	175.88
13	1168	209.02335	-5.6359715	418.72386	883.29089	0	176.6
14	1168	210.47	-5.729195	421.26165	874.68648	0	177.09
15	1168	211.91665	-5.795453	421.70997	863.61847	0	177.34
16	1168	213.36335	-5.8348145	420.11917	849.88655	0	177.37
17	1168	214.81	-5.8473205	416.40543	833.50211	0	177.18
18	1168	216.25665	-5.832984	410.63408	814.34317	0	176.77
19	1168	217.70335	-5.79179	402.83263	792.43047	0	176.16
20	1168	219.15	-5.7236955	392.94972	767.65192	0	175.33
21	1168	220.59665	-5.6286305	380.88279	739.90081	0	174.3
22	1168	222.04335	-5.5064955	366.51326	709.214	0	173.08
23	1168	223.49	-5.357162	349.48074	675.39395	0	171.65
24	1168	224.93665	-5.1804735	328.89831	638.43596	0	170.02
25	1168	226.38335	-4.9762415	303.88761	598.21272	0	168.21
26	1168	227.83	-4.7442455	272.90018	554.63217	0	166.2
27	1168	229.27665	-4.484234	231.55361	507.59236	0	164
28	1168	230.5	-4.244154	191.9664	350.3191	0	162.01
29	1168	231.72475	-3.9795885	149.1284	199.45065	0	159.85
30	1168	233.1742	-3.641949	103.0406	162.25711	0	157.15
31	1168	234.62365	-3.274939	62.330209	121.26194	0	154.25
32	1168	236.07315	-2.8781265	20.967154	76.312372	0	151.17



Name: EMBANKMENT FILL, EL. +3.6 TO 0   Model: Undrained (Phi=0)   Unit Weight: 110 pcf   Cohesion: 580 psf
Name: FILL2, EL.0 TO -2.5/-3.5   Model: Undrained (Phi=0)   Unit Weight: 94 pcf   Cohesion: 400 psf
Name: BEACH SAND, EL. -7 TO -50   Model: Shear/Normal Fn.   Unit Weight: 122 pcf   Strength Function: Sand
Name: BAY SOUND CLAY, EL. -50 TO -70   Model: Spatial Mohr-Coulomb   Unit Weight: 102 pcf   Cohesion Spatial Fn: Bay Sound   Phi: 0 °
Name: Sheet Pile   Model: Undrained (Phi=0)   Unit Weight: 0.1 pcf   Cohesion: 0.01 psf
Name: MARSH, EL. -2.8/-3.5 TO -7   Model: Spatial Mohr-Coulomb   Weight Fn: Marsh   Cohesion Spatial Fn: Marsh   Phi: 0 °
Name: MARSH, EL. -2.8 TO -7 (Protected)   Model: Spatial Mohr-Coulomb   Unit Weight: 100 pcf   Cohesion Fn: Marsh   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.

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 1B,
PROTECTED SIDE STABILITY ANALYSIS
CASE: Slope Stability (Block) 01
STA. 7+00 TO 9+25 WEST
ORLEANS PARISH, LOUISIANA

ETL 1110-2-575 ANALYSIS

Name: Slope Stability (Block) 01
File Name: Orleans Canal Reach 1B.gsz   Directory: Y:\F&MHOME\Middleton\Outfall Canals\Orleans final edits\final\Appendix A and Appendix B\
Last Edited By: Reves, Ryan D MVK

Slope Stability (Block) 01

File Information

Created By: Liljegren, James
Revision Number: 665
Last Edited By: Reves, Ryan D MVK
Date: 6/10/2013
Time: 9:50:58 AM
File Name: Orleans Canal Reach 1B.gsz
Directory: Y:\F&MHOME\Middleton\Outfall Canals\Orleans final edits\final\Appendix A and Appendix B\
Last Solved Date: 6/10/2013
Last Solved Time: 10:01:16 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 (Block) 01

Kind: SLOPE/W
Parent: Gap Analysis (seepage) 01 TWL
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: 16
- Complete Passes per Insertion: 1
- Driving Side Maximum Convex Angle: 5 °
- Resisting Side Maximum Convex Angle: 1 °

Materials

EMBANKMENT FILL, EL. +3.6 TO 0

Model: Undrained (Phi=0)
Unit Weight: 110 pcf
Cohesion: 580 psf

FILL2, EL.0 TO -2.5/-3.5

Model: Undrained (Phi=0)
Unit Weight: 94 pcf
Cohesion: 400 psf

BEACH SAND, EL. -7 TO -50

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

BAY SOUND CLAY, EL. -50 TO -70

Model: Spatial Mohr-Coulomb
Unit Weight: 102 pcf
Cohesion Spatial Fn: Bay Sound
Phi: 0 °
Phi-B: 0 °

Sheet Pile

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

MARSH, EL. -2.8/-3.5 TO -7

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

MARSH, EL. -2.8 TO -7 (Protected)

Model: Spatial Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion Fn: Marsh
Phi: 0 °
Phi-B: 0 °

Slip Surface Limits

Left Coordinate: (120, -4) ft
Right Coordinate: (310, -5) ft

Slip Surface Block

Left Grid
- Upper Left: (190, -5) ft
- Lower Left: (190, -55) ft
- Lower Right: (210, -55) ft
- X Increments: 4
- Y Increments: 10
- Starting Angle: 125 °
- Ending Angle: 145 °
- Angle Increments: 4

Right Grid
- Upper Left: (220, -5) ft
- Lower Left: (220, -55) ft
- Lower Right: (245, -55) ft
- X Increments: 5
- Y Increments: 10
- Starting Angle: 25 °
- Ending Angle: 45 °
- Angle Increments: 4

Cohesion Functions

Marsh

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

Y-Intercept: 150
Data Points: Y (ft), Cohesion (psf)
- Data Point: (-7, 180)
- Data Point: (-2.8, 150)

Shear/Normal Strength Functions

Sand

Model: Spline Data Point Function
Function: Shear Stress vs. Normal Stress
- Curve Fit to Data: 100 %
- Segment Curvature: 0 %

Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
- Data Point: (-10000, 0)
- Data Point: (0, 0)
- Data Point: (10000, 6494)

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

Unit Weight Functions

Marsh

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

Y-Intercept: 100
Data Points: X (ft), Unit Weight (pcf)
- Data Point: (192.5, 100)
- Data Point: (208.3, 94)
- Data Point: (241.1, 100)

Spatial Functions

Marsh

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)

Data Point: (192.53, -3.5, 150)
Data Point: (192.53, -7, 180)
Data Point: (200, -3.5, 160)
Data Point: (200, -7, 190)
Data Point: (241.1, -2.8, 150)
Data Point: (241.1, -7, 180)

Bay Sound

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (120, -50, 600)
Data Point: (120, -70, 770)
Data Point: (192.53, -50, 600)
Data Point: (192.53, -70, 770)
Data Point: (200, -50, 750)
Data Point: (200, -70, 925)
Data Point: (241.1, -50, 600)
Data Point: (241.1, -70, 770)
Data Point: (310, -50, 600)
Data Point: (310, -70, 770)

Regions

	Material	Points	Area (ft²)
Region 1	EMBANKMENT FILL, EL. +3.6 TO 0	21,4,5,26	58.435
Region 2	MARSH, EL. -2.8/-3.5 TO -7	6,7,29,18,27	168.145
Region 3	BEACH SAND, EL. -7 TO -50	18,23,19,20,36,33,32,37,38,1,31	1900.824
Region 4	BEACH SAND, EL. -7 TO -50	20,36,34,15,28,12,11,29,18,23,19	6450
Region 5	BAY SOUND CLAY, EL. -50 TO -70	15,34,35,14,30,13,12,28	3800
Region 6	Sheet Pile	17,22,21,26,25,3	13.075
Region 7	FILL2, EL.0 TO -2.5/-3.5	27,3,25,26,5,6	99.39
Region 8	MARSH, EL. -2.8 TO -7 (Protected)	1,39,31	18.4275
Region 9	MARSH, EL. -2.8 TO -7 (Protected)	29,7,8,9,10,11	178.06
Region 10	MARSH, EL. -2.8/-3.5 TO -7	31,39,27,18	26.145
Region 11	FILL2, EL.0 TO -2.5/-3.5	2,24,3,27,39	6.9625
Region 12		32,40,41,24,2,39,1,38,37	286.571

Points

	X (ft)	Y (ft)
Point 1	182	-5.4
Point 2	195.3	-3
Point 3	200	-1.6
Point 4	208.3	3.3
Point 5	230	0.7
Point 6	230.4	-2.5
Point 7	241.1	-2.8
Point 8	251.6	-3.7
Point 9	267.3	-4.6
Point 10	310	-5
Point 11	310	-7
Point 12	310	-50
Point 13	310	-70
Point 14	182	-70
Point 15	182	-50
Point 16	182	-7
Point 17	200	14.1
Point 18	200	-7
Point 19	200	-28.5
Point 20	182	-28.5
Point 21	201	3.6
Point 22	200.5	14.1
Point 23	200	-23.5
Point 24	199.1	-1.6
Point 25	201	-1.6
Point 26	201	0
Point 27	200	-3.5
Point 28	200	-50
Point 29	241.1	-7
Point 30	200	-70
Point 31	192.53	-7
Point 32	120	-4
Point 33	120	-7
Point 34	120	-50
Point 35	120	-70
Point 36	120	-28.5
Point 37	140	-3.7
Point 38	160	-4.2
Point 39	192.53	-3.5
Point 40	120	0
Point 41	199	-1

Critical Slip Surfaces

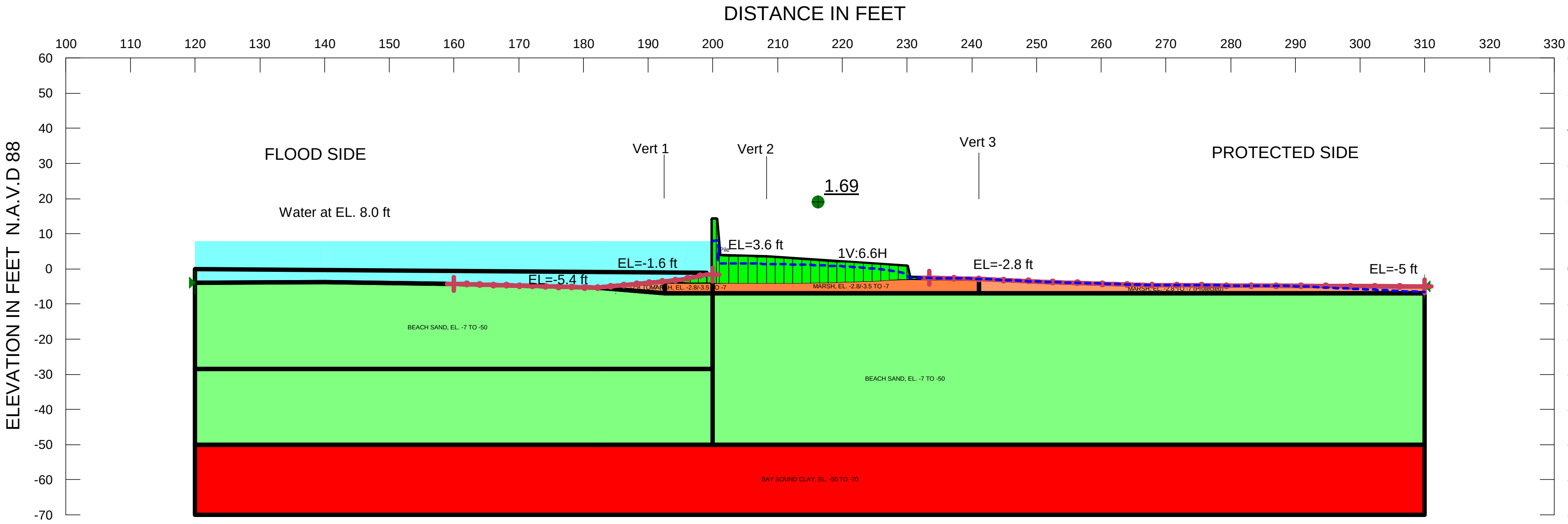
	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	2.02	(217.922, -2.953)	20.45068	(190.248, -3.91173)	(244.815, -3.11841)
2	1181	2.27	(217.922, -2.953)	20.377	(191.089, -3.7601)	(244.767, -3.11427)

Slices of Slip Surface: Optimized

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	191.38905	-4.4682275	760.70713	696.2678	0	161.92
2	Optimized	192.73965	-5.126992	782.29487	764.97675	0	164.23
3	Optimized	194.12465	-5.812862	810.32763	831.55077	0	171.96
4	Optimized	195.3837	-6.438017	840.38245	872.22323	0	179
5	Optimized	196.051	-6.739785	857.36531	918.39889	0	182.48
6	Optimized	197.8673	-7.549629	913.87821	1036.4621	79.606936	1.9789e-006
7	Optimized	199.5485	-8.299234	970.09106	1165.5225	126.91467	3.155e-006
8	Optimized	199.9985	-8.4992375	977.65966	1313.8566	218.32885	-7.3148e-006
9	Optimized	200.25	-8.50388	691.9221	-343.70143	0	0
10	Optimized	200.75	-8.51311	635.25175	704.63993	45.061209	1.463e-006
11	Optimized	202.16705	-8.5392675	636.37898	1273.6575	413.85353	-8.6316e-005
12	Optimized	204.16175	-8.618285	639.7276	1247.8756	394.93594	-8.2378e-005
13	Optimized	205.81705	-8.733235	644.85024	1251.4916	393.9575	-3.619e-005
14	Optimized	207.47235	-8.848185	649.18942	1254.987	393.40958	-8.2055e-005
15	Optimized	209.2756	-8.97341	653.19344	1252.2438	389.02786	-8.1148e-005
16	Optimized	211.06135	-9.1091985	657.1272	1239.4089	378.13818	-7.8879e-005
17	Optimized	212.6817	-9.245275	660.9402	1235.0424	372.82635	-7.7767e-005
18	Optimized	214.30205	-9.3813515	664.2612	1230.7374	367.87397	-7.6728e-005
19	Optimized	215.49895	-9.46755	665.56278	1241.2698	373.86851	-7.7978e-005
20	Optimized	216.9303	-9.5271675	664.12864	1232.9855	369.41995	-7.7054e-005
21	Optimized	219.0195	-9.6100825	661.21118	1215.9112	360.22638	-3.3092e-005
22	Optimized	220.71315	-9.671275	658.1142	1205.1746	355.26518	-7.4103e-005
23	Optimized	222.6967	-9.725905	653.08535	1187.8161	347.25819	-7.2425e-005
24	Optimized	225.026	-9.792805	646.87869	1163.3468	335.39831	-6.995e-005
25	Optimized	227.0156	-9.856815	641.7547	1145.4128	327.07941	-3.0048e-005
26	Optimized	229.0052	-9.920825	636.32929	1127.5793	319.0215	7.9282e-006
27	Optimized	230.1548	-9.95781	633.13492	997.96552	236.92376	5.8878e-006
28	Optimized	230.3548	-9.9455685	631.40866	960.87162	213.95575	-7.1646e-006
29	Optimized	231.44555	-9.52998	600.10796	852.81558	164.11024	4.0759e-006
30	Optimized	233.53665	-8.7332465	540.00332	732.20411	124.81665	3.0998e-006
31	Optimized	235.4948	-8.00116	484.51345	618.11395	86.761181	-3.7517e-007
32	Optimized	237.35435	-7.321145	432.66794	516.12698	54.198936	1.7586e-006
33	Optimized	239.00095	-6.6089035	367.00629	494.44342	0	177.69
34	Optimized	240.4003	-5.8770105	290.57567	408.25476	0	172.13
35	Optimized	241.6069	-5.245942	224.51493	330.16901	0	167.47
36	Optimized	243.4643	-4.0496145	99.877652	198.15509	0	158.93

Slices of Slip Surface: 1181

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	1181	191.80925	-4.264775	751.01662	646.6835	0	160.46
2	1181	193.2225	-5.2543435	786.44502	741.25858	0	165.96
3	1181	194.6075	-6.224131	829.67968	831.21744	0	176.13
4	1181	195.5078	-6.8545125	860.83152	869.72172	0	182.74
5	1181	196.5367	-7.574948	907.03084	982.50035	49.010476	1.5924e-006
6	1181	198.1789	-8.724844	984.64522	1116.7792	85.808824	2.135e-006
7	1181	199.05	-9.3348025	1020.5812	1187.4424	108.36094	2.6954e-006
8	1181	199.55	-9.6849065	1040.1412	1254.668	139.31536	3.4643e-006
9	1181	200.25	-10	783.8	-158.184	0	0
10	1181	200.75	-10	729.02	893.32	106.69767	-4.6152e-007
11	1181	201.9125	-10	728.65753	1462.411	476.50505	-9.9378e-005
12	1181	203.7375	-10	727.28767	1450.5205	469.67292	-4.3142e-005
13	1181	205.5625	-10	725.0411	1438.6301	463.41014	-9.6652e-005
14	1181	207.3875	-10	721.86301	1426.6849	457.71671	1.1374e-005
15	1181	209.20415	-10	717.95405	1408.5348	448.4684	-9.3533e-005
16	1181	211.0125	-10	713.25359	1384.2583	435.75557	-9.0883e-005
17	1181	212.82085	-10	707.88953	1360.0924	423.54551	-8.8332e-005
18	1181	214.62915	-10	701.97248	1335.9818	411.73048	-8.5866e-005
19	1181	216.4375	-10	695.55773	1311.9265	400.27456	-8.3478e-005
20	1181	218.24585	-10	688.75589	1287.9265	389.10595	9.6701e-006
21	1181	220.05415	-10	681.45635	1264.0371	378.33236	-7.8905e-005
22	1181	221.8625	-10	673.82501	1240.1477	367.77425	-7.6704e-005
23	1181	223.67085	-10	665.91717	1216.3689	357.46752	-7.4551e-005
24	1181	225.47915	-10	657.78814	1192.6454	347.34035	-7.2439e-005
25	1181	227.2875	-10	649.43791	1168.9219	337.35683	-7.0363e-005
26	1181	229.09585	-10	640.86648	1145.309	327.58878	8.1407e-006
27	1181	230.2	-9.9067385	629.72526	1136.0114	328.78607	-3.0177e-005
28	1181	231.4056	-9.344564	588.71111	844.08664	165.84281	-5.5508e-006
29	1181	233.41675	-8.4067385	520.21441	699.38736	116.35627	2.8886e-006
30	1181	235.4279	-7.468913	451.62759	554.64302	66.899004	-2.8913e-007
31	1181	237.21125	-6.637331	378.55336	483.6459	0	178.31
32	1181	238.76675	-5.9119925	301.76595	399.47631	0	172.72
33	1181	240.32225	-5.186654	225.63111	314.85227	0	167.2
34	1181	242.0166	-4.3965565	141.96911	216.1399	0	161.4
35	1181	243.84985	-3.5416995	48.374897	103.67497	0	155.3



Name: EMBANKMENT FILL, EL. +3.6 TO 0 Model: Undrained (Phi=0) Unit Weight: 110 pcf Cohesion: 580 psf
Name: FILL2, EL.0 TO -2.5/-3.5 Model: Undrained (Phi=0) Unit Weight: 94 pcf Cohesion: 400 psf
Name: BEACH SAND, EL. -7 TO -50 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand
Name: BAY SOUND CLAY, EL. -50 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 102 pcf Cohesion Spatial Fn: Bay Sound Phi: 0 °
Name: Sheet Pile Model: Undrained (Phi=0) Unit Weight: 0.1 pcf Cohesion: 0.01 psf
Name: MARSH, EL. -2.8/-3.5 TO -7 Model: Spatial Mohr-Coulomb Weight Fn: Marsh Cohesion Spatial Fn: Marsh Phi: 0 °
Name: MARSH, EL. -2.8 TO -7 (Protected) Model: Spatial Mohr-Coulomb Unit Weight: 100 pcf Cohesion Fn: Marsh 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.

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 1B,
PROTECTED SIDE STABILITY ANALYSIS
CASE: Slope Stability (Entry/Exit) 01
STA. 7+00 TO 9+25 WEST
ORLEANS PARISH, LOUISIANA

ETL 1110-2-575 ANALYSIS

Name: Slope Stability (Entry/Exit) 01
File Name: Orleans Canal Reach 1B.gsz Directory: Y:\F&MHOME\Middleton\Outfall Canals\Orleans final edits\final\Appendix A and Appendix B\
Last Edited By: Reves, Ryan D MVK

Slope Stability (Entry/Exit) 01

File Information

Created By: Liljegren, James
Revision Number: 665
Last Edited By: Reves, Ryan D MVK
Date: 6/10/2013
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File Name: Orleans Canal Reach 1B.gsz
Directory: Y:\F&MHOME\Middleton\Outfall Canals\Orleans final edits\final\Appendix A and Appendix B\
Last Solved Date: 6/10/2013
Last Solved Time: 10:02:12 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) 01

Kind: SLOPE/W
Parent: Gap Analysis (seepage) 01 TWL
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: 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. +3.6 TO 0

Model: Undrained (Phi=0)
Unit Weight: 110 pcf
Cohesion: 580 psf

FILL2, EL.0 TO -2.5/-3.5

Model: Undrained (Phi=0)
Unit Weight: 94 pcf
Cohesion: 400 psf

BEACH SAND, EL. -7 TO -50

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

BAY SOUND CLAY, EL. -50 TO -70

Model: Spatial Mohr-Coulomb
Unit Weight: 102 pcf
Cohesion Spatial Fn: Bay Sound
Phi: 0 °
Phi-B: 0 °

Sheet Pile

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

MARSH, EL. -2.8/-3.5 TO -7

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

MARSH, EL. -2.8 TO -7 (Protected)

Model: Spatial Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion Fn: Marsh
Phi: 0 °
Phi-B: 0 °

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (160, -4.2) ft
Left-Zone Right Coordinate: (200, -1.6) ft
Left-Zone Increment: 20
Right Projection: Range
Right-Zone Left Coordinate: (233.43808, -2.58518) ft
Right-Zone Right Coordinate: (309.99629, -4.99997) ft
Right-Zone Increment: 20
Radius Increments: 4

Slip Surface Limits

Left Coordinate: (120, -4) ft
Right Coordinate: (310, -5) ft

Cohesion Functions

Marsh

Model: Spline Data Point Function
Function: Cohesion vs. Y
  Curve Fit to Data: 100 %
  Segment Curvature: 0 %
Y-Intercept: 150
Data Points: Y (ft), Cohesion (psf)
  Data Point: (-7, 180)
  Data Point: (-2.8, 150)

Shear/Normal Strength Functions

Sand

Model: Spline Data Point Function
Function: Shear Stress vs. Normal Stress
  Curve Fit to Data: 100 %
  Segment Curvature: 0 %
Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
  Data Point: (-10000, 0)
  Data Point: (0, 0)
  Data Point: (10000, 6494)
Estimation Properties
  Intact Rock Param.: 10
  Geological Strength: 100
  Disturbance Factor: 0
  SigmaC: 600000 psf
  Sigma3: 300000 psf
  Num. Points: 20

Unit Weight Functions

Marsh

Model: Spline Data Point Function
Function: Unit Weight vs. X
  Curve Fit to Data: 100 %
  Segment Curvature: 0 %
Y-Intercept: 100
Data Points: X (ft), Unit Weight (pcf)
  Data Point: (192.5, 100)
  Data Point: (208.3, 94)
  Data Point: (241.1, 100)

Spatial Functions

Marsh

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
  Data Point: (192.53, -3.5, 150)
  Data Point: (192.53, -7, 180)
  Data Point: (200, -3.5, 160)
  Data Point: (200, -7, 190)
  Data Point: (241.1, -2.8, 150)
  Data Point: (241.1, -7, 180)

Bay Sound

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)

Data Point: (120, -50, 600)
Data Point: (120, -70, 770)
Data Point: (192.53, -50, 600)
Data Point: (192.53, -70, 770)
Data Point: (200, -50, 750)
Data Point: (200, -70, 925)
Data Point: (241.1, -50, 600)
Data Point: (241.1, -70, 770)
Data Point: (310, -50, 600)
Data Point: (310, -70, 770)

Regions

	Material	Points	Area (ft^2)
Region 1	EMBANKMENT FILL, EL. +3.6 TO 0	21,4,5,26	58.435
Region 2	MARSH, EL. -2.8/-3.5 TO -7	6,7,29,18,27	168.145
Region 3	BEACH SAND, EL. -7 TO -50	18,23,19,20,36,33,32,37,38,1,31	1900.824
Region 4	BEACH SAND, EL. -7 TO -50	20,36,34,15,28,12,11,29,18,23,19	6450
Region 5	BAY SOUND CLAY, EL. -50 TO -70	15,34,35,14,30,13,12,28	3800
Region 6	Sheet Pile	17,22,21,26,25,3	13.075
Region 7	FILL2, EL.0 TO -2.5/-3.5	27,3,25,26,5,6	99.39
Region 8	MARSH, EL. -2.8 TO -7 (Protected)	1,39,31	18.4275
Region 9	MARSH, EL. -2.8 TO -7 (Protected)	29,7,8,9,10,11	178.06
Region 10	MARSH, EL. -2.8/-3.5 TO -7	31,39,27,18	26.145
Region 11	FILL2, EL.0 TO -2.5/-3.5	2,24,3,27,39	6.9625
Region 12		32,40,41,24,2,39,1,38,37	286.571

Points

	X (ft)	Y (ft)
Point 1	182	-5.4
Point 2	195.3	-3
Point 3	200	-1.6
Point 4	208.3	3.3
Point 5	230	0.7
Point 6	230.4	-2.5
Point 7	241.1	-2.8
Point 8	251.6	-3.7
Point 9	267.3	-4.6
Point 10	310	-5
Point 11	310	-7
Point 12	310	-50
Point 13	310	-70
Point 14	182	-70
Point 15	182	-50
Point 16	182	-7
Point 17	200	14.1
Point 18	200	-7
Point 19	200	-28.5
Point 20	182	-28.5
Point 21	201	3.6
Point 22	200.5	14.1
Point 23	200	-23.5
Point 24	199.1	-1.6
Point 25	201	-1.6
Point 26	201	0
Point 27	200	-3.5
Point 28	200	-50
Point 29	241.1	-7
Point 30	200	-70
Point 31	192.53	-7
Point 32	120	-4
Point 33	120	-7
Point 34	120	-50
Point 35	120	-70
Point 36	120	-28.5
Point 37	140	-3.7
Point 38	160	-4.2
Point 39	192.53	-3.5
Point 40	120	0
Point 41	199	-1

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.69	(207.843, 207.542)	211.6803	(192.2, -3.55948)	(233.438, -2.58518)
2	1681	1.69	(207.843, 207.542)	211.68	(192.2, -3.55948)	(233.438, -2.58518)

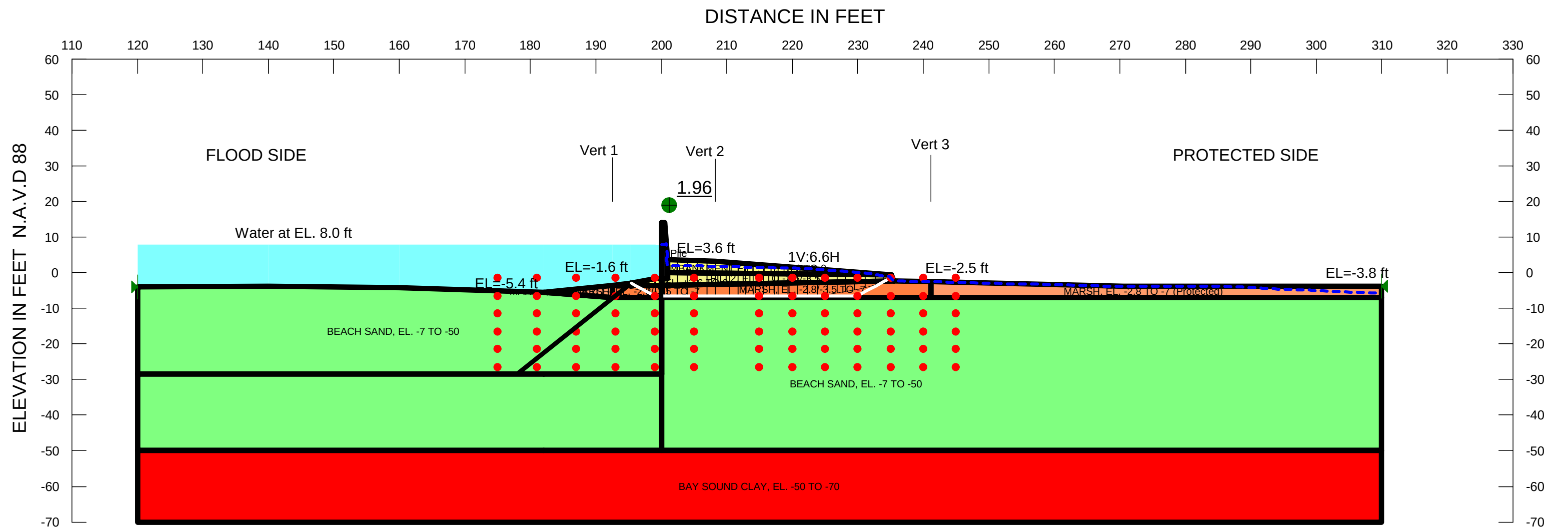
Slices of Slip Surface: Optimized

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	192.36515	-3.5715675	721.14126	695.03291	0	155.51
2	Optimized	193.2225	-3.6315975	712.86364	706.98602	0	152.06
3	Optimized	194.6075	-3.7229275	703.57386	726.30187	0	154.69
4	Optimized	195.91665	-3.801112	704.87559	716.95367	0	157.11
5	Optimized	197.15	-3.867103	711.80086	741.76256	0	159.33
6	Optimized	198.38335	-3.92588	725.17733	765.87986	0	161.49
7	Optimized	199.05	-3.9555445	734.15569	778.72718	0	162.63
8	Optimized	199.55	-3.9752665	741.47474	835.89109	0	163.47
9	Optimized	200.25	-4.0018835	419.21003	-1158.0142	0	164.27
10	Optimized	200.75	-4.019239	354.0411	248.70028	0	164.36
11	Optimized	201.73	-4.048712	355.16692	790.0814	0	164.49
12	Optimized	203.19	-4.0858535	356.10568	788.30255	0	164.63
13	Optimized	204.65	-4.112917	356.05541	785.45864	0	164.67
14	Optimized	206.11	-4.1299075	354.93329	781.48062	0	164.62
15	Optimized	207.57	-4.1368265	352.70524	776.50632	0	164.49
16	Optimized	208.97815	-4.134132	349.50294	765.26117	0	164.28
17	Optimized	210.3344	-4.122515	345.45071	747.74541	0	164
18	Optimized	211.69065	-4.102206	340.47096	729.34682	0	163.65
19	Optimized	213.0469	-4.0732025	334.57904	710.06737	0	163.24
20	Optimized	214.40315	-4.0355015	327.76133	689.8877	0	162.75
21	Optimized	215.7594	-3.9890985	320.01939	668.80391	0	162.2
22	Optimized	217.11565	-3.9339875	311.3175	646.78874	0	161.58
23	Optimized	218.4719	-3.870161	301.58406	623.83879	0	160.89
24	Optimized	219.8281	-3.797612	290.70345	599.93566	0	160.14
25	Optimized	221.18435	-3.7163315	278.40571	575.0755	0	159.33
26	Optimized	222.54065	-3.626309	264.2676	549.24088	0	158.46
27	Optimized	223.8969	-3.5275335	247.69753	522.41379	0	157.52
28	Optimized	225.25315	-3.4199925	227.64265	494.59129	0	156.53
29	Optimized	226.6094	-3.3036725	202.32651	465.74976	0	155.48
30	Optimized	227.96565	-3.1785595	168.5677	435.88614	0	154.36
31	Optimized	229.3219	-3.044638	115.87444	404.97739	0	153.2
32	Optimized	230.2	-2.9542305	62.769453	232.85033	0	152.42
33	Optimized	231.1595	-2.848815	35.704752	66.052056	0	151.52
34	Optimized	232.67855	-2.674911	11.197016	44.663194	0	150.06

Slices of Slip Surface: 1681

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	1681	192.36515	-3.5715675	721.14126	695.03291	0	155.51

2	1681	193.2225	-3.6315975	712.86364	706.98602	0	152.06
3	1681	194.6075	-3.7229275	703.57386	726.30187	0	154.69
4	1681	195.91665	-3.801112	704.87559	716.95367	0	157.11
5	1681	197.15	-3.867103	711.80086	741.76256	0	159.33
6	1681	198.38335	-3.92588	725.17733	765.87986	0	161.49
7	1681	199.05	-3.9555445	734.15569	778.72718	0	162.63
8	1681	199.55	-3.9752665	741.47474	835.89109	0	163.47
9	1681	200.25	-4.0018835	419.21003	-1158.0142	0	164.27
10	1681	200.75	-4.019239	354.0411	248.70028	0	164.36
11	1681	201.73	-4.048712	355.16692	790.0814	0	164.49
12	1681	203.19	-4.0858535	356.10568	788.30255	0	164.63
13	1681	204.65	-4.112917	356.05541	785.45864	0	164.67
14	1681	206.11	-4.1299075	354.93329	781.48062	0	164.62
15	1681	207.57	-4.1368265	352.70524	776.50632	0	164.49
16	1681	208.97815	-4.134132	349.50294	765.26117	0	164.28
17	1681	210.3344	-4.122515	345.45071	747.74541	0	164
18	1681	211.69065	-4.102206	340.47096	729.34682	0	163.65
19	1681	213.0469	-4.0732025	334.57904	710.06737	0	163.24
20	1681	214.40315	-4.0355015	327.76133	689.8877	0	162.75
21	1681	215.7594	-3.9890985	320.01939	668.80391	0	162.2
22	1681	217.11565	-3.9339875	311.3175	646.78874	0	161.58
23	1681	218.4719	-3.870161	301.58406	623.83879	0	160.89
24	1681	219.8281	-3.797612	290.70345	599.93566	0	160.14
25	1681	221.18435	-3.7163315	278.40571	575.0755	0	159.33
26	1681	222.54065	-3.626309	264.2676	549.24088	0	158.46
27	1681	223.8969	-3.5275335	247.69753	522.41379	0	157.52
28	1681	225.25315	-3.4199925	227.64265	494.59129	0	156.53
29	1681	226.6094	-3.3036725	202.32651	465.74976	0	155.48
30	1681	227.96565	-3.1785595	168.5677	435.88614	0	154.36
31	1681	229.3219	-3.044638	115.87444	404.97739	0	153.2
32	1681	230.2	-2.9542305	62.769453	232.85033	0	152.42
33	1681	231.1595	-2.848815	35.704752	66.052056	0	151.52
34	1681	232.67855	-2.674911	11.197016	44.663194	0	150.06



Name: EMBANKMENT FILL, EL. +3.6 TO 0   Model: Undrained (Phi=0)   Unit Weight: 110 pcf   Cohesion: 580 psf
Name: FILL2, EL.0 TO -2.5/-3.5   Model: Undrained (Phi=0)   Unit Weight: 94 pcf   Cohesion: 400 psf
Name: BEACH SAND, EL. -7 TO -50   Model: Shear/Normal Fn.   Unit Weight: 122 pcf   Strength Function: Sand
Name: BAY SOUND CLAY, EL. -50 TO -70   Model: Spatial Mohr-Coulomb   Unit Weight: 102 pcf   Cohesion Spatial Fn: Bay Sound   Phi: 0 °
Name: Sheet Pile   Model: Undrained (Phi=0)   Unit Weight: 0.1 pcf   Cohesion: 0.01 psf
Name: MARSH, EL. -2.8/-3.5 TO -7   Model: Spatial Mohr-Coulomb   Weight Fn: Marsh   Cohesion Spatial Fn: Marsh   Phi: 0 °
Name: MARSH, EL. -2.8 TO -7 (Protected)   Model: Spatial Mohr-Coulomb   Unit Weight: 100 pcf   Cohesion Fn: Marsh   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.

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 1C
REMEDIATION OF CANAL WALLS AND LEVEES
PROTECTED SIDE STABILITY ANALYSIS
CASE: Global P/S Stability Analysis Block
STA. 9+25 TO 11+00 WEST
ORLEANS PARISH, LOUISIANA

ETL 1110-2-575 ANALYSIS

Name: Global P/S Stability Analysis Block
File Name: Orleans Canal Reach 1C.gsz   Directory: Y:\F&MHOME\Middleton\Outfall Canals\Orleans final edits\final\Appendix A and Appendix B\
Last Edited By: Reves, Ryan D MVK

Global P/S Stability Analysis Block

File Information

- Created By: Liljegren, James
- Revision Number: 552
- Last Edited By: Reves, Ryan D MVK
- Date: 6/5/2013
- Time: 11:42:45 AM
- File Name: Orleans Canal Reach 1C.gsz
- Directory: Y:\F&MHOME\Middleton\Outfall Canals\Orleans final edits\final\Appendix A and Appendix B\
- Last Solved Date: 6/5/2013
- Last Solved Time: 11:46:42 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 P/S Stability Analysis Block

- Kind: SLOPE/W
- Parent: 1 - Global Stability Analysis 8ft
- 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: Tension Crack Line
    - Percentage Wet: 1
    - Tension Crack Fluid Unit Weight: 62.4 pcf
- FOS Distribution
  - FOS Calculation Option: Constant
- Restrict Block Crossing: Yes
- Advanced
  - Number of Slices: 30
  - Optimization Tolerance: 0.01
  - Minimum Slip Surface Depth: 0.1 ft
  - Optimization Maximum Iterations: 4000
  - Optimization Convergence Tolerance: 1e-007
  - Starting Optimization Points: 8
  - Ending Optimization Points: 16
  - Complete Passes per Insertion: 1
  - Driving Side Maximum Convex Angle: 5 °
  - Resisting Side Maximum Convex Angle: 1 °

Materials

EMBANKMENT FILL, EL. +3.6 TO 0

- Model: Undrained (Phi=0)
- Unit Weight: 110 pcf
- Cohesion: 580 psf

FILL2, EL.0 TO -2.5/-3.5

- Model: Undrained (Phi=0)
- Unit Weight: 94 pcf
- Cohesion: 400 psf

BEACH SAND, EL. -7 TO -50

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

BAY SOUND CLAY, EL. -50 TO -70

- Model: Spatial Mohr-Coulomb
- Unit Weight: 102 pcf
- Cohesion Spatial Fn: Bay Sound
- Phi: 0 °
- Phi-B: 0 °

Sheet Pile

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

MARSH, EL. -2.8/-3.5 TO -7

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

MARSH, EL. -2.8 TO -7 (Protected)

- Model: Spatial Mohr-Coulomb
- Unit Weight: 100 pcf
- Cohesion Fn: Marsh
- Phi: 0 °
- Phi-B: 0 °

Slip Surface Limits

- Left Coordinate: (120, -4) ft
- Right Coordinate: (310, -3.8) ft

Slip Surface Block

- Left Grid
  - Upper Left: (175, -1.5) ft
  - Lower Left: (175, -26.5) ft
  - Lower Right: (205, -26.5) ft
  - X Increments: 5
  - Y Increments: 5
  - Starting Angle: 115 °
  - Ending Angle: 135 °
  - Angle Increments: 2
- Right Grid
  - Upper Left: (215, -1.5) ft
  - Lower Left: (215, -26.5) ft
  - Lower Right: (245, -26.5) ft
  - X Increments: 6
  - Y Increments: 5
  - Starting Angle: 0 °
  - Ending Angle: 45 °
  - Angle Increments: 2

Cohesion Functions

Marsh

- Model: Spline Data Point Function
- Function: Cohesion vs. Y
  - Curve Fit to Data: 100 %
  - Segment Curvature: 0 %
- Y-Intercept: 150
- Data Points: Y (ft), Cohesion (psf)
  - Data Point: (-7, 180)
  - Data Point: (-2.8, 150)

Shear/Normal Strength Functions

Sand

- Model: Spline Data Point Function
- Function: Shear Stress vs. Normal Stress
  - Curve Fit to Data: 100 %
  - Segment Curvature: 0 %
- Y-Intercept: 0
- Data Points: Normal Stress (psf), Shear Stress (psf)
  - Data Point: (-10000, 0)
  - Data Point: (0, 0)
  - Data Point: (10000, 6494)
- Estimation Properties
  - Intact Rock Param.: 10
  - Geological Strength: 100
  - Disturbance Factor: 0
  - SigmaC: 600000 psf
  - Sigma3: 300000 psf
  - Num. Points: 20

Unit Weight Functions

Marsh

- Model: Spline Data Point Function
- Function: Unit Weight vs. X
  - Curve Fit to Data: 100 %
  - Segment Curvature: 0 %
- Y-Intercept: 100
- Data Points: X (ft), Unit Weight (pcf)
  - Data Point: (192.5, 100)
  - Data Point: (208.3, 94)
  - Data Point: (241.1, 100)

Spatial Functions

Marsh

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
- Data Point: (192.53, -3.5, 150)
- Data Point: (192.53, -7, 180)
- Data Point: (200, -3.5, 160)
- Data Point: (200, -7, 190)
- Data Point: (241.1, -2.8, 150)
- Data Point: (241.1, -7, 180)

Bay Sound

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
- Data Point: (120, -50, 600)
- Data Point: (120, -70, 770)
- Data Point: (192.53, -50, 600)
- Data Point: (192.53, -70, 770)
- Data Point: (200, -50, 750)
- Data Point: (200, -70, 925)
- Data Point: (241.1, -50, 600)
- Data Point: (241.1, -70, 770)
- Data Point: (310, -50, 600)
- Data Point: (310, -70, 770)

Regions

	Material	Points	Area (ft²)
Region 1	EMBANKMENT FILL, EL. +3.6 TO 0	20,4,5,25	71.595
Region 2	MARSH, EL. -2.8/-3.5 TO -7	6,7,28,17,26	171.31
Region 3	BEACH SAND, EL. -7 TO -50	17,22,18,19,35,32,31,36,37,1,30	1900.824
Region 4	BEACH SAND, EL. -7 TO -50	19,35,33,14,27,11,10,28,17,22,18	6450
Region 5	BAY SOUND CLAY, EL. -50 TO -70	14,33,34,13,29,12,11,27	3800
Region 6	Sheet Pile	16,21,20,25,24,3	13.075
Region 7	FILL2, EL.0 TO -2.5/-3.5	26,3,24,25,5,6	90.54
Region 8	MARSH, EL. -2.8 TO -7 (Protected)	1,38,30	18.4275
Region 9	MARSH, EL. -2.8 TO -7 (Protected)	28,7,8,9,10	239.59
Region 10	MARSH, EL. -2.8/-3.5 TO -7	30,38,26,17	26.145
Region 11	EMBANKMENT FILL, EL. +3.6 TO 0	2,23,3,26,38	6.9625

Points

	X (ft)	Y (ft)
Point 1	182	-5.4
Point 2	195.3	-3
Point 3	200	-1.6
Point 4	208.3	3.3
Point 5	235.1	-0.6
Point 6	235.5	-2.3
Point 7	241.1	-2.5
Point 8	270.5	-3.8
Point 9	310	-3.8
Point 10	310	-7
Point 11	310	-50
Point 12	310	-70
Point 13	182	-70
Point 14	182	-50
Point 15	182	-7
Point 16	200	14.1
Point 17	200	-7
Point 18	200	-28.5
Point 19	182	-28.5
Point 20	201	3.6
Point 21	200.5	14.1
Point 22	200	-23.5
Point 23	199.1	-1.6
Point 24	201	-1.6
Point 25	201	0
Point 26	200	-3.5
Point 27	200	-50
Point 28	241.1	-7
Point 29	200	-70
Point 30	192.53	-7
Point 31	120	-4
Point 32	120	-7
Point 33	120	-50
Point 34	120	-70
Point 35	120	-28.5
Point 36	140	-3.7
Point 37	160	-4.2
Point 38	192.53	-3.5

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.96	(215.295, -0.823)	16.31437	(192.707, -3.46802)	(235.262, -1.2874)
2	684	2.30	(215.295, -0.823)	15.202	(195.446, -2.94615)	(235.252, -1.24762)

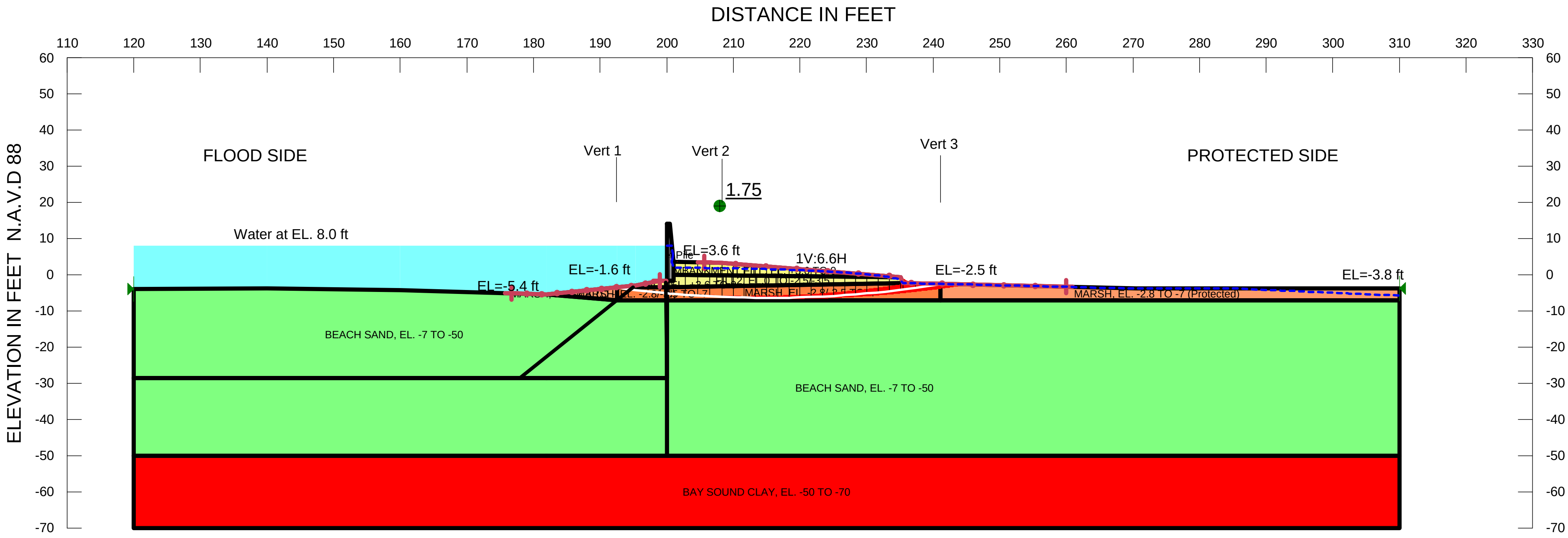
Slices of Slip Surface: Optimized

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	192.7513	-3.484009	714.66782	602.9993	0	580
2	Optimized	193.42155	-3.7270905	715.41602	675.56267	0	153.14
3	Optimized	194.67385	-4.1812715	729.19091	728.185	0	158.71
4	Optimized	196.0921	-4.695631	756.31384	776.43078	0	165.02
5	Optimized	197.43815	-5.2401615	793.75812	829.43394	0	171.49
6	Optimized	198.54605	-5.754684	830.00697	894.35114	0	177.38
7	Optimized	199.54935	-6.2206225	874.69162	975.79535	0	182.72
8	Optimized	199.99935	-6.429301	900.37742	1106.362	0	185.11
9	Optimized	200.25	-6.429692	589.07929	-381.59954	0	185.06
10	Optimized	200.75	-6.430472	526.71937	477.47943	0	184.95
11	Optimized	201.00895	-6.430876	526.67167	1022.4261	0	184.9
12	Optimized	201.7576	-6.48808	529.97766	1005.4891	0	185.22
13	Optimized	203.23705	-6.60246	536.23838	1008.5891	0	185.86
14	Optimized	204.7165	-6.71684	541.98018	1011.487	0	186.48
15	Optimized	206.1959	-6.83122	547.19632	1014.1827	0	187.09
16	Optimized	207.6178	-6.9108095	549.82987	1024.6906	0	187.41
17	Optimized	209.3614	-6.9680595	549.83135	1010.3469	0	187.46
18	Optimized	211.0415	-6.9663165	545.68043	1007.5912	0	187.04
19	Optimized	212.2543	-6.894585	537.93071	982.27173	0	186.17
20	Optimized	213.44255	-6.8243085	530.04196	957.4881	0	185.32
21	Optimized	214.8497	-6.75407	521.23904	925.56581	0	184.42
22	Optimized	216.4365	-6.696325	512.32866	892.84849	0	183.59
23	Optimized	217.51985	-6.669975	506.86173	870.08732	0	183.13
24	Optimized	218.58555	-6.6674425	502.8377	850.81369	0	182.86
25	Optimized	220.09785	-6.6697875	497.25686	828.39775	0	182.53
26	Optimized	221.59715	-6.59507	486.60841	821.0651	0	181.6
27	Optimized	223.08345	-6.44329	470.86581	783.44885	0	180.09
28	Optimized	224.57145	-6.2134625	449.79	759.65294	0	178
29	Optimized	226.0612	-5.9055875	423.10749	705.22298	0	175.33
30	Optimized	227.4794	-5.5299425	391.36841	668.64912	0	172.2
31	Optimized	228.82605	-5.0865275	353.99984	600.80309	0	168.6
32	Optimized	230.3051	-4.4727175	301.17473	539.9272	0	163.75
33	Optimized	231.91655	-3.6885125	228.96534	428.201	0	157.67
34	Optimized	233.31815	-2.8250105	144.00794	353.57394	0	151.1

35	Optimized	234.507	-1.8844855	38.66521	365.18723	0	400
36	Optimized	235.18085	-1.3513815	-8.7680976	261.12765	0	400

Slices of Slip Surface: 684

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	684	195.7231	-3.223077	685.39471	406.23974	0	580
2	684	196.75	-4.25	733.22271	647.94562	0	162.08
3	684	198.25	-5.75	826.93794	794.97671	0	176.94
4	684	199.05	-6.5	877.76	1078.6	0	184.44
5	684	199.55	-6.5	889.4	1112	0	185.11
6	684	200.25	-6.5	593.46	-376.2	0	185.66
7	684	200.75	-6.5	531.08	482.34	0	185.55
8	684	201.60835	-6.5	530.81903	1024.1915	0	185.36
9	684	202.825	-6.5	530.10396	1017.6984	0	185.09
10	684	204.04165	-6.5	529.01081	1011.123	0	184.81
11	684	205.25835	-6.5	527.59712	1004.5477	0	184.54
12	684	206.475	-6.5	525.80534	997.97233	0	184.27
13	684	207.69165	-6.5	523.69301	991.3148	0	184
14	684	208.97815	-6.5	521.13548	977.69585	0	183.71
15	684	210.3344	-6.5	518.00922	957.19816	0	183.41
16	684	211.69065	-6.5	514.52903	936.70046	0	183.1
17	684	213.0469	-6.5	510.72442	916.2765	0	182.8
18	684	214.40315	-6.5	506.61751	895.7788	0	182.49
19	684	215.7594	-6.5	502.23041	875.35484	0	182.19
20	684	217.11565	-6.5	497.58525	855.00461	0	181.88
21	684	218.4719	-6.5	492.70415	834.58065	0	181.57
22	684	219.8281	-6.5	487.60184	814.23041	0	181.27
23	684	221.18435	-6.5	482.27834	793.95392	0	180.96
24	684	222.54065	-6.5	476.74101	773.60369	0	180.65
25	684	223.8969	-6.5	471.00461	753.32719	0	180.35
26	684	225.25315	-6.5	465.05438	733.07281	0	180.04
27	684	226.6094	-6.5	458.85346	712.83318	0	179.73
28	684	227.96565	-6.5	452.32074	692.61567	0	179.42
29	684	229.3219	-6.5	445.42673	672.42765	0	179.12
30	684	230.6924	-5.80758	389.43373	774.99708	0	173.64
31	684	232.07725	-4.4227405	278.11152	584.28591	0	163.09
32	684	233.4621	-3.037901	155.53555	392.85479	0	152.65
33	684	234.62725	-1.8727405	32.265809	383.94689	0	400
34	684	235.1762	-1.3238095	-9.2552548	278.74349	0	400



Name: EMBANKMENT FILL, EL. +3.6 TO 0 Model: Undrained (Phi=0) Unit Weight: 110 pcf Cohesion: 580 psf
Name: FILL2, EL.0 TO -2.5/-3.5 Model: Undrained (Phi=0) Unit Weight: 94 pcf Cohesion: 400 psf
Name: BEACH SAND, EL. -7 TO -50 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand
Name: BAY SOUND CLAY, EL. -50 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 102 pcf Cohesion Spatial Fn: Bay Sound Phi: 0 °
Name: Sheet Pile Model: Undrained (Phi=0) Unit Weight: 0.1 pcf Cohesion: 0.01 psf
Name: MARSH, EL. -2.8/-3.5 TO -7 Model: Spatial Mohr-Coulomb Weight Fn: Marsh Cohesion Spatial Fn: Marsh Phi: 0 °
Name: MARSH, EL. -2.8 TO -7 (Protected) Model: Spatial Mohr-Coulomb Unit Weight: 100 pcf Cohesion Fn: Marsh 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.

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 1C
REMEDIATION OF CANAL WALLS AND LEVEES
PROTECTED SIDE STABILITY ANALYSIS
CASE: Global P/S Stability Analysis Entry Exit
STA. 9+25 TO 11+00 WEST
ORLEANS PARISH, LOUISIANA

ETL 1110-2-575 ANALYSIS

Name: Global P/S Stability Analysis Entry Exit
File Name: Orleans Canal Reach 1C.gsz Directory: Y:\F&MHOME\Middleton\Outfall Canals\Orleans final edits\final\Appendix A and Appendix B\
Last Edited By: Reves, Ryan D MVK

Global P/S Stability Analysis Entry Exit

File Information

Created By: Liljegren, James
Revision Number: 552
Last Edited By: Reves, Ryan D MVK
Date: 6/5/2013
Time: 11:42:45 AM
File Name: Orleans Canal Reach 1C.gsz
Directory: Y:\F&MHOME\Middleton\Outfall Canals\Orleans final edits\final\Appendix A and Appendix B\
Last Solved Date: 6/5/2013
Last Solved Time: 11:48:26 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

Global P/S Stability Analysis Entry Exit

Kind: SLOPE/W
Parent: 1 - Global Stability Analysis 8ft
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: Tension Crack Line
  - Percentage Wet: 1
  - Tension Crack Fluid Unit Weight: 62.4 pcf

FOS Distribution
- FOS Calculation Option: Constant

Advanced
- Number of Slices: 30
- Optimization Tolerance: 0.01
- Minimum Slip Surface Depth: 0.1 ft
- Optimization Maximum Iterations: 4000
- Optimization Convergence Tolerance: 1e-007
- Starting Optimization Points: 8
- Ending Optimization Points: 16
- Complete Passes per Insertion: 1
- Driving Side Maximum Convex Angle: 5 °
- Resisting Side Maximum Convex Angle: 1 °

Materials

EMBANKMENT FILL, EL. +3.6 TO 0

Model: Undrained (Phi=0)
Unit Weight: 110 pcf
Cohesion: 580 psf

FILL2, EL.0 TO -2.5/-3.5

Model: Undrained (Phi=0)
Unit Weight: 94 pcf
Cohesion: 400 psf

BEACH SAND, EL. -7 TO -50

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

BAY SOUND CLAY, EL. -50 TO -70

Model: Spatial Mohr-Coulomb
Unit Weight: 102 pcf
Cohesion Spatial Fn: Bay Sound
Phi: 0 °
Phi-B: 0 °

Sheet Pile

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

MARSH, EL. -2.8/-3.5 TO -7

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

MARSH, EL. -2.8 TO -7 (Protected)

Model: Spatial Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion Fn: Marsh
Phi: 0 °
Phi-B: 0 °

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (176.74291, -5.11325) ft
Left-Zone Right Coordinate: (199, -1.63684) ft
Left-Zone Increment: 10
Right Projection: Range
Right-Zone Left Coordinate: (205.68999, 3.40726) ft
Right-Zone Right Coordinate: (259.98185, -3.33491) ft
Right-Zone Increment: 12
Radius Increments: 10

Slip Surface Limits

Left Coordinate: (120, -4) ft
Right Coordinate: (310, -3.8) ft

Cohesion Functions

Marsh

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

Y-Intercept: 150
Data Points: Y (ft), Cohesion (psf)
- Data Point: (-7, 180)
- Data Point: (-2.8, 150)

Shear/Normal Strength Functions

Sand

Model: Spline Data Point Function
Function: Shear Stress vs. Normal Stress
- Curve Fit to Data: 100 %
- Segment Curvature: 0 %

Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
- Data Point: (-10000, 0)
- Data Point: (0, 0)
- Data Point: (10000, 6494)

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

Unit Weight Functions

Marsh

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

Y-Intercept: 100
Data Points: X (ft), Unit Weight (pcf)
- Data Point: (192.5, 100)
- Data Point: (208.3, 94)
- Data Point: (241.1, 100)

Spatial Functions

Marsh

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
- Data Point: (192.53, -3.5, 150)
- Data Point: (192.53, -7, 180)
- Data Point: (200, -3.5, 160)
- Data Point: (200, -7, 190)
- Data Point: (241.1, -2.8, 150)

Data Point: (241.1, -7, 180)

Bay Sound

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (120, -50, 600)
Data Point: (120, -70, 770)
Data Point: (192.53, -50, 600)
Data Point: (192.53, -70, 770)
Data Point: (200, -50, 750)
Data Point: (200, -70, 925)
Data Point: (241.1, -50, 600)
Data Point: (241.1, -70, 770)
Data Point: (310, -50, 600)
Data Point: (310, -70, 770)

Regions

	Material	Points	Area (ft²)
Region 1	EMBANKMENT FILL, EL. +3.6 TO 0	20,4,5,25	71.595
Region 2	MARSH, EL. -2.8/-3.5 TO -7	6,7,28,17,26	171.31
Region 3	BEACH SAND, EL. -7 TO -50	17,22,18,19,35,32,31,36,37,1,30	1900.824
Region 4	BEACH SAND, EL. -7 TO -50	19,35,33,14,27,11,10,28,17,22,18	6450
Region 5	BAY SOUND CLAY, EL. -50 TO -70	14,33,34,13,29,12,11,27	3800
Region 6	Sheet Pile	16,21,20,25,24,3	13.075
Region 7	FILL2, EL.0 TO -2.5/-3.5	26,3,24,25,5,6	90.54
Region 8	MARSH, EL. -2.8 TO -7 (Protected)	1,38,30	18.4275
Region 9	MARSH, EL. -2.8 TO -7 (Protected)	28,7,8,9,10	239.59
Region 10	MARSH, EL. -2.8/-3.5 TO -7	30,38,26,17	26.145
Region 11	EMBANKMENT FILL, EL. +3.6 TO 0	2,23,3,26,38	6.9625

Points

	X (ft)	Y (ft)
Point 1	182	-5.4
Point 2	195.3	-3
Point 3	200	-1.6
Point 4	208.3	3.3
Point 5	235.1	-0.6
Point 6	235.5	-2.3
Point 7	241.1	-2.5
Point 8	270.5	-3.8
Point 9	310	-3.8
Point 10	310	-7
Point 11	310	-50
Point 12	310	-70
Point 13	182	-70
Point 14	182	-50
Point 15	182	-7
Point 16	200	14.1
Point 17	200	-7
Point 18	200	-28.5
Point 19	182	-28.5
Point 20	201	3.6
Point 21	200.5	14.1
Point 22	200	-23.5
Point 23	199.1	-1.6
Point 24	201	-1.6
Point 25	201	0
Point 26	200	-3.5
Point 27	200	-50
Point 28	241.1	-7
Point 29	200	-70
Point 30	192.53	-7
Point 31	120	-4
Point 32	120	-7
Point 33	120	-50
Point 34	120	-70
Point 35	120	-28.5
Point 36	140	-3.7
Point 37	160	-4.2
Point 38	192.53	-3.5

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.75	(215.125, 84.401)	90.7833	(192.472, -3.51047)	(241.352, -2.51113)
2	1091	1.75	(215.125, 84.401)	90.783	(192.472, -3.51047)	(241.352, -2.51113)

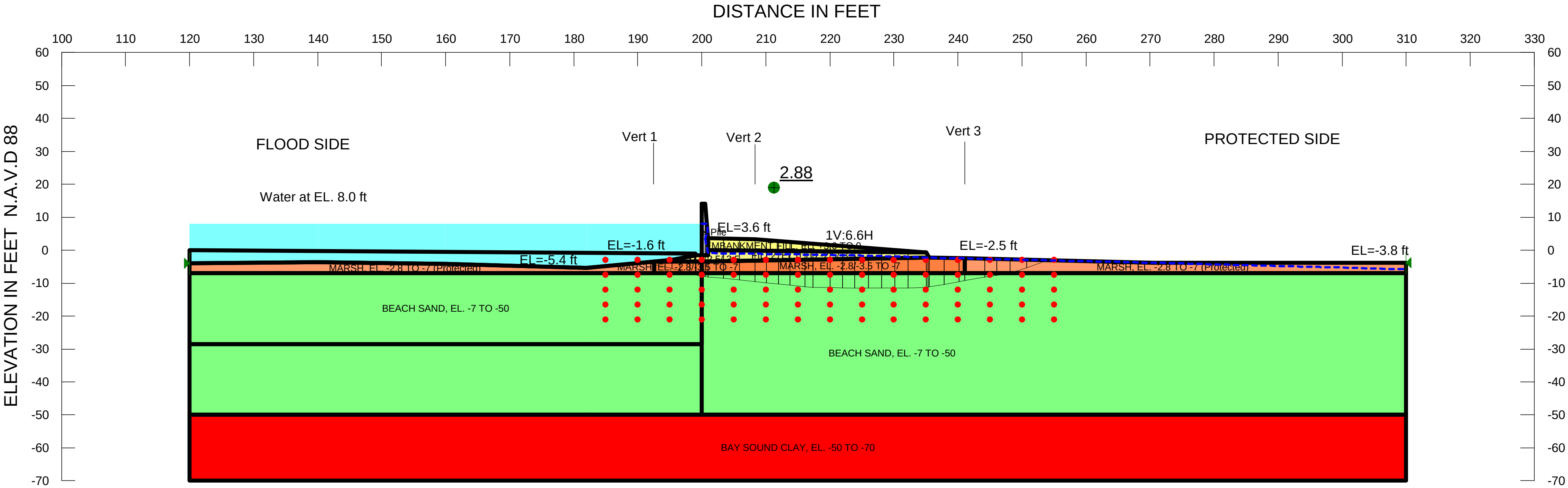
Slices of Slip Surface: Optimized

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	192.501	-3.517936	718.45802	655.23745	0	155.13
2	Optimized	193.2225	-3.6975645	716.66807	680.30915	0	152.62
3	Optimized	194.6075	-4.030396	721.41506	727.11211	0	157.33
4	Optimized	196.25	-4.3930045	739.99293	764.60101	0	162.63
5	Optimized	198.15	-4.7757755	773.99741	840.43607	0	168.46
6	Optimized	199.55	-5.034972	806.72563	927.83627	0	172.55
7	Optimized	200.25	-5.1548605	509.38157	-759.39642	0	174.14
8	Optimized	200.75	-5.236475	451.96533	340.70686	0	174.76
9	Optimized	201.9125	-5.4108045	462.19266	884.88715	0	176.04
10	Optimized	203.7375	-5.660418	476.4043	905.01378	0	177.81
11	Optimized	205.5625	-5.87245	487.57363	921.36595	0	179.24
12	Optimized	207.3875	-6.0471655	495.65286	933.95899	0	180.32
13	Optimized	209.1375	-6.180581	500.61508	934.55773	0	181.05
14	Optimized	210.8125	-6.275766	502.67369	923.6129	0	181.47
15	Optimized	212.4875	-6.339935	502.24174	909.70558	0	181.63
16	Optimized	214.1625	-6.373154	499.36899	892.84542	0	181.53
17	Optimized	215.8375	-6.3754565	494.116	872.86842	0	181.18
18	Optimized	217.5125	-6.346845	486.51213	849.85498	0	180.58
19	Optimized	219.1875	-6.28729	476.60257	823.59186	0	179.74
20	Optimized	220.8625	-6.1967305	464.38896	794.05084	0	178.67
21	Optimized	222.5375	-6.0750735	449.84208	761.2108	0	177.37
22	Optimized	224.2125	-5.922193	432.86523	724.93684	0	175.84
23	Optimized	225.8875	-5.7379305	413.18444	685.16294	0	174.09
24	Optimized	227.5625	-5.522093	390.34954	641.83008	0	172.12
25	Optimized	229.2375	-5.2744525	363.49622	594.7691	0	169.94
26	Optimized	230.9125	-4.9947445	331.06789	543.88213	0	167.54
27	Optimized	232.5875	-4.6826665	289.75692	489.08564	0	164.93
28	Optimized	234.2625	-4.337877	236.15269	430.24552	0	162.11
29	Optimized	235.3	-4.111672	198.89368	311.77835	0	160.28
30	Optimized	236.43335	-3.8407045	155.38035	198.27425	0	158.13
31	Optimized	238.3	-3.368882	93.533654	144.37166	0	154.45
32	Optimized	240.16665	-2.8545785	36.74164	84.947632	0	150.5
33	Optimized	241.2259	-2.5489255	4.0769857	49.693732	0	150

Slices of Slip Surface: 1091

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	1091	192.501	-3.517936	718.45802	655.23745	0	155.13
2	1091	193.2225	-3.6975645	716.66807	680.30915	0	152.62
3	1091	194.6075	-4.030396	721.41506	727.11211	0	157.33
4	1091	196.25	-4.3930045	739.99293	764.60101	0	162.63

5	1091	198.15	-4.7757755	773.99741	840.43607	0	168.46
6	1091	199.55	-5.034972	806.72563	927.83627	0	172.55
7	1091	200.25	-5.1548605	509.38157	-759.39642	0	174.14
8	1091	200.75	-5.236475	451.96533	340.70686	0	174.76
9	1091	201.9125	-5.4108045	462.19266	884.88715	0	176.04
10	1091	203.7375	-5.660418	476.4043	905.01378	0	177.81
11	1091	205.5625	-5.87245	487.57363	921.36595	0	179.24
12	1091	207.3875	-6.0471655	495.65286	933.95899	0	180.32
13	1091	209.1375	-6.180581	500.61508	934.55773	0	181.05
14	1091	210.8125	-6.275766	502.67369	923.6129	0	181.47
15	1091	212.4875	-6.339935	502.24174	909.70558	0	181.63
16	1091	214.1625	-6.373154	499.36899	892.84542	0	181.53
17	1091	215.8375	-6.3754565	494.116	872.86842	0	181.18
18	1091	217.5125	-6.346845	486.51213	849.85498	0	180.58
19	1091	219.1875	-6.28729	476.60257	823.59186	0	179.74
20	1091	220.8625	-6.1967305	464.38896	794.05084	0	178.67
21	1091	222.5375	-6.0750735	449.84208	761.2108	0	177.37
22	1091	224.2125	-5.922193	432.86523	724.93684	0	175.84
23	1091	225.8875	-5.7379305	413.18444	685.16294	0	174.09
24	1091	227.5625	-5.522093	390.34954	641.83008	0	172.12
25	1091	229.2375	-5.2744525	363.49622	594.7691	0	169.94
26	1091	230.9125	-4.9947445	331.06789	543.88213	0	167.54
27	1091	232.5875	-4.6826665	289.75692	489.08564	0	164.93
28	1091	234.2625	-4.337877	236.15269	430.24552	0	162.11
29	1091	235.3	-4.111672	198.89368	311.77835	0	160.28
30	1091	236.43335	-3.8407045	155.38035	198.27425	0	158.13
31	1091	238.3	-3.368882	93.533654	144.37166	0	154.45
32	1091	240.16665	-2.8545785	36.74164	84.947632	0	150.5
33	1091	241.2259	-2.5489255	4.0769857	49.693732	0	150



Name: EMBANKMENT FILL, EL. +3.6 TO 0 Model: Undrained (Phi=0) Unit Weight: 110 pcf Cohesion: 580 psf
Name: FILL2, EL.0 TO -2.5/-3.5 Model: Undrained (Phi=0) Unit Weight: 94 pcf Cohesion: 400 psf
Name: BEACH SAND, EL. -7 TO -50 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand
Name: BAY SOUND CLAY, EL. -50 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 102 pcf Cohesion Spatial Fn: Bay Sound Phi: 0 °
Name: Sheet Pile Model: Undrained (Phi=0) Unit Weight: 0.1 pcf Cohesion: 0.01 psf
Name: MARSH, EL. -2.8/-3.5 TO -7 Model: Spatial Mohr-Coulomb Weight Fn: Marsh Cohesion Spatial Fn: Marsh Phi: 0 °
Name: MARSH, EL. -2.8 TO -7 (Protected) Model: Spatial Mohr-Coulomb Unit Weight: 100 pcf Cohesion Fn: Marsh 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.

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 1D
REMEDIATION OF CANAL WALLS AND LEVEES
PROTECTED SIDE STABILITY ANALYSIS
CASE: Global Stability (Block) 01
STA. 11+00 TO 14+20 WEST
ORLEANS PARISH, LOUISIANA

ETL 1110-2-575 ANALYSIS

Name: Global Stability (Block) 01
File Name: Orleans Canal Reach 1D.gsz Directory: Y:\F&MHOME\Middleton\Outfall Canals\Orleans final edits\final\Appendix A and Appendix B\
Last Edited By: Reves, Ryan D MVK

Global Stability (Block) 01

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File Information

Created By: Liljegren, James
Revision Number: 616
Last Edited By: Reves, Ryan D MVK
Date: 6/5/2013
Time: 10:56:59 AM
File Name: Orleans Canal Reach 1D.gsz
Directory: Y:\F&MHOME\Middleton\Outfall Canals\Orleans final edits\final\Appendix A and Appendix B\
Last Solved Date: 6/5/2013
Last Solved Time: 11:17:38 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) 01

Kind: SLOPE/W
Parent: Gap Analysis (seepage) 01 TWL
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: 16
- Complete Passes per Insertion: 1
- Driving Side Maximum Convex Angle: 5 °
- Resisting Side Maximum Convex Angle: 1 °

Materials

EMBANKMENT FILL, EL. +3.6 TO 0

Model: Undrained (Phi=0)
Unit Weight: 110 pcf
Cohesion: 580 psf

FILL2, EL.0 TO -2.5/-3.5

Model: Undrained (Phi=0)
Unit Weight: 94 pcf
Cohesion: 400 psf

BEACH SAND, EL. -7 TO -50

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

BAY SOUND CLAY, EL. -50 TO -70

Model: Spatial Mohr-Coulomb
Unit Weight: 102 pcf
Cohesion Spatial Fn: Bay Sound
Phi: 0 °
Phi-B: 0 °

Sheet Pile

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

MARSH, EL. -2.8/-3.5 TO -7

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

MARSH, EL. -2.8 TO -7 (Protected)

Model: Spatial Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion Fn: Marsh
Phi: 0 °
Phi-B: 0 °

Slip Surface Limits

Left Coordinate: (120, -4) ft
Right Coordinate: (310, -3.8) ft

Slip Surface Block

Left Grid
- Upper Left: (185, -3) ft
- Lower Left: (185, -21) ft
- Lower Right: (215, -21) ft
- X Increments: 6
- Y Increments: 4
- Starting Angle: 125 °
- Ending Angle: 145 °
- Angle Increments: 4

Right Grid
- Upper Left: (220, -3) ft
- Lower Left: (220, -21) ft
- Lower Right: (255, -21) ft
- X Increments: 7
- Y Increments: 4
- Starting Angle: 25 °
- Ending Angle: 45 °
- Angle Increments: 4

Cohesion Functions

Marsh

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

Y-Intercept: 150
Data Points: Y (ft), Cohesion (psf)
- Data Point: (-7, 180)
- Data Point: (-2.8, 150)

Shear/Normal Strength Functions

Sand

Model: Spline Data Point Function
Function: Shear Stress vs. Normal Stress
- Curve Fit to Data: 100 %
- Segment Curvature: 0 %

Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
- Data Point: (-10000, 0)
- Data Point: (0, 0)
- Data Point: (10000, 6494)

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

Unit Weight Functions

Marsh

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

Y-Intercept: 100
Data Points: X (ft), Unit Weight (pcf)
- Data Point: (192.5, 100)
- Data Point: (208.3, 94)
- Data Point: (241.1, 100)

Spatial Functions

Marsh

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)

Data Point: (192.53, -3.5, 150)
Data Point: (192.53, -7, 180)
Data Point: (200, -3.5, 160)
Data Point: (200, -7, 190)
Data Point: (241.1, -2.8, 150)
Data Point: (241.1, -7, 180)

Bay Sound

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (120, -50, 600)
Data Point: (120, -70, 770)
Data Point: (192.53, -50, 600)
Data Point: (192.53, -70, 770)
Data Point: (200, -50, 750)
Data Point: (200, -70, 925)
Data Point: (241.1, -50, 600)
Data Point: (241.1, -70, 770)
Data Point: (310, -50, 600)
Data Point: (310, -70, 770)

Regions

	Material	Points	Area (ft²)
Region 1	EMBANKMENT FILL, EL. +3.6 TO 0	20,4,5,25	71.595
Region 2	MARSH, EL. -2.8/-3.5 TO -7	6,7,28,17,26	171.31
Region 3	BEACH SAND, EL. -7 TO -50	17,22,18,19,35,32,15,30	1720
Region 4	BEACH SAND, EL. -7 TO -50	19,35,33,14,27,11,10,28,17,22,18	6450
Region 5	BAY SOUND CLAY, EL. -50 TO -70	14,33,34,13,29,12,11,27	3800
Region 6	Sheet Pile	16,21,20,25,24,3	13.075
Region 7	FILL2, EL.0 TO -2.5/-3.5	26,3,24,25,5,6	90.54
Region 8	MARSH, EL. -2.8 TO -7 (Protected)	1,38,30,15,32,31,36,37	199.2515
Region 9	MARSH, EL. -2.8 TO -7 (Protected)	28,7,8,9,10	239.59
Region 10	MARSH, EL. -2.8/-3.5 TO -7	30,38,26,17	26.145
Region 11	FILL2, EL.0 TO -2.5/-3.5	2,23,3,26,38	6.9625
Region 12		31,39,40,23,2,38,1,37,36	286.571

Points

	X (ft)	Y (ft)
Point 1	182	-5.4
Point 2	195.3	-3
Point 3	200	-1.6
Point 4	208.3	3.3
Point 5	235.1	-0.6
Point 6	235.5	-2.3
Point 7	241.1	-2.5
Point 8	270.5	-3.8
Point 9	310	-3.8
Point 10	310	-7
Point 11	310	-50
Point 12	310	-70
Point 13	182	-70
Point 14	182	-50
Point 15	182	-7
Point 16	200	14.1
Point 17	200	-7
Point 18	200	-28.5
Point 19	182	-28.5
Point 20	201	3.6
Point 21	200.5	14.1
Point 22	200	-23.5
Point 23	199.1	-1.6
Point 24	201	-1.6
Point 25	201	0
Point 26	200	-3.5
Point 27	200	-50
Point 28	241.1	-7
Point 29	200	-70
Point 30	192.53	-7
Point 31	120	-4
Point 32	120	-7
Point 33	120	-50
Point 34	120	-70
Point 35	120	-28.5
Point 36	140	-3.7
Point 37	160	-4.2
Point 38	192.53	-3.5
Point 39	120	0
Point 40	199	-1

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	2.88	(221.463, -2.803)	23.86673	(191.05, -3.76699)	(253.815, -3.06221)
2	3576	3.41	(221.463, -2.803)	24.923	(188.817, -4.16988)	(254.137, -3.07645)

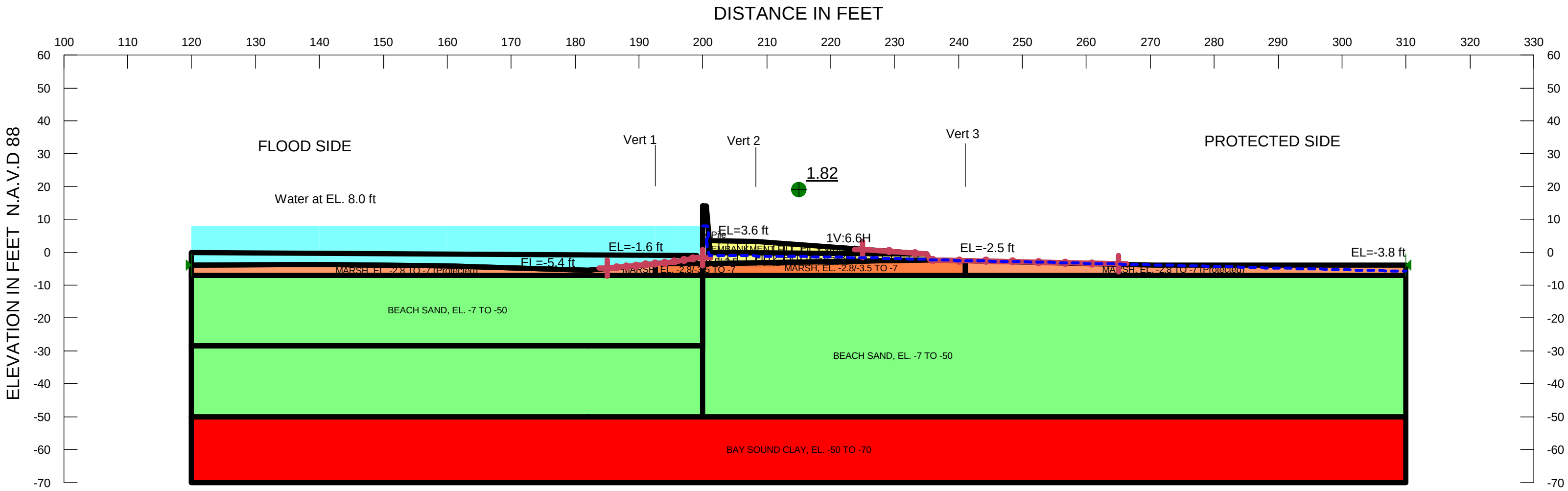
Slices of Slip Surface: Optimized

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	191.79015	-4.091921	709.30587	689.99998	0	159.23
2	Optimized	193.915	-5.0251505	645.13997	788.92308	0	164.93
3	Optimized	195.9349	-5.9122875	658.07832	866.069	0	175.23
4	Optimized	197.3424	-6.595565	699.14273	927.90929	0	182.98
5	Optimized	198.5575	-7.2316315	761.80496	1006.7903	159.09531	3.9552e-006
6	Optimized	199.05	-7.489436	810.1109	1042.2407	150.74685	3.7473e-006
7	Optimized	199.4754	-7.7121195	840.49251	1096.6358	166.34137	4.1355e-006
8	Optimized	199.9254	-7.922967	866.90021	1192.5967	211.50975	5.258e-006
9	Optimized	200.25	-7.985354	508.25747	-226.69092	0	0
10	Optimized	200.75	-8.0814535	442.26531	630.57865	122.29211	3.0396e-006
11	Optimized	202.21665	-8.3633455	459.58828	1182.4268	469.41685	-9.7917e-005
12	Optimized	204.65	-8.83103	487.67692	1224.6002	478.56355	-9.983e-005
13	Optimized	207.08335	-9.2987145	514.75663	1266.6524	488.28683	-4.4859e-005
14	Optimized	209.2123	-9.7079025	537.80397	1295.089	491.78666	-0.00010259
15	Optimized	211.0369	-10.058594	556.99107	1310.105	489.07791	-0.00010202
16	Optimized	212.86155	-10.409285	575.88216	1325.121	486.56139	-0.0001015
17	Optimized	214.94215	-10.85665	599.89663	1333.5112	476.41486	-9.9382e-005
18	Optimized	216.7372	-11.173905	615.99421	1404.7246	512.2075	1.2729e-005
19	Optimized	218.70005	-11.29909	619.3801	1395.3236	503.90363	-0.0001051
20	Optimized	221.0033	-11.41122	620.87156	1384.7032	496.03808	1.2328e-005
21	Optimized	222.93775	-11.47558	619.99323	1363.3651	482.75135	-0.00010069
22	Optimized	224.9505	-11.500015	616.2794	1351.3959	477.39027	-9.957e-005
23	Optimized	227.04155	-11.484525	609.67999	1317.4903	459.65738	-9.5873e-005
24	Optimized	229.1153	-11.461465	602.48667	1285.736	443.70732	-9.2536e-005
25	Optimized	231.1717	-11.43083	594.80425	1250.4844	425.80367	-8.8811e-005
26	Optimized	233.64995	-11.32673	581.20005	1215.5744	411.96751	-3.7841e-005
27	Optimized	235.20665	-11.23142	570.7214	1136.0622	367.13659	-7.6567e-005
28	Optimized	235.40665	-11.193305	567.77126	1134.9843	368.35248	-7.6806e-005
29	Optimized	236.6757	-10.76386	537.22659	1028.3684	318.95119	7.924e-006
30	Optimized	239.0271	-9.96814	480.54709	912.43118	280.46881	-2.5753e-005
31	Optimized	240.6514	-9.4209945	441.56362	831.1705	253.01366	6.2857e-006
32	Optimized	242.63715	-8.7601795	394.34029	731.79953	219.14859	-7.3396e-006
33	Optimized	245.14085	-7.9364875	335.39044	604.92268	175.03628	-5.8623e-006

34	Optimized	247.1221	-7.2965875	289.44265	508.27947	142.11429	3.5302e-006
35	Optimized	249.43275	-6.194875	212.45212	415.64271	0	174.25
36	Optimized	252.27165	-4.241556	79.456436	198.80329	0	160.3

Slices of Slip Surface: 3576

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	3576	189.74555	-4.8197755	709.01455	711.83878	0	164.43
2	3576	191.60185	-6.1195585	641.14473	840.34133	0	173.71
3	3576	192.69465	-6.884725	625.07432	915.60638	0	179.23
4	3576	194.07965	-7.8545125	690.26206	1021.2804	214.96584	5.3436e-006
5	3576	196.225	-9.3567175	807.55108	1181.3501	242.74791	6.0346e-006
6	3576	198.075	-10.6521	892.69861	1337.3875	288.78432	-2.6536e-005
7	3576	199.05	-11.3348	928.3447	1418.7709	318.48647	-2.9266e-005
8	3576	199.55	-11.684905	945.21055	1482.2103	348.73171	-7.2757e-005
9	3576	200.25	-12	733.82	293.96	0	0
10	3576	200.75	-12	688.78	1141.32	293.88291	7.3031e-006
11	3576	202.21665	-12	688.43845	1695.0413	653.69555	5.138e-005
12	3576	204.65	-12	687.12338	1681.192	645.55572	-0.00013464
13	3576	207.08335	-12	684.73982	1667.2194	638.0297	-0.00013307
14	3576	209.4125	-12	681.66292	1643.0112	624.3069	1.5514e-005
15	3576	211.6375	-12	678.02247	1608.764	604.43064	1.502e-005
16	3576	213.8625	-12	673.88764	1574.6067	584.93382	1.4536e-005
17	3576	216.0875	-12	669.25843	1540.5393	565.81643	1.4061e-005
18	3576	218.3125	-12	664.22472	1506.5169	546.99091	-0.00011408
19	3576	220.5375	-12	658.8764	1472.5843	528.42807	1.3132e-005
20	3576	222.7625	-12	653.30337	1438.6966	510.04035	1.2675e-005
21	3576	224.9875	-12	647.46067	1404.8989	491.88612	-0.00010259
22	3576	227.2125	-12	641.4382	1371.191	473.90702	-9.8837e-005
23	3576	229.4375	-12	635.2809	1337.5281	456.04466	-9.5113e-005
24	3576	231.6625	-12	628.98876	1303.9101	438.29905	-4.0262e-005
25	3576	233.9375	-11.976685	620.95028	1273.1201	423.52402	-8.8329e-005
26	3576	235.3	-11.86011	609.71852	1307.8927	453.3996	-9.454e-005
27	3576	236.43335	-11.33163	573.40146	1133.2568	363.57434	-7.5813e-005
28	3576	238.3	-10.461185	513.48804	1005.4189	319.46364	7.9369e-006
29	3576	240.16665	-9.5907415	453.60862	877.58097	275.33087	-2.5283e-005
30	3576	242.25565	-8.6166425	386.54208	732.02073	224.35646	-7.5151e-006
31	3576	244.5669	-7.538881	312.31264	568.89633	166.6274	4.1399e-006
32	3576	246.7743	-6.509556	240.571	437.18639	0	176.5
33	3576	248.87785	-5.5286685	171.54837	320.645	0	169.49
34	3576	250.98135	-4.547781	102.72825	204.095	0	162.48
35	3576	253.08485	-3.566893	34.167924	87.544992	0	155.48



Name: EMBANKMENT FILL, EL. +3.6 TO 0 Model: Undrained (Phi=0) Unit Weight: 110 pcf Cohesion: 580 psf
Name: FILL2, EL.0 TO -2.5/-3.5 Model: Undrained (Phi=0) Unit Weight: 94 pcf Cohesion: 400 psf
Name: BEACH SAND, EL. -7 TO -50 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand
Name: BAY SOUND CLAY, EL. -50 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 102 pcf Cohesion Spatial Fn: Bay Sound Phi: 0 °
Name: Sheet Pile Model: Undrained (Phi=0) Unit Weight: 0.1 pcf Cohesion: 0.01 psf
Name: MARSH, EL. -2.8/-3.5 TO -7 Model: Spatial Mohr-Coulomb Weight Fn: Marsh Cohesion Spatial Fn: Marsh Phi: 0 °
Name: MARSH, EL. -2.8 TO -7 (Protected) Model: Spatial Mohr-Coulomb Unit Weight: 100 pcf Cohesion Fn: Marsh 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.

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 1D
REMEDIATION OF CANAL WALLS AND LEVEES
PROTECTED SIDE STABILITY ANALYSIS
CASE: Global Stability (Entry/Exit) 01
STA. 11+00 TO 14+20 WEST
ORLEANS PARISH, LOUISIANA

ETL 1110-2-575 ANALYSIS

Name: Global Stability (Entry/Exit) 01
File Name: Orleans Canal Reach 1D.gsz Directory: Y:\F&MHOME\Middleton\Outfall Canals\Orleans final edits\final\Appendix A and Appendix B\
Last Edited By: Reves, Ryan D MVK

Global Stability (Entry/Exit) 01

File Information

Created By: Liljegren, James
Revision Number: 616
Last Edited By: Reves, Ryan D MVK
Date: 6/5/2013
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File Name: Orleans Canal Reach 1D.gsz
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Last Solved Date: 6/5/2013
Last Solved Time: 11:18:34 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

Global Stability (Entry/Exit) 01

Kind: SLOPE/W
Parent: Gap Analysis (seepage) 01 TWL
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: 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. +3.6 TO 0

Model: Undrained (Phi=0)
Unit Weight: 110 pcf
Cohesion: 580 psf

FILL2, EL.0 TO -2.5/-3.5

Model: Undrained (Phi=0)
Unit Weight: 94 pcf
Cohesion: 400 psf

BEACH SAND, EL. -7 TO -50

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

BAY SOUND CLAY, EL. -50 TO -70

Model: Spatial Mohr-Coulomb
Unit Weight: 102 pcf
Cohesion Spatial Fn: Bay Sound
Phi: 0 °
Phi-B: 0 °

Sheet Pile

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

MARSH, EL. -2.8/-3.5 TO -7

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

MARSH, EL. -2.8 TO -7 (Protected)

Model: Spatial Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion Fn: Marsh
Phi: 0 °
Phi-B: 0 °

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (185, -4.85869) ft
Left-Zone Right Coordinate: (200, -1.6) ft
Left-Zone Increment: 10
Right Projection: Range
Right-Zone Left Coordinate: (225, 0.86978) ft
Right-Zone Right Coordinate: (265, -3.5568) ft
Right-Zone Increment: 10
Radius Increments: 4

Slip Surface Limits

Left Coordinate: (120, -4) ft
Right Coordinate: (310, -3.8) ft

Cohesion Functions

Marsh

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

Y-Intercept: 150
Data Points: Y (ft), Cohesion (psf)
- Data Point: (-7, 180)
- Data Point: (-2.8, 150)

Shear/Normal Strength Functions

Sand

Model: Spline Data Point Function
Function: Shear Stress vs. Normal Stress
- Curve Fit to Data: 100 %
- Segment Curvature: 0 %

Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
- Data Point: (-10000, 0)
- Data Point: (0, 0)
- Data Point: (10000, 6494)

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

Unit Weight Functions

Marsh

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

Y-Intercept: 100
Data Points: X (ft), Unit Weight (pcf)
- Data Point: (192.5, 100)
- Data Point: (208.3, 94)
- Data Point: (241.1, 100)

Spatial Functions

Marsh

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
- Data Point: (192.53, -3.5, 150)
- Data Point: (192.53, -7, 180)
- Data Point: (200, -3.5, 160)
- Data Point: (200, -7, 190)
- Data Point: (241.1, -2.8, 150)
- Data Point: (241.1, -7, 180)

Bay Sound

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)

Data Point: (120, -50, 600)
Data Point: (120, -70, 770)
Data Point: (192.53, -50, 600)
Data Point: (192.53, -70, 770)
Data Point: (200, -50, 750)
Data Point: (200, -70, 925)
Data Point: (241.1, -50, 600)
Data Point: (241.1, -70, 770)
Data Point: (310, -50, 600)
Data Point: (310, -70, 770)

Regions

	Material	Points	Area (ft²)
Region 1	EMBANKMENT FILL, EL. +3.6 TO 0	20,4,5,25	71.595
Region 2	MARSH, EL. -2.8/-3.5 TO -7	6,7,28,17,26	171.31
Region 3	BEACH SAND, EL. -7 TO -50	17,22,18,19,35,32,15,30	1720
Region 4	BEACH SAND, EL. -7 TO -50	19,35,33,14,27,11,10,28,17,22,18	6450
Region 5	BAY SOUND CLAY, EL. -50 TO -70	14,33,34,13,29,12,11,27	3800
Region 6	Sheet Pile	16,21,20,25,24,3	13.075
Region 7	FILL2, EL.0 TO -2.5/-3.5	26,3,24,25,5,6	90.54
Region 8	MARSH, EL. -2.8 TO -7 (Protected)	1,38,30,15,32,31,36,37	199.2515
Region 9	MARSH, EL. -2.8 TO -7 (Protected)	28,7,8,9,10	239.59
Region 10	MARSH, EL. -2.8/-3.5 TO -7	30,38,26,17	26.145
Region 11	FILL2, EL.0 TO -2.5/-3.5	2,23,3,26,38	6.9625
Region 12		31,39,40,23,2,38,1,37,36	286.571

Points

	X (ft)	Y (ft)
Point 1	182	-5.4
Point 2	195.3	-3
Point 3	200	-1.6
Point 4	208.3	3.3
Point 5	235.1	-0.6
Point 6	235.5	-2.3
Point 7	241.1	-2.5
Point 8	270.5	-3.8
Point 9	310	-3.8
Point 10	310	-7
Point 11	310	-50
Point 12	310	-70
Point 13	182	-70
Point 14	182	-50
Point 15	182	-7
Point 16	200	14.1
Point 17	200	-7
Point 18	200	-28.5
Point 19	182	-28.5
Point 20	201	3.6
Point 21	200.5	14.1
Point 22	200	-23.5
Point 23	199.1	-1.6
Point 24	201	-1.6
Point 25	201	0
Point 26	200	-3.5
Point 27	200	-50
Point 28	241.1	-7
Point 29	200	-70
Point 30	192.53	-7
Point 31	120	-4
Point 32	120	-7
Point 33	120	-50
Point 34	120	-70
Point 35	120	-28.5
Point 36	140	-3.7
Point 37	160	-4.2
Point 38	192.53	-3.5
Point 39	120	0
Point 40	199	-1

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.82	(208.28, 219.536)	223.5774	(192.586, -3.48998)	(235.991, -2.31753)
2	291	1.82	(208.28, 219.536)	223.577	(192.586, -3.48998)	(235.991, -2.31753)

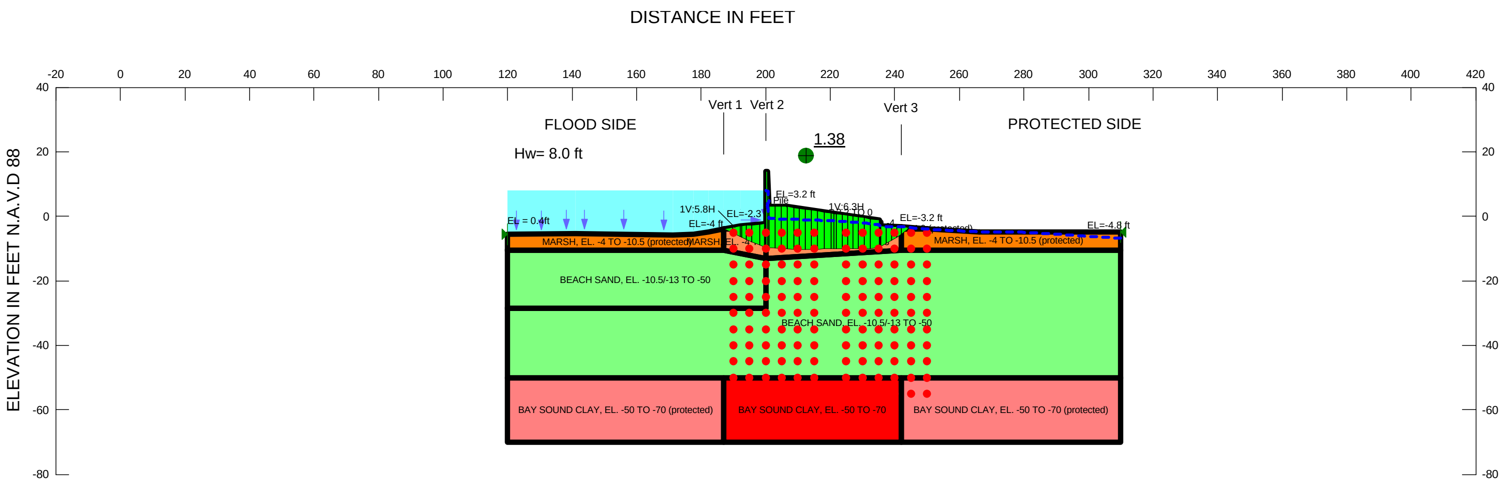
Slices of Slip Surface: Optimized

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	192.65705	-3.494988	710.82862	711.38629	0	400
2	Optimized	193.37145	-3.5429605	662.62802	700.98118	0	151.49
3	Optimized	194.65715	-3.6251625	612.20766	718.37376	0	153.92
4	Optimized	195.91665	-3.698556	603.96382	711.11856	0	156.24
5	Optimized	197.15	-3.763444	620.36791	735.34414	0	158.44
6	Optimized	198.38335	-3.821503	662.83637	758.90431	0	160.59
7	Optimized	199.05	-3.8508915	692.97889	771.46194	0	161.74
8	Optimized	199.55	-3.870541	717.92992	822.78324	0	162.57
9	Optimized	200.25	-3.8971095	275.96184	-1022.24	0	163.38
10	Optimized	200.75	-3.9145185	183.3979	234.8467	0	163.47
11	Optimized	201.73	-3.9443375	184.42765	777.06355	0	163.61
12	Optimized	203.19	-3.982355	185.56155	776.03196	0	163.75
13	Optimized	204.65	-4.0108305	186.06457	774.0078	0	163.81
14	Optimized	206.11	-4.029768	185.84738	770.99096	0	163.79
15	Optimized	207.57	-4.03917	184.77309	766.98262	0	163.68
16	Optimized	209.00525	-4.0391985	182.92363	754.32425	0	163.5
17	Optimized	210.4158	-4.0301715	180.32158	733.09698	0	163.24
18	Optimized	211.82635	-4.012244	176.94711	710.92164	0	162.91
19	Optimized	213.23685	-3.985414	172.80081	687.8578	0	162.5
20	Optimized	214.64735	-3.949678	167.91876	663.87971	0	162.03
21	Optimized	216.0579	-3.9050325	162.29494	638.96283	0	161.49
22	Optimized	217.46845	-3.851472	155.9588	613.11068	0	160.88
23	Optimized	218.87895	-3.7889895	148.91857	586.30535	0	160.2
24	Optimized	220.28945	-3.7175775	141.1757	558.52965	0	159.46
25	Optimized	221.7	-3.637228	132.74606	529.78117	0	158.65
26	Optimized	223.11055	-3.547931	123.63119	500.03537	0	157.78
27	Optimized	224.52105	-3.449676	113.83314	469.29037	0	156.85
28	Optimized	225.93155	-3.342451	103.33985	437.52292	0	155.85
29	Optimized	227.3421	-3.226243	92.125274	404.73101	0	154.8
30	Optimized	228.75265	-3.101038	80.170733	370.89201	0	153.69
31	Optimized	230.16315	-2.9668205	67.383648	335.99749	0	152.52
32	Optimized	231.57365	-2.823575	53.630367	300.03279	0	151.29
33	Optimized	232.9842	-2.6712835	38.699508	262.98304	0	150
34	Optimized	234.39475	-2.509927	21.504695	225.08041	0	150
35	Optimized	235.3	-2.402631	8.1920102	121.42341	0	150
36	Optimized	235.7454	-2.3479055	2.5945092	33.095107	0	150

Slices of Slip Surface: 291

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	291	192.65705	-3.494988	710.82862	711.38629	0	400
2	291	193.37145	-3.5429605	662.62802	700.98118	0	151.49
3	291	194.65715	-3.6251625	612.20766	718.37376	0	153.92
4	291	195.91665	-3.698556	603.96382	711.11856	0	156.24
5	291	197.15	-3.763444	620.36791	735.34414	0	158.44

6	291	198.38335	-3.821503	662.83637	758.90431	0	160.59
7	291	199.05	-3.8508915	692.97889	771.46194	0	161.74
8	291	199.55	-3.870541	717.92992	822.78324	0	162.57
9	291	200.25	-3.8971095	275.96184	-1022.24	0	163.38
10	291	200.75	-3.9145185	183.3979	234.8467	0	163.47
11	291	201.73	-3.9443375	184.42765	777.06355	0	163.61
12	291	203.19	-3.982355	185.56155	776.03196	0	163.75
13	291	204.65	-4.0108305	186.06457	774.0078	0	163.81
14	291	206.11	-4.029768	185.84738	770.99096	0	163.79
15	291	207.57	-4.03917	184.77309	766.98262	0	163.68
16	291	209.00525	-4.0391985	182.92363	754.32425	0	163.5
17	291	210.4158	-4.0301715	180.32158	733.09698	0	163.24
18	291	211.82635	-4.012244	176.94711	710.92164	0	162.91
19	291	213.23685	-3.985414	172.80081	687.8578	0	162.5
20	291	214.64735	-3.949678	167.91876	663.87971	0	162.03
21	291	216.0579	-3.9050325	162.29494	638.96283	0	161.49
22	291	217.46845	-3.851472	155.9588	613.11068	0	160.88
23	291	218.87895	-3.7889895	148.91857	586.30535	0	160.2
24	291	220.28945	-3.7175775	141.1757	558.52965	0	159.46
25	291	221.7	-3.637228	132.74606	529.78117	0	158.65
26	291	223.11055	-3.547931	123.63119	500.03537	0	157.78
27	291	224.52105	-3.449676	113.83314	469.29037	0	156.85
28	291	225.93155	-3.342451	103.33985	437.52292	0	155.85
29	291	227.3421	-3.226243	92.125274	404.73101	0	154.8
30	291	228.75265	-3.101038	80.170733	370.89201	0	153.69
31	291	230.16315	-2.9668205	67.383648	335.99749	0	152.52
32	291	231.57365	-2.823575	53.630367	300.03279	0	151.29
33	291	232.9842	-2.6712835	38.699508	262.98304	0	150
34	291	234.39475	-2.509927	21.504695	225.08041	0	150
35	291	235.3	-2.402631	8.1920102	121.42341	0	150
36	291	235.7454	-2.3479055	2.5945092	33.095107	0	150



Name: EMBANKMENT FILL, EL. +3.2 TO 0 Model: Undrained (Phi=0) Unit Weight: 114 pcf Cohesion: 700 psf
Name: Fill, EL. -3.2 to -4.0 (protected) Model: Spatial Mohr-Coulomb Unit Weight: 104 pcf Cohesion Fn: Fill Phi: 0 °
Name: BEACH SAND, EL. -10.5/-13 TO -50 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand
Name: BAY SOUND CLAY, EL. -50 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 102 pcf Cohesion Spatial Fn: Bay Sound Phi: 0 °
Name: Sheet Pile Model: Undrained (Phi=0) Unit Weight: 0.1 pcf Cohesion: 0.01 psf
Name: MARSH, EL. -4 TO -10.5/-13 Model: Spatial Mohr-Coulomb Weight Fn: Marsh Cohesion Fn: Marsh Phi: 0 °
Name: EMBANKMENT FILL, EL. 0 TO -4 Model: Spatial Mohr-Coulomb Unit Weight: 104 pcf Cohesion: 400 psf Phi: 0 °
Name: MARSH, EL. -4 TO -10.5 (protected) Model: Undrained (Phi=0) Unit Weight: 83 pcf Cohesion: 150 psf
Name: BAY SOUND CLAY, EL. -50 TO -70 (protected) Model: Spatial Mohr-Coulomb Unit Weight: 102 pcf Cohesion Fn: Clay 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 VERTICALSWERE ASSUMED TO VARY LINEARLY BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

Hw IS CANAL WATER LEVEL

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 2,
PROTECTED SIDE STABILITY ANALYSIS,
CASE: Global P/S Stability Analysis Block Analysis
STA. 14+20 TO 21+75 WEST
ORLEANS PARISH, LOUISIANA

Name: Global P/S Stability Analysis Block Analysis
File Name: Orleans Canal Reach 2.gsz Directory: Y:\F&MHOME\Middleton\Outfall Canals\Orleans final edits\final\Appendix A and Appendix B\
Last Edited By: Castro, Felix R MVR

Global P/S Stability Analysis Block Analysis

File Information

- Created By: Moraille, Jacques
- Revision Number: 475
- Last Edited By: Castro, Felix R MVR
- Date: 6/4/2013
- Time: 4:25:51 PM
- File Name: Orleans Canal Reach 2.gsz
- Directory: Y:\F&MHOME\Middleton\Outfall Canals\Orleans final edits\final\Appendix A and Appendix B\
- Last Solved Date: 6/4/2013
- Last Solved Time: 4:31:34 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

Global P/S Stability Analysis Block Analysis

- Description: Block Analysis
- Kind: SLOPE/W
- Parent: 1 - Global Stability Analysis 8ft
- 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: 16
  - Complete Passes per Insertion: 1
  - Driving Side Maximum Convex Angle: 5 °
  - Resisting Side Maximum Convex Angle: 1 °

Materials

EMBANKMENT FILL, EL. +3.2 TO 0

- Model: Undrained (Phi=0)
- Unit Weight: 114 pcf
- Cohesion: 700 psf

Fill, EL. -3.2 to -4.0 (protected)

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

BEACH SAND, EL. -10.5/-13 TO -50

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

BAY SOUND CLAY, EL. -50 TO -70

- Model: Spatial Mohr-Coulomb
- Unit Weight: 102 pcf
- Cohesion Spatial Fn: Bay Sound
- Phi: 0 °
- Phi-B: 0 °

Sheet Pile

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

MARSH, EL. -4 TO -10.5/-13

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

EMBANKMENT FILL, EL. 0 TO -4

- Model: Spatial Mohr-Coulomb
- Unit Weight: 104 pcf
- Cohesion: 400 psf
- Phi: 0 °
- Phi-B: 0 °

MARSH, EL. -4 TO -10.5 (protected)

- Model: Undrained (Phi=0)
- Unit Weight: 83 pcf
- Cohesion: 150 psf

BAY SOUND CLAY, EL. -50 TO -70 (protected)

- Model: Spatial Mohr-Coulomb
- Unit Weight: 102 pcf
- Cohesion Fn: Clay
- Phi: 0 °
- Phi-B: 0 °

Slip Surface Limits

- Left Coordinate: (120, -5.5) ft
- Right Coordinate: (310, -4.8) ft

Slip Surface Block

- Left Grid
  - Upper Left: (190, -5) ft
  - Lower Left: (190, -55) ft
  - Lower Right: (215, -55) ft
  - X Increments: 5
  - Y Increments: 10
  - Starting Angle: 115 °
  - Ending Angle: 135 °
  - Angle Increments: 4
- Right Grid
  - Upper Left: (225, -5) ft
  - Lower Left: (225, -55) ft
  - Lower Right: (250, -55) ft
  - X Increments: 5
  - Y Increments: 10
  - Starting Angle: 25 °
  - Ending Angle: 45 °
  - Angle Increments: 4

Cohesion Functions

Clay

- Model: Spline Data Point Function
- Function: Cohesion vs. X
  - Curve Fit to Data: 100 %
  - Segment Curvature: 0 %
- Y-Intercept: 555
- Data Points: X (ft), Cohesion (psf)
  - Data Point: (186.9, 555)
  - Data Point: (200, 725)
  - Data Point: (242, 555)

Marsh

- Model: Spline Data Point Function
- Function: Cohesion vs. X
  - Curve Fit to Data: 100 %
  - Segment Curvature: 0 %
- Y-Intercept: 150
- Data Points: X (ft), Cohesion (psf)
  - Data Point: (186.9, 150)
  - Data Point: (200, 200)
  - Data Point: (242, 150)

Fill

- Model: Spline Data Point Function
- Function: Cohesion vs. X
  - Curve Fit to Data: 100 %
  - Segment Curvature: 0 %
- Y-Intercept: 150
- Data Points: X (ft), Cohesion (psf)
  - Data Point: (186.9, 150)
  - Data Point: (200, 400)
  - Data Point: (242, 150)

Shear/Normal Strength Functions

Sand

Model: Spline Data Point Function
Function: Shear Stress vs. Normal Stress
- Curve Fit to Data: 100 %
- Segment Curvature: 0 %

Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
- Data Point: (-10000, 0)
- Data Point: (0, 0)
- Data Point: (10000, 6494)

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

Unit Weight Functions

Marsh

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

Y-Intercept: 83
Data Points: X (ft), Unit Weight (pcf)
- Data Point: (186.9, 83)
- Data Point: (200, 93)
- Data Point: (242, 83)

Spatial Functions

Bay Sound

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
- Data Point: (186.9, -50, 555)
- Data Point: (186.9, -70, 725)
- Data Point: (200, -50, 700)
- Data Point: (200, -70, 865)
- Data Point: (242, -50, 555)
- Data Point: (242, -70, 725)

Regions

	Material	Points	Area (ft^2)
Region 1	BEACH SAND, EL. -10.5/-13 TO -50	18,14,35,43,33,11,10,32,22,21,17	6012.5
Region 2	Sheet Pile	16,20,19,29,28,3,45,4	13.525
Region 3	MARSH, EL. -4 TO -10.5/-13	22,30,40,32	325.5
Region 4	EMBANKMENT FILL, EL. 0 TO -4	29,28,3,30,40,7,6,5,39	139.76
Region 5	BAY SOUND CLAY, EL. -50 TO -70 (protected)	13,14,35,36	1338
Region 6	BAY SOUND CLAY, EL. -50 TO -70 (protected)	33,11,12,37	1360
Region 7	MARSH, EL. -4 TO -10.5 (protected)	8,9,10,32,40,41	400.61714
Region 8	EMBANKMENT FILL, EL. +3.2 TO 0	29,19,38,39	47.8
Region 9	MARSH, EL. -4 TO -10.5 (protected)	15,1,23,24,25,2,31,34	339.72
Region 10	EMBANKMENT FILL, EL. 0 TO -4	31,26,47,3,30	13.265015
Region 11	BEACH SAND, EL. -10.5/-13 TO -50	18,17,21,22,34,15	1423.625
Region 12	MARSH, EL. -4 TO -10.5/-13	31,30,22,34	101.525
Region 13	BAY SOUND CLAY, EL. -50 TO -70	36,35,43,33,37,42	1102
Region 14	Fill, EL. -3.2 to -4.0 (protected)	40,7,41	3.337144

Points

	X (ft)	Y (ft)
Point 1	120	-5.5
Point 2	182.2	-4.9
Point 3	200	-2.3
Point 4	200	3.5
Point 5	235.2	-1.2
Point 6	235.6	-3.1
Point 7	242	-3.2
Point 8	266.2	-4.8
Point 9	310	-4.8
Point 10	310	-10.5
Point 11	310	-50
Point 12	310	-70
Point 13	120	-70
Point 14	120	-50
Point 15	120	-10.5
Point 16	200	13.9
Point 17	200	-28.5
Point 18	120	-28.5
Point 19	201	3.2
Point 20	200.5	13.9
Point 21	200	-23.5
Point 22	200	-13
Point 23	141	-5.4
Point 24	171.3	-5.7
Point 25	177.6	-5.5
Point 26	192.1	-3
Point 27	198.9	-2.3
Point 28	201	-2.3
Point 29	201	0
Point 30	200	-4
Point 31	186.9	-4
Point 32	242	-10.5
Point 33	242	-50
Point 34	186.9	-10.5
Point 35	186.9	-50
Point 36	186.9	-70
Point 37	242	-70
Point 38	206.5	3
Point 39	227	0
Point 40	242	-4
Point 41	250.34286	-4
Point 42	200	-70
Point 43	200	-50
Point 44	120	0
Point 45	200	0
Point 46	199	0
Point 47	199.5	-2.3443

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.38	(216.522, -3.371)	21.52812	(187.199, -3.94246)	(244.938, -3.48176)
2	1183	1.60	(216.522, -3.371)	20.797	(188.661, -3.66129)	(244.385, -3.42868)

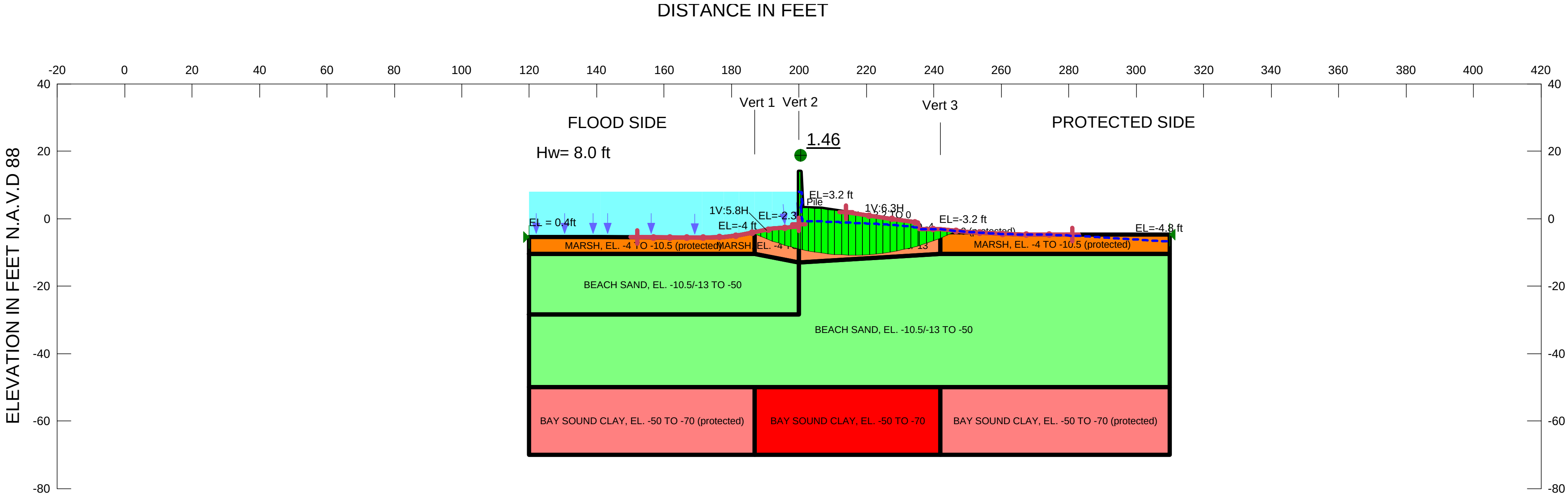
Slices of Slip Surface: Optimized

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	188.45425	-4.547328	694.58825	691.71716	0	155.93
2	Optimized	190.90465	-5.728294	711.07584	804.26065	0	165.28
3	Optimized	192.27125	-6.386916	739.66692	878.84604	0	170.5
4	Optimized	193.23795	-6.81434	766.35799	930.42514	0	174.19
5	Optimized	194.82885	-7.50414	818.89408	995.35998	0	180.26
6	Optimized	196.8719	-8.38857	907.55631	1081.2913	0	188.06
7	Optimized	198.80975	-9.221293	1020.2299	1166.7104	0	195.46
8	Optimized	199.7119	-9.604488	1083.586	1205.8451	0	198.9
9	Optimized	199.9619	-9.6944995	1102.1383	1363.374	0	199.85
10	Optimized	200.25	-9.6945705	651.16	-381.14	0	199.7
11	Optimized	200.73895	-9.694691	560.28458	730.57125	0	199.12

12	Optimized	200.98895	-9.6955705	560.17732	710.30701	0	198.82
13	Optimized	201.91665	-9.764456	563.86601	1307.5099	0	197.72
14	Optimized	203.75	-9.900586	570.66548	1309.7401	0	195.54
15	Optimized	205.58335	-10.036716	576.92098	1311.8615	0	193.35
16	Optimized	207.5662	-10.18395	582.89568	1300.8526	0	190.99
17	Optimized	209.5291	-10.264935	583.93281	1298.0126	0	188.66
18	Optimized	211.32245	-10.26856	579.918	1265.5037	0	186.52
19	Optimized	213.1158	-10.272185	575.45709	1232.9949	0	184.39
20	Optimized	215.02525	-10.23987	567.96875	1207.0878	0	182.11
21	Optimized	217.0508	-10.171615	557.45904	1163.618	0	179.7
22	Optimized	219.07635	-10.10336	546.65327	1120.1976	0	177.29
23	Optimized	220.64325	-10.059945	538.6696	1082.2651	0	175.42
24	Optimized	221.5684	-10.04949	534.84908	1060.2373	0	174.32
25	Optimized	222.78285	-10.060375	531.30739	1033.7596	0	172.88
26	Optimized	224.4697	-10.084485	526.83804	1005.1297	0	170.87
27	Optimized	226.15655	-10.108595	522.25013	976.49975	0	168.86
28	Optimized	227.84795	-10.13277	517.55132	949.01016	0	166.85
29	Optimized	229.6313	-10.090305	508.21047	935.45819	0	164.72
30	Optimized	231.50205	-9.98113	494.20795	894.15501	0	162.5
31	Optimized	233.8187	-9.6937155	466.99499	859.03091	0	159.74
32	Optimized	235.3431	-9.4367705	444.56741	739.70532	0	157.92
33	Optimized	235.5431	-9.380927	440.21325	727.3312	0	157.69
34	Optimized	236.41255	-8.896195	405.5572	647.91763	0	156.65
35	Optimized	238.03765	-7.990177	340.34084	557.89175	0	154.72
36	Optimized	239.6627	-7.084159	274.7375	468.61295	0	152.78
37	Optimized	241.2376	-6.093178	203.3205	401.29313	0	150.91
38	Optimized	243.102	-4.777603	108.81884	262.44718	0	150
39	Optimized	244.5712	-3.740881	26.412453	142.0138	0	150

Slices of Slip Surface: 1183

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	1183	188.83065	-3.830645	696.02207	440.38949	0	400
2	1183	189.775	-4.775	679.87177	622.93827	0	160.97
3	1183	191.325	-6.325	733.42941	746.29419	0	166.89
4	1183	192.825	-7.825	798.83547	876.32461	0	172.61
5	1183	194.275	-9.275	871.7406	991.60738	0	178.15
6	1183	196.125	-10	941.95556	1355.5556	0	185.21
7	1183	198.375	-10	1035.7778	1375.2889	0	193.8
8	1183	199.75	-10	1109.54	1387.36	0	199.05
9	1183	200.25	-10	670.46	-393.02	0	199.7
10	1183	200.75	-10	579.62	756.66	0	199.11
11	1183	201.91665	-10	578.78192	1353.9275	0	197.72
12	1183	203.75	-10	576.98192	1343.5093	0	195.54
13	1183	205.58335	-10	574.58192	1333.0366	0	193.35
14	1183	207.4318	-10	571.51718	1310.8246	0	191.15
15	1183	209.29545	-10	567.70743	1276.8051	0	188.93
16	1183	211.1591	-10	563.36109	1242.8393	0	186.72
17	1183	213.0227	-10	558.53182	1208.8197	0	184.5
18	1183	214.88635	-10	553.27328	1174.8002	0	182.28
19	1183	216.75	-10	547.58547	1140.8344	0	180.06
20	1183	218.61365	-10	541.62937	1106.8149	0	177.84
21	1183	220.4773	-10	535.46401	1072.849	0	175.62
22	1183	222.3409	-10	529.06791	1038.8295	0	173.4
23	1183	224.20455	-10	522.47864	1004.8636	0	171.19
24	1183	226.0682	-10	515.73913	970.84409	0	168.97
25	1183	228	-10	508.6	937.05	0	166.67
26	1183	230	-10	501.1	903.5	0	164.29
27	1183	232	-10	493.5	869.95	0	161.9
28	1183	234	-10	485.865	836.4	0	159.52
29	1183	235.1	-9.929979	477.19706	1003.3794	0	158.21
30	1183	235.4	-9.7199165	462.55471	868.21931	0	157.86
31	1183	236.66665	-8.832987	400.45018	665.74026	0	156.35
32	1183	238.8	-7.339211	294.92163	514.95228	0	153.81
33	1183	240.93335	-5.845435	188.51377	365.88452	0	151.27
34	1183	242.78445	-4.5492735	95.637196	231.18544	0	150
35	1183	243.97685	-3.7143405	28.230102	131.90914	0	150



Name: EMBANKMENT FILL, EL. +3.2 TO 0 Model: Undrained (Phi=0) Unit Weight: 114 pcf Cohesion: 700 psf
Name: Fill, EL. -3.2 to -4.0 (protected) Model: Spatial Mohr-Coulomb Unit Weight: 104 pcf Cohesion Fn: Fill Phi: 0 °
Name: BEACH SAND, EL. -10.5/-13 TO -50 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand
Name: BAY SOUND CLAY, EL. -50 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 102 pcf Cohesion Spatial Fn: Bay Sound Phi: 0 °
Name: Sheet Pile Model: Undrained (Phi=0) Unit Weight: 0.1 pcf Cohesion: 0.01 psf
Name: MARSH, EL. -4 TO -10.5/-13 Model: Spatial Mohr-Coulomb Weight Fn: Marsh Cohesion Fn: Marsh Phi: 0 °
Name: EMBANKMENT FILL, EL. 0 TO -4 Model: Spatial Mohr-Coulomb Unit Weight: 104 pcf Cohesion: 400 psf Phi: 0 °
Name: MARSH, EL. -4 TO -10.5 (protected) Model: Undrained (Phi=0) Unit Weight: 83 pcf Cohesion: 150 psf
Name: BAY SOUND CLAY, EL. -50 TO -70 (protected) Model: Spatial Mohr-Coulomb Unit Weight: 102 pcf Cohesion Fn: Clay 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 VERTICALSWERE ASSUMED TO VARY LINEARLY BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

Hw IS CANAL WATER LEVEL

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 2,
PROTECTED SIDE STABILITY ANALYSIS,
CASE: Global P/S Stability Analysis Entry Exit
STA. 14+20 TO 21+75 WEST
ORLEANS PARISH, LOUISIANA

Name: Global P/S Stability Analysis Entry Exit
File Name: Orleans Canal Reach 2.gsz Directory: Y:\F&MHOME\Middleton\Outfall Canals\Orleans final edits\final\Appendix A and Appendix B\
Last Edited By: Castro, Felix R MVR

Global P/S Stability Analysis Entry Exit

File Information

- Created By: Moraille, Jacques
- Revision Number: 475
- Last Edited By: Castro, Felix R MVR
- Date: 6/4/2013
- Time: 4:25:51 PM
- File Name: Orleans Canal Reach 2.gsz
- Directory: Y:\F&MHOME\Middleton\Outfall Canals\Orleans final edits\final\Appendix A and Appendix B\
- Last Solved Date: 6/4/2013
- Last Solved Time: 4:33:18 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

Global P/S Stability Analysis Entry Exit

- Kind: SLOPE/W
- Parent: 1 - Global Stability Analysis 8ft
- 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: 4000
  - Optimization Convergence Tolerance: 1e-007
  - Starting Optimization Points: 8
  - Ending Optimization Points: 16
  - Complete Passes per Insertion: 1
  - Driving Side Maximum Convex Angle: 5 °
  - Resisting Side Maximum Convex Angle: 1 °

Materials

EMBANKMENT FILL, EL. +3.2 TO 0

- Model: Undrained (Phi=0)
- Unit Weight: 114 pcf
- Cohesion: 700 psf

Fill, EL. -3.2 to -4.0 (protected)

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

BEACH SAND, EL. -10.5/-13 TO -50

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

BAY SOUND CLAY, EL. -50 TO -70

- Model: Spatial Mohr-Coulomb
- Unit Weight: 102 pcf
- Cohesion Spatial Fn: Bay Sound
- Phi: 0 °
- Phi-B: 0 °

Sheet Pile

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

MARSH, EL. -4 TO -10.5/-13

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

EMBANKMENT FILL, EL. 0 TO -4

- Model: Spatial Mohr-Coulomb
- Unit Weight: 104 pcf
- Cohesion: 400 psf
- Phi: 0 °
- Phi-B: 0 °

MARSH, EL. -4 TO -10.5 (protected)

- Model: Undrained (Phi=0)
- Unit Weight: 83 pcf
- Cohesion: 150 psf

BAY SOUND CLAY, EL. -50 TO -70 (protected)

- Model: Spatial Mohr-Coulomb
- Unit Weight: 102 pcf
- Cohesion Fn: Clay
- Phi: 0 °
- Phi-B: 0 °

Slip Surface Entry and Exit

- Left Projection: Range
- Left-Zone Left Coordinate: (151.99392, -5.50885) ft
- Left-Zone Right Coordinate: (200, -1.7) ft
- Left-Zone Increment: 10
- Right Projection: Range
- Right-Zone Left Coordinate: (213.97165, 1.90659) ft
- Right-Zone Right Coordinate: (281.1, -4.8) ft
- Right-Zone Increment: 10
- Radius Increments: 10

Slip Surface Limits

- Left Coordinate: (120, -5.5) ft
- Right Coordinate: (310, -4.8) ft

Cohesion Functions

Clay

- Model: Spline Data Point Function
- Function: Cohesion vs. X
  - Curve Fit to Data: 100 %
  - Segment Curvature: 0 %
- Y-Intercept: 555
- Data Points: X (ft), Cohesion (psf)
  - Data Point: (186.9, 555)
  - Data Point: (200, 725)
  - Data Point: (242, 555)

Marsh

- Model: Spline Data Point Function
- Function: Cohesion vs. X
  - Curve Fit to Data: 100 %
  - Segment Curvature: 0 %
- Y-Intercept: 150
- Data Points: X (ft), Cohesion (psf)
  - Data Point: (186.9, 150)
  - Data Point: (200, 200)
  - Data Point: (242, 150)

Fill

- Model: Spline Data Point Function
- Function: Cohesion vs. X
  - Curve Fit to Data: 100 %
  - Segment Curvature: 0 %
- Y-Intercept: 150
- Data Points: X (ft), Cohesion (psf)
  - Data Point: (186.9, 150)
  - Data Point: (200, 400)
  - Data Point: (242, 150)

Shear/Normal Strength Functions

Sand

- Model: Spline Data Point Function
- Function: Shear Stress vs. Normal Stress
  - Curve Fit to Data: 100 %
  - Segment Curvature: 0 %
- Y-Intercept: 0
- Data Points: Normal Stress (psf), Shear Stress (psf)
  - Data Point: (-10000, 0)
  - Data Point: (0, 0)
  - Data Point: (10000, 6494)
- Estimation Properties
  - Intact Rock Param.: 10
  - Geological Strength: 100

Disturbance Factor: 0
SigmaC: 600000 psf
Sigma3: 300000 psf
Num. Points: 20

Unit Weight Functions

Marsh

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 83
Data Points: X (ft), Unit Weight (pcf)
Data Point: (186.9, 83)
Data Point: (200, 93)
Data Point: (242, 83)

Spatial Functions

Bay Sound

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (186.9, -50, 555)
Data Point: (186.9, -70, 725)
Data Point: (200, -50, 700)
Data Point: (200, -70, 865)
Data Point: (242, -50, 555)
Data Point: (242, -70, 725)

Regions

	Material	Points	Area (ft²)
Region 1	BEACH SAND, EL. -10.5/-13 TO -50	18,14,35,43,33,11,10,32,22,21,17	6012.5
Region 2	Sheet Pile	16,20,19,29,28,3,45,4	13.525
Region 3	MARSH, EL. -4 TO -10.5/-13	22,30,40,32	325.5
Region 4	EMBANKMENT FILL, EL. 0 TO -4	29,28,3,30,40,7,6,5,39	139.76
Region 5	BAY SOUND CLAY, EL. -50 TO -70 (protected)	13,14,35,36	1338
Region 6	BAY SOUND CLAY, EL. -50 TO -70 (protected)	33,11,12,37	1360
Region 7	MARSH, EL. -4 TO -10.5 (protected)	8,9,10,32,40,41	400.61714
Region 8	EMBANKMENT FILL, EL. +3.2 TO 0	29,19,38,39	47.8
Region 9	MARSH, EL. -4 TO -10.5 (protected)	15,1,23,24,25,2,31,34	339.72
Region 10	EMBANKMENT FILL, EL. 0 TO -4	31,26,47,3,30	13.265015
Region 11	BEACH SAND, EL. -10.5/-13 TO -50	18,17,21,22,34,15	1423.625
Region 12	MARSH, EL. -4 TO -10.5/-13	31,30,22,34	101.525
Region 13	BAY SOUND CLAY, EL. -50 TO -70	36,35,43,33,37,42	1102
Region 14	Fill, EL. -3.2 to -4.0 (protected)	40,7,41	3.337144

Points

	X (ft)	Y (ft)
Point 1	120	-5.5
Point 2	182.2	-4.9
Point 3	200	-2.3
Point 4	200	3.5
Point 5	235.2	-1.2
Point 6	235.6	-3.1
Point 7	242	-3.2
Point 8	266.2	-4.8
Point 9	310	-4.8
Point 10	310	-10.5
Point 11	310	-50
Point 12	310	-70
Point 13	120	-70
Point 14	120	-50
Point 15	120	-10.5
Point 16	200	13.9
Point 17	200	-28.5
Point 18	120	-28.5
Point 19	201	3.2
Point 20	200.5	13.9
Point 21	200	-23.5
Point 22	200	-13
Point 23	141	-5.4
Point 24	171.3	-5.7
Point 25	177.6	-5.5
Point 26	192.1	-3
Point 27	198.9	-2.3
Point 28	201	-2.3
Point 29	201	0
Point 30	200	-4
Point 31	186.9	-4
Point 32	242	-10.5
Point 33	242	-50
Point 34	186.9	-10.5
Point 35	186.9	-50
Point 36	186.9	-70
Point 37	242	-70
Point 38	206.5	3
Point 39	227	0
Point 40	242	-4
Point 41	250.34286	-4
Point 42	200	-70
Point 43	200	-50
Point 44	120	0
Point 45	200	0
Point 46	199	0
Point 47	199.5	-2.3443

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.46	(215.841, 59.045)	69.85686	(186.083, -4.15648)	(246.659, -3.64679)
2	905	1.46	(215.841, 59.045)	69.857	(186.083, -4.15648)	(246.659, -3.64679)

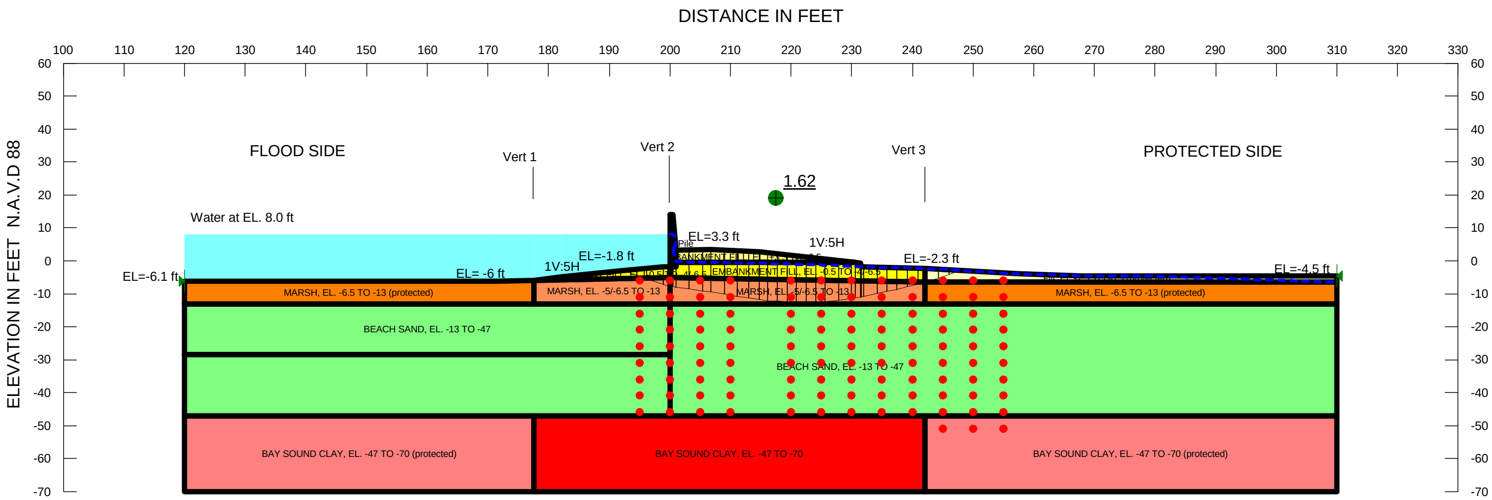
Slices of Slip Surface: Optimized

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	186.4914	-4.345651	754.31712	666.80985	0	150
2	Optimized	187.76665	-4.9152425	724.94775	723.94404	0	153.31
3	Optimized	189.5	-5.6485445	716.31959	802.7738	0	159.92
4	Optimized	191.23335	-6.3276685	733.12445	879.82493	0	166.54
5	Optimized	193.025	-6.9735955	770.57441	965.17216	0	173.38
6	Optimized	194.875	-7.5843565	823.07603	1035.1484	0	180.44
7	Optimized	196.725	-8.138631	891.06255	1102.6633	0	187.5
8	Optimized	198.575	-8.6378085	978.97029	1167.5259	0	194.56
9	Optimized	199.75	-8.9329645	1045.0592	1207.8795	0	199.05
10	Optimized	200.25	-9.0493865	610.48159	-497.27131	0	199.7
11	Optimized	200.75	-9.161944	526.60367	626.33167	0	199.11
12	Optimized	201.91665	-9.403741	541.02709	1229.3641	0	197.72
13	Optimized	203.75	-9.751335	561.23367	1260.1568	0	195.54
14	Optimized	205.58335	-10.048544	577.68601	1286.2645	0	193.35
15	Optimized	207.525	-10.307555	590.84016	1296.1287	0	191.04
16	Optimized	209.575	-10.5228	600.20405	1289.0249	0	188.6

17	Optimized	211.625	-10.677115	604.99234	1276.0104	0	186.16
18	Optimized	213.675	-10.77091	605.41583	1257.1996	0	183.72
19	Optimized	215.725	-10.80443	601.46253	1232.5348	0	181.28
20	Optimized	217.775	-10.777755	593.33348	1202.1732	0	178.84
21	Optimized	219.825	-10.69082	581.10144	1166.0016	0	176.4
22	Optimized	221.875	-10.5434	564.85643	1124.1727	0	173.96
23	Optimized	223.925	-10.335105	544.56028	1076.5229	0	171.52
24	Optimized	225.975	-10.065386	520.19383	1023.1573	0	169.08
25	Optimized	228.025	-9.7335205	491.71076	965.45728	0	166.64
26	Optimized	230.075	-9.338604	459.01594	903.41825	0	164.2
27	Optimized	232.125	-8.879535	421.80957	835.45058	0	161.76
28	Optimized	234.175	-8.3550005	379.92231	761.40734	0	159.32
29	Optimized	235.4	-8.01786	353.11401	613.97149	0	157.86
30	Optimized	236.66665	-7.6263505	322.4812	475.66357	0	156.35
31	Optimized	238.8	-6.9219365	267.75666	413.44193	0	153.81
32	Optimized	240.93335	-6.140108	207.74933	344.33718	0	151.27
33	Optimized	242.98255	-5.315161	144.52531	263.33212	0	150
34	Optimized	244.94765	-4.4504045	76.94247	169.94604	0	150
35	Optimized	246.2948	-3.823396	20.56996	98.13251	0	150

Slices of Slip Surface: 905

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	905	186.4914	-4.345651	754.31712	666.80985	0	150
2	905	187.76665	-4.9152425	724.94775	723.94404	0	153.31
3	905	189.5	-5.6485445	716.31959	802.7738	0	159.92
4	905	191.23335	-6.3276685	733.12445	879.82493	0	166.54
5	905	193.025	-6.9735955	770.57441	965.17216	0	173.38
6	905	194.875	-7.5843565	823.07603	1035.1484	0	180.44
7	905	196.725	-8.138631	891.06255	1102.6633	0	187.5
8	905	198.575	-8.6378085	978.97029	1167.5259	0	194.56
9	905	199.75	-8.9329645	1045.0592	1207.8795	0	199.05
10	905	200.25	-9.0493865	610.48159	-497.27131	0	199.7
11	905	200.75	-9.161944	526.60367	626.33167	0	199.11
12	905	201.91665	-9.403741	541.02709	1229.3641	0	197.72
13	905	203.75	-9.751335	561.23367	1260.1568	0	195.54
14	905	205.58335	-10.048544	577.68601	1286.2645	0	193.35
15	905	207.525	-10.307555	590.84016	1296.1287	0	191.04
16	905	209.575	-10.5228	600.20405	1289.0249	0	188.6
17	905	211.625	-10.677115	604.99234	1276.0104	0	186.16
18	905	213.675	-10.77091	605.41583	1257.1996	0	183.72
19	905	215.725	-10.80443	601.46253	1232.5348	0	181.28
20	905	217.775	-10.777755	593.33348	1202.1732	0	178.84
21	905	219.825	-10.69082	581.10144	1166.0016	0	176.4
22	905	221.875	-10.5434	564.85643	1124.1727	0	173.96
23	905	223.925	-10.335105	544.56028	1076.5229	0	171.52
24	905	225.975	-10.065386	520.19383	1023.1573	0	169.08
25	905	228.025	-9.7335205	491.71076	965.45728	0	166.64
26	905	230.075	-9.338604	459.01594	903.41825	0	164.2
27	905	232.125	-8.879535	421.80957	835.45058	0	161.76
28	905	234.175	-8.3550005	379.92231	761.40734	0	159.32
29	905	235.4	-8.01786	353.11401	613.97149	0	157.86
30	905	236.66665	-7.6263505	322.4812	475.66357	0	156.35
31	905	238.8	-6.9219365	267.75666	413.44193	0	153.81
32	905	240.93335	-6.140108	207.74933	344.33718	0	151.27
33	905	242.98255	-5.315161	144.52531	263.33212	0	150
34	905	244.94765	-4.4504045	76.94247	169.94604	0	150
35	905	246.2948	-3.823396	20.56996	98.13251	0	150



Name: EMBANKMENT FILL, EL. +3.3 TO -0.5 Model: Undrained (Phi=0) Unit Weight: 115 pcf Cohesion: 700 psf
Name: Fill, EL -2.3 TO -6.5 (protected) Model: Undrained (Phi=0) Unit Weight: 106 pcf Cohesion: 200 psf
Name: BEACH SAND, EL. -13 TO -47 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand
Name: BAY SOUND CLAY, EL. -47 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 110 pcf Cohesion Spatial Fn: CLAY Phi: 0 °
Name: Sheet Pile Model: Undrained (Phi=0) Unit Weight: 0.1 pcf Cohesion: 0.01 psf
Name: MARSH, EL. -5/-6.5 TO -13 Model: Spatial Mohr-Coulomb Unit Weight: 88 pcf Cohesion Fn: Marsh Phi: 0 °
Name: EMBANKMENT FILL, EL. -0.5 TO -4/-6.5 Model: Spatial Mohr-Coulomb Unit Weight: 106 pcf Cohesion Fn: Fill Phi: 0 °
Name: MARSH, EL. -6.5 TO -13 (protected) Model: Undrained (Phi=0) Unit Weight: 88 pcf Cohesion: 190 psf
Name: BAY SOUND CLAY, EL. -47 TO -70 (protected) Model: Spatial Mohr-Coulomb Unit Weight: 110 pcf Cohesion 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.

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 4
REMEDIATION OF CANAL WALLS AND LEVEES
PROTECTED SIDE STABILITY ANALYSIS
CASE: Global Stability (Block)
STA. 24+87 TO 29+16 WEST
ORLEANS PARISH, LOUISIANA

ETL 1110-2-575 ANALYSIS

Name: Global Stability (Block)
File Name: Orleans Canal Reach 4.gsz Directory: Y:\F&MHOME\Middleton\Outfall Canals\Orleans final edits\final\Appendix A and Appendix B\
Last Edited By: Jamerson, James MVK

Global Stability (Block)

File Information

Created By: Moraille, Jacques
Revision Number: 529
Last Edited By: Jamerson, James MVK
Date: 6/17/2013
Time: 11:04:02 AM
File Name: Orleans Canal Reach 4.gsz
Directory: Y:\F&MHOME\Middleton\Outfall Canals\Orleans final edits\final\Appendix A and Appendix B\
Last Solved Date: 6/17/2013
Last Solved Time: 11:09:26 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

Global Stability (Block)

Kind: SLOPE/W
Parent: Gap Analysis (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
Advanced
    Number of Slices: 30
    Optimization Tolerance: 0.01
    Minimum Slip Surface Depth: 0.1 ft
    Optimization Maximum Iterations: 3000
    Optimization Convergence Tolerance: 1e-007
    Starting Optimization Points: 8
    Ending Optimization Points: 16
    Complete Passes per Insertion: 1
    Driving Side Maximum Convex Angle: 5 °
    Resisting Side Maximum Convex Angle: 1 °

Materials

EMBANKMENT FILL, EL. +3.3 TO -0.5

Model: Undrained (Phi=0)
Unit Weight: 115 pcf
Cohesion: 700 psf

Fill, EL -2.3 TO -6.5 (protected)

Model: Undrained (Phi=0)
Unit Weight: 106 pcf
Cohesion: 200 psf

BEACH SAND, EL. -13 TO -47

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

BAY SOUND CLAY, EL. -47 TO -70

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

Sheet Pile

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

MARSH, EL. -5/-6.5 TO -13

Model: Spatial Mohr-Coulomb
Unit Weight: 88 pcf
Cohesion Fn: Marsh
Phi: 0 °
Phi-B: 0 °

EMBANKMENT FILL, EL. -0.5 TO -4/-6.5

Model: Spatial Mohr-Coulomb
Unit Weight: 106 pcf
Cohesion Fn: Fill
Phi: 0 °
Phi-B: 0 °

MARSH, EL. -6.5 TO -13 (protected)

Model: Undrained (Phi=0)
Unit Weight: 88 pcf
Cohesion: 190 psf

BAY SOUND CLAY, EL. -47 TO -70 (protected)

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

Slip Surface Limits

Left Coordinate: (120, -6.1) ft
Right Coordinate: (310, -4.5) ft

Slip Surface Block

Left Grid
    Upper Left: (195, -6) ft
    Lower Left: (195, -51) ft
    Lower Right: (210, -51) ft
    X Increments: 3
    Y Increments: 9
    Starting Angle: 115 °
    Ending Angle: 135 °
    Angle Increments: 4
Right Grid
    Upper Left: (220, -6) ft
    Lower Left: (220, -51) ft
    Lower Right: (255, -51) ft
    X Increments: 7
    Y Increments: 9
    Starting Angle: 25 °
    Ending Angle: 45 °
    Angle Increments: 4

Cohesion Functions

Marsh

Model: Spline Data Point Function
Function: Cohesion vs. X
    Curve Fit to Data: 100 %
    Segment Curvature: 0 %
Y-Intercept: 190
Data Points: X (ft), Cohesion (psf)
    Data Point: (177.6, 190)
    Data Point: (200, 215)
    Data Point: (242, 190)

Fill

Model: Spline Data Point Function
Function: Cohesion vs. X
    Curve Fit to Data: 100 %
    Segment Curvature: 0 %
Y-Intercept: 200
Data Points: X (ft), Cohesion (psf)
    Data Point: (177.6, 200)
    Data Point: (200, 230)
    Data Point: (242, 200)

Bay Sound

Model: Spline Data Point Function
Function: Cohesion vs. Y
    Curve Fit to Data: 100 %
    Segment Curvature: 0 %
Y-Intercept: 500
Data Points: Y (ft), Cohesion (psf)
    Data Point: (-70, 735)
    Data Point: (-47, 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: (-10000, 0)
Data Point: (0, 0)
Data Point: (10000, 6494)

Estimation Properties

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

Spatial Functions

CLAY

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)

Data Point: (177.7, -47, 500)
Data Point: (177.7, -70, 735)
Data Point: (200, -47, 530)
Data Point: (200, -70, 775)
Data Point: (242, -47, 500)
Data Point: (242, -70, 735)

Regions

	Material	Points	Area (ft²)
Region 1	BEACH SAND, EL. -13 TO -47	18,14,34,40,32,11,10,31,22,21,17	5220
Region 2	Sheet Pile	16,20,19,29,28,3,4	13.05
Region 3	MARSH, EL. -5/-6.5 TO -13	22,30,42,31	304.5
Region 4	EMBANKMENT FILL, EL. -0.5 TO -4/-6.5	29,28,3,30,42,7,6,5,41	202.38176
Region 5	BAY SOUND CLAY, EL. -47 TO -70 (protected)	13,14,34,35	1324.8
Region 6	BAY SOUND CLAY, EL. -47 TO -70 (protected)	32,11,12,36	1564
Region 7	MARSH, EL. -6.5 TO -13 (protected)	43,10,31,42	442
Region 8	EMBANKMENT FILL, EL. +3.3 TO -0.5	29,19,37,38,41	75.87824
Region 9	BEACH SAND, EL. -13 TO -47	18,17,21,22,33,15	1240
Region 10	BAY SOUND CLAY, EL. -47 TO -70	35,34,40,32,36,44	1481.2
Region 11	Fill, EL -2.3 TO -6.5 (protected)	7,39,8,9,43,42	159.5
Region 12	EMBANKMENT FILL, EL. -0.5 TO -4/-6.5	3,27,26,2,25,30	40.725
Region 13	MARSH, EL. -5/-6.5 TO -13	25,30,22,33	168
Region 14	MARSH, EL. -6.5 TO -13 (protected)	15,1,23,24,25,33	394.095

Points

	X (ft)	Y (ft)
Point 1	120	-6.1
Point 2	182.2	-4.9
Point 3	200	-1.8
Point 4	200	3.5
Point 5	231.5	-0.7
Point 6	231.6	-1.9
Point 7	242	-2.3
Point 8	267.8	-4.5
Point 9	310	-4.5
Point 10	310	-13
Point 11	310	-47
Point 12	310	-70
Point 13	120	-70
Point 14	120	-47
Point 15	120	-13
Point 16	200	13.9
Point 17	200	-28.5
Point 18	120	-28.5
Point 19	201	3.3
Point 20	200.5	13.9
Point 21	200	-23.5
Point 22	200	-13
Point 23	141	-6.1
Point 24	171.3	-6.3
Point 25	177.6	-6
Point 26	192.1	-3
Point 27	198.9	-1.8
Point 28	201	-1.8
Point 29	201	-0.5
Point 30	200	-5
Point 31	242	-13
Point 32	242	-47
Point 33	177.6	-13
Point 34	177.6	-47
Point 35	177.6	-70
Point 36	242	-70
Point 37	206.8	3.4
Point 38	214.8	2.7
Point 39	257.5	-4
Point 40	200	-47
Point 41	230.51765	-0.5
Point 42	242	-6.5
Point 43	310	-6.5
Point 44	200	-70

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.62	(219.703, -2.86)	21.68867	(192.331, -2.95931)	(247.669, -2.92174)
2	1171	1.90	(219.703, -2.86)	21.184	(192.016, -3.0161)	(247.39, -2.89111)

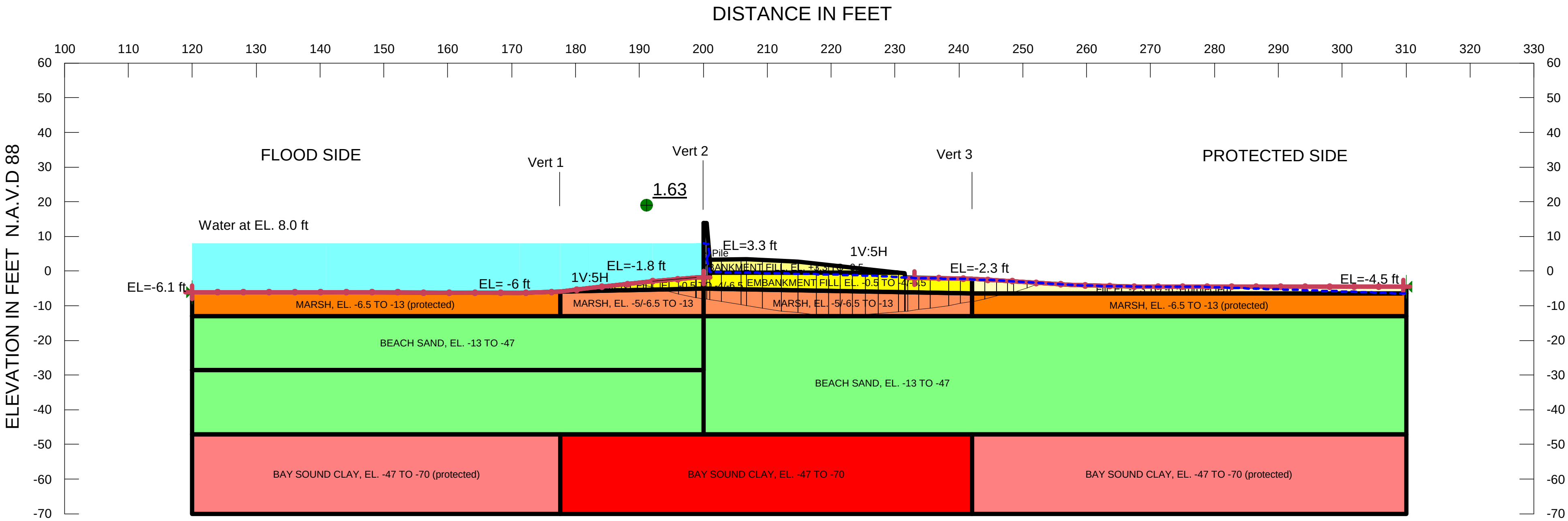
Slices of Slip Surface: **Optimized**

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	193.42495	-3.6828485	676.4266	626.72746	0	221.19
2	Optimized	195.13125	-4.7982135	696.8924	751.80158	0	223.48
3	Optimized	195.93935	-5.3156385	725.46223	809.86373	0	210.47
4	Optimized	197.51775	-6.263344	818.3159	907.17069	0	212.23
5	Optimized	199.4495	-7.412279	943.36081	1022.2675	0	214.39
6	Optimized	199.9995	-7.7392315	982.10652	1138.5307	0	215
7	Optimized	200.25	-7.8019805	551.61509	-210.45688	0	214.85
8	Optimized	200.75	-7.927235	472.28635	564.01203	0	214.55
9	Optimized	202.09255	-8.263554	492.31911	1151.0678	0	213.75
10	Optimized	204.27765	-8.810938	524.45969	1203.3629	0	212.45
11	Optimized	206.0851	-9.3084465	553.29442	1232.6949	0	211.38
12	Optimized	207.8848	-9.8718815	585.71826	1272.4285	0	210.31
13	Optimized	210.0544	-10.551115	624.20605	1310.3445	0	209.02
14	Optimized	212.0544	-11.10683	654.58834	1362.0287	0	207.82
15	Optimized	213.8848	-11.539025	676.92016	1382.2868	0	206.74
16	Optimized	215.4594	-11.910825	695.87863	1391.1817	0	205.8
17	Optimized	216.91655	-12.155085	706.85488	1417.8212	0	204.93
18	Optimized	218.51205	-12.332195	712.89744	1397.3886	0	203.98
19	Optimized	220.10755	-12.509305	718.81541	1376.8938	0	203.03
20	Optimized	221.6918	-12.54733	715.81603	1397.8809	0	202.09
21	Optimized	223.2648	-12.446275	704.07926	1352.7102	0	201.15
22	Optimized	224.8378	-12.34522	692.15216	1307.4761	0	200.22
23	Optimized	226.72195	-12.07602	668.58973	1279.8182	0	199.09
24	Optimized	228.91725	-11.638685	633.20799	1188.6834	0	197.79

25	Optimized	230.2663	-11.341205	609.65067	1162.2688	0	196.98
26	Optimized	231.00885	-11.10839	592.33493	1124.0386	0	196.54
27	Optimized	231.55	-10.938715	579.71429	1031.3941	0	196.22
28	Optimized	231.77535	-10.868065	574.45712	957.92738	0	196.09
29	Optimized	233.09775	-10.386295	539.38583	923.48835	0	195.3
30	Optimized	235.05085	-9.62865	484.66002	855.32964	0	194.14
31	Optimized	236.66295	-8.96695	437.18506	787.55746	0	193.18
32	Optimized	238.31845	-8.24355	385.65113	725.59712	0	192.19
33	Optimized	240.01735	-7.45845	330.03448	645.39673	0	191.18
34	Optimized	241.4334	-6.768479	281.32521	587.99031	0	190.34
35	Optimized	243.1439	-5.870589	217.36463	479.02036	0	200
36	Optimized	245.13305	-4.683025	131.6912	349.75951	0	200
37	Optimized	246.82355	-3.5088355	44.717971	191.1286	0	200

Slices of Slip Surface: 1171

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	1171	192.05805	-3.058051	686.60709	505.05646	0	219.36
2	1171	193.1782	-4.178205	677.03406	617.94483	0	220.86
3	1171	195.03035	-6.030342	744.99465	795.15434	0	209.45
4	1171	196.5782	-7.5782055	863.54145	923.88839	0	211.18
5	1171	198.12605	-9.1260685	992.0014	1052.6224	0	212.91
6	1171	199.45	-10.45	1121.4713	1171.9973	0	214.39
7	1171	200.25	-11	752.38	57.096	0	214.85
8	1171	200.75	-11	665.46	884.36	0	214.55
9	1171	201.96665	-11	664.65529	1460.7934	0	213.83
10	1171	203.9	-11	662.89667	1465.7589	0	212.68
11	1171	205.83335	-11	660.46563	1470.7761	0	211.53
12	1171	207.8	-11	657.2	1463.8	0	210.36
13	1171	209.8	-11	653.1	1444.85	0	209.17
14	1171	211.8	-11	648.45	1425.95	0	207.98
15	1171	213.8	-11	643.25	1407	0	206.79
16	1171	215.75	-11	637.68421	1375.8947	0	205.63
17	1171	217.65	-11	631.94737	1332.5263	0	204.49
18	1171	219.55	-11	625.94737	1289.1579	0	203.36
19	1171	221.45	-11	619.63158	1245.8421	0	202.23
20	1171	223.35	-11	613.15789	1202.4737	0	201.1
21	1171	225.25	-11	606.47368	1159.1579	0	199.97
22	1171	227.15	-11	599.68421	1115.7895	0	198.84
23	1171	229.05	-11	592.78947	1072.4737	0	197.71
24	1171	230.25885	-10.87931	580.77931	1157.0065	0	196.99
25	1171	231.00885	-10.52958	556.11987	1106.6488	0	196.54
26	1171	231.55	-10.277225	538.32866	1003.9171	0	196.22
27	1171	232.6272	-9.774927	502.88168	884.70823	0	195.58
28	1171	234.68155	-8.816962	435.28669	786.68182	0	194.36
29	1171	236.7359	-7.858998	367.64317	688.61129	0	193.13
30	1171	238.79025	-6.901034	299.97759	590.54076	0	191.91
31	1171	240.9087	-5.91318	229.39673	482.31324	0	200.78
32	1171	242.89825	-4.9854425	161.90758	361.04068	0	200
33	1171	244.69475	-4.147711	99.422775	243.80474	0	200
34	1171	246.4913	-3.309979	33.898989	126.57385	0	200



Name: EMBANKMENT FILL, EL. +3.3 TO -0.5 Model: Undrained (Phi=0) Unit Weight: 115 pcf Cohesion: 700 psf
Name: Fill, EL -2.3 TO -6.5 (protected) Model: Undrained (Phi=0) Unit Weight: 106 pcf Cohesion: 200 psf
Name: BEACH SAND, EL. -13 TO -47 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand
Name: BAY SOUND CLAY, EL. -47 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 110 pcf Cohesion Spatial Fn: CLAY Phi: 0 °
Name: Sheet Pile Model: Undrained (Phi=0) Unit Weight: 0.1 pcf Cohesion: 0.01 psf
Name: MARSH, EL. -5/-6.5 TO -13 Model: Spatial Mohr-Coulomb Unit Weight: 88 pcf Cohesion Fn: Marsh Phi: 0 °
Name: EMBANKMENT FILL, EL. -0.5 TO -4/-6.5 Model: Spatial Mohr-Coulomb Unit Weight: 106 pcf Cohesion Fn: Fill Phi: 0 °
Name: MARSH, EL. -6.5 TO -13 (protected) Model: Undrained (Phi=0) Unit Weight: 88 pcf Cohesion: 190 psf
Name: BAY SOUND CLAY, EL. -47 TO -70 (protected) Model: Spatial Mohr-Coulomb Unit Weight: 110 pcf Cohesion Fn: Bay Sound Phi: 0 °

GENERAL NOTES

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LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 4
REMEDIATION OF CANAL WALLS AND LEVEES
PROTECTED SIDE STABILITY ANALYSIS
CASE: Global Stability (Entry/Exit)
STA. 24+87 TO 29+16 WEST
ORLEANS PARISH, LOUISIANA

ETL 1110-2-575 ANALYSIS

Name: Global Stability (Entry/Exit)
File Name: Orleans Canal Reach 4.gsz Directory: Y:\F&MHOME\Middleton\Outfall Canals\Orleans final edits\final\Appendix A and Appendix B\
Last Edited By: Jamerson, James MVK

Global Stability (Entry/Exit)

File Information

Created By: Moraille, Jacques
Revision Number: 529
Last Edited By: Jamerson, James MVK
Date: 6/17/2013
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Directory: Y:\F&MHOME\Middleton\Outfall Canals\Orleans final edits\final\Appendix A and Appendix B\
Last Solved Date: 6/17/2013
Last Solved Time: 11:10:30 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 Analysis (seepage)
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: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

EMBANKMENT FILL, EL. +3.3 TO -0.5

Model: Undrained (Phi=0)
Unit Weight: 115 pcf
Cohesion: 700 psf

Fill, EL -2.3 TO -6.5 (protected)

Model: Undrained (Phi=0)
Unit Weight: 106 pcf
Cohesion: 200 psf

BEACH SAND, EL. -13 TO -47

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

BAY SOUND CLAY, EL. -47 TO -70

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

Sheet Pile

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

MARSH, EL. -5/-6.5 TO -13

Model: Spatial Mohr-Coulomb
Unit Weight: 88 pcf
Cohesion Fn: Marsh
Phi: 0 °
Phi-B: 0 °

EMBANKMENT FILL, EL. -0.5 TO -4/-6.5

Model: Spatial Mohr-Coulomb
Unit Weight: 106 pcf
Cohesion Fn: Fill
Phi: 0 °
Phi-B: 0 °

MARSH, EL. -6.5 TO -13 (protected)

Model: Undrained (Phi=0)
Unit Weight: 88 pcf
Cohesion: 190 psf

BAY SOUND CLAY, EL. -47 TO -70 (protected)

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

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (120, -6.1) ft
Left-Zone Right Coordinate: (200, -1.8) ft
Left-Zone Increment: 20
Right Projection: Range
Right-Zone Left Coordinate: (233.05128, -1.95582) ft
Right-Zone Right Coordinate: (309.55716, -4.5) ft
Right-Zone Increment: 20
Radius Increments: 4

Slip Surface Limits

Left Coordinate: (120, -6.1) ft
Right Coordinate: (310, -4.5) ft

Cohesion Functions

Marsh

Model: Spline Data Point Function
Function: Cohesion vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 190
Data Points: X (ft), Cohesion (psf)
Data Point: (177.6, 190)
Data Point: (200, 215)
Data Point: (242, 190)

Fill

Model: Spline Data Point Function
Function: Cohesion vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 200
Data Points: X (ft), Cohesion (psf)
Data Point: (177.6, 200)
Data Point: (200, 230)
Data Point: (242, 200)

Bay Sound

Model: Spline Data Point Function
Function: Cohesion vs. Y
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 500
Data Points: Y (ft), Cohesion (psf)
Data Point: (-70, 735)
Data Point: (-47, 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: (-10000, 0)
Data Point: (0, 0)
Data Point: (10000, 6494)
Estimation Properties
Intact Rock Param.: 10
Geological Strength: 100
Disturbance Factor: 0
SigmaC: 600000 psf
Sigma3: 300000 psf

Num. Points: 20

Spatial Functions

CLAY

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (177.7, -47, 500)
Data Point: (177.7, -70, 735)
Data Point: (200, -47, 530)
Data Point: (200, -70, 775)
Data Point: (242, -47, 500)
Data Point: (242, -70, 735)

Regions

	Material	Points	Area (ft^2)
Region 1	BEACH SAND, EL. -13 TO -47	18,14,34,40,32,11,10,31,22,21,17	5220
Region 2	Sheet Pile	16,20,19,29,28,3,4	13.05
Region 3	MARSH, EL. -5/-6.5 TO -13	22,30,42,31	304.5
Region 4	EMBANKMENT FILL, EL. -0.5 TO -4/-6.5	29,28,3,30,42,7,6,5,41	202.38176
Region 5	BAY SOUND CLAY, EL. -47 TO -70 (protected)	13,14,34,35	1324.8
Region 6	BAY SOUND CLAY, EL. -47 TO -70 (protected)	32,11,12,36	1564
Region 7	MARSH, EL. -6.5 TO -13 (protected)	43,10,31,42	442
Region 8	EMBANKMENT FILL, EL. +3.3 TO -0.5	29,19,37,38,41	75.87824
Region 9	BEACH SAND, EL. -13 TO -47	18,17,21,22,33,15	1240
Region 10	BAY SOUND CLAY, EL. -47 TO -70	35,34,40,32,36,44	1481.2
Region 11	Fill, EL -2.3 TO -6.5 (protected)	7,39,8,9,43,42	159.5
Region 12	EMBANKMENT FILL, EL. -0.5 TO -4/-6.5	3,27,26,2,25,30	40.725
Region 13	MARSH, EL. -5/-6.5 TO -13	25,30,22,33	168
Region 14	MARSH, EL. -6.5 TO -13 (protected)	15,1,23,24,25,33	394.095

Points

	X (ft)	Y (ft)
Point 1	120	-6.1
Point 2	182.2	-4.9
Point 3	200	-1.8
Point 4	200	3.5
Point 5	231.5	-0.7
Point 6	231.6	-1.9
Point 7	242	-2.3
Point 8	267.8	-4.5
Point 9	310	-4.5
Point 10	310	-13
Point 11	310	-47
Point 12	310	-70
Point 13	120	-70
Point 14	120	-47
Point 15	120	-13
Point 16	200	13.9
Point 17	200	-28.5
Point 18	120	-28.5
Point 19	201	3.3
Point 20	200.5	13.9
Point 21	200	-23.5
Point 22	200	-13
Point 23	141	-6.1
Point 24	171.3	-6.3
Point 25	177.6	-6
Point 26	192.1	-3
Point 27	198.9	-1.8
Point 28	201	-1.8
Point 29	201	-0.5
Point 30	200	-5
Point 31	242	-13
Point 32	242	-47
Point 33	177.6	-13
Point 34	177.6	-47
Point 35	177.6	-70
Point 36	242	-70
Point 37	206.8	3.4
Point 38	214.8	2.7
Point 39	257.5	-4
Point 40	200	-47
Point 41	230.51765	-0.5
Point 42	242	-6.5
Point 43	310	-6.5
Point 44	200	-70

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.63	(219.828, 50.559)	24.41696	(189.459, -3.50675)	(252.732, -3.47704)
2	1812	1.70	(219.828, 50.559)	62.904	(188.114, -3.76493)	(252.138, -3.41194)

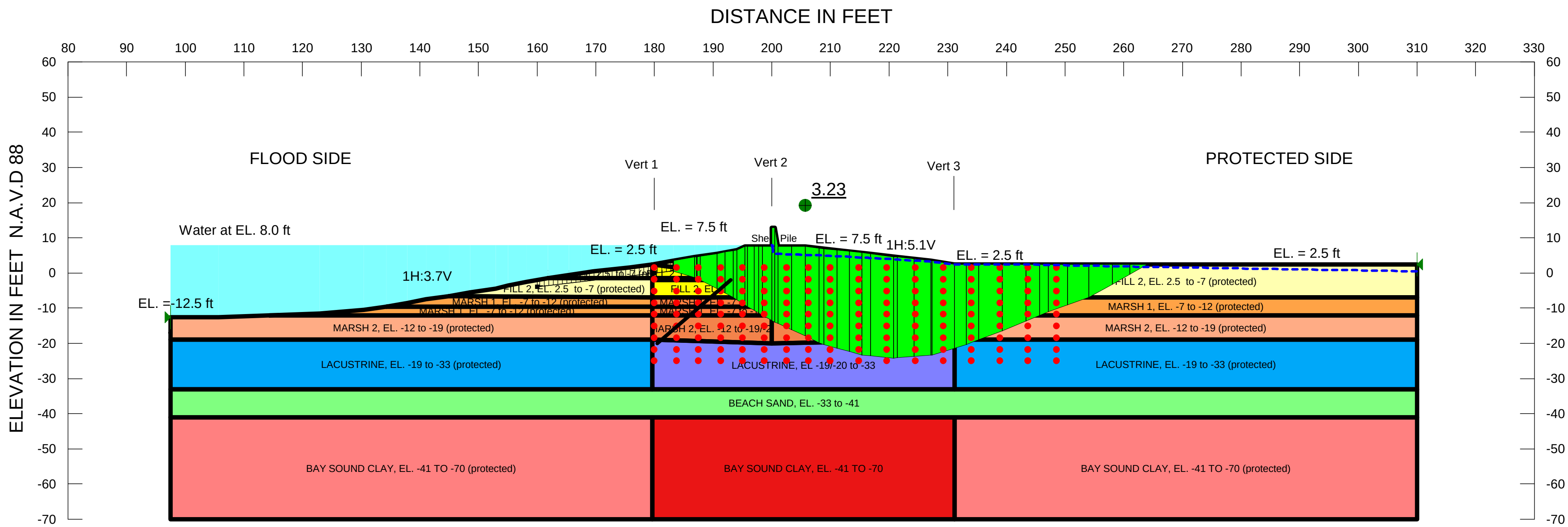
Slices of Slip Surface: Optimized

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	190.77975	-4.1372105	683.37395	690.004	0	217.65
2	Optimized	192.66015	-5.035166	670.05555	795.44329	0	220.17
3	Optimized	194.67135	-5.995592	735.94344	895.8622	0	209.05
4	Optimized	197.46425	-7.185615	867.98282	1039.2313	0	212.17
5	Optimized	198.85305	-7.6946735	939.98531	1121.5634	0	213.72
6	Optimized	199.45	-7.8467825	969.56435	1147.6907	0	214.39
7	Optimized	200.25	-8.0506305	567.15728	-165.5714	0	214.85
8	Optimized	200.75	-8.178036	487.9483	584.61931	0	214.55
9	Optimized	201.9044	-8.4721945	505.57714	1167.928	0	213.87
10	Optimized	204.34605	-9.19715	548.6768	1217.5547	0	212.41
11	Optimized	206.34165	-9.835636	586.0674	1278.806	0	211.23
12	Optimized	208.03245	-10.366766	616.69214	1313.8527	0	210.22
13	Optimized	210.73915	-11.13783	659.72231	1370.3818	0	208.61
14	Optimized	213.5067	-11.76478	692.24991	1420.2921	0	206.96
15	Optimized	216.25405	-12.281055	716.81741	1420.4887	0	205.32
16	Optimized	218.6442	-12.567895	727.31468	1444.375	0	203.9
17	Optimized	220.5164	-12.59509	722.82838	1404.1585	0	202.79
18	Optimized	222.3886	-12.622285	718.12844	1363.8886	0	201.67
19	Optimized	224.3351	-12.56694	707.82733	1338.982	0	200.51
20	Optimized	226.3559	-12.429055	691.97934	1280.1815	0	199.31
21	Optimized	228.942	-12.07817	660.63815	1220.322	0	197.77
22	Optimized	231.00885	-11.708345	629.86021	1139.5342	0	196.54
23	Optimized	231.55	-11.61151	621.8045	1055.1422	0	196.22
24	Optimized	231.78555	-11.56936	618.29599	985.6662	0	196.08
25	Optimized	232.85325	-11.32785	599.18259	974.34746	0	195.44
26	Optimized	234.61755	-10.91123	566.52598	930.05142	0	194.39
27	Optimized	236.96585	-10.307545	519.87795	874.56319	0	193
28	Optimized	239.324	-9.6381095	468.97253	813.42154	0	191.59
29	Optimized	241.108	-9.089988	427.75224	756.57151	0	190.53
30	Optimized	242.15565	-8.7681035	403.47331	721.86104	0	190
31	Optimized	243.1962	-8.3502335	373.1295	694.66237	0	190

32	Optimized	244.96605	-7.61014	319.53114	604.11543	0	190
33	Optimized	246.7359	-6.8700465	265.64085	513.61019	0	190
34	Optimized	248.08645	-6.30528	223.54001	444.35573	0	200
35	Optimized	249.59705	-5.4521795	158.19596	368.23595	0	200
36	Optimized	251.6869	-4.135419	54.135438	190.06105	0	200

Slices of Slip Surface: 1812

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	1812	189.60365	-4.5812805	679.39954	711.66499	0	216.08
2	1812	191.5965	-5.6505065	671.93981	841.27145	0	205.62
3	1812	193.23335	-6.432235	733.81695	926.19653	0	207.45
4	1812	195.5	-7.436493	828.02789	1035.7977	0	209.98
5	1812	197.76665	-8.336417	939.61284	1137.4261	0	212.51
6	1812	199.45	-8.949276	1034.7414	1217.9347	0	214.39
7	1812	200.25	-9.2194895	640.42912	-84.062619	0	214.85
8	1812	200.75	-9.380935	563.48738	674.6526	0	214.55
9	1812	201.96665	-9.7468075	585.61378	1265.4574	0	213.83
10	1812	203.9	-10.286155	617.82047	1326.0098	0	212.68
11	1812	205.83335	-10.759815	645.27093	1381.1602	0	211.53
12	1812	207.8	-11.17526	668.2355	1420.0004	0	210.36
13	1812	209.8	-11.53159	686.70206	1442.3113	0	209.17
14	1812	211.8	-11.82178	700.37436	1458.8694	0	207.98
15	1812	213.8	-12.04675	709.22021	1469.7531	0	206.79
16	1812	215.9227	-12.21287	713.51133	1460.049	0	205.52
17	1812	218.1681	-12.31235	712.81622	1428.7489	0	204.19
18	1812	220.41345	-12.331535	706.62078	1390.0394	0	202.85
19	1812	222.6588	-12.27049	695.16835	1343.8438	0	201.51
20	1812	224.9042	-12.128985	678.3772	1289.9909	0	200.18
21	1812	227.1496	-11.906475	656.41933	1228.4861	0	198.84
22	1812	229.395	-11.60209	629.188	1159.0722	0	197.5
23	1812	231.00885	-11.34058	606.85369	1105.8383	0	196.54
24	1812	231.55	-11.242375	598.70568	1023.6494	0	196.22
25	1812	232.64	-11.016495	580.49967	938.78748	0	195.57
26	1812	234.72	-10.54664	543.32798	897.10773	0	194.33
27	1812	236.8	-10.001721	501.35686	848.37172	0	193.1
28	1812	238.88	-9.379688	454.53296	792.23916	0	191.86
29	1812	240.96	-8.6781075	402.56495	728.40428	0	190.62
30	1812	243.0765	-7.8788305	344.08008	646.01329	0	190
31	1812	245.2295	-6.97528	278.61341	544.20798	0	190
32	1812	247.27805	-6.028472	208.73858	433.13845	0	200
33	1812	249.22215	-5.0430735	132.36787	304.86721	0	200
34	1812	251.16625	-3.9705705	46.243522	165.44469	0	200



Name: FILL 1, EL. +7.5 TO -2 Model: Undrained (Phi=0) Unit Weight: 106 pcf Cohesion: 1000 psf
Name: MARSH 1, EL. -7 to -12 Model: Spatial Mohr-Coulomb Weight Fn: Marsh 1 Cohesion Fn: Marsh Phi: 0 °
Name: BEACH SAND, EL. -33 to -41 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand
Name: BAY SOUND CLAY, EL. -41 TO -70 (protected) Model: Spatial Mohr-Coulomb Unit Weight: 113 pcf Cohesion Fn: Bay Sound Clay Phi: 0 °
Name: Sheet Pile Model: Undrained (Phi=0) Unit Weight: 0.1 pcf Cohesion: 0.01 psf
Name: FILL 2, EL. -2 to -7 Model: Spatial Mohr-Coulomb Weight Fn: Fill 2 Cohesion Fn: FILL 2 Phi: 0 °
Name: LACUSTRINE, EL -19/-20 to -33 Model: Spatial Mohr-Coulomb Unit Weight: 100 pcf Cohesion Spatial Fn: Lacustrine Phi: 0 °
Name: MARSH 1, EL. -7 to -12 (protected) Model: Spatial Mohr-Coulomb Unit Weight: 81 pcf Cohesion: 200 psf Phi: 0 °
Name: LACUSTRINE, EL. -19 to -33 (protected) Model: Spatial Mohr-Coulomb Unit Weight: 100 pcf Cohesion Fn: Lacustrine Phi: 0 °
Name: FILL 2, EL. 2.5 to -7 (protected) Model: Spatial Mohr-Coulomb Unit Weight: 102 pcf Cohesion: 400 psf Phi: 0 °
Name: MARSH 2, EL. -12 to -19 (protected) Model: Spatial Mohr-Coulomb Unit Weight: 98 pcf Cohesion: 300 psf Phi: 0 °
Name: MARSH 2, EL. -12 to -19/-20 Model: Spatial Mohr-Coulomb Weight Fn: MARSH 2 Cohesion Fn: Marsh 2 Phi: 0 °
Name: BAY SOUND CLAY, EL. -41 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 113 pcf Cohesion Spatial Fn: Bay Sound Phi: 0 °

GENERAL NOTES

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

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

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 10A
REMEDIATION OF CANAL WALLS AND LEVEES
PROTECTED SIDE STABILITY ANALYSIS
CASE: Global P/S Stability Analysis (Block)
STA. 91+88 TO 93+53 WEST
ORLEANS PARISH, LOUISIANA

ETL 1110-2-575 ANALYSIS

Name: Global P/S Stability Analysis (Block)
File Name: Orleans Canal Reach 10A.gsz Directory: Y:\F&MHOME\Middleton\Outfall Canals\Orleans final edits\final\Appendix A and Appendix B\
Last Edited By: Jamerson, James MVK

Global P/S Stability Analysis (Block)

File Information

Created By: Liljegren, James
Revision Number: 389
Last Edited By: Jamerson, James MVK
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File Name: Orleans Canal Reach 10A.gsz
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Last Solved Date: 6/14/2013
Last Solved Time: 2:32:32 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 P/S Stability Analysis (Block)

Kind: SLOPE/W
Parent: 1 - Gap Seepage Analysis 8ft
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: Tension Crack Line
Percentage Wet: 1
Tension Crack Fluid Unit Weight: 62.4 pcf
FOS Distribution
FOS Calculation Option: Constant
Restrict Block Crossing: Yes
Advanced
Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 4000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 30 °
Resisting Side Maximum Convex Angle: 10 °

Materials

FILL 1, EL. +7.5 TO -2

Model: Undrained (Phi=0)
Unit Weight: 106 pcf
Cohesion: 1000 psf

MARSH 1, EL. -7 to -12

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

BEACH SAND, EL. -33 to -41

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

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

Model: Spatial Mohr-Coulomb
Unit Weight: 113 pcf
Cohesion Fn: Bay Sound Clay
Phi: 0 °
Phi-B: 0 °

Sheet Pile

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

FILL 2, EL. -2 to -7

Model: Spatial Mohr-Coulomb
Weight Fn: Fill 2
Cohesion Fn: FILL 2
Phi: 0 °
Phi-B: 0 °

LACUSTRINE, EL -19/-20 to -33

Model: Spatial Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion Spatial Fn: Lacustrine
Phi: 0 °
Phi-B: 0 °

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

Model: Spatial Mohr-Coulomb
Unit Weight: 81 pcf
Cohesion: 200 psf
Phi: 0 °
Phi-B: 0 °

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

Model: Spatial Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion Fn: Lacustrine
Phi: 0 °
Phi-B: 0 °

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

Model: Spatial Mohr-Coulomb
Unit Weight: 102 pcf
Cohesion: 400 psf
Phi: 0 °
Phi-B: 0 °

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

Model: Spatial Mohr-Coulomb
Unit Weight: 98 pcf
Cohesion: 300 psf
Phi: 0 °
Phi-B: 0 °

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

Model: Spatial Mohr-Coulomb
Weight Fn: MARSH 2
Cohesion Fn: Marsh 2
Phi: 0 °
Phi-B: 0 °

BAY SOUND CLAY, EL. -41 TO -70

Model: Spatial Mohr-Coulomb
Unit Weight: 113 pcf
Cohesion Spatial Fn: Bay Sound
Phi: 0 °
Phi-B: 0 °

Slip Surface Limits

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

Slip Surface Block

Left Grid
Upper Left: (180, 1.5) ft
Lower Left: (180, -25) ft
Lower Right: (210, -25) ft
X Increments: 8
Y Increments: 8
Starting Angle: 115 °
Ending Angle: 135 °
Angle Increments: 4
Right Grid
Upper Left: (210, 1.5) ft
Lower Left: (210, -25) ft
Lower Right: (248.5, -25) ft
X Increments: 8
Y Increments: 8
Starting Angle: 25 °
Ending Angle: 45 °
Angle Increments: 4

Tension Crack Line

	X (ft)	Y (ft)
	160	-4
	180	0
	195	3
	210	3

Cohesion Functions

Marsh

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

Lacustrine

Model: Spline Data Point Function
Function: Cohesion vs. Y
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 300
Data Points: Y (ft), Cohesion (psf)
Data Point: (-33, 365)
Data Point: (-19, 300)

Marsh 2

Model: Spline Data Point Function
Function: Cohesion vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 300
Data Points: X (ft), Cohesion (psf)
Data Point: (179.6, 300)
Data Point: (200, 370)
Data Point: (231.1, 300)

Bay Sound Clay

Model: Spline Data Point Function
Function: Cohesion vs. Y
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 500
Data Points: Y (ft), Cohesion (psf)
Data Point: (-70, 820)
Data Point: (-41, 500)

FILL 2

Model: Spline Data Point Function
Function: Cohesion vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 330
Data Points: X (ft), Cohesion (psf)
Data Point: (180, 330)
Data Point: (200, 400)
Data Point: (231, 330)

Shear/Normal Strength Functions

Sand

Model: Spline Data Point Function
Function: Shear Stress vs. Normal Stress
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
Data Point: (-10000, 0)
Data Point: (0, 0)
Data Point: (10000, 6494)
Estimation Properties
Intact Rock Param.: 10
Geological Strength: 100
Disturbance Factor: 0
SigmaC: 600000 psf
Sigma3: 300000 psf
Num. Points: 20

Unit Weight Functions

Marsh 1

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 81
Data Points: X (ft), Unit Weight (pcf)
Data Point: (179.6, 81)
Data Point: (200, 82)
Data Point: (231, 81)

Fill 2

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 106
Data Points: X (ft), Unit Weight (pcf)
Data Point: (200, 106)
Data Point: (230, 102)

MARSH 2

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 98
Data Points: X (ft), Unit Weight (pcf)
Data Point: (179.6, 98)
Data Point: (200, 82)
Data Point: (231, 98)

Spatial Functions

Lacustrine

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (179.6, -19, 300)
Data Point: (179.6, -33, 365)
Data Point: (200, -20, 315)
Data Point: (200, -33, 385)
Data Point: (231.1, -19, 300)
Data Point: (231.1, -33, 365)

Bay Sound

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

Regions

	Material	Points	Area (ft^2)
Region 1	FILL 1, EL. +7.5 TO -2	29,30,31,32,33,34,5,8,50,4	164.775
Region 2	FILL 2, EL. 2.5 to -7 (protected)	5,6,36,35	749.55
Region 3	LACUSTRINE, EL. -19 to -33 (protected)	38,41,42,39	1104.6
Region 4	BAY SOUND CLAY, EL. -41 TO -70 (protected)	40,43,9,49	2288.1
Region 5	FILL 1, EL. +7.5 TO -2	22,23,24,25,26,27,4,50,69	103.14
Region 6	LACUSTRINE, EL -19/-20 to -33	45,37,38,39,64,46	695.25
Region 7	BEACH SAND, EL. -33 to -41	56,55,46,64,39,42,43,40,65,47	1700
Region 8	BAY SOUND CLAY, EL. -41 TO -70	47,65,40,49,66,48	1493.5
Region 9	FILL 2, EL. 2.5 to -7 (protected)	13,14,15,16,17,18,51,52,44	138.55
Region 10	LACUSTRINE, EL. -19 to -33 (protected)	54,45,46,55	1149.4
Region 11	BAY SOUND CLAY, EL. -41 TO -70 (protected)	47,48,57,56	2380.9
Region 12	Sheet Pile	4,28,7,29	4.05
Region 13	FILL 2, EL. 2.5 to -7 (protected)	18,19,68,20,21,22,51	37
Region 14	MARSH 2, EL. -12 to -19 (protected)	61,53,1,67,60,45,54	568.45
Region 15	FILL 1, EL. +7.5 TO -2	69,50,8	0.5675
Region 16	FILL 2, EL. -2 to -7	51,69,8,52	9.6325
Region 17	FILL 2, EL. -2 to -7	22,69,51	36.26
Region 18	MARSH 1, EL. -7 to -12 (protected)	10,11,12,13,44,71	111.5
Region 19	MARSH 1, EL. -7 to -12	44,71,70,63	51
Region 20	MARSH 1, EL. -7 to -12 (protected)	67,2,3,10,71,60	130.7
Region 21	MARSH 1, EL. -7 to -12	63,70,58,35	77.75
Region 22	MARSH 1, EL. -7 to -12	71,60,62,70	51
Region 23	MARSH 2, EL. -12 to -19/-20	62,60,45,37	153

Region 24	MARSH 1, EL. -7 to -12	70,62,72,58	77.75
Region 25	MARSH 2, EL. -12 to -19/-20	62,37,38,72	233.25
Region 26	MARSH 1, EL. -7 to -12 (protected)	35,58,72,59,36	394.5
Region 27	MARSH 2, EL. -12 to -19 (protected)	72,38,41,59	552.3
Region 28	FILL 2, EL. -2 to -7	52,8,63,44	102
Region 29	FILL 2, EL. -2 to -7	8,5,35,63	225.475

Points

	X (ft)	Y (ft)
Point 1	105.7	-12.5
Point 2	122.9	-11.5
Point 3	130.4	-10.5
Point 4	200	7.5
Point 5	231.1	2.5
Point 6	310	2.5
Point 7	200.5	12.9
Point 8	200	-2
Point 9	310	-70
Point 10	134.3	-9.5
Point 11	137.9	-8.5
Point 12	141.1	-7.5
Point 13	145	-6.5
Point 14	148.6	-5.5
Point 15	152.9	-4.5
Point 16	155	-3.5
Point 17	158.2	-2.5
Point 18	161.8	-1.5
Point 19	165.4	-0.5
Point 20	169.6	0.5
Point 21	175.7	1.5
Point 22	179.6	2.5
Point 23	183.2	3.5
Point 24	186.8	4.5
Point 25	190.7	5.5
Point 26	194	6.5
Point 27	195.4	7.5
Point 28	200	12.9
Point 29	201	7.5
Point 30	205.7	7.5
Point 31	211.1	6.5
Point 32	216.8	5.5
Point 33	221.4	4.5
Point 34	227.1	3.5
Point 35	231.1	-7
Point 36	310	-7
Point 37	200	-20
Point 38	231.1	-19
Point 39	231.1	-33
Point 40	231.1	-41
Point 41	310	-19
Point 42	310	-33
Point 43	310	-41
Point 44	179.6	-7
Point 45	179.6	-19
Point 46	179.6	-33
Point 47	179.6	-41
Point 48	179.6	-70
Point 49	231.1	-70
Point 50	200	-1.5
Point 51	179.6	-1.5
Point 52	179.6	-2
Point 53	97.5	-12.5
Point 54	97.5	-19
Point 55	97.5	-33
Point 56	97.5	-41
Point 57	97.5	-70
Point 58	231.1	-9.5
Point 59	310	-12
Point 60	179.6	-12
Point 61	97.5	-17
Point 62	200	-12
Point 63	200	-7
Point 64	200	-33
Point 65	200	-41
Point 66	200	-70
Point 67	114.3	-12
Point 68	167.5	0
Point 69	197.73	-1.5
Point 70	200	-9.5
Point 71	179.6	-9.5
Point 72	231.1	-12

Critical Slip Surfaces

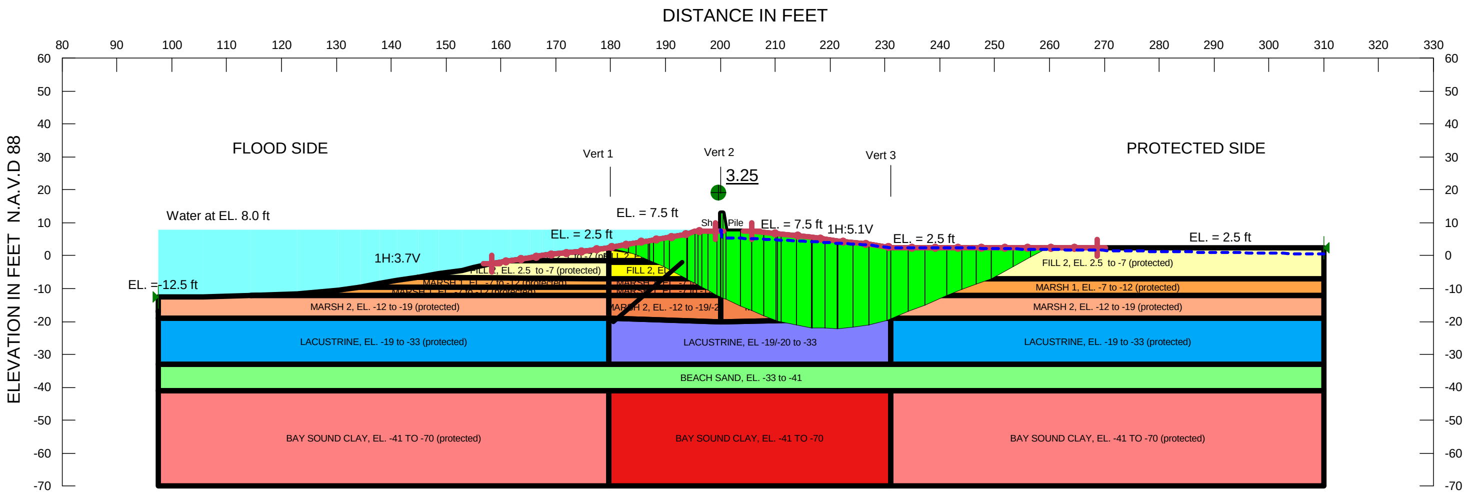
	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	3.23	(224.738, 3.073)	36.196	(183.128, 3.47995)	(264.052, 2.5)
2	17978	3.55	(224.738, 3.073)	38.918	(181.042, 2.90046)	(268.524, 2.5)

Slices of Slip Surface: Optimized

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	183.1639	0.60668515	422.06906	212.78369	0	341.07
2	Optimized	185	-0.35349915	466.7276	648.26423	0	347.5
3	Optimized	186.9962	-1.3974035	519.25057	780.63741	0	354.49
4	Optimized	187.21295	-1.510755	525.21762	794.81741	0	355.25
5	Optimized	187.51155	-1.760755	537.92959	781.71195	0	356.29
6	Optimized	189.2448	-3.2520175	615.6821	954.51824	0	362.36
7	Optimized	191.38345	-5.0920625	715.84248	1168.9839	0	369.84
8	Optimized	192.7293	-6.340045	786.59736	1296.0408	0	374.55
9	Optimized	193.69585	-7.303048	844.34997	1418.2546	0	317.47
10	Optimized	194.7	-8.3035235	913.89612	1520.8494	0	325.83
11	Optimized	195.65045	-9.2504755	979.81229	1616.6853	0	333.75
12	Optimized	196.44935	-10.046415	1031.3573	1678.4986	0	340.41
13	Optimized	197.3639	-10.950055	1087.9255	1751.7262	0	348.03
14	Optimized	198.085	-11.65364	1125.578	1806.5704	0	354.04
15	Optimized	199.19625	-12.73788	1175.2792	1890.5451	0	367.24
16	Optimized	199.97625	-13.494185	1210.6062	1981.0222	0	369.92
17	Optimized	200.25	-13.7066	1218.6942	1967.8479	0	369.44
18	Optimized	200.75	-14.09458	1233.4997	1999.6078	0	368.31
19	Optimized	202.175	-15.20033	1281.1531	2090.7323	0	365.1
20	Optimized	204.525	-17.023845	1365.0325	2244.8082	0	359.82
21	Optimized	206.8639	-18.838735	1453.1022	2379.7629	0	354.55
22	Optimized	208.43345	-20.056655	1514.3887	2470.6193	0	312.63
23	Optimized	209.96955	-20.87538	1554.1982	2575.4638	0	316.33
24	Optimized	212.17015	-21.85639	1601.552	2637.1198	0	320.55
25	Optimized	214.31045	-22.810525	1649.1334	2697.8875	0	324.55
26	Optimized	216.0903	-23.405535	1677.7994	2773.2583	0	326.8
27	Optimized	218.78085	-23.85269	1695.501	2766.1577	0	327.88
28	Optimized	221.08085	-24.13733	1705.5232	2796.7664	0	328.28
29	Optimized	222.825	-23.893755	1685.8501	2742.3342	0	326.34
30	Optimized	225.675	-23.495745	1653.8101	2655.18	0	323.21
31	Optimized	227.2233	-23.27952	1636.4833	2606.6291	0	321.52
32	Optimized	229.2233	-22.323665	1573.0678	2516.2604	0	316.19
33	Optimized	232.1312	-20.869265	1476.4923	2321.9367	0	308.68
34	Optimized	234.22525	-19.67675	1397.8383	2220.0494	0	303.14
35	Optimized	237.2991	-17.719545	1269.4028	2023.5655	0	300
36	Optimized	241.33305	-15.0059	1091.6728	1763.4481	0	300
37	Optimized	244.53155	-12.786355	946.36321	1537.4646	0	300
38	Optimized	246.42035	-11.522895	863.47393	1398.3744	0	200
39	Optimized	248.81125	-10.034343	765.60407	1270.0258	0	200
40	Optimized	252.2501	-7.9610825	629.12012	1098.7964	0	200
41	Optimized	256.0313	-5.02674	438.66154	903.39045	0	400
42	Optimized	259.5515	-1.7406575	227.0403	563.47096	0	400
43	Optimized	262.5519	1.0864475	45.043231	269.1096	0	400

Slices of Slip Surface: 17978

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	17978	181.89585	-0.64583335	484.73725	583.87018	0	336.64
2	17978	182.975	-1.725	534.60416	720.96608	0	340.41
3	17978	185	-3.75	630.75887	953.45489	0	347.5
4	17978	187.525	-6.275	755.82388	1242.7522	0	356.34
5	17978	189.475	-8.225	871.70398	1457.2462	0	282.29
6	17978	191.975	-10.725	1031.6271	1681.5275	0	303.12
7	17978	193.625	-12.375	1133.6338	1825.09	0	348.13
8	17978	194.7	-13.45	1196.7782	1940.6545	0	351.81
9	17978	196.565	-15.315	1299.1341	2114.249	0	358.21
10	17978	198.865	-17.615	1416.8301	2293.4867	0	366.11
11	17978	200.25	-19	1488.0355	2369.5148	0	369.44
12	17978	200.75	-19.5	1513.2085	2411.5169	0	368.31
13	17978	201.10555	-19.85553	1531.11	2441.2797	0	367.51
14	17978	202.3333	-21.083295	1594.8786	2576.9652	0	320.04
15	17978	204.57775	-23.327765	1712.4531	2801.7176	0	331.1
16	17978	205.975	-24.725	1786.923	2936.1643	0	337.85
17	17978	207.4625	-25	1798.0619	3097.4021	0	338.63
18	17978	209.8875	-25	1790.8041	3057.6907	0	337.55
19	17978	212.525	-25	1782.6316	3015.4737	0	336.36
20	17978	215.375	-25	1773.8246	2970.6667	0	335.08
21	17978	217.95	-25	1766.087	2924.5652	0	333.91
22	17978	220.25	-25	1759.4348	2877.3478	0	332.86
23	17978	222.825	-25	1752.2456	2830.3509	0	331.68
24	17978	225.675	-25	1744.7018	2783.4386	0	330.37
25	17978	228.175	-25	1738.3721	2733.3023	0	329.22
26	17978	230.175	-24.35231	1694.1393	2724.1897	0	325.27
27	17978	232.7797	-22.528465	1576.3971	2514.6765	0	316.38
28	17978	236.13915	-20.176155	1423.756	2273.6694	0	305.46
29	17978	239.48505	-17.833335	1271.1026	2037.0729	0	300
30	17978	242.8174	-15.5	1118.8181	1804.9465	0	300
31	17978	246.14975	-13.166665	966.3123	1572.8201	0	300
32	17978	249.6011	-10.75	808.46746	1333.3128	0	200
33	17978	253.1715	-8.25	645.27349	1127.766	0	200
34	17978	256.3134	-6.05	501.84918	967.89512	0	400
35	17978	259.02685	-4.15	378.22837	771.1584	0	400
36	17978	261.74035	-2.25	254.63171	574.42169	0	400
37	17978	264.45385	-0.35	131.09542	377.68498	0	400
38	17978	267.16735	1.55	7.5829822	180.93921	0	400



Name: FILL 1, EL. +7.5 TO -2 Model: Undrained (Phi=0) Unit Weight: 106 pcf Cohesion: 1000 psf
Name: MARSH 1, EL. -7 to -12 Model: Spatial Mohr-Coulomb Weight Fn: Marsh 1 Cohesion Fn: Marsh Phi: 0 °
Name: BEACH SAND, EL. -33 to -41 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand
Name: BAY SOUND CLAY, EL. -41 TO -70 (protected) Model: Spatial Mohr-Coulomb Unit Weight: 113 pcf Cohesion Fn: Bay Sound Clay Phi: 0 °
Name: Sheet Pile Model: Undrained (Phi=0) Unit Weight: 0.1 pcf Cohesion: 0.01 psf
Name: FILL 2, EL. -2 to -7 Model: Spatial Mohr-Coulomb Weight Fn: Fill 2 Cohesion Fn: FILL 2 Phi: 0 °
Name: LACUSTRINE, EL -19/-20 to -33 Model: Spatial Mohr-Coulomb Unit Weight: 100 pcf Cohesion Spatial Fn: Lacustrine Phi: 0 °
Name: MARSH 1, EL. -7 to -12 (protected) Model: Spatial Mohr-Coulomb Unit Weight: 81 pcf Cohesion: 200 psf Phi: 0 °
Name: LACUSTRINE, EL. -19 to -33 (protected) Model: Spatial Mohr-Coulomb Unit Weight: 100 pcf Cohesion Fn: Lacustrine Phi: 0 °
Name: FILL 2, EL. 2.5 to -7 (protected) Model: Spatial Mohr-Coulomb Unit Weight: 102 pcf Cohesion: 400 psf Phi: 0 °
Name: MARSH 2, EL. -12 to -19 (protected) Model: Spatial Mohr-Coulomb Unit Weight: 98 pcf Cohesion: 300 psf Phi: 0 °
Name: MARSH 2, EL. -12 to -19/-20 Model: Spatial Mohr-Coulomb Weight Fn: MARSH 2 Cohesion Fn: Marsh 2 Phi: 0 °
Name: BAY SOUND CLAY, EL. -41 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 113 pcf Cohesion Spatial Fn: Bay Sound Phi: 0 °

GENERAL NOTES

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

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

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 10A
REMEDIATION OF CANAL WALLS AND LEVEES
PROTECTED SIDE STABILITY ANALYSIS
CASE: Global P/S Stability Analysis (Entry/Exit)
STA. 91+88 TO 93+53 WEST
ORLEANS PARISH, LOUISIANA

ETL 1110-2-575 ANALYSIS

Name: Global P/S Stability Analysis (Entry/Exit)
File Name: Orleans Canal Reach 10A.gsz Directory: Y:\F&MHOME\Middleton\Outfall Canals\Orleans final edits\final\Appendix A and Appendix B\
Last Edited By: Jamerson, James MVK

Global P/S Stability Analysis (Entry/Exit)

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File Information

Created By: Liljegren, James
Revision Number: 388
Last Edited By: Jamerson, James MVK
Date: 6/14/2013
Time: 2:00:29 PM
File Name: Orleans Canal Reach 10A.gsz
Directory: Y:\F&MHOME\Middleton\Outfall Canals\Orleans final edits\final\Appendix A and Appendix B\
Last Solved Date: 6/14/2013
Last Solved Time: 2:07:26 PM

Project Settings

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

Analysis Settings

Global P/S Stability Analysis (Entry/Exit)

Kind: SLOPE/W
Parent: 1 - Gap Seepage Analysis 8ft
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: 4000
  Optimization Convergence Tolerance: 1e-007
  Starting Optimization Points: 8
  Ending Optimization Points: 16
  Complete Passes per Insertion: 1
  Driving Side Maximum Convex Angle: 30 °
  Resisting Side Maximum Convex Angle: 10 °

Materials

FILL 1, EL. +7.5 TO -2

Model: Undrained (Phi=0)
Unit Weight: 106 pcf
Cohesion: 1000 psf

MARSH 1, EL. -7 to -12

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

BEACH SAND, EL. -33 to -41

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

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

Model: Spatial Mohr-Coulomb
Unit Weight: 113 pcf
Cohesion Fn: Bay Sound Clay
Phi: 0 °
Phi-B: 0 °

Sheet Pile

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

FILL 2, EL. -2 to -7

Model: Spatial Mohr-Coulomb
Weight Fn: Fill 2
Cohesion Fn: FILL 2
Phi: 0 °
Phi-B: 0 °

LACUSTRINE, EL -19/-20 to -33

Model: Spatial Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion Spatial Fn: Lacustrine
Phi: 0 °
Phi-B: 0 °

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

Model: Spatial Mohr-Coulomb
Unit Weight: 81 pcf
Cohesion: 200 psf
Phi: 0 °
Phi-B: 0 °

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

Model: Spatial Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion Fn: Lacustrine
Phi: 0 °
Phi-B: 0 °

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

Model: Spatial Mohr-Coulomb
Unit Weight: 102 pcf
Cohesion: 400 psf
Phi: 0 °
Phi-B: 0 °

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

Model: Spatial Mohr-Coulomb
Unit Weight: 98 pcf
Cohesion: 300 psf
Phi: 0 °
Phi-B: 0 °

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

Model: Spatial Mohr-Coulomb
Weight Fn: MARSH 2
Cohesion Fn: Marsh 2
Phi: 0 °
Phi-B: 0 °

BAY SOUND CLAY, EL. -41 TO -70

Model: Spatial Mohr-Coulomb
Unit Weight: 113 pcf
Cohesion Spatial Fn: Bay Sound
Phi: 0 °
Phi-B: 0 °

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (158.25266, -2.48537) ft
Left-Zone Right Coordinate: (199.06598, 7.5) ft
Left-Zone Increment: 15
Right Projection: Range
Right-Zone Left Coordinate: (205.77704, 7.48573) ft
Right-Zone Right Coordinate: (268.74841, 2.5) ft
Right-Zone Increment: 15
Radius Increments: 15

Slip Surface Limits

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

Cohesion Functions

Marsh

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

Lacustrine

Model: Spline Data Point Function
Function: Cohesion vs. Y
  Curve Fit to Data: 100 %
  Segment Curvature: 0 %
Y-Intercept: 300
Data Points: Y (ft), Cohesion (psf)
  Data Point: (-33, 365)

- Data Point: (-19, 300)

Marsh 2

- Model: Spline Data Point Function
- Function: Cohesion vs. X
  - Curve Fit to Data: 100 %
  - Segment Curvature: 0 %
- Y-Intercept: 300
- Data Points: X (ft), Cohesion (psf)
  - Data Point: (179.6, 300)
  - Data Point: (200, 370)
  - Data Point: (231.1, 300)

Bay Sound Clay

- Model: Spline Data Point Function
- Function: Cohesion vs. Y
  - Curve Fit to Data: 100 %
  - Segment Curvature: 0 %
- Y-Intercept: 500
- Data Points: Y (ft), Cohesion (psf)
  - Data Point: (-70, 820)
  - Data Point: (-41, 500)

FILL 2

- Model: Spline Data Point Function
- Function: Cohesion vs. X
  - Curve Fit to Data: 100 %
  - Segment Curvature: 0 %
- Y-Intercept: 330
- Data Points: X (ft), Cohesion (psf)
  - Data Point: (180, 330)
  - Data Point: (200, 400)
  - Data Point: (231, 330)

Shear/Normal Strength Functions

Sand

- Model: Spline Data Point Function
- Function: Shear Stress vs. Normal Stress
  - Curve Fit to Data: 100 %
  - Segment Curvature: 0 %
- Y-Intercept: 0
- Data Points: Normal Stress (psf), Shear Stress (psf)
  - Data Point: (-10000, 0)
  - Data Point: (0, 0)
  - Data Point: (10000, 6494)

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

Unit Weight Functions

Marsh 1

- Model: Spline Data Point Function
- Function: Unit Weight vs. X
  - Curve Fit to Data: 100 %
  - Segment Curvature: 0 %
- Y-Intercept: 81
- Data Points: X (ft), Unit Weight (pcf)
  - Data Point: (179.6, 81)
  - Data Point: (200, 82)
  - Data Point: (231, 81)

Fill 2

- Model: Spline Data Point Function
- Function: Unit Weight vs. X
  - Curve Fit to Data: 100 %
  - Segment Curvature: 0 %
- Y-Intercept: 106
- Data Points: X (ft), Unit Weight (pcf)
  - Data Point: (200, 106)
  - Data Point: (230, 102)

MARSH 2

- Model: Spline Data Point Function
- Function: Unit Weight vs. X
  - Curve Fit to Data: 100 %
  - Segment Curvature: 0 %
- Y-Intercept: 98
- Data Points: X (ft), Unit Weight (pcf)
  - Data Point: (179.6, 98)
  - Data Point: (200, 82)
  - Data Point: (231, 98)

Spatial Functions

Lacustrine

- Model: Linear Interpolation
- Limit Range By: Data Values
- Data Points: X (ft), Y (ft), Cohesion (psf)
  - Data Point: (179.6, -19, 300)
  - Data Point: (179.6, -33, 365)
  - Data Point: (200, -20, 315)
  - Data Point: (200, -33, 385)
  - Data Point: (231.1, -19, 300)
  - Data Point: (231.1, -33, 365)

Bay Sound

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

Regions

	Material	Points	Area (ft^2)
Region 1	FILL 1, EL. +7.5 TO -2	29,30,31,32,33,34,5,8,50,4	164.775
Region 2	FILL 2, EL. 2.5 to -7 (protected)	5,6,36,35	749.55
Region 3	LACUSTRINE, EL. -19 to -33 (protected)	38,41,42,39	1104.6
Region 4	BAY SOUND CLAY, EL. -41 TO -70 (protected)	40,43,9,49	2288.1
Region 5	FILL 1, EL. +7.5 TO -2	22,23,24,25,26,27,4,50,69	103.14
Region 6	LACUSTRINE, EL -19/-20 to -33	45,37,38,39,64,46	695.25
Region 7	BEACH SAND, EL. -33 to -41	56,55,46,64,39,42,43,40,65,47	1700
Region 8	BAY SOUND CLAY, EL. -41 TO -70	47,65,40,49,66,48	1493.5
Region 9	FILL 2, EL. 2.5 to -7 (protected)	13,14,15,16,17,18,51,52,44	138.55
Region 10	LACUSTRINE, EL. -19 to -33 (protected)	54,45,46,55	1149.4
Region 11	BAY SOUND CLAY, EL. -41 TO -70 (protected)	47,48,57,56	2380.9
Region 12	Sheet Pile	4,28,7,29	4.05
Region 13	FILL 2, EL. 2.5 to -7 (protected)	18,19,68,20,21,22,51	37
Region 14	MARSH 2, EL. -12 to -19 (protected)	61,53,1,67,60,45,54	568.45
Region 15	FILL 1, EL. +7.5 TO -2	69,50,8	0.5675
Region 16	FILL 2, EL. -2 to -7	51,69,8,52	9.6325
Region 17	FILL 2, EL. -2 to -7	22,69,51	36.26
Region 18	MARSH 1, EL. -7 to -12 (protected)	10,11,12,13,44,71	111.5
Region 19	MARSH 1, EL. -7 to -12	44,71,70,63	51
Region 20	MARSH 1, EL. -7 to -12 (protected)	67,2,3,10,71,60	130.7
Region 21	MARSH 1, EL. -7 to -12	63,70,58,35	77.75
Region 22	MARSH 1, EL. -7 to -12	71,60,62,70	51
Region 23	MARSH 2, EL. -12 to -19/-20	62,60,45,37	153
Region 24	MARSH 1, EL. -7 to -12	70,62,72,58	77.75
Region 25	MARSH 2, EL. -12 to -19/-20	62,37,38,72	233.25
Region 26	MARSH 1, EL. -7 to -12 (protected)	35,58,72,59,36	394.5
Region 27	MARSH 2, EL. -12 to -19 (protected)	72,38,41,59	552.3
Region 28	FILL 2, EL. -2 to -7	52,8,63,44	102
Region 29	FILL 2, EL. -2 to -7	8,5,35,63	225.475

Points

	X (ft)	Y (ft)
Point 1	105.7	-12.5
Point 2	122.9	-11.5
Point 3	130.4	-10.5
Point 4	200	7.5
Point 5	231.1	2.5
Point 6	310	2.5
Point 7	200.5	12.9
Point 8	200	-2
Point 9	310	-70
Point 10	134.3	-9.5
Point 11	137.9	-8.5
Point 12	141.1	-7.5
Point 13	145	-6.5
Point 14	148.6	-5.5
Point 15	152.9	-4.5
Point 16	155	-3.5
Point 17	158.2	-2.5
Point 18	161.8	-1.5
Point 19	165.4	-0.5
Point 20	169.6	0.5
Point 21	175.7	1.5
Point 22	179.6	2.5
Point 23	183.2	3.5
Point 24	186.8	4.5
Point 25	190.7	5.5
Point 26	194	6.5
Point 27	195.4	7.5
Point 28	200	12.9
Point 29	201	7.5
Point 30	205.7	7.5
Point 31	211.1	6.5
Point 32	216.8	5.5
Point 33	221.4	4.5
Point 34	227.1	3.5
Point 35	231.1	-7
Point 36	310	-7
Point 37	200	-20
Point 38	231.1	-19
Point 39	231.1	-33
Point 40	231.1	-41
Point 41	310	-19
Point 42	310	-33
Point 43	310	-41
Point 44	179.6	-7
Point 45	179.6	-19
Point 46	179.6	-33
Point 47	179.6	-41
Point 48	179.6	-70
Point 49	231.1	-70
Point 50	200	-1.5
Point 51	179.6	-1.5
Point 52	179.6	-2
Point 53	97.5	-12.5
Point 54	97.5	-19
Point 55	97.5	-33
Point 56	97.5	-41
Point 57	97.5	-70
Point 58	231.1	-9.5
Point 59	310	-12
Point 60	179.6	-12
Point 61	97.5	-17
Point 62	200	-12
Point 63	200	-7
Point 64	200	-33
Point 65	200	-41
Point 66	200	-70
Point 67	114.3	-12
Point 68	167.5	0
Point 69	197.73	-1.5
Point 70	200	-9.5
Point 71	179.6	-9.5
Point 72	231.1	-12

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	3.25	(220.798, 32.089)	34.78595	(179.551, 2.48748)	(259.775, 2.5)
2	2025	3.82	(220.798, 32.089)	52.791	(177.455, 1.9501)	(264.517, 2.5)

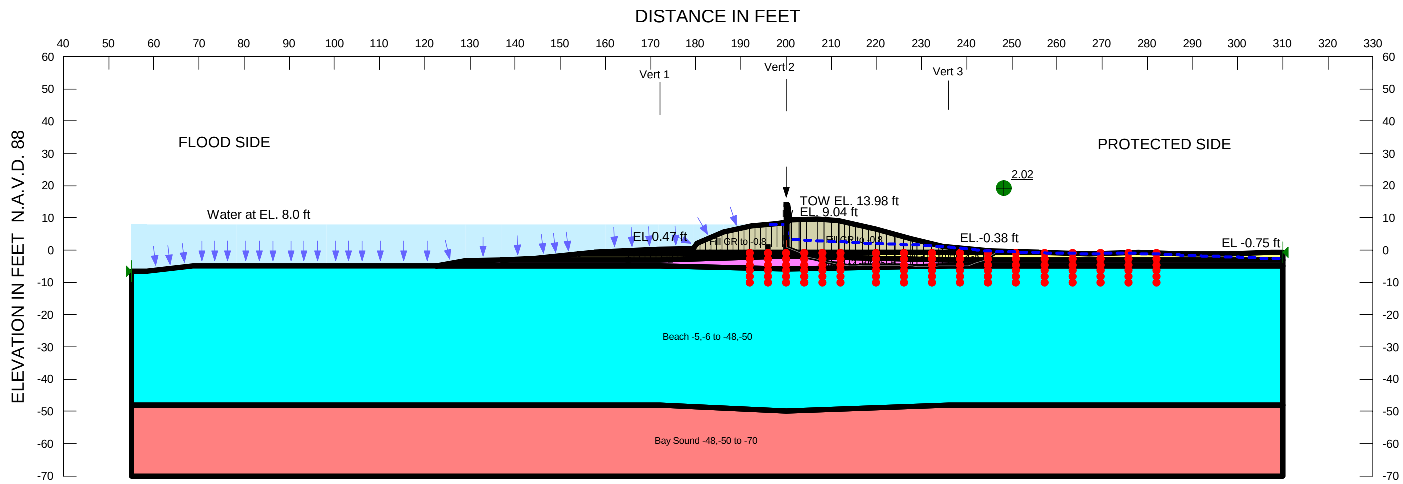
Slices of Slip Surface: Optimized

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	179.5756	2.4769475	344.37217	290.40831	0	400
2	Optimized	181.4	1.6901262	374.69481	403.31343	0	334.9
3	Optimized	183.90915	0.6079877	420.6892	546.34372	0	343.68
4	Optimized	185.70915	-0.4877625	472.86493	647.61372	0	349.98
5	Optimized	186.9535	-1.3888325	518.77753	755.79655	0	354.34
6	Optimized	187.45225	-1.75	537.32268	798.71719	0	356.08
7	Optimized	188.73405	-2.678195	585.47376	909.04099	0	360.57
8	Optimized	190.1853	-3.806346	646.91001	1022.4031	0	365.65
9	Optimized	192.2692	-5.628151	748.45308	1236.5788	0	372.94
10	Optimized	193.9192	-7.0706545	832.34084	1420.8016	0	319.33
11	Optimized	194.7	-7.75328	881.8125	1496.1989	0	325.83
12	Optimized	195.6787	-8.6088855	943.66663	1585.2497	0	333.99
13	Optimized	196.30975	-9.17626	983.12238	1623.6477	0	339.25
14	Optimized	197.19605	-9.990535	1037.5032	1687.2443	0	346.63
15	Optimized	198.55665	-11.240535	1113.1585	1784.9643	0	357.97
16	Optimized	199.69165	-12.28327	1154.5898	1866.2402	0	368.94
17	Optimized	200.00375	-12.56999	1168.0481	1839.5385	0	369.99
18	Optimized	200.25375	-12.76079	1174.8888	1897.6301	0	369.43
19	Optimized	200.75	-13.138345	1188.7416	1928.1795	0	368.31
20	Optimized	202.3497	-14.355435	1236.4821	2028.0193	0	364.71
21	Optimized	204.6997	-16.0484	1311.6514	2184.9484	0	359.42
22	Optimized	206.81105	-17.454315	1375.9019	2285.2288	0	354.67
23	Optimized	209.03315	-18.933985	1447.8585	2373.4421	0	349.67
24	Optimized	210.245	-19.740945	1487.9165	2430.9516	0	310.42
25	Optimized	210.7229	-19.93113	1496.5807	2489.9734	0	311.24
26	Optimized	212.47845	-20.50402	1521.5862	2519.1379	0	313.57
27	Optimized	215.23535	-21.40368	1563.1379	2565.1724	0	317.13
28	Optimized	216.7069	-21.86075	1584.6009	2623.9529	0	318.87
29	Optimized	217.90855	-21.9542	1585.8448	2609.1837	0	318.87
30	Optimized	220.12565	-22.12662	1588.4979	2580.9437	0	318.86
31	Optimized	221.3171	-22.19693	1588.7477	2603.3071	0	318.74
32	Optimized	222.81995	-21.90867	1566.6509	2549.2529	0	316.76
33	Optimized	225.6599	-21.363945	1524.9109	2447.4446	0	313.05
34	Optimized	227.08995	-21.08695	1503.846	2434.0586	0	311.2
35	Optimized	228.72535	-20.33467	1453.2354	2317.0048	0	307.05
36	Optimized	230.72535	-19.334485	1386.4436	2195.4237	0	301.68
37	Optimized	232.6566	-18.03265	1301.0725	2055.8431	0	300
38	Optimized	235.70905	-15.97502	1165.9652	1851.5696	0	300
39	Optimized	239.2067	-13.52442	1005.0322	1614.0541	0	300
40	Optimized	242.5895	-11.20774	852.74678	1366.6218	0	200
41	Optimized	245.2866	-9.4999985	740.1656	1226.6014	0	200
42	Optimized	247.9826	-7.7929585	627.68141	1085.7606	0	200
43	Optimized	251.3655	-5.13482	454.76726	906.42184	0	400
44	Optimized	254.97025	-1.8877925	245.10804	572.51042	0	400
45	Optimized	258.1737	1.0374025	56.418878	268.82817	0	400

Slices of Slip Surface: 2025

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	2025	178.5277	0.51456915	438.80198	386.42479	0	400
2	2025	179.83535	-1.2104814	514.59999	620.43866	0	330
3	2025	180.2795	-1.75	538.85346	684.62313	0	330.98
4	2025	181.84415	-3.484668	617.27382	892.28918	0	336.45
5	2025	184.25795	-5.984668	734.61441	1193.7484	0	344.9
6	2025	186.05795	-7.6487105	824.6565	1402.8698	0	253.82

7	2025	187.54105	-8.8987105	904.30456	1523.5384	0	266.18
8	2025	189.49105	-10.390945	1000.1235	1669.4695	0	282.43
9	2025	191.23105	-11.640945	1079.807	1794.5824	0	296.93
10	2025	192.88105	-12.69747	1147.568	1904.0938	0	345.57
11	2025	194.7	-13.7931	1214.9298	2038.8321	0	351.81
12	2025	196.565	-14.793425	1272.0533	2148.6965	0	358.21
13	2025	198.865	-15.914175	1329.1966	2243.2422	0	366.11
14	2025	200.25	-16.538395	1358.7372	2264.7154	0	369.44
15	2025	200.75	-16.74666	1367.2946	2284.2206	0	368.31
16	2025	202.175	-17.292405	1389.8965	2336.0039	0	365.1
17	2025	204.525	-18.116365	1424.328	2416.7752	0	359.82
18	2025	206.87235	-18.817905	1451.87	2465.6244	0	354.53
19	2025	209.21705	-19.402265	1473.6447	2482.6353	0	349.25
20	2025	210.7447	-19.73485	1485.0826	2492.5459	0	310.23
21	2025	212.525	-20.029955	1493.7905	2498.3375	0	311.15
22	2025	215.375	-20.40335	1503.7169	2497.6555	0	312.08
23	2025	217.95	-20.6127	1505.9772	2478.5585	0	312.22
24	2025	220.25	-20.686775	1501.919	2444.1291	0	311.77
25	2025	222.825	-20.64393	1490.443	2398.7546	0	310.65
26	2025	225.675	-20.45688	1469.8921	2339.5572	0	308.73
27	2025	229.1	-20.005875	1432.1273	2229.0209	0	305.38
28	2025	232.59755	-19.34357	1381.7928	2121.8123	0	301.6
29	2025	235.6689	-18.5377	1324.1014	2048.9904	0	300
30	2025	238.81655	-17.503575	1252.3511	1954.923	0	300
31	2025	241.9642	-16.242505	1166.8168	1838.766	0	300
32	2025	245.11185	-14.73604	1066.1739	1698.7618	0	300
33	2025	248.2595	-12.95941	948.86379	1532.6026	0	300
34	2025	251.44485	-10.849777	810.83961	1334.7994	0	200
35	2025	254.66795	-8.3497765	648.4831	1138.7938	0	200
36	2025	257.6525	-5.6595495	474.92965	951.527	0	400
37	2025	260.39845	-2.758887	288.91548	669.61316	0	400
38	2025	263.14435	0.6506625	71.12047	338.82189	0	400



Name: Fill -0.8 to EL-2,-3 Model: Spatial Mohr-Coulomb Unit Weight: 109 pcf Cohesion Spatial Fn: Fill -0.8 to -2,-3 Phi: 0 ° Phi-B: 0 °
Name: Marsh -2,-3 to-5,-6 Model: Spatial Mohr-Coulomb Unit Weight: 101 pcf Cohesion Spatial Fn: Marsh -2,-3 to -5,-6 Phi: 0 ° Phi-B: 0 °
Name: Beach -5,-6 to -48,-50 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: New Function Phi-B: 0 °
Name: Bay Sound -48,-50 to -70 Model: Spatial Mohr-Coulomb Unit Weight: 102 pcf Cohesion Spatial Fn: Bay -48,-50 to -70 Phi: 0 ° Phi-B: 0 °
Name: IW Model: Undrained (Phi=0) Unit Weight: 0.01 pcf Cohesion: 19999 psf
Name: Fill GR to -0.8 Model: Spatial Mohr-Coulomb Unit Weight: 109 pcf Cohesion Spatial Fn: Fill -0.8 to -2,-3 Phi: 0 ° Phi-B: 0 °

Name: Global Stability (Block)
File Name: Orleans Canal Reach 13A.gsz Directory: Y:\F&MHOME\Middleton\Outfall Canals\Orleans final edits\final\Appendix A and Appendix B\
Last Edited By: Jamerson, James MVK

GENERAL NOTES

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

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

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

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

ETL 1110-2-575 ANALYSIS

Global Stability (Block)

File Information

- Created By: Vicky Curtis
- Revision Number: 296
- Last Edited By: Jamerson, James MVK
- Date: 6/3/2013
- Time: 10:54:59 AM
- File Name: Orleans Canal Reach 13A.gsz
- Directory: Y:\F&MHOME\Middleton\Outfall Canals\Orleans final edits\final\Appendix A and Appendix B\
- Last Solved Date: 6/3/2013
- Last Solved Time: 10:57:48 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 (Block)

- Kind: SLOPE/W
- Parent: Steady-State GAP
- Method: Spencer
- Settings
  - PWP Conditions Source: Parent Analysis
- Slip Surface
  - Direction of movement: Left to Right
  - Use Passive Mode: No
  - Slip Surface Option: Block
  - Critical slip surfaces saved: 1
  - Optimize Critical Slip Surface Location: Yes
  - Tension Crack
    - Tension Crack Option: Tension Crack Line
    - Percentage Wet: 1
    - Tension Crack Fluid Unit Weight: 62.4 pcf
- FOS Distribution
  - FOS Calculation Option: Constant
- Restrict Block Crossing: Yes
- Advanced
  - Number of Slices: 30
  - Optimization Tolerance: 0.01
  - Minimum Slip Surface Depth: 0.1 ft
  - Optimization Maximum Iterations: 7000
  - Optimization Convergence Tolerance: 1e-007
  - Starting Optimization Points: 8
  - Ending Optimization Points: 16
  - Complete Passes per Insertion: 1
  - Driving Side Maximum Convex Angle: 5 °
  - Resisting Side Maximum Convex Angle: 1 °

Materials

Fill -0.8 to EL-2,-3

- Model: Spatial Mohr-Coulomb
- Unit Weight: 109 pcf
- Cohesion Spatial Fn: Fill -0.8 to -2,-3
- Phi: 0 °
- Phi-B: 0 °

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

- Model: Spatial Mohr-Coulomb
- Unit Weight: 101 pcf
- Cohesion Spatial Fn: Marsh -2,-3 to -5,-6
- Phi: 0 °
- Phi-B: 0 °

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

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

Bay Sound -48,-50 to -70

- Model: Spatial Mohr-Coulomb
- Unit Weight: 102 pcf
- Cohesion Spatial Fn: Bay -48,-50 to -70
- Phi: 0 °
- Phi-B: 0 °

IW

- Model: Undrained (Phi=0)
- Unit Weight: 0.01 pcf
- Cohesion: 19999 psf

Fill GR to -0.8

- Model: Spatial Mohr-Coulomb
- Unit Weight: 109 pcf
- Cohesion Spatial Fn: Fill -0.8 to -2,-3
- Phi: 0 °
- Phi-B: 0 °

Slip Surface Limits

- Left Coordinate: (55, -6.48) ft
- Right Coordinate: (310, -0.75) ft

Slip Surface Block

- Left Grid
  - Upper Left: (192, -1) ft
  - Lower Left: (192, -10) ft
  - Lower Right: (212, -10) ft
  - X Increments: 5
  - Y Increments: 5
  - Starting Angle: 115 °
  - Ending Angle: 165 °
  - Angle Increments: 4
- Right Grid
  - Upper Left: (220, -1) ft
  - Lower Left: (220, -10) ft
  - Lower Right: (282, -10) ft
  - X Increments: 10
  - Y Increments: 5
  - Starting Angle: 0 °
  - Ending Angle: 45 °
  - Angle Increments: 4

Reinforcements

Reinforcement 1

- Type: Pile
- Outside Point: (200, 14) ft
- Inside Point: (200, 3.7) ft
- Slip Surface Intersection: (200, 0.99912) ft
- Total Length: 10.3 ft
- Reinforcement Direction: 90 °
- Applied Load Option: Variable
- F of S Dependent: No
- Pile Spacing: 1 ft
- Shear Capacity: 0 lbs
- Shear Safety Factor: 1
- Shear Load Used: 0 lbs
- Shear Option: Parallel to Slip
- Resisting Force Used: 0 lbs/ft

Tension Crack Line

	X (ft)	Y (ft)
	165	-3
	174.5	-3
	196	1
	200	1

Shear/Normal Strength Functions

New Function

- Model: Spline Data Point Function
- Function: Shear Stress vs. Normal Stress
  - Curve Fit to Data: 100 %
  - Segment Curvature: 0 %
- Y-Intercept: 0
- Data Points: Normal Stress (psf), Shear Stress (psf)
  - Data Point: (-10000, 0)
  - Data Point: (0, 0)
  - Data Point: (10000, 6494)
- Estimation Properties
  - Intact Rock Param.: 10
  - Geological Strength: 100
  - Disturbance Factor: 0
  - SigmaC: 600000 psf
  - Sigma3: 300000 psf
  - Num. Points: 20

Spatial Functions

Fill -0.8 to -2,-3

- Model: Linear Interpolation
- Limit Range By: Data Values
- Data Points: X (ft), Y (ft), Cohesion (psf)

Data Point: (172, -0.8, 600)
Data Point: (172, -3, 600)
Data Point: (200, -0.8, 550)
Data Point: (200, -2, 550)
Data Point: (236, -0.8, 600)
Data Point: (236, -3, 600)

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

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (172, -3, 190)
Data Point: (172, -5, 190)
Data Point: (200, -2, 200)
Data Point: (200, -6, 200)
Data Point: (236, -3, 190)
Data Point: (236, -5, 190)

Bay -48,-50 to -70

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (172, -48, 780)
Data Point: (172, -70, 980)
Data Point: (200, -50, 830)
Data Point: (200, -70, 1000)
Data Point: (236, -48, 780)
Data Point: (236, -70, 980)
Data Point: (50, -48, 780)
Data Point: (310, -48, 780)

Regions

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

Points

	X (ft)	Y (ft)
Point 1	55	-6.48
Point 2	58.4	-6.48
Point 3	68.7	-5
Point 4	78.4	-5
Point 5	88.3	-5
Point 6	98.2	-5
Point 7	108.2	-5
Point 8	122.5	-5
Point 9	129.03	-3.27
Point 10	144.52	-2.69
Point 11	159.96	-0.46
Point 12	171.67	0.1
Point 13	179.42	0.47
Point 14	180.22	2.02
Point 15	186.18	5.49
Point 16	192.31	7.58
Point 17	197.81	8.13
Point 18	199.07	8.32
Point 19	199.3	8.34
Point 20	200	8.34
Point 21	200	13.98
Point 22	200.43	13.94
Point 23	200.79	9.42
Point 24	201.16	9.42
Point 25	206.93	9.53
Point 26	211.58	9.04
Point 27	219.73	6.48
Point 28	227.68	3.46
Point 29	234.71	1.15
Point 30	234.74	1.08
Point 31	245.25	-0.38
Point 32	255.96	-0.8
Point 33	267.15	-1.17
Point 34	277.99	-0.82
Point 35	310	-0.75
Point 36	154	-1.3
Point 37	200	-1.3
Point 38	137	-3
Point 39	310	-3
Point 40	236	-3
Point 41	200	-2
Point 42	172	-3
Point 43	310	-5
Point 44	236	-5
Point 45	200	-6
Point 46	172	-5
Point 47	310	-48
Point 48	236	-48
Point 49	200	-50
Point 50	172	-48
Point 51	55	-48
Point 52	310	-70
Point 53	236	-70
Point 54	200.5	-70
Point 55	171	-70
Point 56	55	-70
Point 57	287.93	-1.16
Point 58	297.84	-1.15
Point 59	298.05	-1.16
Point 60	307.55	-0.75
Point 61	157.5	-0.8
Point 62	200	-0.8

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	2.02	(221.136, 1.335)	17.69697	(199.999, 8.34)	(246.995, -0.448439)
2	4584	2.32	(221.136, 1.335)	17.964	(197.243, 8.07325)	(244.973, -0.341551)

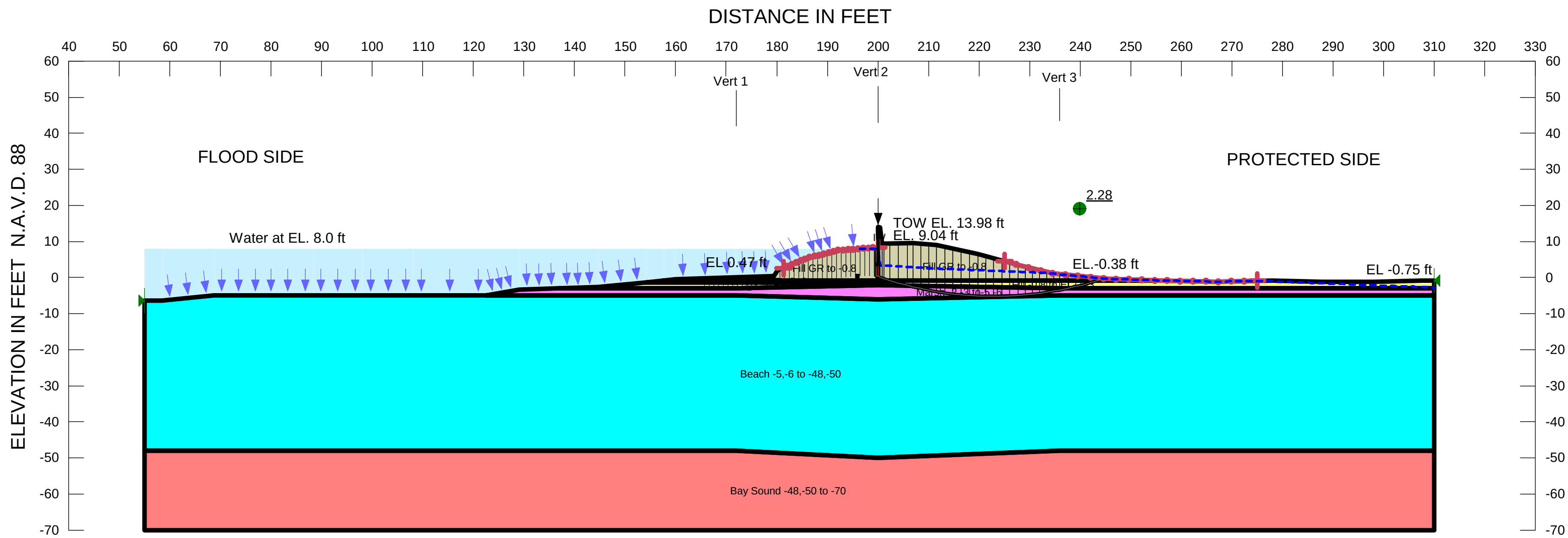
Slices of Slip Surface: Optimized

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	199.9993	0.9995619	436.79561	-100364.78	0	550
2	Optimized	200.215	0.86098795	327.33141	659.22159	0	550.3
3	Optimized	200.61	0.6072035	196.79598	741.03763	0	550.85
4	Optimized	200.975	0.37269385	220.38668	790.49793	0	551.35
5	Optimized	201.9801	-0.2730836	237.57804	858.43646	0	552.75
6	Optimized	203.0011	-0.929065	260.0616	927.8162	0	554.17
7	Optimized	203.8759	-1.578405	287.55215	952.45814	0	555.38
8	Optimized	205.7399	-2.5024195	329.30709	1244.8333	0	198.41
9	Optimized	207.705	-3.169078	361.08988	1304.6451	0	197.86
10	Optimized	209.255	-3.6949155	387.55669	1339.2865	0	197.43
11	Optimized	210.805	-4.220753	414.56725	1373.9891	0	197
12	Optimized	211.64945	-4.507231	429.41456	1391.3359	0	196.76
13	Optimized	212.30655	-4.6191225	434.134	1421.0301	0	196.58
14	Optimized	213.48185	-4.7957875	441.16806	1399.238	0	196.26
15	Optimized	214.77705	-4.8631025	441.06595	1401.1635	0	195.9
16	Optimized	216.19215	-4.8210675	433.79773	1348.6825	0	195.5
17	Optimized	217.6073	-4.7790325	426.54363	1296.131	0	195.11
18	Optimized	219.02245	-4.7369975	419.30366	1243.5794	0	194.72
19	Optimized	220.18045	-4.7026	413.38186	1197.385	0	194.39
20	Optimized	221.4469	-4.6790825	407.7944	1139.2976	0	194.04
21	Optimized	223.0789	-4.6588075	401.22023	1069.941	0	193.59
22	Optimized	224.00315	-4.64919	397.62127	1027.6556	0	193.33
23	Optimized	225.00355	-4.7318495	399.51402	979.05657	0	193.05
24	Optimized	226.78785	-4.896128	403.94525	922.63371	0	192.56

25	Optimized	227.82365	-4.9914935	406.51562	890.5288	0	192.27
26	Optimized	228.47185	-5.053585	408.2929	872.47283	0	192.09
27	Optimized	229.77625	-5.0956735	406.70232	847.00999	0	191.73
28	Optimized	231.37595	-5.082121	400.70761	787.12545	0	191.28
29	Optimized	232.97565	-5.0685685	394.73166	727.30341	0	190.84
30	Optimized	234.25775	-5.0577065	389.96314	679.38227	187.95098	-6.2969e-006
31	Optimized	235.37	-5.0482835	385.86717	651.11167	172.25179	4.2807e-006
32	Optimized	236.7152	-5.0368865	380.91383	629.33377	161.32579	-5.4048e-006
33	Optimized	238.14565	-5.024768	375.6289	605.62147	149.35892	3.7116e-006
34	Optimized	239.5761	-5.0126495	370.30202	581.90217	137.41475	3.4149e-006
35	Optimized	241.1501	-4.563865	336.7064	588.39785	0	190
36	Optimized	242.86125	-3.68171	274.59547	468.02764	0	190
37	Optimized	243.8559	-3.12114	235.1705	439.39449	0	190
38	Optimized	244.6241	-2.4671275	180.35669	556.18545	0	600
39	Optimized	245.91615	-1.3671275	82.122462	413.44707	0	600
40	Optimized	246.78875	-0.6242196	15.599876	322.00641	0	600

Slices of Slip Surface: 4584

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	4584	197.52625	0.8522891	339.67438	448.63214	0	554.42
2	4584	198.44	0.37662098	380.07717	720.59083	0	552.79
3	4584	199.185	-0.01120145	435.90806	772.43232	0	551.46
4	4584	199.65	-0.25326513	482.2551	798.98131	0	550.63
5	4584	200.215	-0.5473855	462.00891	860.64811	0	550.3
6	4584	200.56515	-0.7296537	386.41895	929.71599	0	550.78
7	4584	200.74515	-0.8233558	378.60942	965.23112	0	551.03
8	4584	200.975	-0.9430163	375.97275	984.12658	0	551.35
9	4584	202.16745	-1.563756	306.4077	1050.796	0	553.01
10	4584	204.11365	-2.5768915	343.72684	1221.9267	0	198.86
11	4584	205.9912	-3.5542925	392.3299	1320.9942	0	198.34
12	4584	207.465	-4.3214965	432.9192	1391.7777	0	197.93
13	4584	208.895	-4.6	444.70391	1505.4749	0	197.53
14	4584	210.685	-4.6	438.44134	1485.3073	0	197.03
15	4584	212.395	-4.6	432.65031	1447.4847	0	196.56
16	4584	214.025	-4.6	427.21472	1392.0245	0	196.1
17	4584	215.655	-4.6	421.82822	1336.5644	0	195.65
18	4584	217.285	-4.6	416.47239	1281.1043	0	195.2
19	4584	218.915	-4.6	411.1411	1225.6442	0	194.75
20	4584	220.525	-4.6	405.8805	1165.1572	0	194.3
21	4584	222.115	-4.6	400.7044	1099.6855	0	193.86
22	4584	223.705	-4.6	395.5283	1034.1509	0	193.42
23	4584	225.295	-4.6	390.36478	968.67925	0	192.97
24	4584	226.885	-4.6	385.20755	903.14465	0	192.53
25	4584	228.5625	-4.6	379.76771	838.18697	0	192.07
26	4584	230.3275	-4.6	374.05099	773.71105	0	191.58
27	4584	232.0925	-4.6	368.35127	709.23513	0	191.09
28	4584	233.8575	-4.6	362.64589	644.75921	0	190.6
29	4584	235.37	-4.6	357.78571	603.09524	0	190.18
30	4584	236.65	-4.6	353.67692	583.84615	0	190
31	4584	237.95	-4.6	349.47692	564.16923	0	190
32	4584	239.19865	-4.2	320.09872	590.75865	0	190
33	4584	240.39595	-3.4	265.29172	486.3045	0	190
34	4584	241.8177	-2.45	192.68688	496.89184	0	600
35	4584	243.46395	-1.35	96.613648	343.98378	0	600
36	4584	244.63015	-0.57077545	23.53165	235.66794	0	600



Name: Fill -0.8 to EL-2,-3 Model: Spatial Mohr-Coulomb Unit Weight: 109 pcf Cohesion Spatial Fn: Fill -0.8 to -2,-3 Phi: 0 ° Phi-B: 0 °
Name: Marsh -2,-3 to-5,-6 Model: Spatial Mohr-Coulomb Unit Weight: 101 pcf Cohesion Spatial Fn: Marsh -2,-3 to -5,-6 Phi: 0 ° Phi-B: 0 °
Name: Beach -5,-6 to -48,-50 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: New Function Phi-B: 0 °
Name: Bay Sound -48,-50 to -70 Model: Spatial Mohr-Coulomb Unit Weight: 102 pcf Cohesion Spatial Fn: Bay -48,-50 to -70 Phi: 0 ° Phi-B: 0 °
Name: IW Model: Undrained (Phi=0) Unit Weight: 0.01 pcf Cohesion: 19999 psf
Name: Fill GR to -0.8 Model: Spatial Mohr-Coulomb Unit Weight: 109 pcf Cohesion Spatial Fn: Fill -0.8 to -2,-3 Phi: 0 ° Phi-B: 0 °

Name: Global Stability (Entry/Exit)
File Name: Orleans Canal Reach 13A.gsz Directory: Y:\F&MHOME\Middleton\Outfall Canals\Orleans final edits\final\Appendix A and Appendix B\
Last Edited By: Jamerson, James MVK

GENERAL NOTES

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

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

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 13A
REMEDIATION OF CANAL WALLS AND LEVEES
PROTECTED SIDE STABILITY ANALYSIS
CASE: Name: Global Stability (Entry/Exit)
STA. 4+70 TO STA. 7+00
ORLEANS PARISH, LOUISIANA

ETL 1110-2-575 ANALYSIS

Global Stability (Entry/Exit)

File Information

Created By: Vicky Curtis
Revision Number: 291
Last Edited By: Jamerson, James MVK
Date: 6/3/2013
Time: 10:37:33 AM
File Name: Orleans Canal Reach 13A.gsz
Directory: Y:\F&MHOME\Middleton\Outfall Canals\Orleans final edits\final\Appendix A and Appendix B\
Last Solved Date: 6/3/2013
Last Solved Time: 10:39:38 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: Steady-State GAP
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
FOS Calculation Option: Constant
Advanced
Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 7000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

Fill -0.8 to EL-2,-3

Model: Spatial Mohr-Coulomb
Unit Weight: 109 pcf
Cohesion Spatial Fn: Fill -0.8 to -2,-3
Phi: 0 °
Phi-B: 0 °

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

Model: Spatial Mohr-Coulomb
Unit Weight: 101 pcf
Cohesion Spatial Fn: Marsh -2,-3 to -5,-6
Phi: 0 °
Phi-B: 0 °

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

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

Bay Sound -48,-50 to -70

Model: Spatial Mohr-Coulomb
Unit Weight: 102 pcf
Cohesion Spatial Fn: Bay -48,-50 to -70
Phi: 0 °
Phi-B: 0 °

IW

Model: Undrained (Phi=0)
Unit Weight: 0.01 pcf
Cohesion: 19999 psf

Fill GR to -0.8

Model: Spatial Mohr-Coulomb
Unit Weight: 109 pcf
Cohesion Spatial Fn: Fill -0.8 to -2,-3
Phi: 0 °
Phi-B: 0 °

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (181.31005, 2.65464) ft
Left-Zone Right Coordinate: (200, 8.4) ft
Left-Zone Increment: 20
Right Projection: Range
Right-Zone Left Coordinate: (225, 4.47806) ft
Right-Zone Right Coordinate: (275, -0.91654) ft
Right-Zone Increment: 20
Radius Increments: 25

Slip Surface Limits

Left Coordinate: (55, -6.48) ft
Right Coordinate: (310, -0.75) ft

Reinforcements

Reinforcement 1

Type: Pile
Outside Point: (200, 13) ft
Inside Point: (200, 3.7) ft
Slip Surface Intersection: (200, 0.35649) ft
Total Length: 9.3 ft
Reinforcement Direction: 90 °
Applied Load Option: Variable
F of S Dependent: No
Pile Spacing: 1 ft
Shear Capacity: 0 lbs
Shear Safety Factor: 1
Shear Load Used: 0 lbs
Shear Option: Parallel to Slip
Resisting Force Used: 0 lbs/ft

Tension Crack Line

	X (ft)	Y (ft)
	165.5	-3
	174.5	-3
	196	0.5
	200	0.5

Shear/Normal Strength Functions

New Function

Model: Spline Data Point Function
Function: Shear Stress vs. Normal Stress
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
Data Point: (-10000, 0)
Data Point: (0, 0)
Data Point: (10000, 6494)
Estimation Properties
Intact Rock Param.: 10
Geological Strength: 100
Disturbance Factor: 0
SigmaC: 600000 psf
Sigma3: 300000 psf
Num. Points: 20

Spatial Functions

Fill -0.8 to -2,-3

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (172, -0.8, 600)
Data Point: (172, -3, 600)
Data Point: (200, -0.8, 550)
Data Point: (200, -2, 550)
Data Point: (236, -0.8, 600)
Data Point: (236, -3, 600)

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

Model: Linear Interpolation

Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (172, -3, 190)
Data Point: (172, -5, 190)
Data Point: (200, -2, 200)
Data Point: (200, -6, 200)
Data Point: (236, -3, 190)
Data Point: (236, -5, 190)

Bay -48,-50 to -70

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (172, -48, 780)
Data Point: (172, -70, 980)
Data Point: (200, -50, 830)
Data Point: (200, -70, 1000)
Data Point: (236, -48, 780)
Data Point: (236, -70, 980)
Data Point: (50, -48, 780)
Data Point: (310, -48, 780)

Regions

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

Points

	X (ft)	Y (ft)
Point 1	55	-6.48
Point 2	58.4	-6.48
Point 3	68.7	-5
Point 4	78.4	-5
Point 5	88.3	-5
Point 6	98.2	-5
Point 7	108.2	-5
Point 8	122.5	-5
Point 9	129.03	-3.27
Point 10	144.52	-2.69
Point 11	159.96	-0.46
Point 12	171.67	0.1
Point 13	179.42	0.47
Point 14	180.22	2.02
Point 15	186.18	5.49
Point 16	192.31	7.58
Point 17	197.81	8.13
Point 18	199.07	8.32
Point 19	199.3	8.34
Point 20	200	8.34
Point 21	200	13.98
Point 22	200.43	13.94
Point 23	200.79	9.42
Point 24	201.16	9.42
Point 25	206.93	9.53
Point 26	211.58	9.04
Point 27	219.73	6.48
Point 28	227.68	3.46
Point 29	234.71	1.15
Point 30	234.74	1.08
Point 31	245.25	-0.38
Point 32	255.96	-0.8
Point 33	267.15	-1.17
Point 34	277.99	-0.82
Point 35	310	-0.75
Point 36	154	-1.3
Point 37	200	-1.3
Point 38	137	-3
Point 39	310	-3
Point 40	236	-3
Point 41	200	-2
Point 42	172	-3
Point 43	310	-5
Point 44	236	-5
Point 45	200	-6
Point 46	172	-5
Point 47	310	-48
Point 48	236	-48
Point 49	200	-50
Point 50	172	-48
Point 51	55	-48
Point 52	310	-70
Point 53	236	-70
Point 54	200.5	-70
Point 55	171	-70
Point 56	55	-70
Point 57	287.93	-1.16
Point 58	297.84	-1.15
Point 59	298.05	-1.16
Point 60	307.55	-0.75
Point 61	157.5	-0.8
Point 62	200	-0.8

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	2.28	(222.957, 45.118)	50.30572	(199.722, 8.34)	(244.607, -0.290631)
2	5677	2.28	(222.957, 45.118)	50.306	(199.722, 8.34)	(244.607, -0.290631)

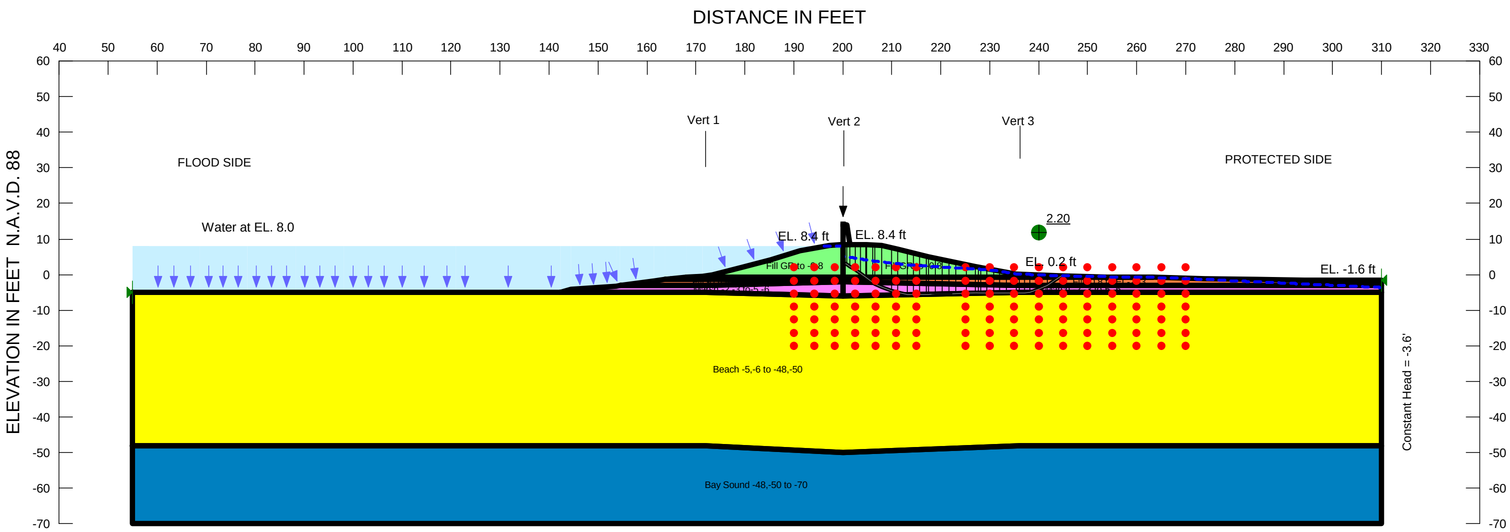
Slices of Slip Surface: Optimized

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	199.86115	0.4282474	463.2943	220.68626	0	550.25
2	Optimized	200.215	0.24752385	383.34085	779.97832	0	550.3
3	Optimized	200.61	0.0493002	273.65078	860.57149	0	550.85
4	Optimized	200.975	-0.12982895	273.36632	908.12558	0	551.35
5	Optimized	201.7853	-0.5098527	254.426	955.77483	0	552.48
6	Optimized	203.2505	-1.157686	269.97067	1038.433	0	554.51
7	Optimized	204.93035	-1.837829	294.3831	1126.7152	0	556.85
8	Optimized	206.35015	-2.363097	317.68835	1236.861	0	198.24
9	Optimized	207.705	-2.812526	339.10903	1279.5512	0	197.86
10	Optimized	209.255	-3.2785665	361.79169	1314.9572	0	197.43
11	Optimized	210.805	-3.690946	381.73941	1345.0029	0	197
12	Optimized	212.395	-4.0589505	399.09476	1352.0492	0	196.56
13	Optimized	214.025	-4.3810685	413.62002	1335.9077	0	196.1
14	Optimized	215.655	-4.647728	424.79487	1313.9669	0	195.65
15	Optimized	217.285	-4.8598175	432.62124	1286.4036	0	195.2
16	Optimized	218.915	-5.01803	437.12736	1253.1722	0	194.75
17	Optimized	220.525	-5.122232	438.35458	1209.2129	0	194.3
18	Optimized	222.115	-5.1740385	436.4042	1154.6808	0	193.86
19	Optimized	223.705	-5.1755375	431.32961	1094.7216	0	193.42
20	Optimized	225.295	-5.1267335	423.13347	1029.3896	0	192.97
21	Optimized	226.885	-5.02748	411.80159	958.63613	0	192.53
22	Optimized	228.386	-4.8885715	398.3043	890.23696	0	192.11
23	Optimized	229.798	-4.715018	382.93173	824.77279	0	191.72
24	Optimized	231.21	-4.5006845	365.00731	754.92736	0	191.33
25	Optimized	232.622	-4.245039	344.50045	680.52165	0	190.94
26	Optimized	234.034	-3.9474355	321.29837	601.55451	0	190.55
27	Optimized	235.37	-3.627634	296.86789	536.49108	0	190.17
28	Optimized	236.8151	-3.233606	267.23418	477.62257	0	190
29	Optimized	238.36445	-2.763739	230.6347	480.80713	0	600

30	Optimized	239.83295	-2.26598	188.82425	412.78963	0	600
31	Optimized	241.30145	-1.7168955	140.2169	338.98327	0	600
32	Optimized	242.76995	-1.1146545	83.690782	259.1654	0	600
33	Optimized	244.05545	-0.5453155	27.053599	184.50464	0	600

Slices of Slip Surface: 5677

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	5677	199.86115	0.4282474	463.2943	220.68626	0	550.25
2	5677	200.215	0.24752385	383.34085	779.97832	0	550.3
3	5677	200.61	0.0493002	273.65078	860.57149	0	550.85
4	5677	200.975	-0.12982895	273.36632	908.12558	0	551.35
5	5677	201.7853	-0.5098527	254.426	955.77483	0	552.48
6	5677	203.2505	-1.157686	269.97067	1038.433	0	554.51
7	5677	204.93035	-1.837829	294.3831	1126.7152	0	556.85
8	5677	206.35015	-2.363097	317.68835	1236.861	0	198.24
9	5677	207.705	-2.812526	339.10903	1279.5512	0	197.86
10	5677	209.255	-3.2785665	361.79169	1314.9572	0	197.43
11	5677	210.805	-3.690946	381.73941	1345.0029	0	197
12	5677	212.395	-4.0589505	399.09476	1352.0492	0	196.56
13	5677	214.025	-4.3810685	413.62002	1335.9077	0	196.1
14	5677	215.655	-4.647728	424.79487	1313.9669	0	195.65
15	5677	217.285	-4.8598175	432.62124	1286.4036	0	195.2
16	5677	218.915	-5.01803	437.12736	1253.1722	0	194.75
17	5677	220.525	-5.122232	438.35458	1209.2129	0	194.3
18	5677	222.115	-5.1740385	436.4042	1154.6808	0	193.86
19	5677	223.705	-5.1755375	431.32961	1094.7216	0	193.42
20	5677	225.295	-5.1267335	423.13347	1029.3896	0	192.97
21	5677	226.885	-5.02748	411.80159	958.63613	0	192.53
22	5677	228.386	-4.8885715	398.3043	890.23696	0	192.11
23	5677	229.798	-4.715018	382.93173	824.77279	0	191.72
24	5677	231.21	-4.5006845	365.00731	754.92736	0	191.33
25	5677	232.622	-4.245039	344.50045	680.52165	0	190.94
26	5677	234.034	-3.9474355	321.29837	601.55451	0	190.55
27	5677	235.37	-3.627634	296.86789	536.49108	0	190.17
28	5677	236.8151	-3.233606	267.23418	477.62257	0	190
29	5677	238.36445	-2.763739	230.6347	480.80713	0	600
30	5677	239.83295	-2.26598	188.82425	412.78963	0	600
31	5677	241.30145	-1.7168955	140.2169	338.98327	0	600
32	5677	242.76995	-1.1146545	83.690782	259.1654	0	600
33	5677	244.05545	-0.5453155	27.053599	184.50464	0	600



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

GENERAL NOTES

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

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

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

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

ETL 1110-2-575 ANALYSIS

Name: Global Stabilit (Block)
File Name: Orleans Canal Reach 13B.gsz Directory: Y:\F&MHOME\Middleton\Outfall Canals\Orleans final edits\final\Appendix A and Appendix B\
Last Edited By: Reves, Ryan D MVK

Global Stabilit (Block)

File Information

Created By: Vicky Curtis
Revision Number: 361
Last Edited By: Reves, Ryan D MVK
Date: 6/17/2013
Time: 12:31:22 PM
File Name: Orleans Canal Reach 13B.gsz
Directory: Y:\F&MHOME\Middleton\Outfall Canals\Orleans final edits\final\Appendix A and Appendix B\
Last Solved Date: 6/17/2013
Last Solved Time: 4:29:46 PM

Project Settings

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

Analysis Settings

Global Stabilit (Block)

Kind: SLOPE/W
Parent: Steady-State GAP
Method: Spencer
Settings
- PWP Conditions Source: Parent Analysis

Slip Surface
- Direction of movement: Left to Right
- Use Passive Mode: No
- Slip Surface Option: Block
- Critical slip surfaces saved: 1
- Optimize Critical Slip Surface Location: Yes
- Tension Crack
  - Tension Crack Option: Tension Crack Line
  - Percentage Wet: 1
  - Tension Crack Fluid Unit Weight: 62.4 pcf

FOS Distribution
- FOS Calculation Option: Constant

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

Materials

Fill -0.8 to EL-2,-3

Model: Spatial Mohr-Coulomb
Unit Weight: 109 pcf
Cohesion Spatial Fn: Fill -0.8 to -2,-3
Phi: 0 °
Phi-B: 0 °

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

Model: Spatial Mohr-Coulomb
Unit Weight: 101 pcf
Cohesion Spatial Fn: Marsh -2,-3 to -5,-6
Phi: 0 °
Phi-B: 0 °

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

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

Bay Sound -48,-50 to -70

Model: Spatial Mohr-Coulomb
Unit Weight: 102 pcf
Cohesion Spatial Fn: Bay -48,-50 to -70
Phi: 0 °
Phi-B: 0 °

Fill GR to -0.8

Model: Spatial Mohr-Coulomb
Unit Weight: 109 pcf
Cohesion Spatial Fn: Fill -0.8 to -2,-3
Phi: 0 °
Phi-B: 0 °

Slip Surface Limits

Left Coordinate: (55, -5) ft
Right Coordinate: (310, -1.6) ft

Slip Surface Block

Left Grid
- Upper Left: (190, 2) ft
- Lower Left: (190, -20) ft
- Lower Right: (215, -20) ft
- X Increments: 6
- Y Increments: 6
- Starting Angle: 125 °
- Ending Angle: 145 °
- Angle Increments: 4

Right Grid
- Upper Left: (225, 2) ft
- Lower Left: (225, -20) ft
- Lower Right: (270, -20) ft
- X Increments: 9
- Y Increments: 6
- Starting Angle: 25 °
- Ending Angle: 45 °
- Angle Increments: 4

Reinforcements

Reinforcement 1

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

Tension Crack Line

	X (ft)	Y (ft)
	185.2	-0.8
	191.2	1.7
	197.3	3.3
	199.4	3.4
	215	3.4

Shear/Normal Strength Functions

Beach Sand

Model: Spline Data Point Function
Function: Shear Stress vs. Normal Stress
- Curve Fit to Data: 100 %
- Segment Curvature: 0 %

Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
- Data Point: (-10000, 0)
- Data Point: (0, 0)
- Data Point: (10000, 6494)

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

Spatial Functions

Fill -0.8 to -2,-3

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
- Data Point: (172, -0.8, 600)
- Data Point: (172, -3, 600)
- Data Point: (200, -0.8, 550)

Data Point: (200, -2, 550)
Data Point: (236, -0.8, 600)
Data Point: (236, -3, 600)

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

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (172, -3, 190)
Data Point: (172, -5, 190)
Data Point: (200, -2, 200)
Data Point: (200, -6, 200)
Data Point: (236, -3, 190)
Data Point: (236, -5, 190)

Bay -48,-50 to -70

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (172, -48, 780)
Data Point: (172, -70, 980)
Data Point: (200, -50, 830)
Data Point: (200, -70, 1000)
Data Point: (236, -48, 780)
Data Point: (236, -70, 980)
Data Point: (55, -48, 780)
Data Point: (310, -48, 780)

Regions

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

Points

	X (ft)	Y (ft)
Point 1	55	-5
Point 2	58.4	-5
Point 3	68.7	-5
Point 4	78.4	-5
Point 5	88.3	-5
Point 6	98.2	-5
Point 7	108.2	-5
Point 8	310	-3
Point 9	236	-3
Point 10	200	-2
Point 11	172	-3
Point 12	310	-5
Point 13	236	-5
Point 14	200	-6
Point 15	172	-5
Point 16	310	-48
Point 17	236	-48
Point 18	200	-50
Point 19	172	-48
Point 20	55	-48
Point 21	310	-70
Point 22	236	-70
Point 23	200.5	-70
Point 24	171	-70
Point 25	55	-70
Point 26	144.5	-4.2
Point 27	153.8	-3.3
Point 28	161.4	-1.8
Point 29	163.6	-1.3
Point 30	168.1	-0.8
Point 31	171.3	-0.4
Point 32	173.4	-0.1
Point 33	179.3	2.1
Point 34	185.2	4.2
Point 35	191.2	6.7
Point 36	197.3	8.3
Point 37	199.4	8.4
Point 38	200	8.4
Point 39	200	14.1
Point 40	200.8	14
Point 41	201.4	8.4
Point 42	204.9	8.4
Point 43	208	8.2
Point 44	211.1	7.2
Point 45	217.5	5.1
Point 46	227	2.2
Point 47	235.4	0.2
Point 48	243.8	-0.3
Point 49	254	-0.6
Point 50	263.3	-0.8
Point 51	273.8	-1.2
Point 52	284.5	-1.3
Point 53	294.3	-1.5
Point 54	304.2	-1.5
Point 55	121	-5
Point 56	154.5	-3
Point 57	200	-0.8
Point 58	200	-1.3
Point 59	310	-1.6
Point 60	142.33621	-5

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	2.20	(223.408, 4.341)	18.25285	(200.255, 8.4)	(244.743, -0.327729)
2	4919	2.32	(223.408, 4.341)	18.634	(200.425, 8.4)	(245.924, -0.362472)

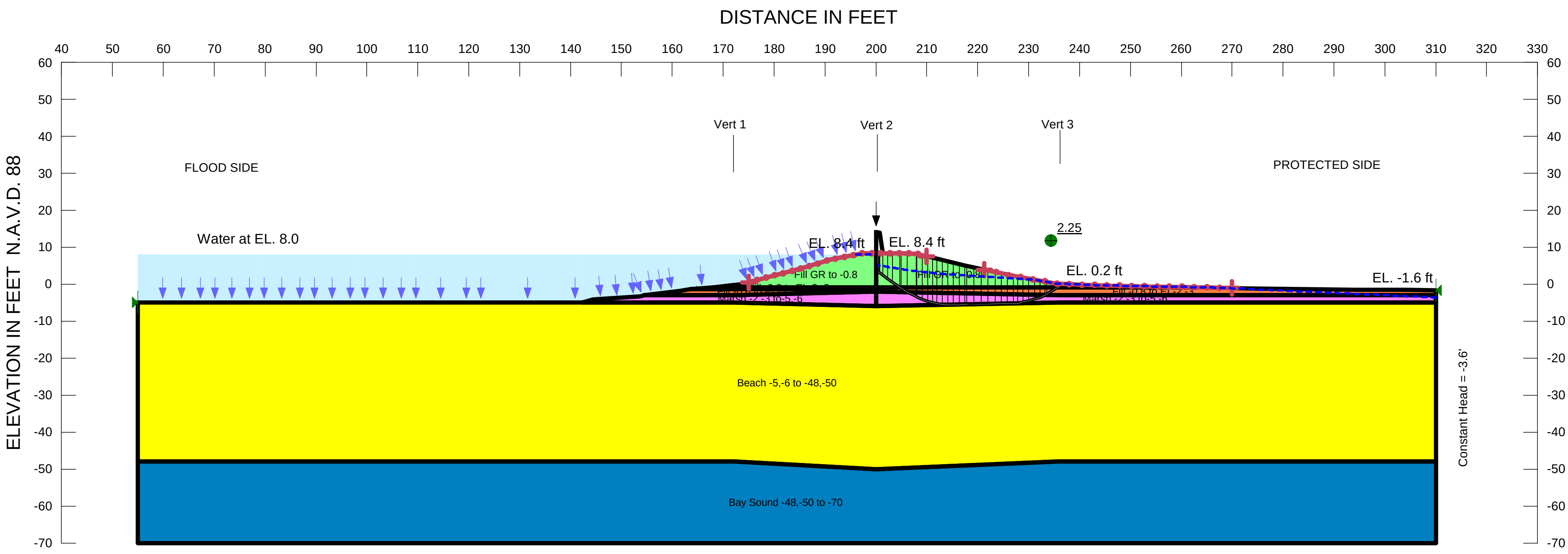
Slices of Slip Surface: Optimized

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	200.5274	3.145528	97.652107	231.18534	0	550.73
2	Optimized	201.1	2.6110195	124.67389	388.26421	0	551.53
3	Optimized	201.9364	1.8302915	161.79721	467.21807	0	552.69
4	Optimized	203.03345	0.7972	203.56137	567.24535	0	554.21
5	Optimized	204.16	-0.272605	243.05331	675.33672	0	555.78
6	Optimized	204.81295	-0.8933833	267.30745	735.69489	0	556.68
7	Optimized	205.52335	-1.5737493	295.23773	800.29614	0	557.67
8	Optimized	206.3542	-2.369466	332.51488	1008.1951	0	198.23
9	Optimized	207.28085	-3.01057	366.65774	1118.9531	0	197.98
10	Optimized	208.933	-4.02687	420.88975	1181.2903	0	197.52
11	Optimized	210.483	-4.7899205	461.02461	1258.2977	0	197.09
12	Optimized	212.10465	-5.2870055	485.00773	1251.418	0	196.64
13	Optimized	213.75585	-5.5836035	496.76555	1283.0307	0	196.18
14	Optimized	215.04895	-5.56089	490.2781	1234.6261	0	195.82
15	Optimized	216.342	-5.5381765	483.80612	1186.2989	0	195.46
16	Optimized	217.24425	-5.5187405	479.07508	1154.7243	0	195.21
17	Optimized	218.2016	-5.4884945	473.45076	1119.2688	0	194.94
18	Optimized	219.60475	-5.4441615	465.23058	1068.3379	0	194.55
19	Optimized	221.0079	-5.399829	457.01041	1017.3357	0	194.16
20	Optimized	222.4111	-5.3554965	448.80448	966.33361	0	193.77
21	Optimized	224.16915	-5.300025	438.52736	902.39968	0	193.29
22	Optimized	226.1128	-5.2541185	428.14259	830.68994	0	192.75
23	Optimized	227.31245	-5.237079	422.44694	791.56399	0	192.41
24	Optimized	227.8703	-5.2291555	419.79845	778.13267	232.70496	5.7835e-00
25	Optimized	228.77205	-5.22701	416.19529	752.00377	218.07657	5.4199e-00
26	Optimized	230.0847	-5.22969	411.31967	718.69717	199.61328	-6.6883e-00
27	Optimized	231.39735	-5.23237	406.45167	685.39058	181.14505	4.5021e-00
28	Optimized	232.71	-5.23505	401.59128	652.08399	162.67186	4.0429e-00

29	Optimized	234.38315	-5.1883975	392.3045	609.05408	140.75882	3.4984e-006
30	Optimized	235.7	-5.1262455	383.45648	573.06209	123.13132	3.0604e-006
31	Optimized	236.5574	-5.085777	377.71621	562.58714	120.05658	-5.1947e-007
32	Optimized	237.67225	-5.033159	370.21672	548.65439	115.87878	-5.0136e-007
33	Optimized	239.0927	-4.503425	330.95359	558.93739	0	190
34	Optimized	240.85255	-3.476855	258.41175	438.20198	0	190
35	Optimized	242.7747	-2.0542525	145.08235	491.59955	0	600
36	Optimized	244.0022	-0.9773975	54.228332	357.86052	0	600
37	Optimized	244.4736	-0.56386445	19.538071	307.8866	0	600

Slices of Slip Surface: 4919

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	4919	200.6127	3.2428165	91.58639	196.69236	0	550.85
2	4919	201.1	2.833903	111.96122	399.58154	0	551.53
3	4919	202.275	1.847961	156.51381	499.54847	0	553.16
4	4919	204.025	0.37953675	211.71715	648.4675	0	555.59
5	4919	205.16535	-0.57733775	248.09401	743.76239	0	557.17
6	4919	206.2632	-1.4985515	286.40349	829.94902	0	558.7
7	4919	207.54785	-2.5764935	338.77644	1038.3293	0	197.9
8	4919	208.70835	-3.5502465	392.74828	1104.2936	0	197.58
9	4919	210.125	-4.738971	459.38874	1170.4258	0	197.19
10	4919	210.96665	-5.333333	492.41244	1353.6373	0	196.95
11	4919	211.9	-5.333333	488.6875	1320.5	0	196.69
12	4919	213.5	-5.333333	482.33125	1263.625	0	196.25
13	4919	215.1	-5.333333	476.00625	1206.75	0	195.81
14	4919	216.7	-5.333333	469.71875	1149.875	0	195.36
15	4919	218.3125	-5.333333	463.40308	1094.5846	0	194.91
16	4919	219.9375	-5.333333	457.05231	1040.8615	0	194.46
17	4919	221.5625	-5.333333	450.72615	987.13846	0	194.01
18	4919	223.1875	-5.333333	444.40615	933.41538	0	193.56
19	4919	224.75	-5.333333	438.35333	885.66667	290.48868	-2.6682e-005
20	4919	226.25	-5.333333	432.56	835.93333	261.95371	6.5096e-006
21	4919	227.7	-5.333333	426.97143	793.14286	237.79451	5.9088e-006
22	4919	229.1	-5.333333	421.57857	757.21429	217.96438	-7.3019e-006
23	4919	230.5	-5.333333	416.2	721.28571	198.12498	4.9234e-006
24	4919	231.9	-5.333333	410.83571	685.37143	178.28558	4.4305e-006
25	4919	233.3	-5.333333	405.48571	649.45714	158.4369	3.9372e-006
26	4919	234.7	-5.333333	400.15714	613.53571	138.56966	3.4435e-006
27	4919	235.7	-5.333333	396.38333	593.86667	128.24718	3.1868e-006
28	4919	236.66665	-5.333333	392.7601	587.77515	126.64425	-5.4786e-007
29	4919	238	-5.333333	387.7051	579.03764	124.25281	3.0877e-006
30	4919	239.33335	-5.333333	382.6201	570.30014	121.88085	-5.2725e-007
31	4919	240.19865	-5.1666665	368.9151	661.35133	189.91031	-6.3621e-006
32	4919	240.99315	-4.5	323.43141	579.71722	0	190
33	4919	242.1849	-3.5	254.74313	462.85202	0	190
34	4919	243.2904	-2.5723775	184.3558	525.56698	0	600
35	4919	244.6013	-1.4723775	91.856523	390.38425	0	600
36	4919	245.6633	-0.5812359	17.923438	282.32352	0	600



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

GENERAL NOTES

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

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

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 13B
REMEDIATION OF CANAL WALLS AND LEVEES
PROTECTED SIDE STABILITY ANALYSIS
CASE: Name: Global Stability (Entry/Exit)
STA. 7+00 TO STA. 11+20
ORLEANS PARISH, LOUISIANA

ETL 1110-2-575 ANALYSIS

Name: Global Stability (Entry/Exit)
File Name: Orleans Canal Reach 13B.gsz Directory: Y:\F&MHOME\Middleton\Outfall Canals\Orleans final edits\final\Appendix A and Appendix B\
Last Edited By: Reves, Ryan D MVK

Global Stability (Entry/Exit)

File Information

Created By: Vicky Curtis
Revision Number: 361
Last Edited By: Reves, Ryan D MVK
Date: 6/17/2013
Time: 12:31:22 PM
File Name: Orleans Canal Reach 13B.gsz
Directory: Y:\F&MHOME\Middleton\Outfall Canals\Orleans final edits\final\Appendix A and Appendix B\
Last Solved Date: 6/17/2013
Last Solved Time: 4:32:06 PM

Project Settings

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

Analysis Settings

Global Stability (Entry/Exit)

Kind: SLOPE/W
Parent: Steady-State GAP
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
- 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 -0.8 to EL-2,-3

Model: Spatial Mohr-Coulomb
Unit Weight: 109 pcf
Cohesion Spatial Fn: Fill -0.8 to -2,-3
Phi: 0 °
Phi-B: 0 °

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

Model: Spatial Mohr-Coulomb
Unit Weight: 101 pcf
Cohesion Spatial Fn: Marsh -2,-3 to -5,-6
Phi: 0 °
Phi-B: 0 °

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

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

Bay Sound -48,-50 to -70

Model: Spatial Mohr-Coulomb
Unit Weight: 102 pcf
Cohesion Spatial Fn: Bay -48,-50 to -70
Phi: 0 °
Phi-B: 0 °

Fill GR to -0.8

Model: Spatial Mohr-Coulomb
Unit Weight: 109 pcf
Cohesion Spatial Fn: Fill -0.8 to -2,-3
Phi: 0 °
Phi-B: 0 °

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (175, 0.49661) ft
Left-Zone Right Coordinate: (210, 7.55484) ft
Left-Zone Increment: 20
Right Projection: Range
Right-Zone Left Coordinate: (221.29993, 3.94002) ft
Right-Zone Right Coordinate: (270, -1.05524) ft
Right-Zone Increment: 20
Radius Increments: 25

Slip Surface Limits

Left Coordinate: (55, -5) ft
Right Coordinate: (310, -1.6) ft

Reinforcements

Reinforcement 1

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

Tension Crack Line

	X (ft)	Y (ft)
	185.2	-0.8
	191.2	1.7
	197.3	3.3
	199.4	3.4
	210	3.4

Shear/Normal Strength Functions

Beach Sand

Model: Spline Data Point Function
Function: Shear Stress vs. Normal Stress
- Curve Fit to Data: 100 %
- Segment Curvature: 0 %

Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
- Data Point: (-10000, 0)
- Data Point: (0, 0)
- Data Point: (10000, 6494)

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

Spatial Functions

Fill -0.8 to -2,-3

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
- Data Point: (172, -0.8, 600)
- Data Point: (172, -3, 600)
- Data Point: (200, -0.8, 550)
- Data Point: (200, -2, 550)
- Data Point: (236, -0.8, 600)
- Data Point: (236, -3, 600)

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

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
- Data Point: (172, -3, 190)
- Data Point: (172, -5, 190)
- Data Point: (200, -2, 200)

Data Point: (200, -6, 200)
Data Point: (236, -3, 190)
Data Point: (236, -5, 190)

Bay -48,-50 to -70

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (172, -48, 780)
Data Point: (172, -70, 980)
Data Point: (200, -50, 830)
Data Point: (200, -70, 1000)
Data Point: (236, -48, 780)
Data Point: (236, -70, 980)
Data Point: (55, -48, 780)
Data Point: (310, -48, 780)

Regions

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

Points

	X (ft)	Y (ft)
Point 1	55	-5
Point 2	58.4	-5
Point 3	68.7	-5
Point 4	78.4	-5
Point 5	88.3	-5
Point 6	98.2	-5
Point 7	108.2	-5
Point 8	310	-3
Point 9	236	-3
Point 10	200	-2
Point 11	172	-3
Point 12	310	-5
Point 13	236	-5
Point 14	200	-6
Point 15	172	-5
Point 16	310	-48
Point 17	236	-48
Point 18	200	-50
Point 19	172	-48
Point 20	55	-48
Point 21	310	-70
Point 22	236	-70
Point 23	200.5	-70
Point 24	171	-70
Point 25	55	-70
Point 26	144.5	-4.2
Point 27	153.8	-3.3
Point 28	161.4	-1.8
Point 29	163.6	-1.3
Point 30	168.1	-0.8
Point 31	171.3	-0.4
Point 32	173.4	-0.1
Point 33	179.3	2.1
Point 34	185.2	4.2
Point 35	191.2	6.7
Point 36	197.3	8.3
Point 37	199.4	8.4
Point 38	200	8.4
Point 39	200	14.1
Point 40	200.8	14
Point 41	201.4	8.4
Point 42	204.9	8.4
Point 43	208	8.2
Point 44	211.1	7.2
Point 45	217.5	5.1
Point 46	227	2.2
Point 47	235.4	0.2
Point 48	243.8	-0.3
Point 49	254	-0.6
Point 50	263.3	-0.8
Point 51	273.8	-1.2
Point 52	284.5	-1.3
Point 53	294.3	-1.5
Point 54	304.2	-1.5
Point 55	121	-5
Point 56	154.5	-3
Point 57	200	-0.8
Point 58	200	-1.3
Point 59	310	-1.6
Point 60	142.33621	-5

Critical Slip Surfaces

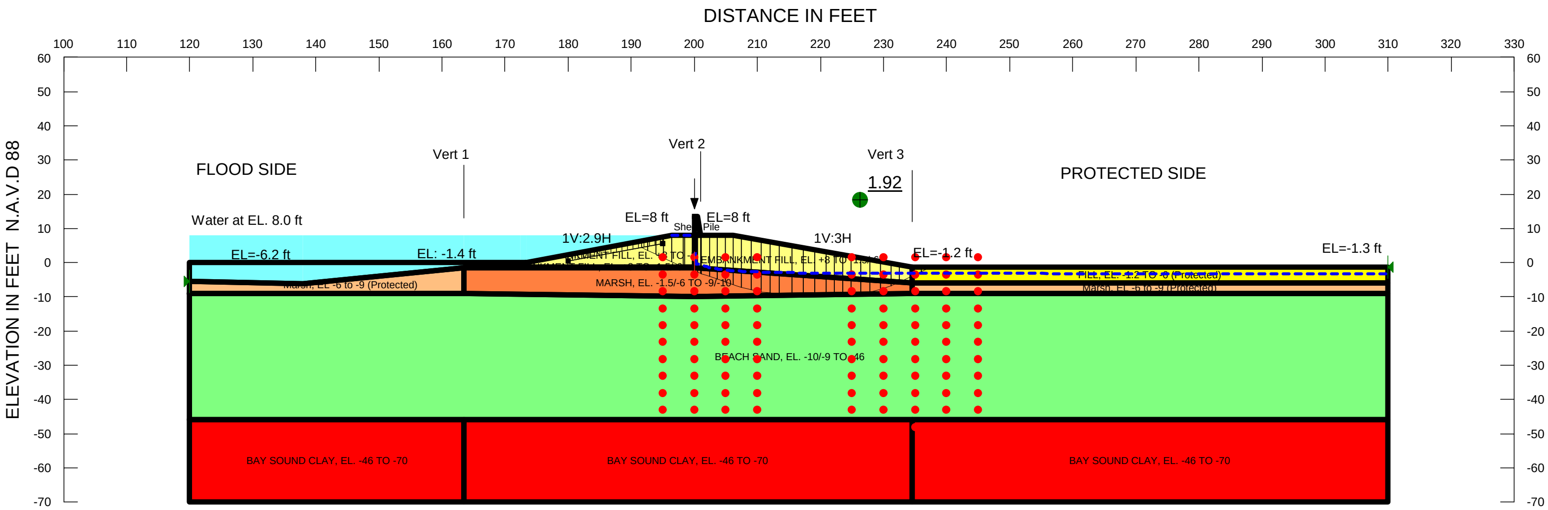
	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	2.25	(219.733, 19.674)	15.62397	(200.412, 8.4)	(236.964, 0.106915)
2	7270	2.40	(219.733, 19.674)	25.11	(200.611, 8.4)	(235.571, 0.189798)

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	200.558	3.27565	90.009879	148.90984	0	550.78
2	Optimized	200.75195	3.1025895	98.828991	322.42575	0	551.04
3	Optimized	201.1	2.74966	116.76677	357.86365	0	551.53
4	Optimized	201.86775	1.971126	154.26001	436.05175	0	552.59
5	Optimized	202.80325	1.0224955	195.2494	531.31586	0	553.89
6	Optimized	203.98805	-0.12591	237.71928	667.11375	0	555.54
7	Optimized	204.80255	-0.89161805	267.32281	744.45935	0	556.67
8	Optimized	205.50955	-1.5562681	294.4583	807.59388	0	557.65
9	Optimized	206.99915	-2.751565	352.25655	1080.6796	0	198.06
10	Optimized	207.9396	-3.4073445	387.5877	1163.5085	0	197.79
11	Optimized	208.55125	-3.746647	405.47904	1177.5017	0	197.62
12	Optimized	209.6538	-4.3582225	438.04553	1199.8683	0	197.32
13	Optimized	210.65255	-4.817978	462.05221	1248.4042	0	197.04
14	Optimized	211.5675	-5.132808	477.6877	1247.9974	0	196.79
15	Optimized	212.5468	-5.3723825	488.52176	1272.528	0	196.51
16	Optimized	213.5704	-5.5298075	494.18001	1252.251	0	196.23
17	Optimized	214.65185	-5.5926985	493.80582	1253.9276	0	195.93
18	Optimized	215.7911	-5.561056	487.38307	1210.0563	0	195.61
19	Optimized	216.93035	-5.5294135	480.96032	1166.2728	0	195.3
20	Optimized	217.69015	-5.508311	476.68903	1137.5611	0	195.09
21	Optimized	218.5825	-5.483485	471.655	1105.4848	0	194.84
22	Optimized	219.98685	-5.444395	463.75411	1055.0187	0	194.45
23	Optimized	221.3649	-5.4060975	456.01023	1005.4275	0	194.07
24	Optimized	222.71675	-5.3685925	448.43089	956.84581	0	193.69
25	Optimized	223.9939	-5.332004	441.19285	911.08144	0	193.34
26	Optimized	225.19635	-5.2963325	434.31818	867.6887	0	193
27	Optimized	226.3988	-5.260661	427.4435	824.18788	0	192.67
28	Optimized	227.4292	-5.2300925	421.55759	790.09734	0	192.38
29	Optimized	228.40735	-5.0149075	404.36297	793.33556	0	192.11
30	Optimized	229.50525	-4.6100025	374.81275	722.06636	0	191.8
31	Optimized	230.6032	-4.2050975	345.15998	650.78862	0	191.5
32	Optimized	231.70115	-3.8001925	315.36193	579.51942	0	191.19
33	Optimized	232.72095	-3.2598675	277.18272	542.0627	0	190.91
34	Optimized	233.40685	-2.7676825	241.944	621.55882	0	596.4
35	Optimized	234.51095	-1.889704	171.79209	521.75316	0	597.93
36	Optimized	235.62485	-0.983019	94.533614	390.60028	0	599.48
37	Optimized	236.40675	-0.3465427	38.688463	311.27576	0	600

Slices of Slip Surface: 7270

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	7270	200.70565	3.2904315	88.329252	-23.065267	0	550.98
2	7270	201.1	2.848632	111.12063	339.2495	0	551.53
3	7270	201.98335	1.932789	155.27992	456.56271	0	552.75
4	7270	203.15	0.8356793	199.93	597.61538	0	554.37
5	7270	204.31665	-0.1318699	234.33611	723.13099	0	556
6	7270	205.04845	-0.6929607	254.98911	795.36234	0	557.01
7	7270	205.75125	-1.1718135	273.33661	854.09263	0	557.99
8	7270	206.85995	-1.87479	302.28508	940.48378	0	559.53
9	7270	207.70715	-2.365744	325.06968	1067.129	0	197.86
10	7270	208.51665	-2.783583	346.70451	1095.9727	0	197.63
11	7270	209.55	-3.27093	371.83576	1117.7983	0	197.35
12	7270	210.58335	-3.702457	393.81184	1133.8537	0	197.06
13	7270	211.74	-4.119682	414.62082	1144.6396	0	196.74
14	7270	213.02	-4.5123155	433.58502	1148.9096	0	196.38
15	7270	214.3	-4.8318435	448.17978	1145.5433	0	196.03
16	7270	215.58	-5.081106	458.51414	1134.7666	0	195.67
17	7270	216.86	-5.2622165	464.68364	1116.8302	0	195.32
18	7270	218.09375	-5.3748145	466.82464	1094.501	0	194.97
19	7270	219.28125	-5.4243625	465.26372	1068.2904	0	194.64
20	7270	220.46875	-5.4176445	460.21498	1036.2707	0	194.31
21	7270	221.65625	-5.354615	451.67926	998.23678	0	193.98
22	7270	222.84375	-5.234845	439.62518	954.10471	0	193.65
23	7270	224.03125	-5.057508	423.98573	903.92433	0	193.32
24	7270	225.21875	-4.8213515	404.67971	847.47225	0	192.99
25	7270	226.40625	-4.524649	381.58829	784.55138	0	192.66
26	7270	227.6364	-4.1498025	353.41581	716.86167	0	192.32
27	7270	228.90915	-3.688744	319.61791	643.57978	0	191.97
28	7270	230.1819	-3.1474305	280.65671	561.63489	0	191.62
29	7270	231.39345	-2.554349	237.22112	578.4685	0	593.6
30	7270	232.5438	-1.911278	187.10131	495.24136	0	595.2
31	7270	233.69415	-1.184961	126.93846	403.58644	0	596.8
32	7270	234.83465	-0.37414212	54.194096	303.68106	0	598.38
33	7270	235.4857	0.12075673	6.1358557	245.38425	0	599.29



Name: EMBANKMENT FILL, EL. +8 TO -1.5/-6 Model: Undrained (Phi=0) Unit Weight: 110 pcf Cohesion: 540 psf
Name: MARSH, EL. -1.5/-6 TO -9/-10 Model: Spatial Mohr-Coulomb Unit Weight: 96 pcf Cohesion Spatial Fn: Marsh Phi: 0 °
Name: BEACH SAND, EL. -10/-9 TO -46 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand
Name: BAY SOUND CLAY, EL. -46 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 105 pcf Cohesion Spatial Fn: Clay Phi: 0 °
Name: Marsh, EL -6 to -9 (Protected) Model: Spatial Mohr-Coulomb Unit Weight: 96 pcf Cohesion Fn: Marsh Protected Side Toe Phi: 0 °
Name: Sheet Pile Model: Undrained (Phi=0) Unit Weight: 0.1 pcf Cohesion: 0.01 psf
Name: FILL, EL. -1.2 TO -6 (Protected) Model: Undrained (Phi=0) Unit Weight: 110 pcf Cohesion: 600 psf

GENERAL NOTES

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

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

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 14
REMEDIATION OF CANAL WALLS AND LEVEES
PROTECTED SIDE STABILITY ANALYSIS
CASE: Global Stability (Block)
STA. 11+20 TO 20+50 EAST
ORLEANS PARISH, LOUISIANA

ETL 1110-2-575 ANALYSIS

Name: Global Stability (Block)
File Name: Orleans Canal Reach 14_updated.gsz Directory: Y:\F&MHOME\Middleton\Outfall Canals\Orleans final edits\final\Appendix A and Appendix B\
Last Edited By: Jamerson, James MVK

Global Stability (Block)

File Information

Created By: Liljegren, James
Revision Number: 401
Last Edited By: Jamerson, James MVK
Date: 6/11/2013
Time: 5:07:34 PM
File Name: Orleans Canal Reach 14_updated.gsz
Directory: Y:\F&MHOME\Middleton\Outfall Canals\Orleans final edits\final\Appendix A and Appendix B\
Last Solved Date: 6/11/2013
Last Solved Time: 5:08:56 PM

Project Settings

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

Analysis Settings

Global Stability (Block)

Kind: SLOPE/W
Parent: Gap Analysis (seepage)
Method: Spencer
Settings
- PWP Conditions Source: Parent Analysis

Slip Surface
- Direction of movement: Left to Right
- Use Passive Mode: No
- Slip Surface Option: Block
- Critical slip surfaces saved: 1
- Optimize Critical Slip Surface Location: Yes
- Tension Crack
  - Tension Crack Option: Tension Crack Line
  - Percentage Wet: 1
  - Tension Crack Fluid Unit Weight: 62.4 pcf

FOS Distribution
- FOS Calculation Option: Constant

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

Materials

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

Model: Undrained (Phi=0)
Unit Weight: 110 pcf
Cohesion: 540 psf

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

Model: Spatial Mohr-Coulomb
Unit Weight: 96 pcf
Cohesion Spatial Fn: Marsh
Phi: 0 °
Phi-B: 0 °

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

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

BAY SOUND CLAY, EL. -46 TO -70

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

Marsh, EL -6 to -9 (Protected)

Model: Spatial Mohr-Coulomb
Unit Weight: 96 pcf
Cohesion Fn: Marsh Protected Side Toe
Phi: 0 °
Phi-B: 0 °

Sheet Pile

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

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

Model: Undrained (Phi=0)
Unit Weight: 110 pcf
Cohesion: 600 psf

Slip Surface Limits

Left Coordinate: (120, -5.5) ft
Right Coordinate: (310, -1.3) ft

Slip Surface Block

Left Grid
- Upper Left: (195, 1.5) ft
- Lower Left: (195, -48) ft
- Lower Right: (210, -48) ft
- X Increments: 3
- Y Increments: 10
- Starting Angle: 115 °
- Ending Angle: 135 °
- Angle Increments: 4

Right Grid
- Upper Left: (225, 1.5) ft
- Lower Left: (225, -48) ft
- Lower Right: (245, -48) ft
- X Increments: 4
- Y Increments: 10
- Starting Angle: 25 °
- Ending Angle: 45 °
- Angle Increments: 4

Reinforcements

Reinforcement 1

Type: Pile
Outside Point: (200, 13.4) ft
Inside Point: (200, 3.7) ft
Slip Surface Intersection: (200, -2.4984) ft
Total Length: 9.7 ft
Reinforcement Direction: 90 °
Applied Load Option: Variable
F of S Dependent: No
Pile Spacing: 1 ft
Shear Capacity: 0 lbs
Shear Safety Factor: 1
Shear Load Used: 0 lbs
Shear Option: Parallel to Slip
Resisting Force Used: 0 lbs/ft

Tension Crack Line

	X (ft)	Y (ft)
	180	0.5
	195	5.5

Cohesion Functions

Marsh Protected Side Toe

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

Y-Intercept: 200
Data Points: Y (ft), Cohesion (psf)
- Data Point: (-9, 220)
- Data Point: (-6, 200)

Shear/Normal Strength Functions

Sand

Model: Spline Data Point Function
Function: Shear Stress vs. Normal Stress
- Curve Fit to Data: 100 %
- Segment Curvature: 0 %

Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
- Data Point: (-10000, 0)
- Data Point: (0, 0)
- Data Point: (10000, 6494)

Estimation Properties

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

Spatial Functions

Marsh

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

Clay

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

Regions

	Material	Points	Area (ft^2)
Region 1	Sheet Pile	4,11,12,13	4.05
Region 2	EMBANKMENT FILL, EL. +8 TO -1.5/-6	28,2,35,3,4,22	160.66498
Region 3	BEACH SAND, EL. -10/-9 TO -46	19,31,16,24,17,8,25,29,32,20	6994.5
Region 4	BAY SOUND CLAY, EL. -46 TO -70	26,30,33,32,29,25	1704
Region 5	FILL, EL. -1.2 TO -6 (Protected)	23,5,18,6,7	355.225

Region 6	Marsh, EL -6 to -9 (Protected)	24,23,7,17	226.5
Region 7	EMBANKMENT FILL, EL. +8 TO -1.5/-6	22,4,13,10,5,23,14	275.195
Region 8	MARSH, EL. -1.5/-6 TO -9/-10	16,31,27,14,23,24	492.2
Region 9	BAY SOUND CLAY, EL. -46 TO -70	26,25,8,9	1812
Region 10	EMBANKMENT FILL, EL. +8 TO -1.5/-6	28,22,14,27	5.435
Region 11		1,34,35,2,28,27,15	209.76458
Region 12	Marsh, EL -6 to -9 (Protected)	27,15,1,19,31	189.505
Region 13	BAY SOUND CLAY, EL. -46 TO -70	21,33,32,20	1044

Points

	X (ft)	Y (ft)
Point 1	120	-5.5
Point 2	172.5	-0.3
Point 3	196.4	8
Point 4	200	8
Point 5	234.5	-1.2
Point 6	310	-1.3
Point 7	310	-6
Point 8	310	-46
Point 9	310	-70
Point 10	206.2	8
Point 11	200	13.4
Point 12	200.5	13.4
Point 13	201	8
Point 14	200	-1.5
Point 15	137.9	-6.2
Point 16	200	-10
Point 17	310	-9
Point 18	242	-1.3
Point 19	120	-9
Point 20	120	-46

Point 21	120	-70
Point 22	200	-1.3
Point 23	234.5	-6
Point 24	234.5	-9
Point 25	234.5	-46
Point 26	234.5	-70
Point 27	163.5	-1.4
Point 28	164.3	-1.3
Point 29	200	-46
Point 30	200	-70
Point 31	163.5	-9
Point 32	163.5	-46
Point 33	163.5	-70
Point 34	120	0
Point 35	173.36386	0

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.92	(215.835, 5.97)	20.6459	(191.629, 6.34303)	(237.539, -1.24052)
2	1359	2.13	(215.835, 5.97)	20.693	(192.075, 6.49801)	(238.517, -1.25356)

Slices of Slip Surface: Optimized

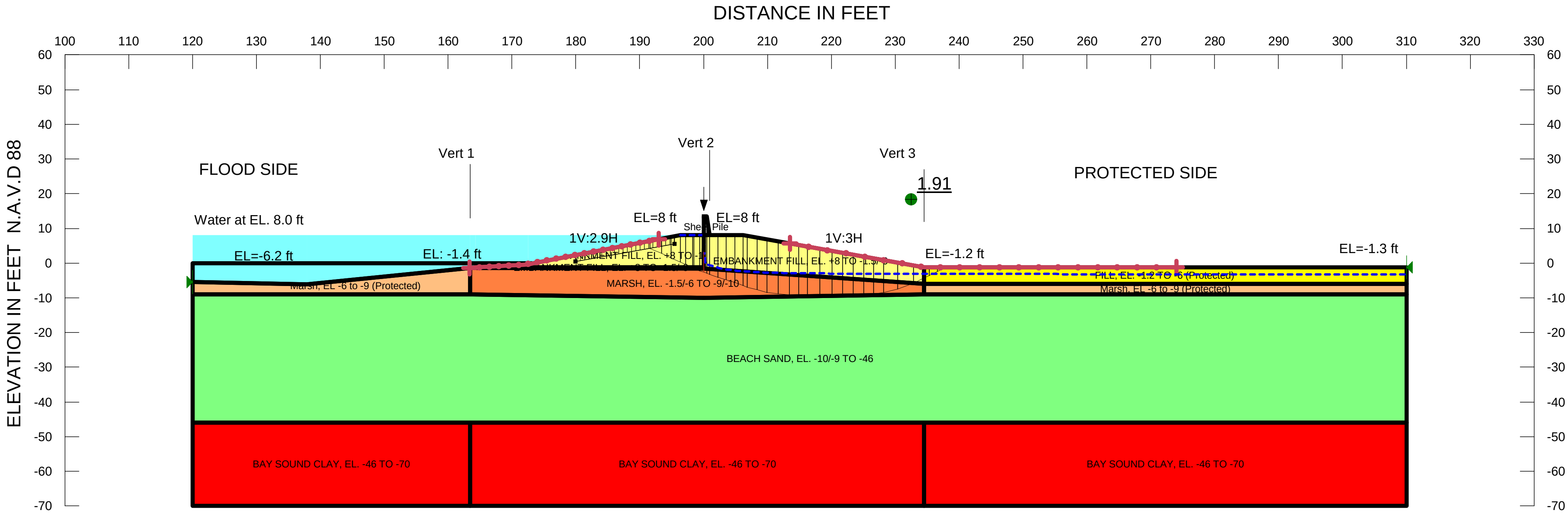
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	192.1286	3.997182	98.085472	146.05626	0	540
2	Optimized	193.26	3.0773775	91.629791	250.61674	0	540
3	Optimized	194.52305	1.9958925	97.770117	384.80182	0	540
4	Optimized	195.7773	0.89668415	105.90471	508.73354	0	540
5	Optimized	197.31335	-0.48089085	114.43979	663.36769	0	540
6	Optimized	198.3202	-1.38386	78.98242	758.13729	0	540
7	Optimized	199.20685	-1.9830445	109.79025	1000.5297	0	179.19
8	Optimized	200.25	-2.660801	116.46595	1063.1784	0	183.81

9	Optimized	200.75	-2.9856645	117.21729	1093.232	0	186.15
10	Optimized	201.0607	-3.187528	120.73213	1111.7774	0	187.6
11	Optimized	201.7518	-3.6301575	127.26694	1154.7369	0	190.78
12	Optimized	203.0126	-4.4365525	151.30782	1230.1068	0	196.55
13	Optimized	204.28225	-5.2367825	181.62948	1308.0698	0	202.26
14	Optimized	205.56075	-6.0308475	216.97733	1382.4863	0	207.89
15	Optimized	206.80895	-6.8061	254.35769	1434.0227	0	213.37
16	Optimized	208.22105	-7.51192	290.86998	1491.8774	0	218.25
17	Optimized	209.8273	-8.16712	325.66508	1499.2561	0	222.65
18	Optimized	211.33685	-8.655285	352.72479	1529.7601	0	225.8
19	Optimized	212.74975	-8.976415	371.03498	1512.7129	0	227.72
20	Optimized	214.4751	-9.267955	387.89334	1501.8711	0	229.28
21	Optimized	216.38405	-9.3982215	395.33461	1475.5459	0	229.56
22	Optimized	218.16415	-9.396805	394.86834	1414.9308	0	228.9
23	Optimized	219.94425	-9.3953885	394.44701	1354.372	0	228.24
24	Optimized	221.51085	-9.375055	392.91574	1304.5479	0	227.52
25	Optimized	222.86395	-9.335805	390.24888	1254.7566	0	226.73
26	Optimized	224.21705	-9.296555	387.58201	1204.9652	0	225.95
27	Optimized	225.63715	-9.0984075	375.02509	1175.6313	0	224
28	Optimized	227.12425	-8.7413625	352.55209	1089.3225	0	220.92
29	Optimized	228.69365	-8.1371	314.62847	1022.6085	0	216.12
30	Optimized	230.3454	-7.28562	261.27288	878.92774	0	209.67
31	Optimized	231.8167	-6.2970305	199.36393	781.92465	0	202.49
32	Optimized	233.48105	-4.8455345	108.65855	732.48925	0	540
33	Optimized	234.5158	-3.943109	52.231364	620.50384	0	600
34	Optimized	235.28345	-3.2571275	9.3150612	548.07601	0	600
35	Optimized	236.78715	-1.9127225	-74.891327	390.40562	0	600

Slices of Slip Surface: 1359

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	1359	192.79585	3.8041665	94.47108	140.08559	0	540
2	1359	194.2375	2.3625	94.912511	324.8832	0	540
3	1359	195.67915	0.9208335	102.91222	497.29624	0	540
4	1359	197.15	-0.55	102.22409	661.23923	0	540

5	1359	197.9974	-1.39739	71.509267	749.0358	0	540
6	1359	199.0474	-2.44739	116.0115	993.8435	0	182.79
7	1359	200.25	-3.65	147.02164	1099.9611	0	191.37
8	1359	200.75	-4.15	161.14963	1144.2543	0	195.04
9	1359	201.66665	-5.0666665	194.66827	1225.6459	0	201.76
10	1359	203	-6.4	250.96812	1344.4399	0	211.51
11	1359	204.33335	-7.7333335	314.36378	1463.2868	0	221.22
12	1359	205.6	-8.4	346.425	1724.25	0	225.85
13	1359	206.99335	-8.4	343.84026	1698.403	0	225.37
14	1359	208.58	-8.4	341.07976	1644.5165	0	224.83
15	1359	210.16665	-8.4	338.88648	1590.6929	0	224.29
16	1359	211.75335	-8.4	337.21001	1536.8064	0	223.75
17	1359	213.34	-8.4	335.97472	1482.9829	0	223.2
18	1359	214.92665	-8.4	334.9222	1429.0963	0	222.66
19	1359	216.51335	-8.4	334.1722	1375.2098	0	222.12
20	1359	218.1	-8.4	333.51043	1321.3863	0	221.58
21	1359	219.68665	-8.4	332.99993	1267.4997	0	221.04
22	1359	221.27335	-8.4	332.55245	1213.6762	0	220.5
23	1359	222.86	-8.4	332.15539	1159.7897	0	219.96
24	1359	224.44665	-8.4	331.82136	1105.9662	0	219.42
25	1359	226.03335	-8.4	331.50623	1052.0796	0	218.87
26	1359	227.62	-8.4	331.19741	998.25609	0	218.33
27	1359	229.20665	-8.4	330.9201	944.36955	0	217.8
28	1359	230.7702	-7.753722	290.37342	963.07101	0	212.79
29	1359	232.3106	-6.4611665	209.51245	772.90352	0	203.51
30	1359	233.7904	-5.2194705	131.87852	734.5297	0	540
31	1359	235.16945	-4.062303	59.513014	599.30669	0	600
32	1359	236.5084	-2.9388045	-10.824709	466.90997	0	600
33	1359	237.84735	-1.815306	-81.185317	334.50181	0	600



Name: EMBANKMENT FILL, EL. +8 TO -1.5/-6 Model: Undrained (Phi=0) Unit Weight: 110 pcf Cohesion: 540 psf
Name: MARSH, EL. -1.5/-6 TO -9/-10 Model: Spatial Mohr-Coulomb Unit Weight: 96 pcf Cohesion Spatial Fn: Marsh Phi: 0 °
Name: BEACH SAND, EL. -10/-9 TO -46 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand
Name: BAY SOUND CLAY, EL. -46 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 105 pcf Cohesion Spatial Fn: Clay Phi: 0 °
Name: Marsh, EL -6 to -9 (Protected) Model: Spatial Mohr-Coulomb Unit Weight: 96 pcf Cohesion Fn: Marsh Protected Side Toe Phi: 0 °
Name: Sheet Pile Model: Undrained (Phi=0) Unit Weight: 0.1 pcf Cohesion: 0.01 psf
Name: FILL, EL. -1.2 TO -6 (Protected) Model: Undrained (Phi=0) Unit Weight: 110 pcf Cohesion: 600 psf

GENERAL NOTES

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

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

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 14
REMEDIATION OF CANAL WALLS AND LEVEES
PROTECTED SIDE STABILITY ANALYSIS
CASE: Global Stability (Entry/Exit)
STA. 11+20 TO 20+50 EAST
ORLEANS PARISH, LOUISIANA

ETL 1110-2-575 ANALYSIS

Name: Global Stability (Entry/Exit)
File Name: Orleans Canal Reach 14_updated.gsz Directory: Y:\F&MHOME\Middleton\Outfall Canals\Orleans final edits\final\Appendix A and Appendix B\
Last Edited By: Jamerson, James MVK

Global Stability (Entry/Exit)

File Information

Created By: Liljegren, James
Revision Number: 403
Last Edited By: Jamerson, James MVK
Date: 6/11/2013
Time: 5:13:17 PM
File Name: Orleans Canal Reach 14_updated.gsz
Directory: Y:\F&MHOME\Middleton\Outfall Canals\Orleans final edits\final\Appendix A and Appendix B\
Last Solved Date: 6/11/2013
Last Solved Time: 5:13:50 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 (Entry/Exit)

Kind: SLOPE/W
Parent: Gap Analysis (seepage)
Method: Spencer
Settings
- PWP Conditions Source: Parent Analysis

Slip Surface
- Direction of movement: Left to Right
- Use Passive Mode: No
- Slip Surface Option: Entry and Exit
- Critical slip surfaces saved: 1
- Optimize Critical Slip Surface Location: Yes
- Tension Crack
  - Tension Crack Option: Tension Crack Line
  - Percentage Wet: 1
  - Tension Crack Fluid Unit Weight: 62.4 pcf

FOS Distribution
- FOS Calculation Option: Constant

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

Materials

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

Model: Undrained (Phi=0)
Unit Weight: 110 pcf
Cohesion: 540 psf

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

Model: Spatial Mohr-Coulomb
Unit Weight: 96 pcf
Cohesion Spatial Fn: Marsh
Phi: 0 °
Phi-B: 0 °

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

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

BAY SOUND CLAY, EL. -46 TO -70

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

Marsh, EL -6 to -9 (Protected)

Model: Spatial Mohr-Coulomb
Unit Weight: 96 pcf
Cohesion Fn: Marsh Protected Side Toe
Phi: 0 °
Phi-B: 0 °

Sheet Pile

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

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

Model: Undrained (Phi=0)
Unit Weight: 110 pcf
Cohesion: 600 psf

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (163.38936, -1.42074) ft
Left-Zone Right Coordinate: (192.99582, 6.8178) ft
Left-Zone Increment: 20
Right Projection: Range
Right-Zone Left Coordinate: (213.52297, 5.61939) ft
Right-Zone Right Coordinate: (274, -1.3) ft
Right-Zone Increment: 20
Radius Increments: 4

Slip Surface Limits

Left Coordinate: (120, -5.5) ft
Right Coordinate: (310, -1.3) ft

Reinforcements

Reinforcement 1

Type: Pile
Outside Point: (200, 13.4) ft
Inside Point: (200, 3.7) ft
Slip Surface Intersection: (200, -2.6002) ft
Total Length: 9.7 ft
Reinforcement Direction: 90 °
Applied Load Option: Variable
F of S Dependent: No
Pile Spacing: 1 ft
Shear Capacity: 0 lbs
Shear Safety Factor: 1
Shear Load Used: 0 lbs
Shear Option: Parallel to Slip
Resisting Force Used: 0 lbs/ft

Tension Crack Line

	X (ft)	Y (ft)
	180	0.5
	195.5	5.5

Cohesion Functions

Marsh Protected Side Toe

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

Y-Intercept: 200
Data Points: Y (ft), Cohesion (psf)
- Data Point: (-9, 220)
- Data Point: (-6, 200)

Shear/Normal Strength Functions

Sand

Model: Spline Data Point Function
Function: Shear Stress vs. Normal Stress
- Curve Fit to Data: 100 %
- Segment Curvature: 0 %

Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
- Data Point: (-10000, 0)
- Data Point: (0, 0)
- Data Point: (10000, 6494)

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

Spatial Functions

Marsh

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

Clay

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

Regions

	Material	Points	Area (ft²)
Region 1	Sheet Pile	4,11,12,13	4.05
Region 2	EMBANKMENT FILL, EL. +8 TO -1.5/-6	28,2,35,3,4,22	160.66498
Region 3	BEACH SAND, EL. -10/-9 TO -46	19,31,16,24,17,8,25,29,32,20	6994.5
Region 4	BAY SOUND CLAY, EL. -46 TO -70	26,30,33,32,29,25	1704
Region 5	FILL, EL. -1.2 TO -6 (Protected)	23,5,18,6,7	355.225
Region 6	Marsh, EL -6 to -9 (Protected)	24,23,7,17	226.5
Region 7	EMBANKMENT FILL, EL. +8 TO -1.5/-6	22,4,13,10,5,23,14	275.195
Region 8	MARSH, EL. -1.5/-6 TO -9/-10	16,31,27,14,23,24	492.2
Region 9	BAY SOUND CLAY, EL. -46 TO -70	26,25,8,9	1812
Region 10	EMBANKMENT FILL, EL. +8 TO -1.5/-6	28,22,14,27	5.435
Region 11		1,34,35,2,28,27,15	209.76458
Region 12	Marsh, EL -6 to -9 (Protected)	27,15,1,19,31	189.505
Region 13	BAY SOUND CLAY, EL. -46 TO -70	21,33,32,20	1044

Points

	X (ft)	Y (ft)
Point 1	120	-5.5
Point 2	172.5	-0.3
Point 3	196.4	8
Point 4	200	8
Point 5	234.5	-1.2
Point 6	310	-1.3
Point 7	310	-6
Point 8	310	-46
Point 9	310	-70
Point 10	206.2	8
Point 11	200	13.4
Point 12	200.5	13.4
Point 13	201	8
Point 14	200	-1.5
Point 15	137.9	-6.2
Point 16	200	-10
Point 17	310	-9
Point 18	242	-1.3
Point 19	120	-9
Point 20	120	-46
Point 21	120	-70
Point 22	200	-1.3
Point 23	234.5	-6
Point 24	234.5	-9
Point 25	234.5	-46
Point 26	234.5	-70
Point 27	163.5	-1.4
Point 28	164.3	-1.3
Point 29	200	-46
Point 30	200	-70
Point 31	163.5	-9
Point 32	163.5	-46
Point 33	163.5	-70
Point 34	120	0
Point 35	173.36386	0

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.91	(218.418, 25.651)	20.74123	(191.634, 6.34492)	(237.946, -1.24595)
2	1938	2.04	(218.418, 25.651)	34.597	(191.314, 6.23357)	(240.143, -1.27524)

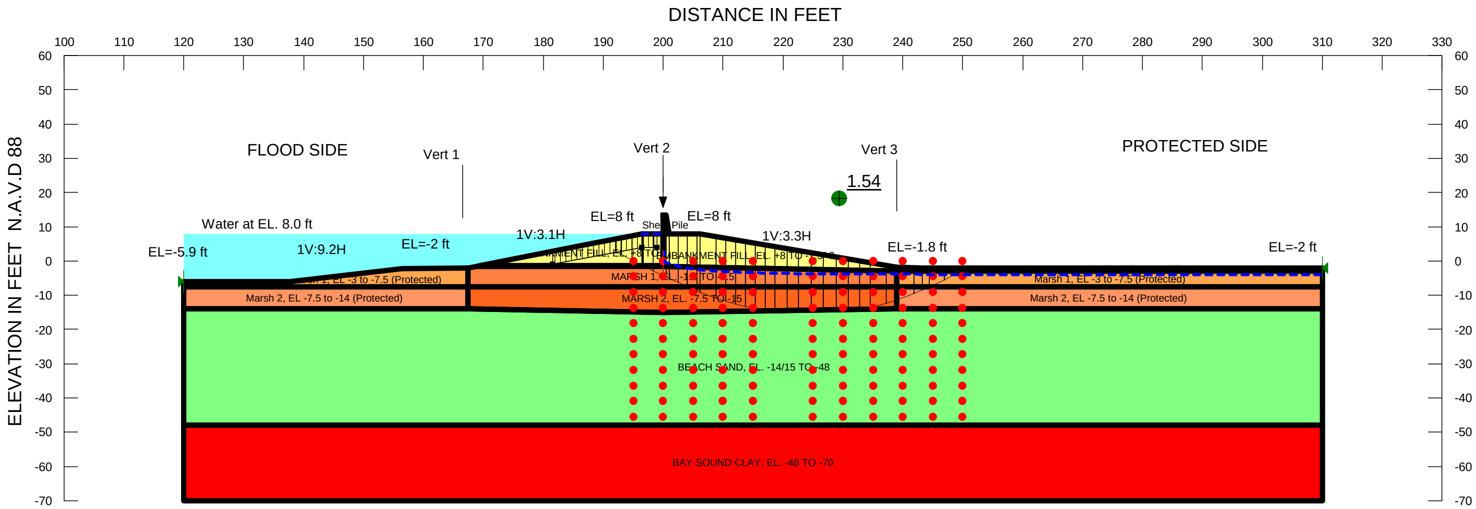
Slices of Slip Surface: Optimized

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	192.54495	3.5195075	94.469874	195.72974	0	540
2	Optimized	194.19175	2.1547805	93.157005	361.20189	0	540
3	Optimized	195.6639	0.8922213	101.81426	517.68215	0	540
4	Optimized	196.7978	-0.0802242	112.05692	631.8026	0	540
5	Optimized	197.7348	-0.860695	106.51796	727.01367	0	540
6	Optimized	198.39425	-1.397965	79.641961	783.62145	0	540
7	Optimized	198.9637	-1.8619	101.31841	965.63579	0	178.43
8	Optimized	199.70645	-2.4140185	122.67288	1041.3033	0	182.16
9	Optimized	200.25	-2.7587095	117.45123	1073.5609	0	184.55
10	Optimized	200.75	-3.075795	120.62317	1102.9326	0	186.83
11	Optimized	201.6375	-3.6386285	129.36202	1155.2569	0	190.87
12	Optimized	202.9125	-4.4472095	152.93477	1230.8302	0	196.66
13	Optimized	204.2125	-5.2734955	184.1621	1307.6139	0	202.56
14	Optimized	205.5375	-6.1174865	221.93535	1386.4832	0	208.56
15	Optimized	206.491	-6.724851	250.91737	1433.1635	0	212.86
16	Optimized	207.5805	-7.2827075	279.45547	1480.101	0	216.73
17	Optimized	209.17745	-8.0276825	318.42999	1495.9337	0	221.82
18	Optimized	210.8444	-8.594915	349.63082	1540.8565	0	225.52
19	Optimized	212.58135	-8.984405	371.60213	1519.3964	0	227.84
20	Optimized	214.15825	-9.2658925	387.8682	1513.4628	0	229.38
21	Optimized	215.57515	-9.4393775	398.03267	1482.2199	0	230.16
22	Optimized	217.2346	-9.498245	401.29032	1462.1185	0	229.99
23	Optimized	219.1366	-9.442495	397.50639	1392.0633	0	228.89
24	Optimized	220.91685	-9.3909065	394.00034	1326.4536	0	227.85
25	Optimized	222.57535	-9.34348	390.77582	1265.4589	0	226.9
26	Optimized	224.2338	-9.2960535	387.5513	1204.4642	0	225.94
27	Optimized	225.8315	-9.083965	374.09706	1168.9901	0	223.83
28	Optimized	227.3685	-8.707215	350.38108	1078.9414	0	220.6
29	Optimized	229.276	-7.9784	304.63835	980.12387	0	214.82
30	Optimized	231.6153	-6.568965	216.35868	794.77389	0	204.4
31	Optimized	233.6578	-4.97122	116.44852	740.27284	0	540
32	Optimized	234.9053	-3.891765	48.945406	613.79998	0	600
33	Optimized	235.9696	-2.9672835	-8.9164729	507.36115	0	600
34	Optimized	237.28755	-1.8197305	-80.79874	372.8015	0	600

Slices of Slip Surface: 1938

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	1938	192.16125	3.15983	93.117358	144.85775	0	540
2	1938	193.85675	1.3145345	76.466183	416.66182	0	540
3	1938	195.55225	-0.2883715	67.882953	647.81476	0	540
4	1938	196.56215	-1.1678415	56.678647	773.52944	0	540
5	1938	196.84445	-1.395842	48.781059	802.68346	0	540
6	1938	197.72345	-2.0584325	82.644977	998.44424	0	180.68
7	1938	199.24115	-3.1307985	131.34699	1106.8591	0	187.84
8	1938	200.25	-3.7906915	152.33673	1175.136	0	192.44
9	1938	200.75	-4.0934695	158.92596	1206.8744	0	194.61
10	1938	201.86665	-4.714383	176.4334	1273.0255	0	199.01

11	1938	203.6	-5.597776	205.9008	1368.9361	0	205.21
12	1938	205.33335	-6.3629925	236.69034	1454.0747	0	210.48
13	1938	207.03325	-7.007705	265.23024	1498.546	0	214.83
14	1938	208.69975	-7.54215	291.25582	1503.0701	0	218.32
15	1938	210.3662	-7.9855855	314.28575	1498.7441	0	221.11
16	1938	212.03265	-8.3415835	333.51557	1485.8758	0	223.21
17	1938	213.69915	-8.6128765	348.55236	1464.7949	0	224.67
18	1938	215.36565	-8.801471	359.18451	1435.6143	0	225.5
19	1938	217.03215	-8.908724	365.16487	1398.4106	0	225.71
20	1938	218.69865	-8.935394	366.3165	1353.1653	0	225.31
21	1938	220.3651	-8.881668	362.59053	1299.9602	0	224.33
22	1938	222.03155	-8.7471685	353.89231	1238.6828	0	222.76
23	1938	223.69805	-8.53094	340.11072	1169.1658	0	220.62
24	1938	225.36455	-8.2314135	321.1429	1091.2075	0	217.9
25	1938	227.03105	-7.846349	296.8351	1004.5412	0	214.61
26	1938	228.69755	-7.3727465	267.01265	908.81589	0	210.75
27	1938	230.364	-6.806718	231.41576	803.54101	0	206.35
28	1938	232.03045	-6.1433115	189.74047	688.165	0	201.4
29	1938	233.68185	-5.384196	142.15205	650.13409	0	540
30	1938	235.4405	-4.4499505	83.605741	554.14776	0	600
31	1938	237.32155	-3.304063	11.781475	450.09633	0	600
32	1938	239.2026	-1.982643	-71.019824	328.82994	0	600



Name: EMBANKMENT FILL, EL. +8 TO -1.5/-3 Model: Undrained (Phi=0) Unit Weight: 111 pcf Cohesion: 600 psf
Name: MARSH 1, EL. -1.5 TO -7.5 Model: Spatial Mohr-Coulomb Unit Weight: 93 pcf Cohesion Fn: MARSH 1 Phi: 0 °
Name: BEACH SAND, EL. -14/15 TO -48 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand
Name: BAY SOUND CLAY, EL. -48 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 105 pcf Cohesion Spatial Fn: CLAY Phi: 0 °
Name: Marsh 1, EL -3 to -7.5 (Protected) Model: Spatial Mohr-Coulomb Unit Weight: 93 pcf Cohesion: 300 psf Phi: 0 °
Name: Sheet Pile Model: Undrained (Phi=0) Unit Weight: 0.1 pcf Cohesion: 0.01 psf
Name: MARSH 2, EL. -7.5 TO -15 Model: Spatial Mohr-Coulomb Unit Weight: 93 pcf Cohesion Spatial Fn: Marsh 2 Phi: 0 °
Name: Marsh 2, EL -7.5 to -14 (Protected) Model: Spatial Mohr-Coulomb Unit Weight: 93 pcf Cohesion Fn: Marsh 2 (protected) Phi: 0 °
Name: FILL, EL. -1.8 TO -3 (Protected) Model: Spatial Mohr-Coulomb Unit Weight: 111 pcf Cohesion: 550 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.

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 15
REMEDIATION OF CANAL WALLS AND LEVEE
PROTECTED SIDE STABILITY ANALYSIS,
CASE: Global Stability (Block)
STA. 20+50 TO 30+00 EAST
ORLEANS PARISH, LOUISIANA

ETL 1110-2-575 ANALYSIS

Name: Global Stability (Block)
File Name: Orleans Canal Reach 15.gsz Directory: Y:\F&MHOME\Middleton\Outfall Canals\Orleans final edits\final\Appendix A and Appendix B\
Last Edited By: Reves, Ryan D MVK

Global Stability (Block)

File Information

Created By: Liljegren, James
Revision Number: 361
Last Edited By: Reves, Ryan D MVK
Date: 6/18/2013
Time: 5:30:07 PM
File Name: Orleans Canal Reach 15.gsz
Directory: Y:\F&MHOME\Middleton\Outfall Canals\Orleans final edits\final\Appendix A and Appendix B\
Last Solved Date: 6/18/2013
Last Solved Time: 5:32:28 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)

Kind: SLOPE/W
Parent: Gap Analysis (seepage)
Method: Spencer
Settings
PWP Conditions Source: Parent Analysis
Slip Surface
Direction of movement: Left to Right
Use Passive Mode: No
Slip Surface Option: Block
Critical slip surfaces saved: 1
Optimize Critical Slip Surface Location: Yes
Tension Crack
Tension Crack Option: Tension Crack Line
Percentage Wet: 1
Tension Crack Fluid Unit Weight: 62.4 pcf
FOS Distribution
FOS Calculation Option: Constant
Restrict Block Crossing: Yes
Advanced
Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 2000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

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

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

MARSH 1, EL. -1.5 TO -7.5

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

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

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

BAY SOUND CLAY, EL. -48 TO -70

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

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

Model: Spatial Mohr-Coulomb
Unit Weight: 93 pcf
Cohesion: 300 psf
Phi: 0 °
Phi-B: 0 °

Sheet Pile

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

MARSH 2, EL. -7.5 TO -15

Model: Spatial Mohr-Coulomb
Unit Weight: 93 pcf
Cohesion Spatial Fn: Marsh 2
Phi: 0 °
Phi-B: 0 °

Marsh 2, EL -7.5 to -14 (Protected)

Model: Spatial Mohr-Coulomb
Unit Weight: 93 pcf
Cohesion Fn: Marsh 2 (protected)
Phi: 0 °
Phi-B: 0 °

FILL, EL. -1.8 TO -3 (Protected)

Model: Spatial Mohr-Coulomb
Unit Weight: 111 pcf
Cohesion: 550 psf
Phi: 0 °
Phi-B: 0 °

Slip Surface Limits

Left Coordinate: (120, -5.9) ft
Right Coordinate: (310, -2) ft

Slip Surface Block

Left Grid
Upper Left: (195, 0) ft
Lower Left: (195, -50) ft
Lower Right: (215, -50) ft
X Increments: 4
Y Increments: 11
Starting Angle: 115 °
Ending Angle: 135 °
Angle Increments: 4
Right Grid
Upper Left: (225, 0) ft
Lower Left: (225, -50) ft
Lower Right: (250, -50) ft
X Increments: 5
Y Increments: 11
Starting Angle: 25 °
Ending Angle: 45 °
Angle Increments: 4

Reinforcements

Reinforcement 1

Type: Pile
Outside Point: (200, 13.4) ft
Inside Point: (200, 3.7) ft
Slip Surface Intersection: (200, -4.2313) ft
Total Length: 9.7 ft
Reinforcement Direction: 90 °
Applied Load Option: Variable
F of S Dependent: No
Pile Spacing: 1 ft
Shear Capacity: 0 lbs
Shear Safety Factor: 1
Shear Load Used: 0 lbs
Shear Option: Parallel to Slip
Resisting Force Used: 0 lbs/ft

Tension Crack Line

	X (ft)	Y (ft)
	181.5	-1
	196.5	4
	199	4

Cohesion Functions

MARSH 1

Model: Spline Data Point Function
Function: Cohesion vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 300
Data Points: X (ft), Cohesion (psf)
Data Point: (166.5, 300)

Data Point: (200, 400)
Data Point: (239, 300)

Marsh 2 (protected)

Model: Spline Data Point Function
Function: Cohesion vs. Y
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 140
Data Points: Y (ft), Cohesion (psf)
Data Point: (-14, 200)
Data Point: (-7.5, 140)

Shear/Normal Strength Functions

Sand

Model: Spline Data Point Function
Function: Shear Stress vs. Normal Stress
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
Data Point: (-10000, 0)
Data Point: (0, 0)
Data Point: (10000, 6494)
Estimation Properties
Intact Rock Param.: 10
Geological Strength: 100
Disturbance Factor: 0
SigmaC: 600000 psf
Sigma3: 300000 psf
Num. Points: 20

Spatial Functions

CLAY

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (120, -48, 630)
Data Point: (120, -70, 840)
Data Point: (167.4, -48, 630)
Data Point: (167.4, -70, 840)
Data Point: (200, -48, 730)
Data Point: (200, -70, 930)
Data Point: (239, -48, 630)
Data Point: (239, -70, 840)
Data Point: (310, -48, 630)
Data Point: (310, -70, 840)

Marsh 2

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (167.4, -7.5, 140)
Data Point: (167.4, -14, 200)
Data Point: (200, -7.5, 300)
Data Point: (200, -15, 300)
Data Point: (239, -7.5, 140)
Data Point: (239, -14, 200)

Regions

	Material	Points	Area (ft²)
Region 1	Sheet Pile	3,11,12,13	4.05
Region 2	EMBANKMENT FILL, EL. +8 TO -1.5/-3	2,3,22,41,43,44	158.39295
Region 3	EMBANKMENT FILL, EL. +8 TO -1.5/-3	3,13,9,4,24,14,40,41,22	245.1963
Region 4	MARSH 1, EL. -1.5 TO -7.5	14,24,25,10,32,1,40	399.975
Region 5	BEACH SAND, EL. -14/15 TO -48	19,33,15,26,16,7,36,30,34,20	6424.2
Region 6	BAY SOUND CLAY, EL. -48 TO -70	7,8,37,31,35,21,20,34,30,36	4180
Region 7	MARSH 2, EL. -7.5 TO -15	32,10,25,26,15,33	501.2
Region 8	FILL, EL. -1.8 TO -3 (Protected)	24,4,17,5,27	71.43
Region 9	Marsh 1, EL -3 to -7.5 (Protected)	25,24,27,6	319.5
Region 10	Marsh 2, EL -7.5 to -14 (Protected)	26,25,6,16	461.5
Region 11	Marsh 2, EL -7.5 to -14 (Protected)	19,33,32,18	308.1
Region 12	Marsh 1, EL -3 to -7.5 (Protected)	18,23,38,39,1,32	150.215

Points

	X (ft)	Y (ft)
Point 1	167.4	-2
Point 2	196.5	8
Point 3	200	8
Point 4	239	-1.8
Point 5	310	-2
Point 6	310	-7.5
Point 7	310	-48
Point 8	310	-70
Point 9	206.2	8
Point 10	200	-7.5
Point 11	200	13.4
Point 12	200.5	13.4
Point 13	201	8
Point 14	200	-1.5
Point 15	200	-15
Point 16	310	-14
Point 17	243.3	-2
Point 18	120	-7.5
Point 19	120	-14
Point 20	120	-48
Point 21	120	-70
Point 22	200	-1.3
Point 23	120	-5.9
Point 24	239	-3
Point 25	239	-7.5
Point 26	239	-14
Point 27	310	-3
Point 28	120	-130
Point 29	310	-130
Point 30	200	-48
Point 31	200	-70
Point 32	167.4	-7.5
Point 33	167.4	-14
Point 34	167.4	-48
Point 35	167.4	-70
Point 36	239	-48
Point 37	239	-70
Point 38	137.7	-6
Point 39	156.5	-2.2
Point 40	168.9	-1.5
Point 41	169.437	-1.3
Point 42	120	0
Point 43	173.22	0
Point 44	187.188	4.8

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.54	(222.826, 4.207)	25.90709	(192.116, 6.49349)	(250.728, -2)
2	2833	1.66	(222.826, 4.207)	25.6	(193.398, 6.93393)	(251.618, -2)

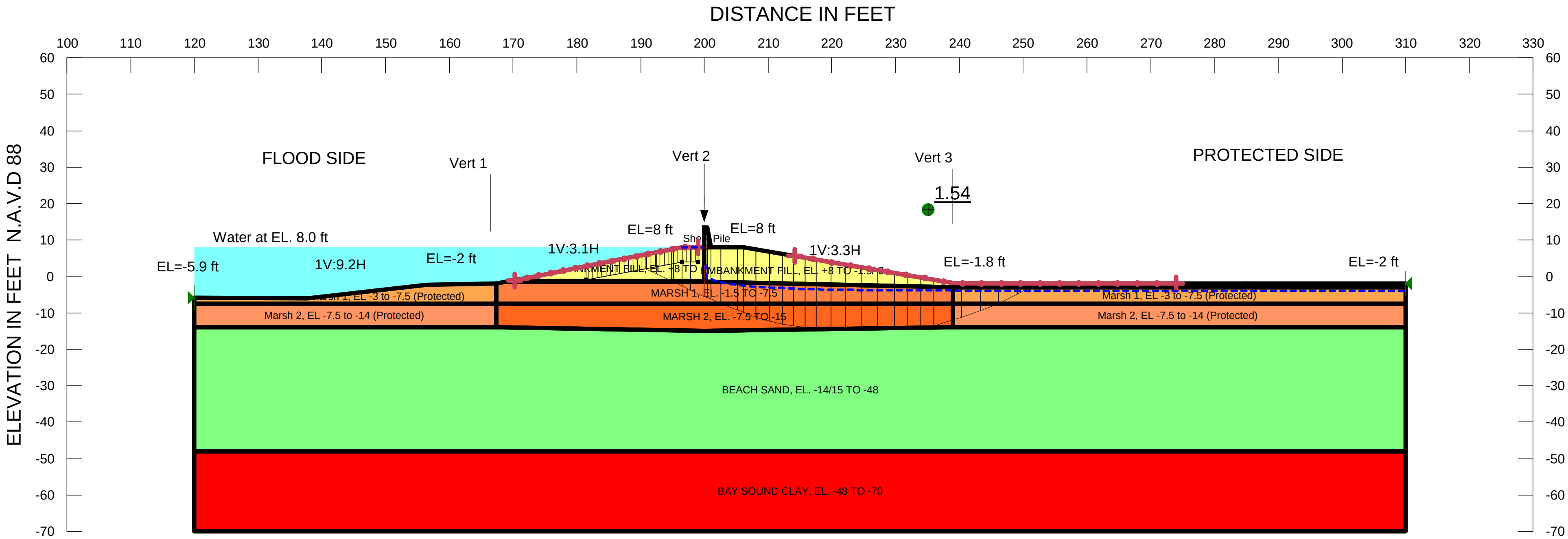
Slices of Slip Surface: Optimized

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	192.5652	2.196754	93.825266	235.92732	0	600
2	Optimized	193.8857	1.0766201	86.478172	378.56615	0	600
3	Optimized	195.62855	-0.47977935	77.371153	571.07177	0	600
4	Optimized	196.52355	-1.2789895	63.409632	669.53965	0	600
5	Optimized	196.623	-1.367795	59.460299	678.90063	0	600
6	Optimized	197.5432	-2.150623	92.991621	869.99159	0	392.67
7	Optimized	199.19375	-3.5484835	153.27121	991.94697	0	397.59
8	Optimized	200.25	-4.443037	180.90149	1071.0168	0	399.36
9	Optimized	200.72275	-4.8434065	194.0949	1107.1511	0	398.15
10	Optimized	200.97275	-5.053924	201.51763	1139.7728	0	397.51
11	Optimized	201.75515	-5.6818485	224.15525	1196.944	0	395.5
12	Optimized	203.2654	-6.8939495	272.70638	1307.3485	0	391.63
13	Optimized	204.8578	-8.17198	329.84193	1473.0949	0	280.75
14	Optimized	205.94755	-9.014912	369.90335	1582.9292	0	277.49
15	Optimized	207.4869	-10.057297	421.15294	1637.7383	0	273.32
16	Optimized	209.6084	-11.354875	488.1595	1733.6969	0	268.44

17	Optimized	211.2776	-12.20716	533.7202	1758.9877	0	265.06
18	Optimized	212.92165	-12.912155	572.49733	1816.4191	0	262
19	Optimized	214.54055	-13.46987	603.81832	1816.2439	0	259.08
20	Optimized	216.17505	-13.902155	628.50102	1846.8957	0	256.13
21	Optimized	217.8252	-14.20901	646.25563	1822.4087	0	252.99
22	Optimized	219.63835	-14.376875	656.00861	1825.5407	0	249.13
23	Optimized	221.6145	-14.40575	657.42537	1763.9624	0	244.39
24	Optimized	223.64195	-14.39357	656.43336	1707.2076	0	239.38
25	Optimized	225.72065	-14.34033	652.92276	1634.3507	0	234.05
26	Optimized	227.7994	-14.28709	649.36408	1561.4939	0	228.72
27	Optimized	229.87815	-14.23385	645.85348	1488.637	0	223.39
28	Optimized	231.82215	-14.03101	633.09783	1444.4613	0	217.28
29	Optimized	233.63145	-13.67857	611.07232	1350.7172	0	210.19
30	Optimized	235.88165	-12.967165	566.61704	1249.527	0	198.66
31	Optimized	238.1136	-11.87071	498.11705	1110.4693	0	182.93
32	Optimized	240.43115	-10.403225	406.44671	923.64056	0	166.8
33	Optimized	242.58115	-8.921606	313.78154	787.92921	0	153.12
34	Optimized	243.82855	-7.923101	251.35496	681.1678	0	143.91
35	Optimized	245.62825	-6.482515	161.23728	631.8978	0	300
36	Optimized	248.26135	-4.232515	20.48707	436.42851	0	300
37	Optimized	250.1758	-2.5	-87.873745	421.83558	0	550

Slices of Slip Surface: 2833

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	2833	194.1733	2.190341	101.92201	220.92068	0	600
2	2833	195.72445	0.6392047	110.94356	436.72201	0	600
3	2833	197.0818	-0.7181818	101.01906	591.02593	0	600
4	2833	197.7636	-1.4	75.526079	662.24089	0	600
5	2833	198.9318	-2.568182	123.16327	874.39934	0	396.81
6	2833	200.25	-3.886364	159.14145	989.04437	0	399.36
7	2833	200.75	-4.386364	173.67956	1033.5638	0	398.08
8	2833	202.4318	-6.068182	237.09607	1183.8877	0	393.76
9	2833	205.0318	-8.668182	355.55642	1473.374	0	280.58
10	2833	207.15	-10.786362	462.67109	1633.1188	0	275.61
11	2833	209.05	-12.68636	564.30838	1742.832	0	272.81
12	2833	210.96155	-13.63636	616.04398	2043.0799	0	269.36
13	2833	212.88465	-13.63636	614.63998	1980.4719	0	264.11
14	2833	214.8077	-13.63636	613.44398	1917.8119	0	258.88
15	2833	216.73075	-13.63636	612.45598	1855.1519	0	253.7
16	2833	218.65385	-13.63636	611.67598	1792.5439	0	248.55
17	2833	220.57695	-13.63636	610.99998	1729.8839	0	243.44
18	2833	222.5	-13.63636	610.42798	1667.2239	0	238.37
19	2833	224.42305	-13.63636	609.95998	1604.6159	0	233.35
20	2833	226.34615	-13.63636	609.54398	1541.9559	0	228.36
21	2833	228.26925	-13.63636	609.23198	1479.3479	0	223.41
22	2833	230.1923	-13.63636	608.91998	1416.6879	0	218.51
23	2833	232.11535	-13.63636	608.65998	1354.0799	0	213.66
24	2833	234.03845	-13.63636	608.39998	1291.4199	0	208.84
25	2833	236	-12.936155	564.64155	1303.23	0	198.09
26	2833	238	-11.53574	477.31993	1090.4553	0	180.26
27	2833	240.075	-10.082809	386.56362	901.44838	0	163.84
28	2833	242.225	-8.577364	292.3916	736.70354	0	149.94
29	2833	243.5318	-7.6623205	235.16134	637.83317	0	141.5
30	2833	244.83475	-6.75	178.03814	625.50427	0	300
31	2833	246.977	-5.25	84.158965	479.58641	0	300
32	2833	249.1192	-3.75	-9.73474	333.67238	0	300
33	2833	250.90435	-2.5	-87.963672	323.18161	0	550



Name: EMBANKMENT FILL, EL. +8 TO -1.5/-3 Model: Undrained (Phi=0) Unit Weight: 111 pcf Cohesion: 600 psf
Name: MARSH 1, EL. -1.5 TO -7.5 Model: Spatial Mohr-Coulomb Unit Weight: 93 pcf Cohesion Fn: MARSH 1 Phi: 0 °
Name: BEACH SAND, EL. -14/15 TO -48 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand
Name: BAY SOUND CLAY, EL. -48 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 105 pcf Cohesion Spatial Fn: CLAY Phi: 0 °
Name: Marsh 1, EL -3 to -7.5 (Protected) Model: Spatial Mohr-Coulomb Unit Weight: 93 pcf Cohesion: 300 psf Phi: 0 °
Name: Sheet Pile Model: Undrained (Phi=0) Unit Weight: 0.1 pcf Cohesion: 0.01 psf
Name: MARSH 2, EL. -7.5 TO -15 Model: Spatial Mohr-Coulomb Unit Weight: 93 pcf Cohesion Spatial Fn: Marsh 2 Phi: 0 °
Name: Marsh 2, EL -7.5 to -14 (Protected) Model: Spatial Mohr-Coulomb Unit Weight: 93 pcf Cohesion Fn: Marsh 2 (protected) Phi: 0 °
Name: FILL, EL. -1.8 TO -3 (Protected) Model: Spatial Mohr-Coulomb Unit Weight: 111 pcf Cohesion: 550 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.

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 15
REMEDIATION OF CANAL WALLS AND LEVEE
PROTECTED SIDE STABILITY ANALYSIS,
CASE: Global Stability (Entry/Exit)
STA. 20+50 TO 30+00 EAST
ORLEANS PARISH, LOUISIANA

ETL 1110-2-575 ANALYSIS

Name: Global Stability (Entry/Exit)
File Name: Orleans Canal Reach 15.gsz Directory: Y:\F&MHOME\Middleton\Outfall Canals\Orleans final edits\final\Appendix A and Appendix B\
Last Edited By: Reves, Ryan D MVK

Global Stability (Entry/Exit)

File Information

Created By: Liljegren, James
Revision Number: 361
Last Edited By: Reves, Ryan D MVK
Date: 6/18/2013
Time: 5:30:07 PM
File Name: Orleans Canal Reach 15.gsz
Directory: Y:\F&MHOME\Middleton\Outfall Canals\Orleans final edits\final\Appendix A and Appendix B\
Last Solved Date: 6/18/2013
Last Solved Time: 5:33:08 PM

Project Settings

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

Analysis Settings

Global Stability (Entry/Exit)

Kind: SLOPE/W
Parent: Gap Analysis (seepage)
Method: Spencer
Settings
- PWP Conditions Source: Parent Analysis

Slip Surface
- Direction of movement: Left to Right
- Use Passive Mode: No
- Slip Surface Option: Entry and Exit
- Critical slip surfaces saved: 1
- Optimize Critical Slip Surface Location: Yes
- Tension Crack
  - Tension Crack Option: Tension Crack Line
  - Percentage Wet: 1
  - Tension Crack Fluid Unit Weight: 62.4 pcf

FOS Distribution
- FOS Calculation Option: Constant

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

Materials

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

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

MARSH 1, EL. -1.5 TO -7.5

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

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

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

BAY SOUND CLAY, EL. -48 TO -70

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

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

Model: Spatial Mohr-Coulomb
Unit Weight: 93 pcf
Cohesion: 300 psf
Phi: 0 °
Phi-B: 0 °

Sheet Pile

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

MARSH 2, EL. -7.5 TO -15

Model: Spatial Mohr-Coulomb
Unit Weight: 93 pcf
Cohesion Spatial Fn: Marsh 2
Phi: 0 °
Phi-B: 0 °

Marsh 2, EL -7.5 to -14 (Protected)

Model: Spatial Mohr-Coulomb
Unit Weight: 93 pcf
Cohesion Fn: Marsh 2 (protected)
Phi: 0 °
Phi-B: 0 °

FILL, EL. -1.8 TO -3 (Protected)

Model: Spatial Mohr-Coulomb
Unit Weight: 111 pcf
Cohesion: 550 psf
Phi: 0 °
Phi-B: 0 °

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (170.23764, -1.02487) ft
Left-Zone Right Coordinate: (199.01133, 8) ft
Left-Zone Increment: 15
Right Projection: Range
Right-Zone Left Coordinate: (214.15099, 5.6244) ft
Right-Zone Right Coordinate: (274, -2) ft
Right-Zone Increment: 20
Radius Increments: 4

Slip Surface Limits

Left Coordinate: (120, -5.9) ft
Right Coordinate: (310, -2) ft

Reinforcements

Reinforcement 1

Type: Pile
Outside Point: (200, 13.4) ft
Inside Point: (200, 3.7) ft
Slip Surface Intersection: (200, -5.4353) ft
Total Length: 9.7 ft
Reinforcement Direction: 90 °
Applied Load Option: Variable
F of S Dependent: No
Pile Spacing: 1 ft
Shear Capacity: 0 lbs
Shear Safety Factor: 1
Shear Load Used: 0 lbs
Shear Option: Parallel to Slip
Resisting Force Used: 0 lbs/ft

Tension Crack Line

	X (ft)	Y (ft)
	181.5	-1
	196.5	4
	199	4

Cohesion Functions

MARSH 1

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

Y-Intercept: 300
Data Points: X (ft), Cohesion (psf)
- Data Point: (166.5, 300)
- Data Point: (200, 400)
- Data Point: (239, 300)

Marsh 2 (protected)

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

Y-Intercept: 140

Data Points: Y (ft), Cohesion (psf)
Data Point: (-14, 200)
Data Point: (-7.5, 140)

Shear/Normal Strength Functions

Sand

Model: Spline Data Point Function
Function: Shear Stress vs. Normal Stress
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
Data Point: (-10000, 0)
Data Point: (0, 0)
Data Point: (10000, 6494)
Estimation Properties
Intact Rock Param.: 10
Geological Strength: 100
Disturbance Factor: 0
SigmaC: 600000 psf
Sigma3: 300000 psf
Num. Points: 20

Spatial Functions

CLAY

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (120, -48, 630)
Data Point: (120, -70, 840)
Data Point: (167.4, -48, 630)
Data Point: (167.4, -70, 840)
Data Point: (200, -48, 730)
Data Point: (200, -70, 930)
Data Point: (239, -48, 630)
Data Point: (239, -70, 840)
Data Point: (310, -48, 630)
Data Point: (310, -70, 840)

Marsh 2

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (167.4, -7.5, 140)
Data Point: (167.4, -14, 200)
Data Point: (200, -7.5, 300)
Data Point: (200, -15, 300)
Data Point: (239, -7.5, 140)
Data Point: (239, -14, 200)

Regions

	Material	Points	Area (ft^2)
Region 1	Sheet Pile	3,11,12,13	4.05
Region 2	EMBANKMENT FILL, EL. +8 TO -1.5/-3	2,3,22,41,43,44	158.39295
Region 3	EMBANKMENT FILL, EL. +8 TO -1.5/-3	3,13,9,4,24,14,40,41,22	245.1963
Region 4	MARSH 1, EL. -1.5 TO -7.5	14,24,25,10,32,1,40	399.975
Region 5	BEACH SAND, EL. -14/15 TO -48	19,33,15,26,16,7,36,30,34,20	6424.2
Region 6	BAY SOUND CLAY, EL. -48 TO -70	7,8,37,31,35,21,20,34,30,36	4180
Region 7	MARSH 2, EL. -7.5 TO -15	32,10,25,26,15,33	501.2
Region 8	FILL, EL. -1.8 TO -3 (Protected)	24,4,17,5,27	71.43
Region 9	Marsh 1, EL -3 to -7.5 (Protected)	25,24,27,6	319.5
Region 10	Marsh 2, EL -7.5 to -14 (Protected)	26,25,6,16	461.5
Region 11	Marsh 2, EL -7.5 to -14 (Protected)	19,33,32,18	308.1
Region 12	Marsh 1, EL -3 to -7.5 (Protected)	18,23,38,39,1,32	150.215

Points

	X (ft)	Y (ft)
Point 1	167.4	-2
Point 2	196.5	8
Point 3	200	8
Point 4	239	-1.8
Point 5	310	-2
Point 6	310	-7.5
Point 7	310	-48
Point 8	310	-70
Point 9	206.2	8
Point 10	200	-7.5
Point 11	200	13.4
Point 12	200.5	13.4
Point 13	201	8
Point 14	200	-1.5
Point 15	200	-15
Point 16	310	-14
Point 17	243.3	-2
Point 18	120	-7.5
Point 19	120	-14
Point 20	120	-48
Point 21	120	-70
Point 22	200	-1.3
Point 23	120	-5.9
Point 24	239	-3
Point 25	239	-7.5
Point 26	239	-14
Point 27	310	-3
Point 28	120	-130
Point 29	310	-130
Point 30	200	-48
Point 31	200	-70
Point 32	167.4	-7.5
Point 33	167.4	-14
Point 34	167.4	-48
Point 35	167.4	-70
Point 36	239	-48
Point 37	239	-70
Point 38	137.7	-6
Point 39	156.5	-2.2
Point 40	168.9	-1.5
Point 41	169.437	-1.3
Point 42	120	0
Point 43	173.22	0
Point 44	187.188	4.8

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.54	(224.595, 31.481)	26.62721	(190.702, 6.00757)	(252.163, -2)
2	1018	1.60	(224.595, 31.481)	45.712	(189.845, 5.7131)	(255.718, -2)

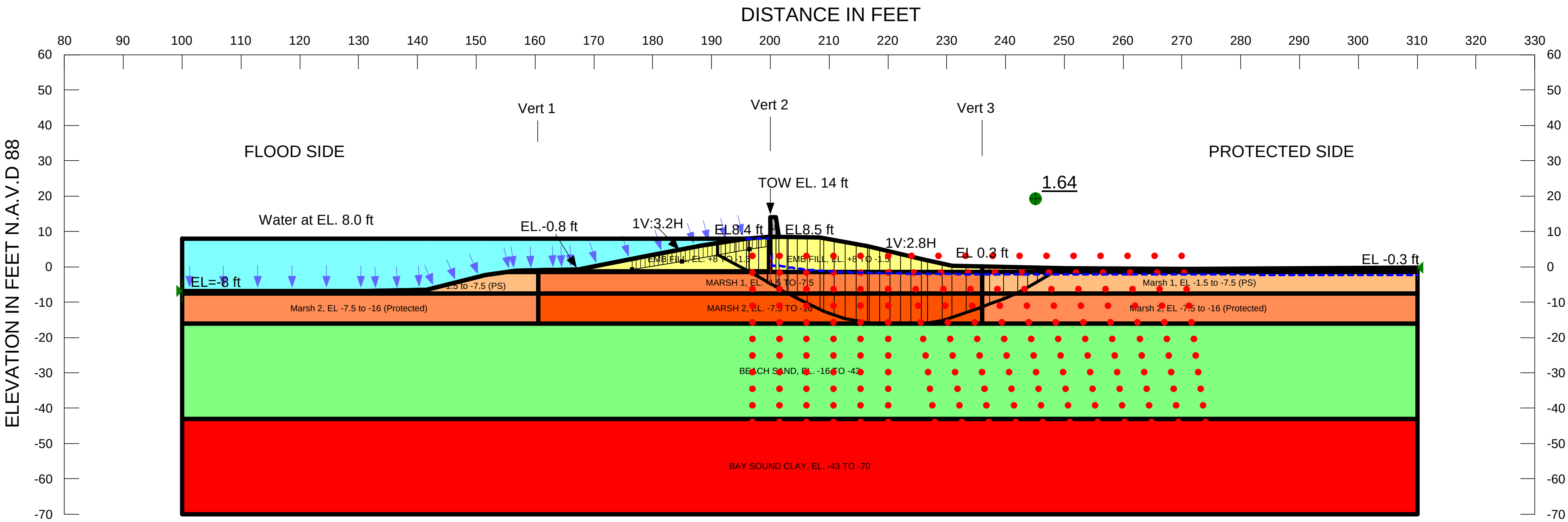
Slices of Slip Surface: Optimized

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	191.56295	1.410547	86.194119	322.63114	0	600
2	Optimized	193.65645	-0.273125	61.084181	539.81224	0	600
3	Optimized	195.009	-1.4	41.852413	680.99385	0	600
4	Optimized	195.8145	-2.071101	72.471118	857.30217	0	387.51
5	Optimized	197.17225	-3.202261	135.89099	966.72328	0	391.56
6	Optimized	198.92225	-4.5987905	194.68877	1105.5282	0	396.78
7	Optimized	200.25	-5.6292895	233.2993	1196.6108	0	399.36
8	Optimized	200.75	-6.017347	247.26629	1231.7337	0	398.08
9	Optimized	201.78805	-6.822998	279.53402	1304.9432	0	395.42
10	Optimized	203.87695	-8.353255	344.83473	1510.1394	0	284.78
11	Optimized	205.6889	-9.610506	403.44021	1637.4926	0	279.17
12	Optimized	207.1454	-10.575456	450.99482	1696.0474	0	275.31
13	Optimized	209.1294	-11.690295	508.08656	1788.0831	0	270.65
14	Optimized	211.20655	-12.667305	560.2762	1811.9997	0	266.38
15	Optimized	213.1293	-13.368105	598.85475	1879.3185	0	262.68
16	Optimized	214.8977	-13.792695	622.60879	1862.0528	0	259.14
17	Optimized	216.6661	-14.217285	647.07765	1844.7322	0	255.98
18	Optimized	218.70045	-14.42016	658.76015	1866.4291	0	251.64
19	Optimized	221.00075	-14.401315	657.23867	1789.7028	0	245.87
20	Optimized	223.35085	-14.38206	655.74126	1711.2688	0	240.03
21	Optimized	225.8909	-14.31848	651.53113	1630.6173	0	233.51
22	Optimized	228.51095	-14.213395	644.76568	1535.0412	0	226.53
23	Optimized	230.8261	-14.057475	634.87166	1458.8448	0	219.88
24	Optimized	232.89645	-13.8483	621.65618	1370.9499	0	213.31

25	Optimized	234.9668	-13.639125	608.4407	1283.0069	0	206.56
26	Optimized	237.501	-12.745925	552.63754	1199.738	0	192.44
27	Optimized	239.66545	-11.60722	481.49621	1030.8182	0	177.91
28	Optimized	241.81545	-10.268888	397.83671	909.41715	0	165.56
29	Optimized	244.6942	-8.3525275	277.97306	707.03045	0	147.87
30	Optimized	247.57475	-6.118755	138.25333	617.07646	0	300
31	Optimized	250.06065	-3.90655	-0.09565866	406.42981	0	300
32	Optimized	251.61155	-2.5	-88.0529	425.0415	0	550

Slices of Slip Surface: 1018

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	1018	191.29045	0.2408515	68.080889	351.67	0	600
2	1018	192.83935	-1.4	34.213925	606.7092	0	600
3	1018	193.83215	-2.3096025	76.030246	836.51148	0	381.59
4	1018	195.6107	-3.848769	158.5518	1024.3816	0	386.9
5	1018	197.375	-5.22717	225.05814	1182.4365	0	392.16
6	1018	199.125	-6.463351	276.70947	1312.3797	0	397.39
7	1018	200.25	-7.208008	306.89619	1392.3235	0	399.36
8	1018	200.60925	-7.4326605	315.72861	1417.0346	0	398.44
9	1018	200.85925	-7.5855175	321.92988	1467.1733	0	296.49
10	1018	202.3	-8.3978295	355.38457	1555.5544	0	290.99
11	1018	204.9	-9.745672	413.9224	1703.0614	0	282.19
12	1018	207.29335	-10.813975	463.77756	1786.2865	0	275.16
13	1018	209.48	-11.64444	504.81445	1809.3392	0	269.44
14	1018	211.66665	-12.35014	541.36185	1819.804	0	264.23
15	1018	213.85335	-12.93704	573.05393	1818.375	0	259.38
16	1018	216.04	-13.409815	599.36488	1805.6417	0	254.77
17	1018	218.22665	-13.772045	619.95775	1781.9823	0	250.23
18	1018	220.41335	-14.026385	634.64306	1747.682	0	245.63
19	1018	222.6	-14.17464	643.197	1702.8867	0	240.82
20	1018	224.78665	-14.21784	645.49734	1647.6531	0	235.63
21	1018	226.97335	-14.15629	641.43169	1582.0459	0	229.91
22	1018	229.16	-13.98956	630.85339	1505.8758	0	223.49
23	1018	231.34665	-13.716485	613.67896	1418.9065	0	216.17
24	1018	233.53335	-13.335115	589.75724	1320.8768	0	207.76
25	1018	235.72	-12.842645	558.88496	1211.2723	0	198.05
26	1018	237.90665	-12.23532	520.8265	1089.4702	0	186.79
27	1018	240.075	-11.515385	475.73535	986.78654	0	177.07
28	1018	242.225	-10.678835	423.32109	903.31899	0	169.34
29	1018	244.593	-9.59989	355.75632	802.05109	0	159.38
30	1018	247.179	-8.235235	270.30634	678.05168	0	146.79
31	1018	249.49445	-6.8356	182.70965	624.27266	0	300
32	1018	251.5393	-5.4247515	94.441421	505.95734	0	300
33	1018	253.58415	-3.8391515	-4.7369018	371.69048	0	300
34	1018	255.16245	-2.5	-88.471961	405.97856	0	550



Name: EMB FILL, EL. +8 TO -1.5 Model: Undrained (Phi=0) Unit Weight: 105 pcf Cohesion: 500 psf
Name: MARSH 1, EL. -1.5 TO -7.5 Model: Undrained (Phi=0) Unit Weight: 105 pcf Cohesion: 400 psf
Name: BEACH SAND, EL. -16 TO -43 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand
Name: BAY SOUND CLAY, EL. -43 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 105 pcf Cohesion Spatial Fn: Bay Sound Phi: 0 °
Name: Marsh 1, EL -1.5 to -7.5 (PS) Model: Spatial Mohr-Coulomb Unit Weight: 105 pcf Cohesion: 400 psf Phi: 0 °
Name: SP Model: Undrained (Phi=0) Unit Weight: 0.1 pcf Cohesion: 0.01 psf
Name: MARSH 2, EL. -7.5 TO -16 Model: Spatial Mohr-Coulomb Unit Weight: 93 pcf Cohesion Spatial Fn: Marsh 2 (-7.5 to-16) Phi: 0 °
Name: Marsh 2, EL -7.5 to -16 (Protected) Model: Spatial Mohr-Coulomb Unit Weight: 93 pcf Cohesion Fn: Marsh 2 (protected side) Phi: 0 °

GENERAL NOTES

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

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

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 16
REMEDIATION OF CANAL WALLS AND LEVEES
PROTECTED SIDE STABILITY ANALYSIS
CASE: Global Stability (Block)
STA. 30+00 TO 36+40 EAST
ORLEANS PARISH, LOUISIANA

ETL 1110-2-575 ANALYSIS

Name: Global Stability (Block)
File Name: Orleans Canal Reach 16.gsz Directory: Y:\F&MHOME\Middleton\Outfall Canals\Orleans final edits\final\Appendix A and Appendix B\
Last Edited By: Reves, Ryan D MVK

FIGURE 31

Global Stability (Block)

File Information

Created By: Liljegren, James
Revision Number: 448
Last Edited By: Reves, Ryan D MVK
Date: 6/18/2013
Time: 5:31:40 PM
File Name: Orleans Canal Reach 16.gsz
Directory: Y:\F&MHOME\Middleton\Outfall Canals\Orleans final edits\final\Appendix A and Appendix B\
Last Solved Date: 6/18/2013
Last Solved Time: 5:35:14 PM

Project Settings

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

Analysis Settings

Global Stability (Block)

Kind: SLOPE/W
Parent: Gap Analysis (seepage)
Method: Spencer
Settings
  PWP Conditions Source: Parent Analysis
Slip Surface
  Direction of movement: Left to Right
  Use Passive Mode: No
  Slip Surface Option: Block
  Critical slip surfaces saved: 1
  Optimize Critical Slip Surface Location: Yes
  Tension Crack
    Tension Crack Option: Tension Crack Line
    Percentage Wet: 1
    Tension Crack Fluid Unit Weight: 62.4 pcf
FOS Distribution
  FOS Calculation Option: Constant
Restrict Block Crossing: Yes
Advanced
  Number of Slices: 30
  Optimization Tolerance: 0.01
  Minimum Slip Surface Depth: 0.1 ft
  Optimization Maximum Iterations: 2000
  Optimization Convergence Tolerance: 1e-007
  Starting Optimization Points: 8
  Ending Optimization Points: 16
  Complete Passes per Insertion: 1
  Driving Side Maximum Convex Angle: 5 °
  Resisting Side Maximum Convex Angle: 1 °

Materials

EMB FILL, EL. +8 TO -1.5

Model: Undrained (Phi=0)
Unit Weight: 105 pcf
Cohesion: 500 psf

MARSH 1, EL. -1.5 TO -7.5

Model: Undrained (Phi=0)
Unit Weight: 105 pcf
Cohesion: 400 psf

BEACH SAND, EL. -16 TO -43

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

BAY SOUND CLAY, EL. -43 TO -70

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

Marsh 1, EL -1.5 to -7.5 (PS)

Model: Spatial Mohr-Coulomb
Unit Weight: 105 pcf
Cohesion: 400 psf
Phi: 0 °
Phi-B: 0 °

SP

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

MARSH 2, EL. -7.5 TO -16

Model: Spatial Mohr-Coulomb
Unit Weight: 93 pcf
Cohesion Spatial Fn: Marsh 2 (-7.5 to-16)
Phi: 0 °
Phi-B: 0 °

Marsh 2, EL -7.5 to -16 (Protected)

Model: Spatial Mohr-Coulomb
Unit Weight: 93 pcf
Cohesion Fn: Marsh 2 (protected side)
Phi: 0 °
Phi-B: 0 °

Slip Surface Limits

Left Coordinate: (100, -6.9) ft
Right Coordinate: (310, -0.3) ft

Slip Surface Block

Left Grid
  Upper Left: (197, 3) ft
  Lower Left: (197, -44) ft
  Lower Right: (220, -44) ft
  X Increments: 5
  Y Increments: 10
  Starting Angle: 115 °
  Ending Angle: 135 °
  Angle Increments: 4
Right Grid
  Upper Left: (224, 3) ft
  Lower Left: (228, -44) ft
  Lower Right: (274, -44) ft
  X Increments: 10
  Y Increments: 10
  Starting Angle: 15 °
  Ending Angle: 45 °
  Angle Increments: 4

Reinforcements

Reinforcement 1

Type: Pile
Outside Point: (200, 13.4) ft
Inside Point: (200, 3.7) ft
Slip Surface Intersection: (200, -4.7752) ft
Total Length: 9.7 ft
Reinforcement Direction: 90 °
Applied Load Option: Variable
F of S Dependent: No
Pile Spacing: 1 ft
Shear Capacity: 0 lbs
Shear Safety Factor: 1
Shear Load Used: 0 lbs
Shear Option: Parallel to Slip
Resisting Force Used: 0 lbs/ft

Tension Crack Line

	X (ft)	Y (ft)
	176.5	-0.83333
	185	1.5
	196.5	5
	200	5.83333

Cohesion Functions

Marsh 2 (protected side)

Model: Spline Data Point Function
Function: Cohesion vs. Y
  Curve Fit to Data: 100 %
  Segment Curvature: 0 %
Y-Intercept: 140
Data Points: Y (ft), Cohesion (psf)
  Data Point: (-16, 200)
  Data Point: (-7.5, 140)

Shear/Normal Strength Functions

Sand

Model: Spline Data Point Function

Function: Shear Stress vs. Normal Stress
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
Data Point: (-10000, 0)
Data Point: (0, 0)
Data Point: (10000, 6494)
Estimation Properties
Intact Rock Param.: 10
Geological Strength: 100
Disturbance Factor: 0
SigmaC: 600000 psf
Sigma3: 300000 psf
Num. Points: 20

Spatial Functions

Marsh 2 (-7.5 to-16)

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (160.5, -7.5, 140)
Data Point: (160.5, -16, 200)
Data Point: (200, -7.5, 250)
Data Point: (200, -16, 250)
Data Point: (236, -7.5, 140)
Data Point: (236, -16, 200)

Bay Sound

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (160.5, -43, 550)
Data Point: (160.5, -70, 800)
Data Point: (200, -43, 580)
Data Point: (200, -70, 800)
Data Point: (236, -43, 550)
Data Point: (236, -70, 800)
Data Point: (112.5, -43, 550)
Data Point: (112.5, -70, 800)
Data Point: (310, -43, 550)
Data Point: (310, -70, 800)

Regions

	Material	Points	Area (ft²)
Region 1	SP	4,12,13,14	6.675
Region 2	EMB FILL, EL. +8 TO -1.5	24,28,37,1,2,36,44,3,45,4,15	188.38
Region 3	EMB FILL, EL. +8 TO -1.5	4,14,10,47,48,46,52,5,16,23,29,41,28,24,15	233.58146
Region 4	MARSH 1, EL. -1.5 TO -7.5	23,16,5,25,11,19,33,29	453
Region 5	BEACH SAND, EL. -16 TO -43	20,34,17,26,18,8,31,21	5670
Region 6	BAY SOUND CLAY, EL. -43 TO -70	8,9,32,22,21,31	5670
Region 7	MARSH 2, EL. -7.5 TO -16	19,11,25,26,17,34,33	641.75
Region 8	Marsh 1, EL -1.5 to -7.5 (PS)	25,5,6,7	444
Region 9	Marsh 2, EL -7.5 to -16 (Protected)	26,25,7,18	629
Region 10	Marsh 1, EL -1.5 to -7.5 (PS)	29,33,30,42,40,39,38,41	109.92
Region 11	Marsh 2, EL -7.5 to -16 (Protected)	27,30,33,34,20	514.25
Region 12		35,3,44,43,36,2,1,37,28,41,38,39,40,42	1005.77
Region 13	Marsh 1, EL -1.5 to -7.5 (PS)	52,49,50,51,6,5	79.173544

Points

	X (ft)	Y (ft)
Point 1	161.8	-1
Point 2	167.3	-0.8
Point 3	195.9	8
Point 4	200	8.4
Point 5	236	-1.5
Point 6	310	-1.5
Point 7	310	-7.5
Point 8	310	-43
Point 9	310	-70
Point 10	208.5	8.2
Point 11	200	-7.5
Point 12	200	14
Point 13	200.9	14
Point 14	201.5	8.5
Point 15	200	-1.3
Point 16	200	-1.5
Point 17	200	-16
Point 18	310	-16
Point 19	165.6	-7.5
Point 20	100	-16
Point 21	100	-43
Point 22	100	-70
Point 23	165.6	-1.5
Point 24	165.6	-1.3
Point 25	236	-7.5
Point 26	236	-16
Point 27	100	-8
Point 28	156	-1.3
Point 29	160.5	-1.5
Point 30	100	-7.5
Point 31	200	-43
Point 32	200	-70
Point 33	160.5	-7.5
Point 34	160.5	-16
Point 35	100	8
Point 36	169.4	-0.1
Point 37	156.8	-1.2
Point 38	151.6	-2.3
Point 39	141.6	-6.5
Point 40	131.6	-6.9
Point 41	155.2	-1.5
Point 42	100	-6.9
Point 43	178.9	3.1
Point 44	188.4	6.1
Point 45	199.6	8.4
Point 46	230.9	0.3
Point 47	216.5	5.8
Point 48	225.7	2.1
Point 49	250.4	-0.5
Point 50	271	-0.6
Point 51	310	-0.3
Point 52	236	0.09077

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.64	(221.037, 4.477)	26.34357	(191.015, 6.76235)	(249.266, -0.453488)
2	7654	1.71	(221.037, 4.477)	26.456	(191.517, 6.88956)	(250.153, -0.489849)

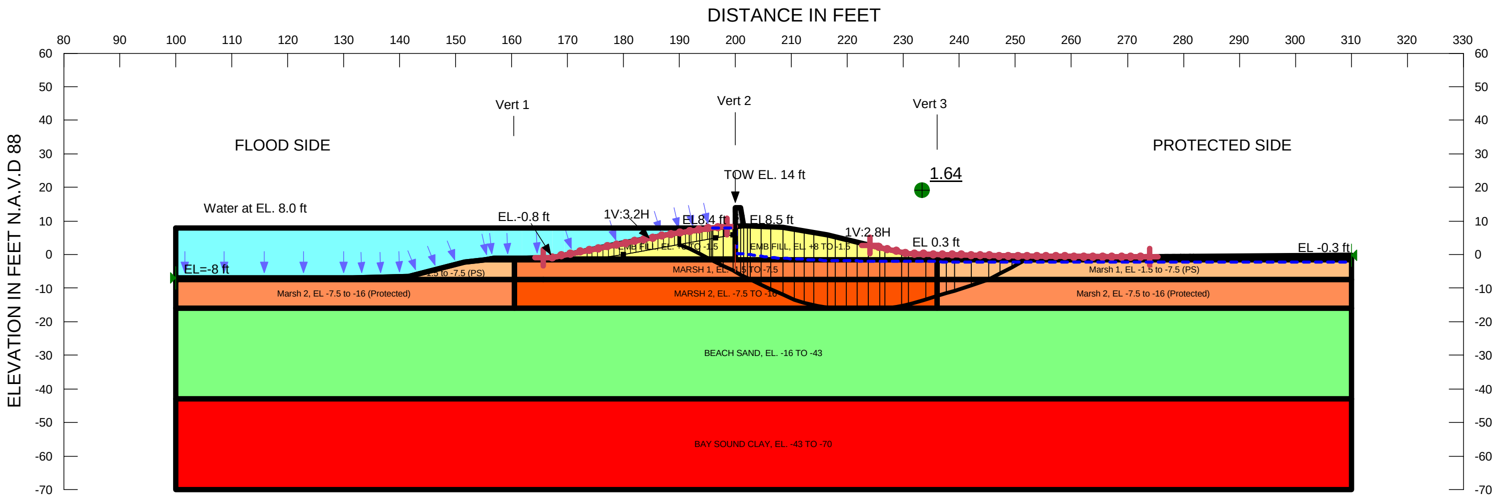
Slices of Slip Surface: Optimized

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	191.72205	2.7582805	115.17937	249.95275	0	500
2	Optimized	193.2972	1.4086618	125.44101	389.68436	0	500
3	Optimized	195.0324	-0.14611445	138.83667	567.8882	0	500
4	Optimized	196.1101	-1.1117513	138.12767	678.63879	0	500
5	Optimized	196.40575	-1.37666	134.99291	709.10997	0	500
6	Optimized	197.24745	-2.168805	171.57349	838.77491	0	400
7	Optimized	198.73505	-3.576435	242.47176	999.67776	0	400
8	Optimized	199.53325	-4.331972	270.99141	1085.2039	0	400
9	Optimized	199.8	-4.585259	281.11949	1111.9141	0	400
10	Optimized	200.45	-5.2024185	306.3923	1178.8348	0	400
11	Optimized	201.2	-5.9145265	336.24589	1256.7523	0	400
12	Optimized	202.1849	-6.849685	378.24898	1351.4451	0	400
13	Optimized	202.9323	-7.5593	411.49867	1507.7273	0	241.07

14	Optimized	203.81995	-8.3002075	446.90759	1594.6503	0	238.93
15	Optimized	205.47025	-9.6634225	515.01216	1713.219	0	235.61
16	Optimized	207.3977	-11.22107	596.54375	1853.7635	0	232.79
17	Optimized	208.8028	-12.337735	657.08775	1941.9421	0	231.45
18	Optimized	210.00845	-13.10904	699.65793	2014.2319	0	230.43
19	Optimized	211.8142	-14.1704	759.23985	2055.8151	0	229.35
20	Optimized	213.66285	-14.99312	806.38765	2126.9276	0	228.33
21	Optimized	215.5543	-15.5772	840.38495	2121.9265	0	227.11
22	Optimized	216.662	-15.91927	860.59002	2117.2254	0	226.59
23	Optimized	217.7116	-15.97013	863.51077	2136.2724	0	225.3
24	Optimized	219.4868	-15.97179	863.39811	2061.4637	0	222.83
25	Optimized	221.262	-15.97345	863.28544	1986.5987	0	220.36
26	Optimized	223.0372	-15.97511	863.17278	1911.7336	0	217.89
27	Optimized	224.8124	-15.97677	863.06011	1836.925	0	215.43
28	Optimized	226.22675	-15.97809	862.99133	1780.4292	0	213.46
29	Optimized	227.99345	-15.618785	840.66125	1732.2881	0	209.03
30	Optimized	230.0667	-14.795225	789.51977	1621.3493	0	201.14
31	Optimized	232.1104	-13.65784	718.76254	1474.3421	0	190.66
32	Optimized	234.6604	-12.177275	626.33484	1324.7989	0	175.88
33	Optimized	236.65835	-10.97377	551.08423	1198.0516	0	164.52
34	Optimized	238.476	-9.8079075	478.12519	1084.3973	0	156.29
35	Optimized	240.83285	-8.2439825	380.15789	921.18795	0	145.25
36	Optimized	242.88485	-6.64428	280.00039	935.02405	0	400
37	Optimized	244.5937	-5.03412	179.24063	754.35665	0	400
38	Optimized	246.82805	-2.86452	43.454849	523.48845	0	400
39	Optimized	248.73715	-0.97674405	-74.699619	311.85982	0	400

Slices of Slip Surface: 7654

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	7654	192.6125	2.3875	118.0067	254.83266	0	500
2	7654	194.80415	0.1958335	140.17813	509.40721	0	500
3	7654	196.1	-1.1	138.22878	655.32892	0	500
4	7654	196.4	-1.4	134.0427	689.21701	0	500
5	7654	197.275	-2.275	177.01848	842.96253	0	400
6	7654	198.825	-3.825	252.46906	1018.0513	0	400
7	7654	199.8	-4.8	291.23962	1126.0146	0	400
8	7654	200.45	-5.45	318.26096	1195.8749	0	400
9	7654	201.2	-6.2	350.6307	1277.1528	0	400
10	7654	202	-7	387.14084	1358.281	0	400
11	7654	203.5	-8.5	459.19516	1580.8433	0	239.99
12	7654	205.5	-10.5	561.30139	1754.6502	0	236.43
13	7654	207.5	-12.5	668.85233	1927.6085	0	234.44
14	7654	209.65	-14.65	788.73155	2082.3989	0	234.04
15	7654	211.75	-15.8	854.31579	2322.1053	0	233.22
16	7654	213.65	-15.8	854	2262.2105	0	230.51
17	7654	215.55	-15.8	853.63158	2202.3158	0	227.79
18	7654	217.42	-15.8	853.31522	2133.4783	0	225.12
19	7654	219.26	-15.8	853.04348	2055.7609	0	222.49
20	7654	221.1	-15.8	852.77174	1977.9891	0	219.87
21	7654	222.94	-15.8	852.5	1900.2717	0	217.24
22	7654	224.78	-15.8	852.22826	1822.5	0	214.61
23	7654	226.825	-15.8	851.95556	1742.7111	0	211.69
24	7654	229.075	-15.8	851.68889	1660.8889	0	208.48
25	7654	230.55	-15.531435	834.90238	1713.3032	0	204.76
26	7654	231.75	-14.610645	777.76632	1605.2339	0	197.25
27	7654	233.45	-13.30619	696.6576	1468.1704	0	185.87
28	7654	235.15	-12.00173	615.31555	1330.687	0	173.62
29	7654	236.83615	-10.70792	534.52976	1194.8759	0	162.64
30	7654	238.5084	-9.424754	454.26727	1061.0418	0	153.59
31	7654	240.18065	-8.141584	373.96683	927.20774	0	144.53
32	7654	241.9942	-6.75	286.79974	899.05963	0	400
33	7654	243.949	-5.25	192.85566	729.25574	0	400
34	7654	245.90385	-3.75	98.883166	559.41127	0	400
35	7654	247.8587	-2.25	4.8976895	389.59115	0	400
36	7654	249.49435	-0.99492465	-73.72146	247.4939	0	400



Name: EMB FILL, EL. +8 TO -1.5 Model: Undrained (Phi=0) Unit Weight: 105 pcf Cohesion: 500 psf
Name: MARSH 1, EL. -1.5 TO -7.5 Model: Undrained (Phi=0) Unit Weight: 105 pcf Cohesion: 400 psf
Name: BEACH SAND, EL. -16 TO -43 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand
Name: BAY SOUND CLAY, EL. -43 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 105 pcf Cohesion Spatial Fn: Bay Sound Phi: 0 °
Name: Marsh 1, EL -1.5 to -7.5 (PS) Model: Spatial Mohr-Coulomb Unit Weight: 105 pcf Cohesion: 400 psf Phi: 0 °
Name: SP Model: Undrained (Phi=0) Unit Weight: 0.1 pcf Cohesion: 0.01 psf
Name: MARSH 2, EL. -7.5 TO -16 Model: Spatial Mohr-Coulomb Unit Weight: 93 pcf Cohesion Spatial Fn: Marsh 2 (-7.5 to-16) Phi: 0 °
Name: Marsh 2, EL -7.5 to -16 (Protected) Model: Spatial Mohr-Coulomb Unit Weight: 93 pcf Cohesion Fn: Marsh 2 (protected side) Phi: 0 °

GENERAL NOTES

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

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

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 16
REMEDIATION OF CANAL WALLS AND LEVEES
PROTECTED SIDE STABILITY ANALYSIS
CASE: Global Stability (Entry/Exit)
STA. 30+00 TO 36+40 EAST
ORLEANS PARISH, LOUISIANA

ETL 1110-2-575 ANALYSIS

Name: Global Stability (Entry/Exit)
File Name: Orleans Canal Reach 16.gsz Directory: Y:\F&MHOME\Middleton\Outfall Canals\Orleans final edits\final\Appendix A and Appendix B\
Last Edited By: Reves, Ryan D MVK

Global Stability (Entry/Exit)

File Information

Created By: Liljegren, James
Revision Number: 448
Last Edited By: Reves, Ryan D MVK
Date: 6/18/2013
Time: 5:31:40 PM
File Name: Orleans Canal Reach 16.gsz
Directory: Y:\F&MHOME\Middleton\Outfall Canals\Orleans final edits\final\Appendix A and Appendix B\
Last Solved Date: 6/18/2013
Last Solved Time: 5:37:28 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)

Kind: SLOPE/W
Parent: Gap Analysis (seepage)
Method: Spencer
Settings
PWP Conditions Source: Parent Analysis
Slip Surface
Direction of movement: Left to Right
Use Passive Mode: No
Slip Surface Option: Entry and Exit
Critical slip surfaces saved: 1
Optimize Critical Slip Surface Location: Yes
Tension Crack
Tension Crack Option: Tension Crack Line
Percentage Wet: 1
Tension Crack Fluid Unit Weight: 62.4 pcf
FOS Distribution
FOS Calculation Option: Constant
Advanced
Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 2000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

EMB FILL, EL. +8 TO -1.5

Model: Undrained (Phi=0)
Unit Weight: 105 pcf
Cohesion: 500 psf

MARSH 1, EL. -1.5 TO -7.5

Model: Undrained (Phi=0)
Unit Weight: 105 pcf
Cohesion: 400 psf

BEACH SAND, EL. -16 TO -43

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

BAY SOUND CLAY, EL. -43 TO -70

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

Marsh 1, EL -1.5 to -7.5 (PS)

Model: Spatial Mohr-Coulomb
Unit Weight: 105 pcf
Cohesion: 400 psf
Phi: 0 °
Phi-B: 0 °

SP

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

MARSH 2, EL. -7.5 TO -16

Model: Spatial Mohr-Coulomb
Unit Weight: 93 pcf
Cohesion Spatial Fn: Marsh 2 (-7.5 to-16)
Phi: 0 °
Phi-B: 0 °

Marsh 2, EL -7.5 to -16 (Protected)

Model: Spatial Mohr-Coulomb
Unit Weight: 93 pcf
Cohesion Fn: Marsh 2 (protected side)
Phi: 0 °
Phi-B: 0 °

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (165.60588, -0.8616) ft
Left-Zone Right Coordinate: (198.5, 8.28108) ft
Left-Zone Increment: 20
Right Projection: Range
Right-Zone Left Coordinate: (224, 2.7837) ft
Right-Zone Right Coordinate: (273.9858, -0.57703) ft
Right-Zone Increment: 30
Radius Increments: 25

Slip Surface Limits

Left Coordinate: (100, -6.9) ft
Right Coordinate: (310, -0.3) ft

Reinforcements

Reinforcement 1

Type: Pile
Outside Point: (200, 13.4) ft
Inside Point: (200, 3.7) ft
Slip Surface Intersection: (200, -5.165) ft
Total Length: 9.7 ft
Reinforcement Direction: 90 °
Applied Load Option: Variable
F of S Dependent: No
Pile Spacing: 1 ft
Shear Capacity: 0 lbs
Shear Safety Factor: 1
Shear Load Used: 0 lbs
Shear Option: Parallel to Slip
Resisting Force Used: 0 lbs/ft

Tension Crack Line

	X (ft)	Y (ft)
	173.5	-1.66667
	180	0
	196.5	5
	199.5	5.83333

Cohesion Functions

Marsh 2 (protected side)

Model: Spline Data Point Function
Function: Cohesion vs. Y
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 140
Data Points: Y (ft), Cohesion (psf)
Data Point: (-16, 200)
Data Point: (-7.5, 140)

Shear/Normal Strength Functions

Sand

Model: Spline Data Point Function
Function: Shear Stress vs. Normal Stress
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
Data Point: (-10000, 0)
Data Point: (0, 0)
Data Point: (10000, 6494)
Estimation Properties
Intact Rock Param.: 10

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

Spatial Functions

Marsh 2 (-7.5 to-16)

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (160.5, -7.5, 140)
Data Point: (160.5, -16, 200)
Data Point: (200, -7.5, 250)
Data Point: (200, -16, 250)
Data Point: (236, -7.5, 140)
Data Point: (236, -16, 200)

Bay Sound

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (160.5, -43, 550)
Data Point: (160.5, -70, 800)
Data Point: (200, -43, 580)
Data Point: (200, -70, 800)
Data Point: (236, -43, 550)
Data Point: (236, -70, 800)
Data Point: (112.5, -43, 550)
Data Point: (112.5, -70, 800)
Data Point: (310, -43, 550)
Data Point: (310, -70, 800)

Regions

	Material	Points	Area (ft²)
Region 1	SP	4,12,13,14	6.675
Region 2	EMB FILL, EL. +8 TO -1.5	24,28,37,1,2,36,44,3,45,4,15	188.38
Region 3	EMB FILL, EL. +8 TO -1.5	4,14,10,47,48,46,52,5,16,23,29,41,28,24,15	233.58146
Region 4	MARSH 1, EL. -1.5 TO -7.5	23,16,5,25,11,19,33,29	453
Region 5	BEACH SAND, EL. -16 TO -43	20,34,17,26,18,8,31,21	5670
Region 6	BAY SOUND CLAY, EL. -43 TO -70	8,9,32,22,21,31	5670
Region 7	MARSH 2, EL. -7.5 TO -16	19,11,25,26,17,34,33	641.75
Region 8	Marsh 1, EL -1.5 to -7.5 (PS)	25,5,6,7	444
Region 9	Marsh 2, EL -7.5 to -16 (Protected)	26,25,7,18	629
Region 10	Marsh 1, EL -1.5 to -7.5 (PS)	29,33,30,42,40,39,38,41	109.92
Region 11	Marsh 2, EL -7.5 to -16 (Protected)	27,30,33,34,20	514.25
Region 12		35,3,44,43,36,2,1,37,28,41,38,39,40,42	1005.77
Region 13	Marsh 1, EL -1.5 to -7.5 (PS)	52,49,50,51,6,5	79.173544

Points

	X (ft)	Y (ft)
Point 1	161.8	-1
Point 2	167.3	-0.8
Point 3	195.9	8
Point 4	200	8.4
Point 5	236	-1.5
Point 6	310	-1.5
Point 7	310	-7.5
Point 8	310	-43
Point 9	310	-70
Point 10	208.5	8.2
Point 11	200	-7.5
Point 12	200	14
Point 13	200.9	14
Point 14	201.5	8.5
Point 15	200	-1.3
Point 16	200	-1.5
Point 17	200	-16
Point 18	310	-16
Point 19	165.6	-7.5
Point 20	100	-16
Point 21	100	-43
Point 22	100	-70
Point 23	165.6	-1.5
Point 24	165.6	-1.3
Point 25	236	-7.5
Point 26	236	-16
Point 27	100	-8
Point 28	156	-1.3
Point 29	160.5	-1.5
Point 30	100	-7.5
Point 31	200	-43
Point 32	200	-70
Point 33	160.5	-7.5
Point 34	160.5	-16
Point 35	100	8
Point 36	169.4	-0.1
Point 37	156.8	-1.2
Point 38	151.6	-2.3
Point 39	141.6	-6.5
Point 40	131.6	-6.9
Point 41	155.2	-1.5
Point 42	100	-6.9
Point 43	178.9	3.1
Point 44	188.4	6.1
Point 45	199.6	8.4
Point 46	230.9	0.3
Point 47	216.5	5.8
Point 48	225.7	2.1
Point 49	250.4	-0.5
Point 50	271	-0.6
Point 51	310	-0.3
Point 52	236	0.09077

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.64	(223.138, 22.439)	27.83916	(189.994, 6.50385)	(252.923, -0.512246)
2	11769	1.74	(223.138, 22.439)	38.312	(190.09, 6.52811)	(253.811, -0.516559)

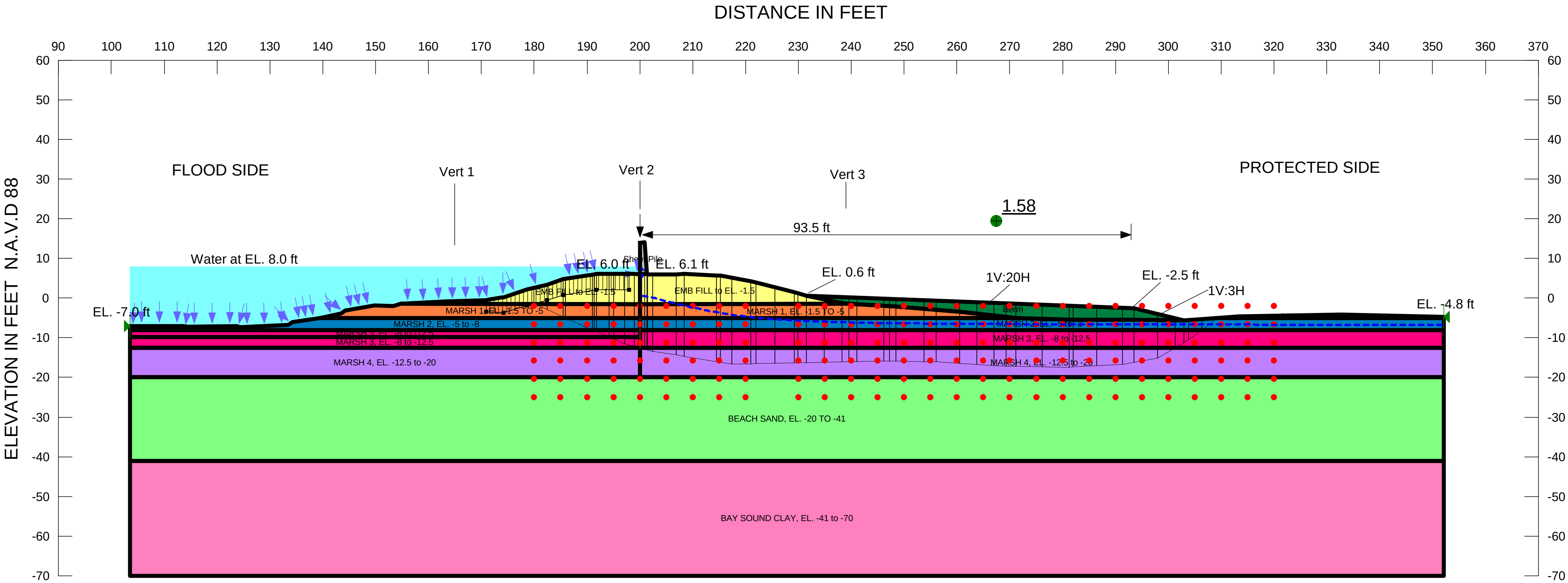
Slices of Slip Surface: Optimized

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	190.85715	2.375106	117.09056	296.45389	0	500
2	Optimized	192.647	0.9662675	120.88932	453.13108	0	500
3	Optimized	194.50065	-0.5445775	128.3746	628.21966	0	500
4	Optimized	195.5502	-1.4	125.10444	727.31982	0	500
5	Optimized	195.78645	-1.5925705	130.07772	796.6825	0	400
6	Optimized	196.86925	-2.4751455	183.11491	899.37997	0	400
7	Optimized	198.71925	-4.0392715	261.79834	1063.7463	0	400
8	Optimized	199.8	-4.989179	300.14444	1171.0215	0	400
9	Optimized	200.45	-5.5604835	323.55413	1233.2429	0	400
10	Optimized	201.2	-6.2196805	351.63314	1305.8084	0	400
11	Optimized	201.82475	-6.7687695	376.19794	1362.5147	0	400
12	Optimized	202.42565	-7.27709	399.22946	1431.6864	0	400
13	Optimized	203.6117	-8.234455	444.31446	1591.0828	0	239.48
14	Optimized	205.43145	-9.703365	517.34776	1718.549	0	235.75
15	Optimized	207.42065	-11.21346	596.03167	1865.2887	0	232.73
16	Optimized	209.5203	-12.722315	677.95477	1967.5253	0	230.66
17	Optimized	211.4182	-13.87446	742.38489	2060.4664	0	229.38
18	Optimized	213.1734	-14.71232	790.09824	2083.0891	0	228.38
19	Optimized	215.2755	-15.41199	830.60663	2129.9494	0	227.02
20	Optimized	217.1494	-15.84162	855.90416	2104.2259	0	225.65

21	Optimized	218.78645	-15.990015	864.57841	2093.1525	0	223.87
22	Optimized	220.76175	-15.98903	864.27466	2009.6208	0	221.12
23	Optimized	222.73705	-15.988045	864.02153	1926.0891	0	218.37
24	Optimized	224.71235	-15.98706	863.71778	1842.5068	0	215.61
25	Optimized	226.1912	-15.986325	863.50765	1782.8785	0	213.55
26	Optimized	228.16325	-15.659015	843.11255	1718.7007	0	209
27	Optimized	230.27205	-15.04763	805.05592	1622.08	0	202.3
28	Optimized	232.45055	-14.06129	743.63224	1496.518	0	192.59
29	Optimized	235.00055	-12.85729	668.42714	1375.6134	0	179.82
30	Optimized	236.79925	-11.9539	611.93708	1279.8911	0	171.44
31	Optimized	238.3977	-11.15108	561.6225	1195.4185	0	165.77
32	Optimized	240.67675	-9.95936	486.99146	1074.3914	0	157.36
33	Optimized	243.6996	-8.304955	383.26959	903.69178	0	145.68
34	Optimized	246.2658	-6.54006	272.74134	893.57432	0	400
35	Optimized	248.3122	-4.73846	160.00566	690.89437	0	400
36	Optimized	249.8677	-3.3442145	72.745209	546.49149	0	400
37	Optimized	251.12855	-2.1753845	-0.40478077	417.96728	0	400
38	Optimized	252.38985	-1.0061228	-73.576427	291.46314	0	400

Slices of Slip Surface: 11769

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	11769	191.57835	0.8787715	118.8388	271.74794	0	500
2	11769	193.1463	-1.4	114.3245	584.65661	0	500
3	11769	194.5629	-3.001849	198.91766	864.39345	0	400
4	11769	196.7331	-5.2968395	319.79762	1165.3583	0	400
5	11769	198.39935	-6.7949905	391.52347	1364.7727	0	400
6	11769	199.41625	-7.6448925	430.88528	1542.136	0	248.39
7	11769	199.8	-7.9434125	445.05553	1574.606	0	249.46
8	11769	200.45	-8.4278015	467.71343	1628.6977	0	248.71
9	11769	201.2	-8.968113	493.33379	1690.3097	0	246.68
10	11769	202.66665	-9.9158265	538.57916	1786.8254	0	243.12
11	11769	205	-11.281525	606.1608	1920.3521	0	238.43
12	11769	207.33335	-12.43774	665.6054	2032.6514	0	234.69
13	11769	209.5	-13.347505	714.05644	2093.8118	0	231.86
14	11769	211.5	-14.047555	752.40333	2107.6344	0	229.63
15	11769	213.5	-14.62654	784.85172	2109.5521	0	227.61
16	11769	215.5	-15.09008	811.36737	2100.246	0	225.71
17	11769	217.65	-15.46012	832.87901	2065.4591	0	223.62
18	11769	219.95	-15.722705	848.26285	2003.9333	0	221.21
19	11769	222.25	-15.845435	855.37886	1928.873	0	218.42
20	11769	224.55	-15.829665	854.11411	1840.486	0	215.08
21	11769	227	-15.65543	843.06295	1738.7408	0	210.68
22	11769	229.6	-15.30103	820.8231	1621.554	0	204.83
23	11769	232.175	-14.76875	787.49639	1528.9205	0	197.54
24	11769	234.725	-14.054235	742.71451	1460.4613	0	188.52
25	11769	237.1043	-13.216835	690.29918	1380.3032	0	180.35
26	11769	239.3129	-12.26963	630.98046	1289.9908	0	173.67
27	11769	241.52155	-11.150595	560.89183	1183.0282	0	165.77
28	11769	243.7302	-9.8417415	478.97792	1057.5838	0	156.53
29	11769	245.9388	-8.3186415	383.6599	910.99221	0	145.78
30	11769	247.88235	-6.7895215	287.96021	889.84057	0	400
31	11769	249.5608	-5.279028	193.47146	747.55433	0	400
32	11769	251.7249	-2.9895065	50.273325	539.52779	0	400
33	11769	253.43045	-1.0082793	-73.633425	365.89955	0	400



Name: EMB FILL to EL. -1.5 Model: Undrained (Phi=0) Unit Weight: 116 pcf Cohesion: 700 psf
Name: MARSH 1, EL. -1.5 TO -5 Model: Spatial Mohr-Coulomb Unit Weight: 97 pcf Cohesion Fn: MARSH 1 Phi: 0 °
Name: BEACH SAND, EL. -20 TO -41 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand
Name: Sheet Pile Model: Undrained (Phi=0) Unit Weight: 0.1 pcf Cohesion: 0.01 psf
Name: Berm Model: Mohr-Coulomb Unit Weight: 110 pcf Cohesion: 400 psf Phi: 0 °
Name: MARSH 2, EL. -5 to -8 Model: Spatial Mohr-Coulomb Unit Weight: 97 pcf Cohesion Fn: MARSH 2 Phi: 0 °
Name: MARSH 3, EL. -8 to -12.5 Model: Spatial Mohr-Coulomb Unit Weight: 73 pcf Cohesion Fn: MARSH 3 Phi: 0 °
Name: MARSH 4, EL. -12.5 to -20 Model: Spatial Mohr-Coulomb Unit Weight: 111 pcf Cohesion Fn: MARSH 4 Phi: 0 °
Name: BAY SOUND CLAY, EL. -41 to -70 Model: Spatial Mohr-Coulomb Unit Weight: 105 pcf Cohesion Spatial Fn: Bay Sound Phi: 0 °

GENERAL NOTES

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

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

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 17B
REMEDIATION OF CANAL WALLS AND LEVEES
PROTECTED SIDE STABILITY ANALYSIS,
CASE: Global Stability (Block)
STA. 37+29 TO 50+00 EAST
ORLEANS PARISH, LOUISIANA

ETL 1110-2-575 ANALYSIS

Name: Global Stability (Block)
File Name: Orleans Canal Reach 17B.gsz Directory: Y:\F&MHOME\Middleton\Outfall Canals\Orleans final edits\final\Appendix A and Appendix B\
Last Edited By: Reves, Ryan D MVK

FIGURE 58

Global Stability (Block)

File Information

Created By: Liljegren, James
Revision Number: 691
Last Edited By: Reves, Ryan D MVK
Date: 6/13/2013
Time: 5:16:06 PM
File Name: Orleans Canal Reach 17B.gsz
Directory: Y:\F&MHOME\Middleton\Outfall Canals\Orleans final edits\final\Appendix A and Appendix B\
Last Solved Date: 6/13/2013
Last Solved Time: 5:22:44 PM

Project Settings

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

Analysis Settings

Global Stability (Block)

Kind: SLOPE/W
Parent: Gap Analysis (seepage)
Method: Spencer
Settings
- PWP Conditions Source: Parent Analysis

Slip Surface
- Direction of movement: Left to Right
- Use Passive Mode: No
- Slip Surface Option: Block
- Critical slip surfaces saved: 1
- Optimize Critical Slip Surface Location: Yes
- Tension Crack
  - Tension Crack Option: Tension Crack Line
  - Percentage Wet: 1
  - Tension Crack Fluid Unit Weight: 62.4 pcf

FOS Distribution
- FOS Calculation Option: Constant

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

Materials

EMB FILL to EL. -1.5

Model: Undrained (Phi=0)
Unit Weight: 116 pcf
Cohesion: 700 psf

MARSH 1, EL. -1.5 TO -5

Model: Spatial Mohr-Coulomb
Unit Weight: 97 pcf
Cohesion Fn: MARSH 1
Phi: 0 °
Phi-B: 0 °

BEACH SAND, EL. -20 TO -41

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

Sheet Pile

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

Berm

Model: Mohr-Coulomb
Unit Weight: 110 pcf
Cohesion: 400 psf
Phi: 0 °
Phi-B: 0 °

MARSH 2, EL. -5 to -8

Model: Spatial Mohr-Coulomb
Unit Weight: 97 pcf
Cohesion Fn: MARSH 2
Phi: 0 °
Phi-B: 0 °

MARSH 3, EL. -8 to -12.5

Model: Spatial Mohr-Coulomb
Unit Weight: 73 pcf
Cohesion Fn: MARSH 3
Phi: 0 °
Phi-B: 0 °

MARSH 4, EL. -12.5 to -20

Model: Spatial Mohr-Coulomb
Unit Weight: 111 pcf
Cohesion Fn: MARSH 4
Phi: 0 °
Phi-B: 0 °

BAY SOUND CLAY, EL. -41 to -70

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

Slip Surface Limits

Left Coordinate: (103.5, -7) ft
Right Coordinate: (352.1, -4.8) ft

Slip Surface Block

Left Grid
- Upper Left: (180, -2) ft
- Lower Left: (180, -25) ft
- Lower Right: (220, -25) ft
- X Increments: 8
- Y Increments: 5
- Starting Angle: 125 °
- Ending Angle: 145 °
- Angle Increments: 4

Right Grid
- Upper Left: (230, -2) ft
- Lower Left: (230, -25) ft
- Lower Right: (320, -25) ft
- X Increments: 18
- Y Increments: 5
- Starting Angle: 0 °
- Ending Angle: 45 °
- Angle Increments: 4

Reinforcements

Reinforcement 1

Type: Pile
Outside Point: (200, 13.9) ft
Inside Point: (200, -4.8) ft
Slip Surface Intersection: (200, -12.54) ft
Total Length: 18.7 ft
Reinforcement Direction: 90 °
Applied Load Option: Variable
F of S Dependent: No
Pile Spacing: 1 ft
Shear Capacity: 0 lbs
Shear Safety Factor: 1
Shear Load Used: 0 lbs
Shear Option: Parallel to Slip
Resisting Force Used: 0 lbs/ft

Tension Crack Line

	X (ft)	Y (ft)
	170.9	-3.5
	174.2	-3.8
	178.6	-1.8
	182.5	-0.6
	185.5	0.8
	191.8	2.1
	198	2.1

Cohesion Functions

MARSH 1

Model: Spline Data Point Function
Function: Cohesion vs. X
- Curve Fit to Data: 100 %

Segment Curvature: 0 %
Y-Intercept: 200
Data Points: X (ft), Cohesion (psf)
Data Point: (165, 200)
Data Point: (200, 275)
Data Point: (239.5, 200)

MARSH 2

Model: Spline Data Point Function
Function: Cohesion vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 350
Data Points: X (ft), Cohesion (psf)
Data Point: (165, 350)
Data Point: (200, 400)
Data Point: (239.5, 350)

MARSH 3

Model: Spline Data Point Function
Function: Cohesion vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 180
Data Points: X (ft), Cohesion (psf)
Data Point: (165, 180)
Data Point: (200, 250)
Data Point: (239.5, 180)

MARSH 4

Model: Spline Data Point Function
Function: Cohesion vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 180
Data Points: X (ft), Cohesion (psf)
Data Point: (165, 180)
Data Point: (200, 250)
Data Point: (239.5, 180)

Shear/Normal Strength Functions

Sand

Model: Spline Data Point Function
Function: Shear Stress vs. Normal Stress
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
Data Point: (-10000, 0)
Data Point: (0, 0)
Data Point: (10000, 6494)
Estimation Properties
Intact Rock Param.: 10
Geological Strength: 100
Disturbance Factor: 0
SigmaC: 600000 psf
Sigma3: 300000 psf
Num. Points: 20

Spatial Functions

Bay Sound

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (103.5, -41, 580)
Data Point: (165, -41, 580)
Data Point: (200, -41, 610)
Data Point: (239.5, -41, 580)
Data Point: (352.1, -41, 580)
Data Point: (103.5, -70, 855)
Data Point: (165, -70, 855)
Data Point: (200, -70, 885)
Data Point: (239.5, -70, 855)
Data Point: (352.1, -70, 855)

Regions

	Material	Points	Area (ft²)
Region 1	MARSH 3, EL. -8 to -12.5	1,7,15,16	173.7
Region 2	MARSH 3, EL. -8 to -12.5	2,1,16,17	260.55
Region 3	MARSH 4, EL. -12.5 to -20	2,17,18,3	723.75
Region 4	BAY SOUND CLAY, EL. -41 to -70	4,19,11,12,20,5	7209.4
Region 5	MARSH 3, EL. -8 to -12.5	15,8,9,17,16	684.45
Region 6	MARSH 4, EL. -12.5 to -20	17,9,10,18	1140.75
Region 7	BEACH SAND, EL. -20 TO -41	3,18,10,11,19,4	5220.6
Region 8	EMB FILL to EL. -1.5	33,34,35,36,38,37,39,40,41,42,43,44,45,46,13	162.855
Region 9	MARSH 1, EL. -1.5 TO -5	73,29,30,31,32,33,13,14	193.77
Region 10	MARSH 2, EL. -5 to -8	21,22,23,24,25,26,27,28,73,14,15,7	222.71
Region 11	EMB FILL to EL. -1.5	59,60,13,46,49,50,51,52,53,54,55,56,57,58	198.42
Region 12	MARSH 1, EL. -1.5 TO -5	65,14,13,60,61,62,63,64	204.175
Region 13	MARSH 1, EL. -1.5 TO -5	74,70,71,72,6	22.16
Region 14	MARSH 2, EL. -5 to -8	14,65,66,67,68,69,74,6,8,15	442.39
Region 15	Sheet Pile	46,75,47,48,49	8.775
Region 16	Berm	58,76,69,68,67,66,65,64,63,62,61,60,59	172.285

Points

	X (ft)	Y (ft)
Point 1	103.5	-9.8
Point 2	103.5	-12.5
Point 3	103.5	-20
Point 4	103.5	-41
Point 5	103.5	-70
Point 6	352.1	-5
Point 7	103.5	-8
Point 8	352.1	-8
Point 9	352.1	-12.5
Point 10	352.1	-20
Point 11	352.1	-41
Point 12	352.1	-70
Point 13	200	-1.5
Point 14	200	-5
Point 15	200	-8
Point 16	200	-9.8
Point 17	200	-12.5
Point 18	200	-20
Point 19	200	-41
Point 20	200	-70
Point 21	103.5	-7
Point 22	104.4	-7.1
Point 23	113.7	-7.1
Point 24	114.4	-7.2
Point 25	123.7	-7.1
Point 26	124.4	-7.3
Point 27	133.5	-6.8
Point 28	134.3	-6
Point 29	143.5	-3.9
Point 30	144.2	-3.1
Point 31	149.8	-1.8
Point 32	153.4	-2
Point 33	154.8	-1.4
Point 34	163.2	-0.9
Point 35	170.9	-0.5
Point 36	171.3	-0.4
Point 37	174.2	0.2
Point 38	173.9	0.2
Point 39	178.6	2.2
Point 40	182.5	3.4
Point 41	185.5	4.8
Point 42	191.4	6
Point 43	191.8	6.1
Point 44	195	6.1
Point 45	198.9	6.1
Point 46	200	6

Point 47	200	13.9
Point 48	200.9	14.1
Point 49	201.3	6.1
Point 50	201.5	6
Point 51	206.9	6
Point 52	208.4	6.1
Point 53	214.5	5.7
Point 54	215.2	5.7
Point 55	221	4.2
Point 56	222	3.9
Point 57	229.2	1.5
Point 58	231.5	0.6
Point 59	238.3	-1.3
Point 60	239.5	-1.4
Point 61	248.5	-2.1
Point 62	253.8	-2.7
Point 63	260.5	-3.5
Point 64	269.3	-4.7
Point 65	271.1	-5
Point 66	282	-5.4
Point 67	286.5	-5.5
Point 68	293.4	-5.4
Point 69	303	-5.6
Point 70	313.4	-4.6
Point 71	332.7	-4.2
Point 72	352.1	-4.8
Point 73	139.5	-5
Point 74	309	-5
Point 75	200	6.1
Point 76	293.5	-2.5

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.58	(245.341, -0.669)	49.33238	(179.955, 2.61688)	(309.282, -4.97436)
2	15180	1.68	(245.341, -0.669)	49.974	(179.577, 2.50053)	(310.98, -4.82)

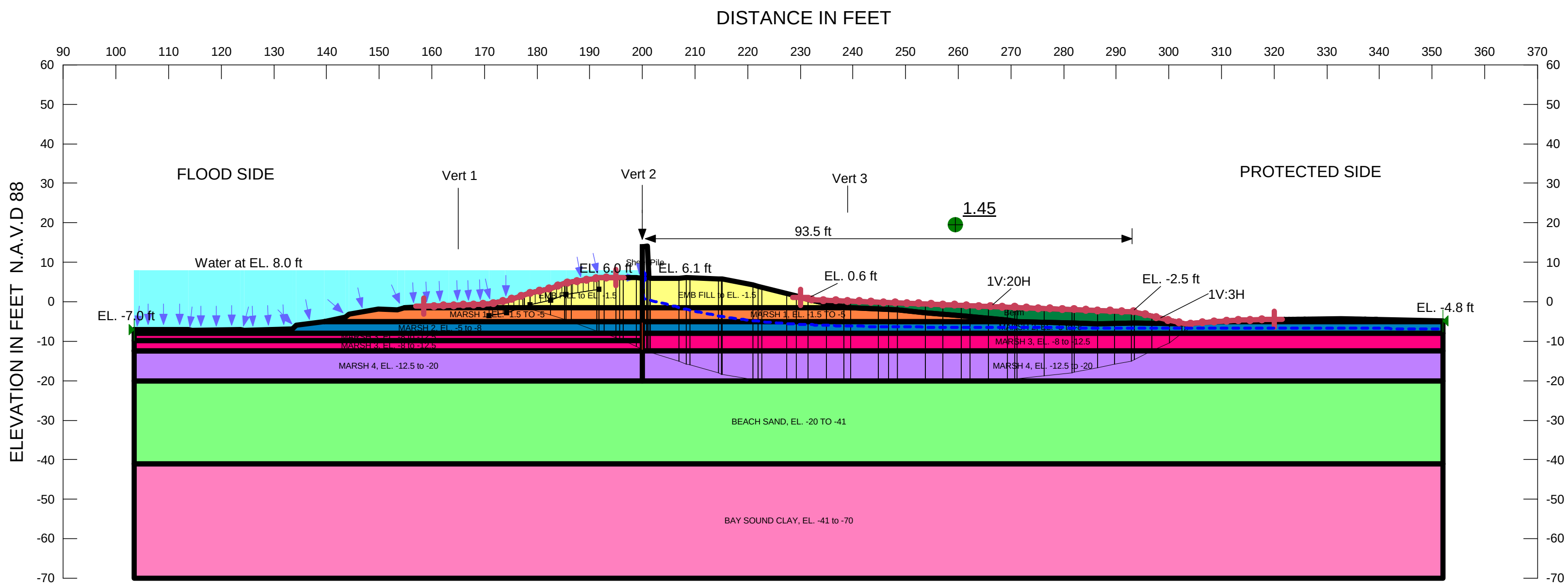
Slices of Slip Surface: Optimized

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	181.22745	-2.1532825	192.53439	731.37388	0	234.77
2	Optimized	184	-3.8312525	280.64267	988.55596	0	240.71
3	Optimized	185.7156	-4.8695295	344.0445	1127.2572	0	244.39
4	Optimized	185.95495	-5.014385	353.22176	1099.0241	0	379.94
5	Optimized	188.52545	-6.514385	454.72151	1271.9789	0	383.61
6	Optimized	191.2361	-8.0956015	570.51089	1493.7798	0	232.47
7	Optimized	191.6	-8.30787	585.5337	1512.4758	0	233.2
8	Optimized	192.97895	-9.1122685	647.48618	1572.7229	0	235.96
9	Optimized	194.57895	-10.045605	719.7088	1637.3524	0	239.16
10	Optimized	196.02865	-10.891265	777.10788	1695.8745	0	242.06
11	Optimized	197.97865	-11.819805	844.71462	1820.6987	0	245.96
12	Optimized	199.39325	-12.324145	830.74335	1854.5731	0	248.79
13	Optimized	199.94325	-12.520235	807.94101	1866.5153	0	249.89
14	Optimized	200.45	-12.70091	801.01242	1758.8866	0	249.2
15	Optimized	201.1	-12.932655	792.017	1798.6044	0	248.05
16	Optimized	201.4	-13.039615	787.77834	1805.9514	0	247.52
17	Optimized	201.9499	-13.235675	779.80582	1821.6475	0	246.54
18	Optimized	204.6499	-13.881465	707.95138	1931.3353	0	241.76
19	Optimized	207.65	-14.52864	667.77278	2008.2059	0	236.44
20	Optimized	211.45	-15.34837	653.70087	2081.1446	0	229.71
21	Optimized	214.85	-16.081815	663.2017	2138.9414	0	223.68
22	Optimized	216.33055	-16.4012	671.38698	2140.6567	0	221.06
23	Optimized	219.23055	-16.602595	670.77977	2143.6703	0	215.92
24	Optimized	221.5	-16.548105	661.19957	2066.7048	0	211.9
25	Optimized	223.8	-16.492885	652.50649	1973.0705	0	207.82
26	Optimized	227.4	-16.40645	640.56548	1823.4747	0	201.44
27	Optimized	229.5366	-16.35515	634.1701	1732.4439	0	197.66
28	Optimized	230.6866	-16.321655	630.55878	1677.988	0	195.62
29	Optimized	233.2	-16.24312	622.72556	1619.6215	0	191.16
30	Optimized	236.6	-16.13688	612.78923	1582.8159	0	185.14
31	Optimized	238.9	-16.065015	606.40387	1558.5722	0	181.06
32	Optimized	240.26645	-16.02232	602.71193	1546.6842	0	180
33	Optimized	243.5874	-15.957625	596.45964	1521.2588	0	180
34	Optimized	246.7081	-15.91516	592.04444	1499.7152	0	180
35	Optimized	247.88715	-15.92198	591.84737	1491.5291	0	180
36	Optimized	251.15	-15.967435	593.15002	1483.1958	0	180
37	Optimized	254.94155	-16.020255	594.91484	1473.8858	0	180
38	Optimized	258.29155	-16.245365	607.75681	1468.4526	0	180
39	Optimized	262.1367	-16.60961	629.27607	1493.9186	0	180
40	Optimized	265.4101	-16.919695	647.73678	1515.9681	0	180
41	Optimized	268.1734	-17.103475	658.49924	1541.0089	0	180
42	Optimized	270.2	-17.155165	661.28508	1539.5552	0	180
43	Optimized	273.6248	-17.242515	665.99067	1533.5543	0	180
44	Optimized	278.67445	-17.37131	672.9988	1522.5076	0	180
45	Optimized	281.59965	-17.40795	674.71721	1532.4006	0	180
46	Optimized	284.25	-17.224195	662.76463	1498.1593	0	180
47	Optimized	288.93045	-16.899695	641.62883	1436.2971	0	180
48	Optimized	292.43045	-16.48907	615.35796	1403.3864	0	180
49	Optimized	295.73915	-15.740065	568.01872	1231.8216	0	180
50	Optimized	299.6752	-13.86659	450.39039	984.17621	0	180
51	Optimized	302.18605	-11.844485	323.75371	678.59535	0	180
52	Optimized	303.4205	-10.850335	261.48869	575.50665	0	180
53	Optimized	305.075	-9.25585	161.67205	502.56636	0	180
54	Optimized	307.6545	-6.630676	-2.6552943	413.59563	0	350
55	Optimized	309.1284	-5.130676	-96.54811	272.59776	0	350
56	Optimized	309.2694	-4.987182	-105.53126	148.51558	0	200

Slices of Slip Surface: 15180

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	15180	181.03835	-2.5229185	211.29506	757.42737	0	234.37
2	15180	183.538	-4.273184	299.95699	1004.8415	0	239.72
3	15180	185.038	-5.3234955	359.22177	1089.4561	0	378.63
4	15180	187.1802	-6.8234955	447.52431	1259.9861	0	381.69
5	15180	190.1302	-8.8891075	572.79732	1516.8904	0	230.26

6	15180	191.41555	-9.7891075	629.53043	1592.0722	0	232.83
7	15180	191.61555	-9.92915	637.26728	1604.3156	0	233.23
8	15180	193.4	-11.17863	707.79851	1694.5695	0	236.8
9	15180	195.14355	-12.39948	769.93197	1778.5525	0	240.29
10	15180	197.09355	-13.764885	808.74781	1918.4124	0	244.19
11	15180	199.45	-15.414885	809.99246	2089.9548	0	248.9
12	15180	200.45	-15.8	805.45556	2200.7778	0	249.2
13	15180	201.1	-15.8	799.25	2215.25	0	248.05
14	15180	201.4	-15.8	796.4	2210.8	0	247.52
15	15180	204.2	-15.8	760.2963	2204.6296	0	242.56
16	15180	207.65	-15.8	712	2210.0667	0	236.44
17	15180	211.45	-15.8	673.32787	2192.1311	0	229.71
18	15180	214.85	-15.8	649.55714	2168.5714	0	223.68
19	15180	218.1	-15.8	633.06897	2081.2069	0	217.92
20	15180	221.5	-15.8	620.61	1976.4	0	211.9
21	15180	223.8	-15.8	613.91667	1889.1389	0	207.82
22	15180	227.4	-15.8	605.72222	1749.5278	0	201.44
23	15180	230.35	-15.8	600.47826	1627.3913	0	196.22
24	15180	233.2	-15.8	596.44118	1562.6471	0	191.16
25	15180	236.6	-15.8	592.52941	1537.8235	0	185.14
26	15180	238.9	-15.8	590.375	1521.75	0	181.06
27	15180	241.75	-15.8	588.08889	1508	0	180
28	15180	246.25	-15.8	585.22222	1487.8	0	180
29	15180	251.15	-15.8	582.81132	1467.0189	0	180
30	15180	255.475	-15.8	581.10448	1449.7313	0	180
31	15180	258.825	-15.8	579.97015	1436.5075	0	180
32	15180	262.7	-15.8	578.81818	1421.7045	0	180
33	15180	267.1	-15.8	577.65909	1405.2955	0	180
34	15180	270.2	-15.8	576.88889	1394.1111	0	180
35	15180	273.825	-15.8	576.09174	1377.4128	0	180
36	15180	279.275	-15.8	574.93578	1350.0367	0	180
37	15180	284.25	-15.8	573.93333	1324.6222	0	180
38	15180	288.225	-15.8	573.15942	1303.0725	0	180
39	15180	291.725	-15.8	572.50704	1283.1831	0	180
40	15180	296.75	-15.8	571.56923	1157.3385	0	180
41	15180	301.5	-14.3	477.10848	994.52204	0	180
42	15180	303.15	-12.65	373.84733	742.69777	0	180
43	15180	305.55	-10.25	223.61859	573.87215	0	180
44	15180	308.4	-7.4	45.2242	480.5852	0	350
45	15180	309.9	-5.9	-48.668596	339.48202	0	350
46	15180	310.89	-4.91	-110.63866	144.20267	0	200



Name: EMB FILL to EL. -1.5 Model: Undrained (Phi=0) Unit Weight: 116 pcf Cohesion: 700 psf
Name: MARSH 1, EL. -1.5 TO -5 Model: Spatial Mohr-Coulomb Unit Weight: 97 pcf Cohesion Fn: MARSH 1 Phi: 0 °
Name: BEACH SAND, EL. -20 TO -41 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand
Name: Sheet Pile Model: Undrained (Phi=0) Unit Weight: 0.1 pcf Cohesion: 0.01 psf
Name: Berm Model: Mohr-Coulomb Unit Weight: 110 pcf Cohesion: 400 psf Phi: 0 °
Name: MARSH 2, EL. -5 to -8 Model: Spatial Mohr-Coulomb Unit Weight: 97 pcf Cohesion Fn: MARSH 2 Phi: 0 °
Name: MARSH 3, EL. -8 to -12.5 Model: Spatial Mohr-Coulomb Unit Weight: 73 pcf Cohesion Fn: MARSH 3 Phi: 0 °
Name: MARSH 4, EL. -12.5 to -20 Model: Spatial Mohr-Coulomb Unit Weight: 111 pcf Cohesion Fn: MARSH 4 Phi: 0 °
Name: BAY SOUND CLAY, EL. -41 to -70 Model: Spatial Mohr-Coulomb Unit Weight: 105 pcf Cohesion Spatial Fn: Bay Sound Phi: 0 °

GENERAL NOTES

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

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

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 17B
REMEDIATION OF CANAL WALLS AND LEVEES
PROTECTED SIDE STABILITY ANALYSIS,
CASE: Global Stability (Entry/Exit)
STA. 37+29 TO 50+00 EAST
ORLEANS PARISH, LOUISIANA

ETL 1110-2-575 ANALYSIS

Name: Global Stability (Entry/Exit)
File Name: Orleans Canal Reach 17B.gsz Directory: Y:\F&MHOME\Middleton\Outfall Canals\Orleans final edits\final\Appendix A and Appendix B\
Last Edited By: Reves, Ryan D MVK

Global Stability (Entry/Exit)

File Information

- Created By: Liljegren, James
- Revision Number: 691
- Last Edited By: Reves, Ryan D MVK
- Date: 6/13/2013
- Time: 5:16:06 PM
- File Name: Orleans Canal Reach 17B.gsz
- Directory: Y:\F&MHOME\Middleton\Outfall Canals\Orleans final edits\final\Appendix A and Appendix B\
- Last Solved Date: 6/13/2013
- Last Solved Time: 5:26:54 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

Global Stability (Entry/Exit)

- Kind: SLOPE/W
- Parent: Gap Analysis (seepage)
- Method: Spencer
- Settings
  - PWP Conditions Source: Parent Analysis
- Slip Surface
  - Direction of movement: Left to Right
  - Use Passive Mode: No
  - Slip Surface Option: Entry and Exit
  - Critical slip surfaces saved: 1
  - Optimize Critical Slip Surface Location: Yes
  - Tension Crack
    - Tension Crack Option: Tension Crack Line
    - Percentage Wet: 1
    - Tension Crack Fluid Unit Weight: 62.4 pcf
- FOS Distribution
  - FOS Calculation Option: Constant
- Advanced
  - Number of Slices: 30
  - Optimization Tolerance: 0.01
  - Minimum Slip Surface Depth: 0.1 ft
  - Optimization Maximum Iterations: 2000
  - Optimization Convergence Tolerance: 1e-007
  - Starting Optimization Points: 8
  - Ending Optimization Points: 16
  - Complete Passes per Insertion: 1
  - Driving Side Maximum Convex Angle: 5 °
  - Resisting Side Maximum Convex Angle: 1 °

Materials

EMB FILL to EL. -1.5

- Model: Undrained (Phi=0)
- Unit Weight: 116 pcf
- Cohesion: 700 psf

MARSH 1, EL. -1.5 TO -5

- Model: Spatial Mohr-Coulomb
- Unit Weight: 97 pcf
- Cohesion Fn: MARSH 1
- Phi: 0 °
- Phi-B: 0 °

BEACH SAND, EL. -20 TO -41

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

Sheet Pile

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

Berm

- Model: Mohr-Coulomb
- Unit Weight: 110 pcf
- Cohesion: 400 psf
- Phi: 0 °
- Phi-B: 0 °

MARSH 2, EL. -5 to -8

- Model: Spatial Mohr-Coulomb
- Unit Weight: 97 pcf
- Cohesion Fn: MARSH 2
- Phi: 0 °
- Phi-B: 0 °

MARSH 3, EL. -8 to -12.5

- Model: Spatial Mohr-Coulomb
- Unit Weight: 73 pcf
- Cohesion Fn: MARSH 3
- Phi: 0 °
- Phi-B: 0 °

MARSH 4, EL. -12.5 to -20

- Model: Spatial Mohr-Coulomb
- Unit Weight: 111 pcf
- Cohesion Fn: MARSH 4
- Phi: 0 °
- Phi-B: 0 °

BAY SOUND CLAY, EL. -41 to -70

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

Slip Surface Entry and Exit

- Left Projection: Range
- Left-Zone Left Coordinate: (158.49405, -1.18012) ft
- Left-Zone Right Coordinate: (195, 6.1) ft
- Left-Zone Increment: 20
- Right Projection: Range
- Right-Zone Left Coordinate: (230, 1.18696) ft
- Right-Zone Right Coordinate: (320, -4.46321) ft
- Right-Zone Increment: 40
- Radius Increments: 25

Slip Surface Limits

- Left Coordinate: (103.5, -7) ft
- Right Coordinate: (352.1, -4.8) ft

Reinforcements

Reinforcement 1

- Type: Pile
- Outside Point: (200, 13.9) ft
- Inside Point: (200, -4.8) ft
- Slip Surface Intersection: (200, -11.994) ft
- Total Length: 18.7 ft
- Reinforcement Direction: 90 °
- Applied Load Option: Variable
- F of S Dependent: No
- Pile Spacing: 1 ft
- Shear Capacity: 0 lbs
- Shear Safety Factor: 1
- Shear Load Used: 0 lbs
- Shear Option: Parallel to Slip
- Resisting Force Used: 0 lbs/ft

Tension Crack Line

	X (ft)	Y (ft)
	170.9	-3.5
	174.2	-2.8
	178.6	-0.8
	182.5	0.4
	185.5	1.8
	191.8	3.1

Cohesion Functions

MARSH 1

- Model: Spline Data Point Function
- Function: Cohesion vs. X
  - Curve Fit to Data: 100 %
  - Segment Curvature: 0 %
- Y-Intercept: 200
- Data Points: X (ft), Cohesion (psf)
  - Data Point: (165, 200)
  - Data Point: (200, 275)
  - Data Point: (239.5, 200)

MARSH 2

- Model: Spline Data Point Function

Function: Cohesion vs. X
- Curve Fit to Data: 100 %
- Segment Curvature: 0 %

Y-Intercept: 350
Data Points: X (ft), Cohesion (psf)
- Data Point: (165, 350)
- Data Point: (200, 400)
- Data Point: (239.5, 350)

MARSH 3

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

Y-Intercept: 180
Data Points: X (ft), Cohesion (psf)
- Data Point: (165, 180)
- Data Point: (200, 250)
- Data Point: (239.5, 180)

MARSH 4

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

Y-Intercept: 180
Data Points: X (ft), Cohesion (psf)
- Data Point: (165, 180)
- Data Point: (200, 250)
- Data Point: (239.5, 180)

Shear/Normal Strength Functions

Sand

Model: Spline Data Point Function
Function: Shear Stress vs. Normal Stress
- Curve Fit to Data: 100 %
- Segment Curvature: 0 %

Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
- Data Point: (-10000, 0)
- Data Point: (0, 0)
- Data Point: (10000, 6494)

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

Spatial Functions

Bay Sound

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
- Data Point: (103.5, -41, 580)
- Data Point: (165, -41, 580)
- Data Point: (200, -41, 610)
- Data Point: (239.5, -41, 580)
- Data Point: (352.1, -41, 580)
- Data Point: (103.5, -70, 855)
- Data Point: (165, -70, 855)
- Data Point: (200, -70, 885)
- Data Point: (239.5, -70, 855)
- Data Point: (352.1, -70, 855)

Regions

	Material	Points	Area (ft²)
Region 1	MARSH 3, EL. -8 to -12.5	1,7,15,16	173.7
Region 2	MARSH 3, EL. -8 to -12.5	2,1,16,17	260.55
Region 3	MARSH 4, EL. -12.5 to -20	2,17,18,3	723.75
Region 4	BAY SOUND CLAY, EL. -41 to -70	4,19,11,12,20,5	7209.4
Region 5	MARSH 3, EL. -8 to -12.5	15,8,9,17,16	684.45
Region 6	MARSH 4, EL. -12.5 to -20	17,9,10,18	1140.75
Region 7	BEACH SAND, EL. -20 TO -41	3,18,10,11,19,4	5220.6
Region 8	EMB FILL to EL. -1.5	33,34,35,36,38,37,39,40,41,42,43,44,45,46,13	162.855
Region 9	MARSH 1, EL. -1.5 TO -5	73,29,30,31,32,33,13,14	193.77
Region 10	MARSH 2, EL. -5 to -8	21,22,23,24,25,26,27,28,73,14,15,7	222.71
Region 11	EMB FILL to EL. -1.5	59,60,13,46,49,50,51,52,53,54,55,56,57,58	198.42
Region 12	MARSH 1, EL. -1.5 TO -5	65,14,13,60,61,62,63,64	204.175
Region 13	MARSH 1, EL. -1.5 TO -5	74,70,71,72,6	22.16
Region 14	MARSH 2, EL. -5 to -8	14,65,66,67,68,69,74,6,8,15	442.39
Region 15	Sheet Pile	46,75,47,48,49	8.775
Region 16	Berm	58,76,69,68,67,66,65,64,63,62,61,60,59	172.285

Points

	X (ft)	Y (ft)
Point 1	103.5	-9.8
Point 2	103.5	-12.5
Point 3	103.5	-20
Point 4	103.5	-41
Point 5	103.5	-70
Point 6	352.1	-5
Point 7	103.5	-8
Point 8	352.1	-8
Point 9	352.1	-12.5
Point 10	352.1	-20
Point 11	352.1	-41
Point 12	352.1	-70
Point 13	200	-1.5
Point 14	200	-5
Point 15	200	-8
Point 16	200	-9.8
Point 17	200	-12.5
Point 18	200	-20
Point 19	200	-41
Point 20	200	-70
Point 21	103.5	-7
Point 22	104.4	-7.1
Point 23	113.7	-7.1
Point 24	114.4	-7.2
Point 25	123.7	-7.1
Point 26	124.4	-7.3
Point 27	133.5	-6.8
Point 28	134.3	-6
Point 29	143.5	-3.9
Point 30	144.2	-3.1
Point 31	149.8	-1.8
Point 32	153.4	-2
Point 33	154.8	-1.4
Point 34	163.2	-0.9
Point 35	170.9	-0.5
Point 36	171.3	-0.4
Point 37	174.2	0.2
Point 38	173.9	0.2
Point 39	178.6	2.2
Point 40	182.5	3.4
Point 41	185.5	4.8
Point 42	191.4	6
Point 43	191.8	6.1
Point 44	195	6.1
Point 45	198.9	6.1
Point 46	200	6
Point 47	200	13.9
Point 48	200.9	14.1
Point 49	201.3	6.1
Point 50	201.5	6
Point 51	206.9	6
Point 52	208.4	6.1
Point 53	214.5	5.7

Point 54	215.2	5.7
Point 55	221	4.2
Point 56	222	3.9
Point 57	229.2	1.5
Point 58	231.5	0.6
Point 59	238.3	-1.3
Point 60	239.5	-1.4
Point 61	248.5	-2.1
Point 62	253.8	-2.7
Point 63	260.5	-3.5
Point 64	269.3	-4.7
Point 65	271.1	-5
Point 66	282	-5.4
Point 67	286.5	-5.5
Point 68	293.4	-5.4
Point 69	303	-5.6
Point 70	313.4	-4.6
Point 71	332.7	-4.2
Point 72	352.1	-4.8
Point 73	139.5	-5
Point 74	309	-5
Point 75	200	6.1
Point 76	293.5	-2.5

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.45	(245.758, 120.87)	50.35778	(177.344, 1.62891)	(305.137, -5.38635)
2	9445	1.60	(245.758, 120.87)	140.75	(176.592, 1.2871)	(308.68, -5.03202)

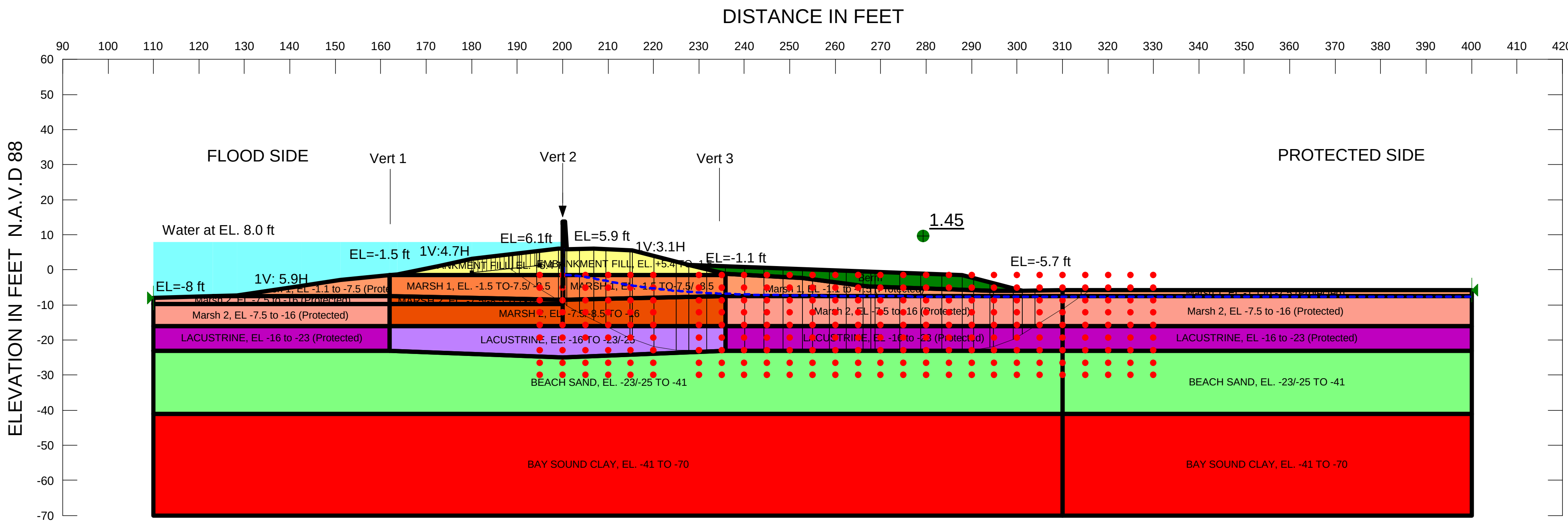
Slices of Slip Surface: Optimized

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	177.44765	-1.4107125	184.45713	148.51512	0	700
2	Optimized	178.07585	-1.649954	183.87177	714.63593	0	228.02
3	Optimized	180.55	-2.5922065	215.35489	851.11104	0	233.32
4	Optimized	183.8777	-3.8595255	281.55892	1033.9914	0	240.45
5	Optimized	185.3777	-4.4434425	320.95255	1102.7753	0	243.67
6	Optimized	186.0134	-4.7513375	341.27614	1143.1677	0	245.03
7	Optimized	188.9634	-6.180206	447.60706	1270.2792	0	384.23
8	Optimized	191.6	-7.457284	556.59629	1418.0853	0	388
9	Optimized	192.26025	-7.777078	584.40485	1452.4325	0	388.94
10	Optimized	193.86025	-8.5520575	656.53445	1555.2472	0	237.72
11	Optimized	195.3231	-9.2606125	729.20858	1604.7101	0	240.65
12	Optimized	195.9697	-9.608555	760.89805	1601.4706	0	241.94
13	Optimized	197.5966	-10.57134	841.51297	1668.1369	0	245.19
14	Optimized	199.45	-11.668165	885.86412	1742.2333	0	248.9
15	Optimized	200.4278	-12.246825	823.36294	1655.054	0	249.24
16	Optimized	200.8778	-12.51313	795.76276	1687.0419	0	248.44
17	Optimized	200.95335	-12.557835	794.69691	1692.3974	0	248.31
18	Optimized	201.15335	-12.65163	791.91003	1748.8562	0	247.96
19	Optimized	201.4	-12.75628	788.42036	1755.615	0	247.52
20	Optimized	204.2	-13.944275	720.39556	1879.4929	0	242.56
21	Optimized	207.65	-15.408055	698.40416	2044.8881	0	236.44
22	Optimized	208.7117	-15.85852	701.99195	2097.3078	0	234.56
23	Optimized	211.7617	-17.041615	724.15406	2215.4726	0	229.16
24	Optimized	214.76595	-18.19453	763.80626	2321.1328	0	223.83
25	Optimized	215.11595	-18.314975	768.57973	2382.7599	0	223.21
26	Optimized	218.1	-18.967535	795.24115	2368.8464	0	217.92
27	Optimized	221.5	-19.711065	831.59768	2347.7187	0	211.9
28	Optimized	222.3401	-19.894785	841.26687	2337.8019	0	210.41
29	Optimized	225.05505	-19.982235	845.48788	2303.675	0	205.6
30	Optimized	228.31495	-19.994845	845.62583	2180.3904	0	199.82
31	Optimized	230.35	-19.99378	845.17391	2093.5652	0	196.22
32	Optimized	233.2	-19.992285	844.55882	2028.6471	0	191.16
33	Optimized	236.6	-19.9905	843.85294	2003.6471	0	185.14
34	Optimized	238.9	-19.989295	843.33333	1987.4167	0	181.06
35	Optimized	242.1905	-19.98757	842.66223	1971.5516	0	180
36	Optimized	245.8155	-19.99083	842.18727	1954.2062	0	180
37	Optimized	247.625	-19.995075	842.15218	1947.8983	0	180
38	Optimized	251.15	-19.99337	841.39607	1933.0185	0	180
39	Optimized	255.475	-19.991285	840.47761	1915.5821	0	180
40	Optimized	258.825	-19.98967	839.79104	1902.1791	0	180
41	Optimized	261.35795	-19.988445	839.22442	1892.2179	0	180
42	Optimized	263.9869	-19.87602	831.7785	1885.019	0	180
43	Optimized	267.52895	-19.652005	817.2116	1846.7844	0	180
44	Optimized	270.02955	-19.49386	806.92214	1820.0722	0	180
45	Optimized	270.92955	-19.42445	802.40882	1826.729	0	180
46	Optimized	273.73555	-19.04144	778.02895	1769.912	0	180
47	Optimized	279.00665	-18.321955	732.20173	1662.6748	0	180
48	Optimized	281.8211	-17.91511	706.30349	1631.5362	0	180
49	Optimized	284.25	-17.27563	665.97211	1546.5424	0	180
50	Optimized	288.09845	-16.26242	602.03352	1411.0671	0	180
51	Optimized	291.2953	-15.420755	548.94494	1297.63	0	180
52	Optimized	293.14685	-14.838495	512.2688	1298.708	0	180
53	Optimized	293.45	-14.64519	500.14671	1274.6077	0	180
54	Optimized	295.15705	-13.556655	431.92275	1087.1213	0	180
55	Optimized	298.46375	-11.44807	299.71927	762.485	0	180
56	Optimized	301.31465	-9.19807	158.78929	544.65197	0	180
57	Optimized	302.75795	-7.758605	68.685642	503.48116	0	350
58	Optimized	304.06825	-6.4517775	-13.126347	370.27107	0	350

Slices of Slip Surface: 9445

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	9445	177.5958	-2.268754	217.58781	692.95453	0	226.99
2	9445	180.55	-3.8441835	275.39677	947.57395	0	233.32
3	9445	182.63575	-4.9318785	327.87231	1085.7976	0	237.79
4	9445	184.13575	-5.66438	367.69867	1159.3431	0	377.34
5	9445	187.33115	-7.16438	463.75626	1366.1297	0	381.9
6	9445	190.28115	-8.479861	562.13578	1553.9951	0	230.56
7	9445	191.6	-9.0430975	609.20834	1610.7412	0	233.2
8	9445	192.6261	-9.4632365	648.30648	1646.8005	0	235.25
9	9445	194.2261	-10.104495	708.64381	1695.3463	0	238.45
10	9445	196.95	-11.130015	813.52745	1773.4451	0	243.9
11	9445	199.45	-12.042665	854.19435	1841.3498	0	248.9

12	9445	200.3902	-12.367145	813.81013	1735.8986	0	249.31
13	9445	200.8402	-12.520145	796.24784	1761.7736	0	248.51
14	9445	201.1	-12.607205	792.68553	1773.7569	0	248.05
15	9445	201.4	-12.707325	788.55798	1781.0174	0	247.52
16	9445	204.2	-13.575115	711.34736	1876.4737	0	242.56
17	9445	207.65	-14.620645	670.9665	2004.1073	0	236.44
18	9445	211.45	-15.59835	664.55118	2102.2896	0	229.71
19	9445	214.85	-16.44389	680.54459	2179.4709	0	223.68
20	9445	218.1	-17.103995	700.12385	2172.6408	0	217.92
21	9445	221.5	-17.772805	727.32126	2149.7433	0	211.9
22	9445	223.8	-18.144605	744.13548	2108.8823	0	207.82
23	9445	227.4	-18.66573	769.86589	2034.8816	0	201.44
24	9445	230.35	-19.029195	788.96861	1959.1539	0	196.22
25	9445	233.2	-19.308145	804.13263	1930.7093	0	191.16
26	9445	236.6	-19.57129	818.73175	1940.966	0	185.14
27	9445	238.9	-19.71141	826.58372	1944.3545	0	181.06
28	9445	241.75	-19.80478	831.6181	1945.5439	0	180
29	9445	246.25	-19.86101	834.17259	1938.7879	0	180
30	9445	251.15	-19.75152	826.48695	1913.688	0	180
31	9445	255.475	-19.533975	812.17648	1878.9677	0	180
32	9445	258.825	-19.261855	794.64199	1840.671	0	180
33	9445	262.7	-18.83887	767.6037	1784.6527	0	180
34	9445	267.1	-18.23454	729.12731	1707.4298	0	180
35	9445	270.2	-17.73829	697.57059	1645.3912	0	180
36	9445	273.825	-17.02493	652.40269	1554.0795	0	180
37	9445	279.275	-15.802005	575.05175	1397.1678	0	180
38	9445	284.25	-14.493915	492.49712	1231.3817	0	180
39	9445	288.6175	-13.17705	409.49299	1064.8572	0	180
40	9445	292.1175	-12.017695	336.47611	937.06141	0	180
41	9445	295.71325	-10.695006	253.26855	754.96922	0	180
42	9445	300.1398	-8.927311	142.12312	467.35398	0	180
43	9445	302.67655	-7.856975	74.840477	348.65614	0	350
44	9445	305.8399	-6.372984	-18.39465	224.48033	0	350



Name: EMBANKMENT FILL, EL. +5.4 TO -1.5 Model: Undrained (Phi=0) Unit Weight: 115 pcf Cohesion: 540 psf
Name: MARSH 1, EL. -1.5 TO-7.5/ -8.5 Model: Spatial Mohr-Coulomb Unit Weight: 102 pcf Cohesion Fn: Marsh 1 Phi: 0 °
Name: BEACH SAND, EL. -23/-25 TO -41 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand
Name: BAY SOUND CLAY, EL. -41 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 103 pcf Cohesion Spatial Fn: Bay Sound Phi: 0 °
Name: MARSH 2, EL. -7.5/-8.5 TO -16 Model: Spatial Mohr-Coulomb Unit Weight: 80 pcf Cohesion Fn: MARSH 2 Phi: 0 °
Name: Marsh 1, EL -1.1 to -7.5 (Protected) Model: Undrained (Phi=0) Unit Weight: 102 pcf Cohesion: 280 psf
Name: Marsh 2, EL -7.5 to -16 (Protected) Model: Undrained (Phi=0) Unit Weight: 80 pcf Cohesion: 180 psf
Name: LACUSTRINE, EL -16 to -23 (Protected) Model: Spatial Mohr-Coulomb Unit Weight: 108 pcf Cohesion Fn: Lacustrine Phi: 0 °
Name: LACUSTRINE, EL. -16 TO -23/-25 Model: Spatial Mohr-Coulomb Unit Weight: 108 pcf Cohesion Spatial Fn: Lacustrine Phi: 0 °
Name: Berm Model: Undrained (Phi=0) Unit Weight: 110 pcf Cohesion: 400 psf

GENERAL NOTES

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

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

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 18A
REMEDIATION OF CANAL WALLS AND LEVEES
PROTECTED SIDE STABILITY ANALYSIS
CASE: Global Stability (Block)
STA. 50+00 TO 61+00 EAST
ORLEANS PARISH, LOUISIANA

ETL 1110-2-575 ANALYSIS

Name: Global Stability (Block)
File Name: Orleans Canal Reach 18A.gsz Directory: Y:\F&MHOME\Middleton\Outfall Canals\Orleans final edits\final\Appendix A and Appendix B\
Last Edited By: Reves, Ryan D MVK

Global Stability (Block)

File Information

Created By: Liljegren, James
Revision Number: 451
Last Edited By: Reves, Ryan D MVK
Date: 6/13/2013
Time: 3:37:28 PM
File Name: Orleans Canal Reach 18A.gsz
Directory: Y:\F&MHOME\Middleton\Outfall Canals\Orleans final edits\final\Appendix A and Appendix B\
Last Solved Date: 6/13/2013
Last Solved Time: 3:44:20 PM

Project Settings

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

Analysis Settings

Global Stability (Block)

Kind: SLOPE/W
Parent: Gap Analysis (seepage)
Method: Spencer
Settings
- PWP Conditions Source: Parent Analysis

Slip Surface
- Direction of movement: Left to Right
- Use Passive Mode: No
- Slip Surface Option: Block
- Critical slip surfaces saved: 1
- Optimize Critical Slip Surface Location: Yes
- Tension Crack
  - Tension Crack Option: Tension Crack Line
  - Percentage Wet: 1
  - Tension Crack Fluid Unit Weight: 62.4 pcf

FOS Distribution
- FOS Calculation Option: Constant

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

Materials

EMBANKMENT FILL, EL. +5.4 TO -1.5

Model: Undrained (Phi=0)
Unit Weight: 115 pcf
Cohesion: 540 psf

MARSH 1, EL. -1.5 TO-7.5/ -8.5

Model: Spatial Mohr-Coulomb
Unit Weight: 102 pcf
Cohesion Fn: Marsh 1
Phi: 0 °
Phi-B: 0 °

BEACH SAND, EL. -23/-25 TO -41

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

BAY SOUND CLAY, EL. -41 TO -70

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

MARSH 2, EL. -7.5/-8.5 TO -16

Model: Spatial Mohr-Coulomb
Unit Weight: 80 pcf
Cohesion Fn: MARSH 2
Phi: 0 °
Phi-B: 0 °

Marsh 1, EL -1.1 to -7.5 (Protected)

Model: Undrained (Phi=0)
Unit Weight: 102 pcf
Cohesion: 280 psf

Marsh 2, EL -7.5 to -16 (Protected)

Model: Undrained (Phi=0)
Unit Weight: 80 pcf
Cohesion: 180 psf

LACUSTRINE, EL -16 to -23 (Protected)

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

LACUSTRINE, EL. -16 TO -23/-25

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

Berm

Model: Undrained (Phi=0)
Unit Weight: 110 pcf
Cohesion: 400 psf

Slip Surface Limits

Left Coordinate: (110, -8) ft
Right Coordinate: (400, -5.7) ft

Slip Surface Block

Left Grid
- Upper Left: (195, -1.5) ft
- Lower Left: (195, -30) ft
- Lower Right: (220, -30) ft
- X Increments: 5
- Y Increments: 8
- Starting Angle: 115 °
- Ending Angle: 135 °
- Angle Increments: 4

Right Grid
- Upper Left: (230, -1.5) ft
- Lower Left: (230, -30) ft
- Lower Right: (330, -30) ft
- X Increments: 20
- Y Increments: 8
- Starting Angle: 25 °
- Ending Angle: 45 °
- Angle Increments: 4

Reinforcements

Reinforcement 1

Type: Pile
Outside Point: (200, 13.5) ft
Inside Point: (200, -4.8) ft
Slip Surface Intersection: (200, -9.3574) ft
Total Length: 18.3 ft
Reinforcement Direction: 90 °
Applied Load Option: Variable
F of S Dependent: No
Pile Spacing: 1 ft
Shear Capacity: 0 lbs
Shear Safety Factor: 1
Shear Load Used: 0 lbs
Shear Option: Parallel to Slip
Resisting Force Used: 0 lbs/ft

Tension Crack Line

	X (ft)	Y (ft)
	180	-0.8
	195	1.3

Cohesion Functions

Marsh 1

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

Y-Intercept: 280

Data Points: X (ft), Cohesion (psf)
Data Point: (162, 280)
Data Point: (200, 300)
Data Point: (235.8, 280)

MARSH 2

Model: Spline Data Point Function
Function: Cohesion vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 180
Data Points: X (ft), Cohesion (psf)
Data Point: (162, 180)
Data Point: (200, 370)
Data Point: (235.8, 180)

Lacustrine

Model: Spline Data Point Function
Function: Cohesion vs. Y
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 180
Data Points: Y (ft), Cohesion (psf)
Data Point: (-23, 225)
Data Point: (-16, 180)

Shear/Normal Strength Functions

Sand

Model: Spline Data Point Function
Function: Shear Stress vs. Normal Stress
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
Data Point: (-10000, 0)
Data Point: (0, 0)
Data Point: (10000, 6494)
Estimation Properties
Intact Rock Param.: 10
Geological Strength: 100
Disturbance Factor: 0
SigmaC: 600000 psf
Sigma3: 300000 psf
Num. Points: 20

Spatial Functions

Lacustrine

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (200, -16, 280)
Data Point: (200, -25, 360)
Data Point: (235.8, -16, 180)
Data Point: (235.8, -23, 225)
Data Point: (162, -16, 180)
Data Point: (162, -23, 225)

Bay Sound

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (200, -41, 560)
Data Point: (200, -70, 800)
Data Point: (235.8, -41, 500)
Data Point: (235.8, -70, 750)
Data Point: (162, -41, 500)
Data Point: (162, -70, 750)
Data Point: (310, -41, 500)
Data Point: (310, -70, 750)
Data Point: (110, -41, 500)
Data Point: (110, -70, 750)

Regions

	Points	Area (ft²)	Material
Region 1	5,20,21,22	5.825	
Region 2	37,2,49,52,3,4,5,25	162.72219	EMBANKMENT FILL, EL. +5.4 TO -1.5
Region 3	19,18,50,14,15,51	5800	BAY SOUND CLAY, EL. -41 TO -70
Region 4	17,44,28,34,13,14,50,18	3526.2	BEACH SAND, EL. -23/-25 TO -41
Region 5	33,32,11,29,12	630.7	Marsh 2, EL -7.5 to -16 (Protected)
Region 6	23,47,25,39,38,32	232.7	MARSH 1, EL. -1.5 TO-7.5/ -8.5
Region 7	34,33,12,13	519.4	LACUSTRINE, EL -16 to -23 (Protected)
Region 8	17,16,43,44	364	LACUSTRINE, EL -16 to -23 (Protected)
Region 9	44,43,27,33,34,28	590.4	LACUSTRINE, EL. -16 TO -23/-25
Region 10	27,33,32,23,24,46,43	522	MARSH 2, EL. -7.5/-8.5 TO -16
Region 11	16,35,46,43	322.4	Marsh 2, EL -7.5 to -16 (Protected)
Region 12	42,41,37,31,45,1,53	114.65366	Marsh 1, EL -1.1 to -7.5 (Protected)
Region 13	42,41,37,25,47,23	247	MARSH 1, EL. -1.5 TO-7.5/ -8.5
Region 14	46,42,23,24	68.4	MARSH 2, EL. -7.5/-8.5 TO -16
Region 15	35,36,26,53,42,46	116.33214	Marsh 2, EL -7.5 to -16 (Protected)
Region 16	25,5,22,48,6,55,7,39	188.551	EMBANKMENT FILL, EL. +5.4 TO -1.5
Region 17	32,38,39,7,8,40,9,30,56,10,11	239.55747	Marsh 1, EL -1.1 to -7.5 (Protected)
Region 18	55,54,56,30,9,40,8,7	215.93952	Berm
Region 19	13,60,61,14	1620	BEACH SAND, EL. -23/-25 TO -41
Region 20	12,13,60,59	630	LACUSTRINE, EL -16 to -23 (Protected)
Region 21	11,29,12,59,58	765	Marsh 2, EL -7.5 to -16 (Protected)
Region 22	10,11,58,57	162	Marsh 1, EL -1.1 to -7.5 (Protected)
Region 23	14,61,62,15	2610	BAY SOUND CLAY, EL. -41 TO -70

Points

	X (ft)	Y (ft)
Point 1	128.3	-7.3
Point 2	163.7	-1.3
Point 3	180	3.2
Point 4	199.1	6.1
Point 5	200	6.1
Point 6	215.4	5.5
Point 7	235.8	-1.1
Point 8	252.8	-2.3
Point 9	267.9	-4.8
Point 10	310	-5.7
Point 11	310	-7.5
Point 12	310	-16
Point 13	310	-23
Point 14	310	-41
Point 15	310	-70
Point 16	110	-16
Point 17	110	-23
Point 18	110	-41
Point 19	110	-70
Point 20	200	13.8
Point 21	200.5	13.8
Point 22	201	5.9
Point 23	200	-8.5
Point 24	200	-9.8
Point 25	200	-1.5
Point 26	110	-8
Point 27	200	-16
Point 28	200	-25
Point 29	310	-10
Point 30	294	-6
Point 31	151.1	-2.8
Point 32	235.8	-7.5
Point 33	235.8	-16
Point 34	235.8	-23
Point 35	110	-9.8
Point 36	110	-8.5
Point 37	162	-1.5
Point 38	235.8	-4.5
Point 39	235.8	-1.5
Point 40	266.12598	-4.5
Point 41	162	-4.5
Point 42	162	-7.5

Point 43	162	-16
Point 44	162	-23
Point 45	142.50631	-4.5
Point 46	162	-9.8
Point 47	200	-6.6
Point 48	206.9	6
Point 49	172.78125	1
Point 50	200	-41
Point 51	200	-70
Point 52	179.34375	3
Point 53	123.07143	-7.5
Point 54	288	-1.5
Point 55	227.73	1.51
Point 56	301.1	-5.86
Point 57	400	-5.7
Point 58	400	-7.5
Point 59	400	-16
Point 60	400	-23
Point 61	400	-41
Point 62	400	-70

Critical Slip Surfaces

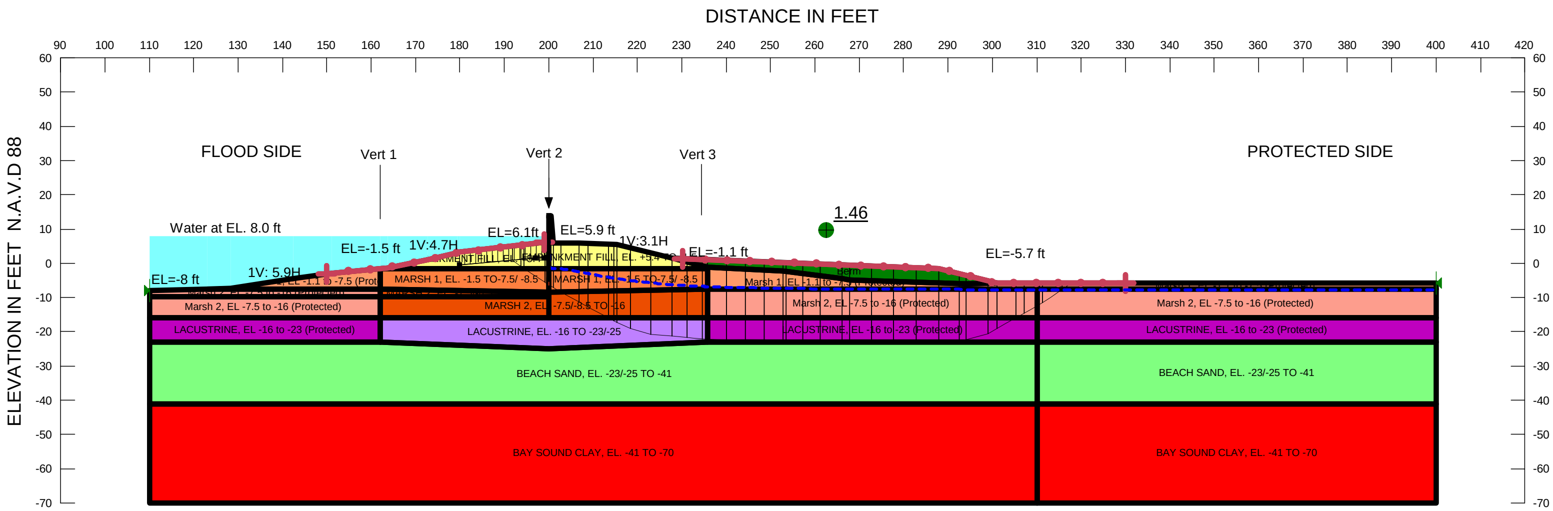
	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.45	(255.679, 2.409)	51.02412	(188.261, 4.45426)	(316.171, -5.7)
2	21488	1.53	(255.679, 2.409)	51.665	(191.338, 4.92143)	(319.528, -5.7)

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	188.61135	0.08425855	237.07958	302.75353	0	540
2	Optimized	189.72015	-0.844	252.10298	512.65377	0	540
3	Optimized	192.42405	-3.183285	406.74818	892.82868	0	296.01
4	Optimized	196.73485	-6.7530695	729.21478	1286.8311	0	298.28
5	Optimized	199.55	-8.9984965	1001.1084	1479.4688	0	367.75
6	Optimized	200.25	-9.5568285	883.59546	1403.6334	0	368.67
7	Optimized	200.75	-9.9556365	820.59988	1423.944	0	366.02
8	Optimized	202.3501	-11.231915	697.43034	1520.8319	0	357.53
9	Optimized	205.3001	-13.330525	664.80203	1744.8946	0	341.87
10	Optimized	208.19005	-15.17613	684.82479	1884.9749	0	326.53
11	Optimized	212.173	-17.71977	753.33289	2122.8711	0	260.07
12	Optimized	215.13295	-19.56276	821.16163	2348.969	0	266.22
13	Optimized	217.7601	-20.77498	870.06436	2387.0503	0	267.74
14	Optimized	222.56365	-22.425545	945.39975	2463.763	0	265.08
15	Optimized	226.36855	-22.988395	972.0112	2461.3364	0	256.69
16	Optimized	229.7475	-22.991585	969.86321	2394.0509	0	245.42
17	Optimized	233.8171	-22.99543	968.02756	2362.4697	0	231.72
18	Optimized	237.98555	-22.97552	965.69249	2332.1957	0	224.84
19	Optimized	242.21825	-22.931825	962.33783	2306.5869	0	224.56
20	Optimized	246.45095	-22.88813	958.9123	2280.9781	0	224.28
21	Optimized	250.68365	-22.84443	955.46314	2255.3457	0	224
22	Optimized	253.88835	-22.811345	952.82678	2236.784	0	223.79
23	Optimized	256.8349	-22.779375	950.31356	2221.2638	0	223.58
24	Optimized	260.5513	-22.73791	947.08486	2201.2458	0	223.32
25	Optimized	264.26775	-22.696445	943.82926	2181.2279	0	223.05
26	Optimized	267.013	-22.665815	941.41917	2166.4703	0	222.85
27	Optimized	268.3347	-22.65107	940.2654	2158.9252	0	222.76
28	Optimized	271.45025	-22.66234	940.40707	2139.0097	0	222.83
29	Optimized	276.4426	-22.708345	942.38904	2116.3415	0	223.13
30	Optimized	281.06555	-22.768115	945.28736	2099.1245	0	223.51
31	Optimized	285.6885	-22.827885	948.20732	2081.9076	0	223.89
32	Optimized	289.21345	-22.87346	950.41188	2031.064	0	224.19
33	Optimized	292.21345	-22.472565	924.91092	1949.9853	0	221.61
34	Optimized	294.3778	-21.96789	893.05716	1813.9559	0	218.36
35	Optimized	296.97535	-20.82528	821.33096	1653.913	0	211.02
36	Optimized	300.14755	-19.011485	707.60932	1404.5048	0	199.36
37	Optimized	302.5126	-17.126105	589.56089	1146.9604	0	187.24
38	Optimized	306.9626	-13.578585	367.39805	817.20097	0	180
39	Optimized	310.04505	-11.12127	213.4829	614.9919	0	180
40	Optimized	312.1144	-9.292685	99.391366	474.85075	0	180
41	Optimized	315.155	-6.6	-68.628798	294.44859	0	280

Slices of Slip Surface: **21488**

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	21488	192.48135	-0.35635965	299.01972	407.85816	0	540
2	21488	196.3625	-4.2375	594.86086	996.6396	0	298.09
3	21488	199.55	-7.425	928.98133	1321.2685	0	299.76
4	21488	200.25	-8.125	618.37901	1271.7739	0	299.86
5	21488	200.554	-8.429008	569.9665	1294.334	0	299.69
6	21488	200.804	-8.679008	608.1912	1271.0772	0	365.73
7	21488	203.95	-11.825	644.61772	1515.0062	0	349.04
8	21488	207.5125	-15.3875	704.56681	1791.433	0	330.13
9	21488	209.84375	-17.71875	775.62673	2030.5227	0	266.82
10	21488	213.28125	-21.15625	906.66005	2343.3776	0	284.75
11	21488	215.2	-22.875	981.65	2867	0	292.49
12	21488	217.455	-22.875	977.05596	2787.5912	0	285.16
13	21488	221.565	-22.875	970.75426	2631.3869	0	271.72
14	21488	225.675	-22.875	966.27737	2475.1825	0	258.17
15	21488	229.7475	-22.875	963.19703	2381.3383	0	244.61
16	21488	233.7825	-22.875	961.01611	2349.5415	0	231.04
17	21488	237.925	-22.875	959.74118	2317.9529	0	224.2
18	21488	242.175	-22.875	958.91765	2297.0118	0	224.2
19	21488	246.425	-22.875	958.11765	2276.0471	0	224.2
20	21488	250.675	-22.875	957.34118	2255.1059	0	224.2
21	21488	255.021	-22.875	956.5301	2235.3705	0	224.2
22	21488	259.463	-22.875	955.74216	2216.8428	0	224.2
23	21488	263.905	-22.875	954.95423	2198.2925	0	224.2
24	21488	267.013	-22.875	954.38608	2185.3756	0	224.2
25	21488	269.91	-22.875	953.90547	2171.3682	0	224.2
26	21488	273.93	-22.875	953.18408	2150.7711	0	224.2
27	21488	277.95	-22.875	952.48756	2130.1741	0	224.2
28	21488	281.97	-22.875	951.79104	2109.5522	0	224.2
29	21488	285.99	-22.875	951.09453	2088.9552	0	224.2
30	21488	291	-22.875	950.21667	1970	0	224.2
31	21488	294.5	-22.875	949.61	1842.8	0	224.2
32	21488	298.05	-20.739365	815.78143	1659.5215	0	210.47
33	21488	302.95925	-17.301865	600.44428	1142.8201	0	188.37
34	21488	307.40925	-14.185945	405.20617	846.37831	0	180
35	21488	311.73945	-11.153917	215.52705	596.21779	0	180
36	21488	315.21835	-8.7179715	63.530478	391.22304	0	180
37	21488	318.2431	-6.6	-68.631612	245.24218	0	280



Name: EMBANKMENT FILL, EL. +5.4 TO -1.5 Model: Undrained (Phi=0) Unit Weight: 115 pcf Cohesion: 540 psf
Name: MARSH 1, EL. -1.5 TO-7.5/ -8.5 Model: Spatial Mohr-Coulomb Unit Weight: 102 pcf Cohesion Fn: Marsh 1 Phi: 0 °
Name: BEACH SAND, EL. -23/-25 TO -41 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand
Name: BAY SOUND CLAY, EL. -41 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 103 pcf Cohesion Spatial Fn: Bay Sound Phi: 0 °
Name: MARSH 2, EL. -7.5/-8.5 TO -16 Model: Spatial Mohr-Coulomb Unit Weight: 80 pcf Cohesion Fn: MARSH 2 Phi: 0 °
Name: Marsh 1, EL -1.1 to -7.5 (Protected) Model: Undrained (Phi=0) Unit Weight: 102 pcf Cohesion: 280 psf
Name: Marsh 2, EL -7.5 to -16 (Protected) Model: Undrained (Phi=0) Unit Weight: 80 pcf Cohesion: 180 psf
Name: LACUSTRINE, EL -16 to -23 (Protected) Model: Spatial Mohr-Coulomb Unit Weight: 108 pcf Cohesion Fn: Lacustrine Phi: 0 °
Name: LACUSTRINE, EL. -16 TO -23/-25 Model: Spatial Mohr-Coulomb Unit Weight: 108 pcf Cohesion Spatial Fn: Lacustrine Phi: 0 °
Name: Berm Model: Undrained (Phi=0) Unit Weight: 110 pcf Cohesion: 400 psf

GENERAL NOTES

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

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

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 18A
REMEDIATION OF CANAL WALLS AND LEVEES
PROTECTED SIDE STABILITY ANALYSIS
CASE: Global Stability (Entry/Exit)
STA. 50+00 TO 61+00 EAST
ORLEANS PARISH, LOUISIANA

ETL 1110-2-575 ANALYSIS

Name: Global Stability (Entry/Exit)
File Name: Orleans Canal Reach 18A.gsz Directory: Y:\F&MHOME\Middleton\Outfall Canals\Orleans final edits\final\Appendix A and Appendix B\
Last Edited By: Reves, Ryan D MVK

Global Stability (Entry/Exit)

File Information

Created By: Liljegren, James
Revision Number: 451
Last Edited By: Reves, Ryan D MVK
Date: 6/13/2013
Time: 3:37:28 PM
File Name: Orleans Canal Reach 18A.gsz
Directory: Y:\F&MHOME\Middleton\Outfall Canals\Orleans final edits\final\Appendix A and Appendix B\
Last Solved Date: 6/13/2013
Last Solved Time: 3:44:56 PM

Project Settings

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

Analysis Settings

Global Stability (Entry/Exit)

Kind: SLOPE/W
Parent: Gap Analysis (seepage)
Method: Spencer
Settings
- PWP Conditions Source: Parent Analysis

Slip Surface
- Direction of movement: Left to Right
- Use Passive Mode: No
- Slip Surface Option: Entry and Exit
- Critical slip surfaces saved: 1
- Optimize Critical Slip Surface Location: Yes
- Tension Crack
  - Tension Crack Option: Tension Crack Line
  - Percentage Wet: 1
  - Tension Crack Fluid Unit Weight: 62.4 pcf

FOS Distribution
- FOS Calculation Option: Constant

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

Materials

EMBANKMENT FILL, EL. +5.4 TO -1.5

Model: Undrained (Phi=0)
Unit Weight: 115 pcf
Cohesion: 540 psf

MARSH 1, EL. -1.5 TO-7.5/ -8.5

Model: Spatial Mohr-Coulomb
Unit Weight: 102 pcf
Cohesion Fn: Marsh 1
Phi: 0 °
Phi-B: 0 °

BEACH SAND, EL. -23/-25 TO -41

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

BAY SOUND CLAY, EL. -41 TO -70

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

MARSH 2, EL. -7.5/-8.5 TO -16

Model: Spatial Mohr-Coulomb
Unit Weight: 80 pcf
Cohesion Fn: MARSH 2
Phi: 0 °
Phi-B: 0 °

Marsh 1, EL -1.1 to -7.5 (Protected)

Model: Undrained (Phi=0)
Unit Weight: 102 pcf
Cohesion: 280 psf

Marsh 2, EL -7.5 to -16 (Protected)

Model: Undrained (Phi=0)
Unit Weight: 80 pcf
Cohesion: 180 psf

LACUSTRINE, EL -16 to -23 (Protected)

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

LACUSTRINE, EL. -16 TO -23/-25

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

Berm

Model: Undrained (Phi=0)
Unit Weight: 110 pcf
Cohesion: 400 psf

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (150, -3.0176) ft
Left-Zone Right Coordinate: (199, 6.08482) ft
Left-Zone Increment: 10
Right Projection: Range
Right-Zone Left Coordinate: (230.2279, 1.38525) ft
Right-Zone Right Coordinate: (330, -5.7) ft
Right-Zone Increment: 20
Radius Increments: 4

Slip Surface Limits

Left Coordinate: (110, -8) ft
Right Coordinate: (400, -5.7) ft

Reinforcements

Reinforcement 1

Type: Pile
Outside Point: (200, 13.8) ft
Inside Point: (200, -4.8) ft
Slip Surface Intersection: (200, -6.3604) ft
Total Length: 18.6 ft
Reinforcement Direction: 90 °
Applied Load Option: Variable
F of S Dependent: No
Pile Spacing: 1 ft
Shear Capacity: 0 lbs
Shear Safety Factor: 1
Shear Load Used: 0 lbs
Shear Option: Parallel to Slip
Resisting Force Used: 0 lbs/ft

Tension Crack Line

	X (ft)	Y (ft)
	180	-0.5
	197	1.5
	199	1.5

Cohesion Functions

Marsh 1

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

Y-Intercept: 280
Data Points: X (ft), Cohesion (psf)
- Data Point: (162, 280)
- Data Point: (200, 300)
- Data Point: (235.8, 280)

MARSH 2

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

Y-Intercept: 180

Data Points: X (ft), Cohesion (psf)
Data Point: (162, 180)
Data Point: (200, 370)
Data Point: (235.8, 180)

Lacustrine

Model: Spline Data Point Function
Function: Cohesion vs. Y
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 180
Data Points: Y (ft), Cohesion (psf)
Data Point: (-23, 225)
Data Point: (-16, 180)

Shear/Normal Strength Functions

Sand

Model: Spline Data Point Function
Function: Shear Stress vs. Normal Stress
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
Data Point: (-10000, 0)
Data Point: (0, 0)
Data Point: (10000, 6494)
Estimation Properties
Intact Rock Param.: 10
Geological Strength: 100
Disturbance Factor: 0
SigmaC: 600000 psf
Sigma3: 300000 psf
Num. Points: 20

Spatial Functions

Lacustrine

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (200, -16, 280)
Data Point: (200, -25, 360)
Data Point: (235.8, -16, 180)
Data Point: (235.8, -23, 225)
Data Point: (162, -16, 180)
Data Point: (162, -23, 225)

Bay Sound

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (200, -41, 560)
Data Point: (200, -70, 800)
Data Point: (235.8, -41, 500)
Data Point: (235.8, -70, 750)
Data Point: (162, -41, 500)
Data Point: (162, -70, 750)
Data Point: (310, -41, 500)
Data Point: (310, -70, 750)
Data Point: (110, -41, 500)
Data Point: (110, -70, 750)

Regions

	Points	Area (ft²)	Material
Region 1	5,20,21,22	5.825	
Region 2	37,2,49,52,3,4,5,25	162.72219	EMBANKMENT FILL, EL. +5.4 TO -1.5
Region 3	19,18,50,14,15,51	5800	BAY SOUND CLAY, EL. -41 TO -70
Region 4	17,44,28,34,13,14,50,18	3526.2	BEACH SAND, EL. -23/-25 TO -41
Region 5	33,32,11,29,12	630.7	Marsh 2, EL -7.5 to -16 (Protected)
Region 6	23,47,25,39,38,32	232.7	MARSH 1, EL. -1.5 TO-7.5/ -8.5
Region 7	34,33,12,13	519.4	LACUSTRINE, EL -16 to -23 (Protected)
Region 8	17,16,43,44	364	LACUSTRINE, EL -16 to -23 (Protected)
Region 9	44,43,27,33,34,28	590.4	LACUSTRINE, EL. -16 TO -23/-25
Region 10	27,33,32,23,24,46,43	522	MARSH 2, EL. -7.5/-8.5 TO -16
Region 11	16,35,46,43	322.4	Marsh 2, EL -7.5 to -16 (Protected)
Region 12	42,41,37,31,45,1,53	114.65366	Marsh 1, EL -1.1 to -7.5 (Protected)
Region 13	42,41,37,25,47,23	247	MARSH 1, EL. -1.5 TO-7.5/ -8.5
Region 14	46,42,23,24	68.4	MARSH 2, EL. -7.5/-8.5 TO -16
Region 15	35,36,26,53,42,46	116.33214	Marsh 2, EL -7.5 to -16 (Protected)
Region 16	25,5,22,48,6,55,7,39	188.551	EMBANKMENT FILL, EL. +5.4 TO -1.5
Region 17	32,38,39,7,8,40,9,30,56,10,11	239.55747	Marsh 1, EL -1.1 to -7.5 (Protected)
Region 18	55,54,56,30,9,40,8,7	215.93952	Berm
Region 19	13,60,61,14	1620	BEACH SAND, EL. -23/-25 TO -41
Region 20	12,13,60,59	630	LACUSTRINE, EL -16 to -23 (Protected)
Region 21	11,29,12,59,58	765	Marsh 2, EL -7.5 to -16 (Protected)
Region 22	10,11,58,57	162	Marsh 1, EL -1.1 to -7.5 (Protected)
Region 23	14,61,62,15	2610	BAY SOUND CLAY, EL. -41 TO -70

Points

	X (ft)	Y (ft)
Point 1	128.3	-7.3
Point 2	163.7	-1.3
Point 3	180	3.2
Point 4	199.1	6.1
Point 5	200	6.1
Point 6	215.4	5.5
Point 7	235.8	-1.1
Point 8	252.8	-2.3
Point 9	267.9	-4.8
Point 10	310	-5.7
Point 11	310	-7.5
Point 12	310	-16
Point 13	310	-23
Point 14	310	-41
Point 15	310	-70
Point 16	110	-16
Point 17	110	-23
Point 18	110	-41
Point 19	110	-70
Point 20	200	13.8
Point 21	200.5	13.8
Point 22	201	5.9
Point 23	200	-8.5
Point 24	200	-9.8
Point 25	200	-1.5
Point 26	110	-8
Point 27	200	-16
Point 28	200	-25
Point 29	310	-10
Point 30	294	-6
Point 31	151.1	-2.8
Point 32	235.8	-7.5
Point 33	235.8	-16
Point 34	235.8	-23
Point 35	110	-9.8
Point 36	110	-8.5
Point 37	162	-1.5
Point 38	235.8	-4.5
Point 39	235.8	-1.5
Point 40	266.12598	-4.5
Point 41	162	-4.5
Point 42	162	-7.5
Point 43	162	-16
Point 44	162	-23
Point 45	142.50631	-4.5
Point 46	162	-9.8
Point 47	200	-6.6
Point 48	206.9	6
Point 49	172.78125	1

Point 50	200	-41
Point 51	200	-70
Point 52	179.34375	3
Point 53	123.07143	-7.5
Point 54	288	-1.5
Point 55	227.73	1.51
Point 56	301.1	-5.86
Point 57	400	-5.7
Point 58	400	-7.5
Point 59	400	-16
Point 60	400	-23
Point 61	400	-41
Point 62	400	-70

Critical Slip Surfaces

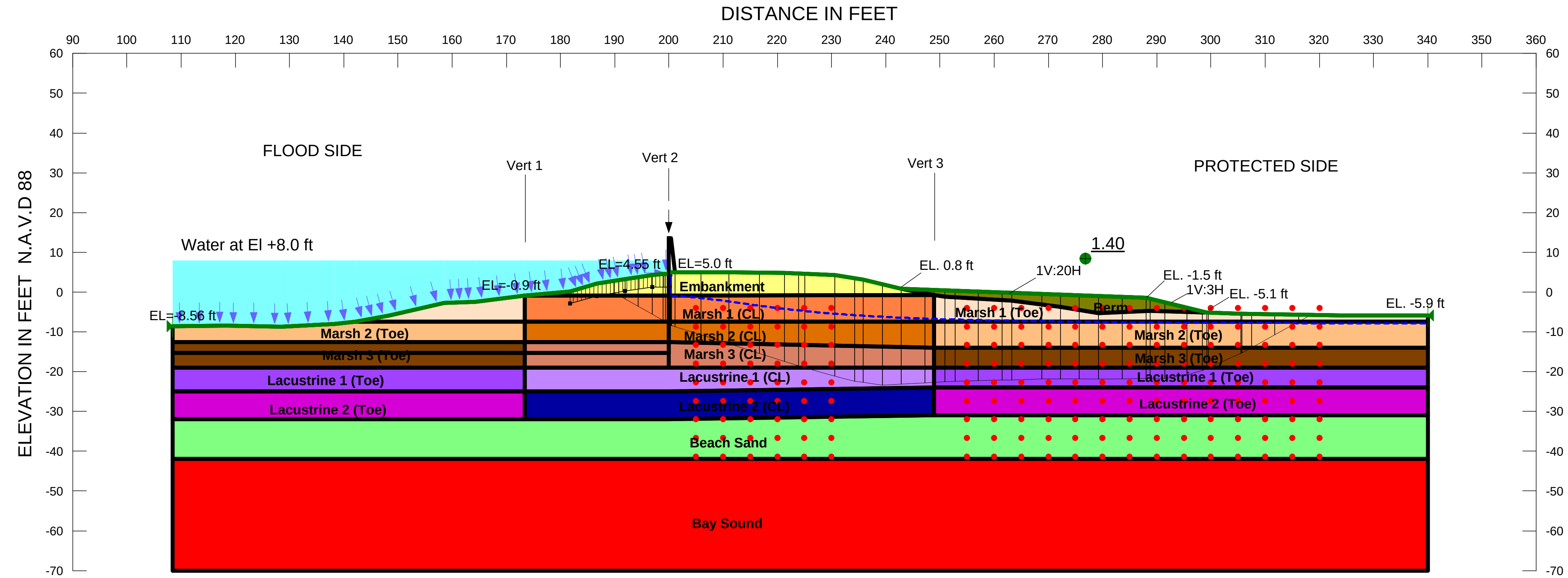
	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.46	(262.431, 133.997)	50.7963	(191.771, 4.98716)	(317.855, -5.7)
2	732	1.67	(262.431, 133.997)	155.18	(184.178, 3.8344)	(330, -5.7)

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	192.7793	-0.03292585	300.40995	390.7423	0	540
2	Optimized	194.1034	-1.225315	357.33857	587.07671	0	540
3	Optimized	196.7594	-3.5383195	574.21445	958.12491	0	298.29
4	Optimized	199.55	-5.968526	845.03549	1210.0305	0	299.76
5	Optimized	200.10495	-6.4517965	715.74561	1195.8439	0	299.94
6	Optimized	200.35495	-6.6474255	386.90334	1197.3487	0	299.8
7	Optimized	200.75	-6.9313235	412.57966	1216.3653	0	299.58
8	Optimized	201.9116	-7.766058	477.43636	1293.9198	0	298.93
9	Optimized	204.8616	-9.88596	515.58887	1454.2419	0	344.2
10	Optimized	207.889	-12.061495	545.82128	1622.3968	0	328.13
11	Optimized	211.14815	-14.386105	605.21702	1786.3551	0	310.83
12	Optimized	214.049	-16.44837	675.08716	1962.909	0	244.37
13	Optimized	215.03985	-17.09944	699.49504	2066.2059	0	246.79
14	Optimized	216.9308	-18.16373	740.82213	2117.5211	0	249.75
15	Optimized	220.7315	-19.882695	813.63437	2215.6308	0	251.67
16	Optimized	225.3657	-21.028975	864.33245	2247.5792	0	245.76
17	Optimized	229.44745	-21.527745	886.55229	2199.5767	0	236.23
18	Optimized	232.8824	-21.947475	907.53201	2218.5047	0	227.88
19	Optimized	235.19995	-22.166725	918.78791	2257.229	0	221.64
20	Optimized	237.925	-22.20935	920.19329	2241.4434	0	219.92
21	Optimized	242.175	-22.27583	922.82827	2227.7039	0	220.34
22	Optimized	246.425	-22.34231	925.72203	2213.9644	0	220.77
23	Optimized	250.675	-22.40879	928.78048	2200.2249	0	221.2
24	Optimized	253.14285	-22.447395	930.6179	2192.5453	0	221.45
25	Optimized	255.41235	-22.475785	931.89276	2187.2531	0	221.63
26	Optimized	259.26565	-22.521835	933.96876	2176.1724	0	221.93
27	Optimized	263.65915	-22.588895	937.2848	2163.3547	0	222.36
28	Optimized	267.013	-22.648765	940.36926	2155.8325	0	222.74
29	Optimized	270.33985	-22.70815	943.45576	2146.1083	0	223.12
30	Optimized	275.21955	-22.795255	948.00451	2130.536	0	223.68
31	Optimized	280.24455	-22.858805	951.07408	2114.7014	0	224.09
32	Optimized	285.41485	-22.898795	952.66001	2092.4597	0	224.35
33	Optimized	290.2799	-22.936425	954.17378	2000.8044	0	224.59
34	Optimized	293.2799	-22.692605	938.47656	1973.6138	0	223.02
35	Optimized	296.4616	-21.53737	865.845	1723.6712	0	215.6
36	Optimized	300.0116	-19.853565	760.1638	1490.9204	0	204.77
37	Optimized	303.2103	-17.53177	614.75528	1180.0977	0	189.85
38	Optimized	306.2154	-15.35052	478.09046	951.20646	0	180
39	Optimized	308.5551	-13.55456	365.59964	817.23867	0	180
40	Optimized	310.5986	-11.93312	264.14818	682.66688	0	180
41	Optimized	313.48545	-9.47908	111.02418	486.73273	0	180
42	Optimized	316.8143	-6.6	-68.632272	288.69165	0	280

Slices of Slip Surface: 732

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	732	185.48435	-0.75421675	205.45547	573.94552	0	540
2	732	188.842	-2.605212	297.74434	905.82765	0	294.13
3	732	192.9452	-4.737968	499.33788	1156.616	0	296.29
4	732	197.0484	-6.718768	741.71863	1393.2393	0	298.45
5	732	199.55	-7.8714785	954.30614	1530.1038	0	299.76
6	732	200.25	-8.180269	623.73689	1441.4536	0	299.86
7	732	200.71285	-8.3818735	563.54748	1452.1887	0	299.6
8	732	200.96285	-8.490165	573.24971	1443.6924	0	364.89
9	732	203.95	-9.706699	538.91438	1552.0163	0	349.04
10	732	209.025	-11.68621	504.22262	1712.1787	0	322.1
11	732	213.275	-13.17496	516.91754	1811.3093	0	299.55
12	732	219.0295	-14.942355	557.85355	1816.4396	0	269.01
13	732	225.1945	-16.626805	619.05215	1754.9096	0	214.2
14	732	229.7475	-17.688315	665.78609	1766.1102	0	208.62
15	732	233.7825	-18.50202	705.35693	1829.1686	0	202.16
16	732	238.63335	-19.3208	747.80439	1890.1317	0	201.35
17	732	244.3	-20.093955	790.16684	1954.3419	0	206.32
18	732	249.96665	-20.655675	821.73564	1996.1161	0	209.93
19	732	255.021	-20.9902	840.5765	2017.3971	0	212.08
20	732	259.463	-21.138865	848.4953	2022.3705	0	213.04
21	732	263.905	-21.160245	848.72475	2013.6221	0	213.17
22	732	267.013	-21.112935	845.11217	2000.7392	0	212.87
23	732	270.4125	-20.95731	834.67451	1972.9068	0	211.87
24	732	275.4375	-20.616525	812.41386	1918.2192	0	209.68
25	732	280.4625	-20.111175	779.93296	1845.2424	0	206.43
26	732	285.4875	-19.43964	737.0974	1753.6444	0	202.11
27	732	291	-18.500055	677.44744	1535.7157	0	196.07
28	732	297.55	-17.112965	589.67828	1148.9967	0	187.15
29	732	301.6511	-16.143955	528.45589	914.98127	0	180.93
30	732	304.15165	-15.45579	485.05579	862.35434	0	180
31	732	308.05055	-14.311925	412.94821	781.03473	0	180
32	732	312.69075	-12.79095	317.67212	665.86326	0	180
33	732	318.0723	-10.835896	195.68039	511.89824	0	180
34	732	323.45385	-8.651081	59.351338	338.39147	0	180
35	732	328.0723	-6.6	-68.636419	186.80415	0	280



Name: EMBANKMENT FILL, EL. +4 TO -1.5 Model: Undrained (Phi=0) Unit Weight: 117 pcf Cohesion: 500 psf
Name: MARSH1, EL. -1.5 TO -7.5 Model: Spatial Mohr-Coulomb Unit Weight: 103 pcf Cohesion Fn: MARSH 1 Phi: 0 °
Name: BEACH SAND, EL. -32/-31 TO -42 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand
Name: BAY SOUND CLAY, EL. -42 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 105 pcf Cohesion Spatial Fn: Bay Sound Phi: 0 °
Name: Marsh2, EL -7.5 to -14 (Protected) Model: Undrained (Phi=0) Unit Weight: 80 pcf Cohesion: 125 psf
Name: MARSH2, EL. -7.5 TO -12.5 Model: Spatial Mohr-Coulomb Weight Fn: Marsh2 Cohesion Spatial Fn: Marsh 2 (2) Phi: 0 °
Name: MARSH3, EL. -12.5 TO -17 Model: Spatial Mohr-Coulomb Unit Weight: 77 pcf Cohesion Spatial Fn: Marsh 3 Phi: 0 °
Name: Marsh3, EL -14 to -19 (Protected) Model: Undrained (Phi=0) Unit Weight: 106 pcf Cohesion: 175 psf
Name: Marsh1, EL -2 to -7.5 (Protected) Model: Undrained (Phi=0) Unit Weight: 110 pcf Cohesion: 285 psf
Name: Lacustrine1, EL -19 to -24 (Protected) Model: Spatial Mohr-Coulomb Unit Weight: 100 pcf Cohesion Fn: Lacustrine (protected) Phi: 0 °
Name: Lacustrine1, EL -19 to -25 Model: Spatial Mohr-Coulomb Weight Fn: Lacustrine1 Cohesion Spatial Fn: Lacustrine Phi: 0 °
Name: Lacustrine2, EL -25 to -32 Model: Spatial Mohr-Coulomb Weight Fn: Lacustrine2 Cohesion Spatial Fn: Lacustrine Phi: 0 °
Name: Lacustrine2, EL -24 to -31 (Protected) Model: Spatial Mohr-Coulomb Unit Weight: 98 pcf Cohesion Fn: Lacustrine (protected) Phi: 0 °
Name: Berm Model: Undrained (Phi=0) Unit Weight: 110 pcf Cohesion: 400 psf

GENERAL NOTES

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

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

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 19
REMEDIATION OF CANAL WALLS AND LEVEES
PROTECTED SIDE STABILITY ANALYSIS
CASE: Global Stability (Block)
STA. 65+00 TO 90+62 EAST
ORLEANS PARISH, LOUISIANA

ETL 1110-2-575 ANALYSIS

Name: Global Stability (Block)
File Name: Orleans Canal Reach 19.gsz Directory: Y:\F&MHOME\Middleton\Outfall Canals\Orleans final edits\final\Appendix A and Appendix B\
Last Edited By: Reves, Ryan D MVK

Global Stability (Block)

File Information

Created By: Liljegren, James
Revision Number: 581
Last Edited By: Reves, Ryan D MVK
Date: 6/12/2013
Time: 11:44:23 AM
File Name: Orleans Canal Reach 19.gsz
Directory: Y:\F&MHOME\Middleton\Outfall Canals\Orleans final edits\final\Appendix A and Appendix B\
Last Solved Date: 6/12/2013
Last Solved Time: 11:47:58 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)

Kind: SLOPE/W
Parent: Global Analysis (seepage)
Method: Spencer
Settings
- PWP Conditions Source: Parent Analysis

Slip Surface
- Direction of movement: Left to Right
- Use Passive Mode: No
- Slip Surface Option: Block
- Critical slip surfaces saved: 1
- Optimize Critical Slip Surface Location: Yes
- Tension Crack
  - Tension Crack Option: Tension Crack Line
  - Percentage Wet: 1
  - Tension Crack Fluid Unit Weight: 62.4 pcf

FOS Distribution
- FOS Calculation Option: Constant

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

Materials

EMBANKMENT FILL, EL. +4 TO -1.5

Model: Undrained (Phi=0)
Unit Weight: 117 pcf
Cohesion: 500 psf

MARSH1, EL. -1.5 TO -7.5

Model: Spatial Mohr-Coulomb
Unit Weight: 103 pcf
Cohesion Fn: MARSH 1
Phi: 0 °
Phi-B: 0 °

BEACH SAND, EL. -32/-31 TO -42

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

BAY SOUND CLAY, EL. -42 TO -70

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

Marsh2, EL -7.5 to -14 (Protected)

Model: Undrained (Phi=0)
Unit Weight: 80 pcf
Cohesion: 125 psf

MARSH2, EL. -7.5 TO -12.5

Model: Spatial Mohr-Coulomb
Weight Fn: Marsh2
Cohesion Spatial Fn: Marsh 2 (2)
Phi: 0 °
Phi-B: 0 °

MARSH3, EL. -12.5 TO -17

Model: Spatial Mohr-Coulomb
Unit Weight: 77 pcf
Cohesion Spatial Fn: Marsh 3
Phi: 0 °
Phi-B: 0 °

Marsh3, EL -14 to -19 (Protected)

Model: Undrained (Phi=0)
Unit Weight: 106 pcf
Cohesion: 175 psf

Marsh1, EL -2 to -7.5 (Protected)

Model: Undrained (Phi=0)
Unit Weight: 110 pcf
Cohesion: 285 psf

Lacustrine1, EL -19 to -24 (Protected)

Model: Spatial Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion Fn: Lacustrine (protected)
Phi: 0 °
Phi-B: 0 °

Lacustrine1, EL -19 to -25

Model: Spatial Mohr-Coulomb
Weight Fn: Lacustrine1
Cohesion Spatial Fn: Lacustrine
Phi: 0 °
Phi-B: 0 °

Lacustrine2, EL -25 to -32

Model: Spatial Mohr-Coulomb
Weight Fn: Lacustrine2
Cohesion Spatial Fn: Lacustrine
Phi: 0 °
Phi-B: 0 °

Lacustrine2, EL -24 to -31 (Protected)

Model: Spatial Mohr-Coulomb
Unit Weight: 98 pcf
Cohesion Fn: Lacustrine (protected)
Phi: 0 °
Phi-B: 0 °

Berm

Model: Undrained (Phi=0)
Unit Weight: 110 pcf
Cohesion: 400 psf

Slip Surface Limits

Left Coordinate: (108.4, -8.56) ft
Right Coordinate: (340, -5.9) ft

Slip Surface Block

Left Grid
- Upper Left: (205, -4) ft
- Lower Left: (205, -46) ft
- Lower Right: (230, -46) ft
- X Increments: 5
- Y Increments: 9
- Starting Angle: 115 °
- Ending Angle: 135 °
- Angle Increments: 4

Right Grid
- Upper Left: (255, -4) ft
- Lower Left: (255, -46) ft
- Lower Right: (320, -46) ft
- X Increments: 13
- Y Increments: 9
- Starting Angle: 25 °
- Ending Angle: 45 °
- Angle Increments: 4

Reinforcements

Reinforcement 1

Type: Pile
Outside Point: (200, 13.48) ft
Inside Point: (200, -10.3) ft
Slip Surface Intersection: (200, -8.0461) ft
Total Length: 23.78 ft
Reinforcement Direction: 90 °

Applied Load Option: Variable
F of S Dependent: No
Pile Spacing: 1 ft
Shear Capacity: 0 lbs
Shear Safety Factor: 1
Shear Load Used: 0 lbs
Shear Option: Parallel to Slip
Resisting Force Used: 0 lbs/ft

Tension Crack Line

	X (ft)	Y (ft)
	181.8	-2.84
	186.7	-0.94
	191.9	0.3
	196.9	1.24
	200	1.24

Cohesion Functions

MARSH 1

Model: Spline Data Point Function
Function: Cohesion vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 285
Data Points: X (ft), Cohesion (psf)
Data Point: (173.4, 285)
Data Point: (200, 300)
Data Point: (248.9, 285)

Lacustrine (protected)

Model: Spline Data Point Function
Function: Cohesion vs. Y
Curve Fit to Data: 100 %
Segment Curvature: 100 %
Y-Intercept: 175
Data Points: Y (ft), Cohesion (psf)
Data Point: (-31, 300)
Data Point: (-19, 175)

Shear/Normal Strength Functions

Sand

Model: Spline Data Point Function
Function: Shear Stress vs. Normal Stress
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
Data Point: (-10000, 0)
Data Point: (0, 0)
Data Point: (10000, 6494)
Estimation Properties
Intact Rock Param.: 10
Geological Strength: 100
Disturbance Factor: 0
SigmaC: 600000 psf
Sigma3: 300000 psf
Num. Points: 20

Unit Weight Functions

Lacustrine1

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 100
Data Points: X (ft), Unit Weight (pcf)
Data Point: (173.4, 100)
Data Point: (200, 105)
Data Point: (248.9, 100)

Marsh2

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 80
Data Points: X (ft), Unit Weight (pcf)
Data Point: (173.4, 80)
Data Point: (200, 92)
Data Point: (248.9, 80)

Lacustrine2

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 98
Data Points: X (ft), Unit Weight (pcf)
Data Point: (173.4, 98)
Data Point: (200, 102)
Data Point: (248.9, 98)

Spatial Functions

Marsh 2 (2)

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (200, -7.5, 225)
Data Point: (200, -12.5, 225)
Data Point: (248.9, -7.5, 125)
Data Point: (248.9, -14, 125)
Data Point: (173.4, -7.5, 125)
Data Point: (173.4, -12.5, 125)

Marsh 3

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (200, -12.5, 300)
Data Point: (200, -19, 300)
Data Point: (248.9, -14, 175)
Data Point: (248.9, -19, 175)
Data Point: (173.4, -12.5, 175)
Data Point: (173.4, -19, 175)

Lacustrine

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (200, -19, 300)
Data Point: (200, -32, 425)
Data Point: (248.9, -19, 175)
Data Point: (248.9, -31, 300)
Data Point: (173.4, -19, 175)
Data Point: (173.4, -32, 300)

Bay Sound

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (200, -42, 510)
Data Point: (200, -70, 770)
Data Point: (248.9, -42, 460)
Data Point: (248.9, -70, 725)
Data Point: (173.4, -42, 460)
Data Point: (173.4, -70, 725)
Data Point: (310, -42, 460)
Data Point: (310, -70, 725)
Data Point: (108.4, -42, 460)
Data Point: (108.4, -70, 725)

Regions

	Material	Points	Area (ft^2)
Region 1	MARSH1, EL. -1.5 TO -7.5	7,30,8,39,1	175.56
Region 2	MARSH2, EL. -7.5 TO -12.5	8,9,40,39	133
Region 3	BEACH SAND, EL. -32/-31 TO -42	21,43,24,16,2,3,37,31,44,22	2431.55
Region 4	MARSH3, EL. -12.5 TO -17	42,28,9,14,15,23,41	379.595
Region 5	Lacustrine1, EL -19 to -25	35,15,23,41,46,33	428.55
Region 6	Marsh2, EL -7.5 to -14 (Protected)	13,27,11,14	592.15
Region 7	Marsh3, EL -14 to -19 (Protected)	14,11,12,15	455.5
Region 8	Lacustrine1, EL -19 to -24 (Protected)	15,12,36,35	455.5
Region 9	BAY SOUND CLAY, EL. -42 TO -70	25,22,44,31,37,3,26,38,32,45	6484.8
Region 10	MARSH3, EL. -12.5 TO -17	40,9,28,42	74.48
Region 11	MARSH1, EL. -1.5 TO -7.5	8,30,7,10,13	327.63
Region 12	MARSH2, EL. -7.5 TO -12.5	9,8,13,14	281.175
Region 13	Marsh3, EL -14 to -19 (Protected)	29,19,40,42	182
Region 14	Marsh3, EL -14 to -19 (Protected)	20,29,42,41	240.5

Region 15	Lacustrine2, EL -24 to -31 (Protected)	21,34,46,43	455
Region 16	Lacustrine1, EL -19 to -24 (Protected)	34,46,41,20	390
Region 17	Lacustrine2, EL -25 to -32	16,24,43,46,33,35	528.5
Region 18	Lacustrine2, EL -24 to -31 (Protected)	16,35,36,2	637.7
Region 19	Marsh1, EL -2 to -7.5 (Protected)	58,50,51,52,1,39	118.991
Region 20	Marsh2, EL -7.5 to -14 (Protected)	18,47,48,49,58,39,40,19	293.6835
Region 21	EMBANKMENT FILL, EL. +4 TO -1.5	1,53,54,55,56,57,4,7	72.852
Region 22		71,5,6,59	6.36
Region 23	EMBANKMENT FILL, EL. +4 TO -1.5	7,4,71,59,60,61,62,63,64,10	220.1
Region 24	Marsh1, EL -2 to -7.5 (Protected)	10,65,66,67,17,68,74,69,70,72,27,13	272.07498
Region 25	Berm	64,73,74,68,17,67,66,65,10	125.82563

Points

	X (ft)	Y (ft)
Point 1	173.4	-0.9
Point 2	340	-31
Point 3	340	-42
Point 4	200	4.55
Point 5	200	13.48
Point 6	200.4	13.48
Point 7	200	-0.9
Point 8	200	-7.5
Point 9	200	-12.5
Point 10	248.9	-0.7
Point 11	340	-14
Point 12	340	-19
Point 13	248.9	-7.5
Point 14	248.9	-14
Point 15	248.9	-19
Point 16	248.9	-31
Point 17	279.3	-5.3
Point 18	108.4	-8.56
Point 19	108.4	-12.5
Point 20	108.4	-19
Point 21	108.4	-32
Point 22	108.4	-42
Point 23	200	-19
Point 24	200	-32
Point 25	108.4	-70
Point 26	340	-70
Point 27	340	-7.5
Point 28	200	-15.3
Point 29	108.4	-15.3
Point 30	200	-6.5
Point 31	200	-42
Point 32	200	-70
Point 33	200	-25
Point 34	108.4	-25
Point 35	248.9	-24
Point 36	340	-24
Point 37	248.9	-42
Point 38	248.9	-70
Point 39	173.4	-7.5
Point 40	173.4	-12.5
Point 41	173.4	-19
Point 42	173.4	-15.3
Point 43	173.4	-32
Point 44	173.4	-42
Point 45	173.4	-70
Point 46	173.4	-25
Point 47	118.4	-8.48
Point 48	128.5	-8.74
Point 49	138.4	-8.05
Point 50	148.5	-5.84
Point 51	158.5	-2.78
Point 52	164.3	-2.38
Point 53	181.8	0.16
Point 54	186.7	2.06
Point 55	191.9	3.3
Point 56	196.9	4.24
Point 57	198.9	4.55
Point 58	142.2	-7.5
Point 59	201.1	5
Point 60	211	5
Point 61	221.3	4.8
Point 62	230.6	4.3
Point 63	235.8	3.1
Point 64	242.8	0.8
Point 65	250.9	-1.1
Point 66	263.3	-2.2
Point 67	272.2	-3.7
Point 68	288.8	-4.7
Point 69	305.5	-5.4
Point 70	324.2	-5.9
Point 71	200	5
Point 72	340	-5.9
Point 73	288	-1.5
Point 74	299.2	-5.13593

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.40	(260.423, 2.864)	51.02316	(189.824, 2.80487)	(318.495, -5.74747)
2	9772	1.57	(260.423, 2.864)	51.515	(196.221, 4.11235)	(324.048, -5.89593)

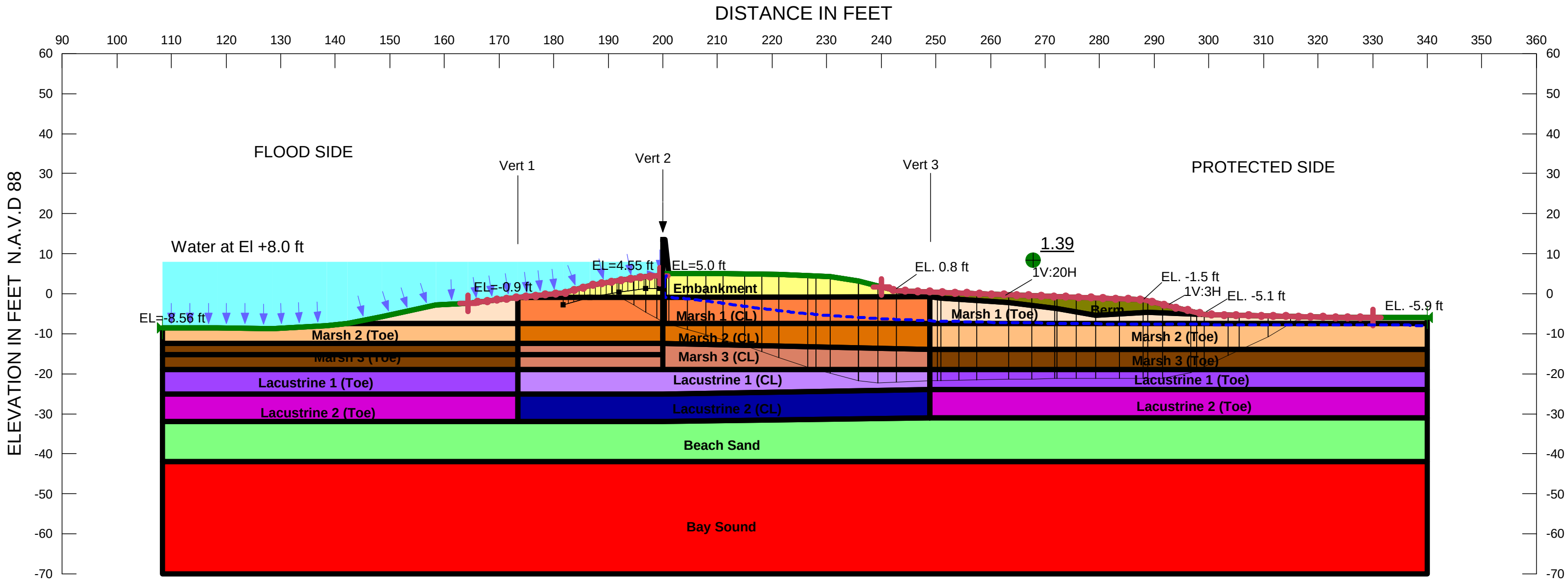
Slices of Slip Surface: Optimized

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	190.29155	-0.54756695	412.3245	362.54854	0	500
2	Optimized	191.32975	-1.3294595	455.23632	639.54417	0	295.11
3	Optimized	193.09095	-2.6558495	552.21474	788.91653	0	296.1
4	Optimized	195.59095	-4.581439	699.99312	992.86823	0	297.51
5	Optimized	197.9	-6.395892	850.72439	1191.0692	0	298.82
6	Optimized	199.10255	-7.340843	934.97889	1293.3334	0	299.49
7	Optimized	199.65255	-7.7730295	975.18586	1369.2159	0	223.69
8	Optimized	200.2	-8.2032175	661.24849	1364.0326	0	224.59
9	Optimized	200.4222	-8.377813	499.37609	1337.5399	0	224.14
10	Optimized	200.7722	-8.536057	510.5646	1367.345	0	223.42
11	Optimized	203.5174	-9.715237	579.53448	1472.2969	0	217.81
12	Optimized	208.4674	-11.841455	630.78293	1657.6169	0	207.68
13	Optimized	213.83075	-14.14522	670.43077	1815.892	0	264.65
14	Optimized	218.98075	-16.38763	731.47392	1966.0924	0	251.48
15	Optimized	222.6051	-17.99175	788.43162	2071.2577	0	242.22
16	Optimized	224.484	-18.78469	818.9934	2138.8136	0	237.41
17	Optimized	227.8289	-20.03977	870.15972	2233.6391	0	239.32
18	Optimized	232.45425	-21.77529	949.7505	2332.3786	0	245.16
19	Optimized	235.05425	-22.59908	988.92923	2408.7557	0	247.02
20	Optimized	237.60435	-23.03691	1007.846	2359.8433	0	245.13
21	Optimized	241.10435	-23.22356	1011.4812	2319.2337	0	238.35
22	Optimized	245.04475	-22.937405	987.68301	2199.4991	0	225.6
23	Optimized	248.09475	-22.728315	970.60716	2144.4858	0	215.84
24	Optimized	249.9	-22.625025	961.92677	2314.0653	0	212.76
25	Optimized	251.8253	-22.514865	952.7704	2292.0761	0	211.61
26	Optimized	254.9385	-22.371175	940.47437	2255.2159	0	210.12
27	Optimized	259.31425	-22.18969	925.03879	2212.2885	0	208.23
28	Optimized	262.40105	-22.074875	915.28524	2178.9593	0	207.03
29	Optimized	266.0499	-21.97715	906.36418	2148.5844	0	206.01
30	Optimized	270.4999	-21.88764	897.6996	2109.572	0	205.08
31	Optimized	273.975	-21.85522	893.5387	2086.839	0	204.74

32	Optimized	277.525	-21.822105	889.45437	2063.6288	0	204.4
33	Optimized	281.475	-21.78526	885.15694	2037.7965	0	204.01
34	Optimized	285.825	-21.74468	880.60542	2009.338	0	203.59
35	Optimized	288.4	-21.72066	878.01181	1980.4139	0	203.34
36	Optimized	290.1269	-21.70455	876.32139	1917.1155	0	203.17
37	Optimized	293.5271	-21.27837	848.49242	1803.3627	0	198.73
38	Optimized	296.9845	-20.301555	786.44226	1628.9658	0	188.56
39	Optimized	298.7843	-19.489415	735.25573	1522.5315	0	180.1
40	Optimized	299.40045	-19.120145	712.05318	1465.6734	0	176.25
41	Optimized	302.55045	-17.232315	593.35536	1241.9211	0	175
42	Optimized	305.6044	-15.40207	478.25994	1025.0482	0	175
43	Optimized	306.6016	-14.669755	432.25169	971.18651	0	175
44	Optimized	309.6606	-12.375	288.14932	718.95157	0	125
45	Optimized	313.99305	-9.125	84.038935	431.33771	0	125
46	Optimized	317.3274	-6.6237365	-73.056284	280.80239	0	285

Slices of Slip Surface: 9772

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	9772	196.5605	0.77283965	415.02975	219.07414	0	500
2	9772	197.56665	-0.23333335	478.49034	435.5283	0	500
3	9772	198.56665	-1.2333335	551.53271	659.26397	0	299.19
4	9772	199.45	-2.116667	621.54683	748.76176	0	299.69
5	9772	200.2	-2.866667	304.44484	778.78977	0	299.94
6	9772	200.75	-3.416667	151.60369	721.93582	0	299.77
7	9772	202.96665	-5.6333335	290.29888	935.55903	0	299.09
8	9772	207.4889	-10.15559	542.58039	1388.0707	0	209.69
9	9772	210.57225	-13.238925	672.65975	1603.9324	0	272.97
10	9772	213.66665	-16.333335	792.45902	1822.3468	0	265.06
11	9772	218.16665	-20.833335	975.13234	2173.1962	0	271.71
12	9772	220.65	-22.66667	1052.6154	2678.3077	0	283.65
13	9772	223.625	-22.66667	1035.7634	2657.4194	0	276.23
14	9772	228.275	-22.66667	1014.8387	2620.2151	0	264.62
15	9772	233.2	-22.66667	998	2526.5385	0	252.33
16	9772	237.55	-22.66667	986.48571	2381.1429	0	241.48
17	9772	241.05	-22.66667	978.88571	2239.9429	0	232.76
18	9772	245.85	-22.66667	970.22951	2140.9836	0	220.79
19	9772	249.9	-22.66667	964.4	2299.4	0	213.19
20	9772	252.96665	-22.66667	960.60492	2282.2502	0	213.19
21	9772	257.1	-22.66667	956.1775	2259.1211	0	213.19
22	9772	261.23335	-22.66667	952.4033	2235.9921	0	213.19
23	9772	265.525	-22.66667	949.05618	2211.9551	0	213.19
24	9772	269.975	-22.66667	946	2187.0562	0	213.19
25	9772	273.975	-22.66667	943.60563	2164.6761	0	213.19
26	9772	277.525	-22.66667	941.69014	2144.7887	0	213.19
27	9772	281.475	-22.66667	939.74713	2122.6897	0	213.19
28	9772	285.825	-22.66667	937.81609	2098.3448	0	213.19
29	9772	288.4	-22.66667	936.75	2071.875	0	213.19
30	9772	291.9	-22.66667	935.41935	1946.9355	0	213.19
31	9772	297.1	-21.454235	858.12812	1785.1259	0	200.56
32	9772	300.27545	-19.6209	742.9162	1502.5823	0	181.47
33	9772	303.42545	-17.802245	628.55065	1287.6376	0	175
34	9772	307.75555	-15.302245	471.28247	994.5713	0	175
35	9772	311.8875	-12.916665	321.18464	726.32313	0	125
36	9772	315.6403	-10.749999	184.87155	534.16158	0	125
37	9772	319.39305	-8.5833335	48.551542	342.0231	0	125
38	9772	322.6586	-6.697965	-70.059265	218.27594	0	285



Name: EMBANKMENT FILL, EL. +4 TO -1.5 Model: Undrained (Phi=0) Unit Weight: 117 pcf Cohesion: 500 psf
Name: MARSH1, EL. -1.5 TO -7.5 Model: Spatial Mohr-Coulomb Unit Weight: 103 pcf Cohesion Fn: MARSH 1 Phi: 0 °
Name: BEACH SAND, EL. -32/-31 TO -42 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand
Name: BAY SOUND CLAY, EL. -42 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 105 pcf Cohesion Spatial Fn: Bay Sound Phi: 0 °
Name: Marsh2, EL -7.5 to -14 (Protected) Model: Undrained (Phi=0) Unit Weight: 80 pcf Cohesion: 125 psf
Name: MARSH2, EL. -7.5 TO -12.5 Model: Spatial Mohr-Coulomb Weight Fn: Marsh2 Cohesion Spatial Fn: Marsh 2 (2) Phi: 0 °
Name: MARSH3, EL. -12.5 TO -17 Model: Spatial Mohr-Coulomb Unit Weight: 77 pcf Cohesion Spatial Fn: Marsh 3 Phi: 0 °
Name: Marsh3, EL -14 to -19 (Protected) Model: Undrained (Phi=0) Unit Weight: 106 pcf Cohesion: 175 psf
Name: Marsh1, EL -2 to -7.5 (Protected) Model: Undrained (Phi=0) Unit Weight: 110 pcf Cohesion: 285 psf
Name: Lacustrine1, EL -19 to -24 (Protected) Model: Spatial Mohr-Coulomb Unit Weight: 100 pcf Cohesion Fn: Lacustrine (protected) Phi: 0 °
Name: Lacustrine1, EL -19 to -25 Model: Spatial Mohr-Coulomb Weight Fn: Lacustrine1 Cohesion Spatial Fn: Lacustrine Phi: 0 °
Name: Lacustrine2, EL -25 to -32 Model: Spatial Mohr-Coulomb Weight Fn: Lacustrine2 Cohesion Spatial Fn: Lacustrine Phi: 0 °
Name: Lacustrine2, EL -24 to -31 (Protected) Model: Spatial Mohr-Coulomb Unit Weight: 98 pcf Cohesion Fn: Lacustrine (protected) Phi: 0 °
Name: Berm Model: Undrained (Phi=0) Unit Weight: 110 pcf Cohesion: 400 psf

GENERAL NOTES

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

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

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 19
REMEDIATION OF CANAL WALLS AND LEVEES
PROTECTED SIDE STABILITY ANALYSIS
CASE: Global Stability (Entry/Exit)
STA. 65+00 TO 90+62 EAST
ORLEANS PARISH, LOUISIANA

ETL 1110-2-575 ANALYSIS

Name: Global Stability (Entry/Exit)
File Name: Orleans Canal Reach 19.gsz Directory: Y:\F&MHOME\Middleton\Outfall Canals\Orleans final edits\final\Appendix A and Appendix B\
Last Edited By: Reves, Ryan D MVK

Global Stability (Entry/Exit)

File Information

Created By: Liljegren, James
Revision Number: 581
Last Edited By: Reves, Ryan D MVK
Date: 6/12/2013
Time: 11:44:23 AM
File Name: Orleans Canal Reach 19.gsz
Directory: Y:\F&MHOME\Middleton\Outfall Canals\Orleans final edits\final\Appendix A and Appendix B\
Last Solved Date: 6/12/2013
Last Solved Time: 11:50:56 AM

Project Settings

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

Analysis Settings

Global Stability (Entry/Exit)

Kind: SLOPE/W
Parent: Global Analysis (seepage)
Method: Spencer
Settings
- PWP Conditions Source: Parent Analysis

Slip Surface
- Direction of movement: Left to Right
- Use Passive Mode: No
- Slip Surface Option: Entry and Exit
- Critical slip surfaces saved: 1
- Optimize Critical Slip Surface Location: Yes
- Tension Crack
  - Tension Crack Option: Tension Crack Line
  - Percentage Wet: 1
  - Tension Crack Fluid Unit Weight: 62.4 pcf

FOS Distribution
- FOS Calculation Option: Constant

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

Materials

EMBANKMENT FILL, EL. +4 TO -1.5

Model: Undrained (Phi=0)
Unit Weight: 117 pcf
Cohesion: 500 psf

MARSH1, EL. -1.5 TO -7.5

Model: Spatial Mohr-Coulomb
Unit Weight: 103 pcf
Cohesion Fn: MARSH 1
Phi: 0 °
Phi-B: 0 °

BEACH SAND, EL. -32/-31 TO -42

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

BAY SOUND CLAY, EL. -42 TO -70

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

Marsh2, EL -7.5 to -14 (Protected)

Model: Undrained (Phi=0)
Unit Weight: 80 pcf
Cohesion: 125 psf

MARSH2, EL. -7.5 TO -12.5

Model: Spatial Mohr-Coulomb
Weight Fn: Marsh2
Cohesion Spatial Fn: Marsh 2 (2)
Phi: 0 °
Phi-B: 0 °

MARSH3, EL. -12.5 TO -17

Model: Spatial Mohr-Coulomb
Unit Weight: 77 pcf
Cohesion Spatial Fn: Marsh 3
Phi: 0 °
Phi-B: 0 °

Marsh3, EL -14 to -19 (Protected)

Model: Undrained (Phi=0)
Unit Weight: 106 pcf
Cohesion: 175 psf

Marsh1, EL -2 to -7.5 (Protected)

Model: Undrained (Phi=0)
Unit Weight: 110 pcf
Cohesion: 285 psf

Lacustrine1, EL -19 to -24 (Protected)

Model: Spatial Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion Fn: Lacustrine (protected)
Phi: 0 °
Phi-B: 0 °

Lacustrine1, EL -19 to -25

Model: Spatial Mohr-Coulomb
Weight Fn: Lacustrine1
Cohesion Spatial Fn: Lacustrine
Phi: 0 °
Phi-B: 0 °

Lacustrine2, EL -25 to -32

Model: Spatial Mohr-Coulomb
Weight Fn: Lacustrine2
Cohesion Spatial Fn: Lacustrine
Phi: 0 °
Phi-B: 0 °

Lacustrine2, EL -24 to -31 (Protected)

Model: Spatial Mohr-Coulomb
Unit Weight: 98 pcf
Cohesion Fn: Lacustrine (protected)
Phi: 0 °
Phi-B: 0 °

Berm

Model: Undrained (Phi=0)
Unit Weight: 110 pcf
Cohesion: 400 psf

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (164.3, -2.38) ft
Left-Zone Right Coordinate: (199.5, 4.55) ft
Left-Zone Increment: 20
Right Projection: Range
Right-Zone Left Coordinate: (240, 1.72) ft
Right-Zone Right Coordinate: (330, -5.9) ft
Right-Zone Increment: 40
Radius Increments: 20

Slip Surface Limits

Left Coordinate: (108.4, -8.56) ft
Right Coordinate: (340, -5.9) ft

Reinforcements

Reinforcement 1

Type: Pile
Outside Point: (200, 13.48) ft
Inside Point: (200, -10.3) ft
Slip Surface Intersection: (200, -7.0059) ft
Total Length: 23.78 ft
Reinforcement Direction: 90 °
Applied Load Option: Variable
F of S Dependent: No
Pile Spacing: 1 ft
Shear Capacity: 0 lbs
Shear Safety Factor: 1
Shear Load Used: 0 lbs
Shear Option: Parallel to Slip
Resisting Force Used: 0 lbs/ft

Tension Crack Line

	X (ft)	Y (ft)
	181.8	-2.84
	186.7	-0.94
	191.9	0.3
	196.9	1.24
	199.5	1.24

Cohesion Functions

MARSH 1

Model: Spline Data Point Function
Function: Cohesion vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 285
Data Points: X (ft), Cohesion (psf)
 Data Point: (173.4, 285)
 Data Point: (200, 300)
 Data Point: (248.9, 285)

Lacustrine (protected)

Model: Spline Data Point Function
Function: Cohesion vs. Y
 Curve Fit to Data: 100 %
 Segment Curvature: 100 %
Y-Intercept: 175
Data Points: Y (ft), Cohesion (psf)
 Data Point: (-31, 300)
 Data Point: (-19, 175)

Shear/Normal Strength Functions

Sand

Model: Spline Data Point Function
Function: Shear Stress vs. Normal Stress
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
 Data Point: (-10000, 0)
 Data Point: (0, 0)
 Data Point: (10000, 6494)
Estimation Properties
 Intact Rock Param.: 10
 Geological Strength: 100
 Disturbance Factor: 0
 SigmaC: 600000 psf
 Sigma3: 300000 psf
 Num. Points: 20

Unit Weight Functions

Lacustrine1

Model: Spline Data Point Function
Function: Unit Weight vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 100
Data Points: X (ft), Unit Weight (pcf)
 Data Point: (173.4, 100)
 Data Point: (200, 105)
 Data Point: (248.9, 100)

Marsh2

Model: Spline Data Point Function
Function: Unit Weight vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 80
Data Points: X (ft), Unit Weight (pcf)
 Data Point: (173.4, 80)
 Data Point: (200, 92)
 Data Point: (248.9, 80)

Lacustrine2

Model: Spline Data Point Function
Function: Unit Weight vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 98
Data Points: X (ft), Unit Weight (pcf)
 Data Point: (173.4, 98)
 Data Point: (200, 102)
 Data Point: (248.9, 98)

Spatial Functions

Marsh 2 (2)

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
 Data Point: (200, -7.5, 225)
 Data Point: (200, -12.5, 225)
 Data Point: (248.9, -7.5, 125)
 Data Point: (248.9, -14, 125)
 Data Point: (173.4, -7.5, 125)
 Data Point: (173.4, -12.5, 125)

Marsh 3

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
 Data Point: (200, -12.5, 300)
 Data Point: (200, -19, 300)
 Data Point: (248.9, -14, 175)
 Data Point: (248.9, -19, 175)
 Data Point: (173.4, -12.5, 175)
 Data Point: (173.4, -19, 175)

Lacustrine

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
 Data Point: (200, -19, 300)
 Data Point: (200, -32, 425)
 Data Point: (248.9, -19, 175)
 Data Point: (248.9, -31, 300)
 Data Point: (173.4, -19, 175)
 Data Point: (173.4, -32, 300)

Bay Sound

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
 Data Point: (200, -42, 510)
 Data Point: (200, -70, 770)
 Data Point: (248.9, -42, 460)
 Data Point: (248.9, -70, 725)
 Data Point: (173.4, -42, 460)
 Data Point: (173.4, -70, 725)
 Data Point: (310, -42, 460)
 Data Point: (310, -70, 725)
 Data Point: (108.4, -42, 460)
 Data Point: (108.4, -70, 725)

Regions

	Material	Points	Area (ft^2)
Region 1	MARSH1, EL. -1.5 TO -7.5	7,30,8,39,1	175.56
Region 2	MARSH2, EL. -7.5 TO -12.5	8,9,40,39	133
Region 3	BEACH SAND, EL. -32/-31 TO -42	21,43,24,16,2,3,37,31,44,22	2431.55
Region 4	MARSH3, EL. -12.5 TO -17	42,28,9,14,15,23,41	379.595
Region 5	Lacustrine1, EL -19 to -25	35,15,23,41,46,33	428.55
Region 6	Marsh2, EL -7.5 to -14 (Protected)	13,27,11,14	592.15
Region 7	Marsh3, EL -14 to -19 (Protected)	14,11,12,15	455.5
Region 8	Lacustrine1, EL -19 to -24 (Protected)	15,12,36,35	455.5
Region 9	BAY SOUND CLAY, EL. -42 TO -70	25,22,44,31,37,3,26,38,32,45	6484.8
Region 10	MARSH3, EL. -12.5 TO -17	40,9,28,42	74.48
Region 11	MARSH1, EL. -1.5 TO -7.5	8,30,7,10,13	327.63
Region 12	MARSH2, EL. -7.5 TO -12.5	9,8,13,14	281.175
Region 13	Marsh3, EL -14 to -19 (Protected)	29,19,40,42	182
Region 14	Marsh3, EL -14 to -19 (Protected)	20,29,42,41	240.5
Region 15	Lacustrine2, EL -24 to -31 (Protected)	21,34,46,43	455
Region 16	Lacustrine1, EL -19 to -24 (Protected)	34,46,41,20	390
Region 17	Lacustrine2, EL -25 to -32	16,24,43,46,33,35	528.5
Region 18	Lacustrine2, EL -24 to -31 (Protected)	16,35,36,2	637.7

Region 19	Marsh1, EL -2 to -7.5 (Protected)	58,50,51,52,1,39	118.991
Region 20	Marsh2, EL -7.5 to -14 (Protected)	18,47,48,49,58,39,40,19	293.6835
Region 21	EMBANKMENT FILL, EL. +4 TO -1.5	1,53,54,55,56,57,4,7	72.852
Region 22		71,5,6,59	6.36
Region 23	EMBANKMENT FILL, EL. +4 TO -1.5	7,4,71,59,60,61,62,63,64,10	220.1
Region 24	Marsh1, EL -2 to -7.5 (Protected)	10,65,66,67,17,68,74,69,70,72,27,13	272.07498
Region 25	Berm	64,73,74,68,17,67,66,65,10	125.82563

Points

	X (ft)	Y (ft)
Point 1	173.4	-0.9
Point 2	340	-31
Point 3	340	-42
Point 4	200	4.55
Point 5	200	13.48
Point 6	200.4	13.48
Point 7	200	-0.9
Point 8	200	-7.5
Point 9	200	-12.5
Point 10	248.9	-0.7
Point 11	340	-14
Point 12	340	-19
Point 13	248.9	-7.5
Point 14	248.9	-14
Point 15	248.9	-19
Point 16	248.9	-31
Point 17	279.3	-5.3
Point 18	108.4	-8.56
Point 19	108.4	-12.5
Point 20	108.4	-19
Point 21	108.4	-32
Point 22	108.4	-42
Point 23	200	-19
Point 24	200	-32
Point 25	108.4	-70
Point 26	340	-70
Point 27	340	-7.5
Point 28	200	-15.3
Point 29	108.4	-15.3
Point 30	200	-6.5
Point 31	200	-42
Point 32	200	-70
Point 33	200	-25
Point 34	108.4	-25
Point 35	248.9	-24
Point 36	340	-24
Point 37	248.9	-42
Point 38	248.9	-70
Point 39	173.4	-7.5
Point 40	173.4	-12.5
Point 41	173.4	-19
Point 42	173.4	-15.3
Point 43	173.4	-32
Point 44	173.4	-42
Point 45	173.4	-70
Point 46	173.4	-25
Point 47	118.4	-8.48
Point 48	128.5	-8.74
Point 49	138.4	-8.05
Point 50	148.5	-5.84
Point 51	158.5	-2.78
Point 52	164.3	-2.38
Point 53	181.8	0.16
Point 54	186.7	2.06
Point 55	191.9	3.3
Point 56	196.9	4.24
Point 57	198.9	4.55
Point 58	142.2	-7.5
Point 59	201.1	5
Point 60	211	5
Point 61	221.3	4.8
Point 62	230.6	4.3
Point 63	235.8	3.1
Point 64	242.8	0.8
Point 65	250.9	-1.1
Point 66	263.3	-2.2
Point 67	272.2	-3.7
Point 68	288.8	-4.7
Point 69	305.5	-5.4
Point 70	324.2	-5.9
Point 71	200	5
Point 72	340	-5.9
Point 73	288	-1.5
Point 74	299.2	-5.13593

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.39	(262.374, 102.238)	50.20097	(190.741, 3.02364)	(317.117, -5.71061)
2	11998	1.45	(262.374, 102.238)	125.195	(190.249, 2.90635)	(325.46, -5.9)

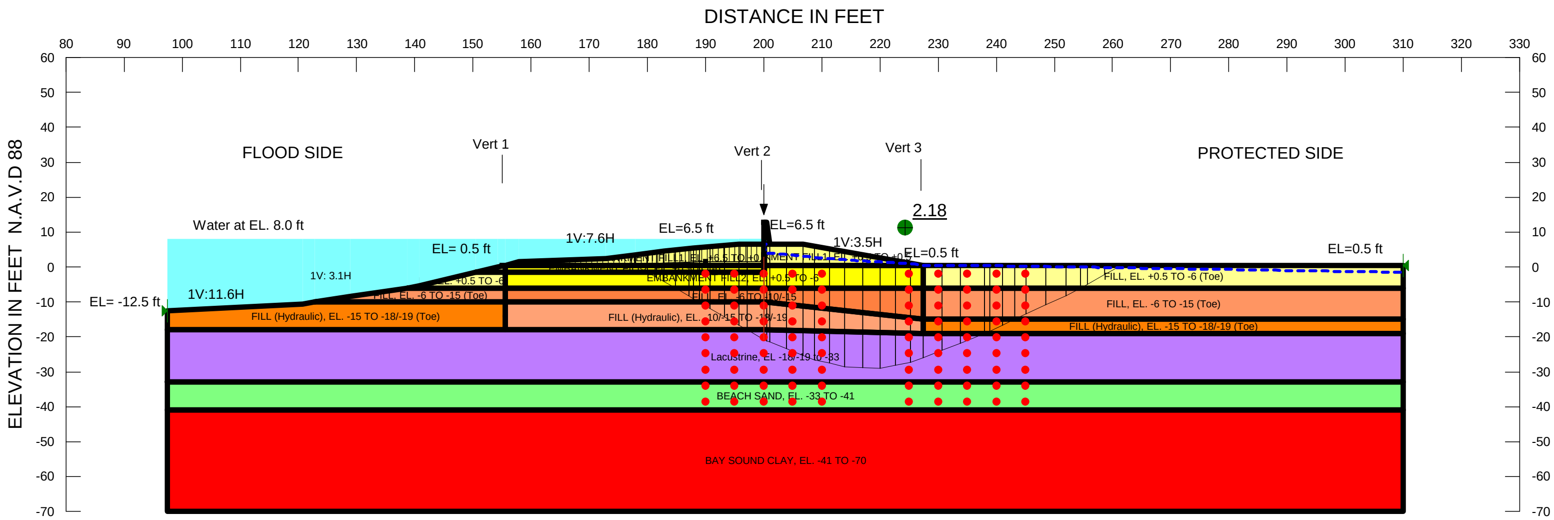
Slices of Slip Surface: Optimized

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	191.32055	-0.39380618	416.27052	387.30703	0	500
2	Optimized	193.29975	-1.8196244	506.4446	715.29431	0	296.22
3	Optimized	195.79975	-3.6952155	652.82403	906.23011	0	297.63
4	Optimized	197.9	-5.350648	789.0932	1086.8242	0	298.82
5	Optimized	199.45	-6.572384	896.52706	1215.884	0	299.69
6	Optimized	200.2	-7.1635465	587.51022	1231.0953	0	299.94
7	Optimized	200.50065	-7.40052	424.85037	1192.4605	0	299.85
8	Optimized	200.6277	-7.489925	430.98485	1286.2514	0	299.81
9	Optimized	200.87705	-7.585036	437.6004	1293.6694	0	223.21
10	Optimized	202.81375	-8.323739	482.88898	1360.0982	0	219.25
11	Optimized	206.24125	-9.631073	529.58588	1475.9818	0	212.24
12	Optimized	209.4775	-10.87066	551.68169	1583.0506	0	205.62
13	Optimized	212.9811	-12.218985	573.66434	1693.8821	0	198.45
14	Optimized	216.54665	-13.73076	610.99512	1764.0922	0	257.7
15	Optimized	219.71555	-15.229505	660.29008	1867.7885	0	249.6
16	Optimized	223.91645	-17.216345	735.73209	1994.7636	0	238.86
17	Optimized	227.31205	-18.726905	799.23595	2122.2721	0	230.18
18	Optimized	229.3456	-19.439695	829.41352	2171.7469	0	229.42
19	Optimized	233.2	-20.79073	890.69589	2223.6999	0	233.3
20	Optimized	235.816	-21.70768	935.51347	2240.8763	0	236.04
21	Optimized	237.5765	-21.95475	945.08765	2264.0312	0	234.14
22	Optimized	241.0605	-22.11827	946.64209	2199.3556	0	227.09
23	Optimized	245.85	-21.903675	924.80986	2078.4066	0	212.89
24	Optimized	249.596	-21.735835	908.91671	2222.1632	0	203.5
25	Optimized	250.596	-21.69435	905.05317	2209.0024	0	203.07
26	Optimized	252.5502	-21.628135	898.4279	2191.4264	0	202.38
27	Optimized	255.85065	-21.516305	887.67789	2161.5989	0	201.21
28	Optimized	260.40045	-21.40492	876.14205	2120.4438	0	200.05
29	Optimized	265.4275	-21.30875	865.83749	2082.6578	0	199.05
30	Optimized	269.6825	-21.22735	857.61335	2050.6071	0	198.2
31	Optimized	272.005	-21.18623	853.49648	2028.6341	0	197.77
32	Optimized	273.975	-21.181965	851.96991	2017.1786	0	197.73
33	Optimized	277.525	-21.174275	849.40654	1996.5307	0	197.65
34	Optimized	281.475	-21.165715	846.75667	1973.5587	0	197.56
35	Optimized	285.825	-21.15629	844.09001	1948.2714	0	197.46
36	Optimized	288.4	-21.150715	842.6105	1921.2454	0	197.4
37	Optimized	290.17315	-21.146875	841.63045	1857.5295	0	197.36
38	Optimized	294.1058	-20.43072	795.55501	1715.6295	0	189.9
39	Optimized	297.2327	-19.35877	727.68563	1575.3028	0	178.74

40	Optimized	298.50005	-18.557415	677.31075	1439.391	0	175
41	Optimized	301.34765	-16.75683	564.17376	1203.3188	0	175
42	Optimized	304.49765	-14.778245	439.7684	966.14178	0	175
43	Optimized	308.17515	-12.50139	296.54672	715.78982	0	125
44	Optimized	312.8916	-9.17256	87.361123	448.37255	0	125
45	Optimized	316.0248	-6.605304	-73.795889	300.82229	0	285

Slices of Slip Surface: 11998

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	11998	190.82815	-0.49682304	415.2064	408.72157	0	500
2	11998	191.65355	-1.068711	443.52323	638.55761	0	295.29
3	11998	194.4	-2.854419	581.70642	851.94573	0	296.84
4	11998	197.9	-5.0722315	772.62324	1115.8828	0	298.82
5	11998	199.45	-5.9928085	860.97478	1222.3405	0	299.69
6	11998	200.2	-6.4270015	536.75256	1224.7055	0	299.94
7	11998	200.75	-6.7393485	376.56432	1144.379	0	299.77
8	11998	201.6068	-7.218632	408.6903	1194.7951	0	299.51
9	11998	204.3352	-8.6626425	490.86096	1358.5818	0	216.13
10	11998	208.7784	-10.877898	564.66851	1563.8773	0	207.05
11	11998	212.11225	-12.418085	598.75629	1701.9451	0	200.23
12	11998	215.2434	-13.726175	627.21451	1789.4095	0	261.03
13	11998	219.28115	-15.286945	667.62575	1907.2397	0	250.71
14	11998	223.625	-16.784125	713.91486	2010.4826	0	239.61
15	11998	228.275	-18.199315	764.36353	2097.5509	0	227.72
16	11998	230.8739	-18.92879	793.33631	2135.491	0	221.08
17	11998	233.4739	-19.55196	818.4524	2130.5738	0	220.04
18	11998	237.55	-20.45798	857.87536	2097.4176	0	218.91
19	11998	241.05	-21.11456	887.57855	2033.2154	0	216.8
20	11998	245.85	-21.823315	920.03908	2018.405	0	212.05
21	11998	249.9	-22.329685	944.17816	2236.2167	0	209.68
22	11998	252.96665	-22.585575	955.71711	2251.9846	0	212.35
23	11998	257.1	-22.828475	966.01239	2263.2304	0	214.88
24	11998	261.23335	-22.93445	968.74202	2260.8416	0	215.98
25	11998	265.525	-22.897255	963.20021	2243.5358	0	215.6
26	11998	269.975	-22.70587	948.40393	2210.0265	0	213.6
27	11998	273.975	-22.4053	927.4844	2166.6359	0	210.47
28	11998	277.525	-22.023665	901.94003	2116.1869	0	206.5
29	11998	281.475	-21.471415	865.69563	2046.6213	0	200.74
30	11998	285.825	-20.72077	817.06545	1954.7878	0	192.92
31	11998	288.4	-20.220935	784.8579	1882.089	0	187.72
32	11998	291.19995	-19.56796	743.07162	1718.9867	0	180.92
33	11998	296.39995	-18.208995	656.44198	1396.0734	0	175
34	11998	302.35	-16.35618	538.84533	1089.8442	0	175
35	11998	307.188	-14.647185	430.65586	893.03494	0	175
36	11998	311.16905	-13.02932	328.45236	720.29802	0	125
37	11998	315.7551	-10.977482	199.02411	543.40623	0	125
38	11998	320.3411	-8.698162	55.427048	346.72827	0	125
39	11998	323.41705	-7.0627415	-47.528192	263.56477	0	285
40	11998	324.83015	-6.2627415	-97.866763	173.31604	0	285



Name: EMBANKMENT FILL1, EL. +6.5 TO +0.5 Model: Undrained (Phi=0) Unit Weight: 111 pcf Cohesion: 500 psf
Name: BEACH SAND, EL. -33 TO -41 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand
Name: BAY SOUND CLAY, EL. -41 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 106 pcf Cohesion Spatial Fn: Bay Sound Phi: 0 °
Name: Lacustrine, EL -18/-19 to -33 Model: Spatial Mohr-Coulomb Unit Weight: 103 pcf Cohesion Spatial Fn: Lacustrine Phi: 0 °
Name: EMBANKMENT FILL2, EL. +0.5 TO -6 Model: Spatial Mohr-Coulomb Unit Weight: 101 pcf Cohesion Fn: Fill2 Phi: 0 °
Name: FILL, EL. +0.5 TO -6 (Toe) Model: Spatial Mohr-Coulomb Unit Weight: 101 pcf Cohesion: 400 psf Phi: 0 °
Name: FILL, EL. -6 TO -10/-15 Model: Spatial Mohr-Coulomb Unit Weight: 92 pcf Cohesion Fn: Fill Phi: 0 °
Name: FILL (Hydraulic), EL. -10/-15 TO -18/-19 Model: Spatial Mohr-Coulomb Unit Weight: 82 pcf Cohesion: 400 psf Phi: 0 °
Name: FILL, EL. -6 TO -15 (Toe) Model: Spatial Mohr-Coulomb Unit Weight: 92 pcf Cohesion: 200 psf Phi: 0 °
Name: FILL (Hydraulic), EL. -15 TO -18/-19 (Toe) Model: Spatial Mohr-Coulomb Unit Weight: 82 pcf Cohesion: 400 psf Phi: 0 °

GENERAL NOTES

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

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

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 20
PROTECTED SIDE STABILITY ANALYSIS
CASE: Global Stability (Block)
STA. 92+20 TO 93+46 EAST
ORLEANS PARISH, LOUISIANA

ETL 1110-2-575 ANALYSIS

Name: Global Stability (Block)
File Name: Orleans Canal Reach 20A.gsz Directory: Y:\F&MHOME\Middleton\Outfall Canals\Orleans final edits\final\Appendix A and Appendix B\
Last Edited By: Reves, Ryan D MVK

Global Stability (Block)

File Information

Created By: Liljegren, James
Revision Number: 350
Last Edited By: Reves, Ryan D MVK
Date: 6/11/2013
Time: 3:05:26 PM
File Name: Orleans Canal Reach 20A.gsz
Directory: Y:\F&MHOME\Middleton\Outfall Canals\Orleans final edits\final\Appendix A and Appendix B\
Last Solved Date: 6/11/2013
Last Solved Time: 3:07:06 PM

Project Settings

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

Analysis Settings

Global Stability (Block)

Kind: SLOPE/W
Parent: Gap Analysis (seepage)
Method: Spencer
Settings
PWP Conditions Source: Parent Analysis
Slip Surface
Direction of movement: Left to Right
Use Passive Mode: No
Slip Surface Option: Block
Critical slip surfaces saved: 1
Optimize Critical Slip Surface Location: Yes
Tension Crack
Tension Crack Option: Tension Crack Line
Percentage Wet: 1
Tension Crack Fluid Unit Weight: 62.4 pcf
FOS Distribution
FOS Calculation Option: Constant
Restrict Block Crossing: Yes
Advanced
Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 2000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

EMBANKMENT FILL1, EL. +6.5 TO +0.5

Model: Undrained (Phi=0)
Unit Weight: 111 pcf
Cohesion: 500 psf

BEACH SAND, EL. -33 TO -41

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

BAY SOUND CLAY, EL. -41 TO -70

Model: Spatial Mohr-Coulomb
Unit Weight: 106 pcf
Cohesion Spatial Fn: Bay Sound
Phi: 0 °
Phi-B: 0 °

Lacustrine, EL -18/-19 to -33

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

EMBANKMENT FILL2, EL. +0.5 TO -6

Model: Spatial Mohr-Coulomb
Unit Weight: 101 pcf
Cohesion Fn: Fill2
Phi: 0 °
Phi-B: 0 °

FILL, EL. +0.5 TO -6 (Toe)

Model: Spatial Mohr-Coulomb
Unit Weight: 101 pcf
Cohesion: 400 psf
Phi: 0 °
Phi-B: 0 °

FILL, EL. -6 TO -10/-15

Model: Spatial Mohr-Coulomb
Unit Weight: 92 pcf
Cohesion Fn: Fill
Phi: 0 °
Phi-B: 0 °

FILL (Hydraulic), EL. -10/-15 TO -18/-19

Model: Spatial Mohr-Coulomb
Unit Weight: 82 pcf
Cohesion: 400 psf
Phi: 0 °
Phi-B: 0 °

FILL, EL. -6 TO -15 (Toe)

Model: Spatial Mohr-Coulomb
Unit Weight: 92 pcf
Cohesion: 200 psf
Phi: 0 °
Phi-B: 0 °

FILL (Hydraulic), EL. -15 TO -18/-19 (Toe)

Model: Spatial Mohr-Coulomb
Unit Weight: 82 pcf
Cohesion: 400 psf
Phi: 0 °
Phi-B: 0 °

Slip Surface Limits

Left Coordinate: (97.5, -12.5) ft
Right Coordinate: (310, 0.5) ft

Slip Surface Block

Left Grid
Upper Left: (190, -2) ft
Lower Left: (190, -43) ft
Lower Right: (210, -43) ft
X Increments: 4
Y Increments: 9
Starting Angle: 115 °
Ending Angle: 135 °
Angle Increments: 4
Right Grid
Upper Left: (225, -2) ft
Lower Left: (225, -43) ft
Lower Right: (245, -43) ft
X Increments: 4
Y Increments: 9
Starting Angle: 25 °
Ending Angle: 45 °
Angle Increments: 4

Reinforcements

Reinforcement 1

Type: Pile
Outside Point: (200, 12.9) ft
Inside Point: (200, 3.5) ft
Slip Surface Intersection: (200, -20.775) ft
Total Length: 9.4 ft
Reinforcement Direction: 90 °
Applied Load Option: Variable
F of S Dependent: No
Pile Spacing: 1 ft
Shear Capacity: 0 lbs
Shear Safety Factor: 1
Shear Load Used: 0 lbs
Shear Option: Parallel to Slip
Resisting Force Used: 0 lbs/ft

Tension Crack Line

	X (ft)	Y (ft)
	155	0.5
	170	0.5
	190	1.5
	200	1.5

Cohesion Functions

Fill2

Model: Spline Data Point Function
Function: Cohesion vs. X
  Curve Fit to Data: 100 %
  Segment Curvature: 0 %
Y-Intercept: 400
Data Points: X (ft), Cohesion (psf)
  Data Point: (155.5, 400)
  Data Point: (200, 500)
  Data Point: (227.5, 400)

Fill

Model: Spline Data Point Function
Function: Cohesion vs. X
  Curve Fit to Data: 100 %
  Segment Curvature: 0 %
Y-Intercept: 200
Data Points: X (ft), Cohesion (psf)
  Data Point: (155.5, 200)
  Data Point: (200, 300)
  Data Point: (227.5, 200)

Shear/Normal Strength Functions

Sand

Model: Spline Data Point Function
Function: Shear Stress vs. Normal Stress
  Curve Fit to Data: 100 %
  Segment Curvature: 0 %
Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
  Data Point: (-10000, 0)
  Data Point: (0, 0)
  Data Point: (10000, 6494)
Estimation Properties
  Intact Rock Param.: 10
  Geological Strength: 100
  Disturbance Factor: 0
  SigmaC: 600000 psf
  Sigma3: 300000 psf
  Num. Points: 20

Spatial Functions

Lacustrine

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
  Data Point: (200, -18, 235)
  Data Point: (200, -33, 350)
  Data Point: (227.5, -19, 220)
  Data Point: (227.5, -33, 340)
  Data Point: (310, -19, 220)
  Data Point: (310, -33, 340)
  Data Point: (155.5, -18, 220)
  Data Point: (155.5, -33, 340)
  Data Point: (97.5, -18, 220)
  Data Point: (97.5, -33, 340)

Bay Sound

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
  Data Point: (200, -41, 525)
  Data Point: (200, -70, 810)
  Data Point: (227.5, -41, 500)
  Data Point: (227.5, -70, 770)
  Data Point: (310, -41, 500)
  Data Point: (310, -70, 770)
  Data Point: (155.5, -41, 500)
  Data Point: (155.5, -70, 770)
  Data Point: (97.5, -41, 500)
  Data Point: (97.5, -70, 770)

Regions

	Points	Area (ft²)	Material
Region 1	7,18,19,20	4.8	
Region 2	7,20,8,9,21	102.9	EMBANKMENT FILL1, EL. +6.5 TO +0.5
Region 3	12,11,39,44,35,15,16,45	3091.25	Lacustrine, EL -18/-19 to -33
Region 4	13,12,45,16,17,46	1700	BEACH SAND, EL. -33 TO -41
Region 5	25,13,46,17,26,47	6162.5	BAY SOUND CLAY, EL. -41 TO -70
Region 6	7,27,6,23,24,5,4,29,21	144.9	EMBANKMENT FILL1, EL. +6.5 TO +0.5
Region 7	38,40,31,28,1,42,11,39	428.68444	FILL (Hydraulic), EL. -15 TO -18/-19 (Toe)
Region 8	34,33,32,14	742.5	FILL, EL. -6 TO -15 (Toe)
Region 9	41,36,3,30,37	47.411173	FILL, EL. +0.5 TO -6 (Toe)
Region 10	36,41,29,49	4.9575125	FILL, EL. +0.5 TO -6 (Toe)
Region 11	9,33,32,10	536.25	FILL, EL. +0.5 TO -6 (Toe)
Region 12	35,34,14,15	330	FILL (Hydraulic), EL. -15 TO -18/-19 (Toe)
Region 13	21,22,41,37,48,33,9	379	EMBANKMENT FILL2, EL. +0.5 TO -6
Region 14	40,37,48,33,34,43	356.75	FILL, EL. -6 TO -10/-15
Region 15	39,38,40,43,34,35,44	521	FILL (Hydraulic), EL. -10/-15 TO -18/-19
Region 16	41,29,21,22	89	EMBANKMENT FILL2, EL. +0.5 TO -6
Region 17	31,2,30,37,40	98.734098	FILL, EL. -6 TO -15 (Toe)

Points

	X (ft)	Y (ft)
Point 1	97.5	-12.5
Point 2	128.9	-8.5
Point 3	140.7	-5.5
Point 4	157.9	1.5
Point 5	172.9	2.5
Point 6	187.9	5.5
Point 7	200	6.5
Point 8	206.8	6.5
Point 9	227.5	0.5
Point 10	310	0.5
Point 11	97.5	-18
Point 12	97.5	-33
Point 13	97.5	-41
Point 14	310	-15
Point 15	310	-19
Point 16	310	-33
Point 17	310	-41
Point 18	200	12.9
Point 19	200.5	12.9
Point 20	201	6.5
Point 21	200	0.5
Point 22	200	-1.5
Point 23	182.9	4.5
Point 24	177.9	3.5
Point 25	97.5	-70
Point 26	310	-70
Point 27	195.7	6.5
Point 28	120.7	-10.5
Point 29	155.5	0.5
Point 30	138.71539	-6
Point 31	122.76222	-10
Point 32	310	-6
Point 33	227.5	-6
Point 34	227.5	-15
Point 35	227.5	-19
Point 36	150.54249	-1.5
Point 37	155.5	-6
Point 38	155.5	-14
Point 39	155.5	-18
Point 40	155.5	-10
Point 41	155.5	-1.5
Point 42	97.5	-14
Point 43	200	-10
Point 44	200	-18
Point 45	200	-33
Point 46	200	-41
Point 47	200	-70
Point 48	200	-6
Point 49	154.26062	0

Critical Slip Surfaces

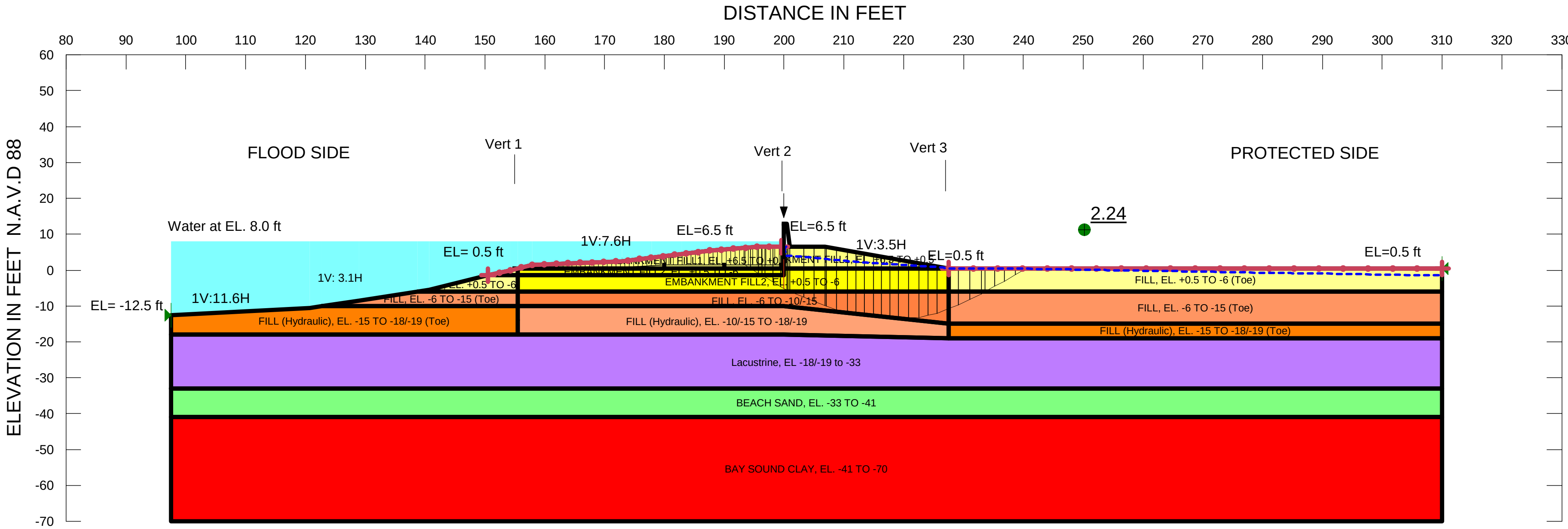
	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	2.18	(223.646, 1.105)	37.92078	(177.327, 3.38551)	(261.474, 0.5)
2	4353	2.28	(223.646, 1.105)	39.573	(179.683, 3.85651)	(267.606, 0.5)

Slices of Slip Surface: Optimized

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	177.53515	0.68318835	373.97995	333.67463	0	500
2	Optimized	177.8214	0.4306436	380.779	432.32379	0	450.16
3	Optimized	178.9548	-0.5693564	408.13149	541.21321	0	452.71
4	Optimized	180.80875	-2.205125	454.55185	719.32827	0	456.87
5	Optimized	182.25395	-3.533223	493.62928	844.82403	0	460.12
6	Optimized	183.856	-5.078098	540.20477	1011.3263	0	463.72
7	Optimized	185.97475	-7.12122	632.00821	1306.239	0	268.48
8	Optimized	187.51875	-8.618836	717.16077	1450.8213	0	271.95
9	Optimized	188.4089	-9.497616	767.09819	1536.0143	0	273.95
10	Optimized	189.836	-10.90643	847.18077	1608.0197	0	400
11	Optimized	192.01635	-13.061185	969.54645	1793.7581	0	400
12	Optimized	194.48925	-15.474205	1106.5361	2008.4315	0	400
13	Optimized	196.40745	-17.31945	1211.523	2164.1979	0	400
14	Optimized	198.55745	-19.387655	1329.62	2423.9811	0	245.17
15	Optimized	200.0397	-20.813505	1411.4175	2552.8397	0	256.54
16	Optimized	200.2897	-20.98947	1421.3898	2560.0092	0	257.71
17	Optimized	200.75	-21.29102	1438.3907	2572.3369	0	259.69
18	Optimized	202.45	-22.40474	1501.3335	2685.0073	0	267.08
19	Optimized	205.35	-24.304615	1609.3256	2877.1376	0	279.94
20	Optimized	207.7887	-25.90228	1700.8662	3007.2691	0	291.02
21	Optimized	210.05255	-27.041355	1765.2816	3106.6132	0	298.78
22	Optimized	212.6029	-28.024045	1820.1277	3127.1759	0	305.28
23	Optimized	215.42875	-28.61496	1850.8794	3167.9576	0	308.61
24	Optimized	218.53005	-28.814095	1857.3471	3092.0497	0	308.68
25	Optimized	221.38285	-28.50791	1833.3523	3050.6747	0	304.67
26	Optimized	223.98715	-27.696405	1778.656	2883.5797	0	296.47
27	Optimized	226.39465	-26.59121	1706.1131	2754.6116	0	285.72
28	Optimized	229.0923	-24.88421	1595.5801	2536.6463	0	270.44
29	Optimized	232.2769	-22.86909	1464.7888	2320.7835	0	253.16
30	Optimized	235.9005	-20.430765	1306.6316	2070.7284	0	232.26
31	Optimized	238.4039	-18.66749	1192.3544	1950.1965	0	400
32	Optimized	239.9528	-17.501235	1116.8836	1869.0728	0	400
33	Optimized	242.10635	-15.833745	1009.0504	1729.8478	0	400
34	Optimized	244.14725	-14.25344	906.86667	1515.8455	0	200
35	Optimized	246.83855	-12.160955	771.54429	1320.4715	0	200
36	Optimized	250.29285	-9.4691	597.42847	1068.329	0	200
37	Optimized	253.25855	-7.061585	441.95464	851.63394	0	200
38	Optimized	255.0981	-5.48491	340.34357	781.35561	0	400
39	Optimized	257.14295	-3.602365	219.33403	605.56659	0	400
40	Optimized	260.03065	-0.867455	43.688291	323.23704	0	400

Slices of Slip Surface: 4353

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	4353	179.9246	0.7420635	360.90964	330.54416	0	500
2	4353	181.1667	-0.5	396.79299	535.98696	0	457.68
3	4353	182.53335	-1.8666665	437.46444	682.35158	0	460.75
4	4353	184.78335	-4.1166665	505.9443	923.31877	0	465.81
5	4353	187.28335	-6.6166665	598.90024	1269.0654	0	271.42
6	4353	189.28335	-8.6166665	712.84022	1461.2317	0	275.92
7	4353	191.925	-11.258335	862.97001	1650.3311	0	400
8	4353	194.44165	-13.775	1005.7868	1866.9306	0	400
9	4353	197.18335	-16.516665	1161.6971	2094.1485	0	400
10	4353	199.33335	-18.666665	1284.6186	2346.4986	0	239.89
11	4353	200.25	-19.58333	1337.1955	2372.7675	0	246.94
12	4353	200.75	-20.08333	1365.9464	2393.8392	0	250.4
13	4353	202.45	-21.78333	1463.9794	2561.4336	0	262.27
14	4353	205.35	-24.68333	1632.1976	2847.2023	0	282.91
15	4353	208.4	-27.73333	1810.5913	3097.128	0	305.18
16	4353	211.5	-29.33333	1901.9333	3378.3333	0	316.38
17	4353	214.5	-29.33333	1896.4333	3284.9	0	314.92
18	4353	217.5	-29.33333	1891.0333	3191.5333	0	313.47
19	4353	220.5	-29.33333	1885.6	3098.1667	0	312.01
20	4353	223.5	-29.33333	1880.2667	3004.7667	0	310.54
21	4353	226.25	-28.45807	1821.434	2974.6037	0	301.72
22	4353	229.0322	-26.50996	1696.1603	2724.9981	0	284.37
23	4353	232.0966	-24.36426	1557.7184	2494.1191	0	265.98
24	4353	235.16095	-22.218555	1418.9825	2263.1331	0	247.59
25	4353	238.2253	-20.07285	1280.006	2032.1739	0	229.2
26	4353	241.18565	-18	1145.5467	1891.5402	0	400
27	4353	244.04195	-16	1015.8037	1724.5434	0	400
28	4353	247.0768	-13.875	877.90341	1470.8795	0	200
29	4353	250.29015	-11.625	731.85809	1260.1093	0	200
30	4353	253.50345	-9.375	585.81278	1049.3645	0	200
31	4353	256.7168	-7.125	439.79295	838.6198	0	200
32	4353	259.87065	-4.9166665	296.54785	686.65042	0	400
33	4353	262.96495	-2.75	156.08074	463.85568	0	400
34	4353	266.05925	-0.5833335	15.603044	241.05035	0	400



Name: EMBANKMENT FILL1, EL. +6.5 TO +0.5 Model: Undrained (Phi=0) Unit Weight: 111 pcf Cohesion: 500 psf
Name: BEACH SAND, EL. -33 TO -41 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand
Name: BAY SOUND CLAY, EL. -41 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 106 pcf Cohesion Spatial Fn: Bay Sound Phi: 0 °
Name: Lacustrine, EL -18/-19 to -33 Model: Spatial Mohr-Coulomb Unit Weight: 103 pcf Cohesion Spatial Fn: Lacustrine Phi: 0 °
Name: EMBANKMENT FILL2, EL. +0.5 TO -6 Model: Spatial Mohr-Coulomb Unit Weight: 101 pcf Cohesion Fn: Fill2 Phi: 0 °
Name: FILL, EL. +0.5 TO -6 (Toe) Model: Spatial Mohr-Coulomb Unit Weight: 101 pcf Cohesion: 400 psf Phi: 0 °
Name: FILL, EL. -6 TO -10/-15 Model: Spatial Mohr-Coulomb Unit Weight: 92 pcf Cohesion Fn: Fill Phi: 0 °
Name: FILL (Hydraulic), EL. -10/-15 TO -18/-19 Model: Spatial Mohr-Coulomb Unit Weight: 82 pcf Cohesion: 400 psf Phi: 0 °
Name: FILL, EL. -6 TO -15 (Toe) Model: Spatial Mohr-Coulomb Unit Weight: 92 pcf Cohesion: 200 psf Phi: 0 °
Name: FILL (Hydraulic), EL. -15 TO -18/-19 (Toe) Model: Spatial Mohr-Coulomb Unit Weight: 82 pcf Cohesion: 400 psf Phi: 0 °

GENERAL NOTES

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

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

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 20
PROTECTED SIDE STABILITY ANALYSIS
CASE: Global Stability (Entry/Exit)
STA. 92+20 TO 93+46 EAST
ORLEANS PARISH, LOUISIANA

ETL 1110-2-575 ANALYSIS

Name: Global Stability (Entry/Exit)
File Name: Orleans Canal Reach 20A.gsz Directory: Y:\F&MHOME\Middleton\Outfall Canals\Orleans final edits\final\Appendix A and Appendix B\
Last Edited By: Reves, Ryan D MVK

Global Stability (Entry/Exit)

File Information

Created By: Liljegren, James
Revision Number: 345
Last Edited By: Reves, Ryan D MVK
Date: 6/11/2013
Time: 2:21:30 PM
File Name: Orleans Canal Reach 20A.gsz
Directory: Y:\F&MHOME\Middleton\Outfall Canals\Orleans final edits\final\Appendix A and Appendix B\
Last Solved Date: 6/11/2013
Last Solved Time: 2:26:38 PM

Project Settings

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

Analysis Settings

Global Stability (Entry/Exit)

Kind: SLOPE/W
Parent: Gap Analysis (seepage)
Method: Spencer
Settings
- PWP Conditions Source: Parent Analysis

Slip Surface
- Direction of movement: Left to Right
- Use Passive Mode: No
- Slip Surface Option: Entry and Exit
- Critical slip surfaces saved: 1
- Optimize Critical Slip Surface Location: Yes
- Tension Crack
  - Tension Crack Option: Tension Crack Line
  - Percentage Wet: 1
  - Tension Crack Fluid Unit Weight: 62.4 pcf

FOS Distribution
- FOS Calculation Option: Constant

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

Materials

EMBANKMENT FILL1, EL. +6.5 TO +0.5

Model: Undrained (Phi=0)
Unit Weight: 111 pcf
Cohesion: 500 psf

BEACH SAND, EL. -33 TO -41

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

BAY SOUND CLAY, EL. -41 TO -70

Model: Spatial Mohr-Coulomb
Unit Weight: 106 pcf
Cohesion Spatial Fn: Bay Sound
Phi: 0 °
Phi-B: 0 °

Lacustrine, EL -18/-19 to -33

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

EMBANKMENT FILL2, EL. +0.5 TO -6

Model: Spatial Mohr-Coulomb
Unit Weight: 101 pcf
Cohesion Fn: Fill2
Phi: 0 °
Phi-B: 0 °

FILL, EL. +0.5 TO -6 (Toe)

Model: Spatial Mohr-Coulomb
Unit Weight: 101 pcf
Cohesion: 400 psf
Phi: 0 °
Phi-B: 0 °

FILL, EL. -6 TO -10/-15

Model: Spatial Mohr-Coulomb
Unit Weight: 92 pcf
Cohesion Fn: Fill
Phi: 0 °
Phi-B: 0 °

FILL (Hydraulic), EL. -10/-15 TO -18/-19

Model: Spatial Mohr-Coulomb
Unit Weight: 82 pcf
Cohesion: 400 psf
Phi: 0 °
Phi-B: 0 °

FILL, EL. -6 TO -15 (Toe)

Model: Spatial Mohr-Coulomb
Unit Weight: 92 pcf
Cohesion: 200 psf
Phi: 0 °
Phi-B: 0 °

FILL (Hydraulic), EL. -15 TO -18/-19 (Toe)

Model: Spatial Mohr-Coulomb
Unit Weight: 82 pcf
Cohesion: 400 psf
Phi: 0 °
Phi-B: 0 °

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (150.54249, -1.5) ft
Left-Zone Right Coordinate: (199.5, 6.5) ft
Left-Zone Increment: 25
Right Projection: Range
Right-Zone Left Coordinate: (227.5, 0.5) ft
Right-Zone Right Coordinate: (310, 0.5) ft
Right-Zone Increment: 20
Radius Increments: 4

Slip Surface Limits

Left Coordinate: (97.5, -12.5) ft
Right Coordinate: (310, 0.5) ft

Reinforcements

Reinforcement 1

Type: Pile
Outside Point: (200, 12.9) ft
Inside Point: (200, 3.5) ft
Slip Surface Intersection: (200, -5.0917) ft
Total Length: 9.4 ft
Reinforcement Direction: 90 °
Applied Load Option: Variable
F of S Dependent: No
Pile Spacing: 1 ft
Shear Capacity: 0 lbs
Shear Safety Factor: 1
Shear Load Used: 0 lbs
Shear Option: Parallel to Slip
Resisting Force Used: 0 lbs/ft

Tension Crack Line

	X (ft)	Y (ft)
	155	0.5
	170	0.5
	180	1.5
	190	1.5
	199.5	1.5

Cohesion Functions

Fill2

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

Y-Intercept: 400

Data Points: X (ft), Cohesion (psf)
- Data Point: (155.5, 400)
- Data Point: (200, 500)
- Data Point: (227.5, 400)

Fill

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

Y-Intercept: 200
Data Points: X (ft), Cohesion (psf)
- Data Point: (155.5, 200)
- Data Point: (200, 300)
- Data Point: (227.5, 200)

Shear/Normal Strength Functions

Sand

Model: Spline Data Point Function
Function: Shear Stress vs. Normal Stress
- Curve Fit to Data: 100 %
- Segment Curvature: 0 %

Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
- Data Point: (-10000, 0)
- Data Point: (0, 0)
- Data Point: (10000, 6494)

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

Spatial Functions

Lacustrine

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
- Data Point: (200, -18, 235)
- Data Point: (200, -33, 350)
- Data Point: (227.5, -19, 220)
- Data Point: (227.5, -33, 340)
- Data Point: (310, -19, 220)
- Data Point: (310, -33, 340)
- Data Point: (155.5, -18, 220)
- Data Point: (155.5, -33, 340)
- Data Point: (97.5, -18, 220)
- Data Point: (97.5, -33, 340)

Bay Sound

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
- Data Point: (200, -41, 525)
- Data Point: (200, -70, 810)
- Data Point: (227.5, -41, 500)
- Data Point: (227.5, -70, 770)
- Data Point: (310, -41, 500)
- Data Point: (310, -70, 770)
- Data Point: (155.5, -41, 500)
- Data Point: (155.5, -70, 770)
- Data Point: (97.5, -41, 500)
- Data Point: (97.5, -70, 770)

Regions

	Points	Area (ft²)	Material
Region 1	7,18,19,20	4.8	
Region 2	7,20,8,9,21	102.9	EMBANKMENT FILL1, EL. +6.5 TO +0.5
Region 3	12,11,39,44,35,15,16,45	3091.25	Lacustrine, EL -18/-19 to -33
Region 4	13,12,45,16,17,46	1700	BEACH SAND, EL. -33 TO -41
Region 5	25,13,46,17,26,47	6162.5	BAY SOUND CLAY, EL. -41 TO -70
Region 6	7,27,6,23,24,5,4,29,21	144.9	EMBANKMENT FILL1, EL. +6.5 TO +0.5
Region 7	38,40,31,28,1,42,11,39	428.68444	FILL (Hydraulic), EL. -15 TO -18/-19 (Toe)
Region 8	34,33,32,14	742.5	FILL, EL. -6 TO -15 (Toe)
Region 9	41,36,3,30,37	47.411173	FILL, EL. +0.5 TO -6 (Toe)
Region 10	36,41,29,49	4.9575125	FILL, EL. +0.5 TO -6 (Toe)
Region 11	9,33,32,10	536.25	FILL, EL. +0.5 TO -6 (Toe)
Region 12	35,34,14,15	330	FILL (Hydraulic), EL. -15 TO -18/-19 (Toe)
Region 13	21,22,41,37,48,33,9	379	EMBANKMENT FILL2, EL. +0.5 TO -6
Region 14	40,37,48,33,34,43	356.75	FILL, EL. -6 TO -10/-15
Region 15	39,38,40,43,34,35,44	521	FILL (Hydraulic), EL. -10/-15 TO -18/-19
Region 16	41,29,21,22	89	EMBANKMENT FILL2, EL. +0.5 TO -6
Region 17	31,2,30,37,40	98.734098	FILL, EL. -6 TO -15 (Toe)

Points

	X (ft)	Y (ft)
Point 1	97.5	-12.5
Point 2	128.9	-8.5
Point 3	140.7	-5.5
Point 4	157.9	1.5
Point 5	172.9	2.5
Point 6	187.9	5.5
Point 7	200	6.5
Point 8	206.8	6.5
Point 9	227.5	0.5
Point 10	310	0.5
Point 11	97.5	-18
Point 12	97.5	-33
Point 13	97.5	-41
Point 14	310	-15
Point 15	310	-19
Point 16	310	-33
Point 17	310	-41
Point 18	200	12.9
Point 19	200.5	12.9
Point 20	201	6.5
Point 21	200	0.5
Point 22	200	-1.5
Point 23	182.9	4.5
Point 24	177.9	3.5
Point 25	97.5	-70
Point 26	310	-70
Point 27	195.7	6.5
Point 28	120.7	-10.5
Point 29	155.5	0.5
Point 30	138.71539	-6
Point 31	122.76222	-10
Point 32	310	-6
Point 33	227.5	-6
Point 34	227.5	-15
Point 35	227.5	-19
Point 36	150.54249	-1.5
Point 37	155.5	-6
Point 38	155.5	-14
Point 39	155.5	-18
Point 40	155.5	-10
Point 41	155.5	-1.5
Point 42	97.5	-14
Point 43	200	-10
Point 44	200	-18
Point 45	200	-33
Point 46	200	-41
Point 47	200	-70
Point 48	200	-6
Point 49	154.26062	0

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	2.24	(216.935, 14.066)	20.5806	(193.437, 6.20986)	(240.528, 0.5)
2	2224	2.35	(216.935, 14.066)	26.651	(193.432, 6.20919)	(239.875, 0.5)

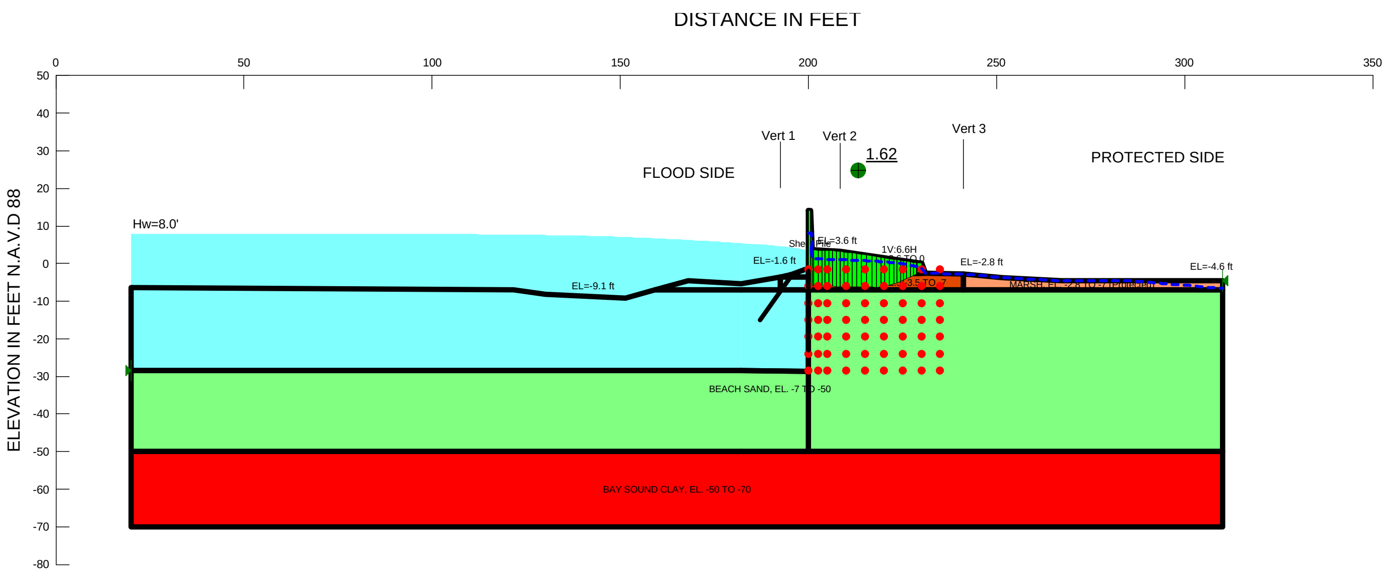
Slices of Slip Surface: Optimized

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	193.92045	1	331.78571	390.79364	0	500
2	Optimized	195.052	-0.17000065	382.99123	578.05949	0	488.88
3	Optimized	196.01915	-1.1700007	427.00172	677.69615	0	491.05
4	Optimized	196.56735	-1.73685	450.74581	731.68803	0	492.29
5	Optimized	197.44965	-2.619705	483.27512	826.96488	0	494.27
6	Optimized	198.75615	-3.911715	509.86099	950.23408	0	497.2
7	Optimized	199.7047	-4.824719	513.7465	1059.5825	0	499.34
8	Optimized	200.25	-5.317762	518.2916	1045.3359	0	499.09
9	Optimized	200.57015	-5.607243	521.15039	1046.128	0	497.93
10	Optimized	200.82015	-5.7969825	523.3421	1118.3531	0	497.02
11	Optimized	202.1586	-6.7369825	564.66428	1261.3037	0	292.15
12	Optimized	204.1879	-8.143494	639.34358	1392.8946	0	284.77
13	Optimized	205.9293	-9.3291215	703.56749	1500.1718	0	278.44
14	Optimized	206.91005	-9.9968525	740.17204	1557.1934	0	274.87
15	Optimized	207.9008	-10.52135	768.31829	1606.9709	0	271.27
16	Optimized	209.66225	-11.42051	816.80905	1633.6687	0	264.86
17	Optimized	211.27225	-12.010455	847.47874	1698.9299	0	259.01
18	Optimized	212.7307	-12.291185	859.93473	1678.327	0	253.71
19	Optimized	214.18915	-12.571915	872.59271	1657.7915	0	248.4
20	Optimized	215.6162	-12.838825	884.74362	1639.0565	0	243.21
21	Optimized	217.0118	-13.09192	896.23563	1617.9055	0	238.14
22	Optimized	218.4074	-13.345015	907.86864	1596.8251	0	233.06
23	Optimized	219.9742	-13.401565	907.10491	1598.9617	0	227.37
24	Optimized	221.71215	-13.261575	893.79887	1529.5638	0	221.05
25	Optimized	223.341	-12.9057	867.58117	1493.9418	0	215.12
26	Optimized	224.86085	-12.33394	828.29123	1389.4354	0	209.6
27	Optimized	226.5604	-11.416815	767.16424	1292.9774	0	203.42
28	Optimized	228.3064	-10.24383	689.99025	1149.0402	0	200
29	Optimized	230.06885	-8.9350525	604.2858	1043.4475	0	200
30	Optimized	231.981	-7.4009775	504.22417	896.55715	0	200
31	Optimized	233.28695	-6.31697	433.60438	806.67848	0	200
32	Optimized	234.446	-5.266835	364.89318	787.95827	0	400
33	Optimized	236.0644	-3.800505	269.25571	633.00413	0	400
34	Optimized	237.78715	-2.175505	164.35963	476.10562	0	400
35	Optimized	239.6143	-0.391835	49.99951	286.94009	0	400

Slices of Slip Surface: 2224

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	2224	193.713	1	330.80042	210.45311	0	500
2	2224	194.6479	-0.5	390.70848	510.57329	0	487.97
3	2224	195.50075	-1.769709	438.81433	673.96692	0	489.89
4	2224	196.62365	-3.130383	484.72613	844.1608	0	492.41
5	2224	198.471	-5.110674	523.54776	1086.1296	0	496.56
6	2224	199.69735	-6.256705	547.22151	1289.1215	0	299.32
7	2224	200.25	-6.714138	571.71998	1275.3441	0	299.09
8	2224	200.75	-7.105975	592.54099	1289.6966	0	297.27
9	2224	201.725	-7.801351	629.46921	1364.9823	0	293.73
10	2224	203.175	-8.7429775	679.45783	1467.2179	0	288.45
11	2224	204.625	-9.5581075	722.49174	1556.6018	0	283.18
12	2224	206.075	-10.259539	759.16349	1634.6418	0	277.91
13	2224	207.59615	-10.881225	791.25473	1679.968	0	272.38
14	2224	209.18845	-11.42122	818.45953	1692.2602	0	266.59
15	2224	210.78075	-11.852225	839.3744	1693.658	0	260.8
16	2224	212.37305	-12.179635	854.23706	1684.7144	0	255.01
17	2224	213.96535	-12.407305	863.20096	1665.9885	0	249.22
18	2224	215.55765	-12.53781	866.38623	1637.692	0	243.43
19	2224	217.15	-12.57258	863.8122	1600.0151	0	237.64
20	2224	218.74235	-12.511995	855.58395	1553.0838	0	231.85
21	2224	220.33465	-12.3554	841.51543	1496.851	0	226.06
22	2224	221.92695	-12.101055	821.45404	1431.1289	0	220.27
23	2224	223.51925	-11.746065	795.28997	1355.7476	0	214.48
24	2224	225.11155	-11.286185	762.66526	1270.2919	0	208.69
25	2224	226.70385	-10.715545	723.19735	1174.1878	0	202.9
26	2224	228.19745	-10.076314	679.81027	1097.5454	0	200
27	2224	229.5924	-9.37431	632.74611	1041.4354	0	200
28	2224	230.98735	-8.5645875	579.07491	975.71166	0	200
29	2224	232.38225	-7.6350145	517.93406	899.4624	0	200
30	2224	233.77715	-6.569268	448.31715	811.2395	0	200
31	2224	235.3747	-5.1356405	354.80305	772.78477	0	400
32	2224	237.17485	-3.2172345	230.67769	613.83222	0	400
33	2224	238.97495	-0.831594	78.497434	421.09193	0	400

APPENDIX B GAP STABILITY ANALYSIS



Name: EMBANKMENT FILL, EL. +3.6 TO 0   Model: Undrained (Phi=0)   Unit Weight: 110 pcf   Cohesion: 580 psf
Name: FILL2, EL.0 TO -2.5/-3.5   Model: Undrained (Phi=0)   Unit Weight: 94 pcf   Cohesion: 400 psf
Name: BEACH SAND, EL. -7 TO -50   Model: Shear/Normal Fn.   Unit Weight: 122 pcf   Strength Function: Sand
Name: BAY SOUND CLAY, EL. -50 TO -70   Model: Spatial Mohr-Coulomb   Unit Weight: 102 pcf   Cohesion Spatial Fn: Bay Sound   Phi: 0 °
Name: Sheet Pile   Model: Undrained (Phi=0)   Unit Weight: 0.1 pcf   Cohesion: 0.01 psf
Name: MARSH, EL. -2.5/-3.5 TO -7   Model: Spatial Mohr-Coulomb   Weight Fn: Marsh   Cohesion Spatial Fn: Marsh   Phi: 0 °
Name: MARSH, EL. -2.8 TO -7 (Protected)   Model: Spatial Mohr-Coulomb   Unit Weight: 100 pcf   Cohesion Fn: Marsh   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
VERTICALSWERE ASSUMED TO VARY LINEARLY
BETWEENTHE VALUES INDICATED FOR THESE LOCATIONS.

GENERAL NOTES

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 1A,
PROTECTED SIDE STABILITY ANALYSIS,
CASE: GAP P/S Stability Analysis Block
STA. 2+45 TO 7+00 WEST
ORLEANS PARISH, LOUISIANA

Name: GAP P/S Stability Analysis Block
File Name: Orleans Canal Reach 1A.gsz   Directory: Y:\F&MHOME\Middleton\Outfall Canals\Orleans final edits\final\Appendix A and Appendix B\
Last Edited By: Hendrix, Joshua M MVR

GAP P/S Stability Analysis Block

File Information

- Created By: Liljegren, James
- Revision Number: 583
- Last Edited By: Hendrix, Joshua M MVR
- Date: 6/10/2013
- Time: 10:35:24 AM
- File Name: Orleans Canal Reach 1A.gsz
- Directory: Y:\F&MHOME\Middleton\Outfall Canals\Orleans final edits\final\Appendix A and Appendix B\
- Last Solved Date: 6/10/2013
- Last Solved Time: 10:36:36 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 P/S Stability Analysis Block

- Kind: SLOPE/W
- Parent: 1 - Global Stability Analysis 8ft
- 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: 16
  - Complete Passes per Insertion: 1
  - Driving Side Maximum Convex Angle: 5 °
  - Resisting Side Maximum Convex Angle: 1 °

Materials

EMBANKMENT FILL, EL. +3.6 TO 0

- Model: Undrained (Phi=0)
- Unit Weight: 110 pcf
- Cohesion: 580 psf

FILL2, EL.0 TO -2.5/-3.5

- Model: Undrained (Phi=0)
- Unit Weight: 94 pcf
- Cohesion: 400 psf

BEACH SAND, EL. -7 TO -50

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

BAY SOUND CLAY, EL. -50 TO -70

- Model: Spatial Mohr-Coulomb
- Unit Weight: 102 pcf
- Cohesion Spatial Fn: Bay Sound
- Phi: 0 °
- Phi-B: 0 °

Sheet Pile

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

MARSH, EL. -2.5/-3.5 TO -7

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

MARSH, EL. -2.8 TO -7 (Protected)

- Model: Spatial Mohr-Coulomb
- Unit Weight: 100 pcf
- Cohesion Fn: Marsh
- Phi: 0 °
- Phi-B: 0 °

Slip Surface Limits

- Left Coordinate: (20, -28.5) ft
- Right Coordinate: (310, -4.6) ft

Slip Surface Block

- Left Grid
  - Upper Left: (200, -1.5) ft
  - Lower Left: (200, -28.5) ft
  - Lower Right: (205, -28.5) ft
  - X Increments: 2
  - Y Increments: 6
  - Starting Angle: 115 °
  - Ending Angle: 135 °
  - Angle Increments: 2
- Right Grid
  - Upper Left: (210, -1.5) ft
  - Lower Left: (210, -28.5) ft
  - Lower Right: (235, -28.5) ft
  - X Increments: 5
  - Y Increments: 6
  - Starting Angle: 0 °
  - Ending Angle: 45 °
  - Angle Increments: 2

Cohesion Functions

Marsh

- Model: Spline Data Point Function
- Function: Cohesion vs. Y
  - Curve Fit to Data: 100 %
  - Segment Curvature: 0 %
- Y-Intercept: 150
- Data Points: Y (ft), Cohesion (psf)
  - Data Point: (-7, 180)
  - Data Point: (-2.8, 150)

Shear/Normal Strength Functions

Sand

- Model: Spline Data Point Function
- Function: Shear Stress vs. Normal Stress
  - Curve Fit to Data: 100 %
  - Segment Curvature: 0 %
- Y-Intercept: 0
- Data Points: Normal Stress (psf), Shear Stress (psf)
  - Data Point: (-10000, 0)
  - Data Point: (0, 0)
  - Data Point: (10000, 6494)
- Estimation Properties
  - Intact Rock Param.: 10
  - Geological Strength: 100
  - Disturbance Factor: 0
  - SigmaC: 600000 psf
  - Sigma3: 300000 psf
  - Num. Points: 20

Unit Weight Functions

Marsh

- Model: Spline Data Point Function
- Function: Unit Weight vs. X
  - Curve Fit to Data: 100 %
  - Segment Curvature: 0 %
- Y-Intercept: 100
- Data Points: X (ft), Unit Weight (pcf)
  - Data Point: (192.5, 100)
  - Data Point: (208.3, 94)
  - Data Point: (241.1, 100)

Spatial Functions

Marsh

- Model: Linear Interpolation
- Limit Range By: Data Values
- Data Points: X (ft), Y (ft), Cohesion (psf)

Data Point: (192.53, -3.5, 150)
Data Point: (192.53, -7, 180)
Data Point: (200, -3.5, 160)
Data Point: (200, -7, 190)
Data Point: (241.1, -2.8, 150)
Data Point: (241.1, -7, 180)

Bay Sound

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (120, -50, 600)
Data Point: (120, -70, 770)
Data Point: (192.53, -50, 600)
Data Point: (192.53, -70, 770)
Data Point: (200, -50, 750)
Data Point: (200, -70, 925)
Data Point: (241.1, -50, 600)
Data Point: (241.1, -70, 770)
Data Point: (310, -50, 600)
Data Point: (310, -70, 770)

Regions

	Material	Points	Area (ft^2)
Region 1	EMBANKMENT FILL, EL. +3.6 TO 0	21,4,5,26	60.99
Region 2	MARSH, EL. -2.5/-3.5 TO -7	6,7,29,46,18,27	167.935
Region 3		18,47,23,19,20,36,33,32,37,38,40,42,16,31	3858.445
Region 4	BEACH SAND, EL. -7 TO -50	20,36,34,15,28,43,12,11,29,46,18,47,23,19	8599.1
Region 5	BAY SOUND CLAY, EL. -50 TO -70	15,34,35,14,30,44,13,12,43,28	5800
Region 6	Sheet Pile	17,22,21,26,25,3	13.075
Region 7	FILL2, EL.0 TO -2.5/-3.5	27,3,25,26,5,6	90.15
Region 8		16,42,41,1,39,31	66.5965
Region 9	MARSH, EL. -2.8 TO -7 (Protected)	29,7,8,9,10,11	186.6
Region 10		31,39,27,18	26.145
Region 11		2,24,3,27,39	6.9625

Points

	X (ft)	Y (ft)
Point 1	182	-5.4
Point 2	195.3	-3
Point 3	200	-1.6
Point 4	208.3	3.3
Point 5	230	0
Point 6	231	-2.5
Point 7	241.1	-2.8
Point 8	251.6	-3.7
Point 9	267.3	-4.6
Point 10	310	-4.6
Point 11	310	-7
Point 12	310	-50
Point 13	310	-70
Point 14	182	-70
Point 15	182	-50
Point 16	182	-7
Point 17	200	14.1
Point 18	200	-7
Point 19	200	-28.6
Point 20	182	-28.5
Point 21	201	3.6
Point 22	200.5	14.1
Point 23	200	-23.5
Point 24	199.1	-1.6
Point 25	201	-1.6
Point 26	201	0
Point 27	200	-3.5
Point 28	200	-50
Point 29	241.1	-7
Point 30	200	-70
Point 31	192.53	-7
Point 32	20	-6.4
Point 33	20	-7
Point 34	20	-50
Point 35	20	-70
Point 36	20	-28.5
Point 37	121.6	-6.9
Point 38	130	-8.2
Point 39	192.53	-3.5
Point 40	151.4	-9.1
Point 41	168.1	-4.5
Point 42	159.1	-7
Point 43	241.1	-50
Point 44	241.1	-70
Point 45	199	0
Point 46	201.6	-7
Point 47	200	-21.3

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.62	(214.451, 0.607)	12.61585	(200, 14.1)	(230.497, -1.2427)
2	192	1.93	(214.451, 0.607)	12.868	(200, 14.1)	(230.286, -0.714286)

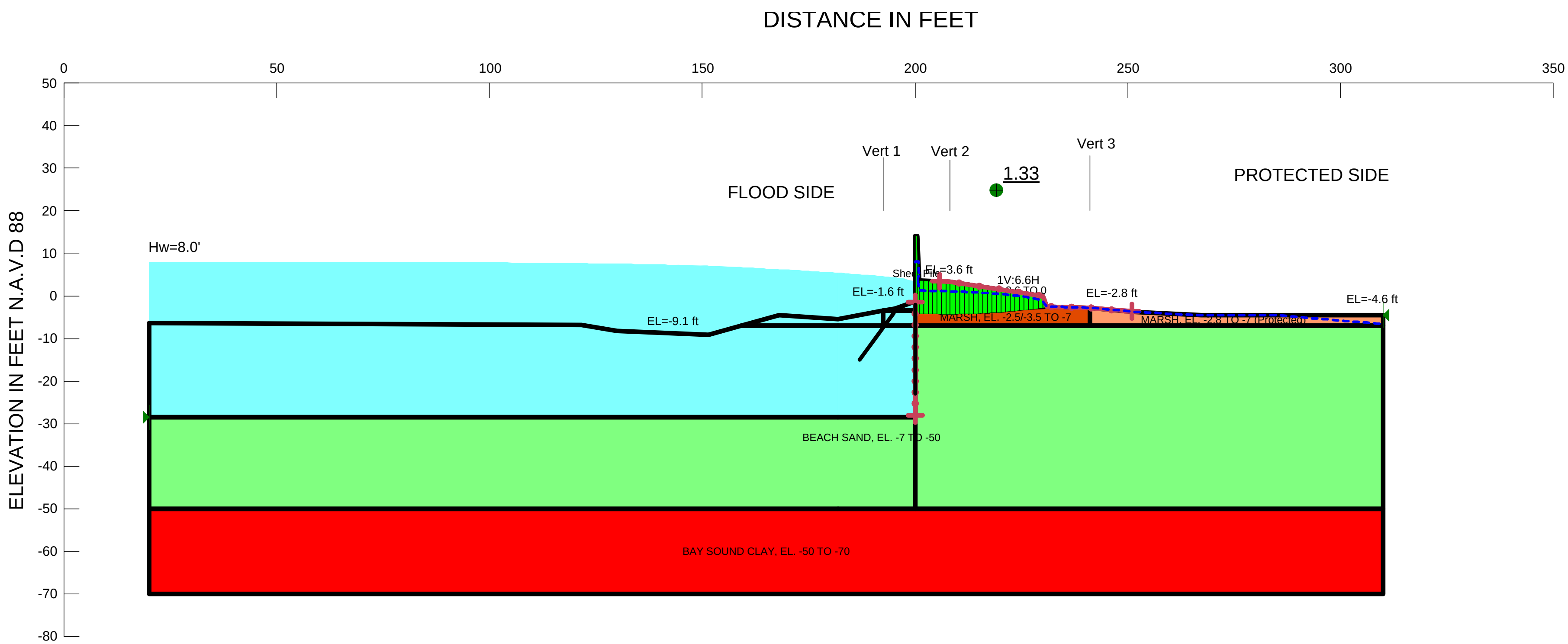
Slices of Slip Surface: Optimized

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	200.25	-5.996889	522.34412	-1575.6121	0	181.35
2	Optimized	200.75	-5.992993	451.66627	440.96659	0	181.22
3	Optimized	201.214	-5.9893775	451.2947	985.29718	0	181.09
4	Optimized	201.96075	-5.99194	451.0363	977.1718	0	180.96
5	Optimized	203.02625	-6.0004	450.8486	972.19772	0	180.82
6	Optimized	204.0123	-6.0122585	450.59521	965.55013	0	180.72
7	Optimized	204.91895	-6.027515	450.54007	962.03218	0	180.66
8	Optimized	205.8256	-6.0427715	450.25334	958.49217	0	180.6
9	Optimized	206.7842	-6.062729	449.99387	953.05272	0	180.57
10	Optimized	207.79475	-6.0873865	449.74655	949.75842	0	180.57
11	Optimized	208.3339	-6.1005425	449.52704	947.62411	0	180.56
12	Optimized	208.8956	-6.1121785	449.06774	940.69229	0	180.54
13	Optimized	209.95115	-6.133795	448.08267	925.68896	0	180.5
14	Optimized	211.00665	-6.1554115	446.85134	910.70456	0	180.45
15	Optimized	212.1524	-6.15994	444.07083	900.58529	0	180.24
16	Optimized	213.38835	-6.14738	439.77462	879.38743	0	179.88
17	Optimized	214.7493	-6.145515	435.41254	853.15367	0	179.58
18	Optimized	216.11335	-6.190685	433.72259	820.82113	0	179.65
19	Optimized	217.4029	-6.25312	433.12429	814.26199	0	179.86
20	Optimized	218.6099	-6.19532	424.97862	833.88218	0	179.15
21	Optimized	219.68685	-6.03636	410.71315	800.21642	0	177.67
22	Optimized	220.8331	-5.8166325	391.89485	779.47708	0	175.72
23	Optimized	222.0487	-5.5361375	368.38388	730.37901	0	173.3
24	Optimized	223.09355	-5.2332185	343.66372	714.60183	0	170.77
25	Optimized	223.9677	-4.907875	317.75091	665.02763	0	168.11
26	Optimized	224.8419	-4.5825315	290.32643	615.34622	0	165.47
27	Optimized	225.70935	-4.2188	259.3956	581.4798	0	162.56
28	Optimized	226.57015	-3.81668	224.57797	522.49611	0	159.37
29	Optimized	227.4051	-3.39038	185.61008	478.23644	0	156.03
30	Optimized	228.21415	-2.9399	142.81436	413.42194	0	152.54

31	Optimized	228.7104	-2.642779	111.49644	411.41746	0	150.25
32	Optimized	229.40105	-2.1015645	64.266959	507.46998	0	400
33	Optimized	230.24855	-1.437468	-5.7961504	357.2002	0	400

Slices of Slip Surface: 192

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	192	200.25	-6	522.54	-1348.16	0	181.38
2	192	200.75	-6	452.12	435.62	0	181.28
3	192	201.52145	-6	451.84527	977.89054	0	181.12
4	192	202.5643	-6	451.13568	972.23301	0	180.91
5	192	203.60715	-6	450.2439	966.57547	0	180.7
6	192	204.65	-6	449.16034	960.82205	0	180.49
7	192	205.69285	-6	447.75075	955.09739	0	180.27
8	192	206.7357	-6	446.12061	949.32479	0	180.06
9	192	207.77855	-6	444.26033	943.52342	0	179.85
10	192	208.7912	-6	442.20361	932.63836	0	179.64
11	192	209.77355	-6	440.08625	916.69704	0	179.44
12	192	210.7559	-6	437.65331	900.77609	0	179.24
13	192	211.73825	-6	435.12876	884.85513	0	179.04
14	192	212.7206	-6	432.3599	868.95453	0	178.83
15	192	213.70295	-6	429.49942	853.05393	0	178.63
16	192	214.6853	-6	426.42517	837.17369	0	178.43
17	192	215.66765	-6	423.18804	821.30363	0	178.22
18	192	216.65	-6	419.84912	805.44375	0	178.02
19	192	217.63235	-6	416.27607	789.59405	0	177.82
20	192	218.6147	-6	412.57068	773.75452	0	177.61
21	192	219.59705	-6	408.75331	757.93536	0	177.41
22	192	220.5794	-6	404.67127	742.1162	0	177.2
23	192	221.56175	-6	400.44672	726.3174	0	177
24	192	222.5441	-6	395.99822	710.51859	0	176.79
25	192	223.52645	-6	391.17307	694.74015	0	176.58
26	192	224.5088	-6	386.05271	678.97188	0	176.38
27	192	225.56945	-5.4305555	341.10834	814.27663	0	171.81
28	192	226.70835	-4.2916665	254.24802	656.76082	0	162.96
29	192	227.84725	-3.1527775	163.73076	498.78557	0	154.18
30	192	228.8125	-2.1875	80.354703	542.42372	0	400
31	192	229.60415	-1.3958335	23.091571	439.78756	0	400
32	192	230.14285	-0.85714285	-26.28316	333.43975	0	400



Name: EMBANKMENT FILL, EL. +3.6 TO 0   Model: Undrained (Phi=0)   Unit Weight: 110 pcf   Cohesion: 580 psf
Name: FILL2, EL.0 TO -2.5/-3.5   Model: Undrained (Phi=0)   Unit Weight: 94 pcf   Cohesion: 400 psf
Name: BEACH SAND, EL. -7 TO -50   Model: Shear/Normal Fn.   Unit Weight: 122 pcf   Strength Function: Sand
Name: BAY SOUND CLAY, EL. -50 TO -70   Model: Spatial Mohr-Coulomb   Unit Weight: 102 pcf   Cohesion Spatial Fn: Bay Sound   Phi: 0 °
Name: Sheet Pile   Model: Undrained (Phi=0)   Unit Weight: 0.1 pcf   Cohesion: 0.01 psf
Name: MARSH, EL. -2.5/-3.5 TO -7   Model: Spatial Mohr-Coulomb   Weight Fn: Marsh   Cohesion Spatial Fn: Marsh   Phi: 0 °
Name: MARSH, EL. -2.8 TO -7 (Protected)   Model: Spatial Mohr-Coulomb   Unit Weight: 100 pcf   Cohesion Fn: Marsh   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 VERTICALSWERE ASSUMED TO VARY LINEARLY BETWEENTHE VALUES INDICATED FOR THESE LOCATIONS.

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HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 1A,
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CASE: GAP P/S Stability Analysis Entry Exit
STA. 2+45 TO 7+00 WEST
ORLEANS PARISH, LOUISIANA

Name: GAP P/S Stability Analysis Entry Exit
File Name: Orleans Canal Reach 1A.gsz Directory: Y:\F&MHOME\Middleton\Outfall Canals\Orleans final edits\final\Appendix A and Appendix B\
Last Edited By: Hendrix, Joshua M MVR

GAP P/S Stability Analysis Entry Exit

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Created By: Liljegren, James
Revision Number: 583
Last Edited By: Hendrix, Joshua M MVR
Date: 6/10/2013
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File Name: Orleans Canal Reach 1A.gsz
Directory: Y:\F&MHOME\Middleton\Outfall Canals\Orleans final edits\final\Appendix A and Appendix B\
Last Solved Date: 6/10/2013
Last Solved Time: 10:38:10 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 P/S Stability Analysis Entry Exit

Kind: SLOPE/W
Parent: 1 - Global Stability Analysis 8ft
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: 4000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

EMBANKMENT FILL, EL. +3.6 TO 0

Model: Undrained (Phi=0)
Unit Weight: 110 pcf
Cohesion: 580 psf

FILL2, EL.0 TO -2.5/-3.5

Model: Undrained (Phi=0)
Unit Weight: 94 pcf
Cohesion: 400 psf

BEACH SAND, EL. -7 TO -50

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

BAY SOUND CLAY, EL. -50 TO -70

Model: Spatial Mohr-Coulomb
Unit Weight: 102 pcf
Cohesion Spatial Fn: Bay Sound
Phi: 0 °
Phi-B: 0 °

Sheet Pile

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

MARSH, EL. -2.5/-3.5 TO -7

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

MARSH, EL. -2.8 TO -7 (Protected)

Model: Spatial Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion Fn: Marsh
Phi: 0 °
Phi-B: 0 °

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (200, -28) ft
Left-Zone Right Coordinate: (200, -1.5) ft
Left-Zone Increment: 10
Right Projection: Range
Right-Zone Left Coordinate: (205.75135, 3.40474) ft
Right-Zone Right Coordinate: (250.9, -3.64) ft
Right-Zone Increment: 10
Radius Increments: 10

Slip Surface Limits

Left Coordinate: (20, -28.5) ft
Right Coordinate: (310, -4.6) ft

Cohesion Functions

Marsh

Model: Spline Data Point Function
Function: Cohesion vs. Y
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 150
Data Points: Y (ft), Cohesion (psf)
Data Point: (-7, 180)
Data Point: (-2.8, 150)

Shear/Normal Strength Functions

Sand

Model: Spline Data Point Function
Function: Shear Stress vs. Normal Stress
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
Data Point: (-10000, 0)
Data Point: (0, 0)
Data Point: (10000, 6494)
Estimation Properties
Intact Rock Param.: 10
Geological Strength: 100
Disturbance Factor: 0
SigmaC: 600000 psf
Sigma3: 300000 psf
Num. Points: 20

Unit Weight Functions

Marsh

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 100
Data Points: X (ft), Unit Weight (pcf)
Data Point: (192.5, 100)
Data Point: (208.3, 94)
Data Point: (241.1, 100)

Spatial Functions

Marsh

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (192.53, -3.5, 150)
Data Point: (192.53, -7, 180)
Data Point: (200, -3.5, 160)
Data Point: (200, -7, 190)
Data Point: (241.1, -2.8, 150)
Data Point: (241.1, -7, 180)

Bay Sound

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)

Data Point: (120, -50, 600)
Data Point: (120, -70, 770)
Data Point: (192.53, -50, 600)
Data Point: (192.53, -70, 770)
Data Point: (200, -50, 750)
Data Point: (200, -70, 925)
Data Point: (241.1, -50, 600)
Data Point: (241.1, -70, 770)
Data Point: (310, -50, 600)
Data Point: (310, -70, 770)

Regions

	Material	Points	Area (ft²)
Region 1	EMBANKMENT FILL, EL. +3.6 TO 0	21,4,5,26	60.99
Region 2	MARSH, EL. -2.5/-3.5 TO -7	6,7,29,46,18,27	167.935
Region 3		18,47,23,19,20,36,33,32,37,38,40,42,16,31	3858.445
Region 4	BEACH SAND, EL. -7 TO -50	20,36,34,15,28,43,12,11,29,46,18,47,23,19	8599.1
Region 5	BAY SOUND CLAY, EL. -50 TO -70	15,34,35,14,30,44,13,12,43,28	5800
Region 6	Sheet Pile	17,22,21,26,25,3	13.075
Region 7	FILL2, EL.0 TO -2.5/-3.5	27,3,25,26,5,6	90.15
Region 8		16,42,41,1,39,31	66.5965
Region 9	MARSH, EL. -2.8 TO -7 (Protected)	29,7,8,9,10,11	186.6
Region 10		31,39,27,18	26.145
Region 11		2,24,3,27,39	6.9625

Points

	X (ft)	Y (ft)
Point 1	182	-5.4
Point 2	195.3	-3
Point 3	200	-1.6
Point 4	208.3	3.3
Point 5	230	0
Point 6	231	-2.5
Point 7	241.1	-2.8
Point 8	251.6	-3.7
Point 9	267.3	-4.6
Point 10	310	-4.6
Point 11	310	-7
Point 12	310	-50
Point 13	310	-70
Point 14	182	-70
Point 15	182	-50
Point 16	182	-7
Point 17	200	14.1
Point 18	200	-7
Point 19	200	-28.6
Point 20	182	-28.5
Point 21	201	3.6
Point 22	200.5	14.1
Point 23	200	-23.5
Point 24	199.1	-1.6
Point 25	201	-1.6
Point 26	201	0
Point 27	200	-3.5
Point 28	200	-50
Point 29	241.1	-7
Point 30	200	-70
Point 31	192.53	-7
Point 32	20	-6.4
Point 33	20	-7
Point 34	20	-50
Point 35	20	-70
Point 36	20	-28.5
Point 37	121.6	-6.9
Point 38	130	-8.2
Point 39	192.53	-3.5
Point 40	151.4	-9.1
Point 41	168.1	-4.5
Point 42	159.1	-7
Point 43	241.1	-50
Point 44	241.1	-70
Point 45	199	0
Point 46	201.6	-7
Point 47	200	-21.3

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.33	(207.556, 165.003)	169.3216	(200, 14.1)	(232.087, -2.53227)
2	1156	1.33	(207.556, 165.003)	169.322	(200, 14.1)	(232.087, -2.53227)

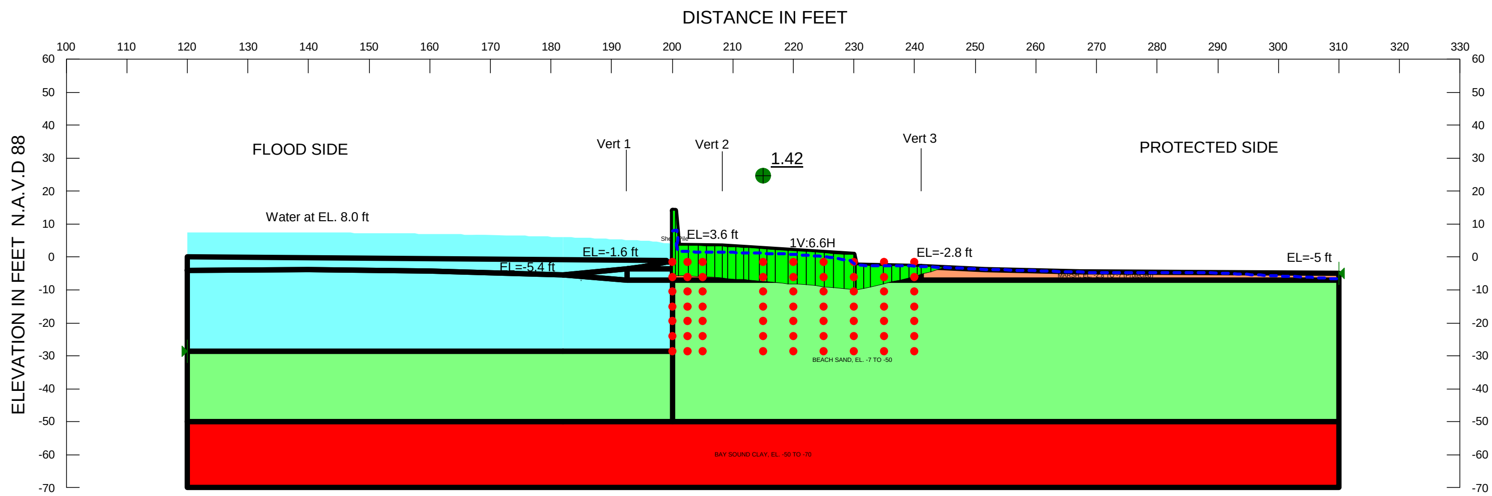
Slices of Slip Surface: Optimized

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	200.25	-4.160797	407.81983	-2011.1252	0	165.63
2	Optimized	200.75	-4.181651	338.62612	269.0424	0	165.75
3	Optimized	201.52145	-4.2103025	339.87849	810.72715	0	165.89
4	Optimized	202.5643	-4.2442755	341.09676	811.09084	0	166.05
5	Optimized	203.60715	-4.2718175	341.76588	810.78205	0	166.14
6	Optimized	204.65	-4.292931	341.87559	809.80929	0	166.18
7	Optimized	205.69285	-4.307618	341.34929	808.16362	0	166.16
8	Optimized	206.7357	-4.315881	340.17695	805.86344	0	166.08
9	Optimized	207.77855	-4.317721	338.39698	802.89934	0	165.95
10	Optimized	208.8425	-4.3129125	335.94432	792.899	0	165.77
11	Optimized	209.9275	-4.30119	332.78776	775.83204	0	165.52
12	Optimized	211.0125	-4.282513	328.91766	758.04487	0	165.21
13	Optimized	212.0975	-4.256879	324.43608	739.53073	0	164.85
14	Optimized	213.1825	-4.2242845	319.31651	720.2745	0	164.43
15	Optimized	214.2675	-4.184726	313.47705	700.27895	0	163.96
16	Optimized	215.3525	-4.138198	307.02885	679.52736	0	163.44
17	Optimized	216.4375	-4.084695	299.94588	658.01439	0	162.86
18	Optimized	217.5225	-4.0242105	292.11922	635.73423	0	162.23
19	Optimized	218.6075	-3.956737	283.58743	612.66289	0	161.55
20	Optimized	219.6925	-3.882266	274.33402	588.80417	0	160.82
21	Optimized	220.7775	-3.8007885	264.28735	564.15237	0	160.04
22	Optimized	221.8625	-3.712294	253.14677	538.68421	0	159.21
23	Optimized	222.9475	-3.6167715	240.86035	512.39501	0	158.33
24	Optimized	224.0325	-3.5142095	227.24813	485.28033	0	157.4
25	Optimized	225.1175	-3.4045945	212.0209	457.32677	0	156.43
26	Optimized	226.2025	-3.287913	194.02001	428.52039	0	155.4
27	Optimized	227.2875	-3.1641505	172.3202	398.84918	0	154.34
28	Optimized	228.3725	-3.033291	145.5967	368.30898	0	153.22
29	Optimized	229.4575	-2.895318	112.19238	336.87872	0	152.06
30	Optimized	230.5	-2.7561665	51.414384	192.85472	0	150.9
31	Optimized	231.5433	-2.6100285	9.8316718	55.366925	0	150

Slices of Slip Surface: 1156

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	1156	200.25	-4.160797	407.81983	-2011.1252	0	165.63

2	1156	200.75	-4.181651	338.62612	269.0424	0	165.75
3	1156	201.52145	-4.2103025	339.87849	810.72715	0	165.89
4	1156	202.5643	-4.2442755	341.09676	811.09084	0	166.05
5	1156	203.60715	-4.2718175	341.76588	810.78205	0	166.14
6	1156	204.65	-4.292931	341.87559	809.80929	0	166.18
7	1156	205.69285	-4.307618	341.34929	808.16362	0	166.16
8	1156	206.7357	-4.315881	340.17695	805.86344	0	166.08
9	1156	207.77855	-4.317721	338.39698	802.89934	0	165.95
10	1156	208.8425	-4.3129125	335.94432	792.899	0	165.77
11	1156	209.9275	-4.30119	332.78776	775.83204	0	165.52
12	1156	211.0125	-4.282513	328.91766	758.04487	0	165.21
13	1156	212.0975	-4.256879	324.43608	739.53073	0	164.85
14	1156	213.1825	-4.2242845	319.31651	720.2745	0	164.43
15	1156	214.2675	-4.184726	313.47705	700.27895	0	163.96
16	1156	215.3525	-4.138198	307.02885	679.52736	0	163.44
17	1156	216.4375	-4.084695	299.94588	658.01439	0	162.86
18	1156	217.5225	-4.0242105	292.11922	635.73423	0	162.23
19	1156	218.6075	-3.956737	283.58743	612.66289	0	161.55
20	1156	219.6925	-3.882266	274.33402	588.80417	0	160.82
21	1156	220.7775	-3.8007885	264.28735	564.15237	0	160.04
22	1156	221.8625	-3.712294	253.14677	538.68421	0	159.21
23	1156	222.9475	-3.6167715	240.86035	512.39501	0	158.33
24	1156	224.0325	-3.5142095	227.24813	485.28033	0	157.4
25	1156	225.1175	-3.4045945	212.0209	457.32677	0	156.43
26	1156	226.2025	-3.287913	194.02001	428.52039	0	155.4
27	1156	227.2875	-3.1641505	172.3202	398.84918	0	154.34
28	1156	228.3725	-3.033291	145.5967	368.30898	0	153.22
29	1156	229.4575	-2.895318	112.19238	336.87872	0	152.06
30	1156	230.5	-2.7561665	51.414384	192.85472	0	150.9
31	1156	231.5433	-2.6100285	9.8316718	55.366925	0	150



Name: EMBANKMENT FILL, EL. +3.6 TO 0 Model: Undrained (Phi=0) Unit Weight: 110 pcf Cohesion: 580 psf
Name: FILL2, EL.0 TO -2.5/-3.5 Model: Undrained (Phi=0) Unit Weight: 94 pcf Cohesion: 400 psf
Name: BEACH SAND, EL. -7 TO -50 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand
Name: BAY SOUND CLAY, EL. -50 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 102 pcf Cohesion Spatial Fn: Bay Sound Phi: 0 °
Name: Sheet Pile Model: Undrained (Phi=0) Unit Weight: 0.1 pcf Cohesion: 0.01 psf
Name: MARSH, EL. -2.8/-3.5 TO -7 Model: Spatial Mohr-Coulomb Weight Fn: Marsh Cohesion Spatial Fn: Marsh Phi: 0 °
Name: MARSH, EL. -2.8 TO -7 (Protected) Model: Spatial Mohr-Coulomb Unit Weight: 100 pcf Cohesion Fn: Marsh 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.

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 1B,
PROTECTED SIDE STABILITY ANALYSIS
CASE: GAP Stability (Block) 01
STA. 7+00 TO 9+25 WEST
ORLEANS PARISH, LOUISIANA

ETL 1110-2-575 ANALYSIS

Name: GAP Stability (Block) 01
File Name: Orleans Canal Reach 1B.gsz Directory: Y:\F&MHOME\Middleton\Outfall Canals\Orleans final edits\final\Appendix A and Appendix B\
Last Edited By: Reves, Ryan D MVK

GAP Stability (Block) 01

File Information

- Created By: Liljegren, James
- Revision Number: 665
- Last Edited By: Reves, Ryan D MVK
- Date: 6/10/2013
- Time: 9:50:58 AM
- File Name: Orleans Canal Reach 1B.gsz
- Directory: Y:\F&MHOME\Middleton\Outfall Canals\Orleans final edits\final\Appendix A and Appendix B\
- Last Solved Date: 6/10/2013
- Last Solved Time: 9:57:38 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) 01

- Kind: SLOPE/W
- Parent: Gap Analysis (seepage) 01 TWL
- 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: No
- Advanced
  - Number of Slices: 30
  - Optimization Tolerance: 0.01
  - Minimum Slip Surface Depth: 0.1 ft
  - Optimization Maximum Iterations: 4000
  - Optimization Convergence Tolerance: 1e-007
  - Starting Optimization Points: 8
  - Ending Optimization Points: 16
  - Complete Passes per Insertion: 1
  - Driving Side Maximum Convex Angle: 5 °
  - Resisting Side Maximum Convex Angle: 1 °

Materials

EMBANKMENT FILL, EL. +3.6 TO 0

- Model: Undrained (Phi=0)
- Unit Weight: 110 pcf
- Cohesion: 580 psf

FILL2, EL.0 TO -2.5/-3.5

- Model: Undrained (Phi=0)
- Unit Weight: 94 pcf
- Cohesion: 400 psf

BEACH SAND, EL. -7 TO -50

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

BAY SOUND CLAY, EL. -50 TO -70

- Model: Spatial Mohr-Coulomb
- Unit Weight: 102 pcf
- Cohesion Spatial Fn: Bay Sound
- Phi: 0 °
- Phi-B: 0 °

Sheet Pile

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

MARSH, EL. -2.8/-3.5 TO -7

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

MARSH, EL. -2.8 TO -7 (Protected)

- Model: Spatial Mohr-Coulomb
- Unit Weight: 100 pcf
- Cohesion Fn: Marsh
- Phi: 0 °
- Phi-B: 0 °

Slip Surface Limits

- Left Coordinate: (120, -28.5) ft
- Right Coordinate: (310, -5) ft

Slip Surface Block

- Left Grid
  - Upper Left: (200, -1.5) ft
  - Lower Left: (200, -28.5) ft
  - Lower Right: (205, -28.5) ft
  - X Increments: 2
  - Y Increments: 6
  - Starting Angle: 115 °
  - Ending Angle: 180 °
  - Angle Increments: 4
- Right Grid
  - Upper Left: (215, -1.5) ft
  - Lower Left: (215, -28.5) ft
  - Lower Right: (240, -28.5) ft
  - X Increments: 5
  - Y Increments: 6
  - Starting Angle: 30 °
  - Ending Angle: 45 °
  - Angle Increments: 4

Cohesion Functions

Marsh

- Model: Spline Data Point Function
- Function: Cohesion vs. Y
  - Curve Fit to Data: 100 %
  - Segment Curvature: 0 %
- Y-Intercept: 150
- Data Points: Y (ft), Cohesion (psf)
  - Data Point: (-7, 180)
  - Data Point: (-2.8, 150)

Shear/Normal Strength Functions

Sand

- Model: Spline Data Point Function
- Function: Shear Stress vs. Normal Stress
  - Curve Fit to Data: 100 %
  - Segment Curvature: 0 %
- Y-Intercept: 0
- Data Points: Normal Stress (psf), Shear Stress (psf)
  - Data Point: (-10000, 0)
  - Data Point: (0, 0)
  - Data Point: (10000, 6494)
- Estimation Properties
  - Intact Rock Param.: 10
  - Geological Strength: 100
  - Disturbance Factor: 0
  - SigmaC: 600000 psf
  - Sigma3: 300000 psf
  - Num. Points: 20

Unit Weight Functions

Marsh

- Model: Spline Data Point Function
- Function: Unit Weight vs. X
  - Curve Fit to Data: 100 %
  - Segment Curvature: 0 %
- Y-Intercept: 100
- Data Points: X (ft), Unit Weight (pcf)
  - Data Point: (192.5, 100)
  - Data Point: (208.3, 94)
  - Data Point: (241.1, 100)

Spatial Functions

Marsh

- Model: Linear Interpolation
- Limit Range By: Data Values
- Data Points: X (ft), Y (ft), Cohesion (psf)

Data Point: (192.53, -3.5, 150)
Data Point: (192.53, -7, 180)
Data Point: (200, -3.5, 160)
Data Point: (200, -7, 190)
Data Point: (241.1, -2.8, 150)
Data Point: (241.1, -7, 180)

Bay Sound

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (120, -50, 600)
Data Point: (120, -70, 770)
Data Point: (192.53, -50, 600)
Data Point: (192.53, -70, 770)
Data Point: (200, -50, 750)
Data Point: (200, -70, 925)
Data Point: (241.1, -50, 600)
Data Point: (241.1, -70, 770)
Data Point: (310, -50, 600)
Data Point: (310, -70, 770)

Regions

	Material	Points	Area (ft²)
Region 1	EMBANKMENT FILL, EL. +3.6 TO 0	21,4,5,26	58.435
Region 2	MARSH, EL. -2.8/-3.5 TO -7	6,7,29,18,27	168.145
Region 3		18,23,19,20,36,33,32,37,38,1,31	1900.824
Region 4	BEACH SAND, EL. -7 TO -50	20,36,34,15,28,12,11,29,18,23,19	6450
Region 5	BAY SOUND CLAY, EL. -50 TO -70	15,34,35,14,30,13,12,28	3800
Region 6	Sheet Pile	17,22,21,26,25,3	13.075
Region 7	FILL2, EL.0 TO -2.5/-3.5	27,3,25,26,5,6	99.39
Region 8		1,39,31	18.4275
Region 9	MARSH, EL. -2.8 TO -7 (Protected)	29,7,8,9,10,11	178.06
Region 10		31,39,27,18	26.145
Region 11		2,24,3,27,39	6.9625
Region 12		32,40,41,24,2,39,1,38,37	286.571

Points

	X (ft)	Y (ft)
Point 1	182	-5.4
Point 2	195.3	-3
Point 3	200	-1.6
Point 4	208.3	3.3
Point 5	230	0.7
Point 6	230.4	-2.5
Point 7	241.1	-2.8
Point 8	251.6	-3.7
Point 9	267.3	-4.6
Point 10	310	-5
Point 11	310	-7
Point 12	310	-50
Point 13	310	-70
Point 14	182	-70
Point 15	182	-50
Point 16	182	-7
Point 17	200	14.1
Point 18	200	-7
Point 19	200	-28.5
Point 20	182	-28.5
Point 21	201	3.6
Point 22	200.5	14.1
Point 23	200	-23.5
Point 24	199.1	-1.6
Point 25	201	-1.6
Point 26	201	0
Point 27	200	-3.5
Point 28	200	-50
Point 29	241.1	-7
Point 30	200	-70
Point 31	192.53	-7
Point 32	120	-4
Point 33	120	-7
Point 34	120	-50
Point 35	120	-70
Point 36	120	-28.5
Point 37	140	-3.7
Point 38	160	-4.2
Point 39	192.53	-3.5
Point 40	120	0
Point 41	199	-1

Critical Slip Surfaces

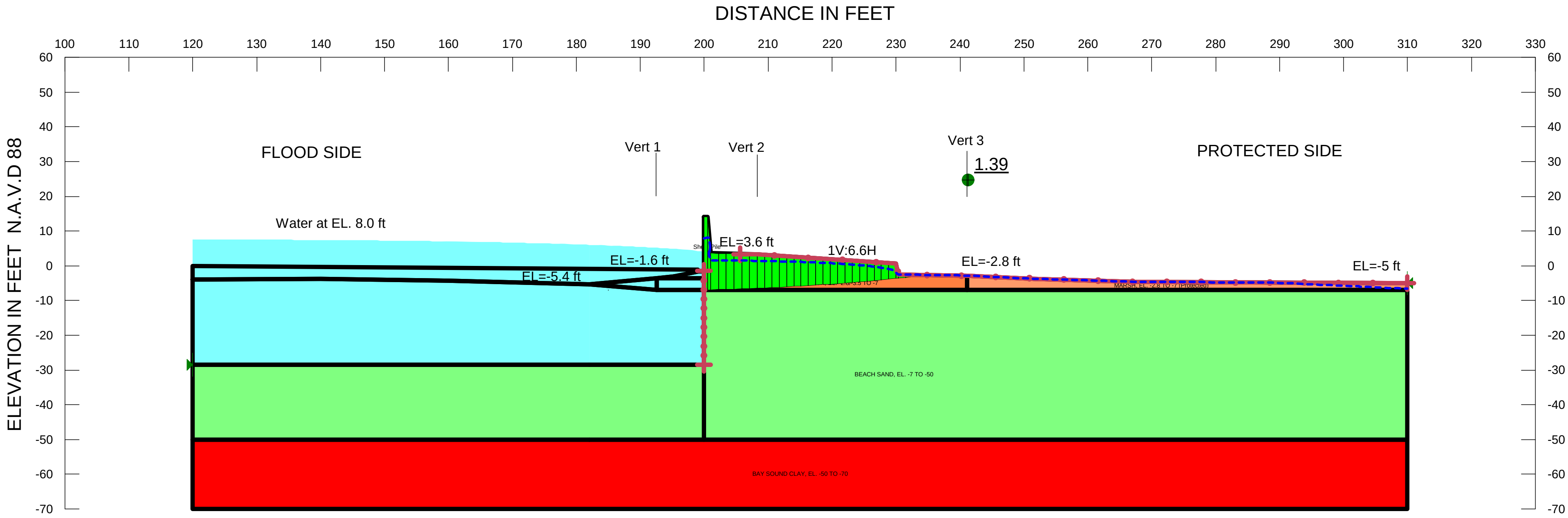
	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.42	(221.364, -2.209)	17.12413	(200, 14.1)	(244.828, -3.11957)
2	18826	1.55	(221.364, -2.209)	16.731	(200, 14.1)	(243.048, -2.96694)

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	-5.5568945	516.22145	-1738.1252	0	177.58
2	Optimized	200.75	-5.5876955	451.98322	393.05493	0	177.76
3	Optimized	201.8272	-5.6540545	455.53266	933.71284	0	178.12
4	Optimized	203.48165	-5.7559715	460.5641	934.13515	0	178.67
5	Optimized	204.9741	-5.9062735	468.30488	913.96507	0	179.64
6	Optimized	206.30445	-6.1049605	478.89123	924.74471	0	181.02
7	Optimized	207.6348	-6.3036475	489.07613	935.22698	0	182.39
8	Optimized	208.74855	-6.4699805	497.2055	940.90786	0	183.51
9	Optimized	209.8421	-6.612255	503.61972	950.01378	0	184.43
10	Optimized	211.13205	-6.762825	509.79504	947.62681	0	185.36
11	Optimized	212.23165	-6.919055	516.58023	929.92888	0	186.37
12	Optimized	213.52155	-7.148715	527.02549	939.42257	267.81379	6.6517e-006
13	Optimized	215.01425	-7.40755	538.26139	955.26902	270.80792	6.7265e-006
14	Optimized	216.32915	-7.62779	547.37455	965.01972	271.22195	-2.4902e-005
15	Optimized	218.08255	-7.90337	558.04176	982.00913	275.32763	6.8394e-006
16	Optimized	219.8982	-8.1626025	567.04873	998.14961	279.96018	-2.5706e-005
17	Optimized	221.3376	-8.3501475	572.80795	1002.5586	279.08332	6.9328e-006
18	Optimized	222.81925	-8.5809035	580.87926	993.08406	267.68893	6.6486e-006
19	Optimized	224.34315	-8.85487	591.29708	1006.7118	269.7735	-2.4767e-005
20	Optimized	225.867	-9.1288365	601.53406	1020.3396	271.97551	6.7557e-006
21	Optimized	227.4717	-9.424552	612.59377	1032.4365	272.64907	-2.5031e-005
22	Optimized	229.15725	-9.742016	624.42936	1049.2279	275.86739	-2.5327e-005
23	Optimized	230.1318	-9.925574	631.22751	965.05155	216.78786	5.3846e-006
24	Optimized	230.3318	-9.923165	630.11643	1035.5765	263.30884	6.5544e-006
25	Optimized	230.96545	-9.6700975	611.20934	916.63334	198.34467	4.9377e-006
26	Optimized	232.0963	-9.2184325	577.45765	843.21727	172.58631	4.296e-006
27	Optimized	233.77085	-8.52658	525.94	738.18619	137.83429	3.4318e-006
28	Optimized	235.54085	-7.79542	471.43088	612.34894	91.513258	-3.966e-007
29	Optimized	236.86255	-7.26514	431.66513	525.97799	61.247487	1.9925e-006
30	Optimized	237.5698	-6.981385	409.74064	541.02327	0	180.72
31	Optimized	238.3254	-6.6206525	371.48113	518.88742	0	177.93
32	Optimized	239.7438	-5.9364175	299.45435	437.85016	0	172.69
33	Optimized	240.7765	-5.425655	246.00426	385.36419	0	168.82
34	Optimized	241.86255	-4.859465	186.53666	312.23364	0	164.71
35	Optimized	243.72675	-3.790747	73.19516	185.98408	0	157.08

Slices of Slip Surface: 18826

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	18826	200.25	-6	543.94	-1877.1	0	181.38
2	18826	200.75	-6	477.8	444	0	181.28
3	18826	201.66665	-6	477.36762	985.27525	0	181.09
4	18826	203	-6	476.44512	977.47524	0	180.82
5	18826	204.33335	-6	475.05762	969.67524	0	180.55
6	18826	205.825	-6.1485	482.41086	922.56744	0	181.49
7	18826	207.475	-6.4455	498.3427	940.1038	0	183.6
8	18826	208.8639	-6.6955	511.23045	950.95392	0	185.34
9	18826	209.9917	-6.8985	521.35348	955.3173	0	186.74
10	18826	211.25	-7.125	532.28081	964.27888	280.54283	-2.5767e-005
11	18826	212.63885	-7.375	543.89496	976.53786	280.96159	-2.5806e-005
12	18826	214.02775	-7.625	555.1548	988.79685	281.61044	6.998e-006
13	18826	215.41665	-7.875	566.09576	1001.1267	282.51239	7.0201e-006
14	18826	216.80555	-8.125	576.73202	1013.4565	283.61221	-2.605e-005
15	18826	218.19445	-8.375	587.09901	1025.8572	284.93293	7.0796e-006
16	18826	219.58335	-8.625	597.22508	1038.1871	286.36408	-2.6303e-005
17	18826	220.97225	-8.875	607.1669	1050.5878	287.9609	7.1557e-006
18	18826	222.36115	-9.125	616.91031	1063.0594	289.73258	-2.661e-005
19	18826	223.75	-9.375	626.47657	1075.4601	291.57329	-2.6782e-005
20	18826	225.13885	-9.625	635.87985	1087.9316	293.56586	-2.6965e-005
21	18826	226.52775	-9.875	645.1414	1100.4741	295.69649	-2.7158e-005
22	18826	227.91665	-10.125	654.2825	1112.9456	297.85932	7.4017e-006
23	18826	229.30555	-10.375	663.32438	1125.4881	300.1326	-2.7568e-005
24	18826	230.2	-10.38453	659.60827	1391.2049	475.10441	-9.914e-005
25	18826	231.10775	-9.8604275	622.44193	1033.9975	267.26734	6.6464e-006
26	18826	232.5233	-9.0431625	564.39466	886.92162	209.45146	5.2077e-006
27	18826	233.93885	-8.2258975	506.32292	739.78453	151.61174	3.7696e-006
28	18826	235.3544	-7.4086325	448.22059	592.6046	93.764074	-4.059e-007
29	18826	236.6919	-6.6364265	381.00962	540.04899	0	178.43
30	18826	237.95135	-5.9092795	305.33028	452.85204	0	172.87
31	18826	239.2108	-5.1821325	230.40046	365.29753	0	167.37
32	18826	240.47025	-4.4549855	155.78693	277.3717	0	161.93
33	18826	242.0738	-3.5291765	60.419495	158.53225	0	155.21



Name: EMBANKMENT FILL, EL. +3.6 TO 0 Model: Undrained (Phi=0) Unit Weight: 110 pcf Cohesion: 580 psf
Name: FILL2, EL.0 TO -2.5/-3.5 Model: Undrained (Phi=0) Unit Weight: 94 pcf Cohesion: 400 psf
Name: BEACH SAND, EL. -7 TO -50 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand
Name: BAY SOUND CLAY, EL. -50 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 102 pcf Cohesion Spatial Fn: Bay Sound Phi: 0 °
Name: Sheet Pile Model: Undrained (Phi=0) Unit Weight: 0.1 pcf Cohesion: 0.01 psf
Name: MARSH, EL. -2.8/-3.5 TO -7 Model: Spatial Mohr-Coulomb Weight Fn: Marsh Cohesion Spatial Fn: Marsh Phi: 0 °
Name: MARSH, EL. -2.8 TO -7 (Protected) Model: Spatial Mohr-Coulomb Unit Weight: 100 pcf Cohesion Fn: Marsh 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.

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 1B,
PROTECTED SIDE STABILITY ANALYSIS
CASE: GAP Stability (Entry/Exit) 01
STA. 7+00 TO 9+25 WEST
ORLEANS PARISH, LOUISIANA

ETL 1110-2-575 ANALYSIS

Name: GAP Stability (Entry/Exit) 01
File Name: Orleans Canal Reach 1B.gsz Directory: Y:\F&MHOME\Middleton\Outfall Canals\Orleans final edits\final\Appendix A and Appendix B\
Last Edited By: Reves, Ryan D MVK

GAP Stability (Entry/Exit) 01

File Information

Created By: Liljegren, James
Revision Number: 665
Last Edited By: Reves, Ryan D MVK
Date: 6/10/2013
Time: 9:50:58 AM
File Name: Orleans Canal Reach 1B.gsz
Directory: Y:\F&MHOME\Middleton\Outfall Canals\Orleans final edits\final\Appendix A and Appendix B\
Last Solved Date: 6/10/2013
Last Solved Time: 9:59:50 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) 01

Kind: SLOPE/W
Parent: Gap Analysis (seepage) 01 TWL
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: 4000
- Optimization Convergence Tolerance: 1e-007
- Starting Optimization Points: 8
- Ending Optimization Points: 16
- Complete Passes per Insertion: 1
- Driving Side Maximum Convex Angle: 5 °
- Resisting Side Maximum Convex Angle: 1 °

Materials

EMBANKMENT FILL, EL. +3.6 TO 0

Model: Undrained (Phi=0)
Unit Weight: 110 pcf
Cohesion: 580 psf

FILL2, EL.0 TO -2.5/-3.5

Model: Undrained (Phi=0)
Unit Weight: 94 pcf
Cohesion: 400 psf

BEACH SAND, EL. -7 TO -50

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

BAY SOUND CLAY, EL. -50 TO -70

Model: Spatial Mohr-Coulomb
Unit Weight: 102 pcf
Cohesion Spatial Fn: Bay Sound
Phi: 0 °
Phi-B: 0 °

Sheet Pile

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

MARSH, EL. -2.8/-3.5 TO -7

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

MARSH, EL. -2.8 TO -7 (Protected)

Model: Spatial Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion Fn: Marsh
Phi: 0 °
Phi-B: 0 °

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (200, -28.5) ft
Left-Zone Right Coordinate: (200, -1.5) ft
Left-Zone Increment: 10
Right Projection: Range
Right-Zone Left Coordinate: (205.6, 3.41096) ft
Right-Zone Right Coordinate: (310, -5) ft
Right-Zone Increment: 20
Radius Increments: 25

Slip Surface Limits

Left Coordinate: (120, -28.5) ft
Right Coordinate: (310, -5) ft

Cohesion Functions

Marsh

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

Y-Intercept: 150
Data Points: Y (ft), Cohesion (psf)
- Data Point: (-7, 180)
- Data Point: (-2.8, 150)

Shear/Normal Strength Functions

Sand

Model: Spline Data Point Function
Function: Shear Stress vs. Normal Stress
- Curve Fit to Data: 100 %
- Segment Curvature: 0 %

Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
- Data Point: (-10000, 0)
- Data Point: (0, 0)
- Data Point: (10000, 6494)

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

Unit Weight Functions

Marsh

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

Y-Intercept: 100
Data Points: X (ft), Unit Weight (pcf)
- Data Point: (192.5, 100)
- Data Point: (208.3, 94)
- Data Point: (241.1, 100)

Spatial Functions

Marsh

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
- Data Point: (192.53, -3.5, 150)
- Data Point: (192.53, -7, 180)
- Data Point: (200, -3.5, 160)
- Data Point: (200, -7, 190)
- Data Point: (241.1, -2.8, 150)
- Data Point: (241.1, -7, 180)

Bay Sound

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)

Data Point: (120, -50, 600)
Data Point: (120, -70, 770)
Data Point: (192.53, -50, 600)
Data Point: (192.53, -70, 770)
Data Point: (200, -50, 750)
Data Point: (200, -70, 925)
Data Point: (241.1, -50, 600)
Data Point: (241.1, -70, 770)
Data Point: (310, -50, 600)
Data Point: (310, -70, 770)

Regions

	Material	Points	Area (ft²)
Region 1	EMBANKMENT FILL, EL. +3.6 TO 0	21,4,5,26	58.435
Region 2	MARSH, EL. -2.8/-3.5 TO -7	6,7,29,18,27	168.145
Region 3		18,23,19,20,36,33,32,37,38,1,31	1900.824
Region 4	BEACH SAND, EL. -7 TO -50	20,36,34,15,28,12,11,29,18,23,19	6450
Region 5	BAY SOUND CLAY, EL. -50 TO -70	15,34,35,14,30,13,12,28	3800
Region 6	Sheet Pile	17,22,21,26,25,3	13.075
Region 7	FILL2, EL.0 TO -2.5/-3.5	27,3,25,26,5,6	99.39
Region 8		1,39,31	18.4275
Region 9	MARSH, EL. -2.8 TO -7 (Protected)	29,7,8,9,10,11	178.06
Region 10		31,39,27,18	26.145
Region 11		2,24,3,27,39	6.9625
Region 12		32,40,41,24,2,39,1,38,37	286.571

Points

	X (ft)	Y (ft)
Point 1	182	-5.4
Point 2	195.3	-3
Point 3	200	-1.6
Point 4	208.3	3.3
Point 5	230	0.7
Point 6	230.4	-2.5
Point 7	241.1	-2.8
Point 8	251.6	-3.7
Point 9	267.3	-4.6
Point 10	310	-5
Point 11	310	-7
Point 12	310	-50
Point 13	310	-70
Point 14	182	-70
Point 15	182	-50
Point 16	182	-7
Point 17	200	14.1
Point 18	200	-7
Point 19	200	-28.5
Point 20	182	-28.5
Point 21	201	3.6
Point 22	200.5	14.1
Point 23	200	-23.5
Point 24	199.1	-1.6
Point 25	201	-1.6
Point 26	201	0
Point 27	200	-3.5
Point 28	200	-50
Point 29	241.1	-7
Point 30	200	-70
Point 31	192.53	-7
Point 32	120	-4
Point 33	120	-7
Point 34	120	-50
Point 35	120	-70
Point 36	120	-28.5
Point 37	140	-3.7
Point 38	160	-4.2
Point 39	192.53	-3.5
Point 40	120	0
Point 41	199	-1

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.39	(193.315, 191.793)	198.8051	(200, 14.1)	(234.852, -2.62481)
2	4525	1.39	(193.315, 191.793)	198.805	(200, 14.1)	(234.852, -2.62481)

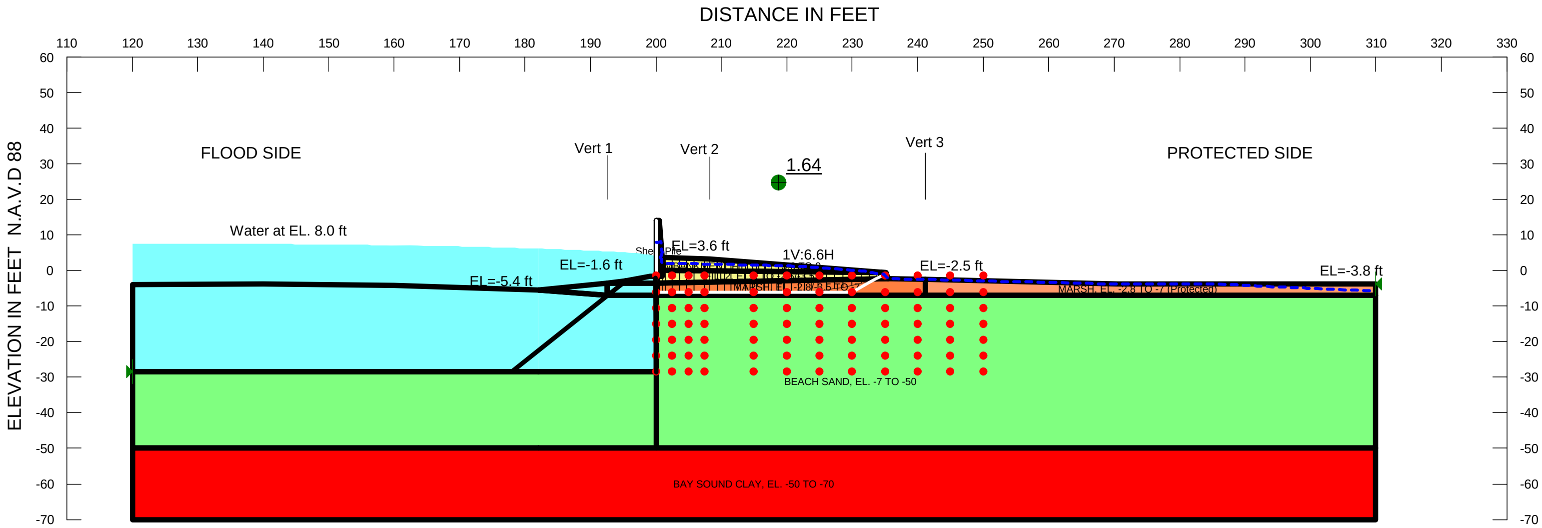
Slices of Slip Surface: Optimized

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	200.25	-6.8912735	599.65481	-2940.6092	0	189.01
2	Optimized	200.75	-6.8731905	532.52723	550.39472	0	188.73
3	Optimized	201.60835	-6.8384345	530.13524	1095.1552	0	188.23
4	Optimized	202.825	-6.7839005	525.99172	1084.6747	0	187.49
5	Optimized	204.04165	-6.7218945	520.95217	1073.42	0	186.68
6	Optimized	205.25835	-6.65241	515.06808	1061.4767	0	185.82
7	Optimized	206.475	-6.575439	508.34836	1048.7632	0	184.9
8	Optimized	207.69165	-6.490973	500.80296	1035.2819	0	183.92
9	Optimized	208.87105	-6.4020435	492.65113	1017.5294	0	182.93
10	Optimized	210.01315	-6.309087	484.02703	995.50235	0	181.92
11	Optimized	211.15525	-6.2094985	474.73167	972.67714	0	180.86
12	Optimized	212.29735	-6.103269	464.794	949.14616	0	179.76
13	Optimized	213.43945	-5.9903875	454.12813	924.82417	0	178.61
14	Optimized	214.58155	-5.870842	442.78866	899.71507	0	177.41
15	Optimized	215.72365	-5.744621	430.80446	873.82366	0	176.18
16	Optimized	216.86575	-5.611712	418.17799	847.15407	0	174.9
17	Optimized	218.00785	-5.472101	404.81521	819.68239	0	173.58
18	Optimized	219.15	-5.3257735	390.66807	791.39801	0	172.21
19	Optimized	220.29215	-5.172715	375.68704	762.28695	0	170.81
20	Optimized	221.43425	-5.0129095	359.76299	732.34556	0	169.36
21	Optimized	222.57635	-4.8463405	342.51018	701.55307	0	167.87
22	Optimized	223.71845	-4.6729915	323.47495	669.91434	0	166.35
23	Optimized	224.86055	-4.492844	302.22319	637.40047	0	164.78
24	Optimized	226.00265	-4.305879	278.08965	604.0174	0	163.17
25	Optimized	227.14475	-4.1120775	248.91092	569.74536	0	161.53
26	Optimized	228.28685	-3.9114185	211.91229	534.57301	0	159.85
27	Optimized	229.42895	-3.7038815	167.78469	498.49797	0	158.13
28	Optimized	230.2	-3.5606285	129.23652	318.694	0	156.95
29	Optimized	230.95645	-3.4155645	99.662703	144.70326	0	155.77
30	Optimized	232.06935	-3.197666	66.533591	119.45113	0	154.01
31	Optimized	233.1823	-2.9731645	39.402358	93.292418	0	152.21
32	Optimized	234.29525	-2.742037	13.043513	66.222534	0	150.38

Slices of Slip Surface: 4525

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	4525	200.25	-6.8912735	599.65481	-2940.6092	0	189.01
2	4525	200.75	-6.8731905	532.52723	550.39472	0	188.73
3	4525	201.60835	-6.8384345	530.13524	1095.1552	0	188.23
4	4525	202.825	-6.7839005	525.99172	1084.6747	0	187.49

5	4525	204.04165	-6.7218945	520.95217	1073.42	0	186.68
6	4525	205.25835	-6.65241	515.06808	1061.4767	0	185.82
7	4525	206.475	-6.575439	508.34836	1048.7632	0	184.9
8	4525	207.69165	-6.490973	500.80296	1035.2819	0	183.92
9	4525	208.87105	-6.4020435	492.65113	1017.5294	0	182.93
10	4525	210.01315	-6.309087	484.02703	995.50235	0	181.92
11	4525	211.15525	-6.2094985	474.73167	972.67714	0	180.86
12	4525	212.29735	-6.103269	464.794	949.14616	0	179.76
13	4525	213.43945	-5.9903875	454.12813	924.82417	0	178.61
14	4525	214.58155	-5.870842	442.78866	899.71507	0	177.41
15	4525	215.72365	-5.744621	430.80446	873.82366	0	176.18
16	4525	216.86575	-5.611712	418.17799	847.15407	0	174.9
17	4525	218.00785	-5.472101	404.81521	819.68239	0	173.58
18	4525	219.15	-5.3257735	390.66807	791.39801	0	172.21
19	4525	220.29215	-5.172715	375.68704	762.28695	0	170.81
20	4525	221.43425	-5.0129095	359.76299	732.34556	0	169.36
21	4525	222.57635	-4.8463405	342.51018	701.55307	0	167.87
22	4525	223.71845	-4.6729915	323.47495	669.91434	0	166.35
23	4525	224.86055	-4.492844	302.22319	637.40047	0	164.78
24	4525	226.00265	-4.305879	278.08965	604.0174	0	163.17
25	4525	227.14475	-4.1120775	248.91092	569.74536	0	161.53
26	4525	228.28685	-3.9114185	211.91229	534.57301	0	159.85
27	4525	229.42895	-3.7038815	167.78469	498.49797	0	158.13
28	4525	230.2	-3.5606285	129.23652	318.694	0	156.95
29	4525	230.95645	-3.4155645	99.662703	144.70326	0	155.77
30	4525	232.06935	-3.197666	66.533591	119.45113	0	154.01
31	4525	233.1823	-2.9731645	39.402358	93.292418	0	152.21
32	4525	234.29525	-2.742037	13.043513	66.222534	0	150.38



Name: EMBANKMENT FILL, EL. +3.6 TO 0 Model: Undrained (Phi=0) Unit Weight: 110 pcf Cohesion: 580 psf
Name: FILL2, EL.0 TO -2.5/-3.5 Model: Undrained (Phi=0) Unit Weight: 94 pcf Cohesion: 400 psf
Name: BEACH SAND, EL. -7 TO -50 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand
Name: BAY SOUND CLAY, EL. -50 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 102 pcf Cohesion Spatial Fn: Bay Sound Phi: 0 °
Name: Sheet Pile Model: Undrained (Phi=0) Unit Weight: 0.1 pcf Cohesion: 0.01 psf
Name: MARSH, EL. -2.8/-3.5 TO -7 Model: Spatial Mohr-Coulomb Weight Fn: Marsh Cohesion Spatial Fn: Marsh Phi: 0 °
Name: MARSH, EL. -2.8 TO -7 (Protected) Model: Spatial Mohr-Coulomb Unit Weight: 100 pcf Cohesion Fn: Marsh 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.

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 1C
REMEDIATION OF CANAL WALLS AND LEVEES
PROTECTED SIDE STABILITY ANALYSIS
CASE: GAP P/S Stability Analysis Block
STA. 9+25 TO 11+00 WEST
ORLEANS PARISH, LOUISIANA

ETL 1110-2-575 ANALYSIS

Name: GAP P/S Stability Analysis Block
File Name: Orleans Canal Reach 1C.gsz Directory: Y:\F&MHOME\Middleton\Outfall Canals\Orleans final edits\final\Appendix A and Appendix B\
Last Edited By: Reves, Ryan D MVK

GAP P/S Stability Analysis Block

File Information

- Created By: Liljegren, James
- Revision Number: 553
- Last Edited By: Reves, Ryan D MVK
- Date: 6/5/2013
- Time: 5:11:29 PM
- File Name: Orleans Canal Reach 1C.gsz
- Directory: Y:\F&MHOME\Middleton\Outfall Canals\Orleans final edits\final\Appendix A and Appendix B\
- Last Solved Date: 6/5/2013
- Last Solved Time: 5:12:32 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

GAP P/S Stability Analysis Block

- Kind: SLOPE/W
- Parent: 1 - Global Stability Analysis 8ft
- 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: Tension Crack Line
    - Percentage Wet: 1
    - Tension Crack Fluid Unit Weight: 62.4 pcf
- FOS Distribution
  - FOS Calculation Option: Constant
- Restrict Block Crossing: Yes
- Advanced
  - Number of Slices: 30
  - Optimization Tolerance: 0.01
  - Minimum Slip Surface Depth: 0.1 ft
  - Optimization Maximum Iterations: 4000
  - Optimization Convergence Tolerance: 1e-007
  - Starting Optimization Points: 8
  - Ending Optimization Points: 16
  - Complete Passes per Insertion: 1
  - Driving Side Maximum Convex Angle: 5 °
  - Resisting Side Maximum Convex Angle: 1 °

Materials

EMBANKMENT FILL, EL. +3.6 TO 0

- Model: Undrained (Phi=0)
- Unit Weight: 110 pcf
- Cohesion: 580 psf

FILL2, EL.0 TO -2.5/-3.5

- Model: Undrained (Phi=0)
- Unit Weight: 94 pcf
- Cohesion: 400 psf

BEACH SAND, EL. -7 TO -50

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

BAY SOUND CLAY, EL. -50 TO -70

- Model: Spatial Mohr-Coulomb
- Unit Weight: 102 pcf
- Cohesion Spatial Fn: Bay Sound
- Phi: 0 °
- Phi-B: 0 °

Sheet Pile

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

MARSH, EL. -2.8/-3.5 TO -7

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

MARSH, EL. -2.8 TO -7 (Protected)

- Model: Spatial Mohr-Coulomb
- Unit Weight: 100 pcf
- Cohesion Fn: Marsh
- Phi: 0 °
- Phi-B: 0 °

Slip Surface Limits

- Left Coordinate: (120, -28.5) ft
- Right Coordinate: (310, -3.8) ft

Slip Surface Block

- Left Grid
  - Upper Left: (200, -1.5) ft
  - Lower Left: (200, -28.5) ft
  - Lower Right: (207.5, -28.5) ft
  - X Increments: 3
  - Y Increments: 6
  - Starting Angle: 115 °
  - Ending Angle: 135 °
  - Angle Increments: 2
- Right Grid
  - Upper Left: (215, -1.5) ft
  - Lower Left: (215, -28.5) ft
  - Lower Right: (250, -28.5) ft
  - X Increments: 7
  - Y Increments: 6
  - Starting Angle: 0 °
  - Ending Angle: 45 °
  - Angle Increments: 2

Cohesion Functions

Marsh

- Model: Spline Data Point Function
- Function: Cohesion vs. Y
  - Curve Fit to Data: 100 %
  - Segment Curvature: 0 %
- Y-Intercept: 150
- Data Points: Y (ft), Cohesion (psf)
  - Data Point: (-7, 180)
  - Data Point: (-2.8, 150)

Shear/Normal Strength Functions

Sand

- Model: Spline Data Point Function
- Function: Shear Stress vs. Normal Stress
  - Curve Fit to Data: 100 %
  - Segment Curvature: 0 %
- Y-Intercept: 0
- Data Points: Normal Stress (psf), Shear Stress (psf)
  - Data Point: (-10000, 0)
  - Data Point: (0, 0)
  - Data Point: (10000, 6494)
- Estimation Properties
  - Intact Rock Param.: 10
  - Geological Strength: 100
  - Disturbance Factor: 0
  - SigmaC: 600000 psf
  - Sigma3: 300000 psf
  - Num. Points: 20

Unit Weight Functions

Marsh

- Model: Spline Data Point Function
- Function: Unit Weight vs. X
  - Curve Fit to Data: 100 %
  - Segment Curvature: 0 %
- Y-Intercept: 100
- Data Points: X (ft), Unit Weight (pcf)
  - Data Point: (192.5, 100)
  - Data Point: (208.3, 94)
  - Data Point: (241.1, 100)

Spatial Functions

Marsh

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (192.53, -3.5, 150)
Data Point: (192.53, -7, 180)
Data Point: (200, -3.5, 160)
Data Point: (200, -7, 190)
Data Point: (241.1, -2.8, 150)
Data Point: (241.1, -7, 180)

Bay Sound

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (120, -50, 600)
Data Point: (120, -70, 770)
Data Point: (192.53, -50, 600)
Data Point: (192.53, -70, 770)
Data Point: (200, -50, 750)
Data Point: (200, -70, 925)
Data Point: (241.1, -50, 600)
Data Point: (241.1, -70, 770)
Data Point: (310, -50, 600)
Data Point: (310, -70, 770)

Regions

	Material	Points	Area (ft²)
Region 1	EMBANKMENT FILL, EL. +3.6 TO 0	20,4,5,25	71.595
Region 2	MARSH, EL. -2.8/-3.5 TO -7	6,7,28,17,26	171.31
Region 3		17,22,18,19,35,32,31,36,37,1,30	1900.824
Region 4	BEACH SAND, EL. -7 TO -50	19,35,33,14,27,11,10,28,17,22,18	6450
Region 5	BAY SOUND CLAY, EL. -50 TO -70	14,33,34,13,29,12,11,27	3800
Region 6	Sheet Pile	16,21,20,25,24,3	13.075
Region 7	FILL2, EL.0 TO -2.5/-3.5	26,3,24,25,5,6	90.54
Region 8		1,38,30	18.4275
Region 9	MARSH, EL. -2.8 TO -7 (Protected)	28,7,8,9,10	239.59
Region 10		30,38,26,17	26.145
Region 11		2,23,3,26,38	6.9625

Points

	X (ft)	Y (ft)
Point 1	182	-5.4
Point 2	195.3	-3
Point 3	200	-1.6
Point 4	208.3	3.3
Point 5	235.1	-0.6
Point 6	235.5	-2.3
Point 7	241.1	-2.5
Point 8	270.5	-3.8
Point 9	310	-3.8
Point 10	310	-7
Point 11	310	-50
Point 12	310	-70
Point 13	182	-70
Point 14	182	-50
Point 15	182	-7
Point 16	200	14.1
Point 17	200	-7
Point 18	200	-28.5
Point 19	182	-28.5
Point 20	201	3.6
Point 21	200.5	14.1
Point 22	200	-23.5
Point 23	199.1	-1.6
Point 24	201	-1.6
Point 25	201	0
Point 26	200	-3.5
Point 27	200	-50
Point 28	241.1	-7
Point 29	200	-70
Point 30	192.53	-7
Point 31	120	-4
Point 32	120	-7
Point 33	120	-50
Point 34	120	-70
Point 35	120	-28.5
Point 36	140	-3.7
Point 37	160	-4.2
Point 38	192.53	-3.5

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.64	(217.011, 0.446)	14.07403	(200, 14.1)	(235.279, -1.35968)
2	324	1.92	(217.011, 0.446)	14.339	(200, 14.1)	(235.157, -0.842857)

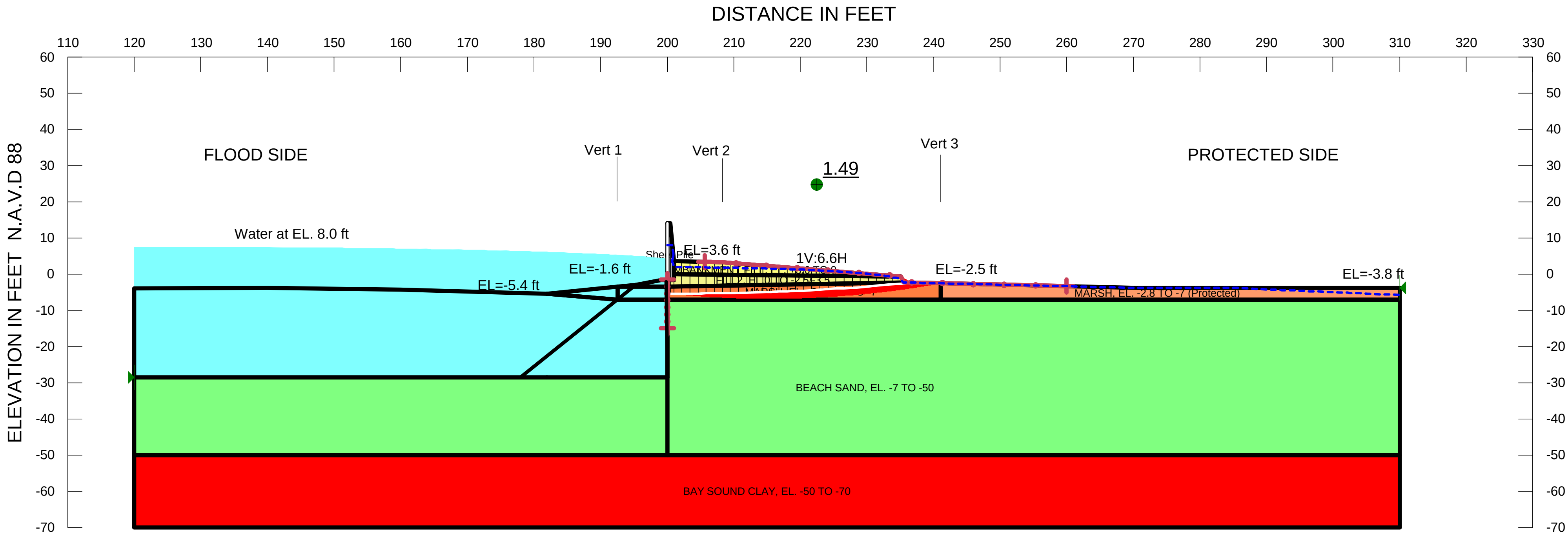
Slices of Slip Surface: Optimized

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	200.25	-5.9931115	561.79966	-1482.8496	0	181.32
2	Optimized	200.75	-5.9819365	498.63544	441.42973	0	181.12
3	Optimized	201.23625	-5.9710695	497.79089	986.20786	0	180.93
4	Optimized	202.00125	-5.9630175	496.84179	976.96585	0	180.71
5	Optimized	203.0588	-5.9574725	495.80166	970.91418	0	180.45
6	Optimized	204.14475	-5.9606225	494.91295	961.50567	0	180.26
7	Optimized	205.25905	-5.9724675	494.31173	956.83948	0	180.13
8	Optimized	206.65665	-5.99714	493.75549	948.83895	0	180.05
9	Optimized	207.89855	-6.0275095	493.40997	943.45625	0	180.05
10	Optimized	208.82825	-6.0544195	493.29569	935.85964	0	180.08
11	Optimized	209.88475	-6.085	492.84155	922.75567	0	180.11
12	Optimized	210.9459	-6.09292	490.77435	918.28684	0	179.95
13	Optimized	212.01165	-6.07818	487.06852	900.65832	0	179.61
14	Optimized	213.0991	-6.0625425	482.97555	882.88431	0	179.26
15	Optimized	214.20825	-6.0460075	478.59412	864.44807	0	178.89
16	Optimized	215.09765	-6.038465	475.33405	846.06684	0	178.65
17	Optimized	215.98325	-6.0635665	473.96357	825.01914	0	178.66
18	Optimized	217.0847	-6.11232	473.24704	813.1374	0	178.82
19	Optimized	218.18615	-6.1610735	472.40352	801.29194	0	178.97
20	Optimized	219.2333	-6.1718615	469.14367	803.41056	0	178.83
21	Optimized	220.22605	-6.144685	463.60562	785.73913	0	178.4
22	Optimized	221.2188	-6.1175085	457.96687	768.0677	0	177.98
23	Optimized	222.2175	-6.0373565	448.77583	769.32717	0	177.15
24	Optimized	223.2221	-5.90423	436.04614	740.53242	0	175.91
25	Optimized	224.2267	-5.7711035	423.16843	711.69819	0	174.68
26	Optimized	225.36335	-5.5494535	403.62264	696.47452	0	172.76
27	Optimized	226.6321	-5.23928	377.20854	644.5115	0	170.16
28	Optimized	227.90085	-4.9291065	349.68429	592.42597	0	167.58
29	Optimized	229.2699	-4.4758875	310.45478	555.24164	0	163.94
30	Optimized	230.73925	-3.8796225	256.93287	467.14839	0	159.25

31	Optimized	232.05355	-3.3063075	201.48223	395.32812	0	154.81
32	Optimized	233.2129	-2.7559425	141.63834	315.66094	0	150.6
33	Optimized	233.87795	-2.416352	102.6529	310.47852	0	150
34	Optimized	234.53165	-1.92323	39.473943	403.71541	0	400
35	Optimized	235.18935	-1.427098	-7.2621447	300.17311	0	400

Slices of Slip Surface: 324

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	324	200.25	-6	562.22	-1268.58	0	181.38
2	324	200.75	-6	499.76	435.12	0	181.28
3	324	201.60835	-6	499.41356	977.09562	0	181.1
4	324	202.825	-6	498.63274	970.84905	0	180.86
5	324	204.04165	-6	497.49849	964.52028	0	180.61
6	324	205.25835	-6	496.05192	958.19152	0	180.36
7	324	206.475	-6	494.23548	951.86275	0	180.11
8	324	207.69165	-6	492.08206	945.3696	0	179.87
9	324	208.87105	-6	489.77984	933.45183	0	179.62
10	324	210.01315	-6	487.17937	916.11542	0	179.39
11	324	211.15525	-6	484.36002	898.77901	0	179.16
12	324	212.29735	-6	481.33053	881.35504	0	178.92
13	324	213.43945	-6	478.04711	864.05366	0	178.68
14	324	214.58155	-6	474.51854	846.74351	0	178.45
15	324	215.72365	-6	470.82361	829.44213	0	178.21
16	324	216.86575	-6	466.94481	812.15825	0	177.98
17	324	218.00785	-6	462.88213	794.89189	0	177.74
18	324	219.15	-6	458.61808	777.63428	0	177.5
19	324	220.29215	-6	454.21393	760.40294	0	177.26
20	324	221.43425	-6	449.65218	743.18036	0	177.02
21	324	222.57635	-6	444.92407	725.97528	0	176.78
22	324	223.71845	-6	439.9683	708.78772	0	176.54
23	324	224.86055	-6	434.83743	691.61767	0	176.3
24	324	226.00265	-6	429.48766	674.46513	0	176.06
25	324	227.14475	-6	423.84895	657.32135	0	175.82
26	324	228.28685	-6	417.63235	640.20383	0	175.58
27	324	229.42895	-6	411.06553	623.09507	0	175.34
28	324	230.60615	-5.393829	361.39167	737.70305	0	170.57
29	324	231.8185	-4.181487	264.16278	571.65571	0	161.34
30	324	233.03085	-2.969145	160.3256	405.04844	0	152.2
31	324	234.3685	-1.631487	31.54343	403.01466	0	400
32	324	235.12855	-0.87142855	-17.275857	293.37155	0	400



Name: EMBANKMENT FILL, EL. +3.6 TO 0 Model: Undrained (Phi=0) Unit Weight: 110 pcf Cohesion: 580 psf
Name: FILL2, EL.0 TO -2.5/-3.5 Model: Undrained (Phi=0) Unit Weight: 94 pcf Cohesion: 400 psf
Name: BEACH SAND, EL. -7 TO -50 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand
Name: BAY SOUND CLAY, EL. -50 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 102 pcf Cohesion Spatial Fn: Bay Sound Phi: 0 °
Name: Sheet Pile Model: Undrained (Phi=0) Unit Weight: 0.1 pcf Cohesion: 0.01 psf
Name: MARSH, EL. -2.8/-3.5 TO -7 Model: Spatial Mohr-Coulomb Weight Fn: Marsh Cohesion Spatial Fn: Marsh Phi: 0 °
Name: MARSH, EL. -2.8 TO -7 (Protected) Model: Spatial Mohr-Coulomb Unit Weight: 100 pcf Cohesion Fn: Marsh 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.

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 1C
REMEDIATION OF CANAL WALLS AND LEVEES
PROTECTED SIDE STABILITY ANALYSIS
CASE: GAP P/S Stability Analysis Entry Exit
STA. 9+25 TO 11+00 WEST
ORLEANS PARISH, LOUISIANA

ETL 1110-2-575 ANALYSIS

Name: GAP P/S Stability Analysis Entry Exit
File Name: Orleans Canal Reach 1C.gsz Directory: Y:\F&MHOME\Middleton\Outfall Canals\Orleans final edits\final\Appendix A and Appendix B\
Last Edited By: Reves, Ryan D MVK

GAP P/S Stability Analysis Entry Exit

File Information

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Revision Number: 552
Last Edited By: Reves, Ryan D MVK
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Directory: Y:\F&MHOME\Middleton\Outfall Canals\Orleans final edits\final\Appendix A and Appendix B\
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Last Solved Time: 11:45:28 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

GAP P/S Stability Analysis Entry Exit

Kind: SLOPE/W
Parent: 1 - Global Stability Analysis 8ft
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: Tension Crack Line
  - Percentage Wet: 1
  - Tension Crack Fluid Unit Weight: 62.4 pcf

FOS Distribution
- FOS Calculation Option: Constant

Advanced
- Number of Slices: 30
- Optimization Tolerance: 0.01
- Minimum Slip Surface Depth: 0.1 ft
- Optimization Maximum Iterations: 4000
- Optimization Convergence Tolerance: 1e-007
- Starting Optimization Points: 8
- Ending Optimization Points: 16
- Complete Passes per Insertion: 1
- Driving Side Maximum Convex Angle: 5 °
- Resisting Side Maximum Convex Angle: 1 °

Materials

EMBANKMENT FILL, EL. +3.6 TO 0

Model: Undrained (Phi=0)
Unit Weight: 110 pcf
Cohesion: 580 psf

FILL2, EL.0 TO -2.5/-3.5

Model: Undrained (Phi=0)
Unit Weight: 94 pcf
Cohesion: 400 psf

BEACH SAND, EL. -7 TO -50

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

BAY SOUND CLAY, EL. -50 TO -70

Model: Spatial Mohr-Coulomb
Unit Weight: 102 pcf
Cohesion Spatial Fn: Bay Sound
Phi: 0 °
Phi-B: 0 °

Sheet Pile

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

MARSH, EL. -2.8/-3.5 TO -7

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

MARSH, EL. -2.8 TO -7 (Protected)

Model: Spatial Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion Fn: Marsh
Phi: 0 °
Phi-B: 0 °

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (200, -15) ft
Left-Zone Right Coordinate: (200, -1.5) ft
Left-Zone Increment: 7
Right Projection: Range
Right-Zone Left Coordinate: (205.68999, 3.40726) ft
Right-Zone Right Coordinate: (259.98185, -3.33491) ft
Right-Zone Increment: 12
Radius Increments: 10

Slip Surface Limits

Left Coordinate: (120, -28.5) ft
Right Coordinate: (310, -3.8) ft

Cohesion Functions

Marsh

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

Y-Intercept: 150
Data Points: Y (ft), Cohesion (psf)
- Data Point: (-7, 180)
- Data Point: (-2.8, 150)

Shear/Normal Strength Functions

Sand

Model: Spline Data Point Function
Function: Shear Stress vs. Normal Stress
- Curve Fit to Data: 100 %
- Segment Curvature: 0 %

Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
- Data Point: (-10000, 0)
- Data Point: (0, 0)
- Data Point: (10000, 6494)

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

Unit Weight Functions

Marsh

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

Y-Intercept: 100
Data Points: X (ft), Unit Weight (pcf)
- Data Point: (192.5, 100)
- Data Point: (208.3, 94)
- Data Point: (241.1, 100)

Spatial Functions

Marsh

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
- Data Point: (192.53, -3.5, 150)
- Data Point: (192.53, -7, 180)
- Data Point: (200, -3.5, 160)
- Data Point: (200, -7, 190)
- Data Point: (241.1, -2.8, 150)

Data Point: (241.1, -7, 180)

Bay Sound

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (120, -50, 600)
Data Point: (120, -70, 770)
Data Point: (192.53, -50, 600)
Data Point: (192.53, -70, 770)
Data Point: (200, -50, 750)
Data Point: (200, -70, 925)
Data Point: (241.1, -50, 600)
Data Point: (241.1, -70, 770)
Data Point: (310, -50, 600)
Data Point: (310, -70, 770)

Regions

	Material	Points	Area (ft²)
Region 1	EMBANKMENT FILL, EL. +3.6 TO 0	20,4,5,25	71.595
Region 2	MARSH, EL. -2.8/-3.5 TO -7	6,7,28,17,26	171.31
Region 3		17,22,18,19,35,32,31,36,37,1,30	1900.824
Region 4	BEACH SAND, EL. -7 TO -50	19,35,33,14,27,11,10,28,17,22,18	6450
Region 5	BAY SOUND CLAY, EL. -50 TO -70	14,33,34,13,29,12,11,27	3800
Region 6	Sheet Pile	16,21,20,25,24,3	13.075
Region 7	FILL2, EL.0 TO -2.5/-3.5	26,3,24,25,5,6	90.54
Region 8		1,38,30	18.4275
Region 9	MARSH, EL. -2.8 TO -7 (Protected)	28,7,8,9,10	239.59
Region 10		30,38,26,17	26.145
Region 11		2,23,3,26,38	6.9625

Points

	X (ft)	Y (ft)
Point 1	182	-5.4
Point 2	195.3	-3
Point 3	200	-1.6
Point 4	208.3	3.3
Point 5	235.1	-0.6
Point 6	235.5	-2.3
Point 7	241.1	-2.5
Point 8	270.5	-3.8
Point 9	310	-3.8
Point 10	310	-7
Point 11	310	-50
Point 12	310	-70
Point 13	182	-70
Point 14	182	-50
Point 15	182	-7
Point 16	200	14.1
Point 17	200	-7
Point 18	200	-28.5
Point 19	182	-28.5
Point 20	201	3.6
Point 21	200.5	14.1
Point 22	200	-23.5
Point 23	199.1	-1.6
Point 24	201	-1.6
Point 25	201	0
Point 26	200	-3.5
Point 27	200	-50
Point 28	241.1	-7
Point 29	200	-70
Point 30	192.53	-7
Point 31	120	-4
Point 32	120	-7
Point 33	120	-50
Point 34	120	-70
Point 35	120	-28.5
Point 36	140	-3.7
Point 37	160	-4.2
Point 38	192.53	-3.5

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.49	(202.019, 194.882)	200.2497	(200, 14.1)	(236.693, -2.3426)
2	793	1.49	(202.019, 194.882)	200.25	(200, 14.1)	(236.693, -2.3426)

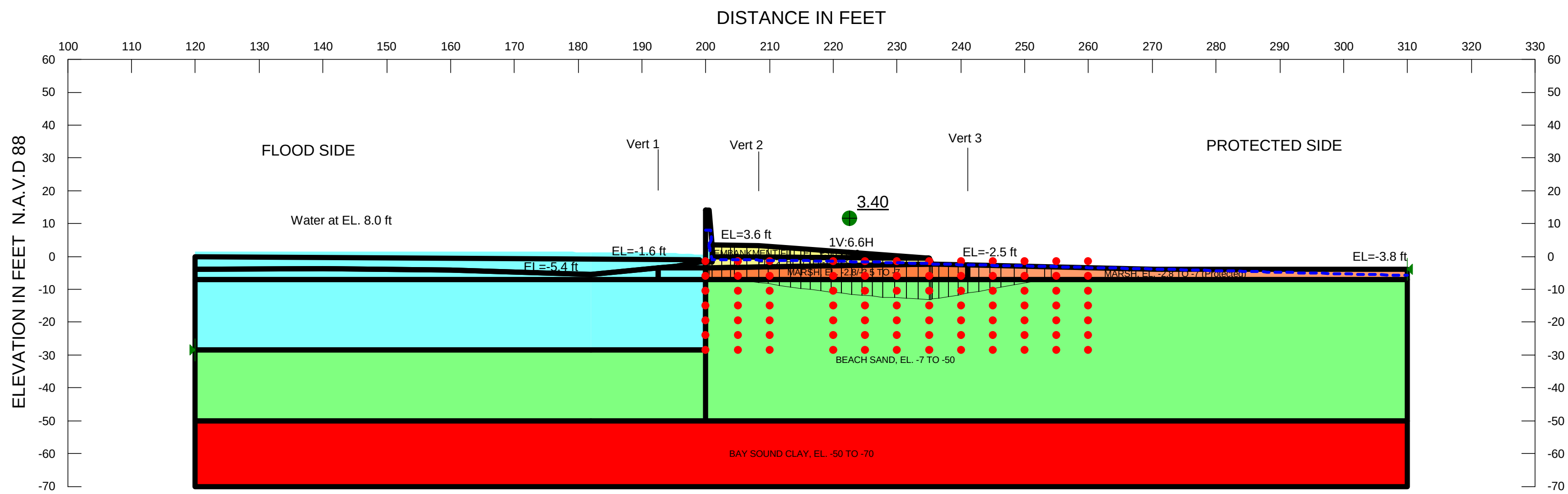
Slices of Slip Surface: Optimized

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	200.25	-5.359352	522.15964	-1696.8938	0	175.89
2	Optimized	200.75	-5.3631455	459.8908	381.01238	0	175.84
3	Optimized	201.60835	-5.3659785	459.5909	924.08042	0	175.71
4	Optimized	202.825	-5.3647795	458.65912	919.80041	0	175.49
5	Optimized	204.04165	-5.3561875	456.91358	914.66547	0	175.2
6	Optimized	205.25835	-5.340202	454.43638	908.7577	0	174.85
7	Optimized	206.475	-5.3168215	451.1951	902.16012	0	174.44
8	Optimized	207.69165	-5.286043	447.10822	894.79154	0	173.97
9	Optimized	208.9091	-5.2478355	442.31575	880.38179	0	173.44
10	Optimized	210.1273	-5.2021845	436.66163	858.85454	0	172.85
11	Optimized	211.34545	-5.149104	430.28114	836.56894	0	172.2
12	Optimized	212.5636	-5.088589	423.18305	813.44467	0	171.5
13	Optimized	213.7818	-5.0206325	415.36882	789.56706	0	170.75
14	Optimized	215	-4.945227	406.85677	764.89106	0	169.94
15	Optimized	216.2182	-4.8623635	397.59887	739.40271	0	169.07
16	Optimized	217.4364	-4.7720325	387.6632	713.09895	0	168.15
17	Optimized	218.65455	-4.6742245	377.043	685.96629	0	167.19
18	Optimized	219.8727	-4.5689285	365.74079	658.00146	0	166.16
19	Optimized	221.0909	-4.4561325	353.72565	629.18337	0	165.09
20	Optimized	222.3091	-4.335824	340.94361	599.51784	0	163.97
21	Optimized	223.5273	-4.207989	327.28297	568.97663	0	162.8
22	Optimized	224.74545	-4.072613	312.68988	537.56495	0	161.58
23	Optimized	225.9636	-3.929681	297.0615	505.2629	0	160.32
24	Optimized	227.1818	-3.779176	280.11734	472.06889	0	159
25	Optimized	228.4	-3.621081	261.5771	437.96363	0	157.64
26	Optimized	229.6182	-3.4553785	240.95896	402.9371	0	156.24
27	Optimized	230.8364	-3.282049	216.88959	366.98768	0	154.79
28	Optimized	232.05455	-3.1010725	187.73334	330.0896	0	153.29
29	Optimized	233.2727	-2.9124275	151.05064	292.24152	0	151.75
30	Optimized	234.4909	-2.7160925	95.332522	253.42623	0	150.17
31	Optimized	235.3	-2.582292	40.885866	148.16782	0	150
32	Optimized	236.0964	-2.4455915	13.314211	50.05056	0	150

Slices of Slip Surface: 793

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	793	200.25	-5.359352	522.15964	-1696.8938	0	175.89
2	793	200.75	-5.3631455	459.8908	381.01238	0	175.84
3	793	201.60835	-5.3659785	459.5909	924.08042	0	175.71
4	793	202.825	-5.3647795	458.65912	919.80041	0	175.49
5	793	204.04165	-5.3561875	456.91358	914.66547	0	175.2

6	793	205.25835	-5.340202	454.43638	908.7577	0	174.85
7	793	206.475	-5.3168215	451.1951	902.16012	0	174.44
8	793	207.69165	-5.286043	447.10822	894.79154	0	173.97
9	793	208.9091	-5.2478355	442.31575	880.38179	0	173.44
10	793	210.1273	-5.2021845	436.66163	858.85454	0	172.85
11	793	211.34545	-5.149104	430.28114	836.56894	0	172.2
12	793	212.5636	-5.088589	423.18305	813.44467	0	171.5
13	793	213.7818	-5.0206325	415.36882	789.56706	0	170.75
14	793	215	-4.945227	406.85677	764.89106	0	169.94
15	793	216.2182	-4.8623635	397.59887	739.40271	0	169.07
16	793	217.4364	-4.7720325	387.6632	713.09895	0	168.15
17	793	218.65455	-4.6742245	377.043	685.96629	0	167.19
18	793	219.8727	-4.5689285	365.74079	658.00146	0	166.16
19	793	221.0909	-4.4561325	353.72565	629.18337	0	165.09
20	793	222.3091	-4.335824	340.94361	599.51784	0	163.97
21	793	223.5273	-4.207989	327.28297	568.97663	0	162.8
22	793	224.74545	-4.072613	312.68988	537.56495	0	161.58
23	793	225.9636	-3.929681	297.0615	505.2629	0	160.32
24	793	227.1818	-3.779176	280.11734	472.06889	0	159
25	793	228.4	-3.621081	261.5771	437.96363	0	157.64
26	793	229.6182	-3.4553785	240.95896	402.9371	0	156.24
27	793	230.8364	-3.282049	216.88959	366.98768	0	154.79
28	793	232.05455	-3.1010725	187.73334	330.0896	0	153.29
29	793	233.2727	-2.9124275	151.05064	292.24152	0	151.75
30	793	234.4909	-2.7160925	95.332522	253.42623	0	150.17
31	793	235.3	-2.582292	40.885866	148.16782	0	150
32	793	236.0964	-2.4455915	13.314211	50.05056	0	150



Name: EMBANKMENT FILL, EL. +3.6 TO 0 Model: Undrained (Phi=0) Unit Weight: 110 pcf Cohesion: 580 psf
Name: FILL2, EL.0 TO -2.5/-3.5 Model: Undrained (Phi=0) Unit Weight: 94 pcf Cohesion: 400 psf
Name: BEACH SAND, EL. -7 TO -50 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand
Name: BAY SOUND CLAY, EL. -50 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 102 pcf Cohesion Spatial Fn: Bay Sound Phi: 0 °
Name: MARSH, EL. -2.8/-3.5 TO -7 Model: Spatial Mohr-Coulomb Weight Fn: Marsh Cohesion Spatial Fn: Marsh Phi: 0 °
Name: MARSH, EL. -2.8 TO -7 (Protected) Model: Spatial Mohr-Coulomb Unit Weight: 100 pcf Cohesion Fn: Marsh 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.

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 1D
REMEDIATION OF CANAL WALLS AND LEVEES
PROTECTED SIDE STABILITY ANALYSIS
CASE: GAP Stability (Block) 01
STA. 11+00 TO 14+20 WEST
ORLEANS PARISH, LOUISIANA

ETL 1110-2-575 ANALYSIS

Name: GAP Stability (Block) 01
File Name: Orleans Canal Reach 1D.gsz Directory: Y:\F&MHOME\Middleton\Outfall Canals\Orleans final edits\final\Appendix A and Appendix B\
Last Edited By: Reves, Ryan D MVK

GAP Stability (Block) 01

File Information

Created By: Liljegren, James
Revision Number: 616
Last Edited By: Reves, Ryan D MVK
Date: 6/5/2013
Time: 10:56:59 AM
File Name: Orleans Canal Reach 1D.gsz
Directory: Y:\F&MHOME\Middleton\Outfall Canals\Orleans final edits\final\Appendix A and Appendix B\
Last Solved Date: 6/5/2013
Last Solved Time: 11:13:56 AM

Project Settings

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

Analysis Settings

GAP Stability (Block) 01

Kind: SLOPE/W
Parent: Gap Analysis (seepage) 01 TWL
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: Search for Tension Crack
  - Percentage Wet: 1
  - Tension Crack Fluid Unit Weight: 62.4 pcf

FOS Distribution
- FOS Calculation Option: Constant

Restrict Block Crossing: No
Advanced
- Number of Slices: 30
- Optimization Tolerance: 0.01
- Minimum Slip Surface Depth: 0.1 ft
- Optimization Maximum Iterations: 4000
- Optimization Convergence Tolerance: 1e-007
- Starting Optimization Points: 8
- Ending Optimization Points: 16
- Complete Passes per Insertion: 1
- Driving Side Maximum Convex Angle: 5 °
- Resisting Side Maximum Convex Angle: 1 °

Materials

EMBANKMENT FILL, EL. +3.6 TO 0

Model: Undrained (Phi=0)
Unit Weight: 110 pcf
Cohesion: 580 psf

FILL2, EL.0 TO -2.5/-3.5

Model: Undrained (Phi=0)
Unit Weight: 94 pcf
Cohesion: 400 psf

BEACH SAND, EL. -7 TO -50

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

BAY SOUND CLAY, EL. -50 TO -70

Model: Spatial Mohr-Coulomb
Unit Weight: 102 pcf
Cohesion Spatial Fn: Bay Sound
Phi: 0 °
Phi-B: 0 °

MARSH, EL. -2.8/-3.5 TO -7

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

MARSH, EL. -2.8 TO -7 (Protected)

Model: Spatial Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion Fn: Marsh
Phi: 0 °
Phi-B: 0 °

Slip Surface Limits

Left Coordinate: (120, -28.5) ft
Right Coordinate: (310, -3.8) ft

Slip Surface Block

Left Grid
- Upper Left: (200, -1.5) ft
- Lower Left: (200, -28.5) ft
- Lower Right: (210, -28.5) ft
- X Increments: 2
- Y Increments: 6
- Starting Angle: 115 °
- Ending Angle: 135 °
- Angle Increments: 4

Right Grid
- Upper Left: (220, -1.5) ft
- Lower Left: (220, -28.5) ft
- Lower Right: (260, -28.5) ft
- X Increments: 8
- Y Increments: 6
- Starting Angle: 25 °
- Ending Angle: 45 °
- Angle Increments: 4

Cohesion Functions

Marsh

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

Y-Intercept: 150
Data Points: Y (ft), Cohesion (psf)
- Data Point: (-7, 180)
- Data Point: (-2.8, 150)

Shear/Normal Strength Functions

Sand

Model: Spline Data Point Function
Function: Shear Stress vs. Normal Stress
- Curve Fit to Data: 100 %
- Segment Curvature: 0 %

Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
- Data Point: (-10000, 0)
- Data Point: (0, 0)
- Data Point: (10000, 6494)

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

Unit Weight Functions

Marsh

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

Y-Intercept: 100
Data Points: X (ft), Unit Weight (pcf)
- Data Point: (192.5, 100)
- Data Point: (208.3, 94)
- Data Point: (241.1, 100)

Spatial Functions

Marsh

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
- Data Point: (192.53, -3.5, 150)
- Data Point: (192.53, -7, 180)
- Data Point: (200, -3.5, 160)
- Data Point: (200, -7, 190)
- Data Point: (241.1, -2.8, 150)

Data Point: (241.1, -7, 180)

Bay Sound

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (120, -50, 600)
Data Point: (120, -70, 770)
Data Point: (192.53, -50, 600)
Data Point: (192.53, -70, 770)
Data Point: (200, -50, 750)
Data Point: (200, -70, 925)
Data Point: (241.1, -50, 600)
Data Point: (241.1, -70, 770)
Data Point: (310, -50, 600)
Data Point: (310, -70, 770)

Regions

	Material	Points	Area (ft²)
Region 1	EMBANKMENT FILL, EL. +3.6 TO 0	20,4,5,25	71.595
Region 2	MARSH, EL. -2.8/-3.5 TO -7	6,7,28,17,26	171.31
Region 3		17,22,18,19,35,32,15,30	1720
Region 4	BEACH SAND, EL. -7 TO -50	19,35,33,14,27,11,10,28,17,22,18	6450
Region 5	BAY SOUND CLAY, EL. -50 TO -70	14,33,34,13,29,12,11,27	3800
Region 6		16,21,20,25,24,3	13.075
Region 7	FILL2, EL.0 TO -2.5/-3.5	26,3,24,25,5,6	90.54
Region 8		1,38,30,15,32,31,36,37	199.2515
Region 9	MARSH, EL. -2.8 TO -7 (Protected)	28,7,8,9,10	239.59
Region 10		30,38,26,17	26.145
Region 11		2,23,3,26,38	6.9625
Region 12		31,39,40,23,2,38,1,37,36	286.571

Points

	X (ft)	Y (ft)
Point 1	182	-5.4
Point 2	195.3	-3
Point 3	200	-1.6
Point 4	208.3	3.3
Point 5	235.1	-0.6
Point 6	235.5	-2.3
Point 7	241.1	-2.5
Point 8	270.5	-3.8
Point 9	310	-3.8
Point 10	310	-7
Point 11	310	-50
Point 12	310	-70
Point 13	182	-70
Point 14	182	-50
Point 15	182	-7
Point 16	200	14.1
Point 17	200	-7
Point 18	200	-28.5
Point 19	182	-28.5
Point 20	201	3.6
Point 21	200.5	14.1
Point 22	200	-23.5
Point 23	199.1	-1.6
Point 24	201	-1.6
Point 25	201	0
Point 26	200	-3.5
Point 27	200	-50
Point 28	241.1	-7
Point 29	200	-70
Point 30	192.53	-7
Point 31	120	-4
Point 32	120	-7
Point 33	120	-50
Point 34	120	-70
Point 35	120	-28.5
Point 36	140	-3.7
Point 37	160	-4.2
Point 38	192.53	-3.5
Point 39	120	0
Point 40	199	-1

Critical Slip Surfaces

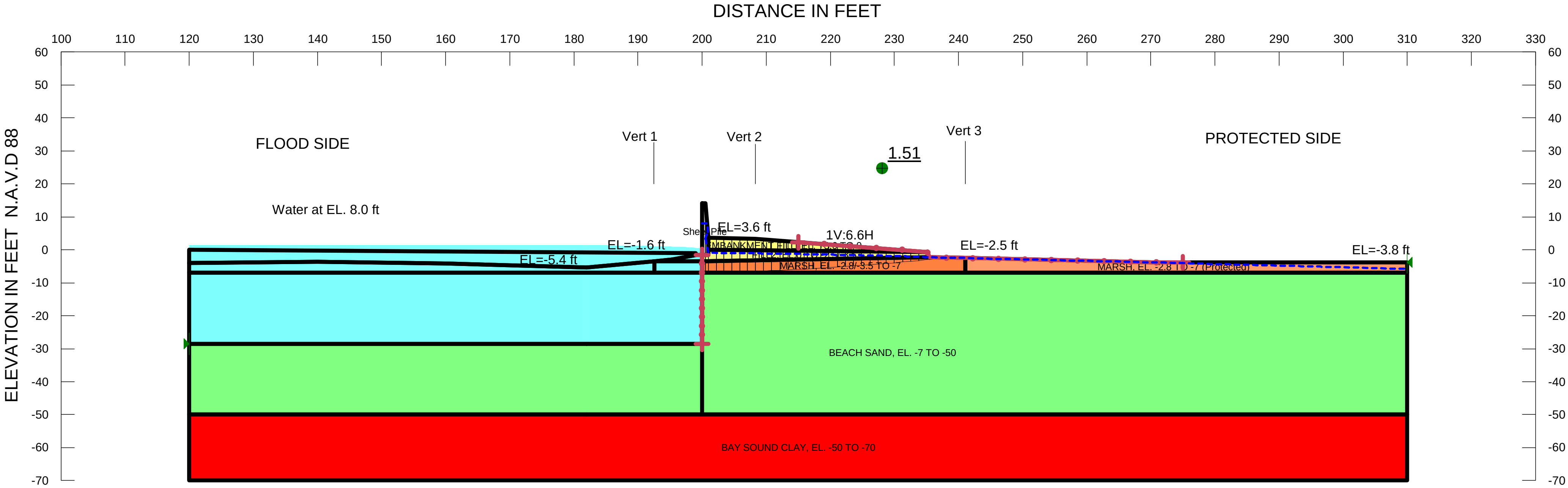
	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	3.40	(227.15, -6)	20.04238	(200, -1.6)	(254.197, -3.07913)
2	24721	3.66	(227.15, -6)	20.502	(200, -1.6)	(254.301, -3.0837)

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	-6.5134845	438.15016	257.70273	0	185.77
2	Optimized	200.75	-6.5792155	348.58081	649.3728	0	186.22
3	Optimized	201.7377	-6.709061	356.39334	1016.3275	0	187.1
4	Optimized	203.2131	-6.9030205	367.90464	1027.7514	0	188.4
5	Optimized	204.22965	-7.036655	375.67684	1032.9602	426.84479	-8.903e-005
6	Optimized	205.45635	-7.281931	390.08561	1036.763	419.95719	-8.7593e-005
7	Optimized	207.3521	-7.699173	414.32912	1075.8637	429.60561	-8.9604e-005
8	Optimized	209.0406	-8.070797	435.4772	1103.9236	434.09419	-9.0546e-005
9	Optimized	210.6638	-8.4994925	459.91521	1113.6999	424.57275	-8.8561e-005
10	Optimized	212.42895	-9.0308775	490.25038	1150.8052	428.9693	-8.9474e-005
11	Optimized	214.09215	-9.4952235	516.23712	1191.8846	438.77061	-9.1517e-005
12	Optimized	215.65345	-9.8925285	537.96812	1216.3405	440.54019	1.0949e-005
13	Optimized	217.2148	-10.289835	559.5005	1240.8585	442.47907	-9.229e-005
14	Optimized	218.8029	-10.66155	579.18039	1271.4055	449.53627	-9.3765e-005
15	Optimized	220.41775	-11.007665	597.01203	1289.2675	449.55594	-4.1296e-005
16	Optimized	222.03265	-11.35378	614.69231	1307.0688	449.63458	-9.3789e-005
17	Optimized	223.65935	-11.66805	630.18324	1331.2756	455.29472	-9.4969e-005
18	Optimized	225.2979	-11.950465	643.53509	1341.3196	453.14655	-9.452e-005
19	Optimized	226.93645	-12.23288	656.76665	1351.4237	451.11555	-9.409e-005
20	Optimized	228.6928	-12.471135	666.83366	1371.8782	457.86131	-9.5497e-005
21	Optimized	230.56705	-12.665225	673.67979	1367.951	450.86501	-9.4033e-005
22	Optimized	232.40315	-12.828365	678.62874	1368.4626	447.98332	-9.3434e-005
23	Optimized	234.20105	-12.96056	681.67963	1358.145	439.30176	-9.1622e-005
24	Optimized	235.19105	-13.033355	683.36294	1317.66	411.91732	-8.5912e-005
25	Optimized	235.39105	-13.012765	681.49176	1313.342	410.32832	-8.5573e-005
26	Optimized	236.0023	-12.85967	670.12221	1244.5541	373.0404	9.2703e-006
27	Optimized	237.2705	-12.477085	642.48815	1212	369.84535	-7.7134e-005
28	Optimized	238.8023	-11.963535	605.85147	1140.1379	346.96968	8.622e-006
29	Optimized	240.3341	-11.44999	569.2086	1068.2758	324.09804	8.0531e-006
30	Optimized	241.9622	-10.90416	530.23584	990.20244	298.7058	7.4221e-006
31	Optimized	243.69345	-10.309185	487.87649	906.76724	272.03084	6.7597e-006
32	Optimized	245.4316	-9.69735	444.40766	817.71314	242.42741	-8.1217e-006
33	Optimized	247.31315	-9.041135	397.74191	721.28757	210.11301	5.221e-006
34	Optimized	249.3381	-8.340545	347.83282	619.31324	176.30144	4.3806e-006
35	Optimized	251.7533	-7.47065	286.14089	496.10457	136.352	3.388e-006
36	Optimized	253.67655	-6.7158345	232.77675	444.26706	0	177.97

Slices of Slip Surface: 24721

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	24721	200.25	-6.0642855	410.36985	301.99548	0	181.93
2	24721	200.75	-6.192857	324.63885	599.94267	0	182.92
3	24721	201.7222	-6.442857	339.83378	974.56476	0	184.85
4	24721	203.16665	-6.8142855	362.38924	1002.7256	0	187.66
5	24721	204.99165	-7.2835715	390.56658	1033.6771	417.64083	-8.7126e-005
6	24721	207.1972	-7.8507145	423.96568	1088.6104	431.62531	-9.0041e-005
7	24721	209.19	-8.363143	453.55396	1130.1986	439.4182	-9.1669e-005
8	24721	210.97	-8.820857	479.54548	1158.6005	440.9835	-9.1995e-005
9	24721	212.75	-9.2785715	505.1779	1187.0024	442.782	-4.0684e-005
10	24721	214.53	-9.736286	530.46754	1215.4587	444.83844	1.1058e-005
11	24721	216.31	-10.194001	555.4688	1243.9694	447.11749	-9.3276e-005
12	24721	218.09	-10.651715	580.22522	1272.4801	449.55554	-9.3786e-005
13	24721	219.87	-11.10943	604.7096	1301.0452	452.2056	-9.4334e-005
14	24721	221.65	-11.567145	628.97633	1329.6103	454.99699	-9.4917e-005
15	24721	223.43	-12.024855	653.13424	1358.2298	457.89439	-9.5526e-005
16	24721	225.21	-12.48257	677.07452	1386.8493	460.93312	-9.616e-005
17	24721	226.99	-12.940285	700.90598	1415.5232	464.07785	-9.6818e-005
18	24721	228.77	-13.398	724.62861	1444.2515	467.32859	-9.7496e-005
19	24721	230.55	-13.855715	748.24243	1472.9799	470.64999	-9.8191e-005
20	24721	232.33	-14.31343	771.74743	1501.7626	474.0774	-9.8904e-005
21	24721	234.11	-14.771145	795.19802	1530.5998	477.57547	-4.388e-005
22	24721	235.05	-14.976685	805.27254	1765.2155	623.39428	-0.00012995
23	24721	235.3	-14.86011	797.25624	1656.1641	557.78126	1.3855e-005
24	24721	236.43335	-14.33163	760.86149	1489.9213	473.45697	-4.3469e-005
25	24721	238.3	-13.461185	700.89953	1367.5212	432.90918	-3.9746e-005
26	24721	240.16665	-12.59074	640.98611	1245.0726	392.29832	-8.1783e-005
27	24721	242.02135	-11.725895	581.35875	1121.5994	350.83638	8.714e-006
28	24721	243.86405	-10.866645	522.19	997.11386	308.41916	7.6607e-006
29	24721	245.7067	-10.007391	462.92781	872.57915	266.03069	-2.4425e-005
30	24721	247.54935	-9.148135	403.69512	748.09362	223.655	5.5552e-006
31	24721	249.39205	-8.288881	344.44276	623.60808	181.29208	4.5028e-006
32	24721	251.23475	-7.429627	285.17073	499.12255	138.94194	3.4508e-006
33	24721	253.22835	-6.5	220.41229	400.38424	0	176.43



Name: EMBANKMENT FILL, EL. +3.6 TO 0 Model: Undrained (Phi=0) Unit Weight: 110 pcf Cohesion: 580 psf
Name: FILL2, EL.0 TO -2.5/-3.5 Model: Undrained (Phi=0) Unit Weight: 94 pcf Cohesion: 400 psf
Name: BEACH SAND, EL. -7 TO -50 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand
Name: BAY SOUND CLAY, EL. -50 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 102 pcf Cohesion Spatial Fn: Bay Sound Phi: 0 °
Name: Sheet Pile Model: Undrained (Phi=0) Unit Weight: 0.1 pcf Cohesion: 0.01 psf
Name: MARSH, EL. -2.8/-3.5 TO -7 Model: Spatial Mohr-Coulomb Weight Fn: Marsh Cohesion Spatial Fn: Marsh Phi: 0 °
Name: MARSH, EL. -2.8 TO -7 (Protected) Model: Spatial Mohr-Coulomb Unit Weight: 100 pcf Cohesion Fn: Marsh 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.

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 1D
REMEDIATION OF CANAL WALLS AND LEVEES
PROTECTED SIDE STABILITY ANALYSIS
CASE: GAP Stability (Entry/Exit) 01
STA. 11+00 TO 14+20 WEST
ORLEANS PARISH, LOUISIANA

ETL 1110-2-575 ANALYSIS

Name: GAP Stability (Entry/Exit) 01
File Name: Orleans Canal Reach 1D.gsz Directory: Y:\F&MHOME\Middleton\Outfall Canals\Orleans final edits\final\Appendix A and Appendix B\
Last Edited By: Reves, Ryan D MVK

GAP Stability (Entry/Exit) 01

File Information

- Created By: Liljegren, James
- Revision Number: 616
- Last Edited By: Reves, Ryan D MVK
- Date: 6/5/2013
- Time: 10:56:59 AM
- File Name: Orleans Canal Reach 1D.gsz
- Directory: Y:\F&MHOME\Middleton\Outfall Canals\Orleans final edits\final\Appendix A and Appendix B\
- Last Solved Date: 6/5/2013
- Last Solved Time: 11:15:56 AM

Project Settings

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

Analysis Settings

GAP Stability (Entry/Exit) 01

- Kind: SLOPE/W
- Parent: Gap Analysis (seepage) 01 TWL
- 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: 4000
  - Optimization Convergence Tolerance: 1e-007
  - Starting Optimization Points: 8
  - Ending Optimization Points: 16
  - Complete Passes per Insertion: 1
  - Driving Side Maximum Convex Angle: 5 °
  - Resisting Side Maximum Convex Angle: 1 °

Materials

EMBANKMENT FILL, EL. +3.6 TO 0

- Model: Undrained (Phi=0)
- Unit Weight: 110 pcf
- Cohesion: 580 psf

FILL2, EL.0 TO -2.5/-3.5

- Model: Undrained (Phi=0)
- Unit Weight: 94 pcf
- Cohesion: 400 psf

BEACH SAND, EL. -7 TO -50

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

BAY SOUND CLAY, EL. -50 TO -70

- Model: Spatial Mohr-Coulomb
- Unit Weight: 102 pcf
- Cohesion Spatial Fn: Bay Sound
- Phi: 0 °
- Phi-B: 0 °

Sheet Pile

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

MARSH, EL. -2.8/-3.5 TO -7

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

MARSH, EL. -2.8 TO -7 (Protected)

- Model: Spatial Mohr-Coulomb
- Unit Weight: 100 pcf
- Cohesion Fn: Marsh
- Phi: 0 °
- Phi-B: 0 °

Slip Surface Entry and Exit

- Left Projection: Range
- Left-Zone Left Coordinate: (200, -28.5) ft
- Left-Zone Right Coordinate: (200, -1.5) ft
- Left-Zone Increment: 10
- Right Projection: Range
- Right-Zone Left Coordinate: (215, 2.325) ft
- Right-Zone Right Coordinate: (275, -3.8) ft
- Right-Zone Increment: 15
- Radius Increments: 10

Slip Surface Limits

- Left Coordinate: (120, -28.5) ft
- Right Coordinate: (310, -3.8) ft

Cohesion Functions

Marsh

- Model: Spline Data Point Function
- Function: Cohesion vs. Y
  - Curve Fit to Data: 100 %
  - Segment Curvature: 0 %
- Y-Intercept: 150
- Data Points: Y (ft), Cohesion (psf)
  - Data Point: (-7, 180)
  - Data Point: (-2.8, 150)

Shear/Normal Strength Functions

Sand

- Model: Spline Data Point Function
- Function: Shear Stress vs. Normal Stress
  - Curve Fit to Data: 100 %
  - Segment Curvature: 0 %
- Y-Intercept: 0
- Data Points: Normal Stress (psf), Shear Stress (psf)
  - Data Point: (-10000, 0)
  - Data Point: (0, 0)
  - Data Point: (10000, 6494)
- Estimation Properties
  - Intact Rock Param.: 10
  - Geological Strength: 100
  - Disturbance Factor: 0
  - SigmaC: 600000 psf
  - Sigma3: 300000 psf
  - Num. Points: 20

Unit Weight Functions

Marsh

- Model: Spline Data Point Function
- Function: Unit Weight vs. X
  - Curve Fit to Data: 100 %
  - Segment Curvature: 0 %
- Y-Intercept: 100
- Data Points: X (ft), Unit Weight (pcf)
  - Data Point: (192.5, 100)
  - Data Point: (208.3, 94)
  - Data Point: (241.1, 100)

Spatial Functions

Marsh

- Model: Linear Interpolation
- Limit Range By: Data Values
- Data Points: X (ft), Y (ft), Cohesion (psf)
  - Data Point: (192.53, -3.5, 150)
  - Data Point: (192.53, -7, 180)
  - Data Point: (200, -3.5, 160)
  - Data Point: (200, -7, 190)
  - Data Point: (241.1, -2.8, 150)
  - Data Point: (241.1, -7, 180)

Bay Sound

- Model: Linear Interpolation
- Limit Range By: Data Values
- Data Points: X (ft), Y (ft), Cohesion (psf)

Data Point: (120, -50, 600)
Data Point: (120, -70, 770)
Data Point: (192.53, -50, 600)
Data Point: (192.53, -70, 770)
Data Point: (200, -50, 750)
Data Point: (200, -70, 925)
Data Point: (241.1, -50, 600)
Data Point: (241.1, -70, 770)
Data Point: (310, -50, 600)
Data Point: (310, -70, 770)

Regions

	Material	Points	Area (ft²)
Region 1	EMBANKMENT FILL, EL. +3.6 TO 0	20,4,5,25	71.595
Region 2	MARSH, EL. -2.8/-3.5 TO -7	6,7,28,17,26	171.31
Region 3		17,22,18,19,35,32,15,30	1720
Region 4	BEACH SAND, EL. -7 TO -50	19,35,33,14,27,11,10,28,17,22,18	6450
Region 5	BAY SOUND CLAY, EL. -50 TO -70	14,33,34,13,29,12,11,27	3800
Region 6	Sheet Pile	16,21,20,25,24,3	13.075
Region 7	FILL2, EL.0 TO -2.5/-3.5	26,3,24,25,5,6	90.54
Region 8		1,38,30,15,32,31,36,37	199.2515
Region 9	MARSH, EL. -2.8 TO -7 (Protected)	28,7,8,9,10	239.59
Region 10		30,38,26,17	26.145
Region 11		2,23,3,26,38	6.9625
Region 12		31,39,40,23,2,38,1,37,36	286.571

Points

	X (ft)	Y (ft)
Point 1	182	-5.4
Point 2	195.3	-3
Point 3	200	-1.6
Point 4	208.3	3.3
Point 5	235.1	-0.6
Point 6	235.5	-2.3
Point 7	241.1	-2.5
Point 8	270.5	-3.8
Point 9	310	-3.8
Point 10	310	-7
Point 11	310	-50
Point 12	310	-70
Point 13	182	-70
Point 14	182	-50
Point 15	182	-7
Point 16	200	14.1
Point 17	200	-7
Point 18	200	-28.5
Point 19	182	-28.5
Point 20	201	3.6
Point 21	200.5	14.1
Point 22	200	-23.5
Point 23	199.1	-1.6
Point 24	201	-1.6
Point 25	201	0
Point 26	200	-3.5
Point 27	200	-50
Point 28	241.1	-7
Point 29	200	-70
Point 30	192.53	-7
Point 31	120	-4
Point 32	120	-7
Point 33	120	-50
Point 34	120	-70
Point 35	120	-28.5
Point 36	140	-3.7
Point 37	160	-4.2
Point 38	192.53	-3.5
Point 39	120	0
Point 40	199	-1

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.51	(193.722, 209.183)	216.1738	(200, 14.1)	(238.076, -2.39201)
2	1475	1.51	(193.722, 209.183)	216.174	(200, 14.1)	(238.076, -2.39201)

Slices of Slip Surface: Optimized

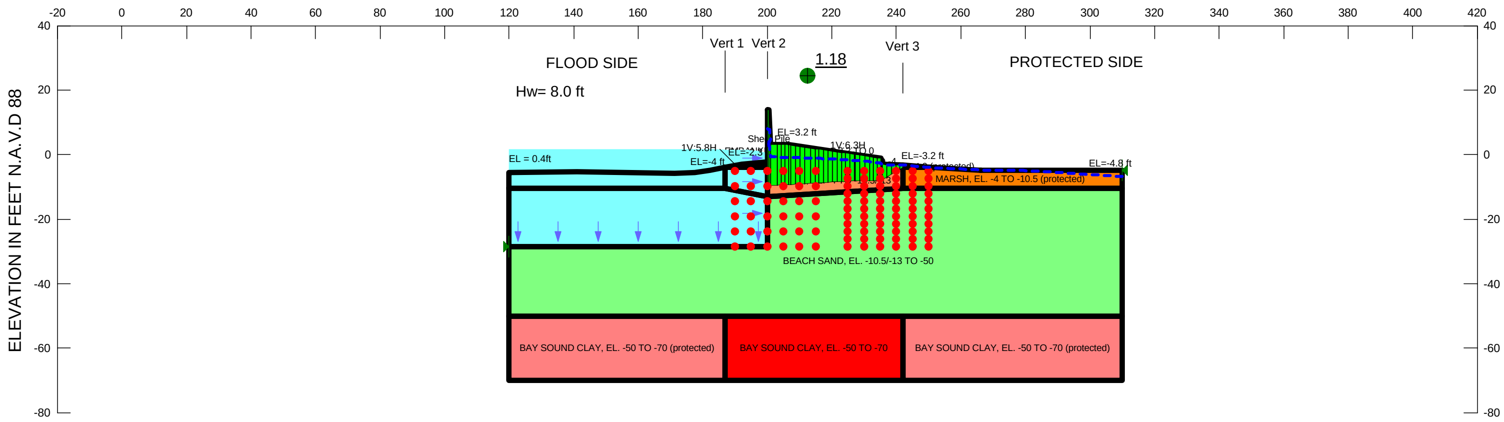
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	200.25	-6.8924475	461.58942	-1963.7441	0	189.02
2	Optimized	200.75	-6.8767635	367.00593	536.45632	0	188.77
3	Optimized	201.60835	-6.846425	364.98431	1079.6097	0	188.3
4	Optimized	202.825	-6.7985795	361.56115	1070.0088	0	187.61
5	Optimized	204.04165	-6.743868	357.45512	1059.7223	0	186.86
6	Optimized	205.25835	-6.6822855	352.71581	1048.7499	0	186.07
7	Optimized	206.475	-6.613826	347.29555	1037.095	0	185.22
8	Optimized	207.69165	-6.5384825	341.25236	1024.7577	0	184.32
9	Optimized	208.9381	-6.4540635	334.39271	1005.187	0	183.34
10	Optimized	210.2143	-6.3602155	326.67641	978.2635	0	182.29
11	Optimized	211.4905	-6.258767	318.29182	950.54911	0	181.19
12	Optimized	212.7667	-6.149707	309.26371	921.96832	0	180.03
13	Optimized	214.0429	-6.0330245	299.6023	892.605	0	178.83
14	Optimized	215.31905	-5.9087065	289.3092	862.30622	0	177.57
15	Optimized	216.5952	-5.77674	278.40221	831.15487	0	176.26
16	Optimized	217.8714	-5.6371115	266.86829	799.15654	0	174.9
17	Optimized	219.1476	-5.4898055	254.7564	766.26125	0	173.5
18	Optimized	220.4238	-5.3348055	242.06109	732.46612	0	172.05
19	Optimized	221.7	-5.172096	228.77744	697.76188	0	170.55
20	Optimized	222.9762	-5.001659	214.92362	662.13834	0	169
21	Optimized	224.2524	-4.8234755	200.49476	625.58616	0	167.41
22	Optimized	225.5286	-4.637527	185.48588	588.08758	0	165.78
23	Optimized	226.8048	-4.443793	169.85403	549.63478	0	164.1
24	Optimized	228.08095	-4.242252	153.59479	510.21876	0	162.37
25	Optimized	229.3571	-4.032882	136.70394	469.83092	0	160.6
26	Optimized	230.6333	-3.8156595	119.03852	428.44757	0	158.79
27	Optimized	231.9095	-3.590561	100.55677	386.06921	0	156.94
28	Optimized	233.1857	-3.3575615	81.016762	342.67255	0	155.05
29	Optimized	234.4619	-3.1166345	59.81334	298.25868	0	153.11
30	Optimized	235.3	-2.9549875	44.493478	189.05558	0	151.82
31	Optimized	236.1441	-2.7868845	30.571452	86.90443	0	150.49
32	Optimized	237.4323	-2.524997	10.15306	55.880222	0	150

Slices of Slip Surface: 1475

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	1475	200.25	-6.8924475	461.58942	-1963.7441	0	189.02
2	1475	200.75	-6.8767635	367.00593	536.45632	0	188.77
3	1475	201.60835	-6.846425	364.98431	1079.6097	0	188.3
4	1475	202.825	-6.7985795	361.56115	1070.0088	0	187.61
5	1475	204.04165	-6.743868	357.45512	1059.7223	0	186.86

6	1475	205.25835	-6.6822855	352.71581	1048.7499	0	186.07
7	1475	206.475	-6.613826	347.29555	1037.095	0	185.22
8	1475	207.69165	-6.5384825	341.25236	1024.7577	0	184.32
9	1475	208.9381	-6.4540635	334.39271	1005.187	0	183.34
10	1475	210.2143	-6.3602155	326.67641	978.2635	0	182.29
11	1475	211.4905	-6.258767	318.29182	950.54911	0	181.19
12	1475	212.7667	-6.149707	309.26371	921.96832	0	180.03
13	1475	214.0429	-6.0330245	299.6023	892.605	0	178.83
14	1475	215.31905	-5.9087065	289.3092	862.30622	0	177.57
15	1475	216.5952	-5.77674	278.40221	831.15487	0	176.26
16	1475	217.8714	-5.6371115	266.86829	799.15654	0	174.9
17	1475	219.1476	-5.4898055	254.7564	766.26125	0	173.5
18	1475	220.4238	-5.3348055	242.06109	732.46612	0	172.05
19	1475	221.7	-5.172096	228.77744	697.76188	0	170.55
20	1475	222.9762	-5.001659	214.92362	662.13834	0	169
21	1475	224.2524	-4.8234755	200.49476	625.58616	0	167.41
22	1475	225.5286	-4.637527	185.48588	588.08758	0	165.78
23	1475	226.8048	-4.443793	169.85403	549.63478	0	164.1
24	1475	228.08095	-4.242252	153.59479	510.21876	0	162.37
25	1475	229.3571	-4.032882	136.70394	469.83092	0	160.6
26	1475	230.6333	-3.8156595	119.03852	428.44757	0	158.79
27	1475	231.9095	-3.590561	100.55677	386.06921	0	156.94
28	1475	233.1857	-3.3575615	81.016762	342.67255	0	155.05
29	1475	234.4619	-3.1166345	59.81334	298.25868	0	153.11
30	1475	235.3	-2.9549875	44.493478	189.05558	0	151.82
31	1475	236.1441	-2.7868845	30.571452	86.90443	0	150.49
32	1475	237.4323	-2.524997	10.15306	55.880222	0	150

DISTANCE IN FEET



Name: EMBANKMENT FILL, EL. +3.2 TO 0 Model: Undrained (Phi=0) Unit Weight: 114 pcf Cohesion: 700 psf
Name: Fill, EL. -3.2 to -4.0 (protected) Model: Spatial Mohr-Coulomb Unit Weight: 104 pcf Cohesion Fn: Fill Phi: 0 °
Name: BEACH SAND, EL. -10.5/-13 TO -50 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand
Name: BAY SOUND CLAY, EL. -50 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 102 pcf Cohesion Spatial Fn: Bay Sound Phi: 0 °
Name: Sheet Pile Model: Undrained (Phi=0) Unit Weight: 0.1 pcf Cohesion: 0.01 psf
Name: MARSH, EL. -4 TO -10.5/-13 Model: Spatial Mohr-Coulomb Weight Fn: Marsh Cohesion Fn: Marsh Phi: 0 °
Name: EMBANKMENT FILL, EL. 0 TO -4 Model: Spatial Mohr-Coulomb Unit Weight: 104 pcf Cohesion: 400 psf Phi: 0 °
Name: MARSH, EL. -4 TO -10.5 (protected) Model: Undrained (Phi=0) Unit Weight: 83 pcf Cohesion: 150 psf
Name: BAY SOUND CLAY, EL. -50 TO -70 (protected) Model: Spatial Mohr-Coulomb Unit Weight: 102 pcf Cohesion Fn: Clay 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 VERTICALSWERE ASSUMED TO VARY LINEARLY BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

Hw IS CANAL WATER LEVEL

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 2,
PROTECTED SIDE STABILITY ANALYSIS,
CASE: GAP P/S Stability Analysis Block Analysis
STA. 14+20 TO 21+75 WEST
ORLEANS PARISH, LOUISIANA

Name: GAP P/S Stability Analysis Block Analysis
File Name: Orleans Canal Reach 2.gsz Directory: Y:\F&MHOME\Middleton\Outfall Canals\Orleans final edits\final\Appendix A and Appendix B\
Last Edited By: Castro, Felix R MVR

GAP P/S Stability Analysis Block Analysis

File Information

Created By: Moraille, Jacques
Revision Number: 475
Last Edited By: Castro, Felix R MVR
Date: 6/4/2013
Time: 4:25:51 PM
File Name: Orleans Canal Reach 2.gsz
Directory: Y:\F&MHOME\Middleton\Outfall Canals\Orleans final edits\final\Appendix A and Appendix B\
Last Solved Date: 6/4/2013
Last Solved Time: 4:28:34 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 P/S Stability Analysis Block Analysis

Description: Block Analysis
Kind: SLOPE/W
Parent: 1 - Global Stability Analysis 8ft
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: 16
- Complete Passes per Insertion: 1
- Driving Side Maximum Convex Angle: 5 °
- Resisting Side Maximum Convex Angle: 1 °

Materials

EMBANKMENT FILL, EL. +3.2 TO 0

Model: Undrained (Phi=0)
Unit Weight: 114 pcf
Cohesion: 700 psf

Fill, EL. -3.2 to -4.0 (protected)

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

BEACH SAND, EL. -10.5/-13 TO -50

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

BAY SOUND CLAY, EL. -50 TO -70

Model: Spatial Mohr-Coulomb
Unit Weight: 102 pcf
Cohesion Spatial Fn: Bay Sound
Phi: 0 °
Phi-B: 0 °

Sheet Pile

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

MARSH, EL. -4 TO -10.5/-13

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

EMBANKMENT FILL, EL. 0 TO -4

Model: Spatial Mohr-Coulomb
Unit Weight: 104 pcf
Cohesion: 400 psf
Phi: 0 °
Phi-B: 0 °

MARSH, EL. -4 TO -10.5 (protected)

Model: Undrained (Phi=0)
Unit Weight: 83 pcf
Cohesion: 150 psf

BAY SOUND CLAY, EL. -50 TO -70 (protected)

Model: Spatial Mohr-Coulomb
Unit Weight: 102 pcf
Cohesion Fn: Clay
Phi: 0 °
Phi-B: 0 °

Slip Surface Limits

Left Coordinate: (120, -28.5) ft
Right Coordinate: (310, -4.8) ft

Slip Surface Block

Left Grid
- Upper Left: (190, -5) ft
- Lower Left: (190, -28.5) ft
- Lower Right: (215, -28.5) ft
- X Increments: 5
- Y Increments: 5
- Starting Angle: 115 °
- Ending Angle: 135 °
- Angle Increments: 4

Right Grid
- Upper Left: (225, -5) ft
- Lower Left: (225, -28.5) ft
- Lower Right: (250, -28.5) ft
- X Increments: 5
- Y Increments: 10
- Starting Angle: 25 °
- Ending Angle: 45 °
- Angle Increments: 4

Cohesion Functions

Clay

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

Y-Intercept: 555
Data Points: X (ft), Cohesion (psf)
- Data Point: (186.9, 555)
- Data Point: (200, 725)
- Data Point: (242, 555)

Marsh

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

Y-Intercept: 150
Data Points: X (ft), Cohesion (psf)
- Data Point: (186.9, 150)
- Data Point: (200, 200)
- Data Point: (242, 150)

Fill

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

Y-Intercept: 150
Data Points: X (ft), Cohesion (psf)
- Data Point: (186.9, 150)
- Data Point: (200, 400)
- Data Point: (242, 150)

Shear/Normal Strength Functions

Sand

Model: Spline Data Point Function
Function: Shear Stress vs. Normal Stress

Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
Data Point: (-10000, 0)
Data Point: (0, 0)
Data Point: (10000, 6494)
Estimation Properties
Intact Rock Param.: 10
Geological Strength: 100
Disturbance Factor: 0
SigmaC: 600000 psf
Sigma3: 300000 psf
Num. Points: 20

Unit Weight Functions

Marsh

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 83
Data Points: X (ft), Unit Weight (pcf)
Data Point: (186.9, 83)
Data Point: (200, 93)
Data Point: (242, 83)

Spatial Functions

Bay Sound

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (186.9, -50, 555)
Data Point: (186.9, -70, 725)
Data Point: (200, -50, 700)
Data Point: (200, -70, 865)
Data Point: (242, -50, 555)
Data Point: (242, -70, 725)

Regions

	Material	Points	Area (ft²)
Region 1	BEACH SAND, EL. -10.5/-13 TO -50	18,14,35,43,33,11,10,32,22,21,17	6012.5
Region 2	Sheet Pile	16,20,19,29,28,3,45,4	13.525
Region 3	MARSH, EL. -4 TO -10.5/-13	22,30,40,32	325.5
Region 4	EMBANKMENT FILL, EL. 0 TO -4	29,28,3,30,40,7,6,5,39	139.76
Region 5	BAY SOUND CLAY, EL. -50 TO -70 (protected)	13,14,35,36	1338
Region 6	BAY SOUND CLAY, EL. -50 TO -70 (protected)	33,11,12,37	1360
Region 7	MARSH, EL. -4 TO -10.5 (protected)	8,9,10,32,40,41	400.61714
Region 8	EMBANKMENT FILL, EL. +3.2 TO 0	29,19,38,39	47.8
Region 9		15,1,23,24,25,2,31,34	339.72
Region 10		31,26,47,3,30	13.265015
Region 11		18,17,21,22,34,15	1423.625
Region 12		31,30,22,34	101.525
Region 13	BAY SOUND CLAY, EL. -50 TO -70	36,35,43,33,37,42	1102
Region 14	Fill, EL. -3.2 to -4.0 (protected)	40,7,41	3.337144

Points

	X (ft)	Y (ft)
Point 1	120	-5.5
Point 2	182.2	-4.9
Point 3	200	-2.3
Point 4	200	3.5
Point 5	235.2	-1.2
Point 6	235.6	-3.1
Point 7	242	-3.2
Point 8	266.2	-4.8
Point 9	310	-4.8
Point 10	310	-10.5
Point 11	310	-50
Point 12	310	-70
Point 13	120	-70
Point 14	120	-50
Point 15	120	-10.5
Point 16	200	13.9
Point 17	200	-28.5
Point 18	120	-28.5
Point 19	201	3.2
Point 20	200.5	13.9
Point 21	200	-23.5
Point 22	200	-13
Point 23	141	-5.4
Point 24	171.3	-5.7
Point 25	177.6	-5.5
Point 26	192.1	-3
Point 27	198.9	-2.3
Point 28	201	-2.3
Point 29	201	0
Point 30	200	-4
Point 31	186.9	-4
Point 32	242	-10.5
Point 33	242	-50
Point 34	186.9	-10.5
Point 35	186.9	-50
Point 36	186.9	-70
Point 37	242	-70
Point 38	206.5	3
Point 39	227	0
Point 40	242	-4
Point 41	250.34286	-4
Point 42	200	-70
Point 43	200	-50
Point 44	120	0
Point 45	200	0
Point 46	199	0
Point 47	199.5	-2.3443

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.18	(221.094, -1.764)	17.3306	(200, 13.9)	(242.997, -3.29562)
2	1301	1.20	(221.094, -1.764)	17.354	(200, 13.9)	(243.576, -3.35109)

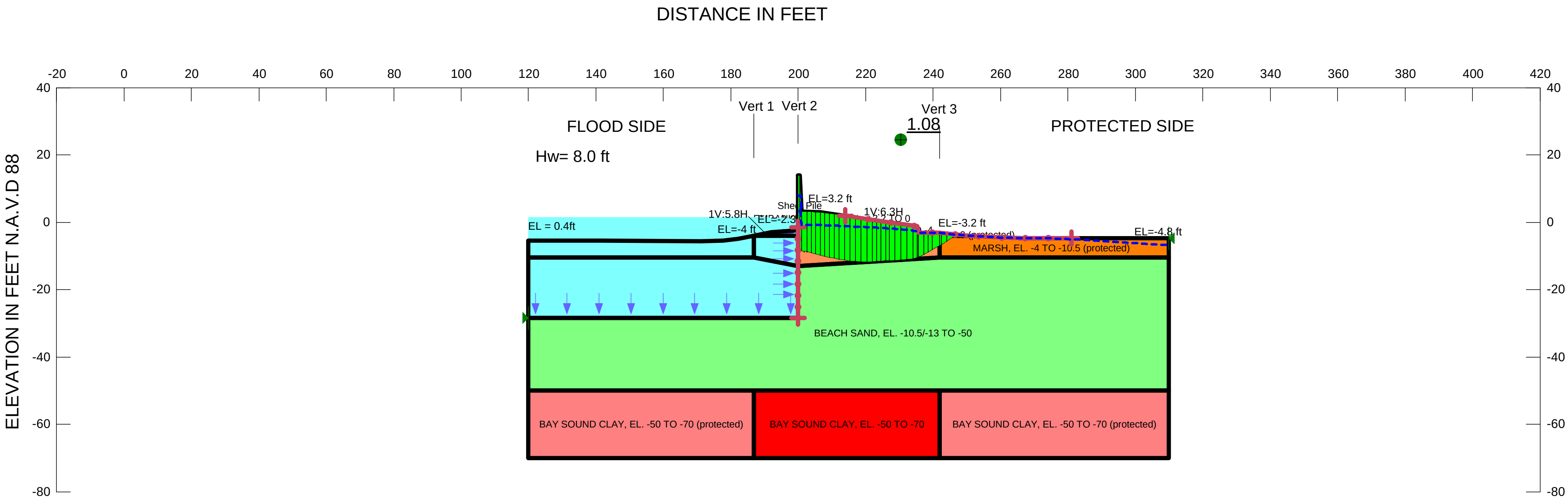
Slices of Slip Surface: Optimized

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	200.25	-9.6818575	650.35139	-2957.049	0	199.7
2	Optimized	200.75	-9.6429245	556.99398	757.56685	0	199.11
3	Optimized	202.04985	-9.541709	549.64256	1353.3571	0	197.56
4	Optimized	203.6573	-9.42618	540.73431	1325.9461	0	195.65
5	Optimized	204.7725	-9.35862	535.10436	1313.2362	0	194.32
6	Optimized	205.91505	-9.298693	529.67538	1294.578	0	192.96
7	Optimized	206.90005	-9.254663	525.21509	1279.8887	0	191.79
8	Optimized	208.00045	-9.2173135	520.8175	1249.4995	0	190.48
9	Optimized	209.40115	-9.17838	515.47208	1220.453	0	188.81
10	Optimized	210.8018	-9.1394465	509.81979	1191.3351	0	187.14
11	Optimized	212.49215	-9.037805	499.1698	1172.2908	0	185.13
12	Optimized	214.11705	-8.9043035	486.34743	1129.3993	0	183.19
13	Optimized	215.38675	-8.80165	476.24431	1096.7427	0	181.68

14	Optimized	216.65645	-8.6989965	465.99988	1064.0862	0	180.17
15	Optimized	218.0422	-8.6001125	455.48486	1023.6481	0	178.52
16	Optimized	219.54405	-8.5049975	444.65961	987.76327	0	176.73
17	Optimized	220.95785	-8.42688	435.04371	949.3411	0	175.05
18	Optimized	222.28355	-8.36576	426.64967	919.87905	0	173.47
19	Optimized	223.60925	-8.30464	418.14259	890.49235	0	171.89
20	Optimized	224.9541	-8.254516	410.13528	856.35701	0	170.29
21	Optimized	226.31805	-8.215388	402.63071	828.36143	0	168.67
22	Optimized	227.0858	-8.193362	398.35621	812.75196	0	167.75
23	Optimized	227.91895	-8.1825035	394.46538	792.94465	0	166.76
24	Optimized	229.4137	-8.16571	387.54141	766.92124	0	164.98
25	Optimized	230.90845	-8.1489165	380.43682	740.89783	0	163.2
26	Optimized	232.22625	-8.10285	372.03343	730.3617	0	161.64
27	Optimized	233.3671	-8.02751	362.4127	704.86677	0	160.28
28	Optimized	234.56875	-7.9055535	349.45335	692.51575	0	158.85
29	Optimized	235.3039	-7.8073935	339.99016	620.57495	0	157.97
30	Optimized	235.5039	-7.742329	334.93933	615.518	0	157.73
31	Optimized	236.3375	-7.2982835	302.68289	518.32163	0	156.74
32	Optimized	237.8125	-6.5125745	245.31166	439.85804	0	154.99
33	Optimized	239.1697	-5.745915	189.65483	379.93836	0	153.37
34	Optimized	240.4091	-4.998305	135.85562	305.68895	0	151.89
35	Optimized	241.5144	-4.2966745	85.586497	250.43587	0	150.58
36	Optimized	242.4986	-3.632237	31.434403	171.69989	0	150

Slices of Slip Surface: 1301

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	1301	200.25	-9.6832145	650.43548	-2965.1237	0	199.7
2	1301	200.75	-9.649643	557.4249	753.84265	0	199.11
3	1301	201.6875	-9.5866965	552.79168	1354.1872	0	197.99
4	1301	203.0625	-9.494375	545.70944	1337.5701	0	196.35
5	1301	204.4375	-9.4020535	538.31518	1321.0255	0	194.72
6	1301	205.8125	-9.309732	530.52182	1304.5535	0	193.08
7	1301	207.23215	-9.214413	522.10335	1278.2923	0	191.39
8	1301	208.69645	-9.116097	513.04764	1242.2466	0	189.65
9	1301	210.16075	-9.0177805	503.65124	1206.3372	0	187.9
10	1301	211.625	-8.919464	493.9414	1170.496	0	186.16
11	1301	213.08925	-8.821148	483.95219	1134.6547	0	184.42
12	1301	214.55355	-8.7228315	473.70404	1098.9498	0	182.67
13	1301	216.01785	-8.624515	463.24467	1063.2448	0	180.93
14	1301	217.48215	-8.526199	452.5945	1027.6761	0	179.19
15	1301	218.94645	-8.4278825	441.76036	992.17557	0	177.44
16	1301	220.41075	-8.329566	430.7695	956.67502	0	175.7
17	1301	221.875	-8.23125	419.62192	921.31075	0	173.96
18	1301	223.33925	-8.132934	408.32444	886.01462	0	172.22
19	1301	224.80355	-8.0346175	396.89067	850.78663	0	170.47
20	1301	226.26785	-7.936301	385.29337	815.55864	0	168.73
21	1301	227.66665	-7.842381	374.0604	783.03719	0	167.06
22	1301	229	-7.752857	363.18737	753.10457	0	165.48
23	1301	230.33335	-7.663333	352.12727	723.22434	0	163.89
24	1301	231.66665	-7.5738095	340.86513	693.40397	0	162.3
25	1301	233	-7.484286	329.39345	663.64347	0	160.71
26	1301	234.33335	-7.394762	317.74218	633.94284	0	159.13
27	1301	235.1	-7.303369	308.4709	721.46626	0	158.21
28	1301	235.4	-7.1634765	298.12992	598.07246	0	157.86
29	1301	236.4	-6.697169	263.53726	443.70555	0	156.67
30	1301	238	-5.951077	207.98061	369.93778	0	154.76
31	1301	239.6	-5.204985	152.63353	296.79309	0	152.86
32	1301	241.2	-4.4588925	97.439398	224.27148	0	150.95
33	1301	242.09205	-4.042923	66.602701	183.33096	0	150
34	1301	242.8799	-3.6755465	32.429687	133.83091	0	150



Name: EMBANKMENT FILL, EL. +3.2 TO 0 Model: Undrained (Phi=0) Unit Weight: 114 pcf Cohesion: 700 psf
Name: Fill, EL. -3.2 to -4.0 (protected) Model: Spatial Mohr-Coulomb Unit Weight: 104 pcf Cohesion Fn: Fill Phi: 0 °
Name: BEACH SAND, EL. -10.5/-13 TO -50 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand
Name: BAY SOUND CLAY, EL. -50 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 102 pcf Cohesion Spatial Fn: Bay Sound Phi: 0 °
Name: Sheet Pile Model: Undrained (Phi=0) Unit Weight: 0.1 pcf Cohesion: 0.01 psf
Name: MARSH, EL. -4 TO -10.5/-13 Model: Spatial Mohr-Coulomb Weight Fn: Marsh Cohesion Fn: Marsh Phi: 0 °
Name: EMBANKMENT FILL, EL. 0 TO -4 Model: Spatial Mohr-Coulomb Unit Weight: 104 pcf Cohesion: 400 psf Phi: 0 °
Name: MARSH, EL. -4 TO -10.5 (protected) Model: Undrained (Phi=0) Unit Weight: 83 pcf Cohesion: 150 psf
Name: BAY SOUND CLAY, EL. -50 TO -70 (protected) Model: Spatial Mohr-Coulomb Unit Weight: 102 pcf Cohesion Fn: Clay 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 VERTICALSWERE ASSUMED TO VARY LINEARLY BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

Hw IS CANAL WATER LEVEL

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 2,
PROTECTED SIDE STABILITY ANALYSIS,
CASE: GAP P/S Stability Analysis Entry Exit
STA. 14+20 TO 21+75 WEST
ORLEANS PARISH, LOUISIANA

Name: GAP P/S Stability Analysis Entry Exit
File Name: Orleans Canal Reach 2.gsz Directory: Y:\F&MHOME\Middleton\Outfall Canals\Orleans final edits\final\Appendix A and Appendix B\
Last Edited By: Castro, Felix R MVR

GAP P/S Stability Analysis Entry Exit

File Information

Created By: Moraille, Jacques
Revision Number: 475
Last Edited By: Castro, Felix R MVR
Date: 6/4/2013
Time: 4:25:51 PM
File Name: Orleans Canal Reach 2.gsz
Directory: Y:\F&MHOME\Middleton\Outfall Canals\Orleans final edits\final\Appendix A and Appendix B\
Last Solved Date: 6/4/2013
Last Solved Time: 4:29:14 PM

Project Settings

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

Analysis Settings

GAP P/S Stability Analysis Entry Exit

Kind: SLOPE/W
Parent: 1 - Global Stability Analysis 8ft
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: 4000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

EMBANKMENT FILL, EL. +3.2 TO 0

Model: Undrained (Phi=0)
Unit Weight: 114 pcf
Cohesion: 700 psf

Fill, EL. -3.2 to -4.0 (protected)

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

BEACH SAND, EL. -10.5/-13 TO -50

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

BAY SOUND CLAY, EL. -50 TO -70

Model: Spatial Mohr-Coulomb
Unit Weight: 102 pcf
Cohesion Spatial Fn: Bay Sound
Phi: 0 °
Phi-B: 0 °

Sheet Pile

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

MARSH, EL. -4 TO -10.5/-13

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

EMBANKMENT FILL, EL. 0 TO -4

Model: Spatial Mohr-Coulomb
Unit Weight: 104 pcf
Cohesion: 400 psf
Phi: 0 °
Phi-B: 0 °

MARSH, EL. -4 TO -10.5 (protected)

Model: Undrained (Phi=0)
Unit Weight: 83 pcf
Cohesion: 150 psf

BAY SOUND CLAY, EL. -50 TO -70 (protected)

Model: Spatial Mohr-Coulomb
Unit Weight: 102 pcf
Cohesion Fn: Clay
Phi: 0 °
Phi-B: 0 °

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (200, -28.5) ft
Left-Zone Right Coordinate: (200, -1.5) ft
Left-Zone Increment: 8
Right Projection: Range
Right-Zone Left Coordinate: (213.97165, 1.90659) ft
Right-Zone Right Coordinate: (281.1, -4.8) ft
Right-Zone Increment: 10
Radius Increments: 10

Slip Surface Limits

Left Coordinate: (120, -28.5) ft
Right Coordinate: (310, -4.8) ft

Cohesion Functions

Clay

Model: Spline Data Point Function
Function: Cohesion vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 555
Data Points: X (ft), Cohesion (psf)
Data Point: (186.9, 555)
Data Point: (200, 725)
Data Point: (242, 555)

Marsh

Model: Spline Data Point Function
Function: Cohesion vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 150
Data Points: X (ft), Cohesion (psf)
Data Point: (186.9, 150)
Data Point: (200, 200)
Data Point: (242, 150)

Fill

Model: Spline Data Point Function
Function: Cohesion vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 150
Data Points: X (ft), Cohesion (psf)
Data Point: (186.9, 150)
Data Point: (200, 400)
Data Point: (242, 150)

Shear/Normal Strength Functions

Sand

Model: Spline Data Point Function
Function: Shear Stress vs. Normal Stress
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
Data Point: (-10000, 0)
Data Point: (0, 0)
Data Point: (10000, 6494)
Estimation Properties
Intact Rock Param.: 10
Geological Strength: 100

Disturbance Factor: 0
SigmaC: 600000 psf
Sigma3: 300000 psf
Num. Points: 20

Unit Weight Functions

Marsh

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 83
Data Points: X (ft), Unit Weight (pcf)
Data Point: (186.9, 83)
Data Point: (200, 93)
Data Point: (242, 83)

Spatial Functions

Bay Sound

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (186.9, -50, 555)
Data Point: (186.9, -70, 725)
Data Point: (200, -50, 700)
Data Point: (200, -70, 865)
Data Point: (242, -50, 555)
Data Point: (242, -70, 725)

Regions

	Material	Points	Area (ft²)
Region 1	BEACH SAND, EL. -10.5/-13 TO -50	18,14,35,43,33,11,10,32,22,21,17	6012.5
Region 2	Sheet Pile	16,20,19,29,28,3,45,4	13.525
Region 3	MARSH, EL. -4 TO -10.5/-13	22,30,40,32	325.5
Region 4	EMBANKMENT FILL, EL. 0 TO -4	29,28,3,30,40,7,6,5,39	139.76
Region 5	BAY SOUND CLAY, EL. -50 TO -70 (protected)	13,14,35,36	1338
Region 6	BAY SOUND CLAY, EL. -50 TO -70 (protected)	33,11,12,37	1360
Region 7	MARSH, EL. -4 TO -10.5 (protected)	8,9,10,32,40,41	400.61714
Region 8	EMBANKMENT FILL, EL. +3.2 TO 0	29,19,38,39	47.8
Region 9		15,1,23,24,25,2,31,34	339.72
Region 10		31,26,47,3,30	13.265015
Region 11		18,17,21,22,34,15	1423.625
Region 12		31,30,22,34	101.525
Region 13	BAY SOUND CLAY, EL. -50 TO -70	36,35,43,33,37,42	1102
Region 14	Fill, EL. -3.2 to -4.0 (protected)	40,7,41	3.337144

Points

	X (ft)	Y (ft)
Point 1	120	-5.5
Point 2	182.2	-4.9
Point 3	200	-2.3
Point 4	200	3.5
Point 5	235.2	-1.2
Point 6	235.6	-3.1
Point 7	242	-3.2
Point 8	266.2	-4.8
Point 9	310	-4.8
Point 10	310	-10.5
Point 11	310	-50
Point 12	310	-70
Point 13	120	-70
Point 14	120	-50
Point 15	120	-10.5
Point 16	200	13.9
Point 17	200	-28.5
Point 18	120	-28.5
Point 19	201	3.2
Point 20	200.5	13.9
Point 21	200	-23.5
Point 22	200	-13
Point 23	141	-5.4
Point 24	171.3	-5.7
Point 25	177.6	-5.5
Point 26	192.1	-3
Point 27	198.9	-2.3
Point 28	201	-2.3
Point 29	201	0
Point 30	200	-4
Point 31	186.9	-4
Point 32	242	-10.5
Point 33	242	-50
Point 34	186.9	-10.5
Point 35	186.9	-50
Point 36	186.9	-70
Point 37	242	-70
Point 38	206.5	3
Point 39	227	0
Point 40	242	-4
Point 41	250.34286	-4
Point 42	200	-70
Point 43	200	-50
Point 44	120	0
Point 45	200	0
Point 46	199	0
Point 47	199.5	-2.3443

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.08	(218.048, 47.587)	18.91511	(200, 13.9)	(246.886, -3.66855)
2	784	1.18	(218.048, 47.587)	58.681	(200, 13.9)	(246.659, -3.64679)

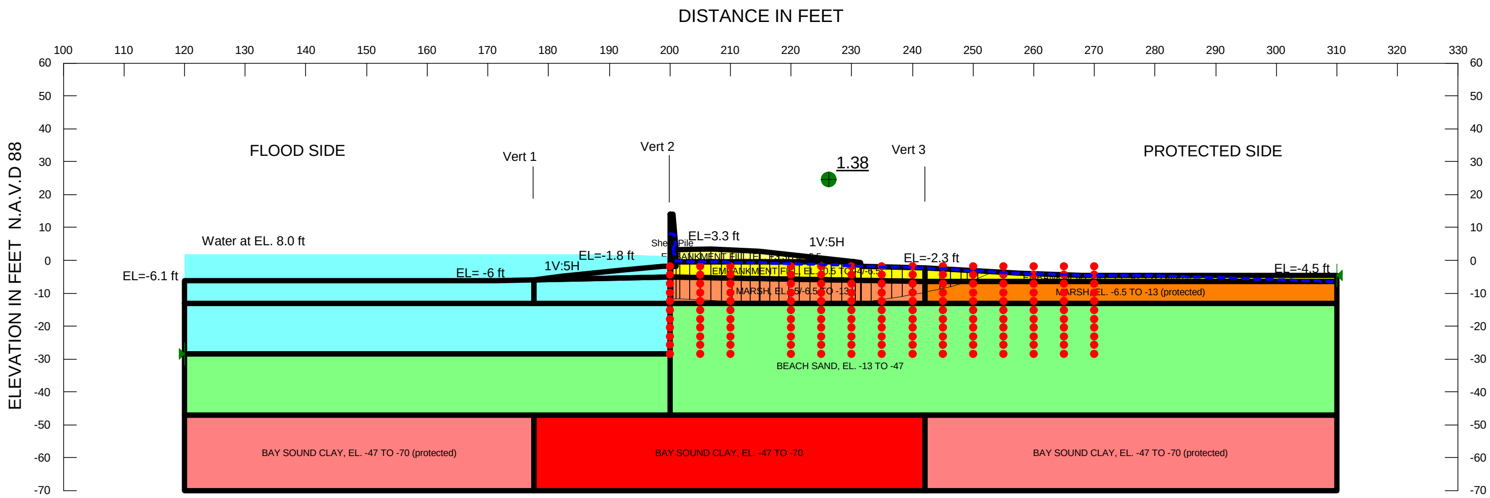
Slices of Slip Surface: Optimized

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	200.25	-8.2933895	562.91205	-2215.661	0	199.7
2	Optimized	200.75	-8.376416	477.08724	568.98884	0	199.11
3	Optimized	201.79555	-8.5500295	487.28739	1166.3847	0	197.86
4	Optimized	203.24255	-8.8490595	504.79082	1152.3547	0	196.14
5	Optimized	204.5455	-9.182918	524.32881	1175.1787	0	194.59
6	Optimized	205.8485	-9.5167765	543.56198	1197.9284	0	193.04
7	Optimized	207.19385	-9.861488	563.12229	1212.7639	0	191.44
8	Optimized	208.58155	-10.21705	582.97551	1219.8842	0	189.78
9	Optimized	209.9767	-10.55032	601.02097	1237.5128	0	188.12
10	Optimized	211.3793	-10.861305	617.28773	1239.949	0	186.45
11	Optimized	212.8946	-11.13858	630.86289	1264.4594	0	184.65
12	Optimized	214.52265	-11.38214	641.55446	1256.5015	0	182.71
13	Optimized	216.16855	-11.561785	647.8983	1272.8308	0	180.75
14	Optimized	217.8322	-11.67751	649.87708	1252.3835	0	178.77
15	Optimized	219.4861	-11.724555	647.33815	1257.3346	0	176.8
16	Optimized	221.13025	-11.70293	640.34418	1224.5541	0	174.84
17	Optimized	222.6066	-11.65326	632.08259	1209.6519	0	173.09
18	Optimized	223.91515	-11.575535	622.57747	1177.9936	0	171.53

19	Optimized	225.2237	-11.49781	613.02659	1146.4116	0	169.97
20	Optimized	226.439	-11.425605	604.11569	1117.0918	0	168.53
21	Optimized	227.8394	-11.34237	593.81779	1084.5987	0	166.86
22	Optimized	229.51815	-11.24259	581.44361	1046.721	0	164.86
23	Optimized	231.2557	-11.08197	564.93741	1023.7937	0	162.79
24	Optimized	233.05205	-10.860505	544.33999	972.90787	0	160.65
25	Optimized	234.5751	-10.607625	522.6004	957.69373	0	158.84
26	Optimized	235.4	-10.41999	507.53539	826.65863	0	157.86
27	Optimized	235.60105	-10.37426	503.82852	719.37512	0	157.62
28	Optimized	236.41715	-9.965435	474.49459	759.43703	0	156.65
29	Optimized	237.85735	-9.22453	421.12258	694.04612	0	154.93
30	Optimized	239.10765	-8.55989	373.11414	627.75379	0	153.44
31	Optimized	240.8664	-7.580881	302.13299	541.23492	0	151.35
32	Optimized	242.26945	-6.780481	243.61576	460.37803	0	150
33	Optimized	243.3114	-6.146995	197.24807	402.22134	0	150
34	Optimized	245.2527	-4.83361	100.164	277.69738	0	150
35	Optimized	246.6539	-3.834274	18.707925	163.12456	0	150

Slices of Slip Surface: 784

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	784	200.25	-8.329575	565.19915	-2178.6953	0	199.7
2	784	200.75	-8.486273	484.01208	542.58813	0	199.11
3	784	201.6875	-8.7630055	500.80948	1142.0035	0	197.99
4	784	203.0625	-9.1442205	523.60383	1177.9944	0	196.35
5	784	204.4375	-9.489769	543.85612	1210.6365	0	194.72
6	784	205.8125	-9.800296	561.57382	1239.9833	0	193.08
7	784	207.28845	-10.09396	577.71718	1258.3192	0	191.32
8	784	208.86535	-10.365975	591.84665	1264.8785	0	189.45
9	784	210.4423	-10.59398	602.71979	1267.2754	0	187.57
10	784	212.01925	-10.778495	610.41535	1265.4275	0	185.69
11	784	213.59615	-10.91994	615.056	1259.4516	0	183.81
12	784	215.17305	-11.01862	616.67575	1249.3508	0	181.94
13	784	216.75	-11.07475	615.33916	1235.205	0	180.06
14	784	218.32695	-11.08845	611.12622	1217.0398	0	178.18
15	784	219.90385	-11.059755	604.06462	1194.7681	0	176.3
16	784	221.48075	-10.988605	594.20319	1168.5663	0	174.43
17	784	223.0577	-10.874835	581.54346	1138.3065	0	172.55
18	784	224.63465	-10.7182	566.09742	1104.0024	0	170.67
19	784	226.21155	-10.51836	547.8363	1065.6803	0	168.8
20	784	227.82	-10.26909	526.24775	1023.5518	0	166.88
21	784	229.46	-9.9680025	501.12834	977.43502	0	164.93
22	784	231.1	-9.618325	472.74165	926.79287	0	162.98
23	784	232.74	-9.2191565	440.9485	871.50715	0	161.02
24	784	234.38	-8.769445	405.61015	811.54827	0	159.07
25	784	235.4	-8.4699035	382.20808	671.20457	0	157.86
26	784	236.4	-8.1445625	357.10597	539.53841	0	156.67
27	784	238	-7.591861	314.64972	492.4579	0	154.76
28	784	239.6	-6.9866605	268.64747	440.66928	0	152.86
29	784	241.2	-6.3271915	218.76947	383.99228	0	150.95
30	784	242.6696	-5.674116	169.45132	322.30318	0	150
31	784	244.0088	-5.0342355	120.74705	255.85169	0	150
32	784	245.34795	-4.3519465	67.704409	184.94283	0	150
33	784	246.33845	-3.823396	20.21626	125.77732	0	150



Name: EMBANKMENT FILL, EL. +3.3 TO -0.5 Model: Undrained (Phi=0) Unit Weight: 115 pcf Cohesion: 700 psf
Name: BEACH SAND, EL. -13 TO -47 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand
Name: BAY SOUND CLAY, EL. -47 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 110 pcf Cohesion Spatial Fn: CLAY Phi: 0 °
Name: Sheet Pile Model: Undrained (Phi=0) Unit Weight: 0.1 pcf Cohesion: 0.01 psf
Name: MARSH, EL. -5/-6.5 TO -13 Model: Spatial Mohr-Coulomb Unit Weight: 88 pcf Cohesion Fn: Marsh Phi: 0 °
Name: EMBANKMENT FILL, EL. -0.5 TO -4/-6.5 Model: Spatial Mohr-Coulomb Unit Weight: 106 pcf Cohesion Fn: Fill Phi: 0 °
Name: MARSH, EL. -6.5 TO -13 (protected) Model: Undrained (Phi=0) Unit Weight: 88 pcf Cohesion: 190 psf
Name: BAY SOUND CLAY, EL. -47 TO -70 (protected) Model: Spatial Mohr-Coulomb Unit Weight: 110 pcf Cohesion 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.

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 4
REMEDIATION OF CANAL WALLS AND LEVEES
PROTECTED SIDE STABILITY ANALYSIS
CASE: GAP Stability (Block) no wall
STA. 24+87 TO 29+16 WEST
ORLEANS PARISH, LOUISIANA

ETL 1110-2-575 ANALYSIS

Name: GAP Stability (Block) no wall
File Name: Orleans Canal Reach 4.gsz Directory: Y:\F&MHOME\Middleton\Outfall Canals\Orleans final edits\final\Appendix A and Appendix B\
Last Edited By: Jamerson, James MVK

GAP Stability (Block) no wall

File Information

Created By: Moraille, Jacques
Revision Number: 529
Last Edited By: Jamerson, James MVK
Date: 6/17/2013
Time: 11:04:02 AM
File Name: Orleans Canal Reach 4.gsz
Directory: Y:\F&MHOME\Middleton\Outfall Canals\Orleans final edits\final\Appendix A and Appendix B\
Last Solved Date: 6/17/2013
Last Solved Time: 11:06:32 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

GAP Stability (Block) no wall

Kind: SLOPE/W
Parent: Gap Analysis (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
Advanced
- Number of Slices: 30
- Optimization Tolerance: 0.01
- Minimum Slip Surface Depth: 0.1 ft
- Optimization Maximum Iterations: 4000
- Optimization Convergence Tolerance: 1e-007
- Starting Optimization Points: 8
- Ending Optimization Points: 16
- Complete Passes per Insertion: 1
- Driving Side Maximum Convex Angle: 5 °
- Resisting Side Maximum Convex Angle: 1 °

Materials

EMBANKMENT FILL, EL. +3.3 TO -0.5

Model: Undrained (Phi=0)
Unit Weight: 115 pcf
Cohesion: 700 psf

BEACH SAND, EL. -13 TO -47

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

BAY SOUND CLAY, EL. -47 TO -70

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

Sheet Pile

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

MARSH, EL. -5/-6.5 TO -13

Model: Spatial Mohr-Coulomb
Unit Weight: 88 pcf
Cohesion Fn: Marsh
Phi: 0 °
Phi-B: 0 °

EMBANKMENT FILL, EL. -0.5 TO -4/-6.5

Model: Spatial Mohr-Coulomb
Unit Weight: 106 pcf
Cohesion Fn: Fill
Phi: 0 °
Phi-B: 0 °

MARSH, EL. -6.5 TO -13 (protected)

Model: Undrained (Phi=0)
Unit Weight: 88 pcf
Cohesion: 190 psf

BAY SOUND CLAY, EL. -47 TO -70 (protected)

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

Slip Surface Limits

Left Coordinate: (120, -28.5) ft
Right Coordinate: (310, -4.5) ft

Slip Surface Block

Left Grid
- Upper Left: (200, -1.8) ft
- Lower Left: (200, -28.5) ft
- Lower Right: (210, -28.5) ft
- X Increments: 2
- Y Increments: 10
- Starting Angle: 115 °
- Ending Angle: 135 °
- Angle Increments: 4

Right Grid
- Upper Left: (220, -1.8) ft
- Lower Left: (220, -28.5) ft
- Lower Right: (270, -28.5) ft
- X Increments: 10
- Y Increments: 10
- Starting Angle: 25 °
- Ending Angle: 45 °
- Angle Increments: 4

Cohesion Functions

Marsh

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

Y-Intercept: 190
Data Points: X (ft), Cohesion (psf)
- Data Point: (177.6, 190)
- Data Point: (200, 215)
- Data Point: (242, 190)

Fill

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

Y-Intercept: 200
Data Points: X (ft), Cohesion (psf)
- Data Point: (177.6, 200)
- Data Point: (200, 230)
- Data Point: (242, 200)

Bay Sound

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

Y-Intercept: 500
Data Points: Y (ft), Cohesion (psf)
- Data Point: (-70, 735)
- Data Point: (-47, 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: (-10000, 0)
- Data Point: (0, 0)
- Data Point: (10000, 6494)

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

Spatial Functions

CLAY

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (177.7, -47, 500)
Data Point: (177.7, -70, 735)
Data Point: (200, -47, 530)
Data Point: (200, -70, 775)
Data Point: (242, -47, 500)
Data Point: (242, -70, 735)

Regions

	Material	Points	Area (ft²)
Region 1	BEACH SAND, EL. -13 TO -47	18,14,34,40,32,11,10,31,22,21,17	5220
Region 2	Sheet Pile	16,20,19,29,28,3,4	13.05
Region 3	MARSH, EL. -5/-6.5 TO -13	22,30,42,31	304.5
Region 4	EMBANKMENT FILL, EL. -0.5 TO -4/-6.5	29,28,3,30,42,7,6,5,41	202.38176
Region 5	BAY SOUND CLAY, EL. -47 TO -70 (protected)	13,14,34,35	1324.8
Region 6	BAY SOUND CLAY, EL. -47 TO -70 (protected)	32,11,12,36	1564
Region 7	MARSH, EL. -6.5 TO -13 (protected)	43,10,31,42	442
Region 8	EMBANKMENT FILL, EL. +3.3 TO -0.5	29,19,37,38,41	75.87824
Region 9		18,17,21,22,33,15	1240
Region 10	BAY SOUND CLAY, EL. -47 TO -70	35,34,40,32,36,44	1481.2
Region 11	EMBANKMENT FILL, EL. -0.5 TO -4/-6.5	7,39,8,9,43,42	159.5
Region 12		3,27,26,2,25,30	40.725
Region 13		25,30,22,33	168
Region 14		15,1,23,24,25,33	394.095

Points

	X (ft)	Y (ft)
Point 1	120	-6.1
Point 2	182.2	-4.9
Point 3	200	-1.8
Point 4	200	3.5
Point 5	231.5	-0.7
Point 6	231.6	-1.9
Point 7	242	-2.3
Point 8	267.8	-4.5
Point 9	310	-4.5
Point 10	310	-13
Point 11	310	-47
Point 12	310	-70
Point 13	120	-70
Point 14	120	-47
Point 15	120	-13
Point 16	200	13.9
Point 17	200	-28.5
Point 18	120	-28.5
Point 19	201	3.3
Point 20	200.5	13.9
Point 21	200	-23.5
Point 22	200	-13
Point 23	141	-6.1
Point 24	171.3	-6.3
Point 25	177.6	-6
Point 26	192.1	-3
Point 27	198.9	-1.8
Point 28	201	-1.8
Point 29	201	-0.5
Point 30	200	-5
Point 31	242	-13
Point 32	242	-47
Point 33	177.6	-13
Point 34	177.6	-47
Point 35	177.6	-70
Point 36	242	-70
Point 37	206.8	3.4
Point 38	214.8	2.7
Point 39	257.5	-4
Point 40	200	-47
Point 41	230.51765	-0.5
Point 42	242	-6.5
Point 43	310	-6.5
Point 44	200	-70

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.38	(225.913, -1.401)	22.40286	(200, 13.9)	(253.428, -3.55335)
2	3371	1.48	(225.913, -1.401)	22.602	(200, 13.9)	(254.007, -3.6169)

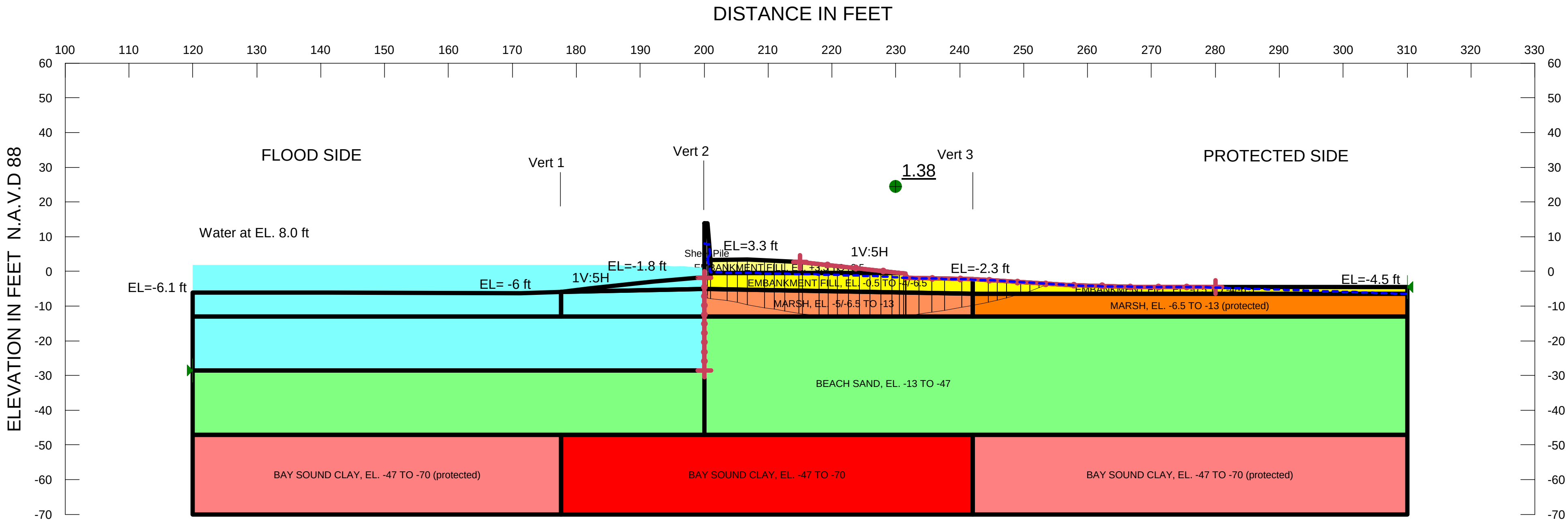
Slices of Slip Surface: Optimized

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	200.25	-11.72534	797.99888	-2312.7968	0	214.85
2	Optimized	200.75	-11.726175	711.239	952.95867	0	214.55
3	Optimized	201.30715	-11.727105	711.01493	1527.5987	0	214.22
4	Optimized	202.4699	-11.803085	715.02002	1506.3562	0	213.53
5	Optimized	204.1811	-11.95402	723.0533	1523.878	0	212.51
6	Optimized	205.91835	-12.14127	732.75324	1530.9389	0	211.48
7	Optimized	207.66885	-12.36321	743.86964	1544.3716	0	210.44
8	Optimized	209.4066	-12.58353	754.25984	1547.3402	0	209.4
9	Optimized	211.0296	-12.742875	760.5642	1567.9731	0	208.43
10	Optimized	212.53775	-12.84125	762.87997	1562.4814	0	207.54
11	Optimized	214.0459	-12.939625	764.86491	1556.9235	0	206.64
12	Optimized	214.85255	-12.99224	765.86344	1553.2585	0	206.16
13	Optimized	215.6808	-12.99527	763.55658	1558.1814	0	205.67
14	Optimized	217.23225	-12.994465	758.65785	1522.6656	0	204.74
15	Optimized	218.7837	-12.99366	753.63021	1487.2143	0	203.82
16	Optimized	219.5784	-12.993365	750.98906	1466.9339	0	203.35
17	Optimized	220.466	-12.993675	747.98096	1448.5295	0	202.82
18	Optimized	222.2032	-12.994085	742.10947	1408.9258	0	201.78
19	Optimized	223.9404	-12.9945	736.0653	1369.2645	0	200.75
20	Optimized	225.6776	-12.994915	729.84844	1329.6608	0	199.72
21	Optimized	227.4148	-12.995325	723.63157	1290.057	0	198.68
22	Optimized	229.152	-12.995735	717.29958	1250.4533	0	197.65
23	Optimized	230.26915	-12.993415	713.01883	1227.931	0	196.98
24	Optimized	230.5188	-12.99088	711.95422	1222.0184	0	196.83
25	Optimized	231.00995	-12.97081	708.86639	1219.315	0	196.54
26	Optimized	231.51485	-12.950145	705.71183	1188.1862	0	196.24

27	Optimized	231.56485	-12.93987	704.87396	1194.628	0	196.21
28	Optimized	232.421	-12.70444	686.94418	1123.61	0	195.7
29	Optimized	234.06295	-12.25292	652.53238	1076.1617	0	194.72
30	Optimized	235.7049	-11.8014	618.12058	1028.772	0	193.75
31	Optimized	237.42015	-11.280435	579.0284	990.33714	0	192.73
32	Optimized	239.2087	-10.69002	535.22697	929.17441	0	191.66
33	Optimized	240.9973	-10.099605	491.36714	868.01168	0	190.6
34	Optimized	241.9458	-9.783372	467.85778	850.49652	0	190.03
35	Optimized	243.29155	-9.261402	429.83749	785.97204	0	190
36	Optimized	245.4305	-8.3557775	364.37344	697.53586	0	190
37	Optimized	247.12535	-7.5464125	306.50368	600.36748	0	190
38	Optimized	248.51335	-6.820865	254.96796	540.97972	0	190
39	Optimized	249.9182	-5.986995	193.26668	439.16694	0	200
40	Optimized	252.10505	-4.5136715	77.940663	267.83958	0	200

Slices of Slip Surface: 3371

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	3371	200.25	-12.48	845.46	-2586	0	214.85
2	3371	200.75	-12.48	758.8	1018.82	0	214.55
3	3371	201.96665	-12.48	758.27599	1595.2244	0	213.83
4	3371	203.9	-12.48	756.77599	1600.1899	0	212.68
5	3371	205.83335	-12.48	754.39668	1605.1554	0	211.53
6	3371	207.8	-12.48	751.05	1598.15	0	210.36
7	3371	209.8	-12.48	746.8	1579.2	0	209.17
8	3371	211.8	-12.48	742	1560.25	0	207.98
9	3371	213.8	-12.48	736.6	1541.3	0	206.79
10	3371	215.6732	-12.48	731.10147	1511.905	0	205.67
11	3371	217.4196	-12.48	725.71899	1472.0517	0	204.63
12	3371	219.166	-12.48	720.10747	1432.1985	0	203.59
13	3371	220.9124	-12.48	714.2669	1392.3452	0	202.55
14	3371	222.6588	-12.48	708.25455	1352.4347	0	201.51
15	3371	224.4052	-12.48	702.12768	1312.5814	0	200.47
16	3371	226.1516	-12.48	695.94355	1272.7281	0	199.43
17	3371	227.898	-12.48	689.58764	1232.8748	0	198.39
18	3371	229.64445	-12.48	683.17447	1193.0216	0	197.35
19	3371	231.00885	-12.48	678.15952	1162.722	0	196.54
20	3371	231.55	-12.48	676.15	1088.9	0	196.22
21	3371	232.45	-12.48	672.76471	1022.3529	0	195.68
22	3371	234.15	-12.48	666.41176	1016.4118	0	194.67
23	3371	235.875	-12.07198	634.41557	1106.4725	0	193.65
24	3371	237.625	-11.25594	576.6708	1022.8333	0	192.6
25	3371	239.375	-10.4399	518.92604	939.24578	0	191.56
26	3371	241.125	-9.623863	461.08806	855.6065	0	190.52
27	3371	242.9707	-8.763205	399.90103	759.16866	0	190
28	3371	244.9121	-7.857923	335.29093	649.92904	0	190
29	3371	246.8535	-6.952641	270.33537	540.68942	0	190
30	3371	248.85465	-6.0194825	200.64626	423.16585	0	200
31	3371	250.91555	-5.0584475	123.59708	288.70247	0	200
32	3371	252.9765	-4.097413	42.34429	154.23469	0	200



Name: EMBANKMENT FILL, EL. +3.3 TO -0.5 Model: Undrained (Phi=0) Unit Weight: 115 pcf Cohesion: 700 psf
Name: BEACH SAND, EL. -13 TO -47 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand
Name: BAY SOUND CLAY, EL. -47 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 110 pcf Cohesion Spatial Fn: CLAY Phi: 0 °
Name: Sheet Pile Model: Undrained (Phi=0) Unit Weight: 0.1 pcf Cohesion: 0.01 psf
Name: MARSH, EL. -5/-6.5 TO -13 Model: Spatial Mohr-Coulomb Unit Weight: 88 pcf Cohesion Fn: Marsh Phi: 0 °
Name: EMBANKMENT FILL, EL. -0.5 TO -4/-6.5 Model: Spatial Mohr-Coulomb Unit Weight: 106 pcf Cohesion Fn: Fill Phi: 0 °
Name: MARSH, EL. -6.5 TO -13 (protected) Model: Undrained (Phi=0) Unit Weight: 88 pcf Cohesion: 190 psf
Name: BAY SOUND CLAY, EL. -47 TO -70 (protected) Model: Spatial Mohr-Coulomb Unit Weight: 110 pcf Cohesion 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.

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 4
REMEDIATION OF CANAL WALLS AND LEVEES
PROTECTED SIDE STABILITY ANALYSIS
CASE: GAP Stability (Entry/Exit) no wall
STA. 24+87 TO 29+16 WEST
ORLEANS PARISH, LOUISIANA

ETL 1110-2-575 ANALYSIS

Name: GAP Stability (Entry/Exit) no wall
File Name: Orleans Canal Reach 4.gsz Directory: Y:\F&MHOME\Middleton\Outfall Canals\Orleans final edits\final\Appendix A and Appendix B\
Last Edited By: Jamerson, James MVK

GAP Stability (Entry/Exit) no wall

File Information

Created By: Moraille, Jacques
Revision Number: 529
Last Edited By: Jamerson, James MVK
Date: 6/17/2013
Time: 11:04:02 AM
File Name: Orleans Canal Reach 4.gsz
Directory: Y:\F&MHOME\Middleton\Outfall Canals\Orleans final edits\final\Appendix A and Appendix B\
Last Solved Date: 6/17/2013
Last Solved Time: 11:07:34 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

GAP Stability (Entry/Exit) no wall

Kind: SLOPE/W
Parent: Gap Analysis (seepage)
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: 8
- Ending Optimization Points: 16
- Complete Passes per Insertion: 1
- Driving Side Maximum Convex Angle: 5 °
- Resisting Side Maximum Convex Angle: 1 °

Materials

EMBANKMENT FILL, EL. +3.3 TO -0.5

Model: Undrained (Phi=0)
Unit Weight: 115 pcf
Cohesion: 700 psf

BEACH SAND, EL. -13 TO -47

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

BAY SOUND CLAY, EL. -47 TO -70

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

Sheet Pile

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

MARSH, EL. -5/-6.5 TO -13

Model: Spatial Mohr-Coulomb
Unit Weight: 88 pcf
Cohesion Fn: Marsh
Phi: 0 °
Phi-B: 0 °

EMBANKMENT FILL, EL. -0.5 TO -4/-6.5

Model: Spatial Mohr-Coulomb
Unit Weight: 106 pcf
Cohesion Fn: Fill
Phi: 0 °
Phi-B: 0 °

MARSH, EL. -6.5 TO -13 (protected)

Model: Undrained (Phi=0)
Unit Weight: 88 pcf
Cohesion: 190 psf

BAY SOUND CLAY, EL. -47 TO -70 (protected)

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

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (200, -28.5) ft
Left-Zone Right Coordinate: (200, -1.8) ft
Left-Zone Increment: 10
Right Projection: Range
Right-Zone Left Coordinate: (215, 2.65928) ft
Right-Zone Right Coordinate: (280, -4.5) ft
Right-Zone Increment: 15
Radius Increments: 15

Slip Surface Limits

Left Coordinate: (120, -28.5) ft
Right Coordinate: (310, -4.5) ft

Cohesion Functions

Marsh

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

Y-Intercept: 190
Data Points: X (ft), Cohesion (psf)
- Data Point: (177.6, 190)
- Data Point: (200, 215)
- Data Point: (242, 190)

Fill

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

Y-Intercept: 200
Data Points: X (ft), Cohesion (psf)
- Data Point: (177.6, 200)
- Data Point: (200, 230)
- Data Point: (242, 200)

Bay Sound

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

Y-Intercept: 500
Data Points: Y (ft), Cohesion (psf)
- Data Point: (-70, 735)
- Data Point: (-47, 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: (-10000, 0)
- Data Point: (0, 0)
- Data Point: (10000, 6494)

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

Spatial Functions

CLAY

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (177.7, -47, 500)
Data Point: (177.7, -70, 735)
Data Point: (200, -47, 530)
Data Point: (200, -70, 775)
Data Point: (242, -47, 500)
Data Point: (242, -70, 735)

Regions

	Material	Points	Area (ft²)
Region 1	BEACH SAND, EL. -13 TO -47	18,14,34,40,32,11,10,31,22,21,17	5220
Region 2	Sheet Pile	16,20,19,29,28,3,4	13.05
Region 3	MARSH, EL. -5/-6.5 TO -13	22,30,42,31	304.5
Region 4	EMBANKMENT FILL, EL. -0.5 TO -4/-6.5	29,28,3,30,42,7,6,5,41	202.38176
Region 5	BAY SOUND CLAY, EL. -47 TO -70 (protected)	13,14,34,35	1324.8
Region 6	BAY SOUND CLAY, EL. -47 TO -70 (protected)	32,11,12,36	1564
Region 7	MARSH, EL. -6.5 TO -13 (protected)	43,10,31,42	442
Region 8	EMBANKMENT FILL, EL. +3.3 TO -0.5	29,19,37,38,41	75.87824
Region 9		18,17,21,22,33,15	1240
Region 10	BAY SOUND CLAY, EL. -47 TO -70	35,34,40,32,36,44	1481.2
Region 11	EMBANKMENT FILL, EL. -0.5 TO -4/-6.5	7,39,8,9,43,42	159.5
Region 12		3,27,26,2,25,30	40.725
Region 13		25,30,22,33	168
Region 14		15,1,23,24,25,33	394.095

Points

	X (ft)	Y (ft)
Point 1	120	-6.1
Point 2	182.2	-4.9
Point 3	200	-1.8
Point 4	200	3.5
Point 5	231.5	-0.7
Point 6	231.6	-1.9
Point 7	242	-2.3
Point 8	267.8	-4.5
Point 9	310	-4.5
Point 10	310	-13
Point 11	310	-47
Point 12	310	-70
Point 13	120	-70
Point 14	120	-47
Point 15	120	-13
Point 16	200	13.9
Point 17	200	-28.5
Point 18	120	-28.5
Point 19	201	3.3
Point 20	200.5	13.9
Point 21	200	-23.5
Point 22	200	-13
Point 23	141	-6.1
Point 24	171.3	-6.3
Point 25	177.6	-6
Point 26	192.1	-3
Point 27	198.9	-1.8
Point 28	201	-1.8
Point 29	201	-0.5
Point 30	200	-5
Point 31	242	-13
Point 32	242	-47
Point 33	177.6	-13
Point 34	177.6	-47
Point 35	177.6	-70
Point 36	242	-70
Point 37	206.8	3.4
Point 38	214.8	2.7
Point 39	257.5	-4
Point 40	200	-47
Point 41	230.51765	-0.5
Point 42	242	-6.5
Point 43	310	-6.5
Point 44	200	-70

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.38	(223.643, 40.277)	21.70045	(200, 13.9)	(253.943, -3.60989)
2	2197	1.46	(223.643, 40.277)	52.984	(200, 13.9)	(253.415, -3.55191)

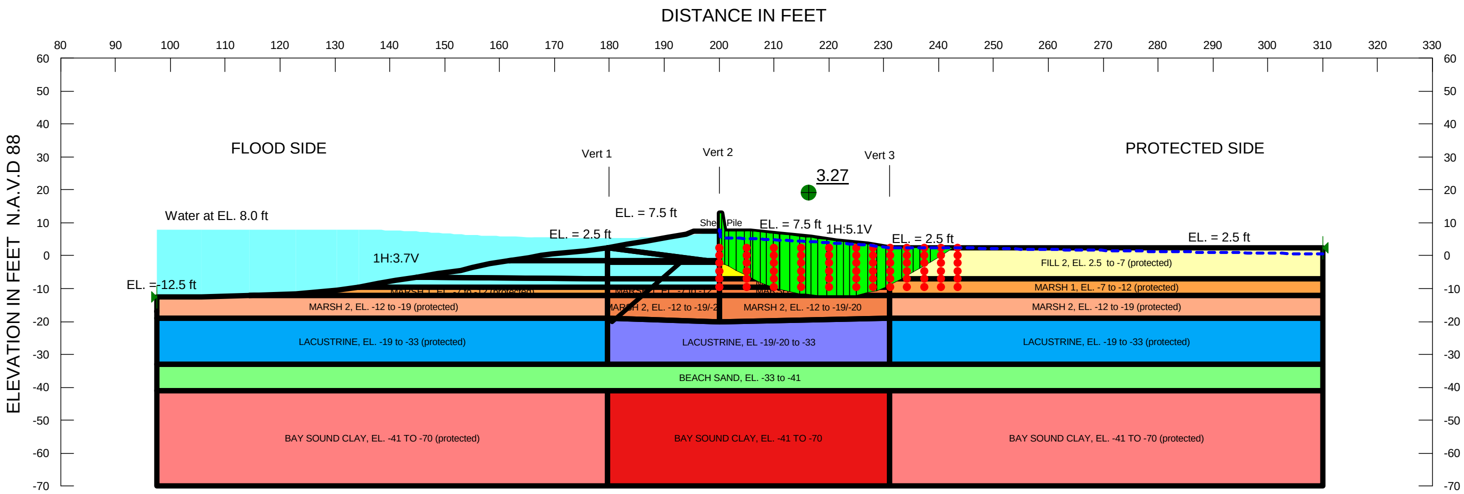
Slices of Slip Surface: Optimized

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	200.25	-7.6078055	539.49018	-1434.2042	0	214.85
2	Optimized	200.75	-7.7330585	460.14198	544.63133	0	214.55
3	Optimized	202.3191	-8.1261225	483.5133	1136.6791	0	213.62
4	Optimized	204.42865	-8.7294685	519.16572	1164.9091	0	212.36
5	Optimized	206.00955	-9.275286	551.33331	1214.8944	0	211.42
6	Optimized	208.1192	-10.003653	593.61097	1266.4346	0	210.17
7	Optimized	210.22125	-10.707355	633.70592	1315.751	0	208.92
8	Optimized	211.787	-11.20385	661.3457	1343.6343	0	207.98
9	Optimized	213.68495	-11.74704	690.64055	1389.5175	0	206.85
10	Optimized	215.1012	-12.121655	710.24197	1404.6616	0	206.01
11	Optimized	216.7118	-12.44839	725.93443	1422.075	0	205.05
12	Optimized	218.73065	-12.771125	739.83282	1432.3617	0	203.85
13	Optimized	220.14955	-12.922475	744.59825	1413.5804	0	203.01
14	Optimized	221.70975	-12.997785	743.98972	1420.8623	0	202.08
15	Optimized	223.41125	-12.997055	738.05379	1381.9555	0	201.06
16	Optimized	225.11275	-12.99633	732.00032	1343.0487	0	200.05
17	Optimized	226.81425	-12.995605	725.8293	1304.1419	0	199.04
18	Optimized	228.51575	-12.994875	719.59951	1265.2351	0	198.03
19	Optimized	229.9421	-12.98485	713.70252	1236.8713	0	197.18
20	Optimized	230.88485	-12.96903	709.22304	1214.5583	0	196.62
21	Optimized	231.376	-12.955555	706.5498	1216.0062	0	196.32
22	Optimized	231.5304	-12.94645	705.42155	1173.6276	0	196.23
23	Optimized	231.5804	-12.93919	704.76913	1175.7286	0	196.2
24	Optimized	232.6108	-12.6518	682.93032	1119.7618	0	195.59
25	Optimized	234.6324	-12.087965	640.09529	1060.5837	0	194.39
26	Optimized	236.654	-11.52413	597.16498	1001.4532	0	193.18
27	Optimized	238.9998	-10.83014	544.81052	937.42194	0	191.79
28	Optimized	241.1674	-10.11457	491.63956	878.50209	0	190.5
29	Optimized	243.22165	-9.3657355	436.62883	791.04609	0	190
30	Optimized	245.17075	-8.6076825	381.24767	713.18965	0	190
31	Optimized	246.6256	-7.9822475	335.9708	636.78098	0	190
32	Optimized	248.42725	-7.084765	271.95022	556.66318	0	190

33	Optimized	250.2295	-6.10373	199.82228	438.48214	0	200
34	Optimized	251.7039	-5.183069	127.68913	347.49464	0	200
35	Optimized	253.19675	-4.1342865	43.398736	205.50517	0	200

Slices of Slip Surface: 2197

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	2197	200.25	-7.2630155	517.95117	-1365.0345	0	214.85
2	2197	200.75	-7.5058055	445.94198	479.52651	0	214.55
3	2197	201.96665	-8.0590745	479.60386	1075.0262	0	213.83
4	2197	203.9	-8.880799	529.2722	1161.6438	0	212.68
5	2197	205.83335	-9.6140935	572.92032	1241.1244	0	211.53
6	2197	207.8	-10.272564	611.18628	1303.3392	0	210.36
7	2197	209.8	-10.856685	644.06681	1348.076	0	209.17
8	2197	211.8	-11.356755	670.97773	1385.6704	0	207.98
9	2197	213.8	-11.775205	692.08589	1416.2042	0	206.79
10	2197	215.6732	-12.097165	706.98842	1427.3932	0	205.67
11	2197	217.4196	-12.333315	716.48717	1419.8387	0	204.63
12	2197	219.166	-12.51065	722.03958	1406.993	0	203.59
13	2197	220.9124	-12.62976	723.66845	1388.7229	0	202.55
14	2197	222.6588	-12.69104	721.52914	1365.1402	0	201.51
15	2197	224.4052	-12.694685	715.62424	1336.206	0	200.47
16	2197	226.1516	-12.64071	705.97266	1301.8998	0	199.43
17	2197	227.898	-12.52894	692.66757	1262.1093	0	198.39
18	2197	229.64445	-12.359	675.64723	1216.8022	0	197.35
19	2197	231.00885	-12.19047	660.04056	1178.8491	0	196.54
20	2197	231.55	-12.113965	653.24139	1099.6454	0	196.22
21	2197	232.46665	-11.960015	640.19933	1022.8171	0	195.67
22	2197	234.2	-11.637365	613.51878	996.93976	0	194.64
23	2197	235.93335	-11.25441	583.01168	965.45702	0	193.61
24	2197	237.66665	-10.809785	548.62447	928.1992	0	192.58
25	2197	239.4	-10.301865	510.21094	884.93333	0	191.55
26	2197	241.13335	-9.7287195	467.6127	835.48167	0	190.52
27	2197	242.8159	-9.108808	422.16365	774.46178	0	190
28	2197	244.44775	-8.443613	373.91794	701.87106	0	190
29	2197	246.0796	-7.7137215	321.38156	622.80064	0	190
30	2197	247.71145	-6.916127	264.41549	536.79031	0	190
31	2197	249.3419	-6.048136	200.25519	439.84105	0	200
32	2197	250.9709	-5.105788	126.57276	320.58894	0	200
33	2197	252.59995	-4.0836065	44.059901	190.94303	0	200



Name: FILL 1, EL. +7.5 TO -2 Model: Undrained (Phi=0) Unit Weight: 106 pcf Cohesion: 1000 psf
Name: MARSH 1, EL. -7 to -12 Model: Spatial Mohr-Coulomb Weight Fn: Marsh 1 Cohesion Fn: Marsh Phi: 0 °
Name: BEACH SAND, EL. -33 to -41 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand
Name: BAY SOUND CLAY, EL. -41 TO -70 (protected) Model: Spatial Mohr-Coulomb Unit Weight: 113 pcf Cohesion Fn: Bay Sound Clay Phi: 0 °
Name: Sheet Pile Model: Undrained (Phi=0) Unit Weight: 0.1 pcf Cohesion: 0.01 psf
Name: FILL 2, EL. -2 to -7 Model: Spatial Mohr-Coulomb Weight Fn: Fill 2 Cohesion Fn: FILL 2 Phi: 0 °
Name: LACUSTRINE, EL -19/-20 to -33 Model: Spatial Mohr-Coulomb Unit Weight: 100 pcf Cohesion Spatial Fn: Lacustrine Phi: 0 °
Name: MARSH 1, EL. -7 to -12 (protected) Model: Spatial Mohr-Coulomb Unit Weight: 81 pcf Cohesion: 200 psf Phi: 0 °
Name: LACUSTRINE, EL. -19 to -33 (protected) Model: Spatial Mohr-Coulomb Unit Weight: 100 pcf Cohesion Fn: Lacustrine Phi: 0 °
Name: FILL 2, EL. 2.5 to -7 (protected) Model: Spatial Mohr-Coulomb Unit Weight: 102 pcf Cohesion: 400 psf Phi: 0 °
Name: MARSH 2, EL. -12 to -19 (protected) Model: Spatial Mohr-Coulomb Unit Weight: 98 pcf Cohesion: 300 psf Phi: 0 °
Name: MARSH 2, EL. -12 to -19/-20 Model: Spatial Mohr-Coulomb Weight Fn: MARSH 2 Cohesion Fn: Marsh 2 Phi: 0 °
Name: BAY SOUND CLAY, EL. -41 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 113 pcf Cohesion Spatial Fn: Bay Sound Phi: 0 °

Name: GAP P/S Stability Analysis (Block)
File Name: Orleans Canal Reach 10A.gsz Directory: Y:\F&MHOME\Middleton\Outfall Canals\Orleans final edits\final\Appendix A and Appendix B\
Last Edited By: Jamerson, James MVK

GENERAL NOTES

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

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

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 10A
REMEDIATION OF CANAL WALLS AND LEVEES
PROTECTED SIDE STABILITY ANALYSIS
CASE: GAP P/S Stability Analysis (Block)
STA. 91+88 TO 93+53 WEST
ORLEANS PARISH, LOUISIANA

ETL 1110-2-575 ANALYSIS

GAP P/S Stability Analysis (Block)

File Information

- Created By: Liljegren, James
- Revision Number: 392
- Last Edited By: Jamerson, James MVK
- Date: 6/14/2013
- Time: 2:57:07 PM
- File Name: Orleans Canal Reach 10A.gsz
- Directory: Y:\F&MHOME\Middleton\Outfall Canals\Orleans final edits\final\Appendix A and Appendix B\
- Last Solved Date: 6/14/2013
- Last Solved Time: 2:58:12 PM

Project Settings

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

Analysis Settings

GAP P/S Stability Analysis (Block)

- Kind: SLOPE/W
- Parent: 1 - Gap Seepage Analysis 8ft
- 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: 16
  - Complete Passes per Insertion: 1
  - Driving Side Maximum Convex Angle: 30 °
  - Resisting Side Maximum Convex Angle: 10 °

Materials

FILL 1, EL. +7.5 TO -2

- Model: Undrained (Phi=0)
- Unit Weight: 106 pcf
- Cohesion: 1000 psf

MARSH 1, EL. -7 to -12

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

BEACH SAND, EL. -33 to -41

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

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

- Model: Spatial Mohr-Coulomb
- Unit Weight: 113 pcf
- Cohesion Fn: Bay Sound Clay
- Phi: 0 °
- Phi-B: 0 °

Sheet Pile

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

FILL 2, EL. -2 to -7

- Model: Spatial Mohr-Coulomb
- Weight Fn: Fill 2
- Cohesion Fn: FILL 2
- Phi: 0 °
- Phi-B: 0 °

LACUSTRINE, EL -19/-20 to -33

- Model: Spatial Mohr-Coulomb
- Unit Weight: 100 pcf
- Cohesion Spatial Fn: Lacustrine
- Phi: 0 °
- Phi-B: 0 °

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

- Model: Spatial Mohr-Coulomb
- Unit Weight: 81 pcf
- Cohesion: 200 psf
- Phi: 0 °
- Phi-B: 0 °

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

- Model: Spatial Mohr-Coulomb
- Unit Weight: 100 pcf
- Cohesion Fn: Lacustrine
- Phi: 0 °
- Phi-B: 0 °

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

- Model: Spatial Mohr-Coulomb
- Unit Weight: 102 pcf
- Cohesion: 400 psf
- Phi: 0 °
- Phi-B: 0 °

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

- Model: Spatial Mohr-Coulomb
- Unit Weight: 98 pcf
- Cohesion: 300 psf
- Phi: 0 °
- Phi-B: 0 °

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

- Model: Spatial Mohr-Coulomb
- Weight Fn: MARSH 2
- Cohesion Fn: Marsh 2
- Phi: 0 °
- Phi-B: 0 °

BAY SOUND CLAY, EL. -41 TO -70

- Model: Spatial Mohr-Coulomb
- Unit Weight: 113 pcf
- Cohesion Spatial Fn: Bay Sound
- Phi: 0 °
- Phi-B: 0 °

Slip Surface Limits

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

Slip Surface Block

- Left Grid
  - Upper Left: (200, 2.5) ft
  - Lower Left: (200, -9.5) ft
  - Lower Right: (220, -9.5) ft
  - X Increments: 4
  - Y Increments: 5
  - Starting Angle: 135 °
  - Ending Angle: 160 °
  - Angle Increments: 4
- Right Grid
  - Upper Left: (225, 2.5) ft
  - Lower Left: (225, -9.5) ft
  - Lower Right: (243.5, -9.5) ft
  - X Increments: 6
  - Y Increments: 5
  - Starting Angle: 25 °
  - Ending Angle: 45 °
  - Angle Increments: 4

Cohesion Functions

Marsh

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

- Data Point: (200, 370)
- Data Point: (231.1, 200)

Lacustrine

- Model: Spline Data Point Function
- Function: Cohesion vs. Y
  - Curve Fit to Data: 100 %
  - Segment Curvature: 0 %
- Y-Intercept: 300
- Data Points: Y (ft), Cohesion (psf)
  - Data Point: (-33, 365)
  - Data Point: (-19, 300)

Marsh 2

- Model: Spline Data Point Function
- Function: Cohesion vs. X
  - Curve Fit to Data: 100 %
  - Segment Curvature: 0 %
- Y-Intercept: 300
- Data Points: X (ft), Cohesion (psf)
  - Data Point: (179.6, 300)
  - Data Point: (200, 370)
  - Data Point: (231.1, 300)

Bay Sound Clay

- Model: Spline Data Point Function
- Function: Cohesion vs. Y
  - Curve Fit to Data: 100 %
  - Segment Curvature: 0 %
- Y-Intercept: 500
- Data Points: Y (ft), Cohesion (psf)
  - Data Point: (-70, 820)
  - Data Point: (-41, 500)

FILL 2

- Model: Spline Data Point Function
- Function: Cohesion vs. X
  - Curve Fit to Data: 100 %
  - Segment Curvature: 0 %
- Y-Intercept: 330
- Data Points: X (ft), Cohesion (psf)
  - Data Point: (180, 330)
  - Data Point: (200, 400)
  - Data Point: (231, 330)

Shear/Normal Strength Functions

Sand

- Model: Spline Data Point Function
- Function: Shear Stress vs. Normal Stress
  - Curve Fit to Data: 100 %
  - Segment Curvature: 0 %
- Y-Intercept: 0
- Data Points: Normal Stress (psf), Shear Stress (psf)
  - Data Point: (-10000, 0)
  - Data Point: (0, 0)
  - Data Point: (10000, 6494)
- Estimation Properties
  - Intact Rock Param.: 10
  - Geological Strength: 100
  - Disturbance Factor: 0
  - SigmaC: 600000 psf
  - Sigma3: 300000 psf
  - Num. Points: 20

Unit Weight Functions

Marsh 1

- Model: Spline Data Point Function
- Function: Unit Weight vs. X
  - Curve Fit to Data: 100 %
  - Segment Curvature: 0 %
- Y-Intercept: 81
- Data Points: X (ft), Unit Weight (pcf)
  - Data Point: (179.6, 81)
  - Data Point: (200, 82)
  - Data Point: (231, 81)

Fill 2

- Model: Spline Data Point Function
- Function: Unit Weight vs. X
  - Curve Fit to Data: 100 %
  - Segment Curvature: 0 %
- Y-Intercept: 106
- Data Points: X (ft), Unit Weight (pcf)
  - Data Point: (200, 106)
  - Data Point: (230, 102)

MARSH 2

- Model: Spline Data Point Function
- Function: Unit Weight vs. X
  - Curve Fit to Data: 100 %
  - Segment Curvature: 0 %
- Y-Intercept: 98
- Data Points: X (ft), Unit Weight (pcf)
  - Data Point: (179.6, 98)
  - Data Point: (200, 82)
  - Data Point: (231, 98)

Spatial Functions

Lacustrine

- Model: Linear Interpolation
- Limit Range By: Data Values
- Data Points: X (ft), Y (ft), Cohesion (psf)
  - Data Point: (179.6, -19, 300)
  - Data Point: (179.6, -33, 365)
  - Data Point: (200, -20, 315)
  - Data Point: (200, -33, 385)
  - Data Point: (231.1, -19, 300)
  - Data Point: (231.1, -33, 365)

Bay Sound

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

Regions

	Material	Points	Area (ft²)
Region 1	FILL 1, EL. +7.5 TO -2	29,30,31,32,33,34,5,8,50,4	164.775
Region 2	FILL 2, EL. 2.5 to -7 (protected)	5,6,36,35	749.55
Region 3	LACUSTRINE, EL. -19 to -33 (protected)	38,41,42,39	1104.6
Region 4	BAY SOUND CLAY, EL. -41 TO -70 (protected)	40,43,9,49	2288.1
Region 5		22,23,24,25,26,27,4,50,69	103.14
Region 6	LACUSTRINE, EL -19/-20 to -33	45,37,38,39,64,46	695.25
Region 7	BEACH SAND, EL. -33 to -41	56,55,46,64,39,42,43,40,65,47	1700
Region 8	BAY SOUND CLAY, EL. -41 TO -70	47,65,40,49,66,48	1493.5
Region 9		13,14,15,16,17,18,51,52,44	138.55
Region 10	LACUSTRINE, EL. -19 to -33 (protected)	54,45,46,55	1149.4
Region 11	BAY SOUND CLAY, EL. -41 TO -70 (protected)	47,48,57,56	2380.9
Region 12	Sheet Pile	4,28,7,29	4.05
Region 13		18,19,68,20,21,22,51	37
Region 14	MARSH 2, EL. -12 to -19 (protected)	61,53,1,67,60,45,54	568.45
Region 15		69,50,8	0.5675
Region 16		51,69,8,52	9.6325
Region 17		22,69,51	36.26
Region 18		10,11,12,13,44,71	111.5
Region 19		44,71,70,63	51
Region 20	MARSH 1, EL. -7 to -12 (protected)	67,2,3,10,71,60	130.7
Region 21	MARSH 1, EL. -7 to -12	63,70,58,35	77.75
Region 22	MARSH 1, EL. -7 to -12	71,60,62,70	51
Region 23	MARSH 2, EL. -12 to -19/-20	62,60,45,37	153
Region 24	MARSH 1, EL. -7 to -12	70,62,72,58	77.75
Region 25	MARSH 2, EL. -12 to -19/-20	62,37,38,72	233.25
Region 26	MARSH 1, EL. -7 to -12 (protected)	35,58,72,59,36	394.5

Region 27	MARSH 2, EL. -12 to -19 (protected)	72,38,41,59	552.3
Region 28		52,8,63,44	102
Region 29	FILL 2, EL. -2 to -7	8,5,35,63	225.475

Points

	X (ft)	Y (ft)
Point 1	105.7	-12.5
Point 2	122.9	-11.5
Point 3	130.4	-10.5
Point 4	200	7.5
Point 5	231.1	2.5
Point 6	310	2.5
Point 7	200.5	12.9
Point 8	200	-2
Point 9	310	-70
Point 10	134.3	-9.5
Point 11	137.9	-8.5
Point 12	141.1	-7.5
Point 13	145	-6.5
Point 14	148.6	-5.5
Point 15	152.9	-4.5
Point 16	155	-3.5
Point 17	158.2	-2.5
Point 18	161.8	-1.5
Point 19	165.4	-0.5
Point 20	169.6	0.5
Point 21	175.7	1.5
Point 22	179.6	2.5
Point 23	183.2	3.5
Point 24	186.8	4.5
Point 25	190.7	5.5
Point 26	194	6.5
Point 27	195.4	7.5
Point 28	200	12.9
Point 29	201	7.5
Point 30	205.7	7.5
Point 31	211.1	6.5
Point 32	216.8	5.5
Point 33	221.4	4.5
Point 34	227.1	3.5
Point 35	231.1	-7
Point 36	310	-7
Point 37	200	-20
Point 38	231.1	-19
Point 39	231.1	-33
Point 40	231.1	-41
Point 41	310	-19
Point 42	310	-33
Point 43	310	-41
Point 44	179.6	-7
Point 45	179.6	-19
Point 46	179.6	-33
Point 47	179.6	-41
Point 48	179.6	-70
Point 49	231.1	-70
Point 50	200	-1.5
Point 51	179.6	-1.5
Point 52	179.6	-2
Point 53	97.5	-12.5
Point 54	97.5	-19
Point 55	97.5	-33
Point 56	97.5	-41
Point 57	97.5	-70
Point 58	231.1	-9.5
Point 59	310	-12
Point 60	179.6	-12
Point 61	97.5	-17
Point 62	200	-12
Point 63	200	-7
Point 64	200	-33
Point 65	200	-41
Point 66	200	-70
Point 67	114.3	-12
Point 68	167.5	0
Point 69	197.73	-1.5
Point 70	200	-9.5
Point 71	179.6	-9.5
Point 72	231.1	-12

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	3.27	(220.817, 3.651)	19.78698	(200, 12.9)	(242.689, 2.5)
2	5014	3.71	(220.817, 3.651)	18.786	(200, 12.9)	(242.384, 2.5)

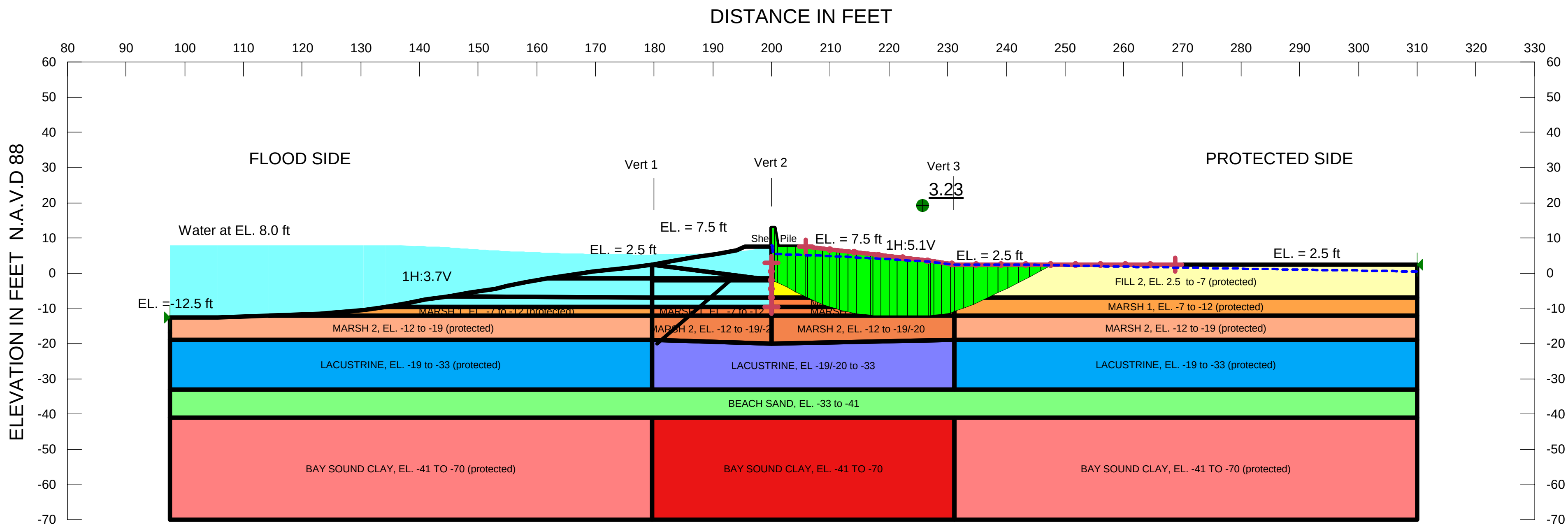
Slices of Slip Surface: Optimized

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	200.25	-2.1581235	517.602	693.99866	0	399.44
2	Optimized	200.75	-2.506244	517.55276	955.77872	0	398.31
3	Optimized	201.3312	-2.910892	543.90187	997.44459	0	396.99
4	Optimized	202.3829	-3.7810525	600.14459	1057.4668	0	394.62
5	Optimized	203.82395	-5.0601975	681.00115	1188.4046	0	391.37
6	Optimized	205.12225	-6.171838	741.2575	1313.2341	0	388.43
7	Optimized	205.9179	-6.821953	771.55103	1375.2631	0	386.64
8	Optimized	206.78605	-7.531295	804.27103	1430.7414	0	332.91
9	Optimized	208.0385	-8.4219425	845.26665	1511.284	0	326.06
10	Optimized	209.2429	-9.1406475	876.13974	1545.5082	0	319.48
11	Optimized	210.3714	-9.814075	907.40593	1577.4163	0	313.31
12	Optimized	210.99885	-10.165605	923.31412	1627.7363	0	309.88
13	Optimized	211.97695	-10.52778	937.2183	1638.2206	0	304.53
14	Optimized	213.7309	-11.177225	964.219	1657.0409	0	294.94
15	Optimized	215.1559	-11.58244	979.40629	1695.6818	0	287.15
16	Optimized	216.25195	-11.74342	982.7462	1687.1063	0	281.16
17	Optimized	217.37225	-11.90796	986.51538	1675.7449	0	275.04
18	Optimized	218.8084	-11.99136	983.71283	1668.7696	0	267.19
19	Optimized	220.53615	-11.99006	975.2046	1625.997	0	257.74
20	Optimized	222.00025	-11.98896	968.17993	1592.3365	0	249.74
21	Optimized	223.20075	-11.98806	962.93211	1567.8467	0	243.18
22	Optimized	224.40125	-11.98716	957.7676	1543.2736	0	236.62
23	Optimized	226.05075	-11.606745	927.70197	1524.2898	0	227.6
24	Optimized	227.8964	-10.938375	879.25178	1423.4493	0	217.51
25	Optimized	229.5447	-10.074985	819.97599	1340.032	0	208.5
26	Optimized	230.62705	-9.344455	770.8241	1247.2413	0	202.59
27	Optimized	230.97875	-9.077169	752.92715	1242.0311	0	200.66
28	Optimized	232.20335	-7.948559	678.62002	1143.0407	0	200
29	Optimized	234.34815	-5.975575	547.54484	1016.1515	0	400
30	Optimized	235.98285	-4.459865	446.71896	860.08651	0	400
31	Optimized	237.5291	-2.945475	346.45726	709.03743	0	400
32	Optimized	239.52075	-0.924285	214.59945	498.51858	0	400
33	Optimized	241.6242	1.321055	70.375192	271.45436	0	400

Slices of Slip Surface: 5014

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	5014	200.25	-2.226105	522.32074	674.9326	0	399.44
2	5014	200.75	-2.4726775	515.19957	986.91875	0	398.31
3	5014	201.78335	-2.9822615	547.19746	1039.4949	0	395.97
4	5014	203.35	-3.754856	593.25284	1119.2975	0	392.44
5	5014	204.91665	-4.5274505	632.81067	1198.6993	0	388.9
6	5014	206.4051	-5.2614565	665.13347	1260.2429	0	385.54
7	5014	207.81525	-5.956874	695.15288	1303.9364	0	382.35
8	5014	209.2254	-6.6522915	723.77308	1347.3119	0	379.17
9	5014	210.51525	-7.2883665	751.61775	1387.7577	0	312.52
10	5014	211.75	-7.8972775	778.48554	1412.7126	0	305.77
11	5014	213.05	-8.5383665	807.87537	1439.5497	0	298.67

12	5014	214.35	-9.1794555	838.43803	1466.3179	0	291.56
13	5014	215.9	-9.5	847.88889	1533.5	0	283.09
14	5014	217.56665	-9.5	838.1741	1496.6742	0	273.98
15	5014	219.1	-9.5	829.5654	1458.9786	0	265.59
16	5014	220.63335	-9.5	821.80453	1421.2177	0	257.21
17	5014	222.1125	-9.5	814.52632	1387.8596	0	249.13
18	5014	223.5375	-9.5	808.14035	1358.9474	0	241.34
19	5014	224.9625	-9.5	801.82456	1329.9649	0	233.55
20	5014	226.3875	-9.5	796.21053	1300.9123	0	225.76
21	5014	227.59165	-9.5	791.43054	1272.4068	0	219.18
22	5014	228.82815	-8.875	747.94758	1284.2381	0	212.42
23	5014	230.3365	-7.609358	663.76565	1131.1257	0	204.17
24	5014	231.80525	-6.3769215	581.2621	1041.0908	0	400
25	5014	233.2158	-5.193332	501.48316	915.47559	0	400
26	5014	234.62635	-4.0097425	421.84542	789.91473	0	400
27	5014	236.0369	-2.826153	342.33802	664.35386	0	400
28	5014	237.44745	-1.6425635	263.70498	538.76583	0	400
29	5014	238.858	-0.458974	186.245	413.1941	0	400
30	5014	240.26855	0.7246155	109.94722	287.61694	0	400
31	5014	241.6791	1.908205	33.535397	162.03978	0	400



Name: FILL 1, EL. +7.5 TO -2 Model: Undrained (Phi=0) Unit Weight: 106 pcf Cohesion: 1000 psf
Name: MARSH 1, EL. -7 to -12 Model: Spatial Mohr-Coulomb Weight Fn: Marsh 1 Cohesion Fn: Marsh Phi: 0 °
Name: BEACH SAND, EL. -33 to -41 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand
Name: BAY SOUND CLAY, EL. -41 TO -70 (protected) Model: Spatial Mohr-Coulomb Unit Weight: 113 pcf Cohesion Fn: Bay Sound Clay Phi: 0 °
Name: Sheet Pile Model: Undrained (Phi=0) Unit Weight: 0.1 pcf Cohesion: 0.01 psf
Name: FILL 2, EL. -2 to -7 Model: Spatial Mohr-Coulomb Weight Fn: Fill 2 Cohesion Fn: FILL 2 Phi: 0 °
Name: LACUSTRINE, EL -19/-20 to -33 Model: Spatial Mohr-Coulomb Unit Weight: 100 pcf Cohesion Spatial Fn: Lacustrine Phi: 0 °
Name: MARSH 1, EL. -7 to -12 (protected) Model: Spatial Mohr-Coulomb Unit Weight: 81 pcf Cohesion: 200 psf Phi: 0 °
Name: LACUSTRINE, EL. -19 to -33 (protected) Model: Spatial Mohr-Coulomb Unit Weight: 100 pcf Cohesion Fn: Lacustrine Phi: 0 °
Name: FILL 2, EL. 2.5 to -7 (protected) Model: Spatial Mohr-Coulomb Unit Weight: 102 pcf Cohesion: 400 psf Phi: 0 °
Name: MARSH 2, EL. -12 to -19 (protected) Model: Spatial Mohr-Coulomb Unit Weight: 98 pcf Cohesion: 300 psf Phi: 0 °
Name: MARSH 2, EL. -12 to -19/-20 Model: Spatial Mohr-Coulomb Weight Fn: MARSH 2 Cohesion Fn: Marsh 2 Phi: 0 °
Name: BAY SOUND CLAY, EL. -41 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 113 pcf Cohesion Spatial Fn: Bay Sound Phi: 0 °

Name: GAP P/S Stability Analysis (Entry/Exit)
File Name: Orleans Canal Reach 10A.gsz Directory: Y:\F&MHOME\Middleton\Outfall Canals\Orleans final edits\final\Appendix A and Appendix B\
Last Edited By: Jamerson, James MVK

GENERAL NOTES

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

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

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 10A
REMEDIATION OF CANAL WALLS AND LEVEES
PROTECTED SIDE STABILITY ANALYSIS
CASE: GAP P/S Stability Analysis (Entry/Exit)
STA. 91+88 TO 93+53 WEST
ORLEANS PARISH, LOUISIANA

ETL 1110-2-575 ANALYSIS

GAP P/S Stability Analysis (Entry/Exit)

File Information

Created By: Liljegren, James
Revision Number: 388
Last Edited By: Jamerson, James MVK
Date: 6/14/2013
Time: 2:00:29 PM
File Name: Orleans Canal Reach 10A.gsz
Directory: Y:\F&MHOME\Middleton\Outfall Canals\Orleans final edits\final\Appendix A and Appendix B\
Last Solved Date: 6/14/2013
Last Solved Time: 2:02:38 PM

Project Settings

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

Analysis Settings

GAP P/S Stability Analysis (Entry/Exit)

Kind: SLOPE/W
Parent: 1 - Gap Seepage Analysis 8ft
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: 4000
 Optimization Convergence Tolerance: 1e-007
 Starting Optimization Points: 8
 Ending Optimization Points: 16
 Complete Passes per Insertion: 1
 Driving Side Maximum Convex Angle: 30 °
 Resisting Side Maximum Convex Angle: 10 °

Materials

FILL 1, EL. +7.5 TO -2

Model: Undrained (Phi=0)
Unit Weight: 106 pcf
Cohesion: 1000 psf

MARSH 1, EL. -7 to -12

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

BEACH SAND, EL. -33 to -41

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

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

Model: Spatial Mohr-Coulomb
Unit Weight: 113 pcf
Cohesion Fn: Bay Sound Clay
Phi: 0 °
Phi-B: 0 °

Sheet Pile

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

FILL 2, EL. -2 to -7

Model: Spatial Mohr-Coulomb
Weight Fn: Fill 2
Cohesion Fn: FILL 2
Phi: 0 °
Phi-B: 0 °

LACUSTRINE, EL -19/-20 to -33

Model: Spatial Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion Spatial Fn: Lacustrine
Phi: 0 °
Phi-B: 0 °

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

Model: Spatial Mohr-Coulomb
Unit Weight: 81 pcf
Cohesion: 200 psf
Phi: 0 °
Phi-B: 0 °

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

Model: Spatial Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion Fn: Lacustrine
Phi: 0 °
Phi-B: 0 °

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

Model: Spatial Mohr-Coulomb
Unit Weight: 102 pcf
Cohesion: 400 psf
Phi: 0 °
Phi-B: 0 °

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

Model: Spatial Mohr-Coulomb
Unit Weight: 98 pcf
Cohesion: 300 psf
Phi: 0 °
Phi-B: 0 °

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

Model: Spatial Mohr-Coulomb
Weight Fn: MARSH 2
Cohesion Fn: Marsh 2
Phi: 0 °
Phi-B: 0 °

BAY SOUND CLAY, EL. -41 TO -70

Model: Spatial Mohr-Coulomb
Unit Weight: 113 pcf
Cohesion Spatial Fn: Bay Sound
Phi: 0 °
Phi-B: 0 °

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (200, -9.5) ft
Left-Zone Right Coordinate: (200, 3) ft
Left-Zone Increment: 5
Right Projection: Range
Right-Zone Left Coordinate: (205.77704, 7.48573) ft
Right-Zone Right Coordinate: (268.74841, 2.5) ft
Right-Zone Increment: 15
Radius Increments: 15

Slip Surface Limits

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

Cohesion Functions

Marsh

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

Lacustrine

Model: Spline Data Point Function
Function: Cohesion vs. Y
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 300
Data Points: Y (ft), Cohesion (psf)
 Data Point: (-33, 365)

Data Point: (-19, 300)

Marsh 2
Model: Spline Data Point Function
Function: Cohesion vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 300
Data Points: X (ft), Cohesion (psf)
Data Point: (179.6, 300)
Data Point: (200, 370)
Data Point: (231.1, 300)

Bay Sound Clay
Model: Spline Data Point Function
Function: Cohesion vs. Y
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 500
Data Points: Y (ft), Cohesion (psf)
Data Point: (-70, 820)
Data Point: (-41, 500)

FILL 2
Model: Spline Data Point Function
Function: Cohesion vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 330
Data Points: X (ft), Cohesion (psf)
Data Point: (180, 330)
Data Point: (200, 400)
Data Point: (231, 330)

Shear/Normal Strength Functions

Sand
Model: Spline Data Point Function
Function: Shear Stress vs. Normal Stress
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
Data Point: (-10000, 0)
Data Point: (0, 0)
Data Point: (10000, 6494)

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

Unit Weight Functions

Marsh 1
Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 81
Data Points: X (ft), Unit Weight (pcf)
Data Point: (179.6, 81)
Data Point: (200, 82)
Data Point: (231, 81)

Fill 2
Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 106
Data Points: X (ft), Unit Weight (pcf)
Data Point: (200, 106)
Data Point: (230, 102)

MARSH 2
Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 98
Data Points: X (ft), Unit Weight (pcf)
Data Point: (179.6, 98)
Data Point: (200, 82)
Data Point: (231, 98)

Spatial Functions

Lacustrine
Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (179.6, -19, 300)
Data Point: (179.6, -33, 365)
Data Point: (200, -20, 315)
Data Point: (200, -33, 385)
Data Point: (231.1, -19, 300)
Data Point: (231.1, -33, 365)

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

Regions

	Material	Points	Area (ft^2)
Region 1	FILL 1, EL. +7.5 TO -2	29,30,31,32,33,34,5,8,50,4	164.775
Region 2	FILL 2, EL. 2.5 to -7 (protected)	5,6,36,35	749.55
Region 3	LACUSTRINE, EL. -19 to -33 (protected)	38,41,42,39	1104.6
Region 4	BAY SOUND CLAY, EL. -41 TO -70 (protected)	40,43,9,49	2288.1
Region 5		22,23,24,25,26,27,4,50,69	103.14
Region 6	LACUSTRINE, EL -19/-20 to -33	45,37,38,39,64,46	695.25
Region 7	BEACH SAND, EL. -33 to -41	56,55,46,64,39,42,43,40,65,47	1700
Region 8	BAY SOUND CLAY, EL. -41 TO -70	47,65,40,49,66,48	1493.5
Region 9		13,14,15,16,17,18,51,52,44	138.55
Region 10	LACUSTRINE, EL. -19 to -33 (protected)	54,45,46,55	1149.4
Region 11	BAY SOUND CLAY, EL. -41 TO -70 (protected)	47,48,57,56	2380.9
Region 12	Sheet Pile	4,28,7,29	4.05
Region 13		18,19,68,20,21,22,51	37
Region 14	MARSH 2, EL. -12 to -19 (protected)	61,53,1,67,60,45,54	568.45
Region 15		69,50,8	0.5675
Region 16		51,69,8,52	9.6325
Region 17		22,69,51	36.26
Region 18		10,11,12,13,44,71	111.5
Region 19		44,71,70,63	51
Region 20	MARSH 1, EL. -7 to -12 (protected)	67,2,3,10,71,60	130.7
Region 21	MARSH 1, EL. -7 to -12	63,70,58,35	77.75
Region 22	MARSH 1, EL. -7 to -12	71,60,62,70	51
Region 23	MARSH 2, EL. -12 to -19/-20	62,60,45,37	153
Region 24	MARSH 1, EL. -7 to -12	70,62,72,58	77.75
Region 25	MARSH 2, EL. -12 to -19/-20	62,37,38,72	233.25
Region 26	MARSH 1, EL. -7 to -12 (protected)	35,58,72,59,36	394.5
Region 27	MARSH 2, EL. -12 to -19 (protected)	72,38,41,59	552.3
Region 28		52,8,63,44	102
Region 29	FILL 2, EL. -2 to -7	8,5,35,63	225.475

Points

	X (ft)	Y (ft)
Point 1	105.7	-12.5
Point 2	122.9	-11.5
Point 3	130.4	-10.5
Point 4	200	7.5
Point 5	231.1	2.5
Point 6	310	2.5
Point 7	200.5	12.9
Point 8	200	-2
Point 9	310	-70
Point 10	134.3	-9.5
Point 11	137.9	-8.5
Point 12	141.1	-7.5
Point 13	145	-6.5
Point 14	148.6	-5.5
Point 15	152.9	-4.5
Point 16	155	-3.5
Point 17	158.2	-2.5
Point 18	161.8	-1.5
Point 19	165.4	-0.5
Point 20	169.6	0.5
Point 21	175.7	1.5
Point 22	179.6	2.5
Point 23	183.2	3.5
Point 24	186.8	4.5
Point 25	190.7	5.5
Point 26	194	6.5
Point 27	195.4	7.5
Point 28	200	12.9
Point 29	201	7.5
Point 30	205.7	7.5
Point 31	211.1	6.5
Point 32	216.8	5.5
Point 33	221.4	4.5
Point 34	227.1	3.5
Point 35	231.1	-7
Point 36	310	-7
Point 37	200	-20
Point 38	231.1	-19
Point 39	231.1	-33
Point 40	231.1	-41
Point 41	310	-19
Point 42	310	-33
Point 43	310	-41
Point 44	179.6	-7
Point 45	179.6	-19
Point 46	179.6	-33
Point 47	179.6	-41
Point 48	179.6	-70
Point 49	231.1	-70
Point 50	200	-1.5
Point 51	179.6	-1.5
Point 52	179.6	-2
Point 53	97.5	-12.5
Point 54	97.5	-19
Point 55	97.5	-33
Point 56	97.5	-41
Point 57	97.5	-70
Point 58	231.1	-9.5
Point 59	310	-12
Point 60	179.6	-12
Point 61	97.5	-17
Point 62	200	-12
Point 63	200	-7
Point 64	200	-33
Point 65	200	-41
Point 66	200	-70
Point 67	114.3	-12
Point 68	167.5	0
Point 69	197.73	-1.5
Point 70	200	-9.5
Point 71	179.6	-9.5
Point 72	231.1	-12

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	3.23	(222.006, 19.184)	21.44843	(200, 12.9)	(247.889, 2.5)
2	937	3.40	(222.006, 19.184)	30.546	(200, 12.9)	(247.593, 2.5)

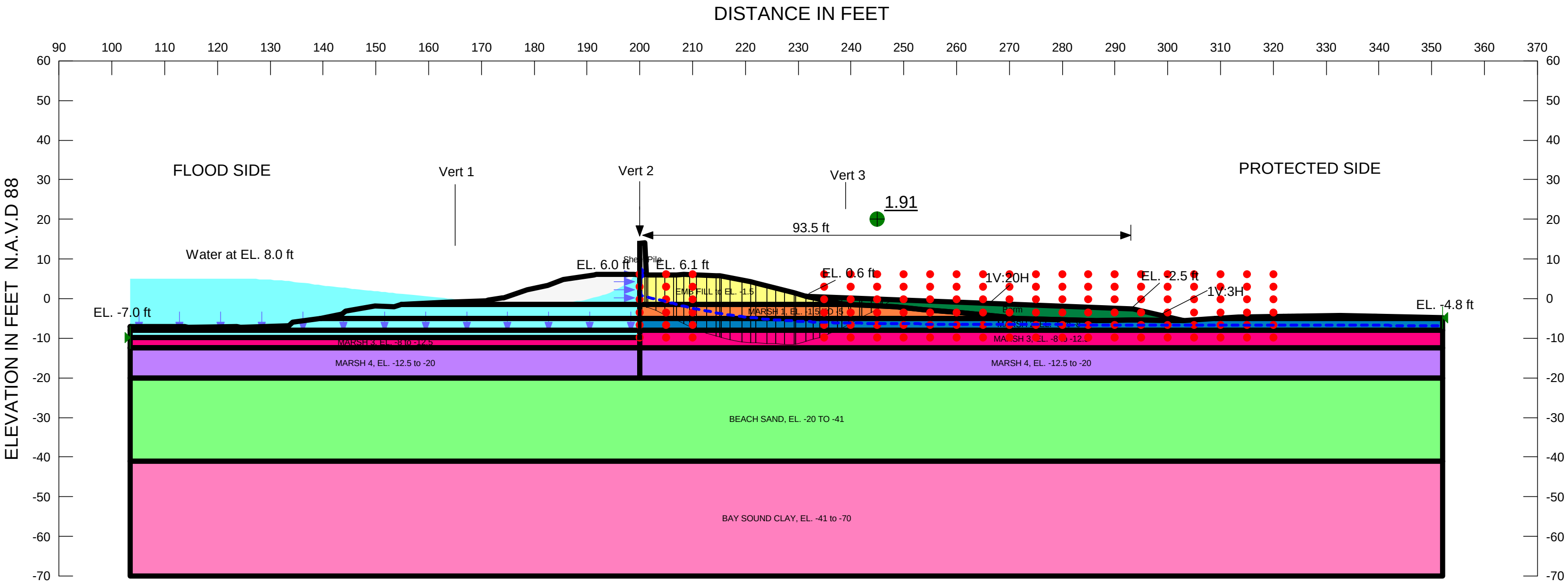
Slices of Slip Surface: Optimized

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	200.25	-2.171623	518.53083	702.67557	0	399.44
2	Optimized	200.75	-2.552025	520.77514	951.0139	0	398.31
3	Optimized	201.81895	-3.365278	573.70816	1034.9779	0	395.89
4	Optimized	203.4034	-4.646418	655.46457	1151.4958	0	392.31
5	Optimized	204.93445	-5.9625945	729.85687	1286.2638	0	388.86
6	Optimized	205.902	-6.7943365	770.02863	1367.263	0	386.67
7	Optimized	206.76345	-7.4407525	798.94058	1440.2498	0	333.03
8	Optimized	208.06	-8.3702725	841.86101	1490.2069	0	325.94
9	Optimized	209.3155	-9.163515	876.78992	1555.2262	0	319.08
10	Optimized	210.51695	-9.817225	906.37081	1584.1903	0	312.51
11	Optimized	211.3289	-10.25899	926.25194	1603.9261	0	308.07
12	Optimized	212.2991	-10.65868	942.50915	1643.4628	0	302.77
13	Optimized	213.7817	-11.208985	965.77942	1659.5243	0	294.67
14	Optimized	215.6615	-11.701155	983.45762	1689.2245	0	284.39
15	Optimized	217.01385	-11.958935	991.61543	1682.5632	0	277
16	Optimized	217.9231	-11.99927	989.02972	1691.0215	0	272.03
17	Optimized	219.31385	-11.998405	981.69558	1656.6517	0	264.43
18	Optimized	220.7046	-11.99754	974.86477	1622.2101	0	256.82
19	Optimized	222.2779	-11.996565	967.42556	1587.0882	0	248.22
20	Optimized	224.0337	-11.995475	959.85064	1551.207	0	238.63
21	Optimized	225.7895	-11.994385	952.6744	1515.2689	0	229.03
22	Optimized	226.8837	-11.97713	947.40998	1500.6823	0	223.05
23	Optimized	227.39125	-11.937915	943.04454	1484.6657	0	220.27
24	Optimized	228.2793	-11.82857	932.96854	1458.3592	0	215.42
25	Optimized	229.68965	-11.503065	907.9388	1407.8477	0	207.71
26	Optimized	230.8016	-11.075815	877.61569	1378.9971	0	201.63
27	Optimized	231.93365	-10.360342	829.54944	1311.1464	0	200
28	Optimized	233.60095	-9.306567	758.82328	1223.8415	0	200
29	Optimized	235.67665	-7.853765	662.01761	1114.4436	0	200
30	Optimized	237.74315	-6.2575725	555.94352	1027.1826	0	400
31	Optimized	239.392	-4.9170175	467.13091	886.52616	0	400
32	Optimized	241.15645	-3.4397825	370.13853	738.49318	0	400
33	Optimized	243.0365	-1.8258675	265.0552	568.82298	0	400
34	Optimized	244.95455	-0.1391825	155.78695	397.3447	0	400
35	Optimized	246.91065	1.6202725	42.167038	212.13889	0	400

Slices of Slip Surface: 937

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	937	200.25	-2.25371	524.21976	681.39865	0	399.44
2	937	200.75	-2.7496945	534.66596	945.78728	0	398.31
3	937	201.78335	-3.6846635	596.07402	1054.1989	0	395.97
4	937	203.35	-4.9820825	680.4285	1204.5813	0	392.44
5	937	204.91665	-6.1159235	740.51232	1335.8842	0	388.9
6	937	205.98815	-6.82252	770.40191	1412.0908	0	386.48
7	937	207.08025	-7.450525	796.13489	1461.7327	0	331.3
8	937	208.68815	-8.2907485	830.12562	1508.7546	0	322.51
9	937	210.29605	-9.014305	859.37783	1545.2374	0	313.72
10	937	211.3029	-9.4240815	876.12998	1564.2442	0	308.22
11	937	212.3882	-9.79287	889.48622	1579.2831	0	302.28
12	937	214.15295	-10.320595	909.39408	1597.1757	0	292.64
13	937	215.91765	-10.73501	923.09965	1604.9851	0	282.99
14	937	217.56665	-11.02723	931.53955	1600.4646	0	273.98
15	937	219.1	-11.213185	934.54303	1585.12	0	265.59
16	937	220.63335	-11.320985	933.62043	1562.9184	0	257.21

17	937	222.1125	-11.35301	928.55554	1538.3762	0	249.13
18	937	223.5375	-11.314755	920.03406	1511.9902	0	241.34
19	937	224.9625	-11.209675	907.36699	1479.8233	0	233.55
20	937	226.3875	-11.037075	891.17485	1441.9087	0	225.76
21	937	227.76665	-10.80573	871.54298	1394.3362	0	218.22
22	937	229.1	-10.51846	848.97347	1337.363	0	210.93
23	937	230.43335	-10.167837	822.59346	1275.5209	0	203.64
24	937	231.9295	-9.691369	788.09012	1223.6631	0	200
25	937	233.5885	-9.066218	743.82594	1179.0676	0	200
26	937	235.2475	-8.326885	692.76639	1125.372	0	200
27	937	236.9065	-7.463819	634.12045	1061.7953	0	200
28	937	238.5574	-6.470059	567.25211	1017.3199	0	400
29	937	240.20025	-5.3304985	491.24604	913.22884	0	400
30	937	241.8431	-4.0186355	405.09498	792.65457	0	400
31	937	243.4859	-2.502844	306.60856	652.88498	0	400
32	937	245.1287	-0.7358421	192.73991	489.99451	0	400
33	937	246.7715	1.3588059	58.766675	297.8979	0	400



Name: EMB FILL to EL. -1.5 Model: Undrained (Phi=0) Unit Weight: 116 pcf Cohesion: 700 psf
Name: MARSH 1, EL. -1.5 TO -5 Model: Spatial Mohr-Coulomb Unit Weight: 97 pcf Cohesion Fn: MARSH 1 Phi: 0 °
Name: BEACH SAND, EL. -20 TO -41 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand
Name: Sheet Pile Model: Undrained (Phi=0) Unit Weight: 0.1 pcf Cohesion: 0.01 psf
Name: Berm Model: Mohr-Coulomb Unit Weight: 110 pcf Cohesion: 400 psf Phi: 0 °
Name: MARSH 2, EL. -5 to -8 Model: Spatial Mohr-Coulomb Unit Weight: 97 pcf Cohesion Fn: MARSH 2 Phi: 0 °
Name: MARSH 3, EL. -8 to -12.5 Model: Spatial Mohr-Coulomb Unit Weight: 73 pcf Cohesion Fn: MARSH 3 Phi: 0 °
Name: MARSH 4, EL. -12.5 to -20 Model: Spatial Mohr-Coulomb Unit Weight: 111 pcf Cohesion Fn: MARSH 4 Phi: 0 °
Name: BAY SOUND CLAY, EL. -41 to -70 Model: Spatial Mohr-Coulomb Unit Weight: 105 pcf Cohesion Spatial Fn: Bay Sound Phi: 0 °

GENERAL NOTES

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

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

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 17B
REMEDIATION OF CANAL WALLS AND LEVEES
PROTECTED SIDE STABILITY ANALYSIS,
CASE: GAP Stability (Block)
STA. 37+29 TO 50+00 EAST
ORLEANS PARISH, LOUISIANA

ETL 1110-2-575 ANALYSIS

Name: GAP Stability (Block)
File Name: Orleans Canal Reach 17B.gsz Directory: Y:\F&MHOME\Middleton\Outfall Canals\Orleans final edits\final\Appendix A and Appendix B\
Last Edited By: Reves, Ryan D MVK

GAP Stability (Block)

File Information

Created By: Liljegren, James
Revision Number: 691
Last Edited By: Reves, Ryan D MVK
Date: 6/13/2013
Time: 5:16:06 PM
File Name: Orleans Canal Reach 17B.gsz
Directory: Y:\F&MHOME\Middleton\Outfall Canals\Orleans final edits\final\Appendix A and Appendix B\
Last Solved Date: 6/13/2013
Last Solved Time: 5:17:52 PM

Project Settings

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

Analysis Settings

GAP Stability (Block)

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

Materials

EMB FILL to EL. -1.5

Model: Undrained (Phi=0)
Unit Weight: 116 pcf
Cohesion: 700 psf

MARSH 1, EL. -1.5 TO -5

Model: Spatial Mohr-Coulomb
Unit Weight: 97 pcf
Cohesion Fn: MARSH 1
Phi: 0 °
Phi-B: 0 °

BEACH SAND, EL. -20 TO -41

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

Sheet Pile

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

Berm

Model: Mohr-Coulomb
Unit Weight: 110 pcf
Cohesion: 400 psf
Phi: 0 °
Phi-B: 0 °

MARSH 2, EL. -5 to -8

Model: Spatial Mohr-Coulomb
Unit Weight: 97 pcf
Cohesion Fn: MARSH 2
Phi: 0 °
Phi-B: 0 °

MARSH 3, EL. -8 to -12.5

Model: Spatial Mohr-Coulomb
Unit Weight: 73 pcf
Cohesion Fn: MARSH 3
Phi: 0 °
Phi-B: 0 °

MARSH 4, EL. -12.5 to -20

Model: Spatial Mohr-Coulomb
Unit Weight: 111 pcf
Cohesion Fn: MARSH 4
Phi: 0 °
Phi-B: 0 °

BAY SOUND CLAY, EL. -41 to -70

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

Slip Surface Limits

Left Coordinate: (103.5, -9.8) ft
Right Coordinate: (352.1, -4.8) ft

Slip Surface Block

Left Grid
- Upper Left: (200, 6.1) ft
- Lower Left: (200, -9.8) ft
- Lower Right: (210, -9.8) ft
- X Increments: 2
- Y Increments: 5
- Starting Angle: 115 °
- Ending Angle: 180 °
- Angle Increments: 4

Right Grid
- Upper Left: (235, 6.1) ft
- Lower Left: (235, -9.8) ft
- Lower Right: (320, -9.8) ft
- X Increments: 17
- Y Increments: 5
- Starting Angle: 5 °
- Ending Angle: 45 °
- Angle Increments: 4

Reinforcements

Reinforcement 1

Type: Pile
Outside Point: (200, 13.9) ft
Inside Point: (200, -9.8) ft
Slip Surface Intersection: (200, -1.4829) ft
Total Length: 23.7 ft
Reinforcement Direction: 90 °
Applied Load Option: Variable
F of S Dependent: No
Pile Spacing: 1 ft
Shear Capacity: 0 lbs
Shear Safety Factor: 1
Shear Load Used: 0 lbs
Shear Option: Parallel to Slip
Resisting Force Used: 0 lbs/ft

Cohesion Functions

MARSH 1

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

Y-Intercept: 200
Data Points: X (ft), Cohesion (psf)
- Data Point: (165, 200)
- Data Point: (200, 275)
- Data Point: (239.5, 200)

MARSH 2

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

Y-Intercept: 350
Data Points: X (ft), Cohesion (psf)

Data Point: (165, 350)
Data Point: (200, 400)
Data Point: (239.5, 350)

MARSH 3

Model: Spline Data Point Function
Function: Cohesion vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 180
Data Points: X (ft), Cohesion (psf)
Data Point: (165, 180)
Data Point: (200, 250)
Data Point: (239.5, 180)

MARSH 4

Model: Spline Data Point Function
Function: Cohesion vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 180
Data Points: X (ft), Cohesion (psf)
Data Point: (165, 180)
Data Point: (200, 250)
Data Point: (239.5, 180)

Shear/Normal Strength Functions

Sand

Model: Spline Data Point Function
Function: Shear Stress vs. Normal Stress
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
Data Point: (-10000, 0)
Data Point: (0, 0)
Data Point: (10000, 6494)
Estimation Properties
Intact Rock Param.: 10
Geological Strength: 100
Disturbance Factor: 0
SigmaC: 600000 psf
Sigma3: 300000 psf
Num. Points: 20

Spatial Functions

Bay Sound

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (103.5, -41, 580)
Data Point: (165, -41, 580)
Data Point: (200, -41, 610)
Data Point: (239.5, -41, 580)
Data Point: (352.1, -41, 580)
Data Point: (103.5, -70, 855)
Data Point: (165, -70, 855)
Data Point: (200, -70, 885)
Data Point: (239.5, -70, 855)
Data Point: (352.1, -70, 855)

Regions

	Points	Area (ft²)	Material
Region 1	1,7,15,16	173.7	
Region 2	2,1,16,17	260.55	MARSH 3, EL. -8 to -12.5
Region 3	2,17,18,3	723.75	MARSH 4, EL. -12.5 to -20
Region 4	4,19,11,12,20,5	7209.4	BAY SOUND CLAY, EL. -41 to -70
Region 5	15,8,9,17,16	684.45	MARSH 3, EL. -8 to -12.5
Region 6	17,9,10,18	1140.75	MARSH 4, EL. -12.5 to -20
Region 7	3,18,10,11,19,4	5220.6	BEACH SAND, EL. -20 TO -41
Region 8	33,34,35,36,38,37,39,40,41,42,43,44,45,46,13	162.855	
Region 9	73,29,30,31,32,33,13,14	193.77	
Region 10	21,22,23,24,25,26,27,28,73,14,15,7	222.71	
Region 11	59,60,13,46,49,50,51,52,53,54,55,56,57,58	198.42	EMB FILL to EL. -1.5
Region 12	65,14,13,60,61,62,63,64	204.175	MARSH 1, EL. -1.5 TO -5
Region 13	74,70,71,72,6	22.16	MARSH 1, EL. -1.5 TO -5
Region 14	14,65,66,67,68,69,74,6,8,15	442.39	MARSH 2, EL. -5 to -8
Region 15	46,75,47,48,49	8.775	Sheet Pile
Region 16	58,76,69,68,67,66,65,64,63,62,61,60,59	172.285	Berm

Points

	X (ft)	Y (ft)
Point 1	103.5	-9.8
Point 2	103.5	-12.5
Point 3	103.5	-20
Point 4	103.5	-41
Point 5	103.5	-70
Point 6	352.1	-5
Point 7	103.5	-8
Point 8	352.1	-8
Point 9	352.1	-12.5
Point 10	352.1	-20
Point 11	352.1	-41
Point 12	352.1	-70
Point 13	200	-1.5
Point 14	200	-5
Point 15	200	-8
Point 16	200	-9.8
Point 17	200	-12.5
Point 18	200	-20
Point 19	200	-41
Point 20	200	-70
Point 21	103.5	-7
Point 22	104.4	-7.1
Point 23	113.7	-7.1
Point 24	114.4	-7.2
Point 25	123.7	-7.1
Point 26	124.4	-7.3
Point 27	133.5	-6.8
Point 28	134.3	-6
Point 29	143.5	-3.9
Point 30	144.2	-3.1
Point 31	149.8	-1.8
Point 32	153.4	-2
Point 33	154.8	-1.4
Point 34	163.2	-0.9
Point 35	170.9	-0.5
Point 36	171.3	-0.4
Point 37	174.2	0.2
Point 38	173.9	0.2
Point 39	178.6	2.2
Point 40	182.5	3.4
Point 41	185.5	4.8
Point 42	191.4	6
Point 43	191.8	6.1
Point 44	195	6.1
Point 45	198.9	6.1
Point 46	200	6
Point 47	200	13.9
Point 48	200.9	14.1
Point 49	201.3	6.1
Point 50	201.5	6
Point 51	206.9	6
Point 52	208.4	6.1
Point 53	214.5	5.7
Point 54	215.2	5.7
Point 55	221	4.2
Point 56	222	3.9
Point 57	229.2	1.5
Point 58	231.5	0.6
Point 59	238.3	-1.3
Point 60	239.5	-1.4
Point 61	248.5	-2.1

Point 62	253.8	-2.7
Point 63	260.5	-3.5
Point 64	269.3	-4.7
Point 65	271.1	-5
Point 66	282	-5.4
Point 67	286.5	-5.5
Point 68	293.4	-5.4
Point 69	303	-5.6
Point 70	313.4	-4.6
Point 71	332.7	-4.2
Point 72	352.1	-4.8
Point 73	139.5	-5
Point 74	309	-5
Point 75	200	6.1
Point 76	293.5	-2.5

Critical Slip Surfaces

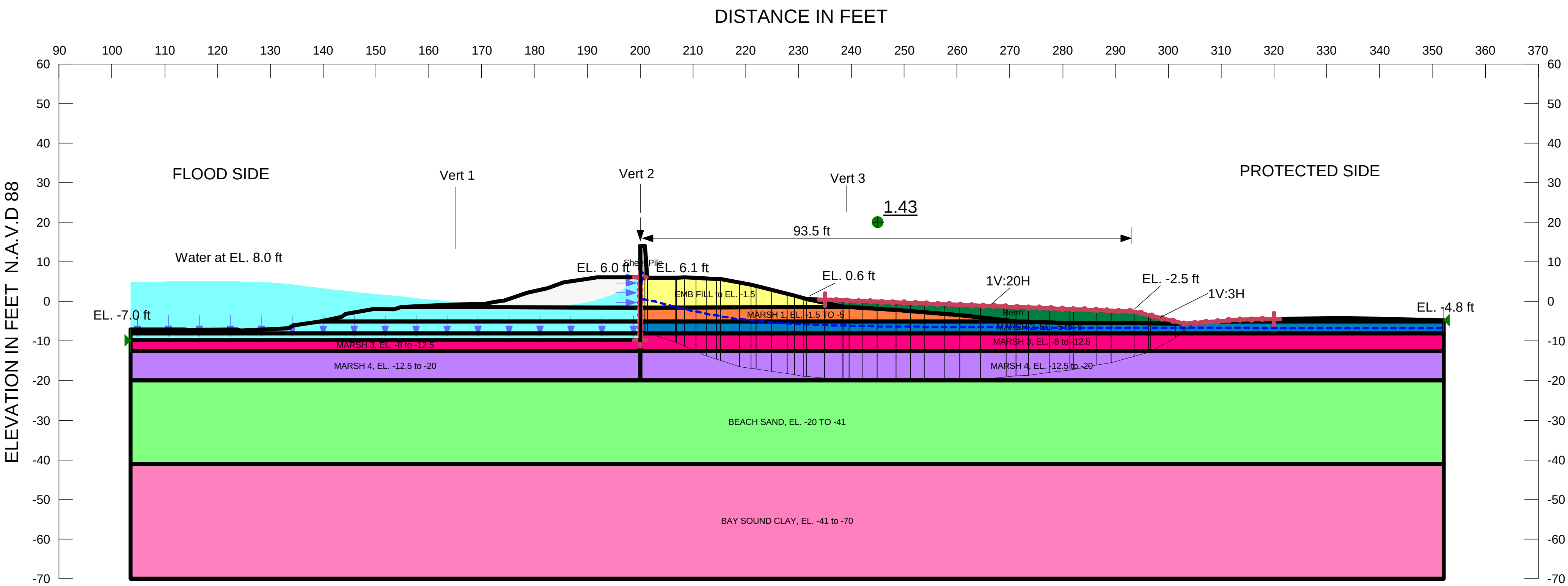
	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.91	(224.16, 0.537)	19.83022	(200, 13.9)	(248.049, -0.227455)
2	7834	2.25	(224.16, 0.537)	19.925	(200, 13.9)	(248.63, -0.256478)

Slices of Slip Surface: Optimized

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	200.45	-1.7074075	98.736624	572.07369	0	274.15
2	Optimized	201.1	-2.0317075	116.32561	839.44583	0	272.91
3	Optimized	201.4	-2.1813845	124.45942	849.26621	0	272.34
4	Optimized	202.29475	-2.6277935	146.36283	885.69806	0	270.64
5	Optimized	203.9083	-3.5182325	184.02428	948.09578	0	267.58
6	Optimized	205.571	-4.5212275	217.68776	1041.7903	0	264.42
7	Optimized	206.65745	-5.196492	236.08252	1048.7077	0	391.57
8	Optimized	207.65	-5.8765645	254.94948	1117.1845	0	390.32
9	Optimized	208.9125	-6.7415825	277.02055	1199.1427	0	388.72
10	Optimized	210.0729	-7.531155	297.53626	1266.3171	0	387.25
11	Optimized	211.68495	-8.347787	312.83869	1430.6618	0	229.29
12	Optimized	213.57455	-9.0889765	324.09186	1470.0172	0	225.94
13	Optimized	214.85	-9.589254	335.11388	1498.9557	0	223.68
14	Optimized	215.31495	-9.7716295	339.66503	1508.6011	0	222.86
15	Optimized	216.27805	-10.09623	346.96327	1517.9153	0	221.15
16	Optimized	218.2446	-10.69567	361.56324	1513.1867	0	217.67
17	Optimized	220.1815	-11.066035	367.59842	1533.6213	0	214.24
18	Optimized	221.5	-11.14728	363.97953	1497.6589	0	211.9
19	Optimized	223.0041	-11.239965	360.91069	1448.3246	0	209.23
20	Optimized	224.8735	-11.34038	357.66858	1387.2292	0	205.92
21	Optimized	226.6041	-11.41746	354.97275	1325.9813	0	202.85
22	Optimized	228.3347	-11.49454	353.27558	1264.791	0	199.79
23	Optimized	229.32045	-11.538445	352.76997	1229.1356	0	198.04
24	Optimized	230.47045	-11.148675	326.26753	1232.8886	0	196
25	Optimized	232.1509	-10.50374	283.16129	1130.5797	0	193.02
26	Optimized	233.45265	-10.00414	249.83343	1082.743	0	190.72
27	Optimized	234.93595	-9.315755	204.57659	1045.6267	0	188.09
28	Optimized	236.62325	-8.426785	146.73464	964.05219	0	185.1
29	Optimized	237.88905	-7.684437	98.644243	995.02191	0	352.04
30	Optimized	238.9	-6.966204	52.557245	913.85	0	350.76
31	Optimized	239.7148	-6.387322	15.317677	849.23212	0	350
32	Optimized	240.7849	-5.617355	-34.008027	768.04246	0	350
33	Optimized	241.84145	-4.854725	-82.94067	618.44431	0	200
34	Optimized	242.94855	-4.077925	-132.86961	529.59478	0	200
35	Optimized	244.76025	-2.814875	-214.07927	391.51344	0	200
36	Optimized	245.8351	-2.044613	-263.44316	324.35381	0	200
37	Optimized	247.0266	-1.0666657	-325.88013	304.65978	0	400

Slices of Slip Surface: 7834

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	7834	200.45	-3.715979	232.37312	610.578	0	274.15
2	7834	201.1	-4.130075	259.27963	1014.1993	0	272.91
3	7834	201.4	-4.321196	271.56362	1027.7147	0	272.34
4	7834	201.98275	-4.6924515	295.05745	1056.6093	0	271.24
5	7834	203.2046	-5.470847	331.28271	1099.1977	0	395.94
6	7834	204.68275	-6.412541	362.82367	1186.2662	0	394.07
7	7834	206.1609	-7.354235	379.29594	1273.3918	0	392.2
8	7834	207.0373	-7.912541	387.6825	1326.0026	0	391.09
9	7834	207.7873	-8.390344	392.55766	1402.6995	0	236.2
10	7834	209.2	-9.290344	407.63227	1464.2861	0	233.7
11	7834	210.75	-9.8	404.54667	1633.7333	0	230.95
12	7834	212.25	-9.8	380.17333	1622.1333	0	228.29
13	7834	213.75	-9.8	359.62	1610.5333	0	225.63
14	7834	214.85	-9.8	346.5	1604.7143	0	223.68
15	7834	215.925	-9.8	334.26207	1582.8276	0	221.78
16	7834	217.375	-9.8	320.28276	1539.1724	0	219.21
17	7834	218.825	-9.8	307.67586	1495.5172	0	216.64
18	7834	220.275	-9.8	296.34483	1451.8621	0	214.07
19	7834	221.5	-9.8	288.01	1412.6	0	211.9
20	7834	222.9	-9.8	279.38333	1360.2222	0	209.42
21	7834	224.7	-9.8	269.55556	1290.3889	0	206.23
22	7834	226.5	-9.8	261.03333	1220.6111	0	203.04
23	7834	228.3	-9.8	253.62778	1150.7778	0	199.85
24	7834	230.35	-9.8	246.43043	1063.5652	0	196.22
25	7834	232.375	-9.8	240.35429	1004.8571	0	192.63
26	7834	234.125	-9.8	235.76571	992.05714	0	189.53
27	7834	235.64265	-9.35	205.00261	1068.8916	0	186.84
28	7834	236.928	-8.45	147.50475	988.39973	0	184.56
29	7834	237.93535	-7.7446575	102.23935	981.31986	0	351.98
30	7834	238.9	-7.0691905	58.888138	904.6166	0	350.76
31	7834	240.67755	-5.824533	-21.046177	766.59296	0	350
32	7834	242.5871	-4.487461	-106.90091	564.3003	0	200
33	7834	244.05105	-3.462383	-172.75367	451.68644	0	200
34	7834	245.515	-2.4373055	-238.58404	339.07817	0	200
35	7834	247.4383	-1.0906226	-324.87764	252.25093	0	400



Name: EMB FILL to EL. -1.5 Model: Undrained (Phi=0) Unit Weight: 116 pcf Cohesion: 700 psf
Name: MARSH 1, EL. -1.5 TO -5 Model: Spatial Mohr-Coulomb Unit Weight: 97 pcf Cohesion Fn: MARSH 1 Phi: 0 °
Name: BEACH SAND, EL. -20 TO -41 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand
Name: Sheet Pile Model: Undrained (Phi=0) Unit Weight: 0.1 pcf Cohesion: 0.01 psf
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WHERE INDICATED, SHEAR STRENGTHS BETWEEN VERTICALS WERE ASSUMED TO VARY LINEARLY BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

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HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 17B
REMEDIATION OF CANAL WALLS AND LEVEES
PROTECTED SIDE STABILITY ANALYSIS,
CASE: GAP Stability (Entry/Exit)
STA. 37+29 TO 50+00 EAST
ORLEANS PARISH, LOUISIANA

ETL 1110-2-575 ANALYSIS

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Last Edited By: Reves, Ryan D MVK

GAP Stability (Entry/Exit)

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Time(t) Units: Seconds
Force(F) Units: lbf
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D

Analysis Settings

GAP Stability (Entry/Exit)

Kind: SLOPE/W
Parent: Gap Analysis (seepage)
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: 8
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Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
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Materials

EMB FILL to EL. -1.5

Model: Undrained (Phi=0)
Unit Weight: 116 pcf
Cohesion: 700 psf

MARSH 1, EL. -1.5 TO -5

Model: Spatial Mohr-Coulomb
Unit Weight: 97 pcf
Cohesion Fn: MARSH 1
Phi: 0 °
Phi-B: 0 °

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

Sheet Pile

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

Berm

Model: Mohr-Coulomb
Unit Weight: 110 pcf
Cohesion: 400 psf
Phi: 0 °
Phi-B: 0 °

MARSH 2, EL. -5 to -8

Model: Spatial Mohr-Coulomb
Unit Weight: 97 pcf
Cohesion Fn: MARSH 2
Phi: 0 °
Phi-B: 0 °

MARSH 3, EL. -8 to -12.5

Model: Spatial Mohr-Coulomb
Unit Weight: 73 pcf
Cohesion Fn: MARSH 3
Phi: 0 °
Phi-B: 0 °

MARSH 4, EL. -12.5 to -20

Model: Spatial Mohr-Coulomb
Unit Weight: 111 pcf
Cohesion Fn: MARSH 4
Phi: 0 °
Phi-B: 0 °

BAY SOUND CLAY, EL. -41 to -70

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

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (200, -9.8) ft
Left-Zone Right Coordinate: (200, 6.1) ft
Left-Zone Increment: 10
Right Projection: Range
Right-Zone Left Coordinate: (234.99923, 0.42504) ft
Right-Zone Right Coordinate: (320, -4.46321) ft
Right-Zone Increment: 40
Radius Increments: 25

Slip Surface Limits

Left Coordinate: (103.5, -9.8) ft
Right Coordinate: (352.1, -4.8) ft

Reinforcements

Reinforcement 1

Type: Pile
Outside Point: (200, 13.9) ft
Inside Point: (200, -9.8) ft
Slip Surface Intersection: (200, -7.1993) ft
Total Length: 23.7 ft
Reinforcement Direction: 90 °
Applied Load Option: Variable
F of S Dependent: No
Pile Spacing: 1 ft
Shear Capacity: 0 lbs
Shear Safety Factor: 1
Shear Load Used: 0 lbs
Shear Option: Parallel to Slip
Resisting Force Used: 0 lbs/ft

Cohesion Functions

MARSH 1

Model: Spline Data Point Function
Function: Cohesion vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 200
Data Points: X (ft), Cohesion (psf)
Data Point: (165, 200)
Data Point: (200, 275)
Data Point: (239.5, 200)

MARSH 2

Model: Spline Data Point Function
Function: Cohesion vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 350
Data Points: X (ft), Cohesion (psf)
Data Point: (165, 350)
Data Point: (200, 400)
Data Point: (239.5, 350)

MARSH 3

Model: Spline Data Point Function
Function: Cohesion vs. X
Curve Fit to Data: 100 %

Segment Curvature: 0 %
Y-Intercept: 180
Data Points: X (ft), Cohesion (psf)
Data Point: (165, 180)
Data Point: (200, 250)
Data Point: (239.5, 180)

MARSH 4

Model: Spline Data Point Function
Function: Cohesion vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 180
Data Points: X (ft), Cohesion (psf)
Data Point: (165, 180)
Data Point: (200, 250)
Data Point: (239.5, 180)

Shear/Normal Strength Functions

Sand

Model: Spline Data Point Function
Function: Shear Stress vs. Normal Stress
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
Data Point: (-10000, 0)
Data Point: (0, 0)
Data Point: (10000, 6494)
Estimation Properties
Intact Rock Param.: 10
Geological Strength: 100
Disturbance Factor: 0
SigmaC: 600000 psf
Sigma3: 300000 psf
Num. Points: 20

Spatial Functions

Bay Sound

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (103.5, -41, 580)
Data Point: (165, -41, 580)
Data Point: (200, -41, 610)
Data Point: (239.5, -41, 580)
Data Point: (352.1, -41, 580)
Data Point: (103.5, -70, 855)
Data Point: (165, -70, 855)
Data Point: (200, -70, 885)
Data Point: (239.5, -70, 855)
Data Point: (352.1, -70, 855)

Regions

	Points	Area (ft²)	Material
Region 1	1,7,15,16	173.7	
Region 2	2,1,16,17	260.55	MARSH 3, EL. -8 to -12.5
Region 3	2,17,18,3	723.75	MARSH 4, EL. -12.5 to -20
Region 4	4,19,11,12,20,5	7209.4	BAY SOUND CLAY, EL. -41 to -70
Region 5	15,8,9,17,16	684.45	MARSH 3, EL. -8 to -12.5
Region 6	17,9,10,18	1140.75	MARSH 4, EL. -12.5 to -20
Region 7	3,18,10,11,19,4	5220.6	BEACH SAND, EL. -20 TO -41
Region 8	33,34,35,36,38,37,39,40,41,42,43,44,45,46,13	162.855	
Region 9	73,29,30,31,32,33,13,14	193.77	
Region 10	21,22,23,24,25,26,27,28,73,14,15,7	222.71	
Region 11	59,60,13,46,49,50,51,52,53,54,55,56,57,58	198.42	EMB FILL to EL. -1.5
Region 12	65,14,13,60,61,62,63,64	204.175	MARSH 1, EL. -1.5 TO -5
Region 13	74,70,71,72,6	22.16	MARSH 1, EL. -1.5 TO -5
Region 14	14,65,66,67,68,69,74,6,8,15	442.39	MARSH 2, EL. -5 to -8
Region 15	46,75,47,48,49	8.775	Sheet Pile
Region 16	58,76,69,68,67,66,65,64,63,62,61,60,59	172.285	Berm

Points

	X (ft)	Y (ft)
Point 1	103.5	-9.8
Point 2	103.5	-12.5
Point 3	103.5	-20
Point 4	103.5	-41
Point 5	103.5	-70
Point 6	352.1	-5
Point 7	103.5	-8
Point 8	352.1	-8
Point 9	352.1	-12.5
Point 10	352.1	-20
Point 11	352.1	-41
Point 12	352.1	-70
Point 13	200	-1.5
Point 14	200	-5
Point 15	200	-8
Point 16	200	-9.8
Point 17	200	-12.5
Point 18	200	-20
Point 19	200	-41
Point 20	200	-70
Point 21	103.5	-7
Point 22	104.4	-7.1
Point 23	113.7	-7.1
Point 24	114.4	-7.2
Point 25	123.7	-7.1
Point 26	124.4	-7.3
Point 27	133.5	-6.8
Point 28	134.3	-6
Point 29	143.5	-3.9
Point 30	144.2	-3.1
Point 31	149.8	-1.8
Point 32	153.4	-2
Point 33	154.8	-1.4
Point 34	163.2	-0.9
Point 35	170.9	-0.5
Point 36	171.3	-0.4
Point 37	174.2	0.2
Point 38	173.9	0.2
Point 39	178.6	2.2
Point 40	182.5	3.4
Point 41	185.5	4.8
Point 42	191.4	6
Point 43	191.8	6.1
Point 44	195	6.1
Point 45	198.9	6.1
Point 46	200	6
Point 47	200	13.9
Point 48	200.9	14.1
Point 49	201.3	6.1
Point 50	201.5	6
Point 51	206.9	6
Point 52	208.4	6.1
Point 53	214.5	5.7
Point 54	215.2	5.7
Point 55	221	4.2
Point 56	222	3.9
Point 57	229.2	1.5
Point 58	231.5	0.6
Point 59	238.3	-1.3
Point 60	239.5	-1.4
Point 61	248.5	-2.1
Point 62	253.8	-2.7
Point 63	260.5	-3.5
Point 64	269.3	-4.7
Point 65	271.1	-5
Point 66	282	-5.4

Point 67	286.5	-5.5
Point 68	293.4	-5.4
Point 69	303	-5.6
Point 70	313.4	-4.6
Point 71	332.7	-4.2
Point 72	352.1	-4.8
Point 73	139.5	-5
Point 74	309	-5
Point 75	200	6.1
Point 76	293.5	-2.5

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.43	(252.317, 89.166)	41.03042	(200, 13.9)	(304.952, -5.40482)
2	3023	1.55	(252.317, 89.166)	109.143	(200, 13.9)	(307.186, -5.18138)

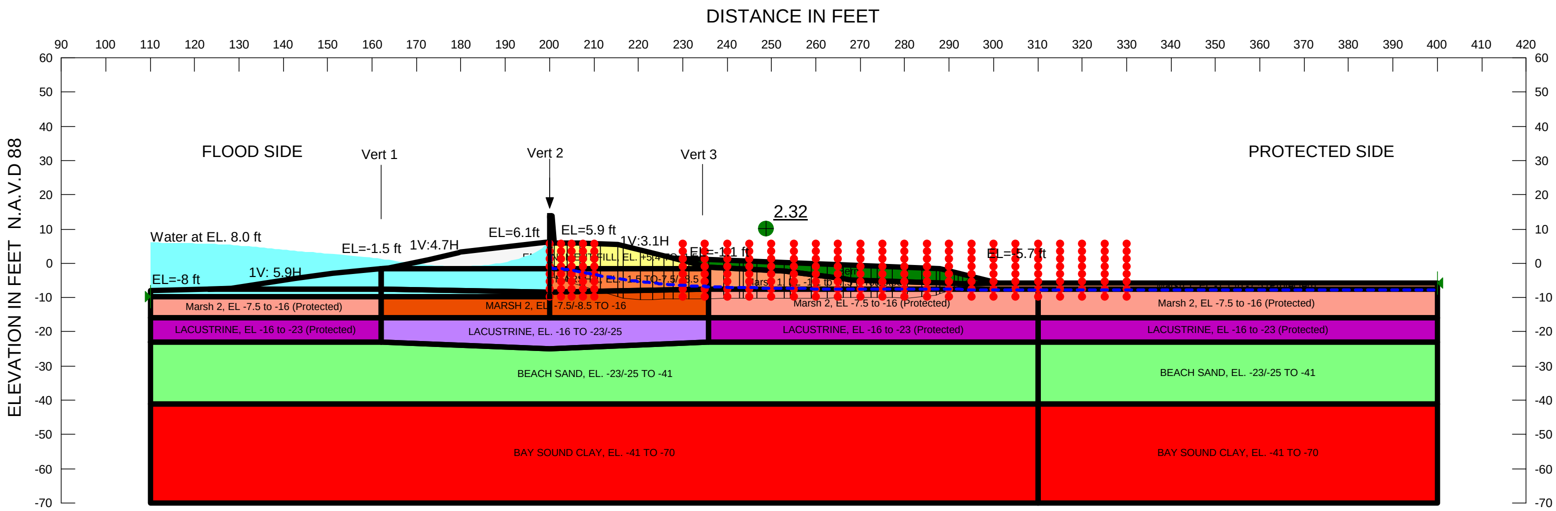
Slices of Slip Surface: Optimized

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	200.45	-7.4069845	555.69237	726.88339	0	399.43
2	Optimized	201.1	-7.7069815	577.46327	1328.5741	0	398.61
3	Optimized	201.4	-7.8454415	587.08752	1337.381	0	398.23
4	Optimized	204.0536	-9.0701575	545.79068	1461.439	0	242.82
5	Optimized	206.7536	-10.332435	519.08597	1523.255	0	238.03
6	Optimized	207.65	-10.84495	517.56598	1565.2337	0	236.44
7	Optimized	209.4724	-11.886875	527.36818	1636.9502	0	233.21
8	Optimized	211.55475	-13.077435	550.80743	1727.3761	0	229.52
9	Optimized	213.53235	-14.09551	577.66065	1855.3892	0	226.02
10	Optimized	214.85	-14.69553	596.07884	1913.256	0	223.68
11	Optimized	217.00365	-15.67623	631.91293	1967.1371	0	219.87
12	Optimized	219.90365	-16.702795	673.88018	2072.9223	0	214.73
13	Optimized	221.5	-17.00164	685.68822	2056.18	0	211.9
14	Optimized	223.45055	-17.366795	701.63539	2023.8635	0	208.44
15	Optimized	226.3517	-17.9099	727.82517	1972.9408	0	203.3
16	Optimized	228.50115	-18.35027	750.86948	1924.2899	0	199.49
17	Optimized	230.0964	-18.73563	772.02639	1900.0557	0	196.66
18	Optimized	231.2464	-18.97555	785.3913	1915.7901	0	194.63
19	Optimized	233.2	-19.15567	795.09844	1912.0378	0	191.16
20	Optimized	236.6	-19.469145	812.61239	1922.2884	0	185.14
21	Optimized	238.4205	-19.63699	822.20291	1927.9098	0	181.91
22	Optimized	239.0205	-19.674335	824.32382	1938.5014	0	180.85
23	Optimized	240.84105	-19.77394	829.95924	1940.5798	0	180
24	Optimized	243.5232	-19.92068	838.33552	1944.7865	0	180
25	Optimized	246.68215	-19.991935	842.11841	1953.5651	0	180
26	Optimized	249.825	-19.98828	841.32012	1939.6589	0	180
27	Optimized	252.475	-19.9852	840.64087	1928.6401	0	180
28	Optimized	255.71945	-19.98143	839.832	1915.3067	0	180
29	Optimized	259.06945	-19.896175	833.92796	1907.741	0	180
30	Optimized	262.4533	-19.699785	821.12582	1872.8579	0	180
31	Optimized	266.8533	-19.314145	796.3253	1827.3155	0	180
32	Optimized	270.2	-18.94172	772.50925	1773.4418	0	180
33	Optimized	272.29575	-18.708505	757.57135	1738.2292	0	180
34	Optimized	275.44255	-18.262745	729.18931	1684.7494	0	180
35	Optimized	279.34465	-17.637355	689.46181	1594.6667	0	180
36	Optimized	281.64785	-17.239915	664.23856	1557.8876	0	180
37	Optimized	284.25	-16.613675	624.67538	1473.3982	0	180
38	Optimized	287.84765	-15.74785	570.00508	1355.8272	0	180
39	Optimized	291.34765	-14.614805	498.63696	1237.3503	0	180
40	Optimized	294.838	-13.303355	416.17532	1026.0784	0	180
41	Optimized	296.39	-12.65031	375.13573	960.72604	0	180
42	Optimized	298.9633	-10.84277	261.86137	718.93951	0	180
43	Optimized	301.89165	-8.59277	120.90576	493.85218	0	180
44	Optimized	302.73035	-7.7190665	66.224434	528.87872	0	350
45	Optimized	303.9759	-6.421476	-14.99879	392.44362	0	350

Slices of Slip Surface: 3023

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	3023	200.45	-6.8630525	497.66005	743.81628	0	399.43
2	3023	201.1	-7.2123875	525.68301	1269.0834	0	398.61
3	3023	201.4	-7.3714135	537.91545	1281.1259	0	398.23
4	3023	202.05495	-7.7120785	562.19385	1310.5354	0	397.4
5	3023	204.75495	-9.03887	518.71907	1463.0328	0	241.57
6	3023	207.65	-10.414155	498.58028	1576.0456	0	236.44
7	3023	210.50875	-11.625285	497.4633	1661.5984	0	231.38
8	3023	213.55875	-12.85757	517.4961	1749.7834	0	225.97
9	3023	214.85	-13.343065	529.14895	1799.4311	0	223.68
10	3023	216.65	-13.972425	547.23664	1830.792	0	220.49
11	3023	219.55	-14.930285	581.22955	1858.4808	0	215.35
12	3023	221.5	-15.533875	606.1202	1870.1729	0	211.9
13	3023	223.8	-16.16835	634.4655	1860.4428	0	207.82
14	3023	227.4	-17.07781	679.02036	1832.5815	0	201.44
15	3023	230.35	-17.73627	713.6113	1792.1626	0	196.22
16	3023	233.2	-18.27506	743.03563	1794.6077	0	191.16
17	3023	236.6	-18.82496	773.99259	1838.8909	0	185.14
18	3023	238.9	-19.146705	792.50098	1863.9201	0	181.06
19	3023	241	-19.377425	805.86501	1883.8218	0	180
20	3023	244	-19.64847	821.63689	1907.1043	0	180
21	3023	247	-19.83629	832.51015	1921.249	0	180
22	3023	251.15	-19.937805	837.97096	1924.4183	0	180
23	3023	255.475	-19.917665	835.91857	1914.7205	0	180
24	3023	258.825	-19.76911	826.10915	1892.5063	0	180
25	3023	262.7	-19.458755	806.09875	1851.7647	0	180
26	3023	267.1	-18.947655	773.48472	1787.9769	0	180
27	3023	270.2	-18.49735	744.85069	1733.1439	0	180
28	3023	272.91665	-17.99866	713.24532	1670.9871	0	180
29	3023	276.55	-17.235715	664.99015	1574.7224	0	180
30	3023	280.18335	-16.342165	608.55473	1463.4159	0	180
31	3023	284.25	-15.17376	534.88845	1318.9254	0	180
32	3023	287.8792	-14.00979	461.57722	1174.7306	0	180
33	3023	290.63755	-13.01721	399.12558	1051.6847	0	180

34	3023	292.70835	-12.22447	349.26538	964.39852	0	180
35	3023	293.45	-11.928595	330.66754	939.51115	0	180
36	3023	295.6311	-10.986605	271.46591	794.90886	0	180
37	3023	299.89325	-9.03248	148.73182	499.59449	0	180
38	3023	302.51215	-7.7473315	68.031031	371.3853	0	350
39	3023	305.0931	-6.3380235	-20.431965	241.46943	0	350



Name: EMBANKMENT FILL, EL. +5.4 TO -1.5 Model: Undrained (Phi=0) Unit Weight: 115 pcf Cohesion: 540 psf
Name: MARSH 1, EL. -1.5 TO-7.5/ -8.5 Model: Spatial Mohr-Coulomb Unit Weight: 102 pcf Cohesion Fn: Marsh 1 Phi: 0 °
Name: BEACH SAND, EL. -23/-25 TO -41 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand
Name: BAY SOUND CLAY, EL. -41 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 103 pcf Cohesion Spatial Fn: Bay Sound Phi: 0 °
Name: MARSH 2, EL. -7.5/-8.5 TO -16 Model: Spatial Mohr-Coulomb Unit Weight: 80 pcf Cohesion Fn: MARSH 2 Phi: 0 °
Name: Marsh 1, EL -1.1 to -7.5 (Protected) Model: Undrained (Phi=0) Unit Weight: 102 pcf Cohesion: 280 psf
Name: Marsh 2, EL -7.5 to -16 (Protected) Model: Undrained (Phi=0) Unit Weight: 80 pcf Cohesion: 180 psf
Name: LACUSTRINE, EL -16 to -23 (Protected) Model: Spatial Mohr-Coulomb Unit Weight: 108 pcf Cohesion Fn: Lacustrine Phi: 0 °
Name: LACUSTRINE, EL. -16 TO -23/-25 Model: Spatial Mohr-Coulomb Unit Weight: 108 pcf Cohesion Spatial Fn: Lacustrine Phi: 0 °
Name: Berm Model: Undrained (Phi=0) Unit Weight: 110 pcf Cohesion: 400 psf

GENERAL NOTES

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

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

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 18A
REMEDIATION OF CANAL WALLS AND LEVEES
PROTECTED SIDE STABILITY ANALYSIS
CASE: GAP Stability (Block)
STA. 50+00 TO 61+00 EAST
ORLEANS PARISH, LOUISIANA

ETL 1110-2-575 ANALYSIS

Name: GAP Stability (Block)
File Name: Orleans Canal Reach 18A.gsz Directory: Y:\F&MHOME\Middleton\Outfall Canals\Orleans final edits\final\Appendix A and Appendix B\
Last Edited By: Reves, Ryan D MVK

GAP Stability (Block)

File Information

Created By: Liljegren, James
Revision Number: 451
Last Edited By: Reves, Ryan D MVK
Date: 6/13/2013
Time: 3:37:28 PM
File Name: Orleans Canal Reach 18A.gsz
Directory: Y:\F&MHOME\Middleton\Outfall Canals\Orleans final edits\final\Appendix A and Appendix B\
Last Solved Date: 6/13/2013
Last Solved Time: 3:39:20 PM

Project Settings

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

Analysis Settings

GAP Stability (Block)

Kind: SLOPE/W
Parent: Gap Analysis (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
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. +5.4 TO -1.5

Model: Undrained (Phi=0)
Unit Weight: 115 pcf
Cohesion: 540 psf

MARSH 1, EL. -1.5 TO-7.5/ -8.5

Model: Spatial Mohr-Coulomb
Unit Weight: 102 pcf
Cohesion Fn: Marsh 1
Phi: 0 °
Phi-B: 0 °

BEACH SAND, EL. -23/-25 TO -41

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

BAY SOUND CLAY, EL. -41 TO -70

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

MARSH 2, EL. -7.5/-8.5 TO -16

Model: Spatial Mohr-Coulomb
Unit Weight: 80 pcf
Cohesion Fn: MARSH 2
Phi: 0 °
Phi-B: 0 °

Marsh 1, EL -1.1 to -7.5 (Protected)

Model: Undrained (Phi=0)
Unit Weight: 102 pcf
Cohesion: 280 psf

Marsh 2, EL -7.5 to -16 (Protected)

Model: Undrained (Phi=0)
Unit Weight: 80 pcf
Cohesion: 180 psf

LACUSTRINE, EL -16 to -23 (Protected)

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

LACUSTRINE, EL. -16 TO -23/-25

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

Berm

Model: Undrained (Phi=0)
Unit Weight: 110 pcf
Cohesion: 400 psf

Slip Surface Limits

Left Coordinate: (110, -9.8) ft
Right Coordinate: (400, -5.7) ft

Slip Surface Block

Left Grid
- Upper Left: (200, 5.8) ft
- Lower Left: (200, -9.8) ft
- Lower Right: (210, -9.8) ft
- X Increments: 4
- Y Increments: 7
- Starting Angle: 115 °
- Ending Angle: 135 °
- Angle Increments: 2

Right Grid
- Upper Left: (230, 5.8) ft
- Lower Left: (230, -9.8) ft
- Lower Right: (330, -9.8) ft
- X Increments: 20
- Y Increments: 7
- Starting Angle: 25 °
- Ending Angle: 45 °
- Angle Increments: 4

Reinforcements

Reinforcement 1

Type: Pile
Outside Point: (200, 13.8) ft
Inside Point: (200, -9.8) ft
Slip Surface Intersection: (200, -3.8855) ft
Total Length: 23.6 ft
Reinforcement Direction: 90 °
Applied Load Option: Variable
F of S Dependent: No
Pile Spacing: 1 ft
Shear Capacity: 0 lbs
Shear Safety Factor: 1
Shear Load Used: 0 lbs
Shear Option: Parallel to Slip
Resisting Force Used: 0 lbs/ft

Cohesion Functions

Marsh 1

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

Y-Intercept: 280
Data Points: X (ft), Cohesion (psf)
- Data Point: (162, 280)
- Data Point: (200, 300)
- Data Point: (235.8, 280)

MARSH 2

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

Y-Intercept: 180

Data Points: X (ft), Cohesion (psf)
Data Point: (162, 180)
Data Point: (200, 370)
Data Point: (235.8, 180)

Lacustrine

Model: Spline Data Point Function
Function: Cohesion vs. Y
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 180
Data Points: Y (ft), Cohesion (psf)
Data Point: (-23, 225)
Data Point: (-16, 180)

Shear/Normal Strength Functions

Sand

Model: Spline Data Point Function
Function: Shear Stress vs. Normal Stress
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
Data Point: (-10000, 0)
Data Point: (0, 0)
Data Point: (10000, 6494)
Estimation Properties
Intact Rock Param.: 10
Geological Strength: 100
Disturbance Factor: 0
SigmaC: 600000 psf
Sigma3: 300000 psf
Num. Points: 20

Spatial Functions

Lacustrine

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (200, -16, 280)
Data Point: (200, -25, 360)
Data Point: (235.8, -16, 180)
Data Point: (235.8, -23, 225)
Data Point: (162, -16, 180)
Data Point: (162, -23, 225)

Bay Sound

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (200, -41, 560)
Data Point: (200, -70, 800)
Data Point: (235.8, -41, 500)
Data Point: (235.8, -70, 750)
Data Point: (162, -41, 500)
Data Point: (162, -70, 750)
Data Point: (310, -41, 500)
Data Point: (310, -70, 750)
Data Point: (110, -41, 500)
Data Point: (110, -70, 750)

Regions

	Points	Area (ft^2)	Material
Region 1	5,20,21,22	5.825	
Region 2	37,2,49,52,3,4,5,25	162.72219	
Region 3	19,18,50,14,15,51	5800	BAY SOUND CLAY, EL. -41 TO -70
Region 4	17,44,28,34,13,14,50,18	3526.2	BEACH SAND, EL. -23/-25 TO -41
Region 5	33,32,11,29,12	630.7	Marsh 2, EL -7.5 to -16 (Protected)
Region 6	23,47,25,39,38,32	232.7	MARSH 1, EL. -1.5 TO-7.5/ -8.5
Region 7	34,33,12,13	519.4	LACUSTRINE, EL -16 to -23 (Protected)
Region 8	17,16,43,44	364	LACUSTRINE, EL -16 to -23 (Protected)
Region 9	44,43,27,33,34,28	590.4	LACUSTRINE, EL. -16 TO -23/-25
Region 10	27,33,32,23,24,46,43	522	MARSH 2, EL. -7.5/-8.5 TO -16
Region 11	16,35,46,43	322.4	Marsh 2, EL -7.5 to -16 (Protected)
Region 12	42,41,37,31,45,1,53	114.65366	
Region 13	42,41,37,25,47,23	247	
Region 14	46,42,23,24	68.4	
Region 15	35,36,26,53,42,46	116.33214	
Region 16	25,5,22,48,6,55,7,39	188.551	EMBANKMENT FILL, EL. +5.4 TO -1.5
Region 17	32,38,39,7,8,40,9,30,56,10,11	239.55747	Marsh 1, EL -1.1 to -7.5 (Protected)
Region 18	55,54,56,30,9,40,8,7	215.93952	Berm
Region 19	13,60,61,14	1620	BEACH SAND, EL. -23/-25 TO -41
Region 20	12,13,60,59	630	LACUSTRINE, EL -16 to -23 (Protected)
Region 21	11,29,12,59,58	765	Marsh 2, EL -7.5 to -16 (Protected)
Region 22	10,11,58,57	162	Marsh 1, EL -1.1 to -7.5 (Protected)
Region 23	14,61,62,15	2610	BAY SOUND CLAY, EL. -41 TO -70

Points

	X (ft)	Y (ft)
Point 1	128.3	-7.3
Point 2	163.7	-1.3
Point 3	180	3.2
Point 4	199.1	6.1
Point 5	200	6.1
Point 6	215.4	5.5
Point 7	235.8	-1.1
Point 8	252.8	-2.3
Point 9	267.9	-4.8
Point 10	310	-5.7
Point 11	310	-7.5
Point 12	310	-16
Point 13	310	-23
Point 14	310	-41
Point 15	310	-70
Point 16	110	-16
Point 17	110	-23
Point 18	110	-41
Point 19	110	-70
Point 20	200	13.8
Point 21	200.5	13.8
Point 22	201	5.9
Point 23	200	-8.5
Point 24	200	-9.8
Point 25	200	-1.5
Point 26	110	-8
Point 27	200	-16
Point 28	200	-25
Point 29	310	-10
Point 30	294	-6
Point 31	151.1	-2.8
Point 32	235.8	-7.5
Point 33	235.8	-16
Point 34	235.8	-23
Point 35	110	-9.8
Point 36	110	-8.5
Point 37	162	-1.5
Point 38	235.8	-4.5
Point 39	235.8	-1.5
Point 40	266.12598	-4.5
Point 41	162	-4.5
Point 42	162	-7.5
Point 43	162	-16
Point 44	162	-23
Point 45	142.50631	-4.5
Point 46	162	-9.8
Point 47	200	-6.6
Point 48	206.9	6
Point 49	172.78125	1

Point 50	200	-41
Point 51	200	-70
Point 52	179.34375	3
Point 53	123.07143	-7.5
Point 54	288	-1.5
Point 55	227.73	1.51
Point 56	301.1	-5.86
Point 57	400	-5.7
Point 58	400	-7.5
Point 59	400	-16
Point 60	400	-23
Point 61	400	-41
Point 62	400	-70

Critical Slip Surfaces

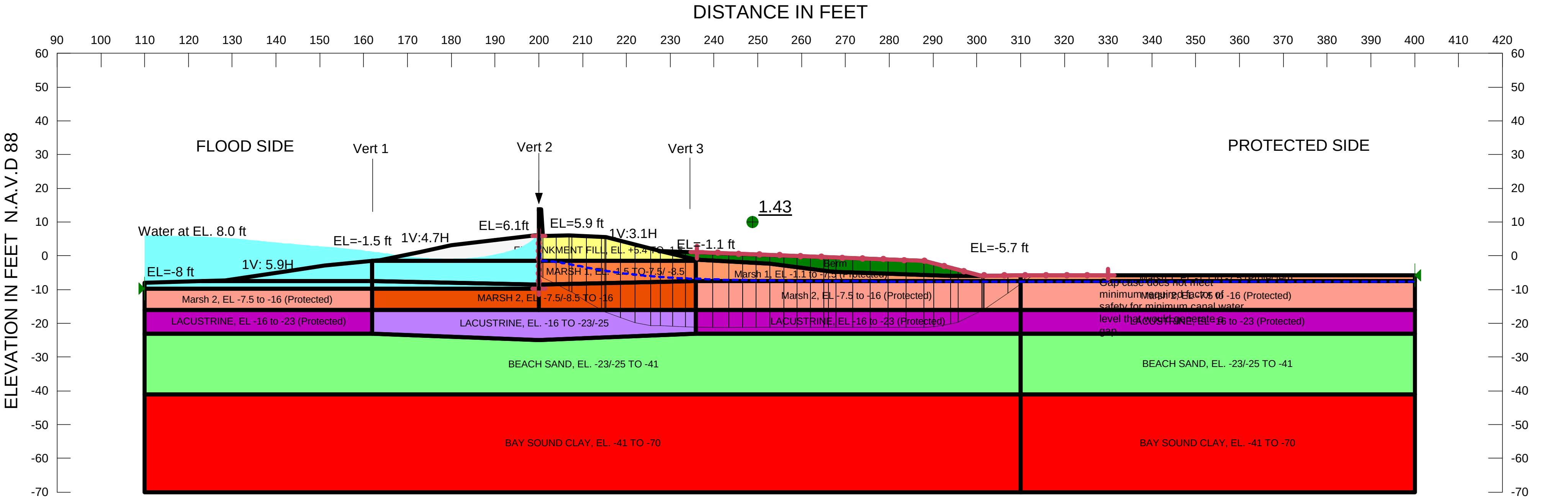
	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	2.32	(247.86, -3.89)	33.82783	(200, 6.1)	(295.141, -3.87682)
2	11930	2.74	(247.86, -3.89)	33.978	(200, 6.1)	(295.728, -4.07205)

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	-3.977285	267.54534	441.9849	0	299.86
2	Optimized	200.75	-4.1608175	183.5868	1061.7889	0	299.58
3	Optimized	202.475	-4.7940035	218.76506	1122.0198	0	298.62
4	Optimized	205.425	-5.8768425	246.16081	1235.3705	0	296.97
5	Optimized	207.38895	-6.597736	252.16788	1306.7265	0	295.87
6	Optimized	209.6893	-7.4779805	261.06475	1374.7539	0	294.59
7	Optimized	213.45035	-8.932999	285.00979	1476.4971	0	298.62
8	Optimized	215.9398	-9.8960685	308.86457	1519.2695	0	285.4
9	Optimized	218.45505	-10.33699	308.23714	1522.6593	0	272.05
10	Optimized	221.7793	-10.548665	293.23776	1443.3561	0	254.41
11	Optimized	224.47685	-10.507815	273.05524	1337.3839	0	240.09
12	Optimized	226.7778	-10.46977	257.92567	1247.3907	0	227.88
13	Optimized	229.58295	-10.417855	241.6805	1192.2283	0	213
14	Optimized	233.2888	-10.34927	223.46388	1157.2897	0	193.33
15	Optimized	235.47085	-10.306985	214.09231	1137.4973	0	181.75
16	Optimized	237.52845	-10.25699	205.44772	1117.1326	0	180
17	Optimized	240.9854	-10.172995	192.6714	1093.3325	0	180
18	Optimized	243.1648	-10.12777	185.74802	1076.2651	0	180
19	Optimized	245.1464	-10.13902	183.0852	1064.8097	0	180
20	Optimized	248.20785	-10.167985	180.5375	1052.0385	0	180
21	Optimized	251.2693	-10.19695	178.72798	1039.2673	0	180
22	Optimized	253.5148	-10.218195	177.75505	1030.4519	0	180
23	Optimized	256.58505	-10.181285	172.80453	1018.9654	0	180
24	Optimized	260.7369	-10.11166	165.52281	995.40787	0	180
25	Optimized	264.32965	-10.05976	160.1347	976.26005	0	180
26	Optimized	267.013	-10.020995	156.32354	961.95197	0	180
27	Optimized	270.1772	-9.975285	152.02932	942.95196	0	180
28	Optimized	273.10875	-9.94434	148.92768	922.8611	0	180
29	Optimized	275.46505	-9.981745	150.41757	911.24068	0	180
30	Optimized	278.8689	-10.052655	153.7513	899.49183	0	180
31	Optimized	282.217	-9.9058575	143.64782	889.34614	0	180
32	Optimized	285.50945	-9.5413525	120.06475	842.9166	0	180
33	Optimized	287.57785	-9.1593235	95.738395	852.49009	0	180
34	Optimized	289.54215	-8.2297735	37.29879	715.32087	0	180
35	Optimized	291.5179	-7.29481	-21.473853	583.28164	0	280
36	Optimized	292.5135	-6.5235575	-69.808214	553.33211	0	280
37	Optimized	294.10845	-4.917157	-170.3244	364.7275	0	400

Slices of Slip Surface: 11930

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	11930	200.25	-5.05	346.69445	322.86495	0	299.86
2	11930	200.75	-5.55	291.01686	1084.7725	0	299.58
3	11930	202.29975	-7.0997285	404.16878	1228.6644	0	298.72
4	11930	204.29975	-9.0997285	486.76507	1391.7527	0	347.18
5	11930	205.95	-9.8	476.33158	1684.6842	0	338.42
6	11930	208.31665	-9.8	419.75299	1675.1296	0	325.86
7	11930	211.15	-9.8	367.62357	1653.7767	0	310.82
8	11930	213.98335	-9.8	326.90121	1632.459	0	295.79
9	11930	216.94125	-9.8	292.78832	1563.2441	0	280.09
10	11930	220.02375	-9.8	264.06488	1446.1638	0	263.73
11	11930	223.10625	-9.8	240.76561	1329.0835	0	247.37
12	11930	226.18875	-9.8	221.75831	1212.0357	0	231.01
13	11930	229.075	-9.8	207.21933	1142.8996	0	215.69
14	11930	231.765	-9.8	195.94424	1121.71	0	201.41
15	11930	234.455	-9.8	186.52788	1100.5204	0	187.14
16	11930	237.5	-9.8	177.83235	1076.3235	0	180
17	11930	240.9	-9.8	170.05882	1059.5882	0	180
18	11930	244.3	-9.8	163.66176	1042.8235	0	180
19	11930	247.7	-9.8	158.48824	1026.0588	0	180
20	11930	251.1	-9.8	154.38235	1009.2941	0	180
21	11930	254.46575	-9.8	151.0343	993.96817	0	180
22	11930	257.79725	-9.8	148.26977	980.07051	0	180
23	11930	261.12875	-9.8	145.92248	966.17284	0	180
24	11930	264.46025	-9.8	143.91437	952.27518	0	180
25	11930	267.013	-9.8	142.57449	941.64666	0	180
26	11930	269.575	-9.8	141.37612	929.37313	0	180
27	11930	272.925	-9.8	140.00597	912.20896	0	180
28	11930	276.275	-9.8	138.81791	895.04478	0	180
29	11930	279.625	-9.8	137.77612	877.8806	0	180
30	11930	282.975	-9.8	136.84179	860.68657	0	180
31	11930	286.325	-9.8	135.99104	843.52239	0	180
32	11930	289	-9.8	135.36	798.7	0	180
33	11930	291.15	-8.65	63.141565	753.13025	0	180
34	11930	293.0544	-6.7456045	-56.079593	537.50364	0	280
35	11930	294.76835	-5.0316295	-163.33591	322.81419	0	400



Name: EMBANKMENT FILL, EL. +5.4 TO -1.5 Model: Undrained (Phi=0) Unit Weight: 115 pcf Cohesion: 540 psf
Name: MARSH 1, EL. -1.5 TO-7.5/ -8.5 Model: Spatial Mohr-Coulomb Unit Weight: 102 pcf Cohesion Fn: Marsh 1 Phi: 0 °
Name: BEACH SAND, EL. -23/-25 TO -41 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand
Name: BAY SOUND CLAY, EL. -41 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 103 pcf Cohesion Spatial Fn: Bay Sound Phi: 0 °
Name: MARSH 2, EL. -7.5/-8.5 TO -16 Model: Spatial Mohr-Coulomb Unit Weight: 80 pcf Cohesion Fn: MARSH 2 Phi: 0 °
Name: Marsh 1, EL -1.1 to -7.5 (Protected) Model: Undrained (Phi=0) Unit Weight: 102 pcf Cohesion: 280 psf
Name: Marsh 2, EL -7.5 to -16 (Protected) Model: Undrained (Phi=0) Unit Weight: 80 pcf Cohesion: 180 psf
Name: LACUSTRINE, EL -16 to -23 (Protected) Model: Spatial Mohr-Coulomb Unit Weight: 108 pcf Cohesion Fn: Lacustrine Phi: 0 °
Name: LACUSTRINE, EL. -16 TO -23/-25 Model: Spatial Mohr-Coulomb Unit Weight: 108 pcf Cohesion Spatial Fn: Lacustrine Phi: 0 °
Name: Berm Model: Undrained (Phi=0) Unit Weight: 110 pcf Cohesion: 400 psf

GENERAL NOTES

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

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

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 18A
REMEDIATION OF CANAL WALLS AND LEVEES
PROTECTED SIDE STABILITY ANALYSIS
CASE: GAP Stability (Entry/Exit)
STA. 50+00 TO 61+00 EAST
ORLEANS PARISH, LOUISIANA

ETL 1110-2-575 ANALYSIS

Name: GAP Stability (Entry/Exit)
File Name: Orleans Canal Reach 18A.gsz Directory: Y:\F&MHOME\Middleton\Outfall Canals\Orleans final edits\final\Appendix A and Appendix B\
Last Edited By: Reves, Ryan D MVK

GAP Stability (Entry/Exit)

File Information

Created By: Liljegren, James
Revision Number: 451
Last Edited By: Reves, Ryan D MVK
Date: 6/13/2013
Time: 3:37:28 PM
File Name: Orleans Canal Reach 18A.gsz
Directory: Y:\F&MHOME\Middleton\Outfall Canals\Orleans final edits\final\Appendix A and Appendix B\
Last Solved Date: 6/13/2013
Last Solved Time: 3:39:56 PM

Project Settings

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

Analysis Settings

GAP Stability (Entry/Exit)

Kind: SLOPE/W
Parent: Gap Analysis (seepage)
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: 8
- Ending Optimization Points: 16
- Complete Passes per Insertion: 1
- Driving Side Maximum Convex Angle: 5 °
- Resisting Side Maximum Convex Angle: 1 °

Materials

EMBANKMENT FILL, EL. +5.4 TO -1.5

Model: Undrained (Phi=0)
Unit Weight: 115 pcf
Cohesion: 540 psf

MARSH 1, EL. -1.5 TO-7.5/ -8.5

Model: Spatial Mohr-Coulomb
Unit Weight: 102 pcf
Cohesion Fn: Marsh 1
Phi: 0 °
Phi-B: 0 °

BEACH SAND, EL. -23/-25 TO -41

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

BAY SOUND CLAY, EL. -41 TO -70

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

MARSH 2, EL. -7.5/-8.5 TO -16

Model: Spatial Mohr-Coulomb
Unit Weight: 80 pcf
Cohesion Fn: MARSH 2
Phi: 0 °
Phi-B: 0 °

Marsh 1, EL -1.1 to -7.5 (Protected)

Model: Undrained (Phi=0)
Unit Weight: 102 pcf
Cohesion: 280 psf

Marsh 2, EL -7.5 to -16 (Protected)

Model: Undrained (Phi=0)
Unit Weight: 80 pcf
Cohesion: 180 psf

LACUSTRINE, EL -16 to -23 (Protected)

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

LACUSTRINE, EL. -16 TO -23/-25

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

Berm

Model: Undrained (Phi=0)
Unit Weight: 110 pcf
Cohesion: 400 psf

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (200, -9.8) ft
Left-Zone Right Coordinate: (200, 5.9) ft
Left-Zone Increment: 7
Right Projection: Range
Right-Zone Left Coordinate: (236.17258, 1.08836) ft
Right-Zone Right Coordinate: (330, -5.7) ft
Right-Zone Increment: 20
Radius Increments: 25

Slip Surface Limits

Left Coordinate: (110, -9.8) ft
Right Coordinate: (400, -5.7) ft

Reinforcements

Reinforcement 1

Type: Pile
Outside Point: (200, 13.8) ft
Inside Point: (200, -9.8) ft
Slip Surface Intersection: (200, -5.7383) ft
Total Length: 23.6 ft
Reinforcement Direction: 90 °
Applied Load Option: Variable
F of S Dependent: No
Pile Spacing: 1 ft
Shear Capacity: 0 lbs
Shear Safety Factor: 1
Shear Load Used: 0 lbs
Shear Option: Parallel to Slip
Resisting Force Used: 0 lbs/ft

Cohesion Functions

Marsh 1

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

Y-Intercept: 280
Data Points: X (ft), Cohesion (psf)
- Data Point: (162, 280)
- Data Point: (200, 300)
- Data Point: (235.8, 280)

MARSH 2

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

Y-Intercept: 180
Data Points: X (ft), Cohesion (psf)
- Data Point: (162, 180)
- Data Point: (200, 370)
- Data Point: (235.8, 180)

Lacustrine

Model: Spline Data Point Function
Function: Cohesion vs. Y
- Curve Fit to Data: 100 %

Segment Curvature: 0 %
Y-Intercept: 180
Data Points: Y (ft), Cohesion (psf)
Data Point: (-23, 225)
Data Point: (-16, 180)

Shear/Normal Strength Functions

Sand

Model: Spline Data Point Function
Function: Shear Stress vs. Normal Stress
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
Data Point: (-10000, 0)
Data Point: (0, 0)
Data Point: (10000, 6494)
Estimation Properties
Intact Rock Param.: 10
Geological Strength: 100
Disturbance Factor: 0
SigmaC: 600000 psf
Sigma3: 300000 psf
Num. Points: 20

Spatial Functions

Lacustrine

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (200, -16, 280)
Data Point: (200, -25, 360)
Data Point: (235.8, -16, 180)
Data Point: (235.8, -23, 225)
Data Point: (162, -16, 180)
Data Point: (162, -23, 225)

Bay Sound

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (200, -41, 560)
Data Point: (200, -70, 800)
Data Point: (235.8, -41, 500)
Data Point: (235.8, -70, 750)
Data Point: (162, -41, 500)
Data Point: (162, -70, 750)
Data Point: (310, -41, 500)
Data Point: (310, -70, 750)
Data Point: (110, -41, 500)
Data Point: (110, -70, 750)

Regions

	Points	Area (ft²)	Material
Region 1	5,20,21,22	5.825	
Region 2	37,2,49,52,3,4,5,25	162.72219	
Region 3	19,18,50,14,15,51	5800	BAY SOUND CLAY, EL. -41 TO -70
Region 4	17,44,28,34,13,14,50,18	3526.2	BEACH SAND, EL. -23/-25 TO -41
Region 5	33,32,11,29,12	630.7	Marsh 2, EL -7.5 to -16 (Protected)
Region 6	23,47,25,39,38,32	232.7	MARSH 1, EL. -1.5 TO-7.5/ -8.5
Region 7	34,33,12,13	519.4	LACUSTRINE, EL -16 to -23 (Protected)
Region 8	17,16,43,44	364	LACUSTRINE, EL -16 to -23 (Protected)
Region 9	44,43,27,33,34,28	590.4	LACUSTRINE, EL. -16 TO -23/-25
Region 10	27,33,32,23,24,46,43	522	MARSH 2, EL. -7.5/-8.5 TO -16
Region 11	16,35,46,43	322.4	Marsh 2, EL -7.5 to -16 (Protected)
Region 12	42,41,37,31,45,1,53	114.65366	
Region 13	42,41,37,25,47,23	247	
Region 14	46,42,23,24	68.4	
Region 15	35,36,26,53,42,46	116.33214	
Region 16	25,5,22,48,6,55,7,39	188.551	EMBANKMENT FILL, EL. +5.4 TO -1.5
Region 17	32,38,39,7,8,40,9,30,56,10,11	239.55747	Marsh 1, EL -1.1 to -7.5 (Protected)
Region 18	55,54,56,30,9,40,8,7	215.93952	Berm
Region 19	13,60,61,14	1620	BEACH SAND, EL. -23/-25 TO -41
Region 20	12,13,60,59	630	LACUSTRINE, EL -16 to -23 (Protected)
Region 21	11,29,12,59,58	765	Marsh 2, EL -7.5 to -16 (Protected)
Region 22	10,11,58,57	162	Marsh 1, EL -1.1 to -7.5 (Protected)
Region 23	14,61,62,15	2610	BAY SOUND CLAY, EL. -41 TO -70

Points

	X (ft)	Y (ft)
Point 1	128.3	-7.3
Point 2	163.7	-1.3
Point 3	180	3.2
Point 4	199.1	6.1
Point 5	200	6.1
Point 6	215.4	5.5
Point 7	235.8	-1.1
Point 8	252.8	-2.3
Point 9	267.9	-4.8
Point 10	310	-5.7
Point 11	310	-7.5
Point 12	310	-16
Point 13	310	-23
Point 14	310	-41
Point 15	310	-70
Point 16	110	-16
Point 17	110	-23
Point 18	110	-41
Point 19	110	-70
Point 20	200	13.8
Point 21	200.5	13.8
Point 22	201	5.9
Point 23	200	-8.5
Point 24	200	-9.8
Point 25	200	-1.5
Point 26	110	-8
Point 27	200	-16
Point 28	200	-25
Point 29	310	-10
Point 30	294	-6
Point 31	151.1	-2.8
Point 32	235.8	-7.5
Point 33	235.8	-16
Point 34	235.8	-23
Point 35	110	-9.8
Point 36	110	-8.5
Point 37	162	-1.5
Point 38	235.8	-4.5
Point 39	235.8	-1.5
Point 40	266.12598	-4.5
Point 41	162	-4.5
Point 42	162	-7.5
Point 43	162	-16
Point 44	162	-23
Point 45	142.50631	-4.5
Point 46	162	-9.8
Point 47	200	-6.6
Point 48	206.9	6
Point 49	172.78125	1
Point 50	200	-41
Point 51	200	-70
Point 52	179.34375	3
Point 53	123.07143	-7.5
Point 54	288	-1.5
Point 55	227.73	1.51
Point 56	301.1	-5.86
Point 57	400	-5.7

Point 58	400	-7.5
Point 59	400	-16
Point 60	400	-23
Point 61	400	-41
Point 62	400	-70

Critical Slip Surfaces

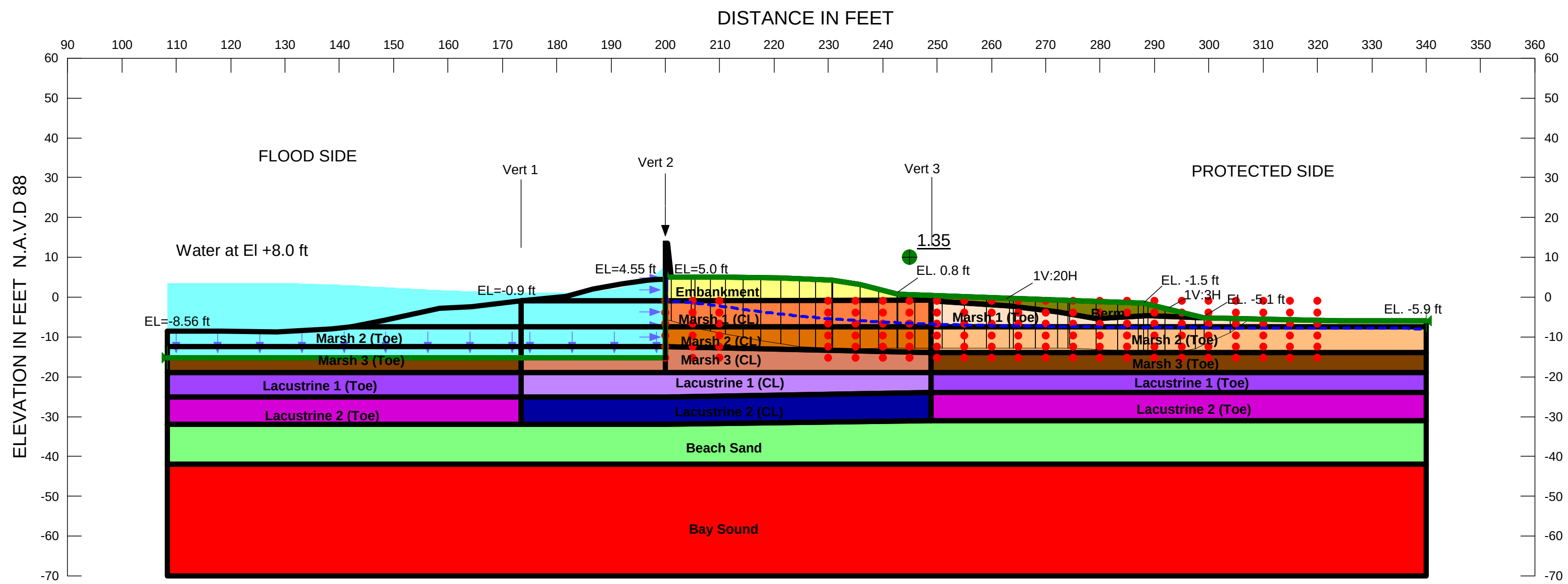
	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.43	(258.619, 100.526)	42.81299	(200, 6.1)	(312.904, -5.7)
2	1021	1.56	(258.619, 100.526)	122.956	(200, 6.1)	(320.54, -5.7)

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	200.25	-5.907132	414.35194	274.31195	0	299.86
2	Optimized	200.75	-6.2447775	349.90934	1155.1102	0	299.58
3	Optimized	202.4636	-7.401951	426.7992	1264.8261	0	298.62
4	Optimized	205.4136	-9.394056	469.14538	1424.6085	0	341.27
5	Optimized	207.1989	-10.59966	486.83671	1519.7878	0	331.79
6	Optimized	209.194	-12.10113	522.15161	1593.9254	0	321.21
7	Optimized	212.58635	-14.700375	602.83181	1774.6135	0	303.2
8	Optimized	214.70445	-16.323295	663.14307	1918.788	0	241.52
9	Optimized	215.2632	-16.71125	678.20908	2044.9707	0	243.05
10	Optimized	217.0562	-17.558805	709.06403	2071.431	0	244.62
11	Optimized	220.3686	-19.124595	774.43254	2113.0266	0	246.98
12	Optimized	223.80215	-20.26901	825.86941	2196.4741	0	245.09
13	Optimized	226.65475	-20.693855	843.45056	2183.966	0	239.26
14	Optimized	229.1634	-20.8416	847.83299	2148.2405	0	232.36
15	Optimized	232.03025	-21.01044	853.96157	2144.2361	0	224.36
16	Optimized	234.63185	-21.109665	857.1228	2149.505	0	216.63
17	Optimized	237.70835	-21.148655	857.32565	2129.9266	0	213.1
18	Optimized	241.52505	-21.197025	858.16401	2116.3557	0	213.41
19	Optimized	244.96965	-21.221985	858.18667	2105.9227	0	213.57
20	Optimized	248.04215	-21.223535	857.11264	2090.9513	0	213.58
21	Optimized	251.1892	-21.22186	855.97378	2075.8668	0	213.57
22	Optimized	254.34175	-21.21707	854.73356	2060.9794	0	213.54
23	Optimized	257.4253	-21.212385	853.56607	2047.6181	0	213.51
24	Optimized	260.5004	-21.2145	852.90572	2033.6565	0	213.52
25	Optimized	263.56705	-21.22342	852.71007	2021.8196	0	213.58
26	Optimized	265.6132	-21.230385	852.68514	2013.413	0	213.62
27	Optimized	267.013	-21.23722	852.79878	2008.3527	0	213.67
28	Optimized	269.81945	-21.25092	853.04664	1996.3292	0	213.76
29	Optimized	273.65835	-21.26966	853.41133	1978.6942	0	213.88
30	Optimized	277.64815	-21.255255	851.7254	1961.6489	0	213.78
31	Optimized	281.7889	-21.207705	847.9582	1935.2302	0	213.48
32	Optimized	285.92965	-21.160155	844.21515	1908.8357	0	213.17
33	Optimized	289.12115	-21.123505	841.37606	1853.5514	0	212.94
34	Optimized	292.12115	-20.639185	810.61081	1760.2683	0	209.82
35	Optimized	294.89345	-19.94355	766.74438	1579.6259	0	205.35
36	Optimized	298.44345	-17.97766	643.44307	1325.2607	0	192.71
37	Optimized	301.27995	-16.11798	526.90247	1004.4725	0	180.76
38	Optimized	301.58745	-15.916365	514.26968	984.18938	0	180
39	Optimized	304.40065	-13.421165	358.0595	827.83943	0	180
40	Optimized	308.54315	-9.6800325	123.83848	516.71405	0	180
41	Optimized	310.46595	-7.9252325	14.057937	368.39469	0	180
42	Optimized	311.91805	-6.6	-68.608117	307.36586	0	280

Slices of Slip Surface: 1021

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	1021	200.25	-7.691984	576.42092	258.46175	0	299.86
2	1021	200.75	-7.96018	519.40453	1371.6557	0	299.58
3	1021	201.3414	-8.2732645	546.17693	1399.4933	0	299.25
4	1021	204.2914	-9.738257	526.67749	1517.6709	0	347.22
5	1021	209.025	-11.96041	518.00632	1700.5291	0	322.1
6	1021	213.275	-13.740555	546.01558	1827.2254	0	299.55
7	1021	217.3891	-15.291905	588.33559	1876.5689	0	277.71
8	1021	221.46615	-16.661955	637.08444	1871.2829	0	225.05
9	1021	225.64205	-17.905295	689.49576	1859.3408	0	222.2
10	1021	229.7475	-18.97411	739.87707	1890.6337	0	217.54
11	1021	233.7825	-19.877705	785.93168	1966.4312	0	211.24
12	1021	237.925	-20.65675	827.96729	2028.7495	0	209.94
13	1021	242.175	-21.306445	864.44378	2087.6112	0	214.11
14	1021	246.425	-21.805085	893.07999	2130.641	0	217.32
15	1021	250.675	-22.15451	913.21681	2157.9041	0	219.56
16	1021	255.021	-22.35714	924.6839	2170.9324	0	220.87
17	1021	259.463	-22.406925	926.83682	2168.9301	0	221.19
18	1021	263.905	-22.296095	919.0966	2149.4769	0	220.47
19	1021	267.013	-22.139815	908.80001	2127.2444	0	219.47
20	1021	269.91	-21.893735	892.95136	2093.5027	0	217.89
21	1021	273.93	-21.45606	864.95441	2034.7063	0	215.07
22	1021	277.95	-20.883735	828.54354	1960.7496	0	211.4
23	1021	281.97	-20.174845	783.60508	1871.2494	0	206.84
24	1021	285.99	-19.32697	729.9633	1765.8079	0	201.39
25	1021	291	-18.048695	649.29156	1513.4326	0	193.17
26	1021	295.93	-16.61472	558.92014	1179.2815	0	183.95
27	1021	299.48	-15.42913	484.29216	936.09829	0	180
28	1021	303.325	-13.989645	393.73433	767.51923	0	180
29	1021	307.775	-12.15036	278.12404	632.00459	0	180
30	1021	311.83585	-10.298133	162.12812	489.87559	0	180
31	1021	315.50755	-8.4582875	47.327066	343.23109	0	180
32	1021	318.9417	-6.6	-68.634691	216.20514	0	280



Name: EMBANKMENT FILL, EL. +4 TO -1.5 Model: Undrained (Phi=0) Unit Weight: 117 pcf Cohesion: 500 psf
Name: MARSH1, EL. -1.5 TO -7.5 Model: Spatial Mohr-Coulomb Unit Weight: 103 pcf Cohesion Fn: MARSH 1 Phi: 0 °
Name: BEACH SAND, EL. -32/-31 TO -42 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand
Name: BAY SOUND CLAY, EL. -42 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 105 pcf Cohesion Spatial Fn: Bay Sound Phi: 0 °
Name: Marsh2, EL -7.5 to -14 (Protected) Model: Undrained (Phi=0) Unit Weight: 80 pcf Cohesion: 125 psf
Name: MARSH2, EL. -7.5 TO -12.5 Model: Spatial Mohr-Coulomb Weight Fn: Marsh2 Cohesion Spatial Fn: Marsh 2 (2) Phi: 0 °
Name: MARSH3, EL. -12.5 TO -17 Model: Spatial Mohr-Coulomb Unit Weight: 77 pcf Cohesion Spatial Fn: Marsh 3 Phi: 0 °
Name: Marsh3, EL -14 to -19 (Protected) Model: Undrained (Phi=0) Unit Weight: 106 pcf Cohesion: 175 psf
Name: Marsh1, EL -2 to -7.5 (Protected) Model: Undrained (Phi=0) Unit Weight: 110 pcf Cohesion: 285 psf
Name: Lacustrine1, EL -19 to -24 (Protected) Model: Spatial Mohr-Coulomb Unit Weight: 100 pcf Cohesion Fn: Lacustrine (protected) Phi: 0 °
Name: Lacustrine1, EL -19 to -25 Model: Spatial Mohr-Coulomb Weight Fn: Lacustrine1 Cohesion Spatial Fn: Lacustrine Phi: 0 °
Name: Lacustrine2, EL -25 to -32 Model: Spatial Mohr-Coulomb Weight Fn: Lacustrine2 Cohesion Spatial Fn: Lacustrine Phi: 0 °
Name: Lacustrine2, EL -24 to -31 (Protected) Model: Spatial Mohr-Coulomb Unit Weight: 98 pcf Cohesion Fn: Lacustrine (protected) Phi: 0 °
Name: Berm Model: Undrained (Phi=0) Unit Weight: 110 pcf Cohesion: 400 psf

GENERAL NOTES

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

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

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 19
REMEDIATION OF CANAL WALLS AND LEVEES
PROTECTED SIDE STABILITY ANALYSIS
CASE: GAP Stability (Block)
STA. 65+00 TO 90+62 EAST
ORLEANS PARISH, LOUISIANA

ETL 1110-2-575 ANALYSIS

Name: GAP Stability (Block)
File Name: Orleans Canal Reach 19.gsz Directory: Y:\F&MHOME\Middleton\Outfall Canals\Orleans final edits\final\Appendix A and Appendix B\
Last Edited By: Reves, Ryan D MVK

GAP Stability (Block)

File Information

Created By: Liljegren, James
Revision Number: 579
Last Edited By: Reves, Ryan D MVK
Date: 6/12/2013
Time: 9:31:58 AM
File Name: Orleans Canal Reach 19.gsz
Directory: Y:\F&MHOME\Middleton\Outfall Canals\Orleans final edits\final\Appendix A and Appendix B\
Last Solved Date: 6/12/2013
Last Solved Time: 9:34:08 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

GAP Stability (Block)

Kind: SLOPE/W
Parent: Gap Analysis (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
Advanced
- Number of Slices: 30
- Optimization Tolerance: 0.01
- Minimum Slip Surface Depth: 0.1 ft
- Optimization Maximum Iterations: 9000
- Optimization Convergence Tolerance: 1e-007
- Starting Optimization Points: 8
- Ending Optimization Points: 16
- Complete Passes per Insertion: 1
- Driving Side Maximum Convex Angle: 5 °
- Resisting Side Maximum Convex Angle: 1 °

Materials

EMBANKMENT FILL, EL. +4 TO -1.5

Model: Undrained (Phi=0)
Unit Weight: 117 pcf
Cohesion: 500 psf

MARSH1, EL. -1.5 TO -7.5

Model: Spatial Mohr-Coulomb
Unit Weight: 103 pcf
Cohesion Fn: MARSH 1
Phi: 0 °
Phi-B: 0 °

BEACH SAND, EL. -32/-31 TO -42

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

BAY SOUND CLAY, EL. -42 TO -70

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

Marsh2, EL -7.5 to -14 (Protected)

Model: Undrained (Phi=0)
Unit Weight: 80 pcf
Cohesion: 125 psf

MARSH2, EL. -7.5 TO -12.5

Model: Spatial Mohr-Coulomb
Weight Fn: Marsh2
Cohesion Spatial Fn: Marsh 2 (2)
Phi: 0 °
Phi-B: 0 °

MARSH3, EL. -12.5 TO -17

Model: Spatial Mohr-Coulomb
Unit Weight: 77 pcf
Cohesion Spatial Fn: Marsh 3
Phi: 0 °
Phi-B: 0 °

Marsh3, EL -14 to -19 (Protected)

Model: Undrained (Phi=0)
Unit Weight: 106 pcf
Cohesion: 175 psf

Marsh1, EL -2 to -7.5 (Protected)

Model: Undrained (Phi=0)
Unit Weight: 110 pcf
Cohesion: 285 psf

Lacustrine1, EL -19 to -24 (Protected)

Model: Spatial Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion Fn: Lacustrine (protected)
Phi: 0 °
Phi-B: 0 °

Lacustrine1, EL -19 to -25

Model: Spatial Mohr-Coulomb
Weight Fn: Lacustrine1
Cohesion Spatial Fn: Lacustrine
Phi: 0 °
Phi-B: 0 °

Lacustrine2, EL -25 to -32

Model: Spatial Mohr-Coulomb
Weight Fn: Lacustrine2
Cohesion Spatial Fn: Lacustrine
Phi: 0 °
Phi-B: 0 °

Lacustrine2, EL -24 to -31 (Protected)

Model: Spatial Mohr-Coulomb
Unit Weight: 98 pcf
Cohesion Fn: Lacustrine (protected)
Phi: 0 °
Phi-B: 0 °

Berm

Model: Undrained (Phi=0)
Unit Weight: 110 pcf
Cohesion: 400 psf

Slip Surface Limits

Left Coordinate: (108.4, -15.3) ft
Right Coordinate: (340, -5.9) ft

Slip Surface Block

Left Grid
- Upper Left: (200, -1) ft
- Lower Left: (200, -15.3) ft
- Lower Right: (210, -15.3) ft
- X Increments: 2
- Y Increments: 5
- Starting Angle: 115 °
- Ending Angle: 135 °
- Angle Increments: 4

Right Grid
- Upper Left: (230, -1) ft
- Lower Left: (230, -15.3) ft
- Lower Right: (320, -15.3) ft
- X Increments: 18
- Y Increments: 5
- Starting Angle: 25 °
- Ending Angle: 45 °
- Angle Increments: 4

Reinforcements

Reinforcement 1

Type: Pile
Outside Point: (200, 13.48) ft
Inside Point: (200, -15.3) ft
Slip Surface Intersection: (200, -5.5635) ft
Total Length: 28.78 ft
Reinforcement Direction: 90 °

Applied Load Option: Variable
F of S Dependent: No
Pile Spacing: 1 ft
Shear Capacity: 0 lbs
Shear Safety Factor: 1
Shear Load Used: 0 lbs
Shear Option: Parallel to Slip
Resisting Force Used: 0 lbs/ft

Cohesion Functions

MARSH 1

Model: Spline Data Point Function
Function: Cohesion vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 285
Data Points: X (ft), Cohesion (psf)
Data Point: (173.4, 285)
Data Point: (200, 300)
Data Point: (248.9, 285)

Lacustrine (protected)

Model: Spline Data Point Function
Function: Cohesion vs. Y
Curve Fit to Data: 100 %
Segment Curvature: 100 %
Y-Intercept: 175
Data Points: Y (ft), Cohesion (psf)
Data Point: (-31, 300)
Data Point: (-19, 175)

Shear/Normal Strength Functions

Sand

Model: Spline Data Point Function
Function: Shear Stress vs. Normal Stress
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
Data Point: (-10000, 0)
Data Point: (0, 0)
Data Point: (10000, 6494)
Estimation Properties
Intact Rock Param.: 10
Geological Strength: 100
Disturbance Factor: 0
SigmaC: 600000 psf
Sigma3: 300000 psf
Num. Points: 20

Unit Weight Functions

Lacustrine1

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 100
Data Points: X (ft), Unit Weight (pcf)
Data Point: (173.4, 100)
Data Point: (200, 105)
Data Point: (248.9, 100)

Marsh2

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 80
Data Points: X (ft), Unit Weight (pcf)
Data Point: (173.4, 80)
Data Point: (200, 92)
Data Point: (248.9, 80)

Lacustrine2

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 98
Data Points: X (ft), Unit Weight (pcf)
Data Point: (173.4, 98)
Data Point: (200, 102)
Data Point: (248.9, 98)

Spatial Functions

Marsh 2 (2)

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (200, -7.5, 225)
Data Point: (200, -12.5, 225)
Data Point: (248.9, -7.5, 125)
Data Point: (248.9, -14, 125)
Data Point: (173.4, -7.5, 125)
Data Point: (173.4, -12.5, 125)

Marsh 3

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (200, -12.5, 300)
Data Point: (200, -19, 300)
Data Point: (248.9, -14, 175)
Data Point: (248.9, -19, 175)
Data Point: (173.4, -12.5, 175)
Data Point: (173.4, -19, 175)

Lacustrine

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (200, -19, 300)
Data Point: (200, -32, 425)
Data Point: (248.9, -19, 175)
Data Point: (248.9, -31, 300)
Data Point: (173.4, -19, 175)
Data Point: (173.4, -32, 300)

Bay Sound

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (200, -42, 510)
Data Point: (200, -70, 770)
Data Point: (248.9, -42, 460)
Data Point: (248.9, -70, 725)
Data Point: (173.4, -42, 460)
Data Point: (173.4, -70, 725)
Data Point: (310, -42, 460)
Data Point: (310, -70, 725)
Data Point: (108.4, -42, 460)
Data Point: (108.4, -70, 725)

Regions

	Points	Area (ft^2)	Material
Region 1	7,30,8,39,1	175.56	
Region 2	8,9,40,39	133	
Region 3	21,43,24,16,2,3,37,31,44,22	2431.55	BEACH SAND, EL. -32/-31 TO -42
Region 4	42,28,9,14,15,23,41	379.595	MARSH3, EL. -12.5 TO -17
Region 5	35,15,23,41,46,33	428.55	Lacustrine1, EL -19 to -25
Region 6	13,27,11,14	592.15	Marsh2, EL -7.5 to -14 (Protected)
Region 7	14,11,12,15	455.5	Marsh3, EL -14 to -19 (Protected)
Region 8	15,12,36,35	455.5	Lacustrine1, EL -19 to -24 (Protected)
Region 9	25,22,44,31,37,3,26,38,32,45	6484.8	BAY SOUND CLAY, EL. -42 TO -70
Region 10	40,9,28,42	74.48	
Region 11	8,30,7,10,13	327.63	MARSH1, EL. -1.5 TO -7.5
Region 12	9,8,13,14	281.175	MARSH2, EL. -7.5 TO -12.5
Region 13	29,19,40,42	182	
Region 14	20,29,42,41	240.5	Marsh3, EL -14 to -19 (Protected)
Region 15	21,34,46,43	455	Lacustrine2, EL -24 to -31 (Protected)
Region 16	34,46,41,20	390	Lacustrine1, EL -19 to -24 (Protected)
Region 17	16,24,43,46,33,35	528.5	Lacustrine2, EL -25 to -32
Region 18	16,35,36,2	637.7	Lacustrine2, EL -24 to -31 (Protected)

Region 19	58,50,51,52,1,39	118.991	
Region 20	18,47,48,49,58,39,40,19	293.6835	
Region 21	1,53,54,55,56,57,4,7	72.852	
Region 22	71,5,6,59	6.36	
Region 23	7,4,71,59,60,61,62,63,64,10	220.1	EMBANKMENT FILL, EL. +4 TO -1.5
Region 24	10,65,66,67,17,68,74,69,70,72,27,13	272.07498	Marsh1, EL -2 to -7.5 (Protected)
Region 25	64,73,74,68,17,67,66,65,10	125.82563	Berm

Points

	X (ft)	Y (ft)
Point 1	173.4	-0.9
Point 2	340	-31
Point 3	340	-42
Point 4	200	4.55
Point 5	200	13.48
Point 6	200.4	13.48
Point 7	200	-0.9
Point 8	200	-7.5
Point 9	200	-12.5
Point 10	248.9	-0.7
Point 11	340	-14
Point 12	340	-19
Point 13	248.9	-7.5
Point 14	248.9	-14
Point 15	248.9	-19
Point 16	248.9	-31
Point 17	279.3	-5.3
Point 18	108.4	-8.56
Point 19	108.4	-12.5
Point 20	108.4	-19
Point 21	108.4	-32
Point 22	108.4	-42
Point 23	200	-19
Point 24	200	-32
Point 25	108.4	-70
Point 26	340	-70
Point 27	340	-7.5
Point 28	200	-15.3
Point 29	108.4	-15.3
Point 30	200	-6.5
Point 31	200	-42
Point 32	200	-70
Point 33	200	-25
Point 34	108.4	-25
Point 35	248.9	-24
Point 36	340	-24
Point 37	248.9	-42
Point 38	248.9	-70
Point 39	173.4	-7.5
Point 40	173.4	-12.5
Point 41	173.4	-19
Point 42	173.4	-15.3
Point 43	173.4	-32
Point 44	173.4	-42
Point 45	173.4	-70
Point 46	173.4	-25
Point 47	118.4	-8.48
Point 48	128.5	-8.74
Point 49	138.4	-8.05
Point 50	148.5	-5.84
Point 51	158.5	-2.78
Point 52	164.3	-2.38
Point 53	181.8	0.16
Point 54	186.7	2.06
Point 55	191.9	3.3
Point 56	196.9	4.24
Point 57	198.9	4.55
Point 58	142.2	-7.5
Point 59	201.1	5
Point 60	211	5
Point 61	221.3	4.8
Point 62	230.6	4.3
Point 63	235.8	3.1
Point 64	242.8	0.8
Point 65	250.9	-1.1
Point 66	263.3	-2.2
Point 67	272.2	-3.7
Point 68	288.8	-4.7
Point 69	305.5	-5.4
Point 70	324.2	-5.9
Point 71	200	5
Point 72	340	-5.9
Point 73	288	-1.5
Point 74	299.2	-5.13593

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.35	(254.918, -5.037)	38.35659	(200, 5)	(307.62, -5.45669)
2	6628	1.63	(254.918, -5.037)	39.115	(200, 5)	(309.887, -5.51729)

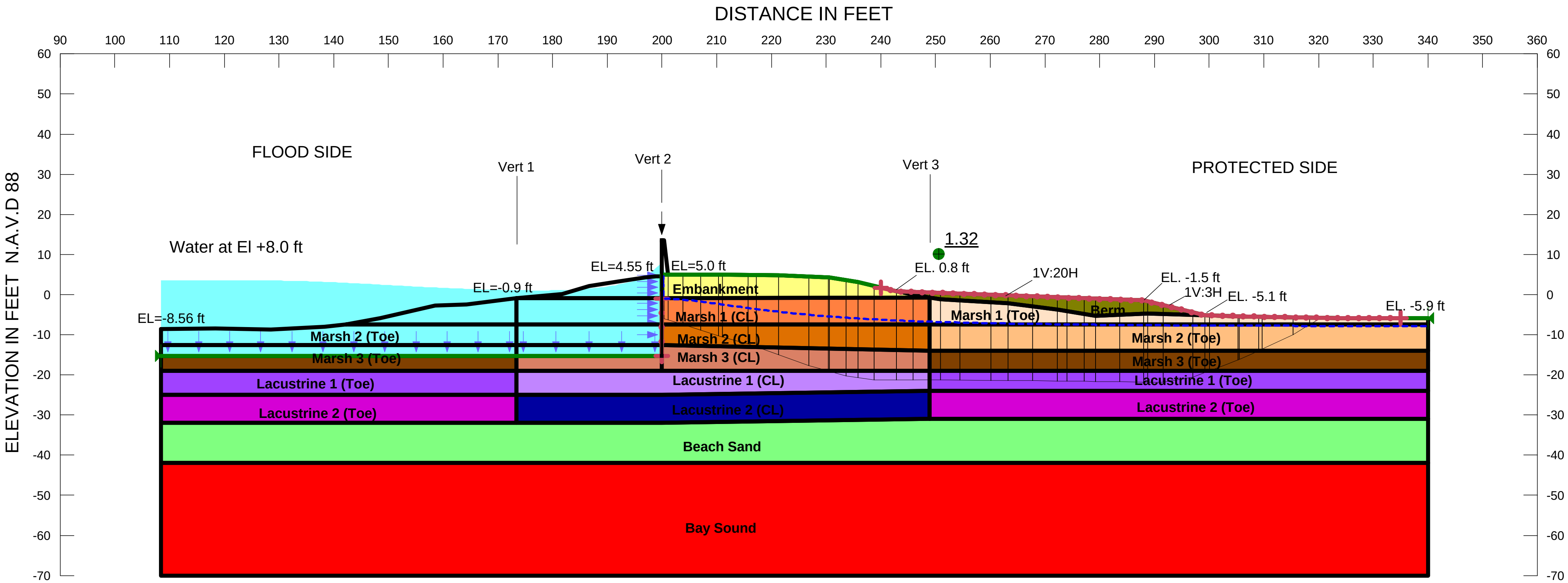
Slices of Slip Surface: Optimized

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	200.2	-5.6440125	481.99851	136.37416	0	299.94
2	Optimized	200.75	-5.8655345	311.85545	1095.1779	0	299.77
3	Optimized	202.95405	-6.7532515	364.97263	1183.7971	0	299.09
4	Optimized	205.16035	-7.64187	405.38743	1290.1612	0	214.45
5	Optimized	206.88445	-8.1355975	416.16608	1371.5687	0	210.92
6	Optimized	209.62815	-8.839312	420.5085	1433.5276	0	205.31
7	Optimized	212.6381	-9.6113145	423.1202	1496.7829	0	199.16
8	Optimized	215.9143	-10.451605	429.29951	1561.03	0	192.46
9	Optimized	219.4262	-11.26035	436.44082	1633.4132	0	185.27
10	Optimized	222.98805	-11.999035	445.85668	1678.7854	0	177.99
11	Optimized	226.1571	-12.52814	451.68472	1723.1457	0	171.51
12	Optimized	229.11905	-12.88618	452.95839	1731.1899	0	165.45
13	Optimized	230.70045	-13.077345	454.91853	1733.19	0	162.22
14	Optimized	233.30045	-13.025015	438.13402	1692.2451	0	156.9
15	Optimized	237.51855	-12.91621	412.83074	1542.7491	0	148.27
16	Optimized	240.9556	-12.82755	394.73994	1397.7319	0	141.25
17	Optimized	242.73705	-12.78269	386.15336	1319.117	0	137.6
18	Optimized	244.325	-12.76931	380.51112	1302.085	0	134.36
19	Optimized	247.4379	-12.74308	370.44582	1272.6774	0	127.99
20	Optimized	249.9629	-12.738105	364.17621	1297.5615	0	125
21	Optimized	252.9518	-12.76492	359.4291	1283.0035	0	125
22	Optimized	257.05535	-12.801735	354.21434	1262.9973	0	125
23	Optimized	261.20355	-12.828745	349.49516	1242.8615	0	125
24	Optimized	263.66505	-12.83885	346.8626	1229.9138	0	125
25	Optimized	266.0726	-12.8174	342.65127	1217.6139	0	125
26	Optimized	270.15755	-12.771505	335.38113	1191.0546	0	125
27	Optimized	273.12475	-12.73817	330.48289	1171.7848	0	125
28	Optimized	274.20445	-12.72871	328.94907	1161.7617	0	125

29	Optimized	276.8297	-12.93135	339.31519	1149.3747	0	125
30	Optimized	281.2401	-13.29147	358.40581	1153.4847	0	125
31	Optimized	285.12025	-13.608295	375.61587	1157.0808	0	125
32	Optimized	287.53015	-13.78209	385.06325	1166.4748	0	125
33	Optimized	288.4	-13.81056	386.35561	1151.9082	0	125
34	Optimized	290.3845	-13.87551	389.40842	1086.4139	0	125
35	Optimized	293.3485	-13.71064	377.72223	1000.2532	0	125
36	Optimized	296.10745	-13.27718	349.49243	865.37026	0	125
37	Optimized	298.34345	-12.506305	300.52388	799.42676	0	125
38	Optimized	301.5694	-10.41929	169.16398	579.58987	0	125
39	Optimized	304.7194	-8.1591335	27.01754	410.02214	0	125
40	Optimized	306.56	-6.444266	-80.630716	350.29824	0	285

Slices of Slip Surface: 6628

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	6628	200.03	-7.47	911.54318	-7904.6292	0	299.99
2	6628	200.23	-7.67	567.61958	1268.1544	0	224.53
3	6628	200.75	-8.19	481.54982	1207.5363	0	223.47
4	6628	203.05	-10.49	646.33185	1403.2806	0	218.76
5	6628	206.5	-12.44	711.83333	1827.2333	0	211.71
6	6628	209.5	-12.44	645.06667	1823.1	0	205.57
7	6628	212.71665	-12.44	589.13598	1814.7963	0	198.99
8	6628	216.15	-12.44	541.45636	1802.272	0	191.97
9	6628	219.58335	-12.44	502.89325	1789.7477	0	184.95
10	6628	222.85	-12.44	472.48387	1771.6129	0	178.27
11	6628	225.95	-12.44	448.06452	1747.8387	0	171.93
12	6628	229.05	-12.44	427.25806	1724.0645	0	165.59
13	6628	233.2	-12.44	404.03846	1638.4231	0	157.11
14	6628	237.55	-12.44	384.28571	1494.9714	0	148.21
15	6628	241.05	-12.44	371.11429	1355.6	0	141.05
16	6628	244.325	-12.44	360.62295	1272.6557	0	134.36
17	6628	247.375	-12.44	352.22951	1246.1639	0	128.12
18	6628	249.9	-12.44	346.16	1274.9	0	125
19	6628	252.96665	-12.44	339.55648	1257.7259	0	125
20	6628	257.1	-12.44	331.93551	1234.5969	0	125
21	6628	261.23335	-12.44	325.54841	1211.4678	0	125
22	6628	265.525	-12.44	320	1187.4382	0	125
23	6628	269.975	-12.44	315.05618	1162.5393	0	125
24	6628	273.975	-12.44	311.26761	1140.1408	0	125
25	6628	277.525	-12.44	308.28169	1120.2817	0	125
26	6628	281.475	-12.44	305.33333	1098.1609	0	125
27	6628	285.825	-12.44	302.52874	1073.8161	0	125
28	6628	288.4	-12.44	301.05	1047.35	0	125
29	6628	290.53335	-12.44	299.94228	971.16337	0	125
30	6628	294	-12.44	298.2692	847.38453	0	125
31	6628	297.46665	-12.44	296.74036	723.57685	0	125
32	6628	299.6	-12.44	295.8875	659.8375	0	125
33	6628	301.375	-11.477215	235.18005	667.17702	0	125
34	6628	304.125	-9.5516445	114.07065	490.12103	0	125
35	6628	306.27755	-8.0444295	19.278675	352.90331	0	125
36	6628	308.4709	-6.508645	-77.306741	265.61662	0	285



Name: EMBANKMENT FILL, EL. +4 TO -1.5 Model: Undrained (Phi=0) Unit Weight: 117 pcf Cohesion: 500 psf
Name: MARSH1, EL. -1.5 TO -7.5 Model: Spatial Mohr-Coulomb Unit Weight: 103 pcf Cohesion Fn: MARSH 1 Phi: 0 °
Name: BEACH SAND, EL. -32/-31 TO -42 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand
Name: BAY SOUND CLAY, EL. -42 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 105 pcf Cohesion Spatial Fn: Bay Sound Phi: 0 °
Name: Marsh2, EL -7.5 to -14 (Protected) Model: Undrained (Phi=0) Unit Weight: 80 pcf Cohesion: 125 psf
Name: MARSH2, EL. -7.5 TO -12.5 Model: Spatial Mohr-Coulomb Weight Fn: Marsh2 Cohesion Spatial Fn: Marsh 2 (2) Phi: 0 °
Name: MARSH3, EL. -12.5 TO -17 Model: Spatial Mohr-Coulomb Unit Weight: 77 pcf Cohesion Spatial Fn: Marsh 3 Phi: 0 °
Name: Marsh3, EL -14 to -19 (Protected) Model: Undrained (Phi=0) Unit Weight: 106 pcf Cohesion: 175 psf
Name: Marsh1, EL -2 to -7.5 (Protected) Model: Undrained (Phi=0) Unit Weight: 110 pcf Cohesion: 285 psf
Name: Lacustrine1, EL -19 to -24 (Protected) Model: Spatial Mohr-Coulomb Unit Weight: 100 pcf Cohesion Fn: Lacustrine (protected) Phi: 0 °
Name: Lacustrine1, EL -19 to -25 Model: Spatial Mohr-Coulomb Weight Fn: Lacustrine1 Cohesion Spatial Fn: Lacustrine Phi: 0 °
Name: Lacustrine2, EL -25 to -32 Model: Spatial Mohr-Coulomb Weight Fn: Lacustrine2 Cohesion Spatial Fn: Lacustrine Phi: 0 °
Name: Lacustrine2, EL -24 to -31 (Protected) Model: Spatial Mohr-Coulomb Unit Weight: 98 pcf Cohesion Fn: Lacustrine (protected) Phi: 0 °
Name: Berm Model: Undrained (Phi=0) Unit Weight: 110 pcf Cohesion: 400 psf

GENERAL NOTES

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

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

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 19
REMEDIATION OF CANAL WALLS AND LEVEES
PROTECTED SIDE STABILITY ANALYSIS
CASE: GAP Stability (Entry/Exit)
STA. 65+00 TO 90+62 EAST
ORLEANS PARISH, LOUISIANA

ETL 1110-2-575 ANALYSIS

Name: GAP Stability (Entry/Exit)
File Name: Orleans Canal Reach 19.gsz Directory: Y:\F&MHOME\Middleton\Outfall Canals\Orleans final edits\final\Appendix A and Appendix B\
Last Edited By: Reves, Ryan D MVK

GAP Stability (Entry/Exit)

File Information

Created By: Liljegren, James
Revision Number: 579
Last Edited By: Reves, Ryan D MVK
Date: 6/12/2013
Time: 9:31:58 AM
File Name: Orleans Canal Reach 19.gsz
Directory: Y:\F&MHOME\Middleton\Outfall Canals\Orleans final edits\final\Appendix A and Appendix B\
Last Solved Date: 6/12/2013
Last Solved Time: 9:35:24 AM

Project Settings

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

Analysis Settings

GAP Stability (Entry/Exit)

Kind: SLOPE/W
Parent: Gap Analysis (seepage)
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: 8
- Ending Optimization Points: 16
- Complete Passes per Insertion: 1
- Driving Side Maximum Convex Angle: 5 °
- Resisting Side Maximum Convex Angle: 1 °

Materials

EMBANKMENT FILL, EL. +4 TO -1.5

Model: Undrained (Phi=0)
Unit Weight: 117 pcf
Cohesion: 500 psf

MARSH1, EL. -1.5 TO -7.5

Model: Spatial Mohr-Coulomb
Unit Weight: 103 pcf
Cohesion Fn: MARSH 1
Phi: 0 °
Phi-B: 0 °

BEACH SAND, EL. -32/-31 TO -42

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

BAY SOUND CLAY, EL. -42 TO -70

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

Marsh2, EL -7.5 to -14 (Protected)

Model: Undrained (Phi=0)
Unit Weight: 80 pcf
Cohesion: 125 psf

MARSH2, EL. -7.5 TO -12.5

Model: Spatial Mohr-Coulomb
Weight Fn: Marsh2
Cohesion Spatial Fn: Marsh 2 (2)
Phi: 0 °
Phi-B: 0 °

MARSH3, EL. -12.5 TO -17

Model: Spatial Mohr-Coulomb
Unit Weight: 77 pcf
Cohesion Spatial Fn: Marsh 3
Phi: 0 °
Phi-B: 0 °

Marsh3, EL -14 to -19 (Protected)

Model: Undrained (Phi=0)
Unit Weight: 106 pcf
Cohesion: 175 psf

Marsh1, EL -2 to -7.5 (Protected)

Model: Undrained (Phi=0)
Unit Weight: 110 pcf
Cohesion: 285 psf

Lacustrine1, EL -19 to -24 (Protected)

Model: Spatial Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion Fn: Lacustrine (protected)
Phi: 0 °
Phi-B: 0 °

Lacustrine1, EL -19 to -25

Model: Spatial Mohr-Coulomb
Weight Fn: Lacustrine1
Cohesion Spatial Fn: Lacustrine
Phi: 0 °
Phi-B: 0 °

Lacustrine2, EL -25 to -32

Model: Spatial Mohr-Coulomb
Weight Fn: Lacustrine2
Cohesion Spatial Fn: Lacustrine
Phi: 0 °
Phi-B: 0 °

Lacustrine2, EL -24 to -31 (Protected)

Model: Spatial Mohr-Coulomb
Unit Weight: 98 pcf
Cohesion Fn: Lacustrine (protected)
Phi: 0 °
Phi-B: 0 °

Berm

Model: Undrained (Phi=0)
Unit Weight: 110 pcf
Cohesion: 400 psf

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (200, -15.3) ft
Left-Zone Right Coordinate: (200, -1) ft
Left-Zone Increment: 4
Right Projection: Range
Right-Zone Left Coordinate: (240, 1.72) ft
Right-Zone Right Coordinate: (335, -5.9) ft
Right-Zone Increment: 50
Radius Increments: 25

Slip Surface Limits

Left Coordinate: (108.4, -15.3) ft
Right Coordinate: (340, -5.9) ft

Reinforcements

Reinforcement 1

Type: Pile
Outside Point: (200, 13.48) ft
Inside Point: (200, -15.3) ft
Slip Surface Intersection: (200, -5.8507) ft
Total Length: 28.78 ft
Reinforcement Direction: 90 °
Applied Load Option: Variable
F of S Dependent: No
Pile Spacing: 1 ft
Shear Capacity: 0 lbs
Shear Safety Factor: 1
Shear Load Used: 0 lbs
Shear Option: Parallel to Slip
Resisting Force Used: 0 lbs/ft

Cohesion Functions

MARSH 1
Model: Spline Data Point Function
Function: Cohesion vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 285
Data Points: X (ft), Cohesion (psf)
Data Point: (173.4, 285)
Data Point: (200, 300)
Data Point: (248.9, 285)

Lacustrine (protected)
Model: Spline Data Point Function
Function: Cohesion vs. Y
Curve Fit to Data: 100 %
Segment Curvature: 100 %
Y-Intercept: 175
Data Points: Y (ft), Cohesion (psf)
Data Point: (-31, 300)
Data Point: (-19, 175)

Shear/Normal Strength Functions

Sand
Model: Spline Data Point Function
Function: Shear Stress vs. Normal Stress
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
Data Point: (-10000, 0)
Data Point: (0, 0)
Data Point: (10000, 6494)
Estimation Properties
Intact Rock Param.: 10
Geological Strength: 100
Disturbance Factor: 0
SigmaC: 600000 psf
Sigma3: 300000 psf
Num. Points: 20

Unit Weight Functions

Lacustrine1
Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 100
Data Points: X (ft), Unit Weight (pcf)
Data Point: (173.4, 100)
Data Point: (200, 105)
Data Point: (248.9, 100)

Marsh2
Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 80
Data Points: X (ft), Unit Weight (pcf)
Data Point: (173.4, 80)
Data Point: (200, 92)
Data Point: (248.9, 80)

Lacustrine2
Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 98
Data Points: X (ft), Unit Weight (pcf)
Data Point: (173.4, 98)
Data Point: (200, 102)
Data Point: (248.9, 98)

Spatial Functions

Marsh 2 (2)
Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (200, -7.5, 225)
Data Point: (200, -12.5, 225)
Data Point: (248.9, -7.5, 125)
Data Point: (248.9, -14, 125)
Data Point: (173.4, -7.5, 125)
Data Point: (173.4, -12.5, 125)

Marsh 3
Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (200, -12.5, 300)
Data Point: (200, -19, 300)
Data Point: (248.9, -14, 175)
Data Point: (248.9, -19, 175)
Data Point: (173.4, -12.5, 175)
Data Point: (173.4, -19, 175)

Lacustrine
Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (200, -19, 300)
Data Point: (200, -32, 425)
Data Point: (248.9, -19, 175)
Data Point: (248.9, -31, 300)
Data Point: (173.4, -19, 175)
Data Point: (173.4, -32, 300)

Bay Sound
Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (200, -42, 510)
Data Point: (200, -70, 770)
Data Point: (248.9, -42, 460)
Data Point: (248.9, -70, 725)
Data Point: (173.4, -42, 460)
Data Point: (173.4, -70, 725)
Data Point: (310, -42, 460)
Data Point: (310, -70, 725)
Data Point: (108.4, -42, 460)
Data Point: (108.4, -70, 725)

Regions

	Points	Area (ft²)	Material
Region 1	7,30,8,39,1	175.56	
Region 2	8,9,40,39	133	
Region 3	21,43,24,16,2,3,37,31,44,22	2431.55	BEACH SAND, EL. -32/-31 TO -42
Region 4	42,28,9,14,15,23,41	379.595	MARSH3, EL. -12.5 TO -17
Region 5	35,15,23,41,46,33	428.55	Lacustrine1, EL -19 to -25
Region 6	13,27,11,14	592.15	Marsh2, EL -7.5 to -14 (Protected)
Region 7	14,11,12,15	455.5	Marsh3, EL -14 to -19 (Protected)
Region 8	15,12,36,35	455.5	Lacustrine1, EL -19 to -24 (Protected)
Region 9	25,22,44,31,37,3,26,38,32,45	6484.8	BAY SOUND CLAY, EL. -42 TO -70
Region 10	40,9,28,42	74.48	
Region 11	8,30,7,10,13	327.63	MARSH1, EL. -1.5 TO -7.5
Region 12	9,8,13,14	281.175	MARSH2, EL. -7.5 TO -12.5
Region 13	29,19,40,42	182	
Region 14	20,29,42,41	240.5	Marsh3, EL -14 to -19 (Protected)
Region 15	21,34,46,43	455	Lacustrine2, EL -24 to -31 (Protected)
Region 16	34,46,41,20	390	Lacustrine1, EL -19 to -24 (Protected)
Region 17	16,24,43,46,33,35	528.5	Lacustrine2, EL -25 to -32
Region 18	16,35,36,2	637.7	Lacustrine2, EL -24 to -31 (Protected)
Region 19	58,50,51,52,1,39	118.991	
Region 20	18,47,48,49,58,39,40,19	293.6835	
Region 21	1,53,54,55,56,57,4,7	72.852	
Region 22	71,5,6,59	6.36	
Region 23	7,4,71,59,60,61,62,63,64,10	220.1	EMBANKMENT FILL, EL. +4 TO -1.5

Region 24	10,65,66,67,17,68,74,69,70,72,27,13	272.07498	Marsh1, EL -2 to -7.5 (Protected)
Region 25	64,73,74,68,17,67,66,65,10	125.82563	Berm

Points

	X (ft)	Y (ft)
Point 1	173.4	-0.9
Point 2	340	-31
Point 3	340	-42
Point 4	200	4.55
Point 5	200	13.48
Point 6	200.4	13.48
Point 7	200	-0.9
Point 8	200	-7.5
Point 9	200	-12.5
Point 10	248.9	-0.7
Point 11	340	-14
Point 12	340	-19
Point 13	248.9	-7.5
Point 14	248.9	-14
Point 15	248.9	-19
Point 16	248.9	-31
Point 17	279.3	-5.3
Point 18	108.4	-8.56
Point 19	108.4	-12.5
Point 20	108.4	-19
Point 21	108.4	-32
Point 22	108.4	-42
Point 23	200	-19
Point 24	200	-32
Point 25	108.4	-70
Point 26	340	-70
Point 27	340	-7.5
Point 28	200	-15.3
Point 29	108.4	-15.3
Point 30	200	-6.5
Point 31	200	-42
Point 32	200	-70
Point 33	200	-25
Point 34	108.4	-25
Point 35	248.9	-24
Point 36	340	-24
Point 37	248.9	-42
Point 38	248.9	-70
Point 39	173.4	-7.5
Point 40	173.4	-12.5
Point 41	173.4	-19
Point 42	173.4	-15.3
Point 43	173.4	-32
Point 44	173.4	-42
Point 45	173.4	-70
Point 46	173.4	-25
Point 47	118.4	-8.48
Point 48	128.5	-8.74
Point 49	138.4	-8.05
Point 50	148.5	-5.84
Point 51	158.5	-2.78
Point 52	164.3	-2.38
Point 53	181.8	0.16
Point 54	186.7	2.06
Point 55	191.9	3.3
Point 56	196.9	4.24
Point 57	198.9	4.55
Point 58	142.2	-7.5
Point 59	201.1	5
Point 60	211	5
Point 61	221.3	4.8
Point 62	230.6	4.3
Point 63	235.8	3.1
Point 64	242.8	0.8
Point 65	250.9	-1.1
Point 66	263.3	-2.2
Point 67	272.2	-3.7
Point 68	288.8	-4.7
Point 69	305.5	-5.4
Point 70	324.2	-5.9
Point 71	200	5
Point 72	340	-5.9
Point 73	288	-1.5
Point 74	299.2	-5.13593

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.32	(260.704, 104.793)	45.33388	(200, 5)	(320.44, -5.79946)
2	3829	1.43	(260.704, 104.793)	128.223	(200, 5)	(325.421, -5.9)

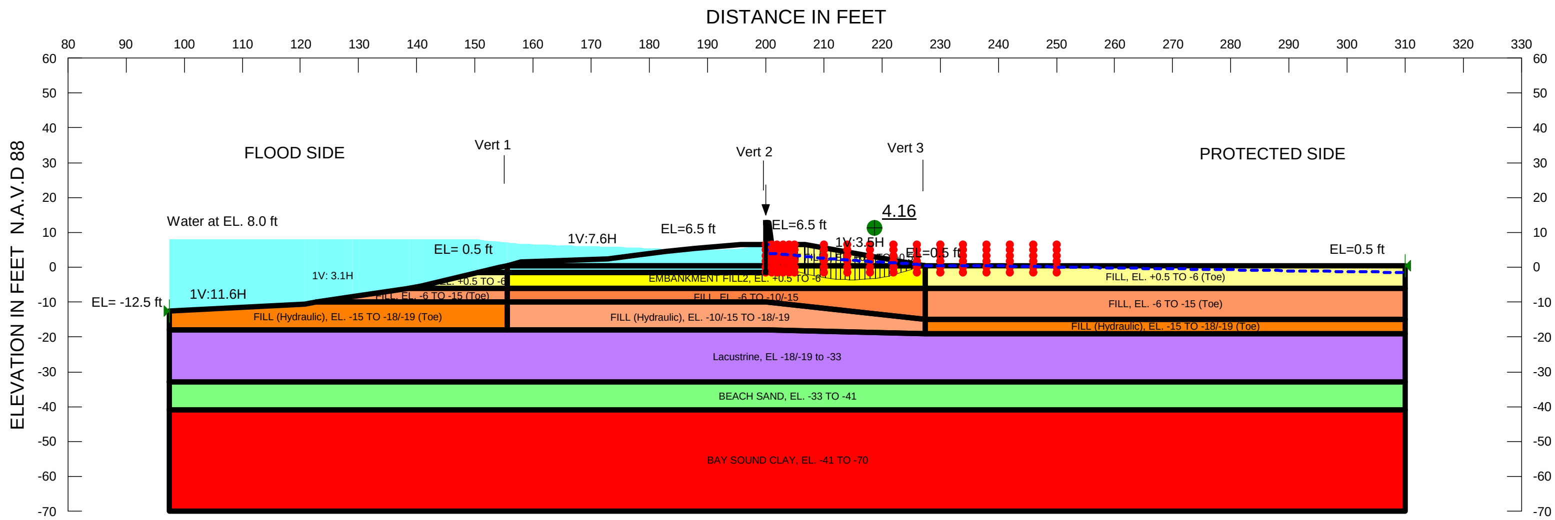
Slices of Slip Surface: Optimized

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	200.2	-5.9364255	501.65702	168.16805	0	299.94
2	Optimized	200.75	-6.1721075	333.13151	1117.1789	0	299.77
3	Optimized	202.4744	-6.9110435	378.85564	1190.9376	0	299.24
4	Optimized	205.47595	-8.1972425	440.05855	1332.8012	0	213.8
5	Optimized	208.7302	-9.5917275	482.39794	1455.1872	0	207.15
6	Optimized	210.67865	-10.41088	501.29058	1538.9186	0	203.16
7	Optimized	213.3629	-11.429225	520.55295	1620.7159	0	197.67
8	Optimized	216.46	-12.676545	551.19847	1692.7293	0	191.34
9	Optimized	219.2471	-14.008535	595.39388	1768.7334	0	250.8
10	Optimized	224.06735	-16.312175	683.24504	1916.9399	0	238.48
11	Optimized	228.62545	-18.317355	768.76617	2066.845	0	226.83
12	Optimized	230.5081	-19.03504	800.46682	2108.5703	0	222.37
13	Optimized	232.1134	-19.647	828.88816	2126.3065	0	224.46
14	Optimized	234.7134	-20.436445	864.94205	2192.7701	0	225.87
15	Optimized	237.3123	-20.944765	886.64903	2153.513	0	224.49
16	Optimized	240.8123	-21.24397	895.48762	2107.5994	0	218.73
17	Optimized	244.325	-21.249995	888.55621	2014.1941	0	209.95
18	Optimized	247.375	-21.25523	883.44146	1986.6531	0	202.33
19	Optimized	249.9	-21.259565	879.74868	2159.9968	0	198.54
20	Optimized	252.67545	-21.264325	876.14038	2144.9401	0	198.59
21	Optimized	257.2568	-21.30747	873.29794	2119.7694	0	199.04
22	Optimized	261.68135	-21.36764	872.55356	2101.6158	0	199.66
23	Optimized	265.525	-21.4153	872.2251	2084.9184	0	200.16
24	Optimized	269.975	-21.47048	872.31498	2065.5716	0	200.73
25	Optimized	273.13575	-21.509675	872.6646	2051.801	0	201.14
26	Optimized	275.6379	-21.55635	874.04961	2039.4597	0	201.63
27	Optimized	278.25215	-21.612715	876.07691	2031.1398	0	202.22
28	Optimized	281.475	-21.67821	878.48531	2019.698	0	202.9
29	Optimized	285.825	-21.76661	881.93288	2004.2529	0	203.82
30	Optimized	288.4	-21.818935	884.09243	1983.0905	0	204.36
31	Optimized	290.1935	-21.85538	885.64116	1922.7754	0	204.74
32	Optimized	294.29295	-21.24025	845.81764	1788.3854	0	198.34

33	Optimized	298.09945	-20.02764	768.99702	1597.6785	0	185.7
34	Optimized	299.64325	-19.22924	718.73472	1467.7073	0	177.39
35	Optimized	302.7166	-17.639845	618.66739	1277.9466	0	175
36	Optimized	305.42335	-16.23223	530.02536	1132.7897	0	175
37	Optimized	307.26435	-15.092385	458.3513	1000.2144	0	175
38	Optimized	309.35885	-13.7956	376.81921	827.60383	0	125
39	Optimized	312.4939	-11.780635	250.14041	652.78828	0	125
40	Optimized	316.82125	-8.735035	58.802765	405.0262	0	125
41	Optimized	319.3918	-6.649731	-72.082772	306.14339	0	285

Slices of Slip Surface: 3829

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	3829	200.2	-8.25704	663.36761	13.693859	0	224.59
2	3829	200.75	-8.5492185	509.11744	1341.9627	0	223.47
3	3829	203.218	-9.7968835	588.27539	1459.0935	0	218.42
4	3829	207.45395	-11.826515	649.30714	1647.1691	0	209.76
5	3829	210.28595	-13.098995	668.35607	1743.2884	0	273.71
6	3829	213.575	-14.42234	688.48242	1845.307	0	265.3
7	3829	218.725	-16.332745	729.92928	1989.7155	0	252.13
8	3829	224.29565	-18.11259	782.18658	2111.6605	0	237.89
9	3829	228.94565	-19.422975	829.89107	2200.6666	0	230.27
10	3829	233.2	-20.41708	868.86127	2226.7176	0	229.51
11	3829	237.55	-21.30954	907.3177	2185.6333	0	227.61
12	3829	241.05	-21.902345	933.74562	2115.2421	0	224.9
13	3829	245.85	-22.529655	961.90201	2092.5285	0	219.37
14	3829	249.9	-22.970055	982.49299	2304.1752	0	216.35
15	3829	252.96665	-23.17958	991.45544	2315.7627	0	218.54
16	3829	257.1	-23.362665	998.38741	2321.5657	0	220.44
17	3829	261.23335	-23.412265	997.85429	2314.0445	0	220.96
18	3829	265.525	-23.320015	989.05292	2291.6368	0	220
19	3829	269.975	-23.074975	971.06919	2253.1871	0	217.45
20	3829	273.975	-22.728945	947.39086	2205.4981	0	213.84
21	3829	277.525	-22.309325	919.55994	2151.4111	0	209.47
22	3829	281.475	-21.717325	880.89618	2077.9958	0	203.31
23	3829	285.825	-20.92563	829.73587	1982.0829	0	195.06
24	3829	288.4	-20.402545	796.11512	1907.0197	0	189.61
25	3829	291.4587	-19.65703	748.47651	1725.3098	0	181.84
26	3829	296.6587	-18.257455	659.3468	1397.8235	0	175
27	3829	300.775	-16.996715	579.29233	1168.8979	0	175
28	3829	303.925	-15.914575	510.7538	1042.3693	0	175
29	3829	307.2339	-14.675315	432.37105	900.829	0	175
30	3829	311.2403	-13.02525	328.15956	723.61317	0	125
31	3829	315.7853	-10.96922	198.48957	546.06734	0	125
32	3829	320.3303	-8.6939705	55.162208	349.28988	0	125
33	3829	323.4014	-7.052342	-48.178492	267.32089	0	285
34	3829	324.81035	-6.252342	-98.512347	176.71206	0	285



Name: EMBANKMENT FILL1, EL. +6.5 TO +0.5 Model: Undrained (Phi=0) Unit Weight: 111 pcf Cohesion: 500 psf
Name: BEACH SAND, EL. -33 TO -41 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand
Name: BAY SOUND CLAY, EL. -41 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 106 pcf Cohesion Spatial Fn: Bay Sound Phi: 0 °
Name: Lacustrine, EL -18/-19 to -33 Model: Spatial Mohr-Coulomb Unit Weight: 103 pcf Cohesion Spatial Fn: Lacustrine Phi: 0 °
Name: EMBANKMENT FILL2, EL. +0.5 TO -6 Model: Spatial Mohr-Coulomb Unit Weight: 101 pcf Cohesion Fn: Fill2 Phi: 0 °
Name: FILL, EL. +0.5 TO -6 (Toe) Model: Spatial Mohr-Coulomb Unit Weight: 101 pcf Cohesion: 400 psf Phi: 0 °
Name: FILL, EL. -6 TO -10/-15 Model: Spatial Mohr-Coulomb Unit Weight: 92 pcf Cohesion Fn: Fill Phi: 0 °
Name: FILL (Hydraulic), EL. -10/-15 TO -18/-19 Model: Spatial Mohr-Coulomb Unit Weight: 82 pcf Cohesion: 400 psf Phi: 0 °
Name: FILL, EL. -6 TO -15 (Toe) Model: Spatial Mohr-Coulomb Unit Weight: 92 pcf Cohesion: 200 psf Phi: 0 °
Name: FILL (Hydraulic), EL. -15 TO -18/-19 (Toe) Model: Spatial Mohr-Coulomb Unit Weight: 82 pcf Cohesion: 400 psf Phi: 0 °

GENERAL NOTES

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

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

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 20
PROTECTED SIDE STABILITY ANALYSIS
CASE: GAP Stability (Block)
STA. 92+20 TO 93+46 EAST
ORLEANS PARISH, LOUISIANA

ETL 1110-2-575 ANALYSIS

Name: GAP Stability (Block)
File Name: Orleans Canal Reach 20A.gsz Directory: Y:\F&MHOME\Middleton\Outfall Canals\Orleans final edits\final\Appendix A and Appendix B\
Last Edited By: Reves, Ryan D MVK

GAP Stability (Block)

File Information

Created By: Liljegren, James
Revision Number: 348
Last Edited By: Reves, Ryan D MVK
Date: 6/11/2013
Time: 2:43:02 PM
File Name: Orleans Canal Reach 20A.gsz
Directory: Y:\F&MHOME\Middleton\Outfall Canals\Orleans final edits\final\Appendix A and Appendix B\
Last Solved Date: 6/11/2013
Last Solved Time: 2:44:26 PM

Project Settings

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

Analysis Settings

GAP Stability (Block)

Kind: SLOPE/W
Parent: Gap Analysis (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
Advanced
- Number of Slices: 30
- Optimization Tolerance: 0.01
- Minimum Slip Surface Depth: 0.1 ft
- Optimization Maximum Iterations: 9000
- Optimization Convergence Tolerance: 1e-007
- Starting Optimization Points: 8
- Ending Optimization Points: 16
- Complete Passes per Insertion: 1
- Driving Side Maximum Convex Angle: 5 °
- Resisting Side Maximum Convex Angle: 1 °

Materials

EMBANKMENT FILL1, EL. +6.5 TO +0.5

Model: Undrained (Phi=0)
Unit Weight: 111 pcf
Cohesion: 500 psf

BEACH SAND, EL. -33 TO -41

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

BAY SOUND CLAY, EL. -41 TO -70

Model: Spatial Mohr-Coulomb
Unit Weight: 106 pcf
Cohesion Spatial Fn: Bay Sound
Phi: 0 °
Phi-B: 0 °

Lacustrine, EL -18/-19 to -33

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

EMBANKMENT FILL2, EL. +0.5 TO -6

Model: Spatial Mohr-Coulomb
Unit Weight: 101 pcf
Cohesion Fn: Fill2
Phi: 0 °
Phi-B: 0 °

FILL, EL. +0.5 TO -6 (Toe)

Model: Spatial Mohr-Coulomb
Unit Weight: 101 pcf
Cohesion: 400 psf
Phi: 0 °
Phi-B: 0 °

FILL, EL. -6 TO -10/-15

Model: Spatial Mohr-Coulomb
Unit Weight: 92 pcf
Cohesion Fn: Fill
Phi: 0 °
Phi-B: 0 °

FILL (Hydraulic), EL. -10/-15 TO -18/-19

Model: Spatial Mohr-Coulomb
Unit Weight: 82 pcf
Cohesion: 400 psf
Phi: 0 °
Phi-B: 0 °

FILL, EL. -6 TO -15 (Toe)

Model: Spatial Mohr-Coulomb
Unit Weight: 92 pcf
Cohesion: 200 psf
Phi: 0 °
Phi-B: 0 °

FILL (Hydraulic), EL. -15 TO -18/-19 (Toe)

Model: Spatial Mohr-Coulomb
Unit Weight: 82 pcf
Cohesion: 400 psf
Phi: 0 °
Phi-B: 0 °

Slip Surface Limits

Left Coordinate: (97.5, -12.5) ft
Right Coordinate: (310, 0.5) ft

Slip Surface Block

Left Grid
- Upper Left: (200, 6.5) ft
- Lower Left: (200, -1.5) ft
- Lower Right: (205, -1.5) ft
- X Increments: 5
- Y Increments: 5
- Starting Angle: 115 °
- Ending Angle: 135 °
- Angle Increments: 4

Right Grid
- Upper Left: (210, 6.5) ft
- Lower Left: (210, -1.5) ft
- Lower Right: (250, -1.5) ft
- X Increments: 10
- Y Increments: 5
- Starting Angle: 25 °
- Ending Angle: 45 °
- Angle Increments: 4

Reinforcements

Reinforcement 1

Type: Pile
Outside Point: (200, 12.9) ft
Inside Point: (200, -1.5) ft
Slip Surface Intersection: (200, 0.72167) ft
Total Length: 14.4 ft
Reinforcement Direction: 90 °
Applied Load Option: Variable
F of S Dependent: No
Pile Spacing: 1 ft
Shear Capacity: 0 lbs
Shear Safety Factor: 1
Shear Load Used: 0 lbs
Shear Option: Parallel to Slip
Resisting Force Used: 0 lbs/ft

Cohesion Functions

Fill2

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

Y-Intercept: 400
Data Points: X (ft), Cohesion (psf)
- Data Point: (155.5, 400)
- Data Point: (200, 500)
- Data Point: (227.5, 400)

Fill

Model: Spline Data Point Function
Function: Cohesion vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 200
Data Points: X (ft), Cohesion (psf)
Data Point: (155.5, 200)
Data Point: (200, 300)
Data Point: (227.5, 200)

Shear/Normal Strength Functions

Sand

Model: Spline Data Point Function
Function: Shear Stress vs. Normal Stress
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
Data Point: (-10000, 0)
Data Point: (0, 0)
Data Point: (10000, 6494)
Estimation Properties
Intact Rock Param.: 10
Geological Strength: 100
Disturbance Factor: 0
SigmaC: 600000 psf
Sigma3: 300000 psf
Num. Points: 20

Spatial Functions

Lacustrine

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (200, -18, 235)
Data Point: (200, -33, 350)
Data Point: (227.5, -19, 220)
Data Point: (227.5, -33, 340)
Data Point: (310, -19, 220)
Data Point: (310, -33, 340)
Data Point: (155.5, -18, 220)
Data Point: (155.5, -33, 340)
Data Point: (97.5, -18, 220)
Data Point: (97.5, -33, 340)

Bay Sound

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (200, -41, 525)
Data Point: (200, -70, 810)
Data Point: (227.5, -41, 500)
Data Point: (227.5, -70, 770)
Data Point: (310, -41, 500)
Data Point: (310, -70, 770)
Data Point: (155.5, -41, 500)
Data Point: (155.5, -70, 770)
Data Point: (97.5, -41, 500)
Data Point: (97.5, -70, 770)

Regions

	Points	Area (ft²)	Material
Region 1	7,18,19,20	4.8	
Region 2	7,20,8,9,21	102.9	EMBANKMENT FILL1, EL. +6.5 TO +0.5
Region 3	12,11,39,44,35,15,16,45	3091.25	Lacustrine, EL -18/-19 to -33
Region 4	13,12,45,16,17,46	1700	BEACH SAND, EL. -33 TO -41
Region 5	25,13,46,17,26,47	6162.5	BAY SOUND CLAY, EL. -41 TO -70
Region 6	7,27,6,23,24,5,4,29,21	144.9	
Region 7	38,40,31,28,1,42,11,39	428.68444	FILL (Hydraulic), EL. -15 TO -18/-19 (Toe)
Region 8	34,33,32,14	742.5	FILL, EL. -6 TO -15 (Toe)
Region 9	41,36,3,30,37	47.411173	FILL, EL. +0.5 TO -6 (Toe)
Region 10	36,41,29,49	4.9575125	
Region 11	9,33,32,10	536.25	FILL, EL. +0.5 TO -6 (Toe)
Region 12	35,34,14,15	330	FILL (Hydraulic), EL. -15 TO -18/-19 (Toe)
Region 13	21,22,41,37,48,33,9	379	EMBANKMENT FILL2, EL. +0.5 TO -6
Region 14	40,37,48,33,34,43	356.75	FILL, EL. -6 TO -10/-15
Region 15	39,38,40,43,34,35,44	521	FILL (Hydraulic), EL. -10/-15 TO -18/-19
Region 16	41,29,21,22	89	
Region 17	31,2,30,37,40	98.734098	FILL, EL. -6 TO -15 (Toe)

Points

	X (ft)	Y (ft)
Point 1	97.5	-12.5
Point 2	128.9	-8.5
Point 3	140.7	-5.5
Point 4	157.9	1.5
Point 5	172.9	2.5
Point 6	187.9	5.5
Point 7	200	6.5
Point 8	206.8	6.5
Point 9	227.5	0.5
Point 10	310	0.5
Point 11	97.5	-18
Point 12	97.5	-33
Point 13	97.5	-41
Point 14	310	-15
Point 15	310	-19
Point 16	310	-33
Point 17	310	-41
Point 18	200	12.9
Point 19	200.5	12.9
Point 20	201	6.5
Point 21	200	0.5
Point 22	200	-1.5
Point 23	182.9	4.5
Point 24	177.9	3.5
Point 25	97.5	-70
Point 26	310	-70
Point 27	195.7	6.5
Point 28	120.7	-10.5
Point 29	155.5	0.5
Point 30	138.71539	-6
Point 31	122.76222	-10
Point 32	310	-6
Point 33	227.5	-6
Point 34	227.5	-15
Point 35	227.5	-19
Point 36	150.54249	-1.5
Point 37	155.5	-6
Point 38	155.5	-14
Point 39	155.5	-18
Point 40	155.5	-10
Point 41	155.5	-1.5
Point 42	97.5	-14
Point 43	200	-10
Point 44	200	-18
Point 45	200	-33
Point 46	200	-41
Point 47	200	-70
Point 48	200	-6
Point 49	154.26062	0

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	4.16	(211.421, 2.456)	10.33416	(200, 6.5)	(226.725, 0.724597)
2	8482	6.53	(211.421, 2.456)	9.416	(200, 6.5)	(223.482, 1.66477)

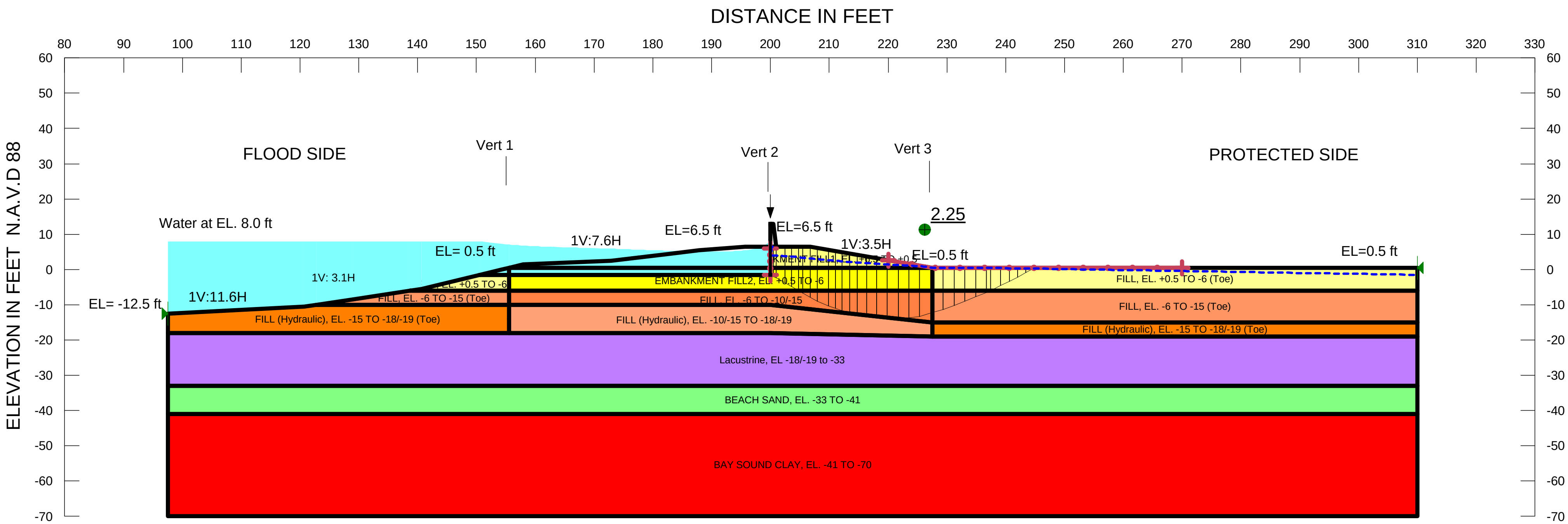
Slices of Slip Surface: Optimized

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)

1	Optimized	200.25	0.63935945	287.13824	153.33543	0	500
2	Optimized	200.58665	0.52852565	258.92944	610.57095	0	500
3	Optimized	200.83665	0.4462175	263.8577	618.84077	0	496.96
4	Optimized	201.4862	0.23236625	271.73472	639.47236	0	494.6
5	Optimized	202.4586	-0.087771245	269.56616	670.35974	0	491.06
6	Optimized	203.36665	-0.42755665	267.70177	682.45851	0	487.76
7	Optimized	204.2104	-0.78699	271.10365	716.67357	0	484.69
8	Optimized	205.0542	-1.1464234	275.75943	750.87773	0	481.62
9	Optimized	206.043	-1.56677	282.12146	791.23093	0	478.03
10	Optimized	206.70495	-1.845284	288.77118	823.67831	0	475.62
11	Optimized	207.07695	-1.993549	292.37074	829.44873	0	474.27
12	Optimized	207.86395	-2.283935	299.50443	843.94617	0	471.4
13	Optimized	208.88405	-2.643945	310.02406	847.46812	0	467.69
14	Optimized	209.8366	-2.9223315	317.81999	876.05671	0	464.23
15	Optimized	210.72155	-3.119095	322.32057	867.79463	0	461.01
16	Optimized	211.6065	-3.3158585	327.8801	859.54357	0	457.79
17	Optimized	212.45795	-3.4456425	330.21852	880.62335	0	454.7
18	Optimized	213.27585	-3.5084475	329.41394	860.83803	0	451.72
19	Optimized	214.09375	-3.5712525	328.80441	841.04052	0	448.75
20	Optimized	214.91165	-3.6340575	328.43869	821.25521	0	445.78
21	Optimized	215.7587	-3.6040025	322.71823	842.48489	0	442.7
22	Optimized	216.63495	-3.4810875	311.47349	800.72681	0	439.51
23	Optimized	217.51125	-3.3581725	300.29657	758.96872	0	436.32
24	Optimized	218.38755	-3.2352575	289.07444	717.22194	0	433.14
25	Optimized	219.21255	-3.0568035	274.78482	706.99071	0	430.14
26	Optimized	219.98625	-2.82281	257.26747	655.72525	0	427.32
27	Optimized	220.76	-2.5888165	239.65116	604.44743	0	424.51
28	Optimized	221.4423	-2.35877	222.5466	572.85437	0	422.03
29	Optimized	222.12295	-2.0710025	201.80019	532.18845	0	419.55
30	Optimized	222.89345	-1.7215675	176.6712	467.04929	0	416.75
31	Optimized	223.73195	-1.31042	146.9334	404.76861	0	413.7
32	Optimized	224.6213	-0.813705	111.27859	330.72472	0	410.47
33	Optimized	225.55975	-0.19718	66.993741	244.90005	0	407.06
34	Optimized	226.26195	0.32953	27.750764	179.31117	0	404.5
35	Optimized	226.59345	0.61229845	5.6200602	159.49702	0	500

Slices of Slip Surface: 8482

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	8482	200.25	-1.5	551.98	28.378	0	499.09
2	8482	200.75	-1.5	480.92	880.2	0	497.27
3	8482	201.4143	-1.5	404.46726	880.14141	0	494.86
4	8482	202.24285	-1.5	365.88277	880.069	0	491.84
5	8482	203.0714	-1.5	336.54312	879.99658	0	488.83
6	8482	203.9	-1.5	317.30518	879.92417	0	485.82
7	8482	204.7286	-1.5	299.41898	879.85175	0	482.81
8	8482	205.55715	-1.5	286.27587	879.77934	0	479.79
9	8482	206.3857	-1.5	274.11035	879.70693	0	476.78
10	8482	207.2	-1.5	264.2875	866.7625	0	473.82
11	8482	208	-1.5	255.4625	840.95	0	470.91
12	8482	208.8	-1.5	247.7	815.1375	0	468
13	8482	209.6	-1.5	240.5875	789.325	0	465.09
14	8482	210.4	-1.5	234.05	763.5125	0	462.18
15	8482	211.2	-1.5	228.025	737.7125	0	459.27
16	8482	212	-1.5	222.3125	711.9	0	456.36
17	8482	212.8	-1.5	217.0125	686.0875	0	453.45
18	8482	213.6	-1.5	211.8875	660.275	0	450.55
19	8482	214.4	-1.5	207.1125	634.4625	0	447.64
20	8482	215.2	-1.5	202.4125	608.65	0	444.73
21	8482	216	-1.5	198.0125	582.8375	0	441.82
22	8482	216.8	-1.5	193.625	557.0375	0	438.91
23	8482	217.6	-1.5	189.475	531.225	0	436
24	8482	218.433	-1.25	170.23	570.14	0	432.97
25	8482	219.29905	-0.75	135.72	483.39	0	429.82
26	8482	220.1651	-0.25	100.98	396.64	0	426.67
27	8482	221.0311	0.25	66.057	309.89	0	423.52
28	8482	221.80035	0.69412835	34.841635	240.54958	0	500
29	8482	222.47285	1.0823849	7.4873135	169.21792	0	500
30	8482	223.1453	1.4706415	-19.953291	97.875955	0	500



Name: EMBANKMENT FILL1, EL. +6.5 TO +0.5 Model: Undrained (Phi=0) Unit Weight: 111 pcf Cohesion: 500 psf
Name: BEACH SAND, EL. -33 TO -41 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand
Name: BAY SOUND CLAY, EL. -41 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 106 pcf Cohesion Spatial Fn: Bay Sound Phi: 0 °
Name: Lacustrine, EL -18/-19 to -33 Model: Spatial Mohr-Coulomb Unit Weight: 103 pcf Cohesion Spatial Fn: Lacustrine Phi: 0 °
Name: EMBANKMENT FILL2, EL. +0.5 TO -6 Model: Spatial Mohr-Coulomb Unit Weight: 101 pcf Cohesion Fn: Fill2 Phi: 0 °
Name: FILL, EL. +0.5 TO -6 (Toe) Model: Spatial Mohr-Coulomb Unit Weight: 101 pcf Cohesion: 400 psf Phi: 0 °
Name: FILL, EL. -6 TO -10/-15 Model: Spatial Mohr-Coulomb Unit Weight: 92 pcf Cohesion Fn: Fill Phi: 0 °
Name: FILL (Hydraulic), EL. -10/-15 TO -18/-19 Model: Spatial Mohr-Coulomb Unit Weight: 82 pcf Cohesion: 400 psf Phi: 0 °
Name: FILL, EL. -6 TO -15 (Toe) Model: Spatial Mohr-Coulomb Unit Weight: 92 pcf Cohesion: 200 psf Phi: 0 °
Name: FILL (Hydraulic), EL. -15 TO -18/-19 (Toe) Model: Spatial Mohr-Coulomb Unit Weight: 82 pcf Cohesion: 400 psf Phi: 0 °

GENERAL NOTES

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

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

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 20
PROTECTED SIDE STABILITY ANALYSIS
CASE: GAP Stability (Entry/Exit)
STA. 92+20 TO 93+46 EAST
ORLEANS PARISH, LOUISIANA

ETL 1110-2-575 ANALYSIS

Name: GAP Stability (Entry/Exit)
File Name: Orleans Canal Reach 20A.gsz Directory: Y:\F&MHOME\Middleton\Outfall Canals\Orleans final edits\final\Appendix A and Appendix B\
Last Edited By: Reves, Ryan D MVK

GAP Stability (Entry/Exit)

File Information

Created By: Liljegren, James
Revision Number: 345
Last Edited By: Reves, Ryan D MVK
Date: 6/11/2013
Time: 2:21:30 PM
File Name: Orleans Canal Reach 20A.gsz
Directory: Y:\F&MHOME\Middleton\Outfall Canals\Orleans final edits\final\Appendix A and Appendix B\
Last Solved Date: 6/11/2013
Last Solved Time: 2:24:04 PM

Project Settings

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

Analysis Settings

GAP Stability (Entry/Exit)

Kind: SLOPE/W
Parent: Gap Analysis (seepage)
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: 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 FILL1, EL. +6.5 TO +0.5

Model: Undrained (Phi=0)
Unit Weight: 111 pcf
Cohesion: 500 psf

BEACH SAND, EL. -33 TO -41

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

BAY SOUND CLAY, EL. -41 TO -70

Model: Spatial Mohr-Coulomb
Unit Weight: 106 pcf
Cohesion Spatial Fn: Bay Sound
Phi: 0 °
Phi-B: 0 °

Lacustrine, EL -18/-19 to -33

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

EMBANKMENT FILL2, EL. +0.5 TO -6

Model: Spatial Mohr-Coulomb
Unit Weight: 101 pcf
Cohesion Fn: Fill2
Phi: 0 °
Phi-B: 0 °

FILL, EL. +0.5 TO -6 (Toe)

Model: Spatial Mohr-Coulomb
Unit Weight: 101 pcf
Cohesion: 400 psf
Phi: 0 °
Phi-B: 0 °

FILL, EL. -6 TO -10/-15

Model: Spatial Mohr-Coulomb
Unit Weight: 92 pcf
Cohesion Fn: Fill
Phi: 0 °
Phi-B: 0 °

FILL (Hydraulic), EL. -10/-15 TO -18/-19

Model: Spatial Mohr-Coulomb
Unit Weight: 82 pcf
Cohesion: 400 psf
Phi: 0 °
Phi-B: 0 °

FILL, EL. -6 TO -15 (Toe)

Model: Spatial Mohr-Coulomb
Unit Weight: 92 pcf
Cohesion: 200 psf
Phi: 0 °
Phi-B: 0 °

FILL (Hydraulic), EL. -15 TO -18/-19 (Toe)

Model: Spatial Mohr-Coulomb
Unit Weight: 82 pcf
Cohesion: 400 psf
Phi: 0 °
Phi-B: 0 °

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (200, -1.5) ft
Left-Zone Right Coordinate: (200, 6) ft
Left-Zone Increment: 4
Right Projection: Range
Right-Zone Left Coordinate: (220, 2.67391) ft
Right-Zone Right Coordinate: (270, 0.5) ft
Right-Zone Increment: 12
Radius Increments: 25

Slip Surface Limits

Left Coordinate: (97.5, -12.5) ft
Right Coordinate: (310, 0.5) ft

Reinforcements

Reinforcement 1

Type: Pile
Outside Point: (200, 12.9) ft
Inside Point: (200, -1.5) ft
Slip Surface Intersection: (200, -1.5) ft
Total Length: 14.4 ft
Reinforcement Direction: 90 °
Applied Load Option: Variable
F of S Dependent: No
Pile Spacing: 1 ft
Shear Capacity: 0 lbs
Shear Safety Factor: 1
Shear Load Used: 0 lbs
Shear Option: Parallel to Slip
Resisting Force Used: 0 lbs/ft

Cohesion Functions

Fill2

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

Y-Intercept: 400
Data Points: X (ft), Cohesion (psf)
- Data Point: (155.5, 400)
- Data Point: (200, 500)
- Data Point: (227.5, 400)

Fill

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

Y-Intercept: 200
Data Points: X (ft), Cohesion (psf)
- Data Point: (155.5, 200)
- Data Point: (200, 300)

Data Point: (227.5, 200)

Shear/Normal Strength Functions

Sand

Model: Spline Data Point Function
Function: Shear Stress vs. Normal Stress
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
Data Point: (-10000, 0)
Data Point: (0, 0)
Data Point: (10000, 6494)
Estimation Properties
Intact Rock Param.: 10
Geological Strength: 100
Disturbance Factor: 0
SigmaC: 600000 psf
Sigma3: 300000 psf
Num. Points: 20

Spatial Functions

Lacustrine

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (200, -18, 235)
Data Point: (200, -33, 350)
Data Point: (227.5, -19, 220)
Data Point: (227.5, -33, 340)
Data Point: (310, -19, 220)
Data Point: (310, -33, 340)
Data Point: (155.5, -18, 220)
Data Point: (155.5, -33, 340)
Data Point: (97.5, -18, 220)
Data Point: (97.5, -33, 340)

Bay Sound

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (200, -41, 525)
Data Point: (200, -70, 810)
Data Point: (227.5, -41, 500)
Data Point: (227.5, -70, 770)
Data Point: (310, -41, 500)
Data Point: (310, -70, 770)
Data Point: (155.5, -41, 500)
Data Point: (155.5, -70, 770)
Data Point: (97.5, -41, 500)
Data Point: (97.5, -70, 770)

Regions

	Points	Area (ft²)	Material
Region 1	7,18,19,20	4.8	
Region 2	7,20,8,9,21	102.9	EMBANKMENT FILL1, EL. +6.5 TO +0.5
Region 3	12,11,39,44,35,15,16,45	3091.25	Lacustrine, EL -18/-19 to -33
Region 4	13,12,45,16,17,46	1700	BEACH SAND, EL. -33 TO -41
Region 5	25,13,46,17,26,47	6162.5	BAY SOUND CLAY, EL. -41 TO -70
Region 6	7,27,6,23,24,5,4,29,21	144.9	
Region 7	38,40,31,28,1,42,11,39	428.68444	FILL (Hydraulic), EL. -15 TO -18/-19 (Toe)
Region 8	34,33,32,14	742.5	FILL, EL. -6 TO -15 (Toe)
Region 9	41,36,3,30,37	47.411173	FILL, EL. +0.5 TO -6 (Toe)
Region 10	36,41,29,49	4.9575125	
Region 11	9,33,32,10	536.25	FILL, EL. +0.5 TO -6 (Toe)
Region 12	35,34,14,15	330	FILL (Hydraulic), EL. -15 TO -18/-19 (Toe)
Region 13	21,22,41,37,48,33,9	379	EMBANKMENT FILL2, EL. +0.5 TO -6
Region 14	40,37,48,33,34,43	356.75	FILL, EL. -6 TO -10/-15
Region 15	39,38,40,43,34,35,44	521	FILL (Hydraulic), EL. -10/-15 TO -18/-19
Region 16	41,29,21,22	89	
Region 17	31,2,30,37,40	98.734098	FILL, EL. -6 TO -15 (Toe)

Points

	X (ft)	Y (ft)
Point 1	97.5	-12.5
Point 2	128.9	-8.5
Point 3	140.7	-5.5
Point 4	157.9	1.5
Point 5	172.9	2.5
Point 6	187.9	5.5
Point 7	200	6.5
Point 8	206.8	6.5
Point 9	227.5	0.5
Point 10	310	0.5
Point 11	97.5	-18
Point 12	97.5	-33
Point 13	97.5	-41
Point 14	310	-15
Point 15	310	-19
Point 16	310	-33
Point 17	310	-41
Point 18	200	12.9
Point 19	200.5	12.9
Point 20	201	6.5
Point 21	200	0.5
Point 22	200	-1.5
Point 23	182.9	4.5
Point 24	177.9	3.5
Point 25	97.5	-70
Point 26	310	-70
Point 27	195.7	6.5
Point 28	120.7	-10.5
Point 29	155.5	0.5
Point 30	138.71539	-6
Point 31	122.76222	-10
Point 32	310	-6
Point 33	227.5	-6
Point 34	227.5	-15
Point 35	227.5	-19
Point 36	150.54249	-1.5
Point 37	155.5	-6
Point 38	155.5	-14
Point 39	155.5	-18
Point 40	155.5	-10
Point 41	155.5	-1.5
Point 42	97.5	-14
Point 43	200	-10
Point 44	200	-18
Point 45	200	-33
Point 46	200	-41
Point 47	200	-70
Point 48	200	-6
Point 49	154.26062	0

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	2.25	(221.819, 13.042)	19.9476	(200, 6.5)	(244.899, 0.5)
2	172	2.38	(221.819, 13.042)	26.221	(200, 6.5)	(244.846, 0.5)

Slices of Slip Surface: Optimized

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	200.25	-1.729026	543.59728	417.56754	0	499.09
2	Optimized	200.75	-2.1870795	481.21484	712.05226	0	497.27
3	Optimized	201.7316	-3.0863335	456.25815	799.99758	0	493.7
4	Optimized	203.0353	-4.31742	461.04908	904.06185	0	488.96
5	Optimized	204.1795	-5.43914	488.56536	1013.403	0	484.8
6	Optimized	205.0969	-6.338535	526.58168	1176.5346	0	281.47

7	Optimized	206.1211	-7.2953365	579.70478	1274.3595	0	277.74
8	Optimized	207.3973	-8.4575515	644.85901	1359.7186	0	273.1
9	Optimized	208.94625	-9.70569	714.81153	1455.6815	0	267.47
10	Optimized	210.4669	-10.73615	772.23433	1533.11	0	261.94
11	Optimized	211.60485	-11.38869	808.29226	1556.7421	0	257.8
12	Optimized	212.81155	-11.954815	839.06026	1608.4801	0	253.41
13	Optimized	214.08705	-12.43452	864.52413	1612.1493	0	248.77
14	Optimized	215.54995	-12.825105	884.08375	1638.9915	0	243.45
15	Optimized	217.2002	-13.12658	897.85378	1614.1935	0	237.45
16	Optimized	218.9543	-13.431645	911.72484	1589.5189	0	231.08
17	Optimized	220.8123	-13.7403	925.79467	1558.7776	0	224.32
18	Optimized	222.63385	-13.75708	922.06517	1559.4384	0	217.7
19	Optimized	224.41895	-13.48198	900.5278	1475.4482	0	211.2
20	Optimized	226.40575	-12.783915	852.40397	1405.1652	0	203.98
21	Optimized	228.41725	-11.75355	783.62537	1270.4803	0	200
22	Optimized	230.26415	-10.71708	714.8342	1187.6397	0	200
23	Optimized	232.12345	-9.58384	640.06709	1079.9439	0	200
24	Optimized	233.9756	-8.3924	561.71884	976.5121	0	200
25	Optimized	235.82055	-7.14276	479.86415	857.27531	0	200
26	Optimized	237.0685	-6.25897	422.16934	788.97989	0	200
27	Optimized	238.27565	-5.29847	359.56205	768.87985	0	400
28	Optimized	239.8676	-3.979045	273.92961	646.17413	0	400
29	Optimized	241.28825	-2.743255	194.06998	515.34073	0	400
30	Optimized	242.7238	-1.46902	111.98466	387.73674	0	400
31	Optimized	244.17425	-0.15634	27.458147	248.48562	0	400

Slices of Slip Surface: 172

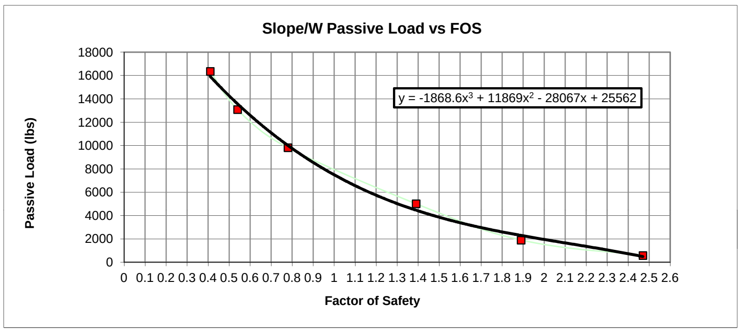
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	172	200.25	-1.861791	538.3562	356.33837	0	499.09
2	172	200.75	-2.561147	478.65849	660.71608	0	497.27
3	172	201.69825	-3.736054	470.38526	808.92324	0	493.82
4	172	203.09475	-5.286698	492.46177	1001.9746	0	488.75
5	172	204.54475	-6.659121	548.57069	1233.2713	0	283.47
6	172	206.04825	-7.8847525	615.74124	1364.8081	0	278.01
7	172	207.5393	-8.931678	673.09764	1454.796	0	272.58
8	172	209.01785	-9.8259215	721.8819	1505.7895	0	267.21
9	172	210.4964	-10.59389	763.4831	1543.801	0	261.83
10	172	211.975	-11.247635	798.43197	1570.1618	0	256.45
11	172	213.4536	-11.79622	827.28005	1585.9139	0	251.08
12	172	214.93215	-12.246525	850.35656	1591.8001	0	245.7
13	172	216.4107	-12.603745	867.91711	1588.4571	0	240.32
14	172	217.8893	-12.871745	880.18916	1576.2895	0	234.95
15	172	219.36785	-13.053285	887.22553	1555.6075	0	229.57
16	172	220.8464	-13.15017	889.23283	1526.6391	0	224.19
17	172	222.325	-13.16334	886.16334	1489.4712	0	218.82
18	172	223.8036	-13.09292	877.98391	1444.1989	0	213.44
19	172	225.28215	-12.93823	864.74709	1390.6748	0	208.06
20	172	226.7607	-12.697745	846.18833	1328.8611	0	202.69
21	172	228.27155	-12.35982	821.62183	1282.2727	0	200
22	172	229.81465	-11.916665	790.51457	1250.604	0	200
23	172	231.35775	-11.368005	752.87315	1209.4983	0	200
24	172	232.90085	-10.706485	708.35438	1158.1964	0	200
25	172	234.4439	-9.9222955	656.14063	1095.9718	0	200
26	172	235.98695	-9.0022595	595.5931	1021.6943	0	200
27	172	237.53005	-7.9283505	525.43519	933.86497	0	200
28	172	239.07315	-6.6751565	444.15942	830.4397	0	200
29	172	240.6782	-5.1352555	344.81467	790.27573	0	400
30	172	242.3452	-3.218382	221.91197	633.51801	0	400
31	172	244.01215	-0.8331265	69.992584	445.19341	0	400

APPENDIX C ETL ROTATIONAL ANALYSIS WITH CORRECT PASSIVE PRESSURES

Canal:	Orleans Avenue Canal
Reach:	Reach 1A
Load Case:	Water @ El 8
Protected Side Top of Ground (GSE):	3.6 ft, Elevation
Critical Slip Surface Elev. (FSE):	Varies ft, Elevation
Sheetpile Tip Elevation:	-28.5 ft, Elevation

Step 1: Compute correct passive pressure forces from slope stability model (Slope/W). Procedure follows the approach cited in Paragraph D-4 of ETL 1110-2-575.

Unit Weight (psf)	Passive Load (lbs)	Factor of Safety	Failure Surface Elevation (feet)	Notes
10	580.06	2.47	-3.12	
30	1890	1.89	-3.5	
60	5015.6	1.39	-4.9	
90	9818.8	0.78	-7	
120	13086	0.54	-7	
150	16352	0.41	-7	



Step 2: Perform CWALSHT analysis of cross section using a range of assumed horizontal distributed load above the critical slip surface elevation found in step 1. Determine the difference in passive load from CWALSHT and Slope/W for each assumed horizontal distributed load.

Check penetration of the sheetpile to determine where the pile behaves as a short pile or long pile. This I-wall has a penetration versus stick up of = (3.6--28)/(8'-3.6')=7.2. This ratio exceeds the recommended 2.5. For short pile behavior, the penetration was determined to be 20 ft. The PS GSE was 3.6 producing a short pile tip elevation of -16.4. See attached EXCEL sheet for short pile versus long pile calculation. This penetration gives a penetration to stickup ratio of 4.5.

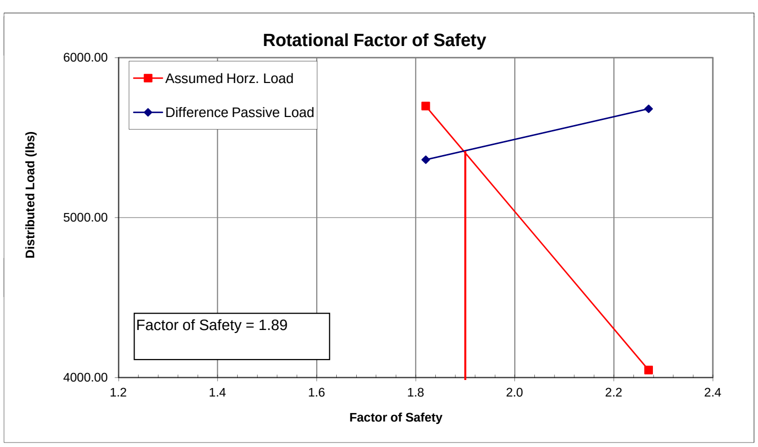
	(A)	(B)			(C)	(D)	
FOS	CWALSHT Passive Load (lbs)	SLOPE/W Passive Load (lbs)	Critical Failure Surface (Assumed) feet	Tip Elev feet	Difference Passive Load (A-B) (lbs)	Assumed Horizontal Distributed Load in CWALSHT (psf)	Resultant Distributed CWALSHT Load (lbs)
2.27	6832.85	1152.51	-3.5	-16.4	5680.34	1140	4047.00
1.82	7892.22	2529.95	-3.5	-16.4	5362.27	1605	5697.75

Interpolate Correction Force at the resultant FOS

FOS = 1.89

Correction Force = 5411.74 lbs

Step 3: Plot the assumed horizontal load and the difference passive load versus factor of safety. The intersection of the two curves represents the actual factor of safety.



SHORT PILE/LONG PILE - HOMOGENEOUS SAND

VALUES OF SUBGRADE REACTION FOR SHEET PILES

CONSTANTS OF HORIZONTAL SUBGRADE REACTION l_h				COEFFICIENT OF SUBGRADE REACTION EQUATIONS n_h	
SANDS				SANDS	
TERZAGHI'S THEORY				TERZAGHI'S THEORY	
	LOOSE	MEDIUM	DENSE		
l_h (Dry or Moist) (pci)	2.89	9.26	23.15	n_h (lbs/in^4)	$n_h=(l_h/D)$ (where D is embedment depth in inches)
l_h (Submerged) (pci)	1.85	4.63	15.05		

From EM 1110-2-2906, Design of Pile Foundations, 1991

(b) Linearly Increasing Modulus of Horizontal Subgrade Reaction

$$R = \sqrt[5]{\frac{EI}{n_h}}$$

$L/R \le 2.0$ Short pile

$2.0 < L/R < 4.0$ Intermediate

$L/R \ge 4.0$ Long pile

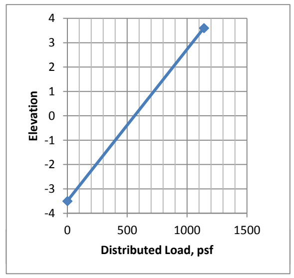
Enter l_h and moment of inertia of sheet pile. Vary penetration depth until D/R = 2.

Penetration, D, ft	Penetration, D, in	l_h, pci	n_H, lb/in^4	I, in^4/ft	EI, lb-in^2/ft	EI, lb-in^2/in	R, in	R, ft	D/R
20	240	2	0.01	84.2	2.68E+09	2.24E+08	121.82	10.15	1.97

VIII.B.--HORIZONTAL DISTRIBUTED LOAD

ELEVATION (FT)	DIST. LOAD (PSF)	Result. (LBS)
3.6	1140	
-3.5	0	4047

4047



RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

NET SOIL PRESSURES INCLUDE APPLIED HORIZONTAL DISTRIBUTED LOADS.

ELEV. (FT)	NET WATER (PSF)	<---LEFTSIDE---> PASSIVE (PSF)	ACTIVE (PSF)	<--RIGHTSIDE---> ACTIVE (PSF)	PASSIVE (PSF)
14.1	0	0	0	0	0
13.1	0	0	0	0	0
12.1	0	0	0	0	0
11.1	0	0	0	0	0
10.1	0	0	0	0	0
9.1	0	0	0	0	0
8.1	0	0	0	0	0
8	0	0	0	0	0
7.1	56	0	0	0	0
6.1	119	0	0	0	0
5.1	181	0	0	0	0
4.1	243	0	0	0	0
3.60+	275	0	0	0	0
-3.6	275	511	0	0	0
3.1	306	782	0	0	0
2.1	368	888	0	0	0
1.1	431	995	0	0	0
0.1	493	1010	0	0	0
0	499	1000	0	0	0
-0.9	555	977	0	0	0
-1.60+	599	1037	0	0	0
-1.60-	599	1037	0	0	352
-1.9	618	1064	0	0	535
-2.6	661	1132	0	0	496
-2.9	680	1074	0	0	482
-3	686	1025	0	0	472
-3.24+	701	912	0	0	408
-3.24-	701	971	0	0	408
-3.5	718	912	212	0	336
-3.9	743	939	270	0	237
-4.6	786	988	339	0	204
-4.9	786	991	377	0	214
-5.9	786	981	466	0	235
-6.13+	786	978	463	0	437
-6.13-	786	978	463	0	282
-6.9	786	1770	2159	650	437
-7	786	1914	2389	753	459
-7.9	786	1986	1330	520	416
-8.9	786	1756	236	113	408
-9.9	786	1893	372	154	538
-10.37	786	1938	373	159	597
-10.9	786	1990	375	165	662
-11.9	786	2086	380	175	777
-12.9	786	2181	386	188	886
-13.9	786	2273	393	192	997
-14.9	786	2361	401	186	1109
-15.9	786	2448	410	192	1222
-16.41	786	2536	419	206	1335
-17.9	786	2623	428	220	1447

ELEV. (FT)	NET WATER (PSF)	LEFTSIDE PASSIVE (PSF)	RESULT. LEFTSIDE PASSIVE (LBS)
14.1	0	0	
13.1	0	0	
12.1	0	0	
11.1	0	0	
10.1	0	0	
9.1	0	0	
8.1	0	0	
8	0	0	
7.1	56	0	0
6.1	119	0	0
5.1	181	0	0
4.1	243	0	0
3.6	275	0	0
3.6	275	511	0
3.1	306	782	323.25
2.1	368	888	835
1.1	431	995	941.5
0.1	493	1010	1002.5
0	499	1000	100.5
-0.9	555	977	889.65
-1.6	599	1037	704.9
-1.6	599	1037	0
-1.9	618	1064	315.15
-2.6	661	1132	768.6
-2.9	680	1074	330.9
-3	686	1025	104.95
-3.24	701	912	232.44
-3.24	701	971	0
-3.5	718	912	244.79
-3.9	743	939	370.2
-4.6	786	988	674.45
-4.9	786	991	296.85
-5.9	786	981	986
-6.13	786	978	225.285
-6.13	786	978	0
-6.9	786	1770	1057.98
-7	786	1914	184.2
-7.9	786	1986	1755
-8.9	786	1756	1871
-9.9	786	1893	1824.5
-10.37	786	1938	900.285
-10.9	786	1990	1040.92
-11.9	786	2086	2038
-12.9	786	2181	2133.5
-13.9	786	2273	2227
-14.9	786	2361	2317
-15.9	786	2448	2404.5
-16.41	786	2536	1270.92
-17.9	786	2623	3843.455

PS WATER ELEVATION (FT)	CRITICAL SLIP SURF. ELEVATION (FT)	UNIT WEIGHT WATER (PCF)
-4.6	-3.5	64

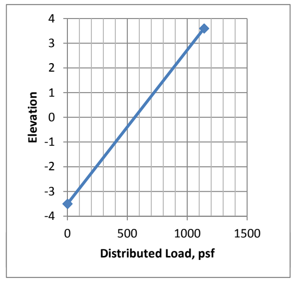
RESULTANT WATER LOAD= 38.72 LBS

PASSIVE LOAD (SOIL)	6794.13	
PASSIVE LOAD (SOIL+WATER)	6832.85	**IF THE PS WATER LEVEL IS BELOW THE CRITICAL SLIP SURFACE,**
FOS =	2.27	**USE PASSIVE LOAD (SOIL)**

VIII.B.--HORIZONTAL DISTRIBUTED LOAD

ELEVATION (FT)	DIST. LOAD (PSF)	Result. (LBS)
3.6	1605	
-3.5	0	5697.75

5697.75



RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

NET SOIL PRESSURES INCLUDE APPLIED HORIZONTAL DISTRIBUTED LOADS.

	NET	<---LEFTSIDE--->		<--RIGHTSIDE--->	
ELEV. (FT)	WATER (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)
14.1	0	0	0	0	0
13.1	0	0	0	0	0
12.1	0	0	0	0	0
11.1	0	0	0	0	0
10.1	0	0	0	0	0
9.1	0	0	0	0	0
8.1	0	0	0	0	0
8	0	0	0	0	0
7.1	56	0	0	0	0
6.1	119	0	0	0	0
5.1	181	0	0	0	0
4.1	243	0	0	0	0
3.60+	275	0	0	0	0
-3.6	275	637	0	0	0
3.1	306	983	0	0	0
2.1	368	1074	0	0	0
1.1	431	1175	0	0	0
0.1	493	1168	0	0	0
0	499	1153	0	0	0
-0.9	555	1104	0	0	0
-1.60+	599	1162	0	0	0
-1.60-	599	1162	0	0	440
-1.9	618	1189	0	0	665
-2.6	661	1258	0	0	611
-2.9	680	1178	0	0	591
-3	686	1115	0	0	579
-3.23+	701	963	0	0	500
-3.23-	701	1045	0	0	500
-3.5	718	963	218	0	407
-3.9	743	987	276	0	280
-4.6	786	1035	344	0	236
-4.9	786	1036	380	0	246
-5.9	786	1020	466	0	265
-6.13+	786	1014	463	0	597
-6.13-	786	1014	463	0	342
-6.9	786	2230	2159	650	597
-7	786	2447	2389	753	634
-7.9	786	2478	1329	520	543
-8.9	786	2072	235	113	485
-9.64	786	2208	335	143	606
-9.9	786	2257	371	154	649
-10.9	786	2376	374	165	796
-11.9	786	2495	379	175	931
-12.9	786	2611	385	188	1063
-13.9	786	2720	393	192	1198
-14.9	786	2827	401	186	1334
-15.9	786	2932	409	192	1471
-16.42	786	3038	418	206	1606
-17.9	786	3143	428	220	1760

ELEV. (FT)	NET WATER (PSF)	LEFTSIDE PASSIVE (PSF)	RESULT. LEFTSIDE PASSIVE (LBS)
14.1	0	0	
13.1	0	0	
12.1	0	0	
11.1	0	0	
10.1	0	0	
9.1	0	0	
8.1	0	0	
8	0	0	
7.1	56	0	0
6.1	119	0	0
5.1	181	0	0
4.1	243	0	0
3.6	275	0	0
3.6	275	637	0
3.1	306	983	405
2.1	368	1074	1028.5
1.1	431	1175	1124.5
0.1	493	1168	1171.5
0	499	1153	116.05
-0.9	555	1104	1015.65
-1.6	599	1162	793.1
-1.6	599	1162	0
-1.9	618	1189	352.65
-2.6	661	1258	856.45
-2.9	680	1178	365.4
-3	686	1115	114.65
-3.23	701	963	238.97
-3.23	701	1045	0
-3.5	718	963	271.08
-3.9	743	987	390
-4.6	786	1035	707.7
-4.9	786	1036	310.65
-5.9	786	1020	1028
-6.13	786	1014	233.91
-6.13	786	1014	0
-6.9	786	2230	1248.94
-7	786	2447	233.85
-7.9	786	2478	2216.25
-8.9	786	2072	2275
-9.64	786	2208	1583.6
-9.9	786	2257	580.45
-10.9	786	2376	2316.5
-11.9	786	2495	2435.5
-12.9	786	2611	2553
-13.9	786	2720	2665.5
-14.9	786	2827	2773.5
-15.9	786	2932	2879.5
-16.42	786	3038	1552.2
-17.9	786	3143	4573.94

PS WATER ELEVATION (FT)	CRITICAL SLIP SURF. ELEVATION (FT)	UNIT WEIGHT WATER (PCF)
-4.6	-3.5	64

RESULTANT WATER LOAD= 38.72 LBS

PASSIVE LOAD (SOIL)	7853.5
PASSIVE LOAD (SOIL+WATER)	7892.22
FOS =	1.82

IF THE PS WATER LEVEL IS BELOW THE CRITICAL SLIP SURFACE, USE PASSIVE LOAD (SOIL)

```
'ORLEANS CANAL REACH 1A I-WALL
CONTROL  CANTILEVER  DESIGN  1.00  2.27
WALL   14.1
SURFACE RIGHTSIDE   6    0   -1.6
                0.9   -1.6
                4.7   -3
                7.5   -3.5
                18   -5.4
                31.9   -4.5
SURFACE LEFTSIDE   8    0    3.6
                8.3    3.3
                30    0
                31   -2.5
                41   -2.8
                51.6   -3.7
                67.3   -4.6
                110   -4.6
SOIL RIGHTSIDE  STRENGTHS   3
   94    94    0    400    0    400   -3.5   0
   94    94    0    170    0    170   -7   0
   122    122    33    0    18    0
SOIL LEFTSIDE  STRENGTHS   5
   110    110    0    580    0    534    0   0
   94    94    0    400    0    400   -3   0
   94    94    0    170    0    170   -4.6   0
   94    94    0    170    0    170   -7   0
   122    122    33    0    18    0
WATER ELEVATIONS   62.4    8   -4.6
HORIZONTAL DISTRIBUTED   2    3.6    1140   -3.5    0
FINISHED
```

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 3-OCTOBER-2013 TIME: 12:03:31

****
* INPUT DATA *
****

I.--HEADING

'ORLEANS CANAL REACH 1A I-WALL

II.--CONTROL

CANTILEVER WALL DESIGN
FACTOR OF SAFETY FOR ACTIVE PRESSURES = 1.00
FACTOR OF SAFETY FOR PASSIVE PRESSURES = 2.27

III.--WALL DATA

ELEVATION AT TOP OF WALL   = 14.10 FT.

IV.--SURFACE POINT DATA

IV.A.--RIGHTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	-1.60
0.90	-1.60
4.70	-3.00
7.50	-3.50
18.00	-5.40
31.90	-4.50

IV.B.--LEFTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	3.60
8.30	3.30
30.00	0.00
31.00	-2.50
41.00	-2.80
51.60	-3.70
67.30	-4.60
110.00	-4.60

V.--SOIL LAYER DATA

V.A.--RIGHTSIDE

LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

```
            ANGLE OF        ANGLE OF                  <-SAFETY->
 SAT.  MOIST  INTERNAL  COH-    WALL    ADH-   <--BOTTOM-->  <-FACTOR->
WGHT.  WGHT.  FRICTION  ESION  FRICTION  ESION   ELEV.  SLOPE  ACT. PASS.
(PCF)  (PCF)   (DEG)   (PSF)   (DEG)   (PSF)   (FT)  (FT/FT)
```

94.00	94.00	0.00	400.00	0.00	400.00	-3.50	0.00	DEF	DEF
94.00	94.00	0.00	170.00	0.00	170.00	-7.00	0.00	DEF	DEF
122.00	122.00	33.00	0.00	18.00	0.00			DEF	DEF

V.B.--LEFTSIDE

LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH-ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH-ESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.
110.00	110.00	0.00	580.00	0.00	534.00	0.00	0.00	DEF	DEF
94.00	94.00	0.00	400.00	0.00	400.00	-3.00	0.00	DEF	DEF
94.00	94.00	0.00	170.00	0.00	170.00	-4.60	0.00	DEF	DEF
94.00	94.00	0.00	170.00	0.00	170.00	-7.00	0.00	DEF	DEF
122.00	122.00	33.00	0.00	18.00	0.00			DEF	DEF

VI.--WATER DATA

UNIT WEIGHT = 62.40 (PCF)
RIGHTSIDE ELEVATION = 8.00 (FT)
LEFTSIDE ELEVATION = -4.60 (FT)
NO SEEPAGE

VII.--VERTICAL SURCHARGE LOADS

NONE

VIII.--HORIZONTAL LOADS

VIII.A.--HORIZONTAL LINE LOADS

NONE

VIII.B.--HORIZONTAL DISTRIBUTED LOADS

ELEVATION (FT)	DIST. LOAD (PSF)
3.60	1140.00
-3.50	0.00

****
* SOIL PRESSURES FOR *
* CANTILEVER WALL DESIGN *

****

I.--HEADING
'ORLEANS CANAL REACH 1A I-WALL

II.--SOIL PRESSURES

RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

NET SOIL PRESSURES INCLUDE APPLIED HORIZONTAL DISTRIBUTED LOADS.

	NET	<---LEFTSIDE--->		<------NET------> (SOIL + WATER)		<--RIGHTSIDE--->	
ELEV. (FT)	WATER (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)
14.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
13.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7.1	56.2	0.0	0.0	56.2	56.2	0.0	0.0
6.1	118.6	0.0	0.0	118.6	118.6	0.0	0.0
5.1	181.0	0.0	0.0	181.0	181.0	0.0	0.0
4.1	243.4	0.0	0.0	243.4	243.4	0.0	0.0
3.6+	274.6	0.0	0.0	274.6	274.6	0.0	0.0
3.6-	274.6	511.0	0.0	903.5	1414.6	0.0	0.0
3.1	305.8	781.5	0.0	584.0	1365.5	0.0	0.0
2.1	368.2	887.7	0.0	379.6	1267.3	0.0	0.0
1.1	430.6	995.0	0.0	174.1	1169.2	0.0	0.0
0.1	493.0	1010.1	0.0	60.9	1071.0	0.0	0.0
0.0	499.2	999.9	0.0	61.3	1061.2	0.0	0.0
-0.9	555.4	977.4	0.0	-4.6	972.8	0.0	0.0
-1.6+	599.0	1036.7	0.0	-132.6	904.1	0.0	0.0
-1.6-	599.0	1036.7	0.0	-132.6	1256.5	0.0	352.4
-1.9	617.8	1064.3	0.0	-189.6	1409.3	0.0	534.7
-2.6	661.4	1131.9	0.0	-325.9	1302.1	0.0	496.2
-2.9	680.2	1073.7	0.0	-297.2	1258.1	0.0	481.6
-3.0	686.4	1024.9	0.0	-258.3	1239.0	0.0	472.3
-3.2+	701.2	911.9	0.0	-198.2	1150.8	0.0	407.5
-3.2-	701.2	971.1	0.0	-198.2	1150.8	0.0	407.5
-3.5	717.6	911.9	211.9	-194.3	841.9	0.0	336.1
-3.9	742.6	938.5	269.7	-195.9	709.6	0.0	236.7
-4.6	786.2	987.9	338.9	-201.7	651.5	0.0	204.2
-4.9	786.2	991.0	376.9	-204.8	623.0	0.0	213.6
-5.9	786.2	980.8	466.5	-194.5	554.5	0.0	234.7
-6.1+	786.2	978.0	463.3	-191.8	682.5	0.0	437.3
-6.1-	786.2	978.0	463.3	-191.8	682.5	0.0	281.8
-6.9	786.2	1770.0	2159.1	-333.6	-935.6	650.1	437.3
-7.0	786.2	1914.2	2389.3	-375.0	-1143.8	753.0	459.2

-7.9	786.2	1985.9	1329.5	-679.9	-127.6	519.8	415.7
-8.9	786.2	1756.0	235.9	-856.8	958.5	113.0	408.2
-9.9	786.2	1892.9	371.7	-952.6	952.8	154.1	538.3
-10.9	786.2	1989.6	374.8	-1038.8	1073.3	164.5	661.9
-11.9	786.2	2086.1	379.7	-1124.5	1183.0	175.3	776.5
-12.9	786.2	2181.2	386.0	-1206.9	1286.3	188.1	886.1
-13.9	786.2	2272.6	393.2	-1294.4	1390.4	191.9	997.4
-14.9	786.2	2360.9	401.2	-1388.2	1494.4	186.5	1109.3
-15.9	786.2	2448.4	409.8	-1470.3	1598.3	191.9	1221.8
-16.9	786.2	2535.8	418.9	-1543.1	1702.1	206.5	1334.7
-17.9	786.2	2623.0	428.3	-1616.7	1804.5	220.1	1446.6
-18.9	786.2	2710.1	438.1	-1690.1	1922.9	233.8	1574.8
-19.9	786.2	2797.1	448.2	-1763.2	2062.5	247.7	1724.4
-20.9	786.2	2884.0	458.4	-1836.2	2193.9	261.6	1866.1
-21.9	786.2	2971.2	469.0	-1909.4	2315.2	275.6	1998.0
-22.9	786.2	3064.0	480.5	-1988.1	2438.0	289.6	2132.2
-23.9	786.2	3064.9	492.6	-1974.9	2560.2	303.7	2266.6
-24.9	786.2	2938.7	505.0	-1834.6	2682.3	317.8	2401.1
-25.9	786.2	2892.7	517.5	-1774.5	2804.4	332.0	2535.7
-26.9	786.2	3046.8	530.0	-1914.3	2926.7	346.2	2670.5
-27.9	786.2	3277.1	542.6	-2130.5	3048.5	360.4	2804.8
-28.9	786.2	3424.2	555.3	-2263.4	3164.7	374.6	2933.8
-29.9	786.2	3488.1	568.0	-2313.0	3276.2	388.9	3057.9
-30.9	786.2	3555.1	580.7	-2365.7	3390.8	403.1	3185.3
-31.9	786.2	3658.3	593.5	-2454.6	3507.8	417.4	3315.1
-32.9	786.2	3780.1	606.3	-2562.2	3624.1	431.7	3444.2
-33.9	786.2	3895.0	619.2	-2662.8	3740.4	446.0	3573.4
-34.9	786.2	3998.7	632.1	-2752.0	3856.6	460.5	3702.5
-35.9	786.2	4105.3	645.0	-2845.2	3972.9	473.9	3831.7
-36.9	786.2	4225.2	657.9	-2961.6	4089.1	477.4	3960.8
-37.9	786.2	4343.1	670.9	-3082.0	4205.4	474.9	4090.0
-38.9	786.2	4452.0	683.9	-3181.8	4321.6	484.0	4219.2
-39.9	786.2	4558.8	696.8	-3271.6	4437.9	500.9	4348.5
-40.9	786.2	4665.8	709.8	-3363.0	4554.1	516.5	4477.7
-41.9	786.2	4772.6	722.9	-3454.5	4670.3	531.8	4606.9
-42.9	786.2	4881.4	735.9	-3548.2	4786.5	547.0	4736.2
-43.9	786.2	4993.9	748.9	-3645.4	4902.8	562.3	4865.5
-44.9	786.2	5106.8	762.0	-3743.0	5019.0	577.5	4994.7
-45.9	786.2	5219.0	775.1	-3840.0	5135.2	592.8	5124.0
-46.9	786.2	5332.3	787.9	-3938.0	5251.7	608.0	5253.3
-47.9	786.2	5446.0	797.2	-4036.5	5371.7	623.3	5382.6
-48.9	786.2	5559.8	861.1	-4135.0	5437.0	638.5	5511.9

DATE: 3-OCTOBER-2013 TIME: 12:04:03

****
* SUMMARY OF RESULTS FOR *
* CANTILEVER WALL DESIGN *
****

I.--HEADING
'ORLEANS CANAL REACH 1A I-WALL

II.--SUMMARY

RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

WALL BOTTOM ELEV. (FT) : -16.41
PENETRATION (FT) : 14.81

MAX. BEND. MOMENT (LB-FT) : 1.6165E+04
AT ELEVATION (FT) : -8.11

MAX. SCALED DEFL. (LB-IN^3): 6.5580E+09
AT ELEVATION (FT) : 14.10

NOTE: DIVIDE SCALED DEFLECTION MODULUS OF
ELLASTICITY IN PSI TIMES PILE MOMENT
OF INERTIA IN IN^4 TO OBTAIN DEFLECTION
IN INCHES.

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHOREDOR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS
DATE: 3-OCTOBER-2013 TIME: 12:04:03

****
* COMPLETE OF RESULTS FOR *
* CANTILEVER WALL DESIGN *
****

I.--HEADING
'ORLEANS CANAL REACH 1A I-WALL

II.--RESULTS

ELEVATION (FT)	BENDING MOMENT (LB-FT)	SHEAR (LB)	SCALED DEFLECTION (LB-IN^3)	NET PRESSURE (PSF)
14.10	0.0000E+00	0.	6.5580E+09	0.00
13.10	1.0477E-09	0.	6.2406E+09	0.00
12.10	1.0477E-09	0.	5.9231E+09	0.00

11.10	1.0477E-09	0.	5.6057E+09	0.00
10.10	1.0477E-09	0.	5.2882E+09	0.00
9.10	1.0477E-09	0.	4.9708E+09	0.00
8.10	1.0477E-09	0.	4.6533E+09	0.00
8.00	9.9816E-08	0.	4.6216E+09	0.00
7.10	7.5816E+00	25.	4.3359E+09	56.16
6.10	7.1334E+01	113.	4.0185E+09	118.56
5.10	2.5365E+02	262.	3.7012E+09	180.96
4.10	6.1692E+02	475.	3.3844E+09	243.36
3.60+	8.8591E+02	604.	3.2263E+09	274.56
3.60-	8.8591E+02	604.	3.2263E+09	903.55
3.10	1.2876E+03	976.	3.0686E+09	583.97
2.10	2.5214E+03	1458.	2.7552E+09	379.64
1.10	4.1347E+03	1735.	2.4462E+09	174.13
0.10	5.9375E+03	1852.	2.1444E+09	60.90
0.00	6.1230E+03	1858.	2.1147E+09	61.28
-0.90	7.8113E+03	1884.	1.8529E+09	-4.57
-1.60	9.1184E+03	1836.	1.6566E+09	-132.58
-1.90	9.6623E+03	1787.	1.5748E+09	-189.64
-2.60	1.0856E+04	1607.	1.3899E+09	-325.90
-2.90	1.1324E+04	1514.	1.3134E+09	-297.23
-3.00	1.1474E+04	1486.	1.2883E+09	-258.26
-3.24	1.1820E+04	1431.	1.2294E+09	-198.19
-3.50	1.2189E+04	1380.	1.1658E+09	-194.29
-3.90	1.2725E+04	1302.	1.0715E+09	-195.94
-4.60	1.3588E+04	1163.	9.1518E+08	-201.67
-4.90	1.3928E+04	1102.	8.5164E+08	-204.76
-5.90	1.4929E+04	902.	6.5578E+08	-194.52
-6.13	1.5134E+04	857.	6.1387E+08	-191.79
-6.90	1.5721E+04	656.	4.8568E+08	-333.59
-7.00	1.5785E+04	620.	4.7015E+08	-374.95
-7.90	1.6150E+04	146.	3.4271E+08	-679.87
-8.90	1.5926E+04	-623.	2.2754E+08	-856.78
-9.90	1.4859E+04	-1527.	1.3977E+08	-952.64
-10.37	1.4031E+04	-1986.	1.0741E+08	-993.27
-10.90	1.2854E+04	-2450.	7.7538E+07	-761.84
-11.90	1.0096E+04	-2993.	3.7410E+07	-323.89
-12.90	7.0141E+03	-3098.	1.4681E+07	114.07
-13.90	4.0463E+03	-2765.	4.0888E+06	552.02
-14.90	1.6306E+03	-1994.	5.6817E+05	989.98
-15.90	2.0485E+02	-785.	7.8089E+03	1427.94
-16.41	0.0000E+00	0.	0.0000E+00	1651.18

NOTE: DIVIDE SCALED DEFLECTION MODULUS OF
ELLASTICITY IN PSI TIMES PILE MOMENT
OF INERTIA IN IN^4 TO OBTAIN DEFLECTION
IN INCHES.

III.--WATER AND SOIL PRESSURES

		<-------------SOIL PRESSURES------------->			
	WATER	<----LEFTSIDE----->		<---RIGHTSIDE---->	
ELEVATION	PRESSURE	PASSIVE	ACTIVE	ACTIVE	PASSIVE
(FT)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)

14.10	0.	0.	0.	0.	0.
13.10	0.	0.	0.	0.	0.
12.10	0.	0.	0.	0.	0.
11.10	0.	0.	0.	0.	0.
10.10	0.	0.	0.	0.	0.
9.10	0.	0.	0.	0.	0.
8.10	0.	0.	0.	0.	0.
8.00	0.	0.	0.	0.	0.
7.10	56.	0.	0.	0.	0.
6.10	119.	0.	0.	0.	0.
5.10	181.	0.	0.	0.	0.
4.10	243.	0.	0.	0.	0.
3.60+	275.	0.	0.	0.	0.
3.60-	275.	511.	0.	0.	0.
3.10	306.	782.	0.	0.	0.
2.10	368.	888.	0.	0.	0.
1.10	431.	995.	0.	0.	0.
0.10	493.	1010.	0.	0.	0.
0.00	499.	1000.	0.	0.	0.
-0.90	555.	977.	0.	0.	0.
-1.60+	599.	1037.	0.	0.	0.
-1.60-	599.	1037.	0.	0.	352.
-1.90	618.	1064.	0.	0.	535.
-2.60	661.	1132.	0.	0.	496.
-2.90	680.	1074.	0.	0.	482.
-3.00	686.	1025.	0.	0.	472.
-3.24+	701.	912.	0.	0.	408.
-3.24-	701.	971.	0.	0.	408.
-3.50	718.	912.	212.	0.	336.
-3.90	743.	939.	270.	0.	237.
-4.60	786.	988.	339.	0.	204.
-4.90	786.	991.	377.	0.	214.
-5.90	786.	981.	466.	0.	235.
-6.13+	786.	978.	463.	0.	437.
-6.13-	786.	978.	463.	0.	282.
-6.90	786.	1770.	2159.	650.	437.
-7.00	786.	1914.	2389.	753.	459.
-7.90	786.	1986.	1330.	520.	416.
-8.90	786.	1756.	236.	113.	408.
-9.90	786.	1893.	372.	154.	538.
-10.37	786.	1938.	373.	159.	597.
-10.90	786.	1990.	375.	165.	662.
-11.90	786.	2086.	380.	175.	777.
-12.90	786.	2181.	386.	188.	886.
-13.90	786.	2273.	393.	192.	997.
-14.90	786.	2361.	401.	186.	1109.
-15.90	786.	2448.	410.	192.	1222.
-16.41	786.	2536.	419.	206.	1335.
-17.90	786.	2623.	428.	220.	1447.

```
'ORLEANS CANAL REACH 1A I-WALL
CONTROL  CANTILEVER  DESIGN  1.00  1.82
WALL   14.1
SURFACE RIGHTSIDE   6    0   -1.6
                 0.9   -1.6
                 4.7   -3
                 7.5   -3.5
                 18   -5.4
                 31.9   -4.5
SURFACE LEFTSIDE   9    0    3.6
                 1    3.6
                 8.3    3.3
                 30    0
                 31   -2.5
                 41   -2.8
                 51.6   -3.7
                 67.3   -4.6
                 110   -4.6
SOIL RIGHTSIDE  STRENGTHS   3
   94    94    0    400    0    400   -3.5   0
   94    94    0    170    0    170   -7   0
   122    122    33    0    18    0
SOIL LEFTSIDE  STRENGTHS   5
   110    110    0    580    0    534    0   0
   94    94    0    400    0    400   -3   0
   94    94    0    170    0    170   -4.6   0
   94    94    0    170    0    170   -7   0
   122    122    33    0    18    0
WATER ELEVATIONS   62.4    8   -4.6
HORIZONTAL DISTRIBUTED   2    3.6    1605   -3.5    0
FINISHED
```

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PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
                    BY CLASSICAL METHODS
DATE: 3-OCTOBER-2013                          TIME: 12:07:37

                     ****************
                     *  INPUT DATA  *
                     ****************

    I.--HEADING
   'ORLEANS CANAL REACH 1A I-WALL

   II.--CONTROL
     CANTILEVER WALL DESIGN
     FACTOR OF SAFETY FOR ACTIVE PRESSURES  = 1.00
     FACTOR OF SAFETY FOR PASSIVE PRESSURES = 1.82

  III.--WALL DATA
     ELEVATION AT TOP OF WALL    = 14.10 FT.

   IV.--SURFACE POINT DATA

      IV.A.--RIGHTSIDE
        DIST. FROM     ELEVATION
        WALL (FT)        (FT)
           0.00        -1.60
           0.90        -1.60
           4.70        -3.00
           7.50        -3.50
          18.00        -5.40
          31.90        -4.50

      IV.B.--LEFTSIDE
        DIST. FROM     ELEVATION
        WALL (FT)        (FT)
           0.00         3.60
           1.00         3.60
           8.30         3.30
          30.00         0.00
          31.00        -2.50
          41.00        -2.80
          51.60        -3.70
          67.30        -4.60
         110.00        -4.60

    V.--SOIL LAYER DATA

      V.A.--RIGHTSIDE
        LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE  = DEFAULT
        LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

          ANGLE OF        ANGLE OF                    <-SAFETY->
 SAT.   MOIST  INTERNAL  COH-    WALL    ADH-    <--BOTTOM-->  <-FACTOR->
WGHT.   WGHT.  FRICTION  ESION  FRICTION  ESION   ELEV.  SLOPE  ACT. PASS.
```

(PCF)	(PCF)	(DEG)	(PSF)	(DEG)	(PSF)	(FT)	(FT/FT)		
94.00	94.00	0.00	400.00	0.00	400.00	-3.50	0.00	DEF	DEF
94.00	94.00	0.00	170.00	0.00	170.00	-7.00	0.00	DEF	DEF
122.00	122.00	33.00	0.00	18.00	0.00			DEF	DEF

V.B.--LEFTSIDE

LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

SAT. WGHT.	MOIST WGHT.	ANGLE OF INTERNAL FRICTION	COH-ESION	ANGLE OF WALL FRICTION	ADH-ESION	<--BOTTOM--> ELEV.	SLOPE	<-SAFETY-> <-FACTOR-> ACT.	PASS.
(PCF)	(PCF)	(DEG)	(PSF)	(DEG)	(PSF)	(FT)	(FT/FT)		
110.00	110.00	0.00	580.00	0.00	534.00	0.00	0.00	DEF	DEF
94.00	94.00	0.00	400.00	0.00	400.00	-3.00	0.00	DEF	DEF
94.00	94.00	0.00	170.00	0.00	170.00	-4.60	0.00	DEF	DEF
94.00	94.00	0.00	170.00	0.00	170.00	-7.00	0.00	DEF	DEF
122.00	122.00	33.00	0.00	18.00	0.00			DEF	DEF

VI.--WATER DATA

UNIT WEIGHT = 62.40 (PCF)
RIGHTSIDE ELEVATION = 8.00 (FT)
LEFTSIDE ELEVATION = -4.60 (FT)
NO SEEPAGE

VII.--VERTICAL SURCHARGE LOADS

NONE

VIII.--HORIZONTAL LOADS

VIII.A.--HORIZONTAL LINE LOADS

NONE

VIII.B.--HORIZONTAL DISTRIBUTED LOADS

ELEVATION (FT)	DIST. LOAD (PSF)
3.60	1605.00
-3.50	0.00

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS
DATE: 3-OCTOBER-2013 TIME: 12:07:39

****
* SOIL PRESSURES FOR *

* CANTILEVER WALL DESIGN *
****

I.--HEADING
'ORLEANS CANAL REACH 1A I-WALL

II.--SOIL PRESSURES

RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

NET SOIL PRESSURES INCLUDE APPLIED HORIZONTAL DISTRIBUTED LOADS.

	NET	<---LEFTSIDE--->		<------NET------> (SOIL + WATER)		<--RIGHTSIDE--->	
ELEV. (FT)	WATER (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)
14.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
13.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7.1	56.2	0.0	0.0	56.2	56.2	0.0	0.0
6.1	118.6	0.0	0.0	118.6	118.6	0.0	0.0
5.1	181.0	0.0	0.0	181.0	181.0	0.0	0.0
4.1	243.4	0.0	0.0	243.4	243.4	0.0	0.0
3.6+	274.6	0.0	0.0	274.6	274.6	0.0	0.0
3.6-	274.6	637.4	0.0	1242.2	1879.6	0.0	0.0
3.1	305.8	982.9	0.0	814.8	1797.7	0.0	0.0
2.1	368.2	1074.0	0.0	560.1	1634.1	0.0	0.0
1.1	430.6	1174.7	0.0	295.7	1470.4	0.0	0.0
0.1	493.0	1167.8	0.0	139.0	1306.8	0.0	0.0
0.0	499.2	1152.6	0.0	137.8	1290.4	0.0	0.0
-0.9	555.4	1103.6	0.0	39.5	1143.1	0.0	0.0
-1.6+	599.0	1161.6	0.0	-133.1	1028.5	0.0	0.0
-1.6-	599.0	1161.6	0.0	-133.1	1468.1	0.0	439.6
-1.9	617.8	1189.2	0.0	-209.8	1644.0	0.0	664.5
-2.6	661.4	1257.5	0.0	-392.6	1476.3	0.0	611.4
-2.9	680.2	1178.2	0.0	-362.4	1407.2	0.0	591.4
-3.0	686.4	1115.1	0.0	-315.6	1378.6	0.0	579.2
-3.2+	700.8	962.6	0.0	-242.0	1261.4	0.0	499.7
-3.2-	700.8	1044.9	0.0	-242.0	1261.4	0.0	499.7
-3.5	717.6	962.6	218.0	-245.0	906.1	0.0	406.5
-3.9	742.6	986.7	275.6	-244.1	747.2	0.0	280.2
-4.6	786.2	1034.7	343.5	-248.5	678.4	0.0	235.7
-4.9	786.2	1035.7	380.3	-249.5	651.7	0.0	245.7
-5.9	786.2	1019.6	466.5	-233.4	585.1	0.0	265.4
-6.1+	786.2	1013.9	463.2	-227.6	792.7	0.0	596.8
-6.1-	786.2	1013.9	463.2	-227.6	792.7	0.0	342.4
-6.9	786.2	2229.6	2159.0	-793.2	-776.0	650.1	596.8

-7.0	786.2	2446.8	2389.1	-907.6	-969.3	753.0	633.5
-7.9	786.2	2477.6	1328.9	-1171.6	0.4	519.8	543.0
-8.9	786.2	2072.5	234.9	-1173.3	1036.6	113.0	485.3
-9.9	786.2	2256.9	370.7	-1316.6	1064.6	154.1	649.0
-10.9	786.2	2376.4	373.9	-1425.7	1208.0	164.5	795.7
-11.9	786.2	2495.3	378.9	-1533.7	1338.4	175.3	931.1
-12.9	786.2	2610.8	385.3	-1636.5	1464.4	188.1	1063.4
-13.9	786.2	2720.3	392.6	-1742.1	1591.6	191.9	1198.0
-14.9	786.2	2826.6	400.6	-1853.9	1719.4	186.5	1333.8
-15.9	786.2	2932.4	409.3	-1954.3	1847.5	191.9	1470.6
-16.9	786.2	3037.9	418.5	-2045.1	1973.8	206.5	1606.0
-17.9	786.2	3143.0	428.0	-2136.7	2117.8	220.1	1759.6
-18.9	786.2	3247.8	437.9	-2227.8	2290.7	233.8	1942.3
-19.9	786.2	3352.5	448.0	-2318.6	2459.2	247.7	2121.0
-20.9	786.2	3459.2	458.3	-2411.4	2614.2	261.6	2286.2
-21.9	786.2	3557.4	469.0	-2495.6	2769.1	275.6	2451.8
-22.9	786.2	3524.2	480.5	-2448.3	2923.8	289.6	2618.0
-23.9	786.2	3344.1	492.6	-2254.2	3078.2	303.7	2784.6
-24.9	786.2	3341.5	505.0	-2237.4	3232.6	317.8	2951.4
-25.9	786.2	3621.0	517.5	-2502.7	3387.7	332.0	3118.9
-26.9	786.2	3898.2	530.0	-2765.8	3538.6	346.2	3282.3
-27.9	786.2	4021.2	542.6	-2874.5	3680.9	360.4	3437.3
-28.9	786.2	4073.5	555.3	-2912.7	3823.0	374.6	3592.0
-29.9	786.2	4171.2	568.0	-2996.1	3969.9	388.9	3751.6
-30.9	786.2	4315.5	580.7	-3126.1	4117.5	403.1	3912.0
-31.9	786.2	4458.4	593.5	-3254.7	4264.6	417.4	4071.9
-32.9	786.2	4586.3	606.3	-3368.4	4411.8	431.7	4231.9
-33.9	786.2	4713.9	619.2	-3481.7	4559.0	446.0	4392.0
-34.9	786.2	4860.2	632.1	-3613.5	4706.3	460.5	4552.1
-35.9	786.2	5007.0	645.0	-3746.8	4853.5	473.9	4712.3
-36.9	786.2	5140.8	657.9	-3877.2	5000.8	477.4	4872.5
-37.9	786.2	5270.7	670.9	-4009.6	5148.0	474.9	5032.7
-38.9	786.2	5400.9	683.8	-4130.7	5295.3	484.0	5192.9
-39.9	786.2	5531.9	696.8	-4244.7	5442.6	500.9	5353.2
-40.9	786.2	5666.4	709.8	-4363.6	5589.9	516.5	5513.5
-41.9	786.2	5804.4	722.9	-4486.3	5737.2	531.8	5673.8
-42.9	786.2	5942.1	735.9	-4608.8	5884.5	547.0	5834.2
-43.9	786.2	6079.8	748.9	-4731.3	6031.9	562.3	5994.6
-44.9	786.2	6218.8	762.0	-4855.0	6179.2	577.5	6154.9
-45.9	786.2	6358.2	775.0	-4979.2	6326.5	592.8	6315.3
-46.9	786.2	6497.6	787.9	-5103.4	6474.1	608.0	6475.7
-47.9	786.2	6637.1	797.2	-5227.6	6625.2	623.3	6636.2
-48.9	786.2	6776.7	861.1	-5351.9	6721.7	638.5	6796.6

BY CLASSICAL METHODS
DATE: 3-OCTOBER-2013 TIME: 12:07:39

****
* SUMMARY OF RESULTS FOR *
* CANTILEVER WALL DESIGN *
****

I.--HEADING
'ORLEANS CANAL REACH 1A I-WALL

II.--SUMMARY

RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

WALL BOTTOM ELEV. (FT) : -16.42
PENETRATION (FT) : 14.82

MAX. BEND. MOMENT (LB-FT) : 2.1481E+04
AT ELEVATION (FT) : -7.83

MAX. SCALED DEFL. (LB-IN^3): 8.3735E+09
AT ELEVATION (FT) : 14.10

NOTE: DIVIDE SCALED DEFLECTION MODULUS OF
ELLASTICITY IN PSI TIMES PILE MOMENT
OF INERTIA IN IN^4 TO OBTAIN DEFLECTION
IN INCHES.

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHOREDOR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS
DATE: 3-OCTOBER-2013 TIME: 12:07:39

****
* COMPLETE OF RESULTS FOR *
* CANTILEVER WALL DESIGN *
****

I.--HEADING
'ORLEANS CANAL REACH 1A I-WALL

II.--RESULTS

ELEVATION (FT)	BENDING MOMENT (LB-FT)	SHEAR (LB)	SCALED DEFLECTION (LB-IN^3)	NET PRESSURE (PSF)
14.10	0.0000E+00	0.	8.3735E+09	0.00
13.10	2.4447E-09	0.	7.9687E+09	0.00

12.10	2.4447E-09	0.	7.5638E+09	0.00
11.10	-3.4925E-10	0.	7.1589E+09	0.00
10.10	-3.4925E-10	0.	6.7540E+09	0.00
9.10	-3.4925E-10	0.	6.3491E+09	0.00
8.10	-3.4925E-10	0.	5.9443E+09	0.00
8.00	1.2525E-08	0.	5.9038E+09	0.00
7.10	7.5816E+00	25.	5.5394E+09	56.16
6.10	7.1334E+01	113.	5.1345E+09	118.56
5.10	2.5365E+02	262.	4.7298E+09	180.96
4.10	6.1692E+02	475.	4.3255E+09	243.36
3.60+	8.8591E+02	604.	4.1238E+09	274.56
3.60-	8.8591E+02	604.	4.1238E+09	1242.20
3.10	1.3254E+03	1118.	3.9224E+09	814.80
2.10	2.8086E+03	1806.	3.5217E+09	560.11
1.10	4.8503E+03	2234.	3.1259E+09	295.69
0.10	7.2057E+03	2451.	2.7385E+09	138.98
0.00	7.4515E+03	2465.	2.7004E+09	137.83
-0.90	9.7124E+03	2545.	2.3636E+09	39.47
-1.60	1.1489E+04	2512.	2.1109E+09	-133.09
-1.90	1.2236E+04	2460.	2.0054E+09	-209.79
-2.60	1.3892E+04	2250.	1.7671E+09	-392.64
-2.90	1.4549E+04	2136.	1.6684E+09	-362.40
-3.00	1.4761E+04	2102.	1.6361E+09	-315.64
-3.23	1.5237E+04	2038.	1.5625E+09	-242.02
-3.50	1.5778E+04	1972.	1.4781E+09	-245.05
-3.90	1.6548E+04	1875.	1.3565E+09	-244.12
-4.60	1.7800E+04	1702.	1.1550E+09	-248.51
-4.90	1.8299E+04	1628.	1.0732E+09	-249.49
-5.90	1.9805E+04	1386.	8.2141E+08	-233.40
-6.13	2.0121E+04	1332.	7.6767E+08	-227.61
-6.90	2.1021E+04	941.	6.0383E+08	-793.23
-7.00	2.1111E+04	856.	5.8403E+08	-907.56
-7.90	2.1478E+04	-80.	4.2246E+08	-1171.58
-8.90	2.0812E+04	-1252.	2.7804E+08	-1173.27
-9.64	1.9564E+04	-2154.	1.9479E+08	-1278.72
-9.90	1.8951E+04	-2476.	1.6941E+08	-1154.35
-10.90	1.5976E+04	-3395.	9.3360E+07	-684.01
-11.90	1.2318E+04	-3844.	4.4822E+07	-213.68
-12.90	8.4455E+03	-3822.	1.7539E+07	256.66
-13.90	4.8299E+03	-3331.	4.8865E+06	727.00
-14.90	1.9413E+03	-2368.	6.8478E+05	1197.33
-15.90	2.4998E+02	-936.	9.9763E+03	1667.67
-16.42	0.0000E+00	0.	0.0000E+00	1913.49

NOTE: DIVIDE SCALED DEFLECTION MODULUS OF ELLASTICITY IN PSI TIMES PILE MOMENT OF INERTIA IN IN^4 TO OBTAIN DEFLECTION IN INCHES.

III.--WATER AND SOIL PRESSURES

		<-------------SOIL PRESSURES-------------->			
	WATER	<----LEFTSIDE----->		<---RIGHTSIDE---->	
ELEVATION	PRESSURE	PASSIVE	ACTIVE	ACTIVE	PASSIVE

(FT)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)
14.10	0.	0.	0.	0.	0.
13.10	0.	0.	0.	0.	0.
12.10	0.	0.	0.	0.	0.
11.10	0.	0.	0.	0.	0.
10.10	0.	0.	0.	0.	0.
9.10	0.	0.	0.	0.	0.
8.10	0.	0.	0.	0.	0.
8.00	0.	0.	0.	0.	0.
7.10	56.	0.	0.	0.	0.
6.10	119.	0.	0.	0.	0.
5.10	181.	0.	0.	0.	0.
4.10	243.	0.	0.	0.	0.
3.60+	275.	0.	0.	0.	0.
3.60-	275.	637.	0.	0.	0.
3.10	306.	983.	0.	0.	0.
2.10	368.	1074.	0.	0.	0.
1.10	431.	1175.	0.	0.	0.
0.10	493.	1168.	0.	0.	0.
0.00	499.	1153.	0.	0.	0.
-0.90	555.	1104.	0.	0.	0.
-1.60+	599.	1162.	0.	0.	0.
-1.60-	599.	1162.	0.	0.	440.
-1.90	618.	1189.	0.	0.	665.
-2.60	661.	1258.	0.	0.	611.
-2.90	680.	1178.	0.	0.	591.
-3.00	686.	1115.	0.	0.	579.
-3.23+	701.	963.	0.	0.	500.
-3.23-	701.	1045.	0.	0.	500.
-3.50	718.	963.	218.	0.	407.
-3.90	743.	987.	276.	0.	280.
-4.60	786.	1035.	344.	0.	236.
-4.90	786.	1036.	380.	0.	246.
-5.90	786.	1020.	466.	0.	265.
-6.13+	786.	1014.	463.	0.	597.
-6.13-	786.	1014.	463.	0.	342.
-6.90	786.	2230.	2159.	650.	597.
-7.00	786.	2447.	2389.	753.	634.
-7.90	786.	2478.	1329.	520.	543.
-8.90	786.	2072.	235.	113.	485.
-9.64	786.	2208.	335.	143.	606.
-9.90	786.	2257.	371.	154.	649.
-10.90	786.	2376.	374.	165.	796.
-11.90	786.	2495.	379.	175.	931.
-12.90	786.	2611.	385.	188.	1063.
-13.90	786.	2720.	393.	192.	1198.
-14.90	786.	2827.	401.	186.	1334.
-15.90	786.	2932.	409.	192.	1471.
-16.42	786.	3038.	418.	206.	1606.
-17.90	786.	3143.	428.	220.	1760.

```
'ORLEANS CANAL REACH 1A I-WALL
CONTROL  CANTILEVER  DESIGN  1.00  1.60
WALL   14.1
SURFACE RIGHTSIDE   6    0   -1.6
                0.9   -1.6
                4.7   -3
                7.5   -3.5
                18   -5.4
                31.9   -4.5
SURFACE LEFTSIDE   9    0    3.6
                1    3.6
                8.3    3.3
                30    0
                31   -2.5
                41   -2.8
                51.6   -3.7
                67.3   -4.6
                110   -4.6
SOIL RIGHTSIDE  STRENGTHS   3
   94    94    0    400    0    400   -3.5   0
   94    94    0    170    0    170   -7   0
   122    122    33    0    18    0
SOIL LEFTSIDE  STRENGTHS   5
   110    110    0    580    0    534    0   0
   94    94    0    400    0    400   -3   0
   94    94    0    170    0    170   -4.6   0
   94    94    0    170    0    170   -7   0
   122    122    33    0    18    0
WATER ELEVATIONS   62.4    8   -4.6
HORIZONTAL DISTRIBUTED   2    3.6    1940   -3.5    0
FINISHED
```

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS
DATE: 3-OCTOBER-2013 TIME: 12:17:26

****
* INPUT DATA *
****

I.--HEADING
'ORLEANS CANAL REACH 1A I-WALL

II.--CONTROL
CANTILEVER WALL DESIGN
FACTOR OF SAFETY FOR ACTIVE PRESSURES = 1.00
FACTOR OF SAFETY FOR PASSIVE PRESSURES = 1.60

III.--WALL DATA
ELEVATION AT TOP OF WALL = 14.10 FT.

IV.--SURFACE POINT DATA

IV.A.--RIGHTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	-1.60
0.90	-1.60
4.70	-3.00
7.50	-3.50
18.00	-5.40
31.90	-4.50

IV.B.--LEFTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	3.60
1.00	3.60
8.30	3.30
30.00	0.00
31.00	-2.50
41.00	-2.80
51.60	-3.70
67.30	-4.60
110.00	-4.60

V.--SOIL LAYER DATA

V.A.--RIGHTSIDE
LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

SAT. WGHT.	MOIST WGHT.	ANGLE OF INTERNAL FRICTION	COH-ESION	ANGLE OF WALL FRICTION	ADH-ESION	<--BOTTOM--> ELEV.	SLOPE	<-SAFETY-> <-FACTOR-> ACT.	PASS.

(PCF)	(PCF)	(DEG)	(PSF)	(DEG)	(PSF)	(FT)	(FT/FT)		
94.00	94.00	0.00	400.00	0.00	400.00	-3.50	0.00	DEF	DEF
94.00	94.00	0.00	170.00	0.00	170.00	-7.00	0.00	DEF	DEF
122.00	122.00	33.00	0.00	18.00	0.00			DEF	DEF

V.B.--LEFTSIDE

LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = DEFAULT

LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH-ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH-ESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.
110.00	110.00	0.00	580.00	0.00	534.00	0.00	0.00	DEF	DEF
94.00	94.00	0.00	400.00	0.00	400.00	-3.00	0.00	DEF	DEF
94.00	94.00	0.00	170.00	0.00	170.00	-4.60	0.00	DEF	DEF
94.00	94.00	0.00	170.00	0.00	170.00	-7.00	0.00	DEF	DEF
122.00	122.00	33.00	0.00	18.00	0.00			DEF	DEF

VI.--WATER DATA

UNIT WEIGHT = 62.40 (PCF)

RIGHTSIDE ELEVATION = 8.00 (FT)

LEFTSIDE ELEVATION = -4.60 (FT)

NO SEEPAGE

VII.--VERTICAL SURCHARGE LOADS

NONE

VIII.--HORIZONTAL LOADS

VIII.A.--HORIZONTAL LINE LOADS

NONE

VIII.B.--HORIZONTAL DISTRIBUTED LOADS

ELEVATION (FT)	DIST. LOAD (PSF)
3.60	1940.00
-3.50	0.00

****

*   SOIL PRESSURES FOR   *

* CANTILEVER WALL DESIGN *
****

I.--HEADING
'ORLEANS CANAL REACH 1A I-WALL

II.--SOIL PRESSURES

RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

NET SOIL PRESSURES INCLUDE APPLIED HORIZONTAL DISTRIBUTED LOADS.

	NET	<---LEFTSIDE--->		<------NET------> (SOIL + WATER)		<--RIGHTSIDE--->	
ELEV.	WATER	PASSIVE	ACTIVE	ACTIVE	PASSIVE	ACTIVE	PASSIVE
(FT)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)
14.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
13.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7.1	56.2	0.0	0.0	56.2	56.2	0.0	0.0
6.1	118.6	0.0	0.0	118.6	118.6	0.0	0.0
5.1	181.0	0.0	0.0	181.0	181.0	0.0	0.0
4.1	243.4	0.0	0.0	243.4	243.4	0.0	0.0
3.6+	274.6	0.0	0.0	274.6	274.6	0.0	0.0
3.6-	274.6	725.0	0.0	1489.6	2214.6	0.0	0.0
3.1	305.8	1110.5	0.0	998.6	2109.1	0.0	0.0
2.1	368.2	1199.3	0.0	699.0	1898.3	0.0	0.0
1.1	430.6	1299.3	0.0	388.1	1687.5	0.0	0.0
0.1	493.0	1277.0	0.0	199.6	1476.6	0.0	0.0
0.0	499.2	1258.3	0.0	197.2	1455.5	0.0	0.0
-0.9	555.4	1191.4	0.0	74.4	1265.8	0.0	0.0
-1.6+	599.0	1248.7	0.0	-130.5	1118.2	0.0	0.0
-1.6-	599.0	1248.7	0.0	-130.5	1618.2	0.0	500.0
-1.9	617.8	1276.4	0.0	-221.5	1809.5	0.0	754.6
-2.6	661.4	1345.5	0.0	-438.1	1598.6	0.0	691.3
-2.9	680.2	1251.5	0.0	-407.4	1511.6	0.0	667.5
-3.0	686.4	1178.5	0.0	-355.5	1476.3	0.0	653.3
-3.2+	700.8	999.0	0.0	-272.9	1336.6	0.0	562.2
-3.2-	700.8	1095.8	0.0	-272.9	1336.6	0.0	562.2
-3.5	717.6	999.0	218.0	-281.4	955.0	0.0	455.3
-3.9	742.6	1021.3	275.6	-278.8	777.3	0.0	310.4
-4.6	786.2	1068.5	343.5	-282.2	700.2	0.0	257.5
-4.9	786.2	1067.7	380.3	-281.4	674.0	0.0	268.0
-5.9	786.2	1046.6	466.5	-260.4	606.1	0.0	286.4
-6.1+	786.2	1038.2	463.2	-252.0	883.0	0.0	730.3
-6.1-	786.2	1038.2	463.2	-252.0	883.0	0.0	389.6
-6.9	786.2	2610.0	2159.0	-1173.7	-642.5	650.1	730.3

-7.0	786.2	2888.1	2389.1	-1348.9	-822.6	753.0	780.3
-7.9	786.2	2879.5	1328.9	-1573.5	109.3	519.8	651.9
-8.9	786.2	2326.3	234.9	-1427.1	1102.3	113.0	550.9
-9.9	786.2	2552.3	370.7	-1612.0	1158.4	154.1	742.9
-10.9	786.2	2692.5	373.9	-1741.7	1320.5	164.5	908.2
-11.9	786.2	2831.1	378.9	-1869.5	1467.8	175.3	1060.5
-12.9	786.2	2964.0	385.3	-1989.7	1613.0	188.1	1212.0
-13.9	786.2	3089.5	392.6	-2111.4	1760.1	191.9	1366.4
-14.9	786.2	3211.9	400.6	-2239.2	1908.2	186.5	1522.6
-15.9	786.2	3333.8	409.3	-2355.6	2056.1	191.9	1679.2
-16.9	786.2	3455.1	418.5	-2462.4	2211.5	206.5	1843.8
-17.9	786.2	3575.9	428.0	-2569.6	2397.4	220.1	2039.2
-18.9	786.2	3696.3	437.9	-2676.2	2603.4	233.8	2255.1
-19.9	786.2	3816.3	448.0	-2782.4	2794.6	247.7	2456.4
-20.9	786.2	3951.3	458.3	-2903.5	2975.4	261.6	2647.5
-21.9	786.2	3953.6	469.0	-2891.7	3158.6	275.6	2841.3
-22.9	786.2	3741.6	480.5	-2665.7	3341.4	289.6	3035.6
-23.9	786.2	3678.9	492.6	-2588.9	3524.0	303.7	3230.4
-24.9	786.2	3965.3	505.0	-2861.2	3707.4	317.8	3426.2
-25.9	786.2	4320.4	517.5	-3202.2	3886.4	332.0	3617.6
-26.9	786.2	4487.6	530.0	-3355.2	4055.2	346.2	3798.9
-27.9	786.2	4535.8	542.6	-3389.2	4222.6	360.4	3979.0
-28.9	786.2	4641.5	555.3	-3480.6	4396.0	374.6	4165.0
-29.9	786.2	4807.4	568.0	-3632.3	4570.9	388.9	4352.7
-30.9	786.2	4970.4	580.7	-3781.0	4745.2	403.1	4539.7
-31.9	786.2	5113.8	593.5	-3910.2	4919.6	417.4	4726.9
-32.9	786.2	5265.5	606.3	-4047.6	5094.0	431.7	4914.1
-33.9	786.2	5441.0	619.2	-4208.8	5268.5	446.0	5101.5
-34.9	786.2	5607.9	632.1	-4361.2	5443.1	460.5	5288.9
-35.9	786.2	5759.2	645.0	-4499.0	5617.6	473.9	5476.4
-36.9	786.2	5909.4	657.9	-4645.8	5792.2	477.4	5663.9
-37.9	786.2	6059.7	670.9	-4798.6	5966.9	474.9	5851.5
-38.9	786.2	6213.1	683.8	-4942.9	6141.5	484.0	6039.2
-39.9	786.2	6371.9	696.8	-5084.8	6316.2	500.9	6226.8
-40.9	786.2	6531.5	709.8	-5228.8	6490.9	516.5	6414.5
-41.9	786.2	6690.5	722.9	-5372.5	6665.7	531.8	6602.3
-42.9	786.2	6851.2	735.9	-5517.9	6840.4	547.0	6790.1
-43.9	786.2	7012.8	748.9	-5664.3	7015.2	562.3	6977.9
-44.9	786.2	7174.5	762.0	-5810.7	7190.0	577.5	7165.7
-45.9	786.2	7336.3	775.0	-5957.2	7364.8	592.8	7353.6
-46.9	786.2	7498.2	787.9	-6103.9	7539.8	608.0	7541.5
-47.9	786.2	7660.2	797.2	-6250.7	7718.5	623.3	7729.4
-48.9	786.2	7821.7	861.1	-6396.9	7842.5	638.5	7917.3

BY CLASSICAL METHODS
DATE: 3-OCTOBER-2013 TIME: 12:17:29

****
* SUMMARY OF RESULTS FOR *
* CANTILEVER WALL DESIGN *
****

I.--HEADING
'ORLEANS CANAL REACH 1A I-WALL

II.--SUMMARY

RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

WALL BOTTOM ELEV. (FT) : -16.44
PENETRATION (FT) : 14.84

MAX. BEND. MOMENT (LB-FT) : 2.5659E+04
AT ELEVATION (FT) : -7.72

MAX. SCALED DEFL. (LB-IN^3): 9.7992E+09
AT ELEVATION (FT) : 14.10

NOTE: DIVIDE SCALED DEFLECTION MODULUS OF
ELLASTICITY IN PSI TIMES PILE MOMENT
OF INERTIA IN IN^4 TO OBTAIN DEFLECTION
IN INCHES.

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHOREDOR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS
DATE: 3-OCTOBER-2013 TIME: 12:17:29

****
* COMPLETE OF RESULTS FOR *
* CANTILEVER WALL DESIGN *
****

I.--HEADING
'ORLEANS CANAL REACH 1A I-WALL

II.--RESULTS

ELEVATION (FT)	BENDING MOMENT (LB-FT)	SHEAR (LB)	SCALED DEFLECTION (LB-IN^3)	NET PRESSURE (PSF)
14.10	0.0000E+00	0.	9.7992E+09	0.00
13.10	-2.0955E-09	0.	9.3258E+09	0.00

12.10	-2.0955E-09	0.	8.8525E+09	0.00
11.10	-2.0955E-09	0.	8.3792E+09	0.00
10.10	-2.0955E-09	0.	7.9058E+09	0.00
9.10	-2.0955E-09	0.	7.4325E+09	0.00
8.10	6.9849E-10	0.	6.9591E+09	0.00
8.00	2.8893E-08	0.	6.9118E+09	0.00
7.10	7.5816E+00	25.	6.4858E+09	56.16
6.10	7.1334E+01	113.	6.0125E+09	118.56
5.10	2.5365E+02	262.	5.5393E+09	180.96
4.10	6.1692E+02	475.	5.0666E+09	243.36
3.60+	8.8591E+02	604.	4.8306E+09	274.56
3.60-	8.8591E+02	604.	4.8306E+09	1489.56
3.10	1.3537E+03	1226.	4.5950E+09	998.60
2.10	3.0291E+03	2075.	4.1259E+09	699.01
1.10	5.4017E+03	2618.	3.6621E+09	388.13
0.10	8.1828E+03	2912.	3.2077E+09	199.62
0.00	8.4750E+03	2932.	3.1630E+09	197.20
-0.90	1.1177E+04	3054.	2.7675E+09	74.40
-1.60	1.3317E+04	3035.	2.4705E+09	-130.55
-1.90	1.4220E+04	2982.	2.3466E+09	-221.50
-2.60	1.6235E+04	2751.	2.0663E+09	-438.14
-2.90	1.7041E+04	2624.	1.9502E+09	-407.45
-3.00	1.7302E+04	2586.	1.9121E+09	-355.49
-3.23	1.7889E+04	2514.	1.8256E+09	-272.92
-3.50	1.8557E+04	2439.	1.7262E+09	-281.36
-3.90	1.9510E+04	2327.	1.5833E+09	-278.79
-4.60	2.1070E+04	2131.	1.3462E+09	-282.21
-4.90	2.1697E+04	2046.	1.2500E+09	-281.45
-5.90	2.3605E+04	1775.	9.5413E+08	-260.37
-6.13	2.4011E+04	1716.	8.9106E+08	-252.01
-6.90	2.5163E+04	1168.	6.9903E+08	-1173.67
-7.00	2.5274E+04	1042.	6.7588E+08	-1348.91
-7.90	2.5635E+04	-273.	4.8726E+08	-1573.49
-8.90	2.4600E+04	-1773.	3.1956E+08	-1427.06
-9.27	2.3850E+04	-2310.	2.6869E+08	-1495.08
-9.90	2.2112E+04	-3154.	1.9416E+08	-1174.58
-10.90	1.8455E+04	-4075.	1.0680E+08	-667.61
-11.90	1.4130E+04	-4489.	5.1238E+07	-160.63
-12.90	9.6450E+03	-4397.	2.0067E+07	346.35
-13.90	5.5060E+03	-3797.	5.6133E+06	853.33
-14.90	2.2204E+03	-2690.	7.9646E+05	1360.31
-15.90	2.9511E+02	-1076.	1.2383E+04	1867.29
-16.44	0.0000E+00	0.	0.0000E+00	2139.62

NOTE: DIVIDE SCALED DEFLECTION MODULUS OF
ELLASTICITY IN PSI TIMES PILE MOMENT
OF INERTIA IN IN^4 TO OBTAIN DEFLECTION
IN INCHES.

III.--WATER AND SOIL PRESSURES

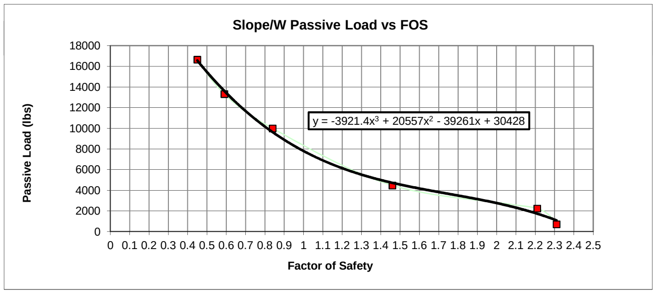
		<-------------SOIL PRESSURES-------------->			
	WATER	<----LEFTSIDE----->		<---RIGHTSIDE---->	
ELEVATION	PRESSURE	PASSIVE	ACTIVE	ACTIVE	PASSIVE

(FT)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)
14.10	0.	0.	0.	0.	0.
13.10	0.	0.	0.	0.	0.
12.10	0.	0.	0.	0.	0.
11.10	0.	0.	0.	0.	0.
10.10	0.	0.	0.	0.	0.
9.10	0.	0.	0.	0.	0.
8.10	0.	0.	0.	0.	0.
8.00	0.	0.	0.	0.	0.
7.10	56.	0.	0.	0.	0.
6.10	119.	0.	0.	0.	0.
5.10	181.	0.	0.	0.	0.
4.10	243.	0.	0.	0.	0.
3.60+	275.	0.	0.	0.	0.
3.60-	275.	725.	0.	0.	0.
3.10	306.	1111.	0.	0.	0.
2.10	368.	1199.	0.	0.	0.
1.10	431.	1299.	0.	0.	0.
0.10	493.	1277.	0.	0.	0.
0.00	499.	1258.	0.	0.	0.
-0.90	555.	1191.	0.	0.	0.
-1.60+	599.	1249.	0.	0.	0.
-1.60-	599.	1249.	0.	0.	500.
-1.90	618.	1276.	0.	0.	755.
-2.60	661.	1345.	0.	0.	691.
-2.90	680.	1252.	0.	0.	668.
-3.00	686.	1179.	0.	0.	653.
-3.23+	701.	999.	0.	0.	562.
-3.23-	701.	1096.	0.	0.	562.
-3.50	718.	999.	218.	0.	455.
-3.90	743.	1021.	276.	0.	310.
-4.60	786.	1068.	344.	0.	257.
-4.90	786.	1068.	380.	0.	268.
-5.90	786.	1047.	466.	0.	286.
-6.13+	786.	1038.	463.	0.	730.
-6.13-	786.	1038.	463.	0.	390.
-6.90	786.	2610.	2159.	650.	730.
-7.00	786.	2888.	2389.	753.	780.
-7.90	786.	2879.	1329.	520.	652.
-8.90	786.	2326.	235.	113.	551.
-9.27	786.	2409.	285.	128.	622.
-9.90	786.	2552.	371.	154.	743.
-10.90	786.	2692.	374.	165.	908.
-11.90	786.	2831.	379.	175.	1060.
-12.90	786.	2964.	385.	188.	1212.
-13.90	786.	3090.	393.	192.	1366.
-14.90	786.	3212.	401.	186.	1523.
-15.90	786.	3334.	409.	192.	1679.
-16.44	786.	3455.	418.	206.	1844.
-17.90	786.	3576.	428.	220.	2039.

Canal:	Orleans Avenue Canal	
Reach:	Reach 1B	
Load Case:	Water @ El 8	
Protected Side Top of Ground (GSE):	3.6	ft, Elevation
Critical Slip Surface Elev. (FSE):	Varies	ft, Elevation
Sheetpile Tip Elevation:	-28.5	ft, Elevation

Step 1: Compute correct passive pressure forces from slope stability model (Slope/W). Procedure follows the approach cited in Paragraph D-4 of ETL 1110-2-575.

Unit Weight (psf)	Passive Load (lbs)	Factor of Safety	Failure Surface Elevation (feet)	Notes
10	710	2.31	-3.8	
30	2232	2.21	-4.1	
60	4464	1.46	-4.1	
90	9988.6	0.84	-7	
120	13318	0.59	-7	
150	16648	0.45	-7	

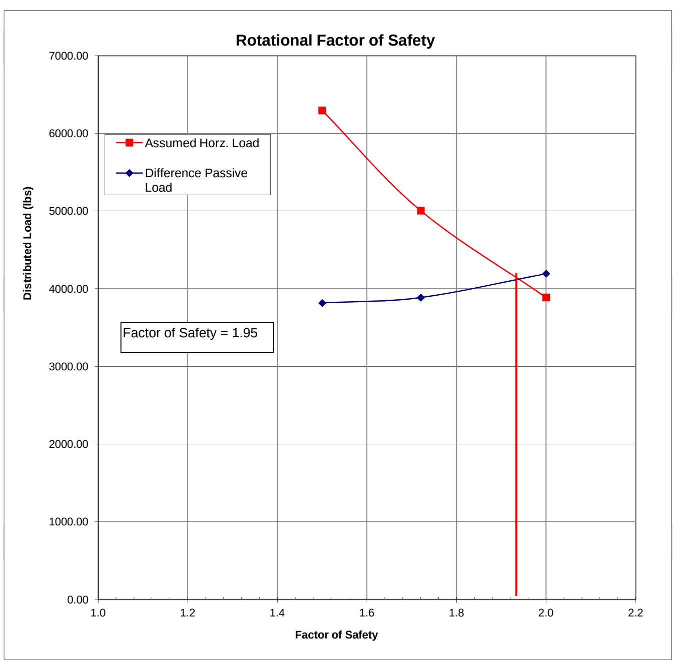


Step 2: Perform CWALSHT analysis of cross section using a range of <u>assumed</u> horizontal distributed load above the critical slip surface elevation found in step 1. Determine the difference in passive load from CWALSHT and Slope/W for each assumed horizontal distributed load.

Check penetration of the sheetpile to determine where the pile behaves as a short pile or long pile. This I-wall has a penetration versus stick up of = (3.6--28)/(8'-3.6')=7.2. This ratio exceeds the recommended 2.5. For short pile behavior, the penetration was determined to be 20 ft. The PS GSE was 3.6 producing a short pile tip elevation of -16.4. See attached EXCEL sheet for short pile versus long pile calculation. This penetration gives a penetration to stickup ratio of 4.5.

	(A)	(B)			(C)	(D)	
FOS	CWALSHT Passive Load (lbs)	SLOPE/W Passive Load (lbs)	Critical Failure Surface feet	Tip Elev feet	Difference Passive Load (A-B) (lbs)	Assumed Horizontal Distributed Load in CWALSHT (psf)	Resultant Distributed CWALSHT Load (D*(GSE-FSE)) (lbs)
2	6955.83	2762.80	-4.1	-16.4	4193.03	1010	3888.50
1.72	7646.96	3761.07	-4.1	-16.4	3885.89	1300	5005.00
1.5	8371.79	4555.03	-4.1	-16.4	3816.77	1635	6294.75

Step 3: Plot the assumed horizontal load and the difference passive load versus factor of safety. The intersection of the two curves represents the actual factor of safety.



Horizontal Load Applied = 4087.875 lbs

SHORT PILE/LONG PILE - HOMOGENEOUS SAND

VALUES OF SUBGRADE REACTION FOR SHEET PILES

CONSTANTS OF HORIZONTAL SUBGRADE REACTION l_h				COEFFICIENT OF SUBGRADE REACTION EQUATIONS n_h	
SANDS				SANDS	
TERZAGHI'S THEORY				TERZAGHI'S THEORY	
	LOOSE	MEDIUM	DENSE		
l_h (Dry or Moist) (pci)	2.89	9.26	23.15	n_h (lbs/in^4)	$n_h=(l_h/D)$ (where D is embedment depth in inches)
l_h (Submerged) (pci)	1.85	4.63	15.05		

From EM 1110-2-2906, Design of Pile Foundations, 1991

(b) Linearly Increasing Modulus of Horizontal Subgrade Reaction

$$R\ \cancel{T} = \sqrt[5]{\frac{EI}{n_h}}$$

$L/R \le 2.0$ Short pile

$2.0 < L/R < 4.0$ Intermediate

$L/R \ge 4.0$ Long pile

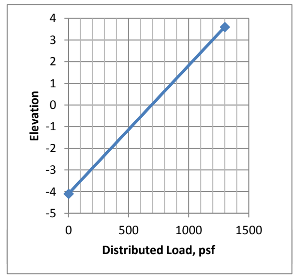
Enter l_h and moment of inertia of sheet pile. Vary penetration depth until D/R = 2.

Penetration, D, ft	Penetration, D, in	l_h, pci	n_H, lb/in^4	I, in^4/ft	EI, lb-in^2/ft	EI, lb-in^2/in	R, in	R, ft	D/R
20	240	2	0.01	84.2	2.68E+09	2.24E+08	121.82	10.15	1.97

VIII.B.--HORIZONTAL DISTRIBUTED LOAD

ELEVATION (FT)	DIST. LOAD (PSF)	Result. (LBS)
3.6	1300	
-4.1	0	5005

5005



RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

NET SOIL PRESSURES INCLUDE APPLIED HORIZONTAL DISTRIBUTED LOADS.

	NET	<---LEFTSIDE--->		<--RIGHTSIDE--->	
ELEV. (FT)	WATER (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)
14.1	0	0	0	0	0
13.1	0	0	0	0	0
12.1	0	0	0	0	0
11.1	0	0	0	0	0
10.1	0	0	0	0	0
9.1	0	0	0	0	0
8.1	0	0	0	0	0
8	0	0	0	0	0
7.1	56	0	0	0	0
6.1	119	0	0	0	0
5.1	181	0	0	0	0
4.1	243	0	0	0	0
3.60+	275	0	0	0	0
-3.6	275	465	0	0	0
3.1	306	743	0	0	0
2.1	368	822	0	0	0
1.1	431	908	0	0	0
0.1	493	999	0	0	0
-0.9	555	1089	0	0	0
-1.60+	599	1153	0	0	0
-1.60-	599	1153	0	0	465
-1.9	618	1180	0	0	705
-2.6	661	1251	0	0	679
-2.9	680	1258	0	0	635
-3.5	718	1123	0	0	437
-3.72+	732	997	0	0	353
-3.72-	732	1052	0	0	353
-3.9	743	997	138	0	287
-4.1	755	985	208	0	263
-4.6	786	1029	237	0	288
-4.9	786	1035	263	0	297
-5.9	786	1039	320	0	323
-6.16+	786	1034	316	0	732
-6.16-	786	1034	316	0	431
-6.9	786	2263	1880	650	732
-7	786	2490	2106	758	774
-7.9	786	2532	1194	541	610
-8.9	786	2131	200	150	521
-9.81	786	2320	316	196	719
-9.9	786	2338	327	200	738
-10.9	786	2478	332	207	899
-11.9	786	2618	339	218	1029
-12.9	786	2755	347	212	1166
-13.9	786	2888	356	186	1306
-14.9	786	3019	366	181	1448
-15.9	786	3150	376	196	1590
-16.38	786	3280	387	210	1732
-17.9	786	3411	398	224	1899

ELEV. (FT)	NET WATER (PSF)	LEFTSIDE PASSIVE (PSF)	RESULT. LEFTSIDE PASSIVE (LBS)
14.1	0	0	
13.1	0	0	
12.1	0	0	
11.1	0	0	
10.1	0	0	
9.1	0	0	
8.1	0	0	
8	0	0	
7.1	56	0	0
6.1	119	0	0
5.1	181	0	0
4.1	243	0	0
3.6	275	0	0
3.6	275	465	0
3.1	306	743	302
2.1	368	822	782.5
1.1	431	908	865
0.1	493	999	953.5
-0.9	555	1089	1044
-1.6	599	1153	784.7
-1.6	599	1153	0
-1.9	618	1180	349.95
-2.6	661	1251	850.85
-2.9	680	1258	376.35
-3.5	718	1123	714.3
-3.72	732	997	233.2
-3.72	732	1052	0
-3.9	743	997	184.41
-4.1	755	985	198.2
-4.6	786	1029	503.5
-4.9	786	1035	309.6
-5.9	786	1039	1037
-6.16	786	1034	269.49
-6.16	786	1034	0
-6.9	786	2263	1219.89
-7	786	2490	237.65
-7.9	786	2532	2259.9
-8.9	786	2131	2331.5
-9.81	786	2320	2025.205
-9.9	786	2338	209.61
-10.9	786	2478	2408
-11.9	786	2618	2548
-12.9	786	2755	2686.5
-13.9	786	2888	2821.5
-14.9	786	3019	2953.5
-15.9	786	3150	3084.5
-16.38	786	3280	1543.2
-17.9	786	3411	5085.16
-17.9	736	3054	0

PS WATER ELEVATION (FT)	CRITICAL SLIP SURF. ELEVATION (FT)	UNIT WEIGHT WATER (PCF)
-4.6	-4.1	64

RESULTANT WATER LOAD= 8 LBS

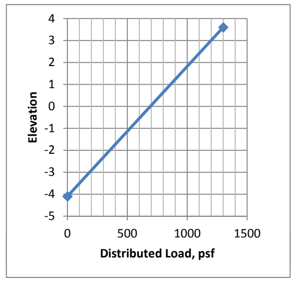
PASSIVE LOAD (SOIL) 7638.96
PASSIVE LOAD (SOIL+WATER) 7646.96
FOS = 1.72

IF THE PS WATER LEVEL IS BELOW THE CRITICAL SLIP SURFACE, USE PASSIVE LOAD (SOIL)

VIII.B.--HORIZONTAL DISTRIBUTED LOAD

ELEVATION (FT)	DIST. LOAD (PSF)	Result. (LBS)
3.6	1635	
-4.1	0	6294.75

6294.75



RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

NET SOIL PRESSURES INCLUDE APPLIED HORIZONTAL DISTRIBUTED LOADS.

ELEV. (FT)	NET WATER (PSF)	<---LEFTSIDE---> PASSIVE (PSF)	ACTIVE (PSF)	<--RIGHTSIDE---> ACTIVE (PSF)	PASSIVE (PSF)
14.1	0	0	0	0	0
13.1	0	0	0	0	0
12.1	0	0	0	0	0
11.1	0	0	0	0	0
10.1	0	0	0	0	0
9.1	0	0	0	0	0
8.1	0	0	0	0	0
8	0	0	0	0	0
7.1	56	0	0	0	0
6.1	119	0	0	0	0
5.1	181	0	0	0	0
4.1	243	0	0	0	0
3.60+	275	0	0	0	0
-3.6	275	533	0	0	0
3.1	306	845	0	0	0
2.1	368	923	0	0	0
1.1	431	1008	0	0	0
0.1	493	1099	0	0	0
-0.9	555	1189	0	0	0
-1.60+	599	1252	0	0	0
-1.60-	599	1252	0	0	533
-1.9	618	1279	0	0	807
-2.6	661	1352	0	0	774
-2.9	680	1356	0	0	722
-3.5	718	1193	0	0	494
-3.72+	732	1043	0	0	396
-3.72-	732	1109	0	0	396
-3.9	743	1043	138	0	320
-4.1	755	1026	208	0	291
-4.6	786	1072	237	0	318
-4.9	786	1077	263	0	327
-5.9	786	1078	320	0	351
-6.16+	786	1070	316	0	906
-6.16-	786	1070	316	0	497
-6.9	786	2688	1880	650	906
-7	786	2985	2106	758	965
-7.9	786	2991	1194	541	746
-8.9	786	2431	200	150	606
-9.44	786	2571	269	177	744
-9.9	786	2689	327	200	861
-10.9	786	2857	332	207	1043
-11.9	786	3024	339	218	1194
-12.9	786	3186	347	212	1354
-13.9	786	3344	356	186	1519
-14.9	786	3500	366	181	1685
-15.9	786	3655	376	196	1850
-16.45	786	3810	387	210	2034
-17.9	786	3964	398	224	2254

ELEV. (FT)	NET WATER (PSF)	LEFTSIDE PASSIVE (PSF)	RESULT. LEFTSIDE PASSIVE (LBS)
14.1	0	0	
13.1	0	0	
12.1	0	0	
11.1	0	0	
10.1	0	0	
9.1	0	0	
8.1	0	0	
8	0	0	
7.1	56	0	0
6.1	119	0	0
5.1	181	0	0
4.1	243	0	0
3.6	275	0	0
3.6	275	533	0
3.1	306	845	344.5
2.1	368	923	884
1.1	431	1008	965.5
0.1	493	1099	1053.5
-0.9	555	1189	1144
-1.6	599	1252	854.35
-1.6	599	1252	0
-1.9	618	1279	379.65
-2.6	661	1352	920.85
-2.9	680	1356	406.2
-3.5	718	1193	764.7
-3.72	732	1043	245.96
-3.72	732	1109	0
-3.9	743	1043	193.68
-4.1	755	1026	206.9
-4.6	786	1072	524.5
-4.9	786	1077	322.35
-5.9	786	1078	1077.5
-6.16	786	1070	279.24
-6.16	786	1070	0
-6.9	786	2688	1390.46
-7	786	2985	283.65
-7.9	786	2991	2689.2
-8.9	786	2431	2711
-9.44	786	2571	1350.54
-9.9	786	2689	1209.8
-10.9	786	2857	2773
-11.9	786	3024	2940.5
-12.9	786	3186	3105
-13.9	786	3344	3265
-14.9	786	3500	3422
-15.9	786	3655	3577.5
-16.45	786	3810	2052.875
-17.9	786	3964	5636.15

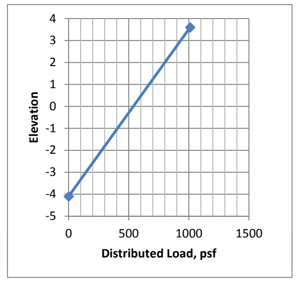
PS WATER ELEVATION (FT)	CRITICAL SLIP SURF. ELEVATION (FT)	UNIT WEIGHT WATER (PCF)
-4.6	-4.1	64

RESULTANT WATER LOAD= 8 LBS

PASSIVE LOAD (SOIL)	8363.79	
PASSIVE LOAD (SOIL+WATER)	8371.79	**IF THE PS WATER LEVEL IS BELOW THE CRITICAL SLIP SURFACE, USE PASSIVE LOAD (SOIL)**
FOS =	1.5	

VIII.B.--HORIZONTAL DISTRIBUTED LOAD

ELEVATION (FT)	DIST. LOAD (PSF)	Result. (LBS)
3.6	1010	
-4.1	0	3888.5



3888.5

RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

NET SOIL PRESSURES INCLUDE APPLIED HORIZONTAL DISTRIBUTED LOADS.

ELEV. (FT)	NET WATER (PSF)	<---LEFTSIDE---> PASSIVE (PSF)	ACTIVE (PSF)	<--RIGHTSIDE---> ACTIVE (PSF)	PASSIVE (PSF)
14.1	0	0	0	0	0
13.1	0	0	0	0	0
12.1	0	0	0	0	0
11.1	0	0	0	0	0
10.1	0	0	0	0	0
9.1	0	0	0	0	0
8.1	0	0	0	0	0
8	0	0	0	0	0
7.1	56	0	0	0	0
6.1	119	0	0	0	0
5.1	181	0	0	0	0
4.1	243	0	0	0	0
3.60+	275	0	0	0	0
-3.6	275	400	0	0	0
3.1	306	645	0	0	0
2.1	368	727	0	0	0
1.1	431	813	0	0	0
0.1	493	904	0	0	0
-0.9	555	994	0	0	0
-1.60+	599	1057	0	0	0
-1.60-	599	1057	0	0	400
-1.9	618	1085	0	0	608
-2.6	661	1155	0	0	588
-2.9	680	1164	0	0	551
-3.5	718	1056	0	0	384
-3.72+	732	952	0	0	312
-3.72-	732	998	0	0	312
-3.9	743	952	138	0	256
-4.1	755	945	208	0	236
-4.6	786	988	237	0	260
-4.9	786	995	263	0	269
-5.9	786	1002	320	0	296
-6.16+	786	1000	316	0	590
-6.16-	786	1000	316	0	373
-6.9	786	1913	1880	650	590
-7	786	2084	2106	758	619
-7.9	786	2153	1194	541	505
-8.9	786	1881	200	150	458
-9.9	786	2048	327	200	637
-10.37	786	2104	329	203	704
-10.9	786	2167	332	207	779
-11.9	786	2286	339	218	897
-12.9	786	2403	347	212	1015
-13.9	786	2517	356	186	1136
-14.9	786	2630	366	181	1259
-15.9	786	2742	376	196	1382
-16.45	786	2854	387	210	1504
-17.9	786	2965	398	224	1634

ELEV. (FT)	NET WATER (PSF)	LEFTSIDE PASSIVE (PSF)	RESULT. LEFTSIDE PASSIVE (LBS)
14.1	0	0	
13.1	0	0	
12.1	0	0	
11.1	0	0	
10.1	0	0	
9.1	0	0	
8.1	0	0	
8	0	0	
7.1	56	0	0
6.1	119	0	0
5.1	181	0	0
4.1	243	0	0
3.6	275	0	0
3.6	275	400	0
3.1	306	645	261.25
2.1	368	727	686
1.1	431	813	770
0.1	493	904	858.5
-0.9	555	994	949
-1.6	599	1057	717.85
-1.6	599	1057	0
-1.9	618	1085	321.3
-2.6	661	1155	784
-2.9	680	1164	347.85
-3.5	718	1056	666
-3.72	732	952	220.88
-3.72	732	998	0
-3.9	743	952	175.5
-4.1	755	945	189.7
-4.6	786	988	483.25
-4.9	786	995	297.45
-5.9	786	1002	998.5
-6.16	786	1000	260.26
-6.16	786	1000	0
-6.9	786	1913	1077.81
-7	786	2084	199.85
-7.9	786	2153	1906.65
-8.9	786	1881	2017
-9.9	786	2048	1964.5
-10.37	786	2104	975.72
-10.9	786	2167	1131.815
-11.9	786	2286	2226.5
-12.9	786	2403	2344.5
-13.9	786	2517	2460
-14.9	786	2630	2573.5
-15.9	786	2742	2686
-16.45	786	2854	1538.9
-17.9	786	2965	4218.775
			-53073.5

PS WATER ELEVATION (FT)	CRITICAL SLIP SURF. ELEVATION (FT)	UNIT WEIGHT WATER (PCF)
-4.6	-4.1	64

RESULTANT WATER LOAD= 8 LBS

PASSIVE LOAD (SOIL) 6947.83

PASSIVE LOAD (SOIL+WATER) 6955.83

FOS = 2

IF THE PS WATER LEVEL IS BELOW THE CRITICAL SLIP SURFACE, USE PASSIVE LOAD (SOIL)

```
'REACH 1B
'WATER LEVEL 8'
CONTROL  CANTILEVER  DESIGN  1.00  2.00
WALL   14.1
SURFACE RIGHTSIDE   6    0   -1.6
                1   -1.6
                7   -3.5
                18   -5.4
                40   -4.2
                69   -3.7
SURFACE LEFTSIDE   8    0    3.6
                1    3.6
                8.3    3.3
                30    0.7
                30.4   -2.5
                41.1   -2.8
                51.6   -3.7
                67.3   -4.6
SOIL RIGHTSIDE  STRENGTHS   4
   94    94    0    400    0    400   -3.5   0
   100    100    0    180    0    180   -7   0
   122    122    33    0    18    0   -50   0
   102    102    0    685    0    621.6
SOIL LEFTSIDE  STRENGTHS   4
   94    94    0    400    0    400   -3.5   0
   94    94    0    180    0    180   -7   0
   122    122    33    0    18    0   -50   0
   102    102    0    685    0    621.6
WATER ELEVATIONS   62.4    8   -4.6
HORIZONTAL DISTRIBUTED   2    3.6    1010   -4.1    0
FINISHED
```

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS
DATE: 3-OCTOBER-2013 TIME: 14:04:07

****
* INPUT DATA *
****

I.--HEADING
'REACH 1B
'WATER LEVEL 8'

II.--CONTROL
CANTILEVER WALL DESIGN
FACTOR OF SAFETY FOR ACTIVE PRESSURES = 1.00
FACTOR OF SAFETY FOR PASSIVE PRESSURES = 2.00

III.--WALL DATA
ELEVATION AT TOP OF WALL = 14.10 FT.

IV.--SURFACE POINT DATA

IV.A.--RIGHTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	-1.60
1.00	-1.60
7.00	-3.50
18.00	-5.40
40.00	-4.20
69.00	-3.70

IV.B.--LEFTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	3.60
1.00	3.60
8.30	3.30
30.00	0.70
30.40	-2.50
41.10	-2.80
51.60	-3.70
67.30	-4.60

V.--SOIL LAYER DATA

V.A.--RIGHTSIDE
LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

SAT. WGHT.	MOIST WGHT.	ANGLE OF INTERNAL FRICTION	COH-ESION	ANGLE OF WALL FRICTION	ADH-ESION	<--BOTTOM--> ELEV.	SLOPE	<-SAFETY-> <-FACTOR-> ACT.	PASS.

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COHESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADHESION (PSF)	BOTTOM ELEV. (FT)	BOTTOM SLOPE (FT/FT)	SAFETY FACTOR ACT.	SAFETY FACTOR PASS.
94.00	94.00	0.00	400.00	0.00	400.00	-3.50	0.00	DEF	DEF
100.00	100.00	0.00	180.00	0.00	180.00	-7.00	0.00	DEF	DEF
122.00	122.00	33.00	0.00	18.00	0.00	-50.00	0.00	DEF	DEF
102.00	102.00	0.00	685.00	0.00	621.60			DEF	DEF

V.B.--LEFTSIDE

LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = DEFAULT

LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH- ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH- ESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.
94.00	94.00	0.00	400.00	0.00	400.00	-3.50	0.00	DEF	DEF
94.00	94.00	0.00	180.00	0.00	180.00	-7.00	0.00	DEF	DEF
122.00	122.00	33.00	0.00	18.00	0.00	-50.00	0.00	DEF	DEF
102.00	102.00	0.00	685.00	0.00	621.60			DEF	DEF

VI.--WATER DATA

UNIT WEIGHT = 62.40 (PCF)
RIGHTSIDE ELEVATION = 8.00 (FT)
LEFTSIDE ELEVATION = -4.60 (FT)
NO SEEPAGE

VII.--VERTICAL SURCHARGE LOADS

NONE

VIII.--HORIZONTAL LOADS

VIII.A.--HORIZONTAL LINE LOADS

NONE

VIII.B.--HORIZONTAL DISTRIBUTED LOADS

ELEVATION (FT)	DIST. LOAD (PSF)
3.60	1010.00
-4.10	0.00

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 3-OCTOBER-2013 TIME: 14:04:09

****
*   SOIL PRESSURES FOR   *

* CANTILEVER WALL DESIGN *
****

I.--HEADING
'REACH 1B
'WATER LEVEL 8'

II.--SOIL PRESSURES

RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

NET SOIL PRESSURES INCLUDE APPLIED HORIZONTAL DISTRIBUTED LOADS.

				<------NET------>			
	NET	<---LEFTSIDE--->		(SOIL + WATER)		<--RIGHTSIDE--->	
ELEV.	WATER	PASSIVE	ACTIVE	ACTIVE	PASSIVE	ACTIVE	PASSIVE
(FT)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)
14.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
13.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7.1	56.2	0.0	0.0	56.2	56.2	0.0	0.0
6.1	118.6	0.0	0.0	118.6	118.6	0.0	0.0
5.1	181.0	0.0	0.0	181.0	181.0	0.0	0.0
4.1	243.4	0.0	0.0	243.4	243.4	0.0	0.0
3.6+	274.6	0.0	0.0	274.6	274.6	0.0	0.0
3.6-	274.6	400.0	0.0	884.6	1284.6	0.0	0.0
3.1	305.8	645.2	0.0	605.0	1250.2	0.0	0.0
2.1	368.2	726.8	0.0	454.7	1181.4	0.0	0.0
1.1	430.6	813.1	0.0	299.5	1112.6	0.0	0.0
0.1	493.0	903.9	0.0	139.9	1043.9	0.0	0.0
-0.9	555.4	994.2	0.0	-19.1	975.1	0.0	0.0
-1.6+	599.0	1057.4	0.0	-130.5	927.0	0.0	0.0
-1.6-	599.0	1057.4	0.0	-130.5	1327.0	0.0	400.0
-1.9	617.8	1084.5	0.0	-178.2	1514.1	0.0	607.7
-2.6	661.4	1155.0	0.0	-296.8	1446.5	0.0	588.3
-2.9	680.2	1164.5	0.0	-326.9	1389.0	0.0	551.4
-3.5	717.6	1055.9	0.0	-259.6	1180.0	0.0	383.7
-3.7+	731.6	952.3	0.0	-194.2	1092.8	0.0	312.0
-3.7-	731.6	997.7	0.0	-194.2	1092.8	0.0	312.0
-3.9	742.6	952.3	138.3	-183.5	886.7	0.0	256.1
-4.1	755.0	944.6	208.0	-189.6	783.2	0.0	236.1
-4.6	786.2	988.2	236.8	-202.0	809.5	0.0	260.0
-4.9	786.2	995.4	262.8	-209.1	792.4	0.0	269.0
-5.9	786.2	1002.0	320.0	-215.8	762.4	0.0	296.1
-6.2+	786.2	999.9	316.1	-213.6	951.7	0.0	589.9
-6.2-	786.2	999.9	316.1	-213.6	951.7	0.0	373.4
-6.9	786.2	1912.5	1880.1	-475.9	-504.0	650.4	589.9

-7.0	786.2	2083.5	2106.2	-539.4	-700.5	757.9	619.4
-7.9	786.2	2152.8	1193.9	-825.6	96.9	541.0	504.6
-8.9	786.2	1880.7	200.2	-944.8	1044.3	149.7	458.2
-9.9	786.2	2048.0	326.6	-1061.7	1096.4	200.1	636.7
-10.9	786.2	2167.0	332.1	-1173.9	1233.4	206.9	779.3
-11.9	786.2	2285.8	339.2	-1281.6	1343.6	217.9	896.6
-12.9	786.2	2403.1	347.4	-1404.8	1454.1	212.1	1015.3
-13.9	786.2	2517.5	356.4	-1545.1	1566.3	186.1	1136.5
-14.9	786.2	2629.9	366.1	-1662.7	1678.8	180.9	1258.7
-15.9	786.2	2741.9	376.3	-1759.9	1791.4	195.7	1381.5
-16.9	786.2	2853.8	386.9	-1857.9	1903.2	209.6	1503.9
-17.9	786.2	2965.5	397.9	-1955.7	2022.4	223.5	1634.0
-18.9	786.2	3077.1	409.1	-2053.2	2163.7	237.6	1786.5
-19.9	786.2	3188.5	420.5	-2150.6	2315.9	251.7	1950.1
-20.9	786.2	3303.0	432.0	-2251.2	2458.5	265.6	2104.3
-21.9	786.2	3405.3	443.9	-2339.5	2595.7	279.5	2253.4
-22.9	786.2	3337.4	456.3	-2257.7	2733.9	293.5	2403.9
-23.9	786.2	3088.3	469.1	-1994.6	2871.8	307.5	2554.7
-24.9	786.2	3019.6	482.1	-1911.8	3009.8	321.5	2705.6
-25.9	786.2	3265.5	495.1	-2143.7	3147.8	335.6	2856.7
-26.9	786.2	3563.5	508.3	-2427.6	3286.0	349.7	3008.0
-27.9	786.2	3720.9	521.4	-2570.9	3424.3	363.8	3159.4
-28.9	786.2	3770.7	534.6	-2606.6	3562.6	377.9	3311.0
-29.9	786.2	3825.4	547.9	-2647.0	3700.9	392.1	3462.6
-30.9	786.2	3936.1	561.2	-2743.6	3839.3	406.2	3614.3
-31.9	786.2	4073.2	574.6	-2866.6	3977.9	420.4	3766.3
-32.9	786.2	4202.1	587.9	-2981.2	4115.6	434.6	3917.3
-33.9	786.2	4318.0	601.3	-3082.9	4248.9	448.8	4064.0
-34.9	786.2	4430.5	614.7	-3181.0	4379.6	463.2	4208.1
-35.9	786.2	4550.6	628.2	-3287.7	4512.6	476.6	4354.6
-36.9	786.2	4672.8	641.6	-3406.3	4647.0	480.3	4502.4
-37.9	786.2	4792.5	655.1	-3528.0	4780.8	478.2	4649.7
-38.9	786.2	4911.4	668.6	-3637.6	4914.6	487.6	4797.0
-39.9	786.2	5038.6	682.1	-3747.8	5048.4	504.5	4944.3
-40.9	786.2	5172.7	695.7	-3866.3	5182.3	520.2	5091.7
-41.9	786.2	5301.2	709.2	-3979.5	5316.1	535.4	5239.0
-42.9	786.2	5426.4	722.7	-4089.5	5449.9	550.7	5386.4
-43.9	786.2	5552.1	736.3	-4199.9	5583.7	565.9	5533.8
-44.9	786.2	5677.5	749.9	-4310.1	5717.5	581.2	5681.2
-45.9	786.2	5804.1	760.4	-4421.4	5854.4	596.4	5828.6
-46.9	786.2	5931.1	791.1	-4533.2	5971.1	611.7	5976.0
-47.9	786.2	6058.1	911.4	-4644.9	5998.2	626.9	6123.4
-48.9	786.2	6185.1	1077.8	-4733.4	6104.8	665.4	6396.4

BY CLASSICAL METHODS
DATE: 3-OCTOBER-2013 TIME: 14:04:09

****
* SUMMARY OF RESULTS FOR *
* CANTILEVER WALL DESIGN *
****

I.--HEADING
'REACH 1B
'WATER LEVEL 8'

II.--SUMMARY

RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

WALL BOTTOM ELEV. (FT) : -16.45
PENETRATION (FT) : 14.85

MAX. BEND. MOMENT (LB-FT) : 1.8369E+04
AT ELEVATION (FT) : -8.09

MAX. SCALED DEFL. (LB-IN^3): 7.3668E+09
AT ELEVATION (FT) : 14.10

NOTE: DIVIDE SCALED DEFLECTION MODULUS OF
ELLASTICITY IN PSI TIMES PILE MOMENT
OF INERTIA IN IN^4 TO OBTAIN DEFLECTION
IN INCHES.

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHOREDOR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS
DATE: 3-OCTOBER-2013 TIME: 14:04:09

****
* COMPLETE OF RESULTS FOR *
* CANTILEVER WALL DESIGN *
****

I.--HEADING
'REACH 1B
'WATER LEVEL 8'

II.--RESULTS

ELEVATION (FT)	BENDING MOMENT (LB-FT)	SHEAR (LB)	SCALED DEFLECTION (LB-IN^3)	NET PRESSURE (PSF)

14.10	0.0000E+00	0.	7.3668E+09	0.00
13.10	2.2701E-09	0.	7.0120E+09	0.00
12.10	-5.2387E-10	0.	6.6572E+09	0.00
11.10	-5.2387E-10	0.	6.3024E+09	0.00
10.10	-5.2387E-10	0.	5.9476E+09	0.00
9.10	-5.2387E-10	0.	5.5928E+09	0.00
8.10	-5.2387E-10	0.	5.2381E+09	0.00
8.00	3.2704E-08	0.	5.2026E+09	0.00
7.10	7.5816E+00	25.	4.8833E+09	56.16
6.10	7.1334E+01	113.	4.5285E+09	118.56
5.10	2.5365E+02	262.	4.1739E+09	180.96
4.10	6.1692E+02	475.	3.8197E+09	243.36
3.60+	8.8591E+02	604.	3.6430E+09	274.56
3.60-	8.8591E+02	604.	3.6430E+09	884.56
3.10	1.2869E+03	976.	3.4667E+09	604.99
2.10	2.5407E+03	1506.	3.1159E+09	454.65
1.10	4.2484E+03	1883.	2.7697E+09	299.51
0.10	6.2549E+03	2103.	2.4308E+09	139.93
-0.90	8.4014E+03	2163.	2.1027E+09	-19.12
-1.60	9.9020E+03	2111.	1.8815E+09	-130.46
-1.90	1.0529E+04	2065.	1.7891E+09	-178.18
-2.60	1.1921E+04	1899.	1.5803E+09	-296.82
-2.90	1.2477E+04	1805.	1.4937E+09	-326.89
-3.50	1.3505E+04	1629.	1.3267E+09	-259.64
-3.72	1.3865E+04	1578.	1.2661E+09	-194.18
-3.90	1.4138E+04	1545.	1.2199E+09	-183.55
-4.10	1.4444E+04	1508.	1.1679E+09	-189.59
-4.60	1.5173E+04	1410.	1.0425E+09	-201.99
-4.90	1.5587E+04	1348.	9.7041E+08	-209.14
-5.90	1.6829E+04	1136.	7.4784E+08	-215.78
-6.16	1.7121E+04	1079.	6.9406E+08	-213.62
-6.90	1.7834E+04	825.	5.5433E+08	-475.91
-7.00	1.7914E+04	774.	5.3664E+08	-539.37
-7.90	1.8354E+04	160.	3.9156E+08	-825.58
-8.90	1.8081E+04	-725.	2.6039E+08	-944.76
-9.90	1.6864E+04	-1728.	1.6033E+08	-1061.68
-10.37	1.5930E+04	-2241.	1.2342E+08	-1114.55
-10.90	1.4601E+04	-2762.	8.9259E+07	-856.28
-11.90	1.1492E+04	-3374.	4.3296E+07	-367.85
-12.90	8.0156E+03	-3498.	1.7139E+07	120.59
-13.90	4.6594E+03	-3133.	4.8493E+06	609.02
-14.90	1.9122E+03	-2280.	6.9920E+05	1097.46
-15.90	2.6255E+02	-938.	1.1477E+04	1585.89
-16.45	0.0000E+00	0.	0.0000E+00	1852.43

NOTE: DIVIDE SCALED DEFLECTION MODULUS OF
ELLASTICITY IN PSI TIMES PILE MOMENT
OF INERTIA IN IN^4 TO OBTAIN DEFLECTION
IN INCHES.

III.--WATER AND SOIL PRESSURES

<-------------SOIL PRESSURES-------------->
WATER <----LEFTSIDE-----> <---RIGHTSIDE---->

ELEVATION (FT)	PRESSURE (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)
14.10	0.	0.	0.	0.	0.
13.10	0.	0.	0.	0.	0.
12.10	0.	0.	0.	0.	0.
11.10	0.	0.	0.	0.	0.
10.10	0.	0.	0.	0.	0.
9.10	0.	0.	0.	0.	0.
8.10	0.	0.	0.	0.	0.
8.00	0.	0.	0.	0.	0.
7.10	56.	0.	0.	0.	0.
6.10	119.	0.	0.	0.	0.
5.10	181.	0.	0.	0.	0.
4.10	243.	0.	0.	0.	0.
3.60+	275.	0.	0.	0.	0.
3.60-	275.	400.	0.	0.	0.
3.10	306.	645.	0.	0.	0.
2.10	368.	727.	0.	0.	0.
1.10	431.	813.	0.	0.	0.
0.10	493.	904.	0.	0.	0.
-0.90	555.	994.	0.	0.	0.
-1.60+	599.	1057.	0.	0.	0.
-1.60-	599.	1057.	0.	0.	400.
-1.90	618.	1085.	0.	0.	608.
-2.60	661.	1155.	0.	0.	588.
-2.90	680.	1164.	0.	0.	551.
-3.50	718.	1056.	0.	0.	384.
-3.72+	732.	952.	0.	0.	312.
-3.72-	732.	998.	0.	0.	312.
-3.90	743.	952.	138.	0.	256.
-4.10	755.	945.	208.	0.	236.
-4.60	786.	988.	237.	0.	260.
-4.90	786.	995.	263.	0.	269.
-5.90	786.	1002.	320.	0.	296.
-6.16+	786.	1000.	316.	0.	590.
-6.16-	786.	1000.	316.	0.	373.
-6.90	786.	1913.	1880.	650.	590.
-7.00	786.	2084.	2106.	758.	619.
-7.90	786.	2153.	1194.	541.	505.
-8.90	786.	1881.	200.	150.	458.
-9.90	786.	2048.	327.	200.	637.
-10.37	786.	2104.	329.	203.	704.
-10.90	786.	2167.	332.	207.	779.
-11.90	786.	2286.	339.	218.	897.
-12.90	786.	2403.	347.	212.	1015.
-13.90	786.	2517.	356.	186.	1136.
-14.90	786.	2630.	366.	181.	1259.
-15.90	786.	2742.	376.	196.	1382.
-16.45	786.	2854.	387.	210.	1504.
-17.90	786.	2965.	398.	224.	1634.

```
'REACH 1B
'WATER LEVEL 8'
CONTROL  CANTILEVER  DESIGN  1.00  1.72
WALL   14.1
SURFACE RIGHTSIDE   6    0   -1.6
            1   -1.6
            7   -3.5
            18   -5.4
            40   -4.2
            69   -3.7
SURFACE LEFTSIDE   8    0    3.6
            1    3.6
            8.3    3.3
            30    0.7
            30.4   -2.5
            41.1   -2.8
            51.6   -3.7
            67.3   -4.6
SOIL RIGHTSIDE  STRENGTHS   4
  94    94    0    400    0    400   -3.5   0
  100    100    0    180    0    180   -7   0
  122    122    33    0    18    0   -50   0
  102    102    0    685    0    621.6
SOIL LEFTSIDE  STRENGTHS   4
  94    94    0    400    0    400   -3.5   0
  94    94    0    180    0    180   -7   0
  122    122    33    0    18    0   -50   0
  102    102    0    685    0    621.6
WATER ELEVATIONS   62.4    8   -4.6
HORIZONTAL DISTRIBUTED   2    3.6    1300   -4.1    0
FINISHED
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PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
                    BY CLASSICAL METHODS
DATE: 3-OCTOBER-2013                          TIME: 12:42:22

                      ****************
                      *  INPUT DATA  *
                      ****************

     I.--HEADING
    'REACH 1B
    'WATER LEVEL 8'

    II.--CONTROL
      CANTILEVER WALL DESIGN
      FACTOR OF SAFETY FOR ACTIVE PRESSURES  = 1.00
      FACTOR OF SAFETY FOR PASSIVE PRESSURES = 1.72

   III.--WALL DATA
      ELEVATION AT TOP OF WALL    = 14.10 FT.

    IV.--SURFACE POINT DATA

        IV.A.--RIGHTSIDE
          DIST. FROM     ELEVATION
          WALL (FT)        (FT)
              0.00        -1.60
              1.00        -1.60
              7.00        -3.50
             18.00        -5.40
             40.00        -4.20
             69.00        -3.70

        IV.B.--LEFTSIDE
          DIST. FROM     ELEVATION
          WALL (FT)        (FT)
              0.00         3.60
              1.00         3.60
              8.30         3.30
             30.00         0.70
             30.40        -2.50
             41.10        -2.80
             51.60        -3.70
             67.30        -4.60

     V.--SOIL LAYER DATA

       V.A.--RIGHTSIDE
          LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE  = DEFAULT
          LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

            ANGLE OF        ANGLE OF                     <-SAFETY->
 SAT.   MOIST  INTERNAL  COH-    WALL    ADH-   <--BOTTOM-->  <-FACTOR->
WGHT.   WGHT.  FRICTION  ESION  FRICTION  ESION   ELEV.  SLOPE  ACT. PASS.
```

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH-ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH-ESION (PSF)	BOTTOM ELEV. (FT)	BOTTOM SLOPE (FT/FT)	SAFETY FACTOR ACT.	SAFETY FACTOR PASS.
94.00	94.00	0.00	400.00	0.00	400.00	-3.50	0.00	DEF	DEF
100.00	100.00	0.00	180.00	0.00	180.00	-7.00	0.00	DEF	DEF
122.00	122.00	33.00	0.00	18.00	0.00	-50.00	0.00	DEF	DEF
102.00	102.00	0.00	685.00	0.00	621.60			DEF	DEF

V.B.--LEFTSIDE

LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = DEFAULT

LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH-ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH-ESION (PSF)	<--BOTTOM--> ELEV. (FT)	<--BOTTOM--> SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	<-SAFETY-> <-FACTOR-> PASS.
94.00	94.00	0.00	400.00	0.00	400.00	-3.50	0.00	DEF	DEF
94.00	94.00	0.00	180.00	0.00	180.00	-7.00	0.00	DEF	DEF
122.00	122.00	33.00	0.00	18.00	0.00	-50.00	0.00	DEF	DEF
102.00	102.00	0.00	685.00	0.00	621.60			DEF	DEF

VI.--WATER DATA

UNIT WEIGHT = 62.40 (PCF)

RIGHTSIDE ELEVATION = 8.00 (FT)

LEFTSIDE ELEVATION = -4.60 (FT)

NO SEEPAGE

VII.--VERTICAL SURCHARGE LOADS

NONE

VIII.--HORIZONTAL LOADS

VIII.A.--HORIZONTAL LINE LOADS

NONE

VIII.B.--HORIZONTAL DISTRIBUTED LOADS

ELEVATION (FT)	DIST. LOAD (PSF)
3.60	1300.00
-4.10	0.00

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS BY CLASSICAL METHODS

DATE: 3-OCTOBER-2013 TIME: 12:42:24

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* SOIL PRESSURES FOR *

* CANTILEVER WALL DESIGN *
****

I.--HEADING
'REACH 1B
'WATER LEVEL 8'

II.--SOIL PRESSURES

RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

NET SOIL PRESSURES INCLUDE APPLIED HORIZONTAL DISTRIBUTED LOADS.

	NET	<---LEFTSIDE--->		<------NET------> (SOIL + WATER)		<--RIGHTSIDE--->	
ELEV. (FT)	WATER (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)
14.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
13.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7.1	56.2	0.0	0.0	56.2	56.2	0.0	0.0
6.1	118.6	0.0	0.0	118.6	118.6	0.0	0.0
5.1	181.0	0.0	0.0	181.0	181.0	0.0	0.0
4.1	243.4	0.0	0.0	243.4	243.4	0.0	0.0
3.6+	274.6	0.0	0.0	274.6	274.6	0.0	0.0
3.6-	274.6	465.1	0.0	1109.4	1574.6	0.0	0.0
3.1	305.8	742.6	0.0	778.8	1521.3	0.0	0.0
2.1	368.2	822.5	0.0	592.5	1414.9	0.0	0.0
1.1	430.6	908.1	0.0	400.3	1308.5	0.0	0.0
0.1	493.0	999.0	0.0	203.0	1202.1	0.0	0.0
-0.9	555.4	1089.3	0.0	6.3	1095.6	0.0	0.0
-1.6+	599.0	1152.5	0.0	-131.4	1021.1	0.0	0.0
-1.6-	599.0	1152.5	0.0	-131.4	1486.2	0.0	465.1
-1.9	617.8	1179.6	0.0	-190.4	1694.3	0.0	705.1
-2.6	661.4	1251.3	0.0	-336.6	1593.8	0.0	679.1
-2.9	680.2	1257.9	0.0	-375.1	1517.7	0.0	634.9
-3.5	717.6	1122.9	0.0	-304.0	1256.2	0.0	437.3
-3.7+	731.6	996.5	0.0	-229.2	1147.9	0.0	352.9
-3.7-	731.6	1051.8	0.0	-229.2	1147.9	0.0	352.9
-3.9	742.6	996.5	138.3	-220.2	925.3	0.0	287.2
-4.1	755.0	984.6	208.0	-229.6	810.0	0.0	263.0
-4.6	786.2	1029.0	236.8	-242.8	837.8	0.0	288.3
-4.9	786.2	1035.1	262.8	-248.9	820.7	0.0	297.3
-5.9	786.2	1039.0	320.0	-252.8	789.4	0.0	323.1
-6.2+	786.2	1034.3	316.1	-248.1	1051.4	0.0	731.9
-6.2-	786.2	1034.3	316.1	-248.1	1051.4	0.0	430.6
-6.9	786.2	2262.7	1880.1	-826.1	-362.0	650.4	731.9

-7.0	786.2	2490.2	2106.2	-946.1	-545.7	757.9	774.3
-7.9	786.2	2532.2	1193.9	-1204.9	202.1	541.0	609.8
-8.9	786.2	2130.9	200.2	-1195.0	1106.9	149.7	520.9
-9.9	786.2	2338.1	326.6	-1351.8	1197.5	200.1	737.9
-10.9	786.2	2478.5	332.1	-1485.3	1352.6	206.9	898.5
-11.9	786.2	2618.2	339.2	-1614.0	1475.7	217.9	1028.7
-12.9	786.2	2755.2	347.4	-1756.9	1604.9	212.1	1166.1
-13.9	786.2	2888.3	356.4	-1915.9	1736.0	186.1	1306.2
-14.9	786.2	3019.3	366.1	-2052.2	1867.8	180.9	1447.7
-15.9	786.2	3150.1	376.3	-2168.1	2000.0	195.7	1590.1
-16.9	786.2	3280.5	386.9	-2284.7	2131.3	209.6	1732.0
-17.9	786.2	3410.7	397.9	-2400.9	2286.9	223.5	1898.5
-18.9	786.2	3540.6	409.1	-2516.8	2473.4	237.6	2096.2
-19.9	786.2	3670.4	420.5	-2632.5	2648.6	251.7	2282.8
-20.9	786.2	3822.2	432.0	-2770.3	2810.3	265.6	2456.1
-21.9	786.2	3780.9	443.9	-2715.2	2975.5	279.5	2633.1
-22.9	786.2	3455.8	456.3	-2376.1	3140.4	293.5	2810.4
-23.9	786.2	3328.0	469.1	-2234.3	3305.2	307.5	2988.1
-24.9	786.2	3613.9	482.1	-2506.2	3470.3	321.5	3166.1
-25.9	786.2	3994.0	495.1	-2872.2	3635.5	335.6	3344.4
-26.9	786.2	4189.2	508.3	-3053.3	3800.9	349.7	3522.9
-27.9	786.2	4230.4	521.4	-3080.3	3966.4	363.8	3701.6
-28.9	786.2	4289.2	534.6	-3125.0	4132.1	377.9	3880.5
-29.9	786.2	4419.9	547.9	-3241.6	4297.8	392.1	4059.5
-30.9	786.2	4580.4	561.2	-3387.9	4464.1	406.2	4239.0
-31.9	786.2	4726.0	574.6	-3519.3	4627.4	420.4	4415.7
-32.9	786.2	4853.9	587.9	-3633.1	4784.7	434.6	4586.4
-33.9	786.2	4987.0	601.3	-3752.0	4941.9	448.8	4757.0
-34.9	786.2	5130.2	614.7	-3880.7	5102.3	463.2	4930.8
-35.9	786.2	5271.3	628.2	-4008.5	5263.1	476.6	5105.0
-36.9	786.2	5409.0	641.6	-4142.5	5423.4	480.3	5278.8
-37.9	786.2	5553.7	655.1	-4289.2	5583.7	478.2	5452.6
-38.9	786.2	5709.4	668.6	-4435.6	5744.1	487.6	5626.5
-39.9	786.2	5862.7	682.1	-4572.0	5904.5	504.5	5800.4
-40.9	786.2	6011.0	695.7	-4704.6	6064.9	520.2	5974.3
-41.9	786.2	6157.4	709.2	-4835.7	6225.3	535.4	6148.3
-42.9	786.2	6303.2	722.7	-4966.3	6385.8	550.7	6322.3
-43.9	786.2	6450.8	736.3	-5098.7	6546.2	565.9	6496.3
-44.9	786.2	6599.1	749.9	-5231.7	6706.7	581.2	6670.3
-45.9	786.2	6747.5	760.4	-5364.8	6870.2	596.4	6844.3
-46.9	786.2	6895.9	791.1	-5498.0	7013.5	611.7	7018.4
-47.9	786.2	7044.5	911.4	-5631.3	7067.3	626.9	7192.5
-48.9	786.2	7193.1	1077.8	-5741.4	7278.5	665.4	7570.1

BY CLASSICAL METHODS
DATE: 3-OCTOBER-2013 TIME: 12:42:25

****
* SUMMARY OF RESULTS FOR *
* CANTILEVER WALL DESIGN *
****

I.--HEADING
'REACH 1B
'WATER LEVEL 8'

II.--SUMMARY

RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

WALL BOTTOM ELEV. (FT) : -16.38
PENETRATION (FT) : 14.78

MAX. BEND. MOMENT (LB-FT) : 2.2338E+04
AT ELEVATION (FT) : -7.88

MAX. SCALED DEFL. (LB-IN^3): 8.6788E+09
AT ELEVATION (FT) : 14.10

NOTE: DIVIDE SCALED DEFLECTION MODULUS OF
ELLASTICITY IN PSI TIMES PILE MOMENT
OF INERTIA IN IN^4 TO OBTAIN DEFLECTION
IN INCHES.

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHOREDOR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS
DATE: 3-OCTOBER-2013 TIME: 12:42:25

****
* COMPLETE OF RESULTS FOR *
* CANTILEVER WALL DESIGN *
****

I.--HEADING
'REACH 1B
'WATER LEVEL 8'

II.--RESULTS

ELEVATION (FT)	BENDING MOMENT (LB-FT)	SHEAR (LB)	SCALED DEFLECTION (LB-IN^3)	NET PRESSURE (PSF)

14.10	0.0000E+00	0.	8.6788E+09	0.00
13.10	1.5716E-09	0.	8.2603E+09	0.00
12.10	1.5716E-09	0.	7.8418E+09	0.00
11.10	1.5716E-09	0.	7.4233E+09	0.00
10.10	-1.2224E-09	0.	7.0048E+09	0.00
9.10	-1.2224E-09	0.	6.5863E+09	0.00
8.10	-1.2224E-09	0.	6.1678E+09	0.00
8.00	1.1602E-07	0.	6.1259E+09	0.00
7.10	7.5816E+00	25.	5.7493E+09	56.16
6.10	7.1334E+01	113.	5.3308E+09	118.56
5.10	2.5365E+02	262.	4.9124E+09	180.96
4.10	6.1692E+02	475.	4.4946E+09	243.36
3.60+	8.8591E+02	604.	4.2860E+09	274.56
3.60-	8.8591E+02	604.	4.2860E+09	1109.44
3.10	1.3128E+03	1076.	4.0778E+09	778.76
2.10	2.7472E+03	1762.	3.6634E+09	592.46
1.10	4.7731E+03	2258.	3.2538E+09	400.34
0.10	7.1985E+03	2560.	2.8526E+09	203.01
-0.90	9.8270E+03	2664.	2.4638E+09	6.29
-1.60	1.1682E+04	2621.	2.2014E+09	-131.41
-1.90	1.2462E+04	2572.	2.0920E+09	-190.43
-2.60	1.4204E+04	2388.	1.8442E+09	-336.62
-2.90	1.4904E+04	2281.	1.7417E+09	-375.12
-3.50	1.6210E+04	2077.	1.5436E+09	-303.98
-3.72	1.6670E+04	2017.	1.4719E+09	-229.21
-3.90	1.7020E+04	1978.	1.4171E+09	-220.19
-4.10	1.7411E+04	1933.	1.3556E+09	-229.57
-4.60	1.8348E+04	1815.	1.2071E+09	-242.77
-4.90	1.8882E+04	1741.	1.1218E+09	-248.89
-5.90	2.0498E+04	1490.	8.5922E+08	-252.80
-6.16	2.0881E+04	1425.	7.9593E+08	-248.08
-6.90	2.1811E+04	1029.	6.3197E+08	-826.06
-7.00	2.1910E+04	940.	6.1129E+08	-946.05
-7.90	2.2338E+04	-28.	4.4230E+08	-1204.92
-8.90	2.1709E+04	-1228.	2.9106E+08	-1194.96
-9.81	2.0072E+04	-2383.	1.8570E+08	-1338.10
-9.90	1.9858E+04	-2499.	1.7716E+08	-1292.82
-10.90	1.6800E+04	-3533.	9.7389E+07	-775.17
-11.90	1.2966E+04	-4049.	4.6540E+07	-257.53
-12.90	8.8743E+03	-4048.	1.8058E+07	260.12
-13.90	5.0431E+03	-3529.	4.9491E+06	777.76
-14.90	1.9896E+03	-2492.	6.6620E+05	1295.41
-15.90	2.3153E+02	-938.	7.8985E+03	1813.06
-16.38	0.0000E+00	0.	0.0000E+00	2063.51

NOTE: DIVIDE SCALED DEFLECTION MODULUS OF ELLASTICITY IN PSI TIMES PILE MOMENT OF INERTIA IN IN^4 TO OBTAIN DEFLECTION IN INCHES.

III.--WATER AND SOIL PRESSURES

<-------------SOIL PRESSURES-------------->
WATER <----LEFTSIDE-----> <---RIGHTSIDE---->

ELEVATION (FT)	PRESSURE (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)
14.10	0.	0.	0.	0.	0.
13.10	0.	0.	0.	0.	0.
12.10	0.	0.	0.	0.	0.
11.10	0.	0.	0.	0.	0.
10.10	0.	0.	0.	0.	0.
9.10	0.	0.	0.	0.	0.
8.10	0.	0.	0.	0.	0.
8.00	0.	0.	0.	0.	0.
7.10	56.	0.	0.	0.	0.
6.10	119.	0.	0.	0.	0.
5.10	181.	0.	0.	0.	0.
4.10	243.	0.	0.	0.	0.
3.60+	275.	0.	0.	0.	0.
3.60-	275.	465.	0.	0.	0.
3.10	306.	743.	0.	0.	0.
2.10	368.	822.	0.	0.	0.
1.10	431.	908.	0.	0.	0.
0.10	493.	999.	0.	0.	0.
-0.90	555.	1089.	0.	0.	0.
-1.60+	599.	1153.	0.	0.	0.
-1.60-	599.	1153.	0.	0.	465.
-1.90	618.	1180.	0.	0.	705.
-2.60	661.	1251.	0.	0.	679.
-2.90	680.	1258.	0.	0.	635.
-3.50	718.	1123.	0.	0.	437.
-3.72+	732.	997.	0.	0.	353.
-3.72-	732.	1052.	0.	0.	353.
-3.90	743.	997.	138.	0.	287.
-4.10	755.	985.	208.	0.	263.
-4.60	786.	1029.	237.	0.	288.
-4.90	786.	1035.	263.	0.	297.
-5.90	786.	1039.	320.	0.	323.
-6.16+	786.	1034.	316.	0.	732.
-6.16-	786.	1034.	316.	0.	431.
-6.90	786.	2263.	1880.	650.	732.
-7.00	786.	2490.	2106.	758.	774.
-7.90	786.	2532.	1194.	541.	610.
-8.90	786.	2131.	200.	150.	521.
-9.81	786.	2320.	316.	196.	719.
-9.90	786.	2338.	327.	200.	738.
-10.90	786.	2478.	332.	207.	899.
-11.90	786.	2618.	339.	218.	1029.
-12.90	786.	2755.	347.	212.	1166.
-13.90	786.	2888.	356.	186.	1306.
-14.90	786.	3019.	366.	181.	1448.
-15.90	786.	3150.	376.	196.	1590.
-16.38	786.	3280.	387.	210.	1732.
-17.90	786.	3411.	398.	224.	1899.

```
'REACH 1B
'WATER LEVEL 8'
CONTROL  CANTILEVER  DESIGN  1.00  1.50
WALL   14.1
SURFACE RIGHTSIDE   6    0   -1.6
                1   -1.6
                7   -3.5
                18   -5.4
                40   -4.2
                69   -3.7
SURFACE LEFTSIDE   8    0    3.6
                1    3.6
                8.3    3.3
                30    0.7
                30.4   -2.5
                41.1   -2.8
                51.6   -3.7
                67.3   -4.6
SOIL RIGHTSIDE  STRENGTHS   4
   94    94    0    400    0    400   -3.5   0
   100    100    0    180    0    180   -7   0
   122    122    33    0    18    0   -50   0
   102    102    0    685    0    621.6
SOIL LEFTSIDE  STRENGTHS   4
   94    94    0    400    0    400   -3.5   0
   94    94    0    180    0    180   -7   0
   122    122    33    0    18    0   -50   0
   102    102    0    685    0    621.6
WATER ELEVATIONS   62.4    8   -4.6
HORIZONTAL DISTRIBUTED   2    3.6    1635   -4.1    0
FINISHED
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PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS
DATE: 3-OCTOBER-2013 TIME: 13:54:15

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*  INPUT DATA  *
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I.--HEADING
'REACH 1B
'WATER LEVEL 8'

II.--CONTROL
CANTILEVER WALL DESIGN
FACTOR OF SAFETY FOR ACTIVE PRESSURES = 1.00
FACTOR OF SAFETY FOR PASSIVE PRESSURES = 1.50

III.--WALL DATA
ELEVATION AT TOP OF WALL = 14.10 FT.

IV.--SURFACE POINT DATA

IV.A.--RIGHTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	-1.60
1.00	-1.60
7.00	-3.50
18.00	-5.40
40.00	-4.20
69.00	-3.70

IV.B.--LEFTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	3.60
1.00	3.60
8.30	3.30
30.00	0.70
30.40	-2.50
41.10	-2.80
51.60	-3.70
67.30	-4.60

V.--SOIL LAYER DATA

V.A.--RIGHTSIDE
LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

```
            ANGLE OF        ANGLE OF                <-SAFETY->
 SAT.   MOIST  INTERNAL  COH-    WALL    ADH-   <--BOTTOM-->  <-FACTOR->
WGHT.   WGHT.  FRICTION  ESION  FRICTION  ESION   ELEV.  SLOPE  ACT. PASS.
```

(PCF)	(PCF)	(DEG)	(PSF)	(DEG)	(PSF)	(FT)	(FT/FT)		
94.00	94.00	0.00	400.00	0.00	400.00	-3.50	0.00	DEF	DEF
100.00	100.00	0.00	180.00	0.00	180.00	-7.00	0.00	DEF	DEF
122.00	122.00	33.00	0.00	18.00	0.00	-50.00	0.00	DEF	DEF
102.00	102.00	0.00	685.00	0.00	621.60			DEF	DEF

V.B.--LEFTSIDE

LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

		ANGLE OF		ANGLE OF				<-SAFETY->	
SAT.	MOIST	INTERNAL	COH-	WALL	ADH-	<--BOTTOM-->		<-FACTOR->	
WGHT.	WGHT.	FRICTION	ESION	FRICTION	ESION	ELEV.	SLOPE	ACT.	PASS.
(PCF)	(PCF)	(DEG)	(PSF)	(DEG)	(PSF)	(FT)	(FT/FT)		
94.00	94.00	0.00	400.00	0.00	400.00	-3.50	0.00	DEF	DEF
94.00	94.00	0.00	180.00	0.00	180.00	-7.00	0.00	DEF	DEF
122.00	122.00	33.00	0.00	18.00	0.00	-50.00	0.00	DEF	DEF
102.00	102.00	0.00	685.00	0.00	621.60			DEF	DEF

VI.--WATER DATA

UNIT WEIGHT = 62.40 (PCF)
RIGHTSIDE ELEVATION = 8.00 (FT)
LEFTSIDE ELEVATION = -4.60 (FT)
NO SEEPAGE

VII.--VERTICAL SURCHARGE LOADS

NONE

VIII.--HORIZONTAL LOADS

VIII.A.--HORIZONTAL LINE LOADS

NONE

VIII.B.--HORIZONTAL DISTRIBUTED LOADS

ELEVATION	DIST. LOAD
(FT)	(PSF)
3.60	1635.00
-4.10	0.00

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 3-OCTOBER-2013 TIME: 13:54:17

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**************************
*   SOIL PRESSURES FOR   *
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* CANTILEVER WALL DESIGN *
****

I.--HEADING
'REACH 1B
'WATER LEVEL 8'

II.--SOIL PRESSURES

RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

NET SOIL PRESSURES INCLUDE APPLIED HORIZONTAL DISTRIBUTED LOADS.

				<------NET------>			
	NET	<---LEFTSIDE--->		(SOIL + WATER)		<--RIGHTSIDE--->	
ELEV.	WATER	PASSIVE	ACTIVE	ACTIVE	PASSIVE	ACTIVE	PASSIVE
(FT)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)
14.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
13.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7.1	56.2	0.0	0.0	56.2	56.2	0.0	0.0
6.1	118.6	0.0	0.0	118.6	118.6	0.0	0.0
5.1	181.0	0.0	0.0	181.0	181.0	0.0	0.0
4.1	243.4	0.0	0.0	243.4	243.4	0.0	0.0
3.6+	274.6	0.0	0.0	274.6	274.6	0.0	0.0
3.6-	274.6	533.3	0.0	1376.2	1909.6	0.0	0.0
3.1	305.8	844.6	0.0	990.0	1834.6	0.0	0.0
2.1	368.2	922.7	0.0	761.9	1684.7	0.0	0.0
1.1	430.6	1007.7	0.0	527.0	1534.7	0.0	0.0
0.1	493.0	1098.7	0.0	286.1	1384.8	0.0	0.0
-0.9	555.4	1189.0	0.0	45.9	1234.8	0.0	0.0
-1.6+	599.0	1252.2	0.0	-122.3	1129.9	0.0	0.0
-1.6-	599.0	1252.2	0.0	-122.3	1663.2	0.0	533.3
-1.9	617.8	1279.3	0.0	-194.3	1892.0	0.0	807.1
-2.6	661.4	1352.2	0.0	-372.2	1754.1	0.0	774.2
-2.9	680.2	1355.7	0.0	-420.8	1657.3	0.0	722.4
-3.5	717.6	1193.0	0.0	-348.0	1338.6	0.0	493.6
-3.7+	731.6	1042.8	0.0	-264.4	1207.1	0.0	395.9
-3.7-	731.6	1108.5	0.0	-264.4	1207.1	0.0	395.9
-3.9	742.6	1042.8	138.3	-257.8	966.6	0.0	319.8
-4.1	755.0	1026.5	208.0	-271.4	838.1	0.0	291.1
-4.6	786.2	1071.7	236.8	-285.5	867.4	0.0	317.9
-4.9	786.2	1076.8	262.8	-290.5	850.3	0.0	326.9
-5.9	786.2	1077.8	320.0	-291.6	817.4	0.0	351.1
-6.2+	786.2	1070.0	316.1	-283.7	1171.7	0.0	906.1
-6.2-	786.2	1070.0	316.1	-283.7	1171.7	0.0	497.1
-6.9	786.2	2688.2	1880.1	-1251.5	-187.8	650.4	906.1

-7.0	786.2	2985.3	2106.2	-1441.2	-355.0	757.9	964.9
-7.9	786.2	2991.2	1193.9	-1664.0	338.6	541.0	746.3
-8.9	786.2	2430.7	200.2	-1494.8	1191.7	149.7	605.6
-9.9	786.2	2689.0	326.6	-1702.7	1320.2	200.1	860.6
-10.9	786.2	2857.3	332.1	-1864.2	1497.0	206.9	1042.9
-11.9	786.2	3024.1	339.2	-2019.9	1640.7	217.9	1193.7
-12.9	786.2	3186.5	347.4	-2188.2	1793.3	212.1	1354.4
-13.9	786.2	3344.0	356.4	-2371.6	1948.4	186.1	1518.6
-14.9	786.2	3499.6	366.1	-2532.4	2104.9	180.9	1684.8
-15.9	786.2	3654.8	376.3	-2672.8	2260.3	195.7	1850.4
-16.9	786.2	3809.5	386.9	-2813.7	2433.0	209.6	2033.7
-17.9	786.2	3963.9	397.9	-2954.1	2642.6	223.5	2254.3
-18.9	786.2	4117.9	409.1	-3094.0	2860.7	237.6	2483.5
-19.9	786.2	4292.0	420.5	-3254.1	3063.3	251.7	2697.5
-20.9	786.2	4294.7	432.0	-3242.9	3261.5	265.6	2907.3
-21.9	786.2	3973.7	443.9	-2908.0	3461.3	279.5	3118.9
-22.9	786.2	3751.0	456.3	-2671.3	3661.2	293.5	3331.3
-23.9	786.2	4023.8	469.1	-2930.1	3861.3	307.5	3544.2
-24.9	786.2	4517.4	482.1	-3409.6	4061.7	321.5	3757.6
-25.9	786.2	4768.7	495.1	-3646.9	4262.5	335.6	3971.4
-26.9	786.2	4799.5	508.3	-3663.6	4463.7	349.7	4185.7
-27.9	786.2	4863.6	521.4	-3713.6	4665.0	363.8	4400.2
-28.9	786.2	5020.0	534.6	-3855.9	4866.6	377.9	4615.0
-29.9	786.2	5207.7	547.9	-4029.4	5069.1	392.1	4830.8
-30.9	786.2	5374.0	561.2	-4181.5	5265.8	406.2	5040.8
-31.9	786.2	5522.7	574.6	-4316.1	5454.5	420.4	5242.8
-32.9	786.2	5683.3	587.9	-4462.4	5646.8	434.6	5448.5
-33.9	786.2	5853.7	601.3	-4618.6	5843.3	448.8	5658.4
-34.9	786.2	6018.5	614.7	-4769.0	6038.6	463.2	5867.1
-35.9	786.2	6184.6	628.2	-4921.8	6233.8	476.6	6075.8
-36.9	786.2	6364.1	641.6	-5097.6	6429.1	480.3	6284.5
-37.9	786.2	6550.9	655.1	-5286.4	6624.4	478.2	6493.3
-38.9	786.2	6729.7	668.6	-5455.9	6819.8	487.6	6702.2
-39.9	786.2	6902.7	682.1	-5611.9	7015.2	504.5	6911.1
-40.9	786.2	7075.9	695.7	-5769.5	7210.7	520.2	7120.1
-41.9	786.2	7250.4	709.2	-5928.7	7406.2	535.4	7329.1
-42.9	786.2	7426.3	722.7	-6089.4	7601.7	550.7	7538.2
-43.9	786.2	7602.4	736.3	-6250.3	7797.2	565.9	7747.3
-44.9	786.2	7778.7	749.9	-6411.3	7992.8	581.2	7956.4
-45.9	786.2	7955.1	760.4	-6572.4	8191.4	596.4	8165.6
-46.9	786.2	8131.6	791.1	-6733.7	8369.9	611.7	8374.8
-47.9	786.2	8308.2	911.4	-6895.0	8458.8	626.9	8584.0
-48.9	786.2	8483.1	1077.8	-7031.5	8829.1	665.4	9120.7

BY CLASSICAL METHODS
DATE: 3-OCTOBER-2013 TIME: 13:54:17

****
* SUMMARY OF RESULTS FOR *
* CANTILEVER WALL DESIGN *
****

I.--HEADING
'REACH 1B
'WATER LEVEL 8'

II.--SUMMARY

RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

WALL BOTTOM ELEV. (FT) : -16.45
PENETRATION (FT) : 14.85

MAX. BEND. MOMENT (LB-FT) : 2.7536E+04
AT ELEVATION (FT) : -7.78

MAX. SCALED DEFL. (LB-IN^3): 1.0498E+10
AT ELEVATION (FT) : 14.10

NOTE: DIVIDE SCALED DEFLECTION MODULUS OF
ELLASTICITY IN PSI TIMES PILE MOMENT
OF INERTIA IN IN^4 TO OBTAIN DEFLECTION
IN INCHES.

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHOREDOR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS
DATE: 3-OCTOBER-2013 TIME: 13:54:17

****
* COMPLETE OF RESULTS FOR *
* CANTILEVER WALL DESIGN *
****

I.--HEADING
'REACH 1B
'WATER LEVEL 8'

II.--RESULTS

ELEVATION (FT)	BENDING MOMENT (LB-FT)	SHEAR (LB)	SCALED DEFLECTION (LB-IN^3)	NET PRESSURE (PSF)

14.10	0.0000E+00	0.	1.0498E+10	0.00
13.10	-1.7462E-09	0.	9.9929E+09	0.00
12.10	-1.7462E-09	0.	9.4878E+09	0.00
11.10	-1.7462E-09	0.	8.9828E+09	0.00
10.10	-1.7462E-09	0.	8.4778E+09	0.00
9.10	-1.7462E-09	0.	7.9728E+09	0.00
8.10	-1.7462E-09	0.	7.4677E+09	0.00
8.00	-1.8733E-07	0.	7.4172E+09	0.00
7.10	7.5816E+00	25.	6.9627E+09	56.16
6.10	7.1334E+01	113.	6.4577E+09	118.56
5.10	2.5365E+02	262.	5.9528E+09	180.96
4.10	6.1692E+02	475.	5.4484E+09	243.36
3.60+	8.8591E+02	604.	5.1966E+09	274.56
3.60-	8.8591E+02	604.	5.1966E+09	1376.23
3.10	1.3439E+03	1196.	4.9451E+09	989.97
2.10	2.9964E+03	2072.	4.4443E+09	761.94
1.10	5.4098E+03	2716.	3.9487E+09	527.04
0.10	8.3492E+03	3123.	3.4626E+09	286.11
-0.90	1.1575E+04	3289.	2.9910E+09	45.88
-1.60	1.3874E+04	3262.	2.6724E+09	-122.28
-1.90	1.4846E+04	3214.	2.5393E+09	-194.35
-2.60	1.7034E+04	3016.	2.2381E+09	-372.23
-2.90	1.7922E+04	2897.	2.1133E+09	-420.78
-3.50	1.9588E+04	2666.	1.8722E+09	-348.00
-3.72	2.0180E+04	2598.	1.7849E+09	-264.39
-3.90	2.0631E+04	2552.	1.7182E+09	-257.77
-4.10	2.1136E+04	2499.	1.6433E+09	-271.44
-4.60	2.2351E+04	2360.	1.4626E+09	-285.48
-4.90	2.3046E+04	2273.	1.3587E+09	-290.53
-5.90	2.5174E+04	1982.	1.0390E+09	-291.57
-6.16	2.5685E+04	1907.	9.6199E+08	-283.73
-6.90	2.6926E+04	1341.	7.6273E+08	-1251.54
-7.00	2.7053E+04	1206.	7.3762E+08	-1441.16
-7.90	2.7525E+04	-191.	5.3282E+08	-1663.95
-8.90	2.6530E+04	-1770.	3.5025E+08	-1494.75
-9.44	2.5340E+04	-2614.	2.7030E+08	-1607.85
-9.90	2.3990E+04	-3289.	2.1329E+08	-1349.79
-10.90	2.0121E+04	-4355.	1.1760E+08	-783.87
-11.90	1.5468E+04	-4856.	5.6564E+07	-217.96
-12.90	1.0597E+04	-4791.	2.2225E+07	347.96
-13.90	6.0735E+03	-4160.	6.2467E+06	913.88
-14.90	2.4643E+03	-2964.	8.9492E+05	1479.79
-15.90	3.3483E+02	-1201.	1.4505E+04	2045.71
-16.45	0.0000E+00	0.	0.0000E+00	2354.60

NOTE: DIVIDE SCALED DEFLECTION MODULUS OF ELLASTICITY IN PSI TIMES PILE MOMENT OF INERTIA IN IN^4 TO OBTAIN DEFLECTION IN INCHES.

III.--WATER AND SOIL PRESSURES

<-------------SOIL PRESSURES-------------->

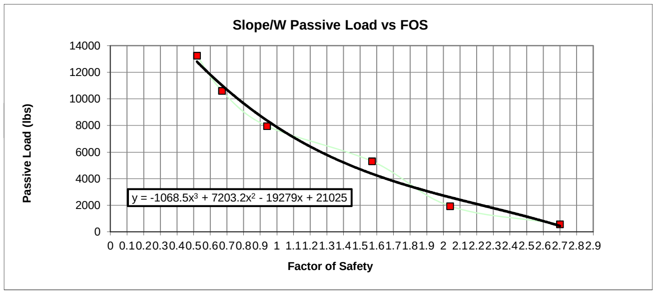
WATER <----LEFTSIDE-----> <---RIGHTSIDE---->

ELEVATION (FT)	PRESSURE (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)
14.10	0.	0.	0.	0.	0.
13.10	0.	0.	0.	0.	0.
12.10	0.	0.	0.	0.	0.
11.10	0.	0.	0.	0.	0.
10.10	0.	0.	0.	0.	0.
9.10	0.	0.	0.	0.	0.
8.10	0.	0.	0.	0.	0.
8.00	0.	0.	0.	0.	0.
7.10	56.	0.	0.	0.	0.
6.10	119.	0.	0.	0.	0.
5.10	181.	0.	0.	0.	0.
4.10	243.	0.	0.	0.	0.
3.60+	275.	0.	0.	0.	0.
3.60-	275.	533.	0.	0.	0.
3.10	306.	845.	0.	0.	0.
2.10	368.	923.	0.	0.	0.
1.10	431.	1008.	0.	0.	0.
0.10	493.	1099.	0.	0.	0.
-0.90	555.	1189.	0.	0.	0.
-1.60+	599.	1252.	0.	0.	0.
-1.60-	599.	1252.	0.	0.	533.
-1.90	618.	1279.	0.	0.	807.
-2.60	661.	1352.	0.	0.	774.
-2.90	680.	1356.	0.	0.	722.
-3.50	718.	1193.	0.	0.	494.
-3.72+	732.	1043.	0.	0.	396.
-3.72-	732.	1109.	0.	0.	396.
-3.90	743.	1043.	138.	0.	320.
-4.10	755.	1026.	208.	0.	291.
-4.60	786.	1072.	237.	0.	318.
-4.90	786.	1077.	263.	0.	327.
-5.90	786.	1078.	320.	0.	351.
-6.16+	786.	1070.	316.	0.	906.
-6.16-	786.	1070.	316.	0.	497.
-6.90	786.	2688.	1880.	650.	906.
-7.00	786.	2985.	2106.	758.	965.
-7.90	786.	2991.	1194.	541.	746.
-8.90	786.	2431.	200.	150.	606.
-9.44	786.	2571.	269.	177.	744.
-9.90	786.	2689.	327.	200.	861.
-10.90	786.	2857.	332.	207.	1043.
-11.90	786.	3024.	339.	218.	1194.
-12.90	786.	3186.	347.	212.	1354.
-13.90	786.	3344.	356.	186.	1519.
-14.90	786.	3500.	366.	181.	1685.
-15.90	786.	3655.	376.	196.	1850.
-16.45	786.	3810.	387.	210.	2034.
-17.90	786.	3964.	398.	224.	2254.

Canal:	Orleans Avenue Canal
Reach:	Reach 1C
Load Case:	Water @ El 8
Protected Side Top of Ground (GSE):	3.6 ft, Elevation
Critical Slip Surface Elev. (FSE):	Varies ft, Elevation
Sheetpile Tip Elevation:	-28.5 ft, Elevation

Step 1: Compute correct passive pressure forces from slope stability model (Slope/W). Procedure follows the approach cited in Paragraph D-4 of ETL 1110-2-575.

Unit Weight (psf)	Passive Load (lbs)	Factor of Safety	Failure Surface Elevation (feet)	Notes
10	576.8	2.7	-3.12	
30	1936	2.04	-3.5	
60	5310	1.571	-5.4	
90	7955	0.94	-5.4	
120	10602	0.67	-5.4	
150	13249	0.52	-5.4	



Step 2: Perform CWALSHT analysis of cross section using a range of <u>assumed</u> horizontal distributed load above the critical slip surface elevation found in step 1. Determine the difference in passive load from CWALSHT and Slope/W for each assumed horizontal distributed load.

Check penetration of the sheetpile to determine where the pile behaves as a short pile or long pile. This I-wall has a penetration versus stick up of = (3.6--28)/(8'-3.6')=7.2. This ratio exceeds the recommended 2.5. For short pile behavior, the penetration was determined to be 20 ft. The PS GSE was 3.6 producing a short pile tip elevation of -16.4. See attached EXCEL sheet for short pile versus long pile calculation. This penetration gives a penetration to stickup ratio of 4.5.

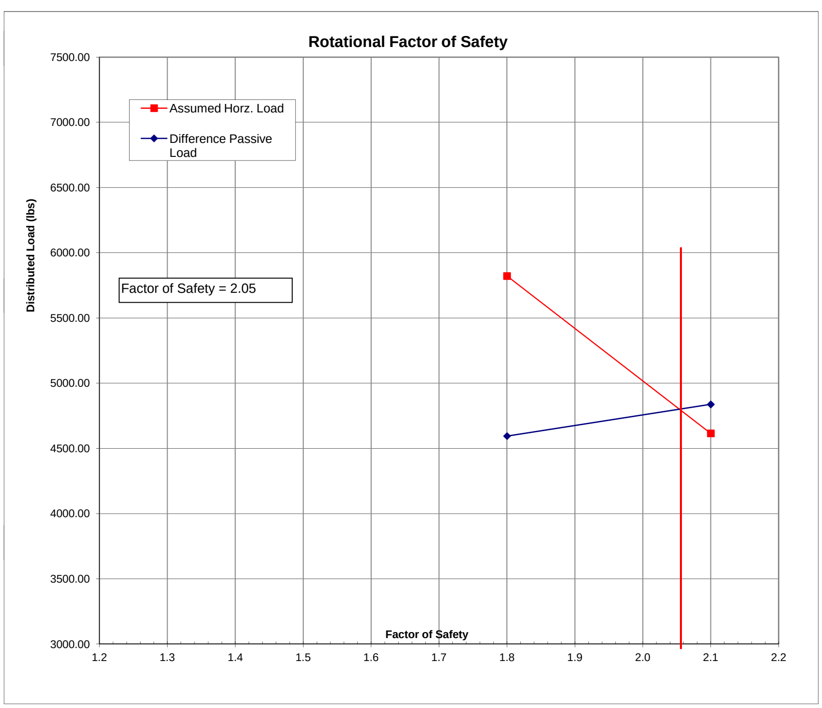
	(A)	(B)			(C)	(D)	
FOS	CWALSHT Passive Load (lbs)	SLOPE/W Passive Load (lbs)	Critical Failure Surface feet	Tip Elev feet	Difference Passive Load (A-B) (lbs)	Assumed Horizontal Distributed Load in CWALSHT (psf)	Resultant Distributed CWALSHT Load (D*(GSE-FSE)) (lbs)
2.1	7247.53	2409.83	-3.5	-16.4	4837.70	1300	4615.00
1.8	8023.93	3429.68	-3.5	-16.4	4594.25	1640	5822.00

Interpolate Correction Force at the resultant FOS

FOS = 2.05

Correction Force = 4797.12 lbs

Step 3: Plot the assumed horizontal load and the difference passive load versus factor of safety. The intersection of the two curves represents the actual factor of safety.



SHORT PILE/LONG PILE - HOMOGENEOUS SAND

VALUES OF SUBGRADE REACTION FOR SHEET PILES					
CONSTANTS OF HORIZONTAL SUBGRADE REACTION l_h				COEFFICIENT OF SUBGRADE REACTION EQUATIONS n_h	
SANDS				SANDS	
TERZAGHI'S THEORY				TERZAGHI'S THEORY	
	LOOSE	MEDIUM	DENSE		
l_h (Dry or Moist) (pci)	2.89	9.26	23.15	n_h (lbs/in^4)	$n_h=(l_h/D)$ (where D is embedment depth in inches)
l_h (Submerged) (pci)	1.85	4.63	15.05		

From EM 1110-2-2906, Design of Pile Foundations, 1991

(b) Linearly Increasing Modulus of Horizontal Subgrade Reaction

$$R\ \cancel{T} = \sqrt[5]{\frac{EI}{n_h}}$$

$L/R \le 2.0$ Short pile

$2.0 < L/R < 4.0$ Intermediate

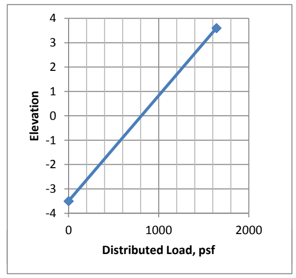
$L/R \ge 4.0$ Long pile

Enter l_h and moment of inertia of sheet pile. Vary penetration depth until D/R = 2.

Penetration, D, ft	Penetration, D, in	l_h, pci	n_H, lb/in^4	I, in^4/ft	EI, lb-in^2/ft	EI, lb-in^2/in	R, in	R, ft	D/R
20	240	2	0.01	84.2	2.68E+09	2.24E+08	121.82	10.15	1.97

VIII.B.--HORIZONTAL DISTRIBUTED LOAD

ELEVATION (FT)	DIST. LOAD (PSF)	Result. (LBS)
3.6	1640	
-3.5	0	5822



5822

RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

NET SOIL PRESSURES INCLUDE APPLIED HORIZONTAL DISTRIBUTED LOADS.

ELEV. (FT)	NET WATER (PSF)	<---LEFTSIDE---> PASSIVE (PSF)	ACTIVE (PSF)	<--RIGHTSIDE---> ACTIVE (PSF)	PASSIVE (PSF)
14.1	0	0	0	0	0
13.1	0	0	0	0	0
12.1	0	0	0	0	0
11.1	0	0	0	0	0
10.1	0	0	0	0	0
9.1	0	0	0	0	0
8.1	0	0	0	0	0
8	0	0	0	0	0
7.1	56	0	0	0	0
6.1	119	0	0	0	0
5.1	181	0	0	0	0
4.1	243	0	0	0	0
3.60+	275	0	0	0	0
-3.6	275	644	0	0	0
3.1	306	993	0	0	0
2.1	368	1084	0	0	0
1.1	431	1185	0	0	0
0.1	493	1177	0	0	0
0	499	1161	0	0	0
-0.9	555	1111	0	0	0
-1.60+	599	1169	0	0	0
-1.60-	599	1169	0	0	444
-1.9	618	1196	0	0	672
-2.6	661	1267	0	0	629
-2.9	680	1277	0	0	591
-3.5	718	1130	0	0	388
-3.57+	722	994	0	0	349
-3.57-	722	1096	0	0	349
-3.8	736	994	234	0	234
-3.9	736	973	285	0	211
-4.9	736	986	335	0	248
-5.9	736	976	411	0	267
-6.13+	736	969	408	0	607
-6.13-	736	969	408	0	346
-6.9	736	2222	2173	650	607
-7	736	2442	2415	753	645
-7.9	736	2428	1346	520	551
-8.9	736	1991	220	113	490
-9.6	736	2124	318	142	607
-9.9	736	2179	359	154	656
-10.9	736	2299	362	165	804
-11.9	736	2418	367	175	941
-12.9	736	2535	373	188	1075
-13.9	736	2646	380	192	1211
-14.9	736	2754	388	186	1348
-15.9	736	2862	397	192	1486
-16.4	736	2970	406	206	1623
-17.9	736	3077	416	220	1779

ELEV. (FT)	NET WATER (PSF)	LEFTSIDE PASSIVE (PSF)	RESULT. LEFTSIDE PASSIVE (LBS)
14.1	0	0	
13.1	0	0	
12.1	0	0	
11.1	0	0	
10.1	0	0	
9.1	0	0	
8.1	0	0	
8	0	0	
7.1	56	0	0
6.1	119	0	0
5.1	181	0	0
4.1	243	0	0
3.6	275	0	0
3.6	275	644	0
3.1	306	993	409.25
2.1	368	1084	1038.5
1.1	431	1185	1134.5
0.1	493	1177	1181
0	499	1161	116.9
-0.9	555	1111	1022.4
-1.6	599	1169	798
-1.6	599	1169	0
-1.9	618	1196	354.75
-2.6	661	1267	862.05
-2.9	680	1277	381.6
-3.5	718	1130	722.1
-3.57	722	994	74.34
-3.57	722	1096	0
-3.8	736	994	240.35
-3.9	736	973	98.35
-4.9	736	986	979.5
-5.9	736	976	981
-6.13	736	969	223.675
-6.13	736	969	0
-6.9	736	2222	1228.535
-7	736	2442	233.2
-7.9	736	2428	2191.5
-8.9	736	1991	2209.5
-9.6	736	2124	1440.25
-9.9	736	2179	645.45
-10.9	736	2299	2239
-11.9	736	2418	2358.5
-12.9	736	2535	2476.5
-13.9	736	2646	2590.5
-14.9	736	2754	2700
-15.9	736	2862	2808
-16.4	736	2970	1458
-17.9	736	3077	4535.25

PS WATER ELEVATION (FT)	CRITICAL SLIP SURF. ELEVATION (FT)	UNIT WEIGHT WATER (PCF)
-3.8	-3.5	64

RESULTANT WATER LOAD= 2.88 LBS

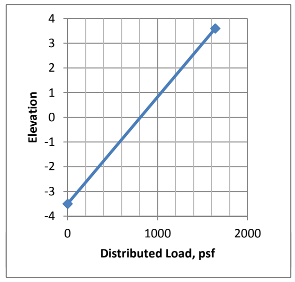
PASSIVE LOAD (SOIL)	8021.05
PASSIVE LOAD (SOIL+WATER)	8023.93
FOS =	1.8

IF THE PS WATER LEVEL IS BELOW THE CRITICAL SLIP SURFACE, USE PASSIVE LOAD (SOIL)

VIII.B.--HORIZONTAL DISTRIBUTED LOAD

ELEVATION (FT)	DIST. LOAD (PSF)	Result. (LBS)
3.6	1300	
-3.5	0	4615

4615



RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

NET SOIL PRESSURES INCLUDE APPLIED HORIZONTAL DISTRIBUTED LOADS.

	NET	<---LEFTSIDE--->		<--RIGHTSIDE--->	
ELEV. (FT)	WATER (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)
14.1	0	0	0	0	0
13.1	0	0	0	0	0
12.1	0	0	0	0	0
11.1	0	0	0	0	0
10.1	0	0	0	0	0
9.1	0	0	0	0	0
8.1	0	0	0	0	0
8	0	0	0	0	0
7.1	56	0	0	0	0
6.1	119	0	0	0	0
5.1	181	0	0	0	0
4.1	243	0	0	0	0
3.60+	275	0	0	0	0
-3.6	275	552	0	0	0
3.1	306	859	0	0	0
2.1	368	952	0	0	0
1.1	431	1054	0	0	0
0.1	493	1062	0	0	0
0	499	1050	0	0	0
-0.9	555	1019	0	0	0
-1.60+	599	1077	0	0	0
-1.60-	599	1077	0	0	381
-1.9	618	1105	0	0	577
-2.6	661	1174	0	0	543
-2.9	680	1186	0	0	512
-3.5	718	1068	0	0	340
-3.57+	722	955	0	0	307
-3.57-	722	1040	0	0	307
-3.8	736	955	234	0	209
-3.9	736	938	285	0	190
-4.9	736	953	335	0	224
-5.9	736	947	411	0	245
-6.13+	736	943	408	0	485
-6.13-	736	943	408	0	301
-6.9	736	1868	2173	650	485
-7	736	2032	2415	753	512
-7.9	736	2061	1346	520	454
-8.9	736	1764	220	113	431
-9.9	736	1915	359	154	572
-10.1	736	1936	360	156	598
-10.9	736	2018	362	165	702
-11.9	736	2120	367	175	823
-12.9	736	2221	373	188	940
-13.9	736	2319	380	192	1058
-14.9	736	2413	388	186	1177
-15.9	736	2507	397	192	1297
-16.39	736	2601	406	206	1417
-17.9	736	2694	416	220	1540

ELEV. (FT)	NET WATER (PSF)	LEFTSIDE PASSIVE (PSF)	RESULT. LEFTSIDE PASSIVE (LBS)
14.1	0	0	
13.1	0	0	
12.1	0	0	
11.1	0	0	
10.1	0	0	
9.1	0	0	
8.1	0	0	
8	0	0	
7.1	56	0	0
6.1	119	0	0
5.1	181	0	0
4.1	243	0	0
3.6	275	0	0
3.6	275	552	0
3.1	306	859	352.75
2.1	368	952	905.5
1.1	431	1054	1003
0.1	493	1062	1058
0	499	1050	105.6
-0.9	555	1019	931.05
-1.6	599	1077	733.6
-1.6	599	1077	0
-1.9	618	1105	327.3
-2.6	661	1174	797.65
-2.9	680	1186	354
-3.5	718	1068	676.2
-3.57	722	955	70.805
-3.57	722	1040	0
-3.8	736	955	229.425
-3.9	736	938	94.65
-4.9	736	953	945.5
-5.9	736	947	950
-6.13	736	943	217.35
-6.13	736	943	0
-6.9	736	1868	1082.235
-7	736	2032	195
-7.9	736	2061	1841.85
-8.9	736	1764	1912.5
-9.9	736	1915	1839.5
-10.1	736	1936	385.1
-10.9	736	2018	1581.6
-11.9	736	2120	2069
-12.9	736	2221	2170.5
-13.9	736	2319	2270
-14.9	736	2413	2366
-15.9	736	2507	2460
-16.39	736	2601	1251.46
-17.9	736	2694	3997.725

PS WATER ELEVATION (FT)	CRITICAL SLIP SURF. ELEVATION (FT)	UNIT WEIGHT WATER (PCF)
-3.8	-3.5	64

RESULTANT WATER LOAD= 2.88 LBS

PASSIVE LOAD (SOIL)	7244.65	
PASSIVE LOAD (SOIL+WATER)	7247.53	**IF THE PS WATER LEVEL IS BELOW THE CRITICAL SLIP SURFACE, USE PASSIVE LOAD (SOIL)**
FOS =	2.1	

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS
DATE: 3-OCTOBER-2013 TIME: 15:32:30

****
* INPUT DATA *
****

I.--HEADING
'REACH 1D
'WATER LEVEL 8'

II.--CONTROL
CANTILEVER WALL DESIGN
FACTOR OF SAFETY FOR ACTIVE PRESSURES = 1.00
FACTOR OF SAFETY FOR PASSIVE PRESSURES = 1.95

III.--WALL DATA
ELEVATION AT TOP OF WALL = 14.10 FT.

IV.--SURFACE POINT DATA

IV.A.--RIGHTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	-1.60
0.90	-1.60
7.50	-3.50
18.00	-5.40
40.00	-4.20
60.00	-3.70

IV.B.--LEFTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	3.60
1.00	3.60
8.30	3.30
35.10	-0.60
35.50	-2.30
41.10	-2.50
70.50	-3.80

V.--SOIL LAYER DATA

V.A.--RIGHTSIDE
LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH-ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH-ESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.

```
 94.00   94.00     0.00  400.00     0.00  400.00   -3.50   0.00   DEF  DEF
 94.00   94.00     0.00  170.00     0.00  170.00   -7.00   0.00   DEF  DEF
122.00  122.00    33.00    0.00    18.00    0.00  -50.00   0.00   DEF  DEF
102.00  102.00     0.00  685.00     0.00  622.00                  DEF  DEF

        V.B.--LEFTSIDE
           LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE  = DEFAULT
           LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

             ANGLE OF         ANGLE OF                    <-SAFETY->
 SAT.   MOIST  INTERNAL  COH-     WALL    ADH-    <--BOTTOM-->  <-FACTOR->
WGHT.   WGHT.  FRICTION  ESION  FRICTION  ESION   ELEV.  SLOPE  ACT. PASS.
(PCF)   (PCF)    (DEG)   (PSF)    (DEG)   (PSF)   (FT)  (FT/FT)
 94.00   94.00     0.00  400.00     0.00  400.00   -3.50   0.00   DEF  DEF
 94.00   94.00     0.00  170.00     0.00  170.00   -7.00   0.00   DEF  DEF
122.00  122.00    33.00    0.00    18.00    0.00  -50.00   0.00   DEF  DEF
102.00  102.00     0.00  685.00     0.00  622.00                  DEF  DEF

     VI.--WATER DATA
        UNIT WEIGHT          = 62.40 (PCF)
        RIGHTSIDE ELEVATION = 8.00 (FT)
        LEFTSIDE ELEVATION  = -3.80 (FT)
        NO SEEPAGE

    VII.--VERTICAL SURCHARGE LOADS
        NONE

   VIII.--HORIZONTAL LOADS

        VIII.A.--HORIZONTAL LINE LOADS
             NONE

        VIII.B.--HORIZONTAL DISTRIBUTED LOADS
           ELEVATION    DIST. LOAD
             (FT)         (PSF)
             3.60       1010.00
            -4.20          0.00
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PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
                  BY CLASSICAL METHODS
DATE: 3-OCTOBER-2013                         TIME: 15:32:33

                  ***************************
                  *   SOIL PRESSURES FOR   *
                  * CANTILEVER WALL DESIGN *
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****

I.--HEADING
'REACH 1D
'WATER LEVEL 8'

II.--SOIL PRESSURES

RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

NET SOIL PRESSURES INCLUDE APPLIED HORIZONTAL DISTRIBUTED LOADS.

				<------NET------>			
	NET	<---LEFTSIDE--->		(SOIL + WATER)		<--RIGHTSIDE--->	
ELEV.	WATER	PASSIVE	ACTIVE	ACTIVE	PASSIVE	ACTIVE	PASSIVE
(FT)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)
14.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
13.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7.1	56.2	0.0	0.0	56.2	56.2	0.0	0.0
6.1	118.6	0.0	0.0	118.6	118.6	0.0	0.0
5.1	181.0	0.0	0.0	181.0	181.0	0.0	0.0
4.1	243.4	0.0	0.0	243.4	243.4	0.0	0.0
3.6+	274.6	0.0	0.0	274.6	274.6	0.0	0.0
3.6-	274.6	410.3	0.0	874.3	1284.6	0.0	0.0
3.1	305.8	660.5	0.0	590.5	1251.0	0.0	0.0
2.1	368.2	741.8	0.0	442.1	1183.9	0.0	0.0
1.1	430.6	828.1	0.0	288.7	1116.8	0.0	0.0
0.1	493.0	918.9	0.0	130.8	1049.8	0.0	0.0
-0.9	555.4	1009.2	0.0	-26.5	982.7	0.0	0.0
-1.6+	599.0	1072.4	0.0	-136.7	935.7	0.0	0.0
-1.6-	599.0	1072.4	0.0	-136.7	1346.0	0.0	410.3
-1.9	617.8	1099.5	0.0	-183.9	1536.9	0.0	621.3
-2.6	661.4	1169.6	0.0	-301.0	1463.5	0.0	594.9
-2.9	680.2	1181.2	0.0	-332.7	1413.5	0.0	565.0
-3.5	717.6	1049.9	0.0	-241.7	1190.2	0.0	382.0
-3.6+	726.3	925.6	0.0	-160.1	1115.9	0.0	317.0
-3.6-	726.3	992.4	0.0	-160.1	1115.9	0.0	317.0
-3.8	736.3	925.6	168.9	-137.5	860.5	0.0	241.3
-3.9	736.3	909.6	215.2	-134.5	782.4	0.0	222.4
-4.2	736.3	927.5	206.6	-191.2	769.7	0.0	240.0
-4.9	736.3	931.5	252.0	-195.2	741.5	0.0	257.2
-5.9	736.3	932.8	314.0	-196.5	701.1	0.0	278.7
-6.2+	736.3	929.4	310.9	-193.0	891.7	0.0	574.7
-6.2-	736.3	929.4	310.9	-193.0	891.7	0.0	357.8
-6.9	736.3	1863.4	1854.2	-500.1	-543.2	627.0	574.7
-7.0	736.3	2037.7	2079.0	-569.7	-738.0	731.6	604.7

-7.9	736.3	2081.9	1177.2	-825.3	44.9	520.2	485.8
-8.9	736.3	1787.2	193.0	-911.6	969.1	139.3	425.7
-9.9	736.3	1953.2	317.7	-1028.0	1012.1	188.9	593.5
-10.9	736.3	2069.0	322.8	-1136.7	1161.4	196.0	747.9
-11.9	736.3	2184.7	329.5	-1243.2	1285.2	205.2	878.3
-12.9	736.3	2298.6	337.2	-1345.2	1399.2	217.1	1000.1
-13.9	736.3	2408.5	345.8	-1459.8	1516.4	212.4	1125.9
-14.9	736.3	2516.0	355.0	-1589.2	1634.3	190.5	1253.0
-15.9	736.3	2623.2	364.8	-1697.9	1752.5	189.0	1380.9
-16.9	736.3	2730.3	374.9	-1789.2	1869.7	204.8	1508.2
-17.9	736.3	2837.3	385.4	-1882.1	1996.3	218.8	1645.3
-18.9	736.3	2944.1	396.1	-1974.8	2145.6	233.0	1805.3
-19.9	736.3	3050.8	407.0	-2067.3	2301.3	247.2	1972.0
-20.9	736.3	3157.5	418.2	-2159.8	2446.2	261.4	2128.0
-21.9	736.3	3264.1	429.6	-2252.3	2586.9	275.5	2280.2
-22.9	736.3	3370.7	441.7	-2344.8	2728.1	289.6	2433.4
-23.9	736.3	3477.2	454.3	-2437.2	2869.0	303.7	2587.0
-24.9	736.3	3583.6	467.1	-2529.5	3009.9	317.8	2740.7
-25.9	736.3	3701.3	480.0	-2633.0	3151.0	332.0	2894.6
-26.9	736.3	3722.7	492.9	-2640.2	3292.1	346.2	3048.7
-27.9	736.3	3570.6	505.9	-2473.9	3433.3	360.4	3202.9
-28.9	736.3	3585.7	518.9	-2474.8	3574.6	374.6	3357.2
-29.9	736.3	3881.4	532.0	-2756.2	3715.9	388.9	3511.6
-30.9	736.3	4106.9	545.1	-2967.5	3857.3	403.1	3666.2
-31.9	736.3	4198.4	558.3	-3044.7	3999.0	417.4	3820.9
-32.9	736.3	4273.1	571.5	-3105.2	4139.1	431.7	3974.3
-33.9	736.3	4376.5	584.7	-3194.2	4275.8	445.9	4124.2
-34.9	736.3	4510.0	597.9	-3313.3	4411.8	460.5	4273.4
-35.9	736.3	4643.9	611.2	-3433.6	4549.8	473.9	4424.7
-36.9	736.3	4777.3	624.4	-3563.0	4688.4	478.0	4576.5
-37.9	736.3	4910.5	637.7	-3697.8	4826.7	476.3	4728.1
-38.9	736.3	5043.7	651.0	-3821.7	4965.0	485.7	4879.7
-39.9	736.3	5177.1	664.4	-3938.2	5103.3	502.5	5031.3
-40.9	736.3	5310.5	677.7	-4056.2	5241.6	518.0	5183.0
-41.9	736.3	5444.1	691.0	-4174.5	5379.9	533.2	5334.6
-42.9	736.3	5577.7	704.4	-4293.0	5518.2	548.4	5486.3
-43.9	736.3	5711.5	717.8	-4411.6	5656.6	563.6	5638.0
-44.9	736.3	5845.3	731.1	-4530.2	5794.9	578.8	5789.7
-45.9	736.3	5979.2	744.5	-4648.9	5933.4	594.0	5941.6
-46.9	736.3	6113.2	757.9	-4767.7	6070.8	609.2	6092.4
-47.9	736.3	6247.2	771.3	-4886.5	6205.4	624.4	6240.4
-48.9	736.3	6381.3	784.7	-4982.4	6473.4	662.6	6521.8

DATE: 3-OCTOBER-2013 TIME: 15:32:33

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*  SUMMARY OF RESULTS FOR  *
*  CANTILEVER WALL DESIGN  *
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I.--HEADING
'REACH 1D
'WATER LEVEL 8'

II.--SUMMARY

RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

WALL BOTTOM ELEV. (FT) : -16.44
PENETRATION (FT) : 14.84

MAX. BEND. MOMENT (LB-FT) : 1.8008E+04
AT ELEVATION (FT) : -8.07

MAX. SCALED DEFL. (LB-IN^3): 7.2199E+09
AT ELEVATION (FT) : 14.10

NOTE: DIVIDE SCALED DEFLECTION MODULUS OF
ELLASTICITY IN PSI TIMES PILE MOMENT
OF INERTIA IN IN^4 TO OBTAIN DEFLECTION
IN INCHES.

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHOREDOR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS
DATE: 3-OCTOBER-2013 TIME: 15:32:33

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* COMPLETE OF RESULTS FOR  *
*  CANTILEVER WALL DESIGN  *
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I.--HEADING
'REACH 1D
'WATER LEVEL 8'

II.--RESULTS

ELEVATION (FT)	BENDING MOMENT (LB-FT)	SHEAR (LB)	SCALED DEFLECTION (LB-IN^3)	NET PRESSURE (PSF)
14.10	0.0000E+00	0.	7.2199E+09	0.00

13.10	3.4925E-10	0.	6.8720E+09	0.00
12.10	3.4925E-10	0.	6.5240E+09	0.00
11.10	3.4925E-10	0.	6.1761E+09	0.00
10.10	3.4925E-10	0.	5.8282E+09	0.00
9.10	3.4925E-10	0.	5.4803E+09	0.00
8.10	3.4925E-10	0.	5.1323E+09	0.00
8.00	1.2671E-08	0.	5.0975E+09	0.00
7.10	7.5816E+00	25.	4.7844E+09	56.16
6.10	7.1334E+01	113.	4.4365E+09	118.56
5.10	2.5365E+02	262.	4.0887E+09	180.96
4.10	6.1692E+02	475.	3.7414E+09	243.36
3.60+	8.8591E+02	604.	3.5681E+09	274.56
3.60-	8.8591E+02	604.	3.5681E+09	874.30
3.10	1.2854E+03	970.	3.3952E+09	590.49
2.10	2.5261E+03	1487.	3.0514E+09	442.10
1.10	4.2081E+03	1852.	2.7119E+09	288.75
0.10	6.1782E+03	2062.	2.3797E+09	130.84
-0.90	8.2791E+03	2114.	2.0583E+09	-26.54
-1.60	9.7433E+03	2057.	1.8416E+09	-136.70
-1.90	1.0353E+04	2009.	1.7511E+09	-183.91
-2.60	1.1705E+04	1839.	1.5466E+09	-300.96
-2.90	1.2243E+04	1744.	1.4619E+09	-332.73
-3.50	1.3235E+04	1572.	1.2982E+09	-241.69
-3.64	1.3450E+04	1544.	1.2616E+09	-160.07
-3.80	1.3697E+04	1520.	1.2195E+09	-137.45
-3.90	1.3849E+04	1506.	1.1937E+09	-134.47
-4.20	1.4294E+04	1457.	1.1178E+09	-191.21
-4.90	1.5267E+04	1322.	9.4942E+08	-195.20
-5.90	1.6491E+04	1126.	7.3150E+08	-196.51
-6.17	1.6785E+04	1074.	6.7800E+08	-193.04
-6.90	1.7493E+04	820.	5.4205E+08	-500.07
-7.00	1.7572E+04	767.	5.2474E+08	-569.75
-7.90	1.7997E+04	139.	3.8276E+08	-825.35
-8.90	1.7709E+04	-730.	2.5445E+08	-911.56
-9.90	1.6504E+04	-1699.	1.5661E+08	-1028.01
-10.39	1.5539E+04	-2220.	1.1900E+08	-1081.62
-10.90	1.4285E+04	-2706.	8.7136E+07	-838.78
-11.90	1.1240E+04	-3305.	4.2230E+07	-359.62
-12.90	7.8342E+03	-3425.	1.6693E+07	119.54
-13.90	4.5484E+03	-3066.	4.7114E+06	598.71
-14.90	1.8613E+03	-2228.	6.7535E+05	1077.87
-15.90	2.5206E+02	-911.	1.0782E+04	1557.03
-16.44	0.0000E+00	0.	0.0000E+00	1815.75

NOTE: DIVIDE SCALED DEFLECTION MODULUS OF
ELLASTICITY IN PSI TIMES PILE MOMENT
OF INERTIA IN IN^4 TO OBTAIN DEFLECTION
IN INCHES.

III.--WATER AND SOIL PRESSURES

		<-------------SOIL PRESSURES-------------->			
	WATER	<----LEFTSIDE----->		<---RIGHTSIDE---->	
ELEVATION	PRESSURE	PASSIVE	ACTIVE	ACTIVE	PASSIVE

(FT)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)
14.10	0.	0.	0.	0.	0.
13.10	0.	0.	0.	0.	0.
12.10	0.	0.	0.	0.	0.
11.10	0.	0.	0.	0.	0.
10.10	0.	0.	0.	0.	0.
9.10	0.	0.	0.	0.	0.
8.10	0.	0.	0.	0.	0.
8.00	0.	0.	0.	0.	0.
7.10	56.	0.	0.	0.	0.
6.10	119.	0.	0.	0.	0.
5.10	181.	0.	0.	0.	0.
4.10	243.	0.	0.	0.	0.
3.60+	275.	0.	0.	0.	0.
3.60-	275.	410.	0.	0.	0.
3.10	306.	661.	0.	0.	0.
2.10	368.	742.	0.	0.	0.
1.10	431.	828.	0.	0.	0.
0.10	493.	919.	0.	0.	0.
-0.90	555.	1009.	0.	0.	0.
-1.60+	599.	1072.	0.	0.	0.
-1.60-	599.	1072.	0.	0.	410.
-1.90	618.	1099.	0.	0.	621.
-2.60	661.	1170.	0.	0.	595.
-2.90	680.	1181.	0.	0.	565.
-3.50	718.	1050.	0.	0.	382.
-3.64+	726.	926.	0.	0.	317.
-3.64-	726.	992.	0.	0.	317.
-3.80	736.	926.	169.	0.	241.
-3.90	736.	910.	215.	0.	222.
-4.20	736.	928.	207.	0.	240.
-4.90	736.	932.	252.	0.	257.
-5.90	736.	933.	314.	0.	279.
-6.17+	736.	929.	311.	0.	575.
-6.17-	736.	929.	311.	0.	358.
-6.90	736.	1863.	1854.	627.	575.
-7.00	736.	2038.	2079.	732.	605.
-7.90	736.	2082.	1177.	520.	486.
-8.90	736.	1787.	193.	139.	426.
-9.90	736.	1953.	318.	189.	594.
-10.39	736.	2010.	320.	192.	670.
-10.90	736.	2069.	323.	196.	748.
-11.90	736.	2185.	329.	205.	878.
-12.90	736.	2299.	337.	217.	1000.
-13.90	736.	2409.	346.	212.	1126.
-14.90	736.	2516.	355.	191.	1253.
-15.90	736.	2623.	365.	189.	1381.
-16.44	736.	2730.	375.	205.	1508.
-17.90	736.	2837.	385.	219.	1645.

```
'REACH 1C UNDRAINED ROTATIONAL STABILITY
CONTROL  CANTILEVER  DESIGN  1.00  1.80
WALL   14.1
SURFACE RIGHTSIDE   7    0   -1.6
                0.9   -1.6
                4.7   -3
                7.5   -3.5
                18   -5.4
                40   -4.2
                100   -4.2
SURFACE LEFTSIDE   8    0    3.6
                1    3.6
                8.3    3.3
                35.1   -0.6
                35.5   -2.3
                41.1   -2.5
                70.5   -3.8
                100   -3.8
SOIL RIGHTSIDE  STRENGTHS   3
   94    94    0    400    0    400   -3.5   0
   94    94    0    170    0    170   -7   0
   122    122    33    0    18    0
SOIL LEFTSIDE  STRENGTHS   4
   110    110    0    580    0    534    0   0
   94    94    0    400    0    400   -3.5   0
   94    94    0    170    0    170   -7   0
   122    122    33    0    18    0
WATER ELEVATIONS   62.4    8   -3.8
HORIZONTAL DISTRIBUTED   2    3.6    1700   -3.5    0
FINISHED
```

```
'REACH 1C UNDRAINED ROTATIONAL STABILITY
CONTROL  CANTILEVER  DESIGN  1.00  2.00
WALL   14.1
SURFACE RIGHTSIDE   7    0   -1.6
            0.9   -1.6
            4.7   -3
            7.5   -3.5
            18   -5.4
            40   -4.2
            100   -4.2
SURFACE LEFTSIDE   8    0    3.6
            1    3.6
            8.3    3.3
            35.1   -0.6
            35.5   -2.3
            41.1   -2.5
            70.5   -3.8
            100   -3.8
SOIL RIGHTSIDE  STRENGTHS   3
  94    94    0    400    0    400   -3.5   0
  94    94    0    170    0    170   -7   0
  122    122    33    0    18    0
SOIL LEFTSIDE  STRENGTHS   4
  110    110    0    580    0    534    0   0
  94    94    0    400    0    400   -3.5   0
  94    94    0    170    0    170   -7   0
  122    122    33    0    18    0
WATER ELEVATIONS   62.4    8   -4
HORIZONTAL DISTRIBUTED   2    3.6    1100   -3.5    0
FINISHED
```

```
PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
                    BY CLASSICAL METHODS
DATE: 3-OCTOBER-2013                         TIME: 15:06:21

                     ****************
                     *  INPUT DATA  *
                     ****************

   I.--HEADING
   'REACH 1C UNDRAINED ROTATIONAL STABILITY

   II.--CONTROL
     CANTILEVER WALL DESIGN
     FACTOR OF SAFETY FOR ACTIVE PRESSURES  = 1.00
     FACTOR OF SAFETY FOR PASSIVE PRESSURES = 2.10

  III.--WALL DATA
     ELEVATION AT TOP OF WALL    = 14.10 FT.

   IV.--SURFACE POINT DATA

      IV.A.--RIGHTSIDE
        DIST. FROM     ELEVATION
        WALL (FT)        (FT)
           0.00        -1.60
           0.90        -1.60
           4.70        -3.00
           7.50        -3.50
          18.00        -5.40
          40.00        -4.20
         100.00        -4.20

      IV.B.--LEFTSIDE
        DIST. FROM     ELEVATION
        WALL (FT)        (FT)
           0.00         3.60
           1.00         3.60
           8.30         3.30
          35.10        -0.60
          35.50        -2.30
          41.10        -2.50
          70.50        -3.80
         100.00        -3.80

   V.--SOIL LAYER DATA

      V.A.--RIGHTSIDE
        LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE  = DEFAULT
        LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

          ANGLE OF        ANGLE OF                    <-SAFETY->
 SAT.   MOIST  INTERNAL  COH-    WALL    ADH-    <--BOTTOM-->  <-FACTOR->
WGHT.   WGHT.  FRICTION  ESION  FRICTION  ESION   ELEV.  SLOPE  ACT. PASS.
```

(PCF)	(PCF)	(DEG)	(PSF)	(DEG)	(PSF)	(FT)	(FT/FT)		
94.00	94.00	0.00	400.00	0.00	400.00	-3.50	0.00	DEF	DEF
94.00	94.00	0.00	170.00	0.00	170.00	-7.00	0.00	DEF	DEF
122.00	122.00	33.00	0.00	18.00	0.00			DEF	DEF

V.B.--LEFTSIDE

LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = DEFAULT

LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH- ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH- ESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.
110.00	110.00	0.00	580.00	0.00	534.00	0.00	0.00	DEF	DEF
94.00	94.00	0.00	400.00	0.00	400.00	-3.50	0.00	DEF	DEF
94.00	94.00	0.00	170.00	0.00	170.00	-7.00	0.00	DEF	DEF
122.00	122.00	33.00	0.00	18.00	0.00			DEF	DEF

VI.--WATER DATA

UNIT WEIGHT = 62.40 (PCF)

RIGHTSIDE ELEVATION = 8.00 (FT)

LEFTSIDE ELEVATION = -3.80 (FT)

NO SEEPAGE

VII.--VERTICAL SURCHARGE LOADS

NONE

VIII.--HORIZONTAL LOADS

VIII.A.--HORIZONTAL LINE LOADS

NONE

VIII.B.--HORIZONTAL DISTRIBUTED LOADS

ELEVATION (FT)	DIST. LOAD (PSF)
3.60	1300.00
-3.50	0.00

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 3-OCTOBER-2013 TIME: 15:06:23

****
*   SOIL PRESSURES FOR   *
* CANTILEVER WALL DESIGN *

****

I.--HEADING
'REACH 1C UNDRAINED ROTATIONAL STABILITY

II.--SOIL PRESSURES

RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

NET SOIL PRESSURES INCLUDE APPLIED HORIZONTAL DISTRIBUTED LOADS.

	NET	<---LEFTSIDE--->		<------NET------> (SOIL + WATER)		<--RIGHTSIDE--->	
ELEV. (FT)	WATER (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)
14.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
13.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7.1	56.2	0.0	0.0	56.2	56.2	0.0	0.0
6.1	118.6	0.0	0.0	118.6	118.6	0.0	0.0
5.1	181.0	0.0	0.0	181.0	181.0	0.0	0.0
4.1	243.4	0.0	0.0	243.4	243.4	0.0	0.0
3.6+	274.6	0.0	0.0	274.6	274.6	0.0	0.0
3.6-	274.6	552.4	0.0	1022.2	1574.6	0.0	0.0
3.1	305.8	859.2	0.0	655.0	1514.2	0.0	0.0
2.1	368.2	952.4	0.0	441.1	1393.5	0.0	0.0
1.1	430.6	1053.9	0.0	218.9	1272.8	0.0	0.0
0.1	493.0	1061.9	0.0	90.2	1152.1	0.0	0.0
0.0	499.2	1050.0	0.0	90.0	1140.0	0.0	0.0
-0.9	555.4	1018.5	0.0	12.9	1031.4	0.0	0.0
-1.6+	599.0	1077.2	0.0	-130.3	946.9	0.0	0.0
-1.6-	599.0	1077.2	0.0	-130.3	1327.9	0.0	381.0
-1.9	617.8	1104.7	0.0	-194.0	1487.7	0.0	577.0
-2.6	661.4	1173.8	0.0	-347.6	1369.6	0.0	543.4
-2.9	680.2	1186.4	0.0	-396.4	1301.6	0.0	511.6
-3.5	717.6	1068.0	0.0	-350.4	1057.1	0.0	339.5
-3.6+	722.2	955.0	0.0	-275.2	1029.4	0.0	307.2
-3.6-	722.2	1040.0	0.0	-275.2	1029.4	0.0	307.2
-3.8	736.3	955.0	234.0	-218.6	711.5	0.0	209.1
-3.9	736.3	937.7	285.4	-201.4	640.5	0.0	189.6
-4.9	736.3	952.9	334.6	-216.6	625.9	0.0	224.2
-5.9	736.3	947.0	410.8	-210.7	570.3	0.0	244.8
-6.1+	736.3	943.1	408.2	-206.8	721.2	0.0	485.4
-6.1-	736.3	943.1	408.2	-206.8	721.2	0.0	300.8
-6.9	736.3	1867.5	2172.9	-481.1	-951.2	650.1	485.4
-7.0	736.3	2032.3	2414.9	-543.1	-1166.9	753.0	511.6
-7.9	736.3	2060.9	1346.0	-804.8	-156.0	519.8	453.7

-8.9	736.3	1763.9	219.7	-914.6	948.0	113.0	431.4
-9.9	736.3	1915.3	359.1	-1025.0	948.9	154.1	571.7
-10.9	736.3	2017.8	362.1	-1117.0	1076.6	164.5	702.4
-11.9	736.3	2120.4	366.9	-1208.7	1192.8	175.3	823.4
-12.9	736.3	2221.4	373.1	-1297.0	1303.1	188.1	939.9
-13.9	736.3	2318.5	380.4	-1390.3	1414.1	191.9	1058.2
-14.9	736.3	2412.9	388.4	-1490.1	1525.2	186.5	1177.4
-15.9	736.3	2506.8	397.1	-1578.6	1636.4	191.9	1297.2
-16.9	736.3	2600.6	406.3	-1657.8	1747.0	206.5	1416.9
-17.9	736.3	2694.3	415.9	-1737.9	1860.9	220.1	1540.4
-18.9	736.3	2787.9	425.8	-1817.8	1993.3	233.8	1682.8
-19.9	736.3	2881.5	436.0	-1897.5	2140.2	247.7	1839.8
-20.9	736.3	2974.9	446.3	-1977.0	2277.9	261.6	1987.9
-21.9	736.3	3068.3	457.1	-2056.5	2408.1	275.6	2128.8
-22.9	736.3	3160.9	468.6	-2135.0	2539.2	289.6	2271.5
-23.9	736.3	3260.2	480.8	-2220.1	2669.9	303.7	2414.4
-24.9	736.3	3371.2	493.2	-2317.0	2800.6	317.8	2557.4
-25.9	736.3	3482.7	505.7	-2414.4	2931.3	332.0	2700.6
-26.9	736.3	3570.1	518.2	-2487.6	3062.0	346.2	2843.9
-27.9	736.3	3501.6	530.8	-2404.9	3192.8	360.4	2987.4
-28.9	736.3	3392.0	543.5	-2281.0	3323.7	374.6	3130.9
-29.9	736.3	3551.2	556.3	-2426.0	3454.5	388.9	3274.5
-30.9	736.3	3810.8	569.0	-2671.4	3585.4	403.1	3418.1
-31.9	736.3	3950.8	581.9	-2797.1	3716.3	417.4	3561.9
-32.9	736.3	4033.3	594.7	-2865.3	3847.8	431.7	3706.2
-33.9	736.3	4114.7	607.6	-2932.5	3974.7	446.0	3846.0
-34.9	736.3	4224.2	620.5	-3027.4	4095.2	460.5	3979.4
-35.9	736.3	4349.9	633.5	-3139.6	4218.4	473.9	4115.6
-36.9	736.3	4474.5	646.5	-3260.2	4344.9	478.0	4255.0
-37.9	736.3	4598.8	659.5	-3386.2	4470.6	476.3	4393.7
-38.9	736.3	4723.1	672.5	-3501.1	4596.0	485.7	4532.2
-39.9	736.3	4847.5	685.5	-3608.6	4721.5	502.5	4670.7
-40.9	736.3	4971.9	698.5	-3717.6	4847.0	518.0	4809.2
-41.9	736.3	5096.4	711.6	-3826.9	4972.4	533.2	4947.7
-42.9	736.3	5221.1	724.7	-3936.3	5097.9	548.4	5086.3
-43.9	736.3	5345.8	737.8	-4045.8	5223.4	563.6	5224.8
-44.9	736.3	5470.5	750.9	-4155.4	5348.8	578.8	5363.4
-45.9	736.3	5595.4	764.0	-4265.0	5474.3	594.0	5501.9
-46.9	736.3	5720.3	777.1	-4374.8	5599.7	609.2	5640.5
-47.9	736.3	5845.3	790.2	-4484.5	5725.2	624.4	5779.1
-48.9	736.3	5970.3	803.5	-4594.4	5850.5	639.6	5917.7

****
* SUMMARY OF RESULTS FOR *
* CANTILEVER WALL DESIGN *
****

I.--HEADING
'REACH 1C UNDRAINED ROTATIONAL STABILITY

II.--SUMMARY

RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

WALL BOTTOM ELEV. (FT)   :   -16.39
PENETRATION (FT)   :   14.79

MAX. BEND. MOMENT (LB-FT) : 1.7536E+04
AT ELEVATION (FT)   :   -7.90

MAX. SCALED DEFL. (LB-IN^3): 7.0270E+09
AT ELEVATION (FT)   :   14.10

NOTE: DIVIDE SCALED DEFLECTION MODULUS OF
ELLASTICITY IN PSI TIMES PILE MOMENT
OF INERTIA IN IN^4 TO OBTAIN DEFLECTION
IN INCHES.

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHOREDOR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS
DATE: 3-OCTOBER-2013   TIME: 15:06:24

****
* COMPLETE OF RESULTS FOR *
* CANTILEVER WALL DESIGN *
****

I.--HEADING
'REACH 1C UNDRAINED ROTATIONAL STABILITY

II.--RESULTS

ELEVATION (FT)	BENDING MOMENT (LB-FT)	SHEAR (LB)	SCALED DEFLECTION (LB-IN^3)	NET PRESSURE (PSF)
14.10	0.0000E+00	0.	7.0270E+09	0.00
13.10	-3.4925E-10	0.	6.6861E+09	0.00
12.10	-3.4925E-10	0.	6.3452E+09	0.00
11.10	-3.4925E-10	0.	6.0043E+09	0.00

10.10	-3.4925E-10	0.	5.6634E+09	0.00
9.10	-3.4925E-10	0.	5.3225E+09	0.00
8.10	-3.4925E-10	0.	4.9816E+09	0.00
8.00	4.8431E-09	0.	4.9475E+09	0.00
7.10	7.5816E+00	25.	4.6406E+09	56.16
6.10	7.1334E+01	113.	4.2998E+09	118.56
5.10	2.5365E+02	262.	3.9590E+09	180.96
4.10	6.1692E+02	475.	3.6188E+09	243.36
3.60+	8.8591E+02	604.	3.4490E+09	274.56
3.60-	8.8591E+02	604.	3.4490E+09	1022.18
3.10	1.3004E+03	1023.	3.2796E+09	655.02
2.10	2.6156E+03	1571.	2.9428E+09	441.07
1.10	4.3705E+03	1901.	2.6105E+09	218.91
0.10	6.3598E+03	2056.	2.2859E+09	90.24
0.00	6.5659E+03	2065.	2.2539E+09	90.05
-0.90	8.4504E+03	2111.	1.9722E+09	12.88
-1.60	9.9198E+03	2070.	1.7611E+09	-130.25
-1.90	1.0534E+04	2022.	1.6731E+09	-193.97
-2.60	1.1889E+04	1832.	1.4744E+09	-347.61
-2.90	1.2422E+04	1720.	1.3923E+09	-396.37
-3.50	1.3386E+04	1496.	1.2338E+09	-350.41
-3.57	1.3496E+04	1473.	1.2147E+09	-275.21
-3.80	1.3822E+04	1417.	1.1577E+09	-218.64
-3.90	1.3963E+04	1396.	1.1328E+09	-201.40
-4.90	1.5256E+04	1187.	8.9743E+08	-216.60
-5.90	1.6336E+04	974.	6.8839E+08	-210.71
-6.13	1.6557E+04	925.	6.4376E+08	-206.82
-6.90	1.7179E+04	661.	5.0755E+08	-481.07
-7.00	1.7243E+04	610.	4.9108E+08	-543.06
-7.90	1.7536E+04	3.	3.5632E+08	-804.77
-8.90	1.7119E+04	-856.	2.3529E+08	-914.62
-9.90	1.5787E+04	-1826.	1.4370E+08	-1024.95
-10.10	1.5400E+04	-2034.	1.2867E+08	-1043.44
-10.90	1.3478E+04	-2729.	7.9248E+07	-696.00
-11.90	1.0474E+04	-3207.	3.7987E+07	-261.19
-12.90	7.2085E+03	-3251.	1.4787E+07	173.62
-13.90	4.1167E+03	-2860.	4.0686E+06	608.44
-14.90	1.6333E+03	-2034.	5.5142E+05	1043.25
-15.90	1.9309E+02	-774.	6.7434E+03	1478.06
-16.39	0.0000E+00	0.	0.0000E+00	1690.39

NOTE: DIVIDE SCALED DEFLECTION MODULUS OF ELLASTICITY IN PSI TIMES PILE MOMENT OF INERTIA IN IN^4 TO OBTAIN DEFLECTION IN INCHES.

III.--WATER AND SOIL PRESSURES

		<-------------SOIL PRESSURES-------------->			
	WATER	<----LEFTSIDE----->		<---RIGHTSIDE---->	
ELEVATION	PRESSURE	PASSIVE	ACTIVE	ACTIVE	PASSIVE
(FT)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)
14.10	0.	0.	0.	0.	0.
13.10	0.	0.	0.	0.	0.

12.10	0.	0.	0.	0.	0.
11.10	0.	0.	0.	0.	0.
10.10	0.	0.	0.	0.	0.
9.10	0.	0.	0.	0.	0.
8.10	0.	0.	0.	0.	0.
8.00	0.	0.	0.	0.	0.
7.10	56.	0.	0.	0.	0.
6.10	119.	0.	0.	0.	0.
5.10	181.	0.	0.	0.	0.
4.10	243.	0.	0.	0.	0.
3.60+	275.	0.	0.	0.	0.
3.60-	275.	552.	0.	0.	0.
3.10	306.	859.	0.	0.	0.
2.10	368.	952.	0.	0.	0.
1.10	431.	1054.	0.	0.	0.
0.10	493.	1062.	0.	0.	0.
0.00	499.	1050.	0.	0.	0.
-0.90	555.	1019.	0.	0.	0.
-1.60+	599.	1077.	0.	0.	0.
-1.60-	599.	1077.	0.	0.	381.
-1.90	618.	1105.	0.	0.	577.
-2.60	661.	1174.	0.	0.	543.
-2.90	680.	1186.	0.	0.	512.
-3.50	718.	1068.	0.	0.	340.
-3.57+	722.	955.	0.	0.	307.
-3.57-	722.	1040.	0.	0.	307.
-3.80	736.	955.	234.	0.	209.
-3.90	736.	938.	285.	0.	190.
-4.90	736.	953.	335.	0.	224.
-5.90	736.	947.	411.	0.	245.
-6.13+	736.	943.	408.	0.	485.
-6.13-	736.	943.	408.	0.	301.
-6.90	736.	1868.	2173.	650.	485.
-7.00	736.	2032.	2415.	753.	512.
-7.90	736.	2061.	1346.	520.	454.
-8.90	736.	1764.	220.	113.	431.
-9.90	736.	1915.	359.	154.	572.
-10.10	736.	1936.	360.	156.	598.
-10.90	736.	2018.	362.	165.	702.
-11.90	736.	2120.	367.	175.	823.
-12.90	736.	2221.	373.	188.	940.
-13.90	736.	2319.	380.	192.	1058.
-14.90	736.	2413.	388.	186.	1177.
-15.90	736.	2507.	397.	192.	1297.
-16.39	736.	2601.	406.	206.	1417.
-17.90	736.	2694.	416.	220.	1540.

```
'REACH 1C UNDRAINED ROTATIONAL STABILITY
CONTROL  CANTILEVER  DESIGN  1.00  2.10
WALL   14.1
SURFACE RIGHTSIDE   7    0   -1.6
            0.9   -1.6
            4.7   -3
            7.5   -3.5
            18   -5.4
            40   -4.2
            100   -4.2
SURFACE LEFTSIDE   8    0    3.6
            1    3.6
            8.3    3.3
            35.1   -0.6
            35.5   -2.3
            41.1   -2.5
            70.5   -3.8
            100   -3.8
SOIL RIGHTSIDE  STRENGTHS   3
  94    94    0    400    0    400   -3.5   0
  94    94    0    170    0    170   -7   0
  122    122    33    0    18    0
SOIL LEFTSIDE  STRENGTHS   4
  110    110    0    580    0    534    0   0
  94    94    0    400    0    400   -3.5   0
  94    94    0    170    0    170   -7   0
  122    122    33    0    18    0
WATER ELEVATIONS   62.4    8   -3.8
HORIZONTAL DISTRIBUTED   2    3.6    1300   -3.5    0
FINISHED
```

```
'REACH 1C UNDRAINED ROTATIONAL STABILITY
CONTROL  CANTILEVER  DESIGN  1.00  1.60
WALL   14.1
SURFACE RIGHTSIDE   7    0   -1.6
            0.9   -1.6
            4.7   -3
            7.5   -3.5
            18   -5.4
            40   -4.2
            100   -4.2
SURFACE LEFTSIDE   8    0    3.6
            1    3.6
            8.3    3.3
            35.1   -0.6
            35.5   -2.3
            41.1   -2.5
            70.5   -3.8
            100   -3.8
SOIL RIGHTSIDE  STRENGTHS   3
  94    94    0    400    0    400   -3.5   0
  94    94    0    170    0    170   -7   0
  122    122    33    0    18    0
SOIL LEFTSIDE  STRENGTHS   4
  110    110    0    580    0    534    0   0
  94    94    0    400    0    400   -3.5   0
  94    94    0    170    0    170   -7   0
  122    122    33    0    18    0
WATER ELEVATIONS   62.4    8   -3.8
HORIZONTAL DISTRIBUTED   2    3.6    1620   -5.4    0
FINISHED
```

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS
DATE: 3-OCTOBER-2013 TIME: 14:58:50

****
* INPUT DATA *
****

I.--HEADING
'REACH 1C UNDRAINED ROTATIONAL STABILITY

II.--CONTROL
CANTILEVER WALL DESIGN
FACTOR OF SAFETY FOR ACTIVE PRESSURES = 1.00
FACTOR OF SAFETY FOR PASSIVE PRESSURES = 1.60

III.--WALL DATA
ELEVATION AT TOP OF WALL = 14.10 FT.

IV.--SURFACE POINT DATA

IV.A.--RIGHTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	-1.60
0.90	-1.60
4.70	-3.00
7.50	-3.50
18.00	-5.40
40.00	-4.20
100.00	-4.20

IV.B.--LEFTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	3.60
1.00	3.60
8.30	3.30
35.10	-0.60
35.50	-2.30
41.10	-2.50
70.50	-3.80
100.00	-3.80

V.--SOIL LAYER DATA

V.A.--RIGHTSIDE
LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

SAT. WGHT.	MOIST WGHT.	ANGLE OF INTERNAL FRICTION	COH-ESION	ANGLE OF WALL FRICTION	ADH-ESION	<--BOTTOM--> ELEV.	SLOPE	<-SAFETY-> <-FACTOR-> ACT.	PASS.

(PCF)	(PCF)	(DEG)	(PSF)	(DEG)	(PSF)	(FT)	(FT/FT)		
94.00	94.00	0.00	400.00	0.00	400.00	-3.50	0.00	DEF	DEF
94.00	94.00	0.00	170.00	0.00	170.00	-7.00	0.00	DEF	DEF
122.00	122.00	33.00	0.00	18.00	0.00			DEF	DEF

V.B.--LEFTSIDE

LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH-ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH-ESION (PSF)	<--BOTTOM--> ELEV. (FT)	<--BOTTOM--> SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.
110.00	110.00	0.00	580.00	0.00	534.00	0.00	0.00	DEF	DEF
94.00	94.00	0.00	400.00	0.00	400.00	-3.50	0.00	DEF	DEF
94.00	94.00	0.00	170.00	0.00	170.00	-7.00	0.00	DEF	DEF
122.00	122.00	33.00	0.00	18.00	0.00			DEF	DEF

VI.--WATER DATA

UNIT WEIGHT = 62.40 (PCF)
RIGHTSIDE ELEVATION = 8.00 (FT)
LEFTSIDE ELEVATION = -3.80 (FT)
NO SEEPAGE

VII.--VERTICAL SURCHARGE LOADS

NONE

VIII.--HORIZONTAL LOADS

VIII.A.--HORIZONTAL LINE LOADS

NONE

VIII.B.--HORIZONTAL DISTRIBUTED LOADS

ELEVATION (FT)	DIST. LOAD (PSF)
3.60	1620.00
-5.40	0.00

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 3-OCTOBER-2013 TIME: 14:59:42

****
*   SOIL PRESSURES FOR   *
* CANTILEVER WALL DESIGN *

****

I.--HEADING
'REACH 1C UNDRAINED ROTATIONAL STABILITY

II.--SOIL PRESSURES

RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

NET SOIL PRESSURES INCLUDE APPLIED HORIZONTAL DISTRIBUTED LOADS.

				<------NET------>			
	NET	<---LEFTSIDE--->		(SOIL + WATER)		<--RIGHTSIDE--->	
ELEV.	WATER	PASSIVE	ACTIVE	ACTIVE	PASSIVE	ACTIVE	PASSIVE
(FT)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)
14.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
13.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7.1	56.2	0.0	0.0	56.2	56.2	0.0	0.0
6.1	118.6	0.0	0.0	118.6	118.6	0.0	0.0
5.1	181.0	0.0	0.0	181.0	181.0	0.0	0.0
4.1	243.4	0.0	0.0	243.4	243.4	0.0	0.0
3.6+	274.6	0.0	0.0	274.6	274.6	0.0	0.0
3.6-	274.6	725.0	0.0	1169.6	1894.6	0.0	0.0
3.1	305.8	1110.5	0.0	725.2	1835.8	0.0	0.0
2.1	368.2	1199.3	0.0	518.9	1718.2	0.0	0.0
1.1	430.6	1299.3	0.0	301.2	1600.6	0.0	0.0
0.1	493.0	1277.0	0.0	206.0	1483.0	0.0	0.0
0.0	499.2	1258.3	0.0	212.9	1471.2	0.0	0.0
-0.9	555.4	1191.4	0.0	174.0	1365.4	0.0	0.0
-1.6+	599.0	1248.7	0.0	34.3	1283.0	0.0	0.0
-1.6-	599.0	1248.7	0.0	34.3	1783.0	0.0	500.0
-1.8	609.2	1263.8	0.0	0.0	1902.3	0.0	638.5
-1.9	617.8	1276.4	0.0	-28.7	2002.1	0.0	754.3
-2.6	661.4	1347.6	0.0	-182.1	1869.2	0.0	703.8
-2.9	680.2	1355.7	0.0	-225.5	1789.9	0.0	659.7
-3.5	717.6	1183.5	0.0	-123.9	1489.1	0.0	429.5
-3.6+	722.2	1027.0	0.0	-35.0	1437.5	0.0	386.7
-3.6-	722.2	1144.8	0.0	-35.0	1437.5	0.0	386.7
-3.8	736.3	1027.0	234.9	-2.7	1045.6	0.0	256.2
-3.9	736.3	1003.1	285.9	3.2	950.3	0.0	229.8
-4.9	736.3	1015.3	336.4	-189.0	757.9	0.0	268.0
-5.4	736.3	1001.2	387.1	-264.9	628.8	0.0	279.5
-5.9	736.3	999.9	412.7	-263.5	611.6	0.0	287.9
-6.1+	736.3	994.5	404.6	-258.2	891.7	0.0	730.3
-6.1-	736.3	994.5	404.6	-258.2	891.7	0.0	389.6
-6.9	736.3	2580.3	2174.9	-1193.9	-708.3	650.1	730.3

-7.0	736.3	2856.7	2416.2	-1367.5	-899.6	753.0	780.3
-7.9	736.3	2796.1	1346.0	-1540.0	42.2	519.8	651.9
-8.9	736.3	2216.2	219.7	-1366.9	1067.5	113.0	550.9
-9.9	736.3	2442.5	359.1	-1552.1	1120.1	154.1	742.9
-10.9	736.3	2580.7	362.1	-1679.8	1282.4	164.5	908.2
-11.9	736.3	2717.9	366.9	-1806.2	1429.9	175.3	1060.5
-12.9	736.3	2850.1	373.1	-1925.8	1575.2	188.1	1212.0
-13.9	736.3	2975.8	380.4	-2047.5	1722.4	191.9	1366.4
-14.9	736.3	3098.7	388.4	-2175.9	1870.5	186.5	1522.6
-15.9	736.3	3221.4	397.1	-2293.2	2018.5	191.9	1679.3
-16.9	736.3	3343.8	406.3	-2401.0	2173.6	206.5	1843.5
-17.9	736.3	3465.9	415.9	-2509.5	2357.5	220.1	2037.0
-18.9	736.3	3587.7	425.8	-2617.5	2560.6	233.8	2250.1
-19.9	736.3	3709.2	436.0	-2725.3	2749.7	247.7	2449.4
-20.9	736.3	3830.2	446.3	-2832.3	2929.0	261.6	2639.0
-21.9	736.3	3953.4	457.1	-2941.5	3110.5	275.6	2831.3
-22.9	736.3	4092.5	468.6	-3066.6	3291.7	289.6	3024.0
-23.9	736.3	4243.8	480.8	-3203.7	3472.8	303.7	3217.2
-24.9	736.3	4389.2	493.2	-3335.0	3654.0	317.8	3410.8
-25.9	736.3	4306.3	505.7	-3238.0	3835.4	332.0	3604.8
-26.9	736.3	4112.0	518.2	-3029.5	4017.1	346.2	3799.0
-27.9	736.3	4322.0	530.8	-3225.3	4198.9	360.4	3993.4
-28.9	736.3	4707.6	543.5	-3596.6	4380.9	374.6	4188.1
-29.9	736.3	4888.5	556.3	-3763.4	4563.3	388.9	4383.2
-30.9	736.3	4973.9	569.0	-3834.5	4743.9	403.1	4576.7
-31.9	736.3	5081.7	581.9	-3928.0	4916.5	417.4	4762.0
-32.9	736.3	5234.5	594.7	-4066.5	5084.2	431.7	4942.7
-33.9	736.3	5401.2	607.6	-4219.0	5257.1	446.0	5128.4
-34.9	736.3	5566.7	620.5	-4369.9	5432.9	460.5	5317.1
-35.9	736.3	5731.9	633.5	-4521.7	5607.5	473.9	5504.7
-36.9	736.3	5897.2	646.5	-4682.9	5782.1	478.0	5692.3
-37.9	736.3	6062.8	659.5	-4850.1	5956.8	476.3	5880.0
-38.9	736.3	6228.5	672.5	-5006.5	6131.5	485.7	6067.7
-39.9	736.3	6394.5	685.5	-5155.7	6306.2	502.5	6255.4
-40.9	736.3	6560.7	698.5	-5306.4	6481.0	518.0	6443.2
-41.9	736.3	6727.1	711.6	-5457.6	6655.7	533.2	6631.0
-42.9	736.3	6893.7	724.7	-5608.9	6830.5	548.4	6818.9
-43.9	736.3	7060.4	737.8	-5760.4	7005.3	563.6	7006.7
-44.9	736.3	7227.2	750.9	-5912.1	7180.0	578.8	7194.6
-45.9	736.3	7393.5	764.0	-6063.2	7354.8	594.0	7382.5
-46.9	736.3	7565.6	777.1	-6220.1	7529.7	609.2	7570.4
-47.9	736.3	7745.1	790.2	-6384.4	7704.5	624.4	7758.4
-48.9	736.3	7919.5	803.5	-6543.6	7879.1	639.6	7946.3

BY CLASSICAL METHODS
DATE: 3-OCTOBER-2013 TIME: 14:59:43

****
* SUMMARY OF RESULTS FOR *
* CANTILEVER WALL DESIGN *
****

I.--HEADING
'REACH 1C UNDRAINED ROTATIONAL STABILITY

II.--SUMMARY

RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

WALL BOTTOM ELEV. (FT) : -16.43
PENETRATION (FT) : 14.83

MAX. BEND. MOMENT (LB-FT) : 2.4037E+04
AT ELEVATION (FT) : -7.89

MAX. SCALED DEFL. (LB-IN^3): 9.0294E+09
AT ELEVATION (FT) : 14.10

NOTE: DIVIDE SCALED DEFLECTION MODULUS OF
ELLASTICITY IN PSI TIMES PILE MOMENT
OF INERTIA IN IN^4 TO OBTAIN DEFLECTION
IN INCHES.

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHOREDOR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS
DATE: 3-OCTOBER-2013 TIME: 14:59:43

****
* COMPLETE OF RESULTS FOR *
* CANTILEVER WALL DESIGN *
****

I.--HEADING
'REACH 1C UNDRAINED ROTATIONAL STABILITY

II.--RESULTS

ELEVATION (FT)	BENDING MOMENT (LB-FT)	SHEAR (LB)	SCALED DEFLECTION (LB-IN^3)	NET PRESSURE (PSF)
14.10	0.0000E+00	0.	9.0294E+09	0.00
13.10	-1.2224E-09	0.	8.5967E+09	0.00

12.10	-1.2224E-09	0.	8.1641E+09	0.00
11.10	-1.2224E-09	0.	7.7314E+09	0.00
10.10	-1.2224E-09	0.	7.2987E+09	0.00
9.10	-1.2224E-09	0.	6.8660E+09	0.00
8.10	-1.2224E-09	0.	6.4334E+09	0.00
8.00	-7.7853E-08	0.	6.3901E+09	0.00
7.10	7.5816E+00	25.	6.0007E+09	56.16
6.10	7.1334E+01	113.	5.5680E+09	118.56
5.10	2.5365E+02	262.	5.1355E+09	180.96
4.10	6.1692E+02	475.	4.7035E+09	243.36
3.60+	8.8591E+02	604.	4.4878E+09	274.56
3.60-	8.8591E+02	604.	4.4878E+09	1169.56
3.10	1.3156E+03	1078.	4.2726E+09	725.22
2.10	2.7216E+03	1700.	3.8440E+09	518.87
1.10	4.6445E+03	2110.	3.4202E+09	301.23
0.10	6.8890E+03	2363.	3.0045E+09	205.96
0.00	7.1264E+03	2384.	2.9635E+09	212.86
-0.90	9.3533E+03	2558.	2.6007E+09	173.97
-1.60	1.1175E+04	2631.	2.3275E+09	34.30
-1.76	1.1606E+04	2634.	2.2650E+09	0.00
-1.90	1.1965E+04	2632.	2.2131E+09	-28.68
-2.60	1.3788E+04	2558.	1.9539E+09	-182.15
-2.90	1.4547E+04	2497.	1.8462E+09	-225.50
-3.50	1.6011E+04	2392.	1.6379E+09	-123.86
-3.57	1.6188E+04	2387.	1.6128E+09	-34.99
-3.80	1.6726E+04	2382.	1.5374E+09	-2.66
-3.90	1.6965E+04	2382.	1.5044E+09	3.22
-4.90	1.9316E+04	2289.	1.1919E+09	-188.99
-5.40	2.0434E+04	2176.	1.0479E+09	-264.88
-5.90	2.1489E+04	2044.	9.1278E+08	-263.55
-6.13	2.1952E+04	1984.	8.5377E+08	-258.18
-6.90	2.3311E+04	1425.	6.7073E+08	-1193.89
-7.00	2.3447E+04	1297.	6.4869E+08	-1367.45
-7.90	2.4037E+04	-12.	4.6879E+08	-1539.96
-8.90	2.3284E+04	-1465.	3.0817E+08	-1366.93
-9.43	2.2304E+04	-2220.	2.3910E+08	-1465.62
-9.90	2.1116E+04	-2849.	1.8759E+08	-1227.53
-10.90	1.7739E+04	-3822.	1.0331E+08	-717.74
-11.90	1.3643E+04	-4284.	4.9589E+07	-207.95
-12.90	9.3399E+03	-4237.	1.9411E+07	301.83
-13.90	5.3383E+03	-3681.	5.4161E+06	811.62
-14.90	2.1484E+03	-2614.	7.6238E+05	1321.41
-15.90	2.7985E+02	-1038.	1.1354E+04	1831.20
-16.43	0.0000E+00	0.	0.0000E+00	2100.36

NOTE: DIVIDE SCALED DEFLECTION MODULUS OF
ELLASTICITY IN PSI TIMES PILE MOMENT
OF INERTIA IN IN^4 TO OBTAIN DEFLECTION
IN INCHES.

III.--WATER AND SOIL PRESSURES

<-------------SOIL PRESSURES-------------->
WATER <----LEFTSIDE-----> <---RIGHTSIDE---->

ELEVATION (FT)	PRESSURE (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)
14.10	0.	0.	0.	0.	0.
13.10	0.	0.	0.	0.	0.
12.10	0.	0.	0.	0.	0.
11.10	0.	0.	0.	0.	0.
10.10	0.	0.	0.	0.	0.
9.10	0.	0.	0.	0.	0.
8.10	0.	0.	0.	0.	0.
8.00	0.	0.	0.	0.	0.
7.10	56.	0.	0.	0.	0.
6.10	119.	0.	0.	0.	0.
5.10	181.	0.	0.	0.	0.
4.10	243.	0.	0.	0.	0.
3.60+	275.	0.	0.	0.	0.
3.60-	275.	725.	0.	0.	0.
3.10	306.	1111.	0.	0.	0.
2.10	368.	1199.	0.	0.	0.
1.10	431.	1299.	0.	0.	0.
0.10	493.	1277.	0.	0.	0.
0.00	499.	1258.	0.	0.	0.
-0.90	555.	1191.	0.	0.	0.
-1.60+	599.	1249.	0.	0.	0.
-1.60-	599.	1249.	0.	0.	500.
-1.76	609.	1264.	0.	0.	638.
-1.90	618.	1276.	0.	0.	754.
-2.60	661.	1348.	0.	0.	704.
-2.90	680.	1356.	0.	0.	660.
-3.50	718.	1183.	0.	0.	430.
-3.57+	722.	1027.	0.	0.	387.
-3.57-	722.	1145.	0.	0.	387.
-3.80	736.	1027.	235.	0.	256.
-3.90	736.	1003.	286.	0.	230.
-4.90	736.	1015.	336.	0.	268.
-5.40	736.	1001.	387.	0.	280.
-5.90	736.	1000.	413.	0.	288.
-6.13+	736.	994.	405.	0.	730.
-6.13-	736.	994.	405.	0.	390.
-6.90	736.	2580.	2175.	650.	730.
-7.00	736.	2857.	2416.	753.	780.
-7.90	736.	2796.	1346.	520.	652.
-8.90	736.	2216.	220.	113.	551.
-9.43	736.	2337.	294.	135.	653.
-9.90	736.	2442.	359.	154.	743.
-10.90	736.	2581.	362.	165.	908.
-11.90	736.	2718.	367.	175.	1060.
-12.90	736.	2850.	373.	188.	1212.
-13.90	736.	2976.	380.	192.	1366.
-14.90	736.	3099.	388.	186.	1523.
-15.90	736.	3221.	397.	192.	1679.
-16.43	736.	3344.	406.	206.	1844.
-17.90	736.	3466.	416.	220.	2037.

```
'REACH 1C UNDRAINED ROTATIONAL STABILITY
CONTROL  CANTILEVER  DESIGN  1.00  1.80
WALL   14.1
SURFACE RIGHTSIDE   7    0   -1.6
              0.9   -1.6
              4.7   -3
              7.5   -3.5
              18   -5.4
              40   -4.2
              100   -4.2
SURFACE LEFTSIDE   8    0    3.6
              1    3.6
              8.3    3.3
              35.1   -0.6
              35.5   -2.3
              41.1   -2.5
              70.5   -3.8
              100   -3.8
SOIL RIGHTSIDE  STRENGTHS   3
  94    94    0    400    0    400   -3.5   0
  94    94    0    170    0    170   -7   0
  122    122    33    0    18    0
SOIL LEFTSIDE  STRENGTHS   4
  110    110    0    580    0    534    0   0
  94    94    0    400    0    400   -3.5   0
  94    94    0    170    0    170   -7   0
  122    122    33    0    18    0
WATER ELEVATIONS   62.4    8   -3.8
HORIZONTAL DISTRIBUTED   2    3.6    1640   -3.5    0
FINISHED
```

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS
DATE: 3-OCTOBER-2013 TIME: 14:44:45

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****************
*  INPUT DATA  *
****************
```

I.--HEADING
'REACH 1C UNDRAINED ROTATIONAL STABILITY

II.--CONTROL
CANTILEVER WALL DESIGN
FACTOR OF SAFETY FOR ACTIVE PRESSURES = 1.00
FACTOR OF SAFETY FOR PASSIVE PRESSURES = 1.80

III.--WALL DATA
ELEVATION AT TOP OF WALL = 14.10 FT.

IV.--SURFACE POINT DATA

IV.A.--RIGHTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	-1.60
0.90	-1.60
4.70	-3.00
7.50	-3.50
18.00	-5.40
40.00	-4.20
100.00	-4.20

IV.B.--LEFTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	3.60
1.00	3.60
8.30	3.30
35.10	-0.60
35.50	-2.30
41.10	-2.50
70.50	-3.80
100.00	-3.80

V.--SOIL LAYER DATA

V.A.--RIGHTSIDE
LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

```
          ANGLE OF       ANGLE OF                 <-SAFETY->
 SAT.  MOIST  INTERNAL  COH-    WALL    ADH-   <--BOTTOM-->  <-FACTOR->
WGHT.  WGHT.  FRICTION  ESION  FRICTION  ESION   ELEV.  SLOPE  ACT. PASS.
```

```
 (PCF)   (PCF)    (DEG)   (PSF)    (DEG)   (PSF)   (FT)  (FT/FT)
 94.00   94.00     0.00  400.00     0.00  400.00   -3.50   0.00   DEF  DEF
 94.00   94.00     0.00  170.00     0.00  170.00   -7.00   0.00   DEF  DEF
122.00  122.00    33.00    0.00    18.00    0.00                  DEF  DEF
```

V.B.--LEFTSIDE

LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = DEFAULT

LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

```
              ANGLE OF        ANGLE OF                     <-SAFETY->
  SAT.   MOIST  INTERNAL  COH-     WALL    ADH-    <--BOTTOM-->  <-FACTOR->
 WGHT.   WGHT.  FRICTION  ESION  FRICTION  ESION   ELEV.  SLOPE  ACT. PASS.
 (PCF)   (PCF)    (DEG)   (PSF)    (DEG)   (PSF)   (FT)  (FT/FT)
110.00  110.00     0.00  580.00     0.00  534.00    0.00   0.00   DEF  DEF
 94.00   94.00     0.00  400.00     0.00  400.00   -3.50   0.00   DEF  DEF
 94.00   94.00     0.00  170.00     0.00  170.00   -7.00   0.00   DEF  DEF
122.00  122.00    33.00    0.00    18.00    0.00                  DEF  DEF
```

VI.--WATER DATA

UNIT WEIGHT   = 62.40 (PCF)

RIGHTSIDE ELEVATION = 8.00 (FT)

LEFTSIDE ELEVATION = -3.80 (FT)

NO SEEPAGE

VII.--VERTICAL SURCHARGE LOADS

NONE

VIII.--HORIZONTAL LOADS

VIII.A.--HORIZONTAL LINE LOADS

NONE

VIII.B.--HORIZONTAL DISTRIBUTED LOADS

ELEVATION (FT)	DIST. LOAD (PSF)
3.60	1640.00
-3.50	0.00

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 3-OCTOBER-2013 TIME: 14:44:47

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**************************
*   SOIL PRESSURES FOR   *
* CANTILEVER WALL DESIGN *
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****

I.--HEADING
'REACH 1C UNDRAINED ROTATIONAL STABILITY

II.--SOIL PRESSURES

RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

NET SOIL PRESSURES INCLUDE APPLIED HORIZONTAL DISTRIBUTED LOADS.

	NET	<---LEFTSIDE--->		<------NET------> (SOIL + WATER)		<--RIGHTSIDE--->	
ELEV.	WATER	PASSIVE	ACTIVE	ACTIVE	PASSIVE	ACTIVE	PASSIVE
(FT)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)
14.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
13.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7.1	56.2	0.0	0.0	56.2	56.2	0.0	0.0
6.1	118.6	0.0	0.0	118.6	118.6	0.0	0.0
5.1	181.0	0.0	0.0	181.0	181.0	0.0	0.0
4.1	243.4	0.0	0.0	243.4	243.4	0.0	0.0
3.6+	274.6	0.0	0.0	274.6	274.6	0.0	0.0
3.6-	274.6	644.4	0.0	1270.1	1914.6	0.0	0.0
3.1	305.8	993.2	0.0	837.0	1830.3	0.0	0.0
2.1	368.2	1084.1	0.0	577.6	1661.7	0.0	0.0
1.1	430.6	1184.8	0.0	308.3	1493.1	0.0	0.0
0.1	493.0	1176.6	0.0	147.9	1324.5	0.0	0.0
0.0	499.2	1161.1	0.0	146.5	1307.7	0.0	0.0
-0.9	555.4	1110.7	0.0	45.2	1155.9	0.0	0.0
-1.6+	599.0	1168.7	0.0	-130.8	1037.9	0.0	0.0
-1.6-	599.0	1168.7	0.0	-130.8	1482.4	0.0	444.4
-1.9	617.8	1196.3	0.0	-209.0	1658.9	0.0	671.5
-2.6	661.4	1266.5	0.0	-397.2	1498.3	0.0	628.9
-2.9	680.2	1276.7	0.0	-457.9	1409.3	0.0	590.6
-3.5	717.6	1129.6	0.0	-412.0	1105.1	0.0	387.5
-3.6+	722.2	993.7	0.0	-322.6	1071.7	0.0	349.5
-3.6-	722.2	1095.9	0.0	-322.6	1071.7	0.0	349.5
-3.8	736.3	993.7	234.0	-257.4	736.6	0.0	234.2
-3.9	736.3	972.8	285.4	-236.5	662.0	0.0	211.0
-4.9	736.3	986.2	334.6	-249.8	649.3	0.0	247.5
-5.9	736.3	975.9	410.8	-239.5	592.6	0.0	267.1
-6.1+	736.3	969.5	408.2	-233.2	804.6	0.0	606.8
-6.1-	736.3	969.5	408.2	-233.2	804.6	0.0	346.1
-6.9	736.3	2221.5	2172.9	-835.1	-829.7	650.1	606.8
-7.0	736.3	2442.0	2414.9	-952.7	-1034.0	753.0	644.6
-7.9	736.3	2428.1	1346.0	-1172.0	-58.6	519.8	551.1

-8.9	736.3	1991.2	219.7	-1141.9	1006.8	113.0	490.2
-9.9	736.3	2179.2	359.1	-1288.8	1033.3	154.1	656.0
-10.9	736.3	2298.9	362.1	-1398.1	1178.4	164.5	804.2
-11.9	736.3	2418.4	366.9	-1506.7	1310.2	175.3	940.8
-12.9	736.3	2534.8	373.1	-1610.5	1437.7	188.1	1074.5
-13.9	736.3	2645.8	380.4	-1717.5	1566.5	191.9	1210.6
-14.9	736.3	2754.0	388.4	-1831.2	1695.8	186.5	1347.9
-15.9	736.3	2861.9	397.1	-1933.6	1825.5	191.9	1486.3
-16.9	736.3	2969.5	406.3	-2026.7	1953.3	206.5	1623.2
-17.9	736.3	3077.0	415.9	-2120.6	2099.3	220.1	1778.9
-18.9	736.3	3184.4	425.8	-2214.2	2273.5	233.8	1963.0
-19.9	736.3	3291.6	436.0	-2307.6	2441.6	247.7	2141.3
-20.9	736.3	3398.6	446.3	-2400.7	2596.5	261.6	2306.6
-21.9	736.3	3504.8	457.1	-2492.9	2752.2	275.6	2473.0
-22.9	736.3	3617.2	468.6	-2591.2	2907.7	289.6	2640.0
-23.9	736.3	3743.7	480.8	-2703.7	3062.8	303.7	2807.3
-24.9	736.3	3875.2	493.2	-2821.0	3218.0	317.8	2974.8
-25.9	736.3	3974.1	505.7	-2905.8	3373.3	332.0	3142.6
-26.9	736.3	3874.1	518.2	-2791.6	3528.7	346.2	3310.6
-27.9	736.3	3750.3	530.8	-2653.6	3684.2	360.4	3478.8
-28.9	736.3	3973.4	543.5	-2862.5	3839.8	374.6	3647.1
-29.9	736.3	4282.5	556.3	-3157.3	3995.5	388.9	3815.5
-30.9	736.3	4424.6	569.0	-3285.2	4151.5	403.1	3984.2
-31.9	736.3	4507.3	581.9	-3353.6	4306.4	417.4	4152.0
-32.9	736.3	4604.6	594.7	-3436.6	4454.9	431.7	4313.3
-33.9	736.3	4738.1	607.6	-3555.8	4598.3	446.0	4469.6
-34.9	736.3	4883.6	620.5	-3686.8	4745.9	460.5	4630.1
-35.9	736.3	5028.2	633.5	-3817.9	4896.2	473.9	4793.4
-36.9	736.3	5172.4	646.5	-3958.1	5045.6	478.0	4955.7
-37.9	736.3	5316.7	659.5	-4104.0	5194.9	476.3	5118.0
-38.9	736.3	5461.1	672.5	-4239.1	5344.2	485.7	5280.3
-39.9	736.3	5605.7	685.5	-4366.9	5493.5	502.5	5442.7
-40.9	736.3	5750.5	698.5	-4496.1	5642.8	518.0	5605.0
-41.9	736.3	5895.3	711.6	-4625.8	5792.1	533.2	5767.4
-42.9	736.3	6040.3	724.7	-4755.6	5941.4	548.4	5929.8
-43.9	736.3	6185.5	737.8	-4885.5	6090.8	563.6	6092.2
-44.9	736.3	6330.7	750.9	-5015.5	6240.1	578.8	6254.6
-45.9	736.3	6476.0	764.0	-5145.6	6389.4	594.0	6417.1
-46.9	736.3	6621.3	777.1	-5275.8	6538.8	609.2	6579.5
-47.9	736.3	6766.8	790.2	-5406.1	6688.1	624.4	6742.0
-48.9	736.3	6917.9	803.5	-5542.0	6837.3	639.6	6904.5

****
* SUMMARY OF RESULTS FOR *
* CANTILEVER WALL DESIGN *
****

I.--HEADING
'REACH 1C UNDRAINED ROTATIONAL STABILITY

II.--SUMMARY

RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

WALL BOTTOM ELEV. (FT) : -16.40
PENETRATION (FT) : 14.80

MAX. BEND. MOMENT (LB-FT) : 2.1497E+04
AT ELEVATION (FT) : -7.74

MAX. SCALED DEFL. (LB-IN^3): 8.3758E+09
AT ELEVATION (FT) : 14.10

NOTE: DIVIDE SCALED DEFLECTION MODULUS OF
ELLASTICITY IN PSI TIMES PILE MOMENT
OF INERTIA IN IN^4 TO OBTAIN DEFLECTION
IN INCHES.

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHOREDOR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS
DATE: 3-OCTOBER-2013 TIME: 14:44:48

****
* COMPLETE OF RESULTS FOR *
* CANTILEVER WALL DESIGN *
****

I.--HEADING
'REACH 1C UNDRAINED ROTATIONAL STABILITY

II.--RESULTS

ELEVATION (FT)	BENDING MOMENT (LB-FT)	SHEAR (LB)	SCALED DEFLECTION (LB-IN^3)	NET PRESSURE (PSF)
14.10	0.0000E+00	0.	8.3758E+09	0.00
13.10	-2.7940E-09	0.	7.9698E+09	0.00
12.10	-2.7940E-09	0.	7.5638E+09	0.00
11.10	-2.7940E-09	0.	7.1578E+09	0.00

10.10	0.0000E+00	0.	6.7518E+09	0.00
9.10	0.0000E+00	0.	6.3458E+09	0.00
8.10	0.0000E+00	0.	5.9398E+09	0.00
8.00	1.6152E-08	0.	5.8992E+09	0.00
7.10	7.5816E+00	25.	5.5338E+09	56.16
6.10	7.1334E+01	113.	5.1278E+09	118.56
5.10	2.5365E+02	262.	4.7219E+09	180.96
4.10	6.1692E+02	475.	4.3166E+09	243.36
3.60+	8.8591E+02	604.	4.1142E+09	274.56
3.60-	8.8591E+02	604.	4.1142E+09	1270.12
3.10	1.3286E+03	1131.	3.9123E+09	837.02
2.10	2.8347E+03	1838.	3.5104E+09	577.58
1.10	4.9168E+03	2281.	3.1136E+09	308.30
0.10	7.3252E+03	2509.	2.7252E+09	147.90
0.00	7.5769E+03	2524.	2.6870E+09	146.54
-0.90	9.8941E+03	2610.	2.3496E+09	45.20
-1.60	1.1718E+04	2580.	2.0965E+09	-130.77
-1.90	1.2485E+04	2529.	1.9910E+09	-208.95
-2.60	1.4189E+04	2317.	1.7526E+09	-397.18
-2.90	1.4865E+04	2189.	1.6540E+09	-457.92
-3.50	1.6099E+04	1928.	1.4639E+09	-411.98
-3.57	1.6241E+04	1901.	1.4410E+09	-322.55
-3.80	1.6662E+04	1835.	1.3725E+09	-257.40
-3.90	1.6845E+04	1810.	1.3427E+09	-236.47
-4.90	1.8535E+04	1567.	1.0603E+09	-249.85
-5.90	1.9979E+04	1323.	8.1003E+08	-239.54
-6.13	2.0280E+04	1268.	7.5668E+08	-233.17
-6.90	2.1125E+04	858.	5.9420E+08	-835.05
-7.00	2.1206E+04	768.	5.7459E+08	-952.69
-7.90	2.1482E+04	-188.	4.1475E+08	-1172.00
-8.90	2.0713E+04	-1345.	2.7227E+08	-1141.92
-9.60	1.9474E+04	-2186.	1.9343E+08	-1245.42
-9.90	1.8776E+04	-2534.	1.6540E+08	-1109.06
-10.90	1.5765E+04	-3412.	9.0826E+07	-647.61
-11.90	1.2106E+04	-3829.	4.3398E+07	-186.16
-12.90	8.2610E+03	-3784.	1.6863E+07	275.29
-13.90	4.6913E+03	-3278.	4.6413E+06	736.74
-14.90	1.8584E+03	-2311.	6.3274E+05	1198.19
-15.90	2.2368E+02	-882.	8.0603E+03	1659.64
-16.40	0.0000E+00	0.	0.0000E+00	1888.98

NOTE: DIVIDE SCALED DEFLECTION MODULUS OF ELLASTICITY IN PSI TIMES PILE MOMENT OF INERTIA IN IN^4 TO OBTAIN DEFLECTION IN INCHES.

III.--WATER AND SOIL PRESSURES

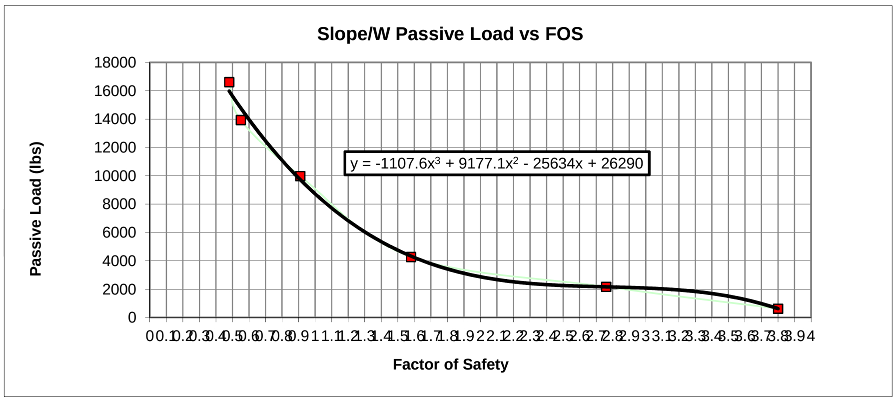
		<--------------SOIL PRESSURES-------------->			
	WATER	<----LEFTSIDE----->		<---RIGHTSIDE---->	
ELEVATION	PRESSURE	PASSIVE	ACTIVE	ACTIVE	PASSIVE
(FT)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)
14.10	0.	0.	0.	0.	0.
13.10	0.	0.	0.	0.	0.

12.10	0.	0.	0.	0.	0.
11.10	0.	0.	0.	0.	0.
10.10	0.	0.	0.	0.	0.
9.10	0.	0.	0.	0.	0.
8.10	0.	0.	0.	0.	0.
8.00	0.	0.	0.	0.	0.
7.10	56.	0.	0.	0.	0.
6.10	119.	0.	0.	0.	0.
5.10	181.	0.	0.	0.	0.
4.10	243.	0.	0.	0.	0.
3.60+	275.	0.	0.	0.	0.
3.60-	275.	644.	0.	0.	0.
3.10	306.	993.	0.	0.	0.
2.10	368.	1084.	0.	0.	0.
1.10	431.	1185.	0.	0.	0.
0.10	493.	1177.	0.	0.	0.
0.00	499.	1161.	0.	0.	0.
-0.90	555.	1111.	0.	0.	0.
-1.60+	599.	1169.	0.	0.	0.
-1.60-	599.	1169.	0.	0.	444.
-1.90	618.	1196.	0.	0.	672.
-2.60	661.	1267.	0.	0.	629.
-2.90	680.	1277.	0.	0.	591.
-3.50	718.	1130.	0.	0.	388.
-3.57+	722.	994.	0.	0.	349.
-3.57-	722.	1096.	0.	0.	349.
-3.80	736.	994.	234.	0.	234.
-3.90	736.	973.	285.	0.	211.
-4.90	736.	986.	335.	0.	248.
-5.90	736.	976.	411.	0.	267.
-6.13+	736.	969.	408.	0.	607.
-6.13-	736.	969.	408.	0.	346.
-6.90	736.	2222.	2173.	650.	607.
-7.00	736.	2442.	2415.	753.	645.
-7.90	736.	2428.	1346.	520.	551.
-8.90	736.	1991.	220.	113.	490.
-9.60	736.	2124.	318.	142.	607.
-9.90	736.	2179.	359.	154.	656.
-10.90	736.	2299.	362.	165.	804.
-11.90	736.	2418.	367.	175.	941.
-12.90	736.	2535.	373.	188.	1075.
-13.90	736.	2646.	380.	192.	1211.
-14.90	736.	2754.	388.	186.	1348.
-15.90	736.	2862.	397.	192.	1486.
-16.40	736.	2970.	406.	206.	1623.
-17.90	736.	3077.	416.	220.	1779.

Canal:	Orleans Avenue Canal		
Reach:	Reach 1D		
Load Case:		Water @ El 8	
Protected Side Top of Ground (GSE):		3.6	ft, Elevation
Critical Slip Surface Elev. (FSE):		Varies	ft, Elevation
Sheetpile Tip Elevation:		-28.5	ft, Elevation

Step 1: Compute correct passive pressure forces from slope stability model (Slope/W). Procedure follows the approach cited in Paragraph D-4 of ETL 1110-2-575.

Unit Weight (psf)	Passive Load (lbs)	Factor of Safety	Failure Surface Elevation (feet)	Notes
10	622	3.8	-3.4	
30	2166	2.76	-4.2	
60	4272	1.58	-4.2	
90	9983	0.91	-6.9	
120	13940	0.55	-7	
150	16616	0.48	-6.9	



Step 2: Perform CWALSHT analysis of cross section using a range of <u>assumed</u> horizontal distributed load above the critical slip surface elevation found in step 1. Determine the difference in passive load from CWALSHT and Slope/W for each assumed horizontal distributed load.

Check penetration of the sheetpile to determine where the pile behaves as a short pile or long pile. This I-wall has a penetration versus stick up of = (3.6--28)/(8'-3.6')=7.2. This ratio exceeds the recommended 2.5. For short pile behavior, the penetration was determined to be 20 ft. The PS GSE was 3.6 producing a short pile tip elevation of -16.4. See attached EXCEL sheet for short pile versus long pile calculation. This penetration gives a penetration to stickup ratio of 4.5.

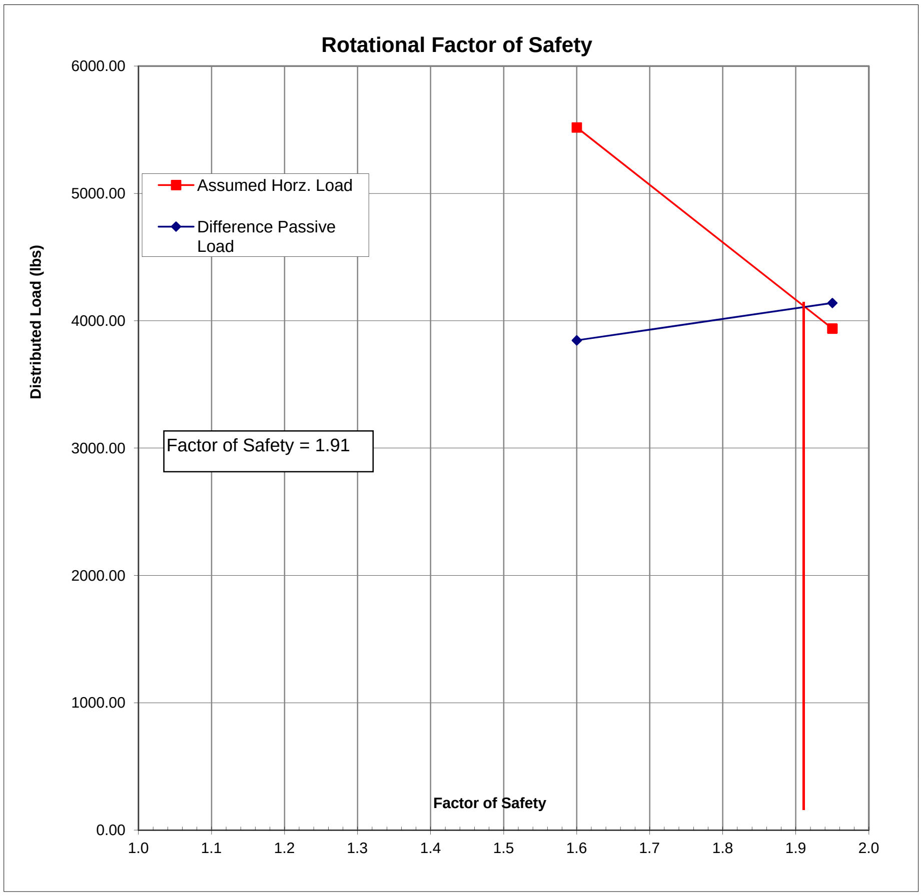
	(A)	(B)			(C)	(D)	
FOS	CWALSHT Passive Load (lbs)	SLOPE/W Passive Load (lbs)	Critical Failure Surface Elevation feet	Tip Elev feet	Difference Passive Load (A-B) (lbs)	Assumed Horizontal Distributed Load in CWALSHT (psf)	Resultant Distributed CWALSHT Load (D*(GSE-FSE)) (lbs)
1.95	7126.23	2986.53	-4.2	-16.4	4139.70	1010	3939.00
1.6	8078.33	4231.99	-4.2	-16.4	3846.34	1415	5518.50

Interpolate Correction Force at the resultant FOS

FOS = 1.91

Correction Force = 4106.18 lbs

Step 3: Plot the assumed horizontal load and the difference passive load versus factor of safety. The intersection of the two curves represents the actual factor of safety.



SHORT PILE/LONG PILE - HOMOGENEOUS SAND

VALUES OF SUBGRADE REACTION FOR SHEET PILES

CONSTANTS OF HORIZONTAL SUBGRADE REACTION l_h				COEFFICIENT OF SUBGRADE REACTION EQUATIONS n_h	
SANDS				SANDS	
TERZAGHI'S THEORY				TERZAGHI'S THEORY	
	LOOSE	MEDIUM	DENSE		
l_h (Dry or Moist) (pci)	2.89	9.26	23.15	n_h (lbs/in^4)	$n_h=(l_h/D)$ (where D is embedment depth in inches)
l_h (Submerged) (pci)	1.85	4.63	15.05		

From EM 1110-2-2906, Design of Pile Foundations, 1991

(b) Linearly Increasing Modulus of Horizontal Subgrade Reaction

$$R\ \cancel{T} = \sqrt[5]{\frac{EI}{n_h}}$$

$L/R \le 2.0$ Short pile

$2.0 < L/R < 4.0$ Intermediate

$L/R \ge 4.0$ Long pile

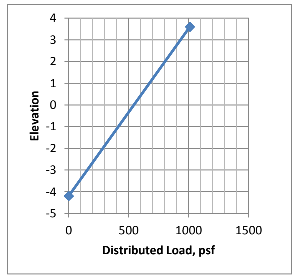
Enter l_h and moment of inertia of sheet pile. Vary penetration depth until D/R = 2.

Penetration, D, ft	Penetration, D, in	l_h, pci	n_H, lb/in^4	I, in^4/ft	EI, lb-in^2/ft	EI, lb-in^2/in	R, in	R, ft	D/R
20	240	2	0.01	84.2	2.68E+09	2.24E+08	121.82	10.15	1.97

VIII.B.--HORIZONTAL DISTRIBUTED LOAD

ELEVATION (FT)	DIST. LOAD (PSF)	Result. (LBS)
3.6	1010	
-4.2	0	3939

3939



RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

NET SOIL PRESSURES INCLUDE APPLIED HORIZONTAL DISTRIBUTED LOADS.

ELEV. (FT)	NET WATER (PSF)	<---LEFTSIDE---> PASSIVE (PSF)	ACTIVE (PSF)	<--RIGHTSIDE---> ACTIVE (PSF)	PASSIVE (PSF)
14.1	0	0	0	0	0
13.1	0	0	0	0	0
12.1	0	0	0	0	0
11.1	0	0	0	0	0
10.1	0	0	0	0	0
9.1	0	0	0	0	0
8.1	0	0	0	0	0
8	0	0	0	0	0
7.1	56	0	0	0	0
6.1	119	0	0	0	0
5.1	181	0	0	0	0
4.1	243	0	0	0	0
3.60+	275	0	0	0	0
-3.6	275	410	0	0	0
3.1	306	661	0	0	0
2.1	368	742	0	0	0
1.1	431	828	0	0	0
0.1	493	919	0	0	0
-0.9	555	1009	0	0	0
-1.60+	599	1072	0	0	0
-1.60-	599	1072	0	0	410
-1.9	618	1099	0	0	621
-2.6	661	1170	0	0	595
-2.9	680	1181	0	0	565
-3.5	718	1050	0	0	382
-3.64+	726	926	0	0	317
-3.64-	726	992	0	0	317
-3.8	736	926	169	0	241
-3.9	736	910	215	0	222
-4.2	736	928	207	0	240
-4.9	736	932	252	0	257
-5.9	736	933	314	0	279
-6.17+	736	929	311	0	575
-6.17-	736	929	311	0	358
-6.9	736	1863	1854	627	575
-7	736	2038	2079	732	605
-7.9	736	2082	1177	520	486
-8.9	736	1787	193	139	426
-9.9	736	1953	318	189	594
-10.39	736	2010	320	192	670
-10.9	736	2069	323	196	748
-11.9	736	2185	329	205	878
-12.9	736	2299	337	217	1000
-13.9	736	2409	346	212	1126
-14.9	736	2516	355	191	1253
-15.9	736	2623	365	189	1381
-16.44	736	2730	375	205	1508
-17.9	736	2837	385	219	1645

ELEV. (FT)	NET WATER (PSF)	LEFTSIDE PASSIVE (PSF)	RESULT. LEFTSIDE PASSIVE (LBS)
14.1	0	0	
13.1	0	0	
12.1	0	0	
11.1	0	0	
10.1	0	0	
9.1	0	0	
8.1	0	0	
8	0	0	
7.1	56	0	0
6.1	119	0	0
5.1	181	0	0
4.1	243	0	0
3.6	275	0	0
3.6	275	410	0
3.1	306	661	267.75
2.1	368	742	701.5
1.1	431	828	785
0.1	493	919	873.5
-0.9	555	1009	964
-1.6	599	1072	728.35
-1.6	599	1072	0
-1.9	618	1099	325.65
-2.6	661	1170	794.15
-2.9	680	1181	352.65
-3.5	718	1050	669.3
-3.64	726	926	138.32
-3.64	726	992	0
-3.8	736	926	153.44
-3.9	736	910	91.8
-4.2	736	928	275.7
-4.9	736	932	651
-5.9	736	933	932.5
-6.17	736	929	251.37
-6.17	736	929	0
-6.9	736	1863	1019.08
-7	736	2038	195.05
-7.9	736	2082	1854
-8.9	736	1787	1934.5
-9.9	736	1953	1870
-10.39	736	2010	970.935
-10.9	736	2069	1040.145
-11.9	736	2185	2127
-12.9	736	2299	2242
-13.9	736	2409	2354
-14.9	736	2516	2462.5
-15.9	736	2623	2569.5
-16.44	736	2730	1445.31
-17.9	736	2837	4063.91

PS WATER ELEVATION (FT)	CRITICAL SLIP SURF. ELEVATION (FT)	UNIT WEIGHT WATER (PCF)
-3.8	-4.2	64

RESULTANT WATER LOAD= 5.12 LBS

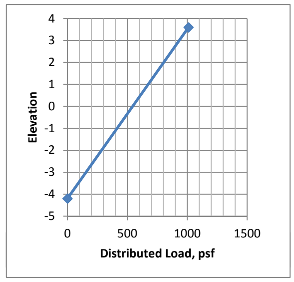
PASSIVE LOAD (SOIL)	7121.11
PASSIVE LOAD (SOIL+WATER)	7126.23
FOS =	1.95

IF THE PS WATER LEVEL IS BELOW THE CRITICAL SLIP SURFACE, USE PASSIVE LOAD (SOIL)

VIII.B.--HORIZONTAL DISTRIBUTED LOAD

ELEVATION (FT)	DIST. LOAD (PSF)	Result. (LBS)
3.6	1415	
-4.2	0	5518.5

5518.5



RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

NET SOIL PRESSURES INCLUDE APPLIED HORIZONTAL DISTRIBUTED LOADS.

ELEV. (FT)	NET WATER (PSF)	<---LEFTSIDE---> PASSIVE (PSF)	ACTIVE (PSF)	<--RIGHTSIDE---> ACTIVE (PSF)	PASSIVE (PSF)
14.1	0	0	0	0	0
13.1	0	0	0	0	0
12.1	0	0	0	0	0
11.1	0	0	0	0	0
10.1	0	0	0	0	0
9.1	0	0	0	0	0
8.1	0	0	0	0	0
8	0	0	0	0	0
7.1	56	0	0	0	0
6.1	119	0	0	0	0
5.1	181	0	0	0	0
4.1	243	0	0	0	0
3.60+	275	0	0	0	0
-3.6	275	500	0	0	0
3.1	306	795	0	0	0
2.1	368	874	0	0	0
1.1	431	959	0	0	0
0.1	493	1050	0	0	0
-0.9	555	1140	0	0	0
-1.60+	599	1203	0	0	0
-1.60-	599	1203	0	0	500
-1.9	618	1231	0	0	755
-2.6	661	1302	0	0	718
-2.9	680	1310	0	0	680
-3.5	718	1139	0	0	454
-3.64+	726	982	0	0	374
-3.64-	726	1066	0	0	374
-3.8	736	982	169	0	281
-3.9	736	961	215	0	257
-4.2	736	981	207	0	277
-4.9	736	982	252	0	294
-5.9	736	979	314	0	314
-6.17+	736	971	311	0	775
-6.17-	736	971	311	0	437
-6.9	736	2357	1854	627	775
-7	736	2612	2079	732	823
-7.9	736	2608	1177	520	634
-8.9	736	2124	193	139	510
-9.74	736	2310	298	181	693
-9.9	736	2346	318	189	729
-10.9	736	2492	323	196	911
-11.9	736	2636	329	205	1064
-12.9	736	2776	337	217	1213
-13.9	736	2911	346	212	1367
-14.9	736	3044	355	191	1523
-15.9	736	3176	365	189	1680
-16.44	736	3308	375	205	1844
-17.9	736	3439	385	219	2038

ELEV. (FT)	NET WATER (PSF)	LEFTSIDE PASSIVE (PSF)	RESULT. LEFTSIDE PASSIVE (LBS)
14.1	0	0	
13.1	0	0	
12.1	0	0	
11.1	0	0	
10.1	0	0	
9.1	0	0	
8.1	0	0	
8	0	0	
7.1	56	0	0
6.1	119	0	0
5.1	181	0	0
4.1	243	0	0
3.6	275	0	0
3.6	275	500	0
3.1	306	795	323.75
2.1	368	874	834.5
1.1	431	959	916.5
0.1	493	1050	1004.5
-0.9	555	1140	1095
-1.6	599	1203	820.05
-1.6	599	1203	0
-1.9	618	1231	365.1
-2.6	661	1302	886.55
-2.9	680	1310	391.8
-3.5	718	1139	734.7
-3.64	726	982	148.47
-3.64	726	1066	0
-3.8	736	982	163.84
-3.9	736	961	97.15
-4.2	736	981	291.3
-4.9	736	982	687.05
-5.9	736	979	980.5
-6.17	736	971	263.25
-6.17	736	971	0
-6.9	736	2357	1214.72
-7	736	2612	248.45
-7.9	736	2608	2349
-8.9	736	2124	2366
-9.74	736	2310	1862.28
-9.9	736	2346	372.48
-10.9	736	2492	2419
-11.9	736	2636	2564
-12.9	736	2776	2706
-13.9	736	2911	2843.5
-14.9	736	3044	2977.5
-15.9	736	3176	3110
-16.44	736	3308	1750.68
-17.9	736	3439	4925.31

PS WATER ELEVATION (FT)	CRITICAL SLIP SURF. ELEVATION (FT)	UNIT WEIGHT WATER (PCF)
-3.8	-4.2	64
RESULTANT WATER LOAD=	5.12	LBS

PASSIVE LOAD (SOIL)	8073.21	
PASSIVE LOAD (SOIL+WATER)	8078.33	**IF THE PS WATER LEVEL IS BELOW THE CRITICAL SLIP SURFACE, USE PASSIVE LOAD (SOIL)**
FOS =	1.6	

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS
DATE: 4-OCTOBER-2013 TIME: 14:27:24

****
* INPUT DATA *
****

I.--HEADING
'REACH 1D
'WATER LEVEL 8'

II.--CONTROL
CANTILEVER WALL DESIGN
FACTOR OF SAFETY FOR ACTIVE PRESSURES = 1.00
FACTOR OF SAFETY FOR PASSIVE PRESSURES = 1.95

III.--WALL DATA
ELEVATION AT TOP OF WALL = 14.10 FT.

IV.--SURFACE POINT DATA

IV.A.--RIGHTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	-1.60
0.90	-1.60
7.50	-3.50
18.00	-5.40
40.00	-4.20
60.00	-3.70

IV.B.--LEFTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	3.60
1.00	3.60
8.30	3.30
35.10	-0.60
35.50	-2.30
41.10	-2.50
70.50	-3.80

V.--SOIL LAYER DATA

V.A.--RIGHTSIDE
LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH-ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH-ESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.

94.00	94.00	0.00	400.00	0.00	400.00	-3.50	0.00	DEF	DEF
94.00	94.00	0.00	170.00	0.00	170.00	-7.00	0.00	DEF	DEF
122.00	122.00	33.00	0.00	18.00	0.00	-50.00	0.00	DEF	DEF
102.00	102.00	0.00	685.00	0.00	622.00			DEF	DEF

V.B.--LEFTSIDE

LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH- ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH- ESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.
94.00	94.00	0.00	400.00	0.00	400.00	-3.50	0.00	DEF	DEF
94.00	94.00	0.00	170.00	0.00	170.00	-7.00	0.00	DEF	DEF
122.00	122.00	33.00	0.00	18.00	0.00	-50.00	0.00	DEF	DEF
102.00	102.00	0.00	685.00	0.00	622.00			DEF	DEF

VI.--WATER DATA

UNIT WEIGHT = 62.40 (PCF)
RIGHTSIDE ELEVATION = 8.00 (FT)
LEFTSIDE ELEVATION = -3.80 (FT)
NO SEEPAGE

VII.--VERTICAL SURCHARGE LOADS

NONE

VIII.--HORIZONTAL LOADS

VIII.A.--HORIZONTAL LINE LOADS

NONE

VIII.B.--HORIZONTAL DISTRIBUTED LOADS

ELEVATION (FT)	DIST. LOAD (PSF)
3.60	1010.00
-4.20	0.00

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 4-OCTOBER-2013 TIME: 14:27:32

****
*   SOIL PRESSURES FOR   *
* CANTILEVER WALL DESIGN *

****

I.--HEADING
'REACH 1D
'WATER LEVEL 8'

II.--SOIL PRESSURES

RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

NET SOIL PRESSURES INCLUDE APPLIED HORIZONTAL DISTRIBUTED LOADS.

				<------NET------> (SOIL + WATER)			
	NET	<---LEFTSIDE--->				<--RIGHTSIDE--->	
ELEV.	WATER	PASSIVE	ACTIVE	ACTIVE	PASSIVE	ACTIVE	PASSIVE
(FT)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)
14.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
13.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7.1	56.2	0.0	0.0	56.2	56.2	0.0	0.0
6.1	118.6	0.0	0.0	118.6	118.6	0.0	0.0
5.1	181.0	0.0	0.0	181.0	181.0	0.0	0.0
4.1	243.4	0.0	0.0	243.4	243.4	0.0	0.0
3.6+	274.6	0.0	0.0	274.6	274.6	0.0	0.0
3.6-	274.6	410.3	0.0	874.3	1284.6	0.0	0.0
3.1	305.8	660.5	0.0	590.5	1251.0	0.0	0.0
2.1	368.2	741.8	0.0	442.1	1183.9	0.0	0.0
1.1	430.6	828.1	0.0	288.7	1116.8	0.0	0.0
0.1	493.0	918.9	0.0	130.8	1049.8	0.0	0.0
-0.9	555.4	1009.2	0.0	-26.5	982.7	0.0	0.0
-1.6+	599.0	1072.4	0.0	-136.7	935.7	0.0	0.0
-1.6-	599.0	1072.4	0.0	-136.7	1346.0	0.0	410.3
-1.9	617.8	1099.5	0.0	-183.9	1536.9	0.0	621.3
-2.6	661.4	1169.6	0.0	-301.0	1463.5	0.0	594.9
-2.9	680.2	1181.2	0.0	-332.7	1413.5	0.0	565.0
-3.5	717.6	1049.9	0.0	-241.7	1190.2	0.0	382.0
-3.6+	726.3	925.6	0.0	-160.1	1115.9	0.0	317.0
-3.6-	726.3	992.4	0.0	-160.1	1115.9	0.0	317.0
-3.8	736.3	925.6	168.9	-137.5	860.5	0.0	241.3
-3.9	736.3	909.6	215.2	-134.5	782.4	0.0	222.4
-4.2	736.3	927.5	206.6	-191.2	769.7	0.0	240.0
-4.9	736.3	931.5	252.0	-195.2	741.5	0.0	257.2
-5.9	736.3	932.8	314.0	-196.5	701.1	0.0	278.7
-6.2+	736.3	929.4	310.9	-193.0	891.7	0.0	574.7
-6.2-	736.3	929.4	310.9	-193.0	891.7	0.0	357.8
-6.9	736.3	1863.4	1854.2	-500.1	-543.2	627.0	574.7
-7.0	736.3	2037.7	2079.0	-569.7	-738.0	731.6	604.7

-7.9	736.3	2081.9	1177.2	-825.3	44.9	520.2	485.8
-8.9	736.3	1787.2	193.0	-911.6	969.1	139.3	425.7
-9.9	736.3	1953.2	317.7	-1028.0	1012.1	188.9	593.5
-10.9	736.3	2069.0	322.8	-1136.7	1161.4	196.0	747.9
-11.9	736.3	2184.7	329.5	-1243.2	1285.2	205.2	878.3
-12.9	736.3	2298.6	337.2	-1345.2	1399.2	217.1	1000.1
-13.9	736.3	2408.5	345.8	-1459.8	1516.4	212.4	1125.9
-14.9	736.3	2516.0	355.0	-1589.2	1634.3	190.5	1253.0
-15.9	736.3	2623.2	364.8	-1697.9	1752.5	189.0	1380.9
-16.9	736.3	2730.3	374.9	-1789.2	1869.7	204.8	1508.2
-17.9	736.3	2837.3	385.4	-1882.1	1996.3	218.8	1645.3
-18.9	736.3	2944.1	396.1	-1974.8	2145.6	233.0	1805.3
-19.9	736.3	3050.8	407.0	-2067.3	2301.3	247.2	1972.0
-20.9	736.3	3157.5	418.2	-2159.8	2446.2	261.4	2128.0
-21.9	736.3	3264.1	429.6	-2252.3	2586.9	275.5	2280.2
-22.9	736.3	3370.7	441.7	-2344.8	2728.1	289.6	2433.4
-23.9	736.3	3477.2	454.3	-2437.2	2869.0	303.7	2587.0
-24.9	736.3	3583.6	467.1	-2529.5	3009.9	317.8	2740.7
-25.9	736.3	3701.3	480.0	-2633.0	3151.0	332.0	2894.6
-26.9	736.3	3722.7	492.9	-2640.2	3292.1	346.2	3048.7
-27.9	736.3	3570.6	505.9	-2473.9	3433.3	360.4	3202.9
-28.9	736.3	3585.7	518.9	-2474.8	3574.6	374.6	3357.2
-29.9	736.3	3881.4	532.0	-2756.2	3715.9	388.9	3511.6
-30.9	736.3	4106.9	545.1	-2967.5	3857.3	403.1	3666.2
-31.9	736.3	4198.4	558.3	-3044.7	3999.0	417.4	3820.9
-32.9	736.3	4273.1	571.5	-3105.2	4139.1	431.7	3974.3
-33.9	736.3	4376.5	584.7	-3194.2	4275.8	445.9	4124.2
-34.9	736.3	4510.0	597.9	-3313.3	4411.8	460.5	4273.4
-35.9	736.3	4643.9	611.2	-3433.6	4549.8	473.9	4424.7
-36.9	736.3	4777.3	624.4	-3563.0	4688.4	478.0	4576.5
-37.9	736.3	4910.5	637.7	-3697.8	4826.7	476.3	4728.1
-38.9	736.3	5043.7	651.0	-3821.7	4965.0	485.7	4879.7
-39.9	736.3	5177.1	664.4	-3938.2	5103.3	502.5	5031.3
-40.9	736.3	5310.5	677.7	-4056.2	5241.6	518.0	5183.0
-41.9	736.3	5444.1	691.0	-4174.5	5379.9	533.2	5334.6
-42.9	736.3	5577.7	704.4	-4293.0	5518.2	548.4	5486.3
-43.9	736.3	5711.5	717.8	-4411.6	5656.6	563.6	5638.0
-44.9	736.3	5845.3	731.1	-4530.2	5794.9	578.8	5789.7
-45.9	736.3	5979.2	744.5	-4648.9	5933.4	594.0	5941.6
-46.9	736.3	6113.2	757.9	-4767.7	6070.8	609.2	6092.4
-47.9	736.3	6247.2	771.3	-4886.5	6205.4	624.4	6240.4
-48.9	736.3	6381.3	784.7	-4982.4	6473.4	662.6	6521.8

DATE: 4-OCTOBER-2013 TIME: 14:27:33

****
* SUMMARY OF RESULTS FOR *
* CANTILEVER WALL DESIGN *
****

I.--HEADING
'REACH 1D
'WATER LEVEL 8'

II.--SUMMARY

RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

WALL BOTTOM ELEV. (FT) : -16.44
PENETRATION (FT) : 14.84

MAX. BEND. MOMENT (LB-FT) : 1.8008E+04
AT ELEVATION (FT) : -8.07

MAX. SCALED DEFL. (LB-IN^3): 7.2199E+09
AT ELEVATION (FT) : 14.10

NOTE: DIVIDE SCALED DEFLECTION MODULUS OF
ELLASTICITY IN PSI TIMES PILE MOMENT
OF INERTIA IN IN^4 TO OBTAIN DEFLECTION
IN INCHES.

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHOREDOR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS
DATE: 4-OCTOBER-2013 TIME: 14:27:33

****
* COMPLETE OF RESULTS FOR *
* CANTILEVER WALL DESIGN *
****

I.--HEADING
'REACH 1D
'WATER LEVEL 8'

II.--RESULTS

ELEVATION (FT)	BENDING MOMENT (LB-FT)	SHEAR (LB)	SCALED DEFLECTION (LB-IN^3)	NET PRESSURE (PSF)
14.10	0.0000E+00	0.	7.2199E+09	0.00

13.10	3.4925E-10	0.	6.8720E+09	0.00
12.10	3.4925E-10	0.	6.5240E+09	0.00
11.10	3.4925E-10	0.	6.1761E+09	0.00
10.10	3.4925E-10	0.	5.8282E+09	0.00
9.10	3.4925E-10	0.	5.4803E+09	0.00
8.10	3.4925E-10	0.	5.1323E+09	0.00
8.00	1.2671E-08	0.	5.0975E+09	0.00
7.10	7.5816E+00	25.	4.7844E+09	56.16
6.10	7.1334E+01	113.	4.4365E+09	118.56
5.10	2.5365E+02	262.	4.0887E+09	180.96
4.10	6.1692E+02	475.	3.7414E+09	243.36
3.60+	8.8591E+02	604.	3.5681E+09	274.56
3.60-	8.8591E+02	604.	3.5681E+09	874.30
3.10	1.2854E+03	970.	3.3952E+09	590.49
2.10	2.5261E+03	1487.	3.0514E+09	442.10
1.10	4.2081E+03	1852.	2.7119E+09	288.75
0.10	6.1782E+03	2062.	2.3797E+09	130.84
-0.90	8.2791E+03	2114.	2.0583E+09	-26.54
-1.60	9.7433E+03	2057.	1.8416E+09	-136.70
-1.90	1.0353E+04	2009.	1.7511E+09	-183.91
-2.60	1.1705E+04	1839.	1.5466E+09	-300.96
-2.90	1.2243E+04	1744.	1.4619E+09	-332.73
-3.50	1.3235E+04	1572.	1.2982E+09	-241.69
-3.64	1.3450E+04	1544.	1.2616E+09	-160.07
-3.80	1.3697E+04	1520.	1.2195E+09	-137.45
-3.90	1.3849E+04	1506.	1.1937E+09	-134.47
-4.20	1.4294E+04	1457.	1.1178E+09	-191.21
-4.90	1.5267E+04	1322.	9.4942E+08	-195.20
-5.90	1.6491E+04	1126.	7.3150E+08	-196.51
-6.17	1.6785E+04	1074.	6.7800E+08	-193.04
-6.90	1.7493E+04	820.	5.4205E+08	-500.07
-7.00	1.7572E+04	767.	5.2474E+08	-569.75
-7.90	1.7997E+04	139.	3.8276E+08	-825.35
-8.90	1.7709E+04	-730.	2.5445E+08	-911.56
-9.90	1.6504E+04	-1699.	1.5661E+08	-1028.01
-10.39	1.5539E+04	-2220.	1.1900E+08	-1081.62
-10.90	1.4285E+04	-2706.	8.7136E+07	-838.78
-11.90	1.1240E+04	-3305.	4.2230E+07	-359.62
-12.90	7.8342E+03	-3425.	1.6693E+07	119.54
-13.90	4.5484E+03	-3066.	4.7114E+06	598.71
-14.90	1.8613E+03	-2228.	6.7535E+05	1077.87
-15.90	2.5206E+02	-911.	1.0782E+04	1557.03
-16.44	0.0000E+00	0.	0.0000E+00	1815.75

NOTE: DIVIDE SCALED DEFLECTION MODULUS OF ELLASTICITY IN PSI TIMES PILE MOMENT OF INERTIA IN IN^4 TO OBTAIN DEFLECTION IN INCHES.

III.--WATER AND SOIL PRESSURES

		<-------------SOIL PRESSURES	-------------->		
	WATER	<----LEFTSIDE----->		<---RIGHTSIDE---->	
ELEVATION	PRESSURE	PASSIVE	ACTIVE	ACTIVE	PASSIVE

(FT)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)
14.10	0.	0.	0.	0.	0.
13.10	0.	0.	0.	0.	0.
12.10	0.	0.	0.	0.	0.
11.10	0.	0.	0.	0.	0.
10.10	0.	0.	0.	0.	0.
9.10	0.	0.	0.	0.	0.
8.10	0.	0.	0.	0.	0.
8.00	0.	0.	0.	0.	0.
7.10	56.	0.	0.	0.	0.
6.10	119.	0.	0.	0.	0.
5.10	181.	0.	0.	0.	0.
4.10	243.	0.	0.	0.	0.
3.60+	275.	0.	0.	0.	0.
3.60-	275.	410.	0.	0.	0.
3.10	306.	661.	0.	0.	0.
2.10	368.	742.	0.	0.	0.
1.10	431.	828.	0.	0.	0.
0.10	493.	919.	0.	0.	0.
-0.90	555.	1009.	0.	0.	0.
-1.60+	599.	1072.	0.	0.	0.
-1.60-	599.	1072.	0.	0.	410.
-1.90	618.	1099.	0.	0.	621.
-2.60	661.	1170.	0.	0.	595.
-2.90	680.	1181.	0.	0.	565.
-3.50	718.	1050.	0.	0.	382.
-3.64+	726.	926.	0.	0.	317.
-3.64-	726.	992.	0.	0.	317.
-3.80	736.	926.	169.	0.	241.
-3.90	736.	910.	215.	0.	222.
-4.20	736.	928.	207.	0.	240.
-4.90	736.	932.	252.	0.	257.
-5.90	736.	933.	314.	0.	279.
-6.17+	736.	929.	311.	0.	575.
-6.17-	736.	929.	311.	0.	358.
-6.90	736.	1863.	1854.	627.	575.
-7.00	736.	2038.	2079.	732.	605.
-7.90	736.	2082.	1177.	520.	486.
-8.90	736.	1787.	193.	139.	426.
-9.90	736.	1953.	318.	189.	594.
-10.39	736.	2010.	320.	192.	670.
-10.90	736.	2069.	323.	196.	748.
-11.90	736.	2185.	329.	205.	878.
-12.90	736.	2299.	337.	217.	1000.
-13.90	736.	2409.	346.	212.	1126.
-14.90	736.	2516.	355.	191.	1253.
-15.90	736.	2623.	365.	189.	1381.
-16.44	736.	2730.	375.	205.	1508.
-17.90	736.	2837.	385.	219.	1645.

```
'REACH 1D
'WATER LEVEL 8'
CONTROL  CANTILEVER  DESIGN  1.00  1.95
WALL   14.1
SURFACE RIGHTSIDE   6    0   -1.6
                0.9   -1.6
                7.5   -3.5
                18   -5.4
                40   -4.2
                60   -3.7
SURFACE LEFTSIDE   7    0    3.6
                1    3.6
                8.3    3.3
                35.1   -0.6
                35.5   -2.3
                41.1   -2.5
                70.5   -3.8
SOIL RIGHTSIDE  STRENGTHS   4
   94    94    0    400    0    400   -3.5   0
   94    94    0    170    0    170   -7   0
   122    122    33    0    18    0   -50   0
   102    102    0    685    0    622
SOIL LEFTSIDE  STRENGTHS   4
   94    94    0    400    0    400   -3.5   0
   94    94    0    170    0    170   -7   0
   122    122    33    0    18    0   -50   0
   102    102    0    685    0    622
WATER ELEVATIONS   62.4    8   -3.8
HORIZONTAL DISTRIBUTED   2    3.6    1010   -4.2    0
FINISHED
```

```
'REACH 1D
'WATER LEVEL 8'
CONTROL  CANTILEVER  DESIGN  1.00  2.00
WALL   14.1
SURFACE RIGHTSIDE   6    0   -1.6
                0.9   -1.6
                7.5   -3.5
                18   -5.4
                40   -4.2
                60   -3.7
SURFACE LEFTSIDE   7    0    3.6
                1    3.6
                8.3    3.3
                35.1   -0.6
                35.5   -2.3
                41.1   -2.5
                70.5   -3.8
SOIL RIGHTSIDE  STRENGTHS   4
   94    94    0    400    0    400   -3.5   0
   94    94    0    170    0    170   -7   0
   122    122    33    0    18    0   -50   0
   102    102    0    685    0    622
SOIL LEFTSIDE  STRENGTHS   4
   94    94    0    400    0    400   -3.5   0
   94    94    0    170    0    170   -7   0
   122    122    33    0    18    0   -50   0
   102    102    0    685    0    622
WATER ELEVATIONS   62.4    8   -3.8
HORIZONTAL DISTRIBUTED   2    3.6    1300   -4.2    0
FINISHED
```

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS
DATE: 4-OCTOBER-2013 TIME: 14:32:05

****
* INPUT DATA *
****

I.--HEADING
'REACH 1D
'WATER LEVEL 8'

II.--CONTROL
CANTILEVER WALL DESIGN
FACTOR OF SAFETY FOR ACTIVE PRESSURES = 1.00
FACTOR OF SAFETY FOR PASSIVE PRESSURES = 1.60

III.--WALL DATA
ELEVATION AT TOP OF WALL = 14.10 FT.

IV.--SURFACE POINT DATA

IV.A.--RIGHTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	-1.60
0.90	-1.60
7.50	-3.50
18.00	-5.40
40.00	-4.20
60.00	-3.70

IV.B.--LEFTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	3.60
1.00	3.60
8.30	3.30
35.10	-0.60
35.50	-2.30
41.10	-2.50
70.50	-3.80

V.--SOIL LAYER DATA

V.A.--RIGHTSIDE
LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH-ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH-ESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.

94.00	94.00	0.00	400.00	0.00	400.00	-3.50	0.00	DEF	DEF
94.00	94.00	0.00	170.00	0.00	170.00	-7.00	0.00	DEF	DEF
122.00	122.00	33.00	0.00	18.00	0.00	-50.00	0.00	DEF	DEF
102.00	102.00	0.00	685.00	0.00	622.00			DEF	DEF

V.B.--LEFTSIDE

LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH-ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH-ESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.
94.00	94.00	0.00	400.00	0.00	400.00	-3.50	0.00	DEF	DEF
94.00	94.00	0.00	170.00	0.00	170.00	-7.00	0.00	DEF	DEF
122.00	122.00	33.00	0.00	18.00	0.00	-50.00	0.00	DEF	DEF
102.00	102.00	0.00	685.00	0.00	622.00			DEF	DEF

VI.--WATER DATA

UNIT WEIGHT = 62.40 (PCF)
RIGHTSIDE ELEVATION = 8.00 (FT)
LEFTSIDE ELEVATION = -3.80 (FT)
NO SEEPAGE

VII.--VERTICAL SURCHARGE LOADS

NONE

VIII.--HORIZONTAL LOADS

VIII.A.--HORIZONTAL LINE LOADS

NONE

VIII.B.--HORIZONTAL DISTRIBUTED LOADS

ELEVATION (FT)	DIST. LOAD (PSF)
3.60	1415.00
-4.20	0.00

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 4-OCTOBER-2013 TIME: 14:32:08

****
* SOIL PRESSURES FOR *
* CANTILEVER WALL DESIGN *

****

I.--HEADING
'REACH 1D
'WATER LEVEL 8'

II.--SOIL PRESSURES

RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

NET SOIL PRESSURES INCLUDE APPLIED HORIZONTAL DISTRIBUTED LOADS.

	NET	<---LEFTSIDE--->		<------NET------> (SOIL + WATER)		<--RIGHTSIDE--->	
ELEV.	WATER	PASSIVE	ACTIVE	ACTIVE	PASSIVE	ACTIVE	PASSIVE
(FT)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)
14.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
13.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7.1	56.2	0.0	0.0	56.2	56.2	0.0	0.0
6.1	118.6	0.0	0.0	118.6	118.6	0.0	0.0
5.1	181.0	0.0	0.0	181.0	181.0	0.0	0.0
4.1	243.4	0.0	0.0	243.4	243.4	0.0	0.0
3.6+	274.6	0.0	0.0	274.6	274.6	0.0	0.0
3.6-	274.6	500.0	0.0	1189.6	1689.6	0.0	0.0
3.1	305.8	794.8	0.0	835.3	1630.1	0.0	0.0
2.1	368.2	873.7	0.0	637.3	1511.0	0.0	0.0
1.1	430.6	959.0	0.0	433.0	1392.0	0.0	0.0
0.1	493.0	1050.0	0.0	223.0	1273.0	0.0	0.0
-0.9	555.4	1140.3	0.0	13.7	1154.0	0.0	0.0
-1.6+	599.0	1203.5	0.0	-132.8	1070.7	0.0	0.0
-1.6-	599.0	1203.5	0.0	-132.8	1570.7	0.0	500.0
-1.9	617.8	1230.6	0.0	-195.6	1790.2	0.0	755.2
-2.6	661.4	1302.2	0.0	-350.5	1670.1	0.0	718.4
-2.9	680.2	1310.4	0.0	-394.4	1596.2	0.0	680.2
-3.5	717.6	1138.6	0.0	-294.0	1298.6	0.0	454.0
-3.6+	726.3	981.7	0.0	-195.8	1202.1	0.0	374.0
-3.6-	726.3	1066.0	0.0	-195.8	1202.1	0.0	374.0
-3.8	736.3	981.7	168.9	-172.8	920.9	0.0	280.9
-3.9	736.3	961.1	215.2	-170.4	832.9	0.0	257.3
-4.2	736.3	981.0	206.6	-244.7	806.9	0.0	277.1
-4.9	736.3	981.9	252.0	-245.6	778.6	0.0	294.3
-5.9	736.3	978.7	314.0	-242.4	736.4	0.0	314.0
-6.2+	736.3	971.4	310.9	-235.1	1031.5	0.0	774.9
-6.2-	736.3	971.4	310.9	-235.1	1031.5	0.0	437.2
-6.9	736.3	2356.7	1854.2	-993.3	-343.1	627.0	774.9
-7.0	736.3	2611.5	2079.0	-1143.6	-519.5	731.6	823.1

-7.9	736.3	2607.7	1177.2	-1351.2	193.3	520.2	634.2
-8.9	736.3	2123.7	193.0	-1248.1	1053.6	139.3	510.2
-9.9	736.3	2346.2	317.7	-1421.0	1147.2	188.9	728.6
-10.9	736.3	2491.6	322.8	-1559.3	1324.7	196.0	911.2
-11.9	736.3	2636.1	329.5	-1694.6	1470.4	205.2	1063.5
-12.9	736.3	2776.5	337.2	-1823.1	1612.0	217.1	1212.9
-13.9	736.3	2911.2	345.8	-1962.4	1757.7	212.4	1367.1
-14.9	736.3	3043.5	355.0	-2116.7	1904.6	190.5	1523.3
-15.9	736.3	3175.7	364.8	-2250.4	2051.4	189.0	1679.8
-16.9	736.3	3307.6	374.9	-2366.5	2205.5	204.8	1844.0
-17.9	736.3	3439.3	385.4	-2484.1	2388.5	218.8	2037.5
-18.9	736.3	3570.7	396.1	-2601.4	2590.7	233.0	2250.5
-19.9	736.3	3701.9	407.0	-2718.3	2779.0	247.2	2449.7
-20.9	736.3	3833.0	418.2	-2835.2	2957.5	261.4	2639.3
-21.9	736.3	3963.9	429.6	-2952.0	3138.3	275.5	2831.6
-22.9	736.3	4094.7	441.7	-3068.7	3319.0	289.6	3024.3
-23.9	736.3	4226.8	454.3	-3186.8	3499.5	303.7	3217.5
-24.9	736.3	4366.9	467.1	-3312.8	3680.3	317.8	3411.1
-25.9	736.3	4288.9	480.0	-3220.6	3861.3	332.0	3605.0
-26.9	736.3	4098.3	492.9	-3015.8	4042.6	346.2	3799.2
-27.9	736.3	4311.1	505.9	-3214.4	4224.0	360.4	3993.6
-28.9	736.3	4698.0	518.9	-3587.0	4405.7	374.6	4188.3
-29.9	736.3	4879.4	532.0	-3754.2	4587.6	388.9	4383.3
-30.9	736.3	4965.2	545.1	-3825.8	4768.6	403.1	4577.4
-31.9	736.3	5073.4	558.3	-3919.7	4945.1	417.4	4767.1
-32.9	736.3	5226.6	571.5	-4058.6	5119.1	431.7	4954.2
-33.9	736.3	5393.7	584.7	-4211.5	5295.9	445.9	5144.3
-34.9	736.3	5559.5	597.9	-4362.8	5474.4	460.5	5336.0
-35.9	736.3	5725.1	611.2	-4514.8	5652.3	473.9	5527.2
-36.9	736.3	5890.7	624.4	-4676.4	5830.3	478.0	5718.4
-37.9	736.3	6056.5	637.7	-4843.8	6008.3	476.3	5909.7
-38.9	736.3	6222.5	651.0	-5000.5	6186.3	485.7	6101.0
-39.9	736.3	6388.8	664.4	-5150.0	6364.4	502.5	6292.4
-40.9	736.3	6555.2	677.7	-5300.9	6542.5	518.0	6483.8
-41.9	736.3	6721.8	691.0	-5452.2	6720.6	533.2	6675.3
-42.9	736.3	6888.5	704.4	-5603.8	6898.8	548.4	6866.9
-43.9	736.3	7055.4	717.8	-5755.5	7076.7	563.6	7058.1
-44.9	736.3	7222.5	731.1	-5907.3	7251.0	578.8	7245.8
-45.9	736.3	7389.0	744.5	-6058.6	7422.3	594.0	7430.5
-46.9	736.3	7561.2	757.9	-6215.7	7596.0	609.2	7617.5
-47.9	736.3	7740.9	771.3	-6380.2	7771.4	624.4	7806.4
-48.9	736.3	7915.6	784.7	-6516.7	8203.5	662.6	8251.9

DATE: 4-OCTOBER-2013 TIME: 14:32:09

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****************************
*  SUMMARY OF RESULTS FOR  *
*  CANTILEVER WALL DESIGN  *
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I.--HEADING
'REACH 1D
'WATER LEVEL 8'

II.--SUMMARY

RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

WALL BOTTOM ELEV. (FT) : -16.44
PENETRATION (FT) : 14.84

MAX. BEND. MOMENT (LB-FT) : 2.3843E+04
AT ELEVATION (FT) : -7.84

MAX. SCALED DEFL. (LB-IN^3): 9.2132E+09
AT ELEVATION (FT) : 14.10

NOTE: DIVIDE SCALED DEFLECTION MODULUS OF
ELLASTICITY IN PSI TIMES PILE MOMENT
OF INERTIA IN IN^4 TO OBTAIN DEFLECTION
IN INCHES.

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHOREDOR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS
DATE: 4-OCTOBER-2013 TIME: 14:32:09

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****************************
* COMPLETE OF RESULTS FOR  *
*  CANTILEVER WALL DESIGN  *
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I.--HEADING
'REACH 1D
'WATER LEVEL 8'

II.--RESULTS

ELEVATION (FT)	BENDING MOMENT (LB-FT)	SHEAR (LB)	SCALED DEFLECTION (LB-IN^3)	NET PRESSURE (PSF)
14.10	0.0000E+00	0.	9.2132E+09	0.00

13.10	-1.5716E-09	0.	8.7696E+09	0.00
12.10	-1.5716E-09	0.	8.3261E+09	0.00
11.10	-1.5716E-09	0.	7.8825E+09	0.00
10.10	-1.5716E-09	0.	7.4389E+09	0.00
9.10	-1.5716E-09	0.	6.9953E+09	0.00
8.10	1.2224E-09	0.	6.5518E+09	0.00
8.00	3.1722E-08	0.	6.5074E+09	0.00
7.10	7.5816E+00	25.	6.1082E+09	56.16
6.10	7.1334E+01	113.	5.6647E+09	118.56
5.10	2.5365E+02	262.	5.2213E+09	180.96
4.10	6.1692E+02	475.	4.7783E+09	243.36
3.60+	8.8591E+02	604.	4.5572E+09	274.56
3.60-	8.8591E+02	604.	4.5572E+09	1189.56
3.10	1.3219E+03	1110.	4.3365E+09	835.29
2.10	2.8168E+03	1847.	3.8970E+09	637.32
1.10	4.9479E+03	2382.	3.4626E+09	432.99
0.10	7.5111E+03	2710.	3.0367E+09	223.04
-0.90	1.0297E+04	2828.	2.6239E+09	13.74
-1.60	1.2269E+04	2786.	2.3452E+09	-132.77
-1.90	1.3098E+04	2737.	2.2288E+09	-195.56
-2.60	1.4953E+04	2546.	1.9654E+09	-350.46
-2.90	1.5700E+04	2434.	1.8564E+09	-394.43
-3.50	1.7096E+04	2228.	1.6456E+09	-293.97
-3.64	1.7403E+04	2194.	1.5984E+09	-195.77
-3.80	1.7754E+04	2164.	1.5442E+09	-172.79
-3.90	1.7970E+04	2147.	1.5110E+09	-170.39
-4.20	1.8605E+04	2085.	1.4133E+09	-244.67
-4.90	2.0004E+04	1913.	1.1966E+09	-245.59
-5.90	2.1795E+04	1669.	9.1682E+08	-242.40
-6.17	2.2233E+04	1605.	8.4829E+08	-235.09
-6.90	2.3278E+04	1155.	6.7463E+08	-993.33
-7.00	2.3388E+04	1048.	6.5259E+08	-1143.61
-7.90	2.3841E+04	-74.	4.7253E+08	-1351.17
-8.90	2.3108E+04	-1374.	3.1143E+08	-1248.13
-9.74	2.1499E+04	-2482.	2.0706E+08	-1393.16
-9.90	2.1082E+04	-2699.	1.9007E+08	-1308.31
-10.90	1.7816E+04	-3744.	1.0496E+08	-781.70
-11.90	1.3769E+04	-4263.	5.0529E+07	-255.10
-12.90	9.4661E+03	-4255.	1.9850E+07	271.50
-13.90	5.4351E+03	-3720.	5.5678E+06	798.10
-14.90	2.2021E+03	-2658.	7.9205E+05	1324.70
-15.90	2.9391E+02	-1070.	1.2366E+04	1851.31
-16.44	0.0000E+00	0.	0.0000E+00	2134.16

NOTE: DIVIDE SCALED DEFLECTION MODULUS OF ELLASTICITY IN PSI TIMES PILE MOMENT OF INERTIA IN IN^4 TO OBTAIN DEFLECTION IN INCHES.

III.--WATER AND SOIL PRESSURES

		<-------------SOIL PRESSURES-------------->			
	WATER	<----LEFTSIDE----->		<---RIGHTSIDE---->	
ELEVATION	PRESSURE	PASSIVE	ACTIVE	ACTIVE	PASSIVE

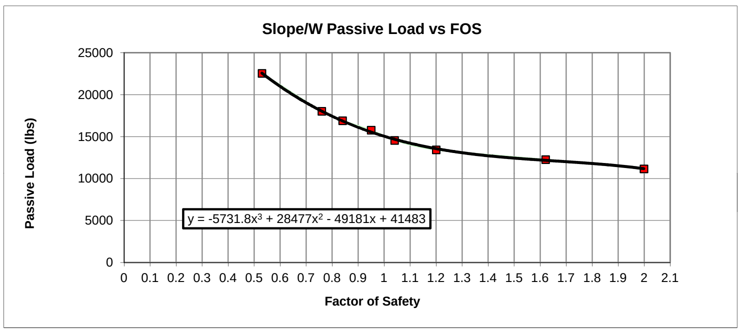
(FT)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)
14.10	0.	0.	0.	0.	0.
13.10	0.	0.	0.	0.	0.
12.10	0.	0.	0.	0.	0.
11.10	0.	0.	0.	0.	0.
10.10	0.	0.	0.	0.	0.
9.10	0.	0.	0.	0.	0.
8.10	0.	0.	0.	0.	0.
8.00	0.	0.	0.	0.	0.
7.10	56.	0.	0.	0.	0.
6.10	119.	0.	0.	0.	0.
5.10	181.	0.	0.	0.	0.
4.10	243.	0.	0.	0.	0.
3.60+	275.	0.	0.	0.	0.
3.60-	275.	500.	0.	0.	0.
3.10	306.	795.	0.	0.	0.
2.10	368.	874.	0.	0.	0.
1.10	431.	959.	0.	0.	0.
0.10	493.	1050.	0.	0.	0.
-0.90	555.	1140.	0.	0.	0.
-1.60+	599.	1203.	0.	0.	0.
-1.60-	599.	1203.	0.	0.	500.
-1.90	618.	1231.	0.	0.	755.
-2.60	661.	1302.	0.	0.	718.
-2.90	680.	1310.	0.	0.	680.
-3.50	718.	1139.	0.	0.	454.
-3.64+	726.	982.	0.	0.	374.
-3.64-	726.	1066.	0.	0.	374.
-3.80	736.	982.	169.	0.	281.
-3.90	736.	961.	215.	0.	257.
-4.20	736.	981.	207.	0.	277.
-4.90	736.	982.	252.	0.	294.
-5.90	736.	979.	314.	0.	314.
-6.17+	736.	971.	311.	0.	775.
-6.17-	736.	971.	311.	0.	437.
-6.90	736.	2357.	1854.	627.	775.
-7.00	736.	2612.	2079.	732.	823.
-7.90	736.	2608.	1177.	520.	634.
-8.90	736.	2124.	193.	139.	510.
-9.74	736.	2310.	298.	181.	693.
-9.90	736.	2346.	318.	189.	729.
-10.90	736.	2492.	323.	196.	911.
-11.90	736.	2636.	329.	205.	1064.
-12.90	736.	2776.	337.	217.	1213.
-13.90	736.	2911.	346.	212.	1367.
-14.90	736.	3044.	355.	191.	1523.
-15.90	736.	3176.	365.	189.	1680.
-16.44	736.	3308.	375.	205.	1844.
-17.90	736.	3439.	385.	219.	2038.

```
'REACH 1D
'WATER LEVEL 8'
CONTROL  CANTILEVER  DESIGN  1.00  1.60
WALL   14.1
SURFACE RIGHTSIDE   6    0   -1.6
                0.9   -1.6
                7.5   -3.5
                18   -5.4
                40   -4.2
                60   -3.7
SURFACE LEFTSIDE   7    0    3.6
                1    3.6
                8.3    3.3
                35.1   -0.6
                35.5   -2.3
                41.1   -2.5
                70.5   -3.8
SOIL RIGHTSIDE  STRENGTHS   4
   94    94    0    400    0    400   -3.5   0
   94    94    0    170    0    170   -7   0
   122    122    33    0    18    0   -50   0
   102    102    0    685    0    622
SOIL LEFTSIDE  STRENGTHS   4
   94    94    0    400    0    400   -3.5   0
   94    94    0    170    0    170   -7   0
   122    122    33    0    18    0   -50   0
   102    102    0    685    0    622
WATER ELEVATIONS   62.4    8   -3.8
HORIZONTAL DISTRIBUTED   2    3.6    1415   -4.2    0
FINISHED
```

Canal:	Orleans Avenue Canal	
Reach:	Reach 2	
Load Case:	Water @ El 8	
Protected Side Top of Ground (GSE):	3.2	ft, Elevation
Critical Slip Surface Elev. (FSE):	-13	ft, Elevation
Sheetpile Tip Elevation:	-28.5	ft, Elevation

Step 1: Compute correct passive pressure forces from slope stability model (Slope/W). Procedure follows the approach cited in Paragraph D-4 of ETL 1110-2-575.

Unit Weight (psf)	Passive Load (lbs)	Factor of Safety	Failure Surface Elevation (feet)	Notes
50	11153	1.999	-13	
55	12265	1.621	-13	
60	13422	1.2	-13	
65	14553	1.04	-13	
70	15772	0.95	-13	
75	16896	0.84	-13	
80	18020	0.76	-13	
100	22535	0.53	-13	



Step 2: Perform CWALSHT analysis of cross section using a range of assumed horizontal distributed load above the critical slip surface elevation found in step 1. Determine the difference in passive load from CWALSHT and Slope/W for each assumed horizontal distributed load. **Note: Landside crest elevation was reduced from 3.2 ft NAVD88 to 0.2 ft NAVD88 as CWALSHT would not run due to the unbalanced levee (landside crest about 5 ft higher than the floodside crest).**

Check penetration of the sheetpile to determine where the pile behaves as a short pile or long pile. This I-wall has a penetration versus stick up of = (3.2--28.5)/(8'-3.2')=6.6. This ratio exceeds the recommended 2.5. For short pile behavior, the penetration was determined to be 20 ft. The PS GSE was 3.2 producing a short pile tip elevation of -16.8. See attached EXCEL sheet for short pile versus long pile calculation. This penetration gives a penetration to stickup ratio of 4.5.

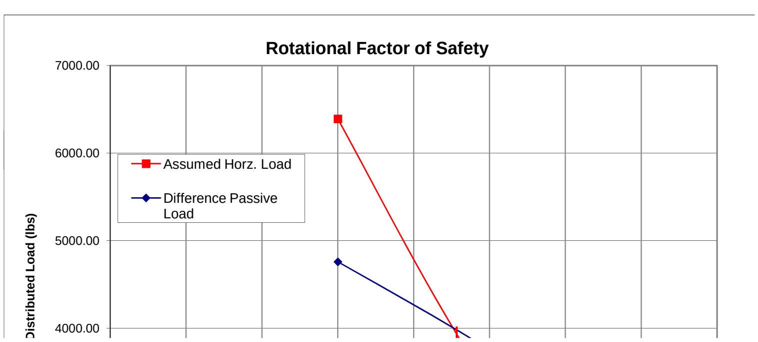
	(A)	(B)		(C)	(D)	
FOS	CWALSHT Passive Load (lbs)	SLOPE/W Passive Load (lbs)	Tip Elev feet	Difference Passive Load (A-B) (lbs)	Assumed Horizontal Distributed Load in CWALSHT (psf)	Resultant Distributed CWALSHT Load (D*(GSE-FSE)) (lbs)
1.1	16769.395	14212.04	-16.8	2557.35	195	1618.50
0.9	19859.405	16107.99	-16.8	3751.42	405	3361.50
0.7	23803.055	19044.02	-16.8	4759.03	770	6391.00

Interpolate Correction Force at the resultant FOS

FOS = 0.85

Correction Force = 4759.03 lbs

Step 3: Plot the assumed horizontal load and the difference passive load versus factor of safety. The intersection of the two curves represents the actual factor of safety.



SHORT PILE/LONG PILE - HOMOGENEOUS SAND

VALUES OF SUBGRADE REACTION FOR SHEET PILES					
CONSTANTS OF HORIZONTAL SUBGRADE REACTION l_h				COEFFICIENT OF SUBGRADE REACTION EQUATIONS n_h	
SANDS				SANDS	
TERZAGHI'S THEORY				TERZAGHI'S THEORY	
	LOOSE	MEDIUM	DENSE		
l_h (Dry or Moist) (pci)	2.89	9.26	23.15	n_h (lbs/in^4)	$n_h=(l_h/D)$ (where D is embedment depth in inches)
l_h (Submerged) (pci)	1.85	4.63	15.05		

From EM 1110-2-2906, Design of Pile Foundations, 1991

(b) Linearly Increasing Modulus of Horizontal Subgrade Reaction

$$R\ \cancel{T} = \sqrt[5]{\frac{EI}{n_h}}$$

$L/R \le 2.0$	Short pile
$2.0 < L/R < 4.0$	Intermediate
$L/R \ge 4.0$	Long pile

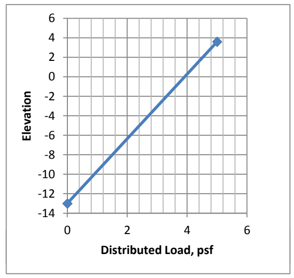
Enter l_h and moment of inertia of sheet pile. Vary penetration depth until D/R = 2.

Penetration, D, ft	Penetration, D, in	l_h, pci	n_H, lb/in^4	I, in^4/ft	EI, lb-in^2/ft	EI, lb-in^2/in	R, in	R, ft	D/R
20	240	2	0.01	84.2	2.68E+09	2.24E+08	121.82	10.15	1.97

VIII.B.--HORIZONTAL DISTRIBUTED LOAD

ELEVATION (FT)	DIST. LOAD (PSF)	Result. (LBS)
3.6	5	
-13	0	41.5

41.5



RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

NET SOIL PRESSURES INCLUDE APPLIED HORIZONTAL DISTRIBUTED LOADS.

ELEV. (FT)	NET WATER (PSF)	<---LEFTSIDE---> PASSIVE (PSF)	ACTIVE (PSF)	<--RIGHTSIDE---> ACTIVE (PSF)	PASSIVE (PSF)
13.9	0	0	0	0	0
12.9	0	0	0	0	0
11.9	0	0	0	0	0
10.9	0	0	0	0	0
9.9	0	0	0	0	0
8.9	0	0	0	0	0
8	0	0	0	0	0
7.9	6.2	0	0	0	0
6.9	68.6	0	0	0	0
5.9	131	0	0	0	0
4.9	193.4	0	0	0	0
3.9	255.8	0	0	0	0
3.2+	299.5	0	0	0	0
-3.2	299.5	0	0	0	0
2.9	318.2	0	0	0	0
1.9	380.6	0	0	0	0
0.9	443	0	0	0	0
0.2+	486.7	0	0	0	0
-0.2	486.7	575.5	0	0	0
-0.1	505.4	876.4	0	0	0
-1.1	567.8	977.3	0	0	0
-2.1	630.2	1078.2	0	0	0
-2.3+	642.7	1098.4	0	0	0
-2.3-	642.7	1098.4	0	0	575.5
-3.1	692.6	1184.1	0	0	852
-3.3	705.1	1198.7	0	0	854.1
-4	748.8	1021.3	0	0	632.7
-4.1	755	972.1	0	0	577.2
-4.8	798.7	842.7	0	0	411.6
-5.1	798.7	857.9	0	0	420.3
-5.2+	798.7	879.8	0	0	423.5
-5.2-	798.7	861.2	0	0	423.5
-6.1	798.7	879.8	22.1	0	442.5
-7.1	798.7	898.5	48.2	0	464.7
-8.1	798.7	918.6	71.6	0	486.9
-9.1	798.7	940.2	92.7	0	510.2
-10.1	798.7	961.7	114.2	0	524.1
-11.1	798.7	983.1	135.6	0	448.9
-11.5+	798.7	892	37.2	0	1034.5
-11.5-	798.7	892	37.2	0	682.4
-12.1	798.7	1474.6	666.9	418	1034.5
-13	798.7	3144.8	1979.3	1241.8	1744.8
-13.1	798.7	3111.9	1831.2	1159.8	1671.3
-14.1	798.7	2239.8	219	183.8	893.1
-15.1	798.7	2440.5	245.9	199.3	1079.4
-16.1	798.7	2632.9	256.3	206.4	1288
-17.1	798.7	2826.7	267.5	214.9	1477.8
-18.1	798.7	3021.3	279.2	225.1	1652
-19.1	798.7	3216.7	291.4	231.1	1839.3
-20.1	798.7	3413.3	303.9	226.6	2033.3
-21.1	798.7	3610.9	316.6	223.3	2223.3
-22.1	798.7	3809.3	329.6	232	2423
-23.1	798.7	4008.4	342.7	245.6	2637.1
-24.1	798.7	4208.3	356	258.8	2846.2
-25.1	798.7	4408.7	369.5	272.1	3050.8
-26.1	798.7	4631	383.1	285.5	3264.1
-27.1	798.7	4670.3	396.8	299.2	3486.2
-28.1	798.7	4394.3	410.6	313.1	3707.3
-29.1	798.7	4403.8	424.5	327.6	3926
-30.1	798.7	4878.5	438.4	340.5	4146.2
-31.1	798.7	5229.3	452.4	349.9	4367.7
-32.1	798.7	5405.8	466.4	360.1	4590.7
-33.1	798.7	5601.6	480.5	374	4815
-34.1	798.7	5799.8	494.5	389.1	5040
-35.1	798.7	5933.8	508.6	404.2	5265.7
-36.1	798.7	6005.5	522.8	419.2	5491.8
-37.1	798.7	6145.2	536.9	434.1	5718.4
-38.1	798.7	6343.3	551.1	449	5945.5
-39.1	798.7	6538.6	565.3	463.5	6173
-40.1	798.7	6745.2	579.5	474.9	6400.9
-41.1	798.7	6956.7	593.7	484.1	6629.1
-42.1	798.7	7158.7	607.9	497	6857.6
-43.1	798.7	7355.1	622.1	512.6	7086.3
-44.1	798.7	7552.4	636.4	527.8	7315.4
-45.1	798.7	7749.9	650.6	543.1	7544.7
-46.1	798.7	7948.2	664.9	558.2	7774.2
-47.1	798.7	8147.5	679.2	573.2	8003.9
-48.1	798.7	8347.4	693.5	726.6	10034.7
-48.8	798.7	12040.9	1041.2	0	2432.6
-49.1	798.7	4620.5	333.6	0	2452.7
-49.2	798.7	2875.4	0	0	2459.4
-50	798.7	2922.3	0	0	2506.3
-50.1	798.7	2926.3	0	0	2510.3
-50.8+	798.7	3893.9	0	0	2536.5
-50.8-	798.7	2952.5	0	0	2536.5
-51.0+	798.7	3893.9	592.6	0	4393.5
-51.0+	798.7	3965.1	592.6	0	4554.1

ELEV. (FT)	NET WATER (PSF)	LEFTSIDE PASSIVE (PSF)	RESULT. LEFTSIDE PASSIVE (LBS)
13.9	0	0	
12.9	0	0	
11.9	0	0	
10.9	0	0	
9.9	0	0	
8.9	0	0	
8	0	0	
7.9	6	0	
6.9	69	0	0
5.9	131	0	0
4.9	193	0	0
3.9	256	0	0
3.2	300	0	0
2.9	318	0	0
1.9	381	0	0
0.9	443	0	0
0.2	487	0	0
0.2	487	576	0
-0.1	505	876	217.8
-1.1	568	977	926.5
-2.1	630	1078	1027.5
-2.3	643	1098	217.6
-2.3	643	1098	0
-3.1	693	1184	912.8
-3.3	705	1199	238.3
-4	749	1021	777
-4.1	755	972	99.65
-4.8	799	843	635.25
-5.1	799	858	255.15
-5.25	799	880	130.35
-5.25	799	861	0
-6.1	799	880	739.925
-7.1	799	898	889
-8.1	799	919	908.5
-9.1	799	940	929.5
-10.1	799	962	951
-11.1	799	983	972.5
-11.5	799	892	375
-11.5	799	892	0
-12.1	799	1475	710.1
-13	799	1475	1327.5
-12.1	799	1475	
-13	799	3145	
-13.09	799	3114	
-13.1	799	3112	
-14.1	799	2240	
-15.1	799	2441	
-16.1	799	2633	
-16.85	799	2827	
-18.1	799	3021	

Last two values are averaged

PS WATER ELEVATION (FT)	CRITICAL SLIP SURF. ELEVATION (FT)	UNIT WEIGHT WATER (PCF)
-4.8	-13	64

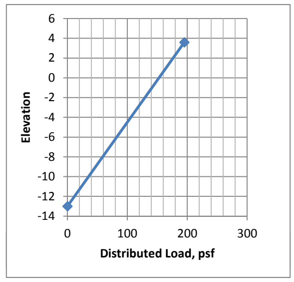
RESULTANT WATER LOAD= 2151.68 LBS

PASSIVE LOAD (SOIL) 13240.925
PASSIVE LOAD (SOIL+WATER) 15392.605
FOS = 1.39

IF THE PS WATER LEVEL IS BELOW THE CRITICAL SLIP SURFACE, USE PASSIVE LOAD (SOIL)

VIII.B.--HORIZONTAL DISTRIBUTED LOAD

ELEVATION (FT)	DIST. LOAD (PSF)	Result. (LBS)
3.6	195	
-13	0	1618.5



1618.5

RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

NET SOIL PRESSURES INCLUDE APPLIED HORIZONTAL DISTRIBUTED LOADS.

ELEV. (FT)	NET WATER (PSF)	<---LEFTSIDE---> PASSIVE (PSF)	ACTIVE (PSF)	<--RIGHTSIDE---> ACTIVE (PSF)	PASSIVE (PSF)
13.9	0	0	0	0	0
12.9	0	0	0	0	0
11.9	0	0	0	0	0
10.9	0	0	0	0	0
9.9	0	0	0	0	0
8.9	0	0	0	0	0
8	0	0	0	0	0
7.9	6.2	0	0	0	0
6.9	68.6	0	0	0	0
5.9	131	0	0	0	0
4.9	193.4	0	0	0	0
3.9	255.8	0	0	0	0
3.2+	299.5	0	0	0	0
-3.2	299.5	0	0	0	0
2.9	318.2	0	0	0	0
1.9	380.6	0	0	0	0
0.9	443	0	0	0	0
0.2+	486.7	0	0	0	0
-0.2	486.7	727.3	0	0	0
-0.1	505.4	1099.5	0	0	0
-1.1	567.8	1200.4	0	0	0
-2.1	630.2	1301.3	0	0	0
-2.3+	642.7	1321.4	0	0	0
-2.3-	642.7	1321.4	0	0	727.3
-3.1	692.6	1408.5	0	0	1068.6
-3.3	705.1	1421.6	0	0	1069.2
-4	748.8	1179.1	0	0	782.7
-4.1	755	1114.5	0	0	711.8
-4.8	798.7	937.3	0	0	498.3
-5.1	798.7	953	0	0	507.5
-5.2+	798.7	974.5	0	0	510.8
-5.2-	798.7	956.2	0	0	510.8
-6.1	798.7	974.5	22.1	0	529.7
-7.1	798.7	992.2	48.2	0	551.9
-8.1	798.7	1012.1	71.6	0	574.1
-9.1	798.7	1033.7	92.7	0	597.7
-10.1	798.7	1055.1	114.2	0	609.4
-11.1	798.7	1076.6	135.6	0	479.6
-11.5+	798.7	919.8	37.2	0	1449.6
-11.5-	798.7	919.8	37.2	0	866.4
-12.1	798.7	1878.6	666.9	418	1449.6
-13	798.7	4589.2	1979.3	1241.8	2650.3
-13.1	798.7	4521.7	1831.2	1159.8	2531.1
-14.1	798.7	2990.8	219	183.8	1229.8
-15.1	798.7	3290.7	245.9	199.3	1500.9
-16.1	798.7	3577.3	256.3	206.4	1785.8
-17.1	798.7	3867.2	267.5	214.9	2044.3
-18.1	798.7	4159.6	279.2	225.1	2300.4
-19.1	798.7	4455	291.4	231.1	2579.6
-20.1	798.7	4753.4	303.9	226.6	2854.5
-21.1	798.7	5054.4	316.6	223.3	3142.4
-22.1	798.7	5357.8	329.6	232	3456.1
-23.1	798.7	5663.3	342.7	245.6	3765
-24.1	798.7	5981.2	356	258.8	4072.7
-25.1	798.7	6246.9	369.5	272.1	4397.1
-26.1	798.7	6015.5	383.1	285.5	4731.8
-27.1	798.7	5773.4	396.8	299.2	5066.3
-28.1	798.7	6372	410.6	313.1	5400.9
-29.1	798.7	7025	424.5	327.6	5739.5
-30.1	798.7	7317.6	438.4	340.5	6082.2
-31.1	798.7	7621.6	452.4	349.9	6428.5
-32.1	798.7	7896.3	466.4	360.1	6777.3
-33.1	798.7	8060.5	480.5	374	7128.2
-34.1	798.7	8195.1	494.5	389.1	7481.1
-35.1	798.7	8438.9	508.6	404.2	7835.7
-36.1	798.7	8743.9	522.8	419.2	8191.9
-37.1	798.7	9059.9	536.9	434.1	8549.6
-38.1	798.7	9390.8	551.1	449	8908.6
-39.1	798.7	9706.9	565.3	463.5	9268.9
-40.1	798.7	10011.3	579.5	474.9	9630.4
-41.1	798.7	10318	593.7	484.1	9992.9
-42.1	798.7	10625.7	607.9	497	10356.4
-43.1	798.7	10935.6	622.1	512.6	10720.8
-44.1	798.7	11246.6	636.4	527.8	11086.1
-45.1	798.7	11564.3	650.6	543.1	11452.1
-46.1	798.7	11902.1	664.9	558.2	11818.9
-47.1	798.7	12252.1	679.2	573.2	12186.4
-48.1	798.7	12594.8	693.5	726.6	17147.3
-48.8	798.7	21574	1041.2	0	2432.6
-49.1	798.7	3268	333.6	0	2452.7
-49.2	798.7	2875.4	0	0	2459.4
-50	798.7	2922.3	0	0	2506.3
-50.1	798.7	2926.3	0	0	2510.3
-50.8+	798.7	4136.2	0	0	2536.5
-50.8-	798.7	2952.5	0	0	2536.5
-51.0+	798.7	4136.2	592.6	0	5070.2

ELEV. (FT)	NET WATER (PSF)	LEFTSIDE PASSIVE (PSF)	RESULT. LEFTSIDE PASSIVE (LBS)
13.9	0	0	
12.9	0	0	
11.9	0	0	
10.9	0	0	
9.9	0	0	
8.9	0	0	
8	0	0	
7.9	6	0	
6.9	69	0	0
5.9	131	0	0
4.9	193	0	0
3.9	256	0	0
3.2	300	0	0
2.9	318	0	0
1.9	381	0	0
0.9	443	0	0
0.2	487	0	0
0.2	487	727	0
-0.1	505	1099	273.9
-1.1	568	1200	1149.5
-2.1	630	1301	1250.5
-2.3	643	1321	262.2
-2.3	643	1321	0
-3.1	693	1408	1091.6
-3.3	705	1422	283
-4	749	1179	910.35
-4.1	755	1114	114.65
-4.8	799	937	717.85
-5.1	799	953	283.5
-5.25	799	974	144.525
-5.25	799	956	0
-6.1	799	974	820.25
-7.1	799	992	983
-8.1	799	1012	1002
-9.1	799	1034	1023
-10.1	799	1055	1044.5
-11.1	799	1077	1066
-11.5	799	920	399.4
-11.5	799	920	0
-12.1	799	1879	839.7
-12.61	799	1879	958.29
-13	799	1879	732.81
-12.61	799	3421	-1033.5
-13	799	4589	1561.95
-13.1	799	4522	455.55
-14.1	799	2991	3756.5
-15.1	799	3291	3141
-16.1	799	3577	3434
-16.82	799	3867	2679.84
-18.1	799	4160	5137.28

Last two values are averaged

PS WATER ELEVATION (FT)	CRITICAL SLIP SURF. ELEVATION (FT)	UNIT WEIGHT WATER (PCF)
-4.8	-13	64

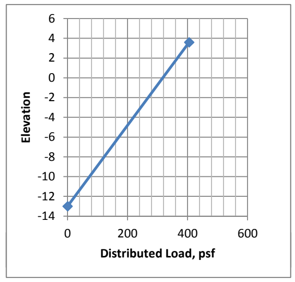
RESULTANT WATER LOAD= 2151.68 LBS

PASSIVE LOAD (SOIL) 14617.715
PASSIVE LOAD (SOIL+WATER) 16769.395
FOS = 1.1

IF THE PS WATER LEVEL IS BELOW THE CRITICAL SLIP SURFACE, USE PASSIVE LOAD (SOIL)

VIII.B.--HORIZONTAL DISTRIBUTED LOAD

ELEVATION (FT)	DIST. LOAD (PSF)	Result. (LBS)
3.6	405	
-13	0	3361.5
		3361.5



RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

NET SOIL PRESSURES INCLUDE APPLIED HORIZONTAL DISTRIBUTED LOADS.

ELEV. (FT)	NET WATER (PSF)	<---LEFTSIDE---> PASSIVE (PSF)	ACTIVE (PSF)	<--RIGHTSIDE---> ACTIVE (PSF)	PASSIVE (PSF)
13.9	0	0	0	0	0
12.9	0	0	0	0	0
11.9	0	0	0	0	0
10.9	0	0	0	0	0
9.9	0	0	0	0	0
8.9	0	0	0	0	0
8	0	0	0	0	0
7.9	6.2	0	0	0	0
6.9	68.6	0	0	0	0
5.9	131	0	0	0	0
4.9	193.4	0	0	0	0
3.9	255.8	0	0	0	0
3.2+	299.5	0	0	0	0
-3.2	299.5	0	0	0	0
2.9	318.2	0	0	0	0
1.9	380.6	0	0	0	0
0.9	443	0	0	0	0
0.2+	486.7	0	0	0	0
-0.2	486.7	888.9	0	0	0
-0.1	505.4	1337.1	0	0	0
-1.1	567.8	1438	0	0	0
-2.1	630.2	1538.9	0	0	0
-2.3+	642.7	1559	0	0	0
-2.3-	642.7	1559	0	0	888.9
-3.1	692.6	1647.5	0	0	1299.3
-3.3	705.1	1659	0	0	1298.3
-4	748.8	1347.2	0	0	942.5
-4.1	755	1266.1	0	0	855.1
-4.8	798.7	1038	0	0	590.7
-5.1	798.7	1054.2	0	0	600.4
-5.2+	798.7	1075.2	0	0	603.7
-5.2-	798.7	1057.3	0	0	603.7
-6.1	798.7	1075.2	22.1	0	622.6
-7.1	798.7	1092.1	48.2	0	644.8
-8.1	798.7	1111.6	71.6	0	667
-9.1	798.7	1133.3	92.7	0	690.9
-10.1	798.7	1154.7	114.2	0	700.3
-11.1	798.7	1176.1	135.6	0	496.6
-11.5+	798.7	928.4	37.2	0	2001.5
-11.5-	798.7	928.4	37.2	0	1096.7
-12.1	798.7	2408.4	666.9	418	2001.5
-13	798.7	6565.6	1979.3	1241.8	3901.9
-13.1	798.7	6452.2	1831.2	1159.8	3723.6
-14.1	798.7	4037.7	219	183.8	1729.5
-15.1	798.7	4505.5	245.9	199.3	2136.8
-16.1	798.7	4957.3	256.3	206.4	2542
-17.1	798.7	5419.5	267.5	214.9	2927.3
-18.1	798.7	5891.5	279.2	225.1	3329.9
-19.1	798.7	6373.7	291.4	231.1	3748.9
-20.1	798.7	6865.7	303.9	226.6	4194.3
-21.1	798.7	7366.7	316.6	223.3	4682.4
-22.1	798.7	7876.2	329.6	232	5174.4
-23.1	798.7	8436.6	342.7	245.6	5674.9
-24.1	798.7	8625	356	258.8	6209.5
-25.1	798.7	8272.8	369.5	272.1	6761.6
-26.1	798.7	8549.5	383.1	285.5	7319.7
-27.1	798.7	9621.8	396.8	299.2	7887.4
-28.1	798.7	10410.1	410.6	313.1	8468.3
-29.1	798.7	10913.9	424.5	327.6	9061.8
-30.1	798.7	11381.5	438.4	340.5	9665.5
-31.1	798.7	11667.9	452.4	349.9	10278
-32.1	798.7	11942.2	466.4	360.1	10898.8
-33.1	798.7	12392.2	480.5	374	11527.3
-34.1	798.7	12941.5	494.5	389.1	12163.1
-35.1	798.7	13515.7	508.6	404.2	12805.6
-36.1	798.7	14086.4	522.8	419.2	13454.4
-37.1	798.7	14636.7	536.9	434.1	14109.2
-38.1	798.7	15185.1	551.1	449	14769.5
-39.1	798.7	15738.8	565.3	463.5	15435.1
-40.1	798.7	16298.7	579.5	474.9	16105.6
-41.1	798.7	16861.6	593.7	484.1	16780.8
-42.1	798.7	17451.3	607.9	497	17460.3
-43.1	798.7	18081.7	622.1	512.6	18143.9
-44.1	798.7	18710.4	636.4	527.8	18831.4
-45.1	798.7	19325.3	650.6	543.1	19522.6
-46.1	798.7	19945.4	664.9	558.2	20217.3
-47.1	798.7	20580.8	679.2	573.2	20915.3
-48.1	798.7	21236.3	693.5	726.6	33751.4
-48.8	798.7	43698.6	1041.2	0	2432.6
-49.1	798.7	2868.7	333.6	0	2452.7
-49.2	798.7	2875.4	0	0	2459.4
-50	798.7	2922.3	0	0	2506.3
-50.1	798.7	2926.3	0	0	2510.3
-50.8+	798.7	4381.8	0	0	2536.5
-50.8-	798.7	2952.5	0	0	2536.5
-51.0+	798.7	4381.8	592.6	0	6229.9

ELEV. (FT)	NET WATER (PSF)	LEFTSIDE PASSIVE (PSF)	RESULT. LEFTSIDE PASSIVE (LBS)
13.9	0	0	
12.9	0	0	
11.9	0	0	
10.9	0	0	
9.9	0	0	
8.9	0	0	
8	0	0	
7.9	6	0	
6.9	69	0	0
5.9	131	0	0
4.9	193	0	0
3.9	256	0	0
3.2	300	0	0
2.9	318	0	0
1.9	381	0	0
0.9	443	0	0
0.2	487	0	0
0.2	487	889	0
-0.1	505	1337	333.9
-1.1	568	1438	1387.5
-2.1	630	1539	1488.5
-2.3	643	1559	309.8
-2.3	643	1559	0
-3.1	693	1647	1282.4
-3.3	705	1659	330.6
-4	749	1347	1052.1
-4.1	755	1266	130.65
-4.8	799	1038	806.4
-5.1	799	1054	313.8
-5.25	799	1075	159.675
-5.25	799	1057	0
-6.1	799	1075	906.1
-7.1	799	1092	1083.5
-8.1	799	1112	1102
-9.1	799	1133	1122.5
-10.1	799	1155	1144
-11.1	799	1176	1165.5
-11.5	799	928	420.8
-11.5	799	928	0
-12.1	799	2408	1000.8
-12.46	799	2408	866.88
-13	799	2408	1300.32
-12.46	799	4056	-1745.28
-13	799	6566	2867.94
-13.1	799	6452	650.9
-14.1	799	4038	5245
-15.1	799	4506	4272
-16.1	799	4957	4731.5
-16.82	799	5420	3735.72
-18.1	799	5891	7239.04

PS WATER ELEVATION (FT)	CRITICAL SLIP SURF. ELEVATION (FT)	UNIT WEIGHT WATER (PCF)
-4.8	-13	64

RESULTANT WATER LOAD= 2151.68 LBS

PASSIVE LOAD (SOIL) 17707.725

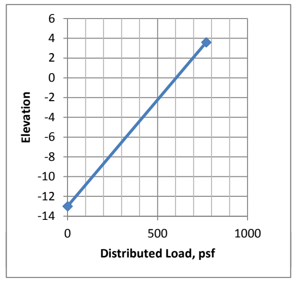
PASSIVE LOAD (SOIL+WATER) 19859.405

FOS = 0.9

IF THE PS WATER LEVEL IS BELOW THE CRITICAL SLIP SURFACE, USE PASSIVE LOAD (SOIL)

VIII.B.--HORIZONTAL DISTRIBUTED LOAD

ELEVATION (FT)	DIST. LOAD (PSF)	Result. (LBS)
3.6	770	
-13	0	6391



6391

RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

NET SOIL PRESSURES INCLUDE APPLIED HORIZONTAL DISTRIBUTED LOADS.

ELEV. (FT)	NET WATER (PSF)	<---LEFTSIDE---> PASSIVE (PSF)	ACTIVE (PSF)	<--RIGHTSIDE---> ACTIVE (PSF)	PASSIVE (PSF)
13.9	0	0	0	0	0
12.9	0	0	0	0	0
11.9	0	0	0	0	0
10.9	0	0	0	0	0
9.9	0	0	0	0	0
8.9	0	0	0	0	0
8	0	0	0	0	0
7.9	6.2	0	0	0	0
6.9	68.6	0	0	0	0
5.9	131	0	0	0	0
4.9	193.4	0	0	0	0
3.9	255.8	0	0	0	0
3.2+	299.5	0	0	0	0
-3.2	299.5	0	0	0	0
2.9	318.2	0	0	0	0
1.9	380.6	0	0	0	0
0.9	443	0	0	0	0
0.2+	486.7	0	0	0	0
-0.2	486.7	1142.9	0	0	0
-0.1	505.4	1710.4	0	0	0
-1.1	567.8	1811.3	0	0	0
-2.1	630.2	1912.2	0	0	0
-2.3+	642.7	1932.4	0	0	0
-2.3-	642.7	1932.4	0	0	1142.9
-3.1	692.6	2023.1	0	0	1661.8
-3.3	705.1	2032.1	0	0	1658.3
-4	748.8	1611.3	0	0	1193.5
-4.1	755	1504.5	0	0	1080.3
-4.8	798.7	1196.2	0	0	735.8
-5.1	798.7	1213.3	0	0	746.4
-5.2+	798.7	1233.6	0	0	749.7
-5.2-	798.7	1216.3	0	0	749.7
-6.1	798.7	1233.6	22.1	0	768.6
-7.1	798.7	1249.1	48.2	0	790.8
-8.1	798.7	1268	71.6	0	813
-9.1	798.7	1289.8	92.7	0	837.4
-10.1	798.7	1311.2	114.2	0	843.1
-11.1	798.7	1332.6	135.6	0	488.7
-11.5+	798.7	895.4	37.2	0	3110.7
-11.5-	798.7	895.4	37.2	0	1534.3
-12.1	798.7	3459.9	666.9	418	3110.7
-13	798.7	10664.3	1979.3	1241.8	6524.6
-13.1	798.7	10467.5	1831.2	1159.8	6237.2
-14.1	798.7	6356.5	219	183.8	2923.3
-15.1	798.7	7315.9	245.9	199.3	3711.5
-16.1	798.7	8287.7	256.3	206.4	4487.7
-17.1	798.7	9322.3	267.5	214.9	5287.3
-18.1	798.7	10422.6	279.2	225.1	6177
-19.1	798.7	11591.5	291.4	231.1	7169.8
-20.1	798.7	12830.1	303.9	226.6	8286.4
-21.1	798.7	14186.9	316.6	223.3	9484.2
-22.1	798.7	15240.7	329.6	232	10786
-23.1	798.7	15371.4	342.7	245.6	12222.5
-24.1	798.7	16111.8	356	258.8	13756.2
-25.1	798.7	18475.2	369.5	272.1	15389.2
-26.1	798.7	20649.8	383.1	285.5	17139.9
-27.1	798.7	22238.3	396.8	299.2	19009.7
-28.1	798.7	23586.8	410.6	313.1	20997.8
-29.1	798.7	24684.1	424.5	327.6	23105.4
-30.1	798.7	26204.5	438.4	340.5	25335.3
-31.1	798.7	28144.8	452.4	349.9	27690.5
-32.1	798.7	30201.4	466.4	360.1	30173.9
-33.1	798.7	32299.4	480.5	374	32788.3
-34.1	798.7	34429.7	494.5	389.1	35537.1
-35.1	798.7	36648.5	508.6	404.2	38423.3
-36.1	798.7	38960.5	522.8	419.2	41450.2
-37.1	798.7	41379.4	536.9	434.1	44621.2
-38.1	798.7	43962.7	551.1	449	47939.8
-39.1	798.7	46706.5	565.3	463.5	51409.7
-40.1	798.7	49521.8	579.5	474.9	55034.5
-41.1	798.7	52414.8	593.7	484.1	58818
-42.1	798.7	55455	607.9	497	62764.2
-43.1	798.7	58662.3	622.1	512.6	66877.9
-44.1	798.7	62010.8	636.4	527.8	71156.8
-45.1	798.7	65480.7	650.6	543.1	75603.6
-46.1	798.7	69075.7	664.9	558.2	80234.2
-47.1	798.7	72798.5	679.2	573.2	85054.2
-48.1	798.7	76642.3	693.5	726.6	163986.1
-48.8	798.7	192153.4	1041.2	0	2432.6
-49.1	798.7	2868.7	333.6	0	2452.7
-49.2	798.7	2875.4	0	0	2459.4
-50	798.7	2922.3	0	0	2506.3
-50.1	798.7	2926.3	0	0	2510.3
-50.8+	798.7	5791.1	0	0	2536.5
-50.8-	798.7	2952.5	0	0	2536.5
-51.0+	798.7	5791.1	592.6	0	14468.2

ELEV. (FT)	NET WATER (PSF)	LEFTSIDE PASSIVE (PSF)	RESULT. LEFTSIDE PASSIVE (LBS)
13.9	0	0	
12.9	0	0	
11.9	0	0	
10.9	0	0	
9.9	0	0	
8.9	0	0	
8	0	0	
7.9	6	0	
6.9	69	0	0
5.9	131	0	0
4.9	193	0	0
3.9	256	0	0
3.2	300	0	0
2.9	318	0	0
1.9	381	0	0
0.9	443	0	0
0.2	487	0	0
0.2	487	1143	0
-0.1	505	1710	427.95
-1.1	568	1811	1760.5
-2.1	630	1912	1861.5
-2.3	643	1932	384.4
-2.3	643	1932	0
-3.1	693	2023	1582
-3.3	705	2032	405.5
-4	749	1611	1275.05
-4.1	755	1504	155.75
-4.8	799	1196	945
-5.1	799	1213	361.35
-5.25	799	1234	183.525
-5.25	799	1216	0
-6.1	799	1234	1041.25
-7.1	799	1249	1241.5
-8.1	799	1268	1258.5
-9.1	799	1290	1279
-10.1	799	1311	1300.5
-11.1	799	1333	1322
-11.5	799	895	445.6
-11.5	799	895	0
-12.1	799	3460	1306.5
-12.43	799	3460	1141.8
-13	799	3460	1972.2
-12.43	799	6082	-2719.47
-13	799	10664	4772.61
-13.1	799	10468	1056.6
-14.1	799	6356	8412
-15.1	799	7316	6836
-16.1	799	8288	7802
-16.83	799	9322	6427.65
-18.1	799	10423	12538.08

PS WATER ELEVATION (FT)	CRITICAL SLIP SURF. ELEVATION (FT)	UNIT WEIGHT WATER (PCF)
-4.8	-13	64

RESULTANT WATER LOAD= 2151.68 LBS

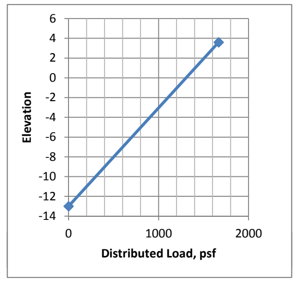
PASSIVE LOAD (SOIL) 21651.375
PASSIVE LOAD (SOIL+WATER) 23803.055
FOS = 0.7

IF THE PS WATER LEVEL IS BELOW THE CRITICAL SLIP SURFACE, USE PASSIVE LOAD (SOIL)

VIII.B.--HORIZONTAL DISTRIBUTED LOAD

ELEVATION (FT)	DIST. LOAD (PSF)	Result. (LBS)
3.6	1667	
-13	0	13836.1

13836.1



RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

NET SOIL PRESSURES INCLUDE APPLIED HORIZONTAL DISTRIBUTED LOADS.

ELEV. (FT)	NET WATER (PSF)	<---LEFTSIDE---> PASSIVE (PSF)	ACTIVE (PSF)	<--RIGHTSIDE---> ACTIVE (PSF)	PASSIVE (PSF)
13.9	0	0	0	0	0
12.9	0	0	0	0	0
11.9	0	0	0	0	0
10.9	0	0	0	0	0
9.9	0	0	0	0	0
8.9	0	0	0	0	0
8	0	0	0	0	0
7.9	6.2	0	0	0	0
6.9	68.6	0	0	0	0
5.9	131	0	0	0	0
4.9	193.4	0	0	0	0
3.9	255.8	0	0	0	0
3.2+	299.5	0	0	0	0
-3.2	299.5	0	0	0	0
2.9	318.2	0	0	0	0
1.9	380.6	0	0	0	0
0.9	443	0	0	0	0
0.2+	486.7	0	0	0	0
-0.2	486.7	1600	0	0	0
-0.1	505.4	2382.5	0	0	0
-1.1	567.8	2483.4	0	0	0
-2.1	630.2	2584.3	0	0	0
-2.3+	642.7	2604.5	0	0	0
-2.3-	642.7	2604.5	0	0	1600
-3.1	692.6	2699.1	0	0	2314.2
-3.3	705.1	2703.7	0	0	2306.3
-4	748.8	2086.8	0	0	1645.4
-4.1	755	1933.5	0	0	1485.8
-4.8	798.7	1481	0	0	997
-5.1	798.7	1499.7	0	0	1009.2
-5.2+	798.7	1518.7	0	0	1012.5
-5.2-	798.7	1502.5	0	0	1012.5
-6.1	798.7	1518.7	22.1	0	1031.4
-7.1	798.7	1531.7	48.2	0	1053.6
-8.1	798.7	1549.5	71.6	0	1075.8
-9.1	798.7	1571.4	92.7	0	1101.1
-10.1	798.7	1592.8	114.2	0	1100.2
-11.1	798.7	1614.3	135.6	0	361.7
-11.5+	798.7	685.2	37.2	0	5893.6
-11.5-	798.7	685.2	37.2	0	2567.7
-12.1	798.7	6062.6	666.9	418	5893.6
-13	798.7	21427.9	1979.3	1241.8	13501.3
-13.1	798.7	21098.9	1831.2	1159.8	13015.9
-14.1	798.7	13667.7	219	183.8	7205.8
-15.1	798.7	17209.5	245.9	199.3	9935.4
-16.1	798.7	21473.2	256.3	206.4	13319.9
-17.1	798.7	26837.2	267.5	214.9	17861.5
-18.1	798.7	33679.7	279.2	225.1	24260.7
-19.1	798.7	42794.2	291.4	231.1	33479.6
-20.1	798.7	52514.2	303.9	226.6	47296.1
-21.1	798.7	64592	316.6	223.3	69099.7
-22.1	798.7	86254.3	329.6	232	105891.7
-23.1	798.7	119198.5	342.7	245.6	173993.3
-24.1	798.7	165898.7	356	258.8	290302.4
-25.1	798.7	239246.7	369.5	272.1	1745280
-26.1	798.7	370683.6	383.1	285.5	1081.9
-27.1	798.7	624460.4	396.8	299.2	1141.5

ELEV. (FT)	NET WATER (PSF)	LEFTSIDE PASSIVE (PSF)	RESULT. LEFTSIDE PASSIVE (LBS)
13.9	0	0	
12.9	0	0	
11.9	0	0	
10.9	0	0	
9.9	0	0	
8.9	0	0	
8	0	0	
7.9	6	0	
6.9	69	0	0
5.9	131	0	0
4.9	193	0	0
3.9	256	0	0
3.2	300	0	0
2.9	318	0	0
1.9	381	0	0
0.9	443	0	0
0.2	487	0	0
0.2	487	1600	0
-0.1	505	2383	597.45
-1.1	568	2483	2433
-2.1	630	2584	2533.5
-2.3	643	2604	518.8
-2.3	643	2604	0
-3.1	693	2699	2121.2
-3.3	705	2704	540.3
-4	749	2087	1676.85
-4.1	755	1933	201
-4.8	799	1481	1194.9
-5.1	799	1500	447.15
-5.25	799	1519	226.425
-5.25	799	1503	0
-6.1	799	1519	1284.35
-7.1	799	1532	1525.5
-8.1	799	1550	1541
-9.1	799	1571	1560.5
-10.1	799	1593	1582
-11.1	799	1614	1603.5
-11.5	799	685	459.8
-11.5	799	685	0
-12.1	799	6063	2024.4
-12.7	799	6063	3637.8
-13	799	6063	1818.9
-12.7	799	16281	-3351.6
-13	799	21428	5656.35
-13.1	799	21099	2126.35
-14.1	799	13668	17383.5
-15.1	799	17210	15439
-16.1	799	21473	19341.5
-16.81	799	26837	17150.05
-18.1	799	33680	39033.47

PS WATER ELEVATION (FT)	CRITICAL SLIP SURF. ELEVATION (FT)	UNIT WEIGHT WATER (PCF)
-4.8	-13	64

RESULTANT WATER LOAD= 2151.68 LBS

PASSIVE LOAD (SOIL) 29528.325

PASSIVE LOAD (SOIL+WATER) 31680.005 **IF THE PS WATER LEVEL IS BELOW THE CRITICAL SLIP SURFACE,**

FOS = 0.5 **USE PASSIVE LOAD (SOIL)**

```
'REACH 2R
'WATER LEVEL 8'
'LANDSIDE LEVEE CREST ELEVATION ALTERED FOR ANALYSIS TO 0.2 FT NAVD 88
'CWALSHT WILL NOT RUN WITH LANDSIDE LEVEE CREST ELEVATION @ 3.2'
CONTROL  CANTILEVER  DESIGN  1.00  1.20
WALL   13.9
SURFACE RIGHTSIDE   6    0   -2.3
            7.9   -3
            17.8   -5
            22.4   -5.5
            28.7   -5.7
            80   -5.5
SURFACE LEFTSIDE   9    0    3.2
            1    3.2
            6.5    3
            35.2   -1.2
            35.6   -3
            42   -3.2
            50.3   -4
            66.2   -4.8
            110   -4.8
SOIL RIGHTSIDE  STRENGTHS   4
  104    104    0    400    0    400   -4   0
  88    88    0    175    0    175   -13   0
  122    122    33    0    18    0   -50   0
  102    102    0    782    0    673
SOIL LEFTSIDE  STRENGTHS   4
  104    104    0    400    0    400   -4   0
  88    88    0    175    0    175   -13   0
  122    122    33    0    18    0   -50   0
  102    102    0    782    0    673
WATER ELEVATIONS   62.4    8   -4.8
HORIZONTAL DISTRIBUTED   2    3.2    800   -13    0
FINISHED
```

```
'REACH 2R
'WATER LEVEL 8'
'LANDSIDE LEVEE CREST ELEVATION ALTERED FOR ANALYSIS TO 0.2 FT NAVD 88
'CWALSHT WILL NOT RUN WITH LANDSIDE LEVEE CREST ELEVATION @ 3.2'
CONTROL  CANTILEVER  DESIGN  1.00  1.10
WALL   13.9
SURFACE RIGHTSIDE   6    0   -2.3
                7.9   -3
                17.8   -5
                22.4   -5.5
                28.7   -5.7
                80   -5.5
SURFACE LEFTSIDE   9    0    3.2
                1    3.2
                6.5    3
                35.2   -1.2
                35.6   -3
                42   -3.2
                50.3   -4
                66.2   -4.8
                110   -4.8
SOIL RIGHTSIDE  STRENGTHS   4
   104    104    0    400    0    400   -4   0
   88    88    0    175    0    175   -13   0
   122    122    33    0    18    0   -50   0
   102    102    0    782    0    673
SOIL LEFTSIDE  STRENGTHS   4
   104    104    0    400    0    400   -4   0
   88    88    0    175    0    175   -13   0
   122    122    33    0    18    0   -50   0
   102    102    0    782    0    673
WATER ELEVATIONS   62.4    8   -4.8
HORIZONTAL DISTRIBUTED   2    3.2    1055   -13    0
FINISHED
```

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS
DATE: 4-OCTOBER-2013 TIME: 14:48:02

****
* INPUT DATA *
****

I.--HEADING
'REACH 2R
'WATER LEVEL 8'
'LANDSIDE LEVEE CREST ELEVATION ALTERED FOR ANALYSIS TO 0.2 FT NAVD 88
'CWALSHT WILL NOT RUN WITH LANDSIDE LEVEE CREST ELEVATION @ 3.2'

II.--CONTROL
CANTILEVER WALL DESIGN
FACTOR OF SAFETY FOR ACTIVE PRESSURES = 1.00
FACTOR OF SAFETY FOR PASSIVE PRESSURES = 1.10

III.--WALL DATA
ELEVATION AT TOP OF WALL = 13.90 FT.

IV.--SURFACE POINT DATA

IV.A.--RIGHTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	-2.30
7.90	-3.00
17.80	-5.00
22.40	-5.50
28.70	-5.70
80.00	-5.50

IV.B.--LEFTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	3.20
1.00	3.20
6.50	3.00
35.20	-1.20
35.60	-3.00
42.00	-3.20
50.30	-4.00
66.20	-4.80
110.00	-4.80

V.--SOIL LAYER DATA

V.A.--RIGHTSIDE
LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COHESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADHESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.
104.00	104.00	0.00	400.00	0.00	400.00	-4.00	0.00	DEF	DEF
88.00	88.00	0.00	175.00	0.00	175.00	-13.00	0.00	DEF	DEF
122.00	122.00	33.00	0.00	18.00	0.00	-50.00	0.00	DEF	DEF
102.00	102.00	0.00	782.00	0.00	673.00			DEF	DEF

V.B.--LEFTSIDE

LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COHESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADHESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.
104.00	104.00	0.00	400.00	0.00	400.00	-4.00	0.00	DEF	DEF
88.00	88.00	0.00	175.00	0.00	175.00	-13.00	0.00	DEF	DEF
122.00	122.00	33.00	0.00	18.00	0.00	-50.00	0.00	DEF	DEF
102.00	102.00	0.00	782.00	0.00	673.00			DEF	DEF

VI.--WATER DATA

UNIT WEIGHT = 62.40 (PCF)
RIGHTSIDE ELEVATION = 8.00 (FT)
LEFTSIDE ELEVATION = -4.80 (FT)
NO SEEPAGE

VII.--VERTICAL SURCHARGE LOADS

NONE

VIII.--HORIZONTAL LOADS

VIII.A.--HORIZONTAL LINE LOADS

NONE

VIII.B.--HORIZONTAL DISTRIBUTED LOADS

ELEVATION (FT)	DIST. LOAD (PSF)
3.20	1055.00
-13.00	0.00

****
*   SOIL PRESSURES FOR   *
* CANTILEVER WALL DESIGN *
****

I.--HEADING

'REACH 2R
'WATER LEVEL 8'
'LANDSIDE LEVEE CREST ELEVATION ALTERED FOR ANALYSIS TO 0.2 FT NAVD 88
'CWALSHT WILL NOT RUN WITH LANDSIDE LEVEE CREST ELEVATION @ 3.2'

II.--SOIL PRESSURES

RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

NET SOIL PRESSURES INCLUDE APPLIED HORIZONTAL DISTRIBUTED LOADS.

	NET	<---LEFTSIDE--->		<------NET------> (SOIL + WATER)		<--RIGHTSIDE--->	
ELEV. (FT)	WATER (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)
13.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7.9	6.2	0.0	0.0	6.2	6.2	0.0	0.0
6.9	68.6	0.0	0.0	68.6	68.6	0.0	0.0
5.9	131.0	0.0	0.0	131.0	131.0	0.0	0.0
4.9	193.4	0.0	0.0	193.4	193.4	0.0	0.0
3.9	255.8	0.0	0.0	255.8	255.8	0.0	0.0
3.2+	299.5	0.0	0.0	299.5	299.5	0.0	0.0
3.2-	299.5	727.3	0.0	627.2	1354.5	0.0	0.0
2.9	318.2	1121.3	0.0	232.4	1353.7	0.0	0.0
1.9	380.6	1207.9	0.0	143.1	1351.0	0.0	0.0
0.9	443.0	1300.2	0.0	48.0	1348.3	0.0	0.0
-0.1	505.4	1400.0	0.0	-54.5	1345.5	0.0	0.0
-1.1	567.8	1500.5	0.0	-157.7	1342.8	0.0	0.0
-2.1	630.2	1600.9	0.0	-260.8	1340.1	0.0	0.0
-2.3+	642.7	1621.1	0.0	-281.5	1339.5	0.0	0.0
-2.3-	642.7	1621.1	0.0	-281.5	2066.8	0.0	727.3
-3.1	692.6	1702.3	0.0	-365.0	2406.0	0.0	1068.6
-3.3	705.1	1704.7	0.0	-367.9	2406.0	0.0	1069.2
-4.0	748.8	1404.2	0.0	-69.3	2117.6	0.0	782.7
-4.0+	751.0	1335.9	0.0	-23.5	2093.0	0.0	758.2
-4.0-	751.0	1380.7	0.0	-23.5	2093.0	0.0	758.2
-4.1	755.0	1335.9	60.5	-1.3	1985.8	0.0	711.8
-4.8	798.7	1155.6	353.5	177.2	1477.5	0.0	498.3
-5.1	798.7	1168.2	360.9	145.0	1459.8	0.0	507.5

-6.1	798.7	1181.7	374.4	66.4	1403.3	0.0	529.7
-7.1	798.7	1193.9	386.6	-11.0	1348.2	0.0	551.9
-8.1	798.7	1206.2	398.9	-88.4	1293.0	0.0	574.1
-9.1	798.7	1218.6	411.3	-165.9	1239.2	0.0	597.7
-10.1	798.7	1230.9	423.6	-243.3	1173.4	0.0	609.4
-11.1	798.7	1243.2	435.9	-320.8	966.1	0.0	479.6
-11.5+	798.7	1021.7	295.4	-125.2	1759.1	0.0	1449.6
-11.5-	798.7	1021.7	295.4	-125.2	1759.1	0.0	866.4
-12.1	798.7	2324.7	1143.0	-1049.4	1163.9	418.0	1449.6
-13.0	798.7	6035.9	2804.7	-3995.4	644.4	1241.8	2650.3
-13.1	798.7	5941.2	2578.1	-3982.7	751.7	1159.8	2531.1
-14.1	798.7	3753.8	264.4	-2771.2	1764.1	183.8	1229.8
-15.1	798.7	4039.1	298.4	-3041.1	2001.2	199.3	1500.9
-16.1	798.7	4298.1	308.0	-3292.9	2276.5	206.4	1785.8
-17.1	798.7	4546.9	318.1	-3533.3	2524.9	214.9	2044.3
-18.1	798.7	4782.8	328.4	-3759.0	2770.7	225.1	2300.4
-19.1	798.7	5013.8	339.0	-3984.0	3039.3	231.1	2579.6
-20.1	798.7	5244.6	349.8	-4219.3	3303.4	226.6	2854.5
-21.1	798.7	5474.7	360.8	-4452.7	3580.3	223.3	3142.4
-22.1	798.7	5704.3	371.9	-4673.6	3882.9	232.0	3456.1
-23.1	798.7	5933.3	383.1	-4889.0	4180.6	245.6	3765.0
-24.1	798.7	6170.7	394.5	-5113.3	4477.0	258.8	4072.7
-25.1	798.7	6361.9	406.3	-5291.1	4789.5	272.1	4397.1
-26.1	798.7	6120.9	418.9	-5036.6	5111.6	285.5	4731.8
-27.1	798.7	5949.9	431.9	-4852.0	5433.1	299.2	5066.3
-28.1	798.7	6575.2	444.9	-5463.4	5754.8	313.1	5400.9
-29.1	798.7	7166.6	457.9	-6040.4	6080.3	327.6	5739.5
-30.1	798.7	7400.5	470.9	-6261.4	6410.0	340.5	6082.2
-31.1	798.7	7635.3	484.0	-6486.6	6743.2	349.9	6428.5
-32.1	798.7	7810.7	497.1	-6651.9	7079.0	360.1	6777.3
-33.1	798.7	7916.7	510.2	-6744.1	7416.7	374.0	7128.2
-34.1	798.7	8035.9	523.4	-6848.1	7756.4	389.1	7481.1
-35.1	798.7	8261.4	536.5	-7058.5	8097.9	404.2	7835.7
-36.1	798.7	8579.3	549.7	-7361.4	8440.9	419.2	8191.9
-37.1	798.7	8931.7	562.9	-7698.8	8785.4	434.1	8549.6
-38.1	798.7	9245.9	576.1	-7998.2	9131.3	449.0	8908.6
-39.1	798.7	9525.3	589.3	-8263.0	9478.3	463.5	9268.9
-40.1	798.7	9808.9	602.5	-8535.2	9826.6	474.9	9630.4
-41.1	798.7	10095.0	615.7	-8812.2	10175.9	484.1	9992.9
-42.1	798.7	10389.2	629.0	-9093.5	10526.1	497.0	10356.4
-43.1	798.7	10692.9	642.2	-9381.6	10877.3	512.6	10720.8
-44.1	798.7	10999.7	655.5	-9673.1	11229.3	527.8	11086.1
-45.1	798.7	11312.2	668.7	-9970.4	11582.1	543.1	11452.1
-46.1	798.7	11642.8	682.0	-10285.9	11935.6	558.2	11818.9
-47.1	798.7	11984.5	695.3	-10612.6	12289.8	573.2	12186.4
-48.1	798.7	12320.3	708.6	-10795.0	17237.5	726.6	17147.3
-48.8	798.7	21095.9	1140.4	-20297.2	2090.9	0.0	2432.6
-49.1	798.7	3208.3	253.3	-2409.6	2998.1	0.0	2452.7
-49.2	798.7	3184.8	0.0	-2386.1	3255.6	0.0	2456.8
-50.0	798.7	3234.3	0.0	-2435.6	3305.0	0.0	2506.3
-50.1	798.7	3238.3	0.0	-2439.6	3309.0	0.0	2510.3
-50.8+	798.7	3863.4	0.0	-2765.4	3335.4	0.0	2536.7
-50.8-	798.7	3264.7	0.0	-2765.4	3335.4	0.0	2536.7
-51.0+	798.7	3863.4	739.5	-3064.7	3866.3	0.0	5070.2

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS
DATE: 4-OCTOBER-2013 TIME: 14:48:05

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*  SUMMARY OF RESULTS FOR  *
*  CANTILEVER WALL DESIGN  *
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I.--HEADING
'REACH 2R
'WATER LEVEL 8'
'LANDSIDE LEVEE CREST ELEVATION ALTERED FOR ANALYSIS TO 0.2 FT NAVD 88
'CWALSHT WILL NOT RUN WITH LANDSIDE LEVEE CREST ELEVATION @ 3.2'

II.--SUMMARY

RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

WALL BOTTOM ELEV. (FT) : -16.80
PENETRATION (FT) : 14.50

MAX. BEND. MOMENT (LB-FT) : 1.0030E+04
AT ELEVATION (FT) : -10.61

MAX. SCALED DEFL. (LB-IN^3): 4.7750E+09
AT ELEVATION (FT) : 13.90

NOTE: DIVIDE SCALED DEFLECTION MODULUS OF
ELLASTICITY IN PSI TIMES PILE MOMENT
OF INERTIA IN IN^4 TO OBTAIN DEFLECTION
IN INCHES.

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* COMPLETE OF RESULTS FOR *
* CANTILEVER WALL DESIGN *
****

I.--HEADING
'REACH 2R
'WATER LEVEL 8'
'LANDSIDE LEVEE CREST ELEVATION ALTERED FOR ANALYSIS TO 0.2 FT NAVD 88
'CWALSHT WILL NOT RUN WITH LANDSIDE LEVEE CREST ELEVATION @ 3.2'

II.--RESULTS

ELEVATION (FT)	BENDING MOMENT (LB-FT)	SHEAR (LB)	SCALED DEFLECTION (LB-IN^3)	NET PRESSURE (PSF)
13.90	0.0000E+00	0.	4.7750E+09	0.00
12.90	4.3656E-10	0.	4.5486E+09	0.00
11.90	4.3656E-10	0.	4.3223E+09	0.00
10.90	4.3656E-10	0.	4.0960E+09	0.00
9.90	4.3656E-10	0.	3.8697E+09	0.00
8.90	4.3656E-10	0.	3.6434E+09	0.00
8.00	1.6801E-09	0.	3.4397E+09	0.00
7.90	1.0400E-02	0.	3.4171E+09	6.24
6.90	1.3842E+01	38.	3.1908E+09	68.64
5.90	9.6314E+01	138.	2.9645E+09	131.04
4.90	3.0983E+02	300.	2.7384E+09	193.44
3.90	7.1678E+02	524.	2.5129E+09	255.84
3.20+	1.1502E+03	719.	2.3557E+09	299.52
3.20-	1.1502E+03	719.	2.3557E+09	627.25
2.90	1.3881E+03	848.	2.2886E+09	232.44
1.90	2.3372E+03	1036.	2.0668E+09	143.09
0.90	3.4285E+03	1131.	1.8490E+09	48.01
-0.10	4.5665E+03	1128.	1.6372E+09	-54.51
-1.10	5.6499E+03	1022.	1.4333E+09	-157.74
-2.10	6.5756E+03	812.	1.2391E+09	-260.81
-2.30	6.7328E+03	758.	1.2015E+09	-281.55
-3.10	7.2404E+03	500.	1.0562E+09	-364.97
-3.30	7.3330E+03	426.	1.0211E+09	-367.89
-4.00	7.5657E+03	273.	9.0223E+08	-69.31
-4.03	7.5750E+03	272.	8.9654E+08	-23.49
-4.10	7.5928E+03	271.	8.8577E+08	-1.31
-4.80	7.7967E+03	332.	7.7425E+08	177.18
-5.10	7.9039E+03	381.	7.2847E+08	145.01
-6.10	8.3441E+03	486.	5.8485E+08	66.36
-7.10	8.8509E+03	514.	4.5566E+08	-10.97
-8.10	9.3466E+03	464.	3.4176E+08	-88.41
-9.10	9.7540E+03	337.	2.4400E+08	-165.86
-10.10	9.9955E+03	133.	1.6307E+08	-243.31
-11.10	9.9937E+03	-149.	9.9383E+07	-320.75
-11.50	9.9139E+03	-238.	7.8806E+07	-125.25
-12.10	9.6923E+03	-591.	5.2920E+07	-1049.37
-12.39	9.4674E+03	-1025.	4.2737E+07	-1985.88
-13.00	8.5024E+03	-2055.	2.5332E+07	-1368.91
-13.10	8.2902E+03	-2187.	2.3040E+07	-1268.41

-14.10	5.6364E+03	-2953.	7.3039E+06	-263.42
-15.10	2.7192E+03	-2714.	1.2692E+06	741.58
-16.10	5.4349E+02	-1470.	4.0001E+04	1746.57
-16.80	0.0000E+00	0.	0.0000E+00	2450.50

NOTE: DIVIDE SCALED DEFLECTION MODULUS OF ELLASTICITY IN PSI TIMES PILE MOMENT OF INERTIA IN IN^4 TO OBTAIN DEFLECTION IN INCHES.

III.--WATER AND SOIL PRESSURES

		<-------------SOIL PRESSURES-------------->			
	WATER	<----LEFTSIDE----->		<---RIGHTSIDE---->	
ELEVATION	PRESSURE	PASSIVE	ACTIVE	ACTIVE	PASSIVE
(FT)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)
13.90	0.	0.	0.	0.	0.
12.90	0.	0.	0.	0.	0.
11.90	0.	0.	0.	0.	0.
10.90	0.	0.	0.	0.	0.
9.90	0.	0.	0.	0.	0.
8.90	0.	0.	0.	0.	0.
8.00	0.	0.	0.	0.	0.
7.90	6.	0.	0.	0.	0.
6.90	69.	0.	0.	0.	0.
5.90	131.	0.	0.	0.	0.
4.90	193.	0.	0.	0.	0.
3.90	256.	0.	0.	0.	0.
3.20+	300.	0.	0.	0.	0.
3.20-	300.	727.	0.	0.	0.
2.90	318.	1121.	0.	0.	0.
1.90	381.	1208.	0.	0.	0.
0.90	443.	1300.	0.	0.	0.
-0.10	505.	1400.	0.	0.	0.
-1.10	568.	1501.	0.	0.	0.
-2.10	630.	1601.	0.	0.	0.
-2.30+	643.	1621.	0.	0.	0.
-2.30-	643.	1621.	0.	0.	727.
-3.10	693.	1702.	0.	0.	1069.
-3.30	705.	1705.	0.	0.	1069.
-4.00	749.	1404.	0.	0.	783.
-4.03+	751.	1336.	0.	0.	758.
-4.03-	751.	1381.	0.	0.	758.
-4.10	755.	1336.	61.	0.	712.
-4.80	799.	1156.	354.	0.	498.
-5.10	799.	1168.	361.	0.	507.
-6.10	799.	1182.	374.	0.	530.
-7.10	799.	1194.	387.	0.	552.
-8.10	799.	1206.	399.	0.	574.
-9.10	799.	1219.	411.	0.	598.
-10.10	799.	1231.	424.	0.	609.
-11.10	799.	1243.	436.	0.	480.
-11.50+	799.	1022.	295.	0.	1450.
-11.50-	799.	1022.	295.	0.	866.

-12.10	799.	2325.	1143.	418.	1450.
-12.39	799.	3504.	1671.	680.	1831.
-13.00	799.	6036.	2805.	1242.	2650.
-13.10	799.	5941.	2578.	1160.	2531.
-14.10	799.	3754.	264.	184.	1230.
-15.10	799.	4039.	298.	199.	1501.
-16.10	799.	4298.	308.	206.	1786.
-16.80	799.	4547.	318.	215.	2044.
-18.10	799.	4783.	328.	225.	2300.

```
'REACH 2R
'WATER LEVEL 8'
'LANDSIDE LEVEE CREST ELEVATION ALTERED FOR ANALYSIS TO 0.2 FT NAVD 88
'CWALSHT WILL NOT RUN WITH LANDSIDE LEVEE CREST ELEVATION @ 3.2'
CONTROL  CANTILEVER  DESIGN  1.00  0.90
WALL   13.9
SURFACE RIGHTSIDE   6    0   -2.3
            7.9   -3
            17.8   -5
            22.4   -5.5
            28.7   -5.7
            80   -5.5
SURFACE LEFTSIDE   9    0    3.2
            1    3.2
            6.5    3
            35.2   -1.2
            35.6   -3
            42   -3.2
            50.3   -4
            66.2   -4.8
            110   -4.8
SOIL RIGHTSIDE  STRENGTHS   4
  104    104    0    400    0    400   -4   0
  88    88    0    175    0    175   -13   0
  122    122    33    0    18    0   -50   0
  102    102    0    782    0    673
SOIL LEFTSIDE  STRENGTHS   4
  104    104    0    400    0    400   -4   0
  88    88    0    175    0    175   -13   0
  122    122    33    0    18    0   -50   0
  102    102    0    782    0    673
WATER ELEVATIONS   62.4    8   -4.8
HORIZONTAL DISTRIBUTED   2    3.2    1375   -13    0
FINISHED
```

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS
DATE: 4-OCTOBER-2013 TIME: 14:53:47

****
* INPUT DATA *
****

I.--HEADING
'REACH 2R
'WATER LEVEL 8'
'LANDSIDE LEVEE CREST ELEVATION ALTERED FOR ANALYSIS TO 0.2 FT NAVD 88
'CWALSHT WILL NOT RUN WITH LANDSIDE LEVEE CREST ELEVATION @ 3.2'

II.--CONTROL
CANTILEVER WALL DESIGN
FACTOR OF SAFETY FOR ACTIVE PRESSURES = 1.00
FACTOR OF SAFETY FOR PASSIVE PRESSURES = 0.90

III.--WALL DATA
ELEVATION AT TOP OF WALL = 13.90 FT.

IV.--SURFACE POINT DATA

IV.A.--RIGHTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	-2.30
7.90	-3.00
17.80	-5.00
22.40	-5.50
28.70	-5.70
80.00	-5.50

IV.B.--LEFTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	3.20
1.00	3.20
6.50	3.00
35.20	-1.20
35.60	-3.00
42.00	-3.20
50.30	-4.00
66.20	-4.80
110.00	-4.80

V.--SOIL LAYER DATA

V.A.--RIGHTSIDE
LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH- ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH- ESION (PSF)	<--BOTTOM--> ELEV. (FT)	<--BOTTOM--> SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	<-SAFETY-> <-FACTOR-> PASS.
104.00	104.00	0.00	400.00	0.00	400.00	-4.00	0.00	DEF	DEF
88.00	88.00	0.00	175.00	0.00	175.00	-13.00	0.00	DEF	DEF
122.00	122.00	33.00	0.00	18.00	0.00	-50.00	0.00	DEF	DEF
102.00	102.00	0.00	782.00	0.00	673.00			DEF	DEF

V.B.--LEFTSIDE

LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH- ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH- ESION (PSF)	<--BOTTOM--> ELEV. (FT)	<--BOTTOM--> SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	<-SAFETY-> <-FACTOR-> PASS.
104.00	104.00	0.00	400.00	0.00	400.00	-4.00	0.00	DEF	DEF
88.00	88.00	0.00	175.00	0.00	175.00	-13.00	0.00	DEF	DEF
122.00	122.00	33.00	0.00	18.00	0.00	-50.00	0.00	DEF	DEF
102.00	102.00	0.00	782.00	0.00	673.00			DEF	DEF

VI.--WATER DATA

UNIT WEIGHT = 62.40 (PCF)
RIGHTSIDE ELEVATION = 8.00 (FT)
LEFTSIDE ELEVATION = -4.80 (FT)
NO SEEPAGE

VII.--VERTICAL SURCHARGE LOADS

NONE

VIII.--HORIZONTAL LOADS

VIII.A.--HORIZONTAL LINE LOADS

NONE

VIII.B.--HORIZONTAL DISTRIBUTED LOADS

ELEVATION (FT)	DIST. LOAD (PSF)
3.20	1375.00
-13.00	0.00

****
*   SOIL PRESSURES FOR   *
* CANTILEVER WALL DESIGN *
****

I.--HEADING
'REACH 2R
'WATER LEVEL 8'
'LANDSIDE LEVEE CREST ELEVATION ALTERED FOR ANALYSIS TO 0.2 FT NAVD 88
'CWALSHT WILL NOT RUN WITH LANDSIDE LEVEE CREST ELEVATION @ 3.2'

II.--SOIL PRESSURES

RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

NET SOIL PRESSURES INCLUDE APPLIED HORIZONTAL DISTRIBUTED LOADS.

				<------NET------>			
	NET	<---LEFTSIDE--->		(SOIL + WATER)		<--RIGHTSIDE--->	
ELEV.	WATER	PASSIVE	ACTIVE	ACTIVE	PASSIVE	ACTIVE	PASSIVE
(FT)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)
13.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7.9	6.2	0.0	0.0	6.2	6.2	0.0	0.0
6.9	68.6	0.0	0.0	68.6	68.6	0.0	0.0
5.9	131.0	0.0	0.0	131.0	131.0	0.0	0.0
4.9	193.4	0.0	0.0	193.4	193.4	0.0	0.0
3.9	255.8	0.0	0.0	255.8	255.8	0.0	0.0
3.2+	299.5	0.0	0.0	299.5	299.5	0.0	0.0
3.2-	299.5	888.9	0.0	785.6	1674.5	0.0	0.0
2.9	318.2	1363.5	0.0	304.3	1667.8	0.0	0.0
1.9	380.6	1446.6	0.0	198.7	1645.3	0.0	0.0
0.9	443.0	1537.1	0.0	85.8	1622.8	0.0	0.0
-0.1	505.4	1636.8	0.0	-36.4	1600.3	0.0	0.0
-1.1	567.8	1737.3	0.0	-159.4	1577.9	0.0	0.0
-2.1	630.2	1837.7	0.0	-282.3	1555.4	0.0	0.0
-2.3+	642.7	1857.9	0.0	-307.0	1550.9	0.0	0.0
-2.3-	642.7	1857.9	0.0	-307.0	2439.8	0.0	888.9
-3.1	692.6	1939.3	0.0	-406.4	2832.2	0.0	1299.3
-3.3	705.1	1937.8	0.0	-409.4	2826.7	0.0	1298.3
-4.0	748.8	1556.2	0.0	-43.5	2455.1	0.0	942.5
-4.0+	751.0	1470.9	0.0	13.1	2424.2	0.0	912.3
-4.0-	751.0	1526.8	0.0	13.1	2424.2	0.0	912.3
-4.1	755.0	1470.9	60.5	39.5	2305.0	0.0	855.1
-4.8	798.7	1240.4	353.5	254.3	1731.8	0.0	590.7
-5.1	798.7	1253.6	360.9	215.6	1708.7	0.0	600.4

-6.1	798.7	1267.1	374.4	117.2	1632.5	0.0	622.6
-7.1	798.7	1279.3	386.6	20.1	1557.7	0.0	644.8
-8.1	798.7	1291.7	398.9	-77.1	1482.7	0.0	667.0
-9.1	798.7	1304.0	411.3	-174.3	1409.4	0.0	690.9
-10.1	798.7	1316.3	423.6	-271.5	1321.6	0.0	700.3
-11.1	798.7	1328.6	435.9	-368.7	1020.7	0.0	496.6
-11.5+	798.7	990.7	295.4	-64.5	2179.9	0.0	2001.5
-11.5-	798.7	990.7	295.4	-64.5	2179.9	0.0	1096.7
-12.1	798.7	2998.4	1143.0	-1705.3	1733.6	418.0	2001.5
-13.0	798.7	8660.3	2804.7	-6619.8	1895.9	1241.8	3901.9
-13.1	798.7	8495.2	2578.1	-6536.7	1944.2	1159.8	3723.6
-14.1	798.7	5024.5	264.4	-4042.0	2263.8	183.8	1729.5
-15.1	798.7	5479.0	298.4	-4480.9	2637.1	199.3	2136.8
-16.1	798.7	5890.5	308.0	-4885.4	3032.7	206.4	2542.0
-17.1	798.7	6284.5	318.1	-5270.8	3407.9	214.9	2927.3
-18.1	798.7	6665.4	328.4	-5641.6	3800.2	225.1	3329.9
-19.1	798.7	7045.5	339.0	-6015.6	4208.5	231.1	3748.9
-20.1	798.7	7427.2	349.8	-6401.8	4643.1	226.6	4194.3
-21.1	798.7	7810.1	360.8	-6788.1	5120.3	223.3	4682.4
-22.1	798.7	8194.2	371.9	-7163.5	5601.2	232.0	5174.4
-23.1	798.7	8615.4	383.1	-7571.2	6090.5	245.6	5674.9
-24.1	798.7	8713.5	394.5	-7656.0	6613.7	258.8	6209.5
-25.1	798.7	8421.2	406.3	-7350.4	7154.0	272.1	6761.6
-26.1	798.7	8759.1	418.9	-7674.8	7699.5	285.5	7319.7
-27.1	798.7	9738.8	431.9	-8640.9	8254.3	299.2	7887.4
-28.1	798.7	10413.2	444.9	-9301.3	8822.2	313.1	8468.3
-29.1	798.7	10791.3	457.9	-9665.1	9402.6	327.6	9061.8
-30.1	798.7	11083.2	470.9	-9944.0	9993.3	340.5	9665.5
-31.1	798.7	11264.3	484.0	-10115.7	10592.8	349.9	10278.0
-32.1	798.7	11501.9	497.1	-10343.1	11200.4	360.1	10898.8
-33.1	798.7	11936.5	510.2	-10763.8	11815.8	374.0	11527.3
-34.1	798.7	12505.0	523.4	-11317.1	12438.4	389.1	12163.1
-35.1	798.7	13072.6	536.5	-11869.7	13067.8	404.2	12805.6
-36.1	798.7	13582.3	549.7	-12364.3	13703.4	419.2	13454.4
-37.1	798.7	14067.2	562.9	-12834.3	14345.0	434.1	14109.2
-38.1	798.7	14561.9	576.1	-13314.3	14992.2	449.0	14769.5
-39.1	798.7	15073.4	589.3	-13811.1	15644.5	463.5	15435.1
-40.1	798.7	15604.6	602.5	-14330.9	16301.8	474.9	16105.6
-41.1	798.7	16143.0	615.7	-14860.1	16963.7	484.1	16780.8
-42.1	798.7	16704.6	629.0	-15408.9	17630.0	497.0	17460.3
-43.1	798.7	17302.5	642.2	-15991.2	18300.4	512.6	18143.9
-44.1	798.7	17900.1	655.5	-16573.5	18974.7	527.8	18831.4
-45.1	798.7	18487.1	668.7	-17145.3	19652.6	543.1	19522.6
-46.1	798.7	19079.8	682.0	-17722.9	20334.0	558.2	20217.3
-47.1	798.7	19686.6	695.3	-18314.7	21018.7	573.2	20915.3
-48.1	798.7	20311.7	708.6	-18786.4	33841.6	726.6	33751.4
-48.8	798.7	41420.0	1140.4	-40621.2	2090.9	0.0	2432.6
-49.1	798.7	3180.7	253.3	-2382.0	2998.1	0.0	2452.7
-49.2	798.7	3184.8	0.0	-2386.1	3255.6	0.0	2456.8
-50.0	798.7	3234.3	0.0	-2435.6	3305.0	0.0	2506.3
-50.1	798.7	3238.3	0.0	-2439.6	3309.0	0.0	2510.3
-50.8+	798.7	4044.7	0.0	-2856.0	3335.4	0.0	2536.7
-50.8-	798.7	3264.7	0.0	-2856.0	3335.4	0.0	2536.7
-51.0+	798.7	4044.7	739.5	-3246.0	4446.2	0.0	6229.9

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS
DATE: 4-OCTOBER-2013 TIME: 14:53:49

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*  SUMMARY OF RESULTS FOR  *
*  CANTILEVER WALL DESIGN  *
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I.--HEADING
'REACH 2R
'WATER LEVEL 8'
'LANDSIDE LEVEE CREST ELEVATION ALTERED FOR ANALYSIS TO 0.2 FT NAVD 88
'CWALSHT WILL NOT RUN WITH LANDSIDE LEVEE CREST ELEVATION @ 3.2'

II.--SUMMARY

RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

WALL BOTTOM ELEV. (FT) : -16.81
PENETRATION (FT) : 14.51

MAX. BEND. MOMENT (LB-FT) : 1.2876E+04
AT ELEVATION (FT) : -11.61

MAX. SCALED DEFL. (LB-IN^3): 5.8409E+09
AT ELEVATION (FT) : 13.90

NOTE: DIVIDE SCALED DEFLECTION MODULUS OF
ELLASTICITY IN PSI TIMES PILE MOMENT
OF INERTIA IN IN^4 TO OBTAIN DEFLECTION
IN INCHES.

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHOREDOR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS
DATE: 4-OCTOBER-2013 TIME: 14:53:49

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* COMPLETE OF RESULTS FOR *
* CANTILEVER WALL DESIGN *
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I.--HEADING
'REACH 2R
'WATER LEVEL 8'
'LANDSIDE LEVEE CREST ELEVATION ALTERED FOR ANALYSIS TO 0.2 FT NAVD 88
'CWALSHT WILL NOT RUN WITH LANDSIDE LEVEE CREST ELEVATION @ 3.2'

II.--RESULTS

ELEVATION (FT)	BENDING MOMENT (LB-FT)	SHEAR (LB)	SCALED DEFLECTION (LB-IN^3)	NET PRESSURE (PSF)
13.90	0.0000E+00	0.	5.8409E+09	0.00
12.90	3.4925E-10	0.	5.5687E+09	0.00
11.90	3.4925E-10	0.	5.2965E+09	0.00
10.90	3.4925E-10	0.	5.0243E+09	0.00
9.90	3.4925E-10	0.	4.7521E+09	0.00
8.90	3.4925E-10	0.	4.4799E+09	0.00
8.00	1.5194E-09	0.	4.2349E+09	0.00
7.90	1.0400E-02	0.	4.2077E+09	6.24
6.90	1.3842E+01	38.	3.9355E+09	68.64
5.90	9.6314E+01	138.	3.6634E+09	131.04
4.90	3.0983E+02	300.	3.3914E+09	193.44
3.90	7.1678E+02	524.	3.1200E+09	255.84
3.20+	1.1502E+03	719.	2.9307E+09	299.52
3.20-	1.1502E+03	719.	2.9307E+09	785.63
2.90	1.3939E+03	882.	2.8498E+09	304.27
1.90	2.4108E+03	1134.	2.5821E+09	198.69
0.90	3.6252E+03	1276.	2.3187E+09	85.75
-0.10	4.9237E+03	1301.	2.0614E+09	-36.41
-1.10	6.1857E+03	1203.	1.8127E+09	-159.43
-2.10	7.2883E+03	982.	1.5747E+09	-282.26
-2.30	7.4789E+03	923.	1.5285E+09	-306.97
-3.10	8.1084E+03	638.	1.3492E+09	-406.37
-3.30	8.2278E+03	556.	1.3058E+09	-409.39
-4.00	8.5467E+03	398.	1.1582E+09	-43.49
-4.03	8.5604E+03	397.	1.1511E+09	13.07
-4.10	8.5864E+03	399.	1.1377E+09	39.53
-4.80	8.8928E+03	502.	9.9840E+08	254.28
-5.10	9.0542E+03	572.	9.4099E+08	215.63
-6.10	9.7177E+03	739.	7.5998E+08	117.22
-7.10	1.0499E+04	807.	5.9577E+08	20.15
-8.10	1.1300E+04	779.	4.4971E+08	-77.05
-9.10	1.2024E+04	653.	3.2317E+08	-174.25
-10.10	1.2574E+04	430.	2.1737E+08	-271.45
-11.10	1.2852E+04	110.	1.3327E+08	-368.65
-11.50	1.2875E+04	24.	1.0590E+08	-64.55
-12.10	1.2778E+04	-508.	7.1324E+07	-1705.26
-12.31	1.2624E+04	-991.	6.1069E+07	-2859.51
-13.00	1.1339E+04	-2635.	3.4293E+07	-1917.05
-13.10	1.1066E+04	-2820.	3.1207E+07	-1780.19

-14.10	7.5836E+03	-3916.	9.9556E+06	-411.58
-15.10	3.6899E+03	-3643.	1.7494E+06	957.03
-16.10	7.5328E+02	-2002.	5.7244E+04	2325.64
-16.81	0.0000E+00	0.	0.0000E+00	3299.75

NOTE: DIVIDE SCALED DEFLECTION MODULUS OF ELLASTICITY IN PSI TIMES PILE MOMENT OF INERTIA IN IN^4 TO OBTAIN DEFLECTION IN INCHES.

III.--WATER AND SOIL PRESSURES

		<-------------SOIL PRESSURES-------------->			
	WATER	<----LEFTSIDE----->		<---RIGHTSIDE---->	
ELEVATION	PRESSURE	PASSIVE	ACTIVE	ACTIVE	PASSIVE
(FT)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)
13.90	0.	0.	0.	0.	0.
12.90	0.	0.	0.	0.	0.
11.90	0.	0.	0.	0.	0.
10.90	0.	0.	0.	0.	0.
9.90	0.	0.	0.	0.	0.
8.90	0.	0.	0.	0.	0.
8.00	0.	0.	0.	0.	0.
7.90	6.	0.	0.	0.	0.
6.90	69.	0.	0.	0.	0.
5.90	131.	0.	0.	0.	0.
4.90	193.	0.	0.	0.	0.
3.90	256.	0.	0.	0.	0.
3.20+	300.	0.	0.	0.	0.
3.20-	300.	889.	0.	0.	0.
2.90	318.	1364.	0.	0.	0.
1.90	381.	1447.	0.	0.	0.
0.90	443.	1537.	0.	0.	0.
-0.10	505.	1637.	0.	0.	0.
-1.10	568.	1737.	0.	0.	0.
-2.10	630.	1838.	0.	0.	0.
-2.30+	643.	1858.	0.	0.	0.
-2.30-	643.	1858.	0.	0.	889.
-3.10	693.	1939.	0.	0.	1299.
-3.30	705.	1938.	0.	0.	1298.
-4.00	749.	1556.	0.	0.	942.
-4.03+	751.	1471.	0.	0.	912.
-4.03-	751.	1527.	0.	0.	912.
-4.10	755.	1471.	61.	0.	855.
-4.80	799.	1240.	354.	0.	591.
-5.10	799.	1254.	361.	0.	600.
-6.10	799.	1267.	374.	0.	623.
-7.10	799.	1279.	387.	0.	645.
-8.10	799.	1292.	399.	0.	667.
-9.10	799.	1304.	411.	0.	691.
-10.10	799.	1316.	424.	0.	700.
-11.10	799.	1329.	436.	0.	497.
-11.50+	799.	991.	295.	0.	2002.
-11.50-	799.	991.	295.	0.	1097.

-12.10	799.	2998.	1143.	418.	2002.
-12.31	799.	4328.	1533.	611.	2448.
-13.00	799.	8660.	2805.	1242.	3902.
-13.10	799.	8495.	2578.	1160.	3724.
-14.10	799.	5025.	264.	184.	1730.
-15.10	799.	5479.	298.	199.	2137.
-16.10	799.	5891.	308.	206.	2542.
-16.81	799.	6284.	318.	215.	2927.
-18.10	799.	6665.	328.	225.	3330.

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'REACH 2R
'WATER LEVEL 8'
'LANDSIDE LEVEE CREST ELEVATION ALTERED FOR ANALYSIS TO 0.2 FT NAVD 88
'CWALSHT WILL NOT RUN WITH LANDSIDE LEVEE CREST ELEVATION @ 3.2'
CONTROL  CANTILEVER  DESIGN  1.00  0.70
WALL   13.9
SURFACE RIGHTSIDE   6    0   -2.3
                 7.9   -3
                 17.8   -5
                 22.4   -5.5
                 28.7   -5.7
                 80   -5.5
SURFACE LEFTSIDE   9    0    3.2
                 1    3.2
                 6.5    3
                 35.2   -1.2
                 35.6   -3
                 42   -3.2
                 50.3   -4
                 66.2   -4.8
                 110   -4.8
SOIL RIGHTSIDE  STRENGTHS   4
   104    104    0    400    0    400   -4   0
   88    88    0    175    0    175   -13   0
   122    122    33    0    18    0   -50   0
   102    102    0    782    0    673
SOIL LEFTSIDE  STRENGTHS   4
   104    104    0    400    0    400   -4   0
   88    88    0    175    0    175   -13   0
   122    122    33    0    18    0   -50   0
   102    102    0    782    0    673
WATER ELEVATIONS   62.4    8   -4.8
HORIZONTAL DISTRIBUTED   2    3.2    1910   -13    0
FINISHED
```

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS
DATE: 4-OCTOBER-2013 TIME: 14:58:36

****
* INPUT DATA *
****

I.--HEADING
'REACH 2R
'WATER LEVEL 8'
'LANDSIDE LEVEE CREST ELEVATION ALTERED FOR ANALYSIS TO 0.2 FT NAVD 88
'CWALSHT WILL NOT RUN WITH LANDSIDE LEVEE CREST ELEVATION @ 3.2'

II.--CONTROL
CANTILEVER WALL DESIGN
FACTOR OF SAFETY FOR ACTIVE PRESSURES = 1.00
FACTOR OF SAFETY FOR PASSIVE PRESSURES = 0.70

III.--WALL DATA
ELEVATION AT TOP OF WALL = 13.90 FT.

IV.--SURFACE POINT DATA

IV.A.--RIGHTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	-2.30
7.90	-3.00
17.80	-5.00
22.40	-5.50
28.70	-5.70
80.00	-5.50

IV.B.--LEFTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	3.20
1.00	3.20
6.50	3.00
35.20	-1.20
35.60	-3.00
42.00	-3.20
50.30	-4.00
66.20	-4.80
110.00	-4.80

V.--SOIL LAYER DATA

V.A.--RIGHTSIDE
LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COHESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADHESION (PSF)	<--BOTTOM--> ELEV. (FT)	<--BOTTOM--> SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	<-SAFETY-> <-FACTOR-> PASS.
104.00	104.00	0.00	400.00	0.00	400.00	-4.00	0.00	DEF	DEF
88.00	88.00	0.00	175.00	0.00	175.00	-13.00	0.00	DEF	DEF
122.00	122.00	33.00	0.00	18.00	0.00	-50.00	0.00	DEF	DEF
102.00	102.00	0.00	782.00	0.00	673.00			DEF	DEF

V.B.--LEFTSIDE

LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COHESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADHESION (PSF)	<--BOTTOM--> ELEV. (FT)	<--BOTTOM--> SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	<-SAFETY-> <-FACTOR-> PASS.
104.00	104.00	0.00	400.00	0.00	400.00	-4.00	0.00	DEF	DEF
88.00	88.00	0.00	175.00	0.00	175.00	-13.00	0.00	DEF	DEF
122.00	122.00	33.00	0.00	18.00	0.00	-50.00	0.00	DEF	DEF
102.00	102.00	0.00	782.00	0.00	673.00			DEF	DEF

VI.--WATER DATA

UNIT WEIGHT = 62.40 (PCF)
RIGHTSIDE ELEVATION = 8.00 (FT)
LEFTSIDE ELEVATION = -4.80 (FT)
NO SEEPAGE

VII.--VERTICAL SURCHARGE LOADS

NONE

VIII.--HORIZONTAL LOADS

VIII.A.--HORIZONTAL LINE LOADS

NONE

VIII.B.--HORIZONTAL DISTRIBUTED LOADS

ELEVATION (FT)	DIST. LOAD (PSF)
3.20	1910.00
-13.00	0.00

****
*   SOIL PRESSURES FOR   *
* CANTILEVER WALL DESIGN *
****

I.--HEADING
'REACH 2R
'WATER LEVEL 8'
'LANDSIDE LEVEE CREST ELEVATION ALTERED FOR ANALYSIS TO 0.2 FT NAVD 88
'CWALSHT WILL NOT RUN WITH LANDSIDE LEVEE CREST ELEVATION @ 3.2'

II.--SOIL PRESSURES

RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

NET SOIL PRESSURES INCLUDE APPLIED HORIZONTAL DISTRIBUTED LOADS.

				<------NET------>			
	NET	<---LEFTSIDE--->		(SOIL + WATER)		<--RIGHTSIDE--->	
ELEV.	WATER	PASSIVE	ACTIVE	ACTIVE	PASSIVE	ACTIVE	PASSIVE
(FT)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)
13.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7.9	6.2	0.0	0.0	6.2	6.2	0.0	0.0
6.9	68.6	0.0	0.0	68.6	68.6	0.0	0.0
5.9	131.0	0.0	0.0	131.0	131.0	0.0	0.0
4.9	193.4	0.0	0.0	193.4	193.4	0.0	0.0
3.9	255.8	0.0	0.0	255.8	255.8	0.0	0.0
3.2+	299.5	0.0	0.0	299.5	299.5	0.0	0.0
3.2-	299.5	1142.9	0.0	1066.7	2209.5	0.0	0.0
2.9	318.2	1744.2	0.0	448.7	2192.9	0.0	0.0
1.9	380.6	1821.7	0.0	315.6	2137.4	0.0	0.0
0.9	443.0	1909.2	0.0	172.6	2081.9	0.0	0.0
-0.1	505.4	2008.7	0.0	17.6	2026.4	0.0	0.0
-1.1	567.8	2109.3	0.0	-138.5	1970.9	0.0	0.0
-2.1	630.2	2209.7	0.0	-294.3	1915.4	0.0	0.0
-2.3+	642.7	2230.0	0.0	-325.7	1904.3	0.0	0.0
-2.3-	642.7	2230.0	0.0	-325.7	3047.1	0.0	1142.9
-3.1	692.6	2311.7	0.0	-451.8	3521.6	0.0	1661.8
-3.3	705.1	2304.1	0.0	-455.4	3507.0	0.0	1658.3
-4.0	748.8	1795.0	0.0	14.9	3003.4	0.0	1193.5
-4.0+	751.0	1683.0	0.0	88.3	2962.5	0.0	1154.5
-4.0-	751.0	1756.4	0.0	88.3	2962.5	0.0	1154.5
-4.1	755.0	1683.0	60.5	121.4	2824.2	0.0	1080.3
-4.8	798.7	1373.8	353.5	391.7	2147.7	0.0	735.8
-5.1	798.7	1387.9	360.9	342.3	2115.6	0.0	746.4

-6.1	798.7	1401.4	374.4	210.8	2006.4	0.0	768.6
-7.1	798.7	1413.6	386.6	80.7	1898.5	0.0	790.8
-8.1	798.7	1425.9	398.9	-49.5	1790.5	0.0	813.0
-9.1	798.7	1438.2	411.3	-179.7	1684.7	0.0	837.4
-10.1	798.7	1450.6	423.6	-309.9	1560.2	0.0	843.1
-11.1	798.7	1462.9	435.9	-440.1	1075.5	0.0	488.7
-11.5+	798.7	990.7	295.4	-15.0	3002.8	0.0	3110.7
-11.5-	798.7	990.7	295.4	-15.0	3002.8	0.0	1534.3
-12.1	798.7	4355.7	1143.0	-3032.8	2872.6	418.0	3110.7
-13.0	798.7	14099.6	2804.7	-12059.1	4518.7	1241.8	6524.6
-13.1	798.7	13797.7	2578.1	-11839.2	4457.8	1159.8	6237.2
-14.1	798.7	7786.6	264.4	-6804.1	3457.6	183.8	2923.3
-15.1	798.7	8723.4	298.4	-7725.4	4211.8	199.3	3711.5
-16.1	798.7	9600.6	308.0	-8595.5	4978.4	206.4	4487.7
-17.1	798.7	10472.3	318.1	-9458.6	5767.9	214.9	5287.3
-18.1	798.7	11360.1	328.4	-10336.3	6647.2	225.1	6177.0
-19.1	798.7	12281.2	339.0	-11251.3	7629.4	231.1	7169.8
-20.1	798.7	13235.1	349.8	-12209.8	8735.3	226.6	8286.4
-21.1	798.7	14260.4	360.8	-13238.4	9922.1	223.3	9484.2
-22.1	798.7	15006.1	371.9	-13975.4	11212.8	232.0	10786.0
-23.1	798.7	15084.3	383.1	-14040.0	12638.0	245.6	12222.5
-24.1	798.7	15824.4	394.5	-14766.9	14160.4	258.8	13756.2
-25.1	798.7	17859.9	406.3	-16789.1	15781.6	272.1	15389.2
-26.1	798.7	19572.5	418.9	-18488.3	17519.7	285.5	17139.9
-27.1	798.7	20657.7	431.9	-19559.8	19376.6	299.2	19009.7
-28.1	798.7	21522.6	444.9	-20410.7	21351.7	313.1	20997.8
-29.1	798.7	22300.2	457.9	-21173.9	23446.2	327.6	23105.4
-30.1	798.7	23584.5	470.9	-22445.3	25663.1	340.5	25335.3
-31.1	798.7	25296.5	484.0	-24147.9	28005.2	349.9	27690.5
-32.1	798.7	27011.0	497.1	-25852.2	30475.5	360.1	30173.9
-33.1	798.7	28658.2	510.2	-27485.5	33076.8	374.0	32788.3
-34.1	798.7	30323.5	523.4	-29135.6	35812.4	389.1	35537.1
-35.1	798.7	32081.3	536.5	-30878.3	38685.5	404.2	38423.3
-36.1	798.7	33945.2	549.7	-32727.2	41699.2	419.2	41450.2
-37.1	798.7	35903.7	562.9	-34670.8	44857.0	434.1	44621.2
-38.1	798.7	37986.1	576.1	-36738.4	48162.5	449.0	47939.8
-39.1	798.7	40190.4	589.3	-38928.2	51619.1	463.5	51409.7
-40.1	798.7	42446.3	602.5	-41172.7	55230.7	474.9	55034.5
-41.1	798.7	44758.2	615.7	-43475.4	59001.0	484.1	58818.0
-42.1	798.7	47180.1	629.0	-45884.4	62933.9	497.0	62764.2
-43.1	798.7	49726.5	642.2	-48415.2	67034.3	512.6	66877.9
-44.1	798.7	52376.7	655.5	-51050.2	71300.1	527.8	71156.8
-45.1	798.7	55114.8	668.7	-53773.0	75733.5	543.1	75603.6
-46.1	798.7	57943.2	682.0	-56586.3	80350.9	558.2	80234.2
-47.1	798.7	60863.4	695.3	-59491.5	85157.6	573.2	85054.2
-48.1	798.7	63870.3	708.6	-62345.0	164076.3	726.6	163986.1
-48.8	798.7	158406.1	1140.4	-157607.4	2090.9	0.0	2432.6
-49.1	798.7	3180.7	253.3	-2382.0	2998.1	0.0	2452.7
-49.2	798.7	3184.8	0.0	-2386.1	3255.6	0.0	2456.8
-50.0	798.7	3234.3	0.0	-2435.6	3305.0	0.0	2506.3
-50.1	798.7	3238.3	0.0	-2439.6	3309.0	0.0	2510.3
-50.8+	798.7	5014.8	0.0	-3341.1	3335.4	0.0	2536.7
-50.8-	798.7	3264.7	0.0	-3341.1	3335.4	0.0	2536.7
-51.0+	798.7	5014.8	739.5	-4216.1	8565.3	0.0	14468.2

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS
DATE: 4-OCTOBER-2013 TIME: 14:58:39

****
* SUMMARY OF RESULTS FOR *
* CANTILEVER WALL DESIGN *
****

I.--HEADING
'REACH 2R
'WATER LEVEL 8'
'LANDSIDE LEVEE CREST ELEVATION ALTERED FOR ANALYSIS TO 0.2 FT NAVD 88
'CWALSHT WILL NOT RUN WITH LANDSIDE LEVEE CREST ELEVATION @ 3.2'

II.--SUMMARY

RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

WALL BOTTOM ELEV. (FT) : -16.78
PENETRATION (FT) : 14.48

MAX. BEND. MOMENT (LB-FT) : 2.0184E+04
AT ELEVATION (FT) : -12.02

MAX. SCALED DEFL. (LB-IN^3): 8.3613E+09
AT ELEVATION (FT) : 13.90

NOTE: DIVIDE SCALED DEFLECTION MODULUS OF
ELLASTICITY IN PSI TIMES PILE MOMENT
OF INERTIA IN IN^4 TO OBTAIN DEFLECTION
IN INCHES.

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHOREDOR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS
DATE: 4-OCTOBER-2013 TIME: 14:58:39

****

* COMPLETE OF RESULTS FOR *
* CANTILEVER WALL DESIGN *
****

I.--HEADING
'REACH 2R
'WATER LEVEL 8'
'LANDSIDE LEVEE CREST ELEVATION ALTERED FOR ANALYSIS TO 0.2 FT NAVD 88
'CWALSHT WILL NOT RUN WITH LANDSIDE LEVEE CREST ELEVATION @ 3.2'

II.--RESULTS

ELEVATION (FT)	BENDING MOMENT (LB-FT)	SHEAR (LB)	SCALED DEFLECTION (LB-IN^3)	NET PRESSURE (PSF)
13.90	0.0000E+00	0.	8.3613E+09	0.00
12.90	-2.7940E-09	0.	7.9810E+09	0.00
11.90	-2.7940E-09	0.	7.6008E+09	0.00
10.90	2.7940E-09	0.	7.2206E+09	0.00
9.90	0.0000E+00	0.	6.8404E+09	0.00
8.90	0.0000E+00	0.	6.4602E+09	0.00
8.00	-1.3038E-09	0.	6.1180E+09	0.00
7.90	1.0400E-02	0.	6.0800E+09	6.24
6.90	1.3842E+01	38.	5.6998E+09	68.64
5.90	9.6314E+01	138.	5.3196E+09	131.04
4.90	3.0983E+02	300.	4.9396E+09	193.44
3.90	7.1678E+02	524.	4.5602E+09	255.84
3.20+	1.1502E+03	719.	4.2953E+09	299.52
3.20-	1.1502E+03	719.	4.2953E+09	1066.66
2.90	1.4045E+03	946.	4.1820E+09	448.71
1.90	2.5529E+03	1328.	3.8064E+09	315.62
0.90	4.0152E+03	1572.	3.4352E+09	172.63
-0.10	5.6481E+03	1668.	3.0709E+09	17.62
-1.10	7.2985E+03	1607.	2.7165E+09	-138.48
-2.10	8.8104E+03	1391.	2.3746E+09	-294.33
-2.30	9.0824E+03	1329.	2.3080E+09	-325.69
-3.10	1.0028E+04	1018.	2.0479E+09	-451.79
-3.30	1.0222E+04	927.	1.9846E+09	-455.38
-4.00	1.0798E+04	773.	1.7686E+09	14.92
-4.03	1.0825E+04	775.	1.7582E+09	88.31
-4.10	1.0876E+04	782.	1.7385E+09	121.36
-4.80	1.1475E+04	961.	1.5330E+09	391.72
-5.10	1.1780E+04	1071.	1.4478E+09	342.28
-6.10	1.3000E+04	1348.	1.1776E+09	210.85
-7.10	1.4432E+04	1494.	9.2990E+08	80.75
-8.10	1.5944E+04	1509.	7.0712E+08	-49.47
-9.10	1.7407E+04	1395.	5.1189E+08	-179.70
-10.10	1.8690E+04	1150.	3.4671E+08	-309.92
-11.10	1.9663E+04	775.	2.1379E+08	-440.15
-11.50	1.9948E+04	684.	1.7017E+08	-14.97
-12.10	2.0175E+04	-232.	1.1478E+08	-3032.84
-12.30	2.0053E+04	-1046.	9.9046E+07	-5052.33
-13.00	1.8223E+04	-4001.	5.5166E+07	-3405.00
-13.10	1.7806E+04	-4329.	5.0189E+07	-3169.21

-14.10	1.2285E+04	-6320.	1.5908E+07	-811.31
-15.10	5.9532E+03	-5952.	2.7404E+06	1546.59
-16.10	1.1676E+03	-3226.	8.2230E+04	3904.49
-16.78	0.0000E+00	0.	0.0000E+00	5519.04

NOTE: DIVIDE SCALED DEFLECTION MODULUS OF ELLASTICITY IN PSI TIMES PILE MOMENT OF INERTIA IN IN^4 TO OBTAIN DEFLECTION IN INCHES.

III.--WATER AND SOIL PRESSURES

		<-------------SOIL PRESSURES-------------->			
	WATER	<----LEFTSIDE----->		<---RIGHTSIDE---->	
ELEVATION	PRESSURE	PASSIVE	ACTIVE	ACTIVE	PASSIVE
(FT)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)
13.90	0.	0.	0.	0.	0.
12.90	0.	0.	0.	0.	0.
11.90	0.	0.	0.	0.	0.
10.90	0.	0.	0.	0.	0.
9.90	0.	0.	0.	0.	0.
8.90	0.	0.	0.	0.	0.
8.00	0.	0.	0.	0.	0.
7.90	6.	0.	0.	0.	0.
6.90	69.	0.	0.	0.	0.
5.90	131.	0.	0.	0.	0.
4.90	193.	0.	0.	0.	0.
3.90	256.	0.	0.	0.	0.
3.20+	300.	0.	0.	0.	0.
3.20-	300.	1143.	0.	0.	0.
2.90	318.	1744.	0.	0.	0.
1.90	381.	1822.	0.	0.	0.
0.90	443.	1909.	0.	0.	0.
-0.10	505.	2009.	0.	0.	0.
-1.10	568.	2109.	0.	0.	0.
-2.10	630.	2210.	0.	0.	0.
-2.30+	643.	2230.	0.	0.	0.
-2.30-	643.	2230.	0.	0.	1143.
-3.10	693.	2312.	0.	0.	1662.
-3.30	705.	2304.	0.	0.	1658.
-4.00	749.	1795.	0.	0.	1193.
-4.03+	751.	1683.	0.	0.	1154.
-4.03-	751.	1756.	0.	0.	1154.
-4.10	755.	1683.	61.	0.	1080.
-4.80	799.	1374.	354.	0.	736.
-5.10	799.	1388.	361.	0.	746.
-6.10	799.	1401.	374.	0.	769.
-7.10	799.	1414.	387.	0.	791.
-8.10	799.	1426.	399.	0.	813.
-9.10	799.	1438.	411.	0.	837.
-10.10	799.	1451.	424.	0.	843.
-11.10	799.	1463.	436.	0.	489.
-11.50+	799.	991.	295.	0.	3111.
-11.50-	799.	991.	295.	0.	1534.

-12.10	799.	4356.	1143.	418.	3111.
-12.30	799.	6536.	1515.	602.	3875.
-13.00	799.	14100.	2805.	1242.	6525.
-13.10	799.	13798.	2578.	1160.	6237.
-14.10	799.	7787.	264.	184.	2923.
-15.10	799.	8723.	298.	199.	3712.
-16.10	799.	9601.	308.	206.	4488.
-16.78	799.	10472.	318.	215.	5287.
-18.10	799.	11360.	328.	225.	6177.

```
'REACH 2R
'WATER LEVEL 8'
'LANDSIDE LEVEE CREST ELEVATION ALTERED FOR ANALYSIS TO 0.2 FT NAVD 88
'CWALSHT WILL NOT RUN WITH LANDSIDE LEVEE CREST ELEVATION @ 3.2'
CONTROL  CANTILEVER  DESIGN  1.00  0.45
WALL   13.9
SURFACE RIGHTSIDE   6    0   -2.3
            7.9   -3
            17.8   -5
            22.4   -5.5
            28.7   -5.7
            80   -5.5
SURFACE LEFTSIDE   9    0    3.2
            1    3.2
            6.5    3
            35.2   -1.2
            35.6   -3
            42   -3.2
            50.3   -4
            66.2   -4.8
            110   -4.8
SOIL RIGHTSIDE  STRENGTHS   4
  104    104    0    400    0    400   -4   0
  88    88    0    175    0    175   -13   0
  122    122    33    0    18    0   -50   0
  102    102    0    782    0    673
SOIL LEFTSIDE  STRENGTHS   4
  104    104    0    400    0    400   -4   0
  88    88    0    175    0    175   -13   0
  122    122    33    0    18    0   -50   0
  102    102    0    782    0    673
WATER ELEVATIONS   62.4    8   -4.8
HORIZONTAL DISTRIBUTED   2    3.2    3870   -13    0
FINISHED
```

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS
DATE: 4-OCTOBER-2013 TIME: 15:27:37

****
* INPUT DATA *
****

I.--HEADING
'REACH 2R
'WATER LEVEL 8'
'LANDSIDE LEVEE CREST ELEVATION ALTERED FOR ANALYSIS TO 0.2 FT NAVD 88
'CWALSHT WILL NOT RUN WITH LANDSIDE LEVEE CREST ELEVATION @ 3.2'

II.--CONTROL
CANTILEVER WALL DESIGN
FACTOR OF SAFETY FOR ACTIVE PRESSURES = 1.00
FACTOR OF SAFETY FOR PASSIVE PRESSURES = 0.45

III.--WALL DATA
ELEVATION AT TOP OF WALL = 13.90 FT.

IV.--SURFACE POINT DATA

IV.A.--RIGHTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	-2.30
7.90	-3.00
17.80	-5.00
22.40	-5.50
28.70	-5.70
80.00	-5.50

IV.B.--LEFTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	3.20
1.00	3.20
6.50	3.00
35.20	-1.20
35.60	-3.00
42.00	-3.20
50.30	-4.00
66.20	-4.80
110.00	-4.80

V.--SOIL LAYER DATA

V.A.--RIGHTSIDE
LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH-ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH-ESION (PSF)	<--BOTTOM--> ELEV. (FT)	<--BOTTOM--> SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.
104.00	104.00	0.00	400.00	0.00	400.00	-4.00	0.00	DEF	DEF
88.00	88.00	0.00	175.00	0.00	175.00	-13.00	0.00	DEF	DEF
122.00	122.00	33.00	0.00	18.00	0.00	-50.00	0.00	DEF	DEF
102.00	102.00	0.00	782.00	0.00	673.00			DEF	DEF

V.B.--LEFTSIDE

LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH-ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH-ESION (PSF)	<--BOTTOM--> ELEV. (FT)	<--BOTTOM--> SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.
104.00	104.00	0.00	400.00	0.00	400.00	-4.00	0.00	DEF	DEF
88.00	88.00	0.00	175.00	0.00	175.00	-13.00	0.00	DEF	DEF
122.00	122.00	33.00	0.00	18.00	0.00	-50.00	0.00	DEF	DEF
102.00	102.00	0.00	782.00	0.00	673.00			DEF	DEF

VI.--WATER DATA

UNIT WEIGHT = 62.40 (PCF)
RIGHTSIDE ELEVATION = 8.00 (FT)
LEFTSIDE ELEVATION = -4.80 (FT)
NO SEEPAGE

VII.--VERTICAL SURCHARGE LOADS

NONE

VIII.--HORIZONTAL LOADS

VIII.A.--HORIZONTAL LINE LOADS

NONE

VIII.B.--HORIZONTAL DISTRIBUTED LOADS

ELEVATION (FT)	DIST. LOAD (PSF)
3.20	3870.00
-13.00	0.00

****
*   SOIL PRESSURES FOR   *
* CANTILEVER WALL DESIGN *
****

I.--HEADING
'REACH 2R
'WATER LEVEL 8'
'LANDSIDE LEVEE CREST ELEVATION ALTERED FOR ANALYSIS TO 0.2 FT NAVD 88
'CWALSHT WILL NOT RUN WITH LANDSIDE LEVEE CREST ELEVATION @ 3.2'

II.--SOIL PRESSURES

RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

NET SOIL PRESSURES INCLUDE APPLIED HORIZONTAL DISTRIBUTED LOADS.

	NET	<---LEFTSIDE--->		<------NET------> (SOIL + WATER)		<--RIGHTSIDE--->	
ELEV.	WATER	PASSIVE	ACTIVE	ACTIVE	PASSIVE	ACTIVE	PASSIVE
(FT)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)
13.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7.9	6.2	0.0	0.0	6.2	6.2	0.0	0.0
6.9	68.6	0.0	0.0	68.6	68.6	0.0	0.0
5.9	131.0	0.0	0.0	131.0	131.0	0.0	0.0
4.9	193.4	0.0	0.0	193.4	193.4	0.0	0.0
3.9	255.8	0.0	0.0	255.8	255.8	0.0	0.0
3.2+	299.5	0.0	0.0	299.5	299.5	0.0	0.0
3.2-	299.5	1777.8	0.0	2391.7	4169.5	0.0	0.0
2.9	318.2	2695.8	0.0	1420.8	4116.6	0.0	0.0
1.9	380.6	2759.6	0.0	1180.5	3940.1	0.0	0.0
0.9	443.0	2839.6	0.0	924.0	3763.6	0.0	0.0
-0.1	505.4	2938.7	0.0	648.4	3587.1	0.0	0.0
-1.1	567.8	3039.4	0.0	371.2	3410.6	0.0	0.0
-2.1	630.2	3139.8	0.0	94.3	3234.1	0.0	0.0
-2.3+	642.7	3160.2	0.0	38.7	3198.8	0.0	0.0
-2.3-	642.7	3160.2	0.0	38.7	4976.6	0.0	1777.8
-2.4	651.4	3174.4	0.0	0.0	5088.9	0.0	1914.5
-3.1	692.6	3242.6	0.0	-184.9	5625.6	0.0	2568.0
-3.3	705.1	3219.9	0.0	-197.6	5580.7	0.0	2558.3
-4.0	748.8	2392.0	0.0	506.8	4719.9	0.0	1821.1
-4.0+	751.0	2213.2	0.0	620.9	4652.5	0.0	1759.8
-4.0-	751.0	2330.3	0.0	620.9	4652.5	0.0	1759.8
-4.1	755.0	2213.2	60.5	667.9	4464.1	0.0	1643.5
-4.8	798.7	1707.2	353.5	1050.4	3502.6	0.0	1098.6

-5.1	798.7	1723.5	360.9	962.5	3436.4	0.0	1111.4
-6.1	798.7	1737.0	374.4	710.1	3206.2	0.0	1133.6
-7.1	798.7	1749.2	386.6	459.0	2977.3	0.0	1155.8
-8.1	798.7	1761.5	398.9	207.8	2748.3	0.0	1178.0
-9.1	798.7	1773.8	411.3	-43.5	2522.7	0.0	1203.6
-10.1	798.7	1786.2	423.6	-294.7	2268.2	0.0	1200.2
-11.1	798.7	1798.5	435.9	-545.9	1088.4	0.0	271.7
-11.5+	798.7	990.7	295.4	166.7	6020.0	0.0	7258.3
-11.5-	798.7	990.7	295.4	166.7	6020.0	0.0	3057.8
-12.1	798.7	9440.6	1143.0	-8008.9	7129.1	418.0	7258.3
-13.0	798.7	35529.6	2804.7	-33489.1	15072.4	1241.8	17078.3
-13.1	798.7	34859.9	2578.1	-32901.4	14755.9	1159.8	16535.4
-14.1	798.7	21099.5	264.4	-20117.0	10600.8	183.8	10066.5
-15.1	798.7	26382.8	298.4	-25384.7	15206.9	199.3	14706.6
-16.1	798.7	32651.0	308.0	-31645.9	21800.1	206.4	21309.4
-17.1	798.7	40639.4	318.1	-39625.8	32275.1	214.9	31794.5
-18.1	798.7	51261.3	328.4	-50237.5	50345.9	225.1	49875.6
-19.1	798.7	64786.2	339.0	-63756.4	84261.6	231.1	83802.0
-20.1	798.7	81983.0	349.8	-80957.6	136456.0	226.6	136007.1
-21.1	798.7	109845.6	360.8	-108823.6	956147.3	223.3	955709.4
-22.1	798.7	156887.5	371.9	-155856.8	1270.3	232.0	843.5
-23.1	798.7	231097.2	383.1	-230052.9	1318.7	245.6	903.1
-24.1	798.7	361332.4	394.5	-360274.9	1366.9	258.8	962.7
-25.1	798.7	598211.0	406.3	-597140.2	821652.9	272.1	821260.5
-26.1	798.7	3248740.5	418.9	-3247656.2	132128.9	285.5	131749.1
-27.1	798.7	1869.5	431.9	-771.6	76277.4	299.2	75910.5
-28.1	798.7	1929.1	444.9	-817.2	43255.7	313.1	42901.8
-29.1	798.7	393007.6	457.9	-391881.3	25071.4	327.6	24730.5
-30.1	798.7	4981517.1	470.9	-4980378.0	13994.9	340.5	13667.1
-31.1	798.7	602480.8	484.0	-601332.1	6679.3	349.9	6364.5
-32.1	798.7	405115.4	497.1	-403956.6	1741.1	360.1	1439.5
-33.1	798.7	247090.9	510.2	-245918.2	1787.6	374.0	1499.1
-34.1	798.7	162200.1	523.4	-161012.2	1834.0	389.1	1558.7
-35.1	798.7	111753.6	536.5	-110550.6	1880.5	404.2	1618.3
-36.1	798.7	79350.1	549.7	-78132.1	1926.9	419.2	1677.9
-37.1	798.7	57279.0	562.9	-56046.1	1973.3	434.1	1737.5
-38.1	798.7	41510.4	576.1	-40262.7	2019.7	449.0	1797.1
-39.1	798.7	29808.0	589.3	-28545.8	2066.1	463.5	1856.7
-40.1	798.7	20847.1	602.5	-19573.5	2112.5	474.9	1916.3
-41.1	798.7	13802.1	615.7	-12519.2	2158.9	484.1	1975.9
-42.1	798.7	8136.5	629.0	-6840.7	2205.2	497.0	2035.5
-43.1	798.7	3489.5	642.2	-2178.2	2251.6	512.6	2095.1
-44.1	798.7	2882.7	655.5	-1556.1	2297.9	527.8	2154.7
-45.1	798.7	2942.3	668.7	-1600.5	2344.3	543.1	2214.3
-46.1	798.7	3001.9	682.0	-1645.0	2390.6	558.2	2273.9
-47.1	798.7	3061.5	695.3	-1689.5	2436.9	573.2	2333.5
-48.1	798.7	3121.1	708.6	-1595.8	2483.2	726.6	2393.1
-48.8+	798.7	3160.6	1140.4	-2361.9	781879.2	0.0	973840.7
-48.8-	798.7	3160.6	1140.4	-2361.9	781879.2	0.0	590601.2
-49.1	798.7	336992.1	253.3	-336193.4	974386.1	0.0	973840.7
-49.2+	798.7	2781014.6	0.0	-1652777.3	1063947.5	0.0	1063148.8
-49.2-	798.7	526137.4	0.0	-1652777.3	1063947.5	0.0	1063148.8
-50.0	798.7	2781014.6	0.0	-2780215.9	2128624.8	0.0	2127826.1
-50.1	798.7	2505740.6	0.0	-2504941.9	1930458.5	0.0	1929659.8

-50.8+	798.7	3264.7	0.0	-267086.1	619853.4	0.0	619054.7
-50.8-	798.7	532504.9	0.0	-267086.1	619853.4	0.0	619054.7
-51.0+	798.7	3272.1	739.5	-2473.4	128124.0	0.0	2544.1

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS
DATE: 4-OCTOBER-2013 TIME: 15:27:40

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*  SUMMARY OF RESULTS FOR  *
*  CANTILEVER WALL DESIGN  *
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I.--HEADING
'REACH 2R
'WATER LEVEL 8'
'LANDSIDE LEVEE CREST ELEVATION ALTERED FOR ANALYSIS TO 0.2 FT NAVD 88
'CWALSHT WILL NOT RUN WITH LANDSIDE LEVEE CREST ELEVATION @ 3.2'

II.--SUMMARY

RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

WALL BOTTOM ELEV. (FT) : -16.81
PENETRATION (FT) : 14.51

MAX. BEND. MOMENT (LB-FT) : 8.9541E+04
AT ELEVATION (FT) : -12.47

MAX. SCALED DEFL. (LB-IN^3): 3.1969E+10
AT ELEVATION (FT) : 13.90

NOTE: DIVIDE SCALED DEFLECTION MODULUS OF
ELLASTICITY IN PSI TIMES PILE MOMENT
OF INERTIA IN IN^4 TO OBTAIN DEFLECTION
IN INCHES.

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHOREDOR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 4-OCTOBER-2013 TIME: 15:27:40

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* COMPLETE OF RESULTS FOR *

* CANTILEVER WALL DESIGN *

****

I.--HEADING

'REACH 2R

'WATER LEVEL 8'

'LANDSIDE LEVEE CREST ELEVATION ALTERED FOR ANALYSIS TO 0.2 FT NAVD 88

'CWALSHT WILL NOT RUN WITH LANDSIDE LEVEE CREST ELEVATION @ 3.2'

II.--RESULTS

ELEVATION	BENDING MOMENT	SHEAR	SCALED DEFLECTION	NET PRESSURE
(FT)	(LB-FT)	(LB)	(LB-IN^3)	(PSF)
13.90	0.0000E+00	0.	3.1969E+10	0.00
12.90	-5.5879E-09	0.	3.0590E+10	0.00
11.90	-5.5879E-09	0.	2.9211E+10	0.00
10.90	-5.5879E-09	0.	2.7832E+10	0.00
9.90	-5.5879E-09	0.	2.6454E+10	0.00
8.90	5.5879E-09	0.	2.5075E+10	0.00
8.00	3.9504E-09	0.	2.3834E+10	0.00
7.90	1.0400E-02	0.	2.3696E+10	6.24
6.90	1.3842E+01	38.	2.2317E+10	68.64
5.90	9.6314E+01	138.	2.0939E+10	131.04
4.90	3.0983E+02	300.	1.9560E+10	193.44
3.90	7.1678E+02	524.	1.8182E+10	255.84
3.20+	1.1502E+03	719.	1.7218E+10	299.52
3.20-	1.1502E+03	719.	1.7218E+10	2391.74
2.90	1.4589E+03	1291.	1.6805E+10	1420.77
1.90	3.4199E+03	2591.	1.5431E+10	1180.50
0.90	6.5588E+03	3644.	1.4063E+10	923.96
-0.10	1.0618E+04	4430.	1.2707E+10	648.40
-1.10	1.5326E+04	4940.	1.1369E+10	371.17
-2.10	2.0405E+04	5172.	1.0058E+10	94.33
-2.30	2.1441E+04	5186.	9.7992E+09	38.67
-2.44	2.2159E+04	5188.	9.6213E+09	0.00
-3.10	2.5578E+04	5127.	8.7814E+09	-184.92
-3.30	2.6600E+04	5089.	8.5311E+09	-197.60
-4.00	3.0171E+04	5197.	7.6703E+09	506.80
-4.03	3.0351E+04	5217.	7.6285E+09	620.94
-4.10	3.0694E+04	5259.	7.5494E+09	667.94
-4.80	3.4570E+04	5860.	6.7180E+09	1050.40
-5.10	3.6374E+04	6162.	6.3705E+09	962.47
-6.10	4.2975E+04	6998.	5.2546E+09	710.05
-7.10	5.0287E+04	7583.	4.2131E+09	458.96
-8.10	5.8057E+04	7916.	3.2585E+09	207.75
-9.10	6.6035E+04	7998.	2.4043E+09	-43.46
-10.10	7.3970E+04	7829.	1.6642E+09	-294.67
-11.10	8.1610E+04	7409.	1.0519E+09	-545.89
-11.50	8.4540E+04	7333.	8.4632E+08	166.66

-12.10	8.8487E+04	4976.	5.8052E+08	-8008.90
-12.74	8.8767E+04	-6065.	3.5683E+08	-26254.79
-13.00	8.6398E+04	-12328.	2.8581E+08	-22767.00
-13.10	8.5054E+04	-14537.	2.6069E+08	-21402.06
-14.10	6.2091E+04	-29114.	8.4822E+07	-7752.70
-15.10	3.1375E+04	-30042.	1.5128E+07	5896.67
-16.10	6.5564E+03	-17321.	4.9951E+05	19546.03
-16.81	0.0000E+00	0.	0.0000E+00	29238.39

NOTE: DIVIDE SCALED DEFLECTION MODULUS OF ELLASTICITY IN PSI TIMES PILE MOMENT OF INERTIA IN IN^4 TO OBTAIN DEFLECTION IN INCHES.

III.--WATER AND SOIL PRESSURES

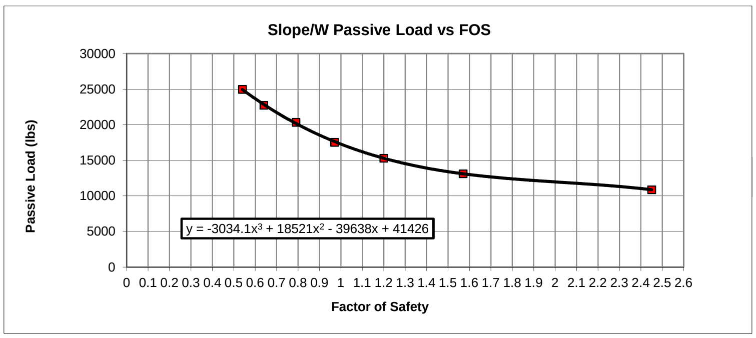
		<-------------SOIL PRESSURES-------------->			
	WATER	<----LEFTSIDE----->		<---RIGHTSIDE---->	
ELEVATION	PRESSURE	PASSIVE	ACTIVE	ACTIVE	PASSIVE
(FT)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)
13.90	0.	0.	0.	0.	0.
12.90	0.	0.	0.	0.	0.
11.90	0.	0.	0.	0.	0.
10.90	0.	0.	0.	0.	0.
9.90	0.	0.	0.	0.	0.
8.90	0.	0.	0.	0.	0.
8.00	0.	0.	0.	0.	0.
7.90	6.	0.	0.	0.	0.
6.90	69.	0.	0.	0.	0.
5.90	131.	0.	0.	0.	0.
4.90	193.	0.	0.	0.	0.
3.90	256.	0.	0.	0.	0.
3.20+	300.	0.	0.	0.	0.
3.20-	300.	1778.	0.	0.	0.
2.90	318.	2696.	0.	0.	0.
1.90	381.	2760.	0.	0.	0.
0.90	443.	2840.	0.	0.	0.
-0.10	505.	2939.	0.	0.	0.
-1.10	568.	3039.	0.	0.	0.
-2.10	630.	3140.	0.	0.	0.
-2.30+	643.	3160.	0.	0.	0.
-2.30-	643.	3160.	0.	0.	1778.
-2.44	651.	3174.	0.	0.	1914.
-3.10	693.	3243.	0.	0.	2568.
-3.30	705.	3220.	0.	0.	2558.
-4.00	749.	2392.	0.	0.	1821.
-4.03+	751.	2213.	0.	0.	1760.
-4.03-	751.	2330.	0.	0.	1760.
-4.10	755.	2213.	61.	0.	1643.
-4.80	799.	1707.	354.	0.	1099.
-5.10	799.	1723.	361.	0.	1111.
-6.10	799.	1737.	374.	0.	1134.
-7.10	799.	1749.	387.	0.	1156.
-8.10	799.	1762.	399.	0.	1178.

-9.10	799.	1774.	411.	0.	1204.
-10.10	799.	1786.	424.	0.	1200.
-11.10	799.	1798.	436.	0.	272.
-11.50+	799.	991.	295.	0.	7258.
-11.50-	799.	991.	295.	0.	3058.
-12.10	799.	9441.	1143.	418.	7258.
-12.74	799.	28122.	2333.	1008.	14290.
-13.00	799.	35530.	2805.	1242.	17078.
-13.10	799.	34860.	2578.	1160.	16535.
-14.10	799.	21100.	264.	184.	10066.
-15.10	799.	26383.	298.	199.	14707.
-16.10	799.	32651.	308.	206.	21309.
-16.81	799.	40639.	318.	215.	31795.
-18.10	799.	51261.	328.	225.	49876.

Canal:	Orleans Avenue Canal	
Reach:	Reach 4	
Load Case:	Water @ El 8	
Protected Side Top of Ground (GSE):	3.3	ft, Elevation
Critical Slip Surface Elev. (FSE):	-13	ft, Elevation
Sheetpile Tip Elevation:	-28.5	ft, Elevation

Step 1: Compute correct passive pressure forces from slope stability model (Slope/W). Procedure follows the approach cited in Paragraph D-4 of ETL 1110-2-575.

Unit Weight (psf)	Passive Load (lbs)	Factor of Safety	Failure Surface Elevation (feet)	Notes
50	10865	2.45	-13	
60	13113	1.57	-13	
70	15298	1.2	-13	
80	17530	0.97	-13	
90	20347	0.79	-13	
100	22737	0.64	-13	
110	24972	0.54	-13	



Step 2: Perform CWALSHT analysis of cross section using a range of <u>assumed</u> horizontal distributed load above the critical slip surface elevation found in step 1. Determine the difference in passive load from CWALSHT and Slope/W for each assumed horizontal distributed load.

> Check penetration of the sheetpile to determine where the pile behaves as a short pile or long pile. This I-wall has a penetration versus stick up of = (3.3--28.5)/(8'-3.3')=6.7. This ratio exceeds the recommended 2.5. For short pile behavior, the penetration was determined to be 20 ft. The PS GSE was 3.3 producing a short pile tip elevation of -16.7. See attached EXCEL sheet for short pile versus long pile calculation. This penetration gives a penetration to stickup ratio of 4.2.

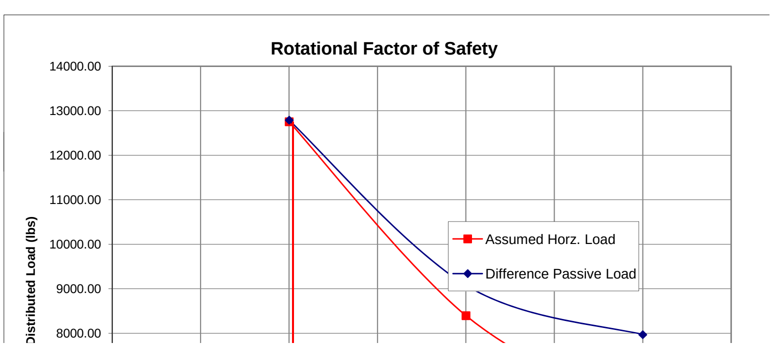
	(A)	(B)		(C)	(D)	
FOS	CWALSHT Passive Load (lbs)	SLOPE/W Passive Load (lbs)	Tip Elev feet	Difference Passive Load (A-B) (lbs)	Assumed Horizontal Distributed Load in CWALSHT (psf)	Resultant Distributed CWALSHT Load (D*(GSE-FSE)) (lbs)
1	25242.79	17274.90	-16.7	7967.89	760	6194.00
0.8	29089.045	20015.58	-16.7	9073.46	1030	8394.50
0.6	36446.445	23655.39	-16.7	12791.05	1565	12754.75

Interpolate Correction Force at the resultant FOS

FOS = 0.6

Correction Force = 12791.05 lbs

Step 3: Plot the assumed horizontal load and the difference passive load versus factor of safety. The intersection of the two curves represents the actual factor of safety.



SHORT PILE/LONG PILE - HOMOGENEOUS SAND

VALUES OF SUBGRADE REACTION FOR SHEET PILES					
CONSTANTS OF HORIZONTAL SUBGRADE REACTION l_h				COEFFICIENT OF SUBGRADE REACTION EQUATIONS n_h	
SANDS				SANDS	
TERZAGHI'S THEORY				TERZAGHI'S THEORY	
	LOOSE	MEDIUM	DENSE		
l_h (Dry or Moist) (pci)	2.89	9.26	23.15	n_h (lbs/in^4)	$n_h=(l_h/D)$ (where D is embedment depth in inches)
l_h (Submerged) (pci)	1.85	4.63	15.05		

From EM 1110-2-2906, Design of Pile Foundations, 1991

(b) Linearly Increasing Modulus of Horizontal Subgrade Reaction

$$R\ \cancel{T} = \sqrt[5]{\frac{EI}{n_h}}$$

$L/R \le 2.0$ Short pile

$2.0 < L/R < 4.0$ Intermediate

$L/R \ge 4.0$ Long pile

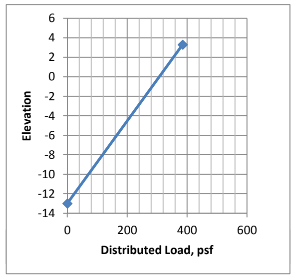
Enter l_h and moment of inertia of sheet pile. Vary penetration depth until D/R = 2.

Penetration, D, ft	Penetration, D, in	l_h, pci	n_H, lb/in^4	I, in^4/ft	EI, lb-in^2/ft	EI, lb-in^2/in	R, in	R, ft	D/R
20	240	2	0.01	84.2	2.68E+09	2.24E+08	121.82	10.15	1.97

VIII.B.--HORIZONTAL DISTRIBUTED LOAD

ELEVATION (FT)	DIST. LOAD (PSF)	Result. (LBS)
3.3	385	
-13	0	3137.75

3137.75



RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

NET SOIL PRESSURES INCLUDE APPLIED HORIZONTAL DISTRIBUTED LOADS.

		<---LEFTSIDE--->		<--RIGHTSIDE--->	
ELEV. (FT)	NET WATER (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)
13.9	0	0	0	0	0
12.9	0	0	0	0	0
11.9	0	0	0	0	0
10.9	0	0	0	0	0
9.9	0	0	0	0	0
8.9	0	0	0	0	0
8	0	0	0	0	0
7.9	6.2	0	0	0	0
6.9	68.6	0	0	0	0
5.9	131	0	0	0	0
4.9	193.4	0	0	0	0
3.9	255.8	0	0	0	0
3.3+	293.3	0	0	0	0
-3.3	293.3	250	0	0	250
2.9	318.2	417.6	0	0	390.4
2.3	355.7	483.5	0	0	371.7
1.9	380.6	527.9	0	0	343.6
0.9	443	636.8	0	0	330.2
-0.1	505.4	744.7	0	0	354.8
-1	564.1	846.6	0	0	376
-1.1	567.8	853.1	0	0	377.4
-2.1	630.2	958.5	0	0	400
-2.3+	642	1053.9	0	0	404.3
-2.3-	642	976.4	0	0	404.3
-3.1	692.6	1053.9	98.7	0	422.7
-4.1	755	1142.6	216.2	0	445.3
-4.5	780	1172.9	249.9	0	454.4
-5.1	780	1202.8	277.9	0	468.1
-6.1	780	1234	319.7	0	486.5
-6.5	780	1240.4	340.4	0	487.9
-7.1	780	1246	364.6	0	485.8
-8.1	780	1260.9	385.8	0	488.1
-9.1	780	1278.5	402.8	0	493.8
-10.1	780	1295.9	420.2	0	519.4
-11.1	780	1313.9	436.6	0	545
-11.4+	780	1257.3	359.7	0	1137.4
-11.4-	780	1257.3	359.7	0	700.7
-12.1	780	1702.9	1023.2	591.5	1137.4
-13	780	3086.1	2130.9	1658.4	1948.3
-13.1	780	3104.9	1959.1	1526.2	1882.5
-14.1	780	2682.4	270.1	74.8	1090.2
-15.1	780	2831.4	299.3	103.6	1198.2
-16.1	780	2974.6	309.7	119.4	1291.9
-17.1	780	3114.7	320.1	136.6	1386.8
-18.1	780	3248.2	330.4	153.8	1489.8
-19.1	780	3376.4	340.7	171.2	1607.3
-20.1	780	3503.1	351	188.6	1733.2
-21.1	780	3629.1	361.3	206.1	1864.3
-22.1	780	3754	371.5	223.6	2001.8
-23.1	780	3873.7	381.8	241.1	2161
-24.1	780	3993.7	392.1	258.7	2339.6
-25.1	780	4033	402.8	276.3	2505.3
-26.1	780	4007.6	414.1	294	2658.2
-27.1	780	4117.1	425.7	311.3	2818
-28.1	780	4318.6	437.3	326.8	2990.4
-29.1	780	4476.3	448.8	340.7	3167.4

ELEV. (FT)	NET WATER (PSF)	LEFTSIDE PASSIVE (PSF)	RESULT. LEFTSIDE PASSIVE (LBS)
13.9	0	0	
12.9	0	0	
11.9	0	0	
10.9	0	0	
9.9	0	0	
8.9	0	0	
8	0	0	
7.9	6	0	
6.9	69	0	0
5.9	131	0	0
4.9	193	0	0
3.9	256	0	0
3.3	293	0	0
3.3	293	250	0
2.9	318	418	133.6
2.3	356	484	270.6
1.9	381	528	202.4
0.9	443	637	582.5
-0.1	505	745	691
-1.04	564	847	748.24
-1.1	568	853	51
-2.1	630	958	905.5
-2.29	642	1054	191.14
-2.29	642	976	0
-3.1	693	1054	822.15
-4.1	755	1143	1098.5
-4.5	780	1173	463.2
-5.1	780	1203	712.8
-6.1	780	1234	1218.5
-6.5	780	1240	494.8
-7.1	780	1246	745.8
-8.1	780	1261	1253.5
-9.1	780	1278	1269.5
-10.1	780	1296	1287
-11.1	780	1314	1305
-11.44	780	1257	437.07
-11.44	780	1257	0
-12.1	780	1703	976.8
-13	780	3083	2153.7

PS WATER ELEVATION (FT)	CRITICAL SLIP SURF. ELEVATION (FT)	UNIT WEIGHT WATER (PCF)
-4.5	-13	64

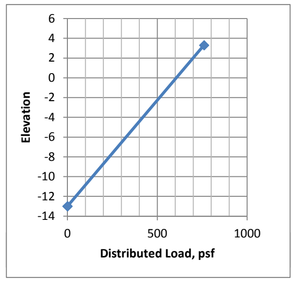
RESULTANT WATER LOAD= 2312 LBS

PASSIVE LOAD (SOIL)	18014.3	
PASSIVE LOAD (SOIL+WATER)	20326.3	**IF THE PS WATER LEVEL IS BELOW THE CRITICAL SLIP SURFACE,**
FOS =	1.6	**USE PASSIVE LOAD (SOIL)**

VIII.B.--HORIZONTAL DISTRIBUTED LOAD

ELEVATION (FT)	DIST. LOAD (PSF)	Result. (LBS)
3.3	760	
-13	0	6194

6194



RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

NET SOIL PRESSURES INCLUDE APPLIED HORIZONTAL DISTRIBUTED LOADS.

ELEV. (FT)	NET WATER (PSF)	<---LEFTSIDE---> PASSIVE (PSF)	ACTIVE (PSF)	<--RIGHTSIDE---> ACTIVE (PSF)	PASSIVE (PSF)
13.9	0	0	0	0	0
12.9	0	0	0	0	0
11.9	0	0	0	0	0
10.9	0	0	0	0	0
9.9	0	0	0	0	0
8.9	0	0	0	0	0
8	0	0	0	0	0
7.9	6	0	0	0	0
6.9	69	0	0	0	0
5.9	131	0	0	0	0
4.9	193	0	0	0	0
3.9	256	0	0	0	0
3.30+	293	0	0	0	0
-3.3	293	400	0	0	0
2.9	318	643	0	0	0
1.9	381	755	0	0	0
0.9	443	865	0	0	0
-0.1	505	973	0	0	0
-1.1	568	1080	0	0	0
-1.80+	612	1156	0	0	0
-1.80-	612	1156	0	0	400
-2.1	630	1189	0	0	613
-2.32+	644	1255	0	0	615
-2.32-	644	1210	0	0	615
-2.8	674	1255	58	0	620
-3.1	693	1277	98	0	616
-4.1	755	1356	217	0	632
-4.5	780	1386	249	0	647
-5.1	780	1416	278	0	670
-6.1	780	1445	320	0	700
-6.5	780	1448	340	0	704
-7.1	780	1449	365	0	706
-8.1	780	1463	386	0	722
-9.1	780	1481	403	0	741
-10.1	780	1498	420	0	759
-11.1	780	1516	437	0	629
-11.58+	780	1266	319	0	1805
-11.58-	780	1266	319	0	1197
-12.1	780	2311	887	336	1805
-12.3	780	3151	1164	516	2143
-13	780	6109	2141	1147	3335
-13.1	780	6104	1973	1072	3214
-14.1	780	4575	270	149	1762
-15.1	780	4939	299	166	2028
-16.1	780	5283	310	175	2287
-16.68	780	5612	320	185	2557
-18.1	780	5926	330	196	2834

ELEV. (FT)	NET WATER (PSF)	LEFTSIDE PASSIVE (PSF)	RESULT. LEFTSIDE PASSIVE (LBS)
13.9	0	0	
12.9	0	0	
11.9	0	0	
10.9	0	0	
9.9	0	0	
8.9	0	0	
8	0	0	
7.9	6	0	
6.9	69	0	0
5.9	131	0	0
4.9	193	0	0
3.9	256	0	0
3.3	293	0	0
3.3	293	400	0
2.9	318	643	208.6
1.9	381	755	699
0.9	443	865	810
-0.1	505	973	919
-1.1	568	1080	1026.5
-1.8	612	1156	782.6
-1.8	612	1156	0
-2.1	630	1189	351.75
-2.32	644	1255	268.84
-2.32	644	1210	0
-2.8	674	1255	591.6
-3.1	693	1277	379.8
-4.1	755	1356	1316.5
-4.5	780	1386	548.4
-5.1	780	1416	840.6
-6.1	780	1445	1430.5
-6.5	780	1448	578.6
-7.1	780	1449	869.1
-8.1	780	1463	1456
-9.1	780	1481	1472
-10.1	780	1498	1489.5
-11.1	780	1516	1507
-11.58	780	1266	667.68
-11.58	780	1266	0
-12.1	780	2311	930.02
-12.3	780	3151	546.2
-13	780	6109	3241
-13.1	780	6104	610.65
-14.1	780	4575	5339.5
-15.1	780	4939	4757
-16.1	780	5283	5111
-16.68	780	5612	3159.55
-18.1	780	5926	8191.98

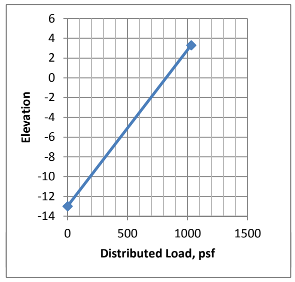
PS WATER ELEVATION (FT)	CRITICAL SLIP SURF. ELEVATION (FT)	UNIT WEIGHT WATER (PCF)
-4.5	-13	64

RESULTANT WATER LOAD= 2312 LBS

PASSIVE LOAD (SOIL) 22930.79
PASSIVE LOAD (SOIL+WATER) 25242.79 **IF THE PS WATER LEVEL IS BELOW THE CRITICAL SLIP SURFACE, USE PASSIVE LOAD (SOIL)**
FOS = 1

VIII.B.--HORIZONTAL DISTRIBUTED LOAD

ELEVATION (FT)	DIST. LOAD (PSF)	Result. (LBS)
3.3	1030	
-13	0	8394.5



8394.5

RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

NET SOIL PRESSURES INCLUDE APPLIED HORIZONTAL DISTRIBUTED LOADS.

	NET	<---LEFTSIDE--->		<--RIGHTSIDE--->	
ELEV. (FT)	WATER (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)
13.9	0	0	0	0	0
12.9	0	0	0	0	0
11.9	0	0	0	0	0
10.9	0	0	0	0	0
9.9	0	0	0	0	0
8.9	0	0	0	0	0
8	0	0	0	0	0
7.9	6	0	0	0	0
6.9	69	0	0	0	0
5.9	131	0	0	0	0
4.9	193	0	0	0	0
3.9	256	0	0	0	0
3.30+	293	0	0	0	0
-3.3	293	500	0	0	0
2.9	318	793	0	0	0
1.9	381	906	0	0	0
0.9	443	1016	0	0	0
-0.1	505	1124	0	0	0
-1.1	568	1232	0	0	0
-1.80+	612	1308	0	0	0
-1.80-	612	1308	0	0	500
-1.9	618	1319	0	0	590
-2.1	630	1341	0	0	763
-2.32+	644	1405	0	0	764
-2.32-	644	1361	0	0	764
-2.8	674	1405	58	0	765
-3.1	693	1424	98	0	757
-4.1	755	1498	217	0	767
-4.5	780	1528	249	0	782
-5.1	780	1559	278	0	805
-6.1	780	1586	320	0	834
-6.5	780	1587	340	0	835
-7.1	780	1585	365	0	835
-8.1	780	1598	386	0	849
-9.1	780	1615	403	0	869
-10.1	780	1633	420	0	886
-11.1	780	1651	437	0	663
-11.58+	780	1240	319	0	2576
-11.58-	780	1240	319	0	1587
-12.1	780	2944	887	336	2576
-12.31	780	4375	1183	528	3177
-13	780	9011	2141	1147	5125
-13.1	780	8979	1973	1072	4939
-14.1	780	6407	270	149	2616
-15.1	780	7063	299	166	3056
-16.1	780	7687	310	175	3495
-16.68	780	8294	320	185	3962
-18.1	780	8895	330	196	4451

ELEV. (FT)	NET WATER (PSF)	LEFTSIDE PASSIVE (PSF)	RESULT. LEFTSIDE PASSIVE (LBS)
13.9	0	0	
12.9	0	0	
11.9	0	0	
10.9	0	0	
9.9	0	0	
8.9	0	0	
8	0	0	
7.9	6	0	
6.9	69	0	0
5.9	131	0	0
4.9	193	0	0
3.9	256	0	0
3.3	293	0	0
3.3	293	500	0
2.9	318	793	258.6
1.9	381	906	849.5
0.9	443	1016	961
-0.1	505	1124	1070
-1.1	568	1232	1178
-1.8	612	1308	889
-1.8	612	1308	0
-1.9	618	1319	131.35
-2.1	630	1341	266
-2.32	644	1405	302.06
-2.32	644	1361	0
-2.8	674	1405	663.84
-3.1	693	1424	424.35
-4.1	755	1498	1461
-4.5	780	1528	605.2
-5.1	780	1559	926.1
-6.1	780	1586	1572.5
-6.5	780	1587	634.6
-7.1	780	1585	951.6
-8.1	780	1598	1591.5
-9.1	780	1615	1606.5
-10.1	780	1633	1624
-11.1	780	1651	1642
-11.58	780	1240	693.84
-11.58	780	1240	0
-12.1	780	2944	1087.84
-12.31	780	4375	768.495
-13	780	9011	4618.17
-13.1	780	8979	899.5
-14.1	780	6407	7693
-15.1	780	7063	6735
-16.1	780	7687	7375
-16.68	780	8294	4634.49
-18.1	780	8895	12204.19

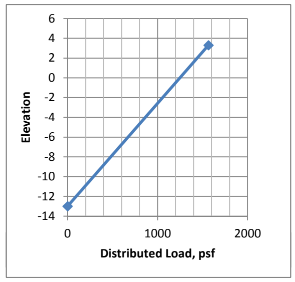
PS WATER ELEVATION (FT)	CRITICAL SLIP SURF. ELEVATION (FT)	UNIT WEIGHT WATER (PCF)
-4.5	-13	64

RESULTANT WATER LOAD= 2312 LBS

PASSIVE LOAD (SOIL)	26777.045	
PASSIVE LOAD (SOIL+WATER)	29089.045	**IF THE PS WATER LEVEL IS BELOW THE CRITICAL SLIP SURFACE, USE PASSIVE LOAD (SOIL)**
FOS =	0.8	

VIII.B.--HORIZONTAL DISTRIBUTED LOAD

ELEVATION (FT)	DIST. LOAD (PSF)	Result. (LBS)
3.3	1565	
-13	0	12754.75



12754.75

RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

NET SOIL PRESSURES INCLUDE APPLIED HORIZONTAL DISTRIBUTED LOADS.

ELEV. (FT)	NET WATER (PSF)	<---LEFTSIDE---> PASSIVE (PSF)	ACTIVE (PSF)	<--RIGHTSIDE---> ACTIVE (PSF)	PASSIVE (PSF)
13.9	0	0	0	0	0
12.9	0	0	0	0	0
11.9	0	0	0	0	0
10.9	0	0	0	0	0
9.9	0	0	0	0	0
8.9	0	0	0	0	0
8	0	0	0	0	0
7.9	6	0	0	0	0
6.9	69	0	0	0	0
5.9	131	0	0	0	0
4.9	193	0	0	0	0
3.9	256	0	0	0	0
3.30+	293	0	0	0	0
-3.3	293	667	0	0	0
2.9	318	1043	0	0	0
1.9	381	1158	0	0	0
0.9	443	1270	0	0	0
-0.1	505	1377	0	0	0
-1.1	568	1485	0	0	0
-1.80+	612	1561	0	0	0
-1.80-	612	1561	0	0	667
-2.1	630	1594	0	0	1013
-2.32+	644	1654	0	0	1011
-2.32-	644	1613	0	0	1011
-2.79	673	1653	57	0	1006
-2.8	674	1654	58	0	1005
-3.1	693	1670	98	0	991
-4.1	755	1735	217	0	992
-4.5	780	1765	249	0	1007
-5.1	780	1796	278	0	1030
-6.1	780	1820	320	0	1056
-6.5	780	1817	340	0	1054
-7.1	780	1811	365	0	1049
-8.1	780	1822	386	0	1061
-9.1	780	1840	403	0	1081
-10.1	780	1857	420	0	1098
-11.1	780	1876	437	0	661
-11.58+	780	1097	319	0	4266
-11.58-	780	1097	319	0	2403
-12.1	780	4309	887	336	4266
-12.44	780	8590	1362	644	6158
-13	780	15607	2141	1147	9258
-13.1	780	15528	1973	1072	8950
-14.1	780	10866	270	149	4920
-15.1	780	12536	299	166	6028
-16.1	780	14235	310	175	7248
-16.76	780	16030	320	185	8646
-18.1	780	17961	330	196	10322

ELEV. (FT)	NET WATER (PSF)	LEFTSIDE PASSIVE (PSF)	RESULT. LEFTSIDE PASSIVE (LBS)
13.9	0	0	
12.9	0	0	
11.9	0	0	
10.9	0	0	
9.9	0	0	
8.9	0	0	
8	0	0	
7.9	6	0	
6.9	69	0	0
5.9	131	0	0
4.9	193	0	0
3.9	256	0	0
3.3	293	0	0
3.3	293	667	0
2.9	318	1043	342
1.9	381	1158	1100.5
0.9	443	1270	1214
-0.1	505	1377	1323.5
-1.1	568	1485	1431
-1.8	612	1561	1066.1
-1.8	612	1561	0
-2.1	630	1594	473.25
-2.32	644	1654	357.28
-2.32	644	1613	0
-2.79	673	1653	767.51
-2.8	674	1654	16.535
-3.1	693	1670	498.6
-4.1	755	1735	1702.5
-4.5	780	1765	700
-5.1	780	1796	1068.3
-6.1	780	1820	1808
-6.5	780	1817	727.4
-7.1	780	1811	1088.4
-8.1	780	1822	1816.5
-9.1	780	1840	1831
-10.1	780	1857	1848.5
-11.1	780	1876	1866.5
-11.58	780	1097	713.52
-11.58	780	1097	0
-12.1	780	4309	1405.56
-12.44	780	8590	2192.83
-13	780	15607	6775.16
-13.1	780	15528	1556.75
-14.1	780	10866	13197
-15.1	780	12536	11701
-16.1	780	14235	13385.5
-16.76	780	16030	9987.45
-18.1	780	17961	22773.97

PS WATER ELEVATION (FT)	CRITICAL SLIP SURF. ELEVATION (FT)	UNIT WEIGHT WATER (PCF)
-4.5	-13	64

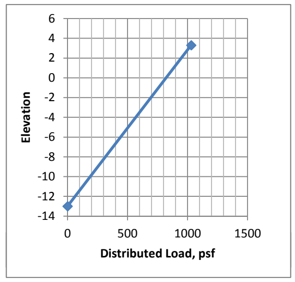
RESULTANT WATER LOAD= 2312 LBS

PASSIVE LOAD (SOIL)	34134.445	
PASSIVE LOAD (SOIL+WATER)	36446.445	**IF THE PS WATER LEVEL IS BELOW THE CRITICAL SLIP SURFACE, USE PASSIVE LOAD (SOIL)**
FOS =	0.6	

VIII.B.--HORIZONTAL DISTRIBUTED LOAD

ELEVATION (FT)	DIST. LOAD (PSF)	Result. (LBS)
3.3	1030	
-13	0	8394.5

8394.5



RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

NET SOIL PRESSURES INCLUDE APPLIED HORIZONTAL DISTRIBUTED LOADS.

ELEV. (FT)	NET WATER (PSF)	<---LEFTSIDE---> PASSIVE (PSF)	ACTIVE (PSF)	<--RIGHTSIDE---> ACTIVE (PSF)	PASSIVE (PSF)
13.9	0	0	0	0	0
12.9	0	0	0	0	0
11.9	0	0	0	0	0
10.9	0	0	0	0	0
9.9	0	0	0	0	0
8.9	0	0	0	0	0
8	0	0	0	0	0
7.9	6.2	0	0	0	0
6.9	68.6	0	0	0	0
5.9	131	0	0	0	0
4.9	193.4	0	0	0	0
3.9	255.8	0	0	0	0
3.3+	293.3	0	0	0	0
-3.3	293.3	500	0	0	500
2.9	318.2	792.9	0	0	763.3
2.3	355.7	860.8	0	0	701.5
1.9	380.6	906.6	0	0	633.1
0.9	443	1016.5	0	0	583
-0.1	505.4	1124.4	0	0	609.6
-1.1	567.8	1233.1	0	0	632.2
-1.9	620.1	1319.1	0	0	651.1
-2.1	630.2	1335.9	0	0	654.8
-2.3+	642	1421.3	0	0	659.1
-2.3-	642	1352	0	0	659.1
-3.1	692.6	1421.3	98.7	0	677.5
-4.1	755	1498.8	216.2	0	700.1
-4.5	780	1527.9	249.9	0	709.1
-5.1	780	1558.6	277.9	0	723.1
-6.1	780	1585.6	319.7	0	737.4
-6.5	780	1586.5	340.4	0	733.3
-7.1	780	1584.9	364.6	0	724
-8.1	780	1597.5	385.8	0	723.9
-9.1	780	1615.3	402.8	0	725.3
-10.1	780	1632.7	420.2	0	756.9
-11.1	780	1651.4	436.6	0	545
-11.4+	780	1382.5	359.7	0	3351
-11.4-	780	1382.5	359.7	0	1453.7
-12.1	780	3371.3	1023.2	591.5	3351
-13	780	8977.9	2130.9	1658.4	7002.5
-13.1	780	8933.7	1959.1	1526.2	6698.9
-14.1	780	6406.9	270.1	74.8	2919.8
-15.1	780	7062.8	299.3	103.6	3183.2
-16.1	780	7687.5	309.7	119.4	3404.8
-17.1	780	8294.4	320.1	136.6	3685.6
-18.1	780	8894.9	330.4	153.8	4043.9
-19.1	780	9501.3	340.7	171.2	4468.3
-20.1	780	10110.4	351	188.6	4989.4
-21.1	780	10515.3	361.3	206.1	5581.6
-22.1	780	10784.4	371.5	223.6	6141.1
-23.1	780	11390.6	381.8	241.1	6707.8
-24.1	780	12195.6	392.1	258.7	7348.6
-25.1	780	12874.3	402.8	276.3	8019.5
-26.1	780	13517.1	414.1	294	8705.1
-27.1	780	14082.5	425.7	311.3	9421.9
-28.1	780	14495.8	437.3	326.8	10169.5
-29.1	780	14986.4	448.8	340.7	10942.2

ELEV. (FT)	NET WATER (PSF)	LEFTSIDE PASSIVE (PSF)	RESULT. LEFTSIDE PASSIVE (LBS)
13.9	0	0	
12.9	0	0	
11.9	0	0	
10.9	0	0	
9.9	0	0	
8.9	0	0	
8	0	0	
7.9	6	0	
6.9	69	0	0
5.9	131	0	0
4.9	193	0	0
3.9	256	0	0
3.3	293	0	0
3.3	293	500	0
2.9	318	793	258.6
2.3	356	861	496.2
1.9	381	907	353.6
0.9	443	1017	962
-0.1	505	1124	1070.5
-1.1	568	1233	1178.5
-1.94	620	1319	1071.84
-2.1	630	1336	212.4
-2.29	642	1421	261.915
-2.29	642	1352	0
-3.1	693	1421	1123.065
-4.1	755	1499	1460
-4.5	780	1528	605.4
-5.1	780	1559	926.1
-6.1	780	1586	1572.5
-6.5	780	1587	634.6
-7.1	780	1585	951.6
-8.1	780	1598	1591.5
-9.1	780	1615	1606.5
-10.1	780	1633	1624
-11.1	780	1651	1642
-11.44	780	1382	515.61
-11.44	780	1382	0
-12.1	780	3371	1568.49
-12.27	780	4426	662.745
-13	780	4426	3230.98

PS WATER ELEVATION (FT)	CRITICAL SLIP SURF. ELEVATION (FT)	UNIT WEIGHT WATER (PCF)
-4.5	-13	64

RESULTANT WATER LOAD= 2312 LBS

PASSIVE LOAD (SOIL) 25580.645

PASSIVE LOAD (SOIL+WATER) 27892.645 **IF THE PS WATER LEVEL IS BELOW THE CRITICAL SLIP SURFACE,**

FOS = 0.8 **USE PASSIVE LOAD (SOIL)**

```
'ORLEANS AVENUE OUTFALL CANAL
'REACH 4
CONTROL  CANTILEVER  DESIGN  1.00  1.00
WALL   13.9
SURFACE RIGHTSIDE   7    0   -1.8
              1.1   -1.8
              7.9   -3
              22.4   -6
              29.7   -6.3
              59   -6.1
              80   -6.1
SURFACE LEFTSIDE   10    0    3.3
              1    3.3
              6.5    3.4
              14.8    2.7
              31.5   -0.7
              31.6   -1.9
              42   -2.3
              57.5   -4
              67.8   -4.5
              110   -4.5
SOIL RIGHTSIDE  STRENGTHS   4
  106    106    0    200    0    200   -6.5   0
  88    88    0    190    0    190   -13   0
  122    122    33    0    18    0   -47   0
  110    110    0    500    0    500
SOIL LEFTSIDE  STRENGTHS   4
  106    106    0    200    0    200   -6.5   0
  88    88    0    190    0    190   -13   0
  122    122    33    0    18    0   -47   0
  110    110    0    500    0    500
WATER ELEVATIONS   62.4    8   -4.5
HORIZONTAL DISTRIBUTED   2    3.3    760   -13    0
FINISHED
```

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 4-OCTOBER-2013 TIME: 15:38:27

****
* INPUT DATA *
****

I.--HEADING
'ORLEANS AVENUE OUTFALL CANAL
'REACH 4

II.--CONTROL
CANTILEVER WALL DESIGN
FACTOR OF SAFETY FOR ACTIVE PRESSURES = 1.00
FACTOR OF SAFETY FOR PASSIVE PRESSURES = 1.00

III.--WALL DATA
ELEVATION AT TOP OF WALL = 13.90 FT.

IV.--SURFACE POINT DATA

IV.A.--RIGHTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	-1.80
1.10	-1.80
7.90	-3.00
22.40	-6.00
29.70	-6.30
59.00	-6.10
80.00	-6.10

IV.B.--LEFTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	3.30
1.00	3.30
6.50	3.40
14.80	2.70
31.50	-0.70
31.60	-1.90
42.00	-2.30
57.50	-4.00
67.80	-4.50
110.00	-4.50

V.--SOIL LAYER DATA

V.A.--RIGHTSIDE
LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

ANGLE OF			ANGLE OF					<-SAFETY->	
SAT.	MOIST	INTERNAL	COH-	WALL	ADH-	<--BOTTOM-->		<-FACTOR->	
WGHT.	WGHT.	FRICTION	ESION	FRICTION	ESION	ELEV.	SLOPE	ACT.	PASS.
(PCF)	(PCF)	(DEG)	(PSF)	(DEG)	(PSF)	(FT)	(FT/FT)		
106.00	106.00	0.00	200.00	0.00	200.00	-6.50	0.00	DEF	DEF
88.00	88.00	0.00	190.00	0.00	190.00	-13.00	0.00	DEF	DEF
122.00	122.00	33.00	0.00	18.00	0.00	-47.00	0.00	DEF	DEF
110.00	110.00	0.00	500.00	0.00	500.00			DEF	DEF

V.B.--LEFTSIDE

LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

ANGLE OF			ANGLE OF					<-SAFETY->	
SAT.	MOIST	INTERNAL	COH-	WALL	ADH-	<--BOTTOM-->		<-FACTOR->	
WGHT.	WGHT.	FRICTION	ESION	FRICTION	ESION	ELEV.	SLOPE	ACT.	PASS.
(PCF)	(PCF)	(DEG)	(PSF)	(DEG)	(PSF)	(FT)	(FT/FT)		
106.00	106.00	0.00	200.00	0.00	200.00	-6.50	0.00	DEF	DEF
88.00	88.00	0.00	190.00	0.00	190.00	-13.00	0.00	DEF	DEF
122.00	122.00	33.00	0.00	18.00	0.00	-47.00	0.00	DEF	DEF
110.00	110.00	0.00	500.00	0.00	500.00			DEF	DEF

VI.--WATER DATA

UNIT WEIGHT = 62.40 (PCF)
RIGHTSIDE ELEVATION = 8.00 (FT)
LEFTSIDE ELEVATION = -4.50 (FT)
NO SEEPAGE

VII.--VERTICAL SURCHARGE LOADS

NONE

VIII.--HORIZONTAL LOADS

VIII.A.--HORIZONTAL LINE LOADS

NONE

VIII.B.--HORIZONTAL DISTRIBUTED LOADS

ELEVATION	DIST. LOAD
(FT)	(PSF)
3.30	760.00
-13.00	0.00

****
* SOIL PRESSURES FOR *
* CANTILEVER WALL DESIGN *
****

I.--HEADING

'ORLEANS AVENUE OUTFALL CANAL

'REACH 4

II.--SOIL PRESSURES

RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

NET SOIL PRESSURES INCLUDE APPLIED HORIZONTAL DISTRIBUTED LOADS.

	NET	<---LEFTSIDE--->		<------NET------> (SOIL + WATER)		<--RIGHTSIDE--->	
ELEV. (FT)	WATER (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)
13.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7.9	6.2	0.0	0.0	6.2	6.2	0.0	0.0
6.9	68.6	0.0	0.0	68.6	68.6	0.0	0.0
5.9	131.0	0.0	0.0	131.0	131.0	0.0	0.0
4.9	193.4	0.0	0.0	193.4	193.4	0.0	0.0
3.9	255.8	0.0	0.0	255.8	255.8	0.0	0.0
3.3+	293.3	0.0	0.0	293.3	293.3	0.0	0.0
3.3-	293.3	400.0	0.0	653.3	1053.3	0.0	0.0
2.9	318.2	642.9	0.0	416.7	1059.6	0.0	0.0
1.9	380.6	754.6	0.0	320.7	1075.4	0.0	0.0
0.9	443.0	864.6	0.0	226.5	1091.1	0.0	0.0
-0.1	505.4	972.5	0.0	134.4	1106.9	0.0	0.0
-1.1	567.8	1080.5	0.0	42.2	1122.7	0.0	0.0
-1.8+	611.5	1156.1	0.0	-22.3	1133.7	0.0	0.0
-1.8-	611.5	1156.1	0.0	-22.3	1533.7	0.0	400.0
-2.1	630.2	1188.8	0.0	-50.3	1751.6	0.0	613.1
-2.3+	644.0	1255.0	0.0	-90.4	1757.4	0.0	615.4
-2.3-	644.0	1209.6	0.0	-90.4	1757.4	0.0	615.4
-2.8	673.9	1255.0	57.8	-105.5	1712.2	0.0	620.5
-3.1	692.6	1277.0	98.3	-122.7	1672.3	0.0	616.4
-4.1	755.0	1355.6	216.9	-185.5	1585.0	0.0	631.9
-4.5	780.0	1386.2	249.5	-209.9	1574.1	0.0	647.3
-5.1	780.0	1416.3	277.9	-267.9	1540.2	0.0	669.8
-6.1	780.0	1444.9	319.7	-343.2	1482.2	0.0	700.1
-6.5	780.0	1448.1	340.4	-365.0	1446.6	0.0	704.0
-7.1	780.0	1449.3	364.6	-394.2	1396.7	0.0	706.3

-8.1	780.0	1462.9	385.8	-454.4	1344.2	0.0	721.5
-9.1	780.0	1480.6	402.8	-518.7	1300.2	0.0	741.1
-10.1	780.0	1497.9	420.2	-582.7	1253.8	0.0	758.7
-11.1	780.0	1516.2	436.7	-647.6	1060.5	0.0	628.6
-11.6+	780.0	1265.6	319.4	-419.5	2027.6	0.0	1804.9
-11.6-	780.0	1265.6	319.4	-419.5	2027.6	0.0	1196.9
-12.1	780.0	2311.2	887.1	-1152.7	1739.7	336.4	1804.9
-13.0	780.0	6109.5	2141.3	-4182.1	1973.7	1147.4	3335.0
-13.1	780.0	6104.4	1973.1	-4252.2	2021.3	1072.2	3214.3
-14.1	780.0	4574.7	270.1	-3645.7	2271.8	149.0	1762.0
-15.1	780.0	4939.4	299.3	-3993.6	2509.1	165.8	2028.4
-16.1	780.0	5282.9	309.7	-4328.3	2757.7	174.6	2287.4
-17.1	780.0	5611.7	320.1	-4647.0	3017.0	184.7	2557.0
-18.1	780.0	5926.1	330.4	-4950.6	3283.8	195.6	2834.2
-19.1	780.0	6236.1	340.7	-5249.1	3556.6	207.0	3117.3
-20.1	780.0	6544.3	351.0	-5545.4	3841.9	218.9	3412.8
-21.1	780.0	6842.9	361.3	-5831.8	4176.9	231.1	3758.1
-22.1	780.0	7092.6	371.5	-6069.0	4554.2	243.6	4145.7
-23.1	780.0	7162.4	381.8	-6126.1	4908.8	256.3	4510.6
-24.1	780.0	7271.8	392.1	-6222.6	5244.1	269.2	4856.2
-25.1	780.0	7695.2	402.8	-6633.0	5610.0	282.2	5232.8
-26.1	780.0	8117.7	414.1	-7042.3	6012.3	295.4	5646.4
-27.1	780.0	8416.4	425.7	-7327.8	6417.4	308.6	6063.1
-28.1	780.0	8732.8	437.3	-7630.8	6817.5	322.0	6474.7
-29.1	780.0	9006.6	448.8	-7891.1	7226.1	335.6	6895.0
-30.1	780.0	9185.2	460.4	-8056.1	7644.1	349.2	7324.5
-31.1	780.0	9379.0	471.9	-8236.2	8069.1	362.8	7761.1
-32.1	780.0	9686.1	483.5	-8529.6	8498.6	376.5	8202.1
-33.1	780.0	10039.4	495.0	-8869.1	8932.0	390.3	8647.0
-34.1	780.0	10389.2	506.5	-9205.1	9369.1	404.1	9095.6
-35.1	780.0	10738.6	518.1	-9540.8	9809.6	417.9	9547.6
-36.1	780.0	11078.3	529.6	-9866.6	10253.2	431.7	10002.8
-37.1	780.0	11403.3	541.1	-10177.7	10699.7	445.6	10460.8
-38.1	780.0	11726.2	552.6	-10486.7	11148.9	459.4	10921.5
-39.1	780.0	12073.3	564.1	-10819.7	11600.7	473.5	11384.8
-40.1	780.0	12444.3	575.9	-11177.7	12054.0	486.5	11849.9
-41.1	780.0	12807.7	588.4	-11535.3	12505.8	492.4	12314.3
-42.1	780.0	13161.5	601.4	-11886.6	12957.3	494.9	12778.7
-43.1	780.0	13516.7	614.5	-12231.0	13412.6	505.7	13247.0
-44.1	780.0	13882.7	627.5	-12581.0	13871.2	521.8	13718.7
-45.1	780.0	14289.7	640.5	-12848.8	20123.8	660.9	19984.3
-45.8	780.0	25926.0	1020.7	-25146.0	2084.0	0.0	2324.7
-46.1	780.0	3270.1	274.4	-2490.1	2849.7	0.0	2344.1
-46.2	780.0	3059.3	0.0	-2279.3	3130.2	0.0	2350.2
-47.0	780.0	3106.8	0.0	-2326.8	3177.7	0.0	2397.7
-47.1	780.0	3111.6	0.0	-2331.6	3182.5	0.0	2402.5
-47.4+	780.0	3485.9	0.0	-2526.5	3198.0	0.0	2418.0
-47.4-	780.0	3127.0	0.0	-2526.5	3198.0	0.0	2418.0
-47.7+	780.0	3485.9	1322.7	-2705.9	2758.5	0.0	4171.8
-47.7-	780.0	3485.9	1322.7	-2705.9	2758.5	0.0	2430.7
-48.1	780.0	3159.2	1349.3	-1639.2	3602.5	739.9	4171.8
-49.1	780.0	3206.8	1266.3	-1663.3	2949.6	763.5	3435.9

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS
DATE: 4-OCTOBER-2013 TIME: 15:38:29

****
* SUMMARY OF RESULTS FOR *
* CANTILEVER WALL DESIGN *
****

I.--HEADING
'ORLEANS AVENUE OUTFALL CANAL
'REACH 4

II.--SUMMARY

RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

WALL BOTTOM ELEV. (FT) : -16.68
PENETRATION (FT) : 14.88

MAX. BEND. MOMENT (LB-FT) : 1.6575E+04
AT ELEVATION (FT) : -8.60

MAX. SCALED DEFL. (LB-IN^3): 7.1957E+09
AT ELEVATION (FT) : 13.90

NOTE: DIVIDE SCALED DEFLECTION MODULUS OF
ELLASTICITY IN PSI TIMES PILE MOMENT
OF INERTIA IN IN^4 TO OBTAIN DEFLECTION
IN INCHES.

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHOREDOR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS
DATE: 4-OCTOBER-2013 TIME: 15:38:29

****
* COMPLETE OF RESULTS FOR *
* CANTILEVER WALL DESIGN *
****

I.--HEADING
'ORLEANS AVENUE OUTFALL CANAL
'REACH 4

II.--RESULTS

ELEVATION (FT)	BENDING MOMENT (LB-FT)	SHEAR (LB)	SCALED DEFLECTION (LB-IN^3)	NET PRESSURE (PSF)
13.90	0.0000E+00	0.	7.1957E+09	0.00
12.90	-6.9849E-10	0.	6.8550E+09	0.00
11.90	-6.9849E-10	0.	6.5144E+09	0.00
10.90	-6.9849E-10	0.	6.1737E+09	0.00
9.90	-6.9849E-10	0.	5.8331E+09	0.00
8.90	-6.9849E-10	0.	5.4924E+09	0.00
8.00	-6.4517E-10	0.	5.1858E+09	0.00
7.90	1.0400E-02	0.	5.1517E+09	6.24
6.90	1.3842E+01	38.	4.8111E+09	68.64
5.90	9.6314E+01	138.	4.4704E+09	131.04
4.90	3.0983E+02	300.	4.1300E+09	193.44
3.90	7.1678E+02	524.	3.7901E+09	255.84
3.30+	1.0798E+03	689.	3.5868E+09	293.28
3.30-	1.0798E+03	689.	3.5868E+09	653.28
2.90	1.4014E+03	903.	3.4515E+09	416.66
1.90	2.4969E+03	1272.	3.1154E+09	320.73
0.90	3.9135E+03	1546.	2.7837E+09	226.53
-0.10	5.5569E+03	1726.	2.4587E+09	134.37
-1.10	7.3347E+03	1814.	2.1434E+09	42.21
-1.80	8.6098E+03	1821.	1.9300E+09	-22.33
-2.10	9.1547E+03	1810.	1.8407E+09	-50.29
-2.32	9.5527E+03	1795.	1.7759E+09	-90.38
-2.80	1.0402E+04	1748.	1.6381E+09	-105.50
-3.10	1.0921E+04	1714.	1.5539E+09	-122.74
-4.10	1.2563E+04	1559.	1.2859E+09	-185.55
-4.50	1.3171E+04	1480.	1.1846E+09	-209.92
-5.10	1.4018E+04	1337.	1.0396E+09	-267.94
-6.10	1.5209E+04	1031.	8.1743E+08	-343.23
-6.50	1.5593E+04	890.	7.3583E+08	-365.02
-7.10	1.6060E+04	662.	6.2153E+08	-394.24
-8.10	1.6515E+04	238.	4.5334E+08	-454.44
-9.10	1.6514E+04	-249.	3.1361E+08	-518.74
-10.10	1.5995E+04	-800.	2.0234E+08	-582.72
-11.10	1.4894E+04	-1415.	1.1864E+08	-647.59
-11.58	1.4143E+04	-1673.	8.7540E+07	-419.52
-12.10	1.3190E+04	-2079.	6.0578E+07	-1152.74
-12.30	1.2750E+04	-2375.	5.1850E+07	-1822.17
-13.00	1.0699E+04	-3387.	2.7787E+07	-1064.70
-13.10	1.0355E+04	-3488.	2.5139E+07	-956.66
-14.10	6.5689E+03	-3904.	7.4553E+06	123.71
-15.10	2.9065E+03	-3240.	1.1408E+06	1204.08
-16.10	4.4826E+02	-1496.	2.2070E+04	2284.46
-16.68	0.0000E+00	0.	0.0000E+00	2907.14

NOTE: DIVIDE SCALED DEFLECTION MODULUS OF

ELLASTICITY IN PSI TIMES PILE MOMENT
OF INERTIA IN IN^4 TO OBTAIN DEFLECTION
IN INCHES.

III.--WATER AND SOIL PRESSURES

		<-------------SOIL PRESSURES-------------->			
	WATER	<----LEFTSIDE----->		<---RIGHTSIDE---->	
ELEVATION	PRESSURE	PASSIVE	ACTIVE	ACTIVE	PASSIVE
(FT)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)
13.90	0.	0.	0.	0.	0.
12.90	0.	0.	0.	0.	0.
11.90	0.	0.	0.	0.	0.
10.90	0.	0.	0.	0.	0.
9.90	0.	0.	0.	0.	0.
8.90	0.	0.	0.	0.	0.
8.00	0.	0.	0.	0.	0.
7.90	6.	0.	0.	0.	0.
6.90	69.	0.	0.	0.	0.
5.90	131.	0.	0.	0.	0.
4.90	193.	0.	0.	0.	0.
3.90	256.	0.	0.	0.	0.
3.30+	293.	0.	0.	0.	0.
3.30-	293.	400.	0.	0.	0.
2.90	318.	643.	0.	0.	0.
1.90	381.	755.	0.	0.	0.
0.90	443.	865.	0.	0.	0.
-0.10	505.	973.	0.	0.	0.
-1.10	568.	1080.	0.	0.	0.
-1.80+	612.	1156.	0.	0.	0.
-1.80-	612.	1156.	0.	0.	400.
-2.10	630.	1189.	0.	0.	613.
-2.32+	644.	1255.	0.	0.	615.
-2.32-	644.	1210.	0.	0.	615.
-2.80	674.	1255.	58.	0.	620.
-3.10	693.	1277.	98.	0.	616.
-4.10	755.	1356.	217.	0.	632.
-4.50	780.	1386.	249.	0.	647.
-5.10	780.	1416.	278.	0.	670.
-6.10	780.	1445.	320.	0.	700.
-6.50	780.	1448.	340.	0.	704.
-7.10	780.	1449.	365.	0.	706.
-8.10	780.	1463.	386.	0.	722.
-9.10	780.	1481.	403.	0.	741.
-10.10	780.	1498.	420.	0.	759.
-11.10	780.	1516.	437.	0.	629.
-11.58+	780.	1266.	319.	0.	1805.
-11.58-	780.	1266.	319.	0.	1197.
-12.10	780.	2311.	887.	336.	1805.
-12.30	780.	3151.	1164.	516.	2143.
-13.00	780.	6109.	2141.	1147.	3335.
-13.10	780.	6104.	1973.	1072.	3214.
-14.10	780.	4575.	270.	149.	1762.
-15.10	780.	4939.	299.	166.	2028.

-16.10	780.	5283.	310.	175.	2287.
-16.68	780.	5612.	320.	185.	2557.
-18.10	780.	5926.	330.	196.	2834.

```
'ORLEANS AVENUE OUTFALL CANAL
'REACH 4
CONTROL  CANTILEVER  DESIGN  1.00  0.80
WALL   13.9
SURFACE RIGHTSIDE   7    0   -1.8
            1.1   -1.8
            7.9   -3
            22.4   -6
            29.7   -6.3
            59   -6.1
            80   -6.1
SURFACE LEFTSIDE   10    0    3.3
            1    3.3
            6.5    3.4
            14.8    2.7
            31.5   -0.7
            31.6   -1.9
            42   -2.3
            57.5   -4
            67.8   -4.5
            110   -4.5
SOIL RIGHTSIDE  STRENGTHS   4
  106    106    0    200    0    200   -6.5   0
  88    88    0    190    0    190   -13   0
  122    122    33    0    18    0   -47   0
  110    110    0    500    0    500
SOIL LEFTSIDE  STRENGTHS   4
  106    106    0    200    0    200   -6.5   0
  88    88    0    190    0    190   -13   0
  122    122    33    0    18    0   -47   0
  110    110    0    500    0    500
WATER ELEVATIONS   62.4    8   -4.5
HORIZONTAL DISTRIBUTED   2    3.3    1030   -13    0
FINISHED
```

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 4-OCTOBER-2013 TIME: 15:42:37

****
* INPUT DATA *
****

I.--HEADING
'ORLEANS AVENUE OUTFALL CANAL
'REACH 4

II.--CONTROL
CANTILEVER WALL DESIGN
FACTOR OF SAFETY FOR ACTIVE PRESSURES = 1.00
FACTOR OF SAFETY FOR PASSIVE PRESSURES = 0.80

III.--WALL DATA
ELEVATION AT TOP OF WALL = 13.90 FT.

IV.--SURFACE POINT DATA

IV.A.--RIGHTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	-1.80
1.10	-1.80
7.90	-3.00
22.40	-6.00
29.70	-6.30
59.00	-6.10
80.00	-6.10

IV.B.--LEFTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	3.30
1.00	3.30
6.50	3.40
14.80	2.70
31.50	-0.70
31.60	-1.90
42.00	-2.30
57.50	-4.00
67.80	-4.50
110.00	-4.50

V.--SOIL LAYER DATA

V.A.--RIGHTSIDE
LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COHESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADHESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.
106.00	106.00	0.00	200.00	0.00	200.00	-6.50	0.00	DEF	DEF
88.00	88.00	0.00	190.00	0.00	190.00	-13.00	0.00	DEF	DEF
122.00	122.00	33.00	0.00	18.00	0.00	-47.00	0.00	DEF	DEF
110.00	110.00	0.00	500.00	0.00	500.00			DEF	DEF

V.B.--LEFTSIDE

LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COHESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADHESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.
106.00	106.00	0.00	200.00	0.00	200.00	-6.50	0.00	DEF	DEF
88.00	88.00	0.00	190.00	0.00	190.00	-13.00	0.00	DEF	DEF
122.00	122.00	33.00	0.00	18.00	0.00	-47.00	0.00	DEF	DEF
110.00	110.00	0.00	500.00	0.00	500.00			DEF	DEF

VI.--WATER DATA

UNIT WEIGHT = 62.40 (PCF)
RIGHTSIDE ELEVATION = 8.00 (FT)
LEFTSIDE ELEVATION = -4.50 (FT)
NO SEEPAGE

VII.--VERTICAL SURCHARGE LOADS

NONE

VIII.--HORIZONTAL LOADS

VIII.A.--HORIZONTAL LINE LOADS

NONE

VIII.B.--HORIZONTAL DISTRIBUTED LOADS

ELEVATION (FT)	DIST. LOAD (PSF)
3.30	1030.00
-13.00	0.00

****
*   SOIL PRESSURES FOR   *
* CANTILEVER WALL DESIGN *
****

I.--HEADING

'ORLEANS AVENUE OUTFALL CANAL

'REACH 4

II.--SOIL PRESSURES

RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

NET SOIL PRESSURES INCLUDE APPLIED HORIZONTAL DISTRIBUTED LOADS.

	NET	<---LEFTSIDE--->		<------NET------> (SOIL + WATER)		<--RIGHTSIDE--->	
ELEV.	WATER	PASSIVE	ACTIVE	ACTIVE	PASSIVE	ACTIVE	PASSIVE
(FT)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)
13.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7.9	6.2	0.0	0.0	6.2	6.2	0.0	0.0
6.9	68.6	0.0	0.0	68.6	68.6	0.0	0.0
5.9	131.0	0.0	0.0	131.0	131.0	0.0	0.0
4.9	193.4	0.0	0.0	193.4	193.4	0.0	0.0
3.9	255.8	0.0	0.0	255.8	255.8	0.0	0.0
3.3+	293.3	0.0	0.0	293.3	293.3	0.0	0.0
3.3-	293.3	500.0	0.0	823.3	1323.3	0.0	0.0
2.9	318.2	793.1	0.0	529.9	1323.0	0.0	0.0
1.9	380.6	905.9	0.0	416.2	1322.2	0.0	0.0
0.9	443.0	1016.5	0.0	304.9	1321.4	0.0	0.0
-0.1	505.4	1124.4	0.0	196.2	1320.6	0.0	0.0
-1.1	567.8	1232.3	0.0	87.5	1319.8	0.0	0.0
-1.8+	611.5	1307.9	0.0	11.3	1319.3	0.0	0.0
-1.8-	611.5	1307.9	0.0	11.3	1819.3	0.0	500.0
-1.9	618.0	1319.2	0.0	0.0	1909.6	0.0	590.4
-2.1	630.2	1340.7	0.0	-21.7	2082.1	0.0	763.1
-2.3+	644.0	1404.6	0.0	-63.9	2082.5	0.0	763.6
-2.3-	644.0	1360.8	0.0	-63.9	2082.5	0.0	763.6
-2.8	673.9	1404.6	57.8	-86.2	2025.5	0.0	764.8
-3.1	692.6	1424.3	98.3	-106.1	1976.6	0.0	756.7
-4.1	755.0	1497.9	216.9	-180.5	1867.3	0.0	766.8
-4.5	780.0	1528.3	249.5	-211.2	1849.9	0.0	782.3
-5.1	780.0	1558.6	277.9	-279.4	1806.1	0.0	804.9
-6.1	780.0	1585.6	319.7	-369.6	1729.9	0.0	833.6
-6.5	780.0	1586.5	340.4	-395.8	1685.6	0.0	835.2

-7.1	780.0	1584.9	364.6	-432.1	1622.8	0.0	834.6
-8.1	780.0	1597.5	385.8	-507.9	1552.8	0.0	849.0
-9.1	780.0	1615.3	402.8	-588.9	1492.3	0.0	868.7
-10.1	780.0	1632.7	420.2	-669.4	1429.0	0.0	885.9
-11.1	780.0	1651.1	436.7	-751.1	1126.0	0.0	662.7
-11.6+	780.0	1239.7	319.4	-370.2	2631.9	0.0	2576.2
-11.6-	780.0	1239.7	319.4	-370.2	2631.9	0.0	1587.2
-12.1	780.0	2943.6	887.1	-1770.3	2526.0	336.4	2576.2
-13.0	780.0	9011.3	2141.3	-7083.8	3763.8	1147.4	5125.1
-13.1	780.0	8978.5	1973.1	-7126.4	3745.6	1072.2	4938.7
-14.1	780.0	6406.9	270.1	-5477.8	3125.5	149.0	2615.6
-15.1	780.0	7062.8	299.3	-6117.0	3536.7	165.8	3056.0
-16.1	780.0	7687.5	309.7	-6732.9	3965.7	174.6	3495.4
-17.1	780.0	8294.4	320.1	-7329.7	4421.9	184.7	3962.0
-18.1	780.0	8894.9	330.4	-7919.3	4900.3	195.6	4450.7
-19.1	780.0	9501.3	340.7	-8514.3	5413.1	207.0	4973.8
-20.1	780.0	10110.4	351.0	-9111.5	6020.1	218.9	5591.1
-21.1	780.0	10515.3	361.3	-9504.2	6707.2	231.1	6288.4
-22.1	780.0	10784.4	371.5	-9760.8	7372.4	243.6	6963.9
-23.1	780.0	11390.6	381.8	-10354.3	8044.5	256.3	7646.3
-24.1	780.0	12195.6	392.1	-11146.5	8799.6	269.2	8411.7
-25.1	780.0	12874.3	402.8	-11812.1	9609.0	282.2	9231.7
-26.1	780.0	13517.1	414.1	-12441.8	10434.0	295.4	10068.1
-27.1	780.0	14082.5	425.7	-12993.9	11283.3	308.6	10928.9
-28.1	780.0	14495.8	437.3	-13393.8	12169.5	322.0	11826.8
-29.1	780.0	14986.4	448.8	-13870.8	13087.4	335.6	12756.3
-30.1	780.0	15678.4	460.4	-14549.2	14031.3	349.2	13711.7
-31.1	780.0	16439.6	471.9	-15296.8	14999.9	362.8	14691.8
-32.1	780.0	17204.0	483.5	-16047.5	15992.1	376.5	15695.6
-33.1	780.0	17961.0	495.0	-16790.7	17007.3	390.3	16722.3
-34.1	780.0	18693.3	506.5	-17509.3	18044.4	404.1	17770.9
-35.1	780.0	19432.3	518.1	-18234.5	19102.6	417.9	18840.7
-36.1	780.0	20223.8	529.6	-19012.1	20181.7	431.7	19931.3
-37.1	780.0	21048.4	541.1	-19822.9	21276.5	445.6	21037.6
-38.1	780.0	21863.4	552.6	-20623.9	22383.8	459.4	22156.5
-39.1	780.0	22672.2	564.1	-21418.7	23510.7	473.5	23294.8
-40.1	780.0	23510.5	575.9	-22244.0	24658.8	486.5	24454.7
-41.1	780.0	24428.7	588.4	-23156.3	25822.7	492.4	25631.2
-42.1	780.0	25412.7	601.4	-24137.8	27000.5	494.9	26822.0
-43.1	780.0	26396.6	614.5	-25111.0	28192.9	505.7	28027.4
-44.1	780.0	27376.1	627.5	-26074.3	29400.2	521.8	29247.7
-45.1	780.0	28376.4	640.5	-26935.6	49934.6	660.9	49795.1
-45.8	780.0	62386.3	1020.7	-61606.3	2084.0	0.0	2324.7
-46.1	780.0	3053.2	274.4	-2273.2	2849.7	0.0	2344.1
-46.2	780.0	3059.3	0.0	-2279.3	3130.2	0.0	2350.2
-47.0	780.0	3106.8	0.0	-2326.8	3177.7	0.0	2397.7
-47.1	780.0	3111.6	0.0	-2331.6	3182.5	0.0	2402.5
-47.4+	780.0	4658.0	0.0	-3112.5	3198.0	0.0	2418.0
-47.4-	780.0	3127.0	0.0	-3112.5	3198.0	0.0	2418.0
-47.7+	780.0	4658.0	1322.7	-3878.0	3551.7	0.0	5758.1
-47.7-	780.0	4658.0	1322.7	-3878.0	3551.7	0.0	2430.7
-48.1	780.0	3159.2	1349.3	-1639.2	5188.9	739.9	5758.1
-49.1	780.0	3206.8	1266.3	-1663.3	2622.8	763.5	3109.1

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS
DATE: 4-OCTOBER-2013 TIME: 15:42:39

****
* SUMMARY OF RESULTS FOR *
* CANTILEVER WALL DESIGN *
****

I.--HEADING
'ORLEANS AVENUE OUTFALL CANAL
'REACH 4

II.--SUMMARY

RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

WALL BOTTOM ELEV. (FT) : -16.68
PENETRATION (FT) : 14.88

MAX. BEND. MOMENT (LB-FT) : 2.0680E+04
AT ELEVATION (FT) : -9.15

MAX. SCALED DEFL. (LB-IN^3): 9.0249E+09
AT ELEVATION (FT) : 13.90

NOTE: DIVIDE SCALED DEFLECTION MODULUS OF
ELLASTICITY IN PSI TIMES PILE MOMENT
OF INERTIA IN IN^4 TO OBTAIN DEFLECTION
IN INCHES.

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHOREDOR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS
DATE: 4-OCTOBER-2013 TIME: 15:42:39

****
* COMPLETE OF RESULTS FOR *
* CANTILEVER WALL DESIGN *
****

I.--HEADING
'ORLEANS AVENUE OUTFALL CANAL
'REACH 4

II.--RESULTS

ELEVATION (FT)	BENDING MOMENT (LB-FT)	SHEAR (LB)	SCALED DEFLECTION (LB-IN^3)	NET PRESSURE (PSF)
13.90	0.0000E+00	0.	9.0249E+09	0.00
12.90	-1.7462E-10	0.	8.6038E+09	0.00
11.90	-1.7462E-10	0.	8.1826E+09	0.00
10.90	-1.7462E-10	0.	7.7615E+09	0.00
9.90	-1.7462E-10	0.	7.3403E+09	0.00
8.90	-1.7462E-10	0.	6.9192E+09	0.00
8.00	1.7008E-10	0.	6.5401E+09	0.00
7.90	1.0400E-02	0.	6.4980E+09	6.24
6.90	1.3842E+01	38.	6.0769E+09	68.64
5.90	9.6314E+01	138.	5.6557E+09	131.04
4.90	3.0983E+02	300.	5.2348E+09	193.44
3.90	7.1678E+02	524.	4.8144E+09	255.84
3.30+	1.0798E+03	689.	4.5628E+09	293.28
3.30-	1.0798E+03	689.	4.5628E+09	823.28
2.90	1.4135E+03	960.	4.3953E+09	529.91
1.90	2.6193E+03	1433.	3.9788E+09	416.22
0.90	4.2418E+03	1793.	3.5668E+09	304.90
-0.10	6.1696E+03	2044.	3.1622E+09	196.19
-1.10	8.2936E+03	2186.	2.7682E+09	87.47
-1.80	9.8389E+03	2220.	2.5008E+09	11.34
-1.90	1.0068E+04	2221.	2.4621E+09	0.00
-2.10	1.0505E+04	2219.	2.3887E+09	-21.66
-2.32	1.0994E+04	2209.	2.3072E+09	-63.91
-2.80	1.2045E+04	2173.	2.1335E+09	-86.19
-3.10	1.2693E+04	2145.	2.0272E+09	-106.09
-4.10	1.4772E+04	2001.	1.6877E+09	-180.46
-4.50	1.5557E+04	1923.	1.5589E+09	-211.22
-5.10	1.6669E+04	1776.	1.3737E+09	-279.37
-6.10	1.8290E+04	1451.	1.0885E+09	-369.59
-6.50	1.8840E+04	1298.	9.8305E+08	-395.81
-7.10	1.9546E+04	1050.	8.3476E+08	-432.09
-8.10	2.0367E+04	580.	6.1477E+08	-507.91
-9.10	2.0679E+04	32.	4.2991E+08	-588.86
-10.10	2.0403E+04	-598.	2.8069E+08	-669.41
-11.10	1.9457E+04	-1308.	1.6664E+08	-751.05
-11.58	1.8752E+04	-1579.	1.2369E+08	-370.17
-12.10	1.7825E+04	-2132.	8.6109E+07	-1770.27
-12.31	1.7323E+04	-2641.	7.3082E+07	-3023.61
-13.00	1.4882E+04	-4328.	3.9874E+07	-1882.09
-13.10	1.4440E+04	-4507.	3.6111E+07	-1716.10
-14.10	9.3512E+03	-5394.	1.0818E+07	-56.21
-15.10	4.2061E+03	-4620.	1.6764E+06	1603.67
-16.10	6.6476E+02	-2186.	3.3560E+04	3263.56
-16.68	0.0000E+00	0.	0.0000E+00	4231.86

NOTE: DIVIDE SCALED DEFLECTION MODULUS OF
ELLASTICITY IN PSI TIMES PILE MOMENT
OF INERTIA IN IN^4 TO OBTAIN DEFLECTION
IN INCHES.

III.--WATER AND SOIL PRESSURES

		<-------------SOIL PRESSURES-------------->			
	WATER	<----LEFTSIDE----->		<---RIGHTSIDE---->	
ELEVATION	PRESSURE	PASSIVE	ACTIVE	ACTIVE	PASSIVE
(FT)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)
13.90	0.	0.	0.	0.	0.
12.90	0.	0.	0.	0.	0.
11.90	0.	0.	0.	0.	0.
10.90	0.	0.	0.	0.	0.
9.90	0.	0.	0.	0.	0.
8.90	0.	0.	0.	0.	0.
8.00	0.	0.	0.	0.	0.
7.90	6.	0.	0.	0.	0.
6.90	69.	0.	0.	0.	0.
5.90	131.	0.	0.	0.	0.
4.90	193.	0.	0.	0.	0.
3.90	256.	0.	0.	0.	0.
3.30+	293.	0.	0.	0.	0.
3.30-	293.	500.	0.	0.	0.
2.90	318.	793.	0.	0.	0.
1.90	381.	906.	0.	0.	0.
0.90	443.	1016.	0.	0.	0.
-0.10	505.	1124.	0.	0.	0.
-1.10	568.	1232.	0.	0.	0.
-1.80+	612.	1308.	0.	0.	0.
-1.80-	612.	1308.	0.	0.	500.
-1.90	618.	1319.	0.	0.	590.
-2.10	630.	1341.	0.	0.	763.
-2.32+	644.	1405.	0.	0.	764.
-2.32-	644.	1361.	0.	0.	764.
-2.80	674.	1405.	58.	0.	765.
-3.10	693.	1424.	98.	0.	757.
-4.10	755.	1498.	217.	0.	767.
-4.50	780.	1528.	249.	0.	782.
-5.10	780.	1559.	278.	0.	805.
-6.10	780.	1586.	320.	0.	834.
-6.50	780.	1587.	340.	0.	835.
-7.10	780.	1585.	365.	0.	835.
-8.10	780.	1598.	386.	0.	849.
-9.10	780.	1615.	403.	0.	869.
-10.10	780.	1633.	420.	0.	886.
-11.10	780.	1651.	437.	0.	663.
-11.58+	780.	1240.	319.	0.	2576.
-11.58-	780.	1240.	319.	0.	1587.
-12.10	780.	2944.	887.	336.	2576.
-12.31	780.	4375.	1183.	528.	3177.
-13.00	780.	9011.	2141.	1147.	5125.

-13.10	780.	8979.	1973.	1072.	4939.
-14.10	780.	6407.	270.	149.	2616.
-15.10	780.	7063.	299.	166.	3056.
-16.10	780.	7687.	310.	175.	3495.
-16.68	780.	8294.	320.	185.	3962.
-18.10	780.	8895.	330.	196.	4451.

```
'ORLEANS AVENUE OUTFALL CANAL
'REACH 4
CONTROL  CANTILEVER  DESIGN  1.00  0.60
WALL   13.9
SURFACE RIGHTSIDE   7    0   -1.8
                1.1   -1.8
                7.9   -3
                22.4   -6
                29.7   -6.3
                59   -6.1
                80   -6.1
SURFACE LEFTSIDE   10    0    3.3
                1    3.3
                6.5    3.4
                14.8    2.7
                31.5   -0.7
                31.6   -1.9
                42   -2.3
                57.5   -4
                67.8   -4.5
                110   -4.5
SOIL RIGHTSIDE  STRENGTHS   4
   106    106    0    200    0    200   -6.5   0
   88    88    0    190    0    190   -13   0
   122    122    33    0    18    0   -47   0
   110    110    0    500    0    500
SOIL LEFTSIDE  STRENGTHS   4
   106    106    0    200    0    200   -6.5   0
   88    88    0    190    0    190   -13   0
   122    122    33    0    18    0   -47   0
   110    110    0    500    0    500
WATER ELEVATIONS   62.4    8   -4.5
HORIZONTAL DISTRIBUTED   2    3.3    1565   -13    0
FINISHED
```

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS
DATE: 4-OCTOBER-2013 TIME: 15:46:07

****
* INPUT DATA *
****

I.--HEADING
'ORLEANS AVENUE OUTFALL CANAL
'REACH 4

II.--CONTROL
CANTILEVER WALL DESIGN
FACTOR OF SAFETY FOR ACTIVE PRESSURES = 1.00
FACTOR OF SAFETY FOR PASSIVE PRESSURES = 0.60

III.--WALL DATA
ELEVATION AT TOP OF WALL = 13.90 FT.

IV.--SURFACE POINT DATA

IV.A.--RIGHTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	-1.80
1.10	-1.80
7.90	-3.00
22.40	-6.00
29.70	-6.30
59.00	-6.10
80.00	-6.10

IV.B.--LEFTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	3.30
1.00	3.30
6.50	3.40
14.80	2.70
31.50	-0.70
31.60	-1.90
42.00	-2.30
57.50	-4.00
67.80	-4.50
110.00	-4.50

V.--SOIL LAYER DATA

V.A.--RIGHTSIDE
LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH- ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH- ESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.
106.00	106.00	0.00	200.00	0.00	200.00	-6.50	0.00	DEF	DEF
88.00	88.00	0.00	190.00	0.00	190.00	-13.00	0.00	DEF	DEF
122.00	122.00	33.00	0.00	18.00	0.00	-47.00	0.00	DEF	DEF
110.00	110.00	0.00	500.00	0.00	500.00			DEF	DEF

V.B.--LEFTSIDE

LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH- ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH- ESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.
106.00	106.00	0.00	200.00	0.00	200.00	-6.50	0.00	DEF	DEF
88.00	88.00	0.00	190.00	0.00	190.00	-13.00	0.00	DEF	DEF
122.00	122.00	33.00	0.00	18.00	0.00	-47.00	0.00	DEF	DEF
110.00	110.00	0.00	500.00	0.00	500.00			DEF	DEF

VI.--WATER DATA

UNIT WEIGHT = 62.40 (PCF)
RIGHTSIDE ELEVATION = 8.00 (FT)
LEFTSIDE ELEVATION = -4.50 (FT)
NO SEEPAGE

VII.--VERTICAL SURCHARGE LOADS

NONE

VIII.--HORIZONTAL LOADS

VIII.A.--HORIZONTAL LINE LOADS

NONE

VIII.B.--HORIZONTAL DISTRIBUTED LOADS

ELEVATION (FT)	DIST. LOAD (PSF)
3.30	1565.00
-13.00	0.00

****
*   SOIL PRESSURES FOR   *
* CANTILEVER WALL DESIGN *
****

I.--HEADING

'ORLEANS AVENUE OUTFALL CANAL

'REACH 4

II.--SOIL PRESSURES

RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

NET SOIL PRESSURES INCLUDE APPLIED HORIZONTAL DISTRIBUTED LOADS.

ELEV. (FT)	NET WATER (PSF)	<---LEFTSIDE---> PASSIVE (PSF)	ACTIVE (PSF)	<------NET------> (SOIL + WATER) ACTIVE (PSF)	PASSIVE (PSF)	<--RIGHTSIDE---> ACTIVE (PSF)	PASSIVE (PSF)
13.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7.9	6.2	0.0	0.0	6.2	6.2	0.0	0.0
6.9	68.6	0.0	0.0	68.6	68.6	0.0	0.0
5.9	131.0	0.0	0.0	131.0	131.0	0.0	0.0
4.9	193.4	0.0	0.0	193.4	193.4	0.0	0.0
3.9	255.8	0.0	0.0	255.8	255.8	0.0	0.0
3.3+	293.3	0.0	0.0	293.3	293.3	0.0	0.0
3.3-	293.3	666.7	0.0	1191.6	1858.3	0.0	0.0
2.9	318.2	1043.3	0.0	801.6	1844.8	0.0	0.0
1.9	380.6	1158.1	0.0	653.1	1811.2	0.0	0.0
0.9	443.0	1269.6	0.0	508.0	1777.6	0.0	0.0
-0.1	505.4	1377.5	0.0	366.5	1744.0	0.0	0.0
-1.1	567.8	1485.4	0.0	225.0	1710.4	0.0	0.0
-1.8+	611.5	1561.0	0.0	125.9	1686.9	0.0	0.0
-1.8-	611.5	1561.0	0.0	125.9	2353.5	0.0	666.7
-2.1	630.2	1593.9	0.0	82.9	2689.9	0.0	1013.1
-2.3+	644.0	1654.1	0.0	35.9	2680.0	0.0	1010.7
-2.3-	644.0	1612.9	0.0	35.9	2680.0	0.0	1010.7
-2.8	673.3	1653.1	56.6	0.0	2602.6	0.0	1005.5
-2.8	673.9	1654.1	57.8	-0.8	2600.8	0.0	1005.4
-3.1	692.6	1669.9	98.3	-26.7	2535.4	0.0	990.6
-4.1	755.0	1735.1	216.9	-125.6	2384.2	0.0	991.6
-4.5	780.0	1765.2	249.5	-169.1	2353.9	0.0	1007.3
-5.1	780.0	1795.7	277.9	-257.2	2290.5	0.0	1030.0
-6.1	780.0	1820.0	319.7	-377.6	2178.8	0.0	1056.0
-6.5	780.0	1817.3	340.4	-413.2	2117.6	0.0	1054.0

-7.1	780.0	1810.9	364.6	-464.4	2030.4	0.0	1048.6
-8.1	780.0	1821.9	385.8	-571.5	1926.0	0.0	1061.3
-9.1	780.0	1839.8	402.8	-685.4	1832.9	0.0	1081.3
-10.1	780.0	1857.2	420.2	-798.8	1736.2	0.0	1097.9
-11.1	780.0	1876.0	436.7	-913.6	1187.1	0.0	661.4
-11.6+	780.0	1097.4	319.4	-181.4	3931.5	0.0	4266.5
-11.6-	780.0	1097.4	319.4	-181.4	3931.5	0.0	2403.2
-12.1	780.0	4309.0	887.1	-3106.1	4245.8	336.4	4266.5
-13.0	780.0	15606.6	2141.3	-13679.2	7896.7	1147.4	9258.0
-13.1	780.0	15528.2	1973.1	-13676.0	7757.4	1072.2	8950.5
-14.1	780.0	10865.6	270.1	-9936.5	5429.8	149.0	4919.9
-15.1	780.0	12536.0	299.3	-11590.3	6508.8	165.8	6028.1
-16.1	780.0	14234.9	309.7	-13280.3	7717.9	174.6	7247.6
-17.1	780.0	16030.5	320.1	-15065.8	9105.8	184.7	8645.9
-18.1	780.0	17960.5	330.4	-16984.9	10771.5	195.6	10321.9
-19.1	780.0	19958.9	340.7	-18971.9	12852.4	207.0	12413.1
-20.1	780.0	21672.3	351.0	-20673.4	15280.9	218.9	14851.8
-21.1	780.0	23604.1	361.3	-22593.0	18026.9	231.1	17608.1
-22.1	780.0	26461.4	371.5	-25437.8	21302.2	243.6	20893.8
-23.1	780.0	29538.1	381.8	-28501.7	25214.7	256.3	24816.5
-24.1	780.0	32480.8	392.1	-31431.6	29774.8	269.2	29386.9
-25.1	780.0	35362.7	402.8	-34300.5	35125.5	282.2	34748.3
-26.1	780.0	38442.2	414.1	-37366.8	41453.0	295.4	41087.1
-27.1	780.0	42368.8	425.7	-41280.2	48939.3	308.6	48585.0
-28.1	780.0	47012.2	437.3	-45910.2	57830.2	322.0	57487.5
-29.1	780.0	52077.8	448.8	-50962.2	68453.4	335.6	68122.2
-30.1	780.0	57576.3	460.4	-56447.1	81236.9	349.2	80917.2
-31.1	780.0	63639.8	471.9	-62497.0	96750.1	362.8	96442.0
-32.1	780.0	70488.5	483.5	-69331.9	115760.0	376.5	115463.5
-33.1	780.0	78159.9	495.0	-76989.6	139303.5	390.3	139018.5
-34.1	780.0	86658.4	506.5	-85474.3	168876.6	404.1	168603.1
-35.1	780.0	96226.2	518.1	-95028.3	206684.6	417.9	206422.7
-36.1	780.0	107259.8	529.6	-106048.1	255954.4	431.7	255704.0
-37.1	780.0	119940.2	541.1	-118714.6	321660.9	445.6	321422.0
-38.1	780.0	134294.4	552.6	-133055.0	411876.9	459.4	411649.5
-39.1	780.0	150648.3	564.1	-149394.8	540319.3	473.5	540103.4
-40.1	780.0	169531.0	575.9	-168264.4	731835.9	486.5	731631.8
-41.1	780.0	191418.9	588.4	-190146.5	1035235.1	492.4	1035043.5
-42.1	780.0	216836.2	601.4	-215561.3	1556298.5	494.9	1556119.9
-43.1	780.0	246521.1	614.5	-245235.5	2540139.9	505.7	2539974.3
-44.1	780.0	281456.1	627.5	-280154.3	3381058.2	521.8	3380905.7
-45.1	780.0	322334.5	640.5	-320893.6	40820223.5	660.9	40820084.0
-45.8+	780.0	745173.6	1020.7	-744393.6	3327869.6	0.0	2324.7
-45.8-	780.0	745173.6	1020.7	-744393.6	3327869.6	0.0	6653895.8
-46.1	780.0	3053.2	274.4	-2273.2	2849.7	0.0	2344.1
-46.2	780.0	3059.3	0.0	-2279.3	3130.2	0.0	2350.2
-47.0	780.0	3106.8	0.0	-2326.8	3177.7	0.0	2397.7
-47.1	780.0	3111.6	0.0	-2331.6	3182.5	0.0	2402.5
-47.4+	780.0	31319.6	0.0	-16443.3	3198.0	0.0	2418.0
-47.4-	780.0	3127.0	0.0	-16443.3	3198.0	0.0	2418.0
-47.7+	780.0	31319.6	1322.7	-30539.6	672987.5	0.0	1344629.6
-47.7-	780.0	31319.6	1322.7	-30539.6	672987.5	0.0	2430.7
-48.1	780.0	3159.2	1349.3	-1639.2	1344060.4	739.9	1344629.6
-49.1	780.0	3206.8	1266.3	-1663.3	2011.4	763.5	2497.7

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS
DATE: 4-OCTOBER-2013 TIME: 15:46:09

****
* SUMMARY OF RESULTS FOR *
* CANTILEVER WALL DESIGN *
****

I.--HEADING
'ORLEANS AVENUE OUTFALL CANAL
'REACH 4

II.--SUMMARY

RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

WALL BOTTOM ELEV. (FT) : -16.76
PENETRATION (FT) : 14.96

MAX. BEND. MOMENT (LB-FT) : 3.3392E+04
AT ELEVATION (FT) : -10.60

MAX. SCALED DEFL. (LB-IN^3): 1.4477E+10
AT ELEVATION (FT) : 13.90

NOTE: DIVIDE SCALED DEFLECTION MODULUS OF
ELLASTICITY IN PSI TIMES PILE MOMENT
OF INERTIA IN IN^4 TO OBTAIN DEFLECTION
IN INCHES.

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHOREDOR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS
DATE: 4-OCTOBER-2013 TIME: 15:46:09

****
* COMPLETE OF RESULTS FOR *
* CANTILEVER WALL DESIGN *

****

I.--HEADING
'ORLEANS AVENUE OUTFALL CANAL
'REACH 4

II.--RESULTS

ELEVATION (FT)	BENDING MOMENT (LB-FT)	SHEAR (LB)	SCALED DEFLECTION (LB-IN^3)	NET PRESSURE (PSF)
13.90	0.0000E+00	0.	1.4477E+10	0.00
12.90	2.4447E-09	0.	1.3820E+10	0.00
11.90	2.4447E-09	0.	1.3164E+10	0.00
10.90	2.4447E-09	0.	1.2507E+10	0.00
9.90	2.4447E-09	0.	1.1851E+10	0.00
8.90	2.4447E-09	0.	1.1194E+10	0.00
8.00	-5.6843E-12	0.	1.0603E+10	0.00
7.90	1.0400E-02	0.	1.0538E+10	6.24
6.90	1.3842E+01	38.	9.8811E+09	68.64
5.90	9.6314E+01	138.	9.2245E+09	131.04
4.90	3.0983E+02	300.	8.5682E+09	193.44
3.90	7.1678E+02	524.	7.9124E+09	255.84
3.30+	1.0798E+03	689.	7.5195E+09	293.28
3.30-	1.0798E+03	689.	7.5195E+09	1191.61
2.90	1.4404E+03	1088.	7.2579E+09	801.57
1.90	2.9043E+03	1815.	6.6060E+09	653.08
0.90	5.0218E+03	2396.	5.9592E+09	508.01
-0.10	7.6479E+03	2833.	5.3212E+09	366.50
-1.10	1.0641E+04	3129.	4.6964E+09	224.97
-1.80	1.2878E+04	3251.	4.2697E+09	125.86
-2.10	1.3858E+04	3283.	4.0901E+09	82.89
-2.32	1.4584E+04	3296.	3.9593E+09	35.90
-2.79	1.6132E+04	3304.	3.6857E+09	0.00
-2.80	1.6167E+04	3304.	3.6796E+09	-0.81
-3.10	1.7158E+04	3300.	3.5077E+09	-26.70
-4.10	2.0428E+04	3224.	2.9550E+09	-125.56
-4.50	2.1706E+04	3165.	2.7434E+09	-169.07
-5.10	2.3570E+04	3037.	2.4375E+09	-257.23
-6.10	2.6458E+04	2720.	1.9607E+09	-377.55
-6.50	2.7515E+04	2562.	1.7825E+09	-413.23
-7.10	2.8975E+04	2298.	1.5296E+09	-464.42
-8.10	3.1023E+04	1780.	1.1485E+09	-571.47
-9.10	3.2499E+04	1152.	8.2095E+08	-685.39
-10.10	3.3289E+04	410.	5.4943E+08	-798.76
-11.10	3.3281E+04	-446.	3.3533E+08	-913.57
-11.58	3.2987E+04	-711.	2.5250E+08	-181.39
-12.10	3.2465E+04	-1560.	1.7862E+08	-3106.12
-12.44	3.1675E+04	-3303.	1.3809E+08	-7112.23
-13.00	2.8824E+04	-6709.	8.5254E+07	-5075.54
-13.10	2.8128E+04	-7198.	7.7496E+07	-4711.19
-14.10	1.9181E+04	-10088.	2.4304E+07	-1067.68
-15.10	9.1671E+03	-9334.	4.1032E+06	2575.83
-16.10	1.7286E+03	-4936.	1.1434E+05	6219.34

-16.76	0.0000E+00	0.	0.0000E+00	8640.00

NOTE: DIVIDE SCALED DEFLECTION MODULUS OF ELLASTICITY IN PSI TIMES PILE MOMENT OF INERTIA IN IN^4 TO OBTAIN DEFLECTION IN INCHES.

III.--WATER AND SOIL PRESSURES

		<-------------SOIL PRESSURES-------------->			
	WATER	<----LEFTSIDE----->		<---RIGHTSIDE---->	
ELEVATION (FT)	PRESSURE (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)
13.90	0.	0.	0.	0.	0.
12.90	0.	0.	0.	0.	0.
11.90	0.	0.	0.	0.	0.
10.90	0.	0.	0.	0.	0.
9.90	0.	0.	0.	0.	0.
8.90	0.	0.	0.	0.	0.
8.00	0.	0.	0.	0.	0.
7.90	6.	0.	0.	0.	0.
6.90	69.	0.	0.	0.	0.
5.90	131.	0.	0.	0.	0.
4.90	193.	0.	0.	0.	0.
3.90	256.	0.	0.	0.	0.
3.30+	293.	0.	0.	0.	0.
3.30-	293.	667.	0.	0.	0.
2.90	318.	1043.	0.	0.	0.
1.90	381.	1158.	0.	0.	0.
0.90	443.	1270.	0.	0.	0.
-0.10	505.	1377.	0.	0.	0.
-1.10	568.	1485.	0.	0.	0.
-1.80+	612.	1561.	0.	0.	0.
-1.80-	612.	1561.	0.	0.	667.
-2.10	630.	1594.	0.	0.	1013.
-2.32+	644.	1654.	0.	0.	1011.
-2.32-	644.	1613.	0.	0.	1011.
-2.79	673.	1653.	57.	0.	1006.
-2.80	674.	1654.	58.	0.	1005.
-3.10	693.	1670.	98.	0.	991.
-4.10	755.	1735.	217.	0.	992.
-4.50	780.	1765.	249.	0.	1007.
-5.10	780.	1796.	278.	0.	1030.
-6.10	780.	1820.	320.	0.	1056.
-6.50	780.	1817.	340.	0.	1054.
-7.10	780.	1811.	365.	0.	1049.
-8.10	780.	1822.	386.	0.	1061.
-9.10	780.	1840.	403.	0.	1081.
-10.10	780.	1857.	420.	0.	1098.
-11.10	780.	1876.	437.	0.	661.
-11.58+	780.	1097.	319.	0.	4266.
-11.58-	780.	1097.	319.	0.	2403.
-12.10	780.	4309.	887.	336.	4266.
-12.44	780.	8590.	1362.	644.	6158.

-13.00	780.	15607.	2141.	1147.	9258.
-13.10	780.	15528.	1973.	1072.	8950.
-14.10	780.	10866.	270.	149.	4920.
-15.10	780.	12536.	299.	166.	6028.
-16.10	780.	14235.	310.	175.	7248.
-16.76	780.	16030.	320.	185.	8646.
-18.10	780.	17961.	330.	196.	10322.

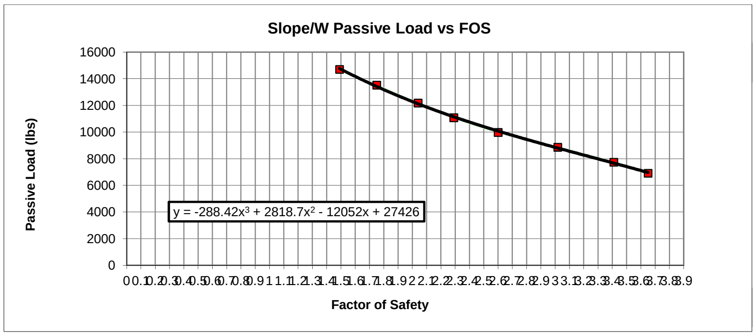
```
'ORLEANS AVENUE OUTFALL CANAL
'REACH 4
CONTROL  CANTILEVER  DESIGN  1.00  1.00
WALL   13.9
SURFACE RIGHTSIDE   7    0   -1.8
              1.1   -1.8
              7.9   -3
              22.4   -6
              29.7   -6.3
              59   -6.1
              80   -6.1
SURFACE LEFTSIDE   10    0    3.3
              1    3.3
              6.5    3.4
              14.8    2.7
              31.5   -0.7
              31.6   -1.9
              42   -2.3
              57.5   -4
              67.8   -4.5
              110   -4.5
SOIL RIGHTSIDE  STRENGTHS   4
  106    106    0    200    0    200   -6.5   0
  88    88    0    190    0    190   -13   0
  122    122    33    0    18    0   -47   0
  110    110    0    500    0    500
SOIL LEFTSIDE  STRENGTHS   4
  106    106    0    200    0    200   -6.5   0
  88    88    0    190    0    190   -13   0
  122    122    33    0    18    0   -47   0
  110    110    0    500    0    500
WATER ELEVATIONS   62.4    8   -4.5
HORIZONTAL DISTRIBUTED   2    3.3    1030   -13    0
FINISHED
```

Canal:	Orleans Avenue Canal		
Reach:	Reach 10A		
Load Case:		Water @ El 8	
Protected Side Top of Ground (GSE):		7.5	ft, Elevation
Critical Slip Surface Elev. (FSE):		-6.9	ft, Elevation
Sheetpile Tip Elevation:		-9.5	ft, Elevation

Step 1: Compute correct passive pressure forces from slope stability model (Slope/W). Procedure follows the approach cited in Paragraph D-4 of ETL 1110-2-575.

Note: CWALSHT Transition point was at Elevation -6.9 ft. Slope/W found that the critical failure surface at -9.5 ft (at the the sheetpile).

Unit Weight (psf)	Passive Load (lbs)	Factor of Safety	Failure Surface Elevation (feet)	Notes
62.4	6910.3	3.65	-6.9	
70	7736	3.41	-6.9	
80	8861.7	3.018	-6.9	
90	9970.7	2.6	-6.9	
100	11077	2.29	-6.9	
110	12182	2.04	-6.9	
120	13526	1.75	-6.9	
130	14704	1.49	-6.9	



Step 2: Perform CWALSHT analysis of cross section using a range of <u>assumed</u> horizontal distributed load above the critical slip surface elevation found in step 1. Determine the difference in passive load from CWALSHT and Slope/W for each assumed horizontal distributed load.

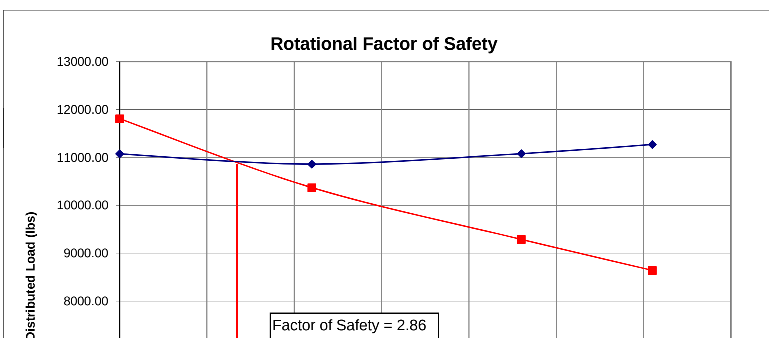
	(A)	(B)		(C)	(D)	
FOS	CWALSHT Passive Load (lbs)	SLOPE/W Passive Load (lbs)	Tip Elev feet	Difference Passive Load (A-B) (lbs)	Assumed Horizontal Distributed Load in CWALSHT (psf)	Resultant Distributed CWALSHT Load (D*(GSE-FSE)) (lbs)
3.82	17711.79	6441.57	-9.5	11270.22	1200	8640.00
3.52	18426.615	7348.57	-9.5	11078.04	1290	9288.00
3.04	19593.665	8734.21	-9.5	10859.45	1440	10368.00
2.6	21150.155	10075.94	-9.5	11074.21	1640	11808.00

Interpolate Correction Force at the resultant FOS

FOS = 2.86

Correction Force = 10947.31 lbs

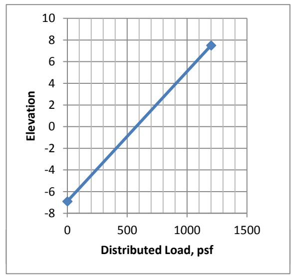
Step 3: Plot the assumed horizontal load and the difference passive load versus factor of safety. The intersection of the two curves represents the actual factor of safety.



VIII.B.--HORIZONTAL DISTRIBUTED LOAD

ELEVATION (FT)	DIST. LOAD (PSF)	Result. (LBS)
7.5	1200	
-6.9	0	8640

8640



RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

NET SOIL PRESSURES INCLUDE APPLIED HORIZONTAL DISTRIBUTED LOADS.

ELEV. (FT)	NET WATER (PSF)	<---LEFTSIDE---> PASSIVE (PSF)	ACTIVE (PSF)	<--RIGHTSIDE---> ACTIVE (PSF)	PASSIVE (PSF)
13	0	0	0	0	0
12	0	0	0	0	0
11	0	0	0	0	0
10	0	0	0	0	0
9	0	0	0	0	0
8	0	0	0	0	0
7.50+	31	0	0	0	0
-7.5	31	524	0	0	524
7	62	773	0	0	742
6.5	94	826	0	0	763
6	125	879	0	0	785
5	187	985	0	0	829
4	250	1091	0	0	876
3.47	283	1147	0	0	875
3	312	1197	0	0	875
2.5	343	1245	0	0	804
2	343	1262	0	0	725
1	343	1238	0	0	740
0	343	1249	0	0	864
-1	343	1228	0	0	885
-2	343	1066	0	0	726
-3	343	901	0	0	571
-3.63+	343	873	0	0	558
-3.63-	343	883	0	0	558
-4	343	873	79	0	551
-4.58	343	890	76	0	573
-5	343	902	74	0	588
-6	343	924	95	0	619
-6.9	343	934	151	0	631
-7	343	928	183	0	630
-7.08+	343	926	209	0	625
-7.08-	343	926	209	0	630
-8	343	944	255	73	632
-9	343	963	256	86	651
-9.53	343	983	260	98	671
-11	343	1003	248	92	691

ELEV. (FT)	NET WATER (PSF)	LEFTSIDE PASSIVE (PSF)	RESULT. LEFTSIDE PASSIVE (LBS)
13	0	0	0
12	0	0	0
11	0	0	0
10	0	0	0
9	0	0	0
8	0	0	0
7.5	31	0	0
7.5	31	524	0
7	62	773	324.25
6.5	94	826	399.75
6	125	879	426.25
5	187	985	932
4	250	1091	1038
3.47	283	1147	593.07
3	312	1197	550.84
2.5	343	1245	610.5
2	343	1262	626.75
1	343	1238	1250
0	343	1249	1243.5
-1	343	1228	1238.5
-2	343	1066	1147
-3	343	901	983.5
-3.63	343	873	558.81
-3.63	343	883	0
-4	343	873	324.86
-4.58	343	890	511.27
-5	343	902	376.32
-6	343	924	913
-6.9	343	934	836.1
-7	343	928	93.1
-7.08	343	926	74.16
-7.08	343	926	0
-8	343	944	860.2
-9	343	963	953.5
-9.53	343	983	
-11	343	1003	

PS WATER ELEVATION (FT)	CRITICAL SLIP SURF. ELEVATION (FT)	UNIT WEIGHT WATER (PCF)
2.5	-6.9	64

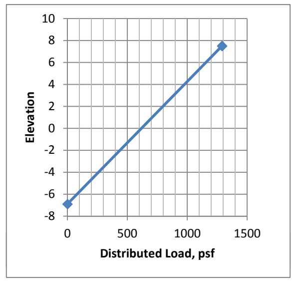
RESULTANT WATER LOAD= 2827.52 LBS

PASSIVE LOAD (SOIL)	14884.27	
PASSIVE LOAD (SOIL+WATER)	17711.79	**IF THE PS WATER LEVEL IS BELOW THE CRITICAL SLIP SURFACE,**
FOS =	3.82	**USE PASSIVE LOAD (SOIL)**

VIII.B.--HORIZONTAL DISTRIBUTED LOAD

ELEVATION (FT)	DIST. LOAD (PSF)	Result. (LBS)
7.5	1290	
-6.9	0	9288

9288



RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

NET SOIL PRESSURES INCLUDE APPLIED HORIZONTAL DISTRIBUTED LOADS.

ELEV. (FT)	NET WATER (PSF)	<---LEFTSIDE---> PASSIVE (PSF)	ACTIVE (PSF)	<--RIGHTSIDE---> ACTIVE (PSF)	PASSIVE (PSF)
13	0	0	0	0	0
12	0	0	0	0	0
11	0	0	0	0	0
10	0	0	0	0	0
9	0	0	0	0	0
8	0	0	0	0	0
7.50+	31	0	0	0	0
-7.5	31	575	0	0	575
7	62	843	0	0	812
6.5	94	896	0	0	834
6	125	949	0	0	856
5	187	1055	0	0	899
4	250	1161	0	0	946
3.51	280	1213	0	0	944
3	312	1267	0	0	941
2.5	343	1316	0	0	862
2	343	1331	0	0	774
1	343	1302	0	0	787
0	343	1312	0	0	921
-1	343	1285	0	0	940
-2	343	1105	0	0	763
-3	343	922	0	0	589
-3.63+	343	889	0	0	574
-3.63-	343	901	0	0	574
-4	343	889	79	0	565
-4.5	343	904	76	0	584
-5	343	919	74	0	603
-6	343	941	95	0	634
-6.9	343	950	151	0	645
-7	343	943	183	0	643
-7.08+	343	937	209	0	636
-7.08-	343	937	209	0	643
-8	343	944	255	73	636
-9	343	963	256	86	651
-9.46	343	983	260	98	671
-11	343	1003	248	92	691

ELEV. (FT)	NET WATER (PSF)	LEFTSIDE PASSIVE (PSF)	RESULT. LEFTSIDE PASSIVE (LBS)
13	0	0	
12	0	0	
11	0	0	
10	0	0	
9	0	0	
8	0	0	
7.5	31	0	0
7.5	31	575	0
7	62	843	354.5
6.5	94	896	434.75
6	125	949	461.25
5	187	1055	1002
4	250	1161	1108
3.51	280	1213	581.63
3	312	1267	632.4
2.5	343	1316	645.75
2	343	1331	661.75
1	343	1302	1316.5
0	343	1312	1307
-1	343	1285	1298.5
-2	343	1105	1195
-3	343	922	1013.5
-3.63	343	889	570.465
-3.63	343	901	0
-4	343	889	331.15
-4.5	343	904	448.25
-5	343	919	455.75
-6	343	941	930
-6.9	343	950	850.95
-7	343	943	94.65
-7.08	343	937	75.2
-7.08	343	937	0
-8	343	944	865.26
-9	343	963	953.5
-9.46	343	983	447.58
-11	343	1003	

PS WATER ELEVATION (FT)	CRITICAL SLIP SURF. ELEVATION (FT)	UNIT WEIGHT WATER (PCF)
2.5	-6.9	64

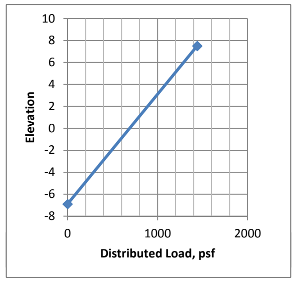
RESULTANT WATER LOAD= 2827.52 LBS

PASSIVE LOAD (SOIL) 15599.095
PASSIVE LOAD (SOIL+WATER) 18426.615 **IF THE PS WATER LEVEL IS BELOW THE CRITICAL SLIP SURFACE, USE PASSIVE LOAD (SOIL)**
FOS = 3.52

VIII.B.--HORIZONTAL DISTRIBUTED LOAD

ELEVATION (FT)	DIST. LOAD (PSF)	Result. (LBS)
7.5	1440	
-6.9	0	10368

10368



RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

NET SOIL PRESSURES INCLUDE APPLIED HORIZONTAL DISTRIBUTED LOADS.

ELEV. (FT)	NET WATER (PSF)	<---LEFTSIDE---> PASSIVE (PSF)	ACTIVE (PSF)	<--RIGHTSIDE---> ACTIVE (PSF)	PASSIVE (PSF)
13	0	0	0	0	0
12	0	0	0	0	0
11	0	0	0	0	0
10	0	0	0	0	0
9	0	0	0	0	0
8	0	0	0	0	0
7.50+	31	0	0	0	0
-7.5	31	658	0	0	658
7	62	958	0	0	926
6.5	94	1011	0	0	948
6	125	1064	0	0	970
5	187	1170	0	0	1014
4	250	1276	0	0	1061
3.55	277	1323	0	0	1056
3	312	1381	0	0	1049
2.5	343	1431	0	0	955
2	343	1444	0	0	852
1	343	1406	0	0	865
0	343	1413	0	0	1014
-1	343	1379	0	0	1031
-2	343	1169	0	0	824
-3	343	957	0	0	620
-3.63+	343	915	0	0	599
-3.63-	343	930	0	0	599
-4	343	915	79	0	587
-4.47	343	930	76	0	606
-5	343	946	74	0	627
-6	343	968	95	0	657
-6.9	343	976	151	0	666
-7	343	968	183	0	664
-7.08+	343	960	209	0	654
-7.08-	343	960	209	0	663
-8	343	947	255	73	654
-9	343	963	256	86	664
-9.48	343	983	260	98	674
-11	343	1003	248	92	691

ELEV. (FT)	NET WATER (PSF)	LEFTSIDE PASSIVE (PSF)	RESULT. LEFTSIDE PASSIVE (LBS)
13	0	0	
12	0	0	
11	0	0	
10	0	0	
9	0	0	
8	0	0	
7.5	31	0	0
7.5	31	658	0
7	62	958	404
6.5	94	1011	492.25
6	125	1064	518.75
5	187	1170	1117
4	250	1276	1223
3.55	277	1323	584.775
3	312	1381	743.6
2.5	343	1431	703
2	343	1444	718.75
1	343	1406	1425
0	343	1413	1409.5
-1	343	1379	1396
-2	343	1169	1274
-3	343	957	1063
-3.63	343	915	589.68
-3.63	343	930	0
-4	343	915	341.325
-4.47	343	930	433.575
-5	343	946	497.14
-6	343	968	957
-6.9	343	976	874.8
-7	343	968	97.2
-7.08	343	960	77.12
-7.08	343	960	0
-8	343	947	877.22
-9	343	963	955
-9.48	343	983	467.04
-11	343	1003	1509.36

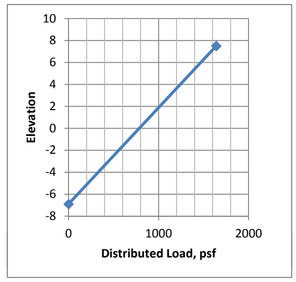
PS WATER ELEVATION (FT)	CRITICAL SLIP SURF. ELEVATION (FT)	UNIT WEIGHT WATER (PCF)
2.5	-6.9	64

RESULTANT WATER LOAD= 2827.52 LBS

PASSIVE LOAD (SOIL)	16766.145	
PASSIVE LOAD (SOIL+WATER)	19593.665	**IF THE PS WATER LEVEL IS BELOW THE CRITICAL SLIP SURFACE, USE PASSIVE LOAD (SOIL)**
FOS =	3.04	

VIII.B.--HORIZONTAL DISTRIBUTED LOAD

ELEVATION (FT)	DIST. LOAD (PSF)	Result. (LBS)
7.5	1640	
-6.9	0	11808



11808

RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

NET SOIL PRESSURES INCLUDE APPLIED HORIZONTAL DISTRIBUTED LOADS.

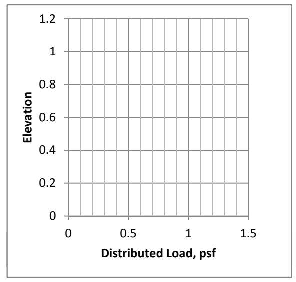
ELEV. (FT)	NET WATER (PSF)	<---LEFTSIDE---> PASSIVE (PSF)	ACTIVE (PSF)	<--RIGHTSIDE---> ACTIVE (PSF)	PASSIVE (PSF)
13	0	0	0	0	0
12	0	0	0	0	0
11	0	0	0	0	0
10	0	0	0	0	0
9	0	0	0	0	0
8	0	0	0	0	0
7.50+	31	0	0	0	0
-7.5	31	769	0	0	769
7	62	1111	0	0	1079
6.5	94	1164	0	0	1101
6	125	1217	0	0	1123
5	187	1323	0	0	1167
4	250	1429	0	0	1215
3.6	274	1471	0	0	1206
3	312	1534	0	0	1193
2.5	343	1584	0	0	1081
2	343	1595	0	0	958
1	343	1545	0	0	969
0	343	1548	0	0	1138
-1	343	1504	0	0	1153
-2	343	1254	0	0	904
-3	343	1002	0	0	661
-3.63+	343	950	0	0	633
-3.63-	343	969	0	0	633
-4	343	950	79	0	617
-4.44	343	965	77	0	636
-5	343	983	74	0	658
-6	343	1005	95	0	689
-6.9	343	1010	151	0	695
-7	343	1001	183	0	692
-7.08+	343	992	209	0	679
-7.08-	343	992	209	0	691
-8	343	976	255	73	679
-9	343	979	256	86	688
-9.45	343	983	260	98	698
-11	343	1003	248	92	715

ELEV. (FT)	NET WATER (PSF)	LEFTSIDE PASSIVE (PSF)	RESULT. LEFTSIDE PASSIVE (LBS)
13	0	0	
12	0	0	
11	0	0	
10	0	0	
9	0	0	
8	0	0	
7.5	31	0	0
7.5	31	769	0
7	62	1111	470
6.5	94	1164	568.75
6	125	1217	595.25
5	187	1323	1270
4	250	1429	1376
3.6	274	1471	580
3	312	1534	901.5
2.5	343	1584	779.5
2	343	1595	794.75
1	343	1545	1570
0	343	1548	1546.5
-1	343	1504	1526
-2	343	1254	1379
-3	343	1002	1128
-3.63	343	950	614.88
-3.63	343	969	0
-4	343	950	355.015
-4.44	343	965	421.3
-5	343	983	545.44
-6	343	1005	994
-6.9	343	1010	906.75
-7	343	1001	100.55
-7.08	343	992	79.72
-7.08	343	992	0
-8	343	976	905.28
-9	343	979	977.5
-9.45	343	983	441.45
-11	343	1003	1539.15

PS WATER ELEVATION (FT)	CRITICAL SLIP SURF. ELEVATION (FT)	UNIT WEIGHT WATER (PCF)
2.5	-6.9	64

RESULTANT WATER LOAD= 2827.52 LBS

PASSIVE LOAD (SOIL) 18322.635
PASSIVE LOAD (SOIL+WATER) 21150.155 **IF THE PS WATER LEVEL IS BELOW THE CRITICAL SLIP SURFACE,**
FOS = 2.6 **USE PASSIVE LOAD (SOIL)**



1.2
1
0.8
0.6
0.4
0.2
0
Elevation
0
0.5
1
1.5
Distributed Load, psf

```
'REACH 10A UNDRAINED ROTATIONAL ANALYSIS
CONTROL  CANTILEVER  DESIGN  1.00  3.82
WALL   13
SURFACE RIGHTSIDE   5    0    7.5
              5    7.5
              6    6.5
              70   -10.5
              102.5   -12.5
SURFACE LEFTSIDE   4    0    7.5
              6    7.5
              31    2.5
              80    2.5
SOIL RIGHTSIDE  STRENGTHS   4
  106    106    0    1000    0    750   -2   0
  102    102    0    330    0    330   -7   0
  82    82    0    285    0    285   -12   0
  82    82    0    335    0    335
SOIL LEFTSIDE  STRENGTHS   4
  106    106    0    1000    0    750   -2   0
  102    102    0    330    0    330   -7   0
  82    82    0    285    0    285   -12   0
  82    82    0    335    0    335
WATER ELEVATIONS   62.4    8    2.5
HORIZONTAL DISTRIBUTED   2    7.5    1200   -6.9    0
FINISHED
```

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS
DATE: 7-OCTOBER-2013 TIME: 11:41:41

****
* INPUT DATA *
****

I.--HEADING
'REACH 10A UNDRAINED ROTATIONAL ANALYSIS

II.--CONTROL
CANTILEVER WALL DESIGN
FACTOR OF SAFETY FOR ACTIVE PRESSURES = 1.00
FACTOR OF SAFETY FOR PASSIVE PRESSURES = 3.82

III.--WALL DATA
ELEVATION AT TOP OF WALL = 13.00 FT.

IV.--SURFACE POINT DATA

IV.A.--RIGHTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	7.50
5.00	7.50
6.00	6.50
70.00	-10.50
102.50	-12.50

IV.B.--LEFTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	7.50
6.00	7.50
31.00	2.50
80.00	2.50

V.--SOIL LAYER DATA

V.A.--RIGHTSIDE
LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH-ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH-ESION (PSF)	<--BOTTOM--> ELEV. (FT)	<--BOTTOM--> SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.
106.00	106.00	0.00	1000.00	0.00	750.00	-2.00	0.00	DEF	DEF
102.00	102.00	0.00	330.00	0.00	330.00	-7.00	0.00	DEF	DEF
82.00	82.00	0.00	285.00	0.00	285.00	-12.00	0.00	DEF	DEF
82.00	82.00	0.00	335.00	0.00	335.00			DEF	DEF

V.B.--LEFTSIDE

LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH-ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH-ESION (PSF)	<--BOTTOM--> ELEV. (FT)	<--BOTTOM--> SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	<-SAFETY-> <-FACTOR-> PASS.
106.00	106.00	0.00	1000.00	0.00	750.00	-2.00	0.00	DEF	DEF
102.00	102.00	0.00	330.00	0.00	330.00	-7.00	0.00	DEF	DEF
82.00	82.00	0.00	285.00	0.00	285.00	-12.00	0.00	DEF	DEF
82.00	82.00	0.00	335.00	0.00	335.00			DEF	DEF

VI.--WATER DATA

UNIT WEIGHT = 62.40 (PCF)
RIGHTSIDE ELEVATION = 8.00 (FT)
LEFTSIDE ELEVATION = 2.50 (FT)
NO SEEPAGE

VII.--VERTICAL SURCHARGE LOADS

NONE

VIII.--HORIZONTAL LOADS

VIII.A.--HORIZONTAL LINE LOADS

NONE

VIII.B.--HORIZONTAL DISTRIBUTED LOADS

ELEVATION (FT)	DIST. LOAD (PSF)
7.50	1200.00
-6.90	0.00

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 7-OCTOBER-2013 TIME: 11:41:43

****
* SOIL PRESSURES FOR *
* CANTILEVER WALL DESIGN *
****

I.--HEADING

'REACH 10A UNDRAINED ROTATIONAL ANALYSIS

II.--SOIL PRESSURES

RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

NET SOIL PRESSURES INCLUDE APPLIED HORIZONTAL DISTRIBUTED LOADS.

	NET	<---LEFTSIDE--->		<------NET------> (SOIL + WATER)		<--RIGHTSIDE--->	
ELEV. (FT)	WATER (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)
13.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7.5+	31.2	0.0	0.0	31.2	31.2	0.0	0.0
7.5-	31.2	523.6	0.0	707.6	1754.8	0.0	523.6
7.0	62.4	772.9	0.0	447.8	1962.4	0.0	741.7
6.5	93.6	825.9	0.0	384.4	1973.8	0.0	763.5
6.0	124.8	878.9	0.0	320.9	1985.1	0.0	785.3
5.0	187.2	984.9	0.0	194.0	2007.8	0.0	828.9
4.0	249.6	1091.0	0.0	66.9	2033.7	0.0	875.8
3.5	282.6	1146.9	0.0	0.0	2022.0	0.0	875.2
3.0	312.0	1196.7	0.0	-59.7	2011.6	0.0	874.6
2.5	343.2	1245.1	0.0	-118.6	1930.7	0.0	804.1
2.0	343.2	1261.6	0.0	-176.7	1810.0	0.0	725.1
1.0	343.2	1238.3	0.0	-236.8	1741.3	0.0	739.8
0.0	343.2	1249.5	0.0	-331.3	1782.0	0.0	863.8
-1.0	343.2	1227.9	0.0	-393.0	1719.5	0.0	884.6
-2.0	343.2	1065.6	0.0	-314.1	1477.9	0.0	726.3
-3.0	343.2	901.4	0.0	-233.2	1238.8	0.0	570.6
-3.6+	343.2	873.0	0.0	-262.6	1173.7	0.0	558.1
-3.6-	343.2	883.4	0.0	-262.6	1173.7	0.0	558.1
-4.0	343.2	873.0	79.1	-288.1	1056.5	0.0	550.7
-5.0	343.2	902.1	73.5	-400.5	1016.4	0.0	588.4
-6.0	343.2	924.2	94.7	-506.0	942.5	0.0	619.0
-6.9	343.2	934.3	151.3	-591.1	823.4	0.0	631.5
-7.0	343.2	928.2	182.5	-585.0	791.0	0.0	630.4
-7.1+	343.2	925.9	208.8	-582.7	761.8	0.0	625.0
-7.1-	343.2	925.9	208.8	-582.7	761.8	0.0	629.9
-8.0	343.2	943.8	255.0	-527.7	720.0	72.9	631.8
-9.0	343.2	963.4	256.2	-534.1	738.4	86.1	651.4
-10.0	343.2	983.0	260.4	-541.4	753.8	98.4	671.0
-11.0	343.2	1002.6	247.9	-566.9	785.9	92.5	690.6
-12.0	343.2	1022.2	183.7	-637.0	869.7	42.0	710.2
-12.8	343.2	1038.5	113.8	-695.3	955.9	0.0	726.5
-13.0	343.2	1041.8	108.8	-698.6	964.2	0.0	729.8
-14.0	343.2	1061.4	115.9	-718.2	976.7	0.0	749.4
-15.0	343.2	1081.0	117.8	-737.8	994.4	0.0	769.0
-15.2	343.2	1084.2	118.1	-741.0	997.2	0.0	772.2
-16.0	343.2	1100.6	119.8	-748.6	1012.0	8.8	788.6

-17.0	343.2	1120.2	121.7	-757.8	1029.7	19.2	808.2
-18.0	343.2	1139.8	123.6	-766.9	1047.4	29.7	827.8
-19.0	343.2	1159.4	125.6	-776.1	1065.0	40.1	847.4
-20.0	343.2	1179.0	127.5	-785.2	1082.7	50.6	867.0
-21.0	343.2	1198.6	129.4	-794.4	1100.4	61.0	886.6
-22.0	343.2	1218.2	131.4	-803.5	1118.0	71.5	906.2
-23.0	343.2	1237.8	133.3	-812.7	1135.7	81.9	925.8

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS
DATE: 7-OCTOBER-2013 TIME: 11:41:44

****
* SUMMARY OF RESULTS FOR *
* CANTILEVER WALL DESIGN *
****

I.--HEADING
'REACH 10A UNDRAINED ROTATIONAL ANALYSIS

II.--SUMMARY

RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

WALL BOTTOM ELEV. (FT) : -9.53
PENETRATION (FT) : 17.03

MAX. BEND. MOMENT (LB-FT) : 6.2911E+03
AT ELEVATION (FT) : -1.26

MAX. SCALED DEFL. (LB-IN^3): 1.4033E+09
AT ELEVATION (FT) : 13.00

NOTE: DIVIDE SCALED DEFLECTION MODULUS OF
ELLASTICITY IN PSI TIMES PILE MOMENT
OF INERTIA IN IN^4 TO OBTAIN DEFLECTION
IN INCHES.

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHOREDOR CANTILEVER SHEET PILE WALLS

BY CLASSICAL METHODS

DATE: 7-OCTOBER-2013 TIME: 11:41:44

****
* COMPLETE OF RESULTS FOR *
* CANTILEVER WALL DESIGN *
****

I.--HEADING

'REACH 10A UNDRAINED ROTATIONAL ANALYSIS

II.--RESULTS

ELEVATION (FT)	BENDING MOMENT (LB-FT)	SHEAR (LB)	SCALED DEFLECTION (LB-IN^3)	NET PRESSURE (PSF)
13.00	0.0000E+00	0.	1.4033E+09	0.00
12.00	-1.3097E-10	0.	1.3046E+09	0.00
11.00	-1.3097E-10	0.	1.2059E+09	0.00
10.00	-1.3097E-10	0.	1.1071E+09	0.00
9.00	-1.3097E-10	0.	1.0084E+09	0.00
8.00	-1.3097E-10	0.	9.0969E+08	0.00
7.50+	1.3000E+00	8.	8.6033E+08	31.20
7.50-	1.3000E+00	8.	8.6033E+08	707.64
7.00	8.2830E+01	297.	8.1097E+08	447.84
6.50	2.8450E+02	505.	7.6165E+08	384.37
6.00	5.8226E+02	681.	7.1246E+08	320.90
5.00	1.4026E+03	938.	6.1500E+08	193.97
4.00	2.4169E+03	1069.	5.2000E+08	66.94
3.47	2.9882E+03	1087.	4.7135E+08	0.00
3.00	3.4982E+03	1073.	4.2918E+08	-59.70
2.50	4.0246E+03	1028.	3.8591E+08	-118.60
2.00	4.5213E+03	954.	3.4439E+08	-176.71
1.00	5.3771E+03	747.	2.6739E+08	-236.76
0.00	5.9904E+03	463.	1.9966E+08	-331.27
-1.00	6.2778E+03	101.	1.4222E+08	-393.01
-2.00	6.1958E+03	-252.	9.5578E+07	-314.07
-3.00	5.7999E+03	-526.	5.9597E+07	-233.20
-3.63	5.4196E+03	-682.	4.2088E+07	-262.60
-4.00	5.1495E+03	-784.	3.3603E+07	-288.09
-4.58	4.6398E+03	-971.	2.2629E+07	-353.64
-5.00	4.2068E+03	-1099.	1.6466E+07	-260.82
-6.00	3.0144E+03	-1249.	6.5602E+06	-38.27
-6.90	1.9021E+03	-1193.	2.1551E+06	162.03
-7.00	1.7837E+03	-1176.	1.8581E+06	184.29
-7.08	1.6849E+03	-1159.	1.6309E+06	203.13
-8.00	7.3730E+02	-880.	2.6469E+05	406.85
-9.00	9.7750E+01	-362.	3.9498E+03	629.40
-9.53	0.0000E+00	0.	0.0000E+00	746.49

NOTE: DIVIDE SCALED DEFLECTION MODULUS OF ELLASTICITY IN PSI TIMES PILE MOMENT OF INERTIA IN IN^4 TO OBTAIN DEFLECTION IN INCHES.

III.--WATER AND SOIL PRESSURES

		<--------------SOIL PRESSURES-------------->			
	WATER	<----LEFTSIDE----->		<---RIGHTSIDE---->	
ELEVATION	PRESSURE	PASSIVE	ACTIVE	ACTIVE	PASSIVE
(FT)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)
13.00	0.	0.	0.	0.	0.
12.00	0.	0.	0.	0.	0.
11.00	0.	0.	0.	0.	0.
10.00	0.	0.	0.	0.	0.
9.00	0.	0.	0.	0.	0.
8.00	0.	0.	0.	0.	0.
7.50+	31.	0.	0.	0.	0.
7.50-	31.	524.	0.	0.	524.
7.00	62.	773.	0.	0.	742.
6.50	94.	826.	0.	0.	763.
6.00	125.	879.	0.	0.	785.
5.00	187.	985.	0.	0.	829.
4.00	250.	1091.	0.	0.	876.
3.47	283.	1147.	0.	0.	875.
3.00	312.	1197.	0.	0.	875.
2.50	343.	1245.	0.	0.	804.
2.00	343.	1262.	0.	0.	725.
1.00	343.	1238.	0.	0.	740.
0.00	343.	1249.	0.	0.	864.
-1.00	343.	1228.	0.	0.	885.
-2.00	343.	1066.	0.	0.	726.
-3.00	343.	901.	0.	0.	571.
-3.63+	343.	873.	0.	0.	558.
-3.63-	343.	883.	0.	0.	558.
-4.00	343.	873.	79.	0.	551.
-4.58	343.	890.	76.	0.	573.
-5.00	343.	902.	74.	0.	588.
-6.00	343.	924.	95.	0.	619.
-6.90	343.	934.	151.	0.	631.
-7.00	343.	928.	183.	0.	630.
-7.08+	343.	926.	209.	0.	625.
-7.08-	343.	926.	209.	0.	630.
-8.00	343.	944.	255.	73.	632.
-9.00	343.	963.	256.	86.	651.
-9.53	343.	983.	260.	98.	671.
-11.00	343.	1003.	248.	92.	691.

```
'REACH 10A UNDRAINED ROTATIONAL ANALYSIS
CONTROL  CANTILEVER  DESIGN  1.00  3.48
WALL   13
SURFACE RIGHTSIDE   5    0    7.5
              5    7.5
              6    6.5
              70   -10.5
              102.5   -12.5
SURFACE LEFTSIDE   4    0    7.5
              6    7.5
              31    2.5
              80    2.5
SOIL RIGHTSIDE  STRENGTHS   4
  106    106    0    1000    0    750   -2   0
  102    102    0    330    0    330   -7   0
  82    82    0    285    0    285   -12   0
  82    82    0    335    0    335
SOIL LEFTSIDE  STRENGTHS   4
  106    106    0    1000    0    750   -2   0
  102    102    0    330    0    330   -7   0
  82    82    0    285    0    285   -12   0
  82    82    0    335    0    335
WATER ELEVATIONS   62.4    8    2.5
HORIZONTAL DISTRIBUTED   2    7.5    1290   -6.9    0
FINISHED
```

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS
DATE: 7-OCTOBER-2013 TIME: 11:45:56

****
* INPUT DATA *
****

I.--HEADING
'REACH 10A UNDRAINED ROTATIONAL ANALYSIS

II.--CONTROL
CANTILEVER WALL DESIGN
FACTOR OF SAFETY FOR ACTIVE PRESSURES = 1.00
FACTOR OF SAFETY FOR PASSIVE PRESSURES = 3.48

III.--WALL DATA
ELEVATION AT TOP OF WALL = 13.00 FT.

IV.--SURFACE POINT DATA

IV.A.--RIGHTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	7.50
5.00	7.50
6.00	6.50
70.00	-10.50
102.50	-12.50

IV.B.--LEFTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	7.50
6.00	7.50
31.00	2.50
80.00	2.50

V.--SOIL LAYER DATA

V.A.--RIGHTSIDE
LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH-ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH-ESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.
106.00	106.00	0.00	1000.00	0.00	750.00	-2.00	0.00	DEF	DEF
102.00	102.00	0.00	330.00	0.00	330.00	-7.00	0.00	DEF	DEF
82.00	82.00	0.00	285.00	0.00	285.00	-12.00	0.00	DEF	DEF
82.00	82.00	0.00	335.00	0.00	335.00			DEF	DEF

V.B.--LEFTSIDE

LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH-ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH-ESION (PSF)	<--BOTTOM--> ELEV. (FT)	<--BOTTOM--> SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.
106.00	106.00	0.00	1000.00	0.00	750.00	-2.00	0.00	DEF	DEF
102.00	102.00	0.00	330.00	0.00	330.00	-7.00	0.00	DEF	DEF
82.00	82.00	0.00	285.00	0.00	285.00	-12.00	0.00	DEF	DEF
82.00	82.00	0.00	335.00	0.00	335.00			DEF	DEF

VI.--WATER DATA

UNIT WEIGHT = 62.40 (PCF)
RIGHTSIDE ELEVATION = 8.00 (FT)
LEFTSIDE ELEVATION = 2.50 (FT)
NO SEEPAGE

VII.--VERTICAL SURCHARGE LOADS

NONE

VIII.--HORIZONTAL LOADS

VIII.A.--HORIZONTAL LINE LOADS

NONE

VIII.B.--HORIZONTAL DISTRIBUTED LOADS

ELEVATION (FT)	DIST. LOAD (PSF)
7.50	1290.00
-6.90	0.00

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 7-OCTOBER-2013 TIME: 11:45:58

****
*   SOIL PRESSURES FOR   *
* CANTILEVER WALL DESIGN *
****

I.--HEADING

'REACH 10A UNDRAINED ROTATIONAL ANALYSIS

II.--SOIL PRESSURES

RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

NET SOIL PRESSURES INCLUDE APPLIED HORIZONTAL DISTRIBUTED LOADS.

ELEV. (FT)	NET WATER (PSF)	<---LEFTSIDE---> PASSIVE (PSF)	ACTIVE (PSF)	<------NET------> (SOIL + WATER) ACTIVE (PSF)	PASSIVE (PSF)	<--RIGHTSIDE---> ACTIVE (PSF)	PASSIVE (PSF)
13.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7.5+	31.2	0.0	0.0	31.2	31.2	0.0	0.0
7.5-	31.2	574.7	0.0	746.5	1895.9	0.0	574.7
7.0	62.4	843.2	0.0	464.4	2119.6	0.0	812.0
6.5	93.6	896.2	0.0	397.8	2127.8	0.0	833.8
6.0	124.8	949.2	0.0	331.2	2136.1	0.0	855.6
5.0	187.2	1055.2	0.0	198.0	2152.5	0.0	899.2
4.0	249.6	1161.3	0.0	64.7	2172.5	0.0	946.5
3.5	280.0	1212.8	0.0	0.0	2156.5	0.0	943.7
3.0	312.0	1267.0	0.0	-68.2	2139.7	0.0	940.9
2.5	343.2	1315.8	0.0	-130.5	2047.0	0.0	861.7
2.0	343.2	1331.0	0.0	-190.5	1914.1	0.0	773.6
1.0	343.2	1302.1	0.0	-251.2	1838.4	0.0	787.5
0.0	343.2	1311.7	0.0	-350.4	1882.2	0.0	920.9
-1.0	343.2	1285.5	0.0	-413.7	1812.2	0.0	940.5
-2.0	343.2	1104.9	0.0	-322.7	1545.6	0.0	763.4
-3.0	343.2	922.4	0.0	-229.8	1282.0	0.0	589.5
-3.6+	343.2	889.0	0.0	-259.2	1209.8	0.0	573.8
-3.6-	343.2	901.3	0.0	-259.2	1209.8	0.0	573.8
-4.0	343.2	889.0	79.1	-286.1	1088.5	0.0	564.6
-5.0	343.2	918.9	73.5	-405.5	1042.8	0.0	602.9
-6.0	343.2	941.0	94.7	-517.2	962.7	0.0	633.6
-6.9	343.2	950.1	151.3	-606.9	836.7	0.0	644.7
-7.0	343.2	943.4	182.5	-600.2	803.9	0.0	643.3
-7.1+	343.2	936.6	208.8	-593.4	773.8	0.0	636.2
-7.1-	343.2	936.6	208.8	-593.4	773.8	0.0	642.7
-8.0	343.2	943.8	255.0	-527.7	724.4	72.9	636.2
-9.0	343.2	963.4	256.2	-534.1	738.4	86.1	651.4
-10.0	343.2	983.0	260.4	-541.4	753.8	98.4	671.0
-11.0	343.2	1002.6	247.9	-566.9	785.9	92.5	690.6
-12.0	343.2	1022.2	183.7	-637.0	869.7	42.0	710.2
-12.8+	343.2	1038.5	113.8	-695.3	956.1	0.0	726.8
-12.8-	343.2	1038.5	113.8	-695.3	956.1	0.0	726.5
-13.0	343.2	1041.8	108.8	-698.6	964.2	0.0	729.8
-14.0	343.2	1061.4	115.9	-718.2	976.7	0.0	749.4
-15.0	343.2	1081.0	117.8	-737.8	994.4	0.0	769.0
-15.2	343.2	1084.2	118.1	-741.0	997.2	0.0	772.2

-16.0	343.2	1100.6	119.8	-748.6	1012.0	8.8	788.6
-17.0	343.2	1120.2	121.7	-757.8	1029.7	19.2	808.2
-18.0	343.2	1139.8	123.6	-766.9	1047.4	29.7	827.8
-19.0	343.2	1159.4	125.6	-776.1	1065.0	40.1	847.4
-20.0	343.2	1179.0	127.5	-785.2	1082.7	50.6	867.0
-21.0	343.2	1198.6	129.4	-794.4	1100.4	61.0	886.6
-22.0	343.2	1218.2	131.4	-803.5	1118.0	71.5	906.2
-23.0	343.2	1237.8	133.3	-812.7	1135.7	81.9	925.8

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS
DATE: 7-OCTOBER-2013 TIME: 11:45:58

****
* SUMMARY OF RESULTS FOR *
* CANTILEVER WALL DESIGN *
****

I.--HEADING
'REACH 10A UNDRAINED ROTATIONAL ANALYSIS

II.--SUMMARY

RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

WALL BOTTOM ELEV. (FT) : -9.46
PENETRATION (FT) : 16.96

MAX. BEND. MOMENT (LB-FT) : 6.4191E+03
AT ELEVATION (FT) : -1.17

MAX. SCALED DEFL. (LB-IN^3): 1.4157E+09
AT ELEVATION (FT) : 13.00

NOTE: DIVIDE SCALED DEFLECTION MODULUS OF
ELLASTICITY IN PSI TIMES PILE MOMENT
OF INERTIA IN IN^4 TO OBTAIN DEFLECTION
IN INCHES.

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHOREDOR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS
DATE: 7-OCTOBER-2013 TIME: 11:45:58

****
* COMPLETE OF RESULTS FOR *
* CANTILEVER WALL DESIGN *
****

I.--HEADING
'REACH 10A UNDRAINED ROTATIONAL ANALYSIS

II.--RESULTS

ELEVATION (FT)	BENDING MOMENT (LB-FT)	SHEAR (LB)	SCALED DEFLECTION (LB-IN^3)	NET PRESSURE (PSF)
13.00	0.0000E+00	0.	1.4157E+09	0.00
12.00	8.7311E-11	0.	1.3156E+09	0.00
11.00	8.7311E-11	0.	1.2155E+09	0.00
10.00	8.7311E-11	0.	1.1155E+09	0.00
9.00	8.7311E-11	0.	1.0154E+09	0.00
8.00	8.7311E-11	0.	9.1532E+08	0.00
7.50+	1.3000E+00	8.	8.6528E+08	31.20
7.50-	1.3000E+00	8.	8.6528E+08	746.49
7.00	8.6756E+01	311.	8.1525E+08	464.38
6.50	2.9729E+02	526.	7.6526E+08	397.79
6.00	6.0726E+02	708.	7.1540E+08	331.20
5.00	1.4590E+03	973.	6.1665E+08	198.01
4.00	2.5087E+03	1104.	5.2044E+08	64.73
3.51	3.0517E+03	1120.	4.7504E+08	0.00
3.00	3.6232E+03	1103.	4.2858E+08	-68.16
2.50	4.1633E+03	1053.	3.8488E+08	-130.49
2.00	4.6710E+03	973.	3.4298E+08	-190.50
1.00	5.5383E+03	752.	2.6541E+08	-251.17
0.00	6.1480E+03	451.	1.9739E+08	-350.35
-1.00	6.4133E+03	69.	1.3993E+08	-413.72
-2.00	6.2906E+03	-299.	9.3501E+07	-322.75
-3.00	5.8455E+03	-576.	5.7894E+07	-229.84
-3.63	5.4344E+03	-730.	4.0667E+07	-259.17
-4.00	5.1471E+03	-830.	3.2353E+07	-286.05
-4.50	4.6896E+03	-990.	2.2929E+07	-346.24
-5.00	4.1607E+03	-1134.	1.5664E+07	-237.03
-6.00	2.9445E+03	-1261.	6.1315E+06	-16.83
-6.90	1.8292E+03	-1187.	1.9615E+06	181.36
-7.00	1.7115E+03	-1168.	1.6843E+06	203.38
-7.08	1.6133E+03	-1150.	1.4729E+06	222.02
-8.00	6.8182E+02	-855.	2.2372E+05	423.58
-9.00	7.5767E+01	-321.	2.3499E+03	643.79
-9.46	0.0000E+00	0.	0.0000E+00	745.50

NOTE: DIVIDE SCALED DEFLECTION MODULUS OF
ELLASTICITY IN PSI TIMES PILE MOMENT
OF INERTIA IN IN^4 TO OBTAIN DEFLECTION

IN INCHES.

III.--WATER AND SOIL PRESSURES

		<-------------SOIL PRESSURES-------------->			
	WATER	<----LEFTSIDE----->		<---RIGHTSIDE---->	
ELEVATION	PRESSURE	PASSIVE	ACTIVE	ACTIVE	PASSIVE
(FT)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)
13.00	0.	0.	0.	0.	0.
12.00	0.	0.	0.	0.	0.
11.00	0.	0.	0.	0.	0.
10.00	0.	0.	0.	0.	0.
9.00	0.	0.	0.	0.	0.
8.00	0.	0.	0.	0.	0.
7.50+	31.	0.	0.	0.	0.
7.50-	31.	575.	0.	0.	575.
7.00	62.	843.	0.	0.	812.
6.50	94.	896.	0.	0.	834.
6.00	125.	949.	0.	0.	856.
5.00	187.	1055.	0.	0.	899.
4.00	250.	1161.	0.	0.	946.
3.51	280.	1213.	0.	0.	944.
3.00	312.	1267.	0.	0.	941.
2.50	343.	1316.	0.	0.	862.
2.00	343.	1331.	0.	0.	774.
1.00	343.	1302.	0.	0.	787.
0.00	343.	1312.	0.	0.	921.
-1.00	343.	1285.	0.	0.	940.
-2.00	343.	1105.	0.	0.	763.
-3.00	343.	922.	0.	0.	589.
-3.63+	343.	889.	0.	0.	574.
-3.63-	343.	901.	0.	0.	574.
-4.00	343.	889.	79.	0.	565.
-4.50	343.	904.	76.	0.	584.
-5.00	343.	919.	74.	0.	603.
-6.00	343.	941.	95.	0.	634.
-6.90	343.	950.	151.	0.	645.
-7.00	343.	943.	183.	0.	643.
-7.08+	343.	937.	209.	0.	636.
-7.08-	343.	937.	209.	0.	643.
-8.00	343.	944.	255.	73.	636.
-9.00	343.	963.	256.	86.	651.
-9.46	343.	983.	260.	98.	671.
-11.00	343.	1003.	248.	92.	691.

```
'REACH 10A UNDRAINED ROTATIONAL ANALYSIS
CONTROL  CANTILEVER  DESIGN  1.00  3.04
WALL   13
SURFACE RIGHTSIDE   5    0    7.5
                 5    7.5
                 6    6.5
                 70   -10.5
                 102.5   -12.5
SURFACE LEFTSIDE   4    0    7.5
                 6    7.5
                 31    2.5
                 80    2.5
SOIL RIGHTSIDE  STRENGTHS   4
   106    106    0    1000    0    750   -2   0
   102    102    0    330    0    330   -7   0
   82    82    0    285    0    285   -12   0
   82    82    0    335    0    335
SOIL LEFTSIDE  STRENGTHS   4
   106    106    0    1000    0    750   -2   0
   102    102    0    330    0    330   -7   0
   82    82    0    285    0    285   -12   0
   82    82    0    335    0    335
WATER ELEVATIONS   62.4    8    2.5
HORIZONTAL DISTRIBUTED   2    7.5    1440   -6.9    0
FINISHED
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PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 7-OCTOBER-2013 TIME: 12:10:33

****
* INPUT DATA *
****

I.--HEADING

'REACH 10A UNDRAINED ROTATIONAL ANALYSIS

II.--CONTROL

CANTILEVER WALL DESIGN
FACTOR OF SAFETY FOR ACTIVE PRESSURES = 1.00
FACTOR OF SAFETY FOR PASSIVE PRESSURES = 3.04

III.--WALL DATA

ELEVATION AT TOP OF WALL = 13.00 FT.

IV.--SURFACE POINT DATA

IV.A.--RIGHTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	7.50
5.00	7.50
6.00	6.50
70.00	-10.50
102.50	-12.50

IV.B.--LEFTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	7.50
6.00	7.50
31.00	2.50
80.00	2.50

V.--SOIL LAYER DATA

V.A.--RIGHTSIDE

LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH- ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH- ESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.
106.00	106.00	0.00	1000.00	0.00	750.00	-2.00	0.00	DEF	DEF
102.00	102.00	0.00	330.00	0.00	330.00	-7.00	0.00	DEF	DEF
82.00	82.00	0.00	285.00	0.00	285.00	-12.00	0.00	DEF	DEF
82.00	82.00	0.00	335.00	0.00	335.00			DEF	DEF

V.B.--LEFTSIDE

LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = DEFAULT

LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH-ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH-ESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.
106.00	106.00	0.00	1000.00	0.00	750.00	-2.00	0.00	DEF	DEF
102.00	102.00	0.00	330.00	0.00	330.00	-7.00	0.00	DEF	DEF
82.00	82.00	0.00	285.00	0.00	285.00	-12.00	0.00	DEF	DEF
82.00	82.00	0.00	335.00	0.00	335.00			DEF	DEF

VI.--WATER DATA

UNIT WEIGHT = 62.40 (PCF)

RIGHTSIDE ELEVATION = 8.00 (FT)

LEFTSIDE ELEVATION = 2.50 (FT)

NO SEEPAGE

VII.--VERTICAL SURCHARGE LOADS

NONE

VIII.--HORIZONTAL LOADS

VIII.A.--HORIZONTAL LINE LOADS

NONE

VIII.B.--HORIZONTAL DISTRIBUTED LOADS

ELEVATION (FT)	DIST. LOAD (PSF)
7.50	1440.00
-6.90	0.00

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 7-OCTOBER-2013 TIME: 12:10:35

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**************************
*   SOIL PRESSURES FOR   *
* CANTILEVER WALL DESIGN *
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I.--HEADING

'REACH 10A UNDRAINED ROTATIONAL ANALYSIS

II.--SOIL PRESSURES

RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

NET SOIL PRESSURES INCLUDE APPLIED HORIZONTAL DISTRIBUTED LOADS.

	NET	<---LEFTSIDE--->		<------NET------> (SOIL + WATER)		<--RIGHTSIDE--->	
ELEV. (FT)	WATER (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)
13.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7.5+	31.2	0.0	0.0	31.2	31.2	0.0	0.0
7.5-	31.2	657.9	0.0	813.3	2129.1	0.0	657.9
7.0	62.4	957.6	0.0	494.8	2378.8	0.0	926.4
6.5	93.6	1010.6	0.0	423.0	2381.8	0.0	948.2
6.0	124.8	1063.6	0.0	351.2	2384.8	0.0	970.0
5.0	187.2	1169.6	0.0	207.6	2390.8	0.0	1013.6
4.0	249.6	1275.7	0.0	63.9	2401.0	0.0	1061.4
3.6	277.4	1322.8	0.0	0.0	2378.5	0.0	1055.7
3.0	312.0	1381.4	0.0	-79.4	2350.7	0.0	1048.7
2.5	343.2	1430.6	0.0	-147.4	2238.5	0.0	955.3
2.0	343.2	1443.9	0.0	-210.7	2085.7	0.0	852.5
1.0	343.2	1405.8	0.0	-272.6	1998.2	0.0	865.0
0.0	343.2	1412.8	0.0	-379.6	2046.9	0.0	1013.7
-1.0	343.2	1379.1	0.0	-445.9	1964.5	0.0	1031.3
-2.0	343.2	1168.8	0.0	-335.6	1656.9	0.0	823.7
-3.0	343.2	956.6	0.0	-223.4	1353.2	0.0	620.0
-3.6+	343.2	915.2	0.0	-252.8	1269.4	0.0	599.3
-3.6-	343.2	930.5	0.0	-252.8	1269.4	0.0	599.3
-4.0	343.2	915.2	79.1	-282.0	1141.3	0.0	587.2
-5.0	343.2	946.2	73.5	-413.0	1086.4	0.0	626.7
-6.0	343.2	968.3	94.7	-535.1	995.8	0.0	657.4
-6.9	343.2	975.9	151.3	-632.7	858.2	0.0	666.2
-7.0	343.2	967.9	182.5	-624.7	824.9	0.0	664.3
-7.1+	343.2	960.1	208.8	-616.9	793.3	0.0	654.4
-7.1-	343.2	960.1	208.8	-616.9	793.3	0.0	663.4
-8.0	343.2	947.3	255.0	-531.2	742.6	72.9	654.4
-9.0	343.2	963.4	256.2	-534.1	750.8	86.1	663.9
-10.0	343.2	983.0	260.4	-541.4	756.5	98.4	673.7
-11.0	343.2	1002.6	247.9	-566.9	785.9	92.5	690.6
-12.0	343.2	1022.2	183.7	-637.0	879.5	42.0	720.1
-12.8+	343.2	1038.5	113.8	-695.3	977.4	0.0	750.6
-12.8-	343.2	1038.5	113.8	-695.3	977.4	0.0	745.4
-13.0	343.2	1041.8	108.8	-698.6	984.9	0.0	750.6
-14.0	343.2	1061.4	115.9	-718.2	993.7	0.0	766.4
-15.0	343.2	1081.0	117.8	-737.8	1001.4	0.0	776.1
-15.2+	343.2	1084.2	118.1	-741.0	1007.2	0.0	786.5

-15.2-	343.2	1084.2	118.1	-741.0	1007.2	0.0	777.8
-16.0	343.2	1100.6	119.8	-748.6	1012.0	8.8	788.6
-17.0	343.2	1120.2	121.7	-757.8	1029.7	19.2	808.2
-18.0	343.2	1139.8	123.6	-766.9	1047.4	29.7	827.8
-19.0	343.2	1159.4	125.6	-776.1	1065.0	40.1	847.4
-20.0	343.2	1179.0	127.5	-785.2	1082.7	50.6	867.0
-21.0	343.2	1198.6	129.4	-794.4	1100.4	61.0	886.6
-22.0	343.2	1218.2	131.4	-803.5	1118.0	71.5	906.2
-23.0	343.2	1237.8	133.3	-812.7	1135.7	81.9	925.8

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS
DATE: 7-OCTOBER-2013 TIME: 12:10:36

****
* SUMMARY OF RESULTS FOR *
* CANTILEVER WALL DESIGN *
****

I.--HEADING
'REACH 10A UNDRAINED ROTATIONAL ANALYSIS

II.--SUMMARY

RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

WALL BOTTOM ELEV. (FT) : -9.48
PENETRATION (FT) : 16.98

MAX. BEND. MOMENT (LB-FT) : 6.7409E+03
AT ELEVATION (FT) : -1.09

MAX. SCALED DEFL. (LB-IN^3): 1.4807E+09
AT ELEVATION (FT) : 13.00

NOTE: DIVIDE SCALED DEFLECTION MODULUS OF
ELLASTICITY IN PSI TIMES PILE MOMENT
OF INERTIA IN IN^4 TO OBTAIN DEFLECTION
IN INCHES.

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHOREDOR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS
DATE: 7-OCTOBER-2013 TIME: 12:10:36

****
* COMPLETE OF RESULTS FOR *
* CANTILEVER WALL DESIGN *
****

I.--HEADING
'REACH 10A UNDRAINED ROTATIONAL ANALYSIS

II.--RESULTS

ELEVATION (FT)	BENDING MOMENT (LB-FT)	SHEAR (LB)	SCALED DEFLECTION (LB-IN^3)	NET PRESSURE (PSF)
13.00	0.0000E+00	0.	1.4807E+09	0.00
12.00	2.6193E-10	0.	1.3757E+09	0.00
11.00	2.6193E-10	0.	1.2708E+09	0.00
10.00	2.6193E-10	0.	1.1658E+09	0.00
9.00	2.6193E-10	0.	1.0609E+09	0.00
8.00	2.6193E-10	0.	9.5591E+08	0.00
7.50+	1.3000E+00	8.	9.0344E+08	31.20
7.50-	1.3000E+00	8.	9.0344E+08	813.31
7.00	9.3592E+01	335.	8.5096E+08	494.79
6.50	3.1986E+02	564.	7.9854E+08	422.99
6.00	6.5188E+02	758.	7.4625E+08	351.19
5.00	1.5614E+03	1037.	6.4272E+08	207.59
4.00	2.6784E+03	1173.	5.4192E+08	63.90
3.55	3.2057E+03	1187.	4.9835E+08	0.00
3.00	3.8595E+03	1165.	4.4575E+08	-79.41
2.50	4.4293E+03	1108.	4.0004E+08	-147.45
2.00	4.9625E+03	1019.	3.5624E+08	-210.68
1.00	5.8658E+03	777.	2.7528E+08	-272.61
0.00	6.4889E+03	451.	2.0441E+08	-379.64
-1.00	6.7392E+03	38.	1.4470E+08	-445.91
-2.00	6.5731E+03	-352.	9.6576E+07	-335.62
-3.00	6.0716E+03	-632.	5.9761E+07	-223.39
-3.63	5.6263E+03	-782.	4.1979E+07	-252.76
-4.00	5.3200E+03	-881.	3.3403E+07	-282.01
-4.47	4.8728E+03	-1028.	2.4276E+07	-343.55
-5.00	4.2851E+03	-1179.	1.6197E+07	-227.52
-6.00	3.0288E+03	-1297.	6.3634E+06	-8.64
-6.90	1.8844E+03	-1216.	2.0498E+06	188.34
-7.00	1.7638E+03	-1196.	1.7622E+06	210.23
-7.08	1.6633E+03	-1178.	1.5426E+06	228.75
-8.00	7.0902E+02	-877.	2.3899E+05	429.10
-9.00	8.3345E+01	-338.	2.8003E+03	647.97
-9.48	0.0000E+00	0.	0.0000E+00	753.59

NOTE: DIVIDE SCALED DEFLECTION MODULUS OF
ELLASTICITY IN PSI TIMES PILE MOMENT

OF INERTIA IN IN^4 TO OBTAIN DEFLECTION
IN INCHES.

III.--WATER AND SOIL PRESSURES

		<-------------SOIL PRESSURES-------------->			
	WATER	<----LEFTSIDE----->		<---RIGHTSIDE---->	
ELEVATION	PRESSURE	PASSIVE	ACTIVE	ACTIVE	PASSIVE
(FT)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)
13.00	0.	0.	0.	0.	0.
12.00	0.	0.	0.	0.	0.
11.00	0.	0.	0.	0.	0.
10.00	0.	0.	0.	0.	0.
9.00	0.	0.	0.	0.	0.
8.00	0.	0.	0.	0.	0.
7.50+	31.	0.	0.	0.	0.
7.50-	31.	658.	0.	0.	658.
7.00	62.	958.	0.	0.	926.
6.50	94.	1011.	0.	0.	948.
6.00	125.	1064.	0.	0.	970.
5.00	187.	1170.	0.	0.	1014.
4.00	250.	1276.	0.	0.	1061.
3.55	277.	1323.	0.	0.	1056.
3.00	312.	1381.	0.	0.	1049.
2.50	343.	1431.	0.	0.	955.
2.00	343.	1444.	0.	0.	852.
1.00	343.	1406.	0.	0.	865.
0.00	343.	1413.	0.	0.	1014.
-1.00	343.	1379.	0.	0.	1031.
-2.00	343.	1169.	0.	0.	824.
-3.00	343.	957.	0.	0.	620.
-3.63+	343.	915.	0.	0.	599.
-3.63-	343.	930.	0.	0.	599.
-4.00	343.	915.	79.	0.	587.
-4.47	343.	930.	76.	0.	606.
-5.00	343.	946.	74.	0.	627.
-6.00	343.	968.	95.	0.	657.
-6.90	343.	976.	151.	0.	666.
-7.00	343.	968.	183.	0.	664.
-7.08+	343.	960.	209.	0.	654.
-7.08-	343.	960.	209.	0.	663.
-8.00	343.	947.	255.	73.	654.
-9.00	343.	963.	256.	86.	664.
-9.48	343.	983.	260.	98.	674.
-11.00	343.	1003.	248.	92.	691.

```
'REACH 10A UNDRAINED ROTATIONAL ANALYSIS
CONTROL  CANTILEVER  DESIGN  1.00  2.60
WALL   13
SURFACE RIGHTSIDE   5    0    7.5
            5    7.5
            6    6.5
            70   -10.5
            102.5   -12.5
SURFACE LEFTSIDE   4    0    7.5
            6    7.5
            31    2.5
            80    2.5
SOIL RIGHTSIDE  STRENGTHS   4
  106    106    0    1000    0    750   -2   0
  102    102    0    330    0    330   -7   0
  82    82    0    285    0    285   -12   0
  82    82    0    335    0    335
SOIL LEFTSIDE  STRENGTHS   4
  106    106    0    1000    0    750   -2   0
  102    102    0    330    0    330   -7   0
  82    82    0    285    0    285   -12   0
  82    82    0    335    0    335
WATER ELEVATIONS   62.4    8    2.5
HORIZONTAL DISTRIBUTED   2    7.5    1640   -6.9    0
FINISHED
```

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS
DATE: 7-OCTOBER-2013 TIME: 12:16:39

****
* INPUT DATA *
****

I.--HEADING
'REACH 10A UNDRAINED ROTATIONAL ANALYSIS

II.--CONTROL
CANTILEVER WALL DESIGN
FACTOR OF SAFETY FOR ACTIVE PRESSURES = 1.00
FACTOR OF SAFETY FOR PASSIVE PRESSURES = 2.60

III.--WALL DATA
ELEVATION AT TOP OF WALL = 13.00 FT.

IV.--SURFACE POINT DATA

IV.A.--RIGHTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	7.50
5.00	7.50
6.00	6.50
70.00	-10.50
102.50	-12.50

IV.B.--LEFTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	7.50
6.00	7.50
31.00	2.50
80.00	2.50

V.--SOIL LAYER DATA

V.A.--RIGHTSIDE
LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH-ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH-ESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.
106.00	106.00	0.00	1000.00	0.00	750.00	-2.00	0.00	DEF	DEF
102.00	102.00	0.00	330.00	0.00	330.00	-7.00	0.00	DEF	DEF
82.00	82.00	0.00	285.00	0.00	285.00	-12.00	0.00	DEF	DEF
82.00	82.00	0.00	335.00	0.00	335.00			DEF	DEF

V.B.--LEFTSIDE

LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = DEFAULT

LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH-ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH-ESION (PSF)	<--BOTTOM--> ELEV. (FT)	<--BOTTOM--> SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	<-SAFETY-> <-FACTOR-> PASS.
106.00	106.00	0.00	1000.00	0.00	750.00	-2.00	0.00	DEF	DEF
102.00	102.00	0.00	330.00	0.00	330.00	-7.00	0.00	DEF	DEF
82.00	82.00	0.00	285.00	0.00	285.00	-12.00	0.00	DEF	DEF
82.00	82.00	0.00	335.00	0.00	335.00			DEF	DEF

VI.--WATER DATA

UNIT WEIGHT = 62.40 (PCF)

RIGHTSIDE ELEVATION = 8.00 (FT)

LEFTSIDE ELEVATION = 2.50 (FT)

NO SEEPAGE

VII.--VERTICAL SURCHARGE LOADS

NONE

VIII.--HORIZONTAL LOADS

VIII.A.--HORIZONTAL LINE LOADS

NONE

VIII.B.--HORIZONTAL DISTRIBUTED LOADS

ELEVATION (FT)	DIST. LOAD (PSF)
7.50	1640.00
-6.90	0.00

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 7-OCTOBER-2013 TIME: 12:16:41

****
* SOIL PRESSURES FOR *
* CANTILEVER WALL DESIGN *
****

I.--HEADING

'REACH 10A UNDRAINED ROTATIONAL ANALYSIS

II.--SOIL PRESSURES

RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

NET SOIL PRESSURES INCLUDE APPLIED HORIZONTAL DISTRIBUTED LOADS.

	NET	<---LEFTSIDE--->		<------NET------> (SOIL + WATER)		<--RIGHTSIDE--->	
ELEV. (FT)	WATER (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)
13.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7.5+	31.2	0.0	0.0	31.2	31.2	0.0	0.0
7.5-	31.2	769.2	0.0	902.0	2440.4	0.0	769.2
7.0	62.4	1110.7	0.0	534.8	2724.9	0.0	1079.5
6.5	93.6	1163.7	0.0	456.0	2721.0	0.0	1101.3
6.0	124.8	1216.7	0.0	377.3	2717.1	0.0	1123.1
5.0	187.2	1322.7	0.0	219.8	2709.2	0.0	1166.7
4.0	249.6	1428.8	0.0	62.2	2706.1	0.0	1215.1
3.6	274.3	1470.6	0.0	0.0	2677.0	0.0	1206.3
3.0	312.0	1534.5	0.0	-95.0	2632.4	0.0	1192.9
2.5	343.2	1584.4	0.0	-170.6	2494.3	0.0	1080.5
2.0	343.2	1595.0	0.0	-238.2	2314.8	0.0	958.0
1.0	343.2	1544.7	0.0	-301.7	2211.7	0.0	968.8
0.0	343.2	1548.2	0.0	-419.2	2266.9	0.0	1137.8
-1.0	343.2	1504.5	0.0	-489.3	2168.0	0.0	1152.8
-2.0	343.2	1254.4	0.0	-353.1	1805.7	0.0	904.5
-3.0	343.2	1002.3	0.0	-215.0	1448.3	0.0	661.0
-3.6+	343.2	950.2	0.0	-244.4	1348.9	0.0	633.5
-3.6-	343.2	969.4	0.0	-244.4	1348.9	0.0	633.5
-4.0	343.2	950.2	79.1	-276.8	1211.8	0.0	617.4
-5.0	343.2	982.7	73.5	-423.1	1144.5	0.0	658.4
-6.0	343.2	1004.9	94.7	-559.2	1040.1	0.0	689.2
-6.9	343.2	1010.5	151.3	-667.3	887.0	0.0	695.0
-7.0	343.2	1000.8	182.5	-657.6	853.0	0.0	692.4
-7.1+	343.2	991.6	208.8	-648.4	819.4	0.0	678.7
-7.1-	343.2	991.6	208.8	-648.4	819.4	0.0	691.2
-8.0	343.2	976.3	255.0	-560.2	766.9	72.9	678.7
-9.0	343.2	978.5	256.2	-549.2	775.0	86.1	688.1
-10.0	343.2	983.0	260.4	-541.4	780.6	98.4	697.8
-11.0	343.2	1002.6	247.9	-566.9	809.8	92.5	714.6
-12.0	343.2	1022.2	183.7	-637.0	908.0	42.0	748.5
-12.8+	343.2	1043.6	113.8	-700.4	1008.9	0.0	782.4
-12.8-	343.2	1043.6	113.8	-700.4	1008.9	0.0	776.6
-13.0	343.2	1045.9	108.8	-702.7	1016.7	0.0	782.4
-14.0	343.2	1061.4	115.9	-718.2	1026.4	0.0	799.1
-15.0	343.2	1081.0	117.8	-737.8	1034.0	0.0	808.7
-15.2+	343.2	1084.2	118.1	-741.0	1039.8	0.0	819.1

-15.2-	343.2	1084.2	118.1	-741.0	1039.8	0.0	810.3
-16.0	343.2	1100.6	119.8	-748.6	1042.5	8.8	819.1
-17.0	343.2	1120.2	121.7	-757.8	1051.1	19.2	829.6
-18.0	343.2	1139.8	123.6	-766.9	1059.6	29.7	840.0
-19.0	343.2	1159.4	125.6	-776.1	1068.1	40.1	850.5
-20.0	343.2	1179.0	127.5	-785.2	1082.7	50.6	867.0
-21.0	343.2	1198.6	129.4	-794.4	1100.4	61.0	886.6
-22.0	343.2	1218.2	131.4	-803.5	1118.0	71.5	906.2
-23.0	343.2	1237.8	133.3	-812.7	1135.7	81.9	925.8

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS
DATE: 7-OCTOBER-2013 TIME: 12:16:41

****
* SUMMARY OF RESULTS FOR *
* CANTILEVER WALL DESIGN *
****

I.--HEADING
'REACH 10A UNDRAINED ROTATIONAL ANALYSIS

II.--SUMMARY

RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

WALL BOTTOM ELEV. (FT) : -9.45
PENETRATION (FT) : 16.95

MAX. BEND. MOMENT (LB-FT) : 7.1533E+03
AT ELEVATION (FT) : -0.99

MAX. SCALED DEFL. (LB-IN^3): 1.5562E+09
AT ELEVATION (FT) : 13.00

NOTE: DIVIDE SCALED DEFLECTION MODULUS OF
ELLASTICITY IN PSI TIMES PILE MOMENT
OF INERTIA IN IN^4 TO OBTAIN DEFLECTION
IN INCHES.

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHOREDOR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS
DATE: 7-OCTOBER-2013 TIME: 12:16:41

****
* COMPLETE OF RESULTS FOR *
* CANTILEVER WALL DESIGN *
****

I.--HEADING
'REACH 10A UNDRAINED ROTATIONAL ANALYSIS

II.--RESULTS

ELEVATION (FT)	BENDING MOMENT (LB-FT)	SHEAR (LB)	SCALED DEFLECTION (LB-IN^3)	NET PRESSURE (PSF)
13.00	0.0000E+00	0.	1.5562E+09	0.00
12.00	-8.7311E-11	0.	1.4454E+09	0.00
11.00	-8.7311E-11	0.	1.3345E+09	0.00
10.00	-8.7311E-11	0.	1.2237E+09	0.00
9.00	-8.7311E-11	0.	1.1129E+09	0.00
8.00	-8.7311E-11	0.	1.0021E+09	0.00
7.50+	1.3000E+00	8.	9.4669E+08	31.20
7.50-	1.3000E+00	8.	9.4669E+08	901.97
7.00	1.0265E+02	367.	8.9129E+08	534.76
6.50	3.4970E+02	615.	8.3593E+08	456.02
6.00	7.1076E+02	823.	7.8073E+08	377.27
5.00	1.6962E+03	1122.	6.7147E+08	219.79
4.00	2.9013E+03	1263.	5.6516E+08	62.20
3.60	3.4041E+03	1275.	5.2436E+08	0.00
3.00	4.1687E+03	1246.	4.6388E+08	-95.00
2.50	4.7768E+03	1180.	4.1580E+08	-170.64
2.00	5.3425E+03	1078.	3.6978E+08	-238.17
1.00	6.2903E+03	808.	2.8489E+08	-301.73
0.00	6.9274E+03	447.	2.1082E+08	-419.20
-1.00	7.1532E+03	-7.	1.4866E+08	-489.31
-2.00	6.9241E+03	-428.	9.8794E+07	-353.11
-3.00	6.3422E+03	-712.	6.0843E+07	-214.96
-3.63	5.8478E+03	-857.	4.2594E+07	-244.36
-4.00	5.5142E+03	-953.	3.3817E+07	-276.76
-4.44	5.0624E+03	-1090.	2.4976E+07	-341.63
-5.00	4.4086E+03	-1246.	1.6280E+07	-217.07
-6.00	3.0913E+03	-1351.	6.3294E+06	6.61
-6.90	1.9051E+03	-1255.	2.0075E+06	207.93
-7.00	1.7807E+03	-1233.	1.7217E+06	230.30
-7.08	1.6772E+03	-1213.	1.5039E+06	249.24
-8.00	7.0029E+02	-891.	2.2418E+05	453.99
-9.00	7.3903E+01	-325.	2.1215E+03	677.68
-9.45	0.0000E+00	0.	0.0000E+00	777.54

NOTE: DIVIDE SCALED DEFLECTION MODULUS OF
ELLASTICITY IN PSI TIMES PILE MOMENT

OF INERTIA IN IN^4 TO OBTAIN DEFLECTION
IN INCHES.

III.--WATER AND SOIL PRESSURES

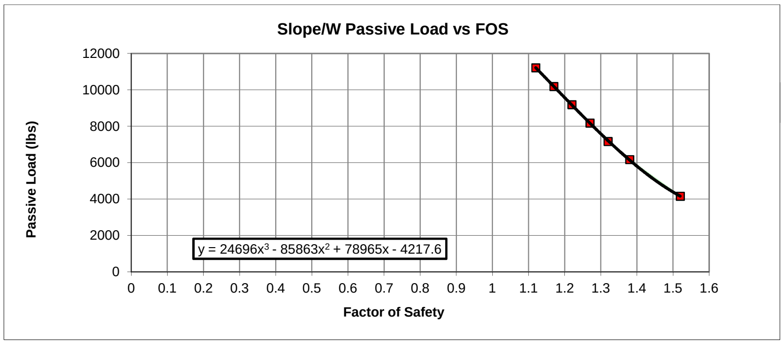
		<-------------SOIL PRESSURES-------------->			
	WATER	<----LEFTSIDE----->		<---RIGHTSIDE---->	
ELEVATION	PRESSURE	PASSIVE	ACTIVE	ACTIVE	PASSIVE
(FT)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)
13.00	0.	0.	0.	0.	0.
12.00	0.	0.	0.	0.	0.
11.00	0.	0.	0.	0.	0.
10.00	0.	0.	0.	0.	0.
9.00	0.	0.	0.	0.	0.
8.00	0.	0.	0.	0.	0.
7.50+	31.	0.	0.	0.	0.
7.50-	31.	769.	0.	0.	769.
7.00	62.	1111.	0.	0.	1079.
6.50	94.	1164.	0.	0.	1101.
6.00	125.	1217.	0.	0.	1123.
5.00	187.	1323.	0.	0.	1167.
4.00	250.	1429.	0.	0.	1215.
3.60	274.	1471.	0.	0.	1206.
3.00	312.	1534.	0.	0.	1193.
2.50	343.	1584.	0.	0.	1081.
2.00	343.	1595.	0.	0.	958.
1.00	343.	1545.	0.	0.	969.
0.00	343.	1548.	0.	0.	1138.
-1.00	343.	1504.	0.	0.	1153.
-2.00	343.	1254.	0.	0.	904.
-3.00	343.	1002.	0.	0.	661.
-3.63+	343.	950.	0.	0.	633.
-3.63-	343.	969.	0.	0.	633.
-4.00	343.	950.	79.	0.	617.
-4.44	343.	965.	77.	0.	636.
-5.00	343.	983.	74.	0.	658.
-6.00	343.	1005.	95.	0.	689.
-6.90	343.	1010.	151.	0.	695.
-7.00	343.	1001.	183.	0.	692.
-7.08+	343.	992.	209.	0.	679.
-7.08-	343.	992.	209.	0.	691.
-8.00	343.	976.	255.	73.	679.
-9.00	343.	979.	256.	86.	688.
-9.45	343.	983.	260.	98.	698.
-11.00	343.	1003.	248.	92.	715.

Canal:	Orleans Avenue Canal		
Reach:	Reach 17B		
Load Case:		Water @ El 8	
Protected Side Top of Ground (GSE):		6.1	ft, Elevation
Critical Slip Surface Elev. (FSE):		-6.6	ft, Elevation
Sheetpile Tip Elevation:		-9.8	ft, Elevation

Step 1: Compute correct passive pressure forces from slope stability model (Slope/W). Procedure follows the approach cited in Paragraph D-4 of ETL 1110-2-575.

Note: CWALSHT Transition point was at Elevation -6.6 ft. Slope/W found that the critical failure surface at -9.8 ft (at the the sheetpile).

Unit Weight (psf)	Passive Load (lbs)	Factor of Safety	Failure Surface Elevation (feet)	Notes
40	4155.6	1.52	-6.6	
60	6166.4	1.38	-6.6	
70	7162.9	1.32	-6.6	
80	8175.7	1.27	-6.6	
90	9182.4	1.22	-6.6	
100	10183	1.17	-6.6	
110	11210	1.12	-6.6	



Step 2: Perform CWALSHT analysis of cross section using a range of <u>assumed</u> horizontal distributed load above the critical slip surface elevation found in step 1. Determine the difference in passive load from CWALSHT and Slope/W for each assumed horizontal distributed load.

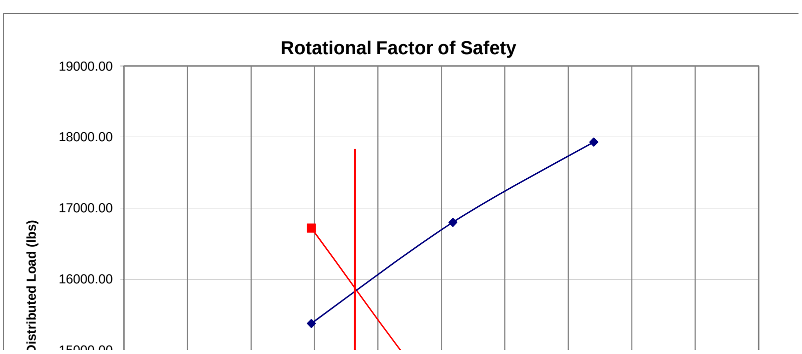
	(A)	(B)		(C)	(D)	
FOS	CWALSHT Passive Load (lbs)	SLOPE/W Passive Load (lbs)	Tip Elev feet	Difference Passive Load (A-B) (lbs)	Assumed Horizontal Distributed Load in CWALSHT (psf)	Resultant Distributed CWALSHT Load (D*(GSE-FSE)) (lbs)
1.54	21882.375	3952.12	-9.8	17930.25	1920	12192.00
1.318	24045.81	7245.81	-9.8	16800.00	2218	14084.30
1.095	27098.43	11721.37	-9.8	15377.06	2633	16719.55

Interpolate Correction Force at the resultant FOS

FOS = 1.16

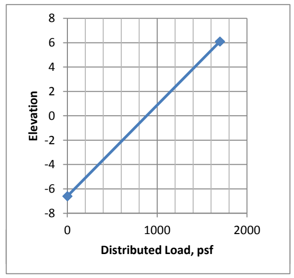
Correction Force = 15791.82 lbs

Step 3: Plot the assumed horizontal load and the difference passive load versus factor of safety. The intersection of the two curves represents the actual factor of safety.



VIII.B.--HORIZONTAL DISTRIBUTED LOAD

ELEVATION (FT)	DIST. LOAD (PSF)	Result. (LBS)
6.1	1698	
-6.6	0	10782.3



10782.3

RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

NET SOIL PRESSURES INCLUDE APPLIED HORIZONTAL DISTRIBUTED LOADS.

ELEV. (FT)	NET WATER (PSF)	<---LEFTSIDE---> PASSIVE (PSF)	ACTIVE (PSF)	<--RIGHTSIDE---> ACTIVE (PSF)	PASSIVE (PSF)
14	0	0	0	0	0
13	0	0	0	0	0
12	0	0	0	0	0
11	0	0	0	0	0
10	0	0	0	0	0
9	0	0	0	0	0
8	0	0	0	0	0
7	62	0	0	0	0
6.10+	119	0	0	0	0
-6.1	119	795	0	0	0
6.00+	125	1165	0	0	0
-6	125	1165	0	0	795
5	187	1281	0	0	1207
4	250	1397	0	0	1261
3	312	1513	0	0	1314
2.56	339	1564	0	0	1338
2	374	1629	0	0	1368
1	437	1745	0	0	1421
0	499	1870	0	0	1484
-1	562	1870	0	0	1420
-1.5	593	1683	0	0	1219
-2	624	1481	0	0	973
-2.13+	632	1437	0	0	940
-2.13-	632	1475	0	0	940
-3	686	1437	285	0	725
-3.50+	717	1487	321	0	703
-3.50-	717	1487	321	0	714
-4	749	1528	375	47	703
-4.06	752	1536	375	39	721
-4.34+	770	1575	376	0	810
-4.34-	770	1575	376	0	739
-5	811	1724	278	0	810
-6	874	1918	187	0	923
-6.6	911	1976	212	0	954
-7	911	1990	238	0	945
-8	911	1895	480	0	838
-8.06+	911	1878	511	0	731
-8.06-	911	1878	511	0	832
-9	911	1678	856	177	731
-9.76	911	1615	933	218	698
-11	911	1593	926	205	696

ELEV. (FT)	NET WATER (PSF)	LEFTSIDE PASSIVE (PSF)	RESULT. LEFTSIDE PASSIVE (LBS)
14	0	0	0
13	0	0	0
12	0	0	0
11	0	0	0
10	0	0	0
9	0	0	0
8	0	0	0
7	62	0	0
6.1	119	0	0
6.1	119	795	0
6	125	1165	98
-6	125	1165	13980
5	187	1281	-13453
4	250	1397	1339
3	312	1513	1455
2.56	339	1564	676.94
2	374	1629	894.04
1	437	1745	1687
0	499	1870	1807.5
-1	562	1870	1870
-1.5	593	1683	888.25
-2	624	1481	791
-2.13	632	1437	189.67
-2.13	632	1475	0
-3	686	1437	1266.72
-3.5	717	1487	731
-3.5	717	1487	0
-4	749	1528	753.75
-4.06	752	1536	91.92
-4.34	770	1575	435.54
-4.34	770	1575	0
-5	811	1724	1088.67
-6	874	1918	1821
-6.6	911	1976	1168.2
-7	911	1990	793.2
-8	911	1895	1942.5
-8.06	911	1878	113.19
-8.06	911	1878	0
-9	911	1678	1671.32
-9.76	911	1615	1251.34

PS WATER ELEVATION (FT)	CRITICAL SLIP SURF. ELEVATION (FT)	UNIT WEIGHT WATER (PCF)
-6.6	-6.6	64

RESULTANT WATER LOAD= 0 LBS

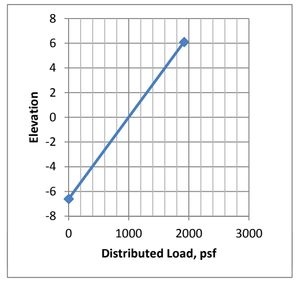
PASSIVE LOAD (SOIL)	19580.2
PASSIVE LOAD (SOIL+WATER)	19580.2
FOS =	1.76

IF THE PS WATER LEVEL IS BELOW THE CRITICAL SLIP SURFACE, USE PASSIVE LOAD (SOIL)

VIII.B.--HORIZONTAL DISTRIBUTED LOAD

ELEVATION (FT)	DIST. LOAD (PSF)	Result. (LBS)
6.1	1920	
-6.6	0	12192

12192



RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

NET SOIL PRESSURES INCLUDE APPLIED HORIZONTAL DISTRIBUTED LOADS.

	NET	<---LEFTSIDE--->		<--RIGHTSIDE--->	
ELEV. (FT)	WATER (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)
14	0	0	0	0	0
13	0	0	0	0	0
12	0	0	0	0	0
11	0	0	0	0	0
10	0	0	0	0	0
9	0	0	0	0	0
8	0	0	0	0	0
7	62	0	0	0	0
6.10+	119	0	0	0	0
-6.1	119	909	0	0	0
6.00+	125	1330	0	0	0
-6	125	1330	0	0	909
5	187	1446	0	0	1372
4	250	1562	0	0	1425
3	312	1678	0	0	1479
2.58	338	1726	0	0	1501
2	374	1794	0	0	1533
1	437	1910	0	0	1586
0	499	2036	0	0	1650
-1	562	2019	0	0	1569
-1.5	593	1798	0	0	1336
-2	624	1560	0	0	1052
-2.13+	632	1497	0	0	1014
-2.13-	632	1551	0	0	1014
-3	686	1497	285	0	765
-3.50+	717	1547	321	0	737
-3.50-	717	1547	321	0	751
-4	749	1588	375	47	737
-4.04	751	1593	375	42	751
-4.34+	770	1637	376	0	857
-4.34-	770	1637	376	0	777
-5	811	1799	278	0	857
-6	874	2007	187	0	983
-6.6	911	2067	212	0	1017
-7	911	2081	238	0	1005
-8	911	1968	480	0	882
-8.06+	911	1949	511	0	760
-8.06-	911	1949	511	0	875
-9	911	1721	856	177	760
-9.8	911	1650	933	218	723
-11	911	1627	926	205	721

ELEV. (FT)	NET WATER (PSF)	LEFTSIDE PASSIVE (PSF)	RESULT. LEFTSIDE PASSIVE (LBS)
14	0	0	
13	0	0	
12	0	0	
11	0	0	
10	0	0	
9	0	0	
8	0	0	0
7	62	0	0
6.1	119	0	0
6.1	119	909	0
6	125	1330	111.95
6	125	1330	0
5	187	1446	1388
4	250	1562	1504
3	312	1678	1620
2.58	338	1726	714.84
2	374	1794	1020.8
1	437	1910	1852
0	499	2036	1973
-1	562	2019	2027.5
-1.5	593	1798	954.25
-2	624	1560	839.5
-2.13	632	1497	198.705
-2.13	632	1551	0
-3	686	1497	1325.88
-3.5	717	1547	761
-3.5	717	1547	0
-4	749	1588	783.75
-4.04	751	1593	63.62
-4.34	770	1637	484.5
-4.34	770	1637	0
-5	811	1799	1133.88
-6	874	2007	1903
-6.6	911	2067	1222.2
-7	911	2081	829.6
-8	911	1968	2024.5
-8.06	911	1949	117.51
-8.06	911	1949	0
-9	911	1721	1724.9
-9.8	911	1650	1348.4
-11	911	1627	1966.2

PS WATER ELEVATION (FT)	CRITICAL SLIP SURF. ELEVATION (FT)	UNIT WEIGHT WATER (PCF)
-6.6	-6.6	64

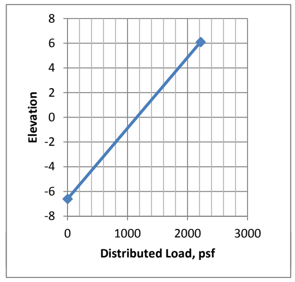
RESULTANT WATER LOAD= 0 LBS

PASSIVE LOAD (SOIL)	21882.375	
PASSIVE LOAD (SOIL+WATER)	21882.375	**IF THE PS WATER LEVEL IS BELOW THE CRITICAL SLIP SURFACE,**
FOS =	1.54	**USE PASSIVE LOAD (SOIL)**

VIII.B.--HORIZONTAL DISTRIBUTED LOAD

ELEVATION (FT)	DIST. LOAD (PSF)	Result. (LBS)
6.1	2218	
-6.6	0	14084.3

14084.3



RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

NET SOIL PRESSURES INCLUDE APPLIED HORIZONTAL DISTRIBUTED LOADS.

ELEV. (FT)	NET WATER (PSF)	<---LEFTSIDE---> PASSIVE (PSF)	ACTIVE (PSF)	<--RIGHTSIDE---> ACTIVE (PSF)	PASSIVE (PSF)
14	0	0	0	0	0
13	0	0	0	0	0
12	0	0	0	0	0
11	0	0	0	0	0
10	0	0	0	0	0
9	0	0	0	0	0
8	0	0	0	0	0
7	62	0	0	0	0
6.10+	119	0	0	0	0
-6.1	119	1062	0	0	0
6.00+	125	1552	0	0	0
-6	125	1552	0	0	1062
5	187	1668	0	0	1594
4	250	1784	0	0	1647
3	312	1900	0	0	1701
2.61	336	1945	0	0	1722
2	374	2016	0	0	1755
1	437	2132	0	0	1808
0	499	2259	0	0	1873
-1	562	2221	0	0	1771
-1.5	593	1953	0	0	1493
-2	624	1666	0	0	1158
-2.13+	632	1577	0	0	1114
-2.13-	632	1654	0	0	1114
-3	686	1577	285	0	819
-3.50+	717	1628	321	0	782
-3.50-	717	1628	321	0	801
-4	749	1668	375	47	782
-4.02	750	1671	375	45	790
-4.34+	770	1720	376	0	920
-4.34-	770	1720	376	0	829
-5	811	1900	278	0	920
-6	874	2128	187	0	1064
-6.6	911	2190	212	0	1102
-7	911	2203	238	0	1087
-8	911	2066	480	0	941
-8.06+	911	2045	511	0	799
-8.06-	911	2045	511	0	933
-9	911	1778	856	177	799
-9.8	911	1698	933	218	756
-11	911	1674	926	205	756

ELEV. (FT)	NET WATER (PSF)	LEFTSIDE PASSIVE (PSF)	RESULT. LEFTSIDE PASSIVE (LBS)
14	0	0	
13	0	0	
12	0	0	
11	0	0	
10	0	0	
9	0	0	
8	0	0	0
7	62	0	0
6.1	119	0	0
6.1	119	1062	0
6	125	1552	130.7
6	125	1552	0
5	187	1668	1610
4	250	1784	1726
3	312	1900	1842
2.61	336	1945	749.775
2	374	2016	1208.105
1	437	2132	2074
0	499	2259	2195.5
-1	562	2221	2240
-1.5	593	1953	1043.5
-2	624	1666	904.75
-2.13	632	1577	210.795
-2.13	632	1654	0
-3	686	1577	1405.485
-3.5	717	1628	801.25
-3.5	717	1628	0
-4	749	1668	824
-4.02	750	1671	33.39
-4.34	770	1720	542.56
-4.34	770	1720	0
-5	811	1900	1194.6
-6	874	2128	2014
-6.6	911	2190	1295.4
-7	911	2203	878.6
-8	911	2066	2134.5
-8.06	911	2045	123.33
-8.06	911	2045	0
-9	911	1778	1796.81
-9.8	911	1698	1390.4
-11	911	1674	2023.2

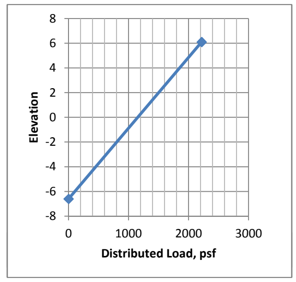
PS WATER ELEVATION (FT)	CRITICAL SLIP SURF. ELEVATION (FT)	UNIT WEIGHT WATER (PCF)
-6.6	-6.6	64

RESULTANT WATER LOAD= 0 LBS

PASSIVE LOAD (SOIL) 24045.81
PASSIVE LOAD (SOIL+WATER) 24045.81 **IF THE PS WATER LEVEL IS BELOW THE CRITICAL SLIP SURFACE, USE PASSIVE LOAD (SOIL)**
FOS = 1.318

VIII.B.--HORIZONTAL DISTRIBUTED LOAD

ELEVATION (FT)	DIST. LOAD (PSF)	Result. (LBS)
6.1	2633	
-6.6	0	16719.55



16719.55

RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

NET SOIL PRESSURES INCLUDE APPLIED HORIZONTAL DISTRIBUTED LOADS.

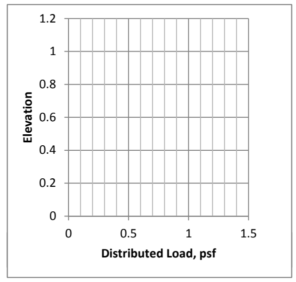
ELEV. (FT)	NET WATER (PSF)	<---LEFTSIDE---> PASSIVE (PSF)	ACTIVE (PSF)	<--RIGHTSIDE---> ACTIVE (PSF)	PASSIVE (PSF)
14	0	0	0	0	0
13	0	0	0	0	0
12	0	0	0	0	0
11	0	0	0	0	0
10	0	0	0	0	0
9	0	0	0	0	0
8	0	0	0	0	0
7	62	0	0	0	0
6.10+	119	0	0	0	0
-6.1	119	1279	0	0	0
6.00+	125	1865	0	0	0
-6	125	1865	0	0	1279
5	187	1981	0	0	1907
4	250	2097	0	0	1961
3	312	2213	0	0	2015
2.66	333	2253	0	0	2033
2	374	2329	0	0	2068
1	437	2445	0	0	2122
0	499	2575	0	0	2189
-1	562	2505	0	0	2055
-1.5	593	2171	0	0	1716
-2	624	1816	0	0	1309
-2.13+	632	1691	0	0	1254
-2.13-	632	1799	0	0	1254
-3	686	1691	285	0	895
-3.50+	717	1743	321	0	847
-3.50-	717	1743	321	0	871
-3.99	748	1781	374	47	847
-4	749	1782	375	47	847
-4.34+	770	1838	376	0	1009
-4.34-	770	1838	376	0	902
-5	811	2042	278	0	1009
-6	874	2298	187	0	1179
-6.6	911	2364	212	0	1222
-7	911	2376	238	0	1203
-8	911	2206	480	0	1025
-8.06+	911	2179	511	0	854
-8.06-	911	2179	511	0	1015
-9	911	1859	856	177	854
-9.57	911	1765	933	218	804
-11	911	1739	926	205	804

ELEV. (FT)	NET WATER (PSF)	LEFTSIDE PASSIVE (PSF)	RESULT. LEFTSIDE PASSIVE (LBS)
14	0	0	
13	0	0	
12	0	0	
11	0	0	
10	0	0	
9	0	0	
8	0	0	0
7	62	0	0
6.1	119	0	0
6.1	119	1279	0
6	125	1865	157.2
6	125	1865	0
5	187	1981	1923
4	250	2097	2039
3	312	2213	2155
2.66	333	2253	759.22
2	374	2329	1512.06
1	437	2445	2387
0	499	2575	2510
-1	562	2505	2540
-1.5	593	2171	1169
-2	624	1816	996.75
-2.13	632	1691	227.955
-2.13	632	1799	0
-3	686	1691	1518.15
-3.5	717	1743	858.5
-3.5	717	1743	0
-3.99	748	1781	863.38
-4	749	1782	17.815
-4.34	770	1838	615.4
-4.34	770	1838	0
-5	811	2042	1280.4
-6	874	2298	2170
-6.6	911	2364	1398.6
-7	911	2376	948
-8	911	2206	2291
-8.06	911	2179	131.55
-8.06	911	2179	0
-9	911	1859	1897.86
-9.57	911	1765	1032.84
-11	911	1739	2505.36

PS WATER ELEVATION (FT)	CRITICAL SLIP SURF. ELEVATION (FT)	UNIT WEIGHT WATER (PCF)
-6.6	-6.6	64

RESULTANT WATER LOAD= 0 LBS

PASSIVE LOAD (SOIL)	27098.43	
PASSIVE LOAD (SOIL+WATER)	27098.43	**IF THE PS WATER LEVEL IS BELOW THE CRITICAL SLIP SURFACE, USE PASSIVE LOAD (SOIL)**
FOS =	1.095	

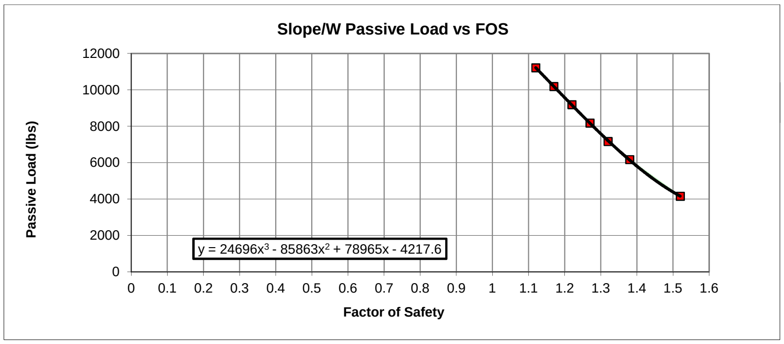

1.2
1
0.8
0.6
0.4
0.2
0
Elevation
0
0.5
1
1.5
Distributed Load, psf

Canal:	Orleans Avenue Canal		
Reach:	Reach 17B		
Load Case:		Water @ El 8	
Protected Side Top of Ground (GSE):		6.1	ft, Elevation
Critical Slip Surface Elev. (FSE):		-6.6	ft, Elevation
Sheetpile Tip Elevation:		-9.8	ft, Elevation

Step 1: Compute correct passive pressure forces from slope stability model (Slope/W). Procedure follows the approach cited in Paragraph D-4 of ETL 1110-2-575.

Note: CWALSHT Transition point was at Elevation -6.6 ft. Slope/W found that the critical failure surface at -9.8 ft (at the the sheetpile).

Unit Weight (psf)	Passive Load (lbs)	Factor of Safety	Failure Surface Elevation (feet)	Notes
40	4155.6	1.52	-6.6	
60	6166.4	1.38	-6.6	
70	7162.9	1.32	-6.6	
80	8175.7	1.27	-6.6	
90	9182.4	1.22	-6.6	
100	10183	1.17	-6.6	
110	11210	1.12	-6.6	



Step 2: Perform CWALSHT analysis of cross section using a range of <u>assumed</u> horizontal distributed load above the critical slip surface elevation found in step 1. Determine the difference in passive load from CWALSHT and Slope/W for each assumed horizontal distributed load.

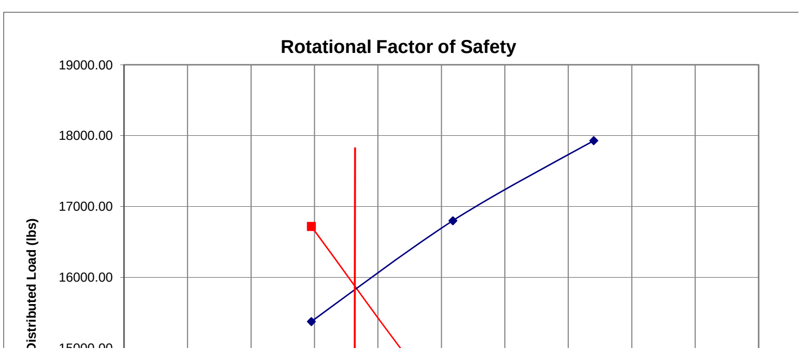
	(A)	(B)		(C)	(D)	
FOS	CWALSHT Passive Load (lbs)	SLOPE/W Passive Load (lbs)	Tip Elev feet	Difference Passive Load (A-B) (lbs)	Assumed Horizontal Distributed Load in CWALSHT (psf)	Resultant Distributed CWALSHT Load (D*(GSE-FSE)) (lbs)
1.54	21882.375	3952.12	-9.8	17930.25	1920	12192.00
1.318	24045.81	7245.81	-9.8	16800.00	2218	14084.30
1.095	27098.43	11721.37	-9.8	15377.06	2633	16719.55

Interpolate Correction Force at the resultant FOS

FOS = 1.16

Correction Force = 15791.82 lbs

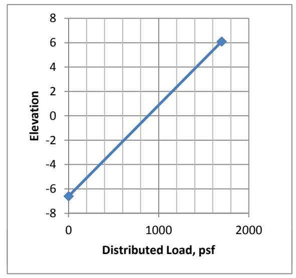
Step 3: Plot the assumed horizontal load and the difference passive load versus factor of safety. The intersection of the two curves represents the actual factor of safety.



VIII.B.--HORIZONTAL DISTRIBUTED LOAD

ELEVATION (FT)	DIST. LOAD (PSF)	Result. (LBS)
6.1	1698	
-6.6	0	10782.3

10782.3



RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

NET SOIL PRESSURES INCLUDE APPLIED HORIZONTAL DISTRIBUTED LOADS.

ELEV. (FT)	NET WATER (PSF)	<---LEFTSIDE---> PASSIVE (PSF)	ACTIVE (PSF)	<--RIGHTSIDE---> ACTIVE (PSF)	PASSIVE (PSF)
14	0	0	0	0	0
13	0	0	0	0	0
12	0	0	0	0	0
11	0	0	0	0	0
10	0	0	0	0	0
9	0	0	0	0	0
8	0	0	0	0	0
7	62	0	0	0	0
6.10+	119	0	0	0	0
-6.1	119	795	0	0	0
6.00+	125	1165	0	0	0
-6	125	1165	0	0	795
5	187	1281	0	0	1207
4	250	1397	0	0	1261
3	312	1513	0	0	1314
2.56	339	1564	0	0	1338
2	374	1629	0	0	1368
1	437	1745	0	0	1421
0	499	1870	0	0	1484
-1	562	1870	0	0	1420
-1.5	593	1683	0	0	1219
-2	624	1481	0	0	973
-2.13+	632	1437	0	0	940
-2.13-	632	1475	0	0	940
-3	686	1437	285	0	725
-3.50+	717	1487	321	0	703
-3.50-	717	1487	321	0	714
-4	749	1528	375	47	703
-4.06	752	1536	375	39	721
-4.34+	770	1575	376	0	810
-4.34-	770	1575	376	0	739
-5	811	1724	278	0	810
-6	874	1918	187	0	923
-6.6	911	1976	212	0	954
-7	911	1990	238	0	945
-8	911	1895	480	0	838
-8.06+	911	1878	511	0	731
-8.06-	911	1878	511	0	832
-9	911	1678	856	177	731
-9.76	911	1615	933	218	698
-11	911	1593	926	205	696

ELEV. (FT)	NET WATER (PSF)	LEFTSIDE PASSIVE (PSF)	RESULT. LEFTSIDE PASSIVE (LBS)
14	0	0	0
13	0	0	0
12	0	0	0
11	0	0	0
10	0	0	0
9	0	0	0
8	0	0	0
7	62	0	0
6.1	119	0	0
6.1	119	795	0
6	125	1165	98
-6	125	1165	13980
5	187	1281	-13453
4	250	1397	1339
3	312	1513	1455
2.56	339	1564	676.94
2	374	1629	894.04
1	437	1745	1687
0	499	1870	1807.5
-1	562	1870	1870
-1.5	593	1683	888.25
-2	624	1481	791
-2.13	632	1437	189.67
-2.13	632	1475	0
-3	686	1437	1266.72
-3.5	717	1487	731
-3.5	717	1487	0
-4	749	1528	753.75
-4.06	752	1536	91.92
-4.34	770	1575	435.54
-4.34	770	1575	0
-5	811	1724	1088.67
-6	874	1918	1821
-6.6	911	1976	1168.2
-7	911	1990	793.2
-8	911	1895	1942.5
-8.06	911	1878	113.19
-8.06	911	1878	0
-9	911	1678	1671.32
-9.76	911	1615	1251.34

PS WATER ELEVATION (FT)	CRITICAL SLIP SURF. ELEVATION (FT)	UNIT WEIGHT WATER (PCF)
-6.6	-6.6	64

RESULTANT WATER LOAD= 0 LBS

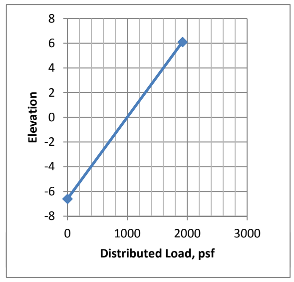
PASSIVE LOAD (SOIL)	19580.2
PASSIVE LOAD (SOIL+WATER)	19580.2
FOS =	1.76

IF THE PS WATER LEVEL IS BELOW THE CRITICAL SLIP SURFACE, USE PASSIVE LOAD (SOIL)

VIII.B.--HORIZONTAL DISTRIBUTED LOAD

ELEVATION (FT)	DIST. LOAD (PSF)	Result. (LBS)
6.1	1920	
-6.6	0	12192

12192



RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

NET SOIL PRESSURES INCLUDE APPLIED HORIZONTAL DISTRIBUTED LOADS.

		<---LEFTSIDE--->		<--RIGHTSIDE--->	
ELEV. (FT)	NET WATER (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)
14	0	0	0	0	0
13	0	0	0	0	0
12	0	0	0	0	0
11	0	0	0	0	0
10	0	0	0	0	0
9	0	0	0	0	0
8	0	0	0	0	0
7	62	0	0	0	0
6.10+	119	0	0	0	0
-6.1	119	909	0	0	0
6.00+	125	1330	0	0	0
-6	125	1330	0	0	909
5	187	1446	0	0	1372
4	250	1562	0	0	1425
3	312	1678	0	0	1479
2.58	338	1726	0	0	1501
2	374	1794	0	0	1533
1	437	1910	0	0	1586
0	499	2036	0	0	1650
-1	562	2019	0	0	1569
-1.5	593	1798	0	0	1336
-2	624	1560	0	0	1052
-2.13+	632	1497	0	0	1014
-2.13-	632	1551	0	0	1014
-3	686	1497	285	0	765
-3.50+	717	1547	321	0	737
-3.50-	717	1547	321	0	751
-4	749	1588	375	47	737
-4.04	751	1593	375	42	751
-4.34+	770	1637	376	0	857
-4.34-	770	1637	376	0	777
-5	811	1799	278	0	857
-6	874	2007	187	0	983
-6.6	911	2067	212	0	1017
-7	911	2081	238	0	1005
-8	911	1968	480	0	882
-8.06+	911	1949	511	0	760
-8.06-	911	1949	511	0	875
-9	911	1721	856	177	760
-9.8	911	1650	933	218	723
-11	911	1627	926	205	721

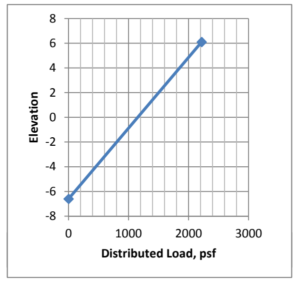
ELEV. (FT)	NET WATER (PSF)	LEFTSIDE PASSIVE (PSF)	RESULT. LEFTSIDE PASSIVE (LBS)
14	0	0	
13	0	0	
12	0	0	
11	0	0	
10	0	0	
9	0	0	
8	0	0	0
7	62	0	0
6.1	119	0	0
6.1	119	909	0
6	125	1330	111.95
6	125	1330	0
5	187	1446	1388
4	250	1562	1504
3	312	1678	1620
2.58	338	1726	714.84
2	374	1794	1020.8
1	437	1910	1852
0	499	2036	1973
-1	562	2019	2027.5
-1.5	593	1798	954.25
-2	624	1560	839.5
-2.13	632	1497	198.705
-2.13	632	1551	0
-3	686	1497	1325.88
-3.5	717	1547	761
-3.5	717	1547	0
-4	749	1588	783.75
-4.04	751	1593	63.62
-4.34	770	1637	484.5
-4.34	770	1637	0
-5	811	1799	1133.88
-6	874	2007	1903
-6.6	911	2067	1222.2
-7	911	2081	829.6
-8	911	1968	2024.5
-8.06	911	1949	117.51
-8.06	911	1949	0
-9	911	1721	1724.9
-9.8	911	1650	1348.4
-11	911	1627	1966.2

PS WATER ELEVATION (FT)	CRITICAL SLIP SURF. ELEVATION (FT)	UNIT WEIGHT WATER (PCF)
-6.6	-6.6	64
RESULTANT WATER LOAD=	0	LBS

PASSIVE LOAD (SOIL) 21882.375
PASSIVE LOAD (SOIL+WATER) 21882.375 **IF THE PS WATER LEVEL IS BELOW THE CRITICAL SLIP SURFACE,**
FOS = 1.54 **USE PASSIVE LOAD (SOIL)**

VIII.B.--HORIZONTAL DISTRIBUTED LOAD

ELEVATION (FT)	DIST. LOAD (PSF)	Result. (LBS)
6.1	2218	
-6.6	0	14084.3



14084.3

RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

NET SOIL PRESSURES INCLUDE APPLIED HORIZONTAL DISTRIBUTED LOADS.

ELEV. (FT)	NET WATER (PSF)	<---LEFTSIDE---> PASSIVE (PSF)	ACTIVE (PSF)	<--RIGHTSIDE---> ACTIVE (PSF)	PASSIVE (PSF)
14	0	0	0	0	0
13	0	0	0	0	0
12	0	0	0	0	0
11	0	0	0	0	0
10	0	0	0	0	0
9	0	0	0	0	0
8	0	0	0	0	0
7	62	0	0	0	0
6.10+	119	0	0	0	0
-6.1	119	1062	0	0	0
6.00+	125	1552	0	0	0
-6	125	1552	0	0	1062
5	187	1668	0	0	1594
4	250	1784	0	0	1647
3	312	1900	0	0	1701
2.61	336	1945	0	0	1722
2	374	2016	0	0	1755
1	437	2132	0	0	1808
0	499	2259	0	0	1873
-1	562	2221	0	0	1771
-1.5	593	1953	0	0	1493
-2	624	1666	0	0	1158
-2.13+	632	1577	0	0	1114
-2.13-	632	1654	0	0	1114
-3	686	1577	285	0	819
-3.50+	717	1628	321	0	782
-3.50-	717	1628	321	0	801
-4	749	1668	375	47	782
-4.02	750	1671	375	45	790
-4.34+	770	1720	376	0	920
-4.34-	770	1720	376	0	829
-5	811	1900	278	0	920
-6	874	2128	187	0	1064
-6.6	911	2190	212	0	1102
-7	911	2203	238	0	1087
-8	911	2066	480	0	941
-8.06+	911	2045	511	0	799
-8.06-	911	2045	511	0	933
-9	911	1778	856	177	799
-9.8	911	1698	933	218	756
-11	911	1674	926	205	756

ELEV. (FT)	NET WATER (PSF)	LEFTSIDE PASSIVE (PSF)	RESULT. LEFTSIDE PASSIVE (LBS)
14	0	0	
13	0	0	
12	0	0	
11	0	0	
10	0	0	
9	0	0	
8	0	0	0
7	62	0	0
6.1	119	0	0
6.1	119	1062	0
6	125	1552	130.7
6	125	1552	0
5	187	1668	1610
4	250	1784	1726
3	312	1900	1842
2.61	336	1945	749.775
2	374	2016	1208.105
1	437	2132	2074
0	499	2259	2195.5
-1	562	2221	2240
-1.5	593	1953	1043.5
-2	624	1666	904.75
-2.13	632	1577	210.795
-2.13	632	1654	0
-3	686	1577	1405.485
-3.5	717	1628	801.25
-3.5	717	1628	0
-4	749	1668	824
-4.02	750	1671	33.39
-4.34	770	1720	542.56
-4.34	770	1720	0
-5	811	1900	1194.6
-6	874	2128	2014
-6.6	911	2190	1295.4
-7	911	2203	878.6
-8	911	2066	2134.5
-8.06	911	2045	123.33
-8.06	911	2045	0
-9	911	1778	1796.81
-9.8	911	1698	1390.4
-11	911	1674	2023.2

PS WATER ELEVATION (FT)	CRITICAL SLIP SURF. ELEVATION (FT)	UNIT WEIGHT WATER (PCF)
-6.6	-6.6	64

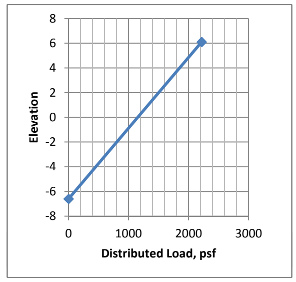
RESULTANT WATER LOAD=	0	LBS

PASSIVE LOAD (SOIL)	24045.81	
PASSIVE LOAD (SOIL+WATER)	24045.81	**IF THE PS WATER LEVEL IS BELOW THE CRITICAL SLIP SURFACE,**
FOS =	1.318	**USE PASSIVE LOAD (SOIL)**

VIII.B.--HORIZONTAL DISTRIBUTED LOAD

ELEVATION (FT)	DIST. LOAD (PSF)	Result. (LBS)
6.1	2633	
-6.6	0	16719.55

16719.55



RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

NET SOIL PRESSURES INCLUDE APPLIED HORIZONTAL DISTRIBUTED LOADS.

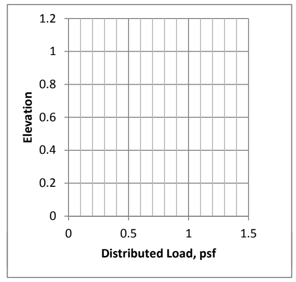
ELEV. (FT)	NET WATER (PSF)	<---LEFTSIDE---> PASSIVE (PSF)	ACTIVE (PSF)	<--RIGHTSIDE---> ACTIVE (PSF)	PASSIVE (PSF)
14	0	0	0	0	0
13	0	0	0	0	0
12	0	0	0	0	0
11	0	0	0	0	0
10	0	0	0	0	0
9	0	0	0	0	0
8	0	0	0	0	0
7	62	0	0	0	0
6.10+	119	0	0	0	0
-6.1	119	1279	0	0	0
6.00+	125	1865	0	0	0
-6	125	1865	0	0	1279
5	187	1981	0	0	1907
4	250	2097	0	0	1961
3	312	2213	0	0	2015
2.66	333	2253	0	0	2033
2	374	2329	0	0	2068
1	437	2445	0	0	2122
0	499	2575	0	0	2189
-1	562	2505	0	0	2055
-1.5	593	2171	0	0	1716
-2	624	1816	0	0	1309
-2.13+	632	1691	0	0	1254
-2.13-	632	1799	0	0	1254
-3	686	1691	285	0	895
-3.50+	717	1743	321	0	847
-3.50-	717	1743	321	0	871
-3.99	748	1781	374	47	847
-4	749	1782	375	47	847
-4.34+	770	1838	376	0	1009
-4.34-	770	1838	376	0	902
-5	811	2042	278	0	1009
-6	874	2298	187	0	1179
-6.6	911	2364	212	0	1222
-7	911	2376	238	0	1203
-8	911	2206	480	0	1025
-8.06+	911	2179	511	0	854
-8.06-	911	2179	511	0	1015
-9	911	1859	856	177	854
-9.57	911	1765	933	218	804
-11	911	1739	926	205	804

ELEV. (FT)	NET WATER (PSF)	LEFTSIDE PASSIVE (PSF)	RESULT. LEFTSIDE PASSIVE (LBS)
14	0	0	
13	0	0	
12	0	0	
11	0	0	
10	0	0	
9	0	0	
8	0	0	0
7	62	0	0
6.1	119	0	0
6.1	119	1279	0
6	125	1865	157.2
6	125	1865	0
5	187	1981	1923
4	250	2097	2039
3	312	2213	2155
2.66	333	2253	759.22
2	374	2329	1512.06
1	437	2445	2387
0	499	2575	2510
-1	562	2505	2540
-1.5	593	2171	1169
-2	624	1816	996.75
-2.13	632	1691	227.955
-2.13	632	1799	0
-3	686	1691	1518.15
-3.5	717	1743	858.5
-3.5	717	1743	0
-3.99	748	1781	863.38
-4	749	1782	17.815
-4.34	770	1838	615.4
-4.34	770	1838	0
-5	811	2042	1280.4
-6	874	2298	2170
-6.6	911	2364	1398.6
-7	911	2376	948
-8	911	2206	2291
-8.06	911	2179	131.55
-8.06	911	2179	0
-9	911	1859	1897.86
-9.57	911	1765	1032.84
-11	911	1739	2505.36

PS WATER ELEVATION (FT)	CRITICAL SLIP SURF. ELEVATION (FT)	UNIT WEIGHT WATER (PCF)
-6.6	-6.6	64

RESULTANT WATER LOAD= 0 LBS

PASSIVE LOAD (SOIL)	27098.43	
PASSIVE LOAD (SOIL+WATER)	27098.43	**IF THE PS WATER LEVEL IS BELOW THE CRITICAL SLIP SURFACE,**
FOS =	1.095	**USE PASSIVE LOAD (SOIL)**


1.2
1
0.8
0.6
0.4
0.2
0
Elevation
0
0.5
1
1.5
Distributed Load, psf

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS
DATE: 7-OCTOBER-2013 TIME: 12:28:00

****
* INPUT DATA *
****

I.--HEADING
'ORLEANS CANAL
'ETL ROTATIONAL ANALYSIS
'MVK DISTRICT
'REACH 17B

II.--CONTROL
CANTILEVER WALL DESIGN
FACTOR OF SAFETY FOR ACTIVE PRESSURES = 1.00
FACTOR OF SAFETY FOR PASSIVE PRESSURES = 1.76

III.--WALL DATA
ELEVATION AT TOP OF WALL = 14.00 FT.

IV.--SURFACE POINT DATA

IV.A.--RIGHTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	6.00
8.60	6.00
22.70	-0.40
50.20	-1.80
66.50	-6.80
106.40	-6.80

IV.B.--LEFTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	6.10
8.00	6.10
14.50	5.70
31.50	0.60
93.50	-2.50
103.00	-5.60
113.40	-4.60
133.00	-4.20

V.--SOIL LAYER DATA

V.A.--RIGHTSIDE
LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

ANGLE OF ANGLE OF <-SAFETY->

		ANGLE OF		ANGLE OF				<-SAFETY->	
SAT.	MOIST	INTERNAL	COH-	WALL	ADH-	<--BOTTOM-->		<-FACTOR->	
WGHT.	WGHT.	FRICTION	ESION	FRICTION	ESION	ELEV.	SLOPE	ACT.	PASS.
(PCF)	(PCF)	(DEG)	(PSF)	(DEG)	(PSF)	(FT)	(FT/FT)		
116.00	116.00	0.00	700.00	0.00	630.00	-1.50	0.00	DEF	DEF
97.00	97.00	0.00	275.00	0.00	275.00	-5.00	0.00	DEF	DEF
97.00	97.00	0.00	400.00	0.00	400.00	-8.00	0.00	DEF	DEF
73.00	73.00	0.00	250.00	0.00	250.00	-12.50	0.00	DEF	DEF
111.00	111.00	0.00	250.00	0.00	250.00	-20.00	0.00	DEF	DEF
120.00	120.00	33.00	0.00	18.00	0.00	-41.00	0.00	DEF	DEF
105.00	105.00	0.00	748.00	0.00	600.00			DEF	DEF

V.B.--LEFTSIDE

LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

		ANGLE OF		ANGLE OF				<-SAFETY->	
SAT.	MOIST	INTERNAL	COH-	WALL	ADH-	<--BOTTOM-->		<-FACTOR->	
WGHT.	WGHT.	FRICTION	ESION	FRICTION	ESION	ELEV.	SLOPE	ACT.	PASS.
(PCF)	(PCF)	(DEG)	(PSF)	(DEG)	(PSF)	(FT)	(FT/FT)		
116.00	116.00	0.00	700.00	0.00	630.00	-1.50	0.00	DEF	DEF
97.00	97.00	0.00	275.00	0.00	275.00	-5.00	0.00	DEF	DEF
97.00	97.00	0.00	400.00	0.00	400.00	-8.00	0.00	DEF	DEF
73.00	73.00	0.00	250.00	0.00	250.00	-12.50	0.00	DEF	DEF
111.00	111.00	0.00	250.00	0.00	250.00	-20.00	0.00	DEF	DEF
122.00	122.00	33.00	0.00	18.00	0.00	-41.00	0.00	DEF	DEF
105.00	105.00	0.00	748.00	0.00	600.00			DEF	DEF

VI.--WATER DATA

UNIT WEIGHT = 62.40 (PCF)
RIGHTSIDE ELEVATION = 8.00 (FT)
LEFTSIDE ELEVATION = -6.60 (FT)
NO SEEPAGE

VII.--VERTICAL SURCHARGE LOADS

NONE

VIII.--HORIZONTAL LOADS

VIII.A.--HORIZONTAL LINE LOADS

NONE

VIII.B.--HORIZONTAL DISTRIBUTED LOADS

ELEVATION	DIST. LOAD
(FT)	(PSF)
6.10	1698.00
-6.60	0.00

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS
DATE: 7-OCTOBER-2013 TIME: 12:28:02

****
* SOIL PRESSURES FOR *
* CANTILEVER WALL DESIGN *
****

I.--HEADING
'ORLEANS CANAL
'ETL ROTATIONAL ANALYSIS
'MVK DISTRICT
'REACH 17B

II.--SOIL PRESSURES

RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

NET SOIL PRESSURES INCLUDE APPLIED HORIZONTAL DISTRIBUTED LOADS.

	NET	<---LEFTSIDE--->		<------NET------> (SOIL + WATER)		<--RIGHTSIDE--->	
ELEV. (FT)	WATER (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)
14.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
13.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7.0	62.4	0.0	0.0	62.4	62.4	0.0	0.0
6.1+	118.6	0.0	0.0	118.6	118.6	0.0	0.0
6.1-	118.6	795.5	0.0	1021.1	1816.6	0.0	0.0
6.0+	124.8	1165.0	0.0	644.4	1809.4	0.0	0.0
6.0-	124.8	1165.0	0.0	644.4	2604.9	0.0	795.5
5.0	187.2	1281.0	0.0	457.1	2945.1	0.0	1207.0
4.0	249.6	1397.0	0.0	269.8	2927.4	0.0	1260.6
3.0	312.0	1513.0	0.0	82.5	2909.7	0.0	1314.2
2.6	339.5	1564.1	0.0	0.0	2901.9	0.0	1337.8
2.0	374.4	1629.0	0.0	-104.8	2892.0	0.0	1367.8
1.0	436.8	1745.0	0.0	-292.1	2874.3	0.0	1421.4
0.0	499.2	1869.6	0.0	-488.0	2865.2	0.0	1483.6
-1.0	561.6	1869.8	0.0	-559.5	2730.5	0.0	1420.1
-1.5	592.8	1683.1	0.0	-408.4	2493.5	0.0	1218.8
-2.0	624.0	1480.7	0.0	-241.6	2211.6	0.0	972.6
-2.1+	632.2	1437.1	0.0	-226.4	2169.7	0.0	940.0
-2.1-	632.2	1474.9	0.0	-226.4	2169.7	0.0	940.0
-3.0	686.4	1437.1	285.2	-269.4	1607.9	0.0	725.4

-3.5+	717.4	1486.8	321.4	-354.6	1519.3	0.0	702.8
-3.5-	717.4	1486.8	321.4	-354.6	1519.3	0.0	714.2
-4.0	748.8	1527.8	374.5	-384.0	1424.7	47.4	702.8
-4.3+	769.9	1574.5	376.4	-502.2	1470.6	0.0	810.2
-4.3-	769.9	1574.5	376.4	-502.2	1470.6	0.0	739.0
-5.0	811.2	1724.1	278.4	-699.0	1556.9	0.0	810.2
-6.0	873.6	1917.5	187.0	-963.7	1689.3	0.0	922.5
-6.6	911.0	1975.9	211.7	-1064.8	1653.1	0.0	953.7
-7.0	911.0	1990.4	237.6	-1079.3	1618.0	0.0	944.6
-8.0	911.0	1894.6	480.4	-983.6	1268.8	0.0	838.2
-8.1+	911.0	1878.4	511.2	-967.4	1181.5	0.0	731.5
-8.1-	911.0	1878.4	511.2	-967.4	1181.5	0.0	831.8
-9.0	911.0	1678.3	856.4	-590.8	786.1	176.5	731.5
-10.0	911.0	1614.7	932.9	-485.2	676.3	218.5	698.2
-11.0	911.0	1592.6	926.4	-476.4	680.5	205.2	695.9
-12.0	911.0	1577.8	908.3	-467.5	692.7	199.2	689.9
-12.5	911.0	1574.6	905.1	-462.5	697.7	201.0	691.7
-13.0	911.0	1580.6	911.1	-457.5	702.7	212.1	702.8
-14.0	911.0	1602.3	932.8	-447.5	725.8	243.8	747.5
-15.0	911.0	1624.1	954.6	-437.4	752.5	275.7	796.1
-16.0	911.0	1646.0	976.5	-427.4	779.3	307.5	844.7
-17.0	911.0	1691.1	998.3	-440.7	806.0	339.4	893.3
-18.0	911.0	1739.7	887.0	-598.5	965.9	230.2	941.9
-19.0	911.0	2489.6	2125.4	-46.0	357.2	1532.5	1571.6
-20.0	911.0	4008.6	3332.7	-130.0	248.7	2967.5	2670.4
-21.0	911.0	4029.7	1689.9	-1554.0	1517.8	1564.6	2296.7
-22.0	911.0	3629.8	354.9	-2421.3	2458.1	297.5	1901.9
-23.0	911.0	3780.4	512.4	-2425.8	2629.4	443.6	2230.8
-24.0	911.0	3880.4	519.1	-2515.6	2805.4	453.8	2413.5
-25.0	911.0	3979.3	526.0	-2645.3	2929.7	423.0	2544.7

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS
DATE: 7-OCTOBER-2013 TIME: 12:28:03

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*****************************
*  SUMMARY OF RESULTS FOR  *
*  CANTILEVER WALL DESIGN  *
*****************************
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I.--HEADING
'ORLEANS CANAL
'ETL ROTATIONAL ANALYSIS
'MVK DISTRICT
'REACH 17B

II.--SUMMARY

RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

WALL BOTTOM ELEV. (FT) : -9.76
PENETRATION (FT) : 15.76

MAX. BEND. MOMENT (LB-FT) : 6.5738E+03
AT ELEVATION (FT) : -1.32

MAX. SCALED DEFL. (LB-IN^3): 1.5096E+09
AT ELEVATION (FT) : 14.00

NOTE: DIVIDE SCALED DEFLECTION MODULUS OF
ELLASTICITY IN PSI TIMES PILE MOMENT
OF INERTIA IN IN^4 TO OBTAIN DEFLECTION
IN INCHES.

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHOREDOR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS
DATE: 7-OCTOBER-2013 TIME: 12:28:03

****
* COMPLETE OF RESULTS FOR *
* CANTILEVER WALL DESIGN *
****

I.--HEADING
'ORLEANS CANAL
'ETL ROTATIONAL ANALYSIS
'MVK DISTRICT
'REACH 17B

II.--RESULTS

ELEVATION (FT)	BENDING MOMENT (LB-FT)	SHEAR (LB)	SCALED DEFLECTION (LB-IN^3)	NET PRESSURE (PSF)
14.00	0.0000E+00	0.	1.5096E+09	0.00
13.00	-8.7311E-11	0.	1.4133E+09	0.00
12.00	-8.7311E-11	0.	1.3170E+09	0.00
11.00	-8.7311E-11	0.	1.2207E+09	0.00
10.00	-8.7311E-11	0.	1.1244E+09	0.00
9.00	-8.7311E-11	0.	1.0281E+09	0.00
8.00	-8.7311E-11	0.	9.3184E+08	0.00
7.00	1.0400E+01	31.	8.3555E+08	62.40
6.10+	7.1334E+01	113.	7.4890E+08	118.56

6.10-	7.1334E+01	113.	7.4890E+08	1021.11
6.00	8.7075E+01	196.	7.3928E+08	644.42
5.00	5.7398E+02	747.	6.4324E+08	457.12
4.00	1.5180E+03	1110.	5.4825E+08	269.82
3.00	2.7318E+03	1286.	4.5593E+08	82.52
2.56	3.3039E+03	1304.	4.1662E+08	0.00
2.00	4.0282E+03	1275.	3.6834E+08	-104.78
1.00	5.2198E+03	1077.	2.8769E+08	-292.08
0.00	6.1178E+03	687.	2.1602E+08	-487.97
-1.00	6.5487E+03	163.	1.5486E+08	-559.50
-1.50	6.5665E+03	-79.	1.2848E+08	-408.40
-2.00	6.4829E+03	-241.	1.0493E+08	-241.64
-2.13	6.4490E+03	-272.	9.9195E+07	-226.39
-3.00	6.1219E+03	-488.	6.6170E+07	-269.39
-3.50	5.8426E+03	-643.	5.0877E+07	-354.57
-4.00	5.4734E+03	-828.	3.7946E+07	-384.03
-4.06	5.4251E+03	-851.	3.6621E+07	-404.20
-4.34	5.1718E+03	-957.	3.0620E+07	-349.89
-5.00	4.4706E+03	-1146.	1.9128E+07	-221.26
-6.00	3.2466E+03	-1270.	8.0026E+06	-27.14
-6.60	2.4867E+03	-1251.	4.1578E+06	89.33
-7.00	1.9954E+03	-1200.	2.4835E+06	166.98
-8.00	9.1115E+02	-936.	4.3644E+05	361.10
-8.06	8.5573E+02	-914.	3.8127E+05	372.73
-9.00	1.8803E+02	-478.	1.5854E+04	555.22
-9.76	0.0000E+00	0.	0.0000E+00	702.70

NOTE: DIVIDE SCALED DEFLECTION MODULUS OF ELLASTICITY IN PSI TIMES PILE MOMENT OF INERTIA IN IN^4 TO OBTAIN DEFLECTION IN INCHES.

III.--WATER AND SOIL PRESSURES

		<-------------SOIL PRESSURES-------------->			
	WATER	<----LEFTSIDE----->		<---RIGHTSIDE---->	
ELEVATION	PRESSURE	PASSIVE	ACTIVE	ACTIVE	PASSIVE
(FT)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)
14.00	0.	0.	0.	0.	0.
13.00	0.	0.	0.	0.	0.
12.00	0.	0.	0.	0.	0.
11.00	0.	0.	0.	0.	0.
10.00	0.	0.	0.	0.	0.
9.00	0.	0.	0.	0.	0.
8.00	0.	0.	0.	0.	0.
7.00	62.	0.	0.	0.	0.
6.10+	119.	0.	0.	0.	0.
6.10-	119.	795.	0.	0.	0.
6.00+	125.	1165.	0.	0.	0.
6.00-	125.	1165.	0.	0.	795.
5.00	187.	1281.	0.	0.	1207.
4.00	250.	1397.	0.	0.	1261.
3.00	312.	1513.	0.	0.	1314.
2.56	339.	1564.	0.	0.	1338.

2.00	374.	1629.	0.	0.	1368.
1.00	437.	1745.	0.	0.	1421.
0.00	499.	1870.	0.	0.	1484.
-1.00	562.	1870.	0.	0.	1420.
-1.50	593.	1683.	0.	0.	1219.
-2.00	624.	1481.	0.	0.	973.
-2.13+	632.	1437.	0.	0.	940.
-2.13-	632.	1475.	0.	0.	940.
-3.00	686.	1437.	285.	0.	725.
-3.50+	717.	1487.	321.	0.	703.
-3.50-	717.	1487.	321.	0.	714.
-4.00	749.	1528.	375.	47.	703.
-4.06	752.	1536.	375.	39.	721.
-4.34+	770.	1575.	376.	0.	810.
-4.34-	770.	1575.	376.	0.	739.
-5.00	811.	1724.	278.	0.	810.
-6.00	874.	1918.	187.	0.	923.
-6.60	911.	1976.	212.	0.	954.
-7.00	911.	1990.	238.	0.	945.
-8.00	911.	1895.	480.	0.	838.
-8.06+	911.	1878.	511.	0.	731.
-8.06-	911.	1878.	511.	0.	832.
-9.00	911.	1678.	856.	177.	731.
-9.76	911.	1615.	933.	218.	698.
-11.00	911.	1593.	926.	205.	696.

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS
DATE: 7-OCTOBER-2013 TIME: 12:35:49

****
* INPUT DATA *
****

I.--HEADING
'ORLEANS CANAL
'ETL ROTATIONAL ANALYSIS
'MVK DISTRICT
'REACH 17B

II.--CONTROL
CANTILEVER WALL DESIGN
FACTOR OF SAFETY FOR ACTIVE PRESSURES = 1.00
FACTOR OF SAFETY FOR PASSIVE PRESSURES = 1.54

III.--WALL DATA
ELEVATION AT TOP OF WALL = 14.00 FT.

IV.--SURFACE POINT DATA

IV.A.--RIGHTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	6.00
8.60	6.00
22.70	-0.40
50.20	-1.80
66.50	-6.80
106.40	-6.80

IV.B.--LEFTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	6.10
8.00	6.10
14.50	5.70
31.50	0.60
93.50	-2.50
103.00	-5.60
113.40	-4.60
133.00	-4.20

V.--SOIL LAYER DATA

V.A.--RIGHTSIDE
LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

ANGLE OF ANGLE OF <-SAFETY->

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	INTERNAL FRICTION (DEG)	COH-ESION (PSF)	WALL FRICTION (DEG)	ADH-ESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-FACTOR-> ACT.	PASS.
116.00	116.00	0.00	700.00	0.00	630.00	-1.50	0.00	DEF	DEF
97.00	97.00	0.00	275.00	0.00	275.00	-5.00	0.00	DEF	DEF
97.00	97.00	0.00	400.00	0.00	400.00	-8.00	0.00	DEF	DEF
73.00	73.00	0.00	250.00	0.00	250.00	-12.50	0.00	DEF	DEF
111.00	111.00	0.00	250.00	0.00	250.00	-20.00	0.00	DEF	DEF
120.00	120.00	33.00	0.00	18.00	0.00	-41.00	0.00	DEF	DEF
105.00	105.00	0.00	748.00	0.00	600.00			DEF	DEF

V.B.--LEFTSIDE

LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH-ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH-ESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.
116.00	116.00	0.00	700.00	0.00	630.00	-1.50	0.00	DEF	DEF
97.00	97.00	0.00	275.00	0.00	275.00	-5.00	0.00	DEF	DEF
97.00	97.00	0.00	400.00	0.00	400.00	-8.00	0.00	DEF	DEF
73.00	73.00	0.00	250.00	0.00	250.00	-12.50	0.00	DEF	DEF
111.00	111.00	0.00	250.00	0.00	250.00	-20.00	0.00	DEF	DEF
122.00	122.00	33.00	0.00	18.00	0.00	-41.00	0.00	DEF	DEF
105.00	105.00	0.00	748.00	0.00	600.00			DEF	DEF

VI.--WATER DATA

UNIT WEIGHT = 62.40 (PCF)
RIGHTSIDE ELEVATION = 8.00 (FT)
LEFTSIDE ELEVATION = -6.60 (FT)
NO SEEPAGE

VII.--VERTICAL SURCHARGE LOADS

NONE

VIII.--HORIZONTAL LOADS

VIII.A.--HORIZONTAL LINE LOADS

NONE

VIII.B.--HORIZONTAL DISTRIBUTED LOADS

ELEVATION (FT)	DIST. LOAD (PSF)
6.10	1920.00
-6.60	0.00

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS
DATE: 7-OCTOBER-2013 TIME: 12:35:51

****
* SOIL PRESSURES FOR *
* CANTILEVER WALL DESIGN *
****

I.--HEADING
'ORLEANS CANAL
'ETL ROTATIONAL ANALYSIS
'MVK DISTRICT
'REACH 17B

II.--SOIL PRESSURES

RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

NET SOIL PRESSURES INCLUDE APPLIED HORIZONTAL DISTRIBUTED LOADS.

	NET	<---LEFTSIDE--->		<------NET------> (SOIL + WATER)		<--RIGHTSIDE--->	
ELEV.	WATER	PASSIVE	ACTIVE	ACTIVE	PASSIVE	ACTIVE	PASSIVE
(FT)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)
14.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
13.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7.0	62.4	0.0	0.0	62.4	62.4	0.0	0.0
6.1+	118.6	0.0	0.0	118.6	118.6	0.0	0.0
6.1-	118.6	909.1	0.0	1129.5	2038.6	0.0	0.0
6.0+	124.8	1329.8	0.0	699.9	2029.7	0.0	0.0
6.0-	124.8	1329.8	0.0	699.9	2938.8	0.0	909.1
5.0	187.2	1445.8	0.0	495.1	3312.7	0.0	1371.8
4.0	249.6	1561.8	0.0	290.3	3277.5	0.0	1425.4
3.0	312.0	1677.8	0.0	85.6	3242.3	0.0	1479.0
2.6	338.1	1726.2	0.0	0.0	3227.6	0.0	1501.4
2.0	374.4	1793.8	0.0	-119.2	3207.1	0.0	1532.6
1.0	436.8	1909.8	0.0	-324.0	3172.0	0.0	1586.2
0.0	499.2	2035.6	0.0	-538.6	3146.6	0.0	1649.6
-1.0	561.6	2019.3	0.0	-611.1	2977.6	0.0	1569.4
-1.5	592.8	1797.9	0.0	-434.1	2699.6	0.0	1335.8
-2.0	624.0	1559.5	0.0	-240.1	2371.1	0.0	1051.7
-2.1+	632.2	1496.7	0.0	-216.3	2321.7	0.0	1014.0
-2.1-	632.2	1551.3	0.0	-216.3	2321.7	0.0	1014.0
-3.0	686.4	1496.7	285.2	-266.1	1710.8	0.0	765.4

-3.5+	717.4	1547.2	321.4	-360.7	1609.0	0.0	736.7
-3.5-	717.4	1547.2	321.4	-360.7	1609.0	0.0	751.1
-4.0	748.8	1587.5	374.5	-398.3	1504.1	47.4	736.7
-4.3+	769.9	1636.5	376.4	-524.6	1552.6	0.0	857.0
-4.3-	769.9	1636.5	376.4	-524.6	1552.6	0.0	777.3
-5.0	811.2	1798.9	278.4	-745.9	1631.6	0.0	857.0
-6.0	873.6	2007.1	187.0	-1042.8	1760.1	0.0	982.8
-6.6	911.0	2067.2	211.7	-1156.1	1716.2	0.0	1016.9
-7.0	911.0	2081.1	237.6	-1170.0	1678.9	0.0	1005.5
-8.0	911.0	1967.8	480.4	-1056.8	1312.7	0.0	882.1
-8.1+	911.0	1949.2	511.2	-1038.2	1217.3	0.0	760.2
-8.1-	911.0	1949.2	511.2	-1038.2	1217.3	0.0	874.8
-9.0	911.0	1720.9	856.4	-633.3	814.8	176.5	760.2
-10.0	911.0	1650.0	932.9	-520.4	701.2	218.5	723.0
-11.0	911.0	1627.0	926.4	-510.9	705.9	205.2	721.3
-12.0	911.0	1612.4	908.3	-502.2	718.1	199.2	715.3
-12.5	911.0	1609.2	905.1	-497.2	723.1	201.0	717.1
-13.0	911.0	1615.3	911.1	-492.1	728.1	212.1	728.2
-14.0	911.0	1636.9	932.8	-482.1	738.2	243.8	759.9
-15.0	911.0	1658.8	954.6	-472.1	752.5	275.7	796.1
-16.0	911.0	1680.6	976.5	-462.0	779.3	307.5	844.7
-17.0	911.0	1702.5	998.3	-452.0	806.0	339.4	893.3
-18.0	911.0	1739.7	887.0	-598.5	965.9	230.2	941.9
-19.0	911.0	2766.2	2125.4	-322.6	603.2	1532.5	1817.6
-20.0	911.0	4709.5	3332.7	-830.9	826.9	2967.5	3248.5
-21.0	911.0	4654.5	1689.9	-2178.9	1944.5	1564.6	2723.4
-22.0	911.0	4090.0	354.9	-2881.5	2728.3	297.5	2172.2
-23.0	911.0	4280.8	512.4	-2926.2	2959.3	443.6	2560.6
-24.0	911.0	4401.7	519.1	-3036.9	3155.9	453.8	2764.0
-25.0	911.0	4518.1	526.0	-3184.1	3300.1	423.0	2915.1

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS
DATE: 7-OCTOBER-2013 TIME: 12:35:51

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******************************
*  SUMMARY OF RESULTS FOR  *
*  CANTILEVER WALL DESIGN  *
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I.--HEADING
'ORLEANS CANAL
'ETL ROTATIONAL ANALYSIS
'MVK DISTRICT
'REACH 17B

II.--SUMMARY

RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

WALL BOTTOM ELEV. (FT) : -9.80
PENETRATION (FT) : 15.80

MAX. BEND. MOMENT (LB-FT) : 6.9840E+03
AT ELEVATION (FT) : -1.24

MAX. SCALED DEFL. (LB-IN^3): 1.6018E+09
AT ELEVATION (FT) : 14.00

NOTE: DIVIDE SCALED DEFLECTION MODULUS OF
ELLASTICITY IN PSI TIMES PILE MOMENT
OF INERTIA IN IN^4 TO OBTAIN DEFLECTION
IN INCHES.

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHOREDOR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS
DATE: 7-OCTOBER-2013 TIME: 12:35:51

****
* COMPLETE OF RESULTS FOR *
* CANTILEVER WALL DESIGN *
****

I.--HEADING
'ORLEANS CANAL
'ETL ROTATIONAL ANALYSIS
'MVK DISTRICT
'REACH 17B

II.--RESULTS

ELEVATION (FT)	BENDING MOMENT (LB-FT)	SHEAR (LB)	SCALED DEFLECTION (LB-IN^3)	NET PRESSURE (PSF)
14.00	0.0000E+00	0.	1.6018E+09	0.00
13.00	-4.3656E-11	0.	1.4996E+09	0.00
12.00	-4.3656E-11	0.	1.3973E+09	0.00
11.00	-4.3656E-11	0.	1.2951E+09	0.00
10.00	-4.3656E-11	0.	1.1928E+09	0.00
9.00	-4.3656E-11	0.	1.0905E+09	0.00
8.00	-4.3656E-11	0.	9.8829E+08	0.00
7.00	1.0400E+01	31.	8.8603E+08	62.40
6.10+	7.1334E+01	113.	7.9402E+08	118.56

6.10-	7.1334E+01	113.	7.9402E+08	1129.47
6.00	8.7528E+01	204.	7.8380E+08	699.90
5.00	6.0745E+02	802.	6.8180E+08	495.12
4.00	1.6225E+03	1194.	5.8092E+08	290.34
3.00	2.9279E+03	1382.	4.8288E+08	85.56
2.58	3.5104E+03	1400.	4.4329E+08	0.00
2.00	4.3188E+03	1365.	3.8992E+08	-119.22
1.00	5.5905E+03	1144.	3.0440E+08	-324.01
0.00	6.5366E+03	713.	2.2849E+08	-538.60
-1.00	6.9677E+03	138.	1.6380E+08	-611.08
-1.50	6.9676E+03	-124.	1.3594E+08	-434.12
-2.00	6.8596E+03	-292.	1.1108E+08	-240.11
-2.13	6.8191E+03	-322.	1.0502E+08	-216.26
-3.00	6.4515E+03	-532.	7.0161E+07	-266.08
-3.50	6.1504E+03	-687.	5.4015E+07	-360.65
-4.00	5.7576E+03	-878.	4.0355E+07	-398.28
-4.04	5.7223E+03	-894.	3.9382E+07	-413.20
-4.34	5.4388E+03	-1009.	3.2610E+07	-354.51
-5.00	4.7022E+03	-1200.	2.0444E+07	-223.79
-6.00	3.4230E+03	-1325.	8.6255E+06	-26.52
-6.60	2.6301E+03	-1306.	4.5173E+06	91.85
-7.00	2.1173E+03	-1253.	2.7181E+06	170.76
-8.00	9.8228E+02	-984.	4.9403E+05	368.03
-8.06	9.2400E+02	-961.	4.3301E+05	379.85
-9.00	2.1534E+02	-517.	2.0291E+04	565.31
-9.80	0.0000E+00	0.	0.0000E+00	723.62

NOTE: DIVIDE SCALED DEFLECTION MODULUS OF
ELLASTICITY IN PSI TIMES PILE MOMENT
OF INERTIA IN IN^4 TO OBTAIN DEFLECTION
IN INCHES.

III.--WATER AND SOIL PRESSURES

		<-------------SOIL PRESSURES-------------->			
	WATER	<----LEFTSIDE----->		<---RIGHTSIDE---->	
ELEVATION	PRESSURE	PASSIVE	ACTIVE	ACTIVE	PASSIVE
(FT)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)
14.00	0.	0.	0.	0.	0.
13.00	0.	0.	0.	0.	0.
12.00	0.	0.	0.	0.	0.
11.00	0.	0.	0.	0.	0.
10.00	0.	0.	0.	0.	0.
9.00	0.	0.	0.	0.	0.
8.00	0.	0.	0.	0.	0.
7.00	62.	0.	0.	0.	0.
6.10+	119.	0.	0.	0.	0.
6.10-	119.	909.	0.	0.	0.
6.00+	125.	1330.	0.	0.	0.
6.00-	125.	1330.	0.	0.	909.
5.00	187.	1446.	0.	0.	1372.
4.00	250.	1562.	0.	0.	1425.
3.00	312.	1678.	0.	0.	1479.
2.58	338.	1726.	0.	0.	1501.

2.00	374.	1794.	0.	0.	1533.
1.00	437.	1910.	0.	0.	1586.
0.00	499.	2036.	0.	0.	1650.
-1.00	562.	2019.	0.	0.	1569.
-1.50	593.	1798.	0.	0.	1336.
-2.00	624.	1560.	0.	0.	1052.
-2.13+	632.	1497.	0.	0.	1014.
-2.13-	632.	1551.	0.	0.	1014.
-3.00	686.	1497.	285.	0.	765.
-3.50+	717.	1547.	321.	0.	737.
-3.50-	717.	1547.	321.	0.	751.
-4.00	749.	1588.	375.	47.	737.
-4.04	751.	1593.	375.	42.	751.
-4.34+	770.	1637.	376.	0.	857.
-4.34-	770.	1637.	376.	0.	777.
-5.00	811.	1799.	278.	0.	857.
-6.00	874.	2007.	187.	0.	983.
-6.60	911.	2067.	212.	0.	1017.
-7.00	911.	2081.	238.	0.	1005.
-8.00	911.	1968.	480.	0.	882.
-8.06+	911.	1949.	511.	0.	760.
-8.06-	911.	1949.	511.	0.	875.
-9.00	911.	1721.	856.	177.	760.
-9.80	911.	1650.	933.	218.	723.
-11.00	911.	1627.	926.	205.	721.

```
'ORLEANS CANAL
'ETL ROTATIONAL ANALYSIS
'MVK DISTRICT
'REACH 17B
CONTROL  CANTILEVER  DESIGN  1.00  1.54
WALL   14
SURFACE RIGHTSIDE   6    0    6
              8.6    6
              22.7   -0.4
              50.2   -1.8
              66.5   -6.8
              106.4   -6.8
SURFACE LEFTSIDE   8    0    6.1
              8    6.1
              14.5    5.7
              31.5    0.6
              93.5   -2.5
              103   -5.6
              113.4   -4.6
              133   -4.2
SOIL RIGHTSIDE  STRENGTHS   7
  116    116    0    700    0    630   -1.5   0
  97    97    0    275    0    275   -5   0
  97    97    0    400    0    400   -8   0
  73    73    0    250    0    250   -12.5   0
  111    111    0    250    0    250   -20   0
  120    120    33    0    18    0   -41   0
  105    105    0    748    0    600
SOIL LEFTSIDE  STRENGTHS   7
  116    116    0    700    0    630   -1.5   0
  97    97    0    275    0    275   -5   0
  97    97    0    400    0    400   -8   0
  73    73    0    250    0    250   -12.5   0
  111    111    0    250    0    250   -20   0
  122    122    33    0    18    0   -41   0
  105    105    0    748    0    600
WATER ELEVATIONS   62.4    8   -6.6
HORIZONTAL DISTRIBUTED   2    6.1    1920   -6.6    0
FINISHED
```

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'ORLEANS CANAL
'ETL ROTATIONAL ANALYSIS
'MVK DISTRICT
'REACH 17B
CONTROL  CANTILEVER  DESIGN  1.00  1.32
WALL   14
SURFACE RIGHTSIDE   6    0    6
                  8.6    6
                  22.7   -0.4
                  50.2   -1.8
                  66.5   -6.8
                  106.4   -6.8
SURFACE LEFTSIDE   8    0    6.1
                  8    6.1
                  14.5    5.7
                  31.5    0.6
                  93.5   -2.5
                  103   -5.6
                  113.4   -4.6
                  133   -4.2
SOIL RIGHTSIDE  STRENGTHS   7
   116    116    0    700    0    630   -1.5   0
   97    97    0    275    0    275   -5   0
   97    97    0    400    0    400   -8   0
   73    73    0    250    0    250   -12.5   0
   111    111    0    250    0    250   -20   0
   120    120    33    0    18    0   -41   0
   105    105    0    748    0    600
SOIL LEFTSIDE  STRENGTHS   7
   116    116    0    700    0    630   -1.5   0
   97    97    0    275    0    275   -5   0
   97    97    0    400    0    400   -8   0
   73    73    0    250    0    250   -12.5   0
   111    111    0    250    0    250   -20   0
   122    122    33    0    18    0   -41   0
   105    105    0    748    0    600
WATER ELEVATIONS   62.4    8   -6.6
HORIZONTAL DISTRIBUTED   2    6.1    2218   -6.6    0
FINISHED
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PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS
DATE: 7-OCTOBER-2013 TIME: 12:48:04

****
* INPUT DATA *
****

I.--HEADING
'ORLEANS CANAL
'ETL ROTATIONAL ANALYSIS
'MVK DISTRICT
'REACH 17B

II.--CONTROL
CANTILEVER WALL DESIGN
FACTOR OF SAFETY FOR ACTIVE PRESSURES = 1.00
FACTOR OF SAFETY FOR PASSIVE PRESSURES = 1.32

III.--WALL DATA
ELEVATION AT TOP OF WALL = 14.00 FT.

IV.--SURFACE POINT DATA

IV.A.--RIGHTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	6.00
8.60	6.00
22.70	-0.40
50.20	-1.80
66.50	-6.80
106.40	-6.80

IV.B.--LEFTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	6.10
8.00	6.10
14.50	5.70
31.50	0.60
93.50	-2.50
103.00	-5.60
113.40	-4.60
133.00	-4.20

V.--SOIL LAYER DATA

V.A.--RIGHTSIDE
LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

ANGLE OF ANGLE OF <-SAFETY->

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	INTERNAL FRICTION (DEG)	COHESION (PSF)	WALL FRICTION (DEG)	ADHESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-FACTOR-> ACT.	PASS.
116.00	116.00	0.00	700.00	0.00	630.00	-1.50	0.00	DEF	DEF
97.00	97.00	0.00	275.00	0.00	275.00	-5.00	0.00	DEF	DEF
97.00	97.00	0.00	400.00	0.00	400.00	-8.00	0.00	DEF	DEF
73.00	73.00	0.00	250.00	0.00	250.00	-12.50	0.00	DEF	DEF
111.00	111.00	0.00	250.00	0.00	250.00	-20.00	0.00	DEF	DEF
120.00	120.00	33.00	0.00	18.00	0.00	-41.00	0.00	DEF	DEF
105.00	105.00	0.00	748.00	0.00	600.00			DEF	DEF

V.B.--LEFTSIDE

LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COHESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADHESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.
116.00	116.00	0.00	700.00	0.00	630.00	-1.50	0.00	DEF	DEF
97.00	97.00	0.00	275.00	0.00	275.00	-5.00	0.00	DEF	DEF
97.00	97.00	0.00	400.00	0.00	400.00	-8.00	0.00	DEF	DEF
73.00	73.00	0.00	250.00	0.00	250.00	-12.50	0.00	DEF	DEF
111.00	111.00	0.00	250.00	0.00	250.00	-20.00	0.00	DEF	DEF
122.00	122.00	33.00	0.00	18.00	0.00	-41.00	0.00	DEF	DEF
105.00	105.00	0.00	748.00	0.00	600.00			DEF	DEF

VI.--WATER DATA

UNIT WEIGHT = 62.40 (PCF)
RIGHTSIDE ELEVATION = 8.00 (FT)
LEFTSIDE ELEVATION = -6.60 (FT)
NO SEEPAGE

VII.--VERTICAL SURCHARGE LOADS

NONE

VIII.--HORIZONTAL LOADS

VIII.A.--HORIZONTAL LINE LOADS

NONE

VIII.B.--HORIZONTAL DISTRIBUTED LOADS

ELEVATION (FT)	DIST. LOAD (PSF)
6.10	2218.00
-6.60	0.00

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS
DATE: 7-OCTOBER-2013 TIME: 12:48:05

****
* SOIL PRESSURES FOR *
* CANTILEVER WALL DESIGN *
****

I.--HEADING
'ORLEANS CANAL
'ETL ROTATIONAL ANALYSIS
'MVK DISTRICT
'REACH 17B

II.--SOIL PRESSURES

RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

NET SOIL PRESSURES INCLUDE APPLIED HORIZONTAL DISTRIBUTED LOADS.

	NET	<---LEFTSIDE--->		<------NET------> (SOIL + WATER)		<--RIGHTSIDE--->	
ELEV.	WATER	PASSIVE	ACTIVE	ACTIVE	PASSIVE	ACTIVE	PASSIVE
(FT)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)
14.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
13.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7.0	62.4	0.0	0.0	62.4	62.4	0.0	0.0
6.1+	118.6	0.0	0.0	118.6	118.6	0.0	0.0
6.1-	118.6	1062.2	0.0	1274.3	2336.6	0.0	0.0
6.0+	124.8	1551.8	0.0	773.5	2325.3	0.0	0.0
6.0-	124.8	1551.8	0.0	773.5	3387.6	0.0	1062.2
5.0	187.2	1667.8	0.0	545.3	3806.9	0.0	1593.8
4.0	249.6	1783.8	0.0	317.0	3748.3	0.0	1647.4
3.0	312.0	1899.8	0.0	88.8	3689.6	0.0	1701.0
2.6	336.3	1944.9	0.0	0.0	3666.8	0.0	1721.9
2.0	374.4	2015.8	0.0	-139.5	3631.0	0.0	1754.6
1.0	436.8	2131.8	0.0	-367.7	3572.3	0.0	1808.2
0.0	499.2	2259.3	0.0	-607.4	3525.1	0.0	1873.3
-1.0	561.6	2220.7	0.0	-681.1	3310.2	0.0	1770.6
-1.5	592.8	1952.7	0.0	-469.2	2977.0	0.0	1493.5
-2.0	624.0	1665.8	0.0	-238.5	2585.7	0.0	1158.3
-2.1+	632.2	1577.1	0.0	-203.0	2526.2	0.0	1113.6
-2.1-	632.2	1654.1	0.0	-203.0	2526.2	0.0	1113.6
-3.0	686.4	1577.1	285.2	-262.0	1849.2	0.0	819.3

-3.5+	717.4	1628.4	321.4	-369.1	1729.6	0.0	782.4
-3.5-	717.4	1628.4	321.4	-369.1	1729.6	0.0	801.0
-4.0	748.8	1668.0	374.5	-417.7	1610.8	47.4	782.4
-4.3+	769.9	1720.1	376.4	-555.1	1663.0	0.0	920.0
-4.3-	769.9	1720.1	376.4	-555.1	1663.0	0.0	828.8
-5.0	811.2	1899.8	278.4	-809.1	1732.2	0.0	920.0
-6.0	873.6	2127.8	187.0	-1149.4	1855.3	0.0	1064.0
-6.6	911.0	2190.2	211.7	-1279.2	1801.3	0.0	1102.0
-7.0	911.0	2203.3	237.6	-1292.3	1760.8	0.0	1087.4
-8.0	911.0	2066.4	480.4	-1155.4	1372.0	0.0	941.4
-8.1+	911.0	2044.6	511.2	-1133.5	1265.7	0.0	798.9
-8.1-	911.0	2044.6	511.2	-1133.5	1265.7	0.0	932.8
-9.0	911.0	1778.2	856.4	-690.6	853.5	176.5	798.9
-10.0	911.0	1697.5	932.9	-568.0	734.6	218.5	756.5
-11.0	911.0	1673.5	926.4	-557.3	740.1	205.2	755.5
-12.0	911.0	1659.1	908.3	-548.9	752.3	199.2	749.5
-12.5	911.0	1655.9	905.1	-543.9	757.3	201.0	751.3
-13.0	911.0	1661.9	911.1	-538.8	762.3	212.1	762.4
-14.0	911.0	1683.6	932.8	-528.8	772.4	243.8	794.1
-15.0	911.0	1705.5	954.6	-518.8	782.4	275.7	826.0
-16.0	911.0	1727.3	976.5	-508.7	792.5	307.5	857.9
-17.0	911.0	1749.1	998.3	-498.7	806.0	339.4	893.3
-18.0	911.0	1739.7	887.0	-598.5	965.9	230.2	941.9
-19.0	911.0	3198.5	2125.4	-755.0	991.2	1532.5	2205.7
-20.0	911.0	5812.1	3332.7	-1933.5	1746.6	2967.5	4168.2
-21.0	911.0	5625.9	1689.9	-3150.3	2622.4	1564.6	3401.3
-22.0	911.0	4796.9	354.9	-3588.4	3155.9	297.5	2599.7
-23.0	911.0	5055.7	512.4	-3701.1	3477.6	443.6	3079.0
-24.0	911.0	5212.5	519.1	-3847.7	3704.8	453.8	3312.9
-25.0	911.0	5357.1	526.0	-4023.1	3880.8	423.0	3495.8

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS
DATE: 7-OCTOBER-2013 TIME: 12:48:06

****
* SUMMARY OF RESULTS FOR *
* CANTILEVER WALL DESIGN *
****

I.--HEADING
'ORLEANS CANAL
'ETL ROTATIONAL ANALYSIS
'MVK DISTRICT
'REACH 17B

II.--SUMMARY

RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

WALL BOTTOM ELEV. (FT) : -9.80
PENETRATION (FT) : 15.80

MAX. BEND. MOMENT (LB-FT) : 7.5162E+03
AT ELEVATION (FT) : -1.15

MAX. SCALED DEFL. (LB-IN^3): 1.7131E+09
AT ELEVATION (FT) : 14.00

NOTE: DIVIDE SCALED DEFLECTION MODULUS OF
ELLASTICITY IN PSI TIMES PILE MOMENT
OF INERTIA IN IN^4 TO OBTAIN DEFLECTION
IN INCHES.

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHOREDOR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS
DATE: 7-OCTOBER-2013 TIME: 12:48:06

****
* COMPLETE OF RESULTS FOR *
* CANTILEVER WALL DESIGN *
****

I.--HEADING
'ORLEANS CANAL
'ETL ROTATIONAL ANALYSIS
'MVK DISTRICT
'REACH 17B

II.--RESULTS

ELEVATION (FT)	BENDING MOMENT (LB-FT)	SHEAR (LB)	SCALED DEFLECTION (LB-IN^3)	NET PRESSURE (PSF)
14.00	0.0000E+00	0.	1.7131E+09	0.00
13.00	-3.0559E-10	0.	1.6035E+09	0.00
12.00	-3.0559E-10	0.	1.4939E+09	0.00
11.00	-3.0559E-10	0.	1.3843E+09	0.00
10.00	-3.0559E-10	0.	1.2747E+09	0.00
9.00	-3.0559E-10	0.	1.1651E+09	0.00
8.00	-3.0559E-10	0.	1.0555E+09	0.00
7.00	1.0400E+01	31.	9.4596E+08	62.40
6.10+	7.1334E+01	113.	8.4734E+08	118.56

6.10-	7.1334E+01	113.	8.4734E+08	1274.34
6.00	8.8134E+01	215.	8.3639E+08	773.52
5.00	6.5188E+02	874.	7.2706E+08	545.28
4.00	1.7609E+03	1306.	6.1894E+08	317.03
3.00	3.1870E+03	1508.	5.1390E+08	88.79
2.61	3.7782E+03	1526.	4.7439E+08	0.00
2.00	4.7018E+03	1483.	4.1438E+08	-139.46
1.00	6.0772E+03	1230.	3.2297E+08	-367.71
0.00	7.0829E+03	742.	2.4200E+08	-607.41
-1.00	7.5090E+03	98.	1.7319E+08	-681.07
-1.50	7.4816E+03	-190.	1.4362E+08	-469.24
-2.00	7.3376E+03	-367.	1.1727E+08	-238.46
-2.13	7.2873E+03	-396.	1.1086E+08	-203.02
-3.00	6.8597E+03	-598.	7.3984E+07	-261.95
-3.50	6.5258E+03	-755.	5.6929E+07	-369.13
-4.00	6.0977E+03	-952.	4.2512E+07	-417.71
-4.02	6.0788E+03	-961.	4.2004E+07	-425.72
-4.34	5.7532E+03	-1086.	3.4343E+07	-360.72
-5.00	4.9646E+03	-1280.	2.1521E+07	-225.16
-6.00	3.6065E+03	-1403.	9.0762E+06	-20.56
-6.60	2.7686E+03	-1378.	4.7531E+06	102.19
-7.00	2.2277E+03	-1321.	2.8603E+06	184.03
-8.00	1.0330E+03	-1035.	5.2042E+05	388.62
-8.06	9.7172E+02	-1011.	4.5619E+05	400.88
-9.00	2.2689E+02	-544.	2.1491E+04	593.21
-9.80	0.0000E+00	0.	0.0000E+00	757.85

NOTE: DIVIDE SCALED DEFLECTION MODULUS OF
ELLASTICITY IN PSI TIMES PILE MOMENT
OF INERTIA IN IN^4 TO OBTAIN DEFLECTION
IN INCHES.

III.--WATER AND SOIL PRESSURES

		<-------------SOIL PRESSURES-------------->			
	WATER	<----LEFTSIDE----->		<---RIGHTSIDE---->	
ELEVATION	PRESSURE	PASSIVE	ACTIVE	ACTIVE	PASSIVE
(FT)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)
14.00	0.	0.	0.	0.	0.
13.00	0.	0.	0.	0.	0.
12.00	0.	0.	0.	0.	0.
11.00	0.	0.	0.	0.	0.
10.00	0.	0.	0.	0.	0.
9.00	0.	0.	0.	0.	0.
8.00	0.	0.	0.	0.	0.
7.00	62.	0.	0.	0.	0.
6.10+	119.	0.	0.	0.	0.
6.10-	119.	1062.	0.	0.	0.
6.00+	125.	1552.	0.	0.	0.
6.00-	125.	1552.	0.	0.	1062.
5.00	187.	1668.	0.	0.	1594.
4.00	250.	1784.	0.	0.	1647.
3.00	312.	1900.	0.	0.	1701.
2.61	336.	1945.	0.	0.	1722.

2.00	374.	2016.	0.	0.	1755.
1.00	437.	2132.	0.	0.	1808.
0.00	499.	2259.	0.	0.	1873.
-1.00	562.	2221.	0.	0.	1771.
-1.50	593.	1953.	0.	0.	1493.
-2.00	624.	1666.	0.	0.	1158.
-2.13+	632.	1577.	0.	0.	1114.
-2.13-	632.	1654.	0.	0.	1114.
-3.00	686.	1577.	285.	0.	819.
-3.50+	717.	1628.	321.	0.	782.
-3.50-	717.	1628.	321.	0.	801.
-4.00	749.	1668.	375.	47.	782.
-4.02	750.	1671.	375.	45.	790.
-4.34+	770.	1720.	376.	0.	920.
-4.34-	770.	1720.	376.	0.	829.
-5.00	811.	1900.	278.	0.	920.
-6.00	874.	2128.	187.	0.	1064.
-6.60	911.	2190.	212.	0.	1102.
-7.00	911.	2203.	238.	0.	1087.
-8.00	911.	2066.	480.	0.	941.
-8.06+	911.	2045.	511.	0.	799.
-8.06-	911.	2045.	511.	0.	933.
-9.00	911.	1778.	856.	177.	799.
-9.80	911.	1698.	933.	218.	756.
-11.00	911.	1674.	926.	205.	756.

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'ORLEANS CANAL
'ETL ROTATIONAL ANALYSIS
'MVK DISTRICT
'REACH 17B
CONTROL  CANTILEVER  DESIGN  1.00  1.10
WALL   14
SURFACE RIGHTSIDE   6    0    6
                  8.6    6
                  22.7   -0.4
                  50.2   -1.8
                  66.5   -6.8
                  106.4   -6.8
SURFACE LEFTSIDE   8    0    6.1
                  8    6.1
                  14.5    5.7
                  31.5    0.6
                  93.5   -2.5
                  103   -5.6
                  113.4   -4.6
                  133   -4.2
SOIL RIGHTSIDE  STRENGTHS   7
   116    116    0    700    0    630   -1.5   0
   97    97    0    275    0    275   -5   0
   97    97    0    400    0    400   -8   0
   73    73    0    250    0    250   -12.5   0
   111    111    0    250    0    250   -20   0
   120    120    33    0    18    0   -41   0
   105    105    0    748    0    600
SOIL LEFTSIDE  STRENGTHS   7
   116    116    0    700    0    630   -1.5   0
   97    97    0    275    0    275   -5   0
   97    97    0    400    0    400   -8   0
   73    73    0    250    0    250   -12.5   0
   111    111    0    250    0    250   -20   0
   122    122    33    0    18    0   -41   0
   105    105    0    748    0    600
WATER ELEVATIONS   62.4    8   -6.6
HORIZONTAL DISTRIBUTED   2    6.1    2633   -6.6    0
FINISHED
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PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS
DATE: 7-OCTOBER-2013 TIME: 12:41:08

****
* INPUT DATA *
****

I.--HEADING
'ORLEANS CANAL
'ETL ROTATIONAL ANALYSIS
'MVK DISTRICT
'REACH 17B

II.--CONTROL
CANTILEVER WALL DESIGN
FACTOR OF SAFETY FOR ACTIVE PRESSURES = 1.00
FACTOR OF SAFETY FOR PASSIVE PRESSURES = 1.10

III.--WALL DATA
ELEVATION AT TOP OF WALL = 14.00 FT.

IV.--SURFACE POINT DATA

IV.A.--RIGHTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	6.00
8.60	6.00
22.70	-0.40
50.20	-1.80
66.50	-6.80
106.40	-6.80

IV.B.--LEFTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	6.10
8.00	6.10
14.50	5.70
31.50	0.60
93.50	-2.50
103.00	-5.60
113.40	-4.60
133.00	-4.20

V.--SOIL LAYER DATA

V.A.--RIGHTSIDE
LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

ANGLE OF ANGLE OF <-SAFETY->

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	INTERNAL FRICTION (DEG)	COHESION (PSF)	WALL FRICTION (DEG)	ADHESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-FACTOR-> ACT.	PASS.
116.00	116.00	0.00	700.00	0.00	630.00	-1.50	0.00	DEF	DEF
97.00	97.00	0.00	275.00	0.00	275.00	-5.00	0.00	DEF	DEF
97.00	97.00	0.00	400.00	0.00	400.00	-8.00	0.00	DEF	DEF
73.00	73.00	0.00	250.00	0.00	250.00	-12.50	0.00	DEF	DEF
111.00	111.00	0.00	250.00	0.00	250.00	-20.00	0.00	DEF	DEF
120.00	120.00	33.00	0.00	18.00	0.00	-41.00	0.00	DEF	DEF
105.00	105.00	0.00	748.00	0.00	600.00			DEF	DEF

V.B.--LEFTSIDE

LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COHESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADHESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.
116.00	116.00	0.00	700.00	0.00	630.00	-1.50	0.00	DEF	DEF
97.00	97.00	0.00	275.00	0.00	275.00	-5.00	0.00	DEF	DEF
97.00	97.00	0.00	400.00	0.00	400.00	-8.00	0.00	DEF	DEF
73.00	73.00	0.00	250.00	0.00	250.00	-12.50	0.00	DEF	DEF
111.00	111.00	0.00	250.00	0.00	250.00	-20.00	0.00	DEF	DEF
122.00	122.00	33.00	0.00	18.00	0.00	-41.00	0.00	DEF	DEF
105.00	105.00	0.00	748.00	0.00	600.00			DEF	DEF

VI.--WATER DATA

UNIT WEIGHT = 62.40 (PCF)
RIGHTSIDE ELEVATION = 8.00 (FT)
LEFTSIDE ELEVATION = -6.60 (FT)
NO SEEPAGE

VII.--VERTICAL SURCHARGE LOADS

NONE

VIII.--HORIZONTAL LOADS

VIII.A.--HORIZONTAL LINE LOADS

NONE

VIII.B.--HORIZONTAL DISTRIBUTED LOADS

ELEVATION (FT)	DIST. LOAD (PSF)
6.10	2633.00
-6.60	0.00

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS
DATE: 7-OCTOBER-2013 TIME: 12:41:10

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**************************
*   SOIL PRESSURES FOR   *
* CANTILEVER WALL DESIGN *
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I.--HEADING
'ORLEANS CANAL
'ETL ROTATIONAL ANALYSIS
'MVK DISTRICT
'REACH 17B

II.--SOIL PRESSURES

RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

NET SOIL PRESSURES INCLUDE APPLIED HORIZONTAL DISTRIBUTED LOADS.

				<------NET------>			
	NET	<---LEFTSIDE--->		(SOIL + WATER)		<--RIGHTSIDE--->	
ELEV.	WATER	PASSIVE	ACTIVE	ACTIVE	PASSIVE	ACTIVE	PASSIVE
(FT)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)
14.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
13.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7.0	62.4	0.0	0.0	62.4	62.4	0.0	0.0
6.1+	118.6	0.0	0.0	118.6	118.6	0.0	0.0
6.1-	118.6	1278.5	0.0	1473.0	2751.6	0.0	0.0
6.0+	124.8	1865.5	0.0	871.6	2737.1	0.0	0.0
6.0-	124.8	1865.5	0.0	871.6	4015.6	0.0	1278.5
5.0	187.2	1981.5	0.0	610.7	4499.6	0.0	1907.5
4.0	249.6	2097.5	0.0	349.7	4408.3	0.0	1961.1
3.0	312.0	2213.5	0.0	88.8	4317.0	0.0	2014.7
2.7	333.2	2253.0	0.0	0.0	4285.9	0.0	2032.9
2.0	374.4	2329.5	0.0	-172.1	4225.7	0.0	2068.3
1.0	436.8	2445.5	0.0	-433.0	4134.3	0.0	2121.9
0.0	499.2	2575.3	0.0	-707.7	4056.8	0.0	2189.3
-1.0	561.6	2505.2	0.0	-782.6	3777.4	0.0	2054.8
-1.5	592.8	2171.4	0.0	-521.3	3366.4	0.0	1716.2
-2.0	624.0	1816.0	0.0	-238.3	2886.6	0.0	1308.9
-2.1+	632.2	1690.6	0.0	-186.4	2813.0	0.0	1254.4
-2.1-	632.2	1799.5	0.0	-186.4	2813.0	0.0	1254.4
-3.0	686.4	1690.6	285.2	-257.8	2042.9	0.0	895.3

-3.5+	717.4	1743.3	321.4	-382.6	1898.4	0.0	847.0
-3.5-	717.4	1743.3	321.4	-382.6	1898.4	0.0	871.3
-4.0	748.8	1781.6	374.5	-446.4	1760.3	47.4	847.0
-4.3+	769.9	1838.1	376.4	-599.2	1817.8	0.0	1009.0
-4.3-	769.9	1838.1	376.4	-599.2	1817.8	0.0	901.7
-5.0	811.2	2042.2	278.4	-899.3	1873.5	0.0	1009.0
-6.0	873.6	2298.3	187.0	-1300.3	1989.6	0.0	1178.7
-6.6	911.0	2364.0	211.7	-1453.0	1921.6	0.0	1222.2
-7.0	911.0	2376.0	237.6	-1465.0	1876.7	0.0	1203.2
-8.0	911.0	2205.8	480.4	-1294.7	1455.7	0.0	1025.1
-8.1+	911.0	2179.3	511.2	-1268.3	1334.0	0.0	853.6
-8.1-	911.0	2179.3	511.2	-1268.3	1334.0	0.0	1014.8
-9.0	911.0	1859.2	856.4	-771.6	908.2	176.5	853.6
-10.0	911.0	1764.7	932.9	-635.2	781.9	218.5	803.7
-11.0	911.0	1739.1	926.4	-623.0	788.5	205.2	803.9
-12.0	911.0	1725.1	908.3	-614.8	800.7	199.2	797.9
-12.5	911.0	1721.9	905.1	-609.8	805.7	201.0	799.7
-13.0	911.0	1727.9	911.1	-604.8	810.7	212.1	810.8
-14.0	911.0	1749.6	932.8	-594.8	820.7	243.8	842.5
-15.0	911.0	1771.5	954.6	-584.7	830.8	275.7	874.4
-16.0	911.0	1793.3	976.5	-574.7	840.8	307.5	906.2
-17.0	911.0	1815.1	998.3	-564.7	850.8	339.4	938.1
-18.0	911.0	1739.7	887.0	-598.5	965.9	230.2	941.9
-19.0	911.0	3931.8	2125.4	-1488.2	1655.4	1532.5	2869.8
-20.0	911.0	7697.6	3332.7	-3819.1	3337.3	2967.5	5758.9
-21.0	911.0	7273.6	1689.9	-4798.0	3799.8	1564.6	4578.7
-22.0	911.0	5989.0	354.9	-4780.5	3902.8	297.5	3346.6
-23.0	911.0	6376.3	512.4	-5021.7	4377.4	443.6	3978.7
-24.0	911.0	6600.5	519.1	-5235.7	4654.7	453.8	4262.9
-25.0	911.0	6842.8	526.0	-5508.8	4886.2	423.0	4501.2

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 7-OCTOBER-2013 TIME: 12:41:11

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****************************
*  SUMMARY OF RESULTS FOR  *
*  CANTILEVER WALL DESIGN  *
****************************
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I.--HEADING

'ORLEANS CANAL
'ETL ROTATIONAL ANALYSIS
'MVK DISTRICT
'REACH 17B

II.--SUMMARY

RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

WALL BOTTOM ELEV. (FT) : -9.57
PENETRATION (FT) : 15.57

MAX. BEND. MOMENT (LB-FT) : 8.1508E+03
AT ELEVATION (FT) : -1.01

MAX. SCALED DEFL. (LB-IN^3): 1.8038E+09
AT ELEVATION (FT) : 14.00

NOTE: DIVIDE SCALED DEFLECTION MODULUS OF
ELLASTICITY IN PSI TIMES PILE MOMENT
OF INERTIA IN IN^4 TO OBTAIN DEFLECTION
IN INCHES.

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHOREDOR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS
DATE: 7-OCTOBER-2013 TIME: 12:41:11

****
* COMPLETE OF RESULTS FOR *
* CANTILEVER WALL DESIGN *
****

I.--HEADING
'ORLEANS CANAL
'ETL ROTATIONAL ANALYSIS
'MVK DISTRICT
'REACH 17B

II.--RESULTS

ELEVATION (FT)	BENDING MOMENT (LB-FT)	SHEAR (LB)	SCALED DEFLECTION (LB-IN^3)	NET PRESSURE (PSF)
14.00	0.0000E+00	0.	1.8038E+09	0.00
13.00	2.6193E-10	0.	1.6875E+09	0.00
12.00	2.6193E-10	0.	1.5711E+09	0.00
11.00	2.6193E-10	0.	1.4548E+09	0.00
10.00	2.6193E-10	0.	1.3384E+09	0.00
9.00	2.6193E-10	0.	1.2221E+09	0.00
8.00	2.6193E-10	0.	1.1057E+09	0.00
7.00	1.0400E+01	31.	9.8937E+08	62.40
6.10+	7.1334E+01	113.	8.8468E+08	118.56

6.10-	7.1334E+01	113.	8.8468E+08	1473.02
6.00	8.8960E+01	230.	8.7305E+08	871.59
5.00	7.1113E+02	971.	7.5697E+08	610.66
4.00	1.9440E+03	1451.	6.4221E+08	349.74
3.00	3.5265E+03	1670.	5.3086E+08	88.82
2.66	4.0986E+03	1686.	4.9421E+08	0.00
2.00	5.1979E+03	1629.	4.2562E+08	-172.10
1.00	6.6972E+03	1326.	3.2933E+08	-433.03
0.00	7.7612E+03	756.	2.4455E+08	-707.74
-1.00	8.1507E+03	11.	1.7309E+08	-782.61
-1.50	8.0691E+03	-315.	1.4260E+08	-521.26
-2.00	7.8581E+03	-505.	1.1560E+08	-238.30
-2.13	7.7897E+03	-533.	1.0906E+08	-186.43
-3.00	7.2475E+03	-726.	7.1658E+07	-257.81
-3.50	6.8496E+03	-885.	5.4538E+07	-382.57
-3.99	6.3621E+03	-1090.	4.0401E+07	-445.38
-4.00	6.3534E+03	-1094.	4.0196E+07	-443.55
-4.34	5.9607E+03	-1230.	3.2142E+07	-366.03
-5.00	5.0764E+03	-1422.	1.9655E+07	-213.77
-6.00	3.5856E+03	-1521.	7.8547E+06	16.01
-6.60	2.6841E+03	-1470.	3.9159E+06	153.88
-7.00	2.1108E+03	-1390.	2.2526E+06	245.79
-8.00	8.8173E+02	-1030.	3.3325E+05	475.57
-8.06	8.2091E+02	-1001.	2.8620E+05	489.33
-9.00	1.2827E+02	-439.	6.0481E+03	705.35
-9.57	0.0000E+00	0.	0.0000E+00	836.24

NOTE: DIVIDE SCALED DEFLECTION MODULUS OF ELLASTICITY IN PSI TIMES PILE MOMENT OF INERTIA IN IN^4 TO OBTAIN DEFLECTION IN INCHES.

III.--WATER AND SOIL PRESSURES

		<-------------SOIL PRESSURES-------------->			
	WATER	<----LEFTSIDE----->		<---RIGHTSIDE---->	
ELEVATION	PRESSURE	PASSIVE	ACTIVE	ACTIVE	PASSIVE
(FT)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)
14.00	0.	0.	0.	0.	0.
13.00	0.	0.	0.	0.	0.
12.00	0.	0.	0.	0.	0.
11.00	0.	0.	0.	0.	0.
10.00	0.	0.	0.	0.	0.
9.00	0.	0.	0.	0.	0.
8.00	0.	0.	0.	0.	0.
7.00	62.	0.	0.	0.	0.
6.10+	119.	0.	0.	0.	0.
6.10-	119.	1279.	0.	0.	0.
6.00+	125.	1865.	0.	0.	0.
6.00-	125.	1865.	0.	0.	1279.
5.00	187.	1981.	0.	0.	1907.
4.00	250.	2097.	0.	0.	1961.
3.00	312.	2213.	0.	0.	2015.
2.66	333.	2253.	0.	0.	2033.

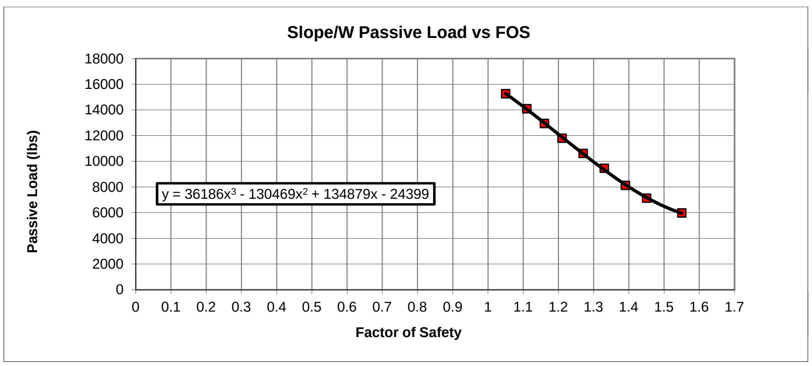
2.00	374.	2329.	0.	0.	2068.
1.00	437.	2445.	0.	0.	2122.
0.00	499.	2575.	0.	0.	2189.
-1.00	562.	2505.	0.	0.	2055.
-1.50	593.	2171.	0.	0.	1716.
-2.00	624.	1816.	0.	0.	1309.
-2.13+	632.	1691.	0.	0.	1254.
-2.13-	632.	1799.	0.	0.	1254.
-3.00	686.	1691.	285.	0.	895.
-3.50+	717.	1743.	321.	0.	847.
-3.50-	717.	1743.	321.	0.	871.
-3.99	748.	1781.	374.	47.	847.
-4.00	749.	1782.	375.	47.	847.
-4.34+	770.	1838.	376.	0.	1009.
-4.34-	770.	1838.	376.	0.	902.
-5.00	811.	2042.	278.	0.	1009.
-6.00	874.	2298.	187.	0.	1179.
-6.60	911.	2364.	212.	0.	1222.
-7.00	911.	2376.	238.	0.	1203.
-8.00	911.	2206.	480.	0.	1025.
-8.06+	911.	2179.	511.	0.	854.
-8.06-	911.	2179.	511.	0.	1015.
-9.00	911.	1859.	856.	177.	854.
-9.57	911.	1765.	933.	218.	804.
-11.00	911.	1739.	926.	205.	804.

Canal:	Orleans Avenue Canal	
Reach:	Reach 18A	
Load Case:	Water @ El 8	
Protected Side Top of Ground (GSE):	5.9	ft, Elevation
Critical Slip Surface Elev. (FSE):	-7.7	ft, Elevation
Sheetpile Tip Elevation:	-9.8	ft, Elevation

Step 1: Compute correct passive pressure forces from slope stability model (Slope/W). Procedure follows the approach cited in Paragraph D-4 of ETL 1110-2-575.

Note: Slope/W found the critical failure surface at Elev. -9.8. However, the transition point in the CWALSHT was around Elev. -7.7. Therefore the transition point was used in the following analysis.

Unit Weight (psf)	Passive Load (lbs)	Factor of Safety	Failure Surface Elevation (feet)	Notes
50	5983.9	1.55	-7.7	
60	7133	1.45	-7.7	
70	8130.5	1.39	-7.7	
80	9463.6	1.33	-7.7	
90	10617	1.27	-7.7	
100	11806	1.21	-7.7	
110	12952	1.16	-7.7	
120	14100	1.11	-7.7	
130	15269	1.05	-7.7	



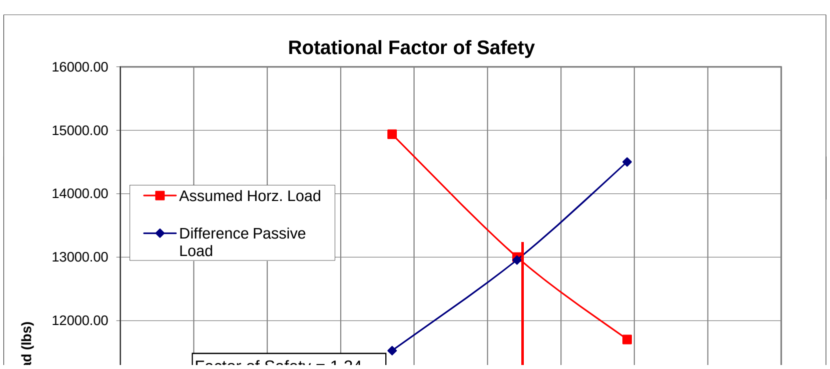
Step 2: Perform CWALSHT analysis of cross section using a range of <u>assumed</u> horizontal distributed load above the critical slip surface elevation found in step 1. Determine the difference in passive load from CWALSHT and Slope/W for each assumed horizontal distributed load.

	(A)	(B)		(C)	(D)	
FOS	CWALSHT Passive Load (lbs)	SLOPE/W Passive Load (lbs)	Tip Elev feet	Difference Passive Load (A-B) (lbs)	Assumed Horizontal Distributed Load in CWALSHT (psf)	Resultant Distributed CWALSHT Load (D*(GSE-FSE)) (lbs)
1.39	22688.085	8185.46	-9.8	14502.62	1721	11702.80
1.24	24190.555	11234.92	-9.8	12955.63	1912	13001.60
1.07	26403.45	14876.98	-9.8	11526.47	2125 (tri)	14939.60

Interpolate Correction Force at the resultant FOS

FOS = 1.24

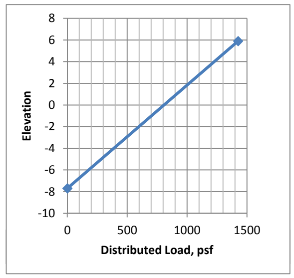
Correction Force = 12955.63 lbs



VIII.B.--HORIZONTAL DISTRIBUTED LOAD

ELEVATION (FT)	DIST. LOAD (PSF)	Result. (LBS)
5.9	1425	
-7.7	0	9690

9690



RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

NET SOIL PRESSURES INCLUDE APPLIED HORIZONTAL DISTRIBUTED LOADS.

ELEV. (FT)	NET WATER (PSF)	<---LEFTSIDE---> PASSIVE (PSF)	ACTIVE (PSF)	<--RIGHTSIDE---> ACTIVE (PSF)	PASSIVE (PSF)
13.8	0	0	0	0	0
12.8	0	0	0	0	0
11.8	0	0	0	0	0
10.8	0	0	0	0	0
9.8	0	0	0	0	0
8.8	0	0	0	0	0
8	0	0	0	0	0
7.8	12	0	0	0	0
6.8	75	0	0	0	0
6.10+	119	0	0	0	0
-6.1	119	0	0	0	633
5.90+	131	0	0	0	965
-5.9	131	633	0	0	965
5.8	137	962	0	0	969
4.9	193	1065	0	0	938
4.8	200	1077	0	0	937
3.8	262	1192	0	0	976
2.8	324	1307	0	0	1022
2.05	371	1393	0	0	1056
1.8	387	1422	0	0	1068
0.8	449	1537	0	0	1113
-0.2	512	1653	0	0	1164
-1.2	574	1633	0	0	1092
-1.5	593	1559	0	0	1004
-2.18+	635	1448	0	0	855
-2.18-	635	1451	0	0	855
-2.2	636	1448	9	0	852
-3.2	699	1508	169	0	847
-4.2	761	1609	258	0	884
-5.2	824	1706	355	0	916
-6.16	884	1798	450	0	947
-6.2	886	1802	454	0	948
-7.2	948	1920	514	0	1002
-7.5	967	1989	471	0	1052
-7.7	980	2036	423	0	1090
-8.2	980	2076	385	0	1124
-9.2	980	2081	409	0	1132
-9.68	980	2078	443	0	1143
-11.2	980	2077	466	0	1154

ELEV. (FT)	NET WATER (PSF)	LEFTSIDE PASSIVE (PSF)	RESULT. LEFTSIDE PASSIVE (LBS)
13.8	0	0	
12.8	0	0	
11.8	0	0	
10.8	0	0	
9.8	0	0	
8.8	0	0	
8	0	0	
7.8	12	0	
6.8	75	0	0
6.1	119	0	0
6.1	119	0	0
5.9	131	0	0
5.9	131	633	0
5.8	137	962	79.75
4.9	193	1065	912.15
4.8	200	1077	107.1
3.8	262	1192	1134.5
2.8	324	1307	1249.5
2.05	371	1393	1012.5
1.8	387	1422	351.875
0.8	449	1537	1479.5
-0.2	512	1653	1595
-1.2	574	1633	1643
-1.5	593	1559	478.8
-2.18	635	1448	1022.38
-2.18	635	1451	0
-2.2	636	1448	28.99
-3.2	699	1508	1478
-4.2	761	1609	1558.5
-5.2	824	1706	1657.5
-6.16	884	1798	1681.92
-6.2	886	1802	72
-7.2	948	1920	1861
-7.5	967	1989	586.35
-7.7	980	2036	402.5
-8.2	980	2076	1028
-9.2	980	2081	2078.5
-9.68	980	2078	998.16
-11.2	980	2077	3157.8

PS WATER ELEVATION (FT)	CRITICAL SLIP SURF. ELEVATION (FT)	UNIT WEIGHT WATER (PCF)
-7.7	-7.7	64

RESULTANT WATER LOAD= 0 LBS

PASSIVE LOAD (SOIL) 20392.815

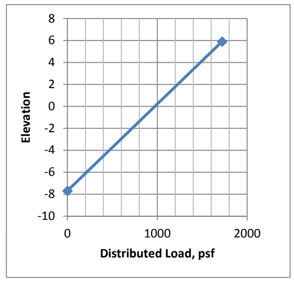
PASSIVE LOAD (SOIL+WATER) 20392.815 **IF THE PS WATER LEVEL IS BELOW THE CRITICAL SLIP SURFACE, USE PASSIVE LOAD (SOIL)**

FOS = 1.71

VIII.B.--HORIZONTAL DISTRIBUTED LOAD

ELEVATION (FT)	DIST. LOAD (PSF)	Result. (LBS)
5.9	1721	
-7.7	0	11702.8

11702.8



RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

NET SOIL PRESSURES INCLUDE APPLIED HORIZONTAL DISTRIBUTED LOADS.

ELEV. (FT)	NET WATER (PSF)	<---LEFTSIDE---> PASSIVE (PSF)	ACTIVE (PSF)	<--RIGHTSIDE---> ACTIVE (PSF)	PASSIVE (PSF)
13.8	0	0	0	0	0
12.8	0	0	0	0	0
11.8	0	0	0	0	0
10.8	0	0	0	0	0
9.8	0	0	0	0	0
8.8	0	0	0	0	0
8	0	0	0	0	0
7.8	12	0	0	0	0
6.8	75	0	0	0	0
6.10+	119	0	0	0	0
-6.1	119	0	0	0	777
5.90+	131	0	0	0	1182
-5.9	131	777	0	0	1182
5.8	137	1177	0	0	1185
4.9	193	1280	0	0	1136
4.8	200	1292	0	0	1134
3.8	262	1407	0	0	1173
2.8	324	1522	0	0	1218
2.07	370	1606	0	0	1252
1.8	387	1637	0	0	1264
0.8	449	1753	0	0	1310
-0.2	512	1869	0	0	1361
-1.2	574	1818	0	0	1262
-1.5	593	1721	0	0	1152
-2.18+	635	1569	0	0	964
-2.18-	635	1573	0	0	964
-2.2	636	1569	9	0	960
-3.2	699	1621	169	0	947
-4.2	761	1722	258	0	984
-5.2	824	1819	355	0	1017
-6.17	884	1912	450	0	1047
-6.2	886	1915	454	0	1048
-7.2	948	2038	514	0	1107
-7.5	967	2116	471	0	1166
-7.7	980	2171	423	0	1213
-8.2	980	2217	385	0	1253
-9.2	980	2221	409	0	1261
-9.78	980	2215	443	0	1271
-11.2	980	2212	466	0	1282

ELEV. (FT)	NET WATER (PSF)	LEFTSIDE PASSIVE (PSF)	RESULT. LEFTSIDE PASSIVE (LBS)
13.8	0	0	
12.8	0	0	
11.8	0	0	
10.8	0	0	
9.8	0	0	
8.8	0	0	
8	0	0	
7.8	12	0	
6.8	75	0	0
6.1	119	0	0
6.1	119	0	0
5.9	131	0	0
5.9	131	777	0
5.8	137	1177	97.7
4.9	193	1280	1105.65
4.8	200	1292	128.6
3.8	262	1407	1349.5
2.8	324	1522	1464.5
2.07	370	1606	1141.72
1.8	387	1637	437.805
0.8	449	1753	1695
-0.2	512	1869	1811
-1.2	574	1818	1843.5
-1.5	593	1721	530.85
-2.18	635	1569	1118.6
-2.18	635	1573	0
-2.2	636	1569	31.42
-3.2	699	1621	1595
-4.2	761	1722	1671.5
-5.2	824	1819	1770.5
-6.17	884	1912	1809.535
-6.2	886	1915	57.405
-7.2	948	2038	1976.5
-7.5	967	2116	623.1
-7.7	980	2171	428.7
-8.2	980	2217	1097
-9.2	980	2221	2219
-9.78	980	2215	1286.44
-11.2	980	2212	3143.17

PS WATER ELEVATION (FT)	CRITICAL SLIP SURF. ELEVATION (FT)	UNIT WEIGHT WATER (PCF)
-7.7	-7.7	64

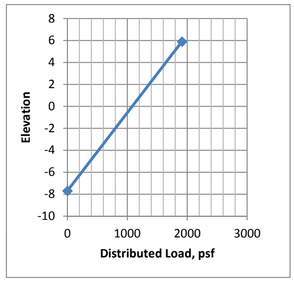
RESULTANT WATER LOAD= 0 LBS

PASSIVE LOAD (SOIL) 22688.085
PASSIVE LOAD (SOIL+WATER) 22688.085 **IF THE PS WATER LEVEL IS BELOW THE CRITICAL SLIP SURFACE,**
FOS = 1.39 **USE PASSIVE LOAD (SOIL)**

VIII.B.--HORIZONTAL DISTRIBUTED LOAD

ELEVATION (FT)	DIST. LOAD (PSF)	Result. (LBS)
5.9	1912	
-7.7	0	13001.6

13001.6



RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

NET SOIL PRESSURES INCLUDE APPLIED HORIZONTAL DISTRIBUTED LOADS.

	NET	<---LEFTSIDE--->		<--RIGHTSIDE--->	
ELEV. (FT)	WATER (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)
13.8	0	0	0	0	0
12.8	0	0	0	0	0
11.8	0	0	0	0	0
10.8	0	0	0	0	0
9.8	0	0	0	0	0
8.8	0	0	0	0	0
8	0	0	0	0	0
7.8	12	0	0	0	0
6.8	75	0	0	0	0
6.10+	119	0	0	0	0
-6.1	119	0	0	0	871
5.90+	131	0	0	0	1323
-5.9	131	871	0	0	1323
5.8	137	1318	0	0	1326
4.9	193	1421	0	0	1267
4.8	200	1433	0	0	1264
3.8	262	1548	0	0	1301
2.8	324	1663	0	0	1347
2.09	369	1745	0	0	1379
1.8	387	1778	0	0	1392
0.8	449	1894	0	0	1438
-0.2	512	2010	0	0	1490
-1.2	574	1939	0	0	1374
-1.5	593	1827	0	0	1249
-2.18+	635	1648	0	0	1035
-2.18-	635	1652	0	0	1035
-2.2	636	1648	9	0	1030
-3.2	699	1694	169	0	1012
-4.2	761	1797	258	0	1050
-5.2	824	1893	355	0	1083
-6.14	882	1983	448	0	1112
-6.2	886	1989	454	0	1114
-7.2	948	2115	514	0	1176
-7.5	967	2199	471	0	1241
-7.7	980	2259	423	0	1293
-8.2	980	2310	385	0	1337
-9.2	980	2313	409	0	1345
-9.78	980	2304	443	0	1355
-11.2	980	2301	466	0	1366

ELEV. (FT)	NET WATER (PSF)	LEFTSIDE PASSIVE (PSF)	RESULT. LEFTSIDE PASSIVE (LBS)
13.8	0	0	
12.8	0	0	
11.8	0	0	
10.8	0	0	
9.8	0	0	
8.8	0	0	
8	0	0	
7.8	12	0	
6.8	75	0	0
6.1	119	0	0
6.1	119	0	0
5.9	131	0	0
5.9	131	871	0
5.8	137	1318	109.45
4.9	193	1421	1232.55
4.8	200	1433	142.7
3.8	262	1548	1490.5
2.8	324	1663	1605.5
2.09	369	1745	1209.84
1.8	387	1778	510.835
0.8	449	1894	1836
-0.2	512	2010	1952
-1.2	574	1939	1974.5
-1.5	593	1827	564.9
-2.18	635	1648	1181.5
-2.18	635	1652	0
-2.2	636	1648	33
-3.2	699	1694	1671
-4.2	761	1797	1745.5
-5.2	824	1893	1845
-6.14	882	1983	1821.72
-6.2	886	1989	119.16
-7.2	948	2115	2052
-7.5	967	2199	647.1
-7.7	980	2259	445.8
-8.2	980	2310	1142.25
-9.2	980	2313	2311.5
-9.78	980	2304	1338.93
-11.2	980	2301	3269.55

PS WATER ELEVATION (FT)	CRITICAL SLIP SURF. ELEVATION (FT)	UNIT WEIGHT WATER (PCF)
-7.7	-7.7	64

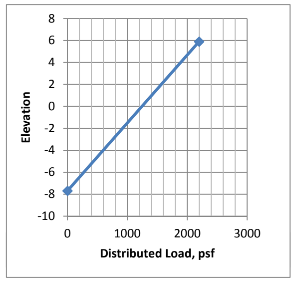
RESULTANT WATER LOAD= 0 LBS

PASSIVE LOAD (SOIL) 24190.555
PASSIVE LOAD (SOIL+WATER) 24190.555 **IF THE PS WATER LEVEL IS BELOW THE CRITICAL SLIP SURFACE,**
FOS = 1.24 **USE PASSIVE LOAD (SOIL)**

VIII.B.--HORIZONTAL DISTRIBUTED LOAD

ELEVATION (FT)	DIST. LOAD (PSF)	Result. (LBS)
5.9	2197	
-7.7	0	14939.6

14939.6



RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

NET SOIL PRESSURES INCLUDE APPLIED HORIZONTAL DISTRIBUTED LOADS.

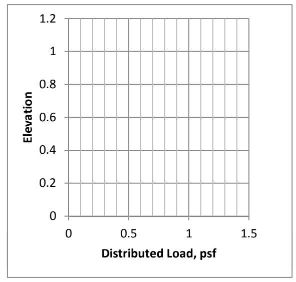
	NET	<---LEFTSIDE--->		<--RIGHTSIDE--->	
ELEV. (FT)	WATER (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)
13.8	0	0	0	0	0
12.8	0	0	0	0	0
11.8	0	0	0	0	0
10.8	0	0	0	0	0
9.8	0	0	0	0	0
8.8	0	0	0	0	0
8	0	0	0	0	0
7.8	12	0	0	0	0
6.8	75	0	0	0	0
6.10+	119	0	0	0	0
-6.1	119	0	0	0	1009
5.90+	131	0	0	0	1532
-5.9	131	1009	0	0	1532
5.8	137	1526	0	0	1535
4.9	193	1629	0	0	1458
4.8	200	1641	0	0	1454
3.8	262	1756	0	0	1490
2.8	324	1871	0	0	1536
2.1	368	1951	0	0	1568
1.8	387	1986	0	0	1581
0.8	449	2101	0	0	1627
-0.2	512	2218	0	0	1680
-1.2	574	2118	0	0	1539
-1.5	593	1982	0	0	1392
-2.18+	635	1764	0	0	1140
-2.18-	635	1769	0	0	1140
-2.2	636	1764	9	0	1134
-3.2	699	1802	169	0	1108
-4.2	761	1906	258	0	1147
-5.2	824	2002	355	0	1179
-6.14	882	2092	448	0	1209
-6.2	886	2098	454	0	1210
-7.2	948	2229	514	0	1277
-7.5	967	2322	471	0	1352
-7.7	980	2390	423	0	1411
-8.2	980	2447	385	0	1461
-9.2	980	2448	409	0	1469
-9.86	980	2436	443	0	1479
-11.2	980	2431	466	0	1490

ELEV. (FT)	NET WATER (PSF)	LEFTSIDE PASSIVE (PSF)	RESULT. LEFTSIDE PASSIVE (LBS)
13.8	0	0	
12.8	0	0	
11.8	0	0	
10.8	0	0	
9.8	0	0	
8.8	0	0	
8	0	0	
7.8	12	0	
6.8	75	0	0
6.1	119	0	0
6.1	119	0	0
5.9	131	0	0
5.9	131	1009	0
5.8	137	1526	126.75
4.9	193	1629	1419.75
4.8	200	1641	163.5
3.8	262	1756	1698.5
2.8	324	1871	1813.5
2.1	368	1951	1337.7
1.8	387	1986	590.55
0.8	449	2101	2043.5
-0.2	512	2218	2159.5
-1.2	574	2118	2168
-1.5	593	1982	615
-2.18	635	1764	1273.64
-2.18	635	1769	0
-2.2	636	1764	35.33
-3.2	699	1802	1783
-4.2	761	1906	1854
-5.2	824	2002	1954
-6.14	882	2092	1924.18
-6.2	886	2098	125.7
-7.2	948	2229	2163.5
-7.5	967	2322	682.65
-7.7	980	2390	471.2
-8.2	980	2447	1209.25
-9.2	980	2448	2447.5
-9.86	980	2436	1611.72
-11.2	980	2431	3260.89

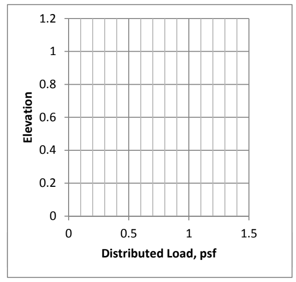
PS WATER ELEVATION (FT)	CRITICAL SLIP SURF. ELEVATION (FT)	UNIT WEIGHT WATER (PCF)
-7.7	-7.7	64

RESULTANT WATER LOAD= 0 LBS

PASSIVE LOAD (SOIL) 26403.45
PASSIVE LOAD (SOIL+WATER) 26403.45 **IF THE PS WATER LEVEL IS BELOW THE CRITICAL SLIP SURFACE, USE PASSIVE LOAD (SOIL)**
FOS = 1.07



1.2
1
0.8
0.6
0.4
0.2
0
Elevation
0
0.5
1
1.5
Distributed Load, psf

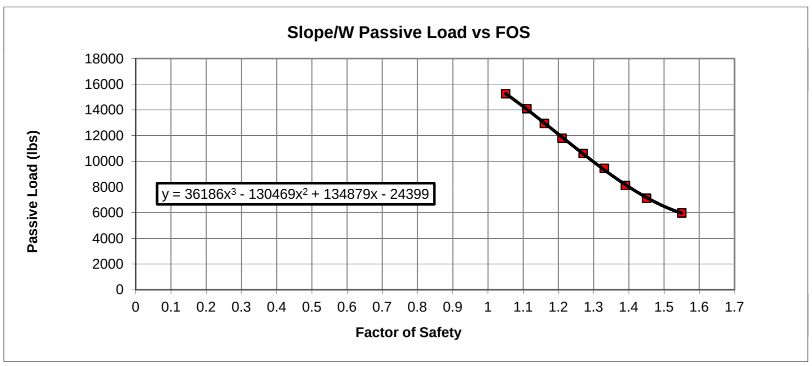

1.2
1
0.8
0.6
0.4
0.2
0
Elevation
0
0.5
1
1.5
Distributed Load, psf

Canal:	Orleans Avenue Canal	
Reach:	Reach 18A	
Load Case:	Water @ El 8	
Protected Side Top of Ground (GSE):	5.9	ft, Elevation
Critical Slip Surface Elev. (FSE):	-7.7	ft, Elevation
Sheetpile Tip Elevation:	-9.8	ft, Elevation

Step 1: Compute correct passive pressure forces from slope stability model (Slope/W). Procedure follows the approach cited in Paragraph D-4 of ETL 1110-2-575.

Note: Slope/W found the critical failure surface at Elev. -9.8. However, the transition point in the CWALSHT was around Elev. -7.7. Therefore the transition point was used in the following analysis.

Unit Weight (psf)	Passive Load (lbs)	Factor of Safety	Failure Surface Elevation (feet)	Notes
50	5983.9	1.55	-7.7	
60	7133	1.45	-7.7	
70	8130.5	1.39	-7.7	
80	9463.6	1.33	-7.7	
90	10617	1.27	-7.7	
100	11806	1.21	-7.7	
110	12952	1.16	-7.7	
120	14100	1.11	-7.7	
130	15269	1.05	-7.7	



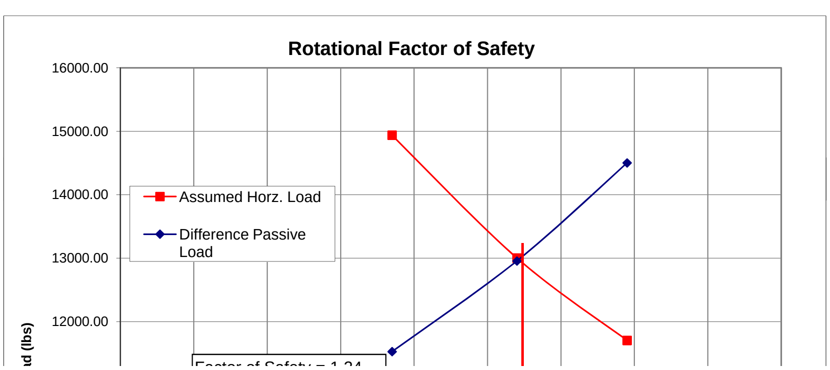
Step 2: Perform CWALSHT analysis of cross section using a range of <u>assumed</u> horizontal distributed load above the critical slip surface elevation found in step 1. Determine the difference in passive load from CWALSHT and Slope/W for each assumed horizontal distributed load.

	(A)	(B)		(C)	(D)	
FOS	CWALSHT Passive Load (lbs)	SLOPE/W Passive Load (lbs)	Tip Elev feet	Difference Passive Load (A-B) (lbs)	Assumed Horizontal Distributed Load in CWALSHT (psf)	Resultant Distributed CWALSHT Load (D*(GSE-FSE)) (lbs)
1.39	22688.085	8185.46	-9.8	14502.62	1721	11702.80
1.24	24190.555	11234.92	-9.8	12955.63	1912	13001.60
1.07	26403.45	14876.98	-9.8	11526.47	2125 (tri)	14939.60

Interpolate Correction Force at the resultant FOS

FOS = 1.24

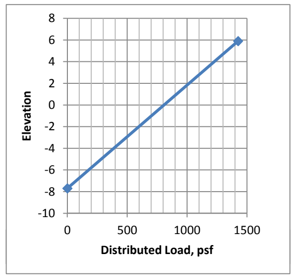
Correction Force = 12955.63 lbs



VIII.B.--HORIZONTAL DISTRIBUTED LOAD

ELEVATION (FT)	DIST. LOAD (PSF)	Result. (LBS)
5.9	1425	
-7.7	0	9690

9690



RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

NET SOIL PRESSURES INCLUDE APPLIED HORIZONTAL DISTRIBUTED LOADS.

ELEV. (FT)	NET WATER (PSF)	<---LEFTSIDE---> PASSIVE (PSF)	ACTIVE (PSF)	<--RIGHTSIDE---> ACTIVE (PSF)	PASSIVE (PSF)
13.8	0	0	0	0	0
12.8	0	0	0	0	0
11.8	0	0	0	0	0
10.8	0	0	0	0	0
9.8	0	0	0	0	0
8.8	0	0	0	0	0
8	0	0	0	0	0
7.8	12	0	0	0	0
6.8	75	0	0	0	0
6.10+	119	0	0	0	0
-6.1	119	0	0	0	633
5.90+	131	0	0	0	965
-5.9	131	633	0	0	965
5.8	137	962	0	0	969
4.9	193	1065	0	0	938
4.8	200	1077	0	0	937
3.8	262	1192	0	0	976
2.8	324	1307	0	0	1022
2.05	371	1393	0	0	1056
1.8	387	1422	0	0	1068
0.8	449	1537	0	0	1113
-0.2	512	1653	0	0	1164
-1.2	574	1633	0	0	1092
-1.5	593	1559	0	0	1004
-2.18+	635	1448	0	0	855
-2.18-	635	1451	0	0	855
-2.2	636	1448	9	0	852
-3.2	699	1508	169	0	847
-4.2	761	1609	258	0	884
-5.2	824	1706	355	0	916
-6.16	884	1798	450	0	947
-6.2	886	1802	454	0	948
-7.2	948	1920	514	0	1002
-7.5	967	1989	471	0	1052
-7.7	980	2036	423	0	1090
-8.2	980	2076	385	0	1124
-9.2	980	2081	409	0	1132
-9.68	980	2078	443	0	1143
-11.2	980	2077	466	0	1154

ELEV. (FT)	NET WATER (PSF)	LEFTSIDE PASSIVE (PSF)	RESULT. LEFTSIDE PASSIVE (LBS)
13.8	0	0	
12.8	0	0	
11.8	0	0	
10.8	0	0	
9.8	0	0	
8.8	0	0	
8	0	0	
7.8	12	0	
6.8	75	0	0
6.1	119	0	0
6.1	119	0	0
5.9	131	0	0
5.9	131	633	0
5.8	137	962	79.75
4.9	193	1065	912.15
4.8	200	1077	107.1
3.8	262	1192	1134.5
2.8	324	1307	1249.5
2.05	371	1393	1012.5
1.8	387	1422	351.875
0.8	449	1537	1479.5
-0.2	512	1653	1595
-1.2	574	1633	1643
-1.5	593	1559	478.8
-2.18	635	1448	1022.38
-2.18	635	1451	0
-2.2	636	1448	28.99
-3.2	699	1508	1478
-4.2	761	1609	1558.5
-5.2	824	1706	1657.5
-6.16	884	1798	1681.92
-6.2	886	1802	72
-7.2	948	1920	1861
-7.5	967	1989	586.35
-7.7	980	2036	402.5
-8.2	980	2076	1028
-9.2	980	2081	2078.5
-9.68	980	2078	998.16
-11.2	980	2077	3157.8

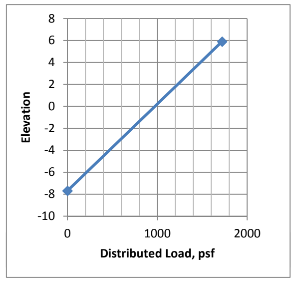
PS WATER ELEVATION (FT)	CRITICAL SLIP SURF. ELEVATION (FT)	UNIT WEIGHT WATER (PCF)
-7.7	-7.7	64
RESULTANT WATER LOAD=	0	LBS

PASSIVE LOAD (SOIL)	20392.815	
PASSIVE LOAD (SOIL+WATER)	20392.815	**IF THE PS WATER LEVEL IS BELOW THE CRITICAL SLIP SURFACE,**
FOS =	1.71	**USE PASSIVE LOAD (SOIL)**

VIII.B.--HORIZONTAL DISTRIBUTED LOAD

ELEVATION (FT)	DIST. LOAD (PSF)	Result. (LBS)
5.9	1721	
-7.7	0	11702.8

11702.8



RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

NET SOIL PRESSURES INCLUDE APPLIED HORIZONTAL DISTRIBUTED LOADS.

ELEV. (FT)	NET WATER (PSF)	<---LEFTSIDE---> PASSIVE (PSF)	ACTIVE (PSF)	<--RIGHTSIDE---> ACTIVE (PSF)	PASSIVE (PSF)
13.8	0	0	0	0	0
12.8	0	0	0	0	0
11.8	0	0	0	0	0
10.8	0	0	0	0	0
9.8	0	0	0	0	0
8.8	0	0	0	0	0
8	0	0	0	0	0
7.8	12	0	0	0	0
6.8	75	0	0	0	0
6.10+	119	0	0	0	0
-6.1	119	0	0	0	777
5.90+	131	0	0	0	1182
-5.9	131	777	0	0	1182
5.8	137	1177	0	0	1185
4.9	193	1280	0	0	1136
4.8	200	1292	0	0	1134
3.8	262	1407	0	0	1173
2.8	324	1522	0	0	1218
2.07	370	1606	0	0	1252
1.8	387	1637	0	0	1264
0.8	449	1753	0	0	1310
-0.2	512	1869	0	0	1361
-1.2	574	1818	0	0	1262
-1.5	593	1721	0	0	1152
-2.18+	635	1569	0	0	964
-2.18-	635	1573	0	0	964
-2.2	636	1569	9	0	960
-3.2	699	1621	169	0	947
-4.2	761	1722	258	0	984
-5.2	824	1819	355	0	1017
-6.17	884	1912	450	0	1047
-6.2	886	1915	454	0	1048
-7.2	948	2038	514	0	1107
-7.5	967	2116	471	0	1166
-7.7	980	2171	423	0	1213
-8.2	980	2217	385	0	1253
-9.2	980	2221	409	0	1261
-9.78	980	2215	443	0	1271
-11.2	980	2212	466	0	1282

ELEV. (FT)	NET WATER (PSF)	LEFTSIDE PASSIVE (PSF)	RESULT. LEFTSIDE PASSIVE (LBS)
13.8	0	0	
12.8	0	0	
11.8	0	0	
10.8	0	0	
9.8	0	0	
8.8	0	0	
8	0	0	
7.8	12	0	
6.8	75	0	0
6.1	119	0	0
6.1	119	0	0
5.9	131	0	0
5.9	131	777	0
5.8	137	1177	97.7
4.9	193	1280	1105.65
4.8	200	1292	128.6
3.8	262	1407	1349.5
2.8	324	1522	1464.5
2.07	370	1606	1141.72
1.8	387	1637	437.805
0.8	449	1753	1695
-0.2	512	1869	1811
-1.2	574	1818	1843.5
-1.5	593	1721	530.85
-2.18	635	1569	1118.6
-2.18	635	1573	0
-2.2	636	1569	31.42
-3.2	699	1621	1595
-4.2	761	1722	1671.5
-5.2	824	1819	1770.5
-6.17	884	1912	1809.535
-6.2	886	1915	57.405
-7.2	948	2038	1976.5
-7.5	967	2116	623.1
-7.7	980	2171	428.7
-8.2	980	2217	1097
-9.2	980	2221	2219
-9.78	980	2215	1286.44
-11.2	980	2212	3143.17

PS WATER ELEVATION (FT)	CRITICAL SLIP SURF. ELEVATION (FT)	UNIT WEIGHT WATER (PCF)
-7.7	-7.7	64

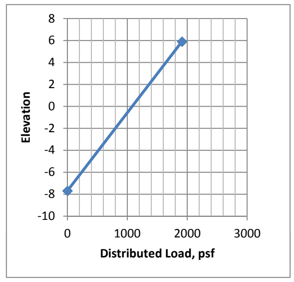
RESULTANT WATER LOAD= 0 LBS

PASSIVE LOAD (SOIL) 22688.085
PASSIVE LOAD (SOIL+WATER) 22688.085 **IF THE PS WATER LEVEL IS BELOW THE CRITICAL SLIP SURFACE,**
FOS = 1.39 **USE PASSIVE LOAD (SOIL)**

VIII.B.--HORIZONTAL DISTRIBUTED LOAD

ELEVATION (FT)	DIST. LOAD (PSF)	Result. (LBS)
5.9	1912	
-7.7	0	13001.6

13001.6



RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

NET SOIL PRESSURES INCLUDE APPLIED HORIZONTAL DISTRIBUTED LOADS.

ELEV. (FT)	NET WATER (PSF)	<---LEFTSIDE---> PASSIVE (PSF)	ACTIVE (PSF)	<--RIGHTSIDE---> ACTIVE (PSF)	PASSIVE (PSF)
13.8	0	0	0	0	0
12.8	0	0	0	0	0
11.8	0	0	0	0	0
10.8	0	0	0	0	0
9.8	0	0	0	0	0
8.8	0	0	0	0	0
8	0	0	0	0	0
7.8	12	0	0	0	0
6.8	75	0	0	0	0
6.10+	119	0	0	0	0
-6.1	119	0	0	0	871
5.90+	131	0	0	0	1323
-5.9	131	871	0	0	1323
5.8	137	1318	0	0	1326
4.9	193	1421	0	0	1267
4.8	200	1433	0	0	1264
3.8	262	1548	0	0	1301
2.8	324	1663	0	0	1347
2.09	369	1745	0	0	1379
1.8	387	1778	0	0	1392
0.8	449	1894	0	0	1438
-0.2	512	2010	0	0	1490
-1.2	574	1939	0	0	1374
-1.5	593	1827	0	0	1249
-2.18+	635	1648	0	0	1035
-2.18-	635	1652	0	0	1035
-2.2	636	1648	9	0	1030
-3.2	699	1694	169	0	1012
-4.2	761	1797	258	0	1050
-5.2	824	1893	355	0	1083
-6.14	882	1983	448	0	1112
-6.2	886	1989	454	0	1114
-7.2	948	2115	514	0	1176
-7.5	967	2199	471	0	1241
-7.7	980	2259	423	0	1293
-8.2	980	2310	385	0	1337
-9.2	980	2313	409	0	1345
-9.78	980	2304	443	0	1355
-11.2	980	2301	466	0	1366

ELEV. (FT)	NET WATER (PSF)	LEFTSIDE PASSIVE (PSF)	RESULT. LEFTSIDE PASSIVE (LBS)
13.8	0	0	
12.8	0	0	
11.8	0	0	
10.8	0	0	
9.8	0	0	
8.8	0	0	
8	0	0	
7.8	12	0	
6.8	75	0	0
6.1	119	0	0
6.1	119	0	0
5.9	131	0	0
5.9	131	871	0
5.8	137	1318	109.45
4.9	193	1421	1232.55
4.8	200	1433	142.7
3.8	262	1548	1490.5
2.8	324	1663	1605.5
2.09	369	1745	1209.84
1.8	387	1778	510.835
0.8	449	1894	1836
-0.2	512	2010	1952
-1.2	574	1939	1974.5
-1.5	593	1827	564.9
-2.18	635	1648	1181.5
-2.18	635	1652	0
-2.2	636	1648	33
-3.2	699	1694	1671
-4.2	761	1797	1745.5
-5.2	824	1893	1845
-6.14	882	1983	1821.72
-6.2	886	1989	119.16
-7.2	948	2115	2052
-7.5	967	2199	647.1
-7.7	980	2259	445.8
-8.2	980	2310	1142.25
-9.2	980	2313	2311.5
-9.78	980	2304	1338.93
-11.2	980	2301	3269.55

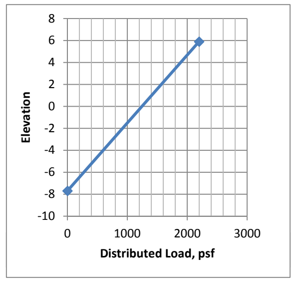
PS WATER ELEVATION (FT)	CRITICAL SLIP SURF. ELEVATION (FT)	UNIT WEIGHT WATER (PCF)
-7.7	-7.7	64

RESULTANT WATER LOAD= 0 LBS

PASSIVE LOAD (SOIL) 24190.555
PASSIVE LOAD (SOIL+WATER) 24190.555 **IF THE PS WATER LEVEL IS BELOW THE CRITICAL SLIP SURFACE,**
FOS = 1.24 **USE PASSIVE LOAD (SOIL)**

VIII.B.--HORIZONTAL DISTRIBUTED LOAD

ELEVATION (FT)	DIST. LOAD (PSF)	Result. (LBS)
5.9	2197	
-7.7	0	14939.6



14939.6

RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

NET SOIL PRESSURES INCLUDE APPLIED HORIZONTAL DISTRIBUTED LOADS.

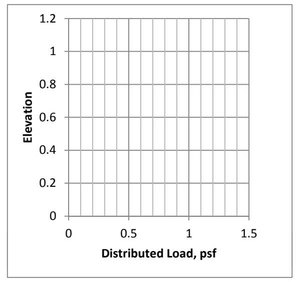
ELEV. (FT)	NET WATER (PSF)	<---LEFTSIDE---> PASSIVE (PSF)	ACTIVE (PSF)	<--RIGHTSIDE---> ACTIVE (PSF)	PASSIVE (PSF)
13.8	0	0	0	0	0
12.8	0	0	0	0	0
11.8	0	0	0	0	0
10.8	0	0	0	0	0
9.8	0	0	0	0	0
8.8	0	0	0	0	0
8	0	0	0	0	0
7.8	12	0	0	0	0
6.8	75	0	0	0	0
6.10+	119	0	0	0	0
-6.1	119	0	0	0	1009
5.90+	131	0	0	0	1532
-5.9	131	1009	0	0	1532
5.8	137	1526	0	0	1535
4.9	193	1629	0	0	1458
4.8	200	1641	0	0	1454
3.8	262	1756	0	0	1490
2.8	324	1871	0	0	1536
2.1	368	1951	0	0	1568
1.8	387	1986	0	0	1581
0.8	449	2101	0	0	1627
-0.2	512	2218	0	0	1680
-1.2	574	2118	0	0	1539
-1.5	593	1982	0	0	1392
-2.18+	635	1764	0	0	1140
-2.18-	635	1769	0	0	1140
-2.2	636	1764	9	0	1134
-3.2	699	1802	169	0	1108
-4.2	761	1906	258	0	1147
-5.2	824	2002	355	0	1179
-6.14	882	2092	448	0	1209
-6.2	886	2098	454	0	1210
-7.2	948	2229	514	0	1277
-7.5	967	2322	471	0	1352
-7.7	980	2390	423	0	1411
-8.2	980	2447	385	0	1461
-9.2	980	2448	409	0	1469
-9.86	980	2436	443	0	1479
-11.2	980	2431	466	0	1490

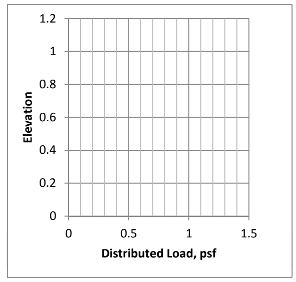
ELEV. (FT)	NET WATER (PSF)	LEFTSIDE PASSIVE (PSF)	RESULT. LEFTSIDE PASSIVE (LBS)
13.8	0	0	
12.8	0	0	
11.8	0	0	
10.8	0	0	
9.8	0	0	
8.8	0	0	
8	0	0	
7.8	12	0	
6.8	75	0	0
6.1	119	0	0
6.1	119	0	0
5.9	131	0	0
5.9	131	1009	0
5.8	137	1526	126.75
4.9	193	1629	1419.75
4.8	200	1641	163.5
3.8	262	1756	1698.5
2.8	324	1871	1813.5
2.1	368	1951	1337.7
1.8	387	1986	590.55
0.8	449	2101	2043.5
-0.2	512	2218	2159.5
-1.2	574	2118	2168
-1.5	593	1982	615
-2.18	635	1764	1273.64
-2.18	635	1769	0
-2.2	636	1764	35.33
-3.2	699	1802	1783
-4.2	761	1906	1854
-5.2	824	2002	1954
-6.14	882	2092	1924.18
-6.2	886	2098	125.7
-7.2	948	2229	2163.5
-7.5	967	2322	682.65
-7.7	980	2390	471.2
-8.2	980	2447	1209.25
-9.2	980	2448	2447.5
-9.86	980	2436	1611.72
-11.2	980	2431	3260.89

PS WATER ELEVATION (FT)	CRITICAL SLIP SURF. ELEVATION (FT)	UNIT WEIGHT WATER (PCF)
-7.7	-7.7	64

RESULTANT WATER LOAD= 0 LBS

PASSIVE LOAD (SOIL)	26403.45	
PASSIVE LOAD (SOIL+WATER)	26403.45	**IF THE PS WATER LEVEL IS BELOW THE CRITICAL SLIP SURFACE,**
FOS =	1.07	**USE PASSIVE LOAD (SOIL)**


Elevation
1.2
1
0.8
0.6
0.4
0.2
0
0
0.5
1
1.5
Distributed Load, psf


1.2
1
0.8
0.6
0.4
0.2
0
Elevation
0
0.5
1
1.5
Distributed Load, psf

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS
DATE: 7-OCTOBER-2013 TIME: 15:16:50

****
* INPUT DATA *
****

I.--HEADING
'ROTATIONAL ANALYSIS
'ORLEANS CANAL
'MVK DISTRICT
'REACH 18A WITH BERM

II.--CONTROL
CANTILEVER WALL DESIGN
FACTOR OF SAFETY FOR ACTIVE PRESSURES = 1.00
FACTOR OF SAFETY FOR PASSIVE PRESSURES = 1.71

III.--WALL DATA
ELEVATION AT TOP OF WALL = 13.80 FT.

IV.--SURFACE POINT DATA

IV.A.--RIGHTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	6.10
0.90	6.10
21.00	3.00
36.30	-1.30
38.00	-1.50
49.00	-2.80
72.00	-7.30
90.00	-8.00

IV.B.--LEFTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	5.90
6.90	5.90
15.40	5.50
88.00	-1.50
101.00	-5.86
110.00	-5.70
200.00	-5.70

V.--SOIL LAYER DATA

V.A.--RIGHTSIDE
LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COHESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADHESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.
115.00	115.00	0.00	540.00	0.00	540.00	-1.50	0.00	DEF	DEF
102.00	102.00	0.00	300.00	0.00	300.00	-7.50	0.00	DEF	DEF
80.00	80.00	0.00	370.00	0.00	370.00	-16.00	0.00	DEF	DEF
108.00	108.00	0.00	300.00	0.00	300.00	-20.50	0.00	DEF	DEF
108.00	108.00	0.00	320.00	0.00	320.00	-25.00	0.00	DEF	DEF
122.00	122.00	33.00	0.00	18.00	0.00	-41.00	0.00	DEF	DEF
103.00	103.00	0.00	500.00	0.00	500.00			DEF	DEF

V.B.--LEFTSIDE

LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COHESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADHESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.
115.00	115.00	0.00	540.00	0.00	540.00	-1.50	0.00	DEF	DEF
102.00	102.00	0.00	300.00	0.00	300.00	-7.50	0.00	DEF	DEF
80.00	80.00	0.00	370.00	0.00	370.00	-16.00	0.00	DEF	DEF
108.00	108.00	0.00	300.00	0.00	300.00	-20.50	0.00	DEF	DEF
108.00	108.00	0.00	320.00	0.00	320.00	-25.00	0.00	DEF	DEF
122.00	122.00	33.00	0.00	18.00	0.00	-41.00	0.00	DEF	DEF
103.00	103.00	0.00	500.00	0.00	500.00			DEF	DEF

VI.--WATER DATA

UNIT WEIGHT = 62.40 (PCF)
RIGHTSIDE ELEVATION = 8.00 (FT)
LEFTSIDE ELEVATION = -7.70 (FT)
NO SEEPAGE

VII.--VERTICAL SURCHARGE LOADS

NONE

VIII.--HORIZONTAL LOADS

VIII.A.--HORIZONTAL LINE LOADS

NONE

VIII.B.--HORIZONTAL DISTRIBUTED LOADS

ELEVATION (FT)	DIST. LOAD (PSF)
5.90	1425.00
-7.70	0.00

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS
DATE: 7-OCTOBER-2013 TIME: 15:16:57

****
* SOIL PRESSURES FOR *
* CANTILEVER WALL DESIGN *
****

I.--HEADING
'ROTATIONAL ANALYSIS
'ORLEANS CANAL
'MVK DISTRICT
'REACH 18A WITH BERM

II.--SOIL PRESSURES

RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

NET SOIL PRESSURES INCLUDE APPLIED HORIZONTAL DISTRIBUTED LOADS.

	NET	<---LEFTSIDE--->		<------NET------> (SOIL + WATER)		<--RIGHTSIDE--->	
ELEV.	WATER	PASSIVE	ACTIVE	ACTIVE	PASSIVE	ACTIVE	PASSIVE
(FT)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)
13.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7.8	12.5	0.0	0.0	12.5	12.5	0.0	0.0
6.8	74.9	0.0	0.0	74.9	74.9	0.0	0.0
6.1+	118.6	0.0	0.0	118.6	118.6	0.0	0.0
6.1-	118.6	0.0	0.0	118.6	750.1	0.0	631.6
5.9+	131.0	0.0	0.0	131.0	1093.4	0.0	962.4
5.9-	131.0	631.6	0.0	924.5	2518.4	0.0	962.4
5.8	137.3	958.9	0.0	592.9	2518.1	0.0	966.3
4.9	193.4	1062.4	0.0	451.3	2448.9	0.0	935.2
4.8	199.7	1073.9	0.0	435.6	2443.9	0.0	934.5
3.8	262.1	1188.9	0.0	278.2	2441.0	0.0	974.0
2.8	324.5	1303.9	0.0	120.8	2444.4	0.0	1019.7
2.0	372.4	1392.1	0.0	0.0	2446.8	0.0	1054.7
1.8	386.9	1418.9	0.0	-36.6	2447.5	0.0	1065.3
0.8	449.3	1534.5	0.0	-194.6	2450.7	0.0	1110.8
-0.2	511.7	1650.2	0.0	-352.7	2458.8	0.0	1161.2
-1.2	574.1	1630.2	0.0	-375.1	2344.7	0.0	1089.5
-1.5	592.8	1557.3	0.0	-314.9	2244.6	0.0	1002.1

-2.2+	635.5	1446.8	0.0	-234.7	2067.4	0.0	853.9
-2.2-	635.5	1449.4	0.0	-234.7	2067.4	0.0	853.9
-2.2	636.5	1446.8	8.9	-234.1	2054.3	0.0	850.4
-3.2	698.9	1506.9	168.6	-336.5	1847.7	0.0	845.9
-4.2	761.3	1607.8	258.4	-479.8	1752.1	0.0	882.5
-5.2	823.7	1704.6	355.2	-619.0	1645.5	0.0	915.1
-6.2	886.1	1800.4	453.8	-757.2	1536.1	0.0	946.7
-7.2	948.5	1918.7	514.4	-917.8	1486.9	0.0	1000.5
-7.5	967.2	1987.4	470.6	-999.2	1567.9	0.0	1050.3
-7.7	979.7	2033.9	422.7	-1054.3	1645.7	0.0	1088.7
-8.2	979.7	2073.9	384.9	-1094.2	1717.0	0.0	1122.3
-9.2	979.7	2079.0	409.2	-1099.3	1701.3	0.0	1130.8
-10.2	979.7	2075.9	442.9	-1096.2	1678.2	0.0	1141.4
-11.2	979.7	2075.6	465.6	-1095.9	1666.0	0.0	1151.9
-12.2	979.7	2082.4	474.2	-1102.7	1668.0	0.0	1162.5
-13.2	979.7	2090.0	481.4	-1110.3	1671.4	0.0	1173.1
-14.2	979.7	2098.4	487.4	-1118.7	1676.8	0.0	1184.5
-15.2	979.7	2099.1	506.2	-1119.5	1661.9	0.0	1188.4
-16.0	979.7	2053.0	609.5	-1073.4	1514.9	0.0	1144.8
-16.2	979.7	2037.0	650.2	-1057.3	1459.2	0.0	1129.7
-17.2	979.7	2029.8	756.5	-1050.1	1340.3	0.0	1117.1
-17.9+	979.7	2056.2	780.4	-1076.5	1327.4	0.0	1129.9
-17.9-	979.7	2056.2	780.4	-1076.5	1327.4	0.0	1126.3
-18.2	979.7	2066.2	790.4	-1064.4	1319.1	22.2	1129.9
-19.2	979.7	2101.3	826.6	-1032.0	1298.8	89.6	1145.8
-20.2	979.7	2146.6	845.4	-1055.5	1321.2	111.4	1186.9
-20.5	979.7	2165.5	841.9	-1078.9	1343.5	107.0	1205.7
-21.2	979.7	2205.0	841.6	-1119.6	1382.3	105.7	1244.2
-22.2	979.7	2243.5	872.1	-1129.3	1389.0	134.5	1281.3
-22.6+	979.7	2256.8	885.9	-1277.1	1240.8	0.0	1087.1
-22.6-	979.7	2256.8	885.9	-1277.1	1240.8	0.0	1207.0
-23.2	979.7	2278.8	907.9	-1299.1	1187.1	0.0	1115.3
-23.3+	979.7	2252.2	863.7	-1272.5	2348.0	0.0	3248.5
-23.3-	979.7	2252.2	863.7	-1272.5	2348.0	0.0	1215.4
-24.2	979.7	4167.7	3981.9	251.7	246.3	3439.7	3248.5

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS
DATE: 7-OCTOBER-2013 TIME: 15:16:57

****
* SUMMARY OF RESULTS FOR *
* CANTILEVER WALL DESIGN *
****

I.--HEADING
'ROTATIONAL ANALYSIS
'ORLEANS CANAL
'MVK DISTRICT
'REACH 18A WITH BERM

II.--SUMMARY

RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

WALL BOTTOM ELEV. (FT) : -9.77
PENETRATION (FT) : 15.67

MAX. BEND. MOMENT (LB-FT) : 7.7163E+03
AT ELEVATION (FT) : -3.18

MAX. SCALED DEFL. (LB-IN^3): 1.9212E+09
AT ELEVATION (FT) : 13.80

NOTE: DIVIDE SCALED DEFLECTION MODULUS OF
ELLASTICITY IN PSI TIMES PILE MOMENT
OF INERTIA IN IN^4 TO OBTAIN DEFLECTION
IN INCHES.

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHOREDOR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS
DATE: 7-OCTOBER-2013 TIME: 15:16:57

****
* COMPLETE OF RESULTS FOR *
* CANTILEVER WALL DESIGN *
****

I.--HEADING
'ROTATIONAL ANALYSIS
'ORLEANS CANAL
'MVK DISTRICT
'REACH 18A WITH BERM

II.--RESULTS

ELEVATION (FT)	BENDING MOMENT (LB-FT)	SHEAR (LB)	SCALED DEFLECTION (LB-IN^3)	NET PRESSURE (PSF)
13.80	0.0000E+00	0.	1.9212E+09	0.00
12.80	-6.1118E-10	0.	1.8027E+09	0.00
11.80	8.7311E-11	0.	1.6843E+09	0.00
10.80	8.7311E-11	0.	1.5658E+09	0.00

9.80	8.7311E-11	0.	1.4474E+09	0.00
8.80	8.7311E-11	0.	1.3289E+09	0.00
8.00	-3.5851E-09	0.	1.2341E+09	0.00
7.80	8.3200E-02	1.	1.2105E+09	12.48
6.80	1.7971E+01	45.	1.0920E+09	74.88
6.10	7.1334E+01	113.	1.0091E+09	118.56
5.90+	9.6314E+01	138.	9.8543E+08	131.04
5.90-	9.6314E+01	138.	9.8543E+08	924.46
5.80	1.1414E+02	213.	9.7360E+08	592.93
4.90	5.2728E+02	683.	8.6723E+08	451.29
4.80	5.9784E+02	728.	8.5545E+08	435.55
3.80	1.5171E+03	1085.	7.3840E+08	278.17
2.80	2.7145E+03	1284.	6.2401E+08	120.80
2.03	3.7238E+03	1330.	5.3928E+08	0.00
1.80	4.0327E+03	1326.	5.1432E+08	-36.58
0.80	5.3143E+03	1211.	4.1161E+08	-194.56
-0.20	6.4012E+03	937.	3.1804E+08	-352.67
-1.20	7.1582E+03	573.	2.3549E+08	-375.06
-1.50	7.3141E+03	470.	2.1308E+08	-314.88
-2.18	7.5678E+03	282.	1.6631E+08	-234.68
-2.20	7.5724E+03	278.	1.6526E+08	-234.08
-3.20	7.7162E+03	-7.	1.0807E+08	-336.49
-4.20	7.5168E+03	-415.	6.4173E+07	-479.78
-5.20	6.8382E+03	-965.	3.3193E+07	-618.99
-6.20	5.5408E+03	-1653.	1.3940E+07	-757.19
-6.20	5.5335E+03	-1656.	1.3878E+07	-757.90
-7.20	3.6219E+03	-2070.	4.1645E+06	-73.98
-7.50	3.0005E+03	-2062.	2.6103E+06	132.10
-7.70	2.5917E+03	-2022.	1.8395E+06	269.49
-8.20	1.6289E+03	-1801.	6.3661E+05	612.96
-9.20	2.4899E+02	-844.	1.1832E+04	1299.91
-9.77	0.0000E+00	0.	0.0000E+00	1688.20

NOTE: DIVIDE SCALED DEFLECTION MODULUS OF
ELLASTICITY IN PSI TIMES PILE MOMENT
OF INERTIA IN IN^4 TO OBTAIN DEFLECTION
IN INCHES.

III.--WATER AND SOIL PRESSURES

		<-------------SOIL PRESSURES-------------->			
	WATER	<----LEFTSIDE----->		<---RIGHTSIDE---->	
ELEVATION	PRESSURE	PASSIVE	ACTIVE	ACTIVE	PASSIVE
(FT)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)
13.80	0.	0.	0.	0.	0.
12.80	0.	0.	0.	0.	0.
11.80	0.	0.	0.	0.	0.
10.80	0.	0.	0.	0.	0.
9.80	0.	0.	0.	0.	0.
8.80	0.	0.	0.	0.	0.
8.00	0.	0.	0.	0.	0.
7.80	12.	0.	0.	0.	0.
6.80	75.	0.	0.	0.	0.
6.10+	119.	0.	0.	0.	0.

6.10-	119.	0.	0.	0.	632.
5.90+	131.	0.	0.	0.	962.
5.90-	131.	632.	0.	0.	962.
5.80	137.	959.	0.	0.	966.
4.90	193.	1062.	0.	0.	935.
4.80	200.	1074.	0.	0.	934.
3.80	262.	1189.	0.	0.	974.
2.80	324.	1304.	0.	0.	1020.
2.03	372.	1392.	0.	0.	1055.
1.80	387.	1419.	0.	0.	1065.
0.80	449.	1534.	0.	0.	1111.
-0.20	512.	1650.	0.	0.	1161.
-1.20	574.	1630.	0.	0.	1090.
-1.50	593.	1557.	0.	0.	1002.
-2.18+	635.	1447.	0.	0.	854.
-2.18-	635.	1449.	0.	0.	854.
-2.20	636.	1447.	9.	0.	850.
-3.20	699.	1507.	169.	0.	846.
-4.20	761.	1608.	258.	0.	883.
-5.20	824.	1705.	355.	0.	915.
-6.20	886.	1800.	454.	0.	947.
-6.20	886.	1801.	454.	0.	947.
-7.20	948.	1919.	514.	0.	1000.
-7.50	967.	1987.	471.	0.	1050.
-7.70	980.	2034.	423.	0.	1089.
-8.20	980.	2074.	385.	0.	1122.
-9.20	980.	2079.	409.	0.	1131.
-9.77	980.	2076.	443.	0.	1141.
-11.20	980.	2076.	466.	0.	1152.

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'ROTATIONAL ANALYSIS
'ORLEANS CANAL
'MVK DISTRICT
'REACH 18A WITH BERM
CONTROL  CANTILEVER  DESIGN  1.00  1.39
WALL   13.8
SURFACE RIGHTSIDE   8    0    6.1
                 0.9    6.1
                 21    3
                 36.3   -1.3
                 38   -1.5
                 49   -2.8
                 72   -7.3
                 90   -8
SURFACE LEFTSIDE   7    0    5.9
                 6.9    5.9
                 15.4    5.5
                 88   -1.5
                 101   -5.86
                 110   -5.7
                 200   -5.7
SOIL RIGHTSIDE  STRENGTHS   7
   115    115    0    540    0    540   -1.5   0
   102    102    0    300    0    300   -7.5   0
   80    80    0    370    0    370   -16   0
   108    108    0    300    0    300   -20.5   0
   108    108    0    320    0    320   -25   0
   122    122    33    0    18    0   -41   0
   103    103    0    500    0    500
SOIL LEFTSIDE  STRENGTHS   7
   115    115    0    540    0    540   -1.5   0
   102    102    0    300    0    300   -7.5   0
   80    80    0    370    0    370   -16   0
   108    108    0    300    0    300   -20.5   0
   108    108    0    320    0    320   -25   0
   122    122    33    0    18    0   -41   0
   103    103    0    500    0    500
WATER ELEVATIONS   62.4    8   -7.7
HORIZONTAL DISTRIBUTED   2    5.9    1721   -7.7    0
FINISHED
```

```
'ROTATIONAL ANALYSIS
'ORLEANS CANAL
'MVK DISTRICT
'REACH 18A WITH BERM
CONTROL  CANTILEVER  DESIGN  1.00  1.24
WALL   13.8
SURFACE RIGHTSIDE   8    0    6.1
                 0.9    6.1
                 21    3
                 36.3   -1.3
                 38   -1.5
                 49   -2.8
                 72   -7.3
                 90   -8
SURFACE LEFTSIDE   7    0    5.9
                 6.9    5.9
                 15.4    5.5
                 88   -1.5
                 101   -5.86
                 110   -5.7
                 200   -5.7
SOIL RIGHTSIDE  STRENGTHS   7
   115    115    0    540    0    540   -1.5   0
   102    102    0    300    0    300   -7.5   0
   80    80    0    370    0    370   -16   0
   108    108    0    300    0    300   -20.5   0
   108    108    0    320    0    320   -25   0
   122    122    33    0    18    0   -41   0
   103    103    0    500    0    500
SOIL LEFTSIDE  STRENGTHS   7
   115    115    0    540    0    540   -1.5   0
   102    102    0    300    0    300   -7.5   0
   80    80    0    370    0    370   -16   0
   108    108    0    300    0    300   -20.5   0
   108    108    0    320    0    320   -25   0
   122    122    33    0    18    0   -41   0
   103    103    0    500    0    500
WATER ELEVATIONS   62.4    8   -7.7
HORIZONTAL DISTRIBUTED   2    5.9    1912   -7.7    0
FINISHED
```

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS
DATE: 7-OCTOBER-2013 TIME: 15:20:58

****
* INPUT DATA *
****

I.--HEADING
'ROTATIONAL ANALYSIS
'ORLEANS CANAL
'MVK DISTRICT
'REACH 18A WITH BERM

II.--CONTROL
CANTILEVER WALL DESIGN
FACTOR OF SAFETY FOR ACTIVE PRESSURES = 1.00
FACTOR OF SAFETY FOR PASSIVE PRESSURES = 1.24

III.--WALL DATA
ELEVATION AT TOP OF WALL = 13.80 FT.

IV.--SURFACE POINT DATA

IV.A.--RIGHTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	6.10
0.90	6.10
21.00	3.00
36.30	-1.30
38.00	-1.50
49.00	-2.80
72.00	-7.30
90.00	-8.00

IV.B.--LEFTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	5.90
6.90	5.90
15.40	5.50
88.00	-1.50
101.00	-5.86
110.00	-5.70
200.00	-5.70

V.--SOIL LAYER DATA

V.A.--RIGHTSIDE
LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH-ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH-ESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.
115.00	115.00	0.00	540.00	0.00	540.00	-1.50	0.00	DEF	DEF
102.00	102.00	0.00	300.00	0.00	300.00	-7.50	0.00	DEF	DEF
80.00	80.00	0.00	370.00	0.00	370.00	-16.00	0.00	DEF	DEF
108.00	108.00	0.00	300.00	0.00	300.00	-20.50	0.00	DEF	DEF
108.00	108.00	0.00	320.00	0.00	320.00	-25.00	0.00	DEF	DEF
122.00	122.00	33.00	0.00	18.00	0.00	-41.00	0.00	DEF	DEF
103.00	103.00	0.00	500.00	0.00	500.00			DEF	DEF

V.B.--LEFTSIDE

LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH-ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH-ESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.
115.00	115.00	0.00	540.00	0.00	540.00	-1.50	0.00	DEF	DEF
102.00	102.00	0.00	300.00	0.00	300.00	-7.50	0.00	DEF	DEF
80.00	80.00	0.00	370.00	0.00	370.00	-16.00	0.00	DEF	DEF
108.00	108.00	0.00	300.00	0.00	300.00	-20.50	0.00	DEF	DEF
108.00	108.00	0.00	320.00	0.00	320.00	-25.00	0.00	DEF	DEF
122.00	122.00	33.00	0.00	18.00	0.00	-41.00	0.00	DEF	DEF
103.00	103.00	0.00	500.00	0.00	500.00			DEF	DEF

VI.--WATER DATA

UNIT WEIGHT = 62.40 (PCF)
RIGHTSIDE ELEVATION = 8.00 (FT)
LEFTSIDE ELEVATION = -7.70 (FT)
NO SEEPAGE

VII.--VERTICAL SURCHARGE LOADS

NONE

VIII.--HORIZONTAL LOADS

VIII.A.--HORIZONTAL LINE LOADS

NONE

VIII.B.--HORIZONTAL DISTRIBUTED LOADS

ELEVATION (FT)	DIST. LOAD (PSF)
5.90	1912.00
-7.70	0.00

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS
DATE: 7-OCTOBER-2013 TIME: 15:21:00

****
* SOIL PRESSURES FOR *
* CANTILEVER WALL DESIGN *
****

I.--HEADING
'ROTATIONAL ANALYSIS
'ORLEANS CANAL
'MVK DISTRICT
'REACH 18A WITH BERM

II.--SOIL PRESSURES

RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

NET SOIL PRESSURES INCLUDE APPLIED HORIZONTAL DISTRIBUTED LOADS.

				<------NET------>			
	NET	<---LEFTSIDE--->		(SOIL + WATER)		<--RIGHTSIDE--->	
ELEV.	WATER	PASSIVE	ACTIVE	ACTIVE	PASSIVE	ACTIVE	PASSIVE
(FT)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)
13.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7.8	12.5	0.0	0.0	12.5	12.5	0.0	0.0
6.8	74.9	0.0	0.0	74.9	74.9	0.0	0.0
6.1+	118.6	0.0	0.0	118.6	118.6	0.0	0.0
6.1-	118.6	0.0	0.0	118.6	989.5	0.0	871.0
5.9+	131.0	0.0	0.0	131.0	1454.2	0.0	1323.1
5.9-	131.0	871.0	0.0	1172.1	3366.2	0.0	1323.1
5.8	137.3	1318.0	0.0	717.3	3361.7	0.0	1326.5
4.9	193.4	1421.5	0.0	543.4	3231.4	0.0	1266.6
4.8	199.7	1433.0	0.0	524.1	3220.8	0.0	1263.7
3.8	262.1	1548.0	0.0	330.9	3179.9	0.0	1301.0
2.8	324.5	1663.0	0.0	137.7	3147.4	0.0	1346.8
2.1	369.0	1744.9	0.0	0.0	3124.2	0.0	1379.3
1.8	386.9	1778.0	0.0	-55.5	3114.8	0.0	1392.4
0.8	449.3	1893.8	0.0	-249.5	3082.2	0.0	1437.9
-0.2	511.7	2009.8	0.0	-443.7	3056.2	0.0	1490.2
-1.2	574.1	1939.2	0.0	-451.3	2862.0	0.0	1374.1
-1.5	592.8	1826.6	0.0	-362.1	2713.3	0.0	1248.9

-2.2+	635.5	1648.0	0.0	-239.1	2446.5	0.0	1035.5
-2.2-	635.5	1652.2	0.0	-239.1	2446.5	0.0	1035.5
-2.2	636.5	1648.0	8.9	-238.3	2431.2	0.0	1030.3
-3.2	698.9	1694.1	168.6	-362.5	2174.8	0.0	1011.8
-4.2	761.3	1796.5	258.4	-543.2	2045.0	0.0	1050.0
-5.2	823.7	1893.4	355.2	-718.2	1902.5	0.0	1082.6
-6.2	886.1	1988.8	453.8	-891.8	1756.9	0.0	1113.8
-7.2	948.5	2115.1	514.4	-1096.3	1680.0	0.0	1175.7
-7.5	967.2	2199.5	470.6	-1204.2	1765.9	0.0	1241.3
-7.7	979.7	2259.3	422.7	-1279.6	1849.8	0.0	1292.8
-8.2	979.7	2310.1	384.9	-1330.5	1931.9	0.0	1337.1
-9.2	979.7	2312.5	409.2	-1332.9	1915.3	0.0	1344.9
-10.2	979.7	2304.3	442.9	-1324.6	1892.2	0.0	1355.4
-11.2	979.7	2300.8	465.6	-1321.1	1880.0	0.0	1366.0
-12.2	979.7	2307.3	474.2	-1327.6	1882.0	0.0	1376.6
-13.2	979.7	2315.0	481.4	-1335.3	1885.4	0.0	1387.1
-14.2	979.7	2323.7	487.4	-1344.0	1891.2	0.0	1398.9
-15.2	979.7	2321.9	506.2	-1342.3	1873.7	0.0	1400.3
-16.0	979.7	2254.9	609.5	-1275.3	1705.9	0.0	1335.7
-16.2	979.7	2231.0	650.2	-1251.3	1642.4	0.0	1312.9
-17.2	979.7	2207.9	756.5	-1228.2	1504.4	0.0	1281.2
-17.9+	979.7	2234.7	780.4	-1255.0	1483.6	0.0	1284.8
-17.9-	979.7	2234.7	780.4	-1255.0	1483.6	0.0	1283.8
-18.2	979.7	2244.7	790.4	-1242.8	1474.1	22.2	1284.8
-19.2	979.7	2279.6	826.6	-1210.3	1446.5	89.6	1293.5
-20.2	979.7	2328.5	845.4	-1237.5	1471.6	111.4	1337.3
-20.5	979.7	2350.7	841.9	-1264.0	1497.2	107.0	1359.3
-21.2	979.7	2395.7	841.6	-1310.3	1541.5	105.7	1403.4
-22.2	979.7	2435.3	872.1	-1321.1	1549.4	134.5	1441.7
-22.6+	979.7	2448.5	885.9	-1468.9	1277.5	0.0	1087.1
-22.6-	979.7	2448.5	885.9	-1468.9	1277.5	0.0	1280.5
-23.2	979.7	2470.5	907.9	-1490.8	1187.1	0.0	1115.3
-23.3+	979.7	2415.7	863.7	-1436.0	3405.5	0.0	5304.5
-23.3-	979.7	2415.7	863.7	-1436.0	3405.5	0.0	1274.5
-24.2	979.7	6187.5	3981.9	-1768.1	2302.3	3439.7	5304.5

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS
DATE: 7-OCTOBER-2013 TIME: 15:21:00

****
* SUMMARY OF RESULTS FOR *
* CANTILEVER WALL DESIGN *
****

I.--HEADING
'ROTATIONAL ANALYSIS
'ORLEANS CANAL
'MVK DISTRICT
'REACH 18A WITH BERM

II.--SUMMARY

RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

WALL BOTTOM ELEV. (FT) : -9.78
PENETRATION (FT) : 15.68

MAX. BEND. MOMENT (LB-FT) : 8.8606E+03
AT ELEVATION (FT) : -3.14

MAX. SCALED DEFL. (LB-IN^3): 2.2170E+09
AT ELEVATION (FT) : 13.80

NOTE: DIVIDE SCALED DEFLECTION MODULUS OF
ELLASTICITY IN PSI TIMES PILE MOMENT
OF INERTIA IN IN^4 TO OBTAIN DEFLECTION
IN INCHES.

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHOREDOR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS
DATE: 7-OCTOBER-2013 TIME: 15:21:00

****
* COMPLETE OF RESULTS FOR *
* CANTILEVER WALL DESIGN *
****

I.--HEADING
'ROTATIONAL ANALYSIS
'ORLEANS CANAL
'MVK DISTRICT
'REACH 18A WITH BERM

II.--RESULTS

ELEVATION (FT)	BENDING MOMENT (LB-FT)	SHEAR (LB)	SCALED DEFLECTION (LB-IN^3)	NET PRESSURE (PSF)
13.80	0.0000E+00	0.	2.2170E+09	0.00
12.80	4.3656E-10	0.	2.0801E+09	0.00
11.80	4.3656E-10	0.	1.9433E+09	0.00
10.80	4.3656E-10	0.	1.8065E+09	0.00

9.80	-2.6193E-10	0.	1.6697E+09	0.00
8.80	-2.6193E-10	0.	1.5329E+09	0.00
8.00	-3.1409E-09	0.	1.4234E+09	0.00
7.80	8.3200E-02	1.	1.3961E+09	12.48
6.80	1.7971E+01	45.	1.2593E+09	74.88
6.10	7.1334E+01	113.	1.1635E+09	118.56
5.90+	9.6314E+01	138.	1.1362E+09	131.04
5.90-	9.6314E+01	138.	1.1362E+09	1172.07
5.80	1.1518E+02	232.	1.1225E+09	717.27
4.90	5.9105E+02	799.	9.9964E+08	543.40
4.80	6.7367E+02	853.	9.8602E+08	524.08
3.80	1.7562E+03	1280.	8.5077E+08	330.89
2.80	3.1697E+03	1515.	7.1860E+08	137.70
2.09	4.2726E+03	1564.	6.2760E+08	0.00
1.80	4.7209E+03	1556.	5.9193E+08	-55.48
0.80	6.2164E+03	1403.	4.7341E+08	-249.49
-0.20	7.4625E+03	1057.	3.6560E+08	-443.70
-1.20	8.2959E+03	609.	2.7062E+08	-451.31
-1.50	8.4597E+03	487.	2.4486E+08	-362.13
-2.18	8.7175E+03	282.	1.9112E+08	-239.07
-2.20	8.7221E+03	278.	1.8991E+08	-238.26
-3.20	8.8599E+03	-23.	1.2424E+08	-362.53
-4.20	8.6258E+03	-476.	7.3819E+07	-543.18
-5.20	7.8494E+03	-1106.	3.8229E+07	-718.20
-6.14	6.4666E+03	-1859.	1.7075E+07	-881.55
-6.20	6.3551E+03	-1910.	1.6101E+07	-836.35
-7.20	4.1545E+03	-2364.	4.8428E+06	-72.52
-7.50	3.4455E+03	-2352.	3.0464E+06	156.63
-7.70	2.9793E+03	-2305.	2.1533E+06	309.39
-8.20	1.8815E+03	-2055.	7.5370E+05	691.31
-9.20	2.9969E+02	-982.	1.5254E+04	1455.14
-9.78	0.0000E+00	0.	0.0000E+00	1901.80

NOTE: DIVIDE SCALED DEFLECTION MODULUS OF
ELLASTICITY IN PSI TIMES PILE MOMENT
OF INERTIA IN IN^4 TO OBTAIN DEFLECTION
IN INCHES.

III.--WATER AND SOIL PRESSURES

		<-------------SOIL PRESSURES-------------->			
	WATER	<----LEFTSIDE----->		<---RIGHTSIDE---->	
ELEVATION	PRESSURE	PASSIVE	ACTIVE	ACTIVE	PASSIVE
(FT)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)
13.80	0.	0.	0.	0.	0.
12.80	0.	0.	0.	0.	0.
11.80	0.	0.	0.	0.	0.
10.80	0.	0.	0.	0.	0.
9.80	0.	0.	0.	0.	0.
8.80	0.	0.	0.	0.	0.
8.00	0.	0.	0.	0.	0.
7.80	12.	0.	0.	0.	0.
6.80	75.	0.	0.	0.	0.
6.10+	119.	0.	0.	0.	0.

6.10-	119.	0.	0.	0.	871.
5.90+	131.	0.	0.	0.	1323.
5.90-	131.	871.	0.	0.	1323.
5.80	137.	1318.	0.	0.	1326.
4.90	193.	1421.	0.	0.	1267.
4.80	200.	1433.	0.	0.	1264.
3.80	262.	1548.	0.	0.	1301.
2.80	324.	1663.	0.	0.	1347.
2.09	369.	1745.	0.	0.	1379.
1.80	387.	1778.	0.	0.	1392.
0.80	449.	1894.	0.	0.	1438.
-0.20	512.	2010.	0.	0.	1490.
-1.20	574.	1939.	0.	0.	1374.
-1.50	593.	1827.	0.	0.	1249.
-2.18+	635.	1648.	0.	0.	1035.
-2.18-	635.	1652.	0.	0.	1035.
-2.20	636.	1648.	9.	0.	1030.
-3.20	699.	1694.	169.	0.	1012.
-4.20	761.	1797.	258.	0.	1050.
-5.20	824.	1893.	355.	0.	1083.
-6.14	882.	1983.	448.	0.	1112.
-6.20	886.	1989.	454.	0.	1114.
-7.20	948.	2115.	514.	0.	1176.
-7.50	967.	2199.	471.	0.	1241.
-7.70	980.	2259.	423.	0.	1293.
-8.20	980.	2310.	385.	0.	1337.
-9.20	980.	2313.	409.	0.	1345.
-9.78	980.	2304.	443.	0.	1355.
-11.20	980.	2301.	466.	0.	1366.

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'ROTATIONAL ANALYSIS
'ORLEANS CANAL
'MVK DISTRICT
'REACH 18A WITH BERM
CONTROL  CANTILEVER  DESIGN  1.00  1.07
WALL   13.8
SURFACE RIGHTSIDE   8    0    6.1
            0.9    6.1
            21    3
            36.3   -1.3
            38   -1.5
            49   -2.8
            72   -7.3
            90   -8
SURFACE LEFTSIDE   7    0    5.9
            6.9    5.9
            15.4    5.5
            88   -1.5
            101   -5.86
            110   -5.7
            200   -5.7
SOIL RIGHTSIDE  STRENGTHS   7
  115    115    0    540    0    540   -1.5   0
  102    102    0    300    0    300   -7.5   0
  80    80    0    370    0    370   -16   0
  108    108    0    300    0    300   -20.5   0
  108    108    0    320    0    320   -25   0
  122    122    33    0    18    0   -41   0
  103    103    0    500    0    500
SOIL LEFTSIDE  STRENGTHS   7
  115    115    0    540    0    540   -1.5   0
  102    102    0    300    0    300   -7.5   0
  80    80    0    370    0    370   -16   0
  108    108    0    300    0    300   -20.5   0
  108    108    0    320    0    320   -25   0
  122    122    33    0    18    0   -41   0
  103    103    0    500    0    500
WATER ELEVATIONS   62.4    8   -7.7
HORIZONTAL DISTRIBUTED   2    5.9    2197   -7.7    0
FINISHED
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PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS
DATE: 7-OCTOBER-2013 TIME: 15:24:28

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*  INPUT DATA  *
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I.--HEADING
'ROTATIONAL ANALYSIS
'ORLEANS CANAL
'MVK DISTRICT
'REACH 18A WITH BERM

II.--CONTROL
CANTILEVER WALL DESIGN
FACTOR OF SAFETY FOR ACTIVE PRESSURES = 1.00
FACTOR OF SAFETY FOR PASSIVE PRESSURES = 1.07

III.--WALL DATA
ELEVATION AT TOP OF WALL = 13.80 FT.

IV.--SURFACE POINT DATA

IV.A.--RIGHTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	6.10
0.90	6.10
21.00	3.00
36.30	-1.30
38.00	-1.50
49.00	-2.80
72.00	-7.30
90.00	-8.00

IV.B.--LEFTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	5.90
6.90	5.90
15.40	5.50
88.00	-1.50
101.00	-5.86
110.00	-5.70
200.00	-5.70

V.--SOIL LAYER DATA

V.A.--RIGHTSIDE
LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COHESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADHESION (PSF)	BOTTOM ELEV. (FT)	BOTTOM SLOPE (FT/FT)	SAFETY FACTOR ACT.	SAFETY FACTOR PASS.
115.00	115.00	0.00	540.00	0.00	540.00	-1.50	0.00	DEF	DEF
102.00	102.00	0.00	300.00	0.00	300.00	-7.50	0.00	DEF	DEF
80.00	80.00	0.00	370.00	0.00	370.00	-16.00	0.00	DEF	DEF
108.00	108.00	0.00	300.00	0.00	300.00	-20.50	0.00	DEF	DEF
108.00	108.00	0.00	320.00	0.00	320.00	-25.00	0.00	DEF	DEF
122.00	122.00	33.00	0.00	18.00	0.00	-41.00	0.00	DEF	DEF
103.00	103.00	0.00	500.00	0.00	500.00			DEF	DEF

V.B.--LEFTSIDE

LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COHESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADHESION (PSF)	BOTTOM ELEV. (FT)	BOTTOM SLOPE (FT/FT)	SAFETY FACTOR ACT.	SAFETY FACTOR PASS.
115.00	115.00	0.00	540.00	0.00	540.00	-1.50	0.00	DEF	DEF
102.00	102.00	0.00	300.00	0.00	300.00	-7.50	0.00	DEF	DEF
80.00	80.00	0.00	370.00	0.00	370.00	-16.00	0.00	DEF	DEF
108.00	108.00	0.00	300.00	0.00	300.00	-20.50	0.00	DEF	DEF
108.00	108.00	0.00	320.00	0.00	320.00	-25.00	0.00	DEF	DEF
122.00	122.00	33.00	0.00	18.00	0.00	-41.00	0.00	DEF	DEF
103.00	103.00	0.00	500.00	0.00	500.00			DEF	DEF

VI.--WATER DATA

UNIT WEIGHT = 62.40 (PCF)
RIGHTSIDE ELEVATION = 8.00 (FT)
LEFTSIDE ELEVATION = -7.70 (FT)
NO SEEPAGE

VII.--VERTICAL SURCHARGE LOADS

NONE

VIII.--HORIZONTAL LOADS

VIII.A.--HORIZONTAL LINE LOADS

NONE

VIII.B.--HORIZONTAL DISTRIBUTED LOADS

ELEVATION (FT)	DIST. LOAD (PSF)
5.90	2197.00
-7.70	0.00

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS
DATE: 7-OCTOBER-2013 TIME: 15:24:30

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**************************
*   SOIL PRESSURES FOR   *
* CANTILEVER WALL DESIGN *
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I.--HEADING

'ROTATIONAL ANALYSIS
'ORLEANS CANAL
'MVK DISTRICT
'REACH 18A WITH BERM

II.--SOIL PRESSURES

RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

NET SOIL PRESSURES INCLUDE APPLIED HORIZONTAL DISTRIBUTED LOADS.

	NET	<---LEFTSIDE--->		<------NET------> (SOIL + WATER)		<--RIGHTSIDE--->	
ELEV.	WATER	PASSIVE	ACTIVE	ACTIVE	PASSIVE	ACTIVE	PASSIVE
(FT)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)
13.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7.8	12.5	0.0	0.0	12.5	12.5	0.0	0.0
6.8	74.9	0.0	0.0	74.9	74.9	0.0	0.0
6.1+	118.6	0.0	0.0	118.6	118.6	0.0	0.0
6.1-	118.6	0.0	0.0	118.6	1127.9	0.0	1009.3
5.9+	131.0	0.0	0.0	131.0	1662.7	0.0	1531.7
5.9-	131.0	1009.3	0.0	1318.7	3859.7	0.0	1531.7
5.8	137.3	1525.5	0.0	792.6	3852.9	0.0	1534.7
4.9	193.4	1629.0	0.0	599.9	3687.0	0.0	1458.1
4.8	199.7	1640.5	0.0	578.5	3673.0	0.0	1454.0
3.8	262.1	1755.5	0.0	364.3	3609.9	0.0	1490.0
2.8	324.5	1870.5	0.0	150.2	3556.6	0.0	1535.9
2.1	368.2	1951.2	0.0	0.0	3519.0	0.0	1567.8
1.8	386.9	1985.5	0.0	-64.0	3503.0	0.0	1581.4
0.8	449.3	2101.5	0.0	-279.1	3449.4	0.0	1627.0
-0.2	511.7	2217.7	0.0	-494.4	3403.5	0.0	1680.3
-1.2	574.1	2117.8	0.0	-493.7	3162.7	0.0	1538.6
-1.5	592.8	1982.2	0.0	-387.8	2985.9	0.0	1391.5

-2.2+	635.5	1764.2	0.0	-240.2	2667.0	0.0	1140.4
-2.2-	635.5	1769.4	0.0	-240.2	2667.0	0.0	1140.4
-2.2	636.5	1764.2	8.9	-239.3	2650.5	0.0	1134.4
-3.2	698.9	1802.3	168.6	-376.4	2365.0	0.0	1107.8
-4.2	761.3	1905.6	258.4	-578.9	2215.1	0.0	1146.9
-5.2	823.7	2002.4	355.2	-774.9	2051.7	0.0	1179.4
-6.2	886.1	2097.7	453.8	-969.3	1885.0	0.0	1210.4
-7.2	948.5	2228.6	514.4	-1199.4	1791.8	0.0	1276.9
-7.5	967.2	2322.1	470.6	-1322.6	1880.5	0.0	1351.6
-7.7	979.7	2389.6	422.7	-1409.9	1967.8	0.0	1410.8
-8.2	979.7	2446.7	384.9	-1467.0	2056.0	0.0	1461.3
-9.2	979.7	2447.5	409.2	-1467.9	2039.0	0.0	1468.6
-10.2	979.7	2436.3	442.9	-1456.6	2015.9	0.0	1479.2
-11.2	979.7	2431.0	465.6	-1451.3	2003.8	0.0	1489.7
-12.2	979.7	2437.3	474.2	-1457.6	2005.8	0.0	1500.3
-13.2	979.7	2445.0	481.4	-1465.4	2009.1	0.0	1510.9
-14.2	979.7	2453.9	487.4	-1474.2	2015.1	0.0	1522.8
-15.2	979.7	2450.7	506.2	-1471.1	1996.2	0.0	1522.7
-16.0	979.7	2371.6	609.5	-1392.0	1816.2	0.0	1446.1
-16.2	979.7	2343.1	650.2	-1363.4	1748.3	0.0	1418.8
-17.2	979.7	2310.8	756.5	-1331.1	1599.3	0.0	1376.1
-17.9+	979.7	2337.8	780.4	-1358.1	1573.9	0.0	1374.4
-17.9-	979.7	2337.8	780.4	-1358.1	1573.9	0.0	1374.9
-18.2	979.7	2347.8	790.4	-1345.9	1563.6	22.2	1374.4
-19.2	979.7	2382.7	826.6	-1313.4	1531.9	89.6	1378.9
-20.2	979.7	2433.7	845.4	-1342.7	1558.6	111.4	1424.3
-20.5	979.7	2457.7	841.9	-1371.0	1586.0	107.0	1448.2
-21.2	979.7	2506.0	841.6	-1420.6	1633.6	105.7	1495.5
-22.2	979.7	2546.1	872.1	-1432.0	1642.1	134.5	1534.5
-22.6+	979.7	2559.4	885.9	-1579.7	1290.9	0.0	1087.1
-22.6-	979.7	2559.4	885.9	-1579.7	1290.9	0.0	1307.3
-23.2	979.7	2581.3	907.9	-1601.7	1187.1	0.0	1115.3
-23.3+	979.7	2505.2	863.7	-1525.5	4178.2	0.0	6833.9
-23.3-	979.7	2505.2	863.7	-1525.5	4178.2	0.0	1290.4
-24.2	979.7	7681.4	3981.9	-3262.0	3831.7	3439.7	6833.9

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS
DATE: 7-OCTOBER-2013 TIME: 15:24:30

****
* SUMMARY OF RESULTS FOR *
* CANTILEVER WALL DESIGN *
****

I.--HEADING
'ROTATIONAL ANALYSIS
'ORLEANS CANAL
'MVK DISTRICT
'REACH 18A WITH BERM

II.--SUMMARY

RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

WALL BOTTOM ELEV. (FT) : -9.86
PENETRATION (FT) : 15.76

MAX. BEND. MOMENT (LB-FT) : 9.6335E+03
AT ELEVATION (FT) : -3.17

MAX. SCALED DEFL. (LB-IN^3): 2.4297E+09
AT ELEVATION (FT) : 13.80

NOTE: DIVIDE SCALED DEFLECTION MODULUS OF
ELLASTICITY IN PSI TIMES PILE MOMENT
OF INERTIA IN IN^4 TO OBTAIN DEFLECTION
IN INCHES.

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHOREDOR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS
DATE: 7-OCTOBER-2013 TIME: 15:24:30

****
* COMPLETE OF RESULTS FOR *
* CANTILEVER WALL DESIGN *
****

I.--HEADING
'ROTATIONAL ANALYSIS
'ORLEANS CANAL
'MVK DISTRICT
'REACH 18A WITH BERM

II.--RESULTS

ELEVATION (FT)	BENDING MOMENT (LB-FT)	SHEAR (LB)	SCALED DEFLECTION (LB-IN^3)	NET PRESSURE (PSF)
13.80	0.0000E+00	0.	2.4297E+09	0.00
12.80	5.2387E-10	0.	2.2800E+09	0.00
11.80	5.2387E-10	0.	2.1304E+09	0.00
10.80	5.2387E-10	0.	1.9807E+09	0.00

9.80	5.2387E-10	0.	1.8310E+09	0.00
8.80	-1.7462E-10	0.	1.6814E+09	0.00
8.00	-4.0233E-09	0.	1.5616E+09	0.00
7.80	8.3200E-02	1.	1.5317E+09	12.48
6.80	1.7971E+01	45.	1.3820E+09	74.88
6.10	7.1334E+01	113.	1.2773E+09	118.56
5.90+	9.6314E+01	138.	1.2473E+09	131.04
5.90-	9.6314E+01	138.	1.2473E+09	1318.69
5.80	1.1579E+02	243.	1.2324E+09	792.61
4.90	6.2962E+02	870.	1.0979E+09	599.88
4.80	7.1956E+02	929.	1.0830E+09	578.46
3.80	1.9018E+03	1400.	9.3503E+08	364.32
2.80	3.4483E+03	1657.	7.9036E+08	150.17
2.10	4.6352E+03	1710.	6.9229E+08	0.00
1.80	5.1451E+03	1700.	6.5166E+08	-63.97
0.80	6.7777E+03	1529.	5.2185E+08	-279.06
-0.20	8.1312E+03	1142.	4.0370E+08	-494.40
-1.20	9.0263E+03	648.	2.9954E+08	-493.72
-1.50	9.2001E+03	516.	2.7128E+08	-387.84
-2.18	9.4736E+03	301.	2.1224E+08	-240.19
-2.20	9.4785E+03	297.	2.1091E+08	-239.26
-3.20	9.6333E+03	-11.	1.3863E+08	-376.43
-4.20	9.4008E+03	-488.	8.2927E+07	-578.93
-5.20	8.5905E+03	-1165.	4.3390E+07	-774.91
-6.14	7.1214E+03	-1982.	1.9658E+07	-958.05
-6.20	7.0055E+03	-2036.	1.8586E+07	-911.81
-7.20	4.6477E+03	-2546.	5.7673E+06	-110.01
-7.50	3.8824E+03	-2543.	3.6820E+06	130.53
-7.70	3.3774E+03	-2501.	2.6346E+06	290.89
-8.20	2.1799E+03	-2256.	9.6363E+05	691.78
-9.20	4.0379E+02	-1163.	2.6391E+04	1493.58
-9.86	0.0000E+00	0.	0.0000E+00	2023.76

NOTE: DIVIDE SCALED DEFLECTION MODULUS OF ELLASTICITY IN PSI TIMES PILE MOMENT OF INERTIA IN IN^4 TO OBTAIN DEFLECTION IN INCHES.

III.--WATER AND SOIL PRESSURES

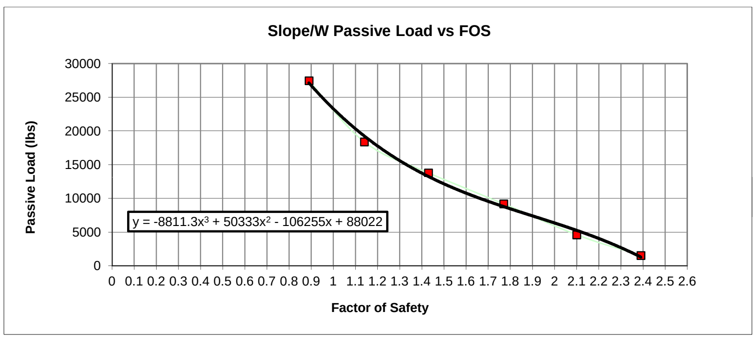
		<-------------SOIL PRESSURES-------------->			
	WATER	<----LEFTSIDE----->		<---RIGHTSIDE---->	
ELEVATION	PRESSURE	PASSIVE	ACTIVE	ACTIVE	PASSIVE
(FT)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)
13.80	0.	0.	0.	0.	0.
12.80	0.	0.	0.	0.	0.
11.80	0.	0.	0.	0.	0.
10.80	0.	0.	0.	0.	0.
9.80	0.	0.	0.	0.	0.
8.80	0.	0.	0.	0.	0.
8.00	0.	0.	0.	0.	0.
7.80	12.	0.	0.	0.	0.
6.80	75.	0.	0.	0.	0.
6.10+	119.	0.	0.	0.	0.

6.10-	119.	0.	0.	0.	1009.
5.90+	131.	0.	0.	0.	1532.
5.90-	131.	1009.	0.	0.	1532.
5.80	137.	1526.	0.	0.	1535.
4.90	193.	1629.	0.	0.	1458.
4.80	200.	1641.	0.	0.	1454.
3.80	262.	1756.	0.	0.	1490.
2.80	324.	1871.	0.	0.	1536.
2.10	368.	1951.	0.	0.	1568.
1.80	387.	1986.	0.	0.	1581.
0.80	449.	2101.	0.	0.	1627.
-0.20	512.	2218.	0.	0.	1680.
-1.20	574.	2118.	0.	0.	1539.
-1.50	593.	1982.	0.	0.	1392.
-2.18+	635.	1764.	0.	0.	1140.
-2.18-	635.	1769.	0.	0.	1140.
-2.20	636.	1764.	9.	0.	1134.
-3.20	699.	1802.	169.	0.	1108.
-4.20	761.	1906.	258.	0.	1147.
-5.20	824.	2002.	355.	0.	1179.
-6.14	882.	2092.	448.	0.	1209.
-6.20	886.	2098.	454.	0.	1210.
-7.20	948.	2229.	514.	0.	1277.
-7.50	967.	2322.	471.	0.	1352.
-7.70	980.	2390.	423.	0.	1411.
-8.20	980.	2447.	385.	0.	1461.
-9.20	980.	2448.	409.	0.	1469.
-9.86	980.	2436.	443.	0.	1479.
-11.20	980.	2431.	466.	0.	1490.

Canal:	Orleans Avenue Canal		
Reach:	Reach 19		
Load Case:		Water @ El 8	
Protected Side Top of Ground (GSE):		5	ft, Elevation
Critical Slip Surface Elev. (FSE):		-12.5	ft, Elevation
Sheetpile Tip Elevation:		-15.3	ft, Elevation

Step 1: Compute correct passive pressure forces from slope stability model (Slope/W). Procedure follows the approach cited in Paragraph D-4 of ETL 1110-2-575.

Unit Weight (psf)	Passive Load (lbs)	Factor of Safety	Failure Surface Elevation (feet)	Notes
10	1531.3	2.39	-12.5	Circular failure surface: Goes below the sheetpile tip to elevation -30
30	4593.7	2.1	-12.5	Circular failure surface: Goes below the sheetpile tip to elevation -30
60	9187.5	1.77	-12.5	Circular failure surface: Goes below the sheetpile tip to elevation -27.5
90	13781	1.43	-12.5	Circular failure surface: Goes below the sheetpile tip to elevation -24.5
120	18375	1.14	-12.5	Circular failure surface: Goes below the sheetpile tip to elevation -20
150	27452	0.89	-12.5	Circular failure surface: Goes below the sheetpile tip to elevation -19.1



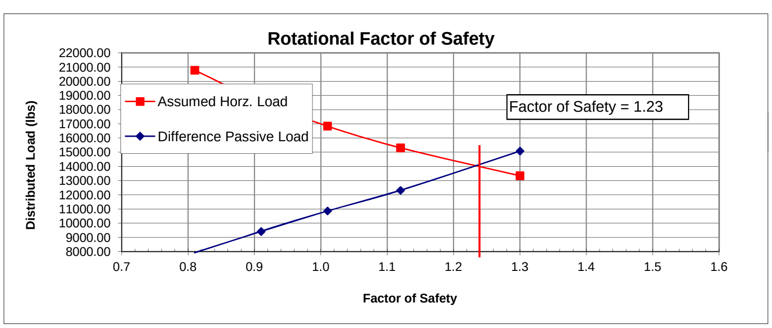
Step 2: Perform CWALSHT analysis of cross section using a range of <u>assumed</u> horizontal distributed load above the critical slip surface elevation found in step 1. Determine the difference in passive load from CWALSHT and Slope/W for each assumed horizontal distributed load.

	(A)	(B)		(C)	(D)	
FOS	CWALSHT Passive Load (lbs)	SLOPE/W Passive Load (lbs)	Tip Elev feet	Difference Passive Load (A-B) (lbs)	Assumed Horizontal Distributed Load in CWALSHT (psf)	Resultant Distributed CWALSHT Load (D*(GSE-FSE)) (lbs)
1.3	30676.145	15594.84	-15.4	15081.30	1525 (tri)	13343.75
1.12	32089.26	19774.87	-15.4	12314.39	1750 (tri)	15312.50
1.01	33836.345	22970.85	-15.3	10865.49	1925 (tri)	16843.75
0.91	35786.6	26370.77	-15.4	9415.83	2125 (tri)	18593.75
0.81	38214.98	30296.25	-15.4	7918.73	2375 (tri)	20781.25

Interpolate Correction Force at the resultant FOS

FOS = 1.23

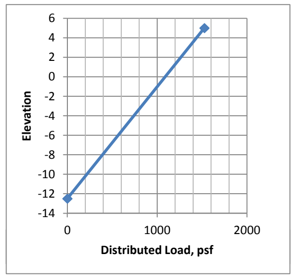
Correction Force = 14005.28 lbs



VIII.B.--HORIZONTAL DISTRIBUTED LOAD

ELEVATION (FT)	DIST. LOAD (PSF)	Result. (LBS)
5	1525	
-12.5	0	13343.75

13343.75



RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

NET SOIL PRESSURES INCLUDE APPLIED HORIZONTAL DISTRIBUTED LOADS.

ELEV. (FT)	NET WATER (PSF)	<---LEFTSIDE---> PASSIVE (PSF)	ACTIVE (PSF)	<--RIGHTSIDE---> ACTIVE (PSF)	PASSIVE (PSF)
13.8	0	0	0	0	0
12.8	0	0	0	0	0
11.8	0	0	0	0	0
10.8	0	0	0	0	0
9.8	0	0	0	0	0
8.8	0	0	0	0	0
8	0	0	0	0	0
7.8	12.5	0	0	0	0
6.8	74.9	0	0	0	0
5.8	137.3	0	0	0	0
5.0+	187.2	0	0	0	0
-5	187.2	769.2	0	0	0
4.8	199.7	1177.2	0	0	0
4.6+	215.3	1206.5	0	0	0
-4.6	215.3	1206.5	0	0	769.2
3.8	262.1	1294.2	0	0	1171.5
3.6	277.7	1323.5	0	0	1159.1
2.8	324.5	1411.2	0	0	1129
1.8	386.9	1528.2	0	0	1156.4
1.6	431.6	1615.3	0	0	1193.5
0.8	449.3	1649.7	0	0	1208.2
-0.2	511.7	1726.2	0	0	1212.9
-0.9	555.4	1613.3	0	0	1049.9
-1.2	574.1	1536.3	0	0	951.4
-2.2	636.5	1511.3	0	0	854.7
-2.9+	681.2	1619.5	0	0	881
-2.9-	681.2	1588.9	0	0	881
-3.2	698.9	1619.5	27.2	0	891.3
-4.2	761.3	1723.1	129.5	0	922.7
-5.2	823.7	1821.7	238	0	954
-6.0+	886.1	1912.5	353.6	0	987.2
-6.0-	948.5	1961.5	519.2	0	977.8
-6.2	967.2	1939.2	614.2	0	935.8
-7.2	992.2	1897.5	738.4	0	872.5
-7.5	992.2	1895.1	771.2	0	863.2
-7.9	992.2	1925.2	792	0	888.9
-8.2	992.2	1932.1	798.8	0	901.2
-9.2	992.2	1932.1	798.8	0	892.2
-9.5+	992.2	1950.7	817.5	22.5	901.2
-9.5-	992.2	1974.5	845.5	88.8	883.7
-10.2	992.2	2039.6	819.4	96.3	905.8
-11.2	992.2	2097.5	758.9	50.9	945.6
-12.2	992.2	2172.7	673.3	0	1021.8
-12.5	992.2	2172.7	673.3	0	986
-12.9+	992.2	2194	653.6	0	1021.8
-12.9-	992.2	2200.6	669.3	0	1036.3
-13.2	992.2	2211.1	679.8	0	1034
-14.2	992.2	2212.2	680.9	0	1033.9
-15.2	992.2	2221.7	690.4	0	1031
-15.3	992.2	2231.6	701.8	0	1046.9
-16.2	992.2	2247.2	705.7	0	1111.6
-17.2	992.2	2301.2	662	0	1206.5
-18.2	992.2	2322.8	646.5	0	1230.5
-19	992.2	2393	642.1	0	1295.1
-19.2	992.2	2430.8	681.8	0	1330
-20.2	992.2	2469.3	720.4	0	1365.7
-21.2	992.2	2507	760.1	0	1400.5
-22.2	992.2	2552.3	789.9	0	1442.9
-23.2	992.2	2642.5	743.1	0	1526.4
-24.2	992.2	2668	727	0	1554.9
-25	992.2	2678.2	784.9	0	1645.6
-25.2	992.2	2738.3	727	0	1619.2
-26.2	992.2	2746.8	784.9	0	1714.8

ELEV. (FT)	NET WATER (PSF)	LEFTSIDE PASSIVE (PSF)	RESULT. LEFTSIDE PASSIVE (LBS)
13.8	0	0	
12.8	0	0	
11.8	0	0	
10.8	0	0	
9.8	0	0	
8.8	0	0	
8	0	0	
7.8	12	0	
6.8	75	0	0
5.8	137	0	0
5	187	0	0
5	187	769	0
4.8	200	1177	194.6
4.55	215	1206	297.875
4.55	215	1206	0
3.8	262	1294	937.5
3.55	278	1323	327.125
2.8	324	1411	1025.25
1.8	387	1528	1469.5
1.08	432	1615	1131.48
0.8	449	1650	457.1
-0.2	512	1726	1688
-0.9	555	1613	1168.65
-1.2	574	1536	472.35
-2.2	636	1511	1523.5
-2.92	681	1620	1127.16
-2.92	681	1589	0
-3.2	699	1620	449.26
-4.2	761	1723	1671.5
-5.2	824	1822	1772.5
-6.2	886	1912	1867
-7.2	948	1961	1936.5
-7.5	967	1939	585
-7.9	992	1898	767.4
-8.2	992	1895	568.95
-9.2	992	1925	1910
-9.47	992	1932	520.695
-9.47	992	1932	0
-9.88	992	1942	794.17
-10.2	992	1951	622.88
-11.2	992	1974	1962.5
-12.2	992	2040	2007
-12.5	992	2098	620.7
-12.87	992	2173	790.135
-12.87	992	2173	0
-13.2	992	2194	720.555
-14.2	992	2201	2197.5
-15.2	992	2211	2206
-15.3	992	2212	221.15
-15.42	992	2222	266.04
-17.2	992	2232	3964.06

PASSIVE LOAD (SOIL) 29876.145
PASSIVE LOAD (SOIL+WATER) 30676.145 **IF THE PS WATER LEVEL IS BELOW THE CRITICAL SLIP SURFACE, USE PASSIVE LOAD (SOIL)**
FOS = 1.3

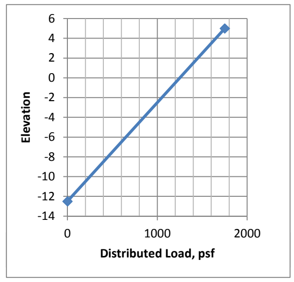
PS WATER ELEVATION (FT)	CRITICAL SLIP SURF. ELEVATION (FT)	UNIT WEIGHT WATER (PCF)
-7.5	-12.5	64

RESULTANT WATER LOAD= 800 LBS

VIII.B.--HORIZONTAL DISTRIBUTED LOAD

ELEVATION (FT)	DIST. LOAD (PSF)	Result. (LBS)
5	1750	
-12.5	0	15312.5

15312.5



RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

NET SOIL PRESSURES INCLUDE APPLIED HORIZONTAL DISTRIBUTED LOADS.

ELEV. (FT)	NET WATER (PSF)	<---LEFTSIDE---> PASSIVE (PSF)	ACTIVE (PSF)	<--RIGHTSIDE---> ACTIVE (PSF)	PASSIVE (PSF)
13.8	0	0	0	0	0
12.8	0	0	0	0	0
11.8	0	0	0	0	0
10.8	0	0	0	0	0
9.8	0	0	0	0	0
8.8	0	0	0	0	0
8	0	0	0	0	0
7.8	12.5	0	0	0	0
6.8	74.9	0	0	0	0
5.8	137.3	0	0	0	0
5.0+	187.2	0	0	0	0
-5	187.2	892.9	0	0	0
4.8	199.7	1362.7	0	0	0
4.6+	215.3	1391.9	0	0	0
-4.6	215.3	1391.9	0	0	892.9
3.8	262.1	1479.7	0	0	1353.2
3.6	277.7	1508.9	0	0	1336.7
2.8	324.5	1596.7	0	0	1296
1.8	386.9	1713.7	0	0	1320.5
1.4	427.2	1792.6	0	0	1354.7
0.8	449.3	1835.9	0	0	1373.4
-0.2	511.7	1905.8	0	0	1371.6
-0.9	555.4	1761.9	0	0	1177.5
-1.2	574.1	1667.3	0	0	1061.5
-2.2	636.5	1621.7	0	0	944.2
-2.9+	681.2	1730.8	0	0	971
-2.9-	681.2	1699.9	0	0	971
-3.2	698.9	1730.8	27.2	0	981.6
-4.2	761.3	1834.5	129.5	0	1013
-5.2	823.7	1932.3	238	0	1044.3
-6.2	886.1	2021.4	353.6	0	1077.8
-7.2	948.5	2062.3	519.2	0	1061.9
-7.5	967.2	2031.8	614.2	0	1011.7
-7.9	992.2	1978.5	738.4	0	936.8
-8.2	992.2	1973.6	771.2	0	925.1
-9.2	992.2	2004.4	792	0	951.5
-9.5+	992.2	2011.2	798.8	0	962.6
-9.5-	992.2	2011.2	798.8	0	954.5
-10.2	992.2	2029.9	817.5	22.5	962.6
-11.2	992.2	2053.4	845.5	88.8	939.2
-12.2	992.2	2124.9	819.4	96.3	962.3
-12.5	992.2	2191.1	758.9	50.9	1008.1
-12.9+	992.2	2277.5	673.3	0	1096.3
-12.9-	992.2	2277.5	673.3	0	1054.9
-13.2	992.2	2301.6	653.6	0	1096.3
-14.2	992.2	2307.6	669.3	0	1113.3
-15.2	992.2	2318.1	679.8	0	1110.7
-15.3	992.2	2319.2	680.9	0	1110.6
-16.2	992.2	2328.7	690.4	0	1107.3
-17.2	992.2	2338.5	701.8	0	1125.8
-18.2	992.2	2355	705.7	0	1200.7
-19	992.2	2415.8	662	0	1309.5
-19.2	992.2	2440	646.5	0	1336.6
-20.2	992.2	2515.3	642.1	0	1406.1
-21.2	992.2	2553	681.8	0	1440.8
-22.2	992.2	2591.5	720.4	0	1476.5
-23.2	992.2	2629.1	760.1	0	1511.1
-24.2	992.2	2675.5	789.9	0	1554.7
-25	992.2	2775.3	743.1	0	1647
-25.2	992.2	2803.6	727	0	1679
-26.2	992.2	2810.5	784.9	0	1779

ELEV. (FT)	NET WATER (PSF)	LEFTSIDE PASSIVE (PSF)	RESULT. LEFTSIDE PASSIVE (LBS)
13.8	0	0	
12.8	0	0	
11.8	0	0	
10.8	0	0	
9.8	0	0	
8.8	0	0	
8	0	0	
7.8	12	0	
6.8	75	0	0
5.8	137	0	0
5	187	0	0
5	187	893	0
4.8	200	1363	225.6
4.55	215	1392	344.375
4.55	215	1392	0
3.8	262	1480	1077
3.55	278	1509	373.625
2.8	324	1597	1164.75
1.8	387	1714	1655.5
1.08	427	1793	1262.52
0.8	449	1836	508.06
-0.2	512	1906	1871
-0.9	555	1762	1283.8
-1.2	574	1667	514.35
-2.2	636	1622	1644.5
-2.92	681	1731	1207.08
-2.92	681	1700	0
-3.2	699	1731	480.34
-4.2	761	1834	1782.5
-5.2	824	1932	1883
-6.2	886	2021	1976.5
-7.2	948	2062	2041.5
-7.5	967	2032	614.1
-7.9	992	1979	802.2
-8.2	992	1974	592.95
-9.2	992	2004	1989
-9.47	992	2011	542.025
-9.47	992	2011	0
-9.88	992	2022	826.765
-10.2	992	2030	648.32
-11.2	992	2053	2041.5
-12.2	992	2125	2089
-12.5	992	2191	647.4
-12.87	992	2277	826.58
-12.87	992	2277	0
-13.2	992	2302	755.535
-14.2	992	2308	2305
-15.2	992	2318	2313
-15.3	992	2319	231.85
-15.42	992	2329	278.88
-17.2	992	2338	4153.63

PASSIVE LOAD (SOIL) 32089.26
PASSIVE LOAD (SOIL+WATER) 32889.26 **IF THE PS WATER LEVEL IS BELOW THE CRITICAL SLIP SURFACE,**
FOS = 1.12 **USE PASSIVE LOAD (SOIL)**

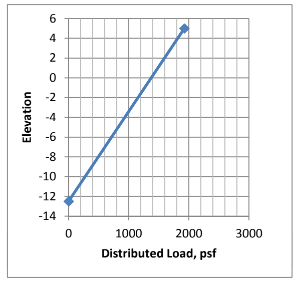
PS WATER ELEVATION (FT)	CRITICAL SLIP SURF. ELEVATION (FT)	UNIT WEIGHT WATER (PCF)
-7.5	-12.5	64

RESULTANT WATER LOAD= 800 LBS

VIII.B.--HORIZONTAL DISTRIBUTED LOAD

ELEVATION (FT)	DIST. LOAD (PSF)	Result. (LBS)
5	1925	
-12.5	0	16843.75

16843.75



RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

NET SOIL PRESSURES INCLUDE APPLIED HORIZONTAL DISTRIBUTED LOADS.

	NET	<---LEFTSIDE--->		<--RIGHTSIDE--->	
ELEV. (FT)	WATER (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)
13.8	0	0	0	0	0
12.8	0	0	0	0	0
11.8	0	0	0	0	0
10.8	0	0	0	0	0
9.8	0	0	0	0	0
8.8	0	0	0	0	0
8	0	0	0	0	0
7.8	12.5	0	0	0	0
6.8	74.9	0	0	0	0
5.8	137.3	0	0	0	0
5.0+	187.2	0	0	0	0
-5	187.2	990.1	0	0	0
4.8	199.7	1508.5	0	0	0
4.6+	215.3	1537.8	0	0	0
-4.6	215.3	1537.8	0	0	990.1
3.8	262.1	1625.5	0	0	1496.1
3.6	277.7	1654.8	0	0	1476.4
2.8	324.5	1742.5	0	0	1427.5
1.8	386.9	1859.5	0	0	1449.6
1.4	423.6	1931.9	0	0	1481.3
0.8	449.3	1982.3	0	0	1503.3
-0.2	511.7	2047.1	0	0	1496.4
-0.9	555.4	1878.7	0	0	1277.9
-1.2	574.1	1770.4	0	0	1148.1
-2.2	636.5	1708.5	0	0	1014.6
-2.9+	681.2	1818.3	0	0	1041.9
-2.9-	681.2	1787.2	0	0	1041.9
-3.2	698.9	1818.3	27.2	0	1052.7
-4.2	761.3	1922.1	129.5	0	1084
-5.2	823.7	2019.4	238	0	1115.4
-6.2	886.1	2107.1	353.6	0	1149.1
-7.2	948.5	2141.5	519.2	0	1128
-7.5	967.2	2104.7	614.2	0	1071.5
-7.9	992.2	2042.2	738.4	0	987.4
-8.2	992.2	2035.4	771.2	0	973.7
-9.2	992.2	2066.7	792	0	1000.9
-9.5+	992.2	2073.5	798.8	0	1010.9
-9.5-	992.2	2073.5	798.8	0	1003.6
-10.2	992.2	2092.2	817.5	22.5	1010.9
-11.2	992.2	2115.4	845.5	88.8	982.9
-12.2	992.2	2191.9	819.4	96.3	1006.8
-12.5	992.2	2264.6	758.9	50.9	1057.3
-12.9+	992.2	2359.9	673.3	0	1154.9
-12.9-	992.2	2359.9	673.3	0	1109.1
-13.2	992.2	2386.3	653.6	0	1154.9
-14.2	992.2	2391.7	669.3	0	1173.9
-15.2	992.2	2402.3	679.8	0	1171
-15.3	992.2	2403.4	680.9	0	1171
-16.2	992.2	2412.9	690.4	0	1167.4
-17.2	992.2	2422.6	701.8	0	1188
-18.2	992.2	2439.7	705.7	0	1270.8
-19	992.2	2505.9	662	0	1390.6
-19.2	992.2	2532.1	646.5	0	1420.1
-20.2	992.2	2611.6	642.1	0	1493.3
-21.2	992.2	2649.1	681.8	0	1528
-22.2	992.2	2687.7	720.4	0	1563.6
-23.2	992.2	2725.1	760.1	0	1598.2
-24.2	992.2	2772.3	789.9	0	1642.6
-25	992.2	2879.7	743.1	0	1741.9
-25.2	992.2	2910.3	727	0	1776.6
-26.2	992.2	2914.5	784.9	0	1883.9

ELEV. (FT)	NET WATER (PSF)	LEFTSIDE PASSIVE (PSF)	RESULT. LEFTSIDE PASSIVE (LBS)
13.8	0	0	
12.8	0	0	
11.8	0	0	
10.8	0	0	
9.8	0	0	
8.8	0	0	
8	0	0	
7.8	12	0	
6.8	75	0	0
5.8	137	0	0
5	187	0	0
5	187	990	0
4.8	200	1509	249.9
4.55	215	1538	380.875
4.55	215	1538	0
3.8	262	1626	1186.5
3.55	278	1655	410.125
2.8	324	1743	1274.25
1.8	387	1860	1801.5
1.21	424	1932	1118.64
0.8	449	1982	802.37
-0.2	512	2047	2014.5
-0.9	555	1879	1374.1
-1.2	574	1770	547.35
-2.2	636	1709	1739.5
-2.92	681	1818	1269.72
-2.92	681	1787	0
-3.2	699	1818	504.7
-4.2	761	1922	1870
-5.2	824	2019	1970.5
-6.2	886	2107	2063
-7.2	948	2142	2124.5
-7.5	967	2105	637.05
-7.9	992	2042	829.4
-8.2	992	2035	611.55
-9.2	992	2067	2051
-9.47	992	2074	559.035
-9.47	992	2074	0
-9.86	992	2084	810.81
-10.2	992	2092	709.92
-11.2	992	2115	2103.5
-12.2	992	2192	2153.5
-12.5	992	2265	668.55
-12.87	992	2360	855.625
-12.87	992	2360	0
-13.2	992	2386	783.09
-14.2	992	2392	2389
-15.2	992	2402	2397
-15.3	992	2403	240.25
-15.37	992	2413	168.56
-17.2	992	2423	4424.94

PASSIVE LOAD (SOIL) 33836.35

PASSIVE LOAD (SOIL+WATER) 34636.35 **IF THE PS WATER LEVEL IS BELOW THE CRITICAL SLIP SURFACE,**

FOS = 1.01 **USE PASSIVE LOAD (SOIL)**

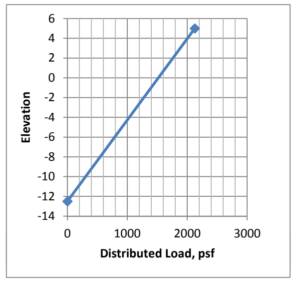
PS WATER ELEVATION (FT)	CRITICAL SLIP SURF. ELEVATION (FT)	UNIT WEIGHT WATER (PCF)
-7.5	-12.5	64

RESULTANT WATER LOAD= 800 LBS

VIII.B.--HORIZONTAL DISTRIBUTED LOAD

ELEVATION (FT)	DIST. LOAD (PSF)	Result. (LBS)
5	2125	
-12.5	0	18593.75

18593.75



RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

NET SOIL PRESSURES INCLUDE APPLIED HORIZONTAL DISTRIBUTED LOADS.

ELEV. (FT)	NET WATER (PSF)	<---LEFTSIDE---> PASSIVE (PSF)	ACTIVE (PSF)	<--RIGHTSIDE---> ACTIVE (PSF)	PASSIVE (PSF)
13.8	0	0	0	0	0
12.8	0	0	0	0	0
11.8	0	0	0	0	0
10.8	0	0	0	0	0
9.8	0	0	0	0	0
8.8	0	0	0	0	0
8	0	0	0	0	0
7.8	12.5	0	0	0	0
6.8	74.9	0	0	0	0
5.8	137.3	0	0	0	0
5.0+	187.2	0	0	0	0
-5	187.2	1098.9	0	0	0
4.8	199.7	1671.8	0	0	0
4.6+	215.3	1701	0	0	0
-4.6	215.3	1701	0	0	1098.9
3.8	262.1	1788.8	0	0	1656
3.6	277.7	1818	0	0	1632.7
2.8	324.5	1905.8	0	0	1574.5
1.8	386.9	2022.8	0	0	1594.1
1.4	421.3	2090.8	0	0	1624.2
0.8	449.3	2146.2	0	0	1648.7
-0.2	511.7	2205.2	0	0	1636.1
-0.9	555.4	2009.5	0	0	1390.3
-1.2	574.1	1885.7	0	0	1245
-2.2	636.5	1805.7	0	0	1093.3
-2.9+	681.2	1916.2	0	0	1121.2
-2.9-	681.2	1884.9	0	0	1121.2
-3.2	698.9	1916.2	27.2	0	1132.1
-4.2	761.3	2020.1	129.5	0	1163.5
-5.2	823.7	2116.7	238	0	1194.8
-6.2	886.1	2203	353.6	0	1228.8
-7.2	948.5	2230.2	519.2	0	1202
-7.5	967.2	2186.1	614.2	0	1138.3
-7.9	992.2	2113.5	738.4	0	1043.9
-8.2	992.2	2104.5	771.2	0	1028.1
-9.2	992.2	2136.4	792	0	1056
-9.5+	992.2	2143.2	798.8	0	1064.9
-9.5-	992.2	2143.2	798.8	0	1058.4
-10.2	992.2	2161.9	817.5	22.5	1064.9
-11.2	992.2	2184.9	845.5	88.8	1031.8
-12.2	992.2	2267	819.4	96.3	1056.6
-12.5	992.2	2347	758.9	50.9	1112.3
-12.9+	992.2	2452.1	673.3	0	1220.5
-12.9-	992.2	2452.1	673.3	0	1169.7
-13.2	992.2	2481	653.6	0	1220.5
-14.2	992.2	2485.9	669.3	0	1241.6
-15.2	992.2	2496.5	679.8	0	1238.5
-15.3	992.2	2497.5	680.9	0	1238.5
-16.2	992.2	2507	690.4	0	1234.6
-17.2	992.2	2516.6	701.8	0	1257.5
-18.2	992.2	2534.5	705.7	0	1349.3
-19	992.2	2606.7	662	0	1481.4
-19.2	992.2	2635.2	646.5	0	1513.6
-20.2	992.2	2719.3	642.1	0	1591
-21.2	992.2	2756.6	681.8	0	1625.5
-22.2	992.2	2795.2	720.4	0	1661.2
-23.2	992.2	2832.5	760.1	0	1695.6
-24.2	992.2	2880.7	789.9	0	1740.9
-25	992.2	2996.5	743.1	0	1848
-25.2	992.2	3029.7	727	0	1885.9
-26.2	992.2	3031	784.9	0	2001.3

ELEV. (FT)	NET WATER (PSF)	LEFTSIDE PASSIVE (PSF)	RESULT. LEFTSIDE PASSIVE (LBS)
13.8	0	0	
12.8	0	0	
11.8	0	0	
10.8	0	0	
9.8	0	0	
8.8	0	0	
8	0	0	
7.8	12	0	
6.8	75	0	0
5.8	137	0	0
5	187	0	0
5	187	1099	0
4.8	200	1672	277.1
4.55	215	1701	421.625
4.55	215	1701	0
3.8	262	1789	1308.75
3.55	278	1818	450.875
2.8	324	1906	1396.5
1.8	387	2023	1964.5
1.25	421	2091	1131.35
0.8	449	2146	953.325
-0.2	512	2205	2175.5
-0.9	555	2010	1475.25
-1.2	574	1886	584.4
-2.2	636	1806	1846
-2.92	681	1916	1339.92
-2.92	681	1885	0
-3.2	699	1916	532.14
-4.2	761	2020	1968
-5.2	824	2117	2068.5
-6.2	886	2203	2160
-7.2	948	2230	2216.5
-7.5	967	2186	662.4
-7.9	992	2114	860
-8.2	992	2105	632.85
-9.2	992	2136	2120.5
-9.47	992	2143	577.665
-9.47	992	2143	0
-9.89	992	2154	902.37
-10.2	992	2162	668.98
-11.2	992	2185	2173.5
-12.2	992	2267	2226
-12.5	992	2347	692.1
-12.87	992	2452	887.815
-12.87	992	2452	0
-13.2	992	2481	813.945
-14.2	992	2486	2483.5
-15.2	992	2496	2491
-15.3	992	2498	249.7
-15.42	992	2507	300.3
-17.2	992	2517	4471.36
		PASSIVE LOAD (SOIL)	35786.6
		PASSIVE LOAD (SOIL+WATER)	36586.6
		FOS =	0.91

IF THE PS WATER LEVEL IS BELOW THE CRITICAL SLIP SURFACE, USE PASSIVE LOAD (SOIL)

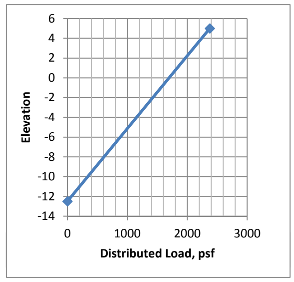
PS WATER ELEVATION (FT)	CRITICAL SLIP SURF. ELEVATION (FT)	UNIT WEIGHT WATER (PCF)
-7.5	-12.5	64

RESULTANT WATER LOAD=	800	LBS

VIII.B.--HORIZONTAL DISTRIBUTED LOAD

ELEVATION (FT)	DIST. LOAD (PSF)	Result. (LBS)
5	2375	
-12.5	0	20781.25

20781.25



RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

NET SOIL PRESSURES INCLUDE APPLIED HORIZONTAL DISTRIBUTED LOADS.

		<---LEFTSIDE--->		<--RIGHTSIDE--->	
ELEV. (FT)	NET WATER (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)
13.8	0	0	0	0	0
12.8	0	0	0	0	0
11.8	0	0	0	0	0
10.8	0	0	0	0	0
9.8	0	0	0	0	0
8.8	0	0	0	0	0
8	0	0	0	0	0
7.8	12.5	0	0	0	0
6.8	74.9	0	0	0	0
5.8	137.3	0	0	0	0
5.0+	187.2	0	0	0	0
-5	187.2	1234.6	0	0	0
4.8	199.7	1875.3	0	0	0
4.6+	215.3	1904.5	0	0	0
-4.6	215.3	1904.5	0	0	1234.6
3.8	262.1	1992.3	0	0	1855.4
3.6	277.7	2021.5	0	0	1827.6
2.8	324.5	2109.3	0	0	1757.8
1.8	386.9	2226.3	0	0	1774.3
1.4	418.9	2290	0	0	1802.9
0.8	449.3	2350.5	0	0	1830
-0.2	511.7	2402.3	0	0	1810.2
-0.9	555.4	2172.6	0	0	1530.3
-1.2	574.1	2029.5	0	0	1365.8
-2.2	636.5	1926.9	0	0	1191.5
-2.9+	681.2	2038.3	0	0	1220
-2.9-	681.2	2006.8	0	0	1220
-3.2	698.9	2038.3	27.2	0	1231.3
-4.2	761.3	2142.3	129.5	0	1262.6
-5.2	823.7	2238.2	238	0	1293.9
-6.2	886.1	2322.5	353.6	0	1328.3
-7.2	948.5	2340.8	519.2	0	1294.3
-7.5	967.2	2287.8	614.2	0	1221.6
-7.9	992.2	2202.4	738.4	0	1114.5
-8.2	992.2	2190.7	771.2	0	1096
-9.2	992.2	2223.3	792	0	1124.8
-9.5+	992.2	2230.1	798.8	0	1132.3
-9.5-	992.2	2230.1	798.8	0	1126.8
-10.2	992.2	2248.8	817.5	22.5	1132.3
-11.2	992.2	2271.5	845.5	88.8	1092.7
-12.2	992.2	2360.5	819.4	96.3	1118.7
-12.5	992.2	2449.6	758.9	50.9	1180.9
-12.9+	992.2	2567.1	673.3	0	1302.3
-12.9-	992.2	2567.1	673.3	0	1245.3
-13.2	992.2	2599.1	653.6	0	1302.3
-14.2	992.2	2603.3	669.3	0	1326.1
-15.2	992.2	2613.9	679.8	0	1322.7
-15.3	992.2	2615	680.9	0	1322.7
-16.2	992.2	2624.5	690.4	0	1318.4
-17.2	992.2	2633.9	701.8	0	1344.2
-18.2	992.2	2652.7	705.7	0	1447
-19	992.2	2732.4	662	0	1594.5
-19.2	992.2	2763.8	646.5	0	1630.1
-20.2	992.2	2853.5	642.1	0	1712.7
-21.2	992.2	2890.7	681.8	0	1747.1
-22.2	992.2	2929.3	720.4	0	1782.8
-23.2	992.2	2966.5	760.1	0	1817
-24.2	992.2	3015.9	789.9	0	1863.5
-25	992.2	3142.1	743.1	0	1980.4
-25.2	992.2	3178.5	727	0	2022.1
-26.2	992.2	3176.1	784.9	0	2147.7

ELEV. (FT)	NET WATER (PSF)	LEFTSIDE PASSIVE (PSF)	RESULT. LEFTSIDE PASSIVE (LBS)
13.8	0	0	
12.8	0	0	
11.8	0	0	
10.8	0	0	
9.8	0	0	
8.8	0	0	
8	0	0	
7.8	12	0	
6.8	75	0	0
5.8	137	0	0
5	187	0	0
5	187	1235	0
4.8	200	1875	311
4.55	215	1905	472.5
4.55	215	1905	0
3.8	262	1992	1461.375
3.55	278	2022	501.75
2.8	324	2109	1549.125
1.8	387	2226	2167.5
1.29	419	2290	1151.58
0.8	449	2350	1136.8
-0.2	512	2402	2376
-0.9	555	2173	1601.25
-1.2	574	2030	630.45
-2.2	636	1927	1978.5
-2.92	681	2038	1427.4
-2.92	681	2007	0
-3.2	699	2038	566.3
-4.2	761	2142	2090
-5.2	824	2238	2190
-6.2	886	2322	2280
-7.2	948	2341	2331.5
-7.5	967	2288	694.35
-7.9	992	2202	898
-8.2	992	2191	658.95
-9.2	992	2223	2207
-9.47	992	2230	601.155
-9.47	992	2230	0
-9.93	992	2242	1028.56
-10.2	992	2249	606.285
-11.2	992	2271	2260
-12.2	992	2361	2316
-12.5	992	2450	721.65
-12.87	992	2567	928.145
-12.87	992	2567	0
-13.2	992	2599	852.39
-14.2	992	2603	2601
-15.2	992	2614	2608.5
-15.3	992	2615	261.45
-15.5	992	2624	523.9
-17.2	992	2634	4469.3
		PASSIVE LOAD (SOIL)	38214.98
		PASSIVE LOAD (SOIL+WATER)	39014.98
		FOS =	0.81

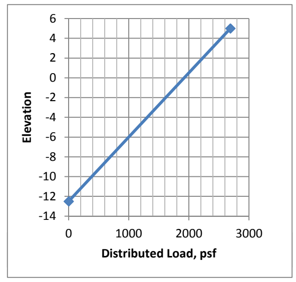
IF THE PS WATER LEVEL IS BELOW THE CRITICAL SLIP SURFACE, USE PASSIVE LOAD (SOIL)

PS WATER ELEVATION (FT)	CRITICAL SLIP SURF. ELEVATION (FT)	UNIT WEIGHT WATER (PCF)
-7.5	-12.5	64

RESULTANT WATER LOAD= 800 LBS

VIII.B.--HORIZONTAL DISTRIBUTED LOAD

ELEVATION (FT)	DIST. LOAD (PSF)	Result. (LBS)
5	2690	
-12.5	0	23537.5
		23537.5



RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

NET SOIL PRESSURES INCLUDE APPLIED HORIZONTAL DISTRIBUTED LOADS.

ELEV. (FT)	NET WATER (PSF)	<---LEFTSIDE---> PASSIVE (PSF)	ACTIVE (PSF)	<--RIGHTSIDE---> ACTIVE (PSF)	PASSIVE (PSF)
13.8	0	0	0	0	0
12.8	0	0	0	0	0
11.8	0	0	0	0	0
10.8	0	0	0	0	0
9.8	0	0	0	0	0
8.8	0	0	0	0	0
8	0	0	0	0	0
7.8	12.5	0	0	0	0
6.8	74.9	0	0	0	0
5.8	137.3	0	0	0	0
5.0+	187.2	0	0	0	0
-5	187.2	1408.5	0	0	0
4.8	199.7	2136.1	0	0	0
4.6+	215.3	2165.3	0	0	0
-4.6	215.3	2165.3	0	0	1408.5
3.8	262.1	2253.1	0	0	2111
3.6	277.7	2282.3	0	0	2077.4
2.8	324.5	2370.1	0	0	1992.8
1.8	386.9	2487.1	0	0	2005.2
1.4	415.1	2543.7	0	0	2031
0.8	449.3	2612.3	0	0	2062.4
-0.2	511.7	2655	0	0	2033.4
-0.9	555.4	2381.6	0	0	1709.9
-1.2	574.1	2213.8	0	0	1520.6
-2.2	636.5	2082.2	0	0	1317.3
-2.9+	681.2	2194.8	0	0	1346.7
-2.9-	681.2	2162.9	0	0	1346.7
-3.2	698.9	2194.8	27.2	0	1358.3
-4.2	761.3	2298.9	129.5	0	1389.6
-5.2	823.7	2393.8	238	0	1421
-6.2	886.1	2475.7	353.6	0	1455.7
-7.2	948.5	2482.6	519.2	0	1412.5
-7.5	967.2	2418	614.2	0	1328.5
-7.9	992.2	2316.3	738.4	0	1205
-8.2	992.2	2301.1	771.2	0	1183
-9.2	992.2	2334.6	792	0	1213
-9.5+	992.2	2341.5	798.8	0	1218.7
-9.5-	992.2	2341.5	798.8	0	1214.5
-10.2	992.2	2360.2	817.5	22.5	1218.7
-11.2	992.2	2382.4	845.5	88.8	1170.9
-12.2	992.2	2480.5	819.4	96.3	1198.2
-12.5	992.2	2581.2	758.9	50.9	1268.8
-12.9+	992.2	2714.4	673.3	0	1407.2
-12.9-	992.2	2714.4	673.3	0	1342.2
-13.2	992.2	2750.5	653.6	0	1407.2
-14.2	992.2	2753.8	669.3	0	1434.4
-15.2	992.2	2764.4	679.8	0	1430.7
-15.3	992.2	2765.5	680.9	0	1430.6
-16.2	992.2	2775	690.4	0	1425.8
-17.2	992.2	2784.3	701.8	0	1455.3
-18.2	992.2	2804.2	705.7	0	1572.4
-19	992.2	2893.5	662	0	1739.5
-19.2	992.2	2928.5	646.5	0	1779.4
-20.2	992.2	3025.6	642.1	0	1868.8
-21.2	992.2	3062.6	681.8	0	1902.9
-22.2	992.2	3101.2	720.4	0	1938.6
-23.2	992.2	3138.1	760.1	0	1972.6
-24.2	992.2	3189.1	789.9	0	2020.7
-25	992.2	3328.8	743.1	0	2150
-25.2	992.2	3369.3	727	0	2196.6
-26.2	992.2	3362.2	784.9	0	2335.3

ELEV. (FT)	NET WATER (PSF)	LEFTSIDE PASSIVE (PSF)	RESULT. LEFTSIDE PASSIVE (LBS)
13.8	0	0	
12.8	0	0	
11.8	0	0	
10.8	0	0	
9.8	0	0	
8.8	0	0	
8	0	0	
7.8	12	0	
6.8	75	0	0
5.8	137	0	0
5	187	0	0
5	187	1408	0
4.8	200	2136	354.4
4.55	215	2165	537.625
4.55	215	2165	0
3.8	262	2253	1656.75
3.55	278	2282	566.875
2.8	324	2370	1744.5
1.8	387	2487	2428.5
1.29	415	2544	1282.905
0.8	449	2612	1263.22
-0.2	512	2655	2633.5
-0.9	555	2382	1762.95
-1.2	574	2214	689.4
-2.2	636	2082	2148
-2.92	681	2195	1539.72
-2.92	681	2163	0
-3.2	699	2195	610.12
-4.2	761	2299	2247
-5.2	824	2394	2346.5
-6.2	886	2476	2435
-7.2	948	2483	2479.5
-7.5	967	2418	735.15
-7.9	992	2316	946.8
-8.2	992	2301	692.55
-9.2	992	2335	2318
-9.47	992	2341	631.26
-9.47	992	2341	0
-9.93	992	2353	1079.62
-10.2	992	2360	636.255
-11.2	992	2382	2371
-12.2	992	2480	2431
-12.5	992	2581	759.15
-12.87	992	2714	979.575
-12.87	992	2714	0
-13.2	992	2751	901.725
-14.2	992	2754	2752.5
-15.2	992	2764	2759
-15.3	992	2765	276.45
-15.5	992	2775	554
-17.2	992	2784	4725.15
		PASSIVE LOAD (SOIL)	41327.25
		PASSIVE LOAD (SOIL+WATER)	42127.25
		FOS =	0.71

IF THE PS WATER LEVEL IS BELOW THE CRITICAL SLIP SURFACE, USE PASSIVE LOAD (SOIL)

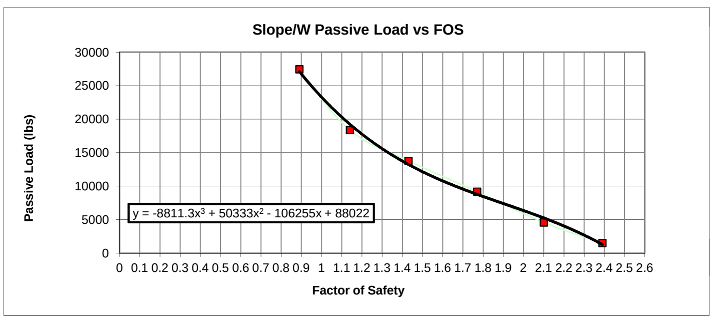
PS WATER ELEVATION (FT)	CRITICAL SLIP SURF. ELEVATION (FT)	UNIT WEIGHT WATER (PCF)
-7.5	-12.5	64

RESULTANT WATER LOAD= 800 LBS

Canal:	Orleans Avenue Canal		
Reach:	Reach 19		
Load Case:	Water @ El 8		
Protected Side Top of Ground (GSE):	5	ft, Elevation	
Critical Slip Surface Elev. (FSE):	-12.5	ft, Elevation	
Sheetpile Tip Elevation:	-15.3	ft, Elevation	

Step 1: Compute correct passive pressure forces from slope stability model (Slope/W). Procedure follows the approach cited in Paragraph D-4 of ETL 1110-2-575.

Unit Weight (psf)	Passive Load (lbs)	Factor of Safety	Failure Surface Elevation (feet)	Notes
10	1531.3	2.39	-12.5	Circular failure surface: Goes below the sheetpile tip to elevation -30
30	4593.7	2.1	-12.5	Circular failure surface: Goes below the sheetpile tip to elevation -30
60	9187.5	1.77	-12.5	Circular failure surface: Goes below the sheetpile tip to elevation -27.5
90	13781	1.43	-12.5	Circular failure surface: Goes below the sheetpile tip to elevation -24.5
120	18375	1.14	-12.5	Circular failure surface: Goes below the sheetpile tip to elevation -20
150	27452	0.89	-12.5	Circular failure surface: Goes below the sheetpile tip to elevation -19.1



Step 2: Perform CWALSHT analysis of cross section using a range of <u>assumed</u> horizontal distributed load above the critical slip surface elevation found in step 1. Determine the difference in passive load from CWALSHT and Slope/W for each assumed horizontal distributed load.

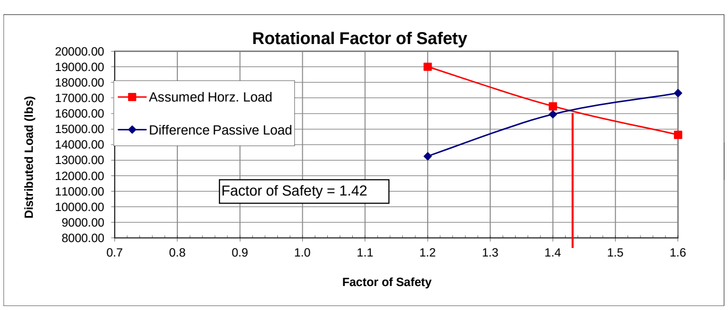
Note: This analysis was performed to compared the results of a uniform distributed load versus and triangular distributed load. The following results are for a uniform distributed load.

	(A)	(B)		(C)	(D)	
FOS	CWALSHT Passive Load (lbs)	SLOPE/W Passive Load (lbs)	Tip Elev feet	Difference Passive Load (A-B) (lbs)	Assumed Horizontal Distributed Load in CWALSHT (psf)	Resultant Distributed CWALSHT Load (D*(GSE-FSE)) (lbs)
1.6	28093.775	10775.40	-15.49	17318.38	836	14630.00
1.4	29694.025	13739.47	-15.4	15954.55	941	16467.50
1.2	31025.82	17769.59	-15.9	13256.23	1086.4	19012.00

Interpolate Correction Force at the resultant FOS

FOS = 1.42

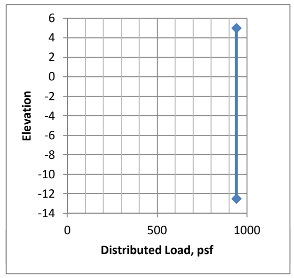
Correction Force = 16090.93 lbs



VIII.B.--HORIZONTAL DISTRIBUTED LOAD

ELEVATION (FT)	DIST. LOAD (PSF)	Result. (LBS)
5	941	
-12.5	941	16467.5

16467.5



RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

NET SOIL PRESSURES INCLUDE APPLIED HORIZONTAL DISTRIBUTED LOADS.

ELEV. (FT)	NET WATER (PSF)	<---LEFTSIDE---> PASSIVE (PSF)	ACTIVE (PSF)	<--RIGHTSIDE---> ACTIVE (PSF)	PASSIVE (PSF)
13.8	0	0	0	0	0
12.8	0	0	0	0	0
11.8	0	0	0	0	0
10.8	0	0	0	0	0
9.8	0	0	0	0	0
8.8	0	0	0	0	0
8	0	0	0	0	0
7.8	12	0	0	0	0
6.8	75	0	0	0	0
5.8	137	0	0	0	0
5.00+	187	0	0	0	0
-5	187	714	0	0	0
4.8	200	1095	0	0	0
4.55+	215	1124	0	0	0
-4.55	215	1124	0	0	714
3.96	252	1193	0	0	1010
3.8	262	1212	0	0	1091
3.55	278	1241	0	0	1080
2.8	324	1329	0	0	1055
1.8	387	1446	0	0	1083
0.8	449	1567	0	0	1135
-0.2	512	1646	0	0	1142
-0.9	555	1547	0	0	993
-1.2	574	1478	0	0	903
-2.2	636	1462	0	0	815
-2.92+	681	1570	0	0	841
-2.92-	681	1540	0	0	841
-3.2	699	1570	27	0	851
-4.2	761	1674	129	0	883
-5.2	824	1772	238	0	914
-6.2	886	1864	354	0	947
-7.2	948	1917	519	0	940
-7.5	967	1898	614	0	902
-7.9	992	1862	738	0	844
-8.2	992	1860	771	0	836
-9.2	992	1890	792	0	861
-9.47+	992	1897	799	0	874
-9.47-	992	1897	799	0	864
-10.2	992	1916	818	22	874
-11.2	992	1939	845	89	859
-12.2	992	2002	819	96	881
-12.5	992	2056	759	51	918
-12.87+	992	2126	673	0	989
-12.87-	992	2126	673	0	955
-12.89	992	2127	672	0	957
-13.2	992	2146	654	0	989
-14.2	992	2153	669	0	1002
-15.2	992	2164	680	0	1000
-15.3	992	2165	681	0	1000
-15.3	992	2174	690	0	997
-17.2	992	2184	702	0	1012

ELEV. (FT)	NET WATER (PSF)	LEFTSIDE PASSIVE (PSF)	RESULT. LEFTSIDE PASSIVE (LBS)
13.8	0	0	
12.8	0	0	
11.8	0	0	
10.8	0	0	
9.8	0	0	
8.8	0	0	
8	0	0	
7.8	12	0	
6.8	75	0	0
5.8	137	0	0
5	187	0	0
5	187	714	0
4.8	200	1095	180.9
4.55	215	1124	277.375
4.55	215	1124	0
3.96	252	1193	683.515
3.8	262	1212	192.4
3.55	278	1241	306.625
2.8	324	1329	963.75
1.8	387	1446	1387.5
0.8	449	1567	1506.5
-0.2	512	1646	1606.5
-0.9	555	1547	1117.55
-1.2	574	1478	453.75
-2.2	636	1462	1470
-2.92	681	1570	1091.52
-2.92	681	1540	0
-3.2	699	1570	435.4
-4.2	761	1674	1622
-5.2	824	1772	1723
-6.2	886	1864	1818
-7.2	948	1917	1890.5
-7.5	967	1898	572.25
-7.9	992	1862	752
-8.2	992	1860	558.3
-9.2	992	1890	1875
-9.47	992	1897	511.245
-9.47	992	1897	0
-10.2	992	1916	1391.745
-11.2	992	1939	1927.5
-12.2	992	2002	1970.5
-12.5	992	2056	608.7
-12.87	992	2126	773.67
-12.87	992	2126	0
-12.89	992	2127	42.53
-13.2	992	2146	662.315
-14.2	992	2153	2149.5
-15.2	992	2164	2158.5
-15.3	992	2165	216.45
-15.3	992	2174	0
-17.2	992	2184	4140.1

PS WATER ELEVATION (FT)	CRITICAL SLIP SURF. ELEVATION (FT)	UNIT WEIGHT WATER (PCF)
-7.5	-12.5	64

RESULTANT WATER LOAD= 800 LBS

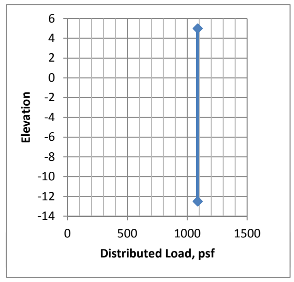
PASSIVE LOAD (SOIL) 28894.025

PASSIVE LOAD (SOIL+WATER) 29694.025 **IF THE PS WATER LEVEL IS BELOW THE CRITICAL SLIP SURFACE, USE PASSIVE LOAD (SOIL)**

FOS = 1.4

VIII.B.--HORIZONTAL DISTRIBUTED LOAD

ELEVATION	DIST. LOAD	Result.
(FT)	(PSF)	(LBS)
5	1086.4	
-12.5	1086.4	19012



19012

RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

NET SOIL PRESSURES INCLUDE APPLIED HORIZONTAL DISTRIBUTED LOADS.

	NET	<---LEFTSIDE--->		<--RIGHTSIDE--->	
ELEV.	WATER	PASSIVE	ACTIVE	ACTIVE	PASSIVE
(FT)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)
13.8	0	0	0	0	0
12.8	0	0	0	0	0
11.8	0	0	0	0	0
10.8	0	0	0	0	0
9.8	0	0	0	0	0
8.8	0	0	0	0	0
8	0	0	0	0	0
7.8	12	0	0	0	0
6.8	75	0	0	0	0
5.8	137	0	0	0	0
5.00+	187	0	0	0	0
-5	187	833	0	0	0
4.8	200	1273	0	0	0
4.55+	215	1303	0	0	0
-4.55	215	1303	0	0	833
3.8	262	1390	0	0	1266
3.55	278	1420	0	0	1251
2.8	324	1507	0	0	1216
1.8	387	1624	0	0	1241
0.8	449	1746	0	0	1294
-0.2	512	1819	0	0	1295
-0.9	555	1690	0	0	1116
-1.2	574	1604	0	0	1009
-2.2	636	1569	0	0	901
-2.92+	681	1677	0	0	928
-2.92-	681	1646	0	0	928
-3.2	699	1677	27	0	938
-4.2	761	1781	129	0	969
-5.2	824	1879	238	0	1001
-6.2	886	1969	354	0	1034
-7.2	948	2014	519	0	1021
-7.5	967	1987	614	0	975
-7.9	992	1940	738	0	906
-8.2	992	1936	771	0	895
-9.2	992	1966	792	0	921
-9.47+	992	1973	799	0	933
-9.47-	992	1973	799	0	925
-10.2	992	1992	818	22	933
-11.2	992	2015	845	89	912
-12.2	992	2084	819	96	935
-12.5	992	2146	759	51	978
-12.87+	992	2227	673	0	1060
-12.87-	992	2227	673	0	1022
-13.15	992	2247	656	0	1055
-13.2	992	2250	654	0	1060
-14.2	992	2256	669	0	1076
-15.2	992	2267	680	0	1074
-15.3	992	2268	681	0	1074
-15.89	992	2277	690	0	1071
-17.2	992	2287	702	0	1088

			RESULT.
	NET	LEFTSIDE	LEFTSIDE
ELEV.	WATER	PASSIVE	PASSIVE
(FT)	(PSF)	(PSF)	(LBS)
13.8	0	0	
12.8	0	0	
11.8	0	0	
10.8	0	0	
9.8	0	0	
8.8	0	0	
8	0	0	
7.8	12	0	
6.8	75	0	0
5.8	137	0	0
5	187	0	0
5	187	833	0
4.8	200	1273	210.6
4.55	215	1303	322
4.55	215	1303	0
3.8	262	1390	1009.875
3.55	278	1420	351.25
2.8	324	1507	1097.625
1.8	387	1624	1565.5
0.8	449	1746	1685
-0.2	512	1819	1782.5
-0.9	555	1690	1228.15
-1.2	574	1604	494.1
-2.2	636	1569	1586.5
-2.92	681	1677	1168.56
-2.92	681	1646	0
-3.2	699	1677	465.22
-4.2	761	1781	1729
-5.2	824	1879	1830
-6.2	886	1969	1924
-7.2	948	2014	1991.5
-7.5	967	1987	600.15
-7.9	992	1940	785.4
-8.2	992	1936	581.4
-9.2	992	1966	1951
-9.47	992	1973	531.765
-9.47	992	1973	0
-10.2	992	1992	1447.225
-11.2	992	2015	2003.5
-12.2	992	2084	2049.5
-12.5	992	2146	634.5
-12.87	992	2227	809.005
-12.87	992	2227	0
-13.15	992	2247	626.36
-13.2	992	2250	112.425
-14.2	992	2256	2253
-15.2	992	2267	2261.5
-15.3	992	2268	226.75
-15.89	992	2277	1340.775
-17.2	992	2287	2989.42

PS WATER ELEVATION	CRITICAL SLIP SURF. ELEVATION	UNIT WEIGHT WATER
(FT)	(FT)	(PCF)
-7.5	-12.5	64
RESULTANT WATER LOAD=	800	LBS

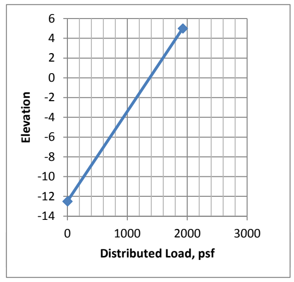
PASSIVE LOAD (SOIL)	31025.82
PASSIVE LOAD (SOIL+WATER)	31825.82
FOS =	1.2

IF THE PS WATER LEVEL IS BELOW THE CRITICAL SLIP SURFACE, USE PASSIVE LOAD (SOIL)

VIII.B.--HORIZONTAL DISTRIBUTED LOAD

ELEVATION (FT)	DIST. LOAD (PSF)	Result. (LBS)
5	1925	
-12.5	0	16843.75

16843.75



RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

NET SOIL PRESSURES INCLUDE APPLIED HORIZONTAL DISTRIBUTED LOADS.

ELEV. (FT)	NET WATER (PSF)	<---LEFTSIDE---> PASSIVE (PSF)	ACTIVE (PSF)	<--RIGHTSIDE---> ACTIVE (PSF)	PASSIVE (PSF)
13.8	0	0	0	0	0
12.8	0	0	0	0	0
11.8	0	0	0	0	0
10.8	0	0	0	0	0
9.8	0	0	0	0	0
8.8	0	0	0	0	0
8	0	0	0	0	0
7.8	12.5	0	0	0	0
6.8	74.9	0	0	0	0
5.8	137.3	0	0	0	0
5.0+	187.2	0	0	0	0
-5	187.2	990.1	0	0	0
4.8	199.7	1508.5	0	0	0
4.6+	215.3	1537.8	0	0	0
-4.6	215.3	1537.8	0	0	990.1
3.8	262.1	1625.5	0	0	1496.1
3.6	277.7	1654.8	0	0	1476.4
2.8	324.5	1742.5	0	0	1427.5
1.8	386.9	1859.5	0	0	1449.6
1.4	423.6	1931.9	0	0	1481.3
0.8	449.3	1982.3	0	0	1503.3
-0.2	511.7	2047.1	0	0	1496.4
-0.9	555.4	1878.7	0	0	1277.9
-1.2	574.1	1770.4	0	0	1148.1
-2.2	636.5	1708.5	0	0	1014.6
-2.9+	681.2	1818.3	0	0	1041.9
-2.9-	681.2	1787.2	0	0	1041.9
-3.2	698.9	1818.3	27.2	0	1052.7
-4.2	761.3	1922.1	129.5	0	1084
-5.2	823.7	2019.4	238	0	1115.4
-6.2	886.1	2107.1	353.6	0	1149.1
-7.2	948.5	2141.5	519.2	0	1128
-7.5	967.2	2104.7	614.2	0	1071.5
-7.9	992.2	2042.2	738.4	0	987.4
-8.2	992.2	2035.4	771.2	0	973.7
-9.2	992.2	2066.7	792	0	1000.9
-9.5+	992.2	2073.5	798.8	0	1010.9
-9.5-	992.2	2073.5	798.8	0	1003.6
-10.2	992.2	2092.2	817.5	22.5	1010.9
-11.2	992.2	2115.4	845.5	88.8	982.9
-12.2	992.2	2191.9	819.4	96.3	1006.8
-12.5	992.2	2264.6	758.9	50.9	1057.3
-12.9+	992.2	2359.9	673.3	0	1154.9
-12.9-	992.2	2359.9	673.3	0	1109.1
-13.2	992.2	2386.3	653.6	0	1154.9
-14.2	992.2	2391.7	669.3	0	1173.9
-15.2	992.2	2402.3	679.8	0	1171
-15.3	992.2	2403.4	680.9	0	1171
-16.2	992.2	2412.9	690.4	0	1167.4
-17.2	992.2	2422.6	701.8	0	1188
-18.2	992.2	2439.7	705.7	0	1270.8
-19	992.2	2505.9	662	0	1390.6
-19.2	992.2	2532.1	646.5	0	1420.1
-20.2	992.2	2611.6	642.1	0	1493.3
-21.2	992.2	2649.1	681.8	0	1528
-22.2	992.2	2687.7	720.4	0	1563.6
-23.2	992.2	2725.1	760.1	0	1598.2
-24.2	992.2	2772.3	789.9	0	1642.6
-25	992.2	2879.7	743.1	0	1741.9
-25.2	992.2	2910.3	727	0	1776.6
-26.2	992.2	2914.5	784.9	0	1883.9

ELEV. (FT)	NET WATER (PSF)	LEFTSIDE PASSIVE (PSF)	RESULT. LEFTSIDE PASSIVE (LBS)
13.8	0	0	
12.8	0	0	
11.8	0	0	
10.8	0	0	
9.8	0	0	
8.8	0	0	
8	0	0	
7.8	12	0	
6.8	75	0	0
5.8	137	0	0
5	187	0	0
5	187	990	0
4.8	200	1509	249.9
4.55	215	1538	380.875
4.55	215	1538	0
3.8	262	1626	1186.5
3.55	278	1655	410.125
2.8	324	1743	1274.25
1.8	387	1860	1801.5
1.21	424	1932	1118.64
0.8	449	1982	802.37
-0.2	512	2047	2014.5
-0.9	555	1879	1374.1
-1.2	574	1770	547.35
-2.2	636	1709	1739.5
-2.92	681	1818	1269.72
-2.92	681	1787	0
-3.2	699	1818	504.7
-4.2	761	1922	1870
-5.2	824	2019	1970.5
-6.2	886	2107	2063
-7.2	948	2142	2124.5
-7.5	967	2105	637.05
-7.9	992	2042	829.4
-8.2	992	2035	611.55
-9.2	992	2067	2051
-9.47	992	2074	559.035
-9.47	992	2074	0
-9.86	992	2084	810.81
-10.2	992	2092	709.92
-11.2	992	2115	2103.5
-12.2	992	2192	2153.5
-12.5	992	2265	668.55
-12.87	992	2360	855.625
-12.87	992	2360	0
-13.2	992	2386	783.09
-14.2	992	2392	2389
-15.2	992	2402	2397
-15.3	992	2403	240.25
-15.37	992	2413	168.56
-17.2	992	2423	4424.94
		PASSIVE LOAD (SOIL)	33836.35
		PASSIVE LOAD (SOIL+WATER)	34636.35
		FOS =	1.01

IF THE PS WATER LEVEL IS BELOW THE CRITICAL SLIP SURFACE, USE PASSIVE LOAD (SOIL)

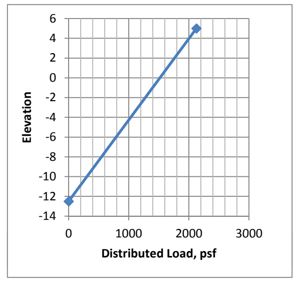
PS WATER ELEVATION (FT)	CRITICAL SLIP SURF. ELEVATION (FT)	UNIT WEIGHT WATER (PCF)
-7.5	-12.5	64

RESULTANT WATER LOAD= 800 LBS

VIII.B.--HORIZONTAL DISTRIBUTED LOAD

ELEVATION (FT)	DIST. LOAD (PSF)	Result. (LBS)
5	2125	
-12.5	0	18593.75

18593.75



RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

NET SOIL PRESSURES INCLUDE APPLIED HORIZONTAL DISTRIBUTED LOADS.

ELEV. (FT)	NET WATER (PSF)	<---LEFTSIDE---> PASSIVE (PSF)	ACTIVE (PSF)	<--RIGHTSIDE---> ACTIVE (PSF)	PASSIVE (PSF)
13.8	0	0	0	0	0
12.8	0	0	0	0	0
11.8	0	0	0	0	0
10.8	0	0	0	0	0
9.8	0	0	0	0	0
8.8	0	0	0	0	0
8	0	0	0	0	0
7.8	12.5	0	0	0	0
6.8	74.9	0	0	0	0
5.8	137.3	0	0	0	0
5.0+	187.2	0	0	0	0
-5	187.2	1098.9	0	0	0
4.8	199.7	1671.8	0	0	0
4.6+	215.3	1701	0	0	0
-4.6	215.3	1701	0	0	1098.9
3.8	262.1	1788.8	0	0	1656
3.6	277.7	1818	0	0	1632.7
2.8	324.5	1905.8	0	0	1574.5
1.8	386.9	2022.8	0	0	1594.1
1.4	421.3	2090.8	0	0	1624.2
0.8	449.3	2146.2	0	0	1648.7
-0.2	511.7	2205.2	0	0	1636.1
-0.9	555.4	2009.5	0	0	1390.3
-1.2	574.1	1885.7	0	0	1245
-2.2	636.5	1805.7	0	0	1093.3
-2.9+	681.2	1916.2	0	0	1121.2
-2.9-	681.2	1884.9	0	0	1121.2
-3.2	698.9	1916.2	27.2	0	1132.1
-4.2	761.3	2020.1	129.5	0	1163.5
-5.2	823.7	2116.7	238	0	1194.8
-6.2	886.1	2203	353.6	0	1228.8
-7.2	948.5	2230.2	519.2	0	1202
-7.5	967.2	2186.1	614.2	0	1138.3
-7.9	992.2	2113.5	738.4	0	1043.9
-8.2	992.2	2104.5	771.2	0	1028.1
-9.2	992.2	2136.4	792	0	1056
-9.5+	992.2	2143.2	798.8	0	1064.9
-9.5-	992.2	2143.2	798.8	0	1058.4
-10.2	992.2	2161.9	817.5	22.5	1064.9
-11.2	992.2	2184.9	845.5	88.8	1031.8
-12.2	992.2	2267	819.4	96.3	1056.6
-12.5	992.2	2347	758.9	50.9	1112.3
-12.9+	992.2	2452.1	673.3	0	1220.5
-12.9-	992.2	2452.1	673.3	0	1169.7
-13.2	992.2	2481	653.6	0	1220.5
-14.2	992.2	2485.9	669.3	0	1241.6
-15.2	992.2	2496.5	679.8	0	1238.5
-15.3	992.2	2497.5	680.9	0	1238.5
-16.2	992.2	2507	690.4	0	1234.6
-17.2	992.2	2516.6	701.8	0	1257.5
-18.2	992.2	2534.5	705.7	0	1349.3
-19	992.2	2606.7	662	0	1481.4
-19.2	992.2	2635.2	646.5	0	1513.6
-20.2	992.2	2719.3	642.1	0	1591
-21.2	992.2	2756.6	681.8	0	1625.5
-22.2	992.2	2795.2	720.4	0	1661.2
-23.2	992.2	2832.5	760.1	0	1695.6
-24.2	992.2	2880.7	789.9	0	1740.9
-25	992.2	2996.5	743.1	0	1848
-25.2	992.2	3029.7	727	0	1885.9
-26.2	992.2	3031	784.9	0	2001.3

ELEV. (FT)	NET WATER (PSF)	LEFTSIDE PASSIVE (PSF)	RESULT. LEFTSIDE PASSIVE (LBS)
13.8	0	0	
12.8	0	0	
11.8	0	0	
10.8	0	0	
9.8	0	0	
8.8	0	0	
8	0	0	
7.8	12	0	
6.8	75	0	0
5.8	137	0	0
5	187	0	0
5	187	1099	0
4.8	200	1672	277.1
4.55	215	1701	421.625
4.55	215	1701	0
3.8	262	1789	1308.75
3.55	278	1818	450.875
2.8	324	1906	1396.5
1.8	387	2023	1964.5
1.25	421	2091	1131.35
0.8	449	2146	953.325
-0.2	512	2205	2175.5
-0.9	555	2010	1475.25
-1.2	574	1886	584.4
-2.2	636	1806	1846
-2.92	681	1916	1339.92
-2.92	681	1885	0
-3.2	699	1916	532.14
-4.2	761	2020	1968
-5.2	824	2117	2068.5
-6.2	886	2203	2160
-7.2	948	2230	2216.5
-7.5	967	2186	662.4
-7.9	992	2114	860
-8.2	992	2105	632.85
-9.2	992	2136	2120.5
-9.47	992	2143	577.665
-9.47	992	2143	0
-9.89	992	2154	902.37
-10.2	992	2162	668.98
-11.2	992	2185	2173.5
-12.2	992	2267	2226
-12.5	992	2347	692.1
-12.87	992	2452	887.815
-12.87	992	2452	0
-13.2	992	2481	813.945
-14.2	992	2486	2483.5
-15.2	992	2496	2491
-15.3	992	2498	249.7
-15.42	992	2507	300.3
-17.2	992	2517	4471.36
		PASSIVE LOAD (SOIL)	35786.6
		PASSIVE LOAD (SOIL+WATER)	36586.6
		FOS =	0.91

IF THE PS WATER LEVEL IS BELOW THE CRITICAL SLIP SURFACE, USE PASSIVE LOAD (SOIL)

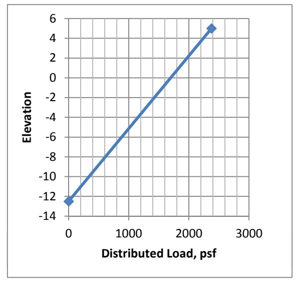
PS WATER ELEVATION (FT)	CRITICAL SLIP SURF. ELEVATION (FT)	UNIT WEIGHT WATER (PCF)
-7.5	-12.5	64

RESULTANT WATER LOAD=	800	LBS

VIII.B.--HORIZONTAL DISTRIBUTED LOAD

ELEVATION (FT)	DIST. LOAD (PSF)	Result. (LBS)
5	2375	
-12.5	0	20781.25

20781.25



RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

NET SOIL PRESSURES INCLUDE APPLIED HORIZONTAL DISTRIBUTED LOADS.

	NET	<---LEFTSIDE--->		<--RIGHTSIDE--->	
ELEV. (FT)	WATER (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)
13.8	0	0	0	0	0
12.8	0	0	0	0	0
11.8	0	0	0	0	0
10.8	0	0	0	0	0
9.8	0	0	0	0	0
8.8	0	0	0	0	0
8	0	0	0	0	0
7.8	12.5	0	0	0	0
6.8	74.9	0	0	0	0
5.8	137.3	0	0	0	0
5.0+	187.2	0	0	0	0
-5	187.2	1234.6	0	0	0
4.8	199.7	1875.3	0	0	0
4.6+	215.3	1904.5	0	0	0
-4.6	215.3	1904.5	0	0	1234.6
3.8	262.1	1992.3	0	0	1855.4
3.6	277.7	2021.5	0	0	1827.6
2.8	324.5	2109.3	0	0	1757.8
1.8	386.9	2226.3	0	0	1774.3
1.4	418.9	2290	0	0	1802.9
0.8	449.3	2350.5	0	0	1830
-0.2	511.7	2402.3	0	0	1810.2
-0.9	555.4	2172.6	0	0	1530.3
-1.2	574.1	2029.5	0	0	1365.8
-2.2	636.5	1926.9	0	0	1191.5
-2.9+	681.2	2038.3	0	0	1220
-2.9-	681.2	2006.8	0	0	1220
-3.2	698.9	2038.3	27.2	0	1231.3
-4.2	761.3	2142.3	129.5	0	1262.6
-5.2	823.7	2238.2	238	0	1293.9
-6.2	886.1	2322.5	353.6	0	1328.3
-7.2	948.5	2340.8	519.2	0	1294.3
-7.5	967.2	2287.8	614.2	0	1221.6
-7.9	992.2	2202.4	738.4	0	1114.5
-8.2	992.2	2190.7	771.2	0	1096
-9.2	992.2	2223.3	792	0	1124.8
-9.5+	992.2	2230.1	798.8	0	1132.3
-9.5-	992.2	2230.1	798.8	0	1126.8
-10.2	992.2	2248.8	817.5	22.5	1132.3
-11.2	992.2	2271.5	845.5	88.8	1092.7
-12.2	992.2	2360.5	819.4	96.3	1118.7
-12.5	992.2	2449.6	758.9	50.9	1180.9
-12.9+	992.2	2567.1	673.3	0	1302.3
-12.9-	992.2	2567.1	673.3	0	1245.3
-13.2	992.2	2599.1	653.6	0	1302.3
-14.2	992.2	2603.3	669.3	0	1326.1
-15.2	992.2	2613.9	679.8	0	1322.7
-15.3	992.2	2615	680.9	0	1322.7
-16.2	992.2	2624.5	690.4	0	1318.4
-17.2	992.2	2633.9	701.8	0	1344.2
-18.2	992.2	2652.7	705.7	0	1447
-19	992.2	2732.4	662	0	1594.5
-19.2	992.2	2763.8	646.5	0	1630.1
-20.2	992.2	2853.5	642.1	0	1712.7
-21.2	992.2	2890.7	681.8	0	1747.1
-22.2	992.2	2929.3	720.4	0	1782.8
-23.2	992.2	2966.5	760.1	0	1817
-24.2	992.2	3015.9	789.9	0	1863.5
-25	992.2	3142.1	743.1	0	1980.4
-25.2	992.2	3178.5	727	0	2022.1
-26.2	992.2	3176.1	784.9	0	2147.7

ELEV. (FT)	NET WATER (PSF)	LEFTSIDE PASSIVE (PSF)	RESULT. LEFTSIDE PASSIVE (LBS)
13.8	0	0	
12.8	0	0	
11.8	0	0	
10.8	0	0	
9.8	0	0	
8.8	0	0	
8	0	0	
7.8	12	0	
6.8	75	0	0
5.8	137	0	0
5	187	0	0
5	187	1235	0
4.8	200	1875	311
4.55	215	1905	472.5
4.55	215	1905	0
3.8	262	1992	1461.375
3.55	278	2022	501.75
2.8	324	2109	1549.125
1.8	387	2226	2167.5
1.29	419	2290	1151.58
0.8	449	2350	1136.8
-0.2	512	2402	2376
-0.9	555	2173	1601.25
-1.2	574	2030	630.45
-2.2	636	1927	1978.5
-2.92	681	2038	1427.4
-2.92	681	2007	0
-3.2	699	2038	566.3
-4.2	761	2142	2090
-5.2	824	2238	2190
-6.2	886	2322	2280
-7.2	948	2341	2331.5
-7.5	967	2288	694.35
-7.9	992	2202	898
-8.2	992	2191	658.95
-9.2	992	2223	2207
-9.47	992	2230	601.155
-9.47	992	2230	0
-9.93	992	2242	1028.56
-10.2	992	2249	606.285
-11.2	992	2271	2260
-12.2	992	2361	2316
-12.5	992	2450	721.65
-12.87	992	2567	928.145
-12.87	992	2567	0
-13.2	992	2599	852.39
-14.2	992	2603	2601
-15.2	992	2614	2608.5
-15.3	992	2615	261.45
-15.5	992	2624	523.9
-17.2	992	2634	4469.3
		PASSIVE LOAD (SOIL)	38214.98
		PASSIVE LOAD (SOIL+WATER)	39014.98
		FOS =	0.81

IF THE PS WATER LEVEL IS BELOW THE CRITICAL SLIP SURFACE, USE PASSIVE LOAD (SOIL)

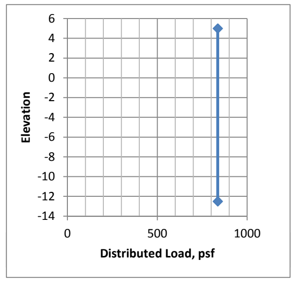
PS WATER ELEVATION (FT)	CRITICAL SLIP SURF. ELEVATION (FT)	UNIT WEIGHT WATER (PCF)
-7.5	-12.5	64

RESULTANT WATER LOAD= 800 LBS

VIII.B.--HORIZONTAL DISTRIBUTED LOAD

ELEVATION (FT)	DIST. LOAD (PSF)	Result. (LBS)
5	836	
-12.5	836	14630

14630



RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

NET SOIL PRESSURES INCLUDE APPLIED HORIZONTAL DISTRIBUTED LOADS.

ELEV. (FT)	NET WATER (PSF)	<---LEFTSIDE---> PASSIVE (PSF)	ACTIVE (PSF)	<--RIGHTSIDE---> ACTIVE (PSF)	PASSIVE (PSF)
13.8	0	0	0	0	0
12.8	0	0	0	0	0
11.8	0	0	0	0	0
10.8	0	0	0	0	0
9.8	0	0	0	0	0
8.8	0	0	0	0	0
8	0	0	0	0	0
7.8	12	0	0	0	0
6.8	75	0	0	0	0
5.8	137	0	0	0	0
5.00+	187	0	0	0	0
-5	187	625	0	0	0
4.8	200	961	0	0	0
4.55+	215	990	0	0	0
-4.55	215	990	0	0	625
3.8	262	1078	0	0	960
3.55	278	1107	0	0	952
3.43	285	1121	0	0	949
2.8	324	1195	0	0	934
1.8	387	1312	0	0	965
0.8	449	1433	0	0	1015
-0.2	512	1517	0	0	1028
-0.9	555	1440	0	0	901
-1.2	574	1383	0	0	823
-2.2	636	1382	0	0	750
-2.92+	681	1490	0	0	776
-2.92-	681	1459	0	0	776
-3.2	699	1490	27	0	786
-4.2	761	1593	129	0	817
-5.2	824	1693	238	0	849
-6.2	886	1785	354	0	882
-7.2	948	1844	519	0	880
-7.5	967	1831	614	0	847
-7.9	992	1803	738	0	797
-8.2	992	1803	771	0	791
-9.2	992	1833	792	0	816
-9.47+	992	1840	799	0	830
-9.47-	992	1840	799	0	819
-10.2	992	1858	818	22	830
-11.2	992	1882	845	89	819
-12.2	992	1940	819	96	840
-12.5	992	1988	759	51	873
-12.78	992	2035	695	13	919
-12.87+	992	2050	673	0	935
-12.87-	992	2050	673	0	906
-13.2	992	2068	654	0	935
-14.2	992	2076	669	0	946
-15.2	992	2086	680	0	944
-15.3	992	2087	681	0	944
-15.49	992	2097	690	0	942
-17.2	992	2107	702	0	955

ELEV. (FT)	NET WATER (PSF)	LEFTSIDE PASSIVE (PSF)	RESULT. LEFTSIDE PASSIVE (LBS)
13.8	0	0	
12.8	0	0	
11.8	0	0	
10.8	0	0	
9.8	0	0	
8.8	0	0	
8	0	0	
7.8	12	0	
6.8	75	0	0
5.8	137	0	0
5	187	0	0
5	187	625	0
4.8	200	961	158.6
4.55	215	990	243.875
4.55	215	990	0
3.8	262	1078	775.5
3.55	278	1107	273.125
3.43	285	1121	133.68
2.8	324	1195	729.54
1.8	387	1312	1253.5
0.8	449	1433	1372.5
-0.2	512	1517	1475
-0.9	555	1440	1034.95
-1.2	574	1383	423.45
-2.2	636	1382	1382.5
-2.92	681	1490	1033.92
-2.92	681	1459	0
-3.2	699	1490	412.86
-4.2	761	1593	1541.5
-5.2	824	1693	1643
-6.2	886	1785	1739
-7.2	948	1844	1814.5
-7.5	967	1831	551.25
-7.9	992	1803	726.8
-8.2	992	1803	540.9
-9.2	992	1833	1818
-9.47	992	1840	495.855
-9.47	992	1840	0
-10.2	992	1858	1349.77
-11.2	992	1882	1870
-12.2	992	1940	1911
-12.5	992	1988	589.2
-12.78	992	2035	563.22
-12.87	992	2050	183.825
-12.87	992	2050	0
-13.2	992	2068	679.47
-14.2	992	2076	2072
-15.2	992	2086	2081
-15.3	992	2087	208.65
-15.49	992	2097	397.48
-17.2	992	2107	3594.42
		PASSIVE LOAD (SOIL)	27293.78
		PASSIVE LOAD (SOIL+WATER)	28093.78
		FOS =	1.6

IF THE PS WATER LEVEL IS BELOW THE CRITICAL SLIP SURFACE, USE PASSIVE LOAD (SOIL)

PS WATER ELEVATION (FT)	CRITICAL SLIP SURF. ELEVATION (FT)	UNIT WEIGHT WATER (PCF)
-7.5	-12.5	64
RESULTANT WATER LOAD=	800	LBS

```
'ROTATIONAL ANALYSIS
'ORLEANS CANAL
'MVK DISTRICT
'REACH 19 WITH BERM
CONTROL  CANTILEVER  DESIGN  1.00  1.60
WALL   13.8
SURFACE RIGHTSIDE   9    0    4.55
                1.1    4.55
                13.3    2.06
                18.2    0.16
                35.7   -2.38
                41.5   -2.78
                57.8   -7.5
                71.5   -8.74
                91.6   -8.56
SURFACE LEFTSIDE   8    0    5
                11    5
                30.6    4.3
                42.8    0.8
                88   -1.5
                99.2   -5.14
                124.2   -5.9
                140   -5.9
SOIL RIGHTSIDE  STRENGTHS   9
  117    117    0    500    0    500   -.9   0
  103    103    0    300    0    300   -7.5   0
  92    92    0    225    0    225   -12.5   0
  77    77    0    300    0    300   -15.3   0
  77    77    0    300    0    300   -19   0
  105    105    0    341    0    341   -25   0
  102    102    0    395    0    395   -32   0
  122    122    33    0    18    0   -42   0
  105    105    0    600    0    500
SOIL LEFTSIDE  STRENGTHS   9
  117    117    0    500    0    500   -.9   0
  103    103    0    300    0    300   -7.5   0
  92    92    0    225    0    225   -12.5   0
  77    77    0    300    0    300   -15.3   0
  77    77    0    300    0    300   -19   0
  105    105    0    341    0    341   -25   0
  102    102    0    395    0    395   -32   0
  122    122    33    0    18    0   -42   0
  105    105    0    600    0    500
WATER ELEVATIONS   62.4    8   -7.9
HORIZONTAL DISTRIBUTED   2    5    836   -12.5    836
FINISHED
```

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS
DATE: 8-OCTOBER-2013 TIME: 12:18:53

****
* INPUT DATA *
****

I.--HEADING
'ROTATIONAL ANALYSIS
'ORLEANS CANAL
'MVK DISTRICT
'REACH 19 WITH BERM

II.--CONTROL
CANTILEVER WALL DESIGN
FACTOR OF SAFETY FOR ACTIVE PRESSURES = 1.00
FACTOR OF SAFETY FOR PASSIVE PRESSURES = 1.60

III.--WALL DATA
ELEVATION AT TOP OF WALL = 13.80 FT.

IV.--SURFACE POINT DATA

IV.A.--RIGHTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	4.55
1.10	4.55
13.30	2.06
18.20	0.16
35.70	-2.38
41.50	-2.78
57.80	-7.50
71.50	-8.74
91.60	-8.56

IV.B.--LEFTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	5.00
11.00	5.00
30.60	4.30
42.80	0.80
88.00	-1.50
99.20	-5.14
124.20	-5.90
140.00	-5.90

V.--SOIL LAYER DATA

V.A.--RIGHTSIDE
LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = DEFAULT

LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH-ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH-ESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.
117.00	117.00	0.00	500.00	0.00	500.00	-0.90	0.00	DEF	DEF
103.00	103.00	0.00	300.00	0.00	300.00	-7.50	0.00	DEF	DEF
92.00	92.00	0.00	225.00	0.00	225.00	-12.50	0.00	DEF	DEF
77.00	77.00	0.00	300.00	0.00	300.00	-15.30	0.00	DEF	DEF
77.00	77.00	0.00	300.00	0.00	300.00	-19.00	0.00	DEF	DEF
105.00	105.00	0.00	341.00	0.00	341.00	-25.00	0.00	DEF	DEF
102.00	102.00	0.00	395.00	0.00	395.00	-32.00	0.00	DEF	DEF
122.00	122.00	33.00	0.00	18.00	0.00	-42.00	0.00	DEF	DEF
105.00	105.00	0.00	600.00	0.00	500.00			DEF	DEF

V.B.--LEFTSIDE

LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH-ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH-ESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.
117.00	117.00	0.00	500.00	0.00	500.00	-0.90	0.00	DEF	DEF
103.00	103.00	0.00	300.00	0.00	300.00	-7.50	0.00	DEF	DEF
92.00	92.00	0.00	225.00	0.00	225.00	-12.50	0.00	DEF	DEF
77.00	77.00	0.00	300.00	0.00	300.00	-15.30	0.00	DEF	DEF
77.00	77.00	0.00	300.00	0.00	300.00	-19.00	0.00	DEF	DEF
105.00	105.00	0.00	341.00	0.00	341.00	-25.00	0.00	DEF	DEF
102.00	102.00	0.00	395.00	0.00	395.00	-32.00	0.00	DEF	DEF
122.00	122.00	33.00	0.00	18.00	0.00	-42.00	0.00	DEF	DEF
105.00	105.00	0.00	600.00	0.00	500.00			DEF	DEF

VI.--WATER DATA

UNIT WEIGHT = 62.40 (PCF)
RIGHTSIDE ELEVATION = 8.00 (FT)
LEFTSIDE ELEVATION = -7.90 (FT)
NO SEEPAGE

VII.--VERTICAL SURCHARGE LOADS

NONE

VIII.--HORIZONTAL LOADS

VIII.A.--HORIZONTAL LINE LOADS

NONE

VIII.B.--HORIZONTAL DISTRIBUTED LOADS

ELEVATION (FT)	DIST. LOAD (PSF)
5.00	836.00
-12.50	836.00

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS
DATE: 8-OCTOBER-2013 TIME: 12:18:55

****
*   SOIL PRESSURES FOR   *
* CANTILEVER WALL DESIGN *
****

I.--HEADING
'ROTATIONAL ANALYSIS
'ORLEANS CANAL
'MVK DISTRICT
'REACH 19 WITH BERM

II.--SOIL PRESSURES

RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

NET SOIL PRESSURES INCLUDE APPLIED HORIZONTAL DISTRIBUTED LOADS.

				<------NET------>			
	NET	<---LEFTSIDE--->		(SOIL + WATER)		<--RIGHTSIDE--->	
ELEV.	WATER	PASSIVE	ACTIVE	ACTIVE	PASSIVE	ACTIVE	PASSIVE
(FT)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)
13.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7.8	12.5	0.0	0.0	12.5	12.5	0.0	0.0
6.8	74.9	0.0	0.0	74.9	74.9	0.0	0.0
5.8	137.3	0.0	0.0	137.3	137.3	0.0	0.0
5.0+	187.2	0.0	0.0	187.2	187.2	0.0	0.0
5.0-	187.2	625.0	0.0	398.2	1023.2	0.0	0.0
4.8	199.7	960.9	0.0	74.8	1035.7	0.0	0.0
4.6+	215.3	990.2	0.0	61.1	1051.3	0.0	0.0
4.6-	215.3	990.2	0.0	61.1	1676.3	0.0	625.0
3.8	262.1	1077.9	0.0	20.2	2057.6	0.0	959.5
3.6	277.7	1107.2	0.0	6.5	2065.6	0.0	951.9
3.4	285.1	1121.1	0.0	0.0	2070.2	0.0	949.0

2.8	324.5	1194.9	0.0	-34.4	2094.6	0.0	934.1
1.8	386.9	1311.9	0.0	-89.0	2187.7	0.0	964.8
0.8	449.3	1432.6	0.0	-147.3	2300.7	0.0	1015.4
-0.2	511.7	1516.6	0.0	-168.9	2375.5	0.0	1027.8
-0.9	555.4	1439.9	0.0	-48.5	2292.3	0.0	901.0
-1.2	574.1	1383.4	0.0	26.7	2233.1	0.0	823.0
-2.2	636.5	1382.4	0.0	90.0	2222.8	0.0	750.4
-2.9+	681.2	1489.7	0.0	42.7	2293.1	0.0	775.9
-2.9-	681.2	1459.4	0.0	42.7	2293.1	0.0	775.9
-3.2	698.9	1489.7	27.2	45.2	2293.6	0.0	786.0
-4.2	761.3	1593.2	129.5	4.1	2285.1	0.0	817.3
-5.2	823.7	1692.5	238.0	-32.9	2270.3	0.0	848.7
-6.2	886.1	1785.4	353.6	-63.3	2250.0	0.0	881.5
-7.2	948.5	1843.9	519.2	-59.4	2145.0	0.0	879.7
-7.5	967.2	1831.2	614.2	-28.0	2036.1	0.0	847.2
-7.9	992.2	1803.0	738.4	25.1	1887.2	0.0	797.4
-8.2	992.2	1803.5	771.2	24.7	1848.0	0.0	791.1
-9.2	992.2	1832.8	792.0	-4.7	1851.9	0.0	815.7
-9.5+	992.2	1839.7	798.8	-11.5	1853.8	0.0	829.6
-9.5-	992.2	1839.7	798.8	-11.5	1853.8	0.0	819.4
-10.2	992.2	1858.4	817.5	-7.7	1840.2	22.5	829.6
-11.2	992.2	1882.5	845.5	34.5	1801.6	88.8	818.9
-12.2	992.2	1940.1	819.4	-15.6	1848.5	96.3	839.8
-12.5+	992.2	1988.4	758.9	-109.4	1941.9	50.9	872.7
-12.5-	992.2	1988.4	758.9	-945.4	1105.9	50.9	872.7
-12.9+	992.2	2050.5	673.3	-1058.3	1239.1	0.0	934.8
-12.9-	992.2	2050.5	673.3	-1058.3	1239.1	0.0	905.6
-13.2	992.2	2068.4	653.6	-1076.2	1273.3	0.0	934.8
-14.2	992.2	2075.7	669.3	-1083.6	1269.4	0.0	946.5
-15.2	992.2	2086.3	679.8	-1094.2	1256.8	0.0	944.5
-15.3	992.2	2087.4	680.9	-1095.2	1255.6	0.0	944.4
-16.2	992.2	2096.9	690.4	-1104.7	1243.6	0.0	941.9
-17.2	992.2	2106.9	701.8	-1114.7	1245.0	0.0	954.7
-18.2	992.2	2121.6	705.7	-1129.4	1294.1	0.0	1007.7
-19.0	992.2	2167.6	662.0	-1175.4	1416.4	0.0	1086.2
-19.2	992.2	2186.2	646.5	-1194.0	1452.3	0.0	1106.6
-20.2	992.2	2250.3	642.1	-1258.1	1515.8	0.0	1165.7
-21.2	992.2	2288.2	681.8	-1296.0	1511.1	0.0	1200.7
-22.2	992.2	2326.7	720.4	-1334.6	1508.2	0.0	1236.4
-23.2	992.2	2364.6	760.1	-1372.4	1503.4	0.0	1271.4
-24.2	992.2	2408.6	789.9	-1416.5	1514.8	0.0	1312.6
-25.0	992.2	2487.7	743.1	-1495.5	1634.7	0.0	1385.6
-25.2	992.2	2509.8	727.0	-1517.6	1675.2	0.0	1410.1
-26.2	992.2	2523.8	784.9	-1531.7	1697.3	0.0	1490.0

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS
DATE: 8-OCTOBER-2013 TIME: 12:18:55

****
* SUMMARY OF RESULTS FOR *
* CANTILEVER WALL DESIGN *
****

I.--HEADING
'ROTATIONAL ANALYSIS
'ORLEANS CANAL
'MVK DISTRICT
'REACH 19 WITH BERM

II.--SUMMARY

RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

WALL BOTTOM ELEV. (FT) : -15.49
PENETRATION (FT) : 20.04

MAX. BEND. MOMENT (LB-FT) : 2.0170E+03
AT ELEVATION (FT) : -6.71

MAX. SCALED DEFL. (LB-IN^3): 1.0694E+09
AT ELEVATION (FT) : 13.80

NOTE: DIVIDE SCALED DEFLECTION MODULUS OF
ELLASTICITY IN PSI TIMES PILE MOMENT
OF INERTIA IN IN^4 TO OBTAIN DEFLECTION
IN INCHES.

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHOREDOR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS
DATE: 8-OCTOBER-2013 TIME: 12:18:55

****
* COMPLETE OF RESULTS FOR *
* CANTILEVER WALL DESIGN *
****

I.--HEADING
'ROTATIONAL ANALYSIS
'ORLEANS CANAL
'MVK DISTRICT
'REACH 19 WITH BERM

II.--RESULTS

ELEVATION (FT)	BENDING MOMENT (LB-FT)	SHEAR (LB)	SCALED DEFLECTION (LB-IN^3)	NET PRESSURE (PSF)
13.80	0.0000E+00	0.	1.0694E+09	0.00
12.80	-8.7311E-11	0.	1.0138E+09	0.00
11.80	-8.7311E-11	0.	9.5818E+08	0.00
10.80	-8.7311E-11	0.	9.0258E+08	0.00
9.80	-8.7311E-11	0.	8.4697E+08	0.00
8.80	-8.7311E-11	0.	7.9136E+08	0.00
8.00	-1.8161E-09	0.	7.4687E+08	0.00
7.80	8.3200E-02	1.	7.3575E+08	12.48
6.80	1.7971E+01	45.	6.8015E+08	74.88
5.80	1.1074E+02	151.	6.2458E+08	137.28
5.00+	2.8080E+02	281.	5.8027E+08	187.20
5.00-	2.8080E+02	281.	5.8027E+08	398.20
4.80	3.4277E+02	328.	5.6923E+08	74.78
4.55	4.2699E+02	345.	5.5547E+08	61.13
3.80	6.9916E+02	376.	5.1449E+08	20.18
3.55	7.9354E+02	379.	5.0097E+08	6.53
3.43	8.3889E+02	379.	4.9453E+08	0.00
2.80	1.0757E+03	368.	4.6096E+08	-34.42
1.80	1.4179E+03	307.	4.0928E+08	-89.02
0.80	1.6704E+03	189.	3.6004E+08	-147.28
-0.20	1.7817E+03	30.	3.1367E+08	-168.91
-0.90	1.7715E+03	-46.	2.8303E+08	-48.52
-1.20	1.7568E+03	-49.	2.7035E+08	26.65
-2.20	1.7318E+03	9.	2.3007E+08	90.03
-2.92	1.7577E+03	57.	2.0304E+08	42.70
-3.20	1.7756E+03	69.	1.9280E+08	45.18
-4.20	1.8608E+03	94.	1.5860E+08	4.08
-5.20	1.9508E+03	80.	1.2761E+08	-32.87
-6.20	2.0090E+03	32.	9.9993E+07	-63.32
-7.20	2.0096E+03	-30.	7.5837E+07	-59.43
-7.50	1.9985E+03	-43.	6.9268E+07	-28.03
-7.90	1.9805E+03	-43.	6.0993E+07	25.12
-8.20	1.9686E+03	-36.	5.5146E+07	24.68
-9.20	1.9400E+03	-26.	3.7861E+07	-4.66
-9.47	1.9328E+03	-28.	3.3778E+07	-11.52
-10.20	1.9095E+03	-35.	2.3926E+07	-7.75
-11.20	1.8774E+03	-22.	1.3291E+07	34.52
-12.20	1.8645E+03	-12.	5.9041E+06	-15.63
-12.50+	1.8587E+03	-31.	4.3170E+06	-109.35
-12.50-	1.8587E+03	-31.	4.3170E+06	-945.35
-12.78	1.8130E+03	-304.	3.1114E+06	-1029.35
-12.87	1.7796E+03	-398.	2.7516E+06	-949.31
-13.20	1.6025E+03	-664.	1.7185E+06	-672.82
-14.20	7.4174E+02	-917.	2.0656E+05	168.25
-15.20	4.9256E+01	-328.	6.1255E+02	1009.31
-15.30	2.1642E+01	-223.	1.1432E+02	1093.41
-15.49	0.0000E+00	0.	0.0000E+00	1253.11

NOTE: DIVIDE SCALED DEFLECTION MODULUS OF

ELLASTICITY IN PSI TIMES PILE MOMENT
OF INERTIA IN IN^4 TO OBTAIN DEFLECTION
IN INCHES.

III.--WATER AND SOIL PRESSURES

		<-------------SOIL PRESSURES-------------->			
	WATER	<----LEFTSIDE----->		<---RIGHTSIDE---->	
ELEVATION	PRESSURE	PASSIVE	ACTIVE	ACTIVE	PASSIVE
(FT)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)
13.80	0.	0.	0.	0.	0.
12.80	0.	0.	0.	0.	0.
11.80	0.	0.	0.	0.	0.
10.80	0.	0.	0.	0.	0.
9.80	0.	0.	0.	0.	0.
8.80	0.	0.	0.	0.	0.
8.00	0.	0.	0.	0.	0.
7.80	12.	0.	0.	0.	0.
6.80	75.	0.	0.	0.	0.
5.80	137.	0.	0.	0.	0.
5.00+	187.	0.	0.	0.	0.
5.00-	187.	625.	0.	0.	0.
4.80	200.	961.	0.	0.	0.
4.55+	215.	990.	0.	0.	0.
4.55-	215.	990.	0.	0.	625.
3.80	262.	1078.	0.	0.	960.
3.55	278.	1107.	0.	0.	952.
3.43	285.	1121.	0.	0.	949.
2.80	324.	1195.	0.	0.	934.
1.80	387.	1312.	0.	0.	965.
0.80	449.	1433.	0.	0.	1015.
-0.20	512.	1517.	0.	0.	1028.
-0.90	555.	1440.	0.	0.	901.
-1.20	574.	1383.	0.	0.	823.
-2.20	636.	1382.	0.	0.	750.
-2.92+	681.	1490.	0.	0.	776.
-2.92-	681.	1459.	0.	0.	776.
-3.20	699.	1490.	27.	0.	786.
-4.20	761.	1593.	129.	0.	817.
-5.20	824.	1693.	238.	0.	849.
-6.20	886.	1785.	354.	0.	882.
-7.20	948.	1844.	519.	0.	880.
-7.50	967.	1831.	614.	0.	847.
-7.90	992.	1803.	738.	0.	797.
-8.20	992.	1803.	771.	0.	791.
-9.20	992.	1833.	792.	0.	816.
-9.47+	992.	1840.	799.	0.	830.
-9.47-	992.	1840.	799.	0.	819.
-10.20	992.	1858.	818.	22.	830.
-11.20	992.	1882.	845.	89.	819.
-12.20	992.	1940.	819.	96.	840.
-12.50	992.	1988.	759.	51.	873.
-12.78	992.	2035.	695.	13.	919.
-12.87+	992.	2050.	673.	0.	935.

-12.87-	992.	2050.	673.	0.	906.
-13.20	992.	2068.	654.	0.	935.
-14.20	992.	2076.	669.	0.	946.
-15.20	992.	2086.	680.	0.	944.
-15.30	992.	2087.	681.	0.	944.
-15.49	992.	2097.	690.	0.	942.
-17.20	992.	2107.	702.	0.	955.

```
'ROTATIONAL ANALYSIS
'ORLEANS CANAL
'MVK DISTRICT
'REACH 19 WITH BERM
CONTROL  CANTILEVER  DESIGN  1.00  1.40
WALL   13.8
SURFACE RIGHTSIDE   9    0    4.55
                1.1    4.55
                13.3    2.06
                18.2    0.16
                35.7   -2.38
                41.5   -2.78
                57.8   -7.5
                71.5   -8.74
                91.6   -8.56
SURFACE LEFTSIDE   8    0    5
                11    5
                30.6    4.3
                42.8    0.8
                88   -1.5
                99.2   -5.14
                124.2   -5.9
                140   -5.9
SOIL RIGHTSIDE  STRENGTHS   9
  117    117    0    500    0    500   -.9   0
  103    103    0    300    0    300   -7.5   0
  92    92    0    225    0    225   -12.5   0
  77    77    0    300    0    300   -15.3   0
  77    77    0    300    0    300   -19   0
  105    105    0    341    0    341   -25   0
  102    102    0    395    0    395   -32   0
  122    122    33    0    18    0   -42   0
  105    105    0    600    0    500
SOIL LEFTSIDE  STRENGTHS   9
  117    117    0    500    0    500   -.9   0
  103    103    0    300    0    300   -7.5   0
  92    92    0    225    0    225   -12.5   0
  77    77    0    300    0    300   -15.3   0
  77    77    0    300    0    300   -19   0
  105    105    0    341    0    341   -25   0
  102    102    0    395    0    395   -32   0
  122    122    33    0    18    0   -42   0
  105    105    0    600    0    500
WATER ELEVATIONS   62.4    8   -7.9
HORIZONTAL DISTRIBUTED   2    5    941   -12.5    941
FINISHED
```

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS
DATE: 8-OCTOBER-2013 TIME: 10:53:20

****
* INPUT DATA *
****

I.--HEADING
'ROTATIONAL ANALYSIS
'ORLEANS CANAL
'MVK DISTRICT
'REACH 19 WITH BERM

II.--CONTROL
CANTILEVER WALL DESIGN
FACTOR OF SAFETY FOR ACTIVE PRESSURES = 1.00
FACTOR OF SAFETY FOR PASSIVE PRESSURES = 1.40

III.--WALL DATA
ELEVATION AT TOP OF WALL = 13.80 FT.

IV.--SURFACE POINT DATA

IV.A.--RIGHTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	4.55
1.10	4.55
13.30	2.06
18.20	0.16
35.70	-2.38
41.50	-2.78
57.80	-7.50
71.50	-8.74
91.60	-8.56

IV.B.--LEFTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	5.00
11.00	5.00
30.60	4.30
42.80	0.80
88.00	-1.50
99.20	-5.14
124.20	-5.90
140.00	-5.90

V.--SOIL LAYER DATA

V.A.--RIGHTSIDE
LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = DEFAULT

LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COHESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADHESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.
117.00	117.00	0.00	500.00	0.00	500.00	-0.90	0.00	DEF	DEF
103.00	103.00	0.00	300.00	0.00	300.00	-7.50	0.00	DEF	DEF
92.00	92.00	0.00	225.00	0.00	225.00	-12.50	0.00	DEF	DEF
77.00	77.00	0.00	300.00	0.00	300.00	-15.30	0.00	DEF	DEF
77.00	77.00	0.00	300.00	0.00	300.00	-19.00	0.00	DEF	DEF
105.00	105.00	0.00	341.00	0.00	341.00	-25.00	0.00	DEF	DEF
102.00	102.00	0.00	395.00	0.00	395.00	-32.00	0.00	DEF	DEF
122.00	122.00	33.00	0.00	18.00	0.00	-42.00	0.00	DEF	DEF
105.00	105.00	0.00	600.00	0.00	500.00			DEF	DEF

V.B.--LEFTSIDE

LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COHESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADHESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.
117.00	117.00	0.00	500.00	0.00	500.00	-0.90	0.00	DEF	DEF
103.00	103.00	0.00	300.00	0.00	300.00	-7.50	0.00	DEF	DEF
92.00	92.00	0.00	225.00	0.00	225.00	-12.50	0.00	DEF	DEF
77.00	77.00	0.00	300.00	0.00	300.00	-15.30	0.00	DEF	DEF
77.00	77.00	0.00	300.00	0.00	300.00	-19.00	0.00	DEF	DEF
105.00	105.00	0.00	341.00	0.00	341.00	-25.00	0.00	DEF	DEF
102.00	102.00	0.00	395.00	0.00	395.00	-32.00	0.00	DEF	DEF
122.00	122.00	33.00	0.00	18.00	0.00	-42.00	0.00	DEF	DEF
105.00	105.00	0.00	600.00	0.00	500.00			DEF	DEF

VI.--WATER DATA

UNIT WEIGHT = 62.40 (PCF)
RIGHTSIDE ELEVATION = 8.00 (FT)
LEFTSIDE ELEVATION = -7.90 (FT)
NO SEEPAGE

VII.--VERTICAL SURCHARGE LOADS

NONE

VIII.--HORIZONTAL LOADS

VIII.A.--HORIZONTAL LINE LOADS

NONE

VIII.B.--HORIZONTAL DISTRIBUTED LOADS

ELEVATION (FT)	DIST. LOAD (PSF)
5.00	941.00
-12.50	941.00

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS
DATE: 8-OCTOBER-2013 TIME: 10:53:22

****
* SOIL PRESSURES FOR *
* CANTILEVER WALL DESIGN *
****

I.--HEADING
'ROTATIONAL ANALYSIS
'ORLEANS CANAL
'MVK DISTRICT
'REACH 19 WITH BERM

II.--SOIL PRESSURES

RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

NET SOIL PRESSURES INCLUDE APPLIED HORIZONTAL DISTRIBUTED LOADS.

	NET	<---LEFTSIDE--->		<------NET------> (SOIL + WATER)		<--RIGHTSIDE--->	
ELEV.	WATER	PASSIVE	ACTIVE	ACTIVE	PASSIVE	ACTIVE	PASSIVE
(FT)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)
13.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7.8	12.5	0.0	0.0	12.5	12.5	0.0	0.0
6.8	74.9	0.0	0.0	74.9	74.9	0.0	0.0
5.8	137.3	0.0	0.0	137.3	137.3	0.0	0.0
5.0+	187.2	0.0	0.0	187.2	187.2	0.0	0.0
5.0-	187.2	714.3	0.0	413.9	1128.2	0.0	0.0
4.8	199.7	1094.8	0.0	45.9	1140.7	0.0	0.0
4.6+	215.3	1124.1	0.0	32.2	1156.3	0.0	0.0
4.6-	215.3	1124.1	0.0	32.2	1870.6	0.0	714.3
4.0	252.1	1193.1	0.0	0.0	2203.4	0.0	1010.3
3.8	262.1	1211.8	0.0	-8.7	2293.8	0.0	1090.8
3.6	277.7	1241.1	0.0	-22.4	2298.8	0.0	1080.2

2.8	324.5	1328.8	0.0	-63.3	2320.2	0.0	1054.7
1.8	386.9	1445.8	0.0	-117.9	2411.3	0.0	1083.4
0.8	449.3	1567.0	0.0	-176.7	2525.0	0.0	1134.8
-0.2	511.7	1646.3	0.0	-193.6	2595.1	0.0	1142.4
-0.9	555.4	1547.2	0.0	-50.8	2489.5	0.0	993.1
-1.2	574.1	1478.1	0.0	37.0	2417.6	0.0	902.5
-2.2	636.5	1462.2	0.0	115.3	2392.5	0.0	815.0
-2.9+	681.2	1570.1	0.0	67.4	2463.2	0.0	840.9
-2.9-	681.2	1539.5	0.0	67.4	2463.2	0.0	840.9
-3.2	698.9	1570.1	27.2	69.8	2463.9	0.0	851.2
-4.2	761.3	1673.6	129.5	28.7	2455.3	0.0	882.5
-5.2	823.7	1772.5	238.0	-7.8	2440.6	0.0	913.9
-6.2	886.1	1864.1	353.6	-37.0	2420.4	0.0	947.0
-7.2	948.5	1916.7	519.2	-27.2	2310.7	0.0	940.4
-7.5	967.2	1898.1	614.2	10.1	2196.0	0.0	902.0
-7.9	992.2	1861.5	738.4	71.6	2038.7	0.0	843.9
-8.2	992.2	1860.2	771.2	73.0	1997.6	0.0	835.7
-9.2	992.2	1890.0	792.0	43.1	2002.2	0.0	861.0
-9.5+	992.2	1896.9	798.8	36.3	2003.5	0.0	873.9
-9.5-	992.2	1896.9	798.8	36.3	2003.5	0.0	864.5
-10.2	992.2	1915.5	817.5	40.1	1989.6	22.5	873.9
-11.2	992.2	1939.4	845.5	82.5	1946.7	88.8	859.0
-12.2	992.2	2001.7	819.4	27.8	1994.4	96.3	880.6
-12.5+	992.2	2056.0	758.9	-71.9	2092.1	50.9	917.8
-12.5-	992.2	2056.0	758.9	-1012.9	1151.1	50.9	917.8
-12.9+	992.2	2126.1	673.3	-1134.0	1290.9	0.0	988.6
-12.9-	992.2	2126.1	673.3	-1134.0	1290.9	0.0	955.4
-13.2	992.2	2146.1	653.6	-1154.0	1327.2	0.0	988.6
-14.2	992.2	2153.0	669.3	-1160.9	1325.0	0.0	1002.1
-15.2	992.2	2163.6	679.8	-1171.4	1312.2	0.0	999.9
-15.3	992.2	2164.6	680.9	-1172.5	1311.1	0.0	999.8
-16.2	992.2	2174.2	690.4	-1182.0	1298.8	0.0	997.0
-17.2	992.2	2184.1	701.8	-1191.9	1302.1	0.0	1011.8
-18.2	992.2	2199.4	705.7	-1207.2	1358.5	0.0	1072.0
-19.0	992.2	2250.3	662.0	-1258.2	1490.8	0.0	1160.6
-19.2	992.2	2270.8	646.5	-1278.6	1529.0	0.0	1183.3
-20.2	992.2	2338.6	642.1	-1346.5	1595.9	0.0	1245.8
-21.2	992.2	2376.4	681.8	-1384.3	1591.1	0.0	1280.8
-22.2	992.2	2415.0	720.4	-1422.8	1588.2	0.0	1316.4
-23.2	992.2	2452.7	760.1	-1460.6	1583.3	0.0	1351.3
-24.2	992.2	2497.6	789.9	-1505.4	1595.5	0.0	1393.3
-25.0	992.2	2583.5	743.1	-1591.4	1721.8	0.0	1472.8
-25.2	992.2	2607.7	727.0	-1615.6	1764.8	0.0	1499.7
-26.2	992.2	2619.4	784.9	-1627.2	1793.7	0.0	1586.4

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS
DATE: 8-OCTOBER-2013 TIME: 10:53:23

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****************************
*  SUMMARY OF RESULTS FOR  *
*  CANTILEVER WALL DESIGN  *
****************************
```

I.--HEADING
'ROTATIONAL ANALYSIS
'ORLEANS CANAL
'MVK DISTRICT
'REACH 19 WITH BERM

II.--SUMMARY

RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

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WALL BOTTOM ELEV. (FT)     :      -15.30
     PENETRATION (FT)     :       19.85

MAX. BEND. MOMENT (LB-FT)  :  1.4646E+03
     AT ELEVATION (FT)    :      -12.70

MAX. SCALED DEFL. (LB-IN^3):  6.7930E+08
     AT ELEVATION (FT)    :       13.80
```

NOTE: DIVIDE SCALED DEFLECTION MODULUS OF
ELLASTICITY IN PSI TIMES PILE MOMENT
OF INERTIA IN IN^4 TO OBTAIN DEFLECTION
IN INCHES.

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHOREDOR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS
DATE: 8-OCTOBER-2013 TIME: 10:53:23

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****************************
* COMPLETE OF RESULTS FOR  *
*  CANTILEVER WALL DESIGN  *
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I.--HEADING
'ROTATIONAL ANALYSIS
'ORLEANS CANAL
'MVK DISTRICT
'REACH 19 WITH BERM

II.--RESULTS

ELEVATION (FT)	BENDING MOMENT (LB-FT)	SHEAR (LB)	SCALED DEFLECTION (LB-IN^3)	NET PRESSURE (PSF)
13.80	0.0000E+00	0.	6.7930E+08	0.00
12.80	1.3097E-10	0.	6.4291E+08	0.00
11.80	1.3097E-10	0.	6.0652E+08	0.00
10.80	1.3097E-10	0.	5.7014E+08	0.00
9.80	1.3097E-10	0.	5.3375E+08	0.00
8.80	1.3097E-10	0.	4.9736E+08	0.00
8.00	-1.3660E-09	0.	4.6825E+08	0.00
7.80	8.3200E-02	1.	4.6097E+08	12.48
6.80	1.7971E+01	45.	4.2459E+08	74.88
5.80	1.1074E+02	151.	3.8825E+08	137.28
5.00+	2.8080E+02	281.	3.5931E+08	187.20
5.00-	2.8080E+02	281.	3.5931E+08	413.91
4.80	3.4278E+02	327.	3.5211E+08	45.85
4.55	4.2577E+02	337.	3.4315E+08	32.20
3.96	6.2798E+02	346.	3.2222E+08	0.00
3.80	6.8339E+02	345.	3.1659E+08	-8.75
3.55	7.6930E+02	341.	3.0787E+08	-22.40
2.80	1.0152E+03	309.	2.8225E+08	-63.35
1.80	1.2837E+03	219.	2.4965E+08	-117.95
0.80	1.4336E+03	71.	2.1925E+08	-176.73
-0.20	1.4137E+03	-114.	1.9131E+08	-193.64
-0.90	1.2982E+03	-199.	1.7320E+08	-50.85
-1.20	1.2374E+03	-202.	1.6578E+08	37.02
-2.20	1.0674E+03	-125.	1.4239E+08	115.29
-2.92	1.0031E+03	-60.	1.2678E+08	67.43
-3.20	9.8884E+02	-40.	1.2087E+08	69.82
-4.20	9.7643E+02	9.	1.0106E+08	28.65
-5.20	9.9346E+02	19.	8.2942E+07	-7.79
-6.20	1.0039E+03	-3.	6.6541E+07	-36.99
-7.20	9.8386E+02	-35.	5.1869E+07	-27.21
-7.50	9.7261E+02	-38.	4.7802E+07	10.10
-7.90	9.5992E+02	-22.	4.2613E+07	71.62
-8.20	9.5671E+02	0.	3.8896E+07	72.97
-9.20	9.8841E+02	58.	2.7585E+07	43.15
-9.47	1.0056E+03	69.	2.4826E+07	36.29
-10.20	1.0660E+03	97.	1.7989E+07	40.06
-11.20	1.1899E+03	158.	1.0241E+07	82.54
-12.20	1.3802E+03	213.	4.5597E+06	27.80
-12.50+	1.4439E+03	207.	3.3045E+06	-71.91
-12.50-	1.4439E+03	207.	3.3045E+06	-1012.91
-12.87	1.4481E+03	-192.	2.0616E+06	-1133.97
-12.89	1.4444E+03	-212.	2.0098E+06	-1135.07
-13.20	1.3287E+03	-516.	1.2472E+06	-820.34
-14.20	5.7135E+02	-830.	1.1607E+05	192.83
-15.20	6.7797E+00	-130.	1.0036E+01	1206.00
-15.30	-6.4593E-02	-5.	-8.2255E-04	1307.31
-15.30	0.0000E+00	0.	0.0000E+00	1311.00

NOTE: DIVIDE SCALED DEFLECTION MODULUS OF

ELLASTICITY IN PSI TIMES PILE MOMENT
OF INERTIA IN IN^4 TO OBTAIN DEFLECTION
IN INCHES.

III.--WATER AND SOIL PRESSURES

		<-------------SOIL PRESSURES-------------->			
	WATER	<----LEFTSIDE----->		<---RIGHTSIDE---->	
ELEVATION	PRESSURE	PASSIVE	ACTIVE	ACTIVE	PASSIVE
(FT)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)
13.80	0.	0.	0.	0.	0.
12.80	0.	0.	0.	0.	0.
11.80	0.	0.	0.	0.	0.
10.80	0.	0.	0.	0.	0.
9.80	0.	0.	0.	0.	0.
8.80	0.	0.	0.	0.	0.
8.00	0.	0.	0.	0.	0.
7.80	12.	0.	0.	0.	0.
6.80	75.	0.	0.	0.	0.
5.80	137.	0.	0.	0.	0.
5.00+	187.	0.	0.	0.	0.
5.00-	187.	714.	0.	0.	0.
4.80	200.	1095.	0.	0.	0.
4.55+	215.	1124.	0.	0.	0.
4.55-	215.	1124.	0.	0.	714.
3.96	252.	1193.	0.	0.	1010.
3.80	262.	1212.	0.	0.	1091.
3.55	278.	1241.	0.	0.	1080.
2.80	324.	1329.	0.	0.	1055.
1.80	387.	1446.	0.	0.	1083.
0.80	449.	1567.	0.	0.	1135.
-0.20	512.	1646.	0.	0.	1142.
-0.90	555.	1547.	0.	0.	993.
-1.20	574.	1478.	0.	0.	903.
-2.20	636.	1462.	0.	0.	815.
-2.92+	681.	1570.	0.	0.	841.
-2.92-	681.	1540.	0.	0.	841.
-3.20	699.	1570.	27.	0.	851.
-4.20	761.	1674.	129.	0.	883.
-5.20	824.	1772.	238.	0.	914.
-6.20	886.	1864.	354.	0.	947.
-7.20	948.	1917.	519.	0.	940.
-7.50	967.	1898.	614.	0.	902.
-7.90	992.	1862.	738.	0.	844.
-8.20	992.	1860.	771.	0.	836.
-9.20	992.	1890.	792.	0.	861.
-9.47+	992.	1897.	799.	0.	874.
-9.47-	992.	1897.	799.	0.	864.
-10.20	992.	1916.	818.	22.	874.
-11.20	992.	1939.	845.	89.	859.
-12.20	992.	2002.	819.	96.	881.
-12.50	992.	2056.	759.	51.	918.
-12.87+	992.	2126.	673.	0.	989.
-12.87-	992.	2126.	673.	0.	955.

-12.89	992.	2127.	672.	0.	957.
-13.20	992.	2146.	654.	0.	989.
-14.20	992.	2153.	669.	0.	1002.
-15.20	992.	2164.	680.	0.	1000.
-15.30	992.	2165.	681.	0.	1000.
-15.30	992.	2174.	690.	0.	997.
-17.20	992.	2184.	702.	0.	1012.

```
'ROTATIONAL ANALYSIS
'ORLEANS CANAL
'MVK DISTRICT
'REACH 19 WITH BERM
CONTROL  CANTILEVER  DESIGN  1.00  1.20
WALL   13.8
SURFACE RIGHTSIDE   9    0    4.55
                 1.1    4.55
                 13.3    2.06
                 18.2    0.16
                 35.7   -2.38
                 41.5   -2.78
                 57.8   -7.5
                 71.5   -8.74
                 91.6   -8.56
SURFACE LEFTSIDE   8    0    5
                 11    5
                 30.6    4.3
                 42.8    0.8
                 88   -1.5
                 99.2   -5.14
                 124.2   -5.9
                 140   -5.9
SOIL RIGHTSIDE  STRENGTHS   9
   117    117    0    500    0    500   -.9   0
   103    103    0    300    0    300   -7.5   0
   92    92    0    225    0    225   -12.5   0
   77    77    0    300    0    300   -15.3   0
   77    77    0    300    0    300   -19   0
   105    105    0    341    0    341   -25   0
   102    102    0    395    0    395   -32   0
   122    122    33    0    18    0   -42   0
   105    105    0    600    0    500
SOIL LEFTSIDE  STRENGTHS   9
   117    117    0    500    0    500   -.9   0
   103    103    0    300    0    300   -7.5   0
   92    92    0    225    0    225   -12.5   0
   77    77    0    300    0    300   -15.3   0
   77    77    0    300    0    300   -19   0
   105    105    0    341    0    341   -25   0
   102    102    0    395    0    395   -32   0
   122    122    33    0    18    0   -42   0
   105    105    0    600    0    500
WATER ELEVATIONS   62.4    8   -7.9
HORIZONTAL DISTRIBUTED   2    5    1086.4   -12.5    1086.4
FINISHED
```

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS
DATE: 8-OCTOBER-2013 TIME: 12:10:18

****
* INPUT DATA *
****

I.--HEADING
'ROTATIONAL ANALYSIS
'ORLEANS CANAL
'MVK DISTRICT
'REACH 19 WITH BERM

II.--CONTROL
CANTILEVER WALL DESIGN
FACTOR OF SAFETY FOR ACTIVE PRESSURES = 1.00
FACTOR OF SAFETY FOR PASSIVE PRESSURES = 1.20

III.--WALL DATA
ELEVATION AT TOP OF WALL = 13.80 FT.

IV.--SURFACE POINT DATA

IV.A.--RIGHTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	4.55
1.10	4.55
13.30	2.06
18.20	0.16
35.70	-2.38
41.50	-2.78
57.80	-7.50
71.50	-8.74
91.60	-8.56

IV.B.--LEFTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	5.00
11.00	5.00
30.60	4.30
42.80	0.80
88.00	-1.50
99.20	-5.14
124.20	-5.90
140.00	-5.90

V.--SOIL LAYER DATA

V.A.--RIGHTSIDE
LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = DEFAULT

LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH-ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH-ESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.
117.00	117.00	0.00	500.00	0.00	500.00	-0.90	0.00	DEF	DEF
103.00	103.00	0.00	300.00	0.00	300.00	-7.50	0.00	DEF	DEF
92.00	92.00	0.00	225.00	0.00	225.00	-12.50	0.00	DEF	DEF
77.00	77.00	0.00	300.00	0.00	300.00	-15.30	0.00	DEF	DEF
77.00	77.00	0.00	300.00	0.00	300.00	-19.00	0.00	DEF	DEF
105.00	105.00	0.00	341.00	0.00	341.00	-25.00	0.00	DEF	DEF
102.00	102.00	0.00	395.00	0.00	395.00	-32.00	0.00	DEF	DEF
122.00	122.00	33.00	0.00	18.00	0.00	-42.00	0.00	DEF	DEF
105.00	105.00	0.00	600.00	0.00	500.00			DEF	DEF

V.B.--LEFTSIDE

LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH-ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH-ESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.
117.00	117.00	0.00	500.00	0.00	500.00	-0.90	0.00	DEF	DEF
103.00	103.00	0.00	300.00	0.00	300.00	-7.50	0.00	DEF	DEF
92.00	92.00	0.00	225.00	0.00	225.00	-12.50	0.00	DEF	DEF
77.00	77.00	0.00	300.00	0.00	300.00	-15.30	0.00	DEF	DEF
77.00	77.00	0.00	300.00	0.00	300.00	-19.00	0.00	DEF	DEF
105.00	105.00	0.00	341.00	0.00	341.00	-25.00	0.00	DEF	DEF
102.00	102.00	0.00	395.00	0.00	395.00	-32.00	0.00	DEF	DEF
122.00	122.00	33.00	0.00	18.00	0.00	-42.00	0.00	DEF	DEF
105.00	105.00	0.00	600.00	0.00	500.00			DEF	DEF

VI.--WATER DATA

UNIT WEIGHT = 62.40 (PCF)
RIGHTSIDE ELEVATION = 8.00 (FT)
LEFTSIDE ELEVATION = -7.90 (FT)
NO SEEPAGE

VII.--VERTICAL SURCHARGE LOADS

NONE

VIII.--HORIZONTAL LOADS

VIII.A.--HORIZONTAL LINE LOADS

NONE

VIII.B.--HORIZONTAL DISTRIBUTED LOADS

ELEVATION (FT)	DIST. LOAD (PSF)
5.00	1086.40
-12.50	1086.40

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS
DATE: 8-OCTOBER-2013 TIME: 12:10:20

****
* SOIL PRESSURES FOR *
* CANTILEVER WALL DESIGN *
****

I.--HEADING
'ROTATIONAL ANALYSIS
'ORLEANS CANAL
'MVK DISTRICT
'REACH 19 WITH BERM

II.--SOIL PRESSURES

RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

NET SOIL PRESSURES INCLUDE APPLIED HORIZONTAL DISTRIBUTED LOADS.

	NET	<---LEFTSIDE--->		<------NET------> (SOIL + WATER)		<--RIGHTSIDE--->	
ELEV. (FT)	WATER (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)
13.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7.8	12.5	0.0	0.0	12.5	12.5	0.0	0.0
6.8	74.9	0.0	0.0	74.9	74.9	0.0	0.0
5.8	137.3	0.0	0.0	137.3	137.3	0.0	0.0
5.0+	187.2	0.0	0.0	187.2	187.2	0.0	0.0
5.0-	187.2	833.3	0.0	440.3	1273.6	0.0	0.0
4.8	199.7	1273.4	0.0	12.7	1286.1	0.0	0.0
4.6+	215.3	1302.7	0.0	-1.0	1301.7	0.0	0.0
4.6-	215.3	1302.7	0.0	-1.0	2135.0	0.0	833.3
3.8	262.1	1390.4	0.0	-41.9	2614.2	0.0	1265.7
3.6	277.7	1419.7	0.0	-55.6	2615.3	0.0	1251.2
2.8	324.5	1507.4	0.0	-96.5	2626.5	0.0	1215.6

1.8	386.9	1624.4	0.0	-151.1	2714.8	0.0	1241.5
0.8	449.3	1746.3	0.0	-210.6	2829.5	0.0	1293.8
-0.2	511.7	1819.3	0.0	-221.2	2893.3	0.0	1295.2
-0.9	555.4	1690.3	0.0	-48.5	2757.8	0.0	1116.1
-1.2	574.1	1604.2	0.0	56.2	2669.0	0.0	1008.5
-2.2	636.5	1568.5	0.0	154.4	2624.0	0.0	901.1
-2.9+	681.2	1677.2	0.0	105.8	2695.3	0.0	927.7
-2.9-	681.2	1646.4	0.0	105.8	2695.3	0.0	927.7
-3.2	698.9	1677.2	27.2	108.1	2696.2	0.0	938.2
-4.2	761.3	1780.9	129.5	66.8	2687.7	0.0	969.5
-5.2	823.7	1879.0	238.0	31.1	2672.9	0.0	1000.8
-6.2	886.1	1969.0	353.6	3.5	2653.0	0.0	1034.2
-7.2	948.5	2013.7	519.2	21.1	2537.0	0.0	1021.4
-7.5	967.2	1987.3	614.2	66.3	2414.5	0.0	975.1
-7.9	992.2	1939.5	738.4	139.0	2246.0	0.0	905.8
-8.2	992.2	1935.8	771.2	142.7	2202.6	0.0	895.3
-9.2	992.2	1966.3	792.0	112.3	2207.9	0.0	921.4
-9.5+	992.2	1973.1	798.8	105.4	2208.5	0.0	933.0
-9.5-	992.2	1973.1	798.8	105.4	2208.5	0.0	924.5
-10.2	992.2	1991.8	817.5	109.2	2194.1	22.5	933.0
-11.2	992.2	2015.4	845.5	152.0	2145.6	88.8	912.5
-12.2	992.2	2083.8	819.4	91.1	2194.3	96.3	935.1
-12.5+	992.2	2146.0	758.9	-16.6	2297.7	50.9	978.0
-12.5-	992.2	2146.0	758.9	-1103.0	1211.3	50.9	978.0
-12.9+	992.2	2227.0	673.3	-1234.9	1359.9	0.0	1060.4
-12.9-	992.2	2227.0	673.3	-1234.9	1359.9	0.0	1021.7
-13.2	992.2	2249.8	653.6	-1257.6	1399.0	0.0	1060.4
-14.2	992.2	2256.1	669.3	-1263.9	1399.1	0.0	1076.2
-15.2	992.2	2266.6	679.8	-1274.5	1386.1	0.0	1073.7
-15.3	992.2	2267.7	680.9	-1275.5	1384.9	0.0	1073.7
-16.2	992.2	2277.2	690.4	-1285.0	1372.3	0.0	1070.6
-17.2	992.2	2287.0	701.8	-1294.9	1378.1	0.0	1087.8
-18.2	992.2	2303.1	705.7	-1310.9	1444.3	0.0	1157.8
-19.0	992.2	2360.6	662.0	-1368.5	1590.1	0.0	1259.9
-19.2	992.2	2383.6	646.5	-1391.4	1631.2	0.0	1285.5
-20.2	992.2	2456.4	642.1	-1464.3	1702.7	0.0	1352.7
-21.2	992.2	2494.1	681.8	-1502.0	1697.8	0.0	1387.5
-22.2	992.2	2532.7	720.4	-1540.5	1694.9	0.0	1423.1
-23.2	992.2	2570.3	760.1	-1578.1	1689.9	0.0	1457.9
-24.2	992.2	2616.2	789.9	-1624.0	1703.1	0.0	1500.9
-25.0	992.2	2711.4	743.1	-1719.2	1838.0	0.0	1588.9
-25.2	992.2	2738.3	727.0	-1746.2	1884.4	0.0	1619.2
-26.2	992.2	2746.8	784.9	-1754.6	1922.1	0.0	1714.8

BY CLASSICAL METHODS
DATE: 8-OCTOBER-2013 TIME: 12:10:21

****
* SUMMARY OF RESULTS FOR *
* CANTILEVER WALL DESIGN *
****

I.--HEADING
'ROTATIONAL ANALYSIS
'ORLEANS CANAL
'MVK DISTRICT
'REACH 19 WITH BERM

II.--SUMMARY

RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

WALL BOTTOM ELEV. (FT) : -15.89
PENETRATION (FT) : 20.44

MAX. BEND. MOMENT (LB-FT) : 1.8820E+03
AT ELEVATION (FT) : -13.02

MAX. SCALED DEFL. (LB-IN^3): 4.4748E+08
AT ELEVATION (FT) : 13.80

NOTE: DIVIDE SCALED DEFLECTION MODULUS OF
ELLASTICITY IN PSI TIMES PILE MOMENT
OF INERTIA IN IN^4 TO OBTAIN DEFLECTION
IN INCHES.

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHOREDOR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS
DATE: 8-OCTOBER-2013 TIME: 12:10:21

****
* COMPLETE OF RESULTS FOR *
* CANTILEVER WALL DESIGN *
****

I.--HEADING
'ROTATIONAL ANALYSIS
'ORLEANS CANAL
'MVK DISTRICT
'REACH 19 WITH BERM

II.--RESULTS

ELEVATION (FT)	BENDING MOMENT (LB-FT)	SHEAR (LB)	SCALED DEFLECTION (LB-IN^3)	NET PRESSURE (PSF)
13.80	0.0000E+00	0.	4.4748E+08	0.00
12.80	0.0000E+00	0.	4.2455E+08	0.00
11.80	0.0000E+00	0.	4.0163E+08	0.00
10.80	0.0000E+00	0.	3.7871E+08	0.00
9.80	0.0000E+00	0.	3.5579E+08	0.00
8.80	0.0000E+00	0.	3.3287E+08	0.00
8.00	-6.9975E-10	0.	3.1453E+08	0.00
7.80	8.3200E-02	1.	3.0995E+08	12.48
6.80	1.7971E+01	45.	2.8703E+08	74.88
5.80	1.1074E+02	151.	2.6415E+08	137.28
5.00+	2.8080E+02	281.	2.4599E+08	187.20
5.00-	2.8080E+02	281.	2.4599E+08	440.27
4.80	3.4291E+02	326.	2.4149E+08	12.68
4.55	4.2469E+02	328.	2.3590E+08	-0.97
3.80	6.6625E+02	311.	2.1943E+08	-41.92
3.55	7.4267E+02	299.	2.1407E+08	-55.57
2.80	9.4766E+02	242.	1.9851E+08	-96.52
1.80	1.1326E+03	118.	1.7922E+08	-151.12
0.80	1.1655E+03	-62.	1.6187E+08	-210.59
-0.20	9.9603E+02	-278.	1.4650E+08	-221.23
-0.90	7.6110E+02	-373.	1.3678E+08	-48.54
-1.20	6.4867E+02	-372.	1.3282E+08	56.23
-2.20	3.2154E+02	-266.	1.2027E+08	154.36
-2.92	1.6611E+02	-173.	1.1165E+08	105.80
-3.20	1.2142E+02	-143.	1.0829E+08	108.08
-4.20	2.5813E+01	-55.	9.6540E+07	66.82
-5.20	-2.0573E+00	-6.	8.4843E+07	31.05
-6.20	2.4956E+00	11.	7.3146E+07	3.52
-7.20	1.8092E+01	23.	6.1455E+07	21.14
-7.50	2.6690E+01	36.	5.7953E+07	66.34
-7.90	4.8477E+01	77.	5.3290E+07	139.02
-8.20	7.8017E+01	120.	4.9801E+07	142.74
-9.20	2.6401E+02	247.	3.8300E+07	112.30
-9.47	3.3461E+02	277.	3.5264E+07	105.44
-10.20	5.6511E+02	355.	2.7273E+07	109.21
-11.20	9.8180E+02	486.	1.7238E+07	151.97
-12.20	1.5332E+03	607.	8.9196E+06	91.09
-12.50+	1.7178E+03	618.	6.8953E+06	-16.58
-12.50-	1.7178E+03	618.	6.8953E+06	-1102.98
-12.87	1.8683E+03	184.	4.7617E+06	-1234.86
-13.15	1.8708E+03	-167.	3.4339E+06	-1254.42
-13.20	1.8617E+03	-224.	3.2409E+06	-1209.90
-14.20	1.1927E+03	-953.	6.1801E+05	-248.44
-15.20	2.7525E+02	-721.	2.0329E+04	713.01
-15.30	2.0685E+02	-645.	1.1037E+04	809.16
-15.89	0.0000E+00	0.	0.0000E+00	1376.66

NOTE: DIVIDE SCALED DEFLECTION MODULUS OF
ELLASTICITY IN PSI TIMES PILE MOMENT
OF INERTIA IN IN^4 TO OBTAIN DEFLECTION

IN INCHES.

III.--WATER AND SOIL PRESSURES

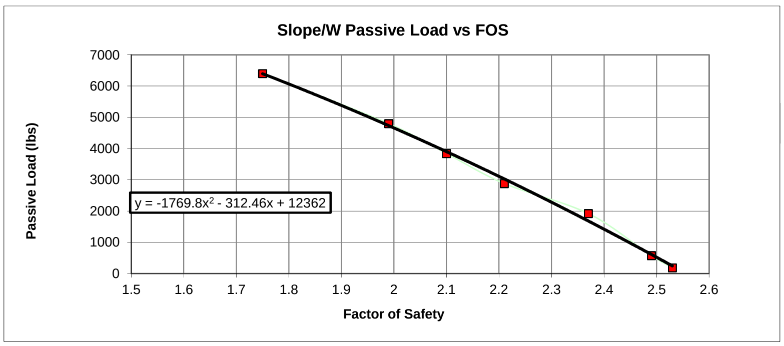
		<-------------SOIL PRESSURES-------------->			
	WATER	<----LEFTSIDE----->		<---RIGHTSIDE---->	
ELEVATION	PRESSURE	PASSIVE	ACTIVE	ACTIVE	PASSIVE
(FT)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)
13.80	0.	0.	0.	0.	0.
12.80	0.	0.	0.	0.	0.
11.80	0.	0.	0.	0.	0.
10.80	0.	0.	0.	0.	0.
9.80	0.	0.	0.	0.	0.
8.80	0.	0.	0.	0.	0.
8.00	0.	0.	0.	0.	0.
7.80	12.	0.	0.	0.	0.
6.80	75.	0.	0.	0.	0.
5.80	137.	0.	0.	0.	0.
5.00+	187.	0.	0.	0.	0.
5.00-	187.	833.	0.	0.	0.
4.80	200.	1273.	0.	0.	0.
4.55+	215.	1303.	0.	0.	0.
4.55-	215.	1303.	0.	0.	833.
3.80	262.	1390.	0.	0.	1266.
3.55	278.	1420.	0.	0.	1251.
2.80	324.	1507.	0.	0.	1216.
1.80	387.	1624.	0.	0.	1241.
0.80	449.	1746.	0.	0.	1294.
-0.20	512.	1819.	0.	0.	1295.
-0.90	555.	1690.	0.	0.	1116.
-1.20	574.	1604.	0.	0.	1009.
-2.20	636.	1569.	0.	0.	901.
-2.92+	681.	1677.	0.	0.	928.
-2.92-	681.	1646.	0.	0.	928.
-3.20	699.	1677.	27.	0.	938.
-4.20	761.	1781.	129.	0.	969.
-5.20	824.	1879.	238.	0.	1001.
-6.20	886.	1969.	354.	0.	1034.
-7.20	948.	2014.	519.	0.	1021.
-7.50	967.	1987.	614.	0.	975.
-7.90	992.	1940.	738.	0.	906.
-8.20	992.	1936.	771.	0.	895.
-9.20	992.	1966.	792.	0.	921.
-9.47+	992.	1973.	799.	0.	933.
-9.47-	992.	1973.	799.	0.	925.
-10.20	992.	1992.	818.	22.	933.
-11.20	992.	2015.	845.	89.	912.
-12.20	992.	2084.	819.	96.	935.
-12.50	992.	2146.	759.	51.	978.
-12.87+	992.	2227.	673.	0.	1060.
-12.87-	992.	2227.	673.	0.	1022.
-13.15	992.	2247.	656.	0.	1055.
-13.20	992.	2250.	654.	0.	1060.
-14.20	992.	2256.	669.	0.	1076.

-15.20	992.	2267.	680.	0.	1074.
-15.30	992.	2268.	681.	0.	1074.
-15.89	992.	2277.	690.	0.	1071.
-17.20	992.	2287.	702.	0.	1088.

Canal:	Orleans Avenue Canal	
Reach:	Reach 20A	
Load Case:	Water @ El 8	
Protected Side Top of Ground (GSE):	6.5	ft, Elevation
Critical Slip Surface Elev. (FSE):	Varies	ft, Elevation
Sheetpile Tip Elevation:	-1.5	ft, Elevation

Step 1: Compute correct passive pressure forces from slope stability model (Slope/W). Procedure follows the approach cited in Paragraph D-4 of ETL 1110-2-575.

Unit Weight (psf)	Passive Load (lbs)	Factor of Safety	Failure Surface Elevation (feet)	Notes
10	184	2.53	0.5	Circular failure surface: Goes below the sheetpile tip to elevation -13.0
30	575	2.49	0.27	
60	1920	2.37	-1.5	
90	2880	2.21	-1.5	
120	3840	2.1	-1.5	Circular failure surface: Goes below the sheetpile tip to elevation -12.5
150	4798	1.99	-1.5	Circular failure surface: Goes below the sheetpile tip to elevation -11.3
200	6398	1.75	-1.5	Circular failure surface: Goes below the sheetpile tip to elevation -10.0



Step 2: Perform CWALSHT analysis of cross section using a range of assumed horizontal distributed load above the critical slip surface elevation found in step 1. Determine the difference in passive load from CWALSHT and Slope/W for each assumed horizontal distributed load.

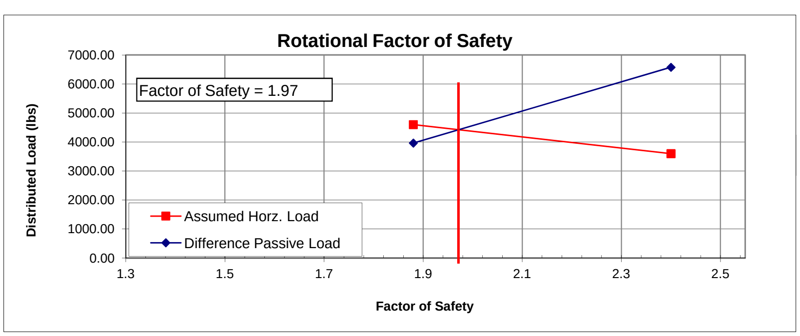
	(A)	(B)		(C)	(D)	
FOS	CWALSHT Passive Load (lbs)	SLOPE/W Passive Load (lbs)	Tip Elev feet	Difference Passive Load (A-B) (lbs)	Assumed Horizontal Distributed Load in CWALSHT (psf)	Resultant Distributed CWALSHT Load (D*(GSE-FSE)) (lbs)
2.35	8429.395	1854.00	-1.5	6575.40	900	3600.00
1.83	9826.5	5863.31	-1.6	3963.19	1150	4600.00

Interpolate Correction Force at the resultant FOS

FOS = 1.97

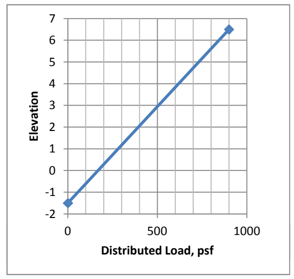
Correction Force = 4666.47 lbs

Step 3: Plot the assumed horizontal load and the difference passive load versus factor of safety. The intersection of the two curves represents the actual factor of safety.



VIII.B.--HORIZONTAL DISTRIBUTED LOAD

ELEVATION (FT)	DIST. LOAD (PSF)	Result. (LBS)
6.5	900	
-1.5	0	3600
		3600



RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

NET SOIL PRESSURES INCLUDE APPLIED HORIZONTAL DISTRIBUTED LOADS.

	NET	<---LEFTSIDE--->		<--RIGHTSIDE--->	
ELEV. (FT)	WATER (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)
13.8	0	0	0	0	0
12.8	0	0	0	0	0
11.8	0	0	0	0	0
10.8	0	0	0	0	0
9.8	0	0	0	0	0
8.8	0	0	0	0	0
8	0	0	0	0	0
7.8	12	0	0	0	0
6.8	75	0	0	0	0
6.50+	94	0	0	0	0
-6.5	94	426	0	0	426
5.8	137	716	0	0	672
5.5	156	749	0	0	687
4.8	200	827	0	0	721
4.29	231	883	0	0	746
3.8	262	938	0	0	771
2.8	324	1049	0	0	808
1.8	387	1160	0	0	829
0.8	449	1273	0	0	859
0.5	468	1301	0	0	871
0.22	486	1313	0	0	881
-0.2	512	1331	0	0	895
-1.2	574	1359	0	0	928
-1.5	593	1370	0	0	938
-1.56	593	1390	0	0	961
-3.2	593	1404	0	0	995

ELEV. (FT)	NET WATER (PSF)	LEFTSIDE PASSIVE (PSF)	RESULT. LEFTSIDE PASSIVE (LBS)
13.8	0	0	
12.8	0	0	
11.8	0	0	
10.8	0	0	
9.8	0	0	
8.8	0	0	
8	0	0	
7.8	12	0	
6.8	75	0	0
6.5	94	0	0
6.5	94	426	0
5.8	137	716	399.7
5.5	156	749	219.75
4.8	200	827	551.6
4.29	231	883	436.05
3.8	262	938	446.145
2.8	324	1049	993.5
1.8	387	1160	1104.5
0.8	449	1273	1216.5
0.5	468	1301	386.1
0.22	486	1313	365.96
-0.2	512	1331	555.24
-1.2	574	1359	1345
-1.5	593	1370	409.35
-1.56	593	1390	82.8
-3.2	593	1404	2291.08

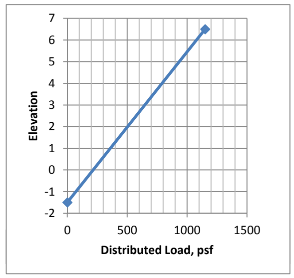
PS WATER ELEVATION (FT)	CRITICAL SLIP SURF. ELEVATION (FT)	UNIT WEIGHT WATER (PCF)
-1.5	-1.5	64

RESULTANT WATER LOAD= 0 LBS

PASSIVE LOAD (SOIL) 8429.395
PASSIVE LOAD (SOIL+WATER) 8429.395 **IF THE PS WATER LEVEL IS BELOW THE CRITICAL SLIP SURFACE, USE PASSIVE LOAD (SOIL)**
FOS = 2.35

VIII.B.--HORIZONTAL DISTRIBUTED LOAD

ELEVATION (FT)	DIST. LOAD (PSF)	Result. (LBS)
6.5	1150	
-1.5	0	4600



4600

RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

NET SOIL PRESSURES INCLUDE APPLIED HORIZONTAL DISTRIBUTED LOADS.

		<---LEFTSIDE--->		<--RIGHTSIDE--->	
ELEV. (FT)	NET WATER (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)
13.8	0	0	0	0	0
12.8	0	0	0	0	0
11.8	0	0	0	0	0
10.8	0	0	0	0	0
9.8	0	0	0	0	0
8.8	0	0	0	0	0
8	0	0	0	0	0
7.8	12	0	0	0	0
6.8	75	0	0	0	0
6.50+	94	0	0	0	0
-6.5	94	546	0	0	546
5.8	137	897	0	0	854
5.5	156	931	0	0	868
4.8	200	1008	0	0	902
4.3	231	1064	0	0	928
3.8	262	1119	0	0	953
2.8	324	1230	0	0	987
1.8	387	1341	0	0	1000
0.8	449	1455	0	0	1026
0.5	468	1481	0	0	1038
0.31	480	1487	0	0	1045
-0.2	512	1501	0	0	1063
-1.2	574	1513	0	0	1096
-1.5	593	1524	0	0	1106
-1.57	593	1545	0	0	1129
-3.2	593	1558	0	0	1162

ELEV. (FT)	NET WATER (PSF)	LEFTSIDE PASSIVE (PSF)	RESULT. LEFTSIDE PASSIVE (LBS)
13.8	0	0	
12.8	0	0	
11.8	0	0	
10.8	0	0	
9.8	0	0	
8.8	0	0	
8	0	0	
7.8	12	0	
6.8	75	0	0
6.5	94	0	0
6.5	94	546	0
5.8	137	897	505.05
5.5	156	931	274.2
4.8	200	1008	678.65
4.3	231	1064	518
3.8	262	1119	545.75
2.8	324	1230	1174.5
1.8	387	1341	1285.5
0.8	449	1455	1398
0.5	468	1481	440.4
0.31	480	1487	281.96
-0.2	512	1501	761.94
-1.2	574	1513	1507
-1.5	593	1524	455.55
-1.57	593	1545	
-3.2	593	1558	

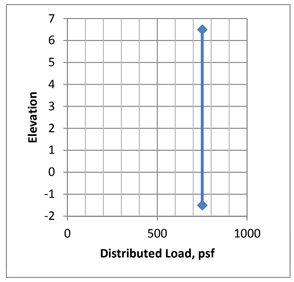
PS WATER ELEVATION (FT)	CRITICAL SLIP SURF. ELEVATION (FT)	UNIT WEIGHT WATER (PCF)
-1.5	-1.5	64

RESULTANT WATER LOAD= 0 LBS

PASSIVE LOAD (SOIL)	9826.5	
PASSIVE LOAD (SOIL+WATER)	9826.5	**IF THE PS WATER LEVEL IS BELOW THE CRITICAL SLIP SURFACE,**
FOS =	1.83	**USE PASSIVE LOAD (SOIL)**

VIII.B.--HORIZONTAL DISTRIBUTED LOAD

ELEVATION (FT)	DIST. LOAD (PSF)	Result. (LBS)
6.5	750	
-1.5	750	6000



6000

RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

NET SOIL PRESSURES INCLUDE APPLIED HORIZONTAL DISTRIBUTED LOADS.

ELEV. (FT)	NET WATER (PSF)	<---LEFTSIDE---> PASSIVE (PSF)	ACTIVE (PSF)	<--RIGHTSIDE---> ACTIVE (PSF)	PASSIVE (PSF)
13.8	0	0	0	0	0
12.8	0	0	0	0	0
11.8	0	0	0	0	0
10.8	0	0	0	0	0
9.8	0	0	0	0	0
8.8	0	0	0	0	0
8	0	0	0	0	0
7.8	12.5	0	0	0	0
6.8	74.9	0	0	0	0
6.5+	93.6	0	0	0	0
-6.5	93.6	518.1	0	0	518.1
5.8	137.3	854.9	0	0	811.2
5.5	156	888.2	0	0	825.8
5.1	178.9	928.9	0	0	843.6
4.8	199.7	965.9	0	0	859.8
3.8	262.1	1076.9	0	0	910.1
2.8	324.5	1187.9	0	0	945.3
1.8	386.9	1298.9	0	0	960.1
0.8	449.3	1412.6	0	0	987
0.5	468	1439.1	0	0	999
-0.2	511.7	1461.3	0	0	1023.7
-1.2	574.1	1476.9	0	0	1056.8
-1.5+	592.8	1487.9	0	0	1066.7
-1.5-	592.8	1487.9	0	0	1066.7
-2.2	592.8	1508.5	0	0	1089.8
-3.2	592.8	1522.1	0	0	1122.9
-4.2	592.8	1537.9	0	0	1158.2
-5.2	592.8	1534.8	0	0	1174.5
-6	592.8	1405.1	0	0	1060.1
-6.2+	592.8	1353.8	0	0	1022.1
-6.2-	592.8	1366	0	0	1022.1
-6.2	592.8	1353.8	24.8	0	1010.1
-7.2	592.8	1252.2	235.3	0	907.1
-8.2	592.8	1258.5	236.6	0	924
-9.2	592.8	1271.6	225	0	954.9
-10	592.8	1344.1	93	0	1040.8
-10.2	592.8	1370.3	41.6	0	1070.3
-10.6+	592.8	1418.5	0	0	1095.4
-10.6-	592.8	1388.9	0	0	1095.4
-11.2	592.8	1418.5	0	0	1135.4
-12.2	592.8	1411.7	0	0	1145.5
-13.2	592.8	1406.4	0	0	1157
-14.2	592.8	1401	0	0	1168.5
-15.2	592.8	1395.7	0	0	1180
-16.2	592.8	1390.3	0	0	1191.5
-17.2	592.8	1385	0	0	1203
-18	592.8	1380.7	0	0	1212.2
-18.2	592.8	1379.7	0	0	1214.5
-19.2	592.8	1374.3	0	0	1226
-20.2	592.8	1369	0	0	1237.5
-21.2	592.8	1379.6	0	0	1249
-22.2	592.8	1399.2	0	0	1260.3
-23.2	592.8	1418.8	0	0	1271.5
-24.2	592.8	1438.4	0	0	1298.8

ELEV. (FT)	NET WATER (PSF)	LEFTSIDE PASSIVE (PSF)	RESULT. LEFTSIDE PASSIVE (LBS)
13.8	0	0	
12.8	0	0	
11.8	0	0	
10.8	0	0	
9.8	0	0	
8.8	0	0	
8	0	0	
7.8	12	0	
6.8	75	0	0
6.5	94	0	0
6.5	94	518	0
5.8	137	855	480.55
5.5	156	888	261.45
5.13	179	929	336.145
4.8	200	966	312.675
3.8	262	1077	1021.5
2.8	324	1188	1132.5
1.8	387	1299	1243.5
0.8	449	1413	1356
0.5	468	1439	427.8
-0.2	512	1461	1015
-0.21	513	1462	14.615
-0.65	540	1477	646.58
-1.5	593	1488	1260.125

PS WATER ELEVATION (FT)	CRITICAL SLIP SURF. ELEVATION (FT)	UNIT WEIGHT WATER (PCF)
-1.5	-1.5	64

RESULTANT WATER LOAD= 0 LBS

PASSIVE LOAD (SOIL) 9508.44
PASSIVE LOAD (SOIL+WATER) 9508.44 **IF THE PS WATER LEVEL IS BELOW THE CRITICAL SLIP SURFACE,**
FOS = 1.47 **USE PASSIVE LOAD (SOIL)**

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS
DATE: 8-OCTOBER-2013 TIME: 12:35:19

****
* INPUT DATA *
****

I.--HEADING
'ROTATIONAL ANALYSIS
'ORLEANS CANAL
'MVK DISTRICT
'REACH 20A WITH BERM

II.--CONTROL
CANTILEVER WALL DESIGN
FACTOR OF SAFETY FOR ACTIVE PRESSURES = 1.00
FACTOR OF SAFETY FOR PASSIVE PRESSURES = 2.35

III.--WALL DATA
ELEVATION AT TOP OF WALL = 13.80 FT.

IV.--SURFACE POINT DATA

IV.A.--RIGHTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	6.50
4.30	6.50
12.10	5.50
27.10	2.50
42.10	1.50
61.30	-6.00
79.30	-10.50
102.50	-12.50

IV.B.--LEFTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	6.50
6.80	6.50
27.50	0.50
110.00	0.50

V.--SOIL LAYER DATA

V.A.--RIGHTSIDE
LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

SAT. WGHT.	MOIST WGHT.	ANGLE OF INTERNAL FRICTION	COH- ESION	ANGLE OF WALL FRICTION	ADH- ESION	<--BOTTOM--> ELEV.	SLOPE	<-SAFETY-> <-FACTOR-> ACT.	PASS.

```
 (PCF)   (PCF)    (DEG)   (PSF)    (DEG)   (PSF)   (FT)  (FT/FT)
111.00  111.00     0.00  500.00     0.00  500.00    0.50   0.00   DEF  DEF
101.00  101.00     0.00  500.00     0.00  500.00   -1.50   0.00   DEF  DEF
101.00  101.00     0.00  500.00     0.00  500.00   -6.00   0.00   DEF  DEF
 92.00   92.00     0.00  300.00     0.00  300.00  -10.00   0.00   DEF  DEF
 82.00   82.00     0.00  400.00     0.00  400.00  -18.00   0.00   DEF  DEF
 82.00   82.00     0.00  400.00     0.00  400.00                  DEF  DEF

        V.B.--LEFTSIDE
            LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE  = DEFAULT
            LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

              ANGLE OF         ANGLE OF                     <-SAFETY->
  SAT.   MOIST  INTERNAL  COH-     WALL    ADH-    <--BOTTOM-->  <-FACTOR->
 WGHT.   WGHT.  FRICTION  ESION  FRICTION  ESION   ELEV.  SLOPE  ACT. PASS.
 (PCF)   (PCF)    (DEG)   (PSF)    (DEG)   (PSF)   (FT)  (FT/FT)
111.00  111.00     0.00  500.00     0.00  500.00    0.50   0.00   DEF  DEF
101.00  101.00     0.00  500.00     0.00  500.00   -1.50   0.00   DEF  DEF
101.00  101.00     0.00  500.00     0.00  500.00   -6.00   0.00   DEF  DEF
 92.00   92.00     0.00  300.00     0.00  300.00  -10.00   0.00   DEF  DEF
 82.00   82.00     0.00  400.00     0.00  400.00  -18.00   0.00   DEF  DEF
 82.00   82.00     0.00  400.00     0.00  400.00                  DEF  DEF

     VI.--WATER DATA
        UNIT WEIGHT          = 62.40 (PCF)
        RIGHTSIDE ELEVATION = 8.00 (FT)
        LEFTSIDE ELEVATION  = -1.50 (FT)
        NO SEEPAGE

    VII.--VERTICAL SURCHARGE LOADS
        NONE

   VIII.--HORIZONTAL LOADS

        VIII.A.--HORIZONTAL LINE LOADS
                 NONE

        VIII.B.--HORIZONTAL DISTRIBUTED LOADS
            ELEVATION    DIST. LOAD
              (FT)         (PSF)
              6.50        900.00
             -1.50          0.00
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DATE: 8-OCTOBER-2013 TIME: 12:35:21

****
* SOIL PRESSURES FOR *
* CANTILEVER WALL DESIGN *
****

I.--HEADING
'ROTATIONAL ANALYSIS
'ORLEANS CANAL
'MVK DISTRICT
'REACH 20A WITH BERM

II.--SOIL PRESSURES

RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

NET SOIL PRESSURES INCLUDE APPLIED HORIZONTAL DISTRIBUTED LOADS.

	NET	<---LEFTSIDE--->		<------NET------> (SOIL + WATER)		<--RIGHTSIDE--->	
ELEV. (FT)	WATER (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)
13.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7.8	12.5	0.0	0.0	12.5	12.5	0.0	0.0
6.8	74.9	0.0	0.0	74.9	74.9	0.0	0.0
6.5+	93.6	0.0	0.0	93.6	93.6	0.0	0.0
6.5-	93.6	425.5	0.0	568.1	1419.1	0.0	425.5
5.8	137.3	716.0	0.0	242.5	1630.8	0.0	672.3
5.5	156.0	749.3	0.0	194.2	1630.4	0.0	686.9
4.8	199.7	827.0	0.0	81.4	1629.3	0.0	720.9
4.3	231.2	883.1	0.0	0.0	1629.3	0.0	746.2
3.8	262.1	938.0	0.0	-79.7	1629.3	0.0	770.9
2.8	324.5	1049.0	0.0	-240.8	1616.7	0.0	808.5
1.8	386.9	1160.0	0.0	-401.9	1586.9	0.0	828.8
0.8	449.3	1273.2	0.0	-565.2	1566.7	0.0	858.7
0.5	468.0	1300.7	0.0	-607.7	1563.7	0.0	870.7
-0.2	511.7	1331.1	0.0	-673.2	1553.3	0.0	895.3
-1.2	574.1	1358.5	0.0	-750.7	1536.2	0.0	928.4
-1.5	592.8	1370.4	0.0	-777.6	1531.1	0.0	938.3
-2.2	592.8	1390.4	0.0	-797.6	1554.3	0.0	961.5
-3.2	592.8	1404.0	0.0	-811.2	1587.3	0.0	994.5
-4.2	592.8	1419.4	0.0	-826.6	1622.2	0.0	1029.4
-5.2	592.8	1419.3	0.0	-826.5	1641.5	0.0	1048.7
-6.0	592.8	1314.6	0.0	-721.8	1552.2	0.0	959.4
-6.2+	592.8	1272.7	0.0	-684.9	1521.7	0.0	928.9

-6.2-	592.8	1282.7	0.0	-684.9	1521.7	0.0	928.9
-6.2	592.8	1272.7	24.8	-679.9	1487.3	0.0	919.3
-7.2	592.8	1190.2	235.3	-597.4	1196.2	0.0	838.7
-8.2	592.8	1196.2	236.6	-603.4	1212.7	0.0	856.5
-9.2	592.8	1207.8	225.0	-615.0	1253.4	0.0	885.6
-10.0	592.8	1267.8	93.0	-675.0	1458.9	0.0	959.1
-10.2	592.8	1289.2	41.6	-696.4	1535.1	0.0	983.9
-10.6+	592.8	1327.9	0.0	-723.2	1598.1	0.0	1005.3
-10.6-	592.8	1304.1	0.0	-723.2	1598.1	0.0	1005.3
-11.2	592.8	1327.9	0.0	-735.1	1632.3	0.0	1039.5
-12.2	592.8	1321.4	0.0	-728.6	1642.6	0.0	1049.8
-13.2	592.8	1316.1	0.0	-723.3	1654.1	0.0	1061.3
-14.2	592.8	1310.7	0.0	-717.9	1665.6	0.0	1072.8
-15.2	592.8	1305.4	0.0	-712.6	1677.1	0.0	1084.3
-16.2	592.8	1300.0	0.0	-707.2	1688.6	0.0	1095.8
-17.2	592.8	1301.2	0.0	-708.4	1700.1	0.0	1107.3
-18.0	592.8	1316.9	0.0	-724.1	1709.3	0.0	1116.5
-18.2	592.8	1320.8	0.0	-728.0	1711.6	0.0	1118.8
-19.2	592.8	1340.4	0.0	-747.6	1723.1	0.0	1130.3
-20.2	592.8	1360.0	0.0	-767.2	1734.6	0.0	1141.8
-21.2	592.8	1379.6	0.0	-786.8	1746.1	0.0	1153.3
-22.2	592.8	1399.2	0.0	-806.4	1757.4	0.0	1164.6
-23.2	592.8	1418.8	0.0	-826.0	1768.7	0.0	1175.9
-24.2	592.8	1438.4	0.0	-845.6	1793.3	0.0	1200.5

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS
DATE: 8-OCTOBER-2013 TIME: 12:35:21

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*  SUMMARY OF RESULTS FOR  *
*  CANTILEVER WALL DESIGN  *
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I.--HEADING
'ROTATIONAL ANALYSIS
'ORLEANS CANAL
'MVK DISTRICT
'REACH 20A WITH BERM

II.--SUMMARY

RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

WALL BOTTOM ELEV. (FT) : -1.56
PENETRATION (FT) : 8.06

MAX. BEND. MOMENT (LB-FT) : 1.8359E+03
AT ELEVATION (FT) : 1.71

MAX. SCALED DEFL. (LB-IN^3): 1.6346E+08
AT ELEVATION (FT) : 13.80

NOTE: DIVIDE SCALED DEFLECTION MODULUS OF ELLASTICITY IN PSI TIMES PILE MOMENT OF INERTIA IN IN^4 TO OBTAIN DEFLECTION IN INCHES.

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHOREDOR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS
DATE: 8-OCTOBER-2013 TIME: 12:35:21

****
* COMPLETE OF RESULTS FOR *
* CANTILEVER WALL DESIGN *
****

I.--HEADING
'ROTATIONAL ANALYSIS
'ORLEANS CANAL
'MVK DISTRICT
'REACH 20A WITH BERM

II.--RESULTS

ELEVATION (FT)	BENDING MOMENT (LB-FT)	SHEAR (LB)	SCALED DEFLECTION (LB-IN^3)	NET PRESSURE (PSF)
13.80	0.0000E+00	0.	1.6346E+08	0.00
12.80	-5.4570E-12	0.	1.4941E+08	0.00
11.80	-5.4570E-12	0.	1.3535E+08	0.00
10.80	-5.4570E-12	0.	1.2129E+08	0.00
9.80	3.8199E-11	0.	1.0723E+08	0.00
8.80	-5.4570E-12	0.	9.3174E+07	0.00
8.00	-2.1584E-10	0.	8.1928E+07	0.00
7.80	8.3200E-02	1.	7.9116E+07	12.48
6.80	1.7971E+01	45.	6.5061E+07	74.88
6.50+	3.5100E+01	70.	6.0848E+07	93.60
6.50-	3.5100E+01	70.	6.0848E+07	568.07
5.80	1.9683E+02	354.	5.1054E+07	242.53
5.50	3.1319E+02	419.	4.6898E+07	194.20
4.80	6.4516E+02	516.	3.7426E+07	81.43
4.29	9.1286E+02	536.	3.0910E+07	0.00

3.80	1.1749E+03	517.	2.4925E+07	-79.67
2.80	1.6250E+03	357.	1.4443E+07	-240.77
1.80	1.8343E+03	35.	6.7337E+06	-401.89
0.80	1.6414E+03	-448.	2.1365E+06	-565.16
0.50	1.4808E+03	-624.	1.3338E+06	-607.72
0.22	1.2806E+03	-799.	7.8986E+05	-634.05
-0.20	9.0567E+02	-958.	2.9488E+05	-123.96
-1.20	8.9226E+01	-472.	1.7030E+03	1095.14
-1.50	2.3767E+00	-89.	5.2826E-01	1460.87
-1.56	0.0000E+00	0.	0.0000E+00	1533.07

NOTE: DIVIDE SCALED DEFLECTION MODULUS OF ELLASTICITY IN PSI TIMES PILE MOMENT OF INERTIA IN IN^4 TO OBTAIN DEFLECTION IN INCHES.

III.--WATER AND SOIL PRESSURES

		<-------------SOIL PRESSURES-------------->			
	WATER	<----LEFTSIDE----->		<---RIGHTSIDE---->	
ELEVATION	PRESSURE	PASSIVE	ACTIVE	ACTIVE	PASSIVE
(FT)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)
13.80	0.	0.	0.	0.	0.
12.80	0.	0.	0.	0.	0.
11.80	0.	0.	0.	0.	0.
10.80	0.	0.	0.	0.	0.
9.80	0.	0.	0.	0.	0.
8.80	0.	0.	0.	0.	0.
8.00	0.	0.	0.	0.	0.
7.80	12.	0.	0.	0.	0.
6.80	75.	0.	0.	0.	0.
6.50+	94.	0.	0.	0.	0.
6.50-	94.	426.	0.	0.	426.
5.80	137.	716.	0.	0.	672.
5.50	156.	749.	0.	0.	687.
4.80	200.	827.	0.	0.	721.
4.29	231.	883.	0.	0.	746.
3.80	262.	938.	0.	0.	771.
2.80	324.	1049.	0.	0.	808.
1.80	387.	1160.	0.	0.	829.
0.80	449.	1273.	0.	0.	859.
0.50	468.	1301.	0.	0.	871.
0.22	486.	1313.	0.	0.	881.
-0.20	512.	1331.	0.	0.	895.
-1.20	574.	1359.	0.	0.	928.
-1.50	593.	1370.	0.	0.	938.
-1.56	593.	1390.	0.	0.	961.
-3.20	593.	1404.	0.	0.	995.

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'ROTATIONAL ANALYSIS
'ORLEANS CANAL
'MVK DISTRICT
'REACH 20A WITH BERM
CONTROL  CANTILEVER  DESIGN  1.00  2.35
WALL   13.8
SURFACE RIGHTSIDE   8    0    6.5
            4.3    6.5
            12.1    5.5
            27.1    2.5
            42.1    1.5
            61.3   -6
            79.3   -10.5
            102.5   -12.5
SURFACE LEFTSIDE   4    0    6.5
            6.8    6.5
            27.5    0.5
            110    0.5
SOIL RIGHTSIDE  STRENGTHS   6
  111    111    0    500    0    500    .5   0
  101    101    0    500    0    500   -1.5   0
  101    101    0    500    0    500   -6   0
  92    92    0    300    0    300   -10   0
  82    82    0    400    0    400   -18   0
  82    82    0    400    0    400
SOIL LEFTSIDE  STRENGTHS   6
  111    111    0    500    0    500    .5   0
  101    101    0    500    0    500   -1.5   0
  101    101    0    500    0    500   -6   0
  92    92    0    300    0    300   -10   0
  82    82    0    400    0    400   -18   0
  82    82    0    400    0    400
WATER ELEVATIONS   62.4    8   -1.5
HORIZONTAL DISTRIBUTED   2    6.5    900   -1.5    0
FINISHED
```

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 8-OCTOBER-2013 TIME: 12:32:15

****
* INPUT DATA *
****

I.--HEADING
'ROTATIONAL ANALYSIS
'ORLEANS CANAL
'MVK DISTRICT
'REACH 20A WITH BERM

II.--CONTROL
CANTILEVER WALL DESIGN
FACTOR OF SAFETY FOR ACTIVE PRESSURES = 1.00
FACTOR OF SAFETY FOR PASSIVE PRESSURES = 2.35

III.--WALL DATA
ELEVATION AT TOP OF WALL = 13.80 FT.

IV.--SURFACE POINT DATA

IV.A.--RIGHTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	6.50
4.30	6.50
12.10	5.50
27.10	2.50
42.10	1.50
61.30	-6.00
79.30	-10.50
102.50	-12.50

IV.B.--LEFTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	6.50
6.80	6.50
27.50	0.50
110.00	0.50

V.--SOIL LAYER DATA

V.A.--RIGHTSIDE
LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

SAT. WGHT.	MOIST WGHT.	ANGLE OF INTERNAL FRICTION	COH- ESION	ANGLE OF WALL FRICTION	ADH- ESION	<--BOTTOM--> ELEV.	SLOPE	<-SAFETY-> <-FACTOR-> ACT.	PASS.

(PCF)	(PCF)	(DEG)	(PSF)	(DEG)	(PSF)	(FT)	(FT/FT)		
111.00	111.00	0.00	500.00	0.00	500.00	0.50	0.00	DEF	DEF
101.00	101.00	0.00	500.00	0.00	500.00	-1.50	0.00	DEF	DEF
101.00	101.00	0.00	500.00	0.00	500.00	-6.00	0.00	DEF	DEF
92.00	92.00	0.00	300.00	0.00	300.00	-10.00	0.00	DEF	DEF
82.00	82.00	0.00	400.00	0.00	400.00	-18.00	0.00	DEF	DEF
82.00	82.00	0.00	400.00	0.00	400.00			DEF	DEF

V.B.--LEFTSIDE

LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH-ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH-ESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.
111.00	111.00	0.00	500.00	0.00	500.00	0.50	0.00	DEF	DEF
101.00	101.00	0.00	500.00	0.00	500.00	-1.50	0.00	DEF	DEF
101.00	101.00	0.00	500.00	0.00	500.00	-6.00	0.00	DEF	DEF
92.00	92.00	0.00	300.00	0.00	300.00	-10.00	0.00	DEF	DEF
82.00	82.00	0.00	400.00	0.00	400.00	-18.00	0.00	DEF	DEF
82.00	82.00	0.00	400.00	0.00	400.00			DEF	DEF

VI.--WATER DATA

UNIT WEIGHT = 62.40 (PCF)
RIGHTSIDE ELEVATION = 8.00 (FT)
LEFTSIDE ELEVATION = -1.50 (FT)
NO SEEPAGE

VII.--VERTICAL SURCHARGE LOADS

NONE

VIII.--HORIZONTAL LOADS

VIII.A.--HORIZONTAL LINE LOADS

NONE

VIII.B.--HORIZONTAL DISTRIBUTED LOADS

ELEVATION (FT)	DIST. LOAD (PSF)
6.50	1000.00
0.27	0.00

DATE: 8-OCTOBER-2013 TIME: 12:32:18

****
*   SOIL PRESSURES FOR   *
* CANTILEVER WALL DESIGN *
****

I.--HEADING
'ROTATIONAL ANALYSIS
'ORLEANS CANAL
'MVK DISTRICT
'REACH 20A WITH BERM

II.--SOIL PRESSURES

RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

NET SOIL PRESSURES INCLUDE APPLIED HORIZONTAL DISTRIBUTED LOADS.

	NET	<---LEFTSIDE--->		<------NET------> (SOIL + WATER)		<--RIGHTSIDE--->	
ELEV.	WATER	PASSIVE	ACTIVE	ACTIVE	PASSIVE	ACTIVE	PASSIVE
(FT)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)
13.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7.8	12.5	0.0	0.0	12.5	12.5	0.0	0.0
6.8	74.9	0.0	0.0	74.9	74.9	0.0	0.0
6.5+	93.6	0.0	0.0	93.6	93.6	0.0	0.0
6.5-	93.6	425.5	0.0	668.1	1519.1	0.0	425.5
5.8	137.3	716.0	0.0	308.9	1697.2	0.0	672.3
5.5	156.0	749.3	0.0	246.2	1682.4	0.0	686.9
4.8	199.7	827.0	0.0	99.8	1647.7	0.0	720.9
4.3	229.5	880.0	0.0	0.0	1624.8	0.0	744.8
3.8	262.1	938.0	0.0	-109.3	1599.6	0.0	770.9
2.8	324.5	1049.0	0.0	-318.4	1539.0	0.0	808.5
1.8	386.9	1160.0	0.0	-527.5	1461.3	0.0	828.8
0.8	449.3	1271.0	0.0	-736.6	1393.2	0.0	858.8
0.5	468.0	1305.3	0.0	-800.4	1376.2	0.0	871.3
0.3	482.4	1323.8	0.0	-841.5	1362.1	0.0	879.7
-0.2	511.7	1335.4	0.0	-823.7	1407.0	0.0	895.3
-1.2	574.1	1358.1	0.0	-784.1	1502.5	0.0	928.4
-1.5	592.8	1370.6	0.0	-777.8	1531.1	0.0	938.3
-2.2	592.8	1390.4	0.0	-797.6	1554.3	0.0	961.5
-3.2	592.8	1404.0	0.0	-811.2	1587.3	0.0	994.5
-4.2	592.8	1419.4	0.0	-826.6	1622.2	0.0	1029.4
-5.2	592.8	1419.3	0.0	-826.5	1641.5	0.0	1048.7
-6.0	592.8	1314.6	0.0	-721.8	1552.2	0.0	959.4

-6.2+	592.8	1272.7	0.0	-684.9	1521.7	0.0	928.9
-6.2-	592.8	1282.7	0.0	-684.9	1521.7	0.0	928.9
-6.2	592.8	1272.7	24.8	-679.9	1487.3	0.0	919.3
-7.2	592.8	1190.2	235.3	-597.4	1196.2	0.0	838.7
-8.2	592.8	1196.2	236.6	-603.4	1212.7	0.0	856.5
-9.2	592.8	1207.8	225.0	-615.0	1253.4	0.0	885.6
-10.0	592.8	1267.8	93.0	-675.0	1458.9	0.0	959.1
-10.2	592.8	1289.2	41.6	-696.4	1535.1	0.0	983.9
-10.6+	592.8	1327.9	0.0	-723.2	1598.1	0.0	1005.3
-10.6-	592.8	1304.1	0.0	-723.2	1598.1	0.0	1005.3
-11.2	592.8	1327.9	0.0	-735.1	1632.3	0.0	1039.5
-12.2	592.8	1321.4	0.0	-728.6	1642.6	0.0	1049.8
-13.2	592.8	1316.1	0.0	-723.3	1654.1	0.0	1061.3
-14.2	592.8	1310.7	0.0	-717.9	1665.6	0.0	1072.8
-15.2	592.8	1305.4	0.0	-712.6	1677.1	0.0	1084.3
-16.2	592.8	1300.0	0.0	-707.2	1688.6	0.0	1095.8
-17.2	592.8	1301.2	0.0	-708.4	1700.1	0.0	1107.3
-18.0	592.8	1316.9	0.0	-724.1	1709.3	0.0	1116.5
-18.2	592.8	1320.8	0.0	-728.0	1711.6	0.0	1118.8
-19.2	592.8	1340.4	0.0	-747.6	1723.1	0.0	1130.3
-20.2	592.8	1360.0	0.0	-767.2	1734.6	0.0	1141.8
-21.2	592.8	1379.6	0.0	-786.8	1746.1	0.0	1153.3
-22.2	592.8	1399.2	0.0	-806.4	1757.4	0.0	1164.6
-23.2	592.8	1418.8	0.0	-826.0	1768.7	0.0	1175.9
-24.2	592.8	1438.4	0.0	-845.6	1793.3	0.0	1200.5

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS
DATE: 8-OCTOBER-2013 TIME: 12:32:19

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*****************************
*  SUMMARY OF RESULTS FOR  *
*  CANTILEVER WALL DESIGN  *
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I.--HEADING

'ROTATIONAL ANALYSIS
'ORLEANS CANAL
'MVK DISTRICT
'REACH 20A WITH BERM

II.--SUMMARY

RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

WALL BOTTOM ELEV. (FT) : -1.46
PENETRATION (FT) : 7.96

MAX. BEND. MOMENT (LB-FT) : 2.1086E+03
AT ELEVATION (FT) : 1.85

MAX. SCALED DEFL. (LB-IN^3): 1.8079E+08
AT ELEVATION (FT) : 13.80

NOTE: DIVIDE SCALED DEFLECTION MODULUS OF
ELLASTICITY IN PSI TIMES PILE MOMENT
OF INERTIA IN IN^4 TO OBTAIN DEFLECTION
IN INCHES.

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHOREDOR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS
DATE: 8-OCTOBER-2013 TIME: 12:32:19

****
* COMPLETE OF RESULTS FOR *
* CANTILEVER WALL DESIGN *
****

I.--HEADING
'ROTATIONAL ANALYSIS
'ORLEANS CANAL
'MVK DISTRICT
'REACH 20A WITH BERM

II.--RESULTS

ELEVATION (FT)	BENDING MOMENT (LB-FT)	SHEAR (LB)	SCALED DEFLECTION (LB-IN^3)	NET PRESSURE (PSF)
13.80	0.0000E+00	0.	1.8079E+08	0.00
12.80	4.3656E-11	0.	1.6512E+08	0.00
11.80	4.3656E-11	0.	1.4945E+08	0.00
10.80	4.3656E-11	0.	1.3378E+08	0.00
9.80	-4.3656E-11	0.	1.1811E+08	0.00
8.80	0.0000E+00	0.	1.0244E+08	0.00
8.00	-2.1928E-10	0.	8.9900E+07	0.00
7.80	8.3200E-02	1.	8.6766E+07	12.48
6.80	1.7971E+01	45.	7.1098E+07	74.88
6.50+	3.5100E+01	70.	6.6402E+07	93.60
6.50-	3.5100E+01	70.	6.6402E+07	668.07
5.80	2.1859E+02	412.	5.5481E+07	308.92
5.50	3.5519E+02	495.	5.0846E+07	246.19
4.80	7.5034E+02	617.	4.0290E+07	99.81

4.32	1.0522E+03	640.	3.3436E+07	0.00
3.80	1.3819E+03	612.	2.6410E+07	-109.30
2.80	1.9042E+03	398.	1.4901E+07	-318.42
1.80	2.1080E+03	-25.	6.6379E+06	-527.54
0.80	1.7843E+03	-657.	1.9410E+06	-736.63
0.63	1.6596E+03	-788.	1.4651E+06	-773.33
0.50	1.5535E+03	-877.	1.1694E+06	-633.14
0.27	1.3373E+03	-994.	7.4324E+05	-379.80
-0.20	8.4742E+02	-1050.	2.2868E+05	137.91
-1.20	4.9559E+01	-362.	5.3156E+02	1239.41
-1.46	0.0000E+00	0.	0.0000E+00	1527.43

NOTE: DIVIDE SCALED DEFLECTION MODULUS OF ELLASTICITY IN PSI TIMES PILE MOMENT OF INERTIA IN IN^4 TO OBTAIN DEFLECTION IN INCHES.

III.--WATER AND SOIL PRESSURES

		<-------------SOIL PRESSURES-------------->			
	WATER	<----LEFTSIDE----->		<---RIGHTSIDE---->	
ELEVATION	PRESSURE	PASSIVE	ACTIVE	ACTIVE	PASSIVE
(FT)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)
13.80	0.	0.	0.	0.	0.
12.80	0.	0.	0.	0.	0.
11.80	0.	0.	0.	0.	0.
10.80	0.	0.	0.	0.	0.
9.80	0.	0.	0.	0.	0.
8.80	0.	0.	0.	0.	0.
8.00	0.	0.	0.	0.	0.
7.80	12.	0.	0.	0.	0.
6.80	75.	0.	0.	0.	0.
6.50+	94.	0.	0.	0.	0.
6.50-	94.	426.	0.	0.	426.
5.80	137.	716.	0.	0.	672.
5.50	156.	749.	0.	0.	687.
4.80	200.	827.	0.	0.	721.
4.32	229.	880.	0.	0.	745.
3.80	262.	938.	0.	0.	771.
2.80	324.	1049.	0.	0.	808.
1.80	387.	1160.	0.	0.	829.
0.80	449.	1271.	0.	0.	859.
0.63	460.	1291.	0.	0.	866.
0.50	468.	1305.	0.	0.	871.
0.27	482.	1324.	0.	0.	880.
-0.20	512.	1335.	0.	0.	895.
-1.20	574.	1358.	0.	0.	928.
-1.46	590.	1371.	0.	0.	938.
-2.20	636.	1390.	0.	0.	961.

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'ROTATIONAL ANALYSIS
'ORLEANS CANAL
'MVK DISTRICT
'REACH 20A WITH BERM
CONTROL  CANTILEVER  DESIGN  1.00  2.35
WALL   13.8
SURFACE RIGHTSIDE   8    0    6.5
                 4.3    6.5
                 12.1    5.5
                 27.1    2.5
                 42.1    1.5
                 61.3   -6
                 79.3   -10.5
                 102.5   -12.5
SURFACE LEFTSIDE   4    0    6.5
                 6.8    6.5
                 27.5    0.5
                 110    0.5
SOIL RIGHTSIDE  STRENGTHS   6
   111    111    0    500    0    500    .5   0
   101    101    0    500    0    500   -1.5   0
   101    101    0    500    0    500   -6   0
   92    92    0    300    0    300   -10   0
   82    82    0    400    0    400   -18   0
   82    82    0    400    0    400
SOIL LEFTSIDE  STRENGTHS   6
   111    111    0    500    0    500    .5   0
   101    101    0    500    0    500   -1.5   0
   101    101    0    500    0    500   -6   0
   92    92    0    300    0    300   -10   0
   82    82    0    400    0    400   -18   0
   82    82    0    400    0    400
WATER ELEVATIONS   62.4    8   -1.5
HORIZONTAL DISTRIBUTED   2    6.5    1000    0.27    0
FINISHED
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PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS
DATE: 8-OCTOBER-2013 TIME: 12:38:15

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*  INPUT DATA  *
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I.--HEADING
'ROTATIONAL ANALYSIS
'ORLEANS CANAL
'MVK DISTRICT
'REACH 20A WITH BERM

II.--CONTROL
CANTILEVER WALL DESIGN
FACTOR OF SAFETY FOR ACTIVE PRESSURES = 1.00
FACTOR OF SAFETY FOR PASSIVE PRESSURES = 1.83

III.--WALL DATA
ELEVATION AT TOP OF WALL = 13.80 FT.

IV.--SURFACE POINT DATA

IV.A.--RIGHTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	6.50
4.30	6.50
12.10	5.50
27.10	2.50
42.10	1.50
61.30	-6.00
79.30	-10.50
102.50	-12.50

IV.B.--LEFTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	6.50
6.80	6.50
27.50	0.50
110.00	0.50

V.--SOIL LAYER DATA

V.A.--RIGHTSIDE
LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

SAT. WGHT.	MOIST WGHT.	ANGLE OF INTERNAL FRICTION	COH- ESION	ANGLE OF WALL FRICTION	ADH- ESION	<--BOTTOM--> ELEV.	SLOPE	<-SAFETY-> <-FACTOR-> ACT.	PASS.

(PCF)	(PCF)	(DEG)	(PSF)	(DEG)	(PSF)	(FT)	(FT/FT)		
111.00	111.00	0.00	500.00	0.00	500.00	0.50	0.00	DEF	DEF
101.00	101.00	0.00	500.00	0.00	500.00	-1.50	0.00	DEF	DEF
101.00	101.00	0.00	500.00	0.00	500.00	-6.00	0.00	DEF	DEF
92.00	92.00	0.00	300.00	0.00	300.00	-10.00	0.00	DEF	DEF
82.00	82.00	0.00	400.00	0.00	400.00	-18.00	0.00	DEF	DEF
82.00	82.00	0.00	400.00	0.00	400.00			DEF	DEF

V.B.--LEFTSIDE

LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = DEFAULT

LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH-ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH-ESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.
111.00	111.00	0.00	500.00	0.00	500.00	0.50	0.00	DEF	DEF
101.00	101.00	0.00	500.00	0.00	500.00	-1.50	0.00	DEF	DEF
101.00	101.00	0.00	500.00	0.00	500.00	-6.00	0.00	DEF	DEF
92.00	92.00	0.00	300.00	0.00	300.00	-10.00	0.00	DEF	DEF
82.00	82.00	0.00	400.00	0.00	400.00	-18.00	0.00	DEF	DEF
82.00	82.00	0.00	400.00	0.00	400.00			DEF	DEF

VI.--WATER DATA

UNIT WEIGHT = 62.40 (PCF)
RIGHTSIDE ELEVATION = 8.00 (FT)
LEFTSIDE ELEVATION = -1.50 (FT)
NO SEEPAGE

VII.--VERTICAL SURCHARGE LOADS

NONE

VIII.--HORIZONTAL LOADS

VIII.A.--HORIZONTAL LINE LOADS

NONE

VIII.B.--HORIZONTAL DISTRIBUTED LOADS

ELEVATION (FT)	DIST. LOAD (PSF)
6.50	1150.00
-1.50	0.00

DATE: 8-OCTOBER-2013 TIME: 12:38:17

****
*   SOIL PRESSURES FOR   *
* CANTILEVER WALL DESIGN *
****

I.--HEADING
'ROTATIONAL ANALYSIS
'ORLEANS CANAL
'MVK DISTRICT
'REACH 20A WITH BERM

II.--SOIL PRESSURES

RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

NET SOIL PRESSURES INCLUDE APPLIED HORIZONTAL DISTRIBUTED LOADS.

	NET	<---LEFTSIDE--->		<------NET------> (SOIL + WATER)		<--RIGHTSIDE--->	
ELEV.	WATER	PASSIVE	ACTIVE	ACTIVE	PASSIVE	ACTIVE	PASSIVE
(FT)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)
13.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7.8	12.5	0.0	0.0	12.5	12.5	0.0	0.0
6.8	74.9	0.0	0.0	74.9	74.9	0.0	0.0
6.5+	93.6	0.0	0.0	93.6	93.6	0.0	0.0
6.5-	93.6	546.4	0.0	697.2	1790.0	0.0	546.4
5.8	137.3	897.4	0.0	289.3	2040.3	0.0	853.7
5.5	156.0	930.7	0.0	231.6	2030.5	0.0	868.3
4.8	199.7	1008.4	0.0	96.9	2007.6	0.0	902.3
4.3	231.1	1064.3	0.0	0.0	1992.0	0.0	927.7
3.8	262.1	1119.4	0.0	-95.4	1976.7	0.0	952.7
2.8	324.5	1230.4	0.0	-287.8	1929.8	0.0	987.2
1.8	386.9	1341.4	0.0	-480.1	1861.4	0.0	1000.2
0.8	449.3	1455.2	0.0	-675.3	1806.1	0.0	1026.2
0.5	468.0	1481.4	0.0	-725.9	1793.8	0.0	1038.3
-0.2	511.7	1501.2	0.0	-802.6	1761.5	0.0	1063.0
-1.2	574.1	1513.1	0.0	-895.9	1713.2	0.0	1096.0
-1.5	592.8	1523.8	0.0	-931.0	1698.7	0.0	1105.9
-2.2	592.8	1544.6	0.0	-951.8	1721.9	0.0	1129.1
-3.2	592.8	1558.2	0.0	-965.4	1755.0	0.0	1162.2
-4.2	592.8	1574.2	0.0	-981.4	1790.4	0.0	1197.6
-5.2	592.8	1570.1	0.0	-977.3	1805.8	0.0	1213.0
-6.0	592.8	1432.8	0.0	-840.0	1683.7	0.0	1090.9
-6.2+	592.8	1378.6	0.0	-792.2	1643.4	0.0	1050.6

-6.2-	592.8	1391.5	0.0	-792.2	1643.4	0.0	1050.6
-6.2	592.8	1378.6	24.8	-785.8	1605.9	0.0	1037.9
-7.2	592.8	1271.1	235.3	-678.3	1285.5	0.0	928.0
-8.2	592.8	1277.6	236.6	-684.8	1300.9	0.0	944.7
-9.2	592.8	1291.2	225.0	-698.4	1343.8	0.0	976.0
-10.0	592.8	1367.4	93.0	-774.6	1565.6	0.0	1065.7
-10.2	592.8	1395.1	41.6	-802.3	1648.0	0.0	1096.8
-10.6+	592.8	1446.2	0.0	-837.7	1715.8	0.0	1123.0
-10.6-	592.8	1414.8	0.0	-837.7	1715.8	0.0	1123.0
-11.2	592.8	1446.2	0.0	-853.4	1757.5	0.0	1164.7
-12.2	592.8	1439.3	0.0	-846.5	1767.5	0.0	1174.7
-13.2	592.8	1434.0	0.0	-841.2	1779.0	0.0	1186.2
-14.2	592.8	1428.6	0.0	-835.8	1790.5	0.0	1197.7
-15.2	592.8	1423.3	0.0	-830.5	1802.0	0.0	1209.2
-16.2	592.8	1418.0	0.0	-825.2	1813.5	0.0	1220.7
-17.2	592.8	1412.6	0.0	-819.8	1825.0	0.0	1232.2
-18.0	592.8	1408.3	0.0	-815.5	1834.2	0.0	1241.4
-18.2	592.8	1407.3	0.0	-814.5	1836.5	0.0	1243.7
-19.2	592.8	1401.9	0.0	-809.1	1848.0	0.0	1255.2
-20.2	592.8	1396.6	0.0	-803.8	1859.5	0.0	1266.7
-21.2	592.8	1391.2	0.0	-798.4	1871.0	0.0	1278.2
-22.2	592.8	1399.2	0.0	-806.4	1882.3	0.0	1289.5
-23.2	592.8	1418.8	0.0	-826.0	1893.6	0.0	1300.8
-24.2	592.8	1438.4	0.0	-845.6	1921.7	0.0	1328.9

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS
DATE: 8-OCTOBER-2013 TIME: 12:38:17

****
* SUMMARY OF RESULTS FOR *
* CANTILEVER WALL DESIGN *
****

I.--HEADING
'ROTATIONAL ANALYSIS
'ORLEANS CANAL
'MVK DISTRICT
'REACH 20A WITH BERM

II.--SUMMARY

RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

WALL BOTTOM ELEV. (FT) : -1.57
PENETRATION (FT) : 8.07

MAX. BEND. MOMENT (LB-FT) : 2.1472E+03
AT ELEVATION (FT) : 1.73

MAX. SCALED DEFL. (LB-IN^3): 1.9005E+08
AT ELEVATION (FT) : 13.80

NOTE: DIVIDE SCALED DEFLECTION MODULUS OF
ELLASTICITY IN PSI TIMES PILE MOMENT
OF INERTIA IN IN^4 TO OBTAIN DEFLECTION
IN INCHES.

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHOREDOR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS
DATE: 8-OCTOBER-2013 TIME: 12:38:17

****
* COMPLETE OF RESULTS FOR *
* CANTILEVER WALL DESIGN *
****

I.--HEADING
'ROTATIONAL ANALYSIS
'ORLEANS CANAL
'MVK DISTRICT
'REACH 20A WITH BERM

II.--RESULTS

ELEVATION (FT)	BENDING MOMENT (LB-FT)	SHEAR (LB)	SCALED DEFLECTION (LB-IN^3)	NET PRESSURE (PSF)
13.80	0.0000E+00	0.	1.9005E+08	0.00
12.80	3.2742E-11	0.	1.7370E+08	0.00
11.80	3.2742E-11	0.	1.5735E+08	0.00
10.80	3.2742E-11	0.	1.4100E+08	0.00
9.80	3.2742E-11	0.	1.2465E+08	0.00
8.80	3.2742E-11	0.	1.0830E+08	0.00
8.00	-2.6262E-10	0.	9.5225E+07	0.00
7.80	8.3200E-02	1.	9.1955E+07	12.48
6.80	1.7971E+01	45.	7.5608E+07	74.88
6.50+	3.5100E+01	70.	7.0708E+07	93.60
6.50-	3.5100E+01	70.	7.0708E+07	697.15
5.80	2.2173E+02	415.	5.9312E+07	289.28
5.50	3.5852E+02	494.	5.4474E+07	231.58
4.80	7.4977E+02	609.	4.3446E+07	96.93
4.30	1.0647E+03	633.	3.5881E+07	0.00

3.80	1.3747E+03	609.	2.8890E+07	-95.42
2.80	1.9043E+03	418.	1.6695E+07	-287.77
1.80	2.1461E+03	34.	7.7494E+06	-480.14
0.80	1.9072E+03	-544.	2.4431E+06	-675.30
0.50	1.7129E+03	-754.	1.5225E+06	-725.86
0.31	1.5557E+03	-895.	1.0775E+06	-746.78
-0.20	1.0321E+03	-1106.	3.3647E+05	-82.10
-1.20	1.0293E+02	-535.	2.0366E+03	1223.21
-1.50	3.3193E+00	-109.	1.0912E+00	1614.80
-1.57	0.0000E+00	0.	0.0000E+00	1700.92

NOTE: DIVIDE SCALED DEFLECTION MODULUS OF ELLASTICITY IN PSI TIMES PILE MOMENT OF INERTIA IN IN^4 TO OBTAIN DEFLECTION IN INCHES.

III.--WATER AND SOIL PRESSURES

		<-------------SOIL PRESSURES-------------->			
	WATER	<----LEFTSIDE----->		<---RIGHTSIDE---->	
ELEVATION	PRESSURE	PASSIVE	ACTIVE	ACTIVE	PASSIVE
(FT)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)
13.80	0.	0.	0.	0.	0.
12.80	0.	0.	0.	0.	0.
11.80	0.	0.	0.	0.	0.
10.80	0.	0.	0.	0.	0.
9.80	0.	0.	0.	0.	0.
8.80	0.	0.	0.	0.	0.
8.00	0.	0.	0.	0.	0.
7.80	12.	0.	0.	0.	0.
6.80	75.	0.	0.	0.	0.
6.50+	94.	0.	0.	0.	0.
6.50-	94.	546.	0.	0.	546.
5.80	137.	897.	0.	0.	854.
5.50	156.	931.	0.	0.	868.
4.80	200.	1008.	0.	0.	902.
4.30	231.	1064.	0.	0.	928.
3.80	262.	1119.	0.	0.	953.
2.80	324.	1230.	0.	0.	987.
1.80	387.	1341.	0.	0.	1000.
0.80	449.	1455.	0.	0.	1026.
0.50	468.	1481.	0.	0.	1038.
0.31	480.	1487.	0.	0.	1045.
-0.20	512.	1501.	0.	0.	1063.
-1.20	574.	1513.	0.	0.	1096.
-1.50	593.	1524.	0.	0.	1106.
-1.57	593.	1545.	0.	0.	1129.
-3.20	593.	1558.	0.	0.	1162.

```
'ROTATIONAL ANALYSIS
'ORLEANS CANAL
'MVK DISTRICT
'REACH 20A WITH BERM
CONTROL  CANTILEVER  DESIGN  1.00  1.83
WALL   13.8
SURFACE RIGHTSIDE   8    0    6.5
                 4.3    6.5
                 12.1    5.5
                 27.1    2.5
                 42.1    1.5
                 61.3   -6
                 79.3   -10.5
                 102.5   -12.5
SURFACE LEFTSIDE   4    0    6.5
                 6.8    6.5
                 27.5    0.5
                 110    0.5
SOIL RIGHTSIDE  STRENGTHS   6
   111    111    0    500    0    500    .5   0
   101    101    0    500    0    500   -1.5   0
   101    101    0    500    0    500   -6   0
   92    92    0    300    0    300   -10   0
   82    82    0    400    0    400   -18   0
   82    82    0    400    0    400
SOIL LEFTSIDE  STRENGTHS   6
   111    111    0    500    0    500    .5   0
   101    101    0    500    0    500   -1.5   0
   101    101    0    500    0    500   -6   0
   92    92    0    300    0    300   -10   0
   82    82    0    400    0    400   -18   0
   82    82    0    400    0    400
WATER ELEVATIONS   62.4    8   -1.5
HORIZONTAL DISTRIBUTED   2    6.5    1150   -1.5    0
FINISHED
```

APPENDIX D FLAC RESULTS

APPENDIX D – FLAC Results
Orleans Avenue Outfall Canal
Summary Soil Structure Interaction Analysis

General

Soil structure interaction (SSI) analyses were completed for the Orleans Avenue Outfall Canal and are summarized in this appendix. Evaluations were competed using the FLAC (Fast Lagrangian Analysis of Continua) v 7.0 finite difference code (Itasca 2011). This appendix presents results from soil structure interaction (SSI) analyses performed for Reaches 2, 4, 8, 17B and 19. Reaches 2, 4, 17B, and 19 are I-wall reaches and the I-wall FLAC template was used to analyze these reaches. Reach 8 is a T-wall reach and the T-wall FLAC model development was similar to the St. Bernard Parrish T-wall FLAC analyses.

For the I-wall reaches, analyses presented were performed to estimate the gap propagation behavior, wall displacements and factors of safety at specific locations along the outfall canal for varying canal water levels. FLAC models were prepared using an I-wall template created for the USACE by the Itasca Consulting Group, developers of the FLAC software. The use of the template allows the relatively quick creation of models by making several simplifying assumptions. These assumptions include:

- Horizontal soil layers
- Pore-water pressures in granular layers based on a piezometric surface
- MC constitutive model (i.e. strength is stress dependent but modulus values are assigned as input parameters and are not recalculated based on changes in mean effective stress)
- Interface properties are uniform with the maximum shear strength based on a percentage of the maximum soil cohesion that the beam passes through in the model (i.e. 0.9 x levee cohesion)

To support these analyses an evaluation of the full scale London Avenue Canal Site Specific Load Test (LLT) was completed by New Orleans USACE and others to estimate the most likely values (MLV) for stress strain properties. The analyses and methodology of this test can be found and further explained within Appendix D FLAC Results London Avenue Outfall Canal Summary Soil Structure Interaction Analysis. The shear modulus to undrained shear strength ratios (G/Su) from the London Load Test analysis were then used to estimate stress strain properties for the Orleans Avenue Outfall Canal's specific reaches.

As mentioned previously, the interface properties used for the sheet pile is constant for each reach analyzed. The interface cohesion is estimated based on the maximum soil cohesion the sheet pile passes through. The interface friction value is set at zero. The interface may encounter frictional foundation materials (i.e. sheet pile penetrates in to a sand layer) or foundation material weaker than interface cohesion value (i.e. sheet pile penetrates in to weak marsh layer). However, the effects of the interface cohesion values and friction values appear to have little impact on the I-wall behavior in the analysis. Additional analyses were conducted in the London Ave Canal Reevaluation Report (2013) examining the impacts of the interface cohesion values. These additional analyses concluded that the interface cohesion value had negligible impacts on the I-wall behavior.

All elevations are presented in NAVD88 unless otherwise stated. The locations, geometrics, and foundation conditions for the reaches analyzed are described in this appendix and in the Orleans Avenue Outfall Canal Reevaluation Report.

All analyses presented in this appendix are based on the non-linear Mohr-Coulomb (MC) constitutive model. All analyses are considered complete SSI analyses in that intrinsic material properties (soil and structure) are used to model the soil-structural response to applied load conditions without using predetermined forces.

Factor of safety (FoS) calculations were performed using the automated 'c-φ' reduction technique built into FLAC. In automated 'c-φ' reduction technique, the cohesion and friction strength properties are factored by a strength reduction factor (SRF) until the model is essentially unstable. The SRF associated with the point of instability is called the FoS. A manual strength reduction factor approach was utilized for some of the reaches to further evaluate the behavior of the I-wall as soil shear strengths were reduced. The intersection of the initial slope and the final slope SRF versus wall displacement curve was useful to determine the limits of the elastic behavior of the I-wall levee. The interface shear strength properties were correspondingly reduced by the same SRF applied to the strength properties in the FoS calculations.

Reach 2

Introduction

The design section includes: clay embankment (EL +3.2 ft), underlain by a clay fill (EL 0.0 ft to EL -4.0 ft). The clay fill is underlain by marsh material (EL -4.0 ft to EL -13 ft) which is underlain by a beach sand stratum (EL -13 ft to EL -50 ft) which mantles a lower clay deposit which extends at least until the bottom of the model (EL -70 ft). Since the FLAC model is limited to horizontal layers, bottom of the marsh layer and the top elevation of the beach sand layer was average to an elevation on -11.7 ft. The clay embankment material was given a unit weight of 114 pcf with cohesion of 700 psf. The values used for the clay embankment are higher than what is seen in the underlying clay fill material. The elevation of the floodside ground line at the wall face is approximately EL -2.3 ft, while the land side top elevation is 3.3 ft resulting in 5.4 ft difference in soil elevation across the wall. The existing I-wall has a top elevation of 13.9 ft consisting of a concrete cap and PZ27sheet pile to tip elevation of -28.5 ft. Figure 1 shows the Geo-Studio model used to the stability analyses and Figure 2 shows the FLAC model cross section for Reach 2.

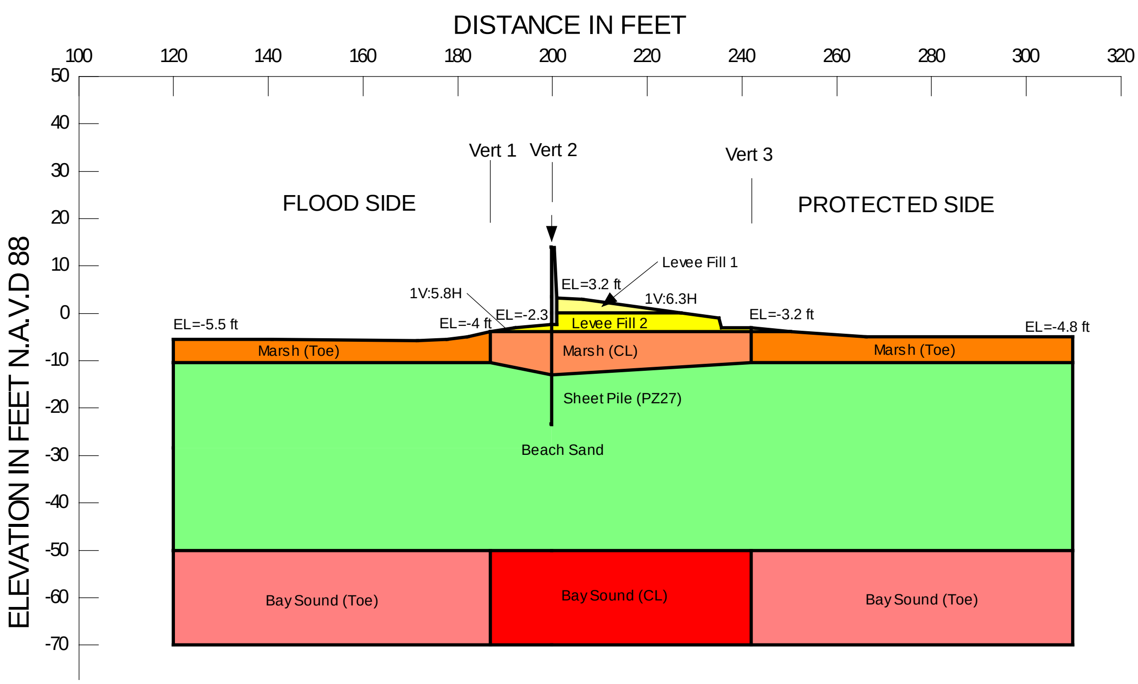


Figure 1. Geo-Studio model for Orleans Avenue Outfall Canal Reach 2.

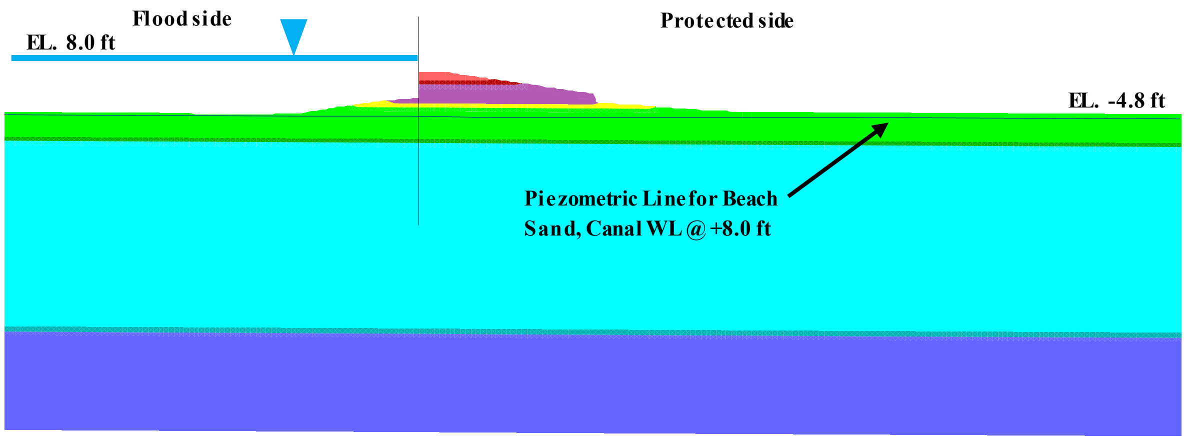


Figure 2. FLAC Model for Orleans Avenue Outfall Canal Reach 2.

Foundation Parameters

The FLAC analyses are based on simple Mohr-Coulomb constitutive models (linear elastic-perfectly plastic soil behavior). Unit weight and shear strength parameters for the various soil layers were based on the information in the MOWL Report. The cross section used came from the slope stability Slope/W file from the MOWL report. As-built drawings were examined for the properties of the I-Wall. There is an additional steel sheet piling on the protected side of the I-wall that was partially removed during construction of the I-wall. Data was not readily available for the old wall, but it was not believed to be critical to the analysis since the sheet pile was a thin corrugated section.

Soil modulus values were determined or selected assuming the soils are linearly elastic and isotropic with Poisson's ratio based on expected drainage conditions during loading. The parameters used for analysis are presented in Table 1 thru 5. The soil modulus values were selected using the same G/Su rations selected for the FLAC model roughly calibrated to the London Load Test (LLT) results. The soil modulus values used in the LLT FLAC model were primarily based on pressure meter testing and relationships for G/Su. At Orleans Avenue Canal, the shear modulus values are determined by multiplying the G/Su ratio for a given soil by its undrained shear strength. The at-rest earth pressure coefficients are computed only to initialize stresses during model development so equilibrium can be reached in fewer computational steps.

The Young's Modulus for the sand in Orleans Avenue Canal Reach 4 was used in Reach 2 due to the close proximity of the reaches and similar CPT data in sand collected within each reach.

At Orleans Avenue Outfall Canal, seepage conditions were modeled as steady state using the Seep/W model, and previously accepted material seepage properties and protected side boundary conditions, from the MOWL report. The flood side canal total head boundary was incrementally raised from a starting water level of EL +0.4 ft to EL +1.0 ft and then by 1 ft. The water table was assumed to be constant for the protected side two feet below the ground surface giving an elevation of -6.8 ft and 8.0 ft for the flood side.

Table 1. Summary of Centerline Soil Parameters, Reach 2.

Material	Strata Top Elevation (NAVD88)	Strata Bottom Elevation (NAVD88)	Unit Weight (pcf)	Unit Weight / Gravity	Su (psf)	Φ (deg)
1 – Levee Fill 1	3.2	0.0	114	3.540	700	0
2 – Levee Fill 2	0.0	-4.0	104	3.230	400	0
3 – Marsh	-4.0	-11.7	93	2.888	200	0
4 - Beach Sand (SP)	-11.7	-50.0	122	3.789	0	33
5 - Bay Sound Clay	-50.0	-70.0	102	3.168	700*	0

*Denotes Su at Top of Bay Sound Clay
8.5 psf/ft is slope of Bay Sound Clay

Table 2. Centerline Most Likely Value Modulus, Reach 2.

Material	E/Su	E (psf)	Poisson	G (psf)	K (psf)	ko
1 – Levee Fill 1	226	1.58E+05	0.40	5.63E+04	2.63E+05	0.85
2 – Levee Fill 2	395	1.58E+05	0.40	5.63E+04	2.63E+05	0.87
3 - Marsh	200	4.00E+04	0.47	1.36E+04	2.22E+05	0.96
4 - Beach Sand	-	8.22E+05	0.31	3.13E+05	7.32E+05	0.46
5 - Bay Sound Clay	600	4.20E+05	0.47	1.43E+05	2.33E+06	0.96

Table 3. Summary of Toe Soil Parameters, Reach 2.

Material	Strata Top Elevation (NAVD88)	Strata Bottom Elevation (NAVD88)	Unit Weight (pcf)	Unit Weight / Gravity	Su (psf)	Φ (deg)
1 – Levee Fill 1						
2 – Levee Fill 2	-3.2	-4.0	104	3.230	150	0
3 – Marsh	-4.0	-11.7	83	2.578	150	0
4 – Beach Sand (SP)	-11.7	-50.0	122	3.789	0	33
5 – Bay Sound Clay	-50.0	-70.0	102	3.168	555*	0

*Denotes Su at Top of Bay Sound Clay
8.5 psf/ft is slope of Bay Sound Clay

Table 4. Toe Most Likely Value Modulus, Reach 2.

Material	E/Su	E (psf)	Poisson	G (psf)	K (psf)	Ko
1 – Levee Fill 1						
2 – Levee Fill 2	1053	1.58E+05	0.40	5.63E+04	2.63E+05	0.87
3 – Marsh	200	3.00E+04	0.47	1.02E+04	1.67E+05	0.97
4 – Beach Sand (SP)	-	8.22E+05	0.31	3.13E+05	7.32E+05	0.46
5 – Bay Sound Clay	600	3.33E+05	0.47	1.13E+05	1.85E+06	0.96

Structural Parameters

The current I-wall structure was modeled as two beam elements: (1) the upper concrete portion of the I-wall and (2) the supporting sheet pile beneath the concrete. Interface elements were applied to the wall below the ground surface. These elements allow slip and separation between the soil and wall. The shear strength of the interfaces was set at 90% of the shear strength of the strongest cohesive soil layer.

In FLAC, the structural beam properties are formulated in plane stress (like a plate) and are adjusted for plane strain conditions by dividing Young's modulus by $1-\nu^2$ (ν =Poisson's ratio). The structural parameters are included in Table 5.

Table 5. Summary of Structural Parameters, Reach 2.

Member	E* (psi)	I (in^4/ft)	E*I ($lbft^2$/ft)	A (in^2/ft)	E*A (lb/ft)	ν
Concrete	3.13E+06	1728	3.75E+07	144	4.50E+08	0.20
PZ27	3.19E+07	184.2	4.08E+07	7.94	2.53E+08	0.30

E *= Adjusted Young's modulus
I = moment of inertia
A = cross-sectional area
ν = Poisson's ratio

Loading Conditions and Gap Formation

Canal water loadings are modeled as mechanical pressures acting normal to the ground surface and normal to the wall face. When a gap is included between the soil and I-wall a horizontal mechanical pressure is added to both the soil and the wall to the depth of the gap.

Gap development is modeled following the procedure used in the IPET report. The total horizontal stress in the element adjacent to the wall is compared to the hydrostatic pressure that would exist if a gap were present. If the hydrostatic water pressure exceeds the total horizontal stress it is assumed that a gap would form. Each zone is checked as canal water levels are raised from the normal pool elevation of 0.4 ft to the maximum operating level of 8 ft in 1 ft increments. Gaps were deepened in 1 ft increments as they developed.

At lower canal water levels, it is believed the higher soil level on the protected side of the wall serves to increase the horizontal stresses along the flood side of the sheet pile which slows the progression of the gap. The progression of the canal water level and gap depth for the Reach 2 FLAC model is presented in Figure 3.

Results

As a check, stresses and pore pressures were calculated by hand and compared to the FLAC computed values. Gap depth was also checked following IPET guidance by hand and the results for the highest water table were similar. The hand gap depth calculations considered either the protected side top of levee elevation adjacent to the I-wall (EL +3.2) or the flood side top of levee elevation adjacent to the I-wall (EL -1.8). Using the protected side ground elevations, the elevation of the gap tip for water at EL +8 ft was approximately -6 ft. Using the flood side ground elevations, the elevation of the gap tip for water at EL +8 ft was approximately -13.0 ft, extending down to the beach sand layer. The FLAC analysis resulted in the gap extending to approximate EL -7.3 ft for a canal water level EL +8.0. It should be noted that water levels above EL +8.0 did not affect the gap depth in the hand calculations.

In the FLAC analysis, the gap did extend further at water levels higher than EL +8.0 and extended down to the sand (EL -13.0) when the canal water level reach EL +9.0. The extension of the gap to the sand caused the pore pressures in the sand to dramatically increase as a hydraulic connection to the beach sand layer was provided via the gap. As shown in Figure 4, the displacements of the I-wall and protected ground surface increased when the canal water level reach EL+9.0 and the gap extended to the sand.

At water level +8.0 and gap tip elevation of -7.3 ft, the maximum protected side ground displacement and top of I-wall displacement was 1.13 inches and 1.79 inches respectively. Graphs of the wall displacement and gap propagation versus Canal Water Elevation can be found in Figure 4 and Figure 5 respectively.

Shear strength and modulus parameters for the soil layers affects the development of gap in the FLAC analysis. The soil shear strength parameters were determined from field and laboratory tests on samples collected from this reach. However, soil modulus parameters were estimated from relationships determined in the London Load Test. Since the gap can provide a hydraulic connection to the beach sand layer, it is important to understand the impacts of this hydraulic connection on pores pressures and displacements. In order to investigate this impact, at a canal water level EL +8.0 the gap was extended in 1 ft increments to the beach sand layer and the displacements and pore pressures at each gap increment are tabulated in Table 6. The pore pressures were determined from a SEEP/W analysis at each gap increment. Displacements and pore pressures increase when the gap extends to the beach sand layer, but the increase is not excessive. Although a gap to the beach sand layer is not predicted in the FLAC analysis for a canal water level EL +8.0, the increase in displacements for a gap to the sand is only about 0.25 inches and factor of safety against uplift is well above criteria at 3.3.

Table 6. Displacements and Pore Pressures Resulting from a Gap Extending to the Beach Sand Layer at Canal Water Level EL +8.0.

Gap Depth (ft)	Gap Elevation (ft, NAVD)	Top of Wall Displacement (in)	Protected Side Ground Displacement (in)	Total Head at the Protected Side Levee Toe (ft, NAVD 88)	Factor of Safety for Uplift
5*	-7.3	1.79	1.13	-6.6	No Excess Head
6	-8.3	1.81	1.13	-6.6	No Excess Head
7	-9.3	1.81	1.13	-6.6	No Excess Head
8	-10.3	1.81	1.13	-6.6	No Excess Head
9.4**	-11.7	2.05	1.36	-2.31	3.3

*Gap depth predicted in the FLAC analysis.
**Gap depth to the Beach Sand layer.

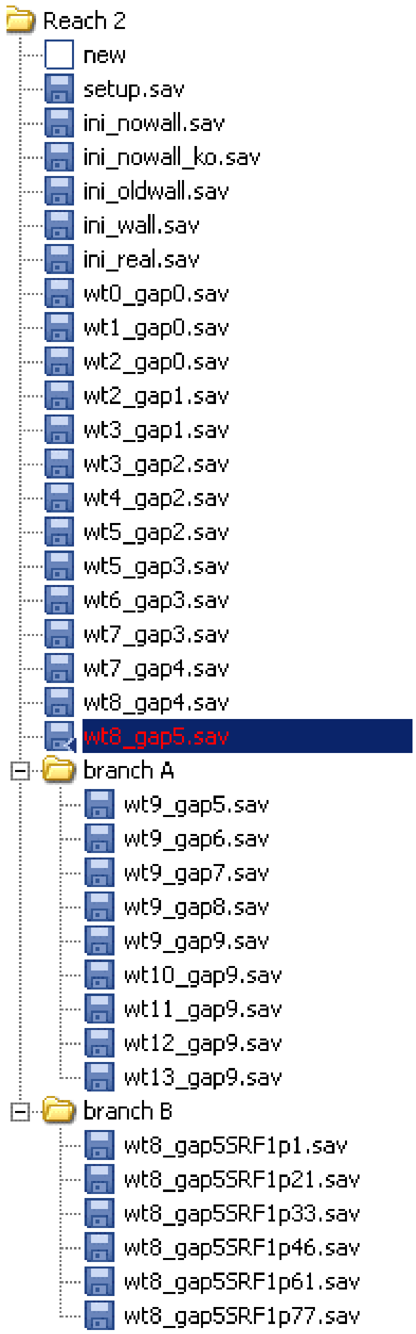


Figure 3. FLAC model progression of water loading and gap development for Reach 2.

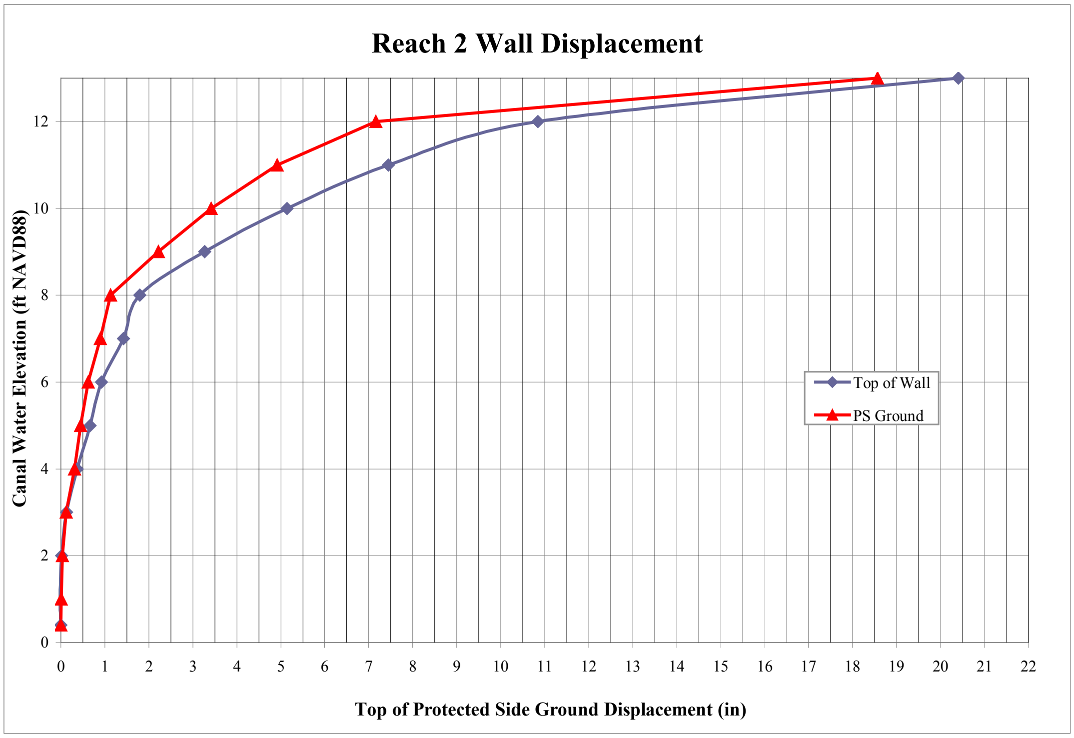


Figure 4. FLAC computed I-wall and protected side displacements versus canal water level, Reach 2.

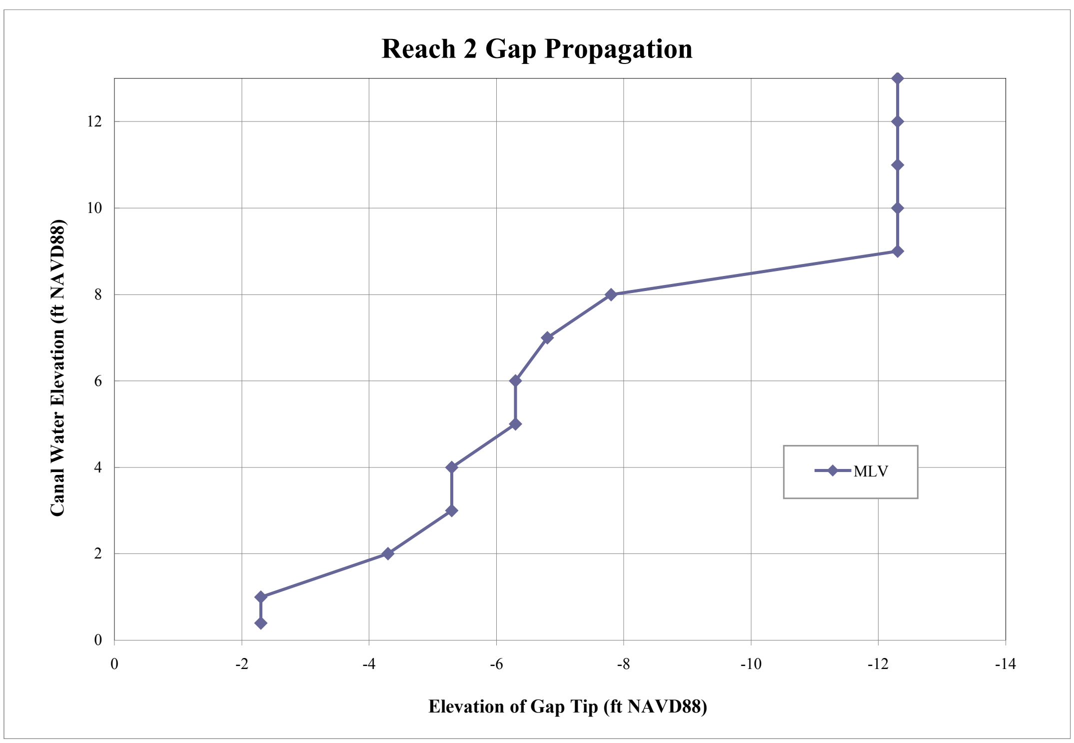


Figure 5. FLAC computed gap propagation versus canal water level, Reach 2.

The automated c-ϕ reduction technique in FLAC was used for this reach and resulted in a factor of safety at 1.97 for a canal water level of EL +8.0. The results of the automated c-ϕ reduction technique in FLAC for canal water level of EL +8.0 are shown in Figure 6. The stratigraphy and sheet pile embedment depth for Reach 2 is very similar to Reach 4. In Reach 2, the sheet pile is embedded 15 ft into a relatively stiff beach sand layer while in Reach 4 the sheet pile is embedded 16 ft into a relatively stiff beach sand layer. Thus, the failure mechanism for Reach 2 is similar to the failure mechanism for Reach 4 - bending of the I-wall at the marsh/beach sand interface. A manual strength reduction approach was used to further evaluate the behavior of the I-wall. This method was performed by reducing the shear strengths of the soil and interface along the I-wall in 10% increments until the protected side ground displacement exceeded three inches or a solution could not be obtained in FLAC.

The top of wall and protected side ground displacements were plotted versus the strength reduction factor (SRF). The elastic limit of the I-wall/levee behavior was estimated by projecting the initial and ending slope of the top of wall displacement versus SRF curve. The initial slope of the curve represents a linear elastic dominated response of the I-wall/levee. The ending slope of the curve represents a plastic dominated response of the I-wall/levee. However, as shown in Figure 7, the transition between the initial and ending slopes is gradual and not sharply defined. This is due to both elastic and plastic responses occurring within the model (between an SRF of 1.1 to 1.58). The intersection of the two slope projections is intended to represent the SFR where behavior transitions from an elastic dominated response to a plastic dominated response. The intent is for the I-wall/levee behavior to stay within the elastic range to prevent permanent plastic deformations during loading.

At canal water level EL +8.0, the SRF was increased in 0.10 increments from 1.0 to 1.77. At a SRF of 1.77, protected side ground displacements and top of wall displacements approached 4 inches and greater. The mechanism of failure for the I-wall is depicted in Figure 6 as rotational/bending of the I-wall. Figure 7 presents the strength reduction factor versus displacements for canal water level of EL +8.0. The elastic limit was determined to be at a SRF of 1.38 for canal water level EL +8.0. The protected side ground displacements at this SRF are around 1.65 inches. Figure 8 presents the strength reduction factor versus displacements for canal water level of EL +7.0. The elastic limit was determined to be 1.60 for a canal water level EL +7.0, which is the estimated extreme water level for this reach.

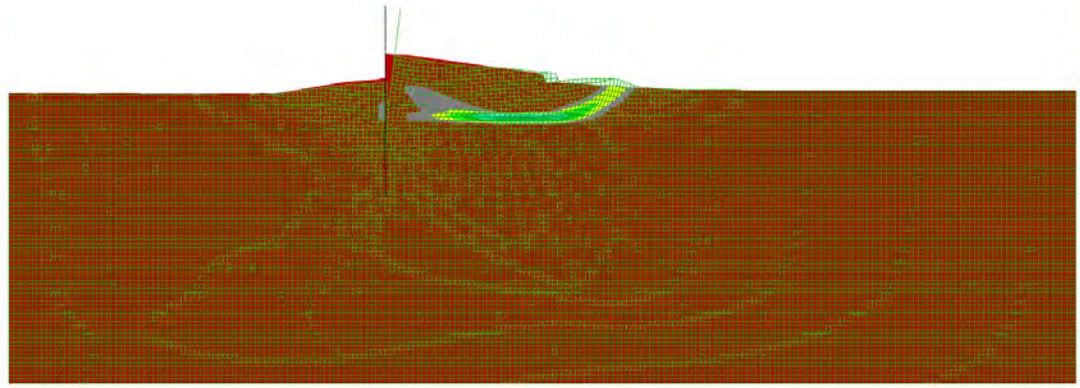


Figure 6. WL+8.0 ft, FoS = 1.97, ssi and wall displacement magnified 5X, Reach 2.

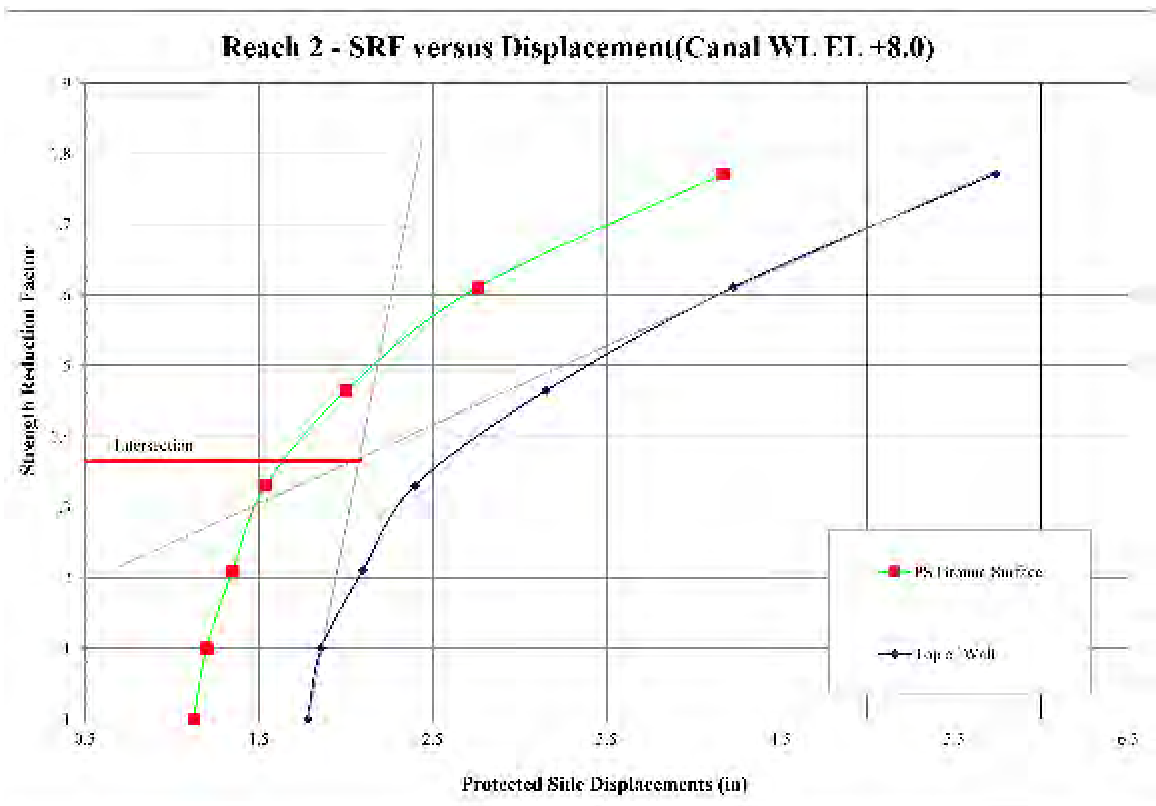


Figure 7. SRF versus Displacements (Canal WL EL +8.0), Reach 2.

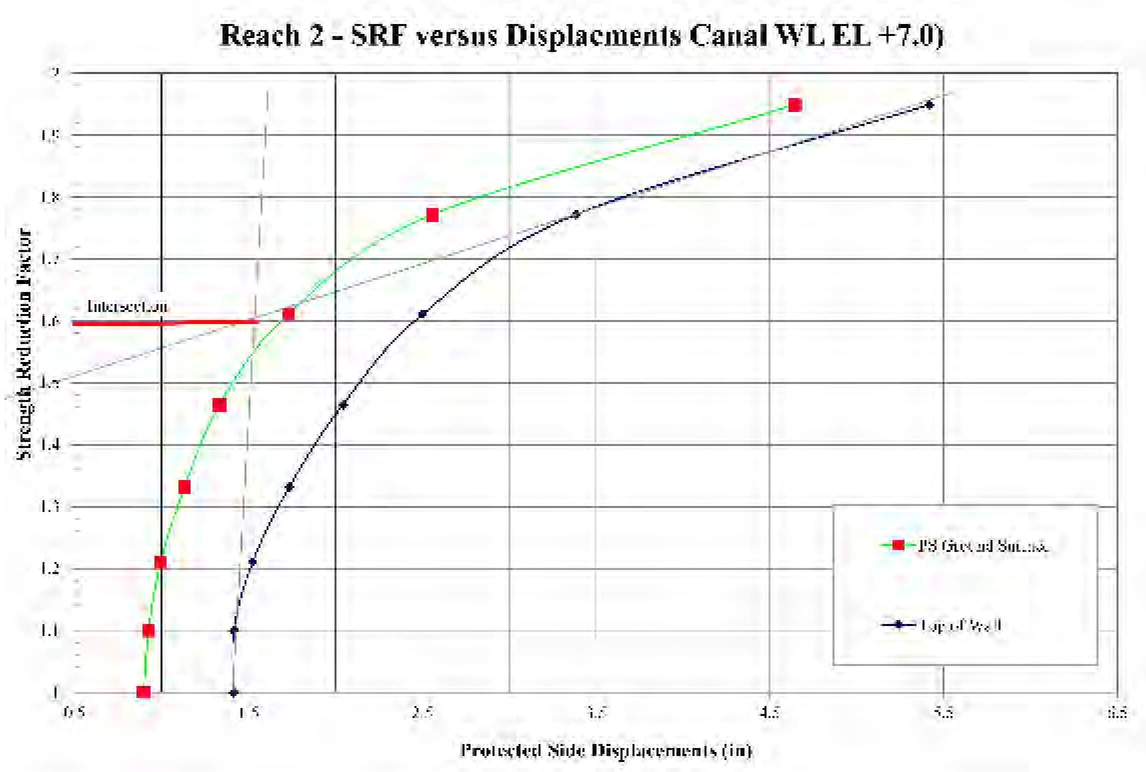


Figure 8. SRF versus Displacements (Canal WL EL +7.0), Reach 2.

Reach 4

Introduction

The design section includes: clay embankment (EL +3.3 ft), underlain by a shallow clay deposit (EL -0.5 ft to EL -6.5 ft). The shallow clay is underlain by marsh material (EL -6.5 ft to EL -13 ft) which is underlain by a beach sand stratum (EL -13 ft to EL -47 ft) which mantles a lower clay deposit which extends at least until the bottom of the model (EL -70 ft). The clay embankment material was given a unit weight of 115 pcf with cohesion of 700 psf. The values used for the clay embankment are higher than what is seen in the underlying shallow clay deposit. The elevation of the floodside ground line at the wall face is approximately EL -1.8 ft, while the land side top elevation is 3.3 ft resulting in 5.1 ft difference in soil elevation across the wall. The existing I-wall has a top elevation of 13.9 ft consisting of a concrete cap and PZ27 sheet pile to tip elevation of -28.5 ft. Figure 9 shows the Geo-Studio model and Figure 10 shows the FLAC model cross section for Reach 4.

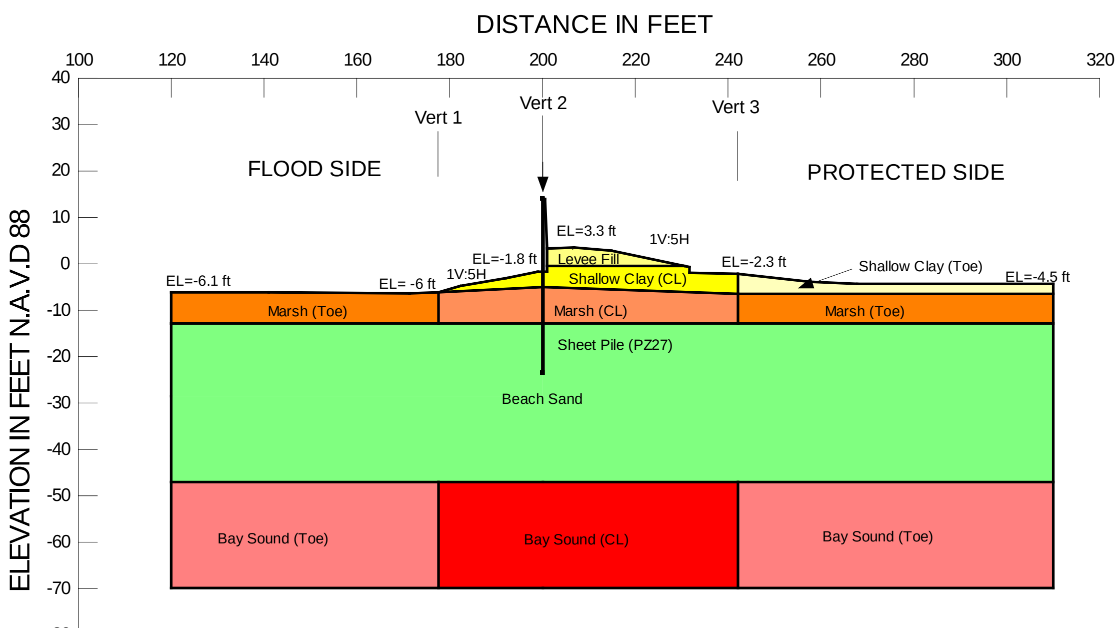


Figure 9. Geo-Studio model for Orleans Avenue Outfall Canal Reach 4.

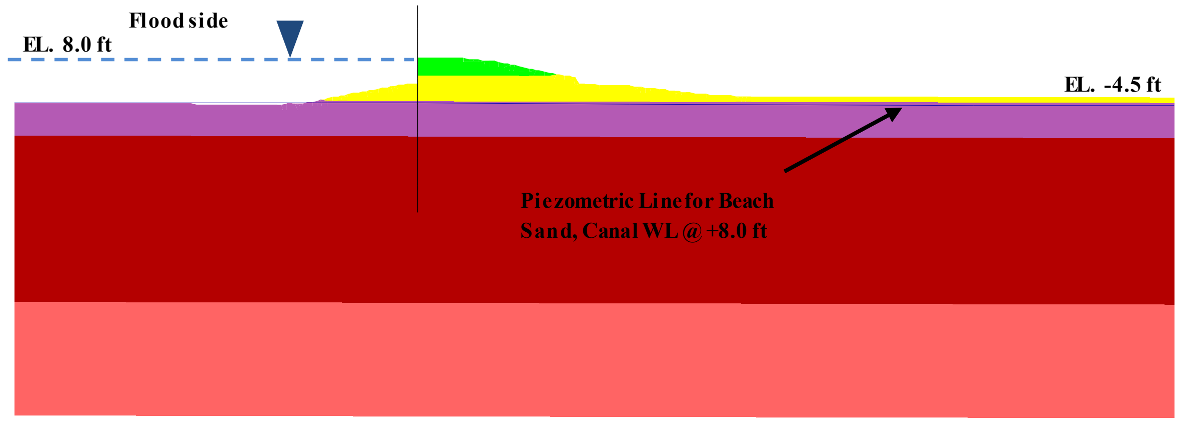


Figure 10. FLAC Model for Orleans Avenue Outfall Canal Reach 4.

Foundation Parameters

The FLAC analyses are based on simple Mohr-Coulomb constitutive models (linear elastic-perfectly plastic soil behavior). Unit weight and shear strength parameters for the various soil layers were based on the information in the MOWL Report. The cross section used came from the slope stability Slope/W file from the MOWL report. As-built drawings were examined for the properties of the I-Wall. There is an additional steel sheet piling on the protected side of the I-wall that was partially removed during construction of the I-wall. Data was not readily available for the old wall, but it was not believed to be critical to the analysis since the sheet pile was a thin corrugated section.

Soil modulus values were determined or selected assuming the soils are linearly elastic and isotropic with Poisson's ratio based on expected drainage conditions during loading. The parameters used for analysis are presented in Table 7 thru Table 11. The soil modulus values were selected using the same G/Su rations selected for the FLAC model roughly calibrated to the London Load Test (LLT) results. The soil modulus values used in the LLT FLAC model were primarily based on pressuremeter testing and relationships for G/Su. At Orleans Avenue Canal, the shear modulus values are determined by multiplying the G/Su ratio for a given soil by its undrained shear strength. The at-rest earth pressure coefficients are computed only to initialize stresses during model development so equilibrium can be reached in fewer computational steps.

Young's Modulus for the sand was also calculated using Equation 1 which is from an Electric Power Research Institute (EPRI) 1990 report ("Manual on Estimating Soil Properties for Foundation Design," August 1990, Report EL-6800).

Equation 1:

$$E = P_a * 10 * N_{60}$$

where, P_a = 2116 psf.

Based on an average from laboratory test results and CPT correlations, N_{60} for this reach was estimated at 20. The resulting Young's Modulus was 4.23E+05 which was between the MLV and LBV used in the models. Figure 11 has the plot of CPT estimated N_{60} values.

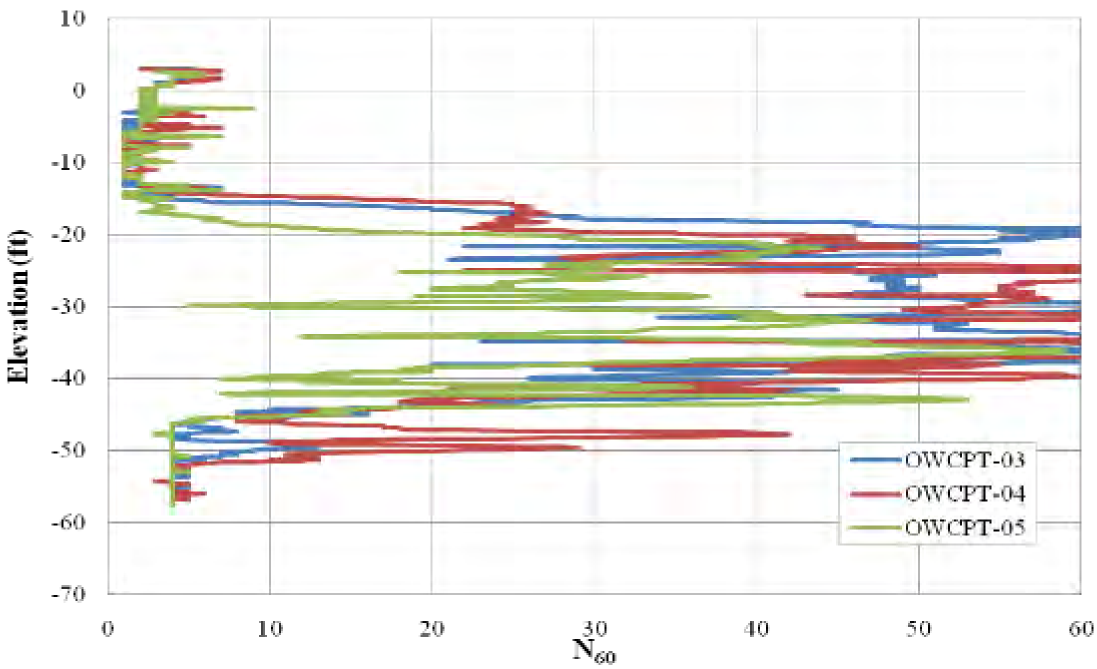


Figure 11. CPT estimated N60 for Orleans Avenue Outfall Canal Reach 4.

At Orleans Avenue Outfall Canal, seepage conditions were modeled as steady state using the Seep/W model, and previously accepted material seepage properties and protected side boundary conditions, from the MOWL report. The flood side canal total head boundary was incrementally raised from a starting water level of EL +0.4 ft to EL +1.0 ft and then by 1 ft. The water table was assumed to be constant for the protected side two feet below the ground surface giving an elevation of -4.5 ft and 8.0 ft for the flood side.

Table 7. Summary of Centerline Soil Parameters, Reach 4.

Material	Strata Top Elevation (NAVD88)	Strata Bottom Elevation (NAVD88)	Unit Weight (pcf)	Unit Weight / Gravity	Su (psf)	Φ (deg)
1 - Levee	3.3	-0.5	115	3.571	700	0
2 - Shallow Clay	-0.5	-5.0	106	3.292	230	0
3 - Marsh	-5.0	-13.0	88	2.733	215	0
4 - Beach Sand (SP)	-13.0	-47.0	122	3.789	0	33
5 - Bay Sound Clay	-47.0	-70.0	110	3.416	530*	0

*Denotes Su at Top of Bay Sound Clay

10.6 psf/ft is slope of Bay Sound Clay

Table 8. Centerline Most Likely Value Modulus, Reach 4.

Material	E/Su	E (psf)	Poisson	G (psf)	K (psf)	ko
1 - Levee	225	1.58E+05	0.40	5.63E+04	2.63E+05	0.85
2 - Shallow Clay	685	1.58E+05	0.40	5.63E+04	2.63E+05	0.86
3 - Marsh	200	4.30E+04	0.47	1.46E+04	2.39E+05	0.97
4 - Beach Sand	-	8.22E+05	0.31	3.13E+05	7.32E+05	0.46
5 - Bay Sound Clay	600	3.18E+05	0.47	1.08E+05	1.77E+06	0.95

Table 9. Summary of Toe Soil Parameters, Reach 4.

Material	Strata Top Elevation (NAVD88)	Strata Bottom Elevation (NAVD88)	Unit Weight (pcf)	Unit Weight / Gravity	Su (psf)	Φ (deg)
1 - Levee						
2 - Shallow Clay	-2.3	-6.5	106	3.292	200	0
3 - Marsh	-6.5	-13.0	88	2.733	190	0
4 - Beach Sand (SP)	-13.0	-47.0	122	3.789	0	33
5 - Bay Sound Clay	-47.0	-70.0	110	3.416	500*	0

*Denotes Su at Top of Bay Sound Clay

10.2 psf/ft is slope of Bay Sound Clay

Table 10. Toe Most Likely Value Modulus, Reach 4.

Material	E/Su	E (psf)	Poisson	G (psf)	K (psf)	Ko
1 - Levee						
2 - Shallow Clay	788	1.58E+05	0.40	5.63E+04	2.63E+05	0.86
3 - Marsh	200	3.80E+04	0.47	1.29E+04	2.11E+05	0.97
4 - Beach Sand	-	8.22E+05	0.31	3.13E+05	7.32E+05	0.46
5 - Bay Sound Clay	600	3.00E+05	0.47	1.02E+05	1.67E+06	0.95

Structural Parameters

The current I-wall structure was modeled as two beam elements: (1) the upper concrete portion of the I-wall and (2) the supporting sheet pile beneath the concrete. Interface elements were applied to the wall below the ground surface. These elements allow slip and separation between the soil and wall. The shear strength of the interfaces was set at 90% of the shear strength of the strongest cohesive soil layer.

In FLAC the structural beam properties are formulated in plane stress (like a plate) and are adjusted for plane strain conditions by dividing Young's modulus by $1-\nu^2$ (ν =Poisson's ratio). The structural parameters are included in Table 11.

Table 11. Summary of Structural Parameters, Reach 4.

Member	E* (psi)	I (in^4/ft)	E*I ($lbft^2$/ft)	A (in^2/ft)	E*A (lb/ft)	ν
Concrete	3.13E+06	1728	3.75E+07	144	4.50E+08	0.20
PZ27	3.19E+07	184.2	4.08E+07	7.94	2.53E+08	0.30

E *= Adjusted Young's modulus
I = moment of inertia
A = cross-sectional area
ν = Poisson's ratio

Loading Conditions and Gap Formation

Canal water loadings are modeled as mechanical pressures acting normal to the ground surface and normal to the wall face. When a gap is included between the soil and I-wall a horizontal mechanical pressure is added to both the soil and the wall to the depth of the gap.

Gap development is modeled following the procedure used in the IPET report. The total horizontal stress in the element adjacent to the wall is compared to the hydrostatic pressure that would exist if a gap were present. If the hydrostatic water pressure exceeds the total horizontal stress it is assumed that a gap would form. Each zone is checked as canal water levels are raised from the normal pool elevation of 0.4 ft to the maximum operating level of 8 ft in 1 ft increments. Gaps were deepened in 1 ft increments as they developed.

At lower canal water levels, it is believed the higher soil level on the protected side of the wall serves to increase the horizontal stresses along the flood side of the sheet pile which slows the progression of the gap.

<u>Results</u>

As a check, stresses and pore pressures were calculated by hand and compared to the FLAC computed values. Gap depth was also checked following IPET guidance by hand and the results for the highest water table were similar. The hand gap depth calculations considered either the protected side top of levee elevation adjacent to the I-wall (EL +3.2) or the flood side top of levee elevation adjacent to the I-wall (EL -1.8). Using the protected side ground elevations, the elevation of the gap tip for water at EL +8 ft was approximately -6 ft. Using the flood side ground elevations, the elevation of the gap tip for water at EL +8 ft was approximately -13.0 ft, extending down to the beach sand layer. The FLAC analysis resulted in the gap extending to approximate EL -5.8 ft for a canal water level EL +8.0. It should be noted that water levels above EL +8.0 did not affect gap depth in the hand calculations.

In the FLAC analysis, the gap did extend further at water levels higher than EL +8.0 and extended down to the sand (EL -13.0) when the canal water level reach EL +11.0. The extension of the gap to the sand caused the pore pressures in the sand to dramatically increase as a hydraulic connection to the beach sand layer was provided via the gap. As shown in Figure 13, the displacements of the I-wall and protected ground surface increased when the canal water level reach EL+11.0 and the gap extended to the sand.

At water level +8.0, the maximum protected side ground displacement and top of I-wall displacement was 0.9 inches and 1.4 inches respectively. The maximum developed crack depth was 4 ft at water level +8.0. Graphs of the wall displacement and gap propagation versus Canal Water Elevation can be found in Figure 13 and Figure 14 respectively.

Shear strength and modulus parameters for the soil layers affects the development of gap in the FLAC analysis. The soil shear strength parameters were determined from field and laboratory tests on samples collected from this reach. However, soil modulus parameters were estimated from relationships determined in the London Load Test. Since the gap can provide a hydraulic connection to the beach sand layer, it is important to understand the impacts of this hydraulic connection on pores pressures and displacements. In order to investigate this impact, at a canal water level EL +8.0 the gap was extended in 1 ft increments to the beach sand layer and the displacements and pore pressures at each gap increment are tabulated in Table 12. The pore pressures were determined from a SEEP/W analysis at each gap increment. Displacements and pore pressures increase when the gap extends to the beach sand layer, but the increase is not excessive. Although a gap to the beach sand layer is not predicted in the FLAC analysis for a canal water level EL +8.0, the increase in displacements for a gap to the sand is only about 0.20 inches and factor of safety against uplift is well above criteria at 4.9.

Table 12. Displacements and Pore Pressures Resulting from a Gap Extending to the Beach Sand Layer at Canal Water Level EL +8.0.

Gap Depth (ft)	Gap Elevation (ft, NAVD)	Top of Wall Displacement (in)	Protected Side Ground Displacement (in)	Total Head at the Protected Side Levee Toe (ft, NAVD 88)	Factor of Safety for Uplift
4*	-5.8	1.37	0.89	-6.28	No Excess Head
5	-6.8	1.44	0.92	-6.3	No Excess Head
6	-7.8	1.45	0.93	-6.3	No Excess Head
7	-8.8	1.45	0.93	-6.3	No Excess Head
8	-9.8	1.47	0.94	-6.3	No Excess Head
9	-10.8	1.47	0.94	-6.3	No Excess Head
10	-11.8	1.47	0.94	-6.3	No Excess Head
11.2**	-13.0	1.55	1.07	-1.4	4.89

*Gap depth predicted in the FLAC analysis.
**Gap depth to the Beach Sand layer.

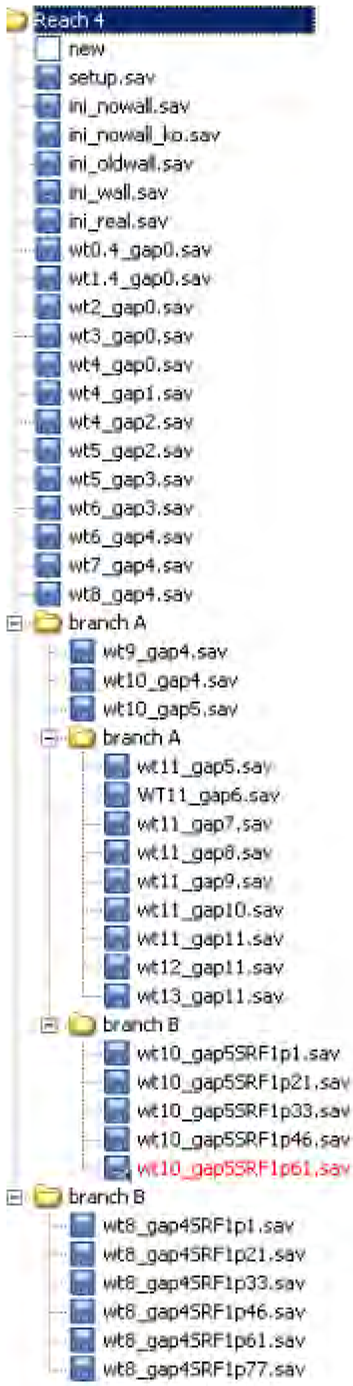


Figure 12. FLAC model progression of water loading and gap development for Reach 4.

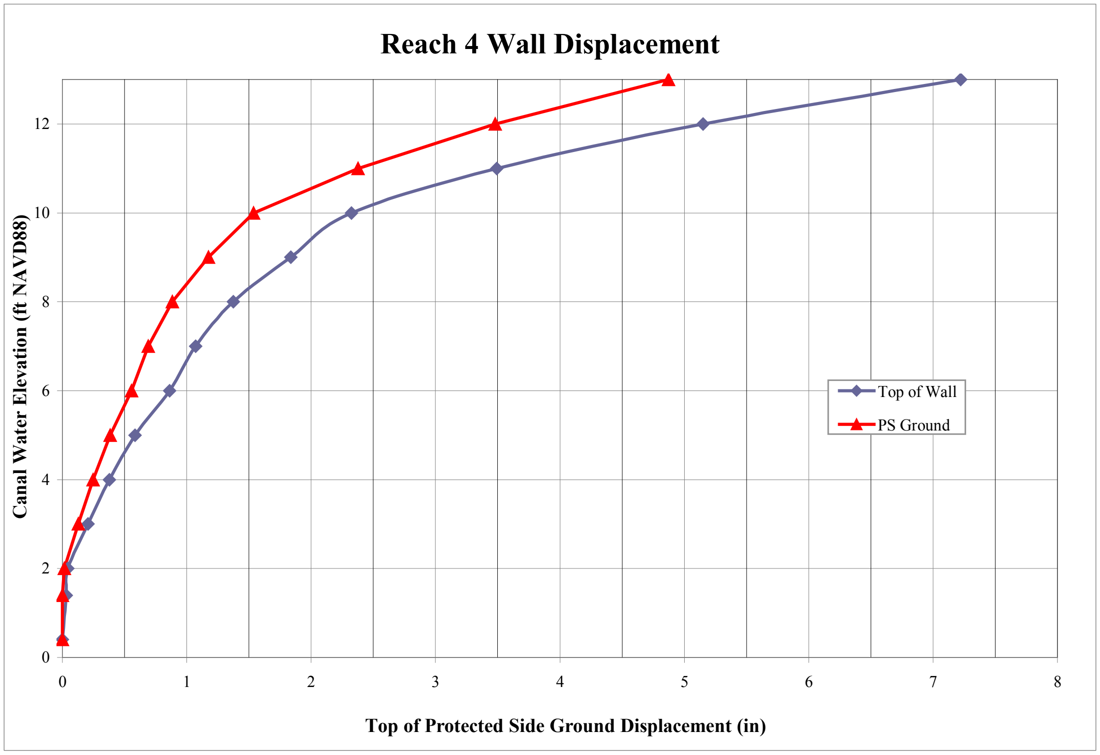


Figure 13. FLAC computed I-wall displacement, Reach 4.

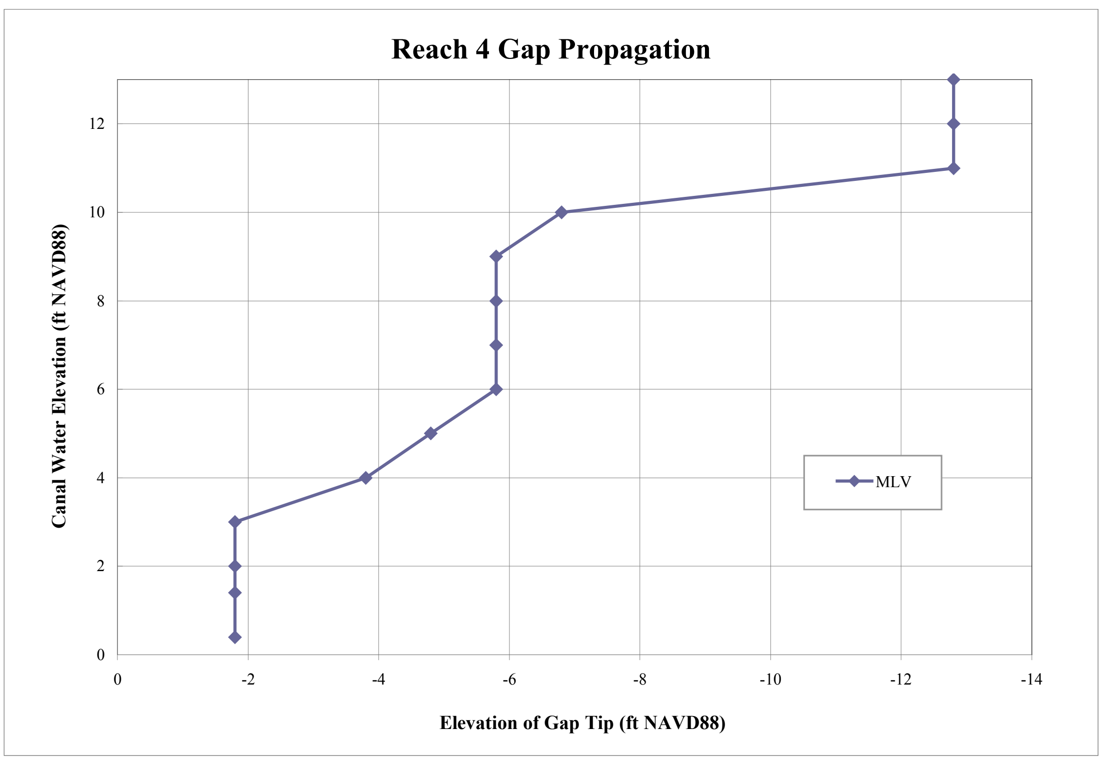


Figure 14. FLAC computed gap propagation, Reach 4.

The automated c-ϕ reduction technique in FLAC could was used in this reach. The automated c-ϕ reported a factor of safety of 1.97 for a canal water level EL +8.0 (gap depth of 4 feet). Figure 15 presents the shear strain increments, grid and wall displacements for automated c-ϕ reduction technique in FLAC for a canal water level EL +8.0. The mechanism of failure for the I-wall is depicted in Figure 15 as rotational/bending of the I-wall.

In this reach, the sheetpile is embedded 16 ft into a relatively stiff beach sand layer. The failure mechanism is bending of the I-wall at the marsh/beach sand interface. Therefore, a manual strength reduction approach was used similar to Reach 2 to further evaluate the behavior of the I-wall. This method was performed by reducing the shear strengths of the soil and interface along the I-wall in 10% increments until the protected side ground displacement exceeded three inches or a solution could not be obtained in FLAC.

The top of wall and protected side ground displacements were plotted versus the strength reduction factor (SRF). The elastic limit of I-wall/levee was determined by projecting the initial and ending slope of the top of wall displacement versus SRF curve. The initial slope of the curve represents a linear elastic dominated response of the I-wall/levee. The ending slope of the curve represents a plastic dominated response of the I-wall/levee. However, as shown in Figure 16, the transition between the initial and ending slopes is gradual and not sharply defined. This is due to both elastic and plastic responses occurring within the model (between an SRF of 1.2 to 1.6). The intersection of the two slope projections (occurs at SRF of 1.52) is intended to represent the SFR where behavior transitions from an elastic dominated response to a plastic dominated response. The intent is for the I-wall/levee behavior to stay within the elastic range to prevent permanent plastic deformations during loading.

At canal water level EL +8.0 and gap depth predicted in FLAC, the SRF was increased in 0.10 increments from 1.0 to 1.95. However, the model would not converge with a SRF of 1.95. Figure 16 represents the strength reduction factor versus displacements for canal water level of EL +8.0. The protected side ground displacements at a SRF of 1.52 are less than 1.5 inches.

At canal water level EL +10.0, the SRF was increased in 0.10 increments from 1.0 to 1.61. However, the model would not converge with a SRF of 1.61. Figure 17 presents the shear strain increments, grid and wall displacements for SRF of 1.61. The mechanism of failure for the I-wall is depicted in Figure 17 as rotational/bending of the I-wall. Figure 18 presents the strength reduction factor versus displacements for canal water level of EL +10.0. The elastic limit was determined to occur at a SRF of 1.38 for canal water level EL +10.0. The protected side ground displacements at this factor of safety are around 2.1 inches.

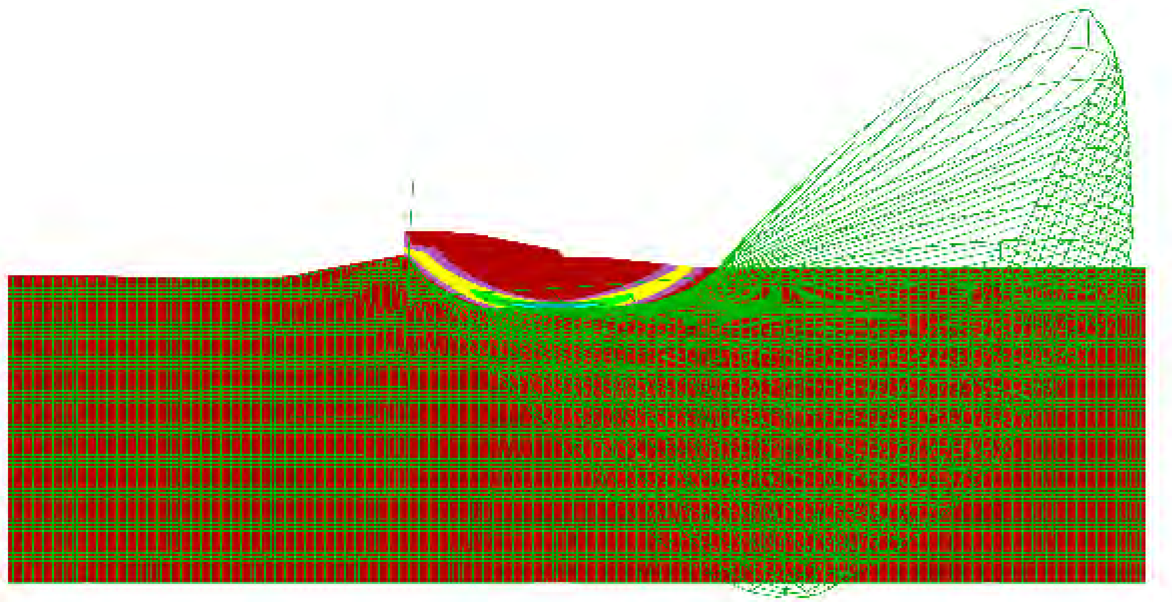


Figure 15. WL+8 ft, FoS= 1.97, ssi and wall displacement magnified 5X, Reach 4.

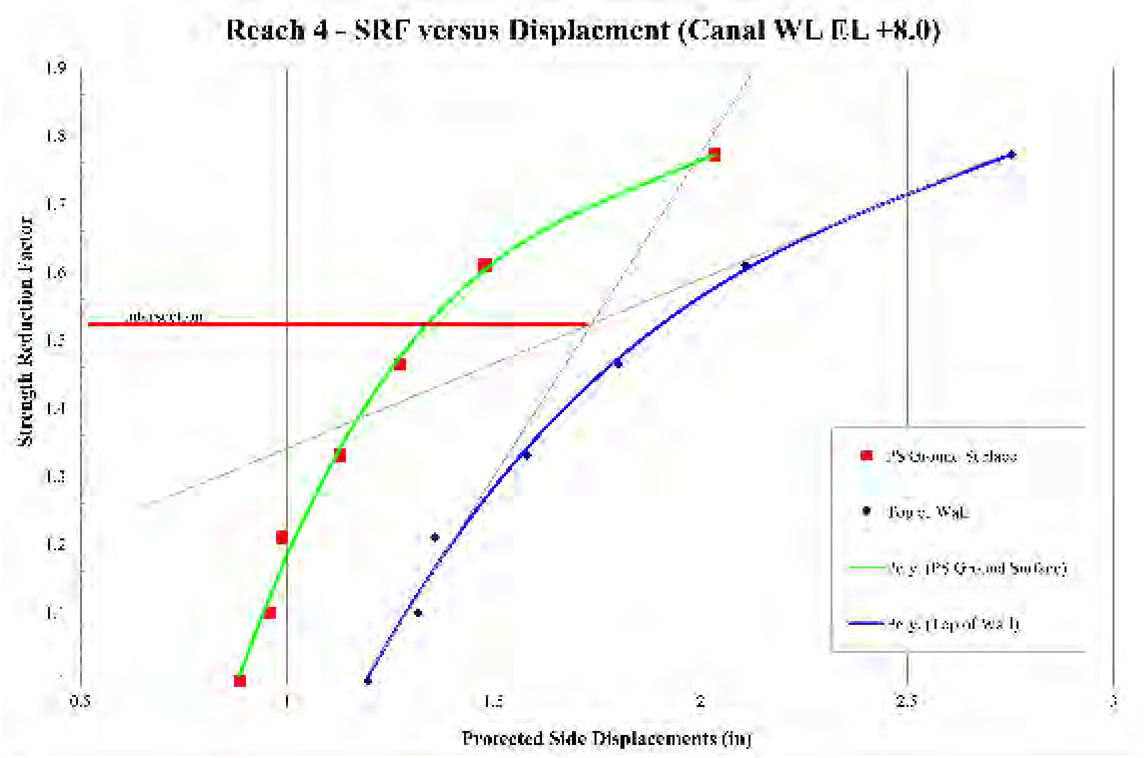


Figure 16. SRF versus Displacements (Canal WL EL +8.0), Reach 4.

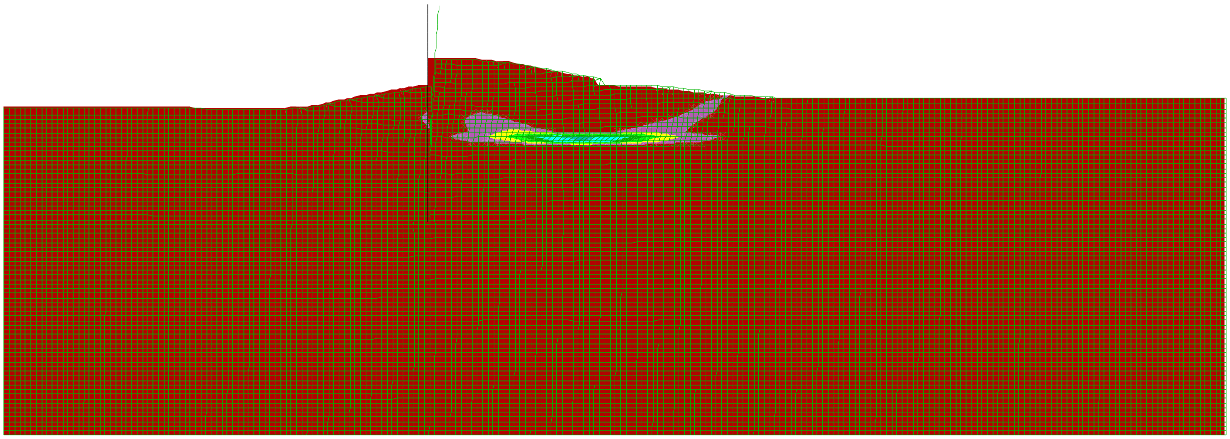


Figure 17. WL+10 ft, SRF = 1.61, ssi and wall displacement magnified 5X, Reach 4.

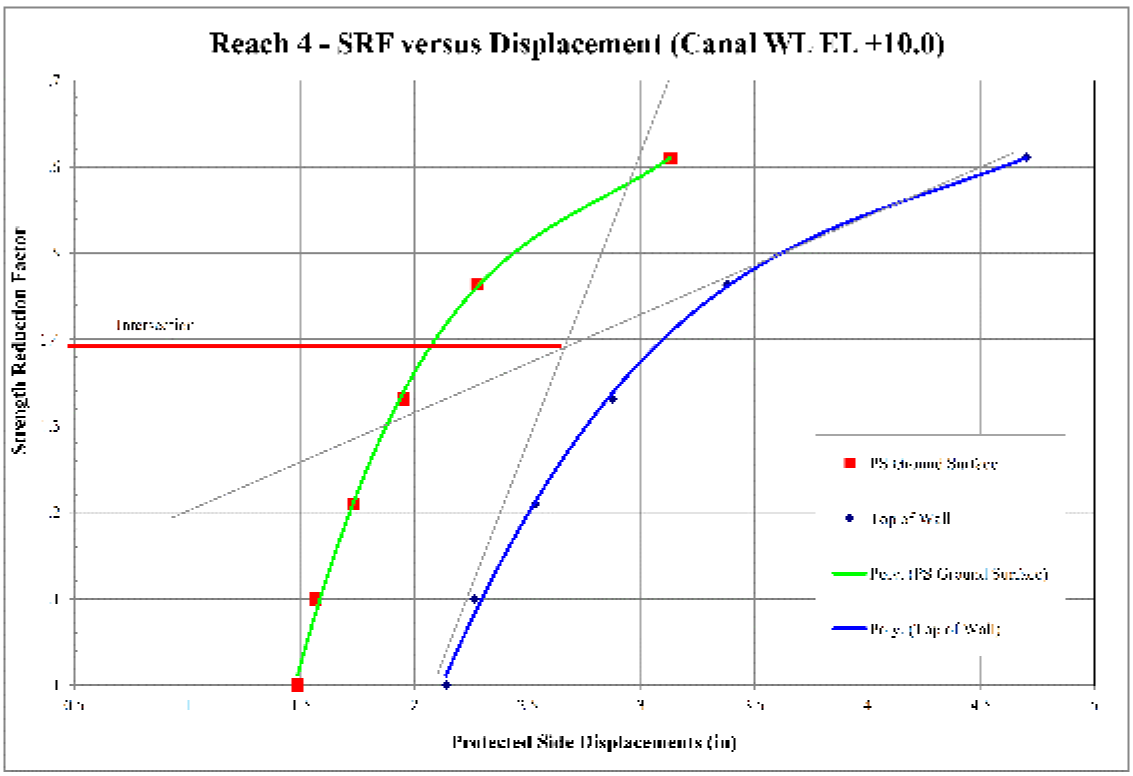


Figure 18. SRF versus Displacements (Canal WL EL +10.0), Reach 4.

Reach 8

Introduction

In the 2011 MOWL Black and Veatch Report, the displacements of the T-wall along Reach 8 were estimated using GROUP 7 (version 7.0.7) to be about 1.6 inches at a canal water level of EL +8.0 ft. The report recommended a finite element analysis of the reach be conducted to further define the deflection of the T-wall. The following report summarizes the soil structure interaction analysis of the Reach 8 T-wall using FLAC 2D (V 7.0).

Orleans Canal Reach 8 consists of a concrete T-wall, battered prestressed precast concrete piles on both the flood side and protected side, and a PZ27 sheet pile. The T-wall was constructed to replace an existing I-wall in 1994 under Contract DACW29-95-B-0035 (Orleans Avenue Outfall Canal Parallel Protection Phase II-C (West Side) Floodwall). The top of wall elevation is approximately EL 12.5 ft. The concrete precast piles are 14 inches by 14 inches in size, battered on a 2V to 1H slope, and have a tip elevation of EL -71.5 ft (see Figure 20 for pile details). A PZ 27 sheet pile with a top elevation of EL -4.75 ft and a tip elevation of EL -34.0 ft is located beneath the T-wall. A cross section for the T-wall from the construction drawings is provided in Figure 19.

The soil conditions along this reach consist of the following: embankment fill (EL +2.8 ft to EL -8.0 ft), underlain by a Marsh deposit (EL -8.0 ft to EL -16.0 ft), underlain by a Lacustrine Clay stratum (EL -16.0 ft to –31.0 ft) which mantles a lower Beach Sand deposit located at EL. -31.0 feet to -41.0 ft. Beneath the Beach Sand stratum lays a Bay Sound Clay layer that extends to an EL -70.0 ft. The Geo-Studio (SLOPE/W) and FLAC model cross section for this reach is provided in Figure 21 and Figure 22 respectively.

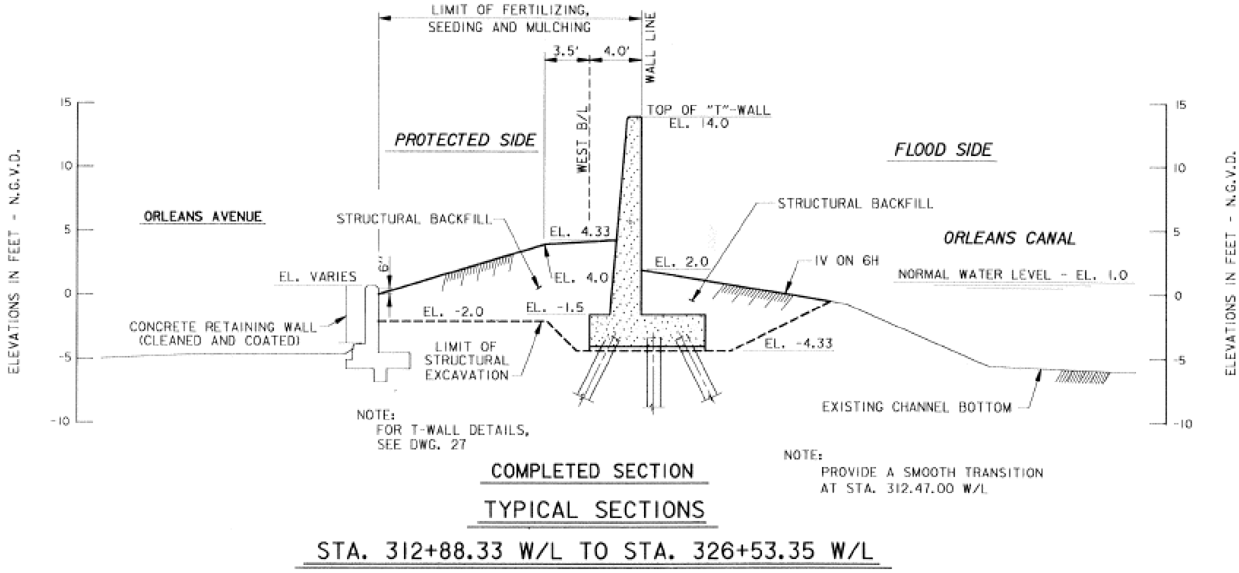
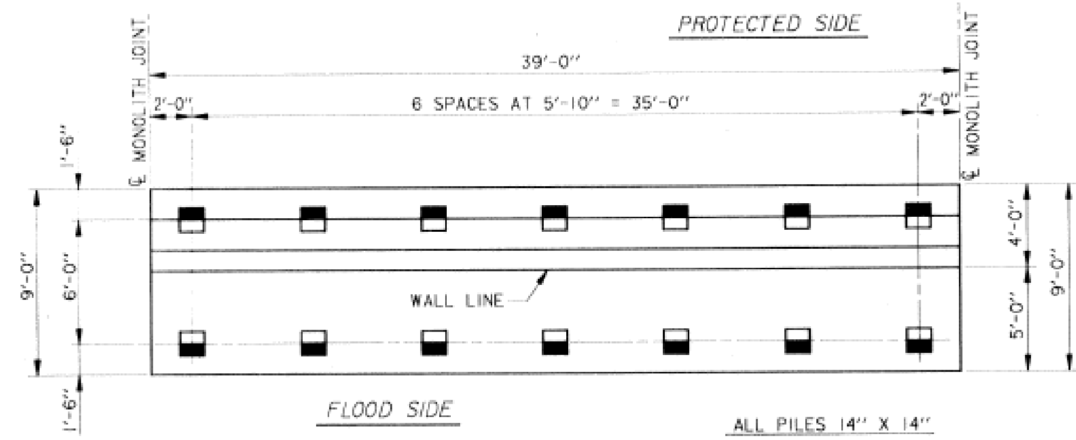


Figure 19. Construction Drawing Orleans Avenue Canal Reach 8 - Typical Cross Section. (Note: elevations shown should be corrected by -1.50 ft to covert to NAVD88).



PILE SCHEDULE								
W/L STATIONS	PILE SIZE	NUMBER OF PILES	PILE BATTER	PILE TIP ELEVATION	PAYMENT LENGTH		MAXIMUM JETTING PRESSURE	
					PROTECTED SIDE	FLOOD SIDE	EL. TO APPROX. EL.	APPROX. EL. TO EL.
100+40.26 TO 103+52.32	14"x14"	56	2V ON 1H	-64.0	—	68'-0"	30 PSI -6.5 TO -20	-20 150 PSI ~~-10~~ TO -44
		56	2V ON 1H	-64.0	68'-0"	—		
200+31.28 TO 207+33.32	14"x14"	126	2V ON 1H	-64.0	—	68'-0"	30 PSI -6.5 TO -20	-20 150 PSI ~~-13~~ TO -45
		126	2V ON 1H	-64.0	68'-0"	—		
300+00.00 TO 302+74.33	14"x14"	49	2V ON 1H	-64.0	—	68'-0"	30 PSI -6.5 TO -20	-20 150 PSI ~~-12~~ TO -45
		49	2V ON 1H	-64.0	68'-0"	—		
302+74.33 TO 317+95.33	14"x14"	273	2V ON 1H	-70.0	—	74'-9"	30 PSI -6.5 TO -20	150 PSI -10 TO -42
		273	2V ON 1H	-70.0	74'-9"	—		
317+95.33 TO 326+53.37	14"x14"	154	2V ON 1H	-70.0	—	74'-9"	30 ~~20~~ PSI -6.5 TO -23	150 PSI -23 TO -42
		154	2V ON 1H	-70.0	74'-9"	—		

Figure 20. Construction Drawing Orleans Avenue Canal Reach 8 – Pile Spacing and Pile Schedule. (Reach 8 highlighted in green and elevations shown should be corrected by -1.50 ft to covert to NAVD88).

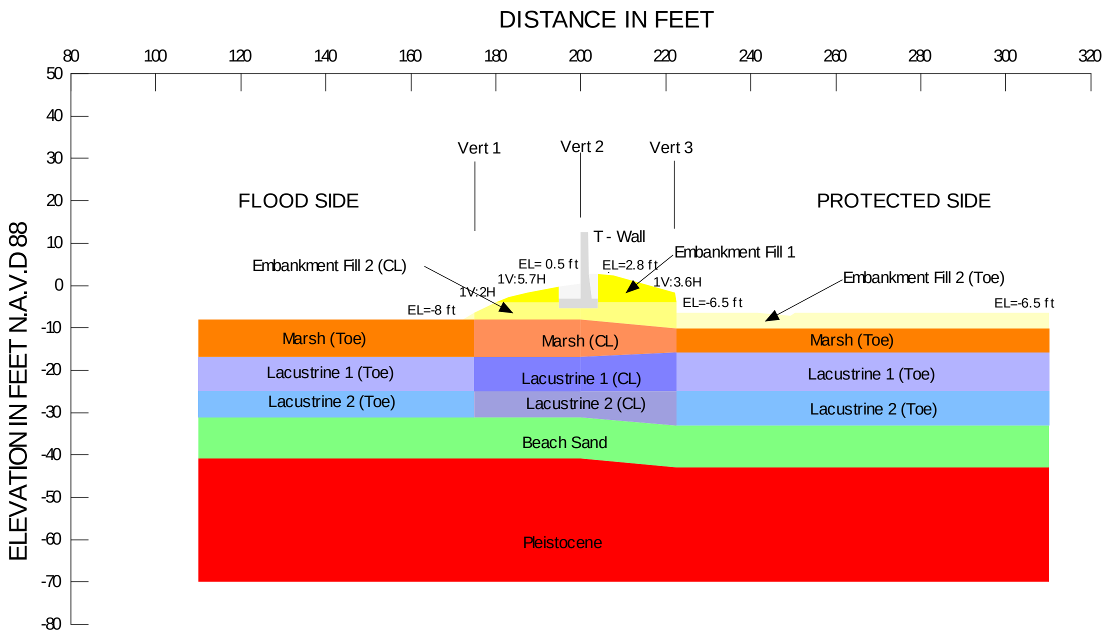


Figure 21. Reach 8 SLOPE/W Model Cross Section.

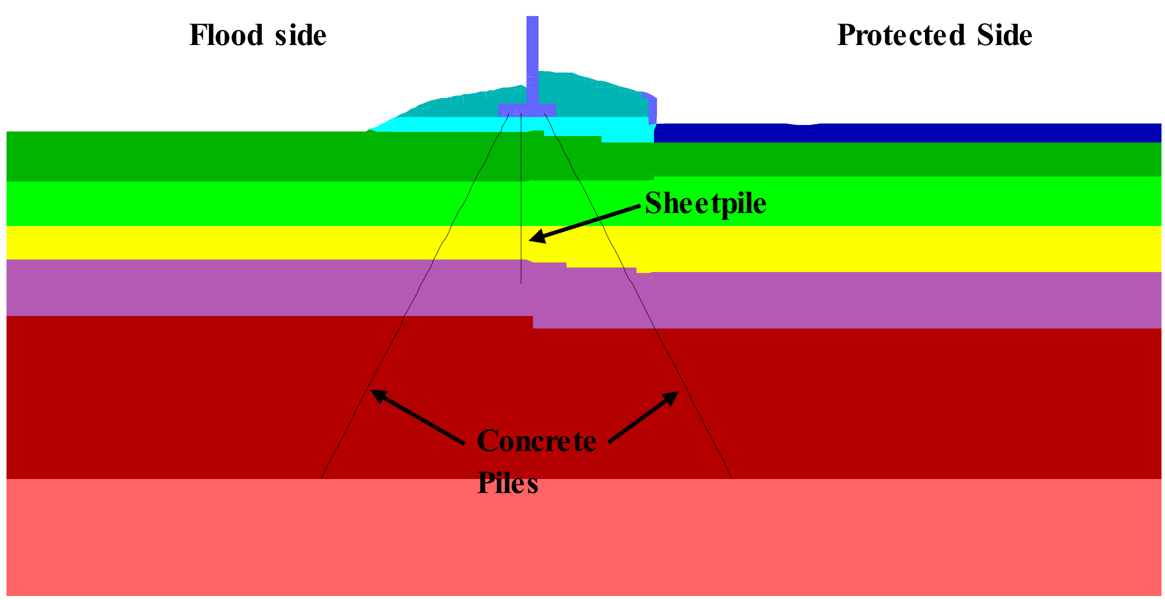


Figure 22. Reach 8 FLAC Model Cross Section.

Soil Properties

The FLAC analyses are based on simple Mohr-Coulomb constitutive models (linear elastic-perfectly plastic soil behavior). Unit weight and shear strength parameters for the various soil layers were based on the Maximum Operating Water Level by Black and Veatch. Soil modulus values were determined or selected assuming the soils are linearly elastic and isotropic with Poisson's ratio based on expected drainage conditions during loading. The parameters used for analysis are presented in Table 13 thru Table 17. The soil modulus values were selected using the same G/Su ratios selected for the FLAC models used in this appendix. The G/Su ratios were calibrated to the London Load Test (LLT) results. The soil modulus values used in the LLT FLAC model were primarily based on pressuremeter testing and relationships for G/Su. At London Avenue Canal, the shear modulus values were determined by multiplying the G/Su ratio for a given soil by its undrained shear strength. Young's Modulus for the levee and sand were assigned the same value used in the LLT calibration. The at-rest earth pressure coefficients are computed only to initialize stresses during model development so equilibrium can be reached in fewer computational steps.

Table 13. Summary of Centerline Soil Parameters, Reach 8.

Material	Strata top elevation (NAVD88)	Strata bottom elevation (NAVD88)	unit wt. (pcf)	unit wt/g	Su (psf)	ϕ' (deg)
1 – Concrete	12.5	-5.5	150	4.658	Elastic	Elastic
2 – Embankment	2.8	-4.0	109	3.385	600	0
3 – Embankment	-4.0	-10.0	96	2.981	340	0
4 – Marsh	-10.0	-16.0	82	2.547	200	0
5 – Lacustrine 1	-16.0	-25.0	103	3.199	200	0
6 – Lacustrine 2	-25.0	-33.0	103	3.199	286 (8	0
7 – Beach Sand	-33.0	-41.0	122	3.789	0	33
8 – Bay Sound Clay	-41.0	-70.0	105	3.261	500 (9.3	0
9 – Pleistocene	-70.0	-90.0	114	3.540	770 (24	0

Table 14. Centerline Most Likely Value Modulus, Reach 8.

Material	E/Su	E (psf)	Poisson	G (psf)	K (psf)	ko
1 – Concrete	N/A			1.84E+08	3.07E+08	
2 – Embankment	350	2.10E+05	0.40	7.50E+04	3.50E+05	0.67
3 – Embankment	350	1.19E+05	0.47	4.05E+04	6.61E+05	0.89
4 – Marsh	200	4.00E+04	0.47	1.36E+04	2.22E+05	0.89
5 – Lacustrine 1	300	6.00E+04	0.47	2.04E+04	3.33E+05	0.89
6 – Lacustrine 2	300	8.58E+04	0.47	2.92E+04	4.77E+05	0.89
7 – Beach Sand		8.22E+05	0.31	3.13E+05	7.32+05	0.46
8 – Bay Sound Clay	600	3.00E+05	0.47	1.02E+05	1.67E+06	0.89
9 – Pleistocene	600	4.62E+05	0.47	1.57E+05	2.57E+06	0.89
Notes: For layers with increasing shear strength with depth, the modulus values presented represent the values for the top of the layer.						

Table 15. Summary of Toe Soil Parameters, Reach 8.

Material	Strata top elevation (NAVD88)	Strata bottom elevation (NAVD88)	unit wt. (pcf)	unit wt/g	Su (psf)	ϕ' (deg)
1 – Concrete						
2 – Embankment						
3 – Embankment	-6.5	-10.0	96	2.981	340	0
4 – Marsh	-10.0	-17.0	81	2.516	175	0
5 – Lacustrine 1	-17.0	-25.0	101	3.137	200	0
6 – Lacustrine 2	-25.0	-33.0	111	3.447	200 (10	0
7 – Beach Sand	-33.0	-41.0	122	3.789	0	33
8 – Bay Sound Clay	-41.0	-70.0	105	3.261	500 (9.3	0
9 – Pleistocene	-70.0	-90.0	114	3.540	770 (24	0

Table 16. Toe Most Likely Value Modulus, Reach 8.

Material	E/Su	E (psf)	Poisson	G (psf)	K (psf)	ko
1 – Concrete						
2 – Embankment						
3 – Embankment	350	1.19E+05	0.47	4.05E+04	6.61E+05	0.89
4 – Marsh	200	3.50E+04	0.47	1.19E+04	1.94E+05	0.89
5 – Lacustrine 1	300	6.00E+04	0.47	2.04E+04	3.33E+05	0.89
6 – Lacustrine 2	300	6.00E+04	0.47	2.04E+04	3.33E+05	0.89
7 – Beach Sand		8.22E+05	0.31	3.13E+05	7.32+05	0.46
8 – Bay Sound Clay	600	3.00E+05	0.47	1.02E+05	1.67E+06	0.89
9 – Pleistocene	600	4.62E+05	0.47	1.57E+05	2.57E+06	0.89
Notes: For layers with increasing shear strength with depth, the modulus values presented represent the values for the top of the layer.						

At Orleans Outfall Canal, seepage conditions were modeled as steady state using the Seep/W model, and previously accepted material seepage properties and protected side boundary conditions, from the MOWL report. The flood side canal total head boundary was incrementally raised from a starting water level of EL +0.4 ft to EL +1.0 ft and then by 1 ft. The water table was assumed to be constant for the protected side two feet below the ground surface giving an elevation of -8.5 ft and 8.0 ft for the flood side.

Structural Parameters

Sheet-pile and precast piles are modeled as two different types of structural elements in the FLAC model. The sheet-pile is modeled as a beam element, which is directly attached to the mesh. Beam elements require density, modulus of elasticity, cross-sectional area, and moment of inertia. The precast piles are modeled as pile elements, which are attached to the mesh with springs. The top of precast piles are pinned and embedded 0.75' in the concrete, which allows for some moment capacity. In addition to the properties required for beam elements, pile elements require both normal and longitudinal spring properties. These spring properties include both stiffness and a limit value, beyond which perfectly plastic deformation occurs. Precast concrete piles are 14 inches by 14 inches in size. Sheet pile is PZ-27. Pile properties are shown in Table 17.

Table 17. Pile properties, Reach 8.

Pile Type	Size	wt. (pcf)	E (psi)	Area (in^2)	I (in^2)	Perimeter (ft)	Spacing (ft)
Prestressed Precast Concrete Pile	14" by 14" square	150	4.03E +06	3.20E +03	904.1	4.67	5.83
Sheet pile	PZ-27	735	4.59E +09	7.94	184.2	n/a	n/a

Based on the construction drawings, the prestressed precast concrete piles were installed via jetting. It was assumed that the sheet pile was installed by vibratory hammer (driving).

Spring cohesion and stiffness are determined in a similar manner used by GeoMatrix in their FLAC analysis of an example pile founded T-Wall for New Orleans. Axial capacities are determined from EM 1110-2-2906 and are input as shear cohesion, cs_scoh. The displacement required to develop full axial capacity is assumed to be 1% of pile diameter for clays and 3% of pile diameter for sand. The axial capacity and the displacement required to achieve that capacity are used to calculate the shear stiffness, cs_stiff. Lateral pile spring capacity is assumed to be 9 times the average cohesion times the width of the pile, and input into the program as cs_ncoh. Lateral pile spring stiffness is determined from ½ the lateral spring cohesion and the displacement required to develop that value, y_{50}. The calculated P-y curve for the sand is provided in Figure 23. The P-y curve was determined from the equations shown in Table 19. This displacement is estimated from an e_{50} value, for which typical values can be found in the literature. The e_{50} value used in the FLAC is assumed to be the inverse of the E/Su ratio, as was done in the GMX report.

The spring properties vary with soil type. Table 18 summarizes the spring properties used for the precast piles in clays. As noted previously, the pile end bearing was accounted by increasing the pile spring shear cohesion for the last foot of pile shear to 9 times cohesion (cohesion of the soil at the pile tip). Table 19 summarizes the spring properties used for precast piles in sand. The spring values for the sand were determine using equations by the American Petroleum Institute for recommended practice (RP2A) on p-y curves for sands. Ensoft's user manual for Group 7 was used to determine the input parameters for the equations. The equations are provided in the notes for the tables.

Model Loading Conditions

The T-wall model was constructed in steps in order to approximate the initial conditions prior to raising the canal water level. Once the T-wall with piles was in place, the canal water level was increased in I ft increments to EL +12.0. The FLAC model progression for reach 8 is presented in Figure 24. A summary of the model progression is presented below:

1. Pre T-wall Stress Conditions (intstep1.sav): Only the foundation layers (the marsh layer and underlying layers) were placed to determine the initial stress conditions. The water table conditions assumed were EL -10.0 ft on both the flood side and protected side. Initial stress conditions were determined by assigning Ko values of 0.89 to the frictionless materials ($\varphi = 0$) and 0.46 to the frictional materials (cohesion = 0) and calculating the total stress. All materials were given a cohesion and tension strength of 1E+10 psf to prevent unrealistic plastic strains from developing. Pore pressure corrections were made in the beach sand layer based on the assumed water table. The pore pressure corrections consist of correcting the total stress in the beach sand layer by subtracting the pore pressure. The model was solved to determine stresses.

2. Water Table Corrections (intstep2.sav): Pore pressure corrections were made again in the beach sand layer based on the assumed water table. The pore pressure corrections consist of correcting the total stress in the beach sand layer by subtracting the pore pressure. The model was solved to determine stresses.

3. Add Embankment Fill (intstep3.sav): The embankment fill 2 material below the T-wall base was placed. All materials were given a cohesion and tension strength of 1E+10 psf to prevent unrealistic plastic strains from developing. The model was solved to determine stresses.

4. Add T-wall (intstep4.sav): T-wall concrete stem and embankment fill material above the T-wall base was placed. All materials were given a cohesion and tension strength of 1E+10 psf to prevent unrealistic plastic strains from developing. The water table was raised to EL -8.5 and a mechanical pressure was added to the flood side ground surface equal to a canal water level of EL +0.4. Pore pressure corrections were made again in the beach sand layer based on the assumed water table. The model was solved to determine stresses.

5. Add T-wall Piles (piles.sav): T-wall precast piles and sheet pile was installed. The model was solved to determine stresses.

6. Assign Realistic Material Properties (Realmat.sav): All materials were assigned the correct properties of cohesion and tension. The water table was held at EL -8.5 and a mechanical pressure was added to the flood side ground surface equal to a canal water level of EL +0.4. Pore pressure corrections were made again in the beach sand layer based on the assumed water table. The model was solved to determine stresses.

7. Increase Canal Water Level (WL1p4.sav to WL 12.sav): The canal water level was raised in 1 ft increments to EL +12.0. The water table was adjusted based on results from SEEP/W analysis. Mechanical pressure was added to the flood side ground surface equal

to a canal water level. Pore pressure corrections were made again in the beach sand layer based on the assumed water table. The model was solved to determine stresses.

Table 18. Pile spring values used in FLAC model for clays, Reach 8.

Layer	Elevation	Average Cohesion (psf)	Alpha	G/Su	E50/Su	e50	y50	cs_nstiff (psf)	cs_ncoh (psf)	cs_sstiff (psf)	cs_scoh (psf)
Fill 2	-5.5 to -8	340	0.95	119.04	350	0.0029	8.33E-03	214200	3570	129200	1587
Marsh	-8 to -17	187.5	0.95	68	200	0.0050	1.46E-02	67500	1969	71250	875
Lacustrine 1	-17 to -25	221.5	0.95	102	300	0.0033	9.72E-03	119610	2326	84170	1034
Lacustrine 2	-25 to -31	279	0.95	102	300	0.0033	9.72E-03	150660	2930	106020	1302
Baysound Clay	-41 to -55.5	567.5	0.95	204	600	0.0020	5.83E-03	510750	5959	215650	2648
Baysound Clay	-55.5 to -69.0	702.5	0.95	204	600	0.0020	5.83E-03	632250	7376	266950	3278
Baysound Clay*	-69.0 to -70.0	770	0.95	204	600	0.0020	5.83E-03	693000	8085	292600	10523

*** Notes**: End bearing added to shear cohesion as 9c

Equations:

e50 = (E50 / Su) ^-1

y50 = 2.5 * e50 * B

cs_nstiff = (9 * c * B) / (2 * y50)

cs_ncoh = 9 * c * B

cs_stiff = 400 * c * Alpha

cs_scoh = 4 * c * B

Table 19. Pile spring values used in FLAC model for sand, Reach 8.

Layer	Elevation	P_{ud} (psf)	y50 (ft)	0.5 Pu	cs_nstiff (psf)	cs_ncoh (psf)	cs_sstiff (psf)	cs_scoh (psf)
Sand	-31 to -41	3992	0.011	1996	182840	1996	330494	3856

Equations:

P_{ud} = C3 * B * x * (Submerged Unit Weight)

P-y curve…..P = A * Pu * tanh (K * x * y /(A * Pu))

Variables: C3 = 42, x = 312 inches, B = 14 inches, Submerged Unit Weight = 37.6 pcf, K = 55 lb/in, A = 0.9

cs_nstiff = 0.5 Pu / y50

cs_ncoh = 0.5 Pu

cs_sstiff = [K *sigma' * tan (delta * phi)] * [4* B]

cs_scoh = 100 * cs_sstiff / B

Variables: K = 1.25, delta = 0.95, Phi = 33 degrees, sigma' = 1085 psf (at sand mid depth)

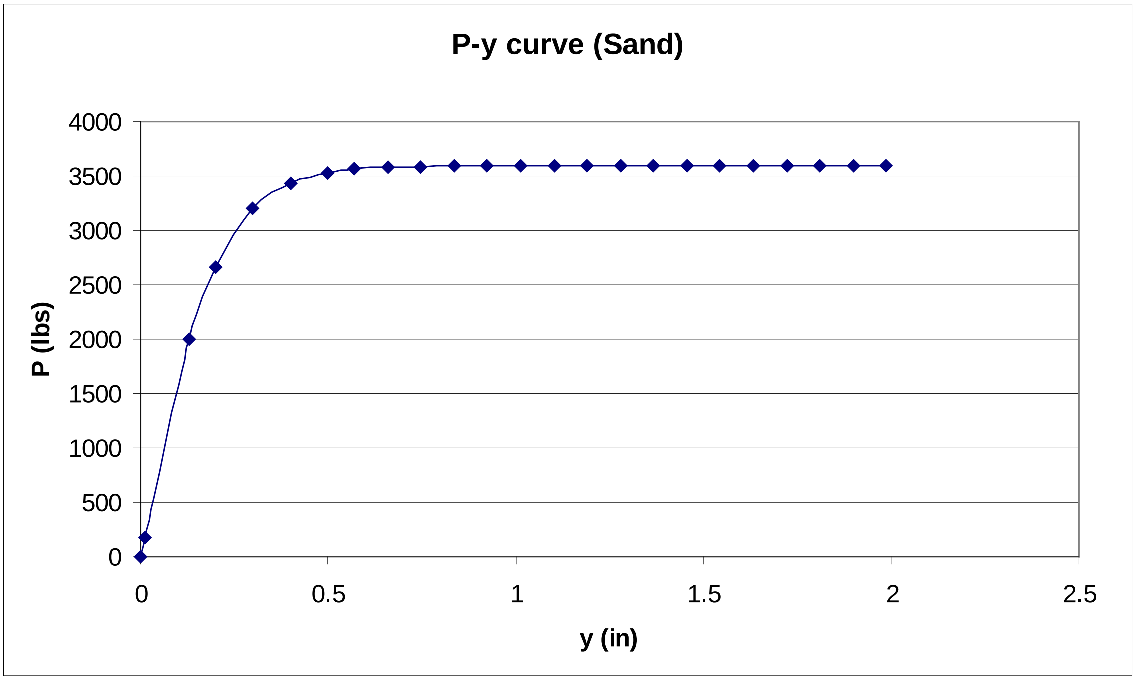


Figure 23. Calculated P-y curve for sand to determine y50, Reach 8.

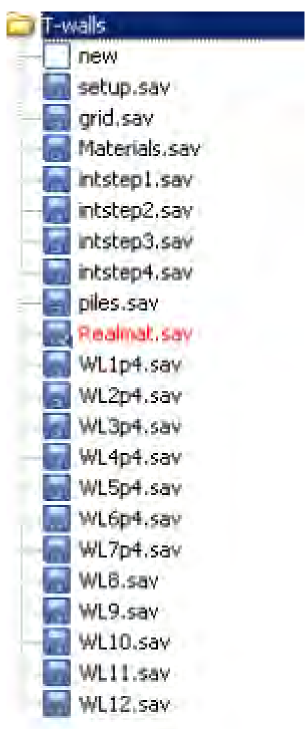


Figure 24. FLAC model progression of water loading and gap development for Reach 8.

Results

The FLAC model estimated T-wall displacements are less than the values estimated in the Black and Veatch report. Figure 25 shows the displacements of the FLAC model versus canal water level. The results from the FLAC model indicate that the top of wall displacements and protected side ground displacements are 0.96 inches and 0.75 inches respectively for a canal water level of EL +8.0. At a canal water level of EL +7.4, the top of wall displacement is 0.70 inches which is less than the 0.75 inch recommended allowable. Figure 26 shows the model displacements magnified by 15 and the shear strain increment at a canal water level of EL +8.0. However, the wall displacements become excessive at a canal water level of EL +12.0 with a top of wall displacement of 4.8 inches. Figure 27 shows the rotation of the T-wall when loaded to EL +12.0.

The maximum and minimum values indicate that the pile loads are within the allowable for the pile given its design. These maximum and minimum values are summarized in Table 20 for the flood side pile, Table 21 for the protected side pile, and Table 22 for the sheet pile. For the concrete precast piles, the design combined service axial load and moment is 150 kips and 50 kip-feet. For the sheet pile, the design elastic yield moment is 90 kip-feet per ft.

Figure 28 through Figure 32 present the pile displacements, shear forces, axial loads, moments, and strains. As shown on Figure 29 and Figure 31, the sheet pile moment and shear forces are higher per 5 ft 10 inch (precast concrete pile spacing) than the precast concrete piles. The precast concrete piles carry the load axially. The protected side concrete pile has the largest axial loads (in compression) and the flood side concrete pile is in tension at the higher canal water levels.

Table 20. Maximum and Minimum displacements, forces, and strain for the Flood side Precast Concrete Piles, Reach 8.

Water Level (EL +)		Displacement (ft)	Shear Force (kips)	Axial Load[1] (kips)	Moment (kip-ft)	Strain[2] (%)
+7.4	Min	0.012	-3.5	1.1	-10.3	-2.4E-02
	Max	0.076	2.0	32.4	18.6	-8.4E-04
+8.0	Min	0.013	-3.7	1.1	-11.7	-2.2E-02
	Max	0.085	2.2	29.9	19.8	-7.9E-04
+9.0	Min	0.016	-4.3	0.9	-14.1	-1.8E-02
	Max	0.104	2.5	23.8	23.0	-6.4E-04
+10.0	Min	0.018	-4.5	0.8	-15.2	-1.5E-02
	Max	0.116	2.6	20.9	23.9	-5.7E-04
+11.0	Min	0.021	-5.2	-3.6	-19.3	-1.0E-02
	Max	0.139	3.3	14.2	28.1	2.7E-03
+12.0	Min	0.023	-5.8	-10.0	-22.4	-6.6E-03
	Max	0.157	3.7	9.0	31.5	7.4E-03

Notes:
1 – Negative axial load represents tension
2 – Negative strain represents compression

Table 21. Maximum and Minimum displacements, forces, and strain for the Protected side Precast Concrete Piles, Reach 8.

Water Level (EL +)		Displacement (ft)	Shear Force (kips)	Axial Load[1] (kips)	Moment (kip-ft)	Strain[2] (%)
+7.4	Min	0.015	-1.0	3.2	-4.4	-6.9E-02
	Max	0.070	1.1	93.9	3.7	-2.4E-03
+8.0	Min	0.017	-1.1	3.4	-5.5	-7.2E-02
	Max	0.078	1.2	97.4	3.8	-2.5E-03
+9.0	Min	0.020	-1.3	3.8	-7.8	-7.7E-02
	Max	0.096	1.4	103.8	3.9	-2.8E-03
+10.0	Min	0.023	-1.4	4.1	-8.4	-8.0E-02
	Max	0.107	1.2	108.7	4.0	-3.0E-03
+11.0	Min	0.026	-1.7	4.6	-11.9	-8.6E-02
	Max	0.129	1.7	115.7	4.1	-3.4E-03
+12.0	Min	0.030	-1.9	5.1	-14.0	-9.0E-02
	Max	0.146	1.8	121.9	4.3	-3.7E-03

Notes:
1 – Negative axial load represents tension
2 – Negative strain represents compression

Table 22. Maximum and Minimum displacements, forces, and strain for the Sheet pile, Reach 8.

Water Level (EL +)		Displacement (ft)	Shear Force (kips/ft)	Axial Load[1] (kips/ft)	Moment (kip-ft/ft)	Strain[2] (%)
+7.4	Min	0.012	-5.5	0.3	-1.4	-1.1E-03
	Max	0.076	0.6	2.9	6.3	-1.1E-04
+8.0	Min	0.013	-6.5	0.3	-1.6	-1.2E-03
	Max	0.085	0.7	2.9	7.4	-1.3E-04
+9.0	Min	0.016	-8.7	0.2	-2.0	-1.1E-03
	Max	0.104	0.9	2.9	9.7	-7.7E-05
+10.0	Min	0.018	-10.2	0	-2.1	-1.2E-03
	Max	0.116	0.9	2.9	11.20	-1.1E-07
+11.0	Min	0.021	-12.7	-0.11	-2.2	-1.1E-03
	Max	0.139	1.1	2.8	13.9	4.5E-05
+12.0	Min	0.023	-14.9	-0.3	-2.2	-1.1E-03
	Max	0.157	1.2	2.7	16.0	1.2E-04
Notes:						

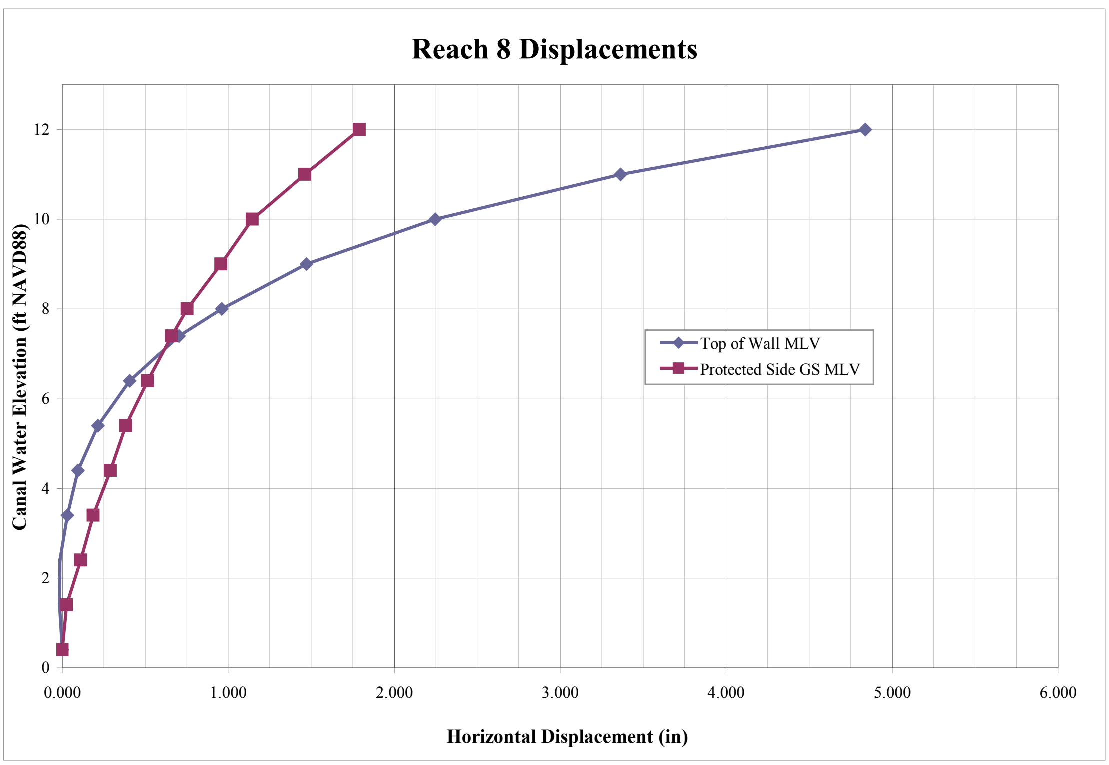


Figure 25. FLAC computed displacements, Reach 8.

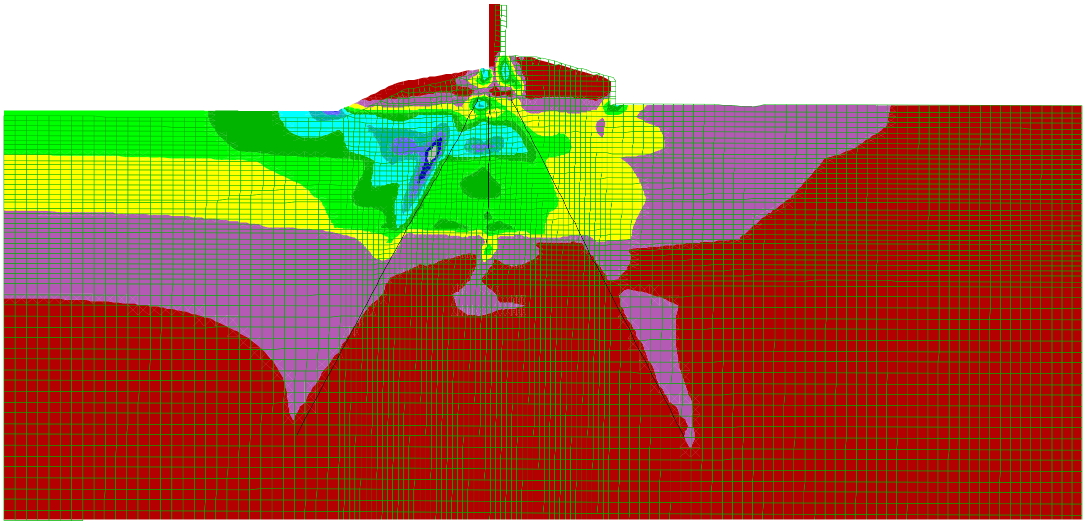


Figure 26. WL+8 ft, ssi and wall displacement magnified 15X, Reach 8.

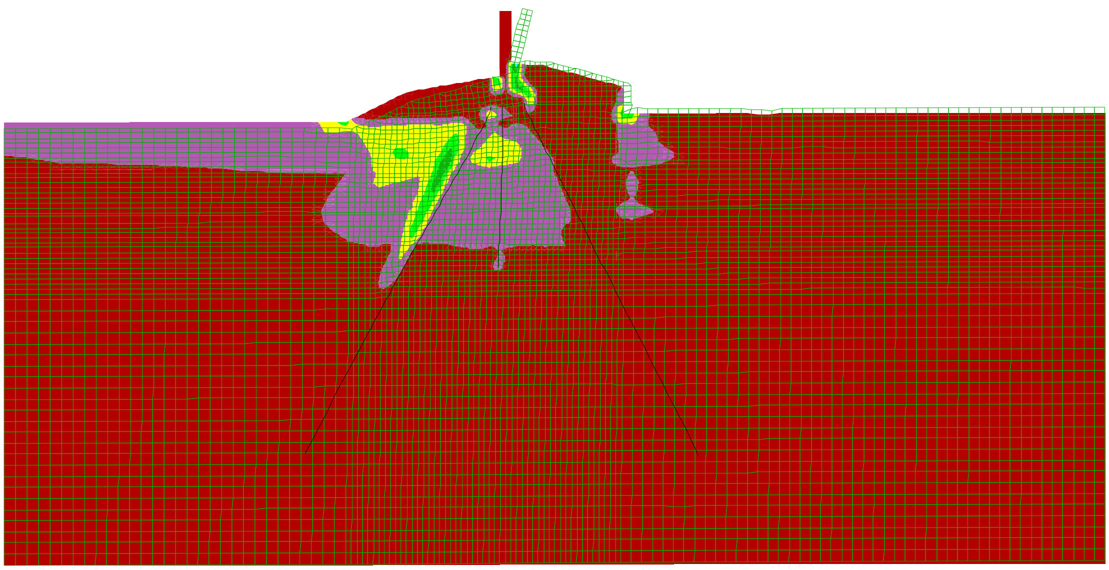


Figure 27. WL+12 ft, ssi and wall displacement magnified 10X, Reach 8.

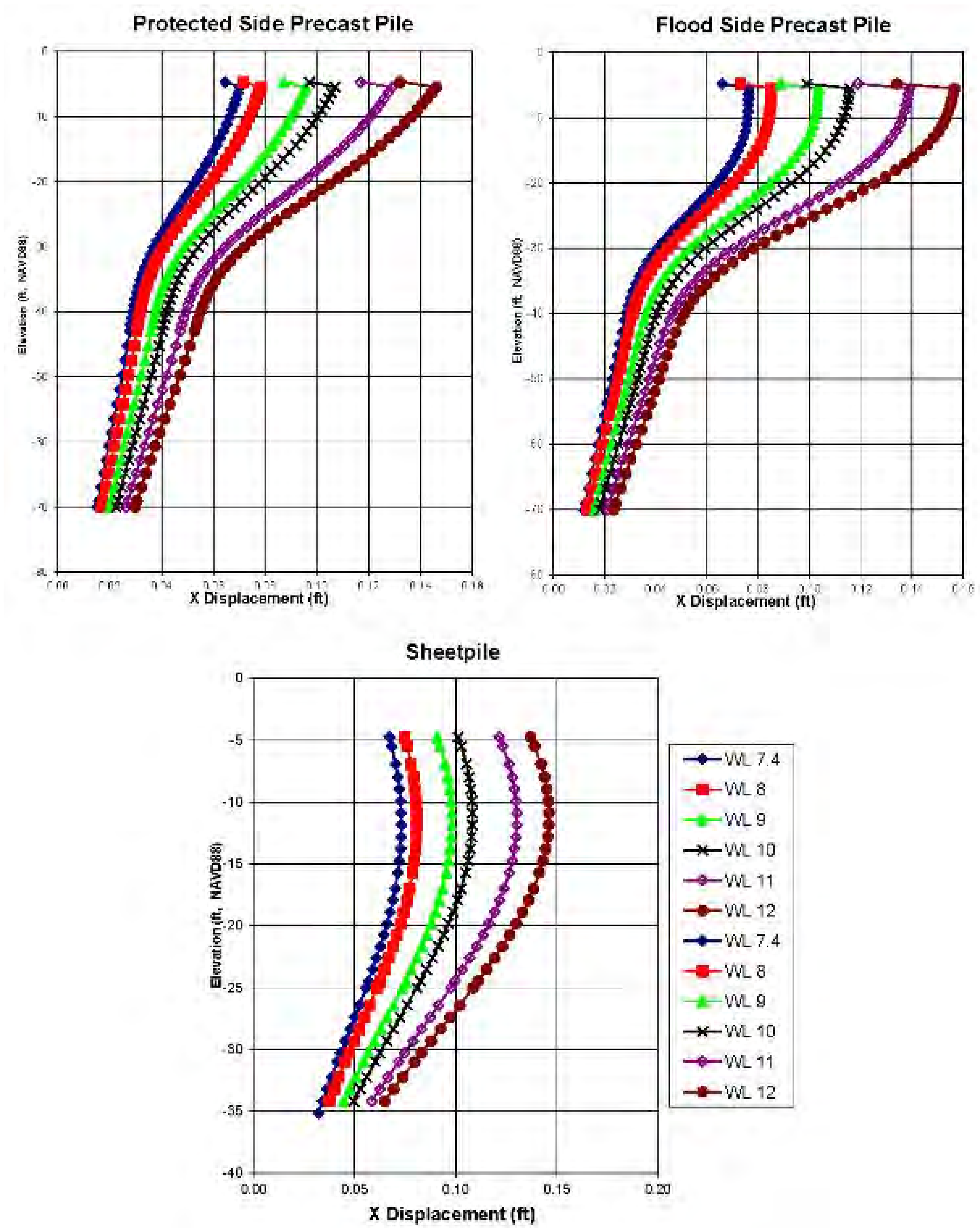


Figure 28. Pile displacements, Reach 8.

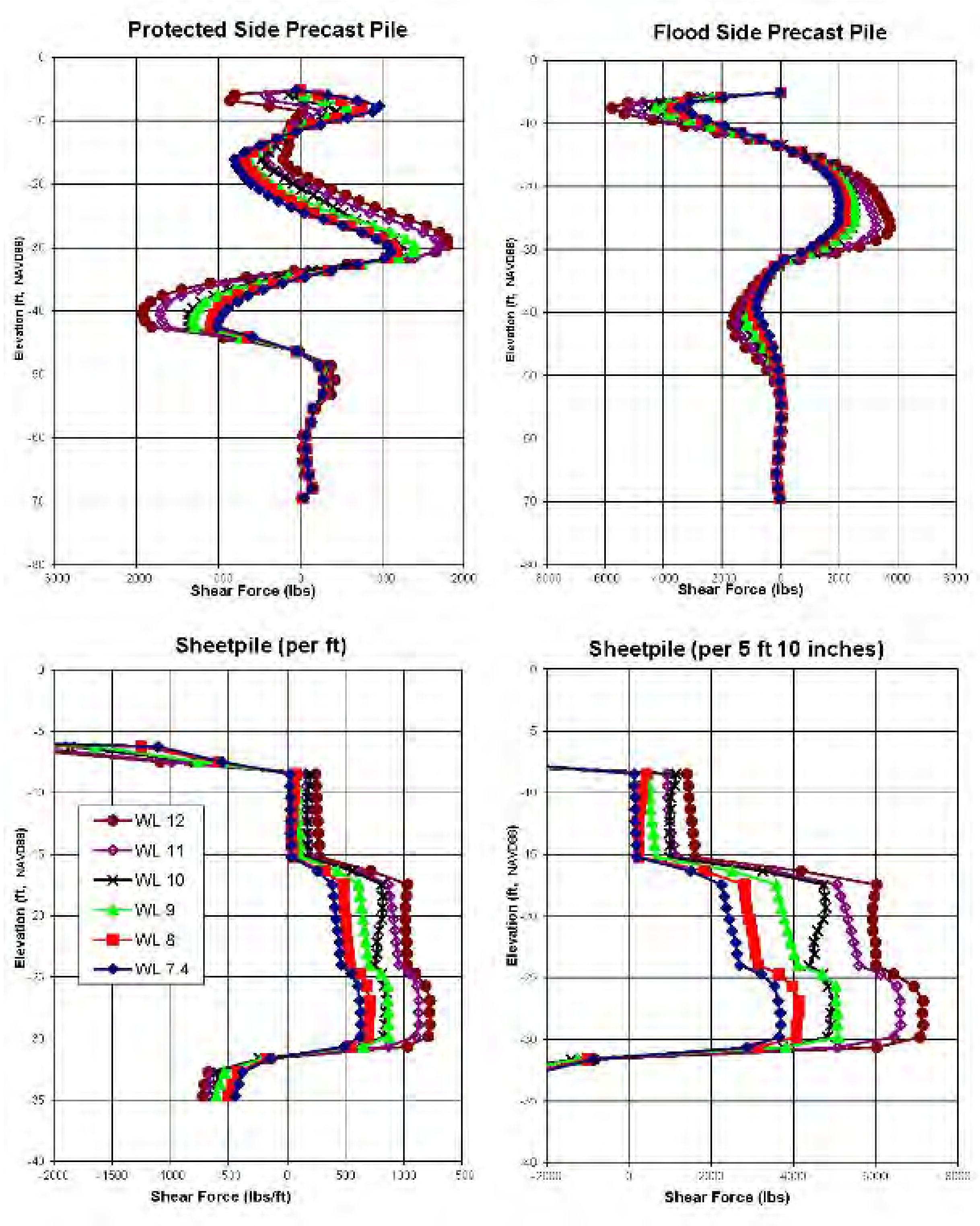


Figure 29. Pile shear, Reach 8.

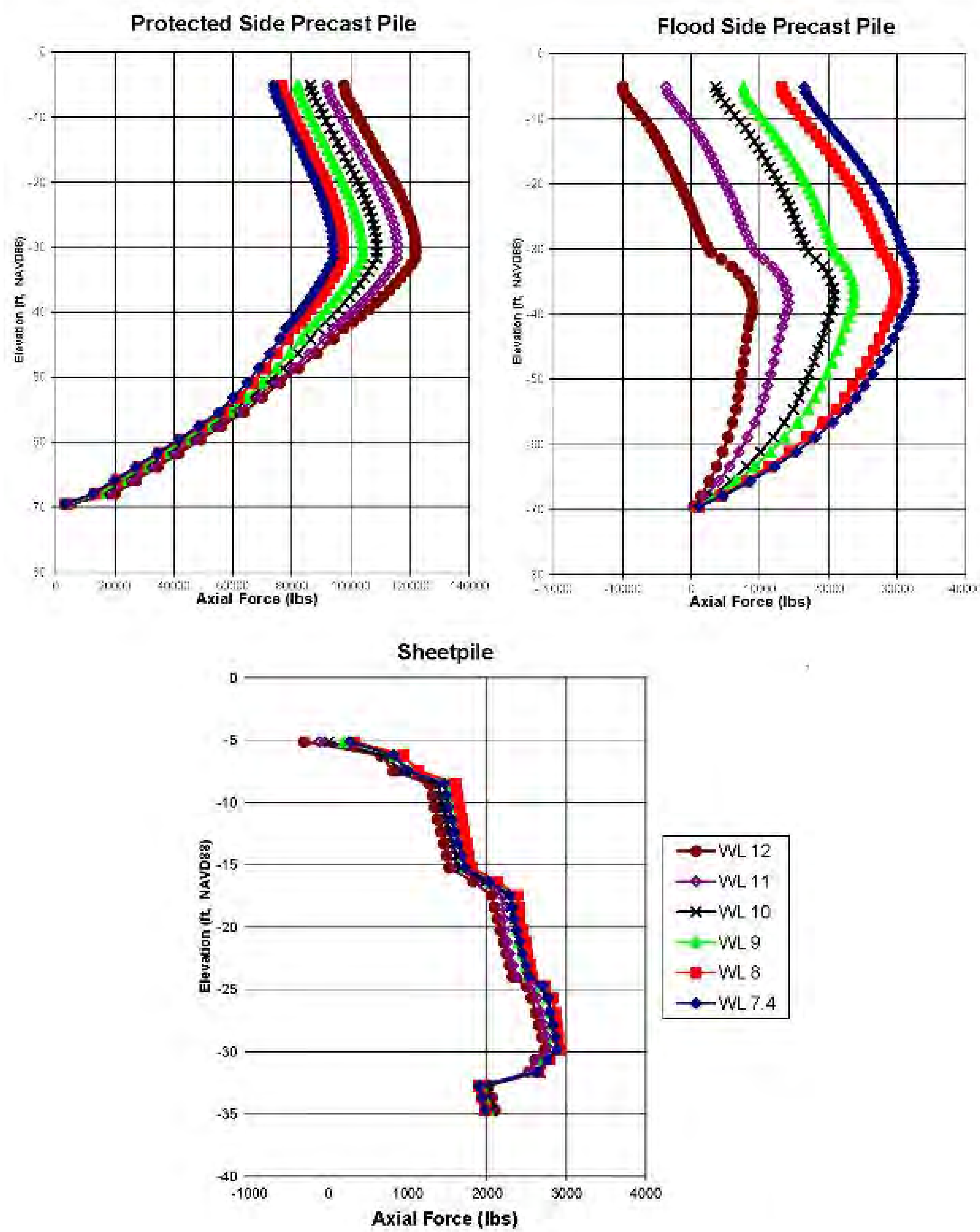


Figure 30. Pile axial loads, Reach 8.

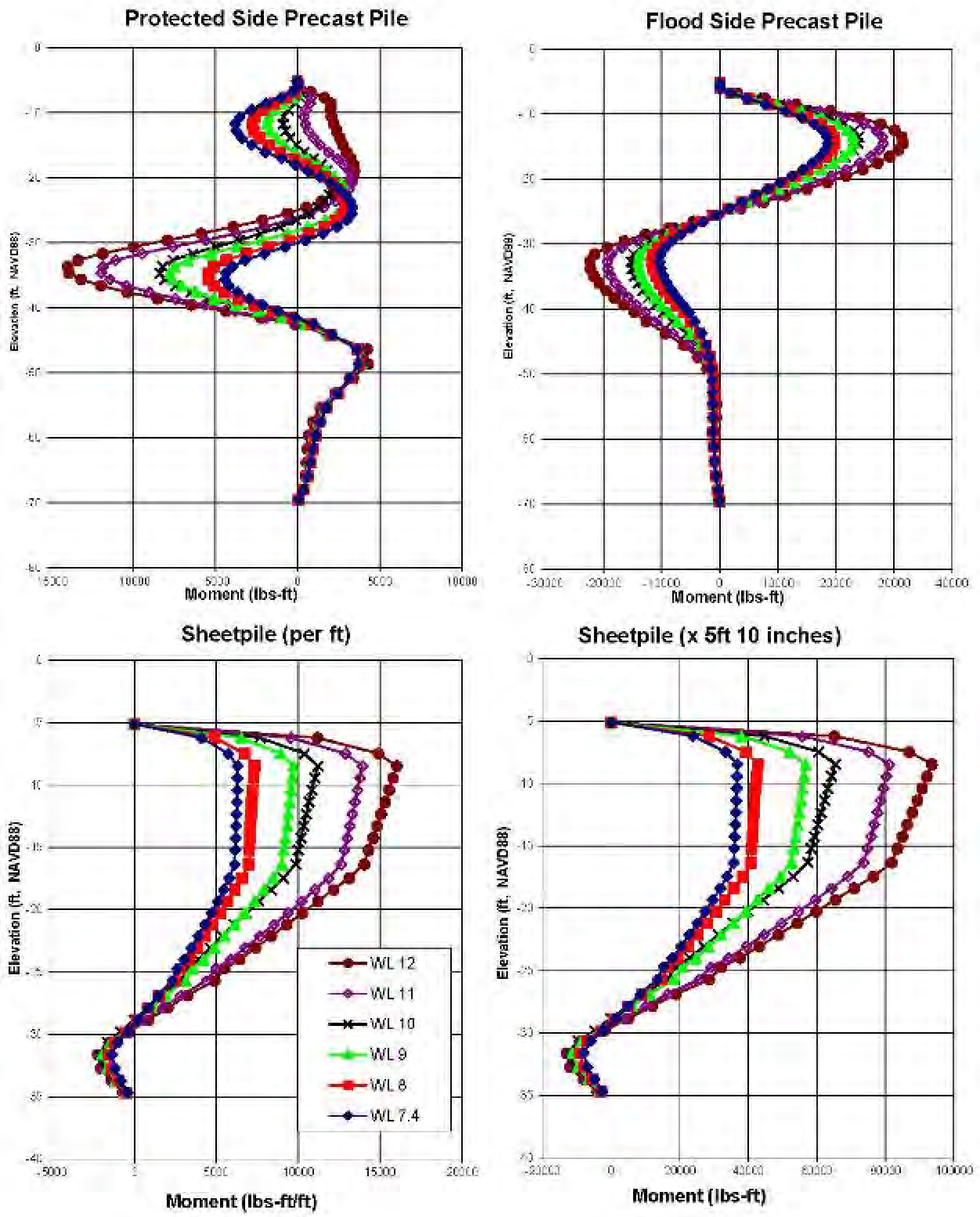


Figure 31. Pile moment, Reach 8.

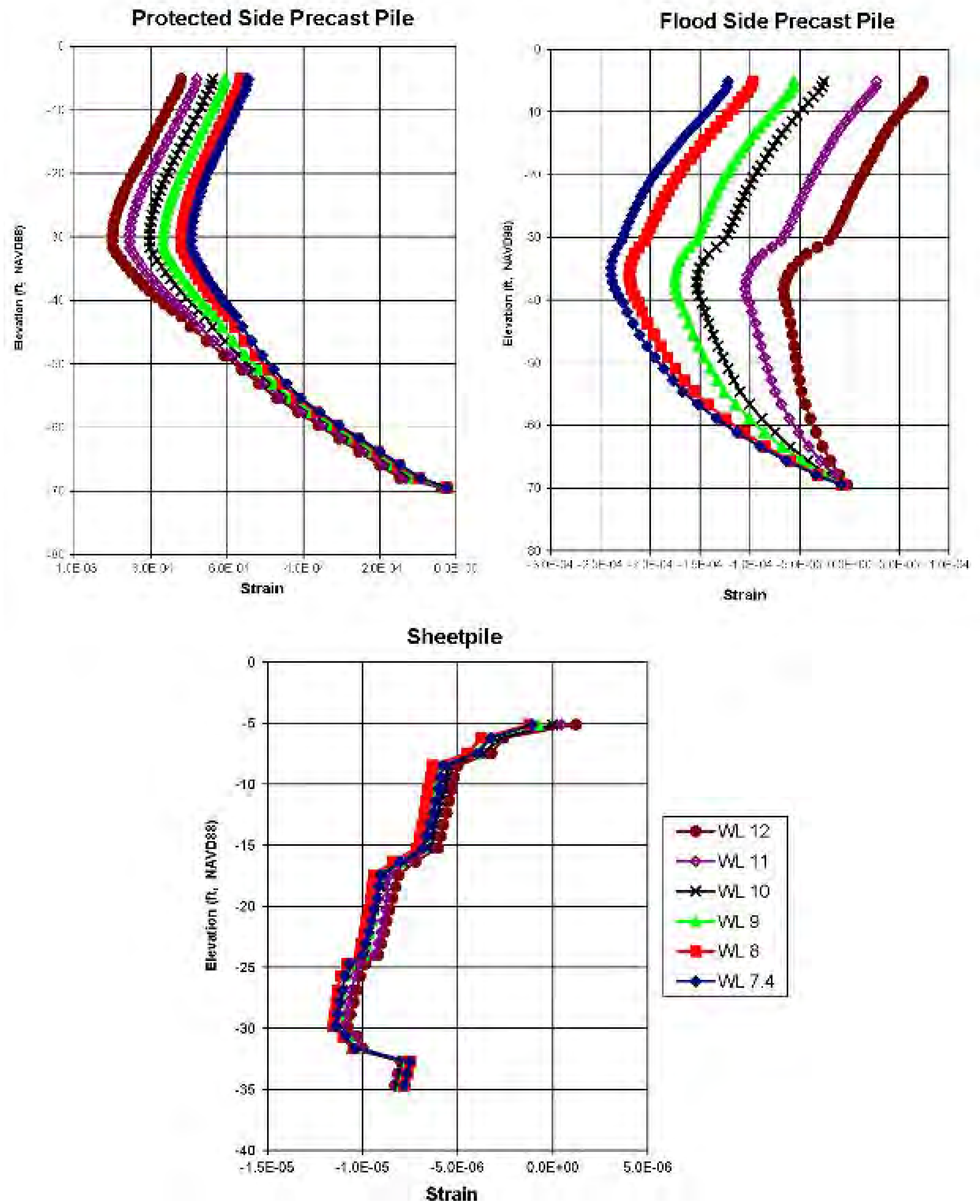


Figure 32. Pile strain, Reach 8.

Reach 17B

<u>Introduction</u>

The design section includes: clay embankment (EL +6.0 ft) and a stability berm (EL +0.6), underlain by four marsh layers (Marsh 1 EL -1.5 ft to -5.0 ft, Marsh 2 EL -5.0 ft to -8.0 ft, Marsh 3 EL -8.0 ft to -12.5 ft, and Marsh 4 EL -12.5 ft to EL -20 ft). The marsh layers are underlain by a beach sand stratum (EL -20 ft to EL -41 ft) which mantles a lower clay deposit which extends at least until the bottom of the model (EL -70 ft). The clay embankment and berm materials were given unit weights of 116 pcf and 110 pcf with cohesions of 700 psf and 400 psf respectively. The crest of the levee reach is relatively flat having a width of approximately 23 ft. The existing I-wall has a top elevation of +13.9 ft consisting of a concrete cap and PZ-22 sheet pile to tip elevation of -9.8 ft. Figure 33 shows the Geo-Studio model and Figure 34 shows the FLAC model cross section.

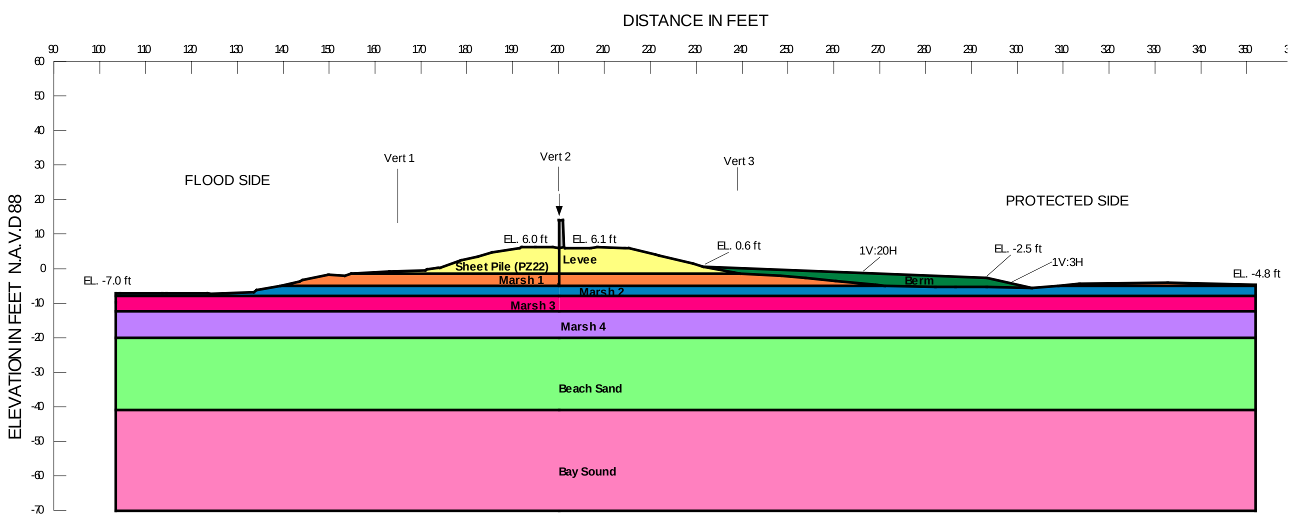


Figure 33. Geo-Studio model for Orleans Avenue Outfall Canal Reach 17B.

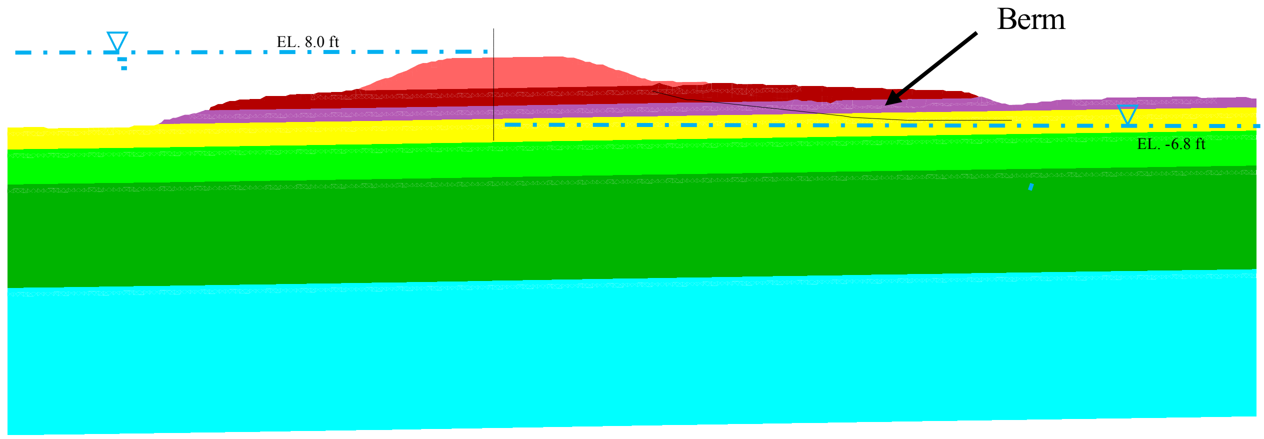


Figure 34. FLAC Model for Orleans Avenue Canal Reach 17B.

Foundation Parameters

The FLAC analyses are based on simple Mohr-Coulomb constitutive models (linear elastic-perfectly plastic soil behavior). Unit weight and shear strength parameters for the various soil layers were based on the information in the MOWL Report. The cross section used came from the slope stability Slope/W file from the MOWL report. As-built drawings were examined for the properties of the I-Wall.

Soil modulus values were determined or selected assuming the soils are linearly elastic and isotropic with Poisson's ratio based on expected drainage conditions during loading. The parameters used for analysis are presented in Table 23 thru

Table 27. The soil modulus values were selected using the same G/Su ratios selected for the FLAC model roughly calibrated to the London Load Test (LLT) results. The soil modulus values used in the LLT FLAC model were primarily based on pressuremeter testing and relationships for G/Su. At Orleans Avenue Canal, the shear modulus values are determined by multiplying the G/Su ratio for a given soil by its undrained shear strength. The at-rest earth pressure coefficients are computed only to initialize stresses during model development so equilibrium can be reached in fewer computational steps.

At Orleans Avenue Canal, seepage conditions were modeled as steady state using the Seep/W model, and previously accepted material seepage properties and protected side boundary conditions, from the MOWL report. The flood side canal total head boundary was incrementally raised from a starting water level of EL +0.4 ft to EL +1.0 ft and then by 1 ft. The water table was assumed to be constant for the protected side two feet below the ground surface giving an elevation of -6.8 ft and 8.0 ft for the flood side. The water table elevations are presented on Figure 34.

Table 23. Summary of Centerline Soil Parameters, Reach 17B.

Material	Strata Top Elevation (NAVD88)	Strata Bottom Elevation (NAVD88)	Unit Weight (pcf)	Unit Weight / Gravity	Su (psf)	Φ (deg)
1 - Levee	+6.0	-1.5	116	3.602	700	0
2 - Marsh Layer 1	-1.5	-5.0	97	3.012	275	0
3 - Marsh Layer 2	-5.0	-8.0	97	3.012	400	0
4 - Marsh Layer 3	-8.0	-12.5	73	2.267	250	0
5 - Marsh Layer 4	-12.5	-20.0	111	3.447	250	0
6 - Beach Sand	-20.0	-41.0	122	3.789	0	33
7 - Bay Sound Clay	-41.0	-70.0	105	3.261	610*	0

*Denotes Su at Top of Bay Sound Clay

9.5 psf/ft is Su/p of Bay Sound Clay

Table 24. Centerline Most Likely Value Modulus, Reach 17B.

Material	E/Su	E (psf)	Poisson	G (psf)	K (psf)	ko
1 - Levee	225	1.58E+05	0.40	5.63E+04	2.63E+05	0.85
2 - Marsh Layer 1	200	5.50E+04	0.47	1.87E+04	3.06E+05	0.96
3 - Marsh Layer 2	200	8.00E+04	0.47	2.72E+04	4.44E+05	0.96
4 - Marsh Layer 3	200	5.00E+04	0.47	1.70E+04	2.78E+05	0.98
5 - Marsh Layer 4	200	5.00E+04	0.47	1.70E+04	2.78E+05	0.95
6 - Beach Sand	-	8.34E+05	0.31	3.19E+05	7.32E+05	0.46
7 - Bay Sound Clay	600	3.66E+05	0.47	1.24E+05	2.03E+06	0.95

Table 25. Summary of Toe Soil Parameters, Reach 17B.

Material	Strata Top Elevation (NAVD88)	Strata Bottom Elevation (NAVD88)	Unit Weight (pcf)	Unit Weight / Gravity	Su (psf)	Φ (deg)
1 - Berm	+0.6	-2.0	110	3.416	400	0
2 - Marsh Layer 1	-2.0	-5.0	97	3.012	200	0
3 - Marsh Layer 2	-5.0	-8.0	97	3.012	350	0
4 - Marsh Layer 3	-8.0	-12.5	73	2.267	180	0
5 - Marsh Layer 4	-12.5	-20.0	111	3.447	180	0
6 - Beach Sand	-20.0	-41.0	122	3.789	0	33
7 - Bay Sound Clay	-41.0	-70.0	105	3.261	580*	0

*Denotes Su at Top of Bay Sound Clay

9.5 psf/ft is Su/P of Bay Sound Clay

Table 26. Toe Most Likely Value Modulus, Reach 17B.

Material	E/Su	E (psf)	Poisson	G (psf)	K (psf)	Ko
1 - Berm	350	1.40E+05	0.40	5.00E+04	2.33E+05	0.86
2 - Marsh Layer 1	200	4.00e+04	0.47	1.36E+04	2.22E+05	0.96
3 - Marsh Layer 2	200	7.00E+04	0.47	2.38E+04	3.89E+05	0.96
4 - Marsh Layer 3	200	3.60E+04	0.47	1.22E+04	2.00E+05	0.98
5 - Marsh Layer 4	200	3.60E+04	0.47	1.22E+04	2.00E+05	0.95
6 - Beach Sand	-	8.34E+05	0.31	3.19E+05	7.32E+05	0.46
7 - Bay Sound Clay	600	3.48E+05	0.47	1.18E+05	1.93E+06	0.95

Structural Parameters

The current I-wall structure was modeled as two beam elements: (1) the upper concrete portion of the I-wall and (2) the supporting sheet pile beneath the concrete. Interface elements were applied to the wall below the ground surface. These elements allow slip and separation between the soil and wall. The shear strength of the interfaces was set at 90% of the shear strength of the strongest cohesive soil layer.

In FLAC the structural beam properties are formulated in plane stress (like a plate) and are adjusted for plane strain conditions by dividing Young's modulus by $1-\nu^2$ (ν =Poisson's ratio). The structural parameters are included in

Table 27.

Table 27. Summary of Structural Parameters, Reach 17B.

Member	E* (psi)	I (in^4/ft)	IE* ($lbft^2$/ft)	A (in^2/ft)	AE* (lb/ft)	ν
Concrete	3.13E+06	1728	3.75E+07	144	4.50E+08	0.20
PZ-22	3.19E+07	84.4	1.87E+07	6.47	2.06E+08	0.30

E *= Adjusted Young's modulus
I = moment of inertia
A = cross-sectional area
ν = Poisson's ratio

Loading Conditions and Gap Formation

Canal water loadings are modeled as mechanical pressures acting normal to the ground surface and normal to the wall face. When a gap is included between the soil and I-wall, a horizontal mechanical pressure is added to both the soil and the wall to the depth of the gap.

Gap development is modeled following the procedure used in the IPET report. The total horizontal stress in the element adjacent to the wall is compared to the hydrostatic pressure that would exist if a gap were present. If the hydrostatic water pressure exceeds the total horizontal stress, it is assumed that a gap could form. This process of gap development cannot occur until water levels are actually loading the wall and the unbalanced hydrostatic water pressure reaches the ground surface adjacent to the wall. With the crest elevation being at +6.0, no gap can form or propagate with depth until the water level has risen to EL +6.0 or higher. Each zone adjacent to the wall is checked as canal water levels are raised from the normal pool elevation of 0.4 ft to the maximum operating level of 8 ft in 1 ft increments. Gaps were deepened in 1 ft increments as they developed.

Results

The gap depth calculations prepared by Black and Veatch which follow IPET guidance was checked and compared with the FLAC results. The gap depth extended to the EL -6.5 ft for hand calculations. It should be noted that for even the shallower water depths, the hand calculation resulted in a gap to approximate EL -6.5 ft. The gap did not form in the FLAC analysis for a canal water level of EL +8.0. For a canal water level of EL +9.0, the gap formed in the FLAC analysis to approximate EL -6.5 ft. At a canal water level of EL +12.0, the gap formed to the sheetpile tip at EL -9.8 ft. A graph of the FLAC gap propagation versus canal water elevation can be found in Figure 37.

At a canal water level EL +8.0, the maximum protected side ground displacement and top of I-wall displacement was 0.9 inches. Wall and protected side ground displacements increased at a higher rate at canal water levels greater than EL +8.0. A graph of the wall displacement versus canal water elevation can be found in Figure 36.

Figure 35. FLAC model progression of water loading and gap development for Reach 17B.

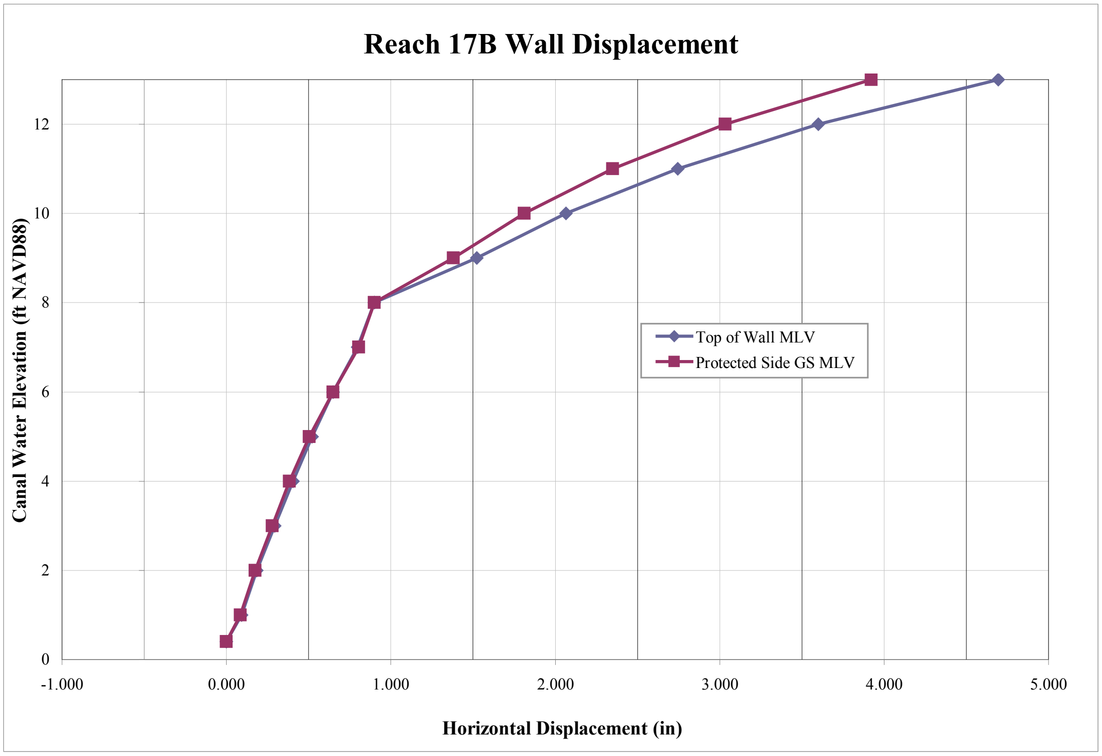


Figure 36. FLAC computed I-wall displacement, Reach 17B.

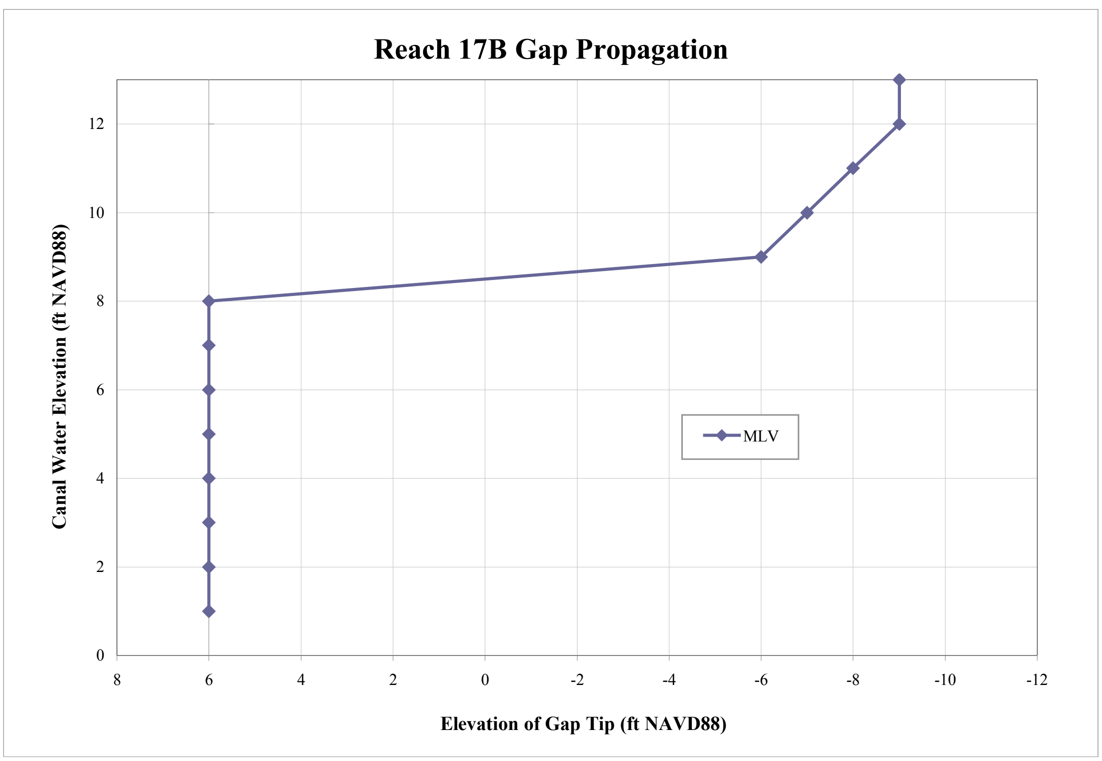


Figure 37. FLAC computed gap propagation, Reach 17B.

The automated c-ϕ reduction technique in FLAC was used for all factor of safety (FoS) calculations. The shear strain increment (ssi) and wall locations (original and displaced) for factor of safety at canal water levels of EL +8.0 and EL +9.0 are shown in Figure 38 and Figure 39. A summary of the FoS and controlling failure mode (global stability or wall rotation) are presented in Table 28.

Table 28. Summary of FLAC FoS and Controlling Failure Mode, Reach 17B.

Canal WL (ft)	FLACAUTO FoS	Controlling Failure Mode
8	1.60	Global Stability
9	1.47	Global Stability

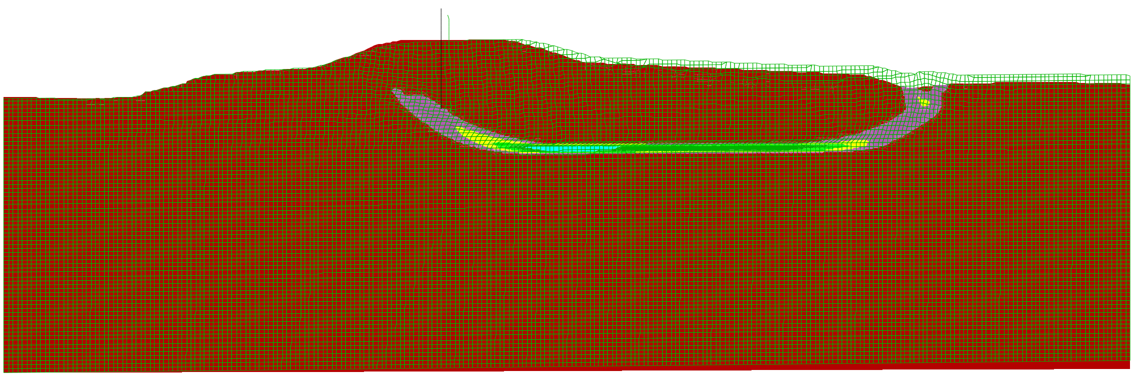


Figure 38. WL+8 ft, FoS ssi and wall displacement magnified 5X, Reach 17B.

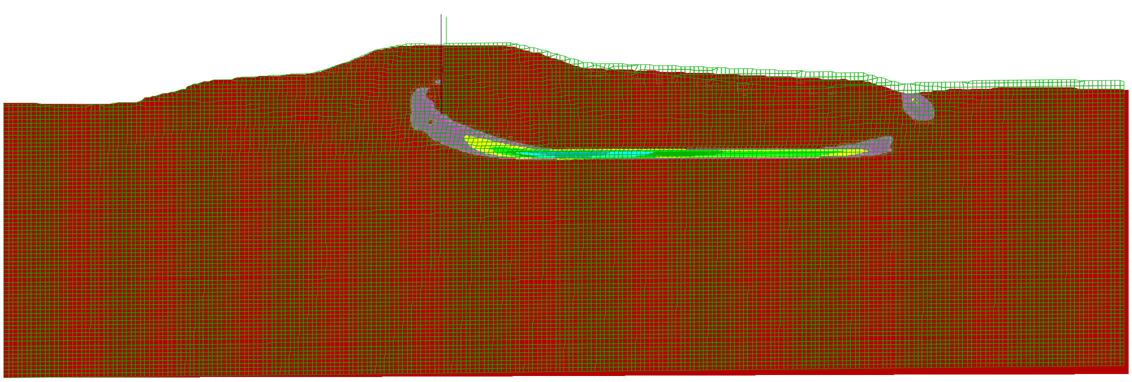


Figure 39. WL+9 ft, FoS ssi and wall displacement magnified 5X, Reach 17B.

Reach 19

Introduction

The design section includes: clay embankment (EL +4.0 ft), underlain by a Marsh deposit divided into three layers; Marsh 1 (EL -1.5 ft to EL -7.0 ft), Marsh 2 (EL -7.0 ft to -12.5ft), and Marsh 3 (EL -12.5ft to -19.0ft). The Marsh is underlain by a Lacustrine Clay stratum divided into two layers; Lacustrine 1 (EL -19.0 to –12.5 ft) which mantles a lower Beach Sand deposit located at EL. -31.0 feet to -42.0 ft. Beneath the Beach Sand stratum lies a Bay Sound Clay layer that extends to an EL -70.0 ft. The clay embankment material was assigned a unit weight of 117 pcf with a cohesion of 500 psf. The shear strength values used for the clay embankment are higher than those in the underlying marsh deposit. The elevation of the flood side ground line at the wall face is approximately EL 4.0 ft. The existing I-wall has a top elevation of 13.5 ft consisting of a concrete cap and PZ-22 sheet pile to tip elevation of -15.3 ft. Figure 40 and Figure 41 show the Geo-Studio and FLAC model cross sections. The FLAC model created by the template is constrained to use horizontal soil layers so the berm was added to the section by changing properties of the marsh to berm properties in the area of the berm as shown Figure 41.

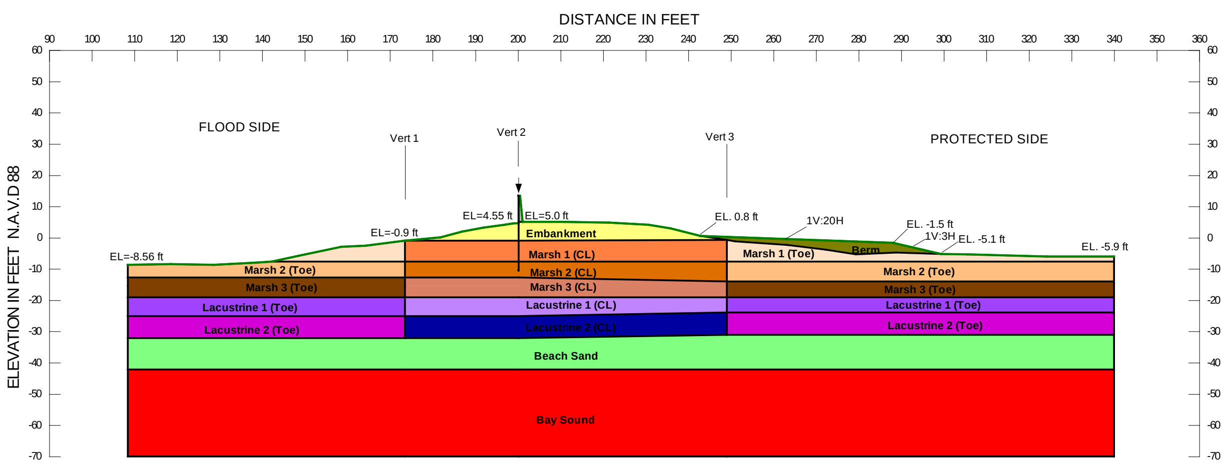


Figure 40. Geo-Studio model for Orleans Avenue Outfall Canal Reach 19.

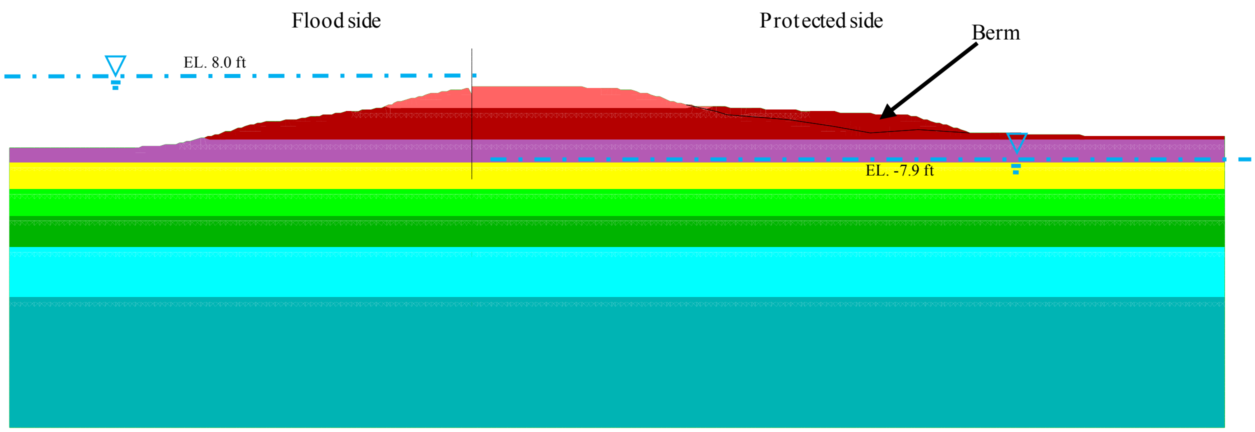


Figure 41. FLAC Model for Orleans Outfall Canal Reach 19.

Foundation Parameters

The FLAC analyses are based on simple Mohr-Coulomb constitutive models (linear elastic-perfectly plastic soil behavior). Unit weight and shear strength parameters for the various soil layers were based on the Maximum Operating Water Level by Black and Veatch. The cross section used is the Seep/W file from the Burns Cooley Dennis 2011 Report. As-built drawings were examined for the properties of the I-Wall.

Soil modulus values were determined or selected assuming the soils are linearly elastic and isotropic with Poisson's ratio based on expected drainage conditions during loading. The parameters used for analysis are presented in Table 29 thru Table 33. The soil modulus values were selected using the same G/Su ratios selected for the FLAC model calibrated to the London Load Test (LLT) results. The soil modulus values used in the LLT FLAC model were primarily based on pressuremeter testing and relationships for G/Su. At London Avenue Canal, the shear modulus values were determined by multiplying the G/Su ratio for a given soil by its undrained shear strength. Young's Modulus for the levee and sand were assigned the same value used in the LLT calibration. The at-rest earth pressure coefficients are computed only to initialize stresses during model development so equilibrium can be reached in fewer computational steps.

At Orleans Outfall Canal, seepage conditions were modeled as steady state using the Seep/W model, and previously accepted material seepage properties and protected side boundary conditions, from the MOWL report. The flood side canal total head boundary was incrementally raised from a starting water level of EL +0.4 ft to EL +1.0 ft and then by 1 ft. The water table was assumed to be constant for the protected side two feet below the ground surface giving an elevation of -7.9 ft and 8.0 ft for the flood side. The water table elevations are presented on Figure 41.

Table 29. Summary of Centerline Soil Parameters, Reach 19.

Material	Strata top elevation (NAVD88)	Strata bottom elevation (NAVD88)	unit wt. (pcf)	unit wt/g	Su (psf)	ϕ' (deg)
1 – Embankment	4.0	-1.5	117	3.634	500	0
2 – Marsh 1	-1.5	-7.5	103	3.199	300	0
3 – Marsh 2	-7.5	-12.5	92	2.857	225	0
4 – Marsh 3	-12.5	-19.0	77	2.391	300	0
5 – Lacustrine 1	-19.0	-25.0	105	3.261	300	0
6 – Lacustrine 2	-25.0	-32.0	105	3.261	358	0
7 – Beach Sand	-32.0	-42.0	122	3.789	0	33
8 – Bay Sound Clay	-42.0	-70.0	105	3.261	510*	0

*Denotes Su at Top of Bay Sound Clay
8.3 psf/ft is slope of Bay Sound Clay

Table 30. Centerline Most Likely Value Modulus, Reach 19.

Material	E/Su	E (psf)	Poisson	G (psf)	K (psf)	ko
1 – Embankment	316	1.58E+05	0.40	56400	263000	0.84
2 – Marsh 1	200	6.00E+04	0.47	20400	333000	0.96
3 – Marsh 2	200	4.50E+04	0.47	15300	250000	0.96
4 – Marsh 3	200	6.00E+04	0.47	20400	333000	0.96
5 – Lacustrine 1	300	9.00E+04	0.47	30600	500000	0.96
6 – Lacustrine 2	300	1.07E+05	0.47	36500	596000	0.96
7 – Beach Sand		8.22E+05	0.31	313000	732000	0.46
8 – Bay Sound Clay	600	3.06E+05	0.47	104000	1700000	0.95

Table 31. Summary of Toe Soil Parameters, Reach 19.

Material	Strata top elevation (NAVD88)	Strata bottom elevation (NAVD88)	unit wt. (pcf)	unit wt/g	Su (psf)	ϕ' (deg)
1 – Berm			110	3.416	400	0
2 – Marsh 1	-2.0	-7.5	110	3.416	285	0
3 – Marsh 2	-7.5	-14.0	80	2.484	125	0
4 – Marsh 3	-14.0	-19.0	106	3.292	175	0
5 – Lacustrine 1	-19.0	-24.0	100	3.106	175	0
6 – Lacustrine 2	-24.0	-31.0	98	3.043	227	0
7 – Beach Sand	-31.0	-42.0	122	3.789	0	33
8 – Bay Sound Clay	-42.0	-70.0	105	3.261	460*	0

*Denotes Su at Top of Bay Sound Clay
8.3 psf/ft is slope of Bay Sound Clay

Table 32. Toe Most Likely Value Modulus, Reach 19.

Material	E/Su	E (psf)	Poisson	G (psf)	K (psf)	ko
1 – Berm	350	1.40E+05	0.40	50000	233000	0.86
2 – Marsh 1	200	5.70E+04	0.47	19400	317000	0.95
3 – Marsh 2	200	2.50E+04	0.47	8500	139000	0.98
4 – Marsh 3	200	3.50E+04	0.47	11900	194000	0.98
5 – Lacustrine 1	300	5.25E+04	0.47	17900	292000	0.95
6 – Lacustrine 2	300	6.81E+04	0.47	23200	378000	0.96
7 – Beach Sand		8.22E+05	0.31	313000	732000	0.46
8 – Bay Sound Clay	600	2.76E+05	0.47	93900	1530000	0.95

Structural Parameters

The current I-wall structure was modeled as two beam elements: (1) the upper concrete portion of the I-wall and (2) the supporting sheet pile beneath the concrete. Interface elements were applied to the wall below the ground surface. These elements allow slip and separation between the soil and wall. The shear strength of the interfaces was set at 90% of the shear strength of the strongest cohesive soil layer.

In FLAC the structural beam properties are formulated in plane stress (like a plate) and are adjusted for plane strain conditions by dividing Young's modulus by $1-\nu^2$ (ν =Poisson's ratio). The structural parameters are included in Table 33.

Table 33. Summary of Structural Parameters, Reach 19.

Member	E* (psi)	I (in^4/ft)	IE* ($lbft^2$/ft)	A (in^2/ft)	AE* (lb/ft)	ν
Concrete	3.13E+06	1728	3.75E+07	144	4.50E+08	0.20
PZ-22	3.19E+07	84.4	1.87E+07	6.47	2.06E+08	0.30

E *= Adjusted Young's modulus
I = moment of inertia
A = cross-sectional area
ν = Poisson's ratio

Loading Conditions and Gap Formation

Canal water loadings are modeled as mechanical pressures acting normal to the ground surface and normal to the wall face. When a gap is included between the soil and I-wall a horizontal mechanical pressure is added to both the soil and the wall to the depth of the gap.

Gap development is modeled following the step-by-step procedure outlined in the London Avenue Outfall Canal Reevaluation report as well as the IPET report. The total horizontal stress in the element adjacent to the wall is compared to the hydrostatic pressure that would exist if a gap were present. If the hydrostatic water pressure exceeds the total horizontal stress it is assumed that a gap would form. Each zone is checked as canal water levels are raised from the normal pool elevation of 0.4 ft to the maximum operating level of 8 ft in 1 ft increments. Gaps were deepened in 1 ft increments as they developed.

At lower canal water levels, it is believed the higher soil level on the protected side of the wall serves to increase the horizontal stresses along the flood side of the sheet pile which slows the progression of the gap.

Results

The gap depth calculations prepared by Black and Veatch which follow IPET guidance was checked and compared with the FLAC results. The hand calculation analysis had the gap extending to approximate EL -6.5 ft. It should be noted that for even the shallower water depths, the hand calculation resulted in a gap to approximate EL -6.5 ft. The FLAC results indicated the gap tip was EL -7.0 ft at a water level EL 8.0 ft.

The maximum protected side ground displacement for the MLV at water level EL 8.0 ft was about 1.67 inches. The maximum developed crack depth for a water level EL 8.0 ft was 11.0 ft. Graphs of the top of protected side ground and top of wall displacement and gap propagation versus canal water elevation can be found in Figure 43 and Figure 44.

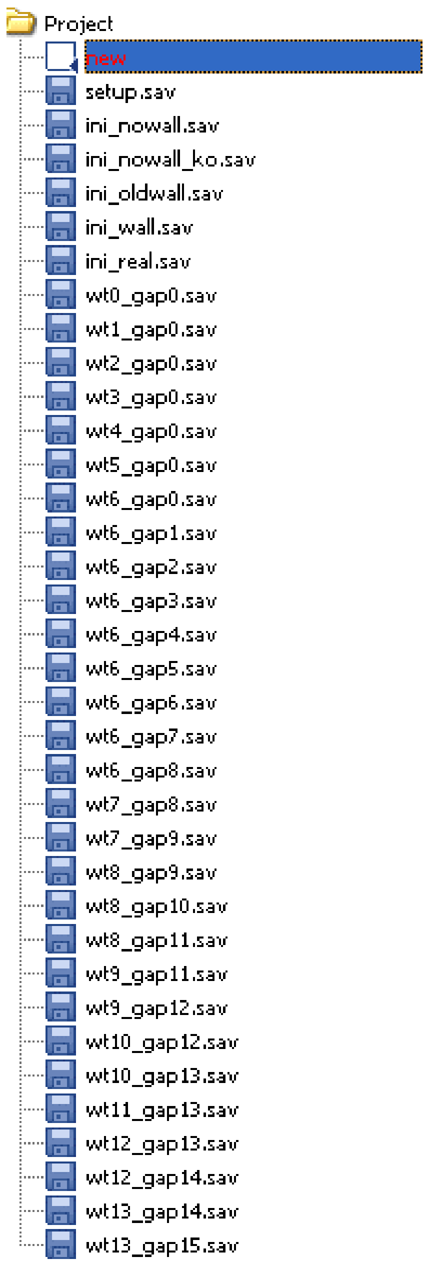


Figure 42. FLAC model progression of water loading and gap development for Reach 19.

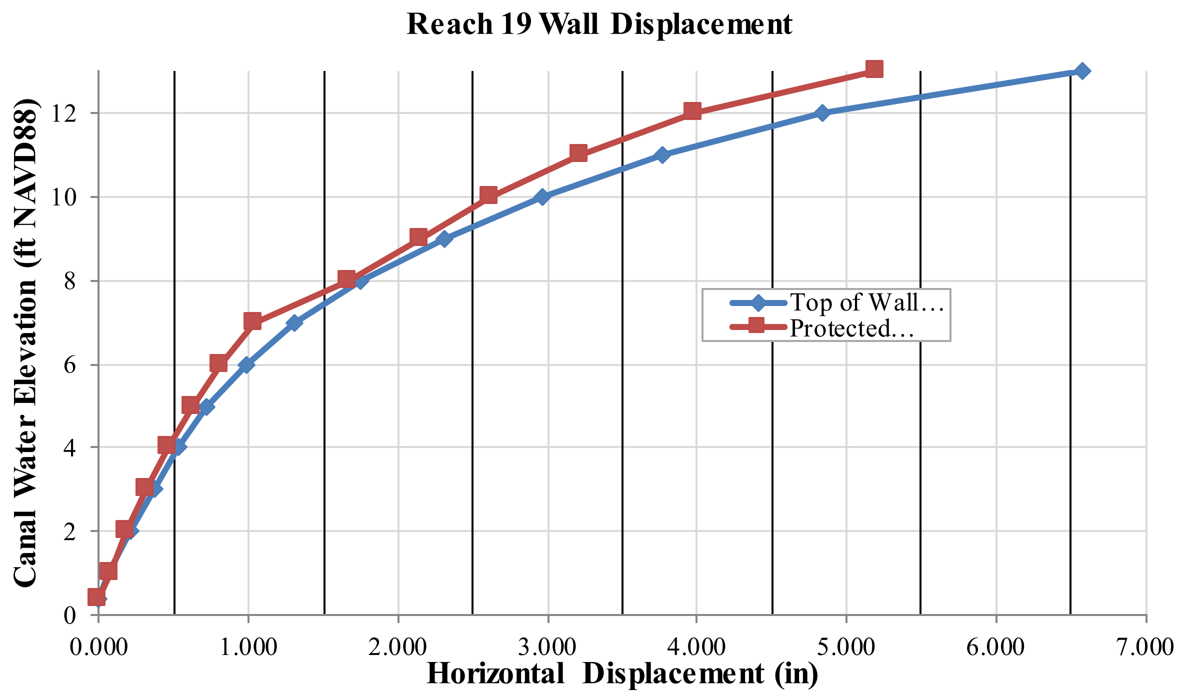


Figure 43. FLAC computed I-wall displacement, Reach 19.

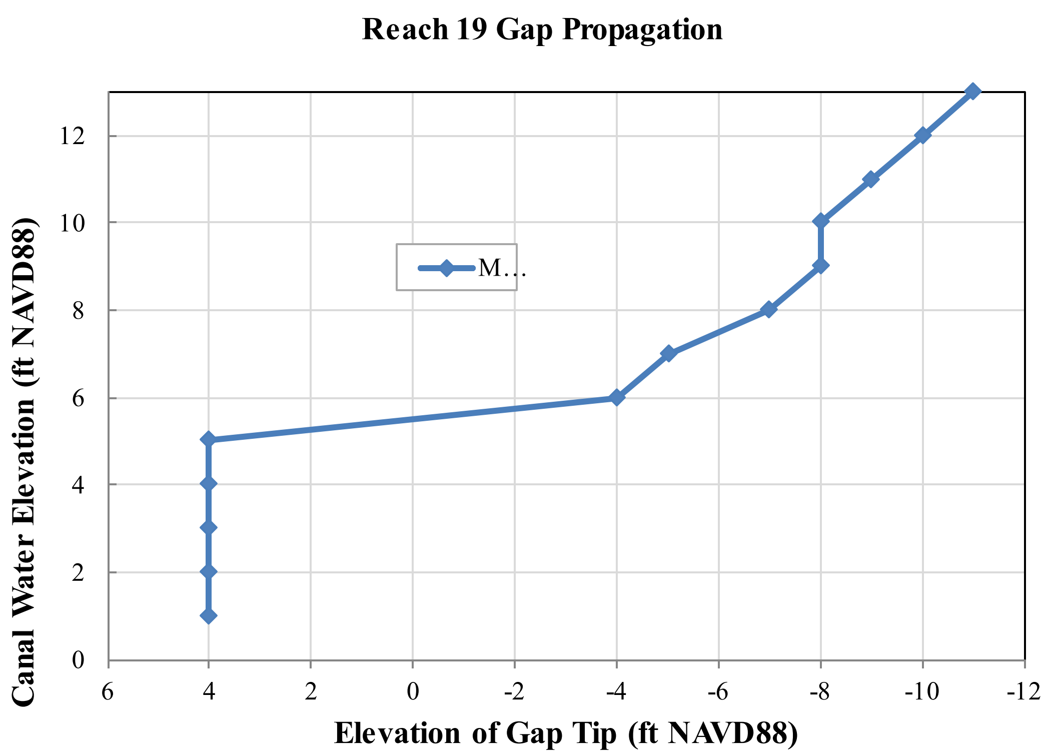


Figure 44. FLAC computed gap propagation, Reach 19.

The automated c-ϕ reduction technique in FLAC was used for all factor of safety (FoS) calculations. Figure 45 presents the computed factors of safety for differing canal water levels and Figure 46 through Figure 51 show the shear strain increment (ssi) and wall locations (original and displaced) for factor of safety at varying water levels. A summary of the FoS and controlling failure mode (global stability or wall rotation) are presented in Table 34.

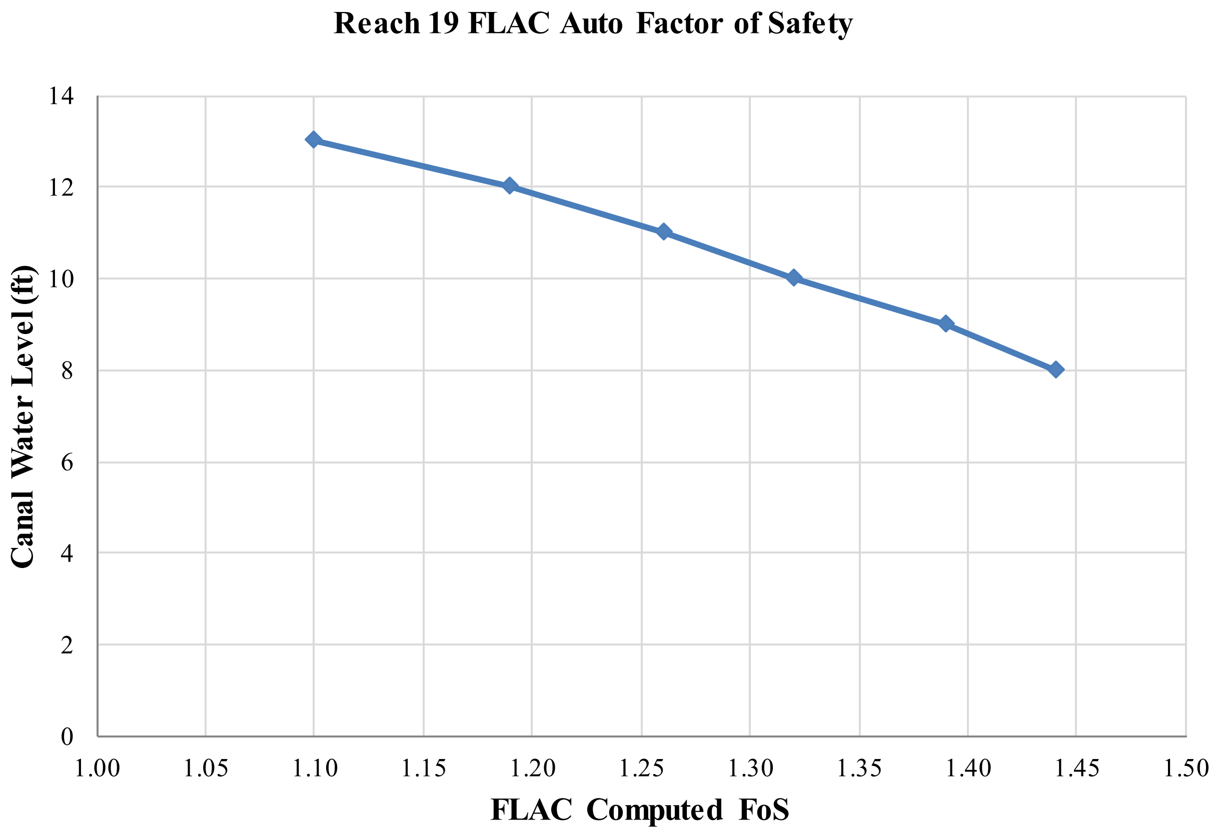


Figure 45. FLAC computed factor of safety (automated c-φ reduction technique), Reach 19.

Table 34. Summary of FLAC FoS and Controlling Failure Mode, Reach 19.

Canal WL (ft)	FLACAUTO FoS	Controlling Failure Mode
8	1.44	Rotational
9	1.39	Rotational
10	1.32	Rotational
11	1.26	Rotational
12	1.19	Rotational
13	1.10	Rotational

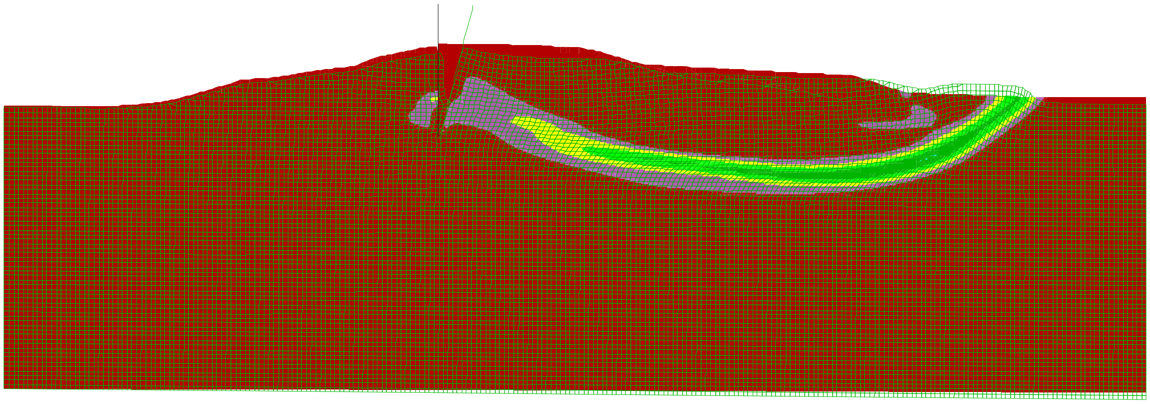


Figure 46. WL+8 ft, FoS ssi and wall displacement magnified 5X, Reach 19.

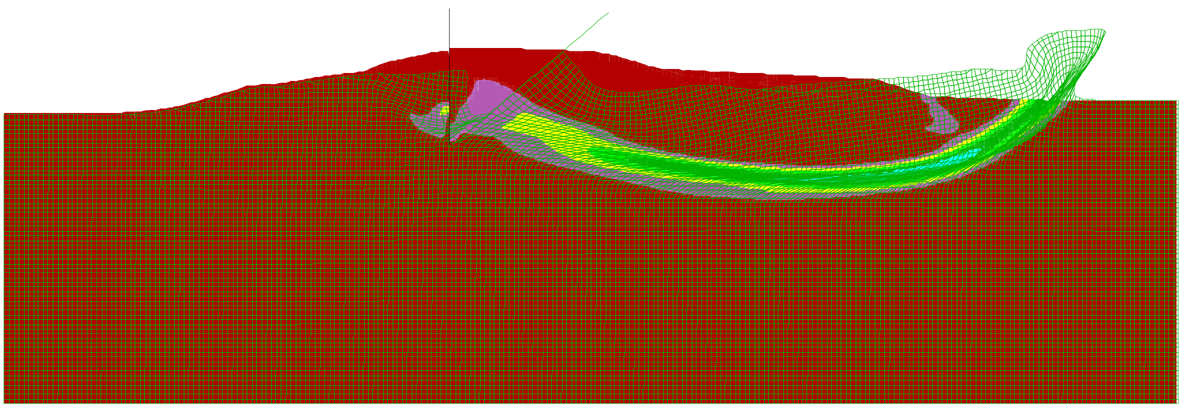


Figure 47. WL+9 ft, FoS ssi and wall displacement magnified 5X, Reach 19.

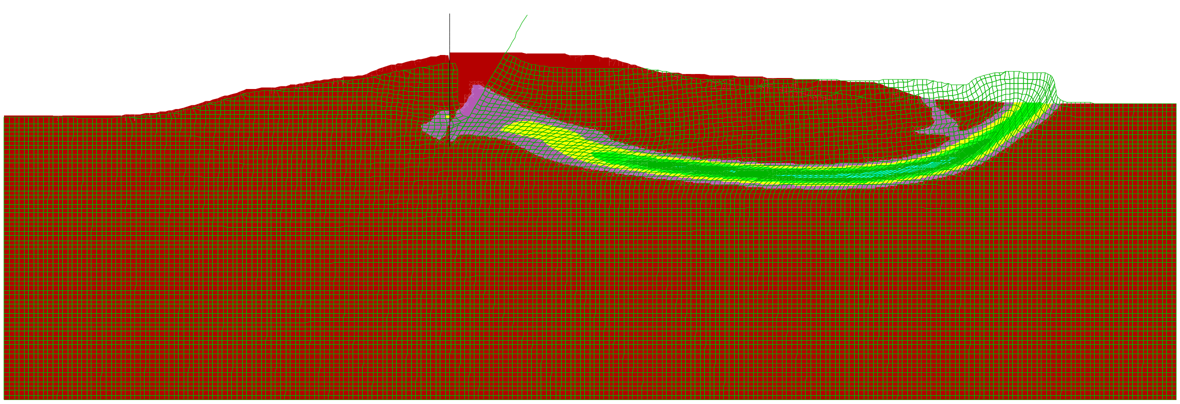


Figure 48. WL +10 ft, FoS ssi and wall displacement magnified 5X, Reach 19.

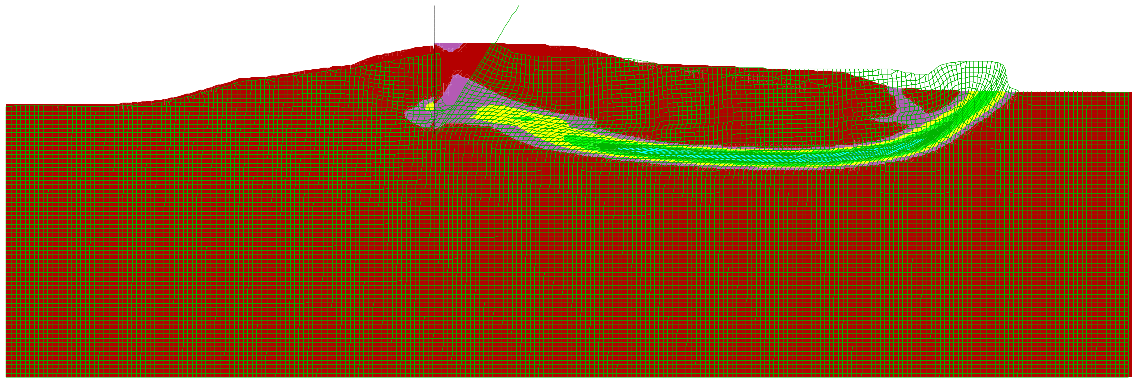


Figure 49. WL+11 ft, FoS ssi and wall displacement magnified 5X, Reach 19.

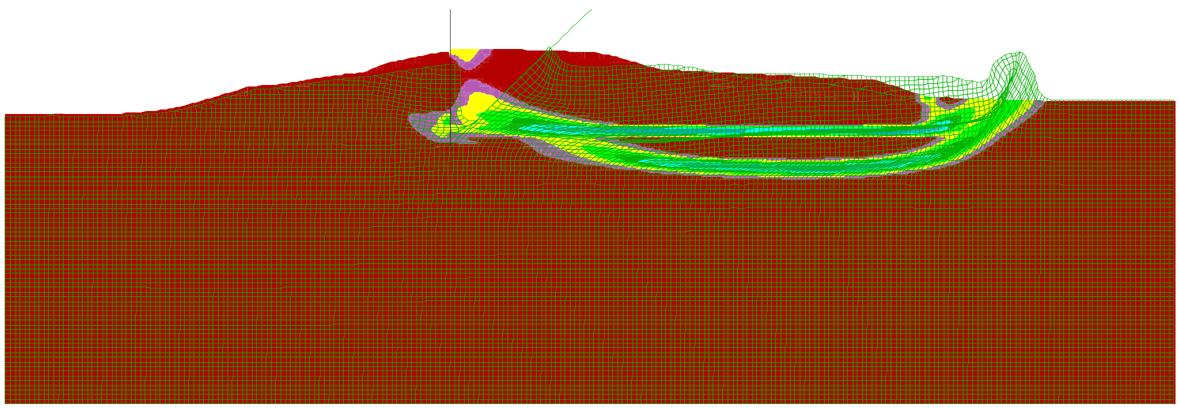


Figure 50. WL+12 ft, FoS ssi and wall displacement magnified 5X, Reach 19.

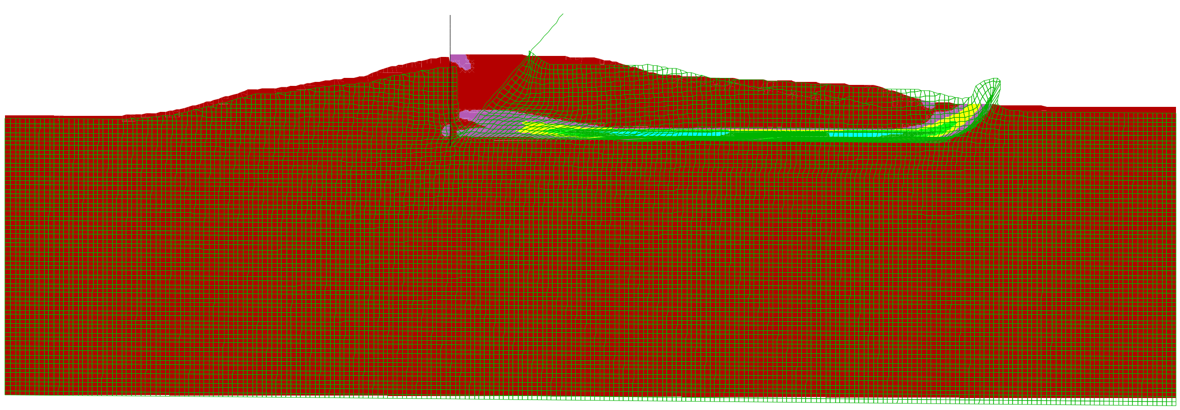
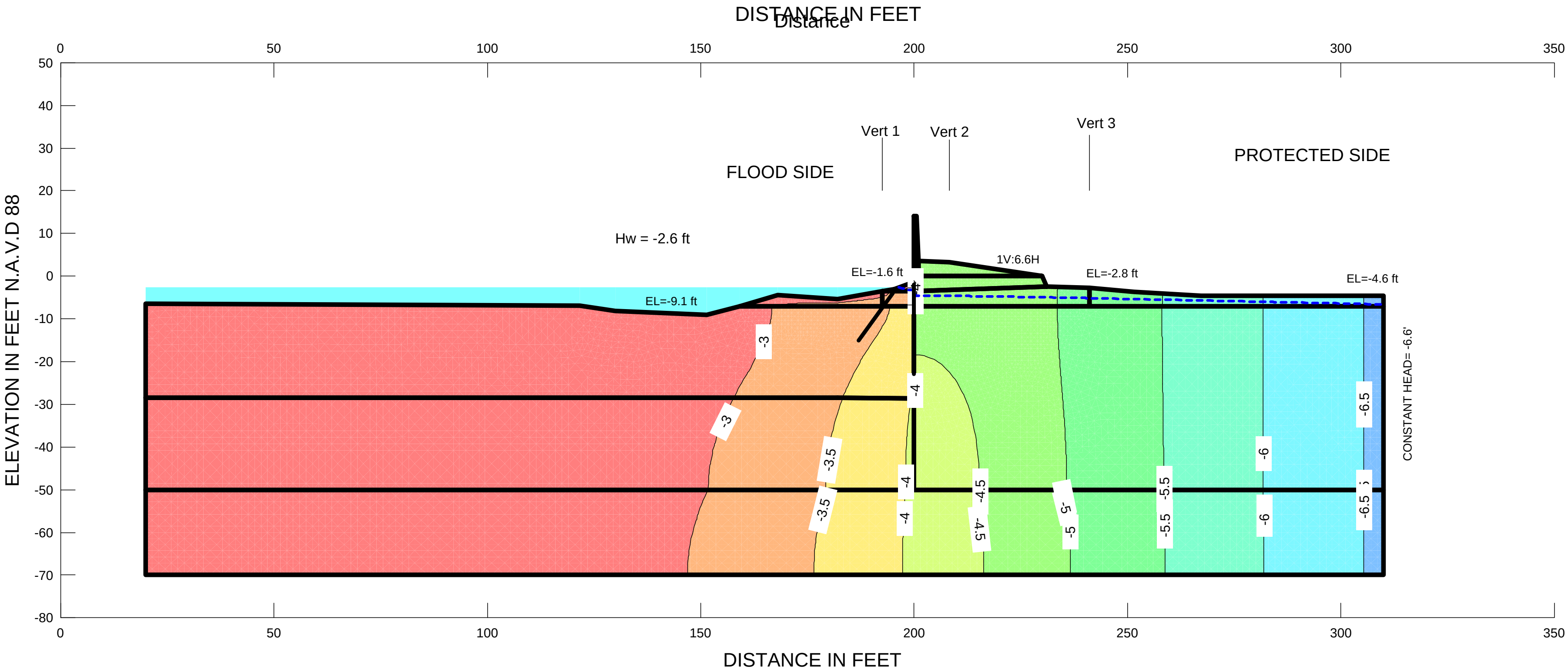


Figure 51. WL+13 ft, FoS ssi and wall displacement magnified 5X, Reach 19.

APPENDIX E LWL Q-CASE STABILITY ANALYSES



Name: BEACH SAND, EL. -7 TO -50 Model: Saturated Only K-Sat: 0.00049 ft/sec Ky'/Kx' Ratio: 1
Name: BAY SOUND CLAY, EL. -50 TO -70 Model: Saturated Only K-Sat: 3.28e-008 ft/sec Ky'/Kx' Ratio: 1
Name: Sheet Pile Model: Saturated Only K-Sat: 1e-010 ft/sec Ky'/Kx' Ratio: 1
Name: MARSH, EL. -2.5/-3.5 TO -7 Model: Saturated Only K-Sat: 3.28e-007 ft/sec Ky'/Kx' Ratio: 1
Name: EMBANKMENT FILL, EL. +3.6 TO -2.5/-3.5 Model: Saturated Only K-Sat: 3.28e-008 ft/sec Ky'/Kx' 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 VERTICALSWERE ASSUMED TO VARY LINEARLY BETWEENTHE VALUES INDICATED FOR THESE LOCATIONS.

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 1A,
PROTECTED SIDE STABILITY ANALYSIS,
CASE: 4 - LWL -2.6ft
STA. 2+45 TO 7+00 WEST
ORLEANS PARISH, LOUISIANA

Name: 4 - LWL -2.6ft
File Name: Reach 1A.gsz Directory: C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix E LWL\
Last Edited By: Hendrix, Joshua M MVR

4 - LWL -2.6ft

File Information

Created By: Liljegren, James
Revision Number: 595
Last Edited By: Hendrix, Joshua M MVR
Date: 10/3/2013
Time: 9:01:09 AM
File Name: Reach 1A.gsz
Directory: C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix E LWL\
Last Solved Date: 10/3/2013
Last Solved Time: 9:01:42 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

4 - LWL -2.6ft

Kind: SEEP/W
Method: Steady-State
Settings
- Include Air Flow: No

Control
- Apply Runoff: No

Convergence
- Convergence Type: Head Vector Norm
- Maximum Number of Iterations: 500
- Tolerance: 0.001
- Maximum Change in K: 0.1
- Rate of Change in K: 1.02
- Minimum Change in K: 1e-005
- Equation Solver: Parallel Direct
- Potential Seepage Max # of Reviews: 10

Time

Starting Time: 0 sec
Duration: 0 sec
Ending Time: 0 sec

Materials

BEACH SAND, EL. -7 TO -50

Model: Saturated Only
Hydraulic
K-Sat: 0.00049 ft/sec
Volumetric Water Content: 0 ft^3/ft^3
Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

BAY SOUND CLAY, EL. -50 TO -70

Model: Saturated Only
Hydraulic
K-Sat: 3.28e-008 ft/sec
Volumetric Water Content: 0 ft^3/ft^3
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 ft^3/ft^3
Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

MARSH, EL. -2.5/-3.5 TO -7

Model: Saturated Only
Hydraulic
K-Sat: 3.28e-007 ft/sec
Volumetric Water Content: 0 ft^3/ft^3
Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

EMBANKMENT FILL, EL. +3.6 TO -2.5/-3.5

Model: Saturated Only
Hydraulic
K-Sat: 3.28e-008 ft/sec
Volumetric Water Content: 0 ft^3/ft^3

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

Boundary Conditions

Potential Seepage Face

Review: true
Type: Total Flux (Q) 0

Protected Side Water

Type: Head (H) -6.6

Extreme Low Water

Type: Head (H) -2.6

Regions

	Material	Points	Area (ft²)
Region 1	EMBANKMENT FILL, EL. +3.6 TO -2.5/-3.5	21,4,5,26	60.99
Region 2	MARSH, EL. -2.5/-3.5 TO -7	6,7,29,46,18,27	167.935
Region 3	BEACH SAND, EL. -7 TO -50	18,47,23,19,20,36,33,32,37,38,40,42,16,31	3858.445
Region 4	BEACH SAND, EL. -7 TO -50	20,36,34,15,28,43,12,11,29,46,18,47,23,19	8599.1
Region 5	BAY SOUND CLAY, EL. -50 TO -70	15,34,35,14,30,44,13,12,43,28	5800
Region 6	Sheet Pile	17,22,21,26,25,3	13.075
Region 7	EMBANKMENT FILL, EL. +3.6 TO -2.5/-3.5	27,3,25,26,5,6	90.15
Region 8	MARSH, EL. -2.5/-3.5 TO -7	16,42,41,1,39,31	66.5965
Region 9	MARSH, EL. -2.5/-3.5 TO -7	29,7,8,9,10,11	186.6
Region 10	MARSH, EL. -2.5/-3.5 TO -7	31,39,27,18	26.145
Region 11	EMBANKMENT FILL, EL. +3.6 TO -2.5/-3.5	2,24,3,27,39	6.9625

Lines

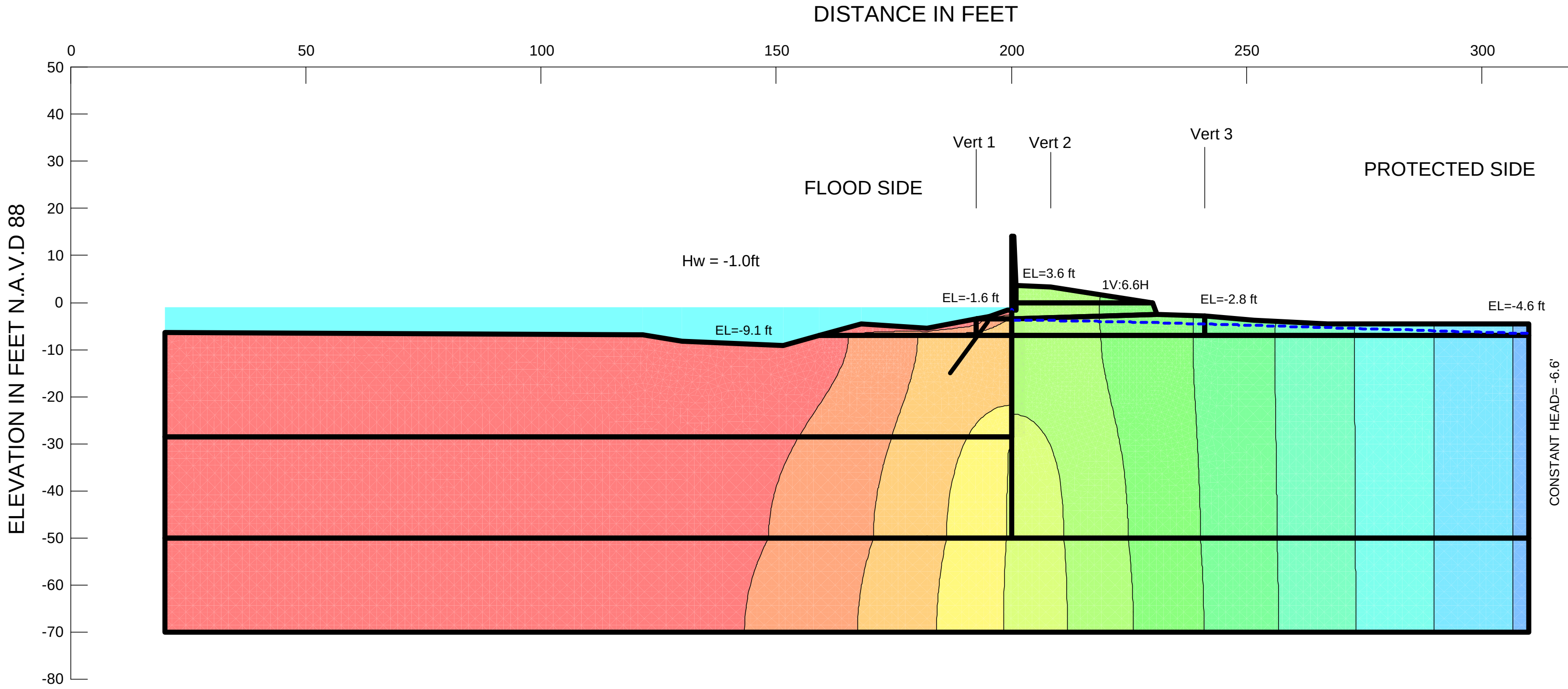
	Start Point	End Point	Hydraulic Boundary	Left Side Material	Right Side Material
Line 1	19	20			
Line 2	13	12	Protected Side Water		
Line 3	17	22			
Line 4	22	21	Potential Seepage Face		
Line 5	23	19		Sheet Pile	
Line 6	21	4	Potential Seepage Face		
Line 7	25	3		Sheet Pile	Sheet Pile
Line 8	5	4	Potential Seepage Face		
Line 9	17	3			
Line 10	25	26			
Line 11	26	21			
Line 12	3	27		Sheet Pile	
Line 13	6	7	Potential Seepage Face		

Line 14	5	26			
Line 15	27	6			
Line 16	5	6	Potential Seepage Face		
Line 17	27	18		Sheet Pile	
Line 18	12	11	Protected Side Water		
Line 19	11	29			
Line 20	28	15			
Line 21	30	14			
Line 22	7	29			
Line 23	7	8	Potential Seepage Face		
Line 24	8	9	Potential Seepage Face		
Line 25	9	10	Potential Seepage Face		
Line 26	10	11	Protected Side Water		
Line 27	31	16			
Line 28	18	31			
Line 29	2	24	Extreme Low Water		
Line 30	24	3	Extreme Low Water		
Line 31	15	34			
Line 32	34	35			
Line 33	35	14			
Line 34	20	36			
Line 35	36	34			
Line 36	36	33			
Line 37	19	28			
Line 38	31	39			
Line 39	39	27			
Line 40	1	39	Extreme Low Water		
Line 41	39	2	Extreme Low Water		
Line 42	41	1	Extreme Low Water		
Line 43	42	16			
Line 44	42	41	Extreme Low Water		
Line 45	38	40	Extreme Low Water		
Line 46	40	42	Extreme Low Water		
Line 47	33	32			
Line 48	32	37	Extreme Low Water		
Line 49	37	38	Extreme Low Water		
Line 50	12	43			
Line 51	43	28			
Line 52	13	44			
Line 53	44	30			
Line 54	29	46			
Line 55	46	18			
Line 56	23	47			Sheet Pile
Line 57	47	18			Sheet Pile

Points

	X (ft)	Y (ft)

Point 1	182	-5.4
Point 2	195.3	-3
Point 3	200	-1.6
Point 4	208.3	3.3
Point 5	230	0
Point 6	231	-2.5
Point 7	241.1	-2.8
Point 8	251.6	-3.7
Point 9	267.3	-4.6
Point 10	310	-4.6
Point 11	310	-7
Point 12	310	-50
Point 13	310	-70
Point 14	182	-70
Point 15	182	-50
Point 16	182	-7
Point 17	200	14.1
Point 18	200	-7
Point 19	200	-28.6
Point 20	182	-28.5
Point 21	201	3.6
Point 22	200.5	14.1
Point 23	200	-23.5
Point 24	199.1	-1.6
Point 25	201	-1.6
Point 26	201	0
Point 27	200	-3.5
Point 28	200	-50
Point 29	241.1	-7
Point 30	200	-70
Point 31	192.53	-7
Point 32	20	-6.4
Point 33	20	-7
Point 34	20	-50
Point 35	20	-70
Point 36	20	-28.5
Point 37	121.6	-6.9
Point 38	130	-8.2
Point 39	192.53	-3.5
Point 40	151.4	-9.1
Point 41	168.1	-4.5
Point 42	159.1	-7
Point 43	241.1	-50
Point 44	241.1	-70
Point 45	199	0
Point 46	201.6	-7
Point 47	200	-21.3



Name: BEACH SAND, EL. -7 TO -50 Model: Saturated Only K-Sat: 0.00049 ft/sec K-Ratio: 1
Name: BAY SOUND CLAY, EL. -50 TO -70 Model: Saturated Only K-Sat: 3.28e-008 ft/sec K-Ratio: 1
Name: Sheet Pile Model: Saturated Only K-Sat: 1e-010 ft/sec K-Ratio: 1
Name: MARSH, EL. -2.5/-3.5 TO -7 Model: Saturated Only K-Sat: 3.28e-007 ft/sec K-Ratio: 1
Name: EMBANKMENT FILL, EL. +3.6 TO -2.5/-3.5 Model: Saturated Only K-Sat: 3.28e-008 ft/sec K-Ratio: 1

GENERAL NOTES

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

WHERE INDICATED, SHEAR STRENGTHS BETWEEN VERTICALSWERE ASSUMED TO VARY LINEARLY BETWEENTHE VALUES INDICATED FOR THESE LOCATIONS.

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 1A,
PROTECTED SIDE STABILITY ANALYSIS,
CASE: 4 - LWL -1.0ft
STA. 2+45 TO 7+00 WEST
ORLEANS PARISH, LOUISIANA

Name: 4 - LWL -1.0ft
File Name: Orleans Canal Reach 1A.gsz Directory: C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix E LWL\WL -1\
Last Edited By: Hendrix, Joshua M MVR

4 - LWL -1.0ft

File Information

Created By: Liljegren, James
Revision Number: 587
Last Edited By: Hendrix, Joshua M MVR
Date: 6/10/2013
Time: 11:03:01 AM
File Name: Orleans Canal Reach 1A.gsz
Directory: C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix E LWL\WL -1\
Last Solved Date: 6/10/2013
Last Solved Time: 11:03:14 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

4 - LWL -1.0ft

Kind: SEEP/W
Method: Steady-State
Settings
- Include Air Flow: No

Control
- Apply Runoff: No

Convergence
- Convergence Type: Head Vector Norm
- Maximum Number of Iterations: 500
- Tolerance: 0.001
- Maximum Change in K: 0.1
- Rate of Change in K: 1.02
- Minimum Change in K: 1e-005
- Equation Solver: Parallel Direct
- Potential Seepage Max # of Reviews: 10

Time

Starting Time: 0 sec
Duration: 0 sec
Ending Time: 0 sec

Materials

BEACH SAND, EL. -7 TO -50

Model: Saturated Only
Hydraulic
K-Sat: 0.00049 ft/sec
Volumetric Water Content: 0 ft^3/ft^3
Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

BAY SOUND CLAY, EL. -50 TO -70

Model: Saturated Only
Hydraulic
K-Sat: 3.28e-008 ft/sec
Volumetric Water Content: 0 ft^3/ft^3
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 ft^3/ft^3
Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

MARSH, EL. -2.5/-3.5 TO -7

Model: Saturated Only
Hydraulic
K-Sat: 3.28e-007 ft/sec
Volumetric Water Content: 0 ft^3/ft^3
Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

EMBANKMENT FILL, EL. +3.6 TO -2.5/-3.5

Model: Saturated Only
Hydraulic
K-Sat: 3.28e-008 ft/sec
Volumetric Water Content: 0 ft^3/ft^3

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

Boundary Conditions

Potential Seepage Face

Review: true
Type: Total Flux (Q) 0

Protected Side Water

Type: Head (H) -6.6

Extreme Low Water

Type: Head (H) -1

Regions

	Material	Points	Area (ft²)
Region 1	EMBANKMENT FILL, EL. +3.6 TO -2.5/-3.5	21,4,5,26	60.99
Region 2	MARSH, EL. -2.5/-3.5 TO -7	6,7,29,46,18,27	167.935
Region 3	BEACH SAND, EL. -7 TO -50	18,47,23,19,20,36,33,32,37,38,40,42,16,31	3858.445
Region 4	BEACH SAND, EL. -7 TO -50	20,36,34,15,28,43,12,11,29,46,18,47,23,19	8599.1
Region 5	BAY SOUND CLAY, EL. -50 TO -70	15,34,35,14,30,44,13,12,43,28	5800
Region 6	Sheet Pile	17,22,21,26,25,3	13.075
Region 7	EMBANKMENT FILL, EL. +3.6 TO -2.5/-3.5	27,3,25,26,5,6	90.15
Region 8	MARSH, EL. -2.5/-3.5 TO -7	16,42,41,1,39,31	66.5965
Region 9	MARSH, EL. -2.5/-3.5 TO -7	29,7,8,9,10,11	186.6
Region 10	MARSH, EL. -2.5/-3.5 TO -7	31,39,27,18	26.145
Region 11	EMBANKMENT FILL, EL. +3.6 TO -2.5/-3.5	2,24,3,27,39	6.9625

Lines

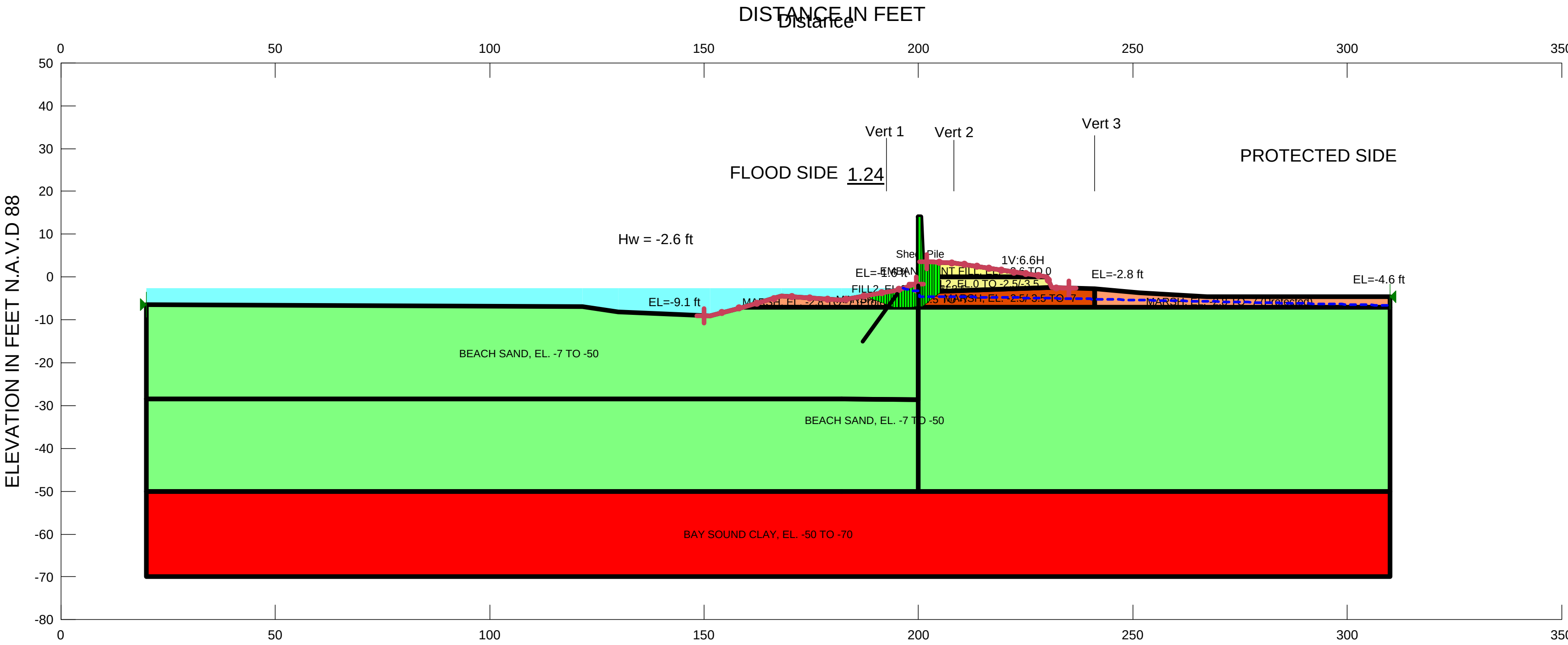
	Start Point	End Point	Hydraulic Boundary	Left Side Material	Right Side Material
Line 1	19	20			
Line 2	13	12	Protected Side Water		
Line 3	17	22			
Line 4	22	21	Potential Seepage Face		
Line 5	23	19		Sheet Pile	
Line 6	21	4	Potential Seepage Face		
Line 7	25	3		Sheet Pile	Sheet Pile
Line 8	5	4	Potential Seepage Face		
Line 9	17	3			
Line 10	25	26			
Line 11	26	21			
Line 12	3	27		Sheet Pile	
Line 13	6	7	Potential Seepage Face		

Line 14	5	26			
Line 15	27	6			
Line 16	5	6	Potential Seepage Face		
Line 17	27	18		Sheet Pile	
Line 18	12	11	Protected Side Water		
Line 19	11	29			
Line 20	28	15			
Line 21	30	14			
Line 22	7	29			
Line 23	7	8	Potential Seepage Face		
Line 24	8	9	Potential Seepage Face		
Line 25	9	10	Potential Seepage Face		
Line 26	10	11	Protected Side Water		
Line 27	31	16			
Line 28	18	31			
Line 29	2	24	Extreme Low Water		
Line 30	24	3	Extreme Low Water		
Line 31	15	34			
Line 32	34	35			
Line 33	35	14			
Line 34	20	36			
Line 35	36	34			
Line 36	36	33			
Line 37	19	28			
Line 38	31	39			
Line 39	39	27			
Line 40	1	39	Extreme Low Water		
Line 41	39	2	Extreme Low Water		
Line 42	41	1	Extreme Low Water		
Line 43	42	16			
Line 44	42	41	Extreme Low Water		
Line 45	38	40	Extreme Low Water		
Line 46	40	42	Extreme Low Water		
Line 47	33	32			
Line 48	32	37	Extreme Low Water		
Line 49	37	38	Extreme Low Water		
Line 50	12	43			
Line 51	43	28			
Line 52	13	44			
Line 53	44	30			
Line 54	29	46			
Line 55	46	18			
Line 56	23	47			Sheet Pile
Line 57	47	18			Sheet Pile

Points

	X (ft)	Y (ft)

Point 1	182	-5.4
Point 2	195.3	-3
Point 3	200	-1.6
Point 4	208.3	3.3
Point 5	230	0
Point 6	231	-2.5
Point 7	241.1	-2.8
Point 8	251.6	-3.7
Point 9	267.3	-4.6
Point 10	310	-4.6
Point 11	310	-7
Point 12	310	-50
Point 13	310	-70
Point 14	182	-70
Point 15	182	-50
Point 16	182	-7
Point 17	200	14.1
Point 18	200	-7
Point 19	200	-28.6
Point 20	182	-28.5
Point 21	201	3.6
Point 22	200.5	14.1
Point 23	200	-23.5
Point 24	199.1	-1.6
Point 25	201	-1.6
Point 26	201	0
Point 27	200	-3.5
Point 28	200	-50
Point 29	241.1	-7
Point 30	200	-70
Point 31	192.53	-7
Point 32	20	-6.4
Point 33	20	-7
Point 34	20	-50
Point 35	20	-70
Point 36	20	-28.5
Point 37	121.6	-6.9
Point 38	130	-8.2
Point 39	192.53	-3.5
Point 40	151.4	-9.1
Point 41	168.1	-4.5
Point 42	159.1	-7
Point 43	241.1	-50
Point 44	241.1	-70
Point 45	199	0
Point 46	201.6	-7
Point 47	200	-21.3



Name: EMBANKMENT FILL, EL. +3.6 TO 0 Model: Undrained (Phi=0) Unit Weight: 110 pcf Cohesion': 580 psf
Name: FILL2, EL.0 TO -2.5/-3.5 Model: Undrained (Phi=0) Unit Weight: 94 pcf Cohesion': 400 psf
Name: BEACH SAND, EL. -7 TO -50 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand
Name: BAY SOUND CLAY, EL. -50 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 102 pcf Cohesion Spatial Fn: Bay Sound Phi': 0 °
Name: Sheet Pile Model: Undrained (Phi=0) Unit Weight: 0.1 pcf Cohesion': 0.01 psf
Name: MARSH, EL. -2.5/-3.5 TO -7 Model: Spatial Mohr-Coulomb Unit Weight: 94 pcf Cohesion Spatial Fn: Marsh Phi': 0 °
Name: MARSH, EL. -2.8 TO -7 (Protected) Model: Spatial Mohr-Coulomb Unit Weight: 100 pcf Cohesion Fn: Marsh 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 VERTICALSWERE ASSUMED TO VARY LINEARLY BETWEENTHE VALUES INDICATED FOR THESE LOCATIONS.

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 1A,
PROTECTED SIDE STABILITY ANALYSIS,
CASE: LWL F/S Stability Analysis (Entry/Exit)
STA. 2+45 TO 7+00 WEST
ORLEANS PARISH, LOUISIANA

Name: LWL F/S Stability Analysis (Entry/Exit)
File Name: Reach 1A.gsz Directory: C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix E LWL\
Last Edited By: Hendrix, Joshua M MVR

LWL F/S Stability Analysis (Entry/Exit)

File Information

Created By: Liljegren, James
Revision Number: 597
Last Edited By: Hendrix, Joshua M MVR
Date: 10/3/2013
Time: 9:16:14 AM
File Name: Reach 1A.gsz
Directory: C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix E LWL\
Last Solved Date: 10/3/2013
Last Solved Time: 9:30:26 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

LWL F/S Stability Analysis (Entry/Exit)

- Description: Tension Crack @ -1.5
- Kind: SLOPE/W
- Parent: 4 - LWL -2.6ft
- Method: Spencer
- Settings
  - PWP Conditions Source: Parent Analysis
- Slip Surface
  - Direction of movement: Right to Left
  - Use Passive Mode: No
  - Slip Surface Option: 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

Optimization Tolerance: 0.01

Minimum Slip Surface Depth: 0.1 ft

Optimization Maximum Iterations: 4000

Optimization Convergence Tolerance: 1e-007

Starting Optimization Points: 8

Ending Optimization Points: 16

Complete Passes per Insertion: 1

Driving Side Maximum Convex Angle: 5 °

Resisting Side Maximum Convex Angle: 1 °

Materials

EMBANKMENT FILL, EL. +3.6 TO 0

Model: Undrained (Phi=0)

Unit Weight: 110 pcf

Cohesion: 580 psf

FILL2, EL.0 TO -2.5/-3.5

Model: Undrained (Phi=0)

Unit Weight: 94 pcf

Cohesion: 400 psf

BEACH SAND, EL. -7 TO -50

Model: Shear/Normal Fn.

Unit Weight: 122 pcf

Strength Function: Sand

Phi-B: 0 °

BAY SOUND CLAY, EL. -50 TO -70

Model: Spatial Mohr-Coulomb

Unit Weight: 102 pcf

Cohesion Spatial Fn: Bay Sound

Phi: 0 °

Phi-B: 0 °

Sheet Pile

Model: Undrained (Phi=0)

Unit Weight: 0.1 pcf

Cohesion: 0.01 psf

MARSH, EL. -2.5/-3.5 TO -7

Model: Spatial Mohr-Coulomb

Unit Weight: 94 pcf

Cohesion Spatial Fn: Marsh

Phi: 0 °
Phi-B: 0 °

MARSH, EL. -2.8 TO -7 (Protected)

Model: Spatial Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion Fn: Marsh
Phi: 0 °
Phi-B: 0 °

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (150, -9.04112) ft
Left-Zone Right Coordinate: (199.5, -1.6) ft
Left-Zone Increment: 12
Right Projection: Range
Right-Zone Left Coordinate: (202, 3.5589) ft
Right-Zone Right Coordinate: (235, -2.61881) ft
Right-Zone Increment: 12
Radius Increments: 5

Slip Surface Limits

Left Coordinate: (20, -6.4) ft
Right Coordinate: (310, -4.6) ft

Cohesion Functions

Marsh

Model: Spline Data Point Function
Function: Cohesion vs. Y
  Curve Fit to Data: 100 %
  Segment Curvature: 0 %
Y-Intercept: 150
Data Points: Y (ft), Cohesion (psf)
  Data Point: (-7, 180)
  Data Point: (-2.8, 150)

Shear/Normal Strength Functions

Sand

Model: Spline Data Point Function
Function: Shear Stress vs. Normal Stress
  Curve Fit to Data: 100 %

Segment Curvature: 0 %
Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
Data Point: (-10000, 0)
Data Point: (0, 0)
Data Point: (10000, 6494)
Estimation Properties
Intact Rock Param.: 10
Geological Strength: 100
Disturbance Factor: 0
SigmaC: 600000 psf
Sigma3: 300000 psf
Num. Points: 20

Spatial Functions

Marsh

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (192.53, -3.5, 150)
Data Point: (192.53, -7, 180)
Data Point: (200, -3.5, 160)
Data Point: (200, -7, 190)
Data Point: (241.1, -2.8, 150)
Data Point: (241.1, -7, 180)

Bay Sound

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (120, -50, 600)
Data Point: (120, -70, 770)
Data Point: (192.53, -50, 600)
Data Point: (192.53, -70, 770)
Data Point: (200, -50, 750)
Data Point: (200, -70, 925)
Data Point: (241.1, -50, 600)
Data Point: (241.1, -70, 770)
Data Point: (310, -50, 600)
Data Point: (310, -70, 770)

Regions

	Material	Points	Area (ft^2)
Region 1	EMBANKMENT FILL, EL. +3.6 TO 0	21,4,5,26	60.99
Region 2	MARSH, EL. -2.5/-3.5 TO -7	6,7,29,46,18,27	167.935

Region 3	BEACH SAND, EL. -7 TO -50	18,47,23,19,20,36,33,32,37,38,40,42,16,31	3858.445
Region 4	BEACH SAND, EL. -7 TO -50	20,36,34,15,28,43,12,11,29,46,18,47,23,19	8599.1
Region 5	BAY SOUND CLAY, EL. -50 TO -70	15,34,35,14,30,44,13,12,43,28	5800
Region 6	Sheet Pile	17,22,21,26,25,3	13.075
Region 7	FILL2, EL.0 TO -2.5/-3.5	27,3,25,26,5,6	90.15
Region 8	MARSH, EL. -2.8 TO -7 (Protected)	16,42,41,1,39,31	66.5965
Region 9	MARSH, EL. -2.8 TO -7 (Protected)	29,7,8,9,10,11	186.6
Region 10	MARSH, EL. -2.5/-3.5 TO -7	31,39,27,18	26.145
Region 11	FILL2, EL.0 TO -2.5/-3.5	2,24,3,27,39	6.9625

Points

	X (ft)	Y (ft)
Point 1	182	-5.4
Point 2	195.3	-3
Point 3	200	-1.6
Point 4	208.3	3.3
Point 5	230	0
Point 6	231	-2.5
Point 7	241.1	-2.8
Point 8	251.6	-3.7
Point 9	267.3	-4.6
Point 10	310	-4.6
Point 11	310	-7
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Point 13	310	-70
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Point 18	200	-7
Point 19	200	-28.6
Point 20	182	-28.5
Point 21	201	3.6
Point 22	200.5	14.1
Point 23	200	-23.5
Point 24	199.1	-1.6
Point 25	201	-1.6
Point 26	201	0
Point 27	200	-3.5
Point 28	200	-50
Point 29	241.1	-7
Point 30	200	-70
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Point 32	20	-6.4
Point 33	20	-7
Point 34	20	-50
Point 35	20	-70

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Point 37	121.6	-6.9
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Point 42	159.1	-7
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Point 44	241.1	-70
Point 45	199	0
Point 46	201.6	-7
Point 47	200	-21.3

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.24	(195.839, 3.89)	6.989089	(205.002, 3.43553)	(187.717, -4.36851)
2	720	1.52	(195.839, 3.89)	11.994	(205.421, 3.41832)	(187.226, -4.45706)

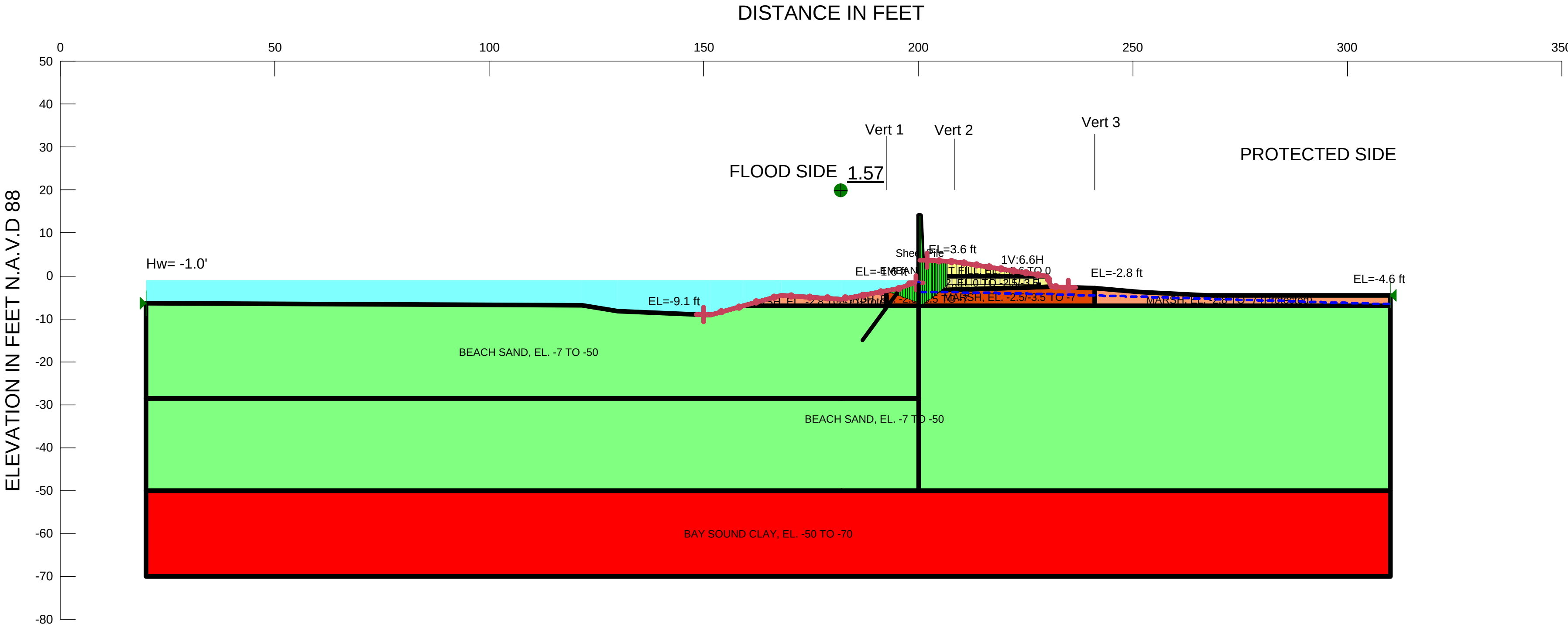
Slices of Slip Surface: Optimized

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	187.9404	-4.497728	115.13806	282.33087	0	162.13
2	Optimized	188.388	-4.756156	124.90703	317.56418	0	163.97
3	Optimized	188.96865	-5.040205	135.71247	320.12873	0	166
4	Optimized	189.68235	-5.349875	147.70525	361.51859	0	168.21
5	Optimized	190.35055	-5.620128	158.29956	381.04525	0	170.14
6	Optimized	190.97325	-5.850964	167.6051	411.86796	0	171.79
7	Optimized	191.59595	-6.0818005	176.79018	442.69068	0	173.44
8	Optimized	192.21865	-6.312637	186.48721	473.49834	0	175.09
9	Optimized	192.78715	-6.523379	195.807	481.03981	0	176.26
10	Optimized	193.30145	-6.7140275	204.59461	505.16017	0	178.58
11	Optimized	193.816	-6.904776	213.77783	529.27225	0	180.91
12	Optimized	194.38005	-7.0014495	218.46283	427.14229	135.51802	3.367e-006
13	Optimized	194.99335	-7.003948	218.39761	431.20239	138.19704	3.4337e-006
14	Optimized	195.3678	-7.0054735	218.34496	435.44371	140.98558	-4.7225e-006
15	Optimized	195.75115	-7.009085	218.44592	441.89865	145.1119	3.6054e-006
16	Optimized	196.38225	-7.015755	218.69943	449.77328	150.06112	3.7284e-006
17	Optimized	196.9775	-7.018425	218.69798	470.30613	163.39624	-5.4735e-006
18	Optimized	197.61875	-7.00888	217.99201	487.85856	175.25339	4.3547e-006
19	Optimized	198.2602	-6.9931245	216.91842	510.58325	0	187.61
20	Optimized	198.82005	-6.979373	216.07918	528.67169	0	188.24
21	Optimized	199.32195	-6.9670455	215.3408	537.27107	0	188.81
22	Optimized	199.7659	-6.956142	214.68999	536.34777	0	189.31
23	Optimized	199.99395	-6.950619	214.36396	539.64215	0	189.57
24	Optimized	200.25	-6.9476265	158.91716	540.90311	0	189.49
25	Optimized	200.75	-6.941783	147.48794	539.80319	0	189.32
26	Optimized	201.00175	-6.9388405	147.29982	1083.1938	0	189.23

27	Optimized	201.2692	-6.709714	132.97209	762.52004	0	187.22
28	Optimized	201.80055	-6.251502	104.27141	727.01654	0	183.2
29	Optimized	202.33185	-5.79329	75.525116	691.51304	0	179.21
30	Optimized	202.8632	-5.335078	46.774547	655.99528	0	175.23
31	Optimized	203.39455	-4.876866	18.011151	620.47753	0	171.27
32	Optimized	203.99565	-4.404115	-11.685659	616.53139	0	167.2
33	Optimized	204.66655	-3.916825	-42.325781	58.401763	0	163.02

Slices of Slip Surface: 720

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	720	187.52475	-4.744824	127.06436	362.52451	0	163.89
2	720	188.12245	-5.283979	148.45879	408.56577	0	167.74
3	720	188.7201	-5.7559335	167.55801	447.11752	0	171.11
4	720	189.31775	-6.1702325	184.67405	479.4309	0	174.07
5	720	189.91545	-6.5338005	199.99753	506.38693	0	176.67
6	720	190.51315	-6.851819	213.72428	528.61459	0	178.94
7	720	191.0983	-7.123268	227.73472	569.13631	221.70879	5.5089e-006
8	720	191.67095	-7.3527025	241.71021	586.4211	223.85787	5.562e-006
9	720	192.24365	-7.548879	253.60471	598.97955	224.28904	-7.5125e-006
10	720	192.807	-7.7112935	263.44145	577.96452	204.25367	5.0746e-006
11	720	193.361	-7.8422145	271.32247	582.99981	202.40563	-6.779e-006
12	720	193.915	-7.945769	277.51097	584.68655	199.48215	4.9557e-006
13	720	194.469	-8.022672	282.09268	583.26531	195.58379	-6.5505e-006
14	720	195.023	-8.0734395	285.04107	578.90638	190.83837	4.7408e-006
15	720	195.61665	-8.0982245	286.37165	573.84836	186.68956	4.6376e-006
16	720	196.25	-8.093255	285.89008	565.10513	181.32437	4.5043e-006
17	720	196.88335	-8.0547255	283.3199	565.74321	183.40784	-6.1424e-006
18	720	197.51665	-7.982308	278.66411	565.37983	186.19537	4.625e-006
19	720	198.15	-7.875375	271.89524	560.46148	187.39711	-6.2756e-006
20	720	198.78335	-7.7329715	262.94337	551.08056	187.11848	4.6481e-006
21	720	199.55	-7.5062355	248.7774	519.24504	175.64374	4.3632e-006
22	720	200.25	-7.260821	178.44121	476.38505	193.48699	-6.4801e-006
23	720	200.68335	-7.080966	156.18639	446.7956	188.72383	4.6882e-006
24	720	200.93335	-6.968742	149.16896	428.97371	0	189.51
25	720	201.3158	-6.775333	137.07334	889.71749	0	187.77
26	720	201.94735	-6.4262105	115.17374	836.09381	0	184.65
27	720	202.5789	-6.024578	89.951817	777.93334	0	181.12
28	720	203.21045	-5.5636935	61.00353	714.61099	0	177.1
29	720	203.842	-5.0342915	27.724626	645.29689	0	172.53
30	720	204.47355	-4.4231245	-10.628395	568.79668	0	167.29
31	720	205.1051	-3.710134	-55.388372	72.190649	0	161.24



Name: EMBANKMENT FILL, EL. +3.6 TO 0 Model: Undrained (Phi=0) Unit Weight: 110 pcf Cohesion: 580 psf
Name: FILL2, EL.0 TO -2.5/-3.5 Model: Undrained (Phi=0) Unit Weight: 94 pcf Cohesion: 400 psf
Name: BEACH SAND, EL. -7 TO -50 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand
Name: BAY SOUND CLAY, EL. -50 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 102 pcf Cohesion Spatial Fn: Bay Sound Phi: 0 °
Name: Sheet Pile Model: Undrained (Phi=0) Unit Weight: 0.1 pcf Cohesion: 0.01 psf
Name: MARSH, EL. -2.5/-3.5 TO -7 Model: Spatial Mohr-Coulomb Unit Weight: 94 pcf Cohesion Spatial Fn: Marsh Phi: 0 °
Name: MARSH, EL. -2.8 TO -7 (Protected) Model: Spatial Mohr-Coulomb Unit Weight: 100 pcf Cohesion Fn: Marsh 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 VERTICALSWERE ASSUMED TO VARY LINEARLY BETWEENTHE VALUES INDICATED FOR THESE LOCATIONS.

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 1A,
PROTECTED SIDE STABILITY ANALYSIS,
CASE: LWL F/S Stability Analysis (Entry/Exit)
STA. 2+45 TO 7+00 WEST
ORLEANS PARISH, LOUISIANA

Name: LWL F/S Stability Analysis (Entry/Exit)
File Name: Orleans Canal Reach 1A.gsz Directory: C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix E LWL\WL -1\
Last Edited By: Hendrix, Joshua M MVR

LWL F/S Stability Analysis (Entry/Exit)

File Information

Created By: Liljegren, James
Revision Number: 590
Last Edited By: Hendrix, Joshua M MVR
Date: 6/10/2013
Time: 11:15:03 AM
File Name: Orleans Canal Reach 1A.gsz
Directory: C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix E LWL\WL -1\
Last Solved Date: 6/10/2013
Last Solved Time: 11:17:04 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

LWL F/S Stability Analysis (Entry/Exit)

Description: Tension Crack @ -1.5
Kind: SLOPE/W
Parent: 4 - LWL -1.0ft
Method: Spencer
Settings
- PWP Conditions Source: Parent Analysis

Slip Surface
- Direction of movement: Right to Left
- Use Passive Mode: No
- Slip Surface Option: Entry and Exit
- Critical slip surfaces saved: 1
- Optimize Critical Slip Surface Location: Yes
- Tension Crack
  - Tension Crack Option: Tension Crack Line
  - Percentage Wet: 0.5
  - Tension Crack Fluid Unit Weight: 62.4 pcf

FOS Distribution

FOS Calculation Option: Constant

Advanced

Number of Slices: 30

Optimization Tolerance: 0.01

Minimum Slip Surface Depth: 0.1 ft

Optimization Maximum Iterations: 4000

Optimization Convergence Tolerance: 1e-007

Starting Optimization Points: 8

Ending Optimization Points: 16

Complete Passes per Insertion: 1

Driving Side Maximum Convex Angle: 5 °

Resisting Side Maximum Convex Angle: 1 °

Materials

EMBANKMENT FILL, EL. +3.6 TO 0

Model: Undrained (Phi=0)

Unit Weight: 110 pcf

Cohesion: 580 psf

FILL2, EL.0 TO -2.5/-3.5

Model: Undrained (Phi=0)

Unit Weight: 94 pcf

Cohesion: 400 psf

BEACH SAND, EL. -7 TO -50

Model: Shear/Normal Fn.

Unit Weight: 122 pcf

Strength Function: Sand

Phi-B: 0 °

BAY SOUND CLAY, EL. -50 TO -70

Model: Spatial Mohr-Coulomb

Unit Weight: 102 pcf

Cohesion Spatial Fn: Bay Sound

Phi: 0 °

Phi-B: 0 °

Sheet Pile

Model: Undrained (Phi=0)

Unit Weight: 0.1 pcf

Cohesion: 0.01 psf

MARSH, EL. -2.5/-3.5 TO -7

Model: Spatial Mohr-Coulomb

Unit Weight: 94 pcf

Cohesion Spatial Fn: Marsh

Phi: 0 °
Phi-B: 0 °

MARSH, EL. -2.8 TO -7 (Protected)

Model: Spatial Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion Fn: Marsh
Phi: 0 °
Phi-B: 0 °

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (150, -9.04112) ft
Left-Zone Right Coordinate: (199.5, -1.6) ft
Left-Zone Increment: 12
Right Projection: Range
Right-Zone Left Coordinate: (202, 3.5589) ft
Right-Zone Right Coordinate: (235, -2.61881) ft
Right-Zone Increment: 12
Radius Increments: 5

Slip Surface Limits

Left Coordinate: (20, -6.4) ft
Right Coordinate: (310, -4.6) ft

Tension Crack Line

	X (ft)	Y (ft)
	202	-2
	228	-2

Cohesion Functions

Marsh

Model: Spline Data Point Function
Function: Cohesion vs. Y
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 150
Data Points: Y (ft), Cohesion (psf)
Data Point: (-7, 180)
Data Point: (-2.8, 150)

Shear/Normal Strength Functions

Sand

Model: Spline Data Point Function
Function: Shear Stress vs. Normal Stress
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
Data Point: (-10000, 0)
Data Point: (0, 0)
Data Point: (10000, 6494)
Estimation Properties
Intact Rock Param.: 10
Geological Strength: 100
Disturbance Factor: 0
SigmaC: 600000 psf
Sigma3: 300000 psf
Num. Points: 20

Spatial Functions

Marsh

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (192.53, -3.5, 150)
Data Point: (192.53, -7, 180)
Data Point: (200, -3.5, 160)
Data Point: (200, -7, 190)
Data Point: (241.1, -2.8, 150)
Data Point: (241.1, -7, 180)

Bay Sound

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (120, -50, 600)
Data Point: (120, -70, 770)
Data Point: (192.53, -50, 600)
Data Point: (192.53, -70, 770)
Data Point: (200, -50, 750)
Data Point: (200, -70, 925)
Data Point: (241.1, -50, 600)
Data Point: (241.1, -70, 770)
Data Point: (310, -50, 600)
Data Point: (310, -70, 770)

Regions

	Material	Points	Area (ft²)
Region 1	EMBANKMENT FILL, EL. +3.6 TO 0	21,4,5,26	60.99
Region 2	MARSH, EL. -2.5/-3.5 TO -7	6,7,29,46,18,27	167.935
Region 3	BEACH SAND, EL. -7 TO -50	18,47,23,19,20,36,33,32,37,38,40,42,16,31	3858.445
Region 4	BEACH SAND, EL. -7 TO -50	20,36,34,15,28,43,12,11,29,46,18,47,23,19	8599.1
Region 5	BAY SOUND CLAY, EL. -50 TO -70	15,34,35,14,30,44,13,12,43,28	5800
Region 6	Sheet Pile	17,22,21,26,25,3	13.075
Region 7	FILL2, EL.0 TO -2.5/-3.5	27,3,25,26,5,6	90.15
Region 8	MARSH, EL. -2.8 TO -7 (Protected)	16,42,41,1,39,31	66.5965
Region 9	MARSH, EL. -2.8 TO -7 (Protected)	29,7,8,9,10,11	186.6
Region 10	MARSH, EL. -2.5/-3.5 TO -7	31,39,27,18	26.145
Region 11	FILL2, EL.0 TO -2.5/-3.5	2,24,3,27,39	6.9625

Points

	X (ft)	Y (ft)
Point 1	182	-5.4
Point 2	195.3	-3
Point 3	200	-1.6
Point 4	208.3	3.3
Point 5	230	0
Point 6	231	-2.5
Point 7	241.1	-2.8
Point 8	251.6	-3.7
Point 9	267.3	-4.6
Point 10	310	-4.6
Point 11	310	-7
Point 12	310	-50
Point 13	310	-70
Point 14	182	-70
Point 15	182	-50
Point 16	182	-7
Point 17	200	14.1
Point 18	200	-7
Point 19	200	-28.6
Point 20	182	-28.5
Point 21	201	3.6
Point 22	200.5	14.1
Point 23	200	-23.5
Point 24	199.1	-1.6
Point 25	201	-1.6
Point 26	201	0
Point 27	200	-3.5
Point 28	200	-50
Point 29	241.1	-7

Point 30	200	-70
Point 31	192.53	-7
Point 32	20	-6.4
Point 33	20	-7
Point 34	20	-50
Point 35	20	-70
Point 36	20	-28.5
Point 37	121.6	-6.9
Point 38	130	-8.2
Point 39	192.53	-3.5
Point 40	151.4	-9.1
Point 41	168.1	-4.5
Point 42	159.1	-7
Point 43	241.1	-50
Point 44	241.1	-70
Point 45	199	0
Point 46	201.6	-7
Point 47	200	-21.3

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.57	(198.932, 5.75)	6.408294	(206.746, 3.36387)	(192.582, -3.4907)
2	803	1.89	(198.932, 5.75)	12.105	(208.23, 3.30287)	(191.377, -3.70805)

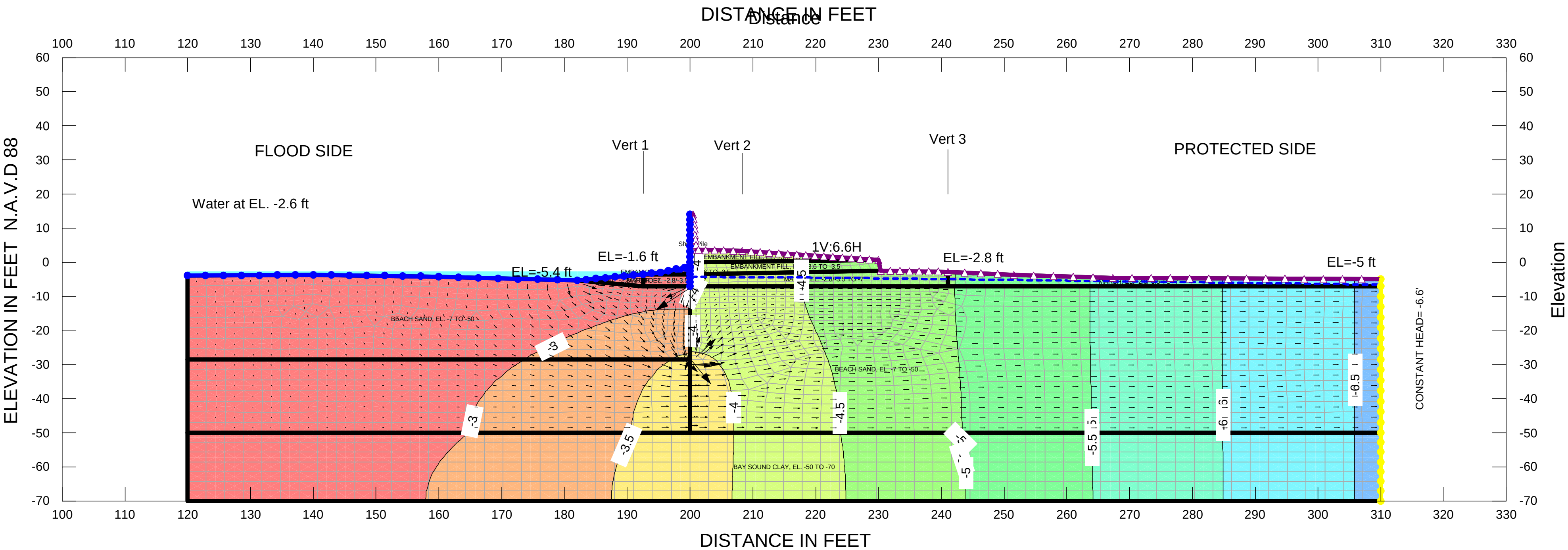
Slices of Slip Surface: Optimized

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	192.8444	-3.588551	153.41986	215.6648	0	151.18
2	Optimized	193.3577	-3.77961	152.25206	237.67745	0	153.5
3	Optimized	193.85845	-3.9660165	152.64881	259.162	0	155.77
4	Optimized	194.30735	-4.134595	156.0684	279.4647	0	157.82
5	Optimized	194.70445	-4.285345	160.49501	296.79439	0	159.64
6	Optimized	195.1015	-4.4360945	165.19945	314.14762	0	161.47
7	Optimized	195.40595	-4.5516995	168.99564	329.64032	0	162.86
8	Optimized	195.7388	-4.6768625	173.79132	345.23826	0	164.38
9	Optimized	196.1926	-4.8467275	180.88842	367.36125	0	166.45
10	Optimized	196.6768	-5.0298765	188.85757	392.18677	0	168.66
11	Optimized	197.19135	-5.226309	198.08165	417.68009	0	171.04
12	Optimized	197.70585	-5.422741	207.81414	443.17341	0	173.41
13	Optimized	198.22035	-5.6191735	217.71005	468.66673	0	175.78
14	Optimized	198.7888	-5.8360065	229.03874	496.70599	0	178.4
15	Optimized	199.325	-6.040382	240.29277	519.74836	0	180.87
16	Optimized	199.775	-6.2119	249.76162	536.90026	0	182.94
17	Optimized	200.11405	-6.3411295	220.30084	512.97156	0	184.33
18	Optimized	200.36405	-6.438733	166.52999	525.28172	0	185.11
19	Optimized	200.74635	-6.590958	176.01944	539.80402	0	186.33
20	Optimized	200.99635	-6.686377	181.96891	380.55982	0	187.08

21	Optimized	201.2397	-6.508152	170.82304	884.67518	0	185.51
22	Optimized	201.7191	-6.1570485	148.78483	852.3987	0	182.42
23	Optimized	202.19855	-5.805945	126.69445	820.10539	0	179.34
24	Optimized	202.678	-5.4548415	104.59903	787.81208	0	176.27
25	Optimized	203.1171	-5.132285	84.295047	757.38783	0	173.47
26	Optimized	203.51585	-4.838275	65.767576	730.36061	0	170.93
27	Optimized	203.91275	-4.5466465	47.390296	704.30849	0	168.41
28	Optimized	204.3078	-4.2574	29.159646	677.67532	0	165.93
29	Optimized	204.7028	-3.9681535	10.907346	651.06257	0	163.45
30	Optimized	205.17545	-3.5738515	-13.965954	591.36625	0	160.1
31	Optimized	205.682	-3.1142165	-42.980002	426.98345	0	400
32	Optimized	206.12155	-2.678195	-70.566585	339.57159	0	400
33	Optimized	206.5378	-2.226065	-99.163885	264.72232	0	400

Slices of Slip Surface: 803

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	803	191.6652	-3.9245735	175.97994	285.07113	0	158.03
2	803	192.24175	-4.332369	188.78238	323.54022	0	160.95
3	803	192.807	-4.6862115	197.98873	347.57779	0	160.54
4	803	193.361	-4.9924225	206.1336	373.79341	0	163.9
5	803	193.915	-5.2622585	215.20121	396.41637	0	166.96
6	803	194.469	-5.498348	223.43619	415.78224	0	169.72
7	803	195.023	-5.702784	230.82592	432.04695	0	172.22
8	803	195.57145	-5.875774	237.36542	448.99988	0	174.44
9	803	196.1143	-6.019204	243.49909	462.41896	0	176.39
10	803	196.65715	-6.1361215	248.50409	473.25238	0	178.12
11	803	197.2	-6.227305	252.50615	481.62129	0	179.63
12	803	197.74285	-6.2933405	255.54753	487.55682	0	180.92
13	803	198.2857	-6.334641	257.26962	491.12267	0	182
14	803	198.82855	-6.3514605	257.86698	492.32165	0	182.87
15	803	199.325	-6.346455	257.46389	487.80878	0	183.49
16	803	199.775	-6.3234205	256.04272	480.40708	0	183.9
17	803	200.25	-6.280305	172.79743	435.33357	0	183.78
18	803	200.75	-6.2149125	152.51072	423.06198	0	183.11
19	803	201.2727	-6.1231455	146.73077	943.27184	0	182.22
20	803	201.8181	-6.002392	139.08032	921.23732	0	181.08
21	803	202.3635	-5.8547605	129.71237	896.71308	0	179.72
22	803	202.90895	-5.6792065	118.59268	869.61385	0	178.13
23	803	203.4544	-5.474416	105.59016	839.78951	0	176.3
24	803	203.9998	-5.23875	90.624557	807.08334	0	174.22
25	803	204.5452	-4.970165	73.620477	771.28844	0	171.87
26	803	205.0906	-4.6661045	54.350185	732.16034	0	169.24
27	803	205.636	-4.323342	32.661393	689.37075	0	166.3
28	803	206.1814	-3.937748	8.2701246	642.52405	0	163.01
29	803	206.72685	-3.503935	-19.167221	591.07227	0	159.35
30	803	207.30725	-2.978978	-52.380375	426.23327	0	400
31	803	207.9226	-2.341874	-92.746388	305.53094	0	400



Name: BEACH SAND, EL. -7 TO -50 Model: Saturated Only K-Sat: 0.00049 ft/sec Ky'/Kx' Ratio: 1
Name: BAY SOUND CLAY, EL. -50 TO -70 Model: Saturated Only K-Sat: 3.28e-008 ft/sec Ky'/Kx' Ratio: 1
Name: Sheet Pile Model: Saturated Only K-Sat: 1e-010 ft/sec Ky'/Kx' Ratio: 1
Name: MARSH, EL. -2.8/-3.5 TO -7 Model: Saturated Only K-Sat: 3.28e-007 ft/sec Ky'/Kx' Ratio: 1
Name: EMBANKMENT FILL, EL. +3.6 TO -3.5 Model: Saturated Only K-Sat: 3.28e-008 ft/sec Ky'/Kx' Ratio: 1

GENERAL NOTES

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

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

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 1B
PROTECTED SIDE STABILITY ANALYSIS
CASE: Gap Analysis (seepage) 03 EWL
STA. 7+00 TO 9+25 WEST
ORLEANS PARISH, LOUISIANA

ETL 1110-2-575 ANALYSIS

Name: Gap Analysis (seepage) 03 EWL
File Name: Reach 1B.gsz Directory: C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix E LWL\
Last Edited By: Reves, Ryan D MVK

Gap Analysis (seepage) 03 EWL

File Information

Created By: Liljegren, James
Revision Number: 680
Last Edited By: Reves, Ryan D MVK
Date: 10/3/2013
Time: 9:37:11 AM
File Name: Reach 1B.gsz
Directory: C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix E LWL\
Last Solved Date: 10/3/2013
Last Solved Time: 9:37:42 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) 03 EWL

Description: WL -2.6
Kind: SEEP/W
Method: Steady-State
Settings
- Include Air Flow: No

Control
- Apply Runoff: No

Convergence
- Convergence Type: Head Vector Norm
- Maximum Number of Iterations: 500
- Tolerance: 0.001
- Maximum Change in K: 0.1
- Rate of Change in K: 1.02
- Minimum Change in K: 1e-005
- Equation Solver: Parallel Direct
- Potential Seepage Max # of Reviews: 10

Time

Starting Time: 0 sec

Duration: 0 sec

Ending Time: 0 sec

Materials

BEACH SAND, EL. -7 TO -50

Model: Saturated Only

Hydraulic

K-Sat: 0.00049 ft/sec

Volumetric Water Content: 0 ft^3/ft^3

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

BAY SOUND CLAY, EL. -50 TO -70

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-008 ft/sec

Volumetric Water Content: 0 ft^3/ft^3

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 ft^3/ft^3

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

MARSH, EL. -2.8/-3.5 TO -7

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-007 ft/sec

Volumetric Water Content: 0 ft^3/ft^3

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

EMBANKMENT FILL, EL. +3.6 TO -3.5

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-008 ft/sec

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

Boundary Conditions

Drainage

Review: true
Type: Total Flux (Q) 0

Curb

Type: Head (H) -6.6

Canal Water (Global) EWL

Type: Head (H) -2.6

Regions

	Material	Points	Area (ft²)
Region 1	EMBANKMENT FILL, EL. +3.6 TO -3.5	21,4,5,26	58.435
Region 2	MARSH, EL. -2.8/-3.5 TO -7	6,7,29,18,27	168.145
Region 3	BEACH SAND, EL. -7 TO -50	18,23,19,20,36,33,32,37,38,1,31	1900.824
Region 4	BEACH SAND, EL. -7 TO -50	20,36,34,15,28,12,11,29,18,23,19	6450
Region 5	BAY SOUND CLAY, EL. -50 TO -70	15,34,35,14,30,13,12,28	3800
Region 6	Sheet Pile	17,22,21,26,25,3	13.075
Region 7	EMBANKMENT FILL, EL. +3.6 TO -3.5	27,3,25,26,5,6	99.39
Region 8	MARSH, EL. -2.8/-3.5 TO -7	1,39,31	18.4275
Region 9	MARSH, EL. -2.8/-3.5 TO -7	29,7,8,9,10,11	178.06
Region 10	MARSH, EL. -2.8/-3.5 TO -7	31,39,27,18	26.145
Region 11	EMBANKMENT FILL, EL. +3.6 TO -3.5	2,24,3,27,39	6.9625

Lines

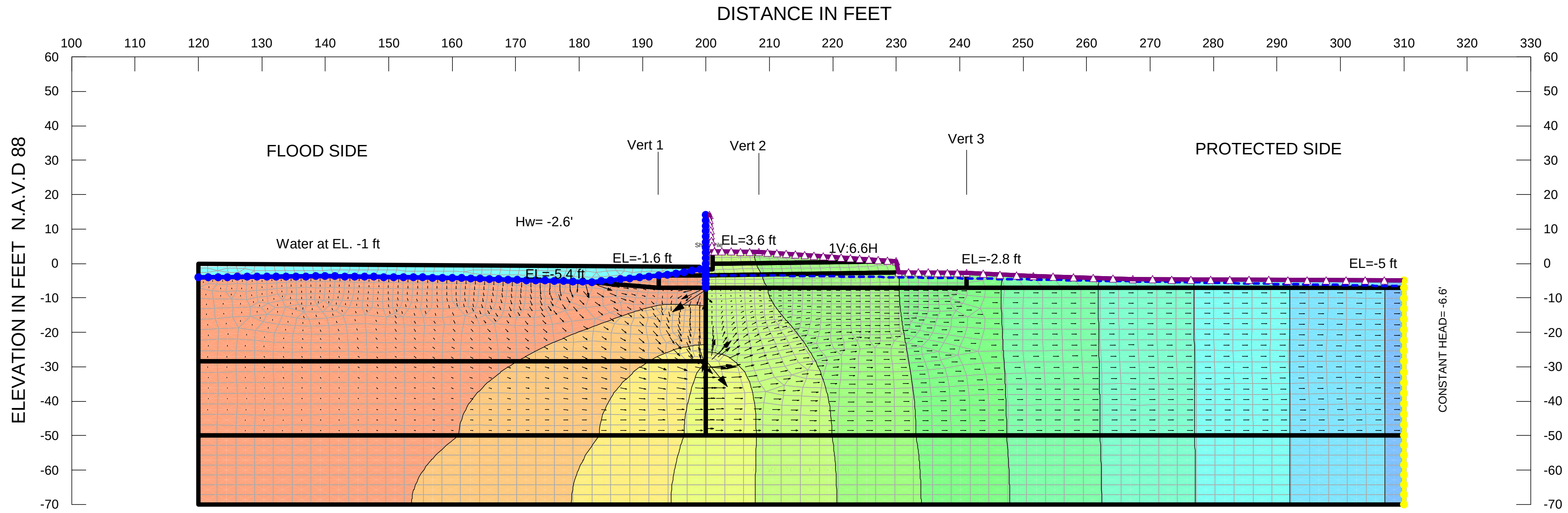
	Start Point	End Point	Hydraulic Boundary	Left Side Material	Right Side Material
Line 1	19	20			
Line 2	13	12	Curb		
Line 3	17	22			
Line 4	22	21	Drainage		
Line 5	23	19		Sheet Pile	
Line 6	21	4	Drainage		
Line 7	25	3		Sheet Pile	Sheet Pile
Line 8	5	4	Drainage		
Line 9	17	3	Canal Water (Global) EWL		
Line 10	25	26			Sheet Pile
Line 11	26	21			Sheet Pile
Line 12	3	27	Canal Water (Global) EWL	Sheet Pile	

Line 13	6	7	Drainage		
Line 14	5	26			
Line 15	27	6			
Line 16	5	6	Drainage		
Line 17	27	18	Canal Water (Global) EWL	Sheet Pile	
Line 18	12	11	Curb		
Line 19	11	29			
Line 20	29	18			
Line 21	28	15			
Line 22	12	28			
Line 23	30	14			
Line 24	13	30			
Line 25	23	18			Sheet Pile
Line 26	7	29			
Line 27	7	8	Drainage		
Line 28	8	9	Drainage		
Line 29	9	10	Drainage		
Line 30	10	11	Curb		
Line 31	18	31			
Line 32	2	24	Canal Water (Global) EWL		
Line 33	24	3	Canal Water (Global) EWL		
Line 34	15	34			
Line 35	34	35			
Line 36	35	14			
Line 37	20	36			
Line 38	36	34			
Line 39	36	33			
Line 40	32	37	Canal Water (Global) EWL		
Line 41	37	38	Canal Water (Global) EWL		
Line 42	38	1	Canal Water (Global) EWL		
Line 43	19	28			
Line 44	31	39			
Line 45	39	27			
Line 46	1	39	Canal Water (Global) EWL		
Line 47	39	2	Canal Water (Global) EWL		
Line 48	31	1			
Line 49	33	32			

Points

	X (ft)	Y (ft)
Point 1	182	-5.4
Point 2	195.3	-3
Point 3	200	-1.6
Point 4	208.3	3.3
Point 5	230	0.7
Point 6	230.4	-2.5
Point 7	241.1	-2.8

Point 8	251.6	-3.7
Point 9	267.3	-4.6
Point 10	310	-5
Point 11	310	-7
Point 12	310	-50
Point 13	310	-70
Point 14	182	-70
Point 15	182	-50
Point 16	182	-7
Point 17	200	14.1
Point 18	200	-7
Point 19	200	-28.5
Point 20	182	-28.5
Point 21	201	3.6
Point 22	200.5	14.1
Point 23	200	-23.5
Point 24	199.1	-1.6
Point 25	201	-1.6
Point 26	201	0
Point 27	200	-3.5
Point 28	200	-50
Point 29	241.1	-7
Point 30	200	-70
Point 31	192.53	-7
Point 32	120	-4
Point 33	120	-7
Point 34	120	-50
Point 35	120	-70
Point 36	120	-28.5
Point 37	140	-3.7
Point 38	160	-4.2
Point 39	192.53	-3.5



Name: BEACH SAND, EL. -7 TO -50 Model: Saturated Only K-Sat: 0.00049 ft/sec K-Ratio: 1
Name: BAY SOUND CLAY, EL. -50 TO -70 Model: Saturated Only K-Sat: 3.28e-008 ft/sec K-Ratio: 1
Name: Sheet Pile Model: Saturated Only K-Sat: 1e-010 ft/sec K-Ratio: 1
Name: MARSH, EL. -2.8/-3.5 TO -7 Model: Saturated Only K-Sat: 3.28e-007 ft/sec K-Ratio: 1
Name: EMBANKMENT FILL, EL. +3.6 TO -3.5 Model: Saturated Only K-Sat: 3.28e-008 ft/sec K-Ratio: 1

GENERAL NOTES

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

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

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 1B,
PROTECTED SIDE STABILITY ANALYSIS
CASE: Gap Analysis (seepage) 03 EWL
STA. 7+00 TO 9+25 WEST
ORLEANS PARISH, LOUISIANA

ETL 1110-2-575 ANALYSIS

Name: Gap Analysis (seepage) 03 EWL
File Name: Orleans Canal Reach 1B.gsz Directory: C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix E LWL\WL -1\
Last Edited By: Reves, Ryan D MVK

Gap Analysis (seepage) 03 EWL

File Information

Created By: Liljegren, James
Revision Number: 664
Last Edited By: Reves, Ryan D MVK
Date: 3/28/2013
Time: 1:31:44 PM
File Name: Orleans Canal Reach 1B.gsz
Directory: C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix E LWL\WL -1\
Last Solved Date: 3/28/2013
Last Solved Time: 1:31:52 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 Analysis (seepage) 03 EWL

Description: WL -2.6
Kind: SEEP/W
Method: Steady-State
Settings
- Include Air Flow: No

Control
- Apply Runoff: No

Convergence
- Convergence Type: Head Vector Norm
- Maximum Number of Iterations: 500
- Tolerance: 0.001
- Maximum Change in K: 0.1
- Rate of Change in K: 1.02
- Minimum Change in K: 1e-005
- Equation Solver: Parallel Direct
- Potential Seepage Max # of Reviews: 10

Time

Starting Time: 0 sec

Duration: 0 sec

Ending Time: 0 sec

Materials

BEACH SAND, EL. -7 TO -50

Model: Saturated Only

Hydraulic

K-Sat: 0.00049 ft/sec

Volumetric Water Content: 0 ft^3/ft^3

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

BAY SOUND CLAY, EL. -50 TO -70

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-008 ft/sec

Volumetric Water Content: 0 ft^3/ft^3

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 ft^3/ft^3

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

MARSH, EL. -2.8/-3.5 TO -7

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-007 ft/sec

Volumetric Water Content: 0 ft^3/ft^3

Mv: 0 /psf

K-Ratio: 1

K-Direction: 0 °

EMBANKMENT FILL, EL. +3.6 TO -3.5

Model: Saturated Only

Hydraulic

K-Sat: 3.28e-008 ft/sec

Volumetric Water Content: 0 ft^3/ft^3
Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

Boundary Conditions

Drainage

Review: true
Type: Total Flux (Q) 0

Curb

Type: Head (H) -6.6

Canal Water (Global) EWL

Type: Head (H) -1

Regions

	Material	Points	Area (ft^2)
Region 1	EMBANKMENT FILL, EL. +3.6 TO -3.5	21,4,5,26	58.435
Region 2	MARSH, EL. -2.8/-3.5 TO -7	6,7,29,18,27	168.145
Region 3	BEACH SAND, EL. -7 TO -50	18,23,19,20,36,33,32,37,38,1,31	1900.824
Region 4	BEACH SAND, EL. -7 TO -50	20,36,34,15,28,12,11,29,18,23,19	6450
Region 5	BAY SOUND CLAY, EL. -50 TO -70	15,34,35,14,30,13,12,28	3800
Region 6	Sheet Pile	17,22,21,26,25,3	13.075
Region 7	EMBANKMENT FILL, EL. +3.6 TO -3.5	27,3,25,26,5,6	99.39
Region 8	MARSH, EL. -2.8/-3.5 TO -7	1,39,31	18.4275
Region 9	MARSH, EL. -2.8/-3.5 TO -7	29,7,8,9,10,11	178.06
Region 10	MARSH, EL. -2.8/-3.5 TO -7	31,39,27,18	26.145
Region 11	EMBANKMENT FILL, EL. +3.6 TO -3.5	2,24,3,27,39	6.9625
Region 12		32,40,41,24,2,39,1,38,37	286.571

Lines

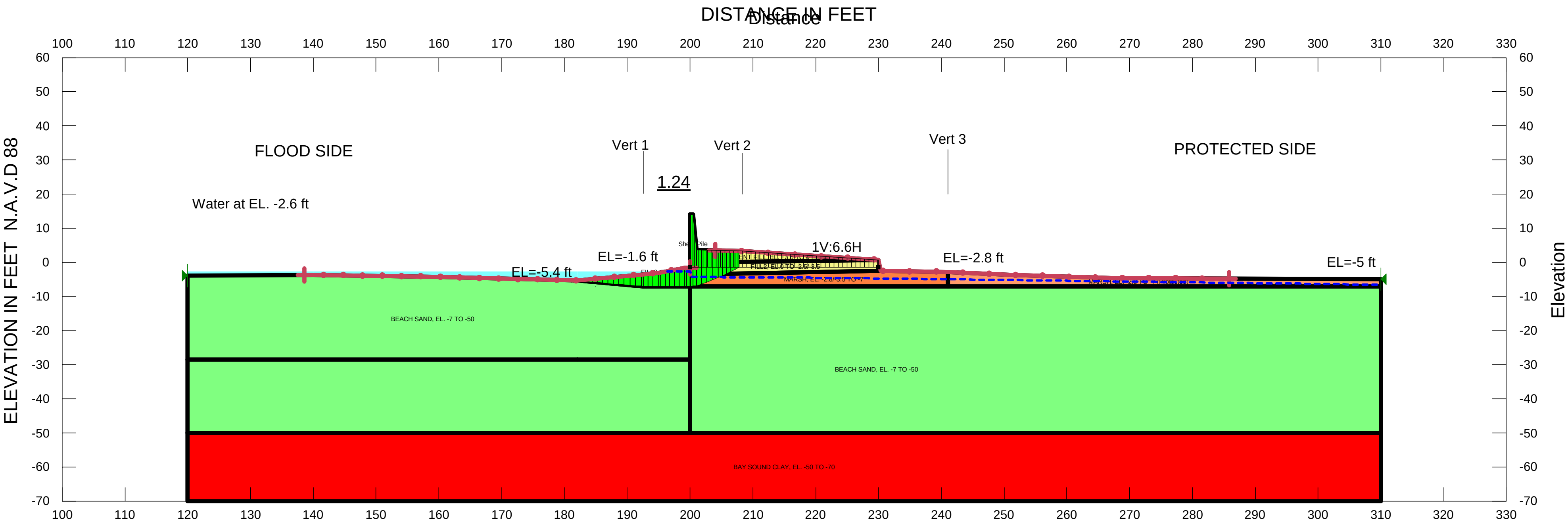
	Start Point	End Point	Hydraulic Boundary	Left Side Material	Right Side Material
Line 1	19	20			
Line 2	13	12	Curb		
Line 3	17	22			
Line 4	22	21	Drainage		
Line 5	23	19		Sheet Pile	
Line 6	21	4	Drainage		
Line 7	25	3		Sheet Pile	Sheet Pile
Line 8	5	4	Drainage		
Line 9	17	3	Canal Water (Global) EWL		
Line 10	25	26			Sheet Pile
Line 11	26	21			Sheet Pile

Line 12	3	27	Canal Water (Global) EWL	Sheet Pile	
Line 13	6	7	Drainage		
Line 14	5	26			
Line 15	27	6			
Line 16	5	6	Drainage		
Line 17	27	18	Canal Water (Global) EWL	Sheet Pile	
Line 18	12	11	Curb		
Line 19	11	29			
Line 20	29	18			
Line 21	28	15			
Line 22	12	28			
Line 23	30	14			
Line 24	13	30			
Line 25	23	18			Sheet Pile
Line 26	7	29			
Line 27	7	8	Drainage		
Line 28	8	9	Drainage		
Line 29	9	10	Drainage		
Line 30	10	11	Curb		
Line 31	18	31			
Line 32	2	24	Canal Water (Global) EWL		
Line 33	24	3	Canal Water (Global) EWL		
Line 34	15	34			
Line 35	34	35			
Line 36	35	14			
Line 37	20	36			
Line 38	36	34			
Line 39	36	33			
Line 40	32	37	Canal Water (Global) EWL		
Line 41	37	38	Canal Water (Global) EWL		
Line 42	38	1	Canal Water (Global) EWL		
Line 43	19	28			
Line 44	31	39			
Line 45	39	27			
Line 46	1	39	Canal Water (Global) EWL		
Line 47	39	2	Canal Water (Global) EWL		
Line 48	32	40			
Line 49	40	41			
Line 50	41	24			
Line 51	31	1			
Line 52	33	32			

Points

	X (ft)	Y (ft)
Point 1	182	-5.4
Point 2	195.3	-3
Point 3	200	-1.6

Point 4	208.3	3.3
Point 5	230	0.7
Point 6	230.4	-2.5
Point 7	241.1	-2.8
Point 8	251.6	-3.7
Point 9	267.3	-4.6
Point 10	310	-5
Point 11	310	-7
Point 12	310	-50
Point 13	310	-70
Point 14	182	-70
Point 15	182	-50
Point 16	182	-7
Point 17	200	14.1
Point 18	200	-7
Point 19	200	-28.5
Point 20	182	-28.5
Point 21	201	3.6
Point 22	200.5	14.1
Point 23	200	-23.5
Point 24	199.1	-1.6
Point 25	201	-1.6
Point 26	201	0
Point 27	200	-3.5
Point 28	200	-50
Point 29	241.1	-7
Point 30	200	-70
Point 31	192.53	-7
Point 32	120	-4
Point 33	120	-7
Point 34	120	-50
Point 35	120	-70
Point 36	120	-28.5
Point 37	140	-3.7
Point 38	160	-4.2
Point 39	192.53	-3.5
Point 40	120	0
Point 41	199	-1



Name: EMBANKMENT FILL, EL. +3.6 TO 0 Model: Undrained (Phi=0) Unit Weight: 110 pcf Cohesion': 580 psf
Name: FILL2, EL.0 TO -2.5/-3.5 Model: Undrained (Phi=0) Unit Weight: 94 pcf Cohesion': 400 psf
Name: BEACH SAND, EL. -7 TO -50 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand
Name: BAY SOUND CLAY, EL. -50 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 102 pcf Cohesion Spatial Fn: Bay Sound Phi': 0 °
Name: Sheet Pile Model: Undrained (Phi=0) Unit Weight: 0.1 pcf Cohesion': 0.01 psf
Name: MARSH, EL. -2.8/-3.5 TO -7 Model: Spatial Mohr-Coulomb Weight Fn: Marsh Cohesion Spatial Fn: Marsh Phi': 0 °
Name: MARSH, EL. -2.8 TO -7 (Protected) Model: Spatial Mohr-Coulomb Unit Weight: 100 pcf Cohesion Fn: Marsh 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.

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 1B
PROTECTED SIDE STABILITY ANALYSIS
CASE: Slope Stability (Entry/Exit) 03 FS
STA. 7+00 TO 9+25 WEST
ORLEANS PARISH, LOUISIANA

ETL 1110-2-575 ANALYSIS

Name: Slope Stability (Entry/Exit) 03 FS
File Name: Reach 1B.gsz Directory: C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix E LWL\
Last Edited By: Reves, Ryan D MVK

Slope Stability (Entry/Exit) 03 FS

File Information

Created By: Liljegren, James
Revision Number: 680
Last Edited By: Reves, Ryan D MVK
Date: 10/3/2013
Time: 9:37:11 AM
File Name: Reach 1B.gsz
Directory: C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix E LWL\
Last Solved Date: 10/3/2013
Last Solved Time: 9:39:52 AM

Project Settings

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

Analysis Settings

Slope Stability (Entry/Exit) 03 FS

Kind: SLOPE/W
Parent: Gap Analysis (seepage) 03 EWL
Method: Spencer
Settings
- PWP Conditions Source: Parent Analysis

Slip Surface
- Direction of movement: Right to Left
- Use Passive Mode: No
- Slip Surface Option: Entry and Exit
- Critical slip surfaces saved: 1
- Optimize Critical Slip Surface Location: Yes
- Tension Crack
  - Tension Crack Option: Tension Crack Line
  - Percentage Wet: 1
  - Tension Crack Fluid Unit Weight: 62.4 pcf

FOS Distribution
- FOS Calculation Option: Constant

Advanced

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

Materials

EMBANKMENT FILL, EL. +3.6 TO 0

Model: Undrained (Phi=0)
Unit Weight: 110 pcf
Cohesion: 580 psf

FILL2, EL.0 TO -2.5/-3.5

Model: Undrained (Phi=0)
Unit Weight: 94 pcf
Cohesion: 400 psf

BEACH SAND, EL. -7 TO -50

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

BAY SOUND CLAY, EL. -50 TO -70

Model: Spatial Mohr-Coulomb
Unit Weight: 102 pcf
Cohesion Spatial Fn: Bay Sound
Phi: 0 °
Phi-B: 0 °

Sheet Pile

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

MARSH, EL. -2.8/-3.5 TO -7

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

Phi-B: 0 °

MARSH, EL. -2.8 TO -7 (Protected)

Model: Spatial Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion Fn: Marsh
Phi: 0 °
Phi-B: 0 °

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (138.6, -3.721) ft
Left-Zone Right Coordinate: (200, -1.6) ft
Left-Zone Increment: 20
Right Projection: Range
Right-Zone Left Coordinate: (204, 3.47671) ft
Right-Zone Right Coordinate: (285.79839, -4.77329) ft
Right-Zone Increment: 20
Radius Increments: 2

Slip Surface Limits

Left Coordinate: (120, -4) ft
Right Coordinate: (310, -5) ft

Tension Crack Line

	X (ft)	Y (ft)
	200	-1.5
	230	-1.5

Cohesion Functions

Marsh

Model: Spline Data Point Function
Function: Cohesion vs. Y
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 150
Data Points: Y (ft), Cohesion (psf)
Data Point: (-7, 180)
Data Point: (-2.8, 150)

Shear/Normal Strength Functions

Sand

Model: Spline Data Point Function
Function: Shear Stress vs. Normal Stress
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
Data Point: (-10000, 0)
Data Point: (0, 0)
Data Point: (10000, 6494)
Estimation Properties
Intact Rock Param.: 10
Geological Strength: 100
Disturbance Factor: 0
SigmaC: 600000 psf
Sigma3: 300000 psf
Num. Points: 20

Unit Weight Functions

Marsh

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 100
Data Points: X (ft), Unit Weight (pcf)
Data Point: (192.5, 100)
Data Point: (208.3, 94)
Data Point: (241.1, 100)

Spatial Functions

Marsh

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (192.53, -3.5, 150)
Data Point: (192.53, -7, 180)
Data Point: (200, -3.5, 160)
Data Point: (200, -7, 190)
Data Point: (241.1, -2.8, 150)
Data Point: (241.1, -7, 180)

Bay Sound

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (120, -50, 600)
Data Point: (120, -70, 770)
Data Point: (192.53, -50, 600)
Data Point: (192.53, -70, 770)
Data Point: (200, -50, 750)
Data Point: (200, -70, 925)
Data Point: (241.1, -50, 600)
Data Point: (241.1, -70, 770)
Data Point: (310, -50, 600)
Data Point: (310, -70, 770)

Regions

	Material	Points	Area (ft²)
Region 1	EMBANKMENT FILL, EL. +3.6 TO 0	21,4,5,26	58.435
Region 2	MARSH, EL. -2.8/-3.5 TO -7	6,7,29,18,27	168.145
Region 3	BEACH SAND, EL. -7 TO -50	18,23,19,20,36,33,32,37,38,1,31	1900.824
Region 4	BEACH SAND, EL. -7 TO -50	20,36,34,15,28,12,11,29,18,23,19	6450
Region 5	BAY SOUND CLAY, EL. -50 TO -70	15,34,35,14,30,13,12,28	3800
Region 6	Sheet Pile	17,22,21,26,25,3	13.075
Region 7	FILL2, EL.0 TO -2.5/-3.5	27,3,25,26,5,6	99.39
Region 8	MARSH, EL. -2.8 TO -7 (Protected)	1,39,31	18.4275
Region 9	MARSH, EL. -2.8 TO -7 (Protected)	29,7,8,9,10,11	178.06
Region 10	MARSH, EL. -2.8/-3.5 TO -7	31,39,27,18	26.145
Region 11	FILL2, EL.0 TO -2.5/-3.5	2,24,3,27,39	6.9625

Points

	X (ft)	Y (ft)
Point 1	182	-5.4
Point 2	195.3	-3
Point 3	200	-1.6
Point 4	208.3	3.3
Point 5	230	0.7
Point 6	230.4	-2.5
Point 7	241.1	-2.8
Point 8	251.6	-3.7
Point 9	267.3	-4.6
Point 10	310	-5
Point 11	310	-7
Point 12	310	-50
Point 13	310	-70
Point 14	182	-70
Point 15	182	-50
Point 16	182	-7

Point 17	200	14.1
Point 18	200	-7
Point 19	200	-28.5
Point 20	182	-28.5
Point 21	201	3.6
Point 22	200.5	14.1
Point 23	200	-23.5
Point 24	199.1	-1.6
Point 25	201	-1.6
Point 26	201	0
Point 27	200	-3.5
Point 28	200	-50
Point 29	241.1	-7
Point 30	200	-70
Point 31	192.53	-7
Point 32	120	-4
Point 33	120	-7
Point 34	120	-50
Point 35	120	-70
Point 36	120	-28.5
Point 37	140	-3.7
Point 38	160	-4.2
Point 39	192.53	-3.5

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.24	(192.616, 15.692)	11.24087	(207.826, 3.31949)	(181.995, -5.39974)
2	890	1.48	(192.616, 15.692)	23.655	(208.865, 3.23228)	(181.894, -5.39419)

Slices of Slip Surface: Optimized

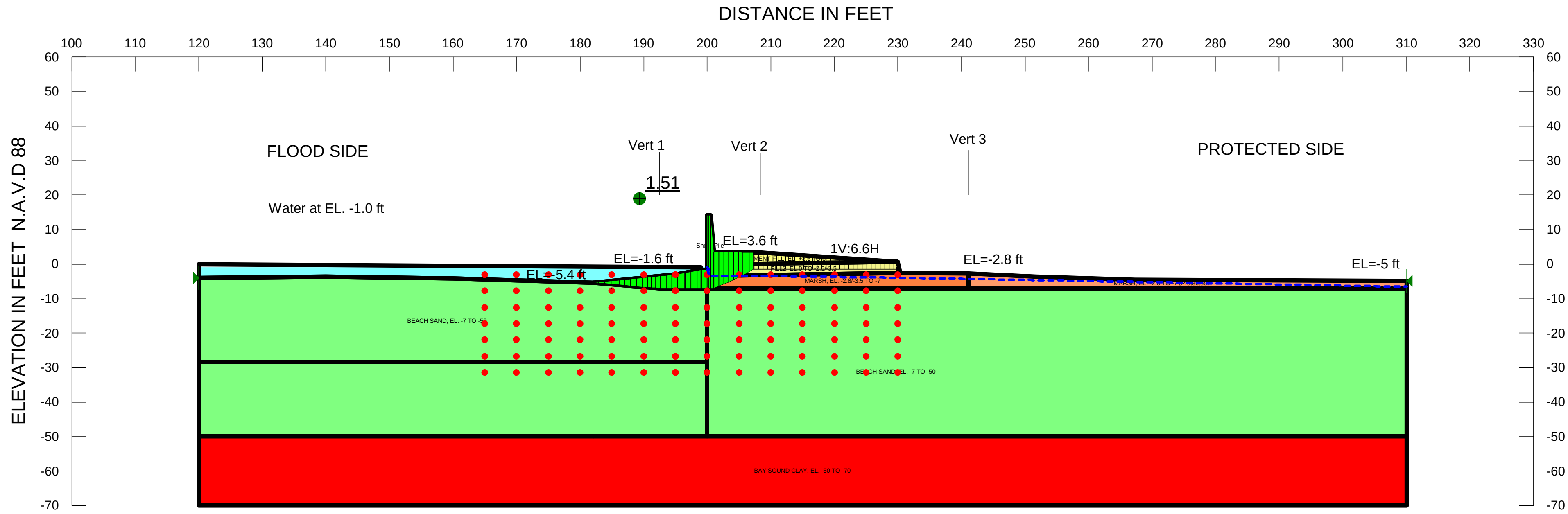
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	181.9976	-5.4001035	174.72496	179.15192	2.8748981	2.4307e-008
2	Optimized	182.4106	-5.462901	176.4794	200.71386	15.738046	-2.1533e-007
3	Optimized	183.2318	-5.5877645	179.93459	222.49238	27.637353	-3.7805e-007
4	Optimized	184.053	-5.712628	185.01503	243.89768	38.238839	-5.2291e-007
5	Optimized	184.86475	-5.8401375	191.09863	266.65469	49.066678	1.5945e-006
6	Optimized	185.66705	-5.9702925	197.74255	288.59191	58.998266	4.6416e-006
7	Optimized	186.49455	-6.100575	204.42267	309.24232	68.070678	-2.9469e-007
8	Optimized	187.34725	-6.230985	211.40137	331.19857	77.797212	-3.3679e-007
9	Optimized	188.19995	-6.361395	218.44963	353.13163	87.463519	2.1752e-006
10	Optimized	189.05265	-6.491805	225.71814	375.01833	96.956676	2.4111e-006
11	Optimized	189.94035	-6.6298585	233.55945	399.1535	107.53804	-4.6555e-007
12	Optimized	190.86305	-6.775555	241.9842	423.49644	117.87542	-5.103e-007
13	Optimized	191.7858	-6.9212515	250.64446	447.78585	128.02511	-4.2923e-006
14	Optimized	192.3886	-6.997543	255.15704	430.32788	113.75727	2.8284e-006
15	Optimized	192.9274	-7.0106615	255.92644	434.2876	115.82909	2.88e-006

16	Optimized	193.72225	-7.030013	257.13388	440.41283	119.02274	2.9593e-006
17	Optimized	194.5171	-7.0493645	258.56771	446.50033	122.04487	3.0345e-006
18	Optimized	195.10725	-7.06031	259.50821	446.74634	121.59386	3.023e-006
19	Optimized	195.6668	-7.0639965	260.10112	452.65856	125.04826	3.1089e-006
20	Optimized	196.4004	-7.06883	261.20527	460.67383	129.5364	3.2206e-006
21	Optimized	197.134	-7.0736635	262.45936	488.6455	146.887	3.652e-006
22	Optimized	197.9006	-7.063904	263.63892	506.29022	157.5796	3.9176e-006
23	Optimized	198.7002	-7.0395515	264.93892	531.97786	173.41711	-5.8123e-006
24	Optimized	199.2802	-7.0218875	268.01491	543.59056	178.96092	4.4491e-006
25	Optimized	199.7302	-7.008996	270.75536	541.7886	176.01104	4.3755e-006
26	Optimized	200.029	-7.000796	264.15371	542.62371	180.84053	4.4961e-006
27	Optimized	200.279	-6.993936	173.61823	542.87928	0	189.88
28	Optimized	200.75	-6.9810115	165.22581	540.51655	0	189.66
29	Optimized	201.0053	-6.9740055	164.7731	1081.7798	0	189.53
30	Optimized	201.41935	-6.6893425	146.96113	838.32499	0	187.01
31	Optimized	202.23685	-6.1203075	111.22984	787.71486	0	182
32	Optimized	203.1113	-5.4907275	71.686075	720.84623	0	176.5
33	Optimized	204.0427	-4.8006025	28.256386	661.15888	0	170.53
34	Optimized	204.83185	-4.1689395	-11.487436	575.66184	0	165.12
35	Optimized	205.47875	-3.595739	-47.557038	528.89619	0	160.25
36	Optimized	206.1596	-2.9924395	-85.573947	365.60273	0	400
37	Optimized	206.84415	-2.381805	-124.1433	310.06268	0	400
38	Optimized	207.4985	-1.793935	-161.27261	70.666188	0	400

Slices of Slip Surface: 890

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	890	181.9468	-5.4210865	175.94221	201.89746	16.855536	-6.2205e-007
2	890	182.43875	-5.657139	187.93123	253.83935	42.801232	1.3932e-006
3	890	183.31625	-6.053939	208.27143	317.83999	71.154656	-3.0819e-007
4	890	184.19375	-6.408784	227.59943	370.84874	93.027191	-4.0272e-007
5	890	185.07125	-6.7236715	245.37862	414.77508	110.00735	2.7351e-006
6	890	185.94875	-7.000267	260.99015	451.06358	123.43513	3.0687e-006
7	890	186.82625	-7.239959	274.60738	480.55462	133.7437	3.3248e-006
8	890	187.70375	-7.443897	286.14502	503.96706	141.45528	3.5166e-006
9	890	188.58125	-7.61302	295.78188	521.84318	146.80593	3.6496e-006
10	890	189.45875	-7.7480835	303.35711	534.63585	150.19417	3.7337e-006
11	890	190.33625	-7.849675	309.08386	542.66909	151.69202	3.7712e-006
12	890	191.21375	-7.9182265	312.83893	546.27366	151.59428	-5.0809e-006
13	890	192.09125	-7.954026	314.73731	545.6548	149.95957	3.7283e-006
14	890	192.99165	-7.956433	314.74369	541.22054	147.07578	3.6566e-006
15	890	193.915	-7.9237085	312.68624	532.97783	143.05903	3.5568e-006
16	890	194.83835	-7.8547455	308.75436	520.5964	137.57183	3.4203e-006
17	890	195.775	-7.747158	302.63234	506.9848	132.70804	3.2997e-006
18	890	196.725	-7.5993435	294.42193	498.37768	132.45042	-4.4398e-006
19	890	197.675	-7.411535	284.52191	499.26551	139.45613	3.4674e-006
20	890	198.625	-7.1827455	273.1128	494.9037	144.03269	3.5813e-006
21	890	199.2	-7.0289835	267.85487	487.30131	142.51018	3.5434e-006

22	890	199.65	-6.89099	262.90085	465.70306	0	188.6
23	890	200.25	-6.6967355	165.51851	442.97658	0	187.34
24	890	200.75	-6.519941	136.41857	421.20564	0	185.72
25	890	201.4791	-6.2347385	118.52189	894.31823	0	183.13
26	890	202.43725	-5.822385	92.557622	839.35026	0	179.43
27	890	203.3954	-5.3583545	63.325546	780.57753	0	175.33
28	890	204.3536	-4.839133	30.57004	717.86137	0	170.8
29	890	205.31175	-4.260397	-5.9677324	651.01335	0	165.82
30	890	206.2699	-3.6167735	-46.581879	579.8087	0	160.33
31	890	207.13675	-2.976383	-87.056923	425.13189	0	400
32	890	207.91225	-2.345948	-126.93508	349.36405	0	400
33	890	208.5826	-1.758562	-164.08735	87.450594	0	400



Name: EMBANKMENT FILL, EL. +3.6 TO 0 Model: Undrained (Phi=0) Unit Weight: 110 pcf Cohesion: 580 psf
Name: FILL2, EL.0 TO -2.5/-3.5 Model: Undrained (Phi=0) Unit Weight: 94 pcf Cohesion: 400 psf
Name: BEACH SAND, EL. -7 TO -50 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand
Name: BAY SOUND CLAY, EL. -50 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 102 pcf Cohesion Spatial Fn: Bay Sound Phi: 0 °
Name: Sheet Pile Model: Undrained (Phi=0) Unit Weight: 0.1 pcf Cohesion: 0.01 psf
Name: MARSH, EL. -2.8/-3.5 TO -7 Model: Spatial Mohr-Coulomb Weight Fn: Marsh Cohesion Spatial Fn: Marsh Phi: 0 °
Name: MARSH, EL. -2.8 TO -7 (Protected) Model: Spatial Mohr-Coulomb Unit Weight: 100 pcf Cohesion Fn: Marsh 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.

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 1B,
PROTECTED SIDE STABILITY ANALYSIS
CASE: Slope Stability (Block) 03 FS
STA. 7+00 TO 9+25 WEST
ORLEANS PARISH, LOUISIANA

ETL 1110-2-575 ANALYSIS

Name: Slope Stability (Block) 03 FS
File Name: Orleans Canal Reach 1B.gsz Directory: C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix E LWL\WL -1\
Last Edited By: Reves, Ryan D MVK

Slope Stability (Block) 03 FS

File Information

Created By: Liljegren, James
Revision Number: 676
Last Edited By: Reves, Ryan D MVK
Date: 6/10/2013
Time: 10:08:00 AM
File Name: Orleans Canal Reach 1B.gsz
Directory: C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix E LWL\WL -1\
Last Solved Date: 6/10/2013
Last Solved Time: 10:08:58 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 (Block) 03 FS

Kind: SLOPE/W
Parent: Gap Analysis (seepage) 03 EWL
Method: Spencer
Settings
 PWP Conditions Source: Parent Analysis
Slip Surface
 Direction of movement: Right to Left
 Use Passive Mode: No
 Slip Surface Option: Block
 Critical slip surfaces saved: 1
 Optimize Critical Slip Surface Location: Yes
 Tension Crack
  Tension Crack Option: Tension Crack Line
  Percentage Wet: 0.5
  Tension Crack Fluid Unit Weight: 62.4 pcf
FOS Distribution
 FOS Calculation Option: Constant

Restrict Block Crossing: Yes

Advanced

Number of Slices: 30

Optimization Tolerance: 0.01

Minimum Slip Surface Depth: 0.1 ft

Optimization Maximum Iterations: 2000

Optimization Convergence Tolerance: 1e-007

Starting Optimization Points: 8

Ending Optimization Points: 16

Complete Passes per Insertion: 1

Driving Side Maximum Convex Angle: 5 °

Resisting Side Maximum Convex Angle: 1 °

Materials

EMBANKMENT FILL, EL. +3.6 TO 0

Model: Undrained (Phi=0)

Unit Weight: 110 pcf

Cohesion: 580 psf

FILL2, EL.0 TO -2.5/-3.5

Model: Undrained (Phi=0)

Unit Weight: 94 pcf

Cohesion: 400 psf

BEACH SAND, EL. -7 TO -50

Model: Shear/Normal Fn.

Unit Weight: 122 pcf

Strength Function: Sand

Phi-B: 0 °

BAY SOUND CLAY, EL. -50 TO -70

Model: Spatial Mohr-Coulomb

Unit Weight: 102 pcf

Cohesion Spatial Fn: Bay Sound

Phi: 0 °

Phi-B: 0 °

Sheet Pile

Model: Undrained (Phi=0)

Unit Weight: 0.1 pcf

Cohesion: 0.01 psf

MARSH, EL. -2.8/-3.5 TO -7

Model: Spatial Mohr-Coulomb

Weight Fn: Marsh

Cohesion Spatial Fn: Marsh

Phi: 0 °
Phi-B: 0 °

MARSH, EL. -2.8 TO -7 (Protected)

Model: Spatial Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion Fn: Marsh
Phi: 0 °
Phi-B: 0 °

Slip Surface Limits

Left Coordinate: (120, -4) ft
Right Coordinate: (310, -5) ft

Slip Surface Block

Left Grid
- Upper Left: (165, -3.1) ft
- Lower Left: (165, -31.5) ft
- Lower Right: (195, -31.5) ft
- X Increments: 6
- Y Increments: 6
- Starting Angle: 135 °
- Ending Angle: 180 °
- Angle Increments: 2

Right Grid
- Upper Left: (195, -3.1) ft
- Lower Left: (195, -31.5) ft
- Lower Right: (230, -31.5) ft
- X Increments: 7
- Y Increments: 6
- Starting Angle: 45 °
- Ending Angle: 65 °
- Angle Increments: 2

Tension Crack Line

	X (ft)	Y (ft)
	200	-1.5
	230	-1.5

Cohesion Functions

Marsh

Model: Spline Data Point Function

Function: Cohesion vs. Y
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 150
Data Points: Y (ft), Cohesion (psf)
Data Point: (-7, 180)
Data Point: (-2.8, 150)

Shear/Normal Strength Functions

Sand

Model: Spline Data Point Function
Function: Shear Stress vs. Normal Stress
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
Data Point: (-10000, 0)
Data Point: (0, 0)
Data Point: (10000, 6494)
Estimation Properties
Intact Rock Param.: 10
Geological Strength: 100
Disturbance Factor: 0
SigmaC: 600000 psf
Sigma3: 300000 psf
Num. Points: 20

Unit Weight Functions

Marsh

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 100
Data Points: X (ft), Unit Weight (pcf)
Data Point: (192.5, 100)
Data Point: (208.3, 94)
Data Point: (241.1, 100)

Spatial Functions

Marsh

Model: Linear Interpolation

Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (192.53, -3.5, 150)
Data Point: (192.53, -7, 180)
Data Point: (200, -3.5, 160)
Data Point: (200, -7, 190)
Data Point: (241.1, -2.8, 150)
Data Point: (241.1, -7, 180)

Bay Sound

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (120, -50, 600)
Data Point: (120, -70, 770)
Data Point: (192.53, -50, 600)
Data Point: (192.53, -70, 770)
Data Point: (200, -50, 750)
Data Point: (200, -70, 925)
Data Point: (241.1, -50, 600)
Data Point: (241.1, -70, 770)
Data Point: (310, -50, 600)
Data Point: (310, -70, 770)

Regions

	Material	Points	Area (ft²)
Region 1	EMBANKMENT FILL, EL. +3.6 TO 0	21,4,5,26	58.435
Region 2	MARSH, EL. -2.8/-3.5 TO -7	6,7,29,18,27	168.145
Region 3	BEACH SAND, EL. -7 TO -50	18,23,19,20,36,33,32,37,38,1,31	1900.824
Region 4	BEACH SAND, EL. -7 TO -50	20,36,34,15,28,12,11,29,18,23,19	6450
Region 5	BAY SOUND CLAY, EL. -50 TO -70	15,34,35,14,30,13,12,28	3800
Region 6	Sheet Pile	17,22,21,26,25,3	13.075
Region 7	FILL2, EL.0 TO -2.5/-3.5	27,3,25,26,5,6	99.39
Region 8	MARSH, EL. -2.8 TO -7 (Protected)	1,39,31	18.4275
Region 9	MARSH, EL. -2.8 TO -7 (Protected)	29,7,8,9,10,11	178.06
Region 10	MARSH, EL. -2.8/-3.5 TO -7	31,39,27,18	26.145
Region 11	FILL2, EL.0 TO -2.5/-3.5	2,24,3,27,39	6.9625
Region 12		32,40,41,24,2,39,1,38,37	286.571

Points

	X (ft)	Y (ft)
Point 1	182	-5.4
Point 2	195.3	-3
Point 3	200	-1.6
Point 4	208.3	3.3
Point 5	230	0.7

Point 6	230.4	-2.5
Point 7	241.1	-2.8
Point 8	251.6	-3.7
Point 9	267.3	-4.6
Point 10	310	-5
Point 11	310	-7
Point 12	310	-50
Point 13	310	-70
Point 14	182	-70
Point 15	182	-50
Point 16	182	-7
Point 17	200	14.1
Point 18	200	-7
Point 19	200	-28.5
Point 20	182	-28.5
Point 21	201	3.6
Point 22	200.5	14.1
Point 23	200	-23.5
Point 24	199.1	-1.6
Point 25	201	-1.6
Point 26	201	0
Point 27	200	-3.5
Point 28	200	-50
Point 29	241.1	-7
Point 30	200	-70
Point 31	192.53	-7
Point 32	120	-4
Point 33	120	-7
Point 34	120	-50
Point 35	120	-70
Point 36	120	-28.5
Point 37	140	-3.7
Point 38	160	-4.2
Point 39	192.53	-3.5
Point 40	120	0
Point 41	199	-1

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.51	(194.474, -0.592)	11.11002	(207.302, 3.34101)	(181.919, -5.39557)
2	892	2.00	(194.474, -0.592)	10.463	(206.333, 3.38082)	(183.481, -5.13286)

Slices of Slip Surface: Optimized

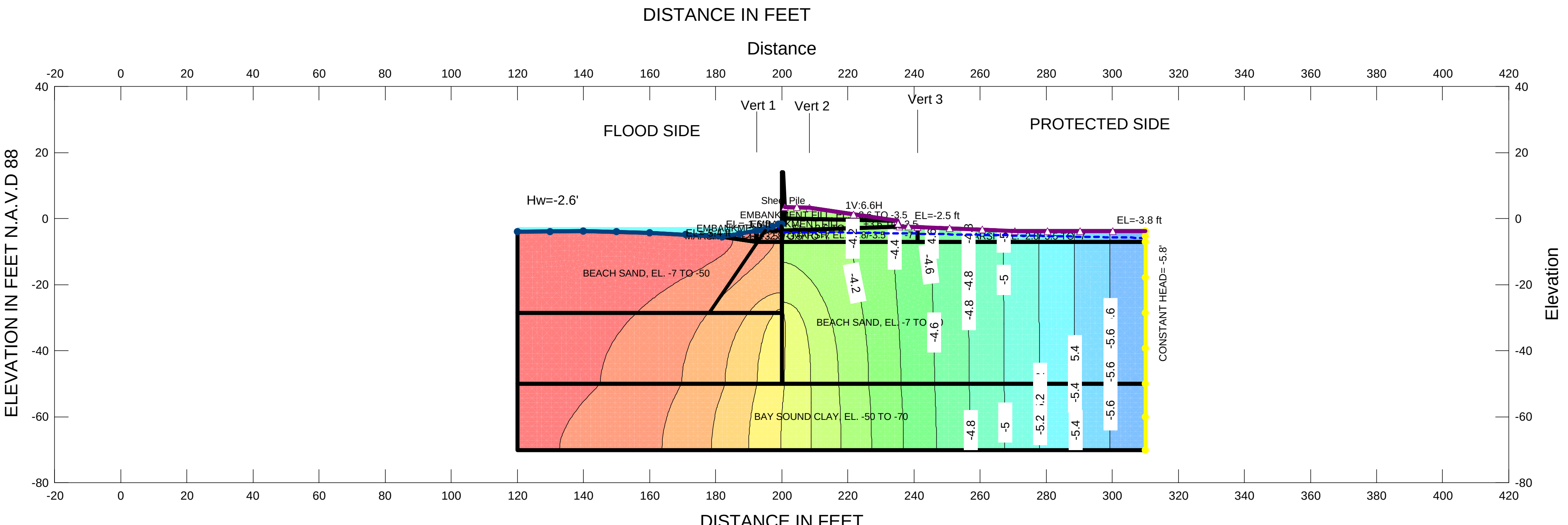
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	181.95935	-5.4018975	274.65486	277.76738	2.0212889	-1.977e-008
2	Optimized	182.476	-5.48239	276.14046	296.84554	13.44604	-1.8378e-007

3	Optimized	183.42805	-5.630714	278.37183	320.65379	27.458228	-3.7512e-007
4	Optimized	184.3801	-5.779038	284.21492	344.02615	38.841868	-5.3071e-007
5	Optimized	185.49055	-5.9519	291.79004	371.15462	51.539964	1.6732e-006
6	Optimized	186.57685	-6.124242	299.93944	398.72528	64.152281	5.0419e-006
7	Optimized	187.4806	-6.271526	307.40898	421.64718	74.187155	-3.209e-007
8	Optimized	188.3844	-6.41881	315.06418	444.54724	84.087286	2.0894e-006
9	Optimized	189.2882	-6.566094	322.97054	467.41454	93.803031	2.3308e-006
10	Optimized	190.192	-6.713378	331.16083	490.24907	103.31311	2.5671e-006
11	Optimized	190.8972	-6.81548	336.83985	499.75663	105.79939	-4.5767e-007
12	Optimized	191.49535	-6.8840335	340.71585	511.31858	110.79071	-4.7921e-007
13	Optimized	192.1851	-6.9642205	345.32401	524.20703	116.16799	2.8865e-006
14	Optimized	192.59985	-7.012432	348.13532	531.98957	119.39635	2.9667e-006
15	Optimized	193.10805	-7.0287725	349.15961	523.32319	113.10315	-4.8918e-007
16	Optimized	193.9848	-7.0452175	350.18591	529.24153	116.28008	-5.0293e-007
17	Optimized	194.8616	-7.061662	351.74817	535.13707	119.09415	2.9589e-006
18	Optimized	195.88555	-7.080867	353.92919	547.49448	125.70277	-5.4366e-007
19	Optimized	196.49625	-7.09234	355.5566	555.12131	129.59884	3.2197e-006
20	Optimized	196.98315	-7.078415	355.43894	551.13113	127.084	-5.4959e-007
21	Optimized	197.9066	-7.049585	356.65119	556.53215	129.80421	3.2248e-006
22	Optimized	198.68415	-7.029343	359.17263	563.34907	132.59373	3.2941e-006
23	Optimized	199.05	-7.0225935	362.42839	565.99378	132.19691	3.2844e-006
24	Optimized	199.55	-7.013369	366.91532	563.31522	127.54359	-5.5159e-007
25	Optimized	200.1373	-7.0025335	305.24952	529.88894	145.88254	3.6243e-006
26	Optimized	200.3873	-6.997921	222.88335	527.49519	0	189.89
27	Optimized	200.75	-6.9912295	222.44214	525.8705	0	189.74
28	Optimized	201.0018	-6.9865835	222.13481	1069.5715	0	189.64
29	Optimized	201.3907	-6.6863335	203.3189	884.75721	0	186.99
30	Optimized	202.16485	-6.0859	165.56215	828.51507	0	181.72
31	Optimized	202.93895	-5.4854665	127.77479	772.56894	0	176.49
32	Optimized	203.7231	-4.862805	88.499528	708.94242	0	171.1
33	Optimized	204.5173	-4.217915	47.826831	650.00073	0	165.57
34	Optimized	205.22	-3.606853	9.2449435	575.18912	0	160.37
35	Optimized	205.6796	-3.172808	-18.16956	409.38638	0	400
36	Optimized	206.20075	-2.645535	-51.539006	335.18335	0	400
37	Optimized	206.93505	-1.881845	-99.910331	245.93893	0	400

Slices of Slip Surface: 892

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	892	183.94955	-5.327162	264.59283	346.27115	0	168.05
2	892	184.8877	-5.7157565	280.63503	394.25987	0	170.83
3	892	185.74375	-6.0703275	298.50942	412.93963	74.311843	-3.2141e-007
4	892	186.5176	-6.390874	316.52457	462.19774	94.601264	2.3506e-006
5	892	187.29145	-6.7114205	334.94562	511.36035	114.56506	2.8466e-006
6	892	188.06535	-7.031967	353.47412	560.51101	134.45133	-4.5036e-006
7	892	188.8392	-7.3525135	372.30109	609.59005	154.09726	3.8289e-006
8	892	189.61305	-7.67306	391.23549	658.64521	173.6579	4.3148e-006
9	892	190.42165	-7.833333	400.41108	611.85773	137.31506	-4.5999e-006

10	892	191.265	-7.833333	399.77077	614.70358	139.579	3.4681e-006
11	892	192.10835	-7.833333	399.32017	617.52572	141.70434	3.521e-006
12	892	192.87625	-7.833333	399.11913	620.38989	143.69491	-4.8135e-006
13	892	193.56875	-7.833333	399.11913	623.37906	145.6361	3.6187e-006
14	892	194.26125	-7.833333	399.26354	626.35379	147.47413	3.6642e-006
15	892	194.95375	-7.833333	399.68231	629.31408	149.12461	3.7054e-006
16	892	195.67	-7.833333	400.22973	637.12162	153.83939	3.8226e-006
17	892	196.41	-7.833333	401.25676	644.27027	157.81482	3.9214e-006
18	892	197.15	-7.833333	402.48649	651.41892	161.65861	4.0167e-006
19	892	197.89	-7.833333	404.5	658.52703	164.96708	4.0989e-006
20	892	198.63	-7.833333	406.89189	665.62162	168.02105	4.1748e-006
21	892	199.05	-7.833333	409.18	669.61	169.12522	4.2024e-006
22	892	199.55	-7.833333	411.92222	667.75556	166.14011	4.1281e-006
23	892	200.25	-7.583333	283.40839	481.83669	128.86084	3.203e-006
24	892	200.66665	-7.1666665	233.40889	432.85544	129.5221	3.2193e-006
25	892	200.91665	-6.9166665	217.76622	382.79219	0	189.07
26	892	201.34805	-6.4852605	190.74698	835.09574	0	185.29
27	892	202.0442	-5.7891155	147.00895	773.50089	0	179.23
28	892	202.74035	-5.0929705	103.28107	712.21076	0	173.2
29	892	203.4365	-4.3968255	59.487176	651.23552	0	167.22
30	892	204.13265	-3.7006805	15.678043	590.55484	0	161.27
31	892	204.94385	-2.889456	-35.508641	422.65939	0	400
32	892	205.87015	-1.963152	-94.099883	319.97166	0	400



Name: EMBANKMENT FILL, EL. +3.6 TO 0 Model: Saturated Only K-Sat: 3.28e-008 ft/sec Ky'/Kx' Ratio: 1
Name: BEACH SAND, EL. -7 TO -50 Model: Saturated Only K-Sat: 0.00049 ft/sec Ky'/Kx' Ratio: 1
Name: BAY SOUND CLAY, EL. -50 TO -70 Model: Saturated Only K-Sat: 3.28e-008 ft/sec Ky'/Kx' Ratio: 1
Name: Sheet Pile Model: Saturated Only K-Sat: 1e-010 ft/sec Ky'/Kx' Ratio: 1
Name: MARSH, EL. -2.8/-3.5 TO -7 Model: Saturated Only K-Sat: 3.28e-007 ft/sec Ky'/Kx' Ratio: 1
Name: EMBANKMENT FILL, EL. +3.6 TO -3.5 Model: Saturated Only K-Sat: 3.28e-008 ft/sec Ky'/Kx' Ratio: 1

GENERAL NOTES

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

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

Hw IS CANAL WATER LEVEL

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 1C,
PROTECTED SIDE STABILITY ANALYSIS,
CASE: 4- Extreme Low Water Level
STA. 9+25 TO 11+00 WEST
ORLEANS PARISH, LOUISIANA

Name: 4- Extreme Low Water Level
File Name: Reach 1C.gsz Directory: C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix E LWL\
Last Edited By: Jamerson, James MVK

4- Extreme Low Water Level

File Information

Created By: Liljegren, James
Revision Number: 565
Last Edited By: Jamerson, James MVK
Date: 10/3/2013
Time: 9:44:37 AM
File Name: Reach 1C.gsz
Directory: C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix E LWL\
Last Solved Date: 10/3/2013
Last Solved Time: 9:45:38 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

4- Extreme Low Water Level

Kind: SEEP/W
Method: Steady-State
Settings
- Include Air Flow: No

Control
- Apply Runoff: No

Convergence
- Convergence Type: Head Vector Norm
- Maximum Number of Iterations: 500
- Tolerance: 0.001
- Maximum Change in K: 0.1
- Rate of Change in K: 1.02
- Minimum Change in K: 1e-005
- Equation Solver: Parallel Direct
- Potential Seepage Max # of Reviews: 10

Time

Starting Time: 0 sec
Duration: 0 sec
Ending Time: 0 sec

Materials

EMBANKMENT FILL, EL. +3.6 TO 0

Model: Saturated Only
Hydraulic
K-Sat: 3.28e-008 ft/sec
Volumetric Water Content: 0 ft^3/ft^3
Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

BEACH SAND, EL. -7 TO -50

Model: Saturated Only
Hydraulic
K-Sat: 0.00049 ft/sec
Volumetric Water Content: 0 ft^3/ft^3
Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

BAY SOUND CLAY, EL. -50 TO -70

Model: Saturated Only
Hydraulic
K-Sat: 3.28e-008 ft/sec
Volumetric Water Content: 0 ft^3/ft^3
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 ft^3/ft^3
Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

MARSH, EL. -2.8/-3.5 TO -7

Model: Saturated Only
Hydraulic
K-Sat: 3.28e-007 ft/sec
Volumetric Water Content: 0 ft^3/ft^3

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

EMBANKMENT FILL, EL. +3.6 TO -3.5

Model: Saturated Only
Hydraulic
K-Sat: 3.28e-008 ft/sec
Volumetric Water Content: 0 ft^3/ft^3
Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

Boundary Conditions

Drainage

Review: true
Type: Total Flux (Q) 0

Curb

Type: Head (H) -5.8

Extreme Low Water

Type: Head (H) -2.6

Regions

	Material	Points	Area (ft^2)
Region 1	EMBANKMENT FILL, EL. +3.6 TO -3.5	20,4,5,25	71.595
Region 2	MARSH, EL. -2.8/-3.5 TO -7	6,7,28,17,26	171.31
Region 3	BEACH SAND, EL. -7 TO -50	17,22,18,19,35,32,31,36,37,1,30	1900.824
Region 4	BEACH SAND, EL. -7 TO -50	19,35,33,14,27,11,10,28,17,22,18	6450
Region 5	BAY SOUND CLAY, EL. -50 TO -70	14,33,34,13,29,12,11,27	3800
Region 6	Sheet Pile	16,21,20,25,24,3	13.075
Region 7	EMBANKMENT FILL, EL. +3.6 TO -3.5	26,3,24,25,5,6	90.54
Region 8	MARSH, EL. -2.8/-3.5 TO -7	1,38,30	18.4275
Region 9	MARSH, EL. -2.8/-3.5 TO -7	28,7,8,9,10	239.59
Region 10	MARSH, EL. -2.8/-3.5 TO -7	30,38,26,17	26.145
Region 11	EMBANKMENT FILL, EL. +3.6 TO 0	2,23,3,26,38	6.9625

Lines

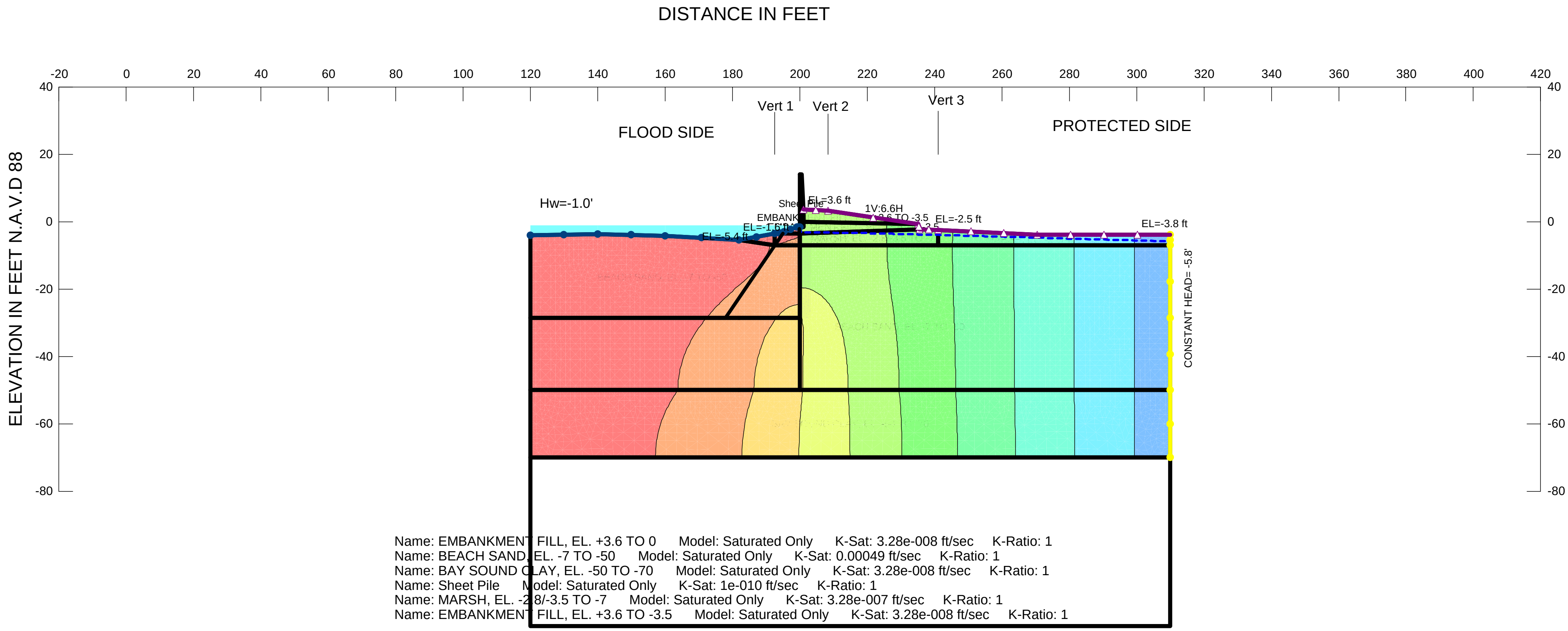
	Start Point	End Point	Hydraulic Boundary	Left Side Material	Right Side Material
Line 1	18	19			
Line 2	12	11	Curb		
Line 3	16	21			
Line 4	21	20			

Line 5	22	18		Sheet Pile	
Line 6	20	4	Drainage		
Line 7	24	3		Sheet Pile	Sheet Pile
Line 8	5	4	Drainage		
Line 9	16	3			
Line 10	24	25			
Line 11	25	20			
Line 12	3	26		Sheet Pile	
Line 13	6	7	Drainage		
Line 14	5	25			
Line 15	26	6			
Line 16	5	6	Drainage		
Line 17	26	17		Sheet Pile	
Line 18	11	10	Curb		
Line 19	10	28			
Line 20	28	17			
Line 21	27	14			
Line 22	11	27			
Line 23	29	13			
Line 24	12	29			
Line 25	22	17			Sheet Pile
Line 26	7	28			
Line 27	7	8	Drainage		
Line 28	9	10	Curb		
Line 29	17	30			
Line 30	2	23	Extreme Low Water		
Line 31	23	3	Extreme Low Water		
Line 32	14	33			
Line 33	33	34			
Line 34	34	13			
Line 35	19	35			
Line 36	35	33			
Line 37	35	32			
Line 38	31	36	Extreme Low Water		
Line 39	36	37	Extreme Low Water		
Line 40	37	1	Extreme Low Water		
Line 41	18	27			
Line 42	30	38			
Line 43	38	26			
Line 44	1	38	Extreme Low Water		
Line 45	38	2	Extreme Low Water		
Line 46	30	1			
Line 47	32	31			
Line 48	9	8	Drainage		

Points

	X (ft)	Y (ft)

Point 1	182	-5.4
Point 2	195.3	-3
Point 3	200	-1.6
Point 4	208.3	3.3
Point 5	235.1	-0.6
Point 6	235.5	-2.3
Point 7	241.1	-2.5
Point 8	270.5	-3.8
Point 9	310	-3.8
Point 10	310	-7
Point 11	310	-50
Point 12	310	-70
Point 13	182	-70
Point 14	182	-50
Point 15	182	-7
Point 16	200	14.1
Point 17	200	-7
Point 18	200	-28.5
Point 19	182	-28.5
Point 20	201	3.6
Point 21	200.5	14.1
Point 22	200	-23.5
Point 23	199.1	-1.6
Point 24	201	-1.6
Point 25	201	0
Point 26	200	-3.5
Point 27	200	-50
Point 28	241.1	-7
Point 29	200	-70
Point 30	192.53	-7
Point 31	120	-4
Point 32	120	-7
Point 33	120	-50
Point 34	120	-70
Point 35	120	-28.5
Point 36	140	-3.7
Point 37	160	-4.2
Point 38	192.53	-3.5



Name: EMBANKMENT FILL, EL. +3.6 TO 0 Model: Saturated Only K-Sat: 3.28e-008 ft/sec K-Ratio: 1
Name: BEACH SAND, EL. -7 TO -50 Model: Saturated Only K-Sat: 0.00049 ft/sec K-Ratio: 1
Name: BAY SOUND CLAY, EL. -50 TO -70 Model: Saturated Only K-Sat: 3.28e-008 ft/sec K-Ratio: 1
Name: Sheet Pile Model: Saturated Only K-Sat: 1e-010 ft/sec K-Ratio: 1
Name: MARSH, EL. -2.8/-3.5 TO -7 Model: Saturated Only K-Sat: 3.28e-007 ft/sec K-Ratio: 1
Name: EMBANKMENT FILL, EL. +3.6 TO -3.5 Model: Saturated Only K-Sat: 3.28e-008 ft/sec K-Ratio: 1

GENERAL NOTES

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

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

Hw IS CANAL WATER LEVEL

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 1C,
PROTECTED SIDE STABILITY ANALYSIS,
CASE: 4- Extreme Low Water Level
STA. 9+25 TO 11+00 WEST
ORLEANS PARISH, LOUISIANA

Name: 4- Extreme Low Water Level
File Name: Orleans Canal Reach 1C.gsz Directory: C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix E LWL\WL -1\
Last Edited By: Hendrix, Joshua M MVR

4- Extreme Low Water Level

File Information

Created By: Liljegren, James
Revision Number: 543
Last Edited By: Hendrix, Joshua M MVR
Date: 3/5/2013
Time: 12:57:23 PM
File Name: Orleans Canal Reach 1C.gsz
Directory: C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix E LWL\WL -1\
Last Solved Date: 3/5/2013
Last Solved Time: 12:57:34 PM

Project Settings

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

Analysis Settings

4- Extreme Low Water Level

Kind: SEEP/W
Method: Steady-State
Settings
- Include Air Flow: No

Control
- Apply Runoff: No

Convergence
- Convergence Type: Head Vector Norm
- Maximum Number of Iterations: 500
- Tolerance: 0.001
- Maximum Change in K: 0.1
- Rate of Change in K: 1.02
- Minimum Change in K: 1e-005
- Equation Solver: Parallel Direct
- Potential Seepage Max # of Reviews: 10

Time

Starting Time: 0 sec
Duration: 0 sec
Ending Time: 0 sec

Materials

EMBANKMENT FILL, EL. +3.6 TO 0

Model: Saturated Only
Hydraulic
K-Sat: 3.28e-008 ft/sec
Volumetric Water Content: 0 ft^3/ft^3
Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

BEACH SAND, EL. -7 TO -50

Model: Saturated Only
Hydraulic
K-Sat: 0.00049 ft/sec
Volumetric Water Content: 0 ft^3/ft^3
Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

BAY SOUND CLAY, EL. -50 TO -70

Model: Saturated Only
Hydraulic
K-Sat: 3.28e-008 ft/sec
Volumetric Water Content: 0 ft^3/ft^3
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 ft^3/ft^3
Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

MARSH, EL. -2.8/-3.5 TO -7

Model: Saturated Only
Hydraulic
K-Sat: 3.28e-007 ft/sec
Volumetric Water Content: 0 ft^3/ft^3

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

EMBANKMENT FILL, EL. +3.6 TO -3.5

Model: Saturated Only
Hydraulic
K-Sat: 3.28e-008 ft/sec
Volumetric Water Content: 0 ft^3/ft^3
Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

Boundary Conditions

Drainage

Review: true
Type: Total Flux (Q) 0

Curb

Type: Head (H) -5.8

Extreme Low Water

Type: Head (H) -1

Regions

	Material	Points	Area (ft^2)
Region 1	EMBANKMENT FILL, EL. +3.6 TO -3.5	20,4,5,25	71.595
Region 2	MARSH, EL. -2.8/-3.5 TO -7	6,7,28,17,26	171.31
Region 3	BEACH SAND, EL. -7 TO -50	17,22,18,19,35,32,31,36,37,1,30	1900.824
Region 4	BEACH SAND, EL. -7 TO -50	19,35,33,14,27,11,10,28,17,22,18	6450
Region 5	BAY SOUND CLAY, EL. -50 TO -70	14,33,34,13,29,12,11,27	3800
Region 6	Sheet Pile	16,21,20,25,24,3	13.075
Region 7	EMBANKMENT FILL, EL. +3.6 TO -3.5	26,3,24,25,5,6	90.54
Region 8	MARSH, EL. -2.8/-3.5 TO -7	1,40,30	18.4275
Region 9	MARSH, EL. -2.8/-3.5 TO -7	28,7,8,9,10	239.59
Region 10	MARSH, EL. -2.8/-3.5 TO -7	30,40,26,17	26.145
Region 11	EMBANKMENT FILL, EL. +3.6 TO 0	2,23,3,26,40	6.9625
Region 12		34,38,39,12,29,13	9500

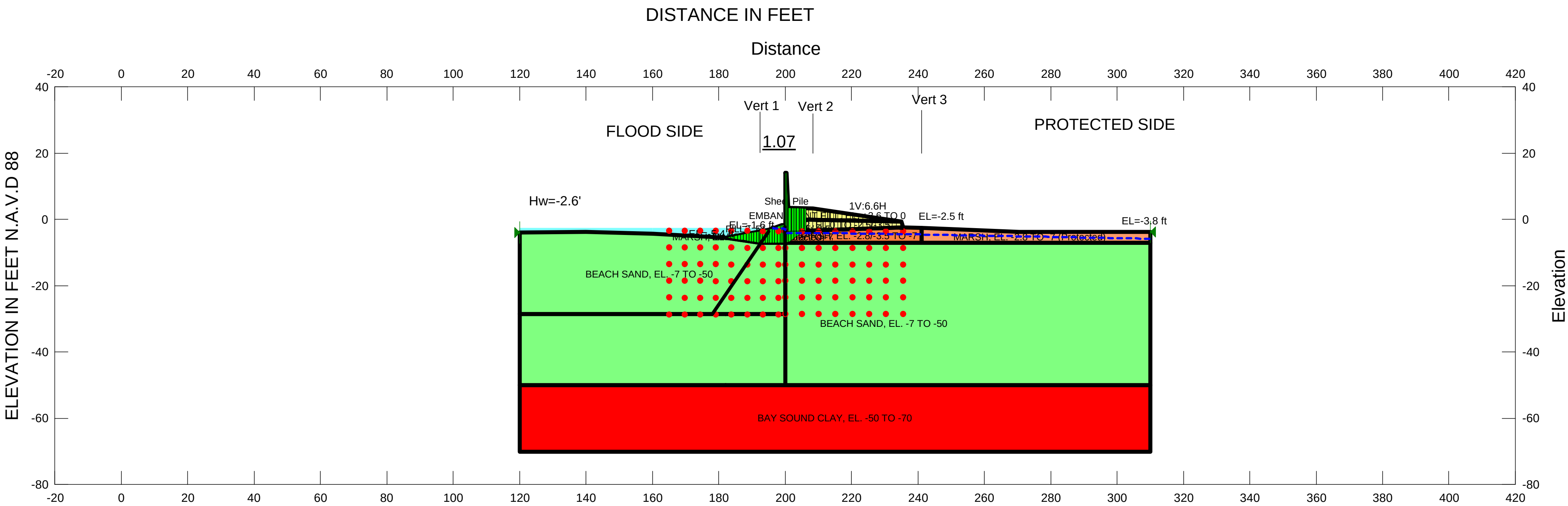
Lines

	Start Point	End Point	Hydraulic Boundary	Left Side Material	Right Side Material
Line 1	18	19			
Line 2	12	11	Curb		
Line 3	16	21			

Line 4	21	20			
Line 5	22	18		Sheet Pile	
Line 6	20	4	Drainage		
Line 7	24	3		Sheet Pile	Sheet Pile
Line 8	5	4	Drainage		
Line 9	16	3			
Line 10	24	25			
Line 11	25	20			
Line 12	3	26		Sheet Pile	
Line 13	6	7	Drainage		
Line 14	5	25			
Line 15	26	6			
Line 16	5	6	Drainage		
Line 17	26	17		Sheet Pile	
Line 18	11	10	Curb		
Line 19	10	28			
Line 20	28	17			
Line 21	27	14			
Line 22	11	27			
Line 23	29	13			
Line 24	12	29			
Line 25	22	17			Sheet Pile
Line 26	7	28			
Line 27	7	8	Drainage		
Line 28	9	10	Curb		
Line 29	17	30			
Line 30	2	23	Extreme Low Water		
Line 31	23	3	Extreme Low Water		
Line 32	14	33			
Line 33	33	34			
Line 34	34	13			
Line 35	19	35			
Line 36	35	33			
Line 37	35	32			
Line 38	31	36	Extreme Low Water		
Line 39	36	37	Extreme Low Water		
Line 40	37	1	Extreme Low Water		
Line 41	34	38			
Line 42	38	39			
Line 43	39	12			
Line 44	18	27			
Line 45	30	40			
Line 46	40	26			
Line 47	1	40	Extreme Low Water		
Line 48	40	2	Extreme Low Water		
Line 49	30	1			
Line 50	32	31			
Line 51	9	8	Drainage		

Points

	X (ft)	Y (ft)
Point 1	182	-5.4
Point 2	195.3	-3
Point 3	200	-1.6
Point 4	208.3	3.3
Point 5	235.1	-0.6
Point 6	235.5	-2.3
Point 7	241.1	-2.5
Point 8	270.5	-3.8
Point 9	310	-3.8
Point 10	310	-7
Point 11	310	-50
Point 12	310	-70
Point 13	182	-70
Point 14	182	-50
Point 15	182	-7
Point 16	200	14.1
Point 17	200	-7
Point 18	200	-28.5
Point 19	182	-28.5
Point 20	201	3.6
Point 21	200.5	14.1
Point 22	200	-23.5
Point 23	199.1	-1.6
Point 24	201	-1.6
Point 25	201	0
Point 26	200	-3.5
Point 27	200	-50
Point 28	241.1	-7
Point 29	200	-70
Point 30	192.53	-7
Point 31	120	-4
Point 32	120	-7
Point 33	120	-50
Point 34	120	-70
Point 35	120	-28.5
Point 36	140	-3.7
Point 37	160	-4.2
Point 38	120	-120
Point 39	310	-120
Point 40	192.53	-3.5



Name: EMBANKMENT FILL, EL. +3.6 TO 0 Model: Undrained (Phi=0) Unit Weight: 110 pcf Cohesion': 580 psf
Name: FILL2, EL.0 TO -2.5/-3.5 Model: Undrained (Phi=0) Unit Weight: 94 pcf Cohesion': 400 psf
Name: BEACH SAND, EL. -7 TO -50 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand
Name: BAY SOUND CLAY, EL. -50 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 102 pcf Cohesion Spatial Fn: Bay Sound Phi': 0 °
Name: Sheet Pile Model: Undrained (Phi=0) Unit Weight: 0.1 pcf Cohesion': 0.01 psf
Name: MARSH, EL. -2.8/-3.5 TO -7 Model: Spatial Mohr-Coulomb Weight Fn: Marsh Cohesion Spatial Fn: Marsh Phi': 0 °
Name: MARSH, EL. -2.8 TO -7 (Protected) Model: Spatial Mohr-Coulomb Unit Weight: 100 pcf Cohesion Fn: Marsh Phi': 0 °

GENERAL NOTES

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

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

Hw IS CANAL WATER LEVEL

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 1C,
PROTECTED SIDE STABILITY ANALYSIS,
CASE: LWL F/S Stability Analysis (Block)
STA. 9+25 TO 11+00 WEST
ORLEANS PARISH, LOUISIANA

Name: LWL F/S Stability Analysis (Block)
File Name: Reach 1C.gsz Directory: C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix E LWL\
Last Edited By: Jamerson, James MVK

LWL F/S Stability Analysis (Block)

File Information

Created By: Liljegren, James
Revision Number: 565
Last Edited By: Jamerson, James MVK
Date: 10/3/2013
Time: 9:44:37 AM
File Name: Reach 1C.gsz
Directory: C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix E LWL\
Last Solved Date: 10/3/2013
Last Solved Time: 9:47:12 AM

Project Settings

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

Analysis Settings

LWL F/S Stability Analysis (Block)

Kind: SLOPE/W
Parent: 4- Extreme Low Water Level
Method: Spencer
Settings
  PWP Conditions Source: Parent Analysis
Slip Surface
  Direction of movement: Right to Left
  Use Passive Mode: No
  Slip Surface Option: Block
  Critical slip surfaces saved: 1
  Optimize Critical Slip Surface Location: Yes
  Tension Crack
    Tension Crack Option: Tension Crack Line
    Percentage Wet: 1
    Tension Crack Fluid Unit Weight: 62.4 pcf
FOS Distribution
  FOS Calculation Option: Constant

Restrict Block Crossing: Yes
Advanced
Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 4000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

EMBANKMENT FILL, EL. +3.6 TO 0

Model: Undrained (Phi=0)
Unit Weight: 110 pcf
Cohesion: 580 psf

FILL2, EL.0 TO -2.5/-3.5

Model: Undrained (Phi=0)
Unit Weight: 94 pcf
Cohesion: 400 psf

BEACH SAND, EL. -7 TO -50

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

BAY SOUND CLAY, EL. -50 TO -70

Model: Spatial Mohr-Coulomb
Unit Weight: 102 pcf
Cohesion Spatial Fn: Bay Sound
Phi: 0 °
Phi-B: 0 °

Sheet Pile

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

MARSH, EL. -2.8/-3.5 TO -7

Model: Spatial Mohr-Coulomb
Weight Fn: Marsh
Cohesion Spatial Fn: Marsh

Phi: 0 °
Phi-B: 0 °

MARSH, EL. -2.8 TO -7 (Protected)

Model: Spatial Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion Fn: Marsh
Phi: 0 °
Phi-B: 0 °

Slip Surface Limits

Left Coordinate: (120, -4) ft
Right Coordinate: (310, -3.8) ft

Slip Surface Block

Left Grid
- Upper Left: (165, -3.4) ft
- Lower Left: (165, -28.6) ft
- Lower Right: (198, -28.7) ft
- X Increments: 7
- Y Increments: 5
- Starting Angle: 135 °
- Ending Angle: 180 °
- Angle Increments: 2

Right Grid
- Upper Left: (200, -3.6) ft
- Lower Left: (200, -28.5) ft
- Lower Right: (235.5, -28.5) ft
- X Increments: 7
- Y Increments: 5
- Starting Angle: 45 °
- Ending Angle: 65 °
- Angle Increments: 2

Tension Crack Line

	X (ft)	Y (ft)
	200	-3.5
	235	-2.5

Cohesion Functions

Marsh

Model: Spline Data Point Function

Function: Cohesion vs. Y
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 150
Data Points: Y (ft), Cohesion (psf)
Data Point: (-7, 180)
Data Point: (-2.8, 150)

Shear/Normal Strength Functions

Sand

Model: Spline Data Point Function
Function: Shear Stress vs. Normal Stress
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
Data Point: (-10000, 0)
Data Point: (0, 0)
Data Point: (10000, 6494)
Estimation Properties
Intact Rock Param.: 10
Geological Strength: 100
Disturbance Factor: 0
SigmaC: 600000 psf
Sigma3: 300000 psf
Num. Points: 20

Unit Weight Functions

Marsh

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 100
Data Points: X (ft), Unit Weight (pcf)
Data Point: (192.5, 100)
Data Point: (208.3, 94)
Data Point: (241.1, 100)

Spatial Functions

Marsh

Model: Linear Interpolation

Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (192.53, -3.5, 150)
Data Point: (192.53, -7, 180)
Data Point: (200, -3.5, 160)
Data Point: (200, -7, 190)
Data Point: (241.1, -2.8, 150)
Data Point: (241.1, -7, 180)

Bay Sound

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (120, -50, 600)
Data Point: (120, -70, 770)
Data Point: (192.53, -50, 600)
Data Point: (192.53, -70, 770)
Data Point: (200, -50, 750)
Data Point: (200, -70, 925)
Data Point: (241.1, -50, 600)
Data Point: (241.1, -70, 770)
Data Point: (310, -50, 600)
Data Point: (310, -70, 770)

Regions

	Material	Points	Area (ft^2)
Region 1	EMBANKMENT FILL, EL. +3.6 TO 0	20,4,5,25	71.595
Region 2	MARSH, EL. -2.8/-3.5 TO -7	6,7,28,17,26	171.31
Region 3	BEACH SAND, EL. -7 TO -50	17,22,18,19,35,32,31,36,37,1,30	1900.824
Region 4	BEACH SAND, EL. -7 TO -50	19,35,33,14,27,11,10,28,17,22,18	6450
Region 5	BAY SOUND CLAY, EL. -50 TO -70	14,33,34,13,29,12,11,27	3800
Region 6	Sheet Pile	16,21,20,25,24,3	13.075
Region 7	FILL2, EL.0 TO -2.5/-3.5	26,3,24,25,5,6	90.54
Region 8	MARSH, EL. -2.8 TO -7 (Protected)	1,38,30	18.4275
Region 9	MARSH, EL. -2.8 TO -7 (Protected)	28,7,8,9,10	239.59
Region 10	MARSH, EL. -2.8/-3.5 TO -7	30,38,26,17	26.145
Region 11	FILL2, EL.0 TO -2.5/-3.5	2,23,3,26,38	6.9625

Points

	X (ft)	Y (ft)
Point 1	182	-5.4
Point 2	195.3	-3
Point 3	200	-1.6
Point 4	208.3	3.3
Point 5	235.1	-0.6
Point 6	235.5	-2.3

Point 7	241.1	-2.5
Point 8	270.5	-3.8
Point 9	310	-3.8
Point 10	310	-7
Point 11	310	-50
Point 12	310	-70
Point 13	182	-70
Point 14	182	-50
Point 15	182	-7
Point 16	200	14.1
Point 17	200	-7
Point 18	200	-28.5
Point 19	182	-28.5
Point 20	201	3.6
Point 21	200.5	14.1
Point 22	200	-23.5
Point 23	199.1	-1.6
Point 24	201	-1.6
Point 25	201	0
Point 26	200	-3.5
Point 27	200	-50
Point 28	241.1	-7
Point 29	200	-70
Point 30	192.53	-7
Point 31	120	-4
Point 32	120	-7
Point 33	120	-50
Point 34	120	-70
Point 35	120	-28.5
Point 36	140	-3.7
Point 37	160	-4.2
Point 38	192.53	-3.5

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.07	(192.951, -2.853)	9.684336	(206.314, 3.38162)	(181.997, -5.39984)
2	961	1.64	(192.951, -2.853)	10.149	(205.229, 3.42619)	(180.917, -5.34094)

Slices of Slip Surface: Optimized

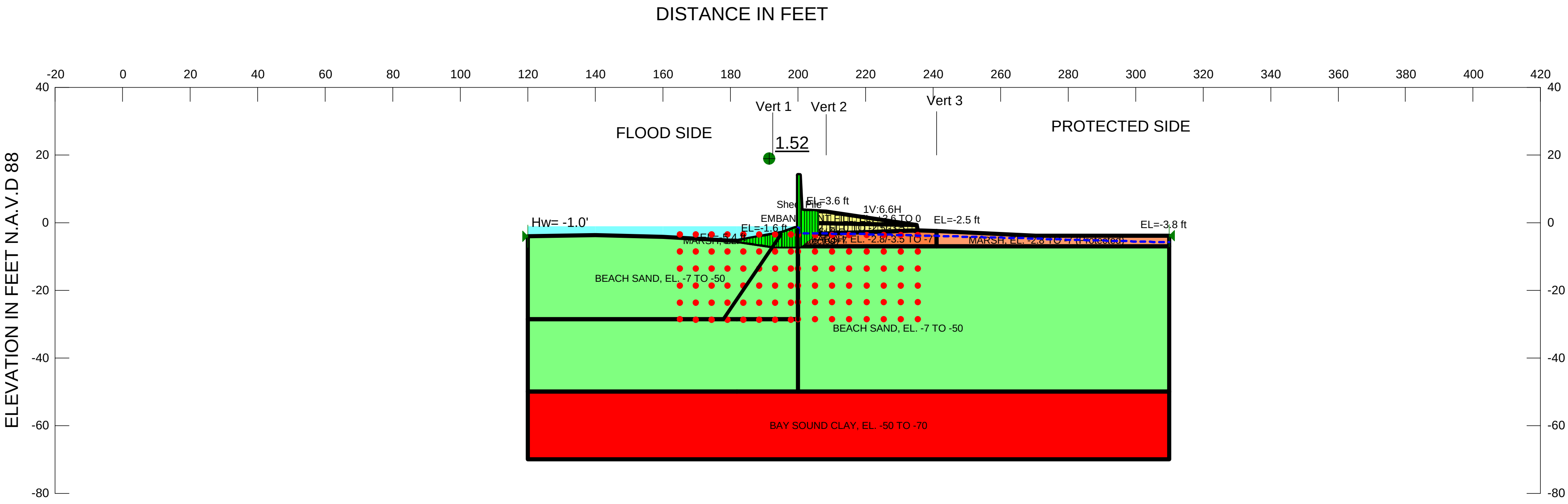
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	181.9985	-5.400078	174.72477	181.31057	4.2768685	7.4933e-008
2	Optimized	182.3989	-5.4645465	176.6172	207.87667	20.300133	-7.443e-007
3	Optimized	183.1967	-5.593002	180.3916	231.90908	33.45584	-4.5664e-007
4	Optimized	184.1647	-5.73784	186.19504	255.86269	45.242701	1.4675e-006
5	Optimized	185.17835	-5.88761	193.17964	285.25145	59.792133	1.9395e-006
6	Optimized	186.0674	-6.02593	200.11503	310.12551	71.441638	1.7738e-006

7	Optimized	186.9564	-6.16425	207.1838	334.944	82.968441	2.06e-006
8	Optimized	187.86965	-6.30199	214.33529	357.45769	92.944773	-4.0177e-007
9	Optimized	188.71945	-6.428675	221.07552	381.69969	104.31056	-4.5091e-007
10	Optimized	189.4815	-6.544885	227.30227	402.45552	113.74585	2.8244e-006
11	Optimized	190.24355	-6.661095	233.68469	423.17243	123.05478	-5.319e-007
12	Optimized	191.0056	-6.777305	240.0671	443.87637	132.35528	3.2865e-006
13	Optimized	191.76765	-6.893515	246.5533	464.54139	141.56312	3.5153e-006
14	Optimized	192.33935	-6.9764395	251.15105	471.6039	143.16375	3.5551e-006
15	Optimized	192.7949	-7.0357445	254.44512	482.4799	148.08752	3.6776e-006
16	Optimized	193.5665	-7.066515	255.75596	448.46841	125.14893	3.1092e-006
17	Optimized	194.3799	-7.0618955	254.90388	452.83096	128.53535	3.1933e-006
18	Optimized	194.9933	-7.060086	254.44741	455.43934	130.52569	3.2429e-006
19	Optimized	195.65775	-7.058126	253.96294	461.46873	134.75584	3.3478e-006
20	Optimized	196.37325	-7.0560155	253.55763	468.13542	139.34845	3.462e-006
21	Optimized	197.1612	-7.04122	252.34592	487.69607	152.83818	3.7974e-006
22	Optimized	198.02155	-7.01374	250.42911	516.90138	173.04912	4.2996e-006
23	Optimized	198.77585	-6.989647	248.8078	542.26472	0	188.27
24	Optimized	199.55	-6.964921	247.25168	550.16386	0	189.1
25	Optimized	200.25	-6.942563	192.97158	548.76013	0	189.45
26	Optimized	200.75	-6.926593	181.3755	546.04152	0	189.19
27	Optimized	201.00075	-6.918584	180.86776	1085.9795	0	189.06
28	Optimized	201.38145	-6.62152	162.28231	780.31944	0	186.44
29	Optimized	202.1813	-6.0244585	124.85079	750.8875	0	181.2
30	Optimized	203.02105	-5.424415	87.20759	700.27284	0	175.96
31	Optimized	203.8608	-4.8243715	49.507224	649.95853	0	170.76
32	Optimized	204.61955	-4.323559	18.030708	640.60804	0	166.44
33	Optimized	205.29725	-3.921977	-7.2644558	605.59769	0	162.99
34	Optimized	205.975	-3.520395	-32.554034	118.99708	0	159.56

Slices of Slip Surface: 961

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	961	181.4586	-5.5651955	184.38095	227.09316	27.737638	-3.7903e-007
2	961	182.4107	-5.9595775	206.04923	306.47574	65.217736	-2.8212e-007
3	961	183.23215	-6.299824	223.60616	367.32325	93.330969	-4.0375e-007
4	961	184.0536	-6.6400705	242.04036	427.81084	120.64076	-5.2189e-007
5	961	184.875	-6.9803175	261.3856	487.96102	147.1398	-4.9295e-006
6	961	185.6964	-7.3205645	280.89954	548.03247	173.47815	4.3111e-006
7	961	186.51785	-7.6608115	300.60468	608.02519	199.64121	4.9614e-006
8	961	187.3393	-8.0010585	320.47854	667.96167	225.65819	5.6077e-006
9	961	188.1607	-8.3413055	340.45362	727.85317	251.58021	-8.4285e-006
10	961	188.96725	-8.513804	350.15791	607.70832	167.25519	-5.6002e-006
11	961	189.759	-8.518554	349.57691	611.01754	169.78153	4.2166e-006
12	961	190.55075	-8.523304	349.04642	614.31412	172.26686	4.2785e-006
13	961	191.34245	-8.5280545	348.57909	617.59808	174.70297	4.339e-006
14	961	192.13415	-8.532805	348.17491	620.89466	177.10628	4.3987e-006
15	961	192.99165	-8.53795	347.80961	624.87681	179.92954	4.4686e-006
16	961	193.915	-8.54349	347.4847	629.64206	183.23513	4.551e-006

17	961	194.83835	-8.54903	347.30059	634.39649	186.44226	4.6306e-006
18	961	195.68	-8.55408	347.17795	641.79106	191.32399	4.7519e-006
19	961	196.44	-8.55864	347.15164	650.93563	197.27963	4.8995e-006
20	961	197.2	-8.5632	347.17795	679.52722	215.83014	5.3605e-006
21	961	197.96	-8.56776	347.28321	708.11881	234.32938	5.82e-006
22	961	198.72	-8.57232	347.41479	736.7104	252.81153	6.2788e-006
23	961	199.55	-8.5773	347.6493	750.68649	261.73541	6.5005e-006
24	961	200.25	-8.33	279.57587	499.82549	143.03177	-4.7921e-006
25	961	200.75	-7.83	237.8	451.0634	138.49487	-4.64e-006
26	961	201.29	-7.29	204.04906	755.51918	358.12888	-7.4691e-005
27	961	201.94495	-6.635059	163.06759	760.46541	0	186.43
28	961	202.67485	-5.9051765	117.33078	702.67678	0	180.09
29	961	203.4047	-5.175294	71.5368	645.18848	0	173.79
30	961	204.13455	-4.445412	25.768012	588.0005	0	167.53
31	961	204.86445	-3.7155295	-20.029839	163.07728	0	161.31



Name: EMBANKMENT FILL, EL. +3.6 TO 0 Model: Undrained (Phi=0) Unit Weight: 110 pcf Cohesion: 580 psf
Name: FILL2, EL.0 TO -2.5/-3.5 Model: Undrained (Phi=0) Unit Weight: 94 pcf Cohesion: 400 psf
Name: BEACH SAND, EL. -7 TO -50 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand
Name: BAY SOUND CLAY, EL. -50 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 102 pcf Cohesion Spatial Fn: Bay Sound Phi: 0 °
Name: Sheet Pile Model: Undrained (Phi=0) Unit Weight: 0.1 pcf Cohesion: 0.01 psf
Name: MARSH, EL. -2.8/-3.5 TO -7 Model: Spatial Mohr-Coulomb Weight Fn: Marsh Cohesion Spatial Fn: Marsh Phi: 0 °
Name: MARSH, EL. -2.8 TO -7 (Protected) Model: Spatial Mohr-Coulomb Unit Weight: 100 pcf Cohesion Fn: Marsh Phi: 0 °

GENERAL NOTES

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

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

Hw IS CANAL WATER LEVEL

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 1C,
PROTECTED SIDE STABILITY ANALYSIS,
CASE: LWL F/S Stability Analysis (Block)
STA. 9+25 TO 11+00 WEST
ORLEANS PARISH, LOUISIANA

Name: LWL F/S Stability Analysis (Block)
File Name: Orleans Canal Reach 1C.gsz Directory: C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix E LWL\WL -1\
Last Edited By: Jamerson, James MVK

LWL F/S Stability Analysis (Block)

File Information

Created By: Liljegren, James
Revision Number: 562
Last Edited By: Jamerson, James MVK
Date: 6/10/2013
Time: 9:41:27 AM
File Name: Orleans Canal Reach 1C.gsz
Directory: C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix E LWL\WL -1\
Last Solved Date: 6/10/2013
Last Solved Time: 9:42:38 AM

Project Settings

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

Analysis Settings

LWL F/S Stability Analysis (Block)

- Kind: SLOPE/W
- Parent: 4- Extreme Low Water Level
- Method: Spencer
- Settings
  - PWP Conditions Source: Parent Analysis
- Slip Surface
  - Direction of movement: Right to Left
  - Use Passive Mode: No
  - Slip Surface Option: Block
  - Critical slip surfaces saved: 1
  - Optimize Critical Slip Surface Location: Yes
  - Tension Crack
    - Tension Crack Option: Tension Crack Line
    - Percentage Wet: 0.5
    - Tension Crack Fluid Unit Weight: 62.4 pcf
- FOS Distribution
  - FOS Calculation Option: Constant

Restrict Block Crossing: Yes
Advanced
Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 4000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

EMBANKMENT FILL, EL. +3.6 TO 0

Model: Undrained (Phi=0)
Unit Weight: 110 pcf
Cohesion: 580 psf

FILL2, EL.0 TO -2.5/-3.5

Model: Undrained (Phi=0)
Unit Weight: 94 pcf
Cohesion: 400 psf

BEACH SAND, EL. -7 TO -50

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

BAY SOUND CLAY, EL. -50 TO -70

Model: Spatial Mohr-Coulomb
Unit Weight: 102 pcf
Cohesion Spatial Fn: Bay Sound
Phi: 0 °
Phi-B: 0 °

Sheet Pile

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

MARSH, EL. -2.8/-3.5 TO -7

Model: Spatial Mohr-Coulomb
Weight Fn: Marsh
Cohesion Spatial Fn: Marsh

Phi: 0 °
Phi-B: 0 °

MARSH, EL. -2.8 TO -7 (Protected)

Model: Spatial Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion Fn: Marsh
Phi: 0 °
Phi-B: 0 °

Slip Surface Limits

Left Coordinate: (120, -4) ft
Right Coordinate: (310, -3.8) ft

Slip Surface Block

Left Grid
- Upper Left: (165, -3.4) ft
- Lower Left: (165, -28.6) ft
- Lower Right: (198, -28.7) ft
- X Increments: 7
- Y Increments: 5
- Starting Angle: 135 °
- Ending Angle: 180 °
- Angle Increments: 2

Right Grid
- Upper Left: (200, -3.6) ft
- Lower Left: (200, -28.5) ft
- Lower Right: (235.5, -28.5) ft
- X Increments: 7
- Y Increments: 5
- Starting Angle: 45 °
- Ending Angle: 65 °
- Angle Increments: 2

Tension Crack Line

	X (ft)	Y (ft)
	200	-3.5
	235	-2.5

Cohesion Functions

Marsh

Model: Spline Data Point Function

Function: Cohesion vs. Y

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 150

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

Data Point: (-7, 180)

Data Point: (-2.8, 150)

Shear/Normal Strength Functions

Sand

Model: Spline Data Point Function

Function: Shear Stress vs. Normal Stress

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 0

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

Data Point: (-10000, 0)

Data Point: (0, 0)

Data Point: (10000, 6494)

Estimation Properties

Intact Rock Param.: 10

Geological Strength: 100

Disturbance Factor: 0

SigmaC: 600000 psf

Sigma3: 300000 psf

Num. Points: 20

Unit Weight Functions

Marsh

Model: Spline Data Point Function

Function: Unit Weight vs. X

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 100

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

Data Point: (192.5, 100)

Data Point: (208.3, 94)

Data Point: (241.1, 100)

Spatial Functions

Marsh

Model: Linear Interpolation

Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (192.53, -3.5, 150)
Data Point: (192.53, -7, 180)
Data Point: (200, -3.5, 160)
Data Point: (200, -7, 190)
Data Point: (241.1, -2.8, 150)
Data Point: (241.1, -7, 180)

Bay Sound

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (120, -50, 600)
Data Point: (120, -70, 770)
Data Point: (192.53, -50, 600)
Data Point: (192.53, -70, 770)
Data Point: (200, -50, 750)
Data Point: (200, -70, 925)
Data Point: (241.1, -50, 600)
Data Point: (241.1, -70, 770)
Data Point: (310, -50, 600)
Data Point: (310, -70, 770)

Regions

	Material	Points	Area (ft^2)
Region 1	EMBANKMENT FILL, EL. +3.6 TO 0	20,4,5,25	71.595
Region 2	MARSH, EL. -2.8/-3.5 TO -7	6,7,28,17,26	171.31
Region 3	BEACH SAND, EL. -7 TO -50	17,22,18,19,35,32,31,36,37,1,30	1900.824
Region 4	BEACH SAND, EL. -7 TO -50	19,35,33,14,27,11,10,28,17,22,18	6450
Region 5	BAY SOUND CLAY, EL. -50 TO -70	14,33,34,13,29,12,11,27	3800
Region 6	Sheet Pile	16,21,20,25,24,3	13.075
Region 7	FILL2, EL.0 TO -2.5/-3.5	26,3,24,25,5,6	90.54
Region 8	MARSH, EL. -2.8 TO -7 (Protected)	1,38,30	18.4275
Region 9	MARSH, EL. -2.8 TO -7 (Protected)	28,7,8,9,10	239.59
Region 10	MARSH, EL. -2.8/-3.5 TO -7	30,38,26,17	26.145
Region 11	FILL2, EL.0 TO -2.5/-3.5	2,23,3,26,38	6.9625

Points

	X (ft)	Y (ft)
Point 1	182	-5.4
Point 2	195.3	-3
Point 3	200	-1.6
Point 4	208.3	3.3
Point 5	235.1	-0.6
Point 6	235.5	-2.3

Point 7	241.1	-2.5
Point 8	270.5	-3.8
Point 9	310	-3.8
Point 10	310	-7
Point 11	310	-50
Point 12	310	-70
Point 13	182	-70
Point 14	182	-50
Point 15	182	-7
Point 16	200	14.1
Point 17	200	-7
Point 18	200	-28.5
Point 19	182	-28.5
Point 20	201	3.6
Point 21	200.5	14.1
Point 22	200	-23.5
Point 23	199.1	-1.6
Point 24	201	-1.6
Point 25	201	0
Point 26	200	-3.5
Point 27	200	-50
Point 28	241.1	-7
Point 29	200	-70
Point 30	192.53	-7
Point 31	120	-4
Point 32	120	-7
Point 33	120	-50
Point 34	120	-70
Point 35	120	-28.5
Point 36	140	-3.7
Point 37	160	-4.2
Point 38	192.53	-3.5

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.52	(192.951, -2.853)	9.701565	(206.053, 3.39236)	(181.783, -5.38814)
2	961	2.25	(192.951, -2.853)	10.149	(205.229, 3.42619)	(180.917, -5.34094)

Slices of Slip Surface: Optimized

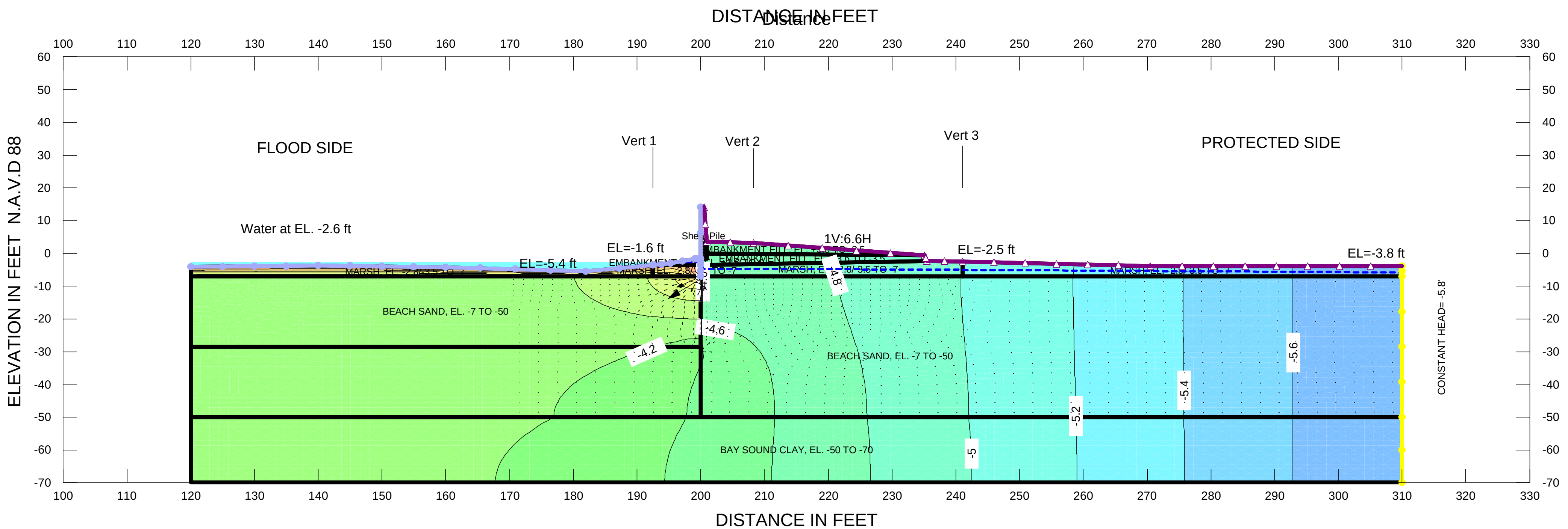
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	181.89125	-5.4084585	275.0073	279.82105	3.1260835	2.635e-008
2	Optimized	182.26585	-5.4784645	277.15778	296.58637	12.617073	-1.7228e-007
3	Optimized	182.82865	-5.568925	278.37505	308.97011	19.868667	-7.2934e-007
4	Optimized	183.56235	-5.672302	279.29587	326.03027	30.349678	-4.1455e-007
5	Optimized	184.43585	-5.797506	283.94211	345.90712	40.240552	-5.4964e-007
6	Optimized	185.30935	-5.92271	288.83766	365.76131	49.954804	1.6214e-006

7	Optimized	186.18285	-6.047914	294.15251	385.57017	59.367325	1.9268e-006
8	Optimized	187.0564	-6.173118	299.728	405.34504	68.588505	1.7038e-006
9	Optimized	187.9424	-6.304125	305.79886	426.81558	78.58918	-3.3984e-007
10	Optimized	188.8408	-6.440935	312.511	448.22843	88.135929	2.1894e-006
11	Optimized	189.73925	-6.577745	319.32218	469.64129	97.618366	2.425e-006
12	Optimized	190.57875	-6.7081415	326.01849	490.80556	107.01397	-4.6274e-007
13	Optimized	191.35925	-6.832124	332.4971	510.10221	115.3381	-4.9876e-007
14	Optimized	192.13975	-6.9561065	339.05164	529.3862	123.60471	3.0705e-006
15	Optimized	193.10835	-7.109969	347.35782	553.86168	134.10517	3.3313e-006
16	Optimized	193.972	-7.193345	351.52048	541.44349	123.33744	3.0647e-006
17	Optimized	194.6743	-7.147915	348.094	531.34978	119.00769	2.9577e-006
18	Optimized	195.19565	-7.1071015	345.10431	535.13602	123.40803	3.0665e-006
19	Optimized	195.64145	-7.0905315	343.71764	538.99047	126.81166	-5.4854e-007
20	Optimized	196.37255	-7.076041	342.38933	548.85977	134.08347	3.3319e-006
21	Optimized	197.1518	-7.0724425	341.73489	556.16131	139.25015	3.4601e-006
22	Optimized	197.93105	-7.068844	341.24726	563.45001	144.30015	3.5858e-006
23	Optimized	198.71035	-7.065246	340.7853	570.73871	149.33349	3.7107e-006
24	Optimized	199.55	-7.061369	340.4297	572.22723	150.53107	3.7406e-006
25	Optimized	200.25	-7.0581365	260.99723	536.91431	179.18264	4.4523e-006
26	Optimized	200.7309	-7.055916	244.98993	535.84239	188.8818	4.6934e-006
27	Optimized	200.9809	-7.0410215	244.05653	441.3292	128.11037	3.1871e-006
28	Optimized	201.43415	-6.7127815	223.50032	898.10546	0	187.21
29	Optimized	202.28365	-6.097555	184.83638	840.24069	0	181.79
30	Optimized	203.09205	-5.5042775	147.50342	781.34353	0	176.62
31	Optimized	203.8781	-4.9193525	110.62756	727.20859	0	171.55
32	Optimized	204.6641	-4.3344275	73.770081	673.36964	0	166.52
33	Optimized	205.4501	-3.7495025	36.848297	619.82668	0	161.53
34	Optimized	205.9478	-3.3920565	14.284398	464.09381	0	158.5

Slices of Slip Surface: 961

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	961	181.4586	-5.5651955	283.89205	312.37255	18.495453	-2.5273e-007
2	961	182.4107	-5.9595775	304.09133	375.71368	46.5121	1.51e-006
3	961	183.23215	-6.299824	319.8037	427.41719	69.885015	1.7366e-006
4	961	184.0536	-6.6400705	336.8545	478.88451	92.235364	2.2919e-006
5	961	184.875	-6.9803175	355.25497	530.09314	113.54124	-4.9116e-007
6	961	185.6964	-7.3205645	373.90288	581.26803	134.66451	3.3462e-006
7	961	186.51785	-7.6608115	392.84321	632.37544	155.55405	3.8654e-006
8	961	187.3393	-8.0010585	412.05348	683.44911	176.24638	4.3795e-006
9	961	188.1607	-8.3413055	431.39871	734.48903	196.82916	4.8909e-006
10	961	188.96725	-8.513804	440.56769	690.22398	162.12869	4.029e-006
11	961	189.759	-8.518554	439.54462	693.49531	164.91751	4.0982e-006
12	961	190.55075	-8.523304	438.59732	696.77926	167.66531	4.1664e-006
13	961	191.34245	-8.5280545	437.75107	700.03795	170.33109	4.2328e-006
14	961	192.13415	-8.532805	436.99324	703.30928	172.94766	4.2979e-006
15	961	192.99165	-8.53795	436.29176	707.25077	175.96284	4.3727e-006
16	961	193.915	-8.54349	435.6203	711.95105	179.45129	4.4593e-006

17	961	194.83835	-8.54903	435.17626	716.62966	182.77798	-6.1235e-006
18	961	195.68	-8.55408	434.83427	725.44745	188.72641	4.6899e-006
19	961	196.44	-8.55864	434.66322	733.4473	194.03266	-6.5004e-006
20	961	197.2	-8.5632	434.55796	741.434	199.28764	-6.6768e-006
21	961	197.96	-8.56776	434.57111	749.43386	204.47426	5.0813e-006
22	961	198.72	-8.57232	434.6369	757.42056	209.61816	5.2091e-006
23	961	199.55	-8.5773	434.82551	759.68633	210.96708	5.2426e-006
24	961	200.25	-8.33	340.41534	566.26524	146.66864	3.6454e-006
25	961	200.75	-7.83	293.36445	511.43618	141.61743	3.52e-006
26	961	201.29	-7.29	259.59352	855.92834	387.26436	-8.0783e-005
27	961	201.94495	-6.635059	218.5408	861.33636	0	186.43
28	961	202.67485	-5.9051765	172.7071	796.37864	0	180.09
29	961	203.4047	-5.175294	126.7959	731.7697	0	173.79
30	961	204.13455	-4.445412	80.915705	667.49014	0	167.53
31	961	204.86445	-3.7155295	34.990942	558.20037	0	161.31



Name: EMBANKMENT FILL, EL. +3.6 TO 0 Model: Saturated Only K-Sat: 3.28e-008 ft/sec Ky'/Kx' Ratio: 1
Name: BEACH SAND, EL. -7 TO -50 Model: Saturated Only K-Sat: 0.00049 ft/sec Ky'/Kx' Ratio: 1
Name: BAY SOUND CLAY, EL. -50 TO -70 Model: Saturated Only K-Sat: 3.28e-008 ft/sec Ky'/Kx' Ratio: 1
Name: Sheet Pile Model: Saturated Only K-Sat: 1e-010 ft/sec Ky'/Kx' Ratio: 1
Name: MARSH, EL. -2.8/-3.5 TO -7 Model: Saturated Only K-Sat: 3.28e-007 ft/sec Ky'/Kx' Ratio: 1
Name: EMBANKMENT FILL, EL. +3.6 TO -3.5 Model: Saturated Only K-Sat: 3.28e-008 ft/sec Ky'/Kx' Ratio: 1

GENERAL NOTES

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

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

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 1D
REMEDIATION OF CANAL WALLS AND LEVEES
PROTECTED SIDE STABILITY ANALYSIS
CASE: Gap Analysis (seepage) 03 EWL
STA. 11+00 TO 14+20 WEST
ORLEANS PARISH, LOUISIANA

ETL 1110-2-575 ANALYSIS

Name: Gap Analysis (seepage) 03 EWL
File Name: Reach 1D.gsz Directory: C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix E LWL\
Last Edited By: Reves, Ryan D MVK

Gap Analysis (seepage) 03 EWL

File Information

Created By: Liljegren, James
Revision Number: 622
Last Edited By: Reves, Ryan D MVK
Date: 10/3/2013
Time: 9:51:49 AM
File Name: Reach 1D.gsz
Directory: C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix E LWL\
Last Solved Date: 10/3/2013
Last Solved Time: 9:52:44 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) 03 EWL

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

Starting Time: 0 sec
Duration: 0 sec
Ending Time: 0 sec

Materials

EMBANKMENT FILL, EL. +3.6 TO 0

Model: Saturated Only
Hydraulic
K-Sat: 3.28e-008 ft/sec
Volumetric Water Content: 0 ft^3/ft^3
Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

BEACH SAND, EL. -7 TO -50

Model: Saturated Only
Hydraulic
K-Sat: 0.00049 ft/sec
Volumetric Water Content: 0 ft^3/ft^3
Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

BAY SOUND CLAY, EL. -50 TO -70

Model: Saturated Only
Hydraulic
K-Sat: 3.28e-008 ft/sec
Volumetric Water Content: 0 ft^3/ft^3
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 ft^3/ft^3
Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

MARSH, EL. -2.8/-3.5 TO -7

Model: Saturated Only
Hydraulic
K-Sat: 3.28e-007 ft/sec
Volumetric Water Content: 0 ft^3/ft^3

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

EMBANKMENT FILL, EL. +3.6 TO -3.5

Model: Saturated Only
Hydraulic
K-Sat: 3.28e-008 ft/sec
Volumetric Water Content: 0 ft^3/ft^3
Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

Boundary Conditions

Drainage

Review: true
Type: Total Flux (Q) 0

Curb

Type: Head (H) -5.8

Canal Water (Global) EWL

Type: Head (H) -2.6

Regions

	Material	Points	Area (ft^2)
Region 1	EMBANKMENT FILL, EL. +3.6 TO -3.5	20,4,5,25	71.595
Region 2	MARSH, EL. -2.8/-3.5 TO -7	6,7,28,17,26	171.31
Region 3	BEACH SAND, EL. -7 TO -50	17,22,18,19,35,32,15,30	1720
Region 4	BEACH SAND, EL. -7 TO -50	19,35,33,14,27,11,10,28,17,22,18	6450
Region 5	BAY SOUND CLAY, EL. -50 TO -70	14,33,34,13,29,12,11,27	3800
Region 6	Sheet Pile	16,21,20,25,24,3	13.075
Region 7	EMBANKMENT FILL, EL. +3.6 TO -3.5	26,3,24,25,5,6	90.54
Region 8	MARSH, EL. -2.8/-3.5 TO -7	1,38,30,15,32,31,36,37	199.2515
Region 9	MARSH, EL. -2.8/-3.5 TO -7	28,7,8,9,10	239.59
Region 10	MARSH, EL. -2.8/-3.5 TO -7	30,38,26,17	26.145
Region 11	EMBANKMENT FILL, EL. +3.6 TO 0	2,23,3,26,38	6.9625

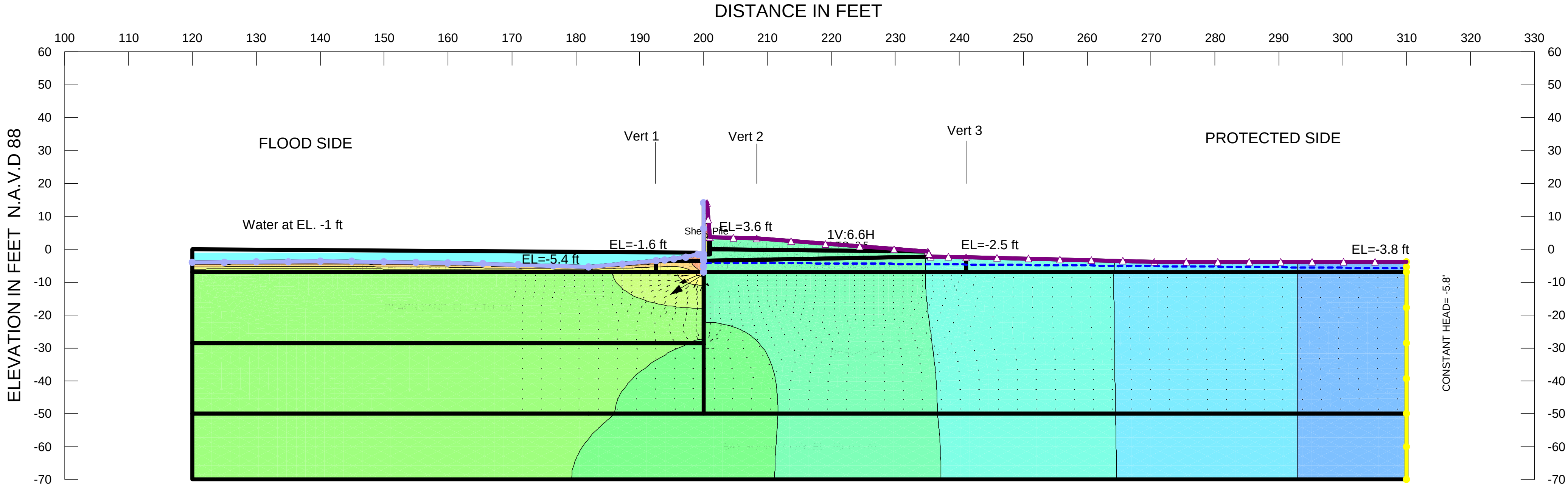
Lines

	Start Point	End Point	Hydraulic Boundary	Left Side Material	Right Side Material
Line 1	18	19			
Line 2	12	11	Curb		
Line 3	16	21			
Line 4	21	20	Drainage		

Line 5	22	18		Sheet Pile	
Line 6	20	4	Drainage		
Line 7	24	3		Sheet Pile	Sheet Pile
Line 8	5	4	Drainage		
Line 9	16	3	Canal Water (Global) EWL		
Line 10	24	25			
Line 11	25	20			
Line 12	3	26	Canal Water (Global) EWL	Sheet Pile	
Line 13	6	7	Drainage		
Line 14	5	25			
Line 15	26	6			
Line 16	5	6	Drainage		
Line 17	26	17	Canal Water (Global) EWL	Sheet Pile	
Line 18	11	10	Curb		
Line 19	10	28			
Line 20	28	17			
Line 21	27	14			
Line 22	11	27			
Line 23	29	13			
Line 24	12	29			
Line 25	22	17			Sheet Pile
Line 26	7	28			
Line 27	7	8	Drainage		
Line 28	9	10	Curb		
Line 29	17	30			
Line 30	2	23	Canal Water (Global) EWL		
Line 31	23	3	Canal Water (Global) EWL		
Line 32	14	33			
Line 33	33	34			
Line 34	34	13			
Line 35	19	35			
Line 36	35	33			
Line 37	35	32			
Line 38	31	36	Canal Water (Global) EWL		
Line 39	36	37	Canal Water (Global) EWL		
Line 40	37	1	Canal Water (Global) EWL		
Line 41	18	27			
Line 42	30	38			
Line 43	38	26			
Line 44	1	38	Canal Water (Global) EWL		
Line 45	38	2	Canal Water (Global) EWL		
Line 46	9	8	Drainage		
Line 47	32	15			
Line 48	15	30			
Line 49	32	31			

Points

	X (ft)	Y (ft)
Point 1	182	-5.4
Point 2	195.3	-3
Point 3	200	-1.6
Point 4	208.3	3.3
Point 5	235.1	-0.6
Point 6	235.5	-2.3
Point 7	241.1	-2.5
Point 8	270.5	-3.8
Point 9	310	-3.8
Point 10	310	-7
Point 11	310	-50
Point 12	310	-70
Point 13	182	-70
Point 14	182	-50
Point 15	182	-7
Point 16	200	14.1
Point 17	200	-7
Point 18	200	-28.5
Point 19	182	-28.5
Point 20	201	3.6
Point 21	200.5	14.1
Point 22	200	-23.5
Point 23	199.1	-1.6
Point 24	201	-1.6
Point 25	201	0
Point 26	200	-3.5
Point 27	200	-50
Point 28	241.1	-7
Point 29	200	-70
Point 30	192.53	-7
Point 31	120	-4
Point 32	120	-7
Point 33	120	-50
Point 34	120	-70
Point 35	120	-28.5
Point 36	140	-3.7
Point 37	160	-4.2
Point 38	192.53	-3.5



Name: EMBANKMENT FILL, EL. +3.6 TO 0 Model: Saturated Only K-Sat: 3.28e-008 ft/sec K-Ratio: 1
Name: BEACH SAND, EL. -7 TO -50 Model: Saturated Only K-Sat: 0.00049 ft/sec K-Ratio: 1
Name: BAY SOUND CLAY, EL. -50 TO -70 Model: Saturated Only K-Sat: 3.28e-008 ft/sec K-Ratio: 1
Name: Sheet Pile Model: Saturated Only K-Sat: 1e-010 ft/sec K-Ratio: 1
Name: MARSH, EL. -2.8/-3.5 TO -7 Model: Saturated Only K-Sat: 3.28e-007 ft/sec K-Ratio: 1
Name: EMBANKMENT FILL, EL. +3.6 TO -3.5 Model: Saturated Only K-Sat: 3.28e-008 ft/sec K-Ratio: 1

GENERAL NOTES

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

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

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 1D
REMEDIATION OF CANAL WALLS AND LEVEES
PROTECTED SIDE STABILITY ANALYSIS
CASE: Gap Analysis (seepage) 03 EWL
STA. 11+00 TO 14+20 WEST
ORLEANS PARISH, LOUISIANA

ETL 1110-2-575 ANALYSIS

Name: Gap Analysis (seepage) 03 EWL
File Name: Orleans Canal Reach 1D.gsz Directory: C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix E LWL\WL -1\
Last Edited By: Reves, Ryan D MVK

Gap Analysis (seepage) 03 EWL

File Information

Created By: Liljegren, James
Revision Number: 608
Last Edited By: Reves, Ryan D MVK
Date: 3/29/2013
Time: 5:16:03 PM
File Name: Orleans Canal Reach 1D.gsz
Directory: C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix E LWL\WL -1\
Last Solved Date: 3/29/2013
Last Solved Time: 5:16:14 PM

Project Settings

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

Analysis Settings

Gap Analysis (seepage) 03 EWL

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

Starting Time: 0 sec
Duration: 0 sec
Ending Time: 0 sec

Materials

EMBANKMENT FILL, EL. +3.6 TO 0

Model: Saturated Only
Hydraulic
K-Sat: 3.28e-008 ft/sec
Volumetric Water Content: 0 ft^3/ft^3
Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

BEACH SAND, EL. -7 TO -50

Model: Saturated Only
Hydraulic
K-Sat: 0.00049 ft/sec
Volumetric Water Content: 0 ft^3/ft^3
Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

BAY SOUND CLAY, EL. -50 TO -70

Model: Saturated Only
Hydraulic
K-Sat: 3.28e-008 ft/sec
Volumetric Water Content: 0 ft^3/ft^3
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 ft^3/ft^3
Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

MARSH, EL. -2.8/-3.5 TO -7

Model: Saturated Only
Hydraulic
K-Sat: 3.28e-007 ft/sec
Volumetric Water Content: 0 ft^3/ft^3

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

EMBANKMENT FILL, EL. +3.6 TO -3.5

Model: Saturated Only
Hydraulic
K-Sat: 3.28e-008 ft/sec
Volumetric Water Content: 0 ft^3/ft^3
Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

Boundary Conditions

Drainage

Review: true
Type: Total Flux (Q) 0

Curb

Type: Head (H) -5.8

Canal Water (Global) EWL

Type: Head (H) -1

Regions

	Material	Points	Area (ft^2)
Region 1	EMBANKMENT FILL, EL. +3.6 TO -3.5	20,4,5,25	71.595
Region 2	MARSH, EL. -2.8/-3.5 TO -7	6,7,28,17,26	171.31
Region 3	BEACH SAND, EL. -7 TO -50	17,22,18,19,35,32,15,30	1720
Region 4	BEACH SAND, EL. -7 TO -50	19,35,33,14,27,11,10,28,17,22,18	6450
Region 5	BAY SOUND CLAY, EL. -50 TO -70	14,33,34,13,29,12,11,27	3800
Region 6	Sheet Pile	16,21,20,25,24,3	13.075
Region 7	EMBANKMENT FILL, EL. +3.6 TO -3.5	26,3,24,25,5,6	90.54
Region 8	MARSH, EL. -2.8/-3.5 TO -7	1,38,30,15,32,31,36,37	199.2515
Region 9	MARSH, EL. -2.8/-3.5 TO -7	28,7,8,9,10	239.59
Region 10	MARSH, EL. -2.8/-3.5 TO -7	30,38,26,17	26.145
Region 11	EMBANKMENT FILL, EL. +3.6 TO 0	2,23,3,26,38	6.9625
Region 12		31,39,40,23,2,38,1,37,36	286.571

Lines

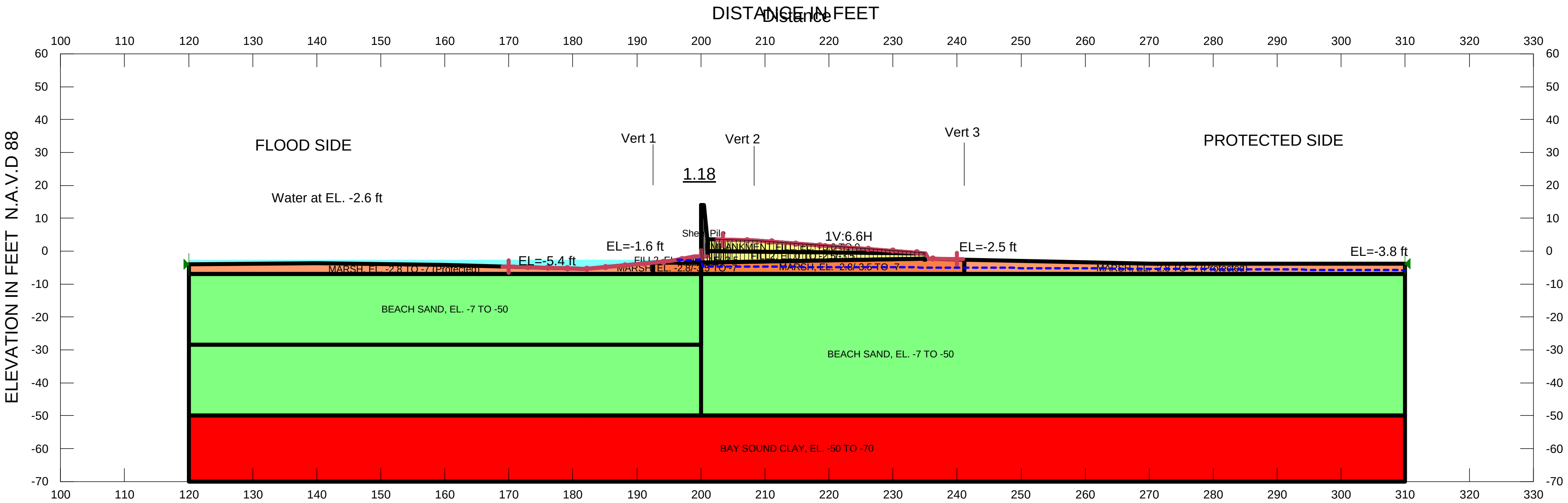
	Start Point	End Point	Hydraulic Boundary	Left Side Material	Right Side Material
Line 1	18	19			
Line 2	12	11	Curb		
Line 3	16	21			

Line 4	21	20	Drainage		
Line 5	22	18		Sheet Pile	
Line 6	20	4	Drainage		
Line 7	24	3		Sheet Pile	Sheet Pile
Line 8	5	4	Drainage		
Line 9	16	3	Canal Water (Global) EWL		
Line 10	24	25			
Line 11	25	20			
Line 12	3	26	Canal Water (Global) EWL	Sheet Pile	
Line 13	6	7	Drainage		
Line 14	5	25			
Line 15	26	6			
Line 16	5	6	Drainage		
Line 17	26	17	Canal Water (Global) EWL	Sheet Pile	
Line 18	11	10	Curb		
Line 19	10	28			
Line 20	28	17			
Line 21	27	14			
Line 22	11	27			
Line 23	29	13			
Line 24	12	29			
Line 25	22	17			Sheet Pile
Line 26	7	28			
Line 27	7	8	Drainage		
Line 28	9	10	Curb		
Line 29	17	30			
Line 30	2	23	Canal Water (Global) EWL		
Line 31	23	3	Canal Water (Global) EWL		
Line 32	14	33			
Line 33	33	34			
Line 34	34	13			
Line 35	19	35			
Line 36	35	33			
Line 37	35	32			
Line 38	31	36	Canal Water (Global) EWL		
Line 39	36	37	Canal Water (Global) EWL		
Line 40	37	1	Canal Water (Global) EWL		
Line 41	18	27			
Line 42	30	38			
Line 43	38	26			
Line 44	1	38	Canal Water (Global) EWL		
Line 45	38	2	Canal Water (Global) EWL		
Line 46	31	39			
Line 47	39	40			
Line 48	40	23			
Line 49	9	8	Drainage		
Line 50	32	15			
Line 51	15	30			

Line 52	32	31			

Points

	X (ft)	Y (ft)
Point 1	182	-5.4
Point 2	195.3	-3
Point 3	200	-1.6
Point 4	208.3	3.3
Point 5	235.1	-0.6
Point 6	235.5	-2.3
Point 7	241.1	-2.5
Point 8	270.5	-3.8
Point 9	310	-3.8
Point 10	310	-7
Point 11	310	-50
Point 12	310	-70
Point 13	182	-70
Point 14	182	-50
Point 15	182	-7
Point 16	200	14.1
Point 17	200	-7
Point 18	200	-28.5
Point 19	182	-28.5
Point 20	201	3.6
Point 21	200.5	14.1
Point 22	200	-23.5
Point 23	199.1	-1.6
Point 24	201	-1.6
Point 25	201	0
Point 26	200	-3.5
Point 27	200	-50
Point 28	241.1	-7
Point 29	200	-70
Point 30	192.53	-7
Point 31	120	-4
Point 32	120	-7
Point 33	120	-50
Point 34	120	-70
Point 35	120	-28.5
Point 36	140	-3.7
Point 37	160	-4.2
Point 38	192.53	-3.5
Point 39	120	0
Point 40	199	-1



Name: EMBANKMENT FILL, EL. +3.6 TO 0 Model: Undrained (Phi=0) Unit Weight: 110 pcf Cohesion': 650 psf
Name: FILL2, EL.0 TO -2.5/-3.5 Model: Undrained (Phi=0) Unit Weight: 94 pcf Cohesion': 400 psf
Name: BEACH SAND, EL. -7 TO -50 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand
Name: BAY SOUND CLAY, EL. -50 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 102 pcf Cohesion Spatial Fn: Bay Sound Phi': 0 °
Name: Sheet Pile Model: Undrained (Phi=0) Unit Weight: 0.1 pcf Cohesion': 0.01 psf
Name: MARSH, EL. -2.8/-3.5 TO -7 Model: Spatial Mohr-Coulomb Weight Fn: Marsh Cohesion Spatial Fn: Marsh Phi': 0 °
Name: MARSH, EL. -2.8 TO -7 (Protected) Model: Spatial Mohr-Coulomb Unit Weight: 100 pcf Cohesion Fn: Marsh 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.

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 1D
REMEDIATION OF CANAL WALLS AND LEVEES
PROTECTED SIDE STABILITY ANALYSIS
CASE: Slope Stability (Entry/Exit) 03 FS
STA. 11+00 TO 14+20 WEST
ORLEANS PARISH, LOUISIANA

ETL 1110-2-575 ANALYSIS

Name: Slope Stability (Entry/Exit) 03 FS
File Name: Reach 1D.gsz Directory: C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix E LWL\
Last Edited By: Reves, Ryan D MVK

Slope Stability (Entry/Exit) 03 FS

File Information

Created By: Liljegren, James
Revision Number: 622
Last Edited By: Reves, Ryan D MVK
Date: 10/3/2013
Time: 9:51:49 AM
File Name: Reach 1D.gsz
Directory: C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix E LWL\
Last Solved Date: 10/3/2013
Last Solved Time: 9:54:30 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) 03 FS

Kind: SLOPE/W
Parent: Gap Analysis (seepage) 03 EWL
Method: Spencer
Settings
- PWP Conditions Source: Parent Analysis

Slip Surface
- Direction of movement: Right to Left
- Use Passive Mode: No
- Slip Surface Option: Entry and Exit
- Critical slip surfaces saved: 1
- Optimize Critical Slip Surface Location: Yes
- Tension Crack
  - Tension Crack Option: Tension Crack Line
  - Percentage Wet: 1
  - Tension Crack Fluid Unit Weight: 62.4 pcf

FOS Distribution
- FOS Calculation Option: Constant

Advanced

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

Materials

EMBANKMENT FILL, EL. +3.6 TO 0

Model: Undrained (Phi=0)
Unit Weight: 110 pcf
Cohesion: 580 psf

FILL2, EL.0 TO -2.5/-3.5

Model: Undrained (Phi=0)
Unit Weight: 94 pcf
Cohesion: 400 psf

BEACH SAND, EL. -7 TO -50

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

BAY SOUND CLAY, EL. -50 TO -70

Model: Spatial Mohr-Coulomb
Unit Weight: 102 pcf
Cohesion Spatial Fn: Bay Sound
Phi: 0 °
Phi-B: 0 °

Sheet Pile

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

MARSH, EL. -2.8/-3.5 TO -7

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

Phi-B: 0 °

MARSH, EL. -2.8 TO -7 (Protected)

Model: Spatial Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion Fn: Marsh
Phi: 0 °
Phi-B: 0 °

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (170, -4.74545) ft
Left-Zone Right Coordinate: (200, -1.6) ft
Left-Zone Increment: 10
Right Projection: Range
Right-Zone Left Coordinate: (203.43333, 3.5) ft
Right-Zone Right Coordinate: (240, -2.46071) ft
Right-Zone Increment: 10
Radius Increments: 15

Slip Surface Limits

Left Coordinate: (120, -4) ft
Right Coordinate: (310, -3.8) ft

Tension Crack Line

	X (ft)	Y (ft)
	200	-3.5
	235	-2.5

Cohesion Functions

Marsh

Model: Spline Data Point Function
Function: Cohesion vs. Y
    Curve Fit to Data: 100 %
    Segment Curvature: 0 %
Y-Intercept: 150
Data Points: Y (ft), Cohesion (psf)
    Data Point: (-7, 180)
    Data Point: (-2.8, 150)

Shear/Normal Strength Functions

Sand

Model: Spline Data Point Function
Function: Shear Stress vs. Normal Stress
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
Data Point: (-10000, 0)
Data Point: (0, 0)
Data Point: (10000, 6494)
Estimation Properties
Intact Rock Param.: 10
Geological Strength: 100
Disturbance Factor: 0
SigmaC: 600000 psf
Sigma3: 300000 psf
Num. Points: 20

Unit Weight Functions

Marsh

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 100
Data Points: X (ft), Unit Weight (pcf)
Data Point: (192.5, 100)
Data Point: (208.3, 94)
Data Point: (241.1, 100)

Spatial Functions

Marsh

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (192.53, -3.5, 150)
Data Point: (192.53, -7, 180)
Data Point: (200, -3.5, 160)
Data Point: (200, -7, 190)
Data Point: (241.1, -2.8, 150)
Data Point: (241.1, -7, 180)

Bay Sound

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
- Data Point: (120, -50, 600)
- Data Point: (120, -70, 770)
- Data Point: (192.53, -50, 600)
- Data Point: (192.53, -70, 770)
- Data Point: (200, -50, 750)
- Data Point: (200, -70, 925)
- Data Point: (241.1, -50, 600)
- Data Point: (241.1, -70, 770)
- Data Point: (310, -50, 600)
- Data Point: (310, -70, 770)

Regions

	Material	Points	Area (ft^2)
Region 1	EMBANKMENT FILL, EL. +3.6 TO 0	20,4,5,25	71.595
Region 2	MARSH, EL. -2.8/-3.5 TO -7	6,7,28,17,26	171.31
Region 3	BEACH SAND, EL. -7 TO -50	17,22,18,19,35,32,15,30	1720
Region 4	BEACH SAND, EL. -7 TO -50	19,35,33,14,27,11,10,28,17,22,18	6450
Region 5	BAY SOUND CLAY, EL. -50 TO -70	14,33,34,13,29,12,11,27	3800
Region 6	Sheet Pile	16,21,20,25,24,3	13.075
Region 7	FILL2, EL.0 TO -2.5/-3.5	26,3,24,25,5,6	90.54
Region 8	MARSH, EL. -2.8 TO -7 (Protected)	1,38,30,15,32,31,36,37	199.2515
Region 9	MARSH, EL. -2.8 TO -7 (Protected)	28,7,8,9,10	239.59
Region 10	MARSH, EL. -2.8/-3.5 TO -7	30,38,26,17	26.145
Region 11	FILL2, EL.0 TO -2.5/-3.5	2,23,3,26,38	6.9625

Points

	X (ft)	Y (ft)
Point 1	182	-5.4
Point 2	195.3	-3
Point 3	200	-1.6
Point 4	208.3	3.3
Point 5	235.1	-0.6
Point 6	235.5	-2.3
Point 7	241.1	-2.5
Point 8	270.5	-3.8
Point 9	310	-3.8
Point 10	310	-7
Point 11	310	-50
Point 12	310	-70
Point 13	182	-70
Point 14	182	-50
Point 15	182	-7
Point 16	200	14.1

Point 17	200	-7
Point 18	200	-28.5
Point 19	182	-28.5
Point 20	201	3.6
Point 21	200.5	14.1
Point 22	200	-23.5
Point 23	199.1	-1.6
Point 24	201	-1.6
Point 25	201	0
Point 26	200	-3.5
Point 27	200	-50
Point 28	241.1	-7
Point 29	200	-70
Point 30	192.53	-7
Point 31	120	-4
Point 32	120	-7
Point 33	120	-50
Point 34	120	-70
Point 35	120	-28.5
Point 36	140	-3.7
Point 37	160	-4.2
Point 38	192.53	-3.5

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.18	(199.551, 8.292)	12.69164	(204.56, 3.4537)	(194.172, -3.20371)
2	1450	1.18	(199.551, 8.292)	12.692	(204.56, 3.4537)	(194.172, -3.20371)

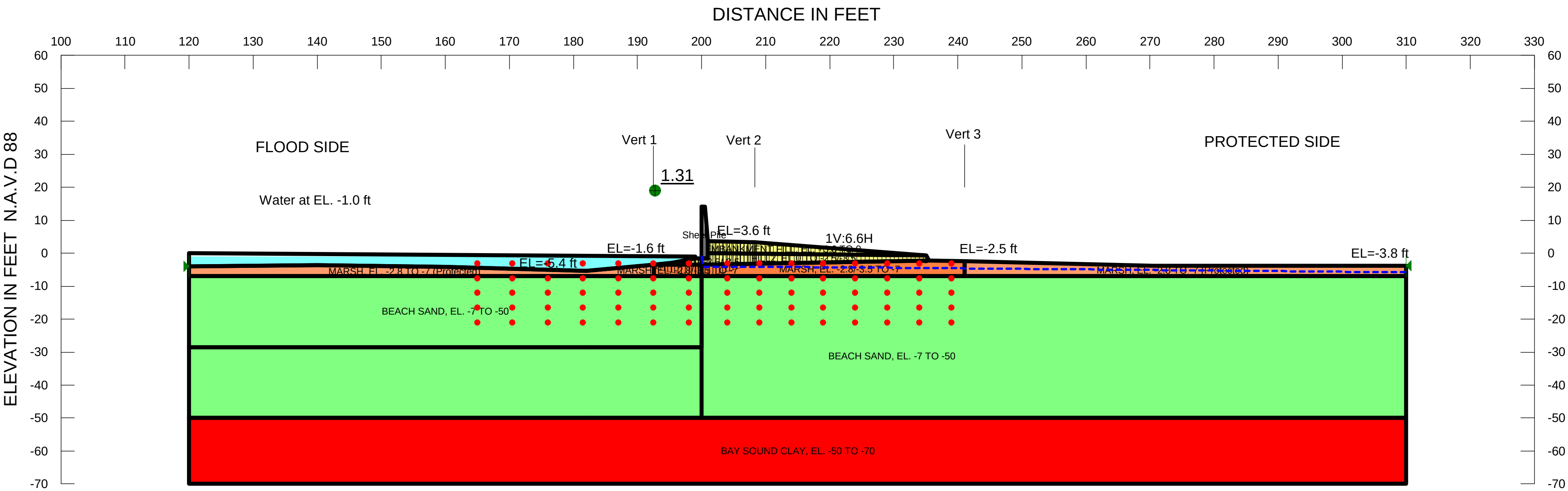
Slices of Slip Surface: Optimized

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	194.3427	-3.280769	34.903921	399.17965	0	400
2	Optimized	194.68515	-3.4289155	31.361979	397.33085	0	400
3	Optimized	195.0782	-3.5835405	33.921496	210.25632	0	154.13
4	Optimized	195.47275	-3.725696	40.155854	223.55865	0	155.87
5	Optimized	195.8182	-3.837466	46.754312	232.47121	0	157.29
6	Optimized	196.16365	-3.9384585	53.102381	239.98594	0	158.62
7	Optimized	196.5091	-4.0289385	58.950078	249.75936	0	159.86
8	Optimized	196.85455	-4.1091365	64.298013	264.5522	0	161.01
9	Optimized	197.2	-4.1792515	70.205682	277.92973	0	162.07
10	Optimized	197.54545	-4.239452	76.524225	289.95284	0	163.05
11	Optimized	197.8909	-4.289881	82.353751	300.70484	0	163.95
12	Optimized	198.23635	-4.330656	87.685077	310.20161	0	164.76
13	Optimized	198.5818	-4.3618695	92.499724	318.53063	0	165.49
14	Optimized	198.92725	-4.3835925	97.802021	325.69834	0	166.14
15	Optimized	199.25	-4.395645	102.47787	326.16168	0	166.67
16	Optimized	199.55	-4.39921	106.56667	320.26	0	167.11

17	Optimized	199.85	-4.3956815	110.21936	313.74278	0	167.48
18	Optimized	200.25	-4.378347	2.763195	305.43519	0	167.5
19	Optimized	200.75	-4.3408165	-21.282315	291.29036	0	167.11
20	Optimized	201.178	-4.2940685	-24.266542	797.48167	0	166.65
21	Optimized	201.534	-4.24289	-27.521073	779.06318	0	166.17
22	Optimized	201.89	-4.1813425	-31.423664	759.97119	0	165.6
23	Optimized	202.246	-4.109271	-35.985263	740.15456	0	164.94
24	Optimized	202.602	-4.026491	-41.214559	719.64612	0	164.2
25	Optimized	202.958	-3.932785	-47.129888	698.425	0	163.36
26	Optimized	203.314	-3.8278985	-53.745961	676.47212	0	162.44
27	Optimized	203.67	-3.7115385	-61.078401	653.79846	0	161.41
28	Optimized	204.026	-3.583368	-69.147662	630.33797	0	160.3
29	Optimized	204.382	-3.442999	-77.982527	-740.52621	0	159.08

Slices of Slip Surface: 1450

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	1450	194.3427	-3.280769	34.903921	399.17965	0	400
2	1450	194.68515	-3.4289155	31.361979	397.33085	0	400
3	1450	195.0782	-3.5835405	33.921496	210.25632	0	154.13
4	1450	195.47275	-3.725696	40.155854	223.55865	0	155.87
5	1450	195.8182	-3.837466	46.754312	232.47121	0	157.29
6	1450	196.16365	-3.9384585	53.102381	239.98594	0	158.62
7	1450	196.5091	-4.0289385	58.950078	249.75936	0	159.86
8	1450	196.85455	-4.1091365	64.298013	264.5522	0	161.01
9	1450	197.2	-4.1792515	70.205682	277.92973	0	162.07
10	1450	197.54545	-4.239452	76.524225	289.95284	0	163.05
11	1450	197.8909	-4.289881	82.353751	300.70484	0	163.95
12	1450	198.23635	-4.330656	87.685077	310.20161	0	164.76
13	1450	198.5818	-4.3618695	92.499724	318.53063	0	165.49
14	1450	198.92725	-4.3835925	97.802021	325.69834	0	166.14
15	1450	199.25	-4.395645	102.47787	326.16168	0	166.67
16	1450	199.55	-4.39921	106.56667	320.26	0	167.11
17	1450	199.85	-4.3956815	110.21936	313.74278	0	167.48
18	1450	200.25	-4.378347	2.763195	305.43519	0	167.5
19	1450	200.75	-4.3408165	-21.282315	291.29036	0	167.11
20	1450	201.178	-4.2940685	-24.266542	797.48167	0	166.65
21	1450	201.534	-4.24289	-27.521073	779.06318	0	166.17
22	1450	201.89	-4.1813425	-31.423664	759.97119	0	165.6
23	1450	202.246	-4.109271	-35.985263	740.15456	0	164.94
24	1450	202.602	-4.026491	-41.214559	719.64612	0	164.2
25	1450	202.958	-3.932785	-47.129888	698.425	0	163.36
26	1450	203.314	-3.8278985	-53.745961	676.47212	0	162.44
27	1450	203.67	-3.7115385	-61.078401	653.79846	0	161.41
28	1450	204.026	-3.583368	-69.147662	630.33797	0	160.3
29	1450	204.382	-3.442999	-77.982527	-740.52621	0	159.08



Name: EMBANKMENT FILL, EL. +3.6 TO 0 Model: Undrained (Phi=0) Unit Weight: 110 pcf Cohesion: 580 psf
Name: FILL2, EL.0 TO -2.5/-3.5 Model: Undrained (Phi=0) Unit Weight: 94 pcf Cohesion: 400 psf
Name: BEACH SAND, EL. -7 TO -50 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand
Name: BAY SOUND CLAY, EL. -50 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 102 pcf Cohesion Spatial Fn: Bay Sound Phi: 0 °
Name: Sheet Pile Model: Undrained (Phi=0) Unit Weight: 0.1 pcf Cohesion: 0.01 psf
Name: MARSH, EL. -2.8/-3.5 TO -7 Model: Spatial Mohr-Coulomb Weight Fn: Marsh Cohesion Spatial Fn: Marsh Phi: 0 °
Name: MARSH, EL. -2.8 TO -7 (Protected) Model: Spatial Mohr-Coulomb Unit Weight: 100 pcf Cohesion Fn: Marsh 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.

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 1D
REMEDIATION OF CANAL WALLS AND LEVEES
PROTECTED SIDE STABILITY ANALYSIS
CASE: Slope Stability (Block) 03 FS
STA. 11+00 TO 14+20 WEST
ORLEANS PARISH, LOUISIANA

ETL 1110-2-575 ANALYSIS

Name: Slope Stability (Block) 03 FS
File Name: Orleans Canal Reach 1D.gsz Directory: C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix E LWL\WL -1\
Last Edited By: Reves, Ryan D MVK

Slope Stability (Block) 03 FS

File Information

Created By: Liljegren, James
Revision Number: 618
Last Edited By: Reves, Ryan D MVK
Date: 6/5/2013
Time: 11:33:30 AM
File Name: Orleans Canal Reach 1D.gsz
Directory: C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix E LWL\WL -1\
Last Solved Date: 6/5/2013
Last Solved Time: 11:34:28 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

Slope Stability (Block) 03 FS

Kind: SLOPE/W
Parent: Gap Analysis (seepage) 03 EWL
Method: Spencer
Settings
- PWP Conditions Source: Parent Analysis

Slip Surface
- Direction of movement: Right to Left
- Use Passive Mode: No
- Slip Surface Option: Block
- Critical slip surfaces saved: 1
- Optimize Critical Slip Surface Location: Yes
- Tension Crack
  - Tension Crack Option: Tension Crack Line
  - Percentage Wet: 1
  - Tension Crack Fluid Unit Weight: 62.4 pcf

FOS Distribution
- FOS Calculation Option: Constant

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

Materials

EMBANKMENT FILL, EL. +3.6 TO 0

Model: Undrained (Phi=0)
Unit Weight: 110 pcf
Cohesion: 580 psf

FILL2, EL.0 TO -2.5/-3.5

Model: Undrained (Phi=0)
Unit Weight: 94 pcf
Cohesion: 400 psf

BEACH SAND, EL. -7 TO -50

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

BAY SOUND CLAY, EL. -50 TO -70

Model: Spatial Mohr-Coulomb
Unit Weight: 102 pcf
Cohesion Spatial Fn: Bay Sound
Phi: 0 °
Phi-B: 0 °

Sheet Pile

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

MARSH, EL. -2.8/-3.5 TO -7

Model: Spatial Mohr-Coulomb
Weight Fn: Marsh
Cohesion Spatial Fn: Marsh

Phi: 0 °
Phi-B: 0 °

MARSH, EL. -2.8 TO -7 (Protected)

Model: Spatial Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion Fn: Marsh
Phi: 0 °
Phi-B: 0 °

Slip Surface Limits

Left Coordinate: (120, -4) ft
Right Coordinate: (310, -3.8) ft

Slip Surface Block

Left Grid
- Upper Left: (165, -3.1) ft
- Lower Left: (165, -21) ft
- Lower Right: (198, -21) ft
- X Increments: 6
- Y Increments: 4
- Starting Angle: 135 °
- Ending Angle: 180 °
- Angle Increments: 2

Right Grid
- Upper Left: (204, -3.1) ft
- Lower Left: (204, -21) ft
- Lower Right: (239, -21) ft
- X Increments: 7
- Y Increments: 4
- Starting Angle: 45 °
- Ending Angle: 65 °
- Angle Increments: 2

Tension Crack Line

	X (ft)	Y (ft)
	200	-3.5
	235	-2.5

Cohesion Functions

Marsh

Model: Spline Data Point Function

Function: Cohesion vs. Y
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 150
Data Points: Y (ft), Cohesion (psf)
Data Point: (-7, 180)
Data Point: (-2.8, 150)

Shear/Normal Strength Functions

Sand

Model: Spline Data Point Function
Function: Shear Stress vs. Normal Stress
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
Data Point: (-10000, 0)
Data Point: (0, 0)
Data Point: (10000, 6494)
Estimation Properties
Intact Rock Param.: 10
Geological Strength: 100
Disturbance Factor: 0
SigmaC: 600000 psf
Sigma3: 300000 psf
Num. Points: 20

Unit Weight Functions

Marsh

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 100
Data Points: X (ft), Unit Weight (pcf)
Data Point: (192.5, 100)
Data Point: (208.3, 94)
Data Point: (241.1, 100)

Spatial Functions

Marsh

Model: Linear Interpolation

Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (192.53, -3.5, 150)
Data Point: (192.53, -7, 180)
Data Point: (200, -3.5, 160)
Data Point: (200, -7, 190)
Data Point: (241.1, -2.8, 150)
Data Point: (241.1, -7, 180)

Bay Sound

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (120, -50, 600)
Data Point: (120, -70, 770)
Data Point: (192.53, -50, 600)
Data Point: (192.53, -70, 770)
Data Point: (200, -50, 750)
Data Point: (200, -70, 925)
Data Point: (241.1, -50, 600)
Data Point: (241.1, -70, 770)
Data Point: (310, -50, 600)
Data Point: (310, -70, 770)

Regions

	Material	Points	Area (ft²)
Region 1	EMBANKMENT FILL, EL. +3.6 TO 0	20,4,5,25	71.595
Region 2	MARSH, EL. -2.8/-3.5 TO -7	6,7,28,17,26	171.31
Region 3	BEACH SAND, EL. -7 TO -50	17,22,18,19,35,32,15,30	1720
Region 4	BEACH SAND, EL. -7 TO -50	19,35,33,14,27,11,10,28,17,22,18	6450
Region 5	BAY SOUND CLAY, EL. -50 TO -70	14,33,34,13,29,12,11,27	3800
Region 6	Sheet Pile	16,21,20,25,24,3	13.075
Region 7	FILL2, EL.0 TO -2.5/-3.5	26,3,24,25,5,6	90.54
Region 8	MARSH, EL. -2.8 TO -7 (Protected)	1,38,30,15,32,31,36,37	199.2515
Region 9	MARSH, EL. -2.8 TO -7 (Protected)	28,7,8,9,10	239.59
Region 10	MARSH, EL. -2.8/-3.5 TO -7	30,38,26,17	26.145
Region 11	FILL2, EL.0 TO -2.5/-3.5	2,23,3,26,38	6.9625
Region 12		31,39,40,23,2,38,1,37,36	286.571

Points

	X (ft)	Y (ft)
Point 1	182	-5.4
Point 2	195.3	-3
Point 3	200	-1.6
Point 4	208.3	3.3
Point 5	235.1	-0.6

Point 6	235.5	-2.3
Point 7	241.1	-2.5
Point 8	270.5	-3.8
Point 9	310	-3.8
Point 10	310	-7
Point 11	310	-50
Point 12	310	-70
Point 13	182	-70
Point 14	182	-50
Point 15	182	-7
Point 16	200	14.1
Point 17	200	-7
Point 18	200	-28.5
Point 19	182	-28.5
Point 20	201	3.6
Point 21	200.5	14.1
Point 22	200	-23.5
Point 23	199.1	-1.6
Point 24	201	-1.6
Point 25	201	0
Point 26	200	-3.5
Point 27	200	-50
Point 28	241.1	-7
Point 29	200	-70
Point 30	192.53	-7
Point 31	120	-4
Point 32	120	-7
Point 33	120	-50
Point 34	120	-70
Point 35	120	-28.5
Point 36	140	-3.7
Point 37	160	-4.2
Point 38	192.53	-3.5
Point 39	120	0
Point 40	199	-1

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.31	(198.875, -3.066)	7.053404	(208.449, 3.27833)	(191.188, -3.74221)
2	961	2.45	(198.875, -3.066)	7.842	(208.313, 3.29818)	(189.488, -4.04899)

Slices of Slip Surface: Optimized

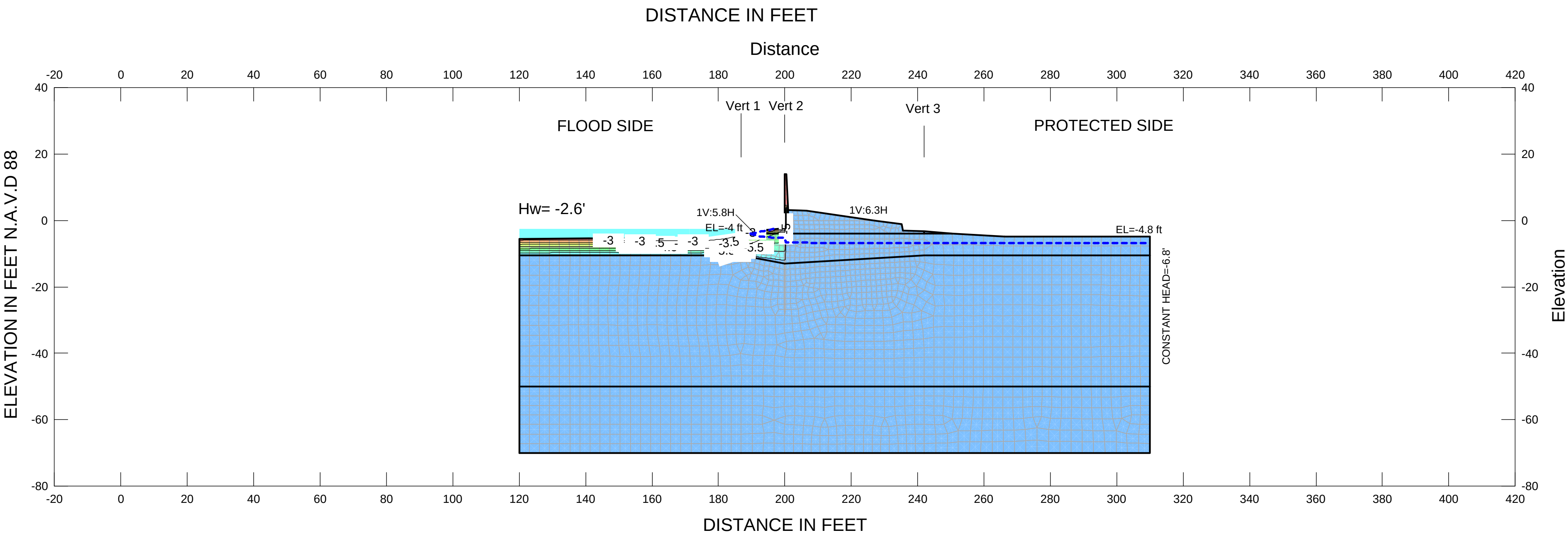
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	191.5232	-3.923551	174.04597	317.23607	0	158.03
2	Optimized	192.1944	-4.2862315	180.48192	364.04418	0	160.62
3	Optimized	192.7837	-4.604651	185.40136	402.81272	0	159.81

4	Optimized	193.31725	-4.8694575	190.09457	418.00977	0	162.79
5	Optimized	193.87695	-5.1249125	197.48967	450.35315	0	165.73
6	Optimized	194.4367	-5.3803675	207.64776	482.58276	0	168.67
7	Optimized	194.99645	-5.6358225	218.32596	514.68235	0	171.61
8	Optimized	195.28815	-5.7675985	224.19344	502.73728	0	173.13
9	Optimized	195.5416	-5.8541785	228.3884	519.56843	0	174.21
10	Optimized	196.06135	-6.025449	239.27853	537.92292	0	176.37
11	Optimized	196.6177	-6.2029265	250.85376	562.83707	0	178.64
12	Optimized	197.1741	-6.3804035	263.6961	587.64847	0	180.91
13	Optimized	197.7305	-6.557881	279.12404	612.39139	0	183.17
14	Optimized	198.2565	-6.705984	292.58044	611.90358	0	185.15
15	Optimized	198.75215	-6.8247125	309.19898	629.18922	0	186.83
16	Optimized	199.05	-6.896054	322.97309	639.56666	0	187.84
17	Optimized	199.29195	-6.9540155	334.26857	643.20801	0	188.66
18	Optimized	199.5268	-7.010275	345.24279	652.59004	199.59364	4.9496e-006
19	Optimized	199.78485	-7.012863	358.03492	570.1616	137.75668	3.4234e-006
20	Optimized	200.07245	-7.002588	327.33644	548.19817	143.42929	3.5642e-006
21	Optimized	200.32245	-6.9936555	178.77892	537.74379	0	189.87
22	Optimized	200.75	-6.9783785	177.81052	535.19844	0	189.63
23	Optimized	201.00805	-6.969158	177.22558	1075.6161	0	189.49
24	Optimized	201.12915	-6.916115	173.91984	932.58808	0	189.01
25	Optimized	201.49665	-6.73874	162.85137	908.64155	0	187.41
26	Optimized	202.00555	-6.4895	147.24087	884.60641	0	185.18
27	Optimized	202.5211	-6.2333985	131.18487	856.21169	0	182.9
28	Optimized	203.04325	-5.970436	114.68327	831.18646	0	180.56
29	Optimized	203.56535	-5.707474	98.137203	806.24676	0	178.24
30	Optimized	204.08745	-5.4445115	81.577448	781.39259	0	175.93
31	Optimized	204.6387	-5.1639715	63.900746	752.46948	0	173.48
32	Optimized	205.2191	-4.865855	45.096672	724.62124	0	170.89
33	Optimized	205.7995	-4.5677385	26.297196	696.88029	0	168.31
34	Optimized	206.34775	-4.2885665	8.6791094	673.17159	0	165.91
35	Optimized	206.8639	-4.028339	-7.7714099	649.03892	0	163.68
36	Optimized	207.3801	-3.768111	-24.220891	624.99276	0	161.46
37	Optimized	207.89625	-3.5078835	-40.693381	601.03309	0	159.25
38	Optimized	208.22715	-3.3483055	-50.805915	607.69669	0	157.9
39	Optimized	208.37445	-3.288722	-54.59162	-981.51472	0	157.4

Slices of Slip Surface: 961

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	961	189.79175	-4.175014	191.14978	276.82557	0	159.82
2	961	190.40025	-4.4270665	193.82193	309.16465	0	161.62
3	961	191.00875	-4.6791195	197.60241	341.51892	0	163.42
4	961	191.61725	-4.9311725	201.54991	373.87318	0	165.22
5	961	192.22575	-5.1832255	205.9377	406.21226	0	167.02
6	961	192.87625	-5.4526735	212.6724	439.59322	0	167.2
7	961	193.56875	-5.7395165	222.02459	475.28099	0	170.59
8	961	194.26125	-6.026359	233.27124	510.78197	0	173.97

9	961	194.95375	-6.3132015	246.66583	546.13621	0	177.36
10	961	195.62795	-6.5924675	261.28387	587.43094	0	180.65
11	961	196.28385	-6.864156	277.9328	623.89799	0	183.86
12	961	196.95885	-7.14375	297.62788	682.53421	249.96109	6.2114e-006
13	961	197.65295	-7.43125	322.93158	731.77059	265.50316	6.5977e-006
14	961	198.25	-7.575	338.18	639.88	195.92627	4.8687e-006
15	961	198.75	-7.575	347.16	643.86	192.67923	4.7882e-006
16	961	199.05	-7.575	354.49	646.14	189.39972	-6.3453e-006
17	961	199.55	-7.575	366.77778	642.16667	178.83964	4.4441e-006
18	961	200.25	-7.575	243.24	615.5	241.74847	6.0077e-006
19	961	200.75	-7.575	215.06	610.96	257.10047	6.389e-006
20	961	201.3	-7.575	215.05	1186.4167	630.81289	-0.00013156
21	961	201.9	-7.575	215	1182.9333	628.58326	-0.0001311
22	961	202.5	-7.575	214.91667	1179.4333	626.36445	-0.00013063
23	961	203.1	-7.575	214.85	1175.9167	624.12399	1.551e-005
24	961	203.7	-7.575	214.73333	1172.4	621.91601	-0.00012971
25	961	204.2875	-7.2875	196.66177	790.4224	385.59267	-3.5423e-005
26	961	204.8854	-6.6895835	159.15882	787.26328	0	186.21
27	961	205.50625	-6.06875	120.18348	737.10331	0	180.89
28	961	206.1271	-5.4479165	81.170545	687.17113	0	175.59
29	961	206.7479	-4.8270835	42.162168	637.46674	0	170.33
30	961	207.36875	-4.20625	3.1368207	587.97876	0	165.09
31	961	207.9896	-3.5854165	-35.894449	538.72996	0	159.88
32	961	208.30625	-3.26875	-55.80826	-18150.016	0	157.24



Name: EMBANKMENT FILL, EL. +3.2 TO 0 Model: Saturated Only K-Sat: 3.28e-008 ft/sec Ky'/Kx' Ratio: 1
Name: BEACH SAND, EL. -10.5/-13 TO -50 Model: Saturated Only K-Sat: 0.00049 ft/sec Ky'/Kx' Ratio: 1
Name: BAY SOUND CLAY, EL. -50 TO -70 Model: Saturated Only K-Sat: 3.28e-008 ft/sec Ky'/Kx' Ratio: 1
Name: Sheet Pile Model: Saturated Only K-Sat: 1e-010 ft/sec Ky'/Kx' Ratio: 1
Name: MARSH, EL. -4 TO -10.5/-13 Model: Saturated Only K-Sat: 3.28e-007 ft/sec Ky'/Kx' Ratio: 1
Name: EMBANKMENT FILL, EL. +3.2 TO -4.0 Model: Saturated Only K-Sat: 3.28e-008 ft/sec Ky'/Kx' 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 VERTICALSWERE ASSUMED TO VARY LINEARLY BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

Hw IS CANAL WATER LEVEL

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 2,
PROTECTED SIDE STABILITY ANALYSIS,
CASE: 4 - Extreme Low Water Level
STA. 14+20 TO 21+75 WEST
ORLEANS PARISH, LOUISIANA

Name: 4 - Extreme Low Water Level
File Name: Reach 2.gsz Directory: C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix E LWL\
Last Edited By: Jamerson, James MVK

4 - Extreme Low Water Level

File Information

Created By: Moraille, Jacques
Revision Number: 488
Last Edited By: Jamerson, James MVK
Date: 10/3/2013
Time: 9:59:57 AM
File Name: Reach 2.gsz
Directory: C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix E LWL\
Last Solved Date: 10/3/2013
Last Solved Time: 10:00:32 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

4 - Extreme Low Water Level

Kind: SEEP/W
Method: Steady-State
Settings
- Include Air Flow: No

Control
- Apply Runoff: No

Convergence
- Convergence Type: Head Vector Norm
- Maximum Number of Iterations: 500
- Tolerance: 0.001
- Maximum Change in K: 0.1
- Rate of Change in K: 1.02
- Minimum Change in K: 1e-005
- Equation Solver: Parallel Direct
- Potential Seepage Max # of Reviews: 10

Time

Starting Time: 0 sec
Duration: 0 sec
Ending Time: 0 sec

Materials

EMBANKMENT FILL, EL. +3.2 TO 0
Model: Saturated Only
Hydraulic
K-Sat: 3.28e-008 ft/sec
Volumetric Water Content: 0 ft^3/ft^3
Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

BEACH SAND, EL. -10.5/-13 TO -50
Model: Saturated Only
Hydraulic
K-Sat: 0.00049 ft/sec
Volumetric Water Content: 0 ft^3/ft^3
Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

BAY SOUND CLAY, EL. -50 TO -70
Model: Saturated Only
Hydraulic
K-Sat: 3.28e-008 ft/sec
Volumetric Water Content: 0 ft^3/ft^3
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 ft^3/ft^3
Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

MARSH, EL. -4 TO -10.5/-13
Model: Saturated Only
Hydraulic
K-Sat: 3.28e-007 ft/sec
Volumetric Water Content: 0 ft^3/ft^3

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

EMBANKMENT FILL, EL. +3.2 TO -4.0

Model: Saturated Only
Hydraulic
K-Sat: 3.28e-008 ft/sec
Volumetric Water Content: 0 ft^3/ft^3
Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

Boundary Conditions

Drainage

Review: true
Type: Total Flux (Q) 0

Curb

Type: Head (H) -6.8

Extreme Low Water -2.6ft

Type: Head (H) -2.6

Regions

	Material	Points	Area (ft^2)
Region 1	BEACH SAND, EL. -10.5/-13 TO -50	18,14,35,43,33,11,10,32,22,21,17	6012.5
Region 2	Sheet Pile	16,20,19,29,28,3,45,4	13.525
Region 3	MARSH, EL. -4 TO -10.5/-13	22,30,40,32	325.5
Region 4	EMBANKMENT FILL, EL. +3.2 TO -4.0	29,28,3,30,40,7,6,5,39	139.76
Region 5	BAY SOUND CLAY, EL. -50 TO -70	13,14,35,36	1338
Region 6	BAY SOUND CLAY, EL. -50 TO -70	33,11,12,37	1360
Region 7	MARSH, EL. -4 TO -10.5/-13	8,9,10,32,40,41	400.61714
Region 8	EMBANKMENT FILL, EL. +3.2 TO -4.0	29,19,38,39	47.8
Region 9	MARSH, EL. -4 TO -10.5/-13	15,1,23,24,25,2,31,34	339.72
Region 10	EMBANKMENT FILL, EL. +3.2 TO 0	31,26,47,3,30	13.265015
Region 11	BEACH SAND, EL. -10.5/-13 TO -50	18,17,21,22,34,15	1423.625
Region 12	MARSH, EL. -4 TO -10.5/-13	31,30,22,34	101.525
Region 13	BAY SOUND CLAY, EL. -50 TO -70	36,35,43,33,37,42	1102
Region 14	EMBANKMENT FILL, EL. +3.2 TO 0	40,7,41	3.337144

Lines

	Start Point	End Point	Hydraulic Boundary	Left Side Material	Right Side Material
Line 1	17	18			

Line 2	18	14				
Line 3	11	10	Curb			
Line 4	16	20				
Line 5	20	19	Drainage			
Line 6	21	17		Sheet Pile		
Line 7	16	4	Extreme Low Water -2.6ft			
Line 8	28	3		Sheet Pile		
Line 9	28	29				
Line 10	29	19				
Line 11	30	3			Sheet Pile	
Line 12	22	32				
Line 13	32	10				
Line 14	33	11				
Line 15	22	34				
Line 16	34	15				
Line 17	14	35				
Line 18	6	5	Drainage			
Line 19	29	39				
Line 20	5	39	Drainage			
Line 21	13	14				
Line 22	36	13				
Line 23	11	12	Curb			
Line 24	12	37				
Line 25	8	9	Drainage			
Line 26	19	38	Drainage			
Line 27	38	39	Drainage			
Line 28	21	22			Sheet Pile	
Line 29	15	1				
Line 30	23	24	Extreme Low Water -2.6ft			
Line 31	24	25	Extreme Low Water -2.6ft			
Line 32	25	2	Extreme Low Water -2.6ft			
Line 33	2	31	Extreme Low Water -2.6ft			
Line 34	31	26	Extreme Low Water -2.6ft			
Line 35	15	18				
Line 36	31	34				
Line 37	30	22		Sheet Pile		
Line 38	31	30				
Line 39	35	36				
Line 40	37	33				
Line 41	10	9	Curb			
Line 42	32	40				
Line 43	8	41	Drainage			
Line 44	30	40				
Line 45	40	41				
Line 46	40	7				
Line 47	7	41	Drainage			
Line 48	7	6	Drainage			
Line 49	23	1	Extreme Low Water -2.6ft			

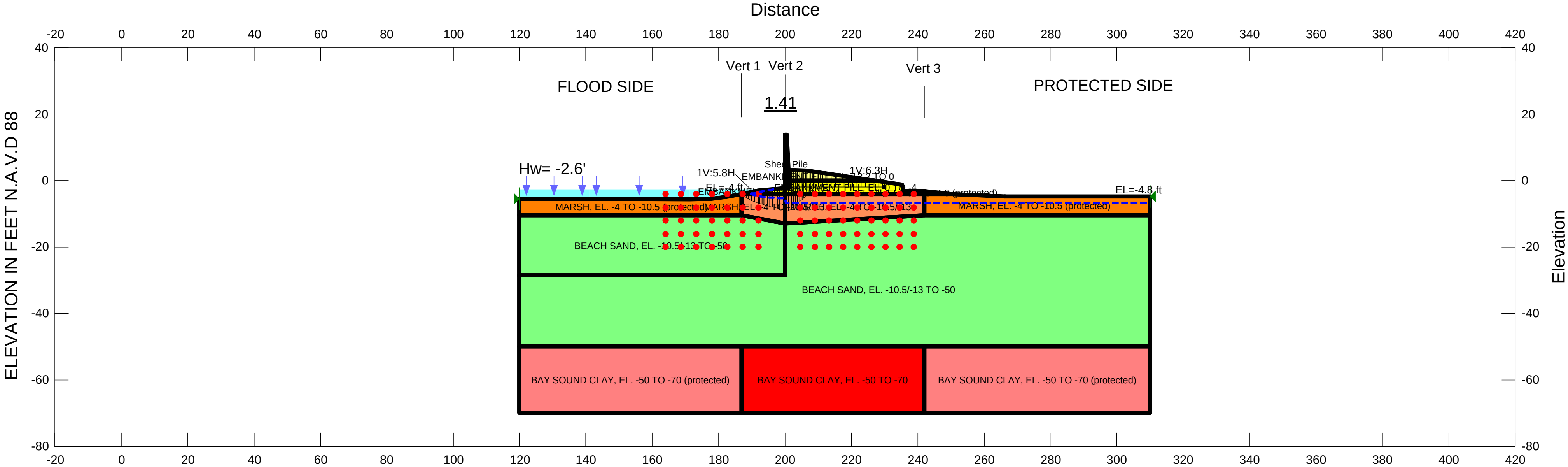
Line 50	37	42			
Line 51	42	36			
Line 52	33	43			
Line 53	43	35			
Line 54	3	45	Extreme Low Water -2.6ft		
Line 55	45	4	Extreme Low Water -2.6ft		
Line 56	26	47	Extreme Low Water -2.6ft		
Line 57	47	3	Extreme Low Water -2.6ft		

Points

	X (ft)	Y (ft)
Point 1	120	-5.5
Point 2	182.2	-4.9
Point 3	200	-2.3
Point 4	200	3.5
Point 5	235.2	-1.2
Point 6	235.6	-3.1
Point 7	242	-3.2
Point 8	266.2	-4.8
Point 9	310	-4.8
Point 10	310	-10.5
Point 11	310	-50
Point 12	310	-70
Point 13	120	-70
Point 14	120	-50
Point 15	120	-10.5
Point 16	200	13.9
Point 17	200	-28.5
Point 18	120	-28.5
Point 19	201	3.2
Point 20	200.5	13.9
Point 21	200	-23.5
Point 22	200	-13
Point 23	141	-5.4
Point 24	171.3	-5.7
Point 25	177.6	-5.5
Point 26	192.1	-3
Point 27	198.9	-2.3
Point 28	201	-2.3
Point 29	201	0
Point 30	200	-4
Point 31	186.9	-4
Point 32	242	-10.5
Point 33	242	-50
Point 34	186.9	-10.5
Point 35	186.9	-50
Point 36	186.9	-70

Point 37	242	-70
Point 38	206.5	3
Point 39	227	0
Point 40	242	-4
Point 41	250.34286	-4
Point 42	200	-70
Point 43	200	-50
Point 44	120	0
Point 45	200	0
Point 46	199	0
Point 47	199.5	-2.3443

DISTANCE IN FEET



Name: EMBANKMENT FILL, EL. +3.2 TO 0 Model: Undrained (Phi=0) Unit Weight: 114 pcf Cohesion': 700 psf
Name: Fill, EL. -3.2 to -4.0 (protected) Model: Spatial Mohr-Coulomb Unit Weight: 104 pcf Cohesion Fn: Fill Phi': 0 °
Name: BEACH SAND, EL. -10.5/-13 TO -50 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand
Name: BAY SOUND CLAY, EL. -50 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 102 pcf Cohesion Spatial Fn: Bay Sound Phi': 0 °
Name: Sheet Pile Model: Undrained (Phi=0) Unit Weight: 0.1 pcf Cohesion': 0.01 psf
Name: MARSH, EL. -4 TO -10.5/-13 Model: Spatial Mohr-Coulomb Weight Fn: Marsh Cohesion Fn: Marsh Phi': 0 °
Name: EMBANKMENT FILL, EL. 0 TO -4 Model: Spatial Mohr-Coulomb Unit Weight: 104 pcf Cohesion': 400 psf Phi': 0 °
Name: MARSH, EL. -4 TO -10.5 (protected) Model: Undrained (Phi=0) Unit Weight: 83 pcf Cohesion': 150 psf
Name: BAY SOUND CLAY, EL. -50 TO -70 (protected) Model: Spatial Mohr-Coulomb Unit Weight: 102 pcf Cohesion Fn: Clay 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 VERTICALSWERE ASSUMED TO VARY LINEARLY BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

Hw IS CANAL WATER LEVEL

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 2,
PROTECTED SIDE STABILITY ANALYSIS,
CASE: LWL F/S Stability Analysis (Block)
STA. 14+20 TO 21+75 WEST
ORLEANS PARISH, LOUISIANA

Name: LWL F/S Stability Analysis (Block)
File Name: Reach 2.gsz Directory: C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix E LWL\
Last Edited By: Jamerson, James MVK

LWL F/S Stability Analysis (Entry/Exit)

File Information

Created By: Moraille, Jacques
Revision Number: 488
Last Edited By: Jamerson, James MVK
Date: 10/3/2013
Time: 9:59:57 AM
File Name: Reach 2.gsz
Directory: C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix E LWL\
Last Solved Date: 10/3/2013
Last Solved Time: 10:03:10 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

LWL F/S Stability Analysis (Entry/Exit)

Kind: SLOPE/W
Parent: 4 - Extreme Low Water Level
Method: Spencer
Settings
- PWP Conditions Source: Parent Analysis

Slip Surface
- Direction of movement: Right to Left
- Use Passive Mode: No
- Slip Surface Option: Entry and Exit
- Critical slip surfaces saved: 1
- Optimize Critical Slip Surface Location: Yes
- Tension Crack
  - Tension Crack Option: Tension Crack Line
  - Percentage Wet: 1
  - Tension Crack Fluid Unit Weight: 62.4 pcf

FOS Distribution
- FOS Calculation Option: Constant

Advanced

Number of Slices: 30

Optimization Tolerance: 0.01

Minimum Slip Surface Depth: 0.1 ft

Optimization Maximum Iterations: 4000

Optimization Convergence Tolerance: 1e-007

Starting Optimization Points: 8

Ending Optimization Points: 32

Complete Passes per Insertion: 1

Driving Side Maximum Convex Angle: 5 °

Resisting Side Maximum Convex Angle: 1 °

Materials

EMBANKMENT FILL, EL. +3.2 TO 0

Model: Undrained (Phi=0)

Unit Weight: 114 pcf

Cohesion: 700 psf

Fill, EL. -3.2 to -4.0 (protected)

Model: Spatial Mohr-Coulomb

Unit Weight: 104 pcf

Cohesion Fn: Fill

Phi: 0 °

Phi-B: 0 °

BEACH SAND, EL. -10.5/-13 TO -50

Model: Shear/Normal Fn.

Unit Weight: 122 pcf

Strength Function: Sand

Phi-B: 0 °

BAY SOUND CLAY, EL. -50 TO -70

Model: Spatial Mohr-Coulomb

Unit Weight: 102 pcf

Cohesion Spatial Fn: Bay Sound

Phi: 0 °

Phi-B: 0 °

Sheet Pile

Model: Undrained (Phi=0)

Unit Weight: 0.1 pcf

Cohesion: 0.01 psf

MARSH, EL. -4 TO -10.5/-13

Model: Spatial Mohr-Coulomb

Weight Fn: Marsh

Cohesion Fn: Marsh
Phi: 0 °
Phi-B: 0 °

EMBANKMENT FILL, EL. 0 TO -4

Model: Spatial Mohr-Coulomb
Unit Weight: 104 pcf
Cohesion: 400 psf
Phi: 0 °
Phi-B: 0 °

MARSH, EL. -4 TO -10.5 (protected)

Model: Undrained (Phi=0)
Unit Weight: 83 pcf
Cohesion: 150 psf

BAY SOUND CLAY, EL. -50 TO -70 (protected)

Model: Spatial Mohr-Coulomb
Unit Weight: 102 pcf
Cohesion Fn: Clay
Phi: 0 °
Phi-B: 0 °

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (164.09311, -5.62864) ft
Left-Zone Right Coordinate: (199, -2.3886) ft
Left-Zone Increment: 20
Right Projection: Range
Right-Zone Left Coordinate: (205.08549, 3.05144) ft
Right-Zone Right Coordinate: (255.6, -4.26523) ft
Right-Zone Increment: 20
Radius Increments: 4

Slip Surface Limits

Left Coordinate: (120, -5.5) ft
Right Coordinate: (310, -4.8) ft

Tension Crack Line

	X (ft)	Y (ft)
	200	-2
	230	-2

Cohesion Functions

Clay

Model: Spline Data Point Function
Function: Cohesion vs. X
  Curve Fit to Data: 100 %
  Segment Curvature: 0 %
Y-Intercept: 555
Data Points: X (ft), Cohesion (psf)
  Data Point: (186.9, 555)
  Data Point: (200, 725)
  Data Point: (242, 555)

Marsh

Model: Spline Data Point Function
Function: Cohesion vs. X
  Curve Fit to Data: 100 %
  Segment Curvature: 0 %
Y-Intercept: 150
Data Points: X (ft), Cohesion (psf)
  Data Point: (186.9, 150)
  Data Point: (200, 200)
  Data Point: (242, 150)

Fill

Model: Spline Data Point Function
Function: Cohesion vs. X
  Curve Fit to Data: 100 %
  Segment Curvature: 0 %
Y-Intercept: 150
Data Points: X (ft), Cohesion (psf)
  Data Point: (186.9, 150)
  Data Point: (200, 400)
  Data Point: (242, 150)

Shear/Normal Strength Functions

Sand

Model: Spline Data Point Function
Function: Shear Stress vs. Normal Stress
  Curve Fit to Data: 100 %
  Segment Curvature: 0 %
Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
  Data Point: (-10000, 0)
  Data Point: (0, 0)
  Data Point: (10000, 6494)

Estimation Properties

Intact Rock Param.: 10

Geological Strength: 100

Disturbance Factor: 0

SigmaC: 600000 psf

Sigma3: 300000 psf

Num. Points: 20

Unit Weight Functions

Marsh

Model: Spline Data Point Function

Function: Unit Weight vs. X

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 83

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

Data Point: (186.9, 83)

Data Point: (200, 93)

Data Point: (242, 83)

Spatial Functions

Bay Sound

Model: Linear Interpolation

Limit Range By: Data Values

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

Data Point: (186.9, -50, 555)

Data Point: (186.9, -70, 725)

Data Point: (200, -50, 700)

Data Point: (200, -70, 865)

Data Point: (242, -50, 555)

Data Point: (242, -70, 725)

Regions

	Material	Points	Area (ft^2)
Region 1	BEACH SAND, EL. -10.5/-13 TO -50	18,14,35,43,33,11,10,32,22,21,17	6012.5
Region 2	Sheet Pile	16,20,19,29,28,3,45,4	13.525
Region 3	MARSH, EL. -4 TO -10.5/-13	22,30,40,32	325.5
Region 4	EMBANKMENT FILL, EL. 0 TO -4	29,28,3,30,40,7,6,5,39	139.76
Region 5	BAY SOUND CLAY, EL. -50 TO -70 (protected)	13,14,35,36	1338
Region 6	BAY SOUND CLAY, EL. -50 TO -70 (protected)	33,11,12,37	1360
Region 7	MARSH, EL. -4 TO -10.5 (protected)	8,9,10,32,40,41	400.61714
Region 8	EMBANKMENT FILL, EL. +3.2 TO 0	29,19,38,39	47.8
Region 9	MARSH, EL. -4 TO -10.5 (protected)	15,1,23,24,25,2,31,34	339.72

Region 10	EMBANKMENT FILL, EL. 0 TO -4	31,26,47,3,30	13.265015
Region 11	BEACH SAND, EL. -10.5/-13 TO -50	18,17,21,22,34,15	1423.625
Region 12	MARSH, EL. -4 TO -10.5/-13	31,30,22,34	101.525
Region 13	BAY SOUND CLAY, EL. -50 TO -70	36,35,43,33,37,42	1102
Region 14	Fill, EL. -3.2 to -4.0 (protected)	40,7,41	3.337144

Points

	X (ft)	Y (ft)
Point 1	120	-5.5
Point 2	182.2	-4.9
Point 3	200	-2.3
Point 4	200	3.5
Point 5	235.2	-1.2
Point 6	235.6	-3.1
Point 7	242	-3.2
Point 8	266.2	-4.8
Point 9	310	-4.8
Point 10	310	-10.5
Point 11	310	-50
Point 12	310	-70
Point 13	120	-70
Point 14	120	-50
Point 15	120	-10.5
Point 16	200	13.9
Point 17	200	-28.5
Point 18	120	-28.5
Point 19	201	3.2
Point 20	200.5	13.9
Point 21	200	-23.5
Point 22	200	-13
Point 23	141	-5.4
Point 24	171.3	-5.7
Point 25	177.6	-5.5
Point 26	192.1	-3
Point 27	198.9	-2.3
Point 28	201	-2.3
Point 29	201	0
Point 30	200	-4
Point 31	186.9	-4
Point 32	242	-10.5
Point 33	242	-50
Point 34	186.9	-10.5
Point 35	186.9	-50
Point 36	186.9	-70
Point 37	242	-70
Point 38	206.5	3
Point 39	227	0

Point 40	242	-4
Point 41	250.34286	-4
Point 42	200	-70
Point 43	200	-50
Point 44	120	0
Point 45	200	0
Point 46	199	0
Point 47	199.5	-2.3443

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.38	(195.241, 7.489)	13.00461	(210.042, 2.48164)	(181.78, -4.95478)
2	1069	1.54	(195.241, 7.489)	18.452	(211.066, 2.33185)	(181.634, -4.97383)

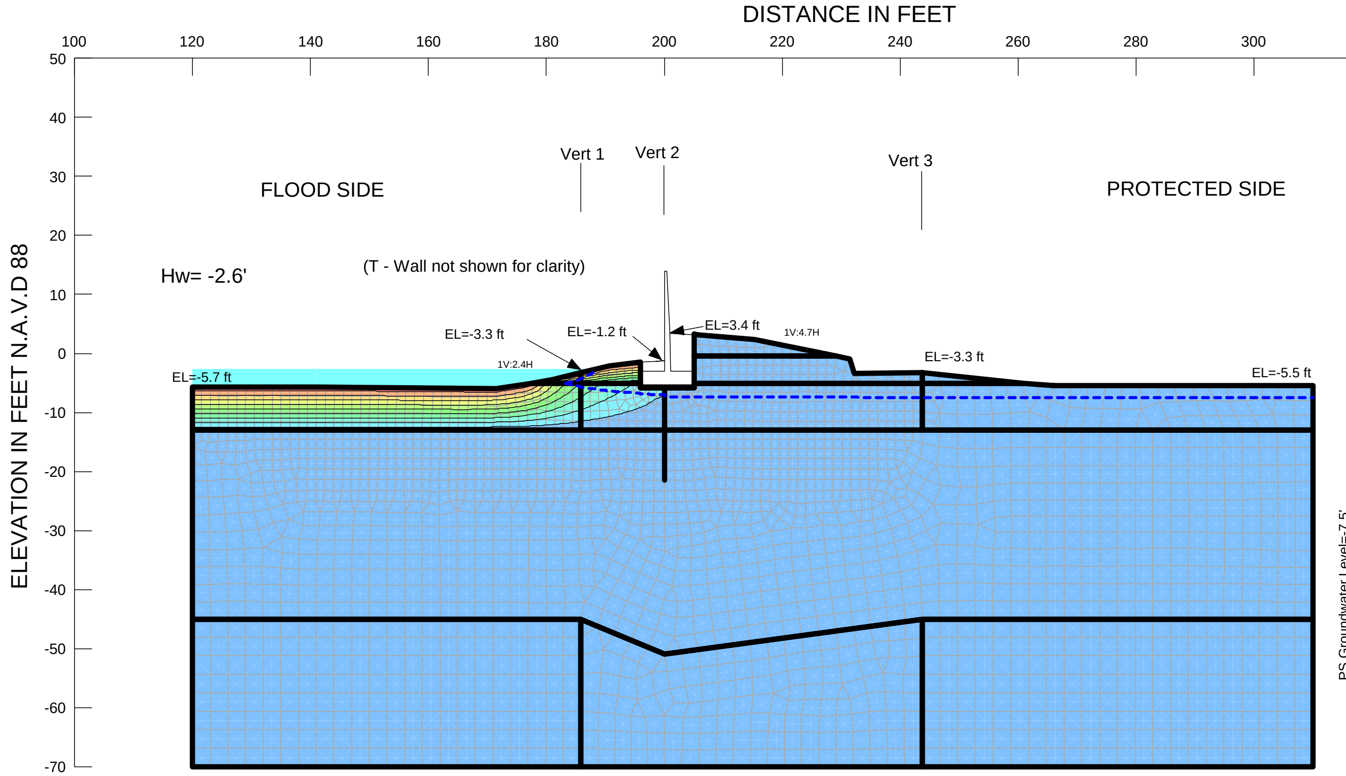
Slices of Slip Surface: Optimized

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	181.99005	-5.084721	147.85546	255.76038	0	150
2	Optimized	182.65525	-5.496398	150.17778	295.7232	0	150
3	Optimized	183.8096	-6.1764	154.05008	353.0164	0	150
4	Optimized	185.1875	-6.934985	160.72723	419.13086	0	150
5	Optimized	186.38315	-7.555046	166.63209	473.60095	0	150
6	Optimized	186.99485	-7.862456	170.41975	503.84478	0	150.36
7	Optimized	187.6952	-8.182375	176.315	531.88974	0	153.04
8	Optimized	188.8664	-8.672295	187.32357	578.7579	0	157.51
9	Optimized	190.0565	-9.085835	199.94331	617.75377	0	162.05
10	Optimized	191.2578	-9.436055	213.07647	655.84985	0	166.63
11	Optimized	191.96735	-9.6237875	220.83356	678.87782	0	169.34
12	Optimized	192.4389	-9.7424625	226.08719	694.12859	0	171.14
13	Optimized	193.19605	-9.90747	233.53723	703.42991	0	174.03
14	Optimized	194.19995	-10.08418	242.22281	723.34142	0	177.86
15	Optimized	195.2522	-10.245685	250.50469	741.84376	0	181.88
16	Optimized	196.396	-10.38796	258.40974	760.28754	0	186.24
17	Optimized	197.7741	-10.524155	266.11234	785.07121	0	191.5
18	Optimized	198.9875	-10.60525	270.91063	801.66975	0	196.14
19	Optimized	199.6561	-10.63481	272.59934	814.26151	0	198.69
20	Optimized	199.9061	-10.642745	272.97252	811.02345	0	199.64
21	Optimized	200.25	-10.64654	250.7847	813.95035	0	199.7
22	Optimized	200.75	-10.65206	246.64495	813.0904	0	199.11
23	Optimized	201.00255	-10.65485	246.80942	1416.5212	0	198.81
24	Optimized	201.05225	-10.61571	244.35954	1185.3839	0	198.75
25	Optimized	201.55935	-10.188155	217.71812	1143.2838	0	198.14
26	Optimized	202.50055	-9.377515	167.17014	1062.4539	0	197.02
27	Optimized	203.5452	-8.44273	108.87268	971.87822	0	195.78
28	Optimized	204.50365	-7.559655	53.774211	887.86992	0	194.64
29	Optimized	205.26705	-6.837005	8.6729703	820.93719	0	193.73
30	Optimized	206.0677	-6.0537655	-40.228591	744.63145	0	192.78

31	Optimized	206.60225	-5.5206655	-73.515382	697.54774	0	192.14
32	Optimized	207.13225	-4.976755	-107.48737	638.15241	0	191.51
33	Optimized	207.8147	-4.267405	-151.78885	567.01144	0	190.7
34	Optimized	208.2627	-3.79707	-181.12167	390.84244	0	400
35	Optimized	208.966	-3.05415	-227.39374	308.19324	0	400
36	Optimized	209.75905	-2.25708	-277.08177	157.42272	0	400

Slices of Slip Surface: 1069

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	1069	181.917	-5.2693895	151.33924	320.17548	0	150
2	1069	182.67	-6.0028545	158.946	374.97587	0	150
3	1069	183.61	-6.8227125	167.11537	435.39821	0	150
4	1069	184.55	-7.5390125	176.82284	487.81883	0	150
5	1069	185.49	-8.1660965	186.74052	533.25796	0	150
6	1069	186.43	-8.714396	196.04141	572.47906	0	150
7	1069	187.42	-9.2134425	206.93823	612.70749	0	151.98
8	1069	188.46	-9.662502	220.44595	653.98757	0	155.95
9	1069	189.5	-10.038394	235.37915	689.47021	0	159.92
10	1069	190.54	-10.345765	248.94051	719.38359	0	163.89
11	1069	191.58	-10.588125	261.11336	743.86256	0	167.86
12	1069	192.5625	-10.7613	270.67927	760.00056	0	171.61
13	1069	193.4875	-10.87333	277.55931	768.92464	0	175.14
14	1069	194.4125	-10.93828	282.16917	773.61894	0	178.67
15	1069	195.3375	-10.956645	284.55826	774.03262	0	182.2
16	1069	196.2625	-10.92856	284.61102	770.06998	0	185.73
17	1069	197.1875	-10.853815	282.09148	764.77537	0	189.27
18	1069	198.1125	-10.73184	276.78884	756.70283	0	192.8
19	1069	199.0375	-10.56167	268.73598	743.7053	0	196.33
20	1069	199.75	-10.401375	260.82292	730.61059	0	199.05
21	1069	200.25	-10.26784	227.94377	717.18939	0	199.7
22	1069	200.75	-10.1191	213.43699	696.63832	0	199.11
23	1069	201.45835	-9.8767805	198.32636	1245.6251	0	198.26
24	1069	202.375	-9.520446	176.08122	1194.4309	0	197.17
25	1069	203.29165	-9.105856	150.20931	1137.8571	0	196.08
26	1069	204.20835	-8.6284935	120.40084	1075.6952	0	194.99
27	1069	205.125	-8.082557	86.315165	1007.1453	0	193.9
28	1069	206.04165	-7.4604905	47.470154	931.48781	0	192.81
29	1069	207.0299	-6.688752	-0.72251087	834.31101	0	191.63
30	1069	208.08965	-5.733241	-60.395559	712.38702	0	190.37
31	1069	209.1494	-4.6091655	-130.59591	574.32349	0	189.11
32	1069	210.3725	-3	-230.93202	174.05169	0	400



Name: 1-EL. +3.4 TO -0.5, EMBANKMENT FILL Model: Saturated Only K-Sat: 3.28e-008 ft/sec K-Ratio: 1
Name: 6-EL. -13 TO -45/-51, BEACH SAND Model: Saturated Only K-Sat: 0.00049 ft/sec K-Ratio: 1
Name: 7-EL. -45/-51 TO -70, BAY SOUND CLAY Model: Saturated Only K-Sat: 3.28e-008 ft/sec K-Ratio: 1
Name: Sheet Pile Model: Saturated Only K-Sat: 1e-010 ft/sec K-Ratio: 1
Name: 4-EL. -5 TO -13, MARSH Model: Saturated Only K-Sat: 3.28e-007 ft/sec K-Ratio: 1
Name: 1A-EL. +3.4 TO -5.0, EMBANKMENT FILL Model: Saturated Only K-Sat: 3.28e-008 ft/sec K-Ratio: 1

GENERAL NOTES

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

Hw IS CANAL WATER LEVEL

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 3,
PROTECTED SIDE STABILITY ANALYSIS,
CASE: LWL Q Case (seepage)
STA. 21+75 TO 24+87 WEST
ORLEANS PARISH, LOUISIANA

Name: LWL Q Case (seepage)
File Name: Reach 3.gsz Directory: C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix E LWL\
Last Edited By: Jamerson, James MVK

LWL Q Case (seepage)

File Information

Created By: Moraille, Jacques
Revision Number: 485
Last Edited By: Jamerson, James MVK
Date: 6/17/2013
Time: 11:40:46 AM
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Directory: C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix E LWL\
Last Solved Date: 6/17/2013
Last Solved Time: 11:41:02 AM

Project Settings

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

Analysis Settings

LWL Q Case (seepage)

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

Starting Time: 0 sec
Duration: 0 sec
Ending Time: 0 sec

Materials

1-EL. +3.4 TO -0.5, EMBANKMENT FILL

Model: Saturated Only
Hydraulic
K-Sat: 3.28e-008 ft/sec
Volumetric Water Content: 0 ft^3/ft^3
Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

6-EL. -13 TO -45/-51, BEACH SAND

Model: Saturated Only
Hydraulic
K-Sat: 0.00049 ft/sec
Volumetric Water Content: 0 ft^3/ft^3
Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

7-EL. -45/-51 TO -70, BAY SOUND CLAY

Model: Saturated Only
Hydraulic
K-Sat: 3.28e-008 ft/sec
Volumetric Water Content: 0 ft^3/ft^3
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 ft^3/ft^3
Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

4-EL. -5 TO -13, MARSH

Model: Saturated Only
Hydraulic
K-Sat: 3.28e-007 ft/sec
Volumetric Water Content: 0 ft^3/ft^3

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

1A-EL. +3.4 TO -5.0, EMBANKMENT FILL

Model: Saturated Only
Hydraulic
K-Sat: 3.28e-008 ft/sec
Volumetric Water Content: 0 ft^3/ft^3
Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

Boundary Conditions

Seepage Face

Review: true
Type: Total Flux (Q) 0

PS Groundwater -7.5'

Type: Head (H) -7.5

Extreme Low Water Level -2.6'

Type: Head (H) -2.6

Regions

	Material	Points	Area (ft^2)
Region 1	6-EL. -13 TO -45/-51, BEACH SAND	18,14,28,35,26,11,10,25,21,27,15	6253.4
Region 2	4-EL. -5 TO -13, MARSH	21,27,39,47,59,41,3,24,42,58,46,37,25	455.2
Region 3	7-EL. -45/-51 TO -70, BAY SOUND CLAY	13,14,28,29	1647.5
Region 4	7-EL. -45/-51 TO -70, BAY SOUND CLAY	26,11,12,30	1657.5
Region 5	4-EL. -5 TO -13, MARSH	8,9,10,25,37,38	507.07496
Region 6	1A-EL. +3.4 TO -5.0, EMBANKMENT FILL	44,31,34,32,45	54.290427
Region 7	4-EL. -5 TO -13, MARSH	15,1,22,23,40,39,27	483.575
Region 8	1-EL. +3.4 TO -0.5, EMBANKMENT FILL	36,33,43,48,47,39	28.01007
Region 9	7-EL. -45/-51 TO -70, BAY SOUND CLAY	29,28,35,26,30,52	1271.6
Region 10	1A-EL. +3.4 TO -5.0, EMBANKMENT FILL	45,32,5,6,7,37,46,49	139.44
Region 11	1A-EL. +3.4 TO -5.0, EMBANKMENT FILL	40,2,36,39	6.6
Region 12	1A-EL. +3.4 TO -5.0, EMBANKMENT FILL	7,37,38	14.705
Region 13		41,3,24,42,58,59	0.9

Lines

	Start Point	End Point	Hydraulic Boundary	Left Side Material
Line 1	18	14		
Line 2	11	10	PS Groundwater -7.5'	

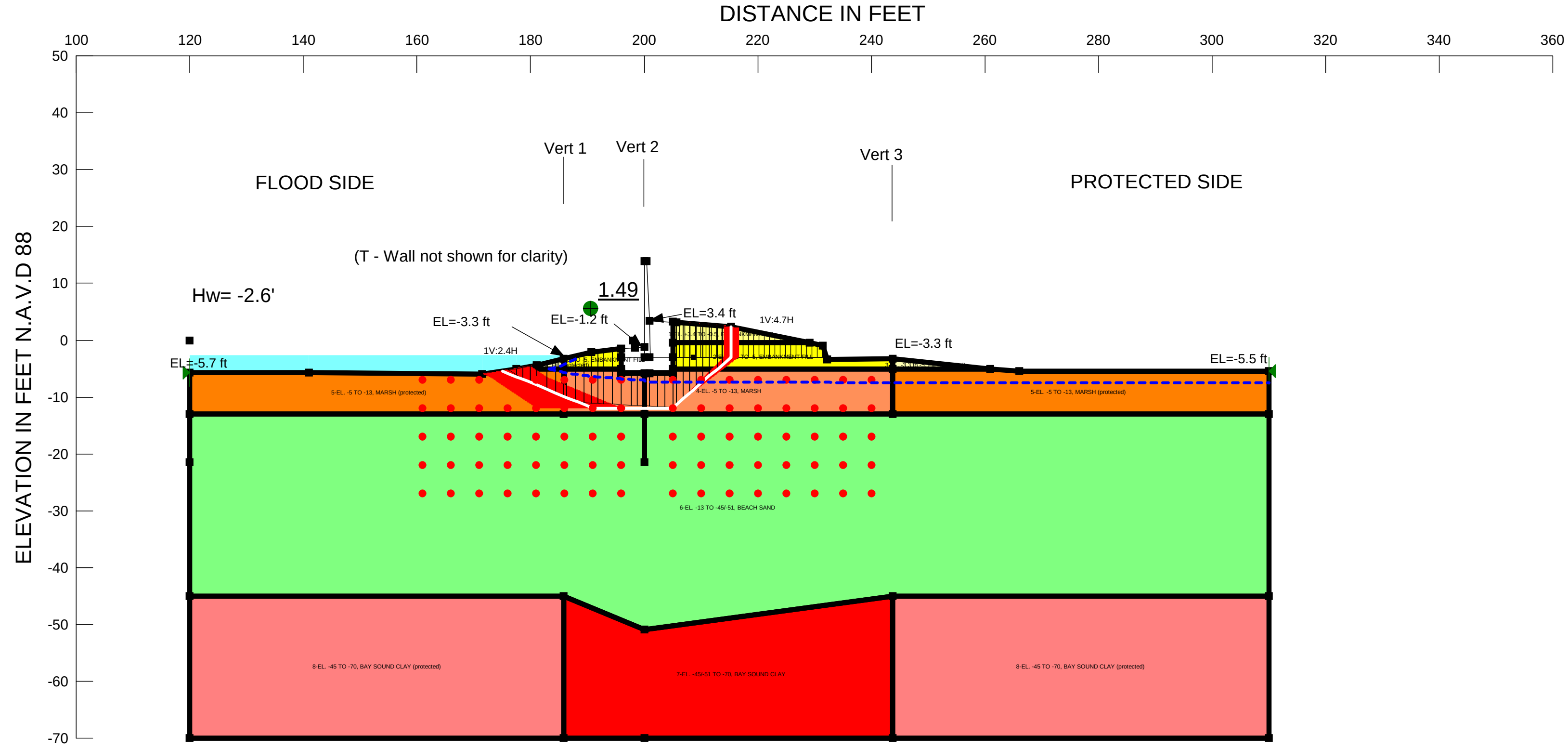
Line 3	24	3		Sheet Pile
Line 4	21	25		
Line 5	25	10		
Line 6	26	11		
Line 7	21	27		
Line 8	27	15		
Line 9	14	28		
Line 10	13	14		
Line 11	29	13		
Line 12	11	12	PS Groundwater -7.5'	
Line 13	12	30		
Line 14	8	9	Seepage Face	
Line 15	15	1		
Line 16	22	23	Extreme Low Water Level -2.6'	
Line 17	28	29		
Line 18	30	26		
Line 19	10	9	PS Groundwater -7.5'	
Line 20	31	34	Seepage Face	
Line 21	34	32	Seepage Face	
Line 22	26	35		
Line 23	35	28		
Line 24	25	37		
Line 25	8	38	Seepage Face	
Line 26	37	38		
Line 27	32	5		
Line 28	5	6	Seepage Face	
Line 29	6	7	Seepage Face	
Line 30	33	36	Extreme Low Water Level -2.6'	
Line 31	27	39		
Line 32	23	40	Extreme Low Water Level -2.6'	
Line 33	39	40		
Line 34	33	43	Extreme Low Water Level -2.6'	
Line 35	44	31	Seepage Face	
Line 36	45	32		
Line 37	46	37		
Line 38	47	39		
Line 39	45	44		
Line 40	24	42		
Line 41	43	48		
Line 42	48	47		
Line 43	46	49		
Line 44	49	45		
Line 45	41	3		
Line 46	3	21		Sheet Pile
Line 47	15	18		
Line 48	21	17		Sheet Pile
Line 49	22	1	Extreme Low Water Level -2.6'	
Line 50	30	52		

Line 51	52	29		
Line 52	7	37		
Line 53	39	36		
Line 54	40	2	Extreme Low Water Level -2.6'	
Line 55	2	36	Extreme Low Water Level -2.6'	
Line 56	38	7	Seepage Face	
Line 57	42	58		
Line 58	58	46		
Line 59	47	59		
Line 60	59	41		
Line 61	58	59		

Points

	X (ft)	Y (ft)
Point 1	120	-5.7
Point 2	181.1	-4.4
Point 3	200	-5.8
Point 4	200	-1.2
Point 5	231.4	-1
Point 6	232.2	-3.4
Point 7	243.7	-3.3
Point 8	266	-5.5
Point 9	310	-5.5
Point 10	310	-13
Point 11	310	-45
Point 12	310	-70
Point 13	120	-70
Point 14	120	-45
Point 15	120	-13
Point 16	200	13.9
Point 17	200	-21.5
Point 18	120	-21.5
Point 19	201	3.4
Point 20	200.5	13.9
Point 21	200	-13
Point 22	141	-5.7
Point 23	171.5	-6
Point 24	201	-5.8
Point 25	243.7	-13
Point 26	243.7	-45
Point 27	185.9	-13
Point 28	185.9	-45
Point 29	185.9	-70
Point 30	243.7	-70
Point 31	205.7	3.2
Point 32	229.1	-0.5
Point 33	190.7	-2.1

Point 34	215.3	2.4
Point 35	200	-51
Point 36	185.9	-3.3
Point 37	243.7	-5
Point 38	261	-5.00673
Point 39	185.9	-5
Point 40	177.5	-5
Point 41	196	-5.8
Point 42	205	-5.8
Point 43	196	-1.4962
Point 44	205	3.22979
Point 45	205	-0.5
Point 46	205	-5
Point 47	196	-5
Point 48	196	-3
Point 49	205	-3
Point 50	200	-3
Point 51	201	-3
Point 52	200	-70
Point 53	120	-130
Point 54	310	-130
Point 55	120	0
Point 56	198	0
Point 57	198.4	-1.31848
Point 58	205	-5.7
Point 59	196	-5.7



Name: 1-EL. +3.4 TO -0.5, EMBANKMENT FILL Model: Undrained (Phi=0) Unit Weight: 115 pcf Cohesion: 700 psf
Name: 3-EL. -3.3 to -5, Fill (protected) Model: Undrained (Phi=0) Unit Weight: 106 pcf Cohesion: 150 psf
Name: 6-EL. -13 TO -45/-51, BEACH SAND Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand
Name: 7-EL. -45/-51 TO -70, BAY SOUND CLAY Model: Spatial Mohr-Coulomb Unit Weight: 102 pcf Cohesion Spatial Fn: Clay Phi: 0 °
Name: 4-EL. -5 TO -13, MARSH Model: Spatial Mohr-Coulomb Unit Weight: 88 pcf Cohesion Fn: MARSH Phi: 0 °
Name: 2-EL.- 0.5 TO -5, EMBANKMENT FILL Model: Spatial Mohr-Coulomb Unit Weight: 106 pcf Cohesion Fn: Marsh Phi: 0 °
Name: 5-EL. -5 TO -13, MARSH (protected) Model: Undrained (Phi=0) Unit Weight: 88 pcf Cohesion: 150 psf
Name: 8-EL. -45 TO -70, BAY SOUND CLAY (protected) Model: Spatial Mohr-Coulomb Unit Weight: 102 pcf Cohesion Spatial Fn: Clay Phi: 0 °
Name: T-wall Model: Mohr-Coulomb Unit Weight: 0.01 pcf Cohesion: 10000 psf Phi: 0 °

GENERAL NOTES

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

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

Hw IS CANAL WATER LEVEL

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 3,
PROTECTED SIDE STABILITY ANALYSIS,
CASE: LWL Q Case (Block)
STA. 21+75 TO 24+87 WEST
ORLEANS PARISH, LOUISIANA

Name: LWL Q Case (Block)
File Name: Reach 3.gsz Directory: C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix E LWL\
Last Edited By: Jamerson, James MVK

LWL Q Case (Block)

File Information

Created By: Moraille, Jacques
Revision Number: 486
Last Edited By: Jamerson, James MVK
Date: 6/17/2013
Time: 11:54:52 AM
File Name: Reach 3.gsz
Directory: C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix E LWL\
Last Solved Date: 6/17/2013
Last Solved Time: 11:56:28 AM

Project Settings

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

Analysis Settings

LWL Q Case (Block)

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

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

Materials

1-EL. +3.4 TO -0.5, EMBANKMENT FILL

Model: Undrained (Phi=0)
Unit Weight: 115 pcf
Cohesion: 700 psf

3-EL. -3.3 to -5, Fill (protected)

Model: Undrained (Phi=0)
Unit Weight: 106 pcf
Cohesion: 150 psf

6-EL. -13 TO -45/-51, BEACH SAND

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

7-EL. -45/-51 TO -70, BAY SOUND CLAY

Model: Spatial Mohr-Coulomb
Unit Weight: 102 pcf
Cohesion Spatial Fn: Clay
Phi: 0 °
Phi-B: 0 °

4-EL. -5 TO -13, MARSH

Model: Spatial Mohr-Coulomb
Unit Weight: 88 pcf
Cohesion Fn: MARSH
Phi: 0 °
Phi-B: 0 °

2-EL.- 0.5 TO -5, EMBANKMENT FILL

Model: Spatial Mohr-Coulomb
Unit Weight: 106 pcf
Cohesion Fn: Marsh
Phi: 0 °
Phi-B: 0 °

5-EL. -5 TO -13, MARSH (protected)

Model: Undrained (Phi=0)
Unit Weight: 88 pcf
Cohesion: 150 psf

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

Model: Spatial Mohr-Coulomb
Unit Weight: 102 pcf
Cohesion Spatial Fn: Clay
Phi: 0 °
Phi-B: 0 °

T-wall

Model: Mohr-Coulomb
Unit Weight: 0.01 pcf
Cohesion: 10000 psf
Phi: 0 °
Phi-B: 0 °

Slip Surface Limits

Left Coordinate: (120, -5.7) ft
Right Coordinate: (310, -5.5) ft

Slip Surface Block

Left Grid
- Upper Left: (161, -7) ft
- Lower Left: (161, -27) ft
- Lower Right: (196, -27) ft
- X Increments: 7
- Y Increments: 4
- Starting Angle: 135 °
- Ending Angle: 180 °
- Angle Increments: 4

Right Grid
- Upper Left: (205, -7) ft
- Lower Left: (205, -27) ft
- Lower Right: (240, -27) ft
- X Increments: 7
- Y Increments: 4
- Starting Angle: 30 °

Ending Angle: 45 °
Angle Increments: 4
FullySpecFixedPoints
[1]
flag: Yes
[2]
flag: Yes

Tension Crack Line

	X (ft)	Y (ft)
	205	-3
	208.6	-3
	231.93333	-3

Cohesion Functions

Marsh

Model: Spline Data Point Function
Function: Cohesion vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 150
Data Points: X (ft), Cohesion (psf)
Data Point: (186.9, 150)
Data Point: (208, 215)
Data Point: (250.4, 150)

MARSH

Model: Spline Data Point Function
Function: Cohesion vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 150
Data Points: X (ft), Cohesion (psf)
Data Point: (185.9, 150)
Data Point: (200, 215)
Data Point: (243.7, 150)

Shear/Normal Strength Functions

Sand

Model: Spline Data Point Function
Function: Shear Stress vs. Normal Stress
Curve Fit to Data: 100 %
Segment Curvature: 0 %

Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
Data Point: (-10000, 0)
Data Point: (0, 0)
Data Point: (10000, 6494)
Estimation Properties
Intact Rock Param.: 10
Geological Strength: 100
Disturbance Factor: 0
SigmaC: 600000 psf
Sigma3: 300000 psf
Num. Points: 20

Spatial Functions

Clay

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (120, -45, 480)
Data Point: (120, -70, 700)
Data Point: (185.9, -45, 480)
Data Point: (185.9, -70, 700)
Data Point: (200, -51, 750)
Data Point: (200, -70, 890)
Data Point: (243.7, -45, 480)
Data Point: (243.7, -70, 700)
Data Point: (310, -45, 480)
Data Point: (310, -70, 700)

Regions

	Material	Points	Area (ft^2)
Region 1	6-EL. -13 TO -45/-51, BEACH SAND	18,14,28,35,26,11,10,25,21,27,15	6253.4
Region 2	4-EL. -5 TO -13, MARSH	21,27,39,47,59,41,3,24,42,58,46,37,25	455.2
Region 3	8-EL. -45 TO -70, BAY SOUND CLAY (protected)	13,14,28,29	1647.5
Region 4	8-EL. -45 TO -70, BAY SOUND CLAY (protected)	26,11,12,30	1657.5
Region 5	5-EL. -5 TO -13, MARSH (protected)	8,9,10,25,37,38	507.07496
Region 6	1-EL. +3.4 TO -0.5, EMBANKMENT FILL	44,31,34,32,45	54.290427
Region 7	5-EL. -5 TO -13, MARSH (protected)	15,1,22,23,40,39,27	483.575
Region 8	2-EL.- 0.5 TO -5, EMBANKMENT FILL	36,33,43,48,47,39	28.01007
Region 9	7-EL. -45/-51 TO -70, BAY SOUND CLAY	29,28,35,26,30,52	1271.6
Region 10	2-EL.- 0.5 TO -5, EMBANKMENT FILL	45,32,5,6,7,37,46,49	139.44
Region 11	3-EL. -3.3 to -5, Fill (protected)	40,2,36,39	6.6
Region 12	3-EL. -3.3 to -5, Fill (protected)	7,37,38	14.705
Region 13	T-wall	41,3,24,42,58,59	0.9

Points

	X (ft)	Y (ft)
Point 1	120	-5.7
Point 2	181.1	-4.4
Point 3	200	-5.8
Point 4	200	-1.2
Point 5	231.4	-1
Point 6	232.2	-3.4
Point 7	243.7	-3.3
Point 8	266	-5.5
Point 9	310	-5.5
Point 10	310	-13
Point 11	310	-45
Point 12	310	-70
Point 13	120	-70
Point 14	120	-45
Point 15	120	-13
Point 16	200	13.9
Point 17	200	-21.5
Point 18	120	-21.5
Point 19	201	3.4
Point 20	200.5	13.9
Point 21	200	-13
Point 22	141	-5.7
Point 23	171.5	-6
Point 24	201	-5.8
Point 25	243.7	-13
Point 26	243.7	-45
Point 27	185.9	-13
Point 28	185.9	-45
Point 29	185.9	-70
Point 30	243.7	-70
Point 31	205.7	3.2
Point 32	229.1	-0.5
Point 33	190.7	-2.1
Point 34	215.3	2.4
Point 35	200	-51
Point 36	185.9	-3.3
Point 37	243.7	-5
Point 38	261	-5.00673
Point 39	185.9	-5
Point 40	177.5	-5
Point 41	196	-5.8
Point 42	205	-5.8
Point 43	196	-1.4962
Point 44	205	3.22979
Point 45	205	-0.5

Point 46	205	-5
Point 47	196	-5
Point 48	196	-3
Point 49	205	-3
Point 50	200	-3
Point 51	201	-3
Point 52	200	-70
Point 53	120	-130
Point 54	310	-130
Point 55	120	0
Point 56	198	0
Point 57	198.4	-1.31848
Point 58	205	-5.7
Point 59	196	-5.7

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.49	(195.061, -2.399)	16.44733	(215.301, 2.39983)	(176.145, -5.22577)
2	2884	1.57	(195.061, -2.399)	16.675	(215.262, 2.40312)	(175.076, -5.40402)
3	2684	1.57	(193.232, -2.25)	18.073	(215.262, 2.40312)	(171.511, -5.99825)
4	2885	1.58	(194.427, -2.399)	16.257	(214, 2.50833)	(175.076, -5.40402)
5	2685	1.58	(192.597, -2.25)	17.537	(214, 2.50833)	(171.511, -5.99825)
6	2644	1.58	(195.493, -2.434)	16.378	(215.262, 2.40312)	(175.918, -5.26362)
7	2883	1.59	(195.798, -2.399)	17.2	(216.729, 2.0997)	(175.076, -5.40402)
8	2645	1.59	(194.858, -2.434)	15.978	(214, 2.50833)	(175.918, -5.26362)
9	2683	1.59	(193.971, -2.25)	18.5	(216.729, 2.0997)	(171.511, -5.99825)
10	2444	1.60	(193.441, -2.267)	17.91	(215.262, 2.40312)	(171.917, -5.93059)
11	2643	1.60	(196.229, -2.434)	16.881	(216.729, 2.0997)	(175.918, -5.26362)

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	176.8227	-5.6554095	165.09431	298.36539	0	150
2	Optimized	178.0909	-6.459859	156.88909	381.10414	0	150
3	Optimized	179.28635	-7.129434	156.81893	430.72982	0	150
4	Optimized	180.49545	-7.718962	159.03424	494.12645	0	150
5	Optimized	182.02265	-8.463583	170.46102	577.40962	0	150
6	Optimized	183.684	-9.178757	186.4562	638.5085	0	150
7	Optimized	185.16135	-9.7093905	201.22924	701.7032	0	150
8	Optimized	186.11305	-10.051223	212.44078	742.94852	0	150.98
9	Optimized	187.10925	-10.345995	222.61185	767.37683	0	155.57
10	Optimized	188.6756	-10.7825	239.41321	825.6158	0	162.8
11	Optimized	190.0794	-11.03723	249.23351	844.34407	0	169.27
12	Optimized	191.25045	-11.106065	250.70615	874.24341	0	174.67
13	Optimized	192.35135	-11.170775	252.37463	893.8661	0	179.74
14	Optimized	193.67635	-11.236575	253.96975	913.10183	0	185.85
15	Optimized	195.22545	-11.30347	255.76912	938.44786	0	192.99

16	Optimized	196.8844	-11.37511	258.23845	511.27474	0	200.64
17	Optimized	198.2797	-11.436275	260.82034	517.61288	0	207.07
18	Optimized	199.30155	-11.482225	263.14709	522.11972	0	211.78
19	Optimized	199.90625	-11.510755	264.65952	527.68475	0	214.57
20	Optimized	200.50565	-11.54627	258.10298	530.79508	0	214.25
21	Optimized	201.6761	-11.61983	262.67994	538.35878	0	212.51
22	Optimized	203.00565	-11.707025	268.09865	545.86392	0	210.53
23	Optimized	204.3352	-11.79422	273.50985	553.36906	0	208.55
24	Optimized	205.00385	-11.83807	276.23012	1539.5685	0	207.56
25	Optimized	205.35385	-11.53998	257.61784	1269.4894	0	207.04
26	Optimized	206.28485	-10.73761	207.50844	1198.1504	0	205.65
27	Optimized	207.45455	-9.729553	144.56037	1106.5778	0	203.91
28	Optimized	208.6242	-8.721498	81.605823	1015.0052	0	202.17
29	Optimized	209.78885	-7.7109175	18.496908	920.91651	0	200.44
30	Optimized	210.94855	-6.6978125	-44.768453	829.15606	0	198.71
31	Optimized	212.1947	-5.59563	-113.59281	725.61998	0	196.86
32	Optimized	213.33885	-4.57283	-177.47066	620.54666	0	206.82
33	Optimized	214.55835	-3.5731325	-239.90219	534.14179	0	204.95
34	Optimized	215.3004	-3.0003025	-275.68243	-102055.95	0	203.81

Slices of Slip Surface: 2884

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	2884	175.6819	-5.655043	175.38444	262.28773	0	150
2	2884	176.89395	-6.1570925	172.06868	313.53332	0	150
3	2884	178.1	-6.656645	161.85595	366.38742	0	150
4	2884	179.3	-7.153701	157.39053	420.8732	0	150
5	2884	180.5	-7.6507575	156.39736	475.35129	0	150
6	2884	181.7	-8.147814	161.08605	532.16986	0	150
7	2884	182.9	-8.64487	169.55494	589.86612	0	150
8	2884	184.1	-9.1419265	181.83484	647.57008	0	150
9	2884	185.3	-9.638983	197.20973	705.27404	0	150
10	2884	186.5	-10.136041	214.88662	764.5409	0	152.77
11	2884	187.7	-10.633095	234.64994	825.17817	0	158.3
12	2884	188.9	-11.13015	256.3534	889.15681	0	163.83
13	2884	190.1	-11.62721	279.55047	969.84227	0	169.36
14	2884	190.85	-11.93787	294.72369	1017.9611	0	172.82
15	2884	191.625	-12	297.256	945.68	0	176.39
16	2884	192.875	-12	296.216	961.12	0	182.15
17	2884	194.125	-12	295.216	976.56	0	187.92
18	2884	195.375	-12	294.312	992.08	0	193.68
19	2884	196.66665	-12	293.58007	558.17264	0	199.63
20	2884	198	-12	293.03257	558.56264	0	205.78
21	2884	199.33335	-12	292.71007	558.95264	0	211.93
22	2884	200.5	-12	286.42	559.1	0	214.26
23	2884	201.66665	-12	286.41007	558.99014	0	212.52
24	2884	203	-12	286.38757	558.86264	0	210.54
25	2884	204.33335	-12	286.35757	558.73514	0	208.55

26	2884	205.35	-11.69306	267.17165	1279.5239	0	207.04
27	2884	206.4282	-10.747505	208.1248	1195.7006	0	205.44
28	2884	207.8846	-9.47028	128.36152	1080.374	0	203.27
29	2884	209.341	-8.1930585	48.601342	965.09899	0	201.11
30	2884	210.7974	-6.915835	-31.156771	849.77237	0	198.94
31	2884	212.2538	-5.6386115	-110.91282	734.49737	0	196.77
32	2884	213.55215	-4.5	-182.01898	618.09706	0	206.49
33	2884	214.6924	-3.5	-244.47221	438.74843	0	204.74

Slices of Slip Surface: 2684

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	2684	172.2592	-6.3083675	211.94535	306.99405	0	150
2	2684	173.75655	-6.928601	214.39483	370.2488	0	150
3	2684	175.2539	-7.5488345	217.2392	433.49737	0	150
4	2684	176.7513	-8.169068	217.81301	496.75212	0	150
5	2684	178.4	-8.851977	221.50525	569.21243	0	150
6	2684	180.2	-9.5975615	230.11786	650.87312	0	150
7	2684	181.9	-10.301727	244.90307	730.84625	0	150
8	2684	183.5	-10.96447	264.36228	807.70146	0	150
9	2684	185.1	-11.62721	288.58524	884.61441	0	150
10	2684	185.95	-11.97929	302.98635	925.63507	0	150.23
11	2684	186.78335	-12	302.73823	859.72322	0	154.07
12	2684	188.35	-12	300.67015	876.63811	0	161.29
13	2684	189.91665	-12	298.8893	913.02108	0	168.52
14	2684	191.3625	-12	297.49434	942.18868	0	175.18
15	2684	192.6875	-12	296.36226	958.56604	0	181.29
16	2684	194.0125	-12	295.29811	974.9434	0	187.4
17	2684	195.3375	-12	294.33208	991.32075	0	193.51
18	2684	196.66665	-12	293.58007	557.91014	0	199.63
19	2684	198	-12	293.03257	558.28514	0	205.78
20	2684	199.33335	-12	292.71007	558.66764	0	211.93
21	2684	200.5	-12	286.42	558.81	0	214.26
22	2684	201.66665	-12	286.41007	558.70514	0	212.52
23	2684	203	-12	286.38757	558.58514	0	210.54
24	2684	204.33335	-12	286.35757	558.45764	0	208.55
25	2684	205.35	-11.69306	267.17165	1281.5647	0	207.04
26	2684	206.4282	-10.747505	208.1248	1197.559	0	205.44
27	2684	207.8846	-9.47028	128.36152	1082.0776	0	203.27
28	2684	209.341	-8.1930585	48.601342	966.59606	0	201.11
29	2684	210.7974	-6.915835	-31.156771	851.11457	0	198.94
30	2684	212.2538	-5.6386115	-110.91282	735.63309	0	196.77
31	2684	213.55215	-4.5	-182.01898	619.05311	0	206.49
32	2684	214.6924	-3.5	-244.47221	440.85834	0	204.74

Slices of Slip Surface: 2885

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	2885	175.6819	-5.655043	175.38444	262.93564	0	150

2	2885	176.89395	-6.1570925	172.06868	314.25745	0	150
3	2885	178.1	-6.656645	161.85595	367.20352	0	150
4	2885	179.3	-7.153701	157.39053	421.77399	0	150
5	2885	180.5	-7.6507575	156.39736	476.34446	0	150
6	2885	181.7	-8.147814	161.08605	533.27082	0	150
7	2885	182.9	-8.64487	169.55494	591.05947	0	150
8	2885	184.1	-9.1419265	181.83484	648.84812	0	150
9	2885	185.3	-9.638983	197.20973	706.62906	0	150
10	2885	186.5	-10.136041	214.88662	765.99601	0	152.77
11	2885	187.7	-10.633095	234.64994	826.71797	0	158.3
12	2885	188.9	-11.13015	256.3534	890.85059	0	163.83
13	2885	190.1	-11.62721	279.55047	971.61304	0	169.36
14	2885	190.85	-11.93787	294.72369	1019.8397	0	172.82
15	2885	191.625	-12	297.256	946.08	0	176.39
16	2885	192.875	-12	296.216	961.52	0	182.15
17	2885	194.125	-12	295.216	977.04	0	187.92
18	2885	195.375	-12	294.312	992.48	0	193.68
19	2885	196.66665	-12	293.58007	558.61514	0	199.63
20	2885	198	-12	293.03257	559.01264	0	205.78
21	2885	199.33335	-12	292.71007	559.41764	0	211.93
22	2885	200.5	-12	286.42	559.57	0	214.26
23	2885	201.66665	-12	286.41007	559.45514	0	212.52
24	2885	203	-12	286.38757	559.32764	0	210.54
25	2885	204.33335	-12	286.35757	559.20014	0	208.55
26	2885	205.35	-11.65	264.48824	1243.8008	0	207.04
27	2885	206.33	-10.67	203.2876	1159.3185	0	205.58
28	2885	207.59	-9.41	124.60793	1048.819	0	203.71
29	2885	208.85	-8.15	45.931077	938.2634	0	201.84
30	2885	210.11	-6.89	-32.744658	827.76393	0	199.96
31	2885	211.37	-5.63	-111.41983	717.20834	0	198.09
32	2885	212.5	-4.5	-181.98094	603.89729	0	208.1
33	2885	213.5	-3.5	-244.42553	411.6633	0	206.57

Slices of Slip Surface: 2685

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	2685	172.2592	-6.3083675	211.94535	307.98125	0	150
2	2685	173.75655	-6.928601	214.39483	371.35323	0	150
3	2685	175.2539	-7.5488345	217.2392	434.7252	0	150
4	2685	176.7513	-8.169068	217.81301	498.09717	0	150
5	2685	178.1	-8.727713	221.25369	557.05301	0	150
6	2685	179.3	-9.224769	224.98	611.60038	0	150
7	2685	180.5	-9.7218255	232.37104	666.14006	0	150
8	2685	181.9	-10.301727	244.90307	732.63627	0	150
9	2685	183.5	-10.96447	264.36228	809.6647	0	150
10	2685	185.1	-11.62721	288.58524	886.69314	0	150
11	2685	185.95	-11.97929	302.98635	927.85239	0	150.23
12	2685	186.78335	-12	302.73823	860.17003	0	154.07

13	2685	188.35	-12	300.67015	877.08492	0	161.29
14	2685	189.91665	-12	298.8893	913.46789	0	168.52
15	2685	191.3625	-12	297.49434	942.64151	0	175.18
16	2685	192.6875	-12	296.36226	959.09434	0	181.29
17	2685	194.0125	-12	295.29811	975.4717	0	187.4
18	2685	195.3375	-12	294.33208	991.84906	0	193.51
19	2685	196.66665	-12	293.58007	558.44264	0	199.63
20	2685	198	-12	293.03257	558.84014	0	205.78
21	2685	199.33335	-12	292.71007	559.23014	0	211.93
22	2685	200.5	-12	286.42	559.38	0	214.26
23	2685	201.66665	-12	286.41007	559.27514	0	212.52
24	2685	203	-12	286.38757	559.14764	0	210.54
25	2685	204.33335	-12	286.35757	559.02014	0	208.55
26	2685	205.35	-11.65	264.48824	1245.114	0	207.04
27	2685	206.4875	-10.5125	193.45547	1146.7254	0	205.35
28	2685	208.0625	-8.9375	95.107	1008.4018	0	203.01
29	2685	209.6375	-7.3625	-3.2413331	870.12309	0	200.67
30	2685	211.2125	-5.7875	-101.58545	731.79952	0	198.32
31	2685	213	-4	-213.20685	508.79871	0	207.33

Slices of Slip Surface: 2644

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	2644	176.70915	-5.79205	168.44311	312.22665	0	150
2	2644	178.1	-6.721389	163.65398	407.82191	0	150
3	2644	179.3	-7.523203	169.48119	492.50015	0	150
4	2644	180.5	-8.3250175	181.489	577.17145	0	150
5	2644	181.7	-9.126832	199.84368	664.24016	0	150
6	2644	182.9	-9.9286445	223.76922	752.2027	0	150
7	2644	184.1	-10.73046	251.83131	840.19989	0	150
8	2644	185.3	-11.532275	283.82903	928.19707	0	150
9	2644	185.95	-11.96659	302.39713	976.06199	0	150.23
10	2644	186.5875	-12	303.02128	857.78723	0	153.17
11	2644	187.7625	-12	301.39574	870.46809	0	158.59
12	2644	188.9375	-12	299.95745	886.97872	0	164
13	2644	190.1125	-12	298.68085	918.46809	0	169.42
14	2644	191.3625	-12	297.49434	942.33962	0	175.18
15	2644	192.6875	-12	296.36226	958.79245	0	181.29
16	2644	194.0125	-12	295.29811	975.16981	0	187.4
17	2644	195.3375	-12	294.33208	991.54717	0	193.51
18	2644	196.66665	-12	293.58007	558.10514	0	199.63
19	2644	198	-12	293.03257	558.49514	0	205.78
20	2644	199.33335	-12	292.71007	558.87764	0	211.93
21	2644	200.5	-12	286.42	559.02	0	214.26
22	2644	201.66665	-12	286.41007	558.91514	0	212.52
23	2644	203	-12	286.38757	558.78764	0	210.54
24	2644	204.33335	-12	286.35757	558.66764	0	208.55
25	2644	205.35	-11.69306	267.17165	1280.1684	0	207.04

26	2644	206.30685	-10.85394	214.76767	1205.8806	0	205.62
27	2644	207.5205	-9.7895855	148.30361	1109.8611	0	203.81
28	2644	208.73415	-8.7252345	81.833365	1013.7797	0	202.01
29	2644	209.9478	-7.6608815	15.36869	917.69831	0	200.2
30	2644	211.16145	-6.596529	-51.097224	821.61689	0	198.4
31	2644	212.37515	-5.5321765	-117.5588	725.53548	0	196.59
32	2644	213.55215	-4.5	-182.01898	618.83553	0	206.49
33	2644	214.6924	-3.5	-244.47221	439.30887	0	204.74

Slices of Slip Surface: 2883

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	2883	175.6819	-5.655043	175.38444	259.74184	0	150
2	2883	176.89395	-6.1570925	172.06868	310.81973	0	150
3	2883	178.1	-6.656645	161.85595	363.5157	0	150
4	2883	179.3	-7.153701	157.39053	417.8244	0	150
5	2883	180.5	-7.6507575	156.39736	472.14081	0	150
6	2883	181.9	-8.2306565	162.36023	538.31558	0	150
7	2883	183.5	-8.893398	175.36384	615.01489	0	150
8	2883	185.1	-9.55614	194.46504	691.75461	0	150
9	2883	186.7	-10.218881	218.04706	770.45757	0	153.69
10	2883	188.3	-10.88162	245.31882	851.06604	0	161.06
11	2883	189.9	-11.544365	275.59319	951.48017	0	168.44
12	2883	190.85	-11.93787	294.72369	1012.849	0	172.82
13	2883	191.625	-12	297.256	944.64	0	176.39
14	2883	192.875	-12	296.216	960.08	0	182.15
15	2883	194.125	-12	295.216	975.52	0	187.92
16	2883	195.375	-12	294.312	990.96	0	193.68
17	2883	196.66665	-12	293.58007	557.02514	0	199.63
18	2883	198	-12	293.03257	557.37764	0	205.78
19	2883	199.33335	-12	292.71007	557.73014	0	211.93
20	2883	200.5	-12	286.42	557.86	0	214.26
21	2883	201.66665	-12	286.41007	557.76764	0	212.52
22	2883	203	-12	286.38757	557.64764	0	210.54
23	2883	204.33335	-12	286.35757	557.53514	0	208.55
24	2883	205.35	-11.731435	269.57013	1316.6265	0	207.04
25	2883	206.4019	-10.9243	219.15854	1242.9609	0	205.48
26	2883	207.80565	-9.8471555	151.8873	1142.5881	0	203.39
27	2883	209.2094	-8.7700085	84.610411	1042.2153	0	201.3
28	2883	210.6132	-7.692863	17.340302	941.84256	0	199.21
29	2883	212.01695	-6.6157175	-49.931502	841.46978	0	197.13
30	2883	213.4207	-5.5385725	-117.20331	741.097	0	195.04
31	2883	214.7113	-4.548266	-179.05705	636.60461	0	204.71
32	2883	216.0145	-3.548266	-241.50993	468.74089	0	202.71

Slices of Slip Surface: 2645

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	2645	176.70915	-5.79205	168.44311	313.05196	0	150

2	2645	178.1	-6.721389	163.65398	408.90282	0	150
3	2645	179.3	-7.523203	169.48119	493.80278	0	150
4	2645	180.5	-8.3250175	181.489	578.70274	0	150
5	2645	181.7	-9.126832	199.84368	666.03475	0	150
6	2645	182.9	-9.9286445	223.76922	754.21209	0	150
7	2645	184.1	-10.73046	251.83131	842.41714	0	150
8	2645	185.3	-11.532275	283.82903	930.62219	0	150
9	2645	185.95	-11.96659	302.39713	978.7227	0	150.23
10	2645	186.5875	-12	303.02128	858.12766	0	153.17
11	2645	187.7625	-12	301.39574	870.80851	0	158.59
12	2645	188.9375	-12	299.95745	887.31915	0	164
13	2645	190.1125	-12	298.68085	918.80851	0	169.42
14	2645	191.3625	-12	297.49434	942.71698	0	175.18
15	2645	192.6875	-12	296.36226	959.09434	0	181.29
16	2645	194.0125	-12	295.29811	975.54717	0	187.4
17	2645	195.3375	-12	294.33208	991.92453	0	193.51
18	2645	196.66665	-12	293.58007	558.51014	0	199.63
19	2645	198	-12	293.03257	558.90764	0	205.78
20	2645	199.33335	-12	292.71007	559.30514	0	211.93
21	2645	200.5	-12	286.42	559.46	0	214.26
22	2645	201.66665	-12	286.41007	559.34264	0	212.52
23	2645	203	-12	286.38757	559.21514	0	210.54
24	2645	204.33335	-12	286.35757	559.08764	0	208.55
25	2645	205.35	-11.65	264.48824	1244.71	0	207.04
26	2645	206.33	-10.67	203.2876	1160.2164	0	205.58
27	2645	207.59	-9.41	124.60793	1049.7169	0	203.71
28	2645	208.85	-8.15	45.931077	939.16132	0	201.84
29	2645	210.11	-6.89	-32.744658	828.66185	0	199.96
30	2645	211.37	-5.63	-111.41983	718.10626	0	198.09
31	2645	212.5	-4.5	-181.98094	604.83774	0	208.1
32	2645	213.5	-3.5	-244.42553	412.54011	0	206.57

Slices of Slip Surface: 2683

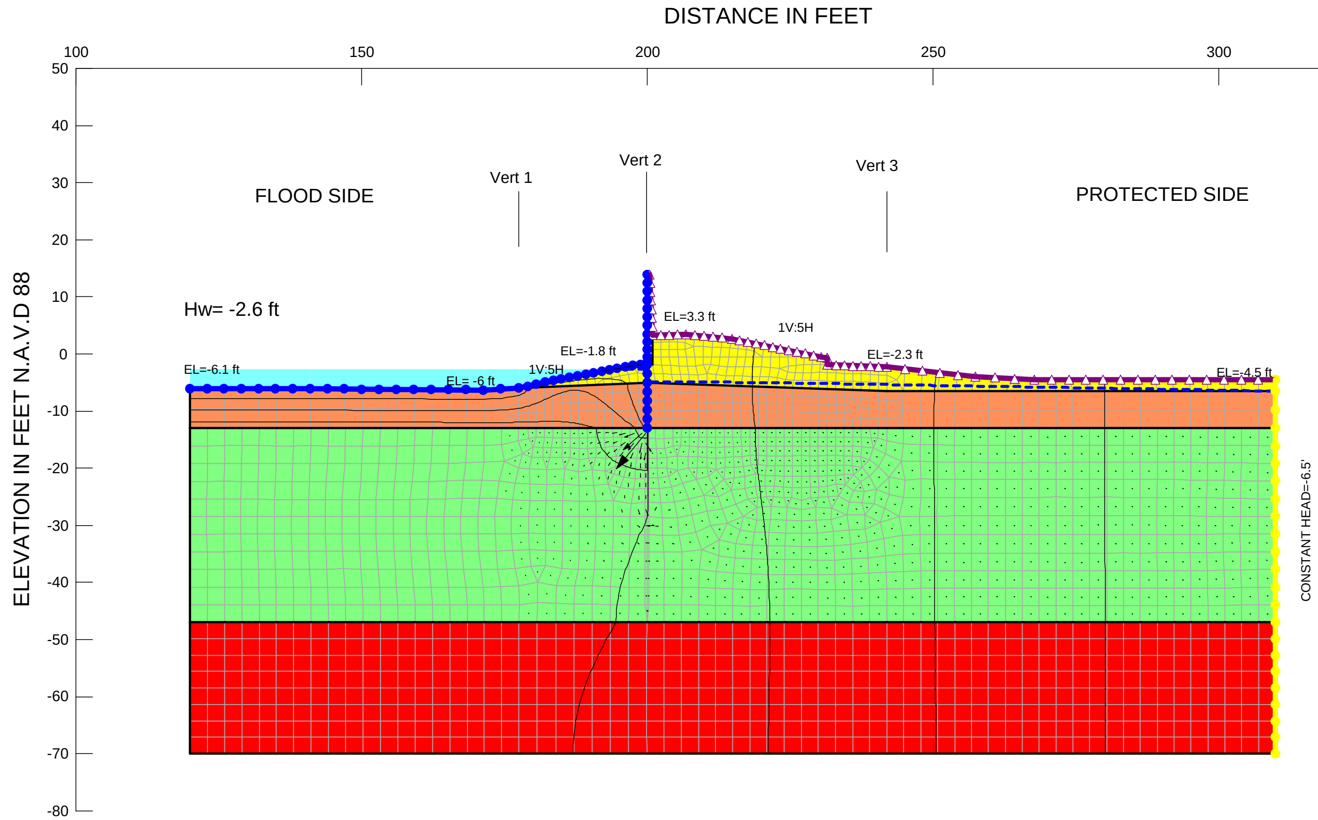
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	2683	172.2592	-6.3083675	211.94535	304.44585	0	150
2	2683	173.75655	-6.928601	214.39483	367.52783	0	150
3	2683	175.2539	-7.5488345	217.2392	430.60365	0	150
4	2683	176.7513	-8.169068	217.81301	493.68563	0	150
5	2683	178.4	-8.851977	221.50525	565.92753	0	150
6	2683	180.2	-9.5975615	230.11786	647.38291	0	150
7	2683	181.9	-10.301727	244.90307	727.09299	0	150
8	2683	183.5	-10.96447	264.36228	803.77497	0	150
9	2683	185.1	-11.62721	288.58524	880.45695	0	150
10	2683	185.95	-11.97929	302.98635	921.41294	0	150.23
11	2683	186.78335	-12	302.73823	858.89343	0	154.07
12	2683	188.35	-12	300.67015	875.80832	0	161.29
13	2683	189.91665	-12	298.8893	912.12747	0	168.52

14	2683	191.3625	-12	297.49434	941.28302	0	175.18
15	2683	192.6875	-12	296.36226	957.66038	0	181.29
16	2683	194.0125	-12	295.29811	973.96226	0	187.4
17	2683	195.3375	-12	294.33208	990.33962	0	193.51
18	2683	196.66665	-12	293.58007	556.86764	0	199.63
19	2683	198	-12	293.03257	557.22014	0	205.78
20	2683	199.33335	-12	292.71007	557.56514	0	211.93
21	2683	200.5	-12	286.42	557.7	0	214.26
22	2683	201.66665	-12	286.41007	557.59514	0	212.52
23	2683	203	-12	286.38757	557.48264	0	210.54
24	2683	204.33335	-12	286.35757	557.37764	0	208.55
25	2683	205.35	-11.731435	269.57013	1317.7599	0	207.04
26	2683	206.4019	-10.9243	219.15854	1243.9782	0	205.48
27	2683	207.80565	-9.8471555	151.8873	1143.5489	0	203.39
28	2683	209.2094	-8.7700085	84.610411	1043.1196	0	201.3
29	2683	210.6132	-7.692863	17.340302	942.69031	0	199.21
30	2683	212.01695	-6.6157175	-49.931502	842.20449	0	197.13
31	2683	213.4207	-5.5385725	-117.20331	741.7752	0	195.04
32	2683	214.7113	-4.548266	-179.05705	637.2043	0	204.71
33	2683	216.0145	-3.548266	-241.50993	469.75685	0	202.71

Slices of Slip Surface: 2444

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	2444	172.61445	-6.3969355	211.31039	349.65839	0	150
2	2444	174.0103	-7.3296325	221.0673	443.53441	0	150
3	2444	175.40615	-8.2623295	231.63431	537.41638	0	150
4	2444	176.80205	-9.1950265	245.06645	631.28049	0	150
5	2444	178.375	-10.246033	264.53088	739.86545	0	150
6	2444	180.125	-11.415345	294.85339	863.20804	0	150
7	2444	181.05	-12	313.35	802.48	0	150
8	2444	181.9	-12	311.48125	811.25	0	150
9	2444	183.5	-12	308.2375	826.75	0	150
10	2444	185.1	-12	305.35625	842.1875	0	150
11	2444	186.7	-12	302.8625	858.6875	0	153.69
12	2444	188.3	-12	300.73125	875.9375	0	161.06
13	2444	189.9	-12	298.90625	912.4375	0	168.44
14	2444	191.3625	-12	297.49434	942.03774	0	175.18
15	2444	192.6875	-12	296.36226	958.41509	0	181.29
16	2444	194.0125	-12	295.29811	974.79245	0	187.4
17	2444	195.3375	-12	294.33208	991.16981	0	193.51
18	2444	196.66665	-12	293.58007	557.71514	0	199.63
19	2444	198	-12	293.03257	558.09014	0	205.78
20	2444	199.33335	-12	292.71007	558.46514	0	211.93
21	2444	200.5	-12	286.42	558.6	0	214.26
22	2444	201.66665	-12	286.41007	558.50264	0	212.52
23	2444	203	-12	286.38757	558.38264	0	210.54
24	2444	204.33335	-12	286.35757	558.25514	0	208.55

25	2444	205.35	-11.69306	267.17165	1282.9609	0	207.04
26	2444	206.4282	-10.747505	208.1248	1199.0045	0	205.44
27	2444	207.8846	-9.47028	128.36152	1083.523	0	203.27
28	2444	209.341	-8.1930585	48.601342	968.04152	0	201.11
29	2444	210.7974	-6.915835	-31.156771	852.56003	0	198.94
30	2444	212.2538	-5.6386115	-110.91282	737.07854	0	196.77
31	2444	213.55215	-4.5	-182.01898	620.56961	0	206.49
32	2444	214.6924	-3.5	-244.47221	442.24956	0	204.74



Name: BEACH SAND, EL. -13 TO -47 Model: Saturated Only K-Sat: 0.00049 ft/sec K-Ratio: 1
Name: BAY SOUND CLAY, EL. -47 TO -70 Model: Saturated Only K-Sat: 3.28e-008 ft/sec K-Ratio: 1
Name: Sheet Pile Model: Saturated Only K-Sat: 1e-010 ft/sec K-Ratio: 1
Name: MARSH, EL. -5/-6.5 TO -13 Model: Saturated Only K-Sat: 3.28e-007 ft/sec K-Ratio: 1
Name: EMBANKMENT FILL, EL. +3.3 TO -4/6.5 Model: Saturated Only K-Sat: 3.28e-008 ft/sec K-Ratio: 1

GENERAL NOTES

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

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

Hw IS CANAL WATER LEVEL

Name: LWL Q Case (seepage)
File Name: Reach 4.gsz Directory: C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix E LWL\
Last Edited By: Jamerson, James MVK

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 4,
PROTECTED SIDE STABILITY ANALYSIS,
CASE: LWL Q Case (seepage)
STA. 24+87 TO 29+16 WEST
ORLEANS PARISH, LOUISIANA

LWL Q Case (seepage)

File Information

Created By: Moraille, Jacques
Revision Number: 537
Last Edited By: Jamerson, James MVK
Date: 10/3/2013
Time: 11:45:11 AM
File Name: Reach 4.gsz
Directory: C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix E LWL\
Last Solved Date: 10/3/2013
Last Solved Time: 11:45:40 AM

Project Settings

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

Analysis Settings

LWL Q Case (seepage)

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

Starting Time: 0 sec
Duration: 0 sec
Ending Time: 0 sec

Materials

BEACH SAND, EL. -13 TO -47

Model: Saturated Only
Hydraulic
K-Sat: 0.00049 ft/sec
Volumetric Water Content: 0 ft^3/ft^3
Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

BAY SOUND CLAY, EL. -47 TO -70

Model: Saturated Only
Hydraulic
K-Sat: 3.28e-008 ft/sec
Volumetric Water Content: 0 ft^3/ft^3
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 ft^3/ft^3
Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

MARSH, EL. -5/-6.5 TO -13

Model: Saturated Only
Hydraulic
K-Sat: 3.28e-007 ft/sec
Volumetric Water Content: 0 ft^3/ft^3
Mv: 0 /psf
K-Ratio: 1
K-Direction: 0 °

EMBANKMENT FILL, EL. +3.3 TO -4/6.5

Model: Saturated Only
Hydraulic
K-Sat: 3.28e-008 ft/sec
Volumetric Water Content: 0 ft^3/ft^3

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

Boundary Conditions

Drainage

Review: true
Type: Total Flux (Q) 0

Canal Water

Type: Head (H) -2.6

Curb

Type: Head (H) -6.5

Regions

	Material	Points	Area (ft²)
Region 1	BEACH SAND, EL. -13 TO -47	18,14,34,40,32,11,10,31,22,21,17	5220
Region 2		16,20,19,29,28,3,4	13.05
Region 3	MARSH, EL. -5/-6.5 TO -13	22,30,42,31	304.5
Region 4	EMBANKMENT FILL, EL. +3.3 TO -4/6.5	29,28,3,30,42,7,6,5,41	202.38176
Region 5	BAY SOUND CLAY, EL. -47 TO -70	13,14,34,35	1324.8
Region 6	BAY SOUND CLAY, EL. -47 TO -70	32,11,12,36	1564
Region 7	MARSH, EL. -5/-6.5 TO -13	43,10,31,42	442
Region 8	EMBANKMENT FILL, EL. +3.3 TO -4/6.5	29,19,37,38,41	75.87824
Region 9	BEACH SAND, EL. -13 TO -47	18,17,21,22,33,15	1240
Region 10	BAY SOUND CLAY, EL. -47 TO -70	35,34,40,32,36,44	1481.2
Region 11	EMBANKMENT FILL, EL. +3.3 TO -4/6.5	7,39,8,9,43,42	159.5
Region 12	EMBANKMENT FILL, EL. +3.3 TO -4/6.5	3,27,26,2,25,30	40.725
Region 13	MARSH, EL. -5/-6.5 TO -13	25,30,22,33	168
Region 14	MARSH, EL. -5/-6.5 TO -13	15,1,23,24,25,33	394.095

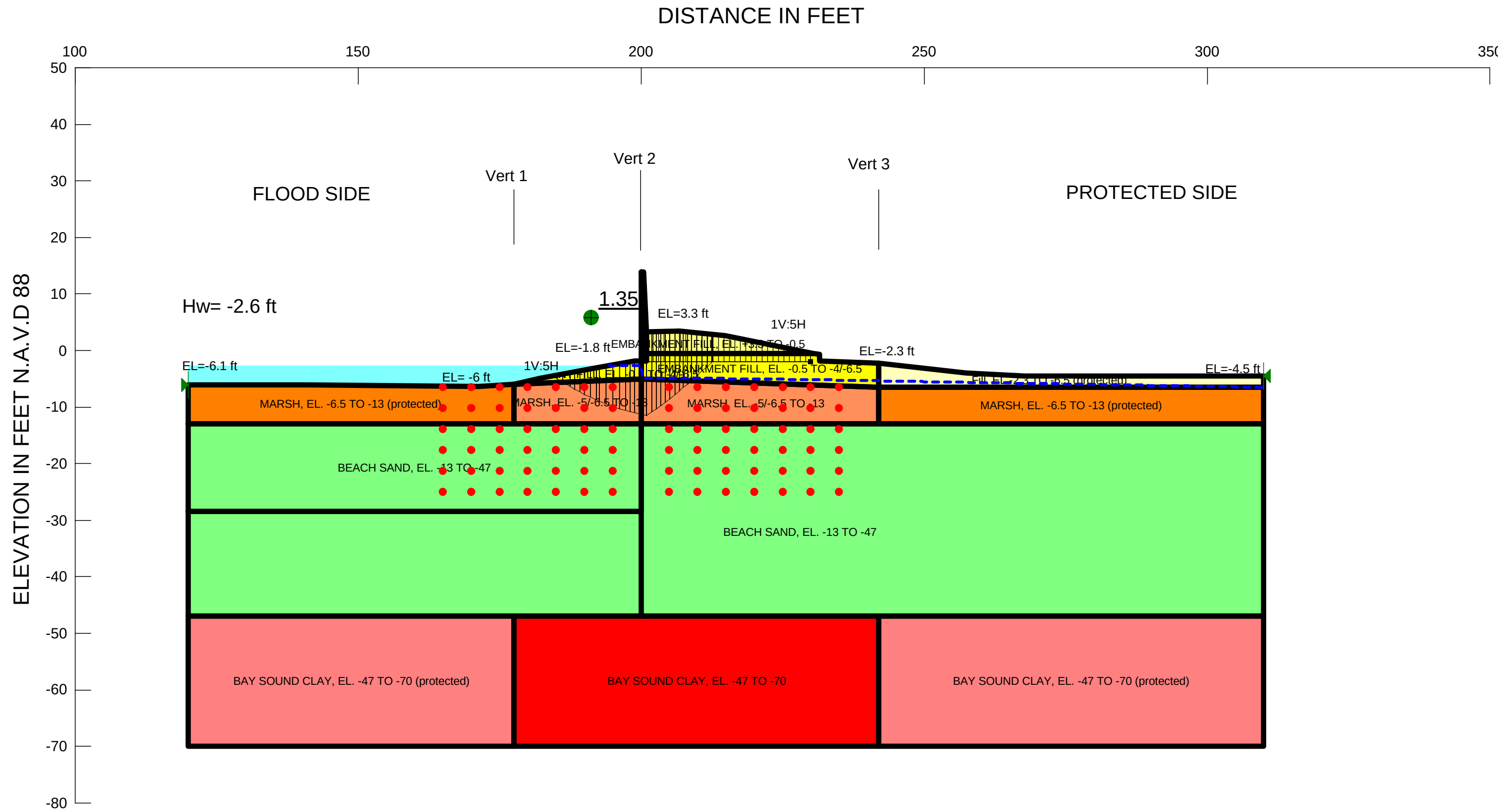
Lines

	Start Point	End Point	Hydraulic Boundary	Left Side Material	Right Side Material
Line 1	17	18			
Line 2	18	14			
Line 3	16	20			
Line 4	20	19	Drainage		
Line 5	21	17		Sheet Pile	
Line 6	16	4	Canal Water		
Line 7	28	3		Sheet Pile	
Line 8	3	4	Canal Water		
Line 9	28	29			
Line 10	29	19			

Line 11	30	3	Canal Water		Sheet Pile
Line 12	22	31			
Line 13	31	10			
Line 14	32	11			
Line 15	22	33			
Line 16	33	15			
Line 17	14	34			
Line 18	6	5	Drainage		
Line 19	13	14			
Line 20	35	13			
Line 21	12	36			
Line 22	19	37	Drainage		
Line 23	37	38	Drainage		
Line 24	15	18			
Line 25	30	22	Canal Water	Sheet Pile	
Line 26	34	35			
Line 27	36	32			
Line 28	21	22			Sheet Pile
Line 29	32	40			
Line 30	40	34			
Line 31	5	41	Drainage		
Line 32	41	29			
Line 33	38	41	Drainage		
Line 34	31	42			
Line 35	42	7			
Line 36	30	42			
Line 37	7	6	Drainage		
Line 38	42	43			
Line 39	7	39	Drainage		
Line 40	39	8	Drainage		
Line 41	8	9	Drainage		
Line 42	3	27	Canal Water		
Line 43	10	11	Curb		
Line 44	12	11	Curb		
Line 45	10	43	Curb		
Line 46	43	9	Curb		
Line 47	26	2	Canal Water		
Line 48	2	25	Canal Water		
Line 49	17	40			
Line 50	36	44			
Line 51	44	35			
Line 52	26	27	Canal Water		
Line 53	25	30			
Line 54	25	33			
Line 55	15	1			
Line 56	1	23	Canal Water		
Line 57	23	24	Canal Water		
Line 58	24	25	Canal Water		

Points

	X (ft)	Y (ft)
Point 1	120	-6.1
Point 2	182.2	-4.9
Point 3	200	-1.8
Point 4	200	3.5
Point 5	231.5	-0.7
Point 6	231.6	-1.9
Point 7	242	-2.3
Point 8	267.8	-4.5
Point 9	310	-4.5
Point 10	310	-13
Point 11	310	-47
Point 12	310	-70
Point 13	120	-70
Point 14	120	-47
Point 15	120	-13
Point 16	200	13.9
Point 17	200	-28.5
Point 18	120	-28.5
Point 19	201	3.3
Point 20	200.5	13.9
Point 21	200	-23.5
Point 22	200	-13
Point 23	141	-6.1
Point 24	171.3	-6.3
Point 25	177.6	-6
Point 26	192.1	-3
Point 27	198.9	-1.8
Point 28	201	-1.8
Point 29	201	-0.5
Point 30	200	-5
Point 31	242	-13
Point 32	242	-47
Point 33	177.6	-13
Point 34	177.6	-47
Point 35	177.6	-70
Point 36	242	-70
Point 37	206.8	3.4
Point 38	214.8	2.7
Point 39	257.5	-4
Point 40	200	-47
Point 41	230.51765	-0.5
Point 42	242	-6.5
Point 43	310	-6.5
Point 44	200	-70



Name: EMBANKMENT FILL, EL. +3.3 TO -0.5 Model: Undrained (Phi=0) Unit Weight: 115 pcf Cohesion: 700 psf
Name: Fill, EL -2.3 TO -6.5 (protected) Model: Undrained (Phi=0) Unit Weight: 106 pcf Cohesion: 200 psf
Name: BEACH SAND, EL. -13 TO -47 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand
Name: BAY SOUND CLAY, EL. -47 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 110 pcf Cohesion Spatial Fn: CLAY Phi: 0 °
Name: MARSH, EL. -5/-6.5 TO -13 Model: Spatial Mohr-Coulomb Unit Weight: 88 pcf Cohesion Fn: Marsh Phi: 0 °
Name: EMBANKMENT FILL, EL. -0.5 TO -4/-6.5 Model: Spatial Mohr-Coulomb Unit Weight: 106 pcf Cohesion Fn: Fill Phi: 0 °
Name: MARSH, EL. -6.5 TO -13 (protected) Model: Undrained (Phi=0) Unit Weight: 88 pcf Cohesion: 190 psf
Name: BAY SOUND CLAY, EL. -47 TO -70 (protected) Model: Spatial Mohr-Coulomb Unit Weight: 110 pcf Cohesion 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 IS CANAL WATER LEVEL

Name: LWL Q Case (Block)
File Name: Reach 4.gsz Directory: C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix E LWL\
Last Edited By: Jamerson, James MVK

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

ORLEANS AVE OUTFALL CANAL, REACH 4,
PROTECTED SIDE STABILITY ANALYSIS,
CASE: LWL Q Case (Block)
STA. 24+87 TO 29+16 WEST
ORLEANS PARISH, LOUISIANA

LWL Q Case (Block)

File Information

Created By: Moraille, Jacques
Revision Number: 538
Last Edited By: Jamerson, James MVK
Date: 10/3/2013
Time: 12:12:36 PM
File Name: Reach 4.gsz
Directory: C:\Users\B4EDGNDV\Documents\Orleans Canal\Final Report\Appendix E LWL\
Last Solved Date: 10/3/2013
Last Solved Time: 12:18:56 PM

Project Settings

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

Analysis Settings

LWL Q Case (Block)

Kind: SLOPE/W
Parent: LWL Q Case (seepage)
Method: Spencer
Settings
- PWP Conditions Source: Parent Analysis

Slip Surface
- Direction of movement: Right to Left
- Use Passive Mode: No
- Slip Surface Option: Block
- Critical slip surfaces saved: 1
- Optimize Critical Slip Surface Location: Yes
- Tension Crack
  - Tension Crack Option: Tension Crack Line
  - Percentage Wet: 1
  - Tension Crack Fluid Unit Weight: 62.4 pcf

FOS Distribution
- FOS Calculation Option: Constant

Restrict Block Crossing: No

Advanced

Number of Slices: 30

Optimization Tolerance: 0.01

Minimum Slip Surface Depth: 0.1 ft

Optimization Maximum Iterations: 3000

Optimization Convergence Tolerance: 1e-007

Starting Optimization Points: 8

Ending Optimization Points: 16

Complete Passes per Insertion: 1

Driving Side Maximum Convex Angle: 5 °

Resisting Side Maximum Convex Angle: 1 °

Materials

EMBANKMENT FILL, EL. +3.3 TO -0.5

Model: Undrained (Phi=0)

Unit Weight: 115 pcf

Cohesion: 700 psf

Fill, EL -2.3 TO -6.5 (protected)

Model: Undrained (Phi=0)

Unit Weight: 106 pcf

Cohesion: 200 psf

BEACH SAND, EL. -13 TO -47

Model: Shear/Normal Fn.

Unit Weight: 122 pcf

Strength Function: Sand

Phi-B: 0 °

BAY SOUND CLAY, EL. -47 TO -70

Model: Spatial Mohr-Coulomb

Unit Weight: 110 pcf

Cohesion Spatial Fn: CLAY

Phi: 0 °

Phi-B: 0 °

MARSH, EL. -5/-6.5 TO -13

Model: Spatial Mohr-Coulomb

Unit Weight: 88 pcf

Cohesion Fn: Marsh

Phi: 0 °

Phi-B: 0 °

EMBANKMENT FILL, EL. -0.5 TO -4/-6.5

Model: Spatial Mohr-Coulomb

Unit Weight: 106 pcf
Cohesion Fn: Fill
Phi: 0 °
Phi-B: 0 °

MARSH, EL. -6.5 TO -13 (protected)

Model: Undrained (Phi=0)
Unit Weight: 88 pcf
Cohesion: 190 psf

BAY SOUND CLAY, EL. -47 TO -70 (protected)

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

Slip Surface Limits

Left Coordinate: (120, -6.1) ft
Right Coordinate: (310, -4.5) ft

Slip Surface Block

Left Grid
- Upper Left: (165, -6.5) ft
- Lower Left: (165, -25) ft
- Lower Right: (195, -25) ft
- X Increments: 6
- Y Increments: 5
- Starting Angle: 185 °
- Ending Angle: 135 °
- Angle Increments: 4

Right Grid
- Upper Left: (205, -6.5) ft
- Lower Left: (205, -25) ft
- Lower Right: (235, -25) ft
- X Increments: 6
- Y Increments: 5
- Starting Angle: 0 °
- Ending Angle: 45 °
- Angle Increments: 4

Tension Crack Line

	X (ft)	Y (ft)
	200	-2
	230	-2

Cohesion Functions

Marsh

Model: Spline Data Point Function
Function: Cohesion vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 190
Data Points: X (ft), Cohesion (psf)
 Data Point: (177.6, 190)
 Data Point: (200, 215)
 Data Point: (242, 190)

Fill

Model: Spline Data Point Function
Function: Cohesion vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 200
Data Points: X (ft), Cohesion (psf)
 Data Point: (177.6, 200)
 Data Point: (200, 230)
 Data Point: (242, 200)

Bay Sound

Model: Spline Data Point Function
Function: Cohesion vs. Y
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 500
Data Points: Y (ft), Cohesion (psf)
 Data Point: (-70, 735)
 Data Point: (-47, 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: (-10000, 0)
 Data Point: (0, 0)

Data Point: (10000, 6494)

Estimation Properties

Intact Rock Param.: 10

Geological Strength: 100

Disturbance Factor: 0

SigmaC: 600000 psf

Sigma3: 300000 psf

Num. Points: 20

Spatial Functions

CLAY

Model: Linear Interpolation

Limit Range By: Data Values

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

Data Point: (177.7, -47, 500)

Data Point: (177.7, -70, 735)

Data Point: (200, -47, 530)

Data Point: (200, -70, 775)

Data Point: (242, -47, 500)

Data Point: (242, -70, 735)

Regions

	Material	Points	Area (ft^2)
Region 1	BEACH SAND, EL. -13 TO -47	18,14,34,40,32,11,10,31,22,21,17	5220
Region 2		16,20,19,29,28,3,4	13.05
Region 3	MARSH, EL. -5/-6.5 TO -13	22,30,42,31	304.5
Region 4	EMBANKMENT FILL, EL. -0.5 TO -4/-6.5	29,28,3,30,42,7,6,5,41	202.38176
Region 5	BAY SOUND CLAY, EL. -47 TO -70 (protected)	13,14,34,35	1324.8
Region 6	BAY SOUND CLAY, EL. -47 TO -70 (protected)	32,11,12,36	1564
Region 7	MARSH, EL. -6.5 TO -13 (protected)	43,10,31,42	442
Region 8	EMBANKMENT FILL, EL. +3.3 TO -0.5	29,19,37,38,41	75.87824
Region 9	BEACH SAND, EL. -13 TO -47	18,17,21,22,33,15	1240
Region 10	BAY SOUND CLAY, EL. -47 TO -70	35,34,40,32,36,44	1481.2
Region 11	Fill, EL -2.3 TO -6.5 (protected)	7,39,8,9,43,42	159.5
Region 12	EMBANKMENT FILL, EL. -0.5 TO -4/-6.5	3,27,26,2,25,30	40.725
Region 13	MARSH, EL. -5/-6.5 TO -13	25,30,22,33	168
Region 14	MARSH, EL. -6.5 TO -13 (protected)	15,1,23,24,25,33	394.095

Points

	X (ft)	Y (ft)
Point 1	120	-6.1
Point 2	182.2	-4.9
Point 3	200	-1.8

Point 4	200	3.5
Point 5	231.5	-0.7
Point 6	231.6	-1.9
Point 7	242	-2.3
Point 8	267.8	-4.5
Point 9	310	-4.5
Point 10	310	-13
Point 11	310	-47
Point 12	310	-70
Point 13	120	-70
Point 14	120	-47
Point 15	120	-13
Point 16	200	13.9
Point 17	200	-28.5
Point 18	120	-28.5
Point 19	201	3.3
Point 20	200.5	13.9
Point 21	200	-23.5
Point 22	200	-13
Point 23	141	-6.1
Point 24	171.3	-6.3
Point 25	177.6	-6
Point 26	192.1	-3
Point 27	198.9	-1.8
Point 28	201	-1.8
Point 29	201	-0.5
Point 30	200	-5
Point 31	242	-13
Point 32	242	-47
Point 33	177.6	-13
Point 34	177.6	-47
Point 35	177.6	-70
Point 36	242	-70
Point 37	206.8	3.4
Point 38	214.8	2.7
Point 39	257.5	-4
Point 40	200	-47
Point 41	230.51765	-0.5
Point 42	242	-6.5
Point 43	310	-6.5
Point 44	200	-70

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.35	(196.936, -1.211)	12.9756	(212.666, 2.88676)	(184.313, -4.49457)
2	36265	1.63	(196.936, -1.211)	13.87	(213.2, 2.84)	(181.137, -5.15423)

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	184.7713	-4.7755315	121.05547	286.42515	0	209.6
2	Optimized	185.68885	-5.3374505	129.89415	359.10491	0	210.83
3	Optimized	186.7943	-6.014445	158.25082	431.50563	0	200.26
4	Optimized	187.8675	-6.6360085	194.55803	481.09951	0	201.46
5	Optimized	188.72055	-7.087065	221.67843	530.40744	0	202.41
6	Optimized	189.5736	-7.5381215	248.77811	579.72573	0	203.36
7	Optimized	190.5251	-8.00861	278.12662	617.0848	0	204.43
8	Optimized	191.57505	-8.4985295	309.42276	671.21868	0	205.6
9	Optimized	192.12835	-8.7567295	325.96015	699.68137	0	206.21
10	Optimized	192.4277	-8.89172	334.64023	710.21422	0	206.55
11	Optimized	193.27075	-9.2377225	357.99408	734.36227	0	207.49
12	Optimized	194.4149	-9.6862275	389.25774	784.70799	0	208.77
13	Optimized	195.5702	-10.09185	419.03075	823.11365	0	210.06
14	Optimized	196.73665	-10.454595	448.45982	878.28805	0	211.36
15	Optimized	197.71495	-10.72583	474.05409	899.15875	0	212.45
16	Optimized	198.505	-10.90555	493.86343	930.13784	0	213.33
17	Optimized	199.45	-11.120525	522.66504	956.65023	0	214.39
18	Optimized	200.25	-11.302515	426.54269	972.90424	0	214.85
19	Optimized	200.75	-11.41626	410.27821	983.4157	0	214.55
20	Optimized	201.0049	-11.47424	413.86882	1578.7057	0	214.4
21	Optimized	201.43245	-11.1856	395.72845	1271.1236	0	214.15
22	Optimized	202.2778	-10.606105	359.28658	1226.0469	0	213.64
23	Optimized	203.1232	-10.02661	322.80568	1180.9702	0	213.14
24	Optimized	203.9328	-9.44257	286.02983	1115.7097	0	212.66
25	Optimized	204.7066	-8.85399	248.96979	1070.0404	0	212.2
26	Optimized	205.5201	-8.203187	207.95544	1000.8373	0	211.71
27	Optimized	206.37335	-7.490161	163.0621	945.79975	0	211.21
28	Optimized	207.15975	-6.833031	121.64725	891.13062	0	210.74
29	Optimized	207.87925	-6.231797	83.77833	836.79143	0	210.31
30	Optimized	208.5724	-5.6246215	45.531918	763.70067	0	209.9
31	Optimized	209.3799	-4.8821075	-1.3052595	682.95951	0	223.3
32	Optimized	210.3281	-4.010196	-56.368205	590.92994	0	222.62
33	Optimized	211.222	-3.213775	-106.68052	518.87129	0	221.98
34	Optimized	212.06155	-2.492845	-152.21743	441.79563	0	221.38
35	Optimized	212.57345	-2.06619	-179.17029	2.0609341	0	221.02

Slices of Slip Surface: 36265

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	36265	181.66845	-5.347705	154.85636	263.15859	0	205.45
2	36265	182.51015	-5.654066	152.11163	304.81408	0	206.58
3	36265	183.33585	-5.954592	160.93871	337.99043	0	196.4
4	36265	184.36695	-6.3298735	179.89519	380.77922	0	197.55
5	36265	185.398	-6.705155	199.79039	423.56801	0	198.7
6	36265	186.42905	-7.080437	220.67897	466.3568	0	199.85