

An aerial photograph of the New Orleans skyline, with the city's skyscrapers visible in the background. In the foreground, a long, straight canal runs through a residential area with many trees and houses. The canal has several small bridges or culverts along its length. The sky is overcast.

U.S. ARMY CORPS OF ENGINEERS NEW ORLEANS DISTRICT

LONDON AVE. OUTFALL CANAL REEVALUATION FINAL REPORT

MARCH 2014

UPDATED: APRIL 2017



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

Table of Contents

Executive Summary	5
Introduction.....	7
Objective and Purpose	9
Existing Reports.....	10
Hydraulic Analysis of Water Surface Profiles	10
Average Low Water Surface Profile for Q-case Analysis:	13
Water Surface Profile for S-case Analysis:.....	13
Extreme Water Surface Profile:	14
Geotechnical Analyses.....	15
Global and Gap Stability Analyses P/S (ETL).....	16
Partial Gap Stability Analyses P/S (ETL).....	20
Rotational Analyses Using Corrected Passive Pressures (ETL 1110-2-575)	21
Alternate Extreme Water Surface Profiles Considered.....	23
FLAC	25
Seepage and Potential Erosion Concerns.....	31
Conclusions of High Water Analyses	35
Non-Hurricane Loading Cases.....	37
Flood Side Analysis with Low Canal Water.....	37
Flood Side Analysis with Low Canal Water and Tension Crack Search.....	42
Erosion along Canal Bottom	44
Flood Side and Protected Side S-Case Analysis with HSDRRS Default Values	45
Protected Side S-Case with GCAT Recommended Values	49
Floodside S-Case with GCAT Recommended Values.....	51
Conclusions of Non-Hurricane Loading Analysis	54
References.....	56
Appendices.....	58

List of Tables

Table 1: London Avenue Canal Levee Reach Locations.....	7
Table 2: West Side ETL Results	18

Table 3: East Side ETL Results	19
Table 4: Summary of Partial Gap Analysis in the MOWL Report	21
Table 5: Extreme Water Surface Profile Results	24
Table 6: Results of Deficient ETL Reaches and FLAC Analyses	28
Table 7: Open Connection Results.....	34
Table 8: West Side Floodside Q-Case with Extreme Low Canal Water at Elevation -2.9 Results	38
Table 9: East Side Floodside Q-Case with Extreme Low Canal Water at Elevation -2.9 Results.....	39
Table 10: Floodside Q-Case with Low Canal Water at Elevation -1 Results	41
Table 11: Floodside Q-Case with Low Canal Water at Elevation -1 Sudden Drawdown Results	42
Table 12: Floodside Q-Case with Low Canal Water Dry and Wet Tension Crack Results.....	43
Table 13: Floodside Q-Case with Low Canal Water Elevation -1 Erosion Results	44
Table 14: West Side S-Case using HSDRRS Default Values with Mean Canal Water at Elevation +0.4 Results.....	47
Table 15: East Side S-Case using HSDRRS Default Values with Mean Canal Water at Elevation +0.4 Results.....	48
Table 16: GCAT Recommended S-case design friction angles.....	49
Table 17: P/S S-Case Analysis with Mean Canal Water at Elevation +0.4 Using G-CAT Recommended Values with Cohesion above Phreatic Surface Results.....	50
Table 18: F/S S-Case Analysis with Mean Canal Water at Elevation +0.4 Using HSDRRS & G-CAT Recommended Values	53

List of Figures

Figure 1: 17th St Canal Profile	12
Figure 2: Orleans Ave. Canal Profile.....	12
Figure 3: London Ave. Canal Profile.....	13
Figure 4: London Ave. Canal Extreme Water Surface Profile	14
Figure 5: FLAC Factor of Safety versus Canal Water Elevation Results.....	29
Figure 6: FLAC Wall Deformation versus Canal Water Elevation Results.	30
Figure 7: Probabilities of Failure Based on Logarithmic Values of F	52

Appendices

APPENDIX A GLOBAL STABILITY ANALYSIS	59
APPENDIX B GAP STABILITY ANALYSIS.....	60
APPENDIX C ETL 1110-2-575 ROTATIONAL ANALYSIS WITH CORRECTED PASSIVE PRESSURES	61

APPENDIX D FAST LAGRANGIAN ANALYSIS OF CONTINUA (FLAC) RESULTS.....	62
APPENDIX E DOCUMENTATION OF CHANGES TO SOILS PROPERTIES.....	63
APPENDIX F THALWEG PROFILE.....	64
APPENDIX G MODIFICATION 11 REPORT	65
APPENDIX H SEEPAGE AND STABILITY WITH POTENTIAL CANAL EROSION.....	66
APPENDIX I SCOUR REPORT	67
APPENDIX J FLOODSIDE STABILITY ANALYSES.....	69
APPENDIX J.1 FLOODSIDE STABILITY ANALYSES WATER AT ELEVATION -2.9 RESULTS ..	70
APPENDIX J.2 FLOODSIDE STABILITY ANALYSES WATER AT ELEVATION -1 RESULTS	71
APPENDIX J.3 FLOODSIDE STABILITY ANALYSES SUDDEN DRAWDOWN RESULTS.....	72
APPENDIX J.4 FLOODSIDE STABILITY ANALYSES MODIFIED ETL REACH 27 RESULTS	73
APPENDIX J.5 FLOODSIDE STABILITY ANALYSES WITH TENSION CRACK SEARCH RESULTS	74
APPENDIX J.6 FLOODSIDE STABILITY ANALYSES WITH EROSION RESULTS.....	75
APPENDIX K S-CASE STABILITY ANALYSES.....	76
APPENDIX K.1 S-CASE STABILITY ANALYSES FOR FLOOD AND PROTECTED SIDE RESULTS	77
APPENDIX K.2 S-CASE STABILITY ANALYSES PROTECTED SIDE GCAT RESULTS.....	78
APPENDIX K.3 S-CASE STABILITY ANALYSES FLOOD SIDE GCAT RESULTS.....	79
APPENDIX L GEOTECHNICAL CRITERIA APPLICATIONS TEAM (GCAT) PAPER.....	80
APPENDIX M ELECTRONIC FILES.....	81
APPENDIX N LEVEE REACH LOCATIONS	82
APPENDIX O EXTREME WATER SURFACE PROFILE RESULTS.....	83
APPENDIX P METHOD OF PLANES (MOP) STABILITY ANALYSIS.....	84
APPENDIX P.1 METHOD OF PLANES (MOP) HIGH WATER Q-CASE STABILITY ANALYSIS ..	85
APPENDIX P.2 METHOD OF PLANES (MOP) FLOODSIDE Q-CASE STABILITY ANALYSIS	86
APPENDIX P.3 METHOD OF PLANES (MOP) PROTECTED SIDE AND FLOOD SIDE S-CASE STABILITY ANALYSIS	87

Executive Summary

London Avenue Canal is one of three outfall canals that provide discharge of surface water pumped from the City pump stations into Lake Pontchartrain. The London Avenue Canal is located east of the Orleans Canal and west of the Inner Harbor Navigation Canal (IHNC). The canal extends about 2.6 miles from Drainage Pump Station No. 3 to discharge at the Lake. A parallel protection system mainly consists of a low levee and an I-wall on both sides of the canal. Analyses conducted for the Maximum Operating Water Level Report (MOWL) dated March 2011, confirmed that most of the deficiencies along the London Ave. Canal were related to seepage and the I-wall gap formation. Critical reaches found through the MOWL Report were expeditiously remediated by June 2011.

This report was prepared to reevaluate existing conditions and to fully evaluate the London Avenue Canal risk reduction measures according to all HSDRRS criteria and the new I-wall Engineering Technical Letter (ETL) 1110-2-575 method. The ETL presented a new method of analysis for evaluating I-wall stability. Each reach was evaluated with this new method to determine the effect of the change. This reevaluation report also analyzes all non-hurricane load cases that were not addressed in the MOWL Report and to perform FLAC analyses on select reaches to confirm the ETL results and on typical sections not meeting the 4-foot maximum stickup criteria. Additionally, select reaches were evaluated for potential channel erosion with regards to seepage and stability due to the report by Royal Haskoning *Hydrodynamic Changes in London Ave. Canal due to the Permanent Pump Station and the Effects on Scour* dated October 2011, which pointed out channel bottom erosion as a potential threat to the canal.

The reevaluation resulted in the recommendation for additional remediation for six reaches, Reaches 7 (unremediated portion), 12, 14, 15, 16, and 35B. Two were found to be deficient under the ETL method and results were confirmed by FLAC, Reaches 12 and 35B. FLAC was also used to confirm the acceptable factors of safety and deflection for two previously remediated reaches (Reaches 30 and 36) and one reach not meeting the 4-foot maximum stick-up requirement (Reach 20). Five reaches were found to be deficient for seepage (Reaches 7 (unremediated portion), 14, 15, 16, and 35B). The six

reaches encompass approximately 3830 linear feet of risk reduction measures. The method for remediation for these reaches is the installation of a sheet pile cutoff wall offset five feet on the protected side of the existing I-wall, through the beach sand and embedded five feet into the underlying Bay Sound clay. After remediation work is complete, these reaches will meet the target water level of elevation +8 required for acceptable factors of safety for seepage and stability. Although results of some of the non-hurricane loading cases for the long-term drained condition show deficient factors of safety, none of the reaches are recommended for remediation due to past performance during the 50-plus year history showing no signs of long-term failure.

Subsequent to completion of all analysis, remediation work recommended herein was included in the OFC-07 contract. As of March 2015, recommended remediation work on all six reaches (7, 12, 14, 15, 16, and 35B) has been completed.

Introduction

London Avenue Canal is one of three outfall canals that provide discharge of surface water pumped from the City pump stations into Lake Pontchartrain. The London Avenue Canal is located east of the Orleans Canal and west of the Inner Harbor Navigation Canal (IHNC). The canal extends about 2.6 miles from Drainage Pump Station No. 3 to discharge at the Lake. A parallel protection system consists of a low levee and an I-wall on both sides of the canal with one section of an earthen levee. The floodwall and earthen levee reaches along the London Avenue Canal are defined in Table 1 and shown in plan view in Appendix N.

Table 1: London Avenue Canal Levee Reach Locations

WEST REACH	WALL TYPE OR LEVEE	WEST BASELINE APPROXIMATE STATION	EAST REACH	WALL TYPE OR LEVEE	EAST BASELINE APPROXIMATE STATION
1	I-wall	2+44 to 10+00	20	I-wall	1+57 to 6+30
2	I-wall	10+00 to 12+21	21	I-wall	6+30 to 10+00
GENTILLY BRIDGE		12+21 to 13+88	22	I-wall	10+00 to 11+85
2	I-wall	13+88 to 21+00	GENTILLY BRIDGE		11+85 to 13+55
3	I-wall	21+00 to 33+00	22	I-wall	13+55 to 21+00
4	I-wall	33+00 to 37+00	23	I-wall	21+00 to 24+00
5	I-wall	37+00 to 40+00	24	I-wall	24+00 to 33+00
6A	I-wall	40+00 to 47+00	25	I-wall	33+00 to 37+00
6B	I-wall	47+00 to 59+00	26A	I-wall	37+00 to 47+00
7	I-wall	59+00 to 66+00	26B	I-wall	47+00 to 48+50
8	I-wall	66+00 to 69+06	27	I-wall	48+50 to 58+50
MIRABEAU BRIDGE		69+06 to 70+18	28	I-wall	58+50 to 68+12
9	I-wall	70+18 to 74+00	MIRABEAU BRIDGE		68+12 to 69+09
10	I-wall	74+00 to 79+50	29	I-wall	69+09 to 70+50
11	I-wall	79+50 to 84+81		T-wall	70+50 to 74+13
FILMORE BRIDGE		84+81 to 85+60	30	I-wall	74+13 to 76+90
12A	I-wall	85+60 to 89+50	31	I-wall	76+90 to 83+73
12B	I-wall	89+50 to 93+00	FILMORE BRIDGE		83+73 to 84+41
13	I-wall	93+00 to 96+00	32	I-wall	84+41 to 90+00
14	I-wall	96+00 to 100+28	33	I-wall	90+00 to 93+00
15	I-wall	100+28 to 104+00	34	I-wall	93+00 to 99+53
16	I-wall	104+00 to 112+50	PUMPING STATION NO. 4		99+53 to 102+42
	T-wall	112+50 to 118+90	35A	I-wall	102+42 to 103+50
17	I-wall	118+90 to 119+63	35B	I-wall	103+50 to 114+66
ROBERT E LEE BRIDGE		119+63 to 120+29		L-wall	114+66 to 119+33
18A	Levee	120+29 to 122+00	ROBERT E LEE BRIDGE		119+33 to 120+39
18B	Levee	122+00 to 125+80	36	I-wall	120+39 to 126+67
LEON C SIMON BRIDGE		125+80 to 129+40	LEON C. SIMON BRIDGE		126+67 to 129+03
19	Levee	129+40 to 137+90	37	Levee	129+03 to 137+60

Analyses conducted for the Maximum Operating Water Level (MOWL) Report dated March 2011, confirmed that most of the deficiencies along the London Ave. Canal were related to seepage and the I-wall gap formation. Critical reaches found through the MOWL Report dated March 2011, were expeditiously remediated in 2011. Remedial construction consisted of a steel sheet pile cutoff installed 5 feet toward the protected side of the existing I-wall in the levee embankment crest through the beach sand and embedded five feet into the underlying Bay Sound clay. Remediated Reaches 10, 11, 30, 31, 32, 33, 34, and 35A included a concrete cap and slab abutting up to the existing I-wall while remediated Reaches 7, 8, 13, 27, 28, and 36 were constructed without a concrete cap. Heave analyses dictated which reaches received a cap and which did not. All physical construction was completed in June 2011.

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. The method of analysis involved conservatively neglecting the sheet pile with regards to translational stability as an intermediate step to determine if the sheet pile is required to satisfy global 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. 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 to the new ETL 1110-2-575 (ETL) method.

Additionally, a letter report was completed in October 2011, entitled *Hydrodynamic Changes in London Ave. Canal due to the Permanent Pump Station and the Effects on Scour* that evaluated the hydrodynamics of the canal. The report, shown in Appendix I, indicated that scour in the channel bottom could pose a threat to the canal. Reaches in the MOWL report not considered having an open connection to the beach sands due to having a 2 foot or greater blanket cover of either marsh or silty sand were evaluated as part of a modification report as having an open connection to the beach sand due to effects of the potential erosion cited in the *Hydrodynamic* October 2011 report. This modification report,

Modification 11 Report, dated February 2011, revealed that Reaches 6A, 7, 8, 12B, 14, 17, 26A and 28 could potentially have a blanket cover less than 2-feet. Originally, Reach 12A was already considered having an open connection to the beach sand in the MOWL report, and Reach 12B had a closed connection. Based on the results of the thalweg profile line and Modification 11, Reach 12B was considered to have an open connection. Reach 12A and 12B were analyzed in this report as separate reaches, but for remediation they are considered one reach, Reach 12, due to both reaches having an open connection to the beach sands. As a result of the thalweg findings, this Reevaluation report also evaluated potential scour effects on I-Wall stability and seepage.

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. Past performance includes no sliding or sloughing of the canal slopes, no rotational failure of the I-wall, and no global failure of the I-wall/levee embankment. The non-hurricane loading cases were analyzed as part of this reevaluation report and include flood side stability analyses with an average low water condition (undrained condition) and S-case (drained condition) analyses with normal water conditions for both flood side and protected side. These S-case (drained condition) cases are considered for long-term conditions, and are named for the slow (S) time with which it would take for such conditions to occur.

Objective and Purpose

This report was prepared to reevaluate existing conditions and to fully evaluate the London Avenue Canal risk reduction measures according to all HSDRRS criteria and the new I-wall Engineering Technical Letter (ETL) 1110-2-575 method. In addition, the Fast Lagrangian Analysis of Continua (FLAC) was performed on selected reaches not meeting the maximum ETL requirements of stickup. This report is intended to identify any areas along the London Avenue 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 as well as the non-hurricane loading cases.

Existing Reports

In addition to the MOWL Report, other major design reports published on this canal include: *Lake Pontchartrain, La. And Vicinity, Lake Pontchartrain High Level Plan, Design Memorandum No. 19A, General Design, London Avenue Outfall Canal*, dated January 1989 and supplements to this report that presented detailed design elements. The supplements covered detailed designs for the parallel protection high level plan, fronting protection for pumping stations No. 3 and 4, and flood proofing of bridges at Gentilly Blvd., Mirabeau Ave., Filmore Ave., Robert E. Lee Blvd., and Leon C. Simon Blvd. A complete list of all referenced reports is included at the end of this report.

Hydraulic Analysis of Water Surface Profiles

To provide the “usual” water surface profile along each outfall canal (17th Street, London Avenue, and Orleans Avenue), 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) and Jefferson Parish Drainage Department pumping stations and any upgrades per the 2010 capital improvement plan. For 17th St. Outfall Canal, the nominal discharge into the canal is a combination of the S&WBNO pumping stations DPS6, I-10, the Jefferson Parish Drainage Department Canal St. pumping station, plus 2000 cubic feet per second (cfs) planned for DPS6 for a total of 12,500 cfs. For London Ave. Outfall Canal, the nominal discharge is delivered from the S&WBNO DPS3 and DPS4, plus 1000 cfs at DPS4 as outlined in the 2010 capital improvement plan for a total of 8980 cfs. Finally, Orleans Ave. Outfall Canal 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', 4', and 3' for 17th St., Orleans Ave., and London Ave, respectively without violating the prescribed maximum operating water level (MOWL). The prescribed MOWL for 17th St is +10 feet, 2100 feet northward of DPS6, then +8 feet from DPS6 to the current location of the Interim Control Structure (ICS). Orleans Ave. prescribed MOWL is +8' from DPS7 to the current location of the ICS. Finally, London Ave. prescribed MOWL is +9 feet, 2000 feet northward of DPS3, then +8' from DPS3 to the current location of the 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 for each of the canals, including all crossings, was provided by recent hydrographic and topographic surveys. Calibration and verification of the models was performed by using the S&WBNO and Jefferson Parish Drainage Department's pumping records for recent rainfall events, with associated lake stages. Each 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, each canal's HEC-RAS model was run using its maximum nominal discharge and its appropriate lake stage. For example, the 17th St. canal model uses three upstream hydrographs, one for DPS6, one for I-10 and one for Canal St. and a constant downstream boundary at Lake Pontchartrain of +4'. The usual water surface profiles for all three outfall canals are shown below in Figures 1, 2, and 3 and the profiles have been adjusted to reflect model uncertainty.

17th St. Outfall Canal S&WB & JP Input - 12500 cfs

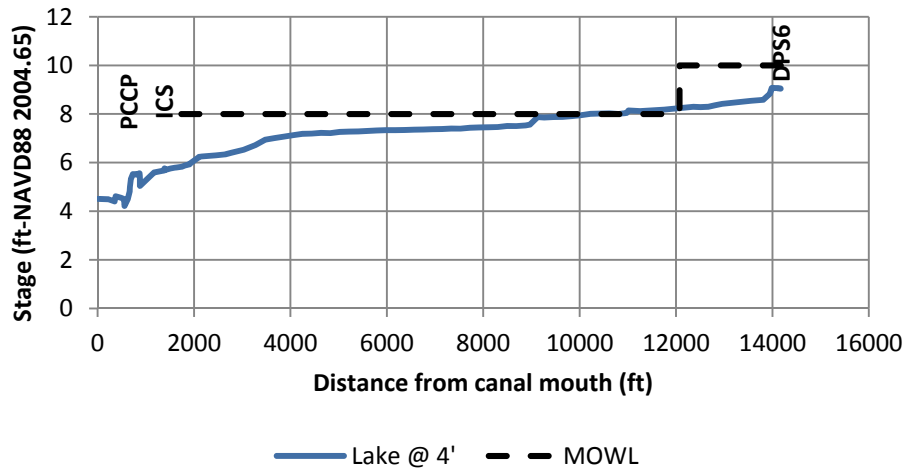


Figure 1: 17th St Canal Profile

Orleans Ave. Outfall Canal S&WB Input - 2700 cfs

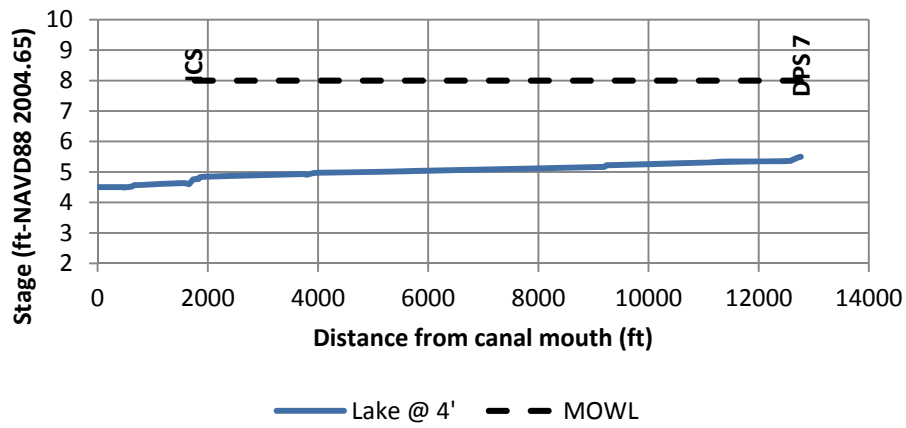


Figure 2: Orleans Ave. Canal Profile

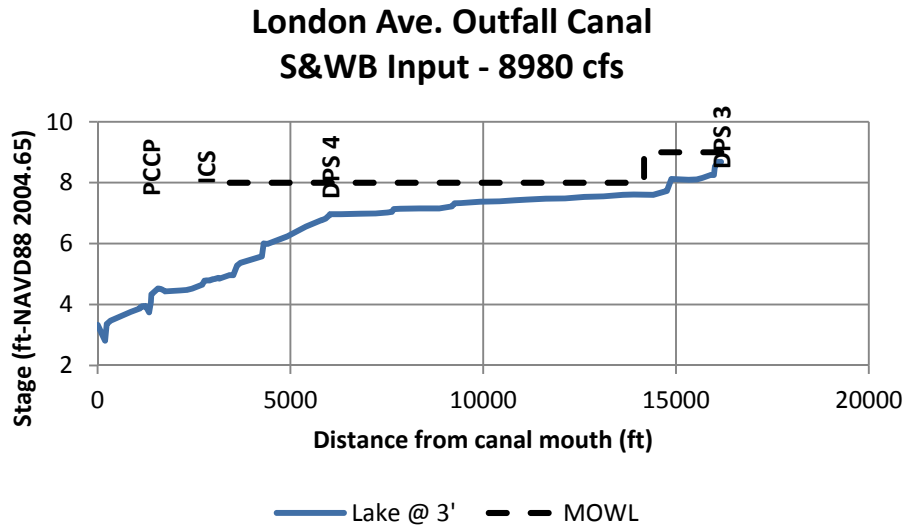


Figure 3: London Ave. Canal Profile

Average Low Water Surface Profile for Q-case Analysis:

For the Q-case analysis, an average low water level was needed for each of the three outfall canals. The NOAA New Canal Station 8761927 gage was used to compute the average low water. The average low water in the Lake along the south shore, excluding all tropical events, is -0.8'. Including tropical events, the average low water in the Lake along the south shore is -0.7'. This number is determined by averaging the monthly minimum observations for the period of record. The new PCCP's prescribed operation, as referenced in "Request for Proposal (RFP) for the Permanent Canal Closures and Pump Stations (PCCP) Revision S, June 2012; Section 01010, Article 3.1.11, pg. 13" allows the pump station operator to draw down the outfall canal to elevation -1.0'. Based on the prescribed operation, an elevation of -1.0' was provided as the elevation for the floodside Q-case low water level analysis.

Water Surface Profile for S-case Analysis:

For the S-case analysis, a mean water level was needed for each of the three outfall canals. The mean water level for the Lake Pontchartrain south shore is based upon analysis of historical data. Due to the proximity of the USACE West End gage to the outfall canals, the mean water level for all canals is based

off of this gage and an assumed elevation of +0.39' was provided as the elevation for the S-case analysis for normal water levels.

Extreme Water Surface Profile:

For the “extreme” water surface profile, the HEC-RAS model was used to simulate conditions at the PCCP similar to what happened in 2012 during Hurricane Isaac at 17th St Canal ICS, where water levels exceeded usual standards, and the peak stage rose to 6.0 ft. The model assumes an uncertainty of 0.5 ft, and the two upstream Orleans Parish pumping stations are producing their nominal capacity.

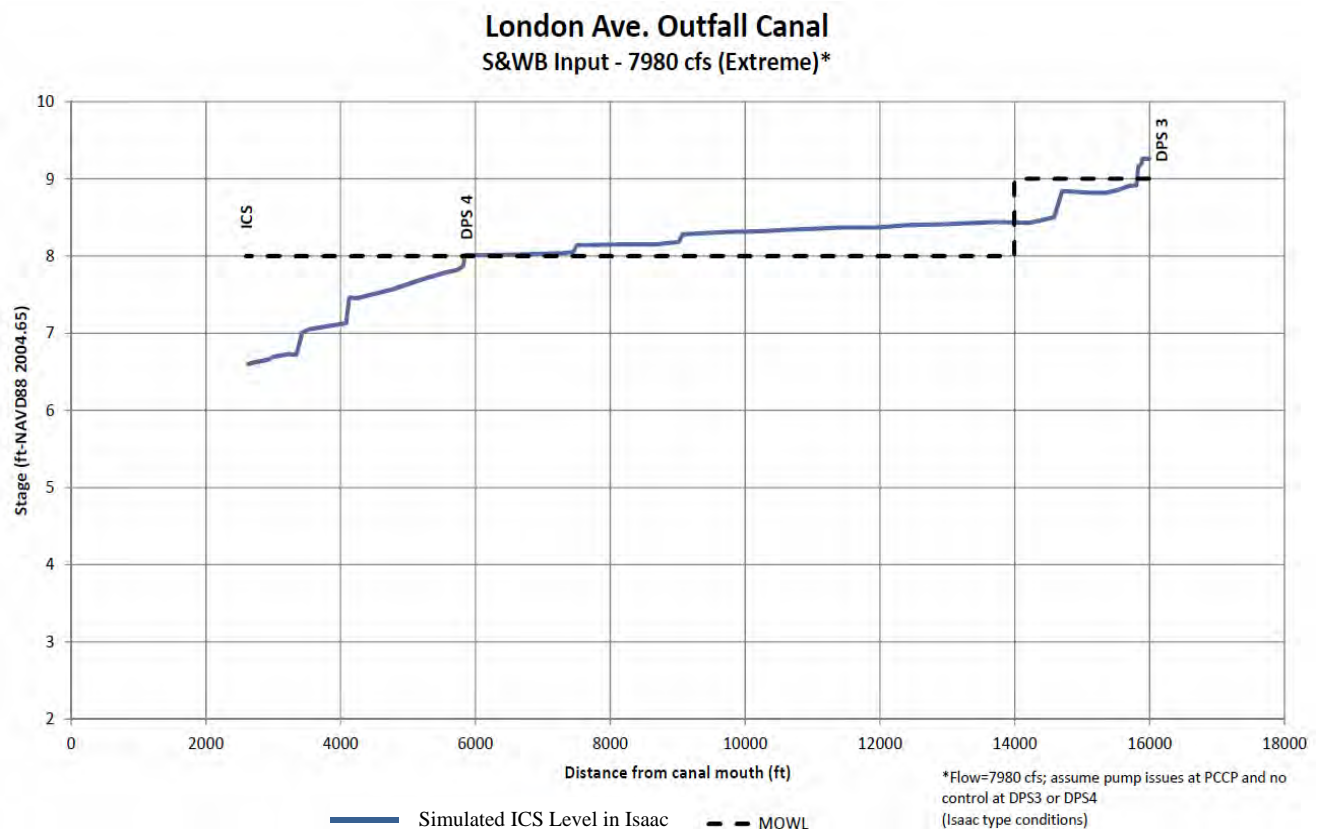


Figure 4: London Ave. Canal Extreme Water Surface Profile

Geotechnical Analyses

The geotechnical data used in this study were obtained from the MOWL Report (March 2011) for all reaches unless specified herein. No additional laboratory investigations were conducted for the analyses performed in this report. The geotechnical data for each reach are included in Appendix B of the MOWL Report (March 2011). Changes were made to the soil properties for Reach 7. The A-E's files had the unit weights at the levee toe as 104 pcf for the fill and 90 pcf for the lower marsh layers. These unit weights were both corrected to 96 pcf to match the MOWL Report (March 2011) strength line. Changes were also made to the canal bottom soil properties for Reaches 14 and 15. The A-E's files had the open connections going to the silty sand rather than the beach sand aquifer. Reaches 14 and 15 were changed to run with the open connection to the beach sand aquifer.

No additional surveys were conducted for the analyses performed. Cross sections as developed in the MOWL Report (March 2011) were utilized in this report and were based on surveys performed from December 2009 thru March 2010. Surveyed cross sections were taken approximately every 100 feet along the baselines on each side of the canal. Within the canal, the cross section grades were obtained from multi-beam bathymetry contours. The survey cross sections are included in Appendix A.4 of the MOWL Report (March 2011) on Plates 73 thru 92.

The target factor of safety required under the ETL process is based upon the Maximum Operating Water Level as outlined in the Permanent Canal Closure and Pumps criteria. The target water level of El. +8 was used for most reaches, and El. +9 was used for Reaches 1, 2, 20, 21, and 22 (reaches near PS #3). When the pumping system is in operation at full capacity and with a lake elevation +3, a water surface profile will be created. This water surface profile will be below the maximum operating water level as seen in the figure in the Hydraulic section of this report. A more detailed presentation of this is included in the Hydraulic Analysis of Water Surface Profiles section of this report. The required factor of safety of 1.5 was used for the Spencer's Analysis for the global, gap, corrected rotation, and FLAC analyses.

Global and Gap Stability Analyses P/S (ETL)

Because methods for determining gap depths are considered approximate, global stability needs to be checked for the no-gap, full-gap and possibly the partial gap conditions. Under the no-gap and full-gap conditions, stability is performed assuming either no flood-side gap develops or that a gap will extend to either the bottom of the sheet piling or to the bottom of the fine-grained material, whichever is shallower. Under these conditions, the reinforcing effect of the sheet pile is neglected, and potential slip surfaces are allowed to pass through the sheet-pile location for the initial conservative analysis. If these two conditions are satisfied for global stability, the global stability analysis is complete. If global stability is not satisfied when the sheet-pile effect is neglected (conservative analysis), a partial gap stability procedure, in accordance with HSDRRS guideline procedures, will be used to determine the global stability factor of safety considering the effects of the sheet pile. The results of this analysis are I-wall/embankment global stability factors of safety. Partial gap stability was not performed for this report because it was previously analyzed in the study *Lake Pontchartrain and Vicinity Hurricane Protection Project Maximum Operating Water Level (MOWL) for London Avenue Canal*, dated March 2011. The partial gap stability analysis performed in the MOWL Report (March 2011) was found to be satisfactory ($FoS > 1.4$) for water at or above elevation +8 for applicable reaches. The results of the full gap and no-gap analyses for the ETL do not reflect the true global factor of safety since the sheet pile was neglected for this intermediate step. However, as stated previously, if the factors of safety are above the required minimum with neglecting the sheet pile (conservative analysis), then it is deemed acceptable and the partial gap analysis is not required. These analyses were conducted using both Spencer's Method and the Method of Planes (MOP) and both utilized the pore pressures developed from gap development (by Seep/W analyses). Method of Planes was run as a design check in accordance with HSDRRS design guidelines and included a full search for the critical failure surface per stratum.

The initial conservative global stability analyses, neglecting the sheet pile reinforcement, were performed on all reaches for target water elevation +8. Out of 39 I-wall reaches, nine reaches were determined to be below the target factors of safety of 1.5 for Spencer's analysis. The nine reaches were 12A, 12B, 30, 31, 33, 34, 35A, 35B, & 36. The low global Spencer's factors of safety range from 1.21 to 1.46 for this initial conservative analysis not including effects of the I-wall sheet pile or the sheet pile installed during remediation. For the MOP analyses, four reaches were found to be below the 1.3 factor of safety for this conservative analysis not including the effect of the sheet pile. Those four were Reaches 30, 34, 35A, and 35B, and the factors of safety range from 0.94 to 1.26 for this initial conservative analysis. MOP was not run on Reaches 14 and 15 with the open connection changes and MOP results are therefore not included in the tables of results. Results for all reaches are shown on Tables 2 and 3 for the west and east sides, respectively. Graphical plots and output reports from Spencer's Method are presented in Appendix A, and graphical plots from MOP are presented in Appendix Q.1.

Initial conservative gap stability analyses, neglecting the sheet pile reinforcement, were performed on all reaches and pore pressures for the gap were utilized just as they were for the global stability analysis. Out of the 39 total I-wall reaches, 15 reaches were determined to be below the target factors of safety of 1.5 for Spencer's analysis. The 15 reaches were 6A, 10, 12A, 12B, 14, 15, 16, 30, 31, 32, 33, 34, 35A, 35B, and 36. The low gap Spencer's factors of safety range from 0.82 to 1.41. For the MOP analyses, twelve reaches were found to be below the 1.3 factor of safety for this conservative analysis not including the effect of the sheet pile. The deficient MOP reaches were the same as the Spencer's analysis except for Reaches 6A which had a MOP factor of safety of 1.91. MOP was not run on Reaches 14 and 15 with the open connection changes and MOP results are therefore not included in the tables of results. The low MOP factors of safety range from 0.81 to 1.26. Results for all reaches are shown on Tables 2 and 3 for the west and east sides, respectively. Graphical plots and output reports from Spencer's Method are presented in Appendix B and graphical plots from MOP are presented in Appendix Q.1.

Table 2: West Side ETL Results

London Ave. Outfall Canal Reevaluation Report West Side ETL Results Water Elevation +8 ⁴												
Reach	Remediated ⁵	Non - Remediated	Sheet Pile Tip EL.		¹ Initial Global Stability Analysis w/ Gap Pore Pressures (neglecting sheet pile in analysis) B-4 Section d		¹ Full Gap Stability Analysis (neglecting sheet pile in analysis) B-4 Section d		⁵ Rotational Analysis (corrected for incorrect passive pressures) B-4 Section c			
			L-Wall	Remedial	Slope/W	MOP	Slope/W	MOP	FoS Prior To Correction	FoS After Correction	Passive Correction	Failure Plane EL.
1		X	-17.3		3.03	2.71	3.65	3.60	2.30	N/A ²	N/A ²	-6.5
2		X	-17.3		3.20	2.76	3.75	3.06	3.91	2.33	228	-5.8
3		X	-13.3		3.15	2.9	4.31	3.71	9.13	5	208	-5
4		X	-13.4		2.86	2.66	3.64	3.36	9.41	4.91	219	-4.7
5		X	-13.3		3.23	2.64	3.35	2.64	4.15	3.14	157	-8.7
6A		X	-13.2		1.91	1.77	1.34	1.91	6.10	3.29	155	-7.2
6B		X	-13.2		2.78	2.74	2.40	2.55	5.84	2.86	258	-6.5
7		X	-17.2		2.16	2.12	1.91	1.77	4.19	2.33	224	-10.5
7	X		-17.2	-51	2.61	2.37	2.29	2.14	4.19	2.39	222	-9.4
8	X		-17.2	-51	2.87	2.99	2.55	2.18	5.79	2.88	311	-7
9		X	-17.7		2.73	2.51	2.39	2.08	5.11	2.48	355	-11
10	X		-17.5	-55	2.05	1.65	1.34	1.26	4.36	1.55	543	-11.5
11	X		-17.5	-55	2.12	1.95	1.84	1.83	3.47	1.75	302	-8.6
12A		X	-15.5		1.41	1.53	1.25	1.22	2.13	1.35	213	-12.5
12B		X	-15.5		1.39	1.43	1.25	1.16	5.40	1.61	462	-8.8
13	X		-15.5	-56	1.79	1.69	1.53	1.38	5.03	1.74	538	-8.5
14		X	-15.5		1.71	N/A ³	1.41	N/A ³	4.34	1.62	481	-6.3
15		X	-17.5		1.66	N/A ³	1.28	N/A ³	3.96	1.9	401	-10.7
16		X	-17.4		1.50	2.18	1.23	1.24	2.73	1.31	433	-10
17		X	-17.5		2.20	1.42	1.86	1.68	9.60	2.10	468.5	-3.5

1. Factors of Safety are not the true system Global Stability Factors of Safety. These values are conservative and the intermediate step as part of ETL 1110-2-575.

2. Passive pressure correction not required since CWALSHT passive force is less than Slope /W passive force.

3. MOP analysis was not performed with open connection changes because reach already required remediation due to seepage deficiencies.

4. Water elevation +9 for Reaches 1 and 2.

5. The rotational analysis for the remediated reaches did not include the larger and longer sheet pile in the analysis.

Table 3: East Side ETL Results

London Ave. Outfall Canal Reevaluation Report East Side ETL Results Water Elevation +8 ⁴												
Reach	Remediated ⁵	Non -Remediated	Sheet Pile Tip EL.		¹ Initial Global Stability Analysis w/ Gap Pore Pressures (neglecting sheet pile in analysis) B-4 Section d		¹ Full Gap Stability Analysis (neglecting sheet pile in analysis) B-4 Section d		⁵ Rotational Analysis (corrected for incorrect passive pressures) B-4 Section c			
			I-Wall	Remedial	Slope/W	MOP	Slope/W	MOP	FoS Prior To Correction	FoS After Correction	Passive Correction	Failure Plane EL.
20		X	-17.6		2.98	2.60	2.48	1.97	2.20	N/A ²	N/A ²	-6
21		X	-17.3		2.35	2.27	3.54	3.52	2.74	N/A ²	N/A ²	-8
22		X	-17.2		2.51	2.58	3.68	3.07	3.14	N/A ²	N/A ²	-6.5
23		X	-13.2		3.75	3.37	4.68	3.85	8.11	5.12	140	-7
24		X	-13.3		2.67	X ³	3.28	X ³	6.03	3.30	195	-6.9
25		X	-19.3		2.60	2.37	3.17	2.69	8.36	2.87	416	-8
26A		X	-19.3		2.14	1.99	2.14	X ³	3.96	2.49	127	-7.6
26B		X	-19.3		2.13	1.99	2.10	2.37	4.66	3.06	188	-6.9
27	X		-19.3	-49	1.77	1.46	1.56	1.38	3.50	1.86	255	-7.7
28	X		-21.6	-52,-57	1.82	1.62	1.53	1.39	4.52	1.88	449	-12.2
29		X	-21.6		1.98	1.93	1.64	1.44	17.50	2.39	672	-13.1
30	X		-17.5	-60	1.21	1.18	0.99	0.86	2.88	1.23	413	-10
31	X		-17.4	-55	1.26	1.31	1.04	0.98	3.21	1.55	503	-12
32	X		-29.9	-55	1.70	1.66	1.34	1.21	2.57	1.66	328	-11
33	X		-29.8	-55	1.40	1.40	1.02	0.83	3.45	1.35	689	-11
34	X		-21.5	-55	1.34	0.94	1.04	1.22	2.03	1.19	313	-14
35A	X		-21.5	-53	1.46	1.26	1.08	0.91	2.68	1.36	363	-12
35B		X	-21.5		1.19	1.20	0.82	0.81	1.94	1.08	407	-12
36	X		-15.5	-50	1.40	1.30	0.98	0.93	2.01	1.08	208	-10.5

1. Factors of Safety are not the true system Global Stability Factors of Safety. These values are conservative and the intermediate step as part of ETL 1110-2-575.

2. Passive pressure correction not required since CWALSHT passive force is less than Slope /W passive force.

3. MOP analysis was not performed.

4. Water elevation +9 for Reaches 20, 21 and 22.

5. The rotational analysis for the remediated reaches did not include the larger and longer sheet pile in the analysis.

Partial Gap Stability Analyses P/S (ETL)

For reaches found to be deficient in the initial global and 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. A summary of the results for only the reaches deficient in this reevaluation are shown in Table 4. 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 met or exceeded the minimum required factor of safety for Spencer's Method for the target water level of +8 except for Reaches 30 and 31. Reaches 30 and 31 had to have the water levels lowered to El. +7.5 in order to meet the required minimum factor of safety of 1.4 that was used for Spencer's Analysis in the MOWL Report. However, both of these reaches were remediated as part of the URS Group Design Documentation Report (DDR) dated April 2011. Both reaches were also analyzed in the DDR for the remediation in-place and found to have acceptable factors of safety for this partial gap analysis. Reach 30 was evaluated in this report using FLAC with the remedial sheet pile cut-off included and the factor of safety was found to be sufficient, ($FOS > 1.50$). All deficient reaches from the initial global and full-gap analyses neglecting sheet pile effect met or exceeded the minimum partial gap required factor of safety of 1.3 for the MOP analysis for the target water level of +8, except for Reaches 31 and 35A. Reaches 31 and 35A had to have the water levels lowered to El. +6.5 and El. +7.5, respectively, in order to meet the required minimum factor of safety of 1.3 that was used for MOP in the MOWL Report. Both of these reaches were remediated and were also analyzed in the DDR (April 2011) for the remediation in-place and found to have acceptable factors of safety for this partial gap analysis.

Table 4: Summary of Partial Gap Analysis in the MOWL Report

Partial Gap Analysis Results for Reaches with FoS Less Than Target Values for Global and/or Full Gap Analysis								
Reach	Remediated	Non-Remediated	Sheet Pile Tip EL. ft.	Partial Gap EL. ft.	Spencer's Analysis		MOP Analysis	
					Water Elev. ft.	FoS**	Water Elev. ft.	FoS**
6A		X	-13.2	-10.0	10.00	2.25	10.00	1.89
10	X		-17.5	-11.5	8.50	1.51	9.00	1.33
12A		X	-15.5	-8.7	10.00	1.44	9.50	1.36
12B		X	-15.5	-8.7	10.00	2.15	10.00	2.57
14*		X	-15.5	-6.9	10.00	2.92	10.00	2.54
15*		X	-17.5	-12.0	10.00	2.17	10.00	2.21
16		X	-17.4	-12.0	10.00	2.18	10.00	1.97
30	X		-17.5	-12.0	7.50	1.44	8.00	1.34
31	X		-17.4	-8.8	7.50	1.45	6.50	1.30
32	X		-29.9	-14.0	10.00	2.19	10.00	1.99
33	X		-29.8	-7.0	10.00	2.21	10.00	1.99
34	X		-21.5	-14.0	9.00	1.44	8.00	1.34
35A	X		-21.5	-12.0	9.00	1.44	7.50	1.41
35B		X	-21.5	-12.0	10.00	2.35	10.00	1.95
36	X		-15.5	-6.9	10.00	2.33	10.00	2.10

*Reaches 14 and 15 were analyzed with closed condition.

**Factors of safety do not include the remedial sheet pile.

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

All 39 reaches were evaluated for the potential rotational failure mechanism. The procedure for this analysis involved applying various floodside loads to the I-wall for the full-gap case, which was the controlling case from the intermediate step (global and gap analyses). The optimized failure surface was loaded with a series of increasing triangular- shaped distributed loads acting normal to the I-Wall to evaluate the response of the factor of safety using Spencer's method. A graph of the applied loads versus the resulting factors of safety was plotted. The factor of safety was evaluated for the existing I-wall without any correction applied to determine the maximum extent of the factor of safety using CWALSHT. The factor of safety in CWALSHT is found using the analysis mode that results in a calculated sheet pile tip at the correct elevation. The ETL procedure, outlined in Section B-4.c.4.b, states that when evaluating existing I-walls, the factor of safety for the active pressure will be 1.0 and the factor

of safety for passive pressure will be solved by CWALSHT. However, the New Orleans District standard procedure is to set the active pressure equal to the passive pressure and solve for both using CWALSHT. This is done for conservatism. CWALSHT was then used to calculate the passive load from the ground surface to the critical failure surface, as determined from the gap analysis using Spencer's Method neglecting the sheet pile. This ETL procedure adjusts the passive pressures in CWALSHT to compute factors of safety against rotation more accurately. The previously developed load versus factor of safety graph for the full-gap analysis was used to determine the passive load at this factor of safety. If the passive load from the Spencer's curve was less than the passive load calculated from the CWALSHT run at the elevation associated with the critical failure surface, then a correction was applied. In almost all cases, the passive pressures developed from the Slope /W curve were lower than the passive pressures computed by CWALSHT. The correction was then calculated as the difference between these forces and applied as a uniformly distributed load from the protected side ground surface elevation to the critical failure surface intersecting elevation at the sheet pile. Therefore, the passive reduction was actually modeled as a loading increase on the driving side and the factor of safety was found for the existing I-wall sheet pile tip elevation using CWALSHT. The resulting factor of safety from this analysis was then evaluated using the loads from the Spencer's graph and this process was used again in an iterative fashion until the resulting factor of safety and the loading from the Spencer's graph did not change. In some cases, the factor of safety corresponding to the existing sheet pile tip would not converge at the appropriate elevation. In these cases, the CWALSHT analyses would converge at a deeper sheet pile tip elevation than the actual existing sheet pile tip elevation. The factor of safety sensitivity in these cases is 0.01, meaning if the factor of safety was decreased by 0.01, the calculated sheet pile tip would be too shallow. In these cases, the factor of safety that would yield the deeper tip elevation was used.

The ETL analysis was performed on all I-wall reaches for a factor of safety of 1.5 with water level of El. +8.0 for most reaches and El. +9.0 for Reaches 1, 2, 20, 21, and 22 (reaches near PS #3). Out of 39 total I-wall reaches, eight reaches were determined to be below the target factor of safety. The eight reaches

were 12A, 16, 30, 33, 34, 35A, 35B, and 36. All ETL factors of safety are shown on Tables 2 and 3 for the west and east sides, respectively under the heading, “Rotational Analysis”. Both the prior to correction and the after correction factors of safety are shown along with the applied uniform loading used for the correction. The low factors of safety range from 1.08 to 1.36. It is important to point out that these analyses do not take into account any sheet piling that may be present in these reaches as a result of the 2011 remediation work. In fact, six of these eight reaches (Reaches 30, 33, 34, 35A, 35B & 36) were remediated in 2011 with the installation of a sheet pile cut-off. The additional sheet pile will increase the factor of safety as seen in the FLAC analyses. Graphical plots and output reports are presented in App C.

Alternate Extreme Water Surface Profiles Considered

Hurricane Isaac came ashore in August 2012. During this time, water levels exceeded those of the usual working conditions at 17th St Canal. This situation was simulated for London Ave Canal and based on the extreme water surface profile provided by MVN H&H branch (see figure 4). Two reaches were chosen to be run with a water surface profile +0.4 feet above the MOWL elevation in the canal, which was the highest differential from the water level analyzed. This made the water level elevation +8.4 in both analyses. The two reaches chosen were Reaches 6A and 26A due to their low global, gap, and ETL factors of safety in the initial analyses, with water at elevation +8.0. Global, gap, and rotational analyses were performed for these two reaches with the extreme water surface profile. Reach 6A initial conservative gap analysis, neglecting sheet pile, has a 1.19 factor of safety for the extreme water surface. Partial gap performed in accordance with HSDDRS guidelines was analyzed at water el +10.00 in the MOWL report and found to have an acceptable factor of safety. Seepage was not performed for these reaches as they were done at water levels higher than 8.4 in the original MOWL analyses with satisfactory results. Reach 6A had a factor of safety of 2.62 at water level 10.00 for seepage and Reach 26A had a factor of safety of 1.90 at water level 10.0 for seepage. Reanalysis for the other reaches at the extreme water level were not deemed necessary. Results can be seen in Table 5 below.

Table 5: Extreme Water Surface Profile Results

Reach	Rem	Non-Rem	Extreme WSP ⁴					WL8 ¹			Seepage ²		FLAC					
								Global	Gap	Rotational			WL8		WL9		Extreme WP Avg	
			Max	Min	Avg	Water EL Analyzed	Diff	FoS	FoS	FoS	FoS	WL	FoS	Disp (in.)	FoS	Disp (in.)	FoS	Disp (in.)
3		X	8.40	8.40	8.40	8.00	0.40	3.15	4.31	5.00	N/A	10.00						
4		X	8.40	8.40	8.40	8.00	0.40	2.86	3.64	4.85	N/A	10.00						
5		X	8.40	8.40	8.40	8.00	0.40	3.23	3.35	3.14	1.93	10.00						
6A ⁵		X	8.40	8.40	8.40	8.40	0.40	1.79	1.19 ³	3.46	2.62	10.00						
6B		X	8.40	8.30	8.35	8.00	0.35	2.78	2.40	2.86	1.62	8.00						
7	X		8.30	8.30	8.30	8.00	0.30	2.61	2.29	2.39			3.17	0.39	2.67	0.56	3.02	0.44
8	X		8.30	8.20	8.25	8.00	0.25	2.87	2.55	2.88								
9		X	8.20	8.20	8.20	8.00	0.20	2.73	2.39	2.48	1.62	9.50	2.63	0.71	2.21	1.04	2.55	0.78
10	X		8.20	8.16	8.18	8.00	0.18	2.05	1.34	1.55								
11	X		8.16	8.08	8.12	8.00	0.12	2.12	1.84	1.75								
12	X		8.02	8.00	8.01	8.00	0.01	1.41	1.25	1.35			1.73	0.99	1.6	1.24	1.73	0.99
23		X	8.40	8.40	8.40	8.00	0.40	3.75	4.68	5.12	N/A	10.00						
24		X	8.40	8.40	8.40	8.00	0.40	2.67	3.28	3.30	N/A	10.00						
25		X	8.40	8.40	8.40	8.00	0.40	2.60	3.17	2.87	N/A	10.00						
26A ⁵		X	8.40	8.40	8.40	8.40	0.40	2.01	1.97	2.62	1.9	10.00						
26B		X	8.40	8.40	8.40	8.00	0.40	2.13	2.10	3.06	1.67	10.00						
27	X		8.40	8.30	8.35	8.00	0.35	1.77	1.56	1.86								
28	X		8.30	8.20	8.25	8.00	0.25	1.82	1.53	1.88								
29		X	8.20	8.20	8.20	8.00	0.20	1.98	1.64	2.39	4.78	10.00						
30	X		8.20	8.19	8.20	8.00	0.20	1.21	0.99	1.23			1.45	0.85	1.40	1.24	1.44	0.93
31	X		8.19	8.09	8.14	8.00	0.14	1.26	1.04	1.55								
32	X		8.04	8.00	8.02	8.00	0.02	1.70	1.34	1.66								

1. The Factors of Safety neglect the existing sheet pile and for the remediated reaches do not include the larger and longer sheet pile.
2. Water elevation +10 for seepage based on MOWL results.
3. Partial Gap was analyzed to water at EL+10 and found to have an acceptable FOS.
4. Water levels came from figure 4: London Ave. Canal Extreme Water Surface Profile. Values consist of the highest, lowest, and average at various reaches along the canal.
5. Reaches reanalyzed due to greatest water surface differential.

FLAC

For select reaches, the Fast Lagrangian Analysis of Continua (FLAC) was used to fully evaluate the factor of safety (which included the second sheet pile for remediated reaches), wall/embankment deformations, and to compare the results with the new ETL 1110-2-575 (ETL) method. FLAC results for factor of safety and deformation at the ground surface are shown in Table 6 for nine selected reaches (Reaches 12A, 16, 20, 30, 33, 34, 35A, 35B, & 36). Since FLAC is a complete soil-structure interaction (SSI) analysis, the benefit in using this tool is the ability to identify potential failure modes without the restriction of having to assume one mode over another (i.e., rotational versus global stability). It is possible that the most critical mode of failure may consist of both modes such as the wall rotating along with translation. The FLAC analyses indicate that Reaches 12A and 35B warranted remediation work (which has since been completed) to increase the factor of safety to acceptable levels for the target water level of El. +8.0. Also, the FLAC analyses, which take into account the second remedial sheet pile, revealed that two of the remediated reaches had acceptable factors of safety, Reaches 30 and 36. Reach 30 was analyzed by the ETL and FLAC methods and factors of safety for a water level at Elevation +8 were 1.23 and 1.93, respectively, a 56.9% increase in factors of safety from ETL to FLAC due to the remedial sheet pile being accounted for in the FLAC analysis and not in the ETL. Reach 36 was analyzed by the ETL and FLAC methods and factors of safety for a water level at Elevation +8 were 1.08 and 1.93, respectively, a 78.7% increase in factors of safety from ETL to FLAC due to the remedial sheet pile being accounted for in the FLAC analysis and not in the ETL. Since these remediated reaches had a large increase in the resulting FLAC factors of safety, it is assumed that similar increases in the factor of safety will be afforded to three other ETL determined deficient remediated reaches. This includes Reach 33 with FoS=1.35 and Reach 34 with FoS=1.19, which have similar sand elevations and blanket cover thickness to Reach 30. Reach 35A is also included with a FoS=1.36, which has a similar sand elevation and blanket cover thickness to Reach 36. These reaches are

assumed to be at acceptable levels when the second deeper sheet pile is included in the analysis. For the remediated reaches, a direct comparison cannot be made because the ETL analysis did not include the second sheet pile. Additionally, Reach 20 was analyzed with FLAC due to higher stick up. Even though Reach 20 has the greatest stick up, the FLAC factor of safety of 2.00 and deflection of 1.55 inches for the target water level of El. +9 are at acceptable levels.

For each of the reaches shown in Table 6, a lower water level than the MOWL based on the lake water elevation of +3, which is the highest the lake can be before closing the gates, and the 1% water levels in the canal, was analyzed and the results are shown for comparison purposes. The factors of safety for the ETL Method for this lower water level range from 1.22 to 2.27 with three deficient reaches below the required factor of safety. The ETL deficient reaches for this case were Reach 35A, 35B, and 36. For remediated Reaches 35A and 36, the ETL analysis did not include the second sheet pile. Therefore, the reported factors of safety for the system are not the true factors of safety for global and rotational analyses. Reaches 35B and 36 were confirmed to be at acceptable factors of safety by FLAC for this lower water level. It is assumed that a similar increase in the factor of safety will be afforded to Reach 35A since it has been remediated such that it will be at an acceptable factor of safety.

For the four unremediated reaches where the ETL and FLAC results can be compared, two of the four analyses produced FLAC factors of safety higher than those computed by the ETL method. Reaches 16 and 35B have a higher FLAC factor of safety when compared to the ETL. Reach 12A (with water level at El. +8.0 & El. +5.6) and Reach 20 have a lower FLAC factor of safety when compared to the ETL. Also, for Reach 20 the full ETL method with reduced passive pressure was not required since the CWALSHT computed passive pressure was lower than the Slope /W computed passive pressures. Detailed results of the FLAC analyses are in Appendix D.

Water at the top of wall was run in FLAC to demonstrate the importance of maintaining MOWL of 8.0. Several reaches were analyzed using FLAC with water to the top of the I-wall. The results of the analyses

are shown in graphs of factor of safety and deflection in Figures 5 and 6, respectively. Of the eight reaches (Reaches 7, 9, 12A, 16, 20, 30, 35B, and 36) that were analyzed for the top of the wall water levels with FLAC, two were non-remediated reaches and six were remediated. The two non-remediated reaches were Reaches 9 and 20 and both had factors of safety just above unity, however both non-remediated reaches had excessive deflections of 6.0 and 3.3 inches, respectively. Three remediated reaches (7, 16, and 36) had acceptable factors of safety ranging from 1.42 to 1.70 (reference ETL Table B-1). Deflections for the top of wall case for these three remediated reaches range from 1.9 to 4.7 inches. The remaining three remediated reaches 12A, 30, and 35B had factors of safety that range from just above unity to 1.25 for water to the top of wall. The deflections for these three reaches range from 4.4 inches to 9.2 inches. The FLAC analyses conducted for the top of wall case shows that the canal water levels must not be allowed to exceed the MOWL because of the increased deflections and reduced factors of safety. The MOWL of 8.0 is a requirement of the Permanent Canal Closures and Pumps Project (PCCP) design.

Table 6: Results of Deficient ETL Reaches and FLAC Analyses

Reach	Remediated	Non - Remediated	F/S Water	P/S	Stickup	Annual	S/P Tip	¹ Global	Target	Full Gap Slope /W FoS	Target	¹ ETL - Rotational					FLAC				
			Elev	Gr. Sur. Elev.			Chance of Exceedance					Elev	Slope /W FoS	Min FoS ⁴	FoS Prior to Corr	FoS after Corr	Target Min FoS ⁴	Passive Corr psf	Failure Surface Elev	FoS	Target Min FoS ⁴
12A		X	8.0	4.3	3.7	---	-15.5	1.41	1.40	1.25	1.40	2.13	1.35	1.40	213	-12.5	1.28⁵	1.50	2.43	1.50	Wall Rotation
		X	5.6	4.3	1.3	1%	-15.5	1.72	1.40	1.48	1.40	17.00	1.51	1.40	389	-12.5	1.48	1.50	0.93	1.50	Wall Rotation
16		X	8.0	3.6	4.4	---	-17.4	1.50	1.40	1.23	1.40	2.73	1.31	1.40	433	-10.0	1.83	1.50	1.14	1.50	Wall Rotation
		X	5.4	3.6	1.8	1%	-17.4	2.07	1.40	1.61	1.40	14.23	2.27	1.40	383	-10	2.34	1.50	0.39	1.50	Wall Rotation
20		X	9.0	3.4	5.6	---	-17.6	2.98	1.50	2.48	1.50	2.20	N/A ²	1.50	N/A ²	-6.0	2.00	1.50	1.55	1.50	Global Stability (minor rotation)
		X	6.7	3.4	3.3	1%	-17.6	N/A ³		N/A ³		N/A ³	N/A ³		N/A ³		2.94	1.50	0.67	1.50	Global Stability (minor rotation)
30	X		8.0	3.3	4.7	---	-17.5	1.21	1.50	0.99	1.50	2.88	1.23	1.50	413	-10	1.93	1.50	1.44	1.50	Rotation/Global Stability
	X		5.7	3.3	2.4	1%	-17.5	1.46	1.50	1.32	1.50	7.25	1.55	1.50	361	-10	2.21	1.50	0.71	1.50	Rotation/Global Stability
33 ⁶	X		8.0	3.0	5.0	---	-29.9	1.40	1.40	1.02	1.40	3.45	1.35	1.40	689	-11.0		1.50		---	
	X		5.5	3.0	2.5	1%	-29.9	1.83	1.40	1.36	1.40	8.79	2.02	1.40	583	-10.7		1.50			
34 ⁶	X		8.0	2.5	5.5	---	-21.5	1.34	1.40	1.04	1.40	2.03	1.19	1.40	313	-14.0		1.50		---	
	X		5.5	2.5	3.0	1%	-21.5	1.69	1.40	1.45	1.40	5.38	1.80	1.40	386	-14		1.50			
35A ⁷	X		8.0	2.6	5.4	---	-21.5	1.46	1.40	1.08	1.40	2.68	1.36	1.40	363	-12.0		1.50		---	
	X		5.4	2.6	2.8	1%	-21.5	1.79	1.40	1.51	1.40	8.54	1.37	1.40	605	-12		1.50			
35B		X	8.0	2.2	5.8	---	-21.5	1.19	1.40	0.82	1.40	1.94	1.08	1.40	407	-12.0	1.30⁵	1.50	2.14	1.50	Wall Rotation
		X	5.4	2.2	3.2	1%	-21.5	1.58	1.40	1.21	1.40	4.63	1.33	1.40	516	-12	1.65	1.50	0.80	1.50	Wall Rotation
36	X		8.0	3.5	4.5	---	-15.5	1.40	1.40	0.98	1.40	2.01	1.08	1.40	208	-10.5	1.93	1.50	1.28	1.50	Global Stability
	X		4.7	3.5	1.2	1%	-15.5	1.66	1.40	1.29	1.40	13.33	1.22	1.40	993	-11	1.94	1.50	0.37	1.50	Global Stability

1. The Factors of Safety neglect the existing sheet pile and for the remediated reaches do not include the deeper sheet pile.
2. Passive pressure correction not required for Reach 20 since CWALSHT passive force < Slope/W passive force.
3. Analyses were not required for the lower water elevation since the minimum FoS was met for the target water level (+9).
4. The required factor of safety of 1.5 was used in reaches where the maximum water surface elevation was relatively close (within 1 foot) to the target water level.
5. Reaches 12A and 35B were remediated due to deficient factors of safety and excessive deflection. Values in table are non-remediated. See London Avenue Outfall Canal Remediation Report (2013) for factors of safety including a second sheet pile.
6. Not analyzed in FLAC due to other Reach 30 having a similar sand elevation and blanket cover thickness.
7. Not analyzed in FLAC due to Reach 36 having a similar sand elevation and blanket cover thickness.

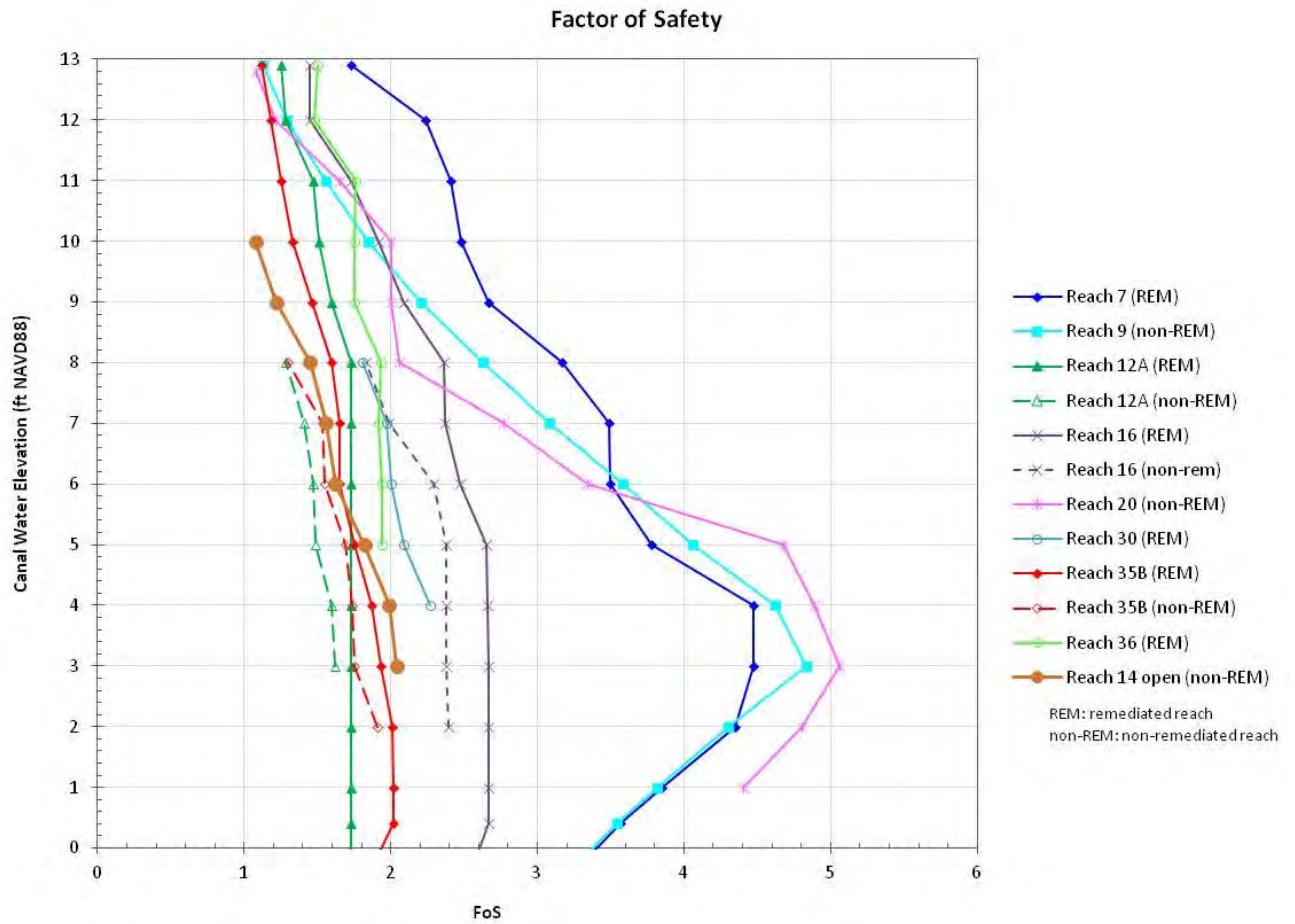


Figure 5: FLAC Factor of Safety versus Canal Water Elevation Results

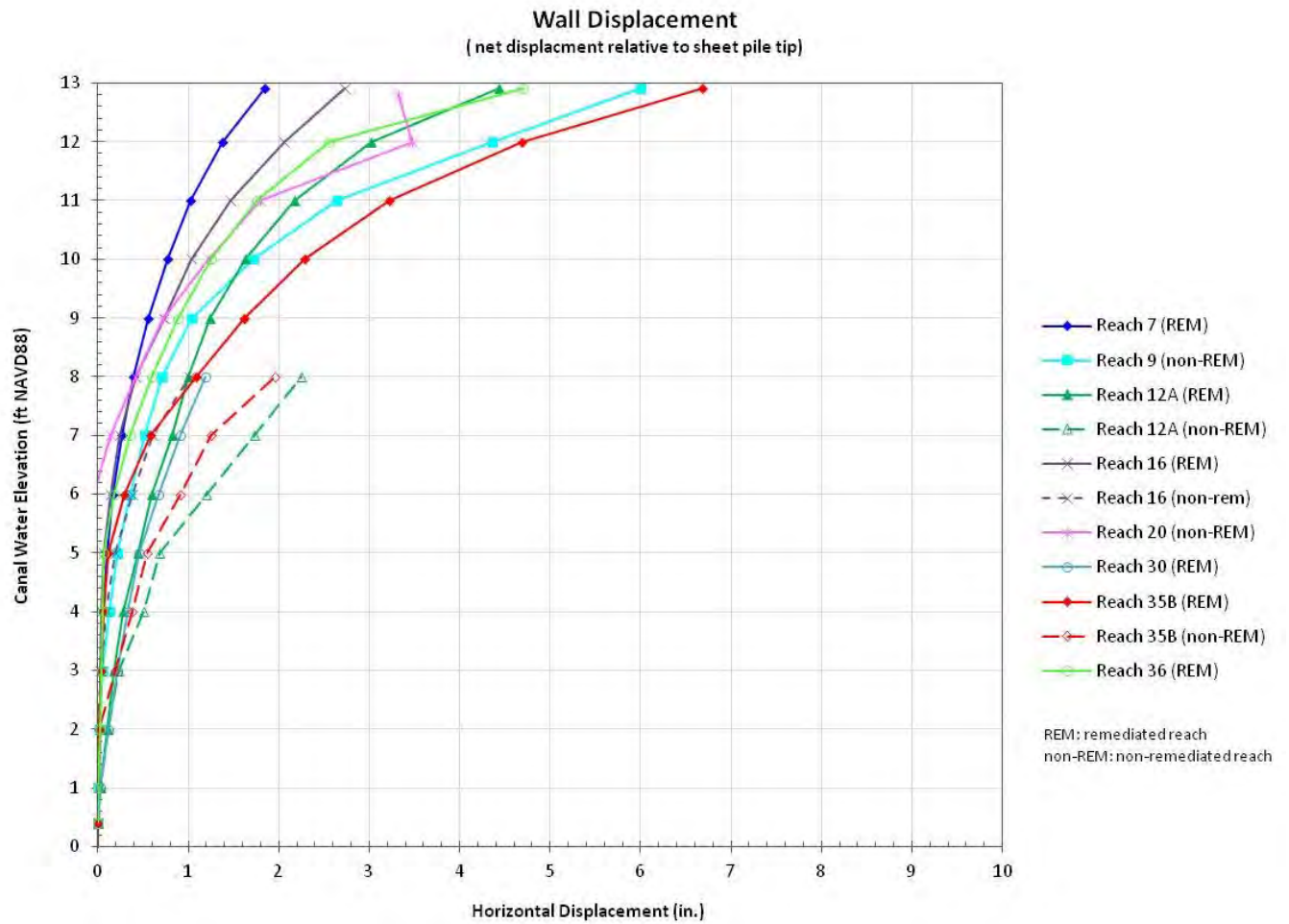


Figure 6: FLAC Wall Deformation versus Canal Water Elevation Results.

Seepage and Potential Erosion Concerns

The MOWL report analyzed for each reach whether a semi-impervious canal bottom sediment blanket was present or absent. The methods used for this determination included canal boring sediment analyses and canal piezometer seepage analyses. The results of these analyses were shown in Tables 7-6 and 7-7, respectively, of the MOWL Report (March 2011). Also, the determination of whether a soils reach was analyzed for seepage with a semi-impervious canal bottom sediment blanket present or absent was summarized in Table 7-9. Subsequent to these analyses, another evaluation was conducted by HPO personnel based upon the canal bottom elevations from multi-beam survey data acquired from the December 2009 to March 2010 survey in areas where the beach sand is shallow. The HPO tasked MVN to develop a canal bottom thalweg profile. The thalweg profile line along the bottom of the canal was developed for the length of canal where the beach sands are at shallow depths, from approximately Sta. 35+00 to Sta. 137+00 at the ICS. The thalweg profile line represents the deepest point in the canal at any given location along the length of canal considered in the analysis. The thalweg profile line was superimposed on profile drawings with the canal borings, and the thalweg profile line was compared against the canal borings to determine if any locations exhibited areas where the silt, silty sand, or clay blanket over the beach sands would have less than a 2-foot thickness. The profile drawings with this data are shown in Appendix F. Without a 2-foot blanket cover in place, to be consistent with the methodology established in the report by the review team, these areas would be considered as having an open connection to the beach sands. All areas that were already being considered as having an open connection to the beach sands as part of the MOWL Report or planned for remediation were excluded from this evaluation. The results of this evaluation revealed that in Reaches 6A, 7, 8, 12B, 14, 17, 26A and 28 areas existed in the canal bottom such that the blanket cover would be less than 2-feet. Therefore, since the blanket was less than 2-feet, these reaches were reevaluated for the Maximum Operating Water Level with the underlying beach sands as having an open connection to the canal. These were conducted as a modification to the MOWL Report in the Modification 11 Report (February 2011), but were not completed in time to be presented in the final MOWL Report. The analyses results are included in

Appendix G of this report. Reaches 6A, 12B, 14, and 26A had acceptable factors of safety in the MOWL Report modification. The analyses indicated that the MOWL for Reach 17 was lowered to EL 7 to achieve an acceptable factor of safety for seepage. Reaches 8, 28, and a portion of Reach 7 were remediated as a result of this Modification 11 evaluation in 2011 under HPO.

As stated earlier in this report, in October 2011 a report entitled, *Hydrodynamic Changes in London Ave. Canal due to the Permanent Pump Station and the Effects on Scour* cited potential erosion concerns in the canal. A copy of the October 2011 report is included in Appendix I. To evaluate the effects of the potential erosion on seepage and stability, additional reaches would be evaluated as having an open connection to the beach sands. All non-remediated reaches and those not considered as having an open connection to the beach sand prior to this analysis were evaluated for potential erosion concerns in this report.

On the west side of the canal, Reaches 4, 5, 7 (unremediated portion), 16, 17, 18A, 18B, and 19 fit the criteria for additional evaluation. Reach 4 was investigated further since it is in a transition area in which the beach sand gradually slopes up from approximately El. -35. Based on borings 11-LKCU and 11-LKTU from Reach 5, the least clay cover that the canal would have in this reach would be 10 feet with using a conservative canal bottom in this area of approximately El. -10 (even though the thalweg profile line and the cross sections indicate a low canal bottom in the area of approximately El. -7.5). Reach 4 with at least a 10 foot blanket was deemed to have sufficient cover so as not to need further consideration. Reach 19 was also deemed to have sufficient cover at 7.6 feet (see Table 7-6 from the MOWL Report) so as not to need further consideration. However, the remaining six reaches on the west side were evaluated with an open connection for this report, including the levee sections 18A and 18B.

On the east side of the canal, Reaches 25 and 35B fit the criteria for additional evaluation. Reach 25 was investigated further since it is in a transition area similar to Reach 4 on the west side. Based on borings B-43 and B-76, which are located in the middle of the Reach 25, the blanket is at least 20 feet. However,

there is no boring coverage in the northern end of Reach 25. Therefore, Boring 10-LKCU from Reach 26A shows at least 10 feet of clay cover using a conservative canal bottom El. -10 (even though the thalweg profile line and the cross sections indicate a low canal bottom in the area of approximately El. -7.5). Reach 25 with a 10 foot blanket was deemed to have sufficient cover so as not to need further consideration. However, Reach 35B was evaluated with an open connection for this report.

The results of these analyses are shown on Table 7. The unremediated portion of Reach 7 was found to be deficient for seepage with a factor of safety equal to 1.43, below the acceptable value of 1.6 when potential erosion of 1.5 feet occurs resulting in an open connection. Reach 16 is deficient with regards to seepage with a factor of safety of 0.97 when potential erosion of 1 foot occurs resulting in an open connection. Reach 16 was also deficient for the initial ETL gap stability analysis when neglecting the sheet pile in Slope/W with a factor of safety of 1.23 and had an ETL rotational analysis factor of safety equal to 1.31 when neglecting the sheet pile in the analysis. However, the global stability factor of safety is 1.83 using FLAC for a more detailed analysis which takes into account the sheet pile, but not the potential erosion. Reach 35B was also found to be deficient for seepage with a factor of safety equal to 0.39, below the acceptable value of 1.6 when potential erosion of 0.5 feet occurs resulting in an open connection. Reach 35B was also found to be deficient for global stability using FLAC for a more detailed analysis which takes into account the sheet pile with a factor of safety of 1.30. (The results of the FLAC analyses are shown in Appendix D.) The potential for erosion in these three reaches dictated a recommendation for remediation for Reaches 7 (unremediated portion), 16, and 35B. The method for remediation for these three reaches is a sheet pile cutoff wall embedded five feet into the underlying Bay Sound clay.

In reviewing the A-E's open connection files in the Mod 11 results (see Appendix G) for Reach 17 an error in the stratification was found. The silty sand stratum above the beach sand was changed to a beach sand for the entire cross section. This was corrected back to a silty sand for this reevaluation and the beach sand was used at the canal bottom only to represent an open connection due to erosion. The

reanalysis resulted in an acceptable seepage factor of safety for water at EL 8.0. Also, Reach 14 and Reach 15 were analyzed in Mod 11 and the MOWL respectively, as having an open connection, however an error was found in the seepage analysis during this reevaluation. The A-E's files modeled Reach 14 and Reach 15 as having a silty sand open to the canal bottom, this was corrected to a beach sand for this reevaluation report. While Reach 14 and Reach 15 were reported as not deficient for the Mod 11 and MOWL results, they are deficient for seepage in this reevaluation report with the correct beach sand permeability (open connection analysis) used for the canal bottom material. The method for remediation for these two reaches is a sheet pile cutoff wall embedded five feet into the underlying Bay Sound clay. Graphical plots and output reports for the seepage analyses are presented in Appendix H.

Table 7: Open Connection Results

London Ave. Outfall Canal Reevaluation Report Open Connection Due to Erosion Concerns Results						*Global Stability Analysis w/ Gap Pore Pressures (neglecting sheet pile in analysis)	*Full Gap Stability Analysis (neglecting sheet pile in analysis) B-4 Section d	Rotational Analysis (corrected for incorrect passive pressures) B-4 Section c		FS _{SEEPAGE}
	Reach	Remediated	Non -Remediated	Sheet Pile Tip EL.		PS	PS	PS		
				Non-Rem	Rem	Slope/W	Slope/W	FoS After Correction	Passive Correction	
West	5		X	-13.3		3.14	3.34	3.03	157	2.81
	7		X	-17.2		2.16	1.91	2.33	224	1.43
	7	X		-17.2	-51	2.61	2.29	2.39	222	**
	14		X	-15.5		1.71	1.41	1.62	481	0.95
	15		X	-17.5		1.66	1.28	1.90	401	1.29
	16		X	-17.4		1.46	1.07	1.64	725	0.97
	17		X	-17.5		2.17	1.86	2.10	468.5	2.78
	18A		X	Levee		2.55	n/a	n/a	n/a	**
	18B		X	Levee		2.22	n/a	n/a	n/a	**
East	35B		X	-21.5		0.66	0.40	1.08***	407	0.39

* The Factors of Safety neglect the existing sheet pile and for the remediated reaches do not include the deeper sheet pile.

**No excess head.

***FLAC factor of safety is 1.30 when including the sheet pile.

Conclusions of High Water Analyses

This reevaluation report analyzed all I-wall levee reaches in accordance to the new ETL 1110-2-575 entitled *Evaluation of I-Walls* and evaluated reaches for potential erosion resulting in an open connection to the beach sand. Eight I-wall levee reaches were found to be deficient under the ETL method when neglecting the I-wall sheet pile and, if applicable, the second deeper sheet pile for the remediated reaches, Reaches 12, 16, 30, 33, 34, 35A, 35B, & 36. Five of these eight were evaluated utilizing the FLAC program for a more detailed, rigorous, and comprehensive analysis (Reaches 12, 16, 30, 35B & 36). Based on the FLAC analyses, which takes into account the I-wall sheet pile and remedial sheet pile, Reaches 12 and 35B were recommended for remediation to achieve acceptable factors of safety for the target water level of El. +8.0. Eight reaches (Reaches 7, 9, 12A, 16, 20, 30, 35B, and 36) were analyzed for the top of the wall water levels utilizing FLAC, and results showed the canal water levels must not be allowed to exceed the MOWL. The Permanent Canal Closures and Pumps Project (PCCP) will be designed for this objective.

Of the nine reaches that were evaluated for an open connection triggered by potential erosion (Reaches 5, 7, 14, 15, 16, 17, 18A, 18B & 35B), five reaches have deficient factors of safety for seepage (Reaches 7, 14, 15, 16, & 35B). One of these five reaches are also deficient for stability as confirmed by FLAC analyses (Reach 35B). Therefore, Reaches 7 (unremediated portion), 14, 15, 16, and 35B were recommended for remediation to achieve acceptable factors of safety for the target water level of El. +8.0.

In summary, a total of six reaches were recommended for remediation, Reaches 7 (unremediated portion), 12, 14, 15, 16 & 35B. The six reaches encompass approximately 3830 linear feet of the risk reduction measures. The method for remediation was the installation of a sheet pile cutoff wall offset 5-feet towards the protected side and embedded five feet into the underlying Bay Sound clay. After remediation, these six reaches meet the target water level of elevation +8 and required factors of safety of 1.5 for global and rotational stability and 1.6 for seepage. Calculations for these remediated reaches can

be found in the Remediation Report *London Ave. Outfall Canal Remediation of Reaches 7, 12, 14, 15, 16, & 35B* (July 2013).

Subsequent to completion of all analysis, remediation work recommended herein was included in the OFC-07 contract. As of March 2015, recommended remediation work on all six reaches (7, 12, 14, 15, 16, and 35B) has been completed.

Non-Hurricane Loading Cases

The non-hurricane loading cases were evaluated for this report and include flood side stability with a low water condition (undrained) analyses and S-case (drained) analyses for both flood side and protected side for normal water conditions. In the MOWL Report, non-hurricane loading cases were not fully considered due to the acceptable non-hurricane past performance history. Past performance includes no sliding or sloughing of the canal slopes, no rotational failure of the I-wall, and no global failure of the I-wall/levee embankment towards the canal for low-water conditions.

Flood Side Analysis with Low Canal Water

All 39 I-wall reaches along the London Avenue Canal were analyzed for the low canal water condition detailed in the Hydraulic Analysis section of this report. These analyses were conducted using both Spencer's Method and the Method of Planes (MOP) and both utilized the pore pressures developed from Seep/W analyses. Method of Planes was run as a design check in accordance with HSDRRS design guidelines and included a full search for the critical failure surface per stratum. The minimum required factor of safety for the second line of risk reduction during a storm event is a 1.3, similar to the criteria used for the second line of protection behind the West Closure Complex (WCC). The average low water is -1.0 for London Avenue canal, which is the minimum operating water elevation with the gates closed. The extreme low water for London Avenue canal is -2.9, 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 -2.9 to determine the factor of safety for the extreme event. Three reaches had factors of safety below 1.3 for Spencer's Method, Reaches 12A, 27, and 35B for this extreme water level. The global Spencer's factors of safety for these three reaches ranged from 1.26 to 1.29. All reaches had required factor of safety above 1.3 for MOP. Factors of safety for all reaches do not include the reinforcing effects of the sheet pile. Results for all reaches are shown on Tables 8 and 9 for the west and east sides, respectively. Graphical plots and output reports from Spencer's Method are presented in Appendix J.1 and graphical plots from MOP are presented in Appendix Q.2.

Table 8: West Side Floodside Q-Case with Extreme Low Canal Water at Elevation -2.9 Results

London Ave. Outfall Canal Reevaluation Report						
West Side Floodside Q-Case with Extreme Low Canal Water at Elevation -2.9 Results						
Reach	Remediated ¹	Non -Remediated	Sheet Pile Tip EL.		F/S Analysis Case with extreme low canal water condition	
			I-Wall	Remedial	Slope/W	MOP
1		X	-17.3		2.11	2.13
2		X	-17.3		1.65	2.10
3		X	-13.3		2.04	2.18
4		X	-13.4		2.11	2.26
5		X	-13.3		2.36	2.33
6A		X	-13.2		2.11	2.44
6B		X	-13.2		2.18	2.61
7		X	-17.2		2.10	2.56
7	X		-17.2	-51	X	X
8	X		-17.2	-51	2.18	2.91
9		X	-17.7		1.94	2.76
10	X		-17.5	-55	1.52	2.26
11	X		-17.5	-55	1.73	2.16
12A		X	-15.5		1.28	1.91
12B		X	-15.5		1.42	1.71
13	X		-15.5	-56	1.44	1.90
14		X	-15.5		1.69	2.11
15		X	-17.5		1.80	2.24
16		X	-17.4		1.82	2.21
17		X	-17.5		1.81	1.91
18A		X	Levee		1.89	X
18B		X	Levee		2.10	X
19		X	Levee		1.56	X

1. The Factors of Safety neglect the existing sheet pile and for the remediated reaches do not include the longer sheet pile.
2. All reaches analyzed with dry tension crack.

Table 9: East Side Floodside Q-Case with Extreme Low Canal Water at Elevation -2.9 Results

London Ave. Outfall Canal Reevaluation Report						
East Side Floodside Q-Case with Extreme Low Canal Water at Elevation -2.9 Results						
Reach	Remediated ¹	Non -Remediated	Sheet Pile Tip EL.		F/S Analysis Case with extreme low canal water condition	
			I-Wall	Remedial	Slope/W	MOP
20		X	-17.6		2.75	2.53
21		X	-17.3		1.66	1.82
22		X	-17.2		1.38	2.34
23		X	-13.2		2.13	2.48
24		X	-13.3		2.02	2.34
25		X	-19.3		2.16	2.22
26A		X	-19.3		1.51	2.05
26B		X	-19.3		1.49	2.05
27	X		-19.3	-49	1.29	1.64
28	X		-21.6	-52,-57	1.70	2.39
29		X	-21.6		1.40	2.02
30	X		-17.5	-60	1.94	2.43
31	X		-17.4	-55	1.42	2.08
32	X		-29.9	-55	1.70	2.87
33	X		-29.8	-55	1.89	2.33
34	X		-21.5	-55	1.57	2.42
35A	X		-21.5	-53	2.00	2.25
35B		X	-21.5		1.26	2.06
36	X		-15.5	-50	1.51	1.93
37		X	Levee		1.74	X

1. The Factors of Safety neglect the existing sheet pile and for the remediated reaches do not include the longer sheet pile.
2. All reaches analyzed with dry tension crack.

The Permanent Canal and Closure Pumps Request for Proposal outlines the average low water in the canal as elevation -0.8 with the gates closed. However, the pump operator is allowed to draw the outfall canal water elevation down to elevation -1 with the new Permanent Pumps. Therefore, the maximum drawdown water elevation of -1 was used as the average low water condition for the 3 reaches with factors of safety below 1.3. For a more detailed explanation of the low water criteria, see the Hydraulics & Hydrology section of this report.

All the reaches that met the minimum Factor of Safety for the extreme low water elevation of -2.9 were not rerun for the average low canal water level of -1 because the analysis performed was conservative and shows adequate factors of safety. Only the 3 reaches (Reaches 12A, 27, and 35B) that did not have a factor of safety above 1.3 for the extreme water elevation of -2.9 were reanalyzed for the average low water elevation of -1. These analyses were conducted using Spencer's Method and utilized the pore pressures developed by Seep/W analyses. Also, the analyses done for the extreme low canal water elevation of -2.9 in Slope/W were analyzed with tension crack searches considered dry, as it was assumed that they would exist above the piezometric surface in the low water case. The Hurricane Protection System Retention Slope Stability Guidance (2009) suggests that even if the crack is above the piezometric surface, it could become filled by heavy rains. It was determined that as standard practice, the Slope/W flood side stability analyses should search for tension cracks filled with water rather than dry as originally analyzed. The lowest factor of safety was searched using three different failure surfaces. First, the reinforcing effect of the sheet pile was neglected, and potential slip surfaces were allowed to pass through the sheet-pile location. Second, potential slip surfaces were only allowed to fail in front of the sheet-pile location, towards the floodside. Third, potential slip surfaces were only allowed to fail around the sheet-pile tip. These three reaches met the required Factor of Safety of 1.3. Results are shown in Table 10. Graphical plots and output reports from Spencer's Method are presented in Appendix J.2.

Table 10: Floodside Q-Case with Low Canal Water at Elevation -1 Results

London Ave. Outfall Canal Reevaluation Report							
Floodside Q-Case with Low Canal Water at Elevation -1 Results							
Reach	Remediated	Non - Remediated	Sheet Pile Tip EL.		F/S Analysis Case with low canal water condition		
			I-Wall	Remedial	Flood Side of Sheet Pile	Through Sheet Pile ¹	Around Sheet Pile
12A		X	-15.5		1.68	1.39	2.25
27	X		-19.3	-49	1.34	1.32	3.03
35B		X	-21.5		1.50	1.47	3.12

1. Factor of safety reported neglects the reinforcing effect of the sheet pile in the global stability analysis.
2. All reaches analyzed with water filled tension crack.

These 3 reaches were also chosen to be analyzed for a sudden drawdown case performed due to the areas having a lower low water Factors of Safety than the surrounding areas. The sudden drawdown case used a normal canal water elevation of +0.4 applied only to the sand layer and a low water elevation of -1 applied to all other layers. The required Factor of Safety was 1.2 per EM 1110-2-1913. This was modeled in Slope/W using two piezometric headlines. In addition, the lowest factor of safety was searched using three different failure surfaces as described previously for the low water Q-case level. Reaches 12A and 35B had adequate Factors of Safety of 1.27 and 1.37, respectively, when the reinforcing effect of the sheet pile was neglected and the failure surface was allowed to pass through the sheet-pile location. Reach 27 had a Factor of Safety of 1.15 when the reinforcing effect of the sheet pile was neglected and the failure surface was allowed to pass through the sheet-pile location. To account for the effects of the sheet pile, a modified version of the ETL 1110-2-575 procedure was used. The procedure was modified as the ETL implicitly assumes that the condition being analyzed is a high water condition. The I-wall was modeled as if a gap could form on the protected side and the stability analysis ran with this case. The gap analysis showed a Factor of Safety of 3.98. An unbalanced load was also computed for the failure surface

from the gap analysis, then input into CWALSHT to determine the passive resistance for rotational stability. The rotational Factor of Safety was greater than 8.60, much higher than the required Factor of Safety. This modified analysis shows that once the I-wall sheet pile is taken into account, Reach 27 exceeds the required factor of safety of 1.2. Results of the sudden drawdown case are shown in Table 11. Graphical plots and output reports from Spencer's Method are presented in Appendix J.3. Graphical plots and output reports from Spencer's Method for Reach 27 modified ETL are presented in Appendix J.4.

Table 11: Floodside Q-Case with Low Canal Water at Elevation -1 Sudden Drawdown Results

London Ave. Outfall Canal Reevaluation Report							
Floodside Q-Case with Low Canal Water Elevation at -1 Sudden Drawdown Results							
Reach	Remediated	Non -Remediated	Sheet Pile Tip EL.		F/S Analysis Case with low canal water condition		
			I-Wall	Remedial	Flood Side of Sheet Pile	Through Sheet Pile ¹	Around Sheet Pile
12A		X	-15.5		1.26	1.27	1.89
27	X		-19.3	-49	1.31	1.15 ²	3.12
35B		X	-21.5		1.35	1.37	3.06

1. Factors of safety shown neglect the reinforcing effects of the sheet pile.
2. Considering the sheet pile for the potential failure surface, the factor of safety would be approximately equal to 4.

Flood Side Analysis with Low Canal Water and Tension Crack Search

As stated previously, analyses done for the extreme low canal water elevation of -2.9 in Slope/W were analyzed with dry tension crack searches for all 39 I-Walls. It was determined that the tension crack filled with water should also be checked. Filling the tension cracks completely with water is considered more conservative as it would apply a force resulting from the water to the entire length of the crack along the driving side. It was expected using the low water canal elevation of -1 with a water filled crack versus using the extreme low water elevation of -2.9 with a dry crack that minimal factor of safety changes

would occur due to the increased load on the passive side. Four reaches (Reaches 13, 26B, 29, & 31) were chosen to be analyzed with the change in canal water elevation and a filled or “wet” tension crack. If these four reaches did not meet the required factor of safety with the above changes made, then they would be reanalyzed with the tension crack half filled with water to determine the sensitivity of the water depth to factor of safety.

The reaches run with the new parameters (higher canal water elevation and filled tension crack) had a slight increase in factors of safety ranging from 0 to 0.38 when neglecting the reinforcing effect of the sheet pile. Filling the tension cracks with water did not create deficient factors of safety. Consequently, the final analyses were performed with the full tension crack rather than the half-filled tension crack. Results of the tension crack analyses are shown in Table 12. Graphical plots and output reports from Spencer’s Method are presented in Appendix J.5.

Table 12: Floodside Q-Case with Low Canal Water Dry and Wet Tension Crack Results

London Ave. Outfall Canal Reevaluation Report Floodside Q-Case with Low Canal Water Dry and Wet Tension Crack Results						
Reach	Remediated	Non -Remediated	Sheet Pile Tip EL.		F/S Analysis Case with low canal water condition and tension crack search	
			I-Wall	Remedial	Flood-side Q-case dry tension crack Water El -2.9*	Flood-side Q-case wet tension crack Water El -1*
13	X		-15.5	-56	1.44	1.57
26B		X	-19.3		1.49	1.49
29		X	-21.6		1.40	1.57
31	X		-17.4	-55	1.42	1.80

*Factors of safety reported neglect the reinforcing effect of the sheet pile in the global stability analysis.

Erosion along Canal Bottom

As discussed in the High Water section, erosion is a concern along the London Avenue Canal. Two reaches, Reaches 27 and 35B, were analyzed for the low water condition with an assumed two feet of erosion along the canal bottom to determine the potential effects of erosion on bank stability. These analyses were conducted using Spencer's Method and included tension cracks filled with water. In addition, the lowest factor of safety was searched using three different failure surfaces as described previously for the low water level. Reach 27 has a factor of safety of 1.26, slightly below the required factor of safety of 1.3 with 2 feet of erosion, and Reach 35B has a factor of safety of 1.43 when neglecting the reinforcing effects of the sheet pile in the analyses. Reach 27 was also analyzed with 1 foot of scour in the channel bottom and has a factor of safety of 1.31. Stability analysis considering an assumed erosion depth was performed for information purposes. No remediation work is required under this reevaluation report based on these two analyses. The results show the sensitivity canal bottom erosion would have on flood side global stability factors of safety. For Reach 27, factors of safety for flood side stability decreased by approximately 0.03 per foot of erosion. Results of the erosion analyses are shown in Table 13. Graphical plots and output reports from Spencer's Method are presented in Appendix J.6.

Table 13: Floodside Q-Case with Low Canal Water Elevation -1 Erosion Results

London Ave. Outfall Canal Reevaluation Report Floodside Q-Case with Low Canal Water Elevation -1 Erosion Results								
Reach	Remediated	Non -Remediated	Scour Depth	Sheet Pile Tip EL.		F/S Analysis Case with low canal water condition		
				I-Wall	Remedial	Flood Side of Sheet Pile	Through Sheet Pile*	Around Sheet Pile
27	X		1ft	-19.3	-49	1.31	1.31	2.85
			2ft			1.28	1.26	2.67
35B		X	2 ft	-21.5		1.43	1.43	2.86

*Factors of safety reported neglects the reinforcing effect of the sheet pile in the global stability analysis.

Flood Side and Protected Side S-Case Analysis with HSDRRS Default Values

Over time, it is anticipated that soil will consolidate and fully drained conditions would set in for normal water levels. In such a case, stability would be maintained more by the friction and not by cohesion.

These cases are considered for long-term, operating cases and are named for the slow (S) time with which it would take for such conditions to occur. The S-case condition along the London Avenue canal would have occurred many years ago. Normal water S-case stability analyses for both flood side and protected side were used to evaluate the London Avenue Outfall Canal I-Walls/ levee embankment using the mean water level detailed in the Hydraulic Analysis section of this report. The S-Case condition along the outfall canals was initially analyzed with the default values for geotechnical shear strength parameters provided in the HSDRRS guidelines. Clays are analyzed with no cohesion and a phi angle of 23 degrees. Silts are analyzed with no cohesion and a phi angle of 28 degrees. Sands are analyzed with the same phi angle used in the Q-case condition. The target factor of safety is 1.3 for water at elevation +0.4 in accordance with the retention basin criteria which allows for the reduction in factor of safety since “retention systems are levees or walls that are not the primary flood protection system and are located behind the mainline Flood Risk Reduction Flood gates or Pump Stations” (Retention Memo, 2009).

Analyses were performed for all 42 I-wall and levee reaches along London Avenue Canal for both Spencer’s Method and Method of Planes (MOP) with a mean canal water elevation of +0.4. Searches were done locally (bank stability failure) and globally (translational stability failure) on the flood side and globally on the protected side. For the I-wall reaches, the reinforcing effect of the sheet pile was neglected for this initial global stability analysis, and potential slip surfaces were allowed to pass through the sheet-pile location. The results of the floodside analyses yielded a factor of safety less than the targeted factor of safety of 1.3 for 27 of the reaches globally and 41 of the reaches locally using Spencer’s Method. Method of Planes yielded 36 I-wall reaches below the target Factor of Safety of 1.3. Levee reaches were not analyzed using Method of Planes. The results of the protected side analyses yielded 6 I-wall reaches that were deficient for the target Factor of Safety of 1.3 for Spencer’s Method, Reaches 12A, 12B, 14, 15,

16, & 35B when neglecting the reinforcing effect of the sheet pile. Not all reaches on the protected side were analyzed with Method of Planes. There were 14 reaches analyzed with MOP, and of these, two were deficient for the target Factor of Safety of 1.3, Reaches 14 & 29. Results for all reaches are shown on Tables 14 and 15 for the west and east sides, respectively. Graphical plots and output reports from Spencer's Method for flood and protected side analyses are presented in Appendix K.1 and graphical plots from MOP for flood and protected side analyses are presented in Appendix Q.3. As shown by the calculated results, the soil properties or the analyses are improper because no knowledge of an S-case slide ever occurred along London Avenue canal over the 50-plus years since the canal has been constructed.

Table 14: West Side S-Case using HSDRRS Default Values with Mean Canal Water at Elevation +0.4 Results

London Ave. Outfall Canal Reevaluation Report									
West Side S-Case using HSDRRS Default Values with Mean Canal Water at Elevation +0.4 Results									
Reach	Remediated	Non -Remediated	Sheet Pile Tip EL.		¹ S-Case analysis with mean canal water condition for both F/S & P/S				
			I-Wall	Remedial	Floodside			Protected Side	
					Slope/W Global	Slope/W Local	MOP	Slope/W	MOP
1		X	-17.3		1.06	0.45	0.70	2.06	1.69
2		X	-17.3		0.90	0.56	0.77	1.62	2.01
3		X	-13.3		1.35	0.62	1.11	2.30	2.73
4		X	-13.4		1.42	1.07	1.33	2.06	X
5		X	-13.3		1.39	1.00	1.17	2.25	X
6A		X	-13.2		1.39	1.13	1.22	1.76	X
6B		X	-13.2		1.40	1.15	1.24	1.76	1.74
7 ²		X	-17.2		1.37	1.04	1.30	1.36	X
8	X		-17.2	-51	1.44	1.03	1.24	1.84	X
9		X	-17.7		1.24	0.67	0.92	1.71	X
10	X		-17.5	-55	1.05	0.46	0.90	1.65	1.78
11	X		-17.5	-55	1.23	0.49	0.88	2.56	X
12A ³		X	-15.5		1.14	0.84	1.00	1.28	X
12B ²		X	-15.5		1.11	0.84	1.00	1.28	X
13	X		-15.5	-56	1.03	0.84	0.87	1.79	1.62
14 ²		X	-15.5		1.24	1.00	1.08	1.26	0.97
15 ³		X	-17.5		1.19	0.86	0.98	1.11	X
16 ²		X	-17.4		1.22	1.07	1.10	0.97	X
17		X	-17.5		1.23	1.19	1.25	1.47	X
18A		X	Levee		1.52	1.00	X	1.56	X
18B		X	Levee		2.27	1.10	X	1.52	X
19		X	Levee		1.56	1.61	X	1.60	X

1. Factors of safety reported neglects the reinforcing effect of the sheet pile in the global stability analysis.
2. Reach analyzed with closed connection.
3. Reach analyzed with open connection.

Table 15: East Side S-Case using HSDRRS Default Values with Mean Canal Water at Elevation +0.4 Results

London Ave. Outfall Canal Reevaluation Report									
East Side S-Case using HSDRRS Default Values with Mean Canal Water at Elevation +0.4 Results									
Reach	Remediated	Non -Remediated	Sheet Pile Tip EL.		1 st S-Case analysis with mean canal water condition for both F/S & P/S				
			I-Wall	Remedial	Floodside			Protected Side	
					Slope/W Global	Slope/W Local	MOP	Slope/W	MOP
20		X	-17.6		1.02	0.69	0.83	1.67	X
21		X	-17.3		1.07	0.72	0.87	1.63	X
22		X	-17.2		0.78	0.64	0.87	1.53	1.56
23		X	-13.2		1.02	0.64	0.79	7.80	3.41
24		X	-13.3		1.18	0.78	1.08	2.61	X
25		X	-19.3		1.12	0.85	1.26	1.84	X
26A		X	-19.3		1.00	0.80	1.03	3.27	X
26B		X	-19.3		1.00	0.80	1.03	3.27	X
27	X		-19.3	-49	0.87	0.70	0.81	1.64	1.57
28	X		-21.6	-52,-57	0.91	0.66	0.78	1.74	1.82
29		X	-21.6		1.14	0.97	1.15	1.60	1.19
30	X		-17.5	-60	1.16	1.14	1.16	1.50	X
31	X		-17.4	-55	1.06	0.88	0.95	1.45	X
32	X		-29.9	-55	1.34	0.85	1.08	1.61	1.30
33	X		-29.8	-55	1.52	0.75	0.91	1.44	X
34	X		-21.5	-55	1.15	0.97	1.05	1.57	X
35A	X		-21.5	-53	1.37	1.19	1.21	1.57	X
35B ²		X	-21.5		1.08	0.66	0.86	0.90	X
36	X		-15.5	-50	1.34	0.99	0.98	1.45	1.61
37		X	Levee		1.88	1.14	X	1.55	X

1. Factors of safety reported neglects the reinforcing effect of the sheet pile in the global stability analysis.
2. Reach analyzed with closed connection.

Protected Side S-Case with GCAT Recommended Values

The 6 deficient reaches (Reaches 12A, 12B, 14, 15, 16 & 35B) when neglecting the sheet pile reinforcing effect on the protected side using the HSDRRS default values were reanalyzed using increased friction angles in the clays and silts and a small amount of cohesion in the embankment fill above the phreatic surface to account for negative pore water pressures. Values used for friction and cohesion were taken from the Geotechnical Criteria Application Team (GCAT)'s paper *S-case Analysis Parameters for Outfall Canals* based on laboratory test results and literature by Brandon et al. (2011). A copy of this report is in Appendix L. For cases where the levee fill material falls above the phreatic surface, a cohesion of 75 psf was used to account for the small contribution of the negative pore pressures to the drained shear strength. Based on soil type, the friction angles used are given in Table 16 below. These friction angle values are the minimum values reported in the GCAT paper and can be increased based on lab tests.

Table 16: GCAT Recommended S-case design friction angles

Soil Type	Design cohesion c'	Design friction angle ϕ
CH	0	26
CHO	0	24
CL	0	32
ML	0	34
PT	0	30
SC	0	33
SM	0	33
SP	0	34

In addition, the lowest factor of safety was searched using three different failure surfaces by Spencer's Method. First, the reinforcing effect of the sheet pile was neglected, and potential slip surfaces were allowed to pass through the sheet-pile location. Second, reaches were analyzed utilizing the reinforcing effect of the sheet pile and potential slip surfaces were only allowed to fail in front of the sheet-pile location, towards the protected side. Third, reaches were analyzed utilizing the reinforcing effect of the sheet pile and potential slip surfaces were only allowed to fail around the sheet-pile tip. Seep/W was used

to define the phreatic surface with canal water elevation of +0.4. Typically, tension cracks are not considered in S-case analyses since the entire levee is considered mainly cohesionless for analysis purposes. However, tension cracks were considered since there was a small value of cohesion in the clay above the piezometric surface. In these cases, tension cracks were considered generally dry and not very deep, so there was minimal impact. Three of the six reaches were analyzed for the closed connection to the beach sand, Reaches 14, 15, and 16, and the other three reaches are analyzed with an open connection. Only Reach 35B was shown to be deficient, with factor of safety of 0.34. The protected side analysis results can be seen in Table 17 below. Graphical plots and output reports from Spencer's Method are presented in Appendix K.2.

Table 17: P/S S-Case Analysis with Mean Canal Water at Elevation +0.4 Using G-CAT Recommended Values with Cohesion above Phreatic Surface Results

London Ave. Outfall Canal Reevaluation Report P/S S-Case Analysis with Mean Canal Water at Elevation +0.4 Using G-CAT Recommended Values With Cohesion above Phreatic Surface Results							
Reach	Remediated	Non -Remediated	Sheet Pile Tip EL.		S-Case analysis with mean canal water condition for P/S using G- CAT recommended S-Case strengths (Cohesion above phreatic surface)		
			It-Wall	Remedial	Protected Side of Sheet Pile	Through Sheet Pile	Around Sheet Pile
12A		X	-15.5		1.64	1.74	4.54
12B		X	-15.5		1.55	1.68	4.35
14*		X	-15.5		2.26	2.26	4.13
15*		X	-17.5		2.46	2.48	4.79
16*		X	-17.4		1.93	1.95	4.37
35B		X	-21.5		0.34	0.67	3.47

*Reach analyzed using closed connection.

Floodside S-Case with GCAT Recommended Values

In 27 of the reaches globally and 41 of the reaches locally using Spencer's Method for floodside analysis, the factor of safety is less than 1.0, indicating slope instability. However, the London Avenue Canal has been normally loaded in the conditions used in the analyses for the 50 year duration of its lifespan. The reason that the calculations come short of the criteria can be due to under estimating matric suction, under estimating shear strength which may come from effective cohesion due to compaction of levee materials, non-linear shear strengths in the fine grained soils where there is a higher friction angle at low stresses, or not including the sheet pile reinforcing effect in the global stability analyses. In any case, the role of factor of safety is to design with confidence to achieve a very low likelihood of failure. Fifty-plus years of past performance are demonstrating this low likelihood of flood side S-case failure in the outfall canals. Past performance includes no sliding or sloughing of the canal slopes, no rotational failure of the I-wall, and no global failure of the I-wall/levee embankment towards the canal.

Duncan and Wright provided a curve, shown in Figure 7, in the book *Soil Strength and Slope Stability* (2005) of probability of failure versus Coefficient of Variation (COV). The curves in this figure range from 10% - 50% COV_f . Failures in the S-case condition have not occurred in the 50 year duration of the structure. Given this performance, the annualized probability of failure is less than 0.02 (less than 1 failure in 50 years) for S-case conditions. The potential range of factors of safety, at less than 0.02 based on the 10% - 50% COV_f curves in Figure 7, would be 1.24 – 3.0.

The coefficient of variation (COV) is the variation of the factor of safety based on a number of parameters such as the variation of shear strength and density. For an S-case condition, the shear strength resistance is usually controlled by the levee material and shallow foundation material where failure would typically take place. The variability of these surface materials is low given that their construction should have been completed with compacted clay. It is a safe assumption then that COV would be one of the lower curves such as 14-16% resulting in a factor of safety of at least 1.3 for a less than 2% probability of failure.

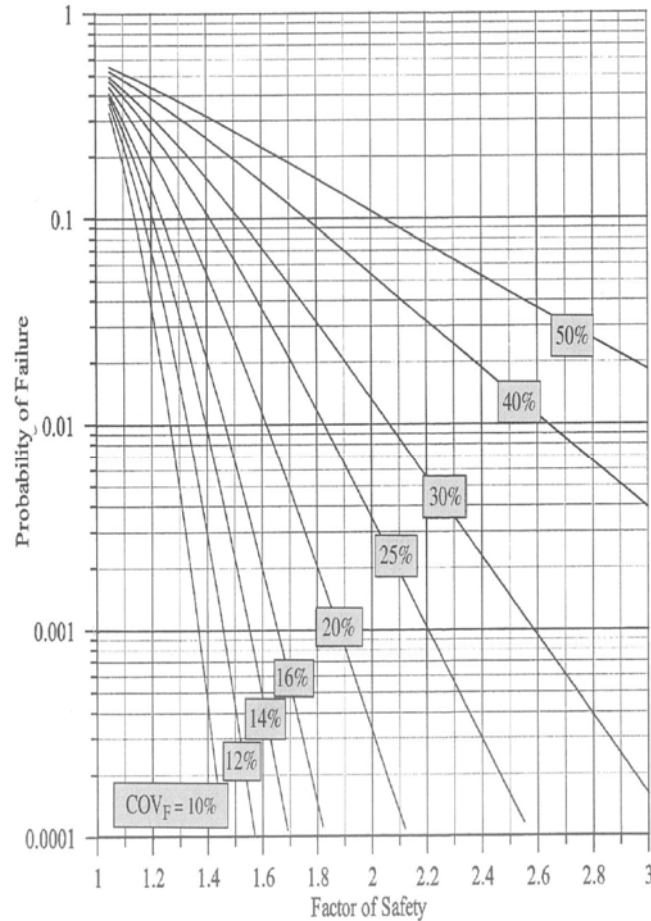


Figure 7: Probabilities of Failure Based on Logarithmic Values of F

Rather than reanalyze all 27 reaches below the factor of safety of 1.3 on the floodside for global stability using a Seep/W defined phreatic surface and the GCAT soil parameters, eight reaches (Reaches 2, 6A, 13, 16, 21, 27, 28, and 35A) were chosen for further investigation. These eight reaches had either the lowest factor of safety or a factor of safety close to 1.3 and are on the north and south ends of the canal. Four were chosen on the east side (Reaches 21, 27, 28, and 35A) and four were chosen on the west side (Reaches 2, 6A, 13, and 16). The target factor of safety is 1.3 in accordance with the retention basin criteria which allows for the reduction in factor of safety since “retention systems are levees or walls that are not the primary flood protection system and are located behind the mainline Flood Risk Reduction Flood gates or Pump Stations” (Retention Memo, 2009). These reaches were analyzed using Spencer’s Method, utilizing the reinforcing effect of the sheet pile, and potential slip surfaces were only allowed to

fail in front of the sheet-pile location (local bank stability), towards the flood side. Originally, the normal-water S-case analyses based on HSDRRS design guideline soil parameters had a static canal water surface elevation of +0.4. For the re-analysis, the reaches use Seep/W to define the phreatic surface with canal water elevation of +0.4 and use the same Seep/W protected side boundary conditions as the high water analyses. Six reaches (Reaches 2, 13, 21, 27, 28, & 35A) are deficient in both phreatic surface cases, though the GCAT values showed a measured increase in factor of safety values. The results of these floodside analyses, as well as the percentage change, are shown in Table 18. Graphical plots and output reports from Spencer's Method are presented in Appendix K.3. As stated in the beginning of this section, these analyses do not capture the true S-case factors of safety due to no known S-case floodside failures over the past 50-plus years since construction.

Table 18: F/S S-Case Analysis with Mean Canal Water at Elevation +0.4 Using HSDRRS & G-CAT Recommended Values

London Ave. Outfall Canal Reevaluation Report F/S S-Case Analysis with Mean Canal Water at Elevation +0.4 Using HSDRRS & G-CAT Recommended Values with Cohesion above Phreatic Surface Results							
Reach	Remediated	Non -Remediated	Sheet Pile Tip EL.		S-Case analysis with mean canal water condition for F/S using HSDRRS & G- CAT recommend ed S-Case strengths (Cohesion above phreatic surface)		
			I-Wall	Remedial	HSDRRS Design Parameters	GCAT Design Parameters	% Change in Factor of Safety
2		X	-17.3		0.46	0.85	84.78
6A		X	-13.2		2.03	2.80	37.93
13	X		-15.5	-56	0.82	0.89	8.54
16		X	-17.4		1.73	2.03	17.34
21		X	-17.3		0.66	1.09	65.15
27	X		-19.3	-49	0.54	0.82	51.85
28	X		-21.6	-52,-57	0.52	0.86	65.38
35A	X		-21.5	-53	1.13	1.28	13.27

Conclusions of Non-Hurricane Loading Analysis

The reevaluation report analyzed all I-wall levee reaches for the non-hurricane low water loading condition in accordance with the HSDRRS design guidelines which included flood side stability analyses with a low water condition and S-case stability analyses for both flood side and protected side. Of the 39 I-wall levee reaches analyzed for the floodside stability analysis with extreme low water condition at El - 2.9, three reaches did not meet the factor of safety of 1.3 for Spencer's Method, Reaches 12A, 27, and 35B. These three reaches were reanalyzed with low water at elevation -1 based on H&H analyses of low water elevations for the Permanent Canal and Closure Pumps, and met the required Factor of Safety of 1.3. These three reaches also had a sudden drawdown analysis performed due to having a lower low water Factors of Safety than the surrounding areas. Reaches 12A and 35B had adequate Factors of Safety of 1.26 and 1.35, respectively. Reach 27 had a Factor of Safety of 1.15 when neglecting the sheet pile. To account for the effects of the sheet pile, a modified version of the ETL 1110-2-575 procedure was used. This modified analysis shows that once the sheet pile is taken into account, Reach 27 exceeds the required factor of safety of 1.2.

An assumed two feet of erosion along canal bottom was also analyzed for the low water condition to determine the potential effects of erosion on bank stability, neglecting the effects of the sheet pile. Two reaches were analyzed for erosion potential, Reach 27 and 35B. Reach 35B met the required factor of safety of 1.3; however Reach 27 is below the required factor of safety of 1.3 with a 1.26. Reach 27 was then analyzed with 1 foot of scour in the channel bottom and met the required factor of safety with a 1.31 factor of safety. Erosion potential was analyzed for information only. Based on these results, no remediation work is required. The results show the sensitivity canal bottom erosion would have on flood side global stability factors of safety; factors of safety decreased by approximately 0.03 per foot of erosion.

Low water S-case stability analyses for both flood side and protected side were used to evaluate the I-Walls and levees. The target factor of safety is 1.3 based on the canal being considered a retention system

that is not the primary flood protection system. The results of the floodside analyses yielded a factor of safety less than 1.3 for 27 of the reaches globally and 41 of the reaches locally using Spencer's Method. The results of the protected side analyses yielded 6 reaches that were deficient for the target Factor of Safety of 1.3, Reaches 12A, 12B, 14, 15, 16, & 35B. The 6 deficient reaches on the protected side were reanalyzed using increased friction angles in the clays and silts based on GCAT soil parameters and a small amount of cohesion in the embankment fill above the phreatic surface to account for negative pore water pressures. Only one of the seven reaches analyzed was shown to be deficient, Reach 35B. Reach 35B is already scheduled for remediation based on the High Water analysis, and is not expected to be deficient for the long-term condition after remediation.

In 27 of the reaches globally and 41 of the reaches locally for floodside analysis, the factor of safety is less than 1.0. However, the London Avenue Canal has demonstrated S-case stability despite the results given in the various analyses. Past performance, including no sliding or sloughing of the canal slopes, no rotational failure of the I-wall, and no global failure of the I-wall/levee embankment towards the canal, is demonstrating this low likelihood of failure in the outfall canals. Eight of the 27 deficient reaches on the flood side (Reaches 2, 6A, 13, 16, 21, 27, 28, and 35A) were chosen for further investigation with both a Seep/W defined phreatic surface with canal water elevation of +0.4 and the GCAT soil parameters. Six reaches (Reaches 2, 13, 21, 27, 28, & 35A) are deficient in both cases, and Reaches 2, 13, 27, & 28 have factors of safety less than 1.0. However, as previously stated, past performance history has shown no sliding or sloughing of slopes and no failure of the I-wall for this condition. Therefore the walls are expected to continue to perform for this condition and no remediation is required.

References

General

Duncan, J. M., and Wright, S. G. (2005). *Soil Strength and Slope Stability*. (pg. 208). Hoboken: John Wiley & Sons, Inc.

ECM-GEC Joint Venture, Black and Veatch Special Projects Corporation, and Ray E. Martin, LLC, *Lake Pontchartrain and Vicinity Hurricane Protection Project Maximum Operating Water Level (MOWL) for London Avenue Canal*, USACE-HPO, Revised Final March 2011

Black & Veatch Special Projects Corporation, *Modification 11 Open Canal Assessment, London Canal, Revision 1*, USACE-HPO, 13 February 2011

Finite Element Seepage Analysis of London Avenue Canal Load Test, Abeera Batool and Thomas L. Brandon, Dept. of Civil and Environmental Engineering, Virginia Tech, Blacksburg, VA November 7, 2010

Geotechnical Criteria Applications Team (GCAT), *Stability Analysis of I-Walls Containing Gaps between the I-Wall and Backfill Soils*, Version 6, Hurricane Protection Office, US Army Corps of Engineers, 14 September 2009

Geotechnical Criteria Applications Team (GCAT), *Hurricane Protection System Retention Slope Stability Guidance, Tensile Stresses in Slope Stability Analyses*, February 2009

Hurricane and Storm Damage Risk Reduction System Design Guidelines (HSDRRSDG), New Orleans District Engineering Division, US Army Corps of Engineers, October 2007 with June 12, 2008 revisions

Lake Pontchartrain, Louisiana and Vicinity, High Level Plan, Design Memorandum No. 19A - General Design, London Avenue Outfall Canal, US Army Corps of Engineers, New Orleans District, New Orleans, Louisiana, January 1989

London Avenue Canal Pump Test, MVN Corps, New Orleans, LA, 2006

Memorandum - London Avenue Canal – Recommended Seepage Analysis Permeabilities, Noah Vroman, ERDC Corps, July 19, 2009

URS, *Structural and Foundation Response Measured During the Site Specific Load Test on the London Avenue Outfall Canal I-Wall/Levee*, Hurricane Protection Office of the New Orleans District Corps of Engineers, November 20, 2007

URS Group, Inc., *Final Geotechnical Engineering Evaluation Report, Remediation of the Floodwalls on the London Avenue Canal*, Orleans Parish, Louisiana, USACE, October 2011.

URS Group, Inc., *Geotechnical Engineering Evaluation Report, Remediation of the Floodwalls on the London Avenue Canal*, Orleans Parish, Louisiana, USACE, April 2011.

URS Group, Inc., *Design Documentation Report (DDR) Addendum 1, Preparation of Plans and Specifications for the Remediation to Raise the Maximum Operating Level (MOL) for the London Avenue Canal OFC-03C Rev. 3*, USACE, April 2011.

U.S. Army Corps of Engineers Publications

DIVR 1110-1-400 Landside Seepage Berms for Mississippi River Levees, December 1998

EM 1110-2-1901 Seepage Analysis and Control for Dams, September 30, 1986 (Original), April 30, 1993 (Change 1)

EM 1110-2-1913 Design and Construction of Levees, April 30, 2000

EM 1110-2-2502 Retaining and Flood Walls, September 29, 1989

EM 1110-2-2504 Design of Sheet Pile Walls, March 31, 1994

ETL 1110-2-569 Design Guidance for Levee Underseepage, May 2005

ETL 1110-2-575 Evaluation of I-Walls, September 2011

TM 3-424 Investigation of Underseepage and Its Control, Lower Mississippi River

Software

Design and Analysis of Sheet-Pile Walls by Classical Methods (CWALSHT), X0031, US Army Corps of Engineers Waterways Experiment Station Information Technology Laboratory (USAEWES), Vicksburg, Mississippi, 2001

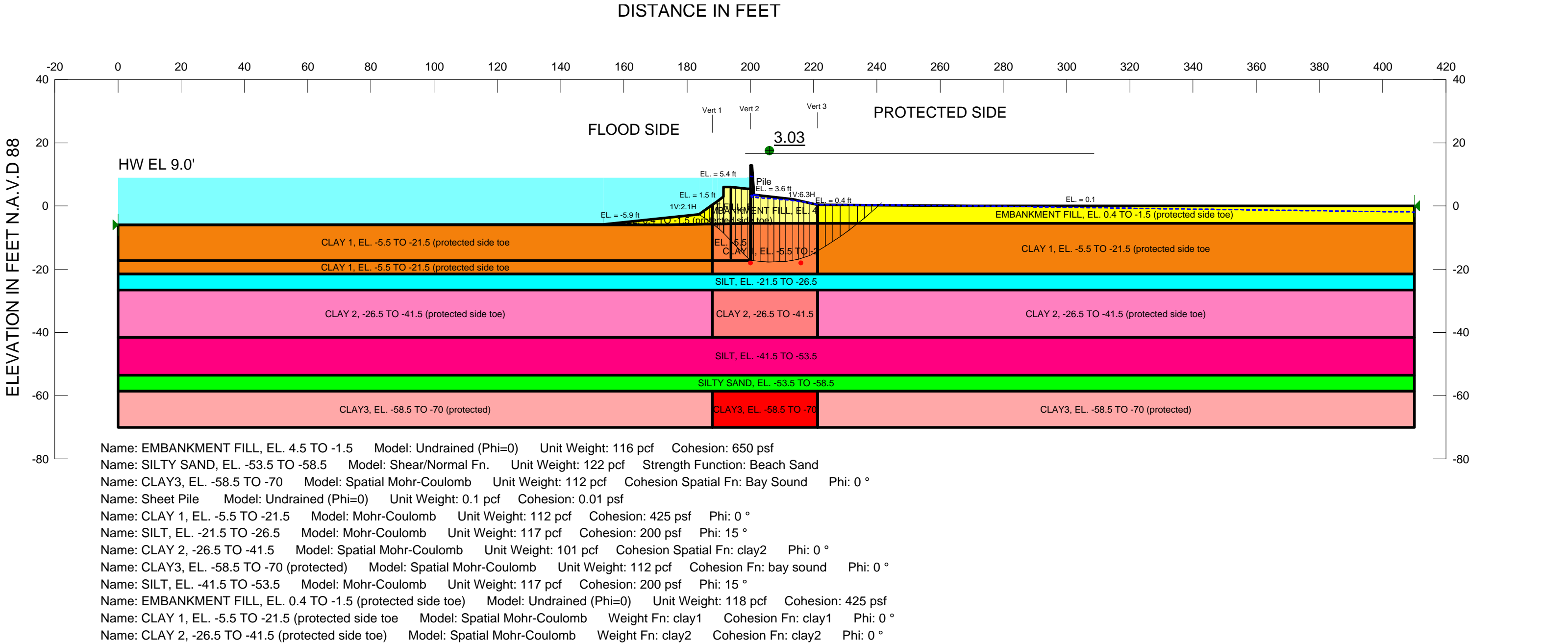
GeoStudio 2007 (includes packages SLOPE/W and SEEP/W), Version 7.16, GEOSLOPE International, Calgary, Canada, 2010

Stability with Uplift (also known as the *Method of Planes*), FS004, New Orleans District, New Orleans, Louisiana, 1982

Fast Lagrangian Analysis of Continua (FLAC), Version 7.0.413, Itasca, Minneapolis, Minnesota, 2012

Appendices

APPENDIX A GLOBAL STABILITY ANALYSIS



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

GENERAL NOTES

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

WHERE INDICATED, SHEAR STRENGTHS BETWEEN
VERTICALSWERE ASSUMED TO VARY LINEARLY
BETWEENTHE VALUES INDICATED FOR THESE LOCATIONS.

Hw = CANAL WATER LEVEL

LONDON AVE CANAL
OUTFALL CANAL REEVALUATION REPORT
REACH 1, STA. 2+44 TO 10+00
PROTECTED SIDE STABILITY ANALYSIS,
CASE: Global Stability (-18 passive)
MARCH 2012

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

Global Stability (-18 passive)

Report generated using GeoStudio 2007, version 7.15. Copyright © 1991-2009 GEO-SLOPE International Ltd.

File Information

Created By: Liljegren, James
Revision Number: 286
Last Edited By: Curran, Matthew MVN
Date: 2/4/2013
Time: 2:26:42 PM
File Name: Reach 1 - manual search - Passive Resistance (shallow).gsz
Directory: C:\Users\B2EDFMJC\Desktop\Chrono Order\Reach 1 SlopeW\
Last Solved Date: 2/4/2013
Last Solved Time: 3:39:38 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 (-18 passive)

Kind: SLOPE/W
Parent: Gap Analysis (Seepage)
Method: Spencer
Settings
 PWP Conditions Source: Parent Analysis
SlipSurface
 Direction of movement: Left to Right
 Use Passive Mode: Yes
 Slip Surface Option: 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

Unit Weight: 117 pcf
Cohesion: 200 psf
Phi: 15 °
Phi-B: 0 °

CLAY 2, -26.5 TO -41.5

Model: Spatial Mohr-Coulomb
Unit Weight: 101 pcf
Cohesion Spatial Fn: clay2
Phi: 0 °
Phi-B: 0 °

CLAY3, EL. -58.5 TO -70 (protected)

Model: Spatial Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion Fn: bay sound
Phi: 0 °
Phi-B: 0 °

SILT, EL. -41.5 TO -53.5

Model: Mohr-Coulomb
Unit Weight: 117 pcf
Cohesion: 200 psf
Phi: 15 °
Phi-B: 0 °

EMBANKMENT FILL, EL. 0.4 TO -1.5 (protected side toe)

Model: Undrained (Phi=0)
Unit Weight: 118 pcf
Cohesion: 425 psf

CLAY 1, EL. -5.5 TO -21.5 (protected side toe)

Model: Spatial Mohr-Coulomb
Weight Fn: clay1
Cohesion Fn: clay1
Phi: 0 °
Phi-B: 0 °

CLAY 2, -26.5 TO -41.5 (protected side toe)

Model: Spatial Mohr-Coulomb
Weight Fn: clay2
Cohesion Fn: clay2
Phi: 0 °
Phi-B: 0 °

Advanced

Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 6000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 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. 4.5 TO -1.5

Model: Undrained (Phi=0)
Unit Weight: 116 pcf
Cohesion: 650 psf

SILTY SAND, EL. -53.5 TO -58.5

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

CLAY3, EL. -58.5 TO -70

Model: Spatial Mohr-Coulomb
Unit Weight: 112 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

CLAY 1, EL. -5.5 TO -21.5

Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion: 425 psf
Phi: 0 °
Phi-B: 0 °

SILT, EL. -21.5 TO -26.5

Model: Mohr-Coulomb

Slip Surface Limits

Left Coordinate: (0, -5.9) ft
Right Coordinate: (410, 0.1) ft

Slip Surface Block

Left Grid
 Upper Left: (200, -18) ft
 Lower Left: (200, -18) ft
 Lower Right: (200, -18) ft
 X Increments: 0
 Y Increments: 0
 Starting Angle: 125 °
 Ending Angle: 145 °
 Angle Increments: 4
Right Grid
 Upper Left: (216, -18) ft
 Lower Left: (216, -18) ft
 Lower Right: (216, -18) ft
 X Increments: 0
 Y Increments: 0
 Starting Angle: 25 °
 Ending Angle: 45 °
 Angle Increments: 4

Cohesion Functions

bay sound

Model: Spline Data Point Function
Function: Cohesion vs. Y
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 775
Data Points: Y (ft), Cohesion (psf)
 Data Point: (-70, 645)
 Data Point: (-58.5, 775)

clay1

Model: Spline Data Point Function
Function: Cohesion vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 400
Data Points: X (ft), Cohesion (psf)
 Data Point: (188, 400)

Data Point: (200, 425)
Data Point: (221.6, 400)

clay2

Model: Spline Data Point Function
Function: Cohesion vs. Y
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 405
Data Points: Y (ft), Cohesion (psf)
Data Point: (-41.5, 560)
Data Point: (-26.5, 405)

Shear/Normal Strength Functions

Beach Sand

Model: Spline Data Point Function
Function: Shear Stress vs. Normal Stress
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
Data Point: (-100000, 0)
Data Point: (0, 0)
Data Point: (100000, 57735)
Estimation Properties
Intact Rock Param.: 10
Geological Strength: 100
Disturbance Factor: 0
SigmaC: 600000 psf
Sigma3: 300000 psf
Num. Points: 20

Unit Weight Functions

clay1

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 111
Data Points: X (ft), Unit Weight (pcf)
Data Point: (188, 111)
Data Point: (200, 112)
Data Point: (221.6, 111)

clay2

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 102
Data Points: X (ft), Unit Weight (pcf)
Data Point: (188, 102)
Data Point: (200, 101)
Data Point: (221.6, 102)

Spatial Functions

Bay Sound

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (188, -58.5, 645)
Data Point: (188, -70, 775)
Data Point: (200, -58.5, 725)
Data Point: (200, -70, 850)
Data Point: (221.2, -58.5, 645)
Data Point: (221.2, -70, 775)

clay2

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (188, -26.5, 405)
Data Point: (188, -41.5, 560)
Data Point: (200, -26.5, 430)
Data Point: (200, -41.5, 590)
Data Point: (221.2, -26.5, 405)
Data Point: (221.2, -41.5, 560)

Regions

	Material	Points	Area (ft²)
Region 1	EMBANKMENT FILL, EL. 4.5 TO -1.5	26,42,13,3,43,2,45,46,27,20,12,24	121.83862
Region 2	EMBANKMENT FILL, EL. 4.5 TO -1.5	24,16,4,21,51,27,20,12	166.3
Region 3	CLAY 1, EL. -5.5 TO -21.5	46,27,34,44,33,17,56	140.50074

Region 4	CLAY 1, EL. -5.5 TO -21.5	27,51,52,47,56,17,33,44,34	389.6
Region 5	SILT, EL. -21.5 TO -26.5	6,47,52,7,30,53,48,29	2050
Region 6	CLAY 2, -26.5 TO -41.5	48,53,54,49	498
Region 7	SILTY SAND, EL. -53.5 TO -58.5	41,9,36,37,8,40,50,55	2050
Region 8	CLAY3, EL. -58.5 TO -70	37,36,39,38	381.8
Region 9	CLAY3, EL. -58.5 TO -70 (protected)	10,8,37,38	2162
Region 10	CLAY3, EL. -58.5 TO -70 (protected)	36,9,11,39	2171.2
Region 11	SILT, EL. -41.5 TO -53.5	40,31,49,54,32,41,55,50	4920
Region 12	EMBANKMENT FILL, EL. 0.4 TO -1.5 (protected side toe)	45,23,58,57,1,46	76.126433
Region 13	EMBANKMENT FILL, EL. 0.4 TO -1.5 (protected side toe)	21,35,5,28,51	1064.66
Region 14	CLAY 1, EL. -5.5 TO -21.5 (protected side toe)	51,28,7,52	3020.8
Region 15	CLAY 1, EL. -5.5 TO -21.5 (protected side toe)	57,1,46,56,19	2144.7392
Region 16	CLAY 1, EL. -5.5 TO -21.5 (protected side toe)	19,56,47,6	789.6
Region 17	CLAY 2, -26.5 TO -41.5 (protected side toe)	53,30,32,54	2832
Region 18	CLAY 2, -26.5 TO -41.5 (protected side toe)	29,48,49,31	2820
Region 19	Sheet Pile	25,15,22,16,24,26	7.5

Points

	X (ft)	Y (ft)
Point 1	173.8	-5.9
Point 2	189.5	1.5

Point 3	191.5	6
Point 4	213.4	2.2
Point 5	410	0.1
Point 6	0	-21.5
Point 7	410	-21.5
Point 8	0	-58.5
Point 9	410	-58.5
Point 10	0	-70
Point 11	410	-70
Point 12	200	1.5
Point 13	193.8	6
Point 14	193.8	1.5
Point 15	200.5	12.8
Point 16	201	3.6
Point 17	200	-17.3
Point 18	193.8	-16.5
Point 19	0	-17.3
Point 20	200	-4.9
Point 21	221.2	0.4
Point 22	201	6
Point 23	183.8	-2.7
Point 24	200	3.6
Point 25	200	12.8
Point 26	200	5.4
Point 27	200	-5.5
Point 28	410	-5.5
Point 29	0	-26.5
Point 30	410	-26.5
Point 31	0	-41.5
Point 32	410	-41.5
Point 33	200	-12.5
Point 34	200	-7.2
Point 35	270.4	0.1
Point 36	221.2	-58.5
Point 37	188	-58.5
Point 38	188	-70

Point 39	221.2	-70
Point 40	0	-53.5
Point 41	410	-53.5
Point 42	199	5.4
Point 43	191.5	3
Point 44	200	-10.9
Point 45	188.00714	0.4
Point 46	188	-5.68321
Point 47	188	-21.5
Point 48	188	-26.5
Point 49	188	-41.5
Point 50	188	-53.5
Point 51	221.2	-5.5
Point 52	221.2	-21.5
Point 53	221.2	-26.5
Point 54	221.2	-41.5
Point 55	221.2	-53.5
Point 56	188	-17.3
Point 57	0	-5.9
Point 58	153.47813	-5.8

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	3.03	(213.12, -0.92)	25.66901	(183.799, -2.70015)	(240.705, 0.28107)
2	13	3.13	(213.12, -0.92)	25.657	(184.318, -2.31818)	(242.096, 0.272586)

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	183.7993	-2.700635	730.08954	617.26482	0	425

2	Optimized	184.63355	-3.2632065	748.38082	692.33183	0	425
3	Optimized	186.3007	-4.3873755	788.76394	889.27415	0	425
4	Optimized	187.5707	-5.288931	827.66042	1025.1031	0	425
5	Optimized	188.75355	-6.2089885	868.93349	1162.0677	0	425
6	Optimized	189.92145	-7.1173825	910.35599	1306.1809	0	425
7	Optimized	190.92145	-7.9747805	950.47824	1410.4817	0	425
8	Optimized	191.5698	-8.5682455	978.54019	1362.7893	0	425
9	Optimized	192.7198	-9.78002	1035.8482	1761.3384	0	425
10	Optimized	194.585	-11.762085	1173.2599	1968.0193	0	425
11	Optimized	196.23705	-13.48875	1239.7569	2149.4933	0	425
12	Optimized	198.05205	-15.29617	1294.2235	2346.8854	0	425
13	Optimized	199.4896	-16.68363	1319.3475	2487.9124	0	425
14	Optimized	199.9896	-17.15719	1321.388	2774.0048	0	425
15	Optimized	200.25	-17.18271	1307.6351	2299.5827	0	425
16	Optimized	200.75	-17.23171	1299.3548	2388.1583	0	425
17	Optimized	202.14265	-17.368195	1277.3283	2351.4077	0	425
18	Optimized	204.4279	-17.59216	1270.7087	2346.5736	0	425
19	Optimized	206.51165	-17.66831	1260.5093	2363.6143	0	425
20	Optimized	208.39395	-17.596655	1245.3263	2330.9124	0	425

21	Optimized	210.2763	-17.525	1231.3643	2298.1574	0	425
22	Optimized	212.30875	-17.31384	1208.2165	2279.6785	0	425
23	Optimized	214.27795	-16.997445	1179.5532	2205.8286	0	425
24	Optimized	216.0519	-16.547825	1143.6043	2154.0325	0	425
25	Optimized	217.8439	-15.93072	1097.1193	2034.7862	0	425
26	Optimized	219.96995	-14.921975	1024.8015	1916.8487	0	425
27	Optimized	222.4686	-13.499655	924.45495	1716.4192	0	400
28	Optimized	224.8983	-12.00397	820.18414	1564.8939	0	400
29	Optimized	227.22045	-10.456845	712.8499	1385.2031	0	400
30	Optimized	229.7766	-8.67778	591.39253	1189.6469	0	400
31	Optimized	232.5609	-6.58614	450.259	957.84946	0	400
32	Optimized	234.96265	-4.708375	325.44714	740.12118	0	425
33	Optimized	237.15755	-2.867295	204.4367	530.45566	0	425
34	Optimized	239.5222	-0.76838505	67.856702	268.91875	0	425

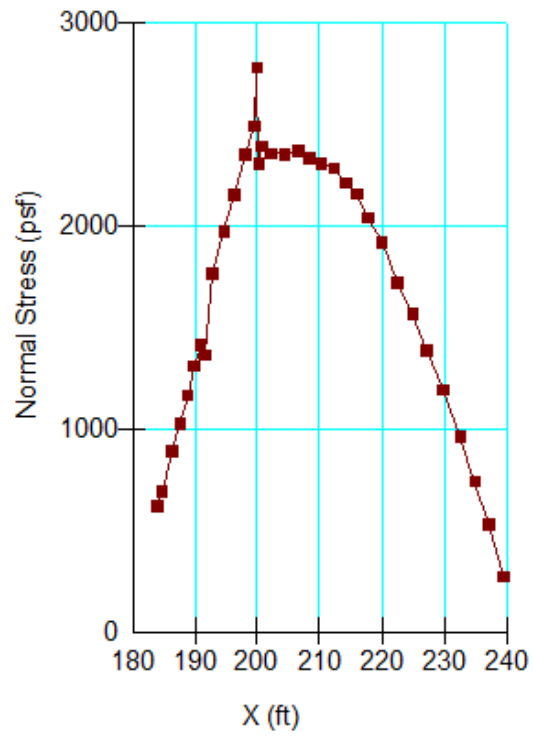
Slices of Slip Surface: 13

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	13	185.16065	-3.16063	738.96163	653.39015	0	425
2	13	186.84555	-4.845526	808.79536	911.11183	0	425
3	13	187.84755	-5.847557	853.71336	1070.5203	0	400
4	13	188.75355	-6.75357	895.12098	1184.1478	0	425

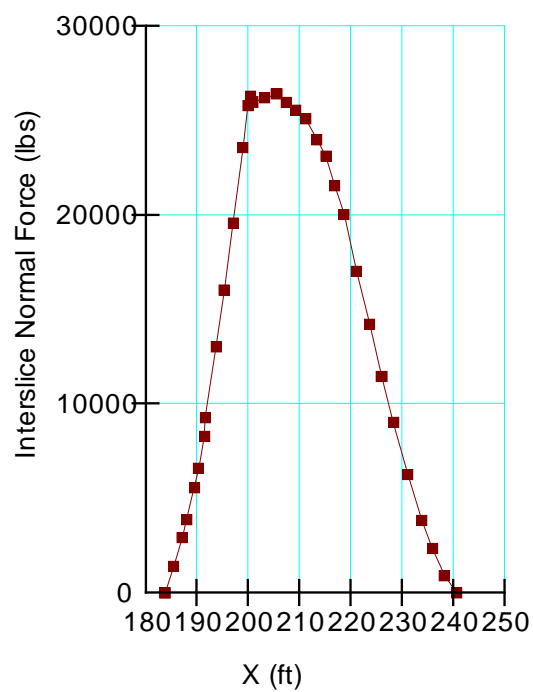
5	13	190.5	-8.5	976.51451	1439.2099	0	425
6	13	192.65	-10.65	1076.8315	1857.2314	0	425
7	13	194.66665	-12.666665	1207.3166	2085.7062	0	425
8	13	196.4	-14.4	1270.589	2260.2664	0	425
9	13	198.13335	-16.133335	1319.8689	2434.8265	0	425
10	13	199.15	-17.15	1333.3204	2536.8632	0	425
11	13	199.65	-17.65	1345.6242	2590.1321	0	425
12	13	200.25	-18	1353.98	2418	0	425
13	13	200.75	-18	1343.58	2498.4	0	425
14	13	202.03335	-18	1320.1449	2448.919	0	425
15	13	204.1	-18	1298.7579	2421.8706	0	425
16	13	206.16665	-18	1283.1288	2394.7738	0	425
17	13	208.23335	-18	1271.5159	2367.7254	0	425
18	13	210.3	-18	1261.0159	2340.677	0	425
19	13	212.36665	-18	1251.0966	2313.5803	0	425
20	13	214.7	-18	1240.9615	2265.2692	0	425
21	13	216.86665	-17.393155	1193.7567	2316.2945	0	425
22	13	218.6	-16.17946	1109.9669	2127.2594	0	425
23	13	220.33335	-14.965765	1026.1771	1938.2715	0	425
24	13	222.1037	-13.72614	940.24892	1767.1023	0	400
25	13	223.9111	-12.46058	852.68693	1620.1233	0	400
26	13	225.7185	-11.19502	765.30624	1473.1443	0	400
27	13	227.5259	-9.92946	677.92554	1326.1652	0	400
28	13	229.3333	-8.6639	591.58725	1179.2315	0	400
29	13	231.1407	-7.39834	505.43025	1032.2525	0	400
30	13	232.94815	-6.13278	420.2522	885.27341	0	400
31	13	234.8824	-4.778427	330.07306	728.96037	0	425
32	13	236.9434	-3.335280	234.76888	550.90342	0	425

			5				
33	13	239.0044	-1.892134	140.34305	372.83853	0	425
34	13	241.06545	- 0.448987 7	46.628663	194.76966	0	425

Base Normal Stress Vs. X



Interslice Normal Stress
Vs. X



Global Stability (Block) Angled In clay

Report generated using GeoStudio 2007, version 7.15. Copyright © 1991-2009 GEO-SLOPE International Ltd.

File Information

Created By: Liljegren, James
Revision Number: 239
Last Edited By: Schroeder, Danielle V MVN
Date: 1/11/2012
Time: 3:57:06 PM
File Name: Reach 2-DVS.gsz
Directory: G:\F&MHOME\London Ave Reeevaluation 2011\Priority Reaches\Reach 2\SlopeW\
Last Solved Date: 1/11/2012
Last Solved Time: 3:59:26 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 Stability (Block) Angled In clay

Kind: [SLOPE/W](#)
Parent: [Gap Analysis \(Seepage\)](#)
Method: [Spencer](#)
Settings
 PWP Conditions Source: [Parent Analysis](#)
SlipSurface
 Direction of movement: [Left to Right](#)
 Use Passive Mode: [Yes](#)
 Slip Surface Option: [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. 5.8 TO -5.5

Model: [Undrained \(Phi=0\)](#)
Unit Weight: 116 pcf
Cohesion: 825 psf

CLAY 1, EL. -5.5 TO -30

Model: [Spatial Mohr-Coulomb](#)
Unit Weight: 117 pcf
Cohesion Spatial Fn: [Clay](#)
Phi: 0 °
Phi-B: 0 °

SILT, EL.-30 TO -58.5

Model: [Mohr-Coulomb](#)
Unit Weight: 117 pcf
Cohesion: 200 psf
Phi: 15 °
Phi-B: 0 °

CLAY 2, EL. -58.5 TO -70

Model: [Spatial Mohr-Coulomb](#)
Unit Weight: 105 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

FILL, EL. 0.9 TO -1.5 (Protected)

Model: [Undrained \(Phi=0\)](#)
Unit Weight: 116 pcf
Cohesion: 900 psf

FILL, EL. -1.5 TO -5.5 (Protected)

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

3/1/2012

3/1/2012

Global Stability (Block) Angled In clay

Unit Weight: 116 pcf
Cohesion: 500 psf

Slip Surface Limits

Left Coordinate: (150.6, -6.7) ft
Right Coordinate: (310, 1.4) ft

Slip Surface Block

Left Grid
 Upper Left: (178, -8) ft
 Lower Left: (190, -30) ft
 Lower Right: (210, -30) ft
 X Increments: 7
 Y Increments: 10
 Starting Angle: 125 °
 Ending Angle: 145 °
 Angle Increments: 4
Right Grid
 Upper Left: (202, -8) ft
 Lower Left: (215, -30) ft
 Lower Right: (240, -30) ft
 X Increments: 10
 Y Increments: 10
 Starting Angle: 25 °
 Ending Angle: 45 °
 Angle Increments: 4

Spatial Functions

Bay sound

Model: [Linear Interpolation](#)
Limit Range By: [Data Values](#)
Data Points: X (ft), Y (ft), Cohesion (psf)
 Data Point: (180.7, -58.5, 710)
 Data Point: (180.7, -70, 820)
 Data Point: (200, -58.5, 780)
 Data Point: (200, -70, 890)
 Data Point: (212.8, -58.5, 710)
 Data Point: (212.8, -70, 820)
 Data Point: (150.6, -58.5, 710)
 Data Point: (150.6, -70, 820)
 Data Point: (310, -58.5, 710)
 Data Point: (310, -70, 820)

Clay

Model: [Linear Interpolation](#)

Global Stability (Block) Angled In clay

Limit Range By: [Data Values](#)
Data Points: X (ft), Y (ft), Cohesion (psf)
 Data Point: (180.7, -5.5, 285)
 Data Point: (180.7, -30, 400)
 Data Point: (200, -5.5, 300)
 Data Point: (200, -30, 425)
 Data Point: (212.8, -5.5, 285)
 Data Point: (212.8, -30, 400)
 Data Point: (150.6, -5.5, 285)
 Data Point: (150.6, -30, 400)
 Data Point: (310, -5.5, 285)
 Data Point: (310, -30, 400)

Regions

	Material	Points	Area (ft²)
Region 1	EMBANKMENT FILL, EL. 5.8 TO -5.5	3,4,14,21,15,32,23	115.235
Region 2	EMBANKMENT FILL, EL. 5.8 TO -5.5	15,21,19,5,24,28,29	107.48
Region 3	SILT, EL.-30 TO -58.5	10,8,9,11	4542.9
Region 4	Sheet Pile	21,14,27,18,22,19	7.4
Region 5	FILL, EL. 0.9 TO -1.5 (Protected)	26,6,28,24,25	279.18
Region 6	FILL, EL. -1.5 TO -5.5 (Protected)	29,28,6,30	388.8
Region 7	CLAY 1, EL. -5.5 TO -30	8,20,31,17,16,15,29,30,9	3322.38
Region 8	CLAY 1, EL. -5.5 TO -30	20,7,1,2,32,15,16,17,31	553.78
Region 9	CLAY 2, EL. -58.5 TO -70	12,10,11,13	1833.1

Points

	X (ft)	Y (ft)
Point 1	150.6	-6.7
Point 2	179.1	-6.3
Point 3	194.8	3
Point 4	195.4	5.8
Point 5	206.3	3.5
Point 6	310	-1.5
Point 7	150.6	-9.5
Point 8	150.6	-30
Point 9	310	-30
Point 10	150.6	-58.5
Point 11	310	-58.5
Point 12	150.6	-70
Point 13	310	-70
Point 14	200	5.8
Point 15	200	-5.5
Point 16	200	-9.5

3/1/2012

3/1/2012

Point 17	200	-17.3
Point 18	200.5	12.8
Point 19	201	3.7
Point 20	150.6	-17.3
Point 21	200	3.7
Point 22	201	6
Point 23	184.3	-3.7
Point 24	212.8	0.9
Point 25	223.6	1.4
Point 26	310	1.4
Point 27	200	12.8
Point 28	212.8	-1.5
Point 29	212.8	-5.5
Point 30	310	-5.5
Point 31	180.7	-17.3
Point 32	180.7	-5.5

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	3.20	(209.189, 2.192)	21.11204	(186.179, -2.50135)	(230.686, 1.4)
2	10514	3.21	(209.189, 2.192)	21.143	(187.329, -1.76727)	(231.39, 1.4)

Slices of Slip Surface: **Optimized**

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	186.80095	-2.9389	736.65043	593.17774	0	825
2	Optimized	188.0459	-3.813992	775.55293	735.5333	0	825
3	Optimized	189.2909	-4.689084	815.63828	877.80343	0	825
4	Optimized	190.1451	-5.313315	845.26193	949.71193	0	825
5	Optimized	191.064	-6.05368	880.43829	1191.9344	0	295.78
6	Optimized	192.43845	-7.16104	933.97846	1364.2261	0	302.33
7	Optimized	193.96285	-8.5190265	998.8591	1549.1964	0	310.33
8	Optimized	195.1	-9.6115595	1049.9193	1746.0596	0	316.74
9	Optimized	195.86665	-10.348118	1082.5725	1935.8971	0	321.1
10	Optimized	197.2439	-11.82106	1145.9203	2076.4516	0	329.74
11	Optimized	199.0651	-13.87028	1230.2885	2305.4095	0	341.81
12	Optimized	199.98785	-14.896715	1268.9866	2586.3403	0	347.93
13	Optimized	200.25	-14.936065	1160.0838	2133.8944	0	347.77

3/1/2012

14	Optimized	200.75	-15.011115	1153.2603	2158.6174	0	347.42
15	Optimized	201.7829	-15.16616	1159.0961	2172.8078	0	346.68
16	Optimized	203.34875	-15.4012	1165.159	2193.4597	0	345.53
17	Optimized	204.9146	-15.63624	1169.0115	2214.0485	0	344.37
18	Optimized	205.99875	-15.77756	1171.3486	2237.4911	0	343.44
19	Optimized	207.2499	-15.876415	1170.2937	2203.7916	0	342.05
20	Optimized	208.79495	-15.785185	1156.0839	2179.704	0	339.28
21	Optimized	209.9852	-15.452615	1128.8143	2084.5437	0	335.91
22	Optimized	211.5567	-14.69256	1072.6544	1971.9148	0	329.97
23	Optimized	212.66655	-13.9929	1022.8211	1863.6182	0	325.06
24	Optimized	213.52225	-13.313915	975.68964	1779.2562	0	321.68
25	Optimized	214.9668	-12.167725	895.81021	1648.8895	0	316.3
26	Optimized	216.79055	-10.73557	797.22746	1484.2061	0	309.58
27	Optimized	218.9887	-9.01934	679.37457	1289.4575	0	301.52
28	Optimized	220.8923	-7.5349925	578.83077	1120.2829	0	294.55
29	Optimized	222.5061	-6.2806375	494.97345	977.86245	0	288.66
30	Optimized	223.40065	-5.57673	448.48785	909.16544	0	285.36
31	Optimized	223.54415	-5.4510925	440.24937	956.68616	0	500
32	Optimized	224.62015	-4.5091375	378.69946	845.20526	0	500
33	Optimized	226.8007	-2.50558	249.17762	621.79224	0	500
34	Optimized	228.64235	-0.6963025	133.29665	553.17828	0	900
35	Optimized	230.0049	0.7012325	44.290126	386.62535	0	900

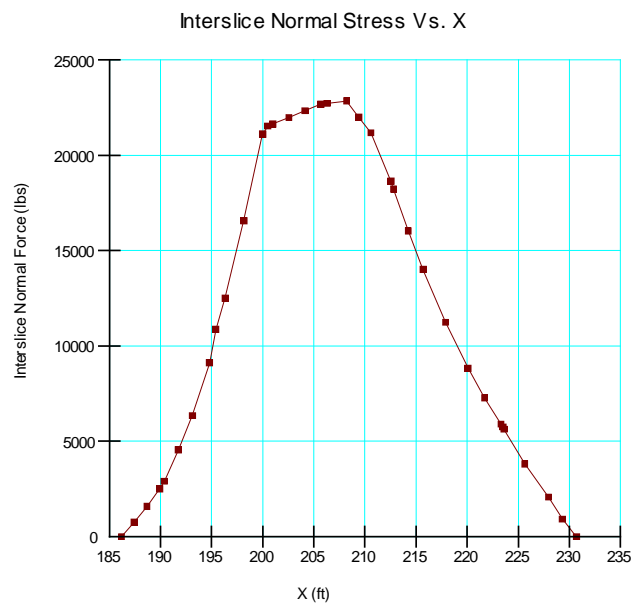
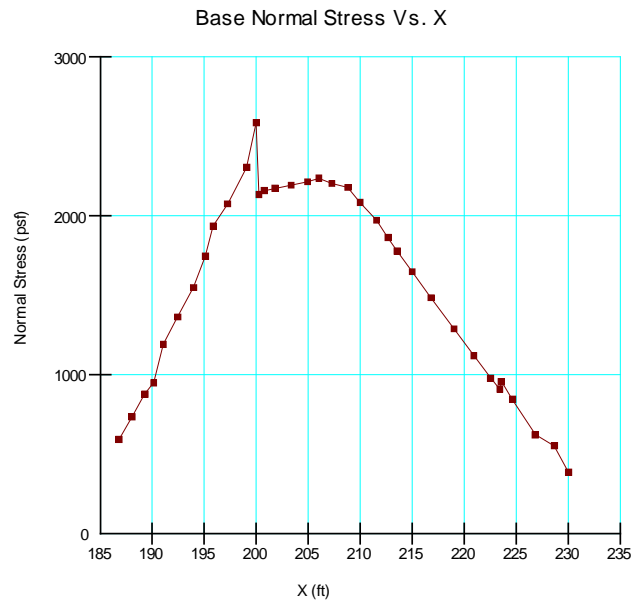
Slices of Slip Surface: **10514**

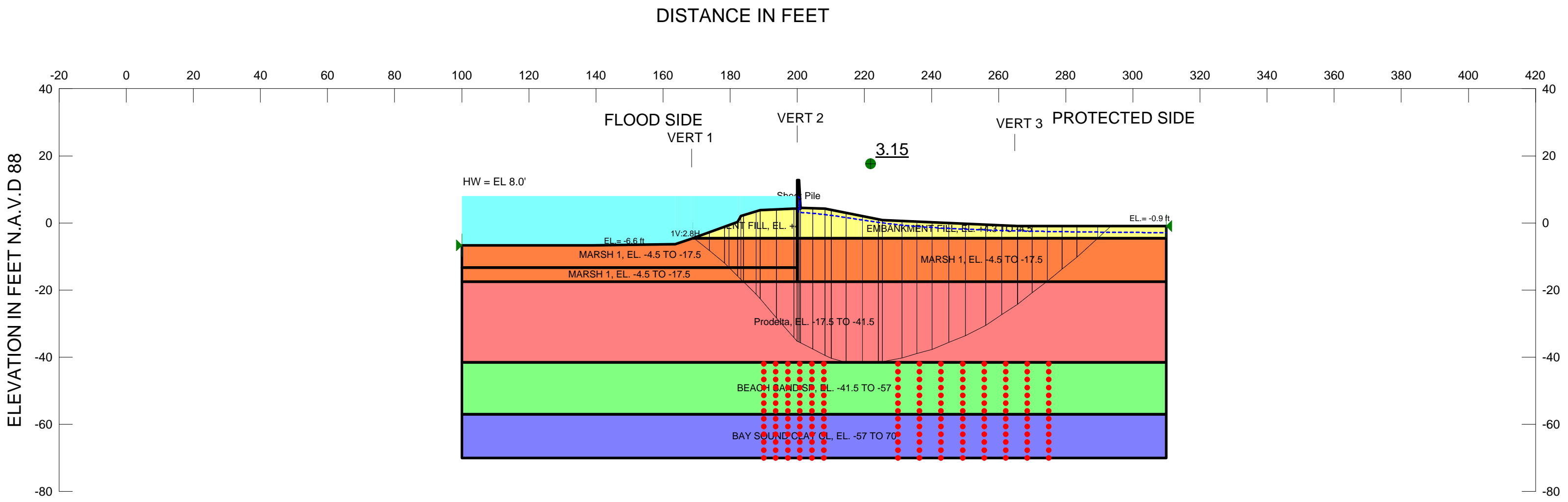
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	10514	188.11195	-2.7004545	716.96975	487.32435	0	825
2	10514	189.678	-4.566818	807.84283	752.22719	0	825
3	10514	191.1842	-6.3618305	895.74633	1196.2247	0	297.38
4	10514	192.63055	-8.085491	979.29895	1439.105	0	307.06
5	10514	194.07685	-9.8091505	1060.7628	1681.9854	0	316.84

3/1/2012

6	10514	195.1	-11.028505	1115.3436	1896.8662	0	323.83
7	10514	196.15715	-12.28836	1169.9585	2136.3353	0	331.1
8	10514	197.67145	-14.093015	1245.0919	2339.1105	0	341.61
9	10514	199.2143	-15.89767	1307.4288	2548.5376	0	352.27
10	10514	200.25	-16.8	1300.96	2380.4	0	357.27
11	10514	200.75	-16.8	1292.54	2392	0	356.5
12	10514	201.6625	-16.8	1277.8868	2388.4528	0	355.11
13	10514	202.9875	-16.8	1260.6038	2382.6415	0	353.08
14	10514	204.3125	-16.8	1249.7358	2376.8302	0	351.05
15	10514	205.6375	-16.8	1239.8491	2371.0189	0	349.02
16	10514	207.15	-16.8	1230.4706	2328.6471	0	346.7
17	10514	208.85	-16.8	1221.0588	2249.7647	0	344.09
18	10514	210.475	-16.1497	1171.1586	2221.4304	0	338.5
19	10514	212.025	-14.849095	1080.7653	1991.4687	0	330.02
20	10514	213.5405	-13.57745	992.6684	1805.9003	0	322.91
21	10514	215.02145	-12.334765	906.49334	1664.689	0	317.08
22	10514	216.5024	-11.09208	821.35279	1523.4778	0	311.25
23	10514	217.9834	-9.8493965	736.00535	1382.2666	0	305.42
24	10514	219.4644	-8.606711	651.58896	1241.0553	0	299.58
25	10514	220.94535	-7.3640265	567.58638	1099.8441	0	293.75
26	10514	222.4263	-6.121342	484.67005	958.63287	0	287.92
27	10514	223.3834	-5.3182575	431.75549	926.11243	0	500
28	10514	224.3223	-4.530429	380.22509	834.44515	0	500
29	10514	225.7669	-3.3182575	301.6008	691.58831	0	500
30	10514	227.2115	-2.106086	223.528	548.73147	0	500
31	10514	228.79785	-0.775	138.27467	500.31031	0	900
32	10514	230.5259	0.675	45.952655	329.44853	0	900

3/1/2012





Name: EMBANKMENT FILL, EL. +4.3 TO -4.5 Model: Undrained (Phi=0) Unit Weight: 117 pcf Cohesion: 760 psf

Name: MARSH 1, EL. -4.5 TO -17.5 Model: Spatial Mohr-Coulomb Unit Weight: 114 pcf Cohesion Fn: Marsh 1 Phi: 0 °

Name: BEACH SAND SP, EL. -41.5 TO -57 Model: Mohr-Coulomb Unit Weight: 122 pcf Cohesion: 0 psf Phi: 30 °

Name: BAY SOUND CLAY CL, EL. -57 TO 70 Model: Spatial Mohr-Coulomb Unit Weight: 112 pcf Cohesion Spatial Fn: Bay Sound Phi: 0 °

Name: Prodelta, EL. -17.5 TO -41.5 Model: Spatial Mohr-Coulomb Unit Weight: 98 pcf Cohesion Fn: Prodelta Phi: 0 °

Name: Sheet Pile Model: Undrained (Phi=0) Unit Weight: 0.1 pcf Cohesion: 0.01 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
VERTICALSWERE ASSUMED TO VARY LINEARLY
BETWEENTHE VALUES INDICATED FOR THESE LOCATIONS.

Hw = CANAL WATER LEVEL

LONDON AVE CANAL
OUTFALL CANAL REEVALUATION REPORT
REACH 3, STA. 21+00 TO STA. 33+00
PROTECTED SIDE STABILITY ANALYSIS,
CASE: Global Stability (Block) lower
MARCH 2012

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

Global Stability (Block) lower

Report generated using GeoStudio 2007, version 7.15. Copyright © 1991-2009 GEO-SLOPE International Ltd.

File Information

Created By: Liljegren, James
Revision Number: 256
Last Edited By: Schroeder, Danielle V MVN
Date: 1/20/2012
Time: 11:22:10 AM
File Name: Reach 3-DVS.gsz
Directory: G:\F&MHOME\London Ave Reevaluation 2011\West Side\Reach 3\SlopeW\
Last Solved Date: 1/20/2012
Last Solved Time: 11:24:52 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

Global Stability (Block) lower

Kind: SLOPE/W
Parent: Gap Analysis (Seepage)
Method: Spencer
Settings
 PWP Conditions Source: Parent Analysis
SlipSurface
 Direction of movement: Left to Right
 Use Passive Mode: Yes
 Slip Surface Option: 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

Sheet Pile

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

Slip Surface Limits

Left Coordinate: (100, -6.6) ft
Right Coordinate: (310, -0.9) ft

Slip Surface Block

Left Grid
 Upper Left: (189.999, -42) ft
 Lower Left: (189.999, -70) ft
 Lower Right: (207.953, -70) ft
 X Increments: 5
 Y Increments: 12
 Starting Angle: 125 °
 Ending Angle: 145 °
 Angle Increments: 4
Right Grid
 Upper Left: (230, -42) ft
 Lower Left: (230, -70) ft
 Lower Right: (275, -70) ft
 X Increments: 7
 Y Increments: 12
 Starting Angle: 25 °
 Ending Angle: 45 °
 Angle Increments: 4

Cohesion Functions

Marsh 1

Model: Spline Data Point Function
Function: Cohesion vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 475
Data Points: X (ft), Cohesion (psf)
 Data Point: (100, 475)
 Data Point: (168.8, 475)
 Data Point: (200, 500)
 Data Point: (265.7, 475)
 Data Point: (310, 475)

Advanced

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

Materials

EMBANKMENT FILL, EL. +4.3 TO -4.5

Model: Undrained (Phi=0)
Unit Weight: 117 pcf
Cohesion: 760 psf

MARSH 1, EL. -4.5 TO -17.5

Model: Spatial Mohr-Coulomb
Unit Weight: 114 pcf
Cohesion Fn: Marsh 1
Phi: 0 °
Phi-B: 0 °

BEACH SAND SP, EL. -41.5 TO -57

Model: Mohr-Coulomb
Unit Weight: 122 pcf
Cohesion: 0 psf
Phi: 30 °
Phi-B: 0 °

BAY SOUND CLAY CL, EL. -57 TO 70

Model: Spatial Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion Spatial Fn: Bay Sound
Phi: 0 °
Phi-B: 0 °

Prodelta, EL. -17.5 TO -41.5

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

Prodelta

Model: Spline Data Point Function
Function: Cohesion vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 380
Data Points: X (ft), Cohesion (psf)
 Data Point: (100, 380)
 Data Point: (168.8, 380)
 Data Point: (200, 400)
 Data Point: (265.7, 380)
 Data Point: (310, 380)

Spatial Functions

Bay Sound

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
 Data Point: (168.8, -57, 580)
 Data Point: (168.8, -70, 720)
 Data Point: (200, -57, 715)
 Data Point: (200, -70, 860)
 Data Point: (265.7, -57, 580)
 Data Point: (265.7, -70, 720)
 Data Point: (100, -57, 580)
 Data Point: (100, -70, 720)
 Data Point: (310, -57, 580)
 Data Point: (310, -70, 720)

Regions

	Material	Points	Area (ft²)
Region 1	EMBANKMENT FILL, EL. +4.3 TO -4.5	27,23,24,7,22,1,16	175.48
Region 2	EMBANKMENT FILL, EL. +4.3 TO -4.5	1,25,21,2,3,26,4,8,16	536.01
Region 3	BEACH SAND SP, EL. -41.5 TO -57	12,10,11,13	3255
Region 4	BAY SOUND CLAY CL, EL. -57 TO 70	14,12,13,15	2730
Region 5	Prodelta, EL. -17.5 TO -41.5	10,18,17,9,11	5040
Region 6	Sheet Pile	1,19,20,21,25	6.425
Region 7	MARSH 1, EL. -4.5 TO -17.5	16,8,9,17,29	1430
Region 8	MARSH 1, EL. -4.5 TO -17.5	18,30,29,17	420
Region 9	MARSH 1, EL. -4.5 TO -17.5	30,28,5,6,27,16,29	745.33

Points

	X (ft)	Y (ft)
Point 1	200	4.3
Point 2	208.3	4.3
Point 3	225.4	0.9
Point 4	310	-0.9
Point 5	139.1	-6.6
Point 6	163.7	-6.3
Point 7	188.9	3.8
Point 8	310	-4.5
Point 9	310	-17.5
Point 10	100	-41.5
Point 11	310	-41.5
Point 12	100	-57
Point 13	310	-57
Point 14	100	-70
Point 15	310	-70
Point 16	200	-4.5
Point 17	200	-17.5
Point 18	100	-17.5
Point 19	200	12.8
Point 20	200.5	12.8
Point 21	201	4.5
Point 22	199	4.3
Point 23	182.2	0.3
Point 24	183.2	2.1
Point 25	201	4.3
Point 26	265.7	-0.9
Point 27	168.8	-4.5
Point 28	100	-6.6
Point 29	200	-13.3
Point 30	100	-13.3
Point 31		

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	3.15	(232.908, 0.344)	55.89414	(169.101, -4.39202)	(293.488, -0.9)
2	1122	4.83	(232.908, 0.344)	59.862	(164.902, -5.87581)	(301.187, -0.9)

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	171.43545	-	803.82196	902.12577	0	477.11
2	Optimized	176.0382	-	953.72202	1419.4703	0	480.8
3	Optimized	178.97175	-	1070.6939	1733.5888	0	483.15
4	Optimized	180.9183	-14.55693	1163.4002	1985.6626	0	484.71
5	Optimized	182.7	-16.3042	1249.3083	2247.2271	0	486.14
6	Optimized	183.5597	-17.14727	1291.4419	2404.9284	0	486.83
7	Optimized	185.80835	-19.35247	1398.8399	2689.0519	0	390.9
8	Optimized	188.29865	-21.90444	1519.9247	2945.9687	0	392.5
9	Optimized	191.35355	-25.45796	1681.2041	3305.1503	0	394.46
10	Optimized	196.40355	-31.20362	1936.1641	3880.4336	0	397.69
11	Optimized	199.4969	-	2092.0027	4219.4334	0	399.68

12	Optimized	199.9969	-	2117.494	4384.4616	0	400
13	Optimized	200.25	-35.33194	2123.1415	4157.0904	0	399.92
14	Optimized	200.75	-	2134.5582	4192.7674	0	399.77
15	Optimized	202.825	-36.63739	2182.1895	4312.2808	0	399.14
16	Optimized	206.475	-	2268.4498	4480.8915	0	398.03
17	Optimized	209.2241	-	2336.0569	4589.5915	0	397.19
18	Optimized	212.35725	-	2388.0573	4665.2766	0	396.24
19	Optimized	216.96015	-	2417.2459	4663.8455	0	394.84
20	Optimized	221.74785	-	2416.8282	4552.3093	0	393.38
21	Optimized	224.77085	-	2410.1933	4504.7186	0	392.46
22	Optimized	228.298	-40.73783	2373.2817	4411.3781	0	391.39
23	Optimized	233.42845	-39.56858	2304.6386	4288.4409	0	389.82
24	Optimized	237.8933	-	2228.1978	4139.2197	0	388.46
25	Optimized	242.6294	-	2127.922	3972.7259	0	387.02
26	Optimized	247.6368	-	2003.3056	3746.8239	0	385.5

	d		34.61728				
27	Optimized	253.1437	-	1843.7001	3483.8414	0	383.82
28	Optimized	258.52305	-	1648.5073	3169.5785	0	382.18
29	Optimized	263.27535	-	1451.8239	2833.435	0	380.74
30	Optimized	265.67575	-	1351.9044	2681.0842	0	380.01
31	Optimized	267.85545	-	1246.1541	2514.1512	0	380
32	Optimized	272.26885	-	1031.4902	2175.1918	0	380
33	Optimized	276.72365	-15.54598	808.21513	1826.0308	0	475
34	Optimized	281.11735	-11.95482	581.52086	1412.0812	0	475
35	Optimized	286.42335	-7.32962	289.53495	894.16394	0	475
36	Optimized	291.5103	-2.7	-2.5296618	438.92344	0	760

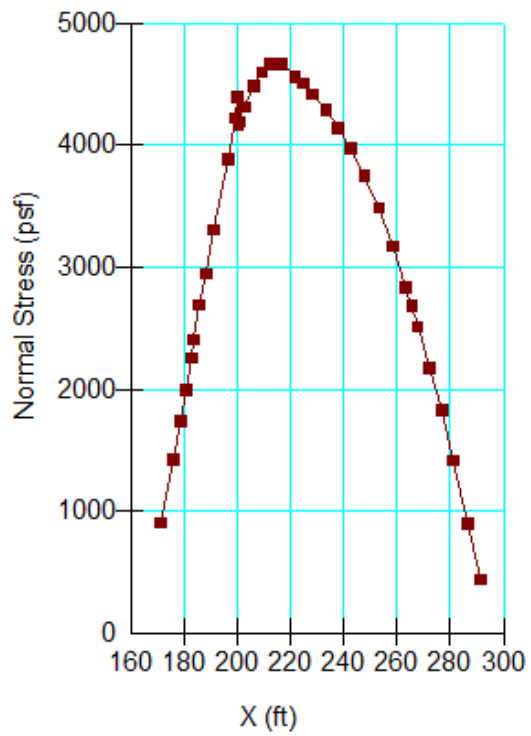
Slices of Slip Surface: 1122

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	1122	166.85095	-	914.03417	980.24034	0	475
2	1122	171.27485	-	1037.912	1477.4804	0	476.98

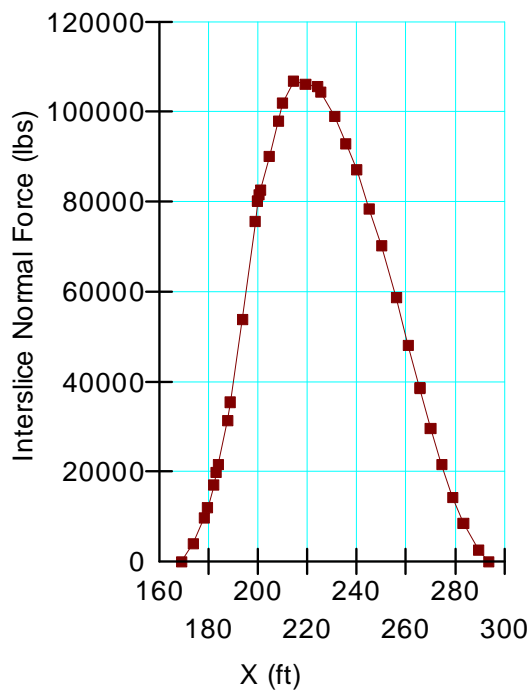
			6				
3	1122	176.25235	-15.4	1213.6289	2039.6263	0	480.97
4	1122	180.4775	- 18.94533 5	1377.9386	2510.2956	0	387.49
5	1122	182.7	-20.81022	1465.9796	2756.3051	0	388.91
6	1122	186.05	-23.6212	1597.5386	3135.5407	0	391.06
7	1122	191.425	-28.13136	1801.9488	3622.2524	0	394.5
8	1122	196.475	- 32.36881 5	1989.7435	4041.9841	0	397.74
9	1122	199.5	-34.90709	2104.2479	4292.3012	0	399.68
10	1122	200.25	- 35.53641 5	2132.9743	4106.7645	0	399.92
11	1122	200.75	- 35.95596 5	2152.2786	4167.2821	0	399.77
12	1122	204.17855	-38.83287	2287.6051	4456.1545	0	398.73
13	1122	207.65505	-41.75	2433.7225	4591.1749	1245.6057	0
14	1122	208.1265	-42	2449.3084	4932.5648	1433.7088	0
15	1122	210.4375	-42	2449.1228	4882.1053	1404.6831	0
16	1122	214.7125	-42	2448.655	4782.2222	1347.2857	0
17	1122	218.9875	-42	2448.4211	4682.5731	1289.8883	0
18	1122	223.2625	-42	2447.9532	4582.924	1232.6259	0
19	1122	227.7	-42	2447.6087	4520.8696	1196.9977	0
20	1122	230.433	-41.75	2431.8	4700.1	1309.6036	0
21	1122	233.04315	- 40.24303 5	2343.7449	4414.0131	0	389.94
22	1122	237.3974	-37.72911	2195.7691	4140.9342	0	388.62
23	1122	241.75165	- 35.21518 5	2044.4122	3867.6564	0	387.29
24	1122	246.1059	-32.70126	1890.4697	3594.5775	0	385.96
25	1122	250.46015	- 30.18733 5	1734.4985	3321.2997	0	384.64

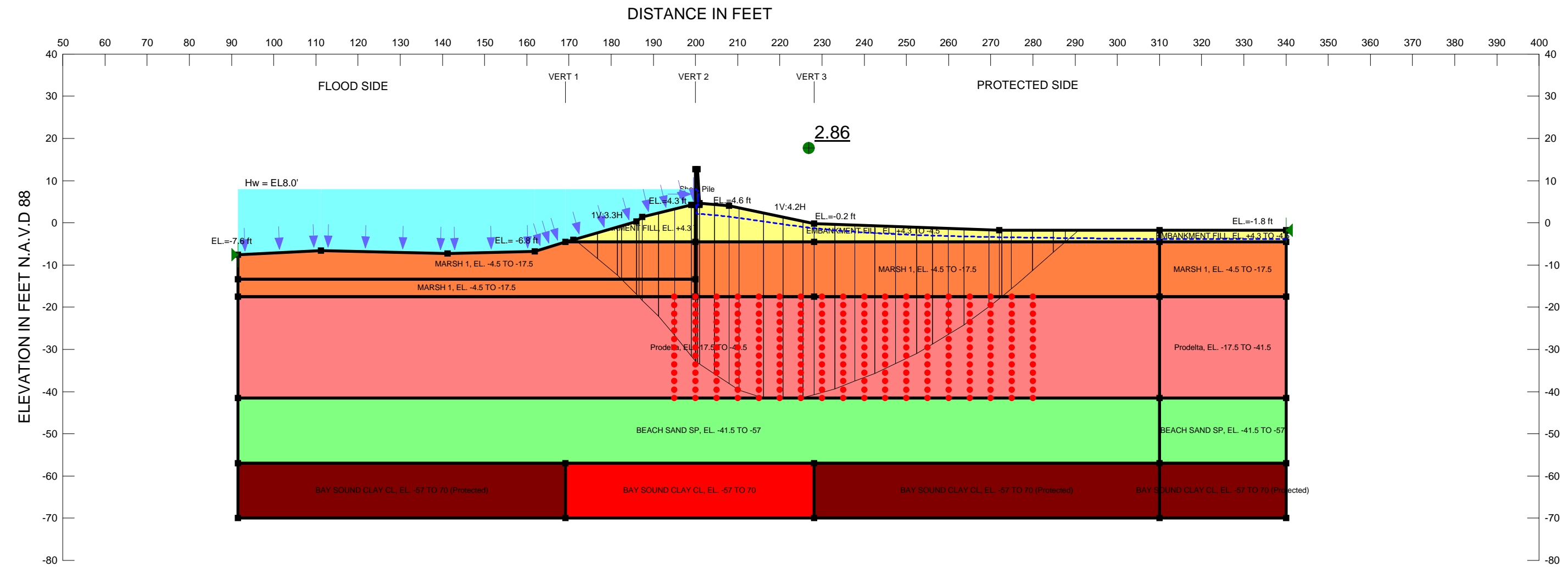
26	1122	254.8144	-27.67341	1577.1748	3048.2208	0	383.31
27	1122	259.16865	- 25.15948 5	1418.7771	2774.943	0	381.99
28	1122	263.5229	-22.64556	1259.7828	2501.8641	0	380.66
29	1122	269.0676	-19.4443	1056.6926	2171.9924	0	380
30	1122	274.6869	-16.2	850.55769	1840.3846	0	475
31	1122	279.19025	-13.6	685.32692	1539.7308	0	475
32	1122	283.69355	-11	520.13462	1239.0577	0	475
33	1122	288.1969	-8.4	355.05769	938.38462	0	475
34	1122	292.70025	-5.8	190.09231	637.71154	0	475
35	1122	298.0696	-2.7	-6.3518056	309.80556	0	760

Base Normal Stress Vs. X



Interslice Normal Stress
Vs. X





Name: EMBANKMENT FILL, EL. +4.3 TO -4.5 Model: Undrained (Phi=0) Unit Weight: 117 pcf Cohesion: 760 psf
Name: MARSH 1, EL. -4.5 TO -17.5 Model: Spatial Mohr-Coulomb Unit Weight: 114 pcf Cohesion Fn: MARSH 1 Phi: 0 °
Name: BEACH SAND SP, EL. -41.5 TO -57 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: SAND
Name: BAY SOUND CLAY CL, EL. -57 TO 70 Model: Spatial Mohr-Coulomb Unit Weight: 112 pcf Cohesion Spatial Fn: Bay Sound Phi: 0 °
Name: Prodelta, EL. -17.5 TO -41.5 Model: Spatial Mohr-Coulomb Unit Weight: 98 pcf Cohesion Fn: PRODELTA Phi: 0 °
Name: Sheet Pile Model: Undrained (Phi=0) Unit Weight: 0.1 pcf Cohesion: 0.01 psf
Name: BAY SOUND CLAY CL, EL. -57 TO 70 (Protected) Model: Spatial Mohr-Coulomb Unit Weight: 112 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
VERTICALSWERE ASSUMED TO VARY LINEARLY
BETWEENTHE VALUES INDICATED FOR THESE LOCATIONS.

Hw = CANAL WATER LEVEL

LONDON AVE CANAL
OUTFALL CANAL REEVALUATION REPORT
REACH 4, STA. 33+00 TO 37+00
PROTECTED SIDE STABILITY ANALYSIS
CASE: Global Stability (Block) EL -17.5 to EL-41.5 (Passive)
MARCH 2012

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

Global Stability (Block) EL -17.5 to EL-41.5 (Passive)

Report generated using GeoStudio 2007, version 7.15. Copyright © 1991-2009 GEO-SLOPE International Ltd.

File Information

Revision Number: 193
Last Edited By: Haggerty, Daniel R MVN
Date: 2/27/2012
Time: 1:02:11 PM
File Name: Reach 4.gsz
Last Solved Date: 2/27/2012
Last Solved Time: 1:04:14 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) EL -17.5 to EL-41.5 (Passive)

Kind: SLOPE/W
Parent: Gap Analysis (Seepage)
Method: Spencer
Settings
 PWP Conditions Source: Parent Analysis
SlipSurface
 Direction of movement: Left to Right
 Use Passive Mode: Yes
 Slip Surface Option: Block
 Critical slip surfaces saved: 1
 Optimize Critical Slip Surface Location: Yes
 Tension Crack
 Tension Crack Option: (none)
FOS Distribution
 FOS Calculation Option: Constant
Restrict Block Crossing: Yes
Advanced
 Number of Slices: 30
 Optimization Tolerance: 0.01

Cohesion: 0.01 psf

BAY SOUND CLAY CL, EL. -57 TO 70 (Protected)

Model: Spatial Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion Fn: Bay Sound
Phi: 0 °
Phi-B: 0 °

Slip Surface Limits

Left Coordinate: (91.5, -7.6) ft
Right Coordinate: (340, -1.8) ft

Slip Surface Block

Left Grid
 Upper Left: (195, -17.5) ft
 Lower Left: (195, -41.5) ft
 Lower Right: (220, -41.5) ft
 X Increments: 5
 Y Increments: 12
 Starting Angle: 120 °
 Ending Angle: 150 °
 Angle Increments: 6
Right Grid
 Upper Left: (225, -17.5) ft
 Lower Left: (225, -41.5) ft
 Lower Right: (280, -41.5) ft
 X Increments: 11
 Y Increments: 12
 Starting Angle: 20 °
 Ending Angle: 45 °
 Angle Increments: 5

Cohesion Functions

Bay Sound

Model: Spline Data Point Function
Function: Cohesion vs. Y
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 580
Data Points: Y (ft), Cohesion (psf)
 Data Point: (-70, 720)

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

Materials

EMBANKMENT FILL, EL. +4.3 TO -4.5

Model: Undrained (Phi=0)
Unit Weight: 117 pcf
Cohesion: 760 psf

MARSH 1, EL. -4.5 TO -17.5

Model: Spatial Mohr-Coulomb
Unit Weight: 114 pcf
Cohesion Fn: MARSH 1
Phi: 0 °
Phi-B: 0 °

BEACH SAND SP, EL. -41.5 TO -57

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

BAY SOUND CLAY CL, EL. -57 TO 70

Model: Spatial Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion Spatial Fn: Bay Sound
Phi: 0 °
Phi-B: 0 °

Prodelta, EL. -17.5 TO -41.5

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

Sheet Pile

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

Data Point: (-57, 580)

MARSH 1

Model: Spline Data Point Function
Function: Cohesion vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 475
Data Points: X (ft), Cohesion (psf)
 Data Point: (169.2, 475)
 Data Point: (200, 500)
 Data Point: (228.1, 475)

PRODELTA

Model: Spline Data Point Function
Function: Cohesion vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 380
Data Points: X (ft), Cohesion (psf)
 Data Point: (169.2, 380)
 Data Point: (200, 400)
 Data Point: (228.1, 380)

Shear/Normal Strength Functions

SAND

Model: Spline Data Point Function
Function: Shear Stress vs. Normal Stress
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
 Data Point: (-100000, 0)
 Data Point: (0, 0)
 Data Point: (100000, 57735)
Estimation Properties
 Intact Rock Param.: 10
 Geological Strength: 100
 Disturbance Factor: 0
 SigmaC: 600000 psf
 Sigma3: 300000 psf
 Num. Points: 20

Spatial Functions

Bay Sound

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (169.2, -57, 580)
Data Point: (169.2, -70, 720)
Data Point: (200, -57, 715)
Data Point: (200, -70, 860)
Data Point: (228.1, -57, 580)
Data Point: (228.1, -70, 720)

Regions

	Material	Points	Area (ft²)
Region 1	EMBANKMENT FILL, EL. +4.3 TO -4.5	7,28,25,26,24,1,15	141.75
Region 2	EMBANKMENT FILL, EL. +4.3 TO -4.5	1,29,21,2,3,43,4,8,22,15	456.645
Region 3	MARSH 1, EL. -4.5 TO -17.5	5,27,30,6,7,15,16,9	779.75
Region 4	MARSH 1, EL. -4.5 TO -17.5	16,15,22,8,10,17	1430
Region 5	MARSH 1, EL. -4.5 TO -17.5	9,16,17,18	444.85
Region 6	Prodelta, EL. -17.5 TO -41.5	18,17,10,12,11	5244
Region 7	BEACH SAND SP, EL. -41.5 TO -57	36,11,12,38,40,39	3386.75
Region 8	Sheet Pile	1,19,20,21,29	6.375
Region 9	BEACH SAND SP, EL. -41.5 TO -57	38,12,32,37	465
Region 10	Prodelta, EL. -17.5 TO -41.5	10,33,32,12	720
Region 11	MARSH 1, EL. -4.5 TO -17.5	8,34,33,10	390
Region 12	EMBANKMENT FILL, EL. +4.3 TO -4.5	4,35,34,8	81
Region 13	BAY SOUND CLAY CL, EL. -57 TO 70 (Protected)	36,13,41,39	1010.1
Region 14	BAY SOUND CLAY CL, EL. -57 TO 70	39,41,42,40	765.7
Region 15	BAY SOUND CLAY CL, EL. -57 TO 70 (Protected)	40,42,14,38	1064.7
Region 16	BAY SOUND CLAY CL, EL. -57 TO 70 (Protected)	38,14,31,37	390

Points

	X (ft)	Y (ft)
Point 1	200	4.3
Point 2	208	4.1
Point 3	228.1	-0.2
Point 4	310	-1.8
Point 5	91.5	-7.6
Point 6	161.9	-6.8
Point 7	169.2	-4.5
Point 8	310	-4.5
Point 9	91.5	-13.4
Point 10	310	-17.5
Point 11	91.5	-41.5
Point 12	310	-41.5
Point 13	91.5	-70
Point 14	310	-70
Point 15	200	-4.5
Point 16	200	-13.4
Point 17	200	-17.5
Point 18	91.5	-17.5
Point 19	200	12.7
Point 20	200.5	12.7
Point 21	201	4.6
Point 22	228.1	-4.5
Point 23	228.1	-17.5
Point 24	199	4.3
Point 25	186	0.3
Point 26	187.4	1.4
Point 27	111.2	-6.6
Point 28	171	-4
Point 29	201	4.3
Point 30	141.2	-7.3
Point 31	340	-70
Point 32	340	-41.5
Point 33	340	-17.5

Point 34	340	-4.5
Point 35	340	-1.8
Point 36	91.5	-57
Point 37	340	-57
Point 38	310	-57
Point 39	169.2	-57
Point 40	228.1	-57
Point 41	169.2	-70
Point 42	228.1	-70
Point 43	272	-1.8

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	2.86	(235.443, -1.334)	53.66462	(171.361, -3.89658)	(290.808, -1.8)
2	38025	3.01	(235.443, -1.334)	55.725	(172.166, -3.6658)	(298.762, -1.8)

Slices of Slip Surface: Optimized

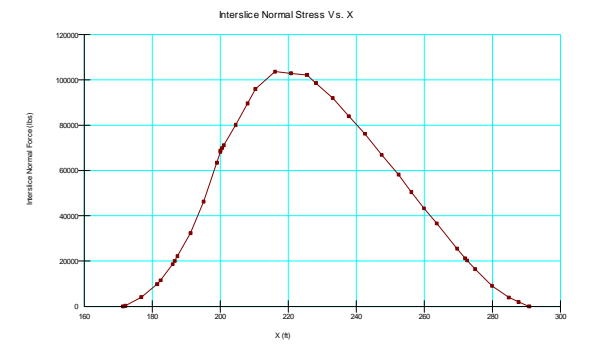
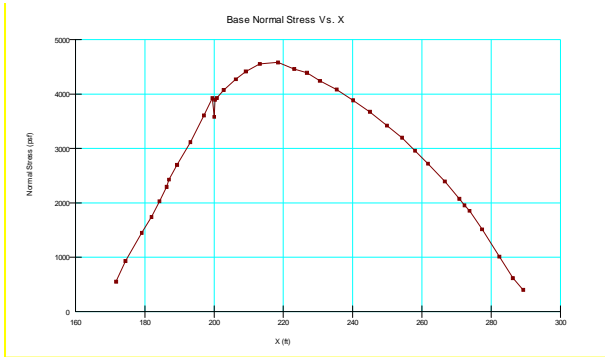
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	171.71745	-4.19829	723.7019	551.53921	0	760
2	Optimized	174.4156	-6.4805875	774.05115	930.71348	0	479.23
3	Optimized	179.09855	-10.441762	945.17487	1447.2802	0	483.03
4	Optimized	181.93225	-12.911175	1062.5877	1739.0026	0	485.33
5	Optimized	184.21225	-15.175305	1172.8625	2027.4049	0	487.19
6	Optimized	186.2766	-17.225305	1271.563	2291.948	0	488.86
7	Optimized	186.9766	-17.92043	1304.4149	2425.729	0	391.54
8	Optimized	189.3151	-20.242605	1411.4167	2696.6347	0	393.06
9	Optimized	193.15715	-24.41736	1591.5366	3114.5471	0	395.56
10	Optimized	197.04205	-29.11414	1789.741	3605.1574	0	398.08
11	Optimized	199.5	-32.156865	1923.0177	3923.6423	0	399.68
12	Optimized	200.0202	-32.800855	1951.6783	3579.6045	0	399.99
13	Optimized	200.2702	-32.97849	1959.5282	3893.8599	0	399.81

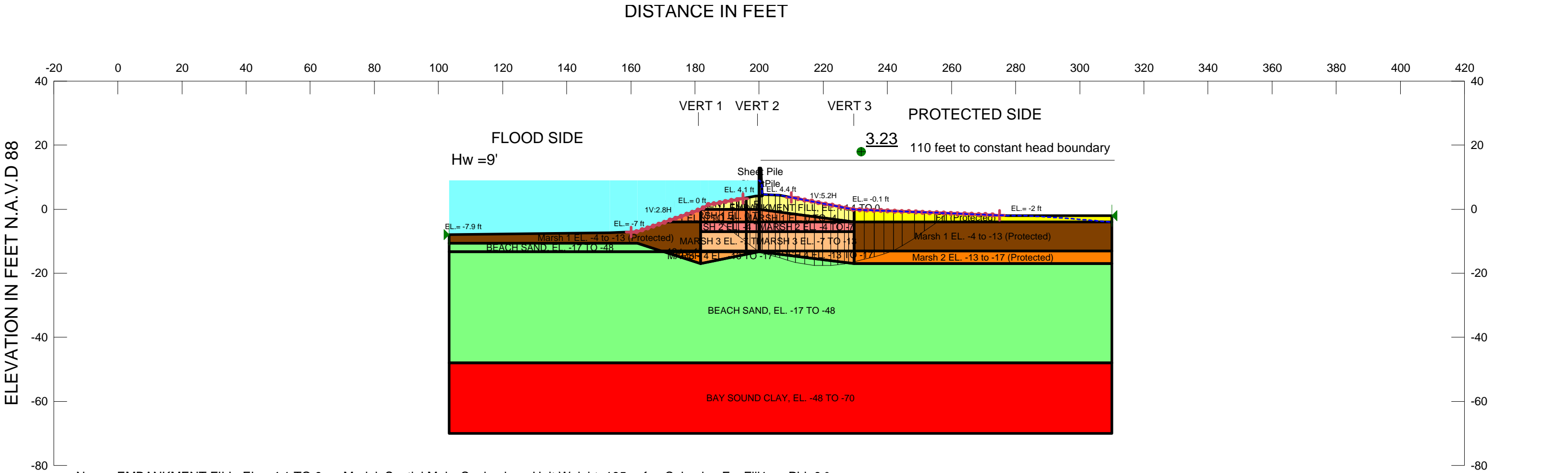
14	Optimized	200.75	-33.29712	1973.2722	3924.3859	0	399.47
15	Optimized	202.75	-34.62537	2031.8935	4073.2596	0	398.04
16	Optimized	206.25	-36.94981	2138.2352	4270.0918	0	395.55
17	Optimized	209.1501	-38.87583	2230.6066	4413.9877	0	393.49
18	Optimized	213.18785	-40.56373	2314.2025	4551.8861	0	390.61
19	Optimized	218.42745	-41.47862	2361.2091	4580.4097	0	386.88
20	Optimized	223.13135	-41.460205	2359.721	4460.723	0	383.54
21	Optimized	226.79165	-41.08009	2337.9011	4390.4125	0	380.93
22	Optimized	230.5684	-40.009395	2275.9986	4241.3591	0	380
23	Optimized	235.39975	-38.400255	2180.606	4082.9586	0	380
24	Optimized	240.1256	-36.581545	2070.8055	3883.3034	0	380
25	Optimized	244.96975	-34.49057	1942.5227	3674.3643	0	380
26	Optimized	249.93225	-32.127325	1795.8828	3419.473	0	380
27	Optimized	254.2826	-29.818115	1651.8228	3196.6774	0	380
28	Optimized	258.0208	-27.56295	1510.6339	2957.316	0	380
29	Optimized	261.759	-25.307785	1368.7808	2717.7255	0	380
30	Optimized	266.61425	-22.00597	1160.9216	2391.8248	0	380
31	Optimized	270.8002	-18.89068	964.50982	2074.1519	0	380
32	Optimized	272.2866	-17.72481	891.01268	1953.1095	0	380
33	Optimized	273.74355	-16.58203	818.84249	1851.6483	0	475
34	Optimized	277.3915	-13.498915	624.29994	1512.7379	0	475
35	Optimized	282.34665	-9.168625	350.89234	1011.4349	0	475
36	Optimized	286.2637	-5.75174	135.04428	615.09339	0	475
37	Optimized	289.25565	-3.15	-29.248926	399.44773	0	760

Slices of Slip Surface: 38025

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	38025	172.5829	-4.0829015	707.39735	522.90645	0	760
2	38025	175.225	-6.725	778.37365	950.87594	0	479.89
3	38025	179.675	-11.175	980.30429	1517.2606	0	483.5
4	38025	183.95	-15.45	1185.9387	2061.3024	0	486.97
5	38025	186.7	-18.2	1316.8348	2446.842	0	391.36
6	38025	189.33335	-20.833335	1437.4872	2759.7283	0	393.07

7	38025	193.2	-24.7	1603.7915	3183.6266	0	395.58
8	38025	197.06665	-28.566665	1765.085	3607.3421	0	398.1
9	38025	199.5	-31	1869.2362	3868.3679	0	399.68
10	38025	200.25	-31.75	1901.8343	3700.0068	0	399.82
11	38025	200.75	-32.25	1923.7547	3762.3737	0	399.47
12	38025	202.75	-34.25	2013.8605	3975.1527	0	398.04
13	38025	206.25	-37.75	2177.8891	4284.4614	0	395.55
14	38025	209	-40.5	2312.805	4510.9879	0	393.59
15	38025	212.2625	-41.5	2362.8729	4735.6906	0	391.27
16	38025	216.7875	-41.5	2362.4309	4622.5414	0	388.05
17	38025	221.3125	-41.5	2361.989	4509.1713	0	384.83
18	38025	225.8375	-41.5	2361.547	4396.0221	0	381.61
19	38025	229.05	-41.5	2361.2632	4335.2105	0	380
20	38025	232.07845	-40.3	2292.0833	4320.625	0	380
21	38025	236.23535	-37.9	2151.0417	4065	0	380
22	38025	240.3923	-35.5	2006.7708	3809.5833	0	380
23	38025	244.54925	-33.1	1860.0208	3554.1667	0	380
24	38025	248.70615	-30.7	1711.3958	3298.75	0	380
25	38025	252.86305	-28.3	1561.3333	3043.125	0	380
26	38025	257.02	-25.9	1410.3542	2787.7083	0	380
27	38025	261.17695	-23.5	1258.6458	2532.2917	0	380
28	38025	265.33385	-21.1	1106.4583	2276.875	0	380
29	38025	269.49075	-18.7	954.02083	2021.3125	0	380
30	38025	271.7846	-17.375645	869.88408	1897.2399	0	475
31	38025	274.2086	-15.97616	780.86232	1735.1777	0	475
32	38025	278.6258	-13.4259	618.74144	1441.5211	0	475
33	38025	283.04295	-10.875643	456.65977	1147.8645	0	475
34	38025	287.4601	-8.3253865	294.69573	854.20786	0	475
35	38025	291.8773	-5.775129	132.84933	560.55124	0	475
36	38025	296.42415	-3.15	-33.561111	310.96296	0	760





Name: EMBANKMENT FILL, EL. +4.1 TO 0 Model: Spatial Mohr-Coulomb Unit Weight: 105 pcf Cohesion Fn: Fill1 Phi: 0 °

Name: MARSH 1 EL. 0 TO -4 Model: Undrained (Phi=0) Unit Weight: 107 pcf Cohesion: 475 psf

Name: BEACH SAND, EL. -17 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: 111 pcf Cohesion Spatial Fn: Clay Phi: 0 °

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

Name: MARSH 2 EL. -4 TO -7 Model: Spatial Mohr-Coulomb Unit Weight: 104 pcf Cohesion Fn: Marsh 2 Phi: 0 °

Name: MARSH 3 EL. -7 TO -13 Model: Spatial Mohr-Coulomb Unit Weight: 111 pcf Cohesion Fn: Marsh 3 Phi: 0 °

Name: Fill (Protected) Model: Spatial Mohr-Coulomb Unit Weight: 112 pcf Cohesion: 500 psf Phi: 0 °

Name: Marsh 1 EL. -4 to -13 (Protected) Model: Undrained (Phi=0) Unit Weight: 112 pcf Cohesion: 450 psf

Name: Marsh 2 EL. -13 to -17 (Protected) Model: Undrained (Phi=0) Unit Weight: 100 pcf Cohesion: 300 psf

Name: MARSH 4 EL. -13 TO -17 Model: Spatial Mohr-Coulomb Unit Weight: 99 pcf Cohesion Fn: Marsh 4 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.

Hw = CANAL WATER LEVEL



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

LONDON AVE CANAL
OUTFALL CANAL REEVALUATION REPORT
REACH 5, STA. 37+00 TO STA. 40+00
PROTECTED SIDE STABILITY ANALYSIS,
CASE: Slope Stability (Entry/Exit)
MARCH 2012

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

Slope Stability (Entry/Exit)

Report generated using GeoStudio 2007, version 7.15. Copyright © 1991-2009 GEO-SLOPE International Ltd.

File Information

Created By: Liljegren, James
Revision Number: 365
Last Edited By: Middleton, Mark C MVN
Date: 3/15/2012
Time: 1:11:47 PM
File Name: Reach 5.gsz
Directory: G:\F&MHOME\Middleton\London Ave Canal\Reach 5\optimization check\
Last Solved Date: 3/15/2012
Last Solved Time: 1:18:50 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

Slope Stability (Entry/Exit)

Kind: SLOPE/W
Parent: Gap Analysis (Seepage)
Method: Spencer
Settings
 PWP Conditions Source: Parent Analysis
SlipSurface
 Direction of Movement: Left to Right
 Use Passive Mode: No
 Slip Surface Option: Entry and Exit
 Critical slip surfaces saved: 1
 Optimize Critical Slip Surface Location: Yes
 Tension Crack
 Tension Crack Option: (none)
FOS Distribution
 FOS Calculation Option: Constant
Advanced

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

Materials

EMBANKMENT FILL, EL. +4.1 TO 0

Model: Spatial Mohr-Coulomb
Unit Weight: 105 pcf
Cohesion Fn: Fill1
Phi: 0 °
Phi-B: 0 °

MARSH 1 EL. 0 TO -4

Model: Undrained (Phi=0)
Unit Weight: 107 pcf
Cohesion: 475 psf

BEACH SAND, EL. -17 TO -48

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

BAY SOUND CLAY, EL. -48 TO -70

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

SheetPile

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

MARSH 2 EL. -4 TO -7

Model: Spatial Mohr-Coulomb
Unit Weight: 104 pcf

Cohesion Fn: Marsh 2
Phi: 0 °
Phi-B: 0 °

MARSH 3 EL. -7 TO -13

Model: Spatial Mohr-Coulomb
Unit Weight: 111 pcf
Cohesion Fn: Marsh 3
Phi: 0 °
Phi-B: 0 °

Fill (Protected)

Model: Spatial Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion: 500 psf
Phi: 0 °
Phi-B: 0 °

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

Model: Undrained (Phi=0)
Unit Weight: 112 pcf
Cohesion: 450 psf

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

Model: Undrained (Phi=0)
Unit Weight: 100 pcf
Cohesion: 300 psf

MARSH 4 EL. -13 TO -17

Model: Spatial Mohr-Coulomb
Unit Weight: 99 pcf
Cohesion Fn: Marsh 4
Phi: 0 °
Phi-B: 0 °

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (160, -7.09302) ft
Left-Zone Right Coordinate: (195, 3.33333) ft
Left-Zone Increment: 20
Right Projection: Range
Right-Zone Left Coordinate: (210, 3.70172) ft
Right-Zone Right Coordinate: (275, -1.89708) ft
Right-Zone Increment: 30
Radius Increments: 30

Slip Surface Limits

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

Cohesion Functions

Marsh 3

Model: Spline Data Point Function
Function: Cohesion vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 450
Data Points: X (ft), Cohesion (psf)
 Data Point: (181.8, 450)
 Data Point: (200, 475)
 Data Point: (229.6, 450)

Marsh 4

Model: Spline Data Point Function
Function: Cohesion vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 300
Data Points: X (ft), Cohesion (psf)
 Data Point: (181.8, 300)
 Data Point: (200, 330)
 Data Point: (229.6, 300)

Marsh 2

Model: Spline Data Point Function
Function: Cohesion vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 450
Data Points: X (ft), Cohesion (psf)
 Data Point: (181.8, 450)
 Data Point: (200, 475)
 Data Point: (229.6, 450)

Fill1

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

Data Point: (181.8, 500)
Data Point: (200, 625)
Data Point: (229.6, 500)

Shear/Normal Strength Functions

Sand

Model: Spline Data Point Function
Function: Shear Stress vs. Normal Stress
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
Data Point: (-100000, 0)
Data Point: (0, 0)
Data Point: (100000, 57735)
Estimation Properties
Intact Rock Param.: 10
Geological Strength: 100
Disturbance Factor: 0
SigmaC: 600000 psf
Sigma3: 300000 psf
Num. Points: 20

Spatial Functions

Clay

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (103.3, -48, 503)
Data Point: (181.8, -48, 503)
Data Point: (200, -48, 595)
Data Point: (229.6, -48, 503)
Data Point: (310, -48, 503)
Data Point: (103.3, -70, 802)
Data Point: (181.8, -70, 802)
Data Point: (200, -70, 895)
Data Point: (229.6, -70, 802)
Data Point: (310, -70, 802)

Regions

	Material	Points	Area (ft²)
--	----------	--------	------------

Region 1	Marsh 1 EL -4 to -13 (Protected)	5,6,18,17,54	723.6
Region 2	Fill (Protected)	34,35,36,6,5	206.4
Region 3	Marsh 2 EL -13 to -17 (Protected)	17,18,23,19	321.6
Region 4	BAY SOUND CLAY, EL. -48 TO -70	7,40,21,42,24,11,43,22,41,10	4547.4
Region 5	EMBANKMENT FILL, EL. +4.1 TO 0	30,31,3,14,32,4,8,15	46.405
Region 6	MARSH 1 EL. 0 TO -4	37,30,15,8,27,29	72.8
Region 7	MARSH 2 EL. -4 TO -7	38,37,29,27,28,57	54.6
Region 8	MARSH 4 EL. -13 TO -17	39,56,55,20,16,49	5.46
Region 9	EMBANKMENT FILL, EL. +4.1 TO 0	8,4,44,25,33,34,5	137.48
Region 10	MARSH 2 EL. -4 TO -7	27,5,54,28	88.8
Region 11	MARSH 1 EL. 0 TO -4	8,5,27	59.2
Region 12	MARSH 1 EL. 0 TO -4	30,2,1,37	21.95
Region 13	Marsh 1 EL -4 to -13 (Protected)	47,51,53,39,38,37,1,26,12,13	333.275
Region 14	SheetPile	4,45,46,25,44	6.65
Region 15	MARSH 4 EL. -13 TO -17	20,55,17,19	63.64
Region 16	Marsh 2 EL. -13 to -17 (Protected)	49,39,53,52	3.58125
Region 17	Marsh 2 EL. -13 to -17 (Protected)	48,52,49	21.275
Region 18	BEACH SAND, EL. -17 TO -48	20,48,52,50,7,40,21,42,24,23,19	6765.305
Region 19	BEACH SAND, EL. -17 TO -48	52,53,51,47,50	169.75875
Region 20	MARSH 3 EL. -7 TO -13	28,55,56,39,38,57	109.2
Region 21	MARSH 3 EL. -7 TO -13	55,28,54,17	177.6
Region 22	MARSH 4 EL. -13 TO -17	48,49,16,20	33.67

Points

	X (ft)	Y (ft)
Point 1	170.7	-4
Point 2	173.6	-3
Point 3	193.6	-3.1
Point 4	200	4.1
Point 5	229.6	-4
Point 6	310	-4
Point 7	103.3	-48
Point 8	200	0
Point 9	200	-13.35
Point 10	103.3	-70

Point 11	310	-70
Point 12	153.4	-7.4
Point 13	103.3	-7.9
Point 14	196	3.5
Point 15	196	0
Point 16	196	-13.3
Point 17	229.6	-13
Point 18	310	-13
Point 19	229.6	-17
Point 20	200	-13.3
Point 21	200.05	-48
Point 22	200	-70
Point 23	310	-17
Point 24	310	-48
Point 25	201	4.6
Point 26	162	-7
Point 27	200	-4
Point 28	200	-7
Point 29	196	-4
Point 30	181.8	0
Point 31	184.1	1.4
Point 32	199	4.1
Point 33	206.4	4.4
Point 34	229.6	-0.1
Point 35	277.6	-2
Point 36	310	-2
Point 37	181.8	-4
Point 38	181.8	-7
Point 39	181.8	-13
Point 40	181.8	-48
Point 41	181.8	-70
Point 42	229.6	-48
Point 43	229.6	-70
Point 44	201	4.1
Point 45	200	12.8
Point 46	200.5	12.8

Point 47	103.3	-10.6
Point 48	181.8	-17
Point 49	181.8	-13.3
Point 50	103.3	-13.3
Point 51	162	-10.6
Point 52	170.3	-13.3
Point 53	169.425	-13
Point 54	229.6	-7
Point 55	200	-13
Point 56	196	-13
Point 57	196	-7

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	3.23	(220.786, 31.808)	32.01401	(181.878, 0.0472853)	(258.656, -1.25012)
2	13190	3.31	(220.786, 31.808)	49.43	(182.564, 0.46505)	(257.573, -1.20728)

Slices of Slip Surface: Optimized

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesiv e Strengt h (psf)
1	Optimize d	182.98885	-	573.48208	535.14643	0	475
2	Optimize d	185.90475	-2.747497	659.16123	797.33905	0	475
3	Optimize d	188.2989	-4.40902	741.0154	987.53265	0	458.93
4	Optimize d	190.30635	-5.90902	820.27412	1136.2887	0	461.68
5	Optimize d	192.32705	-7.463645	905.56147	1308.2013	0	464.46
6	Optimize	193.26485	-8.183667	945.8269	1392.2288	0	465.75

	d						
7	Optimize d	194.8	-9.357932	1012.3114	1527.3034	0	467.86
8	Optimize d	196.5829	-10.72169	1183.3622	1683.8504	0	470.31
9	Optimize d	198.0829	- 11.866735	1256.8363	1817.9209	0	472.37
10	Optimize d	199.2847	- 12.782955	1335.5771	1925.8848	0	474.02
11	Optimize d	199.7731	- 13.155285	1373.6818	1993.5536	0	329.63
12	Optimize d	199.9884	- 13.313935	1384.6261	2106.9535	417.03593	- 8.4351e-005
13	Optimize d	200.25	-13.38969	1375.6107	1740.4052	210.61418	1.1184e-006
14	Optimize d	200.75	-13.53447	1359.8963	1840.8202	277.66156	- 1.9703e-005
15	Optimize d	202.0146	- 13.900645	1318.9006	1923.1088	348.83974	7.0558e-005
16	Optimize d	204.04375	- 14.488215	1300.8179	1976.6468	390.18999	7.8924e-005
17	Optimize d	205.72915	-14.98036	1306.621	2020.9348	412.40926	- 2.9267e-005
18	Optimize d	207.62325	-15.54043	1320.9351	2054.4264	423.48143	8.5654e-005
19	Optimize d	210.06975	- 16.263845	1342.9246	2084.2945	428.03012	8.6572e-005
20	Optimize d	212.78155	- 16.849415	1357.7084	2128.7727	445.17421	9.0029e-005
21	Optimize	215.7586	-17.29714	1364.4182	2113.8583	432.68946	-

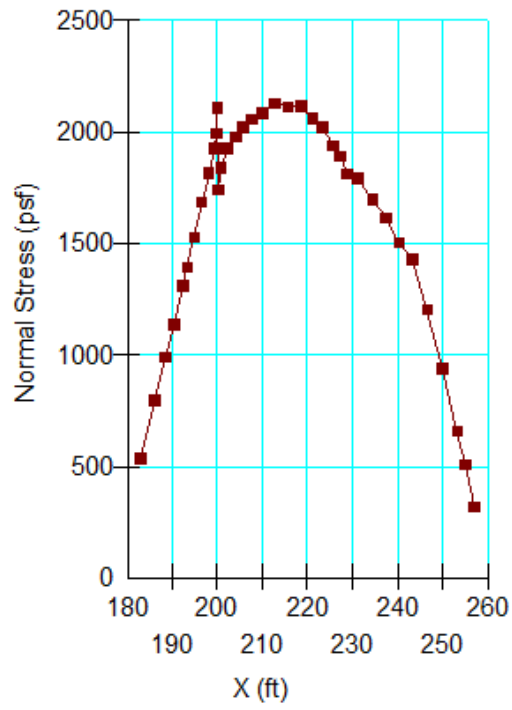
	d						8.7509e-005
22	Optimize d	218.5206	-17.5383	1361.2041	2114.2967	434.7982	8.7927e-005
23	Optimize d	221.0676	-17.5729	1347.3067	2058.3143	410.50045	- 8.3014e-005
24	Optimize d	223.41595	- 17.464755	1326.1679	2022.0572	401.77188	- 8.1236e-005
25	Optimize d	225.56565	-17.21387	1297.5672	1938.5653	370.08042	- 7.4828e-005
26	Optimize d	227.2681	-16.9377	1270.0567	1891.8391	358.98626	- 2.5465e-005
27	Optimize d	228.74785	- 16.582325	1236.4753	1814.3187	0	300.86
28	Optimize d	231.1895	15.995955	1178.9233	1791.4936	0	300
29	Optimize d	234.36845	- 15.232505	1104.6575	1699.732	0	300
30	Optimize d	237.42285	- 14.388085	1025.6325	1614.9815	0	300
31	Optimize d	240.41255	- 13.443795	940.44838	1504.9488	0	300
32	Optimize d	243.2941	- 12.196225	835.13792	1430.3309	0	450
33	Optimize d	246.53835	- 10.263645	680.65442	1203.0543	0	450
34	Optimize d	250.021	- 7.9598375	501.10614	938.25323	0	450
35	Optimize d	253.21145	- 5.6854325	327.80927	657.17541	0	450
36	Optimize d	255.1266	-4.274115	221.91599	508.65737	0	450
37	Optimize d	257.05115	- 2.6250625	100.41964	319.78591	0	500

Slices of Slip Surface: 13190

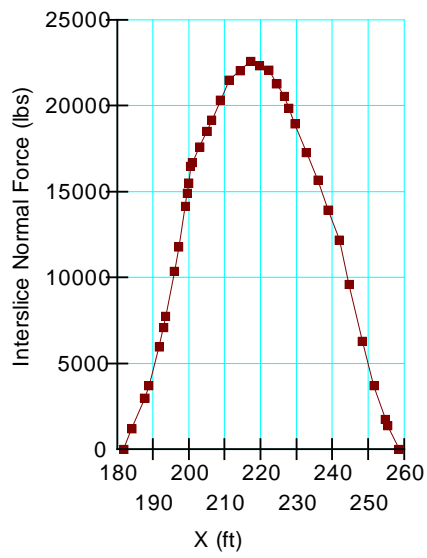
	Slip Surfac e	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	13190	182.75705	0.23252515	533.95243	343.20195	0	506.57
2	13190	183.52505	-0.6598155	561.66969	470.76044	0	475
3	13190	185.4056	-2.6598155	657.2117	727.78854	0	475
4	13190	188.44135	-5.5	801.38262	1066.9453	0	459.12
5	13190	191.88575	-8.2371735	949.09884	1401.0732	0	463.85
6	13190	194.8	-10.216383	1061.5621	1656.0085	0	467.86
7	13190	197.5	-11.76014	1238.2626	1861.3773	0	471.57
8	13190	199.458	-12.78093	1340.4992	2001.2449	0	474.26
9	13190	199.958	-13.01952	1372.2042	2047.5134	0	329.93
10	13190	200.25	-13.15323	1354.2419	1678.8809	0	329.75
11	13190	200.64805	-13.333465	1358.1334	1784.3506	0	329.34
12	13190	200.89805	-13.44432	1353.4919	1804.3565	260.30682	1.5705e-005
13	13190	202.35	-14.03208	1309.4691	1913.6571	348.82809	-7.0542e-005
14	13190	205.05	-15.028605	1318.6374	2023.6497	407.03906	-8.2316e-005
15	13190	207.6574	-15.828725	1337.8267	2093.7997	436.46118	-3.0966e-005
16	13190	210.1722	-16.451815	1353.5272	2124.1197	444.90175	-3.1566e-005
17	13190	212.687	-16.93728	1363.7603	2138.0196	447.01884	-9.0399e-005
18	13190	215.2018	-17.28922	1367.6342	2135.6271	443.4009	-8.967e-005
19	13190	217.7166	-17.5105	1364.5465	2116.9878	434.42219	-3.0821e-005
20	13190	220.2314	-17.602875	1354.3373	2082.0237	420.12994	-8.4963e-005
21	13190	222.7462	-17.567075	1336.6291	2030.5716	400.64791	-2.8427e-005
22	13190	225.261	-17.402825	1311.078	1962.2806	375.97203	-7.6031e-005

23	13190	227.7758	-17.10882	1277.3871	1876.6764	345.99989	-6.997e-005
24	13190	229.3166	-16.879495	1252.8489	1817.5388	0	300.29
25	13190	230.80565	-16.580195	1222.0944	1844.208	0	300
26	13190	233.2169	-16.01718	1167.3842	1786.9199	0	300
27	13190	235.62815	-15.32415	1103.2867	1716.382	0	300
28	13190	238.0394	-14.49525	1029.5673	1632.0427	0	300
29	13190	240.45065	-13.523005	945.91016	1533.0806	0	300
30	13190	242.9768	-12.33621	846.82602	1430.1755	0	450
31	13190	245.61775	-10.904735	730.87513	1269.9884	0	450
32	13190	248.2587	-9.2535695	600.68329	1084.547	0	450
33	13190	250.89965	-7.3547215	454.63742	870.43284	0	450
34	13190	253.5406	-5.169677	290.30102	622.97658	0	450
35	13190	256.21725	-2.6036405	101.44932	348.36198	0	500

Base Normal Stress Vs. X



Interslice Normal Stress
Vs. X



Global Stability (Block)

Report generated using GeoStudio 2007, version 7.15. Copyright © 1991-2009 GEO-SLOPE International Ltd.

File Information

Created By: [Liljegren, James](#)
Revision Number: [285](#)
Last Edited By: [Curran, Matthew MVN](#)
Date: [1/10/2012](#)
Time: [4:04:15 PM](#)
File Name: [Reach 6A.gsz](#)
Directory: [Z:\Edf\F&MHOME\London Ave Reevaluation 2011\West Side\Reach 6A\ETL\](#)
Last Solved Date: [1/10/2012](#)
Last Solved Time: [4:09:50 PM](#)

Project Settings

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

Analysis Settings

Global Stability (Block)

Kind: [SLOPE/W](#)
Parent: [Gap Analysis \(Seepage\)](#)
Method: [Spencer](#)
Settings
 PWP Conditions Source: [Parent Analysis](#)
SlipSurface
 Direction of movement: [Left to Right](#)
 Use Passive Mode: [No](#)
 Slip Surface Option: [Block](#)
 Critical slip surfaces saved: [1](#)
 Optimize Critical Slip Surface Location: [Yes](#)
 Tension Crack
 Tension Crack Option: [\(none\)](#)
FOS Distribution
 FOS Calculation Option: [Constant](#)
Restrict Block Crossing: [Yes](#)

Advanced

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

Materials

EMBANKMENT FIL, EL. +4 TO -0.8

Model: Spatial Mohr-Coulomb
Unit Weight: 108 pcf
Cohesion Fn: Fill 1
Phi: 0 °
Phi-B: 0 °

MARSH 1, EL. -0.8 TO -4

Model: Undrained (Phi=0)
Unit Weight: 101 pcf
Cohesion: 375 psf

BEACH SAND, EL. -8/-10 TO -44

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

BAY SOUND CLAY, EL. -44 TO 70

Model: Spatial Mohr-Coulomb
Unit Weight: 109 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. -4 TO -8 (Protected Side)

Model: Undrained (Phi=0)

Unit Weight: 101 pcf
Cohesion: 350 psf

MARSH 2, EL. -4 TO -7

Model: Spatial Mohr-Coulomb
Unit Weight: 96 pcf
Cohesion Fn: Marsh 2/3
Phi: 0 °
Phi-B: 0 °

MARSH 3, EL. -7 TO -10

Model: Spatial Mohr-Coulomb
Weight Fn: Marsh 3 (protected)
Cohesion Fn: Marsh 2/3
Phi: 0 °
Phi-B: 0 °

Fill, EL. -0.8 to -4 (Protected)

Model: Undrained (Phi=0)
Unit Weight: 109 pcf
Cohesion: 500 psf

Slip Surface Limits

Left Coordinate: (100.5, -9.5) ft
Right Coordinate: (410, -3) ft

Slip Surface Block

Left Grid

Upper Left: (192, -2) ft
Lower Left: (192, -22) ft
Lower Right: (204, -22) ft
X Increments: 3
Y Increments: 12
Starting Angle: 125 °
Ending Angle: 145 °
Angle Increments: 4

Right Grid

Upper Left: (225, -2) ft
Lower Left: (225, -22) ft
Lower Right: (285, -22) ft
X Increments: 12
Y Increments: 12
Starting Angle: 25 °
Ending Angle: 45 °
Angle Increments: 4

Cohesion Functions

Marsh 2/3

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: [\(179, 350\)](#)

Data Point: [\(200, 375\)](#)

Data Point: [\(227.4, 350\)](#)

Fill 1

Model: [Spline Data Point Function](#)

Function: [Cohesion vs. X](#)

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 500

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

Data Point: [\(179, 500\)](#)

Data Point: [\(200, 700\)](#)

Data Point: [\(227.4, 500\)](#)

Shear/Normal Strength Functions

Sand

Model: [Spline Data Point Function](#)

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

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 0

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

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

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

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

Estimation Properties

Intact Rock Param.: 10

Geological Strength: 100

Disturbance Factor: 0

SigmaC: 600000 psf

Sigma3: 300000 psf

Num. Points: 20

Unit Weight Functions

Marsh 3 (protected)

Model: [Spline Data Point Function](#)

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

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

Segment Curvature: [0 %](#)

Y-Intercept: [101](#)

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

Data Point: [\(179, 101\)](#)

Data Point: [\(200, 103\)](#)

Data Point: [\(227.4, 101\)](#)

Spatial Functions

Clay

Model: [Linear Interpolation](#)

Limit Range By: [Data Values](#)

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

Data Point: [\(179, -44, 530\)](#)

Data Point: [\(179, -70, 796\)](#)

Data Point: [\(200, -44, 744\)](#)

Data Point: [\(200, -70, 1022\)](#)

Data Point: [\(227.4, -44, 530\)](#)

Data Point: [\(227.4, -70, 796\)](#)

Data Point: [\(500, -44, 530\)](#)

Data Point: [\(500, -70, 796\)](#)

Data Point: [\(0, -44, 530\)](#)

Data Point: [\(0, -70, 796\)](#)

Regions

	Material	Points	Area (ft ²)
Region 1	MARSH, EL. -4 TO -8 (Protected Side)	29,35,28,40,41,42,55	53.85
Region 2	Fill, EL. -0.8 to -4 (Protected)	4,37,5,22,21	230.67
Region 3	MARSH 1, EL. -0.8 TO -4	9,21,25	43.84
Region 4	BAY SOUND CLAY, EL. -44 TO 70	13,7,8,14	8047
Region 5	MARSH, EL. -4 TO -8 (Protected Side)	39,21,22,6,23	730.4
Region 6	BEACH SAND, EL. -8/-10 TO -44	11,10,23,6,8,7,12,20	10597.2
Region 7	EMBANKMENT FIL, EL. +4 TO -0.8	2,24,38,3,4,21,9	130.1
Region 8	EMBANKMENT FIL, EL. +4 TO -0.8	49,56,36,1,17,33,2,9,18	58.44
Region 9	BEACH SAND, EL. -8/-10 TO -44	42,55,54,53,15,16,12,20,11,10,19	293.97

Region 10	BEACH SAND, EL. -8/-10 TO -44	16,27,26,34,29,55,54,53,15	133.855
Region 11	MARSH 2, EL. -4 TO -7	32,25,21,39	82.2
Region 12	MARSH 3, EL. -7 TO -10	10,52,32,39,23	54.8
Region 13	MARSH 1, EL. -0.8 TO -4	18,9,25,30,40,28,49	80.8
Region 14	MARSH 2, EL. -4 TO -7	40,30,25,32,31,41	63
Region 15	MARSH 3, EL. -7 TO -10	41,31,32,52,10,19,42	43.9
Region 16	Sheet Pile	2,50,51,38,24	6.875

Points

	X (ft)	Y (ft)
Point 1	192	2.7
Point 2	200	3.9
Point 3	208	4
Point 4	227.4	-0.8
Point 5	410	-3
Point 6	410	-8
Point 7	100.5	-44
Point 8	410	-44
Point 9	200	-0.8
Point 10	200	-10
Point 11	200	-13.2
Point 12	100.5	-13.2
Point 13	100.5	-70
Point 14	410	-70
Point 15	143.1	-11.2
Point 16	100.5	-11.7
Point 17	196	3.4
Point 18	196	-0.8
Point 19	196	-9.8
Point 20	196	-13.2
Point 21	227.4	-4
Point 22	410	-4
Point 23	227.4	-8
Point 24	201	3.9
Point 25	200	-4

Point 26	143	-9
Point 27	100.5	-9.5
Point 28	170.5	-4
Point 29	162.5	-7
Point 30	196	-4
Point 31	196	-7
Point 32	200	-7
Point 33	199	3.9
Point 34	156.8	-9
Point 35	164.3	-6.3
Point 36	186	1.4
Point 37	271.1	-3
Point 38	201	4.4
Point 39	227.4	-7
Point 40	179	-4
Point 41	179	-7
Point 42	179	-8
Point 43	179	-44
Point 44	200	-44
Point 45	227.4	-44
Point 46	227.4	-70
Point 47	200	-70
Point 48	179	-70
Point 49	179	-0.8
Point 50	200	12.9
Point 51	200.5	12.9
Point 52	200	-9
Point 53	156.8	-11.2
Point 54	159	-10
Point 55	163	-8
Point 56	180.1	-0.4

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
--	--------------	-----	-------------	-------------	------------	-----------

1	Optimized	1.91	(231.525, 1.768)	35.65662	(184.044, 0.803373)	(278.001, - 3)
2	7459	1.96	(231.525, 1.768)	35.686	(184.08, 0.814156)	(278.74, -3)

Slices of Slip Surface: **Optimized**

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimiz ed	185.0222	0.18646805	467.1555 3	341.8858 9	0	557.35
2	Optimiz ed	186.2929	-0.6152187	493.7052 4	440.1822 4	0	569.46
3	Optimiz ed	188.1337	-1.776605	554.7841 1	627.9157 4	0	375
4	Optimiz ed	190.6706	-3.376605	646.0608 1	808.1533 8	0	375
5	Optimiz ed	191.8298	-4.107266	688.5509	892.7151 1	0	365.27
6	Optimiz ed	194	-5.475178	768.3294 9	1036.438	0	367.86
7	Optimiz ed	196.2095 5	-6.867912	885.5480 8	1181.659 3	0	370.49
8	Optimiz ed	196.6899 5	-7.17071	918.5319 1	1214.135 8	0	371.06
9	Optimiz ed	197.9804	-7.874429	964.6879 4	1321.567 7	0	372.6
10	Optimiz ed	199.5	-8.6688155	1029.693 5	1410.677 5	0	374.4
11	Optimiz ed	200.25	-9.060882	959.2748 6	1140.293 2	0	374.77
12	Optimiz ed	200.75	-9.3222595	956.3858	1229.021 1	0	374.32
13	Optimiz ed	201.3821 5	-9.652719	978.0371	1312.104 2	0	373.74
14	Optimiz ed	203.3539	-9.979275	994.2773 4	1461.910 6	269.98822	1.629e- 005
15	Optimiz	206.4717	-10.227955	997.7653	1478.971	277.82463	-1.9713e-

	ed	5		5	7		005
16	Optimized	209.932	-10.503945	1001.6018	1458.9978	264.0777	-1.8737e-005
17	Optimized	213.796	-10.812135	1006.4776	1402.1393	228.43541	-1.2128e-006
18	Optimized	217.9088	-10.938625	999.70219	1334.1208	193.07665	-1.0251e-006
19	Optimized	221.34735	-10.827265	980.86854	1242.9042	151.28635	-8.0318e-007
20	Optimized	223.8628	-10.65976	961.86838	1157.9786	113.2243	3.1142e-006
21	Optimized	226.26025	-10.512595	944.80284	1077.3906	76.549585	2.1059e-006
22	Optimized	227.74785	-10.429825	934.74617	1055.2044	69.546596	1.9132e-006
23	Optimized	229.3631	-10.36149	925.2492	1035.9432	63.909232	7.0949e-007
24	Optimized	231.8979	-10.26353	910.86055	1009.6495	57.035803	8.2711e-007
25	Optimized	234.51055	-10.178545	897.00261	983.50009	49.939341	3.3147e-006
26	Optimized	237.201	-10.10654	883.70102	959.60925	43.825633	6.3576e-007
27	Optimized	240.876	-10.015235	865.90703	927.65485	35.650123	-1.3328e-006
28	Optimized	244.5561	-9.9297235	848.48382	896.53495	27.742335	-1.0376e-006
29	Optimized	247.2567	-9.86931	835.82319	874.0642	22.078453	-2.5274e-007
30	Optimized	249.95735	-9.8088965	823.16257	851.59344	16.414571	-6.1399e-007
31	Optimized	253.0684	-9.7655225	810.20152	828.09115	10.328583	-2.521e-007
32	Optimized	256.58985	-9.7391875	796.96887	805.34576	4.8364002	3.3809e-008
33	Optimized	259.7799	-9.7388565	786.4601	786.8449	0.22216406	-3.5692e-010
34	Optimized	262.6384	-9.76453	778.6591	774.2864	0	0

	ed	5		6	4		
35	Optimized	265.49695	-9.7902035	770.85823	761.72799	0	0
36	Optimized	269.0131	-9.396613	734.74458	703.27871	0	0
37	Optimized	271.1244	-8.985433	702.15348	640.91916	0	0
38	Optimized	271.7106	-8.49034	669.33088	605.39638	0	0
39	Optimized	274.56385	-6	459.52632	509.43588	0	350
40	Optimized	277.42815	-3.5	140.70022	315.80449	0	500

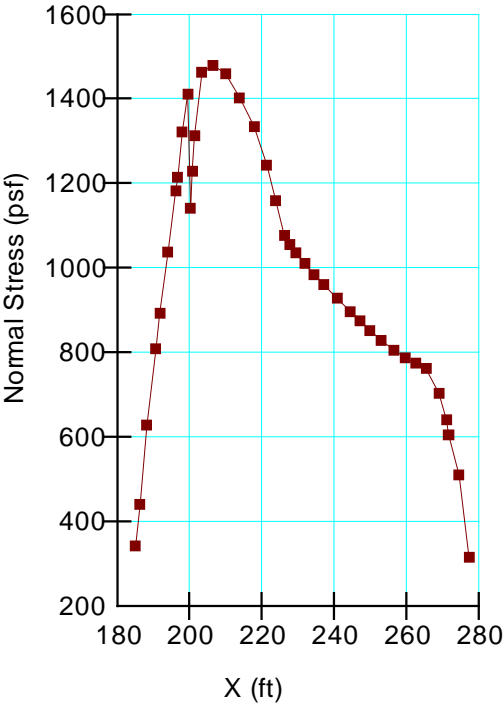
Slices of Slip Surface: 7459

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	7459	185.03985	0.1418643	468.81445	330.27317	0	557.52
2	7459	186.1925	-0.6652139	496.10115	427.52446	0	568.5
3	7459	188.67005	-2.4	591.21388	680.58426	0	375
4	7459	191.47755	-4.3658365	704.24644	899.31822	0	364.85
5	7459	193.61975	-5.8658365	791.6895	1054.9454	0	367.4
6	7459	195.61975	-7.2662515	874.25449	1200.2486	0	369.79
7	7459	197.5	-8.5828145	992.34803	1343.4093	0	372.02
8	7459	199.24365	-9.8037465	1070.2828	1477.0491	0	374.1
9	7459	199.74365	-10.153849	1094.9951	1549.5853	262.45777	1.5841e-005
10	7459	200.25	-10.33333	1040.7	1411.36	214.00065	-1.1361e-006
11	7459	200.75	-10.33333	1024.08	1478.76	262.50962	1.5837e-005
12	7459	202.75	-10.33333	1018.6286	1526.4571	293.19496	1.7688e-005
13	7459	206.25	-10.33333	1005.2286	1511.9429	292.55163	-2.0755e-005
14	7459	209.61665	-10.33333	992.1032	1464.2785	272.61054	-1.934e-

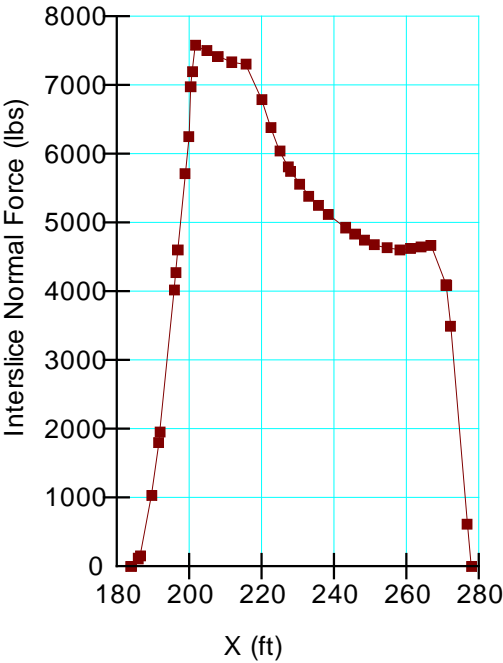
							005
15	7459	212.85	-10.33333	979.94855	1383.4331	232.95193	-1.6527e-005
16	7459	216.08335	-10.33333	968.2269	1302.6805	193.0969	-1.0252e-006
17	7459	219.31665	-10.33333	956.87639	1222.0517	153.09902	-8.1282e-007
18	7459	222.55	-10.33333	945.86608	1141.5156	112.95829	3.1076e-006
19	7459	225.78335	-10.33333	935.13412	1061.1032	72.728285	2.0005e-006
20	7459	228.92145	-10.33333	924.92023	1031.0705	61.285869	-3.2537e-007
21	7459	231.9643	-10.33333	915.02821	1014.2442	57.282365	3.8034e-006
22	7459	235.00715	-10.33333	905.0376	997.41789	53.335783	7.7333e-007
23	7459	238.05	-10.33333	895.04699	980.5916	49.389201	3.2787e-006
24	7459	241.09285	-10.33333	885.05638	963.7653	45.442618	3.0174e-006
25	7459	244.1357	-10.33333	875.0329	946.93901	41.51501	2.7563e-006
26	7459	247.17855	-10.33333	865.04229	930.11272	37.568428	5.4503e-007
27	7459	250.22145	-10.33333	855.01882	913.28643	33.640819	4.8802e-007
28	7459	253.2643	-10.33333	844.99534	896.493	29.732185	-3.401e-007
29	7459	256.30715	-10.33333	835.00473	879.66671	25.785603	-2.9509e-007
30	7459	259.35	-10.33333	824.98126	862.84042	21.857994	-8.1709e-007
31	7459	262.39285	-10.33333	814.99065	846.01412	17.911412	-6.6996e-007
32	7459	265.4357	-10.33333	804.96717	829.18783	13.983804	-3.4138e-007
33	7459	268.47855	-10.33333	794.97656	812.36154	10.037221	-2.452e-

							007
34	7459	270.55	-9.871827	759.35897	795.50234	20.867384	-7.7979e-007
35	7459	271.9404	-8.705162	681.97335	632.02062	0	0
36	7459	273.97255	-7	546.30513	604.4774	0	350
37	7459	276.35605	-5	369.69925	391.32905	0	350
38	7459	278.14365	-3.5	139.81915	300.02751	0	500

Base Normal Stress Vs. X



Interslice Normal Stress
Vs. X



Global Stability (Entry/Exit)

Report generated using GeoStudio 2007, version 7.15. Copyright © 1991-2009 GEO-SLOPE International Ltd.

File Information

Created By: Lijegren, James
Revision Number: 318
Last Edited By: Schroeder, Danielle V MVN
Date: 1/12/2012
Time: 9:15:03 AM
File Name: Reach 6B-DVS.gsz
Directory: G:\F&M\HOME\London Ave Reevaluation 2011\West Side\Reach 6B\SlopeW\
Last Solved Date: 1/12/2012
Last Solved Time: 9:20:22 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 Stability (Entry/Exit)

Kind: [SLOPE/W](#)
Parent: [Gap Analysis \(Seepage\)](#)
Method: [Spencer](#)
Settings
 PWP Conditions Source: [Parent Analysis](#)
SlipSurface
 Direction of movement: [Left to Right](#)
 Use Passive Mode: [No](#)
 Slip Surface Option: [Entry and Exit](#)
 Critical slip surfaces saved: [1](#)
 Optimize Critical Slip Surface Location: [Yes](#)
 Tension Crack
 Tension Crack Option: [\(none\)](#)
FOS Distribution
 FOS Calculation Option: [Constant](#)
Advanced
 Number of Slices: [30](#)
 Optimization Tolerance: [0.01](#)
 Minimum Slip Surface Depth: [0.1 ft](#)

3/1/2012

Global Stability (Entry/Exit)

Page 3 of 9

MARSH 3, EL. -7 TO -10

Model: [Spatial Mohr-Coulomb](#)
Weight Fn: [Marsh El -7](#)
Cohesion Fn: [Marsh El -7](#)
Phi: 0 °
Phi-B: 0 °

Slip Surface Entry and Exit

Left Projection: [Range](#)
Left-Zone Left Coordinate: [\(146.04966, -9\) ft](#)
Left-Zone Right Coordinate: [\(196.2, 3.43333\) ft](#)
Left-Zone Increment: [20](#)
Right Projection: [Range](#)
Right-Zone Left Coordinate: [\(212.44583, 2.9\) ft](#)
Right-Zone Right Coordinate: [\(286.25002, -2.36743\) ft](#)
Right-Zone Increment: [20](#)
Radius Increments: [20](#)

Slip Surface Limits

Left Coordinate: [\(100.5, -9.5\) ft](#)
Right Coordinate: [\(310, -3\) ft](#)

Cohesion Functions

Marsh El -4

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: [\(100.5, 350\)](#)
 Data Point: [\(179, 350\)](#)
 Data Point: [\(200, 375\)](#)
 Data Point: [\(227.4, 350\)](#)
 Data Point: [\(310, 350\)](#)

fill1

Model: [Spline Data Point Function](#)
Function: [Cohesion vs. X](#)
 Curve Fit to Data: [100 %](#)
 Segment Curvature: [0 %](#)
Y-Intercept: [500](#)
Data Points: [X \(ft\), Cohesion \(psf\)](#)
 Data Point: [\(100.5, 500\)](#)

3/1/2012

Global Stability (Entry/Exit)

Page 2 of 9

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: [10 °](#)
Resisting Side Maximum Convex Angle: [5 °](#)

Materials

EMBANKMENT FIL, EL. +4 TO -0.8

Model: [Spatial Mohr-Coulomb](#)
Unit Weight: [108 pcf](#)
Cohesion Fn: [fill1](#)
Phi: 0 °
Phi-B: 0 °

MARSH 1, EL. -0.8 TO -4

Model: [Spatial Mohr-Coulomb](#)
Weight Fn: [Marsh El -0.8](#)
Cohesion Fn: [Marsh El -0.8](#)
Phi: 0 °
Phi-B: 0 °

BEACH SAND, EL. -9/10 TO -44

Model: [Mohr-Coulomb](#)
Unit Weight: [122 pcf](#)
Cohesion: [0 psf](#)
Phi: [30 °](#)
Phi-B: 0 °

BAY SOUND CLAY, EL. -44 TO 70

Model: [Spatial Mohr-Coulomb](#)
Unit Weight: [109 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 2, EL. -4 TO -7

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

3/1/2012

Global Stability (Entry/Exit)

Page 4 of 9

Data Point: [\(179, 500\)](#)
Data Point: [\(200, 700\)](#)
Data Point: [\(227.4, 500\)](#)
Data Point: [\(310, 500\)](#)

Marsh El -0.8

Model: [Spline Data Point Function](#)
Function: [Cohesion vs. X](#)
 Curve Fit to Data: [100 %](#)
 Segment Curvature: [0 %](#)
Y-Intercept: [500](#)
Data Points: [X \(ft\), Cohesion \(psf\)](#)
 Data Point: [\(100.5, 500\)](#)
 Data Point: [\(179, 500\)](#)
 Data Point: [\(200, 375\)](#)
 Data Point: [\(227.4, 500\)](#)
 Data Point: [\(310, 500\)](#)

Marsh El -7

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: [\(100.5, 350\)](#)
 Data Point: [\(179, 350\)](#)
 Data Point: [\(200, 375\)](#)
 Data Point: [\(227.4, 350\)](#)
 Data Point: [\(310, 350\)](#)

Unit Weight Functions

Marsh El -7

Model: [Spline Data Point Function](#)
Function: [Unit Weight vs. X](#)
 Curve Fit to Data: [100 %](#)
 Segment Curvature: [0 %](#)
Y-Intercept: [101](#)
Data Points: [X \(ft\), Unit Weight \(pcf\)](#)
 Data Point: [\(100.5, 101\)](#)
 Data Point: [\(179, 101\)](#)
 Data Point: [\(200, 103\)](#)
 Data Point: [\(227.4, 101\)](#)
 Data Point: [\(310, 101\)](#)

Marsh El -4

Model: [Spline Data Point Function](#)
Function: [Unit Weight vs. X](#)

3/1/2012

Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 101
Data Points: X (ft), Unit Weight (pcf)
Data Point: (100.5, 101)
Data Point: (179, 101)
Data Point: (200, 96)
Data Point: (227.4, 101)
Data Point: (310, 101)

Marsh EI -0.8

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 109
Data Points: X (ft), Unit Weight (pcf)
Data Point: (100.5, 109)
Data Point: (179, 109)
Data Point: (200, 101)
Data Point: (227.4, 109)
Data Point: (310, 109)

Spatial Functions

Clay

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (179, -44, 530)
Data Point: (179, -70, 796)
Data Point: (200, -44, 744)
Data Point: (200, -70, 1022)
Data Point: (227.4, -44, 530)
Data Point: (227.4, -70, 796)
Data Point: (500, -44, 530)
Data Point: (500, -70, 796)
Data Point: (0, -44, 530)
Data Point: (0, -70, 796)

Regions

	Material	Points	Area (ft²)
Region 1	BAY SOUND CLAY, EL. -44 TO 70	13,7,8,14	5447
Region 2	BEACH SAND, EL. -9/10 TO -44	11,10,20,6,8,7,12,18	6997.2
Region 3	EMBANKMENT FIL. EL. +4 TO -0.8	35,39,32,1,15,29,2,9,16	58.44
Region 4	BEACH SAND, EL. -9/10 TO -44	34,38,30,23,24,12,18,11,10,17	428.325
Region 5	MARSH 1, EL. -0.8 TO -4	16,9,22,26,25,35	80.8

3/1/2012

Region 6	Sheet Pile	2,36,37,33,21	6.875
Region 7	EMBANKMENT FIL. EL. +4 TO -0.8	9,2,21,33,3,4	86.26
Region 8	MARSH 1, EL. -0.8 TO -4	22,9,4,5,19	261.14
Region 9	MARSH 2, EL. -4 TO -7	41,31,25,26,22,28,27	100.82
Region 10	MARSH 2, EL. -4 TO -7	22,28,40,19	330
Region 11	MARSH 3, EL. -7 TO -10	10,28,40,6,20	137.4
Region 12	MARSH 3, EL. -7 TO -10	38,34,17,10,28,27,41	59.9

Points

	X (ft)	Y (ft)
Point 1	192	2.7
Point 2	200	3.9
Point 3	208	4
Point 4	227.4	-0.8
Point 5	310	-3
Point 6	310	-8
Point 7	100.5	-44
Point 8	310	-44
Point 9	200	-0.8
Point 10	200	-10
Point 11	200	-13.2
Point 12	100.5	-13.2
Point 13	100.5	-70
Point 14	310	-70
Point 15	196	3.4
Point 16	196	-0.8
Point 17	196	-9.6
Point 18	196	-13.2
Point 19	310	-4
Point 20	227.4	-8
Point 21	201	3.9
Point 22	200	-4
Point 23	143	-9
Point 24	100.5	-9.5
Point 25	170.5	-4
Point 26	196	-4
Point 27	196	-7
Point 28	200	-7
Point 29	199	3.9
Point 30	156.8	-9
Point 31	164.2	-6.3
Point 32	186	1.4
Point 33	201	4.4

3/1/2012

Global Stability (Entry/Exit)

Page 7 of 9

Global Stability (Entry/Exit)

Page 8 of 9

Point 34	179	-8
Point 35	179	-0.8
Point 36	200	12.9
Point 37	200.5	12.9
Point 38	159.5	-8
Point 39	180.1	-0.4
Point 40	310	-7
Point 41	162.3	-7

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	2.78	(218.496, 27.3)	24.18422	(187.647, 1.75681)	(245.158, -1.27297)
2	7696	2.84	(218.496, 27.3)	39.26	(188.521, 1.94611)	(245.413, -1.27976)

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	188.43735	1.1176053	401.7975	288.01488	0	589.88
2	Optimized	190.01845	-0.1607982	429.96405	429.88044	0	604.94
3	Optimized	191.10735	-1.041225	459.54602	573.60497	0	427.93
4	Optimized	191.70285	-1.514958	485.96746	631.65302	0	424.39
5	Optimized	192.71975	-2.3105995	531.01877	720.34631	0	418.33
6	Optimized	194.15925	-3.4368665	595.21856	842.84786	0	409.77
7	Optimized	195.114	-4.183855	637.89489	930.859	0	369.18
8	Optimized	195.6745	-4.6341545	663.61578	968.82294	0	369.85
9	Optimized	196.7356	-5.5027045	818.26363	1054.5854	0	371.11
10	Optimized	198.02405	-6.552405	884.15204	1159.1403	0	372.65
11	Optimized	198.78845	-7.171295	928.38057	1220.6118	0	373.56
12	Optimized	199.49375	-7.74235	964.13345	1279.1099	0	374.4
13	Optimized	199.99375	-8.143921	1007.025	1433.62	0	374.99
14	Optimized	200.25	-8.21806	829.25252	1118.4525	0	374.77
15	Optimized	200.75	-8.362716	801.60629	1206.5592	0	374.32
16	Optimized	201.9971	-8.723513	822.75545	1291.1191	0	373.18
17	Optimized	203.99125	-9.300451	854.0664	1339.916	0	371.36
18	Optimized	206.49415	-9.972165	882.39771	1416.4636	308.34308	0
19	Optimized	209.26505	-10.67738	908.96277	1464.8124	320.91994	0
20	Optimized	211.53225	-11.159185	924.87936	1489.681	326.08839	0

3/1/2012

21	Optimized	213.5365	-11.47885	932.76283	1481.1077	316.58708	0
22	Optimized	215.4516	-11.69296	934.68009	1483.3085	316.75079	0
23	Optimized	217.27765	-11.801515	930.7988	1453.0236	301.5066	0
24	Optimized	219.16355	-11.80921	920.31075	1431.2637	294.9988	0
25	Optimized	221.10925	-11.716045	903.42102	1372.2266	270.66503	0
26	Optimized	223.47125	-11.43712	872.67011	1302.4021	248.10588	0
27	Optimized	226.1302	-10.80791	818.71407	1180.6786	208.98031	0
28	Optimized	228.79545	-9.9749	752.17155	1035.2704	163.4472	0
29	Optimized	231.2906	-9.2823	695.54744	928.06079	134.24164	0
30	Optimized	233.48995	-8.76938	651.62186	856.10608	118.05902	0
31	Optimized	235.74395	-8.24371	606.58725	782.70003	101.67876	0
32	Optimized	237.5675	-7.48725	538.4805	814.16265	0	350
33	Optimized	238.72315	-6.6458	462.313	720.98527	0	350
34	Optimized	240.69235	-5.094155	324.96475	563.12008	0	350
35	Optimized	242.92075	-3.240774	165.20928	417.84647	0	500
36	Optimized	244.41205	-1.9289025	54.656914	260.6726	0	500

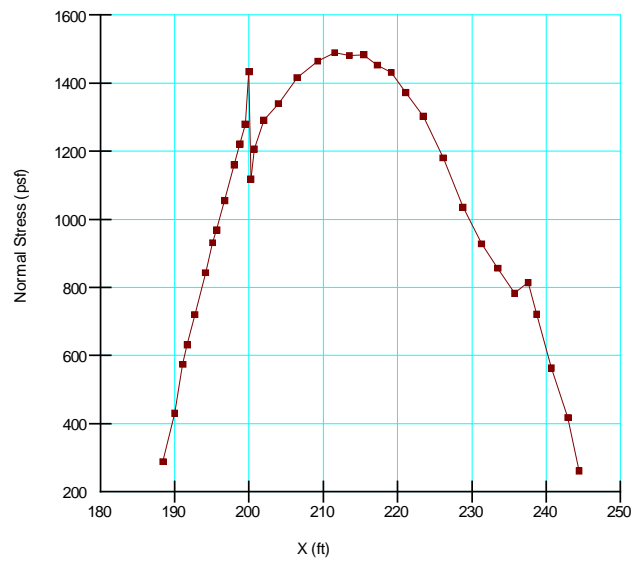
Slices of Slip Surface: 7696

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	7696	189.79935	0.5730555	409.54349	297.38469	0	602.85
2	7696	191.5391	-1.235396	469.86402	574.51132	0	425.36
3	7696	193.3984	-2.835396	560.89865	769.48755	0	414.3
4	7696	195.3984	-4.437806	652.38866	967.49481	0	369.52
5	7696	196.75	-5.3747465	812.2916	1074.194	0	371.13
6	7696	198.25	-6.325447	873.95104	1183.2778	0	372.92
7	7696	199.1975	-6.8885065	921.37851	1249.836	0	374.04
8	7696	199.6975	-7.1649775	943.64183	1279.5362	0	374.64
9	7696	200.25	-7.4611755	776.62039	994.81078	0	374.77
10	7696	200.75	-7.7190805	756.26396	1097.101	0	374.32
11	7696	202.03885	-8.325644	795.05107	1214.1613	0	373.14
12	7696	204.11655	-9.2146085	847.47508	1307.9795	0	371.24
13	7696	206.5777	-10.077202	888.46539	1415.5092	304.28889	0
14	7696	208.97	-10.773395	916.84352	1483.9514	327.41987	0

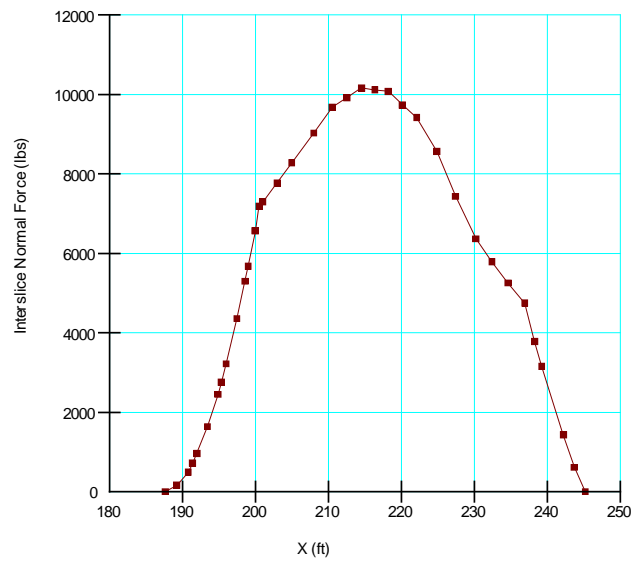
3/1/2012

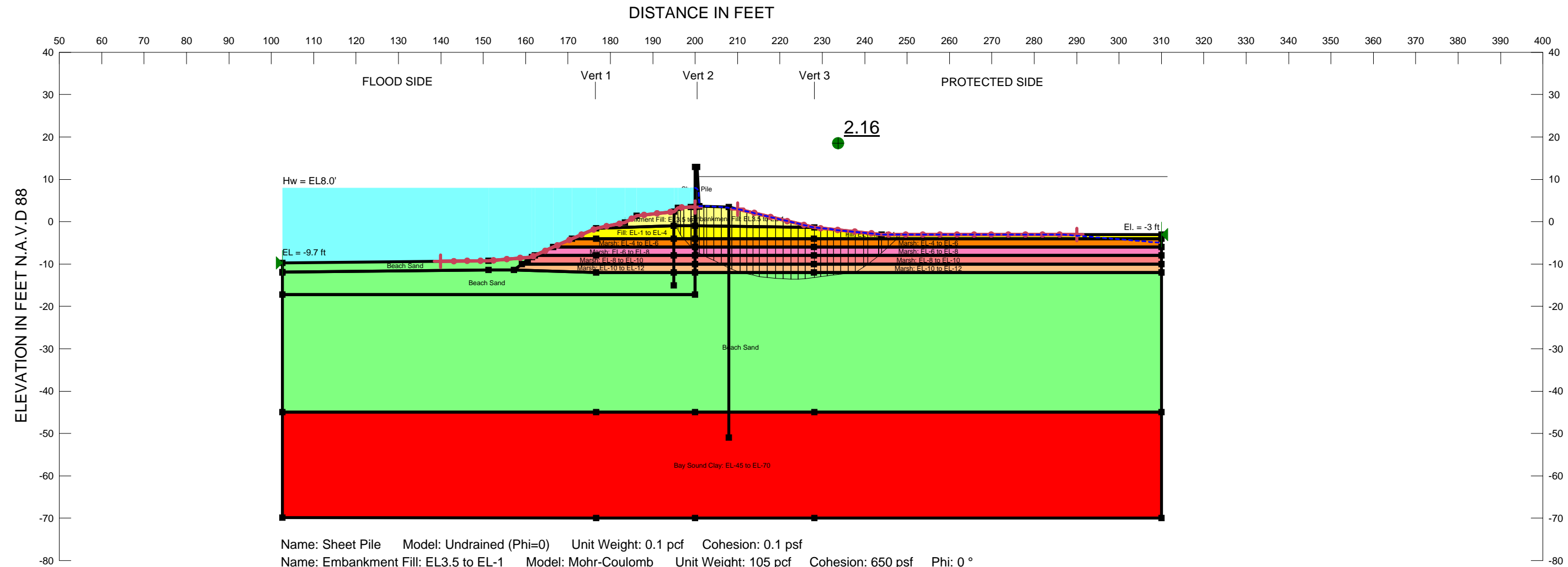
15	7696	210.91	-11.20716	931.78319	1501.8581	329.1329	0
16	7696	212.85	-11.53924	940.68113	1507.5077	327.25747	0
17	7696	214.79	- 11.772235	943.60101	1500.8942	321.75337	0
18	7696	216.73	- 11.907915	940.64469	1482.0548	312.58327	0
19	7696	218.67	-11.94729	931.84654	1450.9136	299.68352	0
20	7696	220.61	-11.89065	917.17147	1407.1806	282.90689	0
21	7696	222.55	-11.73758	896.67223	1350.5199	262.0291	0
22	7696	224.49	- 11.486935	870.18538	1280.5714	236.93646	0
23	7696	226.43	- 11.136795	837.64913	1196.6272	207.25608	0
24	7696	228.43475	- 10.665675	797.28728	1117.7728	185.03242	0
25	7696	230.50425	- 10.062212	748.46581	1043.0218	170.062	0
26	7696	232.57375	- 9.3319685	691.67585	950.57506	149.47553	0
27	7696	234.6433	- 8.4671515	626.47508	838.52974	122.42981	0
28	7696	236.6372	-7.5	544.4053	777.75487	0	350
29	7696	238.74585	- 6.3073375	433.98017	660.67512	0	350
30	7696	241.045	- 4.8073375	299.92867	512.01865	0	350
31	7696	242.9991	- 3.3569595	174.40302	410.42117	0	500
32	7696	244.60815	-1.996838	59.653603	267.24424	0	500

Base Normal Stress Vs. X



Interslice Normal Stress Vs. X





GENERAL NOTES

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

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

Hw = CANAL WATER LEVEL

LONDON AVE CANAL
OUTFALL CANAL REEVALUATION REPORT
REACH 7: NON-REMEDiated, STA. 59+00 TO 64+00
PROTECTED SIDE STABILITY ANALYSIS
CASE: Non-Rem: Global Stability (Entry/Exit)
MARCH 2012

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

Non-Rem: Global Stability (Entry/Exit)

Report generated using GeoStudio 2007, version 7.15. Copyright © 1991-2009 GEO-SLOPE International Ltd.

File Information

Revision Number: 323
Last Edited By: Haggerty, Daniel R MVN
Date: 12/21/2011
Time: 8:03:50 AM
File Name: Reach 7.gsz
Last Solved Date: 12/21/2011
Last Solved Time: 8:04:44 AM

Project Settings

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

Analysis Settings

Non-Rem: Global Stability (Entry/Exit)

Kind: SLOPE/W
Parent: Gap Analysis (Seepage) Non-Remediated Reach
Method: Spencer
Settings
 PWP Conditions Source: Parent Analysis
SlipSurface
 Direction of movement: Left to Right
 Use Passive Mode: No
 Slip Surface Option: Entry and Exit
 Critical slip surfaces saved: 1
 Optimize Critical Slip Surface Location: Yes
 Tension Crack
 Tension Crack Option: Search for Tension Crack
 Percentage Wet: 1
 Tension Crack Fluid Unit Weight: 62.4 pcf
FOS Distribution
 FOS Calculation Option: Constant
Advanced
 Number of Slices: 30

Marsh: EL-8 to EL-10

Model: Spatial Mohr-Coulomb
Weight Fn: Marsh -8 to -10
Cohesion Fn: Marsh -6 to -10
Phi: 0 °
Phi-B: 0 °

Marsh: EL-10 to EL-12

Model: Spatial Mohr-Coulomb
Weight Fn: Marsh -10 to -12
Cohesion Fn: Marsh -10 to -12
Phi: 0 °
Phi-B: 0 °

Beach Sand

Model: Mohr-Coulomb
Unit Weight: 122 pcf
Cohesion: 0 psf
Phi: 30 °
Phi-B: 0 °

Bay Sound Clay: EL-45 to EL-70

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

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (139.97742, -9.31625) ft
Left-Zone Right Coordinate: (199.99, 3.5) ft
Left-Zone Increment: 20
Right Projection: Range
Right-Zone Left Coordinate: (210, 3.01244) ft
Right-Zone Right Coordinate: (290, -3) ft
Right-Zone Increment: 20
Radius Increments: 20

Slip Surface Limits

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

Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 5000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

Sheet Pile

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

Embankment Fill: EL3.5 to EL-1

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

Fill: EL-1 to EL-4

Model: Spatial Mohr-Coulomb
Weight Fn: Fill -1 to -4
Cohesion Fn: Fill -1 to -4
Phi: 0 °
Phi-B: 0 °

Marsh: EL-4 to EL-6

Model: Spatial Mohr-Coulomb
Weight Fn: Marsh -4 to -6
Cohesion Fn: Marsh -4 to -6
Phi: 0 °
Phi-B: 0 °

Marsh: EL-6 to EL-8

Model: Spatial Mohr-Coulomb
Weight Fn: Marsh -6 to -8
Cohesion Fn: Marsh -6 to -10
Phi: 0 °
Phi-B: 0 °

Cohesion Functions

Fill -1 to -4

Model: Spline Data Point Function
Function: Cohesion vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 600
Data Points: X (ft), Cohesion (psf)
 Data Point: (0, 600)
 Data Point: (176.6, 600)
 Data Point: (200, 450)
 Data Point: (228.1, 600)
 Data Point: (400, 600)

Marsh -4 to -6

Model: Spline Data Point Function
Function: Cohesion vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 600
Data Points: X (ft), Cohesion (psf)
 Data Point: (0, 600)
 Data Point: (176.6, 600)
 Data Point: (200, 340)
 Data Point: (228.1, 600)
 Data Point: (400, 600)

Marsh -6 to -10

Model: Spline Data Point Function
Function: Cohesion vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 320
Data Points: X (ft), Cohesion (psf)
 Data Point: (0, 320)
 Data Point: (176.6, 320)
 Data Point: (200, 340)
 Data Point: (228.1, 320)
 Data Point: (400, 320)

Marsh -10 to -12

Model: Spline Data Point Function
Function: Cohesion vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 300

Data Points: X (ft), Cohesion (psf)
Data Point: (0, 300)
Data Point: (176.6, 300)
Data Point: (200, 340)
Data Point: (228.1, 300)
Data Point: (400, 300)

Unit Weight Functions

Fill -1 to -4

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 96
Data Points: X (ft), Unit Weight (pcf)
Data Point: (0, 96)
Data Point: (176.6, 96)
Data Point: (200, 105)
Data Point: (228.1, 96)
Data Point: (400, 96)

Marsh -4 to -6

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 96
Data Points: X (ft), Unit Weight (pcf)
Data Point: (0, 96)
Data Point: (176.6, 96)
Data Point: (200, 90)
Data Point: (228.1, 96)
Data Point: (400, 96)

Marsh -6 to -8

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 104
Data Points: X (ft), Unit Weight (pcf)
Data Point: (0, 104)
Data Point: (176.6, 104)
Data Point: (200, 90)
Data Point: (228.1, 104)

Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (0, -45, 790)
Data Point: (0, -70, 950)
Data Point: (176.6, -45, 790)
Data Point: (176.6, -70, 950)
Data Point: (200, -45, 800)
Data Point: (200, -70, 1000)
Data Point: (228.1, -45, 790)
Data Point: (228.1, -70, 950)
Data Point: (400, -45, 790)
Data Point: (400, -70, 950)

Regions

	Material	Points	Area (ft²)
Region 1	Sheet Pile	6,46,47,41,32	7.085
Region 2	Bay Sound Clay: EL-45 to EL-70	31,11,52,33,51,12,30,58,34,57	5181.295
Region 3	Beach Sand	11,24,17,16,26,29,12,51,33,52	6337.72
Region 4	Beach Sand	24,42,49,50,48,56,23,16,17	532.945
Region 5	Marsh: EL-10 to EL-12	48,63,43,16,23,56	78.271
Region 6	Marsh: EL-8 to EL-10	63,36,2,62,55,21,15,43	78.9175
Region 7	Marsh: EL-6 to EL-8	62,61,60,15,21,55	71.35
Region 8	Marsh: EL-4 to EL-6	61,3,54,20,14,60	62.6
Region 9	Fill: EL-1 to EL-4	3,4,19,13,14,20,54	71.37
Region 10	Embankment Fill: EL3.5 to EL-1	4,37,5,18,38,39,6,13,19	57.67
Region 11	Beach Sand	49,1,35,2,36,63,48,50	127.584
Region 12	Marsh: EL-10 to EL-12	16,43,44,45,29,26	220
Region 13	Marsh: EL-8 to EL-10	43,15,53,59,45,44	220
Region 14	Marsh: EL-6 to EL-8	15,60,25,28,59,53	220
Region 15	Marsh: EL-4 to EL-6	60,14,27,10,28,25	220
Region 16	Fill: EL-1 to EL-4	14,13,8,40,9,10,27	173.3
Region 17	Embankment Fill: EL3.5 to EL-1	13,6,32,41,7,8	83.54

Points

	X (ft)	Y (ft)
Point 1	102.6	-9.7
Point 2	161.5	-8.3
Point 3	170.9	-4

Data Point: (400, 104)

Marsh -8 to -10

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 104
Data Points: X (ft), Unit Weight (pcf)
Data Point: (0, 104)
Data Point: (176.6, 104)
Data Point: (200, 98)
Data Point: (228.1, 104)
Data Point: (400, 104)

Marsh -10 to -12

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 96
Data Points: X (ft), Unit Weight (pcf)
Data Point: (0, 96)
Data Point: (176.6, 96)
Data Point: (200, 98)
Data Point: (228.1, 96)
Data Point: (400, 96)

Bay Sound Clay

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 111
Data Points: X (ft), Unit Weight (pcf)
Data Point: (0, 111)
Data Point: (176.6, 111)
Data Point: (200, 108)
Data Point: (228.1, 111)
Data Point: (400, 111)

Spatial Functions

Bay Sound

Model: Linear Interpolation
Limit Range By: Data Values

Point 4	176.7	-1.6
Point 5	186.2	1.4
Point 6	200	3.5
Point 7	208	3.5
Point 8	228.1	-1.4
Point 9	310	-3
Point 10	310	-4
Point 11	102.6	-45
Point 12	310	-45
Point 13	200	-1
Point 14	200	-4
Point 15	200	-8
Point 16	200	-12
Point 17	200	-17.2
Point 18	195.1	2.4
Point 19	195	-1
Point 20	195	-4
Point 21	195	-8
Point 22	195	-15
Point 23	195	-12
Point 24	102.6	-17.2
Point 25	228	-6
Point 26	228	-12
Point 27	228	-4
Point 28	310	-6
Point 29	310	-12
Point 30	310	-70
Point 31	102.6	-69.9
Point 32	201	3.53
Point 33	200	-45
Point 34	200	-70
Point 35	151.3	-9.2
Point 36	160.5	-9
Point 37	183.4	-0.2
Point 38	195.9	3.3
Point 39	199	3.5

Point 40	244	-3
Point 41	201	3.7
Point 42	102.6	-12
Point 43	200	-10
Point 44	228	-10
Point 45	310	-10
Point 46	200	12.9
Point 47	200.5	12.9
Point 48	157.3	-11.4
Point 49	102.6	-11.9
Point 50	151.3	-11.4
Point 51	228.1	-45
Point 52	176.7	-45
Point 53	228	-8
Point 54	176.7	-4
Point 55	176.7	-8
Point 56	176.7	-12
Point 57	176.7	-70
Point 58	228.1	-70
Point 59	310	-8
Point 60	200	-6
Point 61	166.5	-6
Point 62	162.15	-8
Point 63	159.17	-10
Point 64	208	-51

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	2.16	(221.255, 12.727)	21.69496	(195.9, 3.3)	(248.657, -3)
2	8142	2.39	(221.255, 12.727)	29.038	(195.9, 3.3)	(245.664, -3)

29	Optimized	233.52115	-12.489175	882.40158	1079.3349	113.69951	0
30	Optimized	235.2214	-12.295705	861.01357	1037.7276	102.02591	0
31	Optimized	236.92165	-12.102235	839.684	996.12035	90.318574	0
32	Optimized	238.76905	-11.35568	776.80637	1052.2088	0	300
33	Optimized	240.22805	-10.35293	695.91498	962.08691	0	300
34	Optimized	241.9719	-9.020055	588.36269	806.21398	0	320
35	Optimized	243.2762	-8.020055	507.28965	712.41641	0	320
36	Optimized	243.6492	-7.683591	480.16115	670.25272	0	320
37	Optimized	244.78875	-6.655721	397.4399	550.02549	0	320
38	Optimized	246.59435	-4.97213	262.21836	527.27301	0	600
39	Optimized	248.1342	-3.5	91.528073	372.03449	0	600

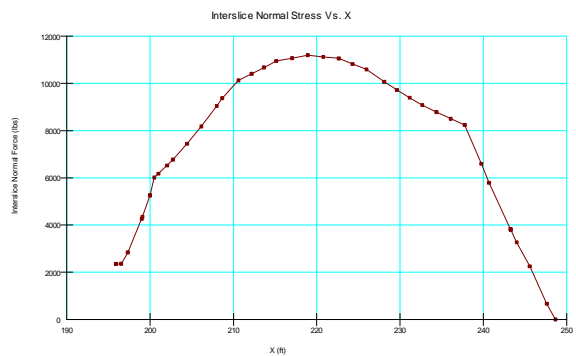
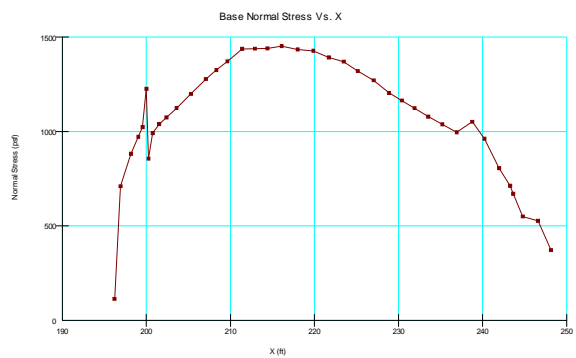
Slices of Slip Surface: 8142

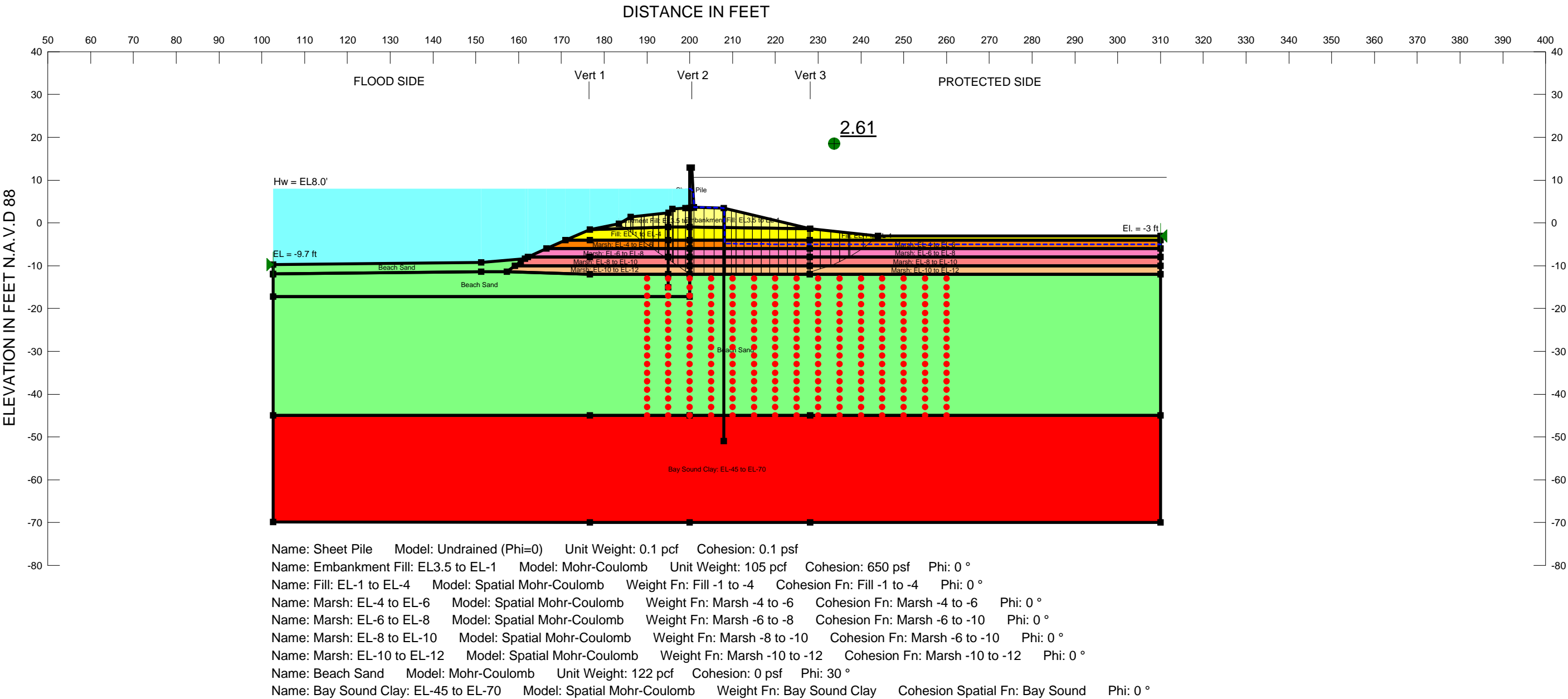
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	8142	196.70955	-2.713054	656.89777	439.88308	0	471.09
2	8142	198.25955	-4.962494	797.71367	862.02815	0	359.34
3	8142	199.03155	-5.962494	864.02577	973.81702	0	350.76
4	8142	199.53155	-6.528483	902.12745	1037.7793	0	339.6
5	8142	200.25	-7.3189185	709.75466	757.54479	0	339.82
6	8142	200.7093	-7.7904355	739.76245	915.84411	0	339.5
7	8142	200.9593	-8.039793	755.67507	942.2446	0	339.32
8	8142	202.09065	-9.039793	820.00974	1068.0669	0	338.51
9	8142	203.8939	-10.531895	914.16426	1232.8679	0	334.46
10	8142	205.3191	-11.531895	975.18838	1343.9995	0	332.43
11	8142	207.01585	-12.55428	1032.1363	1485.035	261.48119	0
12	8142	208.83335	-13.50318	1081.6694	1590.5371	293.79494	0
13	8142	210.5	-14.23026	1117.9199	1653.9754	309.49174	0
14	8142	212.16665	-14.837465	1146.5526	1703.9021	321.78592	0
15	8142	213.83335	-15.33261	1168.1731	1740.8035	330.60834	0
16	8142	215.5	-15.72158	1183.1762	1765.2078	336.03613	0
17	8142	217.16665	-16.0087	1191.8403	1777.3651	338.05291	0
18	8142	218.83335	-16.19701	1194.3227	1777.3436	336.60723	0
19	8142	220.5	-16.288445	1190.8375	1765.0834	331.54103	0

Slices of Slip Surface: Optimized

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	196.21315	-2.484212	642.56486	113.74566	0	474.27
2	Optimized	196.9227	-3.55119	706.70661	710.34706	0	469.73
3	Optimized	198.15955	-4.9514625	796.49845	881.96557	0	360.45
4	Optimized	199.04285	-5.9514625	863.40278	972.18705	0	350.63
5	Optimized	199.5409	-6.515285	901.42636	1023.2407	0	339.61
6	Optimized	199.99805	-7.0315065	937.95264	1226.5658	0	340
7	Optimized	200.25	-7.1512955	698.95321	856.26104	0	339.82
8	Optimized	200.75	-7.389001	713.85492	991.47821	0	339.47
9	Optimized	201.5176	-7.753927	736.70821	1039.3166	0	338.92
10	Optimized	202.38665	-8.16708	762.05623	1074.439	0	338.3
11	Optimized	203.5921	-8.75062	797.73798	1123.8533	0	337.44
12	Optimized	205.30005	-9.58354	846.57371	1199.2119	0	336.23
13	Optimized	207.077	-10.450105	895.62646	1278.2421	0	329.93
14	Optimized	208.33085	-11.061545	929.30082	1325.8746	0	328.14
15	Optimized	209.63765	-11.60399	957.60912	1371.7491	0	326.28
16	Optimized	211.3945	-12.14735	982.90834	1438.034	262.7669	0
17	Optimized	212.92045	-12.4644	994.27105	1439.0385	256.78659	0
18	Optimized	214.41055	-12.774	1005.3097	1440.2869	251.13418	0
19	Optimized	216.1003	-13.047025	1012.9623	1452.3555	253.68378	0
20	Optimized	217.98975	-13.28347	1017.2685	1434.973	241.1618	0
21	Optimized	219.8613	-13.446765	1017.0947	1427.4352	236.91018	0
22	Optimized	221.7149	-13.536915	1012.5144	1392.5172	219.3947	0
23	Optimized	223.47495	-13.55204	1003.7263	1370.0643	211.5053	0
24	Optimized	225.14145	-13.49214	990.83346	1320.2917	190.21282	0
25	Optimized	227.03735	-13.32313	969.89857	1270.7729	173.70986	0
26	Optimized	228.86185	-13.08438	944.97095	1204.8851	150.06153	0
27	Optimized	230.3855	-12.884995	924.21165	1164.1475	138.527	0
28	Optimized	231.90915	-12.685605	903.45236	1123.4098	126.99248	0

20	8142	222.16665	-16.28392	1181.3564	1740.4602	322.79873	0
21	8142	223.83335	-16.183395	1165.9116	1703.1787	310.19134	0
22	8142	225.5	-15.98586	1144.4784	1652.7331	293.44102	0
23	8142	227.16665	-15.689275	1116.8065	1588.3888	272.26816	0
24	8142	228.05	-15.503865	1100.3723	1550.0296	259.60978	0
25	8142	228.93775	-15.26186	1080.4567	1517.8653	252.53795	0
26	8142	230.6133	-14.74652	1039.1132	1450.3971	237.45485	0
27	8142	232.28885	-14.11679	990.64282	1366.4534	216.97433	0
28	8142	233.96435	-13.36434	934.57242	1263.9639	190.17424	0
29	8142	235.63985	-12.478125	870.1025	1140.0592	155.8596	0
30	8142	237.1902	-11.531895	798.31856	1078.2842	0	300
31	8142	238.61545	-10.531895	718.37634	982.08839	0	300
32	8142	240.45945	-9	596.31054	835.2255	0	320
33	8142	242.5185	-7	436.85281	627.49482	0	320
34	8142	243.7231	-5.661699	329.92486	666.17463	0	600
35	8142	244.4951	-4.661699	250.16381	594.49903	0	600
36	8142	245.32725	-3.5	97.936217	517.37619	0	600





GENERAL NOTES

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

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

Hw = CANAL WATER LEVEL

LONDON AVE CANAL
OUTFALL CANAL REEVALUATION REPORT
REACH 7: REMEDIATED, STA. 64+00 TO 66+00
PROTECTED SIDE STABILITY ANALYSIS
CASE: Rem: Global Stability (Block) EL-13 to EL-45
MARCH 2012

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

Rem: Global Stability (Block) EL-13 to EL-45

Report generated using GeoStudio 2007, version 7.15. Copyright © 1991-2009 GEO-SLOPE International Ltd.

File Information

Revision Number: 324
Last Edited By: Haggerty, Daniel R MVN
Date: 12/21/2011
Time: 8:07:38 AM
File Name: Reach 7.gsz
Last Solved Date: 12/21/2011
Last Solved Time: 8:09:04 AM

Project Settings

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

Analysis Settings

Rem: Global Stability (Block) EL-13 to EL-45
Kind: SLOPE/W
Parent: Gap Analysis (Seepage) Remediated Reach
Method: Spencer
Settings
 PWP Conditions Source: Parent Analysis
SlipSurface
 Direction of movement: Left to Right
 Use Passive Mode: No
 Slip Surface Option: Block
 Critical slip surfaces saved: 1
 Optimize Critical Slip Surface Location: Yes
Tension Crack
 Tension Crack Option: Search for Tension Crack
 Percentage Wet: 1
 Tension Crack Fluid Unit Weight: 62.4 pcf
FOS Distribution
 FOS Calculation Option: Constant
Restrict Block Crossing: Yes
Advanced

Marsh: EL-8 to EL-10

Model: Spatial Mohr-Coulomb
Weight Fn: Marsh -8 to -10
Cohesion Fn: Marsh -6 to -10
Phi: 0 °
Phi-B: 0 °

Marsh: EL-10 to EL-12

Model: Spatial Mohr-Coulomb
Weight Fn: Marsh -10 to -12
Cohesion Fn: Marsh -10 to -12
Phi: 0 °
Phi-B: 0 °

Beach Sand

Model: Mohr-Coulomb
Unit Weight: 122 pcf
Cohesion: 0 psf
Phi: 30 °
Phi-B: 0 °

Bay Sound Clay: EL-45 to EL-70

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

Slip Surface Limits

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

Slip Surface Block

Left Grid
 Upper Left: (190, -13) ft
 Lower Left: (190, -45) ft
 Lower Right: (210, -45) ft
 X Increments: 4
 Y Increments: 16
 Starting Angle: 120 °
 Ending Angle: 150 °
 Angle Increments: 6
Right Grid
 Upper Left: (215, -13) ft
 Lower Left: (215, -45) ft

Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 5000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

Sheet Pile

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

Embankment Fill: EL3.5 to EL-1

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

Fill: EL-1 to EL-4

Model: Spatial Mohr-Coulomb
Weight Fn: Fill -1 to -4
Cohesion Fn: Fill -1 to -4
Phi: 0 °
Phi-B: 0 °

Marsh: EL-4 to EL-6

Model: Spatial Mohr-Coulomb
Weight Fn: Marsh -4 to -6
Cohesion Fn: Marsh -4 to -6
Phi: 0 °
Phi-B: 0 °

Marsh: EL-6 to EL-8

Model: Spatial Mohr-Coulomb
Weight Fn: Marsh -6 to -8
Cohesion Fn: Marsh -6 to -10
Phi: 0 °
Phi-B: 0 °

Lower Right: (260, -45) ft
X Increments: 9
Y Increments: 16
Starting Angle: 20 °
Ending Angle: 45 °
Angle Increments: 5

Cohesion Functions

Fill -1 to -4

Model: Spline Data Point Function
Function: Cohesion vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 600
Data Points: X (ft), Cohesion (psf)
 Data Point: (0, 600)
 Data Point: (176.6, 600)
 Data Point: (200, 450)
 Data Point: (228.1, 600)
 Data Point: (400, 600)

Marsh -4 to -6

Model: Spline Data Point Function
Function: Cohesion vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 600
Data Points: X (ft), Cohesion (psf)
 Data Point: (0, 600)
 Data Point: (176.6, 600)
 Data Point: (200, 340)
 Data Point: (228.1, 600)
 Data Point: (400, 600)

Marsh -6 to -10

Model: Spline Data Point Function
Function: Cohesion vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 320
Data Points: X (ft), Cohesion (psf)
 Data Point: (0, 320)
 Data Point: (176.6, 320)
 Data Point: (200, 340)
 Data Point: (228.1, 320)

Data Point: (400, 320)

Marsh -10 to -12

Model: Spline Data Point Function

Function: Cohesion vs. X

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 300

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

Data Point: (0, 300)

Data Point: (176.6, 300)

Data Point: (200, 340)

Data Point: (228.1, 300)

Data Point: (400, 300)

Unit Weight Functions

Fill -1 to -4

Model: Spline Data Point Function

Function: Unit Weight vs. X

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 96

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

Data Point: (0, 96)

Data Point: (176.6, 96)

Data Point: (200, 105)

Data Point: (228.1, 96)

Data Point: (400, 96)

Marsh -4 to -6

Model: Spline Data Point Function

Function: Unit Weight vs. X

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 96

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

Data Point: (0, 96)

Data Point: (176.6, 96)

Data Point: (200, 90)

Data Point: (228.1, 96)

Data Point: (400, 96)

Marsh -6 to -8

Model: Spline Data Point Function

Function: Unit Weight vs. X

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 104

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

Data Point: (0, 104)

Data Point: (176.6, 104)

Data Point: (200, 90)

Data Point: (228.1, 104)

Data Point: (400, 104)

Marsh -8 to -10

Model: Spline Data Point Function

Function: Unit Weight vs. X

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 104

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

Data Point: (0, 104)

Data Point: (176.6, 104)

Data Point: (200, 98)

Data Point: (228.1, 104)

Data Point: (400, 104)

Marsh -10 to -12

Model: Spline Data Point Function

Function: Unit Weight vs. X

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 96

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

Data Point: (0, 96)

Data Point: (176.6, 96)

Data Point: (200, 98)

Data Point: (228.1, 96)

Data Point: (400, 96)

Bay Sound Clay

Model: Spline Data Point Function

Function: Unit Weight vs. X

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 111

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

Data Point: (0, 111)

Data Point: (176.6, 111)

Data Point: (200, 108)

Data Point: (228.1, 111)

Data Point: (400, 111)

Spatial Functions

Bay Sound

Model: Linear Interpolation

Limit Range By: Data Values

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

Data Point: (0, -45, 790)

Data Point: (0, -70, 950)

Data Point: (176.6, -45, 790)

Data Point: (176.6, -70, 950)

Data Point: (200, -45, 800)

Data Point: (200, -70, 1000)

Data Point: (228.1, -45, 790)

Data Point: (228.1, -70, 950)

Data Point: (400, -45, 790)

Data Point: (400, -70, 950)

Regions

	Material	Points	Area (ft²)
Region 1	Sheet Pile	6,46,47,41,32	7.085
Region 2	Bay Sound Clay: EL-45 to EL-70	31,11,52,33,51,12,30,58,34,57	5181.295
Region 3	Beach Sand	11,24,17,16,26,29,12,51,33,52	6337.72
Region 4	Beach Sand	24,42,49,50,48,56,23,16,17	532.945
Region 5	Marsh: EL-10 to EL-12	48,63,43,16,23,56	78.271
Region 6	Marsh: EL-8 to EL-10	63,36,2,62,55,21,15,43	78.9175
Region 7	Marsh: EL-6 to EL-8	62,61,60,15,21,55	71.35
Region 8	Marsh: EL-4 to EL-6	61,3,54,20,14,60	62.6
Region 9	Fill: EL-1 to EL-4	3,4,19,13,14,20,54	71.37
Region 10	Embankment Fill: EL3.5 to EL-1	4,37,5,18,38,39,6,13,19	57.67
Region 11	Beach Sand	49,1,35,2,36,63,48,50	127.584
Region 12	Marsh: EL-10 to EL-12	16,43,44,45,29,26	220
Region 13	Marsh: EL-8 to EL-10	43,15,53,59,45,44	220
Region 14	Marsh: EL-6 to EL-8	15,60,25,28,59,53	220
Region 15	Marsh: EL-4 to EL-6	60,14,27,10,28,25	220
Region 16	Fill: EL-1 to EL-4	14,13,8,40,9,10,27	173.3
Region 17	Embankment Fill: EL3.5 to EL-1	13,6,32,41,7,8	83.54

Points

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

Point 34	200	-70
Point 35	151.3	-9.2
Point 36	160.5	-9
Point 37	183.4	-0.2
Point 38	195.9	3.3
Point 39	199	3.5
Point 40	244	-3
Point 41	201	3.7
Point 42	102.6	-12
Point 43	200	-10
Point 44	228	-10
Point 45	310	-10
Point 46	200	12.9
Point 47	200.5	12.9
Point 48	157.3	-11.4
Point 49	102.6	-11.9
Point 50	151.3	-11.4
Point 51	228.1	-45
Point 52	176.7	-45
Point 53	228	-8
Point 54	176.7	-4
Point 55	176.7	-8
Point 56	176.7	-12
Point 57	176.7	-70
Point 58	228.1	-70
Point 59	310	-8
Point 60	200	-6
Point 61	166.5	-6
Point 62	162.15	-8
Point 63	159.17	-10
Point 64	208	-51

1	Optimized	2.61	(214.35, 0.162)	24.8369	(183.401, -0.199632)	(244.008, -3)
2	1154	3.08	(214.35, 0.162)	25.888	(182.106, -0.470411)	(246.445, -3)

Slices of Slip Surface: **Optimized**

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	184.2093	-0.7634558	546.80895	390.36914	0	650
2	Optimized	185.609	-1.7393615	607.70467	542.61774	0	542.25
3	Optimized	186.4477	-2.3241415	644.19158	630.33176	0	536.87
4	Optimized	187.68125	-3.24842	701.84878	708.9072	0	528.97
5	Optimized	189.03	-4.27669	766.00895	826.94609	0	461.89
6	Optimized	190.38635	-5.27669	828.41749	932.58	0	446.82
7	Optimized	192.0532	-6.49033	904.1053	1073.4262	0	333.21
8	Optimized	193.4902	-7.49033	966.52194	1181.4377	0	334.44
9	Optimized	194.6269	-8.249055	1013.8744	1254.219	0	335.41
10	Optimized	195.05	-8.5314845	1031.5161	1282.2837	0	335.77
11	Optimized	195.5	-8.831856	1050.2712	1301.1428	0	336.15
12	Optimized	196.0417	-9.1934365	1072.8304	1381.8102	0	336.62
13	Optimized	196.68385	-9.64401	1100.94	1414.2963	0	337.17
14	Optimized	198.09215	-10.64577	1163.4629	1509.1267	0	336.74
15	Optimized	199.49975	-11.647025	1225.937	1603.3303	0	339.14
16	Optimized	199.99975	-12.00251	1248.1535	1831.1905	336.61655	0
17	Optimized	200.25	-12.003325	1248.0733	1431.7323	106.03558	0
18	Optimized	200.75	-12.004955	1248.1733	1548.7916	173.5621	0
19	Optimized	202.16665	-12.009565	1248.4647	1565.3915	182.9778	0
20	Optimized	204.5	-12.01716	1248.9361	1561.063	180.20654	0
21	Optimized	206.83335	-12.02476	1249.4075	1556.7344	177.43527	0
22	Optimized	208.094	-12.028865	868.48081	1559.713	399.08311	0
23	Optimized	208.2432	-12.033585	439.12405	1535.1866	632.81198	0
24	Optimized	209.0216	-12.019	438.21369	1555.0076	644.78124	0
25	Optimized	210.26415	-11.986355	436.2015	1506.3267	0	325.39
26	Optimized	211.71245	-11.96253	434.74189	1464.0838	0	323.33

Critical Slip Surfaces

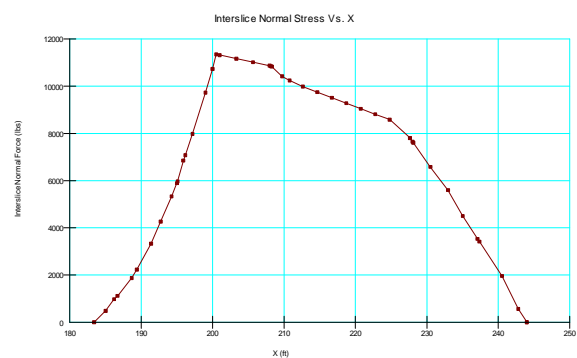
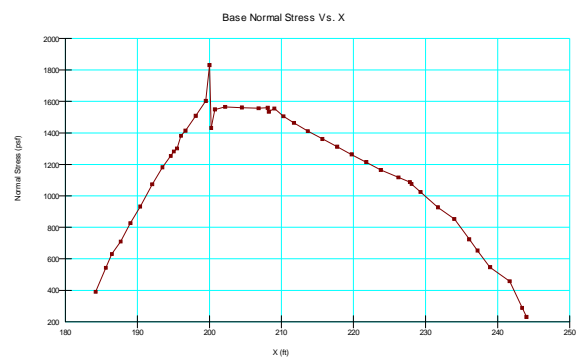
	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
--	--------------	-----	-------------	-------------	------------	-----------

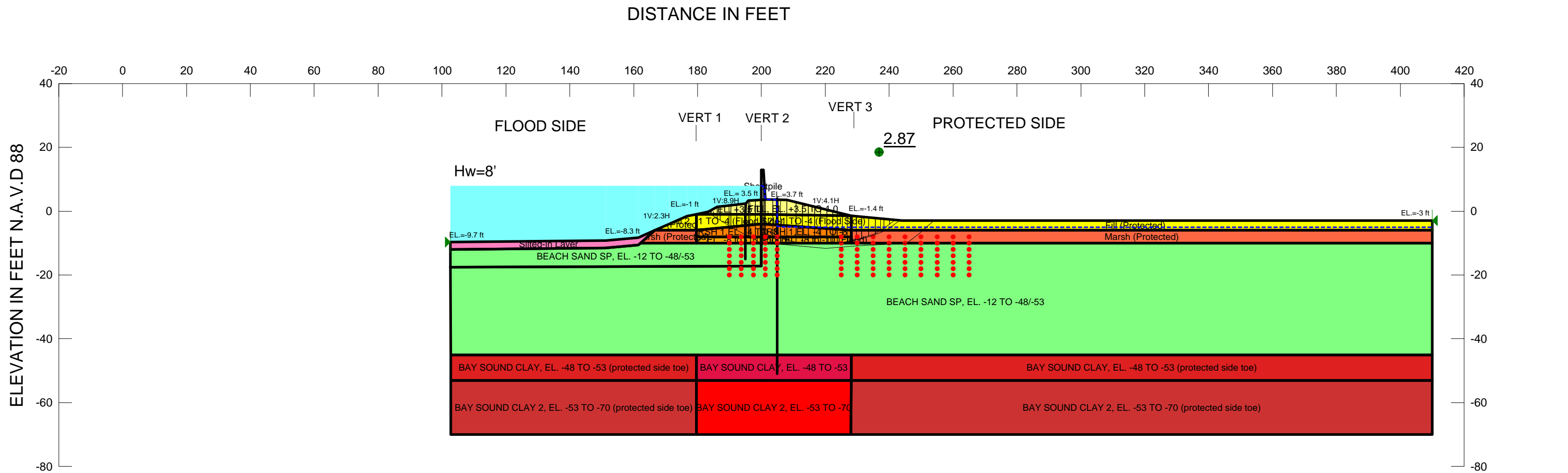
27	Optimized	213.6551	-11.95626	434.3404	1411.5964	0	320.56
28	Optimized	215.68245	-11.964085	434.80405	1362.1723	0	317.68
29	Optimized	217.70975	-11.97191	435.27758	1312.7975	0	314.79
30	Optimized	219.7371	-11.97973	435.75604	1263.4227	0	311.9
31	Optimized	221.76445	-11.987555	436.23449	1214.0972	0	309.02
32	Optimized	223.79175	-11.99538	436.71788	1164.8211	0	306.13
33	Optimized	226.2312	-11.97931	424.36321	1117.0523	0	302.66
34	Optimized	227.8285	-11.542965	408.51156	1087.5237	0	300.39
35	Optimized	228.05	-11.47533	404.29921	1075.1855	0	300.07
36	Optimized	229.2953	-11.095045	380.58676	1024.5182	0	300
37	Optimized	231.7264	-10.352665	334.26773	927.02305	0	300
38	Optimized	233.99475	-9.481475	279.89825	852.7911	0	320
39	Optimized	236.0599	-8.493825	218.25633	724.62344	0	320
40	Optimized	237.22655	-7.935895	183.43564	652.22607	0	320
41	Optimized	238.9467	-6.89099	118.21755	546.79503	0	320
42	Optimized	241.6734	-4.955095	-2.6029382	457.22659	0	600
43	Optimized	243.407	-3.503433	-93.198458	288.47111	0	600
44	Optimized	244.0041	-3.003433	-124.40393	230.38803	0	600

Slices of Slip Surface: **1154**

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	1154	182.75295	-0.9234828	556.81871	416.68829	0	650
2	1154	184.8	-2.3568455	646.22317	594.9384	0	547.44
3	1154	186.67335	-3.668568	728.06377	773.78624	0	535.43
4	1154	188.57485	-5	811.1517	914.96902	0	466.95
5	1154	191.43115	-7	935.93324	1130.433	0	332.68
6	1154	193.97965	-8.7844915	1047.2911	1302.6067	0	334.85
7	1154	195.4078	-9.7844915	1109.7137	1384.3808	0	336.08
8	1154	195.8078	-10.064575	1127.1754	1431.2641	0	332.83
9	1154	197.23595	-11.064575	1189.5838	1556.751	0	335.28
10	1154	198.78595	-12.149895	1257.3081	1679.3508	243.66648	0
11	1154	199.5	-12.649895	1288.5257	1735.4549	258.0347	0
12	1154	200.25	-13	1310.28	1549.22	137.95207	0

13	1154	200.75	-13	1310.28	1671.24	208.40035	0
14	1154	202.16665	-13	1310.2716	1687.2431	217.64459	0
15	1154	204.5	-13	1310.2716	1681.9717	214.60113	0
16	1154	206.83335	-13	1310.2716	1676.7431	211.58241	0
17	1154	209.0625	-13	499.43529	1661.8824	671.13912	0
18	1154	211.1875	-13	499.43529	1608.3294	640.22032	0
19	1154	213.3125	-13	499.43529	1554.8235	609.32868	0
20	1154	215.4375	-13	499.43529	1501.3176	578.43705	0
21	1154	217.5625	-13	499.43529	1447.9059	547.59975	0
22	1154	219.6875	-13	499.38824	1394.5412	516.81679	0
23	1154	221.8125	-13	499.38824	1341.1765	486.00666	0
24	1154	223.9375	-13	499.38824	1287.9059	455.25088	0
25	1154	226.07225	-12.5	468.21869	1305.214	483.23947	0
26	1154	227.57225	-11.80054	424.56439	1148.1757	0	300.75
27	1154	228.05	-11.577765	410.68428	1113.399	0	300.07
28	1154	228.9334	-11.165835	385.00501	1062.3321	0	300
29	1154	230.60015	-10.38861	336.52934	967.44708	0	300
30	1154	232.50575	-9.5	281.07913	858.63337	0	320
31	1154	234.65025	-8.5	218.66688	728.2134	0	320
32	1154	236.79475	-7.5	156.24617	597.79343	0	320
33	1154	238.93925	-6.5	93.825464	467.37345	0	320
34	1154	241.00865	-5.5350385	33.59094	398.5757	0	600
35	1154	243.0029	-4.6051155	-24.452085	285.07738	0	600
36	1154	244.1503	-4.070077	-57.846938	221.2953	0	600
37	1154	245.37285	-3.5	-93.423976	164.06461	0	600





Name: FILL, EL. +3.5 TO-1.0 Model: Undrained (Phi=0) Unit Weight: 106 pcf Cohesion: 900 psf

Name: Fill 2. -1 TO -4 (Flood Side) Model: Spatial Mohr-Coulomb Unit Weight: 101 pcf Cohesion: 500 psf Phi: 0 °

Name: BEACH SAND SP, EL. -12 TO -48/-53 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand

Name: BAY SOUND CLAY, EL. -48 TO -53 Model: Spatial Mohr-Coulomb Unit Weight: 108 pcf Cohesion: 450 psf Phi: 0 °

Name: Silted-in Layer Model: Mohr-Coulomb Unit Weight: 90 pcf Cohesion: 0 psf Phi: 20 °

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

Name: Sheetpile Model: Mohr-Coulomb Unit Weight: 0.1 pcf Cohesion: 0.01 psf Phi: 0 °

Name: MARSH 1,EL. -4 TO -8 Model: Spatial Mohr-Coulomb Unit Weight: 90 pcf Cohesion Fn: Marsh Phi: 0 °

Name: BAY SOUND CLAY 2, EL. -53 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 111 pcf Cohesion Spatial Fn: Bay Sound 2 Phi: 0 °

Name: Marsh 2, EL. -8 to -10 (Flood) Model: Spatial Mohr-Coulomb Unit Weight: 98 pcf Cohesion Fn: Marsh Phi: 0 °

Name: Marsh (Protected) Model: Spatial Mohr-Coulomb Unit Weight: 101 pcf Cohesion: 320 psf Phi: 0 °

Name: BAY SOUND CLAY, EL. -48 TO -53 (protected side toe) Model: Undrained (Phi=0) Unit Weight: 111 pcf Cohesion: 425 psf

Name: BAY SOUND CLAY 2, EL. -53 TO -70 (protected side toe) Model: Spatial Mohr-Coulomb Unit Weight: 111 pcf Cohesion Fn: Bay Sound Phi: 0 °

GENERAL NOTES

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

WHERE INDICATED, SHEAR STRENGTHS BETWEEN
VERTICALSWERE ASSUMED TO VARY LINEARLY
BETWEENTHE VALUES INDICATED FOR THESE LOCATIONS.

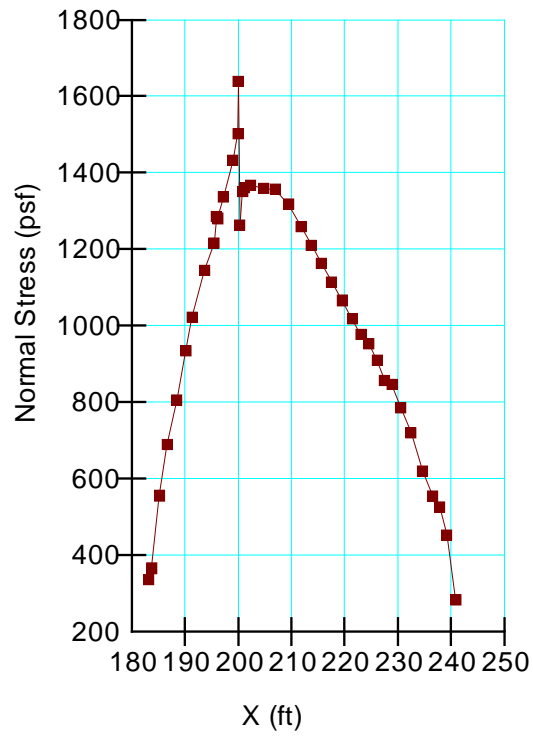
Hw = CANAL WATER LEVEL



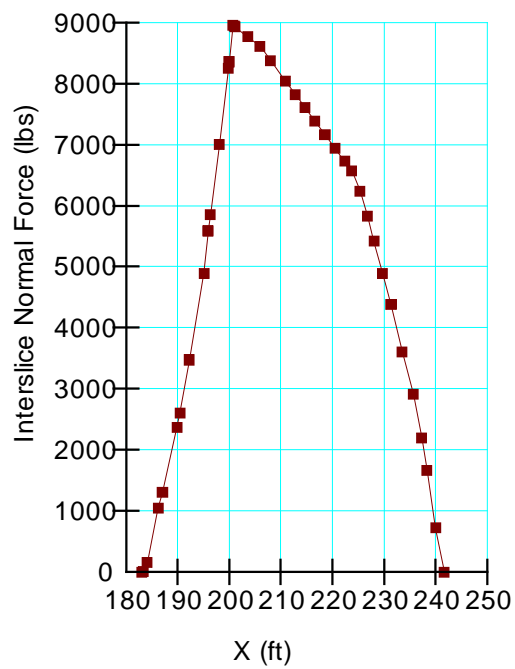
**US Army Corps
of Engineers®**
New Orleans District
LONDON AVE CANAL
OUTFALL CANAL REEVALUATION REPORT
REACH 8, STA. 66+00 TO 69+06
PROTECTED SIDE STABILITY ANALYSIS,
CASE: Global Stability (Block) (2)
MARCH 2012

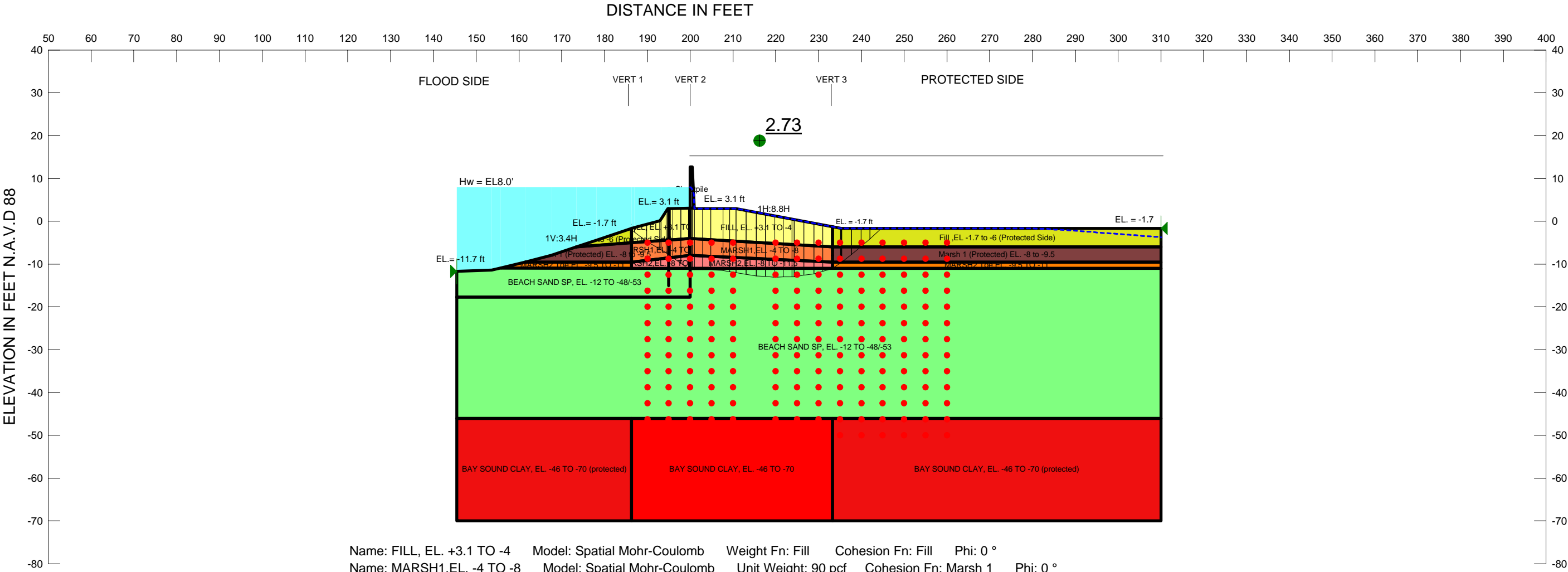
LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

Base Normal Stress Vs. X



Interslice Normal Stress
Vs. X





Name: FILL, EL. +3.1 TO -4 Model: Spatial Mohr-Coulomb Weight Fn: Fill Cohesion Fn: Fill Phi: 0 °
Name: MARSH1,EL. -4 TO -8 Model: Spatial Mohr-Coulomb Unit Weight: 90 pcf Cohesion Fn: Marsh 1 Phi: 0 °
Name: BEACH SAND SP, EL. -12 TO -48/-53 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand
Name: BAY SOUND CLAY, EL. -46 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 108 pcf Cohesion Spatial Fn: Bay Sound Phi: 0 °
Name: Fill ,EL -1.7 to -6 (Protected Side) Model: Undrained (Phi=0) Unit Weight: 102 pcf Cohesion: 600 psf
Name: Sheetpile Model: Mohr-Coulomb Unit Weight: 0.1 pcf Cohesion: 0.01 psf Phi: 0 °
Name: MARSH2,EL. -8 TO -11.5 Model: Spatial Mohr-Coulomb Unit Weight: 98 pcf Cohesion Fn: Marsh 2 Phi: 0 °
Name: BAY SOUND CLAY, EL. -46 TO -70 (protected) Model: Spatial Mohr-Coulomb Unit Weight: 108 pcf Cohesion Fn: Bay Sound Phi: 0 °
Name: MARSH2 Toe,EL. -9.5 TO -11 Model: Spatial Mohr-Coulomb Unit Weight: 101 pcf Cohesion: 220 psf Phi: 0 °
Name: Marsh 1 (Protected) EL. -8 to -9.5 Model: Spatial Mohr-Coulomb Unit Weight: 101 pcf Cohesion: 320 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
VERTICALSWERE ASSUMED TO VARY LINEARLY
BETWEENTHE VALUES INDICATED FOR THESE LOCATIONS.

Hw = CANAL WATER LEVEL

LONDON AVE CANAL
OUTFALL CANAL REEVALUATION REPORT
REACH 9, STA. 70+18 TO 74+00
PROTECTED SIDE STABILITY ANALYSIS,
CASE: Global Stability (Block)
MARCH 2012

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

Global Stability (Block)

Report generated using GeoStudio 2007, version 7.15. Copyright © 1991-2009 GEO-SLOPE International Ltd.

File Information

Revision Number: 344
Last Edited By: Haggerty, Daniel R MVN
Date: 2/28/2012
Time: 10:34:48 AM
File Name: Reach 9.gsz
Last Solved Date: 2/28/2012
Last Solved Time: 10:37:40 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 Stability (Block)

Kind: SLOPE/W
Parent: Gap Analysis (Seepage)
Method: Spencer
Settings
 PWP Conditions Source: Parent Analysis
SlipSurface
 Direction of movement: Left to Right
 Use Passive Mode: Yes
 Slip Surface Option: Block
 Critical slip surfaces saved: 1
 Optimize Critical Slip Surface Location: Yes
 Tension Crack
 Tension Crack Option: (none)
FOS Distribution
 FOS Calculation Option: Constant
Restrict Block Crossing: Yes
Advanced
 Number of Slices: 30
 Optimization Tolerance: 0.01

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

MARSH2,EL. -8 TO -11.5

Model: Spatial Mohr-Coulomb
Unit Weight: 98 pcf
Cohesion Fn: Marsh 2
Phi: 0 °
Phi-B: 0 °

BAY SOUND CLAY, EL. -46 TO -70 (protected)

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

MARSH2 Toe,EL. -9.5 TO -11

Model: Spatial Mohr-Coulomb
Unit Weight: 101 pcf
Cohesion: 220 psf
Phi: 0 °
Phi-B: 0 °

Marsh 1 (Protected) EL. -8 to -9.5

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

Slip Surface Limits

Left Coordinate: (145.5, -11.7) ft
Right Coordinate: (310, -1.7) ft

Slip Surface Block

Left Grid
 Upper Left: (190, -5) ft
 Lower Left: (190, -50) ft
 Lower Right: (210, -50) ft
 X Increments: 4
 Y Increments: 12
 Starting Angle: 120 °
 Ending Angle: 150 °

Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 5000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

FILL, EL. +3.1 TO -4

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

MARSH1,EL. -4 TO -8

Model: Spatial Mohr-Coulomb
Unit Weight: 90 pcf
Cohesion Fn: Marsh 1
Phi: 0 °
Phi-B: 0 °

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

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

BAY SOUND CLAY, EL. -46 TO -70

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

Fill ,EL -1.7 to -6 (Protected Side)

Model: Undrained (Phi=0)
Unit Weight: 102 pcf
Cohesion: 600 psf

Sheetpile

Model: Mohr-Coulomb
Unit Weight: 0.1 pcf

Angle Increments: 6
Right Grid
 Upper Left: (220, -5) ft
 Lower Left: (220, -50) ft
 Lower Right: (260, -50) ft
 X Increments: 8
 Y Increments: 12
 Starting Angle: 20 °
 Ending Angle: 45 °
 Angle Increments: 5

Cohesion Functions

Marsh 2

Model: Spline Data Point Function
Function: Cohesion vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 220
Data Points: X (ft), Cohesion (psf)
 Data Point: (186.3, 220)
 Data Point: (200, 340)
 Data Point: (220, 220)

Marsh 1

Model: Spline Data Point Function
Function: Cohesion vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 320
Data Points: X (ft), Cohesion (psf)
 Data Point: (186.3, 320)
 Data Point: (200, 340)
 Data Point: (233.2, 320)

Bay Sound

Model: Spline Data Point Function
Function: Cohesion vs. Y
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 820
Data Points: Y (ft), Cohesion (psf)
 Data Point: (-70, 1040)
 Data Point: (-46, 820)

Fill

Model: Spline Data Point Function
Function: Cohesion vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 600
Data Points: X (ft), Cohesion (psf)
Data Point: (186.3, 600)
Data Point: (200, 950)
Data Point: (233.2, 600)

Shear/Normal Strength Functions

Sand

Model: Spline Data Point Function
Function: Shear Stress vs. Normal Stress
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
Data Point: (-100000, 0)
Data Point: (0, 0)
Data Point: (100000, 57735)
Estimation Properties
Intact Rock Param.: 10
Geological Strength: 100
Disturbance Factor: 0
SigmaC: 600000 psf
Sigma3: 300000 psf
Num. Points: 20

Unit Weight Functions

Fill

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 102
Data Points: X (ft), Unit Weight (pcf)
Data Point: (186.3, 102)
Data Point: (200, 106)
Data Point: (233.2, 102)

Spatial Functions

Bay Sound

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (200, -70, 1080)
Data Point: (233.2, -46, 820)
Data Point: (233.2, -70, 1040)
Data Point: (186.3, -46, 820)
Data Point: (186.3, -70, 1040)
Data Point: (200, -46, 840)

Regions

	Material	Points	Area (ft²)
Region 1	FILL, EL. +3.1 TO -4	35,3,38,51,4,15,36,5,11,12,56	75.381047
Region 2	FILL, EL. +3.1 TO -4	11,5,30,6,54,50,7,22,12	217.32501
Region 3	Fill ,EL -1.7 to -6 (Protected Side)	7,44,8,18,9,23,22	330.66
Region 4	BEACH SAND SP, EL. -12 TO -48/-53	1,43,31,48,16,13,14,26	361.91
Region 5	BEACH SAND SP, EL. -12 TO -48/-53	26,14,13,32,33,29,28,27,52,10	5392.35
Region 6	MARSH2,EL. -8 TO -11.5	47,45,13,16,48	30.825
Region 7	MARSH2,EL. -8 TO -11.5	13,45,40,32	74.7
Region 8	BAY SOUND CLAY, EL. -46 TO -70 (protected)	34,28,29,20,24	1843.2
Region 9	Marsh 1 (Protected) EL. -8 to -9.5	21,22,23,39,40	268.8
Region 10	MARSH2 Toe,EL. -9.5 TO -11	32,40,39,33	115.2
Region 11	Sheetpile	5,41,42,30	7.2
Region 12	MARSH1,EL. -4 TO -8	47,45,12,56	58.018952
Region 13	MARSH2 Toe,EL. -9.5 TO -11	47,48,31,49	40.382415
Region 14	MARSH1,EL. -4 TO -8	45,12,22,21,40	124.5
Region 15	Marsh 1 (Protected) EL. -8 to -9.5	46,56,47,49,37	70.733572

Region 16	BAY SOUND CLAY, EL. -46 TO -70 (protected)	10,52,53,25,19	979.2
Region 17	BAY SOUND CLAY, EL. -46 TO -70	52,27,28,34,55,53	1125.6
Region 18	Fill ,EL -1.7 to -6 (Protected Side)	46,2,35,56	21.694016

Points

	X (ft)	Y (ft)
Point 1	145.5	-11.7
Point 2	178.1	-4.4
Point 3	187	-1.5
Point 4	194.8	3
Point 5	200	3.1
Point 6	201	3
Point 7	233.2	-1.3
Point 8	310	-1.7
Point 9	310	-4
Point 10	145.5	-46
Point 11	200	0.5
Point 12	200	-4
Point 13	200	-11
Point 14	200	-17.7
Point 15	195	3
Point 16	195	-11
Point 17	195	-15
Point 18	310	-3
Point 19	145.5	-53
Point 20	310	-53
Point 21	233.2	-8
Point 22	233.2	-6
Point 23	310	-6
Point 24	310	-70
Point 25	145.5	-70
Point 26	145.5	-17.7

Point 27	200	-46
Point 28	233.2	-46
Point 29	310	-46
Point 30	201	3.1
Point 31	155.7	-10.9
Point 32	233.2	-11
Point 33	310	-11
Point 34	233.2	-70
Point 35	186.3	-1.7
Point 36	195.4	3
Point 37	167.5	-8
Point 38	192.9	0.1
Point 39	310	-9.5
Point 40	233.2	-9.5
Point 41	200	12.7
Point 42	200.5	12.7
Point 43	153.6	-11.4
Point 44	235.3	-1.7
Point 45	200	-8
Point 46	173.4	-6
Point 47	186.3	-9.5
Point 48	186.3	-11
Point 49	161.39655	-9.5
Point 50	223.7814	0.5
Point 51	193.16207	0.5
Point 52	186.3	-46
Point 53	186.3	-70
Point 54	210.7	3
Point 55	200	-70
Point 56	186.3	-5.03008

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	2.73	(215.274, -1.603)	23.30151	(186.046, -1.78375)	(244.638, -1.7)
2	4822	2.87	(215.274, -1.603)	23.843	(185.127, -2.0861)	(245.424, -1.7)

Slices of Slip Surface: Optimized

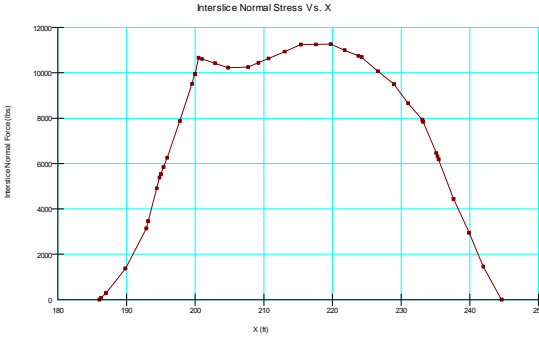
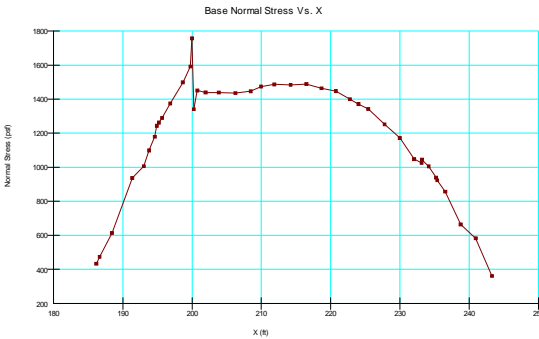
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	186.1728	-1.8801615	611.47258	433.29742	0	600
2	Optimized	186.65	-2.241904	616.2619	473.53795	0	608.94
3	Optimized	188.42385	-3.5866475	639.84566	613.59702	0	654.26
4	Optimized	191.37385	-5.574806	712.38761	936.88246	0	327.41
5	Optimized	193.03105	-6.561577	769.37906	1005.8942	0	329.83
6	Optimized	193.7881	-7.012371	795.42522	1098.745	0	330.93
7	Optimized	194.60705	-7.522287	824.99164	1178.7888	0	332.13
8	Optimized	194.9	-7.730517	837.11184	1243.2992	0	332.55
9	Optimized	195.2	-7.9437655	908.42978	1261.7601	0	332.99
10	Optimized	195.6546	-8.2669135	954.3418	1289.4651	0	333.66
11	Optimized	196.84205	-9.110983	997.29531	1374.4484	0	312.34
12	Optimized	198.66055	-10.387035	1073.7414	1498.6886	0	328.27
13	Optimized	199.7627	-11.14984	1146.1031	1591.5208	257.16202	1.5519e-005
14	Optimized	199.9896	-11.29968	1169.9952	1757.3692	339.12053	-6.8577e-005
15	Optimized	200.25	-11.299695	998.46	1340.88	197.69628	-1.0495e-006
16	Optimized	200.75	-11.299725	963.46	1450.88	281.41207	1.6977e-005
17	Optimized	201.94965	-11.29979	961.99106	1439.3273	275.59022	1.6626e-005
18	Optimized	203.84895	-11.299895	958.09487	1438.8535	277.56611	1.6745e-005
19	Optimized	206.25155	-11.410375	957.57859	1436.0076	276.22111	-1.9597e-005
20	Optimized	208.4534	-11.639275	963.29177	1446.0917	278.74469	-1.9779e-005

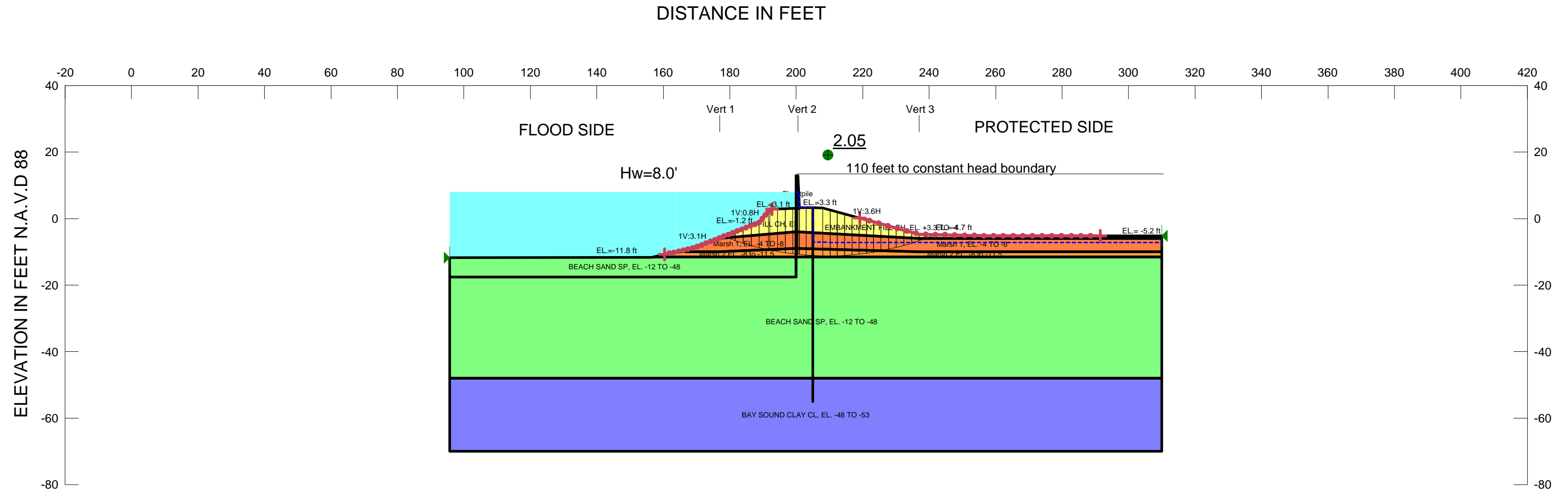
21	Optimized	209.95115	-11.876225	971.79897	1473.7896	289.82442	-2.0565e-005
22	Optimized	211.876	-12.18075	982.39269	1486.5025	291.04796	-2.0649e-005
23	Optimized	214.228	-12.55285	995.03323	1484.3608	282.5134	-2.0045e-006
24	Optimized	216.4918	-12.815505	1001.0742	1489.0028	281.70569	1.6996e-005
25	Optimized	218.66745	-12.96871	1000.6158	1463.8774	267.46422	1.6137e-005
26	Optimized	220.7618	-13.020525	994.20708	1447.2119	261.54247	-1.8555e-005
27	Optimized	222.77485	-12.970955	986.79191	1399.9846	241.44367	-1.2818e-006
28	Optimized	224.01655	-12.94038	974.12687	1370.9194	229.08826	-1.2162e-006
29	Optimized	225.428	-12.77274	957.11571	1342.1264	222.28605	-1.1801e-006
30	Optimized	227.7806	-12.449045	926.03861	1252.306	188.37059	-1.0001e-006
31	Optimized	229.9879	-11.980435	886.54848	1171.9471	164.77496	-8.7467e-007
32	Optimized	232.04995	-11.36691	838.71864	1047.7011	120.65606	3.3188e-006
33	Optimized	233.12865	-11.030075	812.70696	1024.7233	122.40767	-6.4974e-007
34	Optimized	233.18815	-10.99251	810.04989	1045.1889	0	220
35	Optimized	234.1667	-10.374945	764.7578	1004.9365	0	220
36	Optimized	235.2167	-9.6976815	714.98449	939.18801	0	220
37	Optimized	235.3809	-9.5652465	705.47043	923.25989	0	220
38	Optimized	236.5467	-8.625	637.4769	856.52214	0	320
39	Optimized	238.7704	-6.83153	507.95667	664.10643	0	320
40	Optimized	240.93535	-5.018005	341.29022	582.33597	0	600
41	Optimized	243.2998	-2.911475	121.41054	361.62248	0	600

Slices of Slip Surface: 4822

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	4822	185.7137	-2.4966275	633.01972	506.88382	0	600
2	4822	186.65	-3.1522295	640.34286	582.05434	0	608.94
3	4822	188.01895	-4.1107635	656.89484	684.22861	0	643.91
4	4822	190.0034	-5.5003005	709.67925	900.3976	0	325.41
5	4822	191.93445	-6.852451	787.05253	1036.9886	0	328.23
6	4822	193.03105	-7.620278	831.12346	1079.3665	0	329.83
7	4822	193.80225	-8.160265	862.3442	1180.2049	0	330.95
8	4822	194.6212	-8.7337105	895.54475	1297.1072	0	292.89
9	4822	194.9	-8.9289415	906.80138	1361.267	0	295.33

10	4822	195.2	-9.1390035	965.16597	1380.8447	0	297.96
11	4822	196.6289	-10.139523	1030.0651	1474.7068	0	310.47
12	4822	198.9289	-11.75	1133.8842	1650.5237	298.28193	-6.0335e-005
13	4822	200.25	-12.5	1061.74	1486.9	245.46624	-1.7415e-005
14	4822	200.75	-12.5	1039.08	1598.16	322.78499	-6.5272e-005
15	4822	201.97	-12.5	1038.1443	1586.5979	316.64984	-6.4032e-005
16	4822	203.91	-12.5	1033.6598	1586.134	318.97114	-6.4497e-005
17	4822	205.85	-12.5	1027.6289	1585.567	322.12574	-6.5145e-005
18	4822	207.79	-12.5	1019.8454	1585.0515	326.32194	-2.315e-005
19	4822	209.73	-12.5	1011.7526	1584.433	330.63719	-6.6861e-005
20	4822	211.6344	-12.5	1003.4402	1564.8252	324.11578	-6.5546e-005
21	4822	213.50315	-12.5	994.98547	1526.3507	306.78388	-6.2037e-005
22	4822	215.3719	-12.5	986.53072	1487.9833	289.51377	1.7467e-005
23	4822	217.2407	-12.5	977.91543	1449.7764	272.42903	-1.9326e-005
24	4822	219.1095	-12.5	969.35366	1411.6229	255.34429	-1.3557e-006
25	4822	220.97825	-12.5	960.68486	1373.63	238.41402	-1.2656e-006
26	4822	222.847	-12.5	952.06957	1335.6907	221.48375	-1.1759e-006
27	4822	224.81785	-12.5	942.94521	1295.8381	203.7428	-1.0817e-006
28	4822	226.8907	-12.5	933.34498	1254.0602	185.16502	-9.8307e-007
29	4822	228.96355	-12.5	923.74475	1212.3788	166.64295	-8.8484e-007
30	4822	231.0711	-11.75	867.17116	1185.3532	183.70246	-9.749e-007
31	4822	232.6711	-10.62967	788.58026	1027.6402	0	220
32	4822	233.7422	-9.87967	734.03421	969.88961	0	220
33	4822	234.7922	-9.14445	680.508	898.47673	0	320
34	4822	236.29575	-8.091675	603.25385	776.01167	0	320
35	4822	238.28725	-6.697225	501.28561	627.56335	0	320
36	4822	240.3065	-5.2833335	371.04532	555.83567	0	600
37	4822	242.3535	-3.85	217.6963	401.73033	0	600
38	4822	244.4005	-2.4166665	71.03812	247.60899	0	600





Name: EMBANKMENT FILL CH, EL. +3.3 TO -4 Model: Spatial Mohr-Coulomb Weight Fn: Fill Cohesion Fn: Fill Phi: 0 °
Name: BEACH SAND SP, EL. -12 TO -48 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand
Name: BAY SOUND CLAY CL, EL. -48 TO -53 Model: Spatial Mohr-Coulomb Unit Weight: 108 pcf Cohesion Spatial Fn: Clay 2 Cohesion Phi: 0 °
Name: Marsh 1, EL. -4 TO -8 Model: Spatial Mohr-Coulomb Weight Fn: Marsh 1 Cohesion Fn: Marsh1 Phi: 0 °
Name: Sheetpile Model: Mohr-Coulomb Unit Weight: 0.1 pcf Cohesion: 0.01 psf Phi: 0 °
Name: Marsh 2 EL. -8 to -11.5 Model: Spatial Mohr-Coulomb Weight Fn: Marsh 2 Cohesion Fn: Marsh 2 Phi: 0 °

GENERAL NOTES

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

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

Hw = CANAL WATER LEVEL



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

LONDON AVE CANAL
OUTFALL CANAL REEVALUATION REPORT
REACH 10, STA. 74+00 TO 79+50
PROTECTED SIDE STABILITY ANALYSIS,
CASE: Global Stability (Entry/Exit)
MARCH 2012

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

Global Stability (Entry/Exit)

Report generated using GeoStudio 2007, version 7.15. Copyright © 1991-2009 GEO-SLOPE International Ltd.

File Information

Created By: Lijegren, James
Revision Number: 417
Last Edited By: Schroeder, Danielle V MVN
Date: 1/12/2012
Time: 9:35:45 AM
File Name: Reach 10-DVS.gsz
Directory: G:\F&M\HOME\London Ave Reevaluation 2011\West Side\Reach 10\SlopeW\
Last Solved Date: 1/12/2012
Last Solved Time: 9:51:32 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

Global Stability (Entry/Exit)

Kind: [SLOPE/W](#)
Parent: [Gap Analysis \(Seepage\)](#)
Method: [Spencer](#)
Settings
 PWP Conditions Source: [Parent Analysis](#)
SlipSurface
 Direction of movement: [Left to Right](#)
 Use Passive Mode: [Yes](#)
 Slip Surface Option: [Entry and Exit](#)
 Critical slip surfaces saved: [1](#)
 Optimize Critical Slip Surface Location: [Yes](#)
 Tension Crack
 Tension Crack Option: [\(none\)](#)
FOS Distribution
 FOS Calculation Option: [Constant](#)
Advanced
 Number of Slices: [30](#)
 Optimization Tolerance: [0.01](#)
 Minimum Slip Surface Depth: [0.1 ft](#)

3/1/2012

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 CH, EL. +3.3 TO -4

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

BEACH SAND SP, EL. -12 TO -48

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

BAY SOUND CLAY CL, EL. -48 TO -53

Model: [Spatial Mohr-Coulomb](#)
Unit Weight: [108 pcf](#)
Cohesion Spatial Fn: [Clay 2 Cohesion](#)
Phi: [0 °](#)
Phi-B: [0 °](#)

Marsh 1, EL. -4 TO -8

Model: [Spatial Mohr-Coulomb](#)
Weight Fn: [Marsh 1](#)
Cohesion Fn: [Marsh1](#)
Phi: [0 °](#)
Phi-B: [0 °](#)

Sheetpile

Model: [Mohr-Coulomb](#)
Unit Weight: [0.1 pcf](#)
Cohesion: [0.01 psf](#)
Phi: [0 °](#)
Phi-B: [0 °](#)

Marsh 2 EL. -8 to -11.5

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

3/1/2012

Phi-B: [0 °](#)

Slip Surface Entry and Exit

Left Projection: [Range](#)
Left-Zone Left Coordinate: [\(160.40474, -10.76116\) ft](#)
Left-Zone Right Coordinate: [\(192.69986, 2.82999\) ft](#)
Left-Zone Increment: [25](#)
Right Projection: [Range](#)
Right-Zone Left Coordinate: [\(219.16838, 0.15758\) ft](#)
Right-Zone Right Coordinate: [\(291.5, -5.2\) ft](#)
Right-Zone Increment: [25](#)
Radius Increments: [25](#)

Slip Surface Limits

Left Coordinate: [\(95.7, -11.8\) ft](#)
Right Coordinate: [\(310, -5.2\) ft](#)

Cohesion Functions

Fill

Model: [Spline Data Point Function](#)
Function: [Cohesion vs. X](#)
 Curve Fit to Data: [100 %](#)
 Segment Curvature: [0 %](#)
Y-Intercept: [600](#)
Data Points: [X \(ft\), Cohesion \(psf\)](#)
 Data Point: [\(95.7, 600\)](#)
 Data Point: [\(176.5, 600\)](#)
 Data Point: [\(200, 750\)](#)
 Data Point: [\(237, 600\)](#)
 Data Point: [\(310, 600\)](#)

Marsh1

Model: [Spline Data Point Function](#)
Function: [Cohesion vs. X](#)
 Curve Fit to Data: [100 %](#)
 Segment Curvature: [0 %](#)
Y-Intercept: [260](#)
Data Points: [X \(ft\), Cohesion \(psf\)](#)
 Data Point: [\(95.7, 260\)](#)
 Data Point: [\(176.5, 260\)](#)
 Data Point: [\(200, 275\)](#)
 Data Point: [\(237, 260\)](#)
 Data Point: [\(310, 260\)](#)

Marsh 2

3/1/2012

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: [\(95.7, 180\)](#)
 Data Point: [\(176.5, 180\)](#)
 Data Point: [\(200, 275\)](#)
 Data Point: [\(237, 180\)](#)
 Data Point: [\(310, 180\)](#)

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: [\(-100000, 0\)](#)
 Data Point: [\(0, 0\)](#)
 Data Point: [\(100000, 57735\)](#)
Estimation Properties
 Intact Rock Param.: [10](#)
 Geological Strength: [100](#)
 Disturbance Factor: [0](#)
 SigmaC: [600000 psf](#)
 Sigma3: [300000 psf](#)
 Num. Points: [20](#)

Unit Weight Functions

Marsh 1

Model: [Spline Data Point Function](#)
Function: [Unit Weight vs. X](#)
 Curve Fit to Data: [100 %](#)
 Segment Curvature: [0 %](#)
Y-Intercept: [99](#)
Data Points: [X \(ft\), Unit Weight \(pcf\)](#)
 Data Point: [\(95.7, 99\)](#)
 Data Point: [\(176.5, 99\)](#)
 Data Point: [\(200, 87\)](#)
 Data Point: [\(237, 99\)](#)
 Data Point: [\(310, 99\)](#)

Marsh 2

3/1/2012

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 96
Data Points: X (ft), Unit Weight (pcf)
Data Point: (95.7, 96)
Data Point: (176.5, 96)
Data Point: (200, 98)
Data Point: (237, 96)
Data Point: (310, 96)

Fill

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 99
Data Points: X (ft), Unit Weight (pcf)
Data Point: (95.7, 99)
Data Point: (176.5, 99)
Data Point: (200, 101)
Data Point: (237, 99)
Data Point: (310, 99)

Spatial Functions

Clay 2 Cohesion

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (176.5, -48, 820)
Data Point: (176.5, -70, 1040)
Data Point: (200, -48, 1100)
Data Point: (200, -70, 1100)
Data Point: (237, -48, 820)
Data Point: (237, -70, 1040)

Regions

	Material	Points	Area (ft²)
Region 1	EMBANKMENT FILL CH, EL. +3.3 TO -4	2,38,21,3,7,35,19	99.529999
Region 2	EMBANKMENT FILL CH, EL. +3.3 TO -4	3,37,18,39,4,30,20,10,11,22,7	252.67501
Region 3	BEACH SAND SP, EL. -12 TO -48	16,9,15,1,31,33,27	613.59732
Region 4	Marsh 2 EL. -8 TO -11.5	16,8,23,12,25,24	183.5
Region 5	Marsh 1, EL. -4 TO -8	7,8,23,12,11,22	458.5
Region 6	Marsh 2 EL. -8 TO -11.5	8,16,27,33,34,26	71.066968

3/1/2012

Region 7	Marsh 1, EL. -4 TO -8	7,8,26,34,32,35	127.73572
Region 8	Sheetpile	28,29,18,37,3,36	7.4
Region 9	BEACH SAND SP, EL. -12 TO -48	6,15,9,16,24,25,17	7196.15
Region 10	BAY SOUND CLAY CL, EL. -48 TO -53	14,6,17,13	4714.6

Points

	X (ft)	Y (ft)
Point 1	95.7	-11.8
Point 2	192	2.8
Point 3	200	3.1
Point 4	208	3.2
Point 5	310	-5.6
Point 6	95.7	-48
Point 7	200	-4
Point 8	200	-9
Point 9	200	-17.5
Point 10	310	-5.2
Point 11	310	-6
Point 12	310	-10
Point 13	310	-70
Point 14	95.7	-70
Point 15	95.7	-17.5
Point 16	200	-11.5
Point 17	310	-48
Point 18	201	3.3
Point 19	188.8	-1.2
Point 20	257.7	-5.2
Point 21	199	3.1
Point 22	237	-6
Point 23	237	-10
Point 24	237	-11.5
Point 25	310	-11.5
Point 26	176.5	-10
Point 27	176.5	-11.5
Point 28	200	12.9
Point 29	200.5	12.9
Point 30	237	-4.7
Point 31	156.6	-11.6
Point 32	169.3	-8.8
Point 33	157.05357	-11.5
Point 34	163.85714	-10
Point 35	176.5	-6
Point 36	200	3.5

3/1/2012

Point 37	201	3.1
Point 38	196.66667	3
Point 39	205	3.24286
Point 40	205	-55

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	2.05	(209.377, 74.601)	85.80999	(178.189, -5.34078)	(241.873, -4.81771)
2	9001	2.05	(209.377, 74.601)	85.81	(178.189, -5.34078)	(241.873, -4.81771)

Slices of Slip Surface: Optimized

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	178.74075	-5.5515695	845.60455	704.00707	0	614.3
2	Optimized	180.4807	-6.1874475	885.27757	832.78997	0	262.54
3	Optimized	182.85765	-6.9987735	935.89756	949.58132	0	264.06
4	Optimized	185.2346	-7.733497	981.7062	1058.2096	0	265.58
5	Optimized	187.61155	-8.393654	1022.9051	1159.0293	0	267.09
6	Optimized	190.21975	-9.030546	1062.6539	1252.7274	0	268.76
7	Optimized	191.81975	-9.3934365	1085.2974	1384.0624	0	241.93
8	Optimized	193.16665	-9.6555635	1101.6676	1479.8464	0	247.38
9	Optimized	195.5	-10.071219	1127.6133	1527.239	0	256.81
10	Optimized	197.83335	-10.42082	1149.4277	1568.7102	0	266.24
11	Optimized	199.5	-10.637155	1162.9189	1596.4184	0	272.98
12	Optimized	200.25	-10.721835	1164.9343	1089.5643	0	274.36
13	Optimized	200.75	-10.77384	1167.7536	1314.1879	0	273.07
14	Optimized	202	-10.88539	1175.183	1349.5849	0	269.86
15	Optimized	204	-11.034465	1185.0167	1371.6991	0	264.73
16	Optimized	206.5	-11.147575	247.13095	1392.0501	0	258.31
17	Optimized	209.0913	-11.20153	250.1985	1378.5018	0	251.66
18	Optimized	211.2739	-11.181025	248.83778	1327.4646	0	246.05
19	Optimized	213.45645	-11.104945	244.05436	1270.5911	0	240.45

3/1/2012

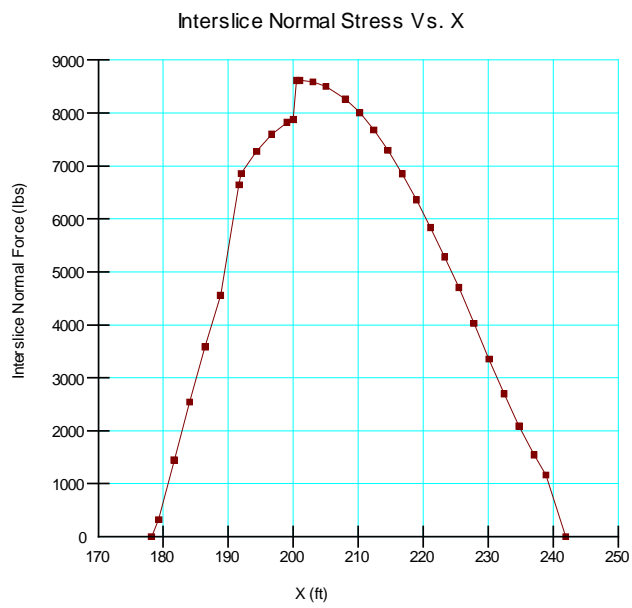
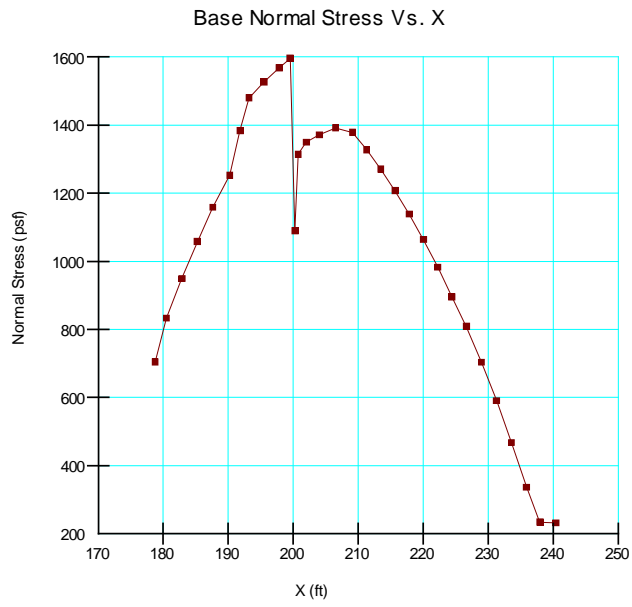
20	Optimized	215.639	-10.97314	235.80123	1207.6799	0	234.85
21	Optimized	217.8216	-10.78535	224.07196	1138.7802	0	229.24
22	Optimized	220.0042	-10.541205	208.8145	1063.8269	0	223.64
23	Optimized	222.18675	-10.24022	190.00024	982.6427	0	218.03
24	Optimized	224.3693	-9.881787	167.61576	895.12365	0	212.43
25	Optimized	226.61455	-9.45147	140.73094	808.77316	0	264.21
26	Optimized	228.92245	-8.9448505	109.0922	703.73897	0	263.27
27	Optimized	231.2303	-8.3709545	73.259398	590.21498	0	262.34
28	Optimized	233.53815	-7.7283745	33.144272	467.81739	0	261.4
29	Optimized	235.84605	-7.015487	-11.350185	335.9841	0	260.47
30	Optimized	237.90935	-6.3206245	-54.719051	233.76941	0	260
31	Optimized	240.3459	-5.4088545	111.62265	231.68111	0	600

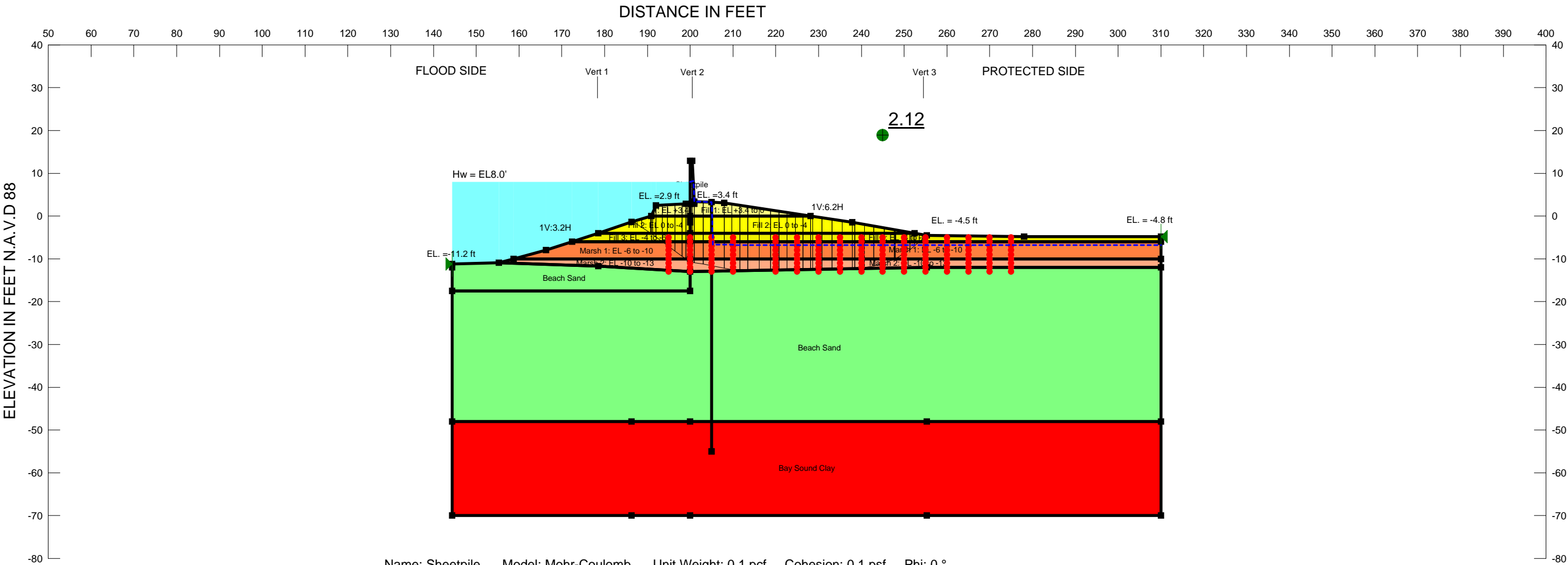
Slices of Slip Surface: 9001

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	9001	178.74075	-5.5515695	845.60455	704.00707	0	614.3
2	9001	180.4807	-6.1874475	885.27757	832.78997	0	262.54
3	9001	182.85765	-6.9987735	935.89756	949.58132	0	264.06
4	9001	185.2346	-7.733497	981.7062	1058.2096	0	265.58
5	9001	187.61155	-8.393654	1022.9051	1159.0293	0	267.09
6	9001	190.21975	-9.030546	1062.6539	1252.7274	0	268.76
7	9001	191.81975	-9.3934365	1085.2974	1384.0624	0	241.93
8	9001	193.16665	-9.6555635	1101.6676	1479.8464	0	247.38
9	9001	195.5	-10.071219	1127.6133	1527.239	0	256.81
10	9001	197.83335	-10.42082	1149.4277	1568.7102	0	266.24
11	9001	199.5	-10.637155	1162.9189	1596.4184	0	272.98
12	9001	200.25	-10.721835	1164.9343	1089.5643	0	274.36
13	9001	200.75	-10.77384	1167.7536	1314.1879	0	273.07
14	9001	202	-10.88539	1175.183	1349.5849	0	269.86

3/1/2012

15	9001	204	11.034465	1185.0167	1371.6991	0	264.73
16	9001	206.5	-11.147575	247.13095	1392.0501	0	258.31
17	9001	209.0913	-11.20153	250.1985	1378.5018	0	251.66
18	9001	211.2739	-11.181025	248.83778	1327.4646	0	246.05
19	9001	213.45645	-11.104945	244.05436	1270.5911	0	240.45
20	9001	215.639	-10.97314	235.80123	1207.6799	0	234.85
21	9001	217.8216	-10.78535	224.07196	1138.7802	0	229.24
22	9001	220.0042	-10.541205	208.8145	1063.8269	0	223.64
23	9001	222.18675	-10.24022	190.00024	982.6427	0	218.03
24	9001	224.3693	-9.881787	167.61576	895.12365	0	212.43
25	9001	226.61455	-9.45147	140.73094	808.77316	0	264.21
26	9001	228.92245	-8.9448505	109.0922	703.73897	0	263.27
27	9001	231.2303	-8.3709545	73.259398	590.21498	0	262.34
28	9001	233.53815	-7.7283745	33.144272	467.81739	0	261.4
29	9001	235.84605	-7.015487	-11.350185	335.9841	0	260.47
30	9001	237.90935	-6.3206245	-54.719051	233.76941	0	260
31	9001	240.3459	-5.4088545	-111.62265	231.68111	0	600





Name: Sheetpile Model: Mohr-Coulomb Unit Weight: 0.1 pcf Cohesion: 0.1 psf Phi: 0 °
Name: Fill 1: EL +3.4 to 0 Model: Mohr-Coulomb Unit Weight: 106 pcf Cohesion: 650 psf Phi: 0 °
Name: Fill 2: EL 0 to -4 Model: Mohr-Coulomb Unit Weight: 104 pcf Cohesion: 450 psf Phi: 0 °
Name: Fill 3: EL -4 to -6 Model: Spatial Mohr-Coulomb Weight Fn: Fill 3: EL -4 to -6 Cohesion Fn: Fill 3: EL -4 to -6 Phi: 0 °
Name: Marsh 1: EL -6 to -10 Model: Spatial Mohr-Coulomb Unit Weight: 100 pcf Cohesion Fn: Marsh 1: EL -6 to -10 Phi: 0 °
Name: Marsh 2: EL -10 to -13 Model: Spatial Mohr-Coulomb Weight Fn: Marsh 2: EL -10 to -13 Cohesion Fn: Marsh 2: EL -10 to -13 Phi: 0 °
Name: Beach Sand Model: Mohr-Coulomb Unit Weight: 122 pcf Cohesion: 0 psf Phi: 30 °
Name: Bay Sound Clay Model: Spatial Mohr-Coulomb Unit Weight: 106 pcf Cohesion Spatial Fn: Bay Sound 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
BETWEENTHE VALUES INDICATED FOR THESE LOCATIONS.

Hw = CANAL WATER LEVEL

LONDON AVE CANAL
OUTFALL CANAL REEVALUATION REPORT
REACH 11, STA. 79+50 TO 84+81
PROTECTED SIDE STABILITY ANALYSIS
CASE: Global Stability (Block) EL-5 to -13
MARCH 2012

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

Global Stability (Block) EL-5 to -13

Report generated using GeoStudio 2007, version 7.15. Copyright © 1991-2009 GEO-SLOPE International Ltd.

File Information

Revision Number: 352
Last Edited By: Haggerty, Daniel R MVN
Date: 1/26/2012
Time: 12:05:17 PM
File Name: Reach 11.gsz
Last Solved Date: 1/26/2012
Last Solved Time: 12:11:36 PM

Project Settings

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

Analysis Settings

Global Stability (Block) EL-5 to -13

Kind: SLOPE/W
Parent: Gap Analysis (Seepage): Rem
Method: Spencer
Settings
 PWP Conditions Source: Parent Analysis
SlipSurface
 Direction of movement: Left to Right
 Use Passive Mode: No
 Slip Surface Option: Block
 Critical slip surfaces saved: 1
 Optimize Critical Slip Surface Location: Yes
 Tension Crack
 Tension Crack Option: Search for Tension Crack
 Percentage Wet: 1
 Tension Crack Fluid Unit Weight: 62.4 pcf
FOS Distribution
 FOS Calculation Option: Constant
Restrict Block Crossing: Yes
Advanced

Phi-B: 0 °

Marsh 2: EL -10 to -13

Model: Spatial Mohr-Coulomb
Weight Fn: Marsh 2: EL -10 to -13
Cohesion Fn: Marsh 2: EL -10 to -13
Phi: 0 °
Phi-B: 0 °

Beach Sand

Model: Mohr-Coulomb
Unit Weight: 122 pcf
Cohesion: 0 psf
Phi: 30 °
Phi-B: 0 °

Bay Sound Clay

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

Slip Surface Limits

Left Coordinate: (144.4, -11.2) ft
Right Coordinate: (310, -4.8) ft

Slip Surface Block

Left Grid
 Upper Left: (195, -5) ft
 Lower Left: (195, -13) ft
 Lower Right: (210, -13) ft
 X Increments: 3
 Y Increments: 8
 Starting Angle: 120 °
 Ending Angle: 150 °
 Angle Increments: 6
Right Grid
 Upper Left: (220, -5) ft
 Lower Left: (220, -13) ft
 Lower Right: (275, -13) ft
 X Increments: 11
 Y Increments: 8
 Starting Angle: 20 °
 Ending Angle: 45 °

Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 5000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

Sheetpile

Model: Mohr-Coulomb
Unit Weight: 0.1 pcf
Cohesion: 0.1 psf
Phi: 0 °
Phi-B: 0 °

Fill 1: EL +3.4 to 0

Model: Mohr-Coulomb
Unit Weight: 106 pcf
Cohesion: 650 psf
Phi: 0 °
Phi-B: 0 °

Fill 2: EL 0 to -4

Model: Mohr-Coulomb
Unit Weight: 104 pcf
Cohesion: 450 psf
Phi: 0 °
Phi-B: 0 °

Fill 3: EL -4 to -6

Model: Spatial Mohr-Coulomb
Weight Fn: Fill 3: EL -4 to -6
Cohesion Fn: Fill 3: EL -4 to -6
Phi: 0 °
Phi-B: 0 °

Marsh 1: EL -6 to -10

Model: Spatial Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion Fn: Marsh 1: EL -6 to -10
Phi: 0 °

Angle Increments: 5

Cohesion Functions

Fill 3: EL -4 to -6

Model: Spline Data Point Function
Function: Cohesion vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 600
Data Points: X (ft), Cohesion (psf)
 Data Point: (144.4, 600)
 Data Point: (186.2, 600)
 Data Point: (186.3, 350)
 Data Point: (200, 350)
 Data Point: (255.3, 350)
 Data Point: (255.4, 600)
 Data Point: (310, 600)

Marsh 1: EL -6 to -10

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: (144.4, 285)
 Data Point: (186.3, 285)
 Data Point: (200, 300)
 Data Point: (255.3, 285)
 Data Point: (310, 285)

Marsh 2: EL -10 to -13

Model: Spline Data Point Function
Function: Cohesion vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 240
Data Points: X (ft), Cohesion (psf)
 Data Point: (144.4, 240)
 Data Point: (186.3, 240)
 Data Point: (200, 300)
 Data Point: (255.3, 240)
 Data Point: (310, 240)

Unit Weight Functions

Fill 3: EL -4 to -6

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 108
Data Points: X (ft), Unit Weight (pcf)
Data Point: (144.4, 108)
Data Point: (186.2, 108)
Data Point: (186.3, 82)
Data Point: (200, 82)
Data Point: (255.3, 82)
Data Point: (255.4, 108)
Data Point: (310, 108)

Marsh 2: EL -10 to -13

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 96
Data Points: X (ft), Unit Weight (pcf)
Data Point: (144.4, 96)
Data Point: (186.3, 96)
Data Point: (200, 100)
Data Point: (255.3, 96)
Data Point: (310, 96)

Spatial Functions

Bay Sound Clay

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (144.4, -48, 820)
Data Point: (144.4, -70, 1040)
Data Point: (186.3, -48, 820)
Data Point: (186.3, -70, 1040)
Data Point: (200, -48, 1100)
Data Point: (200, -70, 1100)
Data Point: (255.3, -48, 820)
Data Point: (255.3, -70, 1040)
Data Point: (310, -48, 820)
Data Point: (310, -70, 1040)

Point 17	144.4	-70
Point 18	144.4	-17.5
Point 19	200	-13
Point 20	200	-48
Point 21	255.3	-48
Point 22	310	-48
Point 23	201	2.9
Point 24	252.4	-4
Point 25	200	-17.5
Point 26	155.3	-10.9
Point 27	310	-10
Point 28	255.3	-70
Point 29	201	3.4
Point 30	255.3	-4.5
Point 31	310	-4.8
Point 32	190.9	0
Point 33	192	2.5
Point 34	199	2.9
Point 35	200	12.9
Point 36	200.5	12.9
Point 37	278	-4.8
Point 38	172.4	-6
Point 39	186.3	-48
Point 40	186.3	-70
Point 41	158.71379	-10
Point 42	200	-10
Point 43	200	-70
Point 44	178.5	-11.72323
Point 45	205	3.23
Point 46	205	-55
Point 47	228.15	0
Point 48	200	0

Regions

	Material	Points	Area (ft²)
Region 1	Bay Sound Clay	17,9,39,20,21,22,16,28,43,40	3643.2
Region 2	Beach Sand	9,18,25,19,13,15,22,21,20,39	5628.15
Region 3	Beach Sand	18,8,1,26,44,19,25	324.35081
Region 4	Marsh 2: EL -10 to -13	26,41,42,19,44	79.667985
Region 5	Marsh 2: EL -10 to -13	19,42,27,15,13	247.65
Region 6	Marsh 1: EL -6 to -10	41,2,38,12,42	136.28621
Region 7	Marsh 1: EL -6 to -10	42,12,14,27	440
Region 8	Fill 3: EL -4 to -6	38,3,11,12	49.1
Region 9	Fill 3: EL -4 to -6	12,11,24,30,37,31,14	178.92
Region 10	Fill 2: EL 0 to -4	3,4,32,48,10,11	61.72
Region 11	Fill 2: EL 0 to -4	11,10,48,47,7,24	162.4125
Region 12	Fill 1: EL +3.4 to 0	32,33,34,5,48	23.175
Region 13	Fill 1: EL +3.4 to 0	48,5,23,29,45,6,47	56.8875
Region 14	Sheetpile	5,35,36,29,23	7.625

Points

	X (ft)	Y (ft)
Point 1	144.4	-11.2
Point 2	166.3	-8
Point 3	178.5	-4
Point 4	186.3	-1.4
Point 5	200	2.9
Point 6	208	3.1
Point 7	237.9	-1.5
Point 8	144.4	-12
Point 9	144.4	-48
Point 10	200	-1.5
Point 11	200	-4
Point 12	200	-6
Point 13	255.3	-12
Point 14	310	-6
Point 15	310	-12
Point 16	310	-70

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	2.12	(220.597, -1.03)	27.09806	(186.636, -1.2977)	(255.313, -4.50018)
2	15010	2.22	(220.597, -1.03)	27.205	(185.326, -1.72482)	(255.703, -4.50533)

Slices of Slip Surface: Optimized

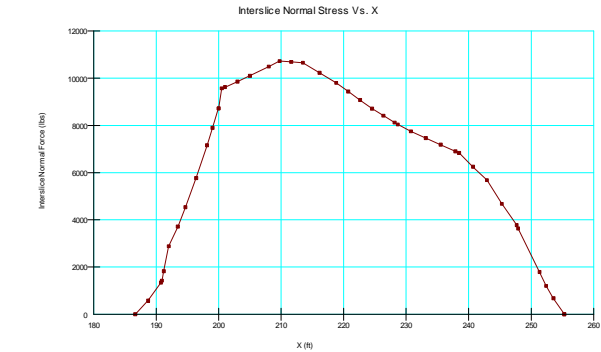
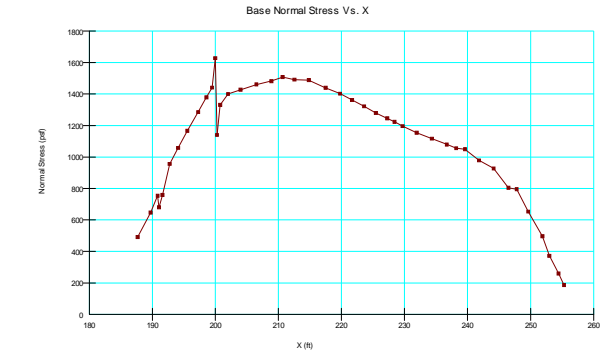
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	187.66195	-1.973276	622.32151	491.04293	0	450
2	Optimized	189.7136	-3.3244255	706.62474	647.07108	0	450
3	Optimized	190.8197	-4.052867	752.07643	753.94908	0	350
4	Optimized	191.0477	-4.203007	761.42921	679.95151	0	350
5	Optimized	191.5977	-4.601722	786.31234	758.65176	0	350
6	Optimized	192.7319	-5.451582	839.35436	955.52893	0	350
7	Optimized	194.06885	-6.453355	901.87027	1057.3515	0	293.51
8	Optimized	195.537	-7.5279175	968.91133	1166.6714	0	295.11
9	Optimized	197.2632	-8.7703325	1046.4449	1284.923	0	297
10	Optimized	198.56315	-9.69611	1104.2042	1379.2929	0	298.43
11	Optimized	199.4782	-10.334065	1144.0442	1441.4203	0	297.71
12	Optimized	199.9782	-10.671455	1165.0927	1628.6089	0	299.9
13	Optimized	200.25	-10.721395	1160.7118	1139.9198	0	299.73
14	Optimized	200.75	-10.81326	1165.2951	1331.3358	0	299.19
15	Optimized	202	-11.04292	1180.3926	1400.7542	0	297.83
16	Optimized	204	-11.41038	1204.2926	1427.7031	0	295.66
17	Optimized	206.5	-11.869705	318.13823	1461.1757	0	292.95
18	Optimized	208.86885	-12.304935	344.28794	1482.6755	0	290.38
19	Optimized	210.6725	-12.537295	358.42802	1508.337	0	288.42
20	Optimized	212.5421	-12.682745	367.3353	1492.0192	0	286.39

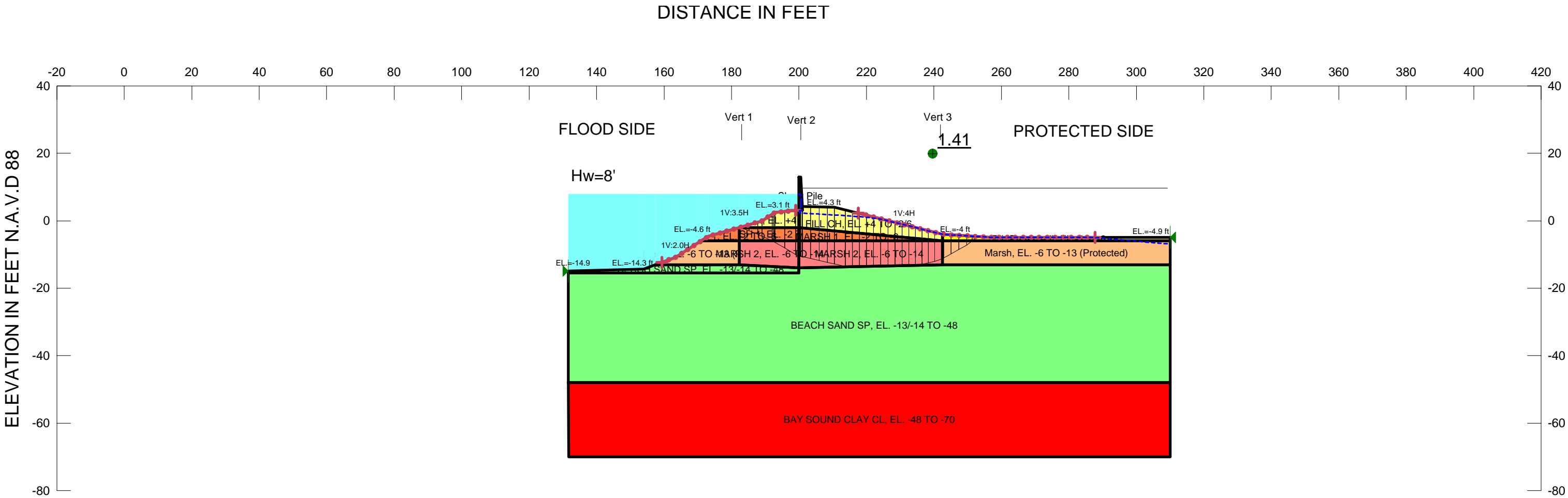
21	Optimized	214.80795	-12.73122	370.29998	1488.7417	0	283.93
22	Optimized	217.47005	-12.682715	367.26902	1439.7655	0	281.05
23	Optimized	219.76005	-12.616355	363.13129	1402.7172	0	278.56
24	Optimized	221.67795	-12.532145	357.87546	1362.3999	0	276.48
25	Optimized	223.59585	-12.447935	352.61963	1322.1348	0	274.4
26	Optimized	225.4536	-12.380415	348.40702	1280.2098	0	272.38
27	Optimized	227.2512	-12.32958	345.22624	1245.3991	0	270.43
28	Optimized	228.4093	-12.29683	343.18496	1223.006	0	269.18
29	Optimized	229.7056	-12.2779	341.99399	1195.4892	0	267.77
30	Optimized	231.9355	-12.271985	341.61639	1154.5648	0	265.35
31	Optimized	234.3213	-12.28336	342.32055	1117.0098	0	262.76
32	Optimized	236.7071	-12.294735	343.0247	1079.4129	0	260.17
33	Optimized	238.18535	-12.30178	343.46848	1055.5834	0	258.57
34	Optimized	239.58655	-12.15229	334.12879	1049.5367	0	257.05
35	Optimized	241.8182	-11.85059	315.30063	978.53146	0	254.63
36	Optimized	244.1204	-11.31039	281.58936	927.12537	0	252.13
37	Optimized	246.4932	-10.531695	232.99266	803.91176	0	249.56
38	Optimized	247.7951	-10.071175	204.25341	795.56565	0	248.14
39	Optimized	249.6274	-8.94214	133.79842	653.19773	0	286.54
40	Optimized	251.8721	-7.434189	39.697349	496.22587	0	285.93
41	Optimized	252.9771	-6.492049	-19.094591	372.06202	0	285.63
42	Optimized	254.4271	-5.255794	-96.241319	259.71512	0	350
43	Optimized	255.3067	-4.5058825	-143.03722	186.32876	0	366.73

Slices of Slip Surface: 15010

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	15010	185.81275	-2.0659905	628.11289	470.37225	0	450
2	15010	187.4374	-3.2035785	699.09018	602.44044	0	450
3	15010	189.7374	-4.8140555	799.56992	794.00365	0	350
4	15010	191.16555	-5.8140555	861.94877	814.93843	0	350
5	15010	191.71555	-6.19917	885.98141	931.06523	0	290.93
6	15010	193.28595	-7.298755	954.59624	1150.7326	0	292.65
7	15010	195.8578	-9.099585	1066.9654	1322.9492	0	295.46

8	15010	198.07185	-10.649895	1163.7518	1472.4293	0	291.56
9	15010	199.5	-11.649895	1226.1064	1567.7746	0	297.81
10	15010	200.25	-12	1244.68	1320.58	0	299.73
11	15010	200.75	-12	1244	1503.02	0	299.19
12	15010	202	-12	1243.95	1550.75	0	297.83
13	15010	204	-12	1243.75	1541.35	0	295.66
14	15010	206.5	-12	326.06667	1529.4333	0	292.95
15	15010	209.11945	-12	325.55433	1503.7816	0	290.11
16	15010	211.35835	-12	325.25507	1466.7989	0	287.68
17	15010	213.59725	-12	325.07194	1429.861	0	285.25
18	15010	215.83615	-12	324.93795	1392.923	0	282.82
19	15010	218.075	-12	324.83969	1355.9404	0	280.39
20	15010	220.31385	-12	324.77716	1319.0024	0	277.96
21	15010	222.55275	-12	324.73249	1282.0198	0	275.53
22	15010	224.79165	-12	324.70122	1245.0818	0	273.1
23	15010	227.03055	-12	324.68336	1208.0992	0	270.67
24	15010	229.36875	-12	324.66462	1169.8872	0	268.14
25	15010	231.80625	-12	324.65231	1130.3795	0	265.49
26	15010	234.24375	-12	324.6441	1090.9128	0	262.85
27	15010	236.68125	-12	324.6359	1051.4051	0	260.2
28	15010	239.08335	-12	324.62953	1010.2393	0	257.59
29	15010	241.45	-12	324.62531	967.30972	0	255.03
30	15010	243.81665	-12	324.62108	924.42241	0	252.46
31	15010	246.42815	-11	262.21617	932.86461	0	249.63
32	15010	248.9922	-9.204616	150.17926	706.42049	0	286.71
33	15010	251.26405	-7.613848	50.908283	489.21566	0	286.09
34	15010	252.98445	-6.409232	-24.262255	327.14554	0	285.63
35	15010	254.43445	-5.393931	-87.62138	232.09705	0	350
36	15010	255.50175	-4.6465975	-134.25551	255.55463	0	600





Name: FILL CH, EL. +4 TO -2/6 Model: Spatial Mohr-Coulomb Unit Weight: 107 pcf Cohesion Fn: Fill Phi: 0 °

Name: MARSH 1, EL. -2 TO -6 Model: Undrained (Phi=0) Unit Weight: 80 pcf Cohesion: 200 psf

Name: BEACH SAND SP, EL. -13/-14 TO -48 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand

Name: BAY SOUND CLAY CL, EL. -48 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 108 pcf Cohesion Spatial Fn: CLAY Phi: 0 °

Name: MARSH 2, EL. -6 TO -14 Model: Spatial Mohr-Coulomb Unit Weight: 101 pcf Cohesion Fn: Marsh 1 Phi: 0 °

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

Name: Fill (Protected), EL -4 to -6 Model: Undrained (Phi=0) Unit Weight: 107 pcf Cohesion: 600 psf

Name: Marsh, EL. -6 TO -13 (Protected) Model: Undrained (Phi=0) Unit Weight: 101 pcf Cohesion: 190 psf



Name: Global Stability (Entry/Exit)
File Name: Reach 12A.gsz Directory: C:\Users\B2EDFMJC\Desktop\Chrono Order\SlopeW\
Last Edited By: Curran, Matthew MVN

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 = CANAL WATER LEVEL

LONDON AVE CANAL
OUTFALL CANAL REEVALUATION REPORT
REACH 12A, STA. 85+90 TO STA. 89+50
PROTECTED SIDE STABILITY ANALYSIS,
CASE: Global Stability (Entry/Exit)
MARCH 2012

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

Global Stability (Entry/Exit)

Report generated using GeoStudio 2007, version 7.15. Copyright © 1991-2009 GEO-SLOPE International Ltd.

File Information

Created By: Liljegren, James
Revision Number: 298
Last Edited By: Curran, Matthew MVN
Date: 2/1/2013
Time: 2:56:33 PM
File Name: Reach 12A.gsz
Directory: C:\Users\B2EDFMJC\Desktop\Chrono Order\SlopeW\
Last Solved Date: 2/1/2013
Last Solved Time: 3:05:33 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: Global Analysis (Seepage)
Method: Spencer
Settings
 PWP Conditions Source: Parent Analysis
SlipSurface
 Direction of movement: Left to Right
 Use Passive Mode: No
 Slip Surface Option: Entry and Exit
 Critical slip surfaces saved: 1
 Optimize Critical Slip Surface Location: Yes
Tension Crack
 Tension Crack Option: Search for Tension Crack
 Percentage Wet: 1
 Tension Crack Fluid Unit Weight: 62.4 pcf
FOS Distribution

FOS Calculation Option: Constant
Advanced
 Number of Slices: 30
 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 CH, EL. +4 TO -2/6

Model: Spatial Mohr-Coulomb
Unit Weight: 107 pcf
Cohesion Fn: Fill
Phi: 0 °
Phi-B: 0 °

MARSH 1, EL. -2 TO -6

Model: Undrained (Phi=0)
Unit Weight: 80 pcf
Cohesion: 200 psf

BEACH SAND SP, EL. -13/-14 TO -48

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

BAY SOUND CLAY CL, EL. -48 TO -70

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

MARSH 2, EL. -6 TO -14

Model: Spatial Mohr-Coulomb
Unit Weight: 101 pcf
Cohesion Fn: Marsh 1
Phi: 0 °
Phi-B: 0 °

Sheet Pile

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

Fill (Protected), EL -4 to -6

Model: Undrained (Phi=0)
Unit Weight: 107 pcf
Cohesion: 600 psf

Marsh, EL. -6 TO -13 (Protected)

Model: Undrained (Phi=0)
Unit Weight: 101 pcf
Cohesion: 190 psf

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (159.37055, -12.28453) ft
Left-Zone Right Coordinate: (199.0102, 3.1) ft
Left-Zone Increment: 20
Right Projection: Range
Right-Zone Left Coordinate: (217.56817, 2.23296) ft
Right-Zone Right Coordinate: (287.8, -4.9) ft
Right-Zone Increment: 30
Radius Increments: 30

Slip Surface Limits

Left Coordinate: (131.6, -14.9) ft
Right Coordinate: (310, -4.9) ft

Cohesion Functions

Marsh 1

Model: Spline Data Point Function
Function: Cohesion vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 190
Data Points: X (ft), Cohesion (psf)
 Data Point: (182.3, 190)
 Data Point: (200, 200)
 Data Point: (242.5, 190)

Fill

Model: Spline Data Point Function
Function: Cohesion vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 600
Data Points: X (ft), Cohesion (psf)
 Data Point: (182.3, 600)
 Data Point: (200, 700)
 Data Point: (242.5, 600)

Shear/Normal Strength Functions

Sand

Model: Spline Data Point Function
Function: Shear Stress vs. Normal Stress
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
 Data Point: (-100000, 0)
 Data Point: (0, 0)
 Data Point: (100000, 57735)
Estimation Properties
 Intact Rock Param.: 10
 Geological Strength: 100
 Disturbance Factor: 0
 SigmaC: 600000 psf
 Sigma3: 300000 psf
 Num. Points: 20

Spatial Functions

CLAY

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
 Data Point: (131.6, -48, 610)
 Data Point: (131.6, -70, 855)
 Data Point: (182.3, -48, 610)
 Data Point: (182.3, -70, 855)
 Data Point: (200, -48, 855)
 Data Point: (200, -70, 855)
 Data Point: (242.5, -48, 610)
 Data Point: (242.5, -70, 855)

Data Point: (310, -48, 610)
Data Point: (310, -70, 855)

Regions

	Material	Points	Area (ft²)
Region 1	FILL CH, EL. +4 TO -2/6	35,21,2,3,24,9	53.225
Region 2	MARSH 1, EL. -2 TO -6	9,10,26,35	70.8
Region 3	FILL CH, EL. +4 TO -2/6	24,19,23,4,30,14,9	212.525
Region 4	MARSH 1, EL. -2 TO -6	9,14,10	85
Region 5	Marsh, EL. -6 TO -13 (Protected)	26,27,36,20,34	120.62857
Region 6	BEACH SAND SP, EL. -13/-14 TO -48	27,12,13,1,32,33,36	124.17643
Region 7	BEACH SAND SP, EL. -13/-14 TO -48	13,12,15,6,8,25,7,1	6051.75
Region 8	BAY SOUND CLAY CL, EL. -48 TO -70	7,25,8,16,17	3923.7
Region 9	Fill (Protected), EL -4 to -6	31,18,5,14,30	80.595
Region 10	Marsh, EL. -6 TO -13 (Protected)	15,14,5,6	472.5
Region 11	MARSH 2, EL. -6 TO -14	15,12,11,10,14	318.75
Region 12	MARSH 2, EL. -6 TO -14	26,27,12,11,10	132.75
Region 13	Sheet Pile	28,29,23,19,24	7.65
Region 14	MARSH 1, EL. -2 TO -6	34,22,35,26	26.11

Points

	X (ft)	Y (ft)
Point 1	131.6	-15.5
Point 2	192.9	2.5
Point 3	199	3.1
Point 4	210.5	4
Point 5	310	-6
Point 6	310	-13
Point 7	131.6	-48
Point 8	310	-48
Point 9	200	-2
Point 10	200	-6
Point 11	200	-8.7
Point 12	200	-14
Point 13	200	-15.5

Point 14	242.5	-6
Point 15	242.5	-13
Point 16	310	-70
Point 17	131.7	-70
Point 18	310	-4.9
Point 19	201	3.1
Point 20	163.4	-10.8
Point 21	189	-0.1
Point 22	173.2	-4.6
Point 23	201	4.3
Point 24	200	3.1
Point 25	200	-48
Point 26	182.3	-6
Point 27	182.3	-13
Point 28	200	12.9
Point 29	200.5	12.9
Point 30	242.5	-4
Point 31	256.6	-4.9
Point 32	131.6	-14.9
Point 33	153.9	-14.3
Point 34	171	-6
Point 35	182.3	-2
Point 36	157.42857	-13

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.41	(221.155, -56.188)	27.70013	(182.466, -1.95304)	(253.108, -4.67711)
2	12037	1.48	(221.155, -56.188)	69.564	(182.813, -1.85468)	(254.658, -4.77602)

Slices of Slip Surface: Optimized

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

						(psf)	(psf)
1	Optimize d	183.8228	-2.4676515	613.06623	599.25269	0	200
2	Optimize d	186.47525	3.4733975	626.71202	710.81263	0	200
3	Optimize d	188.38525	4.2562975	654.41402	774.6749	0	200
4	Optimize d	190.5296	5.2740325	705.75534	887.98958	0	200
5	Optimize d	192.27585	-6.102825	754.8516	1008.5885	0	195.64
6	Optimize d	192.69625	-6.323903	767.3758	1018.0099	0	195.87
7	Optimize d	194.32615	-7.269948	820.26564	1139.433	0	196.79
8	Optimize d	197.37615	-9.037406	932.92935	1320.3218	0	198.52
9	Optimize d	199.42755	10.224471	992.75057	1442.7401	0	199.68
10	Optimize d	199.92755	-10.48216	997.37472	1595.0481	0	199.96
11	Optimize d	200.25	10.527955	835.5557	1143.6442	0	199.94
12	Optimize d	200.7405	10.597615	807.47836	1307.7086	0	199.83
13	Optimize d	200.9905	-10.63395	809.59715	1287.6416	0	199.77
14	Optimize d	202.24645	-10.92177	826.96751	1440.292	0	199.47
15	Optimize d	204.73935	-11.49305	856.7618	1494.6411	0	198.88
16	Optimize	207.23225	-12.06433	884.21008	1548.9512	0	198.3

	d						
17	Optimize d	209.48935	12.5577045	903.96526	1603.1073	0	197.77
18	Optimize d	212.14935	-13.10206	924.27464	1617.1094	0	197.14
19	Optimize d	214.84725	13.469655	932.41893	1643.7685	0	196.51
20	Optimize d	216.94435	13.528965	924.41124	1599.0589	0	196.01
21	Optimize d	219.03085	-13.53645	913.18197	1564.5122	0	195.52
22	Optimize d	221.10675	-13.49211	898.82998	1509.6086	0	195.03
23	Optimize d	223.18265	-13.44777	884.47798	1454.705	0	194.55
24	Optimize d	225.3077	-13.40238	869.79994	1398.3937	0	194.05
25	Optimize d	227.45445	13.351335	854.69723	1342.6576	0	193.54
26	Optimize d	229.5347	13.296715	839.71675	1286.5111	0	193.05
27	Optimize d	231.57585	-13.24312	825.12235	1231.4638	0	192.57
28	Optimize d	233.5839	13.136655	807.27094	1186.2012	0	192.1
29	Optimize d	235.55885	12.977325	786.12392	1121.6499	0	191.63
30	Optimize d	237.46185	-12.68353	756.01429	1083.9023	0	191.19
31	Optimize d	239.29295	12.255265	717.24842	993.98039	0	190.75

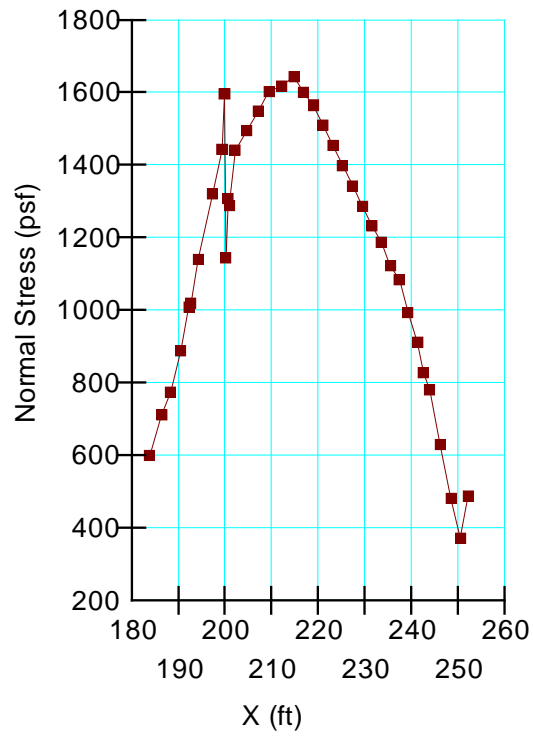
32	Optimize d	241.35425	-11.59564	661.07211	911.13496	0	190.27
33	Optimize d	242.67365	- 11.08263 5	618.35313	826.85039	0	190
34	Optimize d	243.98885	- 10.39369 7	563.07307	780.15453	0	190
35	Optimize d	246.27195	-9.15085	462.55316	630.3941	0	190
36	Optimize d	248.5551	- 7.908003 5	361.07921	480.67213	0	190
37	Optimize d	250.53765	-6.64329	259.52187	371.4822	0	190
38	Optimize d	252.24335	-5.338556	105.94355	486.54671	0	600

Slices of Slip Surface: 12037

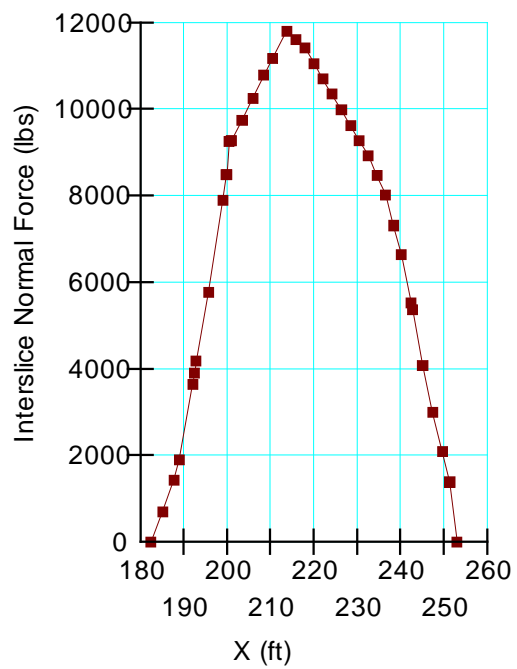
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	12037	182.92295	-1.927339	611.68163	356.07934	0	603.52
2	12037	184.52505	-2.924316	621.3725	599.51847	0	200
3	12037	187.50835	- 4.6732675	681.66544	781.34694	0	200
4	12037	189.4911	- 5.7489515	732.55441	885.8555	0	200
5	12037	191.4411	- 6.6894255	778.28306	1041.5427	0	195.16
6	12037	193.91665	- 7.8115365	843.00907	1230.4158	0	196.56
7	12037	195.95	- 8.6394935	900.94178	1328.5167	0	197.71
8	12037	197.98335	- 9.3939685	954.31794	1419.9305	0	198.86
9	12037	199.5	-9.916961	991.93565	1485.4327	0	199.72
10	12037	200.25	-10.15952	814.6601	1063.7488	0	199.94
11	12037	200.75	-	788.73006	1236.5075	0	199.82

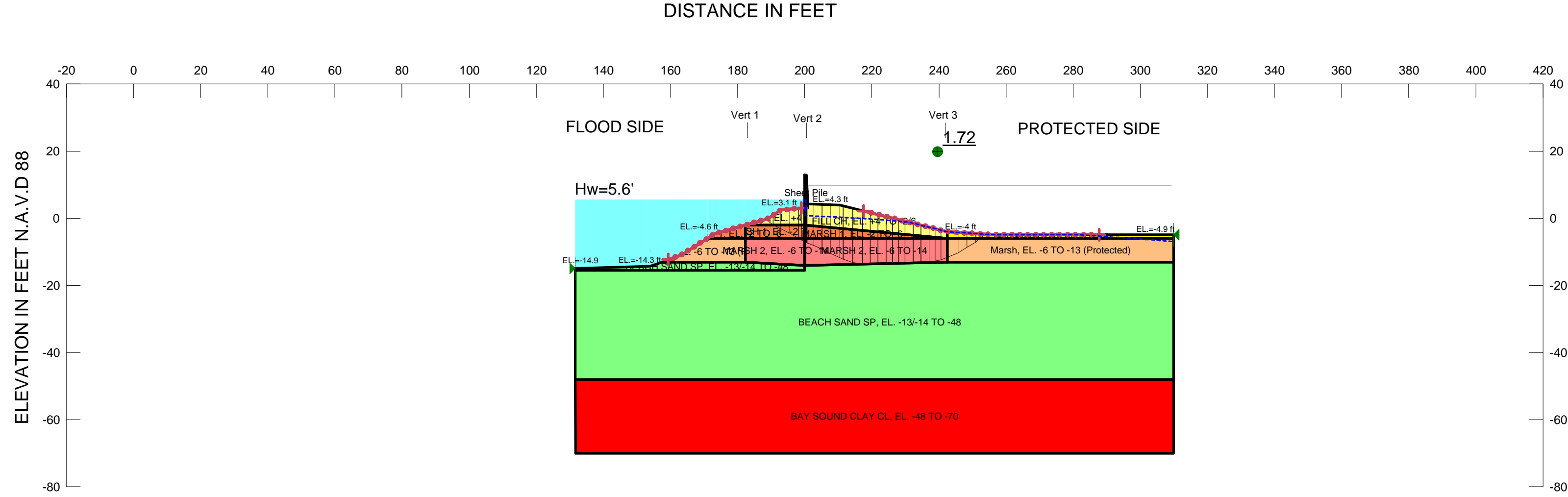
			10.314995				
12	12037	202.1875	- 10.728285	814.23955	1406.8925	0	199.49
13	12037	204.5625	- 11.356575	848.50135	1477.3026	0	198.93
14	12037	206.9375	- 11.896245	874.85631	1539.2212	0	198.37
15	12037	209.3125	-12.34939	891.63095	1592.779	0	197.81
16	12037	211.73075	-12.72288	902.53412	1610.3772	0	197.24
17	12037	214.1923	-13.01501	907.45055	1591.5349	0	196.66
18	12037	216.65385	-13.21864	906.51184	1563.5008	0	196.08
19	12037	219.1154	-13.33455	900.02546	1526.3155	0	195.5
20	12037	221.57695	- 13.363175	888.0867	1479.982	0	194.92
21	12037	224.03845	- 13.304625	870.6975	1424.3866	0	194.34
22	12037	226.5	-13.15868	847.80707	1359.5454	0	193.76
23	12037	228.96155	- 12.924785	819.27407	1285.245	0	193.19
24	12037	231.42305	-12.60204	784.91264	1201.296	0	192.61
25	12037	233.8846	- 12.189185	744.33848	1107.5415	0	192.03
26	12037	236.34615	- 11.684575	696.78482	1003.7095	0	191.45
27	12037	238.8077	-11.08614	641.91783	889.435	0	190.87
28	12037	241.26925	- 10.391345	580.14593	764.36306	0	190.29
29	12037	243.72835	-9.598011	509.98133	650.39367	0	190
30	12037	246.1851	-8.702691	431.91237	547.36244	0	190
31	12037	248.64185	- 7.7003805	345.95665	432.38506	0	190
32	12037	251.0986	- 6.5859455	251.83969	304.6772	0	190
33	12037	253.4923	- 5.3880095	103.49043	348.38941	0	600

Base Normal Stress Vs. X



Interslice Normal Stress
Vs. X





Name: FILL CH, EL. +4 TO -2/6 Model: Spatial Mohr-Coulomb Unit Weight: 107 pcf Cohesion Fn: Fill Phi: 0 °
Name: MARSH 1, EL. -2 TO -6 Model: Undrained (Phi=0) Unit Weight: 80 pcf Cohesion: 200 psf
Name: BEACH SAND SP, EL. -13/-14 TO -48 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand
Name: BAY SOUND CLAY CL, EL. -48 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 108 pcf Cohesion Spatial Fn: CLAY Phi: 0 °
Name: MARSH 2, EL. -6 TO -14 Model: Spatial Mohr-Coulomb Unit Weight: 101 pcf Cohesion Fn: Marsh 1 Phi: 0 °
Name: Sheet Pile Model: Undrained (Phi=0) Unit Weight: 0.1 pcf Cohesion: 0.01 psf
Name: Fill (Protected), EL -4 to -6 Model: Undrained (Phi=0) Unit Weight: 107 pcf Cohesion: 600 psf
Name: Marsh, EL. -6 TO -13 (Protected) Model: Undrained (Phi=0) Unit Weight: 101 pcf Cohesion: 190 psf

Name: Global Stability (Entry/Exit)
File Name: Reach 12A.gsz Directory: G:\F&MHOME\Middleton\London Ave Canal\Reach 12A\water level 5.6\optimization check\
Last Edited By: Middleton, Mark C MVN

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 = CANAL WATER LEVEL

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

LONDON AVE CANAL
OUTFALL CANAL REEVALUATION REPORT
REACH 12A, STA. 85+90 TO 89+50
PROTECTED SIDE STABILITY ANALYSIS,
1% FLOWLINE WATER EL +5.6
CASE: Global Stability (Entry/Exit)
MARCH 2012

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

Global Stability (Entry/Exit)

Report generated using GeoStudio 2007, version 7.15. Copyright © 1991-2009 GEO-SLOPE International Ltd.

File Information

Created By: [Liljegren, James](#)
Revision Number: 296
Last Edited By: [Middleton, Mark C MVN](#)
Date: 3/14/2012
Time: 1:18:04 PM
File Name: [Reach 12A.gsz](#)
Directory: [G:\F&M\HOME\Middleton\London Ave Canal\Reach 12A\water level 5.6\optimization check\](#)
Last Solved Date: 3/14/2012
Last Solved Time: 1:25:28 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: [Global Analysis \(Seepage\)](#)
Method: [Spencer](#)
Settings
 PWP Conditions Source: [Parent Analysis](#)
SlipSurface
 Direction of movement: [Left to Right](#)
 Use Passive Mode: [No](#)
 Slip Surface Option: [Entry and Exit](#)
 Critical slip surfaces saved: [1](#)
 Optimize Critical Slip Surface Location: [Yes](#)
 Tension Crack
 Tension Crack Option: [\(none\)](#)
FOS Distribution
 FOS Calculation Option: [Constant](#)
Advanced
 Number of Slices: [30](#)
 Optimization Tolerance: [0.01](#)
 Minimum Slip Surface Depth: [0.1 ft](#)

3/20/2012

Global Stability (Entry/Exit)

Unit Weight: [107 pcf](#)
Cohesion: [600 psf](#)

Marsh, EL. -6 TO -13 (Protected)

Model: [Undrained \(Phi=0\)](#)
Unit Weight: [101 pcf](#)
Cohesion: [190 psf](#)

Slip Surface Entry and Exit

Left Projection: [Range](#)
Left-Zone Left Coordinate: [\(159.37055, -12.28453\) ft](#)
Left-Zone Right Coordinate: [\(199.0102, 3.1\) ft](#)
Left-Zone Increment: [20](#)
Right Projection: [Range](#)
Right-Zone Left Coordinate: [\(217.56817, 2.23296\) ft](#)
Right-Zone Right Coordinate: [\(287.8, -4.9\) ft](#)
Right-Zone Increment: [30](#)
Radius Increments: [30](#)

Slip Surface Limits

Left Coordinate: [\(131.6, -14.9\) ft](#)
Right Coordinate: [\(310, -4.9\) ft](#)

Cohesion Functions

Marsh 1

Model: [Spline Data Point Function](#)
Function: [Cohesion vs. X](#)
 Curve Fit to Data: [100 %](#)
 Segment Curvature: [0 %](#)
Y-Intercept: [190](#)
Data Points: [X \(ft\), Cohesion \(psf\)](#)
 Data Point: [\(182.3, 190\)](#)
 Data Point: [\(200, 200\)](#)
 Data Point: [\(242.5, 190\)](#)

Fill

Model: [Spline Data Point Function](#)
Function: [Cohesion vs. X](#)
 Curve Fit to Data: [100 %](#)
 Segment Curvature: [0 %](#)
Y-Intercept: [600](#)
Data Points: [X \(ft\), Cohesion \(psf\)](#)
 Data Point: [\(182.3, 600\)](#)
 Data Point: [\(200, 700\)](#)
 Data Point: [\(242.5, 600\)](#)

3/20/2012

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 CH, EL. +4 TO -2/6

Model: [Spatial Mohr-Coulomb](#)
Unit Weight: [107 pcf](#)
Cohesion Fn: [Fill](#)
Phi: [0 °](#)
Phi-B: [0 °](#)

MARSH 1, EL. -2 TO -6

Model: [Undrained \(Phi=0\)](#)
Unit Weight: [80 pcf](#)
Cohesion: [200 psf](#)

BEACH SAND SP, EL. -13/-14 TO -48

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

BAY SOUND CLAY CL, EL. -48 TO -70

Model: [Spatial Mohr-Coulomb](#)
Unit Weight: [108 pcf](#)
Cohesion Spatial Fn: [CLAY](#)
Phi: [0 °](#)
Phi-B: [0 °](#)

MARSH 2, EL. -6 TO -14

Model: [Spatial Mohr-Coulomb](#)
Unit Weight: [101 pcf](#)
Cohesion Fn: [Marsh 1](#)
Phi: [0 °](#)
Phi-B: [0 °](#)

Sheet Pile

Model: [Undrained \(Phi=0\)](#)
Unit Weight: [0.1 pcf](#)
Cohesion: [0.01 psf](#)

Fill (Protected), EL -4 to -6

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

3/20/2012

Global Stability (Entry/Exit)

Shear/Normal Strength Functions

Sand

Model: [Spline Data Point Function](#)
Function: [Shear Stress vs. Normal Stress](#)
 Curve Fit to Data: [100 %](#)
 Segment Curvature: [0 %](#)
Y-Intercept: [0](#)
Data Points: [Normal Stress \(psf\), Shear Stress \(psf\)](#)
 Data Point: [\(-100000, 0\)](#)
 Data Point: [\(0, 0\)](#)
 Data Point: [\(100000, 57735\)](#)
Estimation Properties
 Intact Rock Param.: [10](#)
 Geological Strength: [100](#)
 Disturbance Factor: [0](#)
 SigmaC: [600000 psf](#)
 Sigma3: [300000 psf](#)
 Num. Points: [20](#)

Spatial Functions

CLAY

Model: [Linear Interpolation](#)
Limit Range By: [Data Values](#)
Data Points: [X \(ft\), Y \(ft\), Cohesion \(psf\)](#)
 Data Point: [\(131.6, -48, 610\)](#)
 Data Point: [\(131.6, -70, 900\)](#)
 Data Point: [\(182.3, -48, 610\)](#)
 Data Point: [\(182.3, -70, 900\)](#)
 Data Point: [\(200, -48, 900\)](#)
 Data Point: [\(200, -70, 900\)](#)
 Data Point: [\(242.5, -48, 610\)](#)
 Data Point: [\(242.5, -70, 900\)](#)
 Data Point: [\(310, -48, 610\)](#)
 Data Point: [\(310, -70, 900\)](#)

Regions

	Material	Points	Area (ft²)
Region 1	FILL CH, EL. +4 TO -2/6	35,21,2,3,24,9	53.225
Region 2	MARSH 1, EL. -2 TO -6	9,10,26,35	70.8
Region 3	FILL CH, EL. +4 TO -2/6	24,19,23,4,30,14,9	212.525
Region 4	MARSH 1, EL. -2 TO -6	9,14,10	85
Region 5	Marsh, EL. -6 TO -13 (Protected)	26,27,36,20,34	120.62857

3/20/2012

Region 6	BEACH SAND SP, EL. -13/-14 TO -48	27,12,13,1,32,33,36	124.17643
Region 7	BEACH SAND SP, EL. -13/-14 TO -48	13,12,15,6,8,25,7,1	6051.75
Region 8	BAY SOUND CLAY CL, EL. -48 TO -70	7,25,8,16,17	3923.7
Region 9	Fill (Protected), EL -4 to -6	31,18,5,14,30	80.595
Region 10	Marsh, EL. -6 TO -13 (Protected)	15,14,5,6	472.5
Region 11	MARSH 2, EL. -6 TO -14	15,12,11,10,14	318.75
Region 12	MARSH 2, EL. -6 TO -14	26,27,12,11,10	132.75
Region 13	Sheet Pile	28,29,23,19,24	7.65
Region 14	MARSH 1, EL. -2 TO -6	34,22,35,26	26.11

Points

	X (ft)	Y (ft)
Point 1	131.6	-15.5
Point 2	192.9	2.5
Point 3	199	3.1
Point 4	210.5	4
Point 5	310	-6
Point 6	310	-13
Point 7	131.6	-48
Point 8	310	-48
Point 9	200	-2
Point 10	200	-6
Point 11	200	-8.7
Point 12	200	-14
Point 13	200	-15.5
Point 14	242.5	-6
Point 15	242.5	-13
Point 16	310	-70
Point 17	131.7	-70
Point 18	310	-4.9
Point 19	201	3.1
Point 20	163.4	-10.8
Point 21	189	-0.1
Point 22	173.2	-4.6
Point 23	201	4.3
Point 24	200	3.1
Point 25	200	-48
Point 26	182.3	-6
Point 27	182.3	-13
Point 28	200	12.9
Point 29	200.5	12.9
Point 30	242.5	-4
Point 31	256.6	-4.9

Point 32	131.6	-14.9
Point 33	153.9	-14.3
Point 34	171	-6
Point 35	182.3	-2
Point 36	157.42857	-13

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.72	(225.068, 42.578)	26.79716	(188.507, -0.239931)	(253.862, -4.72525)
2	14922	1.79	(225.068, 42.578)	55.839	(189.034, -0.0776116)	(254.658, -4.77602)

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	188.7533	-0.4410685	364.75902	100.79174	0	636.46
2	Optimized	189.81535	-1.3069078	374.0024	204.40445	0	642.46
3	Optimized	191.76535	-2.5372865	425.68278	601.76891	0	200
4	Optimized	194.2431	-3.7725615	505.27598	745.5536	0	200
5	Optimized	196.91455	-5.22108	617.18654	854.02149	0	200
6	Optimized	198.62145	-6.221962	708.20074	942.89272	0	199.22
7	Optimized	199.4936	-6.733362	754.86734	995.00792	0	199.71
8	Optimized	199.9936	-7.0252415	787.56319	1060.6757	0	200
9	Optimized	200.25	-7.123123	540.28744	893.33527	0	199.94
10	Optimized	200.75	-7.3140035	501.53532	939.57996	0	199.82
11	Optimized	201.84405	-7.731662	527.6254	1105.1598	0	199.57
12	Optimized	203.9187	-8.6438225	582.64656	1174.4525	0	199.08
13	Optimized	206.3799	-9.8237075	651.74494	1287.8823	0	198.5
14	Optimized	209.05525	-11.08158	722.9905	1412.3053	0	197.87
15	Optimized	210.9875	-11.97488	771.73304	1487.1958	0	197.41
16	Optimized	212.9012	-12.65906	806.45888	1539.6306	0	196.96
17	Optimized	215.76815	-13.35205	836.61154	1575.2193	0	196.29
18	Optimized	218.37845	-13.56009	837.36122	1574.4972	0	195.68
19	Optimized	220.7176	-13.507815	823.12881	1512.4816	0	195.13

3/20/2012

3/20/2012

20	Optimized	223.05675	-13.45554	808.93915	1450.4231	0	194.57
21	Optimized	225.17545	-13.406975	796.01817	1394.3879	0	194.08
22	Optimized	227.07375	-13.36212	784.3794	1343.7777	0	193.63
23	Optimized	228.97205	-13.317265	772.74063	1293.2201	0	193.18
24	Optimized	231.11115	-13.266685	759.64904	1236.215	0	192.68
25	Optimized	233.49105	-13.210375	745.11473	1172.7429	0	192.12
26	Optimized	235.87095	-13.154065	730.58041	1109.3128	0	191.56
27	Optimized	237.94105	-12.93946	707.31687	1072.4518	0	191.07
28	Optimized	239.70135	-12.56656	674.91601	990.92165	0	190.66
29	Optimized	241.54075	-11.97726	627.62994	922.22194	0	190.23
30	Optimized	244.0754	-10.9128	544.56429	776.3772	0	190
31	Optimized	246.98005	-9.4517775	431.49717	632.80449	0	190
32	Optimized	249.63855	-7.8529525	309.19773	445.26149	0	190
33	Optimized	251.6227	-6.52677	208.41365	319.4026	0	190
34	Optimized	253.06995	-5.362627	85.755054	400.93597	0	600

Slices of Slip Surface: **14922**

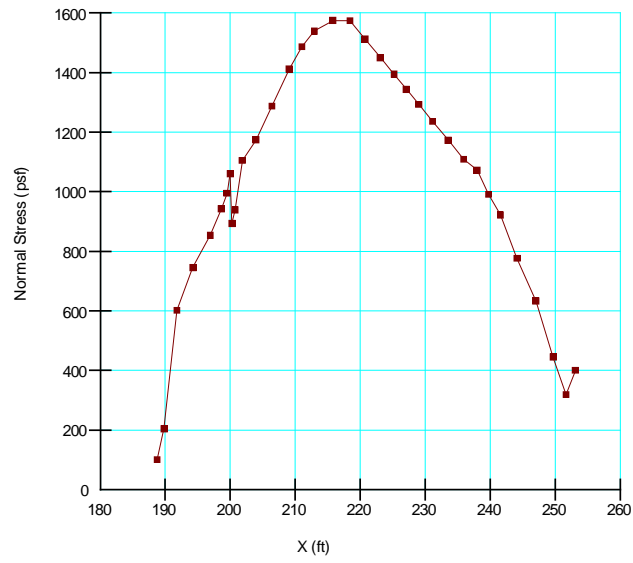
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	14922	190.23725	-1.0388058	362.67661	204.29083	0	644.84
2	14922	192.17045	-2.53204	426.96375	581.92881	0	200
3	14922	194.05835	-3.837943	507.22887	724.98698	0	200
4	14922	196.37505	-5.305903	615.79031	858.31491	0	200
5	14922	198.2667	-6.4012685	710.52813	967.72746	0	199.02
6	14922	199.5	-7.06008	771.81981	1041.5509	0	199.72
7	14922	200.25	-7.4416635	560.62637	906.58365	0	199.94
8	14922	200.75	-7.686653	525.49236	959.77791	0	199.82
9	14922	202.1875	-8.3412	566.45136	1153.5268	0	199.49
10	14922	204.5625	-9.3437745	625.84614	1260.4254	0	198.93
11	14922	206.9375	-10.22052	675.91273	1355.0909	0	198.37
12	14922	209.3125	-10.97764	715.28978	1438.0524	0	197.81
13	14922	211.56665	-11.592835	745.02193	1482.1297	0	197.28
14	14922	213.7	-	766.41224	1488.5378	0	196.78

			12.080525				
15	14922	215.83335	-12.48127	781.73757	1486.0411	0	196.27
16	14922	217.96665	-12.796955	791.61132	1474.798	0	195.77
17	14922	220.1	-13.029035	796.14162	1455.0174	0	195.27
18	14922	222.23335	-13.17855	795.47285	1426.6734	0	194.77
19	14922	224.36665	-13.24617	789.73444	1389.8745	0	194.27
20	14922	226.5	-13.232195	778.8997	1344.5415	0	193.76
21	14922	228.63335	-13.136555	762.97026	1290.7342	0	193.26
22	14922	230.76665	-12.958835	741.88542	1228.2843	0	192.76
23	14922	232.9	-12.69824	715.47849	1157.1296	0	192.26
24	14922	235.03335	-12.353585	683.57627	1077.0904	0	191.76
25	14922	237.16665	-11.923275	645.04674	987.93375	0	191.25
26	14922	239.3	-11.405265	601.07088	889.3909	0	190.75
27	14922	241.43335	-10.79699	550.47097	781.13726	0	190.25
28	14922	243.5102	-10.116366	494.44127	684.20133	0	190
29	14922	245.53065	-9.364825	433.34325	598.92483	0	190
30	14922	247.5511	-8.52237	365.62024	503.95385	0	190
31	14922	249.5715	-7.5844115	291.30976	398.69199	0	190
32	14922	251.5919	-6.545466	209.85219	282.48278	0	190
33	14922	253.62985	-5.3880095	85.23536	308.72999	0	600

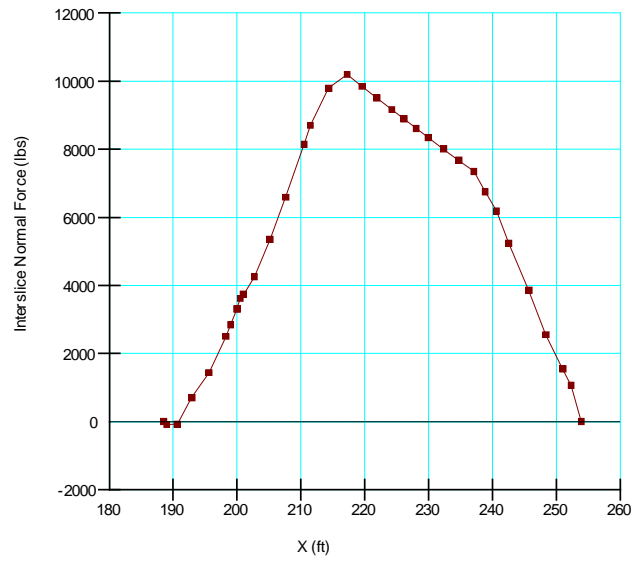
3/20/2012

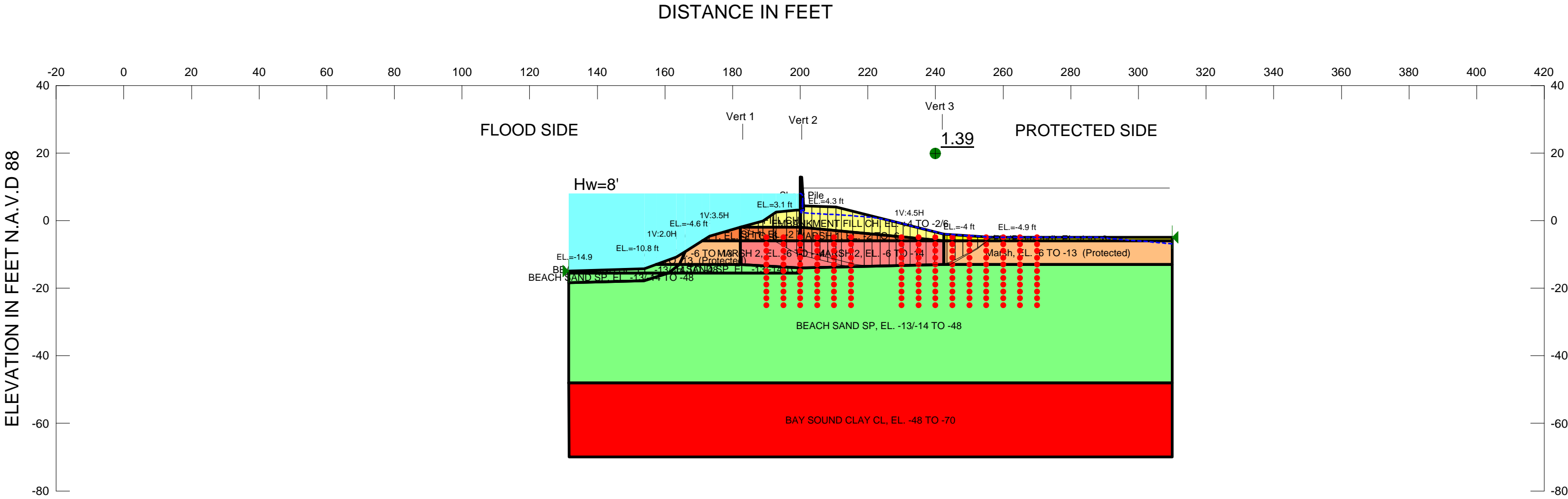
3/20/2012

Base Normal Stress Vs. X



Interslice Normal Stress Vs. X





Name: EMBANKMENT FILL CH, EL. +4 TO -2/6 Model: Spatial Mohr-Coulomb Unit Weight: 107 pcf Cohesion Fn: Fill Phi: 0 °

Name: MARSH 1, EL. -2 TO -6 Model: Spatial Mohr-Coulomb Unit Weight: 80 pcf Cohesion Fn: Marsh Phi: 0 °

Name: BEACH SAND SP, EL. -13/-14 TO -48 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand

Name: BAY SOUND CLAY CL, EL. -48 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 108 pcf Cohesion Spatial Fn: CLAY Phi: 0 °

Name: MARSH 2, EL. -6 TO -14 Model: Spatial Mohr-Coulomb Unit Weight: 101 pcf Cohesion Fn: Marsh Phi: 0 °

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

Name: Fill (Protected), EL -4 to -6 Model: Undrained (Phi=0) Unit Weight: 107 pcf Cohesion: 600 psf

Name: Marsh, EL. -6 TO -13 (Protected) Model: Undrained (Phi=0) Unit Weight: 101 pcf Cohesion: 190 psf

GENERAL NOTES

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

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

Hw=CANAL WATER LEVEL



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

LONDON AVE CANAL
OUTFALL CANAL REEVALUATION REPORT
REACH 12B, STA. 89+50 TO 93+00
PROTECTED SIDE STABILITY ANALYSIS,
CASE: Global Stability (Block)
MARCH 2012

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

Global Stability (Block)

Report generated using GeoStudio 2007, version 7.15. Copyright © 1991-2009 GEO-SLOPE International Ltd.

File Information

Created By: [Liljegren, James](#)
Revision Number: [274](#)
Last Edited By: [Curran, Matthew MVN](#)
Date: [1/10/2012](#)
Time: [2:34:53 PM](#)
File Name: [Reach 12B OPEN.gsz](#)
Directory: [Z:\Edf\F&MHOME\London Ave Reevaluation 2011\West Side\Reach 12B\SlopeW\](#)
Last Solved Date: [1/10/2012](#)
Last Solved Time: [2:36:18 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 Stability (Block)

Kind: [SLOPE/W](#)
Parent: [Global Analysis \(Seepage\)](#)
Method: [Spencer](#)
Settings
 PWP Conditions Source: [Parent Analysis](#)
SlipSurface
 Direction of movement: [Left to Right](#)
 Use Passive Mode: [No](#)
 Slip Surface Option: [Block](#)
 Critical slip surfaces saved: [1](#)
 Optimize Critical Slip Surface Location: [Yes](#)
 Tension Crack
 Tension Crack Option: [\(none\)](#)
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 CH, EL. +4 TO -2/6

Model: Spatial Mohr-Coulomb
Unit Weight: 107 pcf
Cohesion Fn: Fill
Phi: 0 °
Phi-B: 0 °

MARSH 1, EL. -2 TO -6

Model: Spatial Mohr-Coulomb
Unit Weight: 80 pcf
Cohesion Fn: Marsh
Phi: 0 °
Phi-B: 0 °

BEACH SAND SP, EL. -13/-14 TO -48

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

BAY SOUND CLAY CL, EL. -48 TO -70

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

MARSH 2, EL. -6 TO -14

Model: Spatial Mohr-Coulomb
Unit Weight: 101 pcf
Cohesion Fn: Marsh
Phi: 0 °

Phi-B: 0 °

Sheet Pile

Model: Undrained (Phi=0)

Unit Weight: 0.1 pcf

Cohesion: 0.01 psf

Fill (Protected), EL -4 to -6

Model: Undrained (Phi=0)

Unit Weight: 107 pcf

Cohesion: 600 psf

Marsh, EL. -6 TO -13 (Protected)

Model: Undrained (Phi=0)

Unit Weight: 101 pcf

Cohesion: 190 psf

Slip Surface Limits

Left Coordinate: (131.6, -14.9) ft

Right Coordinate: (310, -4.9) ft

Slip Surface Block

Left Grid

Upper Left: (190, -5) ft

Lower Left: (190, -25) ft

Lower Right: (215, -25) ft

X Increments: 5

Y Increments: 10

Starting Angle: 125 °

Ending Angle: 145 °

Angle Increments: 4

Right Grid

Upper Left: (230, -5) ft

Lower Left: (230, -25) ft

Lower Right: (270, -25) ft

X Increments: 8

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: (182.3, 190)

Data Point: (200, 200)

Data Point: (310, 190)

Fill

Model: [Spline Data Point Function](#)

Function: [Cohesion vs. X](#)

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 600

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

Data Point: (182.3, 600)

Data Point: (200, 700)

Data Point: (242.5, 600)

Shear/Normal Strength Functions

Sand

Model: [Spline Data Point Function](#)

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

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 0

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

Data Point: (-100000, 0)

Data Point: (0, 0)

Data Point: (100000, 57735)

Estimation Properties

Intact Rock Param.: 10

Geological Strength: 100

Disturbance Factor: 0

SigmaC: 600000 psf

Sigma3: 300000 psf

Num. Points: 20

Spatial Functions

CLAY

Model: [Linear Interpolation](#)

Limit Range By: [Data Values](#)

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

Data Point: [\(131.6, -48, 610\)](#)

Data Point: [\(131.6, -70, 855\)](#)

Data Point: [\(182.3, -48, 610\)](#)

Data Point: [\(182.3, -70, 855\)](#)

Data Point: [\(200, -48, 900\)](#)

Data Point: [\(200, -70, 900\)](#)

Data Point: [\(242.5, -48, 610\)](#)

Data Point: [\(242.5, -70, 855\)](#)

Data Point: [\(310, -48, 610\)](#)

Data Point: [\(310, -70, 855\)](#)

Regions

	Material	Points	Area (ft ²)
Region 1	EMBANKMENT FILL CH, EL. +4 TO -2/6	35,21,2,3,24,9	53.225
Region 2	MARSH 1, EL. -2 TO -6	9,10,26,35	70.8
Region 3	EMBANKMENT FILL CH, EL. +4 TO -2/6	24,19,23,4,30,14,9	212.525
Region 4	MARSH 1, EL. -2 TO -6	9,14,10	85
Region 5	Marsh, EL. -6 TO -13 (Protected)	26,27,38,40,34	109.57536
Region 6	BEACH SAND SP, EL. -13/-14 TO -48	38,27,12,13,39	84.467862
Region 7	BEACH SAND SP, EL. -13/-14 TO -48	13,12,15,6,8,25,7,37,36,39	5985.635
Region 8	BAY SOUND CLAY CL, EL. -48 TO -70	7,25,8,16,17	3923.7
Region 9	Fill (Protected), EL -4 to -6	31,18,5,14,30	80.595
Region 10	Marsh, EL. -6 TO -13 (Protected)	15,14,5,6	472.5
Region 11	MARSH 2, EL. -6 TO -14	15,12,11,10,14	318.75
Region 12	MARSH 2, EL. -6 TO -14	26,27,12,11,10	132.75
Region 13	Sheet Pile	28,29,23,19,24	7.65
Region 14	BEACH SAND SP, EL. -13/-14 TO -48	1,32,33,41,38,39	39.708567
Region 15	MARSH 1, EL. -2 TO -6	34,22,35,26	26.11
Region 16	BEACH SAND SP, EL. -13/-14 TO -48	1,39,36,37	66.115
Region 17	Marsh, EL. -6 TO -13 (Protected)	41,20,40,38	11.053228

Points

	X (ft)	Y (ft)
Point 1	131.6	-15.5
Point 2	192.9	2.5
Point 3	199	3.1
Point 4	210.5	4
Point 5	310	-6
Point 6	310	-13
Point 7	131.6	-48
Point 8	310	-48
Point 9	200	-2
Point 10	200	-6
Point 11	200	-8.7
Point 12	200	-14
Point 13	200	-15.5
Point 14	242.5	-6
Point 15	242.5	-13
Point 16	310	-70
Point 17	131.7	-70
Point 18	310	-4.9
Point 19	201	3.1
Point 20	163.4	-10.8
Point 21	189	-0.1
Point 22	173.2	-4.6
Point 23	201	4.3
Point 24	200	3.1
Point 25	200	-48
Point 26	182.3	-6
Point 27	182.3	-13
Point 28	200	12.9
Point 29	200.5	12.9
Point 30	242.5	-4
Point 31	256.6	-4.9
Point 32	131.6	-14.9
Point 33	153.9	-14.3

Point 34	171	-6
Point 35	182.3	-2
Point 36	153.8	-17.8
Point 37	131.6	-18.4
Point 38	164.24571	-13
Point 39	161.1	-15.5
Point 40	166	-9.15789
Point 41	157.42857	-13

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.39	(219.107, -0.81)	28.90359	(182.272, -2.00801)	(256.52, -4.89489)
2	6042	1.52	(219.107, -0.81)	27.707	(183.717, -1.59827)	(254.286, -4.75227)

Slices of Slip Surface: **Optimized**

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	182.286	-2.0129465	624.62342	551.75574	0	190
2	Optimized	183.6274	-2.485219	617.94565	605.15469	0	190.75
3	Optimized	186.28215	-3.419893	626.04659	710.68013	0	192.25
4	Optimized	188.30475	-4.201554	652.37435	775.10084	0	193.39
5	Optimized	190.49065	-5.189814	702.04844	885.8586	0	194.63
6	Optimized	192.10315	-5.93187	746.2069	967.70461	0	195.54

			5				
7	Optimized	192.5625	- 6.18875 55	761.12457	1004.9203	0	195.8
8	Optimized	194.425	- 7.23035 05	820.53624	1140.2632	0	196.85
9	Optimized	197.475	- 8.93602 9	932.25325	1315.1644	0	198.57
10	Optimized	199.47895	- 10.0567 04	993.10232	1431.1097	0	199.71
11	Optimized	199.97895	- 10.3278 2	996.47458	1575.4086	0	199.99
12	Optimized	200.25	- 10.3700 1	827.69488	1123.8493	0	199.98
13	Optimized	200.75	- 10.4478 3	798.8225	1288.9417	0	199.93
14	Optimized	201.06655	- 10.4970 95	801.71095	1420.2225	0	199.9
15	Optimized	202.30395	- 10.7948 9	819.73468	1422.6954	0	199.79
16	Optimized	204.64565	- 11.3697 75	850.38245	1477.397	0	199.58
17	Optimized	206.9874	- 11.9446 6	879.08105	1532.0985	0	199.36
18	Optimized	209.32915	- 12.5195 45	903.71539	1586.8	0	199.15
19	Optimized	211.3491	- 13.0154	924.45702	1614.6115	0	198.97

			35				
20	Optimized	213.8461	-13.4091	935.44509	1635.559	0	198.74
21	Optimized	217.2087	- 13.5742 3	926.95536	1610.0933	0	198.44
22	Optimized	220.0998	- 13.5265 05	907.72387	1538.7498	0	198.17
23	Optimized	222.4526	- 13.4712 35	891.1101	1476.0339	0	197.96
24	Optimized	224.948	- 13.4126 15	873.49898	1409.5209	0	197.73
25	Optimized	227.309	- 13.3547 85	856.775	1347.0186	0	197.52
26	Optimized	229.393	-13.3011	841.80866	1290.9428	0	197.33
27	Optimized	231.477	- 13.2474 15	826.89029	1234.9149	0	197.14
28	Optimized	233.5909	- 13.2024 85	812.4424	1176.6423	0	196.95
29	Optimized	235.9226	- 13.1631 5	797.11077	1115.1297	183.6083	-9.7469e-007
30	Optimized	238.44225	- 13.1206 45	780.72172	1047.4306	153.98445	-8.1758e-007
31	Optimized	240.9619	- 13.0781 4	764.33268	979.77124	124.38351	3.4217e-006
32	Optimized	242.3047	- 13.0297 65	754.00226	1010.3733	148.01591	-7.8561e-007
33	Optimized	242.44385	-	750.29044	1017.0574	0	196.14

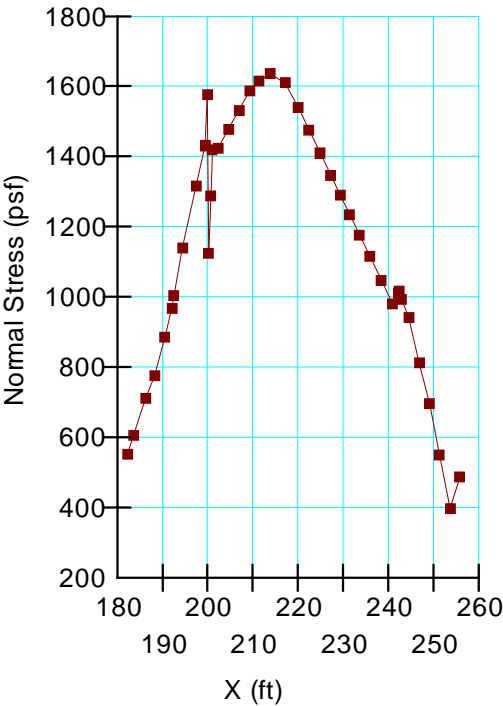
	ed		12.9843 05				
34	Optimiz ed	242.96	- 12.8157 05	735.96274	992.81767	0	190
35	Optimiz ed	244.58545	- 12.1293 3	679.82931	942.1806	0	190
36	Optimiz ed	246.9163	- 11.0571 15	592.13203	811.60909	0	190
37	Optimiz ed	249.16485	-9.91685	498.78388	696.00751	0	190
38	Optimiz ed	251.3311	-8.70853	400.90178	550.58935	0	190
39	Optimiz ed	253.7602	- 7.05218 5	268.75705	397.66866	0	190
40	Optimiz ed	255.81305	- 5.44744 35	95.123824	487.45596	0	600

Slices of Slip Surface: 6042

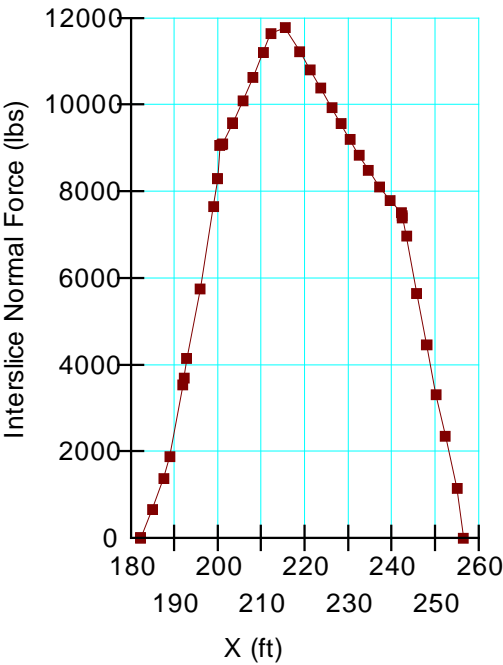
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	6042	184.0035	- 1.7991335	590.49098	344.04616	0	609.62
2	6042	185.4678	- 2.8244295	602.04606	595.50624	0	191.79
3	6042	187.8226	-4.473288	669.67058	746.96568	0	193.12
4	6042	189.5015	- 5.6488585	728.00155	845.3985	0	194.07
5	6042	191.4515	-7.014263	794.54215	1025.9773	0	195.17
6	6042	193.91665	-8.740404	883.91865	1255.075	0	196.56
7	6042	195.95	- 10.164161	953.61371	1397.2046	0	197.71
8	6042	197.98335	- 11.587915	1008.4029	1539.3342	0	198.86

9	6042	199.5	- 12.649895	1034.0153	1646.1674	0	199.72
10	6042	200.25	-13	984.68	1433.16	0	199.98
11	6042	200.75	-13	972.84	1588.74	0	199.93
12	6042	202.1875	-13	967.95789	1716.2105	0	199.8
13	6042	204.5625	-13	957.81053	1714.2316	0	199.59
14	6042	206.9375	-13	947.62105	1712.2105	0	199.37
15	6042	209.3125	-13	934.61053	1710.2316	0	199.15
16	6042	211.6346	-13	921.89821	1681.7592	0	198.94
17	6042	213.90385	-13	909.29482	1626.8066	0	198.74
18	6042	216.1731	-13	896.64737	1571.8541	0	198.53
19	6042	218.4423	-13	883.95584	1516.9015	0	198.32
20	6042	220.71155	-13	871.26432	1461.949	0	198.12
21	6042	222.9808	-13	858.52873	1406.9965	0	197.91
22	6042	225.25	-13	845.8372	1352.0439	0	197.7
23	6042	227.5192	-13	833.14568	1297.0914	0	197.5
24	6042	229.78845	-13	820.45415	1242.1389	0	197.29
25	6042	232.0577	-13	807.85077	1187.1863	0	197.09
26	6042	234.3269	-13	795.29144	1132.2338	0	196.88
27	6042	236.59615	-13	782.64399	1077.2812	0	196.67
28	6042	238.8654	-13	770.48128	1022.3287	0	196.47
29	6042	241.25	-12.27831	708.78992	1027.1063	0	196.25
30	6042	243.70305	- 10.862045	597.80903	831.11616	0	190
31	6042	246.10915	-9.472891	486.73439	664.43222	0	190
32	6042	248.51525	-8.083734	374.29202	497.74827	0	190
33	6042	250.92135	-6.694578	261.17297	331.07873	0	190
34	6042	253.20495	-5.376133	104.2249	363.26238	0	600

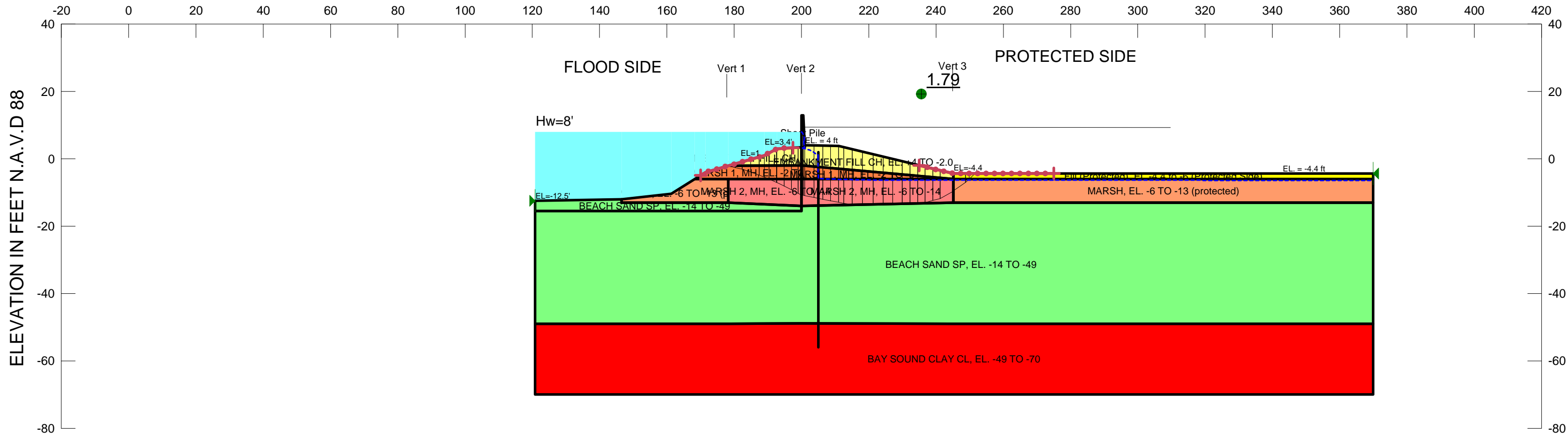
Base Normal Stress Vs. X



Interslice Normal Stress
Vs. X



DISTANCE IN FEET



Name: EMBANKMENT FILL CH, EL. +4 TO -2.0	Model: Spatial Mohr-Coulomb	Unit Weight: 109 pcf	Cohesion Fn: Fill	Phi: 0 °
Name: MARSH 1, MH, EL. -2 TO -6	Model: Spatial Mohr-Coulomb	Unit Weight: 75 pcf	Cohesion: 250 psf	Phi: 0 °
Name: BEACH SAND SP, EL. -14 TO -49	Model: Shear/Normal Fn.	Unit Weight: 122 pcf	Strength Function: Sand	
Name: BAY SOUND CLAY CL, EL. -49 TO -70	Model: Spatial Mohr-Coulomb	Unit Weight: 108 pcf	Cohesion Spatial Fn: Bay Sound	Phi: 0 °
Name: MARSH 2, MH, EL. -6 TO -14	Model: Spatial Mohr-Coulomb	Weight Fn: Marsh 2	Cohesion Spatial Fn: Marsh 2	Phi: 0 °
Name: Fill (Protected) ,EL -4.4 to -6 (Protected Side)	Model: Spatial Mohr-Coulomb	Unit Weight: 109 pcf	Cohesion: 600 psf	Phi: 0 °
Name: Sheet Pile	Model: Undrained (Phi=0)	Unit Weight: 0.1 pcf	Cohesion: 0.01 psf	
Name: MARSH, EL. -6 TO -13 (protected)	Model: Spatial Mohr-Coulomb	Unit Weight: 75 pcf	Cohesion: 220 psf	Phi: 0 °

GENERAL NOTES

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

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

H_w=CANAL WATER LEVELS



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

LONDON AVE CANAL,
OUTFALL CANAL REEVALUATION REPORT
REACH 13, STA. 93+00 TO 96+00
PROTECTED SIDE STABILITY ANALYSIS,
CASE: Slope Stability (Entry/Exit)
MARCH 2012

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

Slope Stability (Entry/Exit)

Report generated using GeoStudio 2007, version 7.15. Copyright © 1991-2009 GEO-SLOPE International Ltd.

File Information

Created By: [Liljegren, James](#)
Revision Number: 350
Last Edited By: [Bonanno, Brian P MVN](#)
Date: 12/19/2011
Time: 11:29:57 AM
File Name: [Reach 13.gsz](#)
Directory: [G:\F&M\HOME\London Ave Reevaluation 2011\West Side\Reach 13\Slope W\](#)
Last Solved Date: 12/19/2011
Last Solved Time: 11:30:28 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 (Entry/Exit)

Kind: [SLOPE/W](#)
Parent: [Gap Stability \(Seepage\)](#)
Method: [Spencer](#)
Settings
 PWP Conditions Source: [Parent Analysis](#)
SlipSurface
 Direction of movement: [Left to Right](#)
 Use Passive Mode: [No](#)
 Slip Surface Option: [Entry and Exit](#)
 Critical slip surfaces saved: [1](#)
 Optimize Critical Slip Surface Location: [Yes](#)
 Tension Crack
 Tension Crack Option: [\(none\)](#)
FOS Distribution
 FOS Calculation Option: [Constant](#)
Advanced
 Number of Slices: [30](#)
 Optimization Tolerance: [0.01](#)
 Minimum Slip Surface Depth: [0.1 ft](#)

3/19/2012

Phi-B: 0 °

Sheet Pile

Model: [Undrained \(Phi=0\)](#)
Unit Weight: [0.1 pcf](#)
Cohesion: [0.01 psf](#)

MARSH, EL. -6 TO -13 (protected)

Model: [Spatial Mohr-Coulomb](#)
Unit Weight: [75 pcf](#)
Cohesion: [220 psf](#)
Phi: 0 °
Phi-B: 0 °

Slip Surface Entry and Exit

Left Projection: [Range](#)
Left-Zone Left Coordinate: [\(170, -4.94118\) ft](#)
Left-Zone Right Coordinate: [\(197.5, 3.30476\) ft](#)
Left-Zone Increment: [11](#)
Right Projection: [Range](#)
Right-Zone Left Coordinate: [\(235, -1.95439\) ft](#)
Right-Zone Right Coordinate: [\(275, -4.4\) ft](#)
Right-Zone Increment: [16](#)
Radius Increments: [4](#)

Slip Surface Limits

Left Coordinate: [\(120.8, -12.5\) ft](#)
Right Coordinate: [\(370, -4.4\) ft](#)

Cohesion Functions

Fill

Model: [Spline Data Point Function](#)
Function: [Cohesion vs. X](#)
 Curve Fit to Data: [100 %](#)
 Segment Curvature: [0 %](#)
Y-Intercept: [600](#)
Data Points: [X \(ft\), Cohesion \(psf\)](#)
 Data Point: [\(178.2, 600\)](#)
 Data Point: [\(200, 700\)](#)
 Data Point: [\(245.2, 600\)](#)

Shear/Normal Strength Functions

Sand

3/19/2012

Optimization Maximum Iterations: [2000](#)
Optimization Convergence Tolerance: [1e-007](#)
Starting Optimization Points: [8](#)
Ending Optimization Points: [16](#)
Complete Passes per Insertion: [1](#)
Driving Side Maximum Convex Angle: [5 °](#)
Resisting Side Maximum Convex Angle: [1 °](#)

Materials

EMBANKMENT FILL CH, EL. +4 TO -2.0

Model: [Spatial Mohr-Coulomb](#)
Unit Weight: [109 pcf](#)
Cohesion Fn: [Fill](#)
Phi: 0 °
Phi-B: 0 °

MARSH 1, MH, EL. -2 TO -6

Model: [Spatial Mohr-Coulomb](#)
Unit Weight: [75 pcf](#)
Cohesion: [250 psf](#)
Phi: 0 °
Phi-B: 0 °

BEACH SAND SP, EL. -14 TO -49

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

BAY SOUND CLAY CL, EL. -49 TO -70

Model: [Spatial Mohr-Coulomb](#)
Unit Weight: [108 pcf](#)
Cohesion Spatial Fn: [Bay Sound](#)
Phi: 0 °
Phi-B: 0 °

MARSH 2, MH, EL. -6 TO -14

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

Fill (Protected) ,EL -4.4 to -6 (Protected Side)

Model: [Spatial Mohr-Coulomb](#)
Unit Weight: [109 pcf](#)
Cohesion: [600 psf](#)
Phi: 0 °

3/19/2012

Model: [Spline Data Point Function](#)
Function: [Shear Stress vs. Normal Stress](#)
 Curve Fit to Data: [100 %](#)
 Segment Curvature: [0 %](#)
Y-Intercept: [0](#)
Data Points: [Normal Stress \(psf\), Shear Stress \(psf\)](#)
 Data Point: [\(-100000, 0\)](#)
 Data Point: [\(0, 0\)](#)
 Data Point: [\(100000, 57735\)](#)
Estimation Properties
 Intact Rock Param.: [10](#)
 Geological Strength: [100](#)
 Disturbance Factor: [0](#)
 SigmaC: [600000 psf](#)
 Sigma3: [300000 psf](#)
 Num. Points: [20](#)

Unit Weight Functions

Marsh 2

Model: [Spline Data Point Function](#)
Function: [Unit Weight vs. X](#)
 Curve Fit to Data: [100 %](#)
 Segment Curvature: [0 %](#)
Y-Intercept: [75](#)
Data Points: [X \(ft\), Unit Weight \(pcf\)](#)
 Data Point: [\(178.2, 75\)](#)
 Data Point: [\(200, 105\)](#)
 Data Point: [\(245.2, 75\)](#)

Spatial Functions

Bay Sound

Model: [Linear Interpolation](#)
Limit Range By: [Data Values](#)
Data Points: [X \(ft\), Y \(ft\), Cohesion \(psf\)](#)
 Data Point: [\(0, -49, 700\)](#)
 Data Point: [\(0, -70, 900\)](#)
 Data Point: [\(200, -49, 720\)](#)
 Data Point: [\(200, -70, 930\)](#)
 Data Point: [\(310, -49, 700\)](#)
 Data Point: [\(310, -70, 900\)](#)
 Data Point: [\(245.2, -49, 700\)](#)
 Data Point: [\(245.2, -70, 900\)](#)
 Data Point: [\(178.2, -49, 700\)](#)
 Data Point: [\(178.2, -70, 900\)](#)

Marsh 2

3/19/2012

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (200, -6, 250)
Data Point: (200, -14, 310)
Data Point: (245.2, -6, 220)
Data Point: (245.2, -13, 220)
Data Point: (178.2, -6, 220)
Data Point: (178.2, -13, 220)

Regions

	Material	Points	Area (ft²)
Region 1	MARSH 1, MH, EL. -2 TO -6	23,2,11,12,42,39	109.0625
Region 2	MARSH 1, MH, EL. -2 TO -6	11,15,12	90.4
Region 3	BEACH SAND SP, EL. -14 TO -49	7,1,34,35,31,40,30,14,41,32,33	206.375
Region 4	BAY SOUND CLAY CL, EL. -49 TO -70	9,38,37,36,10,17,18	5236.55
Region 5	Fill (Protected) ,EL. -4.4 to -6 (Protected Side)	24,19,6,15	199.68
Region 6	BEACH SAND SP, EL. -14 TO -49	14,16,8,10,36,37,38,9,7,33,32,41	8747.25
Region 7	EMBANKMENT FILL CH, EL. +4 TO -2.0	2,22,3,27,4,11	69.71
Region 8	EMBANKMENT FILL CH, EL. +4 TO -2.0	4,20,25,5,24,15,11	212.94
Region 9	MARSH 2, MH, EL. -6 TO -14	12,15,16,14,21,13	339
Region 10	Sheet Pile	20,4,28,29,25	7.275
Region 11	MARSH, EL. -6 TO -13 (protected)	30,40,31,35,26,39,42	129.5125
Region 12	MARSH 2, MH, EL. -6 TO -14	30,42,12,13,21,14	163.5
Region 13	MARSH, EL. -6 TO -13 (protected)	16,15,6,8	873.6

Points

	X (ft)	Y (ft)
Point 1	120.8	-13
Point 2	178.2	-2.1
Point 3	192.7	3
Point 4	200	3.4
Point 5	211	3.8
Point 6	370	-6
Point 7	120.8	-15.5
Point 8	370	-13
Point 9	120.8	-49
Point 10	370	-49
Point 11	200	-2

Point 12	200	-6
Point 13	200	-7.9
Point 14	200	-14
Point 15	245.2	-6
Point 16	245.2	-13
Point 17	370	-70
Point 18	120.8	-70
Point 19	370	-4.4
Point 20	201	3.4
Point 21	200	-10.7
Point 22	189	1
Point 23	171.5	-4
Point 24	245.2	-4.4
Point 25	201	4
Point 26	161.3	-10.4
Point 27	199	3.4
Point 28	200	12.9
Point 29	200.5	12.9
Point 30	178.2	-13
Point 31	146.5	-13
Point 32	151.7	-15.5
Point 33	138.6	-15.5
Point 34	120.8	-12.5
Point 35	146.5	-12
Point 36	245.2	-49
Point 37	199.9	-48.9
Point 38	178.2	-49
Point 39	168.3125	-6
Point 40	154.61111	-13
Point 41	200	-15.5
Point 42	178.2	-6
Point 43	205	2
Point 44	205	-56

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.79	(221.106, 64.852)	28.53282	(178.274, -2.0787)	(251.631, -4.4)
2	387	1.94	(221.106, 64.852)	78.174	(179.935, -1.60184)	(257.373, -4.4)

Slices of Slip Surface: **Optimized**

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)

1	Optimized	179.3121	-2.331932	644.68422	607.75821	0	250
2	Optimized	181.34575	-2.828113	675.64206	671.64186	0	250
3	Optimized	183.61925	-3.493005	717.13861	732.26169	0	250
4	Optimized	186.1748	-4.336895	769.7907	827.34758	0	250
5	Optimized	188.2263	-5.087532	816.63193	887.35119	0	250
6	Optimized	189.6871	-5.708112	855.37006	948.13394	0	250
7	Optimized	191.489	-6.473585	903.09845	1059.3873	0	240.56
8	Optimized	192.6519	-6.971733	934.15213	1113.4301	0	244.93
9	Optimized	193.7856	-7.5505045	970.31502	1186.2095	0	250.07
10	Optimized	195.9568	-8.6589215	1039.4767	1298.4435	0	261.06
11	Optimized	198.0212	-9.747965	1107.4577	1403.6315	0	273.13
12	Optimized	199.4395	-10.52296	1155.8489	1489.0864	0	282.39
13	Optimized	199.9395	-10.774515	1171.5663	1630.3478	0	285.64
14	Optimized	200.25	-10.833015	1152.2657	1214.3925	0	285.91
15	Optimized	200.75	-10.927225	1154.3293	1365.4742	0	285.92
16	Optimized	202.3365	-11.226145	1175.1397	1456.0938	0	285.86
17	Optimized	205.0095	-11.729775	342.57874	1499.3656	0	285.42
18	Optimized	207.5095	-12.220915	369.32181	1534.6842	0	284.75
19	Optimized	209.8365	-12.699565	396.84594	1573.3249	0	283.88
20	Optimized	211.77305	-13.09079	419.86445	1586.2517	0	282.88
21	Optimized	213.8183	-13.402765	438.02056	1588.7519	0	280.91
22	Optimized	216.6096	-13.54439	446.34746	1562.3642	0	276.49
23	Optimized	219.71715	-13.53574	445.73946	1473.5433	0	270.61
24	Optimized	222.7953	-13.4673	441.43108	1392.8686	0	264.5
25	Optimized	225.71035	-13.342025	433.63718	1298.8438	0	258.5
26	Optimized	228.561	-13.219515	425.99692	1207.5812	0	252.69
27	Optimized	231.1209	-13.129255	420.35099	1123.1064	0	247.57
28	Optimized	233.39005	-13.07125	416.7032	1054.5561	0	243.11
29	Optimized	235.65915	-13.013245	413.07302	986.182	0	238.65
30	Optimized	237.9117	-12.690505	392.94385	953.12989	0	233.88
31	Optimized	240.1477	-	356.28069	841.27176	0	229.11

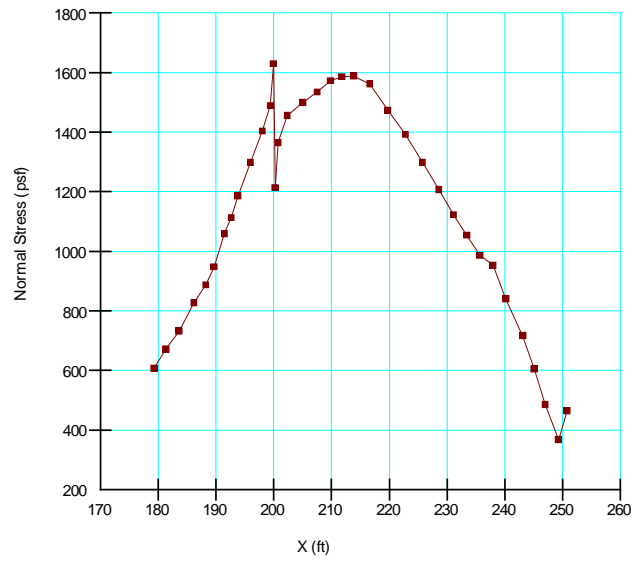
			12.103035				
32	Optimized	243.0818	-10.792155	274.50731	716.9906	0	223.32
33	Optimized	245.04895	-9.664187	204.10222	605.3305	0	220.21
34	Optimized	246.96635	-8.257522	116.31259	486.30763	0	220
35	Optimized	249.27675	-6.48084	5.427365	367.99896	0	220
36	Optimized	250.72595	-5.274.509461	464.55627	0	600	

Slices of Slip Surface: **387**

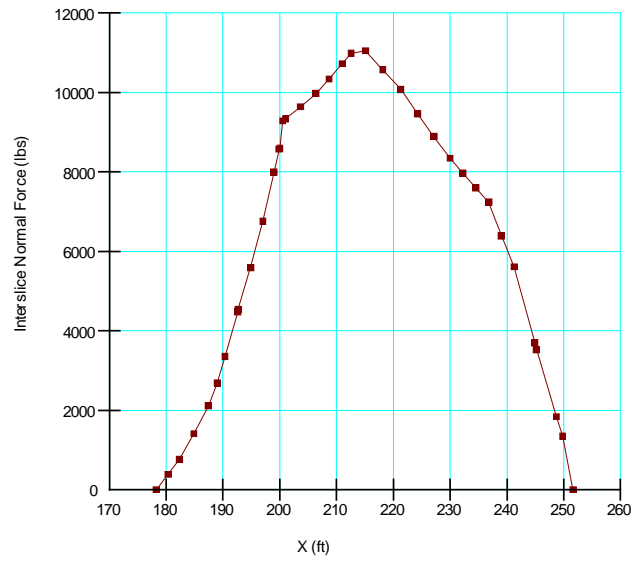
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	387	180.33345	-1.845113	614.32447	426.70504	0	609.79
2	387	181.95515	-2.7966205	673.69917	617.22458	0	250
3	387	184.40265	-4.1557345	758.47431	754.32589	0	250
4	387	186.85015	-5.403308	836.34112	884.15722	0	250
5	387	188.53695	-6.21222	886.8011	975.90233	0	235.03
6	387	190.85	-7.2012845	948.5237	1113.9621	0	242.93
7	387	194.275	-8.553824	1032.9077	1323.8882	0	256.72
8	387	197.425	-9.6302845	1100.1142	1459.8606	0	270.83
9	387	199.5	-10.27485	1140.3749	1548.9147	0	280.73
10	387	200.25	-10.487855	1128.285	1165.7557	0	283.33
11	387	200.75	-10.624485	1132.8608	1313.6992	0	283.68
12	387	202.25	-11.002645	1159.2785	1418.1209	0	284.38
13	387	204.75	-11.580875	1198.5049	1479.542	0	284.8
14	387	207.25	-12.073525	360.77793	1530.9226	0	284.22
15	387	209.75	-12.48224	383.93057	1572.7334	0	282.72
16	387	212.3154	-12.814685	402.74697	1574.8793	0	280.32
17	387	214.94615	-13.067565	417.62379	1536.9207	0	277.09
18	387	217.5769	-13.231015	427.15748	1489.2983	0	273.17
19	387	220.2077	-13.305595	431.55629	1432.4522	0	268.68
20	387	222.83845	-13.291565	430.56682	1366.7932	0	263.72

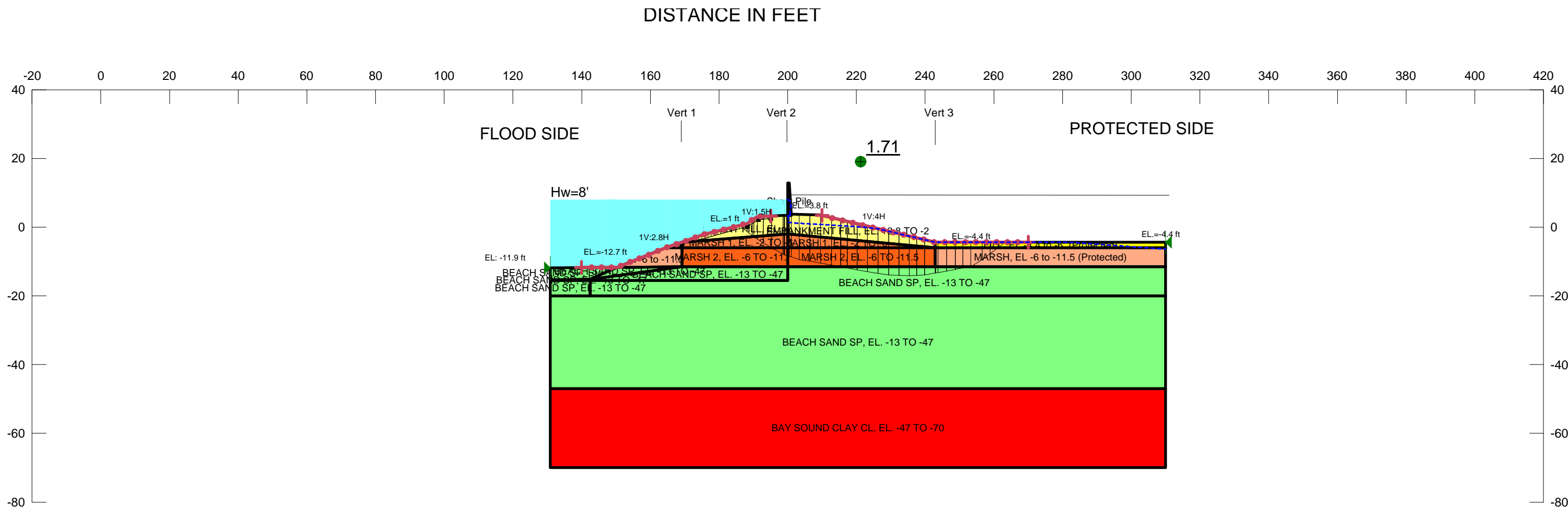
21	387	225.4692	-13.18887	424.15642	1292.66	0	258.41
22	387	228.1	-12.99716	412.21127	1210.4352	0	252.88
23	387	230.7308	-12.71578	394.65202	1120.5069	0	247.22
24	387	233.36155	-12.34375	371.4061	1023.195	0	241.59
25	387	235.9923	-11.879745	342.44863	918.83105	0	236.09
26	387	238.6231	-11.32208	307.6315	807.68873	0	230.87
27	387	241.25385	-10.66868	266.82298	690.14048	0	226.07
28	387	243.8846	-9.917028	219.89766	566.47963	0	221.85
29	387	246.6898	-9.000209	162.65453	467.09663	0	220
30	387	249.6694	-7.8992095	93.926575	388.81466	0	220
31	387	252.649	-6.6571485	16.402453	299.01252	0	220
32	387	255.75615	-5.2	-74.539662	286.68675	0	600

Base Normal Stress Vs. X



Interslice Normal Stress Vs. X





Name: EMBANKMENT FILL, EL. +3.8 TO -2 Model: Spatial Mohr-Coulomb Unit Weight: 107 pcf Cohesion Fn: Fill Phi: 0 °
Name: MARSH 1, EL. -2 TO -6 Model: Spatial Mohr-Coulomb Unit Weight: 80 pcf Cohesion Fn: Marsh 1&2 Phi: 0 °
Name: BEACH SAND SP, EL. -13 TO -47 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand
Name: BAY SOUND CLAY CL, EL. -47 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 108 pcf Cohesion Spatial Fn: Clay Cohesion Phi: 0 °
Name: MARSH 2, EL. -6 TO -11.5 Model: Spatial Mohr-Coulomb Weight Fn: Marsh 2 Cohesion Fn: Marsh 1&2 Phi: 0 °
Name: Sheet Pile Model: Undrained (Phi=0) Unit Weight: 0.1 pcf Cohesion: 0.01 psf
Name: FILL, EL -4.4 to -6 (Protected) Model: Undrained (Phi=0) Unit Weight: 107 pcf Cohesion: 600 psf
Name: MARSH, EL -6 to -11.5 (Protected) Model: Spatial Mohr-Coulomb Unit Weight: 80 pcf Cohesion: 220 psf Phi: 0 °

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.

H_w=CANAL WATER LEVEL

LONDON AVE OUTFALL CANAL, REACH 14,
PROTECTED SIDE STABILITY ANALYSIS,
CASE: Global Stability (Entry/Exit) OPEN
STA. 96+00 TO 100+28
ORLEANS PARISH, LOUISIANA

Name: Global Stability (Entry/Exit) OPEN
File Name: Reach 14 OPEN-SP.gsz Directory: Y:\Middleton\London Ave Canal\seepage test\14 and 15\
Last Edited By: Middleton, Mark C MVN

Global Stability (Entry/Exit) OPEN

Report generated using GeoStudio 2007, version 7.19. Copyright © 1991-2012 GEO-SLOPE International Ltd.

File Information

Created By: Liljegren, James
Revision Number: 293
Last Edited By: Middleton, Mark C MVN
Date: 6/27/2013
Time: 10:59:15 AM
File Name: Reach 14 OPEN-SP.gsz
Directory: Y:\Middleton\London Ave Canal\seepage test\14 and 15\
Last Solved Date: 6/27/2013
Last Solved Time: 11:00:08 AM

Project Settings

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

Analysis Settings

Global Stability (Entry/Exit) OPEN

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

Phi: 0 °
Phi-B: 0 °

Sheet Pile

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

FILL, EL -4.4 to -6 (Protected)

Model: Undrained (Phi=0)
Unit Weight: 107 pcf
Cohesion: 600 psf

MARSH, EL -6 to -11.5 (Protected)

Model: Spatial Mohr-Coulomb
Unit Weight: 80 pcf
Cohesion: 220 psf
Phi: 0 °
Phi-B: 0 °

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (139.98064, -11.78207) ft
Left-Zone Right Coordinate: (195, 3.25) ft
Left-Zone Increment: 20
Right Projection: Range
Right-Zone Left Coordinate: (210.00041, 3.38172) ft
Right-Zone Right Coordinate: (270, -4.4) ft
Right-Zone Increment: 20
Radius Increments: 10

Slip Surface Limits

Left Coordinate: (130.9, -11.9) ft
Right Coordinate: (310, -4.4) ft

Tension Crack Line

	X (ft)	Y (ft)
	169.20482	-5.1
	188.3	0.2
	191.5	2.2
	195	2.5

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

Materials

EMBANKMENT FILL, EL. +3.8 TO -2

Model: Spatial Mohr-Coulomb
Unit Weight: 107 pcf
Cohesion Fn: Fill
Phi: 0 °
Phi-B: 0 °

MARSH 1, EL. -2 TO -6

Model: Spatial Mohr-Coulomb
Unit Weight: 80 pcf
Cohesion Fn: Marsh 1&2
Phi: 0 °
Phi-B: 0 °

BEACH SAND SP, EL. -13 TO -47

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

BAY SOUND CLAY CL, EL. -47 TO -70

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

MARSH 2, EL. -6 TO -11.5

Model: Spatial Mohr-Coulomb
Weight Fn: Marsh 2
Cohesion Fn: Marsh 1&2

Cohesion Functions

Marsh 1&2

Model: Spline Data Point Function
Function: Cohesion vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 220
Data Points: X (ft), Cohesion (psf)
 Data Point: (169.2, 220)
 Data Point: (200, 250)
 Data Point: (242.9, 220)

Fill

Model: Spline Data Point Function
Function: Cohesion vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 600
Data Points: X (ft), Cohesion (psf)
 Data Point: (169.2, 600)
 Data Point: (200, 700)
 Data Point: (242.9, 600)

Shear/Normal Strength Functions

Sand

Model: Spline Data Point Function
Function: Shear Stress vs. Normal Stress
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
 Data Point: (-100000, 0)
 Data Point: (0, 0)
 Data Point: (100000, 57735)
Estimation Properties
 Intact Rock Param.: 10
 Geological Strength: 100
 Disturbance Factor: 0
 SigmaC: 600000 psf
 Sigma3: 300000 psf
 Num. Points: 20

Unit Weight Functions

Marsh 2
Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 80
Data Points: X (ft), Unit Weight (pcf)
Data Point: (169.2, 80)
Data Point: (200, 109)
Data Point: (242.9, 80)

Spatial Functions

Clay Cohesion
Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (100.5, -47, 630)
Data Point: (100.5, -70, 900)
Data Point: (169.2, -47, 630)
Data Point: (169.2, -70, 900)
Data Point: (200, -47, 705)
Data Point: (200, -70, 935)
Data Point: (242.9, -47, 630)
Data Point: (242.9, -70, 900)
Data Point: (310, -47, 630)
Data Point: (310, -70, 900)

Regions

	Material	Points	Area (ft²)
Region 1	MARSH 1, EL. -2 TO -6	3,28,34	3.76
Region 2	MARSH 1, EL. -2 TO -6	12,32,13	85.8
Region 3	BEACH SAND SP, EL. -13 TO -47	29,35,14,15,48	180.605
Region 4	BAY SOUND CLAY CL, EL. -47 TO -70	10,11,17,18	4119.3
Region 5	FILL, EL. -4.4 to -6 (Protected)	27,25,19,7,32	107.34186
Region 6	BEACH SAND SP, EL. -13 TO -47	36,11,10,37,49	4835.7
Region 7	EMBANKMENT FILL, EL. +3.8 TO -2	24,23,4,26,5,31,12,28	105.99085
Region 8	EMBANKMENT FILL, EL. +3.8 TO -2	31,30,20,6,27,32,12	191.10273
Region 9	MARSH, EL.-6 to -11.5 (Protected)	16,3,34,35	65.37

Region 10	BEACH SAND SP, EL. -13 TO -47	1,21,22,16,2,29	53.34
Region 11	MARSH 1, EL. -2 TO -6	12,13,34,28	86.22286
Region 12	MARSH, EL.-6 to -11.5 (Protected)	32,7,9,33	369.05
Region 13	BEACH SAND SP, EL. -13 TO -47	15,14,33,9,36,49,48	1193.75
Region 14	Sheet Pile	31,44,45,20,30	7.225
Region 15	MARSH 2, EL. -6 TO -11.5	34,13,46,47,14,35	169.4
Region 16	MARSH 2, EL. -6 TO -11.5	13,32,33,14,47,46	235.95
Region 17	BEACH SAND SP, EL. -13 TO -47	29,2,16,35	32.245
Region 18	BEACH SAND SP, EL. -13 TO -47	8,48,49,37	52.2
Region 19	BEACH SAND SP, EL. -13 TO -47	1,29,48,8	2.9

Points

	X (ft)	Y (ft)
Point 1	130.9	-15.3
Point 2	148.1	-12.7
Point 3	164.5	-6
Point 4	191.1	3.1
Point 5	198.9	3.4
Point 6	209.5	3.5
Point 7	310	-6
Point 8	130.9	-15.5
Point 9	310	-11.5
Point 10	130.9	-47
Point 11	310	-47
Point 12	200	-2
Point 13	200	-6
Point 14	200	-11.5
Point 15	200	-15.5
Point 16	150.3	-11.7
Point 17	310	-70
Point 18	130.9	-70
Point 19	310	-4.4
Point 20	201	3.8
Point 21	130.9	-11.9
Point 22	146.3	-11.7

Point 23	188.1	1
Point 24	175.3	-2.2
Point 25	243.1	-4.4
Point 26	198.6	3.38846
Point 27	242.92268	-4.4
Point 28	169.20857	-4.4
Point 29	142.5	-15.2
Point 30	201	3.4
Point 31	200	3.4
Point 32	242.9	-6
Point 33	242.9	-11.5
Point 34	169.2	-6
Point 35	169.2	-11.5
Point 36	310	-20
Point 37	130.9	-20
Point 38	169.2	-47
Point 39	200	-47
Point 40	242.9	-47
Point 41	169.2	-70
Point 42	200	-70
Point 43	242.9	-70
Point 44	200	12.9
Point 45	200.5	12.9
Point 46	200	-6.9
Point 47	200	-10.3
Point 48	142.5	-15.5
Point 49	142.5	-20

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.71	(230.878, 58.751)	30.34812	(186.735, 0.658723)	(263.27, -4.4)
2	4140	1.84	(230.878, 58.751)	72.73	(187.89, 0.94746)	(266.955, -4.4)

Slices of Slip Surface: Optimized

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	187.41745	0.76269705	449.71861	295.62024	0	659.15
2	Optimized	188.8683	1.8856585	440.25627	448.16099	0	663.86
3	Optimized	189.85645	2.6269095	443.10779	596.85953	0	667.07
4	Optimized	190.58815	3.114764	467.95019	794.93419	0	240.83
5	Optimized	191.9679	4.0347195	529.94328	896.24453	0	242.18
6	Optimized	194.0773	-5.3067	621.53756	1014.6928	0	244.23
7	Optimized	196.9594	6.916185	748.20632	1158.2976	0	247.04
8	Optimized	198.75	7.916136	815.43266	1261.3174	0	248.78
9	Optimized	198.9593	8.033026	819.87483	1274.4123	0	248.99
10	Optimized	199.5093	8.2146135	829.92785	1358.2287	0	249.52
11	Optimized	200.25	8.4387175	598.31339	987.64302	0	249.83
12	Optimized	200.75	8.589999	607.69344	1119.7103	0	249.48
13	Optimized	202.17785	-9.02201	634.01668	1202.9414	0	248.48
14	Optimized	204.89175	-9.6502	668.48404	1290.9088	0	246.58

15	Optimiz ed	207.9639	- 10.19384	693.26051	1335.2052	0	244.43
16	Optimiz ed	211.129	- 10.75392	716.1648	1344.0142	0	242.22
17	Optimiz ed	214.0587	- 11.27109	736.22832	1320.0774	0	240.17
18	Optimiz ed	216.31255	11.66773 5	751.16532	1300.06	316.90451	-2.2487e- 005
19	Optimiz ed	218.74315	- 12.13712	769.61667	1285.9439	298.10165	-6.0288e- 005
20	Optimiz ed	221.6981	12.74041 5	794.05368	1282.396	281.94459	1.7012e- 005
21	Optimiz ed	224.72745	- 13.25329 5	812.43529	1284.036	272.27878	-1.9319e- 005
22	Optimiz ed	227.83115	- 13.67576 5	824.75846	1254.3454	248.02215	-1.3169e- 006
23	Optimiz ed	230.8626	- 13.96417 5	829.0537	1230.6387	231.85521	-1.645e- 005
24	Optimiz ed	233.8218	- 14.11852 5	825.24033	1170.6372	199.41497	-1.0587e- 006
25	Optimiz ed	236.4345	- 14.12922 5	814.07289	1125.3853	179.7363	-1.2751e- 005
26	Optimiz ed	238.7007	- 13.99627	795.48313	1045.652	144.43504	-7.6674e- 007
27	Optimiz ed	241.37825	- 13.64170 5	761.16042	946.5415	107.02982	2.9438e- 006
28	Optimiz ed	243.01135	- 13.33708 5	734.73361	861.63358	73.265729	-3.8897e- 007
29	Optimiz ed	243.39775	- 13.26501	728.47614	852.42572	71.56232	-3.7987e- 007

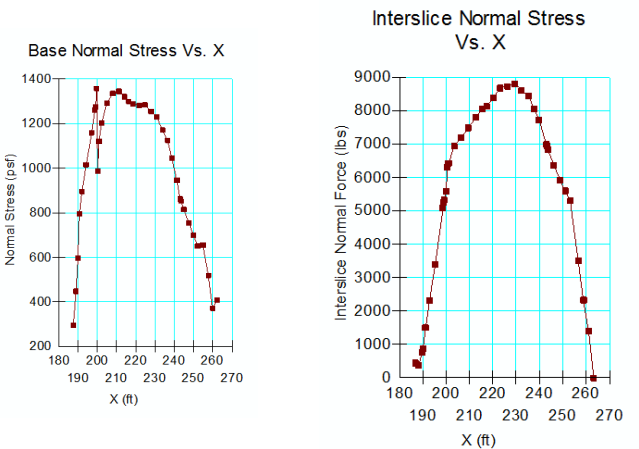
			5				
30	Optimiz ed	244.96845	- 12.97664	703.35981	815.06127	64.490863	-3.4244e- 007
31	Optimiz ed	247.51435	- 12.51096	662.713	755.55928	53.604823	7.7703e- 007
32	Optimiz ed	249.8947	- 12.08359	625.29322	700.22524	43.26202	2.8719e- 006
33	Optimiz ed	252.12325	11.69211 5	590.78784	650.39372	34.413471	4.9913e- 007
34	Optimiz ed	254.91905	-10.4589	495.31659	655.42047	0	220
35	Optimiz ed	257.73105	8.566972 5	355.48021	519.88848	0	220
36	Optimiz ed	260.00575	6.855657 5	231.87539	373.01006	0	220
37	Optimiz ed	262.2065	-5.2	84.158302	407.86605	0	600

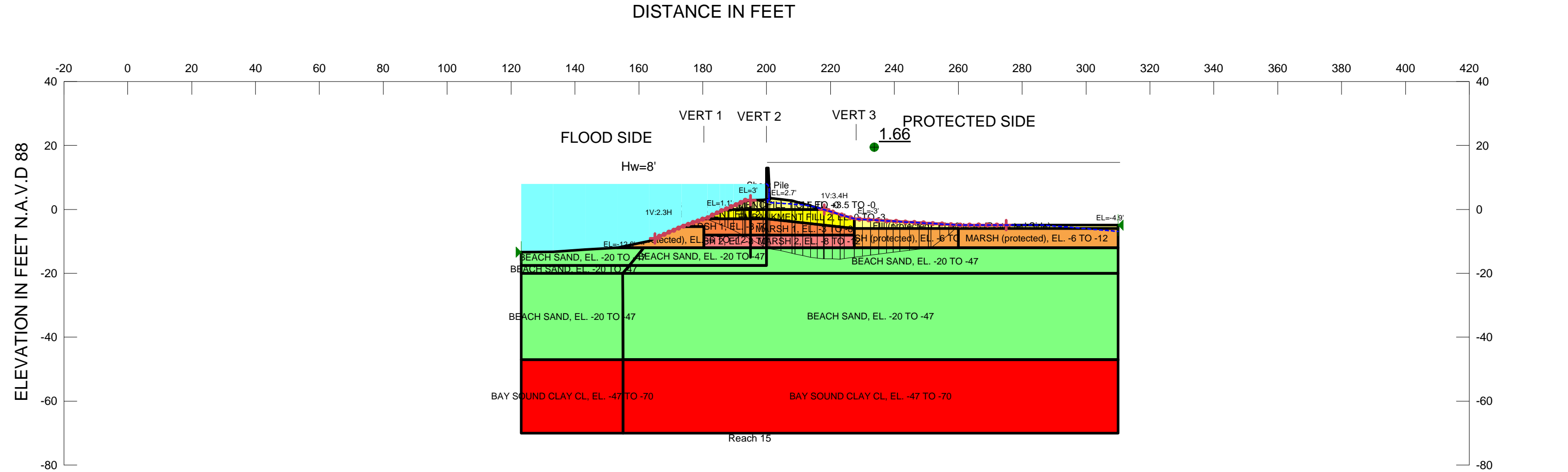
Slices of Slip Surface: 4140

	Slip Surfa ce	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	4140	187.9949	0.009445705	441.61555	124.17195	0	661.02
2	4140	189.6	-1.1017514	430.43008	440.44583	0	666.23
3	4140	191.4859	-2.3848895	446.30964	651.47179	0	672.36
4	4140	193.34365	-3.520704	521.51447	875.2133	0	243.52
5	4140	196.28735	-5.203933	666.09038	1014.3745	0	246.38
6	4140	198.1796	-6.2115935	769.76018	1104.0588	0	248.23
7	4140	198.75	-6.497047	807.36515	1135.7778	0	248.78
8	4140	199.45	-6.834462	863.84926	1173.825	0	249.46
9	4140	200.25	-7.2140935	519.85727	830.08823	0	249.83
10	4140	200.75	-7.443955	534.11971	968.13976	0	249.48
11	4140	202.41665	-8.160332	578.04463	1086.9435	0	248.31
12	4140	205.25	-9.296469	644.83078	1206.6259	0	246.33

13	4140	208.08335	-10.297692	699.42562	1308.8968	0	244.35
14	4140	210.777	-11.132685	741.53762	1364.4714	0	242.46
15	4140	213.33925	-11.81942	773.6643	1373.5071	346.3194	-7.0027e- 005
16	4140	215.90975	-12.40919	799.20084	1389.2839	340.68459	-6.8883e- 005
17	4140	218.48025	-12.90192	818.53281	1393.1503	331.75555	-6.7078e- 005
18	4140	221.05075	-13.299605	831.8628	1385.1146	319.42007	-6.4584e- 005
19	4140	223.62125	-13.603815	839.28352	1365.1034	303.58227	-6.138e- 005
20	4140	226.19175	-13.81572	840.92564	1332.9958	284.09686	-2.0152e- 005
21	4140	228.76225	-13.936135	836.79877	1288.5822	260.8373	1.5734e- 005
22	4140	231.33275	-13.965515	826.9832	1231.6829	233.65348	-1.2403e- 006
23	4140	233.90325	-13.90397	811.47453	1161.9591	202.35235	-1.0741e- 006
24	4140	236.47375	-13.751265	790.29813	1078.9945	166.67894	-8.8488e- 007
25	4140	239.04425	-13.506825	763.35789	982.38791	126.45704	3.4784e- 006
26	4140	241.6261	-13.16781	730.44175	870.90838	81.098448	2.2308e- 006
27	4140	243.01135	-12.95904	711.13133	809.21841	56.630602	3.7589e- 006
28	4140	244.2004	-12.738985	691.96996	783.05038	52.585304	7.6254e- 007
29	4140	246.4012	-12.293495	654.18839	729.29776	43.364414	2.8782e- 006
30	4140	248.602	-11.77653	611.92752	665.38194	30.861924	-3.5293e- 007
31	4140	251.13185	-11.08543	554.73046	639.68857	0	220
32	4140	253.9908	-10.191641	481.07408	574.19803	0	220
33	4140	256.8498	-9.165788	399.46277	497.60509	0	220
34	4140	259.70875	-8.0017675	309.86019	409.22083	0	220

35	4140	262.5677	-6.69219	211.95662	308.30483	0	220
36	4140	265.47595	-5.2	78.75868	305.7501	0	600





Name: EMBANKMENT FILL 1 CH, EL. +3.5 TO -0 Model: Undrained (Phi=0) Unit Weight: 113 pcf Cohesion: 1000 psf
Name: MARSH 1, EL. -3 TO -8 Model: Spatial Mohr-Coulomb Unit Weight: 87 pcf Cohesion Fn: Marsh 1 Phi: 0 °
Name: BEACH SAND, EL. -20 TO -47 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Beach Sand
Name: BAY SOUND CLAY CL, EL. -47 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 104 pcf Cohesion Spatial Fn: Bay Sound Phi: 0 °
Name: MARSH 2, EL. -8 TO -12 Model: Spatial Mohr-Coulomb Weight Fn: Marsh 2 Cohesion Fn: Marsh 2 Phi: 0 °
Name: Fill (protected) ,EL -3 to -6 (Protected Side) Model: Undrained (Phi=0) Unit Weight: 100 pcf Cohesion: 600 psf
Name: Sheet Pile Model: Undrained (Phi=0) Unit Weight: 0.1 pcf Cohesion: 0.01 psf
Name: EMBANKMENT FILL 2, EL. 0 TO -3 Model: Undrained (Phi=0) Unit Weight: 100 pcf Cohesion: 500 psf
Name: MARSH (protected), EL. -6 TO -12 Model: Undrained (Phi=0) Unit Weight: 87 pcf Cohesion: 250 psf

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

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

Hw=CANAL WATER LEVEL

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

LONDON AVE OUTFALL CANAL, REACH 15,
PROTECTED SIDE STABILITY ANALYSIS,
CASE: Global Stability (Entry/Exit)
STA. 100+28 TO 104+00
ORLEANS PARISH, LOUISIANA

Global Stability (Entry/Exit)

Report generated using GeoStudio 2007, version 7.19. Copyright © 1991-2012 GEO-SLOPE International Ltd.

File Information

Created By: Liljegren, James
Revision Number: 202
Last Edited By: Middleton, Mark C MVN
Date: 6/27/2013
Time: 9:01:54 AM
File Name: Reach 15 OPEN-SP.gsz
Directory: Y:\Middleton\London Ave Canal\seepage test\14 and 15\
Last Solved Date: 6/27/2013
Last Solved Time: 9:04:31 AM

Project Settings

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

Analysis Settings

Global Stability (Entry/Exit)

Kind: [SLOPE/W](#)
Parent: [Gap Stability \(Seepage\)](#)
Method: [Spencer](#)
Settings
 PWP Conditions Source: [Parent Analysis](#)
Slip Surface
 Direction of Movement: [Left to Right](#)
 Use Passive Mode: [No](#)
 Slip Surface Option: [Entry and Exit](#)
 Critical slip surfaces saved: [1](#)
 Optimize Critical Slip Surface Location: [Yes](#)
 Tension Crack
 Tension Crack Option: [\(none\)](#)
FOS Distribution
 FOS Calculation Option: [Constant](#)
Advanced

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

Materials

EMBANKMENT FILL 1 CH, EL. +3.5 TO -0

Model: [Undrained \(Phi=0\)](#)
Unit Weight: 113 pcf
Cohesion: 1000 psf

MARSH 1, EL. -3 TO -8

Model: [Spatial Mohr-Coulomb](#)
Unit Weight: 87 pcf
Cohesion Fn: [Marsh 1](#)
Phi: 0 °
Phi-B: 0 °

BEACH SAND, EL. -20 TO -47

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

BAY SOUND CLAY CL, EL. -47 TO -70

Model: [Spatial Mohr-Coulomb](#)
Unit Weight: 104 pcf
Cohesion Spatial Fn: [Bay Sound](#)
Phi: 0 °
Phi-B: 0 °

MARSH 2, EL. -8 TO -12

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

FILL (protected) ,EL -3 to -6 (Protected Side)

Model: [Undrained \(Phi=0\)](#)
Unit Weight: 100 pcf
Cohesion: 600 psf

Sheet Pile

Model: [Undrained \(Phi=0\)](#)
Unit Weight: 0.1 pcf
Cohesion: 0.01 psf

EMBANKMENT FILL 2, EL. 0 TO -3

Model: [Undrained \(Phi=0\)](#)
Unit Weight: 100 pcf
Cohesion: 500 psf

MARSH (protected), EL. -6 TO -12

Model: [Undrained \(Phi=0\)](#)
Unit Weight: 87 pcf
Cohesion: 250 psf

Slip Surface Entry and Exit

Left Projection: [Range](#)
Left-Zone Left Coordinate: (165, -9.10588) ft
Left-Zone Right Coordinate: (195, 2.9) ft
Left-Zone Increment: 20
Right Projection: [Range](#)
Right-Zone Left Coordinate: (218, -0.06186) ft
Right-Zone Right Coordinate: (275, -4.9) ft
Right-Zone Increment: 20
Radius Increments: 20

Slip Surface Limits

Left Coordinate: (123.2, -13.4) ft
Right Coordinate: (310, -4.9) ft

Cohesion Functions

Marsh 1

Model: [Spline Data Point Function](#)
Function: [Cohesion vs. X](#)
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 250

Data Points: X (ft), Cohesion (psf)
Data Point: (180.3, 250)
Data Point: (200, 400)
Data Point: (227.5, 250)

Marsh 2

Model: [Spline Data Point Function](#)
Function: [Cohesion vs. X](#)
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 250
Data Points: X (ft), Cohesion (psf)
Data Point: (180.3, 250)
Data Point: (200, 400)
Data Point: (227.5, 250)

Shear/Normal Strength Functions

Beach Sand

Model: [Spline Data Point Function](#)
Function: [Shear Stress vs. Normal Stress](#)
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 0
Data Points: [Normal Stress \(psf\)](#), [Shear Stress \(psf\)](#)
Data Point: (-100000, 0)
Data Point: (0, 0)
Data Point: (100000, 57735)
Estimation Properties
 Intact Rock Param.: 10
 Geological Strength: 100
 Disturbance Factor: 0
 SigmaC: 600000 psf
 Sigma3: 300000 psf
 Num. Points: 20

Unit Weight Functions

Marsh 2

Model: [Spline Data Point Function](#)
Function: [Unit Weight vs. X](#)
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 88
Data Points: X (ft), Unit Weight (pcf)

Data Point: (180.3, 88)
Data Point: (200, 109)
Data Point: (227.5, 88)

Spatial Functions

Bay Sound

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (0, -47, 640)
Data Point: (0, -70, 850)
Data Point: (180.3, -47, 640)
Data Point: (180.3, -70, 850)
Data Point: (400, -47, 640)
Data Point: (400, -70, 850)
Data Point: (200, -47, 680)
Data Point: (200, -70, 890)
Data Point: (227.5, -47, 640)
Data Point: (227.5, -70, 850)

Regions

	Material	Points	Area (ft²)
Region 1	EMBANKMENT FILL 1 CH, EL. +3.5 TO -0	30,36,50,3,41,4,28,20	28.44
Region 2	MARSH 1, EL. -3 TO -8	47,46,45,21,11,12,22,31	106.78
Region 3	Fill (protected), EL -3 to -6 (Protected Side)	15,37,6,7,58,16	121.625
Region 4	MARSH 2, EL. -8 TO -12	31,22,12,13,23,48	78.8
Region 5	BEACH SAND, EL. -20 TO -47	27,24,13,17,59,8,34,33,32	989.9375
Region 6	MARSH (protected), EL. -6 TO -12	16,58,59,17,44	195
Region 7	BEACH SAND, EL. -20 TO -47	13,24,27,57,48,23	223.7125
Region 8	EMBANKMENT FILL 2, EL. 0 TO -3	21,11,28,20,30,51,35,45	48.875
Region 9	EMBANKMENT FILL 1 CH, EL. +3.5 TO -0	28,4,26,38,5,29	38.03
Region 10	EMBANKMENT FILL 2, EL. 0 TO -3	11,28,29,15,16	109.2
Region 11	BEACH SAND, EL. -20 TO -47	9,32,33,34,10,18,14	4183.65
Region 12	BAY SOUND CLAY CL, EL. -47 TO -70	9,14,18,10,40,39	3562.7
Region 13	MARSH 2, EL. -8 TO -12	12,44,17,13	110
Region 14	Sheet Pile	4,42,43,38,26	7.45
Region 15	MARSH 1, EL. -3 TO -8	12,11,16,44	96.25
Region 16	MARSH (protected), EL. -6 TO -12	49,2,46,47,31,48,57	100.41

Region 17	BAY SOUND CLAY CL, EL. -47 TO -70	55,9,39,56	733.7
Region 18	BEACH SAND, EL. -20 TO -47	54,32,9,55	859.95
Region 19	BEACH SAND, EL. -20 TO -47	53,27,32,54	82.0625
Region 20	BEACH SAND, EL. -20 TO -47	52,1,19,49,57,27,53	172.6875
Region 21	MARSH (protected), EL. -6 TO -12	58,7,8,59	300

Points

	X (ft)	Y (ft)
Point 1	133.2	-13.3
Point 2	163.2	-9.9
Point 3	195	2.9
Point 4	200	3.1
Point 5	208	2.7
Point 6	310	-4.9
Point 7	310	-6
Point 8	310	-12
Point 9	155.1	-47
Point 10	310	-47
Point 11	200	-3
Point 12	200	-8
Point 13	200	-12
Point 14	200	-47
Point 15	227.5	-3
Point 16	227.5	-6
Point 17	227.5	-12
Point 18	231.5	-47
Point 19	143.2	-12.6
Point 20	195	0
Point 21	195	-3
Point 22	195	-8
Point 23	195	-12
Point 24	200	-17.5
Point 25	195	-15
Point 26	201	3.1
Point 27	157.05	-17.5

Point 28	200	0
Point 29	217.8	0
Point 30	187	0
Point 31	180.3	-8
Point 32	155	-20
Point 33	200	-20
Point 34	310	-20
Point 35	181.5	-2.6
Point 36	189.6	1.1
Point 37	260	-4.9
Point 38	201	3.5
Point 39	155.1	-70
Point 40	310	-70
Point 41	198.9	3
Point 42	200	12.9
Point 43	200.5	12.9
Point 44	227.5	-8
Point 45	180.3	-3
Point 46	173.4	-5.4
Point 47	180.3	-5.4
Point 48	180.3	-12
Point 49	153.2	-12
Point 50	193.5	2.9
Point 51	185.3	-0.7
Point 52	123.2	-13.4
Point 53	123.2	-17.5
Point 54	123.2	-20
Point 55	123.2	-47
Point 56	123.2	-70
Point 57	161.6	-12
Point 58	260	-6
Point 59	260	-12

Critical Slip Surfaces

	Slip	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
--	------	-----	-------------	-------------	------------	-----------

	Surface					
1	Optimized	1.66	(222.812, 53.74)	31.15991	(180.699, -2.86691)	(260.404, -4.9)
2	5173	1.76	(222.812, 53.74)	69.774	(181.589, -2.55536)	(260.625, -4.9)

Slices of Slip Surface: Optimized

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimiz ed	180.8676	- 2.93345 25	667.18693	552.90437	0	500
2	Optimiz ed	181.26795	3.09173 8	650.96704	612.51219	0	257.37
3	Optimiz ed	183.4	- 3.93465 9	638.19545	709.21482	0	273.6
4	Optimiz ed	186.15	- 5.02189 75	656.33101	852.22377	0	294.54
5	Optimiz ed	187.42075	- 5.52430 65	671.29142	914.66302	0	304.22
6	Optimiz ed	188.72075	- 6.12488 25	693.13751	963.83539	0	314.12
7	Optimiz ed	191.0588	- 7.27955 25	743.26845	1106.8818	0	331.92
8	Optimiz ed	192.8306	- 8.15458 5	785.44222	1220.0421	0	345.41
9	Optimiz ed	193.3218	- 8.40964 55	798.22903	1232.8823	0	349.15
10	Optimiz ed	194.25	-	824.89996	1301.083	0	356.22

	ed		8.933021				
11	Optimized	196.95	10.455461	1022.9892	1451.7772	0	376.78
12	Optimized	199.2946	-11.7775	1139.3989	1590.0592	0	394.63
13	Optimized	199.8393	12.084645	1203.0348	1660.922	264.36133	1.5958e-005
14	Optimized	199.9947	12.170135	1230.808	1803.6046	330.70427	-2.3464e-005
15	Optimized	200.25	12.21091	960.1501	1358.185	229.80556	-1.2203e-006
16	Optimized	200.75	12.29077	910.79566	1518.9671	351.12794	-7.1018e-005
17	Optimized	202.715	12.604625	927.2449	1574.8884	373.91714	-7.5629e-005
18	Optimized	206.215	13.31312	957.85847	1578.7763	358.48709	-7.2515e-005
19	Optimized	208.4725	13.86273	981.20146	1603.6863	359.3918	-7.2694e-005
20	Optimized	210.1618	14.221415	995.03109	1608.9324	354.43611	-2.5152e-005
21	Optimized	212.59535	-14.7087	1012.8002	1590.2366	333.38303	-2.3656e-005
22	Optimized	214.80905	15.069285	1023.5945	1592.2747	328.32767	-6.6401e-005
23	Optimized	216.803	15.303175	1027.5295	1556.0628	305.14889	-2.1652e-005

24	Optimized	217.94705	15.43737	1029.764	1535.3422	291.89572	-2.0711e-005
25	Optimized	219.32845	-15.4801	1024.9854	1528.1836	290.52161	1.7527e-005
26	Optimized	221.79715	15.53106	1014.8606	1452.2482	252.52583	-1.7917e-005
27	Optimized	223.6962	15.46482	1000.4352	1429.7892	247.88767	-1.3159e-006
28	Optimized	225.93045	15.17063	969.94406	1309.5193	196.05383	-1.0406e-006
29	Optimized	228.76075	14.805525	931.80736	1194.6722	151.7651	-8.0558e-007
30	Optimized	231.28225	14.480255	897.82333	1137.5602	138.41213	-7.348e-007
31	Optimized	233.8037	14.154985	863.79997	1080.4875	125.10458	-6.6402e-007
32	Optimized	236.32515	13.829715	829.81595	1023.4148	111.77433	-5.9323e-007
33	Optimized	238.6183	13.54226	799.43611	971.13193	99.128626	-5.261e-007
34	Optimized	240.6831	13.29262	772.65522	926.60929	88.885427	2.4449e-006
35	Optimized	243.209	12.98845	739.96218	872.22531	76.362153	2.1002e-006
36	Optimized	246.19595	12.629755	701.40344	808.2045	61.661623	-3.2734e-007
37	Optimized	249.18285	-	662.81146	744.15046	46.961093	6.8112e-

	ed		12.27106				007
38	Optimized	251.0793	12.049235	638.6754	702.71198	36.971535	2.4541e-006
39	Optimized	252.8679	10.978427	554.65115	772.96481	0	250
40	Optimized	255.63455	8.9251425	395.70829	561.5098	0	250
41	Optimized	258.0886	6.950095	243.23073	389.20266	0	250
42	Optimized	259.5808	5.6288335	112.07509	477.27019	0	600
43	Optimized	260.20195	5.0788335	26.797487	413.86159	0	600

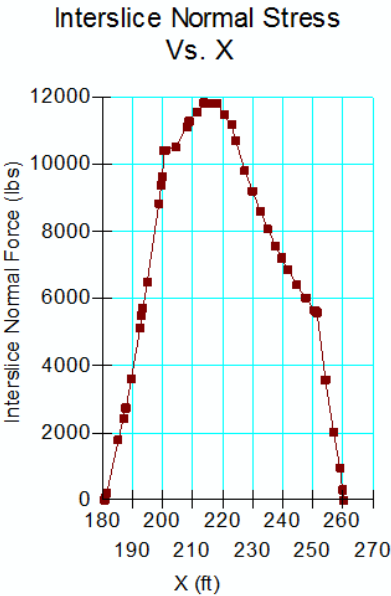
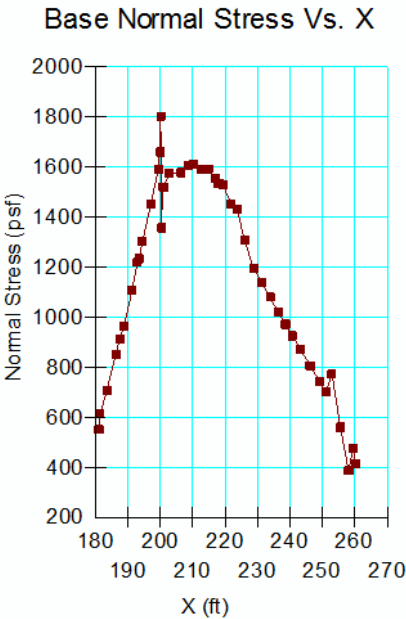
Slices of Slip Surface: 5173

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	5173	181.8964	2.7776805	635.23171	441.96913	0	500
2	5173	183.75175	4.0465375	638.00709	665.43128	0	276.28
3	5173	186.15	5.6180715	687.64639	848.99806	0	294.54
4	5173	188.3	6.883143	735.64508	1000.9038	0	310.91
5	5173	189.9529	7.811609	775.86477	1118.3382	0	323.5
6	5173	191.9029	-	819.80763	1263.3474	0	338.35

			8.7894715				
7	5173	194.25	9.9154665	876.2358	1439.5302	0	356.22
8	5173	196.95	-11.0306	1029.1956	1573.1072	0	376.78
9	5173	199.1648	11.904605	1130.1244	1684.573	0	393.64
10	5173	199.7148	12.100045	1174.1464	1724.7395	317.88508	-6.4273e-005
11	5173	200.25	12.28552	962.87417	1320.1882	206.29533	-1.0949e-006
12	5173	200.75	12.45427	921.08793	1481.4631	323.53274	-6.5405e-005
13	5173	202.16665	12.899035	947.00761	1564.5091	356.51467	-7.2071e-005
14	5173	204.5	13.57784	981.79496	1624.277	370.93719	-7.4987e-005
15	5173	206.83335	14.16971	1008.5301	1674.4311	384.45812	-7.7719e-005
16	5173	209.225	14.687455	1029.0128	1694.6703	384.31755	-7.7686e-005
17	5173	211.675	15.12879	1043.9478	1683.6373	369.32492	-7.4656e-005
18	5173	214.125	15.480625	1052.9649	1660.9307	351.0092	-7.0952e-005
19	5173	216.575	15.74432	1056.3246	1626.4	329.13319	-6.6533e-005
20	5173	219.0125	15.92041	1054.1859	1580.4964	303.86556	-6.1424e-005
21	5173	221.4375	16.010435	1046.7245	1523.1268	275.051	-1.9507e-005
22	5173	223.8625	-	1033.9446	1453.5671	242.26917	-1.2858e-

			16.01607				006
23	5173	226.2875	- 15.93733	1015.8916	1371.4907	205.30525	-1.0896e- 006
24	5173	228.8353	- 15.76112 5	991.07041	1305.1375	181.32675	-9.6231e- 007
25	5173	231.50595	- 15.47768 5	958.90564	1263.073	175.61113	-1.2455e- 005
26	5173	234.1766	- 15.08949	920.16913	1206.8561	165.5188	-8.7837e- 007
27	5173	236.8472	- 14.59475 5	874.78827	1135.6476	150.60718	-7.9927e- 007
28	5173	239.5178	- 13.99114 5	822.63833	1048.6203	130.47075	-6.9239e- 007
29	5173	242.18845	- 13.27570 5	763.44912	944.56325	104.56629	2.8751e- 006
30	5173	244.8591	- 12.44481	697.07578	822.19559	72.237955	1.9855e- 006
31	5173	247.46115	- 11.52154	622.02529	763.44503	0	250
32	5173	249.9947	- 10.50710 9	537.69636	666.12262	0	250
33	5173	252.5283	- 9.374700 5	444.66124	557.50493	0	250
34	5173	255.06185	- 8.117821 5	342.40045	436.78974	0	250
35	5173	257.5954	- -6.72869	230.38025	303.04637	0	250
36	5173	259.4311	- 5.649211 5	115.96183	347.90792	0	600
37	5173	260.31255	- 5.099211	29.766454	293.72553	0	600

			5				
--	--	--	---	--	--	--	--



Global Stability (Block)

Report generated using GeoStudio 2007, version 7.15. Copyright © 1991-2009 GEO-SLOPE International Ltd.

File Information

Created By: Liljegren, James
Revision Number: 249
Last Edited By: Curran, Matthew MVN
Date: 3/4/2013
Time: 1:24:30 PM
File Name: Reach 16.gsz
Directory: C:\Users\B2EDFMJC\Desktop\Chrono Order\Reach 16 SlopeW\
Last Solved Date: 3/4/2013
Last Solved Time: 1:30:07 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 Stability (Seepage)
Method: Spencer
Settings
 PWP Conditions Source: Parent Analysis
SlipSurface
 Direction of movement: Left to Right
 Use Passive Mode: No
 Slip Surface Option: Block
 Critical slip surfaces saved: 1
 Optimize Critical Slip Surface Location: Yes
Tension Crack
 Tension Crack Option: Search for Tension Crack
 Percentage Wet: 1
 Tension Crack Fluid Unit Weight: 62.4 pcf
FOS Distribution

Phi-B: 0 °

MARSH 2, EL. -7.5 to -12

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

Sheet Pile

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

EMBANKMENT FILL 2, EL. -1 TO -4

Model: Undrained (Phi=0)
Unit Weight: 90 pcf
Cohesion: 300 psf

Fill, EL. -3.5 to -6 (Protected)

Model: Undrained (Phi=0)
Unit Weight: 90 pcf
Cohesion: 600 psf

Marsh, EL. -6 to -12 (Protected)

Model: Undrained (Phi=0)
Unit Weight: 80 pcf
Cohesion: 200 psf

BAY SOUND CLAY CL, EL. -46 TO -70 (Protected)

Model: Spatial Mohr-Coulomb
Unit Weight: 104 pcf
Cohesion Fn: Clay 2
Phi: 0 °
Phi-B: 0 °

Slip Surface Limits

Left Coordinate: (143.6, -13.3) ft
Right Coordinate: (310, -4.7) ft

Slip Surface Block

Left Grid
 Upper Left: (185, -5) ft
 Lower Left: (185, -55) ft
 Lower Right: (210, -55) ft

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

Materials

EMBANKMENT FILL 1 CH, EL. +3.6 TO -1

Model: Undrained (Phi=0)
Unit Weight: 118 pcf
Cohesion: 1000 psf

MARSH 1, EL. -4 TO -7.5

Model: Spatial Mohr-Coulomb
Unit Weight: 80 pcf
Cohesion Fn: Marsh 1
Phi: 0 °
Phi-B: 0 °

BEACH SAND, EL. -24 TO -46

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

BAY SOUND CLAY CL, EL. -46 TO -70

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

Silted-in Layer

Model: Mohr-Coulomb
Unit Weight: 90 pcf
Cohesion: 0 psf
Phi: 20 °

X Increments: 5
Y Increments: 10
Starting Angle: 120 °
Ending Angle: 145 °
Angle Increments: 5
Right Grid
 Upper Left: (220, -5) ft
 Lower Left: (220, -55) ft
 Lower Right: (270, -55) ft
X Increments: 10
Y Increments: 10
Starting Angle: 25 °
Ending Angle: 45 °
Angle Increments: 4

Cohesion Functions

Marsh 1

Model: Spline Data Point Function
Function: Cohesion vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 200
Data Points: X (ft), Cohesion (psf)
 Data Point: (166.6, 200)
 Data Point: (200, 450)
 Data Point: (231.4, 200)

Marsh 2

Model: Spline Data Point Function
Function: Cohesion vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 200
Data Points: X (ft), Cohesion (psf)
 Data Point: (166.6, 200)
 Data Point: (200, 250)
 Data Point: (231.4, 200)

Clay 2

Model: Spline Data Point Function
Function: Cohesion vs. Y
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 650
Data Points: Y (ft), Cohesion (psf)

Data Point: (-70, 865)
Data Point: (-46, 650)

Shear/Normal Strength Functions

Beach Sand

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

Y-Intercept: 0

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

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

Estimation Properties

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

Unit Weight Functions

Marsh 2

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

Y-Intercept: 80

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

Data Point: (166.7, 80)
Data Point: (200, 97)
Data Point: (231.4, 80)

Spatial Functions

Clay 1 Cohesion

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (166.7, -46, 650)

Data Point: (166.7, -70, 865)
Data Point: (200, -46, 665)
Data Point: (200, -70, 885)
Data Point: (231.4, -46, 650)
Data Point: (231.4, -70, 865)
Data Point: (310, -46, 650)
Data Point: (310, -70, 865)
Data Point: (143.6, -46, 650)
Data Point: (143.6, -70, 865)

Regions

	Material	Points	Area (ft²)
Region 1	EMBANKMENT FILL 1 CH, EL. +3.6 TO -1	55,30,4,5,33,24,21	50.995458
Region 2	Marsh, EL. -6 to -12 (Protected)	25,3,8,28,35,41,42,43	100.17577
Region 3	Fill, EL. -3.5 to -6 (Protected)	36,31,32,7,9,18	110.58019
Region 4	Marsh, EL. -6 to -12 (Protected)	18,9,19,38,37	471.6
Region 5	Silted-in Layer	52,20,3,25,51	29.215
Region 6	EMBANKMENT FILL 2, EL. -1 TO -4	35,12,24,21,55,29	69.918042
Region 7	EMBANKMENT FILL 1 CH, EL. +3.6 TO -1	24,33,34,23,6,56	69.275
Region 8	EMBANKMENT FILL 2, EL. -1 TO -4	12,24,56,36,18	114.85463
Region 9	BEACH SAND, EL. -24 TO -46	10,26,44,39,40,27,11,47,17,45	3928.9
Region 10	MARSH 1, EL. -4 TO -7.5	35,12,13,42,41	133.23846
Region 11	MARSH 2, EL. -7.5 to -12	42,43,14,54,13	141.525
Region 12	BEACH SAND, EL. -24 TO -46	25,43,14,22,51	280.301
Region 13	Sheet Pile	33,49,50,23,34	7.675
Region 14	MARSH 1, EL. -4 TO -7.5	12,18,37,13	86.35
Region 15	MARSH 2, EL. -7.5 to -12	14,54,13,37,38	133.45
Region 16	BEACH SAND, EL. -24 TO -46	39,44,26,1,2,51,22,14,38,19,27,40	1411.969
Region 17	Silted-in Layer	52,51,2,1	9.15

Region 18	BAY SOUND CLAY CL, EL. -46 TO -70	45,17,47,48,53,46	1552.8
Region 19	BAY SOUND CLAY CL, EL. -46 TO -70 (Protected)	47,48,15,11	1886.4
Region 20	BAY SOUND CLAY CL, EL. -46 TO -70 (Protected)	10,16,46,45	554.4

Points

	X (ft)	Y (ft)
Point 1	143.6	-20
Point 2	146.9	-20
Point 3	149.7	-10
Point 4	195	2.8
Point 5	199	2.9
Point 6	208	3.5
Point 7	310	-4.7
Point 8	156.1	-6.4
Point 9	310	-6
Point 10	143.6	-46
Point 11	310	-46
Point 12	200	-4
Point 13	200	-7.5
Point 14	200	-12
Point 15	310	-70
Point 16	143.6	-70
Point 17	200	-46
Point 18	231.4	-6
Point 19	310	-12
Point 20	143.6	-13.3
Point 21	195	-1
Point 22	200	-17.4
Point 23	201	3.6
Point 24	200	-1
Point 25	149.5	-12
Point 26	143.6	-22

Point 27	310	-22
Point 28	165.3	-3.7
Point 29	176.2	-2.4
Point 30	192.6	2.8
Point 31	231.5	-3.5
Point 32	245.2	-4.7
Point 33	200	2.9
Point 34	201	2.9
Point 35	166.66154	-3.5
Point 36	231.35185	-3.5
Point 37	231.4	-8
Point 38	231.4	-12
Point 39	200	-24
Point 40	231.4	-22
Point 41	166.7	-6
Point 42	166.7	-8
Point 43	166.7	-12
Point 44	166.7	-22
Point 45	166.7	-46
Point 46	166.7	-70
Point 47	231.4	-46
Point 48	231.4	-70
Point 49	200	12.9
Point 50	200.5	12.9
Point 51	147.62	-17.5
Point 52	143.6	-17.5
Point 53	200	-70
Point 54	200	-11.6
Point 55	180.71818	-1
Point 56	222.9	-1

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.50	(219.201, -	20.53735	(192.918,	(244.881, -

			0.094)		2.8)	4.67201)
2	3042	1.88	(219.201, -0.094)	20.317	(193.698, 2.8)	(244.314, -4.62242)

Slices of Slip Surface: **Optimized**

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimize d	193.8738	-3.2816495	369.32886	598.83649	0	300
2	Optimize d	194.9146	3.9797445	421.60484	815.04501	0	411.94
3	Optimize d	195.37985	-4.2918	461.03811	836.01695	0	415.42
4	Optimize d	196.56975	-5.197197	581.17264	851.04233	0	424.32
5	Optimize d	198.1899	-6.498471	754.89403	941.31971	0	436.45
6	Optimize d	199.2236	-7.328704	883.08326	999.7317	0	444.19
7	Optimize d	199.6985	-7.710115	946.97593	1105.175	0	249.55
8	Optimize d	199.9749	7.9189575	990.70595	1292.821	0	249.96
9	Optimize d	200.25	7.9959225	329.7788	758.46043	0	249.6
10	Optimize d	200.75	8.1357975	204.35423	1008.4236	0	248.81
11	Optimize d	201.95	8.4714985	223.91263	1116.6995	0	246.89
12	Optimize d	203.85	-9.003026	253.96397	1162.0628	0	243.87

13	Optimize d	205.6	-9.5122025	281.29415	1196.6542	0	241.08
14	Optimize d	207.2	9.9990275	306.95169	1236.6563	0	238.54
15	Optimize d	208.39435	10.362435	325.79193	1253.3164	0	236.63
16	Optimize d	209.7915	10.739305	344.81043	1253.5575	0	234.41
17	Optimize d	211.95385	11.184775	366.29775	1246.9122	0	230.97
18	Optimize d	213.97385	11.416055	375.73938	1231.5328	0	227.75
19	Optimize d	215.69475	-11.50143	377.21931	1175.4116	0	225.01
20	Optimize d	217.4157	11.586805	379.56398	1119.2323	0	222.27
21	Optimize d	219.3223	11.684995	382.55096	1056.0338	0	219.23
22	Optimize d	221.41455	11.796005	386.54103	988.06891	0	215.9
23	Optimize d	222.68035	11.856035	388.67753	955.52454	0	213.88
24	Optimize d	223.89005	11.880945	388.81399	921.42933	0	211.96
25	Optimize d	225.87015	11.921715	389.16744	868.86711	0	208.81
26	Optimize	227.7263	-11.80887	380.30355	853.76013	0	205.85

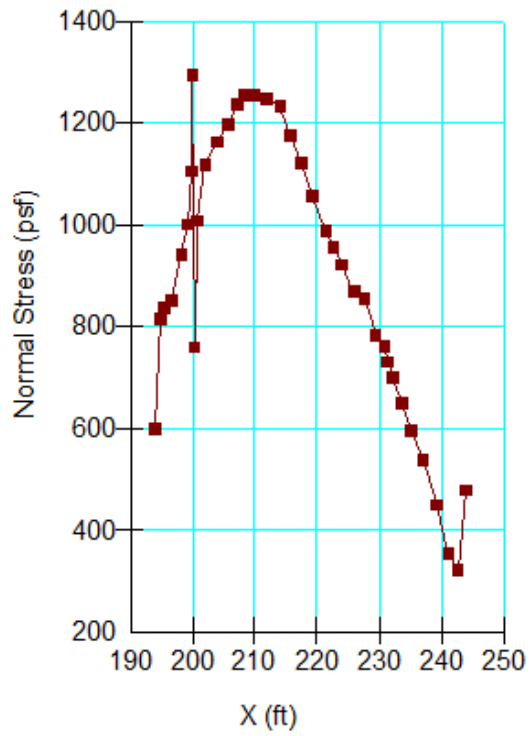
	d						
27	Optimize d	229.4585	11.542405	362.11343	781.2393	0	203.09
28	Optimize d	230.83825	-11.24024	342.08039	761.28631	0	200.89
29	Optimize d	231.37595	11.063395	330.59433	731.06782	0	200.04
30	Optimize d	231.45	11.039035	329.01111	728.98262	0	200
31	Optimize d	232.2419	10.778575	312.11988	700.89808	0	200
32	Optimize d	233.7257	-10.29055	280.45526	647.44084	0	200
33	Optimize d	235.2095	-9.802525	248.79705	594.04762	0	200
34	Optimize d	237.1331	-9.055155	200.63179	537.12019	0	200
35	Optimize d	239.26255	-8.09523	139.05352	449.09482	0	200
36	Optimize d	241.1581	-7.18209	80.603229	354.12379	0	200
37	Optimize d	242.59605	-6.36276	28.368405	322.05031	0	200
38	Optimize d	243.98335	-5.336005	-36.726559	478.2552	0	600

Slices of Slip Surface: **3042**

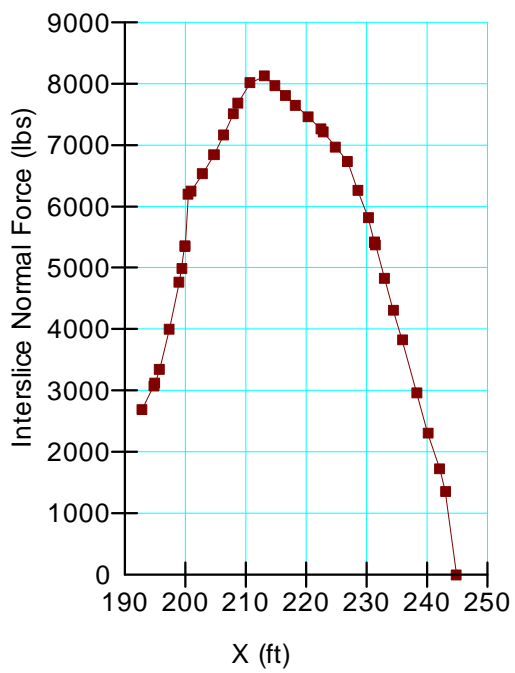
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	3042	194.34905	-1.92963	388.97018	365.39916	0	300
2	3042	195.3771	-3.397791	438.78009	640.0502	0	300
3	3042	197.01095	5.7311665	637.07727	728.37844	0	427.63
4	3042	198.63385	-	858.595	987.36075	0	247.95

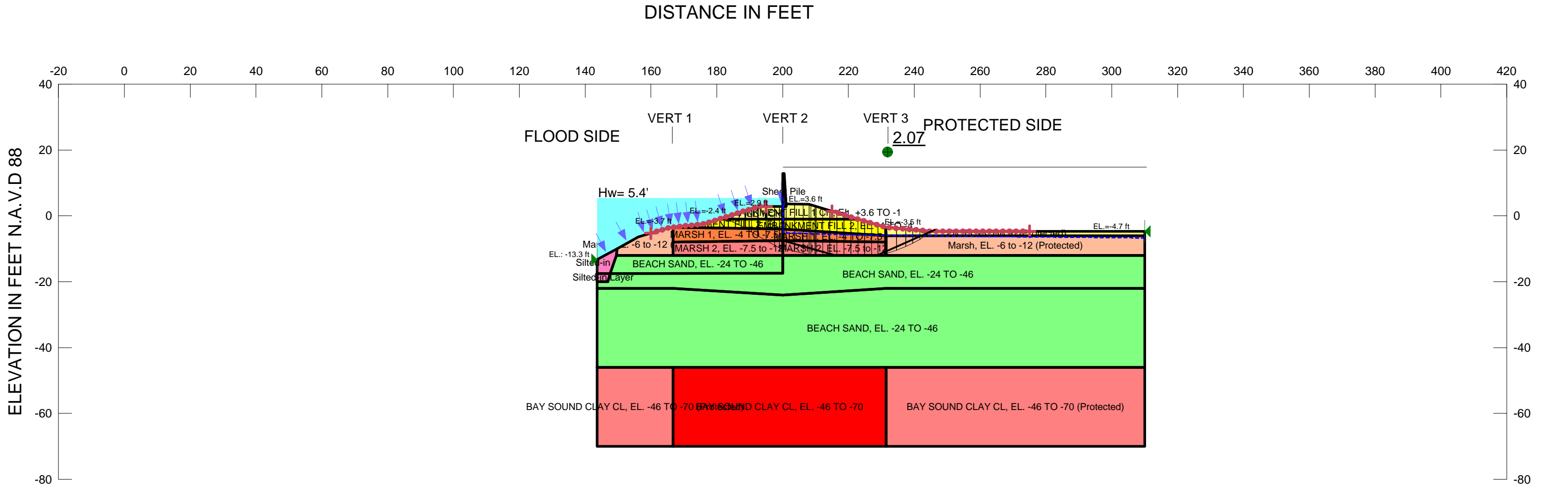
			8.0489315				
5	3042	199.5	-9.285926	1006.7412	1086.1242	0	249.25
6	3042	200.25	-10	456.56	1016.76	0	249.6
7	3042	200.75	-10	322.72	1273.74	0	248.81
8	3042	201.875	-10	321.30857	1353.0857	0	247.01
9	3042	203.625	-10	317.8	1348.2857	0	244.23
10	3042	205.375	-10	312.56571	1343.4857	0	241.44
11	3042	207.125	-10	307.24571	1338.7429	0	238.65
12	3042	208.8278	-10	301.97106	1306.0869	0	235.94
13	3042	210.48335	-10	297.26569	1245.503	0	233.31
14	3042	212.1389	-10	292.80193	1184.9795	0	230.67
15	3042	213.79445	-10	288.94824	1124.5165	0	228.03
16	3042	215.45	-10	285.29992	1064.0534	0	225.4
17	3042	217.10555	-10	282.26167	1003.6507	0	222.76
18	3042	218.7611	-10	279.33818	943.30847	0	220.13
19	3042	220.41665	-10	276.89791	883.02661	0	217.49
20	3042	222.0722	-10	274.50597	822.74475	0	214.85
21	3042	223.7452	-10	272.4374	769.53566	0	212.19
22	3042	225.43555	-10	270.40234	723.33276	0	209.5
23	3042	227.1259	-10	268.59208	677.24818	0	206.81
24	3042	228.8163	-10	266.8469	631.16359	0	204.11
25	3042	230.5067	-10	265.25554	585.10267	0	201.42
26	3042	231.37595	-10	264.44444	562.09761	0	200.04
27	3042	231.45	-10	264.38	562.08	0	200
28	3042	232.375	-10	263.54286	555.17714	0	200
29	3042	234.125	-10	262.01714	541.38286	0	200
30	3042	235.86605	-9.5	229.395	604.65	0	200
31	3042	237.5981	-8.5	165.635	501.5	0	200
32	3042	239.33015	-7.5	101.88	398.385	0	200
33	3042	241.0622	-6.5	38.1245	295.265	0	200
34	3042	243.1212	-5.311208	-37.602063	338.04472	0	600

Base Normal Stress Vs. X



Interslice Normal Stress
Vs. X





Name: EMBANKMENT FILL 1 CH, EL. +3.6 TO -1 Model: Undrained (Phi=0) Unit Weight: 118 pcf Cohesion: 1000 psf
Name: MARSH 1, EL. -4 TO -7.5 Model: Spatial Mohr-Coulomb Unit Weight: 80 pcf Cohesion Fn: Marsh 1 Phi: 0 °
Name: BEACH SAND, EL. -24 TO -46 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Beach Sand
Name: BAY SOUND CLAY CL, EL. -46 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 104 pcf Cohesion Spatial Fn: Clay 1 Cohesion Phi: 0 °
Name: Silted-in Layer Model: Mohr-Coulomb Unit Weight: 90 pcf Cohesion: 0 psf Phi: 20 °
Name: MARSH 2, EL. -7.5 to -12 Model: Spatial Mohr-Coulomb Weight Fn: Marsh 2 Cohesion Fn: Marsh 2 Phi: 0 °
Name: Sheet Pile Model: Undrained (Phi=0) Unit Weight: 0.1 pcf Cohesion: 0.01 psf
Name: EMBANKMENT FILL 2, EL. -1 TO -4 Model: Undrained (Phi=0) Unit Weight: 90 pcf Cohesion: 300 psf
Name: Fill, El. -3.5 to -6 (Protected) Model: Undrained (Phi=0) Unit Weight: 90 pcf Cohesion: 600 psf
Name: Marsh, EL. -6 to -12 (Protected) Model: Undrained (Phi=0) Unit Weight: 80 pcf Cohesion: 200 psf
Name: BAY SOUND CLAY CL, EL. -46 TO -70 (Protected) Model: Spatial Mohr-Coulomb Unit Weight: 104 pcf Cohesion Fn: Clay 2 Phi: 0 °

Name: Global Stability (Entry/Exit)
File Name: Reach 16 low water surf.gsz Directory: G:\F&MHOME\London Ave Reevaluation 2011\West Side\Reach 16 1% flowline\SlopeW\
Last Edited By: Schroeder, Danielle V MVN

GENERAL NOTES

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

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

Hw=CANAL WATER LEVEL



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

LONDON AVE CANAL
OUTFALL CANAL REEVALUATION REPORT
REACH 16, STA. 104+00 TO 112+50
PROTECTED SIDE STABILITY ANALYSIS,
1% FLOWLINE WATER EL +5.4
CASE: Global Stability (Entry/Exit)
MARCH 2012

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

Global Stability (Entry/Exit)

Report generated using GeoStudio 2007, version 7.15. Copyright © 1991-2009 GEO-SLOPE International Ltd.

File Information

Created By: Lijjegren, James
Revision Number: 244
Last Edited By: Schroeder, Danielle V MVN
Date: 2/13/2012
Time: 10:05:07 AM
File Name: Reach 16 low water surf.gsz
Directory: G:\F&MHOME\London Ave Reevaluation 2011\West Side\Reach 16 1% flowline\SlopeW\
Last Solved Date: 2/13/2012
Last Solved Time: 10:14:26 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 (Entry/Exit)

Kind: SLOPE/W
Parent: Gap Stability (Seepage)
Method: Spencer
Settings
 PWP Conditions Source: Parent Analysis
SlipSurface
 Direction of movement: Left to Right
 Use Passive Mode: No
 Slip Surface Option: Entry and Exit
 Critical slip surfaces saved: 1
 Optimize Critical Slip Surface Location: Yes
 Tension Crack
 Tension Crack Option: (none)
FOS Distribution
 FOS Calculation Option: Constant
Advanced
 Number of Slices: 30
 Optimization Tolerance: 0.01
 Minimum Slip Surface Depth: 0.1 ft

Optimization Maximum Iterations: 2000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

EMBANKMENT FILL 1 CH, EL. +3.6 TO -1

Model: Undrained (Phi=0)
Unit Weight: 118 pcf
Cohesion: 1000 psf

MARSH 1, EL. -4 TO -7.5

Model: Spatial Mohr-Coulomb
Unit Weight: 80 pcf
Cohesion Fn: Marsh 1
Phi: 0 °
Phi-B: 0 °

BEACH SAND, EL. -24 TO -46

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

BAY SOUND CLAY CL, EL. -46 TO -70

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

Silted-in Layer

Model: Mohr-Coulomb
Unit Weight: 90 pcf
Cohesion: 0 psf
Phi: 20 °
Phi-B: 0 °

MARSH 2, EL. -7.5 to -12

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

3/9/2012

3/9/2012

Global Stability (Entry/Exit)

Page 3 of 9

Sheet Pile

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

EMBANKMENT FILL 2, EL. -1 TO -4

Model: Undrained (Phi=0)
Unit Weight: 90 pcf
Cohesion: 300 psf

Fill, EL. -3.5 to -6 (Protected)

Model: Undrained (Phi=0)
Unit Weight: 90 pcf
Cohesion: 600 psf

Marsh, EL. -6 to -12 (Protected)

Model: Undrained (Phi=0)
Unit Weight: 80 pcf
Cohesion: 200 psf

BAY SOUND CLAY CL, EL. -46 TO -70 (Protected)

Model: Spatial Mohr-Coulomb
Unit Weight: 104 pcf
Cohesion Fn: Clay 2
Phi: 0 °
Phi-B: 0 °

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (160.00573, -5.25375) ft
Left-Zone Right Coordinate: (195, 2.8) ft
Left-Zone Increment: 20
Right Projection: Range
Right-Zone Left Coordinate: (214.99944, 1.38608) ft
Right-Zone Right Coordinate: (275, -4.7) ft
Right-Zone Increment: 30
Radius Increments: 20

Slip Surface Limits

Left Coordinate: (143.6, -13.3) ft
Right Coordinate: (310, -4.7) ft

Cohesion Functions

Marsh 1

Global Stability (Entry/Exit)

Page 4 of 9

Model: Spline Data Point Function
Function: Cohesion vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 200
Data Points: X (ft), Cohesion (psf)
 Data Point: (166.6, 200)
 Data Point: (200, 450)
 Data Point: (231.4, 200)

Marsh 2

Model: Spline Data Point Function
Function: Cohesion vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 200
Data Points: X (ft), Cohesion (psf)
 Data Point: (166.6, 200)
 Data Point: (200, 250)
 Data Point: (231.4, 200)

Clay 2

Model: Spline Data Point Function
Function: Cohesion vs. Y
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 650
Data Points: Y (ft), Cohesion (psf)
 Data Point: (-70, 865)
 Data Point: (-46, 650)

Shear/Normal Strength Functions

Beach Sand

Model: Spline Data Point Function
Function: Shear Stress vs. Normal Stress
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
 Data Point: (-100000, 0)
 Data Point: (0, 0)
 Data Point: (100000, 57735)
Estimation Properties
 Intact Rock Param.: 10
 Geological Strength: 100
 Disturbance Factor: 0
 SigmaC: 600000 psf
 Sigma3: 300000 psf

3/9/2012

3/9/2012

Num. Points: 20

Unit Weight Functions

Marsh 2

Model: Spline Data Point Function

Function: Unit Weight vs. X

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 80

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

Data Point: (166.7, 80)

Data Point: (200, 97)

Data Point: (231.4, 80)

Spatial Functions

Clay 1 Cohesion

Model: Linear Interpolation

Limit Range By: Data Values

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

Data Point: (166.7, -46, 650)

Data Point: (166.7, -70, 865)

Data Point: (200, -46, 665)

Data Point: (200, -70, 885)

Data Point: (231.4, -46, 650)

Data Point: (231.4, -70, 865)

Data Point: (310, -46, 650)

Data Point: (310, -70, 865)

Data Point: (143.6, -46, 650)

Data Point: (143.6, -70, 865)

Regions

	Material	Points	Area (ft ²)
Region 1	EMBANKMENT FILL 1 CH, EL. +3.6 TO -1	55,30,4,5,33,24,21	50.995458
Region 2	Marsh, EL. -6 to -12 (Protected)	25,3,8,28,35,41,42,43	100.17577
Region 3	Fill, EL. -3.5 to -6 (Protected)	36,31,32,7,9,18	110.58019
Region 4	Marsh, EL. -6 to -12 (Protected)	18,9,19,38,37	471.6
Region 5	Silted-in Layer	52,20,3,25,51	29.215
Region 6	EMBANKMENT FILL 2, EL. -1 TO -4	35,12,24,21,55,29	69.918042
Region 7	EMBANKMENT FILL 1 CH, EL. +3.6 TO -1	24,33,34,23,6,56	69.275
Region 8	EMBANKMENT FILL 2, EL. -1 TO -4	12,24,56,36,18	114.85463
Region 9	BEACH SAND, EL. -24 TO -46	10,26,44,39,40,27,11,47,17,45	3928.9
Region	MARSH 1, EL. -4 TO -7.5	35,12,13,42,41	133.23846

3/9/2012

10			
Region 11	MARSH 2, EL. -7.5 to -12	42,43,14,54,13	141.525
Region 12	BEACH SAND, EL. -24 TO -46	25,43,14,22,51	280.301
Region 13	Sheet Pile	33,49,50,23,34	7.675
Region 14	MARSH 1, EL. -4 TO -7.5	12,18,37,13	86.35
Region 15	MARSH 2, EL. -7.5 to -12	14,54,13,37,38	133.45
Region 16	BEACH SAND, EL. -24 TO -46	39,44,26,1,2,51,22,14,38,19,27,40	1411.969
Region 17	Silted-in Layer	52,51,2,1	9.15
Region 18	BAY SOUND CLAY CL, EL. -46 TO -70	45,17,47,48,53,46	1552.8
Region 19	BAY SOUND CLAY CL, EL. -46 TO -70 (Protected)	47,48,15,11	1886.4
Region 20	BAY SOUND CLAY CL, EL. -46 TO -70 (Protected)	10,16,46,45	554.4

Points

	X (ft)	Y (ft)
Point 1	143.6	-20
Point 2	146.9	-20
Point 3	149.7	-10
Point 4	195	2.8
Point 5	199	2.9
Point 6	208	3.5
Point 7	310	-4.7
Point 8	156.1	-6.4
Point 9	310	-6
Point 10	143.6	-46
Point 11	310	-46
Point 12	200	-4
Point 13	200	-7.5
Point 14	200	-12
Point 15	310	-70
Point 16	143.6	-70
Point 17	200	-46
Point 18	231.4	-6
Point 19	310	-12
Point 20	143.6	-13.3

3/9/2012

Point 21	195	-1
Point 22	200	-17.4
Point 23	201	3.6
Point 24	200	-1
Point 25	149.5	-12
Point 26	143.6	-22
Point 27	310	-22
Point 28	165.3	-3.7
Point 29	176.2	-2.4
Point 30	192.6	2.8
Point 31	231.5	-3.5
Point 32	245.2	-4.7
Point 33	200	2.9
Point 34	201	2.9
Point 35	166.66154	-3.5
Point 36	231.35185	-3.5
Point 37	231.4	-8
Point 38	231.4	-12
Point 39	200	-24
Point 40	231.4	-22
Point 41	166.7	-6
Point 42	166.7	-8
Point 43	166.7	-12
Point 44	166.7	-22
Point 45	166.7	-46
Point 46	166.7	-70
Point 47	231.4	-46
Point 48	231.4	-70
Point 49	200	12.9
Point 50	200.5	12.9
Point 51	147.62	-17.5
Point 52	143.6	-17.5
Point 53	200	-70
Point 54	200	-11.6
Point 55	180.71818	-1
Point 56	222.9	-1

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	2.07	(217.041, 44.667)	25.41728	(182.178, -0.533071)	(244.959, -4.67894)
2	8785	2.18	(217.041, 44.667)	56.503	(182.851, -0.317774)	(244.619, -4.64907)

Slices of Slip Surface: **Optimized**

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	182.6506	0.76653535	334.45397	189.51158	0	1000
2	Optimized	184.0281	-1.4473335	250.2382	413.50464	0	300
3	Optimized	185.83835	-2.342	179.4257	522.81115	0	300
4	Optimized	187.6486	-3.2366665	142.87299	632.10775	0	300
5	Optimized	188.6767	-3.7580105	138.20878	674.68876	0	300
6	Optimized	189.70415	-4.376336	180.00821	723.13056	0	372.94
7	Optimized	191.5131	-5.4649655	275.94249	834.77127	0	386.48
8	Optimized	192.5088	-6.0620575	332.10301	901.87111	0	393.93
9	Optimized	193.8	-6.809087	409.38229	962.52264	0	403.59
10	Optimized	196.28295	-8.2455695	572.10191	1121.1632	0	244.44
11	Optimized	198.28295	-9.292908	722.65239	1252.4349	0	247.43
12	Optimized	199.43475	-9.783003	873.22381	1300.6925	0	249.15
13	Optimized	199.93475	-9.9821315	950.93929	1366.5633	0	249.9
14	Optimized	200.25	-10.050462	415.43249	1189.8484	0	249.6
15	Optimized	200.75	-10.15884	312.19007	1230.0156	0	248.81
16	Optimized	202.2957	-10.49389	331.64317	1338.6559	0	246.34
17	Optimized	204.88715	-11.05561	361.28171	1383.6473	0	242.22
18	Optimized	207.09145	-11.53014	384.78327	1421.3477	0	238.71
19	Optimized	208.27535	-11.782505	397.12485	1431.3082	0	236.82
20	Optimized	209.2049	-11.91859	402.88461	1430.8442	0	235.34
21	Optimized	209.98865	-11.99743	405.80025	1433.128	0	234.09
22	Optimized	211.18335	-11.99888	403.08559	1390.9361	0	232.19
23	Optimized	213.31365	-11.998875	398.48997	1310.9001	0	228.8
24	Optimized	215.44395	-11.99887	394.64543	1231.005	0	225.41
25	Optimized	217.57425	-11.998865	391.60829	1151.1098	0	222.02
26	Optimized	219.70455	-11.99886	388.89974	1071.3555	0	218.62
27	Optimized	221.83485	-11.99886	386.51509	991.64809	0	215.23
28	Optimized	223.9305	-11.998855	384.50192	922.64547	0	211.89
29	Optimized	225.99155	-11.99885	382.65819	864.2766	0	208.61
30	Optimized	228.0178	-11.969905	379.19661	809.36972	0	205.39
31	Optimized	230.01775	-11.760305	364.65043	759.72106	0	202.2
32	Optimized	231.18695	-11.528535	349.36754	727.92626	0	200.34
33	Optimized	231.37595	-11.46996	345.5678	718.29301	0	200.04
34	Optimized	231.45	-11.447	344.09112	716.37891	0	200
35	Optimized	233.06115	-10.947635	311.85909	662.78469	0	200
36	Optimized	236.026	-9.900545	244.58424	566.22049	0	200
37	Optimized	238.4842	-8.7999525	174.32488	470.27373	0	200
38	Optimized	240.59325	-7.7252175	105.91298	363.27505	0	200
39	Optimized	242.4318	-6.593925	34.155455	284.7186	0	200
40	Optimized	244.08765	-5.3394675	-	329.47885	0	600

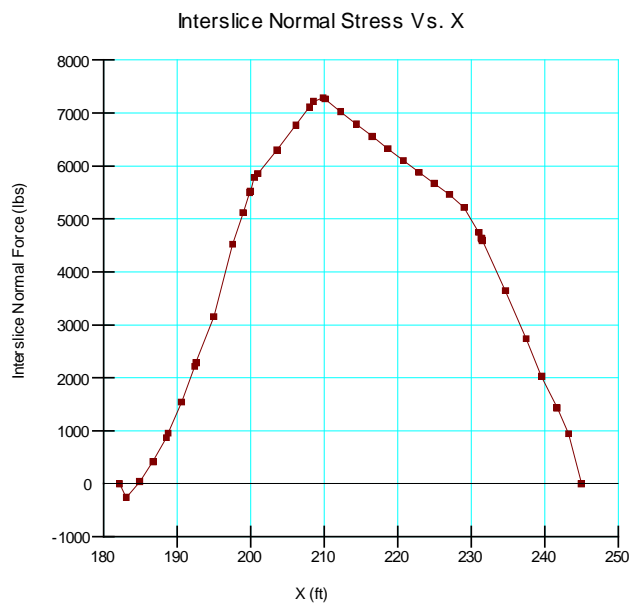
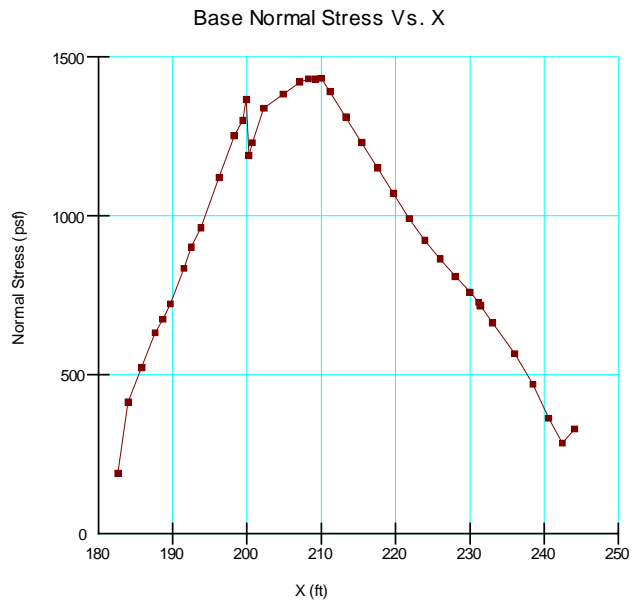
3/9/2012

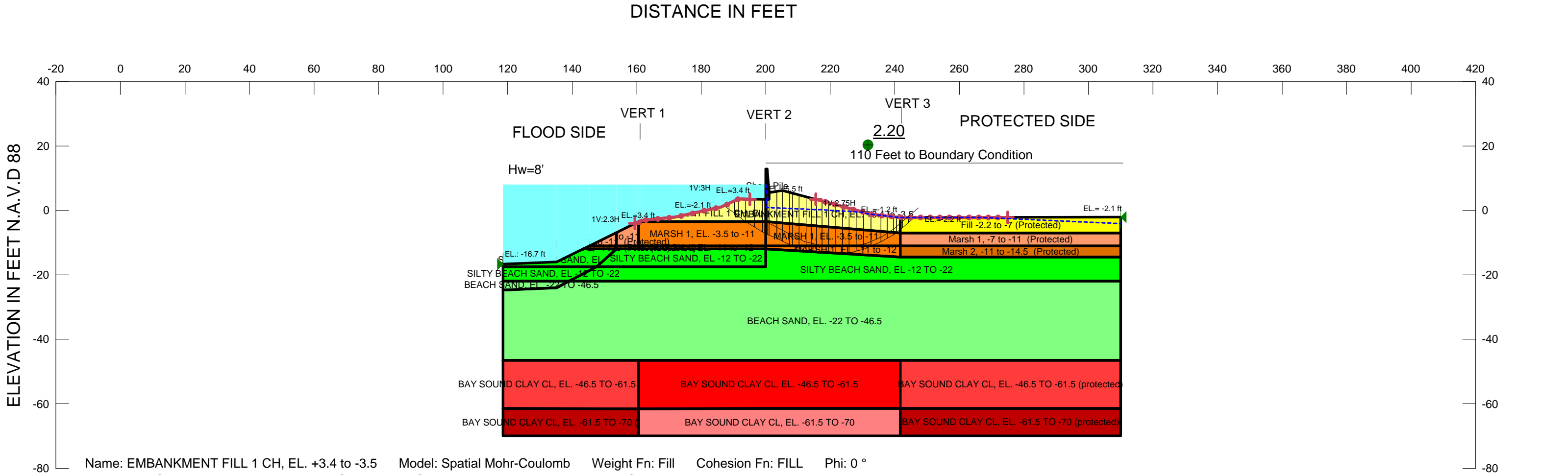
3/9/2012

45.135754

Slices of Slip Surface: 8785

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	8785	183.30975	-0.65888705	317.80938	86.696846	0	1000
2	8785	184.83405	-1.7397995	218.14775	423.30167	0	300
3	8785	186.966	-3.150053	142.66378	591.92108	0	300
4	8785	189.174	-4.468194	174.69155	734.22244	0	368.97
5	8785	191.458	-5.6959875	284.79685	878.79925	0	386.06
6	8785	193.8	-6.8177935	409.7293	1000.4929	0	403.59
7	8785	195.2489	-7.4635465	502.21119	1057.6496	0	414.44
8	8785	196.37335	-7.91176	568.47897	1129.6766	0	244.57
9	8785	198.12445	-8.5670435	694.75311	1201.2755	0	247.19
10	8785	199.5	-9.0414665	845.83196	1254.3941	0	249.25
11	8785	200.25	-9.282575	366.74735	1099.4018	0	249.6
12	8785	200.75	-9.435663	266.19382	1145.342	0	248.81
13	8785	202.16665	-9.829376	289.69023	1265.604	0	246.55
14	8785	204.5	-10.41345	321.8987	1323.7913	0	242.83
15	8785	206.83335	-10.893435	345.79518	1371.0664	0	239.12
16	8785	209.0643	-11.25958	362.4459	1370.9971	0	235.57
17	8785	211.19285	-11.522155	373.6046	1324.5828	0	232.18
18	8785	213.3214	-11.70316	380.22671	1269.9225	0	228.79
19	8785	215.45	-11.80338	382.56968	1207.2324	0	225.4
20	8785	217.5786	-11.82325	380.74984	1136.8612	0	222.01
21	8785	219.70715	-11.76285	374.28934	1059.0137	0	218.62
22	8785	221.8357	-11.62192	363.15481	973.93646	0	215.23
23	8785	223.9565	-11.40097	347.37876	891.79149	0	211.85
24	8785	226.06945	-11.099635	326.74102	812.8581	0	208.49
25	8785	228.1824	-10.716075	301.10087	727.41917	0	205.12
26	8785	230.2954	-10.248568	270.39536	635.48015	0	201.76
27	8785	231.37595	-9.9872715	253.30187	587.52214	0	200.04
28	8785	231.45	-9.9677705	252.03275	586.1103	0	200
29	8785	232.555	-9.653285	231.62742	554.92692	0	200
30	8785	234.665	-9.0055775	189.74583	490.63113	0	200
31	8785	236.77495	-8.2658665	142.16406	418.48093	0	200
32	8785	238.8849	-7.430225	88.625576	338.12075	0	200
33	8785	240.9949	-6.493943	28.839472	249.06934	0	200
34	8785	243.3342	-5.324533	45.582787	247.55771	0	600





**US Army Corps
of Engineers®**
New Orleans District
LONDON AVE CANAL
OUTFALL CANAL REEVALUATION REPORT
REACH 17, STA. 118+90 TO 119+63
PROTECTED SIDE STABILITY ANALYSIS,
CASE: Global Stability (Entry/Exit) OPEN
MARCH 2012

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

GENERAL NOTES

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

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

Hw=CANAL WATER LEVEL

Global Stability (Entry/Exit) OPEN

Report generated using GeoStudio 2007, version 7.15. Copyright © 1991-2009 GEO-SLOPE International Ltd.

File Information

Created By: [Liljegren, James](#)
Revision Number: [225](#)
Last Edited By: [Curran, Matthew MVN](#)
Date: [1/9/2012](#)
Time: [1:36:51 PM](#)
File Name: [Reach 17 OPEN.gsz](#)
Directory: [Z:\Edf\F&MHOME\London Ave Reevaluation 2011\West Side\Reach 17\ETL\](#)
Last Solved Date: [1/9/2012](#)
Last Solved Time: [1:40:20 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 (Entry/Exit) OPEN

Kind: [SLOPE/W](#)
Parent: [Gap Stability \(Seepage\) OPEN](#)
Method: [Spencer](#)
Settings
 PWP Conditions Source: [Parent Analysis](#)
SlipSurface
 Direction of movement: [Left to Right](#)
 Use Passive Mode: [No](#)
 Slip Surface Option: [Entry and Exit](#)
 Critical slip surfaces saved: [1](#)
 Optimize Critical Slip Surface Location: [Yes](#)
 Tension Crack
 Tension Crack Option: [\(none\)](#)
FOS Distribution
 FOS Calculation Option: [Constant](#)
Advanced

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

Materials

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

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

MARSH 1, EL. -3.5 to -11

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

BEACH SAND, EL. -22 TO -46.5

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

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

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

Sheet Pile

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

SILTY BEACH SAND, EL -12 TO -22

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

Fill -2.2 to -7 (Protected)

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

Marsh 1, -7 to -11 (Protected)

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

Marsh 2, -11 to -14.5 (Protected)

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

MARSH 1, EL. -11 to -12

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

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

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

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

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

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

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

Slip Surface Entry and Exit

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

Slip Surface Limits

Left Coordinate: (118.6, -16.7) ft
Right Coordinate: (310, -2.1) ft

Cohesion Functions

Marsh 1

Model: [Spline Data Point Function](#)
Function: [Cohesion vs. X](#)
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 200
Data Points: [X \(ft\), Cohesion \(psf\)](#)
Data Point: (160.6, 200)
Data Point: (200, 320)
Data Point: (241.7, 200)

Marsh 2

Model: [Spline Data Point Function](#)
Function: [Cohesion vs. X](#)
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 300
Data Points: [X \(ft\), Cohesion \(psf\)](#)
Data Point: (160.6, 300)
Data Point: (200, 320)
Data Point: (241.7, 300)

FILL

Model: [Spline Data Point Function](#)
Function: [Cohesion vs. X](#)
Curve Fit to Data: 100 %
Segment Curvature: 0 %

Y-Intercept: 400

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

Data Point: (160.6, 400)

Data Point: (200, 520)

Data Point: (241.7, 400)

CLAY 1

Model: Spline Data Point Function

Function: Cohesion vs. X

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 720

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

Data Point: (160.6, 720)

Data Point: (200, 750)

Data Point: (241.7, 720)

CLAY 2

Model: Spline Data Point Function

Function: Cohesion vs. X

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 995

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

Data Point: (160.6, 995)

Data Point: (200, 1050)

Data Point: (241.7, 995)

Shear/Normal Strength Functions

Beach Sand

Model: Spline Data Point Function

Function: Shear Stress vs. Normal Stress

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 0

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

Data Point: (-100000, 0)

Data Point: (0, 0)

Data Point: (100000, 57735)

Estimation Properties

Intact Rock Param.: 10

Geological Strength: 100

Disturbance Factor: 0

SigmaC: 600000 psf

Sigma3: 300000 psf

Num. Points: 20

Unit Weight Functions

Marsh 1

Model: Spline Data Point Function

Function: Unit Weight vs. X

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 85

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

Data Point: (160.6, 85)

Data Point: (200, 90)

Data Point: (241.7, 85)

Fill

Model: Spline Data Point Function

Function: Unit Weight vs. X

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 100

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

Data Point: (160.6, 100)

Data Point: (200, 110)

Data Point: (241.7, 100)

Marsh 2

Model: Spline Data Point Function

Function: Unit Weight vs. X

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 116

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

Data Point: (160.6, 116)

Data Point: (200, 90)

Data Point: (241.7, 116)

Clay 1

Model: Spline Data Point Function

Function: Unit Weight vs. X

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 109

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

Data Point: (160.6, 109)

Data Point: (200, 110)

Data Point: (241.7, 109)

Clay 2

Model: Spline Data Point Function

Function: Unit Weight vs. X

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 119

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

Data Point: (160.6, 119)

Data Point: (200, 102)

Data Point: (241.7, 119)

Regions

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

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

Points

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

Point 8	118.6	-46.5
Point 9	310	-46.5
Point 10	200	-3.5
Point 11	200	-12
Point 12	310	-70
Point 13	118.6	-70
Point 14	200	-46.5
Point 15	241.7	-7
Point 16	310	-14.5
Point 17	118.6	-16.7
Point 18	200	-17.5
Point 19	201	5.5
Point 20	186.1	1
Point 21	153.7	-12
Point 22	118.6	-24.7
Point 23	310	-22
Point 24	171.9	-2.1
Point 25	191.6	3.5
Point 26	232.6	-1.2
Point 27	241.7	-2.2
Point 28	200	3.4
Point 29	201	3.4
Point 30	241.7	-11
Point 31	241.7	-14.5
Point 32	160.6	-12
Point 33	160.6	-46.5
Point 34	160.6	-70
Point 35	241.7	-46.5
Point 36	241.7	-70
Point 37	200	12.9
Point 38	200.5	12.9
Point 39	147.62	-17.5
Point 40	118.6	-17.5
Point 41	200	-70
Point 42	160.6	-3.5
Point 43	310	-11

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

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	2.20	(219.933, 28.702)	24.8697	(187.032, 1.42349)	(246.052, -2.19363)
2	3769	2.25	(219.933, 28.702)	41.697	(188.016, 1.87083)	(247.938, -2.19087)

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	187.85125	0.86697455	404.51546	322.50298	0	483
2	Optimized	189.49035	-0.24604845	410.3551	467.91374	0	487.99
3	Optimized	190.95495	-1.3131885	434.4568	577.43628	0	492.45
4	Optimized	192.61895	-2.6304285	482.34759	734.23637	0	497.52

	d						
5	Optimize d	195.09395	-4.33089	607.23265	989.09065	0	305.06
6	Optimize d	197.775	-5.9563075	784.63488	1133.3771	0	313.22
7	Optimize d	199.4	-6.9267525	904.49993	1217.2039	0	318.17
8	Optimize d	199.9	-7.2064885	944.35822	1287.6728	0	319.7
9	Optimize d	200.25	-7.3494985	580.17579	915.94718	0	319.28
10	Optimize d	200.75	-7.5538015	517.13534	1041.269	0	317.84
11	Optimize d	202.2386	-8.1620465	554.11372	1337.9372	0	313.56
12	Optimize d	204.2886	-9.0841585	609.58658	1426.8833	0	307.66
13	Optimize d	206.18825	-10.058124	666.75907	1492.6441	0	302.19
14	Optimize d	207.7925	-10.808035	709.35493	1546.3641	0	297.58
15	Optimize d	209.34205	-11.384515	740.7666	1550.4955	0	315.52
16	Optimize d	211.40915	-12.153545	782.16212	1562.692	0	314.53
17	Optimize d	213.26595	-12.62101	805.37164	1628.1476	0	313.64
18	Optimize d	214.9124	-12.786915	810.50833	1597.267	0	312.85
19	Optimize d	216.5588	-12.95282	815.88674	1566.9908	0	312.06
20	Optimize d	218.44635	-13.10108	819.43499	1539.465	0	311.15
21	Optimize d	220.57505	-13.2317	821.31056	1493.4198	0	310.13
22	Optimize d	222.6837	-13.27448	817.86572	1461.4934	0	309.12
23	Optimize	224.7723	-13.22942	809.05808	1399.1698	0	308.12

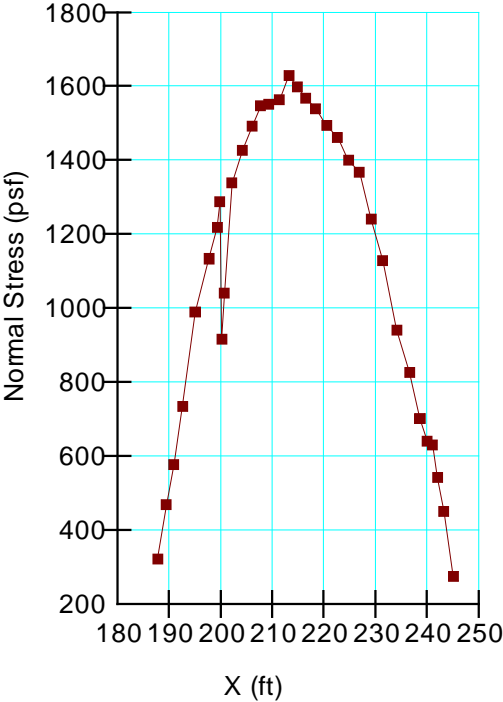
	d						
24	Optimize d	226.93445	-12.914345	783.13469	1367.7812	0	307.08
25	Optimize d	229.17015	-12.32925	740.07916	1240.6484	0	306.01
26	Optimize d	231.444	-11.548915	684.41728	1127.7443	0	304.92
27	Optimize d	234.13635	-10.412865	604.81707	941.21302	0	221.77
28	Optimize d	236.66475	-9.2091325	521.0846	826.32961	0	214.49
29	Optimize d	238.6488	-8.0981975	444.65241	701.52262	0	208.78
30	Optimize d	240.05265	-7.219516	384.6062	640.13486	0	204.74
31	Optimize d	241.08225	-6.4114875	324.32054	629.2338	0	401.78
32	Optimize d	242.01295	-5.6810815	266.39383	542.34033	0	400
33	Optimize d	243.2574	-4.6250245	183.74585	449.48407	0	400
34	Optimize d	245.12045	-3.0040935	59.57891	274.82914	0	400

Slices of Slip Surface: 3769

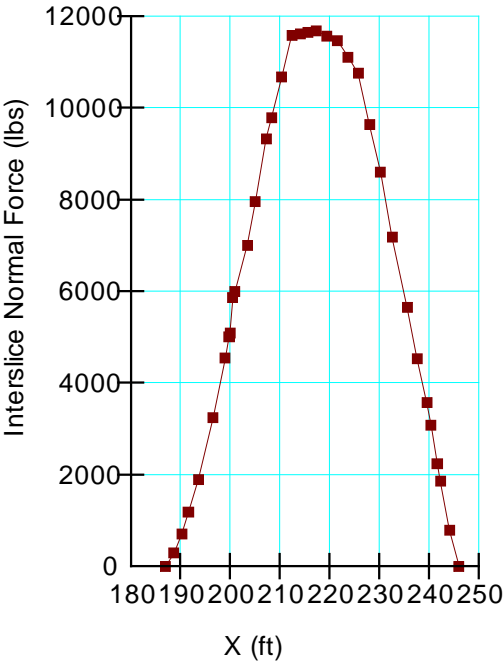
	Slip Surfac e	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Friction al Strength (psf)	Cohesiv e Strengt h (psf)
1	3769	188.91185	0.8720156	390.99471	248.04857	0	486.23
2	3769	190.70395	-1.0083394	426.77382	497.93594	0	491.69
3	3769	192.5221	-2.6949425	482.19297	722.57464	0	497.22
4	3769	194.37015	-4.2190125	582.4239	948.14482	0	302.85
5	3769	196.2221	-5.578499	710.64191	1081.0177	0	308.49
6	3769	198.07405	-6.789281	841.37892	1201.9765	0	314.13
7	3769	199.5	-7.6407095	951.86542	1288.3307	0	318.48
8	3769	200.25	-8.0557025	624.72804	950.9943	0	319.28
9	3769	200.75	-8.3191185	565.50829	1084.0655	0	317.84

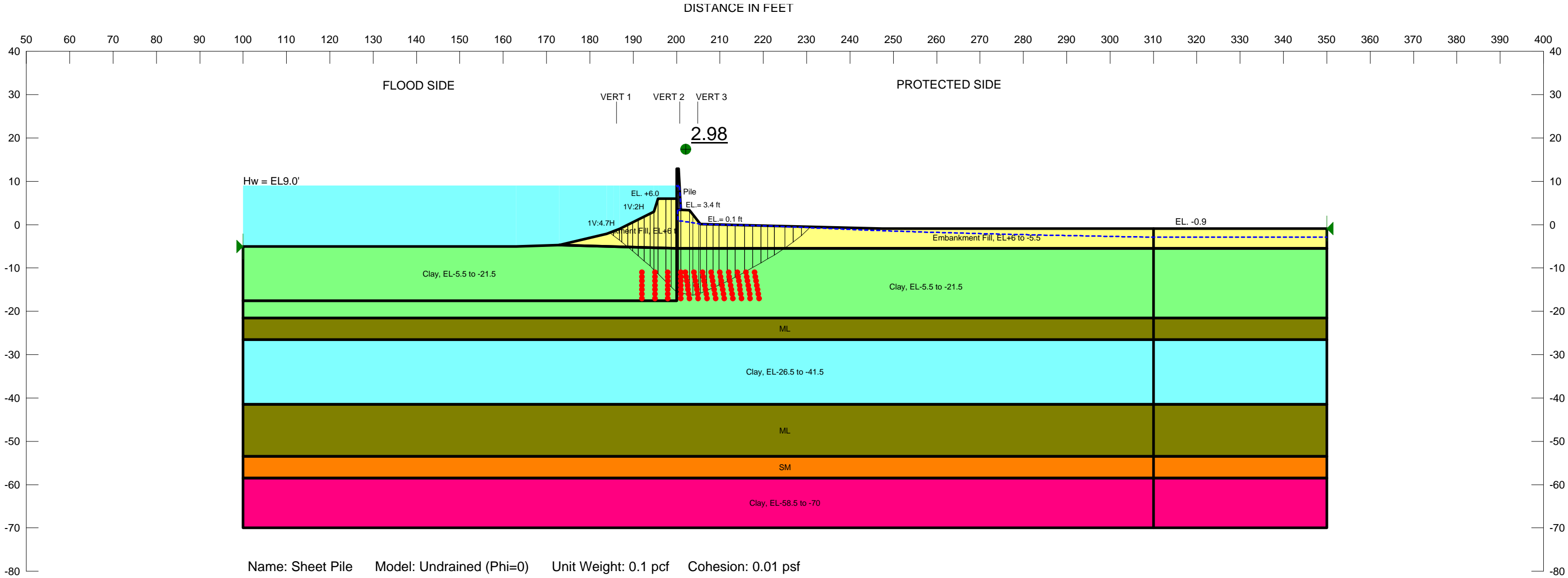
10	3769	202.025	-8.9363575	603.77462	1385.6379	0	314.17
11	3769	204.075	-9.8457315	658.45656	1515.5418	0	308.27
12	3769	206.14495	-10.633705	703.28029	1586.0946	0	302.32
13	3769	208.16725	-11.28755	738.3667	1597.5695	0	316.08
14	3769	210.1219	-11.81178	764.99624	1603.1358	0	315.15
15	3769	212.0765	-12.236025	785.16157	1600.3187	0	314.21
16	3769	214.0311	-12.563375	799.38739	1589.0002	0	313.27
17	3769	215.9857	-12.796125	807.86659	1569.1314	0	312.33
18	3769	217.94035	-12.935865	810.63665	1540.4805	0	311.4
19	3769	219.895	-12.98354	807.8804	1502.7977	0	310.46
20	3769	221.8496	-12.93946	799.41166	1455.7755	0	309.52
21	3769	223.8042	-12.803335	785.28777	1399.0103	0	308.58
22	3769	225.7588	-12.57425	765.35265	1332.0216	0	307.65
23	3769	227.71345	-12.25064	739.40191	1254.1837	0	306.71
24	3769	229.6681	-11.83024	707.34044	1164.9055	0	305.77
25	3769	231.6227	-11.30999	668.9001	1063.3356	0	304.83
26	3769	233.7414	-10.6237	619.28833	950.52885	0	222.9
27	3769	235.9859	-9.7625505	558.08016	857.95099	0	216.44
28	3769	238.19215	-8.7645655	488.1998	753.52755	0	210.09
29	3769	240.39845	-7.6051525	407.91637	634.63747	0	203.75
30	3769	241.6008	-6.9229995	360.14725	629.04997	0	400.29
31	3769	242.73965	-6.182959	301.4226	560.65143	0	400
32	3769	244.81895	-4.729351	188.29027	427.59574	0	400
33	3769	246.8983	-3.0731525	64.100167	273.52118	0	400

Base Normal Stress Vs. X



Interslice Normal Stress
Vs. X





GENERAL NOTES

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

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

Hw=CANAL WATER LEVEL

LONDON AVE CANAL
OUTFALL CANAL REEVALUATION REPORT
REACH 20, STA. 1+57 TO 6+30
PROTECTED SIDE STABILITY ANALYSIS,
CASE: Slope Stability (Block EL-11 to EL-17) (Passive)
MARCH 2012

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

Slope Stability (Block EL-11 to EL-17) (Passive)

Report generated using GeoStudio 2007, version 7.15. Copyright © 1991-2009 GEO-SLOPE International Ltd.

File Information

Created By: Liljegren, James
Revision Number: 361
Last Edited By: Curran, Matthew MVN
Date: 3/4/2013
Time: 2:22:30 PM
File Name: Reach 20.gsz
Directory: C:\Users\B2EDFMJC\Desktop\Chrono Order\Reach 20 SlopeW\
Last Solved Date: 3/4/2013
Last Solved Time: 2:22:54 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

Slope Stability (Block EL-11 to EL-17) (Passive)

Kind: SLOPE/W
Parent: Gap Stability (Seepage)
Method: Spencer
Settings
 PWP Conditions Source: Parent Analysis
Slip Surface
 Direction of movement: Left to Right
 Use Passive Mode: Yes
 Slip Surface Option: Block
 Critical slip surfaces saved: 1
 Optimize Critical Slip Surface Location: Yes
 Tension Crack
 Tension Crack Option: (none)

Cohesion Spatial Fn: CH EL-26.5 to EL-41.5
Phi: 0 °
Phi-B: 0 °

SM

Model: Mohr-Coulomb
Unit Weight: 122 pcf
Cohesion: 0 psf
Phi: 30 °
Phi-B: 0 °

Clay, EL-58.5 to -70

Model: Spatial Mohr-Coulomb
Unit Weight: 107 pcf
Cohesion Spatial Fn: CH EL-58.5 to EL-70
Phi: 0 °
Phi-B: 0 °

Slip Surface Limits

Left Coordinate: (100, -5) ft
Right Coordinate: (350, -0.9) ft

Slip Surface Block

Left Grid
 Upper Left: (192, -11) ft
 Lower Left: (192, -17) ft
 Lower Right: (201, -17) ft
 X Increments: 3
 Y Increments: 6
 Starting Angle: 130 °
 Ending Angle: 150 °
 Angle Increments: 4
Right Grid
 Upper Left: (202, -11) ft
 Lower Left: (203, -17) ft
 Lower Right: (219, -17) ft
 X Increments: 8
 Y Increments: 6
 Starting Angle: 20 °
 Ending Angle: 45 °
 Angle Increments: 5

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

Sheet Pile

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

Embankment Fill, EL+6 to -5.5

Model: Mohr-Coulomb
Unit Weight: 115 pcf
Cohesion: 650 psf
Phi: 0 °
Phi-B: 0 °

Clay, EL-5.5 to -21.5

Model: Spatial Mohr-Coulomb
Unit Weight: 107 pcf
Cohesion Fn: CH EL-5.5 to EL-21.5
Phi: 0 °
Phi-B: 0 °

ML

Model: Mohr-Coulomb
Unit Weight: 117 pcf
Cohesion: 200 psf
Phi: 15 °
Phi-B: 0 °

Clay, EL-26.5 to -41.5

Model: Spatial Mohr-Coulomb
Unit Weight: 101 pcf

Cohesion Functions

CH EL-5.5 to EL-21.5

Model: Spline Data Point Function
Function: Cohesion vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 445
Data Points: X (ft), Cohesion (psf)
 Data Point: (100, 445)
 Data Point: (186.1, 445)
 Data Point: (200, 470)
 Data Point: (205.5, 445)
 Data Point: (350, 445)

Spatial Functions

CH EL-26.5 to EL-41.5

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
 Data Point: (100, -26.5, 280)
 Data Point: (100, -41.5, 405)
 Data Point: (186.1, -26.5, 280)
 Data Point: (186.1, -41.5, 405)
 Data Point: (200, -26.5, 470)
 Data Point: (200, -41.5, 620)
 Data Point: (205.5, -26.5, 280)
 Data Point: (205.5, -41.5, 405)
 Data Point: (350, -26.5, 280)
 Data Point: (350, -41.5, 405)

CH EL-58.5 to EL-70

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
 Data Point: (100, -58.5, 615)
 Data Point: (100, -70, 730)
 Data Point: (186.1, -58.5, 615)
 Data Point: (186.1, -70, 730)
 Data Point: (200, -58.5, 700)
 Data Point: (200, -70, 815)
 Data Point: (205.5, -58.5, 615)
 Data Point: (205.5, -70, 730)
 Data Point: (350, -58.5, 615)
 Data Point: (350, -70, 730)

Regions

	Material	Points	Area (ft²)
Region 1	Clay, EL-58.5 to -70	14,7,40,11,8,49,50,13,12,41	2875
Region 2	SM	7,32,33,48,49,8,11,40	1250
Region 3	ML	32,31,37,39,30,47,48,33	3000
Region 4	Clay, EL-26.5 to -41.5	31,28,36,38,29,46,47,30,39,37	3750
Region 5	ML	28,16,15,6,45,46,29,38,36	1250
Region 6	Clay, EL-5.5 to -21.5	16,35,34,42,10,5,44,45,6,15	2790
Region 7	Clay, EL-5.5 to -21.5	35,20,51,19,10,42,34	1258.775
Region 8	Embankment Fill, EL+6 to -5.5	19,21,27,2,3,4,9,24,10	134.177
Region 9	Embankment Fill, EL+6 to -5.5	10,24,17,18,1,22,23,43,44,5	730.25
Region 10	Sheet Pile	24,9,25,26,17	7.125

Points

	X (ft)	Y (ft)
Point 1	205.5	0.1
Point 2	186.8	-1
Point 3	194.8	3
Point 4	195.7	6
Point 5	310	-5.5
Point 6	310	-21.5
Point 7	100	-58.5
Point 8	310	-58.5
Point 9	200	6
Point 10	200	-5.5
Point 11	205.5	-58.5
Point 12	205.5	-70
Point 13	310	-70
Point 14	100	-70
Point 15	200	-21.5
Point 16	100	-21.5
Point 17	201	3.4
Point 18	203	3.3
Point 19	172.9	-4.7
Point 20	100	-5

Point 21	183.9	-2.1
Point 22	247.4	-0.9
Point 23	310	-0.9
Point 24	200	3.4
Point 25	200	12.9
Point 26	200.5	12.9
Point 27	185.46	-1.5
Point 28	100	-26.5
Point 29	310	-26.5
Point 30	310	-41.5
Point 31	100	-41.5
Point 32	100	-53.5
Point 33	310	-53.5
Point 34	200	-17.6
Point 35	100	-17.6
Point 36	186.1	-26.5
Point 37	186.1	-41.5
Point 38	205.5	-26.5
Point 39	205.5	-41.5
Point 40	186.1	-58.5
Point 41	186.1	-70
Point 42	200	-13.1
Point 43	350	-0.9
Point 44	350	-5.5
Point 45	350	-21.5
Point 46	350	-26.5
Point 47	350	-41.5
Point 48	350	-53.5
Point 49	350	-58.5
Point 50	350	-70
Point 51	163	-5

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
--	--------------	-----	-------------	-------------	------------	-----------

1	Optimized	2.98	(208.384, -0.154)	21.00187	(184.58, -1.83856)	(230.933, -0.506981)
2	7407	3.10	(208.384, -0.154)	21.946	(183.387, -2.22119)	(233.462, -0.567355)

Slices of Slip Surface: Optimized

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	185.01985	-	689.71003	523.33771	0	650
2	Optimized	186.13	-3.054914	724.85849	640.48933	0	650
3	Optimized	187.07155	-	756.4485	735.96362	0	650
4	Optimized	188.0379	-4.587038	791.78173	834.47476	0	650
5	Optimized	189.2816	-5.625878	840.7973	1024.938	0	450.72
6	Optimized	190.5049	-6.65883	891.96722	1157.345	0	452.92
7	Optimized	191.85375	-7.80775	950.83344	1308.1509	0	455.35
8	Optimized	193.2026	-8.95667	1012.4652	1458.9568	0	457.77
9	Optimized	194.3385	-9.985965	1069.6475	1559.3302	0	459.82
10	Optimized	195.25	-10.88429	1118.3742	1687.2952	0	461.46
11	Optimized	196.61255	-12.22712	1192.9194	1955.0407	0	463.91
12	Optimized	198.1438	-13.73717	1268.8004	2105.6185	0	466.66
13	Optimized	199.38125	-14.95859	1291.5181	2227.7192	0	468.89
14	Optimize	200.00435	-15.57359	1286.0633	-221.29986	0	469.98

	d					
15	Optimized	200.25435	-	1111.7246	2062.4166	0
16	Optimized	200.75	-15.7171	1083.6164	2071.9781	0
17	Optimized	202	-15.95185	1090.7318	2090.8478	0
18	Optimized	203.37115	-16.20935	1092.8622	2058.6664	0
19	Optimized	204.43265	-16.15021	1079.5482	2004.4583	0
20	Optimized	205.3115	-15.93768	1058.268	1923.0261	0
21	Optimized	206.22235	-	1025.8036	1847.5851	0
22	Optimized	207.6671	-14.89187	975.38325	1772.7454	0
23	Optimized	209.11185	-14.25045	925.91187	1697.9058	0
24	Optimized	210.7519	-13.47907	868.06023	1620.754	0
25	Optimized	212.5873	-12.57773	802.33217	1515.7554	0
26	Optimized	214.58855	-	728.8105	1406.5386	0
27	Optimized	216.6252	-10.44558	650.9911	1284.8075	0
28	Optimized	218.5314	-9.38072	577.20844	1160.9662	0
29	Optimized	220.2555	-8.38482	509.00768	1055.0321	0
30	Optimized	221.7975	-7.45788	446.10149	947.2056	0
31	Optimized	223.77785	-6.210025	362.20925	812.14376	0

32	Optimize d	225.93035	- 4.694312 5	261.47318	716.77635	0	650
33	Optimize d	227.81665	- 3.231657 5	165.03578	533.73843	0	650
34	Optimize d	229.84615	- 1.503655 3	51.760386	354.40704	0	650

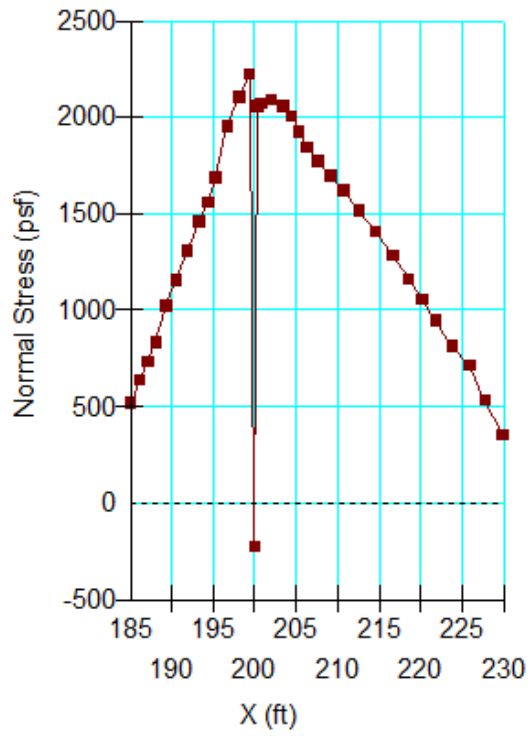
Slices of Slip Surface: **7407**

	Slip Surfac e	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictiona l Strength (psf)	Cohesiv e Strength (psf)
1	7407	183.64365	- 2.436290 5	708.54189	526.72235	0	650
2	7407	184.68	-3.305894	742.27756	633.85279	0	650
3	7407	186.13	- 4.522588 5	792.57006	795.3141	0	650
4	7407	187.6126	-5.766656	847.37694	1003.2023	0	447.72
5	7407	189.22205	-7.117159	910.25195	1181.7365	0	450.62
6	7407	190.81575	-8.454423	975.67166	1358.4803	0	453.48
7	7407	192.40945	- 9.791687 5	1043.5428	1535.224	0	456.35
8	7407	194.00315	-11.12895	1113.1444	1711.9678	0	459.21
9	7407	195.25	- 12.17517 5	1168.5578	1867.7859	0	461.46
10	7407	196.41665	- 13.15412 5	1220.6293	2098.8368	0	463.56
11	7407	197.85	- 14.35683 5	1272.9519	2220.6913	0	466.13
12	7407	199.28335	-	1291.2836	2342.4924	0	468.71

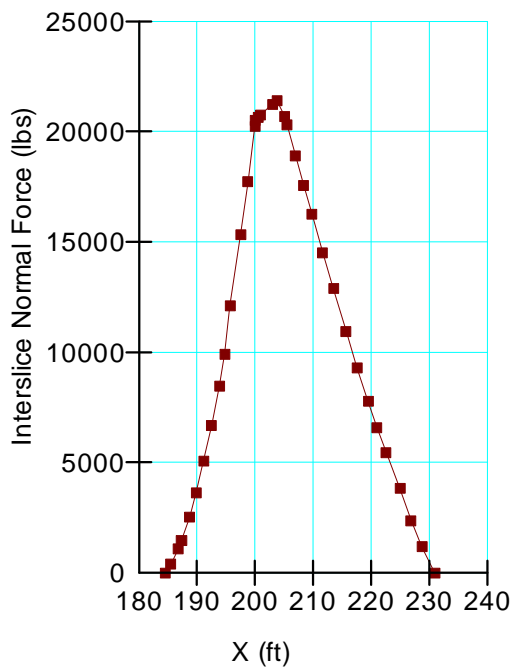
			15.55954 5				
13	7407	200.25	- 16.37067 5	1141.2684	1930.2789	0	468.86
14	7407	200.75	- 16.79022 5	1171.9102	2007.1898	0	466.59
15	7407	202	-17	1160.8	2257.8	0	460.91
16	7407	204	-17	1137.75	2104.65	0	451.82
17	7407	205.25	-16.85566	1116.8783	2064.6045	0	446.14
18	7407	206.3091	- 16.24418 5	1070.4534	1955.951	0	445
19	7407	207.9273	-15.30991	1000.0781	1847.5249	0	445
20	7407	209.5455	-14.37563	931.46893	1739.0988	0	445
21	7407	211.16375	- 13.44135 5	863.55546	1630.6727	0	445
22	7407	212.782	-12.50708	797.03343	1522.2466	0	445
23	7407	214.4002	-11.5728	730.88602	1413.8205	0	445
24	7407	216.0184	- 10.63852 5	665.48786	1305.3944	0	445
25	7407	217.6366	-9.704249	600.57135	1196.9684	0	445
26	7407	219.2548	- 8.769969 5	536.4576	1088.5423	0	445
27	7407	220.87305	- 7.835692 5	472.58468	980.11618	0	445
28	7407	222.4913	- 6.901415 5	409.19342	871.63657	0	445
29	7407	224.1095	- 5.967138 5	346.07509	763.21048	0	445
30	7407	225.77295	-	281.40582	691.66745	0	650

			5.006735 5				
31	7407	227.48165	- 4.020206 5	215.10772	569.0152	0	650
32	7407	229.19035	- 3.033677 5	148.90591	446.30214	0	650
33	7407	230.8991	- 2.047148 5	82.769995	323.60934	0	650
34	7407	232.60785	- 1.060619 5	16.663474	200.91655	0	650

Base Normal Stress Vs. X



Interslice Normal Stress
Vs. X



Slope Stability (Block) (2)

Report generated using GeoStudio 2007, version 7.15. Copyright © 1991-2009 GEO-SLOPE International Ltd.

File Information

Created By: Liljegren, James
Revision Number: 276
Last Edited By: Curran, Matthew MVN
Date: 3/4/2013
Time: 3:33:09 PM
File Name: Reach 21.gsz
Directory: C:\Users\B2EDFMJC\Desktop\Chrono Order\Reach 21 SlopeW\
Last Solved Date: 3/4/2013
Last Solved Time: 3:33:53 PM

Project Settings

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

Analysis Settings

Slope Stability (Block) (2)

Kind: SLOPE/W
Parent: GAP Analysis (Seepage)
Method: Spencer
Settings
 PWP Conditions Source: Parent Analysis
SlipSurface
 Direction of movement: Left to Right
 Use Passive Mode: Yes
 Slip Surface Option: 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

Phi: 30 °
Phi-B: 0 °

CLAY 3, EL. -58.5 TO -70

Model: Spatial Mohr-Coulomb
Unit Weight: 104 pcf
Cohesion Spatial Fn: Clay 3
Phi: 0 °
Phi-B: 0 °

Sheet Pile

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

CLAY 2, EL. -26.5 TO -41.5 (protected)

Model: Spatial Mohr-Coulomb
Unit Weight: 99 pcf
Cohesion Fn: CLAY2
Phi: 0 °
Phi-B: 0 °

CLAY 3, EL. -58.5 TO -70 (protected)

Model: Spatial Mohr-Coulomb
Unit Weight: 104 pcf
Cohesion Fn: CLAY3
Phi: 0 °
Phi-B: 0 °

Slip Surface Limits

Left Coordinate: (117.4, -6.1) ft
Right Coordinate: (310, 0) ft

Slip Surface Block

Left Grid
 Upper Left: (180, -20) ft
 Lower Left: (180, -22) ft
 Lower Right: (205, -22) ft
 X Increments: 5
 Y Increments: 2
 Starting Angle: 125 °
 Ending Angle: 145 °
 Angle Increments: 10
Right Grid
 Upper Left: (206, -20) ft

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. +3.7 TO -5.5

Model: Undrained (Phi=0)
Unit Weight: 118 pcf
Cohesion: 650 psf

CLAY 1, EL. -5.5 TO -21.5

Model: Spatial Mohr-Coulomb
Unit Weight: 107 pcf
Cohesion Fn: CLAY1
Phi: 0 °
Phi-B: 0 °

SILT, EL. -21.5 TO -26.5

Model: Mohr-Coulomb
Unit Weight: 117 pcf
Cohesion: 200 psf
Phi: 15 °
Phi-B: 0 °

CLAY 2, EL. -26.5 TO -41.5

Model: Spatial Mohr-Coulomb
Unit Weight: 99 pcf
Cohesion Spatial Fn: Clay 2
Phi: 0 °
Phi-B: 0 °

SILTY SAND, EL. -53.5 TO -58.5

Model: Mohr-Coulomb
Unit Weight: 122 pcf
Cohesion: 0 psf

Lower Left: (206, -22) ft
Lower Right: (226, -22) ft
X Increments: 5
Y Increments: 2
Starting Angle: 25 °
Ending Angle: 45 °
Angle Increments: 10

Tension Crack Line

	X (ft)	Y (ft)
	166.5	-6.9
	175.9	-4.7
	183.1	-1.9
	190.3	2

Cohesion Functions

CLAY2

Model: Spline Data Point Function
Function: Cohesion vs. Y
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 290
Data Points: Y (ft), Cohesion (psf)
 Data Point: (-41.5, 410)
 Data Point: (-26.5, 290)

CLAY3

Model: Spline Data Point Function
Function: Cohesion vs. Y
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 620
Data Points: Y (ft), Cohesion (psf)
 Data Point: (-70, 725)
 Data Point: (-58.5, 620)

CLAY1

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: (186.2, 330)
Data Point: (200, 350)
Data Point: (211.9, 330)

Spatial Functions

Clay 2

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (186.2, -26.5, 290)
Data Point: (186.2, -41.5, 410)
Data Point: (200, -26.5, 370)
Data Point: (200, -41.5, 490)
Data Point: (211.9, -26.5, 290)
Data Point: (211.9, -41.5, 410)

Clay 3

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (186.2, -58.5, 620)
Data Point: (186.2, -70, 725)
Data Point: (200, -58.5, 700)
Data Point: (200, -70, 805)
Data Point: (211.9, -58.5, 620)
Data Point: (211.9, -70, 725)

Regions

	Material	Points	Area (ft²)
Region 1	CLAY 3, EL. -58.5 TO -70	45,12,42,43,13,44	295.55
Region 2	EMBANKMENT FILL, EL. +3.7 TO -5.5	2,3,4,9,25,10,11,21,22,23	196.39
Region 3	EMBANKMENT FILL, EL. +3.7 TO -5.5	10,25,18,1,19,24,5,39,11	645.345
Region 4	CLAY 1, EL. -5.5 TO -21.5	17,20,21,11,48,16	939.39
Region 5	Sheet Pile	25,9,26,27,18	6.825
Region 6	SILTY SAND, EL. -53.5 TO -58.5	7,32,28,35,8,42,12,45	963
Region 7	SILT, EL. -21.5 TO -26.5	32,6,46,29,41,36,35,28	2311.2
Region 8	CLAY 2, EL. -26.5 TO -41.5	47,30,40,41,29,46	385.5
Region 9	SILT, EL. -21.5 TO -26.5	33,34,31,38,37,40,30,47	963
Region 10	CLAY 1, EL. -5.5 TO -21.5	34,17,16,48,11,39,38,31	2106.92

Region 11	CLAY 2, EL. -26.5 TO -41.5 (protected)	6,46,47,33	1032
Region 12	CLAY 3, EL. -58.5 TO -70 (protected)	7,15,44,45	791.2
Region 13	CLAY 3, EL. -58.5 TO -70 (protected)	43,42,8,14	1128.15
Region 14	CLAY 2, EL. -26.5 TO -41.5 (protected)	41,40,37,36	1471.5

Points

	X (ft)	Y (ft)
Point 1	203	3.2
Point 2	186.2	1
Point 3	189.9	3
Point 4	191.8	6
Point 5	310	0
Point 6	117.4	-41.5
Point 7	117.4	-58.5
Point 8	310	-58.5
Point 9	200	6
Point 10	200	1
Point 11	200	-5.5
Point 12	200	-58.5
Point 13	200	-70
Point 14	310	-70
Point 15	117.4	-70
Point 16	200	-17.3
Point 17	117.4	-17.3
Point 18	201	3.7
Point 19	211.9	0.7
Point 20	117.4	-6.1
Point 21	166.2	-6
Point 22	175.7	-3.8
Point 23	182.6	-1
Point 24	247.3	0
Point 25	200	3.7
Point 26	200	12.8
Point 27	200.5	12.8
Point 28	200	-53.5

Point 29	200	-41.5
Point 30	200	-26.5
Point 31	200	-21.5
Point 32	117.4	-53.5
Point 33	117.4	-26.5
Point 34	117.4	-21.5
Point 35	310	-53.5
Point 36	310	-41.5
Point 37	310	-26.5
Point 38	310	-21.5
Point 39	310	-5.5
Point 40	211.9	-26.5
Point 41	211.9	-41.5
Point 42	211.9	-58.5
Point 43	211.9	-70
Point 44	186.2	-70
Point 45	186.2	-58.5
Point 46	186.2	-41.5
Point 47	186.2	-26.5
Point 48	200	-6.9

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	2.35	(211.698, 0.623)	26.14862	(182.719, -0.934039)	(238.13, 0.181319)
2	7475	2.40	(211.698, 0.623)	26.229	(183.302, -0.610186)	(240.192, 0.140557)

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	183.4238	-2.6290215	693.13418	587.10868	0	650

2	Optimized	184.834	-3.7905205	739.49639	777.70279	0	650
3	Optimized	185.86955	-4.6930365	777.04857	869.96008	0	650
4	Optimized	186.5487	-5.354314	805.4221	966.77979	0	650
5	Optimized	187.88735	-6.6576825	861.96446	1270.9262	0	332.45
6	Optimized	189.38865	-8.214136	930.21473	1444.5733	0	334.62
7	Optimized	190.85	-9.907661	1003.4051	1709.454	0	336.74
8	Optimized	192.32215	-11.613675	1073.8656	1977.5642	0	338.87
9	Optimized	193.787	-13.48907	1147.1539	2134.5964	0	341
10	Optimized	195.67245	-16.02969	1239.2575	2395.5775	0	343.73
11	Optimized	196.89975	-17.68342	1297.0385	2565.3842	0	345.51
12	Optimized	197.87895	-18.89024	1337.9691	2723.3731	0	346.93
13	Optimized	199.26825	-20.537035	1401.3239	2893.201	0	348.94
14	Optimized	199.98145	-21.360915	1437.2642	3238.9964	0	349.97
15	Optimized	200.25	-21.367915	1436.112	2768.0594	0	349.58
16	Optimized	200.75	-21.38095	1433.9927	2783.4542	0	348.74
17	Optimized	202	-21.41354	1428.8142	2756.9626	0	346.64
18	Optimized	203.949	-21.46435	1421.3519	2701.4956	0	343.36
19	Optimized	205.99205	-21.210155	1395.7505	2666.4423	0	339.93
20	Optimized	208.1802	-20.652285	1351.8648	2532.9253	0	336.25

21	Optimize d	210.58715	- 19.682635	1282.3231	2403.0666	0	332.21
22	Optimize d	212.3666	-18.74645	1217.7241	2255.7297	0	330
23	Optimize d	213.89765	-17.8304	1155.643	2173.418	0	330
24	Optimize d	216.0266	-16.48924	1065.069	2022.5143	0	330
25	Optimize d	218.00275	-15.23237	980.59974	1883.6575	0	330
26	Optimize d	219.8261	-14.05979	901.95064	1751.7299	0	330
27	Optimize d	221.87715	-12.68387	810.25077	1606.3986	0	330
28	Optimize d	224.15585	- 11.104605	705.43467	1428.9398	0	330
29	Optimize d	226.6643	-9.33877	588.65107	1234.0976	0	330
30	Optimize d	229.3892	-7.36709	458.76087	1016.3011	0	330
31	Optimize d	231.2315	-5.935805	365.01044	882.66997	0	330
32	Optimize d	233.10045	-4.261515	256.05957	809.11959	0	650
33	Optimize d	235.3948	- 2.2219425	123.38295	552.11727	0	650
34	Optimize d	237.21855	- 0.6197679 5	19.139351	354.34699	0	650

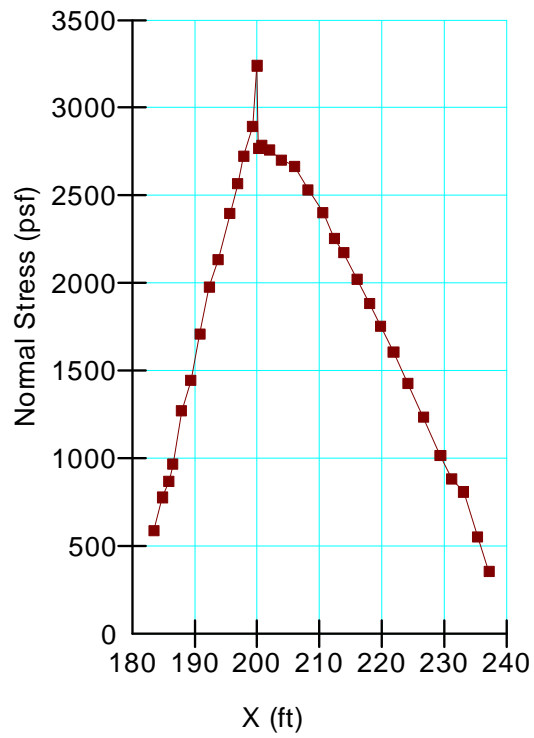
Slices of Slip Surface: 7475

	Slip Surfac e	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictiona l Strength (psf)	Cohesiv e Strength (psf)
1	7475	184.02625	-2.624302	689.25803	517.95081	0	650
2	7475	185.4754	-4.291378	759.88152	766.12898	0	650
3	7475	186.44855	-5.410852	808.36637	924.09237	0	650
4	7475	187.49785	-6.617911	860.91801	1228.5544	0	331.88

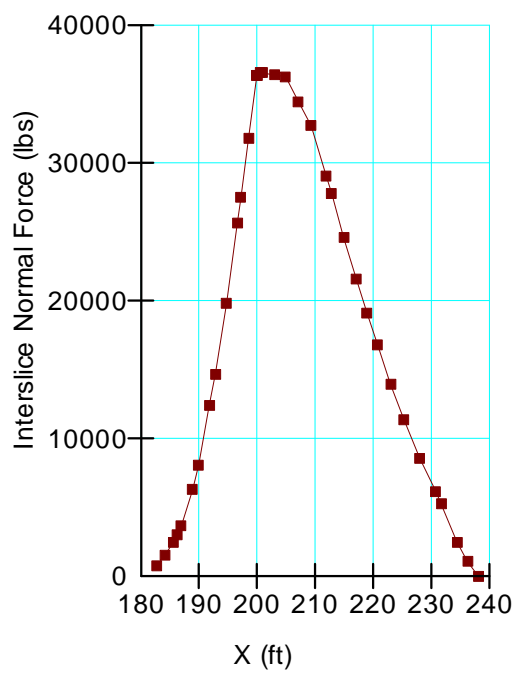
5	7475	189.0993	- 8.460156 5	941.37687	1466.203	0	334.2
6	7475	190.85	-10.47413	1027.561	1772.8095	0	336.74
7	7475	192.6306	- 12.52248 5	1110.7342	2076.2929	0	339.32
8	7475	194.2918	-14.43349	1182.9665	2273.5593	0	341.73
9	7475	195.953	- 16.34449 5	1249.9067	2470.7862	0	344.13
10	7475	197.5877	-18.225	1312.0524	2664.9	0	346.5
11	7475	199.1959	-20.075	1379.5683	2855.8619	0	348.83
12	7475	200.25	-21	1417.4	2734.4	0	349.58
13	7475	200.75	-21	1414.14	2748.2	0	348.74
14	7475	202	-21	1405.9	2718.3	0	346.64
15	7475	203.875	-21	1394.5143	2659.7714	0	343.49
16	7475	205.625	-21	1385.0857	2601.7143	0	340.55
17	7475	207.375	-21	1376.6286	2543.6571	0	337.61
18	7475	209.125	-21	1368.4571	2485.6571	0	334.66
19	7475	210.95	- 20.33480 5	1320.2574	2495.6111	0	331.6
20	7475	212.81985	- 19.02553 5	1232.8715	2318.224	0	330
21	7475	214.6595	- 17.73738 5	1146.8002	2173.5104	0	330
22	7475	216.49915	-16.44924	1060.8626	2028.7522	0	330
23	7475	218.33885	- 15.16109 5	975.05849	1884.0385	0	330
24	7475	220.1785	-13.87295	889.20988	1739.3248	0	330
25	7475	222.01815	- 12.58480 5	803.67297	1594.6111	0	330
26	7475	223.8578	-	718.22511	1449.8529	0	330

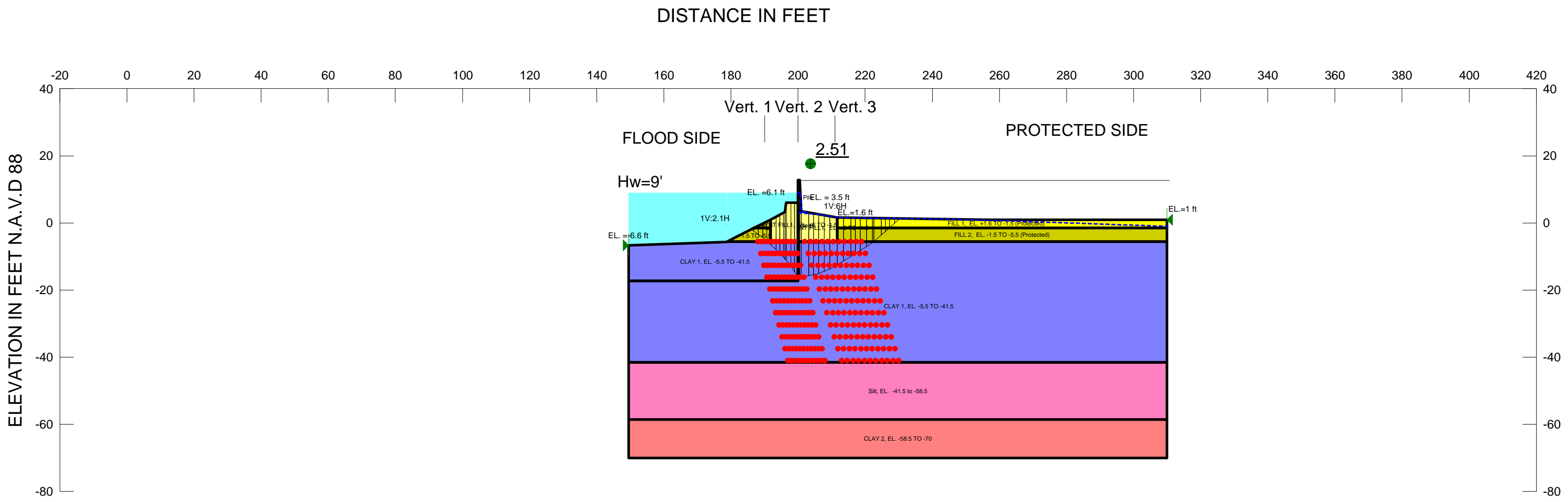
			11.29665 5				
27	7475	225.69745	- 10.00850 9	632.95536	1305.1393	0	330
28	7475	227.53715	-8.720365	547.90824	1160.4256	0	330
29	7475	229.3768	-7.432219	462.8166	1015.7119	0	330
30	7475	231.21645	-6.144073	377.96986	870.95369	0	330
31	7475	233.14325	- 4.794930 5	289.11089	810.12714	0	650
32	7475	235.15715	- 3.384791 5	196.33086	635.87476	0	650
33	7475	237.17105	-1.974652	103.65251	461.66305	0	650
34	7475	239.1849	- 0.564512 6	11.010359	287.43101	0	650

Base Normal Stress Vs. X



Interslice Normal Stress
Vs. X





Name: EMBANKMENT FILL1, EL. +6 TO -1.5 Model: Undrained (Phi=0) Unit Weight: 114 pcf Cohesion: 825 psf
Name: CLAY 1, EL. -5.5 TO -41.5 Model: Spatial Mohr-Coulomb Unit Weight: 117 pcf Cohesion Spatial Fn: Clay 1 Phi: 0 °
Name: Silt, EL. -41.5 to -58.5 Model: Mohr-Coulomb Unit Weight: 117 pcf Cohesion: 200 psf Phi: 15 °
Name: Sheet Pile Model: Undrained (Phi=0) Unit Weight: 0.1 pcf Cohesion: 0.01 psf
Name: FILL 1, EL. +1.6 TO -1.5 (Protected) Model: Undrained (Phi=0) Unit Weight: 114 pcf Cohesion: 900 psf
Name: FILL 2, EL. -1.5 TO -5.5 (Protected) Model: Undrained (Phi=0) Unit Weight: 114 pcf Cohesion: 500 psf
Name: CLAY 2, EL. -58.5 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 118 pcf Cohesion Spatial Fn: Clay 2 Phi: 0 °



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

GENERAL NOTES

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

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

Hw=CANAL WATER LEVEL

LONDON AVE CANAL
OUTFALL CANAL REEVALUATION REPORT
REACH 22, STA. 10+00 TO 11+85
AND STA. 13+55 TO 21+00
PROTECTED SIDE STABILITY ANALYSIS,
CASE: Global Stability (Block)
MARCH 2012

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

Global Stability (Block)

Report generated using GeoStudio 2007, version 7.15. Copyright © 1991-2009 GEO-SLOPE International Ltd.

File Information

Created By: Lijegren, James
Revision Number: 269
Last Edited By: Schroeder, Danielle V MVN
Date: 1/18/2012
Time: 11:13:07 AM
File Name: Reach 22-DVS.gsz
Directory: G:\F&MHOME\London Ave Reeevaluation 2011\Priority Reaches\Reach 22\SlopeW\
Last Solved Date: 1/18/2012
Last Solved Time: 11:14:20 AM

Project Settings

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

Analysis Settings

Global Stability (Block)

Kind: SLOPE/W
Parent: GAP Analysis (Seepage)
Method: Spencer
Settings
PWP Conditions Source: Parent Analysis
SlipSurface
Direction of movement: Left to Right
Use Passive Mode: Yes
Slip Surface Option: 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

3/1/2012

Phi: 0 °
Phi-B: 0 °

Slip Surface Limits

Left Coordinate: (149.5, -6.6) ft
Right Coordinate: (310, 1) ft

Slip Surface Block

Left Grid
Upper Left: (188, -5.5) ft
Lower Left: (197, -41) ft
Lower Right: (208, -41) ft
X Increments: 10
Y Increments: 10
Starting Angle: 125 °
Ending Angle: 145 °
Angle Increments: 4
Right Grid
Upper Left: (202, -5.5) ft
Lower Left: (213, -41) ft
Lower Right: (230, -41) ft
X Increments: 10
Y Increments: 10
Starting Angle: 25 °
Ending Angle: 45 °
Angle Increments: 4

Spatial Functions

Clay 2

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (191.8, -58.5, 715)
Data Point: (191.8, -70, 855)
Data Point: (200, -58.5, 765)
Data Point: (200, -70, 905)
Data Point: (211.7, -58.5, 715)
Data Point: (211.7, -70, 855)
Data Point: (149.5, -58.5, 715)
Data Point: (149.5, -70, 855)
Data Point: (310, -58.5, 715)
Data Point: (310, -70, 855)

Clay 1

Model: Linear Interpolation

3/1/2012

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 TO -1.5

Model: Undrained (Phi=0)
Unit Weight: 114 pcf
Cohesion: 825 psf

CLAY 1, EL. -5.5 TO -41.5

Model: Spatial Mohr-Coulomb
Unit Weight: 117 pcf
Cohesion Spatial Fn: Clay 1
Phi: 0 °
Phi-B: 0 °

Silt, EL. -41.5 to -58.5

Model: Mohr-Coulomb
Unit Weight: 117 pcf
Cohesion: 200 psf
Phi: 15 °
Phi-B: 0 °

Sheet Pile

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

FILL 1, EL. +1.6 TO -1.5 (Protected)

Model: Undrained (Phi=0)
Unit Weight: 114 pcf
Cohesion: 900 psf

FILL 2, EL. -1.5 TO -5.5 (Protected)

Model: Undrained (Phi=0)
Unit Weight: 114 pcf
Cohesion: 500 psf

CLAY 2, EL. -58.5 TO -70

Model: Spatial Mohr-Coulomb
Unit Weight: 118 pcf
Cohesion Spatial Fn: Clay 2

3/1/2012

Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (191.8, -5.5, 165)
Data Point: (191.8, -41, 520)
Data Point: (200, -5.5, 175)
Data Point: (200, -41.5, 550)
Data Point: (211.7, -5.5, 165)
Data Point: (211.7, -41.5, 520)
Data Point: (149.5, -5.5, 165)
Data Point: (149.5, -41.5, 520)
Data Point: (310, -5.5, 165)
Data Point: (310, -41.5, 520)

Regions

	Material	Points	Area (ft²)
Region 1	Sheet Pile	6,16,17,18,12	6.975
Region 2	FILL 1, EL. +1.6 TO -1.5 (Protected)	19,26,27,2,13	259.25
Region 3	FILL 2, EL. -1.5 TO -5.5 (Protected)	26,25,23,27	393.2
Region 4	Silt, EL. -41.5 to -58.5	28,4,5,3	2728.5
Region 5	FILL 2, EL. -1.5 TO -5.5 (Protected)	31,30,29,24	35.73136
Region 6	EMBANKMENT FILL1, EL. +6 TO -1.5	7,32,6,12,19,26,25	95.135
Region 7	CLAY 2, EL. -58.5 TO -70	9,4,5,8	1845.75
Region 8	CLAY 1, EL. -5.5 TO -41.5	28,11,10,7,25,23,3	5187.15
Region 9	CLAY 1, EL. -5.5 TO -41.5	11,14,15,24,29,7,10	571.9603
Region 10	FILL 1, EL. +1.6 TO -1.5 (Protected)	31,1,30	6.2033625
Region 11	EMBANKMENT FILL1, EL. +6 TO -1.5	29,30,1,20,21,22,16,6,32,7	77.715

Points

	X (ft)	Y (ft)
Point 1	191.8	1
Point 2	310	1
Point 3	310	-41.5
Point 4	149.5	-58.5
Point 5	310	-58.5
Point 6	200	3.5
Point 7	200	-5.5
Point 8	310	-70
Point 9	149.5	-70
Point 10	200	-17.2
Point 11	149.5	-17.2
Point 12	201	3.5
Point 13	256.7	1
Point 14	149.5	-6.6

3/1/2012

Point 15	178.5	-5.7
Point 16	200	6.1
Point 17	200	12.8
Point 18	200.5	12.8
Point 19	211.7	1.6
Point 20	196.1	3.3
Point 21	196.4	6.1
Point 22	199	6.1
Point 23	310	-5.5
Point 24	178.89701	-5.5
Point 25	211.7	-5.5
Point 26	211.7	-1.5
Point 27	310	-1.5
Point 28	149.5	-41.5
Point 29	191.8	-5.5
Point 30	191.8	-1.5
Point 31	186.83731	-1.5
Point 32	200	-1.5

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	2.51	(209.409, 2.005)	20.83596	(186.092, -1.87541)	(230.36, 1.3512)
2	11338	2.70	(209.409, 2.005)	21.148	(187.097, -1.36903)	(231.964, 1.32982)

Slices of Slip Surface: **Optimized**

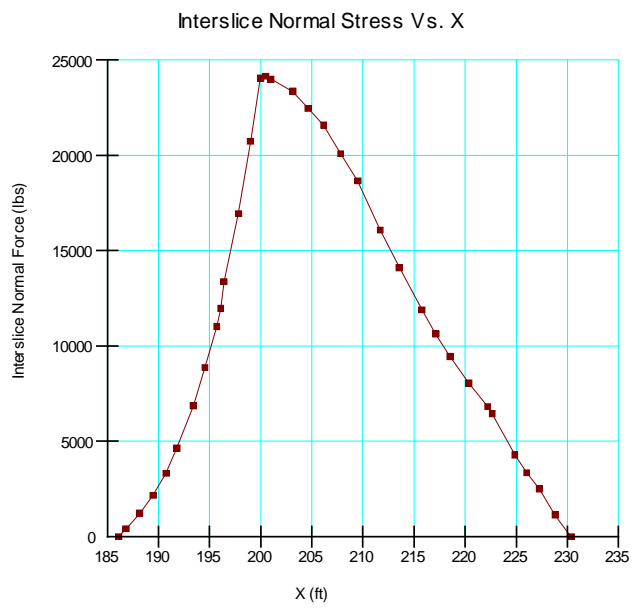
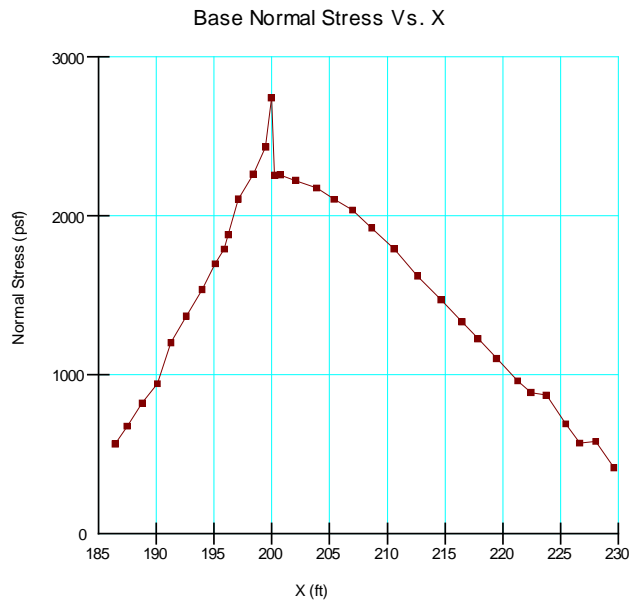
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	186.4647	-2.1506735	691.73386	564.30977	0	500
2	Optimized	187.49605	-2.9126	728.31167	676.96966	0	500
3	Optimized	188.81355	-3.88592	775.44131	820.86158	0	500
4	Optimized	190.11205	-4.93629	829.10882	942.98741	0	500
5	Optimized	191.2759	-5.961821	881.04434	1202.283	0	169.62
6	Optimized	192.6066	-7.134366	940.20195	1368.8392	0	182.4
7	Optimized	193.98305	-8.4383975	1005.6033	1536.0902	0	197.38
8	Optimized	195.1227	-9.6250125	1062.7972	1698.5548	0	211
9	Optimized	195.89625	-10.468955	1102.2683	1791.6794	0	220.73
10	Optimized	196.25	-10.904125	1122.1582	1881.6103	0	225.7
11	Optimized	197.11245	-11.965145	1169.0843	2105.6797	0	237.88
12	Optimized	198.41245	-13.70777	1245.2448	2263.569	0	257.91
13	Optimized	199.4761	-15.275795	1303.269	2432.8042	0	275.94
14	Optimized	199.9761	-15.97569	1323.6956	2743.5598	0	284.08
15	Optimized	200.25	-15.952845	1260.6216	2255.9646	0	283.55

16	Optimized	200.75	-15.911135	1251.1545	2258.5556	0	282.44
17	Optimized	202.0648	-15.801455	1227.5465	2223.4628	0	279.53
18	Optimized	203.8868	-15.54236	1193.1858	2176.0936	0	274.43
19	Optimized	205.40125	-15.20182	1159.3635	2104.8414	0	268.96
20	Optimized	206.9919	-14.706535	1116.6799	2036.0586	0	261.87
21	Optimized	208.65875	-14.0565	1064.3084	1924.2173	0	253.21
22	Optimized	210.5961	-13.070085	989.8882	1792.5381	0	240.99
23	Optimized	212.6248	-11.854605	901.18878	1621.7781	0	227.66
24	Optimized	214.65445	-10.613145	811.463	1471.5692	0	215.42
25	Optimized	216.4492	-9.4915125	731.60679	1334.2869	0	204.36
26	Optimized	217.829	-8.6229975	670.14887	1227.3182	0	195.8
27	Optimized	219.4401	-7.6150925	599.37128	1102.6331	0	185.86
28	Optimized	221.2825	-6.4677975	519.52576	961.41752	0	174.54
29	Optimized	222.42515	-5.697075	466.82108	888.20312	0	166.94
30	Optimized	223.75025	-4.51784	387.27604	870.90573	0	500
31	Optimized	225.44025	-3.02676	287.73323	691.36858	0	500
32	Optimized	226.63965	-1.98581	218.67981	569.25128	0	500
33	Optimized	228.0296	-0.75253612	137.46123	579.981	0	900
34	Optimized	229.5834	0.64995188	45.66371	415.52247	0	900

Slices of Slip Surface: **11338**

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	11338	187.15225	-1.4345155	650.41297	253.73125	0	900
2	11338	188.0463	-2.5	704.14794	567.44733	0	500
3	11338	189.7245	-4.5	806.41486	834.60529	0	500
4	11338	191.1818	-6.2367485	895.49647	1209.1412	0	172.37
5	11338	192.51665	-7.827587	976.02059	1420.0373	0	189.24
6	11338	193.95	-9.5357685	1059.8371	1647.315	0	208.43
7	11338	195.38335	-11.24395	1140.335	1874.5031	0	227.86
8	11338	196.25	-12.2768	1186.5003	2043.9363	0	239.74
9	11338	197.05	-13.2302	1227.3782	2257.2723	0	250.78
10	11338	198.35	-14.77948	1292.0031	2427.5615	0	268.88
11	11338	199.25	-15.85206	1326.5851	2545.439	0	281.53
12	11338	199.75	-16.15	1331.54	2751	0	285.5
13	11338	200.25	-16.15	1276.46	2266.6	0	285.6
14	11338	200.75	-16.15	1269.76	2274.2	0	284.92
15	11338	201.75	-16.15	1256.5333	2258.4667	0	283.56
16	11338	203.25	-16.15	1238.7333	2228.1333	0	281.52
17	11338	204.75	-16.15	1226.8	2197.7333	0	279.48
18	11338	206.25	-16.15	1215.4667	2167.3333	0	277.44
19	11338	207.78335	-15.601505	1169.9059	2165.3324	0	269.84

20	11338	209.35	-14.504515	1089.751	2000.0031	0	256.81
21	11338	210.91665	-13.40752	1010.1713	1834.7784	0	243.94
22	11338	212.4507	-12.33338	933.01914	1687.4656	0	232.38
23	11338	213.9521	-11.282095	858.16374	1558.0509	0	222.02
24	11338	215.4535	-10.230804	783.47201	1428.6361	0	211.65
25	11338	216.9549	-9.1795125	709.435	1299.2214	0	201.28
26	11338	218.4563	-8.128223	635.88902	1169.8066	0	190.92
27	11338	219.9577	-7.0769335	562.72495	1040.3919	0	180.55
28	11338	221.4591	-6.0256445	490.39565	910.97717	0	170.18
29	11338	222.92385	-5	420.36265	877.34241	0	500
30	11338	224.352	-4	352.58887	759.93133	0	500
31	11338	225.78015	-3	285.45175	642.52025	0	500
32	11338	227.2083	-2	218.83086	525.08622	0	500
33	11338	228.59595	-1.0283639	154.52906	518.25277	0	900
34	11338	229.94305	-0.08509175	92.451103	407.48657	0	900
35	11338	231.2902	0.85818015	30.737377	296.72037	0	900



Global Stability (Block)

Report generated using GeoStudio 2007, version 7.15. Copyright © 1991-2009 GEO-SLOPE International Ltd.

File Information

Created By: Liljegren, James
Revision Number: 188
Last Edited By: Schroeder, Danielle V MVN
Date: 1/18/2012
Time: 11:42:45 AM
File Name: Reach 23-DVS.gsz
Directory: G:\F&M\HOME\London Ave Reevaluation 2011\East Side\Reach 23\SlopeW\
Last Solved Date: 1/18/2012
Last Solved Time: 11:43:44 AM

Project Settings

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

Analysis Settings

Global Stability (Block)

Kind: SLOPE/W
Parent: Gap Seepage Analysis
Method: Spencer
Settings
PWP Conditions Source: Parent Analysis
SlipSurface
Direction of movement: Left to Right
Use Passive Mode: Yes
Slip Surface Option: Block
Critical slip surfaces saved: 1
Optimize Critical Slip Surface Location: Yes
Tension Crack
Tension Crack Option: (none)
FOS Distribution
FOS Calculation Option: Constant
Restrict Block Crossing: Yes
Advanced
Number of Slices: 30
Optimization Tolerance: 0.01

2/27/2012

Slip Surface Limits

Left Coordinate: (93.4, -6.1) ft
Right Coordinate: (310, -0.4) ft

Slip Surface Block

Left Grid
Upper Left: (191.196, 0) ft
Lower Left: (191.196, -44) ft
Lower Right: (222.306, -44) ft
X Increments: 10
Y Increments: 12
Starting Angle: 125 °
Ending Angle: 145 °
Angle Increments: 4
Right Grid
Upper Left: (226.314, 0) ft
Lower Left: (226.314, -44) ft
Lower Right: (269.397, -44) ft
X Increments: 10
Y Increments: 12
Starting Angle: 25 °
Ending Angle: 45 °
Angle Increments: 4

Cohesion Functions

MARSH 1

Model: Spline Data Point Function
Function: Cohesion vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 475
Data Points: X (ft), Cohesion (psf)
Data Point: (93.4, 475)
Data Point: (185.9, 475)
Data Point: (200, 500)
Data Point: (251.9, 475)
Data Point: (310, 475)

PRODELTA

Model: Spline Data Point Function
Function: Cohesion vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 380

2/27/2012

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

Materials

EMBANKMENT FILL, EL. 4.3 TO -4.5

Model: Undrained (Phi=0)
Unit Weight: 117 pcf
Cohesion: 760 psf

MARSH, EL. -4.5 TO -17.5

Model: Spatial Mohr-Coulomb
Unit Weight: 114 pcf
Cohesion Fn: MARSH 1
Phi: 0 °
Phi-B: 0 °

BEACH SAND SP, EL. -41.5 TO -57

Model: Mohr-Coulomb
Unit Weight: 122 pcf
Cohesion: 0 psf
Phi: 30 °
Phi-B: 0 °

BAY SOUND CLAY CL, EL. -57 TO -70

Model: Spatial Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion Spatial Fn: Bay Sound
Phi: 0 °
Phi-B: 0 °

Prodelta, MH, EL. -17.5 TO -41.5

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

Sheet Pile

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

2/27/2012

Data Points: X (ft), Cohesion (psf)
Data Point: (93.4, 380)
Data Point: (185.9, 380)
Data Point: (200, 400)
Data Point: (251.9, 380)
Data Point: (310, 380)

Spatial Functions

Bay Sound

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (185.9, -57, 580)
Data Point: (185.9, -70, 720)
Data Point: (200, -57, 715)
Data Point: (200, -70, 860)
Data Point: (251.9, -57, 580)
Data Point: (251.9, -70, 720)
Data Point: (93.4, -57, 580)
Data Point: (93.4, -70, 720)
Data Point: (310, -57, 580)
Data Point: (310, -70, 720)

Regions

	Material	Points	Area (ft²)
Region 1	MARSH, EL. -4.5 TO -17.5	14,10,11,16,17,21,22,23,40	885.955
Region 2	MARSH, EL. -4.5 TO -17.5	16,11,10,1,2,4,12,3	1888.38
Region 3	Prodelta, MH, EL. -17.5 TO -41.5	3,12,4,6,5	5198.4
Region 4	BEACH SAND SP, EL. -41.5 TO -57	5,6,7,38,13,39,8	3357.3
Region 5	EMBANKMENT FILL, EL. 4.3 TO -4.5	10,33,28,27,29,30,31,32,1	580.965
Region 6	EMBANKMENT FILL, EL. 4.3 TO -4.5	20,9,24,33,10,14,40,18,19	91.95
Region 7	Sheet Pile	25,26,27,28,33	6.725
Region 8	BAY SOUND CLAY CL, EL. -57 TO -70	39,8,34,35,36,37,7,38,13	2815.8

Points

	X (ft)	Y (ft)
Point 1	310	-4.5
Point 2	310	-7.5
Point 3	93.4	-17.5
Point 4	310	-17.5
Point 5	93.4	-41.5
Point 6	310	-41.5

2/27/2012

Point 7	310	-57
Point 8	93.4	-57
Point 9	197.1	3.8
Point 10	200	-4.5
Point 11	200	-13.2
Point 12	200	-17.5
Point 13	200	-57
Point 14	197	-4.5
Point 15	197	-10
Point 16	93.4	-13.2
Point 17	93.4	-6.1
Point 18	183.5	-4
Point 19	188	-1.2
Point 20	194.4	3.5
Point 21	110	-5
Point 22	149.1	-4.6
Point 23	176.1	-5.2
Point 24	199	4
Point 25	200	12.9
Point 26	200.5	12.9
Point 27	201	4.2
Point 28	201	4
Point 29	201.2	4.2
Point 30	208	3.9
Point 31	251.9	-0.4
Point 32	310	-0.4
Point 33	200	4
Point 34	93.4	-70
Point 35	185.9	-70
Point 36	251.9	-70
Point 37	310	-70
Point 38	251.9	-57
Point 39	185.9	-57
Point 40	180.4	-4.5

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	3.75	(235.59, 0.63)	51.22649	(180.785, -4.43798)	(290.535, -0.4)
2	35609	4.06	(235.59, 0.63)	51.235	(180.272, -4.52091)	(291.138, -0.4)

Slices of Slip Surface: **Optimized**

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

2/27/2012

						(psf)	(psf)
1	Optimized	182.14225	-5.8359525	805.90971	805.11435	0	475
2	Optimized	185.75	-9.550592	961.67646	1305.4022	0	475
3	Optimized	188.0367	-11.905045	1075.2494	1645.5265	0	478.79
4	Optimized	188.5868	-12.571415	1108.3614	1712.7822	0	479.76
5	Optimized	190.85625	-15.35	1244.9057	2113.1173	0	483.79
6	Optimized	193.50615	-18.59441	1394.7057	2594.5503	0	390.79
7	Optimized	195.0251	-20.454175	1472.3294	2814.8262	0	392.94
8	Optimized	196.3251	-22.196985	1545.025	2957.2007	0	394.79
9	Optimized	197.05	-23.24686	1588.401	3061.9162	0	395.82
10	Optimized	198.05	-24.69518	1649.4234	3206.0244	0	397.23
11	Optimized	199.5	-26.79524	1740.5025	3412.5962	0	399.29
12	Optimized	200.04275	-27.58131	1775.4519	3161.1737	0	399.98
13	Optimized	200.29275	-27.803035	1784.86	3368.7382	0	399.89
14	Optimized	200.75	-28.15562	1799.6957	3402.5226	0	399.71
15	Optimized	201.1	-28.4255	1811.218	3451.3438	0	399.58
16	Optimized	202.9	-29.81347	1871.4473	3577.3388	0	398.88
17	Optimized	206.3	-32.43519	1990.001	3814.2132	0	397.57
18	Optimized	209.00095	-34.517865	2088.8485	3996.2024	0	396.53
19	Optimized	211.69955	-36.17898	2169.5788	4167.5407	0	395.49
20	Optimized	215.09485	-37.95758	2258.805	4302.1626	0	394.18
21	Optimized	218.7995	-39.431555	2335.161	4442.6181	0	392.76
22	Optimized	222.8135	-40.600905	2397.8274	4511.025	0	391.21
23	Optimized	226.8524	-41.263615	2434.1371	4572.6134	0	389.65
24	Optimized	230.91625	-41.41968	2442.5712	4541.385	0	388.09
25	Optimized	234.9904	-41.067595	2421.6405	4502.1238	0	386.52
26	Optimized	239.0748	-40.207365	2370.2034	4370.5963	0	384.94
27	Optimized	243.76825	-38.641835	2275.7178	4198.1246	0	383.13
28	Optimized	249.15975	-35.721895	2097.8022	3883.2276	0	381.06
29	Optimized	252.7416	-33.38928	1954.3935	3620.5416	0	380
30	Optimized	255.84775	-31.09282	1812.5276	3411.8372	0	380
			-				

2/27/2012

31	Optimized	260.3768	27.596085	1595.1326	3065.2706	0	380
32	Optimized	264.89725	-23.93125	1366.0868	2712.9174	0	380
33	Optimized	269.40915	-20.098305	1125.6386	2332.6934	0	380
34	Optimized	272.0334	-17.840915	983.66976	2118.9155	0	380
35	Optimized	275.1384	-14.96675	802.82774	1816.4785	0	475
36	Optimized	279.9508	10.450125	518.28063	1298.9322	0	475
37	Optimized	284.13995	-6.447295	265.91082	836.08136	0	475
38	Optimized	288.3943	-2.41392	11.662283	435.21136	0	760

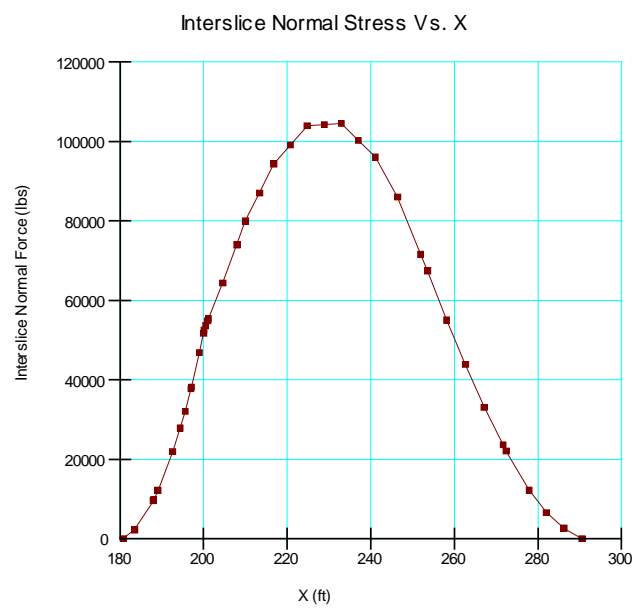
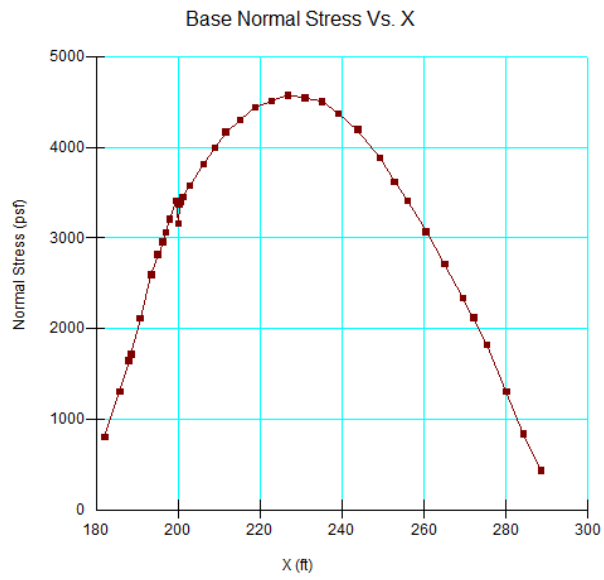
Slices of Slip Surface: **35609**

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	35609	180.3358	-4.58512	783.27214	660.43507	0	475
2	35609	181.95	-6.199333	825.21643	855.30269	0	475
3	35609	185.75	-9.9993315	984.27693	1364.6532	0	475
4	35609	188.47535	-12.724665	1115.9243	1762.8823	0	479.57
5	35609	191.1007	-15.35	1245.5769	2160.9513	0	484.22
6	35609	193.82535	-18.074665	1372.5212	2588.2197	0	391.24
7	35609	195.75	-19.99933	1452.0043	2806.9517	0	393.97
8	35609	198.05	-22.29933	1542.1998	3041.1916	0	397.23
9	35609	199.5	-23.74933	1599.475	3186.2222	0	399.29
10	35609	200.25	-24.49933	1630.1639	2996.7185	0	399.9
11	35609	200.75	-24.99933	1650.67	3061.6309	0	399.71
12	35609	201.1	-25.34933	1665.0598	3117.9168	0	399.58
13	35609	202.9	-27.14933	1741.7912	3282.8473	0	398.88
14	35609	206.3	-30.54933	1894.8174	3593.3504	0	397.57
15	35609	210.021	-34.27033	2073.5619	3920.7516	0	396.14
16	35609	214.063	-38.31233	2278.9412	4264.8582	0	394.58
17	35609	218.04565	-40.33333	2384.7951	4588.9776	0	393.05
18	35609	221.96895	-40.33333	2383.1638	4544.1175	0	391.53
19	35609	225.89225	-40.33333	2381.66	4499.0026	0	390.02
20	35609	229.8156	-40.33333	2380.3346	4454.1426	0	388.51
21	35609	233.73895	-40.33333	2379.1111	4409.2826	0	387
22	35609	237.66225	-40.33333	2378.0151	4364.1676	0	385.49
23	35609	241.58555	-40.33333	2377.0211	4319.3076	0	383.97
24	35609	245.6354	-38.581125	2271.317	4242.3719	0	382.41
25	35609	249.8118	-35.07671	2058.5473	3844.896	0	380.8

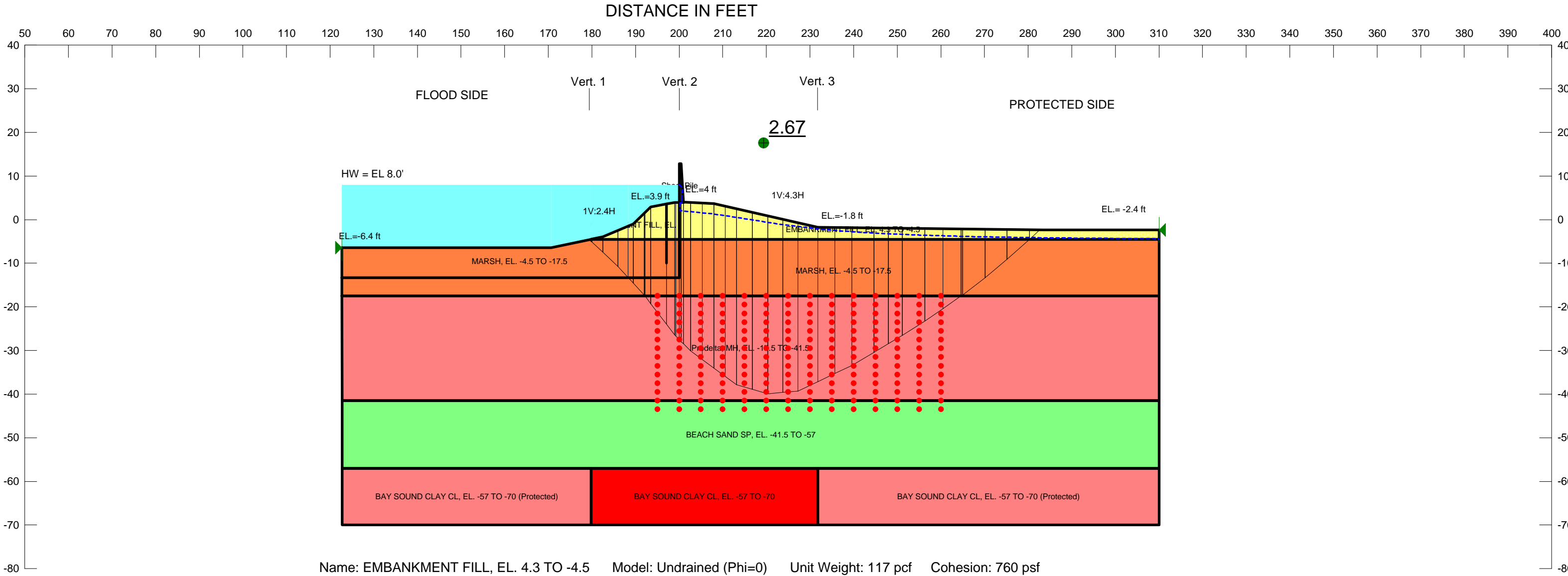
2/27/2012

26	35609	253.7859	-31.74205	1853.6831	3488.8319	0	380
27	35609	257.5577	-28.57715	1657.6724	3174.0287	0	380
28	35609	261.32945	-25.41225	1460.4025	2859.2255	0	380
29	35609	265.1012	-22.24735	1262.1781	2544.4223	0	380
30	35609	268.873	-19.08245	1063.2834	2229.6191	0	380
31	35609	272.6955	-15.875	861.23658	1904.6095	0	475
32	35609	276.5687	-12.625	656.17743	1528.6084	0	475
33	35609	280.4419	-9.375	450.96005	1152.5875	0	475
34	35609	284.3151	-6.125	245.70311	776.56661	0	475
35	35609	288.6948	-2.45	13.726023	406.17904	0	760

2/27/2012



ELEVATION IN FEET N.A.V.D 88



Name: EMBANKMENT FILL, EL. 4.3 TO -4.5 Model: Undrained (Phi=0) Unit Weight: 117 pcf Cohesion: 760 psf
Name: MARSH, EL. -4.5 TO -17.5 Model: Spatial Mohr-Coulomb Unit Weight: 114 pcf Cohesion Fn: MARSH 1 Phi: 0 °
Name: BEACH SAND SP, EL. -41.5 TO -57 Model: Mohr-Coulomb Unit Weight: 122 pcf Cohesion: 0 psf Phi: 30 °
Name: BAY SOUND CLAY CL, EL. -57 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 112 pcf Cohesion Spatial Fn: Bay Sound Phi: 0 °
Name: Prodelta, MH, EL. -17.5 TO -41.5 Model: Spatial Mohr-Coulomb Unit Weight: 98 pcf Cohesion Fn: PRODELTA Phi: 0 °
Name: Sheet Pile Model: Undrained (Phi=0) Unit Weight: 0.1 pcf Cohesion: 0.01 psf
Name: BAY SOUND CLAY CL, EL. -57 TO -70 (Protected) Model: Spatial Mohr-Coulomb Unit Weight: 112 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=CANAL WATER LEVEL

LONDON AVE CANAL
OUTFALL CANAL REEVALUATION REPORT
REACH 24, STA. 24+00 TO 33+00
PROTECTED SIDE STABILITY ANALYSIS,
CASE: Global Stability (Block) EI-17.5 to EL-41.5 (Passive)
MARCH 2012

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

Global Stability (Block) EL-17.5 to EL-41.5 (Passive)

Report generated using GeoStudio 2007, version 7.15. Copyright © 1991-2009 GEO-SLOPE International Ltd.

File Information

Created By: Liljegren, James
Revision Number: 218
Last Edited By: Curran, Matthew MVN
Date: 3/7/2013
Time: 10:49:16 AM
File Name: Reach 24.gsz
Directory: C:\Users\B2EDFMJC\Desktop\Chrono Order\Reach 24 SlopeW\
Last Solved Date: 3/7/2013
Last Solved Time: 10:49:59 AM

Project Settings

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

Analysis Settings

Global Stability (Block) EL-17.5 to EL-41.5 (Passive)

Kind: SLOPE/W
Parent: Gap Seepage Analysis
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: 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

EMBANKMENT FILL, EL. 4.3 TO -4.5

Model: Undrained (Phi=0)
Unit Weight: 117 pcf
Cohesion: 760 psf

MARSH, EL. -4.5 TO -17.5

Model: Spatial Mohr-Coulomb
Unit Weight: 114 pcf
Cohesion Fn: MARSH 1
Phi: 0 °
Phi-B: 0 °

BEACH SAND SP, EL. -41.5 TO -57

Model: Mohr-Coulomb
Unit Weight: 122 pcf
Cohesion: 0 psf
Phi: 30 °
Phi-B: 0 °

BAY SOUND CLAY CL, EL. -57 TO -70

Model: Spatial Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion Spatial Fn: Bay Sound
Phi: 0 °
Phi-B: 0 °

Prodelta, MH, EL. -17.5 TO -41.5

Model: Spatial Mohr-Coulomb
Unit Weight: 98 pcf

Cohesion Fn: PRODELTA
Phi: 0 °
Phi-B: 0 °

Sheet Pile

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

BAY SOUND CLAY CL, EL. -57 TO -70 (Protected)

Model: Spatial Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion Fn: Bay Sound
Phi: 0 °
Phi-B: 0 °

Slip Surface Limits

Left Coordinate: (122.7, -6.4) ft
Right Coordinate: (310, -2.4) ft

Slip Surface Block

Left Grid
 Upper Left: (195, -17.5) ft
 Lower Left: (195, -43.5) ft
 Lower Right: (220, -43.5) ft
 X Increments: 5
 Y Increments: 13
 Starting Angle: 120 °
 Ending Angle: 150 °
 Angle Increments: 6
Right Grid
 Upper Left: (225, -17.5) ft
 Lower Left: (225, -43.5) ft
 Lower Right: (260, -43.5) ft
 X Increments: 7
 Y Increments: 13
 Starting Angle: 20 °
 Ending Angle: 45 °
 Angle Increments: 5

Cohesion Functions

Bay Sound

Model: Spline Data Point Function
Function: Cohesion vs. Y
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 580
Data Points: Y (ft), Cohesion (psf)
 Data Point: (-70, 720)
 Data Point: (-57, 580)

MARSH 1

Model: Spline Data Point Function
Function: Cohesion vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 475
Data Points: X (ft), Cohesion (psf)
 Data Point: (179.8, 475)
 Data Point: (200, 500)
 Data Point: (231.8, 475)

PRODELTA

Model: Spline Data Point Function
Function: Cohesion vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 380
Data Points: X (ft), Cohesion (psf)
 Data Point: (179.8, 380)
 Data Point: (200, 400)
 Data Point: (231.8, 380)

Spatial Functions

Bay Sound

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
 Data Point: (179.8, -57, 580)
 Data Point: (179.8, -70, 720)
 Data Point: (200, -57, 715)
 Data Point: (200, -70, 860)
 Data Point: (231.8, -57, 580)
 Data Point: (231.8, -70, 720)

Regions

	Material	Points	Area (ft²)
Region 1	EMBANKMENT FILL, EL. 4.3 TO -4.5	32,18,21,19,22,20,10,23,31,11,15	89.001625
Region 2	MARSH, EL. -4.5 TO -17.5	1,2,32,15,11,12,17	580.42588
Region 3	MARSH, EL. -4.5 TO -17.5	17,12,11,4,5,7,13,6	1754.66
Region 4	Prodelta, MH, EL. -17.5 TO -41.5	6,13,7,9,14,8	4494
Region 5	Sheet Pile	31,24,25,26,41	6.7
Region 6	EMBANKMENT FILL, EL. 4.3 TO -4.5	26,27,30,28,29,3,4,11,31,41	376.29
Region 7	BEACH SAND SP, EL. -41.5 TO -57	8,33,35,36,34,9,14	2901.6
Region 8	BAY SOUND CLAY CL, EL. -57 TO -70 (Protected)	33,37,38,35	741
Region 9	BAY SOUND CLAY CL, EL. -57 TO -70	35,38,39,36	676
Region 10	BAY SOUND CLAY CL, EL. -57 TO -70 (Protected)	36,39,40,34	1016.6

Points

	X (ft)	Y (ft)
Point 1	122.7	-6.4
Point 2	170.7	-6.4
Point 3	310	-2.5
Point 4	310	-4.5
Point 5	310	-7.5
Point 6	122.7	-17.5
Point 7	310	-17.5
Point 8	122.8	-41.5
Point 9	310	-41.5
Point 10	197.1	3.6
Point 11	200	-4.5
Point 12	200	-13.3
Point 13	200	-17.5
Point 14	200	-41.5
Point 15	197.1	-4.5
Point 16	197.1	-10
Point 17	122.7	-13.3

Point 18	180	-4.4
Point 19	188.3	-1.5
Point 20	193.5	2.9
Point 21	182.5	-3.9
Point 22	189.5	-1
Point 23	199	3.9
Point 24	200	12.8
Point 25	200.5	12.8
Point 26	201	4
Point 27	208	3.7
Point 28	283.5	-2.4
Point 29	310	-2.4
Point 30	231.8	-1.8
Point 31	200	3.9
Point 32	179.7675	-4.5
Point 33	122.8	-57
Point 34	310	-57
Point 35	179.8	-57
Point 36	231.8	-57
Point 37	122.8	-70
Point 38	179.8	-70
Point 39	231.8	-70
Point 40	310	-70
Point 41	201	3.9

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	2.67	(232.033, -1.798)	47.82932	(179.37, -4.58322)	(282.661, -2.39026)
2	25690	2.81	(232.033, -1.798)	49.247	(178.306, -4.8062)	(285.841, -2.4)

Slices of Slip Surface: Optimized

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

					Stress (psf)	Strength (psf)	Strength (psf)
1	Optimized	179.5689	4.7677065	789.57029	629.78574	0	475
2	Optimized	179.88375	5.0601885	794.71017	663.27733	0	475.1
3	Optimized	181.25	6.3294485	819.75789	824.53465	0	476.79
4	Optimized	184.23735	9.1047455	919.96095	1181.6413	0	480.49
5	Optimized	187.13735	-11.99019	1047.4251	1532.292	0	484.08
6	Optimized	188.9	-13.91774	1136.8103	1785.0425	0	486.26
7	Optimized	190.75315	15.944255	1229.919	2082.4992	0	488.56
8	Optimized	192.07745	17.407315	1294.2818	2267.004	0	490.19
9	Optimized	192.8243	18.379735	1334.9326	2445.7086	0	392.9
10	Optimized	195.3	21.603055	1459.3433	2811.2777	0	395.35
11	Optimized	198.05	-25.18353	1594.4951	3177.3847	0	398.07
12	Optimized	199.1176	26.573555	1648.5688	3317.9052	0	399.13
13	Optimized	199.6176	-27.10664	1669.8652	3437.2156	0	399.62
14	Optimized	200.25	-27.735	1694.663	3224.3287	0	399.84

15	Optimized	200.75	-28.23182	1714.3832	3295.4066	0	399.53
16	Optimized	201.80015	-29.27531	1756.3036	3402.6804	0	398.87
17	Optimized	203.95025	31.055845	1829.4575	3623.4345	0	397.52
18	Optimized	206.6501	33.026755	1912.9532	3800.2384	0	395.82
19	Optimized	209.30095	34.961925	1999.5002	3946.043	0	394.15
20	Optimized	211.90285	36.861355	2088.6525	4060.2771	0	392.51
21	Optimized	214.9817	-38.33601	2159.3067	4225.6686	0	390.58
22	Optimized	218.53755	-39.38589	2210.6879	4232.6812	0	388.34
23	Optimized	222.05155	-39.76434	2228.4474	4267.2518	0	386.13
24	Optimized	225.52365	39.471365	2210.1661	4144.4202	0	383.95
25	Optimized	229.52985	38.233645	2137.9118	4008.0387	0	381.43
26	Optimized	233.73685	36.211385	2018.3205	3742.6458	0	380
27	Optimized	237.6106	34.349335	1905.6177	3552.7913	0	380
28	Optimized	242.1061	31.932395	1757.2943	3329.2101	0	380
29	Optimized	246.2907	-29.46283	1604.1994	3083.3696	0	380

			5				
30	Optimize d	249.54265	- 27.49554 5	1481.0383	2883.4071	0	380
31	Optimize d	253.74855	-24.87251	1315.8551	2623.2371	0	380
32	Optimize d	258.4111	-21.79984	1121.6433	2321.6439	0	380
33	Optimize d	262.57635	-18.93328	939.85145	2030.3259	0	380
34	Optimize d	264.82845	-17.38336	841.46834	1896.7	0	475
35	Optimize d	267.55485	-15.29755	709.14954	1669.3436	0	475
36	Optimize d	272.6294	- 11.21945 5	450.49221	1203.0837	0	475
37	Optimize d	277.7244	-6.805265	170.60903	694.01829	0	475
38	Optimize d	281.48115	-3.445129	-42.223066	394.36002	0	760

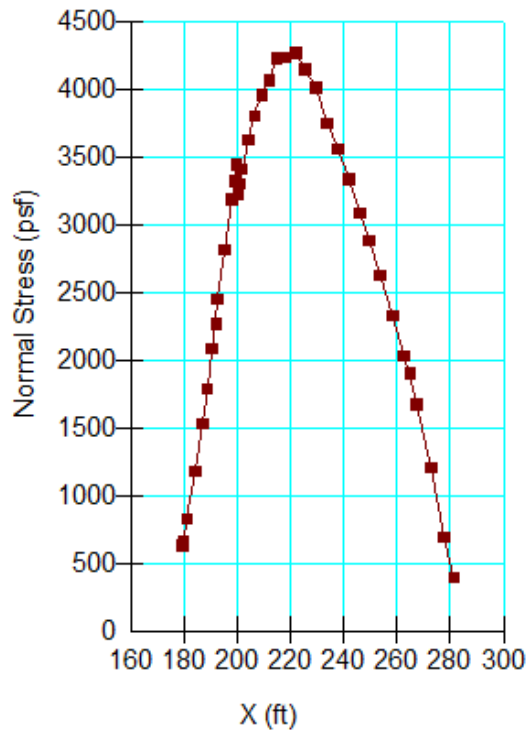
Slices of Slip Surface: 25690

	Slip Surfac e	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictiona l Strength (psf)	Cohesiv e Strength (psf)
1	25690	179.03685	-5.53685	818.74005	704.44549	0	475
2	25690	179.88375	-6.38375	839.16075	805.06757	0	475.1
3	25690	181.25	-7.75	881.47929	976.85385	0	476.79
4	25690	184.65	-11.15	1014.4023	1411.4181	0	481
5	25690	187.55	-14.05	1142.6376	1797.6543	0	484.59
6	25690	188.9	-15.4	1203.6138	1977.4834	0	486.26
7	25690	190.25	-16.75	1263.8829	2173.2695	0	487.93
8	25690	192.25	-18.75	1349.386	2515.4333	0	392.33
9	25690	195.3	-21.8	1467.2465	2897.5664	0	395.35
10	25690	198.05	-24.55	1567.5812	3186.7811	0	398.07
11	25690	199.5	-26	1622.0317	3334.0074	0	399.5

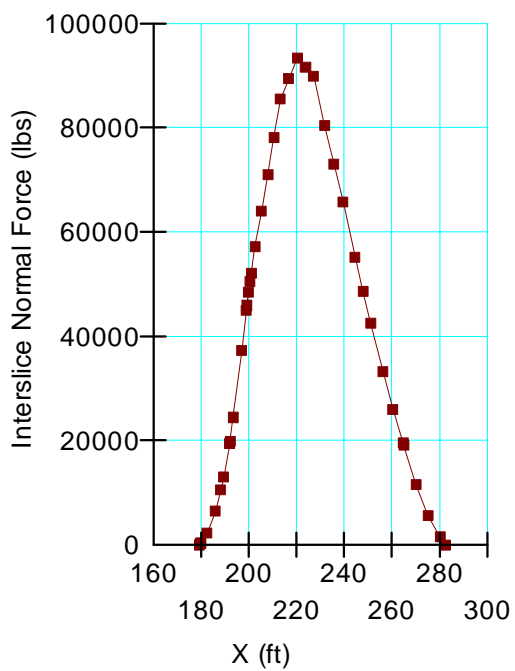
12	25690	200.25	-26.75	1650.8114	3131.7759	0	399.84
13	25690	200.75	-27.25	1670.3276	3204.325	0	399.53
14	25690	202.75	-29.25	1750.8168	3398.5575	0	398.27
15	25690	206.25	-32.75	1901.0265	3716.9577	0	396.07
16	25690	209.75	-36.25	2062.3276	3997.7801	0	393.87
17	25690	213.25	-39.75	2233.8515	4241.0248	0	391.67
18	25690	216.875	-41.5	2323.0667	4556.8	0	389.39
19	25690	220.625	-41.5	2322.7467	4455.4667	0	387.03
20	25690	224.375	-41.5	2322.4533	4353.8667	0	384.67
21	25690	228.125	-41.5	2322.16	4252.5333	0	382.31
22	25690	230.9	- 40.86981 5	2286.1626	4283.4376	0	380.57
23	25690	233.6042	- 38.97631 5	2177.0759	4067.1622	0	380
24	25690	237.2126	-36.44969	2028.2917	3810.4107	0	380
25	25690	240.821	- 33.92306 5	1876.4428	3553.4321	0	380
26	25690	244.4294	-31.39644	1722.1195	3296.6806	0	380
27	25690	248.0378	- 28.86981 5	1565.9346	3039.7021	0	380
28	25690	251.6462	-26.34319	1408.2742	2782.7235	0	380
29	25690	255.2546	- 23.81656 5	1249.456	2525.972	0	380
30	25690	258.863	-21.28994	1089.7752	2269.0388	0	380
31	25690	262.4714	- 18.76331 5	929.52681	2012.1511	0	380
32	25690	266.13215	-16.2	766.69515	1755.2541	0	475
33	25690	269.8453	-13.6	601.32867	1448.5892	0	475
34	25690	273.5585	-11	435.87394	1141.9244	0	475
35	25690	277.2717	-8.4	270.35303	835.25959	0	475
36	25690	280.9849	-5.8	105.03066	528.59477	0	475

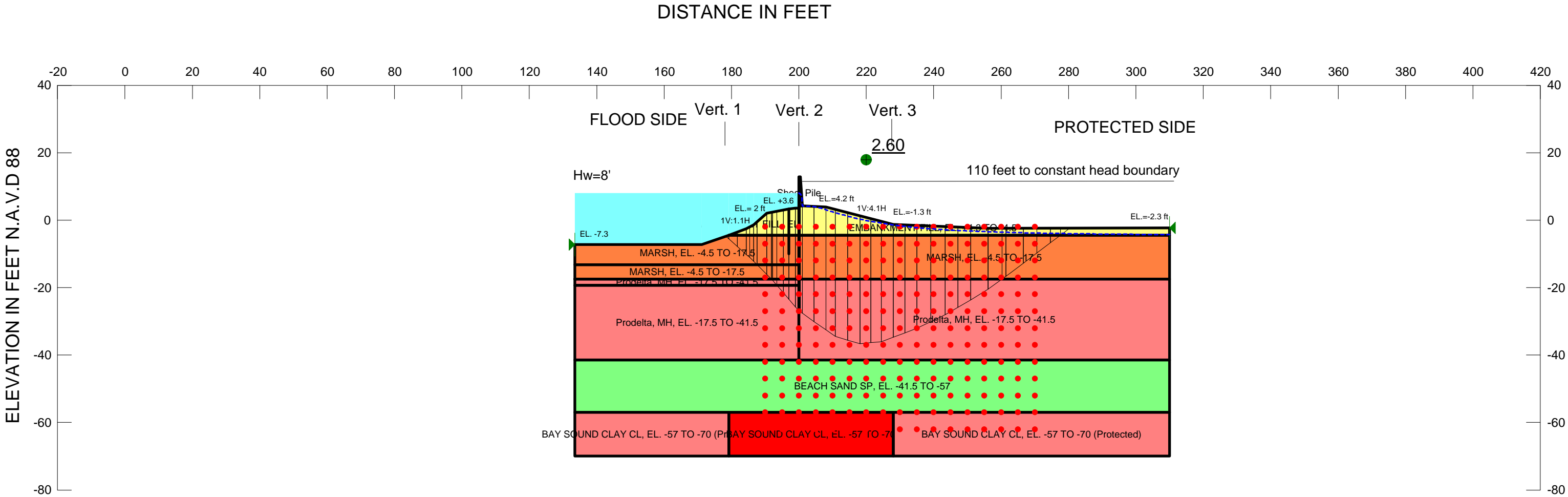
37	25690	283.17075	- 4.269448 5	7.7823475	422.00045	0	760
38	25690	284.6703	- 3.219448 5	-58.855666	296.56718	0	760

Base Normal Stress Vs. X



Interslice Normal Stress
Vs. X





Name: EMBANKMENT FILL, EL. +4.3 TO -4.5 Model: Undrained (Phi=0) Unit Weight: 117 pcf Cohesion: 760 psf
Name: MARSH, EL. -4.5 TO -17.5 Model: Spatial Mohr-Coulomb Unit Weight: 114 pcf Cohesion Fn: MARSH 1 Phi: 0 °
Name: BEACH SAND SP, EL. -41.5 TO -57 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: SAND
Name: BAY SOUND CLAY CL, EL. -57 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 112 pcf Cohesion Spatial Fn: Bay Sound Phi: 0 °
Name: Prodelta, MH, EL. -17.5 TO -41.5 Model: Spatial Mohr-Coulomb Unit Weight: 98 pcf Cohesion Fn: PRODELTA Phi: 0 °
Name: Sheet Pile Model: Undrained (Phi=0) Unit Weight: 0.1 pcf Cohesion: 0.01 psf
Name: BAY SOUND CLAY CL, EL. -57 TO -70 (Protected) Model: Spatial Mohr-Coulomb Unit Weight: 112 pcf Cohesion Fn: Bay Sound Phi: 0 °



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

GENERAL NOTES

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

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

Hw=CANAL WATER LEVEL

LONDON AVE CANAL
OUTFALL CANAL REEVALUATION REPORT
REACH 25, STA. 33+00 TO STA. 37+00
PROTECTED SIDE STABILITY ANALYSIS,
CASE: Global Stability (Block)
MARCH 2012

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

Global Stability (Block)

Report generated using GeoStudio 2007, version 7.15. Copyright © 1991-2009 GEO-SLOPE International Ltd.

File Information

Created By: Liljegren, James
Revision Number: 155
Last Edited By: Middleton, Mark C MVN
Date: 12/13/2011
Time: 3:19:47 PM
File Name: Reach 25.gsz
Directory: G:\F&MHOME\Middleton\London Ave Canal\Reach 25\
Last Solved Date: 12/13/2011
Last Solved Time: 3:25:14 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 Seepage Analysis
Method: Spencer
Settings
 PWP Conditions Source: Parent Analysis
SlipSurface
 Direction of movement: Left to Right
 Use Passive Mode: Yes
 Slip Surface Option: Block
 Critical slip surfaces saved: 1
 Optimize Critical Slip Surface Location: Yes
 Tension Crack
 Tension Crack Option: (none)
FOS Distribution
 FOS Calculation Option: Constant
Restrict Block Crossing: Yes

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

Materials

EMBANKMENT FILL, EL. +4.3 TO -4.5

Model: Undrained (Phi=0)
Unit Weight: 117 pcf
Cohesion: 760 psf

MARSH, EL. -4.5 TO -17.5

Model: Spatial Mohr-Coulomb
Unit Weight: 114 pcf
Cohesion Fn: MARSH 1
Phi: 0 °
Phi-B: 0 °

BEACH SAND SP, EL. -41.5 TO -57

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

BAY SOUND CLAY CL, EL. -57 TO -70

Model: Spatial Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion Spatial Fn: Bay Sound
Phi: 0 °
Phi-B: 0 °

Prodelta, MH, EL. -17.5 TO -41.5

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

Sheet Pile

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

BAY SOUND CLAY CL, EL. -57 TO -70 (Protected)

Model: Spatial Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion Fn: Bay Sound
Phi: 0 °
Phi-B: 0 °

Slip Surface Limits

Left Coordinate: (133.5, -7.3) ft
Right Coordinate: (310, -2.3) ft

Slip Surface Block

Left Grid
 Upper Left: (190, -2) ft
 Lower Left: (190, -62) ft
 Lower Right: (215, -62) ft
 X Increments: 5
 Y Increments: 12
 Starting Angle: 125 °
 Ending Angle: 145 °
 Angle Increments: 4
Right Grid
 Upper Left: (220, -2) ft
 Lower Left: (220, -62) ft
 Lower Right: (270, -62) ft
 X Increments: 10
 Y Increments: 12
 Starting Angle: 25 °
 Ending Angle: 45 °
 Angle Increments: 4

Cohesion Functions

Bay Sound

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

Y-Intercept: 580
Data Points: Y (ft), Cohesion (psf)
 Data Point: (-70, 720)
 Data Point: (-57, 580)

MARSH 1

Model: Spline Data Point Function
Function: Cohesion vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 475
Data Points: X (ft), Cohesion (psf)
 Data Point: (179.2, 475)
 Data Point: (200, 500)
 Data Point: (228, 475)

PRODELTA

Model: Spline Data Point Function
Function: Cohesion vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 380
Data Points: X (ft), Cohesion (psf)
 Data Point: (179.2, 380)
 Data Point: (200, 400)
 Data Point: (228, 380)

Shear/Normal Strength Functions

SAND

Model: Spline Data Point Function
Function: Shear Stress vs. Normal Stress
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
 Data Point: (-10000, 0)
 Data Point: (0, 0)
 Data Point: (10000, 5774)
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: (179.2, -57, 580)
Data Point: (179.2, -70, 720)
Data Point: (200, -57, 715)
Data Point: (200, -70, 860)
Data Point: (228, -57, 580)
Data Point: (228, -70, 720)

Regions

	Material	Points	Area (ft ²)
Region 1	EMBANKMENT FILL, EL. +4.3 TO -4.5	32,3,20,21,12,40,41,13,17	100.28
Region 2	MARSH, EL. -4.5 TO -17.5	1,2,32,17,13,14,19	461.86
Region 3	MARSH, EL. -4.5 TO -17.5	14,13,5,7,15,31	1430
Region 4	Prodelta, MH, EL. -17.5 TO -41.5	15,7,9,30,29	2640
Region 5	BEACH SAND SP, EL. -41.5 TO -57	30,9,10,38,16,37,11,8	2735.75
Region 6	Sheet Pile	4,22,23,28	6.525
Region 7	EMBANKMENT FILL, EL. +4.3 TO -4.5	4,28,24,25,26,27,5,13,41	374.9
Region 8	MARSH, EL. -4.5 TO -17.5	6,19,14,31,15	285.95
Region 9	Prodelta, MH, EL. -17.5 TO -41.5	6,33,29,15	119.7
Region 10	Prodelta, MH, EL. -17.5 TO -41.5	33,29,30,8	1476.3
Region 11	BAY SOUND CLAY CL, EL. -57 TO -70 (Protected)	11,34,36,37	594.1
Region 12	BAY SOUND CLAY CL, EL. -57 TO -70	37,36,39,38,16	634.4
Region 13	BAY SOUND CLAY CL, EL. -57 TO -70 (Protected)	38,39,35,10	1066

Points

	X (ft)	Y (ft)
Point 1	133.5	-7.3
Point 2	171.2	-7.3

Point 3	184.4	-2.5
Point 4	200	4.2
Point 5	310	-4.5
Point 6	133.5	-17.5
Point 7	310	-17.5
Point 8	133.5	-41.5
Point 9	310	-41.5
Point 10	310	-57
Point 11	133.5	-57
Point 12	197	3.3
Point 13	200	-4.5
Point 14	200	-13.2
Point 15	200	-17.5
Point 16	200	-57
Point 17	197	-4.5
Point 18	197	-10
Point 19	133.5	-13.2
Point 20	186.5	-1.4
Point 21	190.5	2
Point 22	200	12.9
Point 23	200.5	12.9
Point 24	208	3.9
Point 25	228	-1.3
Point 26	256.1	-2.4
Point 27	310	-2.3
Point 28	201	4.2
Point 29	200	-19.3
Point 30	200	-41.5
Point 31	200	-14.6
Point 32	179.15	-4.5
Point 33	133.5	-19.3
Point 34	133.5	-70
Point 35	310	-70
Point 36	179.2	-70
Point 37	179.2	-57
Point 38	228	-57

Point 39	228	-70
Point 40	199	3.6
Point 41	200	3.6

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	2.60	(231.429, -1.7)	46.40917	(178.299, -4.79965)	(280.488, -2.35475)
2	12767	2.73	(231.429, -1.7)	47.691	(177.93, -4.92977)	(285.022, -2.34634)

Slices of Slip Surface: Optimized

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimize d	178.7246	-5.175219	808.6578	670.8167	0	475
2	Optimize d	180.4625	6.7095125	844.46989	875.59848	0	476.52
3	Optimize d	183.0875	-9.026971	930.85885	1187.1128	0	479.67
4	Optimize d	184.90235	-10.6292	999.97911	1404.1641	0	481.85
5	Optimize d	185.95235	11.615685	1044.9982	1519.8441	0	483.12
6	Optimize d	187.02515	12.679335	1094.7232	1673.0178	0	484.41
7	Optimize d	189.02515	-14.66231	1188.9283	1985.5434	0	486.81
8	Optimize d	191.1936	-16.81231	1288.0256	2305.5561	0	489.42
9	Optimize d	192.03505	-17.64659	1325.4262	2440.3423	0	392.34

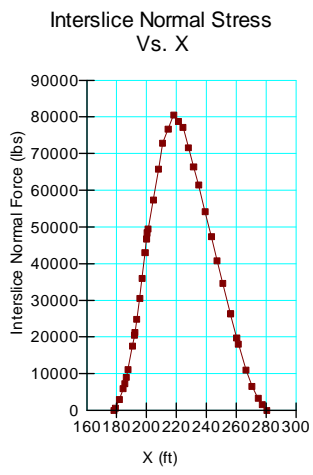
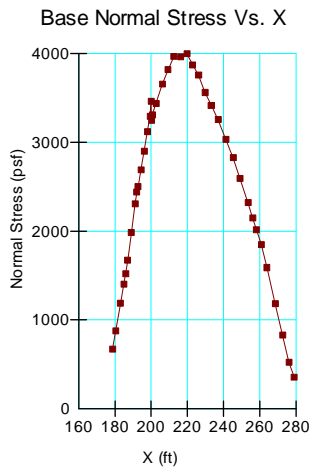
			5				
10	Optimize d	192.8345	18.546595	1362.7593	2500.4919	0	393.11
11	Optimize d	194.4321	-20.39376	1433.822	2692.8636	0	394.65
12	Optimize d	196.18905	22.437705	1503.2499	2902.2725	0	396.34
13	Optimize d	198	-24.55959	1579.0205	3120.5836	0	398.08
14	Optimize d	199.4949	-26.31115	1644.3677	3295.7533	0	399.51
15	Optimize d	199.9949	26.894595	1667.3818	3460.7577	0	400
16	Optimize d	200.25	27.073405	1673.6318	3248.6702	0	399.82
17	Optimize d	200.75	-27.42386	1686.2426	3311.3966	0	399.46
18	Optimize d	202.75	-28.82568	1738.4639	3437.9023	0	398.04
19	Optimize d	206.25	-31.27886	1836.9404	3657.5967	0	395.54
20	Optimize d	209.3966	-33.48434	1932.3642	3819.9908	0	393.29
21	Optimize d	212.63675	35.012605	1999.4178	3969.4649	0	390.97
22	Optimize d	216.3239	36.111355	2047.4766	3965.3062	0	388.34
23	Optimize d	219.7321	36.508485	2061.9754	3998.3791	0	385.91
24	Optimize d	222.86135	36.203995	2040.1562	3873.062	0	383.67

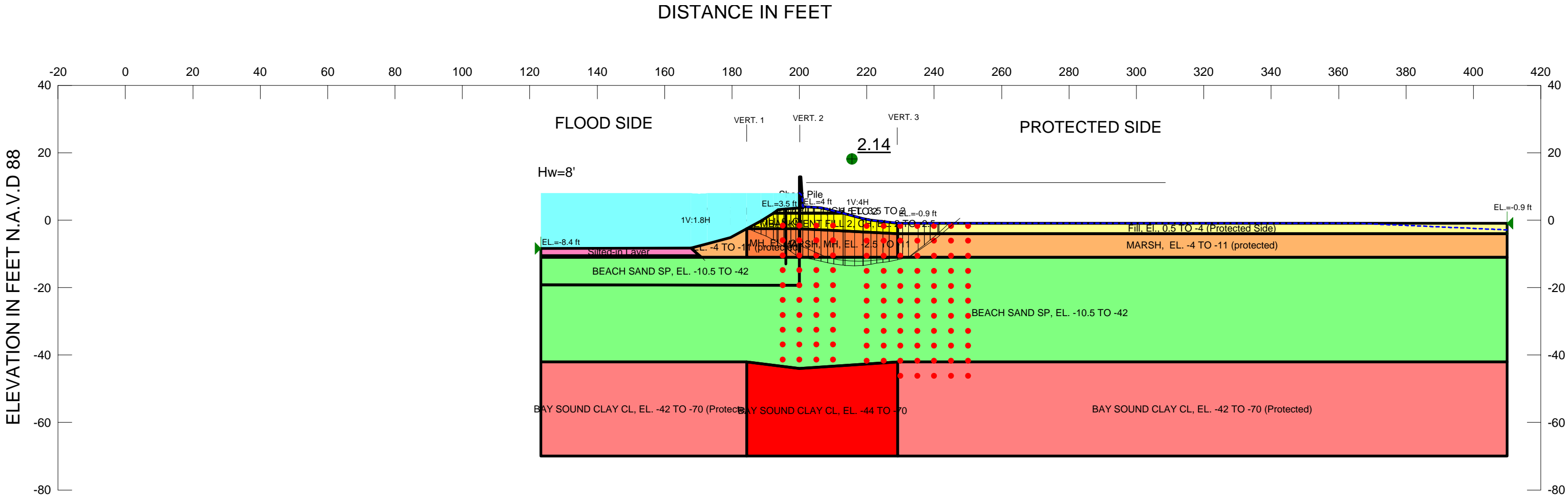
25	Optimize d	226.213	-35.38076	1989.0724	3756.7525	0	381.28
26	Optimize d	229.74245	-34.05551	1908.322	3562.4052	0	380
27	Optimize d	233.22735	-32.74699	1827.2203	3417.0722	0	380
28	Optimize d	237.08215	- 31.07075 5	1722.7221	3258.1903	0	380
29	Optimize d	241.3068	- 29.02680 5	1594.4272	3035.7359	0	380
30	Optimize d	245.31605	- 26.93197 5	1462.1301	2827.2574	0	380
31	Optimize d	249.10995	- 24.78626 5	1326.0555	2596.4515	0	380
32	Optimize d	253.55345	-22.09474	1154.8291	2322.8149	0	380
33	Optimize d	256.12555	-20.45982	1050.7595	2148.0653	0	380
34	Optimize d	258.23705	- 18.97178 5	956.1063	2014.3707	0	380
35	Optimize d	260.89295	- 17.09785 5	836.79009	1848.694	0	475
36	Optimize d	264.00805	-14.74188	686.81387	1590.1095	0	475
37	Optimize d	268.57765	- 11.26255 5	464.99325	1183.6873	0	475
38	Optimize d	272.62655	-8.211565	270.44721	830.13939	0	475
39	Optimize d	276.12415	-5.593035	103.48872	524.43516	0	475
40	Optimize d	279.0429	-3.427376	-34.445309	355.95245	0	760

Slices of Slip Surface: **12767**

	Slip Surfac e	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictiona l Strength (psf)	Cohesiv e Strength (psf)
1	12767	178.5399	- 5.539883 5	824.02825	693.87582	0	475
2	12767	181.775	-8.775	927.53556	1117.0267	0	478.09
3	12767	185.3	-12.3	1078.4166	1584.8623	0	482.33
4	12767	186.35	-13.35	1126.4917	1730.9973	0	483.59
5	12767	188.5	-15.5	1225.0095	2061.7467	0	486.18
6	12767	191.4	-18.4	1354.1097	2511.5258	0	391.73
7	12767	194.65	-21.65	1480.4258	2856.1095	0	394.86
8	12767	198	-25	1597.1422	3208.9921	0	398.08
9	12767	199.5	-26.5	1652.6495	3360.9482	0	399.52
10	12767	200.25	-27.25	1681.4999	3205.0321	0	399.82
11	12767	200.75	-27.75	1700.7332	3281.5411	0	399.46
12	12767	202.75	-29.75	1781.2022	3464.2175	0	398.04
13	12767	206.25	-33.25	1931.6947	3782.8196	0	395.54
14	12767	209	-36	2057.7869	4008.235	0	393.57
15	12767	211.875	-37	2101.76	4261.3333	0	391.52
16	12767	215.625	-37	2095.0667	4147.2	0	388.84
17	12767	219.375	-37	2088.8	4033.3333	0	386.16
18	12767	223.125	-37	2083.0667	3919.2	0	383.48
19	12767	226.5	- 36.13397 5	2030.3675	3867.0917	0	381.07
20	12767	229.75625	-34.25398	1919.5066	3625.3484	0	380
21	12767	233.26875	- 32.22603 5	1797.2645	3407.3936	0	380
22	12767	236.78125	-30.19809	1672.5815	3189.6853	0	380
23	12767	240.29375	-28.17015	1546.0494	2971.7305	0	380
24	12767	243.80625	-26.14221	1418.1612	2753.7756	0	380
25	12767	247.31875	- 24.11426	1289.1635	2535.8208	0	380

			5				
26	12767	250.83125	-22.08632	1159.4754	2317.8906	0	380
27	12767	254.34375	-20.05838	1029.4421	2099.9851	0	380
28	12767	257.4375	- 18.27220 5	914.59082	1914.5542	0	380
29	12767	260.6514	- 16.41666 5	795.20775	1734.4386	0	475
30	12767	264.40415	-14.25	655.82313	1484.7232	0	475
31	12767	268.1569	- 12.08333 5	516.46158	1234.9847	0	475
32	12767	271.9097	- 9.916666 5	377.30772	985.26931	0	475
33	12767	275.6625	-7.75	238.38463	735.53083	0	475
34	12767	279.4153	- 5.583333 5	99.669238	485.79235	0	475
35	12767	283.1568	-3.423171	-38.32316	297.2384	0	760





Name: EMBANKMENT FILL 1, CH, EL. 3.5 TO 2 Model: Undrained (Phi=0) Unit Weight: 110 pcf Cohesion: 600 psf

Name: MARSH, MH, EL. -2.5 TO -11 Model: Spatial Mohr-Coulomb Unit Weight: 103 pcf Cohesion Spatial Fn: MARSH Phi: 0 °

Name: BEACH SAND SP, EL. -10.5 TO -42 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Beach Sand

Name: BAY SOUND CLAY CL, EL. -44 TO -70 Model: Spatial Mohr-Coulomb Weight Fn: Bay Sound Cohesion Spatial Fn: Bay Sound Phi: 0 °

Name: Silted-in Layer Model: Mohr-Coulomb Unit Weight: 90 pcf Cohesion: 0 psf Phi: 20 °

Name: Fill, EL. 0.5 TO -4 (Protected Side) Model: Undrained (Phi=0) Unit Weight: 105 pcf Cohesion: 600 psf

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

Name: EMBANKMENT FILL 2, CH, EL. 2 TO -2.5 Model: Spatial Mohr-Coulomb Unit Weight: 110 pcf Cohesion: 500 psf Phi: 0 °

Name: MARSH, EL. -4 TO -11 (protected) Model: Spatial Mohr-Coulomb Unit Weight: 105 pcf Cohesion Fn: Marsh (protected) Phi: 0 °

Name: BAY SOUND CLAY CL, EL. -42 TO -70 (Protected) Model: Spatial Mohr-Coulomb Unit Weight: 109 pcf Cohesion Fn: Bay Sound (Protected) Phi: 0 °



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

GENERAL NOTES

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

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

Hw=CANAL WATER LEVEL

LONDON AVE CANAL
OUTFALL CANAL REEVALUATION REPORT
REACH 26A, STA. 37+00 TO 47+00
PROTECTED SIDE STABILITY ANALYSIS,
CASE: Global Stability (Block)
MARCH 2012

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

Global Stability (Block)

Report generated using GeoStudio 2007, version 7.15. Copyright © 1991-2009 GEO-SLOPE International Ltd.

File Information

Created By: Liljegren, James
Revision Number: 258
Last Edited By: Curran, Matthew MVN
Date: 1/10/2012
Time: 4:47:15 PM
File Name: Reach 26A - Passive Resistance.gsz
Directory: Z:\Edf\F&MHOME\London Ave Reevaluation 2011\East Side\Reach 26A\ETL\
Last Solved Date: 1/10/2012
Last Solved Time: 4:52:30 PM

Project Settings

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

Analysis Settings

Global Stability (Block)

Kind: SLOPE/W
Parent: GAP Analysis (See page)
Method: Spencer
Settings
 PWP Conditions Source: Parent Analysis
Slip Surface
 Direction of movement: Left to Right
 Use Passive Mode: Yes
 Slip Surface Option: Block
 Critical slip surfaces saved: 1
 Optimize Critical Slip Surface Location: Yes
 Tension Crack
 Tension Crack Option: (none)
FOS Distribution
 FOS Calculation Option: Constant
Restrict Block Crossing: Yes

Fill, EL., 0.5 TO -4 (Protected Side)

Model: Undrained (Phi=0)
Unit Weight: 105 pcf
Cohesion: 600 psf

Sheet Pile

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

EMBANKMENT FILL 2, CH, EL. 2 TO -2.5

Model: Spatial Mohr-Coulomb
Unit Weight: 110 pcf
Cohesion: 500 psf
Phi: 0 °
Phi-B: 0 °

MARSH, EL. -4 TO -11 (protected)

Model: Spatial Mohr-Coulomb
Unit Weight: 105 pcf
Cohesion Fn: Marsh (protected)
Phi: 0 °
Phi-B: 0 °

BAY SOUND CLAY CL, EL. -42 TO -70 (Protected)

Model: Spatial Mohr-Coulomb
Unit Weight: 109 pcf
Cohesion Fn: Bay Sound (Protected)
Phi: 0 °
Phi-B: 0 °

Slip Surface Limits

Left Coordinate: (123.3, -8.4) ft
Right Coordinate: (410, -0.9) ft

Slip Surface Block

Left Grid
 Upper Left: (195, -1.59945) ft
 Lower Left: (195, -45.7642) ft
 Lower Right: (210, -45.7642) ft
 X Increments: 3
 Y Increments: 10
 Starting Angle: 125 °
 Ending Angle: 145 °
 Angle Increments: 4

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 1, CH, EL. 3.5 TO 2

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

MARSH, MH, EL. -2.5 TO -11

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

BEACH SAND SP, EL. -10.5 TO -42

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

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

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

Silted-in Layer

Model: Mohr-Coulomb
Unit Weight: 90 pcf
Cohesion: 0 psf
Phi: 20 °
Phi-B: 0 °

Right Grid

Upper Left: (220, -1.70065) ft
Lower Left: (220, -46.1546) ft
Lower Right: (250, -46.1546) ft
X Increments: 6
Y Increments: 10
Starting Angle: 25 °
Ending Angle: 45 °
Angle Increments: 4

Cohesion Functions

Marsh (protected)

Model: Spline Data Point Function
Function: Cohesion vs. Y
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 235
Data Points: Y (ft), Cohesion (psf)
 Data Point: (-11, 295)
 Data Point: (-4, 235)

Bay Sound (Protected)

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, 785)
 Data Point: (-42, 500)

Shear/Normal Strength Functions

Beach Sand

Model: Spline Data Point Function
Function: Shear Stress vs. Normal Stress
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
 Data Point: (-100000, 0)
 Data Point: (0, 0)
 Data Point: (100000, 57735)
Estimation Properties

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

Unit Weight Functions

Bay Sound

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 109
Data Points: X (ft), Unit Weight (pcf)
Data Point: (184.4, 109)
Data Point: (200, 110)
Data Point: (229.1, 109)

Spatial Functions

Bay Sound

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (184.4, -42, 500)
Data Point: (184.4, -70, 785)
Data Point: (200, -44, 640)
Data Point: (200, -70, 910)
Data Point: (229.1, -42, 500)
Data Point: (229.1, -70, 785)

MARSH

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (184.4, -4, 235)
Data Point: (184.4, -11, 295)
Data Point: (229.1, -4, 235)
Data Point: (229.1, -11, 295)
Data Point: (200, -2.5, 237)
Data Point: (200, -11, 313)

Regions

	Material	Points	Area (ft ²)
Region 1	BEACH SAND SP, EL. -10.5 TO -42	20,24,14,17,47,49,41	632.775
Region 2	BEACH SAND SP, EL. -10.5 TO -42	17,14,24,38,8,10,16,11,42,9	8299.625
Region 3	MARSH, EL. -4 TO -11 (protected)	15,7,8,38	1266.3
Region 4	EMBANKMENT FILL 1, CH, EL. 3.5 TO 2	25,30,4,31,12,23,27	9.23
Region 5	Fill, EL., 0.5 TO -4 (Protected Side)	15,35,6,7	560.79
Region 6	EMBANKMENT FILL 2, CH, EL. 2 TO -2.5	25,27,23,13,40,39,29	52.06
Region 7	EMBANKMENT FILL 2, CH, EL. 2 TO -2.5	23,26,5,34,35,15,13	124.87
Region 8	EMBANKMENT FILL 1, CH, EL. 3.5 TO 2	23,12,32,22,33,26	17.1
Region 9	Sheet Pile	12,36,37,22,32	7.1
Region 10	MARSH, MH, EL. -2.5 TO -11	13,40,39,41,20,24,45	132.6
Region 11	MARSH, MH, EL. -2.5 TO -11	13,15,38,24,45	225.525
Region 12	BAY SOUND CLAY CL, EL. -42 TO -70 (Protected)	9,18,43,42	1710.8
Region 13	BAY SOUND CLAY CL, EL. -42 TO -70 (Protected)	16,44,19,10	5065.2
Region 14	BAY SOUND CLAY CL, EL. -44 TO -70	42,43,44,16,11	1206.9
Region 15	MARSH, EL. -4 TO -11 (protected)	48,2,3,28,39,41,49	80.64
Region 16	Silted-in Layer	46,1,2,48	103.115
Region 17		48,49,47,46	18.94

Points

	X (ft)	Y (ft)
Point 1	123.3	-8.4
Point 2	167.8	-8.3
Point 3	172.7	-7
Point 4	196	3.3
Point 5	218.8	0.5
Point 6	410	-0.9

Point 7	410	-4
Point 8	410	-11
Point 9	123.3	-42
Point 10	410	-42
Point 11	200	-44
Point 12	200	3.5
Point 13	200	-2.5
Point 14	200	-19.3
Point 15	229.1	-4
Point 16	229.1	-42
Point 17	123.3	-19.2
Point 18	123.3	-70
Point 19	410	-70
Point 20	196	-11
Point 21	196	-13
Point 22	201	4
Point 23	200	2
Point 24	200	-11
Point 25	192.3	2
Point 26	213	2
Point 27	196	2
Point 28	179.5	-5.2
Point 29	188.6	-0.2
Point 30	193.7	3.1
Point 31	199	3.5
Point 32	201	3.5
Point 33	206.4	3.7
Point 34	221.2	0
Point 35	229.1	-0.9
Point 36	200	12.8
Point 37	200.5	12.8
Point 38	229.1	-11
Point 39	184.4	-2.5
Point 40	196	-2.5
Point 41	184.4	-11
Point 42	184.4	-42

Point 43	184.4	-70
Point 44	229.1	-70
Point 45	200	-10.8
Point 46	123.3	-10.6
Point 47	123.3	-11
Point 48	170.4	-10.6
Point 49	170.9	-11

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	2.14	(215.62, -0.728)	24.38759	(184.563, -2.41054)	(244.457, -0.9)
2	2598	2.41	(215.62, -0.728)	24.525	(186.063, -1.58919)	(245.19, -0.9)

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	184.6691	-2.45527	651.03605	537.57188	0	500
2	Optimized	185.7311	-2.904604	668.88456	654.96853	0	235
3	Optimized	187.6437	-3.713812	706.01004	786.85787	0	235.64
4	Optimized	189.3773	-4.447278	745.39063	905.58267	0	243.7
5	Optimized	191.2273	-5.343071	796.16424	1028.8733	0	253.37
6	Optimized	192.80605	-6.177441	844.28654	1156.3547	0	262.32
7	Optimized	193.50605	-	867.43158	1199.8014	0	266.5

	ed		6.56954 25				
8	Optimiz ed	194.5578	- 7.24553 25	907.85259	1288.2534	0	273.58
9	Optimiz ed	195.7078	- 8.00351 45	953.36067	1352.6888	0	281.52
10	Optimiz ed	196.75	- 8.74063 3	1027.8826	1427.1159	0	289.2
11	Optimiz ed	198.25	- 9.80156 35	1098.9119	1533.2515	0	300.31
12	Optimiz ed	199.4756	- 10.6683 95	1156.9818	1619.6372	0	309.43
13	Optimiz ed	199.9756	- 11.0079 75	1185.4062	1791.413	349.87822	-2.4826e- 005
14	Optimiz ed	200.25	- 11.0441 1	1094.0352	1447.4839	204.06369	-1.0835e- 006
15	Optimiz ed	200.75	- 11.1099 55	1079.1636	1528.901	259.65602	1.5666e- 005
16	Optimiz ed	201.81465	- 11.2501 55	1087.3891	1594.3302	292.68261	-2.0767e- 005
17	Optimiz ed	203.572	- 11.5643 25	1106.1468	1602.413	286.51943	-2.0334e- 005
18	Optimiz ed	205.45735	- 11.9781 1	1129.1494	1640.9061	295.46288	1.783e-005
19	Optimiz ed	207.35525	- 12.3946 6	1151.8804	1659.4931	293.0703	-2.0797e- 005
20	Optimiz	209.2658	-	1173.6594	1658.215	279.75832	1.6882e-

	ed		12.8139 8				005
21	Optimiz ed	211.61055	- 13.2034 55	1192.3625	1661.1922	270.67891	-1.9206e- 005
22	Optimiz ed	213.2904	- 13.4208 5	1201.6564	1641.4026	253.88757	-1.348e- 006
23	Optimiz ed	214.9675	- 13.5161 2	1203.2888	1624.9677	243.45641	-1.2925e- 006
24	Optimiz ed	217.5771	- 13.5058 05	1195.7973	1569.2901	215.63614	-1.1447e- 006
25	Optimiz ed	218.852	- 13.4349 1	1187.9674	1523.7642	193.87234	-1.3754e- 005
26	Optimiz ed	220.052	- 13.2546 1	1173.5007	1491.4099	183.54495	-1.302e- 005
27	Optimiz ed	222.09635	- 12.9386 85	1148.2784	1412.1801	152.36372	-8.0883e- 007
28	Optimiz ed	223.889	- 12.6616 55	1126.1166	1353.964	131.54778	-6.9822e- 007
29	Optimiz ed	225.68165	- 12.3846 25	1103.9548	1295.6928	110.70002	-5.8763e- 007
30	Optimiz ed	227.839	- 11.9707 1	1072.2123	1223.2107	87.178943	-4.6272e- 007
31	Optimiz ed	229.89595	- 11.5214 8	1038.5514	1147.4268	62.859261	-3.3356e- 007
32	Optimiz ed	231.5276	- 11.1651 35	1011.841	1102.0889	52.104684	3.4588e- 006
33	Optimiz	233.8189	-	913.70915	1102.7449	0	285.25

	ed		9.86252 5				
34	Optimiz ed	236.1647	- 8.03466 25	776.29975	899.97485	0	269.58
35	Optimiz ed	237.94505	- 6.61912 75	670.16691	738.75317	0	257.45
36	Optimiz ed	239.952	- 4.95568	546.06926	558.72345	0	243.19
37	Optimiz ed	241.2714	- 3.82660 5	448.18382	594.66615	0	600
38	Optimiz ed	242.96545	- 2.27660 5	208.885	444.83401	0	600

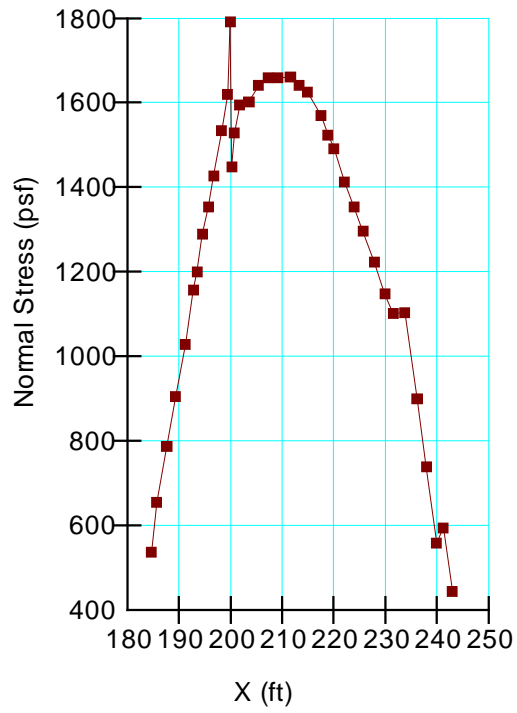
Slices of Slip Surface: 2598

	Slip Surfac e	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	2598	186.7136	- 2.044596 5	615.92891	490.26319	0	500
2	2598	187.982	- 2.932735 5	657.93494	680.4281	0	235
3	2598	189.525	- 4.013163	718.68415	826.36943	0	240.06
4	2598	191.375	- 5.308547	793.86902	1003.2177	0	253.22
5	2598	193	- 6.446384 5	860.22688	1160.7972	0	264.88
6	2598	194.85	- 7.741768 5	937.75087	1329.7685	0	278.27
7	2598	196.75	- 9.072162	1045.2926	1464.4799	0	292.14

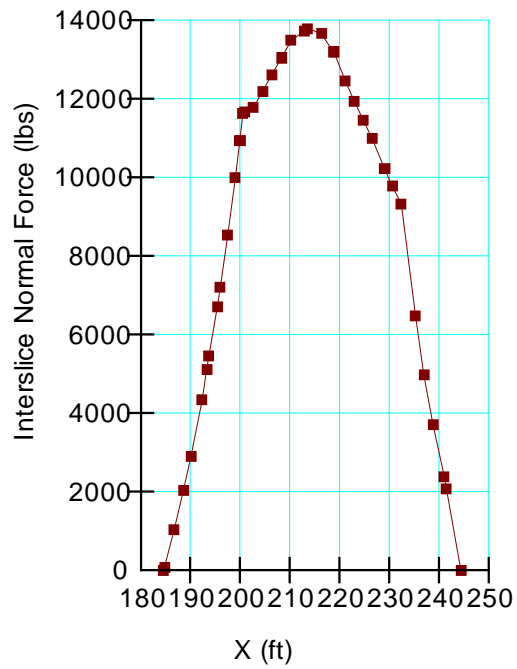
			5				
8	2598	198.25	- 10.12247 4	1115.9581	1569.659	0	303.17
9	2598	199.2516	- 10.82381 5	1163.6903	1640.3004	0	310.56
10	2598	199.7516	- 11.17392	1188.3863	1684.1024	286.20183	-2.0312e- 005
11	2598	200.25	- 11.52289	1123.1557	1407.8766	164.38367	-8.7308e- 007
12	2598	200.75	- 11.87299	1127.3662	1513.793	223.10361	-1.185e-006
13	2598	202	- 12.74825	1181.8727	1650.5915	270.61494	-1.9207e- 005
14	2598	204	- 14.14866 5	1268.7437	1794.5575	303.5787	-6.142e-005
15	2598	205.7	- 14.85545	1309.6563	2042.981	423.38519	-3.0036e- 005
16	2598	207.5	- 14.87237	1306.7151	2009.8205	405.93807	-2.8799e- 005
17	2598	209.7	- 14.89304 5	1302.6698	1950.0958	373.79158	-2.6517e- 005
18	2598	211.9	- 14.91372	1298.4882	1890.3257	341.69756	-6.9096e- 005
19	2598	213.96665	- 14.93314 5	1294.3909	1834.1084	311.60602	-6.3009e- 005
20	2598	215.9	- 14.95131 5	1290.4601	1781.4038	283.44651	-2.0108e- 005
21	2598	217.83335	- 14.96948 5	1286.4775	1728.6993	255.31687	-1.3553e- 006
22	2598	220	- 14.98984 5	1281.9434	1676.301	227.68246	-1.2087e- 006

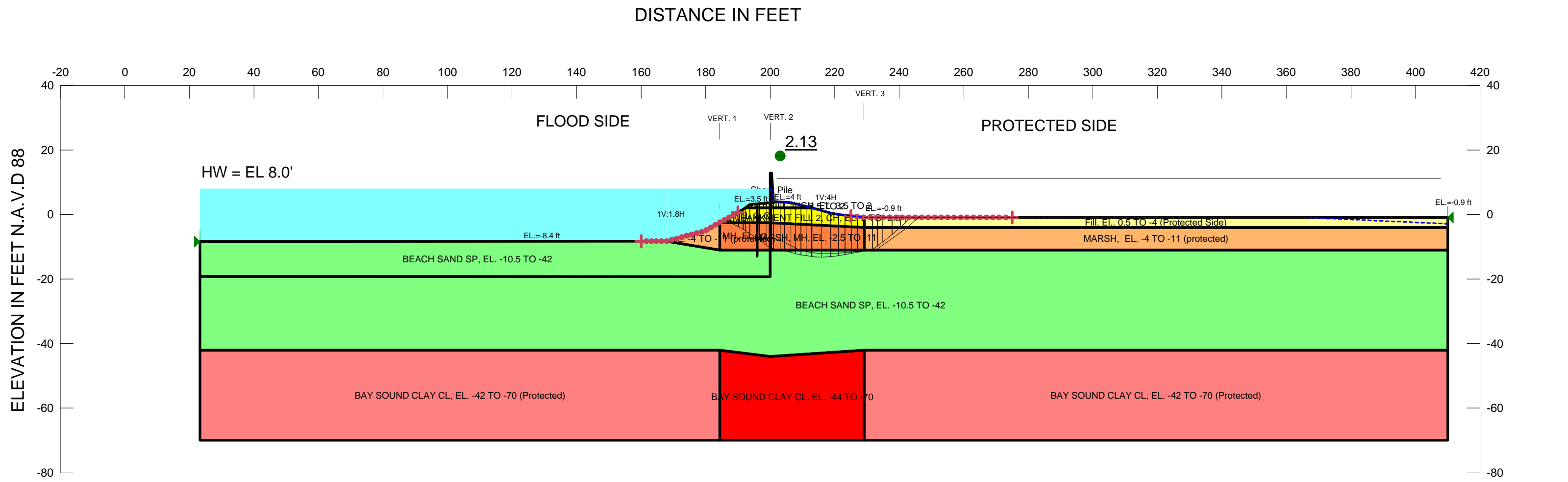
23	2598	222.15	- 15.01005	1277.4172	1639.717	209.17387	-1.1105e- 006
24	2598	224.05	- 15.02790 5	1273.3648	1618.56	199.29858	-1.4139e- 005
25	2598	226.025	- 14.31912	1223.7732	1662.0395	253.03317	-1.3426e- 006
26	2598	228.075	- 12.88369 5	1128.5517	1424.885	171.08807	-9.0776e- 007
27	2598	229.9326	- 11.58299	1042.2903	1221.2033	103.2955	2.8399e- 006
28	2598	231.7649	-10.3	950.78469	1131.4612	0	289
29	2598	233.7643	-8.9	844.91889	973.31805	0	277
30	2598	235.7637	-7.5	739.05309	815.13389	0	265
31	2598	237.7631	-6.1	633.43311	656.99071	0	253
32	2598	239.7625	-4.7	528.22282	498.80655	0	241
33	2598	241.86905	-3.225	355.29539	456.12271	0	600
34	2598	244.0827	-1.675	116.64322	285.43749	0	600

Base Normal Stress Vs. X



Interslice Normal Stress
Vs. X





Name: EMBANKMENT FILL 1, CH, EL. 3.5 TO 2 Model: Undrained (Phi=0) Unit Weight: 110 pcf Cohesion: 600 psf
Name: MARSH, MH, EL. -2.5 TO -11 Model: Spatial Mohr-Coulomb Unit Weight: 103 pcf Cohesion Spatial Fn: MARSH Phi: 0 °
Name: BEACH SAND SP, EL. -10.5 TO -42 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Beach Sand
Name: BAY SOUND CLAY CL, EL. -44 TO -70 Model: Spatial Mohr-Coulomb Weight Fn: Bay Sound Cohesion Spatial Fn: Bay Sound Phi: 0 °
Name: Fill, EL., 0.5 TO -4 (Protected Side) Model: Undrained (Phi=0) Unit Weight: 105 pcf Cohesion: 600 psf
Name: Sheet Pile Model: Undrained (Phi=0) Unit Weight: 0.1 pcf Cohesion: 0.01 psf
Name: EMBANKMENT FILL 2, CH, EL. 2 TO -2.5 Model: Spatial Mohr-Coulomb Unit Weight: 110 pcf Cohesion: 500 psf Phi: 0 °
Name: MARSH, EL. -4 TO -11 (protected) Model: Spatial Mohr-Coulomb Unit Weight: 105 pcf Cohesion Fn: Marsh (protected) Phi: 0 °
Name: BAY SOUND CLAY CL, EL. -42 TO -70 (Protected) Model: Spatial Mohr-Coulomb Unit Weight: 109 pcf Cohesion Fn: Bay Sound (Protected) Phi: 0 °



GENERAL NOTES

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

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

Hw=CANAL WATER LEVEL

LONDON AVE CANAL
OUTFALL CANAL REEVALUATION REPORT
REACH 26B, STA. 47+00 TO 48+50
PROTECTED SIDE STABILITY ANALYSIS,
CASE: Global Stability (Entry/Exit)
MARCH 2012

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

Global Stability (Entry/Exit)

Report generated using GeoStudio 2007, version 7.15. Copyright © 1991-2009 GEO-SLOPE International Ltd.

File Information

Created By: [Liljegren, James](#)

Revision Number: [202](#)

Last Edited By: [Curran, Matthew MVN](#)

Date: [12/9/2011](#)

Time: [4:33:34 PM](#)

File Name: [Reach 26B.gsz](#)

Directory: [Z:\Edf\F&MHOME\London Ave Reevaluation 2011\East Side\Reach 26B\ETL\](#)

Last Solved Date: [12/9/2011](#)

Last Solved Time: [4:35:30 PM](#)

Project Settings

Length(L) Units: [feet](#)

Time(t) Units: [Seconds](#)

Force(F) Units: [lbf](#)

Pressure(p) Units: [psf](#)

Strength Units: [psf](#)

Unit Weight of Water: [62.4 pcf](#)

View: [2D](#)

Analysis Settings

Global Stability (Entry/Exit)

Kind: [SLOPE/W](#)

Parent: [GAP Analysis \(Seepage\)](#)

Method: [Spencer](#)

Settings

PWP Conditions Source: [Parent Analysis](#)

SlipSurface

Direction of movement: [Left to Right](#)

Use Passive Mode: [Yes](#)

Slip Surface Option: [Entry and Exit](#)

Critical slip surfaces saved: [1](#)

Optimize Critical Slip Surface Location: [Yes](#)

Tension Crack

Tension Crack Option: [\(none\)](#)

FOS Distribution

FOS Calculation Option: [Constant](#)

Advanced

Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
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 1, CH, EL. 3.5 TO 2

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

MARSH, MH, EL. -2.5 TO -11

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

BEACH SAND SP, EL. -10.5 TO -42

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

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

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

Fill, EL., 0.5 TO -4 (Protected Side)

Model: Undrained (Phi=0)
Unit Weight: 105 pcf
Cohesion: 600 psf

Sheet Pile

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

Cohesion: 0.01 psf

EMBANKMENT FILL 2, CH, EL. 2 TO -2.5

Model: Spatial Mohr-Coulomb

Unit Weight: 110 pcf

Cohesion: 500 psf

Phi: 0 °

Phi-B: 0 °

MARSH, EL. -4 TO -11 (protected)

Model: Spatial Mohr-Coulomb

Unit Weight: 105 pcf

Cohesion Fn: Marsh (protected)

Phi: 0 °

Phi-B: 0 °

BAY SOUND CLAY CL, EL. -42 TO -70 (Protected)

Model: Spatial Mohr-Coulomb

Unit Weight: 109 pcf

Cohesion Fn: Bay Sound (Protected)

Phi: 0 °

Phi-B: 0 °

Slip Surface Entry and Exit

Left Projection: Range

Left-Zone Left Coordinate: (160, -8.3054) ft

Left-Zone Right Coordinate: (190, 0.63243) ft

Left-Zone Increment: 20

Right Projection: Range

Right-Zone Left Coordinate: (225, -0.43291) ft

Right-Zone Right Coordinate: (275, -0.9) ft

Right-Zone Increment: 25

Radius Increments: 25

Slip Surface Limits

Left Coordinate: (23.3, -8.4) ft

Right Coordinate: (410, -0.9) ft

Cohesion Functions

Marsh (protected)

Model: Spline Data Point Function

Function: Cohesion vs. Y

Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 235
Data Points: Y (ft), Cohesion (psf)
Data Point: (-11, 295)
Data Point: (-4, 235)

Bay Sound (Protected)

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, 785)
Data Point: (-42, 500)

Shear/Normal Strength Functions

Beach Sand

Model: Spline Data Point Function
Function: Shear Stress vs. Normal Stress
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
Data Point: (-100000, 0)
Data Point: (0, 0)
Data Point: (100000, 57735)
Estimation Properties
Intact Rock Param.: 10
Geological Strength: 100
Disturbance Factor: 0
SigmaC: 600000 psf
Sigma3: 300000 psf
Num. Points: 20

Unit Weight Functions

Bay Sound

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

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

Data Point: (184.4, 109)

Data Point: (200, 110)

Data Point: (229.1, 109)

Spatial Functions

Bay Sound

Model: Linear Interpolation

Limit Range By: Data Values

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

Data Point: (184.4, -42, 500)

Data Point: (184.4, -70, 785)

Data Point: (200, -44, 640)

Data Point: (200, -70, 910)

Data Point: (229.1, -42, 500)

Data Point: (229.1, -70, 785)

MARSH

Model: Linear Interpolation

Limit Range By: Data Values

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

Data Point: (184.4, -4, 235)

Data Point: (184.4, -11, 295)

Data Point: (229.1, -4, 235)

Data Point: (229.1, -11, 295)

Data Point: (200, -2.5, 237)

Data Point: (200, -11, 313)

Regions

	Material	Points	Area (ft ²)
Region 1	BEACH SAND SP, EL. -10.5 TO -42	20,24,14,17,1,2,41	1863.11
Region 2	BEACH SAND SP, EL. -10.5 TO -42	17,14,24,38,8,10,16,11,42,9	10574.625
Region 3	MARSH, EL. -4 TO -11 (protected)	15,7,8,38	1266.3
Region 4	EMBANKMENT FILL 1, CH, EL. 3.5 TO 2	25,30,4,31,12,23,27	9.23
Region 5	Fill, EL. 0.5 TO -4 (Protected Side)	15,35,6,7	560.79
Region 6	EMBANKMENT FILL 2, CH, EL. 2 TO -2.5	25,27,23,13,40,39,29	52.06
Region 7	EMBANKMENT FILL 2, CH, EL. 2 TO -2.5	23,26,5,34,35,15,13	124.87
Region 8	EMBANKMENT FILL 1, CH, EL. 3.5 TO 2	23,12,32,22,33,26	17.1
Region 9	Sheet Pile	12,36,37,22,32	7.1
Region	MARSH, MH, EL. -2.5 TO -11	13,40,39,41,20,24,45	132.6

10			
Region 11	MARSH, MH, EL. -2.5 TO -11	13,15,38,24,45	225.525
Region 12	BAY SOUND CLAY CL, EL. -42 TO -70 (Protected)	9,18,43,42	4510.8
Region 13	BAY SOUND CLAY CL, EL. -42 TO -70 (Protected)	16,44,19,10	5065.2
Region 14	BAY SOUND CLAY CL, EL. -44 TO -70	42,43,44,16,11	1206.9
Region 15	MARSH, EL. -4 TO -11 (protected)	2,3,28,39,41	62.36

Points

	X (ft)	Y (ft)
Point 1	23.3	-8.4
Point 2	167.8	-8.3
Point 3	172.7	-7
Point 4	196	3.3
Point 5	218.8	0.5
Point 6	410	-0.9
Point 7	410	-4
Point 8	410	-11
Point 9	23.3	-42
Point 10	410	-42
Point 11	200	-44
Point 12	200	3.5
Point 13	200	-2.5
Point 14	200	-19.3
Point 15	229.1	-4
Point 16	229.1	-42
Point 17	23.3	-19.2
Point 18	23.3	-70
Point 19	410	-70
Point 20	196	-11
Point 21	196	-13
Point 22	201	4

Point 23	200	2
Point 24	200	-11
Point 25	192.3	2
Point 26	213	2
Point 27	196	2
Point 28	179.5	-5.2
Point 29	188.6	-0.2
Point 30	193.7	3.1
Point 31	199	3.5
Point 32	201	3.5
Point 33	206.4	3.7
Point 34	221.2	0
Point 35	229.1	-0.9
Point 36	200	12.8
Point 37	200.5	12.8
Point 38	229.1	-11
Point 39	184.4	-2.5
Point 40	196	-2.5
Point 41	184.4	-11
Point 42	184.4	-42
Point 43	184.4	-70
Point 44	229.1	-70
Point 45	200	-10.8

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	2.13	(216.084, 25.043)	23.36291	(186.003, -1.62204)	(243.593, -0.9)
2	12440	2.23	(216.084, 25.043)	38.836	(187.229, -0.950627)	(244.984, -0.9)

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	186.8323	- 2.06101 9	616.44073	525.03524	0	500
2	Optimized	188.1307	- 2.74848 35	647.5608	687.03174	0	235
3	Optimized	189.3379	- 3.38767 75	682.7778	782.96086	0	235
4	Optimized	190.81375	- 4.16909 9	726.97092	901.70742	0	242.69
5	Optimized	191.92585	-4.80177	763.98794	975.44127	0	249.34
6	Optimized	193	- 5.49639 7	804.87182	1075.6816	0	256.53
7	Optimized	194.85	- 6.69273 1	876.26615	1234.7901	0	269.01
8	Optimized	196.30355	- 7.63269 4	962.75285	1331.2422	0	278.88
9	Optimized	197.80355	- 8.72485 35	1033.7675	1419.3353	0	290.22
10	Optimized	199.4968	- 9.99269 35	1117.0389	1544.9216	0	303.42
11	Optimized	199.9968	- 10.3653 35	1145.9365	1708.6388	0	307.32
12	Optimized	200.25	- 10.4175 85	1054.2895	1362.0069	0	307.64
13	Optimized	200.75	- 10.5207 55	1041.9886	1447.8387	0	308.25
14	Optimized	202.0363	-	1059.1009	1522.8031	0	309.83

	ed		10.7861 7				
15	Optimiz ed	203.77235	- 11.1443 9	1081.2479	1554.5169	273.24199	-1.9391e- 005
16	Optimiz ed	205.43605	- 11.5258 4	1102.6195	1581.9777	276.75758	-1.9643e- 005
17	Optimiz ed	207.17765	- 11.9541 5	1126.5657	1606.5611	277.12548	-1.9669e- 005
18	Optimiz ed	208.733	- 12.3366 45	1146.9193	1610.4945	267.64525	1.6151e- 005
19	Optimiz ed	210.3259	- 12.6557 25	1163.1451	1624.6221	266.43389	1.6076e- 005
20	Optimiz ed	211.9563	- 12.9113 9	1175.1425	1610.9887	251.63589	-1.7857e- 005
21	Optimiz ed	212.88575	- 13.0470 9	1181.2129	1620.4232	253.5782	-1.3463e- 006
22	Optimiz ed	214.42905	- 13.1534 45	1183.9427	1590.2369	234.57407	-1.2455e- 006
23	Optimiz ed	217.24175	- 13.1957 55	1179.1531	1537.5172	206.90158	-1.0983e- 006
24	Optimiz ed	218.7127	- 13.1281 7	1171.0183	1503.4533	191.93141	-1.0186e- 006
25	Optimiz ed	220	- 12.9599 5	1157.0791	1450.9968	169.69349	-1.2037e- 005
26	Optimiz ed	221.22745	- 12.7995 5	1143.7534	1401.7926	148.97898	-7.9072e- 007
27	Optimiz	222.23345	-	1129.8875	1373.9931	140.93443	-9.9948e-

	ed		12.6211 5				006
28	Optimiz ed	224.19055	- 12.2715 25	1102.7256	1304.0259	116.22081	-6.1664e- 007
29	Optimiz ed	226.14765	- 11.9218 95	1075.5636	1234.0084	91.478152	2.5152e- 006
30	Optimiz ed	228.10475	- 11.5722 7	1048.4016	1163.9909	66.73549	-3.5424e- 007
31	Optimiz ed	229.09165	-11.3961	1034.7004	1127.1434	53.371986	7.737e-007
32	Optimiz ed	230.3723	- 11.1875 9	1018.1584	1099.3039	46.849359	6.7921e- 007
33	Optimiz ed	232.4519	- 10.3633 65	955.09668	1158.9589	0	289.54
34	Optimiz ed	234.0665	- 9.12921 5	862.09654	1018.819	0	278.96
35	Optimiz ed	236.2961	-7.3557	728.81924	826.27699	0	263.76
36	Optimiz ed	239.0591	-5.0454	556.05336	570.01687	0	243.96
37	Optimiz ed	241.1981	- 3.14365 5	344.90419	546.25751	0	600
38	Optimiz ed	242.7947	- 1.64788 5	113.58006	379.76118	0	600

Slices of Slip Surface: 12440

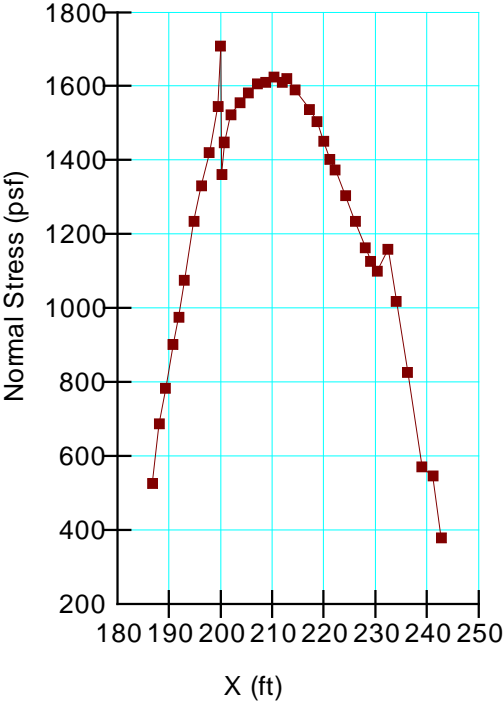
	Slip Surfac e	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	12440	187.91465	- 1.673262	591.99878	391.33067	0	500

			2				
2	12440	188.65215	- 2.447948 5	628.38319	502.72419	0	500
3	12440	189.60325	- 3.338713	679.05563	730.70566	0	235
4	12440	191.4011	- 4.917988 5	771.75506	947.21053	0	249.83
5	12440	193	- 6.176145	845.81883	1129.3091	0	262.51
6	12440	194.85	- 7.445366	921.72138	1310.485	0	275.65
7	12440	196.75	- 8.627650 5	1022.6629	1448.1702	0	288.19
8	12440	198.25	- 9.446126 5	1078.9543	1544.7642	0	297.14
9	12440	199.5	- 10.07009 7	1121.6855	1619.1876	0	304.12
10	12440	200.25	- 10.41788	1054.3096	1314.2345	0	307.64
11	12440	200.75	- 10.63695	1049.7792	1411.7473	0	309.29
12	12440	201.3107	- 10.87219 5	1065.2477	1490.6355	0	311.05
13	12440	202.81605	- 11.43453	1100.3222	1563.4212	267.37032	-1.8971e-005
14	12440	205.20535	- 12.21784 5	1146.5446	1656.0575	294.1674	1.7747e-005
15	12440	207.5	- 12.81604	1179.8261	1705.0404	303.23263	-6.1318e-005
16	12440	209.7	- 13.24884	1201.7316	1710.8411	293.9345	1.7734e-005
17	12440	211.9	-	1215.2434	1700.1749	279.97531	1.689e-005

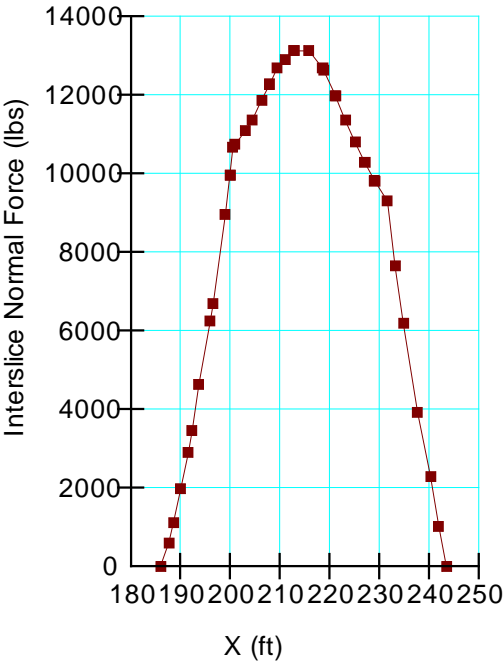
			13.55148				
18	12440	213.96665	- 13.72352 5	1220.7322	1675.4338	262.52207	1.5838e- 005
19	12440	215.9	- 13.78089 5	1219.2277	1638.3954	242.00659	-1.2848e- 006
20	12440	217.83335	- 13.74187	1211.6991	1588.2817	217.42009	-1.1543e- 006
21	12440	220	- 13.57659	1195.5775	1522.1943	188.5723	-1.3379e- 005
22	12440	222.1875	- 13.29770 5	1172.2768	1456.0954	163.86274	-8.7005e- 007
23	12440	224.1625	- 12.93041 5	1143.9679	1392.4822	143.47978	-7.6185e- 007
24	12440	226.1375	- 12.45557 5	1108.937	1313.6563	118.19474	-6.2763e- 007
25	12440	228.1125	- 11.86902	1066.9067	1218.5036	87.52448	-4.6469e- 007
26	12440	229.8232	- 11.27361	1025.0302	1131.0767	61.225991	-3.2497e- 007
27	12440	231.4898	- 10.59215 5	974.15597	1110.0338	0	291.5
28	12440	233.37655	- 9.714964	906.06213	1026.4022	0	283.99
29	12440	235.2633	- 8.709556 5	828.72292	928.39639	0	275.37
30	12440	237.15005	- 7.564013	741.45369	814.55288	0	265.55
31	12440	239.0368	- 6.262862	643.33132	682.82625	0	254.4
32	12440	240.92355	- 4.785596 5	532.92985	530.52688	0	241.73

33	12440	242.6462	- 3.268865 5	361.20653	546.94515	0	600
34	12440	244.2048	- 1.718865 5	123.54356	409.59439	0	600

Base Normal Stress Vs. X



Interslice Normal Stress
Vs. X



Global Stability (Block) (2)

Report generated using GeoStudio 2007, version 7.15. Copyright © 1991-2009 GEO-SLOPE International Ltd.

File Information

Created By: Liljegren, James
Revision Number: 313
Last Edited By: Curran, Matthew MVN
Date: 3/12/2013
Time: 3:51:27 PM
File Name: Reach 27.gsz
Directory: C:\Users\B2EDFMJC\Desktop\Chrono Order\Reach 27 Slope W\
Last Solved Date: 3/12/2013
Last Solved Time: 4:01:06 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) (2)

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: (none)
FOS Distribution
 FOS Calculation Option: Constant
Restrict Block Crossing: Yes

Phi: 0 °
Phi-B: 0 °

EMBANKMENT FILL CH, EL. 2 TO -2.5

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

Marsh1, El., -2.5 TO -4

Model: Undrained (Phi=0)
Unit Weight: 103 pcf
Cohesion: 315 psf

BAY SOUND CLAY 1, EL. -45 to -50

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

BAY SOUND CLAY 2, EL. -50 TO -70

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

MARSH 1, El, -4 to -7 (Protected)

Model: Spatial Mohr-Coulomb
Unit Weight: 105 pcf
Cohesion Fn: Marsh (protected)
Phi: 0 °
Phi-B: 0 °

MARSH 2, EL. -7 TO -8

Model: Spatial Mohr-Coulomb
Weight Fn: Marsh2
Cohesion Spatial Fn: Marsh 2
Phi: 0 °
Phi-B: 0 °

Slip Surface Limits

Left Coordinate: (123.3, -9.2) ft
Right Coordinate: (310, -3) ft

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 CH, EL. 4TO 2

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

MARSH 2, MH, EL. -4 TO -7

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

BEACH SAND SP, EL. -14 TO -40

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

Fill (Protected), El., -2.5 TO -4

Model: Undrained (Phi=0)
Unit Weight: 105 pcf
Cohesion: 400 psf

Sheet Pile

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

MARSH 2, El, -7 to -8 (Protected)

Model: Spatial Mohr-Coulomb
Unit Weight: 99 pcf
Cohesion Fn: Marsh (protected)

Slip Surface Block

Left Grid
 Upper Left: (205, -6) ft
 Lower Left: (205, -9) ft
 Lower Right: (215, -9) ft
 X Increments: 2
 Y Increments: 3
 Starting Angle: 140 °
 Ending Angle: 165 °
 Angle Increments: 5
Right Grid
 Upper Left: (216, -6) ft
 Lower Left: (216, -9) ft
 Lower Right: (226, -9) ft
 X Increments: 2
 Y Increments: 3
 Starting Angle: 20 °
 Ending Angle: 35 °
 Angle Increments: 5

Cohesion Functions

Fill 2

Model: Spline Data Point Function
Function: Cohesion vs. Y
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 240
Data Points: Y (ft), Cohesion (psf)
 Data Point: (-2.5, 315)
 Data Point: (2, 180)

Marsh (protected)

Model: Spline Data Point Function
Function: Cohesion vs. Y
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 235
Data Points: Y (ft), Cohesion (psf)
 Data Point: (-8, 275)
 Data Point: (-4, 235)

Shear/Normal Strength Functions

Beach Sand
Model: Spline Data Point Function
Function: Shear Stress vs. Normal Stress
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
Data Point: (-100000, 0)
Data Point: (0, 0)
Data Point: (100000, 57735)
Estimation Properties
Intact Rock Param.: 10
Geological Strength: 100
Disturbance Factor: 0
SigmaC: 600000 psf
Sigma3: 300000 psf
Num. Points: 20

Unit Weight Functions

Marsh2
Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 99
Data Points: X (ft), Unit Weight (pcf)
Data Point: (187.56, 99)
Data Point: (200, 103)
Data Point: (226.1, 99)

Bay Sound 1
Model: Spline Data Point Function
Function: Unit Weight vs. Y
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 107
Data Points: Y (ft), Unit Weight (pcf)
Data Point: (191.1, 107)
Data Point: (200, 110)
Data Point: (238.5, 107)

Bay Sound 2
Model: Spline Data Point Function

Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 112
Data Points: X (ft), Unit Weight (pcf)
Data Point: (191.1, 112)
Data Point: (200, 110)
Data Point: (226.1, 112)

Spatial Functions

Marsh 2
Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (187.56, -4, 235)
Data Point: (187.56, -8, 275)
Data Point: (200, -4, 250)
Data Point: (200, -8, 290)
Data Point: (226.1, -4, 235)
Data Point: (226.1, -8, 275)

Bay Sound
Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (187.56, -45, 620)
Data Point: (187.56, -70, 900)
Data Point: (200, -45, 693)
Data Point: (200, -70, 955)
Data Point: (226.1, -45, 620)
Data Point: (226.1, -70, 900)
Data Point: (123.3, -45, 620)
Data Point: (123.3, -70, 900)
Data Point: (310, -45, 620)
Data Point: (310, -70, 900)

Regions

	Material	Points	Area (ft²)
Region 1	Marsh1, EL., -2.5 TO -4	5,26,16,20,27,50,4	21.15
Region 2	Marsh1, EL., -2.5 TO -4	16,21,19,20	19.575
Region 3	BEACH SAND SP, EL. -14 TO -40	28,17,18,23,1,24,2,25,51	809.5
Region 4	BEACH SAND SP, EL. -14 TO -40	23,18,17,14,22,11,13,12	6045.025

Region 5	MARSH 2, MH, EL. -4 TO -7	50,27,20,42,41,52	37.32
Region 6	Sheet Pile	15,30,31,32	6.675
Region 7	MARSH 2, MH, EL. -4 TO -7	20,19,21,33,34,42	78.3
Region 8	EMBANKMENT FILL CH, EL. 4TO 2	6,53,15,38,39,37	8.876
Region 9	EMBANKMENT FILL CH, EL. 4TO 2	15,32,7,36,38	19.4
Region 10	EMBANKMENT FILL CH, EL. 2 TO -2.5	37,47,46,5,26,16,38,39	38.211
Region 11	EMBANKMENT FILL CH, EL. 2 TO -2.5	38,16,21,8,36	107.55
Region 12	Fill (Protected), EL., -2.5 TO -4	21,8,43,9,10	86.025
Region 13	MARSH 2, EL, -7 to -8 (Protected)	35,33,22,11	83.9
Region 14	BAY SOUND CLAY 1, EL. -45 to -50	12,13,49,48	933.5
Region 15	BAY SOUND CLAY 2, EL. -50 TO -70	48,49,45,44	3734
Region 16	MARSH 1 , EL, -4 to -7 (Protected)	33,21,10,35	251.7
Region 17	MARSH 1 , EL, -4 to -7 (Protected)	40,3,4,50,52	19.905
Region 18	MARSH 2, EL, -7 to -8 (Protected)	25,51,52,40	11.055
Region 19	MARSH 2, EL. -7 TO -8	17,28,51,52,41,42	12.44
Region 20	MARSH 2, EL. -7 TO -8	17,42,34,33,22,14	26.1

Points

	X (ft)	Y (ft)
Point 1	123.3	-11.2
Point 2	164.5	-9.1
Point 3	179.82	-6
Point 4	184.24	-4
Point 5	187.56	-2.5
Point 6	196	3.7
Point 7	206.4	4
Point 8	226.1	-2.5
Point 9	310	-3
Point 10	310	-4
Point 11	310	-8
Point 12	123.3	-45
Point 13	310	-45
Point 14	202	-8
Point 15	200	4
Point 16	200	-2.5

Point 17	200	-8
Point 18	200	-19.3
Point 19	202	-4
Point 20	200	-4
Point 21	226.1	-4
Point 22	226.1	-8
Point 23	123.3	-19.2
Point 24	123.3	-9.2
Point 25	175.4	-8
Point 26	196	-2.5
Point 27	196	-4
Point 28	196	-8
Point 29	196	-13
Point 30	200	12.9
Point 31	200.5	12.9
Point 32	201	4
Point 33	226.1	-7
Point 34	202	-7
Point 35	310	-7
Point 36	213	2
Point 37	194.44	2
Point 38	200	2
Point 39	196	2
Point 40	177.61	-7
Point 41	196	-7
Point 42	200	-7
Point 43	234.6	-3
Point 44	123.3	-70
Point 45	310	-70
Point 46	191.1	-0.9
Point 47	193.4	1.2
Point 48	123.3	-50
Point 49	310	-50
Point 50	187.56	-4
Point 51	187.56	-8
Point 52	187.56	-7

Point 53	199	4
Point 54	205	3
Point 55	205	-49

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.77	(211.28, -0.572)	15.75725	(191.769, -0.289265)	(230.373, -2.75135)
2	837	1.87	(211.28, -0.572)	16.15	(190.829, -1.0224)	(231.612, -2.82423)

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	192.58445	-0.71436755	543.769	431.37811	0	261.43
2	Optimized	193.92	-1.410518	587.20007	569.49888	0	282.32
3	Optimized	194.5259	-1.726333	606.90444	606.07844	0	291.79
4	Optimized	195.19215	-2.13555	632.42848	657.45305	0	304.07
5	Optimized	195.88625	-2.571415	659.61062	739.28812	0	315
6	Optimized	196.49525	-2.953825	683.51493	826.99792	0	315
7	Optimized	197.55495	-3.63241	725.85763	887.34491	0	315
8	Optimized	198.5597	-4.2867455	766.68931	967.18756	0	251.13
9	Optimized	199.4892	-4.8920755	804.45988	1027.2653	0	258.3
10	Optimized	199.9892	-5.2126495	824.45301	1209.6587	0	262.11

11	Optimized	200.2183	-5.2548145	816.55224	772.06545	0	262.42
12	Optimized	200.4683	-5.303494	815.87882	952.05165	0	262.77
13	Optimized	200.75	-5.3790875	820.97267	959.14395	0	263.36
14	Optimized	201.5	-5.580355	834.46496	978.76919	0	264.94
15	Optimized	202.75025	-5.9158715	856.90139	1012.0872	0	267.58
16	Optimized	204.2254	-6.320844	883.75043	1048.2417	0	270.78
17	Optimized	205.67515	-6.7281125	112.65361	1088.6174	0	274.02
18	Optimized	206.5215	-6.9658735	126.31012	1108.3241	0	275.91
19	Optimized	207.0867	-7.12465	135.46696	1105.8018	0	277.17
20	Optimized	208.3411	-7.419835	152.7339	1118.9341	0	279.4
21	Optimized	210.0897	-7.72733	170.95681	1115.4105	0	281.47
22	Optimized	211.95725	-7.931355	183.23372	1100.84	0	282.44
23	Optimized	212.94345	-7.9983935	187.31772	1100.928	0	282.55
24	Optimized	213.63185	-7.998071	187.30415	1075.0799	0	282.15
25	Optimized	214.89555	-7.9974795	187.26458	1027.1263	0	281.41
26	Optimized	216.1593	-7.996888	187.21711	979.1726	0	280.68
27	Optimized	217.42305	-7.996296	187.17754	931.21894	0	279.95
28	Optimized	218.6393	-7.926015	182.82354	916.70872	0	278.55
29	Optimized	219.8081	-7.786045	174.11604	856.90305	0	276.48

30	Optimized	221.0074	-7.56248	160.21042	827.79589	0	273.55
31	Optimized	222.2372	-7.25532	141.04796	746.11288	0	269.77
32	Optimized	222.9803	-7.05087	128.28906	738.7559	0	267.3
33	Optimized	224.0289	-6.634825	102.32014	648.52074	0	262.54
34	Optimized	225.52465	-5.937315	58.778468	555.31434	0	254.7
35	Optimized	227.03805	-5.06316	4.2045722	411.97838	0	245.63
36	Optimized	228.3291	-4.26067	-45.889002	340.30763	0	237.61
37	Optimized	229.52755	-3.375676	-101.12942	321.88053	0	400

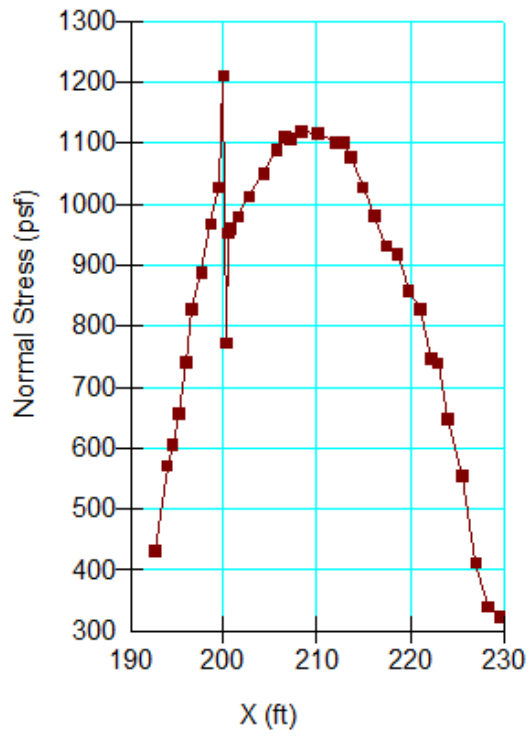
Slices of Slip Surface: 837

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	837	190.9646	-1.0716805	566.06098	467.7906	0	272.15
2	837	191.675	-1.3302455	582.20107	482.29128	0	279.91
3	837	192.825	-1.748811	608.30819	582.79757	0	292.46
4	837	193.92	-2.1473585	633.17205	684.19555	0	304.42
5	837	194.66445	-2.4183115	650.07697	726.63419	0	312.55
6	837	195.44445	-2.7022085	667.78301	803.07163	0	315
7	837	196.75	-5	697.43971	932.55076	0	315

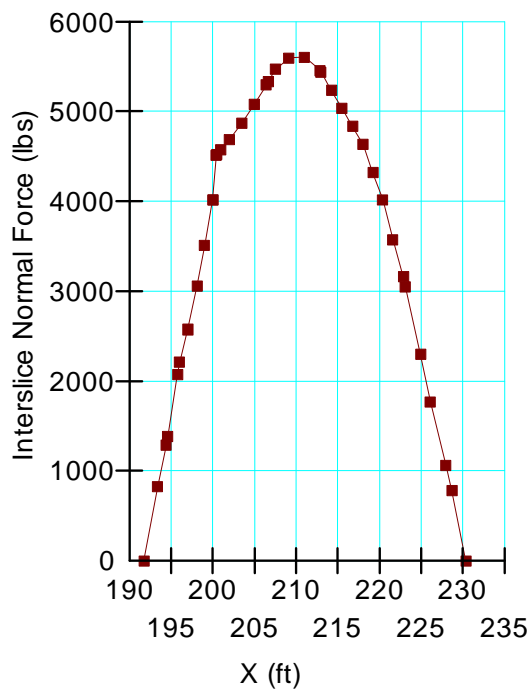
			3.1773945				
8	837	198.25	-3.7233495	731.51923	992.25255	0	315
9	837	199.5	-4.1783125	759.92926	1049.8244	0	251.18
10	837	200.25	-4.4512905	761.50809	671.95538	0	254.37
11	837	200.75	-4.6332755	770.6419	860.00666	0	255.9
12	837	201.5	-4.906253	788.95636	886.07357	0	258.2
13	837	202.73335	-5.3551495	818.87808	929.59096	0	261.98
14	837	204.2	-5.8889725	854.43691	981.42356	0	266.48
15	837	205.66665	-6.4227955	94.618508	1033.1921	0	270.97
16	837	206.82625	-6.8448535	118.99886	1060.6727	0	274.53
17	837	207.9394	-7.25	142.68398	1064.572	0	277.94
18	837	209.31315	-7.75	172.35765	1069.0183	0	282.15
19	837	210.75	-8	187.42667	1172.6667	0	283.82
20	837	212.25	-8	187.42	1122.6	0	282.96
21	837	213.66665	-8	187.41755	1072.2753	0	282.15
22	837	215	-8	187.41755	1021.8003	0	281.38
23	837	216.33335	-8	187.41005	971.32524	0	280.61
24	837	217.66665	-8	187.41005	920.77523	0	279.85
25	837	219	-8	187.41005	870.30022	0	279.08
26	837	220.33335	-8	187.40255	819.7502	0	278.31
27	837	221.5126	-7.75	171.85903	902.08016	0	275.14

28	837	222.53775	-7.25	140.69961	802.69265	0	269.55
29	837	223.81275	-6.628141	101.91866	677.84662	0	262.6
30	837	225.3376	-5.884423	55.487935	527.45898	0	254.28
31	837	226.8753	-5.134423	8.6540239	395.36079	0	246.34
32	837	228.4259	-4.378141	-38.562284	294.70053	0	238.78
33	837	229.8039	- 3.706057 5	-80.517976	271.3511	0	400
34	837	231.00925	- 3.118172 5	-117.21264	195.41902	0	400

Base Normal Stress Vs. X



Interslice Normal Stress
Vs. X



Global Stability (Entry/Exit) OPEN

Report generated using GeoStudio 2007, version 7.15. Copyright © 1991-2009 GEO-SLOPE International Ltd.

File Information

Created By: [Liljegren, James](#)
Revision Number: 243
Last Edited By: [Schroeder, Danielle V MVN](#)
Date: 1/12/2012
Time: 11:13:44 AM
File Name: [Reach 28-DVS.gsz](#)
Directory: [G:\F&M\HOME\London Ave Reeevaluation 2011\East Side\Reach 28\SlopeW\](#)
Last Solved Date: 1/12/2012
Last Solved Time: 11:17:22 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 Stability (Entry/Exit) OPEN

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

3/1/2012

Global Stability (Entry/Exit) OPEN

Phi: 0 °
Phi-B: 0 °

Sheet Pile

Model: [Undrained \(Phi=0\)](#)
Unit Weight: [0.1 pcf](#)
Cohesion: [0.01 psf](#)

Marsh 3, EL. -12 to -15

Model: [Spatial Mohr-Coulomb](#)
Unit Weight: [89 pcf](#)
Cohesion: [260 psf](#)
Phi: 0 °
Phi-B: 0 °

Slip Surface Entry and Exit

Left Projection: [Range](#)
Left-Zone Left Coordinate: [\(170.2558, -8.66097\) ft](#)
Left-Zone Right Coordinate: [\(195, 1.7\) ft](#)
Left-Zone Increment: [25](#)
Right Projection: [Range](#)
Right-Zone Left Coordinate: [\(208.8, 2.74807\) ft](#)
Right-Zone Right Coordinate: [\(259.1, -3.9\) ft](#)
Right-Zone Increment: [25](#)
Radius Increments: [25](#)

Slip Surface Limits

Left Coordinate: [\(73, -9.3\) ft](#)
Right Coordinate: [\(310, -3.9\) ft](#)

Cohesion Functions

Marsh 2

Model: [Spline Data Point Function](#)
Function: [Cohesion vs. X](#)
 Curve Fit to Data: [100 %](#)
 Segment Curvature: [0 %](#)
Y-Intercept: [245](#)
Data Points: [X \(ft\), Cohesion \(psf\)](#)
 Data Point: [\(73, 245\)](#)
 Data Point: [\(188.9, 245\)](#)
 Data Point: [\(200, 260\)](#)
 Data Point: [\(226.1, 245\)](#)
 Data Point: [\(310, 245\)](#)

Marsh 1

3/1/2012

Global Stability (Entry/Exit) OPEN

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. 3.9 TO 0

Model: [Spatial Mohr-Coulomb](#)
Unit Weight: [111 pcf](#)
Cohesion: [850 psf](#)
Phi: 0 °
Phi-B: 0 °

MARSH 1, EL. -2.7 TO -8/-7

Model: [Spatial Mohr-Coulomb](#)
Weight Fn: [Marsh 1](#)
Cohesion Fn: [Marsh 1](#)
Phi: 0 °
Phi-B: 0 °

BEACH SAND, EL. -12/-15 TO -45

Model: [Mohr-Coulomb](#)
Unit Weight: [122 pcf](#)
Cohesion: [0 psf](#)
Phi: [30 °](#)
Phi-B: 0 °

BAY SOUND CLAY, EL. -45 TO -70

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

EMBANKMENT FILL, EL. 0 TO -2.7

Model: [Spatial Mohr-Coulomb](#)
Unit Weight: [103 pcf](#)
Cohesion: [850 psf](#)
Phi: 0 °
Phi-B: 0 °

MARSH 2, MH, EL. -7/-8 TO -12

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

3/1/2012

Global Stability (Entry/Exit) OPEN

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: [\(73, 400\)](#)
 Data Point: [\(188.9, 400\)](#)
 Data Point: [\(200, 260\)](#)
 Data Point: [\(226.1, 400\)](#)
 Data Point: [\(310, 400\)](#)

Unit Weight Functions

Clay

Model: [Spline Data Point Function](#)
Function: [Unit Weight vs. X](#)
 Curve Fit to Data: [100 %](#)
 Segment Curvature: [0 %](#)
Y-Intercept: [112](#)
Data Points: [X \(ft\), Unit Weight \(pcf\)](#)
 Data Point: [\(73, 112\)](#)
 Data Point: [\(188.9, 112\)](#)
 Data Point: [\(200, 106\)](#)
 Data Point: [\(226.1, 112\)](#)
 Data Point: [\(310, 112\)](#)

Marsh 2

Model: [Spline Data Point Function](#)
Function: [Unit Weight vs. X](#)
 Curve Fit to Data: [100 %](#)
 Segment Curvature: [0 %](#)
Y-Intercept: [100](#)
Data Points: [X \(ft\), Unit Weight \(pcf\)](#)
 Data Point: [\(73, 100\)](#)
 Data Point: [\(188.9, 100\)](#)
 Data Point: [\(200, 97\)](#)
 Data Point: [\(226.1, 100\)](#)
 Data Point: [\(310, 100\)](#)

Marsh 1

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: [\(73, 100\)](#)
 Data Point: [\(188.9, 100\)](#)

3/1/2012

Data Point: (200, 86)
Data Point: (226.1, 100)
Data Point: (310, 100)

Spatial Functions

Bay Sound Clay

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (310, -45, 680)
Data Point: (310, -70, 960)
Data Point: (188.9, -45, 680)
Data Point: (188.9, -70, 960)
Data Point: (226.1, -45, 680)
Data Point: (226.1, -70, 960)
Data Point: (200, -45, 715)
Data Point: (200, -70, 1010)
Data Point: (73, -45, 680)
Data Point: (73, -70, 960)

Regions

	Material	Points	Area (ft ²)
Region 1	BEACH SAND, EL. -12/-15 TO -45	26,11,15,27,40,30	1202.55
Region 2	BEACH SAND, EL. -12/-15 TO -45	9,15,11,26,31,28,10	6562.65
Region 3	BAY SOUND CLAY, EL. -45 TO -70	16,9,10,17	5925
Region 4	Sheet Pile	5,19,6,20,21	7.375
Region 5	EMBANKMENT FILL, EL. 3.9 TO 0	5,19,6,41,18,29,22	40.139495
Region 6	EMBANKMENT FILL, EL. 0 TO -2.7	22,29,13,23	58.895532
Region 7	MARSH 1, EL. -2.7 TO -8/-7	24,23,13,7,8,34,33	396.59
Region 8	MARSH 2, MH, EL. -7/-8 TO -12	24,33,34,28,31,25,36	536.95
Region 9	Marsh 3, EL. -12 to -15	26,31,25	39.15
Region 10	EMBANKMENT FILL, EL. 3.9 TO 0	5,39,12,4,22	15.445
Region 11	EMBANKMENT FILL, EL. 0 TO -2.7	22,4,3,37,23	23.328102
Region 12	Marsh 3, EL. -12 to -15	26,25,30	16.65
Region 13	MARSH 2, MH, EL. -7/-8 TO -12	25,36,24,32,35,2,40,30	106.64052
Region 14	MARSH 1, EL. -2.7 TO -8/-7	24,23,37,35,32	76.596363
Region 15	BEACH SAND, EL. -12/-15 TO -45	38,1,14,2,40,27	292.49

Points

	X (ft)	Y (ft)
Point 1	73	-9.3
Point 2	175.8	-7.9

Point 3	190.4	-2.1
Point 4	193.3	0
Point 5	200	3.1
Point 6	201	3.5
Point 7	244.8	-3.9
Point 8	310	-3.9
Point 9	73	-45
Point 10	310	-45
Point 11	200	-21.6
Point 12	196	2.7
Point 13	226.1	-2.7
Point 14	165.6	-9.3
Point 15	73	-21.6
Point 16	73	-70
Point 17	310	-70
Point 18	208	3
Point 19	201	3.1
Point 20	200.5	12.8
Point 21	200	12.8
Point 22	200	0
Point 23	200	-2.7
Point 24	200	-8
Point 25	200	-12
Point 26	200	-15
Point 27	73	-12
Point 28	310	-12
Point 29	217.52632	0
Point 30	188.9	-12
Point 31	226.1	-12
Point 32	188.9	-7
Point 33	226.1	-7
Point 34	310	-7
Point 35	178.06552	-7
Point 36	200	-11.9
Point 37	188.88966	-2.7
Point 38	73	-11.6
Point 39	199	3.1
Point 40	179.6	-12
Point 41	205	3.21429
Point 42	205	-57

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
--	--------------	-----	-------------	-------------	------------	-----------

3/1/2012

3/1/2012

1	Optimized	1.82	(212.729, 26.287)	20.29503	(186.83, -3.51842)	(237.8, -3.4508)
2	11216	1.86	(212.729, 26.287)	39.485	(186.831, -3.51771)	(238.642, -3.50485)

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	187.8596	-4.1249005	756.59406	611.74193	0	400
2	Optimized	189.64485	-5.1760115	822.16807	737.15555	0	390.61
3	Optimized	190.79025	-5.850399	864.24769	798.00066	0	376.16
4	Optimized	192.24025	-6.714365	918.15026	916.32845	0	357.87
5	Optimized	194.29195	-7.942195	994.75568	1109.2008	0	252.29
6	Optimized	195.64195	-8.742264	1044.6936	1250.1869	0	254.11
7	Optimized	196.808	-9.414579	1086.6687	1361.6328	0	255.69
8	Optimized	198.308	-10.26754	1139.8927	1442.3801	0	257.71
9	Optimized	199.48655	-10.926775	1181.0575	1502.0634	0	259.31
10	Optimized	199.98655	-11.200455	1198.1055	1671.8102	0	259.98
11	Optimized	200.25	-11.230485	1183.7559	1183.9745	0	259.86
12	Optimized	200.75	-11.287475	1184.3322	1381.8931	0	259.57
13	Optimized	201.03255	-11.31968	1186.5125	1428.9758	0	259.41
14	Optimized	201.89855	-11.492545	1198.1163	1413.3528	0	258.91
15	Optimized	203.5655	-11.83085	1220.6335	1438.4568	0	257.95
16	Optimized	204.6995	-12.06099	1235.6916	1454.9107	0	260
17	Optimized	205.7383	-12.271815	401.06671	1468.7904	0	260
18	Optimized	207.2149	-12.571485	418.52229	1488.3698	0	260
19	Optimized	207.9766	-12.724415	427.56009	1521.7846	0	260
20	Optimized	208.7066	-12.82088	433.27436	1508.2491	0	260
21	Optimized	210.1198	-13.00762	444.39331	1480.7498	0	260
22	Optimized	211.7262	-13.112985	450.65038	1479.1272	0	260
23	Optimized	213.52575	-13.136975	451.93392	1424.3962	0	260
24	Optimized	215.2007	-13.10294	449.69806	1391.8337	0	260
25	Optimized	216.7511	-13.010885	443.90975	1333.9506	0	260
26	Optimized	217.62025	-12.95928	440.66698	1301.7195	0	260

27	Optimized	218.6143	-12.80706	431.17807	1291.0176	0	260
28	Optimized	220.4145	-12.513775	412.89318	1210.4216	0	260
29	Optimized	221.94155	-12.183565	392.30919	1173.6288	0	260
30	Optimized	223.71995	-11.66287	359.84037	1063.9433	0	246.37
31	Optimized	225.4857	-11.057205	322.08795	985.92264	0	245.35
32	Optimized	226.92335	-10.428755	282.89367	894.23579	0	245
33	Optimized	229.0177	-9.419865	219.93927	791.50108	0	245
34	Optimized	230.9972	-8.3281675	151.80424	688.37071	0	245
35	Optimized	232.4142	-7.4427225	96.546656	582.11074	0	245
36	Optimized	233.5703	-6.72032	51.455396	565.14346	0	400
37	Optimized	234.96345	-5.693181	-12.66287	494.69197	0	400
38	Optimized	236.8545	-4.1982635	105.96986	314.64483	0	400

Slices of Slip Surface: 11216

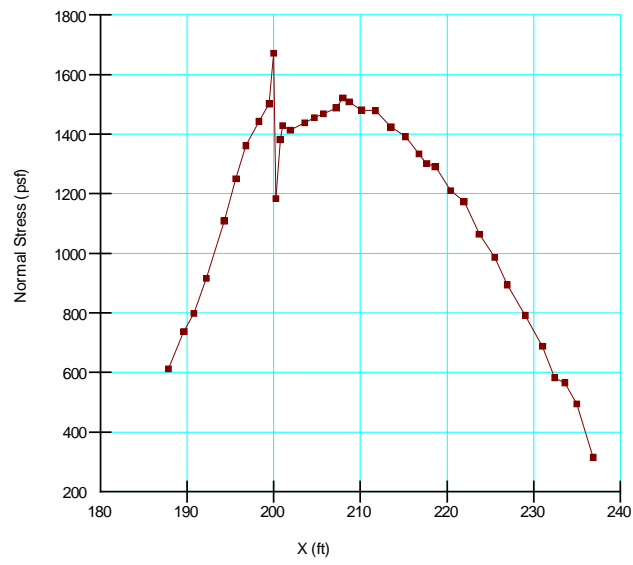
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	11216	187.8605	-4.3530335	770.83305	577.21005	0	400
2	11216	189.64485	-5.732795	856.9093	755.07915	0	390.61
3	11216	191.163	-6.7749185	921.95012	879.63164	0	371.46
4	11216	192.613	-7.6794905	978.37175	1045.0618	0	250.02
5	11216	193.975	-8.4507925	1026.4767	1161.8585	0	251.86
6	11216	195.325	-9.1467575	1069.9055	1301.878	0	253.68
7	11216	196.75	-9.8103065	1111.315	1441.6614	0	255.61
8	11216	198.25	-10.43801	1150.5402	1512.7393	0	257.64
9	11216	199.5	-10.91153	1180.0919	1568.5565	0	259.32
10	11216	200.25	-11.172635	1179.8887	1124.786	0	259.86
11	11216	200.75	-11.33552	1187.5917	1325.128	0	259.57
12	11216	202.0394	-11.70756	1212.6825	1409.9958	0	258.83
13	11216	204.0394	-12.2168	1246.6972	1465.024	0	260
14	11216	205.75	-12.568315	419.14533	1502.8812	0	260
			-				

3/1/2012

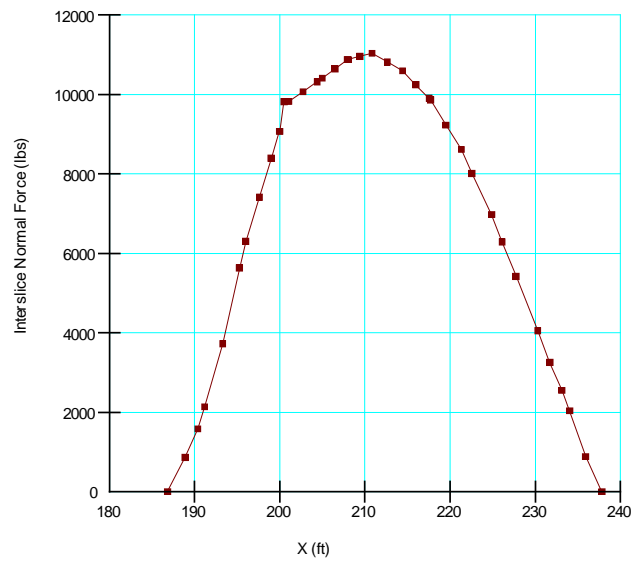
3/1/2012

15	11216	207.25	12.808145	432.98137	1530.0453	0	260
16	11216	208.79385	-12.9928	443.80131	1531.3326	0	260
17	11216	210.38155	-13.119635	451.25068	1506.1599	0	260
18	11216	211.9693	-13.18222	454.88894	1474.8611	0	260
19	11216	213.55705	-13.180865	454.64649	1437.469	0	260
20	11216	215.14475	-13.115555	450.48721	1393.8518	0	260
21	11216	216.73245	-12.98597	442.36431	1344.0296	0	260
22	11216	218.33525	-12.789	430.06648	1289.4285	0	260
23	11216	219.95315	-12.52238	413.4428	1229.6519	0	260
24	11216	221.57105	-12.185905	392.46892	1163.094	0	260
25	11216	223.31	-11.741245	364.73349	1077.5016	0	246.6
26	11216	225.17	-11.173635	329.34249	975.8126	0	245.53
27	11216	226.88665	-10.56257	291.23627	891.08188	0	245
28	11216	228.4599	-9.918589	251.0479	825.26394	0	245
29	11216	230.03315	-9.1931805	205.77782	750.57859	0	245
30	11216	231.6064	-8.381223	155.09463	666.42179	0	245
31	11216	233.17965	-7.4764515	98.633474	571.8371	0	245
32	11216	234.7456	-6.4763105	36.203117	539.01294	0	400
33	11216	236.30425	-5.3723015	32.707395	428.95104	0	400
34	11216	237.86295	-4.148416	109.09668	305.6864	0	400

Base Normal Stress Vs. X



Interslice Normal Stress Vs. X



Global Stability (Block)

Report generated using GeoStudio 2007, version 7.15. Copyright © 1991-2009 GEO-SLOPE International Ltd.

File Information

Created By: Liljegren, James
Revision Number: 261
Last Edited By: Curran, Matthew MVN
Date: 3/7/2013
Time: 1:03:42 PM
File Name: Reach 29-DVS.gsz
Directory: C:\Users\B2EDFMJC\Desktop\Chrono Order\Reach 29 SlopeW\
Last Solved Date: 3/7/2013
Last Solved Time: 1:05:01 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 Stability (Seepage)
Method: Spencer
Settings
 PWP Conditions Source: Parent Analysis
Slip Surface
 Direction of movement: Left to Right
 Use Passive Mode: No
 Slip Surface Option: 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. 4.6 TO 0

Model: Mohr-Coulomb
Unit Weight: 114 pcf
Cohesion: 850 psf
Phi: 0 °
Phi-B: 0 °

MARSH 1, EL. -3 TO -8

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

BEACH SAND, EL. -11 TO -52

Model: Mohr-Coulomb
Unit Weight: 122 pcf
Cohesion: 0 psf
Phi: 30 °
Phi-B: 0 °

BAY SOUND CLAY, EL. -45 TO -70

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

EMBANKMENT FILL1, EL. 0 TO -3

Model: Spatial Mohr-Coulomb
Weight Fn: Fill 2
Cohesion Fn: Fill 2

Phi: 0 °
Phi-B: 0 °

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

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

Sheet Pile

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

Marsh 3, EL. -12 to -16

Model: Spatial Mohr-Coulomb
Weight Fn: Marsh 3
Cohesion Fn: Marsh 3
Phi: 0 °
Phi-B: 0 °

Fill -2.6 to -7 (Protected)

Model: Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion: 400 psf
Phi: 0 °
Phi-B: 0 °

Slip Surface Limits

Left Coordinate: (127.5, -11.6) ft
Right Coordinate: (310, -2.6) ft

Slip Surface Block

Left Grid
 Upper Left: (195, -3) ft
 Lower Left: (195, -51) ft
 Lower Right: (215, -51) ft
 X Increments: 12
 Y Increments: 12
 Starting Angle: 125 °
 Ending Angle: 145 °
 Angle Increments: 4
Right Grid
 Upper Left: (220, -3) ft

Lower Left: (220, -51) ft
Lower Right: (250, -51) ft
X Increments: 10
Y Increments: 12
Starting Angle: 25 °
Ending Angle: 45 °
Angle Increments: 4

Cohesion Functions

Marsh 3

Model: Spline Data Point Function
Function: Cohesion vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 220
Data Points: X (ft), Cohesion (psf)
 Data Point: (127.5, 220)
 Data Point: (172.7, 220)
 Data Point: (200, 260)
 Data Point: (263.6, 220)
 Data Point: (310, 220)

Fill 2

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: (127.5, 400)
 Data Point: (172.7, 400)
 Data Point: (200, 850)
 Data Point: (263.6, 400)
 Data Point: (310, 400)

Marsh 2

Model: Spline Data Point Function
Function: Cohesion vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 220
Data Points: X (ft), Cohesion (psf)
 Data Point: (127.5, 220)
 Data Point: (172.7, 220)
 Data Point: (200, 260)

Data Point: (263.6, 220)
Data Point: (310, 220)

Marsh 1

Model: Spline Data Point Function
Function: Cohesion vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 220
Data Points: X (ft), Cohesion (psf)
Data Point: (127.5, 220)
Data Point: (172.7, 220)
Data Point: (200, 260)
Data Point: (263.6, 220)
Data Point: (310, 220)

Unit Weight Functions

Clay

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 112
Data Points: X (ft), Unit Weight (pcf)
Data Point: (127.5, 112)
Data Point: (172.7, 112)
Data Point: (200, 106)
Data Point: (263.6, 112)
Data Point: (310, 112)

Marsh 3

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: (127.5, 100)
Data Point: (172.7, 100)
Data Point: (200, 90)
Data Point: (263.6, 100)
Data Point: (310, 100)

Marsh 2

Model: Spline Data Point Function

Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 100
Data Points: X (ft), Unit Weight (pcf)
Data Point: (127.5, 100)
Data Point: (172.7, 100)
Data Point: (200, 97)
Data Point: (263.6, 100)
Data Point: (310, 100)

Marsh 1

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: (127.5, 100)
Data Point: (172.7, 100)
Data Point: (200, 93)
Data Point: (263.6, 100)
Data Point: (310, 100)

Fill 2

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 100
Data Points: X (ft), Unit Weight (pcf)
Data Point: (127.5, 100)
Data Point: (172.7, 100)
Data Point: (200, 103)
Data Point: (263.6, 100)
Data Point: (310, 100)

Spatial Functions

Clay Cohesion

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (172.7, -49, 544)
Data Point: (172.7, -70, 773)
Data Point: (200, -49, 900)

Data Point: (200, -70, 900)
Data Point: (263.6, -49, 544)
Data Point: (263.6, -70, 773)
Data Point: (310, -49, 544)
Data Point: (310, -70, 773)
Data Point: (127.5, -49, 544)
Data Point: (127.5, -70, 773)

Regions

	Material	Points	Area (ft²)
Region 1	BEACH SAND, EL. -11 TO -52	25,10,14,1,13,44,27	573.48
Region 2	BEACH SAND, EL. -11 TO -52	8,14,10,25,28,26,9	5616.5
Region 3	BAY SOUND CLAY, EL. -45 TO -70	15,8,9,16	3832.5
Region 4	Sheet Pile	4,18,5,19,20	6.45
Region 5	EMBANKMENT FILL, EL. 4.6 TO 0	4,18,5,17,33,21	99.833372
Region 6	EMBANKMENT FILL1, EL. 0 TO -3	21,33,12,6,30,22	247.73162
Region 7	MARSH 1, EL. -3 TO -8	23,22,30,31,40,41	237.2
Region 8	MARSH 2, MH, EL. -8 TO -12	23,41,40,39,34,24	440
Region 9	Marsh 3, EL. -12 to -16	25,28,26,39,34,24	440
Region 10	Fill -2.6 to -7 (Protected)	6,7,31,30	204.16
Region 11	EMBANKMENT FILL, EL. 4.6 TO 0	4,32,11,36,21	56.9916
Region 12	Marsh 3, EL. -12 to -16	25,24,37,44,27	147.2
Region 13	MARSH 2, MH, EL. -8 TO -12	24,23,42,43,2,13,44,37	190.25902
Region 14	MARSH 1, EL. -3 TO -8	43,38,29,22,23,42	91.78235
Region 15	EMBANKMENT FILL1, EL. 0 TO -3	38,35,45,3,36,21,22,29	143.66422

Points

	X (ft)	Y (ft)
Point 1	127.5	-11.6
Point 2	161.5	-8.1
Point 3	177.3	-0.9
Point 4	200	4.6
Point 5	201	5.8
Point 6	263.6	-2.6
Point 7	310	-2.6
Point 8	127.5	-49

Point 9	310	-49
Point 10	200	-21.6
Point 11	196	4.9
Point 12	231	-1.5
Point 13	146.1	-10.4
Point 14	127.5	-21.6
Point 15	127.5	-70
Point 16	310	-70
Point 17	209.3	5.6
Point 18	201	4.6
Point 19	200.5	12.8
Point 20	200	12.8
Point 21	200	0
Point 22	200	-3
Point 23	200	-8
Point 24	200	-12
Point 25	200	-16
Point 26	310	-16
Point 27	172.7	-16
Point 28	263.6	-16
Point 29	172.7	-7
Point 30	263.6	-7
Point 31	310	-7
Point 32	199	4.6
Point 33	226.41549	0
Point 34	263.6	-12
Point 35	172.7	-3
Point 36	180.432	0
Point 37	172.7	-12
Point 38	163.91569	-7
Point 39	310	-12
Point 40	310	-8
Point 41	263.6	-8
Point 42	172.7	-8
Point 43	161.71961	-8
Point 44	153.7	-12

Point 45	173.6	-2.6
----------	-------	------

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.98	(216.947, 2.725)	26.76004	(186.054, 1.76952)	(247.474, -2.05586)
2	13438	2.08	(216.947, 2.725)	26.521	(186.052, 1.76879)	(247.486, -2.05626)

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	187.1814	0.884759	429.07015	175.87061	0	850
2	Optimized	189.39815	-0.85494	514.80395	459.05579	0	675.24
3	Optimized	191.91365	-2.842869	621.19798	678.21456	0	716.71
4	Optimized	194.1008	-4.580444	731.22061	1055.9846	0	251.36
5	Optimized	195.4309	-5.613772	804.45679	1176.7917	0	253.31
6	Optimized	197.29915	-7.021257	907.02355	1307.0644	0	256.04
7	Optimized	198.79915	-8.151299	993.09811	1399.2299	0	258.24
8	Optimized	199.48035	-8.664494	1032.9393	1444.1199	0	259.24
9	Optimized	199.98035	-9.0356495	1062.7289	1528.4476	0	259.97
10	Optimized	200.25	-9.162866	846.21617	1308.3214	0	259.84
11	Optimized	200.75	-9.39878	816.22672	1355.6751	0	259.53
12	Optimize	201.8898	-9.9365735	850.20056	1540.1691	0	258.81

	d						
13	Optimized	203.6694	-10.77625	902.03586	1617.7695	0	257.69
14	Optimized	205.29895	-11.598045	951.73218	1680.6907	0	256.67
15	Optimized	206.85405	-12.44303	1002.0875	1756.4147	0	255.69
16	Optimized	208.4847	-13.329085	1053.547	1833.5232	0	254.66
17	Optimized	209.3372	-13.79232	1080.0987	1872.7366	0	254.13
18	Optimized	210.2004	-14.16756	1100.4699	1897.7933	0	253.58
19	Optimized	211.8524	-14.877625	1138.676	1903.7439	0	252.55
20	Optimized	213.55095	-15.40384	1164.0866	1936.4706	0	251.48
21	Optimized	215.29605	-15.7462	1177.1884	1905.8812	0	250.38
22	Optimized	217.20785	-15.927705	1178.995	1890.1638	0	249.18
23	Optimized	219.2863	-15.94836	1169.5653	1817.6614	0	247.87
24	Optimized	221.36475	-15.96902	1160.2319	1745.0627	0	246.56
25	Optimized	223.44975	-15.98974	1150.8239	1672.1871	0	245.25
26	Optimized	225.4555	-15.73541	1124.0485	1627.6536	0	243.99
27	Optimized	227.3379	-15.21634	1080.667	1513.3518	0	242.81
28	Optimized	229.63015	-14.284	1008.0381	1387.5368	0	241.36
29	Optimized	231.326	-13.44466	944.26456	1260.5177	0	240.3
30	Optimized	232.71765	-12.641655	884.32935	1196.7246	0	239.42
31	Optimize	234.3289	-11.67151	812.07744	1096.3791	0	238.41

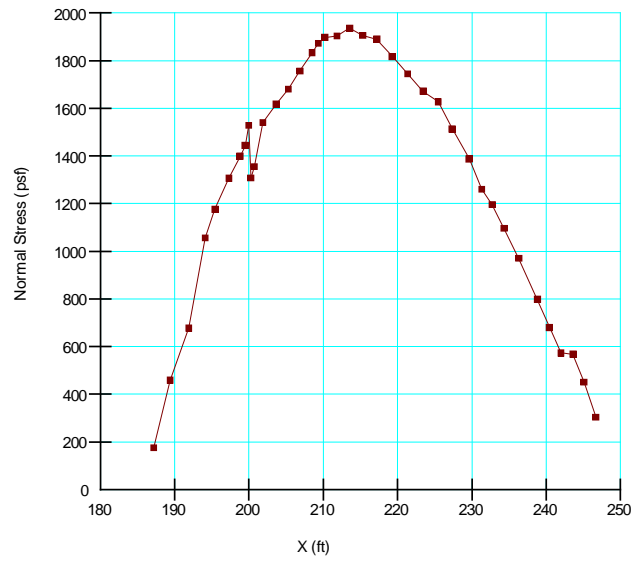
	d						
32	Optimized	236.3004	-10.407145	718.44863	971.28932	0	237.17
33	Optimized	238.8022	-8.735635	595.66009	798.33106	0	235.6
34	Optimized	240.4323	-7.621065	514.2552	680.5274	0	234.57
35	Optimized	241.9769	-6.4722385	431.22982	573.56476	0	233.6
36	Optimized	243.61725	-5.1971135	322.19604	568.22075	0	541.39
37	Optimized	245.0688	-4.0328755	200.39702	450.96556	0	531.12
38	Optimized	246.67205	-2.7148665	65.965463	303.38042	0	519.77

Slices of Slip Surface: **13438**

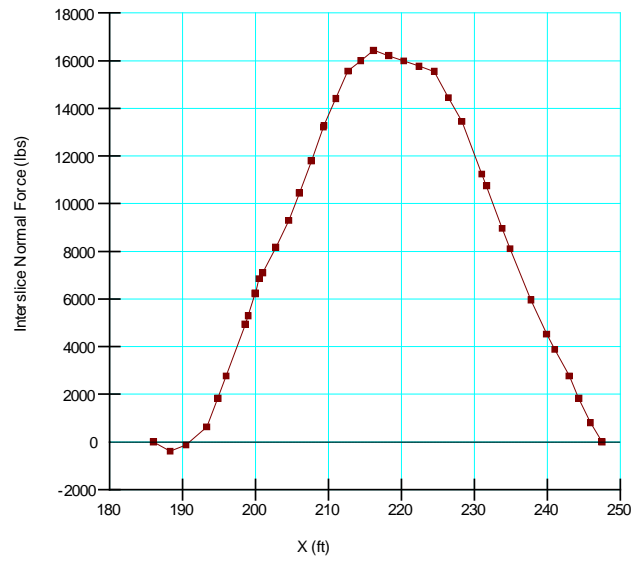
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	13438	187.31475	0.8843935	428.79096	229.14034	0	850
2	13438	189.4977	-0.6441425	504.21717	479.77432	0	676.89
3	13438	191.33755	-1.9324275	571.13447	628.03421	0	707.21
4	13438	193.17745	-3.2207125	647.89124	776.78384	0	737.54
5	13438	195.0487	-4.5309745	736.51703	1081.8065	0	252.75
6	13438	197.5	-6.2474055	862.59435	1245.3022	0	256.34
7	13438	199.5	-7.647821	970.53102	1359.5462	0	259.27
8	13438	200.25	-8.1729765	782.25743	1173.6974	0	259.84
9	13438	200.75	-8.52308	759.25564	1234.2983	0	259.53
10	13438	202.1789	-9.523601	823.12047	1460.1599	0	258.63
11	13438	204.5367	-11.174535	926.16687	1612.9576	0	257.15
12	13438	206.6117	-12.627465	1014.9006	1743.8191	0	255.84
13	13438	208.4039	-13.88239	1089.8584	1852.9649	0	254.71
14	13438	209.65	-14.754925	1141.3012	1917.5179	0	253.93
15	13438	211.02595	-15	1150.5719	2028.2309	0	253.07
16	13438	213.0779	-15	1140.4352	1954.6906	0	251.77

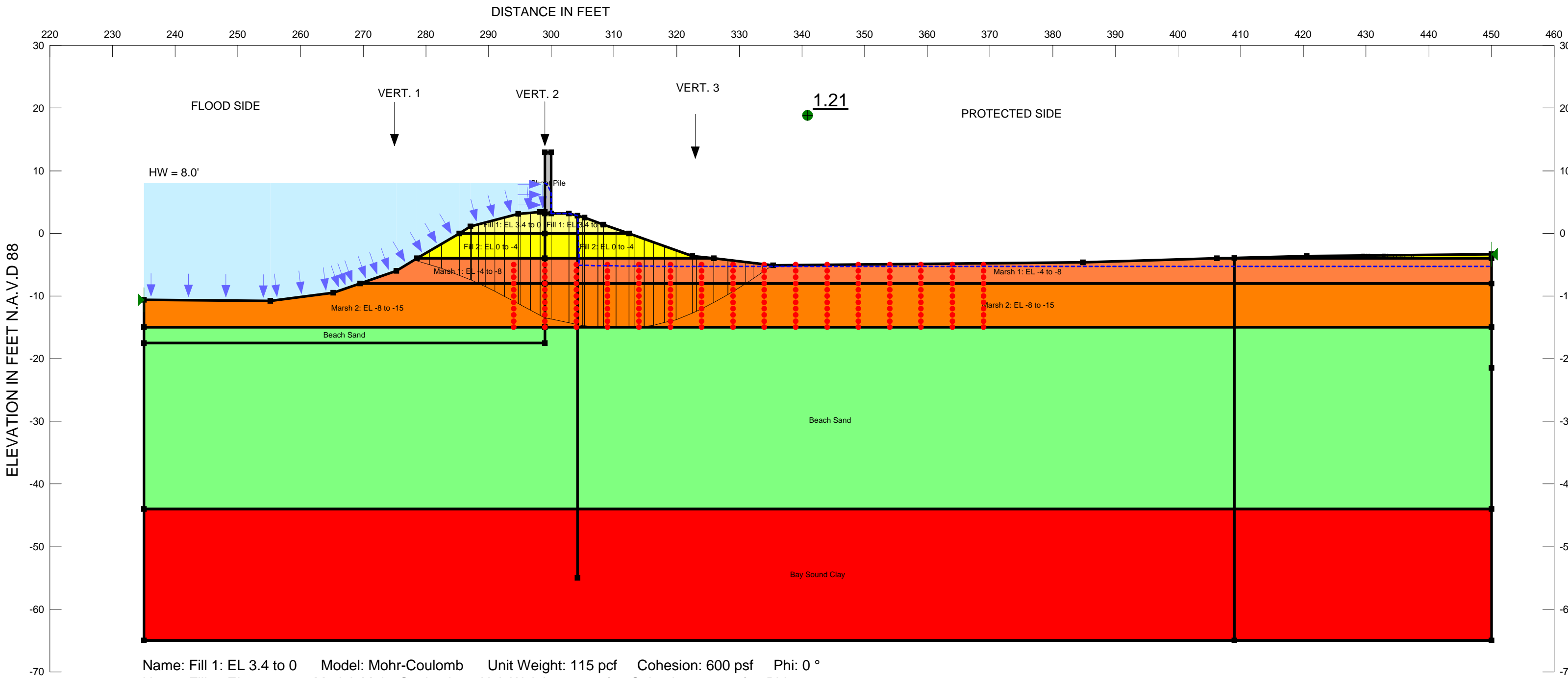
17	13438	215.12985	-15	1130.1035	1881.0528	0	250.48
18	13438	217.18175	-15	1119.6256	1807.3176	0	249.19
19	13438	219.2337	-15	1109.0015	1733.4849	0	247.9
20	13438	221.28565	-15	1098.3286	1659.6034	0	246.61
21	13438	223.3376	-15	1087.607	1585.6245	0	245.32
22	13438	225.38955	-15	1076.8367	1511.5481	0	244.03
23	13438	227.70775	-15	1064.6892	1432.9602	0	242.57
24	13438	230	-14.29979	1007.1066	1412.6278	0	241.13
25	13438	232.1422	-12.79979	897.73669	1229.7085	0	239.78
26	13438	234.2365	-11.333335	790.33088	1077.5206	0	238.47
27	13438	236.1407	-10.000002	692.42139	936.20569	0	237.27
28	13438	238.0449	-8.6666665	594.94209	794.6327	0	236.07
29	13438	239.83155	-7.415648	503.58907	662.40539	0	234.95
30	13438	241.50065	-6.2469435	418.64001	539.36691	0	233.9
31	13438	243.1936	-5.061536	311.43016	525.71434	0	544.38
32	13438	244.9104	-3.8594265	184.31493	390.33025	0	532.24
33	13438	246.6272	-2.657317	60.601723	255.17042	0	520.09

Base Normal Stress Vs. X



Interslice Normal Stress Vs. X





Name: Fill 1: EL 3.4 to 0 Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion: 600 psf Phi: 0 °
Name: Fill 2: EL 0 to -4 Model: Mohr-Coulomb Unit Weight: 102 pcf Cohesion: 600 psf Phi: 0 °
Name: Marsh 1: EL -4 to -8 Model: Mohr-Coulomb Unit Weight: 80 pcf Cohesion: 200 psf Phi: 0 °
Name: Marsh 2: EL -8 to -15 Model: Mohr-Coulomb Unit Weight: 94 pcf Cohesion: 250 psf Phi: 0 °
Name: Beach Sand Model: Mohr-Coulomb Unit Weight: 122 pcf Cohesion: 0 psf Phi: 30 °
Name: Bay Sound Clay Model: Spatial Mohr-Coulomb Unit Weight: 105 pcf Cohesion Spatial Fn: Bay Sound Clay Phi: 0 °
Name: Sheet Pile Model: Undrained (Phi=0) Unit Weight: 0.1 pcf Cohesion: 0.01 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.

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

LONDON AVE CANAL
OUTFALL CANAL REEVALUATION REPORT
REACH 30, STA. 74+13 TO 76+90
PROTECTED SIDE STABILITY ANALYSIS,
CASE: Global Stability (Block) EL-5 to -15
MARCH 2012

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

Global Stability (Block) EL-5 to -15

Report generated using GeoStudio 2007, version 7.15. Copyright © 1991-2009 GEO-SLOPE International Ltd.

File Information

Title: London Avenue Canal OFC-03 Reach 30 & 31
Comments: Station: 74+13 to 83+73
Created By: B. Lim & K. Hesterberg
Revision Number: 297
Last Edited By: Curran, Matthew MVN
Date: 3/12/2013
Time: 2:30:09 PM
File Name: Reach 30.gsz
Directory: C:\Users\B2EDFMJC\Desktop\Chrono Order\Reach 30 - SlopeW\
Last Solved Date: 3/12/2013
Last Solved Time: 2:31:54 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 (Block) EL-5 to -15

Kind: [SLOPE/W](#)
Parent: [Seepage Analysis Gap: Rem](#)
Method: [Spencer](#)
Settings
 PWP Conditions Source: [Parent Analysis](#)
SlipSurface
 Direction of movement: [Left to Right](#)
 Use Passive Mode: [No](#)
 Slip Surface Option: [Block](#)
 Critical slip surfaces saved: [1](#)
 Optimize Critical Slip Surface Location: [Yes](#)
 Tension Crack
 Tension Crack Option: [Search for Tension Crack](#)
 Percentage Wet: [1](#)

Beach Sand

Model: [Mohr-Coulomb](#)
Unit Weight: [122 pcf](#)
Cohesion: [0 psf](#)
Phi: [30 °](#)
Phi-B: [0 °](#)

Bay Sound Clay

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

Sheet Pile

Model: [Undrained \(Phi=0\)](#)
Unit Weight: [0.1 pcf](#)
Cohesion: [0.01 psf](#)

Slip Surface Limits

Left Coordinate: [\(235, -10.6\) ft](#)
Right Coordinate: [\(450, -3.3\) ft](#)

Slip Surface Block

Left Grid
 Upper Left: [\(294, -5\) ft](#)
 Lower Left: [\(294, -15\) ft](#)
 Lower Right: [\(304, -15\) ft](#)
 X Increments: [2](#)
 Y Increments: [10](#)
 Starting Angle: [145 °](#)
 Ending Angle: [160 °](#)
 Angle Increments: [5](#)
Right Grid
 Upper Left: [\(309, -5\) ft](#)
 Lower Left: [\(309, -15\) ft](#)
 Lower Right: [\(369, -15\) ft](#)
 X Increments: [12](#)
 Y Increments: [10](#)
 Starting Angle: [20 °](#)
 Ending Angle: [45 °](#)
 Angle Increments: [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: [5000](#)
 Optimization Convergence Tolerance: [1e-007](#)
 Starting Optimization Points: [8](#)
 Ending Optimization Points: [16](#)
 Complete Passes per Insertion: [1](#)
 Driving Side Maximum Convex Angle: [5 °](#)
 Resisting Side Maximum Convex Angle: [1 °](#)

Materials

Fill 1: EL 3.4 to 0

Model: [Mohr-Coulomb](#)
Unit Weight: [115 pcf](#)
Cohesion: [600 psf](#)
Phi: [0 °](#)
Phi-B: [0 °](#)

Fill 2: EL 0 to -4

Model: [Mohr-Coulomb](#)
Unit Weight: [102 pcf](#)
Cohesion: [600 psf](#)
Phi: [0 °](#)
Phi-B: [0 °](#)

Marsh 1: EL -4 to -8

Model: [Mohr-Coulomb](#)
Unit Weight: [80 pcf](#)
Cohesion: [200 psf](#)
Phi: [0 °](#)
Phi-B: [0 °](#)

Marsh 2: EL -8 to -15

Model: [Mohr-Coulomb](#)
Unit Weight: [94 pcf](#)
Cohesion: [250 psf](#)
Phi: [0 °](#)
Phi-B: [0 °](#)

Spatial Functions

Bay Sound Clay

Model: [Linear Interpolation](#)
Limit Range By: [Data Values](#)
Data Points: X (ft), Y (ft), Cohesion (psf)
 Data Point: [\(0, -44, 750\)](#)
 Data Point: [\(275, -44, 750\)](#)
 Data Point: [\(299, -44, 750\)](#)
 Data Point: [\(323, -44, 750\)](#)
 Data Point: [\(600, -44, 750\)](#)
 Data Point: [\(0, -65, 950\)](#)
 Data Point: [\(275, -65, 950\)](#)
 Data Point: [\(323, -65, 950\)](#)
 Data Point: [\(600, -65, 950\)](#)
 Data Point: [\(299, -65, 950\)](#)

Regions

	Material	Points	Area (ft²)
Region 1	Bay Sound Clay	24,23,28,29	4515
Region 2	Beach Sand	23,31,32,1,27,33,28	6075
Region 3	Beach Sand	31,22,1,32	160
Region 4	Marsh 2: EL -8 to -15	22,4,5,6,16,3,1	368.735
Region 5	Marsh 2: EL -8 to -15	1,3,26,27	1057
Region 6	Marsh 1: EL -4 to -8	16,7,17,2,3	97.3
Region 7	Marsh 1: EL -4 to -8	3,2,42,13,14,18,25,26	550.387
Region 8	Fill 2: EL 0 to -4	17,19,20,2	68.2
Region 9	Fill 2: EL 0 to -4	2,20,21,12,42	76.508
Region 10	Fill 1: EL 3.4 to 0	19,8,9,10,11,36,20	31.045
Region 11	Fill 1: EL 3.4 to 0	20,36,40,37,43,38,39,21	28.194
Region 12	Sheet Pile	36,11,34,35,40	9.7
Region 13	Fill 2: EL 0 to -4	18,44,15,30,25	19.097

Points

	X (ft)	Y (ft)
Point 1	299	-15
Point 2	299	-4
Point 3	299	-8

Point 4	235	-10.6
Point 5	255.2	-10.8
Point 6	265.2	-9.5
Point 7	275.3	-6
Point 8	287.1	1.1
Point 9	294.7	3.1
Point 10	298.2	3.4
Point 11	299	3.4
Point 12	322.5	-3.6
Point 13	335.4	-5.1
Point 14	384.8	-4.6
Point 15	420.5	-3.6
Point 16	269.5	-8
Point 17	278.6	-4
Point 18	406.2	-4
Point 19	285.3	0
Point 20	299	0
Point 21	312.4	0
Point 22	235	-15
Point 23	235	-44
Point 24	235	-65
Point 25	450	-8
Point 26	450	-8
Point 27	450	-15
Point 28	450	-44
Point 29	450	-65
Point 30	450	-3.3
Point 31	235	-17.5
Point 32	299	-17.5
Point 33	450	-21.5
Point 34	299	12.9
Point 35	300	12.9
Point 36	299	3.2
Point 37	302.8	3.2
Point 38	305.3	2.53
Point 39	308.3	1.43

Point 40	300	3.2
Point 41	304.2	-55
Point 42	325.94	-4
Point 43	304.2	2.8248
Point 44	409	-3.92
Point 45	409	-65

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.21	(307.535, -3.527)	22.65606	(278.192, -4.24732)	(335.303, -5.08866)
2	14679	1.26	(307.535, -3.527)	22.945	(278.867, -3.84034)	(336.161, -5.0923)

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	278.39595	4.3097825	768.13219	642.56266	0	200
2	Optimized	279.5738	-4.670323	790.6064	699.13899	0	200
3	Optimized	281.5214	5.2664875	827.77271	795.07421	0	200
4	Optimized	283.8976	6.1287835	881.55239	894.25374	0	200
5	Optimized	286.2	7.0550825	939.33034	1029.0113	0	200
6	Optimized	287.18885	-7.452914	964.17446	1112.9668	0	200
7	Optimized	287.84725	-7.74433	982.38263	1128.787	0	200

8	Optimized	288.93655	-8.23331	1012.9015	1171.9326	0	250
9	Optimized	290.23415	-8.86355	1052.1735	1221.8771	0	250
10	Optimized	291.78985	-9.65741	1101.7563	1311.7673	0	250
11	Optimized	293.63385	10.624235	1162.0549	1410.8776	0	250
12	Optimized	294.90995	-11.30635	1204.6345	1493.1016	0	250
13	Optimized	295.8899	11.828465	1237.2031	1543.3944	0	250
14	Optimized	297.42995	12.648255	1288.3878	1620.888	0	250
15	Optimized	298.5958	-13.26885	1327.1464	1681.513	0	250
16	Optimized	298.9958	-13.48042	1340.3893	1849.4024	0	250
17	Optimized	299.5	13.585625	1339.353	1457.8019	0	250
18	Optimized	301.4	13.982085	1366.0427	1595.0391	0	250
19	Optimized	303.5	-14.42027	1395.515	1614.0231	0	250
20	Optimized	304.57535	14.644655	583.97513	1602.4272	0	250
21	Optimized	305.12535	14.742555	589.85795	1638.5765	0	250
22	Optimized	306.361	14.881065	598.22415	1602.1018	0	250
23	Optimize	307.861	-14.99958	605.45321	1602.218	0	250

	d						
24	Optimized	309.325	-14.99819	605.36556	1542.4871	0	250
25	Optimized	311.375	14.996245	605.268	1460.0481	0	250
26	Optimized	312.8706	-14.99482	605.14827	1401.661	0	250
27	Optimized	314.07545	-14.91234	600.04629	1397.6851	0	250
28	Optimized	315.5439	14.748285	589.87429	1327.5708	0	250
29	Optimized	317.18665	-14.44473	571.02314	1293.1963	0	250
30	Optimized	319.00375	14.001665	543.43438	1181.1304	0	250
31	Optimized	321.20615	-13.25515	496.92381	1088.7777	0	250
32	Optimized	322.8363	-12.59372	455.68754	967.73842	0	250
33	Optimized	324.5563	-11.72093	401.25989	905.55416	0	250
34	Optimized	327.0581	10.389595	318.14471	739.48216	0	250
35	Optimized	329.60385	-8.8973	224.96718	591.89249	0	250
36	Optimized	331.6221	-7.628775	145.76321	408.18287	0	200
37	Optimized	332.98515	-6.715327	88.720718	330.59673	0	200
38	Optimized	334.53005	5.6308815	21.006667	216.6892	0	200

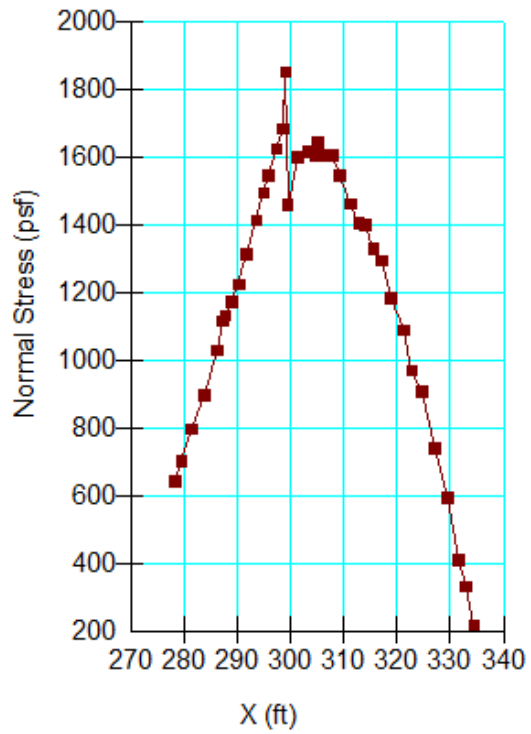
Slices of Slip Surface: 14679

	Slip	X (ft)	Y (ft)	PWP (psf)	Base	Frictional	Cohesiv
--	------	--------	--------	-----------	------	------------	---------

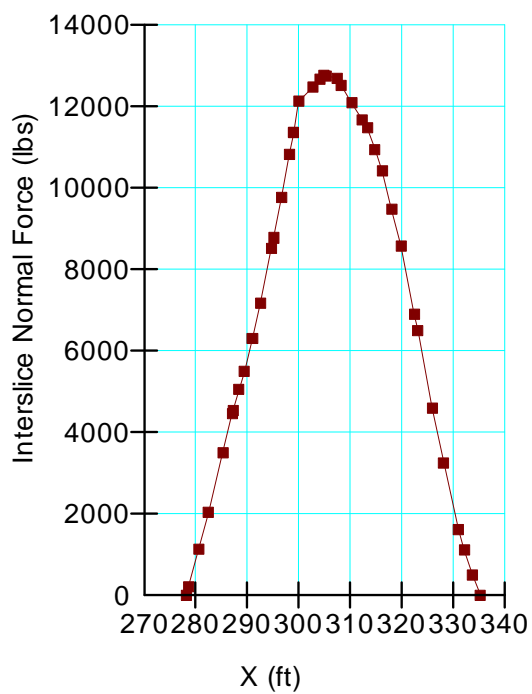
	Surface				Normal Stress (psf)	l Strength (psf)	e Strength (psf)
1	14679	279.01145	3.9201685	743.81094	454.46678	0	600
2	14679	280.17955	-4.567661	784.18679	649.16182	0	200
3	14679	282.2277	-5.702983	854.98736	783.88787	0	200
4	14679	284.2759	-6.838305	925.83064	918.65663	0	200
5	14679	285.83585	-7.702983	979.76566	1024.5713	0	200
6	14679	286.73585	-8.201861	1010.8989	1079.0111	0	250
7	14679	288.05	8.9303155	1056.3563	1188.1017	0	250
8	14679	289.95	9.9835045	1122.0449	1304.6562	0	250
9	14679	291.85	-11.03669	1187.7794	1421.2568	0	250
10	14679	293.75	12.089875	1253.514	1537.8574	0	250
11	14679	295.575	-13.10149	1316.6273	1649.5325	0	250
12	14679	297.325	-14.07153	1377.2009	1740.8927	0	250
13	14679	298.6	14.778275	1421.257	1809.2601	0	250
14	14679	299.5	-15	1435	1683.4	0	250
15	14679	301.4	-15	1435.0357	1784.5357	0	250
16	14679	303.5	-15	1435	1762.9286	0	250
17	14679	304.75	-15	605.48182	1724.4545	0	250
18	14679	306.05	-15	605.48667	1675.8667	0	250
19	14679	307.55	-15	605.48	1612.6	0	250
20	14679	309.325	-15	605.46341	1539.8537	0	250
21	14679	311.375	-15	605.46341	1457.6585	0	250
22	14679	313.5	-15	605.45455	1376.5455	0	250
23	14679	315.7	-15	605.45455	1296.5455	0	250
24	14679	317.9	-15	605.45455	1216.5455	0	250

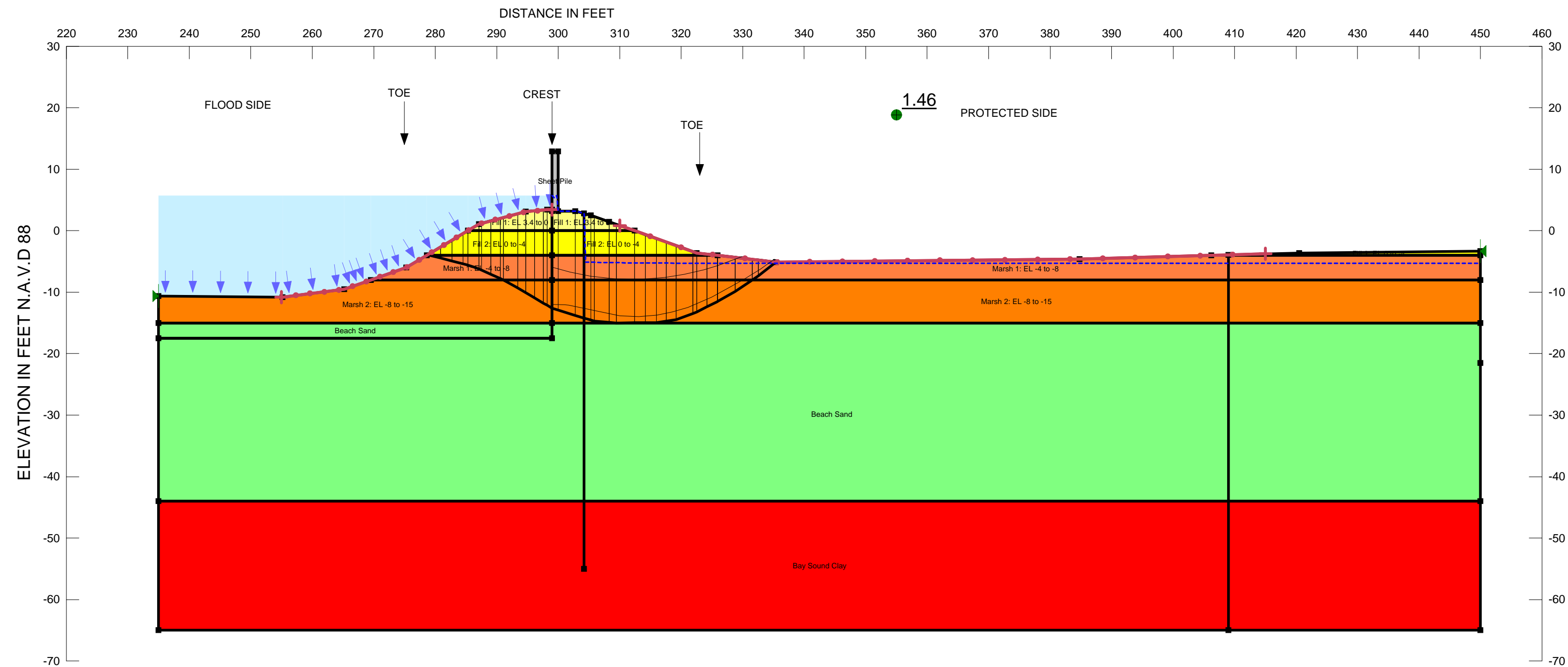
25	14679	319.875	-14.49482	574.05111	1329.8686	0	250
26	14679	321.625	13.484455	511.20241	1155.7727	0	250
27	14679	323.36	-12.48275	448.75219	1006.251	0	250
28	14679	325.08	-11.48971	386.82634	881.33187	0	250
29	14679	326.80405	10.494325	324.6872	758.57234	0	250
30	14679	328.53215	9.4965945	262.40078	637.94846	0	250
31	14679	330.2603	-8.498865	200.09431	517.32459	0	250
32	14679	332.1933	-7.382864	130.3967	360.16372	0	200
33	14679	334.3311	-6.148592	53.314828	229.9088	0	200
34	14679	335.7803	5.3118785	1.0592745	145.82572	0	200

Base Normal Stress Vs. X



Interslice Normal Stress
Vs. X





Name: Fill 1: EL 3.4 to 0 Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion: 600 psf Phi: 0 °
Name: Fill 2: EL 0 to -4 Model: Mohr-Coulomb Unit Weight: 102 pcf Cohesion: 600 psf Phi: 0 °
Name: Marsh 1: EL -4 to -8 Model: Mohr-Coulomb Unit Weight: 80 pcf Cohesion: 200 psf Phi: 0 °
Name: Marsh 2: EL -8 to -15 Model: Mohr-Coulomb Unit Weight: 94 pcf Cohesion: 250 psf Phi: 0 °
Name: Beach Sand Model: Mohr-Coulomb Unit Weight: 122 pcf Cohesion: 0 psf Phi: 30 °
Name: Bay Sound Clay Model: Spatial Mohr-Coulomb Unit Weight: 105 pcf Cohesion Spatial Fn: Bay Sound Clay Phi: 0 °
Name: Sheet Pile Model: Undrained (Phi=0) Unit Weight: 0.1 pcf Cohesion: 0.01 psf



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

GENERAL NOTES

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

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

LONDON AVE CANAL
OUTFALL CANAL REEVALUATION REPORT
REACH 30, STA. 74+13 TO 76+90
PROTECTED SIDE STABILITY ANALYSIS,
1% FLOWLINE WATER EL +5.7
CASE: Global Stability (Entry/Exit)
MARCH 2012

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

Global Stability (Entry/Exit)

Report generated using GeoStudio 2007, version 7.15. Copyright © 1991-2009 GEO-SLOPE International Ltd.

File Information

Title: London Avenue Canal OFC-03 Reach 30 & 31
Comments: Station: 74+13 to 83+73
Created By: B. Lim & K. Hesterberg
Revision Number: 287
Last Edited By: Curran, Matthew MVN
Date: 2/13/2012
Time: 9:01:49 AM
File Name: Reach 30.gsz
Directory: Z:\Ed\F&M\HOME\London Ave Reeevaluation 2011\East Side\Reach 30 1% flowline\
Last Solved Date: 2/13/2012
Last Solved Time: 9:21:28 AM

Project Settings

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

Analysis Settings

Global Stability (Entry/Exit)

Kind: [SLOPE/W](#)
Parent: [Seepage Analysis Gap: Rem](#)
Method: [Spencer](#)
Settings
 PWP Conditions Source: [Parent Analysis](#)
Slip Surface
 Direction of movement: [Left to Right](#)
 Use Passive Mode: [No](#)
 Slip Surface Option: [Entry and Exit](#)
 Critical slip surfaces saved: [1](#)
 Optimize Critical Slip Surface Location: [Yes](#)
 Tension Crack
 Tension Crack Option: [\(none\)](#)
FOS Distribution

FOS Calculation Option: [Constant](#)
Advanced
 Number of Slices: [30](#)
 Optimization Tolerance: [0.01](#)
 Minimum Slip Surface Depth: [0.1 ft](#)
 Optimization Maximum Iterations: [5000](#)
 Optimization Convergence Tolerance: [1e-007](#)
 Starting Optimization Points: [8](#)
 Ending Optimization Points: [16](#)
 Complete Passes per Insertion: [1](#)
 Driving Side Maximum Convex Angle: [5 °](#)
 Resisting Side Maximum Convex Angle: [1 °](#)

Materials

Fill 1: EL 3.4 to 0
Model: [Mohr-Coulomb](#)
Unit Weight: [115 pcf](#)
Cohesion: [600 psf](#)
Phi: 0 °
Phi-B: 0 °

Fill 2: EL 0 to -4
Model: [Mohr-Coulomb](#)
Unit Weight: [102 pcf](#)
Cohesion: [600 psf](#)
Phi: 0 °
Phi-B: 0 °

Marsh 1: EL -4 to -8
Model: [Mohr-Coulomb](#)
Unit Weight: [80 pcf](#)
Cohesion: [200 psf](#)
Phi: 0 °
Phi-B: 0 °

Marsh 2: EL -8 to -15
Model: [Mohr-Coulomb](#)
Unit Weight: [94 pcf](#)
Cohesion: [250 psf](#)
Phi: 0 °
Phi-B: 0 °

Beach Sand
Model: [Mohr-Coulomb](#)
Unit Weight: [122 pcf](#)

Cohesion: 0 psf
Phi: 30 °
Phi-B: 0 °

Bay Sound Clay

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

Sheet Pile

Model: [Undrained \(Phi=0\)](#)
Unit Weight: [0.1 pcf](#)
Cohesion: [0.01 psf](#)

Slip Surface Entry and Exit

Left Projection: [Range](#)
Left-Zone Left Coordinate: [\(255, -10.79802\) ft](#)
Left-Zone Right Coordinate: [\(298.99, 3.4\) ft](#)
Left-Zone Increment: [20](#)
Right Projection: [Range](#)
Right-Zone Left Coordinate: [\(310, 0.83707\) ft](#)
Right-Zone Right Coordinate: [\(415, -3.75304\) ft](#)
Right-Zone Increment: [20](#)
Radius Increments: [20](#)

Slip Surface Limits

Left Coordinate: [\(235, -10.6\) ft](#)
Right Coordinate: [\(450, -3.3\) ft](#)

Spatial Functions

Bay Sound Clay

Model: [Linear Interpolation](#)
Limit Range By: [Data Values](#)
Data Points: X (ft), Y (ft), Cohesion (psf)
 Data Point: (0, -44, 750)
 Data Point: (275, -44, 750)
 Data Point: (299, -44, 750)
 Data Point: (323, -44, 750)
 Data Point: (600, -44, 750)
 Data Point: (0, -65, 950)

Data Point: (275, -65, 950)
Data Point: (323, -65, 950)
Data Point: (600, -65, 950)
Data Point: (299, -65, 950)

Regions

	Material	Points	Area (ft²)
Region 1	Bay Sound Clay	24,23,28,29	4515
Region 2	Beach Sand	23,31,32,1,27,33,28	6075
Region 3	Beach Sand	31,22,1,32	160
Region 4	Marsh 2: EL -8 to -15	22,4,5,6,16,3,1	368.735
Region 5	Marsh 2: EL -8 to -15	1,3,26,27	1057
Region 6	Marsh 1: EL -4 to -8	16,7,17,2,3	97.3
Region 7	Marsh 1: EL -4 to -8	3,2,42,13,14,18,25,26	550.387
Region 8	Fill 2: EL 0 to -4	17,19,20,2	68.2
Region 9	Fill 2: EL 0 to -4	2,20,21,12,42	76.508
Region 10	Fill 1: EL 3.4 to 0	19,8,9,10,11,36,20	31.045
Region 11	Fill 1: EL 3.4 to 0	20,36,40,37,43,38,39,21	28.194
Region 12	Sheet Pile	36,11,34,35,40	9.7
Region 13	Fill 2: EL 0 to -4	18,44,15,30,25	19.097

Points

	X (ft)	Y (ft)
Point 1	299	-15
Point 2	299	-4
Point 3	299	-8
Point 4	235	-10.6
Point 5	255.2	-10.8
Point 6	265.2	-9.5
Point 7	275.3	-6
Point 8	287.1	1.1
Point 9	294.7	3.1
Point 10	298.2	3.4
Point 11	299	3.4
Point 12	322.5	-3.6

Point 13	335.4	-5.1
Point 14	384.8	-4.6
Point 15	420.5	-3.6
Point 16	269.5	-8
Point 17	278.6	-4
Point 18	406.2	-4
Point 19	285.3	0
Point 20	299	0
Point 21	312.4	0
Point 22	235	-15
Point 23	235	-44
Point 24	235	-65
Point 25	450	-4
Point 26	450	-8
Point 27	450	-15
Point 28	450	-44
Point 29	450	-65
Point 30	450	-3.3
Point 31	235	-17.5
Point 32	299	-17.5
Point 33	450	-21.5
Point 34	299	12.9
Point 35	300	12.9
Point 36	299	3.2
Point 37	302.8	3.2
Point 38	305.3	2.53
Point 39	308.3	1.43
Point 40	300	3.2
Point 41	304.2	-55
Point 42	325.94	-4
Point 43	304.2	2.8248
Point 44	409	-3.92
Point 45	409	-65

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.46	(310.052, -25.806)	22.54161	(278.737, -3.91832)	(335.372, -5.09675)
2	5406	1.62	(310.052, 25.806)	40.107	(281.443, -2.30239)	(335.615, -5.09782)

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	278.9008	-3.9591575	602.73345	497.59383	0	600
2	Optimized	279.97165	4.2258285	619.35672	579.92462	0	200
3	Optimized	281.7853	-4.677485	647.49957	661.41048	0	200
4	Optimized	283.59895	5.1291415	675.69592	742.89634	0	200
5	Optimized	284.9029	-5.491552	698.2955	782.92439	0	200
6	Optimized	286.2	5.9376725	726.14179	856.84941	0	200
7	Optimized	287.308	6.318755	749.91096	931.04151	0	200
8	Optimized	288.2841	6.7302025	775.55236	951.99826	0	200
9	Optimized	289.82025	7.4100075	817.99701	1024.5054	0	200
10	Optimize	290.81755	-7.874955	847.01938	1047.4398	0	200

	d						
11	Optimized	292.23945	-8.65048	895.4	1119.7653	0	250
12	Optimized	294.06605	-9.67803	959.52896	1219.9677	0	250
13	Optimized	295.42565	10.486725	1009.988	1305.6707	0	250
14	Optimized	296.87695	11.349975	1063.8777	1387.4528	0	250
15	Optimized	297.9013	11.958275	1101.8642	1446.1094	0	250
16	Optimized	298.59865	12.370755	1127.6453	1484.9597	0	250
17	Optimized	298.99865	-12.60697	1142.3725	1604.3976	0	250
18	Optimized	299.5	12.759545	1144.1856	1439.0334	0	250
19	Optimized	301.4	-13.33778	1182.0089	1510.115	0	250
20	Optimized	303.5	13.976885	1223.7956	1547.2209	0	250
21	Optimized	304.75	14.357305	566.33557	1544.512	0	250
22	Optimized	305.59865	-14.61558	581.98889	1539.4669	0	250
23	Optimized	307.09865	-14.8056	593.52363	1573.7564	0	250
24	Optimized	308.88555	14.953045	602.55647	1514.1354	0	250
25	Optimized	310.93555	14.98677	604.62981	1468.0794	0	250

			5				
26	Optimized	313.29665	14.963265	603.16308	1374.3888	0	250
27	Optimized	315.08995	-14.94541	602.04787	1307.4202	0	250
28	Optimized	316.784	14.810455	593.66751	1281.8814	0	250
29	Optimized	318.37885	-14.55841	577.99237	1198.582	0	250
30	Optimized	320.5518	13.958485	540.64197	1119.2605	0	250
31	Optimized	322.21365	-13.34388	502.33482	1041.7171	0	250
32	Optimized	323.3447	12.788135	467.68971	964.35468	0	250
33	Optimized	325.0341	11.958045	415.9178	859.96085	0	250
34	Optimized	325.9094	11.525075	388.89809	832.97263	0	250
35	Optimized	327.34545	-10.68445	336.44117	733.30543	0	250
36	Optimized	330.14025	-8.930875	226.96995	549.39667	0	250
37	Optimized	332.0392	-7.658565	147.54382	375.40898	0	200
38	Optimized	333.9604	6.2069385	56.913539	250.60667	0	200

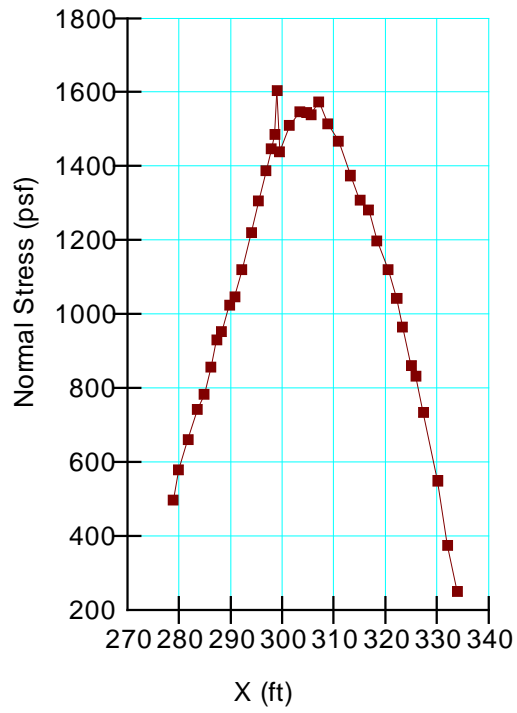
Slices of Slip Surface: 5406

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

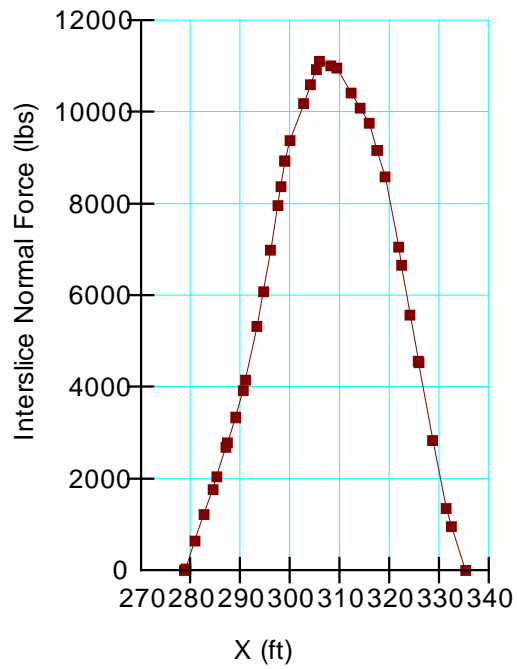
						(psf)	(psf)
1	5406	282.33015	- 3.151193 5	552.28701	237.59992	0	600
2	5406	284.2584	- 4.875647 5	659.84676	631.81117	0	200
3	5406	286.2	- 6.417470 5	756.07681	817.11845	0	200
4	5406	287.78625	-7.541823	826.23595	964.15402	0	200
5	5406	289.5104	-8.619322	893.4315	1077.7273	0	250
6	5406	291.58625	-9.777262	965.70166	1228.9232	0	250
7	5406	293.6621	- 10.78083 5	1028.3489	1366.8675	0	250
8	5406	295.575	- 11.58457 5	1078.4988	1478.4796	0	250
9	5406	297.325	-12.21624	1117.9496	1559.689	0	250
10	5406	298.6	- 12.62830 5	1143.6743	1614.2424	0	250
11	5406	299.5	- 12.88385 5	1152.3129	1466.9221	0	250
12	5406	300.7	-13.1881	1172.2581	1522.5394	0	250
13	5406	302.1	- 13.49760 5	1192.4815	1563.0448	0	250
14	5406	303.5	-13.75516	1209.1017	1577.5825	0	250
15	5406	304.75	-13.94445	541.21589	1567.8419	0	250
16	5406	306.05	- 14.09303 5	550.02	1544.5163	0	250
17	5406	307.55	- 14.21514 5	557.26555	1505.5279	0	250

18	5406	309.325	-14.28062	561.12727	1453.5659	0	250
19	5406	311.375	-14.26537	560.08507	1386.0253	0	250
20	5406	313.24165	- 14.16436 5	553.72079	1318.8368	0	250
21	5406	314.925	-13.99415	543.08531	1253.7274	0	250
22	5406	316.60835	- 13.75160 5	527.94443	1181.2715	0	250
23	5406	318.29165	- 13.43538 5	508.21493	1101.1953	0	250
24	5406	319.975	- 13.04368 5	483.75882	1013.3685	0	250
25	5406	321.65835	-12.57419	454.45938	917.36859	0	250
26	5406	323.36	-12.01708	419.67097	833.62721	0	250
27	5406	325.08	-11.36682	379.08385	761.89768	0	250
28	5406	326.8886	- 10.58022 5	329.95861	678.61182	0	250
29	5406	328.7858	- 9.639958 5	271.2484	581.9589	0	250
30	5406	330.683	- 8.569308 5	204.40289	471.92494	0	250
31	5406	332.5737	- 7.360267 5	128.90966	330.60761	0	200
32	5406	334.4579	-5.997578	43.834571	207.4595	0	200
33	5406	335.50765	-5.186221	-6.8226733	134.98159	0	200

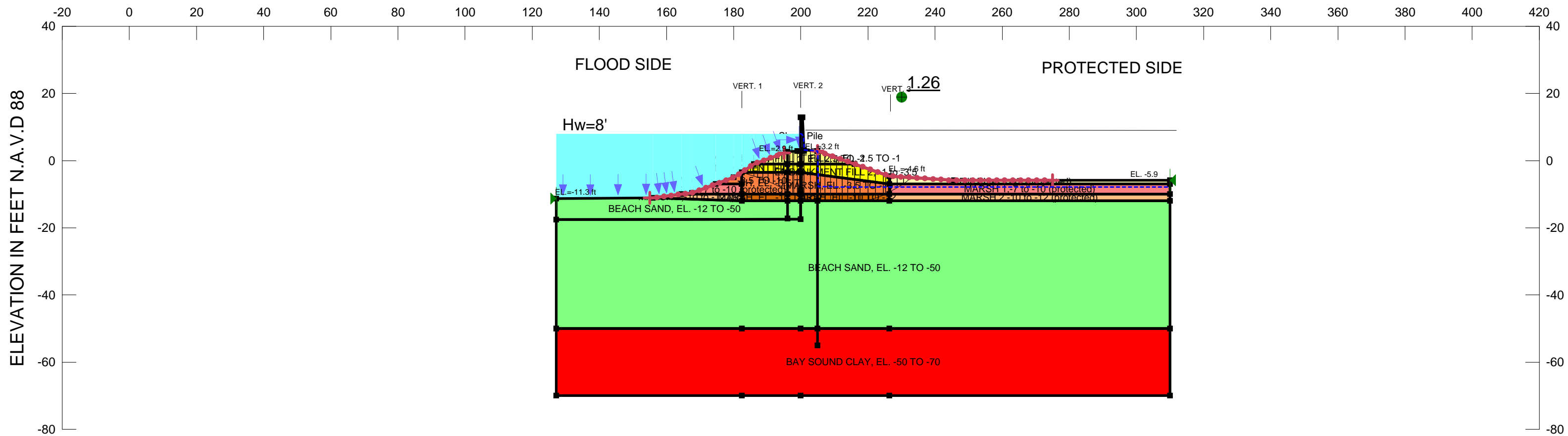
Base Normal Stress Vs. X



Interslice Normal Stress
Vs. X



DISTANCE IN FEET



Name: EMBANKMENT FILL 1, EL. 2.5 TO -1	Model: Spatial Mohr-Coulomb	Unit Weight: 112 pcf	Cohesion: 900 psf	Phi: 0 °
Name: MARSH, EL. -3.5 TO -10	Model: Spatial Mohr-Coulomb	Unit Weight: 92 pcf	Cohesion Fn: Marsh	Phi: 0 °
Name: BEACH SAND, EL. -12 TO -50	Model: Shear/Normal Fn.	Unit Weight: 122 pcf	Strength Function: Beach Sand	
Name: BAY SOUND CLAY, EL. -50 TO -70	Model: Spatial Mohr-Coulomb	Unit Weight: 106 pcf	Cohesion Spatial Fn: Bay Sound	Phi: 0 °
Name: EMBANKMENT FILL 2, -1 to -3.5	Model: Spatial Mohr-Coulomb	Weight Fn: Fill 2	Cohesion Fn: FILL	Phi: 0 °
Name: Fill, EL -4 to -7 (protected)	Model: Undrained (Phi=0)	Unit Weight: 96 pcf	Cohesion: 550 psf	
Name: Sheet Pile	Model: Undrained (Phi=0)	Unit Weight: 0.1 pcf	Cohesion: 0.01 psf	
Name: MARSH 1,-7 to -10 (protected)	Model: Undrained (Phi=0)	Unit Weight: 96 pcf	Cohesion: 215 psf	
Name: MARSH 2,-10 to -12 (protected)	Model: Undrained (Phi=0)	Unit Weight: 96 pcf	Cohesion: 200 psf	
Name: MARSH, EL. -10 TO -12	Model: Spatial Mohr-Coulomb	Unit Weight: 92 pcf	Cohesion Fn: Marsh (2)	Phi: 0 °

GENERAL NOTES

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

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

H_w=CANAL WATER LEVEL



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

LONDON AVE CANAL
OUTFALL CANAL REEVALUATION REPORT
REACH 31, STA. 76+90 TO 83+73
PROTECTED SIDE STABILITY ANALYSIS,
CASE: Global Stability (Entry/Exit)
S. MARCH 2012

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

Name: Global Stability (Entry/Exit)
File Name: Reach 31.gsz Directory: G:\F&MHOME\Middleton\London Ave Canal\Reach 31\optimization check\
Last Edited By: Middleton, Mark C MVN

Global Stability (Entry/Exit)

Report generated using GeoStudio 2007, version 7.15. Copyright © 1991-2009 GEO-SLOPE International Ltd.

File Information

Created By: Liljegren, James
Revision Number: 291
Last Edited By: Middleton, Mark C MVN
Date: 1/12/2012
Time: 5:35:11 PM
File Name: Reach 31.gsz
Directory: G:\F&M\HOME\Middleton\London Ave Canal\Reach 31\optimization check\
Last Solved Date: 1/12/2012
Last Solved Time: 5:39:16 PM

Project Settings

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

Analysis Settings

Global Stability (Entry/Exit)

Kind: SLOPE/W
Parent: Global Analysis (Seepage)
Method: Spencer
Settings
PWP Conditions Source: Parent Analysis
SlipSurface
Direction of movement: Left to Right
Use Passive Mode: No
Slip Surface Option: Entry and Exit
Critical slip surfaces saved: 1
Optimize Critical Slip Surface Location: Yes
Tension Crack
Tension Crack Option: (none)
FOS Distribution
FOS Calculation Option: Constant
Advanced
Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft

3/14/2012

Sheet Pile

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

MARSH 1,-7 to -10 (protected)

Model: Undrained (Phi=0)
Unit Weight: 96 pcf
Cohesion: 215 psf

MARSH 2,-10 to -12 (protected)

Model: Undrained (Phi=0)
Unit Weight: 96 pcf
Cohesion: 200 psf

MARSH, EL. -10 TO -12

Model: Spatial Mohr-Coulomb
Unit Weight: 92 pcf
Cohesion Fn: Marsh (2)
Phi: 0 °
Phi-B: 0 °

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (155, -11.10627) ft
Left-Zone Right Coordinate: (195, 2.24) ft
Left-Zone Increment: 20
Right Projection: Range
Right-Zone Left Coordinate: (204.98786, 2.80607) ft
Right-Zone Right Coordinate: (275, -5.9) ft
Right-Zone Increment: 30
Radius Increments: 20

Slip Surface Limits

Left Coordinate: (127.2, -11.3) ft
Right Coordinate: (310, -5.9) ft

Cohesion Functions

Marsh

Model: Spline Data Point Function
Function: Cohesion vs. X
Curve Fit to Data: 100 %
Segment Curvature: 6 %
Y-Intercept: 215

3/14/2012

Optimization Maximum Iterations: 2000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

EMBANKMENT FILL 1, EL. 2.5 TO -1

Model: Spatial Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion: 900 psf
Phi: 0 °
Phi-B: 0 °

MARSH, EL. -3.5 TO -10

Model: Spatial Mohr-Coulomb
Unit Weight: 92 pcf
Cohesion Fn: Marsh
Phi: 0 °
Phi-B: 0 °

BEACH SAND, EL. -12 TO -50

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

BAY SOUND CLAY, EL. -50 TO -70

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

EMBANKMENT FILL 2, -1 to -3.5

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

Fill, EL -4 to -7 (protected)

Model: Undrained (Phi=0)
Unit Weight: 96 pcf
Cohesion: 550 psf

3/14/2012

Data Points: X (ft), Cohesion (psf)
Data Point: (182.4, 215)
Data Point: (200, 225)
Data Point: (226.4, 215)

FILL

Model: Spline Data Point Function
Function: Cohesion vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 550
Data Points: X (ft), Cohesion (psf)
Data Point: (182.4, 550)
Data Point: (200, 600)
Data Point: (226.4, 550)

Marsh (2)

Model: Spline Data Point Function
Function: Cohesion vs. X
Curve Fit to Data: 100 %
Segment Curvature: 6 %
Y-Intercept: 200
Data Points: X (ft), Cohesion (psf)
Data Point: (182.4, 200)
Data Point: (200, 225)
Data Point: (226.4, 200)

Shear/Normal Strength Functions

Beach Sand

Model: Spline Data Point Function
Function: Shear Stress vs. Normal Stress
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
Data Point: (-100000, 0)
Data Point: (0, 0)
Data Point: (100000, 57735)
Estimation Properties
Intact Rock Param.: 10
Geological Strength: 100
Disturbance Factor: 0
SigmaC: 600000 psf
Sigma3: 300000 psf
Num. Points: 20

Unit Weight Functions

3/14/2012

Fill 2

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 96
Data Points: X (ft), Unit Weight (pcf)
Data Point: (182.4, 96)
Data Point: (200, 103)
Data Point: (226.4, 96)

Spatial Functions

Bay Sound

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (127.2, -50, 700)
Data Point: (127.2, -70, 900)
Data Point: (200, -50, 1050)
Data Point: (200, -70, 1050)
Data Point: (226.4, -50, 700)
Data Point: (226.4, -70, 900)
Data Point: (310, -50, 700)
Data Point: (310, -70, 900)
Data Point: (182.4, -50, 700)
Data Point: (182.4, -70, 900)

Regions

	Material	Points	Area (ft²)
Region 1	BAY SOUND CLAY, EL. -50 TO -70	5,3,46,9,49,4,6,50,48,47	3656
Region 2	MARSH 1,-7 to -10 (protected)	8,7,45,39	250.8
Region 3	Fill, EL -4 to -7 (protected)	1,11,12,7,8	104.505
Region 4	BEACH SAND, EL. -12 TO -50	3,13,14,15,54,10,2,4,49,9,46	6549.64
Region 5	BEACH SAND, EL. -12 TO -50	13,16,17,44,27,15,14	431.645
Region 6	MARSH, EL. -3.5 TO -10	20,26,21,37,51,52,41,40	114.725
Region 7	MARSH, EL. -3.5 TO -10	51,37,21,8,39	125.4
Region 8	Sheet Pile	23,34,29,30,25,24	7.675
Region 9	EMBANKMENT FILL 1, EL. 2.5 TO -1	23,24,25,31,53,32,33	40.86
Region 10	EMBANKMENT FILL 1, EL. 2.5 TO -1	23,34,38,22,35,36,33	33.15
Region 11	EMBANKMENT FILL 2, -1 to -3.5	20,35,36,33,21,26	39.5
Region 12	EMBANKMENT FILL 2, -1 to -3.5	21,33,32,1,8	93.48
Region 13	MARSH, EL. -3.5 TO -10	20,19,42,40	11.8163
Region 14	MARSH 1,-7 to -10 (protected)	40,42,18,43,41	35.76269

3/14/2012

Region 15	MARSH 2,-10 to -12 (protected)	41,43,17,44	36.356
Region 16	MARSH 2,-10 to -12 (protected)	2,10,39,45	167.2
Region 17	MARSH, EL. -10 TO -12	15,51,39,10,54	52.8
Region 18	MARSH, EL. -10 TO -12	44,41,52,51,15,27	35.2

Points

	X (ft)	Y (ft)
Point 1	226.4	-4.6
Point 2	310	-12
Point 3	127.2	-50
Point 4	310	-50
Point 5	127.2	-70
Point 6	310	-70
Point 7	310	-7
Point 8	226.4	-7
Point 9	200	-50
Point 10	226.4	-12
Point 11	245.7	-5.9
Point 12	310	-5.9
Point 13	127.2	-17.5
Point 14	200	-17.4
Point 15	200	-12
Point 16	127.2	-11.3
Point 17	155.9	-11.1
Point 18	167.6	-9.6
Point 19	180	-5
Point 20	182.4	-3.5
Point 21	200	-3.5
Point 22	196	2.6
Point 23	200	2.8
Point 24	201	2.8
Point 25	201	3.2
Point 26	196	-3.5
Point 27	196	-12
Point 28	196	-17.2
Point 29	200	12.9
Point 30	200.5	12.9
Point 31	204.8	2.9
Point 32	216	-1
Point 33	200	-1
Point 34	200	2.9
Point 35	186	-1
Point 36	196	-1

3/14/2012

Point 37	200	-8.8
Point 38	199	2.9
Point 39	226.4	-10
Point 40	182.3	-7
Point 41	182.4	-10
Point 42	174.6087	-7
Point 43	164.48	-10
Point 44	182.4	-12
Point 45	310	-10
Point 46	182.4	-50
Point 47	182.4	-70
Point 48	200	-70
Point 49	226.4	-50
Point 50	226.4	-70
Point 51	200	-10
Point 52	196	-10
Point 53	205	2.8
Point 54	205	-12
Point 55	205	-50
Point 56	205	-55

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.26	(210.684, 33.982)	19.917	(182.425, -3.48269)	(232.972, -5.0427)
2	9394	1.37	(210.684, 33.982)	45.876	(183.335, -2.8507)	(234.621, -5.15377)

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	183.33275	-3.7619255	733.93549	633.38917	0	215.89
2	Optimized	185.1203	-4.3117405	768.22156	731.06269	0	217.56
3	Optimized	186.55755	-4.7538105	795.79303	833.55977	0	218.86
4	Optimized	187.90135	-5.2419135	826.22153	873.76791	0	220.02
5	Optimized	189.4738	-5.87514	865.7452	958.12438	0	221.29
6	Optimized	191.04625	-6.5083665	905.26886	1042.4219	0	222.42
7	Optimized	192.62465	-7.2184975	949.56047	1102.5823	0	223.4
8	Optimized	194.20895	-	998.68346	1199.1324	0	224.19

3/14/2012

9	Optimized	195.50055	-8.670309	1040.2123	1263.668	0	224.68
10	Optimized	196.81005	-9.381524	1084.561	1350.2907	0	225
11	Optimized	197.78335	-9.91074	1117.5939	1399.2427	0	225.13
12	Optimized	198.4733	-10.28793	1141.1041	1434.9806	0	225.38
13	Optimized	199.4998	-10.849085	1176.1701	1490.5996	0	225.21
14	Optimized	199.9998	-11.12234	1193.2325	1681.9047	0	225
15	Optimized	200.25	-11.15618	1192.5613	1113.8777	0	224.88
16	Optimized	200.75	-11.223805	1194.4045	1369.5299	0	224.62
17	Optimized	201.95	-11.38611	1205.4973	1420.0699	0	223.95
18	Optimized	203.85	-11.643095	1223.1784	1427.8934	0	222.74
19	Optimized	204.9	-11.785115	1232.775	1427.4523	0	222.01
20	Optimized	205.412	-11.854365	247.35933	1412.7431	0	221.64
21	Optimized	206.52545	-11.953675	253.31431	1408.3214	0	220.78
22	Optimized	208.0738	-11.996845	255.91281	1377.4516	0	219.52
23	Optimized	209.7676	-11.996015	255.85967	1311.9768	0	218.04
24	Optimized	211.4614	-11.99518	255.80064	1246.2067	0	216.46
25	Optimized	213.1552	-11.994345	255.7475	1180.3186	0	214.8
26	Optimized	215.00105	-11.994595	255.75343	1107.8911	0	212.91
27	Optimized	216.85885	-11.99583	255.826	1039.2204	0	210.93
28	Optimized	218.8808	-11.870145	248.01325	993.12997	0	208.7
29	Optimized	221.14525	-11.48961	224.33068	916.73317	0	206.13
30	Optimized	223.4062	-10.79918	181.26549	814.27007	0	203.51
31	Optimized	224.90115	-10.181515	142.71733	748.40053	0	201.76
32	Optimized	225.81825	-9.685102	111.73602	673.10694	0	215.27
33	Optimized	226.62725	-9.247207	84.398	615.90763	0	215
34	Optimized	227.76035	-8.5931575	43.567033	551.9148	0	215
35	Optimized	229.61315	-7.5069975	24.246187	423.84706	0	215
36	Optimized	231.7662	5.9972925	118.48128	585.2063	0	550

Slices of Slip Surface: 9394

--	--	--	--	--	--	--	--

3/14/2012

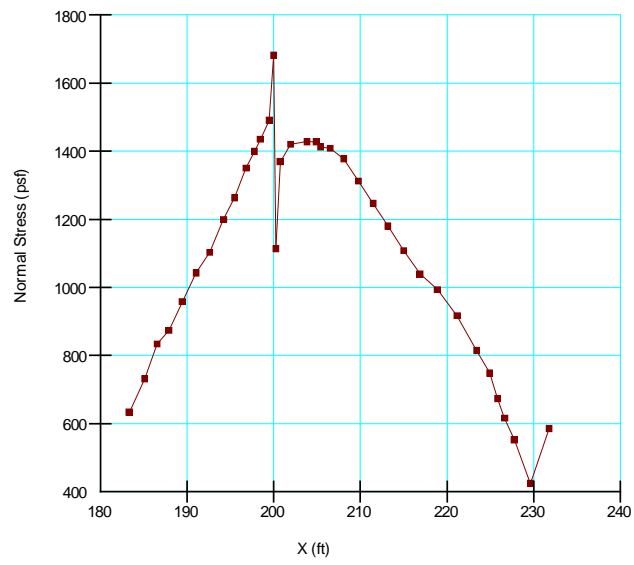
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	9394	183.78345	-3.1753485	697.32723	373.82072	0	553.93
2	9394	185.11595	-4.0936505	754.633	623.68032	0	217.56
3	9394	186.83335	-5.19463	823.32598	796.8299	0	219.11
4	9394	188.5	-6.1624595	883.67262	924.05678	0	220.52
5	9394	190.16665	-7.0397555	938.44664	1044.6444	0	221.8
6	9394	191.83335	-7.832231	987.85583	1158.8982	0	222.93
7	9394	193.5	-8.544639	1032.3283	1267.1431	0	223.86
8	9394	195.16665	-9.180953	1072.0474	1369.5467	0	224.57
9	9394	196.81905	-9.7402695	1106.9595	1467.7412	0	225
10	9394	198.31905	-10.19061	1135.0885	1530.2093	0	225.38
11	9394	199.5	-10.506915	1154.7705	1578.5839	0	225.21
12	9394	200.25	-10.691	1162.0259	1039.2308	0	224.88
13	9394	200.75	-10.80484	1165.5728	1300.201	0	224.62
14	9394	201.95	-11.044565	1181.9177	1367.2527	0	223.95
15	9394	203.85	-11.371985	1204.4562	1397.3836	0	222.74
16	9394	204.9	-11.52784	1214.7287	1407.0814	0	222.01
17	9394	205.91665	-11.636345	234.24077	1385.4372	0	221.26
18	9394	207.75	-11.790895	243.45489	1345.0032	0	219.79
19	9394	209.58335	-11.871655	248.25218	1296.8267	0	218.2
20	9394	211.41665	-11.879015	248.67376	1240.86	0	216.51
21	9394	213.25	-11.813005	244.59089	1177.0447	0	214.71
22	9394	215.08335	-11.67331	235.89103	1105.3167	0	212.82
23	9394	216.773	-11.48145	223.9705	1035.801	0	211.02
24	9394	218.31895	-11.24744	209.3407	970.13255	0	209.32
25	9394	219.8649	-10.95905	191.37009	898.86145	0	207.59
26	9394	221.41085	-10.615215	169.89446	821.92591	0	205.82
27	9394	222.9568	-10.214645	144.86557	739.00575	0	204.03
28	9394	224.39735	-9.7908655	118.37635	661.24793	0	215.94

3/14/2012

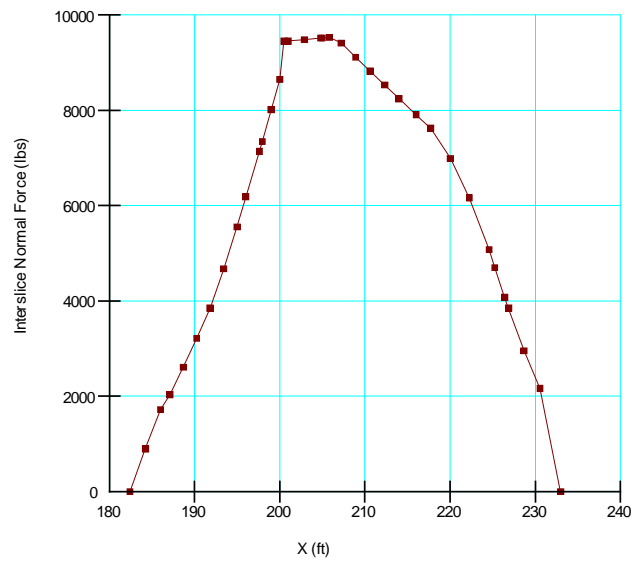
29	9394	225.73245	-9.3498995	90.835056	580.21086	0	215.31
30	9394	227.21695	-8.802387	56.635044	515.14015	0	215
31	9394	228.8508	-8.1343255	14.910854	446.48261	0	215
32	9394	230.48465	-7.3909725	-31.50387	369.50136	0	215
33	9394	232.13155	-6.5609445	-83.317491	466.4363	0	550
34	9394	233.79145	-5.6378315	-140.93383	385.43181	0	550

3/14/2012

Base Normal Stress Vs. X



Interslice Normal Stress Vs. X



Global Stability (Block)

Report generated using GeoStudio 2007, version 7.15. Copyright © 1991-2009 GEO-SLOPE International Ltd.

File Information

Created By: [Liljegren, James](#)
Revision Number: 306
Last Edited By: [Middleton, Mark C MVN](#)
Date: 2/15/2012
Time: 7:55:37 AM
File Name: [Reach 31.gsz](#)
Directory: [G:\F&M\HOME\Middleton\London Ave Canal\Reach 31\water level 5.7\optimization check\](#)
Last Solved Date: 2/15/2012
Last Solved Time: 8:00:18 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 \(See page\)](#)
Method: [Spencer](#)
Settings
 PWP Conditions Source: [Parent Analysis](#)
SlipSurface
 Direction of movement: [Left to Right](#)
 Use Passive Mode: [No](#)
 Slip Surface Option: [Block](#)
 Critical slip surfaces saved: [1](#)
 Optimize Critical Slip Surface Location: [Yes](#)
 Tension Crack
 Tension Crack Option: [\(none\)](#)
FOS Distribution
 FOS Calculation Option: [Constant](#)
Restrict Block Crossing: [Yes](#)
Advanced
 Number of Slices: [30](#)
 Optimization Tolerance: [0.01](#)

3/19/2012

Sheet Pile

Model: [Undrained \(Phi=0\)](#)
Unit Weight: [0.1 pcf](#)
Cohesion: [0.01 psf](#)

MARSH 1,-7 to -10 (protected)

Model: [Undrained \(Phi=0\)](#)
Unit Weight: [96 pcf](#)
Cohesion: [215 psf](#)

MARSH 2,-10 to -12 (protected)

Model: [Undrained \(Phi=0\)](#)
Unit Weight: [96 pcf](#)
Cohesion: [200 psf](#)

MARSH, EL. -10 TO -12

Model: [Spatial Mohr-Coulomb](#)
Unit Weight: [92 pcf](#)
Cohesion Fn: [Marsh \(2\)](#)
Phi: [0 °](#)
Phi-B: [0 °](#)

Slip Surface Limits

Left Coordinate: [\(127.2, -11.3\) ft](#)
Right Coordinate: [\(310, -5.9\) ft](#)

Slip Surface Block

Left Grid
 Upper Left: [\(184, -5\) ft](#)
 Lower Left: [\(184, -55\) ft](#)
 Lower Right: [\(209, -55\) ft](#)
 X Increments: [5](#)
 Y Increments: [15](#)
 Starting Angle: [125 °](#)
 Ending Angle: [145 °](#)
 Angle Increments: [4](#)
Right Grid
 Upper Left: [\(220, -5\) ft](#)
 Lower Left: [\(220, -55\) ft](#)
 Lower Right: [\(270, -55\) ft](#)
 X Increments: [10](#)
 Y Increments: [15](#)
 Starting Angle: [25 °](#)
 Ending Angle: [45 °](#)
 Angle Increments: [4](#)

3/19/2012

Minimum Slip Surface Depth: [0.1 ft](#)
Optimization Maximum Iterations: [2000](#)
Optimization Convergence Tolerance: [1e-007](#)
Starting Optimization Points: [8](#)
Ending Optimization Points: [16](#)
Complete Passes per Insertion: [1](#)
Driving Side Maximum Convex Angle: [5 °](#)
Resisting Side Maximum Convex Angle: [1 °](#)

Materials

EMBANKMENT FILL 1, EL. 2.5 TO -1

Model: [Spatial Mohr-Coulomb](#)
Unit Weight: [112 pcf](#)
Cohesion: [900 psf](#)
Phi: [0 °](#)
Phi-B: [0 °](#)

MARSH, EL. -3.5 TO -10

Model: [Spatial Mohr-Coulomb](#)
Unit Weight: [92 pcf](#)
Cohesion Fn: [Marsh](#)
Phi: [0 °](#)
Phi-B: [0 °](#)

BEACH SAND, EL. -12 TO -50

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

BAY SOUND CLAY, EL. -50 TO -70

Model: [Spatial Mohr-Coulomb](#)
Unit Weight: [106 pcf](#)
Cohesion Spatial Fn: [Bay Sound](#)
Phi: [0 °](#)
Phi-B: [0 °](#)

EMBANKMENT FILL 2, -1 to -3.5

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

Fill, EL -4 to -7 (protected)

Model: [Undrained \(Phi=0\)](#)
Unit Weight: [96 pcf](#)
Cohesion: [550 psf](#)

3/19/2012

Cohesion Functions

Marsh

Model: [Spline Data Point Function](#)
Function: [Cohesion vs. X](#)
 Curve Fit to Data: [100 %](#)
 Segment Curvature: [6 %](#)
Y-Intercept: [215](#)
Data Points: [X \(ft\), Cohesion \(psf\)](#)
 Data Point: [\(182.4, 215\)](#)
 Data Point: [\(200, 225\)](#)
 Data Point: [\(226.4, 215\)](#)

FILL

Model: [Spline Data Point Function](#)
Function: [Cohesion vs. X](#)
 Curve Fit to Data: [100 %](#)
 Segment Curvature: [0 %](#)
Y-Intercept: [550](#)
Data Points: [X \(ft\), Cohesion \(psf\)](#)
 Data Point: [\(182.4, 550\)](#)
 Data Point: [\(200, 600\)](#)
 Data Point: [\(226.4, 550\)](#)

Marsh (2)

Model: [Spline Data Point Function](#)
Function: [Cohesion vs. X](#)
 Curve Fit to Data: [100 %](#)
 Segment Curvature: [6 %](#)
Y-Intercept: [200](#)
Data Points: [X \(ft\), Cohesion \(psf\)](#)
 Data Point: [\(182.4, 200\)](#)
 Data Point: [\(200, 225\)](#)
 Data Point: [\(226.4, 200\)](#)

Shear/Normal Strength Functions

Beach Sand

Model: [Spline Data Point Function](#)
Function: [Shear Stress vs. Normal Stress](#)
 Curve Fit to Data: [100 %](#)
 Segment Curvature: [0 %](#)
Y-Intercept: [0](#)
Data Points: [Normal Stress \(psf\), Shear Stress \(psf\)](#)
 Data Point: [\(-100000, 0\)](#)
 Data Point: [\(0, 0\)](#)
 Data Point: [\(100000, 57735\)](#)

3/19/2012

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

Unit Weight Functions

Fill 2

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 96
Data Points: X (ft), Unit Weight (pcf)
Data Point: (182.4, 96)
Data Point: (200, 103)
Data Point: (226.4, 96)

Spatial Functions

Bay Sound

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (127.2, -50, 700)
Data Point: (127.2, -70, 900)
Data Point: (200, -50, 1050)
Data Point: (200, -70, 1050)
Data Point: (226.4, -50, 700)
Data Point: (226.4, -70, 900)
Data Point: (310, -50, 700)
Data Point: (310, -70, 900)
Data Point: (182.4, -50, 700)
Data Point: (182.4, -70, 900)

Regions

	Material	Points	Area (ft²)
Region 1	BAY SOUND CLAY, EL. -50 TO -70	5,3,46,9,49,4,6,50,48,47	3656
Region 2	MARSH 1,-7 to -10 (protected)	8,7,45,39	250.8
Region 3	Fill, EL -4 to -7 (protected)	1,11,12,7,8	104.505
Region 4	BEACH SAND, EL. -12 TO -50	3,13,14,15,54,10,2,4,49,9,46	6549.64
Region 5	BEACH SAND, EL. -12 TO -50	13,16,17,44,27,15,14	431.645

Region 6	MARSH, EL. -3.5 TO -10	20,26,21,37,51,52,41,40	114.725
Region 7	MARSH, EL. -3.5 TO -10	51,37,21,8,39	125.4
Region 8	Sheet Pile	23,34,29,30,25,24	7.675
Region 9	EMBANKMENT FILL 1, EL. 2.5 TO -1	23,24,25,31,53,32,33	40.86
Region 10	EMBANKMENT FILL 1, EL. 2.5 TO -1	23,34,38,22,35,36,33	33.15
Region 11	EMBANKMENT FILL 2, -1 to -3.5	20,35,36,33,21,26	39.5
Region 12	EMBANKMENT FILL 2, -1 to -3.5	21,33,32,1,8	93.48
Region 13	MARSH, EL. -3.5 TO -10	20,19,42,40	11.8163
Region 14	MARSH 1,-7 to -10 (protected)	40,42,18,43,41	35.76269
Region 15	MARSH 2,-10 to -12 (protected)	41,43,17,44	36.356
Region 16	MARSH 2,-10 to -12 (protected)	2,10,39,45	167.2
Region 17	MARSH, EL. -10 TO -12	15,51,39,10,54	52.8
Region 18	MARSH, EL. -10 TO -12	44,41,52,51,15,27	35.2

Points

	X (ft)	Y (ft)
Point 1	226.4	-4.6
Point 2	310	-12
Point 3	127.2	-50
Point 4	310	-50
Point 5	127.2	-70
Point 6	310	-70
Point 7	310	-7
Point 8	226.4	-7
Point 9	200	-50
Point 10	226.4	-12
Point 11	245.7	-5.9
Point 12	310	-5.9
Point 13	127.2	-17.5
Point 14	200	-17.4
Point 15	200	-12
Point 16	127.2	-11.3
Point 17	155.9	-11.1
Point 18	167.6	-9.6
Point 19	180	-5
Point 20	182.4	-3.5
Point 21	200	-3.5
Point 22	196	2.6
Point 23	200	2.8
Point 24	201	2.8
Point 25	201	3.2
Point 26	196	-3.5
Point 27	196	-12

3/19/2012

3/19/2012

Point 28	196	-17.2
Point 29	200	12.9
Point 30	200.5	12.9
Point 31	204.8	2.9
Point 32	216	-1
Point 33	200	-1
Point 34	200	2.9
Point 35	186	-1
Point 36	196	-1
Point 37	200	-8.8
Point 38	199	2.9
Point 39	226.4	-10
Point 40	182.3	-7
Point 41	182.4	-10
Point 42	174.6087	-7
Point 43	164.48	-10
Point 44	182.4	-12
Point 45	310	-10
Point 46	182.4	-50
Point 47	182.4	-70
Point 48	200	-70
Point 49	226.4	-50
Point 50	226.4	-70
Point 51	200	-10
Point 52	196	-10
Point 53	205	2.8
Point 54	205	-12
Point 55	205	-50
Point 56	205	-55

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.55	(209.775, -0.94)	20.40586	(182.472, -3.45012)	(234.366, -5.13654)
2	4353	1.76	(209.775, -0.94)	20.183	(184.879, -1.77875)	(234.33, -5.13411)

Slices of Slip Surface: Optimized

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	182.5757	-3.4750625	572.53998	472.81114	0	550.5
2	Optimized	183.5097	-3.6992585	586.51885	543.32942	0	216.05

3	Optimized	185.1699	-4.097776	611.35248	624.00358	0	217.61
4	Optimized	186.4427	-4.4033025	630.41328	698.86556	0	218.76
5	Optimized	187.74595	-4.79689	654.94771	738.27663	0	219.89
6	Optimized	189.46705	-5.37153	690.82544	821.77089	0	221.28
7	Optimized	191.0123	-5.940305	726.31784	883.07661	0	222.4
8	Optimized	192.38175	-6.503215	761.43829	958.18033	0	223.26
9	Optimized	193.79985	-7.1553835	802.13107	1018.3164	0	224.01
10	Optimized	195.2666	-7.89681	848.37392	1109.9503	0	224.6
11	Optimized	196.4211	-8.4803915	884.81959	1182.239	0	224.92
12	Optimized	197.9211	-9.276248	934.50094	1250.2416	0	225.14
13	Optimized	199.13025	-9.929618	975.28225	1314.9323	0	225.12
14	Optimized	199.61895	-10.19369	991.75452	1338.2685	0	225.16
15	Optimized	199.9887	-10.390165	1004.0346	1442.4516	0	225.01
16	Optimized	200.25	-10.45454	1004.6603	1212.8357	0	224.88
17	Optimized	200.75	-10.57772	1009.4763	1279.6577	0	224.62
18	Optimized	201.95	-10.873355	1029.0723	1341.8261	0	223.95
19	Optimized	203.85	-11.341445	1060.2966	1368.5532	0	222.74
20	Optimized	204.9	-11.60013	1077.24	1378.6283	0	222.01
21	Optimized	205.11995	-11.654315	573.93397	1373.6283	0	221.85
22	Optimized	205.92625	-11.7919	243.49576	1382.3472	0	221.25
23	Optimized	207.29115	-11.94872	252.96156	1370.4963	0	220.17
24	Optimized	208.7727	-11.99764	255.92284	1339.6676	0	218.92
25	Optimized	210.37875	-11.997915	255.9353	1277.5906	0	217.48
26	Optimized	211.98485	-11.99819	255.94775	1215.3891	0	215.96
27	Optimized	213.5909	-11.99847	255.9602	1153.0008	0	214.36
28	Optimized	215.19695	-11.99875	255.97888	1090.4257	0	212.7
29	Optimized	216.7147	-11.99901	255.98869	1034.379	0	211.08
30	Optimized	218.14405	-11.999255	256.00269	985.19617	0	209.52
31	Optimized	219.7679	-11.999647	255.82676	930.11413	0	207.7
32	Optimized	221.703	-11.845425	246.41978	883.54367	0	205.49
33	Optimized	223.87525	-11.344195	215.17192	798.98488	0	202.96
34	Optimized	225.7108	-10.65823	172.37561	707.54548	0	200.81
35	Optimized	226.73685	-10.16268	141.45841	645.63205	0	200
36	Optimized	227.30055	-9.89043	124.46042	620.17861	0	215

3/19/2012

3/19/2012

37	Optimized	228.5908	- 9.1444275	77.893931	560.39089	0	215
38	Optimized	230.71765	- 7.8715625	1.5542072	414.14057	0	215
39	Optimized	231.92585	- 7.117565	48.616153	369.59429	0	215
40	Optimized	233.21805	- 6.0682675	114.10119	470.07119	0	550

Slices of Slip Surface: 4353

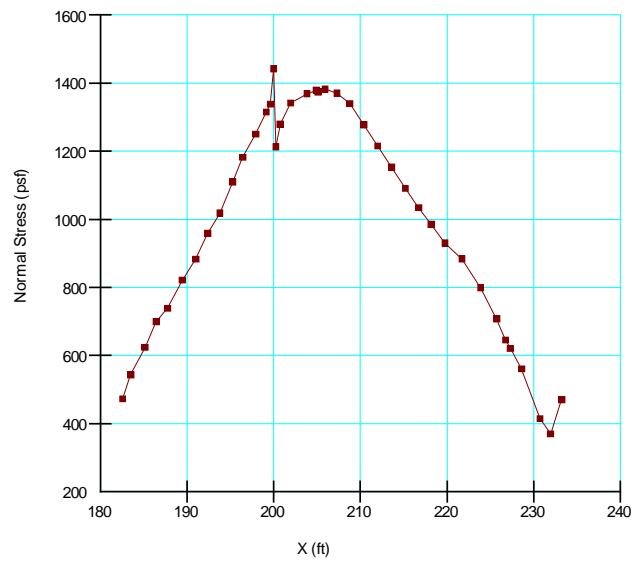
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	4353	185.4393	-2.171361	491.16059	276.83344	0	558.63
2	4353	186.6684	- 3.0319845	544.84868	394.57792	0	562.13
3	4353	188.2031	- 4.1066045	611.91444	622.93013	0	220.27
4	4353	189.93575	- 5.3198135	687.60593	757.8605	0	221.63
5	4353	191.6684	-6.533022	763.29743	892.88543	0	222.83
6	4353	193.40105	- 7.7462305	838.98892	1028.0049	0	223.81
7	4353	195.1337	- 8.9594395	914.72769	1163.1244	0	224.55
8	4353	196.3099	-9.783022	966.09859	1256.1277	0	224.9
9	4353	197.8099	- 10.833335	1031.6459	1354.1106	0	225.33
10	4353	199.5	-11.66667	1083.7	1634	0	225.21
11	4353	200.25	-11.66667	1082.9	1395.96	0	224.88
12	4353	200.75	-11.66667	1082.12	1449.66	0	224.62
13	4353	201.95	-11.66667	1082.1053	1486.3158	0	223.95
14	4353	203.85	-11.66667	1082.0526	1470.5789	0	222.74
15	4353	204.9	-11.66667	1081.75	1457.05	0	222.01
16	4353	205.7857	-11.66667	235.94448	1421.3814	0	221.36
17	4353	207.35715	-11.66667	235.85539	1360.9905	0	220.12
18	4353	208.9286	-11.66667	235.75994	1300.4724	0	218.78
19	4353	210.5	-11.66667	235.60721	1239.7633	0	217.37
20	4353	212.0714	-11.66667	235.5563	1178.8633	0	215.87
21	4353	213.64285	-11.66667	235.46721	1117.8361	0	214.31
22	4353	215.2143	-11.66667	235.42266	1056.5543	0	212.69
23	4353	216.9	-11.66667	235.38889	994.77778	0	210.88
24	4353	218.7	-11.66667	235.33333	932.88889	0	208.9
25	4353	220.5	-11.66667	235.31111	871.38889	0	206.87
26	4353	222.3	-11.66667	235.27778	810.22222	0	204.8
27	4353	224.1	-11.66667	235.26667	749.44444	0	202.7

3/19/2012

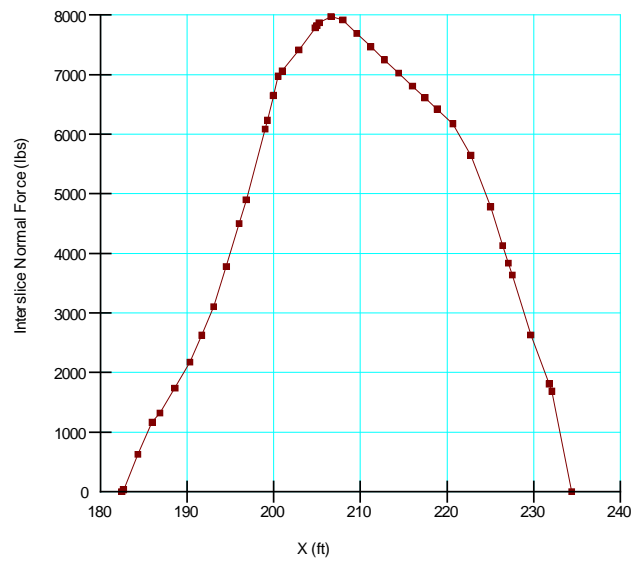
28	4353	225.7	- 11.176525	204.7003	791.24256	0	200.82
29	4353	226.8901	-10.34319	152.70837	693.53033	0	200
30	4353	228.0943	-9.5	100.08908	604.83628	0	215
31	4353	229.52245	-8.5	37.677085	490.84945	0	215
32	4353	230.9506	-7.5	- 24.741217	376.83394	0	215
33	4353	232.3309	-6.533527	- 85.063949	433.4966	0	550
34	4353	233.6633	- 5.6005815	- 143.28566	327.12363	0	550

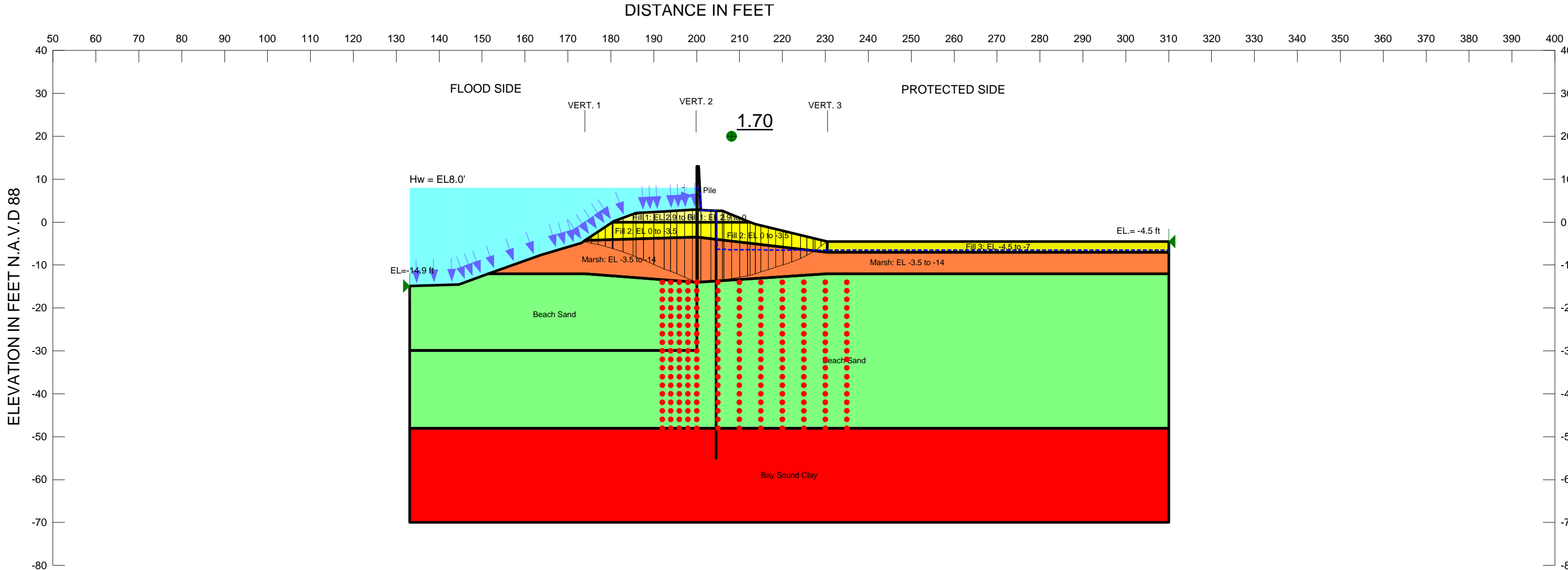
3/19/2012

Base Normal Stress Vs. X



Interslice Normal Stress Vs. X





Name: Sheet Pile Model: Undrained (Phi=0) Unit Weight: 0.1 pcf Cohesion: 0.01 psf
Name: Fill 1: EL 2.9 to 0 Model: Mohr-Coulomb Unit Weight: 112 pcf Cohesion: 600 psf Phi: 0 °
Name: Fill 2: EL 0 to -3.5 Model: Spatial Mohr-Coulomb Weight Fn: Fill 2: EL 0 to -3.5 Cohesion Fn: Fill 2: EL0 to -3.5 Phi: 0 °
Name: Fill 3: EL -4.5 to -7 Model: Mohr-Coulomb Unit Weight: 85 pcf Cohesion: 500 psf Phi: 0 °
Name: Marsh: EL -3.5 to -14 Model: Spatial Mohr-Coulomb Weight Fn: Marsh: EL -3.5 to -14 Cohesion Spatial Fn: Marsh: EL -3.5 to -14 Phi: 0 °
Name: Beach Sand Model: Mohr-Coulomb Unit Weight: 122 pcf Cohesion: 0 psf Phi: 30 °
Name: Bay Sound Clay Model: Spatial Mohr-Coulomb Unit Weight: 106 pcf Cohesion Spatial Fn: Bay Sound 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
VERTICALS WERE ASSUMED TO VARY LINEARLY
BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

Hw=CANAL WATER LEVEL

LONDON AVE CANAL
OUTFALL CANAL REEVALUATION REPORT
REACH 32, STA. 84+41 TO 90+00
PROTECTED SIDE STABILITY ANALYSIS
CASE: Global Stability (Block) EL -14 to EL-48 (Passive)
MARCH 2012

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

Global Stability (Block) EL -14 to EL-48 (Passive)

Report generated using GeoStudio 2007, version 7.15. Copyright © 1991-2009 GEO-SLOPE International Ltd.

File Information

Created By: Liljegren, James
Revision Number: 321
Last Edited By: Curran, Matthew MVN
Date: 3/7/2013
Time: 5:10:38 PM
File Name: Reach 32.gsz
Directory: C:\Users\B2EDFMJC\Desktop\Chrono Order\Reach 32 SlopeW\
Last Solved Date: 3/7/2013
Last Solved Time: 5:11:14 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) EL -14 to EL-48 (Passive)

Kind: SLOPE/W
Parent: Gap Analysis (Seepage): Rem
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)

Cohesion Spatial Fn: Marsh: EL -3.5 to -14
Phi: 0 °
Phi-B: 0 °

Beach Sand

Model: Mohr-Coulomb
Unit Weight: 122 pcf
Cohesion: 0 psf
Phi: 30 °
Phi-B: 0 °

Bay Sound Clay

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

Slip Surface Limits

Left Coordinate: (133.1, -14.9) ft
Right Coordinate: (310, -4.5) ft

Slip Surface Block

Left Grid
 Upper Left: (192, -14) ft
 Lower Left: (192, -48) ft
 Lower Right: (198, -48) ft
 X Increments: 3
 Y Increments: 17
 Starting Angle: 145 °
 Ending Angle: 165 °
 Angle Increments: 5
Right Grid
 Upper Left: (200, -14) ft
 Lower Left: (200, -48) ft
 Lower Right: (235, -48) ft
 X Increments: 7
 Y Increments: 17
 Starting Angle: 15 °
 Ending Angle: 25 °
 Angle Increments: 5

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: 5000
 Optimization Convergence Tolerance: 1e-007
 Starting Optimization Points: 8
 Ending Optimization Points: 16
 Complete Passes per Insertion: 1
 Driving Side Maximum Convex Angle: 5 °
 Resisting Side Maximum Convex Angle: 1 °

Materials

Sheet Pile

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

Fill 1: EL 2.9 to 0

Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion: 600 psf
Phi: 0 °
Phi-B: 0 °

Fill 2: EL 0 to -3.5

Model: Spatial Mohr-Coulomb
Weight Fn: Fill 2: EL 0 to -3.5
Cohesion Fn: Fill 2: EL0 to -3.5
Phi: 0 °
Phi-B: 0 °

Fill 3: EL -4.5 to -7

Model: Mohr-Coulomb
Unit Weight: 85 pcf
Cohesion: 500 psf
Phi: 0 °
Phi-B: 0 °

Marsh: EL -3.5 to -14

Model: Spatial Mohr-Coulomb
Weight Fn: Marsh: EL -3.5 to -14

Cohesion Functions

Fill 2: EL0 to -3.5

Model: Spline Data Point Function
Function: Cohesion vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 500
Data Points: X (ft), Cohesion (psf)
 Data Point: (133, 500)
 Data Point: (174, 500)
 Data Point: (200, 600)
 Data Point: (230.4, 500)
 Data Point: (310, 500)

Unit Weight Functions

Fill 2: EL 0 to -3.5

Model: Spline Data Point Function
Function: Unit Weight vs. Y
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 85
Data Points: Y (ft), Unit Weight (pcf)
 Data Point: (133, 85)
 Data Point: (174, 85)
 Data Point: (200, 105)
 Data Point: (230.4, 85)
 Data Point: (310, 85)

Marsh: EL -3.5 to -14

Model: Spline Data Point Function
Function: Unit Weight vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 95
Data Points: X (ft), Unit Weight (pcf)
 Data Point: (133, 95)
 Data Point: (174, 95)
 Data Point: (200, 98)
 Data Point: (230.4, 95)
 Data Point: (310, 95)

Spatial Functions

Marsh: EL -3.5 to -14
Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (133, -3.5, 250)
Data Point: (133, -14, 250)
Data Point: (174, -3.5, 250)
Data Point: (174, -14, 250)
Data Point: (200, -3.5, 260)
Data Point: (200, -14, 340)
Data Point: (230.4, -3.5, 250)
Data Point: (230.4, -14, 250)
Data Point: (310, -3.5, 250)
Data Point: (310, -14, 250)

Bay Sound Clay
Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (133, -48, 660)
Data Point: (133, -70, 880)
Data Point: (174, -48, 660)
Data Point: (174, -70, 880)
Data Point: (200, -48, 900)
Data Point: (200, -70, 900)
Data Point: (230.4, -48, 660)
Data Point: (230.4, -70, 880)
Data Point: (310, -48, 660)
Data Point: (310, -70, 880)

Regions

	Material	Points	Area (ft²)
Region 1	Bay Sound Clay	15,9,10,16	3891.8
Region 2	Beach Sand	9,14,13,12,18,8,10	5140.49
Region 3	Beach Sand	14,1,25,28,29,12,13	1131.96
Region 4	Marsh: EL -3.5 to -14	28,2,30,26,31,11,12,29	324.03373
Region 5	Marsh: EL -3.5 to -14	12,11,17,7,8,18	633.6
Region 6	Fill 2: EL 0 to -3.5	31,32,21,11	87.807785
Region 7	Fill 2: EL 0 to -3.5	11,21,20,33,5,17	117.55
Region 8	Fill 3: EL -4.5 to -7	17,5,6,7	199

Region 9	Fill 1: EL 2.9 to 0	32,19,3,35,34,27,21	41.597439
Region 10	Fill 1: EL 2.9 to 0	21,27,24,36,4,20	24.8
Region 11	Sheet Pile	27,22,23,24	7.6

Points

	X (ft)	Y (ft)
Point 1	133.1	-14.9
Point 2	163.8	-7.6
Point 3	185.9	2.1
Point 4	206	2.6
Point 5	230.4	-4.5
Point 6	310	-4.5
Point 7	310	-7
Point 8	310	-12
Point 9	133.1	-48
Point 10	310	-48
Point 11	200	-3.5
Point 12	200	-14
Point 13	200	-29.9
Point 14	133.1	-29.9
Point 15	133.1	-70
Point 16	310	-70
Point 17	230.4	-7
Point 18	230.4	-12
Point 19	180.5	0.1
Point 20	212.5	0
Point 21	200	0
Point 22	200	13
Point 23	200.5	13
Point 24	201	2.8
Point 25	144.6	-14.5
Point 26	173.1	-4.9
Point 27	200	2.9
Point 28	151.4	-12
Point 29	174	-12

Point 30	165.86667	-7
Point 31	173.96613	-4.30037
Point 32	180.35122	0
Point 33	213.7	-0.5
Point 34	199	2.9
Point 35	192.45	2.5
Point 36	204.5	2.66
Point 37	204.5	-55

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.70	(203.123, -4.496)	22.09354	(173.615, -4.54345)	(230.421, -4.5)
2	729	2.03	(203.123, -4.496)	22.815	(173.656, -4.51536)	(232.59, -4.5)

Slices of Slip Surface: Optimized

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesiv e Strengt h (psf)
1	Optimize d	173.79055	-4.577173	784.80993	691.05787	0	250
2	Optimize d	174.7513	4.761693	796.33488	729.42124	0	250.57
3	Optimize d	176.3217	5.0632975	815.09572	787.07954	0	251.96
4	Optimize d	177.918	5.4431995	838.85053	829.65521	0	253.74
5	Optimize d	179.54015	5.901398	867.38568	902.20925	0	256.03
6	Optimize d	180.3677	6.1351535	881.99066	939.60887	0	257.37

7	Optimize d	180.4421	-6.159695	883.55585	928.30939	0	257.5
8	Optimize d	181.6675	-6.580505	909.78502	1010.3187	0	259.87
9	Optimize d	184.0025	-7.382355	959.80882	1128.3505	0	265.23
10	Optimize d	185.535	-7.9390165	994.54573	1183.4941	0	269.44
11	Optimize d	186.741	-8.4535765	1026.6654	1254.4184	0	273.4
12	Optimize d	188.78865	-9.33709	1081.7947	1338.9432	0	280.98
13	Optimize d	191.22265	-10.367685	1146.0818	1448.8261	0	291.28
14	Optimize d	193.17655	-11.173075	1196.3441	1529.3582	0	300.49
15	Optimize d	194.62965	-11.77204	1233.7557	1589.3568	0	307.94
16	Optimize d	196.26715	-12.45052	1276.0916	1655.9646	0	316.97
17	Optimize d	198.08905	-13.208515	1323.373	1732.1824	0	327.8
18	Optimize d	199.4956	-13.793695	1359.9188	1792.1417	0	336.71
19	Optimize d	199.9936	-13.999785	1372.7909	2017.9763	372.49794	0
20	Optimize d	199.998	-13.999615	1372.7692	2014.6302	0	339.99
21	Optimize d	200.25	-13.9899	1372.0009	1440.2102	39.380677	0
22	Optimize	200.75	-	1370.7618	1665.1032	169.93807	0

	d		13.970625				
23	Optimize d	202.1736	-13.915745	1367.3145	1647.6485	161.85089	0
24	Optimize d	203.9236	-13.79039	1359.4641	1656.6696	171.5917	0
25	Optimize d	204.54325	-13.70427	1223.7786	1655.4041	249.19912	0
26	Optimize d	205.29325	-13.60003	443.32638	1651.56	0	321.81
27	Optimize d	206.17585	-13.477355	435.76672	1625.4732	0	318.54
28	Optimize d	207.26745	-13.30343	425.02329	1564.9393	0	314.45
29	Optimize d	209.0989	-13.004475	406.47467	1445.8983	0	307.75
30	Optimize d	210.9303	-12.70552	387.87215	1327.0729	0	301.32
31	Optimize d	212.173	-12.45923	372.43697	1289.5861	0	296.92
32	Optimize d	213.1	-12.18479	355.38609	1221.5897	0	293.35
33	Optimize d	214.3327	-11.819845	332.67132	1145.4781	0	288.79
34	Optimize d	215.83145	-11.354835	303.67205	1070.4804	0	283.47
35	Optimize d	217.5635	-10.799445	269.0083	972.67419	0	277.71
36	Optimize d	219.2955	-10.244055	234.30056	875.30781	0	272.42
37	Optimize d	221.16715	-9.604955	194.33375	777.21335	0	267.16

38	Optimize d	223.1785	-8.882145	149.12614	656.54432	0	262.12
39	Optimize d	224.9228	-8.133395	102.33359	580.00424	0	258.16
40	Optimize d	226.40005	-7.358705	53.937655	464.67363	0	255.18
41	Optimize d	227.33845	-6.820938	20.345715	438.20771	0	253.56
42	Optimize d	228.25365	-6.131742	-22.671281	497.42834	0	507.06
43	Optimize d	229.68455	-5.054194	-89.942627	360.30086	0	502.35
44	Optimize d	230.41025	-4.50771	-124.06652	291.00607	0	500

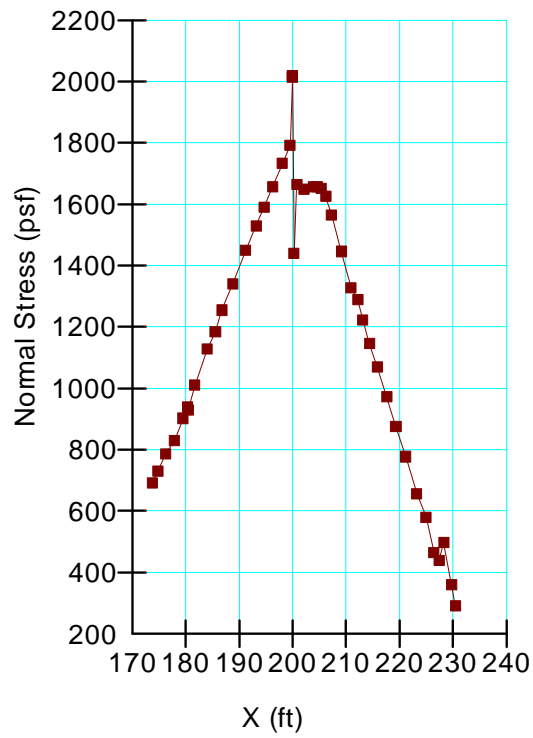
Slices of Slip Surface: 729

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	729	173.81085	4.5812685	785.06826	648.71508	0	250
2	729	175.0303	5.0988955	817.3707	720.31901	0	250.88
3	729	177.1587	6.002332	873.72468	840.59563	0	253.53
4	729	179.28705	6.9057685	930.07867	961.13175	0	257.31
5	729	180.4256	7.3890635	960.2255	1027.1072	0	259.79
6	729	181.4	7.8026675	986.06509	1102.6112	0	262.18
7	729	183.2	8.566722	1033.7268	1206.0146	0	267.2

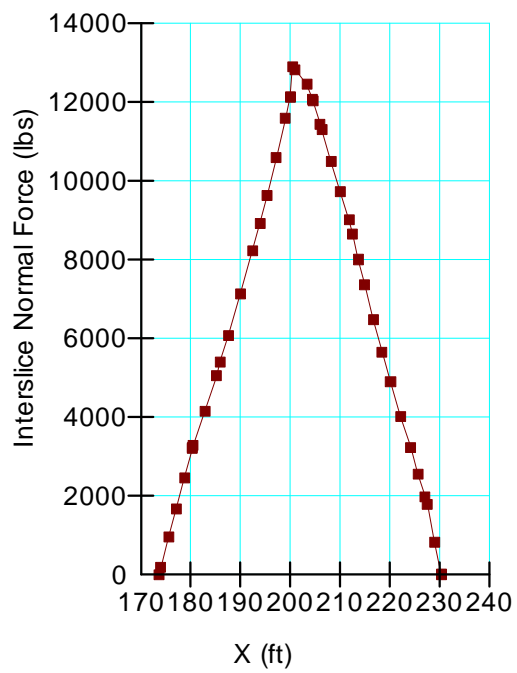
			5				
8	729	185	-9.330777	1081.3885	1309.6225	0	273.03
9	729	186.99165	-10.176187	1134.1603	1421.6107	0	280.41
10	729	189.175	-11.102955	1191.9623	1513.9001	0	289.65
11	729	191.35835	-12.029725	1249.8066	1606.4846	0	300.06
12	729	193.78235	-13.05866	1314.0068	1709.6113	0	313.02
13	729	195.55735	-13.812105	1361.0327	1798.6634	252.66623	0
14	729	196.75	-14	1372.7333	1983.6	352.68403	0
15	729	198.25	-14	1372.7333	1987.9333	355.18589	0
16	729	199.5	-14	1372.8	1992.6	357.8417	0
17	729	200.25	-14	1372.62	1440.1	38.959596	0
18	729	200.75	-14	1372.58	1653.08	161.94675	0
19	729	201.875	-14	1372.5714	1644.5143	157.00628	0
20	729	203.625	-14	1372.5714	1634.8	151.39774	0
21	729	204.75	-14	618.92	1657.62	599.69372	0
22	729	205.5	-13.827835	457.4512	1868.3441	814.57942	0
23	729	206.0905	-13.624515	444.76685	1831.9707	800.90251	0
24	729	207.23415	-13.230725	420.58886	1615.7399	0	314.12
25	729	209.3405	-12.50545	375.77602	1435.8691	0	304.46
26	729	211.44685	-11.78017	330.68487	1256.5819	0	295.57

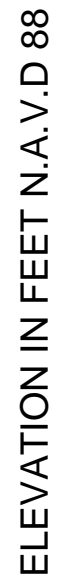
			5				
27	729	213.1	-11.210945	295.12782	1122.1728	0	289.12
28	729	214.62145	-10.687075	262.4558	1022.9075	0	283.61
29	729	216.4643	-10.052526	222.76471	914.54717	0	277.47
30	729	218.30715	-9.417977	183.02231	806.59726	0	271.91
31	729	220.15005	-8.7834275	143.28504	699.16041	0	266.94
32	729	221.9929	-8.1488785	103.52725	592.13402	0	262.56
33	729	223.83575	-7.5143295	63.800248	485.6207	0	258.76
34	729	225.67865	-6.8797805	24.09633	379.55888	0	255.55
35	729	227.55005	-6.235399	-16.180033	339.73442	0	509.37
36	729	229.45	-5.5811855	-57.055356	239.4832	0	503.12
37	729	231.495	-4.8770395	-101.04512	155.80308	0	500

Base Normal Stress Vs. X



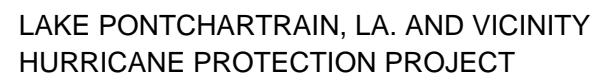
Interslice Normal Stress
Vs. X





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.

H_w=CANAL WATER LEVEL



Global Stability (Entry/Exit)

Report generated using GeoStudio 2007, version 7.15. Copyright © 1991-2009 GEO-SLOPE International Ltd.

File Information

Created By: Lijjegren, James
Revision Number: 278
Last Edited By: Middleton, Mark C MVN
Date: 1/12/2012
Time: 12:49:57 PM
File Name: Reach 33.gsz
Directory: G:\F&M\HOME\Middleton\London Ave Canal\Reach 33\optimization check\
Last Solved Date: 1/12/2012
Last Solved Time: 1:02:06 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: Gap Stability (Seepage)
Method: Spencer
Settings
PWP Conditions Source: Parent Analysis
SlipSurface
Direction of movement: Left to Right
Use Passive Mode: Yes
Slip Surface Option: Entry and Exit
Critical slip surfaces saved: 1
Optimize Critical Slip Surface Location: Yes
Tension Crack
Tension Crack Option: (none)
FOS Distribution
FOS Calculation Option: Constant
Advanced
Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft

3/14/2012

Global Stability (Entry/Exit)

Unit Weight: 94 pcf
Cohesion: 190 psf

Sheet Pile

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

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (160, -8.35632) ft
Left-Zone Right Coordinate: (195, 2.64444) ft
Left-Zone Increment: 20
Right Projection: Range
Right-Zone Left Coordinate: (205, 2.44828) ft
Right-Zone Right Coordinate: (255, -5) ft
Right-Zone Increment: 30
Radius Increments: 20

Slip Surface Limits

Left Coordinate: (141.5, -12.4) ft
Right Coordinate: (310, -5) ft

Cohesion Functions

FILL 2

Model: Spline Data Point Function
Function: Cohesion vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 500
Data Points: X (ft), Cohesion (psf)
Data Point: (165.9, 500)
Data Point: (200, 600)
Data Point: (226.2, 500)

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)

3/14/2012

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 1, EL. +3 to 0

Model: Undrained (Phi=0)
Unit Weight: 112 pcf
Cohesion: 600 psf

MARSH, EL. -7 TO -14

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

BEACH SAND, EL. -14 TO -46

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

BAY SOUND CLAY, EL. -46 TO -70

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

EMBANKMENT FILL 2, EL. 0 to -7

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

Fill, EL. -4.6 TO -7 (Protected Side)

Model: Undrained (Phi=0)
Unit Weight: 84 pcf
Cohesion: 500 psf

Marsh, EL. -7 TO -14 (Protected Side)

Model: Undrained (Phi=0)

3/14/2012

Global Stability (Entry/Exit)

Data Point: (-100000, 0)
Data Point: (0, 0)
Data Point: (100000, 57753)

Estimation Properties

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

Unit Weight Functions

FILL 2

Model: Spline Data Point Function
Function: Unit Weight vs. Y
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 84
Data Points: Y (ft), Unit Weight (pcf)
Data Point: (165.9, 84)
Data Point: (200, 105)
Data Point: (226.2, 84)

Marsh

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 94
Data Points: X (ft), Unit Weight (pcf)
Data Point: (165.9, 94)
Data Point: (200, 104)
Data Point: (226.2, 94)

Spatial Functions

Marsh

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (165.9, -7, 190)
Data Point: (165.9, -14, 190)
Data Point: (200, -7, 200)
Data Point: (200, -14, 265)
Data Point: (226.2, -7, 190)
Data Point: (226.2, -14, 190)

3/14/2012

Bay Sound

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (141.4, -46, 600)
Data Point: (141.5, -70, 800)
Data Point: (200, -46, 685)
Data Point: (200, -70, 915)
Data Point: (226.2, -46, 600)
Data Point: (226.2, -70, 800)
Data Point: (310, -46, 600)
Data Point: (310, -70, 800)
Data Point: (165.9, -46, 600)
Data Point: (165.9, -70, 800)

Regions

	Material	Points	Area (ft²)
Region 1	BEACH SAND, EL. -14 TO -46	12,13,14,22,1,2,35,33	940.29
Region 2	Fill, EL. -4.6 TO -7 (Protected Side)	6,29,7,8,17	170.06
Region 3	BEACH SAND, EL. -14 TO -46	14,13,12,31,9,11,32,10	4467.7
Region 4	BAY SOUND CLAY, EL. -46 TO -70	15,10,32,11,16	4044
Region 5	Marsh, EL. -7 TO -14 (Protected Side)	17,8,9,31	586.6
Region 6	EMBANKMENT FILL 1, EL. +3 to 0	19,3,28,4,21	45.05
Region 7	EMBANKMENT FILL 1, EL. +3 to 0	4,25,5,20,21	24.9
Region 8	EMBANKMENT FILL 2, EL. 0 to -7	26,30,19,21,18	189.07
Region 9	EMBANKMENT FILL 2, EL. 0 to -7	18,21,20,6,17	153.04
Region 10	Sheet Pile	4,23,24,25	7.575
Region 11	Marsh, EL. -7 TO -14 (Protected Side)	35,33,26,27,2	81.825
Region 12	MARSH, EL. -7 TO -14	18,17,31,12,34	183.4
Region 13	MARSH, EL. -7 TO -14	33,26,18,34,12	238.7

Points

	X (ft)	Y (ft)
Point 1	141.5	-12.4
Point 2	149.3	-11.5
Point 3	181	1.4
Point 4	200	3
Point 5	206.8	2.2
Point 6	226.2	-4.6
Point 7	310	-5
Point 8	310	-7
Point 9	310	-14
Point 10	141.5	-46

Point 11	310	-46
Point 12	200	-14
Point 13	200	-29.8
Point 14	141.5	-29.8
Point 15	141.5	-70
Point 16	310	-70
Point 17	226.2	-7
Point 18	200	-7
Point 19	177.5	0
Point 20	213	0
Point 21	200	0
Point 22	141.5	-14
Point 23	200	13.1
Point 24	200.5	13.1
Point 25	201	3
Point 26	165.9	-7
Point 27	157.2	-9
Point 28	199	3
Point 29	238.5	-5
Point 30	170.8	-5.6
Point 31	226.2	-14
Point 32	200	-46
Point 33	165.9	-14
Point 34	200	-8.3
Point 35	149.3	-14
Point 36	205	2.45
Point 37	205	-55

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.40	(202.196, 48.881)	24.13941	(169.612, -5.93939)	(232.474, -4.80403)
2	4290	1.59	(202.196, 48.881)	62.727	(170.924, -5.49604)	(234.53, -4.87089)

Slices of Slip Surface: Optimized

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	170.20605	-6.3468645	895.21861	617.47592	0	512.63
2	Optimized	170.97905	-6.87717	928.26505	609.68561	0	514.89
3	Optimized	171.52915	-7.25456	951.80451	771.29312	0	192.04
4	Optimized	173.1843	-7.7001325	979.58338	976.7334	0	193.52

5	Optimized	175.75255	-8.0821575	1003.4231	1073.2475	0	195.79
6	Optimized	177.26835	-8.3181565	1018.1254	1118.7429	0	197.41
7	Optimized	178.98535	-8.6515815	1038.9291	1214.5623	0	199.72
8	Optimized	180.73535	-9.007439	1061.1219	1267.2534	0	202.46
9	Optimized	182.0464	-9.341426	1081.9859	1325.6839	0	205.03
10	Optimized	184.1392	-9.874562	1115.2322	1387.0367	0	209.63
11	Optimized	186.7431	-10.569395	1158.5687	1460.4609	0	216.37
12	Optimized	189.42945	-11.270025	1202.31	1554.0081	0	224.26
13	Optimized	191.6871	-11.81475	1236.2828	1619.6286	0	231.37
14	Optimized	193.94475	-12.359475	1270.2556	1685.895	0	239.15
15	Optimized	196.0552	-12.9108	1304.691	1735.9133	0	247.38
16	Optimized	198.0184	-13.46872	1339.4789	1802.4021	0	255.99
17	Optimized	199.44395	-13.87384	1364.7543	1852.6076	0	262.62
18	Optimized	199.9435	-14.0158	1373.6516	1865.7924	284.22925	1.5099e-005
19	Optimized	199.99955	-14.031595	1374.5518	2004.3287	363.71909	-7.6143e-005
20	Optimized	200.25	-14.030155	1374.4172	1459.9958	49.424749	3.7641e-006
21	Optimized	200.75	-14.027285	1374.2172	1671.6123	171.75649	-2.1486e-006
22	Optimized	202.1249	-14.019385	1373.7117	1647.7785	158.28353	-1.9799e-006
23	Optimized	204.3747	-14.00646	1372.9117	1602.9304	132.84419	7.0551e-006
24	Optimized	205.82855	-13.99811	436.89652	1586.6698	0	248.3
25	Optimized	206.47875	-13.99553	436.73533	1573.1437	0	246.42
26	Optimized	207.72345	-13.99285	436.5708	1527.5376	0	242.84
27	Optimized	209.57035	-13.98887	436.31632	1448.2694	0	237.54
28	Optimized	211.7469	-13.92072	432.12147	1365.8545	0	230.97
29	Optimized	213.5317	-13.826485	426.24881	1285.2261	0	225.49
30	Optimized	215.59425	-13.51823	407.08915	1228.946	0	218.55
31	Optimized	218.09085	-12.996135	374.58486	1114.2577	0	210.33
32	Optimized	220.02235	-12.512305	344.40694	1001.4107	0	204.43
33	Optimized	222.059	-11.751955	296.96625	921.62374	0	198.55
34	Optimized	224.20075	-	232.25507	743.35069	0	193.4

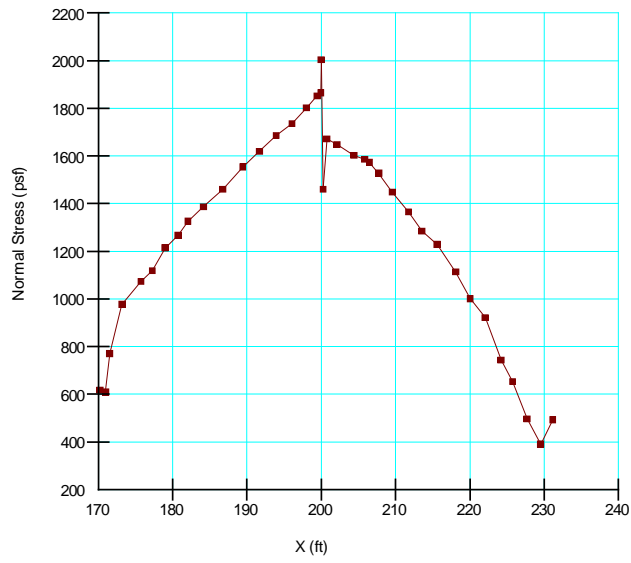
			10.715085				
35	Optimized	225.7358	-9.882354	180.25949	653.52202	0	190.65
36	Optimized	227.69575	-8.555364	97.406938	496.47367	0	190
37	Optimized	229.5167	-7.271335	17.232364	390.79466	0	190
38	Optimized	231.1579	-5.9020145	-68.240039	492.56758	0	500

Slices of Slip Surface: 4290

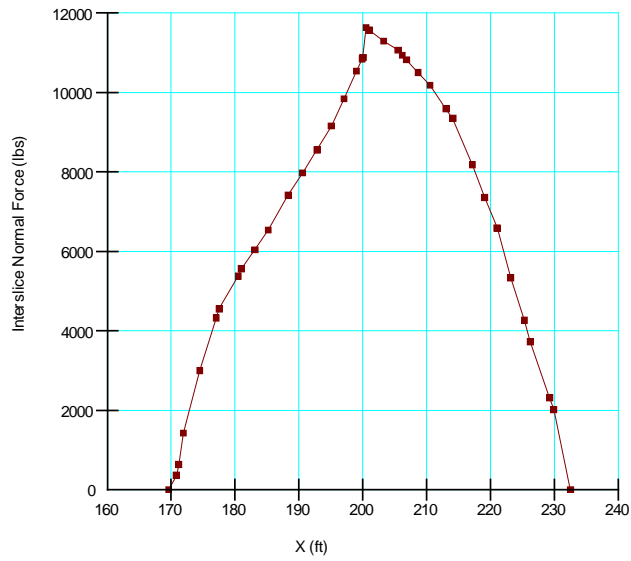
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	4290	172.3116	-6.2480205	889.01845	664.8626	0	518.8
2	4290	174.6491	-7.464591	964.89225	907.83915	0	193.67
3	4290	176.5497	-8.3549895	1020.4204	1041.115	0	197.05
4	4290	178.375	-9.140033	1069.3825	1189.2188	0	200.93
5	4290	180.125	-9.8282145	1112.3378	1298.6367	0	205.13
6	4290	182.125	-10.53717	1156.597	1416.1871	0	210.39
7	4290	184.375	-11.25059	1201.075	1508.4388	0	216.8
8	4290	186.625	-11.87233	1239.881	1593.5176	0	223.58
9	4290	188.875	-12.405185	1273.1185	1671.4621	0	230.55
10	4290	191.125	-12.85146	1300.9784	1742.2935	0	237.59
11	4290	193.375	-13.21302	1323.5125	1805.9579	0	244.54
12	4290	195.625	-13.491345	1340.8909	1862.405	0	251.26
13	4290	197.875	-13.68755	1353.1333	1911.4039	0	257.61
14	4290	199.5	-13.78675	1359.3426	1944.4014	0	261.95
15	4290	200.25	-13.816015	1360.3651	1439.2871	0	262.59
16	4290	200.75	-13.829535	1361.0985	1645.5829	0	261.32
17	4290	201.96665	-13.83883	1361.7325	1635.041	0	257.99
18	4290	203.9	-13.81608	1360.1007	1608.7501	0	252.38
19	4290	205.83335	-13.733645	420.84733	1575.9119	0	246.38
20	4290	207.83335	-13.584225	411.54816	1509.5898	0	239.87
21	4290	209.9	-13.36306	397.79816	1409.0215	0	232.98
22	4290	211.96665	-13.072185	379.66038	1300.6808	0	226.06
23	4290	214.1	-12.696555	356.24041	1192.3771	0	219.05
24	4290	216.3	-12.23002	327.10096	1083.7373	0	212.13

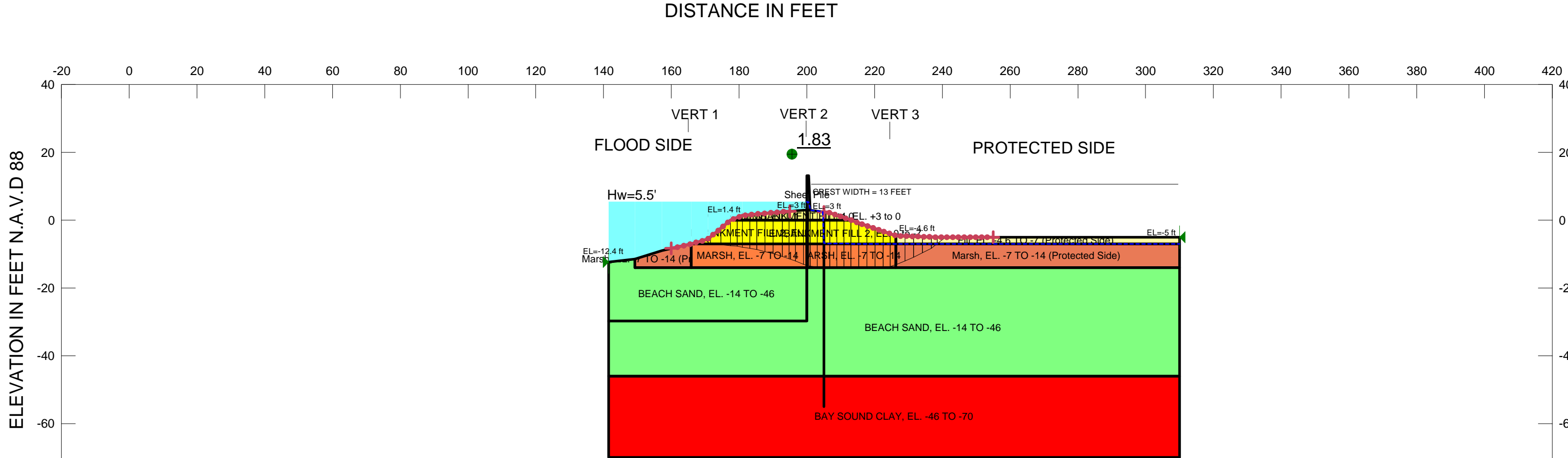
25	4290	218.5	- 11.679995	292.72705	966.4518	0	205.71
26	4290	220.7	-11.04418	252.99457	840.43431	0	199.98
27	4290	222.9	- 10.319803	207.68759	705.63582	0	195.14
28	4290	225.1	- 9.5035615	156.67923	561.89902	0	191.4
29	4290	227.32315	-8.580886	99.014061	440.06702	0	190
30	4290	229.56945	-7.544872	34.296897	338.55509	0	190
31	4290	231.6519	- 6.4896695	- 31.590025	378.06704	0	500
32	4290	233.5705	- 5.4251125	- 98.047047	293.61311	0	500

Base Normal Stress Vs. X



Interslice Normal Stress Vs. X





Name: EMBANKMENT FILL 1, EL. +3 to 0 Model: Undrained (Phi=0) Unit Weight: 112 pcf Cohesion: 600 psf
Name: MARSH, EL. -7 TO -14 Model: Spatial Mohr-Coulomb Weight Fn: Marsh Cohesion Spatial Fn: Marsh Phi: 0 °
Name: BEACH SAND, EL. -14 TO -46 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Beach Sand
Name: BAY SOUND CLAY, EL. -46 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 106 pcf Cohesion Spatial Fn: Bay Sound Phi: 0 °
Name: EMBANKMENT FILL 2, EL. 0 to 7 Model: Spatial Mohr-Coulomb Weight Fn: FILL 2 Cohesion Fn: Fill 2 Phi: 0 °
Name: Fill, EL. -4.6 TO -7 (Protected Side) Model: Undrained (Phi=0) Unit Weight: 84 pcf Cohesion: 500 psf
Name: Marsh, EL. -7 TO -14 (Protected Side) Model: Undrained (Phi=0) Unit Weight: 94 pcf Cohesion: 190 psf
Name: Sheet Pile Model: Undrained (Phi=0) Unit Weight: 0.1 pcf Cohesion: 0.01 psf

GENERAL NOTES

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

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

Hw=CANAL WATER LEVEL



**US Army Corps
of Engineers®**
New Orleans District
LONDON AVE CANAL
OUTFALL CANAL REEVALUATION REPORT
REACH 33, STA. 90+00 TO 93+00
1% FLOWLINE WATER EL +5.5
PROTECTED SIDE STABILITY ANALYSIS,
CASE: Global Stability (Entry/Exit)
MARCH 2012

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

Global Stability (Entry/Exit)

Report generated using GeoStudio 2007, version 7.15. Copyright © 1991-2009 GEO-SLOPE International Ltd.

File Information

Created By: Lijegren, James
Revision Number: 297
Last Edited By: Middleton, Mark C MVN
Date: 3/13/2012
Time: 2:40:01 PM
File Name: Reach 33.gsz
Directory: G:\F&M\HOME\Middleton\London Ave Canal\Reach 33\water level 5.5\optimization check\
Last Solved Date: 3/13/2012
Last Solved Time: 2:52:36 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 Stability (Seepage)
Method: Spencer
Settings
PWP Conditions Source: Parent Analysis
SlipSurface
Direction of movement: Left to Right
Use Passive Mode: Yes
Slip Surface Option: Entry and Exit
Critical slip surfaces saved: 1
Optimize Critical Slip Surface Location: Yes
Tension Crack
Tension Crack Option: (none)
FOS Distribution
FOS Calculation Option: Constant
Advanced
Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft

3/19/2012

Global Stability (Entry/Exit)

Unit Weight: 94 pcf
Cohesion: 190 psf
Sheet Pile
Model: Undrained (Phi=0)
Unit Weight: 0.1 pcf
Cohesion: 0.01 psf

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (160, -8.35632) ft
Left-Zone Right Coordinate: (195, 2.64444) ft
Left-Zone Increment: 20
Right Projection: Range
Right-Zone Left Coordinate: (205, 2.44828) ft
Right-Zone Right Coordinate: (255, -5) ft
Right-Zone Increment: 30
Radius Increments: 20

Slip Surface Limits

Left Coordinate: (141.5, -12.4) ft
Right Coordinate: (310, -5) ft

Cohesion Functions

FILL 2

Model: Spline Data Point Function
Function: Cohesion vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 500
Data Points: X (ft), Cohesion (psf)
Data Point: (165.9, 500)
Data Point: (200, 600)
Data Point: (226.2, 500)

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)

3/19/2012

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 1, EL. +3 to 0

Model: Undrained (Phi=0)
Unit Weight: 112 pcf
Cohesion: 600 psf

MARSH, EL. -7 TO -14

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

BEACH SAND, EL. -14 TO -46

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

BAY SOUND CLAY, EL. -46 TO -70

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

EMBANKMENT FILL 2, EL. 0 to -7

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

Fill, EL. -4.6 TO -7 (Protected Side)

Model: Undrained (Phi=0)
Unit Weight: 84 pcf
Cohesion: 500 psf

Marsh, EL. -7 TO -14 (Protected Side)

Model: Undrained (Phi=0)

3/19/2012

Global Stability (Entry/Exit)

Data Point: (-100000, 0)
Data Point: (0, 0)
Data Point: (100000, 57753)
Estimation Properties
Intact Rock Param.: 10
Geological Strength: 100
Disturbance Factor: 0
SigmaC: 600000 psf
Sigma3: 300000 psf
Num. Points: 20

Unit Weight Functions

FILL 2

Model: Spline Data Point Function
Function: Unit Weight vs. Y
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 84
Data Points: Y (ft), Unit Weight (pcf)
Data Point: (165.9, 84)
Data Point: (200, 105)
Data Point: (226.2, 84)

Marsh

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 94
Data Points: X (ft), Unit Weight (pcf)
Data Point: (165.9, 94)
Data Point: (200, 104)
Data Point: (226.2, 94)

Spatial Functions

Marsh

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (165.9, -7, 190)
Data Point: (165.9, -14, 190)
Data Point: (200, -7, 200)
Data Point: (200, -14, 265)
Data Point: (226.2, -7, 190)
Data Point: (226.2, -14, 190)

3/19/2012

Bay Sound

Model: Linear Interpolation

Limit Range By: Data Values

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

Data Point: (141.4, -46, 600)

Data Point: (141.5, -70, 800)

Data Point: (200, -46, 685)

Data Point: (200, -70, 915)

Data Point: (226.2, -46, 600)

Data Point: (226.2, -70, 800)

Data Point: (310, -46, 600)

Data Point: (310, -70, 800)

Data Point: (165.9, -46, 600)

Data Point: (165.9, -70, 800)

Regions

	Material	Points	Area (ft ²)
Region 1	BEACH SAND, EL. -14 TO -46	12,13,14,22,1,2,35,33	940.29
Region 2	Fill, EL. -4.6 TO -7 (Protected Side)	6,29,7,8,17	170.06
Region 3	BEACH SAND, EL. -14 TO -46	14,13,12,31,9,11,32,10	4467.7
Region 4	BAY SOUND CLAY, EL. -46 TO -70	15,10,32,11,16	4044
Region 5	Marsh, EL. -7 TO -14 (Protected Side)	17,8,9,31	586.6
Region 6	EMBANKMENT FILL 1, EL. +3 to 0	19,3,28,4,21	45.05
Region 7	EMBANKMENT FILL 1, EL. +3 to 0	4,25,5,20,21	24.9
Region 8	EMBANKMENT FILL 2, EL. 0 to -7	26,30,19,21,18	189.07
Region 9	EMBANKMENT FILL 2, EL. 0 to -7	18,21,20,6,17	153.04
Region 10	Sheet Pile	4,23,24,25	7.575
Region 11	Marsh, EL. -7 TO -14 (Protected Side)	35,33,26,27,2	81.825
Region 12	MARSH, EL. -7 TO -14	18,17,31,12,34	183.4
Region 13	MARSH, EL. -7 TO -14	33,26,18,34,12	238.7

Points

	X (ft)	Y (ft)
Point 1	141.5	-12.4
Point 2	149.3	-11.5
Point 3	181	1.4
Point 4	200	3
Point 5	206.8	2.2
Point 6	226.2	-4.6
Point 7	310	-5
Point 8	310	-7
Point 9	310	-14
Point 10	141.5	-46

Point 11	310	-46
Point 12	200	-14
Point 13	200	-29.8
Point 14	141.5	-29.8
Point 15	141.5	-70
Point 16	310	-70
Point 17	226.2	-7
Point 18	200	-7
Point 19	177.5	0
Point 20	213	0
Point 21	200	0
Point 22	141.5	-14
Point 23	200	13.1
Point 24	200.5	13.1
Point 25	201	3
Point 26	165.9	-7
Point 27	157.2	-9
Point 28	199	3
Point 29	238.5	-5
Point 30	170.8	-5.6
Point 31	226.2	-14
Point 32	200	-46
Point 33	165.9	-14
Point 34	200	-8.3
Point 35	149.3	-14
Point 36	205	2.45
Point 37	205	-55

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.83	(208.183, 73.092)	26.76417	(170.016, -5.82404)	(241.003, -5)
2	4436	2.09	(208.183, 73.092)	86.973	(170.924, -5.49604)	(246.47, -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	170.40795	- 6.1130065	724.63716	500.69741	0	513.22
2	Optimized	171.19725	-6.694778	760.90595	523.52493	0	515.53
3	Optimized	173.1058	- 7.1218875	787.5365	813.30659	0	192.35
4	Optimized	176.05855	- 7.3842925	803.87863	903.21462	0	194.04

3/19/2012

3/19/2012

5	Optimized	178.47685	-7.5992	817.28629	989.61491	0	195.74
6	Optimized	180.22685	-7.816108	830.83132	1031.1415	0	197.39
7	Optimized	182.0526	-8.1233245	849.96253	1089.0013	0	199.68
8	Optimized	184.1578	-8.4775615	872.07233	1133.4551	0	202.7
9	Optimized	186.41035	-8.95691	901.99698	1173.1658	0	206.94
10	Optimized	188.81025	-9.56137	939.69635	1243.9582	0	212.7
11	Optimized	191.399	-10.292265	985.31691	1315.6021	0	220.34
12	Optimized	193.74205	-11.053935	1032.8649	1392.7202	0	228.9
13	Optimized	195.65055	-11.71995	1074.4209	1468.362	0	236.96
14	Optimized	197.8024	-12.533885	1125.1961	1546.52	0	247.43
15	Optimized	199.4747	-13.20543	1167.0904	1621.2195	0	256.58
16	Optimized	199.9747	-13.39899	1179.1674	1723.5781	0	259.37
17	Optimized	200.25	-13.430985	1179.6815	1537.5135	0	259.05
18	Optimized	200.75	-13.48909	1183.1779	1577.2262	0	258.24
19	Optimized	202.03295	-13.63818	1192.8877	1573.0635	0	256.08
20	Optimized	204.09885	-13.878255	1208.5621	1560.6587	0	252.31
21	Optimized	205.9659	-13.998385	436.87918	1571.5613	0	247.91
22	Optimized	207.83335	-13.9986	436.88703	1512.3385	0	242.57
23	Optimized	209.9	-13.99884	436.8967	1424.4191	0	236.65
24	Optimized	211.96665	-13.99908	436.91122	1336.4998	0	230.74
25	Optimized	214.17525	-13.999335	436.93389	1254.8554	0	224.42
26	Optimized	216.5257	-13.999605	436.93389	1179.4662	0	217.69
27	Optimized	218.91805	-13.99888	436.89542	1102.8169	0	210.84
28	Optimized	221.3523	-13.997155	436.77217	1024.5167	0	203.87
29	Optimized	223.6071	-13.821995	425.85553	968.38264	0	197.26
30	Optimized	225.4224	-13.39846	399.44596	897.25777	0	192.06
31	Optimized	226.39975	-13.085185	379.90942	840.47213	0	190
32	Optimized	227.81535	-12.506085	343.77528	799.18238	0	190
33	Optimized	230.247	-11.47595	279.49231	691.52658	0	190
34	Optimized	232.7718	-10.30215	206.23151	582.54037	0	190
35	Optimized	235.38975	-8.98469	124.00436	445.20511	0	190
			-				

36	Optimized	237.59935	7.6300925	39.465655	343.84125	0	190
37	Optimized	239.7517	- 5.9671125	-64.31352	340.69159	0	500

Slices of Slip Surface: **4436**

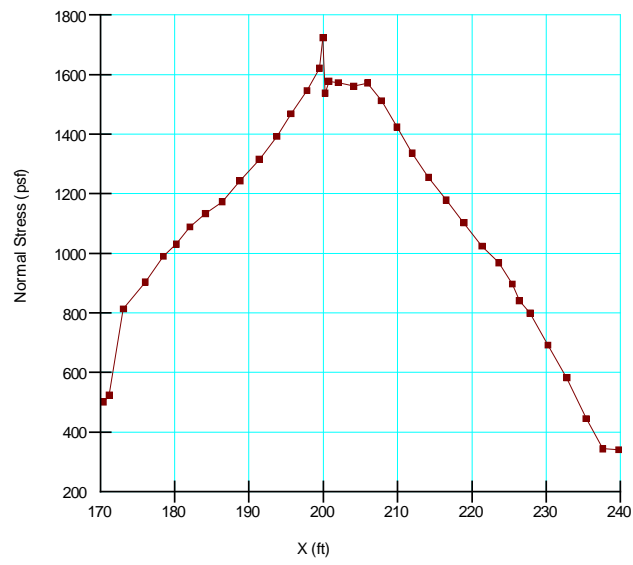
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	4436	172.60115	- 6.2480205	733.02022	623.94194	0	519.65
2	4436	175.88895	- 7.6443985	820.10863	876.44427	0	194.68
3	4436	179.25	-8.906276	898.85854	1085.0104	0	200.84
4	4436	182.2857	- 9.9248325	962.37805	1238.6585	0	207.86
5	4436	184.85715	-10.68389	1009.7631	1331.8772	0	214.58
6	4436	187.4286	-11.35784	1051.7976	1418.3462	0	221.86
7	4436	190	-11.94871	1088.6658	1498.0516	0	229.54
8	4436	192.5714	-12.45823	1120.4752	1570.953	0	237.46
9	4436	195.14285	- 12.887845	1147.2858	1637.0134	0	245.46
10	4436	197.7143	- 13.238745	1169.1468	1696.0813	0	253.38
11	4436	199.5	- 13.444815	1182.0649	1732.7996	0	258.82
12	4436	200.25	-13.51788	1185.3185	1557.1421	0	259.85
13	4436	200.75	-13.56222	1187.9581	1593.4093	0	258.9
14	4436	202.45	-13.67946	1195.6005	1583.4102	0	255.29
15	4436	205.35	-13.82252	426.18747	1554.1747	0	248.37
16	4436	208.35	- 13.866795	428.77336	1475.0294	0	240.25
17	4436	211.45	- 13.805535	424.95785	1345.1465	0	231.21
18	4436	214.32	-13.65387	415.47662	1228.5579	0	222.55
19	4436	216.96	- 13.426565	401.3113	1127.2442	0	214.57
20	4436	219.6	- 13.117835	382.043	1017.78	0	206.83
21	4436	222.24	-12.7268	357.63174	900.2752	0	199.55
22	4436	224.88	-12.25233	328.00122	774.89237	0	192.96
23	4436	227.43	- 11.714925	294.44306	682.44192	0	190
24	4436	229.89	-11.11871	257.21388	622.96908	0	190
25	4436	232.35	- 10.445815	215.19997	555.90396	0	190
26	4436	234.81	-9.694366	168.28979	480.97723	0	190

3/19/2012

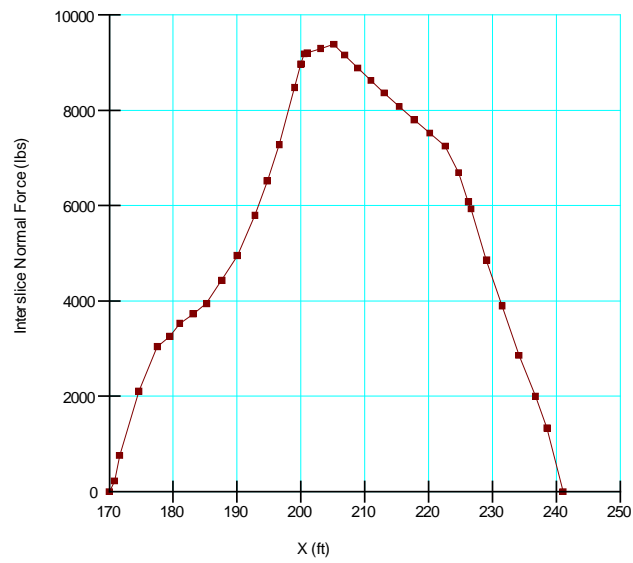
3/19/2012

27	4436	237.27	- 8.8621995	116.34852	397.95475	0	190
28	4436	240.29375	- 7.7128235	44.614293	288.20683	0	190
29	4436	243.1831	- 6.5183325	- 29.930113	262.28956	0	500
30	4436	245.3743	- 5.5183325	-92.33426	183.97546	0	500

Base Normal Stress Vs. X



Interslice Normal Stress Vs. X



Global Stability (Block) EL-6 to EL-14

Report generated using GeoStudio 2007, version 7.15. Copyright © 1991-2009 GEO-SLOPE International Ltd.

File Information

Created By: Liljegren, James
Revision Number: 375
Last Edited By: Curran, Matthew MVN
Date: 3/8/2013
Time: 11:14:17 AM
File Name: Reach 34.gsz
Directory: C:\Users\B2EDFMJC\Desktop\Chrono Order\Reach 34 SlopeW\
Last Solved Date: 3/8/2013
Last Solved Time: 11:30:46 AM

Project Settings

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

Analysis Settings

Global Stability (Block) EL-6 to EL-14

Kind: [SLOPE/W](#)
Parent: [Seepage Analysis: Rem](#)
Method: [Spencer](#)
Settings
 PWP Conditions Source: [Parent Analysis](#)
SlipSurface
 Direction of movement: [Left to Right](#)
 Use Passive Move: [No](#)
 Slip Surface Option: [Block](#)
 Critical slip surfaces saved: [1](#)
 Optimize Critical Slip Surface Location: [Yes](#)
Tension Crack
 Tension Crack Option: [Search for Tension Crack](#)
 Percentage Wet: [1](#)
 Tension Crack Fluid Unit Weight: [62.4 pcf](#)
FOS Distribution

FOS Calculation Option: [Constant](#)
Restrict Block Crossing: [Yes](#)
Advanced
 Number of Slices: [30](#)
 Optimization Tolerance: [0.01](#)
 Minimum Slip Surface Depth: [0.1 ft](#)
 Optimization Maximum Iterations: [5000](#)
 Optimization Convergence Tolerance: [1e-007](#)
 Starting Optimization Points: [8](#)
 Ending Optimization Points: [16](#)
 Complete Passes per Insertion: [1](#)
 Driving Side Maximum Convex Angle: [5 °](#)
 Resisting Side Maximum Convex Angle: [1 °](#)

Materials

EMBANKMENT FILL, EL. +2.7 TO 0

Model: [Undrained \(Phi=0\)](#)
Unit Weight: [112 pcf](#)
Cohesion: [600 psf](#)

MARSH, EL. -3.5 to -14

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

BEACH SAND, EL. -10 TO -46

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

BAY SOUND CLAY, EL. -46 TO -63

Model: [Spatial Mohr-Coulomb](#)
Unit Weight: [107 pcf](#)
Cohesion Spatial Fn: [Bay Sound](#)
Phi: [0 °](#)
Phi-B: [0 °](#)

Silted-in Layer

Model: [Mohr-Coulomb](#)
Unit Weight: [90 pcf](#)
Cohesion: [0 psf](#)
Phi: [20 °](#)

Phi-B: [0 °](#)

Fill, EL -4.8 to -7 (Protected Side)

Model: [Undrained \(Phi=0\)](#)
Unit Weight: [84 pcf](#)
Cohesion: [500 psf](#)

Sheet Pile

Model: [Undrained \(Phi=0\)](#)
Unit Weight: [0.1 pcf](#)
Cohesion: [0.01 psf](#)

Fill 2 EL. 0 to -3.5

Model: [Spatial Mohr-Coulomb](#)
Weight Fn: [Fill2](#)
Cohesion Fn: [Fill 2](#)
Phi: [0 °](#)
Phi-B: [0 °](#)

Marsh EL. -7 to -14 (Protected)

Model: [Undrained \(Phi=0\)](#)
Unit Weight: [94 pcf](#)
Cohesion: [200 psf](#)

PLEISTOCENE CLAY, EL. -63 TO -70

Model: [Spatial Mohr-Coulomb](#)
Unit Weight: [122 pcf](#)
Cohesion Spatial Fn: [Bay Sound](#)
Phi: [0 °](#)
Phi-B: [0 °](#)

Slip Surface Limits

Left Coordinate: [\(148.6, -12\) ft](#)
Right Coordinate: [\(310, -5.8\) ft](#)

Slip Surface Block

Left Grid
 Upper Left: [\(195, -6\) ft](#)
 Lower Left: [\(195, -14\) ft](#)
 Lower Right: [\(210, -14\) ft](#)
 X Increments: [3](#)
 Y Increments: [8](#)
 Starting Angle: [140 °](#)
 Ending Angle: [160 °](#)
 Angle Increments: [5](#)

Right Grid
 Upper Left: [\(215, -6\) ft](#)
 Lower Left: [\(215, -14\) ft](#)
 Lower Right: [\(265, -14\) ft](#)
 X Increments: [25](#)
 Y Increments: [8](#)
 Starting Angle: [20 °](#)
 Ending Angle: [45 °](#)
 Angle Increments: [5](#)

Cohesion Functions

Fill 2

Model: [Spline Data Point Function](#)
Function: [Cohesion vs. X](#)
 Curve Fit to Data: [100 %](#)
 Segment Curvature: [0 %](#)
Y-Intercept: [500](#)
Data Points: [X \(ft\), Cohesion \(psf\)](#)
 Data Point: [\(180.4, 500\)](#)
 Data Point: [\(200, 600\)](#)
 Data Point: [\(227, 500\)](#)

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: [\(10000, 5773\)](#)
Estimation Properties
 Intact Rock Param.: [10](#)
 Geological Strength: [100](#)
 Disturbance Factor: [0](#)
 SigmaC: [600000 psf](#)
 Sigma3: [300000 psf](#)
 Num. Points: [20](#)

Unit Weight Functions

Fill2
Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 84
Data Points: X (ft), Unit Weight (pcf)
Data Point: (180.4, 84)
Data Point: (200, 98)
Data Point: (227, 84)

Spatial Functions

Marsh Cohesion
Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (180.4, -3.5, 200)
Data Point: (180.4, -14, 200)
Data Point: (200, -3.5, 260)
Data Point: (200, -14, 340)
Data Point: (227, -7, 200)
Data Point: (227, -14, 200)

Marsh Gamma
Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Unit Weight (pcf)
Data Point: (180.4, -7, 94)
Data Point: (180.4, -14, 94)
Data Point: (200, -3.5, 102)
Data Point: (200, -14, 102)
Data Point: (227, -7, 94)
Data Point: (227, -14, 94)

Bay Sound
Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (0, -46, 600)
Data Point: (0, -70, 880)
Data Point: (180.4, -46, 600)
Data Point: (180.4, -70, 880)
Data Point: (200, -46, 665)

Data Point: (200, -70, 905)
Data Point: (227, -46, 600)
Data Point: (227, -70, 880)
Data Point: (310, -46, 600)
Data Point: (310, -70, 880)

Regions

	Material	Points	Area (ft²)
Region 1	BEACH SAND, EL. -10 TO -46	21,17,42,35,12,6,38,5,36	4299.05
Region 2	BAY SOUND CLAY, EL. -46 TO -63	5,38,6,44,43	2743.8
Region 3	Sheet Pile	19,20,11,18	7.7
Region 4	EMBANKMENT FILL, EL. +2.7 TO 0	23,18,37,1,13	20.85
Region 5	EMBANKMENT FILL, EL. +2.7 TO 0	18,11,9,45,26,23	18.291285
Region 6	Fill 2 EL. 0 to -3.5	23,22,24,13	53.9
Region 7	Fill 2 EL. 0 to -3.5	23,26,25,2,30,22	104.20037
Region 8	MARSH, EL. -3.5 to -14	22,24,27,34,28,29,17	220.58209
Region 9	MARSH, EL. -3.5 to -14	22,17,42,31,30	236.25
Region 10	Fill, EL. -4.8 to -7 (Protected Side)	2,3,4,32,30	108.55
Region 11	Marsh EL. -7 to -14 (Protected)	30,32,33,31	581
Region 12	BEACH SAND, EL. -10 TO -46	31,33,12,35,42	480.25
Region 13	BEACH SAND, EL. -10 TO -46	17,29,41,39,10,36,21	377.46778
Region 14	Silted-in Layer	10,16,15,14,34,40,41,39	77.761398
Region 15	Marsh EL. -7 to -14 (Protected)	41,40,34,28,29	80.694834
Region 16	PLEISTOCENE CLAY, EL. -63 TO -70	7,43,44,8	1129.8

Points

	X (ft)	Y (ft)
Point 1	195	2.5
Point 2	227	-4.8
Point 3	244.9	-5.8
Point 4	310	-5.8
Point 5	148.6	-46
Point 6	310	-46
Point 7	148.6	-70
Point 8	310	-70
Point 9	203.2	2.5

Point 10	148.6	-15.4
Point 11	201	2.5
Point 12	310	-19
Point 13	188.8	0
Point 14	168.6	-8.4
Point 15	158.5	-10.8
Point 16	148.6	-12
Point 17	200	-14
Point 18	200	2.7
Point 19	200	12.9
Point 20	200.5	12.9
Point 21	200	-21.5
Point 22	200	-3.5
Point 23	200	0
Point 24	180.4	-3.5
Point 25	222.76443	-3.5
Point 26	211.35185	0
Point 27	177.25465	-4.8
Point 28	180.4	-7
Point 29	180.4	-14
Point 30	227	-7
Point 31	227	-14
Point 32	310	-7
Point 33	310	-14
Point 34	171.9657	-7
Point 35	227	-19
Point 36	148.6	-21.5
Point 37	199	2.7
Point 38	200	-46
Point 39	158.5	-14.2
Point 40	168.6	-12.4
Point 41	159.62222	-14
Point 42	200.9	-14
Point 43	148.6	-63
Point 44	310	-63
Point 45	205.5	1.795

Point 46	205.5	-55
----------	-------	-----

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.34	(210.06, -3.04)	23.19818	(180.496, -3.46001)	(238.826, -5.46067)
2	31389	1.38	(210.06, -3.04)	23.587	(180.317, -3.53433)	(239.706, -5.5098)

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	181.7438	3.879965	741.28227	658.18756	0	204.31
2	Optimized	184.17995	-4.69988	792.37571	759.91666	0	213.33
3	Optimized	186.22625	5.4549065	839.48312	833.18255	0	222.26
4	Optimized	187.9421	6.1650395	883.74863	921.28277	0	230.9
5	Optimized	189.51975	-6.817998	924.47935	1010.8745	0	239.68
6	Optimized	191.08685	7.5536275	970.4218	1079.7319	0	249.55
7	Optimized	192.7815	8.4291025	1025.0506	1197.2205	0	261.63
8	Optimized	194.3144	-9.274896	1077.8463	1279.2649	0	273.83
9	Optimized	196	10.27813	1140.4371	1407.8123	0	288.86

			6				
10	Optimize d	198	- 11.46850 5	1214.7676	1526.1397	0	308.39
11	Optimize d	199.0664	-12.1032	1254.4055	1592.0205	0	319.57
12	Optimize d	199.56305	-12.40091	1273.0374	1618.4993	0	324.97
13	Optimize d	199.99665	- 12.65975 5	1289.1723	1845.3751	0	329.77
14	Optimize d	200.25	- 12.70854 5	1285.0075	1250.6979	0	328.92
15	Optimize d	200.75	-12.80484	1290.1726	1519.5575	0	327.18
16	Optimize d	202.1	-13.06483	1308.0102	1532.521	0	322.37
17	Optimize d	204.35	-13.49814	1337.638	1525.0636	0	314.05
18	Optimize d	205.56615	-13.73235	1137.0797	1500.9155	0	309.4
19	Optimize d	206.88105	- 13.87254 5	379.43911	1504.6435	0	303.53
20	Optimize d	208.9353	-14	387.15965	1481.3642	0	293.67
21	Optimize d	210.54635	-14	387.15965	1415.3189	0	285.32
22	Optimize d	212.79645	-14	387.13943	1331.9881	0	273.65
23	Optimize d	215.12935	- 13.99997 5	387.14572	1252.0072	0	261.55
24	Optimize d	216.9061	- 13.99992 5	387.13447	1192.0099	0	252.34
25	Optimize d	218.68285	- 13.99987	387.12321	1132.8568	0	243.13

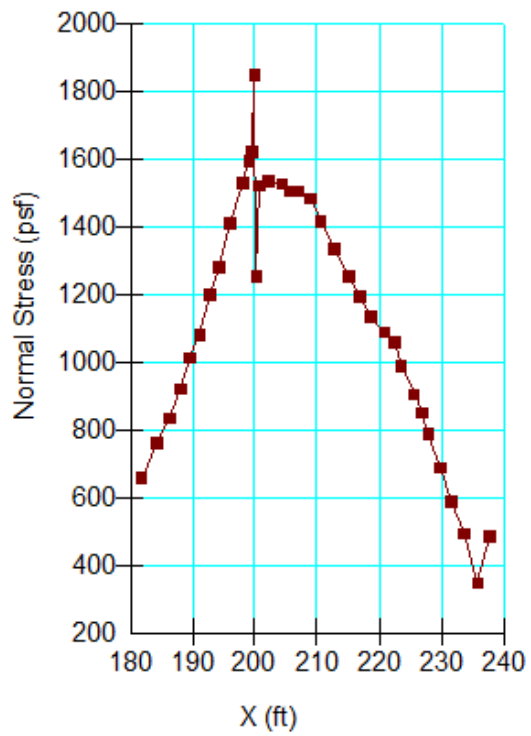
			5				
26	Optimize d	220.7873	-13.86813	378.9228	1088.9314	0	231.9
27	Optimize d	222.3839	-13.65039	365.35785	1054.9171	0	223.31
28	Optimize d	223.59395	-13.37684	348.30036	986.82064	0	216.82
29	Optimize d	225.57785	-12.7781	310.95653	902.25582	0	206.66
30	Optimize d	226.8661	-12.30218	281.2544	849.74491	0	200.6
31	Optimize d	227.9254	- 11.79019 5	249.31019	788.22474	0	200
32	Optimize d	229.7762	-10.89565	193.47821	687.62308	0	200
33	Optimize d	231.627	- 10.00110 5	137.6365	587.02141	0	200
34	Optimize d	233.62905	- 8.915372 5	69.859873	493.40108	0	200
35	Optimize d	235.8328	- 7.608537 5	-11.71073	346.52557	0	200
36	Optimize d	237.89295	-6.200415	-99.594659	484.57811	0	500

Slices of Slip Surface: 31389

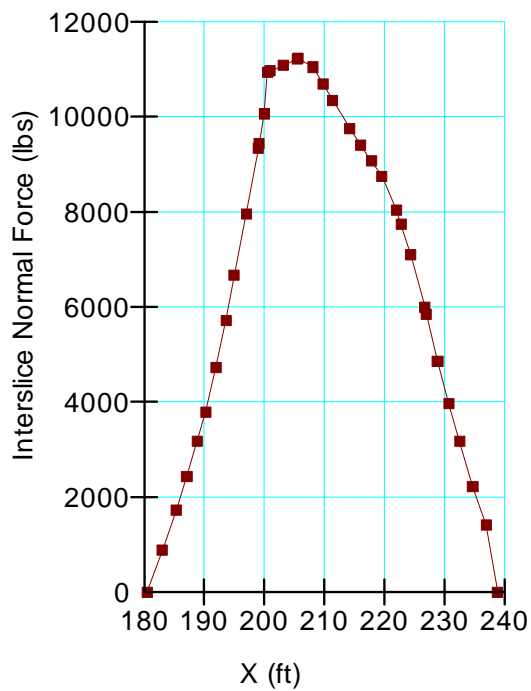
	Slip Surfac e	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictiona l Strength (psf)	Cohesiv e Strength (psf)
1	31389	180.35845	- 3.556412 5	721.11623	574.40132	0	200
2	31389	181.45	-4.13679	757.27475	635.04957	0	203.47
3	31389	183.55	-5.25338	826.90148	754.92023	0	211.79
4	31389	185.65	-6.36997	896.57025	878.49085	0	221.93

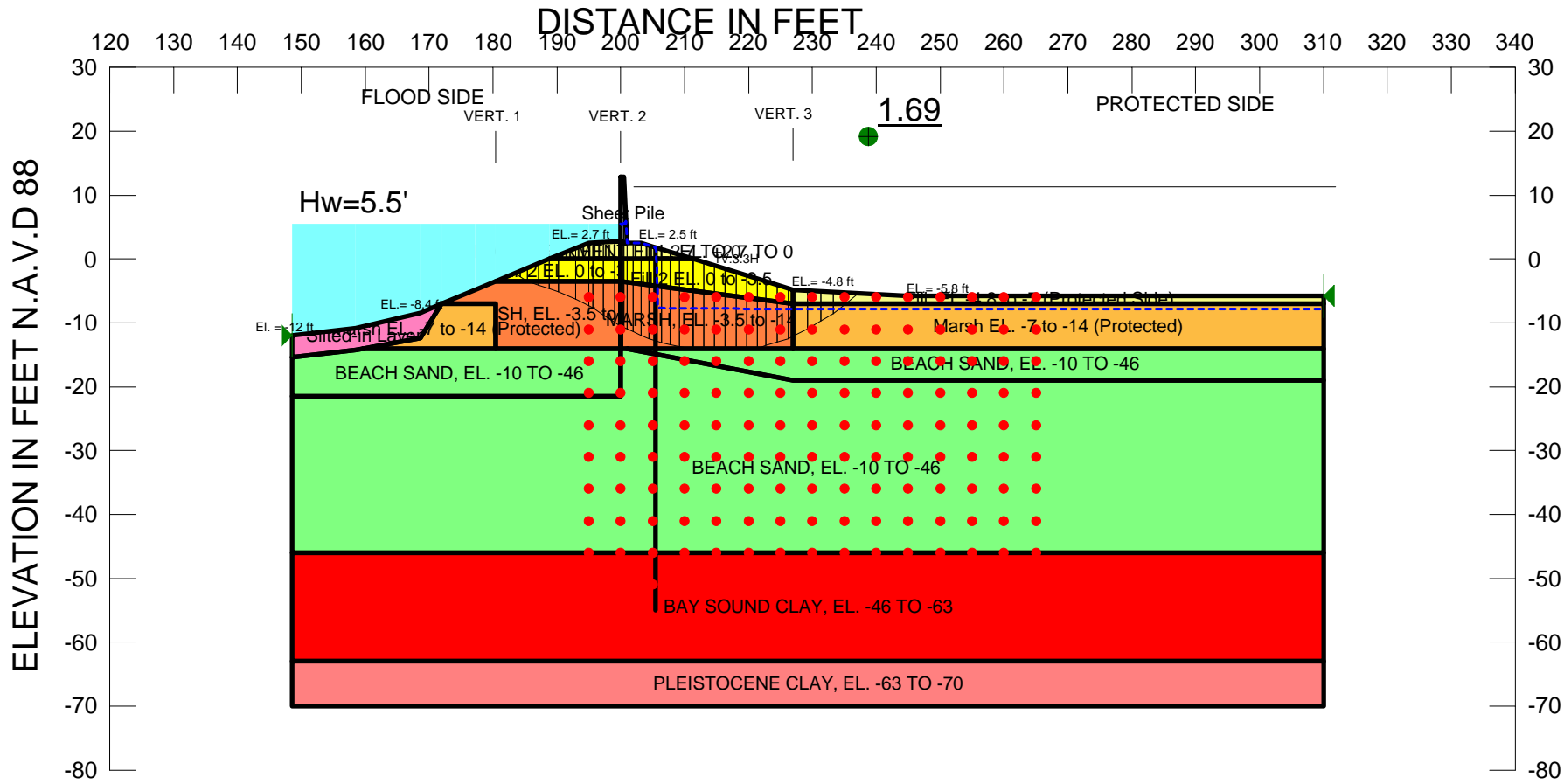
5	31389	187.75	- 7.486559 5	966.19698	1005.8035	0	233.89
6	31389	189.83335	8.594287 5	1035.3129	1144.4709	0	247.56
7	31389	191.9	- 9.693155 5	1103.8838	1290.7126	0	262.89
8	31389	193.96665	-10.79202	1172.4546	1438.236	0	279.99
9	31389	196	-11.87316	1239.9234	1584.4054	0	298.53
10	31389	198	-12.93658	1306.321	1694.3324	0	318.44
11	31389	199.5	- 13.73414 5	1356.1193	1778.7863	0	334.45
12	31389	200.25	-14	1372.52	1476.5	0	338.7
13	31389	200.7	-14	1372.475	1735.275	0	336.37
14	31389	200.95	-14	1372.5	1727.6	0	335.07
15	31389	202.1	-14	1372.4545	1719.3636	0	329.11
16	31389	204.35	-14	1372.3913	1665.913	0	317.44
17	31389	206.4753	-14	387.18518	1579.449	0	306.42
18	31389	208.4259	-14	387.16468	1499.8331	0	296.31
19	31389	210.37655	-14	387.15955	1420.0122	0	286.2
20	31389	212.3029	-14	387.15691	1346.9345	0	276.21
21	31389	214.20495	-14	387.1464	1281.4278	0	266.34
22	31389	216.10705	-14	387.14114	1216.8675	0	256.48
23	31389	218.00915	-14	387.13588	1153.2535	0	246.62
24	31389	219.91125	-14	387.13062	1090.5858	0	236.76
25	31389	221.81335	-14	387.12011	1028.8645	0	226.89
26	31389	223.8822	-14	387.1138	962.79696	0	216.17
27	31389	226	-13.42265	351.12135	1018.6191	0	204.95
28	31389	228.01245	-12.26077	278.65122	857.31271	0	200
29	31389	230.0373	-11.09171	205.69945	726.18172	0	200
30	31389	232.06215	-9.92265	132.73485	595.05072	0	200
31	31389	234.08705	-8.75359	59.757412	463.91973	0	200
32	31389	236.11195	-7.58453	-13.211469	332.76735	0	200
33	31389	238.41495	-6.254901	-96.198626	366.39426	0	500

Base Normal Stress Vs. X



Interslice Normal Stress
Vs. X





Name: EMBANKMENT FILL, EL. +2.7 TO 0 Model: Undrained (Phi=0) Unit Weight: 112 pcf Cohesion: 600 psf

Name: MARSH, EL. -3.5 to -14 Model: Spatial Mohr-Coulomb Weight Spatial Fn: Marsh Gamma Cohesion Spatial Fn: Marsh Cohesion Phi: 0 °

Name: BEACH SAND, EL. -10 TO -46 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand

Name: BAY SOUND CLAY, EL. -46 TO -63 Model: Spatial Mohr-Coulomb Unit Weight: 107 pcf Cohesion Spatial Fn: Bay Sound Phi: 0 °

Name: Silted-in Layer Model: Mohr-Coulomb Unit Weight: 90 pcf Cohesion: 0 psf Phi: 20 °

Name: Fill, EL -4.8 to -7 (Protected Side) Model: Undrained (Phi=0) Unit Weight: 84 pcf Cohesion: 500 psf

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

Name: Fill 2 EL. 0 to -3.5 Model: Spatial Mohr-Coulomb Weight Fn: Fill2 Cohesion Fn: Fill 2 Phi: 0 °

Name: Marsh EL. -7 to -14 (Protected) Model: Undrained (Phi=0) Unit Weight: 94 pcf Cohesion: 200 psf

Name: PLEISTOCENE CLAY, EL. -63 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 122 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.



LONDON AVE CANAL
OUTFALL CANAL REEVALUATION REPORT
REACH 34, STA. 93+00 TO 99+53
PROTECTED SIDE STABILITY ANALYSIS,
1% FLOWLINE WATER EL +5.5
CASE: Global Stability (Block)
MARCH 2012

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

Global Stability (Block)

Report generated using GeoStudio 2007, version 7.15. Copyright © 1991-2009 GEO-SLOPE International Ltd.

File Information

Created By: [Liljegren, James](#)
Revision Number: 372
Last Edited By: [Schroeder, Danielle V MVN](#)
Date: 2/16/2012
Time: 1:34:39 PM
File Name: [Reach 34.gsz](#)
Directory: [G:\F&M\HOME\London Ave Reevaluation 2011\East Side\Reach 34 1% flowline\SlopeW\](#)
Last Solved Date: 2/16/2012
Last Solved Time: 1:55:58 PM

Project Settings

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

Analysis Settings

Global Stability (Block)

Kind: [SLOPE/W](#)
Parent: [Seepage Analysis: Rem](#)
Method: [Spencer](#)
Settings
 PWP Conditions Source: [Parent Analysis](#)
SlipSurface
 Direction of movement: [Left to Right](#)
 Use Passive Mode: [No](#)
 Slip Surface Option: [Block](#)
 Critical slip surfaces saved: [1](#)
 Optimize Critical Slip Surface Location: [Yes](#)
 Tension Crack
 Tension Crack Option: [Search for Tension Crack](#)
 Percentage Wet: [1](#)
 Tension Crack Fluid Unit Weight: [62.4 pcf](#)
FOS Distribution
 FOS Calculation Option: [Constant](#)
Restrict Block Crossing: [Yes](#)
Advanced

3/9/2012

Sheet Pile

Model: [Undrained \(Phi=0\)](#)
Unit Weight: [0.1 pcf](#)
Cohesion: [0.01 psf](#)

Fill 2 EL. 0 to -3.5

Model: [Spatial Mohr-Coulomb](#)
Weight Fn: [Fill2](#)
Cohesion Fn: [Fill 2](#)
Phi: [0 °](#)
Phi-B: [0 °](#)

Marsh EL. -7 to -14 (Protected)

Model: [Undrained \(Phi=0\)](#)
Unit Weight: [94 pcf](#)
Cohesion: [200 psf](#)

PLEISTOCENE CLAY, EL. -63 TO -70

Model: [Spatial Mohr-Coulomb](#)
Unit Weight: [122 pcf](#)
Cohesion Spatial Fn: [Bay Sound](#)
Phi: [0 °](#)
Phi-B: [0 °](#)

Slip Surface Limits

Left Coordinate: [\(148.6, -12\) ft](#)
Right Coordinate: [\(310, -5.8\) 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: [120 °](#)
 Ending Angle: [150 °](#)
 Angle Increments: [6](#)
Right Grid
 Upper Left: [\(215, -6\) ft](#)
 Lower Left: [\(215, -51\) ft](#)
 Lower Right: [\(265, -51\) ft](#)
 X Increments: [10](#)
 Y Increments: [9](#)
 Starting Angle: [20 °](#)
 Ending Angle: [45 °](#)
 Angle Increments: [5](#)

3/9/2012

Number of Slices: [30](#)
Optimization Tolerance: [0.01](#)
Minimum Slip Surface Depth: [0.1 ft](#)
Optimization Maximum Iterations: [5000](#)
Optimization Convergence Tolerance: [1e-007](#)
Starting Optimization Points: [8](#)
Ending Optimization Points: [16](#)
Complete Passes per Insertion: [1](#)
Driving Side Maximum Convex Angle: [5 °](#)
Resisting Side Maximum Convex Angle: [1 °](#)

Materials

EMBANKMENT FILL, EL. +2.7 TO 0

Model: [Undrained \(Phi=0\)](#)
Unit Weight: [112 pcf](#)
Cohesion: [600 psf](#)

MARSH, EL. -3.5 to -14

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

BEACH SAND, EL. -10 TO -46

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

BAY SOUND CLAY, EL. -46 TO -63

Model: [Spatial Mohr-Coulomb](#)
Unit Weight: [107 pcf](#)
Cohesion Spatial Fn: [Bay Sound](#)
Phi: [0 °](#)
Phi-B: [0 °](#)

Silted-in Layer

Model: [Mohr-Coulomb](#)
Unit Weight: [90 pcf](#)
Cohesion: [0 psf](#)
Phi: [20 °](#)
Phi-B: [0 °](#)

Fill, EL -4.8 to -7 (Protected Side)

Model: [Undrained \(Phi=0\)](#)
Unit Weight: [84 pcf](#)
Cohesion: [500 psf](#)

3/9/2012

Cohesion Functions

Fill 2

Model: [Spline Data Point Function](#)
Function: [Cohesion vs. X](#)
 Curve Fit to Data: [100 %](#)
 Segment Curvature: [0 %](#)
Y-Intercept: [500](#)
Data Points: [X \(ft\), Cohesion \(psf\)](#)
 Data Point: [\(180.4, 500\)](#)
 Data Point: [\(200, 600\)](#)
 Data Point: [\(227, 500\)](#)

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: [\(10000, 5773\)](#)
Estimation Properties
 Intact Rock Param.: [10](#)
 Geological Strength: [100](#)
 Disturbance Factor: [0](#)
 SigmaC: [600000 psf](#)
 Sigma3: [300000 psf](#)
 Num. Points: [20](#)

Unit Weight Functions

Fill2

Model: [Spline Data Point Function](#)
Function: [Unit Weight vs. X](#)
 Curve Fit to Data: [100 %](#)
 Segment Curvature: [0 %](#)
Y-Intercept: [84](#)
Data Points: [X \(ft\), Unit Weight \(pcf\)](#)
 Data Point: [\(180.4, 84\)](#)
 Data Point: [\(200, 98\)](#)
 Data Point: [\(227, 84\)](#)

3/9/2012

Spatial Functions

Marsh Cohesion

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (180.4, -3.5, 200)
Data Point: (180.4, -14, 200)
Data Point: (200, -3.5, 260)
Data Point: (200, -14, 340)
Data Point: (227, -7, 200)
Data Point: (227, -14, 200)

Marsh Gamma

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Unit Weight (pcf)
Data Point: (180.4, -7, 94)
Data Point: (180.4, -14, 94)
Data Point: (200, -3.5, 102)
Data Point: (200, -14, 102)
Data Point: (227, -7, 94)
Data Point: (227, -14, 94)

Bay Sound

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (0, -46, 600)
Data Point: (0, -70, 880)
Data Point: (180.4, -46, 600)
Data Point: (180.4, -70, 880)
Data Point: (200, -46, 665)
Data Point: (200, -70, 905)
Data Point: (227, -46, 600)
Data Point: (227, -70, 880)
Data Point: (310, -46, 600)
Data Point: (310, -70, 880)

Regions

	Material	Points	Area (ft²)
Region 1	BEACH SAND, EL. -10 TO -46	21,17,42,35,12,6,38,5,36	4299.05
Region 2	BAY SOUND CLAY, EL. -46 TO -63	5,38,6,44,43	2743.8
Region 3	Sheet Pile	19,20,11,18	7.7
Region 4	EMBANKMENT FILL, EL. +2.7 TO 0	23,18,37,1,13	20.85
Region 5	EMBANKMENT FILL, EL. +2.7 TO 0	18,11,9,45,26,23	18.291285

Region 6	Fill 2 EL. 0 to -3.5	23,22,24,13	53.9
Region 7	Fill 2 EL. 0 to -3.5	23,26,25,2,30,22	104.20037
Region 8	MARSH, EL. -3.5 to -14	22,24,27,34,28,29,17	220.58209
Region 9	MARSH, EL. -3.5 to -14	22,17,42,31,30	236.25
Region 10	Fill, EL. -4.8 to -7 (Protected Side)	2,3,4,32,30	108.55
Region 11	Marsh EL. -7 to -14 (Protected)	30,32,33,31	581
Region 12	BEACH SAND, EL. -10 TO -46	31,33,12,35,42	480.25
Region 13	BEACH SAND, EL. -10 TO -46	17,29,41,39,10,36,21	377.46778
Region 14	Silted-in Layer	10,16,15,14,34,40,41,39	77.761398
Region 15	Marsh EL. -7 to -14 (Protected)	41,40,34,28,29	80.694834
Region 16	PLEISTOCENE CLAY, EL. -63 TO -70	7,43,44,8	1129.8

Points

	X (ft)	Y (ft)
Point 1	195	2.5
Point 2	227	-4.8
Point 3	244.9	-5.8
Point 4	310	-5.8
Point 5	148.6	-46
Point 6	310	-46
Point 7	148.6	-70
Point 8	310	-70
Point 9	203.2	2.5
Point 10	148.6	-15.4
Point 11	201	2.5
Point 12	310	-19
Point 13	188.8	0
Point 14	168.6	-8.4
Point 15	158.5	-10.8
Point 16	148.6	-12
Point 17	200	-14
Point 18	200	2.7
Point 19	200	12.9
Point 20	200.5	12.9
Point 21	200	-21.5
Point 22	200	-3.5
Point 23	200	0
Point 24	180.4	-3.5
Point 25	222.76443	-3.5
Point 26	211.35185	0
Point 27	177.25465	-4.8
Point 28	180.4	-7
Point 29	180.4	-14

3/9/2012

3/9/2012

Point 30	227	-7
Point 31	227	-14
Point 32	310	-7
Point 33	310	-14
Point 34	171.9657	-7
Point 35	227	-19
Point 36	148.6	-21.5
Point 37	199	2.7
Point 38	200	-46
Point 39	158.5	-14.2
Point 40	168.6	-12.4
Point 41	159.62222	-14
Point 42	200.9	-14
Point 43	148.6	-63
Point 44	310	-63
Point 45	205.5	1.795
Point 46	205.5	-55

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.69	(208.955, -1.087)	22.13846	(183.406, -2.24742)	(237.252, -5.37273)
2	2722	1.97	(208.955, -1.087)	19.796	(184.239, -1.9004)	(233.348, -5.15464)

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	184.41035	-2.8603315	521.65723	347.5009	0	520.46
2	Optimized	186.281	-3.7614455	577.83212	579.6938	0	218.6
3	Optimized	187.97375	-4.324477	612.96922	654.77171	0	225.61
4	Optimized	189.53415	-4.8434965	645.33515	732.44829	0	232.73
5	Optimized	191.6082	-5.66707	696.71433	834.37202	0	243.75
6	Optimized	193.97405	-6.797951	767.3024	967.46638	0	258.96
7	Optimized	195.29635	-7.508746	811.67082	1065.2706	0	268.81
8	Optimized	196.4445	-8.2238745	856.32389	1105.9457	0	278.58
9	Optimized	198.14815	-9.3355435	925.68515	1216.7468	0	294.59
10	Optimized	199.4998	-10.217499	980.76507	1305.1733	0	308.34
11	Optimized	199.9998	-10.54371	1001.121	1408.9098	0	313.67

12	Optimized	200.25	-10.65173	996.39408	1193.3079	0	313.35
13	Optimized	200.75	-10.867585	1008.3844	1255.4631	0	312.69
14	Optimized	201.47525	-11.180685	1029.0598	1276.9073	0	311.67
15	Optimized	202.57525	-11.654255	1060.2947	1318.6215	0	309.95
16	Optimized	203.80865	-12.184135	1095.3255	1344.1739	0	307.78
17	Optimized	204.95865	-12.633145	1124.9772	1371.4423	0	305.23
18	Optimized	205.94935	-12.976335	324.90243	1367.0253	0	302.59
19	Optimized	207.08035	-13.285875	343.56214	1393.3667	0	298.89
20	Optimized	208.4437	-13.59362	362.21525	1370.3276	0	293.84
21	Optimized	210.1832	-13.864485	378.78008	1365.7093	0	286.46
22	Optimized	211.29645	-13.98148	385.96934	1368.3499	0	281.33
23	Optimized	212.18685	-13.98147	385.96874	1337.2433	0	276.72
24	Optimized	213.85675	-13.98145	385.96275	1279.9953	0	268.07
25	Optimized	215.52665	-13.981425	385.95077	1223.5258	0	259.42
26	Optimized	217.1966	-13.9814	385.94478	1167.7749	0	250.77
27	Optimized	218.86655	-13.98138	385.93879	1112.6827	0	242.12
28	Optimized	220.53645	-13.98136	385.92682	1058.369	0	233.47
29	Optimized	222.0679	-13.76811	372.6442	1067.9337	0	225.13
30	Optimized	223.64135	-13.28639	342.61583	967.10301	0	216.46
31	Optimized	225.39525	-12.74943	309.12514	856.26698	0	207.5
32	Optimized	226.6361	-12.29138	280.53858	819.18191	0	201.63
33	Optimized	228.14155	-11.50712	231.60535	722.74948	0	200
34	Optimized	230.2887	-10.31082	156.93883	607.89742	0	200
35	Optimized	232.2999	-9.1076	81.833822	476.13724	0	200
36	Optimized	234.25395	-7.752995	-2.713238	363.26935	0	200
37	Optimized	236.22715	-6.186367	-100.4885	378.30491	0	500

Slices of Slip Surface: 2722

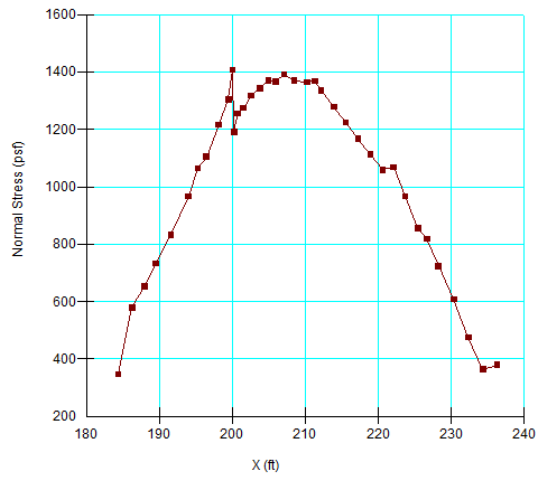
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	2722	184.93165	-2.3003015	486.70979	335.78437	0	523.12
2	2722	186.31695	-3.1001005	536.57231	416.26709	0	530.19
3	2722	187.9048	-4.0168385	593.75414	581.85487	0	224.48

3/9/2012

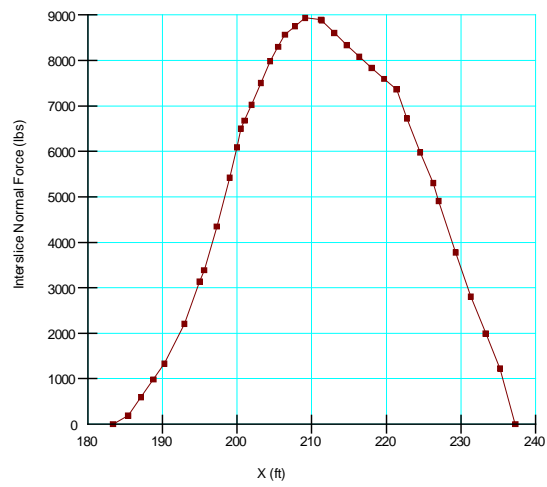
3/9/2012

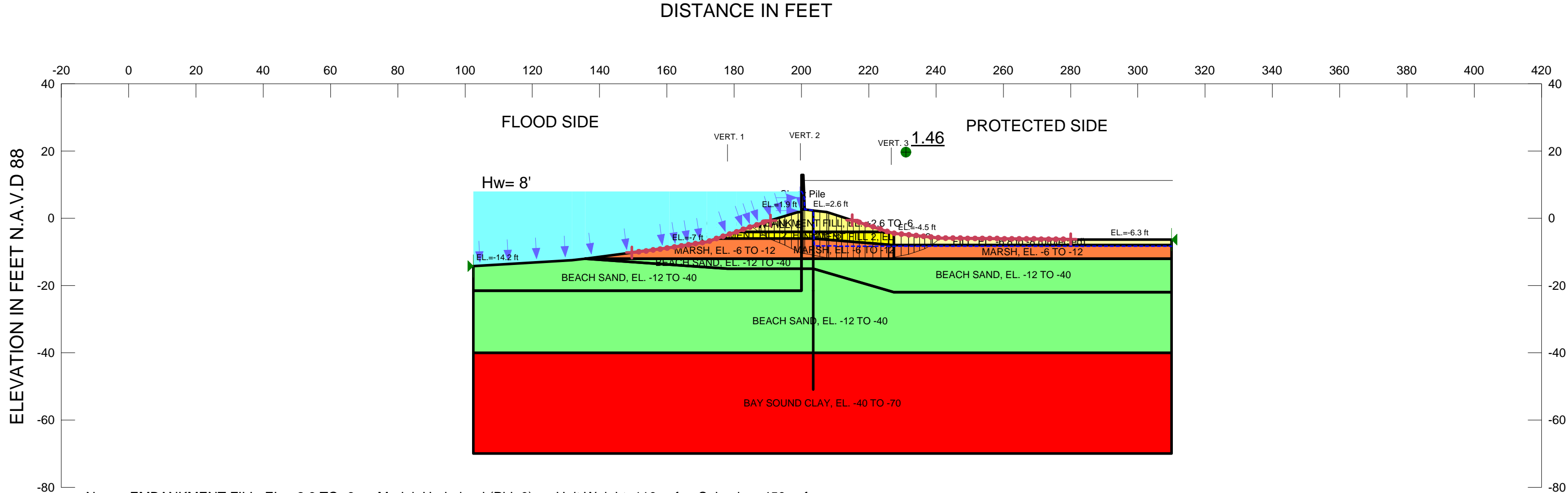
4	2722	189.575	- 4.9811235	653.93293	698.35165	0	233.37
5	2722	191.125	- 5.8760165	709.74966	813.50508	0	242.74
6	2722	192.675	- 6.7709095	765.62226	929.4966	0	253.18
7	2722	194.225	- 7.6658025	821.43899	1046.3262	0	264.71
8	2722	196	-8.690599	885.4244	1171.5592	0	279.23
9	2722	198	- 9.8452995	957.47772	1289.7284	0	297.29
10	2722	199.5	- 10.711325	1011.6039	1379.1449	0	312.01
11	2722	200.25	-11	1019.26	1362.28	0	315.99
12	2722	200.75	-11	1017.16	1411.24	0	313.68
13	2722	202.1	-11	1016.9545	1398.4545	0	307.47
14	2722	204.35	-11	1015.9565	1347.6522	0	297.18
15	2722	206.2315	-11	204.57797	1273.3063	0	288.64
16	2722	207.69445	-11	203.67569	1215.4101	0	282.04
17	2722	209.1574	-11	202.83493	1157.3088	0	275.49
18	2722	210.6204	-11	202.35645	1099.1392	0	268.97
19	2722	212.16705	-11	201.86841	1042.5861	0	262.14
20	2722	213.7974	-11	201.40839	988.24254	0	254.99
21	2722	215.4278	-11	201.07718	934.63504	0	247.9
22	2722	217.05815	-11	200.8441	881.70224	0	240.89
23	2722	218.6885	-11	200.59876	829.44413	0	233.95
24	2722	220.3189	-11	200.41475	777.92205	0	227.09
25	2722	221.94925	-11	200.27981	727.07467	0	220.32
26	2722	223.8822	-11	200.14582	667.6597	0	212.42
27	2722	226	- 10.299792	156.40071	670.72174	0	203.65
28	2722	227.92815	- 8.9496885	72.096832	492.47193	0	200
29	2722	229.78445	-7.649896	- 9.0577768	348.57834	0	200
30	2722	231.37145	-6.53866	- 78.426302	369.57214	0	500
31	2722	232.68915	- 5.6159795	- 136.02761	277.56918	0	500

Base Normal Stress Vs. X



Interslice Normal Stress Vs. X





Name: EMBANKMENT FILL, EL. +2.6 TO -6 Model: Undrained (Phi=0) Unit Weight: 110 pcf Cohesion: 450 psf
 Name: MARSH, EL. -6 TO -12 Model: Spatial Mohr-Coulomb Unit Weight: 88 pcf Cohesion Fn: Marsh Phi: 0 °
 Name: BEACH SAND, EL. -12 TO -40 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand
 Name: BAY SOUND CLAY, EL. -40 TO -70 Model: Spatial Mohr-Coulomb Weight Fn: Clay Cohesion Spatial Fn: CLAY Phi: 0 °
 Name: Sheet Pile Model: Undrained (Phi=0) Unit Weight: 0.1 pcf Cohesion: 0.01 psf
 Name: FILL, EL. -6.8 to -8 (protected) Model: Undrained (Phi=0) Unit Weight: 96 pcf Cohesion: 600 psf
 Name: EMBANKMENT FILL 2, EL. -4 to -6 Model: Undrained (Phi=0) Unit Weight: 88 pcf Cohesion: 450 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.

 $H_w = \text{CANAL WATER LEVEL}$ 

**US Army Corps
of Engineers®**

New Orleans District

LONDON AVE CANAL,
OUTFALL CANAL REEVALUATION REPORT
REACH 35A, STA. 102+42 TO 103+50 EAST
PROTECTED SIDE STABILITY ANALYSIS,
CASE: Global Stability (Entry/Exit)
MARCH 2012

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

Global Stability (Entry/Exit)

Report generated using GeoStudio 2007, version 7.15. Copyright © 1991-2009 GEO-SLOPE International Ltd.

File Information

Created By: Lijjegren, James
Revision Number: 378
Last Edited By: Middleton, Mark C MVN
Date: 1/24/2012
Time: 3:13:29 PM
File Name: Reach 35A.gsz
Directory: G:\F&MHOME\Middleton\London Ave Canal\Reach 35A\optimization check\
Last Solved Date: 1/24/2012
Last Solved Time: 3:16:08 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: Global Analysis (Seepage)
Method: Spencer
Settings
PWP Conditions Source: Parent Analysis
SlipSurface
Direction of movement: Left to Right
Use Passive Mode: No
Slip Surface Option: Entry and Exit
Critical slip surfaces saved: 1
Optimize Critical Slip Surface Location: Yes
Tension Crack
Tension Crack Option: (none)
FOS Distribution
FOS Calculation Option: Constant
Advanced
Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft

3/14/2012

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (149.59831, -10.22132) ft
Left-Zone Right Coordinate: (190.78638, -0.61437) ft
Left-Zone Increment: 20
Right Projection: Range
Right-Zone Left Coordinate: (215.08294, -0.53874) ft
Right-Zone Right Coordinate: (280.00506, -6.27223) ft
Right-Zone Increment: 30
Radius Increments: 20

Slip Surface Limits

Left Coordinate: (102.4, -14.2) ft
Right Coordinate: (310, -6.3) ft

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: (174.8, 150)
Data Point: (200, 275)
Data Point: (227.4, 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, 5773)
Estimation Properties
Intact Rock Param.: 10
Geological Strength: 100
Disturbance Factor: 0

3/14/2012

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. +2.6 TO -6

Model: Undrained (Phi=0)
Unit Weight: 110 pcf
Cohesion: 450 psf

MARSH, EL. -6 TO -12

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

BEACH SAND, EL. -12 TO -40

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

BAY SOUND CLAY, EL. -40 TO -70

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

Sheet Pile

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

FILL, EL. -6.8 to -8 (protected)

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

EMBANKMENT FILL 2, EL. -4 to -6

Model: Undrained (Phi=0)
Unit Weight: 88 pcf
Cohesion: 450 psf

3/14/2012

SigmaC: 600000 psf
Sigma3: 300000 psf
Num. Points: 20

Unit Weight Functions

Clay

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 107
Data Points: X (ft), Unit Weight (pcf)
Data Point: (103, 107)
Data Point: (174.8, 107)
Data Point: (200, 108)
Data Point: (227.4, 107)
Data Point: (310, 107)

Spatial Functions

CLAY

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (102.4, -40, 400)
Data Point: (102.4, -70, 700)
Data Point: (174.8, -40, 400)
Data Point: (174.8, -70, 700)
Data Point: (200, -40, 600)
Data Point: (200, -70, 900)
Data Point: (227.4, -40, 400)
Data Point: (227.4, -70, 700)
Data Point: (310, -40, 400)
Data Point: (310, -70, 700)

Regions

	Material	Points	Area (ft²)
Region 1	EMBANKMENT FILL, EL. +2.6 TO -6	2,35,31,36,41	61.349915
Region 2	EMBANKMENT FILL 2, EL. -4 to -6	40,4,25,11,14,36,37	78.311328
Region 3	BEACH SAND, EL. -12 TO -40	1,28,29,44,45,18,9,12	757.09176
Region 4	BEACH SAND, EL. -12 TO -40	12,9,18,22,16,20,6,5	3893.75
Region 5	BAY SOUND CLAY, EL. -40 TO -70	5,6,8,7	6228
Region 6	BEACH SAND, EL. -12 TO -40	18,17,21,15,19,20,16,22	991.85
Region 7	MARSH, EL. -6 TO -12	44,43,30,42,14,24,34,17	253.04524

3/14/2012

Region 8	MARSH, EL. -6 TO -12	17,34,24,14,11,25,15,21	140.5
Region 9	BEACH SAND, EL. -12 TO -40	44,17,18,45	129.44189
Region 10	MARSH, EL. -6 TO -12	15,25,26,19	330.4
Region 11	FILL, EL. -6.8 to -8 (protected)	4,25,26,27,38,39	163.94
Region 12	Sheet Pile	13,32,33,23	7.725
Region 13	EMBANKMENT FILL 2, EL. -4 to -6	42,41,36,14	44.47119
Region 14	EMBANKMENT FILL, EL. +2.6 TO -6	36,31,13,23,46,3,40,37	101.34367

Points

	X (ft)	Y (ft)
Point 1	102.4	-15
Point 2	189.2	-1.1
Point 3	207.5	1.9
Point 4	227.4	-4.5
Point 5	102.4	-40
Point 6	310	-40
Point 7	102.4	-70
Point 8	310	-70
Point 9	200	-21.5
Point 10	203.5	-21.5
Point 11	203.5	-6
Point 12	102.4	-21.5
Point 13	200	2.6
Point 14	200	-6
Point 15	227.4	-12
Point 16	227.4	-22
Point 17	200	-12
Point 18	200	-15
Point 19	310	-12
Point 20	310	-22
Point 21	203.5	-12
Point 22	203.5	-15
Point 23	201	2.6
Point 24	200	-7
Point 25	227.4	-8
Point 26	310	-8
Point 27	310	-6.3
Point 28	102.4	-14.2
Point 29	131.8	-12.5
Point 30	171.9	-7
Point 31	200	1.9
Point 32	200	12.9
Point 33	200.5	12.9

Point 34	200	-10
Point 35	199	1.9
Point 36	200	-4
Point 37	203.5	-4
Point 38	282.9	-6.3
Point 39	241.2	-5.9
Point 40	225.84531	-4
Point 41	180.69661	-4
Point 42	174.8322	-6
Point 43	160.7	-8.8
Point 44	135.70541	-12
Point 45	178	-15
Point 46	203.5	2.33077
Point 47	203.5	-51

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.46	(216.738, 47.842)	22.32252	(185.187, -2.46861)	(241.319, -5.90114)
2	11346	1.56	(216.738, 47.842)	59.753	(184.74, -2.62096)	(242.824, -5.91558)

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	186.32765	-3.2343055	700.99674	509.34268	0	450
2	Optimized	187.7171	-4.16703	759.15176	620.54174	0	450
3	Optimized	188.58295	-4.7733905	796.94556	667.10278	0	450
4	Optimized	189.7345	-5.5932755	848.09504	751.80894	0	450
5	Optimized	191.0906	-6.3233865	893.67261	984.10944	0	230.81
6	Optimized	192.70305	-7.009415	936.45465	1062.696	0	238.8
7	Optimized	194.2848	-7.6823585	978.45753	1139.7788	0	246.65
8	Optimized	196.05675	-8.4843005	1028.5425	1213.2271	0	255.44
9	Optimized	198.0189	-9.415241	1086.6507	1315.7222	0	265.17
10	Optimized	199.49785	-10.116916	1130.4854	1403.0576	0	272.51
11	Optimized	199.99785	-10.353505	1145.2649	1540.5011	0	274.99
12	Optimized	200.25	-10.398965	1139.9412	891.01453	0	273.86

3/14/2012

3/14/2012

13	Optimized	200.75	-10.489115	1144.3895	1257.4861	0	271.58
14	Optimized	202.25	-10.75955	1162.5765	1265.8318	0	264.74
15	Optimized	204.50155	-11.16548	180.79893	1274.7653	0	254.46
16	Optimized	206.50155	-11.514245	201.64695	1285.9777	0	245.34
17	Optimized	207.7734	-11.72849	214.6542	1283.4525	0	239.54
18	Optimized	209.2051	-11.875975	223.66553	1275.3674	0	233.01
19	Optimized	211.12385	-11.985455	230.38814	1244.2183	0	224.25
20	Optimized	212.75895	-11.992505	230.8078	1190.3108	0	216.79
21	Optimized	214.50825	-11.990515	230.6706	1127.3139	0	208.81
22	Optimized	216.25755	-11.98852	230.53912	1064.3741	0	200.83
23	Optimized	218.00685	-11.986525	230.40192	1001.4343	0	192.85
24	Optimized	220.05085	-11.98915	230.55472	927.18726	0	183.53
25	Optimized	222.43	-11.99651	231.00427	842.53282	0	172.67
26	Optimized	224.74255	-11.950655	228.13345	766.81649	0	162.12
27	Optimized	225.9283	-11.89733	224.79835	719.67732	0	156.71
28	Optimized	226.70565	-11.753755	215.84303	718.84144	0	153.17
29	Optimized	228.51285	-11.389775	193.12218	682.38235	0	150
30	Optimized	230.7386	-10.941505	165.14067	619.22245	0	150
31	Optimized	232.65265	-10.444655	134.12973	582.87325	0	150
32	Optimized	234.25495	-9.899225	100.08773	515.62818	0	150
33	Optimized	235.85725	-9.353795	66.045734	448.38312	0	150
34	Optimized	237.55195	-8.54054	15.291839	401.90753	0	150
35	Optimized	238.6703	-7.863985	-26.930319	583.39827	0	600
36	Optimized	240.04755	-6.8594035	-89.619569	543.72531	0	600
37	Optimized	241.2595	-5.9459895	-146.62444	431.26413	0	600

Slices of Slip Surface: **11346**

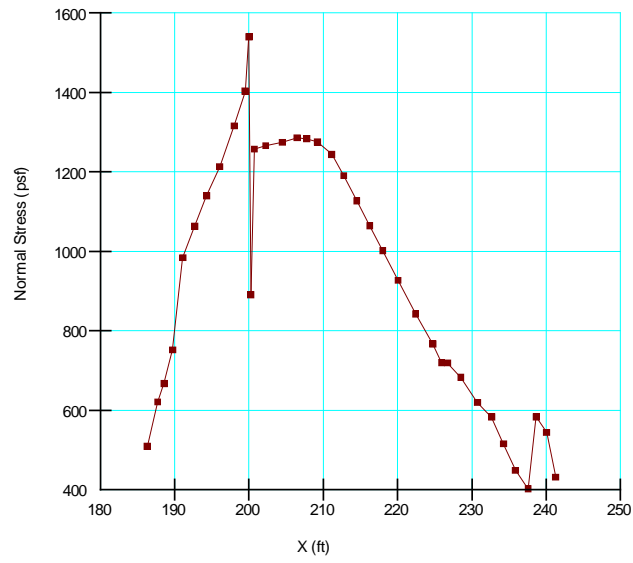
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	11346	185.88335	-3.310478	705.738	541.95345	0	450
2	11346	188.11325	-4.593261	785.73854	715.31001	0	450

3	11346	190.01325	-5.593261	848.12167	846.08714	0	450
4	11346	191.8482	-6.4682265	902.68769	999.67434	0	234.56
5	11346	193.8916	-7.359302	958.32574	1114.3312	0	244.7
6	11346	195.93495	-8.1616645	1008.4008	1222.963	0	254.84
7	11346	197.9783	-8.8790855	1053.1882	1325.836	0	264.97
8	11346	199.5	-9.3676495	1083.7708	1409.601	0	272.52
9	11346	200.25	-9.590078	1085.6466	792.41149	0	273.86
10	11346	200.75	-9.7312745	1092.7866	1159.0201	0	271.58
11	11346	202.25	-10.113184	1118.3449	1186.5656	0	264.74
12	11346	204.5	-10.63495	148.65448	1219.6274	0	254.47
13	11346	206.5	-11.018165	171.33253	1241.7557	0	245.35
14	11346	208.5192	-11.333655	190.33166	1234.1018	0	236.14
15	11346	210.55755	-11.581215	205.42481	1196.1766	0	226.84
16	11346	212.5959	-11.75805	216.28407	1151.1855	0	217.54
17	11346	214.6343	-11.86479	222.86362	1099.0703	0	208.24
18	11346	216.67265	-11.90182	225.14079	1039.8019	0	198.94
19	11346	218.711	-11.869265	223.09608	973.28731	0	189.64
20	11346	220.7494	-11.767005	216.70816	899.52021	0	180.34
21	11346	222.78775	-11.594685	205.94475	818.29314	0	171.04
22	11346	224.8261	-11.35169	190.77367	729.44874	0	161.74
23	11346	226.62265	-11.08203	173.93285	650.65437	0	153.55
24	11346	228.45995	-10.739545	152.55206	620.98585	0	150
25	11346	230.5798	-10.27502	123.55684	564.75916	0	150
26	11346	232.69965	-9.7287115	89.456872	500.49299	0	150
27	11346	234.81955	-9.0982615	50.103881	427.77133	0	150
28	11346	236.9394	-8.38084	5.3290715	346.20319	0	150
29	11346	238.7995	-7.68207	-38.281474	436.12379	0	600
30	11346	240.39985	-7.0190255	-79.662987	367.64664	0	600
31	11346	242.01215	-6.294746	-124.86075	300.37314	0	600

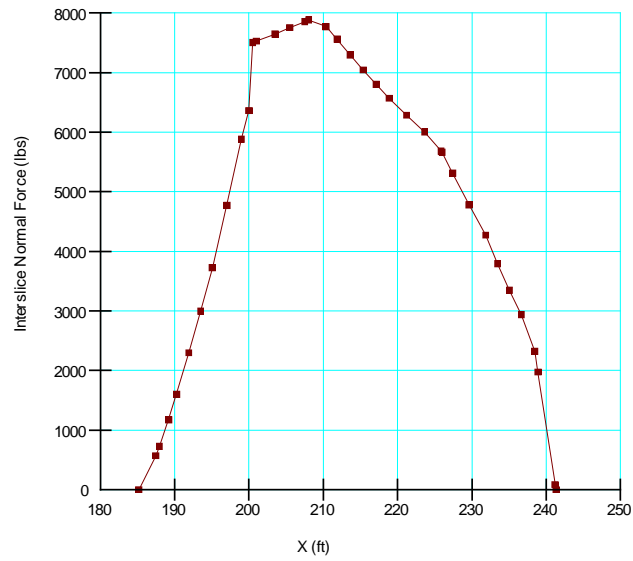
3/14/2012

3/14/2012

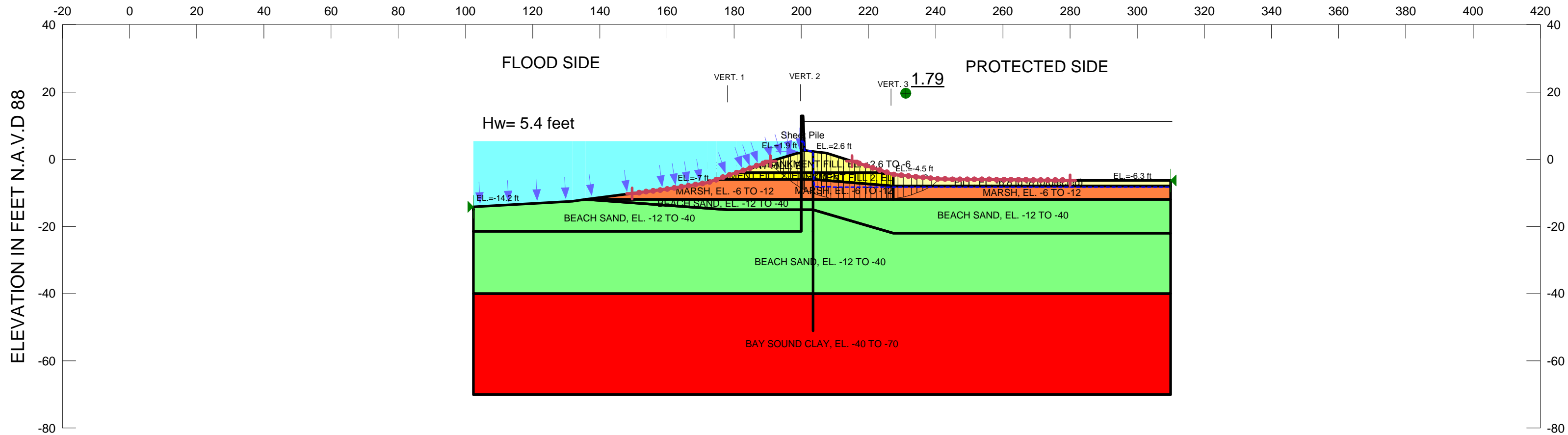
Base Normal Stress Vs. X



Interslice Normal Stress Vs. X



DISTANCE IN FEET



Name: EMBANKMENT FILL, EL. +2.6 TO -6 Model: Undrained (Phi=0) Unit Weight: 110 pcf Cohesion: 450 psf
 Name: MARSH, EL. -6 TO -12 Model: Spatial Mohr-Coulomb Unit Weight: 88 pcf Cohesion Fn: Marsh Phi: 0 °
 Name: BEACH SAND, EL. -12 TO -40 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand
 Name: BAY SOUND CLAY, EL. -40 TO -70 Model: Spatial Mohr-Coulomb Weight Fn: Clay Cohesion Spatial Fn: CLAY Phi: 0 °
 Name: Sheet Pile Model: Undrained (Phi=0) Unit Weight: 0.1 pcf Cohesion: 0.01 psf
 Name: FILL, EL. -6.8 to -8 (protected) Model: Undrained (Phi=0) Unit Weight: 96 pcf Cohesion: 600 psf
 Name: EMBANKMENT FILL 2, EL. -4 to -6 Model: Undrained (Phi=0) Unit Weight: 88 pcf Cohesion: 450 psf



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

GENERAL NOTES

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

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

 $H_w = \text{CANAL WATER LEVEL}$

LONDON AVE CANAL
OUTFALL CANAL REEVALUATION REPORT
REACH 35A, STA. 102+42 TO 103+50 EAST
PROTECTED SIDE STABILITY ANALYSIS,
1% FLOWLINE WATER EL +5.4
CASE: Global Stability (Entry/Exit)
MARCH 2012

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

Name: Global Stability (Entry/Exit)
File Name: Reach 35A Low water surf.gsz Directory: G:\F&MHOME\London Ave Reeevaluation 2011\East Side\Reach 35A 1% flowline\SlopeW\
Last Edited By: Schroeder, Danielle V MVN

Global Stability (Entry/Exit)

Report generated using GeoStudio 2007, version 7.15. Copyright © 1991-2009 GEO-SLOPE International Ltd.

File Information

Created By: Lijjegren, James
Revision Number: 382
Last Edited By: Schroeder, Danielle V MVN
Date: 2/15/2012
Time: 5:09:39 PM
File Name: Reach 35A Low water surf.gsz
Directory: G:\F&M\HOME\London Ave Reevaluation 2011\East Side\Reach 35A 1% flowline\SlopeW\
Last Solved Date: 2/15/2012
Last Solved Time: 5:14:42 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
SlipSurface
Direction of movement: Left to Right
Use Passive Mode: No
Slip Surface Option: Entry and Exit
Critical slip surfaces saved: 1
Optimize Critical Slip Surface Location: Yes
Tension Crack
Tension Crack Option: (none)
FOS Distribution
FOS Calculation Option: Constant
Advanced
Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft

3/9/2012

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (149.59831, -10.22132) ft
Left-Zone Right Coordinate: (190.78638, -0.61437) ft
Left-Zone Increment: 20
Right Projection: Range
Right-Zone Left Coordinate: (215.08294, -0.53874) ft
Right-Zone Right Coordinate: (280.00506, -6.27223) ft
Right-Zone Increment: 30
Radius Increments: 20

Slip Surface Limits

Left Coordinate: (102.4, -14.2) ft
Right Coordinate: (310, -6.3) ft

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: (174.8, 150)
Data Point: (200, 275)
Data Point: (227.4, 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, 5773)
Estimation Properties
Intact Rock Param.: 10
Geological Strength: 100
Disturbance Factor: 0

3/9/2012

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. +2.6 TO -6

Model: Undrained (Phi=0)
Unit Weight: 110 pcf
Cohesion: 450 psf

MARSH, EL. -6 TO -12

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

BEACH SAND, EL. -12 TO -40

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

BAY SOUND CLAY, EL. -40 TO -70

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

Sheet Pile

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

FILL, EL. -6.8 to -8 (protected)

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

EMBANKMENT FILL 2, EL. -4 to -6

Model: Undrained (Phi=0)
Unit Weight: 88 pcf
Cohesion: 450 psf

3/9/2012

SigmaC: 600000 psf
Sigma3: 300000 psf
Num. Points: 20

Unit Weight Functions

Clay

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 107
Data Points: X (ft), Unit Weight (pcf)
Data Point: (103, 107)
Data Point: (174.8, 107)
Data Point: (200, 108)
Data Point: (227.4, 107)
Data Point: (310, 107)

Spatial Functions

CLAY

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (102.4, -40, 400)
Data Point: (102.4, -70, 700)
Data Point: (174.8, -40, 400)
Data Point: (174.8, -70, 700)
Data Point: (200, -40, 600)
Data Point: (200, -70, 900)
Data Point: (227.4, -40, 400)
Data Point: (227.4, -70, 700)
Data Point: (310, -40, 400)
Data Point: (310, -70, 700)

Regions

	Material	Points	Area (ft²)
Region 1	EMBANKMENT FILL, EL. +2.6 TO -6	2,35,31,36,41	61.349915
Region 2	EMBANKMENT FILL 2, EL. -4 to -6	40,4,25,11,14,36,37	78.311328
Region 3	BEACH SAND, EL. -12 TO -40	1,28,29,44,45,18,9,12	757.09176
Region 4	BEACH SAND, EL. -12 TO -40	12,9,18,22,16,20,6,5	3893.75
Region 5	BAY SOUND CLAY, EL. -40 TO -70	5,6,8,7	6228
Region 6	BEACH SAND, EL. -12 TO -40	18,17,21,15,19,20,16,22	991.85
Region 7	MARSH, EL. -6 TO -12	44,43,30,42,14,24,34,17	253.04524

3/9/2012

Region 8	MARSH, EL. -6 TO -12	17,34,24,14,11,25,15,21	140.5
Region 9	BEACH SAND, EL. -12 TO -40	44,17,18,45	129.44189
Region 10	MARSH, EL. -6 TO -12	15,25,26,19	330.4
Region 11	FILL, EL. -6.8 to -8 (protected)	4,25,26,27,38,39	163.94
Region 12	Sheet Pile	13,32,33,23	7.725
Region 13	EMBANKMENT FILL 2, EL. -4 to -6	42,41,36,14	44.47119
Region 14	EMBANKMENT FILL, EL. +2.6 TO -6	36,31,13,23,46,3,40,37	101.34367

Points

	X (ft)	Y (ft)
Point 1	102.4	-15
Point 2	189.2	-1.1
Point 3	207.5	1.9
Point 4	227.4	-4.5
Point 5	102.4	-40
Point 6	310	-40
Point 7	102.4	-70
Point 8	310	-70
Point 9	200	-21.5
Point 10	203.5	-21.5
Point 11	203.5	-6
Point 12	102.4	-21.5
Point 13	200	2.6
Point 14	200	-6
Point 15	227.4	-12
Point 16	227.4	-22
Point 17	200	-12
Point 18	200	-15
Point 19	310	-12
Point 20	310	-22
Point 21	203.5	-12
Point 22	203.5	-15
Point 23	201	2.6
Point 24	200	-7
Point 25	227.4	-8
Point 26	310	-8
Point 27	310	-6.3
Point 28	102.4	-14.2
Point 29	131.8	-12.5
Point 30	171.9	-7
Point 31	200	1.9
Point 32	200	12.9
Point 33	200.5	12.9

Point 34	200	-10
Point 35	199	1.9
Point 36	200	-4
Point 37	203.5	-4
Point 38	282.9	-6.3
Point 39	241.2	-5.9
Point 40	225.84531	-4
Point 41	180.69661	-4
Point 42	174.8322	-6
Point 43	160.7	-8.8
Point 44	135.70541	-12
Point 45	178	-15
Point 46	203.5	2.33077
Point 47	203.5	-51

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.79	(216.517, 29.58)	21.53837	(189.832, -0.906506)	(241.207, -5.90007)
2	12608	1.91	(216.517, 29.58)	41.484	(188.76, -1.24998)	(238.464, -5.62244)

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	190.5263	-1.4434947	427.01966	261.59199	0	450
2	Optimized	191.9147	-2.5174715	494.01565	390.19466	0	450
3	Optimized	193.19415	-3.52723	557.00885	501.08133	0	450
4	Optimized	194.2538	-4.38328	610.41943	594.81873	0	450
5	Optimized	195.4988	-5.38328	672.8419	695.4861	0	450
6	Optimized	196.52235	-6.20242	723.92592	844.60596	0	257.75
7	Optimized	197.88765	-7.1914475	785.64833	962.94861	0	264.52
8	Optimized	199.49825	-8.3303825	856.74089	1076.0063	0	272.51
9	Optimized	199.99825	-8.683395	878.79907	1187.53	0	274.99
10	Optimized	200.25	-8.780833	874.64307	982.63752	0	273.86
11	Optimized	200.75	-8.9743395	885.31195	1077.3332	0	271.58
12	Optimized	202.25	-9.5548565	922.97029	1112.6974	0	264.74
13	Optimized	204.10025	-10.27093	126.29633	1153.4309	0	256.29
14	Optimized	205.4004	-10.71195	152.61636	1199.598	0	250.36

3/9/2012

3/9/2012

15	Optimized	206.80015	-11.129375	177.87213	1219.7944	0	243.98
16	Optimized	208.13565	-11.527645	202.17173	1224.5636	0	237.88
17	Optimized	209.88505	-11.85814	222.4752	1236.9037	0	229.9
18	Optimized	211.80545	-11.999125	231.16636	1213.7877	0	221.14
19	Optimized	213.41875	-11.99921	231.16016	1156.2657	0	213.78
20	Optimized	215.03205	-11.999295	231.15397	1098.8057	0	206.42
21	Optimized	216.64535	-11.99938	231.15397	1041.2838	0	199.06
22	Optimized	218.25865	-11.999465	231.15397	983.76182	0	191.7
23	Optimized	219.87195	-11.99955	231.14777	926.23987	0	184.34
24	Optimized	221.48525	-11.999635	231.14777	868.7799	0	176.98
25	Optimized	223.0584	-11.99899	231.10151	812.78221	0	169.81
26	Optimized	224.5914	-11.99761	231.01019	757.9879	0	162.81
27	Optimized	225.6016	-11.977985	229.78161	733.05529	0	158.2
28	Optimized	226.18465	-11.932685	226.95578	710.38084	0	155.54
29	Optimized	226.962	-11.83113	220.61254	693.86801	0	152
30	Optimized	228.1214	-11.63211	208.19571	684.42197	0	150
31	Optimized	229.56415	-11.384445	192.73662	647.93632	0	150
32	Optimized	231.54365	-10.917755	163.60839	601.63562	0	150
33	Optimized	233.6369	-10.260305	122.57485	536.18163	0	150
34	Optimized	235.3071	-9.631115	83.309661	461.53967	0	150
35	Optimized	237.48325	-8.626175	20.591808	364.68354	0	150
36	Optimized	240.01215	-6.92107	85.813573	474.17816	0	600
37	Optimized	241.20365	-5.90319	149.33368	353.90634	0	600

Slices of Slip Surface: **12608**

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	12608	188.9801	-1.4451295	427.13653	220.14156	0	450
2	12608	189.9398	-2.257822	477.82291	329.81823	0	450
3	12608	191.41935	-3.43768	551.42192	489.18787	0	450
4	12608	192.916	-4.5237795	619.1604	629.04698	0	450

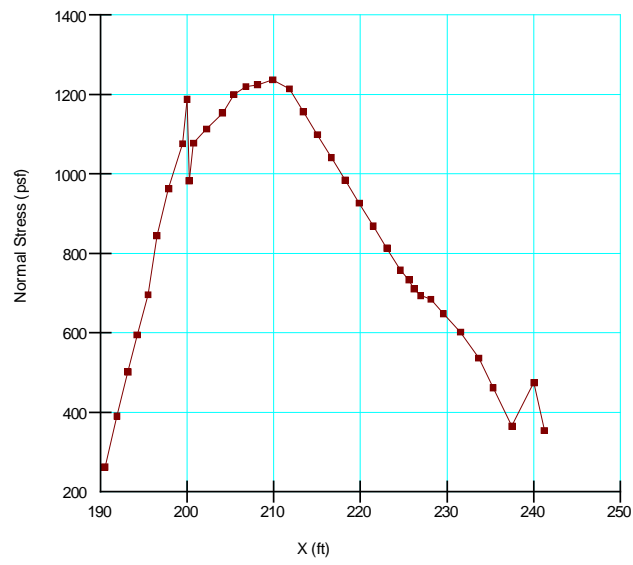
5	12608	194.42975	-5.5237795	681.59084	750.81229	0	450
6	12608	196.13995	-6.537851	744.83898	922.39258	0	255.85
7	12608	198.04665	-7.5499355	808.05235	1047.397	0	265.31
8	12608	199.5	-8.2490845	851.68844	1137.0559	0	272.52
9	12608	200.25	-8.580567	861.58792	957.0562	0	273.86
10	12608	200.75	-8.789862	873.15791	1057.816	0	271.58
11	12608	201.625	-9.1330075	895.5478	1086.2456	0	267.59
12	12608	202.875	-9.5910865	925.18022	1120.5515	0	261.88
13	12608	204.5	-10.111499	116.4119	1158.3764	0	254.47
14	12608	206.5	-10.663155	149.35309	1196.8334	0	245.35
15	12608	208.3339	-11.079875	174.58337	1204.684	0	236.98
16	12608	210.00165	-11.380325	192.95087	1183.4407	0	229.37
17	12608	211.6694	-11.611085	207.13253	1155.4474	0	221.76
18	12608	213.33715	-11.773325	217.14281	1120.7776	0	214.16
19	12608	215.0049	-11.86785	222.98402	1079.4169	0	206.55
20	12608	216.67265	-11.895125	224.66568	1031.3791	0	198.94
21	12608	218.3404	-11.855285	222.17363	976.71577	0	191.33
22	12608	220.00815	-11.74813	215.48106	915.33892	0	183.72
23	12608	221.6759	-11.573135	204.55601	847.03158	0	176.11
24	12608	223.3437	-11.32943	189.346	771.81486	0	168.51
25	12608	225.01145	-11.015775	169.76568	689.36861	0	160.9
26	12608	226.62265	-10.645985	146.68086	608.37652	0	153.55
27	12608	228.2356	-10.204548	119.12845	571.81658	0	150
28	12608	229.90685	-9.6733545	85.966555	513.16596	0	150
29	12608	231.5781	-9.0626065	47.851953	446.8587	0	150
30	12608	233.24935	-8.368455	4.5276932	372.42409	0	150
31	12608	234.81485	-7.6411985	40.858798	441.20296	0	600

3/9/2012

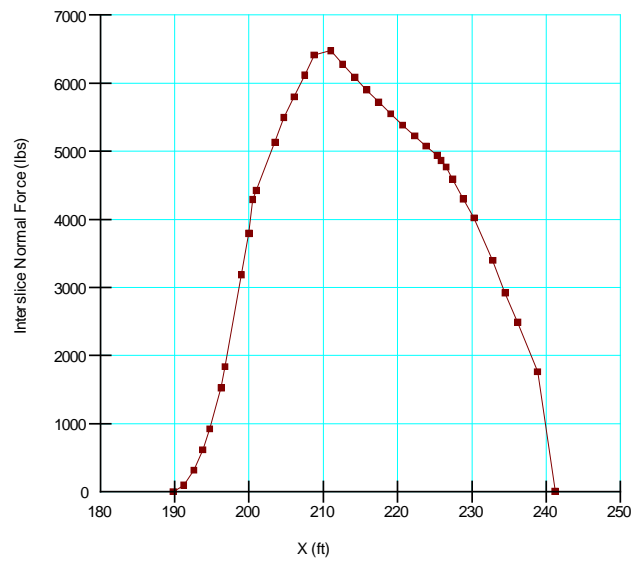
3/9/2012

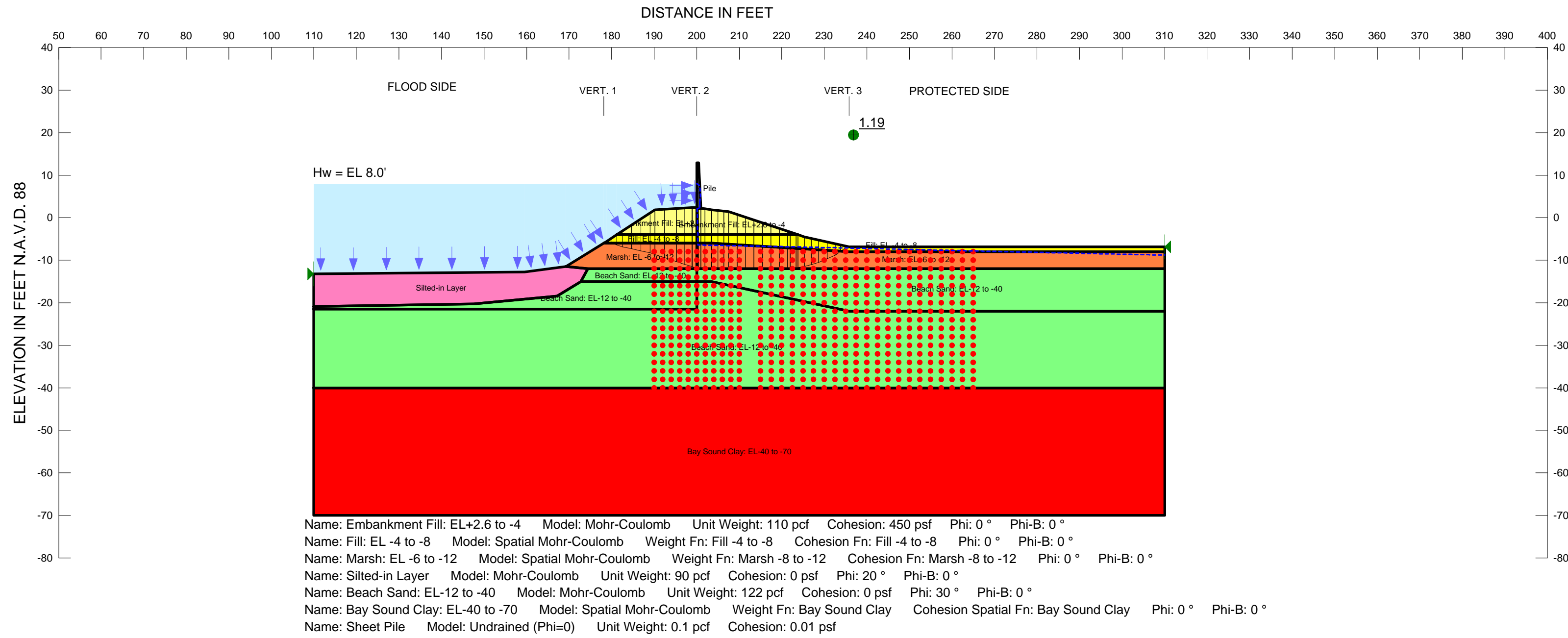
32	12608	236.27455	-6.88696	- 87.930171	368.42971	0	600
33	12608	237.73425	- 6.0569815	- 139.72549	288.28059	0	600

Base Normal Stress Vs. X



Interslice Normal Stress Vs. X





GENERAL NOTES

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

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

Hw=CANAL WATER LEVEL



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

LONDON AVE CANAL
OUTFALL CANAL REEVALUATION REPORT
REACH 35B, STA. 103+50 TO 114+66
PROTECTED SIDE STABILITY ANALYSIS
CASE: Global Stability (Block)
MARCH 2012

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

Global Stability (Block)

Report generated using GeoStudio 2007, version 7.19. Copyright © 1991-2012 GEO-SLOPE International Ltd.

File Information

Created By: [Haggerty, Daniel R MVN](#)
Revision Number: 80
Last Edited By: [Middleton, Mark C MVN](#)
Date: 3/22/2013
Time: 2:41:44 PM
File Name: [Reach 35B.gsz](#)
Directory: [Z:\London Ave Reevaluation 2011\East Side\Reach 35B\35B SlopeW\](#)
Last Solved Date: 3/22/2013
Last Solved Time: 2:45:12 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

Global Stability (Block)

Kind: [SLOPE/W](#)
Parent: [Steady-State Seepage](#)
Method: [Spencer](#)
Settings
PWP Conditions Source: [Parent Analysis](#)
Slip Surface
Direction of movement: [Left to Right](#)
Use Passive Mode: [No](#)
Slip Surface Option: [Block](#)
Critical slip surfaces saved: [1](#)
Optimize Critical Slip Surface Location: [Yes](#)
Tension Crack
Tension Crack Option: [Search for Tension Crack](#)
Percentage Wet: [1](#)
Tension Crack Fluid Unit Weight: [62.4 pcf](#)
FOS Distribution
FOS Calculation Option: [Constant](#)
Restrict Block Crossing: [Yes](#)
Advanced

file://Z:\London Ave Reevaluation 2011\East Side\Reach 35B\35B SlopeW\reach 35b.html 5/23/2013

Number of Slices: [30](#)
Optimization Tolerance: [0.01](#)
Minimum Slip Surface Depth: [0.1 ft](#)
Optimization Maximum Iterations: [5000](#)
Optimization Convergence Tolerance: [1e-007](#)
Starting Optimization Points: [8](#)
Ending Optimization Points: [16](#)
Complete Passes per Insertion: [1](#)
Driving Side Maximum Convex Angle: [5 °](#)
Resisting Side Maximum Convex Angle: [1 °](#)

Materials

Embankment Fill: EL+2.6 to -4

Model: [Mohr-Coulomb](#)
Unit Weight: [110 pcf](#)
Cohesion: [450 psf](#)
Phi: [0 °](#)
Phi-B: [0 °](#)

Fill: EL -4 to -8

Model: [Spatial Mohr-Coulomb](#)
Weight Fn: [Fill -4 to -8](#)
Cohesion Fn: [Fill -4 to -8](#)
Phi: [0 °](#)
Phi-B: [0 °](#)

Marsh: EL -6 to -12

Model: [Spatial Mohr-Coulomb](#)
Weight Fn: [Marsh -8 to -12](#)
Cohesion Fn: [Marsh -8 to -12](#)
Phi: [0 °](#)
Phi-B: [0 °](#)

Silted-in Layer

Model: [Mohr-Coulomb](#)
Unit Weight: [90 pcf](#)
Cohesion: [0 psf](#)
Phi: [20 °](#)
Phi-B: [0 °](#)

Beach Sand: EL-12 to -40

Model: [Mohr-Coulomb](#)
Unit Weight: [122 pcf](#)
Cohesion: [0 psf](#)
Phi: [30 °](#)
Phi-B: [0 °](#)

Bay Sound Clay: EL-40 to -70

file://Z:\London Ave Reevaluation 2011\East Side\Reach 35B\35B SlopeW\reach 35b.html 5/23/2013

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

Sheet Pile

Model: [Undrained \(Phi=0\)](#)
Unit Weight: [0.1 pcf](#)
Cohesion: [0.01 psf](#)

Slip Surface Limits

Left Coordinate: [\(110, -13.2\) ft](#)
Right Coordinate: [\(310, -6.8\) ft](#)

Slip Surface Block

Left Grid
Upper Left: [\(190, -8\) ft](#)
Lower Left: [\(190, -48\) ft](#)
Lower Right: [\(210, -48\) ft](#)
X Increments: [10](#)
Y Increments: [20](#)
Starting Angle: [155 °](#)
Ending Angle: [165 °](#)
Angle Increments: [5](#)
Right Grid
Upper Left: [\(215, -8\) ft](#)
Lower Left: [\(215, -48\) ft](#)
Lower Right: [\(265, -48\) ft](#)
X Increments: [20](#)
Y Increments: [20](#)
Starting Angle: [32 °](#)
Ending Angle: [42 °](#)
Angle Increments: [5](#)

Cohesion Functions

Fill -4 to -8

Model: [Spline Data Point Function](#)
Function: [Cohesion vs. X](#)
Curve Fit to Data: [100 %](#)
Segment Curvature: [0 %](#)
Y-Intercept: [600](#)
Data Points: [X \(ft\), Cohesion \(psf\)](#)
Data Point: [\(110, 600\)](#)
Data Point: [\(178.1, 600\)](#)

file://Z:\London Ave Reevaluation 2011\East Side\Reach 35B\35B SlopeW\reach 35b.html 5/23/2013

Data Point: [\(178.3, 450\)](#)
Data Point: [\(200, 450\)](#)
Data Point: [\(235.7, 450\)](#)
Data Point: [\(235.9, 600\)](#)
Data Point: [\(310, 600\)](#)

Marsh -8 to -12

Model: [Spline Data Point Function](#)
Function: [Cohesion vs. X](#)
Curve Fit to Data: [100 %](#)
Segment Curvature: [0 %](#)
Y-Intercept: [150](#)
Data Points: [X \(ft\), Cohesion \(psf\)](#)
Data Point: [\(110, 150\)](#)
Data Point: [\(178.2, 150\)](#)
Data Point: [\(200, 275\)](#)
Data Point: [\(235.8, 150\)](#)
Data Point: [\(310, 150\)](#)

Unit Weight Functions

Fill -4 to -8

Model: [Spline Data Point Function](#)
Function: [Unit Weight vs. X](#)
Curve Fit to Data: [100 %](#)
Segment Curvature: [0 %](#)
Y-Intercept: [96](#)
Data Points: [X \(ft\), Unit Weight \(pcf\)](#)
Data Point: [\(110, 96\)](#)
Data Point: [\(178.1, 96\)](#)
Data Point: [\(178.3, 88\)](#)
Data Point: [\(200, 88\)](#)
Data Point: [\(235.7, 88\)](#)
Data Point: [\(235.9, 96\)](#)
Data Point: [\(310, 96\)](#)

Marsh -8 to -12

Model: [Spline Data Point Function](#)
Function: [Unit Weight vs. X](#)
Curve Fit to Data: [100 %](#)
Segment Curvature: [0 %](#)
Y-Intercept: [96](#)
Data Points: [X \(ft\), Unit Weight \(pcf\)](#)
Data Point: [\(110, 96\)](#)
Data Point: [\(178.2, 96\)](#)
Data Point: [\(200, 88\)](#)
Data Point: [\(235.8, 96\)](#)
Data Point: [\(310, 96\)](#)

file://Z:\London Ave Reevaluation 2011\East Side\Reach 35B\35B SlopeW\reach 35b.html 5/23/2013

Bay Sound Clay

Model: Spline Data Point Function

Function: Unit Weight vs. X

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 107

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

Data Point: (110, 107)

Data Point: (178.2, 107)

Data Point: (200, 108)

Data Point: (235.8, 107)

Data Point: (310, 107)

Spatial Functions

Bay Sound Clay

Model: Linear Interpolation

Limit Range By: Data Values

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

Data Point: (110, -40, 400)

Data Point: (110, -70, 700)

Data Point: (178.2, -40, 400)

Data Point: (178.2, -70, 700)

Data Point: (200, -40, 600)

Data Point: (200, -70, 900)

Data Point: (235.8, -40, 400)

Data Point: (235.8, -70, 700)

Data Point: (310, -40, 400)

Data Point: (310, -70, 700)

Regions

	Material	Points	Area (ft²)
Region 1	Bay Sound Clay: EL-40 to -70	1,3,4,2	6000
Region 2	Beach Sand: EL-12 to -40	3,9,7,14,15,5,6,4	3782.9
Region 3	Beach Sand: EL-12 to -40	9,10,11,12,13,14,7	279.66
Region 4	Beach Sand: EL-12 to -40	13,18,20,14	79.2
Region 5	Beach Sand: EL-12 to -40	14,20,22,19,21,6,5,15	962.1
Region 6	Silted-in Layer	10,16,17,23,18,13,12,11	446.445
Region 7	Marsh: EL -6 to -12	23,32,31,27,24,20,18	158.45
Region 8	Marsh: EL -6 to -12	20,24,27,31,30,25,26,21,19,22	479.3
Region 9	Fill: EL -4 to -8	32,33,37,35,31	40.6
Region 10	Fill: EL -4 to -8	31,35,38,36,34,28,29,26,25,30	175.24
Region 11	Embankment Fill: EL+2.6 to -4	37,41,46,45,43,35	87.07
Region 12	Embankment Fill: EL+2.6 to -4	43,44,42,40,39,36,38,35	87.9045

file:///Z:/London Ave Reeevaluation 2011/East Side/Reach 35B\35B SlopeW\reach 35b.html 5/23/2013

Region 13	Sheet Pile	43,45,47,48,44	8.025
-----------	------------	----------------	-------

Points

	X (ft)	Y (ft)
Point 1	110	-70
Point 2	310	-70
Point 3	110	-40
Point 4	310	-40
Point 5	235.9	-22
Point 6	310	-22
Point 7	200	-21.5
Point 8	203.5	-21.5
Point 9	110	-21.5
Point 10	110	-20.9
Point 11	147.6	-20.3
Point 12	167.2	-18.4
Point 13	172.8	-15
Point 14	200	-15
Point 15	203.5	-15
Point 16	110	-13.2
Point 17	159.5	-12.8
Point 18	174.4	-12
Point 19	235.8	-12
Point 20	200	-12
Point 21	310	-12
Point 22	203.5	-12
Point 23	169.3	-11.5
Point 24	200	-10
Point 25	235.8	-8
Point 26	310	-8
Point 27	200	-7
Point 28	235.8	-6.8
Point 29	310	-6.8
Point 30	203.5	-6
Point 31	200	-6
Point 32	178.2	-6
Point 33	178.8	-5.6
Point 34	225.3	-4.5
Point 35	200	-4
Point 36	223.8	-4
Point 37	181.2	-4
Point 38	203.5	-4
Point 39	207.5	1.4

file:///Z:/London Ave Reeevaluation 2011/East Side/Reach 35B\35B SlopeW\reach 35b.html 5/23/2013

Global Stability (Block)

Page 7 of 9

Global Stability (Block)

Page 8 of 9

Point 40	203.5	1.89
Point 41	190.2	1.9
Point 42	201.9	2.09
Point 43	200	2.2
Point 44	201	2.2
Point 45	200	2.4
Point 46	199	2.4
Point 47	200	12.9
Point 48	200.5	12.9

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.19	(207.137, -5.255)	21.14856	(178.838, -5.5744)	(235.488, -6.73165)
2	20948	1.21	(207.137, -5.255)	21.15	(178.884, -5.54413)	(235.354, -6.70233)

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	179.46665	-5.787199	713.67893	669.15361	0	450
2	Optimized	180.64745	-6.1871465	489.44696	759.68202	0	164.03
3	Optimized	181.8368	-6.5899915	376.46331	829.61139	0	170.85
4	Optimized	183.56715	-7.0505815	298.82998	965.09032	0	180.78
5	Optimized	185.75425	-7.540365	258.95029	1084.31	0	193.32
6	Optimized	187.94135	-8.0301485	251.50798	1202.7265	0	205.86
7	Optimized	189.61745	-8.460093	280.49691	1258.9682	0	215.47
8	Optimized	191.3284	-9.003578	318.82681	1368.9767	0	225.28
9	Optimized	193.85225	-9.83535	394.56151	1432.2366	0	239.75
10	Optimized	196.1649	-10.604735	497.05829	1506.0014	0	253.01
11	Optimized	197.9993	-11.196825	674.61394	1556.1669	0	263.53
12	Optimized	198.95825	-11.505905	832.99179	1587.3535	0	269.03
13	Optimized	199.4946	-11.673435	908.93125	1603.8544	0	272.1
14	Optimized	199.9946	-11.82803	1231.3908	1777.4127	0	274.97
15	Optimized	200.25	-11.832825	481.99517	1019.3606	0	274.13
16	Optimized	200.75	-11.84221	331.36168	1409.7319	0	272.38

file:///Z:/London Ave Reeevaluation 2011/East Side/Reach 35B\35B SlopeW\reach 35b.html 5/23/2013

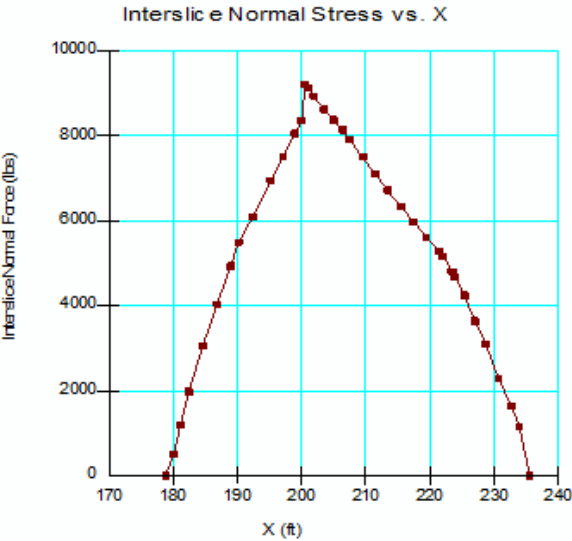
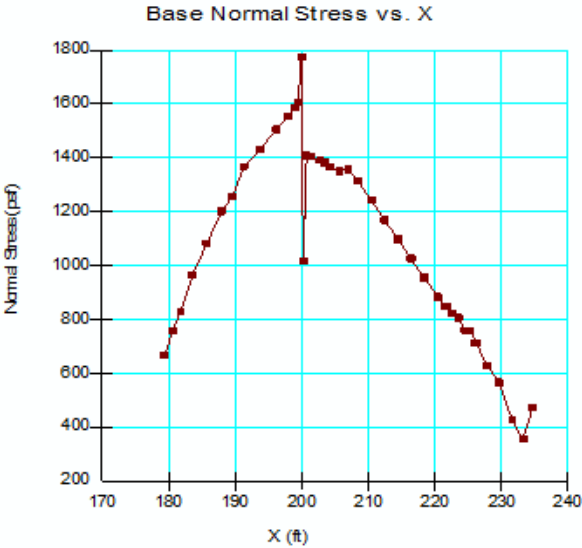
17	Optimized	201.45	11.855345	332.0082	1404.8637	0	269.94
18	Optimized	202.7	-11.878805	333.00381	1390.9423	0	265.57
19	Optimized	203.5048	-11.89391	333.65492	1381.8105	0	262.76
20	Optimized	204.2376	-11.9205	334.88018	1366.2892	0	260.2
21	Optimized	205.6936	-11.9735	337.33053	1352.5618	0	255.12
22	Optimized	206.9608	-11.99997	338.01615	1356.3487	0	250.7
23	Optimized	208.492	-11.99988	336.76915	1313.8105	0	245.35
24	Optimized	210.476	-11.99976	334.94456	1242.5907	0	238.42
25	Optimized	212.46	-11.99964	332.92843	1171.2198	0	231.49
26	Optimized	214.444	-11.99952	330.78629	1099.7984	0	224.57
27	Optimized	216.428	-11.9994	328.56351	1028.2258	0	217.64
28	Optimized	218.412	-11.99928	326.25504	956.55242	0	210.71
29	Optimized	220.396	-11.99916	323.87097	884.72782	0	203.78
30	Optimized	221.69135	-11.986715	321.5057	850.4371	0	199.26
31	Optimized	222.6989	-11.903995	315.09481	825.32232	0	195.74
32	Optimized	223.60155	-11.797875	307.34369	808.08527	0	192.59
33	Optimized	224.51925	-11.63238	295.84831	762.19731	0	189.39
34	Optimized	225.26925	-11.4939	286.25104	759.1148	0	186.77
35	Optimized	226.1395	-11.245775	269.64193	715.50162	0	183.73
36	Optimized	227.8185	-10.76706	237.57838	631.70568	0	177.87
37	Optimized	229.65375	-10.080658	192.3143	567.89109	0	171.46
38	Optimized	231.64525	-9.1865725	133.86233	428.41718	0	164.51
39	Optimized	233.25045	-8.3097	76.979497	356.55144	0	158.9
40	Optimized	234.67395	-7.3057595	12.449316	475.34983	0	450

Slices of Slip Surface: 20948

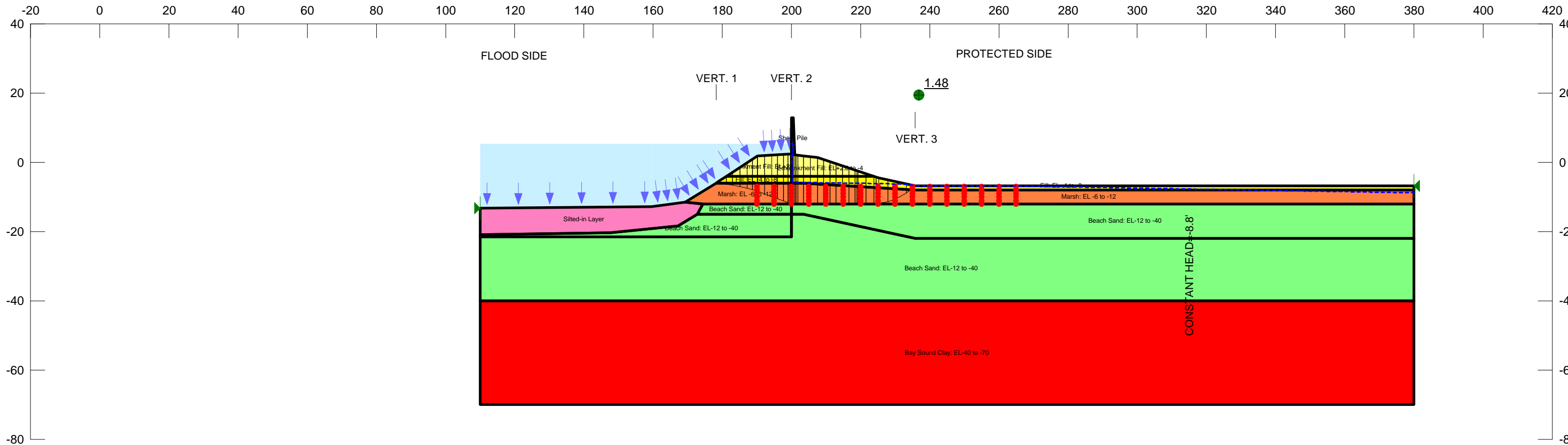
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	20948	179.62935	-5.7720655	691.05464	689.45127	0	450
2	20948	180.78745	-6.1261315	469.98395	768.59894	0	164.84
3	20948	182.1	-6.5274205	362.08358	844.94845	0	172.36
4	20948	183.9	-7.077736	282.74215	954.44536	0	182.68
5	20948	185.7	-7.6280515	262.33036	1063.1985	0	193

file:///Z:/London Ave Reeevaluation 2011/East Side/Reach 35B\35B SlopeW\reach 35b.html 5/23/2013

6	20948	187.5	-	8.1783665	261.37405	1171.314	0	203.33
7	20948	189.3	-	8.7286815	287.75744	1278.739	0	213.65
8	20948	191.08	-9.272882	317.63997	1398.4331	0	0	223.85
9	20948	192.84	-	9.8109675	368.34044	1446.1397	0	233.94
10	20948	194.6	-	10.349055	422.93676	1493.1942	0	244.04
11	20948	196.36	-10.88714	494.80091	1539.5967	0	0	254.13
12	20948	198.12	-	11.425225	682.83438	1585.3472	0	264.22
13	20948	199.5	-	11.847135	872.35056	1623.1357	0	272.13
14	20948	200.25	-12	492.16	1047.94	0	0	274.13
15	20948	200.75	-12	340.92	1431.48	0	0	272.38
16	20948	201.45	-12	340.82222	1425.4444	0	0	269.94
17	20948	202.7	-12	340.475	1409.375	0	0	265.57
18	20948	204.5	-12	339.65	1386.2	0	0	259.29
19	20948	206.5	-12	338.37	1360.6	0	0	252.3
20	20948	208.40555	-12	336.85953	1315.3252	0	0	245.65
21	20948	210.21665	-12	335.20309	1250.3375	0	0	239.33
22	20948	212.02775	-12	333.38652	1185.2946	0	0	233
23	20948	213.83885	-12	331.47057	1120.1412	0	0	226.68
24	20948	215.65	-12	329.48284	1054.8774	0	0	220.36
25	20948	217.46115	-12	327.42333	989.55834	0	0	214.03
26	20948	219.27225	-12	325.281	924.12889	0	0	207.71
27	20948	221.08335	-12	323.08346	858.64422	0	0	201.39
28	20948	222.89445	-12	320.83069	792.99391	0	0	195.06
29	20948	224.55	-12	318.73333	738.26667	0	0	189.28
30	20948	226.4	-12	316.32727	695.31818	0	0	182.82
31	20948	228.5216	-	11.310935	270.54959	791.68124	0	175.41
32	20948	230.56475	-9.932803	181.85418	590.78873	0	0	168.28
33	20948	232.6079	-	8.5546695	93.14255	388.2894	0	161.15
34	20948	234.4918	-7.283967	11.365827	449.86446	0	0	450



ELEVATION IN FEET N.A.V.D. 88



Name: Embankment Fill: EL+2.6 to -4 Model: Mohr-Coulomb Unit Weight: 110 pcf Cohesion: 450 psf Phi: 0 ° Phi-B: 0 °
Name: Fill: EL -4 to -8 Model: Spatial Mohr-Coulomb Weight Fn: Fill -4 to -8 Cohesion Fn: Fill -4 to -8 Phi: 0 ° Phi-B: 0 °
Name: Marsh: EL -6 to -12 Model: Spatial Mohr-Coulomb Weight Fn: Marsh -8 to -12 Cohesion Fn: Marsh -8 to -12 Phi: 0 ° Phi-B: 0 °
Name: Silted-in Layer Model: Mohr-Coulomb Unit Weight: 90 pcf Cohesion: 0 psf Phi: 20 ° Phi-B: 0 °
Name: Beach Sand: EL-12 to -40 Model: Mohr-Coulomb Unit Weight: 122 pcf Cohesion: 0 psf Phi: 30 ° Phi-B: 0 °
Name: Bay Sound Clay: EL-40 to -70 Model: Spatial Mohr-Coulomb Weight Fn: Bay Sound Clay Cohesion Spatial Fn: Bay Sound Clay Phi: 0 ° Phi-B: 0 °
Name: Sheet Pile Model: Undrained (Phi=0) Unit Weight: 0.1 pcf Cohesion: 0.01 psf



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

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

Hw=CANAL WATER LEVEL

LONDON AVE CANAL
OUTFALL CANAL REEVALUATION REPORT
REACH 35B, STA. 103+50 TO 114+66 EAST
PROTECTED SIDE STABILITY ANALYSIS,
1% FLOWLINE WATER EL +5.4
CASE: Global Stability (Block) EL-7 to EL-12
MARCH 2012

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

Global Stability (Block) EL-7 to EL-12

Report generated using GeoStudio 2007, version 7.15. Copyright © 1991-2009 GEO-SLOPE International Ltd.

File Information

Created By: Haggerty, Daniel R MVN
Revision Number: 58
Last Edited By: Curran, Matthew MVN
Date: 2/10/2012
Time: 3:55:45 PM
File Name: Reach 35B Modified FOS min 078.gsz
Directory: Z:\Edf\F&MHOME\London Ave Reeevaluation 2011\East Side\Reach 35B 1% flowline\SlopeW\
Last Solved Date: 2/10/2012
Last Solved Time: 4:15:34 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 Stability (Block) EL-7 to EL-12

Kind: [SLOPE/W](#)
Parent: [Steady-State Seepage](#)
Method: [Spencer](#)
Settings
 PWP Conditions Source: [Parent Analysis](#)
Slip Surface
 Direction of movement: [Left to Right](#)
 Use Passive Mode: [No](#)
 Slip Surface Option: [Block](#)
 Critical slip surfaces saved: 1
 Optimize Critical Slip Surface Location: [Yes](#)
 Tension Crack
 Tension Crack Option: [Search for Tension Crack](#)
 Percentage Wet: 1
 Tension Crack Fluid Unit Weight: 62.4 pcf

Beach Sand: EL-12 to -40

Model: [Mohr-Coulomb](#)
Unit Weight: 122 pcf
Cohesion: 0 psf
Phi: 30 °
Phi-B: 0 °

Bay Sound Clay: EL-40 to -70

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

Sheet Pile

Model: [Undrained \(Phi=0\)](#)
Unit Weight: 0.1 pcf
Cohesion: 0.01 psf

Slip Surface Limits

Left Coordinate: (110, -13.2) ft
Right Coordinate: (380, -6.8) ft

Slip Surface Block

Left Grid
 Upper Left: (190, -7) ft
 Lower Left: (190, -12) ft
 Lower Right: (210, -12) ft
 X Increments: 4
 Y Increments: 5
 Starting Angle: 120 °
 Ending Angle: 160 °
 Angle Increments: 6
Right Grid
 Upper Left: (215, -7) ft
 Lower Left: (215, -12) ft
 Lower Right: (265, -12) ft
 X Increments: 10
 Y Increments: 5
 Starting Angle: 20 °
 Ending Angle: 45 °
 Angle Increments: 5

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: 5000
 Optimization Convergence Tolerance: 1e-007
 Starting Optimization Points: 8
 Ending Optimization Points: 16
 Complete Passes per Insertion: 1
 Driving Side Maximum Convex Angle: 5 °
 Resisting Side Maximum Convex Angle: 1 °

Materials

Embankment Fill: EL+2.6 to -4

Model: [Mohr-Coulomb](#)
Unit Weight: 110 pcf
Cohesion: 450 psf
Phi: 0 °
Phi-B: 0 °

Fill: EL -4 to -8

Model: [Spatial Mohr-Coulomb](#)
Weight Fn: Fill -4 to -8
Cohesion Fn: Fill -4 to -8
Phi: 0 °
Phi-B: 0 °

Marsh: EL -6 to -12

Model: [Spatial Mohr-Coulomb](#)
Weight Fn: Marsh -8 to -12
Cohesion Fn: Marsh -8 to -12
Phi: 0 °
Phi-B: 0 °

Silted-in Layer

Model: [Mohr-Coulomb](#)
Unit Weight: 90 pcf
Cohesion: 0 psf
Phi: 20 °
Phi-B: 0 °

Cohesion Functions

Fill -4 to -8

Model: [Spline Data Point Function](#)
Function: [Cohesion vs. X](#)
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 600
Data Points: X (ft), Cohesion (psf)
 Data Point: (110, 600)
 Data Point: (178.1, 600)
 Data Point: (178.3, 450)
 Data Point: (200, 450)
 Data Point: (235.7, 450)
 Data Point: (235.9, 600)
 Data Point: (310, 600)

Marsh -8 to -12

Model: [Spline Data Point Function](#)
Function: [Cohesion vs. X](#)
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 150
Data Points: X (ft), Cohesion (psf)
 Data Point: (110, 150)
 Data Point: (178.2, 150)
 Data Point: (200, 275)
 Data Point: (235.8, 150)
 Data Point: (310, 150)

Unit Weight Functions

Fill -4 to -8

Model: [Spline Data Point Function](#)
Function: [Unit Weight vs. X](#)
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 96
Data Points: X (ft), Unit Weight (pcf)
 Data Point: (110, 96)
 Data Point: (178.1, 96)
 Data Point: (178.3, 88)
 Data Point: (200, 88)
 Data Point: (235.7, 88)
 Data Point: (235.9, 96)
 Data Point: (310, 96)

Marsh -8 to -12

Model: Spline Data Point Function

Function: Unit Weight vs. X

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 96

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

Data Point: (110, 96)

Data Point: (178.2, 96)

Data Point: (200, 88)

Data Point: (235.8, 96)

Data Point: (310, 96)

Bay Sound Clay

Model: Spline Data Point Function

Function: Unit Weight vs. X

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 107

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

Data Point: (110, 107)

Data Point: (178.2, 107)

Data Point: (200, 108)

Data Point: (235.8, 107)

Data Point: (310, 107)

Spatial Functions

Bay Sound Clay

Model: Linear Interpolation

Limit Range By: Data Values

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

Data Point: (110, -40, 400)

Data Point: (110, -70, 700)

Data Point: (178.2, -40, 400)

Data Point: (178.2, -70, 700)

Data Point: (200, -40, 600)

Data Point: (200, -70, 900)

Data Point: (235.8, -40, 400)

Data Point: (235.8, -70, 700)

Data Point: (310, -40, 400)

Data Point: (310, -70, 700)

Regions

	Material	Points	Area (ft²)
Region 1	Bay Sound Clay: EL-40 to -70	1,3,4,2	8100
Region 2	Beach Sand: EL-12 to -40	3,9,7,14,15,5,6,4	5042.9
Region 3	Beach Sand: EL-12 to -40	9,10,11,12,13,14,7	279.66
Region 4	Beach Sand: EL-12 to -40	13,18,20,14	79.2
Region 5	Beach Sand: EL-12 to -40	14,20,22,19,21,6,5,15	1662.1
Region 6	Silted-in Layer	10,16,17,23,18,13,12,11	446.445
Region 7	Marsh: EL-6 to -12	23,32,31,27,24,20,18	158.45
Region 8	Marsh: EL-6 to -12	20,24,27,31,30,25,26,21,19,22	759.3
Region 9	Fill: EL -4 to -8	32,33,37,35,31	40.6
Region 10	Fill: EL -4 to -8	31,35,38,36,34,28,29,26,25,30	259.24
Region 11	Embankment Fill: EL+2.6 to -4	37,41,46,45,43,35	87.07
Region 12	Embankment Fill: EL+2.6 to -4	43,44,42,40,39,36,38,35	87.9045
Region 13	Sheet Pile	43,45,47,48,44	8.025

Points

	X (ft)	Y (ft)
Point 1	110	-70
Point 2	380	-70
Point 3	110	-40
Point 4	380	-40
Point 5	235.9	-22
Point 6	380	-22
Point 7	200	-21.5
Point 8	203.5	-21.5
Point 9	110	-21.5
Point 10	110	-20.9
Point 11	147.6	-20.3
Point 12	167.2	-18.4
Point 13	172.8	-15
Point 14	200	-15
Point 15	203.5	-15
Point 16	110	-13.2
Point 17	159.5	-12.8

Point 18	174.4	-12
Point 19	235.8	-12
Point 20	200	-12
Point 21	380	-12
Point 22	203.5	-12
Point 23	169.3	-11.5
Point 24	200	-10
Point 25	235.8	-8
Point 26	380	-8
Point 27	200	-7
Point 28	235.8	-6.8
Point 29	380	-6.8
Point 30	203.5	-6
Point 31	200	-6
Point 32	178.2	-6
Point 33	178.8	-5.6
Point 34	225.3	-4.5
Point 35	200	-4
Point 36	223.8	-4
Point 37	181.2	-4
Point 38	203.5	-4
Point 39	207.5	1.4
Point 40	203.5	1.89
Point 41	190.2	1.9
Point 42	201.9	2.09
Point 43	200	2.2
Point 44	201	2.2
Point 45	200	2.4
Point 46	199	2.4
Point 47	200	12.9
Point 48	200.5	12.9

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
--	--------------	-----	-------------	-------------	------------	-----------

1	Optimized	1.48	(208.171, -4.236)	21.88298	(178.207, -5.99536)	(235.799, -6.79973)
2	12884	1.61	(208.171, -4.236)	21.348	(180.077, -4.74864)	(236.151, -6.8)

Slices of Slip Surface: Optimized

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesiv e Strengt h (psf)
1	Optimize d	178.22665	-5.9976825	708.44424	640.07718	0	505.02
2	Optimize d	178.52315	-6.032597	670.846	641.17811	0	151.85
3	Optimize d	180	-6.2064895	491.19003	688.53504	0	160.32
4	Optimize d	182.05705	-6.4486975	322.51373	766.95728	0	172.12
5	Optimize d	183.9982	-6.773295	256.7532	842.27805	0	183.25
6	Optimize d	186.1664	-7.220665	240.73605	955.78932	0	195.68
7	Optimize d	187.98785	-7.663455	241.78934	1030.6223	0	206.12
8	Optimize d	189.4626	-8.1016655	270.48635	1117.2658	0	214.58
9	Optimize d	190.2047	-8.3221705	285.4261	1179.5998	0	218.83
10	Optimize d	191.22475	-8.7206975	312.39223	1185.877	0	224.68
11	Optimize d	193.25545	-9.5149525	379.32195	1255.2649	0	236.33

12	Optimize d	195.1301	- 10.23096	447.32218	1323.8393	0	247.08
13	Optimize d	196.84875	- 10.86872 5	505.67519	1378.2265	0	256.93
14	Optimize d	198.35405	- 11.41691 5	674.48826	1430.3679	0	265.56
15	Optimize d	199.49845	- 11.82316	796.53781	1464.6048	0	272.12
16	Optimize d	199.99845	-12.0001	1084.1984	1628.0123	313.97112	0
17	Optimize d	200.0533	- 12.00005	961.0605	987.41533	15.215971	0
18	Optimize d	200.3033	- 11.99982	384.08311	1416.0666	0	273.94
19	Optimize d	200.75	- 11.99941 5	383.99985	1415.9394	0	272.38
20	Optimize d	201.16785	- 11.99903 5	383.93936	1413.5164	0	270.92
21	Optimize d	201.61785	-11.9989	383.87651	1407.5	0	269.35
22	Optimize d	202.7	- 11.99897	383.63125	1393.75	0	265.57
23	Optimize d	204.5	- 11.99908 5	382.995	1371	0	259.29
24	Optimize d	206.5	- 11.99921 5	382.02	1345.85	0	252.3
25	Optimize d	208.40735	- 11.99934	380.85434	1300.8519	0	245.64
26	Optimize d	210.222	- 11.99946	379.58138	1236.1565	0	239.31
27	Optimize d	212.03665	- 11.99958	378.18166	1171.3508	0	232.97
28	Optimize	213.8513	-11.9997	376.7048	1106.435	0	226.64

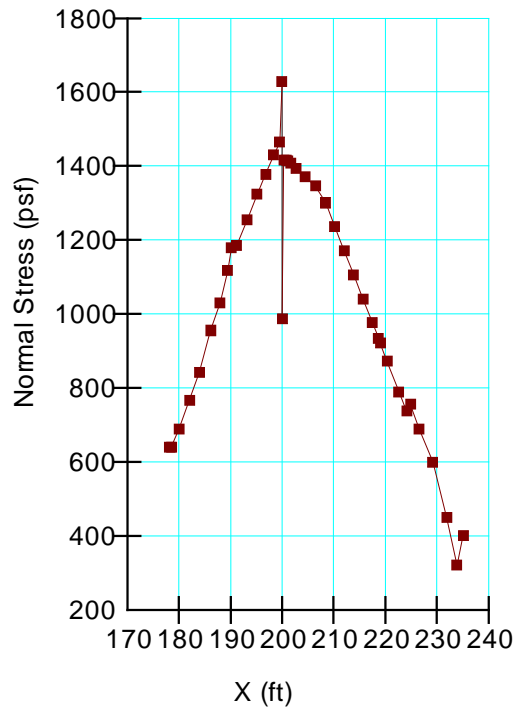
	d						
29	Optimize d	215.66595	- 11.99982	375.16732	1041.464	0	220.3
30	Optimize d	217.4806	- 11.99994	373.58024	976.38286	0	213.96
31	Optimize d	218.6649	- 11.99897 5	372.43639	934.8276	0	209.83
32	Optimize d	219.0698	- 11.99692 5	371.9371	921.28233	0	208.42
33	Optimize d	220.3483	- 11.99647 5	370.71706	872.8736	0	203.95
34	Optimize d	222.64945	- 11.99762 5	368.58333	790.13183	0	195.92
35	Optimize d	224.1683	- 11.99838 5	367.14131	738.07025	0	190.61
36	Optimize d	224.9183	- 11.92409 5	361.75779	756.66096	0	187.99
37	Optimize d	226.57115	- 11.60159 5	339.95403	688.38596	0	182.22
38	Optimize d	229.19855	- 10.85495 5	290.49185	599.58581	0	173.05
39	Optimize d	231.90885	-9.5989	208.41028	451.31013	0	163.59
40	Optimize d	233.8387	- 8.377836 5	128.53636	320.91818	0	156.85
41	Optimize d	235.10665	- 7.356973 5	53.474482	401.73246	0	450

Slices of Slip Surface: 12884

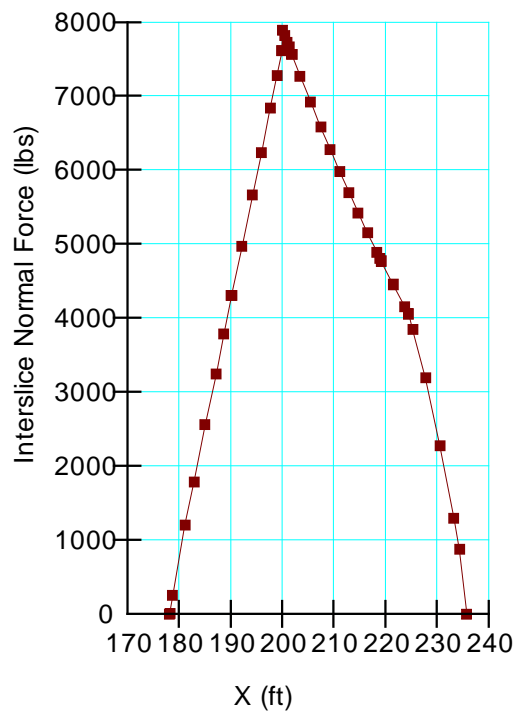
	Slip Surfac e	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictiona l Strength (psf)	Cohesiv e Strength (psf)
1	12884	180.6385	- 4.952998 5	555.50302	514.06456	0	450
2	12884	182.35755	-5.57868	328.95837	617.11658	0	450
3	12884	184.35075	- 6.304136 5	230.03468	779.4898	0	185.27
4	12884	186.022	- 6.912409 5	229.99532	887.61639	0	194.85
5	12884	187.6932	- 7.520682 5	237.6592	995.06824	0	204.43
6	12884	189.3644	- 8.128955 5	271.0137	1101.7891	0	214.02
7	12884	191.08	- 8.753385 5	311.26248	1201.5785	0	223.85
8	12884	192.84	-9.393973	368.38084	1258.3338	0	233.94
9	12884	194.6	- 10.03455 8	425.03469	1314.2882	0	244.04
10	12884	196.36	- 10.67514 5	491.45921	1369.4417	0	254.13
11	12884	198.12	- 11.31573 5	644.91741	1423.7944	0	264.22
12	12884	199.5	- 11.81801 5	797.55454	1466.0141	0	272.13
13	12884	200.25	-12	501.02	1330.58	0	274.13
14	12884	200.75	-12	384.04	1412.36	0	272.38

15	12884	201.45	-12	383.96667	1406.4444	0	269.94
16	12884	202.7	-12	383.69375	1390.6875	0	265.57
17	12884	204.5	-12	383.055	1368	0	259.29
18	12884	206.5	-12	382.065	1342.9	0	252.3
19	12884	208.40555	-12	380.8988	1298.0982	0	245.65
20	12884	210.21665	-12	379.61781	1233.5522	0	239.33
21	12884	212.02775	-12	378.21536	1168.951	0	233
22	12884	213.83885	-12	376.73561	1104.2393	0	226.68
23	12884	215.65	-12	375.19512	1039.4172	0	220.36
24	12884	217.46115	-12	373.60493	974.53994	0	214.03
25	12884	219.27225	-12	371.94297	909.5522	0	207.71
26	12884	221.08335	-12	370.23683	844.50925	0	201.39
27	12884	222.89445	-12	368.49205	779.30066	0	195.06
28	12884	224.4	-12	367.01667	729.35	0	189.8
29	12884	225.15	- 11.93005 5	361.88867	810.14847	0	187.19
30	12884	226.15385	- 11.46195 5	331.66228	739.92854	0	183.68
31	12884	227.86155	-10.66564	280.12945	622.63963	0	177.72
32	12884	229.56925	-9.869325	228.39496	504.6077	0	171.76
33	12884	231.27695	- 9.073013 5	176.48002	385.83808	0	165.79
34	12884	232.98465	- 8.276700 5	123.78492	266.32545	0	159.83
35	12884	234.81925	- 7.421210 5	60.643528	262.25727	0	450
36	12884	235.9757	- 6.881938 5	6.8275589	252.87112	0	600

base normal



interslice normal



Global Stability (Entry/Exit)

Report generated using GeoStudio 2007, version 7.15. Copyright © 1991-2009 GEO-SLOPE International Ltd.

File Information

Created By: Liljegren, James
Revision Number: 263
Last Edited By: Curran, Matthew MVN
Date: 3/14/2013
Time: 1:31:44 PM
File Name: Reach 36.gsz
Directory: C:\Users\B2EDFMJC\Desktop\Chrono Order\Reach 36 SlopeW\
Last Solved Date: 3/14/2013
Last Solved Time: 1:38:16 PM

Project Settings

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

Analysis Settings

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

Phi: 20 °
Phi-B: 0 °

MARSH, MH, EL. -7 TO -11.5 (protected)
Model: Undrained (Phi=0)
Unit Weight: 74 pcf
Cohesion: 175 psf

Fill, EL -3.8 to -7 (Protected Side)
Model: Undrained (Phi=0)
Unit Weight: 108 pcf
Cohesion: 250 psf

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

BAY SOUND CLAY 2, EL. --51/-55 TO -70
Model: Spatial Mohr-Coulomb
Weight Fn: Clay2
Cohesion Fn: Clay2
Phi: 0 °
Phi-B: 0 °

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (150, -9.6169) ft
Left-Zone Right Coordinate: (199, 3.6) ft
Left-Zone Increment: 30
Right Projection: Range
Right-Zone Left Coordinate: (215, 0.49032) ft
Right-Zone Right Coordinate: (260, -5.98655) ft
Right-Zone Increment: 30
Radius Increments: 20

Slip Surface Limits

Left Coordinate: (96, -14) ft
Right Coordinate: (410, -6.8) ft

Tension Crack Line

X (ft)	Y (ft)
171	-1.95

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 -4
Model: Spatial Mohr-Coulomb
Weight Fn: Fill
Cohesion Fn: Fill
Phi: 0 °
Phi-B: 0 °

MARSH, EL. -4 TO -11.5
Model: Spatial Mohr-Coulomb
Weight Fn: Marsh
Cohesion Fn: Marsh
Phi: 0 °
Phi-B: 0 °

BEACH SAND, EL. -11.5 TO -45
Model: Shear/Normal Fn.
Unit Weight: 122 pcf
Strength Function: Beach Sand
Phi-B: 0 °

BAY SOUND CLAY 1, EL. -45 TO -51/-55
Model: Spatial Mohr-Coulomb
Weight Fn: Clay1
Cohesion Fn: Clay1
Phi: 0 °
Phi-B: 0 °

Silted-in Layer
Model: Mohr-Coulomb
Unit Weight: 90 pcf
Cohesion: 0 psf

	200	3.65
--	-----	------

Cohesion Functions

Marsh
Model: Spline Data Point Function
Function: Cohesion vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 175
Data Points: X (ft), Cohesion (psf)
 Data Point: (165.2, 175)
 Data Point: (200, 250)
 Data Point: (226.4, 175)

Clay2
Model: Spline Data Point Function
Function: Cohesion vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 710
Data Points: X (ft), Cohesion (psf)
 Data Point: (0, 710)
 Data Point: (153, 710)
 Data Point: (200, 1000)
 Data Point: (235, 710)
 Data Point: (300, 710)

Fill
Model: Spline Data Point Function
Function: Cohesion vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 250
Data Points: X (ft), Cohesion (psf)
 Data Point: (165.2, 250)
 Data Point: (200, 625)
 Data Point: (226.4, 250)

Clay1
Model: Spline Data Point Function
Function: Cohesion vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 710
Data Points: X (ft), Cohesion (psf)

Data Point: (0, 710)
Data Point: (153, 710)
Data Point: (200, 750)
Data Point: (235, 710)
Data Point: (300, 710)

Shear/Normal Strength Functions

Beach Sand

Model: Spline Data Point Function
Function: Shear Stress vs. Normal Stress
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
Data Point: (-100000, 0)
Data Point: (0, 0)
Data Point: (100000, 57735)
Estimation Properties
Intact Rock Param.: 10
Geological Strength: 100
Disturbance Factor: 0
SigmaC: 600000 psf
Sigma3: 300000 psf
Num. Points: 20

Unit Weight Functions

Marsh

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 74
Data Points: X (ft), Unit Weight (pcf)
Data Point: (165.2, 74)
Data Point: (200, 90)
Data Point: (226.4, 74)

Clay1

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 103

Data Points: X (ft), Unit Weight (pcf)
Data Point: (96, 103)
Data Point: (165.6, 103)
Data Point: (200, 107)
Data Point: (226.4, 103)
Data Point: (310, 103)

Clay2

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 118
Data Points: X (ft), Unit Weight (pcf)
Data Point: (96, 118)
Data Point: (165.2, 118)
Data Point: (200, 120)
Data Point: (226.4, 118)
Data Point: (310, 118)

Fill

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 108
Data Points: X (ft), Unit Weight (pcf)
Data Point: (165.2, 108)
Data Point: (200, 118)
Data Point: (226.4, 108)

Regions

	Material	Points	Area (ft²)
Region 1	EMBANKMENT FILL, EL. +3.6 TO -4	3,34,35,4,5,14	155.595
Region 2	Sheet Pile	5,17,18,19	7
Region 3	EMBANKMENT FILL, EL. +3.6 TO -4	5,19,6,36,12,14	165.95
Region 4	MARSH, EL. -4 TO -11.5	27,28,3	11.7
Region 5	Fill, EL. -3.8 to -7 (Protected Side)	37,7,8,12,36	105.87
Region 6	MARSH, MH, EL. -7 TO -11.5 (protected)	12,8,9,13	826.2
Region 7	BAY SOUND CLAY 1, EL. -45 TO -51/-55	29,10,11,30,45,44,46	2006.4
Region 8	Silted-in Layer	22,25,26,24,28,41,23,39,42,40	184.19974

Region 9	MARSH, MH, EL. -7 TO -11.5 (protected)	41,28,27,38	37.41
Region 10	BEACH SAND, EL. -11.5 TO -45	31,16,15,13,9,33	1785
Region 11	BEACH SAND, EL. -11.5 TO -45	10,32,31,33,11	7850
Region 12	MARSH, EL. -4 TO -11.5	3,27,38,15,43,14	261
Region 13	MARSH, EL. -4 TO -11.5	14,12,13,15,43	158.4
Region 14	BEACH SAND, EL. -11.5 TO -45	42,39,23,41,38,15,16	201.69026
Region 15	BEACH SAND, EL. -11.5 TO -45	16,31,32,1,2,42	403.57474
Region 16	Silted-in Layer	1,2,42,40	64.425264
Region 17	BAY SOUND CLAY 2, EL. -51/-55 TO -70	20,29,46,44,45,30,21	5843.6

Points

	X (ft)	Y (ft)
Point 1	96	-18.1
Point 2	124.5	-16.8
Point 3	165.2	-4
Point 4	199	3.6
Point 5	200	3.6
Point 6	207.8	3.2
Point 7	410	-6.8
Point 8	410	-7
Point 9	410	-11.5
Point 10	96	-45
Point 11	410	-45
Point 12	226.4	-7
Point 13	226.4	-11.5
Point 14	200	-4
Point 15	200	-11.5

Point 16	200	-15.5
Point 17	200	12.9
Point 18	200.5	12.9
Point 19	201	3.5
Point 20	96	-70
Point 21	410	-70
Point 22	96	-14
Point 23	151.5	-13.4
Point 24	151.5	-9.3
Point 25	124.6	-12.7
Point 26	144.4	-10.8
Point 27	165.2	-7
Point 28	157.4	-7
Point 29	96	-51
Point 30	410	-51
Point 31	200	-20
Point 32	96	-20
Point 33	410	-20
Point 34	170.7	-1.7
Point 35	196.8	3.3
Point 36	226.4	-3.8
Point 37	272.5	-6.8
Point 38	165.2	-11.5
Point 39	144.4	-14.9
Point 40	96	-15.5
Point 41	156.2	-11.4
Point 42	138.11579	-15.5
Point 43	200	-6.9
Point 44	200	-55
Point 45	226.4	-51
Point 46	165.2	-51
Point 47	205	3
Point 48	205	-51

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.40	(215.793, 35.903)	21.9914	(185.049, 1.04886)	(236.539, -4.45981)
2	14036	1.45	(215.793, 35.903)	47.357	(184.223, 0.890606)	(240.173, -4.69628)

Slices of Slip Surface: Optimized

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	185.81445	0.12311705	459.03802	232.86201	0	472.14
2	Optimized	187.3453	-1.156481	537.18495	381.15171	0	488.63
3	Optimized	188.78025	-2.3370525	609.48368	522.09589	0	504.1
4	Optimized	190.11935	-3.4185975	675.88725	643.005	0	518.53
5	Optimized	191.541	-4.3900365	736.09035	936.97338	0	231.77
6	Optimized	193.0097	-5.231055	788.87952	1021.9287	0	234.93
7	Optimized	194.44295	-6.0517585	840.40584	1105.5454	0	238.02
8	Optimized	195.9798	-6.9720365	898.20747	1185.3232	0	241.34
9	Optimized	197.9	-8.165823	972.90324	1306.4304	0	245.47
10	Optimized	199.4392	-9.1227265	1031.9036	1402.5884	0	248.79
11	Optimized	199.9392	-9.410876	1049.6654	1556.8214	0	249.87
12	Optimized	200.25	-9.4880895	1042.5498	1211.3586	0	249.29
13	Optimize	200.75	-9.6123045	1048.5863	1328.3815	0	247.87

	d						
14	Optimized	201.79245	-9.871281	1066.0349	1340.6725	0	244.91
15	Optimized	203.37735	-10.265015	1092.6107	1361.9822	0	240.41
16	Optimized	205.07735	-10.65315	861.19202	1393.8642	0	235.58
17	Optimized	206.89245	-11.035685	142.17889	1411.3306	0	230.42
18	Optimized	208.0834	-11.28668	156.89096	1411.922	0	227.04
19	Optimized	209.1299	-11.420105	164.76969	1412.7682	0	224.06
20	Optimized	210.0118	-11.49356	169.12942	1410.7865	0	221.56
21	Optimized	210.99345	-11.49347	169.09395	1364.5843	0	218.77
22	Optimized	212.7192	-11.493775	169.06498	1285.4293	0	213.87
23	Optimized	214.44495	-11.49408	169.0418	1207.3173	0	208.96
24	Optimized	216.17065	-11.494385	169.01283	1130.1903	0	204.06
25	Optimized	217.89635	-11.49469	168.99544	1054.1065	0	199.16
26	Optimized	219.6221	-11.494995	168.98385	979.00769	0	194.26
27	Optimized	221.34785	-11.4953	168.97806	904.894	0	189.35
28	Optimized	222.63035	-11.46218	166.89361	866.92981	0	185.71
29	Optimized	223.75605	-11.31344	157.63357	827.41028	0	182.51
30	Optimized	225.1977	-10.96915	136.1784	773.05353	0	178.42
31	Optimized	226.16665	-10.6338	115.26311	738.11743	0	175.66
32	Optimize	227.6516	-9.955865	72.974955	665.39088	0	175

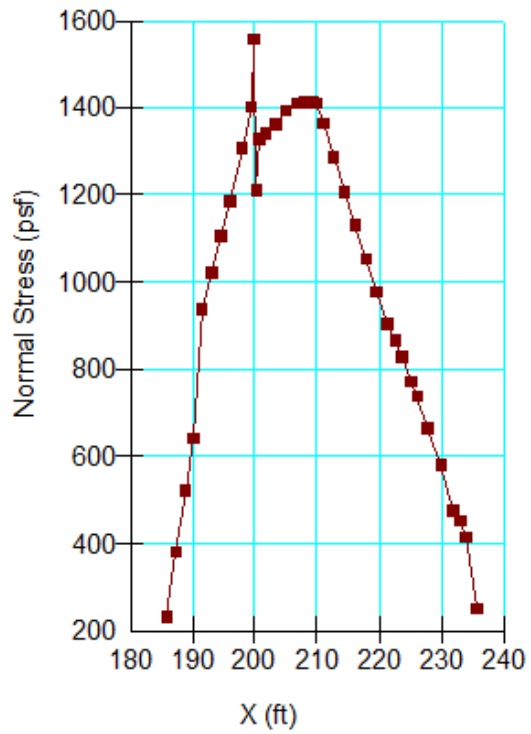
	d						
33	Optimized	229.9137	-8.81841	1.955466	580.93705	0	175
34	Optimized	231.93465	-7.68631	-68.735079	475.68888	0	175
35	Optimized	233.02635	-7.06013	-107.82979	452.58829	0	175
36	Optimized	233.96545	-6.364952	-151.22145	415.75709	0	250
37	Optimized	235.68115	-5.0948555	-230.5025	251.51732	0	250

Slices of Slip Surface: 14036

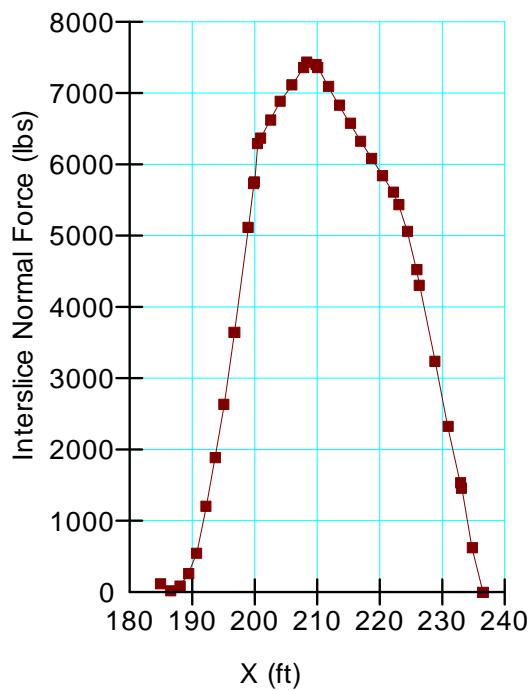
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	14036	185.23395	-0.25108085	482.02392	274.12395	0	465.88
2	14036	187.25585	-1.8693215	580.85021	490.16513	0	487.67
3	14036	189.27775	-3.3165405	669.54847	686.0608	0	509.46
4	14036	191.3739	-4.653401	752.43972	950.19049	0	231.41
5	14036	193.54435	-5.884586	829.68028	1093.4162	0	236.09
6	14036	195.7148	-6.9705805	897.95949	1228.5451	0	240.76
7	14036	197.9	-7.927829	958.27661	1355.0791	0	245.47
8	14036	199.5	-8.5600805	997.63291	1440.535	0	248.92
9	14036	200.25	-8.8301565	998.60104	1121.8345	0	249.29
10	14036	200.75	-9.0007675	1007.0367	1247.9768	0	247.87
11	14036	201.85	-9.3464225	1030.3164	1276.1465	0	244.74
12	14036	203.55	-9.8358395	1063.163	1318.1289	0	239.91
13	14036	205.25	-10.25748	262.63725	1353.4437	0	235.09
14	14036	206.95	-10.613195	117.18964	1382.3628	0	230.26
15	14036	208.73	-10.91507	134.68053	1371.2066	0	225.2
16	14036	210.59	-11.15817	148.98487	1319.8627	0	219.91
17	14036	212.45	-11.3268	158.99482	1262.1122	0	214.63
18	14036	214.31	-11.421755	164.65574	1198.1216	0	209.35

19	14036	216.17	-11.443475	165.88183	1128.2975	0	204.06
20	14036	218.03	-11.392065	162.66218	1052.8012	0	198.78
21	14036	219.89	-11.267285	154.89522	971.82438	0	193.49
22	14036	221.75	-11.06855	142.50893	885.48723	0	188.21
23	14036	223.61	-10.794915	125.38961	794.00514	0	182.93
24	14036	225.47	-10.44505	103.54653	697.43257	0	177.64
25	14036	227.34435	-10.013295	76.564198	627.51731	0	175
26	14036	229.233	-9.496153	44.247549	583.18792	0	175
27	14036	231.12165	-8.8934435	6.5991043	532.11634	0	175
28	14036	233.01035	-8.201652	-36.611038	473.81572	0	175
29	14036	234.899	-7.4165015	-85.63103	407.9246	0	175
30	14036	236.9257	-6.460045	-145.33359	342.77133	0	250
31	14036	239.0905	-5.3081865	-217.22617	207.88471	0	250

Base Normal Stress Vs. X



Interslice Normal Stress
Vs. X



Global Stability (Block)

Report generated using GeoStudio 2007, version 7.15. Copyright © 1991-2009 GEO-SLOPE International Ltd.

File Information

Created By: Liljegren, James
Revision Number: 244
Last Edited By: Schroeder, Danielle V MVN
Date: 2/22/2012
Time: 3:21:39 PM
File Name: Reach 36 global and gap.gsz
Directory: Z:\Ed\F&M\HOME\London Ave Reeevaluation 2011\East Side\Reach 36 1% flowline\SlopeW\
Last Solved Date: 2/22/2012
Last Solved Time: 3:30:52 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

Global Stability (Block)

Kind: SLOPE/W
Parent: Gap Analysis (Seepage)
Method: Spencer
Settings
PWP Conditions Source: Parent Analysis
SlipSurface
Direction of movement: Left to Right
Use Passive Mode: No
Slip Surface Option: Block
Critical slip surfaces saved: 1
Optimize Critical Slip Surface Location: Yes
Tension Crack
Tension Crack Option: (none)
FOS Distribution
FOS Calculation Option: Constant
Restrict Block Crossing: Yes
Advanced

file:///Z:/...%2036%201%25%20flowline/reach%2036%201%25%20flowline%20-%20slopew%20report%20-%20global.html[3/30/2012 1:45:00 PM]

MARSH, MH, EL. -7 TO -11.5 (protected)

Model: Undrained (Phi=0)
Unit Weight: 74 pcf
Cohesion: 175 psf

Fill, EL -3.8 to -7 (Protected Side)

Model: Undrained (Phi=0)
Unit Weight: 108 pcf
Cohesion: 250 psf

Sheet Pile

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

BAY SOUND CLAY 2, EL. --51/-55 TO -70

Model: Spatial Mohr-Coulomb
Weight Fn: Clay2
Cohesion Fn: Clay2
Phi: 0 °
Phi-B: 0 °

Slip Surface Limits

Left Coordinate: (96, -14) ft
Right Coordinate: (410, -6.8) ft

Slip Surface Block

Left Grid
Upper Left: (190, -5) ft
Lower Left: (190, -50) ft
Lower Right: (215, -50) ft
X Increments: 12
Y Increments: 15
Starting Angle: 125 °
Ending Angle: 145 °
Angle Increments: 4
Right Grid
Upper Left: (220, -5) ft
Lower Left: (220, -50) ft
Lower Right: (250, -50) ft
X Increments: 12
Y Increments: 15
Starting Angle: 25 °
Ending Angle: 45 °
Angle Increments: 4

file:///Z:/...%2036%201%25%20flowline/reach%2036%201%25%20flowline%20-%20slopew%20report%20-%20global.html[3/30/2012 1:45:00 PM]

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 -4

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

MARSH, EL. -4 TO -11.5

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

BEACH SAND, EL. -11.5 TO -45

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

BAY SOUND CLAY 1, EL. -45 TO -51/-55

Model: Spatial Mohr-Coulomb
Weight Fn: Clay1
Cohesion Fn: Clay1
Phi: 0 °
Phi-B: 0 °

Silted-in Layer

Model: Mohr-Coulomb
Unit Weight: 90 pcf
Cohesion: 0 psf
Phi: 20 °
Phi-B: 0 °

file:///Z:/...%2036%201%25%20flowline/reach%2036%201%25%20flowline%20-%20slopew%20report%20-%20global.html[3/30/2012 1:45:00 PM]

Cohesion Functions

Marsh

Model: Spline Data Point Function
Function: Cohesion vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 175
Data Points: X (ft), Cohesion (psf)
Data Point: (165.2, 175)
Data Point: (200, 250)
Data Point: (226.4, 175)

Clay2

Model: Spline Data Point Function
Function: Cohesion vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 710
Data Points: X (ft), Cohesion (psf)
Data Point: (0, 710)
Data Point: (153, 710)
Data Point: (200, 1000)
Data Point: (235, 710)
Data Point: (300, 710)

Fill

Model: Spline Data Point Function
Function: Cohesion vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 250
Data Points: X (ft), Cohesion (psf)
Data Point: (165.2, 250)
Data Point: (200, 625)
Data Point: (226.4, 250)

Clay1

Model: Spline Data Point Function
Function: Cohesion vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 710
Data Points: X (ft), Cohesion (psf)
Data Point: (0, 710)
Data Point: (153, 710)
Data Point: (200, 750)

file:///Z:/...%2036%201%25%20flowline/reach%2036%201%25%20flowline%20-%20slopew%20report%20-%20global.html[3/30/2012 1:45:00 PM]

Data Point: (235, 710)
Data Point: (300, 710)

Shear/Normal Strength Functions

Beach Sand

Model: Spline Data Point Function
Function: Shear Stress vs. Normal Stress
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
Data Point: (-100000, 0)
Data Point: (0, 0)
Data Point: (100000, 57735)
Estimation Properties
Intact Rock Param.: 10
Geological Strength: 100
Disturbance Factor: 0
SigmaC: 600000 psf
Sigma3: 300000 psf
Num. Points: 20

Unit Weight Functions

Marsh

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 74
Data Points: X (ft), Unit Weight (pcf)
Data Point: (165.2, 74)
Data Point: (200, 90)
Data Point: (226.4, 74)

Clay1

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 103
Data Points: X (ft), Unit Weight (pcf)
Data Point: (96, 103)
Data Point: (165.6, 103)
Data Point: (200, 107)

Points

	X (ft)	Y (ft)
Point 1	96	-18.1
Point 2	124.5	-16.8
Point 3	165.2	-4
Point 4	199	3.6
Point 5	200	3.6
Point 6	207.8	3.2
Point 7	410	-6.8
Point 8	410	-7
Point 9	410	-11.5
Point 10	96	-45
Point 11	410	-45
Point 12	226.4	-7
Point 13	226.4	-11.5
Point 14	200	-4
Point 15	200	-11.5
Point 16	200	-15.5
Point 17	200	12.9
Point 18	200.5	12.9
Point 19	201	3.5
Point 20	96	-70
Point 21	410	-70
Point 22	96	-14
Point 23	151.5	-13.4
Point 24	151.5	-9.3
Point 25	124.6	-12.7
Point 26	144.4	-10.8
Point 27	165.2	-7
Point 28	157.4	-7
Point 29	96	-51
Point 30	410	-51
Point 31	200	-20
Point 32	96	-20
Point 33	410	-20
Point 34	170.7	-1.7
Point 35	196.8	3.3
Point 36	226.4	-3.8
Point 37	272.5	-6.8
Point 38	165.2	-11.5
Point 39	144.4	-14.9
Point 40	96	-15.5
Point 41	156.2	-11.4
Point 42	138.11579	-15.5
Point 43	200	-6.9
Point 44	200	-55
Point 45	226.4	-51

Data Point: (226.4, 103)
Data Point: (310, 103)

Clay2

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 118
Data Points: X (ft), Unit Weight (pcf)
Data Point: (96, 118)
Data Point: (165.2, 118)
Data Point: (200, 120)
Data Point: (226.4, 118)
Data Point: (310, 118)

Fill

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 108
Data Points: X (ft), Unit Weight (pcf)
Data Point: (165.2, 108)
Data Point: (200, 118)
Data Point: (226.4, 108)

Regions

	Material	Points	Area (ft²)
Region 1	EMBANKMENT FILL, EL. +3.6 TO -4	3,34,35,4,5,14	155.595
Region 2	Sheet Pile	5,17,18,19	7
Region 3	EMBANKMENT FILL, EL. +3.6 TO -4	5,19,6,36,12,14	165.95
Region 4	MARSH, EL. -4 TO -11.5	27,28,3	11.7
Region 5	Fill, EL -3.8 to -7 (Protected Side)	37,7,8,12,36	105.87
Region 6	MARSH, MH, EL. -7 TO -11.5 (protected)	12,8,9,13	826.2
Region 7	BAY SOUND CLAY 1, EL. -45 TO -51/-55	29,10,11,30,45,44,46	2006.4
Region 8	Silted-in Layer	22,25,26,24,28,41,23,39,42,40	184.19974
Region 9	MARSH, MH, EL. -7 TO -11.5 (protected)	41,28,27,38	37.41
Region 10	BEACH SAND, EL. -11.5 TO -45	31,16,15,13,9,33	1785
Region 11	BEACH SAND, EL. -11.5 TO -45	10,32,31,33,11	7850
Region 12	MARSH, EL. -4 TO -11.5	3,27,38,15,43,14	261
Region 13	MARSH, EL. -4 TO -11.5	14,12,13,15,43	158.4
Region 14	BEACH SAND, EL. -11.5 TO -45	42,39,23,41,38,15,16	201.69026
Region 15	BEACH SAND, EL. -11.5 TO -45	16,31,32,1,2,42	403.57474
Region 16	Silted-in Layer	1,2,42,40	64.425264
Region 17	BAY SOUND CLAY 2, EL. --51/-55 TO -70	20,29,46,44,45,30,21	5843.6

Point 46	165.2	-51
Point 47	205	3.32
Point 48	205	-51

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.66	(214.951, 5.136)	17.59637	(196.758, 3.29189)	(230.744, -4.08267)
2	11449	1.66	(214.951, 5.136)	17.596	(196.758, 3.29189)	(230.744, -4.08267)

Slices of Slip Surface: Optimized

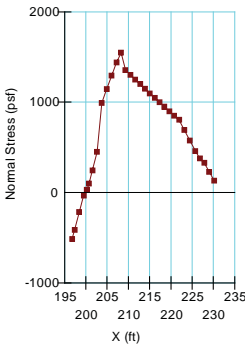
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	196.77885	3.2666735	89.438477	-513.7089	0	590.29
2	Optimized	197.35	2.5859905	131.87082	-412.64048	0	596.44
3	Optimized	198.45	1.2750617	213.63341	-214.91314	0	608.3
4	Optimized	199.5	0.0237207	291.75484	-32.144519	0	619.61
5	Optimized	200.25	-0.87009455	231.45497	29.892196	0	621.45
6	Optimized	200.75	-1.4659715	262.51446	100.379	0	614.35
7	Optimized	201.54485	-2.4132585	350.06185	246.70728	0	603.06
8	Optimized	202.6346	-3.7119555	471.41882	449.90677	0	587.58
9	Optimized	203.75705	-5.04962	577.49688	992.50667	0	239.33
10	Optimized	204.91215	-6.4262525	667.92205	1143.6419	0	236.04
11	Optimized	206.0673	-7.802885	-51.276915	1292.3844	0	232.76
12	Optimized	207.22245	-9.1795175	30.396212	1438.7897	0	229.48
13	Optimized	208.275	-10.433917	105.26152	1546.6819	0	226.49
14	Optimized	209.3229	-11	139.19131	1355.3458	0	223.51
15	Optimized	210.46875	-11	139.0604	1303.0695	0	220.26
16	Optimized	211.6146	-11	138.93822	1251.2295	0	217
17	Optimized	212.7604	-11	138.82477	1199.8258	0	213.75
18	Optimized	213.90625	-11	138.72004	1148.7712	0	210.49
19	Optimized	215.0521	-11	138.59786	1098.2403	0	207.24
20	Optimized	216.1979	-11	138.36222	1048.1458	0	203.98
21	Optimized	217.34375	-11	138.2924	998.48756	0	200.73
22	Optimized	218.4896	-11	138.22259	949.26573	0	197.47
23	Optimized	219.6354	-11	138.16149	900.56753	0	194.22
24	Optimized	220.78125	-11	138.11786	852.20098	0	190.96
25	Optimized	221.9271	-11	138.06549	804.30569	0	187.71
26	Optimized	223.15	-10.454585	104.05833	693.74183	0	184.23
27	Optimized	224.45	-9.3637555	36.122541	576.00076	0	180.54
28	Optimized	225.75	-8.272926	-31.964687	460.21017	0	176.85
29	Optimized	226.8335	-7.3637555	-88.743045	377.2463	0	175
30	Optimized	227.84645	-6.513779	-141.76545	327.97678	0	250
				-			

31	Optimized	229.00535	-5.541337	202.48524	230.49858	0	250
32	Optimized	230.16425	-4.5688945	263.21825	133.01376	0	250

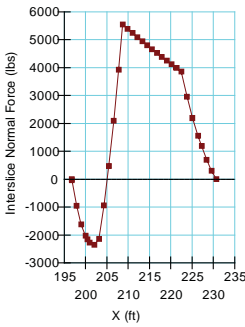
Slices of Slip Surface: 11449

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	11449	196.77885	3.2666735	89.438477	-513.7089	0	590.29
2	11449	197.35	2.5859905	131.87082	-412.64048	0	596.44
3	11449	198.45	1.2750617	213.63341	-214.91314	0	608.3
4	11449	199.5	0.0237207	291.75484	-32.144519	0	619.61
5	11449	200.25	0.87009455	231.45497	29.892196	0	621.45
6	11449	200.75	-1.4659715	262.51446	100.379	0	614.35
7	11449	201.54485	-2.4132585	350.06185	246.70728	0	603.06
8	11449	202.6346	-3.7119555	471.41882	449.90677	0	587.58
9	11449	203.75705	-5.04962	577.49688	992.50667	0	239.33
10	11449	204.91215	-6.4262525	667.92205	1143.6419	0	236.04
11	11449	206.0673	-7.802885	51.276915	1292.3844	0	232.76
12	11449	207.22245	-9.1795175	30.396212	1438.7897	0	229.48
13	11449	208.275	-10.433917	105.26152	1546.6819	0	226.49
14	11449	209.3229	-11	139.19131	1355.3458	0	223.51
15	11449	210.46875	-11	139.0604	1303.0695	0	220.26
16	11449	211.6146	-11	138.93822	1251.2295	0	217
17	11449	212.7604	-11	138.82477	1199.8258	0	213.75
18	11449	213.90625	-11	138.72004	1148.7712	0	210.49
19	11449	215.0521	-11	138.59786	1098.2403	0	207.24
20	11449	216.1979	-11	138.36222	1048.1458	0	203.98
21	11449	217.34375	-11	138.2924	998.48756	0	200.73
22	11449	218.4896	-11	138.22259	949.26573	0	197.47
23	11449	219.6354	-11	138.16149	900.56753	0	194.22
24	11449	220.78125	-11	138.11786	852.20098	0	190.96
25	11449	221.9271	-11	138.06549	804.30569	0	187.71
26	11449	223.15	-10.454585	104.05833	693.74183	0	184.23
27	11449	224.45	-9.3637555	36.122541	576.00076	0	180.54
28	11449	225.75	-8.272926	31.964687	460.21017	0	176.85
29	11449	226.8335	-7.3637555	88.743045	377.2463	0	175
30	11449	227.84645	-6.513779	141.76545	327.97678	0	250
31	11449	229.00535	-5.541337	202.48524	230.49858	0	250
32	11449	230.16425	-4.5688945	263.21825	133.01376	0	250

Base Normal Stress Vs. X



Interslice Normal Stress Vs. X



APPENDIX B GAP STABILITY ANALYSIS

GAP Stability (Entry/Exit Shallow)

Report generated using GeoStudio 2007, version 7.15. Copyright © 1991-2009 GEO-SLOPE International Ltd.

File Information

Created By: Liljegren, James
Revision Number: 280
Last Edited By: Curran, Matthew MVN
Date: 3/29/2012
Time: 5:10:30 PM
File Name: Reach 1 - manual search - Passive Resistance.gsz
Directory: Z:\Edf\F&MHOME\London Ave Reevaluation 2011\West Side\Reach 1\ETL\Deep Failure\
Last Solved Date: 3/29/2012
Last Solved Time: 5:11:14 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 Stability (Entry/Exit Shallow)

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

Unit Weight: 117 pcf
Cohesion: 200 psf
Phi: 15 °
Phi-B: 0 °

CLAY 2, -26.5 TO -41.5

Model: Spatial Mohr-Coulomb
Unit Weight: 101 pcf
Cohesion Spatial Fn: clay2
Phi: 0 °
Phi-B: 0 °

CLAY3, EL. -58.5 TO -70 (protected)

Model: Spatial Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion Fn: bay sound
Phi: 0 °
Phi-B: 0 °

SILT, EL. -41.5 TO -53.5

Model: Mohr-Coulomb
Unit Weight: 117 pcf
Cohesion: 200 psf
Phi: 15 °
Phi-B: 0 °

EMBANKMENT FILL, EL. 0.4 TO -1.5 (protected side toe)

Model: Undrained (Phi=0)
Unit Weight: 118 pcf
Cohesion: 425 psf

CLAY 1, EL. -5.5 TO -21.5 (protected side toe)

Model: Spatial Mohr-Coulomb
Weight Fn: clay1
Cohesion Fn: clay1
Phi: 0 °
Phi-B: 0 °

CLAY 2, -26.5 TO -41.5 (protected side toe)

Model: Spatial Mohr-Coulomb
Weight Fn: clay2
Cohesion Fn: clay2
Phi: 0 °
Phi-B: 0 °

Advanced

Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 6000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 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. 4.5 TO -1.5

Model: Undrained (Phi=0)
Unit Weight: 116 pcf
Cohesion: 650 psf

SILTY SAND, EL. -53.5 TO -58.5

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

CLAY3, EL. -58.5 TO -70

Model: Spatial Mohr-Coulomb
Unit Weight: 112 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

CLAY 1, EL. -5.5 TO -21.5

Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion: 425 psf
Phi: 0 °
Phi-B: 0 °

SILT, EL. -21.5 TO -26.5

Model: Mohr-Coulomb

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (200, -8) ft
Left-Zone Right Coordinate: (200, -2) ft
Left-Zone Increment: 6
Right Projection: Range
Right-Zone Left Coordinate: (220, 0.67692) ft
Right-Zone Right Coordinate: (235, 0.31585) ft
Right-Zone Increment: 15
Radius Increments: 20

Slip Surface Limits

Left Coordinate: (0, -17.3) ft
Right Coordinate: (410, 0.1) ft

Cohesion Functions

bay sound

Model: Spline Data Point Function
Function: Cohesion vs. Y
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 775
Data Points: Y (ft), Cohesion (psf)
 Data Point: (-70, 645)
 Data Point: (-58.5, 775)

clay1

Model: Spline Data Point Function
Function: Cohesion vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 400
Data Points: X (ft), Cohesion (psf)
 Data Point: (188, 400)
 Data Point: (200, 425)
 Data Point: (221.6, 400)

clay2

Model: Spline Data Point Function
Function: Cohesion vs. Y
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 405

Data Points: Y (ft), Cohesion (psf)
Data Point: (-41.5, 560)
Data Point: (-26.5, 405)

Shear/Normal Strength Functions

Beach Sand

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

Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
Data Point: (-100000, 0)
Data Point: (0, 0)
Data Point: (100000, 57735)

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

Unit Weight Functions

clay1

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

Y-Intercept: 111
Data Points: X (ft), Unit Weight (pcf)
Data Point: (188, 111)
Data Point: (200, 112)
Data Point: (221.6, 111)

clay2

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

Y-Intercept: 101
Data Points: X (ft), Unit Weight (pcf)
Data Point: (188, 101)

Data Point: (200, 102)
Data Point: (221.6, 101)

Spatial Functions

Bay Sound

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (188, -58.5, 645)
Data Point: (188, -70, 775)
Data Point: (200, -58.5, 725)
Data Point: (200, -70, 850)
Data Point: (221.2, -58.5, 645)
Data Point: (221.2, -70, 775)

clay2

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (188, -26.5, 405)
Data Point: (188, -41.5, 560)
Data Point: (200, -26.5, 430)
Data Point: (200, -41.5, 590)
Data Point: (221.2, -26.5, 405)
Data Point: (221.2, -41.5, 560)

Regions

	Points	Area (ft²)	Material
Region 1	26,42,13,3,43,2,45,46,27,20,12,24	121.83862	
Region 2	24,16,4,21,51,27,20,12	166.3	EMBANKMENT FILL, EL. 4.5 TO -1.5
Region 3	46,27,34,44,33,17,56	140.50074	
Region 4	27,51,52,47,56,17,33,44,34	389.6	CLAY 1, EL. -5.5 TO -21.5
Region 5	6,47,52,7,30,53,48,29	2050	SILT, EL. -21.5 TO -26.5
Region 6	48,53,54,49	498	CLAY 2, -26.5 TO -41.5

Region 7	41,9,36,37,8,40,50,55	2050	SILTY SAND, EL. -53.5 TO -58.5
Region 8	37,36,39,38	381.8	CLAY3, EL. -58.5 TO -70
Region 9	10,8,37,38	2162	CLAY3, EL. -58.5 TO -70 (protected)
Region 10	36,9,11,39	2171.2	CLAY3, EL. -58.5 TO -70 (protected)
Region 11	40,31,49,54,32,41,55,50	4920	SILT, EL. -41.5 TO -53.5
Region 12	45,23,58,57,1,46	76.126433	
Region 13	21,35,5,28,51	1064.66	EMBANKMENT FILL, EL. 0.4 TO -1.5 (protected side toe)
Region 14	51,28,7,52	3020.8	CLAY 1, EL. -5.5 TO -21.5 (protected side toe)
Region 15	57,1,46,56,19	2144.7392	
Region 16	19,56,47,6	789.6	CLAY 1, EL. -5.5 TO -21.5 (protected side toe)
Region 17	53,30,32,54	2832	CLAY 2, -26.5 TO -41.5 (protected side toe)
Region 18	29,48,49,31	2820	CLAY 2, -26.5 TO -41.5 (protected side toe)
Region 19	25,15,22,16,24,26	7.5	Sheet Pile

Points

	X (ft)	Y (ft)
Point 1	173.8	-5.9
Point 2	189.5	1.5
Point 3	191.5	6
Point 4	213.4	2.2
Point 5	410	0.1
Point 6	0	-21.5
Point 7	410	-21.5
Point 8	0	-58.5

Point 9	410	-58.5
Point 10	0	-70
Point 11	410	-70
Point 12	200	1.5
Point 13	193.8	6
Point 14	193.8	1.5
Point 15	200.5	12.8
Point 16	201	3.6
Point 17	200	-17.3
Point 18	193.8	-16.5
Point 19	0	-17.3
Point 20	200	-4.9
Point 21	221.2	0.4
Point 22	201	6
Point 23	183.8	-2.7
Point 24	200	3.6
Point 25	200	12.8
Point 26	200	5.4
Point 27	200	-5.5
Point 28	410	-5.5
Point 29	0	-26.5
Point 30	410	-26.5
Point 31	0	-41.5
Point 32	410	-41.5
Point 33	200	-12.5
Point 34	200	-7.2
Point 35	270.4	0.1
Point 36	221.2	-58.5
Point 37	188	-58.5
Point 38	188	-70
Point 39	221.2	-70
Point 40	0	-53.5
Point 41	410	-53.5
Point 42	199	5.4
Point 43	191.5	3
Point 44	200	-10.9

Point 45	188.00714	0.4
Point 46	188	-5.68321
Point 47	188	-21.5
Point 48	188	-26.5
Point 49	188	-41.5
Point 50	188	-53.5
Point 51	221.2	-5.5
Point 52	221.2	-21.5
Point 53	221.2	-26.5
Point 54	221.2	-41.5
Point 55	221.2	-53.5
Point 56	188	-17.3
Point 57	0	-5.9
Point 58	153.47813	-5.8

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	3.65	(209.84, 24.814)	13.93666	(200, 12.8)	(229.769, 0.347752)
2	910	3.90	(209.84, 24.814)	32.347	(200, 12.8)	(230.992, 0.340295)

Slices of Slip Surface: **Optimized**

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimize d	200.25	-	646.19458	-1108.2675	0	425
2	Optimize d	200.75	-6.532498	581.2034	1283.8556	0	425
3	Optimize d	201.1594	-6.54837	580.51868	1177.1786	0	425
4	Optimize d	201.8396	-6.62035	582.25562	1150.9472	0	425

5	Optimize d	202.88115	-6.75195	586.29437	1151.9949	0	425
6	Optimize d	203.9267	-6.9049	591.17153	1144.0908	0	425
7	Optimize d	204.97635	-7.0792	597.31821	1149.7299	0	425
8	Optimize d	206.067	-	601.57604	1168.9355	0	425
9	Optimize d	207.1986	-	603.57947	1167.6174	0	425
10	Optimize d	208.35285	-	603.70847	1177.8788	0	425
11	Optimize d	209.5298	-	601.86764	1169.9047	0	425
12	Optimize d	210.59455	-7.53594	598.11664	1178.1769	0	425
13	Optimize d	211.5471	-7.52796	592.60525	1164.7396	0	425
14	Optimize d	212.49965	-7.51998	587.03088	1151.4073	0	425
15	Optimize d	213.18795	-7.498688	581.96514	1161.4625	0	425
16	Optimize d	214.13495	-7.421418	571.91873	1129.9504	0	425
17	Optimize d	215.37755	-	555.63746	1106.7359	0	425
18	Optimize d	216.39285	-	538.73236	1058.1446	0	425
19	Optimize d	217.3458	-6.88055	519.98035	1035.0989	0	425
20	Optimize d	218.23645	-6.63617	499.3964	981.66296	0	425
21	Optimize	219.18165	-6.32259	474.35335	948.14621	0	425

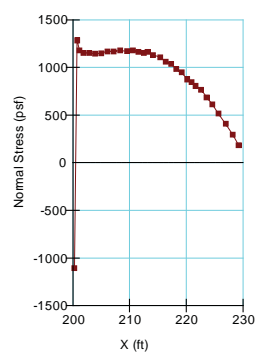
	d						
22	Optimize d	220.18135	-5.93981	444.39566	874.18146	0	425
23	Optimize d	220.9406	-5.618154	419.50566	845.38496	0	425
24	Optimize d	221.6549	-5.259424	392.52663	805.24731	0	425
25	Optimize d	222.6052	-4.72454	352.85978	765.51525	0	425
26	Optimize d	223.59595	-4.1117	307.66537	684.89494	0	425
27	Optimize d	224.6196	-3.450025	259.71058	610.34774	0	425
28	Optimize d	225.67615	-2.739515	209.96289	516.09103	0	425
29	Optimize d	226.9471	-1.844925	147.72854	408.14781	0	425
30	Optimize d	228.2095	-	82.955402	293.25416	0	425
31	Optimize d	229.2489	-	27.522038	181.40706	0	425

Slices of Slip Surface: **910**

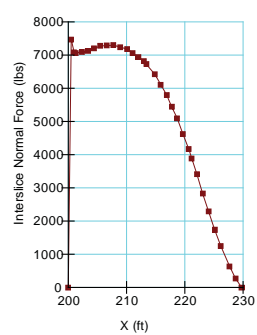
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	910	200.25	-6.0776145	618.74727	-1018.83	0	425
2	910	200.75	-6.2284395	561.95972	1177.029	0	425
3	910	201.51665	-6.4392565	572.12058	1096.8294	0	425
4	910	202.55	-6.6964035	584.14284	1120.9365	0	425
5	910	203.58335	-6.917825	593.58242	1141.249	0	425
6	910	204.61665	-7.104265	600.58391	1157.6946	0	425
7	910	205.65	-7.2563345	605.39268	1170.406	0	425
8	910	206.68335	-7.374521	607.85405	1179.437	0	425
9	910	207.71665	-7.459197	608.04312	1184.6639	0	425

10	910	208.75	-7.5106265	606.11981	1186.1641	0	425
11	910	209.78335	-7.5289685	601.92484	1184.0303	0	425
12	910	210.81665	-7.514279	595.57711	1178.173	0	425
13	910	211.85	-7.4665125	587.10522	1168.4152	0	425
14	910	212.88335	-7.3855225	576.403	1154.9834	0	425
15	910	213.95195	-7.2659535	562.98418	1129.1491	0	425
16	910	215.0559	-7.10502	546.66177	1090.5879	0	425
17	910	216.15985	-6.9048605	527.91864	1047.1488	0	425
18	910	217.26375	-6.664725	506.49261	998.84325	0	425
19	910	218.3677	-6.383689	482.3903	945.45213	0	425
20	910	219.47165	-6.060635	455.86421	886.7197	0	425
21	910	220.57555	-5.6942255	426.35878	822.41716	0	425
22	910	221.16375	-5.486457	409.72372	818.68491	0	650
23	910	221.744	-5.257584	392.03755	774.16135	0	425
24	910	222.83195	-4.8036415	357.20779	726.34299	0	425
25	910	223.9199	-4.3019785	319.05316	672.2566	0	425
26	910	225.00785	-3.7500755	278.9116	611.45099	0	425
27	910	226.0958	-3.144951	236.10322	543.41167	0	425
28	910	227.18375	-2.4830565	189.91015	467.4944	0	425
29	910	228.2717	-1.760139	140.49541	382.92213	0	425
30	910	229.35965	-	87.253423	288.70726	0	425
31	910	230.4476	-0.1094802	29.773057	183.60406	0	425

Base Normal Stress Vs. X



Interslice Normal Stress
Vs. X



GAP Stability Fully Spec

Report generated using GeoStudio 2007, version 7.15. Copyright © 1991-2009 GEO-SLOPE International Ltd.

File Information

Created By: Lijjegren, James
Revision Number: 239
Last Edited By: Schroeder, Danielle V MVN
Date: 1/11/2012
Time: 3:57:06 PM
File Name: Reach 2-DVS.gsz
Directory: G:\F&M\HOME\London Ave Reevaluation 2011\Priority Reaches\Reach 2\SlopeW\
Last Solved Date: 1/11/2012
Last Solved Time: 3:58:20 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 Fully Spec

Kind: SLOPE/W
Parent: Gap Analysis (Seepage)
Method: Spencer
Settings
PWP Conditions Source: Parent Analysis
SlipSurface
Direction of movement: Left to Right
Use Passive Mode: Yes
Slip Surface Option: Fully-Specified
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. 5.8 TO -5.5

Model: Undrained (Phi=0)
Unit Weight: 116 pcf
Cohesion: 825 psf

CLAY 1, EL. -5.5 TO -30

Model: Spatial Mohr-Coulomb
Unit Weight: 117 pcf
Cohesion Spatial Fn: Clay
Phi: 0 °
Phi-B: 0 °

SILT, EL.-30 TO -58.5

Model: Mohr-Coulomb
Unit Weight: 117 pcf
Cohesion: 200 psf
Phi: 15 °
Phi-B: 0 °

CLAY 2, EL. -58.5 TO -70

Model: Spatial Mohr-Coulomb
Unit Weight: 105 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

FILL, EL. 0.9 TO -1.5 (Protected)

Model: Undrained (Phi=0)
Unit Weight: 116 pcf
Cohesion: 900 psf

FILL, EL. -1.5 TO -5.5 (Protected)

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

3/1/2012

3/1/2012

GAP Stability Fully Spec

Page 3 of 7

GAP Stability Fully Spec

Page 4 of 7

Cohesion: 500 psf

Slip Surface Limits

Left Coordinate: (150.6, -17.3) ft
Right Coordinate: (310, 1.4) ft

Fully Specified Slip Surfaces

Fully Specified Slip Surface 1

X (ft)	Y (ft)
175	7.5
200	-5.8
211	-5.8
231	6.2

FullySpecFixedPoints

- [1] flag: Yes
[2] flag: Yes

Spatial Functions

Bay sound

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (180.7, -58.5, 710)
Data Point: (180.7, -70, 820)
Data Point: (200, -58.5, 780)
Data Point: (200, -70, 890)
Data Point: (212.8, -58.5, 710)
Data Point: (212.8, -70, 820)
Data Point: (150.6, -58.5, 710)
Data Point: (150.6, -70, 820)
Data Point: (310, -58.5, 710)
Data Point: (310, -70, 820)

Clay

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (180.7, -5.5, 285)
Data Point: (180.7, -30, 400)
Data Point: (200, -5.5, 300)
Data Point: (200, -30, 425)

Data Point: (212.8, -5.5, 285)
Data Point: (212.8, -30, 400)
Data Point: (150.6, -5.5, 285)
Data Point: (150.6, -30, 400)
Data Point: (310, -5.5, 285)
Data Point: (310, -30, 400)

Regions

	Points	Area (ft²)	Material
Region 1	3,4,14,21,15,32,23	115.235	
Region 2	15,21,19,5,24,28,29	107.48	EMBANKMENT FILL, EL. 5.8 TO -5.5
Region 3	10,8,9,11	4542.9	SILT, EL.-30 TO -58.5
Region 4	21,14,27,18,22,19	7.4	Sheet Pile
Region 5	26,6,28,24,25	279.18	FILL, EL. 0.9 TO -1.5 (Protected)
Region 6	29,28,6,30	388.8	FILL, EL. -1.5 TO -5.5 (Protected)
Region 7	8,20,31,17,16,15,29,30,9	3322.38	CLAY 1, EL. -5.5 TO -30
Region 8	20,7,1,2,32,15,16,17,31	553.78	
Region 9	12,10,11,13	1833.1	CLAY 2, EL. -58.5 TO -70

Points

	X (ft)	Y (ft)
Point 1	150.6	-6.7
Point 2	179.1	-6.3
Point 3	194.8	3
Point 4	195.4	5.8
Point 5	206.3	3.5
Point 6	310	-1.5
Point 7	150.6	-9.5
Point 8	150.6	-30
Point 9	310	-30
Point 10	150.6	-58.5
Point 11	310	-58.5
Point 12	150.6	-70
Point 13	310	-70
Point 14	200	5.8
Point 15	200	-5.5
Point 16	200	-9.5
Point 17	200	-17.3
Point 18	200.5	12.8
Point 19	201	3.7
Point 20	150.6	-17.3
Point 21	200	3.7

3/1/2012

3/1/2012

Point 22	201	6
Point 23	184.3	-3.7
Point 24	212.8	0.9
Point 25	223.6	1.4
Point 26	310	1.4
Point 27	200	12.8
Point 28	212.8	-1.5
Point 29	212.8	-5.5
Point 30	310	-5.5
Point 31	180.7	-17.3
Point 32	180.7	-5.5

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	3.75	(209.795, 3.162)	11.28645	(200, 12.8)	(220.879, 1.27402)
2	1	4.11	(209.795, 3.162)	11.794	(200, 12.8)	(222.95, 1.3699)

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	-5.792149	603.15466	-879.05733	0	301.2
2	Optimized	200.75	-5.781957	538.62807	1117.3878	0	300.55
3	Optimized	201.26395	-5.7714805	536.03318	1114.3967	0	299.89
4	Optimized	201.6584	-5.76565	534.11681	1107.8517	0	299.4
5	Optimized	202.1441	-5.7701365	532.44364	1102.0705	0	298.85
6	Optimized	202.85455	-5.78001	530.19181	1100.0861	0	298.06
7	Optimized	203.56505	-5.7898835	527.71481	1098.1157	0	297.27
8	Optimized	204.3169	-5.834898	527.34105	1079.4914	0	296.6
9	Optimized	205.11015	-5.915054	528.84616	1085.3111	0	296.06
10	Optimized	205.9034	-5.99521	530.32619	1091.1183	0	295.52
11	Optimized	206.5627	-6.061836	531.40748	1085.0634	0	295.06
12	Optimized	207.08815	-6.114932	532.29742	1067.17	0	294.69
13	Optimized	207.6449	-6.15002	531.79047	1062.306	0	294.2
14	Optimized	208.2329	-6.1671	529.93754	1037.096	0	293.58
15	Optimized	208.7973	-6.15166	526.0709	1036.0613	0	292.83
16	Optimized	209.3381	-6.1037	520.17655	1004.8949	0	291.96
17	Optimized	209.95635	-6.00979	510.83026	989.87188	0	290.77
18	Optimized	210.6521	-5.86993	498.1768	939.61035	0	289.28
19	Optimized	211.4039	-5.725	484.89203	882.82238	0	287.7
20	Optimized	212.2257	-5.5724	470.99826	825.11743	0	286.01

21	Optimized	212.7218	-5.436988	459.66248	1046.0922	0	825
22	Optimized	213.15755	-5.1147895	436.42462	916.38712	0	500
23	Optimized	213.8726	-4.5860165	398.11532	851.93486	0	500
24	Optimized	214.5703	-4.0517	359.09735	801.82059	0	500
25	Optimized	215.25065	-3.51184	319.91535	735.13174	0	500
26	Optimized	216.0505	-2.86609	273.83302	661.52595	0	500
27	Optimized	216.80565	-2.2427025	231.01889	589.07159	0	500
28	Optimized	217.41115	-1.7353725	196.53785	525.74091	0	500
29	Optimized	218.0378	-1.2036775	160.22803	586.54434	0	900
30	Optimized	218.671	-0.6598125	123.44771	518.31504	0	900
31	Optimized	219.5043	0.059395	76.573578	430.37336	0	900
32	Optimized	220.44995	0.890347	23.839083	335.36307	0	900

Slices of Slip Surface: **1**

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	1	200.25	-5.8	603.62	-870.82	0	301.24
2	1	200.75	-5.8	539.78	1113.5	0	300.64
3	1	201.37855	-5.8	537.45469	1111.2433	0	299.9
4	1	202.1357	-5.8	534.41695	1107.8886	0	299.01
5	1	202.89285	-5.8	531.32639	1104.5471	0	298.11
6	1	203.65	-5.8	527.99808	1101.2056	0	297.22
7	1	204.40715	-5.8	524.65657	1097.8509	0	296.32
8	1	205.1643	-5.8	521.09054	1094.5094	0	295.43
9	1	205.92145	-5.8	517.48488	1091.1679	0	294.53
10	1	206.69165	-5.8	513.63832	1071.3064	0	293.62
11	1	207.475	-5.8	509.69364	1034.9234	0	292.7
12	1	208.25835	-5.8	505.6596	998.54047	0	291.77
13	1	209.04165	-5.8	501.63832	962.15749	0	290.85
14	1	209.825	-5.8	497.61704	925.78727	0	289.92
15	1	210.60835	-5.8	493.74896	889.40429	0	289
16	1	211.25	-5.65	480.64193	968.41819	0	287.53
17	1	211.825	-5.305	454.90662	1001.9739	0	825
18	1	212.475	-4.915	425.6859	919.37759	0	825
19	1	213.18335	-4.49	394.09256	786.52979	0	500
20	1	213.95	-4.03	359.90096	732.58602	0	500
21	1	214.71665	-3.57	325.51922	678.64226	0	500
22	1	215.48335	-3.11	291.73027	624.6985	0	500

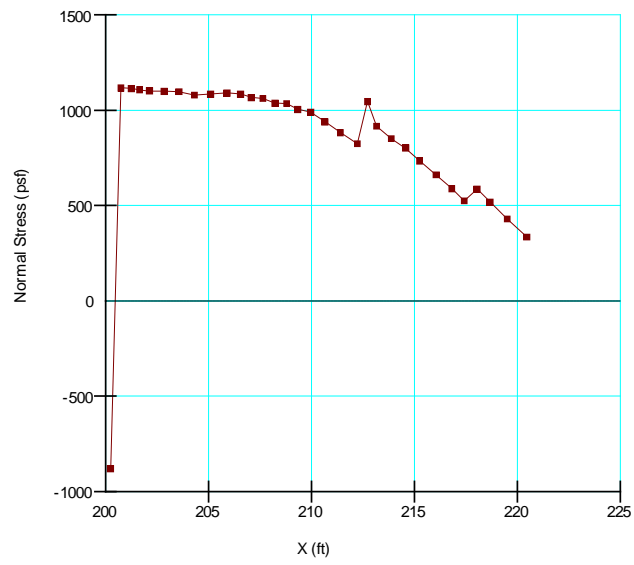
3/1/2012

3/1/2012

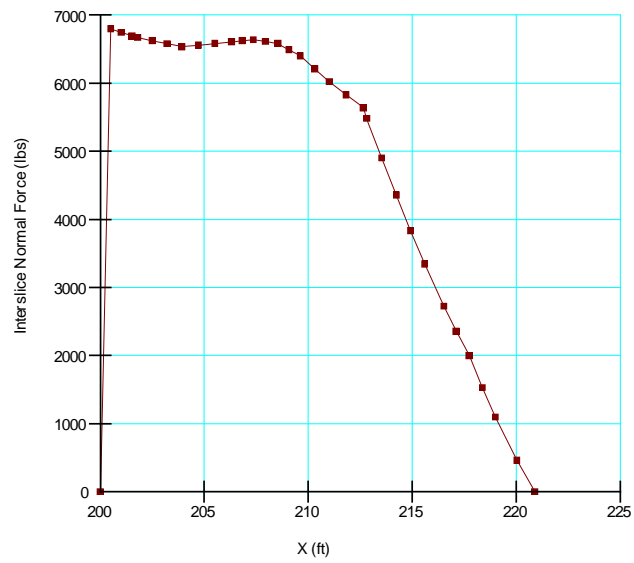
23	1	216.25	-2.65	258.97032	570.75474	0	500
24	1	217.01665	-2.19	227.38475	516.81098	0	500
25	1	217.78335	-1.73	196.1571	462.86722	0	500
26	1	218.5653	-1.2608415	164.33604	487.32876	0	900
27	1	219.3625	-0.7825249	132.77681	431.23422	0	900
28	1	220.15965	-0.30420849	102.09207	375.13967	0	900
29	1	220.9568	0.17410811	72.076382	319.04513	0	900
30	1	221.754	0.65242475	42.658746	262.96134	0	900
31	1	222.5512	1.1307416	14.010191	206.86679	0	900

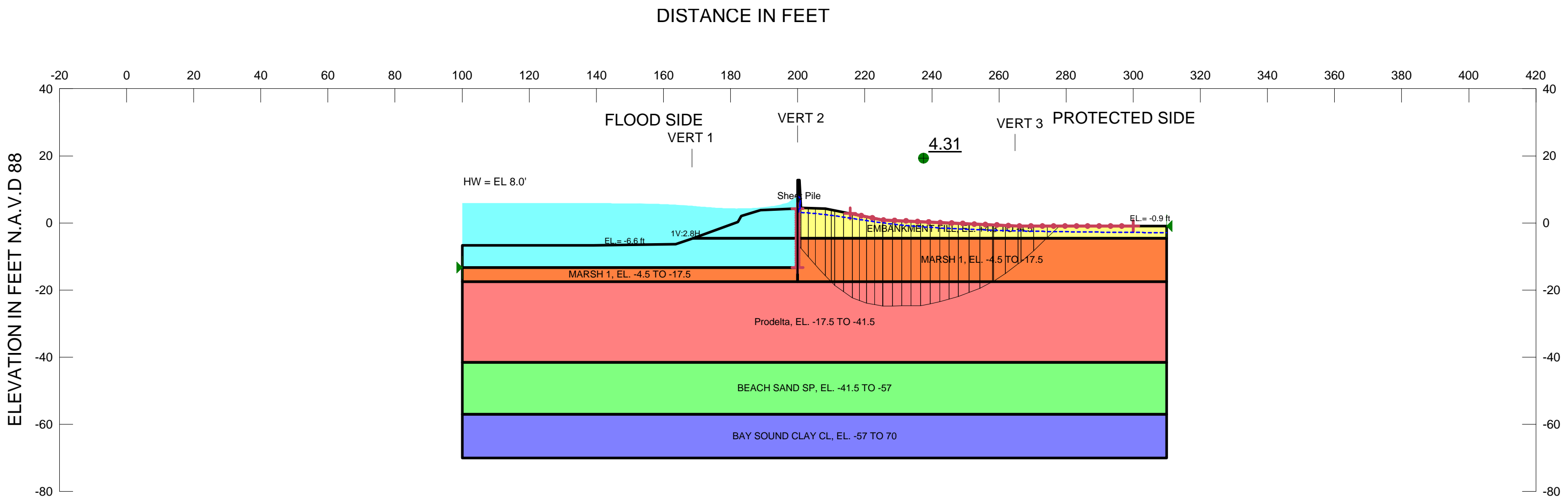
3/1/2012

Base Normal Stress Vs. X



Interslice Normal Stress Vs. X





Name: EMBANKMENT FILL, EL. +4.3 TO -4.5 Model: Undrained (Phi=0) Unit Weight: 117 pcf Cohesion: 760 psf
Name: MARSH 1, EL. -4.5 TO -17.5 Model: Spatial Mohr-Coulomb Unit Weight: 114 pcf Cohesion Fn: Marsh 1 Phi: 0 °
Name: BEACH SAND SP, EL. -41.5 TO -57 Model: Mohr-Coulomb Unit Weight: 122 pcf Cohesion: 0 psf Phi: 30 °
Name: BAY SOUND CLAY CL, EL. -57 TO 70 Model: Spatial Mohr-Coulomb Unit Weight: 112 pcf Cohesion Spatial Fn: Bay Sound Phi: 0 °
Name: Prodelta, EL. -17.5 TO -41.5 Model: Spatial Mohr-Coulomb Unit Weight: 98 pcf Cohesion Fn: Prodelta Phi: 0 °
Name: Sheet Pile Model: Undrained (Phi=0) Unit Weight: 0.1 pcf Cohesion: 0.01 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
VERTICALSWERE ASSUMED TO VARY LINEARLY
BETWEENTHE VALUES INDICATED FOR THESE LOCATIONS.

Hw = CANAL WATER LEVEL

LONDON AVE CANAL
OUTFALL CANAL REEVALUATION REPORT
REACH 3, STA. 21+00 TO STA. 33+00
PROTECTED SIDE STABILITY ANALYSIS,
CASE: GAP Stability (Entry/Exit)
MARCH 2012

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

GAP Stability (Entry/Exit)

Report generated using GeoStudio 2007, version 7.15. Copyright © 1991-2009 GEO-SLOPE International Ltd.

File Information

Created By: Liljegren, James
Revision Number: 214
Last Edited By: Schroeder, Danielle V MVN
Date: 1/11/2012
Time: 4:37:53 PM
File Name: Reach 3-DVS.gsz
Directory: G:\F&MHOME\London Ave Reevaluation 2011\West Side\Reach 3\SlopeW\
Last Solved Date: 1/11/2012
Last Solved Time: 4:38:30 PM

Project Settings

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

Analysis Settings

GAP Stability (Entry/Exit)

Kind: SLOPE/W
Parent: Gap Analysis (Seepage)
Method: Spencer
Settings
PWP Conditions Source: Parent Analysis
SlipSurface
Direction of movement: Left to Right
Use Passive Mode: Yes
Slip Surface Option: Entry and Exit
Critical slip surfaces saved: 1
Optimize Critical Slip Surface Location: Yes
Tension Crack
Tension Crack Option: (none)
FOS Distribution
FOS Calculation Option: Constant
Advanced
Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft

Optimization Maximum Iterations: 4000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

EMBANKMENT FILL, EL. +4.3 TO -4.5

Model: Undrained (Phi=0)
Unit Weight: 117 pcf
Cohesion: 760 psf

MARSH 1, EL. -4.5 TO -17.5

Model: Spatial Mohr-Coulomb
Unit Weight: 114 pcf
Cohesion Fn: Marsh 1
Phi: 0 °
Phi-B: 0 °

BEACH SAND SP, EL. -41.5 TO -57

Model: Mohr-Coulomb
Unit Weight: 122 pcf
Cohesion: 0 psf
Phi: 30 °
Phi-B: 0 °

BAY SOUND CLAY CL, EL. -57 TO 70

Model: Spatial Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion Spatial Fn: Bay Sound
Phi: 0 °
Phi-B: 0 °

Prodelta, EL. -17.5 TO -41.5

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

Sheet Pile

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

3/1/2012

3/1/2012

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (200, -13.3) ft
Left-Zone Right Coordinate: (200, 4.3) ft
Left-Zone Increment: 25
Right Projection: Range
Right-Zone Left Coordinate: (215.6, 2.84854) ft
Right-Zone Right Coordinate: (300, -0.9) ft
Right-Zone Increment: 25
Radius Increments: 25

Slip Surface Limits

Left Coordinate: (100, -13.3) ft
Right Coordinate: (310, -0.9) ft

Cohesion Functions

Marsh 1

Model: Spline Data Point Function
Function: Cohesion vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 475
Data Points: X (ft), Cohesion (psf)
Data Point: (100, 475)
Data Point: (168.8, 475)
Data Point: (200, 500)
Data Point: (265.7, 475)
Data Point: (310, 475)

Prodelta

Model: Spline Data Point Function
Function: Cohesion vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 380
Data Points: X (ft), Cohesion (psf)
Data Point: (100, 380)
Data Point: (168.8, 380)
Data Point: (200, 400)
Data Point: (265.7, 380)
Data Point: (310, 380)

Spatial Functions

Bay Sound

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (168.8, -57, 580)
Data Point: (168.8, -70, 720)
Data Point: (200, -57, 715)
Data Point: (200, -70, 860)
Data Point: (265.7, -57, 580)
Data Point: (265.7, -70, 720)
Data Point: (100, -57, 580)
Data Point: (100, -70, 720)
Data Point: (310, -57, 580)
Data Point: (310, -70, 720)

Regions

	Points	Area (ft²)	Material
Region 1	27,23,24,7,22,1,16	175.48	
Region 2	1,25,21,2,3,26,4,8,16	536.01	EMBANKMENT FILL, EL. +4.3 TO -4.5
Region 3	12,10,11,13	3255	BEACH SAND SP, EL. -41.5 TO -57
Region 4	14,12,13,15	2730	BAY SOUND CLAY CL, EL. -57 TO 70
Region 5	10,18,17,9,11	5040	Prodelta, EL. -17.5 TO -41.5
Region 6	1,19,20,21,25	6.425	Sheet Pile
Region 7	16,8,9,17,29	1430	MARSH 1, EL. -4.5 TO -17.5
Region 8	18,30,29,17	420	MARSH 1, EL. -4.5 TO -17.5
Region 9	30,28,5,6,27,16,29	745.33	

Points

	X (ft)	Y (ft)
Point 1	200	4.3
Point 2	208.3	4.3
Point 3	225.4	0.9
Point 4	310	-0.9
Point 5	139.1	-6.6
Point 6	163.7	-6.3
Point 7	188.9	3.8
Point 8	310	-4.5
Point 9	310	-17.5
Point 10	100	-41.5
Point 11	310	-41.5
Point 12	100	-57
Point 13	310	-57
Point 14	100	-70

3/1/2012

3/1/2012

Point 15	310	-70
Point 16	200	-4.5
Point 17	200	-17.5
Point 18	100	-17.5
Point 19	200	12.8
Point 20	200.5	12.8
Point 21	201	4.5
Point 22	199	4.3
Point 23	182.2	0.3
Point 24	183.2	2.1
Point 25	201	4.3
Point 26	265.7	-0.9
Point 27	168.8	-4.5
Point 28	100	-6.6
Point 29	200	-13.3
Point 30	100	-13.3
Point 31		

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	4.31	(236.196, 20.675)	34.73873	(200, 12.8)	(277.983, -0.9)
2	6568	4.54	(236.196, 20.675)	45.542	(200, 12.8)	(276.303, -0.9)

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	200.25	-6.666716	694.10181	642.64254	0	499.9
2	Optimized	200.75	-7.2506655	687.94907	1162.2693	0	499.71
3	Optimized	202.07105	-8.79353	798.40489	1349.7524	0	499.21
4	Optimized	204.21315	-11.29531	945.81346	1616.7881	0	498.4
5	Optimized	206.7921	-14.127835	1056.6798	1940.0149	0	497.42
6	Optimized	209.1535	-16.604735	1153.2645	2188.2922	0	496.52
7	Optimized	210.501	-18.018155	1212.9496	2327.8407	0	396.8
8	Optimized	212.31685	-19.471985	1270.9146	2484.7438	0	396.25
9	Optimized	214.96055	-21.34333	1348.8706	2603.6692	0	395.45
10	Optimized	217.34555	-22.686865	1405.0726	2738.9212	0	394.72
11	Optimized	219.4718	-	1437.1279	2769.0004	0	394.07

			23.502595				
12	Optimized	221.7326	-24.117845	1458.7143	2817.1836	0	393.38
13	Optimized	224.128	-24.53262	1470.1085	2802.2517	0	392.66
14	Optimized	225.36285	-24.73968	1476.267	2829.1867	0	392.28
15	Optimized	226.799	-24.726945	1469.2612	2819.7978	0	391.84
16	Optimized	229.59695	-24.70213	1456.7168	2802.7503	0	390.99
17	Optimized	232.3949	-24.677315	1445.3161	2785.6671	0	390.14
18	Optimized	235.19285	-24.6525	1434.9161	2768.584	0	389.29
19	Optimized	238.0453	-24.34011	1408.2827	2761.0104	0	388.42
20	Optimized	240.9523	-23.740155	1364.9572	2686.3866	0	387.53
21	Optimized	243.7678	-23.05517	1317.0765	2618.2213	0	386.68
22	Optimized	246.49185	-22.28515	1264.5475	2527.5053	0	385.85
23	Optimized	249.4594	-21.278865	1197.4396	2430.9812	0	384.94
24	Optimized	252.6704	-20.03631	1115.6507	2293.3196	0	383.97
25	Optimized	256.166	-18.457515	1012.8772	2135.0844	0	382.9
26	Optimized	258.2407	-17.4065	945.02449	2029.7546	0	477.84
27	Optimized	260.14815	-16.20245	867.8732	1905.0816	0	477.11
28	Optimized	263.7855	-13.651355	705.04834	1606.2414	0	475.73
29	Optimized	266.10275	-11.90776	593.92878	1391.3758	0	475
30	Optimized	268.4339	-9.93693	468.60963	1178.0448	0	475
31	Optimized	272.39025	-6.30545	238.01891	764.96209	0	475
32	Optimized	276.2008	-2.620875	4.4143807	392.13827	0	760

Slices of Slip Surface: **6568**

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	6568	200.25	-7.2853945	735.2301	692.22686	0	499.9
2	6568	200.75	-7.9167155	736.67316	1233.7112	0	499.71
3	6568	202.21665	-9.592486	862.09135	1453.2655	0	499.16
4	6568	204.65	-12.128345	987.76125	1750.6058	0	498.23
5	6568	207.08335	-14.310765	1062.1078	2006.4809	0	497.3
6	6568	209.83105	-16.411585	1134.1178	2222.987	0	496.26
7	6568	212.53195	-18.21187	1200.4571	2382.3659	0	396.19

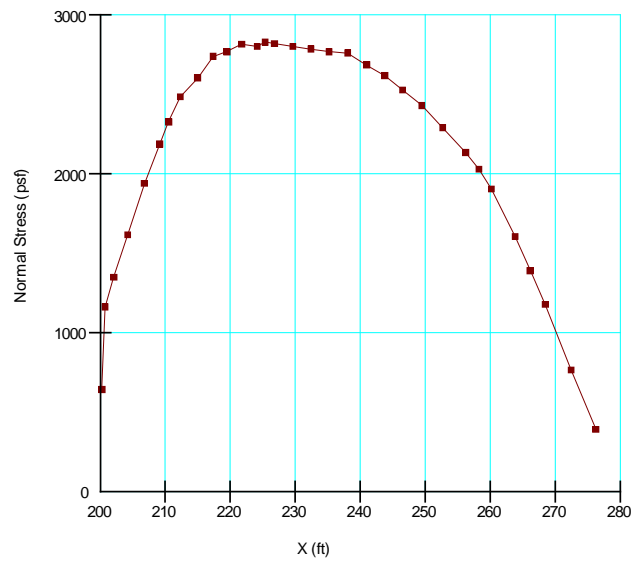
3/1/2012

3/1/2012

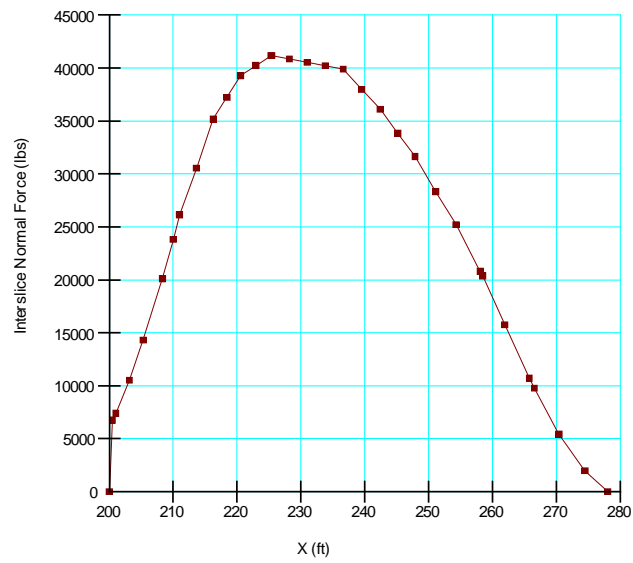
8	6568	214.8716	-19.543975	1250.8704	2470.2472	0	395.47
9	6568	217.21125	-20.70096	1296.4194	2540.5112	0	394.76
10	6568	219.5509	-21.697245	1335.6068	2594.6328	0	394.05
11	6568	221.89055	-22.54398	1369.1337	2633.7423	0	393.34
12	6568	224.2302	-23.249855	1396.7981	2658.7455	0	392.62
13	6568	226.6725	-23.840755	1419.0242	2692.9992	0	391.88
14	6568	229.2175	-24.310375	1435.5351	2736.1017	0	391.11
15	6568	231.76245	-24.632285	1444.9391	2764.6598	0	390.33
16	6568	234.3074	-24.80963	1446.979	2779.0068	0	389.56
17	6568	236.8524	-24.84411	1441.4745	2779.3046	0	388.78
18	6568	239.3974	-24.73605	1428.217	2765.5781	0	388.01
19	6568	241.94235	-24.48442	1406.9783	2737.792	0	387.23
20	6568	244.4873	-24.086795	1377.3684	2695.7013	0	386.46
21	6568	247.0323	-23.53922	1339.1993	2638.8993	0	385.68
22	6568	249.5773	-22.836015	1291.703	2566.9184	0	384.91
23	6568	252.12225	-21.96945	1234.4543	2478.9577	0	384.13
24	6568	254.6672	-20.92927	1166.7344	2374.0503	0	383.36
25	6568	257.2122	-19.701995	1087.4926	2250.9678	0	382.58
26	6568	259.7572	-18.269835	995.70579	2107.9028	0	381.81
27	6568	262.19725	-16.687465	894.77312	1952.8522	0	476.33
28	6568	264.5324	-14.946135	784.14287	1753.681	0	475.44
29	6568	267.1078	-12.713985	642.60756	1506.6368	0	475
30	6568	269.92345	-9.855409	461.77498	1196.911	0	475
31	6568	272.7391	-6.400094	243.52944	821.16655	0	475
32	6568	275.22495	-2.7	10.31672	526.27377	0	760

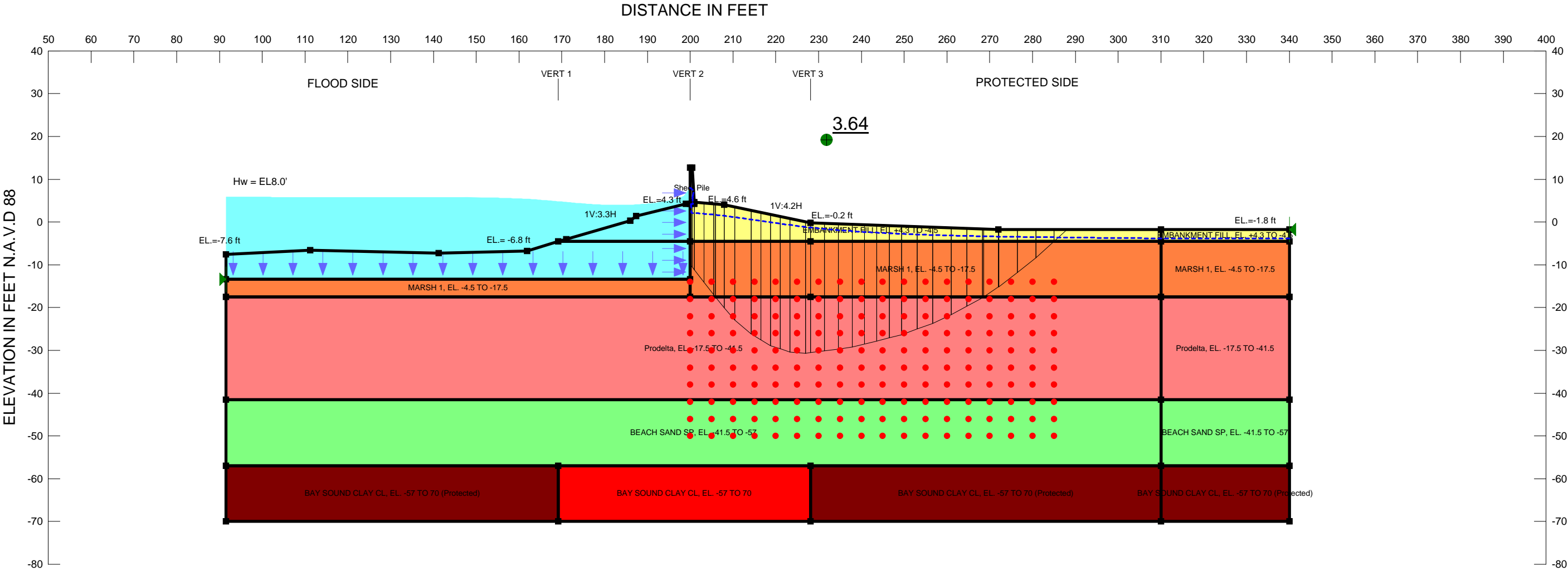
3/1/2012

Base Normal Stress Vs. X



Interslice Normal Stress Vs. X





Name: EMBANKMENT FILL, EL. +4.3 TO -4.5 Model: Undrained (Phi=0) Unit Weight: 117 pcf Cohesion: 760 psf
Name: MARSH 1, EL. -4.5 TO -17.5 Model: Spatial Mohr-Coulomb Unit Weight: 114 pcf Cohesion Fn: MARSH 1 Phi: 0 °
Name: BEACH SAND SP, EL. -41.5 TO -57 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: SAND
Name: BAY SOUND CLAY CL, EL. -57 TO 70 Model: Spatial Mohr-Coulomb Unit Weight: 112 pcf Cohesion Spatial Fn: Bay Sound Phi: 0 °
Name: Prodelta, EL. -17.5 TO -41.5 Model: Spatial Mohr-Coulomb Unit Weight: 98 pcf Cohesion Fn: PRODELTA Phi: 0 °
Name: Sheet Pile Model: Undrained (Phi=0) Unit Weight: 0.1 pcf Cohesion: 0.01 psf
Name: BAY SOUND CLAY CL, EL. -57 TO 70 (Protected) Model: Spatial Mohr-Coulomb Unit Weight: 112 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
VERTICALSWERE ASSUMED TO VARY LINEARLY
BETWEENTHE VALUES INDICATED FOR THESE LOCATIONS.

Hw = CANAL WATER LEVEL

LONDON AVE CANAL
OUTFALL CANAL REEVALUATION REPORT
REACH 4, STA. 33+00 TO 37+00
PROTECTED SIDE STABILITY ANALYSIS
CASE: GAP Stability (Block) below sheet pile tip
MARCH 2012

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

GAP Stability (Block) below sheet pile tip

Report generated using GeoStudio 2007, version 7.15. Copyright © 1991-2009 GEO-SLOPE International Ltd.

File Information

Revision Number: 184
Last Edited By: Haggerty, Daniel R MVN
Date: 12/13/2011
Time: 2:28:41 PM
File Name: Reach 4.gsz
Last Solved Date: 12/13/2011
Last Solved Time: 2:32:16 PM

Project Settings

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

Analysis Settings

GAP Stability (Block) below sheet pile tip

Kind: SLOPE/W
Parent: Gap Analysis (Seepage)
Method: Spencer
Settings
 PWP Conditions Source: Parent Analysis
SlipSurface
 Direction of movement: Left to Right
 Use Passive Mode: Yes
 Slip Surface Option: Block
 Critical slip surfaces saved: 1
 Optimize Critical Slip Surface Location: Yes
 Tension Crack
 Tension Crack Option: (none)
FOS Distribution
 FOS Calculation Option: Constant
Restrict Block Crossing: Yes
Advanced
 Number of Slices: 30
 Optimization Tolerance: 0.01

Cohesion: 0.01 psf

BAY SOUND CLAY CL, EL. -57 TO 70 (Protected)

Model: Spatial Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion Fn: Bay Sound
Phi: 0 °
Phi-B: 0 °

Slip Surface Limits

Left Coordinate: (91.5, -13.4) ft
Right Coordinate: (340, -1.8) ft

Slip Surface Block

Left Grid
 Upper Left: (200, -14) ft
 Lower Left: (200, -50) ft
 Lower Right: (230, -50) ft
 X Increments: 6
 Y Increments: 9
 Starting Angle: 120 °
 Ending Angle: 150 °
 Angle Increments: 6
Right Grid
 Upper Left: (235, -14) ft
 Lower Left: (235, -50) ft
 Lower Right: (285, -50) ft
 X Increments: 10
 Y Increments: 9
 Starting Angle: 25 °
 Ending Angle: 45 °
 Angle Increments: 4

Cohesion Functions

Bay Sound

Model: Spline Data Point Function
Function: Cohesion vs. Y
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 580
Data Points: Y (ft), Cohesion (psf)
 Data Point: (-70, 720)

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

Materials

EMBANKMENT FILL, EL. +4.3 TO -4.5

Model: Undrained (Phi=0)
Unit Weight: 117 pcf
Cohesion: 760 psf

MARSH 1, EL. -4.5 TO -17.5

Model: Spatial Mohr-Coulomb
Unit Weight: 114 pcf
Cohesion Fn: MARSH 1
Phi: 0 °
Phi-B: 0 °

BEACH SAND SP, EL. -41.5 TO -57

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

BAY SOUND CLAY CL, EL. -57 TO 70

Model: Spatial Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion Spatial Fn: Bay Sound
Phi: 0 °
Phi-B: 0 °

PRODELTA, EL. -17.5 TO -41.5

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

Sheet Pile

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

Data Point: (-57, 580)

MARSH 1

Model: Spline Data Point Function
Function: Cohesion vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 475
Data Points: X (ft), Cohesion (psf)
 Data Point: (169.2, 475)
 Data Point: (200, 500)
 Data Point: (228.1, 475)

PRODELTA

Model: Spline Data Point Function
Function: Cohesion vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 380
Data Points: X (ft), Cohesion (psf)
 Data Point: (169.2, 380)
 Data Point: (200, 400)
 Data Point: (228.1, 380)

Shear/Normal Strength Functions

SAND

Model: Spline Data Point Function
Function: Shear Stress vs. Normal Stress
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
 Data Point: (-100000, 0)
 Data Point: (0, 0)
 Data Point: (100000, 57735)
Estimation Properties
 Intact Rock Param.: 10
 Geological Strength: 100
 Disturbance Factor: 0
 SigmaC: 600000 psf
 Sigma3: 300000 psf
 Num. Points: 20

Spatial Functions

Bay Sound

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (169.2, -57, 580)
Data Point: (169.2, -70, 720)
Data Point: (200, -57, 715)
Data Point: (200, -70, 860)
Data Point: (228.1, -57, 580)
Data Point: (228.1, -70, 720)

Regions

	Points	Area (ft²)	Material
Region 1	7,28,25,26,24,1,15	141.75	
Region 2	1,29,21,2,3,43,4,8,22,15	456.645	EMBANKMENT FILL, EL. +4.3 TO -4.5
Region 3	5,27,30,6,7,15,16,9	779.75	
Region 4	16,15,22,8,10,17	1430	MARSH 1, EL. -4.5 TO -17.5
Region 5	9,16,17,18	444.85	MARSH 1, EL. -4.5 TO -17.5
Region 6	18,17,10,12,11	5244	Prodelta, EL. -17.5 TO -41.5
Region 7	36,11,12,38,40,39	3386.75	BEACH SAND SP, EL. -41.5 TO -57
Region 8	1,19,20,21,29	6.375	Sheet Pile
Region 9	38,12,32,37	465	BEACH SAND SP, EL. -41.5 TO -57
Region 10	10,33,32,12	720	Prodelta, EL. -17.5 TO -41.5
Region 11	8,34,33,10	390	MARSH 1, EL. -4.5 TO -17.5
Region 12	4,35,34,8	81	EMBANKMENT FILL, EL. +4.3 TO -4.5
Region 13	36,13,41,39	1010.1	BAY SOUND CLAY CL, EL. -57 TO 70 (Protected)
Region 14	39,41,42,40	765.7	BAY SOUND CLAY CL, EL. -57 TO 70
Region 15	40,42,14,38	1064.7	BAY SOUND CLAY CL, EL. -57 TO 70 (Protected)
Region 16	38,14,31,37	390	BAY SOUND CLAY CL, EL. -57 TO 70 (Protected)

Points

	X (ft)	Y (ft)
Point 1	200	4.3
Point 2	208	4.1
Point 3	228.1	-0.2
Point 4	310	-1.8
Point 5	91.5	-7.6
Point 6	161.9	-6.8
Point 7	169.2	-4.5
Point 8	310	-4.5
Point 9	91.5	-13.4
Point 10	310	-17.5
Point 11	91.5	-41.5
Point 12	310	-41.5
Point 13	91.5	-70
Point 14	310	-70
Point 15	200	-4.5
Point 16	200	-13.4
Point 17	200	-17.5
Point 18	91.5	-17.5
Point 19	200	12.7
Point 20	200.5	12.7
Point 21	201	4.6
Point 22	228.1	-4.5
Point 23	228.1	-17.5
Point 24	199	4.3
Point 25	186	0.3
Point 26	187.4	1.4
Point 27	111.2	-6.6
Point 28	171	-4
Point 29	201	4.3
Point 30	141.2	-7.3
Point 31	340	-70
Point 32	340	-41.5
Point 33	340	-17.5

Point 34	340	-4.5
Point 35	340	-1.8
Point 36	91.5	-57
Point 37	340	-57
Point 38	310	-57
Point 39	169.2	-57
Point 40	228.1	-57
Point 41	169.2	-70
Point 42	228.1	-70
Point 43	272	-1.8

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	3.64	(246.385, 0.25)	39.76393	(200, 12.7)	(288.089, -1.8)
2	12497	3.94	(246.385, 0.25)	41.763	(200, 12.7)	(293.844, -1.8)

Slices of Slip Surface: Optimized

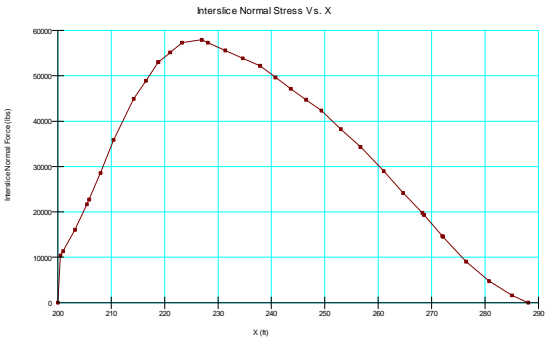
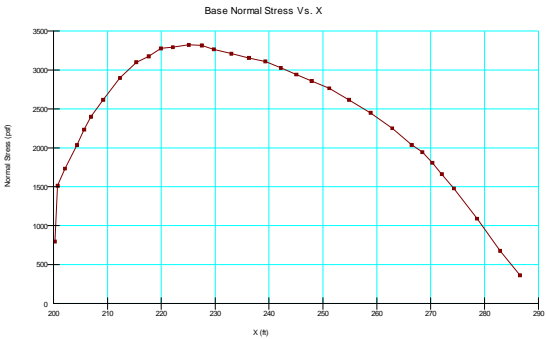
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	200.25	-	887.85341	794.86173	0	499.78
2	Optimized	200.75	-10.86158	894.04312	1513.866	0	499.33
3	Optimized	202.1145	-12.64326	1019.7229	1733.0079	0	498.12
4	Optimized	204.3435	-	1119.9958	2033.5538	0	496.14
5	Optimized	205.66445	-17.2545	1179.5603	2232.6707	0	494.96
6	Optimized	206.93545	-	1236.8921	2399.0593	0	395.06
7	Optimized	209.21605	-	1348.9686	2617.2521	0	393.44
8	Optimized	212.32075	-24.55438	1483.0545	2897.4894	0	391.23
9	Optimized	215.3565	-26.86785	1587.0038	3099.4863	0	389.07
10	Optimized	217.6507	-28.23443	1649.0175	3174.7191	0	387.44

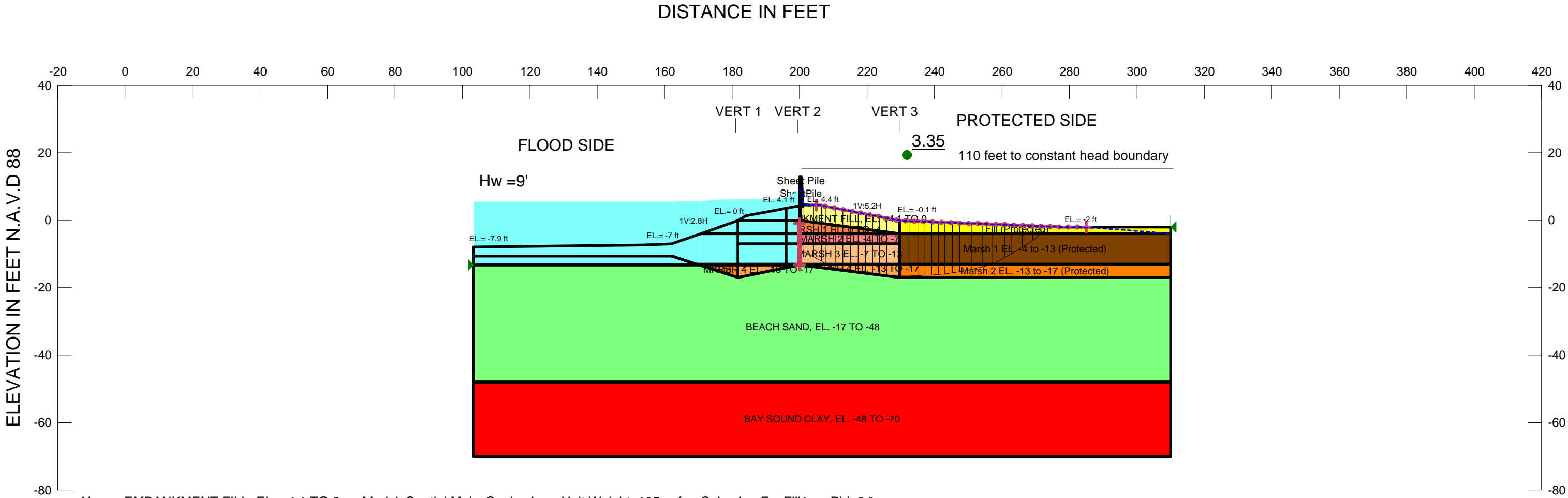
11	Optimized	219.9148	-29.28087	1696.5112	3277.5322	0	385.83
12	Optimized	222.14885	-	1728.3956	3292.7294	0	384.24
13	Optimized	225.1037	-	1747.6561	3321.9484	0	382.13
14	Optimized	227.52075	-	1745.1356	3315.0557	0	380.41
15	Optimized	229.7311	-	1722.8198	3265.3205	0	380
16	Optimized	232.9933	-	1690.3247	3209.3888	0	380
17	Optimized	236.25555	-	1658.2247	3153.761	0	380
18	Optimized	239.32005	-	1617.9984	3109.8523	0	380
19	Optimized	242.1868	-	1569.4345	3025.9137	0	380
20	Optimized	245.0536	-	1520.9381	2941.9414	0	380
21	Optimized	247.92035	-	1472.5771	2858.0028	0	380
22	Optimized	251.1799	-	1404.8252	2764.7444	0	380
23	Optimized	254.83235	-	1317.6337	2615.4863	0	380
24	Optimized	258.8514	-	1210.1126	2448.7037	0	380
25	Optimized	262.852	-	1083.4807	2250.6217	0	380
26	Optimized	266.46755	-	957.80798	2038.1316	0	380
27	Optimized	268.43935	-	887.86548	1943.8688	0	380
28	Optimized	270.3017	-	807.19259	1808.3118	0	475
29	Optimized	272.06205	-	731.0141	1660.6032	0	475
30	Optimized	274.29715	-	623.37832	1477.0425	0	475
31	Optimized	278.6137	-	408.98103	1088.371	0	475
32	Optimized	282.9059	-	178.66863	674.67097	0	475
33	Optimized	286.57195	-	361.64629		0	760

Slices of Slip Surface: 12497

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	12497	200.25	-10.25	891.20908	802.99044	0	499.78
2	12497	200.75	-10.75	883.60061	1563.6959	0	499.33
3	12497	202.625	-12.625	1001.2415	1790.7425	0	497.66
4	12497	205.875	-15.875	1103.413	2122.7564	0	494.77
5	12497	207.75	-17.75	1173.2881	2333.7352	0	394.48
6	12497	209.5	-19.5	1242.6458	2461.2028	0	393.24
7	12497	212.5	-22.5	1372.7299	2673.0991	0	391.1
8	12497	215.5	-25.5	1512.4542	2884.7598	0	388.97
9	12497	218.5	-28.5	1659.6973	3096.6561	0	386.83
10	12497	221.35	-30	1730.8519	3382.5926	0	384.8
11	12497	224.05	-30	1721.6296	3315	0	382.88
12	12497	226.75	-30	1713.2593	3247.4074	0	380.96
13	12497	229.79	-30	1704.7929	3206.5089	0	380
14	12497	233.17	-30	1696.4497	3192.0118	0	380
15	12497	236.55	-30	1689.1124	3177.5148	0	380
16	12497	239.93	-30	1682.6331	3163.0178	0	380
17	12497	243.31	-30	1676.9527	3148.8166	0	380
18	12497	246.54645	-29.107145	1618.5958	3169.3196	0	380
19	12497	249.6394	-27.32143	1506.4558	2977.2396	0	380
20	12497	252.73235	-25.535715	1393.7838	2784.9637	0	380
21	12497	255.8253	-23.75	1280.6918	2592.7437	0	380
22	12497	258.91825	-21.964285	1167.2359	2400.5517	0	380
23	12497	262.0112	-20.17857	1053.6119	2208.3317	0	380
24	12497	265.10415	-18.392855	939.81989	2016.1398	0	380
25	12497	267.98795	-16.727885	833.65253	1839.4299	0	475
26	12497	270.66265	-	735.18913	1647.975	0	475

			15.183655				
27	12497	273.71675	-13.420385	622.73355	1436.8601	0	475
28	12497	277.1502	-11.43808	496.41617	1206.0434	0	475
29	12497	280.58365	-9.4557735	370.17447	975.25183	0	475
30	12497	284.0171	-7.473463	244.01853	744.43509	0	475
31	12497	287.45055	-5.4911545	117.97609	513.64356	0	475
32	12497	291.50555	-3.15	-30.674074	282.27778	0	760





Name: EMBANKMENT FILL, EL. +4.1 TO 0 Model: Spatial Mohr-Coulomb Unit Weight: 105 pcf Cohesion Fn: Fill1 Phi: 0 °

Name: MARSH 1 EL. 0 TO -4 Model: Undrained (Phi=0) Unit Weight: 107 pcf Cohesion: 475 psf

Name: BEACH SAND, EL. -17 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: 111 pcf Cohesion Spatial Fn: Clay Phi: 0 °

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

Name: MARSH 2 EL. -4 TO -7 Model: Spatial Mohr-Coulomb Unit Weight: 104 pcf Cohesion Fn: Marsh 2 Phi: 0 °

Name: MARSH 3 EL. -7 TO -13 Model: Spatial Mohr-Coulomb Unit Weight: 111 pcf Cohesion Fn: Marsh 3 Phi: 0 °

Name: Fill (Protected) Model: Spatial Mohr-Coulomb Unit Weight: 112 pcf Cohesion: 500 psf Phi: 0 °

Name: Marsh 1 EL. -4 to -13 (Protected) Model: Undrained (Phi=0) Unit Weight: 112 pcf Cohesion: 450 psf

Name: Marsh 2 EL. -13 to -17 (Protected) Model: Undrained (Phi=0) Unit Weight: 100 pcf Cohesion: 300 psf

Name: MARSH 4 EL. -13 TO -17 Model: Spatial Mohr-Coulomb Unit Weight: 99 pcf Cohesion Fn: Marsh 4 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.

Hw = CANAL WATER LEVEL



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

LONDON AVE CANAL
OUTFALL CANAL REEVALUATION REPORT
REACH 5, STA. 37+00 TO STA. 40+00
PROTECTED SIDE STABILITY ANALYSIS,
CASE: GAP Stability (Entry/Exit)
MARCH 2012

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

GAP Stability (Entry/Exit)

Report generated using GeoStudio 2007, version 7.15. Copyright © 1991-2009 GEO-SLOPE International Ltd.

File Information

Created By: Liljegren, James
Revision Number: 365
Last Edited By: Middleton, Mark C MVN
Date: 3/15/2012
Time: 1:11:47 PM
File Name: Reach 5.gsz
Directory: G:\F&MHOME\Middleton\London Ave Canal\Reach 5\optimization check\
Last Solved Date: 3/15/2012
Last Solved Time: 1:14:12 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 Stability (Entry/Exit)

Kind: SLOPE/W
Parent: GAP Analysis (Seepage)
Method: Spencer
Settings
 PWP Conditions Source: Parent Analysis
SlipSurface
 Direction of Movement: Left to Right
 Use Passive Mode: Yes
 Slip Surface Option: Entry and Exit
 Critical slip surfaces saved: 1
 Optimize Critical Slip Surface Location: Yes
 Tension Crack
 Tension Crack Option: (none)
FOS Distribution
 FOS Calculation Option: Constant
Advanced

Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 2000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 10
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

EMBANKMENT FILL, EL. +4.1 TO 0

Model: Spatial Mohr-Coulomb
Unit Weight: 105 pcf
Cohesion Fn: Fill1
Phi: 0 °
Phi-B: 0 °

MARSH 1 EL. 0 TO -4

Model: Undrained (Phi=0)
Unit Weight: 107 pcf
Cohesion: 475 psf

BEACH SAND, EL. -17 TO -48

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

BAY SOUND CLAY, EL. -48 TO -70

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

SheetPile

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

MARSH 2 EL. -4 TO -7

Model: Spatial Mohr-Coulomb
Unit Weight: 104 pcf

Cohesion Fn: Marsh 2
Phi: 0 °
Phi-B: 0 °

MARSH 3 EL. -7 TO -13

Model: Spatial Mohr-Coulomb
Unit Weight: 111 pcf
Cohesion Fn: Marsh 3
Phi: 0 °
Phi-B: 0 °

Fill (Protected)

Model: Spatial Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion: 500 psf
Phi: 0 °
Phi-B: 0 °

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

Model: Undrained (Phi=0)
Unit Weight: 112 pcf
Cohesion: 450 psf

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

Model: Undrained (Phi=0)
Unit Weight: 100 pcf
Cohesion: 300 psf

MARSH 4 EL. -13 TO -17

Model: Spatial Mohr-Coulomb
Unit Weight: 99 pcf
Cohesion Fn: Marsh 4
Phi: 0 °
Phi-B: 0 °

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (200, -13.3) ft
Left-Zone Right Coordinate: (200, -1) ft
Left-Zone Increment: 20
Right Projection: Range
Right-Zone Left Coordinate: (205, 4.45185) ft
Right-Zone Right Coordinate: (285, -2) ft
Right-Zone Increment: 30
Radius Increments: 4

Slip Surface Limits

Left Coordinate: (103.3, -13.3) ft
Right Coordinate: (310, -2) ft

Cohesion Functions

Marsh 3

Model: Spline Data Point Function
Function: Cohesion vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 450
Data Points: X (ft), Cohesion (psf)
 Data Point: (181.8, 450)
 Data Point: (200, 475)
 Data Point: (229.6, 450)

Marsh 4

Model: Spline Data Point Function
Function: Cohesion vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 300
Data Points: X (ft), Cohesion (psf)
 Data Point: (181.8, 300)
 Data Point: (200, 330)
 Data Point: (229.6, 300)

Marsh 2

Model: Spline Data Point Function
Function: Cohesion vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 450
Data Points: X (ft), Cohesion (psf)
 Data Point: (181.8, 450)
 Data Point: (200, 475)
 Data Point: (229.6, 450)

Fill1

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

Data Point: (181.8, 500)
Data Point: (200, 625)
Data Point: (229.6, 500)

Shear/Normal Strength Functions

Sand

Model: Spline Data Point Function
Function: Shear Stress vs. Normal Stress
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
Data Point: (-100000, 0)
Data Point: (0, 0)
Data Point: (100000, 57735)
Estimation Properties
Intact Rock Param.: 10
Geological Strength: 100
Disturbance Factor: 0
SigmaC: 600000 psf
Sigma3: 300000 psf
Num. Points: 20

Spatial Functions

Clay

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (103.3, -48, 503)
Data Point: (181.8, -48, 503)
Data Point: (200, -48, 595)
Data Point: (229.6, -48, 503)
Data Point: (310, -48, 503)
Data Point: (103.3, -70, 802)
Data Point: (181.8, -70, 802)
Data Point: (200, -70, 895)
Data Point: (229.6, -70, 802)
Data Point: (310, -70, 802)

Regions

	Material	Points	Area (ft²)
--	----------	--------	------------

Point 11	310	-70
Point 12	153.4	-7.4
Point 13	103.3	-7.9
Point 14	196	3.5
Point 15	196	0
Point 16	196	-13.3
Point 17	229.6	-13
Point 18	310	-13
Point 19	229.6	-17
Point 20	200	-13.3
Point 21	200.05	-48
Point 22	200	-70
Point 23	310	-17
Point 24	310	-48
Point 25	201	4.6
Point 26	162	-7
Point 27	200	-4
Point 28	200	-7
Point 29	196	-4
Point 30	181.8	0
Point 31	184.1	1.4
Point 32	199	4.1
Point 33	206.4	4.4
Point 34	229.6	-0.1
Point 35	277.6	-2
Point 36	310	-2
Point 37	181.8	-4
Point 38	181.8	-7
Point 39	181.8	-13
Point 40	181.8	-48
Point 41	181.8	-70
Point 42	229.6	-48
Point 43	229.6	-70
Point 44	201	4.1
Point 45	200	12.8
Point 46	200.5	12.8

Region 1	Marsh 1 EL -4 to -13 (Protected)	5,6,18,17,54	723.6
Region 2	Fill (Protected)	34,35,36,6,5	206.4
Region 3	Marsh 2 EL -13 to -17 (Protected)	17,18,23,19	321.6
Region 4	BAY SOUND CLAY, EL. -48 TO -70	7,40,21,42,24,11,43,22,41,10	4547.4
Region 5		30,31,3,14,32,4,8,15	46.405
Region 6		37,30,15,8,27,29	72.8
Region 7		38,37,29,27,28,57	54.6
Region 8		39,56,55,20,16,49	5.46
Region 9	EMBANKMENT FILL, EL. +4.1 TO 0	8,4,44,25,33,34,5	137.48
Region 10	MARSH 2 EL. -4 TO -7	27,5,54,28	88.8
Region 11	MARSH 1 EL. 0 TO -4	8,5,27	59.2
Region 12		30,2,1,37	21.95
Region 13		47,51,53,39,38,37,1,26,12,13	333.275
Region 14	SheetPile	4,45,46,25,44	6.65
Region 15	MARSH 4 EL. -13 TO -17	20,55,17,19	63.64
Region 16		49,39,53,52	3.58125
Region 17	Marsh 2 EL. -13 to -17 (Protected)	48,52,49	21.275
Region 18	BEACH SAND, EL. -17 TO -48	20,48,52,50,7,40,21,42,24,23,19	6765.305
Region 19		52,53,51,47,50	169.75875
Region 20		28,55,56,39,38,57	109.2
Region 21	MARSH 3 EL. -7 TO -13	55,28,54,17	177.6
Region 22	MARSH 4 EL. -13 TO -17	48,49,16,20	33.67

Points

	X (ft)	Y (ft)
Point 1	170.7	-4
Point 2	173.6	-3
Point 3	193.6	-3.1
Point 4	200	4.1
Point 5	229.6	-4
Point 6	310	-4
Point 7	103.3	-48
Point 8	200	0
Point 9	200	-13.35
Point 10	103.3	-70

Point 47	103.3	-10.6
Point 48	181.8	-17
Point 49	181.8	-13.3
Point 50	103.3	-13.3
Point 51	162	-10.6
Point 52	170.3	-13.3
Point 53	169.425	-13
Point 54	229.6	-7
Point 55	200	-13
Point 56	196	-13
Point 57	196	-7

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	3.35	(229.979, 67.357)	30.68048	(200, 12.8)	(274.164, -1.86401)
2	757	3.50	(229.979, 67.357)	83.746	(200, 12.8)	(276.953, -1.97441)

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	8.8779925	971.66396	-50.662795	0	474.79
2	Optimized	200.75	-9.123083	960.13459	1302.2445	0	474.37
3	Optimized	202.59165	10.025819	1018.6319	1443.1842	0	472.81
4	Optimized	205.29165	11.471905	1089.0089	1561.0855	0	470.53
5	Optimize	207.11755	-12.5689	1140.6065	1659.5419	0	468.99

	d						
6	Optimize d	208.21805	-13.230085	1172.1874	1728.0644	0	321.67
7	Optimize d	209.67275	-13.818985	1195.7303	1812.0879	0	320.2
8	Optimize d	211.8162	-14.53661	1222.8054	1838.4552	0	318.02
9	Optimize d	214.00565	-15.037125	1238.0353	1888.8715	0	315.81
10	Optimize d	216.2412	-15.32053	1239.8992	1870.9875	0	313.54
11	Optimize d	218.47675	-15.603935	1242.5618	1853.1478	0	311.27
12	Optimize d	220.63625	-15.875805	1245.5202	1836.0849	0	309.08
13	Optimize d	222.7197	-16.13614	1248.6159	1819.0348	0	306.97
14	Optimize d	224.80315	-16.396475	1251.8544	1801.9846	0	304.86
15	Optimize d	226.7837	-16.5166	1246.1341	1802.3622	0	302.85
16	Optimize d	228.66125	-16.496525	1231.1686	1761.5665	0	300.95
17	Optimize d	231.0201	-16.471305	1213.1243	1794.179	0	300
18	Optimize d	233.8603	-16.440935	1193.2324	1778.5472	0	300
19	Optimize d	236.23755	-16.382355	1174.8492	1769.5273	0	300

20	Optimize d	238.1519	-16.29557	1157.4201	1752.3069	0	300
21	Optimize d	240.10475	-16.160325	1136.5693	1739.9593	0	300
22	Optimize d	242.096	-15.97661	1112.1657	1712.6052	0	300
23	Optimize d	244.18875	-15.729225	1082.8545	1688.6916	0	300
24	Optimize d	246.3831	-15.41817	1048.698	1647.4512	0	300
25	Optimize d	249.27335	-14.91759	997.68453	1594.2416	0	300
26	Optimize d	252.60845	-14.18216	928.45742	1516.7508	0	300
27	Optimize d	255.6926	-13.401405	858.23689	1423.333	0	300
28	Optimize d	258.98995	-12.095865	751.56596	1341.5282	0	450
29	Optimize d	261.85455	-10.565235	632.91838	1157.9265	0	450
30	Optimize d	264.50255	-8.9536	511.2511	977.46562	0	450
31	Optimize d	267.5798	-6.96126	363.78426	729.47801	0	450
32	Optimize d	270.32735	-4.982545	220.55477	514.13246	0	450
33	Optimize d	272.8504	-2.932006	75.152804	272.77881	0	500

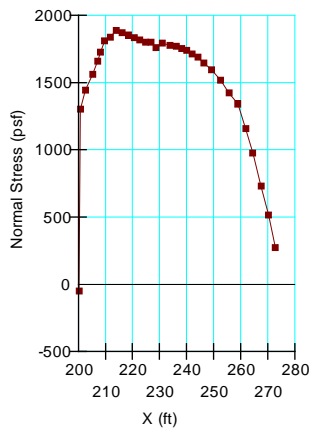
Slices of Slip Surface: 757

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

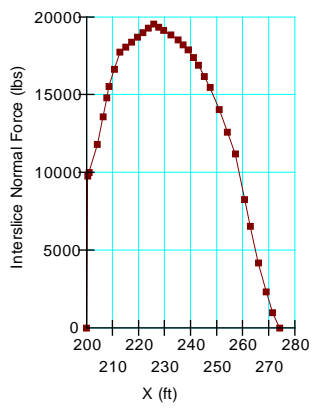
1	757	200.25	-10.93493	1130.1106	-146.75059	0	474.79
2	757	200.75	-11.122965	1119.855	1547.1242	0	474.37
3	757	202.34845	-11.68743	1146.9248	1659.0805	0	473.02
4	757	205.04845	-12.580295	1167.0579	1754.5248	0	470.74
5	757	207.6889	-13.357735	1185.8964	1820.9496	0	322.21
6	757	210.2667	-14.025855	1203.7032	1841.1463	0	319.59
7	757	212.84445	-14.607475	1219.3663	1852.7442	0	316.98
8	757	215.4222	-15.104425	1231.7621	1855.9522	0	314.37
9	757	218	-15.518235	1240.2071	1850.8273	0	311.76
10	757	220.5778	-15.85015	1244.2091	1837.5377	0	309.14
11	757	223.15555	-16.10114	1243.2444	1816.0918	0	306.53
12	757	225.7333	-16.27194	1236.8384	1786.5272	0	303.92
13	757	228.3111	-16.36304	1224.4942	1748.9118	0	301.31
14	757	230.9313	-16.37356	1206.907	1784.654	0	300
15	757	233.5939	-16.30088	1184.997	1772.2236	0	300
16	757	236.2565	-16.143255	1157.7473	1751.2459	0	300
17	757	238.91905	-15.9002	1124.8026	1721.6154	0	300
18	757	241.5816	-15.57097	1086.0618	1683.2303	0	300
19	757	244.2442	-15.15453	1041.5283	1635.9207	0	300
20	757	246.9068	-14.649545	991.20138	1579.4927	0	300

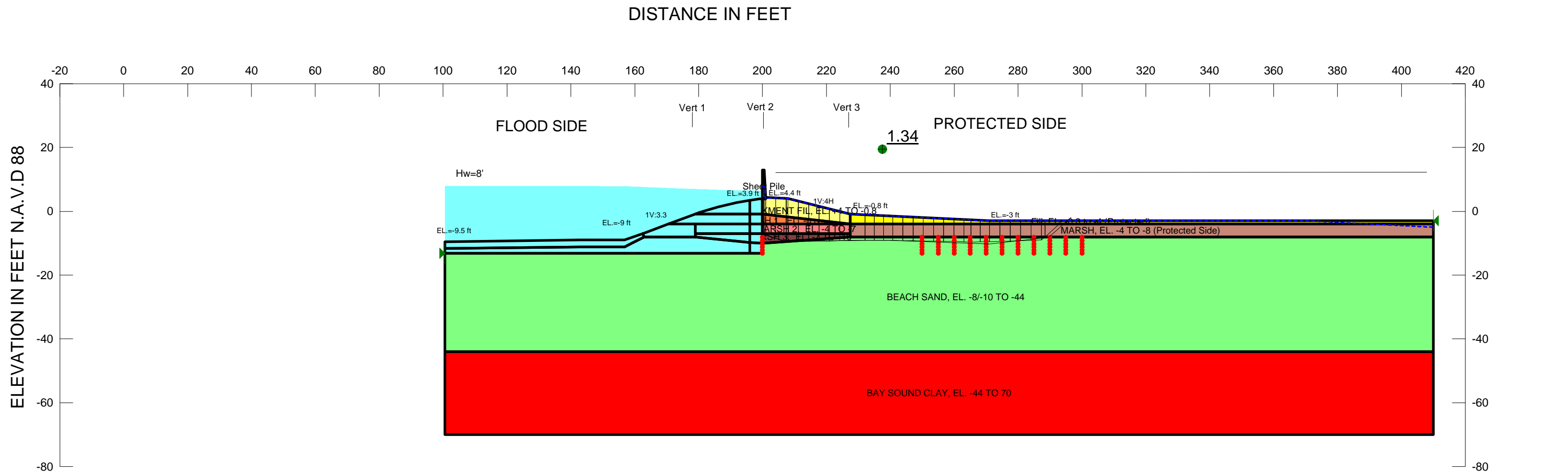
21	757	249.5694	-14.054365	935.04253	1513.8071	0	300
22	757	252.232	-13.367	873.02061	1438.4999	0	300
23	757	254.82905	-12.60664	806.88542	1367.5557	0	450
24	757	257.36055	-11.77529	736.86611	1268.7506	0	450
25	757	259.89205	-10.85318	661.427	1159.2221	0	450
26	757	262.42355	-9.837059	580.40364	1038.594	0	450
27	757	264.95505	-8.7231495	493.68067	906.28358	0	450
28	757	267.48655	-7.5070785	401.13581	761.72717	0	450
29	757	270.01805	-6.1837715	302.56783	604.18506	0	450
30	757	272.54955	-4.7473135	197.73787	432.88644	0	450
31	757	275.38435	-2.987203	71.862069	233.13071	0	500

Base Normal Stress Vs. X



Interslice Normal Stress
Vs. X





Name: EMBANKMENT FIL, EL. +4 TO -0.8 Model: Spatial Mohr-Coulomb Unit Weight: 108 pcf Cohesion Fn: Fill 1 Phi: 0 °
Name: MARSH 1, EL. -0.8 TO -4 Model: Undrained (Phi=0) Unit Weight: 101 pcf Cohesion: 375 psf
Name: BEACH SAND, EL. -8/-10 TO -44 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand
Name: BAY SOUND CLAY, EL. -44 TO 70 Model: Spatial Mohr-Coulomb Unit Weight: 109 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. -4 TO -8 (Protected Side) Model: Undrained (Phi=0) Unit Weight: 101 pcf Cohesion: 350 psf
Name: MARSH 2, EL. -4 TO -7 Model: Spatial Mohr-Coulomb Unit Weight: 96 pcf Cohesion Fn: Marsh 2/3 Phi: 0 °
Name: MARSH 3, EL. -7 TO -10 Model: Spatial Mohr-Coulomb Weight Fn: Marsh 3 (protected) Cohesion Fn: Marsh 2/3 Phi: 0 °
Name: Fill, EL. -0.8 to -4 (Protected) Model: Undrained (Phi=0) Unit Weight: 109 pcf Cohesion: 500 psf



**US Army Corps
of Engineers®**
New Orleans District
LONDON AVE CANAL
OUTFALL CANAL REEVALUATION REPORT
REACH 6A, STA.40+00 TO 47+00
PROTECTED SIDE STABILITY ANALYSIS,
CASE: GAP Stability (Block)
MARCH 2012

GENERAL NOTES

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

WHERE INDICATED, SHEAR STRENGTHS BETWEEN
VERTICALSWERE ASSUMED TO VARY LINEARLY
BETWEENTHE VALUES INDICATED FOR THESE LOCATIONS.

Hw = CANAL WATER LEVEL

GAP Stability (Block)

Report generated using GeoStudio 2007, version 7.19. Copyright © 1991-2012 GEO-SLOPE International Ltd.

File Information

Created By: Liljegren, James
Revision Number: 285
Last Edited By: Curran, Matthew MVN
Date: 1/10/2012
Time: 4:04:15 PM
File Name: Reach 6A.gsz
Directory: G:\F&MHOME\London Ave Reevaluation 2011\West Side\Reach 6A\SlopeW\
Last Solved Date: 1/10/2012
Last Solved Time: 4:05:32 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 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

Unit Weight: 101 pcf
Cohesion: 350 psf

MARSH 2, EL. -4 TO -7

Model: Spatial Mohr-Coulomb
Unit Weight: 96 pcf
Cohesion Fn: Marsh 2/3
Phi: 0 °
Phi-B: 0 °

MARSH 3, EL. -7 TO -10

Model: Spatial Mohr-Coulomb
Weight Fn: Marsh 3 (protected)
Cohesion Fn: Marsh 2/3
Phi: 0 °
Phi-B: 0 °

Fill, EL. -0.8 to -4 (Protected)

Model: Undrained (Phi=0)
Unit Weight: 109 pcf
Cohesion: 500 psf

Slip Surface Limits

Left Coordinate: (100.5, -13.2) ft
Right Coordinate: (410, -3) ft

Slip Surface Block

Left Grid

Upper Left: (200, -8.2) ft
Lower Left: (200, -13.2) ft
Lower Right: (200, -13.2) ft
X Increments: 0
Y Increments: 5
Starting Angle: 135 °
Ending Angle: 135 °
Angle Increments: 1

Right Grid

Upper Left: (250, -8.2) ft
Lower Left: (250, -13.2) ft
Lower Right: (300, -13.2) ft
X Increments: 10
Y Increments: 5
Starting Angle: 25 °
Ending Angle: 45 °
Angle Increments: 4

Advanced

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

Materials

EMBANKMENT FIL, EL. +4 TO -0.8

Model: Spatial Mohr-Coulomb
Unit Weight: 108 pcf
Cohesion Fn: Fill 1
Phi: 0 °
Phi-B: 0 °

MARSH 1, EL. -0.8 TO -4

Model: Undrained (Phi=0)
Unit Weight: 101 pcf
Cohesion: 375 psf

BEACH SAND, EL. -8/-10 TO -44

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

BAY SOUND CLAY, EL. -44 TO 70

Model: Spatial Mohr-Coulomb
Unit Weight: 109 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. -4 TO -8 (Protected Side)

Model: Undrained (Phi=0)

Cohesion Functions

Marsh 2/3

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: (179, 350)
 Data Point: (200, 375)
 Data Point: (227.4, 350)

Fill 1

Model: Spline Data Point Function
Function: Cohesion vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 500
Data Points: X (ft), Cohesion (psf)
 Data Point: (179, 500)
 Data Point: (200, 700)
 Data Point: (227.4, 500)

Shear/Normal Strength Functions

Sand

Model: Spline Data Point Function
Function: Shear Stress vs. Normal Stress
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
 Data Point: (-100000, 0)
 Data Point: (0, 0)
 Data Point: (100000, 57735)
Estimation Properties
 Intact Rock Param.: 10
 Geological Strength: 100
 Disturbance Factor: 0
 SigmaC: 600000 psf
 Sigma3: 300000 psf
 Num. Points: 20

Unit Weight Functions

Marsh 3 (protected)
Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 101
Data Points: X (ft), Unit Weight (pcf)
Data Point: (179, 101)
Data Point: (200, 103)
Data Point: (227.4, 101)

Spatial Functions

Clay
Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (179, -44, 530)
Data Point: (179, -70, 796)
Data Point: (200, -44, 744)
Data Point: (200, -70, 1022)
Data Point: (227.4, -44, 530)
Data Point: (227.4, -70, 796)
Data Point: (500, -44, 530)
Data Point: (500, -70, 796)
Data Point: (0, -44, 530)
Data Point: (0, -70, 796)

Regions

	Points	Area (ft²)	Material
Region 1	29,35,28,40,41,42,55	53.85	
Region 2	4,37,5,22,21	230.67	Fill, EL. -0.8 to -4 (Protected)
Region 3	9,21,25	43.84	MARSH 1, EL. -0.8 TO -4
Region 4	13,7,8,14	8047	BAY SOUND CLAY, EL. -44 TO 70
Region 5	39,21,22,6,23	730.4	MARSH, EL. -4 TO -8 (Protected Side)
Region 6	11,10,23,6,8,7,12,20	10597.2	BEACH SAND, EL. -8/-10 TO -44
Region 7	2,24,38,3,4,21,9	130.1	EMBANKMENT FIL, EL. +4 TO -0.8
Region 8	49,56,36,1,17,33,2,9,18	58.44	
Region 9	42,55,54,53,15,16,12,20,11,10,19	293.97	

Region 10	16,27,26,34,29,55,54,53,15	133.855	
Region 11	32,25,21,39	82.2	MARSH 2, EL. -4 TO -7
Region 12	10,52,32,39,23	54.8	MARSH 3, EL. -7 TO -10
Region 13	18,9,25,30,40,28,49	80.8	
Region 14	40,30,25,32,31,41	63	
Region 15	41,31,32,52,10,19,42	43.9	
Region 16	2,50,51,38,24	6.875	Sheet Pile

Points

	X (ft)	Y (ft)
Point 1	192	2.7
Point 2	200	3.9
Point 3	208	4
Point 4	227.4	-0.8
Point 5	410	-3
Point 6	410	-8
Point 7	100.5	-44
Point 8	410	-44
Point 9	200	-0.8
Point 10	200	-10
Point 11	200	-13.2
Point 12	100.5	-13.2
Point 13	100.5	-70
Point 14	410	-70
Point 15	143.1	-11.2
Point 16	100.5	-11.7
Point 17	196	3.4
Point 18	196	-0.8
Point 19	196	-9.8
Point 20	196	-13.2
Point 21	227.4	-4
Point 22	410	-4
Point 23	227.4	-8
Point 24	201	3.9
Point 25	200	-4

Point 26	143	-9
Point 27	100.5	-9.5
Point 28	170.5	-4
Point 29	162.5	-7
Point 30	196	-4
Point 31	196	-7
Point 32	200	-7
Point 33	199	3.9
Point 34	156.8	-9
Point 35	164.3	-6.3
Point 36	186	1.4
Point 37	271.1	-3
Point 38	201	4.4
Point 39	227.4	-7
Point 40	179	-4
Point 41	179	-7
Point 42	179	-8
Point 43	179	-44
Point 44	200	-44
Point 45	227.4	-44
Point 46	227.4	-70
Point 47	200	-70
Point 48	179	-70
Point 49	179	-0.8
Point 50	200	12.9
Point 51	200.5	12.9
Point 52	200	-9
Point 53	156.8	-11.2
Point 54	159	-10
Point 55	163	-8
Point 56	180.1	-0.4

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.34	(248.398, -1.45)	33.84222	(200, 12.9)	(293.928, -3)

2	154	1.45	(248.398, -1.45)	35.394	(200, 12.9)	(297.389, -3)
---	-----	------	------------------	--------	-------------	---------------

Slices of Slip Surface: Optimized

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	200.25	7.263984	839.38329	67.926331	0	374.77
2	Optimized	200.75	7.418802	826.71659	1072.886	0	374.32
3	Optimized	202.5882	7.987981	862.82624	1174.6538	0	372.64
4	Optimized	205.76465	8.9715215	919.42374	1257.054	0	369.74
5	Optimized	207.4379	9.489611	947.66943	1326.962	218.98465	-1.5547e-005
6	Optimized	207.76145	9.512208	947.82002	1415.0446	269.75225	1.6272e-005
7	Optimized	209.61665	9.483261	938.91661	1369.2869	248.4744	-1.3191e-006
8	Optimized	212.85	9.4328115	923.57827	1280.7513	206.21393	-1.4629e-005
9	Optimized	216.08335	9.3823625	908.67287	1192.3084	163.75707	-8.693e-007
10	Optimized	219.31665	9.331913	894.16948	1103.9584	121.12167	-6.4298e-007
11	Optimized	222.55	9.2814635	880.00626	1015.732	78.361294	-4.1595e-007

12	Optimiz ed	225.78335	- 9.23101 45	866.21412	927.5984	35.44023	-1.325e- 006
13	Optimiz ed	229.73705	- 9.16932 5	849.55748	884.89688	20.403212	-2.3345e- 007
14	Optimiz ed	233.5271	- 9.13352 65	835.02407	858.14845	13.350866	-3.2593e- 007
15	Optimiz ed	236.4331	- 9.13486	825.56097	842.14721	9.5760678	-1.0957e- 007
16	Optimiz ed	239.33915	- 9.13619 35	816.09787	826.18038	5.8211367	8.8918e- 009
17	Optimiz ed	242.3817	- 9.16305 35	807.78783	811.625	2.2153929	-7.2512e- 009
18	Optimiz ed	245.5607	- 9.21544 05	800.58526	800.49091	0	0
19	Optimiz ed	248.73965	- 9.26782 75	793.3827	789.45117	0	0
20	Optimiz ed	251.9186	- 9.32021 5	786.21159	778.41144	0	0
21	Optimiz ed	255.0976	- 9.37260 25	779.00903	767.3717	0	0
22	Optimiz ed	258.2766	- 9.42498 95	771.83792	756.33196	0	0
23	Optimiz ed	261.4556	- 9.47737 65	764.63536	745.29223	0	0
24	Optimiz ed	264.1315	- 9.60096	763.55614	741.87384	0	0
25	Optimiz ed	266.68845	- 9.65174	758.32934	740.38554	0	0

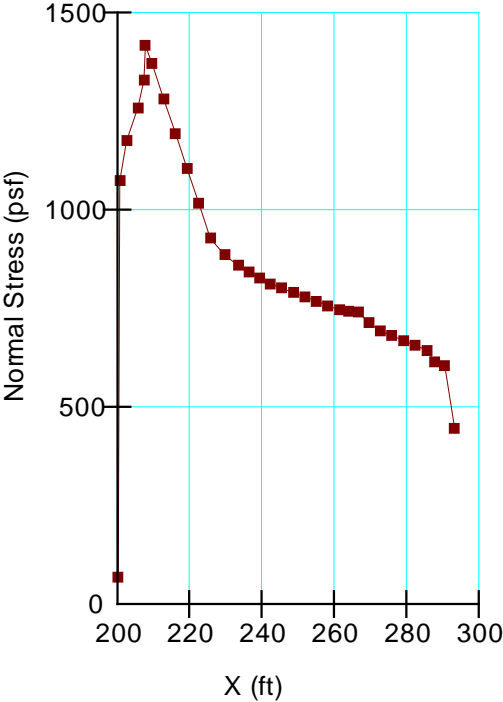
			9				
26	Optimiz ed	269.6295	- 9.55854 75	742.83242	712.79016	0	0
27	Optimiz ed	272.72065	- 9.46058 8	726.56226	692.73496	0	0
28	Optimiz ed	275.96195	- 9.35787 05	709.50985	680.18463	0	0
29	Optimiz ed	279.20325	- 9.25515 35	692.48827	667.60347	0	0
30	Optimiz ed	282.4446	- 9.15243 6	675.43586	655.05314	0	0
31	Optimiz ed	285.68595	- 9.04971 85	658.41429	642.50281	0	0
32	Optimiz ed	287.8576	- 8.49918	616.94364	612.90201	0	0
33	Optimiz ed	290.61635	-6	414.05765	603.70609	0	350
34	Optimiz ed	293.376	-3.5	122.04366	446.17303	0	500

Slices of Slip Surface: 154

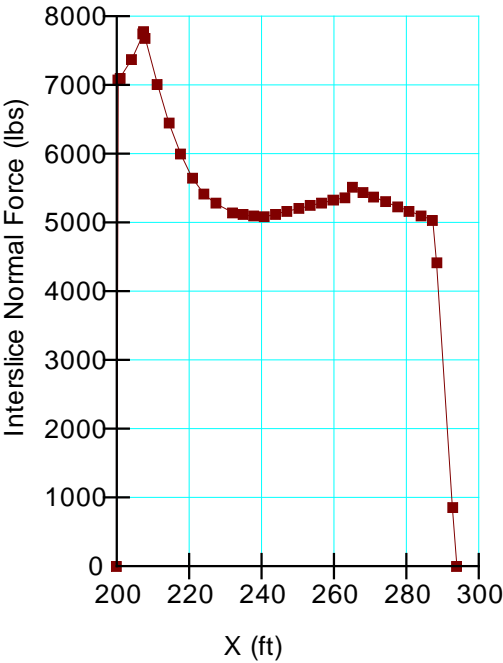
	Slip Surfac e	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	154	200.25	-9.2	968.94	6.3196	0	374.77
2	154	200.75	-9.2	947.9	1365.32	0	374.32
3	154	202.75	-9.2	944.08571	1409.2571	0	372.49
4	154	206.25	-9.2	932.91429	1389.8	0	369.3
5	154	209.48	-9.2	921.38514	1341.4189	0	366.35
6	154	212.604	-9.2	909.91484	1253.8929	198.59585	-1.0544e- 006
7	154	215.892	-9.2	897.93187	1170.9854	157.64753	-8.3694e- 007

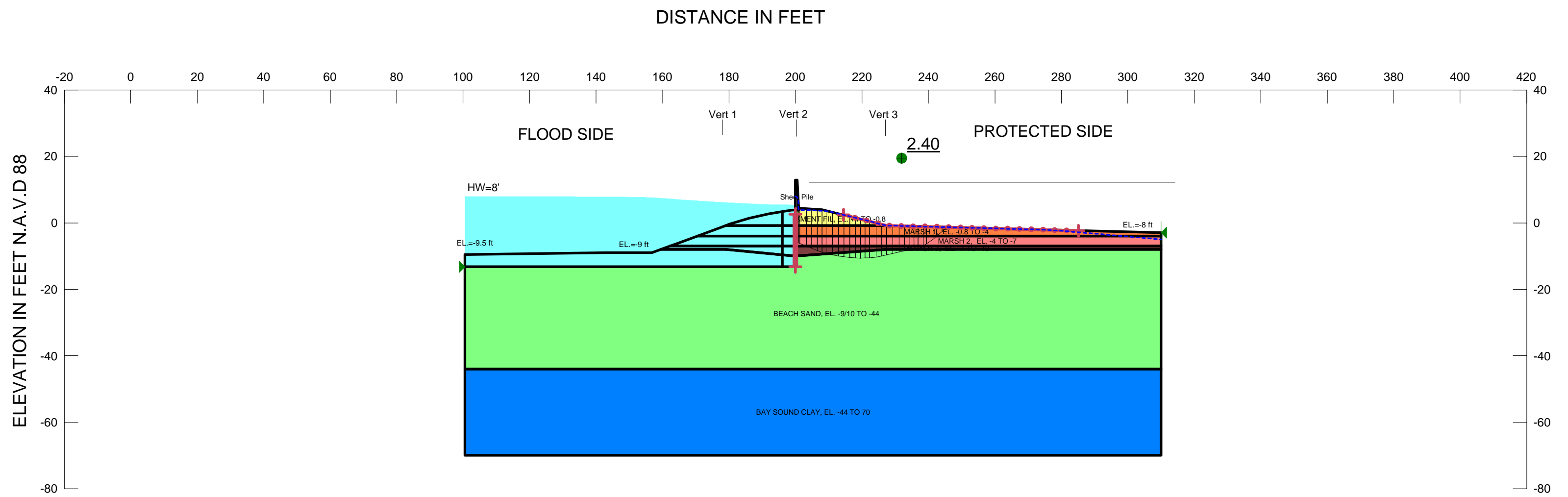
8	154	219.18	-9.2	886.40511	1088.1995	116.50605	-6.185e-007
9	154	222.468	-9.2	875.2129	1005.5049	75.224104	-3.9938e- 007
10	154	225.756	-9.2	864.35523	922.90146	33.801681	-1.264e-006
11	154	229.08075	-9.2	853.59737	891.08021	21.640729	-2.476e-007
12	154	232.4423	-9.2	842.7095	872.39829	17.140832	-1.9615e- 007
13	154	235.80385	-9.2	831.70263	853.71636	12.709635	-3.1052e- 007
14	154	239.1654	-9.2	820.66602	835.06419	8.3127881	-9.5138e- 008
15	154	242.52695	-9.2	809.59965	816.38226	3.9159415	6.7603e-008
16	154	245.88845	-9.2	798.53329	797.75983	0	0
17	154	249.25	-9.2	787.46693	779.28615	0	0
18	154	252.61155	-9.2	776.43031	760.84221	0	0
19	154	255.97305	-9.2	765.36395	742.39827	0	0
20	154	259.3346	-9.2	754.29759	723.95433	0	0
21	154	262.69615	-9.2	743.26097	705.51039	0	0
22	154	266.0577	-9.2	732.19461	687.06646	0	0
23	154	269.41925	-9.2	721.15799	668.62252	0	0
24	154	272.675	-9.2	710.44444	659.39683	0	0
25	154	275.825	-9.2	700.12698	659.39683	0	0
26	154	278.975	-9.2	689.77778	659.39683	0	0
27	154	282.125	-9.2	679.46032	659.39683	0	0
28	154	285.275	-9.2	669.14286	659.39683	0	0
29	154	288.425	-9.2	658.8254	659.42857	0.34824302	-5.8784e- 010
30	154	290.71505	-8.6	613.86203	631.69939	10.2984	-2.5042e- 007
31	154	293.8136	-6	405.03656	566.16735	0	350
32	154	296.793	-3.5	117.8551	393.36026	0	500

Base Normal Stress Vs. X



Interslice Normal Stress
Vs. X





Name: EMBANKMENT FIL, EL. +4 TO -0.8 Model: Spatial Mohr-Coulomb Unit Weight: 108 pcf Cohesion Fn: fill1 Phi: 0 °
Name: MARSH 1, EL. -0.8 TO -4 Model: Spatial Mohr-Coulomb Weight Fn: Marsh EI -0.8 Cohesion Fn: Marsh EI -0.8 Phi: 0 °
Name: BEACH SAND, EL. -9/10 TO -44 Model: Mohr-Coulomb Unit Weight: 122 pcf Cohesion: 0 psf Phi: 30 °
Name: BAY SOUND CLAY, EL. -44 TO 70 Model: Spatial Mohr-Coulomb Unit Weight: 109 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 2, EL. -4 TO -7 Model: Spatial Mohr-Coulomb Weight Fn: Marsh EI -4 Cohesion Fn: Marsh EI -4 Phi: 0 °
Name: MARSH 3, EL. -7 TO -10 Model: Spatial Mohr-Coulomb Weight Fn: Marsh EI -7 Cohesion Fn: Marsh EI -7 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.

Hw = CANAL WATER LEVEL

LONDON AVE CANAL
OUTFALL CANAL REEVALUATION REPORT
REACH 6B, STA. 47+00 TO STA 59+00
PROTECTED SIDE STABILITY ANALYSIS,
CASE: GAP Stability (Entry/Exit)
MARCH 2012

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

GAP Stability (Entry/Exit)

Report generated using GeoStudio 2007, version 7.15. Copyright © 1991-2009 GEO-SLOPE International Ltd.

File Information

Created By: Liljegren, James
Revision Number: 318
Last Edited By: Schroeder, Danielle V MVN
Date: 1/12/2012
Time: 9:15:03 AM
File Name: Reach 6B-DVS.gsz
Directory: G:\F&M\HOME\London Ave Reevaluation 2011\West Side\Reach 6B\SlopeW\
Last Solved Date: 1/12/2012
Last Solved Time: 9:16:46 AM

Project Settings

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

Analysis Settings

GAP Stability (Entry/Exit)

Kind: SLOPE/W
Parent: Gap Analysis (Seepage)
Method: Spencer
Settings
 PWP Conditions Source: Parent Analysis
SlipSurface
 Direction of movement: Left to Right
 Use Passive Mode: Yes
 Slip Surface Option: Entry and Exit
 Critical slip surfaces saved: 1
 Optimize Critical Slip Surface Location: Yes
 Tension Crack
 Tension Crack Option: (none)
FOS Distribution
 FOS Calculation Option: Constant
Advanced
 Number of Slices: 30
 Optimization Tolerance: 0.01
 Minimum Slip Surface Depth: 0.1 ft

Optimization Maximum Iterations: 4000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 10
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 10 °
Resisting Side Maximum Convex Angle: 5 °

Materials

EMBANKMENT FIL, EL. +4 TO -0.8

Model: Spatial Mohr-Coulomb
Unit Weight: 108 pcf
Cohesion Fn: fill1
Phi: 0 °
Phi-B: 0 °

MARSH 1, EL. -0.8 TO -4

Model: Spatial Mohr-Coulomb
Weight Fn: Marsh El -0.8
Cohesion Fn: Marsh El -0.8
Phi: 0 °
Phi-B: 0 °

BEACH SAND, EL. -9/10 TO -44

Model: Mohr-Coulomb
Unit Weight: 122 pcf
Cohesion: 0 psf
Phi: 30 °
Phi-B: 0 °

BAY SOUND CLAY, EL. -44 TO 70

Model: Spatial Mohr-Coulomb
Unit Weight: 109 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 2, EL. -4 TO -7

Model: Spatial Mohr-Coulomb
Weight Fn: Marsh El -4
Cohesion Fn: Marsh El -4
Phi: 0 °
Phi-B: 0 °

3/1/2012

3/1/2012

MARSH 3, EL. -7 TO -10

Model: Spatial Mohr-Coulomb
Weight Fn: Marsh El -7
Cohesion Fn: Marsh El -7
Phi: 0 °
Phi-B: 0 °

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (200, -13.2) ft
Left-Zone Right Coordinate: (200, 2.6) ft
Left-Zone Increment: 20
Right Projection: Range
Right-Zone Left Coordinate: (214.46667, 2.4) ft
Right-Zone Right Coordinate: (285.1508, -2.33816) ft
Right-Zone Increment: 20
Radius Increments: 20

Slip Surface Limits

Left Coordinate: (100.5, -13.2) ft
Right Coordinate: (310, -3) ft

Cohesion Functions

Marsh El -4

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: (100.5, 350)
 Data Point: (179, 350)
 Data Point: (200, 375)
 Data Point: (227.4, 350)
 Data Point: (310, 350)

fill1

Model: Spline Data Point Function
Function: Cohesion vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 500
Data Points: X (ft), Cohesion (psf)
 Data Point: (100.5, 500)

Data Point: (179, 500)
Data Point: (200, 700)
Data Point: (227.4, 500)
Data Point: (310, 500)

Marsh El -0.8

Model: Spline Data Point Function
Function: Cohesion vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 500
Data Points: X (ft), Cohesion (psf)
 Data Point: (100.5, 500)
 Data Point: (179, 500)
 Data Point: (200, 375)
 Data Point: (227.4, 500)
 Data Point: (310, 500)

Marsh El -7

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: (100.5, 350)
 Data Point: (179, 350)
 Data Point: (200, 375)
 Data Point: (227.4, 350)
 Data Point: (310, 350)

Unit Weight Functions

Marsh El -7

Model: Spline Data Point Function
Function: Unit Weight vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 101
Data Points: X (ft), Unit Weight (pcf)
 Data Point: (100.5, 101)
 Data Point: (179, 101)
 Data Point: (200, 103)
 Data Point: (227.4, 101)
 Data Point: (310, 101)

Marsh El -4

Model: Spline Data Point Function
Function: Unit Weight vs. X

3/1/2012

3/1/2012

Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 101
Data Points: X (ft), Unit Weight (pcf)
Data Point: (100.5, 101)
Data Point: (179, 101)
Data Point: (200, 96)
Data Point: (227.4, 101)
Data Point: (310, 101)

Marsh EI -0.8

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 109
Data Points: X (ft), Unit Weight (pcf)
Data Point: (100.5, 109)
Data Point: (179, 109)
Data Point: (200, 101)
Data Point: (227.4, 109)
Data Point: (310, 109)

Spatial Functions

Clay

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (179, -44, 530)
Data Point: (179, -70, 796)
Data Point: (200, -44, 744)
Data Point: (200, -70, 1022)
Data Point: (227.4, -44, 530)
Data Point: (227.4, -70, 796)
Data Point: (500, -44, 530)
Data Point: (500, -70, 796)
Data Point: (0, -44, 530)
Data Point: (0, -70, 796)

Regions

	Material	Points	Area (ft²)
Region 1	BAY SOUND CLAY, EL. -44 TO 70	13,7,8,14	5447
Region 2	BEACH SAND, EL. -9/10 TO -44	11,10,20,6,8,7,12,18	6997.2
Region 3		35,39,32,1,15,29,2,9,16	58.44
Region 4		34,38,30,23,24,12,18,11,10,17	428.325
Region 5		16,9,22,26,25,35	80.8

Region 6	Sheet Pile	2,36,37,33,21	6.875
Region 7	EMBANKMENT FIL, EL. +4 TO -0.8	9,2,21,33,3,4	86.26
Region 8	MARSH 1, EL. -0.8 TO -4	22,9,4,5,19	261.14
Region 9		41,31,25,26,22,28,27	100.82
Region 10	MARSH 2, EL. -4 TO -7	22,28,40,19	330
Region 11	MARSH 3, EL. -7 TO -10	10,28,40,6,20	137.4
Region 12		38,34,17,10,28,27,41	59.9

Points

	X (ft)	Y (ft)
Point 1	192	2.7
Point 2	200	3.9
Point 3	208	4
Point 4	227.4	-0.8
Point 5	310	-3
Point 6	310	-8
Point 7	100.5	-44
Point 8	310	-44
Point 9	200	-0.8
Point 10	200	-10
Point 11	200	-13.2
Point 12	100.5	-13.2
Point 13	100.5	-70
Point 14	310	-70
Point 15	196	3.4
Point 16	196	-0.8
Point 17	196	-9.6
Point 18	196	-13.2
Point 19	310	-4
Point 20	227.4	-8
Point 21	201	3.9
Point 22	200	-4
Point 23	143	-9
Point 24	100.5	-9.5
Point 25	170.5	-4
Point 26	196	-4
Point 27	196	-7
Point 28	200	-7
Point 29	199	3.9
Point 30	156.8	-9
Point 31	164.2	-6.3
Point 32	186	1.4
Point 33	201	4.4

3/1/2012

3/1/2012

Point 34	179	-8
Point 35	179	-0.8
Point 36	200	12.9
Point 37	200.5	12.9
Point 38	159.5	-8
Point 39	180.1	-0.4
Point 40	310	-7
Point 41	162.3	-7

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	2.40	(220.376, 27.258)	18.94883	(200, 12.9)	(245.751, -1.28876)
2	4607	2.53	(220.376, 27.258)	38.408	(200, 12.9)	(246.063, -1.29707)

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	-5.9401015	675.19113	-218.6714	0	374.77
2	Optimized	200.75	-6.053036	643.09955	987.19146	0	374.32
3	Optimized	201.13985	-6.1410865	648.36701	1047.4533	0	373.96
4	Optimized	202.27965	-6.586335	676.23168	1036.1555	0	372.92
5	Optimized	204.0828	-7.33226	720.30676	1099.2703	0	371.27
6	Optimized	205.6892	-7.99678	756.9491	1157.5989	0	369.81
7	Optimized	207.2462	-8.597964	788.31903	1224.9621	0	368.39
8	Optimized	208.61185	-9.085174	812.40677	1254.7471	0	367.14
9	Optimized	210.154	-9.4838305	828.45176	1309.187	277.55262	0
10	Optimized	211.97095	-9.8361155	839.14055	1308.7005	271.10058	0
11	Optimized	213.7308	-10.116615	846.1531	1317.785	272.29681	0
12	Optimized	215.4772	-10.33379	849.22155	1302.7837	261.86423	0
13	Optimized	217.1602	-10.480975	848.64775	1299.0601	260.04571	0
14	Optimized	218.77975	-10.55816	844.0838	1269.6412	245.69566	0
15	Optimized	220.2646	-10.56853	836.22311	1255.8887	242.29405	0
16	Optimized	221.61475	-10.51209	825.0488	1215.6316	225.50308	0
17	Optimized	223.28375	-10.371385	806.8922	1172.4254	211.0407	0
18	Optimized	225.09715	-10.109875	780.57601	1107.7672	188.9039	0

19	Optimized	226.6583	-9.7824785	751.63429	1036.6759	164.56887	0
20	Optimized	228.34415	-9.377055	717.19892	961.67164	141.14639	0
21	Optimized	230.23245	-8.9229515	678.73618	897.05217	126.0448	0
22	Optimized	231.98	-8.569495	647.30271	833.95016	107.76096	0
23	Optimized	233.58685	-8.316685	622.83443	797.06332	100.59109	0
24	Optimized	235.0177	-8.143325	604.24985	760.57932	90.256863	0
25	Optimized	236.2725	-8.049415	591.57406	745.25711	88.728952	0
26	Optimized	237.6438	-7.50123	539.25309	843.62809	0	350
27	Optimized	238.8995	-6.65515	462.24979	747.96384	0	350
28	Optimized	240.51075	-5.51326	360.28722	630.66556	0	350
29	Optimized	242.0428	-4.35811	259.25893	522.00776	0	350
30	Optimized	243.2943	-3.322191	170.63492	461.35444	0	500
31	Optimized	244.93205	-1.9665735	56.401667	294.82583	0	500

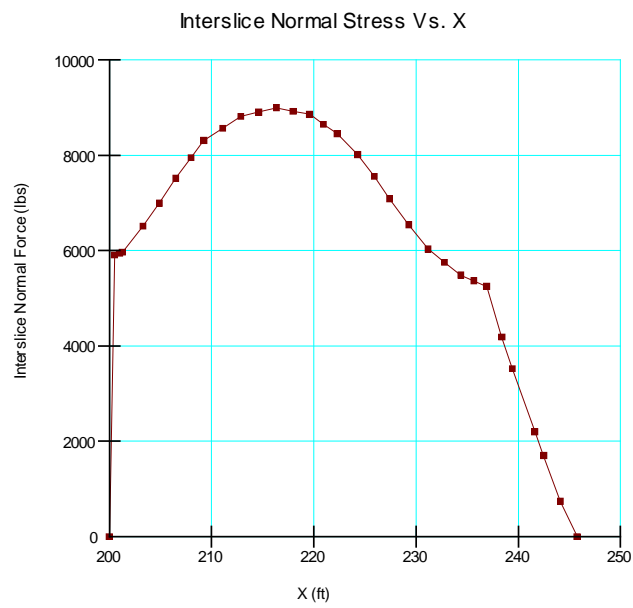
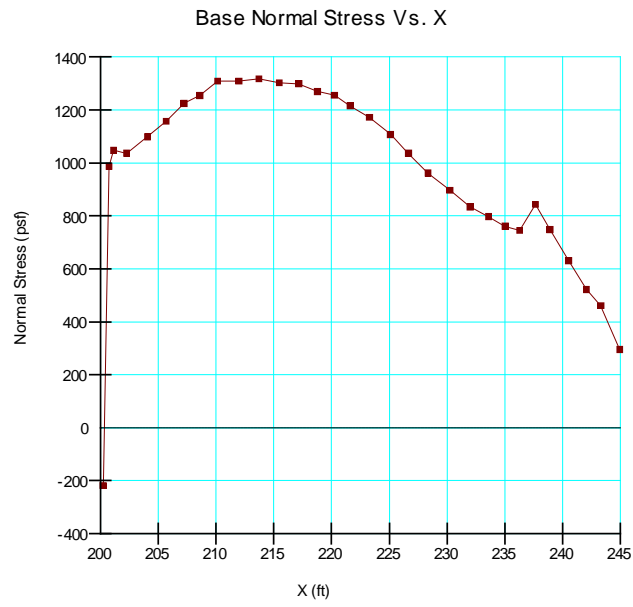
Slices of Slip Surface: **4607**

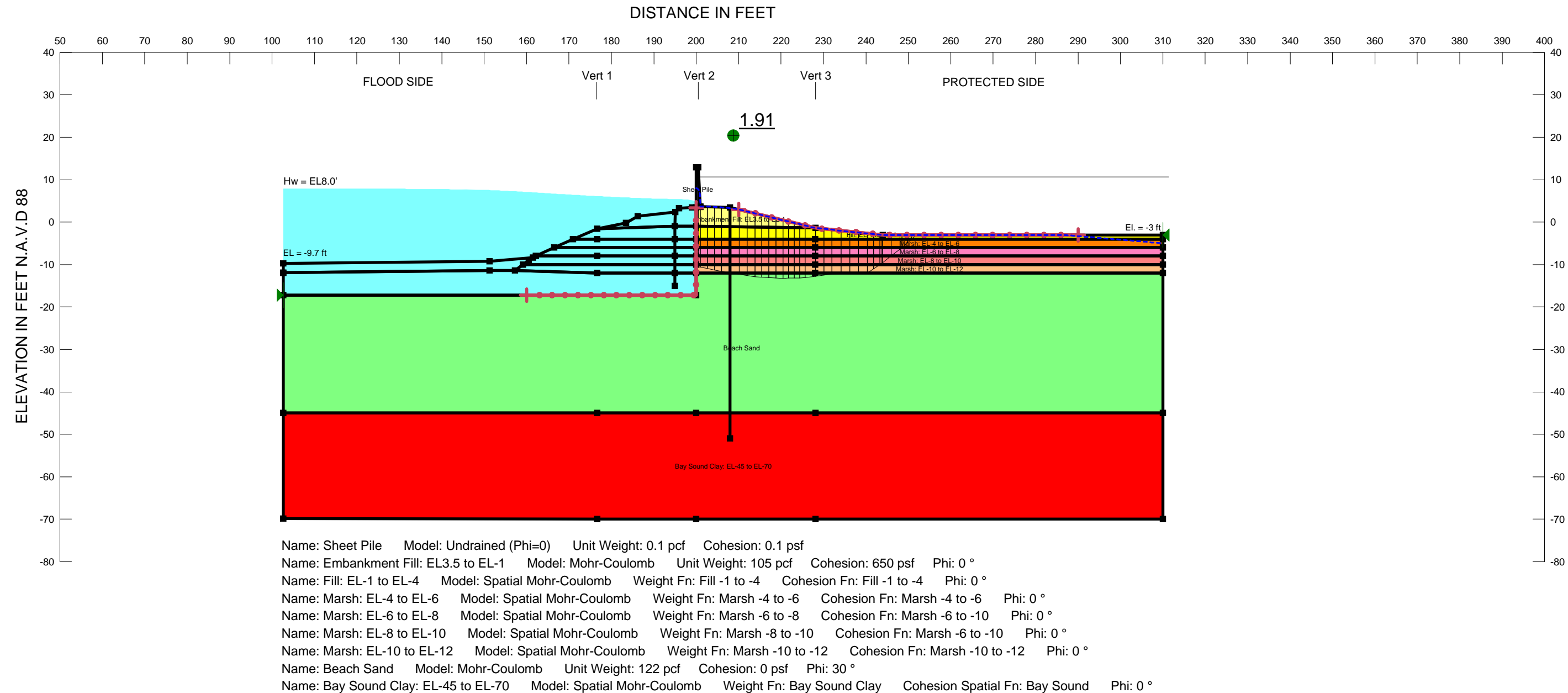
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	4607	200.25	-5.453812	643.36512	-167.58938	0	374.77
2	4607	200.75	-5.7562405	623.4737	876.51813	0	374.32
3	4607	202.0048	-6.4524285	667.74593	997.86113	0	373.17
4	4607	203.8413	-7.396841	725.72516	1095.0984	0	371.5
5	4607	205.50475	-8.1430745	767.61454	1175.1985	0	369.98
6	4607	207.16825	-8.797147	801.82752	1245.9513	0	368.46
7	4607	208.3914	-9.230375	823.26669	1285.3491	0	367.34
8	4607	209.5585	-9.5866695	838.69332	1313.6086	274.19246	0
9	4607	211.1099	-10.007298	855.2697	1337.4809	278.40478	0
10	4607	212.66135	-10.359265	867.82743	1353.3915	280.34056	0
11	4607	214.2128	-10.64448	876.31289	1361.2306	279.96738	0
12	4607	215.7642	-10.86445	880.82076	1361.1288	277.306	0
13	4607	217.31565	-11.020305	881.59307	1353.0054	272.17003	0
14	4607	218.8671	-11.112825	878.37716	1336.8877	264.72119	0
15	4607	220.41855	-11.142465	871.32067	1312.5243	254.72901	0
16	4607	221.97	-	860.5239	1279.9021	242.12812	0

3/1/2012

3/1/2012

			11.109375				
17	4607	223.5214	-11.01339	845.78086	1238.7998	226.90959	0
18	4607	225.07285	-10.85403	827.35511	1188.8632	208.71678	0
19	4607	226.6243	-10.630505	804.88835	1129.7437	187.55534	0
20	4607	228.221	-10.331235	777.53785	1077.7144	173.30703	0
21	4607	229.86295	-9.9505645	744.94039	1032.3411	165.9309	0
22	4607	231.5049	-9.4926245	707.50675	976.33367	155.20729	0
23	4607	233.1469	-8.9544755	665.04507	908.80112	140.73262	0
24	4607	234.78885	-8.3324705	617.27454	828.84701	122.15142	0
25	4607	236.676	-7.5	544.23906	789.86419	0	350
26	4607	238.56765	-6.555914	455.56383	699.17275	0	350
27	4607	240.21855	-5.6135555	369.82356	607.35799	0	350
28	4607	241.86945	-4.5576415	276.24229	503.28538	0	350
29	4607	243.53685	-3.3631865	173.18314	433.45517	0	500
30	4607	245.2207	-2.0117205	59.315542	291.77397	0	500





GENERAL NOTES

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

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

Hw = CANAL WATER LEVEL

LONDON AVE CANAL
OUTFALL CANAL REEVALUATION REPORT
REACH 7: NON-REMEDIATED, STA. 59+00 TO 64+00
PROTECTED SIDE STABILITY ANALYSIS
CASE: Non-Rem: GAP Stability (Entry/Exit)
MARCH 2012

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

Non-Rem: GAP Stability (Entry/Exit)

Report generated using GeoStudio 2007, version 7.15. Copyright © 1991-2009 GEO-SLOPE International Ltd.

File Information

Revision Number: 348
Last Edited By: Haggerty, Daniel R MVN
Date: 12/21/2011
Time: 9:49:31 AM
File Name: Reach 7.gsz
Last Solved Date: 12/21/2011
Last Solved Time: 9:50:32 AM

Project Settings

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

Analysis Settings

Non-Rem: GAP Stability (Entry/Exit)

Kind: SLOPE/W
Parent: Gap Analysis (Seepage) Non-Remediated Reach
Method: Spencer
Settings
PWP Conditions Source: Parent Analysis
SlipSurface
Direction of movement: Left to Right
Use Passive Mode: Yes
Slip Surface Option: Entry and Exit
Critical slip surfaces saved: 1
Optimize Critical Slip Surface Location: Yes
Tension Crack
Tension Crack Option: (none)
FOS Distribution
FOS Calculation Option: Constant
Advanced
Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft

Cohesion Fn: Marsh -6 to -10
Phi: 0 °
Phi-B: 0 °

Marsh: EL-10 to EL-12

Model: Spatial Mohr-Coulomb
Weight Fn: Marsh -10 to -12
Cohesion Fn: Marsh -10 to -12
Phi: 0 °
Phi-B: 0 °

Beach Sand

Model: Mohr-Coulomb
Unit Weight: 122 pcf
Cohesion: 0 psf
Phi: 30 °
Phi-B: 0 °

Bay Sound Clay: EL-45 to EL-70

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

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (160, -17.2) ft
Left-Zone Right Coordinate: (200, 3.4) ft
Left-Zone Increment: 20
Right Projection: Range
Right-Zone Left Coordinate: (210, 3.01244) ft
Right-Zone Right Coordinate: (290, -3) ft
Right-Zone Increment: 20
Radius Increments: 20

Slip Surface Limits

Left Coordinate: (102.6, -17.2) ft
Right Coordinate: (310, -3) ft

Optimization Maximum Iterations: 5000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 10
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 30 °
Resisting Side Maximum Convex Angle: 10 °

Materials

Sheet Pile

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

Embankment Fill: EL3.5 to EL-1

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

Fill: EL-1 to EL-4

Model: Spatial Mohr-Coulomb
Weight Fn: Fill -1 to -4
Cohesion Fn: Fill -1 to -4
Phi: 0 °
Phi-B: 0 °

Marsh: EL-4 to EL-6

Model: Spatial Mohr-Coulomb
Weight Fn: Marsh -4 to -6
Cohesion Fn: Marsh -4 to -6
Phi: 0 °
Phi-B: 0 °

Marsh: EL-6 to EL-8

Model: Spatial Mohr-Coulomb
Weight Fn: Marsh -6 to -8
Cohesion Fn: Marsh -6 to -10
Phi: 0 °
Phi-B: 0 °

Marsh: EL-8 to EL-10

Model: Spatial Mohr-Coulomb
Weight Fn: Marsh -8 to -10

Cohesion Functions

Fill -1 to -4

Model: Spline Data Point Function
Function: Cohesion vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 600
Data Points: X (ft), Cohesion (psf)
Data Point: (0, 600)
Data Point: (176.6, 600)
Data Point: (200, 450)
Data Point: (228.1, 600)
Data Point: (400, 600)

Marsh -4 to -6

Model: Spline Data Point Function
Function: Cohesion vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 600
Data Points: X (ft), Cohesion (psf)
Data Point: (0, 600)
Data Point: (176.6, 600)
Data Point: (200, 340)
Data Point: (228.1, 600)
Data Point: (400, 600)

Marsh -6 to -10

Model: Spline Data Point Function
Function: Cohesion vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 320
Data Points: X (ft), Cohesion (psf)
Data Point: (0, 320)
Data Point: (176.6, 320)
Data Point: (200, 340)
Data Point: (228.1, 320)
Data Point: (400, 320)

Marsh -10 to -12

Model: Spline Data Point Function
Function: Cohesion vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 300

Data Points: X (ft), Cohesion (psf)
Data Point: (0, 300)
Data Point: (176.6, 300)
Data Point: (200, 340)
Data Point: (228.1, 300)
Data Point: (400, 300)

Unit Weight Functions

Fill -1 to -4

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 96
Data Points: X (ft), Unit Weight (pcf)
Data Point: (0, 96)
Data Point: (176.6, 96)
Data Point: (200, 105)
Data Point: (228.1, 96)
Data Point: (400, 96)

Marsh -4 to -6

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 96
Data Points: X (ft), Unit Weight (pcf)
Data Point: (0, 96)
Data Point: (176.6, 96)
Data Point: (200, 90)
Data Point: (228.1, 96)
Data Point: (400, 96)

Marsh -6 to -8

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 104
Data Points: X (ft), Unit Weight (pcf)
Data Point: (0, 104)
Data Point: (176.6, 104)
Data Point: (200, 90)
Data Point: (228.1, 104)

Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (0, -45, 790)
Data Point: (0, -70, 950)
Data Point: (176.6, -45, 790)
Data Point: (176.6, -70, 950)
Data Point: (200, -45, 800)
Data Point: (200, -70, 1000)
Data Point: (228.1, -45, 790)
Data Point: (228.1, -70, 950)
Data Point: (400, -45, 790)
Data Point: (400, -70, 950)

Regions

	Material	Points	Area (ft²)
Region 1	Sheet Pile	6,46,47,41,32	7.085
Region 2	Bay Sound Clay: EL-45 to EL-70	31,11,52,33,51,12,30,58,34,57	5181.295
Region 3	Beach Sand	11,24,17,16,26,29,12,51,33,52	6337.72
Region 4		24,42,49,50,48,56,23,16,17	532.945
Region 5		48,63,43,16,23,56	78.271
Region 6		63,36,2,62,55,21,15,43	78.9175
Region 7		62,61,60,15,21,55	71.35
Region 8		61,3,54,20,14,60	62.6
Region 9		3,4,19,13,14,20,54	71.37
Region 10		4,37,5,18,38,39,6,13,19	57.67
Region 11		49,1,35,2,36,63,48,50	127.584
Region 12	Marsh: EL-10 to EL-12	16,43,44,45,29,26	220
Region 13	Marsh: EL-8 to EL-10	43,15,53,59,45,44	220
Region 14	Marsh: EL-6 to EL-8	15,60,25,28,59,53	220
Region 15	Marsh: EL-4 to EL-6	60,14,27,10,28,25	220
Region 16	Fill: EL-1 to EL-4	14,13,8,40,9,10,27	173.3
Region 17	Embankment Fill: EL3.5 to EL-1	13,6,32,41,7,8	83.54

Points

	X (ft)	Y (ft)
Point 1	102.6	-9.7
Point 2	161.5	-8.3
Point 3	170.9	-4

Data Point: (400, 104)

Marsh -8 to -10

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 104
Data Points: X (ft), Unit Weight (pcf)
Data Point: (0, 104)
Data Point: (176.6, 104)
Data Point: (200, 98)
Data Point: (228.1, 104)
Data Point: (400, 104)

Marsh -10 to -12

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 96
Data Points: X (ft), Unit Weight (pcf)
Data Point: (0, 96)
Data Point: (176.6, 96)
Data Point: (200, 98)
Data Point: (228.1, 96)
Data Point: (400, 96)

Bay Sound Clay

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 111
Data Points: X (ft), Unit Weight (pcf)
Data Point: (0, 111)
Data Point: (176.6, 111)
Data Point: (200, 108)
Data Point: (228.1, 111)
Data Point: (400, 111)

Spatial Functions

Bay Sound

Model: Linear Interpolation
Limit Range By: Data Values

Point 4	176.7	-1.6
Point 5	186.2	1.4
Point 6	200	3.5
Point 7	208	3.5
Point 8	228.1	-1.4
Point 9	310	-3
Point 10	310	-4
Point 11	102.6	-45
Point 12	310	-45
Point 13	200	-1
Point 14	200	-4
Point 15	200	-8
Point 16	200	-12
Point 17	200	-17.2
Point 18	195.1	2.4
Point 19	195	-1
Point 20	195	-4
Point 21	195	-8
Point 22	195	-15
Point 23	195	-12
Point 24	102.6	-17.2
Point 25	228	-6
Point 26	228	-12
Point 27	228	-4
Point 28	310	-6
Point 29	310	-12
Point 30	310	-70
Point 31	102.6	-69.9
Point 32	201	3.53
Point 33	200	-45
Point 34	200	-70
Point 35	151.3	-9.2
Point 36	160.5	-9
Point 37	183.4	-0.2
Point 38	195.9	3.3
Point 39	199	3.5

Point 40	244	-3
Point 41	201	3.7
Point 42	102.6	-12
Point 43	200	-10
Point 44	228	-10
Point 45	310	-10
Point 46	200	12.9
Point 47	200.5	12.9
Point 48	157.3	-11.4
Point 49	102.6	-11.9
Point 50	151.3	-11.4
Point 51	228.1	-45
Point 52	176.7	-45
Point 53	228	-8
Point 54	176.7	-4
Point 55	176.7	-8
Point 56	176.7	-12
Point 57	176.7	-70
Point 58	228.1	-70
Point 59	310	-8
Point 60	200	-6
Point 61	166.5	-6
Point 62	162.15	-8
Point 63	159.17	-10
Point 64	208	-51

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.91	(222.304, 36.954)	21.85163	(200, 12.9)	(251.893, -3)
2	7294	2.07	(222.304, 36.954)	50.829	(200, 12.9)	(253.725, -3)

30	Optimized	243.90885	-9.591403	618.80091	881.84535	0	320
31	Optimized	244.9745	-8.760143	551.74545	786.83805	0	320
32	Optimized	246.96745	-7.20557	426.31782	611.00522	0	320
33	Optimized	248.22635	-6.20557	346.24	515.88306	0	320
34	Optimized	249.1354	-5.428475	284.85478	586.70647	0	600
35	Optimized	250.28615	-4.428475	206.5666	495.01412	0	600
36	Optimized	251.3309	-3.5	85.725294	396.86726	0	600

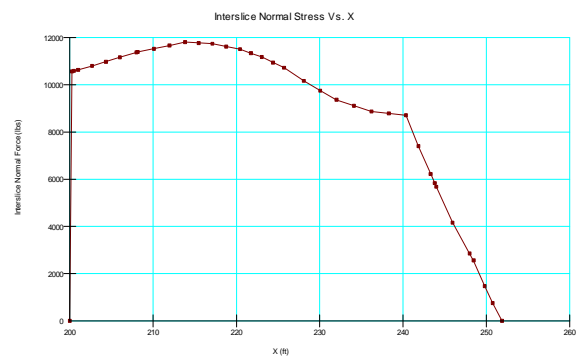
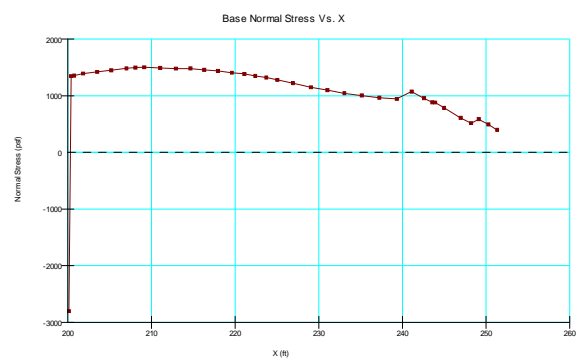
Slices of Slip Surface: 7294

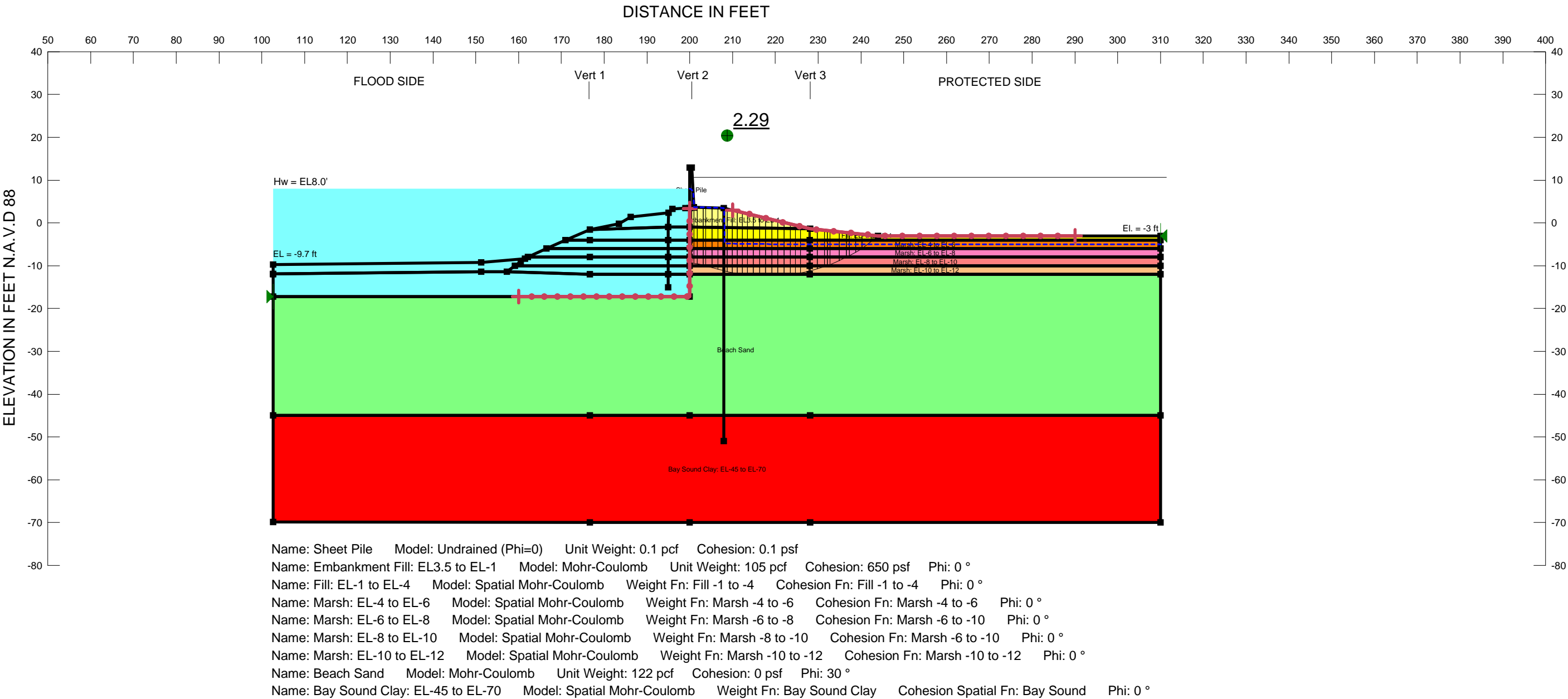
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	7294	200.25	-8.8403985	809.04609	-570.02081	0	339.82
2	7294	200.75	-9.0778585	824.23564	1142.1494	0	339.47
3	7294	201.91925	-9.59746	857.03495	1214.8761	0	338.63
4	7294	203.69875	-10.338435	901.90663	1294.04	0	334.73
5	7294	205.41925	-10.9799	938.14688	1362.9526	0	332.29
6	7294	207.13975	-11.551875	967.42251	1425.1439	0	329.84
7	7294	208.3129	-11.91041	984.69307	1457.6905	0	328.17
8	7294	209.50645	-12.22915	998.38292	1476.31	275.93131	0
9	7294	211.26775	-12.654225	1015.267	1494.774	276.84353	0
10	7294	213.02905	-13.01362	1027.9226	1505.4316	275.68993	0
11	7294	214.79035	-13.30874	1036.5749	1508.2558	272.32509	0
12	7294	216.5516	-13.54072	1041.3012	1503.2555	266.70947	0
13	7294	218.31285	-13.71043	1042.1395	1490.3637	258.78233	0
14	7294	220.07415	-13.81849	1039.087	1469.4922	248.49454	0
15	7294	221.83545	-13.865295	1032.3232	1440.5856	235.71043	0
16	7294	223.59675	-13.85102	1021.7032	1403.4016	220.3737	0
17	7294	225.35805	-13.77561	1007.3223	1357.7938	202.34483	0
18	7294	227.11935	-13.638785	989.11912	1303.4329	181.46916	0
19	7294	228.05	-13.549285	978.44803	1272.0937	169.53642	0
20	7294	229.08535	-13.41093	964.13898	1247.9193	163.84064	0
21	7294	231.0561	-13.105995	934.3113	1197.48	151.94051	0
22	7294	233.02685	-12.72104	899.55141	1135.6985	136.33961	0
23	7294	234.99755	-12.254175	859.65461	1061.9899	116.81832	0

Slices of Slip Surface: Optimized

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	200.13035	-10.449235	997.84808	-2800.8344	0	339.81
2	Optimized	200.38035	-10.473235	917.28341	1347.8492	0	339.46
3	Optimized	200.75	-10.54631	921.84289	1355.8844	0	338.93
4	Optimized	201.83545	-10.76087	935.0409	1392.8152	0	337.39
5	Optimized	203.50635	-11.091155	952.94794	1421.0555	0	335.01
6	Optimized	205.17725	-11.421445	968.50651	1449.2371	0	332.63
7	Optimized	207.00635	-11.77187	982.52605	1482.5943	0	330.03
8	Optimized	208.0779	-11.971675	989.93405	1497.7754	0	328.5
9	Optimized	209.13475	-12.131535	994.29321	1503.7415	294.13013	0
10	Optimized	211.0462	-12.415305	1001.58	1491.338	282.76191	0
11	Optimized	212.9112	-12.692175	1008.5281	1479.4043	271.86054	0
12	Optimized	214.6604	-12.89622	1011.5508	1481.1994	271.15174	0
13	Optimized	216.2938	-13.027435	1010.6965	1456.8504	257.58711	0
14	Optimized	217.94555	-13.125565	1007.6576	1439.6904	249.43423	0
15	Optimized	219.6157	-13.190615	1002.4524	1406.0061	232.99182	0
16	Optimized	221.10335	-13.21669	995.84439	1385.0496	224.70774	0
17	Optimized	222.4085	-13.203785	987.87641	1350.3429	209.27014	0
18	Optimized	223.7246	-13.16104	977.96954	1322.8962	199.14352	0
19	Optimized	225.0516	-13.08846	966.15595	1279.6299	180.98428	0
20	Optimized	226.90755	-12.90539	944.51397	1224.0894	161.41297	0
21	Optimized	229.0781	-12.63822	915.95284	1148.5307	134.27888	0
22	Optimized	231.0343	-12.397435	890.22924	1097.946	119.92534	0
23	Optimized	233.06245	-12.20804	867.32008	1043.1218	101.49916	0
24	Optimized	235.16255	-12.07004	847.26918	1004.778	90.937762	0
25	Optimized	237.25145	-12.001355	831.58462	965.48139	77.305337	0
26	Optimized	239.3292	-12.001985	820.32228	945.2188	72.10904	0
27	Optimized	241.10695	-11.50115	774.26169	1074.4456	0	300
28	Optimized	242.58295	-10.5	692.9651	955.72489	0	300
29	Optimized	243.5689	-9.83126	638.39378	883.83133	0	320

24	7294	236.94745	-11.709765	812.3939	1025.8421	0	300
25	7294	238.87655	-11.0868	756.81657	955.9195	0	300
26	7294	240.80565	-10.377035	694.26976	877.15529	0	300
27	7294	242.8851	-9.5061295	618.55028	782.6906	0	320
28	7294	245.0132	-8.5061295	532.84996	675.75263	0	320
29	7294	246.89	-7.5226425	450.1376	579.95147	0	320
30	7294	248.61715	-6.5226425	367.85955	481.09435	0	320
31	7294	250.2131	-5.5187365	287.01623	494.58625	0	600
32	7294	251.6779	-4.5187365	208.16632	409.90369	0	600
33	7294	253.0678	-3.5	82.818718	322.6855	0	600





GENERAL NOTES

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

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

Hw = CANAL WATER LEVEL

LONDON AVE CANAL
OUTFALL CANAL REEVALUATION REPORT
REACH 7: REMEDIATED, STA. 64+00 TO 66+00
PROTECTED SIDE STABILITY ANALYSIS
CASE: Rem: Gap Stability (Entry/Exit)
MARCH 2012

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

Rem: Gap Stability (Entry/Exit)

Report generated using GeoStudio 2007, version 7.15. Copyright © 1991-2009 GEO-SLOPE International Ltd.

File Information

Revision Number: 316
Last Edited By: Haggerty, Daniel R MVN
Date: 12/20/2011
Time: 4:10:50 PM
File Name: Reach 7.gsz
Last Solved Date: 12/20/2011
Last Solved Time: 4:42:58 PM

Project Settings

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

Analysis Settings

Rem: Gap Stability (Entry/Exit)
Kind: SLOPE/W
Parent: Gap Analysis (Seepage) Remediated Reach
Method: Spencer
Settings
 PWP Conditions Source: Parent Analysis
SlipSurface
 Direction of movement: Left to Right
 Use Passive Mode: Yes
 Slip Surface Option: Entry and Exit
 Critical slip surfaces saved: 1
 Optimize Critical Slip Surface Location: Yes
 Tension Crack
 Tension Crack Option: (none)
FOS Distribution
 FOS Calculation Option: Constant
Advanced
 Number of Slices: 30
 Optimization Tolerance: 0.01
 Minimum Slip Surface Depth: 0.1 ft

Cohesion Fn: Marsh -6 to -10
Phi: 0 °
Phi-B: 0 °

Marsh: EL-10 to EL-12
Model: Spatial Mohr-Coulomb
Weight Fn: Marsh -10 to -12
Cohesion Fn: Marsh -10 to -12
Phi: 0 °
Phi-B: 0 °

Beach Sand
Model: Mohr-Coulomb
Unit Weight: 122 pcf
Cohesion: 0 psf
Phi: 30 °
Phi-B: 0 °

Bay Sound Clay: EL-45 to EL-70
Model: Spatial Mohr-Coulomb
Weight Fn: Bay Sound Clay
Cohesion Spatial Fn: Bay Sound
Phi: 0 °
Phi-B: 0 °

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (160, -17.2) ft
Left-Zone Right Coordinate: (200, 3.4) ft
Left-Zone Increment: 20
Right Projection: Range
Right-Zone Left Coordinate: (210, 3.01244) ft
Right-Zone Right Coordinate: (290, -3) ft
Right-Zone Increment: 20
Radius Increments: 20

Slip Surface Limits

Left Coordinate: (102.6, -17.2) ft
Right Coordinate: (310, -3) ft

Optimization Maximum Iterations: 5000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

Sheet Pile

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

Embankment Fill: EL3.5 to EL-1

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

Fill: EL-1 to EL-4

Model: Spatial Mohr-Coulomb
Weight Fn: Fill -1 to -4
Cohesion Fn: Fill -1 to -4
Phi: 0 °
Phi-B: 0 °

Marsh: EL-4 to EL-6

Model: Spatial Mohr-Coulomb
Weight Fn: Marsh -4 to -6
Cohesion Fn: Marsh -4 to -6
Phi: 0 °
Phi-B: 0 °

Marsh: EL-6 to EL-8

Model: Spatial Mohr-Coulomb
Weight Fn: Marsh -6 to -8
Cohesion Fn: Marsh -6 to -10
Phi: 0 °
Phi-B: 0 °

Marsh: EL-8 to EL-10

Model: Spatial Mohr-Coulomb
Weight Fn: Marsh -8 to -10

Cohesion Functions

Fill -1 to -4

Model: Spline Data Point Function
Function: Cohesion vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 600
Data Points: X (ft), Cohesion (psf)
 Data Point: (0, 600)
 Data Point: (176.6, 600)
 Data Point: (200, 450)
 Data Point: (228.1, 600)
 Data Point: (400, 600)

Marsh -4 to -6

Model: Spline Data Point Function
Function: Cohesion vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 600
Data Points: X (ft), Cohesion (psf)
 Data Point: (0, 600)
 Data Point: (176.6, 600)
 Data Point: (200, 340)
 Data Point: (228.1, 600)
 Data Point: (400, 600)

Marsh -6 to -10

Model: Spline Data Point Function
Function: Cohesion vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 320
Data Points: X (ft), Cohesion (psf)
 Data Point: (0, 320)
 Data Point: (176.6, 320)
 Data Point: (200, 340)
 Data Point: (228.1, 320)
 Data Point: (400, 320)

Marsh -10 to -12

Model: Spline Data Point Function
Function: Cohesion vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 300

Data Points: X (ft), Cohesion (psf)
Data Point: (0, 300)
Data Point: (176.6, 300)
Data Point: (200, 340)
Data Point: (228.1, 300)
Data Point: (400, 300)

Unit Weight Functions

Fill -1 to -4

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 96
Data Points: X (ft), Unit Weight (pcf)
Data Point: (0, 96)
Data Point: (176.6, 96)
Data Point: (200, 105)
Data Point: (228.1, 96)
Data Point: (400, 96)

Marsh -4 to -6

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 96
Data Points: X (ft), Unit Weight (pcf)
Data Point: (0, 96)
Data Point: (176.6, 96)
Data Point: (200, 90)
Data Point: (228.1, 96)
Data Point: (400, 96)

Marsh -6 to -8

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 104
Data Points: X (ft), Unit Weight (pcf)
Data Point: (0, 104)
Data Point: (176.6, 104)
Data Point: (200, 90)
Data Point: (228.1, 104)

Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (0, -45, 790)
Data Point: (0, -70, 950)
Data Point: (176.6, -45, 790)
Data Point: (176.6, -70, 950)
Data Point: (200, -45, 800)
Data Point: (200, -70, 1000)
Data Point: (228.1, -45, 790)
Data Point: (228.1, -70, 950)
Data Point: (400, -45, 790)
Data Point: (400, -70, 950)

Regions

	Material	Points	Area (ft²)
Region 1	Sheet Pile	6,46,47,41,32	7.085
Region 2	Bay Sound Clay: EL-45 to EL-70	31,11,52,33,51,12,30,58,34,57	5181.295
Region 3	Beach Sand	11,24,17,16,26,29,12,51,33,52	6337.72
Region 4		24,42,49,50,48,56,23,16,17	532.945
Region 5		48,63,43,16,23,56	78.271
Region 6		63,36,2,62,55,21,15,43	78.9175
Region 7		62,61,60,15,21,55	71.35
Region 8		61,3,54,20,14,60	62.6
Region 9		3,4,19,13,14,20,54	71.37
Region 10		4,37,5,18,38,39,6,13,19	57.67
Region 11		49,1,35,2,36,63,48,50	127.584
Region 12	Marsh: EL-10 to EL-12	16,43,44,45,29,26	220
Region 13	Marsh: EL-8 to EL-10	43,15,53,59,45,44	220
Region 14	Marsh: EL-6 to EL-8	15,60,25,28,59,53	220
Region 15	Marsh: EL-4 to EL-6	60,14,27,10,28,25	220
Region 16	Fill: EL-1 to EL-4	14,13,8,40,9,10,27	173.3
Region 17	Embankment Fill: EL3.5 to EL-1	13,6,32,41,7,8	83.54

Points

	X (ft)	Y (ft)
Point 1	102.6	-9.7
Point 2	161.5	-8.3
Point 3	170.9	-4

Data Point: (400, 104)

Marsh -8 to -10

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 104
Data Points: X (ft), Unit Weight (pcf)
Data Point: (0, 104)
Data Point: (176.6, 104)
Data Point: (200, 98)
Data Point: (228.1, 104)
Data Point: (400, 104)

Marsh -10 to -12

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 96
Data Points: X (ft), Unit Weight (pcf)
Data Point: (0, 96)
Data Point: (176.6, 96)
Data Point: (200, 98)
Data Point: (228.1, 96)
Data Point: (400, 96)

Bay Sound Clay

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 111
Data Points: X (ft), Unit Weight (pcf)
Data Point: (0, 111)
Data Point: (176.6, 111)
Data Point: (200, 108)
Data Point: (228.1, 111)
Data Point: (400, 111)

Spatial Functions

Bay Sound

Model: Linear Interpolation
Limit Range By: Data Values

Point 4	176.7	-1.6
Point 5	186.2	1.4
Point 6	200	3.5
Point 7	208	3.5
Point 8	228.1	-1.4
Point 9	310	-3
Point 10	310	-4
Point 11	102.6	-45
Point 12	310	-45
Point 13	200	-1
Point 14	200	-4
Point 15	200	-8
Point 16	200	-12
Point 17	200	-17.2
Point 18	195.1	2.4
Point 19	195	-1
Point 20	195	-4
Point 21	195	-8
Point 22	195	-15
Point 23	195	-12
Point 24	102.6	-17.2
Point 25	228	-6
Point 26	228	-12
Point 27	228	-4
Point 28	310	-6
Point 29	310	-12
Point 30	310	-70
Point 31	102.6	-69.9
Point 32	201	3.53
Point 33	200	-45
Point 34	200	-70
Point 35	151.3	-9.2
Point 36	160.5	-9
Point 37	183.4	-0.2
Point 38	195.9	3.3
Point 39	199	3.5

Point 40	244	-3
Point 41	201	3.7
Point 42	102.6	-12
Point 43	200	-10
Point 44	228	-10
Point 45	310	-10
Point 46	200	12.9
Point 47	200.5	12.9
Point 48	157.3	-11.4
Point 49	102.6	-11.9
Point 50	151.3	-11.4
Point 51	228.1	-45
Point 52	176.7	-45
Point 53	228	-8
Point 54	176.7	-4
Point 55	176.7	-8
Point 56	176.7	-12
Point 57	176.7	-70
Point 58	228.1	-70
Point 59	310	-8
Point 60	200	-6
Point 61	166.5	-6
Point 62	162.15	-8
Point 63	159.17	-10
Point 64	208	-51

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	2.29	(217.287, 38.407)	18.76538	(200, 12.9)	(244.005, -3)
2	7251	2.42	(217.287, 38.407)	50.197	(200, 12.9)	(245.664, -3)

Slices of Slip Surface: Optimized

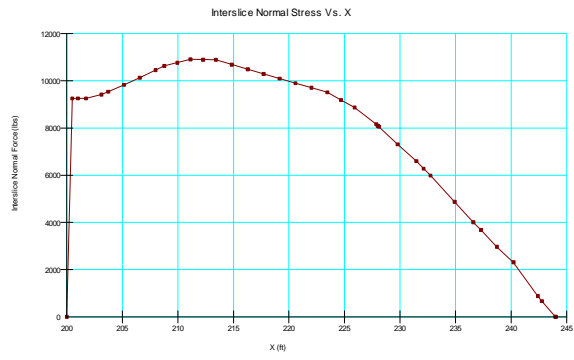
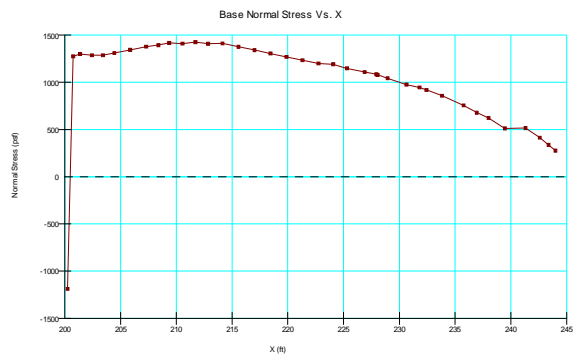
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	200.25	-9.3851105	1074.0469	-1188.1994	0	339.82
2	Optimized	200.75	-9.442424	1077.8222	1275.5673	0	339.47
3	Optimized	201.36775	-9.5132355	1082.4686	1299.6972	0	339.03
4	Optimized	202.42695	-9.696245	1094.4175	1287.2249	0	338.27
5	Optimized	203.4225	-9.91855	1109.018	1286.6781	0	337.56
6	Optimized	204.4388	-10.19077	1126.8778	1310.6448	0	333.68
7	Optimized	205.86325	-10.57231	1151.9	1343.8042	0	331.65
8	Optimized	207.28775	-10.95385	1176.7865	1376.9636	0	329.63
9	Optimized	208.38775	-11.24847	392.22506	1394.1129	0	328.06
10	Optimized	209.36525	-11.460545	404.75249	1417.6928	0	326.67
11	Optimized	210.54475	-11.677	417.41091	1409.8542	0	324.99
12	Optimized	211.7066	-11.838515	427.17178	1426.2555	0	323.34
13	Optimized	212.8508	-11.94509	433.66346	1408.5034	0	321.71
14	Optimized	214.13965	-11.998395	436.92361	1412.2079	0	319.87
15	Optimized	215.57315	-11.99843	436.92361	1376.6306	0	317.83
16	Optimized	217.00665	-11.998465	436.92361	1341.1231	0	315.79
17	Optimized	218.44015	-11.998495	436.92361	1305.6156	0	313.75
18	Optimized	219.87365	-11.998525	436.91664	1270.1081	0	311.71
19	Optimized	221.30715	-11.99856	436.91664	1234.6704	0	309.67
20	Optimized	222.74065	-11.998595	436.91664	1199.2326	0	307.63
21	Optimized	224.0713	-11.93068	432.68943	1192.0432	0	305.73
22	Optimized	225.2991	-11.794815	424.22977	1147.9235	0	303.99
23	Optimized	226.8901	-11.522055	407.22701	1109.3944	0	301.72
24	Optimized	227.9336	-11.29743	393.21705	1085.6447	0	300.24
25	Optimized	228.05	-11.26272	391.05085	1079.1608	0	300.07
26	Optimized	228.94425	-10.996115	374.42952	1042.7338	0	300
27	Optimized	230.6327	-10.492725	343.02038	975.42038	0	300
28	Optimized	231.804	-10.120515	319.79239	945.20496	0	300
29	Optimized	232.4396	-9.88633	305.18124	918.75262	0	320

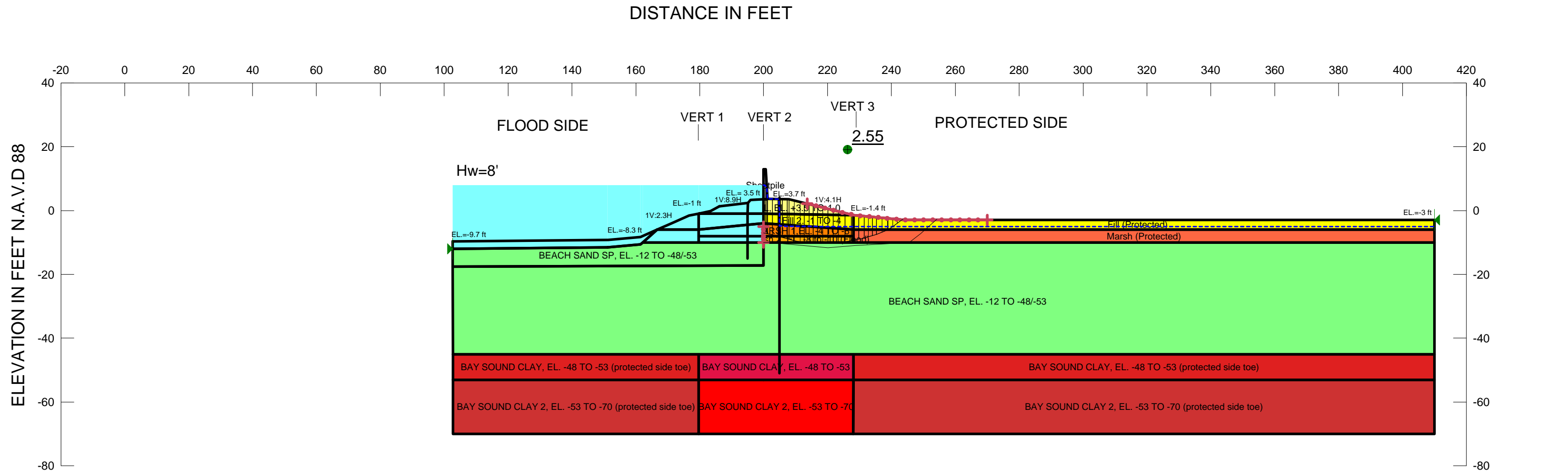
30	Optimized	233.8348	-9.30037	268.60517	858.13221	0	320
31	Optimized	235.7579	-8.41404	213.2846	755.98679	0	320
32	Optimized	236.9406	-7.828575	176.74351	678.59725	0	320
33	Optimized	238.0008	-7.2428625	140.18454	622.71932	0	320
34	Optimized	239.4626	-6.3945625	87.237239	512.015	0	320
35	Optimized	241.30845	-5.127045	8.1301196	515.64995	0	600
36	Optimized	242.5878	-4.14677	-53.049545	414.83125	0	600
37	Optimized	243.3846	-3.502104	-93.279552	336.88774	0	600
38	Optimized	244.0026	-3.002104	-124.48564	276.44873	0	600

Slices of Slip Surface: 7251

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	7251	200.25	-8.810207	1035.9066	-1072.6668	0	339.82
2	7251	200.75	-8.987646	1047.636	1163.335	0	339.47
3	7251	201.74985	-9.318999	1069.5584	1217.1624	0	338.75
4	7251	203.24955	-9.78156	1099.9599	1267.8795	0	337.69
5	7251	204.6662	-10.173225	1125.6441	1311.8845	0	333.36
6	7251	205.99975	-10.500335	1146.9586	1348.9934	0	331.46
7	7251	207.33325	-10.789125	1165.6375	1382.5362	0	329.56
8	7251	208.76925	-11.0565	380.62734	1397.5339	0	327.52
9	7251	210.3077	-11.296985	394.36622	1393.2552	0	325.33
10	7251	211.84615	-11.488885	405.81371	1384.0301	0	323.14
11	7251	213.3846	-11.632765	414.49441	1369.9402	0	320.95
12	7251	214.92305	-11.72903	420.33644	1351.0188	0	318.76
13	7251	216.46155	-11.777955	423.30714	1327.3151	0	316.57
14	7251	218	-11.779685	423.38022	1298.7638	0	314.38
15	7251	219.53845	-11.734225	420.53596	1265.3806	0	312.19
16	7251	221.07695	-11.64144	414.74114	1227.067	0	310
17	7251	222.6154	-11.50107	405.99042	1183.8775	0	307.81
18	7251	224.15385	-11.31271	394.24003	1135.6905	0	305.62
19	7251	225.6923	-11.07581	379.45579	1082.475	0	303.43
20	7251	227.23075	-10.789675	361.60176	1024.0371	0	301.24
21	7251	228.05	-10.623225	351.20774	991.39489	0	300.07

22	7251	228.71875	-10.467525	341.49216	972.30845	0	300
23	7251	229.95625	-10.1614	322.3781	936.58466	0	300
24	7251	231.30605	-9.7873515	299.02324	895.25715	0	320
25	7251	232.76815	-9.3376645	270.9513	840.38753	0	320
26	7251	234.23025	-8.8384595	239.78507	779.84067	0	320
27	7251	235.6923	-8.2881465	205.4319	713.42806	0	320
28	7251	237.1349	-7.6936485	168.32105	641.81436	0	320
29	7251	238.55805	-7.054362	128.41752	564.93018	0	320
30	7251	239.98115	-6.3607135	85.118411	481.51663	0	320
31	7251	241.51955	-5.544134	34.153639	472.71119	0	600
32	7251	243.1732	-4.590493	-25.365431	372.95888	0	600
33	7251	244.07345	-4.046359	-59.325355	316.6206	0	600
34	7251	244.9056	-3.5	-93.42215	268.06109	0	600





Name: FILL, EL. +3.5 TO-1.0 Model: Undrained (Phi=0) Unit Weight: 106 pcf Cohesion: 900 psf

Name: Fill 2. -1 TO -4 Model: Spatial Mohr-Coulomb Unit Weight: 101 pcf Cohesion: 500 psf Phi: 0 °

Name: BEACH SAND SP, EL. -12 TO -48/-53 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand

Name: BAY SOUND CLAY, EL. -48 TO -53 Model: Spatial Mohr-Coulomb Unit Weight: 108 pcf Cohesion: 450 psf Phi: 0 °

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

Name: Sheetpile Model: Mohr-Coulomb Unit Weight: 0.1 pcf Cohesion: 0.01 psf Phi: 0 °

Name: MARSH 1,EL. -4 TO -8 Model: Spatial Mohr-Coulomb Unit Weight: 90 pcf Cohesion Fn: Marsh Phi: 0 °

Name: BAY SOUND CLAY 2, EL. -53 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 108 pcf Cohesion Spatial Fn: Bay Sound 2 Phi: 0 °

Name: Marsh 2, EL. -8 to -10 (Flood) Model: Spatial Mohr-Coulomb Unit Weight: 98 pcf Cohesion Fn: Marsh Phi: 0 °

Name: Marsh (Protected) Model: Spatial Mohr-Coulomb Unit Weight: 101 pcf Cohesion: 320 psf Phi: 0 °

Name: BAY SOUND CLAY, EL. -48 TO -53 (protected side toe) Model: Undrained (Phi=0) Unit Weight: 111 pcf Cohesion: 425 psf

Name: BAY SOUND CLAY 2, EL. -53 TO -70 (protected side toe) Model: Spatial Mohr-Coulomb Unit Weight: 108 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
VERTICALSWERE ASSUMED TO VARY LINEARLY
BETWEENTHE VALUES INDICATED FOR THESE LOCATIONS.

Hw = CANAL WATER LEVEL

GAP Stability (Entry/Exit)

Report generated using GeoStudio 2007, version 7.19. Copyright © 1991-2012 GEO-SLOPE International Ltd.

File Information

Created By: Lijegren, James
Revision Number: 329
Last Edited By: Curran, Matthew MVN
Date: 1/29/2013
Time: 1:22:29 PM
File Name: Reach 8.gsz
Directory: G:\F&MHOME\London Ave Reevaluation 2011\West Side\Reach 8\SlopeW\
Last Solved Date: 1/29/2013
Last Solved Time: 4:31:08 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

GAP Stability (Entry/Exit)

Kind: [SLOPE/W](#)
Parent: [Gap Analysis \(See page\)](#)
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

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

MARSH 1,EL. -4 TO -8

Model: [Spatial Mohr-Coulomb](#)
Unit Weight: 90 pcf
Cohesion Fn: [Marsh](#)
Phi: 0 °
Phi-B: 0 °

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

Model: [Spatial Mohr-Coulomb](#)
Unit Weight: 108 pcf
Cohesion Spatial Fn: [Bay Sound 2](#)
Phi: 0 °
Phi-B: 0 °

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

Model: [Spatial Mohr-Coulomb](#)
Unit Weight: 98 pcf
Cohesion Fn: [Marsh](#)
Phi: 0 °
Phi-B: 0 °

Marsh (Protected)

Model: [Spatial Mohr-Coulomb](#)
Unit Weight: 101 pcf
Cohesion: 320 psf
Phi: 0 °
Phi-B: 0 °

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

Model: [Undrained \(Phi=0\)](#)
Unit Weight: 111 pcf
Cohesion: 425 psf

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

Model: [Spatial Mohr-Coulomb](#)
Unit Weight: 108 pcf
Cohesion Fn: [Bay Sound](#)
Phi: 0 °
Phi-B: 0 °

Slip Surface Entry and Exit

Left Projection: [Range](#)

Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 2000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 10
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

FILL, EL. +3.5 TO -1.0

Model: [Undrained \(Phi=0\)](#)
Unit Weight: 106 pcf
Cohesion: 900 psf

Fill 2. -1 TO -4

Model: [Spatial Mohr-Coulomb](#)
Unit Weight: 101 pcf
Cohesion: 500 psf
Phi: 0 °
Phi-B: 0 °

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

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

BAY SOUND CLAY, EL. -48 TO -53

Model: [Spatial Mohr-Coulomb](#)
Unit Weight: 108 pcf
Cohesion: 450 psf
Phi: 0 °
Phi-B: 0 °

Fill (Protected)

Model: [Undrained \(Phi=0\)](#)
Unit Weight: 106 pcf
Cohesion: 600 psf

Sheetpile

Model: [Mohr-Coulomb](#)
Unit Weight: 0.1 pcf

Left-Zone Left Coordinate: (200, -10) ft
Left-Zone Right Coordinate: (200, -5) ft
Left-Zone Increment: 5
Right Projection: [Range](#)
Right-Zone Left Coordinate: (213.64217, 2.12455) ft
Right-Zone Right Coordinate: (270, -3) ft
Right-Zone Increment: 20
Radius Increments: 20

Slip Surface Limits

Left Coordinate: (102.6, -12) ft
Right Coordinate: (410, -3) ft

Cohesion Functions

Marsh

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

Bay Sound

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

Shear/Normal Strength Functions

Sand

Model: [Spline Data Point Function](#)
Function: [Shear Stress vs. Normal Stress](#)
Curve Fit to Data: 100 %
Segment Curvature: 0 %

Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
Data Point: (-100000, 0)
Data Point: (0, 0)
Data Point: (100000, 57735)
Estimation Properties
Intact Rock Param.: 10
Geological Strength: 100
Disturbance Factor: 0
SigmaC: 600000 psf
Sigma3: 300000 psf
Num. Points: 20

Spatial Functions

Bay Sound 2
Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (179.7, -53, 760)
Data Point: (179.7, -70, 930)
Data Point: (200, -53, 800)
Data Point: (200, -70, 980)
Data Point: (228.1, -53, 760)
Data Point: (228.1, -70, 930)

Regions

	Points	Area (ft²)	Material
Region 1	26,14,31,4,10,52,34,30	52.9145	
Region 2	6,44,7,8,19,37	558.42	Fill (Protected)
Region 3	46,47,48,36,49,32,13,22,45	619.89152	BEACH SAND SP, EL. -12 TO -48/-53
Region 4	22,13,32,33,27,23,57,53,55,9	10041.735	BEACH SAND SP, EL. -12 TO -48/-53
Region 5	54,58,28,59,41,56	821.95	BAY SOUND CLAY 2, EL. -53 TO -70
Region 6	4,40,24,5,6,10	83.525	FILL, EL. +3.5 TO -1.0
Region 7	18,37,19,27,33	727.6	Marsh (Protected)
Region 8	32,12,18,33	56.2	Marsh 2, EL. -8 to -10 (Flood)
Region 9	32,12,50,35,36,49	40.6	
Region 10	38,34,29,3,39	36.2	
Region	10,11,37,6	106.78	Fill 2. -1 TO -4

11			
Region 12	11,12,18,37	84.3	MARSH 1,EL. -4 TO -8
Region 13	10,52,34,38,51,11	81.199992	
Region 14	11,12,50,35,38,51	60.900009	
Region 15	39,38,35,36,48	61.04348	
Region 16	4,42,43,24,40	8.96	Sheetpile
Region 17	1,2,25,39,48,47,46,45	141.31	
Region 18	9,55,56,16	615.6	BAY SOUND CLAY, EL. -48 TO -53 (protected side toe)
Region 19	55,53,57,58,54,56	387.2	BAY SOUND CLAY, EL. -48 TO -53
Region 20	57,23,17,58	1455.2	BAY SOUND CLAY, EL. -48 TO -53 (protected side toe)
Region 21	16,56,41,21	1307.3	BAY SOUND CLAY 2, EL. -53 TO -70 (protected side toe)
Region 22	58,17,20,28	3093.15	BAY SOUND CLAY 2, EL. -53 TO -70 (protected side toe)

Points

	X (ft)	Y (ft)
Point 1	102.6	-9.7
Point 2	151.3	-9.2
Point 3	171.2	-4
Point 4	200	3.5
Point 5	208	3.5
Point 6	228.1	-1.4
Point 7	410	-3
Point 8	410	-5.2
Point 9	102.7	-45
Point 10	200	-1

Point 11	200	-4
Point 12	200	-8
Point 13	200	-17.2
Point 14	195.1	2.4
Point 15	195	-15
Point 16	102.8	-53
Point 17	410	-53
Point 18	228.1	-8
Point 19	410	-6
Point 20	410	-70
Point 21	102.8	-70
Point 22	102.6	-17.5
Point 23	410	-45
Point 24	201.2	3.7
Point 25	161.5	-8.3
Point 26	186.2	1.4
Point 27	410	-10
Point 28	228	-70
Point 29	176.7	-1.6
Point 30	183.4	-0.2
Point 31	195.9	3.31
Point 32	200	-10
Point 33	228.1	-10
Point 34	179.7	-1
Point 35	179.7	-8
Point 36	179.7	-10
Point 37	228.1	-6
Point 38	179.7	-6
Point 39	166.7	-6
Point 40	201	3.5
Point 41	179.7	-70
Point 42	200	12.9
Point 43	200.7	12.9
Point 44	244	-3
Point 45	102.6	-12
Point 46	151.1	-11.5

Point 47	161.5	-10.6
Point 48	162.17826	-10
Point 49	195	-10
Point 50	195	-8
Point 51	195	-4.49261
Point 52	195	-1
Point 53	200	-45
Point 54	200	-53
Point 55	179.7	-45
Point 56	179.7	-53
Point 57	228.1	-45
Point 58	228.1	-53
Point 59	200	-70
Point 60	205	4
Point 61	205	-51

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	2.55	(217.659, 45.483)	17.32173	(200, 12.9)	(243.237, -2.92321)
2	1559	2.66	(217.659, 45.483)	55.375	(200, 12.9)	(244.412, -3)

Slices of Slip Surface: Optimized

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	200.35	-7.066087	927.30266	-367.92515	0	339.75
2	Optimized	200.85	-7.162787	933.66584	1030.8647	0	339.4
3	Optimized	201.1	-7.211137	936.84035	1045.1828	0	339.22
4	Optimized	201.98745	-7.382773	947.99405	1068.683	0	338.59

			5				
5	Optimize d	203.60465	-7.767535	972.79821	1074.7491	0	337.43
6	Optimize d	205.17635	-8.207865	204.91146	1111.0916	0	336.32
7	Optimize d	206.66025	-8.623595	228.90876	1147.0422	0	335.26
8	Optimize d	207.7011	-8.911525	246.10863	1175.5274	0	334.52
9	Optimize d	208.7958	-9.204745	263.81239	1183.4506	0	333.74
10	Optimize d	210.52245	-9.58949	287.15626	1202.5593	0	332.51
11	Optimize d	212.1051	-9.83567	302.30282	1208.1138	0	331.38
12	Optimize d	213.4708	-9.954705	309.65193	1201.4758	0	330.41
13	Optimize d	214.85685	-9.99866	312.37028	1190.0139	0	329.43
14	Optimize d	216.20115	-9.99768	312.30333	1156.3153	0	328.47
15	Optimize d	217.68275	-9.997541	312.29249	1118.8865	0	327.41
16	Optimize d	219.30165	- 9.998243 5	312.33573	1078.4277	0	326.26
17	Optimize d	220.9206	-9.998946	312.37279	1037.9689	0	325.11
18	Optimize d	222.5741	- 9.999663 5	312.41651	996.64291	0	323.93
19	Optimize d	224.4709	-9.908375	306.72089	963.3378	0	322.58
20	Optimize d	226.45915	-9.64277	290.15375	912.21506	0	321.17
21	Optimize d	227.7473	-9.392872	274.55557	861.35054	0	320.25
22	Optimize	228.9604	-	258.25372	866.26175	0	320

	d		9.131645 5				
23	Optimize d	230.68115	- 8.761088 5	235.12576	808.7117	0	320
24	Optimize d	232.1652	-8.39213	212.09723	773.17824	0	320
25	Optimize d	233.4126	-8.02477	189.16489	720.59996	0	320
26	Optimize d	234.65995	-7.65741	166.24024	667.98324	0	320
27	Optimize d	236.16205	- 7.120877 5	132.75507	618.61518	0	320
28	Optimize d	237.9189	- 6.415172 5	88.714657	523.13442	0	320
29	Optimize d	238.8445	-6.03116	64.750091	526.60295	0	320
30	Optimize d	239.6379	-5.507185	32.052906	553.59027	0	600
31	Optimize d	241.0973	-4.491581	-31.323858	441.49344	0	600
32	Optimize d	242.5237	- 3.446003 5	-96.574216	300.74839	0	600

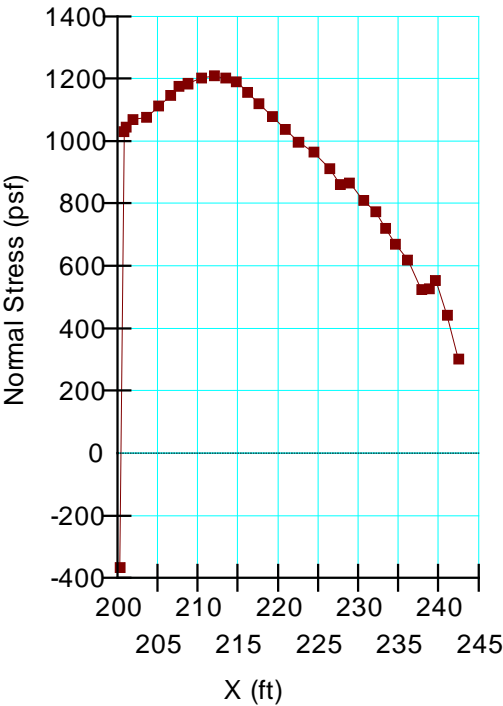
Slices of Slip Surface: 1559

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	1559	200.35	- 7.115179 5	930.57736	-368.28484	0	339.75
2	1559	200.85	- 7.278147 5	941.34768	1008.3304	0	339.4
3	1559	201.1	-	946.55827	1026.4282	0	339.22

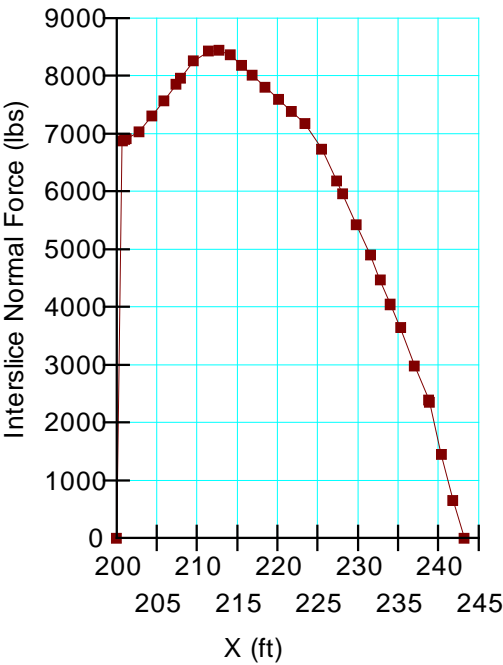
			7.357274 5				
4	1559	202.2553	- 7.694306 5	968.60146	1069.5847	0	338.39
5	1559	204.0922	- 8.197529 5	1001.194	1120.8386	0	337.09
6	1559	205.65535	-8.568631	226.31663	1161.1858	0	335.97
7	1559	207.21845	-8.892274	245.04313	1197.1007	0	334.86
8	1559	208.71785	-9.159811	261.07895	1211.7055	0	333.8
9	1559	210.15355	-9.375494	274.10306	1205.0321	0	332.77
10	1559	211.58925	-9.552885	284.8479	1194.5971	0	331.75
11	1559	213.025	- 9.692353 5	293.42643	1180.2717	0	330.73
12	1559	214.46075	-9.794187	299.71157	1162.0759	0	329.71
13	1559	215.89645	- 9.858593 5	303.67373	1140.1079	0	328.69
14	1559	217.33215	- 9.885703 5	305.33405	1114.2694	0	327.66
15	1559	218.76785	- 9.875571 5	304.70013	1084.5389	0	326.64
16	1559	220.20355	-9.828177	301.73973	1050.909	0	325.62
17	1559	221.63925	-9.743425	296.45598	1013.3121	0	324.6
18	1559	223.075	-9.621142	288.81259	971.76617	0	323.58
19	1559	224.51075	- 9.461077 5	278.82969	926.16079	0	322.55
20	1559	225.94645	- 9.262900 5	266.46098	876.40403	0	321.53
21	1559	227.38215	-9.026194	251.68441	822.49135	0	320.51
22	1559	228.8108	-8.752005	234.56707	823.73742	0	320
23	1559	230.23235	-	215.10525	782.21338	0	320

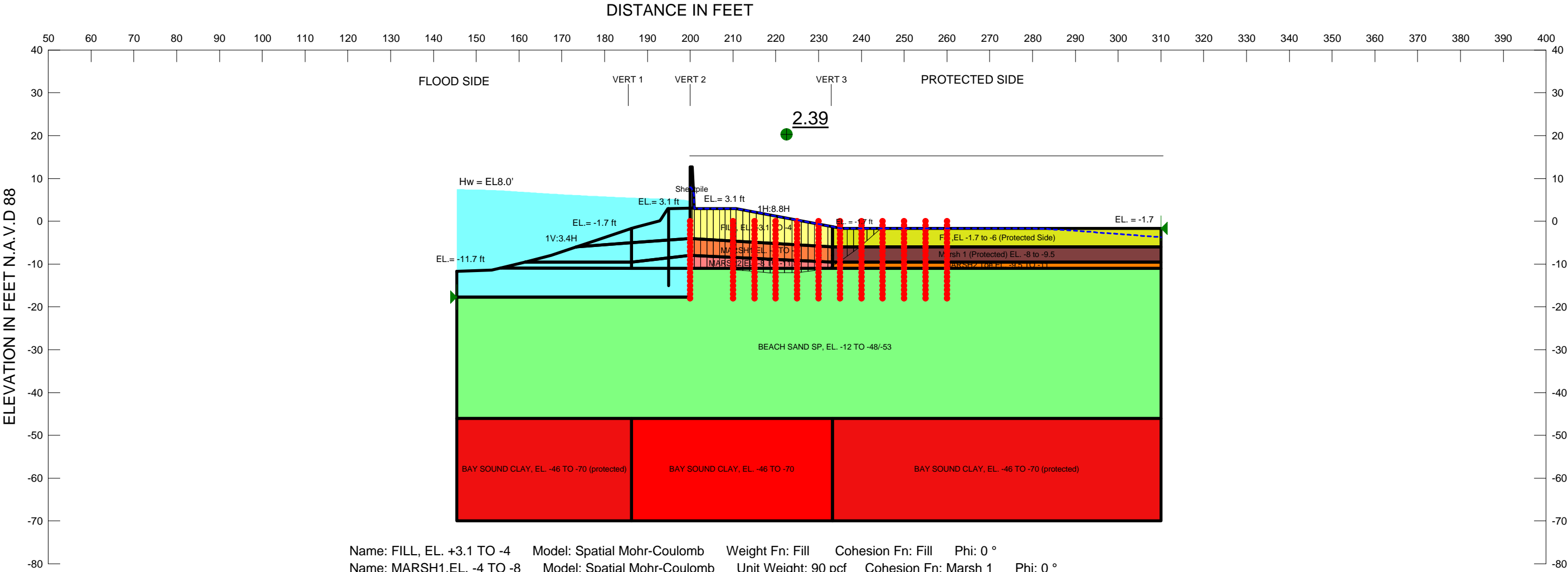
			8.440129 5				
24	1559	231.6539	-8.088722	193.16971	736.34806	0	320
25	1559	233.0755	- 7.696998 5	168.71856	686.03565	0	320
26	1559	234.4971	-7.26406	141.69935	631.00941	0	320
27	1559	235.91865	-6.788881	112.03959	571.19538	0	320
28	1559	237.3402	- 6.270297 5	79.676874	506.38671	0	320
29	1559	238.79465	- 5.692891 5	43.643356	494.94496	0	600
30	1559	240.2819	-5.052901	3.7042924	416.49969	0	600
31	1559	241.76915	- 4.360323 5	-39.516445	331.64518	0	600
32	1559	243.2564	- 3.612930 5	-86.159353	240.0311	0	600
33	1559	244.20615	- 3.112616 5	-117.38007	180.94542	0	600

Base Normal Stress Vs. X



Interslice Normal Stress
Vs. X





Name: FILL, EL. +3.1 TO -4 Model: Spatial Mohr-Coulomb Weight Fn: Fill Cohesion Fn: Fill Phi: 0 °
Name: MARSH1,EL. -4 TO -8 Model: Spatial Mohr-Coulomb Unit Weight: 90 pcf Cohesion Fn: Marsh 1 Phi: 0 °
Name: BEACH SAND SP, EL. -12 TO -48/-53 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand
Name: BAY SOUND CLAY, EL. -46 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 108 pcf Cohesion Spatial Fn: Bay Sound Phi: 0 °
Name: Fill ,EL -1.7 to -6 (Protected Side) Model: Undrained (Phi=0) Unit Weight: 102 pcf Cohesion: 600 psf
Name: Sheetpile Model: Mohr-Coulomb Unit Weight: 0.1 pcf Cohesion: 0.01 psf Phi: 0 °
Name: MARSH2,EL. -8 TO -11.5 Model: Spatial Mohr-Coulomb Unit Weight: 98 pcf Cohesion Fn: Marsh 2 Phi: 0 °
Name: BAY SOUND CLAY, EL. -46 TO -70 (protected) Model: Spatial Mohr-Coulomb Unit Weight: 108 pcf Cohesion Fn: Bay Sound Phi: 0 °
Name: MARSH2 Toe,EL. -9.5 TO -11 Model: Spatial Mohr-Coulomb Unit Weight: 101 pcf Cohesion: 220 psf Phi: 0 °
Name: Marsh 1 (Protected) EL. -8 to -9.5 Model: Spatial Mohr-Coulomb Unit Weight: 101 pcf Cohesion: 320 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
VERTICALSWERE ASSUMED TO VARY LINEARLY
BETWEENTHE VALUES INDICATED FOR THESE LOCATIONS.

Hw = CANAL WATER LEVEL

LONDON AVE CANAL
OUTFALL CANAL REEVALUATION REPORT
REACH 9, STA. 70+18 TO 74+00
PROTECTED SIDE STABILITY ANALYSIS,
CASE: GAP Stability (Block) - above sheet pile tip
MARCH 2012

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

GAP Stability (Block) - above sheet pile tip

Report generated using GeoStudio 2007, version 7.15. Copyright © 1991-2009 GEO-SLOPE International Ltd.

File Information

Revision Number: 328
Last Edited By: Haggerty, Daniel R MVN
Date: 12/9/2011
Time: 10:42:57 AM
File Name: Reach 9.gsz
Last Solved Date: 12/9/2011
Last Solved Time: 10:43:38 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) - above sheet pile tip

Kind: SLOPE/W
Parent: Gap Analysis (Seepage)
Method: Spencer
Settings
 PWP Conditions Source: Parent Analysis
SlipSurface
 Direction of movement: Left to Right
 Use Passive Mode: Yes
 Slip Surface Option: Block
 Critical slip surfaces saved: 1
 Optimize Critical Slip Surface Location: Yes
 Tension Crack
 Tension Crack Option: (none)
FOS Distribution
 FOS Calculation Option: Constant
Restrict Block Crossing: Yes
Advanced
 Number of Slices: 30
 Optimization Tolerance: 0.01

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

MARSH2,EL. -8 TO -11.5

Model: Spatial Mohr-Coulomb
Unit Weight: 98 pcf
Cohesion Fn: Marsh 2
Phi: 0 °
Phi-B: 0 °

BAY SOUND CLAY, EL. -46 TO -70 (protected)

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

MARSH2 Toe,EL. -9.5 TO -11

Model: Spatial Mohr-Coulomb
Unit Weight: 101 pcf
Cohesion: 220 psf
Phi: 0 °
Phi-B: 0 °

Marsh 1 (Protected) EL. -8 to -9.5

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

Slip Surface Limits

Left Coordinate: (145.5, -17.7) ft
Right Coordinate: (310, -1.7) ft

Slip Surface Block

Left Grid
 Upper Left: (200, 0) ft
 Lower Left: (200, -18) ft
 Lower Right: (200, -18) ft
 X Increments: 0
 Y Increments: 18
 Starting Angle: 135 °
 Ending Angle: 135 °

Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 5000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 8
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

FILL, EL. +3.1 TO -4

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

MARSH1,EL. -4 TO -8

Model: Spatial Mohr-Coulomb
Unit Weight: 90 pcf
Cohesion Fn: Marsh 1
Phi: 0 °
Phi-B: 0 °

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

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

BAY SOUND CLAY, EL. -46 TO -70

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

Fill ,EL -1.7 to -6 (Protected Side)

Model: Undrained (Phi=0)
Unit Weight: 102 pcf
Cohesion: 600 psf

Sheetpile

Model: Mohr-Coulomb
Unit Weight: 0.1 pcf

Angle Increments: 1
Right Grid
 Upper Left: (210, 0) ft
 Lower Left: (210, -18) ft
 Lower Right: (260, -18) ft
 X Increments: 10
 Y Increments: 18
 Starting Angle: 20 °
 Ending Angle: 45 °
 Angle Increments: 5

Cohesion Functions

Marsh 2

Model: Spline Data Point Function
Function: Cohesion vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 220
Data Points: X (ft), Cohesion (psf)
 Data Point: (186.3, 220)
 Data Point: (200, 340)
 Data Point: (220, 220)

Marsh 1

Model: Spline Data Point Function
Function: Cohesion vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 320
Data Points: X (ft), Cohesion (psf)
 Data Point: (186.3, 320)
 Data Point: (200, 340)
 Data Point: (233.2, 320)

Bay Sound

Model: Spline Data Point Function
Function: Cohesion vs. Y
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 820
Data Points: Y (ft), Cohesion (psf)
 Data Point: (-70, 1040)
 Data Point: (-46, 820)

Fill

Model: Spline Data Point Function
Function: Cohesion vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 600
Data Points: X (ft), Cohesion (psf)
Data Point: (186.3, 600)
Data Point: (200, 950)
Data Point: (233.2, 600)

Shear/Normal Strength Functions

Sand

Model: Spline Data Point Function
Function: Shear Stress vs. Normal Stress
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
Data Point: (-100000, 0)
Data Point: (0, 0)
Data Point: (100000, 57735)
Estimation Properties
Intact Rock Param.: 10
Geological Strength: 100
Disturbance Factor: 0
SigmaC: 600000 psf
Sigma3: 300000 psf
Num. Points: 20

Unit Weight Functions

Fill

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 102
Data Points: X (ft), Unit Weight (pcf)
Data Point: (186.3, 102)
Data Point: (200, 106)
Data Point: (233.2, 102)

Spatial Functions

Bay Sound

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (200, -70, 1080)
Data Point: (233.2, -46, 820)
Data Point: (233.2, -70, 1040)
Data Point: (186.3, -46, 820)
Data Point: (186.3, -70, 1040)
Data Point: (200, -46, 840)

Regions

	Points	Area (ft²)	Material
Region 1	35,3,38,51,4,15,36,5,11,12,56	75.381047	
Region 2	11,5,30,6,54,50,7,22,12	217.32501	FILL, EL. +3.1 TO -4
Region 3	7,44,8,18,9,23,22	330.66	FILL ,EL. -1.7 to -6 (Protected Side)
Region 4	1,43,31,48,16,13,14,26	361.91	
Region 5	26,14,13,32,33,29,28,27,52,10	5392.35	BEACH SAND SP, EL. -12 TO -48/-53
Region 6	47,45,13,16,48	30.825	
Region 7	13,45,40,32	74.7	MARSH2,EL. -8 TO -11.5
Region 8	34,28,29,20,24	1843.2	BAY SOUND CLAY, EL. -46 TO -70 (protected)
Region 9	21,22,23,39,40	268.8	Marsh 1 (Protected) EL. -8 to -9.5
Region 10	32,40,39,33	115.2	MARSH2 Toe,EL. -9.5 TO -11
Region 11	5,41,42,30	7.2	Sheetpile
Region 12	47,45,12,56	58.018952	
Region 13	47,48,31,49	40.382415	
Region 14	45,12,22,21,40	124.5	MARSH1,EL. -4 TO -8
Region 15	46,56,47,49,37	70.733572	
Region	10,52,53,25,19	979.2	BAY SOUND CLAY, EL. -46 TO -70

16			(protected)
Region 17	52,27,28,34,55,53	1125.6	BAY SOUND CLAY, EL. -46 TO -70
Region 18	46,2,35,56	21.694016	

Point 28	233.2	-46
Point 29	310	-46
Point 30	201	3.1
Point 31	155.7	-10.9
Point 32	233.2	-11
Point 33	310	-11
Point 34	233.2	-70
Point 35	186.3	-1.7
Point 36	195.4	3
Point 37	167.5	-8
Point 38	192.9	0.1
Point 39	310	-9.5
Point 40	233.2	-9.5
Point 41	200	12.7
Point 42	200.5	12.7
Point 43	153.6	-11.4
Point 44	235.3	-1.7
Point 45	200	-8
Point 46	173.4	-6
Point 47	186.3	-9.5
Point 48	186.3	-11
Point 49	161.39655	-9.5
Point 50	223.7814	0.5
Point 51	193.16207	0.5
Point 52	186.3	-46
Point 53	186.3	-70
Point 54	210.7	3
Point 55	200	-70
Point 56	186.3	-5.03008

Points

	X (ft)	Y (ft)
Point 1	145.5	-11.7
Point 2	178.1	-4.4
Point 3	187	-1.5
Point 4	194.8	3
Point 5	200	3.1
Point 6	201	3
Point 7	233.2	-1.3
Point 8	310	-1.7
Point 9	310	-4
Point 10	145.5	-46
Point 11	200	0.5
Point 12	200	-4
Point 13	200	-11
Point 14	200	-17.7
Point 15	195	3
Point 16	195	-11
Point 17	195	-15
Point 18	310	-3
Point 19	145.5	-53
Point 20	310	-53
Point 21	233.2	-8
Point 22	233.2	-6
Point 23	310	-6
Point 24	310	-70
Point 25	145.5	-70
Point 26	145.5	-17.7
Point 27	200	-46

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	2.39	(220.575, 0.875)	20.13034	(200, 12.7)	(244.572, -1.7)
2	1612	2.66	(220.575, 0.875)	20.512	(200, 12.7)	(244.71, -1.7)

Slices of Slip Surface: Optimized

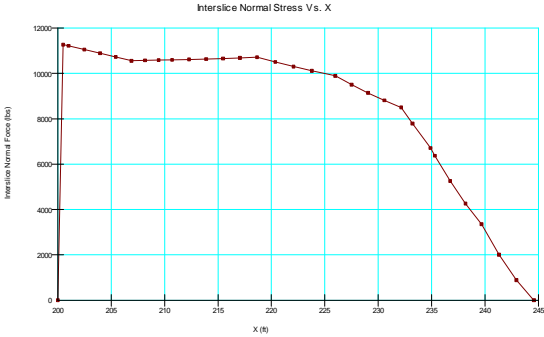
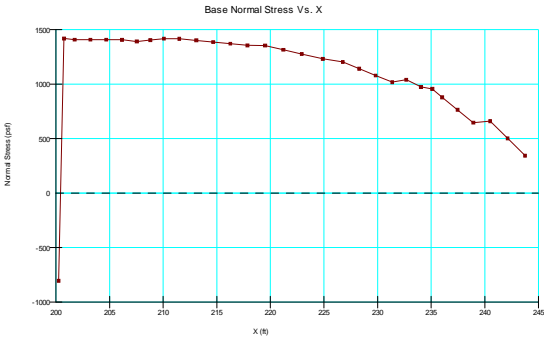
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	200.25	-11.009765	985.8398	-804.69984	0	0
2	Optimized	200.75	-11.010115	945.39981	1419.1197	273.50231	-1.9404e-005
3	Optimized	201.7376	-11.01081	944.06898	1407.664	267.65671	-1.8987e-005
4	Optimized	203.2128	-11.011845	941.83201	1407.3928	268.79167	-1.9071e-005
5	Optimized	204.688	-11.01288	937.49364	1407.1895	271.17902	-1.924e-005
6	Optimized	206.1632	-11.013915	933.01971	1406.9183	273.6055	1.6507e-005
7	Optimized	207.534	-11.07019	931.18234	1391.3459	265.67558	1.6027e-005
8	Optimized	208.8004	-11.181705	933.22751	1404.4036	272.03363	-1.9299e-005
9	Optimized	210.0668	-11.29322	934.80072	1417.4612	278.66416	-1.9769e-005
10	Optimized	211.4952	-11.419	936.46847	1416.3843	277.07953	-1.9655e-005
11	Optimized	213.0856	-11.559045	938.097	1401.1638	267.35173	-1.8965e-005
12	Optimized	214.67595	-11.699095	939.66289	1386.0685	257.73242	-1.8282e-005
13	Optimized	216.2663	-11.83914	941.16615	1370.9733	248.14927	-1.3175e-006
14	Optimized	217.8567	-11.979185	942.60678	1356.066	238.71077	-1.2672e-006
15	Optimized	219.5068	-12.03339	938.34807	1354.2806	240.13878	-1.2749e-006
16	Optimized	221.21665	-12.00175	928.52427	1315.1609	223.22474	-1.1852e-006
17	Optimized	222.9265	-11.97011	918.642	1276.1581	206.41199	-1.0959e-006
18	Optimized	224.8802	-11.933955	907.32236	1231.6618	187.25745	-9.9419e-007

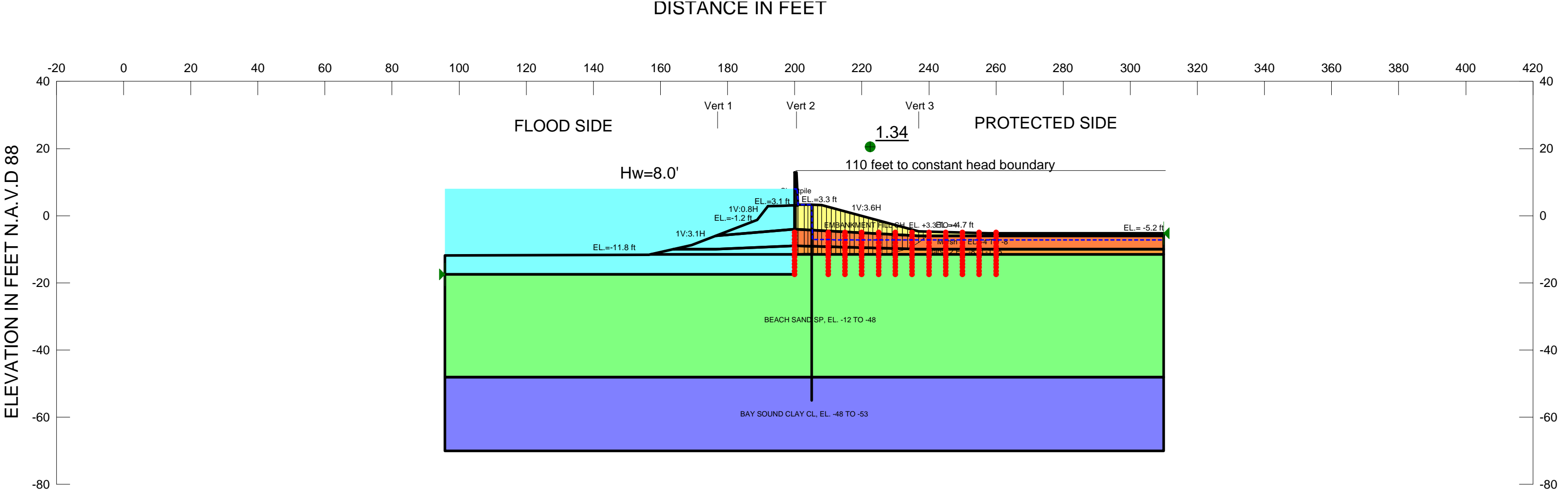
19	Optimized	226.7451	-11.799415	890.30905	1202.9371	180.49592	-9.586e-007
20	Optimized	228.2773	-11.57101	868.94214	1141.354	157.27705	-8.3514e-007
21	Optimized	229.8095	-11.34261	847.57524	1079.7708	134.05819	-7.1192e-007
22	Optimized	231.3625	-11.111105	825.93	1017.5493	110.63144	-5.875e-007
23	Optimized	232.6747	-10.69911	793.11622	1040.1551	0	220
24	Optimized	234.0463	-9.929655	735.90486	974.06144	0	220
25	Optimized	235.0963	-9.3057545	689.68741	956.16294	0	320
26	Optimized	236.0186	-8.6305155	640.40628	878.44632	0	320
27	Optimized	237.4558	-7.578309	563.71697	763.91762	0	320
28	Optimized	238.9252	-6.502543	485.36281	646.81009	0	320
29	Optimized	240.49205	-5.2440665	366.28718	660.14402	0	600
30	Optimized	242.12415	-3.82644	215.78304	502.08137	0	600
31	Optimized	243.75625	-2.4088135	70.718813	343.99096	0	600

Slices of Slip Surface: 1612

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	1612	200.25	-12	1031.66	-1066.78	0	0
2	1612	200.75	-12	1007.38	1540.98	308.0741	-6.23e-005
3	1612	201.69285	-12	1006.6291	1529.3921	301.81736	-6.104e-005
4	1612	203.07855	-12	1004.5363	1529.1034	302.85897	-6.1239e-005
5	1612	204.46425	-12	1000.4229	1528.7426	305.02552	-2.1641e-005
6	1612	205.85	-12	996.16515	1528.3818	307.2754	-6.2136e-005
7	1612	207.23575	-12	990.68062	1528.0209	310.23358	-6.2737e-005
8	1612	208.62145	-12	985.19608	1527.6601	313.19175	-6.3334e-005
9	1612	210.00715	-12	979.27855	1527.2993	316.39992	-2.2447e-005
10	1612	211.42675	-12	973.10678	1511.9481	311.10021	-2.2074e-005
11	1612	212.88025	-12	966.57078	1481.8138	297.47567	-6.0158e-005
12	1612	214.33375	-12	960.03479	1451.817	283.93058	-2.0143e-005
13	1612	215.78725	-12	953.42999	1421.8202	270.42521	-1.9186e-005
14	1612	217.2407	-12	946.75639	1391.8922	256.99928	-1.8234e-005
15	1612	218.69415	-12	940.01399	1362.033	243.65279	-1.7285e-005
16	1612	220.14765	-12	933.3404	1332.2426	230.30631	-1.2227e-006
17	1612	221.60115	-12	926.598	1302.521	217.03927	-1.1522e-006

18	1612	223.05465	-12	919.8556	1272.8683	203.81195	-1.082e-006
19	1612	224.55875	-12	912.9386	1242.2732	190.14141	-1.0095e-006
20	1612	226.1134	-12	905.73441	1210.6905	176.06649	-9.348e-007
21	1612	227.668	-12	898.53022	1179.2365	162.06584	-8.6037e-007
22	1612	229.22265	-12	891.32602	1147.7825	148.06519	-7.8619e-007
23	1612	230.71405	-11.5	853.19485	1199.8644	200.14976	-1.0632e-006
24	1612	232.31405	-10.379668	773.77496	1040.8538	0	220
25	1612	233.3852	-9.629668	719.22684	980.80609	0	220
26	1612	234.4352	-8.89445	665.73904	911.34783	0	320
27	1612	236.1172	-7.716675	579.16451	764.85199	0	320
28	1612	237.75165	-6.572225	495.49238	640.15821	0	320
29	1612	239.3365	-5.4625	393.43615	610.12536	0	600
30	1612	240.87175	-4.3875	276.30382	491.84054	0	600
31	1612	242.40705	-3.3125	163.07714	373.53438	0	600
32	1612	243.9423	-2.2375	53.548038	255.22822	0	600





Name: EMBANKMENT FILL CH, EL. +3.3 TO -4 Model: Spatial Mohr-Coulomb Weight Fn: Fill Cohesion Fn: Fill Phi: 0 °

Name: BEACH SAND SP, EL. -12 TO -48 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand

Name: BAY SOUND CLAY CL, EL. -48 TO -53 Model: Spatial Mohr-Coulomb Unit Weight: 108 pcf Cohesion Spatial Fn: Clay 2 Cohesion Phi: 0 °

Name: Marsh 1, EL. -4 TO -8 Model: Spatial Mohr-Coulomb Weight Fn: Marsh 1 Cohesion Fn: Marsh1 Phi: 0 °

Name: Sheetpile Model: Mohr-Coulomb Unit Weight: 0.1 pcf Cohesion: 0.01 psf Phi: 0 °

Name: Marsh 2 EL. -8 to -11.5 Model: Spatial Mohr-Coulomb Weight Fn: Marsh 2 Cohesion Fn: Marsh 2 Phi: 0 °

GENERAL NOTES

CLASSIFICATION STRATIFICATION

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

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

Hw = CANAL WATER LEVEL



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

LONDON AVE CANAL
OUTFALL CANAL REEVALUATION REPORT
REACH 10, STA. 74+00 TO 79+50
PROTECTED SIDE STABILITY ANALYSIS,
CASE: GAP Stability (Block)
MARCH 2012

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

GAP Stability (Block)

Report generated using GeoStudio 2007, version 7.15. Copyright © 1991-2009 GEO-SLOPE International Ltd.

File Information

Created By: [Liljegren, James](#)
Revision Number: 417
Last Edited By: [Schroeder, Danielle V MVN](#)
Date: 1/12/2012
Time: 9:35:45 AM
File Name: [Reach 10-DVS.gsz](#)
Directory: [G:\F&M\HOME\London Ave Reevaluation 2011\West Side\Reach 10\SlopeW\](#)
Last Solved Date: 1/12/2012
Last Solved Time: 9:36:52 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

GAP Stability (Block)

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

3/1/2012

GAP Stability (Block)

Page 3 of 9

Phi: 0 °
Phi-B: 0 °

Slip Surface Limits

Left Coordinate: [\(95.7, -17.5\) ft](#)
Right Coordinate: [\(310, -5.2\) ft](#)

Slip Surface Block

Left Grid
 Upper Left: [\(200, -5\) ft](#)
 Lower Left: [\(200, -17.5\) ft](#)
 Lower Right: [\(200, -17.5\) ft](#)
 X Increments: [0](#)
 Y Increments: [12](#)
 Starting Angle: [125 °](#)
 Ending Angle: [145 °](#)
 Angle Increments: [4](#)
Right Grid
 Upper Left: [\(210, -5\) ft](#)
 Lower Left: [\(210, -17.5\) ft](#)
 Lower Right: [\(260, -17.5\) ft](#)
 X Increments: [10](#)
 Y Increments: [12](#)
 Starting Angle: [25 °](#)
 Ending Angle: [45 °](#)
 Angle Increments: [4](#)

Cohesion Functions

Fill

Model: [Spline Data Point Function](#)
Function: [Cohesion vs. X](#)
 Curve Fit to Data: [100 %](#)
 Segment Curvature: [0 %](#)
Y-Intercept: [600](#)
Data Points: [X \(ft\), Cohesion \(psf\)](#)
 Data Point: [\(95.7, 600\)](#)
 Data Point: [\(176.5, 600\)](#)
 Data Point: [\(200, 750\)](#)
 Data Point: [\(237, 600\)](#)
 Data Point: [\(310, 600\)](#)

Marsh1

Model: [Spline Data Point Function](#)
Function: [Cohesion vs. X](#)
 Curve Fit to Data: [100 %](#)

3/1/2012

GAP Stability (Block)

Page 2 of 9

Minimum Slip Surface Depth: [0.1 ft](#)
Optimization Maximum Iterations: [4000](#)
Optimization Convergence Tolerance: [1e-007](#)
Starting Optimization Points: [8](#)
Ending Optimization Points: [8](#)
Complete Passes per Insertion: [1](#)
Driving Side Maximum Convex Angle: [5 °](#)
Resisting Side Maximum Convex Angle: [1 °](#)

Materials

EMBANKMENT FILL CH, EL. +3.3 TO -4

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

BEACH SAND SP, EL. -12 TO -48

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

BAY SOUND CLAY CL, EL. -48 TO -53

Model: [Spatial Mohr-Coulomb](#)
Unit Weight: [108 pcf](#)
Cohesion Spatial Fn: [Clay 2 Cohesion](#)
Phi: 0 °
Phi-B: 0 °

Marsh 1, EL. -4 TO -8

Model: [Spatial Mohr-Coulomb](#)
Weight Fn: [Marsh 1](#)
Cohesion Fn: [Marsh1](#)
Phi: 0 °
Phi-B: 0 °

Sheetpile

Model: [Mohr-Coulomb](#)
Unit Weight: [0.1 pcf](#)
Cohesion: [0.01 psf](#)
Phi: 0 °
Phi-B: 0 °

Marsh 2 EL. -8 to -11.5

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

3/1/2012

GAP Stability (Block)

Page 4 of 9

Segment Curvature: 0 %
Y-Intercept: [260](#)
Data Points: [X \(ft\), Cohesion \(psf\)](#)
 Data Point: [\(95.7, 260\)](#)
 Data Point: [\(176.5, 260\)](#)
 Data Point: [\(200, 275\)](#)
 Data Point: [\(237, 260\)](#)
 Data Point: [\(310, 260\)](#)

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: [\(95.7, 180\)](#)
 Data Point: [\(176.5, 180\)](#)
 Data Point: [\(200, 275\)](#)
 Data Point: [\(237, 180\)](#)
 Data Point: [\(310, 180\)](#)

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: [\(-100000, 0\)](#)
 Data Point: [\(0, 0\)](#)
 Data Point: [\(100000, 57735\)](#)
Estimation Properties
 Intact Rock Param.: [10](#)
 Geological Strength: [100](#)
 Disturbance Factor: [0](#)
 SigmaC: [600000 psf](#)
 Sigma3: [300000 psf](#)
 Num. Points: [20](#)

Unit Weight Functions

Marsh 1

Model: [Spline Data Point Function](#)
Function: [Unit Weight vs. X](#)
 Curve Fit to Data: [100 %](#)

3/1/2012

Segment Curvature: 0 %
Y-Intercept: 99
Data Points: X (ft), Unit Weight (pcf)
Data Point: (95.7, 99)
Data Point: (176.5, 99)
Data Point: (200, 87)
Data Point: (237, 99)
Data Point: (310, 99)

Marsh 2
Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 96
Data Points: X (ft), Unit Weight (pcf)
Data Point: (95.7, 96)
Data Point: (176.5, 96)
Data Point: (200, 98)
Data Point: (237, 96)
Data Point: (310, 96)

Fill
Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 99
Data Points: X (ft), Unit Weight (pcf)
Data Point: (95.7, 99)
Data Point: (176.5, 99)
Data Point: (200, 101)
Data Point: (237, 99)
Data Point: (310, 99)

Spatial Functions

Clay 2 Cohesion
Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (176.5, -48, 820)
Data Point: (176.5, -70, 1040)
Data Point: (200, -48, 1100)
Data Point: (200, -70, 1100)
Data Point: (237, -48, 820)
Data Point: (237, -70, 1040)

Regions

	Points	Area (ft²)	Material
Region 1	2,38,21,3,7,35,19	99.529999	
Region 2	3,37,18,39,4,30,20,10,11,22,7	252.67501	EMBANKMENT FILL CH, EL. +3.3 TO -4
Region 3	16,9,15,1,31,33,27	613.59732	
Region 4	16,8,23,12,25,24	183.5	Marsh 2 EL. -8 to -11.5
Region 5	7,8,23,12,11,22	458.5	Marsh 1, EL. -4 TO -8
Region 6	8,16,27,33,34,26	71.066968	
Region 7	7,8,26,34,32,35	127.73572	
Region 8	28,29,18,37,3,36	7.4	Sheetpile
Region 9	6,15,9,16,24,25,17	7196.15	BEACH SAND SP, EL. -12 TO -48
Region 10	14,6,17,13	4714.6	BAY SOUND CLAY CL, EL. -48 TO -53

Points

	X (ft)	Y (ft)
Point 1	95.7	-11.8
Point 2	192	2.8
Point 3	200	3.1
Point 4	208	3.2
Point 5	310	-5.6
Point 6	95.7	-48
Point 7	200	-4
Point 8	200	-9
Point 9	200	-17.5
Point 10	310	-5.2
Point 11	310	-6
Point 12	310	-10
Point 13	310	-70
Point 14	95.7	-70
Point 15	95.7	-17.5
Point 16	200	-11.5
Point 17	310	-48
Point 18	201	3.3
Point 19	188.8	-1.2
Point 20	257.7	-5.2
Point 21	199	3.1
Point 22	237	-6
Point 23	237	-10
Point 24	237	-11.5
Point 25	310	-11.5
Point 26	176.5	-10

3/1/2012

3/1/2012

Point 27	176.5	-11.5
Point 28	200	12.9
Point 29	200.5	12.9
Point 30	237	-4.7
Point 31	156.6	-11.6
Point 32	169.3	-8.8
Point 33	157.05357	-11.5
Point 34	163.85714	-10
Point 35	176.5	-6
Point 36	200	3.5
Point 37	201	3.1
Point 38	196.66667	3
Point 39	205	3.24286
Point 40	205	-55

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.34	(219.828, -3.188)	17.07315	(200, 12.9)	(241.252, -4.80269)
2	1727	1.39	(219.828, -3.188)	17.032	(200, 12.9)	(241.171, -4.80074)

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	-11.244765	1199.7148	-2777.4639	0	274.36
2	Optimized	200.75	-11.23699	1198.9549	1416.9286	0	273.07
3	Optimized	201.9223	-11.21875	1197.7083	1434.9191	0	270.06
4	Optimized	203.38345	-11.20542	1196.778	1425.129	0	266.31
5	Optimized	204.46115	-11.20746	1196.6852	1425.0362	0	263.55
6	Optimized	205.2975	-11.20904	258.9407	1424.9385	0	261.4
7	Optimized	206.19625	-11.25407	253.62752	1396.8505	0	259.09
8	Optimized	207.39875	-11.343005	258.93527	1405.1439	0	256
9	Optimized	208.7534	-11.44319	265.03185	1395.218	0	252.53
10	Optimized	210.1969	-11.498935	268.45093	1395.2899	0	248.82
11	Optimized	211.5771	-11.498985	268.45093	1358.9187	0	245.28
12	Optimized	212.9573	-11.49903	268.45093	1322.62	0	241.73
13	Optimized	214.3375	-11.499075	268.45093	1286.3213	0	238.19
14	Optimized	215.7177	-11.499125	268.45093	1250.0951	0	234.64

15	Optimized	217.0979	-11.499175	268.45093	1213.7964	0	231.1
16	Optimized	218.47815	-11.49922	268.45093	1177.5702	0	227.56
17	Optimized	219.8584	-11.499265	268.45093	1141.3439	0	224.01
18	Optimized	221.2386	-11.499315	268.45093	1105.1177	0	220.47
19	Optimized	222.6188	-11.499365	268.45093	1068.9639	0	216.92
20	Optimized	223.999	-11.49941	268.45817	1032.8101	0	213.38
21	Optimized	225.3792	-11.499455	268.45817	996.65632	0	209.84
22	Optimized	226.7594	-11.499505	268.45817	960.50253	0	206.29
23	Optimized	228.21825	-11.3006	256.04682	988.66072	0	202.55
24	Optimized	229.75575	-10.90274	231.22483	905.47998	0	198.6
25	Optimized	231.2932	-10.50488	206.39654	822.36221	0	194.65
26	Optimized	232.86845	-10.097245	180.95588	737.26767	0	190.61
27	Optimized	234.50625	-9.411894	138.18337	756.76815	0	261.01
28	Optimized	236.16875	-8.458602	78.692826	603.25426	0	260.34
29	Optimized	237.00225	-7.980663	48.868791	525.92714	0	260
30	Optimized	237.6661	-7.4845275	17.908488	525.75582	0	260
31	Optimized	238.98925	-6.4948425	-43.851617	408.78267	0	260
32	Optimized	240.4512	-5.4013475	-112.09217	552.58182	0	600

Slices of Slip Surface: **1727**

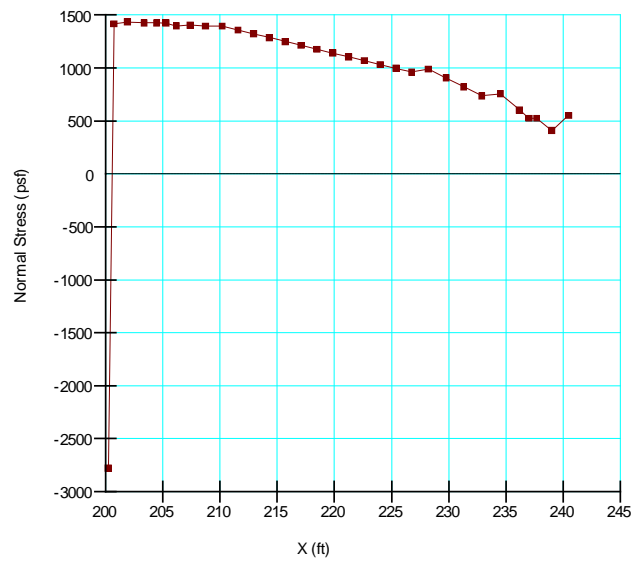
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	1727	200.25	-11.25	1200.06	-2811.6	0	274.36
2	1727	200.75	-11.25	1199.84	1410.06	0	273.07
3	1727	201.66665	-11.25	1199.8503	1429.8754	0	270.72
4	1727	203	-11.25	1199.7753	1429.5754	0	267.3
5	1727	204.33335	-11.25	1199.6253	1429.2004	0	263.87
6	1727	205.75	-11.25	253.44667	1428.7333	0	260.24
7	1727	207.25	-11.25	253.27333	1428.2	0	256.39
8	1727	208.6875	-11.25	253.18545	1409.8909	0	252.69
9	1727	210.0625	-11.25	253.13455	1373.6727	0	249.16
10	1727	211.4375	-11.25	253.08364	1337.5273	0	245.63
11	1727	212.8125	-11.25	253.04727	1301.3818	0	242.1
12	1727	214.1875	-11.25	253.01818	1265.2364	0	238.57
13	1727	215.5625	-11.25	252.98909	1229.0909	0	235.04

3/1/2012

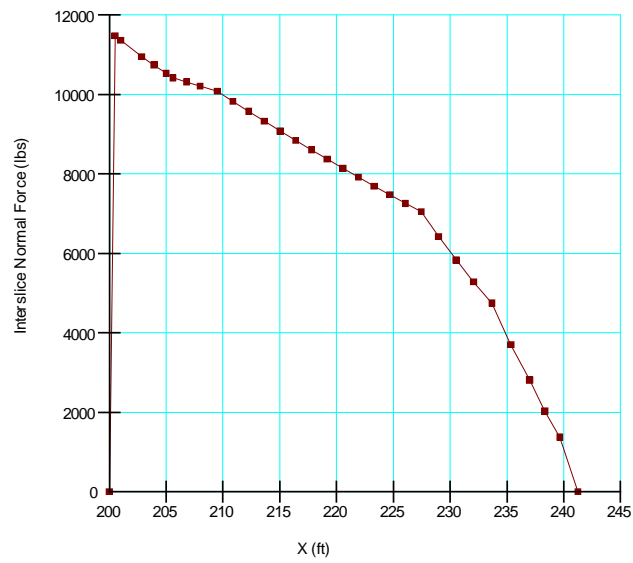
3/1/2012

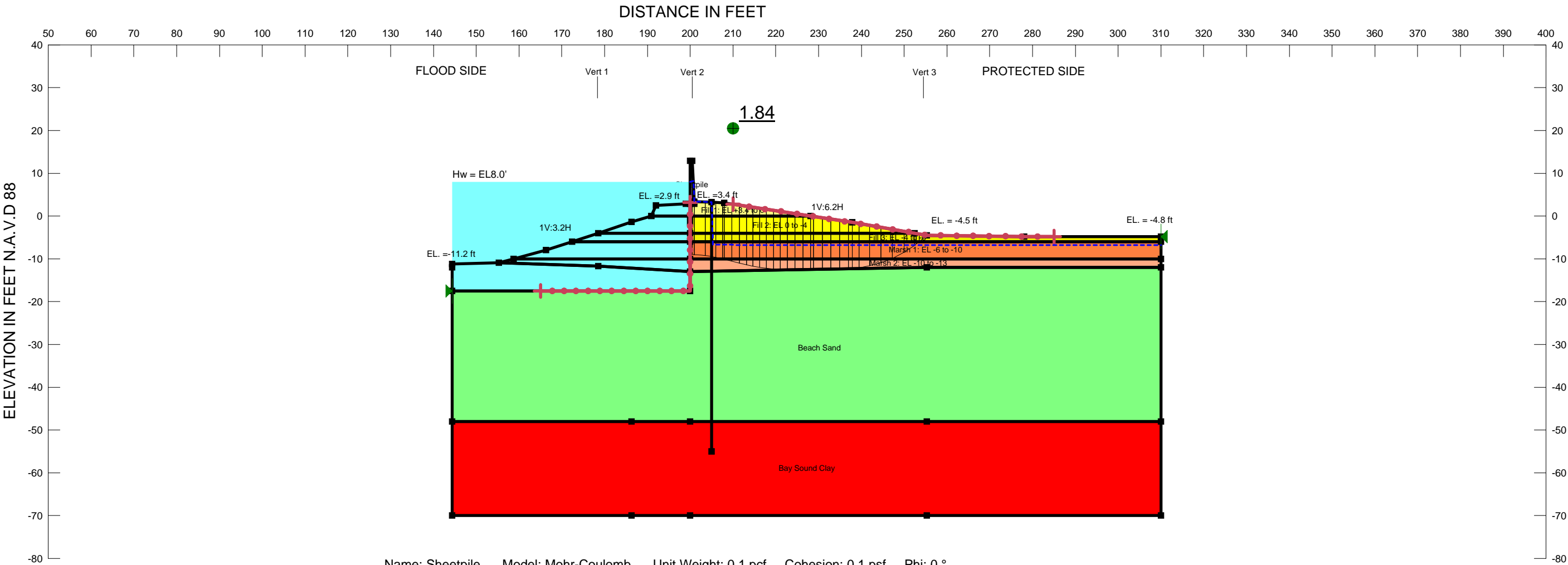
14	1727	216.9375	-11.25	252.96727	1193.0182	0	231.51
15	1727	218.3125	-11.25	252.95273	1156.9455	0	227.98
16	1727	219.6875	-11.25	252.93818	1120.8727	0	224.45
17	1727	221.0625	-11.25	252.93091	1084.8727	0	220.92
18	1727	222.4375	-11.25	252.91636	1048.8	0	217.39
19	1727	223.8125	-11.25	252.90909	1012.8	0	213.86
20	1727	225.1875	-11.25	252.90182	976.8	0	210.33
21	1727	226.5625	-11.25	252.89455	940.8	0	206.8
22	1727	227.9375	-11.25	252.89455	904.87273	0	203.27
23	1727	229.3125	-11.25	252.88727	868.94545	0	199.74
24	1727	230.5953	-10.90629	231.43952	988.41311	0	196.44
25	1727	231.78595	-10.218875	188.54695	878.29041	0	193.39
26	1727	233.1511	-9.430733	139.36733	795.27582	0	261.56
27	1727	234.69065	-8.541859	83.89828	652.67968	0	260.94
28	1727	236.2302	-7.652985	28.425851	509.09915	0	260.31
29	1727	237.5233	-6.906411	-18.164773	402.08581	0	260
30	1727	238.56995	-6.302137	-55.874487	332.41543	0	260
31	1727	239.6126	-5.700184	-93.440644	471.34743	0	600
32	1727	240.6512	-5.100552	-130.8636	402.21336	0	600

Base Normal Stress Vs. X



Interslice Normal Stress Vs. X





Name: Sheetpile Model: Mohr-Coulomb Unit Weight: 0.1 pcf Cohesion: 0.1 psf Phi: 0 °
Name: Fill 1: EL +3.4 to 0 Model: Mohr-Coulomb Unit Weight: 106 pcf Cohesion: 650 psf Phi: 0 °
Name: Fill 2: EL 0 to -4 Model: Mohr-Coulomb Unit Weight: 104 pcf Cohesion: 450 psf Phi: 0 °
Name: Fill 3: EL -4 to -6 Model: Spatial Mohr-Coulomb Weight Fn: Fill 3: EL -4 to -6 Cohesion Fn: Fill 3: EL -4 to -6 Phi: 0 °
Name: Marsh 1: EL -6 to -10 Model: Spatial Mohr-Coulomb Unit Weight: 100 pcf Cohesion Fn: Marsh 1: EL -6 to -10 Phi: 0 °
Name: Marsh 2: EL -10 to -13 Model: Spatial Mohr-Coulomb Weight Fn: Marsh 2: EL -10 to -13 Cohesion Fn: Marsh 2: EL -10 to -13 Phi: 0 °
Name: Beach Sand Model: Mohr-Coulomb Unit Weight: 122 pcf Cohesion: 0 psf Phi: 30 °
Name: Bay Sound Clay Model: Spatial Mohr-Coulomb Unit Weight: 106 pcf Cohesion Spatial Fn: Bay Sound 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
BETWEENTHE VALUES INDICATED FOR THESE LOCATIONS.

Hw = CANAL WATER LEVEL

LONDON AVE CANAL
OUTFALL CANAL REEVALUATION REPORT
REACH 11, STA. 79+50 TO 84+81
PROTECTED SIDE STABILITY ANALYSIS
CASE: GAP Stability (Entry/Exit)
MARCH 2012

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

GAP Stability (Entry/Exit)

Report generated using GeoStudio 2007, version 7.15. Copyright © 1991-2009 GEO-SLOPE International Ltd.

File Information

Revision Number: 352
Last Edited By: Haggerty, Daniel R MVN
Date: 1/26/2012
Time: 12:05:17 PM
File Name: Reach 11.gsz
Last Solved Date: 1/26/2012
Last Solved Time: 12:06:38 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 Stability (Entry/Exit)

Kind: SLOPE/W
Parent: Gap Analysis (Seepage): Rem
Method: Spencer
Settings
PWP Conditions Source: Parent Analysis
SlipSurface
Direction of movement: Left to Right
Use Passive Mode: Yes
Slip Surface Option: Entry and Exit
Critical slip surfaces saved: 1
Optimize Critical Slip Surface Location: Yes
Tension Crack
Tension Crack Option: (none)
FOS Distribution
FOS Calculation Option: Constant
Advanced
Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft

Marsh 2: EL -10 to -13

Model: Spatial Mohr-Coulomb
Weight Fn: Marsh 2: EL -10 to -13
Cohesion Fn: Marsh 2: EL -10 to -13
Phi: 0 °
Phi-B: 0 °

Beach Sand

Model: Mohr-Coulomb
Unit Weight: 122 pcf
Cohesion: 0 psf
Phi: 30 °
Phi-B: 0 °

Bay Sound Clay

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

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (165, -17.5) ft
Left-Zone Right Coordinate: (200, 3.2) ft
Left-Zone Increment: 20
Right Projection: Range
Right-Zone Left Coordinate: (210, 2.79231) ft
Right-Zone Right Coordinate: (285, -4.8) ft
Right-Zone Increment: 20
Radius Increments: 20

Slip Surface Limits

Left Coordinate: (144.4, -17.5) ft
Right Coordinate: (310, -4.8) ft

Cohesion Functions

Fill 3: EL -4 to -6

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

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

Sheetpile

Model: Mohr-Coulomb
Unit Weight: 0.1 pcf
Cohesion: 0.1 psf
Phi: 0 °
Phi-B: 0 °

Fill 1: EL +3.4 to 0

Model: Mohr-Coulomb
Unit Weight: 106 pcf
Cohesion: 650 psf
Phi: 0 °
Phi-B: 0 °

Fill 2: EL 0 to -4

Model: Mohr-Coulomb
Unit Weight: 104 pcf
Cohesion: 450 psf
Phi: 0 °
Phi-B: 0 °

Fill 3: EL -4 to -6

Model: Spatial Mohr-Coulomb
Weight Fn: Fill 3: EL -4 to -6
Cohesion Fn: Fill 3: EL -4 to -6
Phi: 0 °
Phi-B: 0 °

Marsh 1: EL -6 to -10

Model: Spatial Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion Fn: Marsh 1: EL -6 to -10
Phi: 0 °
Phi-B: 0 °

Y-Intercept: 600

Data Points: X (ft), Cohesion (psf)
Data Point: (144.4, 600)
Data Point: (186.2, 600)
Data Point: (186.3, 350)
Data Point: (200, 350)
Data Point: (255.3, 350)
Data Point: (255.4, 600)
Data Point: (310, 600)

Marsh 1: EL -6 to -10

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: (144.4, 285)
Data Point: (186.3, 285)
Data Point: (200, 300)
Data Point: (255.3, 285)
Data Point: (310, 285)

Marsh 2: EL -10 to -13

Model: Spline Data Point Function
Function: Cohesion vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 240

Data Points: X (ft), Cohesion (psf)
Data Point: (144.4, 240)
Data Point: (186.3, 240)
Data Point: (200, 300)
Data Point: (255.3, 240)
Data Point: (310, 240)

Unit Weight Functions

Fill 3: EL -4 to -6

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 108

Data Points: X (ft), Unit Weight (pcf)
Data Point: (144.4, 108)

Data Point: (186.2, 108)

Data Point: (186.3, 82)

Data Point: (200, 82)

Data Point: (255.3, 82)

Data Point: (255.4, 108)

Data Point: (310, 108)

Marsh 2: EL -10 to -13

Model: Spline Data Point Function

Function: Unit Weight vs. X

Curve Fit to Data: 100 %

Segment Curvature: 0 %

Y-Intercept: 96

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

Data Point: (144.4, 96)

Data Point: (186.3, 96)

Data Point: (200, 100)

Data Point: (255.3, 96)

Data Point: (310, 96)

Spatial Functions

Bay Sound Clay

Model: Linear Interpolation

Limit Range By: Data Values

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

Data Point: (144.4, -48, 820)

Data Point: (144.4, -70, 1040)

Data Point: (186.3, -48, 820)

Data Point: (186.3, -70, 1040)

Data Point: (200, -48, 1100)

Data Point: (200, -70, 1100)

Data Point: (255.3, -48, 820)

Data Point: (255.3, -70, 1040)

Data Point: (310, -48, 820)

Data Point: (310, -70, 1040)

Regions

	Material	Points	Area (ft ²)
Region 1	Bay Sound Clay	17,9,39,20,21,22,16,28,43,40	3643.2
Region 2	Beach Sand	9,18,25,19,13,15,22,21,20,39	5628.15
Region 3		18,8,1,26,44,19,25	324.35081
Region 4		26,41,42,19,44	79.667985

Region 5	Marsh 2: EL -10 to -13	19,42,27,15,13	247.65
Region 6		41,2,38,12,42	136.28621
Region 7	Marsh 1: EL -6 to -10	42,12,14,27	440
Region 8		38,3,11,12	49.1
Region 9	Fill 3: EL -4 to -6	12,11,24,30,37,31,14	178.92
Region 10		3,4,32,48,10,11	61.72
Region 11	Fill 2: EL 0 to -4	11,10,48,47,7,24	162.4125
Region 12		32,33,34,5,48	23.175
Region 13	Fill 1: EL +3.4 to 0	48,5,23,29,45,6,47	56.8875
Region 14	Sheetpile	5,35,36,29,23	7.625

Points

	X (ft)	Y (ft)
Point 1	144.4	-11.2
Point 2	166.3	-8
Point 3	178.5	-4
Point 4	186.3	-1.4
Point 5	200	2.9
Point 6	208	3.1
Point 7	237.9	-1.5
Point 8	144.4	-12
Point 9	144.4	-48
Point 10	200	-1.5
Point 11	200	-4
Point 12	200	-6
Point 13	255.3	-12
Point 14	310	-6
Point 15	310	-12
Point 16	310	-70
Point 17	144.4	-70
Point 18	144.4	-17.5
Point 19	200	-13
Point 20	200	-48
Point 21	255.3	-48
Point 22	310	-48

Point 23	201	2.9
Point 24	252.4	-4
Point 25	200	-17.5
Point 26	155.3	-10.9
Point 27	310	-10
Point 28	255.3	-70
Point 29	201	3.4
Point 30	255.3	-4.5
Point 31	310	-4.8
Point 32	190.9	0
Point 33	192	2.5
Point 34	199	2.9
Point 35	200	12.9
Point 36	200.5	12.9
Point 37	278	-4.8
Point 38	172.4	-6
Point 39	186.3	-48
Point 40	186.3	-70
Point 41	158.71379	-10
Point 42	200	-10
Point 43	200	-70
Point 44	178.5	-11.72323
Point 45	205	3.23
Point 46	205	-55
Point 47	228.15	0
Point 48	200	0

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.84	(223.485, 54.371)	21.69239	(200, 12.9)	(255.303, -4.50004)
2	7313	1.99	(223.485, 54.371)	66.59	(200, 12.9)	(254.775, -4.40947)

Slices of Slip Surface: Optimized

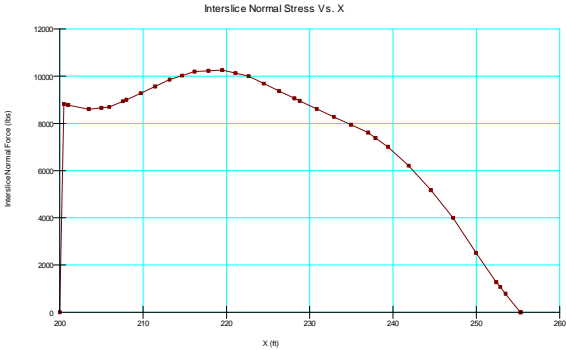
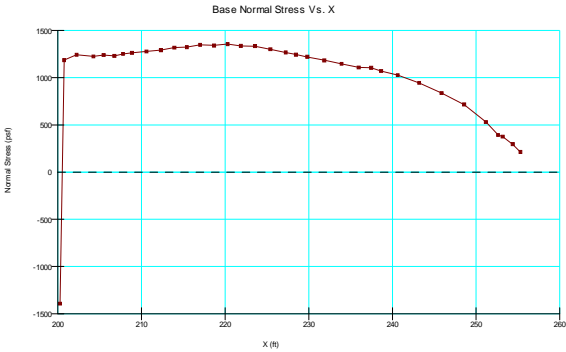
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	200.25	-8.958104	1045.1646	-1392.0767	0	299.93
2	Optimized	200.75	-8.994302	1044.9053	1186.5944	0	299.8
3	Optimized	202.2435	-9.1024255	1051.7434	1243.684	0	299.39
4	Optimized	204.2435	-9.3141455	1064.483	1225.8553	0	298.85
5	Optimized	205.4739	-9.5120705	175.28102	1239.7596	0	298.52
6	Optimized	206.76665	-9.79415	191.56485	1231.3233	0	298.16
7	Optimized	207.79275	-10.052105	206.64594	1251.9948	0	291.54
8	Optimized	208.8628	-10.321105	222.60652	1263.3741	0	290.38
9	Optimized	210.5884	-10.754895	248.67882	1277.8181	0	288.51
10	Optimized	212.314	-11.188685	275.05461	1292.1497	0	286.64
11	Optimized	213.9266	-11.55639	297.58414	1318.7029	0	284.89
12	Optimized	215.42625	-11.858005	316.15006	1323.802	0	283.26
13	Optimized	217.01005	-12.114265	331.9815	1348.4592	0	281.54
14	Optimized	218.67795	-12.32518	345.03782	1341.9162	0	279.73
15	Optimized	220.30105	-12.47046	354.05236	1355.6894	0	277.97
16	Optimized	221.87935	-12.550095	358.99445	1337.5283	0	276.26
17	Optimized	223.58205	-12.5734	360.43722	1335.1756	0	274.41
18	Optimized	225.4092	-12.540375	358.37426	1301.5226	0	272.43
19	Optimized	227.2364	-12.50735	356.3113	1267.9243	0	270.45
20	Optimized	228.4722	-12.485015	354.90792	1245.2654	0	269.11
21	Optimized	229.82135	-12.46062	353.38944	1220.8521	0	267.64
22	Optimized	231.87525	-12.42348	351.06739	1183.7091	0	265.42
23	Optimized	233.92915	-12.386345	348.74534	1146.566	0	263.19
24	Optimized	235.983	-12.34921	346.42329	1109.423	0	260.96
25	Optimized	237.45495	-12.28393	342.35447	1105.3472	0	259.36
26	Optimized	238.65165	-12.158325	334.5114	1071.6379	0	258.06
27	Optimized	240.63865	-11.857955	315.76406	1027.0101	0	255.91
28	Optimized	243.20675	-11.28261	279.85715	946.00724	0	253.12
29	Optimized	245.8729	-10.44249	227.42853	837.38286	0	250.23
30	Optimized	248.58255	-9.21955	151.11039	716.08953	0	286.82
31	Optimized	251.1794	-7.661426	53.878073	531.06638	0	286.12
32	Optimized	252.63795	-6.679861	-7.3744683	394.08829	0	285.72

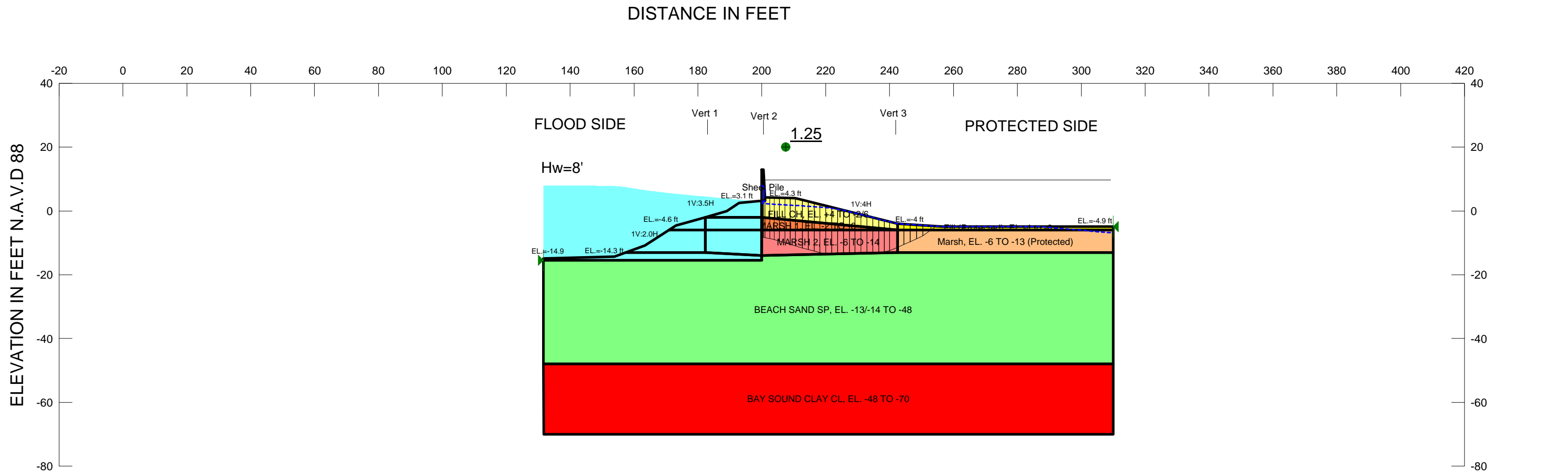
33	Optimized	253.1882	-6.259865	-33.583222	375.82983	0	285.57
34	Optimized	254.40025	-5.2513055	-96.521781	295.81901	0	350
35	Optimized	255.30155	-4.501326	-143.32045	213.71522	0	353.86

28	7313	248.82075	-7.202634	25.255329	454.34191	0	286.76
29	7313	250.66285	-6.411826	-24.095508	342.44454	0	286.26
30	7313	251.99195	-5.8066955	-61.858049	282.33767	0	350
31	7313	253.58745	-5.0114325	-111.48601	193.84707	0	350

Slices of Slip Surface: 7313

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	7313	200.25	-8.0330825	984.75652	-1119.3686	0	299.93
2	7313	200.75	-8.2169765	993.67384	1023.8638	0	299.8
3	7313	202	-8.6487115	1021.8004	1117.1135	0	299.46
4	7313	204	-9.2956805	1063.4605	1180.8366	0	298.92
5	7313	205.7193	-9.800863	192.7537	1230.8288	0	298.45
6	7313	207.2193	-10.19667	215.87296	1270.4328	0	292.17
7	7313	208.9159	-10.598725	239.61946	1299.9984	0	290.33
8	7313	210.7477	-10.982615	262.66099	1317.3772	0	288.34
9	7313	212.57955	-11.31319	282.71404	1329.3704	0	286.35
10	7313	214.4114	-11.59125	299.68611	1336.1326	0	284.36
11	7313	216.2432	-11.81745	313.5911	1337.6747	0	282.38
12	7313	218.075	-11.992325	324.36021	1334.0262	0	280.39
13	7313	219.9068	-12.11628	332.02523	1325.1791	0	278.4
14	7313	221.7386	-12.1896	336.54961	1311.1961	0	276.41
15	7313	223.57045	-12.212455	337.95351	1292.0483	0	274.43
16	7313	225.4023	-12.184895	336.22034	1267.6677	0	272.44
17	7313	227.2341	-12.106855	331.34049	1238.1665	0	270.45
18	7313	229.125	-11.972315	322.94278	1202.3807	0	268.4
19	7313	231.075	-11.777555	310.78131	1159.9276	0	266.28
20	7313	233.025	-11.524525	294.98612	1111.4382	0	264.17
21	7313	234.975	-11.212555	275.51649	1056.7258	0	262.05
22	7313	236.925	-10.840795	252.31242	995.68856	0	259.94
23	7313	239.21565	-10.319925	219.8001	912.44259	0	257.45
24	7313	241.45235	-9.7418815	183.7266	828.30648	0	288.76
25	7313	243.29445	-9.1967405	149.69968	745.18143	0	288.26
26	7313	245.13655	-8.592997	112.02489	655.35227	0	287.76
27	7313	246.97865	-7.928946	70.584004	558.53606	0	287.26





Name: FILL CH, EL. +4 TO -2/6 Model: Spatial Mohr-Coulomb Unit Weight: 107 pcf Cohesion Fn: Fill Phi: 0 °

Name: MARSH 1, EL. -2 TO -6 Model: Undrained (Phi=0) Unit Weight: 80 pcf Cohesion: 200 psf

Name: BEACH SAND SP, EL. -13/-14 TO -48 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand

Name: BAY SOUND CLAY CL, EL. -48 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 108 pcf Cohesion Spatial Fn: CLAY Phi: 0 °

Name: MARSH 2, EL. -6 TO -14 Model: Spatial Mohr-Coulomb Unit Weight: 101 pcf Cohesion Fn: Marsh 1 Phi: 0 °

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

Name: Fill (Protected), EL -4 to -6 Model: Undrained (Phi=0) Unit Weight: 107 pcf Cohesion: 600 psf

Name: Marsh, EL. -6 TO -13 (Protected) Model: Undrained (Phi=0) Unit Weight: 101 pcf Cohesion: 190 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
VERTICALSWERE ASSUMED TO VARY LINEARLY
BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

Hw = CANAL WATER LEVEL

LONDON AVE CANAL
OUTFALL CANAL REEVALUATION REPORT
REACH 12A, STA. 85+90 TO STA. 89+50
PROTECTED SIDE STABILITY ANALYSIS,
CASE: GAP Stability (Fully Spec)
MARCH 2012

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

GAP Stability (Fully Spec)

Report generated using GeoStudio 2007, version 7.19. Copyright © 1991-2012 GEO-SLOPE International Ltd.

File Information

Created By: Liljegren, James
Revision Number: 298
Last Edited By: Curran, Matthew MVN
Date: 2/1/2013
Time: 2:56:33 PM
File Name: Reach 12A.gsz
Directory: G:\F&MHOME\London Ave Reeevaluation 2011\West Side\Reach 12A\SlopeW\
Last Solved Date: 2/1/2013
Last Solved Time: 2:59:16 PM

Project Settings

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

Analysis Settings

GAP Stability (Fully Spec)

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: Fully-Specified
 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: 8
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

FILL CH, EL. +4 TO -2/6

Model: Spatial Mohr-Coulomb
Unit Weight: 107 pcf
Cohesion Fn: Fill
Phi: 0 °
Phi-B: 0 °

MARSH 1, EL. -2 TO -6

Model: Undrained (Phi=0)
Unit Weight: 80 pcf
Cohesion: 200 psf

BEACH SAND SP, EL. -13/-14 TO -48

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

BAY SOUND CLAY CL, EL. -48 TO -70

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

MARSH 2, EL. -6 TO -14

Model: Spatial Mohr-Coulomb
Unit Weight: 101 pcf
Cohesion Fn: Marsh 1
Phi: 0 °
Phi-B: 0 °

Sheet Pile

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

Fill (Protected), EL -4 to -6

Model: Undrained (Phi=0)
Unit Weight: 107 pcf
Cohesion: 600 psf

Marsh, EL. -6 TO -13 (Protected)

Model: Undrained (Phi=0)
Unit Weight: 101 pcf
Cohesion: 190 psf

Slip Surface Limits

Left Coordinate: (131.6, -15.5) ft
Right Coordinate: (310, -4.9) ft

Fully Specified Slip Surfaces

Fully Specified Slip Surface 1

X (ft)	Y (ft)
176	5
200	-12.5
240	-12.5
260	2

FullySpecFixedPoints
[1]
 flag: Yes
[2]
 flag: Yes

Cohesion Functions

Marsh 1

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: (182.3, 190)
Data Point: (200, 200)
Data Point: (242.5, 190)

Fill

Model: Spline Data Point Function
Function: Cohesion vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 600
Data Points: X (ft), Cohesion (psf)
Data Point: (182.3, 600)
Data Point: (200, 700)
Data Point: (242.5, 600)

Shear/Normal Strength Functions

Sand

Model: Spline Data Point Function
Function: Shear Stress vs. Normal Stress
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
Data Point: (-100000, 0)
Data Point: (0, 0)
Data Point: (100000, 57735)
Estimation Properties
Intact Rock Param.: 10
Geological Strength: 100
Disturbance Factor: 0
SigmaC: 600000 psf
Sigma3: 300000 psf
Num. Points: 20

Spatial Functions

CLAY

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (131.6, -48, 610)
Data Point: (131.6, -70, 855)
Data Point: (182.3, -48, 610)

Data Point: (182.3, -70, 855)
Data Point: (200, -48, 855)
Data Point: (200, -70, 855)
Data Point: (242.5, -48, 610)
Data Point: (242.5, -70, 855)
Data Point: (310, -48, 610)
Data Point: (310, -70, 855)

Regions

	Points	Area (ft²)	Material
Region 1	35,21,2,3,24,9	53.225	
Region 2	9,10,26,35	70.8	
Region 3	24,19,23,4,30,14,9	212.525	FILL CH, EL. +4 TO -2/6
Region 4	9,14,10	85	MARSH 1, EL. -2 TO -6
Region 5	26,27,36,20,34	120.62857	
Region 6	27,12,13,1,32,33,36	124.17643	
Region 7	13,12,15,6,8,25,7,1	6051.75	BEACH SAND SP, EL. -13/-14 TO -48
Region 8	7,25,8,16,17	3923.7	BAY SOUND CLAY CL, EL. -48 TO -70
Region 9	31,18,5,14,30	80.595	Fill (Protected), EL -4 to -6
Region 10	15,14,5,6	472.5	Marsh, EL. -6 TO -13 (Protected)
Region 11	15,12,11,10,14	318.75	MARSH 2, EL. -6 TO -14
Region 12	26,27,12,11,10	132.75	
Region 13	28,29,23,19,24	7.65	Sheet Pile
Region 14	34,22,35,26	26.11	

Points

	X (ft)	Y (ft)
Point 1	131.6	-15.5
Point 2	192.9	2.5
Point 3	199	3.1
Point 4	210.5	4
Point 5	310	-6
Point 6	310	-13
Point 7	131.6	-48
Point 8	310	-48
Point 9	200	-2

Point 10	200	-6
Point 11	200	-8.7
Point 12	200	-14
Point 13	200	-15.5
Point 14	242.5	-6
Point 15	242.5	-13
Point 16	310	-70
Point 17	131.7	-70
Point 18	310	-4.9
Point 19	201	3.1
Point 20	163.4	-10.8
Point 21	189	-0.1
Point 22	173.2	-4.6
Point 23	201	4.3
Point 24	200	3.1
Point 25	200	-48
Point 26	182.3	-6
Point 27	182.3	-13
Point 28	200	12.9
Point 29	200.5	12.9
Point 30	242.5	-4
Point 31	256.6	-4.9
Point 32	131.6	-14.9
Point 33	153.9	-14.3
Point 34	171	-6
Point 35	182.3	-2
Point 36	157.42857	-13

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.25	(224.557, -2.551)	21.50394	(200, 12.9)	(254.579, -4.771)
2	1	1.50	(224.557, -2.551)	20.98	(200, 12.9)	(250.978, -4.54113)

Slices of Slip Surface: Optimized

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimize d	200.25	-8.180282	709.12305	-1012.9771	0	199.94
2	Optimize d	200.75	-8.2874885	655.73642	1056.2926	0	199.82
3	Optimize d	201.73515	-8.498714	668.55713	1201.4476	0	199.59
4	Optimize d	203.2054	-8.813958	686.64602	1231.2411	0	199.25
5	Optimize d	204.76045	-9.2237085	707.95614	1241.2256	0	198.88
6	Optimize d	206.40035	-9.7279655	735.29283	1288.9045	0	198.49
7	Optimize d	208.0402	-10.232222	761.58035	1336.5834	0	198.11
8	Optimize d	209.68005	-10.73648	786.17754	1384.3206	0	197.72
9	Optimize d	211.62055	-11.33317	814.76272	1415.5452	0	197.27
10	Optimize d	213.65045	-11.908995	840.63435	1441.9629	0	196.79
11	Optimize d	215.4692	-12.371525	859.81719	1444.6272	0	196.36
12	Optimize d	217.288	-12.83405	878.84016	1447.2382	0	195.93
13	Optimize d	219.1068	-13.296575	897.70328	1449.9024	0	195.5
14	Optimize	220.9381	-	900.63028	1522.8297	0	195.07

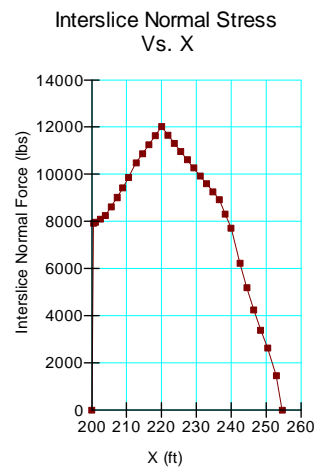
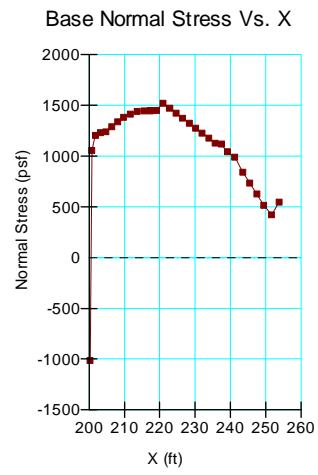
	d		13.506145				
15	Optimize d	222.78185	-13.46276	887.61696	1473.596	0	194.64
16	Optimize d	224.6256	-13.419375	874.65786	1424.4165	0	194.21
17	Optimize d	226.46935	-13.37599	861.69876	1375.1827	0	193.77
18	Optimize d	228.3131	-13.332605	848.73966	1325.949	0	193.34
19	Optimize d	230.15685	-13.28922	835.83478	1276.7153	0	192.9
20	Optimize d	232.0006	-13.245835	822.92991	1227.5358	0	192.47
21	Optimize d	233.84435	-13.20245	810.07925	1178.302	0	192.04
22	Optimize d	235.6881	-13.159065	797.2286	1129.0683	0	191.6
23	Optimize d	237.4575	-12.97803	775.66753	1116.9427	0	191.19
24	Optimize d	239.1525	-12.659345	745.16962	1041.7995	0	190.79
25	Optimize d	241.25	-11.94507	685.33942	989.43913	0	190.29
26	Optimize d	243.49185	-10.94982	604.32593	843.31942	0	190
27	Optimize d	245.4755	-10.069181	531.43453	734.53523	0	190
28	Optimize d	247.45915	-9.188545	457.70456	625.70495	0	190
29	Optimize d	249.4428	-8.3079085	383.60137	516.92076	0	190

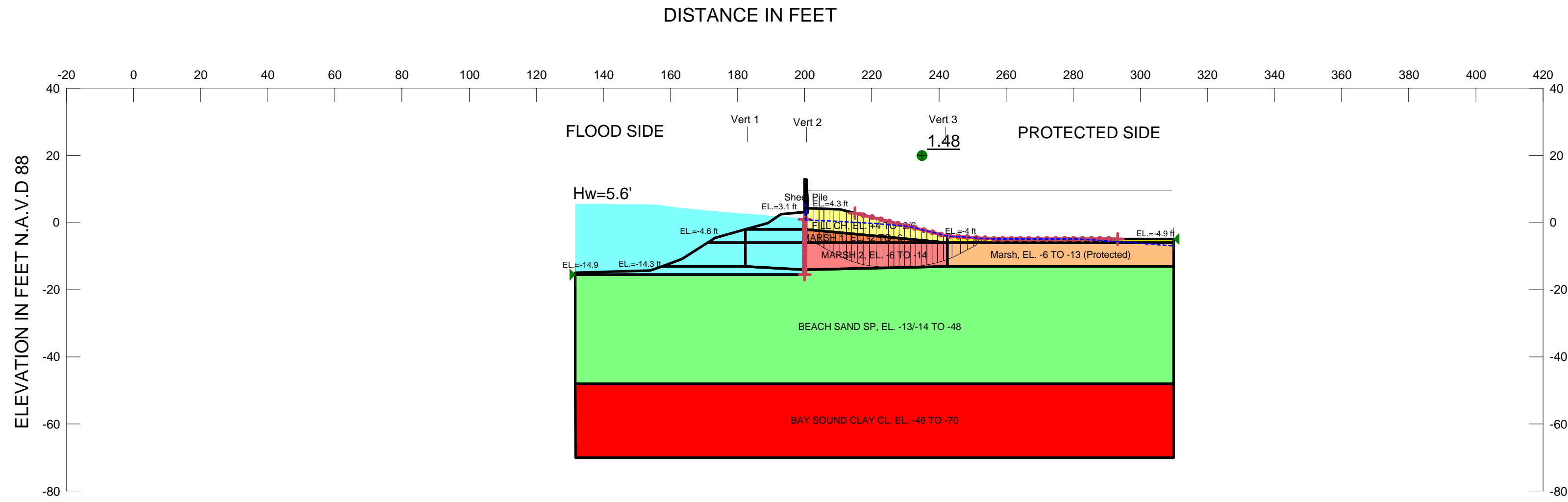
30	Optimize d	251.68435	-6.933795	272.73785	419.91719	0	190
31	Optimize d	253.7565	-5.385498	101.02432	545.95893	0	600

Slices of Slip Surface: 1

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	1	200.25	-12.5	952.22	-2047.4	0	199.94
2	1	200.75	-12.5	936.16	1543.74	0	199.82
3	1	201.79165	-12.5	933.97914	1671.5372	0	199.58
4	1	203.375	-12.5	928.29493	1670.2109	0	199.21
5	1	204.95835	-12.5	921.91598	1668.8214	0	198.83
6	1	206.54165	-12.5	916.0423	1667.4319	0	198.46
7	1	208.125	-12.5	907.57914	1666.1056	0	198.09
8	1	209.70835	-12.5	899.17914	1664.7161	0	197.72
9	1	211.36765	-12.5	890.33904	1643.0069	0	197.33
10	1	213.10295	-12.5	881.00345	1600.9967	0	196.92
11	1	214.83825	-12.5	871.37972	1558.9289	0	196.51
12	1	216.57355	-12.5	861.81362	1516.8611	0	196.1
13	1	218.30885	-12.5	852.18989	1474.8509	0	195.69
14	1	220.04415	-12.5	842.4509	1432.7831	0	195.28
15	1	221.77945	-12.5	832.71192	1390.7153	0	194.88
16	1	223.51475	-12.5	823.03056	1348.7052	0	194.47
17	1	225.25	-12.5	813.23395	1306.6374	0	194.06
18	1	226.98525	-12.5	803.43734	1264.5696	0	193.65
19	1	228.72055	-12.5	793.64073	1222.5594	0	193.24
20	1	230.45585	-12.5	783.84412	1180.4916	0	192.83
21	1	232.19115	-12.5	774.04751	1138.4238	0	192.43
22	1	233.92645	-12.5	764.19327	1096.4136	0	192.02
23	1	235.66175	-12.5	754.45429	1054.3458	0	191.61
24	1	237.39705	-12.5	744.13903	1012.278	0	191.2
25	1	239.13235	-12.5	734.57293	970.26786	0	190.79
26	1	241.25	-11.59375	661.54885	1025.8735	0	190.29
27	1	243.3082	- 10.101563	547.31053	817.58486	0	190

28	1	244.9246	- 8.9296875	455.99527	673.18143	0	190
29	1	246.54095	- 7.7578125	363.66824	528.77801	0	190
30	1	248.1573	- 6.5859375	270.9405	384.38459	0	190
31	1	249.9716	- 5.2705665	113.79515	482.08942	0	600





Name: FILL CH, EL. +4 TO -2/6 Model: Spatial Mohr-Coulomb Unit Weight: 107 pcf Cohesion Fn: Fill Phi: 0 °
Name: MARSH 1, EL. -2 TO -6 Model: Undrained (Phi=0) Unit Weight: 80 pcf Cohesion: 200 psf
Name: BEACH SAND SP, EL. -13/-14 TO -48 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand
Name: BAY SOUND CLAY CL, EL. -48 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 108 pcf Cohesion Spatial Fn: CLAY Phi: 0 °
Name: MARSH 2, EL. -6 TO -14 Model: Spatial Mohr-Coulomb Unit Weight: 101 pcf Cohesion Fn: Marsh 1 Phi: 0 °
Name: Sheet Pile Model: Undrained (Phi=0) Unit Weight: 0.1 pcf Cohesion: 0.01 psf
Name: Fill (Protected), EL -4 to -6 Model: Undrained (Phi=0) Unit Weight: 107 pcf Cohesion: 600 psf
Name: Marsh, EL. -6 TO -13 (Protected) Model: Undrained (Phi=0) Unit Weight: 101 pcf Cohesion: 190 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
VERTICALSWERE ASSUMED TO VARY LINEARLY
BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

Hw = CANAL WATER LEVEL



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

LONDON AVE CANAL
OUTFALL CANAL REEVALUATION REPORT
REACH 12A, STA. 85+90 TO 89+50
PROTECTED SIDE STABILITY ANALYSIS,
1% FLOWLINE WATER EL +5.6
CASE: GAP Stability (Entry/Exit)
MARCH 2012

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

GAP Stability (Entry/Exit)

Report generated using GeoStudio 2007, version 7.15. Copyright © 1991-2009 GEO-SLOPE International Ltd.

File Information

Created By: [Liljegren, James](#)
Revision Number: 296
Last Edited By: [Middleton, Mark C MVN](#)
Date: 3/14/2012
Time: 1:18:04 PM
File Name: [Reach 12A.gsz](#)
Directory: [G:\F&M\HOME\Middleton\London Ave Canal\Reach 12A\water level 5.6\optimization check\](#)
Last Solved Date: 3/14/2012
Last Solved Time: 1:20:32 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 Stability (Entry/Exit)

Kind: [SLOPE/W](#)
Parent: [Gap Analysis \(Seepage\)](#)
Method: [Spencer](#)
Settings
 PWP Conditions Source: [Parent Analysis](#)
SlipSurface
 Direction of movement: [Left to Right](#)
 Use Passive Mode: [Yes](#)
 Slip Surface Option: [Entry and Exit](#)
 Critical slip surfaces saved: [1](#)
 Optimize Critical Slip Surface Location: [Yes](#)
 Tension Crack
 Tension Crack Option: [\(none\)](#)
FOS Distribution
 FOS Calculation Option: [Constant](#)
Advanced
 Number of Slices: [30](#)
 Optimization Tolerance: [0.01](#)
 Minimum Slip Surface Depth: [0.1 ft](#)

3/20/2012

3/20/2012

GAP Stability (Entry/Exit)

Page 3 of 8

Unit Weight: [107 pcf](#)
Cohesion: [600 psf](#)

Marsh, EL. -6 TO -13 (Protected)
Model: [Undrained \(Phi=0\)](#)
Unit Weight: [101 pcf](#)
Cohesion: [190 psf](#)

Slip Surface Entry and Exit

Left Projection: [Range](#)
Left-Zone Left Coordinate: [\(200, -15.5\) ft](#)
Left-Zone Right Coordinate: [\(200, 1\) ft](#)
Left-Zone Increment: [20](#)
Right Projection: [Range](#)
Right-Zone Left Coordinate: [\(215, 2.875\) ft](#)
Right-Zone Right Coordinate: [\(293.3, -4.9\) ft](#)
Right-Zone Increment: [30](#)
Radius Increments: [20](#)

Slip Surface Limits

Left Coordinate: [\(131.6, -15.5\) ft](#)
Right Coordinate: [\(310, -4.9\) ft](#)

Cohesion Functions

Marsh 1
Model: [Spline Data Point Function](#)
Function: [Cohesion vs. X](#)
 Curve Fit to Data: [100 %](#)
 Segment Curvature: [0 %](#)
Y-Intercept: [190](#)
Data Points: [X \(ft\), Cohesion \(psf\)](#)
 Data Point: [\(182.3, 190\)](#)
 Data Point: [\(200, 200\)](#)
 Data Point: [\(242.5, 190\)](#)

Fill
Model: [Spline Data Point Function](#)
Function: [Cohesion vs. X](#)
 Curve Fit to Data: [100 %](#)
 Segment Curvature: [0 %](#)
Y-Intercept: [600](#)
Data Points: [X \(ft\), Cohesion \(psf\)](#)
 Data Point: [\(182.3, 600\)](#)
 Data Point: [\(200, 700\)](#)
 Data Point: [\(242.5, 600\)](#)

3/20/2012

3/20/2012

Optimization Maximum Iterations: [2000](#)
Optimization Convergence Tolerance: [1e-007](#)
Starting Optimization Points: [10](#)
Ending Optimization Points: [16](#)
Complete Passes per Insertion: [1](#)
Driving Side Maximum Convex Angle: [5 °](#)
Resisting Side Maximum Convex Angle: [1 °](#)

Materials

FILL CH, EL. +4 TO -2/6
Model: [Spatial Mohr-Coulomb](#)
Unit Weight: [107 pcf](#)
Cohesion Fn: [Fill](#)
Phi: [0 °](#)
Phi-B: [0 °](#)

MARSH 1, EL. -2 TO -6
Model: [Undrained \(Phi=0\)](#)
Unit Weight: [80 pcf](#)
Cohesion: [200 psf](#)

BEACH SAND SP, EL. -13/-14 TO -48
Model: [Shear/Normal Fn.](#)
Unit Weight: [122 pcf](#)
Strength Function: [Sand](#)
Phi-B: [0 °](#)

BAY SOUND CLAY CL, EL. -48 TO -70
Model: [Spatial Mohr-Coulomb](#)
Unit Weight: [108 pcf](#)
Cohesion Spatial Fn: [CLAY](#)
Phi: [0 °](#)
Phi-B: [0 °](#)

MARSH 2, EL. -6 TO -14
Model: [Spatial Mohr-Coulomb](#)
Unit Weight: [101 pcf](#)
Cohesion Fn: [Marsh 1](#)
Phi: [0 °](#)
Phi-B: [0 °](#)

Sheet Pile
Model: [Undrained \(Phi=0\)](#)
Unit Weight: [0.1 pcf](#)
Cohesion: [0.01 psf](#)

Fill (Protected), EL -4 to -6
Model: [Undrained \(Phi=0\)](#)

GAP Stability (Entry/Exit)

Page 4 of 8

Shear/Normal Strength Functions

Sand
Model: [Spline Data Point Function](#)
Function: [Shear Stress vs. Normal Stress](#)
 Curve Fit to Data: [100 %](#)
 Segment Curvature: [0 %](#)
Y-Intercept: [0](#)
Data Points: [Normal Stress \(psf\), Shear Stress \(psf\)](#)
 Data Point: [\(-100000, 0\)](#)
 Data Point: [\(0, 0\)](#)
 Data Point: [\(100000, 57735\)](#)
Estimation Properties
 Intact Rock Param.: [10](#)
 Geological Strength: [100](#)
 Disturbance Factor: [0](#)
 SigmaC: [600000 psf](#)
 Sigma3: [300000 psf](#)
 Num. Points: [20](#)

Spatial Functions

CLAY
Model: [Linear Interpolation](#)
Limit Range By: [Data Values](#)
Data Points: [X \(ft\), Y \(ft\), Cohesion \(psf\)](#)
 Data Point: [\(131.6, -48, 610\)](#)
 Data Point: [\(131.6, -70, 900\)](#)
 Data Point: [\(182.3, -48, 610\)](#)
 Data Point: [\(182.3, -70, 900\)](#)
 Data Point: [\(200, -48, 900\)](#)
 Data Point: [\(200, -70, 900\)](#)
 Data Point: [\(242.5, -48, 610\)](#)
 Data Point: [\(242.5, -70, 900\)](#)
 Data Point: [\(310, -48, 610\)](#)
 Data Point: [\(310, -70, 900\)](#)

Regions

	Points	Area (ft²)	Material
Region 1	35,21,2,3,24,9	53.225	
Region 2	9,10,26,35	70.8	
Region 3	24,19,23,4,30,14,9	212.525	FILL CH, EL. +4 TO -2/6
Region 4	9,14,10	85	MARSH 1, EL. -2 TO -6
Region 5	26,27,36,20,34	120.62857	

3/20/2012

3/20/2012

Region 6	27,12,13,1,32,33,36	124.17643	
Region 7	13,12,15,6,8,25,7,1	6051.75	BEACH SAND SP, EL -13/-14 TO -48
Region 8	7,25,8,16,17	3923.7	BAY SOUND CLAY CL, EL -48 TO -70
Region 9	31,18,5,14,30	80.595	Fill (Protected), EL -4 to -6
Region 10	15,14,5,6	472.5	Marsh, EL -6 TO -13 (Protected)
Region 11	15,12,11,10,14	318.75	MARSH 2, EL -6 TO -14
Region 12	26,27,12,11,10	132.75	
Region 13	28,29,23,19,24	7.65	Sheet Pile
Region 14	34,22,35,26	26.11	

Points

	X (ft)	Y (ft)
Point 1	131.6	-15.5
Point 2	192.9	2.5
Point 3	199	3.1
Point 4	210.5	4
Point 5	310	-6
Point 6	310	-13
Point 7	131.6	-48
Point 8	310	-48
Point 9	200	-2
Point 10	200	-6
Point 11	200	-8.7
Point 12	200	-14
Point 13	200	-15.5
Point 14	242.5	-6
Point 15	242.5	-13
Point 16	310	-70
Point 17	131.7	-70
Point 18	310	-4.9
Point 19	201	3.1
Point 20	163.4	-10.8
Point 21	189	-0.1
Point 22	173.2	-4.6
Point 23	201	4.3
Point 24	200	3.1
Point 25	200	-48
Point 26	182.3	-6
Point 27	182.3	-13
Point 28	200	12.9
Point 29	200.5	12.9
Point 30	242.5	-4
Point 31	256.6	-4.9

Point 32	131.6	-14.9
Point 33	153.9	-14.3
Point 34	171	-6
Point 35	182.3	-2
Point 36	157.42857	-13

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.48	(226.818, 32.975)	20.69073	(200, 12.9)	(253.48, -4.70084)
2	8785	1.51	(226.818, 32.975)	46.306	(200, 12.9)	(253.718, -4.71606)

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	-4.848471	396.16194	63.330228	0	200
2	Optimized	200.75	-5.0765125	359.22249	713.89578	0	200
3	Optimized	201.8874	-5.5952665	390.97247	875.78818	0	200
4	Optimized	203.513	-6.33668	435.84712	938.18828	0	199.17
5	Optimized	204.995	-7.0853785	480.47373	987.75088	0	198.82
6	Optimized	206.48255	-7.909415	529.39966	1065.5502	0	198.47
7	Optimized	207.97005	-8.7334515	577.60228	1143.3494	0	198.12
8	Optimized	209.6069	-9.57597	624.60285	1240.2792	0	197.74
9	Optimized	211.4528	-10.46576	673.94931	1303.4634	0	197.31
10	Optimized	213.2057	-11.200855	713.28977	1369.0933	0	196.89
11	Optimized	214.8059	-11.75246	740.70354	1385.577	0	196.52
12	Optimized	216.4993	-12.25077	764.22155	1419.8738	0	196.12
13	Optimized	218.37135	-12.625825	779.00458	1437.6226	0	195.68
14	Optimized	220.3288	-12.930915	788.94846	1421.3187	0	195.22
15	Optimized	222.2032	-13.139085	793.14403	1422.4775	0	194.78
16	Optimized	223.99455	-13.250335	791.75108	1390.5511	0	194.35
17	Optimized	225.71075	-13.294065	786.42964	1373.9367	0	193.95
18	Optimized	227.3519	-13.27028	777.29078	1331.7151	0	193.56
19	Optimized	228.9931	-13.246495	768.21284	1289.4936	0	193.18

3/20/2012

3/20/2012

20	Optimized	230.63425	-13.222705	759.07398	1247.272	0	192.79
21	Optimized	232.29595	-13.119515	744.91692	1220.1154	0	192.4
22	Optimized	233.9782	-12.93693	725.53313	1160.2502	0	192.01
23	Optimized	235.6003	-12.71205	703.74718	1112.6677	0	191.62
24	Optimized	237.1623	-12.444875	678.82069	1046.6599	0	191.26
25	Optimized	238.7966	-12.084765	647.73068	991.16329	0	190.87
26	Optimized	240.5032	-11.63171	609.95535	901.62389	0	190.47
27	Optimized	241.92825	-11.179955	573.17813	847.16389	0	190.13
28	Optimized	243.1987	-10.679495	533.52961	775.1969	0	190
29	Optimized	245.1918	-9.80549	464.74449	683.12812	0	190
30	Optimized	247.48595	-8.6652525	375.64892	561.21742	0	190
31	Optimized	249.4855	-7.5823175	291.62461	431.19458	0	190
32	Optimized	251.1513	-6.520425	210.46529	346.96189	0	190
33	Optimized	252.6486	-5.3504215	87.011128	466.9425	0	600

Slices of Slip Surface: **8785**

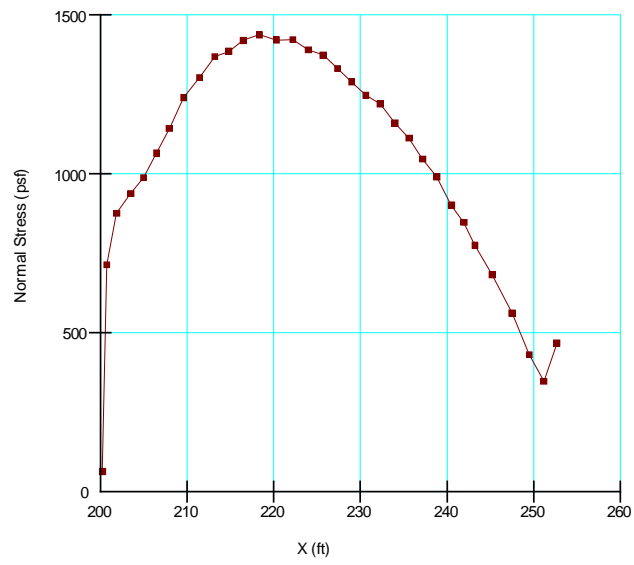
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	8785	200.25	-4.950132	402.55262	47.813259	0	200
2	8785	200.75	-5.295549	373.09319	689.043	0	200
3	8785	201.40685	-5.732917	400.15201	847.01873	0	200
4	8785	202.6823	-6.5306755	449.6035	926.21337	0	199.37
5	8785	204.41955	-7.541542	510.86926	1034.0304	0	198.96
6	8785	206.15685	-8.4549135	564.82653	1132.7438	0	198.55
7	8785	207.8941	-9.27713	612.22678	1222.7725	0	198.14
8	8785	209.63135	-10.013438	652.2879	1304.5758	0	197.73
9	8785	211.3889	-10.6749	687.48551	1359.2198	0	197.32
10	8785	213.1667	-11.263385	717.39011	1386.6747	0	196.9
11	8785	214.94445	-11.77353	741.42619	1406.1381	0	196.48
12	8785	216.7222	-12.20799	760.53434	1417.9184	0	196.07
13	8785	218.5	-12.56894	774.85235	1422.2135	0	195.65
14	8785	220.2778	-	784.61508	1419.1008	0	195.23

15	8785	222.05555	-12.858115	789.98108	1408.7502	0	194.81
16	8785	223.8333	-13.07687	790.97022	1391.2005	0	194.39
17	8785	225.6111	-13.22621	787.68229	1366.5231	0	193.97
18	8785	227.3889	-13.306805	780.18441	1334.6547	0	193.56
19	8785	229.1667	-13.319015	768.39675	1295.6232	0	193.14
20	8785	230.94445	-13.262895	752.31864	1249.3263	0	192.72
21	8785	232.7222	-13.138195	731.86217	1195.7059	0	192.3
22	8785	234.5	-12.944355	706.85706	1134.588	0	191.88
23	8785	236.2778	-12.68049	677.0024	1065.8039	0	191.46
24	8785	238.05555	-12.34538	641.71683	989.14975	0	191.05
25	8785	239.8333	-11.937425	601.67666	904.35036	0	190.63
26	8785	241.6111	-11.454615	555.98404	811.02992	0	190.21
27	8785	243.4322	-10.894475	502.8444	722.97649	0	190
28	8785	245.2966	-10.236314	441.81074	639.4765	0	190
29	8785	247.16095	-9.472085	373.611	545.31412	0	190
30	8785	249.0253	-8.610255	298.30334	439.70845	0	190
31	8785	250.8897	-7.644596	215.09037	321.63448	0	190
32	8785	252.7701	-6.5674765	87.153808	408.89807	0	600

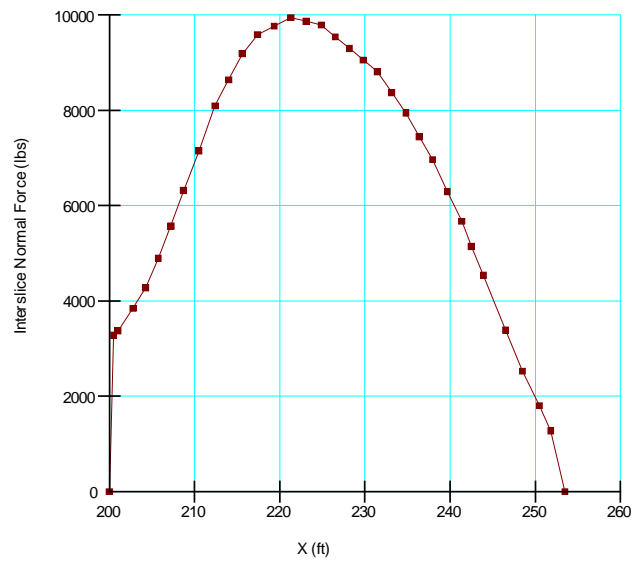
3/20/2012

3/20/2012

Base Normal Stress Vs. X



Interslice Normal Stress Vs. X



GAP Stability (Block)

Report generated using GeoStudio 2007, version 7.19. Copyright © 1991-2012 GEO-SLOPE International Ltd.

File Information

Created By: Liljegren, James
Revision Number: 267
Last Edited By: Curran, Matthew MVN
Date: 1/10/2012
Time: 1:38:59 PM
File Name: Reach 12B OPEN.gsz
Directory: G:\F&MHOME\London Ave Reevaluation 2011\West Side\Reach 12B\SlopeW\
Last Solved Date: 1/10/2012
Last Solved Time: 1:39:14 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 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

Phi-B: 0 °

Sheet Pile

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

Fill (Protected), EL -4 to -6

Model: Undrained (Phi=0)
Unit Weight: 107 pcf
Cohesion: 600 psf

Marsh, EL. -6 TO -13 (Protected)

Model: Undrained (Phi=0)
Unit Weight: 101 pcf
Cohesion: 190 psf

Slip Surface Limits

Left Coordinate: (131.6, -14.9) ft
Right Coordinate: (310, -4.9) ft

Slip Surface Block

Left Grid
 Upper Left: (200, -10.5) ft
 Lower Left: (200, -15.5) ft
 Lower Right: (200, -15.5) ft
 X Increments: 0
 Y Increments: 5
 Starting Angle: 135 °
 Ending Angle: 135 °
 Angle Increments: 0
Right Grid
 Upper Left: (220, -10.5) ft
 Lower Left: (220, -15.5) ft
 Lower Right: (280, -15.5) ft
 X Increments: 12
 Y Increments: 5
 Starting Angle: 30 °
 Ending Angle: 45 °
 Angle Increments: 4

Advanced

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

Materials

EMBANKMENT FILL CH, EL. +4 TO -2/-6

Model: Spatial Mohr-Coulomb
Unit Weight: 107 pcf
Cohesion Fn: Fill
Phi: 0 °
Phi-B: 0 °

MARSH 1, EL. -2 TO -6

Model: Spatial Mohr-Coulomb
Unit Weight: 80 pcf
Cohesion Fn: Marsh
Phi: 0 °
Phi-B: 0 °

BEACH SAND SP, EL. -13/-14 TO -48

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

BAY SOUND CLAY CL, EL. -48 TO -70

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

MARSH 2, EL. -6 TO -14

Model: Spatial Mohr-Coulomb
Unit Weight: 101 pcf
Cohesion Fn: Marsh
Phi: 0 °

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: (182.3, 190)
 Data Point: (200, 200)
 Data Point: (310, 190)

Fill

Model: Spline Data Point Function
Function: Cohesion vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 600
Data Points: X (ft), Cohesion (psf)
 Data Point: (182.3, 600)
 Data Point: (200, 700)
 Data Point: (242.5, 600)

Shear/Normal Strength Functions

Sand

Model: Spline Data Point Function
Function: Shear Stress vs. Normal Stress
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
 Data Point: (-100000, 0)
 Data Point: (0, 0)
 Data Point: (100000, 57735)
Estimation Properties
 Intact Rock Param.: 10
 Geological Strength: 100
 Disturbance Factor: 0
 SigmaC: 600000 psf
 Sigma3: 300000 psf
 Num. Points: 20

Spatial Functions

CLAY
Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (131.6, -48, 610)
Data Point: (131.6, -70, 855)
Data Point: (182.3, -48, 610)
Data Point: (182.3, -70, 855)
Data Point: (200, -48, 900)
Data Point: (200, -70, 900)
Data Point: (242.5, -48, 610)
Data Point: (242.5, -70, 855)
Data Point: (310, -48, 610)
Data Point: (310, -70, 855)

Regions

	Points	Area (ft²)	Material
Region 1	35,21,2,3,24,9	53.225	
Region 2	9,10,26,35	70.8	
Region 3	24,19,23,4,30,14,9	212.525	EMBANKMENT FILL CH, EL. +4 TO -2/6
Region 4	9,14,10	85	MARSH 1, EL. -2 TO -6
Region 5	26,27,38,40,34	109.57536	
Region 6	38,27,12,13,39	84.467862	BEACH SAND SP, EL. -13/-14 TO -48
Region 7	13,12,15,6,8,25,7,37,36,39	5985.635	BEACH SAND SP, EL. -13/-14 TO -48
Region 8	7,25,8,16,17	3923.7	BAY SOUND CLAY CL, EL. -48 TO -70
Region 9	31,18,5,14,30	80.595	Fill (Protected), EL -4 to -6
Region 10	15,14,5,6	472.5	Marsh, EL. -6 TO -13 (Protected)
Region 11	15,12,11,10,14	318.75	MARSH 2, EL. -6 TO -14
Region 12	26,27,12,11,10	132.75	
Region 13	28,29,23,19,24	7.65	Sheet Pile
Region 14	1,32,33,41,38,39	39.708567	BEACH SAND SP, EL. -13/-14 TO -48
Region 15	34,22,35,26	26.11	
Region 16	1,39,36,37	66.115	BEACH SAND SP, EL. -13/-14 TO -48
Region 17	41,20,40,38	11.053228	

Points

	X (ft)	Y (ft)
Point 1	131.6	-15.5
Point 2	192.9	2.5
Point 3	199	3.1
Point 4	210.5	4
Point 5	310	-6
Point 6	310	-13
Point 7	131.6	-48
Point 8	310	-48
Point 9	200	-2
Point 10	200	-6
Point 11	200	-8.7
Point 12	200	-14
Point 13	200	-15.5
Point 14	242.5	-6
Point 15	242.5	-13
Point 16	310	-70
Point 17	131.7	-70
Point 18	310	-4.9
Point 19	201	3.1
Point 20	163.4	-10.8
Point 21	189	-0.1
Point 22	173.2	-4.6
Point 23	201	4.3
Point 24	200	3.1
Point 25	200	-48
Point 26	182.3	-6
Point 27	182.3	-13
Point 28	200	12.9
Point 29	200.5	12.9
Point 30	242.5	-4
Point 31	256.6	-4.9
Point 32	131.6	-14.9
Point 33	153.9	-14.3

Point 34	171	-6
Point 35	182.3	-2
Point 36	153.8	-17.8
Point 37	131.6	-18.4
Point 38	164.24571	-13
Point 39	161.1	-15.5
Point 40	166	-9.15789
Point 41	157.42857	-13

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.25	(227.426, -2.984)	22.36348	(200, 12.9)	(256.659, -4.9)
2	157	1.50	(227.426, -2.984)	22.526	(200, 12.9)	(256.394, -4.88684)

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	8.8375245	749.24198	1098.8586	0	199.98
2	Optimized	200.75	8.968654	701.36123	1109.0731	0	199.93
3	Optimized	201.95	9.2833655	720.528	1263.3295	0	199.82
4	Optimized	203.85	9.781656	749.03755	1310.4721	0	199.65
5	Optimized	205.75	10.27995	775.0016	1357.6146	0	199.48
6	Optimized	207.65	-	800.1511	1404.8081	0	199.3

	ed		10.778245				
7	Optimized	209.55	11.276535	822.80601	1451.9507	0	199.13
8	Optimized	211.46595	11.77901	845.21767	1477.6914	0	198.96
9	Optimized	213.39785	12.28567	867.04783	1481.9473	0	198.78
10	Optimized	215.32975	12.79233	888.27715	1486.2032	0	198.61
11	Optimized	217.4231	13.16186	899.85203	1528.297	0	198.42
12	Optimized	219.6782	13.394295	901.80644	1497.5712	0	198.21
13	Optimized	221.73925	13.486515	896.04881	1502.483	0	198.02
14	Optimized	223.58785	13.43895	882.74229	1452.6692	0	197.86
15	Optimized	225.41835	13.39185	869.58089	1403.4641	0	197.69
16	Optimized	227.24885	13.34475	856.4741	1354.2044	0	197.52
17	Optimized	229.07935	13.29765	843.3127	1304.9448	0	197.36
18	Optimized	230.90985	13.25055	830.20591	1255.6851	0	197.19
19	Optimized	232.61635	-	818.52863	1207.4166	0	197.03

	ed		13.2144 25				
20	Optimiz ed	234.19885	- 13.1892 75	808.22989	1166.4744	0	196.89
21	Optimiz ed	235.89725	- 13.1622 85	797.20381	1121.5966	187.28826	-9.9427e- 007
22	Optimiz ed	237.7115	- 13.1334 55	785.46482	1072.381	165.65115	-8.7948e- 007
23	Optimiz ed	239.5257	- 13.1046 25	773.78095	1023.2206	144.01404	-7.6457e- 007
24	Optimiz ed	241.33995	- 13.0757 95	762.09708	974.06015	122.37694	-6.4966e- 007
25	Optimiz ed	242.37355	- 13.0581 3	755.37441	948.13085	111.28798	3.0614e- 006
26	Optimiz ed	243.44055	- 13.0306 9	747.86291	934.92163	107.99841	-5.733e- 007
27	Optimiz ed	245.3723	- 12.4312 9	696.20935	1029.5888	0	190
28	Optimiz ed	247.3491	- 11.2841 25	605.43222	889.71946	0	190
29	Optimiz ed	249.32025	- 10.1402 13	513.41951	750.27435	0	190
30	Optimiz ed	251.2914	- 8.99629 75	421.49017	610.82924	0	190
31	Optimiz ed	253.03045	- 7.81825 5	327.67771	522.69799	0	190
32	Optimiz	254.5374	-	232.16084	374.57523	0	190

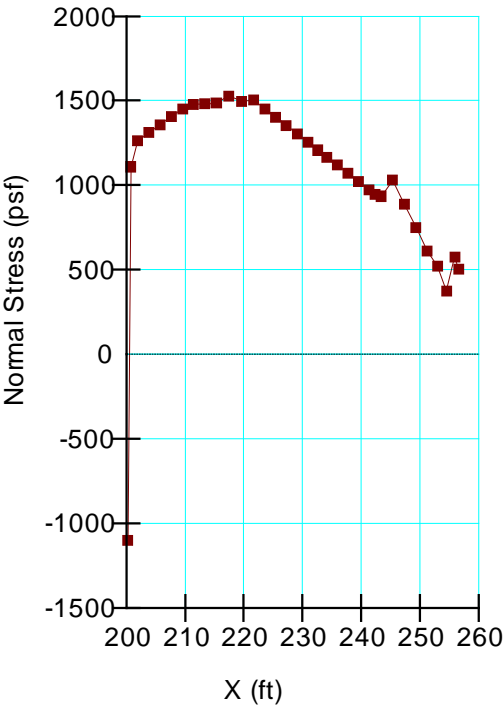
	ed		6.60608 5				
33	Optimiz ed	255.94545	- 5.47351 7	98.238388	576.15052	0	600
34	Optimiz ed	256.62925	- 4.92351 7	3.7246893	505.48689	0	600

Slices of Slip Surface: 157

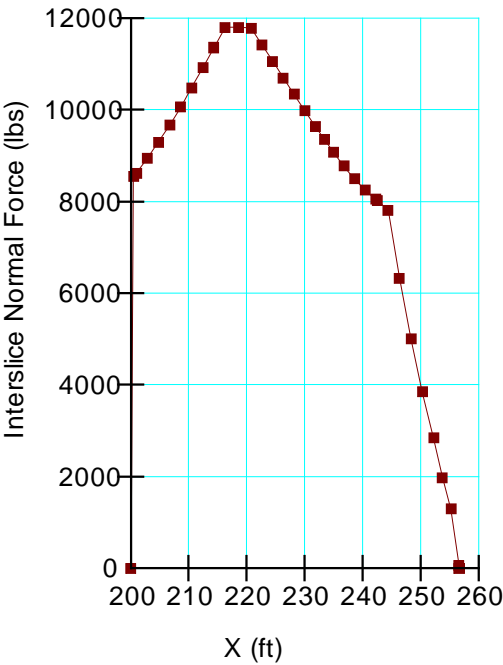
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	157	200.25	-12.5	953.5	-2035	0	199.98
2	157	200.75	-12.5	937.44	1543.58	0	199.93
3	157	201.95	-12.5	934.78947	1671.2632	0	199.82
4	157	203.85	-12.5	927.68421	1669.6316	0	199.65
5	157	205.75	-12.5	920.31579	1668.0526	0	199.48
6	157	207.65	-12.5	911.47368	1666.4211	0	199.3
7	157	209.55	-12.5	901.31579	1664.8421	0	199.13
8	157	211.4412	-12.5	891.17185	1641.2437	0	198.96
9	157	213.32355	-12.5	880.97185	1595.6625	0	198.79
10	157	215.2059	-12.5	870.55935	1550.0812	0	198.62
11	157	217.08825	-12.5	860.09372	1504.5	0	198.45
12	157	218.9706	-12.5	849.6281	1458.8656	0	198.28
13	157	220.85295	-12.5	839.05622	1413.2843	0	198.1
14	157	222.7353	-12.5	828.48435	1367.7031	0	197.93
15	157	224.61765	-12.5	817.91247	1322.1218	0	197.76
16	157	226.5	-12.5	807.23435	1276.5406	0	197.59
17	157	228.38235	-12.5	796.55623	1230.9593	0	197.42
18	157	230.2647	-12.5	785.93123	1185.3781	0	197.25
19	157	232.14705	-12.5	775.2531	1139.7968	0	197.08
20	157	234.0294	-12.5	764.57498	1094.2156	0	196.91
21	157	235.91175	-12.5	754.0031	1048.6343	0	196.74
22	157	237.7941	-12.5	742.84685	1003.0531	0	196.56
23	157	239.67645	-12.5	732.48748	957.41872	0	196.39
24	157	241.5588	-12.5	722.1281	911.83747	0	196.22

25	157	243.75	-12.5	709.96	879.96	0	190
26	157	245.9728	-11.85	652.62413	977.16264	0	190
27	157	247.9184	-10.55	550.78382	817.32935	0	190
28	157	249.864	-9.25	447.78964	657.49605	0	190
29	157	251.80955	-7.95	344.38947	497.66276	0	190
30	157	253.7551	-6.65	240.17303	337.83374	0	190
31	157	255.5609	- 5.443422	96.425133	431.10319	0	600

Base Normal Stress Vs. X



Interslice Normal Stress
Vs. X



GAP Stability (Entry/Exit)

Report generated using GeoStudio 2007, version 7.15. Copyright © 1991-2009 GEO-SLOPE International Ltd.

File Information

Created By: Lijegren, James
Revision Number: 349
Last Edited By: Bonanno, Brian P MVN
Date: 12/19/2011
Time: 11:15:08 AM
File Name: Reach 13.gsz
Directory: G:\F&M\HOME\London Ave Reevaluation 2011\West Side\Reach 13\Slope W\
Last Solved Date: 12/19/2011
Last Solved Time: 11:16:04 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

GAP Stability (Entry/Exit)

Kind: SLOPE/W
Parent: Gap Stability (Seepage)
Method: Spencer
Settings
PWP Conditions Source: Parent Analysis
SlipSurface
Direction of movement: Left to Right
Use Passive Mode: Yes
Slip Surface Option: Entry and Exit
Critical slip surfaces saved: 1
Optimize Critical Slip Surface Location: Yes
Tension Crack
Tension Crack Option: (none)
FOS Distribution
FOS Calculation Option: Constant
Advanced
Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft

3/19/2012

Phi-B: 0 °

Sheet Pile

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

MARSH, EL. -6 TO -13 (protected)

Model: Spatial Mohr-Coulomb
Unit Weight: 75 pcf
Cohesion: 220 psf
Phi: 0 °
Phi-B: 0 °

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (200, -15.5) ft
Left-Zone Right Coordinate: (200, 2) ft
Left-Zone Increment: 14
Right Projection: Range
Right-Zone Left Coordinate: (230, -0.75556) ft
Right-Zone Right Coordinate: (275, -4.4) ft
Right-Zone Increment: 18
Radius Increments: 4

Slip Surface Limits

Left Coordinate: (120.8, -15.5) ft
Right Coordinate: (370, -4.4) ft

Cohesion Functions

Fill

Model: Spline Data Point Function
Function: Cohesion vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 600
Data Points: X (ft), Cohesion (psf)
Data Point: (178.2, 600)
Data Point: (200, 700)
Data Point: (245.2, 600)

Shear/Normal Strength Functions

Sand

3/19/2012

Optimization Maximum Iterations: 2000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 10
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

EMBANKMENT FILL CH, EL. +4 TO -2.0

Model: Spatial Mohr-Coulomb
Unit Weight: 109 pcf
Cohesion Fn: Fill
Phi: 0 °
Phi-B: 0 °

MARSH 1, MH, EL. -2 TO -6

Model: Spatial Mohr-Coulomb
Unit Weight: 75 pcf
Cohesion: 250 psf
Phi: 0 °
Phi-B: 0 °

BEACH SAND SP, EL. -14 TO -49

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

BAY SOUND CLAY CL, EL. -49 TO -70

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

MARSH 2, MH, EL. -6 TO -14

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

Fill (Protected) ,EL -4.4 to -6 (Protected Side)

Model: Spatial Mohr-Coulomb
Unit Weight: 109 pcf
Cohesion: 600 psf
Phi: 0 °

3/19/2012

Model: Spline Data Point Function
Function: Shear Stress vs. Normal Stress
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
Data Point: (-100000, 0)
Data Point: (0, 0)
Data Point: (100000, 57735)
Estimation Properties
Intact Rock Param.: 10
Geological Strength: 100
Disturbance Factor: 0
SigmaC: 600000 psf
Sigma3: 300000 psf
Num. Points: 20

Unit Weight Functions

Marsh 2

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 75
Data Points: X (ft), Unit Weight (pcf)
Data Point: (178.2, 75)
Data Point: (200, 105)
Data Point: (245.2, 75)

Spatial Functions

Bay Sound

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (0, -49, 700)
Data Point: (0, -70, 900)
Data Point: (200, -49, 720)
Data Point: (200, -70, 930)
Data Point: (310, -49, 700)
Data Point: (310, -70, 900)
Data Point: (245.2, -49, 700)
Data Point: (245.2, -70, 900)
Data Point: (178.2, -49, 700)
Data Point: (178.2, -70, 900)

Marsh 2

3/19/2012

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (200, -6, 250)
Data Point: (200, -14, 310)
Data Point: (245.2, -6, 220)
Data Point: (245.2, -13, 220)
Data Point: (178.2, -6, 220)
Data Point: (178.2, -13, 220)

Regions

	Points	Area (ft²)	Material
Region 1	23,2,11,12,42,39	109.0625	
Region 2	11,15,12	90.4	MARSH 1, MH, EL -2 TO -6
Region 3	7,1,34,35,31,40,30,14,41,32,33	206.375	
Region 4	9,38,37,36,10,17,18	5236.55	BAY SOUND CLAY CL, EL -49 TO -70
Region 5	24,19,6,15	199.68	Fill (Protected) ,EL -4.4 to -6 (Protected Side)
Region 6	14,16,8,10,36,37,38,9,7,33,32,41	8747.25	BEACH SAND SP, EL -14 TO -49
Region 7	2,22,3,27,4,11	69.71	
Region 8	4,20,25,5,24,15,11	212.94	EMBANKMENT FILL CH, EL +4 TO -2.0
Region 9	12,15,16,14,21,13	339	MARSH 2, MH, EL -6 TO -14
Region 10	20,4,28,29,25	7.275	Sheet Pile
Region 11	30,40,31,35,26,39,42	129.5125	
Region 12	30,42,12,13,21,14	163.5	
Region 13	16,15,6,8	873.6	MARSH, EL -6 TO -13 (protected)

Points

	X (ft)	Y (ft)
Point 1	120.8	-13
Point 2	178.2	-2.1
Point 3	192.7	3
Point 4	200	3.4
Point 5	211	3.8
Point 6	370	-6
Point 7	120.8	-15.5
Point 8	370	-13
Point 9	120.8	-49
Point 10	370	-49
Point 11	200	-2

Point 12	200	-6
Point 13	200	-7.9
Point 14	200	-14
Point 15	245.2	-6
Point 16	245.2	-13
Point 17	370	-70
Point 18	120.8	-70
Point 19	370	-4.4
Point 20	201	3.4
Point 21	200	-10.7
Point 22	189	1
Point 23	171.5	-4
Point 24	245.2	-4.4
Point 25	201	4
Point 26	161.3	-10.4
Point 27	199	3.4
Point 28	200	12.9
Point 29	200.5	12.9
Point 30	178.2	-13
Point 31	146.5	-13
Point 32	151.7	-15.5
Point 33	138.6	-15.5
Point 34	120.8	-12.5
Point 35	146.5	-12
Point 36	245.2	-49
Point 37	199.9	-48.9
Point 38	178.2	-49
Point 39	168.3125	-6
Point 40	154.61111	-13
Point 41	200	-15.5
Point 42	178.2	-6
Point 43	205	2
Point 44	205	-56

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.53	(224.141, 43.477)	20.90723	(200, 12.9)	(252.395, -4.4)
2	622	1.62	(224.141, 43.477)	56.857	(200, 12.9)	(254.809, -4.4)

Slices of Slip Surface: **Optimized**

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)

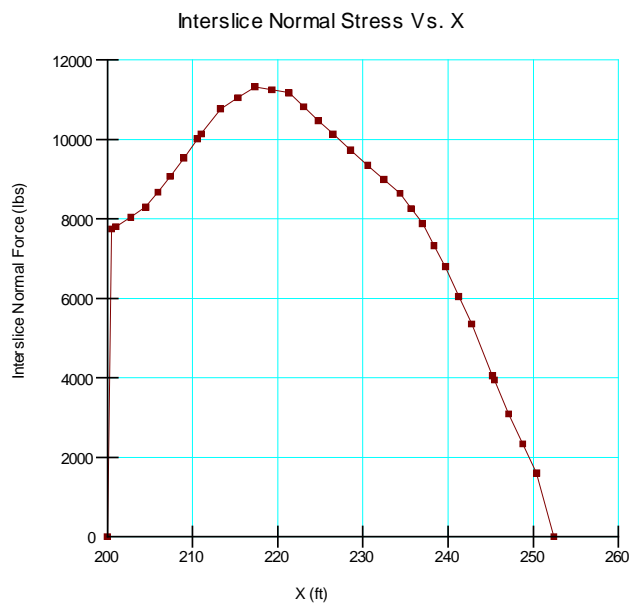
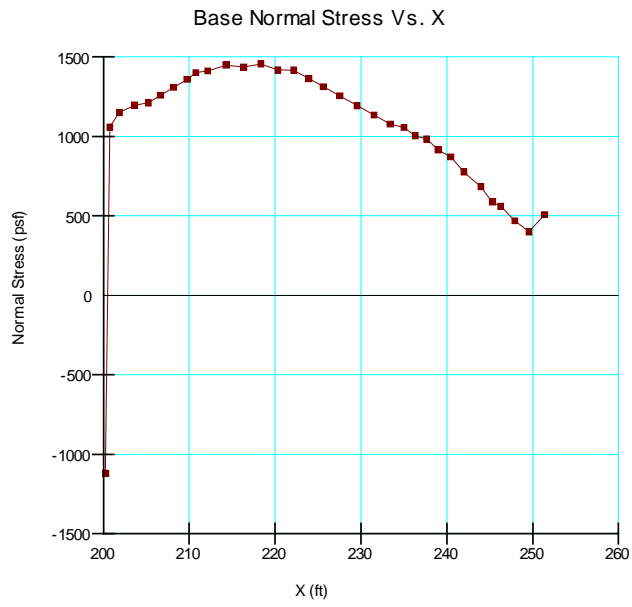
1	Optimized	200.25	-8.065578	960.64192	-1120.5042	0	265.25
2	Optimized	200.75	-8.1997745	961.66569	1058.9236	0	265.76
3	Optimized	201.87645	-8.5020995	982.53889	1151.4196	0	266.84
4	Optimized	203.6293	-8.972553	1014.4967	1196.4361	0	268.3
5	Optimized	205.2227	-9.4672775	209.29043	1211.6642	0	269.87
6	Optimized	206.6567	-9.9862725	238.20172	1259.0737	0	271.55
7	Optimized	208.16975	-10.529025	268.79382	1309.7966	0	273.05
8	Optimized	209.7619	-11.095535	301.17334	1359.502	0	274.31
9	Optimized	210.779	-11.45008	321.54777	1401.8863	0	274.93
10	Optimized	212.14645	-11.89122	347.24055	1412.8451	0	275.37
11	Optimized	214.3046	-12.48265	382.32855	1449.1263	0	275.11
12	Optimized	216.328	-12.92581	408.57185	1435.8502	0	273.91
13	Optimized	218.33205	-13.242045	427.77125	1456.4176	0	271.84
14	Optimized	220.3167	-13.43136	439.29779	1418.7481	0	269.03
15	Optimized	222.17345	-13.50727	443.9209	1417.165	0	265.84
16	Optimized	223.9023	-13.46977	441.57881	1364.7138	0	262.4
17	Optimized	225.6311	-13.43227	439.23094	1312.3205	0	258.96
18	Optimized	227.51575	-13.39084	436.6417	1255.4362	0	255.21
19	Optimized	229.5562	-13.34548	433.80481	1193.7496	0	251.15
20	Optimized	231.51895	-13.299795	430.94867	1135.083	0	247.23
21	Optimized	233.4041	-13.25378	428.07437	1077.9153	0	243.47
22	Optimized	235.005	-13.145955	421.34269	1055.8802	0	240.15
23	Optimized	236.3216	-12.97632	410.76656	1004.0542	0	237.32
24	Optimized	237.65605	-12.71342	394.37327	984.34206	0	234.39
25	Optimized	239.00835	-12.35726	372.16211	915.54896	0	231.43
26	Optimized	240.45405	-11.877915	342.23714	870.89938	0	228.36
27	Optimized	241.9932	-11.275385	304.64841	776.57967	0	225.3
28	Optimized	243.9814	-10.283715	242.77234	684.42487	0	221.79
29	Optimized	245.319	-9.52589	195.47201	587.36652	0	220
30	Optimized	246.26905	-8.9095775	157.00908	559.861	0	220
31	Optimized	247.93115	-7.8117925	88.492376	469.10448	0	220
32	Optimized	249.56355	-6.63145	14.822558	399.63322	0	220

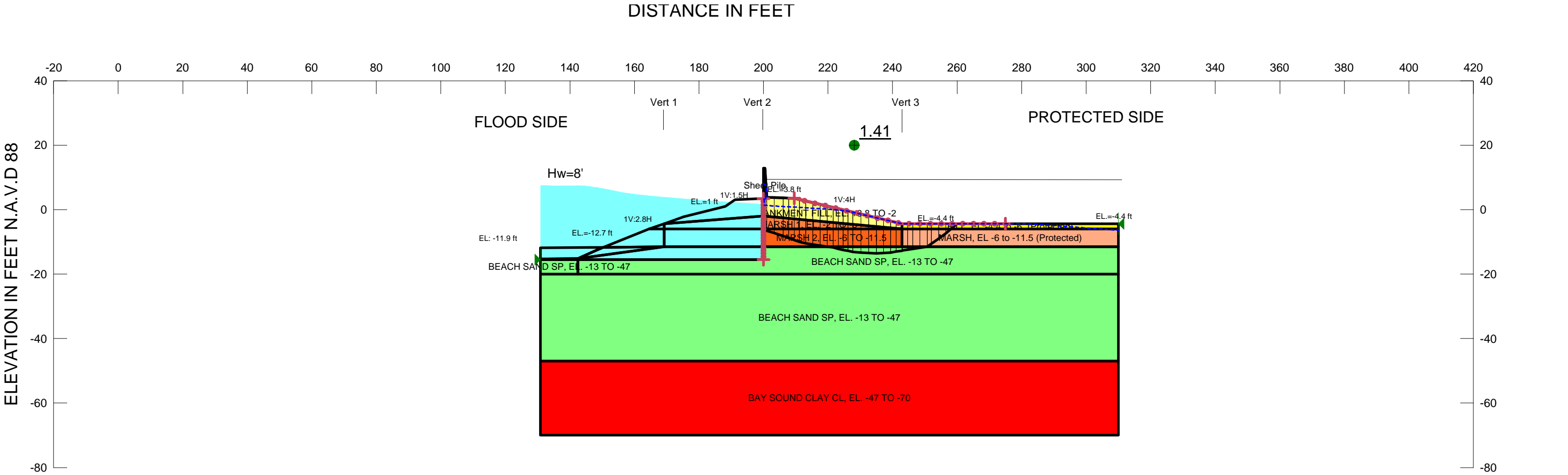
33	Optimized	251.38015	-5.2	-74.514772	507.75108	0	600
----	-----------	-----------	------	------------	-----------	---	-----

Slices of Slip Surface: **622**

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	622	200.25	-8.115768	964.10736	-971.16716	0	265.63
2	622	200.75	-8.344381	971.82453	1023.2121	0	266.83
3	622	202	-8.8801135	1009.1265	1144.61	0	269.43
4	622	204	-9.6818855	1064.27	1233.4815	0	272.8
5	622	206	-10.3975	263.24618	1312.677	0	275.1
6	622	208	-11.03036	298.59769	1382.6018	0	276.44
7	622	210	-11.58332	330.10171	1443.6956	0	276.9
8	622	211.9	-12.038605	356.17736	1473.1134	0	276.6
9	622	213.7	-12.405215	377.77353	1471.7527	0	275.7
10	622	215.5	-12.711785	395.99443	1463.6809	0	274.27
11	622	217.3	-12.959295	410.52804	1449.1691	0	272.35
12	622	219.1	-13.148515	421.9866	1428.3509	0	270.01
13	622	220.9	-13.28004	429.97161	1401.5496	0	267.28
14	622	222.7	-13.354265	434.44914	1368.893	0	264.23
15	622	224.5	-13.37141	435.47462	1330.5289	0	260.9
16	622	226.3	-13.33153	432.97642	1286.627	0	257.34
17	622	228.1	-13.23451	426.92781	1237.3779	0	253.61
18	622	229.9	-13.08005	417.30895	1182.8838	0	249.75
19	622	231.7	-12.867675	404.07483	1123.2713	0	245.82
20	622	233.5	-12.59673	387.15041	1058.6345	0	241.88
21	622	235.3	-12.26636	366.55027	989.15406	0	237.98
22	622	237.1	-11.8755	342.16509	914.87443	0	234.18
23	622	238.9	-11.422855	313.90515	835.93226	0	230.53
24	622	240.7	-10.90688	281.68258	752.29089	0	227.12
25	622	242.5	-10.32575	245.42248	664.12395	0	223.99
26	622	244.3	-9.677331	204.93502	571.39948	0	221.22
27	622	246.06925	-8.972601	160.94409	499.4165	0	220
28	622	247.80775	-8.211189	113.41118	447.20666	0	220
29	622	249.54625	-	61.466025	389.10644	0	220

			7.3789585				
30	622	251.28475	- 6.4723645	4.8807977	324.74802	0	220
31	622	253.48125	-5.2	- 74.526438	390.52254	0	600





Name: EMBANKMENT FILL, EL. +3.8 TO -2 Model: Spatial Mohr-Coulomb Unit Weight: 107 pcf Cohesion Fn: Fill Phi: 0 °

Name: MARSH 1, EL. -2 TO -6 Model: Spatial Mohr-Coulomb Unit Weight: 80 pcf Cohesion Fn: Marsh 1&2 Phi: 0 °

Name: BEACH SAND SP, EL. -13 TO -47 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand

Name: BAY SOUND CLAY CL, EL. -47 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 108 pcf Cohesion Spatial Fn: Clay Cohesion Phi: 0 °

Name: MARSH 2, EL. -6 TO -11.5 Model: Spatial Mohr-Coulomb Weight Fn: Marsh 2 Cohesion Fn: Marsh 1&2 Phi: 0 °

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

Name: FILL, EL -4.4 to -6 (Protected) Model: Undrained (Phi=0) Unit Weight: 107 pcf Cohesion: 600 psf

Name: MARSH, EL -6 to -11.5 (Protected) Model: Spatial Mohr-Coulomb Unit Weight: 80 pcf Cohesion: 220 psf Phi: 0 °

GENERAL NOTES

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

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

Hw=CANAL WATER LEVEL

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

LONDON AVE OUTFALL CANAL, REACH 14,
PROTECTED SIDE STABILITY ANALYSIS,
CASE: GAP Stability (Entry/Exit) OPEN
STA. 96+00 TO 100+28
ORLEANS PARISH, LOUISIANA

GAP Stability (Entry/Exit) OPEN

Report generated using GeoStudio 2007, version 7.19. Copyright © 1991-2012 GEO-SLOPE International Ltd.

File Information

Created By: Liljegren, James
Revision Number: 280
Last Edited By: Middleton, Mark C MVN
Date: 6/18/2013
Time: 11:48:46 AM
File Name: Reach 14 OPEN-SP.gsz
Directory: Y:\Middleton\London Ave Canal\seepage test\14 and 15\
Last Solved Date: 6/18/2013
Last Solved Time: 11:50:20 AM

Project Settings

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

Analysis Settings

GAP Stability (Entry/Exit) OPEN

Kind: SLOPE/W
Parent: GAP Analysis (seepage) OPEN
Method: Spencer
Settings
PWP Conditions Source: Parent Analysis
Slip Surface
Direction of Movement: Left to Right
Use Passive Mode: Yes
Slip Surface Option: Entry and Exit
Critical slip surfaces saved: 1
Optimize Critical Slip Surface Location: Yes
Tension Crack
Tension Crack Option: (none)
FOS Distribution
FOS Calculation Option: Constant
Advanced

Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 2000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 10
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

EMBANKMENT FILL, EL. +3.8 TO -2

Model: Spatial Mohr-Coulomb
Unit Weight: 107 pcf
Cohesion Fn: Fill
Phi: 0 °
Phi-B: 0 °

MARSH 1, EL. -2 TO -6

Model: Spatial Mohr-Coulomb
Unit Weight: 80 pcf
Cohesion Fn: Marsh 1&2
Phi: 0 °
Phi-B: 0 °

BEACH SAND SP, EL. -13 TO -47

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

BAY SOUND CLAY CL, EL. -47 TO -70

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

MARSH 2, EL. -6 TO -11.5

Model: Spatial Mohr-Coulomb
Weight Fn: Marsh 2
Cohesion Fn: Marsh 1&2
Phi: 0 °
Phi-B: 0 °

Sheet Pile

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

FILL, EL -4.4 to -6 (Protected)

Model: Undrained (Phi=0)
Unit Weight: 107 pcf
Cohesion: 600 psf

MARSH, EL -6 to -11.5 (Protected)

Model: Spatial Mohr-Coulomb
Unit Weight: 80 pcf
Cohesion: 220 psf
Phi: 0 °
Phi-B: 0 °

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (200, -15.5) ft
Left-Zone Right Coordinate: (200, 3.4) ft
Left-Zone Increment: 20
Right Projection: Range
Right-Zone Left Coordinate: (209.5, 3.5) ft
Right-Zone Right Coordinate: (275, -4.4) ft
Right-Zone Increment: 20
Radius Increments: 20

Slip Surface Limits

Left Coordinate: (130.9, -15.5) ft
Right Coordinate: (310, -4.4) ft

Cohesion Functions

Marsh 1&2

Model: Spline Data Point Function
Function: Cohesion vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 220
Data Points: X (ft), Cohesion (psf)
Data Point: (169.2, 220)
Data Point: (200, 250)

Data Point: (242.9, 220)

Fill

Model: Spline Data Point Function
Function: Cohesion vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 600
Data Points: X (ft), Cohesion (psf)
Data Point: (169.2, 600)
Data Point: (200, 700)
Data Point: (242.9, 600)

Shear/Normal Strength Functions

Sand

Model: Spline Data Point Function
Function: Shear Stress vs. Normal Stress
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
Data Point: (-100000, 0)
Data Point: (0, 0)
Data Point: (100000, 57735)
Estimation Properties
Intact Rock Param.: 10
Geological Strength: 100
Disturbance Factor: 0
SigmaC: 600000 psf
Sigma3: 300000 psf
Num. Points: 20

Unit Weight Functions

Marsh 2

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 80
Data Points: X (ft), Unit Weight (pcf)
Data Point: (169.2, 80)
Data Point: (200, 109)
Data Point: (242.9, 80)

Spatial Functions

Clay Cohesion

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (100.5, -47, 630)
Data Point: (100.5, -70, 900)
Data Point: (169.2, -47, 630)
Data Point: (169.2, -70, 900)
Data Point: (200, -47, 705)
Data Point: (200, -70, 935)
Data Point: (242.9, -47, 630)
Data Point: (242.9, -70, 900)
Data Point: (310, -47, 630)
Data Point: (310, -70, 900)

Regions

	Points	Area (ft²)	Material
Region 1	3,28,34	3.76	
Region 2	12,32,13	85.8	MARSH 1, EL. -2 TO -6
Region 3	29,35,14,15,48	180.605	
Region 4	10,11,17,18	4119.3	BAY SOUND CLAY CL. -47 TO -70
Region 5	27,25,19,7,32	107.34186	FILL, EL.-4.4 to -6 (Protected)
Region 6	36,11,10,37,49	4835.7	BEACH SAND SP, EL. -13 TO -47
Region 7	24,23,4,26,5,31,12,28	105.99085	
Region 8	31,30,20,6,27,32,12	191.10273	EMBANKMENT FILL, EL. +3.8 TO -2
Region 9	16,3,34,35	65.37	
Region 10	1,21,22,16,2,29	53.34	
Region 11	12,13,34,28	86.22286	
Region 12	32,7,9,33	369.05	MARSH, EL -6 to -11.5 (Protected)
Region 13	15,14,33,9,36,49,48	1193.75	BEACH SAND SP, EL. -13 TO -47
Region 14	31,44,45,20,30	7.225	Sheet Pile
Region 15	34,13,46,47,14,35	169.4	
Region 16	13,32,33,14,47,46	235.95	MARSH 2, EL. -6 TO -11.5
Region 17	29,2,16,35	32.245	
Region 18	8,48,49,37	52.2	BEACH SAND SP, EL. -13 TO -47
Region 19	1,29,48,8	2.9	

Points

	X (ft)	Y (ft)
Point 1	130.9	-15.3
Point 2	148.1	-12.7
Point 3	164.5	-6
Point 4	191.1	3.1
Point 5	198.9	3.4
Point 6	209.5	3.5
Point 7	310	-6
Point 8	130.9	-15.5
Point 9	310	-11.5
Point 10	130.9	-47
Point 11	310	-47
Point 12	200	-2
Point 13	200	-6
Point 14	200	-11.5
Point 15	200	-15.5
Point 16	150.3	-11.7
Point 17	310	-70
Point 18	130.9	-70
Point 19	310	-4.4
Point 20	201	3.8
Point 21	130.9	-11.9
Point 22	146.3	-11.7
Point 23	188.1	1
Point 24	175.3	-2.2
Point 25	243.1	-4.4
Point 26	198.6	3.38846
Point 27	242.92268	-4.4
Point 28	169.20857	-4.4
Point 29	142.5	-15.2
Point 30	201	3.4
Point 31	200	3.4
Point 32	242.9	-6
Point 33	242.9	-11.5

Point 34	169.2	-6
Point 35	169.2	-11.5
Point 36	310	-20
Point 37	130.9	-20
Point 38	169.2	-47
Point 39	200	-47
Point 40	242.9	-47
Point 41	169.2	-70
Point 42	200	-70
Point 43	242.9	-70
Point 44	200	12.9
Point 45	200.5	12.9
Point 46	200	-6.9
Point 47	200	-10.3
Point 48	142.5	-15.5
Point 49	142.5	-20

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.41	(231.918, 50.593)	23.1711	(200, 12.9)	(259.929, -4.4)
2	5214	1.56	(231.918, 50.593)	64.196	(200, 12.9)	(265.037, -4.4)

Slices of Slip Surface: Optimized

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	200.25	-6.4085625	468.57112	-606.52282	0	249.83
2	Optimized	200.75	-6.538011	476.39322	905.89254	0	249.48
3	Optimized	202.16395	-6.9040725	498.25128	983.90176	0	248.49

4	Optimized	204.7171	-7.692135	543.59917	1033.7351	0	246.7
5	Optimized	206.95475	-8.482088	587.75411	1105.8057	0	245.14
6	Optimized	208.6516	-9.088544	620.55203	1161.1904	0	243.95
7	Optimized	210.30535	-9.679616	651.67089	1197.2925	0	242.79
8	Optimized	212.08255	-10.21736	678.37893	1237.2169	0	241.55
9	Optimized	214.1739	-10.639385	696.08969	1258.338	0	240.09
10	Optimized	216.41295	-10.98363	707.91999	1234.5009	0	238.52
11	Optimized	218.652	-11.327875	719.52958	1209.6484	0	236.96
12	Optimized	220.688	-11.640905	729.95613	1189.2186	265.15532	-1.8812e-005
13	Optimized	222.37575	-11.95707	742.10623	1161.236	241.98468	-1.2848e-006
14	Optimized	223.91825	-12.30759	757.02548	1163.6382	234.75799	-1.2463e-006
15	Optimized	225.44545	-12.62468	769.97838	1173.8205	233.15834	-1.238e-006
16	Optimized	226.9573	-12.908335	780.83505	1168.9447	224.07522	-1.1897e-006

17	Optimiz ed	228.9762	- 13.2203 45	791.16004	1169.4181	218.3874	-1.1594e- 006
18	Optimiz ed	231.43125	- 13.4252 55	792.82358	1160.2225	212.11785	-1.1262e- 006
19	Optimiz ed	233.8154	- 13.4947 05	786.32503	1103.8737	183.33682	-9.7326e- 007
20	Optimiz ed	236.10085	- 13.4738 55	774.6383	1059.2189	164.30268	-8.7217e- 007
21	Optimiz ed	238.28755	-13.3627	757.78543	983.0841	130.07625	-6.9056e- 007
22	Optimiz ed	240.26065	- 13.1606 65	736.19439	925.06425	109.04406	-5.7887e- 007
23	Optimiz ed	242.03155	- 12.8658 7	709.72348	832.54002	70.908159	-3.7633e- 007
24	Optimiz ed	243.01135	- 12.7027 7	695.09307	784.10059	51.388513	7.4535e- 007
25	Optimiz ed	243.8795	- 12.5582 55	682.15483	765.42315	48.074987	6.9753e- 007
26	Optimiz ed	245.4385	- 12.2987 4	658.87007	731.88803	42.156941	2.8001e- 006
27	Optimiz ed	247.32145	- 12.0017 35	631.75654	691.6977	34.607045	-1.2938e- 006
28	Optimiz ed	249.58225	- 11.6590 85	600.14549	648.11441	27.694871	-1.0354e- 006
29	Optimiz ed	251.3773	- 11.0419 9	550.65114	765.41991	0	220
30	Optimiz	253.13015	-9.78205	456.71773	666.06176	0	220

	ed						
31	Optimiz ed	255.3604	-8.14555	336.10362	522.43824	0	220
32	Optimiz ed	257.25845	-6.66365	228.61552	418.21909	0	220
33	Optimiz ed	258.98515	-5.2	89.486842	554.71092	0	600

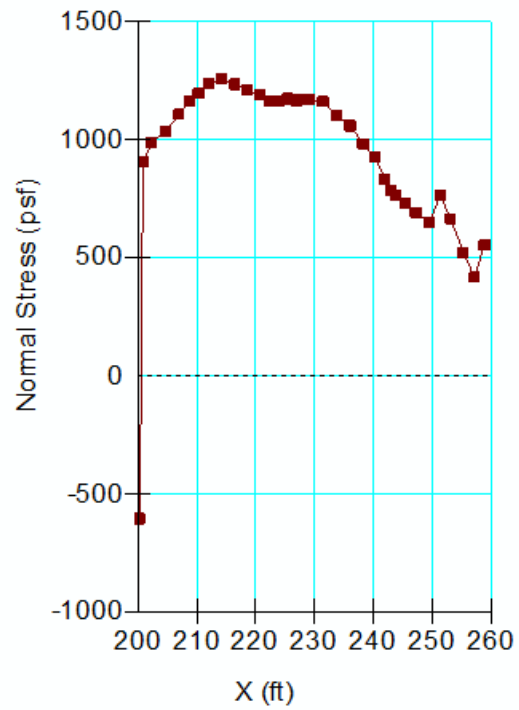
Slices of Slip Surface: 5214

	Slip Surfac e	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	5214	200.25	- 5.246782	451.46935	- 369.56431	0	249.83
2	5214	200.75	-5.52741	412.33512	746.11273	0	249.48
3	5214	201.3076	- 5.833128	431.13259	812.42953	0	249.09
4	5214	202.6008	- 6.506057	472.23371	881.96324	0	248.18
5	5214	204.572	- 7.476259	530.23603	987.35979	0	246.8
6	5214	206.5432	- 8.364603 5	581.58797	1082.4218	0	245.42
7	5214	208.5144	- 9.174746 5	626.47028	1167.676	0	244.05
8	5214	210.52065	-9.92159	666.09488	1223.7912	0	242.64
9	5214	212.56195	- 10.60531	700.8022	1250.6451	0	241.22
10	5214	214.60325	- 11.21406 5	730.27271	1268.2244	0	239.79
11	5214	216.673	- 11.75651 5	755.10203	1277.7475	301.74948	-2.1415e- 005
12	5214	218.77115	- 12.23257	775.46719	1291.8389	298.12732	-6.0307e- 005
13	5214	220.8693	-	791.237	1296.9751	291.98806	1.7622e-

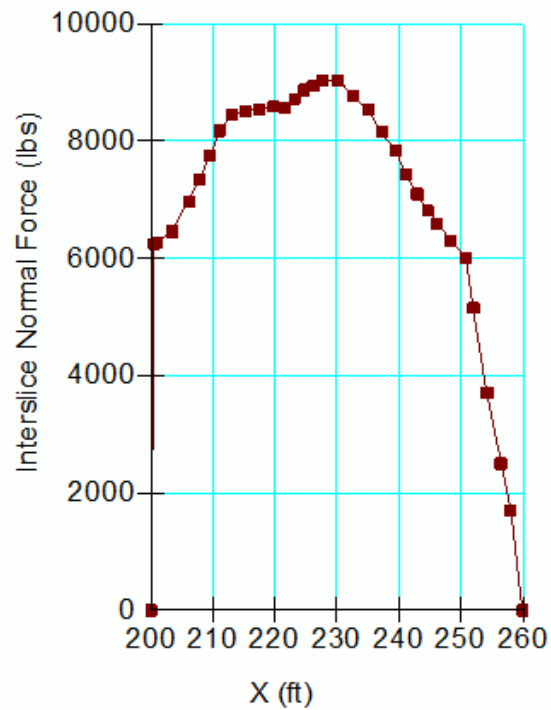
			12.63543 5				005
14	5214	222.9675	-12.9665	802.45792	1293.1452	283.2984	1.7096e- 005
15	5214	225.06565	- 13.22689	809.25135	1280.2444	271.92799	-1.9298e- 005
16	5214	227.1638	- 13.41746 5	811.66725	1258.1151	257.7568	1.5555e- 005
17	5214	229.26195	- 13.53884 5	809.72971	1226.6424	240.70466	-1.2783e- 006
18	5214	231.3601	- 13.59142 5	803.53058	1185.6604	220.62273	-1.1716e- 006
19	5214	233.4583	- 13.57537 5	792.99016	1134.8102	197.34991	-1.048e- 006
20	5214	235.55645	- 13.49064 5	778.1916	1073.8797	170.71558	-9.0656e- 007
21	5214	237.6546	- 13.33696 5	759.04661	1002.4257	140.51499	-7.4621e- 007
22	5214	239.75275	- 13.11383	735.58421	920.07156	106.51383	2.9313e- 006
23	5214	241.86225	- 12.81853	707.53168	825.70983	68.230185	1.8774e- 006
24	5214	243.01135	- 12.63669	690.94769	773.21263	47.495683	3.1531e- 006
25	5214	244.37825	- 12.36817 5	668.00813	741.29755	42.313667	6.1411e- 007
26	5214	246.9348	- 11.80760 5	621.40902	672.90155	29.729222	-1.113e- 006
27	5214	249.38045	- 11.16995	568.35441	660.18135	0	220
28	5214	251.7152	-	509.27865	610.60473	0	220

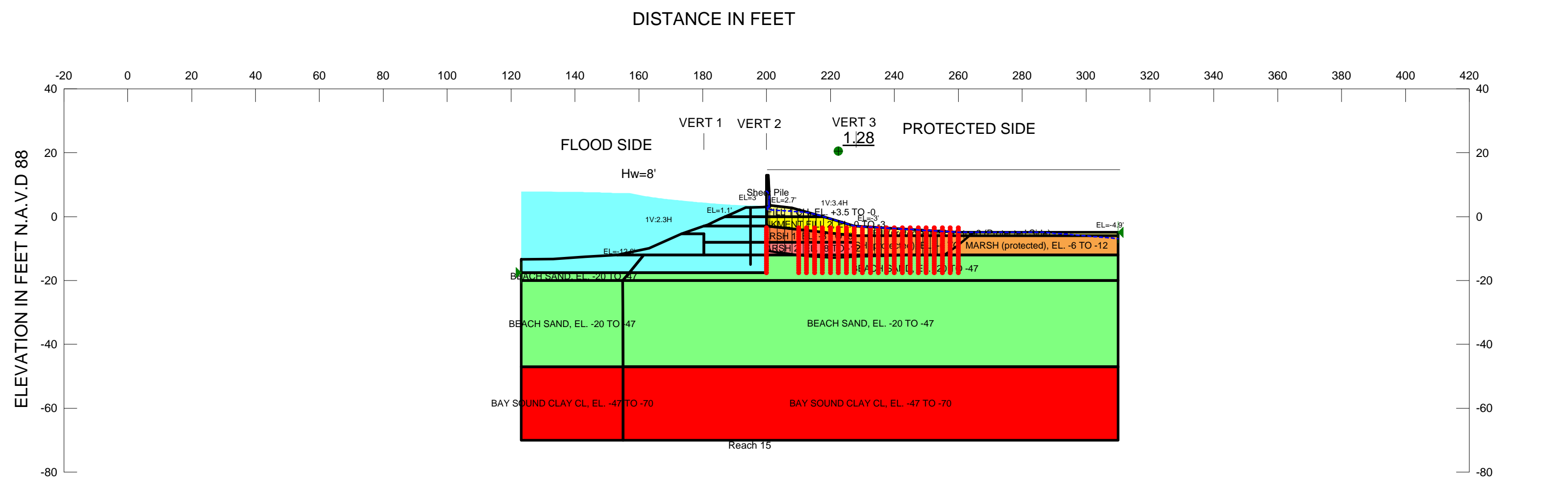
			10.46137 5				
29	5214	254.05	- 9.654016	444.13068	552.64056	0	220
30	5214	256.3848	- 8.743834	372.7425	485.88976	0	220
31	5214	258.7196	- 7.726001	295.02683	409.84165	0	220
32	5214	261.0544	- 6.594758	210.73252	323.87831	0	220
33	5214	263.62935	-5.2	81.806115	368.95982	0	600

Base Normal Stress Vs. X



Interslice Normal Stress
Vs. X





Name: EMBANKMENT FILL 1 CH, EL. +3.5 TO -0 Model: Undrained (Phi=0) Unit Weight: 113 pcf Cohesion: 1000 psf
Name: MARSH 1, EL. -3 TO -8 Model: Spatial Mohr-Coulomb Unit Weight: 87 pcf Cohesion Fn: Marsh 1 Phi: 0 °
Name: BEACH SAND, EL. -20 TO -47 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Beach Sand
Name: BAY SOUND CLAY CL, EL. -47 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 104 pcf Cohesion Spatial Fn: Bay Sound Phi: 0 °
Name: MARSH 2, EL. -8 TO -12 Model: Spatial Mohr-Coulomb Weight Fn: Marsh 2 Cohesion Fn: Marsh 2 Phi: 0 °
Name: Flll (protected) ,EL -3 to -6 (Protected Side) Model: Undrained (Phi=0) Unit Weight: 100 pcf Cohesion: 600 psf
Name: Sheet Pile Model: Undrained (Phi=0) Unit Weight: 0.1 pcf Cohesion: 0.01 psf
Name: EMBANKMENT FILL 2, EL. 0 TO -3 Model: Undrained (Phi=0) Unit Weight: 100 pcf Cohesion: 500 psf
Name: MARSH (protected), EL. -6 TO -12 Model: Undrained (Phi=0) Unit Weight: 87 pcf Cohesion: 250 psf

GENERAL NOTES

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

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

Hw=CANAL WATER LEVEL

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

LONDON AVE OUTFALL CANAL, REACH 15,
PROTECTED SIDE STABILITY ANALYSIS,
CASE: GAP Stability (Block)
STA. 100+28 TO 104+00
ORLEANS PARISH, LOUISIANA

GAP Stability (Block)

Report generated using GeoStudio 2007, version 7.19. Copyright © 1991-2012 GEO-SLOPE International Ltd.

File Information

Created By: Liljegren, James
Revision Number: 198
Last Edited By: Middleton, Mark C MVN
Date: 6/19/2013
Time: 1:48:29 PM
File Name: Reach 15 OPEN-SP.gsz
Directory: Y:\Middleton\London Ave Canal\seepage test\14 and 15\
Last Solved Date: 6/19/2013
Last Solved Time: 1:49:24 PM

Project Settings

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

Analysis Settings

GAP Stability (Block)

Kind: SLOPE/W
Parent: Gap Stability (Seepage)
Method: Spencer
Settings
 PWP Conditions Source: Parent Analysis
Slip Surface
 Direction of movement: Left to Right
 Use Passive Mode: Yes
 Slip Surface Option: Block
 Critical slip surfaces saved: 1
 Optimize Critical Slip Surface Location: Yes
 Tension Crack
 Tension Crack Option: (none)
FOS Distribution
 FOS Calculation Option: Constant
Restrict Block Crossing: Yes

FILL (protected) ,EL -3 to -6 (Protected Side)

Model: Undrained (Phi=0)
Unit Weight: 100 pcf
Cohesion: 600 psf

Sheet Pile

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

EMBANKMENT FILL 2, EL. 0 TO -3

Model: Undrained (Phi=0)
Unit Weight: 100 pcf
Cohesion: 500 psf

MARSH (protected), EL. -6 TO -12

Model: Undrained (Phi=0)
Unit Weight: 87 pcf
Cohesion: 250 psf

Slip Surface Limits

Left Coordinate: (123.2, -17.5) ft
Right Coordinate: (310, -4.9) ft

Slip Surface Block

Left Grid
 Upper Left: (200, -3.5) ft
 Lower Left: (200, -17.5) ft
 Lower Right: (200, -17.5) ft
 X Increments: 0
 Y Increments: 20
 Starting Angle: 135 °
 Ending Angle: 135 °
 Angle Increments: 0
Right Grid
 Upper Left: (210, -3.5) ft
 Lower Left: (210, -17.5) ft
 Lower Right: (260, -17.5) ft
 X Increments: 20
 Y Increments: 20
 Starting Angle: 30 °
 Ending Angle: 45 °
 Angle Increments: 3

Advanced

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

Materials

EMBANKMENT FILL 1 CH, EL. +3.5 TO -0

Model: Undrained (Phi=0)
Unit Weight: 113 pcf
Cohesion: 1000 psf

MARSH 1, EL. -3 TO -8

Model: Spatial Mohr-Coulomb
Unit Weight: 87 pcf
Cohesion Fn: Marsh 1
Phi: 0 °
Phi-B: 0 °

BEACH SAND, EL. -20 TO -47

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

BAY SOUND CLAY CL, EL. -47 TO -70

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

MARSH 2, EL. -8 TO -12

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

Cohesion Functions

Marsh 1

Model: Spline Data Point Function
Function: Cohesion vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 250
Data Points: X (ft), Cohesion (psf)
 Data Point: (180.3, 250)
 Data Point: (200, 400)
 Data Point: (227.5, 250)

Marsh 2

Model: Spline Data Point Function
Function: Cohesion vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 250
Data Points: X (ft), Cohesion (psf)
 Data Point: (180.3, 250)
 Data Point: (200, 400)
 Data Point: (227.5, 250)

Shear/Normal Strength Functions

Beach Sand

Model: Spline Data Point Function
Function: Shear Stress vs. Normal Stress
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
 Data Point: (-100000, 0)
 Data Point: (0, 0)
 Data Point: (100000, 57735)
Estimation Properties
 Intact Rock Param.: 10
 Geological Strength: 100
 Disturbance Factor: 0
 SigmaC: 600000 psf
 Sigma3: 300000 psf
 Num. Points: 20

Unit Weight Functions

Marsh 2
Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 88
Data Points: X (ft), Unit Weight (pcf)
Data Point: (180.3, 88)
Data Point: (200, 109)
Data Point: (227.5, 88)

Spatial Functions

Bay Sound
Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (0, -47, 640)
Data Point: (0, -70, 850)
Data Point: (180.3, -47, 640)
Data Point: (180.3, -70, 850)
Data Point: (400, -47, 640)
Data Point: (400, -70, 850)
Data Point: (200, -47, 680)
Data Point: (200, -70, 890)
Data Point: (227.5, -47, 640)
Data Point: (227.5, -70, 850)

Regions

	Points	Area (ft²)	Material
Region 1	30,36,50,3,41,4,28,20	28.44	
Region 2	47,46,45,21,11,12,22,31	106.78	
Region 3	15,37,6,7,58,16	121.625	Fill (protected) ,EL -3 to -6 (Protected Side)
Region 4	31,22,12,13,23,48	78.8	
Region 5	27,24,13,17,59,8,34,33,32	989.9375	BEACH SAND, EL. -20 TO -47
Region 6	16,58,59,17,44	195	MARSH (protected), EL. -6 TO -12
Region 7	13,24,27,57,48,23	223.7125	
Region 8	21,11,28,20,30,51,35,45	48.875	
Region 9	28,4,26,38,5,29	38.03	EMBANKMENT FILL 1 CH, EL. +3.5 TO -0

Region 10	11,28,29,15,16	109.2	EMBANKMENT FILL 2, EL. 0 TO -3
Region 11	9,32,33,34,10,18,14	4183.65	BEACH SAND, EL. -20 TO -47
Region 12	9,14,18,10,40,39	3562.7	BAY SOUND CLAY CL, EL. -47 TO -70
Region 13	12,44,17,13	110	MARSH 2, EL. -8 TO -12
Region 14	4,42,43,38,26	7.45	Sheet Pile
Region 15	12,11,16,44	96.25	MARSH 1, EL. -3 TO -8
Region 16	49,2,46,47,31,48,57	100.41	
Region 17	55,9,39,56	733.7	BAY SOUND CLAY CL, EL. -47 TO -70
Region 18	54,32,9,55	859.95	BEACH SAND, EL. -20 TO -47
Region 19	53,27,32,54	82.0625	BEACH SAND, EL. -20 TO -47
Region 20	52,1,19,49,57,27,53	172.6875	
Region 21	58,7,8,59	300	MARSH (protected), EL. -6 TO -12

Points

	X (ft)	Y (ft)
Point 1	133.2	-13.3
Point 2	163.2	-9.9
Point 3	195	2.9
Point 4	200	3.1
Point 5	208	2.7
Point 6	310	-4.9
Point 7	310	-6
Point 8	310	-12
Point 9	155.1	-47
Point 10	310	-47
Point 11	200	-3
Point 12	200	-8
Point 13	200	-12
Point 14	200	-47
Point 15	227.5	-3
Point 16	227.5	-6
Point 17	227.5	-12
Point 18	231.5	-47
Point 19	143.2	-12.6
Point 20	195	0

Point 21	195	-3
Point 22	195	-8
Point 23	195	-12
Point 24	200	-17.5
Point 25	195	-15
Point 26	201	3.1
Point 27	157.05	-17.5
Point 28	200	0
Point 29	217.8	0
Point 30	187	0
Point 31	180.3	-8
Point 32	155	-20
Point 33	200	-20
Point 34	310	-20
Point 35	181.5	-2.6
Point 36	189.6	1.1
Point 37	260	-4.9
Point 38	201	3.5
Point 39	155.1	-70
Point 40	310	-70
Point 41	198.9	3
Point 42	200	12.9
Point 43	200.5	12.9
Point 44	227.5	-8
Point 45	180.3	-3
Point 46	173.4	-5.4
Point 47	180.3	-5.4
Point 48	180.3	-12
Point 49	153.2	-12
Point 50	193.5	2.9
Point 51	185.3	-0.7
Point 52	123.2	-13.4
Point 53	123.2	-17.5
Point 54	123.2	-20
Point 55	123.2	-47
Point 56	123.2	-70

Point 57	161.6	-12
Point 58	260	-6
Point 59	260	-12

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.28	(232.325, -2.975)	24.90874	(200, 12.9)	(264.796, -4.9)
2	1166	1.38	(232.325, -2.975)	25.914	(200, 12.9)	(265.997, -4.9)

Slices of Slip Surface: Optimized

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimiz ed	200.25	-10.707975	866.76445	1377.5272	0	398.64
2	Optimiz ed	200.75	-10.77536	810.81028	1361.8291	0	395.91
3	Optimiz ed	202.16665	-10.966275	821.64365	1410.152	0	388.18
4	Optimiz ed	204.5	-11.28073	835.57486	1411.2988	0	375.45
5	Optimiz ed	206.83335	-11.595185	846.40552	1411.3413	0	362.73
6	Optimiz ed	208.9186	-11.876205	854.56899	1394.0015	0	351.35
7	Optimiz ed	210.65845	-12.11068	860.56318	1364.0617	290.69502	-2.0622e-005
8	Optimiz ed	212.301	-12.33204	865.87269	1337.8158	272.47651	-1.9328e-005

9	Optimiz ed	214.29175	- 12.5151 35	866.80066	1322.5623	263.13412	1.5874e- 005
10	Optimiz ed	216.6306	- 12.6599 7	863.38672	1262.4342	230.39019	-1.6344e- 005
11	Optimiz ed	219.1783	- 12.8177 4	859.54698	1197.1744	194.9293	-1.3829e- 005
12	Optimiz ed	221.71385	- 12.8528 95	848.04257	1147.9179	173.13313	-1.2284e- 005
13	Optimiz ed	224.0283	- 12.7525 1	829.22212	1053.9884	129.76885	-6.8898e- 007
14	Optimiz ed	226.34275	- 12.6521 25	810.40167	960.05878	86.404572	2.3774e- 006
15	Optimiz ed	228.57395	- 12.5553 45	792.25098	896.43945	60.153241	6.6791e- 007
16	Optimiz ed	230.7219	- 12.4621 8	774.7622	871.83423	56.04456	8.129e-007
17	Optimiz ed	232.83225	- 12.3876 55	758.65977	847.20464	51.121404	3.3937e- 006
18	Optimiz ed	234.905	- 12.3317 65	743.95052	827.86559	48.44839	7.0286e- 007
19	Optimiz ed	236.9778	- 12.2758 7	729.19304	808.52654	45.803219	6.6439e- 007
20	Optimiz ed	239.05055	- 12.2199 75	714.48379	789.23572	43.158048	2.8654e- 006
21	Optimiz ed	241.1233	- 12.1640 85	699.77454	769.89667	40.485034	2.6891e- 006

22	Optimiz ed	243.28605	- 12.1251 1	685.58731	749.86251	37.109302	2.464e-006
23	Optimiz ed	245.53875	- 12.1030 5	672.04868	733.83809	35.674136	5.1764e- 007
24	Optimiz ed	247.79145	- 12.0809 9	658.46566	717.81368	34.264598	-1.2815e- 006
25	Optimiz ed	250.04415	- 12.0589 3	644.88264	701.78927	32.855059	-1.2284e- 006
26	Optimiz ed	252.29685	- 12.0368 7	631.29962	685.76486	31.445521	-1.1751e- 006
27	Optimiz ed	254.5496	- 12.0148 1	617.76099	669.69606	29.984726	-1.1217e- 006
28	Optimiz ed	256.7583	- 11.2244 3	550.5641	825.20883	0	250
29	Optimiz ed	258.9203	- 9.66761 55	429.80454	662.12523	0	250
30	Optimiz ed	260.0059	- 8.88589 55	369.26298	580.28217	0	250
31	Optimiz ed	260.87745	- 8.16123	314.10484	543.60542	0	250
32	Optimiz ed	262.6087	- 6.72041	205.01525	403.33089	0	250
33	Optimiz ed	264.13515	- -5.45	74.32043	565.80644	0	600

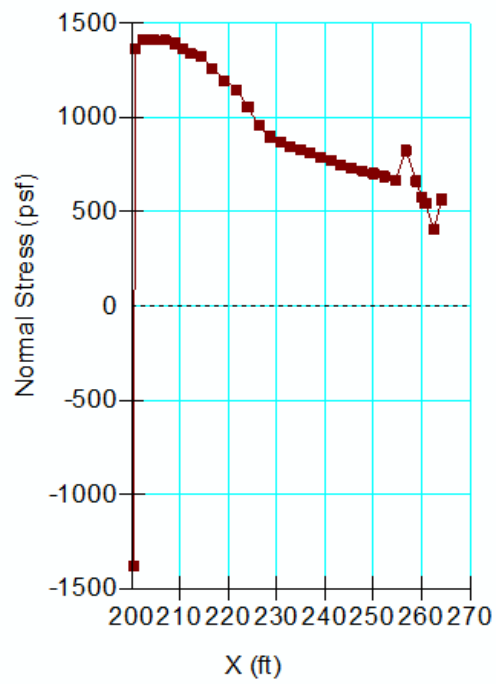
Slices of Slip Surface: 1166

	Slip Surfac e	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	1166	200.25	-12.6	974.34	-1843.48	0	0

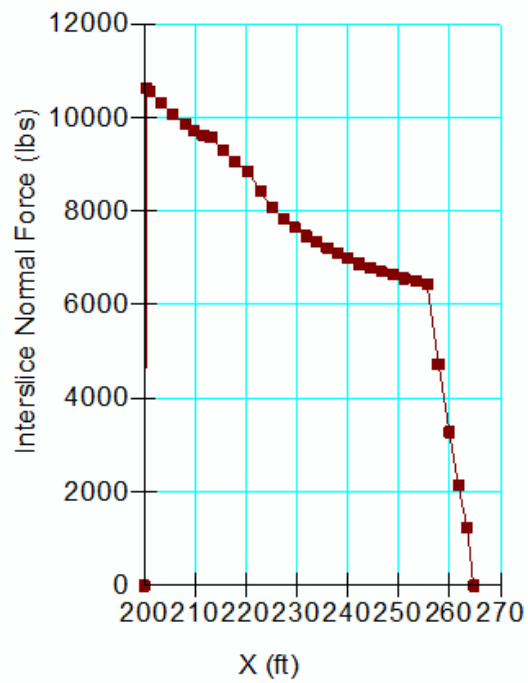
2	1166	200.75	-12.6	930.26	1631.9	405.09204	-8.1918e- 005
3	1166	202.16665	-12.6	927.98585	1660.886	423.14007	-8.5571e- 005
4	1166	204.5	-12.6	920.2287	1625.4431	407.15572	-8.2335e- 005
5	1166	206.83335	-12.6	910.15727	1590.1288	392.58174	-7.9389e- 005
6	1166	209.225	-12.6	898.4898	1530.3673	364.81467	-7.3774e- 005
7	1166	211.675	-12.6	885.87755	1446.2041	323.50467	-6.5421e- 005
8	1166	214.125	-12.6	872.97959	1362.0816	282.38319	1.7035e- 005
9	1166	216.575	-12.6	859.91837	1277.9184	241.33241	-1.2812e- 006
10	1166	219.0125	-12.6	846.84536	1194.4742	200.70362	-1.4239e- 005
11	1166	221.4375	-12.6	833.73196	1111.7113	160.49147	-8.5203e- 007
12	1166	223.8625	-12.6	820.61856	1028.9897	120.30313	-6.3867e- 007
13	1166	226.2875	-12.6	807.46392	946.2268	80.11479	-4.2536e- 007
14	1166	228.5577	-12.6	795.12713	894.39984	57.315125	8.3127e- 007
15	1166	230.6731	-12.6	783.63986	882.01439	56.79656	8.2343e- 007
16	1166	232.7885	-12.6	772.15259	869.58166	56.250702	8.1555e- 007
17	1166	234.90385	-12.6	760.71259	857.14894	55.67755	3.6974e- 006
18	1166	237.0192	-12.6	749.22532	844.71621	55.131692	7.9966e- 007
19	1166	239.1346	-12.6	737.78532	832.33076	54.585834	7.9165e- 007
20	1166	241.25	-12.6	726.29805	819.89803	54.039975	3.5875e- 006

21	1166	243.3654	-12.6	714.85805	807.46531	53.466824	7.7555e- 007
22	1166	245.4808	-12.6	703.41805	795.07986	52.920966	7.6746e- 007
23	1166	247.59615	-12.6	691.93078	782.64713	52.375107	7.5936e- 007
24	1166	249.7115	-12.6	680.49079	770.21441	51.801956	7.5123e- 007
25	1166	251.8269	-12.6	669.05079	757.78168	51.228805	7.4306e- 007
26	1166	253.9423	-12.6	657.61079	745.39623	50.682947	3.3643e- 006
27	1166	255.42845	-12.3	630.82897	848.05194	125.41374	-6.6618e- 007
28	1166	256.89265	- 11.27474	553.36268	811.45889	0	250
29	1166	258.9642	- 9.824221	440.58647	659.25844	0	250
30	1166	261.10645	- 8.324221 5	324.42351	509.02519	0	250
31	1166	263.31935	- 6.774740 5	205.77189	360.70789	0	250
32	1166	265.21125	- -5.45	72.301935	457.76104	0	600

Base Normal Stress Vs. X



Interslice Normal Stress Vs. X



GAP Stability (Block)

Report generated using GeoStudio 2007, version 7.15. Copyright © 1991-2009 GEO-SLOPE International Ltd.

File Information

Created By: Liljegren, James
Revision Number: 223
Last Edited By: Middleton, Mark C MVN
Date: 12/13/2011
Time: 8:53:43 AM
File Name: Reach 16.gsz
Directory: G:\F&MHOME\Middleton\London Ave Canal\Reach 16\optimization check\
Last Solved Date: 12/13/2011
Last Solved Time: 8:54:38 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)

Kind: SLOPE/W
Parent: Gap Stability (Seepage)
Method: Spencer
Settings
 PWP Conditions Source: Parent Analysis
Slip Surface
 Direction of movement: Left to Right
 Use Passive Mode: Yes
 Slip Surface Option: Block
 Critical slip surfaces saved: 1
 Optimize Critical Slip Surface Location: Yes
 Tension Crack
 Tension Crack Option: (none)
FOS Distribution
 FOS Calculation Option: Constant
Restrict Block Crossing: Yes

MARSH 2, EL. -7.5 to -12

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

Sheet Pile

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

EMBANKMENT FILL 2, EL. -1 TO -4

Model: Undrained (Phi=0)
Unit Weight: 90 pcf
Cohesion: 300 psf

Fill, EL. -3.5 to -6 (Protected)

Model: Undrained (Phi=0)
Unit Weight: 90 pcf
Cohesion: 600 psf

Marsh, EL. -6 to -12 (Protected)

Model: Undrained (Phi=0)
Unit Weight: 80 pcf
Cohesion: 200 psf

BAY SOUND CLAY CL, EL. -46 TO -70 (Protected)

Model: Spatial Mohr-Coulomb
Unit Weight: 104 pcf
Cohesion Fn: Clay 2
Phi: 0 °
Phi-B: 0 °

Slip Surface Limits

Left Coordinate: (143.6, -17.5) ft
Right Coordinate: (310, -4.7) ft

Slip Surface Block

Left Grid
 Upper Left: (200, -5) ft
 Lower Left: (200, -55) ft
 Lower Right: (200, -55) ft
 X Increments: 0
 Y Increments: 10

Advanced

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

Materials

EMBANKMENT FILL 1 CH, EL. +3.6 TO -1

Model: Undrained (Phi=0)
Unit Weight: 118 pcf
Cohesion: 1000 psf

MARSH 1, EL. -4 TO -7.5

Model: Spatial Mohr-Coulomb
Unit Weight: 80 pcf
Cohesion Fn: Marsh 1
Phi: 0 °
Phi-B: 0 °

BEACH SAND, EL. -24 TO -46

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

BAY SOUND CLAY CL, EL. -46 TO -70

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

Silted-in Layer

Model: Mohr-Coulomb
Unit Weight: 90 pcf
Cohesion: 0 psf
Phi: 20 °
Phi-B: 0 °

Starting Angle: 135 °
Ending Angle: 155 °
Angle Increments: 4
Right Grid
 Upper Left: (210, -5) ft
 Lower Left: (210, -55) ft
 Lower Right: (260, -55) ft
 X Increments: 10
 Y Increments: 10
 Starting Angle: 30 °
 Ending Angle: 45 °
 Angle Increments: 4

Cohesion Functions

Marsh 1

Model: Spline Data Point Function
Function: Cohesion vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 200
Data Points: X (ft), Cohesion (psf)
 Data Point: (166.6, 200)
 Data Point: (200, 450)
 Data Point: (231.4, 200)

Marsh 2

Model: Spline Data Point Function
Function: Cohesion vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 200
Data Points: X (ft), Cohesion (psf)
 Data Point: (166.6, 200)
 Data Point: (200, 250)
 Data Point: (231.4, 200)

Clay 2

Model: Spline Data Point Function
Function: Cohesion vs. Y
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 650
Data Points: Y (ft), Cohesion (psf)
 Data Point: (-70, 865)
 Data Point: (-46, 650)

Shear/Normal Strength Functions

Beach Sand

Model: Spline Data Point Function
Function: Shear Stress vs. Normal Stress
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
Data Point: (-100000, 0)
Data Point: (0, 0)
Data Point: (100000, 57735)
Estimation Properties
Intact Rock Param.: 10
Geological Strength: 100
Disturbance Factor: 0
SigmaC: 600000 psf
Sigma3: 300000 psf
Num. Points: 20

Unit Weight Functions

Marsh 2

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 80
Data Points: X (ft), Unit Weight (pcf)
Data Point: (166.7, 80)
Data Point: (200, 97)
Data Point: (231.4, 80)

Spatial Functions

Clay 1 Cohesion

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (166.7, -46, 650)
Data Point: (166.7, -70, 865)
Data Point: (200, -46, 665)
Data Point: (200, -70, 885)
Data Point: (231.4, -46, 650)

Data Point: (231.4, -70, 865)
Data Point: (310, -46, 650)
Data Point: (310, -70, 865)
Data Point: (143.6, -46, 650)
Data Point: (143.6, -70, 865)

Regions

	Points	Area (ft²)	Material
Region 1	55,30,4,5,33,24,21	50.995458	
Region 2	25,3,8,28,35,41,42,43	100.17577	
Region 3	36,31,32,7,9,18	110.58019	Fill, EL. -3.5 to -6 (Protected)
Region 4	18,9,19,38,37	471.6	Marsh, EL. -6 to -12 (Protected)
Region 5	52,20,3,25,51	29.215	
Region 6	35,12,24,21,55,29	69.918042	
Region 7	24,33,34,23,6,56	69.275	EMBANKMENT FILL 1 CH, EL. +3.6 TO -1
Region 8	12,24,56,36,18	114.85463	EMBANKMENT FILL 2, EL. -1 TO -4
Region 9	10,26,44,39,40,27,11,47,17,45	3928.9	BEACH SAND, EL. -24 TO -46
Region 10	35,12,13,42,41	133.23846	
Region 11	42,43,14,54,13	141.525	
Region 12	25,43,14,22,51	280.301	
Region 13	33,49,50,23,34	7.675	Sheet Pile
Region 14	12,18,37,13	86.35	MARSH 1, EL. -4 TO -7.5
Region 15	14,54,13,37,38	133.45	MARSH 2, EL. -7.5 to -12
Region 16	39,44,26,1,2,51,22,14,38,19,27,40	1411.969	BEACH SAND, EL. -24 TO -46
Region 17	52,51,2,1	9.15	Silted-in Layer
Region 18	45,17,47,48,53,46	1552.8	BAY SOUND CLAY CL, EL. -46 TO -70
Region 19	47,48,15,11	1886.4	BAY SOUND CLAY CL, EL. -46 TO -70 (Protected)

Region 20	10,16,46,45	554.4	BAY SOUND CLAY CL, EL. -46 TO -70 (Protected)
-----------	-------------	-------	---

Points

	X (ft)	Y (ft)
Point 1	143.6	-20
Point 2	146.9	-20
Point 3	149.7	-10
Point 4	195	2.8
Point 5	199	2.9
Point 6	208	3.5
Point 7	310	-4.7
Point 8	156.1	-6.4
Point 9	310	-6
Point 10	143.6	-46
Point 11	310	-46
Point 12	200	-4
Point 13	200	-7.5
Point 14	200	-12
Point 15	310	-70
Point 16	143.6	-70
Point 17	200	-46
Point 18	231.4	-6
Point 19	310	-12
Point 20	143.6	-13.3
Point 21	195	-1
Point 22	200	-17.4
Point 23	201	3.6
Point 24	200	-1
Point 25	149.5	-12
Point 26	143.6	-22
Point 27	310	-22
Point 28	165.3	-3.7
Point 29	176.2	-2.4
Point 30	192.6	2.8

Point 31	231.5	-3.5
Point 32	245.2	-4.7
Point 33	200	2.9
Point 34	201	2.9
Point 35	166.66154	-3.5
Point 36	231.35185	-3.5
Point 37	231.4	-8
Point 38	231.4	-12
Point 39	200	-24
Point 40	231.4	-22
Point 41	166.7	-6
Point 42	166.7	-8
Point 43	166.7	-12
Point 44	166.7	-22
Point 45	166.7	-46
Point 46	166.7	-70
Point 47	231.4	-46
Point 48	231.4	-70
Point 49	200	12.9
Point 50	200.5	12.9
Point 51	147.62	-17.5
Point 52	143.6	-17.5
Point 53	200	-70
Point 54	200	-11.6
Point 55	180.71818	-1
Point 56	222.9	-1

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.23	(214.627, -1.852)	14.25246	(200, 12.9)	(231.334, -3.49472)
2	341	1.31	(214.627, -1.852)	13.916	(200, 12.9)	(231.29, -3.48171)

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	200.1265	-	785.84266	-6860.0167	0	249.8
2	Optimized	200.3765	-10.01125	323.86916	1253.9563	0	249.4
3	Optimized	200.75	-10.04528	325.61145	1256.3168	0	248.81
4	Optimized	201.5	-10.11361	329.14667	1341.6429	0	247.61
5	Optimized	202.5	-	333.31939	1347.419	0	246.02
6	Optimized	203.5	-	336.95434	1353.0955	0	244.43
7	Optimized	204.5	-	339.60336	1358.6724	0	242.83
8	Optimized	205.5	-10.47804	342.2026	1364.2493	0	241.24
9	Optimized	206.5	-	344.72216	1369.627	0	239.65
10	Optimized	207.5	-	347.17201	1375.0047	0	238.06
11	Optimized	208.49575	-	349.56792	1363.8	0	236.47
12	Optimized	209.48725	-	351.9484	1335.8772	0	234.89
13	Optimized	210.47875	-10.93164	354.7909	1307.8539	0	233.31

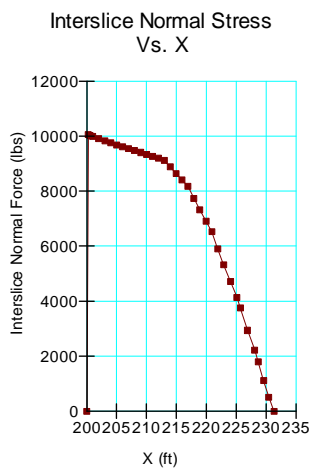
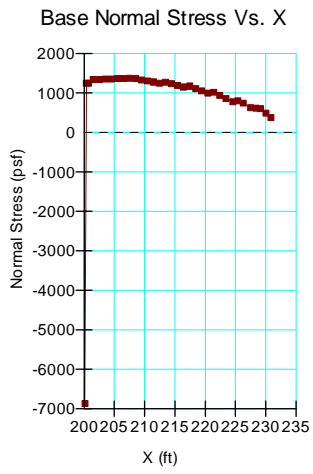
14	Optimized	211.47025	-	357.61332	1279.8306	0	231.74
15	Optimized	212.46175	-	360.41565	1251.7069	0	230.16
16	Optimized	213.45375	-	359.54407	1277.7885	0	228.58
17	Optimized	214.44625	-11.08851	354.53195	1236.2221	0	227
18	Optimized	215.4388	-	349.51983	1194.7564	0	225.42
19	Optimized	216.43135	-10.99656	344.85997	1153.3913	0	223.84
20	Optimized	217.4275	-10.86568	335.07128	1176.4108	0	222.25
21	Optimized	218.42735	-10.6499	320.03496	1117.7516	0	220.66
22	Optimized	219.4272	-	305.15507	1059.2879	0	219.07
23	Optimized	220.427	-10.21833	290.38272	1001.1175	0	217.47
24	Optimized	221.4202	-	268.97649	1022.2649	0	215.89
25	Optimized	222.40675	-9.465937	241.03148	942.15653	0	214.32
26	Optimized	223.4604	-	211.2774	862.6472	0	212.64
27	Optimized	224.58125	-8.518868	179.58047	784.03064	0	210.86
28	Optimized	225.4213	-8.09202	152.07129	799.7962	0	209.52
29	Optimized	226.29835	-7.51874	115.4333	744.87335	0	240.62

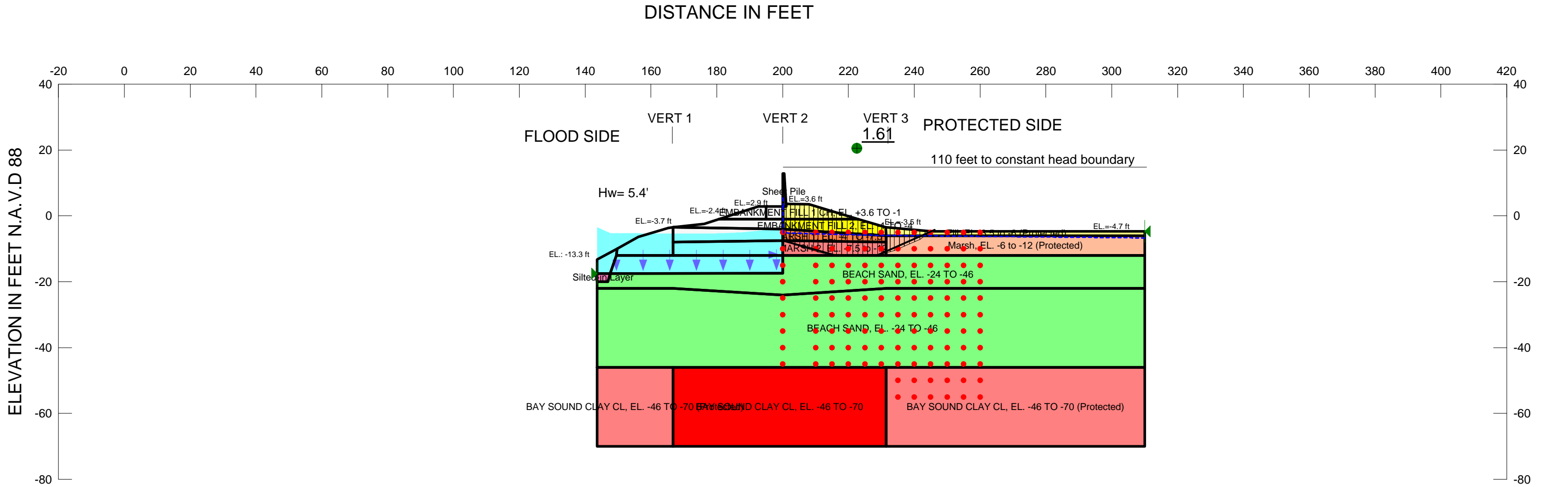
30	Optimized	227.49325	-6.73772	65.449099	629.28593	0	231.11
31	Optimized	228.3865	-6.087053	23.919091	616.95896	0	223.99
32	Optimized	229.12425	-5.4382	-17.15694	606.79634	0	300
33	Optimized	230.00815	-4.660808	-66.345094	492.83301	0	300
34	Optimized	230.89205	-	-115.6199	378.86118	0	300

Slices of Slip Surface: **341**

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	341	200.25	-10	456.56	-3052.2	0	249.6
2	341	200.75	-10	322.72	1293.12	0	248.81
3	341	201.5	-10	321.89	1373.4	0	247.61
4	341	202.5	-10	320.29	1370.5	0	246.02
5	341	203.5	-10	318.17	1367.6	0	244.43
6	341	204.5	-10	315.18	1364.8	0	242.83
7	341	205.5	-10	312.19	1361.9	0	241.24
8	341	206.5	-10	309.18	1359.1	0	239.65
9	341	207.5	-10	306.08	1356.3	0	238.06
10	341	208.5	-10	302.98	1336.5	0	236.46
11	341	209.5	-10	299.92	1299.8	0	234.87
12	341	210.5	-10	297.22	1263.1	0	233.28
13	341	211.5	-10	294.53	1226.4	0	231.69
14	341	212.5	-10	291.83	1189.7	0	230.1
15	341	213.5	-10	289.6	1153	0	228.5
16	341	214.5	-10	287.39	1116.4	0	226.91
17	341	215.5	-10	285.19	1079.8	0	225.32
18	341	216.5	-10	283.33	1043.2	0	223.73
19	341	217.5	-10	281.57	1006.6	0	222.13
20	341	218.5	-10	279.8	970	0	220.54

21	341	219.5	-10	278.24	933.44	0	218.95
22	341	220.48335	-	259.55666	1106.2425	0	217.38
23	341	221.45	-9.162842	223.60468	1010.92	0	215.84
24	341	222.41665	-	187.70645	916.22462	0	214.3
25	341	223.28855	-8.101354	155.39596	835.47619	0	212.92
26	341	224.13905	-7.61033	123.79356	795.08725	0	257.81
27	341	225.0629	-7.076942	89.3899	713.90807	0	250.45
28	341	225.98675	-	55.126849	632.7289	0	243.1
29	341	226.9106	-6.010167	20.858175	551.54972	0	235.74
30	341	227.8622	-	-14.3702	513.71407	0	300
31	341	228.8416	-	-50.51986	425.84461	0	300
32	341	229.82095	-	-86.672173	337.97514	0	300
33	341	230.8003	-	-122.90407	250.10567	0	300





- Name: EMBANKMENT FILL 1 CH, EL. +3.6 TO -1 Model: Undrained (Phi=0) Unit Weight: 118 pcf Cohesion: 1000 psf
- Name: MARSH 1, EL. -4 TO -7.5 Model: Spatial Mohr-Coulomb Unit Weight: 80 pcf Cohesion Fn: Marsh 1 Phi: 0 °
- Name: BEACH SAND, EL. -24 TO -46 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Beach Sand
- Name: BAY SOUND CLAY CL, EL. -46 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 104 pcf Cohesion Spatial Fn: Clay 1 Cohesion Phi: 0 °
- Name: Silted-in Layer Model: Mohr-Coulomb Unit Weight: 90 pcf Cohesion: 0 psf Phi: 20 °
- Name: MARSH 2, EL. -7.5 to -12 Model: Spatial Mohr-Coulomb Weight Fn: Marsh 2 Cohesion Fn: Marsh 2 Phi: 0 °
- Name: Sheet Pile Model: Undrained (Phi=0) Unit Weight: 0.1 pcf Cohesion: 0.01 psf
- Name: EMBANKMENT FILL 2, EL. -1 TO -4 Model: Undrained (Phi=0) Unit Weight: 90 pcf Cohesion: 300 psf
- Name: Fill, El. -3.5 to -6 (Protected) Model: Undrained (Phi=0) Unit Weight: 90 pcf Cohesion: 600 psf
- Name: Marsh, EL. -6 to -12 (Protected) Model: Undrained (Phi=0) Unit Weight: 80 pcf Cohesion: 200 psf
- Name: BAY SOUND CLAY CL, EL. -46 TO -70 (Protected) Model: Spatial Mohr-Coulomb Unit Weight: 104 pcf Cohesion Fn: Clay 2 Phi: 0 °

Name: GAP Stability (Block)
File Name: Reach 16 low water surf.gsz Directory: G:\F&MHOME\London Ave Reevaluation 2011\West Side\Reach 16 1% flowline\SlopeW\
Last Edited By: Schroeder, Danielle V MVN

GENERAL NOTES

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

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

Hw=CANAL WATER LEVEL



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

LONDON AVE CANAL
OUTFALL CANAL REEVALUATION REPORT
REACH 16, STA. 104+00 TO 112+50
PROTECTED SIDE STABILITY ANALYSIS,
1% FLOWLINE WATER EL +5.4
CASE: GAP Stability (Block)
MARCH 2012

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

GAP Stability (Block)

Report generated using GeoStudio 2007, version 7.15. Copyright © 1991-2009 GEO-SLOPE International Ltd.

File Information

Created By: [Liljegren, James](#)
Revision Number: 247
Last Edited By: [Schroeder, Danielle V MVN](#)
Date: 2/13/2012
Time: 11:03:08 AM
File Name: [Reach 16 low water surf.gsz](#)
Directory: [G:\F&M\HOME\London Ave Reevaluation 2011\West Side\Reach 16 1% flowline\SlopeW\](#)
Last Solved Date: 2/13/2012
Last Solved Time: 11:04:50 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 (Block)

Kind: [SLOPE/W](#)
Parent: [Gap Stability \(Seepage\)](#)
Method: [Spencer](#)
Settings
 PWP Conditions Source: [Parent Analysis](#)
SlipSurface
 Direction of movement: [Left to Right](#)
 Use Passive Mode: [Yes](#)
 Slip Surface Option: [Block](#)
 Critical slip surfaces saved: [1](#)
 Optimize Critical Slip Surface Location: [Yes](#)
 Tension Crack
 Tension Crack Option: [\(none\)](#)
FOS Distribution
 FOS Calculation Option: [Constant](#)
Restrict Block Crossing: [Yes](#)
Advanced
 Number of Slices: [30](#)
 Optimization Tolerance: [0.01](#)

3/9/2012

Minimum Slip Surface Depth: [0.1 ft](#)
Optimization Maximum Iterations: [2000](#)
Optimization Convergence Tolerance: [1e-007](#)
Starting Optimization Points: [8](#)
Ending Optimization Points: [8](#)
Complete Passes per Insertion: [1](#)
Driving Side Maximum Convex Angle: [5 °](#)
Resisting Side Maximum Convex Angle: [1 °](#)

Materials

EMBANKMENT FILL 1 CH, EL. +3.6 TO -1

Model: [Undrained \(Phi=0\)](#)
Unit Weight: [118 pcf](#)
Cohesion: [1000 psf](#)

MARSH 1, EL. -4 TO -7.5

Model: [Spatial Mohr-Coulomb](#)
Unit Weight: [80 pcf](#)
Cohesion Fn: [Marsh 1](#)
Phi: [0 °](#)
Phi-B: [0 °](#)

BEACH SAND, EL. -24 TO -46

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

BAY SOUND CLAY CL, EL. -46 TO -70

Model: [Spatial Mohr-Coulomb](#)
Unit Weight: [104 pcf](#)
Cohesion Spatial Fn: [Clay 1 Cohesion](#)
Phi: [0 °](#)
Phi-B: [0 °](#)

Silted-in Layer

Model: [Mohr-Coulomb](#)
Unit Weight: [90 pcf](#)
Cohesion: [0 psf](#)
Phi: [20 °](#)
Phi-B: [0 °](#)

MARSH 2, EL. -7.5 to -12

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

3/9/2012

Sheet Pile

Model: [Undrained \(Phi=0\)](#)
Unit Weight: [0.1 pcf](#)
Cohesion: [0.01 psf](#)

EMBANKMENT FILL 2, EL. -1 TO -4

Model: [Undrained \(Phi=0\)](#)
Unit Weight: [90 pcf](#)
Cohesion: [300 psf](#)

Fill, EL. -3.5 to -6 (Protected)

Model: [Undrained \(Phi=0\)](#)
Unit Weight: [90 pcf](#)
Cohesion: [600 psf](#)

Marsh, EL. -6 to -12 (Protected)

Model: [Undrained \(Phi=0\)](#)
Unit Weight: [80 pcf](#)
Cohesion: [200 psf](#)

BAY SOUND CLAY CL, EL. -46 TO -70 (Protected)

Model: [Spatial Mohr-Coulomb](#)
Unit Weight: [104 pcf](#)
Cohesion Fn: [Clay 2](#)
Phi: [0 °](#)
Phi-B: [0 °](#)

Slip Surface Limits

Left Coordinate: [\(143.6, -17.5\) ft](#)
Right Coordinate: [\(310, -4.7\) ft](#)

Slip Surface Block

Left Grid
 Upper Left: [\(200, -5\) ft](#)
 Lower Left: [\(200, -55\) ft](#)
 Lower Right: [\(200, -55\) ft](#)
 X Increments: [0](#)
 Y Increments: [10](#)
 Starting Angle: [135 °](#)
 Ending Angle: [155 °](#)
 Angle Increments: [4](#)
Right Grid
 Upper Left: [\(210, -5\) ft](#)
 Lower Left: [\(210, -55\) ft](#)
 Lower Right: [\(260, -55\) ft](#)
 X Increments: [10](#)
 Y Increments: [10](#)

3/9/2012

Starting Angle: [30 °](#)
Ending Angle: [45 °](#)
Angle Increments: [4](#)

Cohesion Functions

Marsh 1

Model: [Spline Data Point Function](#)
Function: [Cohesion vs. X](#)
 Curve Fit to Data: [100 %](#)
 Segment Curvature: [0 %](#)
Y-Intercept: [200](#)
Data Points: [X \(ft\), Cohesion \(psf\)](#)
 Data Point: [\(166.6, 200\)](#)
 Data Point: [\(200, 450\)](#)
 Data Point: [\(231.4, 200\)](#)

Marsh 2

Model: [Spline Data Point Function](#)
Function: [Cohesion vs. X](#)
 Curve Fit to Data: [100 %](#)
 Segment Curvature: [0 %](#)
Y-Intercept: [200](#)
Data Points: [X \(ft\), Cohesion \(psf\)](#)
 Data Point: [\(166.6, 200\)](#)
 Data Point: [\(200, 250\)](#)
 Data Point: [\(231.4, 200\)](#)

Clay 2

Model: [Spline Data Point Function](#)
Function: [Cohesion vs. Y](#)
 Curve Fit to Data: [100 %](#)
 Segment Curvature: [0 %](#)
Y-Intercept: [650](#)
Data Points: [Y \(ft\), Cohesion \(psf\)](#)
 Data Point: [\(-70, 865\)](#)
 Data Point: [\(-46, 650\)](#)

Shear/Normal Strength Functions

Beach Sand

Model: [Spline Data Point Function](#)
Function: [Shear Stress vs. Normal Stress](#)
 Curve Fit to Data: [100 %](#)
 Segment Curvature: [0 %](#)
Y-Intercept: [0](#)
Data Points: [Normal Stress \(psf\), Shear Stress \(psf\)](#)
 Data Point: [\(-100000, 0\)](#)

3/9/2012

Data Point: (0, 0)
Data Point: (100000, 57735)
Estimation Properties
Intact Rock Param.: 10
Geological Strength: 100
Disturbance Factor: 0
SigmaC: 600000 psf
Sigma3: 300000 psf
Num. Points: 20

Unit Weight Functions

Marsh 2
Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-intercept: 80
Data Points: X (ft), Unit Weight (pcf)
Data Point: (166.7, 80)
Data Point: (200, 97)
Data Point: (231.4, 80)

Spatial Functions

Clay 1 Cohesion
Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (166.7, -46, 650)
Data Point: (166.7, -70, 865)
Data Point: (200, -46, 665)
Data Point: (200, -70, 885)
Data Point: (231.4, -46, 650)
Data Point: (231.4, -70, 865)
Data Point: (310, -46, 650)
Data Point: (310, -70, 865)
Data Point: (143.6, -46, 650)
Data Point: (143.6, -70, 865)

Regions

	Points	Area (ft ²)	Material
Region 1	55,30,4,5,33,24,21	50.995458	
Region 2	25,3,8,28,35,41,42,43	100.17577	
Region 3	36,31,32,7,9,18	110.58019	Fill, El. -3.5 to -6 (Protected)

Region 4	18,9,19,38,37	471.6	Marsh, EL. -6 to -12 (Protected)
Region 5	52,20,3,25,51	29.215	
Region 6	35,12,24,21,55,29	69.918042	
Region 7	24,33,34,23,6,56	69.275	EMBANKMENT FILL 1 CH, EL. +3.6 TO -1
Region 8	12,24,56,36,18	114.85463	EMBANKMENT FILL 2, EL. -1 TO -4
Region 9	10,26,44,39,40,27,11,47,17,45	3928.9	BEACH SAND, EL. -24 TO -46
Region 10	35,12,13,42,41	133.23846	
Region 11	42,43,14,54,13	141.525	
Region 12	25,43,14,22,51	280.301	
Region 13	33,49,50,23,34	7.675	Sheet Pile
Region 14	12,18,37,13	86.35	MARSH 1, EL. -4 TO -7.5
Region 15	14,54,13,37,38	133.45	MARSH 2, EL. -7.5 to -12
Region 16	39,44,26,1,2,51,22,14,38,19,27,40	1411.969	BEACH SAND, EL. -24 TO -46
Region 17	52,51,2,1	9.15	Silted-in Layer
Region 18	45,17,47,48,53,46	1552.8	BAY SOUND CLAY CL, EL. -46 TO -70
Region 19	47,48,15,11	1886.4	BAY SOUND CLAY CL, EL. -46 TO -70 (Protected)
Region 20	10,16,46,45	554.4	BAY SOUND CLAY CL, EL. -46 TO -70 (Protected)

Points

	X (ft)	Y (ft)
Point 1	143.6	-20
Point 2	146.9	-20
Point 3	149.7	-10
Point 4	195	2.8
Point 5	199	2.9
Point 6	208	3.5
Point 7	310	-4.7
Point 8	156.1	-6.4
Point 9	310	-6
Point 10	143.6	-46
Point 11	310	-46
Point 12	200	-4
Point 13	200	-7.5

Point 14	200	-12
Point 15	310	-70
Point 16	143.6	-70
Point 17	200	-46
Point 18	231.4	-6
Point 19	310	-12
Point 20	143.6	-13.3
Point 21	195	-1
Point 22	200	-17.4
Point 23	201	3.6
Point 24	200	-1
Point 25	149.5	-12
Point 26	143.6	-22
Point 27	310	-22
Point 28	165.3	-3.7
Point 29	176.2	-2.4
Point 30	192.6	2.8
Point 31	231.5	-3.5
Point 32	245.2	-4.7
Point 33	200	2.9
Point 34	201	2.9
Point 35	166.66154	-3.5
Point 36	231.35185	-3.5
Point 37	231.4	-8
Point 38	231.4	-12
Point 39	200	-24
Point 40	231.4	-22
Point 41	166.7	-6
Point 42	166.7	-8
Point 43	166.7	-12
Point 44	166.7	-22
Point 45	166.7	-46
Point 46	166.7	-70
Point 47	231.4	-46
Point 48	231.4	-70
Point 49	200	12.9
Point 50	200.5	12.9
Point 51	147.62	-17.5
Point 52	143.6	-17.5
Point 53	200	-70
Point 54	200	-11.6
Point 55	180.71818	-1
Point 56	222.9	-1

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.61	(221.668, -3.278)	17.78778	(200, 12.9)	(245.057, -4.68748)
2	Slip	2.03	(221.668, -3.278)	17.532	(200, 12.9)	(244.314, -4.62242)

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	200.0123	-7.4964	777.65737	-24015.083	0	449.9
2	Optimized	200.2623	-7.5774615	232.49964	949.72873	0	249.58
3	Optimized	200.75	-7.735592	158.87698	964.22024	0	248.81
4	Optimized	201.7	-8.043624	177.0879	1070.8983	0	247.29
5	Optimized	203.1	-8.497566	204.01493	1110.6468	0	245.06
6	Optimized	204.5	-8.9515075	229.80048	1149.7838	0	242.83
7	Optimized	205.9	-9.405449	255.19873	1188.2412	0	240.61
8	Optimized	207.3	-9.85939	280.11456	1226.1552	0	238.38
9	Optimized	208.67945	-10.30667	304.38706	1240.6347	0	236.18
10	Optimized	210.03835	-10.747285	328.33453	1231.8145	0	234.02
11	Optimized	211.49555	-11.161275	350.60643	1238.0583	0	231.7
12	Optimized	213.05105	-11.548645	371.18043	1216.1618	0	229.22
13	Optimized	214.45895	-11.80604	384.52065	1229.7114	0	226.98
14	Optimized	215.7192	-11.93346	390.11778	1194.3444	0	224.97
15	Optimized	217.16815	-11.99667	392.02815	1174.7228	0	222.66
16	Optimized	218.80585	-11.99567	389.71388	1113.2327	0	220.05
17	Optimized	220.4435	-11.994675	387.81483	1051.7426	0	217.45
18	Optimized	222.08115	-11.99368	385.9341	990.31364	0	214.84
19	Optimized	223.63795	-11.99273	384.40169	938.55996	0	212.36
20	Optimized	225.11385	-11.99183	382.93816	896.61883	0	210.01
21	Optimized	226.5897	-11.99093	381.67111	854.67769	0	207.66
22	Optimized	228.06555	-11.99003	380.40407	812.73655	0	205.31
23	Optimized	229.4406	-11.806885	367.97468	824.20111	0	203.12
24	Optimized	230.7148	-11.441495	344.29351	756.15265	0	201.09
25	Optimized	231.37595	-11.251895	331.99769	721.71067	0	200.04
26	Optimized	231.45	-11.23065	330.6338	719.90426	0	200

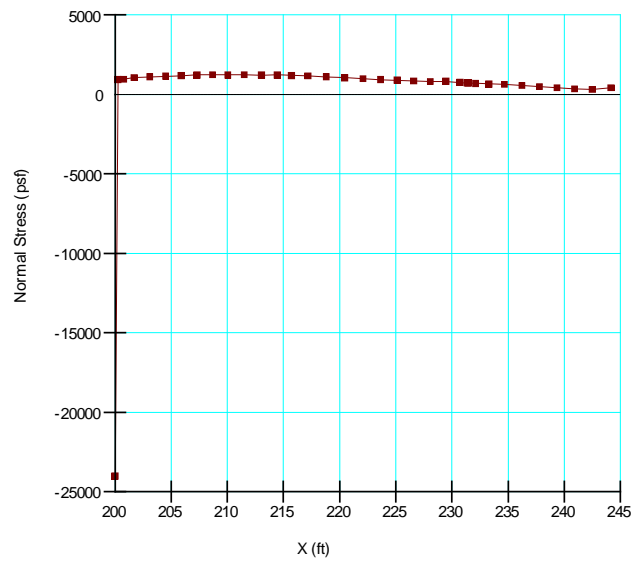
27	Optimized	232.09595	-11.045415	318.64178	699.67474	0	200
28	Optimized	233.28785	-10.703625	296.51937	661.5916	0	200
29	Optimized	234.6641	-10.196052	263.93526	638.6878	0	200
30	Optimized	236.22475	-9.522696	220.89914	568.81808	0	200
31	Optimized	237.78545	-8.84934	177.8689	498.9366	0	200
32	Optimized	239.3461	-8.175984	134.83867	429.05512	0	200
33	Optimized	240.90675	-7.502628	91.826079	359.16775	0	200
34	Optimized	242.47975	-6.582975	33.441502	321.01504	0	200
35	Optimized	244.1647	-5.343739	-44.918973	425.19749	0	600

Slices of Slip Surface: 356

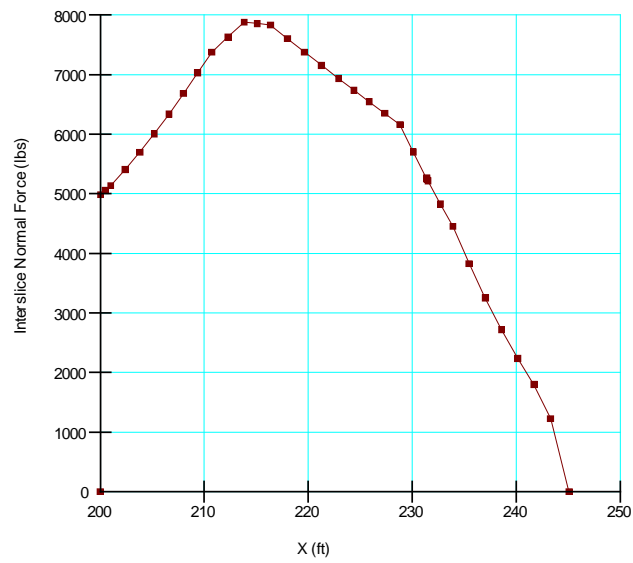
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	356	200.25	-10	412.22	-789.18	0	249.6
2	356	200.75	-10	302.06	1269.58	0	248.81
3	356	201.7	-10	301.13571	1349.4286	0	247.29
4	356	203.1	-10	299.25714	1345.6429	0	245.06
5	356	204.5	-10	295.85	1341.7857	0	242.83
6	356	205.9	-10	292.40714	1338.0714	0	240.61
7	356	207.3	-10	288.87143	1334.2857	0	238.38
8	356	208.745	-10	285.18792	1305.1678	0	236.07
9	356	210.235	-10	281.65772	1250.6711	0	233.7
10	356	211.725	-10	278.3557	1196.2416	0	231.33
11	356	213.215	-10	275.31544	1141.8121	0	228.96
12	356	214.705	-10	272.61074	1087.4497	0	226.58
13	356	216.195	-10	270.08725	1033.0872	0	224.21
14	356	217.685	-10	267.91946	978.79195	0	221.84
15	356	219.175	-10	265.83221	924.56376	0	219.47
16	356	220.665	-10	264.04698	870.33557	0	217.09
17	356	222.155	-10	262.28859	816.1745	0	214.72
18	356	223.6043	-10	260.81858	769.81944	0	212.41
19	356	225.01295	-10	259.38457	731.41366	0	210.17
20	356	226.4216	-10	258.12804	692.96528	0	207.93
21	356	227.83025	-10	256.88571	654.5737	0	205.68
22	356	229.2389	-10	255.74277	616.2247	0	203.44
23	356	230.64755	-10	254.65661	577.90411	0	201.2
24	356	231.37595	-10	254.10177	558.75389	0	200.04
25	356	231.45	-10	254.04	558.73	0	200
26	356	232.375	-10	253.35429	551.83429	0	200
27	356	234.125	-10	252.09143	538.04	0	200

28	356	235.6928	-9.6	226.08125	598.7	0	200
29	356	237.07845	-8.8	175.2625	517.23125	0	200
30	356	238.4641	-8	124.44375	435.7625	0	200
31	356	239.84975	-7.2	73.63125	354.2875	0	200
32	356	241.2354	-6.4	22.82375	272.81875	0	200
33	356	242.5247	-5.655604	-24.429	346.88992	0	600
34	356	243.7177	-4.966812	68.135228	269.254	0	600

Base Normal Stress Vs. X



Interslice Normal Stress Vs. X



GAP Stability (Block) OPEN (2)

Report generated using GeoStudio 2007, version 7.19. Copyright © 1991-2012 GEO-SLOPE International Ltd.

File Information

Created By: Liljegren, James
Revision Number: 225
Last Edited By: Curran, Matthew MVN
Date: 1/9/2012
Time: 1:36:51 PM
File Name: Reach 17 OPEN.gsz
Directory: G:\F&MHOME\London Ave Reevaluation 2011\West Side\Reach 17\SlopeW\
Last Solved Date: 1/9/2012
Last Solved Time: 1:37:24 PM

Project Settings

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

Analysis Settings

GAP Stability (Block) OPEN (2)

Kind: SLOPE/W
Parent: Gap Stability (Seepage) OPEN
Method: Spencer
Settings
 PWP Conditions Source: Parent Analysis
Slip Surface
 Direction of movement: Left to Right
 Use Passive Mode: Yes
 Slip Surface Option: Block
 Critical slip surfaces saved: 1
 Optimize Critical Slip Surface Location: Yes
 Tension Crack
 Tension Crack Option: (none)
FOS Distribution
 FOS Calculation Option: Constant
Restrict Block Crossing: Yes

SILTY BEACH SAND, EL -12 TO -22

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

Fill -2.2 to -7 (Protected)

Model: Undrained (Phi=0)
Unit Weight: 100 pcf
Cohesion: 400 psf

Marsh 1, -7 to -11 (Protected)

Model: Undrained (Phi=0)
Unit Weight: 85 pcf
Cohesion: 200 psf

Marsh 2, -11 to -14.5 (Protected)

Model: Undrained (Phi=0)
Unit Weight: 116 pcf
Cohesion: 300 psf

MARSH 1, EL. -11 to -12

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

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

Model: Spatial Mohr-Coulomb
Weight Fn: Clay 2
Cohesion Fn: CLAY 2
Phi: 0 °
Phi-B: 0 °

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

Model: Undrained (Phi=0)
Unit Weight: 119 pcf
Cohesion: 995 psf

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

Model: Undrained (Phi=0)
Unit Weight: 109 pcf
Cohesion: 710 psf

Advanced

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

Materials

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

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

MARSH 1, EL. -3.5 to -11

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

BEACH SAND, EL. -22 TO -46.5

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

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

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

Sheet Pile

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

Slip Surface Limits

Left Coordinate: (118.6, -17.5) ft
Right Coordinate: (310, -2.1) ft

Slip Surface Block

Left Grid
 Upper Left: (200, -7.4) ft
 Lower Left: (200, -12.4) ft
 Lower Right: (200, -12.4) ft
 X Increments: 0
 Y Increments: 5
 Starting Angle: 135 °
 Ending Angle: 135 °
 Angle Increments: 0
Right Grid
 Upper Left: (215, -7.4) ft
 Lower Left: (215, -12.4) ft
 Lower Right: (260, -12.4) ft
 X Increments: 9
 Y Increments: 5
 Starting Angle: 30 °
 Ending Angle: 45 °
 Angle Increments: 4

Cohesion Functions

Marsh 1

Model: Spline Data Point Function
Function: Cohesion vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 200
Data Points: X (ft), Cohesion (psf)
 Data Point: (160.6, 200)
 Data Point: (200, 320)
 Data Point: (241.7, 200)

Marsh 2

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

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

FILL

Model: Spline Data Point Function
Function: Cohesion vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 400
Data Points: X (ft), Cohesion (psf)
Data Point: (160.6, 400)
Data Point: (200, 520)
Data Point: (241.7, 400)

CLAY 1

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

CLAY 2

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

Shear/Normal Strength Functions

Beach Sand

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

Data Point: (-100000, 0)
Data Point: (0, 0)
Data Point: (100000, 57735)
Estimation Properties
Intact Rock Param.: 10
Geological Strength: 100
Disturbance Factor: 0
SigmaC: 600000 psf
Sigma3: 300000 psf
Num. Points: 20

Unit Weight Functions

Marsh 1

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 85
Data Points: X (ft), Unit Weight (pcf)
Data Point: (160.6, 85)
Data Point: (200, 90)
Data Point: (241.7, 85)

Fill

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

Marsh 2

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

Clay 1

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

Clay 2

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

Regions

	Points	Area (ft²)	Material
Region 1	47,46,42,45	40.034938	
Region 2	27,5,7,15	331.255	Fill -2.2 to -7 (Protected)
Region 3	15,7,43,30	273.2	Marsh 1, -7 to -11 (Protected)
Region 4	40,17,2,58,21,39	87.864	
Region 5	10,28,3,25,20,24,6,42	141.455	
Region 6	8,22,1,56,55,53,54,23,9,35,14,33	4646.4685	BEACH SAND, EL. -22 TO -46.5
Region 7	21,32,11,18,39	271.37	
Region 8	28,37,38,19,29	7.65	Sheet Pile
Region	56,1,22,57	42.83154	BEACH SAND, EL. -22 TO -46.5

9			
Region 10	10,28,29,19,4,26,27,15	299.59	EMBANKMENT FILL 1 CH, EL. +3.4 to -3.5
Region 11	30,15,10,44	239.775	MARSH 1, EL. -3.5 to -11
Region 12	44,10,42,45	295.5	
Region 13	31,30,43,16	239.05	Marsh 2, -11 to -14.5 (Protected)
Region 14	11,32,45,44	39.4	
Region 15	44,30,31,11	93.825	MARSH 1, EL. -11 to -12
Region 16	21,47,45,32	6.9	
Region 17	8,33,49,48	632.1	BAY SOUND CLAY CL, EL. -46.5 TO -61.5 (protected)
Region 18	48,49,34,13	354.9	BAY SOUND CLAY CL, EL. -61.5 TO -70 (protected)
Region 19	33,14,35,51,50,49	1218.47	BAY SOUND CLAY CL, EL. -46.5 TO -61.5
Region 20	49,50,51,36,41,34	687.38	BAY SOUND CLAY CL, EL. -61.5 TO -70
Region 21	35,9,52,51	1024.5	BAY SOUND CLAY CL, EL. -46.5 TO -61.5 (protected)
Region 22	51,52,12,36	580.55	BAY SOUND CLAY CL, EL. -61.5 TO -70 (protected)
Region 23	56,39,18,11,31,16,23,54,53,55	1132.1815	SILTY BEACH SAND, EL -12 TO -22
Region 24	47,46,59	17.238186	
Region 25	57,40,39,56	111.24347	SILTY BEACH SAND, EL -12 TO -22
Region 26	58,59,47,21	9.2328574	

Points

	X (ft)	Y (ft)
Point 1	135.2	-24
Point 2	135.2	-16
Point 3	199	3.4
Point 4	205.1	6.2
Point 5	310	-2.1
Point 6	161.4	-3.1
Point 7	310	-7
Point 8	118.6	-46.5
Point 9	310	-46.5
Point 10	200	-3.5
Point 11	200	-12
Point 12	310	-70
Point 13	118.6	-70
Point 14	200	-46.5
Point 15	241.7	-7
Point 16	310	-14.5
Point 17	118.6	-16.7
Point 18	200	-17.5
Point 19	201	5.5
Point 20	186.1	1
Point 21	153.7	-12
Point 22	118.6	-24.7
Point 23	310	-22
Point 24	171.9	-2.1
Point 25	191.6	3.5
Point 26	232.6	-1.2
Point 27	241.7	-2.2
Point 28	200	3.4
Point 29	201	3.4
Point 30	241.7	-11
Point 31	241.7	-14.5
Point 32	160.6	-12
Point 33	160.6	-46.5

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

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.86	(220.963, -0.145)	17.72992	(200, 12.9)	(243.852, -2.19685)
2	166	2.29	(220.963, -0.145)	19.023	(200, 12.9)	(244.209, -2.19633)

Slices of Slip Surface: Optimized

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	200.25	3.6308645	347.64013	-285.30932	0	319.28
2	Optimized	200.75	3.8878195	287.53288	684.26919	0	317.84
3	Optimized	201.68335	-4.367469	316.43733	953.35343	0	315.16
4	Optimized	203.05	-5.069813	358.77171	1036.5254	0	311.22
5	Optimized	204.41665	-5.772157	400.42927	1119.3068	0	307.29
6	Optimized	205.77955	-6.472553	441.84986	1170.9018	0	303.37
7	Optimized	207.13865	-7.171001	482.3262	1191.5817	0	299.46
8	Optimized	208.49775	-7.8694495	522.84836	1212.2616	0	295.55
9	Optimized	209.8568	-8.567898	562.84697	1232.9415	0	291.64
10	Optimized	211.21585	-9.266346	602.55763	1253.556	0	287.72
11	Optimized	212.57565	-9.9787356	631.00693	1337.1152	0	283.81
12	Optimized	213.9361	-10.7030926	648.31061	1327.4229	0	279.9
13	Optimized	215.29655	-11.4745	665.57865	1317.7306	0	275.98
14	Optimized	216.65705	-12.2818075	682.86808	1308.1808	0	272.07

15	Optimized	218.0573	-13.0990355	689.38076	1358.8181	0	268.04
16	Optimized	219.49735	-13.991345	685.15876	1316.2509	0	263.89
17	Optimized	220.93745	-14.992335	680.9437	1273.892	0	259.75
18	Optimized	222.37755	-16.09332	676.74253	1231.8108	0	255.6
19	Optimized	223.8176	-17.0994305	672.54136	1189.938	0	251.46
20	Optimized	225.25765	-18.0995295	668.31241	1148.2735	0	247.32
21	Optimized	226.69775	-19.0996285	664.08347	1106.8174	0	243.17
22	Optimized	228.04555	-20.0867525	651.98211	1111.639	0	239.29
23	Optimized	229.3011	-21.1060901	632.01942	1051.5715	0	235.68
24	Optimized	230.55665	-22.10350495	611.98651	991.73799	0	232.07
25	Optimized	231.8922	-23.915754	580.58068	970.17481	0	228.22
26	Optimized	233.448	-25.9244251	533.5184	876.69248	0	223.75
27	Optimized	235.14405	-28.512217	482.04283	788.45483	0	218.87
28	Optimized	237.08005	-31.74248735	407.21082	714.90761	0	213.29
29	Optimized	238.9893	-35.6159003	314.47185	653.62329	0	407.8

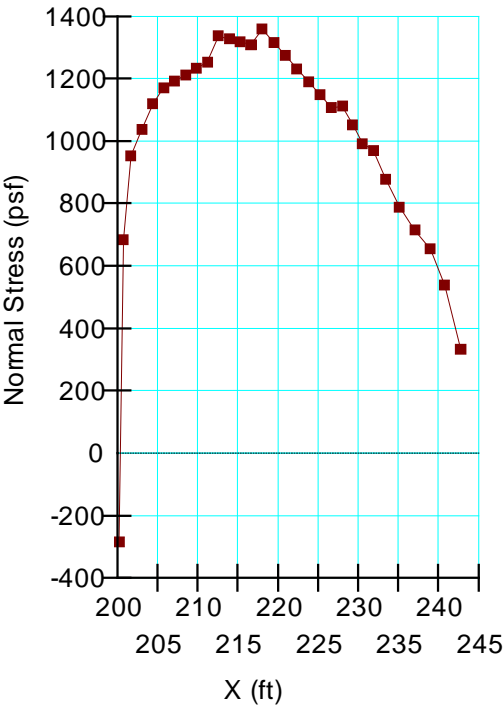
			5				
30	Optimize d	240.7553	-4.815558	207.36417	537.77846	0	402.72
31	Optimize d	242.77595	-3.1067525	69.557547	333.5661	0	400

Slices of Slip Surface: 166

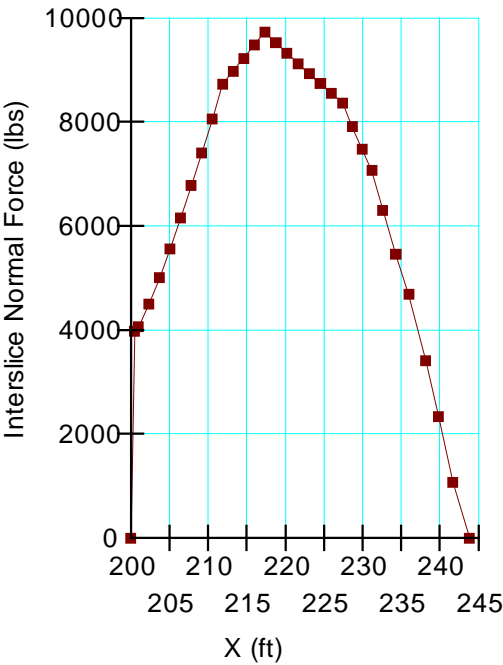
	Slip Surfac e	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictiona l Strength (psf)	Cohesiv e Strength (psf)
1	166	200.25	-10.4	774.56	-1457.98	0	319.28
2	166	200.75	-10.4	699.28	1398.7	0	317.84
3	166	201.68335	-10.4	698.09251	1640.1216	0	315.16
4	166	203.05	-10.4	696.22666	1663.463	0	311.22
5	166	204.41665	-10.4	692.91934	1686.6581	0	307.29
6	166	205.83235	-10.4	689.42163	1675.4898	0	303.22
7	166	207.29705	-10.4	685.12043	1630.293	0	299
8	166	208.76175	-10.4	680.83288	1585.3694	0	294.79
9	166	210.22645	-10.4	676.36782	1540.6505	0	290.57
10	166	211.69115	-10.4	671.8891	1496.1364	0	286.36
11	166	213.15585	-10.4	667.43087	1451.8955	0	282.14
12	166	214.62055	-10.4	662.97946	1407.8593	0	277.93
13	166	216.08525	-10.4	658.57585	1364.028	0	273.71
14	166	217.55	-10.4	654.18589	1320.4698	0	269.5
15	166	219.01475	-10.4	649.82324	1277.1164	0	265.28
16	166	220.47945	-10.4	645.46059	1234.036	0	261.07
17	166	221.94415	-10.4	641.10477	1191.1605	0	256.85
18	166	223.40885	-10.4	636.74212	1148.5581	0	252.64
19	166	224.87355	-10.4	632.35216	1106.1606	0	248.42
20	166	226.33825	-10.4	627.94854	1064.0361	0	244.21
21	166	227.80295	-10.4	623.51079	1022.0481	0	239.99
22	166	229.26765	-10.4	619.04573	980.40153	0	235.78
23	166	230.65	-10.024722	591.28872	1049.2895	0	231.8

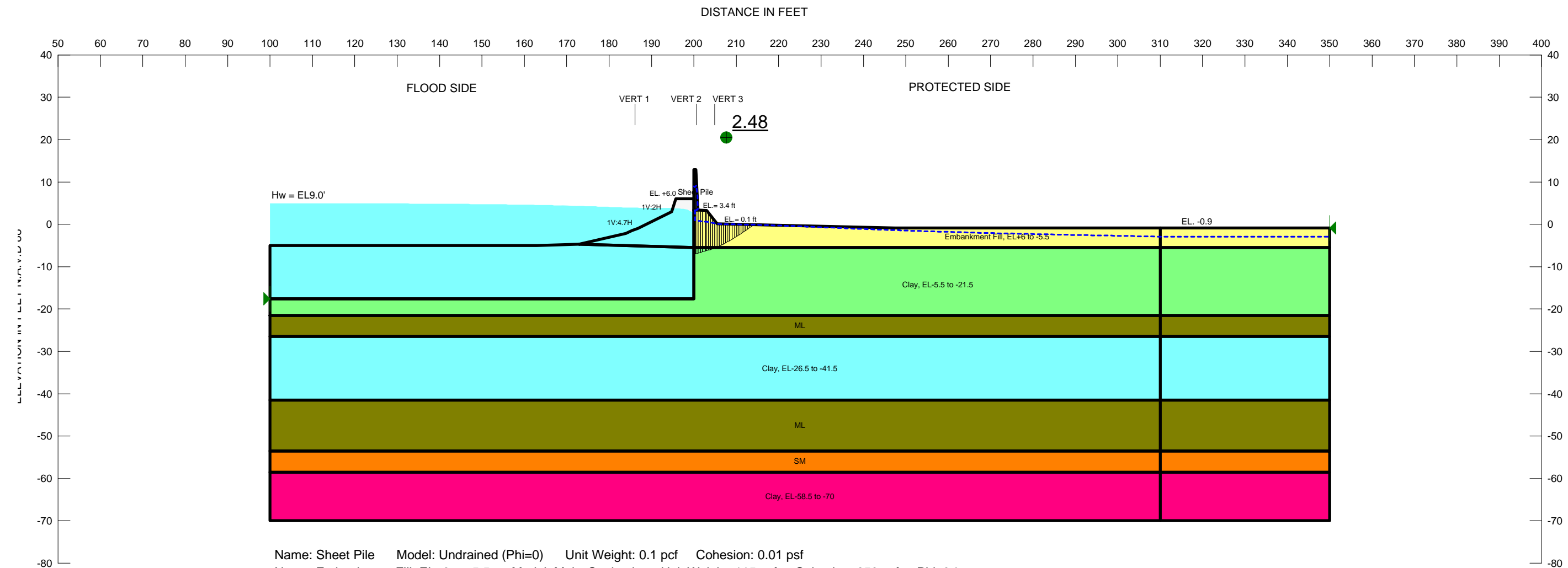
24	166	231.95	-9.274167	540.15326	938.50488	0	228.06
25	166	233.2711	-8.511436	488.04598	838.16564	0	224.26
26	166	234.6133	-7.7365295	434.94925	748.2193	0	220.39
27	166	235.95545	-6.9616225	381.6525	658.59559	0	216.53
28	166	237.4721	-6.0859745	316.01646	615.89182	0	412.17
29	166	239.16325	-5.1095855	236.3095	485.47761	0	407.3
30	166	240.8544	-4.1331965	155.3428	356.10807	0	402.43
31	166	242.3273	-3.282833	83.545251	252.61687	0	400
32	166	243.5819	-2.558495	27.39605	174.24876	0	400

Base Normal Stress Vs. X



Interslice Normal Stress
Vs. X





Name: Sheet Pile Model: Undrained (Phi=0) Unit Weight: 0.1 pcf Cohesion: 0.01 psf
Name: Embankment Fill, EL+6 to -5.5 Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion: 650 psf Phi: 0 °
Name: Clay, EL-5.5 to -21.5 Model: Spatial Mohr-Coulomb Unit Weight: 107 pcf Cohesion Fn: CH EL-5.5 to EL-21.5 Phi: 0 °
Name: ML Model: Mohr-Coulomb Unit Weight: 117 pcf Cohesion: 200 psf Phi: 15 °
Name: Clay, EL-26.5 to -41.5 Model: Spatial Mohr-Coulomb Unit Weight: 101 pcf Cohesion Spatial Fn: CH EL-26.5 to EL-41.5 Phi: 0 °
Name: SM Model: Mohr-Coulomb Unit Weight: 122 pcf Cohesion: 0 psf Phi: 30 °
Name: Clay, EL-58.5 to -70 Model: Spatial Mohr-Coulomb Unit Weight: 107 pcf Cohesion Spatial Fn: CH EL-58.5 to EL-70 Phi: 0 °

GENERAL NOTES

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

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

Hw=CANAL WATER LEVEL

LONDON AVE CANAL
OUTFALL CANAL REEVALUATION REPORT
REACH 20, STA. 1+57 TO 6+30
PROTECTED SIDE STABILITY ANALYSIS,
CASE: Gap - Slope Stability (Fully Specified EL-6) (Passive)
MARCH 2012

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

Gap - Slope Stability (Fully Specified EL-6) (Passive)

Report generated using GeoStudio 2007, version 7.15. Copyright © 1991-2009 GEO-SLOPE International Ltd.

File Information

Revision Number: 346
Last Edited By: Haggerty, Daniel R MVN
Date: 11/3/2011
Time: 2:36:07 PM
File Name: Reach 20.gsz
Last Solved Date: 11/3/2011
Last Solved Time: 2:36:20 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 - Slope Stability (Fully Specified EL-6) (Passive)

Kind: SLOPE/W
Parent: Gap Stability (Seepage)
Method: Spencer
Settings
 PWP Conditions Source: Parent Analysis
SlipSurface
 Direction of movement: Left to Right
 Use Passive Mode: Yes
 Slip Surface Option: Fully-Specified
 Critical slip surfaces saved: 1
 Optimize Critical Slip Surface Location: Yes
 Tension Crack
 Tension Crack Option: (none)
FOS Distribution
 FOS Calculation Option: Constant
Advanced
 Number of Slices: 30
 Optimization Tolerance: 0.01
 Minimum Slip Surface Depth: 0.1 ft

Cohesion: 0 psf
Phi: 30 °
Phi-B: 0 °

Clay, EL-58.5 to -70

Model: Spatial Mohr-Coulomb
Unit Weight: 107 pcf
Cohesion Spatial Fn: CH EL-58.5 to EL-70
Phi: 0 °
Phi-B: 0 °

Slip Surface Limits

Left Coordinate: (100, -17.6) ft
Right Coordinate: (350, -0.9) ft

Fully Specified Slip Surfaces

Fully Specified Slip Surface 1

	X (ft)	Y (ft)
	200	-6
	205	-6
	220.5	3.1

Cohesion Functions

CH EL-5.5 to EL-21.5

Model: Spline Data Point Function
Function: Cohesion vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 445
Data Points: X (ft), Cohesion (psf)
 Data Point: (100, 445)
 Data Point: (186.1, 445)
 Data Point: (200, 470)
 Data Point: (205.5, 445)
 Data Point: (350, 445)

Optimization Maximum Iterations: 5000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

Sheet Pile

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

Embankment Fill, EL+6 to -5.5

Model: Mohr-Coulomb
Unit Weight: 115 pcf
Cohesion: 650 psf
Phi: 0 °
Phi-B: 0 °

Clay, EL-5.5 to -21.5

Model: Spatial Mohr-Coulomb
Unit Weight: 107 pcf
Cohesion Fn: CH EL-5.5 to EL-21.5
Phi: 0 °
Phi-B: 0 °

ML

Model: Mohr-Coulomb
Unit Weight: 117 pcf
Cohesion: 200 psf
Phi: 15 °
Phi-B: 0 °

Clay, EL-26.5 to -41.5

Model: Spatial Mohr-Coulomb
Unit Weight: 101 pcf
Cohesion Spatial Fn: CH EL-26.5 to EL-41.5
Phi: 0 °
Phi-B: 0 °

SM

Model: Mohr-Coulomb
Unit Weight: 122 pcf

Spatial Functions

CH EL-26.5 to EL-41.5

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
 Data Point: (100, -26.5, 280)
 Data Point: (100, -41.5, 405)
 Data Point: (186.1, -26.5, 280)
 Data Point: (186.1, -41.5, 405)
 Data Point: (200, -26.5, 470)
 Data Point: (200, -41.5, 620)
 Data Point: (205.5, -26.5, 280)
 Data Point: (205.5, -41.5, 405)
 Data Point: (350, -26.5, 280)
 Data Point: (350, -41.5, 405)

CH EL-58.5 to EL-70

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
 Data Point: (100, -58.5, 615)
 Data Point: (100, -70, 730)
 Data Point: (186.1, -58.5, 615)
 Data Point: (186.1, -70, 730)
 Data Point: (200, -58.5, 700)
 Data Point: (200, -70, 815)
 Data Point: (205.5, -58.5, 615)
 Data Point: (205.5, -70, 730)
 Data Point: (350, -58.5, 615)
 Data Point: (350, -70, 730)

Regions

	Material	Points	Area (ft²)
Region 1	Clay, EL-58.5 to -70	14,7,40,11,8,49,50,13,12,41	2875
Region 2	SM	7,32,33,48,49,8,11,40	1250
Region 3	ML	32,31,37,39,30,47,48,33	3000
Region 4	Clay, EL-26.5 to -41.5	31,28,36,38,29,46,47,30,39,37	3750
Region 5	ML	28,16,15,6,45,46,29,38,36	1250
Region 6	Clay, EL-5.5 to -21.5	16,35,34,42,10,5,44,45,6,15	2790
Region 7		35,20,51,19,10,42,34	1258.775
Region 8		19,21,27,2,3,4,9,24,10	134.177

Region 9	Embankment Fill, EL+6 to -5.5	10,24,17,18,1,22,23,43,44,5	730.25
Region 10	Sheet Pile	24,9,25,26,17	7.125

Points

	X (ft)	Y (ft)
Point 1	205.5	0.1
Point 2	186.8	-1
Point 3	194.8	3
Point 4	195.7	6
Point 5	310	-5.5
Point 6	310	-21.5
Point 7	100	-58.5
Point 8	310	-58.5
Point 9	200	6
Point 10	200	-5.5
Point 11	205.5	-58.5
Point 12	205.5	-70
Point 13	310	-70
Point 14	100	-70
Point 15	200	-21.5
Point 16	100	-21.5
Point 17	201	3.4
Point 18	203	3.3
Point 19	172.9	-4.7
Point 20	100	-5
Point 21	183.9	-2.1
Point 22	247.4	-0.9
Point 23	310	-0.9
Point 24	200	3.4
Point 25	200	12.9
Point 26	200.5	12.9
Point 27	185.46	-1.5
Point 28	100	-26.5
Point 29	310	-26.5
Point 30	310	-41.5

Point 31	100	-41.5
Point 32	100	-53.5
Point 33	310	-53.5
Point 34	200	-17.6
Point 35	100	-17.6
Point 36	186.1	-26.5
Point 37	186.1	-41.5
Point 38	205.5	-26.5
Point 39	205.5	-41.5
Point 40	186.1	-58.5
Point 41	186.1	-70
Point 42	200	-13.1
Point 43	350	-0.9
Point 44	350	-5.5
Point 45	350	-21.5
Point 46	350	-26.5
Point 47	350	-41.5
Point 48	350	-53.5
Point 49	350	-58.5
Point 50	350	-70
Point 51	163	-5

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	2.48	(205.778, 1.341)	8.847732	(200, 12.9)	(214.17, -0.106925)
2	1	2.88	(205.778, 1.341)	8.238	(200, 12.9)	(215.004, -0.12682)

Slices of Slip Surface: Optimized

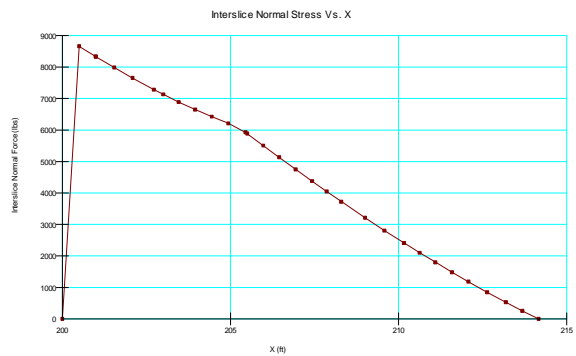
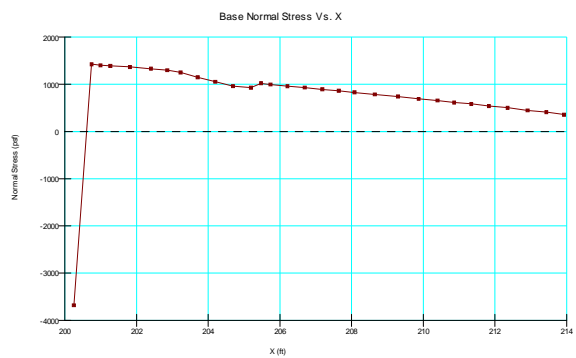
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	200.25	-7.070957	591.45241	-3679.8364	0	468.86
2	Optimized	200.7433	-6.9062205	496.17359	1426.75	0	466.62

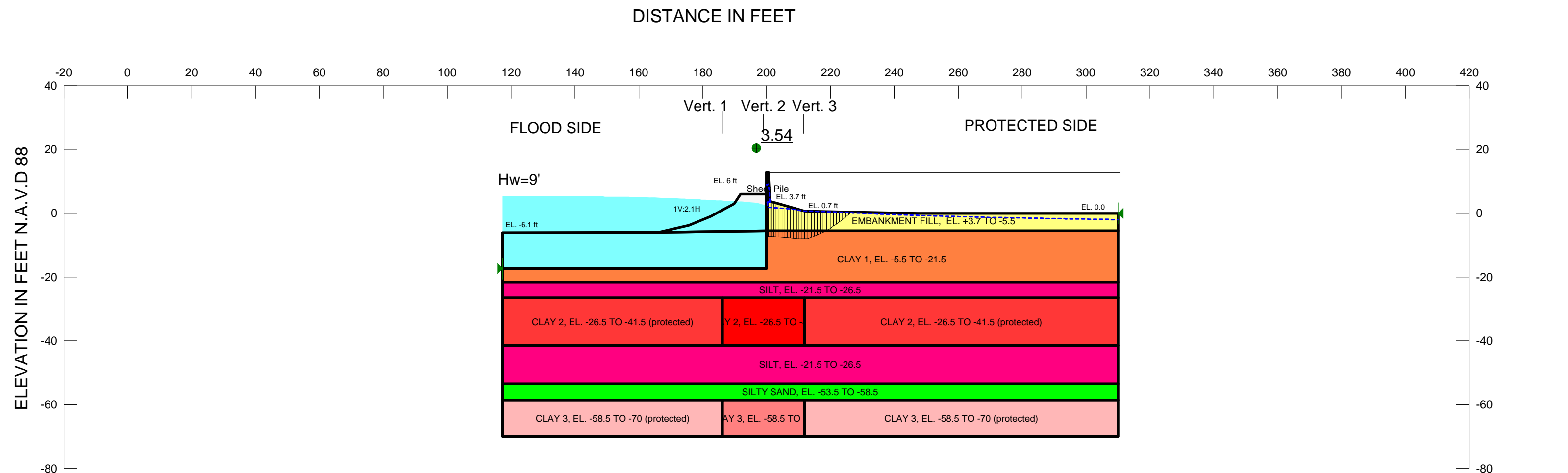
3	Optimized	200.9933	-6.822863	489.47098	1403.5363	0	465.48
4	Optimized	201.27145	-6.7353345	482.33887	1391.1938	0	464.22
5	Optimized	201.8143	-6.5644915	468.38757	1367.0339	0	461.75
6	Optimized	202.40445	-6.384465	453.57203	1330.3657	0	459.07
7	Optimized	202.8616	-6.25124	442.49881	1300.5666	0	456.99
8	Optimized	203.229	-6.148735	433.89254	1250.7564	0	455.32
9	Optimized	203.7045	-6.0203715	423.05567	1149.589	0	453.16
10	Optimized	204.1975	-5.891415	412.08683	1055.7358	0	450.92
11	Optimized	204.69055	-5.7624585	401.13762	961.86298	0	448.68
12	Optimized	205.1918	-5.5956	387.64639	929.80127	0	446.4
13	Optimized	205.47325	-5.4786665	378.53181	1021.1724	0	650
14	Optimized	205.73705	-5.3351645	367.67642	996.21336	0	650
15	Optimized	206.21115	-5.077268	348.29577	959.58283	0	650
16	Optimized	206.69285	-4.81143	328.56377	931.5936	0	650
17	Optimized	207.1821	-4.53765	308.33733	892.53195	0	650
18	Optimized	207.64455	-4.2755825	289.05392	864.29591	0	650
19	Optimized	208.0802	-4.0252275	270.72435	828.45275	0	650
20	Optimized	208.65005	-3.694495	246.57744	786.47691	0	650
21	Optimized	209.29255	-3.3142775	219.46272	741.78014	0	650
22	Optimized	209.8735	-2.9649525	194.90095	691.38795	0	650
23	Optimized	210.3968	-2.645395	172.48482	656.76981	0	650
24	Optimized	210.86235	-2.355605	152.23121	614.70167	0	650
25	Optimized	211.34025	-2.0515575	131.143	584.61233	0	650
26	Optimized	211.8305	-1.7332525	109.28697	538.04317	0	650
27	Optimized	212.35395	-1.3836	85.517865	504.438	0	650
28	Optimized	212.91065	-1.0026	59.793425	448.12085	0	650
29	Optimized	213.43425	-0.6358061	35.194791	410.07899	0	650
30	Optimized	213.9248	-0.28321835	11.699707	357.39356	0	650

3	1	201.25	-6	434.52	1128.1	0	464.32
4	1	201.75	-6	431.9	1124.96	0	462.05
5	1	202.25	-6	429.26	1121.84	0	459.77
6	1	202.75	-6	426.66	1118.7	0	457.5
7	1	203.25	-6	424.06	1080.2	0	455.23
8	1	203.75	-6	421.48	1006.34	0	452.95
9	1	204.25	-6	418.92	932.5	0	450.68
10	1	204.75	-6	416.34	858.64	0	448.41
11	1	205.25	-5.853226	404.17225	1062.983	0	446.14
12	1	205.6758	-5.603226	385.65574	983.41479	0	445
13	1	206.10585	-5.350745	366.89144	1027.4385	0	650
14	1	206.61435	-5.052235	344.85964	983.27313	0	650
15	1	207.1228	-4.753725	322.87871	939.12472	0	650
16	1	207.63125	-4.455215	300.96563	894.97631	0	650
17	1	208.1397	-4.156705	279.1204	850.8279	0	650
18	1	208.64815	-3.858195	257.343	806.67949	0	650
19	1	209.1566	-3.559685	235.9557	762.51412	0	650
20	1	209.66505	-3.261175	214.87369	718.3657	0	650
21	1	210.1735	-2.962665	193.89344	674.21729	0	650
22	1	210.68195	-2.664155	172.93016	630.06888	0	650
23	1	211.1904	-2.365645	152.03132	585.90351	0	650
24	1	211.69885	-2.067135	131.28682	541.7551	0	650
25	1	212.2073	-1.768625	110.78826	497.60669	0	650
26	1	212.71575	-1.470115	90.398238	453.45828	0	650
27	1	213.2242	-1.171605	70.116767	409.30987	0	650
28	1	213.73265	-0.8730951	49.943843	365.1445	0	650
29	1	214.2411	-0.5745852	29.88286	320.99609	0	650
30	1	214.74955	-0.2760752	9.9344948	276.84768	0	650

Slices of Slip Surface: 1

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	1	200.25	-6	522.26	-3434.2	0	468.86
2	1	200.75	-6	437.14	1130.26	0	466.59





Name: EMBANKMENT FILL, EL. +3.7 TO -5.5 Model: Undrained (Phi=0) Unit Weight: 118 pcf Cohesion: 650 psf

Name: CLAY 1, EL. -5.5 TO -21.5 Model: Spatial Mohr-Coulomb Unit Weight: 107 pcf Cohesion Fn: CLAY1 Phi: 0 °

Name: SILT, EL. -21.5 TO -26.5 Model: Mohr-Coulomb Unit Weight: 117 pcf Cohesion: 200 psf Phi: 15 °

Name: CLAY 2, EL. -26.5 TO -41.5 Model: Spatial Mohr-Coulomb Unit Weight: 99 pcf Cohesion Spatial Fn: Clay 2 Phi: 0 °

Name: SILTY SAND, EL. -53.5 TO -58.5 Model: Mohr-Coulomb Unit Weight: 122 pcf Cohesion: 0 psf Phi: 30 °

Name: CLAY 3, EL. -58.5 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 104 pcf Cohesion Spatial Fn: Clay 3 Phi: 0 °

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

Name: CLAY 2, EL. -26.5 TO -41.5 (protected) Model: Spatial Mohr-Coulomb Unit Weight: 99 pcf Cohesion Fn: CLAY2 Phi: 0 °

Name: CLAY 3, EL. -58.5 TO -70 (protected) Model: Spatial Mohr-Coulomb Unit Weight: 104 pcf Cohesion Fn: CLAY3 Phi: 0 °



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

GENERAL NOTES

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

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

Hw=CANAL WATER LEVEL

LONDON AVE CANAL
OUTFALL CANAL REEVALUATION REPORT
REACH 21, STA. 6+30 TO STA. 10+00
PROTECTED SIDE STABILITY ANALYSIS,
CASE: GAP Stability (Fully Spec)
MARCH 2012

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

GAP Stability (Fully Spec)

Report generated using GeoStudio 2007, version 7.15. Copyright © 1991-2009 GEO-SLOPE International Ltd.

File Information

Created By: Liljegren, James
Revision Number: 265
Last Edited By: Middleton, Mark C MVN
Date: 3/9/2012
Time: 9:28:19 AM
File Name: Reach 21.gsz
Directory: G:\F&MHOME\Middleton\London Ave Canal\Reach 21\final run\
Last Solved Date: 3/9/2012
Last Solved Time: 9:31:22 AM

Project Settings

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

Analysis Settings

GAP Stability (Fully Spec)

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: Fully-Specified
 Critical slip surfaces saved: 1
 Optimize Critical Slip Surface Location: Yes
 Tension Crack
 Tension Crack Option: (none)
FOS Distribution
 FOS Calculation Option: Constant
Advanced

CLAY 3, EL. -58.5 TO -70

Model: Spatial Mohr-Coulomb
Unit Weight: 104 pcf
Cohesion Spatial Fn: Clay 3
Phi: 0 °
Phi-B: 0 °

Sheet Pile

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

CLAY 2, EL. -26.5 TO -41.5 (protected)

Model: Spatial Mohr-Coulomb
Unit Weight: 99 pcf
Cohesion Fn: CLAY2
Phi: 0 °
Phi-B: 0 °

CLAY 3, EL. -58.5 TO -70 (protected)

Model: Spatial Mohr-Coulomb
Unit Weight: 104 pcf
Cohesion Fn: CLAY3
Phi: 0 °
Phi-B: 0 °

Slip Surface Limits

Left Coordinate: (117.4, -17.3) ft
Right Coordinate: (310, 0) ft

Fully Specified Slip Surfaces

Fully Specified Slip Surface 1

	X (ft)	Y (ft)
	177	7
	200	-8
	213	-8
	230	4

FullySpecFixedPoints
[1]
 flag: Yes
[2]
 flag: Yes

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

Materials

EMBANKMENT FILL, EL. +3.7 TO -5.5

Model: Undrained (Phi=0)
Unit Weight: 118 pcf
Cohesion: 650 psf

CLAY 1, EL. -5.5 TO -21.5

Model: Spatial Mohr-Coulomb
Unit Weight: 107 pcf
Cohesion Fn: CLAY1
Phi: 0 °
Phi-B: 0 °

SILT, EL. -21.5 TO -26.5

Model: Mohr-Coulomb
Unit Weight: 117 pcf
Cohesion: 200 psf
Phi: 15 °
Phi-B: 0 °

CLAY 2, EL. -26.5 TO -41.5

Model: Spatial Mohr-Coulomb
Unit Weight: 99 pcf
Cohesion Spatial Fn: Clay 2
Phi: 0 °
Phi-B: 0 °

SILTY SAND, EL. -53.5 TO -58.5

Model: Mohr-Coulomb
Unit Weight: 122 pcf
Cohesion: 0 psf
Phi: 30 °
Phi-B: 0 °

Cohesion Functions

CLAY2

Model: Spline Data Point Function
Function: Cohesion vs. Y
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 290
Data Points: Y (ft), Cohesion (psf)
 Data Point: (-41.5, 410)
 Data Point: (-26.5, 290)

CLAY3

Model: Spline Data Point Function
Function: Cohesion vs. Y
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 620
Data Points: Y (ft), Cohesion (psf)
 Data Point: (-70, 725)
 Data Point: (-58.5, 620)

CLAY1

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: (186.2, 330)
 Data Point: (200, 350)
 Data Point: (211.9, 330)

Spatial Functions

Clay 2

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
 Data Point: (186.2, -26.5, 290)
 Data Point: (186.2, -41.5, 410)
 Data Point: (200, -26.5, 370)
 Data Point: (200, -41.5, 490)
 Data Point: (211.9, -26.5, 290)
 Data Point: (211.9, -41.5, 410)

Clay 3

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (186.2, -58.5, 620)
Data Point: (186.2, -70, 725)
Data Point: (200, -58.5, 700)
Data Point: (200, -70, 805)
Data Point: (211.9, -58.5, 620)
Data Point: (211.9, -70, 725)

Regions

	Material	Points	Area (ft²)
Region 1	CLAY 3, EL. -58.5 TO -70	45,12,42,43,13,44	295.55
Region 2		2,3,4,9,25,10,11,21,22,23	196.39
Region 3	EMBANKMENT FILL, EL. +3.7 TO -5.5	10,25,18,1,19,24,5,39,11	645.345
Region 4		17,20,21,11,48,16	939.39
Region 5	Sheet Pile	25,9,26,27,18	6.825
Region 6	SILTY SAND, EL. -53.5 TO -58.5	7,32,28,35,8,42,12,45	963
Region 7	SILT, EL. -21.5 TO -26.5	32,6,46,29,41,36,35,28	2311.2
Region 8	CLAY 2, EL. -26.5 TO -41.5	47,30,40,41,29,46	385.5
Region 9	SILT, EL. -21.5 TO -26.5	33,34,31,38,37,40,30,47	963
Region 10	CLAY 1, EL. -5.5 TO -21.5	34,17,16,48,11,39,38,31	2106.92
Region 11	CLAY 2, EL. -26.5 TO -41.5 (protected)	6,46,47,33	1032
Region 12	CLAY 3, EL. -58.5 TO -70 (protected)	7,15,44,45	791.2
Region 13	CLAY 3, EL. -58.5 TO -70 (protected)	43,42,8,14	1128.15
Region 14	CLAY 2, EL. -26.5 TO -41.5 (protected)	41,40,37,36	1471.5

Points

	X (ft)	Y (ft)
Point 1	203	3.2
Point 2	186.2	1
Point 3	189.9	3
Point 4	191.8	6
Point 5	310	0
Point 6	117.4	-41.5
Point 7	117.4	-58.5

Point 44	186.2	-70
Point 45	186.2	-58.5
Point 46	186.2	-41.5
Point 47	186.2	-26.5
Point 48	200	-6.9

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	3.54	(210.338, 2.552)	13.53345	(200, 12.8)	(226.765, 0.406062)
2	1	3.75	(210.338, 2.552)	13.476	(200, 12.8)	(224.959, 0.441768)

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	-7.181031	630.50865	-1090.1675	0	349.58
2	Optimized	200.75	-7.190429	556.32175	1275.8747	0	348.74
3	Optimized	201.1974	-7.198839	554.92294	1270.4861	0	347.99
4	Optimized	201.7961	-7.2443875	555.16925	1234.0674	0	346.98
5	Optimized	202.5987	-7.3280625	556.84226	1219.5556	0	345.63
6	Optimized	203.4512	-7.41694	558.61279	1202.5149	0	344.2
7	Optimized	204.35355	-7.51102	560.46451	1182.8955	0	342.68
8	Optimized	205.2559	-7.6051	562.29418	1163.3863	0	341.17
9	Optimized	206.1583	-7.69918	564.09079	1143.7669	0	339.65

Point 8	310	-58.5
Point 9	200	6
Point 10	200	1
Point 11	200	-5.5
Point 12	200	-58.5
Point 13	200	-70
Point 14	310	-70
Point 15	117.4	-70
Point 16	200	-17.3
Point 17	117.4	-17.3
Point 18	201	3.7
Point 19	211.9	0.7
Point 20	117.4	-6.1
Point 21	166.2	-6
Point 22	175.7	-3.8
Point 23	182.6	-1
Point 24	247.3	0
Point 25	200	3.7
Point 26	200	12.8
Point 27	200.5	12.8
Point 28	200	-53.5
Point 29	200	-41.5
Point 30	200	-26.5
Point 31	200	-21.5
Point 32	117.4	-53.5
Point 33	117.4	-26.5
Point 34	117.4	-21.5
Point 35	310	-53.5
Point 36	310	-41.5
Point 37	310	-26.5
Point 38	310	-21.5
Point 39	310	-5.5
Point 40	211.9	-26.5
Point 41	211.9	-41.5
Point 42	211.9	-58.5
Point 43	211.9	-70

10	Optimized	207.0607	-7.79326	565.82127	1124.2577	0	338.13
11	Optimized	207.96305	-7.88734	567.56276	1104.6383	0	336.62
12	Optimized	208.8654	-7.98142	569.30426	1085.1181	0	335.1
13	Optimized	209.74715	-8.025133	568.09921	1088.762	0	333.62
14	Optimized	210.6083	-8.0184795	563.84909	1059.4176	0	332.17
15	Optimized	211.46945	-8.011826	559.59897	1030.0616	0	330.72
16	Optimized	212.45	-8.0042495	554.95608	1013.606	0	330
17	Optimized	213.47515	-7.7916665	537.47223	1097.3994	0	330
18	Optimized	214.42545	-7.375	507.55805	1047.3818	0	330
19	Optimized	215.37575	-6.9583335	477.85589	997.46057	0	330
20	Optimized	216.32605	-6.5416665	448.37539	947.45262	0	330
21	Optimized	217.27635	-6.125	418.93344	897.46394	0	330
22	Optimized	218.2469	-5.6994585	389.03237	846.30971	0	330
23	Optimized	219.2965	-5.1147425	349.12923	904.30883	0	650
24	Optimized	220.4049	-4.3797275	299.72195	805.43412	0	650
25	Optimized	221.40755	-3.6917815	253.76456	729.5062	0	650
26	Optimized	222.30445	-3.050905	211.14539	642.78917	0	650
27	Optimized	223.2013	-2.4100285	168.56251	556.06307	0	650
28	Optimized	224.1689	-1.673648	119.8333	481.05433	0	650

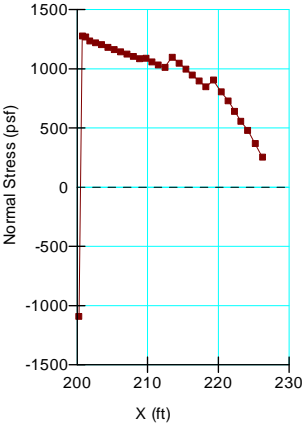
29	Optimize d	225.2073	- 0.8417641 5	64.99363	367.21871	0	650
30	Optimize d	226.2457	- 0.0098804	10.164485	253.37557	0	650

Slices of Slip Surface: 1

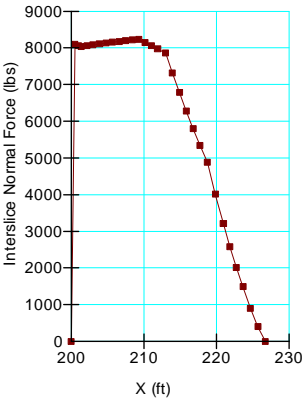
	Slip Surfac e	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Friction al Strengt h (psf)	Cohesiv e Strengt h (psf)
1	1	200.25	-8	673.8	-1501.36	0	349.58
2	1	200.75	-8	606.24	1368.36	0	348.74
3	1	201.5	-8	603.19	1353.1	0	347.48
4	1	202.5	-8	598.98	1323.5	0	345.8
5	1	203.40455	-8	595.02585	1295.2809	0	344.28
6	1	204.21365	-8	591.44158	1268.4607	0	342.92
7	1	205.02275	-8	587.89439	1241.5169	0	341.56
8	1	205.83185	-8	584.31012	1214.6843	0	340.2
9	1	206.64095	-8	580.62697	1187.8146	0	338.84
10	1	207.45	-8	576.93147	1160.9326	0	337.48
11	1	208.25905	-8	573.23596	1134.0629	0	336.12
12	1	209.06815	-8	569.55282	1107.1809	0	334.76
13	1	209.87725	-8	565.95619	1080.3112	0	333.4
14	1	210.68635	-8	562.3472	1053.4292	0	332.04
15	1	211.49545	-8	558.75057	1026.5596	0	330.68
16	1	212.45	-8	554.69091	1011.8182	0	330
17	1	213.4427	-7.6875	531.09291	1169.9748	0	330
18	1	214.3281	-7.0625	488.42758	1092.2841	0	330
19	1	215.21355	-6.4375	445.92834	1014.5933	0	330
20	1	216.099	-5.8125	403.69668	936.90256	0	330
21	1	216.96255	-5.2029115	362.44522	940.48052	0	650
22	1	217.8043	-4.6087345	322.27382	859.24481	0	650
23	1	218.64605	-4.014558	282.44212	778.00909	0	650
24	1	219.4878	-3.4203815	242.71717	696.77338	0	650
25	1	220.32955	-2.8262045	203.07958	615.53766	0	650
26	1	221.1713	-2.2320275	163.51963	534.30195	0	650

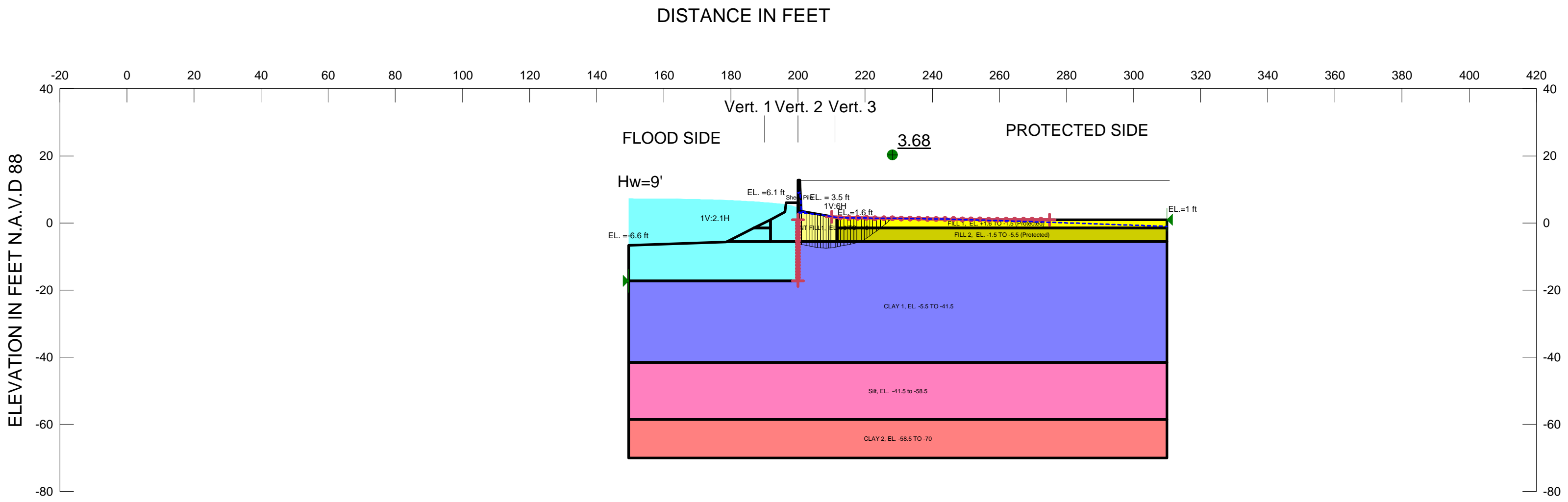
27	1	222.01305	-1.637851	123.96939	453.06624	0	650
28	1	222.8548	-1.0436744	84.441468	371.84023	0	650
29	1	223.69655	-0.4494974	44.929076	290.60451	0	650
30	1	224.5383	0.1446794	5.4722978	209.3688	0	650

Base Normal Stress Vs. X



Interslice Normal Stress
Vs. X





Name: EMBANKMENT FILL1, EL. +6 TO -1.5 Model: Undrained (Phi=0) Unit Weight: 114 pcf Cohesion: 825 psf

Name: CLAY 1, EL. -5.5 TO -41.5 Model: Spatial Mohr-Coulomb Unit Weight: 117 pcf Cohesion Spatial Fn: Clay 1 Phi: 0 °

Name: Silt, EL. -41.5 to -58.5 Model: Mohr-Coulomb Unit Weight: 117 pcf Cohesion: 200 psf Phi: 15 °

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

Name: FILL 1, EL. +1.6 TO -1.5 (Protected) Model: Undrained (Phi=0) Unit Weight: 114 pcf Cohesion: 900 psf

Name: FILL 2, EL. -1.5 TO -5.5 (Protected) Model: Undrained (Phi=0) Unit Weight: 114 pcf Cohesion: 500 psf

Name: CLAY 2, EL. -58.5 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 118 pcf Cohesion Spatial Fn: Clay 2 Phi: 0 °



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

GENERAL NOTES

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

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

Hw=CANAL WATER LEVEL

LONDON AVE CANAL
OUTFALL CANAL REEVALUATION REPORT
REACH 22, STA. 10+00 TO 11+85
AND STA. 13+55 TO 21+00
PROTECTED SIDE STABILITY ANALYSIS,
CASE: GAP Stability (Entry/Exit)
MARCH 2012

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

GAP Stability (Entry/Exit)

Report generated using GeoStudio 2007, version 7.15. Copyright © 1991-2009 GEO-SLOPE International Ltd.

File Information

Created By: Liljegren, James
Revision Number: 263
Last Edited By: Schroeder, Danielle V MVN
Date: 1/12/2012
Time: 10:58:03 AM
File Name: Reach 22-DVS.gsz
Directory: G:\F&MHOME\London Ave Reeevaluation 2011\Priority Reaches\Reach 22\SlopeW\
Last Solved Date: 1/12/2012
Last Solved Time: 10:59:06 AM

Project Settings

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

Analysis Settings

GAP Stability (Entry/Exit)

Kind: SLOPE/W
Parent: GAP Analysis (Seepage)
Method: Spencer
Settings
PWP Conditions Source: Parent Analysis
SlipSurface
Direction of movement: Left to Right
Use Passive Mode: Yes
Slip Surface Option: Entry and Exit
Critical slip surfaces saved: 1
Optimize Critical Slip Surface Location: Yes
Tension Crack
Tension Crack Option: (none)
FOS Distribution
FOS Calculation Option: Constant
Advanced
Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft

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 TO -1.5

Model: Undrained (Phi=0)
Unit Weight: 114 pcf
Cohesion: 825 psf

CLAY 1, EL. -5.5 TO -41.5

Model: Spatial Mohr-Coulomb
Unit Weight: 117 pcf
Cohesion Spatial Fn: Clay 1
Phi: 0 °
Phi-B: 0 °

Silt, EL. -41.5 to -58.5

Model: Mohr-Coulomb
Unit Weight: 117 pcf
Cohesion: 200 psf
Phi: 15 °
Phi-B: 0 °

Sheet Pile

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

FILL 1, EL. +1.6 TO -1.5 (Protected)

Model: Undrained (Phi=0)
Unit Weight: 114 pcf
Cohesion: 900 psf

FILL 2, EL. -1.5 TO -5.5 (Protected)

Model: Undrained (Phi=0)
Unit Weight: 114 pcf
Cohesion: 500 psf

CLAY 2, EL. -58.5 TO -70

Model: Spatial Mohr-Coulomb
Unit Weight: 118 pcf
Cohesion Spatial Fn: Clay 2
Phi: 0 °

3/1/2012

3/1/2012

Phi-B: 0 °

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (200, -17.2) ft
Left-Zone Right Coordinate: (200, 1) ft
Left-Zone Increment: 20
Right Projection: Range
Right-Zone Left Coordinate: (210, 1.90187) ft
Right-Zone Right Coordinate: (275, 1) ft
Right-Zone Increment: 25
Radius Increments: 25

Slip Surface Limits

Left Coordinate: (149.5, -17.2) ft
Right Coordinate: (310, 1) ft

Spatial Functions

Clay 2

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (191.8, -58.5, 715)
Data Point: (191.8, -70, 855)
Data Point: (200, -58.5, 765)
Data Point: (200, -70, 905)
Data Point: (211.7, -58.5, 715)
Data Point: (211.7, -70, 855)
Data Point: (149.5, -58.5, 715)
Data Point: (149.5, -70, 855)
Data Point: (310, -58.5, 715)
Data Point: (310, -70, 855)

Clay 1

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (191.8, -5.5, 165)
Data Point: (191.8, -41, 520)
Data Point: (200, -5.5, 175)
Data Point: (200, -41.5, 550)
Data Point: (211.7, -5.5, 165)
Data Point: (211.7, -41.5, 520)
Data Point: (149.5, -5.5, 165)
Data Point: (149.5, -41.5, 520)

Data Point: (310, -5.5, 165)
Data Point: (310, -41.5, 520)

Regions

	Material	Points	Area (ft²)
Region 1	Sheet Pile	6,16,17,18,12	6.975
Region 2	FILL 1, EL. +1.6 TO -1.5 (Protected)	19,26,27,2,13	259.25
Region 3	FILL 2, EL. -1.5 TO -5.5 (Protected)	26,25,23,27	393.2
Region 4	Silt, EL. -41.5 to -58.5	28,4,5,3	2728.5
Region 5		31,30,29,24	35.73136
Region 6	EMBANKMENT FILL1, EL. +6 TO -1.5	7,32,6,12,19,26,25	95.135
Region 7	CLAY 1, EL. -58.5 TO -70	9,4,5,8	1845.75
Region 8	CLAY 1, EL. -5.5 TO -41.5	28,11,10,7,25,23,3	5187.15
Region 9		11,14,15,24,29,7,10	571.9603
Region 10		31,1,30	6.2033625
Region 11		29,30,1,20,21,22,16,6,32,7	77.715

Points

	X (ft)	Y (ft)
Point 1	191.8	1
Point 2	310	1
Point 3	310	-41.5
Point 4	149.5	-58.5
Point 5	310	-58.5
Point 6	200	3.5
Point 7	200	-5.5
Point 8	310	-70
Point 9	149.5	-70
Point 10	200	-17.2
Point 11	149.5	-17.2
Point 12	201	3.5
Point 13	256.7	1
Point 14	149.5	-6.6
Point 15	178.5	-5.7
Point 16	200	6.1
Point 17	200	12.8
Point 18	200.5	12.8
Point 19	211.7	1.6
Point 20	196.1	3.3
Point 21	196.4	6.1
Point 22	199	6.1
Point 23	310	-5.5

3/1/2012

3/1/2012

Point 24	178.89701	-5.5
Point 25	211.7	-5.5
Point 26	211.7	-1.5
Point 27	310	-1.5
Point 28	149.5	-41.5
Point 29	191.8	-5.5
Point 30	191.8	-1.5
Point 31	186.83731	-1.5
Point 32	200	-1.5

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	3.68	(207.94, 20.177)	13.82255	(200, 12.8)	(227.959, 1.38322)
2	8304	3.89	(207.94, 20.177)	27.623	(200, 12.8)	(228.18, 1.38026)

Slices of Slip Surface: **Optimized**

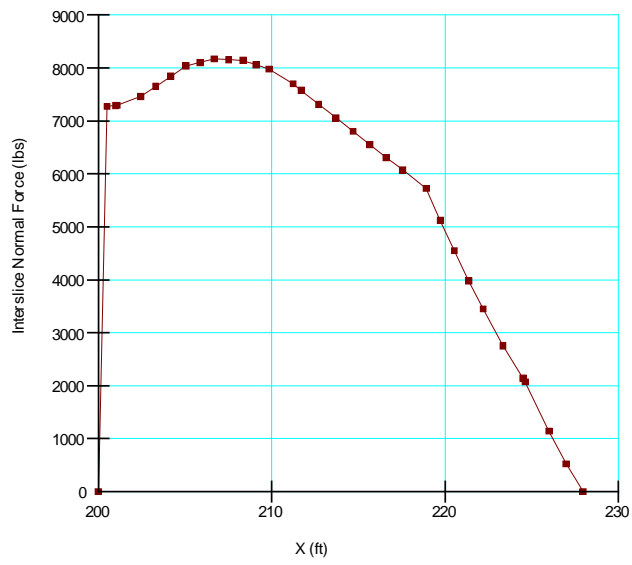
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	200.25	-6.3339545	650.35451	-237.87619	0	183.46
2	Optimized	200.75	-6.3701895	594.8002	1121.6985	0	183.39
3	Optimized	201.0421	-6.3913585	595.09105	1122.8569	0	183.35
4	Optimized	201.76655	-6.501345	599.57417	1108.2338	0	183.84
5	Optimized	202.88215	-6.7147815	609.41246	1097.1352	0	185.02
6	Optimized	203.7487	-6.927785	619.57662	1104.296	0	186.41
7	Optimized	204.61525	-7.1407885	629.74078	1111.4569	0	187.79
8	Optimized	205.45805	-7.295135	636.19222	1132.2022	0	188.57
9	Optimized	206.27715	-7.390825	638.73879	1126.8787	0	188.77
10	Optimized	207.1012	-7.4514925	638.79179	1130.7404	0	188.6
11	Optimized	207.93025	-7.4771375	636.51319	1116.9844	0	188.07
12	Optimized	208.71945	-7.4702	632.3016	1113.1584	0	187.25
13	Optimized	209.4687	-7.43068	626.19743	1093.2332	0	186.15
14	Optimized	210.5407	-7.31371	613.50556	1070.631	0	183.98
15	Optimized	211.46905	-7.1678835	599.57301	1044.7776	0	181.66
16	Optimized	212.1998	-7.014059	586.274	1020.7178	0	179.93
17	Optimized	213.19945	-6.8036435	568.25212	993.89547	0	177.86
18	Optimized	214.1991	-6.593228	550.24003	967.04375	0	175.78
19	Optimized	215.1741	-6.3787035	532.40503	942.45534	0	173.66
20	Optimized	216.12445	-6.16007	514.75732	914.63533	0	171.51
21	Optimized	217.0748	-5.9414365	497.14037	886.82558	0	169.35
22	Optimized	218.2304	-5.66426	475.4267	853.76173	0	166.62
23	Optimized	219.3162	-5.22875	443.87468	926.58119	0	500
24	Optimized	220.12705	-4.69345	406.59694	860.22847	0	500

25	Optimized	220.9466	-4.1392625	368.37099	798.70806	0	500
26	Optimized	221.77485	-3.5661875	329.2711	727.52799	0	500
27	Optimized	222.76395	-2.8609775	281.44717	647.58296	0	500
28	Optimized	223.9139	-2.0236325	225.1029	543.28807	0	500
29	Optimized	224.55305	-1.55248	193.63876	502.17271	0	500
30	Optimized	225.3028	-0.93951	152.87369	532.66669	0	900
31	Optimized	226.48095	0.06153965	86.686177	430.93403	0	900
32	Optimized	227.46605	0.94265915	28.831836	319.69547	0	900

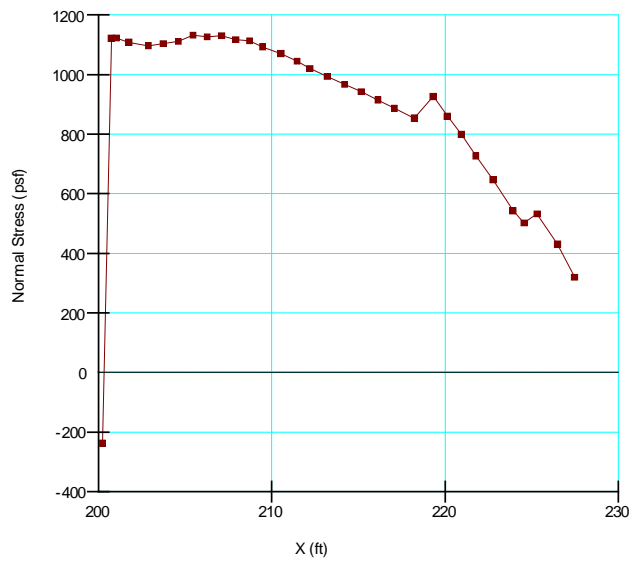
Slices of Slip Surface: **8304**

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	8304	200.25	-6.3524625	651.46617	-281.26342	0	183.66
2	8304	200.75	-6.49232	602.72291	1105.5327	0	184.66
3	8304	201.48635	-6.676593	612.00296	1120.9292	0	185.9
4	8304	202.4591	-6.891942	622.50129	1132.0312	0	187.24
5	8304	203.43185	-7.0708745	630.30676	1139.0047	0	188.17
6	8304	204.40455	-7.2141045	635.45415	1141.8293	0	188.73
7	8304	205.37725	-7.322191	638.31913	1140.499	0	188.92
8	8304	206.35	-7.3955485	638.69744	1135.0219	0	188.75
9	8304	207.32275	-7.4344535	636.6075	1125.5229	0	188.22
10	8304	208.29545	-7.439052	632.27276	1111.833	0	187.34
11	8304	209.26815	-7.409361	625.7299	1094.003	0	186.13
12	8304	210.2409	-7.345269	616.98243	1072.0998	0	184.57
13	8304	211.21365	-7.2465355	605.95011	1045.7976	0	182.68
14	8304	212.1588	-7.117551	593.26704	1024.967	0	180.95
15	8304	213.07635	-6.9597885	579.04509	1009.7711	0	179.4
16	8304	213.9939	-6.769867	562.71233	990.67994	0	177.52
17	8304	214.9115	-6.5470995	544.39496	967.54964	0	175.33
18	8304	215.8291	-6.290656	524.35222	940.27252	0	172.8
19	8304	216.74665	-5.999545	502.08039	908.65529	0	169.93
20	8304	217.6642	-5.672594	477.52197	872.53283	0	166.7
21	8304	218.6185	-5.292235	449.92146	877.10025	0	500
22	8304	219.60955	-4.8534435	418.42294	833.63589	0	500
23	8304	220.6006	-4.3668015	383.99835	784.58662	0	500
24	8304	221.59165	-3.829392	346.81533	729.5928	0	500
25	8304	222.5827	-3.23771	306.31756	668.20945	0	500
26	8304	223.57375	-2.5875105	262.23244	599.91483	0	500
27	8304	224.5648	-1.8735995	214.42861	524.02633	0	500
28	8304	225.58035	-1.0681983	160.85138	541.11012	0	900
29	8304	226.6204	-0.15868595	100.7582	453.08619	0	900
30	8304	227.66045	0.84964235	34.647222	354.87779	0	900

Interslice Normal Stress Vs. X



Base Normal Stress Vs. X



GAP Stability (Entry/Exit)

Report generated using GeoStudio 2007, version 7.15. Copyright © 1991-2009 GEO-SLOPE International Ltd.

File Information

Created By: Lijjegen, James
Revision Number: 149
Last Edited By: Schroeder, Danielle V MVN
Date: 1/6/2012
Time: 10:20:17 AM
File Name: Reach 23-DVS.gsz
Directory: G:\F&M\HOME\London Ave Reevaluation 2011\East Side\Reach 23\SlopeW\
Last Solved Date: 1/6/2012
Last Solved Time: 10:21:24 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 Seepage Analysis
Method: Spencer
Settings
 PWP Conditions Source: Parent Analysis
SlipSurface
 Direction of movement: Left to Right
 Use Passive Mode: Yes
 Slip Surface Option: Entry and Exit
 Critical slip surfaces saved: 1
 Optimize Critical Slip Surface Location: Yes
 Tension Crack
 Tension Crack Option: (none)
FOS Distribution
 FOS Calculation Option: Constant
Advanced
 Number of Slices: 30
 Optimization Tolerance: 0.01
 Minimum Slip Surface Depth: 0.1 ft

2/28/2012

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (200, -13.1) ft
Left-Zone Right Coordinate: (200, -1.09782) ft
Left-Zone Increment: 25
Right Projection: Range
Right-Zone Left Coordinate: (217.42747, 2.97658) ft
Right-Zone Right Coordinate: (294.9, -0.4) ft
Right-Zone Increment: 25
Radius Increments: 25

Slip Surface Limits

Left Coordinate: (93.4, -13.2) ft
Right Coordinate: (310, -0.4) ft

Cohesion Functions

MARSH 1

Model: Spline Data Point Function
Function: Cohesion vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 475
Data Points: X (ft), Cohesion (psf)
 Data Point: (93.4, 475)
 Data Point: (185.9, 475)
 Data Point: (200, 500)
 Data Point: (251.9, 475)
 Data Point: (310, 475)

PRODELTA

Model: Spline Data Point Function
Function: Cohesion vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 380
Data Points: X (ft), Cohesion (psf)
 Data Point: (93.4, 380)
 Data Point: (185.9, 380)
 Data Point: (200, 400)
 Data Point: (251.9, 380)
 Data Point: (310, 380)

Spatial Functions

2/28/2012

Optimization Maximum Iterations: 4000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

EMBANKMENT FILL, EL. 4.3 TO -4.5

Model: Undrained (Phi=0)
Unit Weight: 117 pcf
Cohesion: 760 psf

MARSH, EL. -4.5 TO -17.5

Model: Spatial Mohr-Coulomb
Unit Weight: 114 pcf
Cohesion Fn: MARSH 1
Phi: 0 °
Phi-B: 0 °

BEACH SAND SP, EL. -41.5 TO -57

Model: Mohr-Coulomb
Unit Weight: 122 pcf
Cohesion: 0 psf
Phi: 30 °
Phi-B: 0 °

BAY SOUND CLAY CL, EL. -57 TO -70

Model: Spatial Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion Spatial Fn: Bay Sound
Phi: 0 °
Phi-B: 0 °

Prodelta, MH, EL. -17.5 TO -41.5

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

Sheet Pile

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

2/28/2012

Bay Sound

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
 Data Point: (185.9, -57, 580)
 Data Point: (185.9, -70, 720)
 Data Point: (200, -57, 715)
 Data Point: (200, -70, 860)
 Data Point: (251.9, -57, 580)
 Data Point: (251.9, -70, 720)
 Data Point: (93.4, -57, 580)
 Data Point: (93.4, -70, 720)
 Data Point: (310, -57, 580)
 Data Point: (310, -70, 720)

Regions

	Points	Area (ft²)	Material
Region 1	14,10,11,16,17,21,22,23,40	885.955	
Region 2	16,11,10,1,2,4,12,3	1888.38	MARSH, EL. -4.5 TO -17.5
Region 3	3,12,4,6,5	5198.4	Prodelta, MH, EL. -17.5 TO -41.5
Region 4	5,6,7,38,13,39,8	3357.3	BEACH SAND SP, EL. -41.5 TO -57
Region 5	10,33,28,27,29,30,31,32,1	580.965	EMBANKMENT FILL, EL. 4.3 TO -4.5
Region 6	20,9,24,33,10,14,40,18,19	91.95	
Region 7	25,26,27,28,33	6.725	Sheet Pile
Region 8	39,8,34,35,36,37,7,38,13	2815.8	BAY SOUND CLAY CL, EL. -57 TO -70

Points

	X (ft)	Y (ft)
Point 1	310	-4.5
Point 2	310	-7.5
Point 3	93.4	-17.5
Point 4	310	-17.5
Point 5	93.4	-41.5
Point 6	310	-41.5
Point 7	310	-57
Point 8	93.4	-57
Point 9	197.1	3.8
Point 10	200	-4.5
Point 11	200	-13.2
Point 12	200	-17.5
Point 13	200	-57
Point 14	197	-4.5
Point 15	197	-10

2/28/2012

Point 16	93.4	-13.2
Point 17	93.4	-6.1
Point 18	183.5	-4
Point 19	188	-1.2
Point 20	194.4	3.5
Point 21	110	-5
Point 22	149.1	-4.6
Point 23	176.1	-5.2
Point 24	199	4
Point 25	200	12.9
Point 26	200.5	12.9
Point 27	201	4.2
Point 28	201	4
Point 29	201.2	4.2
Point 30	208	3.9
Point 31	251.9	-0.4
Point 32	310	-0.4
Point 33	200	4
Point 34	93.4	-70
Point 35	185.9	-70
Point 36	251.9	-70
Point 37	310	-70
Point 38	251.9	-57
Point 39	185.9	-57
Point 40	180.4	-4.5

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	4.68	(236.209, 21.158)	34.69549	(200, 12.9)	(277.863, -0.4)
2	9974	4.85	(236.209, 21.158)	45.49	(200, 12.9)	(276.267, -0.4)

Slices of Slip Surface: **Optimized**

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	200.25	-5.7369455	613.99659	636.84863	0	499.88
2	Optimized	200.75	-6.2614785	599.24489	1051.2763	0	499.64
3	Optimized	201.1	-6.628652	623.80807	1113.9676	0	499.47
4	Optimized	202.2797	-7.866259	704.30883	1245.1214	0	498.9
5	Optimized	204.43915	-10.13166	837.67476	1484.279	0	497.86
6	Optimized	206.75945	-12.45346	947.62046	1743.1526	0	496.74

2/28/2012

7	Optimized	209.05915	-14.65778	1042.6784	1969.0417	0	495.64
8	Optimized	211.3543	-16.5865	1124.9224	2194.6706	0	494.53
9	Optimized	213.85385	-18.433835	1205.1897	2372.5093	0	394.66
10	Optimized	216.23105	-19.873095	1267.5518	2530.1567	0	393.75
11	Optimized	218.4584	-20.88394	1309.6618	2602.684	0	392.89
12	Optimized	220.68575	-21.894785	1353.8568	2675.2522	0	392.03
13	Optimized	223.0576	-22.750225	1390.9579	2761.2037	0	391.11
14	Optimized	225.57405	-23.450255	1420.2456	2800.6369	0	390.14
15	Optimized	228.08095	-23.99151	1441.7261	2846.6017	0	389.18
16	Optimized	230.57825	-24.373995	1455.3423	2855.4284	0	388.22
17	Optimized	233.07485	-24.611345	1461.495	2870.5406	0	387.25
18	Optimized	235.5708	-24.703555	1459.9335	2850.9622	0	386.29
19	Optimized	237.9765	-24.66915	1451.891	2838.6819	0	385.37
20	Optimized	240.29195	-24.50813	1436.9408	2796.2441	0	384.47
21	Optimized	242.6986	-24.06184	1404.9744	2763.2675	0	383.55
22	Optimized	245.1964	-23.330275	1355.8726	2661.9132	0	382.58
23	Optimized	247.70175	-22.414595	1295.5977	2566.3685	0	381.62
24	Optimized	250.2146	-21.31481	1224.252	2427.7237	0	380.65
25	Optimized	251.6855	-20.63692	1180.4556	2368.7181	0	380.08
26	Optimized	253.0781	-19.80584	1127.2608	2283.1669	0	380
27	Optimized	255.4343	-18.39968	1037.3526	2142.6374	0	380
28	Optimized	256.7536	-17.5983	986.08317	2077.6427	0	380
29	Optimized	258.45945	-16.410565	910.40861	1955.8509	0	475
30	Optimized	261.5887	-14.23169	771.54605	1701.7023	0	475
31	Optimized	264.76735	-11.87952	621.70813	1440.3885	0	475
32	Optimized	267.9954	-9.354055	461.01704	1144.9667	0	475
33	Optimized	271.53415	-6.29566	266.83585	806.9277	0	475
34	Optimized	273.73125	-4.245945	136.93869	625.78295	0	760
35	Optimized	275.9334	-2.195945	7.1584044	378.00593	0	760

Slices of Slip Surface: **9974**

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	9974	200.25	-6.701467	677.87791	710.15373	0	499.88

2/28/2012

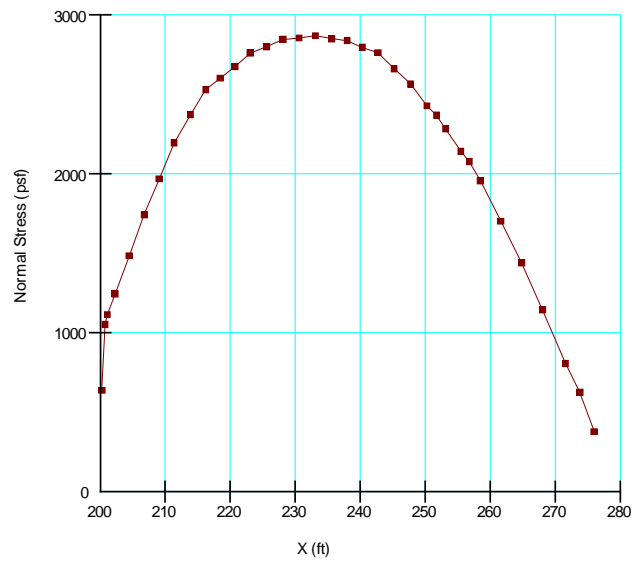
2	9974	200.75	-7.335278	673.43012	1150.9547	0	499.64
3	9974	201.1	-7.7677795	702.47068	1224.8011	0	499.47
4	9974	202.33335	-9.155684	795.3487	1385.4101	0	498.88
5	9974	204.6	-11.518535	929.14589	1657.128	0	497.78
6	9974	206.86665	-13.572385	1012.8215	1892.4267	0	496.69
7	9974	209.0578	-15.31731	1079.6806	2085.196	0	495.64
8	9974	211.17335	-16.802355	1139.2285	2241.2074	0	494.62
9	9974	213.47075	-18.215905	1196.4189	2387.1446	0	394.81
10	9974	215.95005	-19.54877	1251.1794	2499.8673	0	393.85
11	9974	218.4294	-20.69239	1298.9944	2593.7197	0	392.9
12	9974	220.90875	-21.662005	1339.3578	2670.2076	0	391.94
13	9974	223.38805	-22.469275	1373.1009	2730.5293	0	390.99
14	9974	225.86735	-23.123115	1399.947	2775.6208	0	390.03
15	9974	228.34665	-23.63026	1419.742	2806.1932	0	389.08
16	9974	230.82595	-23.995675	1432.3579	2822.7031	0	388.12
17	9974	233.30525	-24.222795	1437.9069	2825.5396	0	387.17
18	9974	235.78455	-24.3137	1436.2276	2814.9416	0	386.21
19	9974	238.26385	-24.26921	1427.289	2790.996	0	385.25
20	9974	240.74315	-24.08892	1410.7925	2753.6401	0	384.3
21	9974	243.22245	-23.771195	1386.4275	2702.7964	0	383.34
22	9974	245.70175	-23.31308	1353.8806	2638.1009	0	382.39
23	9974	248.18105	-22.710155	1312.7375	2559.2098	0	381.43
24	9974	250.66035	-21.95633	1262.5479	2465.5136	0	380.48
25	9974	253.2812	-20.98124	1198.8892	2365.0658	0	380
26	9974	256.0436	-19.752005	1119.4261	2254.8132	0	380
27	9974	258.806	-18.291175	1025.785	2122.1211	0	380
28	9974	261.5458	-16.588055	917.1758	1965.0755	0	475
29	9974	264.263	-14.610545	791.5798	1752.335	0	475
30	9974	266.98015	-12.295315	644.88291	1501.8827	0	475

2/28/2012

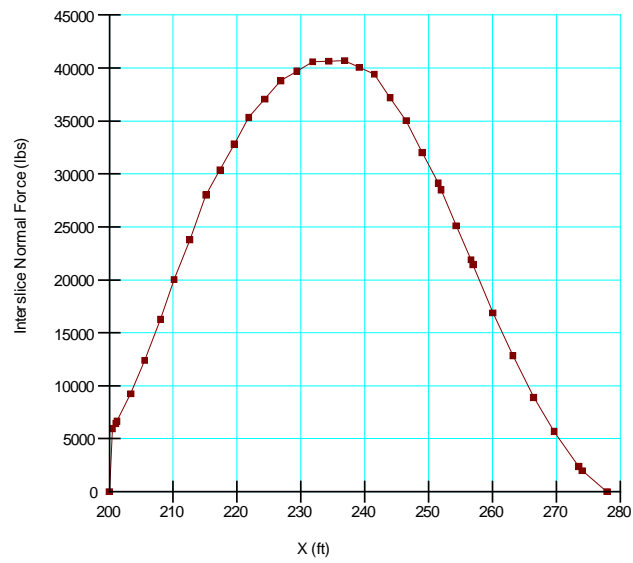
31	9974	269.6973	-9.5647625	472.29124	1205.247	0	475
32	9974	272.4145	-6.2919375	265.74994	848.85672	0	475
33	9974	275.02005	-2.45	23.817844	527.34749	0	760

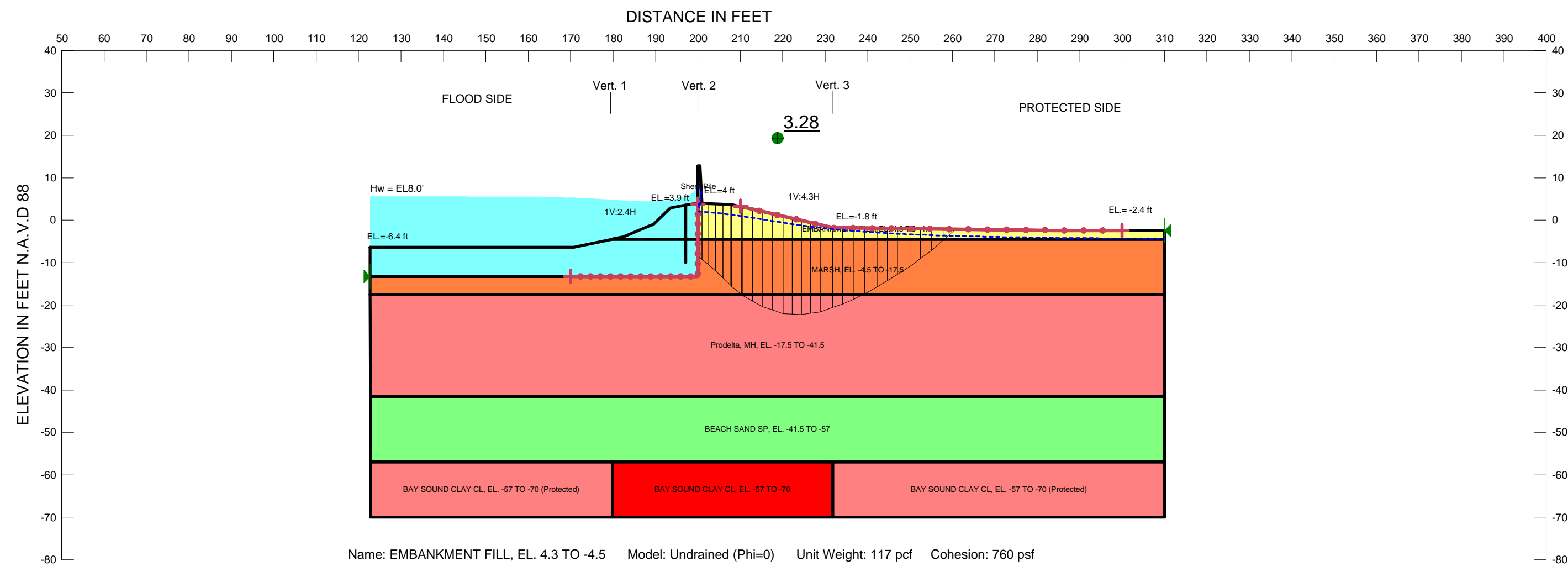
2/28/2012

Base Normal Stress Vs. X



Interslice Normal Stress Vs. X





GENERAL NOTES

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

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

Hw=CANAL WATER LEVEL

LONDON AVE CANAL
OUTFALL CANAL REEVALUATION REPORT
REACH 24, STA. 24+00 TO 33+00
PROTECTED SIDE STABILITY ANALYSIS,
CASE: GAP Stability (Entry/Exit)
MARCH 2012

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

GAP Stability (Entry/Exit)

Report generated using GeoStudio 2007, version 7.15. Copyright © 1991-2009 GEO-SLOPE International Ltd.

File Information

Revision Number: 175
Last Edited By: Haggerty, Daniel R MVN
Date: 12/15/2011
Time: 7:58:17 AM
File Name: Reach 24.gsz
Last Solved Date: 12/15/2011
Last Solved Time: 7:58:40 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

GAP Stability (Entry/Exit)

Kind: SLOPE/W
Parent: Gap Seepage Analysis
Method: Spencer
Settings
 PWP Conditions Source: Parent Analysis
SlipSurface
 Direction of movement: Left to Right
 Use Passive Mode: Yes
 Slip Surface Option: Entry and Exit
 Critical slip surfaces saved: 1
 Optimize Critical Slip Surface Location: Yes
 Tension Crack
 Tension Crack Option: (none)
FOS Distribution
 FOS Calculation Option: Constant
Advanced
 Number of Slices: 30
 Optimization Tolerance: 0.01
 Minimum Slip Surface Depth: 0.1 ft

Cohesion: 0.01 psf

BAY SOUND CLAY CL, EL. -57 TO -70 (Protected)

Model: Spatial Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion Fn: Bay Sound
Phi: 0 °
Phi-B: 0 °

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (170, -13.3) ft
Left-Zone Right Coordinate: (200, 3.8) ft
Left-Zone Increment: 20
Right Projection: Range
Right-Zone Left Coordinate: (210, 3.23782) ft
Right-Zone Right Coordinate: (300, -2.4) ft
Right-Zone Increment: 20
Radius Increments: 20

Slip Surface Limits

Left Coordinate: (122.7, -13.3) ft
Right Coordinate: (310, -2.4) ft

Cohesion Functions

Bay Sound

Model: Spline Data Point Function
Function: Cohesion vs. Y
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 580
Data Points: Y (ft), Cohesion (psf)
 Data Point: (-70, 720)
 Data Point: (-57, 580)

MARSH 1

Model: Spline Data Point Function
Function: Cohesion vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 475
Data Points: X (ft), Cohesion (psf)

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

EMBANKMENT FILL, EL. 4.3 TO -4.5

Model: Undrained (Phi=0)
Unit Weight: 117 pcf
Cohesion: 760 psf

MARSH, EL. -4.5 TO -17.5

Model: Spatial Mohr-Coulomb
Unit Weight: 114 pcf
Cohesion Fn: MARSH 1
Phi: 0 °
Phi-B: 0 °

BEACH SAND SP, EL. -41.5 TO -57

Model: Mohr-Coulomb
Unit Weight: 122 pcf
Cohesion: 0 psf
Phi: 30 °
Phi-B: 0 °

BAY SOUND CLAY CL, EL. -57 TO -70

Model: Spatial Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion Spatial Fn: Bay Sound
Phi: 0 °
Phi-B: 0 °

Prodelta, MH, EL. -17.5 TO -41.5

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

Sheet Pile

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

Data Point: (179.8, 475)
Data Point: (200, 500)
Data Point: (231.8, 475)

PRODELTA

Model: Spline Data Point Function
Function: Cohesion vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 380
Data Points: X (ft), Cohesion (psf)
 Data Point: (179.8, 380)
 Data Point: (200, 400)
 Data Point: (231.8, 380)

Spatial Functions

Bay Sound

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
 Data Point: (179.8, -57, 580)
 Data Point: (179.8, -70, 720)
 Data Point: (200, -57, 715)
 Data Point: (200, -70, 860)
 Data Point: (231.8, -57, 580)
 Data Point: (231.8, -70, 720)

Regions

	Points	Area (ft ²)	Material
Region 1	32,18,21,19,22,20,10,23,31,11,15	89.001625	
Region 2	1,2,32,15,11,12,17	580.42588	
Region 3	17,12,11,4,5,7,13,6	1754.66	MARSH, EL. -4.5 TO -17.5
Region 4	6,13,7,9,14,8	4494	Prodelta, MH, EL. -17.5 TO -41.5
Region 5	31,24,25,26,41	6.7	Sheet Pile
Region 6	26,27,30,28,29,3,4,11,31,41	376.29	EMBANKMENT FILL, EL. 4.3 TO -4.5
Region 7	8,33,35,36,34,9,14	2901.6	BEACH SAND SP, EL. -41.5 TO -57
Region 8	33,37,38,35	741	BAY SOUND CLAY CL, EL. -57 TO -70 (Protected)
Region 9	35,38,39,36	676	BAY SOUND CLAY CL, EL. -57 TO -70

Region 10	36,39,40,34	1016.6	BAY SOUND CLAY CL, EL. -57 TO - 70 (Protected)
--------------	-------------	--------	---

Points

	X (ft)	Y (ft)
Point 1	122.7	-6.4
Point 2	170.7	-6.4
Point 3	310	-2.5
Point 4	310	-4.5
Point 5	310	-7.5
Point 6	122.7	-17.5
Point 7	310	-17.5
Point 8	122.8	-41.5
Point 9	310	-41.5
Point 10	197.1	3.6
Point 11	200	-4.5
Point 12	200	-13.3
Point 13	200	-17.5
Point 14	200	-41.5
Point 15	197.1	-4.5
Point 16	197.1	-10
Point 17	122.7	-13.3
Point 18	180	-4.4
Point 19	188.3	-1.5
Point 20	193.5	2.9
Point 21	182.5	-3.9
Point 22	189.5	-1
Point 23	199	3.9
Point 24	200	12.8
Point 25	200.5	12.8
Point 26	201	4
Point 27	208	3.7
Point 28	283.5	-2.4
Point 29	310	-2.4
Point 30	231.8	-1.8

Point 31	200	3.9
Point 32	179.7675	-4.5
Point 33	122.8	-57
Point 34	310	-57
Point 35	179.8	-57
Point 36	231.8	-57
Point 37	122.8	-70
Point 38	179.8	-70
Point 39	231.8	-70
Point 40	310	-70
Point 41	201	3.9

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	3.28	(227.664, 14.743)	28.04953	(200, 12.8)	(260.748, -2.13595)
2	6859	3.53	(227.664, 14.743)	35.797	(200, 12.8)	(259.241, -2.11847)

Slices of Slip Surface: Optimized

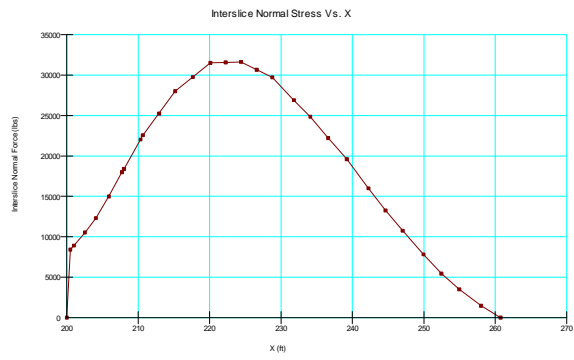
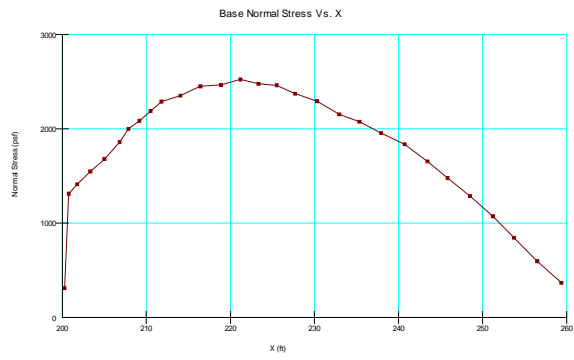
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	200.25	-8.593427	760.86952	310.46073	0	499.8
2	Optimized	200.75	-9.018573	738.44126	1311.1084	0	499.41
3	Optimized	201.77145	-9.887088	798.93186	1412.5491	0	498.61
4	Optimized	203.3143	-11.19897	875.02296	1547.7453	0	497.39
5	Optimized	204.99485	-12.73183	934.74296	1678.9272	0	496.07
6	Optimized	206.8131	-14.485665	1000.6508	1859.669	0	494.64
7	Optimized	207.8611	-15.47633	1034.5849	1998.9016	0	493.82
8	Optimized	209.166	-16.54504	1071.2211	2084.5518	0	492.79
9	Optimized	210.49455	-17.63312	1113.4209	2188.4545	0	393.4
10	Optimized	211.7887	-18.40957	1138.3772	2289.1615	0	392.59
11	Optimized	214.05185	-19.69623	1184.8941	2352.1187	0	391.16
12	Optimized	216.41425	-20.75502	1222.0891	2450.2597	0	389.68

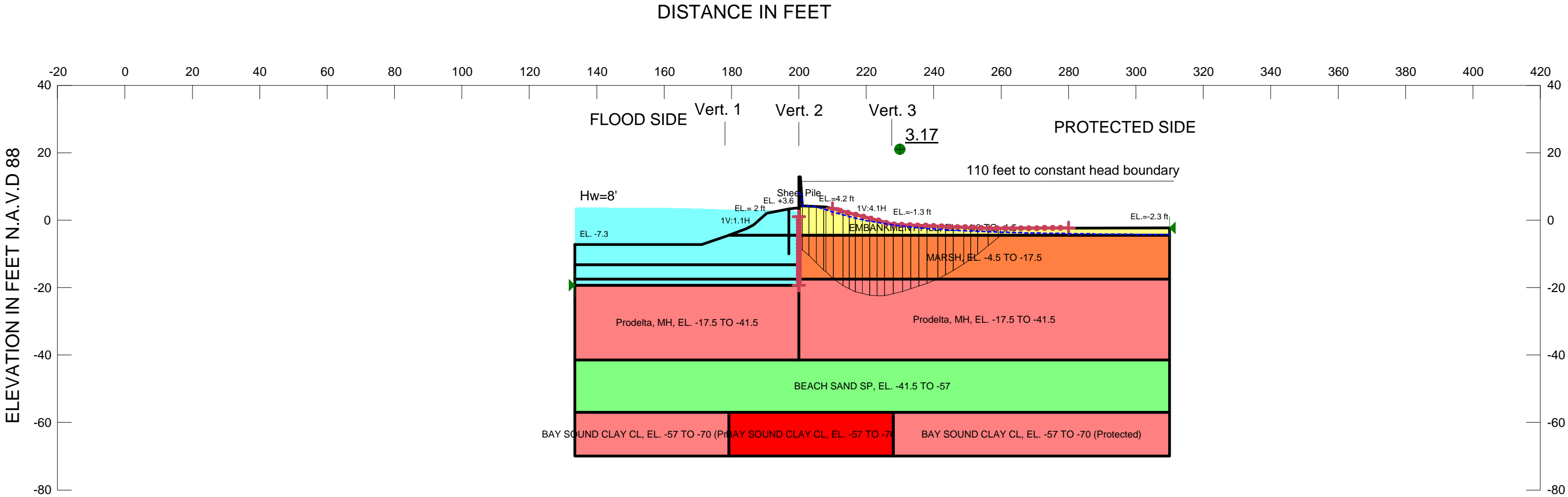
13	Optimized	218.8759	-21.585945	1248.8395	2465.0012	0	388.13
14	Optimized	221.18215	-22.063655	1259.8224	2523.6829	0	386.68
15	Optimized	223.33305	-22.18815	1253.835	2477.872	0	385.33
16	Optimized	225.5034	-22.106085	1237.2324	2461.3803	0	383.96
17	Optimized	227.6932	-21.817455	1209.3882	2373.1392	0	382.58
18	Optimized	230.29405	-21.13244	1157.2579	2292.5793	0	380.95
19	Optimized	232.95075	-20.178575	1089.5835	2153.69	0	380
20	Optimized	235.35095	-19.19906	1021.6113	2075.4066	0	380
21	Optimized	237.9072	-18.040355	942.72293	1954.6899	0	380
22	Optimized	240.73225	-16.586315	845.04162	1834.8902	0	475
23	Optimized	243.44625	-14.996785	739.65094	1653.8921	0	475
24	Optimized	245.83775	-13.5411	643.46203	1478.2661	0	475
25	Optimized	248.49615	-11.83796	531.32487	1286.4029	0	475
26	Optimized	251.21345	-9.92629	406.27778	1072.8787	0	475
27	Optimized	253.72275	-8.05355	284.31779	845.8345	0	475
28	Optimized	256.4951	-5.788005	137.32537	595.95476	0	475
29	Optimized	259.3804	-3.297392	-23.438107	367.11565	0	760

14	6859	222.9412	-20.72728	1173.3635	2327.8953	0	385.57
15	6859	224.9098	-20.93435	1173.4217	2308.4536	0	384.33
16	6859	226.87845	-21.031975	1168.0475	2277.9466	0	383.1
17	6859	228.8471	-21.02105	1157.6388	2236.5346	0	381.86
18	6859	230.8157	-20.90148	1141.5259	2184.231	0	380.62
19	6859	232.75125	-20.677845	1119.8588	2146.7429	0	380
20	6859	234.65375	-20.35178	1093.0612	2124.6236	0	380
21	6859	236.55625	-19.918295	1059.9679	2092.0862	0	380
22	6859	238.45875	-19.373285	1020.4619	2048.7915	0	380
23	6859	240.36125	-18.711275	974.43395	1994.1767	0	380
24	6859	242.2638	-17.92512	921.03337	1927.6773	0	380
25	6859	244.2604	-16.952665	856.02282	1850.7823	0	475
26	6859	246.351	-15.76506	777.81032	1729.546	0	475
27	6859	248.4416	-14.379005	687.57264	1586.3467	0	475
28	6859	250.5322	-12.764205	582.88481	1417.9104	0	475
29	6859	252.6228	-10.876853	461.71541	1219.6948	0	475
30	6859	254.71345	-8.649813	319.08446	984.69377	0	475
31	6859	256.8041	-5.9705545	148.08359	701.66152	0	475
32	6859	258.54545	-3.309235	-21.05647	575.76683	0	760

Slices of Slip Surface: 6859

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	6859	200.25	-8.2727825	737.37493	339.79173	0	499.8
2	6859	200.75	-8.855695	725.3923	1246.7544	0	499.41
3	6859	201.875	-10.050967	811.98038	1402.2632	0	498.53
4	6859	203.625	-11.754935	906.48352	1606.9038	0	497.15
5	6859	205.375	-13.245595	956.44182	1785.9809	0	495.77
6	6859	207.125	-14.55584	998.50692	1943.5324	0	494.4
7	6859	209.02845	-15.796835	1031.9106	2071.2913	0	492.9
8	6859	211.08535	-16.96221	1068.6161	2168.2084	0	491.29
9	6859	213.0981	-17.938715	1098.6819	2247.2405	0	391.76
10	6859	215.0667	-18.74769	1122.5255	2288.9821	0	390.52
11	6859	217.0353	-19.42416	1142.7066	2317.1834	0	389.29
12	6859	219.00395	-19.975905	1157.9405	2332.6878	0	388.05
13	6859	220.9726	-20.408825	1168.0268	2336.1035	0	386.81





Name: EMBANKMENT FILL, EL. +4.3 TO -4.5 Model: Undrained (Phi=0) Unit Weight: 117 pcf Cohesion: 760 psf
Name: MARSH, EL. -4.5 TO -17.5 Model: Spatial Mohr-Coulomb Unit Weight: 114 pcf Cohesion Fn: MARSH 1 Phi: 0 °
Name: BEACH SAND SP, EL. -41.5 TO -57 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: SAND
Name: BAY SOUND CLAY CL, EL. -57 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 112 pcf Cohesion Spatial Fn: Bay Sound Phi: 0 °
Name: Prodelta, MH, EL. -17.5 TO -41.5 Model: Spatial Mohr-Coulomb Unit Weight: 98 pcf Cohesion Fn: PRODELTA Phi: 0 °
Name: Sheet Pile Model: Undrained (Phi=0) Unit Weight: 0.1 pcf Cohesion: 0.01 psf
Name: BAY SOUND CLAY CL, EL. -57 TO -70 (Protected) Model: Spatial Mohr-Coulomb Unit Weight: 112 pcf Cohesion Fn: Bay Sound Phi: 0 °



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

GENERAL NOTES

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

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

Hw=CANAL WATER LEVEL

LONDON AVE CANAL
OUTFALL CANAL REEVALUATION REPORT
REACH 25, STA. 33+00 TO STA. 37+00
PROTECTED SIDE STABILITY ANALYSIS,
CASE: GAP Stability (No Soil, Entry/Exit)
MARCH 2012

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

GAP Stability (No Soil, Entry/Exit)

Report generated using GeoStudio 2007, version 7.15. Copyright © 1991-2009 GEO-SLOPE International Ltd.

File Information

Created By: Liljegren, James
Revision Number: 155
Last Edited By: Middleton, Mark C MVN
Date: 12/13/2011
Time: 3:19:47 PM
File Name: Reach 25.gsz
Directory: G:\F&MHOME\Middleton\London Ave Canal\Reach 25\
Last Solved Date: 12/13/2011
Last Solved Time: 3:23:04 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 (No Soil, Entry/Exit)

Kind: SLOPE/W
Parent: Gap Seepage Analysis
Method: Spencer
Settings
 PWP Conditions Source: Parent Analysis
SlipSurface
 Direction of Movement: Left to Right
 Use Passive Mode: Yes
 Slip Surface Option: Entry and Exit
 Critical slip surfaces saved: 1
 Optimize Critical Slip Surface Location: Yes
 Tension Crack
 Tension Crack Option: (none)
FOS Distribution
 FOS Calculation Option: Constant
Advanced

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

Materials

EMBANKMENT FILL, EL. +4.3 TO -4.5

Model: Undrained (Phi=0)
Unit Weight: 117 pcf
Cohesion: 760 psf

MARSH, EL. -4.5 TO -17.5

Model: Spatial Mohr-Coulomb
Unit Weight: 114 pcf
Cohesion Fn: MARSH 1
Phi: 0 °
Phi-B: 0 °

BEACH SAND SP, EL. -41.5 TO -57

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

BAY SOUND CLAY CL, EL. -57 TO -70

Model: Spatial Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion Spatial Fn: Bay Sound
Phi: 0 °
Phi-B: 0 °

Prodelta, MH, EL. -17.5 TO -41.5

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

Sheet Pile

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

BAY SOUND CLAY CL, EL. -57 TO -70 (Protected)

Model: Spatial Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion Fn: Bay Sound
Phi: 0 °
Phi-B: 0 °

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (200, -19.3) ft
Left-Zone Right Coordinate: (200, 1) ft
Left-Zone Increment: 20
Right Projection: Range
Right-Zone Left Coordinate: (210, 3.38) ft
Right-Zone Right Coordinate: (279.99998, -2.35566) ft
Right-Zone Increment: 30
Radius Increments: 20

Slip Surface Limits

Left Coordinate: (133.5, -19.3) ft
Right Coordinate: (310, -2.3) ft

Cohesion Functions

Bay Sound

Model: Spline Data Point Function
Function: Cohesion vs. Y
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 580
Data Points: Y (ft), Cohesion (psf)
 Data Point: (-70, 720)
 Data Point: (-57, 580)

MARSH 1

Model: Spline Data Point Function
Function: Cohesion vs. X
 Curve Fit to Data: 100 %

Segment Curvature: 0 %
Y-Intercept: 475
Data Points: X (ft), Cohesion (psf)
 Data Point: (179.2, 475)
 Data Point: (200, 500)
 Data Point: (228, 475)

PRODELTA

Model: Spline Data Point Function
Function: Cohesion vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 380
Data Points: X (ft), Cohesion (psf)
 Data Point: (179.2, 380)
 Data Point: (200, 400)
 Data Point: (228, 380)

Shear/Normal Strength Functions

SAND

Model: Spline Data Point Function
Function: Shear Stress vs. Normal Stress
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
 Data Point: (-10000, 0)
 Data Point: (0, 0)
 Data Point: (10000, 5774)
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: (179.2, -57, 580)

Data Point: (179.2, -70, 720)
Data Point: (200, -57, 715)
Data Point: (200, -70, 860)
Data Point: (228, -57, 580)
Data Point: (228, -70, 720)

Regions

	Points	Area (ft²)	Material
Region 1	32,3,20,21,12,40,41,13,17	100.28	
Region 2	1,2,32,17,13,14,19	461.86	
Region 3	14,13,5,7,15,31	1430	MARSH, EL. -4.5 TO -17.5
Region 4	15,7,9,30,29	2640	Prodelta, MH, EL. -17.5 TO -41.5
Region 5	30,9,10,38,16,37,11,8	2735.75	BEACH SAND SP, EL. -41.5 TO -57
Region 6	4,22,23,28	6.525	Sheet Pile
Region 7	4,28,24,25,26,27,5,13,41	374.9	EMBANKMENT FILL, EL. +4.3 TO -4.5
Region 8	6,19,14,31,15	285.95	
Region 9	6,33,29,15	119.7	
Region 10	33,29,30,8	1476.3	Prodelta, MH, EL. -17.5 TO -41.5
Region 11	11,34,36,37	594.1	BAY SOUND CLAY CL, EL. -57 TO -70 (Protected)
Region 12	37,36,39,38,16	634.4	BAY SOUND CLAY CL, EL. -57 TO -70
Region 13	38,39,35,10	1066	BAY SOUND CLAY CL, EL. -57 TO -70 (Protected)

Points

	X (ft)	Y (ft)
Point 1	133.5	-7.3
Point 2	171.2	-7.3
Point 3	184.4	-2.5
Point 4	200	4.2
Point 5	310	-4.5
Point 6	133.5	-17.5
Point 7	310	-17.5
Point 8	133.5	-41.5

Point 9	310	-41.5
Point 10	310	-57
Point 11	133.5	-57
Point 12	197	3.3
Point 13	200	-4.5
Point 14	200	-13.2
Point 15	200	-17.5
Point 16	200	-57
Point 17	197	-4.5
Point 18	197	-10
Point 19	133.5	-13.2
Point 20	186.5	-1.4
Point 21	190.5	2
Point 22	200	12.9
Point 23	200.5	12.9
Point 24	208	3.9
Point 25	228	-1.3
Point 26	256.1	-2.4
Point 27	310	-2.3
Point 28	201	4.2
Point 29	200	-19.3
Point 30	200	-41.5
Point 31	200	-14.6
Point 32	179.15	-4.5
Point 33	133.5	-19.3
Point 34	133.5	-70
Point 35	310	-70
Point 36	179.2	-70
Point 37	179.2	-57
Point 38	228	-57
Point 39	228	-70
Point 40	199	3.6
Point 41	200	3.6

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	3.17	(227.947, 18.096)	28.01028	(200, 12.9)	(262.154, -2.38877)
2	6984	3.37	(227.947, 18.096)	39.03	(200, 12.9)	(261.168, -2.3906)

Slices of Slip Surface: **Optimized**

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strengt h (psf)
1	Optimize d	200.25	- 8.2968825	834.37324	313.19072	0	499.78
2	Optimize d	200.75	- 8.7030895	810.7939	1312.9298	0	499.33
3	Optimize d	201.9868	- 9.7078915	839.29647	1417.1141	0	498.23
4	Optimize d	204.07735	-11.57746	897.39299	1572.8795	0	496.36
5	Optimize d	206.28485	- 13.713205	971.26415	1792.6372	0	494.39
6	Optimize d	207.6943	- 15.062515	1021.6659	1943.6465	0	493.13
7	Optimize d	209.1234	- 16.378235	1071.1205	2052.0315	0	491.85
8	Optimize d	211.68645	- 18.443295	1150.7791	2262.8714	0	391.65
9	Optimize d	214.0201	-19.90779	1206.7114	2393.3957	0	389.99
10	Optimize	215.8081	-	1238.2617	2423.2854	0	388.71

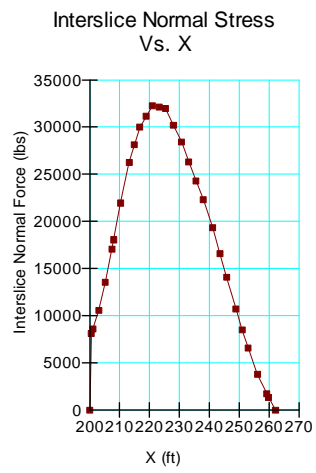
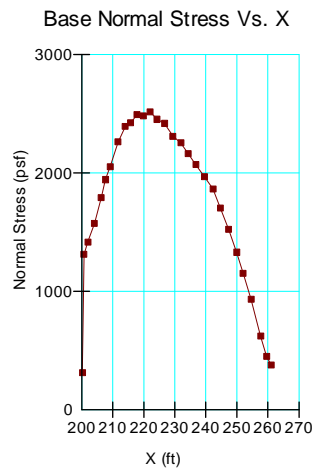
	d		20.775235				
11	Optimize d	217.76925	-21.49115	1261.6739	2493.0448	0	387.31
12	Optimize d	219.9036	- 22.055525	1278.1163	2483.6685	0	385.78
13	Optimize d	222.0602	-22.35948	1281.4118	2515.2858	0	384.24
14	Optimize d	224.23905	-22.40302	1271.1334	2453.3397	0	382.69
15	Optimize d	226.66425	-22.12072	1242.0096	2418.9057	0	380.95
16	Optimize d	229.3622	- 21.50655	1193.3508	2310.2204	0	380
17	Optimize d	231.92755	-20.79269	1140.1643	2255.8225	0	380
18	Optimize d	234.33385	- 19.985155	1082.3267	2163.7473	0	380
19	Optimize d	236.7401	-19.17762	1024.6862	2071.6721	0	380
20	Optimize d	239.56455	-18.10569	950.11816	1969.5784	0	380
21	Optimize d	242.34565	-16.80437	862.09213	1865.8229	0	475
22	Optimize d	244.66515	-15.53805	777.74469	1705.4152	0	475
23	Optimize d	247.37215	- 13.948395	672.71378	1523.2676	0	475
24	Optimize d	249.94945	- 12.282565	563.49368	1330.5567	0	475
25	Optimize d	252.0096	-10.86389	470.7441	1151.7339	0	475
26	Optimize d	254.56985	- 8.897898	343.0232	934.14732	0	475

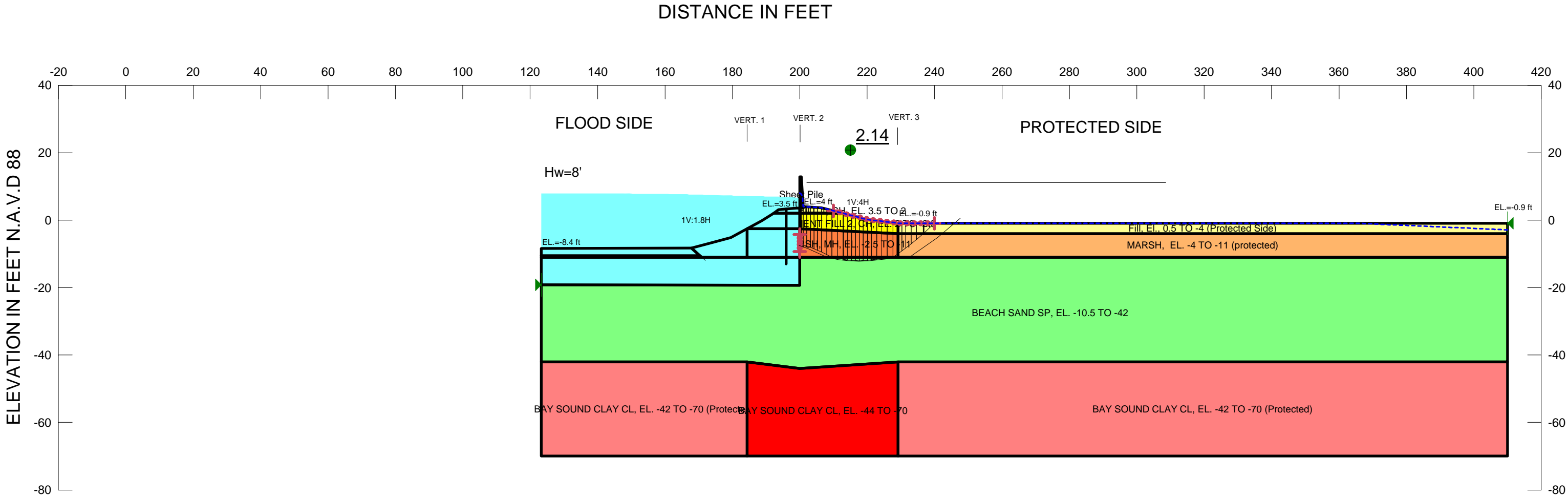
			5				
27	Optimize d	257.6529	6.365928 5	179.04615	622.95529	0	475
28	Optimize d	259.5281	-4.795305	77.437954	452.5259	0	475
29	Optimize d	261.00245	- 3.444383 5	-9.5301178	379.50239	0	760

Slices of Slip Surface: 6984

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	6984	200.25	-9.401808	897.51752	312.28661	0	499.78
2	6984	200.75	-9.896508	877.18493	1415.6515	0	499.33
3	6984	202.16665	-11.1672	914.6364	1567.6036	0	498.07
4	6984	204.5	-13.07263	968.8601	1794.4581	0	495.98
5	6984	206.83335	- 14.701305	1015.2734	1988.9255	0	493.9
6	6984	208.98445	- 15.999835	1052.7909	2120.363	0	491.98
7	6984	210.9533	-17.02366	1083.6468	2195.0455	0	490.22
8	6984	212.9416	- 17.918265	1109.9827	2257.4352	0	390.76
9	6984	214.9494	-18.69121	1131.8148	2287.5799	0	389.32
10	6984	216.9572	- 19.340585	1150.0586	2305.0396	0	387.89
11	6984	218.965	- 19.872755	1163.6812	2310.5922	0	386.45
12	6984	220.9728	-20.2926	1172.5214	2304.7125	0	385.02
13	6984	222.98055	- 20.603795	1177.0309	2287.8148	0	383.59
14	6984	224.9883	- 20.808955	1176.5121	2260.1547	0	382.15
15	6984	226.9961	- 20.909755	1170.8945	2221.8914	0	380.72
16	6984	228.9972	-20.90736	1160.5527	2199.161	0	380

17	6984	230.99165	- 20.802435	1144.9863	2192.2993	0	380
18	6984	232.9861	-20.59448	1123.8542	2175.3668	0	380
19	6984	234.98055	-20.28182	1097.221	2148.2314	0	380
20	6984	236.975	-19.86186	1064.5402	2110.5934	0	380
21	6984	238.96945	-19.33097	1025.4691	2062.1928	0	380
22	6984	240.9639	- 18.684335	979.92459	2002.4834	0	380
23	6984	242.95835	-17.9157	927.29716	1930.9088	0	380
24	6984	244.9676	-17.00931	866.26043	1853.7066	0	475
25	6984	246.99165	-15.95254	796.13866	1738.9231	0	475
26	6984	249.01575	-14.73703	716.5569	1606.2135	0	475
27	6984	251.03985	-13.34425	625.82524	1453.4499	0	475
28	6984	253.0639	- 11.749185	522.74166	1277.918	0	475
29	6984	255.08795	-9.91692	404.96173	1075.7228	0	475
30	6984	257.0177	-7.910511	276.37581	858.59111	0	475
31	6984	258.85315	-5.692326	134.64309	622.58762	0	475
32	6984	260.46945	- 3.4452985	-8.5046711	525.14901	0	760





Name: EMBANKMENT FILL 1, CH, EL. 3.5 TO 2 Model: Undrained (Phi=0) Unit Weight: 110 pcf Cohesion: 600 psf

Name: MARSH, MH, EL. -2.5 TO -11 Model: Spatial Mohr-Coulomb Unit Weight: 103 pcf Cohesion Spatial Fn: MARSH Phi: 0 °

Name: BEACH SAND SP, EL. -10.5 TO -42 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Beach Sand

Name: BAY SOUND CLAY CL, EL. -44 TO -70 Model: Spatial Mohr-Coulomb Weight Fn: Bay Sound Cohesion Spatial Fn: Bay Sound Phi: 0 °

Name: Fill, EL. 0.5 TO -4 (Protected Side) Model: Undrained (Phi=0) Unit Weight: 105 pcf Cohesion: 600 psf

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

Name: EMBANKMENT FILL 2, CH, EL. 2 TO -2.5 Model: Spatial Mohr-Coulomb Unit Weight: 110 pcf Cohesion: 500 psf Phi: 0 °

Name: MARSH, EL. -4 TO -11 (protected) Model: Spatial Mohr-Coulomb Unit Weight: 105 pcf Cohesion Fn: Marsh (protected) Phi: 0 °

Name: BAY SOUND CLAY CL, EL. -42 TO -70 (Protected) Model: Spatial Mohr-Coulomb Unit Weight: 109 pcf Cohesion Fn: Bay Sound (Protected) Phi: 0 °



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

GENERAL NOTES

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

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

Hw=CANAL WATER LEVEL

LONDON AVE CANAL
OUTFALL CANAL REEVALUATION REPORT
REACH 26A, STA. 37+00 TO 47+00
PROTECTED SIDE STABILITY ANALYSIS,
CASE: GAP Stability (Entry/Exit) (3)
MARCH 2012

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

GAP Stability (Entry/Exit) (3)

Report generated using GeoStudio 2007, version 7.15. Copyright © 1991-2009 GEO-SLOPE International Ltd.

File Information

Created By: Liljegren, James
Revision Number: 258
Last Edited By: Curran, Matthew MVN
Date: 1/10/2012
Time: 4:47:15 PM
File Name: Reach 26A - Passive Resistance.gsz
Directory: Z:\Edf\F&M\HOME\London Ave Reevaluation 2011\East Side\Reach 26A\ETL\
Last Solved Date: 1/10/2012
Last Solved Time: 4:51:16 PM

Project Settings

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

Analysis Settings

GAP Stability (Entry/Exit) (3)

Kind: SLOPE/W
Parent: GAP Analysis (Seepage)
Method: Spencer
Settings
 PWP Conditions Source: Parent Analysis
SlipSurface
 Direction of Movement: Left to Right
 Use Passive Mode: Yes
 Slip Surface Option: Entry and Exit
 Critical slip surfaces saved: 1
 Optimize Critical Slip Surface Location: Yes
 Tension Crack
 Tension Crack Option: (none)
FOS Distribution
 FOS Calculation Option: Constant
Advanced

Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
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 1, CH, EL. 3.5 TO 2

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

MARSH, MH, EL. -2.5 TO -11

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

BEACH SAND SP, EL. -10.5 TO -42

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

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

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

Fill, EL., 0.5 TO -4 (Protected Side)

Model: Undrained (Phi=0)
Unit Weight: 105 pcf
Cohesion: 600 psf

Sheet Pile

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

Cohesion: 0.01 psf

EMBANKMENT FILL 2, CH, EL. 2 TO -2.5

Model: Spatial Mohr-Coulomb
Unit Weight: 110 pcf
Cohesion: 500 psf
Phi: 0 °
Phi-B: 0 °

MARSH, EL. -4 TO -11 (protected)

Model: Spatial Mohr-Coulomb
Unit Weight: 105 pcf
Cohesion Fn: Marsh (protected)
Phi: 0 °
Phi-B: 0 °

BAY SOUND CLAY CL, EL. -42 TO -70 (Protected)

Model: Spatial Mohr-Coulomb
Unit Weight: 109 pcf
Cohesion Fn: Bay Sound (Protected)
Phi: 0 °
Phi-B: 0 °

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (200, -9.3) ft
Left-Zone Right Coordinate: (200, -4.3) ft
Left-Zone Increment: 5
Right Projection: Range
Right-Zone Left Coordinate: (210, 2.77273) ft
Right-Zone Right Coordinate: (240, -0.9) ft
Right-Zone Increment: 15
Radius Increments: 25

Slip Surface Limits

Left Coordinate: (123.3, -19.2) ft
Right Coordinate: (410, -0.9) ft

Cohesion Functions

Marsh (protected)

Model: Spline Data Point Function
Function: Cohesion vs. Y

Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 235
Data Points: Y (ft), Cohesion (psf)
 Data Point: (-11, 295)
 Data Point: (-4, 235)

Bay Sound (Protected)

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, 785)
 Data Point: (-42, 500)

Shear/Normal Strength Functions

Beach Sand

Model: Spline Data Point Function
Function: Shear Stress vs. Normal Stress
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
 Data Point: (-100000, 0)
 Data Point: (0, 0)
 Data Point: (100000, 57735)
Estimation Properties
 Intact Rock Param.: 10
 Geological Strength: 100
 Disturbance Factor: 0
 SigmaC: 600000 psf
 Sigma3: 300000 psf
 Num. Points: 20

Unit Weight Functions

Bay Sound

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

Data Points: X (ft), Unit Weight (pcf)
Data Point: (184.4, 109)
Data Point: (200, 110)
Data Point: (229.1, 109)

Spatial Functions

Bay Sound

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (184.4, -42, 500)
Data Point: (184.4, -70, 785)
Data Point: (200, -44, 640)
Data Point: (200, -70, 910)
Data Point: (229.1, -42, 500)
Data Point: (229.1, -70, 785)

MARSH

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (184.4, -4, 235)
Data Point: (184.4, -11, 295)
Data Point: (229.1, -4, 235)
Data Point: (229.1, -11, 295)
Data Point: (200, -2.5, 237)
Data Point: (200, -11, 313)

Regions

	Points	Area (ft²)	Material
Region 1	20,24,14,17,47,49,41	632.775	
Region 2	17,14,24,38,8,10,16,11,42,9	8299.625	BEACH SAND SP, EL. -10.5 TO -42
Region 3	15,7,8,38	1266.3	MARSH, EL. -4 TO -11 (protected)
Region 4	25,30,4,31,12,23,27	9.23	
Region 5	15,35,6,7	560.79	Fill, El., 0.5 TO -4 (Protected Side)
Region 6	25,27,23,13,40,39,29	52.06	
Region 7	23,26,5,34,35,15,13	124.87	EMBANKMENT FILL 2, CH, EL. 2 TO -2.5
Region 8	23,12,32,22,33,26	17.1	EMBANKMENT FILL 1, CH, EL. 3.5 TO 2
Region 9	12,36,37,22,32	7.1	Sheet Pile
Region	13,40,39,41,20,24,45	132.6	

10			
Region 11	13,15,38,24,45	225.525	MARSH, MH, EL. -2.5 TO -11
Region 12	9,18,43,42	1710.8	BAY SOUND CLAY CL, EL. -42 TO -70 (Protected)
Region 13	16,44,19,10	5065.2	BAY SOUND CLAY CL, EL. -42 TO -70 (Protected)
Region 14	42,43,44,16,11	1206.9	BAY SOUND CLAY CL, EL. -44 TO -70
Region 15	48,2,3,28,39,41,49	80.64	
Region 16	46,1,2,48	103.115	
Region 17	48,49,47,46	18.94	

Points

	X (ft)	Y (ft)
Point 1	123.3	-8.4
Point 2	167.8	-8.3
Point 3	172.7	-7
Point 4	196	3.3
Point 5	218.8	0.5
Point 6	410	-0.9
Point 7	410	-4
Point 8	410	-11
Point 9	123.3	-42
Point 10	410	-42
Point 11	200	-44
Point 12	200	3.5
Point 13	200	-2.5
Point 14	200	-19.3
Point 15	229.1	-4
Point 16	229.1	-42
Point 17	123.3	-19.2
Point 18	123.3	-70

Point 19	410	-70
Point 20	196	-11
Point 21	196	-13
Point 22	201	4
Point 23	200	2
Point 24	200	-11
Point 25	192.3	2
Point 26	213	2
Point 27	196	2
Point 28	179.5	-5.2
Point 29	188.6	-0.2
Point 30	193.7	3.1
Point 31	199	3.5
Point 32	201	3.5
Point 33	206.4	3.7
Point 34	221.2	0
Point 35	229.1	-0.9
Point 36	200	12.8
Point 37	200.5	12.8
Point 38	229.1	-11
Point 39	184.4	-2.5
Point 40	196	-2.5
Point 41	184.4	-11
Point 42	184.4	-42
Point 43	184.4	-70
Point 44	229.1	-70
Point 45	200	-10.8
Point 46	123.3	-10.6
Point 47	123.3	-11
Point 48	170.4	-10.6
Point 49	170.9	-11

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	2.14	(217.364, 15.923)	18.07881	(200, 12.8)	(240, -0.9)

2	1651	2.27	(217.364, 15.923)	28.202	(200, 12.8)	(240, -0.9)
---	------	------	-------------------	--------	-------------	-------------

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	200.25	7.236055	843.98135	103.40804	0	279.2
2	Optimized	200.75	7.384684	832.2104	1108.061	0	280.24
3	Optimized	201.5452	7.621061	847.40384	1181.8434	0	281.89
4	Optimized	202.6356	7.945187	868.25576	1208.0401	0	284.14
5	Optimized	203.712	8.316455	891.1368	1216.6754	0	286.82
6	Optimized	204.77435	8.734865	917.32352	1252.0582	0	289.91
7	Optimized	205.85275	9.2061885	947.14324	1272.2242	0	293.45
8	Optimized	207.1911	9.8472385	987.942	1310.5679	0	298.34
9	Optimized	208.7733	-10.6051	1034.9679	1341.9755	0	304.08
10	Optimized	210.3996	11.152865	1067.1844	1430.6386	209.84035	-1.1143e-006
11	Optimized	212.03055	11.48255	1083.7618	1425.7787	197.46355	-1.0486e-006
12	Optimized	212.91315	-	1092.23	1439.5421	200.52074	-1.0646e-

	ed		11.6537 65				006
13	Optimiz ed	213.5873	-11.7342	1095.5745	1430.6715	193.46835	-1.0271e- 006
14	Optimiz ed	214.7619	- 11.8743 45	1101.3229	1415.1171	181.16915	-9.6182e- 007
15	Optimiz ed	215.91565	- 11.9656 15	1103.9825	1410.6101	177.03148	-9.3966e- 007
16	Optimiz ed	217.0485	- 12.0080 05	1103.6297	1383.7052	161.70165	-8.582e- 007
17	Optimiz ed	218.20745	- 12.0016 35	1100.2182	1365.98	153.43762	-8.1457e- 007
18	Optimiz ed	219.4354	- 11.9445 15	1093.3425	1326.8048	134.78952	-7.1529e- 007
19	Optimiz ed	220.6354	- 11.8503 85	1084.3046	1298.8955	123.89414	-6.5767e- 007
20	Optimiz ed	221.9937	- 11.6950 4	1070.9348	1255.5054	106.56186	2.9308e- 006
21	Optimiz ed	223.5811	- 11.5134 95	1055.2879	1212.1322	90.554092	2.4902e- 006
22	Optimiz ed	225.18355	- 11.3170 4	1038.7018	1169.03	75.244989	2.0692e- 006
23	Optimiz ed	226.83405	- 11.1013 7	1020.7357	1120.3355	57.503957	3.8178e- 006
24	Optimiz ed	228.31215	- 10.5451 35	977.90467	1203.9016	0	291.58
25	Optimiz ed	229.02425	- 10.0426	940.06745	1147.8757	0	286.84

			76				
26	Optimiz ed	229.6922	- 9.54691 9	902.80782	1085.9322	0	282.55
27	Optimiz ed	230.87655	- 8.66783 3	836.50066	984.23408	0	275.01
28	Optimiz ed	232.2648	- 7.60271 75	756.16458	870.29051	0	265.88
29	Optimiz ed	233.857	- 6.35157 25	661.84154	724.75649	0	255.16
30	Optimiz ed	235.65255	-4.863	550.10716	565.10182	0	242.4
31	Optimiz ed	236.75705	-3.9093	471.14341	627.75887	0	600
32	Optimiz ed	237.7222	- 3.02830 5	331.82056	547.36246	0	600
33	Optimiz ed	239.29115	- 1.56900 5	103.02573	389.5423	0	600

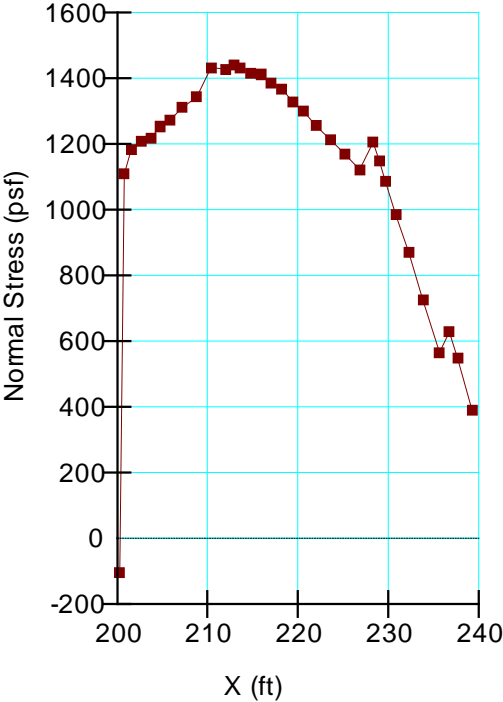
Slices of Slip Surface: 1651

	Slip Surfac e	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	1651	200.25	- 6.490891 5	795.44653	-86.847227	0	272.54
2	1651	200.75	- 6.864063	798.00631	971.92579	0	275.59
3	1651	201.675	- 7.498508 5	839.31112	1091.9414	0	280.72
4	1651	203.025	- 8.349444 5	894.33311	1182.8565	0	287.52

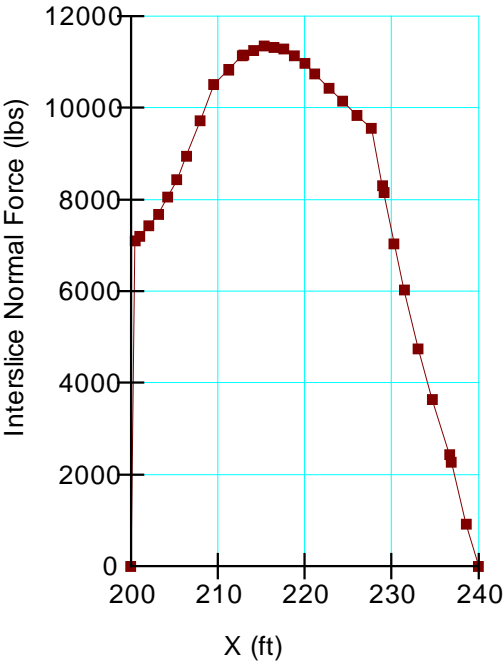
5	1651	204.375	- 9.098627 5	942.23146	1263.7814	0	293.38
6	1651	205.725	- 9.755005	983.99963	1335.6353	0	298.4
7	1651	207.04145	- 10.31335 5	1019.2905	1383.7891	0	302.56
8	1651	208.3243	- 10.78287	1047.8572	1408.9072	0	305.93
9	1651	209.6381	- 11.19159 5	1071.317	1439.0547	212.3135	-1.1273e- 006
10	1651	210.98285	- 11.53943	1089.9775	1455.0417	210.76993	-1.119e-006
11	1651	212.3276	- 11.81775	1103.944	1462.3892	206.94845	-1.0987e- 006
12	1651	213.725	- 12.03421	1113.9796	1460.8459	200.26333	-1.421e-005
13	1651	215.175	- 12.18506 5	1119.6431	1449.6779	190.54569	-1.0116e- 006
14	1651	216.625	- 12.26056	1120.5109	1428.5429	177.84232	-9.4419e- 007
15	1651	218.075	-12.2613	1116.7484	1397.3488	162.00474	-1.1493e- 005
16	1651	219.4	- 12.19959	1109.3481	1363.5997	146.79222	-7.7938e- 007
17	1651	220.6	- 12.08685	1099.1076	1328.9955	132.72585	-7.0469e- 007
18	1651	221.9605	- 11.89187 5	1083.3212	1288.8156	118.64224	3.2647e- 006
19	1651	223.4815	- 11.59716 5	1060.7485	1240.7061	103.89856	2.8575e- 006
20	1651	225.00255	- 11.21406	1032.7664	1179.8434	84.914929	-4.5099e- 007
21	1651	226.31925	-	1002.5234	1164.2399	0	295.12

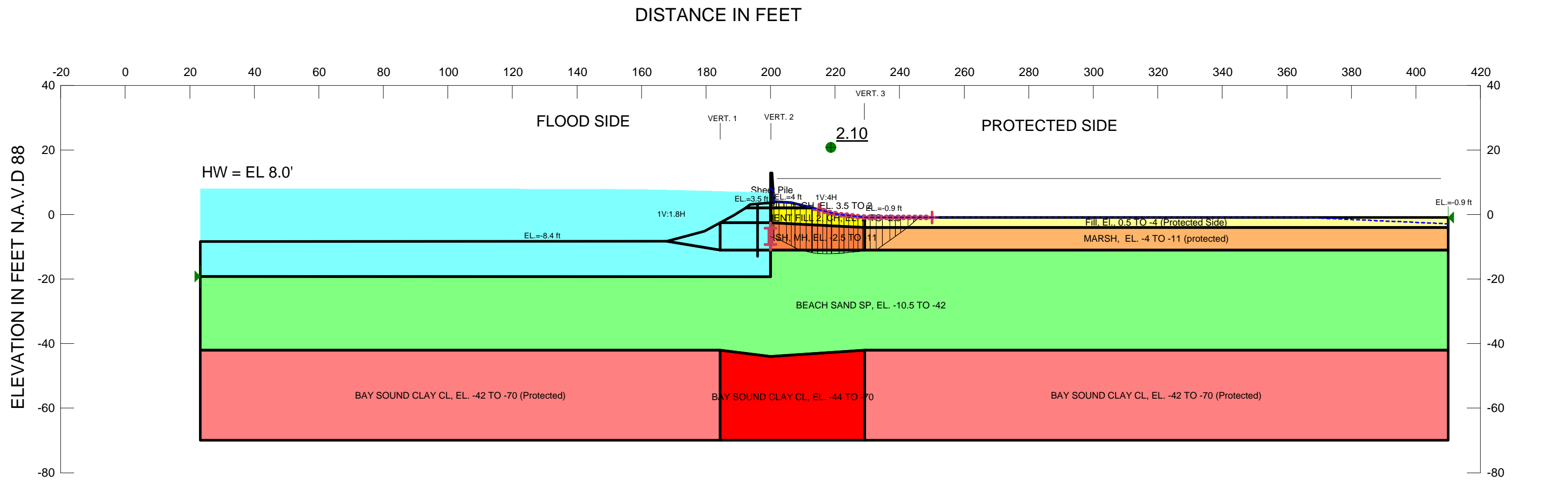
			10.81373				
22	1651	227.43155	- 10.41488	971.11512	1118.1596	0	291
23	1651	228.54385	- 9.962101 5	935.77503	1066.0968	0	286.44
24	1651	229.7855	- 9.385474	890.98512	1004.0034	0	281.16
25	1651	231.15645	-8.66453	835.46924	938.08189	0	274.98
26	1651	232.5274	- 7.842658	772.57589	860.81582	0	267.94
27	1651	233.8984	- 6.908896 5	701.71956	770.89902	0	259.93
28	1651	235.2694	- 5.848750 5	621.90043	666.29372	0	250.85
29	1651	236.64035	- 4.642504 5	531.73848	544.479	0	240.51
30	1651	237.99435	- 3.281841 5	370.89223	611.97065	0	600
31	1651	239.33145	- 1.731841 5	128.17203	490.11501	0	600

Base Normal Stress Vs. X



Interslice Normal Stress
Vs. X





Name: EMBANKMENT FILL 1, CH, EL. 3.5 TO 2 Model: Undrained (Phi=0) Unit Weight: 110 pcf Cohesion: 600 psf

Name: MARSH, MH, EL. -2.5 TO -11 Model: Spatial Mohr-Coulomb Unit Weight: 103 pcf Cohesion Spatial Fn: MARSH Phi: 0 °

Name: BEACH SAND SP, EL. -10.5 TO -42 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Beach Sand

Name: BAY SOUND CLAY CL, EL. -44 TO -70 Model: Spatial Mohr-Coulomb Weight Fn: Bay Sound Cohesion Spatial Fn: Bay Sound Phi: 0 °

Name: Fill, EL. 0.5 TO -4 (Protected Side) Model: Undrained (Phi=0) Unit Weight: 105 pcf Cohesion: 600 psf

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

Name: EMBANKMENT FILL 2, CH, EL. 2 TO -2.5 Model: Spatial Mohr-Coulomb Unit Weight: 110 pcf Cohesion: 500 psf Phi: 0 °

Name: MARSH, EL. -4 TO -11 (protected) Model: Spatial Mohr-Coulomb Unit Weight: 105 pcf Cohesion Fn: Marsh (protected) Phi: 0 °

Name: BAY SOUND CLAY CL, EL. -42 TO -70 (Protected) Model: Spatial Mohr-Coulomb Unit Weight: 109 pcf Cohesion Fn: Bay Sound (Protected) Phi: 0 °



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

GENERAL NOTES

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

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

Hw=CANAL WATER LEVEL

LONDON AVE CANAL
OUTFALL CANAL REEVALUATION REPORT
REACH 26B, STA. 47+00 TO 48+50
PROTECTED SIDE STABILITY ANALYSIS,
CASE: GAP Stability (Entry/Exit) (3)
MARCH 2012

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

GAP Stability (Entry/Exit) (3)

Report generated using GeoStudio 2007, version 7.19. Copyright © 1991-2012 GEO-SLOPE International Ltd.

File Information

Created By: Liljegren, James
Revision Number: 192
Last Edited By: Curran, Matthew MVN
Date: 12/9/2011
Time: 10:28:01 AM
File Name: Reach 26B.gsz
Directory: G:\F&MHOME\London Ave Reevaluation 2011\East Side\Reach 26B\slopew\
Last Solved Date: 12/9/2011
Last Solved Time: 10:33:12 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

GAP Stability (Entry/Exit) (3)

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 FILL 1, CH, EL. 3.5 TO 2

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

MARSH, MH, EL. -2.5 TO -11

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

BEACH SAND SP, EL. -10.5 TO -42

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

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

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

Fill, EL., 0.5 TO -4 (Protected Side)

Model: Undrained (Phi=0)
Unit Weight: 105 pcf
Cohesion: 600 psf

Sheet Pile

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

Cohesion: 0.01 psf

EMBANKMENT FILL 2, CH, EL. 2 TO -2.5

Model: Spatial Mohr-Coulomb
Unit Weight: 110 pcf
Cohesion: 500 psf
Phi: 0 °
Phi-B: 0 °

MARSH, EL. -4 TO -11 (protected)

Model: Spatial Mohr-Coulomb
Unit Weight: 105 pcf
Cohesion Fn: Marsh (protected)
Phi: 0 °
Phi-B: 0 °

BAY SOUND CLAY CL, EL. -42 TO -70 (Protected)

Model: Spatial Mohr-Coulomb
Unit Weight: 109 pcf
Cohesion Fn: Bay Sound (Protected)
Phi: 0 °
Phi-B: 0 °

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (200, -9.3) ft
Left-Zone Right Coordinate: (200, -4.3) ft
Left-Zone Increment: 20
Right Projection: Range
Right-Zone Left Coordinate: (215, 1.48276) ft
Right-Zone Right Coordinate: (250, -0.9) ft
Right-Zone Increment: 20
Radius Increments: 25

Slip Surface Limits

Left Coordinate: (23.3, -19.2) ft
Right Coordinate: (410, -0.9) ft

Cohesion Functions

Marsh (protected)

Model: Spline Data Point Function
Function: Cohesion vs. Y

Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 235
Data Points: Y (ft), Cohesion (psf)
 Data Point: (-11, 295)
 Data Point: (-4, 235)

Bay Sound (Protected)

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, 785)
 Data Point: (-42, 500)

Shear/Normal Strength Functions

Beach Sand

Model: Spline Data Point Function
Function: Shear Stress vs. Normal Stress
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
 Data Point: (-100000, 0)
 Data Point: (0, 0)
 Data Point: (100000, 57735)
Estimation Properties
 Intact Rock Param.: 10
 Geological Strength: 100
 Disturbance Factor: 0
 SigmaC: 600000 psf
 Sigma3: 300000 psf
 Num. Points: 20

Unit Weight Functions

Bay Sound

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

Data Points: X (ft), Unit Weight (pcf)
Data Point: (184.4, 109)
Data Point: (200, 110)
Data Point: (229.1, 109)

Spatial Functions

Bay Sound

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (184.4, -42, 500)
Data Point: (184.4, -70, 785)
Data Point: (200, -44, 640)
Data Point: (200, -70, 910)
Data Point: (229.1, -42, 500)
Data Point: (229.1, -70, 785)

MARSH

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (184.4, -4, 235)
Data Point: (184.4, -11, 295)
Data Point: (229.1, -4, 235)
Data Point: (229.1, -11, 295)
Data Point: (200, -2.5, 237)
Data Point: (200, -11, 313)

Regions

	Points	Area (ft²)	Material
Region 1	20,24,14,17,1,2,41	1863.11	
Region 2	17,14,24,38,8,10,16,11,42,9	10574.625	BEACH SAND SP, EL. -10.5 TO -42
Region 3	15,7,8,38	1266.3	MARSH, EL. -4 TO -11 (protected)
Region 4	25,30,4,31,12,23,27	9.23	
Region 5	15,35,6,7	560.79	Fill, EL., 0.5 TO -4 (Protected Side)
Region 6	25,27,23,13,40,39,29	52.06	
Region 7	23,26,5,34,35,15,13	124.87	EMBANKMENT FILL 2, CH, EL. 2 TO -2.5
Region 8	23,12,32,22,33,26	17.1	EMBANKMENT FILL 1, CH, EL. 3.5 TO 2
Region 9	12,36,37,22,32	7.1	Sheet Pile
Region	13,40,39,41,20,24,45	132.6	

10			
Region 11	13,15,38,24,45	225.525	MARSH, MH, EL. -2.5 TO -11
Region 12	9,18,43,42	4510.8	BAY SOUND CLAY CL, EL. -42 TO -70 (Protected)
Region 13	16,44,19,10	5065.2	BAY SOUND CLAY CL, EL. -42 TO -70 (Protected)
Region 14	42,43,44,16,11	1206.9	BAY SOUND CLAY CL, EL. -44 TO -70
Region 15	2,3,28,39,41	62.36	

Points

	X (ft)	Y (ft)
Point 1	23.3	-8.4
Point 2	167.8	-8.3
Point 3	172.7	-7
Point 4	196	3.3
Point 5	218.8	0.5
Point 6	410	-0.9
Point 7	410	-4
Point 8	410	-11
Point 9	23.3	-42
Point 10	410	-42
Point 11	200	-44
Point 12	200	3.5
Point 13	200	-2.5
Point 14	200	-19.3
Point 15	229.1	-4
Point 16	229.1	-42
Point 17	23.3	-19.2
Point 18	23.3	-70
Point 19	410	-70
Point 20	196	-11
Point 21	196	-13
Point 22	201	4

Point 23	200	2
Point 24	200	-11
Point 25	192.3	2
Point 26	213	2
Point 27	196	2
Point 28	179.5	-5.2
Point 29	188.6	-0.2
Point 30	193.7	3.1
Point 31	199	3.5
Point 32	201	3.5
Point 33	206.4	3.7
Point 34	221.2	0
Point 35	229.1	-0.9
Point 36	200	12.8
Point 37	200.5	12.8
Point 38	229.1	-11
Point 39	184.4	-2.5
Point 40	196	-2.5
Point 41	184.4	-11
Point 42	184.4	-42
Point 43	184.4	-70
Point 44	229.1	-70
Point 45	200	-10.8

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	2.10	(220.376, 21.039)	20.00512	(200, 12.8)	(246.049, -0.9)
2	7032	2.21	(220.376, 21.039)	34.097	(200, 12.8)	(246.477, -0.9)

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	200.25	-6.99481	829.75106	57.301896	0	277.04

			95				
2	Optimized	200.75	7.1719145	820.00437	1076.6045	0	278.34
3	Optimized	201.8407	7.558226	844.97093	1163.5169	0	281.15
4	Optimized	203.8221	-8.37494	896.62929	1211.3453	0	287.27
5	Optimized	205.6814	9.2767015	953.98225	1272.0173	0	294.18
6	Optimized	207.0061	9.9823815	999.09207	1320.546	0	299.65
7	Optimized	208.3975	10.645245	1040.3849	1371.3846	0	304.67
8	Optimized	210.07235	11.192025	1072.2637	1439.8312	212.21523	-1.1271e-006
9	Optimized	211.81975	11.59821	1093.4409	1441.2301	200.79617	-1.0664e-006
10	Optimized	212.8388	11.816135	1104.4619	1462.7649	206.86633	-1.0985e-006
11	Optimized	213.78975	11.92542	1108.8594	1449.6938	196.78079	-1.045e-006
12	Optimized	215.3693	12.106945	1116.0925	1427.9946	180.07676	-9.5618e-007
13	Optimized	216.8193	12.20418	1118.4078	1419.1186	173.61544	-9.218e-007
14	Optimized	218.13975	12.21712	1115.6816	1382.9969	154.33456	-8.1942e-007

15	Optimiz ed	218.8574	12.2241 5	1114.2423	1363.7294	144.04146	-1.0221e- 005
16	Optimiz ed	220.0574	12.1294 45	1105.0791	1340.1281	135.7056	-7.205e- 007
17	Optimiz ed	221.96525	11.9703 8	1090.0034	1283.5213	111.72763	3.0731e- 006
18	Optimiz ed	223.4957	11.8427 8	1077.8923	1248.0995	98.269187	-5.217e- 007
19	Optimiz ed	224.96355	11.7113 9	1065.7084	1214.7447	86.046124	-4.5691e- 007
20	Optimiz ed	226.3688	11.5762 15	1053.3832	1179.8232	73.000157	2.0083e- 006
21	Optimiz ed	227.77405	11.4410 4	1041.1288	1144.9725	59.954191	-3.183e- 007
22	Optimiz ed	228.78835	11.3455 65	1032.3739	1119.2692	50.169065	3.3311e- 006
23	Optimiz ed	229.9876	11.2382 6	1022.3742	1100.3623	45.026481	2.9895e- 006
24	Optimiz ed	231.8069	11.0754 75	1007.1866	1080.2013	42.155082	2.799e-006
25	Optimiz ed	233.7162	10.3037 15	947.27985	1154.5757	0	289.03
26	Optimiz ed	235.84415	-8.81659	834.79267	982.70756	0	276.29
27	Optimiz ed	237.8237	7.42956 75	730.05875	827.58024	0	264.4
28	Optimiz	239.48215	-	641.4878	693.22385	0	254.31

	ed		6.25298 25				
29	Optimiz ed	241.46775	-4.79226	532.11759	533.7399	0	241.79
30	Optimiz ed	243.48025	3.16487 25	343.6079	546.00383	0	600
31	Optimiz ed	245.19255	1.65495 75	113.31824	376.37251	0	600

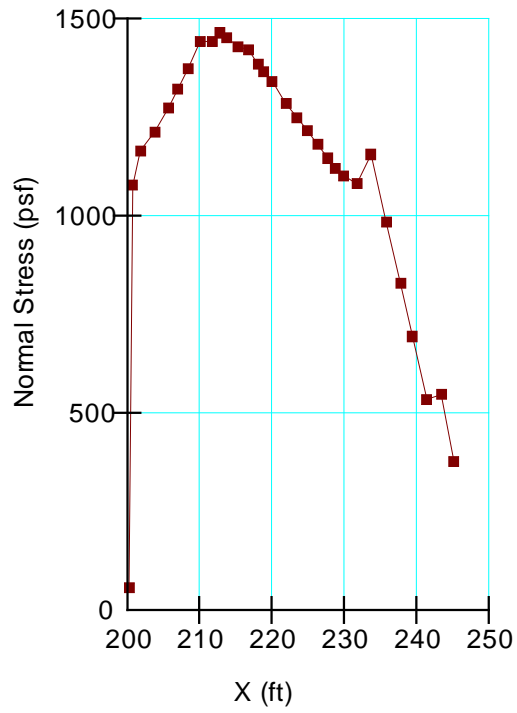
Slices of Slip Surface: **7032**

	Slip Surfac e	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	7032	200.25	- 6.482814 5	796.38683	71.873387	0	272.47
2	7032	200.75	- 6.841607 5	798.31274	979.79874	0	275.39
3	7032	201.9	- 7.598229	847.57987	1110.9664	0	281.48
4	7032	203.7	- 8.683806	917.37341	1223.3906	0	290.09
5	7032	205.5	- 9.62534	977.54696	1321.8402	0	297.39
6	7032	207.55495	- 10.53097	1034.6962	1392.6844	0	304.17
7	7032	209.4249	- 11.24255 5	1076.898	1444.0314	211.96454	-1.5037e- 005
8	7032	210.85495	- 11.69308 5	1101.7906	1468.2036	211.54865	-1.123e- 006
9	7032	212.285	- 12.07576	1122.0697	1484.1373	209.0398	-1.1097e- 006
10	7032	213.725	- 12.39468	1138.3167	1491.9397	204.16428	-1.0838e- 006
11	7032	215.175	-	1150.5777	1491.6411	196.91303	-1.0453e-

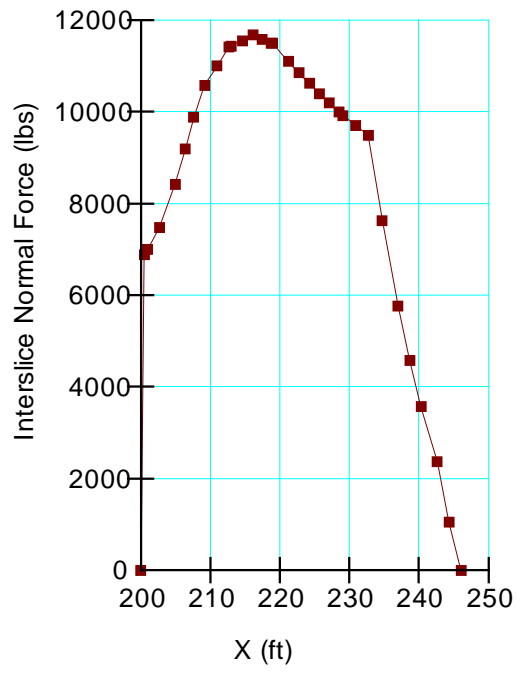
			12.65082				006
12	7032	216.625	-12.843	1158.7831	1483.1464	187.27124	-9.9418e- 007
13	7032	218.075	12.97230 5	1162.9971	1466.5103	175.23343	-1.2429e- 005
14	7032	219.4	- 13.03853	1163.6063	1447.6565	163.99646	-1.1635e- 005
15	7032	220.6	- 13.05176 5	1161.2248	1428.1357	154.10107	-8.1813e- 007
16	7032	221.99	- 13.01037	1154.8426	1406.3956	145.23419	-7.7093e- 007
17	7032	223.57	- 12.89857	1143.5542	1380.4819	136.79027	-9.7034e- 006
18	7032	225.15	12.71247 5	1127.6358	1344.7154	125.33097	3.4469e- 006
19	7032	226.73	- 12.45084	1107.023	1298.543	110.57413	3.0424e- 006
20	7032	228.31	- 12.11188	1081.483	1241.5203	92.397593	2.5416e- 006
21	7032	229.83545	- 11.71038	1052.2864	1184.0917	76.097784	-4.0402e- 007
22	7032	231.30635	- 11.24897 5	1019.3739	1130.1334	63.947035	-3.3942e- 007
23	7032	232.8617	10.67724 5	976.44491	1119.6742	0	292.23
24	7032	234.50145	- 9.981158 5	922.0053	1056.1545	0	286.27
25	7032	236.14115	- 9.180111 5	860.03994	980.99488	0	279.4
26	7032	237.78085	- 8.265456	790.08814	893.07016	0	271.56
27	7032	239.4206	-	711.30964	790.91725	0	262.65

			7.226109 5				
28	7032	241.06035	- 6.047632 5	622.83613	672.61455	0	252.55
29	7032	242.70005	- 4.710781	523.37468	535.678	0	241.09
30	7032	244.25925	- 3.273739 5	358.89675	575.51812	0	600
31	7032	245.7379	- 1.723739 5	123.3481	443.36833	0	600

Base Normal Stress Vs. X



Interslice Normal Stress
Vs. X



GAP Stability (Block)

Report generated using GeoStudio 2007, version 7.15. Copyright © 1991-2009 GEO-SLOPE International Ltd.

File Information

Created By: Liljegren, James
Revision Number: 245
Last Edited By: Bonanno, Brian P MVN
Date: 1/12/2012
Time: 9:40:57 AM
File Name: Reach 27.gsz
Directory: G:\F&M\HOME\London Ave Reeevaluation 2011\East Side\Reach 27\Slope W\
Last Solved Date: 1/12/2012
Last Solved Time: 9:44:30 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

GAP Stability (Block)

Kind: SLOPE/W
Parent: GAP Analysis (Seepage)
Method: Spencer
Settings
PWP Conditions Source: Parent Analysis
SlipSurface
Direction of movement: Left to Right
Use Passive Mode: Yes
Slip Surface Option: 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

3/20/2012

GAP Stability (Block)

Page 3 of 10

Cohesion Fn: Fill 2
Phi: 0 °
Phi-B: 0 °

Marsh1, EL., -2.5 TO -4
Model: Undrained (Phi=0)
Unit Weight: 103 pcf
Cohesion: 315 psf

BAY SOUND CLAY 1, EL. -45 to -50
Model: Spatial Mohr-Coulomb
Weight Fn: Bay Sound 1
Cohesion Spatial Fn: Bay Sound
Phi: 0 °
Phi-B: 0 °

BAY SOUND CLAY 2, EL. -50 TO -70
Model: Spatial Mohr-Coulomb
Weight Fn: Bay Sound 2
Cohesion Spatial Fn: Bay Sound
Phi: 0 °
Phi-B: 0 °

MARSH 1 , El, -4 to -7 (Protected)
Model: Spatial Mohr-Coulomb
Unit Weight: 105 pcf
Cohesion Fn: Marsh (protected)
Phi: 0 °
Phi-B: 0 °

MARSH 2, EL. -7 TO -8
Model: Spatial Mohr-Coulomb
Weight Fn: Marsh2
Cohesion Spatial Fn: Marsh 2
Phi: 0 °
Phi-B: 0 °

Slip Surface Limits

Left Coordinate: (123.3, -19.2) ft
Right Coordinate: (310, -3) ft

Slip Surface Block

Left Grid
Upper Left: (200, 0) ft
Lower Left: (200, -60) ft
Lower Right: (200, -60) ft
X Increments: 0
Y Increments: 125

3/20/2012

GAP Stability (Block)

Page 2 of 10

Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 8000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

EMBANKMENT FILL CH, EL. 4TO 2

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

MARSH 2, MH, EL. -4 TO -7

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

BEACH SAND SP, EL. -14 TO -40

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

Fill (Protected), El., -2.5 TO -4

Model: Undrained (Phi=0)
Unit Weight: 105 pcf
Cohesion: 400 psf

Sheet Pile

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

MARSH 2, El, -7 to -8 (Protected)

Model: Spatial Mohr-Coulomb
Unit Weight: 99 pcf
Cohesion Fn: Marsh (protected)
Phi: 0 °
Phi-B: 0 °

EMBANKMENT FILL CH, EL. 2 TO -2.5

Model: Spatial Mohr-Coulomb
Unit Weight: 111 pcf

3/20/2012

GAP Stability (Block)

Page 4 of 10

Starting Angle: 135 °
Ending Angle: 135 °
Angle Increments: 0
Right Grid
Upper Left: (210, 0) ft
Lower Left: (225, -60) ft
Lower Right: (255, -60) ft
X Increments: 24
Y Increments: 120
Starting Angle: 30 °
Ending Angle: 45 °
Angle Increments: 3

Cohesion Functions

Fill 2

Model: Spline Data Point Function
Function: Cohesion vs. Y
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 240
Data Points: Y (ft), Cohesion (psf)
Data Point: (-2.5, 315)
Data Point: (2, 180)

Marsh (protected)

Model: Spline Data Point Function
Function: Cohesion vs. Y
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 235
Data Points: Y (ft), Cohesion (psf)
Data Point: (-8, 275)
Data Point: (-4, 235)

Shear/Normal Strength Functions

Beach Sand

Model: Spline Data Point Function
Function: Shear Stress vs. Normal Stress
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
Data Point: (-100000, 0)
Data Point: (0, 0)
Data Point: (100000, 57735)
Estimation Properties

3/20/2012

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

Unit Weight Functions

Marsh2

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 99
Data Points: X (ft), Unit Weight (pcf)
Data Point: (187.56, 99)
Data Point: (200, 103)
Data Point: (226.1, 99)

Bay Sound 1

Model: Spline Data Point Function
Function: Unit Weight vs. Y
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 107
Data Points: Y (ft), Unit Weight (pcf)
Data Point: (191.1, 107)
Data Point: (200, 110)
Data Point: (238.5, 107)

Bay Sound 2

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 112
Data Points: X (ft), Unit Weight (pcf)
Data Point: (191.1, 112)
Data Point: (200, 110)
Data Point: (226.1, 112)

Spatial Functions

Marsh 2

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

Data Point: (187.56, -4, 235)
Data Point: (187.56, -8, 275)
Data Point: (200, -4, 250)
Data Point: (200, -8, 290)
Data Point: (226.1, -4, 235)
Data Point: (226.1, -8, 275)

Bay Sound

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (187.56, -45, 620)
Data Point: (187.56, -70, 900)
Data Point: (200, -45, 693)
Data Point: (200, -70, 955)
Data Point: (226.1, -45, 620)
Data Point: (226.1, -70, 900)
Data Point: (123.3, -45, 620)
Data Point: (123.3, -70, 900)
Data Point: (310, -45, 620)
Data Point: (310, -70, 900)

Regions

	Points	Area (ft²)	Material
Region 1	5,26,16,20,27,50,4	21.15	
Region 2	16,21,19,20	19.575	Marsh1, EL., -2.5 TO -4
Region 3	28,17,18,23,1,24,2,25,51	809.5	
Region 4	23,18,17,14,22,11,13,12	6045.025	BEACH SAND SP, EL. -14 TO -40
Region 5	50,27,20,42,41,52	37.32	
Region 6	15,30,31,32	6.675	Sheet Pile
Region 7	20,19,21,33,34,42	78.3	MARSH 2, MH, EL. -4 TO -7
Region 8	6,53,15,38,39,37	8.876	
Region 9	15,32,7,36,38	19.4	EMBANKMENT FILL CH, EL. 4TO 2
Region 10	37,47,46,5,26,16,38,39	38.211	
Region 11	38,16,21,8,36	107.55	EMBANKMENT FILL CH, EL. 2 TO -2.5
Region 12	21,8,43,9,10	86.025	Fill (Protected), EL., -2.5 TO -4
Region 13	35,33,22,11	83.9	MARSH 2, EL. -7 to -8 (Protected)
Region 14	12,13,49,48	933.5	BAY SOUND CLAY 1, EL. -45 to -50
Region 15	48,49,45,44	3734	BAY SOUND CLAY 2, EL. -50 TO -70
Region 16	33,21,10,35	251.7	MARSH 1 , EL. -4 to -7 (Protected)
Region 17	40,3,4,50,52	19.905	
Region 18	25,51,52,40	11.055	
Region 19	17,28,51,52,41,42	12.44	
Region 20	17,42,34,33,22,14	26.1	MARSH 2, EL. -7 TO -8

3/20/2012

3/20/2012

Points

	X (ft)	Y (ft)
Point 1	123.3	-11.2
Point 2	164.5	-9.1
Point 3	179.82	-6
Point 4	184.24	-4
Point 5	187.56	-2.5
Point 6	196	3.7
Point 7	206.4	4
Point 8	226.1	-2.5
Point 9	310	-3
Point 10	310	-4
Point 11	310	-8
Point 12	123.3	-45
Point 13	310	-45
Point 14	202	-8
Point 15	200	4
Point 16	200	-2.5
Point 17	200	-8
Point 18	200	-19.3
Point 19	202	-4
Point 20	200	-4
Point 21	226.1	-4
Point 22	226.1	-8
Point 23	123.3	-19.2
Point 24	123.3	-9.2
Point 25	175.4	-8
Point 26	196	-2.5
Point 27	196	-4
Point 28	196	-8
Point 29	196	-13
Point 30	200	12.9
Point 31	200.5	12.9
Point 32	201	4
Point 33	226.1	-7
Point 34	202	-7
Point 35	310	-7
Point 36	213	2
Point 37	194.44	2
Point 38	200	2
Point 39	196	2
Point 40	177.61	-7

Point 41	196	-7
Point 42	200	-7
Point 43	234.6	-3
Point 44	123.3	-70
Point 45	310	-70
Point 46	191.1	-0.9
Point 47	193.4	1.2
Point 48	123.3	-50
Point 49	310	-50
Point 50	187.56	-4
Point 51	187.56	-8
Point 52	187.56	-7
Point 53	199	4
Point 54	205	3
Point 55	205	-49

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.64	(214.934, -1.567)	12.87448	(200, 12.9)	(231.024, -2.78968)
2	1633	1.68	(214.934, -1.567)	12.903	(200, 12.9)	(231.024, -2.78968)

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	-7.678104	976.79648	-2094.5925	0	286.64
2	Optimized	200.75	-7.6767535	976.37649	1294.9953	0	286.34
3	Optimized	201.5	-7.6747275	976.2261	1294.4948	0	285.89
4	Optimized	202.33455	-7.6724735	976.05246	1294.5429	0	285.38
5	Optimized	203.1402	-7.678	976.38934	1287.8368	0	284.98
6	Optimized	204.08235	-7.69086	977.13222	1289.4287	0	284.56
7	Optimized	205.0245	-7.70372	911.69504	1291.0205	0	284.15
8	Optimized	205.9478	-7.72152	170.949	1287.8931	0	283.8
9	Optimized	206.68695	-7.740105	172.00125	1280.3982	0	283.56
10	Optimized	207.4915	-7.7482415	172.43211	1265.0109	0	283.18
11	Optimized	208.52675	-7.750085	172.43211	1230.7196	0	282.6
12	Optimized	209.562	-7.7519285	172.46109	1196.3317	0	282.02
13	Optimized	210.5612	-7.77209	173.63413	1148.8465	0	281.65
14	Optimized	211.52435	-7.81057	175.93722	1120.9397	0	281.48

3/20/2012

3/20/2012

15	Optimized	212.50295	-7.8420985	177.77196	1097.9885	0	281.24
16	Optimized	213.3285	-7.8625085	179.00433	1071.211	0	280.97
17	Optimized	214.1232	-7.8756415	179.79013	1048.2073	0	280.64
18	Optimized	215.05555	-7.885665	180.39071	1013.9953	0	280.2
19	Optimized	215.9879	-7.8956885	180.98058	979.77254	0	279.77
20	Optimized	216.9398	-7.89198	180.73619	954.33321	0	279.18
21	Optimized	217.91115	-7.87454	179.64513	915.60035	0	278.45
22	Optimized	218.9685	-7.7906075	174.40761	908.93482	0	277
23	Optimized	220.1119	-7.6401825	165.05119	848.49525	0	274.84
24	Optimized	221.20895	-7.4398525	152.5803	822.79483	0	272.21
25	Optimized	222.25965	-7.1896175	136.96119	753.72632	0	269.1
26	Optimized	222.86365	-7.03225	127.13372	773.0596	0	267.18
27	Optimized	223.67225	-6.700725	106.44481	700.52662	0	263.4
28	Optimized	224.80645	-6.235685	77.409734	598.65816	0	258.1
29	Optimized	225.615	-5.904155	56.706492	526.02003	0	254.32
30	Optimized	226.05965	-5.717916	45.072408	514.28887	0	252.2
31	Optimized	226.7545	-5.365166	23.052254	458.27271	0	248.65
32	Optimized	228.15055	-4.630915	-22.78596	366.90031	0	241.31
33	Optimized	229.0617	-4.11447	55.026471	328.8051	0	236.14
34	Optimized	229.6796	-3.6974195	81.053923	377.6939	0	400
35	Optimized	230.5762	-3.092259	118.82609	296.51056	0	400

Slices of Slip Surface: 1633

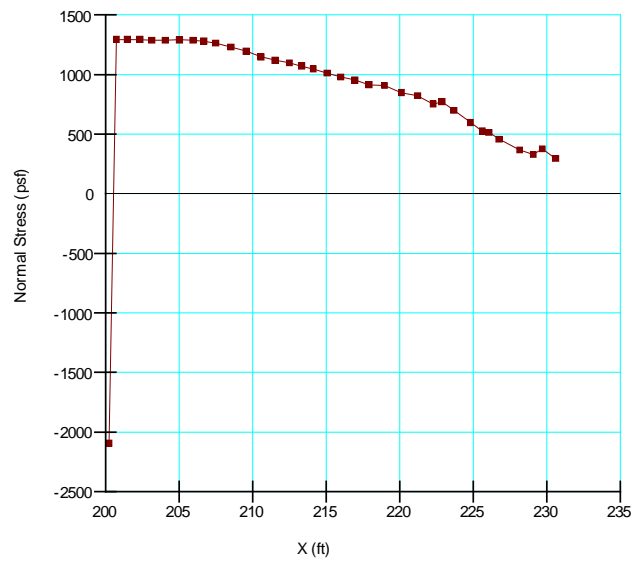
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	1633	200.25	-7.6836365	977.15662	-2072.1808	0	286.69
2	1633	200.75	-7.690909	977.3366	1287.4638	0	286.48
3	1633	201.5	-7.701818	978.06632	1288.3634	0	286.16
4	1633	202.55	-7.717091	979.07857	1290.2276	0	285.71
5	1633	203.65	-7.733091	980.07846	1292.2274	0	285.23
6	1633	204.75	-7.749091	980.98746	1294.1363	0	284.76
7	1633	205.85	-7.765091	173.52716	1296.136	0	284.29
8	1633	206.95	-7.781091	174.41797	1279.5923	0	283.82

3/20/2012

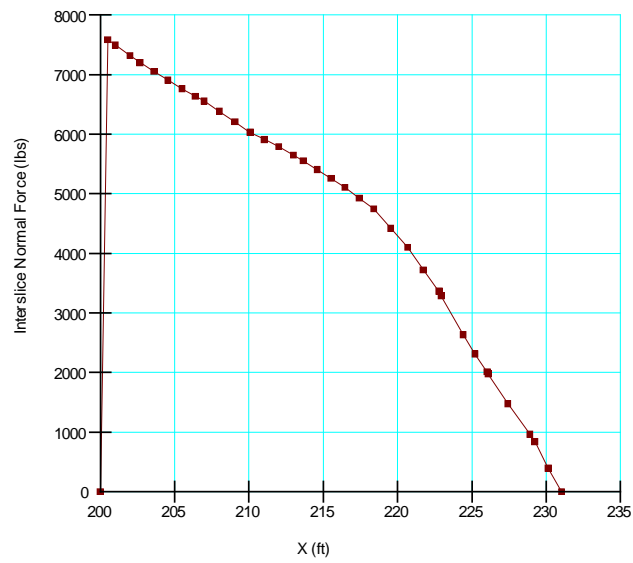
9	1633	208.05	-7.797091	175.31788	1244.6869	0	283.34
10	1633	209.15	-7.813091	176.16324	1209.6906	0	282.87
11	1633	210.25	-7.829091	177.09951	1174.7852	0	282.4
12	1633	211.35	-7.845091	178.03577	1139.7889	0	281.93
13	1633	212.45	-7.861091	178.93568	1104.8835	0	281.46
14	1633	213.5	-7.8763635	179.85094	1069.1867	0	281.01
15	1633	214.5	-7.890909	180.72084	1032.9905	0	280.58
16	1633	215.5	-7.9054545	181.58075	996.67435	0	280.15
17	1633	216.5	-7.92	182.47066	960.3882	0	279.72
18	1633	217.5	-7.9345455	183.36056	924.10205	0	279.29
19	1633	218.5	-7.949091	184.26047	887.80589	0	278.86
20	1633	219.5	-7.9636365	185.15037	851.50974	0	278.43
21	1633	220.5	-7.978182	186.05028	815.21359	0	278
22	1633	221.5	-7.9927275	186.95018	778.90744	0	277.57
23	1633	222.433	-7.75	171.83	936.65	0	274.61
24	1633	223.29905	-7.25	140.68	839.27	0	269.11
25	1633	224.32405	-6.658216	103.76437	722.7518	0	262.6
26	1633	225.508	-5.974648	61.107308	586.98623	0	255.09
27	1633	226.57135	-5.36072	22.779301	475.00588	0	248.61
28	1633	227.5141	-4.816432	11.198116	399.94451	0	243.16
29	1633	228.45685	-4.272144	45.175532	324.88315	0	237.72
30	1633	229.4523	-3.6974195	81.052051	336.42315	0	400
31	1633	230.50045	-3.092259	118.82798	256.23781	0	400

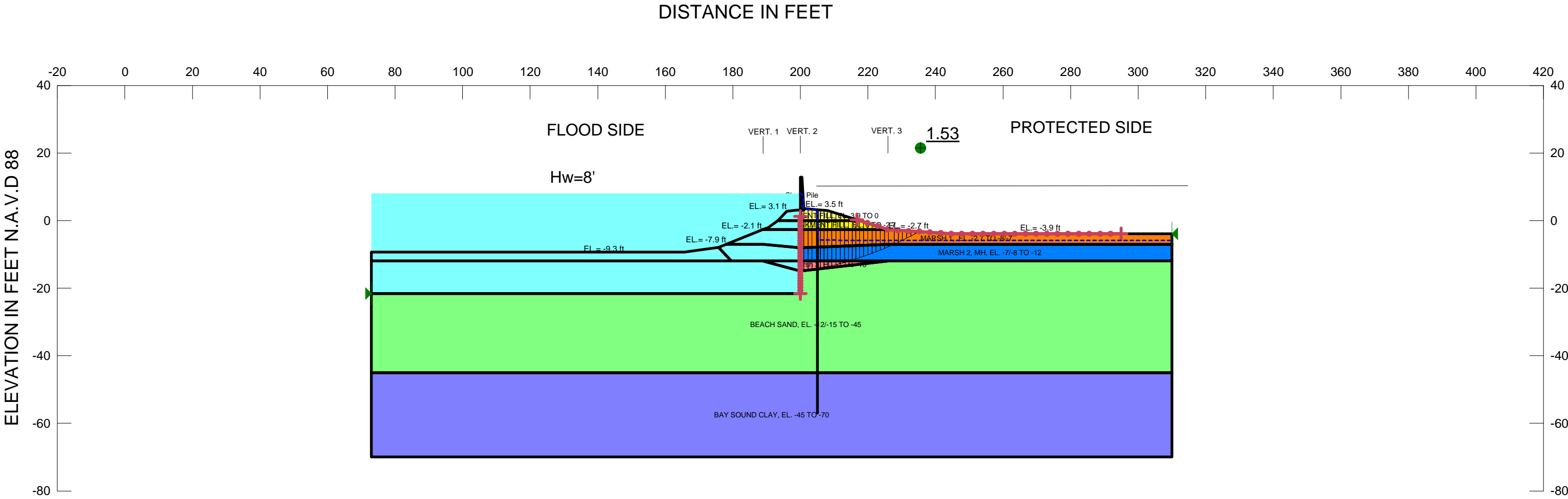
3/20/2012

Base Normal Stress Vs. X



Interslice Normal Stress Vs. X





Name: EMBANKMENT FILL, EL. 3.9 TO 0 Model: Spatial Mohr-Coulomb Unit Weight: 111 pcf Cohesion: 850 psf Phi: 0 °

Name: MARSH 1, EL. -2.7 TO -8/-7 Model: Spatial Mohr-Coulomb Weight Fn: Marsh 1 Cohesion Fn: Marsh 1 Phi: 0 °

Name: BEACH SAND, EL. -12/-15 TO -45 Model: Mohr-Coulomb Unit Weight: 122 pcf Cohesion: 0 psf Phi: 30 °

Name: BAY SOUND CLAY, EL. -45 TO -70 Model: Spatial Mohr-Coulomb Weight Fn: Clay Cohesion Spatial Fn: Bay Sound Clay Phi: 0 °

Name: EMBANKMENT FILL, EL. 0 TO -2.7 Model: Spatial Mohr-Coulomb Unit Weight: 103 pcf Cohesion: 850 psf Phi: 0 °

Name: MARSH 2, MH, EL. -7/-8 TO -12 Model: Spatial Mohr-Coulomb Weight Fn: Marsh 2 Cohesion Fn: Marsh 2 Phi: 0 °

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

Name: Marsh 3, EL. -12 to -15 Model: Spatial Mohr-Coulomb Unit Weight: 89 pcf Cohesion: 260 psf Phi: 0 °

GENERAL NOTES

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

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

Hw = CANAL WATER LEVEL



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

LONDON AVE CANAL
OUTFALL CANAL REEVALUATION REPORT
REACH 28, STA. 58+50 TO STA 68+12
PROTECTED SIDE STABILITY ANALYSIS,
CASE: GAP Stability (Entry/Exit) OPEN
MARCH 2012

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

GAP Stability (Entry/Exit) OPEN

Report generated using GeoStudio 2007, version 7.15. Copyright © 1991-2009 GEO-SLOPE International Ltd.

File Information

Created By: [Liljegren, James](#)
Revision Number: 243
Last Edited By: [Schroeder, Danielle V MVN](#)
Date: 1/12/2012
Time: 11:13:44 AM
File Name: [Reach 28-DVS.gsz](#)
Directory: [G:\F&M\HOME\London Ave Reeevaluation 2011\East Side\Reach 28\SlopeW\](#)
Last Solved Date: 1/12/2012
Last Solved Time: 11:15:04 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

GAP Stability (Entry/Exit) OPEN

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

3/1/2012

Optimization Maximum Iterations: [6000](#)
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. 3.9 TO 0

Model: [Spatial Mohr-Coulomb](#)
Unit Weight: [111 pcf](#)
Cohesion: [850 psf](#)
Phi: [0 °](#)
Phi-B: [0 °](#)

MARSH 1, EL. -2.7 TO -8/-7

Model: [Spatial Mohr-Coulomb](#)
Weight Fn: [Marsh 1](#)
Cohesion Fn: [Marsh 1](#)
Phi: [0 °](#)
Phi-B: [0 °](#)

BEACH SAND, EL. -12/-15 TO -45

Model: [Mohr-Coulomb](#)
Unit Weight: [122 pcf](#)
Cohesion: [0 psf](#)
Phi: [30 °](#)
Phi-B: [0 °](#)

BAY SOUND CLAY, EL. -45 TO -70

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

EMBANKMENT FILL, EL. 0 TO -2.7

Model: [Spatial Mohr-Coulomb](#)
Unit Weight: [103 pcf](#)
Cohesion: [850 psf](#)
Phi: [0 °](#)
Phi-B: [0 °](#)

MARSH 2, MH, EL. -7/-8 TO -12

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

3/1/2012

Phi: [0 °](#)
Phi-B: [0 °](#)

Sheet Pile

Model: [Undrained \(Phi=0\)](#)
Unit Weight: [0.1 pcf](#)
Cohesion: [0.01 psf](#)

Marsh 3, EL. -12 to -15

Model: [Spatial Mohr-Coulomb](#)
Unit Weight: [89 pcf](#)
Cohesion: [260 psf](#)
Phi: [0 °](#)
Phi-B: [0 °](#)

Slip Surface Entry and Exit

Left Projection: [Range](#)
Left-Zone Left Coordinate: [\(200, -21.6\) ft](#)
Left-Zone Right Coordinate: [\(200, 1.3\) ft](#)
Left-Zone Increment: [25](#)
Right Projection: [Range](#)
Right-Zone Left Coordinate: [\(216.8, 0.22873\) ft](#)
Right-Zone Right Coordinate: [\(295, -3.9\) ft](#)
Right-Zone Increment: [25](#)
Radius Increments: [25](#)

Slip Surface Limits

Left Coordinate: [\(73, -21.6\) ft](#)
Right Coordinate: [\(310, -3.9\) ft](#)

Cohesion Functions

Marsh 2

Model: [Spline Data Point Function](#)
Function: [Cohesion vs. X](#)
 Curve Fit to Data: [100 %](#)
 Segment Curvature: [0 %](#)
Y-Intercept: [245](#)
Data Points: [X \(ft\), Cohesion \(psf\)](#)
 Data Point: [\(73, 245\)](#)
 Data Point: [\(188.9, 245\)](#)
 Data Point: [\(200, 260\)](#)
 Data Point: [\(226.1, 245\)](#)
 Data Point: [\(310, 245\)](#)

Marsh 1

3/1/2012

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: [\(73, 400\)](#)
 Data Point: [\(188.9, 400\)](#)
 Data Point: [\(200, 260\)](#)
 Data Point: [\(226.1, 400\)](#)
 Data Point: [\(310, 400\)](#)

Unit Weight Functions

Clay

Model: [Spline Data Point Function](#)
Function: [Unit Weight vs. X](#)
 Curve Fit to Data: [100 %](#)
 Segment Curvature: [0 %](#)
Y-Intercept: [112](#)
Data Points: [X \(ft\), Unit Weight \(pcf\)](#)
 Data Point: [\(73, 112\)](#)
 Data Point: [\(188.9, 112\)](#)
 Data Point: [\(200, 106\)](#)
 Data Point: [\(226.1, 112\)](#)
 Data Point: [\(310, 112\)](#)

Marsh 2

Model: [Spline Data Point Function](#)
Function: [Unit Weight vs. X](#)
 Curve Fit to Data: [100 %](#)
 Segment Curvature: [0 %](#)
Y-Intercept: [100](#)
Data Points: [X \(ft\), Unit Weight \(pcf\)](#)
 Data Point: [\(73, 100\)](#)
 Data Point: [\(188.9, 100\)](#)
 Data Point: [\(200, 97\)](#)
 Data Point: [\(226.1, 100\)](#)
 Data Point: [\(310, 100\)](#)

Marsh 1

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: [\(73, 100\)](#)
 Data Point: [\(188.9, 100\)](#)

3/1/2012

Data Point: (200, 86)
Data Point: (226.1, 100)
Data Point: (310, 100)

Spatial Functions

Bay Sound Clay

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (310, -45, 680)
Data Point: (310, -70, 960)
Data Point: (188.9, -45, 680)
Data Point: (188.9, -70, 960)
Data Point: (226.1, -45, 680)
Data Point: (226.1, -70, 960)
Data Point: (200, -45, 715)
Data Point: (200, -70, 1010)
Data Point: (73, -45, 680)
Data Point: (73, -70, 960)

Regions

	Points	Area (ft²)	Material
Region 1	26,11,15,27,40,30	1202.55	
Region 2	9,15,11,26,31,28,10	6562.65	BEACH SAND, EL. -12/-15 TO -45
Region 3	16,9,10,17	5925	BAY SOUND CLAY, EL. -45 TO -70
Region 4	5,19,6,20,21	7.375	Sheet Pile
Region 5	5,19,6,41,18,29,22	40.139495	EMBANKMENT FILL, EL. 3.9 TO 0
Region 6	22,29,13,23	58.895532	EMBANKMENT FILL, EL. 0 TO -2.7
Region 7	24,23,13,7,8,34,33	396.59	MARSH 1, EL. -2.7 TO -8/-7
Region 8	24,33,34,28,31,25,36	536.95	MARSH 2, MH, EL. -7/-8 TO -12
Region 9	26,31,25	39.15	Marsh 3, EL. -12 to -15
Region 10	5,39,12,4,22	15.445	
Region 11	22,4,3,37,23	23.328102	
Region 12	26,25,30	16.65	
Region 13	25,36,24,32,35,2,40,30	106.64052	
Region 14	24,23,37,35,32	76.596363	
Region 15	38,1,14,2,40,27	292.49	

Points

	X (ft)	Y (ft)
Point 1	73	-9.3
Point 2	175.8	-7.9

Point 3	190.4	-2.1
Point 4	193.3	0
Point 5	200	3.1
Point 6	201	3.5
Point 7	244.8	-3.9
Point 8	310	-3.9
Point 9	73	-45
Point 10	310	-45
Point 11	200	-21.6
Point 12	196	2.7
Point 13	226.1	-2.7
Point 14	165.6	-9.3
Point 15	73	-21.6
Point 16	73	-70
Point 17	310	-70
Point 18	208	3
Point 19	201	3.1
Point 20	200.5	12.8
Point 21	200	12.8
Point 22	200	0
Point 23	200	-2.7
Point 24	200	-8
Point 25	200	-12
Point 26	200	-15
Point 27	73	-12
Point 28	310	-12
Point 29	217.52632	0
Point 30	188.9	-12
Point 31	226.1	-12
Point 32	188.9	-7
Point 33	226.1	-7
Point 34	310	-7
Point 35	178.06552	-7
Point 36	200	-11.9
Point 37	188.88966	-2.7
Point 38	73	-11.6
Point 39	199	3.1
Point 40	179.6	-12
Point 41	205	3.21429
Point 42	205	-57

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
--	--------------	-----	-------------	-------------	------------	-----------

1	Optimized	1.53	(183.877, 90.559)	106.9693	(200, 12.8)	(235.216, -3.285)
2	4891	1.53	(183.877, 90.559)	106.969	(200, 12.8)	(235.216, -3.285)

Slices of Slip Surface: Optimized

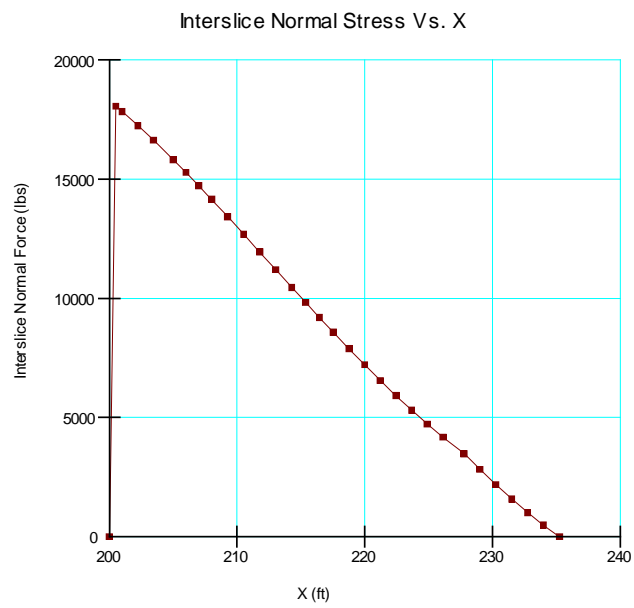
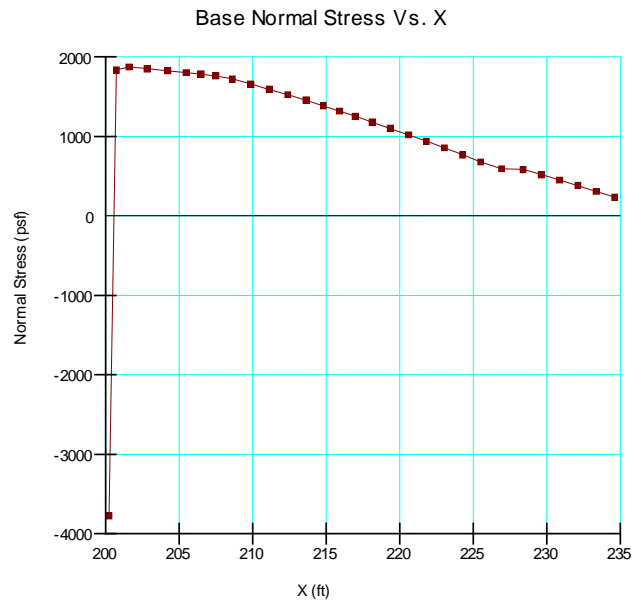
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	200.25	-15.14928	1444.3979	-3775.1869	-3013.5287	0
2	Optimized	200.75	-15.070625	1439.4918	1835.9658	228.90436	0
3	Optimized	201.61485	-14.92731	1430.5534	1873.9625	256.00231	0
4	Optimized	202.8445	-14.713155	1417.1643	1850.7091	250.30724	0
5	Optimized	204.22965	-14.45308	1400.5313	1827.5917	0	260
6	Optimized	205.5	-14.20058	518.43197	1804.3658	0	260
7	Optimized	206.5	-13.98919	505.423	1784.8922	0	260
8	Optimized	207.5	-13.767785	491.57624	1764.3376	0	260
9	Optimized	208.6275	-13.505325	475.28315	1722.4392	0	260
10	Optimized	209.8825	-13.19881	456.20717	1658.626	0	260
11	Optimized	211.13755	-12.87616	436.13498	1593.0619	0	260
12	Optimized	212.3926	-12.537215	415.01522	1525.7901	0	260
13	Optimized	213.6476	-12.181825	392.87521	1456.7034	0	260
14	Optimized	214.817	-11.83627	371.31092	1386.4206	0	251.48
15	Optimized	215.90075	-11.502525	350.45861	1320.0966	0	250.86
16	Optimized	216.98445	-11.15614	328.85143	1252.0905	0	250.24
17	Optimized	218.1387	-10.77271	304.92078	1179.4178	0	249.58
18	Optimized	219.3635	-10.35029	278.51761	1101.7932	0	248.87
19	Optimized	220.58835	-9.911162	251.05578	1021.9223	0	248.17
20	Optimized	221.8132	-9.455107	222.57949	939.87674	0	247.46
21	Optimized	223.038	-8.9818935	192.99704	855.42621	0	246.76
22	Optimized	224.2628	-8.4912745	162.31888	768.65212	0	246.06
23	Optimized	225.4876	-7.9829895	130.53515	679.50482	0	245.35
24	Optimized	226.9239	-7.3621985	91.764424	592.59663	0	245
25	Optimized	228.3702	-6.7153325	51.343327	583.71555	0	400
26	Optimized	229.61495	-6.136281	15.155829	518.8088	0	400
27	Optimized	230.8597	-	-	451.57123	0	400

			5.5376175	22.241148			
28	Optimized	232.10445	-4.918973	-60.888465	381.95303	0	400
29	Optimized	233.34915	-4.2799565	-100.78972	309.88387	0	400
30	Optimized	234.5939	-3.6201535	-141.99136	235.29653	0	400

Slices of Slip Surface: 4891

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	4891	200.25	-15.14928	1444.3979	-3775.1869	-3013.5287	0
2	4891	200.75	-15.070625	1439.4918	1835.9658	228.90436	0
3	4891	201.61485	-14.92731	1430.5534	1873.9625	256.00231	0
4	4891	202.8445	-14.713155	1417.1643	1850.7091	250.30724	0
5	4891	204.22965	-14.45308	1400.5313	1827.5917	0	260
6	4891	205.5	-14.20058	518.43197	1804.3658	0	260
7	4891	206.5	-13.98919	505.423	1784.8922	0	260
8	4891	207.5	-13.767785	491.57624	1764.3376	0	260
9	4891	208.6275	-13.505325	475.28315	1722.4392	0	260
10	4891	209.8825	-13.19881	456.20717	1658.626	0	260
11	4891	211.13755	-12.87616	436.13498	1593.0619	0	260
12	4891	212.3926	-12.537215	415.01522	1525.7901	0	260
13	4891	213.6476	-12.181825	392.87521	1456.7034	0	260
14	4891	214.817	-11.83627	371.31092	1386.4206	0	251.48
15	4891	215.90075	-11.502525	350.45861	1320.0966	0	250.86
16	4891	216.98445	-11.15614	328.85143	1252.0905	0	250.24
17	4891	218.1387	-10.77271	304.92078	1179.4178	0	249.58
18	4891	219.3635	-10.35029	278.51761	1101.7932	0	248.87
19	4891	220.58835	-9.911162	251.05578	1021.9223	0	248.17
20	4891	221.8132	-9.455107	222.57949	939.87674	0	247.46
21	4891	223.038	-8.9818935	192.99704	855.42621	0	246.76
22	4891	224.2628	-8.4912745	162.31888	768.65212	0	246.06
23	4891	225.4876	-7.9829895	130.53515	679.50482	0	245.35
24	4891	226.9239	-7.3621985	91.764424	592.59663	0	245

			7.3621985				
25	4891	228.3702	-6.7153325	51.343327	583.71555	0	400
26	4891	229.61495	-6.136281	15.155829	518.8088	0	400
27	4891	230.8597	-5.5376175	22.241148	451.57123	0	400
28	4891	232.10445	-4.918973	60.888465	381.95303	0	400
29	4891	233.34915	-4.2799565	100.78972	309.88387	0	400
30	4891	234.5939	-3.6201535	141.99136	235.29653	0	400



GAP Stability (Entry/Exit)

Report generated using GeoStudio 2007, version 7.15. Copyright © 1991-2009 GEO-SLOPE International Ltd.

File Information

Created By: [Liljegren, James](#)
Revision Number: 246
Last Edited By: [Schroeder, Danielle V MVN](#)
Date: 1/12/2012
Time: 2:55:29 PM
File Name: [Reach 29-DVS.gsz](#)
Directory: [G:\F&M\HOME\London Ave Reevaluation 2011\East Side\Reach 29\SlopeW\](#)
Last Solved Date: 1/12/2012
Last Solved Time: 2:56:46 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

GAP Stability (Entry/Exit)

Kind: [SLOPE/W](#)
Parent: [GAP Stability \(Seepage\)](#)
Method: [Spencer](#)
Settings
 PWP Conditions Source: [Parent Analysis](#)
SlipSurface
 Direction of movement: [Left to Right](#)
 Use Passive Mode: [Yes](#)
 Slip Surface Option: [Entry and Exit](#)
 Critical slip surfaces saved: [1](#)
 Optimize Critical Slip Surface Location: [Yes](#)
 Tension Crack
 Tension Crack Option: [\(none\)](#)
FOS Distribution
 FOS Calculation Option: [Constant](#)
Advanced
 Number of Slices: [30](#)
 Optimization Tolerance: [0.01](#)
 Minimum Slip Surface Depth: [0.1 ft](#)

3/1/2012

GAP Stability (Entry/Exit)

Phi: 0 °
Phi-B: 0 °

Sheet Pile

Model: [Undrained \(Phi=0\)](#)
Unit Weight: [0.1 pcf](#)
Cohesion: [0.01 psf](#)

Marsh 3, EL. -12 to -16

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

Fill -2.6 to -7 (Protected)

Model: [Mohr-Coulomb](#)
Unit Weight: [100 pcf](#)
Cohesion: [400 psf](#)
Phi: 0 °
Phi-B: 0 °

Slip Surface Entry and Exit

Left Projection: [Range](#)
Left-Zone Left Coordinate: [\(200, -21.5\) ft](#)
Left-Zone Right Coordinate: [\(200, 0.9\) ft](#)
Left-Zone Increment: [25](#)
Right Projection: [Range](#)
Right-Zone Left Coordinate: [\(219.08028, 2.4\) ft](#)
Right-Zone Right Coordinate: [\(294.3, -2.6\) ft](#)
Right-Zone Increment: [25](#)
Radius Increments: [25](#)

Slip Surface Limits

Left Coordinate: [\(127.5, -21.6\) ft](#)
Right Coordinate: [\(310, -2.6\) ft](#)

Cohesion Functions

Marsh 3

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

3/1/2012

Optimization Maximum Iterations: [4000](#)
Optimization Convergence Tolerance: [1e-007](#)
Starting Optimization Points: [8](#)
Ending Optimization Points: [16](#)
Complete Passes per Insertion: [1](#)
Driving Side Maximum Convex Angle: [5 °](#)
Resisting Side Maximum Convex Angle: [1 °](#)

Materials

EMBANKMENT FILL, EL. 4.6 TO 0

Model: [Mohr-Coulomb](#)
Unit Weight: [114 pcf](#)
Cohesion: [850 psf](#)
Phi: 0 °
Phi-B: 0 °

MARSH 1, EL. -3 TO -8

Model: [Spatial Mohr-Coulomb](#)
Weight Fn: [Marsh 1](#)
Cohesion Fn: [Marsh 1](#)
Phi: 0 °
Phi-B: 0 °

BEACH SAND, EL. -11 TO -52

Model: [Mohr-Coulomb](#)
Unit Weight: [122 pcf](#)
Cohesion: [0 psf](#)
Phi: [30 °](#)
Phi-B: 0 °

BAY SOUND CLAY, EL. -45 TO -70

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

EMBANKMENT FILL1, EL. 0 TO -3

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

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

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

3/1/2012

GAP Stability (Entry/Exit)

Data Point: [\(127.5, 220\)](#)
Data Point: [\(172.7, 220\)](#)
Data Point: [\(200, 260\)](#)
Data Point: [\(263.6, 220\)](#)
Data Point: [\(310, 220\)](#)

Fill 2

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: [\(127.5, 400\)](#)
 Data Point: [\(172.7, 400\)](#)
 Data Point: [\(200, 850\)](#)
 Data Point: [\(263.6, 400\)](#)
 Data Point: [\(310, 400\)](#)

Marsh 2

Model: [Spline Data Point Function](#)
Function: [Cohesion vs. X](#)
 Curve Fit to Data: [100 %](#)
 Segment Curvature: [0 %](#)
Y-Intercept: [220](#)
Data Points: [X \(ft\), Cohesion \(psf\)](#)
 Data Point: [\(127.5, 220\)](#)
 Data Point: [\(172.7, 220\)](#)
 Data Point: [\(200, 260\)](#)
 Data Point: [\(263.6, 220\)](#)
 Data Point: [\(310, 220\)](#)

Marsh 1

Model: [Spline Data Point Function](#)
Function: [Cohesion vs. X](#)
 Curve Fit to Data: [100 %](#)
 Segment Curvature: [0 %](#)
Y-Intercept: [220](#)
Data Points: [X \(ft\), Cohesion \(psf\)](#)
 Data Point: [\(127.5, 220\)](#)
 Data Point: [\(172.7, 220\)](#)
 Data Point: [\(200, 260\)](#)
 Data Point: [\(263.6, 220\)](#)
 Data Point: [\(310, 220\)](#)

Unit Weight Functions

Clay

Model: [Spline Data Point Function](#)

3/1/2012

Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 112
Data Points: X (ft), Unit Weight (pcf)
Data Point: (127.5, 112)
Data Point: (172.7, 112)
Data Point: (200, 106)
Data Point: (263.6, 112)
Data Point: (310, 112)

Marsh 3
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: (127.5, 100)
Data Point: (172.7, 100)
Data Point: (200, 90)
Data Point: (263.6, 100)
Data Point: (310, 100)

Marsh 2
Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 100
Data Points: X (ft), Unit Weight (pcf)
Data Point: (127.5, 100)
Data Point: (172.7, 100)
Data Point: (200, 97)
Data Point: (263.6, 100)
Data Point: (310, 100)

Marsh 1
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: (127.5, 100)
Data Point: (172.7, 100)
Data Point: (200, 93)
Data Point: (263.6, 100)
Data Point: (310, 100)

Fill 2

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 100
Data Points: X (ft), Unit Weight (pcf)
Data Point: (127.5, 100)
Data Point: (172.7, 100)
Data Point: (200, 103)
Data Point: (263.6, 100)
Data Point: (310, 100)

Spatial Functions

Clay Cohesion

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (172.7, -49, 544)
Data Point: (172.7, -70, 773)
Data Point: (200, -49, 900)
Data Point: (200, -70, 900)
Data Point: (263.6, -49, 544)
Data Point: (263.6, -70, 773)
Data Point: (310, -49, 544)
Data Point: (310, -70, 773)
Data Point: (127.5, -49, 544)
Data Point: (127.5, -70, 773)

Regions

	Points	Area (ft²)	Material
Region 1	25,10,14,1,13,44,27	573.48	
Region 2	8,14,10,25,28,26,9	5616.5	BEACH SAND, EL. -11 TO -52
Region 3	15,8,9,16	3832.5	BAY SOUND CLAY, EL. -45 TO -70
Region 4	4,18,5,19,20	6.45	Sheet Pile
Region 5	4,18,5,17,33,21	99.833372	EMBANKMENT FILL, EL. 4.6 TO 0
Region 6	21,33,12,6,30,22	247.73162	EMBANKMENT FILL1, EL. 0 TO -3
Region 7	23,22,30,31,40,41	237.2	MARSH 1, EL. -3 TO -8
Region 8	23,41,40,39,34,24	440	MARSH 2, MH, EL. -8 TO -12
Region 9	25,28,26,39,34,24	440	Marsh 3, EL. -12 to -16
Region 10	6,7,31,30	204.16	Fill -2.6 to -7 (Protected)
Region 11	4,32,11,36,21	56.9916	
Region 12	25,24,37,44,27	147.2	

3/1/2012

3/1/2012

Region 13	24,23,42,43,2,13,44,37	190.25902	
Region 14	43,38,29,22,23,42	91.78235	
Region 15	38,35,45,3,36,21,22,29	143.66422	

Points

	X (ft)	Y (ft)
Point 1	127.5	-11.6
Point 2	161.5	-8.1
Point 3	177.3	-0.9
Point 4	200	4.6
Point 5	201	5.8
Point 6	263.6	-2.6
Point 7	310	-2.6
Point 8	127.5	-49
Point 9	310	-49
Point 10	200	-21.6
Point 11	196	4.9
Point 12	231	-1.5
Point 13	146.1	-10.4
Point 14	127.5	-21.6
Point 15	127.5	-70
Point 16	310	-70
Point 17	209.3	5.6
Point 18	201	4.6
Point 19	200.5	12.8
Point 20	200	12.8
Point 21	200	0
Point 22	200	-3
Point 23	200	-8
Point 24	200	-12
Point 25	200	-16
Point 26	310	-16
Point 27	172.7	-16
Point 28	263.6	-16
Point 29	172.7	-7
Point 30	263.6	-7
Point 31	310	-7
Point 32	199	4.6
Point 33	226.41549	0
Point 34	263.6	-12
Point 35	172.7	-3
Point 36	180.432	0
Point 37	172.7	-12

Point 38	163.91569	-7
Point 39	310	-12
Point 40	310	-8
Point 41	263.6	-8
Point 42	172.7	-8
Point 43	161.71961	-8
Point 44	153.7	-12
Point 45	173.6	-2.6

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.64	(224.085, 19.062)	22.5274	(200, 12.8)	(252.319, -2.21935)
2	11791	1.71	(224.085, 19.062)	34.953	(200, 12.8)	(251.825, -2.20269)

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	-6.0761525	648.91142	54.292273	0	259.84
2	Optimized	200.75	-6.361176	620.8331	1022.3044	0	259.53
3	Optimized	201.7271	-6.918169	655.54242	1201.2204	0	258.91
4	Optimized	202.9366	-7.666325	702.16236	1236.0212	0	258.15
5	Optimized	204.1444	-8.501755	753.60804	1309.8857	0	257.39
6	Optimized	205.9083	-9.75263	830.81022	1414.8803	0	256.28
7	Optimized	207.9853	-11.250875	920.65815	1549.6717	0	254.98
8	Optimized	209.1619	-12.09961	970.97756	1625.5689	0	254.24
9	Optimized	209.8965	-12.62949	1002.2802	1650.9104	0	253.78
10	Optimized	211.16085	-13.41028	1047.0899	1730.5222	0	252.98
11	Optimized	212.4966	-14.111315	1086.0011	1746.2988	0	252.14
12	Optimized	213.8446	-14.70007	1117.3056	1802.2737	0	251.29
13	Optimized	215.2048	-15.176545	1141.0353	1797.6943	0	250.44
14	Optimized	216.6533	-15.55834	1158.1653	1829.5136	0	249.53
15	Optimized	218.19015	-15.84546	1168.6551	1801.5621	0	248.56
16	Optimized	219.80075	-15.990395	1169.65	1812.5686	0	247.55
17	Optimized	221.4851	-15.99314	1161.1601	1752.3674	0	246.49
18	Optimized	223.16945	-15.99588	1152.6702	1692.1067	0	245.43
19	Optimized	224.88445	-15.998675	1144.0617	1630.7405	0	244.35
20	Optimized	226.0864	-15.94175	1134.1849	1632.4674	0	243.59

3/1/2012

3/1/2012

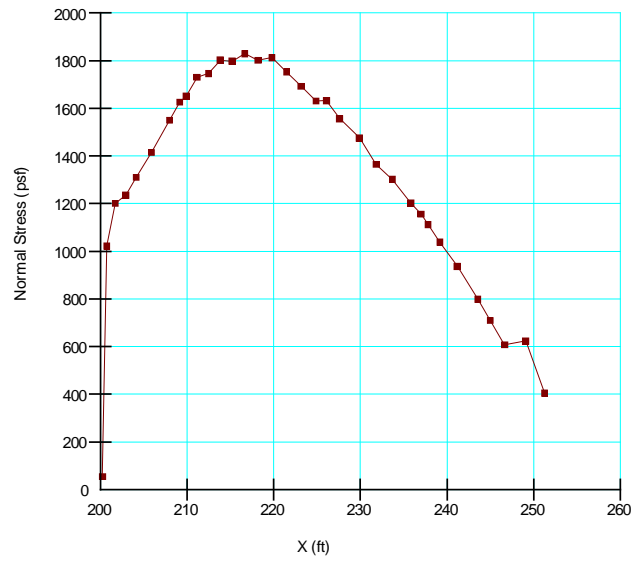
21	Optimized	227.5939	-15.67446	1109.115	1556.5713	0	242.65
22	Optimized	229.88615	-15.04684	1056.3827	1475.5155	0	241.2
23	Optimized	231.82105	-14.31954	998.79554	1365.0928	0	239.99
24	Optimized	233.69965	-13.5368	937.74659	1301.956	0	238.81
25	Optimized	235.81475	-12.588555	864.49053	1201.779	0	237.48
26	Optimized	236.9891	-12.057215	823.48736	1155.6112	0	236.74
27	Optimized	237.798	-11.661065	793.25686	1112.4153	0	236.23
28	Optimized	239.18215	-10.983195	741.67505	1038.1894	0	235.36
29	Optimized	241.16045	-9.951245	664.00831	936.51762	0	234.11
30	Optimized	243.5411	-8.629115	565.69904	799.23507	0	232.62
31	Optimized	244.96015	-7.81337	505.51857	709.60328	0	231.72
32	Optimized	246.6344	-6.78127	430.19544	607.46032	0	230.67
33	Optimized	249.0677	-5.006686	272.55612	623.34169	0	502.82
34	Optimized	251.2351	-3.1484585	89.34354	404.73776	0	487.49

Slices of Slip Surface: **11791**

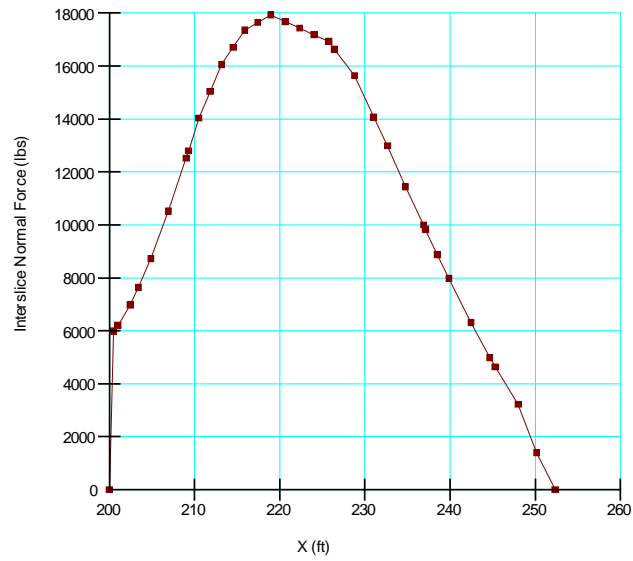
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	11791	200.25	-6.501102	675.8947	58.372458	0	259.84
2	11791	200.75	-6.958405	658.87588	1009.3304	0	259.53
3	11791	201.48195	-7.591303	698.58567	1202.8182	0	259.07
4	11791	202.7257	-8.5884935	761.8553	1308.3675	0	258.29
5	11791	204.2493	-9.7023385	831.26261	1428.7343	0	257.33
6	11791	205.77295	-10.696485	892.11352	1537.2748	0	256.37
7	11791	207.2966	-11.58264	944.62183	1635.1726	0	255.41
8	11791	208.6792	-12.304905	986.15365	1714.0754	0	254.54
9	11791	210.15575	-12.98181	1023.9168	1758.5927	0	253.61
10	11791	211.8673	-13.67321	1060.8285	1777.2435	0	252.54
11	11791	213.57885	-14.262415	1090.441	1786.1412	0	251.46
12	11791	215.2904	-14.75478	1113.4967	1785.7678	0	250.38
13	11791	217.00195	-15.15449	1130.4264	1776.4825	0	249.31
14	11791	218.7135	-15.46478	1141.5372	1758.5204	0	248.23
15	11791	220.42505	-15.68805	1146.9969	1732.1164	0	247.15
16	11791	222.1366	-15.825975	1147.055	1697.3357	0	246.08

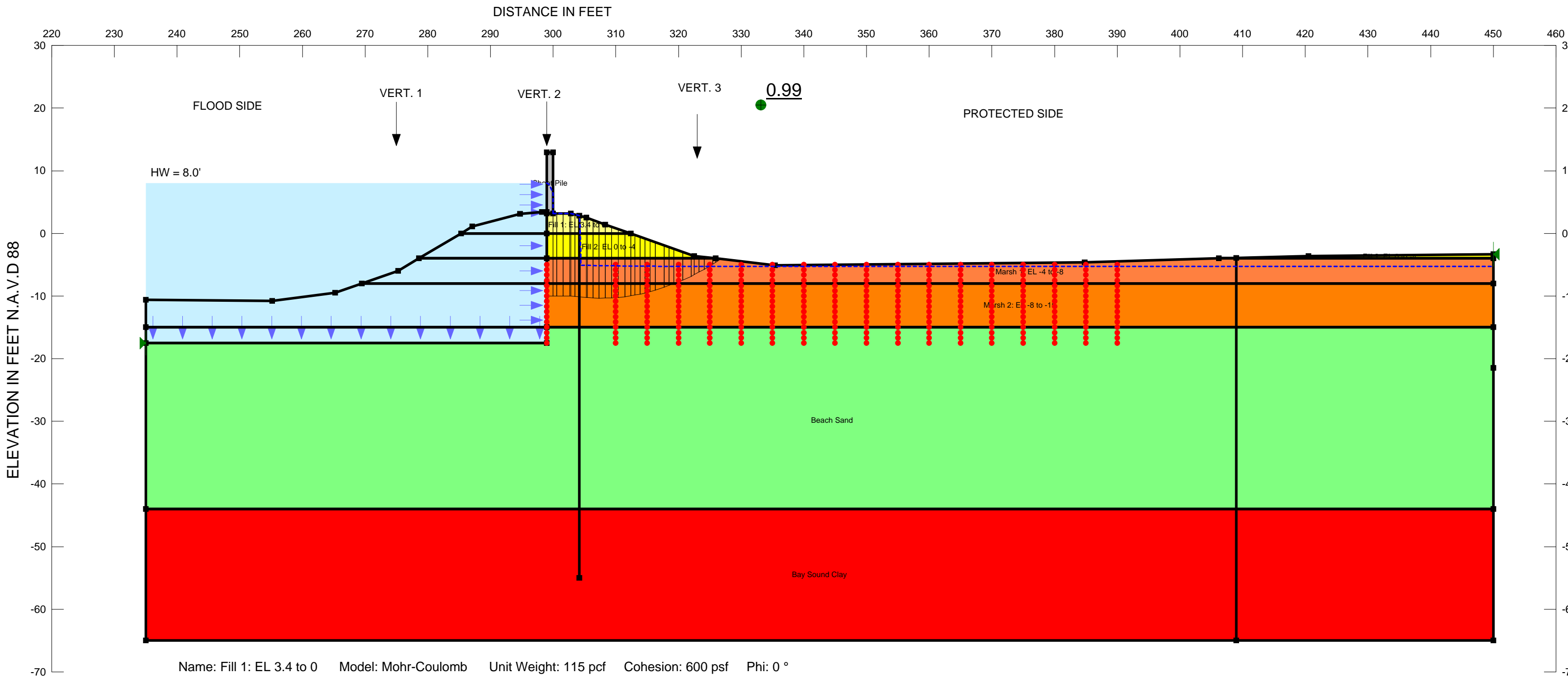
17	11791	223.84815	-15.87957	1141.6883	1654.2532	0	245
18	11791	225.5597	-15.849225	1130.8904	1602.8487	0	243.92
19	11791	227.1796	-15.745145	1115.8273	1549.6696	0	242.91
20	11791	228.70775	-15.575235	1096.8918	1495.6672	0	241.94
21	11791	230.2359	-15.33663	1073.4929	1434.7379	0	240.98
22	11791	231.91115	-14.99059	1042.1758	1387.1255	0	239.93
23	11791	233.7335	-14.51939	1001.9219	1351.1204	0	238.78
24	11791	235.55585	-13.940905	954.55992	1304.5376	0	237.64
25	11791	237.37815	-13.249345	899.75976	1246.6722	0	236.49
26	11791	239.20045	-12.43724	837.13949	1176.7744	0	235.35
27	11791	240.87345	-11.58264	772.57414	1100.4375	0	234.29
28	11791	242.3971	-10.696485	706.92729	1018.9434	0	233.34
29	11791	243.92075	-9.7023385	634.32064	926.46473	0	232.38
30	11791	245.4444	-8.5884935	554.04353	821.79401	0	231.42
31	11791	247.3047	-7.0221145	442.94962	674.09664	0	230.25
32	11791	249.25865	-5.15497	285.42508	687.39634	0	501.47
33	11791	250.9696	-3.2341985	98.314806	521.19906	0	489.37

Base Normal Stress Vs. X



Interslice Normal Stress Vs. X





Name: Fill 1: EL 3.4 to 0 Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion: 600 psf Phi: 0 °
Name: Fill 2: EL 0 to -4 Model: Mohr-Coulomb Unit Weight: 102 pcf Cohesion: 600 psf Phi: 0 °
Name: Marsh 1: EL -4 to -8 Model: Mohr-Coulomb Unit Weight: 80 pcf Cohesion: 200 psf Phi: 0 °
Name: Marsh 2: EL -8 to -15 Model: Mohr-Coulomb Unit Weight: 94 pcf Cohesion: 250 psf Phi: 0 °
Name: Beach Sand Model: Mohr-Coulomb Unit Weight: 122 pcf Cohesion: 0 psf Phi: 30 °
Name: Bay Sound Clay Model: Spatial Mohr-Coulomb Unit Weight: 105 pcf Cohesion Spatial Fn: Bay Sound Clay Phi: 0 °
Name: Sheet Pile Model: Undrained (Phi=0) Unit Weight: 0.1 pcf Cohesion: 0.01 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.

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

LONDON AVE CANAL
OUTFALL CANAL REEVALUATION REPORT
REACH 30, STA. 74+13 TO 76+90
PROTECTED SIDE STABILITY ANALYSIS,
CASE: GAP Stability (Block)
MARCH 2012

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

GAP Stability (Block)

Report generated using GeoStudio 2007, version 7.15. Copyright © 1991-2009 GEO-SLOPE International Ltd.

File Information

Revision Number: 263
Last Edited By: Haggerty, Daniel R MVN
Date: 12/28/2011
Time: 4:10:12 PM
File Name: Reach 30.gsz
Last Solved Date: 12/28/2011
Last Solved Time: 4:10:40 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: [Seepage Analysis Gap: Rem](#)
Method: [Spencer](#)
Settings
 PWP Conditions Source: [Parent Analysis](#)
SlipSurface
 Direction of movement: [Left to Right](#)
 Use Passive Mode: [Yes](#)
 Slip Surface Option: [Block](#)
 Critical slip surfaces saved: [1](#)
 Optimize Critical Slip Surface Location: [Yes](#)
 Tension Crack
 Tension Crack Option: [\(none\)](#)
FOS Distribution
 FOS Calculation Option: [Constant](#)
Restrict Block Crossing: [Yes](#)
Advanced
 Number of Slices: [30](#)
 Optimization Tolerance: [0.01](#)

Bay Sound Clay

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

Sheet Pile

Model: [Undrained \(Phi=0\)](#)
Unit Weight: [0.1 pcf](#)
Cohesion: [0.01 psf](#)

Slip Surface Limits

Left Coordinate: [\(235, -17.5\) ft](#)
Right Coordinate: [\(450, -3.3\) ft](#)

Slip Surface Block

Left Grid
 Upper Left: [\(299, -5\) ft](#)
 Lower Left: [\(299, -17.5\) ft](#)
 Lower Right: [\(299, -17.5\) ft](#)
 X Increments: [0](#)
 Y Increments: [15](#)
 Starting Angle: [135 °](#)
 Ending Angle: [135 °](#)
 Angle Increments: [0](#)
Right Grid
 Upper Left: [\(310, -5\) ft](#)
 Lower Left: [\(310, -17.5\) ft](#)
 Lower Right: [\(390, -17.5\) ft](#)
 X Increments: [16](#)
 Y Increments: [15](#)
 Starting Angle: [20 °](#)
 Ending Angle: [45 °](#)
 Angle Increments: [5](#)

Spatial Functions

Bay Sound Clay

Model: [Linear Interpolation](#)
Limit Range By: [Data Values](#)
Data Points: [X \(ft\), Y \(ft\), Cohesion \(psf\)](#)
 Data Point: [\(0, -44, 750\)](#)

Minimum Slip Surface Depth: [0.1 ft](#)
Optimization Maximum Iterations: [5000](#)
Optimization Convergence Tolerance: [1e-007](#)
Starting Optimization Points: [8](#)
Ending Optimization Points: [16](#)
Complete Passes per Insertion: [1](#)
Driving Side Maximum Convex Angle: [5 °](#)
Resisting Side Maximum Convex Angle: [1 °](#)

Materials

Fill 1: EL 3.4 to 0

Model: [Mohr-Coulomb](#)
Unit Weight: [115 pcf](#)
Cohesion: [600 psf](#)
Phi: [0 °](#)
Phi-B: [0 °](#)

Fill 2: EL 0 to -4

Model: [Mohr-Coulomb](#)
Unit Weight: [102 pcf](#)
Cohesion: [600 psf](#)
Phi: [0 °](#)
Phi-B: [0 °](#)

Marsh 1: EL -4 to -8

Model: [Mohr-Coulomb](#)
Unit Weight: [80 pcf](#)
Cohesion: [200 psf](#)
Phi: [0 °](#)
Phi-B: [0 °](#)

Marsh 2: EL -8 to -15

Model: [Mohr-Coulomb](#)
Unit Weight: [94 pcf](#)
Cohesion: [250 psf](#)
Phi: [0 °](#)
Phi-B: [0 °](#)

Beach Sand

Model: [Mohr-Coulomb](#)
Unit Weight: [122 pcf](#)
Cohesion: [0 psf](#)
Phi: [30 °](#)
Phi-B: [0 °](#)

Data Point: [\(275, -44, 750\)](#)
Data Point: [\(299, -44, 750\)](#)
Data Point: [\(323, -44, 750\)](#)
Data Point: [\(600, -44, 750\)](#)
Data Point: [\(0, -65, 950\)](#)
Data Point: [\(275, -65, 950\)](#)
Data Point: [\(323, -65, 950\)](#)
Data Point: [\(600, -65, 950\)](#)
Data Point: [\(299, -65, 950\)](#)

Regions

	Material	Points	Area (ft²)
Region 1	Bay Sound Clay	24,23,28,29	4515
Region 2	Beach Sand	23,31,32,1,27,33,28	6075
Region 3		31,22,1,32	160
Region 4		22,4,5,6,16,3,1	368.735
Region 5	Marsh 2: EL -8 to -15	1,3,26,27	1057
Region 6		16,7,17,2,3	97.3
Region 7	Marsh 1: EL -4 to -8	3,2,42,13,14,18,25,26	550.387
Region 8		17,19,20,2	68.2
Region 9	Fill 2: EL 0 to -4	2,20,21,12,42	76.508
Region 10		19,8,9,10,11,36,20	31.045
Region 11	Fill 1: EL 3.4 to 0	20,36,40,37,43,38,39,21	28.194
Region 12	Sheet Pile	36,11,34,35,40	9.7
Region 13	Fill 2: EL 0 to -4	18,44,15,30,25	19.097

Points

	X (ft)	Y (ft)
Point 1	299	-15
Point 2	299	-4
Point 3	299	-8
Point 4	235	-10.6
Point 5	255.2	-10.8
Point 6	265.2	-9.5
Point 7	275.3	-6
Point 8	287.1	1.1
Point 9	294.7	3.1

Point 10	298.2	3.4
Point 11	299	3.4
Point 12	322.5	-3.6
Point 13	335.4	-5.1
Point 14	384.8	-4.6
Point 15	420.5	-3.6
Point 16	269.5	-8
Point 17	278.6	-4
Point 18	406.2	-4
Point 19	285.3	0
Point 20	299	0
Point 21	312.4	0
Point 22	235	-15
Point 23	235	-44
Point 24	235	-65
Point 25	450	-4
Point 26	450	-8
Point 27	450	-15
Point 28	450	-44
Point 29	450	-65
Point 30	450	-3.3
Point 31	235	-17.5
Point 32	299	-17.5
Point 33	450	-21.5
Point 34	299	12.9
Point 35	300	12.9
Point 36	299	3.2
Point 37	302.8	3.2
Point 38	305.3	2.53
Point 39	308.3	1.43
Point 40	300	3.2
Point 41	304.2	-55
Point 42	325.94	-4
Point 43	304.2	2.8248
Point 44	409	-3.92
Point 45	409	-65

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	0.99	(312.349, -2.724)	12.36797	(299, 12.9)	(326.741, -4.09318)
2	620	1.02	(312.349, -2.724)	12.717	(299, 12.9)	(327.482, -4.17935)

Slices of Slip Surface: Optimized

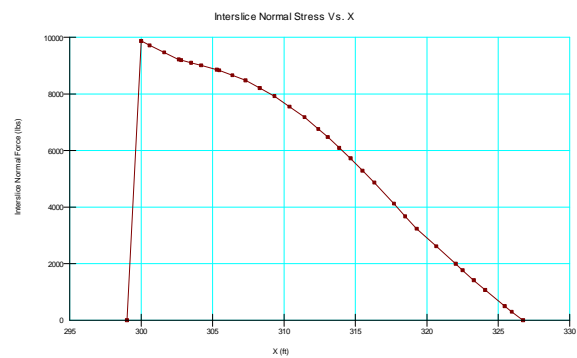
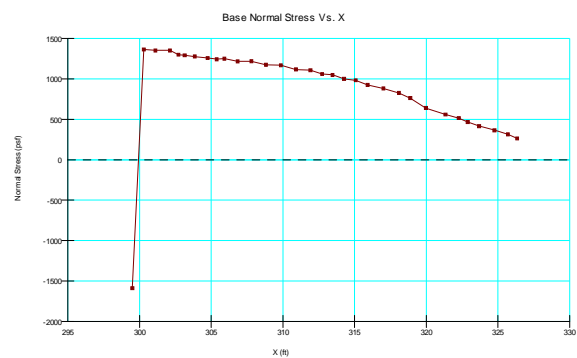
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	299.5	-9.99315	1097.0298	-1588.4983	0	250
2	Optimized	300.29505	-9.98415	1096.2929	1363.5197	0	250
3	Optimized	301.09965	-9.9839	1096.0837	1352.2715	0	250
4	Optimized	302.1188	-9.99008	1095.9856	1352.8603	0	250
5	Optimized	302.7142	-10.001185	1096.4346	1298.8979	0	250
6	Optimized	303.15	-10.04189	1098.8747	1292.1194	0	250
7	Optimized	303.85	-10.10727	1102.7578	1277.099	0	250
8	Optimized	304.75	-10.191325	313.11013	1257.799	0	250
9	Optimized	305.3813	-10.250285	316.19471	1243.3592	0	250
10	Optimized	305.92325	-10.280435	317.58663	1250.5502	0	250
11	Optimized	306.84455	-10.32555	319.58144	1216.3999	0	250
12	Optimized	307.8026	-10.33883	319.72078	1218.2998	0	250
13	Optimized	308.81675	-10.319905	318.00592	1174.5642	0	250
14	Optimized	309.8584	-10.26377	313.98874	1168.9304	0	250
15	Optimized	310.90825	-10.170785	307.72661	1116.6511	0	250
16	Optimized	311.9166	-10.045392	299.58482	1107.0592	0	250
17	Optimized	312.73195	-9.912317	291.03246	1060.9447	0	250
18	Optimized	313.4629	-9.7726325	282.07348	1049.1859	0	250
19	Optimized	314.2609	-9.6016175	271.21696	1001.0913	0	250
20	Optimized	315.0772	-9.40285	258.63968	982.29426	0	250
21	Optimized	315.9118	-9.17633	244.31321	926.21404	0	250
22	Optimized	317.01215	-8.83665	222.87185	881.30063	0	250
23	Optimized	318.0923	-8.4576725	199.06989	827.17966	0	250
24	Optimized	318.8865	-8.1525575	179.89985	762.37058	0	250

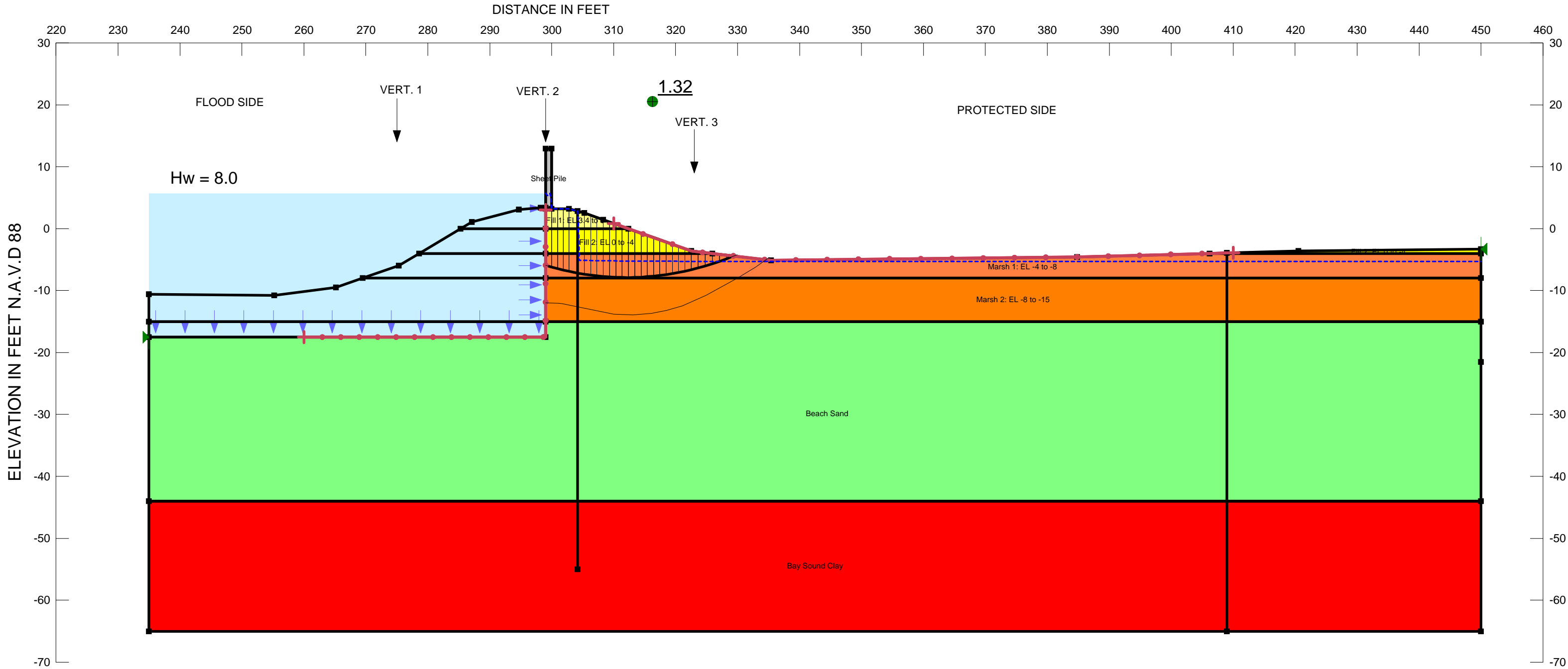
25	Optimized	319.97435	-7.734635	153.59521	639.38202	0	200
26	Optimized	321.3411	-7.162995	117.74811	560.2366	0	200
27	Optimized	322.25855	-6.7272455	90.415847	515.41048	0	200
28	Optimized	322.8946	-6.3861605	69.027683	467.11554	0	200
29	Optimized	323.6838	-5.96294	42.54068	415.89251	0	200
30	Optimized	324.7622	-5.34234	3.700845	364.46822	0	200
31	Optimized	325.693	-4.7731445	-31.926104	313.87747	0	200
32	Optimized	326.3407	-4.353061	-58.198041	264.24627	0	200

23	620	320.8945	-7.2513465	123.33856	587.39501	0	200
24	620	321.96485	-6.752244	92.033968	496.14006	0	200
25	620	322.93	-6.3021805	63.787207	426.03843	0	200
26	620	323.79	-5.9011555	38.675104	377.09781	0	200
27	620	324.65	-5.500131	13.555625	328.16773	0	200
28	620	325.51	-5.0991065	-11.570178	279.22711	0	200
29	620	326.3256	-4.7187835	-35.388057	233.95392	0	200
30	620	327.0968	-4.359162	-57.882089	192.35271	0	200

Slices of Slip Surface: 620

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	620	299.5	-10	1097.5	-1592.2	0	250
2	620	300.46665	-10	1097.3572	1355.4643	0	250
3	620	301.4	-10	1097.0358	1355.4643	0	250
4	620	302.33335	-10	1096.5	1355.4643	0	250
5	620	303.5	-10	1095.7857	1333.8571	0	250
6	620	304.75	-10	301.36364	1295.3636	0	250
7	620	305.8	-10	300.47	1257.3	0	250
8	620	306.8	-10	299.62	1215.2	0	250
9	620	307.8	-10	298.89	1173	0	250
10	620	308.8125	-10	298.3122	1131.3171	0	250
11	620	309.8375	-10	297.73659	1090.2439	0	250
12	620	310.8625	-10	297.2	1049.0732	0	250
13	620	311.8875	-10	296.79024	1008	0	250
14	620	312.83335	-10	296.41153	971.69996	0	250
15	620	313.7	-10	296.06537	940.18843	0	250
16	620	314.56665	-10	295.81153	908.67689	0	250
17	620	315.4289	-9.8	283.16481	1125.4325	0	250
18	620	316.2867	-9.4	258.08242	1045.8112	0	250
19	620	317.1445	-9	232.98946	966.20047	0	250
20	620	318.0023	-8.6	207.92819	886.57919	0	250
21	620	318.8601	-8.2	182.85636	806.96847	0	250
22	620	319.82415	-7.750449	154.61774	678.6415	0	200





Name: Fill 1: EL 3.4 to 0 Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion: 600 psf Phi: 0 °
Name: Fill 2: EL 0 to -4 Model: Mohr-Coulomb Unit Weight: 102 pcf Cohesion: 600 psf Phi: 0 °
Name: Marsh 1: EL -4 to -8 Model: Mohr-Coulomb Unit Weight: 80 pcf Cohesion: 200 psf Phi: 0 °
Name: Marsh 2: EL -8 to -15 Model: Mohr-Coulomb Unit Weight: 94 pcf Cohesion: 250 psf Phi: 0 °
Name: Beach Sand Model: Mohr-Coulomb Unit Weight: 122 pcf Cohesion: 0 psf Phi: 30 °
Name: Bay Sound Clay Model: Spatial Mohr-Coulomb Unit Weight: 105 pcf Cohesion Spatial Fn: Bay Sound Clay Phi: 0 °
Name: Sheet Pile Model: Undrained (Phi=0) Unit Weight: 0.1 pcf Cohesion: 0.01 psf

Name: GAP Stability (Entry/Exit)
File Name: Reach 30.gsz Directory: G:\F&MHOME\London Ave Reevaluation 2011\East Side\Reach 30 1% flowline\
Last Edited By: Curran, Matthew MVN



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

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

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

LONDON AVE CANAL
OUTFALL CANAL REEVALUATION REPORT
REACH 30, STA. 74+13 TO 76+90
PROTECTED SIDE STABILITY ANALYSIS,
1% FLOWLINE WATER EL +5.7
CASE: GAP Stability (Entry/Exit)
MARCH 2012

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

GAP Stability (Entry/Exit)

Report generated using GeoStudio 2007, version 7.15. Copyright © 1991-2009 GEO-SLOPE International Ltd.

File Information

Title: London Avenue Canal OFC-03 Reach 30 & 31
Comments: Station: 74+13 to 83+73
Created By: B. Lim & K. Hesterberg
Revision Number: 286
Last Edited By: Curran, Matthew MVN
Date: 2/13/2012
Time: 9:00:29 AM
File Name: Reach 30.gsz
Directory: Z:\Ed\F&M\HOME\London Ave Reeevaluation 2011\East Side\Reach 30 1% flowline\
Last Solved Date: 2/13/2012
Last Solved Time: 9:00:58 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

GAP Stability (Entry/Exit)

Kind: [SLOPE/W](#)
Parent: [Seepage Analysis Gap: Rem](#)
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: [5000](#)
 Optimization Convergence Tolerance: [1e-007](#)
 Starting Optimization Points: [8](#)
 Ending Optimization Points: [16](#)
 Complete Passes per Insertion: [1](#)
 Driving Side Maximum Convex Angle: [5 °](#)
 Resisting Side Maximum Convex Angle: [1 °](#)

Materials

Fill 1: EL 3.4 to 0
Model: [Mohr-Coulomb](#)
Unit Weight: [115 pcf](#)
Cohesion: [600 psf](#)
Phi: 0 °
Phi-B: 0 °

Fill 2: EL 0 to -4
Model: [Mohr-Coulomb](#)
Unit Weight: [102 pcf](#)
Cohesion: [600 psf](#)
Phi: 0 °
Phi-B: 0 °

Marsh 1: EL -4 to -8
Model: [Mohr-Coulomb](#)
Unit Weight: [80 pcf](#)
Cohesion: [200 psf](#)
Phi: 0 °
Phi-B: 0 °

Marsh 2: EL -8 to -15
Model: [Mohr-Coulomb](#)
Unit Weight: [94 pcf](#)
Cohesion: [250 psf](#)
Phi: 0 °
Phi-B: 0 °

Beach Sand
Model: [Mohr-Coulomb](#)
Unit Weight: [122 pcf](#)

Cohesion: 0 psf
Phi: 30 °
Phi-B: 0 °

Bay Sound Clay

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

Sheet Pile

Model: [Undrained \(Phi=0\)](#)
Unit Weight: [0.1 pcf](#)
Cohesion: [0.01 psf](#)

Slip Surface Entry and Exit

Left Projection: [Range](#)
Left-Zone Left Coordinate: [\(260, -17.5\) ft](#)
Left-Zone Right Coordinate: [\(299, 3\) ft](#)
Left-Zone Increment: [20](#)
Right Projection: [Range](#)
Right-Zone Left Coordinate: [\(310, 0.83707\) ft](#)
Right-Zone Right Coordinate: [\(410, -3.89217\) ft](#)
Right-Zone Increment: [20](#)
Radius Increments: [20](#)

Slip Surface Limits

Left Coordinate: [\(235, -17.5\) ft](#)
Right Coordinate: [\(450, -3.3\) ft](#)

Spatial Functions

Bay Sound Clay

Model: [Linear Interpolation](#)
Limit Range By: [Data Values](#)
Data Points: X (ft), Y (ft), Cohesion (psf)
 Data Point: (0, -44, 750)
 Data Point: (275, -44, 750)
 Data Point: (299, -44, 750)
 Data Point: (323, -44, 750)
 Data Point: (600, -44, 750)
 Data Point: (0, -65, 950)

Data Point: (275, -65, 950)
Data Point: (323, -65, 950)
Data Point: (600, -65, 950)
Data Point: (299, -65, 950)

Regions

	Material	Points	Area (ft²)
Region 1	Bay Sound Clay	24,23,28,29	4515
Region 2	Beach Sand	23,31,32,1,27,33,28	6075
Region 3		31,22,1,32	160
Region 4		22,4,5,6,16,3,1	368.735
Region 5	Marsh 2: EL -8 to -15	1,3,26,27	1057
Region 6		16,7,17,2,3	97.3
Region 7	Marsh 1: EL -4 to -8	3,2,42,13,14,18,25,26	550.387
Region 8		17,19,20,2	68.2
Region 9	Fill 2: EL 0 to -4	2,20,21,12,42	76.508
Region 10		19,8,9,10,11,36,20	31.045
Region 11	Fill 1: EL 3.4 to 0	20,36,40,37,43,38,39,21	28.194
Region 12	Sheet Pile	36,11,34,35,40	9.7
Region 13	Fill 2: EL 0 to -4	18,44,15,30,25	19.097

Points

	X (ft)	Y (ft)
Point 1	299	-15
Point 2	299	-4
Point 3	299	-8
Point 4	235	-10.6
Point 5	255.2	-10.8
Point 6	265.2	-9.5
Point 7	275.3	-6
Point 8	287.1	1.1
Point 9	294.7	3.1
Point 10	298.2	3.4
Point 11	299	3.4
Point 12	322.5	-3.6

Point 13	335.4	-5.1
Point 14	384.8	-4.6
Point 15	420.5	-3.6
Point 16	269.5	-8
Point 17	278.6	-4
Point 18	406.2	-4
Point 19	285.3	0
Point 20	299	0
Point 21	312.4	0
Point 22	235	-15
Point 23	235	-44
Point 24	235	-65
Point 25	450	-4
Point 26	450	-8
Point 27	450	-15
Point 28	450	-44
Point 29	450	-65
Point 30	450	-3.3
Point 31	235	-17.5
Point 32	299	-17.5
Point 33	450	-21.5
Point 34	299	12.9
Point 35	300	12.9
Point 36	299	3.2
Point 37	302.8	3.2
Point 38	305.3	2.53
Point 39	308.3	1.43
Point 40	300	3.2
Point 41	304.2	-55
Point 42	325.94	-4
Point 43	304.2	2.8248
Point 44	409	-3.92
Point 45	409	-65

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.32	(312.078, 36.649)	44.5372	(299, 12.9)	(329.362, -4.39794)
2	7585	1.32	(312.078, 36.649)	44.537	(299, 12.9)	(329.362, -4.39794)

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	299.5	-6.072215	707.67351	-110.61505	0	200
2	Optimized	300.46665	-6.345465	725.16491	899.60086	0	200
3	Optimized	301.4	6.5867575	740.49927	925.99334	0	200
4	Optimized	302.33335	6.8066665	754.31217	950.90107	0	200
5	Optimized	303.5	-7.048736	769.31596	959.19177	0	200
6	Optimized	304.75	-7.277911	132.60366	950.85827	0	200
7	Optimized	305.8	7.4408675	141.84903	935.93825	0	200
8	Optimized	306.8	-7.571749	149.16111	913.79298	0	200
9	Optimized	307.8	-7.679688	155.06939	889.53632	0	200
10	Optimized	308.8125	7.7656295	159.72492	863.85338	0	200
11	Optimized	309.8375	-7.829134	163.00302	836.67544	0	200

12	Optimized	310.8625	-7.868951	164.86539	807.27963	0	200
13	Optimized	311.8875	7.8851435	165.38391	775.63221	0	200
14	Optimized	312.905	7.8779635	164.45682	743.90155	0	200
15	Optimized	313.915	-7.847743	162.11938	712.10652	0	200
16	Optimized	314.925	7.7945515	158.4673	678.09539	0	200
17	Optimized	315.935	-7.718307	153.38195	641.83687	0	200
18	Optimized	316.945	7.6188905	146.85779	603.28614	0	200
19	Optimized	317.955	-7.496145	138.96222	562.40492	0	200
20	Optimized	318.965	-7.349875	129.61987	519.12507	0	200
21	Optimized	319.975	-7.179845	118.80982	473.39763	0	200
22	Optimized	320.985	6.9857775	106.55533	425.1639	0	200
23	Optimized	321.995	6.7673495	92.774987	374.32964	0	200
24	Optimized	323.07335	-6.505927	76.302777	332.02935	0	200
25	Optimized	324.22	6.1973815	56.939015	298.057	0	200
26	Optimized	325.36665	-5.855667	35.500309	260.82947	0	200
27	Optimized	326.5104	-5.481031	12.019847	221.91188	0	200

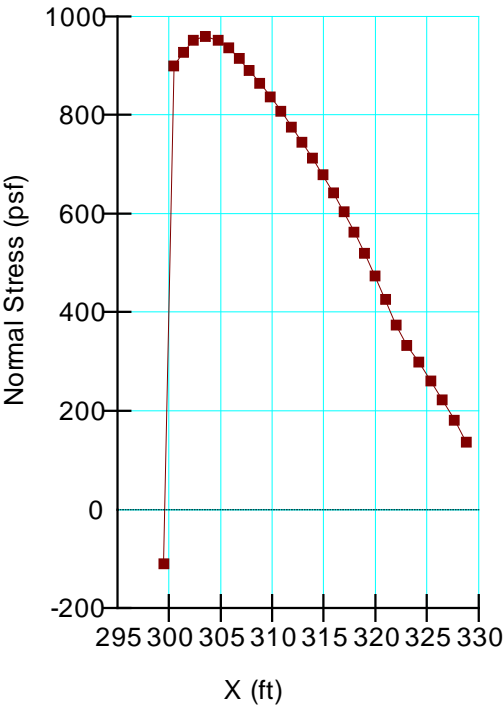
			5				
28	Optimized	327.65115	5.0727415	-13.528651	181.19507	0	200
29	Optimized	328.7919	4.6288915	-41.299134	136.74021	0	200

Slices of Slip Surface: 7585

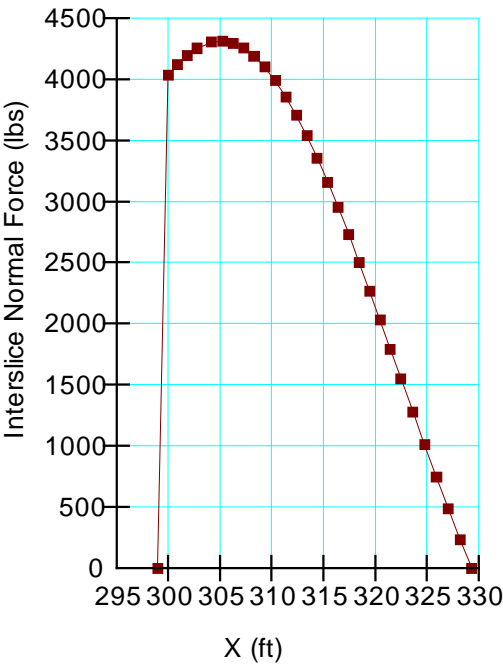
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	7585	299.5	-6.072215	707.67351	-110.61505	0	200
2	7585	300.46665	-6.345465	725.16491	899.60086	0	200
3	7585	301.4	6.5867575	740.49927	925.99334	0	200
4	7585	302.33335	6.8066665	754.31217	950.90107	0	200
5	7585	303.5	-7.048736	769.31596	959.19177	0	200
6	7585	304.75	-7.277911	132.60366	950.85827	0	200
7	7585	305.8	7.4408675	141.84903	935.93825	0	200
8	7585	306.8	-7.571749	149.16111	913.79298	0	200
9	7585	307.8	-7.679688	155.06939	889.53632	0	200
10	7585	308.8125	7.7656295	159.72492	863.85338	0	200
11	7585	309.8375	-7.829134	163.00302	836.67544	0	200
12	7585	310.8625	-7.868951	164.86539	807.27963	0	200
13	7585	311.8875	7.8851435	165.38391	775.63221	0	200
14	7585	312.905	7.8779635	164.45682	743.90155	0	200

15	7585	313.915	-7.847743	162.11938	712.10652	0	200
16	7585	314.925	-	158.4673	678.09539	0	200
17	7585	315.935	-7.718307	153.38195	641.83687	0	200
18	7585	316.945	-	146.85779	603.28614	0	200
19	7585	317.955	-7.496145	138.96222	562.40492	0	200
20	7585	318.965	-7.349875	129.61987	519.12507	0	200
21	7585	319.975	-7.179845	118.80982	473.39763	0	200
22	7585	320.985	-	106.55533	425.1639	0	200
23	7585	321.995	-	92.774987	374.32964	0	200
24	7585	323.07335	-6.505927	76.302777	332.02935	0	200
25	7585	324.22	-	56.939015	298.057	0	200
26	7585	325.36665	-5.855667	35.500309	260.82947	0	200
27	7585	326.5104	-	12.019847	221.91188	0	200
28	7585	327.65115	-	-13.528651	181.19507	0	200
29	7585	328.7919	-	-41.299134	136.74021	0	200

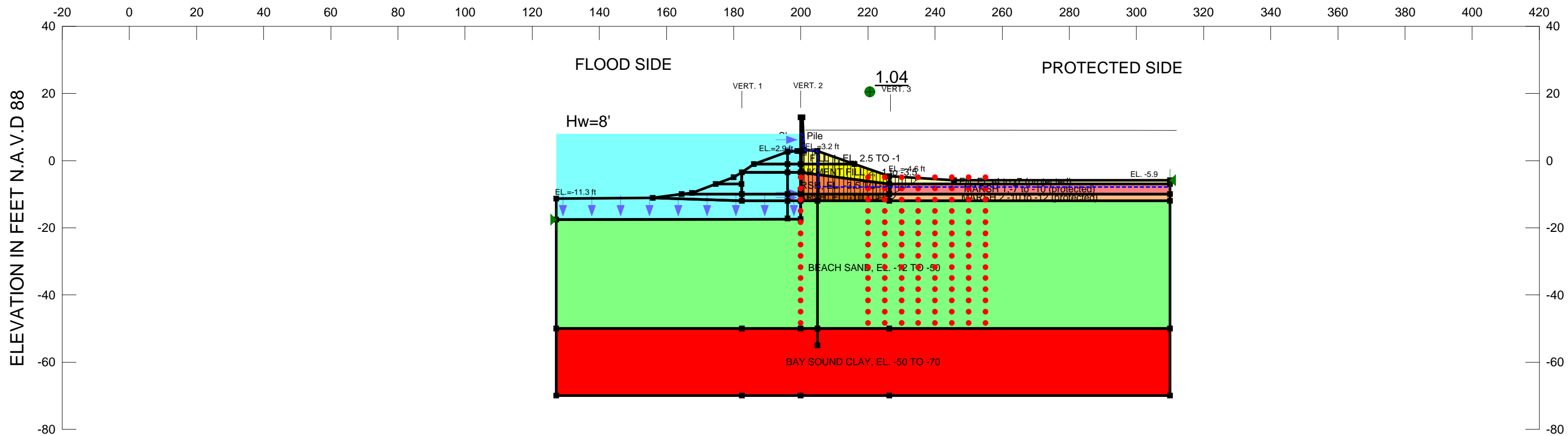
Base Normal Stress Vs. X



Interslice Normal Stress
Vs. X



DISTANCE IN FEET



Name: EMBANKMENT FILL 1, EL. 2.5 TO -1	Model: Spatial Mohr-Coulomb	Unit Weight: 112 pcf	Cohesion: 900 psf	Phi: 0 °
Name: MARSH, EL. -3.5 TO -10	Model: Spatial Mohr-Coulomb	Unit Weight: 92 pcf	Cohesion Fn: Marsh	Phi: 0 °
Name: BEACH SAND, EL. -12 TO -50	Model: Shear/Normal Fn.	Unit Weight: 122 pcf	Strength Function: Beach Sand	
Name: BAY SOUND CLAY, EL. -50 TO -70	Model: Spatial Mohr-Coulomb	Unit Weight: 106 pcf	Cohesion Spatial Fn: Bay Sound	Phi: 0 °
Name: EMBANKMENT FILL 2, -1 to -3.5	Model: Spatial Mohr-Coulomb	Weight Fn: Fill 2	Cohesion Fn: FILL	Phi: 0 °
Name: Fill, EL -4 to -7 (protected)	Model: Undrained (Phi=0)	Unit Weight: 96 pcf	Cohesion: 550 psf	
Name: Sheet Pile	Model: Undrained (Phi=0)	Unit Weight: 0.1 pcf	Cohesion: 0.01 psf	
Name: MARSH 1,-7 to -10 (protected)	Model: Undrained (Phi=0)	Unit Weight: 96 pcf	Cohesion: 215 psf	
Name: MARSH 2,-10 to -12 (protected)	Model: Undrained (Phi=0)	Unit Weight: 96 pcf	Cohesion: 200 psf	
Name: MARSH, EL. -10 TO -12	Model: Spatial Mohr-Coulomb	Unit Weight: 92 pcf	Cohesion Fn: Marsh (2)	Phi: 0 °

GENERAL NOTES

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

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

 $H_w = \text{CANAL WATER LEVEL}$ 

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

LONDON AVE CANAL
OUTFALL CANAL REEVALUATION REPORT
REACH 31, STA. 76+90 TO 83+73
PROTECTED SIDE STABILITY ANALYSIS,
CASE: GAP Stability (Block)
S. MARCH 2012

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

Name: GAP Stability (Block)
File Name: Reach 31.gsz Directory: G:\F&MHOME\Middleton\London Ave Canal\Reach 31\optimization check\
Last Edited By: Middleton, Mark C MVN

GAP Stability (Block)

Report generated using GeoStudio 2007, version 7.15. Copyright © 1991-2009 GEO-SLOPE International Ltd.

File Information

Created By: Liljegren, James
Revision Number: 291
Last Edited By: Middleton, Mark C MVN
Date: 1/12/2012
Time: 5:35:11 PM
File Name: Reach 31.gsz
Directory: G:\F&M\HOME\Middleton\London Ave Canal\Reach 31\optimization check\
Last Solved Date: 1/12/2012
Last Solved Time: 5:35:34 PM

Project Settings

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

Analysis Settings

GAP Stability (Block)

Kind: SLOPE/W
Parent: Gap Analysis (Seepage)
Method: Spencer
Settings
 PWP Conditions Source: Parent Analysis
SlipSurface
 Direction of movement: Left to Right
 Use Passive Mode: Yes
 Slip Surface Option: 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

3/14/2012

Sheet Pile

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

MARSH 1,-7 to -10 (protected)

Model: Undrained (Phi=0)
Unit Weight: 96 pcf
Cohesion: 215 psf

MARSH 2,-10 to -12 (protected)

Model: Undrained (Phi=0)
Unit Weight: 96 pcf
Cohesion: 200 psf

MARSH, EL. -10 TO -12

Model: Spatial Mohr-Coulomb
Unit Weight: 92 pcf
Cohesion Fn: Marsh (2)
Phi: 0 °
Phi-B: 0 °

Slip Surface Limits

Left Coordinate: (127.2, -17.5) ft
Right Coordinate: (310, -5.9) ft

Slip Surface Block

Left Grid
 Upper Left: (200, -5) ft
 Lower Left: (200, -55) ft
 Lower Right: (200, -55) ft
 X Increments: 0
 Y Increments: 15
 Starting Angle: 135 °
 Ending Angle: 135 °
 Angle Increments: 0
Right Grid
 Upper Left: (220, -5) ft
 Lower Left: (220, -55) ft
 Lower Right: (255, -55) ft
 X Increments: 7
 Y Increments: 15
 Starting Angle: 30 °
 Ending Angle: 45 °
 Angle Increments: 3

3/14/2012

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

Materials

EMBANKMENT FILL 1, EL. 2.5 TO -1

Model: Spatial Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion: 900 psf
Phi: 0 °
Phi-B: 0 °

MARSH, EL. -3.5 TO -10

Model: Spatial Mohr-Coulomb
Unit Weight: 92 pcf
Cohesion Fn: Marsh
Phi: 0 °
Phi-B: 0 °

BEACH SAND, EL. -12 TO -50

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

BAY SOUND CLAY, EL. -50 TO -70

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

EMBANKMENT FILL 2, -1 to -3.5

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

Fill, EL -4 to -7 (protected)

Model: Undrained (Phi=0)
Unit Weight: 96 pcf
Cohesion: 550 psf

3/14/2012

Cohesion Functions

Marsh

Model: Spline Data Point Function
Function: Cohesion vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 6 %
Y-Intercept: 215
Data Points: X (ft), Cohesion (psf)
 Data Point: (182.4, 215)
 Data Point: (200, 225)
 Data Point: (226.4, 215)

FILL

Model: Spline Data Point Function
Function: Cohesion vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 550
Data Points: X (ft), Cohesion (psf)
 Data Point: (182.4, 550)
 Data Point: (200, 600)
 Data Point: (226.4, 550)

Marsh (2)

Model: Spline Data Point Function
Function: Cohesion vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 6 %
Y-Intercept: 200
Data Points: X (ft), Cohesion (psf)
 Data Point: (182.4, 200)
 Data Point: (200, 225)
 Data Point: (226.4, 200)

Shear/Normal Strength Functions

Beach Sand

Model: Spline Data Point Function
Function: Shear Stress vs. Normal Stress
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
 Data Point: (-100000, 0)
 Data Point: (0, 0)
 Data Point: (100000, 57735)

3/14/2012

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

Unit Weight Functions

Fill 2
Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 96
Data Points: X (ft), Unit Weight (pcf)
Data Point: (182.4, 96)
Data Point: (200, 103)
Data Point: (226.4, 96)

Spatial Functions

Bay Sound
Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (127.2, -50, 700)
Data Point: (127.2, -70, 900)
Data Point: (200, -50, 1050)
Data Point: (200, -70, 1050)
Data Point: (226.4, -50, 700)
Data Point: (226.4, -70, 900)
Data Point: (310, -50, 700)
Data Point: (310, -70, 900)
Data Point: (182.4, -50, 700)
Data Point: (182.4, -70, 900)

Regions

	Material	Points	Area (ft²)
Region 1	BAY SOUND CLAY, EL. -50 TO -70	5,3,46,9,49,4,6,50,48,47	3656
Region 2	MARSH 1,-7 to -10 (protected)	8,7,45,39	250.8
Region 3	Fill, EL -4 to -7 (protected)	1,11,12,7,8	104.505
Region 4	BEACH SAND, EL. -12 TO -50	3,13,14,15,54,10,2,4,49,9,46	6549.64
Region 5		13,16,17,44,27,15,14	431.645

Region 6		20,26,21,37,51,52,41,40	114.725
Region 7	MARSH, EL. -3.5 TO -10	51,37,21,8,39	125.4
Region 8	Sheet Pile	23,34,29,30,25,24	7.675
Region 9	EMBANKMENT FILL 1, EL. 2.5 TO -1	23,24,25,31,53,32,33	40.86
Region 10		23,34,38,22,35,36,33	33.15
Region 11		20,35,36,33,21,26	39.5
Region 12	EMBANKMENT FILL 2, -1 to -3.5	21,33,32,1,8	93.48
Region 13		20,19,42,40	11.8163
Region 14		40,42,18,43,41	35.76269
Region 15		41,43,17,44	36.356
Region 16	MARSH 2,-10 to -12 (protected)	2,10,39,45	167.2
Region 17	MARSH, EL. -10 TO -12	15,51,39,10,54	52.8
Region 18		44,41,52,51,15,27	35.2

Points

	X (ft)	Y (ft)
Point 1	226.4	-4.6
Point 2	310	-12
Point 3	127.2	-50
Point 4	310	-50
Point 5	127.2	-70
Point 6	310	-70
Point 7	310	-7
Point 8	226.4	-7
Point 9	200	-50
Point 10	226.4	-12
Point 11	245.7	-5.9
Point 12	310	-5.9
Point 13	127.2	-17.5
Point 14	200	-17.4
Point 15	200	-12
Point 16	127.2	-11.3
Point 17	155.9	-11.1
Point 18	167.6	-9.6
Point 19	180	-5
Point 20	182.4	-3.5
Point 21	200	-3.5
Point 22	196	2.6
Point 23	200	2.8
Point 24	201	2.8
Point 25	201	3.2
Point 26	196	-3.5
Point 27	196	-12

3/14/2012

3/14/2012

Point 28	196	-17.2
Point 29	200	12.9
Point 30	200.5	12.9
Point 31	204.8	2.9
Point 32	216	-1
Point 33	200	-1
Point 34	200	2.9
Point 35	186	-1
Point 36	196	-1
Point 37	200	-8.8
Point 38	199	2.9
Point 39	226.4	-10
Point 40	182.3	-7
Point 41	182.4	-10
Point 42	174.6087	-7
Point 43	164.48	-10
Point 44	182.4	-12
Point 45	310	-10
Point 46	182.4	-50
Point 47	182.4	-70
Point 48	200	-70
Point 49	226.4	-50
Point 50	226.4	-70
Point 51	200	-10
Point 52	196	-10
Point 53	205	2.8
Point 54	205	-12
Point 55	205	-50
Point 56	205	-55

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.04	(217.199, -3.651)	15.25904	(200, 12.9)	(235.418, -5.20744)
2	69	1.09	(217.199, -3.651)	15.323	(200, 12.9)	(236.107, -5.25386)

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	200.06425	-11.66527	1226.6844	-17477.8	0	224.97
2	Optimized	200.31425	-11.672155	1226.012	1460.7408	0	224.84
3	Optimized	200.75	-11.68817	1226.312	1461.9929	0	224.62

4	Optimized	201.63335	-11.720635	1228.5388	1503.8792	0	224.13
5	Optimized	202.9	-11.76719	1231.6946	1497.7255	0	223.37
6	Optimized	204.16665	-11.813745	1234.9293	1491.414	0	222.53
7	Optimized	204.9	-11.840695	1236.6153	1482.999	0	222.01
8	Optimized	205.28935	-11.855005	247.4441	1467.7769	0	221.73
9	Optimized	206.24455	-11.849495	247.04853	1461.5111	0	221
10	Optimized	207.5762	-11.817205	245.0516	1406.9334	0	219.94
11	Optimized	208.8905	-11.79467	243.6386	1346.8743	0	218.82
12	Optimized	209.82855	-11.790305	243.27695	1302.0816	0	217.98
13	Optimized	210.77905	-11.844135	246.54712	1237.5622	0	217.11
14	Optimized	212.101	-11.947745	252.88953	1196.4609	0	215.85
15	Optimized	213.30165	-11.99952	256.06389	1189.5232	0	214.66
16	Optimized	214.381	-11.999455	256.05463	1147.3678	0	213.55
17	Optimized	215.46035	-11.99939	256.05463	1105.1198	0	212.43
18	Optimized	216.85625	-11.99931	256.03938	1054.3004	0	210.93
19	Optimized	218.22185	-11.96258	253.76034	1033.1748	0	209.43
20	Optimized	219.24055	-11.88922	249.19761	990.68067	0	208.29
21	Optimized	220.5931	-11.737945	239.78311	954.6904	0	206.76
22	Optimized	221.96655	-11.5088	225.50064	916.01168	0	205.18
23	Optimized	223.0271	-11.2797	211.20582	856.00291	0	203.95
24	Optimized	224.07065	-11.00678	194.18108	827.45717	0	202.73
25	Optimized	225.09715	-10.690045	174.41855	759.03766	0	201.53
26	Optimized	226.0052	-10.36782	154.30398	733.08429	0	200.46
27	Optimized	226.6457	-10.10198	137.70779	703.5178	0	200
28	Optimized	227.5065	-9.74472	115.40466	669.67135	0	215
29	Optimized	228.62535	-9.2498215	84.505376	631.99315	0	215
30	Optimized	229.63285	-8.770585	54.591738	573.89223	0	215
31	Optimized	230.6403	-8.2913485	24.673619	515.79131	0	215
32	Optimized	232.05165	-7.499735	-24.738124	465.55664	0	215
33	Optimized	233.574	-6.512665	-86.342141	718.35599	0	550

3/14/2012

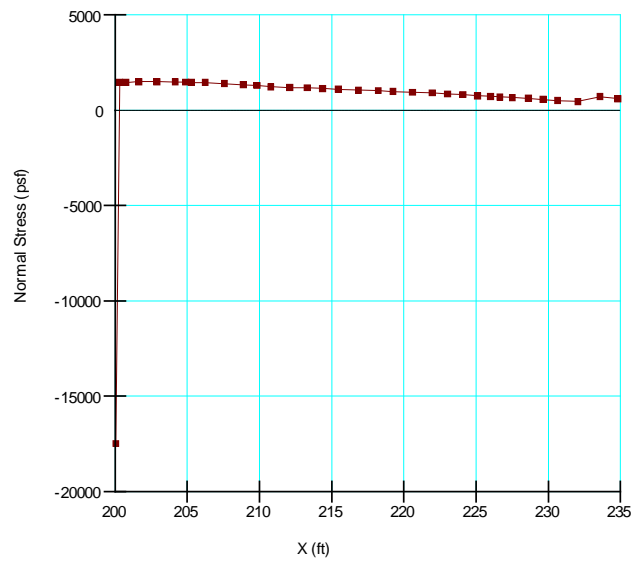
3/14/2012

34	Optimized	234.8034	- 5.6425145	- 140.65038	611.65821	0	550
----	-----------	----------	----------------	----------------	-----------	---	-----

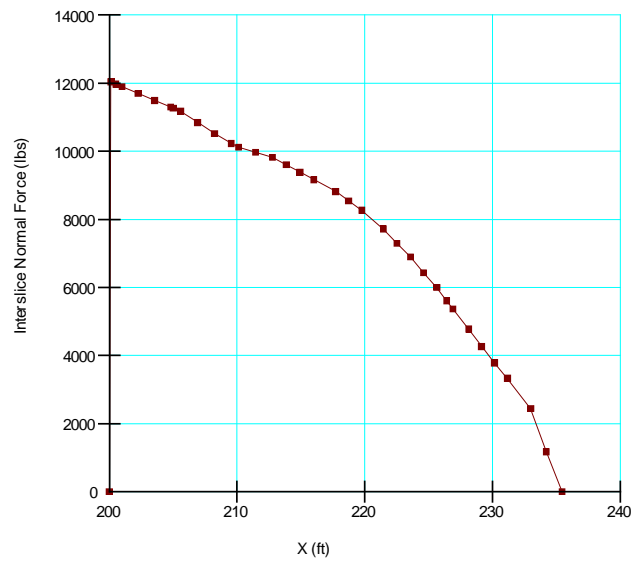
Slices of Slip Surface: 69

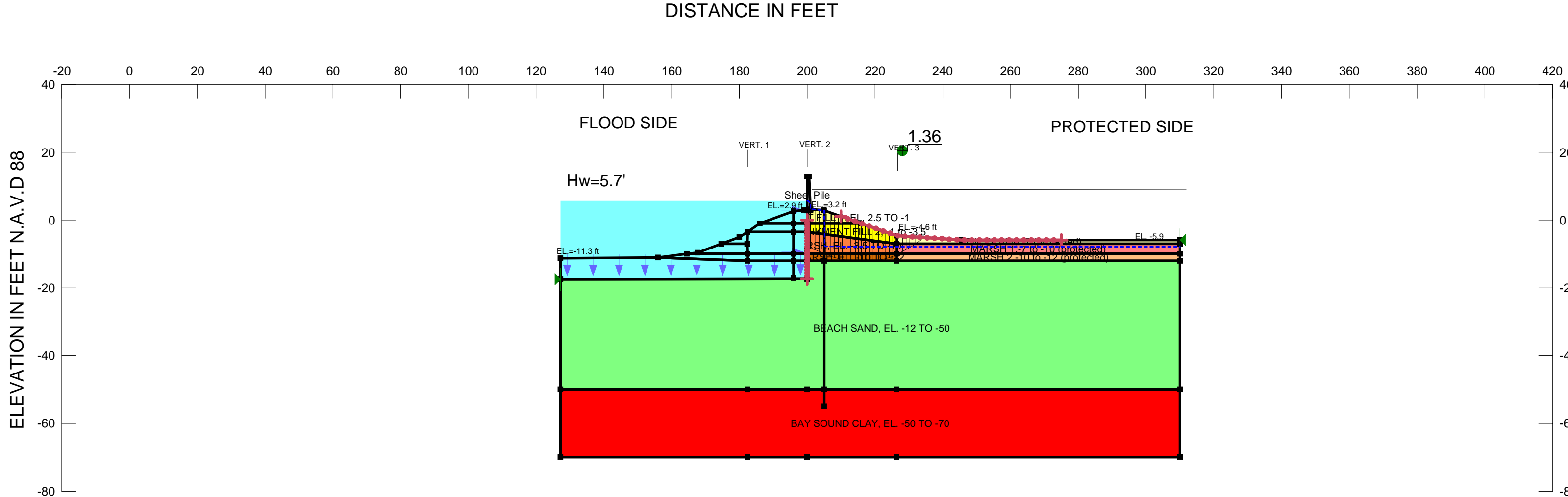
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	69	200.25	-11.66667	1225.94	-3365	0	224.88
2	69	200.75	-11.66667	1224.84	1476.88	0	224.62
3	69	201.63335	-11.66667	1224.7892	1516.1049	0	224.13
4	69	202.9	-11.66667	1224.7892	1505.5259	0	223.37
5	69	204.16665	-11.66667	1224.7102	1494.868	0	222.53
6	69	204.9	-11.66667	1224.4	1483.95	0	222.01
7	69	205.6111	-11.66667	236.08641	1454.8912	0	221.49
8	69	206.8333	-11.66667	236.00459	1407.9275	0	220.54
9	69	208.05555	-11.66667	235.92277	1360.7184	0	219.54
10	69	209.2778	-11.66667	235.81641	1313.5093	0	218.48
11	69	210.5	-11.66667	235.6855	1266.1366	0	217.37
12	69	211.7222	-11.66667	235.64459	1218.6002	0	216.21
13	69	212.94445	-11.66667	235.5955	1171.0638	0	215.01
14	69	214.1667	-11.66667	235.49732	1123.3638	0	213.78
15	69	215.3889	-11.66667	235.47277	1075.5002	0	212.5
16	69	216.64285	-11.66667	235.44894	1029.2336	0	211.16
17	69	217.92855	-11.66667	235.38672	984.82244	0	209.76
18	69	219.21425	-11.66667	235.37116	940.56688	0	208.32
19	69	220.5	-11.66667	235.35561	896.46687	0	206.87
20	69	221.78575	-11.66667	235.33227	852.60019	0	205.39
21	69	223.07145	-11.66667	235.30894	808.88907	0	203.9
22	69	224.35715	-11.66667	235.30116	765.32573	0	202.4
23	69	225.7	- 11.262525	210.09773	892.93391	0	200.82
24	69	227.1434	-10.42919	158.10661	789.1642	0	200
25	69	228.5363	-9.625	107.91333	703.8	0	215
26	69	229.8353	-8.875	61.102	612.88	0	215
27	69	231.13435	-8.125	14.288	521.94667	0	215
28	69	232.4334	-7.375	-32.526	431.01333	0	215
29	69	233.58695	- 6.7089765	- 74.094596	621.12735	0	550
30	69	234.5951	-6.12693	- 110.42073	550.55739	0	550
31	69	235.60325	- 5.5448835	- 146.74944	479.98742	0	550

Base Normal Stress Vs. X



Interslice Normal Stress Vs. X





Name: EMBANKMENT FILL 1, EL. 2.5 TO -1 Model: Spatial Mohr-Coulomb Unit Weight: 112 pcf Cohesion: 900 psf Phi: 0 °
Name: MARSH, EL. -3.5 TO -10 Model: Spatial Mohr-Coulomb Unit Weight: 92 pcf Cohesion Fn: Marsh Phi: 0 °
Name: BEACH SAND, EL. -12 TO -50 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Beach Sand
Name: BAY SOUND CLAY, EL. -50 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 106 pcf Cohesion Spatial Fn: Bay Sound Phi: 0 °
Name: EMBANKMENT FILL 2, -1 to -3.5 Model: Spatial Mohr-Coulomb Weight Fn: Fill 2 Cohesion Fn: FILL Phi: 0 °
Name: Fill, EL -4 to -7 (protected) Model: Undrained (Phi=0) Unit Weight: 96 pcf Cohesion: 550 psf
Name: Sheet Pile Model: Undrained (Phi=0) Unit Weight: 0.1 pcf Cohesion: 0.01 psf
Name: MARSH 1,-7 to -10 (protected) Model: Undrained (Phi=0) Unit Weight: 96 pcf Cohesion: 215 psf
Name: MARSH 2,-10 to -12 (protected) Model: Undrained (Phi=0) Unit Weight: 96 pcf Cohesion: 200 psf
Name: MARSH, EL. -10 TO -12 Model: Spatial Mohr-Coulomb Unit Weight: 92 pcf Cohesion Fn: Marsh (2) Phi: 0 °

GENERAL NOTES

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

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

Hw=CANAL WATER LEVEL



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

LONDON AVE CANAL
OUTFALL CANAL REEVALUATION REPORT
REACH 31 STA. 76+90 TO 83+73
PROTECTED SIDE STABILITY ANALYSIS,
CASE: GAP Stability (Entry/Exit)

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

GAP Stability (Entry/Exit)

Report generated using GeoStudio 2007, version 7.15. Copyright © 1991-2009 GEO-SLOPE International Ltd.

File Information

Created By: [Liljegren, James](#)
Revision Number: 306
Last Edited By: [Middleton, Mark C MVN](#)
Date: 2/15/2012
Time: 7:55:37 AM
File Name: [Reach 31.gsz](#)
Directory: [G:\F&M\HOME\Middleton\London Ave Canal\Reach 31\water level 5.7\optimization check\](#)
Last Solved Date: 2/15/2012
Last Solved Time: 7:57:26 AM

Project Settings

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

Analysis Settings

GAP Stability (Entry/Exit)

Kind: [SLOPE/W](#)
Parent: [Gap Analysis \(Seepage\)](#)
Method: [Spencer](#)
Settings
 PWP Conditions Source: [Parent Analysis](#)
SlipSurface
 Direction of movement: [Left to Right](#)
 Use Passive Mode: [Yes](#)
 Slip Surface Option: [Entry and Exit](#)
 Critical slip surfaces saved: [1](#)
 Optimize Critical Slip Surface Location: [Yes](#)
 Tension Crack
 Tension Crack Option: [\(none\)](#)
FOS Distribution
 FOS Calculation Option: [Constant](#)
Advanced
 Number of Slices: [30](#)
 Optimization Tolerance: [0.01](#)
 Minimum Slip Surface Depth: [0.1 ft](#)

3/19/2012

Sheet Pile

Model: [Undrained \(Phi=0\)](#)
Unit Weight: [0.1 pcf](#)
Cohesion: [0.01 psf](#)

MARSH 1,-7 to -10 (protected)

Model: [Undrained \(Phi=0\)](#)
Unit Weight: [96 pcf](#)
Cohesion: [215 psf](#)

MARSH 2,-10 to -12 (protected)

Model: [Undrained \(Phi=0\)](#)
Unit Weight: [96 pcf](#)
Cohesion: [200 psf](#)

MARSH, EL. -10 TO -12

Model: [Spatial Mohr-Coulomb](#)
Unit Weight: [92 pcf](#)
Cohesion Fn: [Marsh \(2\)](#)
Phi: [0 °](#)
Phi-B: [0 °](#)

Slip Surface Entry and Exit

Left Projection: [Range](#)
Left-Zone Left Coordinate: [\(200, -17.4\) ft](#)
Left-Zone Right Coordinate: [\(200, 0\) ft](#)
Left-Zone Increment: [20](#)
Right Projection: [Range](#)
Right-Zone Left Coordinate: [\(209.99489, 1.07449\) ft](#)
Right-Zone Right Coordinate: [\(275, -5.9\) ft](#)
Right-Zone Increment: [30](#)
Radius Increments: [20](#)

Slip Surface Limits

Left Coordinate: [\(127.2, -17.5\) ft](#)
Right Coordinate: [\(310, -5.9\) ft](#)

Cohesion Functions

Marsh

Model: [Spline Data Point Function](#)
Function: [Cohesion vs. X](#)
 Curve Fit to Data: [100 %](#)
 Segment Curvature: [6 %](#)
Y-Intercept: [215](#)

3/19/2012

Optimization Maximum Iterations: [2000](#)
Optimization Convergence Tolerance: [1e-007](#)
Starting Optimization Points: [8](#)
Ending Optimization Points: [16](#)
Complete Passes per Insertion: [1](#)
Driving Side Maximum Convex Angle: [5 °](#)
Resisting Side Maximum Convex Angle: [1 °](#)

Materials

EMBANKMENT FILL 1, EL. 2.5 TO -1

Model: [Spatial Mohr-Coulomb](#)
Unit Weight: [112 pcf](#)
Cohesion: [900 psf](#)
Phi: [0 °](#)
Phi-B: [0 °](#)

MARSH, EL. -3.5 TO -10

Model: [Spatial Mohr-Coulomb](#)
Unit Weight: [92 pcf](#)
Cohesion Fn: [Marsh](#)
Phi: [0 °](#)
Phi-B: [0 °](#)

BEACH SAND, EL. -12 TO -50

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

BAY SOUND CLAY, EL. -50 TO -70

Model: [Spatial Mohr-Coulomb](#)
Unit Weight: [106 pcf](#)
Cohesion Spatial Fn: [Bay Sound](#)
Phi: [0 °](#)
Phi-B: [0 °](#)

EMBANKMENT FILL 2, -1 to -3.5

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

Fill, EL -4 to -7 (protected)

Model: [Undrained \(Phi=0\)](#)
Unit Weight: [96 pcf](#)
Cohesion: [550 psf](#)

3/19/2012

Data Points: [X \(ft\), Cohesion \(psf\)](#)
 Data Point: [\(182.4, 215\)](#)
 Data Point: [\(200, 225\)](#)
 Data Point: [\(226.4, 215\)](#)

FILL

Model: [Spline Data Point Function](#)
Function: [Cohesion vs. X](#)
 Curve Fit to Data: [100 %](#)
 Segment Curvature: [0 %](#)
Y-Intercept: [550](#)
Data Points: [X \(ft\), Cohesion \(psf\)](#)
 Data Point: [\(182.4, 550\)](#)
 Data Point: [\(200, 600\)](#)
 Data Point: [\(226.4, 550\)](#)

Marsh (2)

Model: [Spline Data Point Function](#)
Function: [Cohesion vs. X](#)
 Curve Fit to Data: [100 %](#)
 Segment Curvature: [6 %](#)
Y-Intercept: [200](#)
Data Points: [X \(ft\), Cohesion \(psf\)](#)
 Data Point: [\(182.4, 200\)](#)
 Data Point: [\(200, 225\)](#)
 Data Point: [\(226.4, 200\)](#)

Shear/Normal Strength Functions

Beach Sand

Model: [Spline Data Point Function](#)
Function: [Shear Stress vs. Normal Stress](#)
 Curve Fit to Data: [100 %](#)
 Segment Curvature: [0 %](#)
Y-Intercept: [0](#)
Data Points: [Normal Stress \(psf\), Shear Stress \(psf\)](#)
 Data Point: [\(-100000, 0\)](#)
 Data Point: [\(0, 0\)](#)
 Data Point: [\(100000, 57735\)](#)
Estimation Properties
 Intact Rock Param.: [10](#)
 Geological Strength: [100](#)
 Disturbance Factor: [0](#)
 SigmaC: [600000 psf](#)
 Sigma3: [300000 psf](#)
 Num. Points: [20](#)

Unit Weight Functions

3/19/2012

Fill 2

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 96
Data Points: X (ft), Unit Weight (pcf)
Data Point: (182.4, 96)
Data Point: (200, 103)
Data Point: (226.4, 96)

Spatial Functions

Bay Sound

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (127.2, -50, 700)
Data Point: (127.2, -70, 900)
Data Point: (200, -50, 1050)
Data Point: (200, -70, 1050)
Data Point: (226.4, -50, 700)
Data Point: (226.4, -70, 900)
Data Point: (310, -50, 700)
Data Point: (310, -70, 900)
Data Point: (182.4, -50, 700)
Data Point: (182.4, -70, 900)

Regions

	Material	Points	Area (ft²)
Region 1	BAY SOUND CLAY, EL. -50 TO -70	5,3,46,9,49,4,6,50,48,47	3656
Region 2	MARSH 1, -7 to -10 (protected)	8,7,45,39	250.8
Region 3	Fill, EL. -4 to -7 (protected)	1,11,12,7,8	104.505
Region 4	BEACH SAND, EL. -12 TO -50	3,13,14,15,54,10,2,4,49,9,46	6549.64
Region 5		13,16,17,44,27,15,14	431.645
Region 6		20,26,21,37,51,52,41,40	114.725
Region 7	MARSH, EL. -3.5 TO -10	51,37,21,8,39	125.4
Region 8	Sheet Pile	23,34,29,30,25,24	7.675
Region 9	EMBANKMENT FILL 1, EL. 2.5 TO -1	23,24,25,31,53,32,33	40.86
Region 10		23,34,38,22,35,36,33	33.15
Region 11		20,35,36,33,21,26	39.5
Region 12	EMBANKMENT FILL 2, -1 to -3.5	21,33,32,1,8	93.48
Region 13		20,19,42,40	11.8163
Region 14		40,42,18,43,41	35.76269

Region 15		41,43,17,44	36.356
Region 16	MARSH 2, -10 to -12 (protected)	2,10,39,45	167.2
Region 17	MARSH, EL. -10 TO -12	15,51,39,10,54	52.8
Region 18		44,41,52,51,15,27	35.2

Points

	X (ft)	Y (ft)
Point 1	226.4	-4.6
Point 2	310	-12
Point 3	127.2	-50
Point 4	310	-50
Point 5	127.2	-70
Point 6	310	-70
Point 7	310	-7
Point 8	226.4	-7
Point 9	200	-50
Point 10	226.4	-12
Point 11	245.7	-5.9
Point 12	310	-5.9
Point 13	127.2	-17.5
Point 14	200	-17.4
Point 15	200	-12
Point 16	127.2	-11.3
Point 17	155.9	-11.1
Point 18	167.6	-9.6
Point 19	180	-5
Point 20	182.4	-3.5
Point 21	200	-3.5
Point 22	196	2.6
Point 23	200	2.8
Point 24	201	2.8
Point 25	201	3.2
Point 26	196	-3.5
Point 27	196	-12
Point 28	196	-17.2
Point 29	200	12.9
Point 30	200.5	12.9
Point 31	204.8	2.9
Point 32	216	-1
Point 33	200	-1
Point 34	200	2.9
Point 35	186	-1
Point 36	196	-1

3/19/2012

3/19/2012

Point 37	200	-8.8
Point 38	199	2.9
Point 39	226.4	-10
Point 40	182.3	-7
Point 41	182.4	-10
Point 42	174.6087	-7
Point 43	164.48	-10
Point 44	182.4	-12
Point 45	310	-10
Point 46	182.4	-50
Point 47	182.4	-70
Point 48	200	-70
Point 49	226.4	-50
Point 50	226.4	-70
Point 51	200	-10
Point 52	196	-10
Point 53	205	2.8
Point 54	205	-12
Point 55	205	-50
Point 56	205	-55

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.36	(215.7, 20.647)	14.1798	(200, 12.9)	(234.474, -5.14387)
2	7420	1.41	(215.7, 20.647)	32.518	(200, 12.9)	(235.422, -5.20768)

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	-8.155136	856.48663	-801.77452	0	224.95
2	Optimized	200.75	-8.306998	858.43858	1050.7826	0	224.85
3	Optimized	201.6755	-8.5880945	876.87924	1112.5835	0	224.64
4	Optimized	202.96325	-9.038512	906.30799	1110.0093	0	224.33
5	Optimized	204.18775	-9.529016	938.14818	1142.9109	0	224.01
6	Optimized	204.8608	-9.798629	955.38655	1158.2478	0	223.82
7	Optimized	204.9608	-9.840007	958.01826	1145.4459	0	223.79
8	Optimized	205.1646	-9.928512	279.57482	1145.1563	0	223.73
9	Optimized	206.1585	-10.360125	157.4909	1147.1832	0	221.07
10	Optimized	207.54485	-10.894	188.99934	1184.2234	0	219.96
11	Optimized	208.659	-11.2415	209.88884	1173.9414	0	219.02

12	Optimized	209.79055	-11.524415	226.90524	1198.6575	0	218.02
13	Optimized	210.93945	-11.74274	240.26166	1175.1427	0	216.96
14	Optimized	212.21725	-11.91554	250.86431	1176.5106	0	215.73
15	Optimized	213.56005	-11.989145	255.38369	1157.459	0	214.39
16	Optimized	214.64965	-11.998575	255.96206	1121.5766	0	213.28
17	Optimized	215.5499	-11.9975	255.89541	1086.3086	0	212.33
18	Optimized	216.57825	-11.99627	255.8185	1048.5229	0	211.23
19	Optimized	217.73475	-11.99489	255.73203	1008.4878	0	209.97
20	Optimized	218.8912	-11.99351	255.64556	968.62559	0	208.68
21	Optimized	220.2789	-11.99078	250.4338	944.51845	0	207.12
22	Optimized	221.61395	-11.715595	238.34301	913.23555	0	205.59
23	Optimized	222.66505	-11.493305	224.47395	854.89243	0	204.37
24	Optimized	223.7133	-11.204775	206.48479	828.22194	0	203.15
25	Optimized	224.75865	-10.85	184.3543	756.03289	0	201.93
26	Optimized	225.84065	-10.39983	156.26343	714.91183	0	200.66
27	Optimized	226.53025	-10.063525	135.27397	673.09238	0	200
28	Optimized	227.3691	-9.654435	109.73936	632.34429	0	215
29	Optimized	228.6306	-8.9975675	68.732319	575.65346	0	215
30	Optimized	229.7364	-8.3749625	29.871317	501.97398	0	215
31	Optimized	231.182	-7.50882	-24.193295	414.70007	0	215
32	Optimized	232.67465	-6.501453	-87.064602	586.07752	0	550
33	Optimized	233.8745	-5.596399	-143.54847	478.1733	0	550

Slices of Slip Surface: 7420

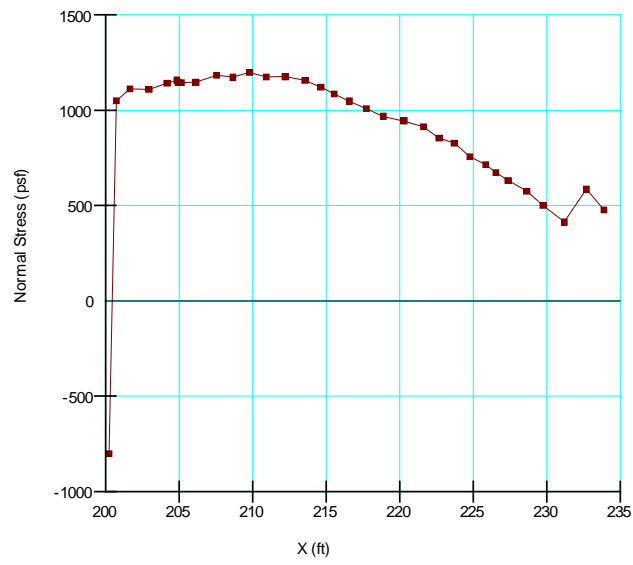
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	7420	200.25	-7.964993	844.2437	-750.25113	0	224.95
2	7420	200.75	-8.2294145	853.30624	980.42124	0	224.85
3	7420	201.63335	-8.6627925	881.85932	1065.064	0	224.65
4	7420	202.9	-9.237998	919.62298	1120.9356	0	224.35
5	7420	204.16665	-9.749553	952.85125	1171.1161	0	224.01

3/19/2012

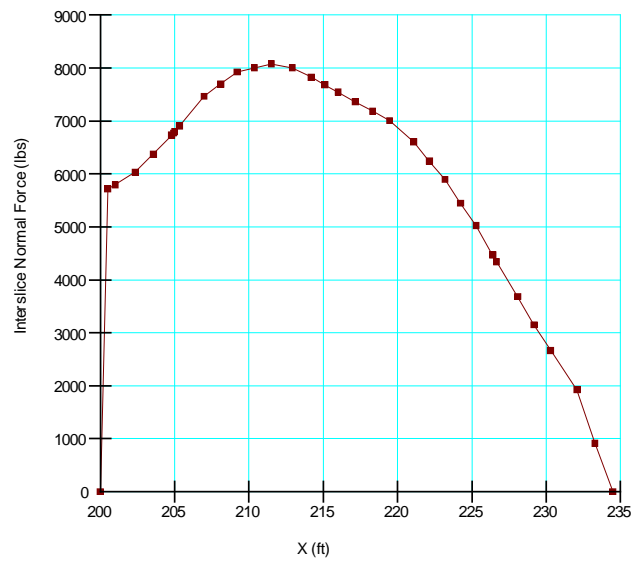
3/19/2012

6	7420	204.8143	-9.994926	968.52628	1194.651	0	223.83
7	7420	204.9143	-10.030135	970.77655	1193.9214	0	222
8	7420	205.6111	-10.25975	151.97299	1195.7013	0	221.49
9	7420	206.8333	-10.632455	173.39762	1198.1502	0	220.54
10	7420	208.05555	-10.95351	192.48907	1195.4919	0	219.54
11	7420	209.2778	-11.224475	208.7205	1187.6928	0	218.48
12	7420	210.5	-11.44662	222.10377	1175.0501	0	217.37
13	7420	211.7222	-11.62096	232.75378	1157.4756	0	216.21
14	7420	212.94445	-11.748265	240.55241	1135.0565	0	215.01
15	7420	214.1667	-11.82909	245.48396	1107.8121	0	213.78
16	7420	215.3889	-11.86378	247.61961	1075.86	0	212.5
17	7420	216.5778	-11.854015	247.00318	1042.7543	0	211.23
18	7420	217.73335	-11.8022	243.77647	1009.0489	0	209.97
19	7420	218.8889	-11.70904	237.96134	971.27429	0	208.69
20	7420	220.04445	-11.574185	229.56862	929.32069	0	207.38
21	7420	221.2	-11.397105	218.53291	883.10426	0	206.06
22	7420	222.35555	-11.177095	204.78469	832.48839	0	204.73
23	7420	223.5111	-10.913255	188.32801	777.37073	0	203.39
24	7420	224.66665	-10.60447	169.05108	717.57082	0	202.04
25	7420	225.8222	-10.2494	146.88407	652.88205	0	200.68
26	7420	226.4855	-10.030055	133.18515	629.36673	0	200
27	7420	227.19575	-9.7638135	116.56596	610.18972	0	215
28	7420	228.4453	-9.2613685	85.19291	562.684	0	215
29	7420	229.6949	-8.697125	49.971974	508.61145	0	215
30	7420	230.9445	-8.067431	10.664548	447.48975	0	215
31	7420	232.1941	-7.367861	-33.000642	378.69295	0	215
32	7420	233.4696	-6.5752345	-82.46888	515.83426	0	550
33	7420	234.77105	-5.679077	-138.39773	447.23357	0	550

Base Normal Stress Vs. X



Interslice Normal Stress Vs. X



GAP Stability (Entry/Exit) (sand function)

Report generated using GeoStudio 2007, version 7.15. Copyright © 1991-2009 GEO-SLOPE International Ltd.

File Information

Revision Number: 309
Last Edited By: Haggerty, Daniel R MVN
Date: 2/2/2012
Time: 2:42:51 PM
File Name: Reach 32.gsz
Last Solved Date: 2/2/2012
Last Solved Time: 2:45:24 PM

Project Settings

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

Analysis Settings

GAP Stability (Entry/Exit) (sand function)

Kind: SLOPE/W
Parent: Gap Analysis (Seepage): Rem
Method: Spencer
Settings
 PWP Conditions Source: Parent Analysis
SlipSurface
 Direction of movement: Left to Right
 Use Passive Mode: Yes
 Slip Surface Option: Entry and Exit
 Critical slip surfaces saved: 1
 Optimize Critical Slip Surface Location: Yes
 Tension Crack
 Tension Crack Option: (none)
FOS Distribution
 FOS Calculation Option: Constant
Advanced
 Number of Slices: 30
 Optimization Tolerance: 0.01
 Minimum Slip Surface Depth: 0.1 ft

Cohesion Spatial Fn: Bay Sound Clay
Phi: 0 °
Phi-B: 0 °

Beach Sand (sand function)

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

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (170, -29.9) ft
Left-Zone Right Coordinate: (200, 2.8) ft
Left-Zone Increment: 25
Right Projection: Range
Right-Zone Left Coordinate: (210, 1) ft
Right-Zone Right Coordinate: (290, -4.5) ft
Right-Zone Increment: 25
Radius Increments: 20

Slip Surface Limits

Left Coordinate: (133.1, -29.9) ft
Right Coordinate: (310, -4.5) ft

Cohesion Functions

Fill 2: EL0 to -3.5

Model: Spline Data Point Function
Function: Cohesion vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 500
Data Points: X (ft), Cohesion (psf)
 Data Point: (133, 500)
 Data Point: (174, 500)
 Data Point: (200, 600)
 Data Point: (230.4, 500)
 Data Point: (310, 500)

Optimization Maximum Iterations: 5000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

Sheet Pile

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

Fill 1: EL 2.9 to 0

Model: Mohr-Coulomb
Unit Weight: 112 pcf
Cohesion: 600 psf
Phi: 0 °
Phi-B: 0 °

Fill 2: EL 0 to -3.5

Model: Spatial Mohr-Coulomb
Weight Fn: Fill 2: EL 0 to -3.5
Cohesion Fn: Fill 2: ELO to -3.5
Phi: 0 °
Phi-B: 0 °

Fill 3: EL -4.5 to -7

Model: Mohr-Coulomb
Unit Weight: 85 pcf
Cohesion: 500 psf
Phi: 0 °
Phi-B: 0 °

Marsh: EL -3.5 to -14

Model: Spatial Mohr-Coulomb
Weight Fn: Marsh: EL -3.5 to -14
Cohesion Spatial Fn: Marsh: EL -3.5 to -14
Phi: 0 °
Phi-B: 0 °

Bay Sound Clay

Model: Spatial Mohr-Coulomb
Unit Weight: 106 pcf

Shear/Normal Strength Functions

Beach Sand

Model: Spline Data Point Function
Function: Shear Stress vs. Normal Stress
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
 Data Point: (-100000, 0)
 Data Point: (0, 0)
 Data Point: (100000, 57735)
Estimation Properties
 Intact Rock Param.: 10
 Geological Strength: 100
 Disturbance Factor: 0
 SigmaC: 600000 psf
 Sigma3: 300000 psf
 Num. Points: 20

Unit Weight Functions

Fill 2: EL 0 to -3.5

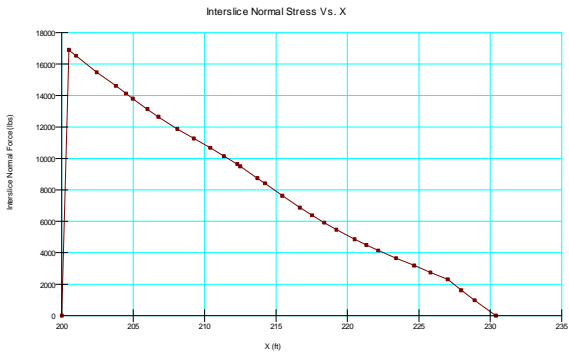
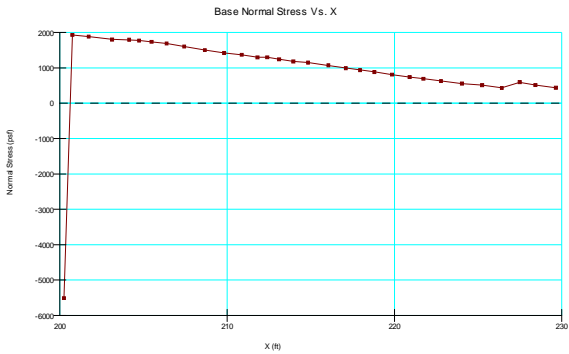
Model: Spline Data Point Function
Function: Unit Weight vs. Y
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 85
Data Points: Y (ft), Unit Weight (pcf)
 Data Point: (133, 85)
 Data Point: (174, 85)
 Data Point: (200, 105)
 Data Point: (230.4, 85)
 Data Point: (310, 85)

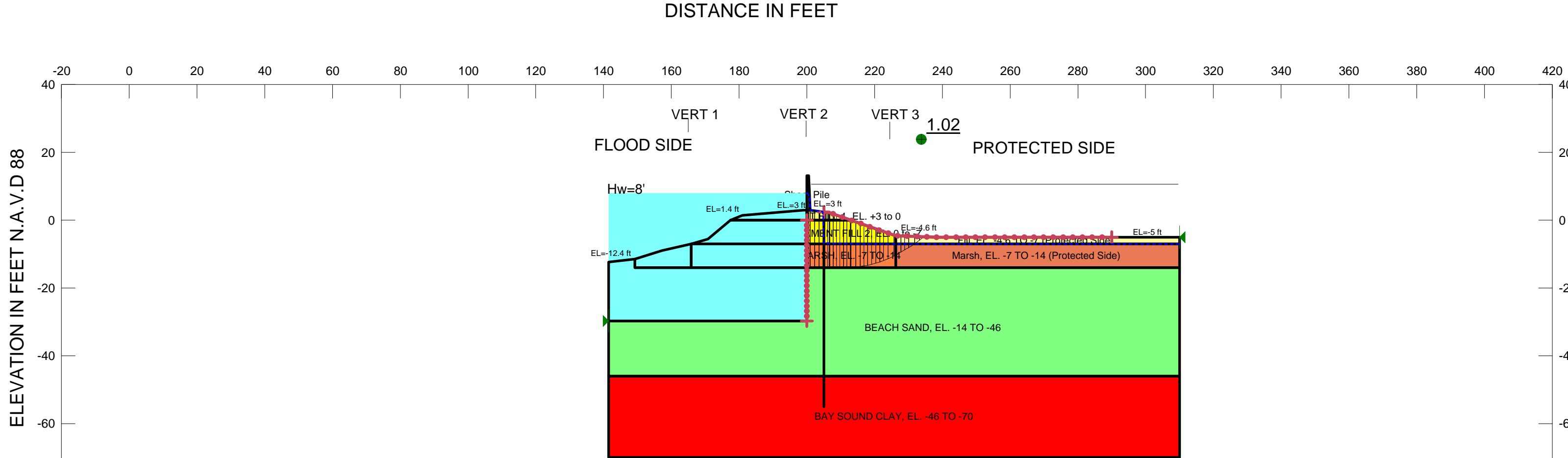
Marsh: EL -3.5 to -14

Model: Spline Data Point Function
Function: Unit Weight vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 95
Data Points: X (ft), Unit Weight (pcf)
 Data Point: (133, 95)
 Data Point: (174, 95)
 Data Point: (200, 98)
 Data Point: (230.4, 95)

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	9976	200.25	-14.694865	1415.979	-5011.3438	0	0
2	9976	200.75	-14.572005	1408.2877	1894.4673	280.69589	1.6953e-005
3	9976	201.5065	-14.3834	1396.5456	1861.8374	268.63632	-1.9082e-005
4	9976	202.5195	-14.127185	1380.4984	1821.2478	254.4668	-1.3526e-006
5	9976	203.5325	-13.866065	1364.263	1779.7518	239.88256	-1.2755e-006
6	9976	204.2695	-13.673485	1351.902	1783.1567	0	325.22
7	9976	205.25	-13.41134	431.86785	1750.3544	0	320.75
8	9976	206.54165	-13.06119	410.3537	1683.6261	0	315.02
9	9976	207.625	-12.760735	391.78056	1600.1003	0	310.35
10	9976	208.70835	-12.45456	372.76641	1515.867	0	305.82
11	9976	209.79165	-12.142645	353.37781	1431.0268	0	301.42
12	9976	210.875	-11.82497	333.60861	1345.4987	0	297.16

13	9976	211.95835	-11.501505	313.30347	1259.2947	0	293.05
14	9976	213.1	-11.15416	291.61475	1173.7882	0	288.88
15	9976	214.23635	-10.802345	269.66352	1101.9313	0	284.9
16	9976	215.309	-10.46415	248.50299	1042.5736	0	281.3
17	9976	216.38165	-10.120171	226.97476	982.65845	0	277.87
18	9976	217.4543	-9.7703805	205.08256	922.19403	0	274.6
19	9976	218.52695	-9.414754	182.77695	861.13479	0	271.51
20	9976	219.5996	-9.053262	160.15903	799.47108	0	268.58
21	9976	220.67225	-8.685875	137.14444	737.22956	0	265.84
22	9976	221.74495	-8.312563	113.75502	674.39285	0	263.29
23	9976	222.8176	-7.9332955	90.0124	610.98661	0	260.92
24	9976	223.89025	-7.548041	65.895486	546.98574	0	258.75
25	9976	224.9629	-7.1567675	41.419145	482.40813	0	256.77
26	9976	226.03555	-6.7594425	16.572964	417.23693	0	255
27	9976	227.0504	-6.3780865	-7.2633461	470.54225	0	511.02
28	9976	228.0074	-6.013293	-30.048709	416.92803	0	507.87
29	9976	228.96445	-5.643605	-53.146702	362.73527	0	504.72
30	9976	229.9215	-5.2689965	-76.549991	307.9518	0	501.57
31	9976	231.1246	-4.7902295	-106.45269	255.29685	0	500





Name: EMBANKMENT FILL 1, EL. +3 to 0 Model: Undrained (Phi=0) Unit Weight: 112 pcf Cohesion: 600 psf
Name: MARSH, EL. -7 TO -14 Model: Spatial Mohr-Coulomb Weight Fn: Marsh Cohesion Spatial Fn: Marsh Phi: 0 °
Name: BEACH SAND, EL. -14 TO -46 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Beach Sand
Name: BAY SOUND CLAY, EL. -46 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 106 pcf Cohesion Spatial Fn: Bay Sound Phi: 0 °
Name: EMBANKMENT FILL 2, EL. 0 to -7 Model: Spatial Mohr-Coulomb Weight Fn: FILL 2 Cohesion Fn: Fill 2 Phi: 0 °
Name: Fill, EL. -4.6 TO -7 (Protected Side) Model: Undrained (Phi=0) Unit Weight: 84 pcf Cohesion: 500 psf
Name: Marsh, EL. -7 TO -14 (Protected Side) Model: Undrained (Phi=0) Unit Weight: 94 pcf Cohesion: 190 psf
Name: Sheet Pile Model: Undrained (Phi=0) Unit Weight: 0.1 pcf Cohesion: 0.01 psf

GENERAL NOTES

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

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

Hw=CANAL WATER LEVEL



**US Army Corps
of Engineers®**
New Orleans District
LONDON AVE CANAL,
OUTFALL CANAL REEVALUATION REPORT
REACH 33, STA. 90+00 TO 93+00
PROTECTED SIDE STABILITY ANALYSIS,
CASE: GAP Stability (No Soil, Entry/Exit)
MARCH 2012

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

GAP Stability (No Soil, Entry/Exit)

Report generated using GeoStudio 2007, version 7.15. Copyright © 1991-2009 GEO-SLOPE International Ltd.

File Information

Created By: Lijegren, James
Revision Number: 278
Last Edited By: Middleton, Mark C MVN
Date: 1/12/2012
Time: 12:49:57 PM
File Name: Reach 33.gsz
Directory: G:\F&M\HOME\Middleton\London Ave Canal\Reach 33\optimization check\
Last Solved Date: 1/12/2012
Last Solved Time: 12:55:44 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

GAP Stability (No Soil, Entry/Exit)

Kind: SLOPE/W
Parent: Gap Stability (Seepage)
Method: Spencer
Settings
 PWP Conditions Source: Parent Analysis
SlipSurface
 Direction of movement: Left to Right
 Use Passive Mode: Yes
 Slip Surface Option: Entry and Exit
 Critical slip surfaces saved: 1
 Optimize Critical Slip Surface Location: Yes
 Tension Crack
 Tension Crack Option: (none)
FOS Distribution
 FOS Calculation Option: Constant
Advanced
 Number of Slices: 30
 Optimization Tolerance: 0.01
 Minimum Slip Surface Depth: 0.1 ft

Optimization Maximum Iterations: 2000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

EMBANKMENT FILL 1, EL. +3 to 0

Model: Undrained (Phi=0)
Unit Weight: 112 pcf
Cohesion: 600 psf

MARSH, EL. -7 TO -14

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

BEACH SAND, EL. -14 TO -46

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

BAY SOUND CLAY, EL. -46 TO -70

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

EMBANKMENT FILL 2, EL. 0 to -7

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

Fill, EL. -4.6 TO -7 (Protected Side)

Model: Undrained (Phi=0)
Unit Weight: 84 pcf
Cohesion: 500 psf

Marsh, EL. -7 TO -14 (Protected Side)

Model: Undrained (Phi=0)

3/14/2012

3/14/2012

GAP Stability (No Soil, Entry/Exit)

GAP Stability (No Soil, Entry/Exit)

Unit Weight: 94 pcf
Cohesion: 190 psf

Sheet Pile

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

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (200, -29.8) ft
Left-Zone Right Coordinate: (200, 0) ft
Left-Zone Increment: 20
Right Projection: Range
Right-Zone Left Coordinate: (205, 2.44828) ft
Right-Zone Right Coordinate: (290, -5) ft
Right-Zone Increment: 30
Radius Increments: 25

Slip Surface Limits

Left Coordinate: (141.5, -29.8) ft
Right Coordinate: (310, -5) ft

Cohesion Functions

FILL 2

Model: Spline Data Point Function
Function: Cohesion vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 500
Data Points: X (ft), Cohesion (psf)
 Data Point: (165.9, 500)
 Data Point: (200, 600)
 Data Point: (226.2, 500)

Shear/Normal Strength Functions

Beach Sand

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

Data Point: (-100000, 0)
Data Point: (0, 0)
Data Point: (100000, 57753)
Estimation Properties
 Intact Rock Param.: 10
 Geological Strength: 100
 Disturbance Factor: 0
 SigmaC: 600000 psf
 Sigma3: 300000 psf
 Num. Points: 20

Unit Weight Functions

FILL 2

Model: Spline Data Point Function
Function: Unit Weight vs. Y
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 84
Data Points: Y (ft), Unit Weight (pcf)
 Data Point: (165.9, 84)
 Data Point: (200, 105)
 Data Point: (226.2, 84)

Marsh

Model: Spline Data Point Function
Function: Unit Weight vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 94
Data Points: X (ft), Unit Weight (pcf)
 Data Point: (165.9, 94)
 Data Point: (200, 104)
 Data Point: (226.2, 94)

Spatial Functions

Marsh

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
 Data Point: (165.9, -7, 190)
 Data Point: (165.9, -14, 190)
 Data Point: (200, -7, 200)
 Data Point: (200, -14, 265)
 Data Point: (226.2, -7, 190)
 Data Point: (226.2, -14, 190)

3/14/2012

3/14/2012

Bay Sound

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (141.4, -46, 600)
Data Point: (141.5, -70, 800)
Data Point: (200, -46, 685)
Data Point: (200, -70, 915)
Data Point: (226.2, -46, 600)
Data Point: (226.2, -70, 800)
Data Point: (310, -46, 600)
Data Point: (310, -70, 800)
Data Point: (165.9, -46, 600)
Data Point: (165.9, -70, 800)

Regions

	Points	Area (ft²)	Material
Region 1	12,13,14,22,1,2,35,33	940.29	
Region 2	6,29,7,8,17	170.06	Fill, EL. -4.6 TO -7 (Protected Side)
Region 3	14,13,12,31,9,11,32,10	4467.7	BEACH SAND, EL. -14 TO -46
Region 4	15,10,32,11,16	4044	BAY SOUND CLAY, EL. -46 TO -70
Region 5	17,8,9,31	586.6	Marsh, EL. -7 TO -14 (Protected Side)
Region 6	19,3,28,4,21	45.05	
Region 7	4,25,5,20,21	24.9	EMBANKMENT FILL 1, EL. +3 to 0
Region 8	26,30,19,21,18	189.07	
Region 9	18,21,20,6,17	153.04	EMBANKMENT FILL 2, EL. 0 to -7
Region 10	4,23,24,25	7.575	Sheet Pile
Region 11	35,33,26,27,2	81.825	
Region 12	18,17,31,12,34	183.4	MARSH, EL. -7 TO -14
Region 13	33,26,18,34,12	238.7	

Points

	X (ft)	Y (ft)
Point 1	141.5	-12.4
Point 2	149.3	-11.5
Point 3	181	1.4
Point 4	200	3
Point 5	206.8	2.2
Point 6	226.2	-4.6
Point 7	310	-5
Point 8	310	-7
Point 9	310	-14
Point 10	141.5	-46

Point 11	310	-46
Point 12	200	-14
Point 13	200	-29.8
Point 14	141.5	-29.8
Point 15	141.5	-70
Point 16	310	-70
Point 17	226.2	-7
Point 18	200	-7
Point 19	177.5	0
Point 20	213	0
Point 21	200	0
Point 22	141.5	-14
Point 23	200	13.1
Point 24	200.5	13.1
Point 25	201	3
Point 26	165.9	-7
Point 27	157.2	-9
Point 28	199	3
Point 29	238.5	-5
Point 30	170.8	-5.6
Point 31	226.2	-14
Point 32	200	-46
Point 33	165.9	-14
Point 34	200	-8.3
Point 35	149.3	-14
Point 36	205	2.45
Point 37	205	-55

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.02	(206.36, 38.086)	16.45497	(200, 13.1)	(234.599, -4.87315)
2	9158	1.08	(206.36, 38.086)	51.887	(200, 13.1)	(235.42, -4.89985)

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	-13.789615	1358.6018	-4250.5788	0	262.35
2	Optimized	200.75	-13.775805	1357.5022	1694.6537	0	260.83
3	Optimized	201.64225	-13.751165	1355.8399	1678.7293	0	258.13
4	Optimized	202.9267	-13.71569	1353.4273	1650.8685	0	254.28

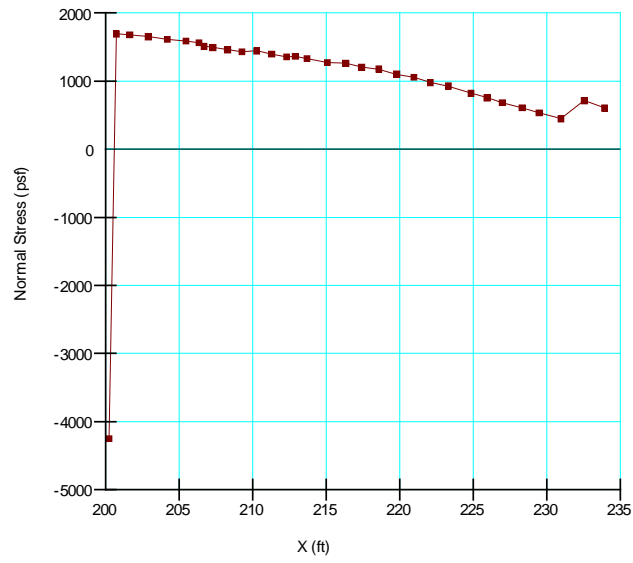
5	Optimized	204.202	-13.69149	1351.6598	1614.4891	0	250.57
6	Optimized	205.46815	-13.678565	417.54954	1589.6119	0	246.99
7	Optimized	206.35845	-13.673785	417.15504	1563.3061	0	244.5
8	Optimized	206.70785	-13.68405	417.75348	1511.206	0	243.62
9	Optimized	207.2963	-13.738845	421.04955	1494.2765	0	242.36
10	Optimized	208.28895	-13.831275	426.65672	1461.9776	0	240.2
11	Optimized	209.2816	-13.923705	432.31405	1429.5784	0	237.97
12	Optimized	210.284	-13.965595	434.88742	1443.5322	0	235.37
13	Optimized	211.29615	-13.95695	434.34403	1399.0733	0	232.44
14	Optimized	212.30825	-13.948305	433.80065	1354.6143	0	229.51
15	Optimized	212.90715	-13.936115	433.04777	1365.3896	0	227.75
16	Optimized	213.69315	-13.86953	428.9192	1331.478	0	225.22
17	Optimized	215.0795	-13.752085	421.61673	1273.547	0	220.86
18	Optimized	216.3203	-13.595805	411.89923	1260.7784	0	216.87
19	Optimized	217.41545	-13.4007	399.75441	1203.6052	0	213.28
20	Optimized	218.5701	-13.145555	383.85623	1175.6753	0	209.53
21	Optimized	219.7843	-12.830365	364.20584	1101.2988	0	205.71
22	Optimized	220.95295	-12.48947	342.95228	1055.1727	0	202.21
23	Optimized	222.07605	-12.12287	320.06453	978.23124	0	199.06
24	Optimized	223.30875	-11.65637	290.9502	926.3403	0	195.87
25	Optimized	224.83625	-10.96652	247.89683	821.43516	0	192.44
26	Optimized	225.9463	-10.419715	213.75685	754.22084	0	190.4
27	Optimized	226.9665	-9.856145	178.56959	683.29677	0	190
28	Optimized	228.31565	-9.0927775	130.91047	609.23289	0	190
29	Optimized	229.4809	-8.4128725	88.452216	533.30022	0	190
30	Optimized	230.9594	-7.510965	32.147845	446.69038	0	190
31	Optimized	232.5413	-6.4300445	-35.330211	712.23092	0	500
32	Optimized	233.9133	-5.3921135	-100.11224	605.10274	0	500

Slices of Slip Surface: 9158

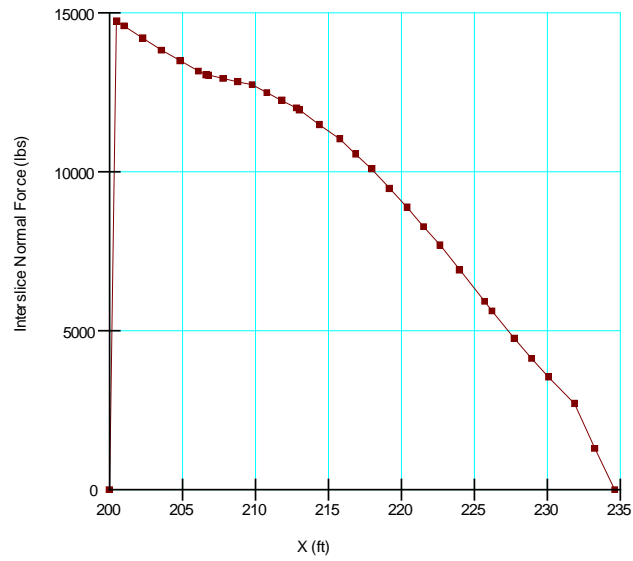
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	9158	200.25	-13.439645	1335.4433	-4007.5217	0	259.13
2	9158	200.75	-13.49648	1338.8053	1585.8088	0	258.31
3	9158	201.58	-13.577335	1344.1721	1591.3919	0	256.79
4	9158	202.74	-13.671565	1350.4937	1592.5747	0	254.43
5	9158	203.9	-13.73966	1354.94	1590.7091	0	251.78
6	9158	205.06	-13.78173	423.83252	1586.054	0	248.88
7	9158	206.22	-13.797835	424.71405	1578.4428	0	245.76
8	9158	207.42	-13.78673	423.9679	1552.3371	0	242.34
9	9158	208.66	-13.74655	421.44825	1507.3879	0	238.63
10	9158	209.9	-13.67664	417.09845	1458.7705	0	234.79
11	9158	211.14	-13.576875	410.89026	1406.6535	0	230.85
12	9158	212.38	-13.447085	402.80928	1350.9747	0	226.85
13	9158	213.6	-13.290105	393.04142	1299.0807	0	222.9
14	9158	214.8	-13.10663	381.59874	1251.2755	0	219.02
15	9158	216	-12.894255	368.35576	1200.2309	0	215.2
16	9158	217.2	-12.652615	353.28585	1145.8911	0	211.47
17	9158	218.4	-12.38129	336.34412	1088.2913	0	207.85
18	9158	219.6	-12.079795	317.51928	1027.2422	0	204.4
19	9158	220.8	-11.74758	296.77547	962.89146	0	201.15
20	9158	222	-11.38403	274.05522	895.16282	0	198.13
21	9158	223.2	-10.98845	249.33672	823.84451	0	195.39
22	9158	224.4	-10.560055	222.57955	749.09931	0	192.96
23	9158	225.6	-10.097971	193.71905	670.75346	0	190.89
24	9158	226.78415	-9.608238	163.11639	607.95494	0	190
25	9158	227.95245	-9.090719	130.79114	560.55346	0	190
26	9158	229.12075	-8.5381835	96.277432	509.19278	0	190
27	9158	230.2891	-7.949369	59.515935	453.67932	0	190
28	9158	231.45745	-7.3228625	20.39948	393.75618	0	190
29	9158	232.60475	-	-20.37315	590.28522	0	500

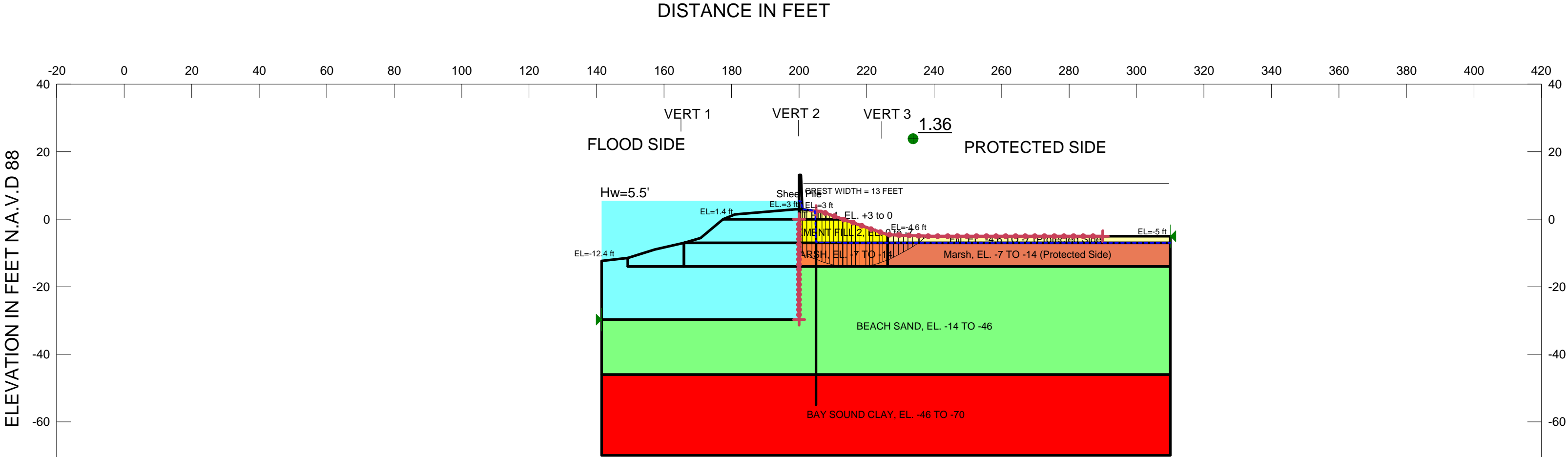
			6.6697765				
30	9158	233.731	-5.989845	-	544.5331	0	500
				62.814438			
31	9158	234.85725	-5.269994	-107.747	495.2934	0	500

Base Normal Stress Vs. X



Interslice Normal Stress Vs. X





Name: EMBANKMENT FILL 1, EL. +3 to 0 Model: Undrained (Phi=0) Unit Weight: 112 pcf Cohesion: 600 psf
Name: MARSH, EL. -7 TO -14 Model: Spatial Mohr-Coulomb Weight Fn: Marsh Cohesion Spatial Fn: Marsh Phi: 0 °
Name: BEACH SAND, EL. -14 TO -46 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Beach Sand
Name: BAY SOUND CLAY, EL. -46 TO -70 Model: Spatial Mohr-Coulomb Unit Weight: 106 pcf Cohesion Spatial Fn: Bay Sound Phi: 0 °
Name: EMBANKMENT FILL 2, EL. 0 to -7 Model: Spatial Mohr-Coulomb Weight Fn: FILL 2 Cohesion Fn: Fill 2 Phi: 0 °
Name: Fill, EL. -4.6 TO -7 (Protected Side) Model: Undrained (Phi=0) Unit Weight: 84 pcf Cohesion: 500 psf
Name: Marsh, EL. -7 TO -14 (Protected Side) Model: Undrained (Phi=0) Unit Weight: 94 pcf Cohesion: 190 psf
Name: Sheet Pile Model: Undrained (Phi=0) Unit Weight: 0.1 pcf Cohesion: 0.01 psf

GENERAL NOTES

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

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

Hw=CANAL WATER LEVEL



**US Army Corps
of Engineers®**
New Orleans District
LONDON AVE CANAL
OUTFALL CANAL REEVALUATION REPORT
REACH 33, STA. 90+00 TO 93+00
1% FLOWLINE WATER EL +5.5
PROTECTED SIDE STABILITY ANALYSIS,
CASE: GAP Stability (No Soil, Entry/Exit)
MARCH 2012

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

GAP Stability (No Soil, Entry/Exit)

Report generated using GeoStudio 2007, version 7.15. Copyright © 1991-2009 GEO-SLOPE International Ltd.

File Information

Created By: Lijegren, James
Revision Number: 297
Last Edited By: Middleton, Mark C MVN
Date: 3/13/2012
Time: 2:40:01 PM
File Name: Reach 33.gsz
Directory: G:\F&M\HOME\Middleton\London Ave Canal\Reach 33\water level 5.5\optimization check\
Last Solved Date: 3/13/2012
Last Solved Time: 2:46:46 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

GAP Stability (No Soil, Entry/Exit)

Kind: SLOPE/W
Parent: Gap Stability (Seepage)
Method: Spencer
Settings
PWP Conditions Source: Parent Analysis
SlipSurface
Direction of movement: Left to Right
Use Passive Mode: Yes
Slip Surface Option: Entry and Exit
Critical slip surfaces saved: 1
Optimize Critical Slip Surface Location: Yes
Tension Crack
Tension Crack Option: (none)
FOS Distribution
FOS Calculation Option: Constant
Advanced
Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft

3/19/2012

GAP Stability (No Soil, Entry/Exit)

Page 3 of 9

Unit Weight: 94 pcf
Cohesion: 190 psf

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

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (200, -29.8) ft
Left-Zone Right Coordinate: (200, 0) ft
Left-Zone Increment: 20
Right Projection: Range
Right-Zone Left Coordinate: (205, 2.44828) ft
Right-Zone Right Coordinate: (290, -5) ft
Right-Zone Increment: 30
Radius Increments: 25

Slip Surface Limits

Left Coordinate: (141.5, -29.8) ft
Right Coordinate: (310, -5) ft

Cohesion Functions

FILL 2
Model: Spline Data Point Function
Function: Cohesion vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 500
Data Points: X (ft), Cohesion (psf)
Data Point: (165.9, 500)
Data Point: (200, 600)
Data Point: (226.2, 500)

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)

3/19/2012

Optimization Maximum Iterations: 2000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

EMBANKMENT FILL 1, EL. +3 to 0

Model: Undrained (Phi=0)
Unit Weight: 112 pcf
Cohesion: 600 psf

MARSH, EL. -7 TO -14

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

BEACH SAND, EL. -14 TO -46

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

BAY SOUND CLAY, EL. -46 TO -70

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

EMBANKMENT FILL 2, EL. 0 to -7

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

Fill, EL. -4.6 TO -7 (Protected Side)

Model: Undrained (Phi=0)
Unit Weight: 84 pcf
Cohesion: 500 psf

Marsh, EL. -7 TO -14 (Protected Side)

Model: Undrained (Phi=0)

3/19/2012

GAP Stability (No Soil, Entry/Exit)

Page 4 of 9

Data Point: (-100000, 0)
Data Point: (0, 0)
Data Point: (100000, 57753)
Estimation Properties
Intact Rock Param.: 10
Geological Strength: 100
Disturbance Factor: 0
SigmaC: 600000 psf
Sigma3: 300000 psf
Num. Points: 20

Unit Weight Functions

FILL 2
Model: Spline Data Point Function
Function: Unit Weight vs. Y
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 84
Data Points: Y (ft), Unit Weight (pcf)
Data Point: (165.9, 84)
Data Point: (200, 105)
Data Point: (226.2, 84)

Marsh

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 94
Data Points: X (ft), Unit Weight (pcf)
Data Point: (165.9, 94)
Data Point: (200, 104)
Data Point: (226.2, 94)

Spatial Functions

Marsh

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (165.9, -7, 190)
Data Point: (165.9, -14, 190)
Data Point: (200, -7, 200)
Data Point: (200, -14, 265)
Data Point: (226.2, -7, 190)
Data Point: (226.2, -14, 190)

3/19/2012

Bay Sound

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (141.4, -46, 600)
Data Point: (141.5, -70, 800)
Data Point: (200, -46, 685)
Data Point: (200, -70, 915)
Data Point: (226.2, -46, 600)
Data Point: (226.2, -70, 800)
Data Point: (310, -46, 600)
Data Point: (310, -70, 800)
Data Point: (165.9, -46, 600)
Data Point: (165.9, -70, 800)

Regions

	Points	Area (ft²)	Material
Region 1	12,13,14,22,1,2,35,33	940.29	
Region 2	6,29,7,8,17	170.06	Fill, EL. -4.6 TO -7 (Protected Side)
Region 3	14,13,12,31,9,11,32,10	4467.7	BEACH SAND, EL. -14 TO -46
Region 4	15,10,32,11,16	4044	BAY SOUND CLAY, EL. -46 TO -70
Region 5	17,8,9,31	586.6	Marsh, EL. -7 TO -14 (Protected Side)
Region 6	19,3,28,4,21	45.05	
Region 7	4,25,5,20,21	24.9	EMBANKMENT FILL 1, EL. +3 to 0
Region 8	26,30,19,21,18	189.07	
Region 9	18,21,20,6,17	153.04	EMBANKMENT FILL 2, EL. 0 to -7
Region 10	4,23,24,25	7.575	Sheet Pile
Region 11	35,33,26,27,2	81.825	
Region 12	18,17,31,12,34	183.4	MARSH, EL. -7 TO -14
Region 13	33,26,18,34,12	238.7	

Points

	X (ft)	Y (ft)
Point 1	141.5	-12.4
Point 2	149.3	-11.5
Point 3	181	1.4
Point 4	200	3
Point 5	206.8	2.2
Point 6	226.2	-4.6
Point 7	310	-5
Point 8	310	-7
Point 9	310	-14
Point 10	141.5	-46

4	Optimized	203.01605	11.216675	1034.1759	1236.0121	0	233.5
5	Optimized	204.53675	-11.71507	1065.7948	1259.7575	0	234.47
6	Optimized	206.04855	-12.257455	330.7427	1266.0174	0	235.24
7	Optimized	207.26495	-12.732035	359.30683	1280.6123	0	235.69
8	Optimized	208.36595	-13.08581	380.77448	1311.914	0	235.27
9	Optimized	209.63805	-13.430565	401.87466	1293.8563	0	234.07
10	Optimized	210.93315	-13.700775	418.4805	1310.1623	0	232.08
11	Optimized	212.25125	-13.89644	430.55479	1274.6673	0	229.42
12	Optimized	212.95515	-13.994295	436.60894	1306.8597	0	227.89
13	Optimized	213.6242	-13.9947	436.63508	1284.9371	0	225.98
14	Optimized	214.8726	-13.99546	436.68315	1244.7252	0	222.41
15	Optimized	216.121	-13.996215	436.7232	1204.5133	0	218.84
16	Optimized	217.3694	-13.99697	436.77126	1164.3816	0	215.27
17	Optimized	218.88295	-13.933845	432.8446	1132.5512	0	210.77
18	Optimized	220.3078	-13.78224	423.39542	1100.6162	0	206.41
19	Optimized	221.3788	-13.606045	412.42242	1047.5478	0	203.13
20	Optimized	222.83225	-13.275895	391.83072	996.61545	0	198.78
21	Optimized	224.31495	-12.821325	363.47817	934.46637	0	194.61
22	Optimized	225.4444	-12.396295	336.96143	853.25887	0	191.73
23	Optimized	226.10455	-12.137455	320.81325	835.20128	0	190.21
24	Optimized	227.08235	-11.662865	291.19967	781.25996	0	190
25	Optimized	228.7009	-10.850265	240.48911	703.79713	0	190
26	Optimized	230.1733	-10.081595	192.51169	621.19579	0	190
27	Optimized	231.58515	-9.3124925	144.49657	550.00531	0	190
28	Optimized	232.9364	-8.5429575	96.463953	467.02701	0	190
29	Optimized	234.45825	-7.579095	36.308085	388.17303	0	190
30	Optimized	235.5544	-6.828975	-10.508238	518.06474	0	500
31	Optimized	236.32775	-6.2385685	-47.354442	518.04893	0	500

Point 11	310	-46
Point 12	200	-14
Point 13	200	-29.8
Point 14	141.5	-29.8
Point 15	141.5	-70
Point 16	310	-70
Point 17	226.2	-7
Point 18	200	-7
Point 19	177.5	0
Point 20	213	0
Point 21	200	0
Point 22	141.5	-14
Point 23	200	13.1
Point 24	200.5	13.1
Point 25	201	3
Point 26	165.9	-7
Point 27	157.2	-9
Point 28	199	3
Point 29	238.5	-5
Point 30	170.8	-5.6
Point 31	226.2	-14
Point 32	200	-46
Point 33	165.9	-14
Point 34	200	-8.3
Point 35	149.3	-14
Point 36	205	2.45
Point 37	205	-55

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.36	(214.912, 22.107)	16.50608	(200, 13.1)	(237.898, -4.98043)
2	10799	1.42	(214.912, 22.107)	35.792	(200, 13.1)	(238.292, -4.99322)

Slices of Slip Surface: Optimized

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	200.25	-10.490665	989.17121	-1023.0471	0	232.01
2	Optimized	200.75	-10.609535	995.18363	1240.0199	0	232.27
3	Optimized	201.62785	-10.818225	1008.6422	1249.8392	0	232.63
			-				

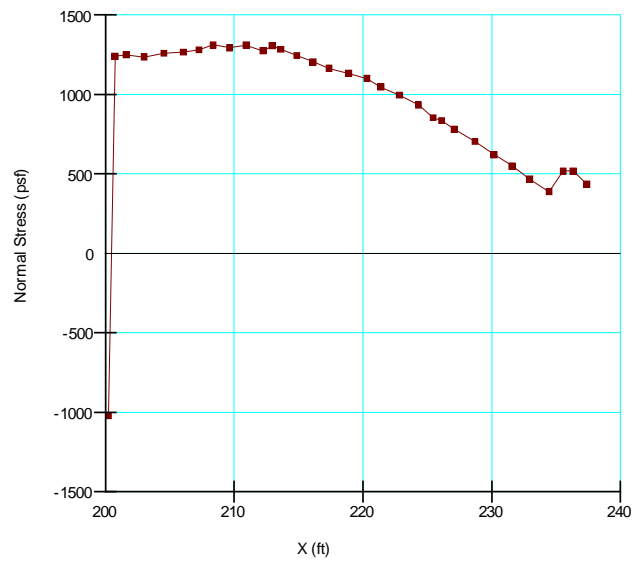
32	Optimized	237.37465	-5.399806	-99.699054	434.92911	0	500
----	-----------	-----------	-----------	------------	-----------	---	-----

Slices of Slip Surface: 10799

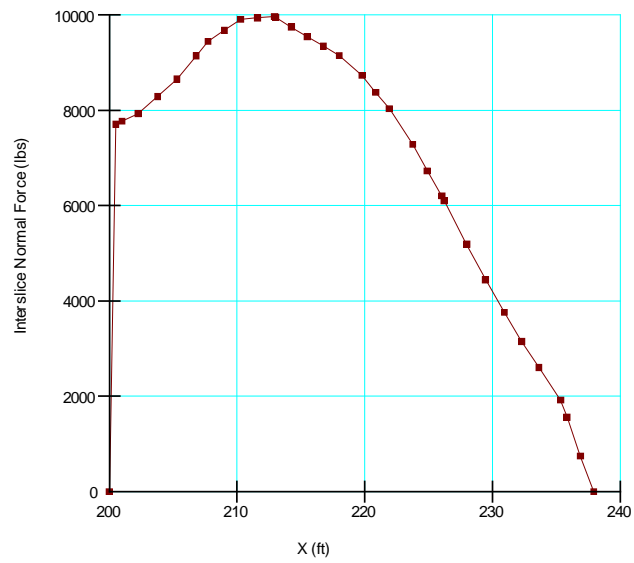
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	10799	200.25	-10.54227	992.51454	-1023.2205	0	232.48
2	10799	200.75	-10.76225	1005.1158	1192.3374	0	233.65
3	10799	201.58	-11.1028	1027.2148	1224.7376	0	235.2
4	10799	202.74	-11.545425	1055.7369	1262.0527	0	236.75
5	10799	203.9	-11.942785	1081.2407	1294.7492	0	237.58
6	10799	205.06	-12.29645	333.6245	1322.7794	0	237.75
7	10799	206.22	-12.607765	352.03812	1346.37	0	237.34
8	10799	207.42	-12.88573	368.68485	1351.4686	0	236.34
9	10799	208.66	-13.12848	383.35895	1337.6551	0	234.79
10	10799	209.9	-13.32619	395.42681	1318.7282	0	232.77
11	10799	211.14	-13.479605	404.81304	1294.7634	0	230.33
12	10799	212.38	-13.589295	411.5468	1265.8523	0	227.55
13	10799	213.66	-13.65638	415.66192	1237.6506	0	224.37
14	10799	214.98	-13.678235	416.99179	1209.9982	0	220.84
15	10799	216.3	-13.65136	415.3009	1176.9925	0	217.12
16	10799	217.62	-13.575655	410.57686	1138.7706	0	213.27
17	10799	218.94	-13.450805	402.78763	1095.1174	0	209.37
18	10799	220.26	-13.276285	391.90497	1046.2235	0	205.48
19	10799	221.58	-13.051355	377.87024	992.01358	0	201.67
20	10799	222.9	-12.775045	360.61995	932.38062	0	198.01
21	10799	224.22	-12.446115	340.09605	867.19261	0	194.58
22	10799	225.54	-12.06304	316.18772	796.52771	0	191.44
23	10799	226.88145	-11.6159	288.27889	739.60927	0	190
24	10799	228.2443	-11.100455	256.09983	696.16991	0	190
25	10799	229.60715	-10.519955	219.86653	646.12554	0	190
26	10799	230.97005	-9.870852	179.3447	589.02254	0	190

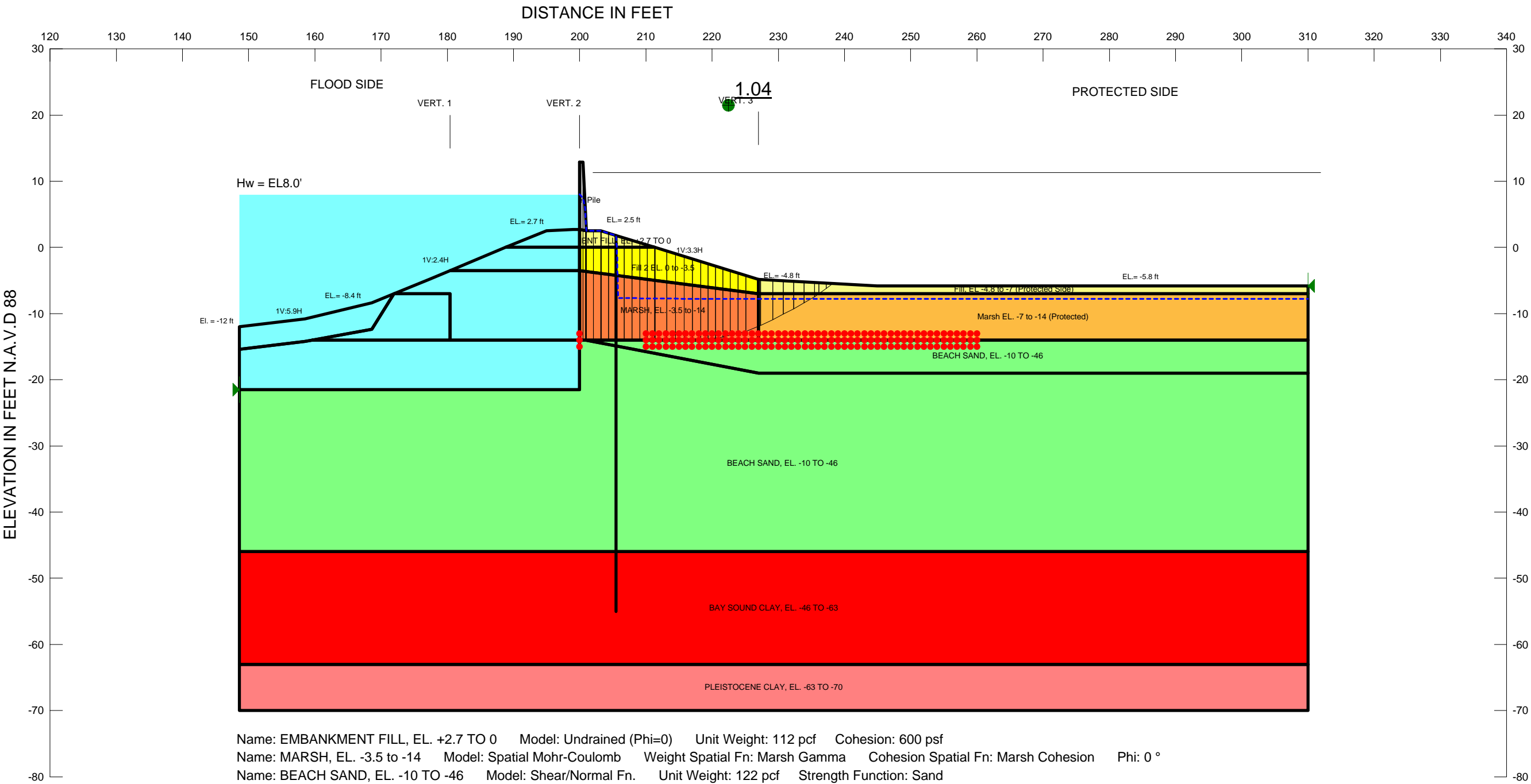
27	10799	232.3329	- 9.1488595	134.27864	524.29622	0	190
28	10799	233.69575	- 8.3487795	84.34136	451.26531	0	190
29	10799	235.05865	-7.464252	29.135268	369.07382	0	190
30	10799	236.37795	-6.52172	- 29.686305	505.6568	0	500
31	10799	237.6537	- 5.5183315	- 92.306761	441.43002	0	500

Base Normal Stress Vs. X



Interslice Normal Stress Vs. X





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.

LONDON AVE CANAL
OUTFALL CANAL REEVALUATION REPORT
REACH 34, STA. 93+00 TO 99+53
PROTECTED SIDE STABILITY ANALYSIS
CASE: GAP Stability (Block) (3)
MARCH 2012

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

GAP Stability (Block) (3)

Report generated using GeoStudio 2007, version 7.15. Copyright © 1991-2009 GEO-SLOPE International Ltd.

File Information

Revision Number: 367
Last Edited By: Haggerty, Daniel R MVN
Date: 1/9/2012
Time: 11:20:52 AM
File Name: Reach 34.gsz
Last Solved Date: 1/9/2012
Last Solved Time: 11:21:08 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) (3)
Kind: SLOPE/W
Parent: Seepage Analysis: Rem
Method: Spencer
Settings
 PWP Conditions Source: Parent Analysis
SlipSurface
 Direction of movement: Left to Right
 Use Passive Mode: Yes
 Slip Surface Option: Block
 Critical slip surfaces saved: 1
 Optimize Critical Slip Surface Location: Yes
 Tension Crack
 Tension Crack Option: (none)
FOS Distribution
 FOS Calculation Option: Constant
Restrict Block Crossing: Yes
Advanced
 Number of Slices: 30
 Optimization Tolerance: 0.01

Fill 2 EL. 0 to -3.5

Model: Spatial Mohr-Coulomb
Weight Fn: Fill2
Cohesion Fn: Fill 2
Phi: 0 °
Phi-B: 0 °

Marsh EL. -7 to -14 (Protected)

Model: Undrained (Phi=0)
Unit Weight: 94 pcf
Cohesion: 200 psf

PLEISTOCENE CLAY, EL. -63 TO -70

Model: Spatial Mohr-Coulomb
Unit Weight: 122 pcf
Cohesion Spatial Fn: Bay Sound
Phi: 0 °
Phi-B: 0 °

Slip Surface Limits

Left Coordinate: (148.6, -21.5) ft
Right Coordinate: (310, -5.8) ft

Slip Surface Block

Left Grid
 Upper Left: (200, -13) ft
 Lower Left: (200, -15) ft
 Lower Right: (200, -15) ft
 X Increments: 0
 Y Increments: 2
 Starting Angle: 135 °
 Ending Angle: 135 °
 Angle Increments: 0
Right Grid
 Upper Left: (210, -13) ft
 Lower Left: (210, -15) ft
 Lower Right: (260, -15) ft
 X Increments: 50
 Y Increments: 2
 Starting Angle: 20 °
 Ending Angle: 45 °
 Angle Increments: 5

Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 5000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

EMBANKMENT FILL, EL. +2.7 TO 0

Model: Undrained (Phi=0)
Unit Weight: 112 pcf
Cohesion: 600 psf

MARSH, EL. -3.5 to -14

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

BEACH SAND, EL. -10 TO -46

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

BAY SOUND CLAY, EL. -46 TO -63

Model: Spatial Mohr-Coulomb
Unit Weight: 107 pcf
Cohesion Spatial Fn: Bay Sound
Phi: 0 °
Phi-B: 0 °

Fill, EL -4.8 to -7 (Protected Side)

Model: Undrained (Phi=0)
Unit Weight: 84 pcf
Cohesion: 500 psf

Sheet Pile

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

Cohesion Functions

Fill 2

Model: Spline Data Point Function
Function: Cohesion vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 500
Data Points: X (ft), Cohesion (psf)
 Data Point: (180.4, 500)
 Data Point: (200, 600)
 Data Point: (227, 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, 5773)
Estimation Properties
 Intact Rock Param.: 10
 Geological Strength: 100
 Disturbance Factor: 0
 SigmaC: 600000 psf
 Sigma3: 300000 psf
 Num. Points: 20

Unit Weight Functions

Fill2

Model: Spline Data Point Function
Function: Unit Weight vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 84
Data Points: X (ft), Unit Weight (pcf)
 Data Point: (180.4, 84)
 Data Point: (200, 98)

Data Point: (227, 84)

Spatial Functions

Marsh Cohesion

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (180.4, -3.5, 200)
Data Point: (180.4, -14, 200)
Data Point: (200, -3.5, 260)
Data Point: (200, -14, 340)
Data Point: (227, -7, 200)
Data Point: (227, -14, 200)

Marsh Gamma

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Unit Weight (pcf)
Data Point: (180.4, -7, 94)
Data Point: (180.4, -14, 94)
Data Point: (200, -3.5, 102)
Data Point: (200, -14, 102)
Data Point: (227, -7, 94)
Data Point: (227, -14, 94)

Bay Sound

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (0, -46, 600)
Data Point: (0, -70, 880)
Data Point: (180.4, -46, 600)
Data Point: (180.4, -70, 880)
Data Point: (200, -46, 665)
Data Point: (200, -70, 905)
Data Point: (227, -46, 600)
Data Point: (227, -70, 880)
Data Point: (310, -46, 600)
Data Point: (310, -70, 880)

Regions

	Material	Points	Area (ft²)
Region 1	BEACH SAND, EL. -10 TO -46	21,17,42,35,12,6,38,5,36	4299.05

Region 2	BAY SOUND CLAY, EL. -46 TO -63	5,38,6,44,43	2743.8
Region 3	Sheet Pile	19,20,11,18	7.7
Region 4		23,18,37,1,13	20.85
Region 5	EMBANKMENT FILL, EL. +2.7 TO 0	18,11,9,45,26,23	18.291285
Region 6		23,22,24,13	53.9
Region 7	Fill 2 EL. 0 to -3.5	23,26,25,2,30,22	104.20037
Region 8		22,24,27,34,28,29,17	220.58209
Region 9	MARSH, EL. -3.5 to -14	22,17,42,31,30	236.25
Region 10	Fill, EL -4.8 to -7 (Protected Side)	2,3,4,32,30	108.55
Region 11	Marsh EL. -7 to -14 (Protected)	30,32,33,31	581
Region 12	BEACH SAND, EL. -10 TO -46	31,33,12,35,42	480.25
Region 13		17,29,41,39,10,36,21	377.46778
Region 14		10,16,15,14,34,40,41,39	77.761398
Region 15		41,40,34,28,29	80.694834
Region 16	PLEISTOCENE CLAY, EL. -63 TO -70	7,43,44,8	1129.8

Points

	X (ft)	Y (ft)
Point 1	195	2.5
Point 2	227	-4.8
Point 3	244.9	-5.8
Point 4	310	-5.8
Point 5	148.6	-46
Point 6	310	-46
Point 7	148.6	-70
Point 8	310	-70
Point 9	203.2	2.5
Point 10	148.6	-15.4
Point 11	201	2.5
Point 12	310	-19
Point 13	188.8	0
Point 14	168.6	-8.4
Point 15	158.5	-10.8
Point 16	148.6	-12
Point 17	200	-14

Point 18	200	2.7
Point 19	200	12.9
Point 20	200.5	12.9
Point 21	200	-21.5
Point 22	200	-3.5
Point 23	200	0
Point 24	180.4	-3.5
Point 25	222.76443	-3.5
Point 26	211.35185	0
Point 27	177.25465	-4.8
Point 28	180.4	-7
Point 29	180.4	-14
Point 30	227	-7
Point 31	227	-14
Point 32	310	-7
Point 33	310	-14
Point 34	171.9657	-7
Point 35	227	-19
Point 36	148.6	-21.5
Point 37	199	2.7
Point 38	200	-46
Point 39	158.5	-14.2
Point 40	168.6	-12.4
Point 41	159.62222	-14
Point 42	200.9	-14
Point 43	148.6	-63
Point 44	310	-63
Point 45	205.5	1.795
Point 46	205.5	-55

2	393	1.14	(217.986, -3.324)	17.504	(200, 12.9)	(238.794, -5.45887)
---	-----	------	-------------------	--------	-------------	---------------------

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	200.08885	-13.99921	1372.6302	-15448.139	0	339.53
2	Optimized	200.33885	-14.00143	1372.5615	1745.0687	215.04979	7.1312e-006
3	Optimized	200.7	-14.004635	1372.7461	1733.7819	208.42733	-6.7698e-006
4	Optimized	200.91755	-14.006565	1372.8633	1726.7293	204.28817	6.774e-006
5	Optimized	200.96755	-14.007005	1372.8981	1725.1318	203.3458	6.7425e-006
6	Optimized	201.55	-14.01217	1373.219	1721.2963	200.94632	6.6635e-006
7	Optimized	202.65	-14.02193	1373.7645	1715.7511	197.43016	6.5453e-006
8	Optimized	203.21415	-14.026935	1374.1157	1712.265	195.21484	6.4737e-006
9	Optimized	203.79625	-14.020525	1373.6822	1697.3832	186.87376	6.1958e-006
10	Optimized	204.9321	-14.00746	1372.8899	1643.9466	156.482	5.1893e-006
11	Optimized	205.54025	-14.000465	1240.1391	1633.1408	226.88132	7.5234e-006
12	Optimized	206.16165	-13.993315	386.78021	1624.2102	0	308.01
13	Optimized	207.333	-13.989975	386.56833	1564.9778	0	301.92
14	Optimized	208.5134	-13.99666	386.95801	1517.0306	0	295.84
15	Optimized	209.66565	-14	387.16134	1473.083	0	289.88
16	Optimized	210.7898	-14	387.16134	1426.5571	0	284.05
17	Optimized	211.36375	-14	387.15852	1402.8246	0	281.08
18	Optimized	212.25765	-14	387.15712	1371.3019	0	276.44
19	Optimized	213.80675	-14	387.15287	1317.2432	0	268.41
20	Optimized	215.1409	-14	387.14537	1271.1464	0	261.49
21	Optimized	216.42645	-13.99458	386.8025	1230.9998	0	254.81
22	Optimized	217.66335	-13.98374	386.13151	1187.9104	0	248.36
23	Optimized	218.83505	-13.903925	381.1606	1200.6151	0	242.05
24	Optimized	219.9416	-13.75514	371.89961	1147.2346	0	235.95
25	Optimized	221.0482	-13.606355	362.62966	1094.3018	0	229.97
26	Optimized	222.18295	-13.394655	349.434	1080.0352	0	223.84
27	Optimized	223.34495	-13.120275	332.32241	1011.8461	0	217.68
28	Optimized	224.506	-12.846125	315.2222	944.36733	0	211.77
29	Optimized	226.04325	-12.314555	282.05094	909.7638	0	204.29

Critical Slip Surfaces

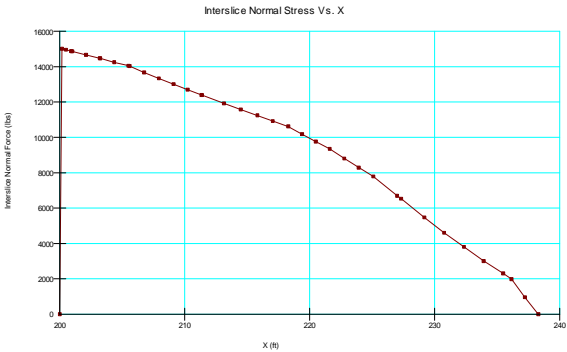
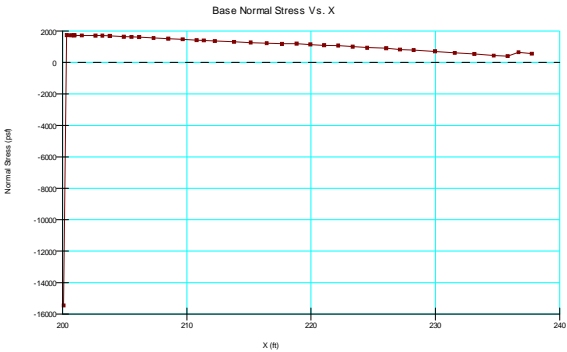
	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.04	(217.986, -3.324)	17.42443	(200, 12.9)	(238.298, -5.43116)

30	Optimized	227.15885	-11.85456	253.33984	827.74462	0	200
31	Optimized	228.2484	-11.34899	221.79084	793.5845	0	200
32	Optimized	229.97175	-10.50871	169.33854	709.21387	0	200
33	Optimized	231.55705	-9.708285	119.36979	617.09208	0	200
34	Optimized	233.13295	-8.85188	65.902084	545.26017	0	200
35	Optimized	234.6995	-7.9395	8.955601	439.66016	0	200
36	Optimized	235.81425	-7.241655	-34.603008	404.87592	0	200
37	Optimized	236.68375	-6.6077905	-74.162661	649.5419	0	500
38	Optimized	237.7598	-5.8233715	-123.11505	566.27366	0	500

Slices of Slip Surface: 393

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	393	200.25	-14	1372.52	-4660.4	0	338.7
2	393	200.7	-14	1372.475	1760.5	0	336.37
3	393	200.95	-14	1372.5	1752.8	0	335.07
4	393	201.55	-14	1372.4545	1747.6364	0	331.96
5	393	202.65	-14	1372.4545	1740.4545	0	326.26
6	393	203.775	-14	1372.4348	1713.3043	0	320.43
7	393	204.925	-14	1372.3478	1666.1739	0	314.46
8	393	206.0852	-14	387.18525	1618.4625	0	308.45
9	393	207.25555	-14	387.1767	1570.3581	0	302.38
10	393	208.4259	-14	387.16816	1522.0828	0	296.31
11	393	209.5963	-14	387.15962	1473.8074	0	290.24
12	393	210.7667	-14	387.15962	1425.3612	0	284.17
13	393	211.9859	-14	387.15712	1378.7948	0	277.85
14	393	213.25395	-14	387.14923	1334.3964	0	271.28
15	393	214.522	-14	387.14923	1290.4711	0	264.7
16	393	215.79005	-14	387.14134	1246.9402	0	258.13
17	393	217.05815	-14	387.14134	1203.8036	0	251.55
18	393	218.3262	-14	387.13346	1161.1401	0	244.98
19	393	219.59425	-14	387.13346	1118.871	0	238.4
20	393	220.86235	-14	387.12557	1076.9961	0	231.82
21	393	222.1304	-14	387.12557	1035.5944	0	225.25

22	393	223.3822	-14	387.11688	995.08729	0	218.76
23	393	224.75	-13.566985	360.13374	1160.0698	0	211.27
24	393	226.25	-12.70096	306.13417	1008.6308	0	203.48
25	393	227.65175	-11.89167	255.64603	889.95753	0	200
26	393	228.95525	-11.139105	208.68657	802.32379	0	200
27	393	230.2587	-10.38654	161.70718	714.69005	0	200
28	393	231.56215	-9.6339765	114.73443	627.04302	0	200
29	393	232.86565	-8.8814105	67.748391	539.40263	0	200
30	393	234.16915	-8.128846	20.77697	451.76889	0	200
31	393	235.47265	-7.376282	-26.197772	364.1285	0	200
32	393	236.7917	-6.614716	-73.731373	517.46278	0	500
33	393	238.12635	-5.8441485	-121.8258	436.51594	0	500



GAP Stability (Entry/Exit)

Report generated using GeoStudio 2007, version 7.15. Copyright © 1991-2009 GEO-SLOPE International Ltd.

File Information

Created By: Lijegren, James
Revision Number: 373
Last Edited By: Schroeder, Danielle V MVN
Date: 2/16/2012
Time: 2:59:11 PM
File Name: Reach 34.gsz
Directory: G:\F&M\HOME\London Ave Reevaluation 2011\East Side\Reach 34 1% flowline\SlopeW\
Last Solved Date: 2/16/2012
Last Solved Time: 3:01:12 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 Stability (Entry/Exit)

Kind: SLOPE/W
Parent: Seepage Analysis: Rem
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

3/9/2012

GAP Stability (Entry/Exit)

Phi: 0 °
Phi-B: 0 °

Marsh EL. -7 to -14 (Protected)

Model: Undrained (Phi=0)
Unit Weight: 94 pcf
Cohesion: 200 psf

PLEISTOCENE CLAY, EL. -63 TO -70

Model: Spatial Mohr-Coulomb
Unit Weight: 122 pcf
Cohesion Spatial Fn: Bay Sound
Phi: 0 °
Phi-B: 0 °

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (200, -21.5) ft
Left-Zone Right Coordinate: (200, 5) ft
Left-Zone Increment: 20
Right Projection: Range
Right-Zone Left Coordinate: (210.00002, 0.41466) ft
Right-Zone Right Coordinate: (285, -5.8) ft
Right-Zone Increment: 20
Radius Increments: 20

Slip Surface Limits

Left Coordinate: (148.6, -21.5) ft
Right Coordinate: (310, -5.8) ft

Cohesion Functions

Fill 2

Model: Spline Data Point Function
Function: Cohesion vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 500
Data Points: X (ft), Cohesion (psf)
Data Point: (180.4, 500)
Data Point: (200, 600)
Data Point: (227, 500)

Shear/Normal Strength Functions

Optimization Maximum Iterations: 5000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

EMBANKMENT FILL, EL. +2.7 TO 0

Model: Undrained (Phi=0)
Unit Weight: 112 pcf
Cohesion: 600 psf

MARSH, EL. -3.5 to -14

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

BEACH SAND, EL. -10 TO -46

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

BAY SOUND CLAY, EL. -46 TO -63

Model: Spatial Mohr-Coulomb
Unit Weight: 107 pcf
Cohesion Spatial Fn: Bay Sound
Phi: 0 °
Phi-B: 0 °

Fill, EL -4.8 to -7 (Protected Side)

Model: Undrained (Phi=0)
Unit Weight: 84 pcf
Cohesion: 500 psf

Sheet Pile

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

Fill 2 EL. 0 to -3.5

Model: Spatial Mohr-Coulomb
Weight Fn: Fill2
Cohesion Fn: Fill 2

3/9/2012

GAP Stability (Entry/Exit)

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, 5773)
Estimation Properties
Intact Rock Param.: 10
Geological Strength: 100
Disturbance Factor: 0
SigmaC: 600000 psf
Sigma3: 300000 psf
Num. Points: 20

Unit Weight Functions

Fill2

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 84
Data Points: X (ft), Unit Weight (pcf)
Data Point: (180.4, 84)
Data Point: (200, 98)
Data Point: (227, 84)

Spatial Functions

Marsh Cohesion

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (180.4, -3.5, 200)
Data Point: (180.4, -14, 200)
Data Point: (200, -3.5, 260)
Data Point: (200, -14, 340)
Data Point: (227, -7, 200)
Data Point: (227, -14, 200)

Marsh Gamma

Model: Linear Interpolation
Limit Range By: Data Values

3/9/2012

3/9/2012

Data Points: X (ft), Y (ft), Unit Weight (pcf)
Data Point: (180.4, -7, 94)
Data Point: (180.4, -14, 94)
Data Point: (200, -3.5, 102)
Data Point: (200, -14, 102)
Data Point: (227, -7, 94)
Data Point: (227, -14, 94)

Bay Sound

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (0, -46, 600)
Data Point: (0, -70, 880)
Data Point: (180.4, -46, 600)
Data Point: (180.4, -70, 880)
Data Point: (200, -46, 665)
Data Point: (200, -70, 905)
Data Point: (227, -46, 600)
Data Point: (227, -70, 880)
Data Point: (310, -46, 600)
Data Point: (310, -70, 880)

Regions

	Material	Points	Area (ft²)
Region 1	BEACH SAND, EL. -10 TO -46	21,17,42,35,12,6,38,5,36	4299.05
Region 2	BAY SOUND CLAY, EL. -46 TO -63	5,38,6,44,43	2743.8
Region 3	Sheet Pile	19,20,11,18	7.7
Region 4		23,18,37,1,13	20.85
Region 5	EMBANKMENT FILL, EL. +2.7 TO 0	18,11,9,45,26,23	18.291285
Region 6		23,22,24,13	53.9
Region 7	Fill 2 EL. 0 to -3.5	23,26,25,2,30,22	104.20037
Region 8		22,24,27,34,28,29,17	220.58209
Region 9	MARSH, EL. -3.5 to -14	22,17,42,31,30	236.25
Region 10	Fill, EL. -4.8 to -7 (Protected Side)	2,3,4,32,30	108.55
Region 11	Marsh EL. -7 to -14 (Protected)	30,32,33,31	581
Region 12	BEACH SAND, EL. -10 TO -46	31,33,12,35,42	480.25
Region 13		17,29,41,39,10,36,21	377.46778
Region 14		10,16,15,14,34,40,41,39	77.761398
Region 15		41,40,34,28,29	80.694834
Region 16	PLEISTOCENE CLAY, EL. -63 TO -70	7,43,44,8	1129.8

Points

	X (ft)	Y (ft)
Point 1	195	2.5

Point 2	227	-4.8
Point 3	244.9	-5.8
Point 4	310	-5.8
Point 5	148.6	-46
Point 6	310	-46
Point 7	148.6	-70
Point 8	310	-70
Point 9	203.2	2.5
Point 10	148.6	-15.4
Point 11	201	2.5
Point 12	310	-19
Point 13	188.8	0
Point 14	168.6	-8.4
Point 15	158.5	-10.8
Point 16	148.6	-12
Point 17	200	-14
Point 18	200	2.7
Point 19	200	12.9
Point 20	200.5	12.9
Point 21	200	-21.5
Point 22	200	-3.5
Point 23	200	0
Point 24	180.4	-3.5
Point 25	222.76443	-3.5
Point 26	211.35185	0
Point 27	177.25465	-4.8
Point 28	180.4	-7
Point 29	180.4	-14
Point 30	227	-7
Point 31	227	-14
Point 32	310	-7
Point 33	310	-14
Point 34	171.9657	-7
Point 35	227	-19
Point 36	148.6	-21.5
Point 37	199	2.7
Point 38	200	-46
Point 39	158.5	-14.2
Point 40	168.6	-12.4
Point 41	159.62222	-14
Point 42	200.9	-14
Point 43	148.6	-63
Point 44	310	-63
Point 45	205.5	1.795

3/9/2012

3/9/2012

	205.5	-55
--	-------	-----

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.45	(216.654, 33.422)	17.68507	(200, 12.9)	(242.27, -5.65308)
2	3723	1.51	(216.654, 33.422)	47.347	(200, 12.9)	(243.307, -5.71101)

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	-11.046545	1022.3223	-1316.8519	0	316.34
2	Optimized	200.75	-11.122855	1025.3078	1371.2026	0	314.6
3	Optimized	201.5043	-11.23798	1032.8142	1373.198	0	311.95
4	Optimized	202.6043	-11.459175	1047.3314	1352.1164	0	308.42
5	Optimized	203.408	-11.653755	1060.0304	1360.5363	0	306.02
6	Optimized	204.558	-12.02046	1084.0579	1314.5554	0	303.08
7	Optimized	206.4664	-12.661355	305.61798	1304.4664	0	298.04
8	Optimized	207.9664	-13.11945	333.2397	1325.5412	0	293.45
9	Optimized	209.0336	-13.38655	349.44763	1310.1786	0	289.66
10	Optimized	210.45955	-13.66195	366.31107	1317.6928	0	283.95
11	Optimized	211.53755	-13.833315	376.8326	1292.8637	0	279.33
12	Optimized	212.6356	-13.930945	382.8452	1298.6112	0	274.15
13	Optimized	214.2525	-13.999035	387.04778	1279.6082	0	266.09
14	Optimized	215.6615	-13.99898	387.04068	1231.7028	0	258.79
15	Optimized	217.07055	-13.998925	387.03359	1184.3651	0	251.48
16	Optimized	218.4796	-13.998875	387.02649	1137.4532	0	244.18
17	Optimized	219.8886	-13.99882	387.01939	1091.1091	0	236.87
18	Optimized	221.2976	-13.998765	387.0123	1045.3328	0	229.57
19	Optimized	222.38325	-13.95135	384.04749	1046.175	0	223.85
20	Optimized	223.51585	-13.810525	375.27412	995.10503	0	217.8
21	Optimized	225.22575	-13.496895	355.71834	941.00325	0	208.83

22	Optimized	226.5921	-13.142395	333.59642	890.60336	0	201.97
23	Optimized	227.7527	-12.760265	309.76145	835.25933	0	200
24	Optimized	229.3635	-12.181535	273.64394	785.59891	0	200
25	Optimized	231.07965	-11.519725	232.34156	710.68159	0	200
26	Optimized	232.6681	-10.872895	191.96623	650.04505	0	200
27	Optimized	234.1289	-10.24104	152.53377	578.79519	0	200
28	Optimized	235.6303	-9.5528075	109.57141	513.63423	0	200
29	Optimized	237.17225	-8.8082025	63.101965	429.83505	0	200
30	Optimized	238.58935	-8.076925	17.459613	363.57339	0	200
31	Optimized	239.9123	-7.34194	28.409168	280.99832	0	200
32	Optimized	241.4296	-6.3095055	92.837643	440.61077	0	500

Slices of Slip Surface: 3723

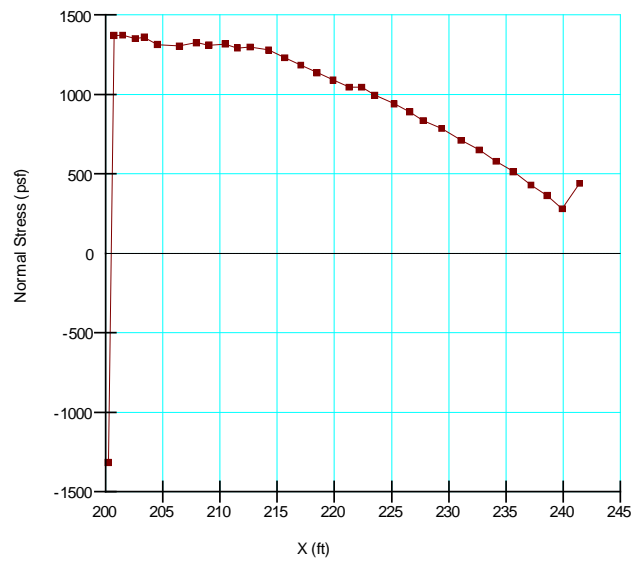
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	3723	200.25	-10.992335	1018.7549	-1280.9246	0	315.93
2	3723	200.75	-11.173825	1028.682	1292.9968	0	314.98
3	3723	201.55	-11.44812	1046.8281	1318.228	0	313.28
4	3723	202.65	-11.80357	1070.2302	1358.4559	0	310.66
5	3723	203.775	-12.136425	1092.1554	1377.5785	0	307.62
6	3723	204.925	-12.446005	1112.4656	1375.144	0	304.16
7	3723	206.2315	-12.75813	311.57006	1367.8198	0	299.8
8	3723	207.69445	-13.064205	329.91093	1354.4651	0	294.47
9	3723	209.1574	-13.3225	345.51205	1335.4652	0	288.67
10	3723	210.6204	-13.5338	358.41575	1310.9911	0	282.45
11	3723	212.06515	-13.697255	368.43082	1285.8241	0	275.94
12	3723	213.4917	-13.81447	375.63489	1260.6958	0	269.19
13	3723	214.9183	-13.88839	380.19463	1231.2859	0	262.18
14	3723	216.34485	-13.919215	382.08948	1197.46	0	254.94
15	3723	217.7714	-13.90703	381.32547	1159.3096	0	247.54

3/9/2012

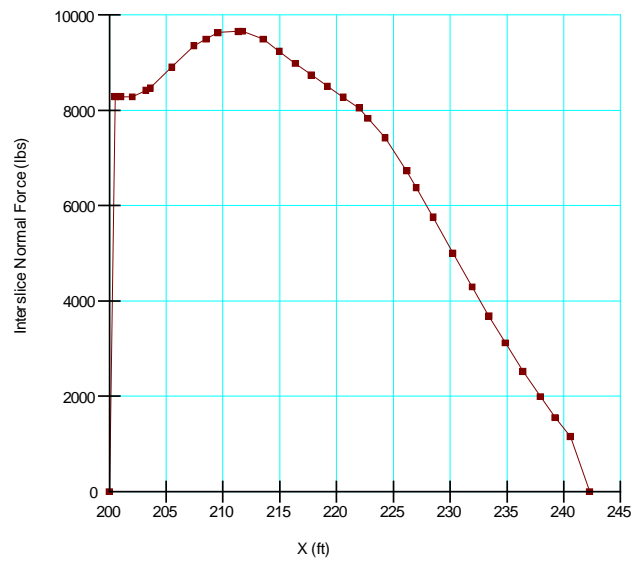
3/9/2012

16	3723	219.198	-13.8518	377.87766	1116.8687	0	240.03
17	3723	220.6246	-13.753375	371.74049	1070.1186	0	232.46
18	3723	222.05115	-13.61149	362.89247	1019.0573	0	224.92
19	3723	223.47035	-13.426925	351.37164	964.02735	0	217.5
20	3723	224.8822	-13.19962	337.19566	904.94518	0	210.29
21	3723	226.29405	-12.928205	320.25469	841.56744	0	203.34
22	3723	227.71545	-12.60946	300.35581	793.02087	0	200
23	3723	229.1463	-12.241815	277.41057	758.9153	0	200
24	3723	230.57715	-11.825945	251.4455	719.8757	0	200
25	3723	232.008	-11.360505	222.39558	675.71498	0	200
26	3723	233.43885	-10.84393	190.14982	626.23059	0	200
27	3723	234.8697	-10.274407	154.60516	571.07857	0	200
28	3723	236.30055	-9.649828	115.62421	509.98263	0	200
29	3723	237.7314	-8.967756	73.054777	442.57778	0	200
30	3723	239.16225	-8.225363	26.718829	368.42066	0	200
31	3723	240.5931	-7.419353	-23.582116	287.0106	0	200
32	3723	242.3078	-6.355507	-89.975006	364.76502	0	500

Base Normal Stress Vs. X



Interslice Normal Stress Vs. X



Gap Stability (Fully spec)

Report generated using GeoStudio 2007, version 7.15. Copyright © 1991-2009 GEO-SLOPE International Ltd.

File Information

Created By: Lijegren, James
Revision Number: 383
Last Edited By: Schroeder, Danielle V MVN
Date: 2/17/2012
Time: 2:07:11 PM
File Name: Reach 35A.gsz
Directory: G:\F&M\HOME\Middleton\London Ave Canal\Reach 35A\optimization check\
Last Solved Date: 2/17/2012
Last Solved Time: 2:07:32 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 Stability (Fully spec)

Kind: SLOPE/W
Parent: Gap Analysis (Seepage)
Method: Spencer
Settings
 PWP Conditions Source: Parent Analysis
SlipSurface
 Direction of movement: Left to Right
 Use Passive Mode: Yes
 Slip Surface Option: Fully-Specified
 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. +2.6 TO -6

Model: Undrained (Phi=0)
Unit Weight: 110 pcf
Cohesion: 450 psf

MARSH, EL. -6 TO -12

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

BEACH SAND, EL. -12 TO -40

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

BAY SOUND CLAY, EL. -40 TO -70

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

Sheet Pile

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

FILL, EL. -6.8 to -8 (protected)

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

EMBANKMENT FILL 2, EL. -4 to -6

Model: Undrained (Phi=0)
Unit Weight: 88 pcf
Cohesion: 450 psf

3/14/2012

3/14/2012

Slip Surface Limits

Left Coordinate: (102.4, -21.5) ft
Right Coordinate: (310, -6.3) ft

Fully Specified Slip Surfaces

Fully Specified Slip Surface 1

X (ft)	Y (ft)
188	-4
200	-12
227	-12
235	-4

FullySpecFixedPoints
[1]
flag: Yes

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: (174.8, 150)
 Data Point: (200, 275)
 Data Point: (227.4, 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, 5773)
Estimation Properties
 Intact Rock Param.: 10

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

Unit Weight Functions

Clay

Model: Spline Data Point Function
Function: Unit Weight vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 107
Data Points: X (ft), Unit Weight (pcf)
 Data Point: (103, 107)
 Data Point: (174.8, 107)
 Data Point: (200, 108)
 Data Point: (227.4, 107)
 Data Point: (310, 107)

Spatial Functions

CLAY

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
 Data Point: (102.4, -40, 400)
 Data Point: (102.4, -70, 700)
 Data Point: (174.8, -40, 400)
 Data Point: (174.8, -70, 700)
 Data Point: (200, -40, 600)
 Data Point: (200, -70, 900)
 Data Point: (227.4, -40, 400)
 Data Point: (227.4, -70, 700)
 Data Point: (310, -40, 400)
 Data Point: (310, -70, 700)

Regions

	Points	Area (ft²)	Material
Region 1	2,35,31,36,41	61.349915	
Region 2	40,4,25,11,14,36,37	78.311328	EMBANKMENT FILL 2, EL. -4 to -6
Region 3	1,28,29,44,45,18,9,12	757.09176	
Region 4	12,9,18,22,16,20,6,5	3893.75	BEACH SAND, EL. -12 TO -40
Region 5	5,6,8,7	6228	BAY SOUND CLAY, EL. -40 TO -70

3/14/2012

3/14/2012

Region 6	18,17,21,15,19,20,16,22	991.85	BEACH SAND, EL. -12 TO -40
Region 7	44,43,30,42,14,24,34,17	253.04524	
Region 8	17,34,24,14,11,25,15,21	140.5	MARSH, EL. -6 TO -12
Region 9	44,17,18,45	129.44189	
Region 10	15,25,26,19	330.4	MARSH, EL. -6 TO -12
Region 11	4,25,26,27,38,39	163.94	FILL, EL. -6.8 to -8 (protected)
Region 12	13,32,33,23	7.725	Sheet Pile
Region 13	42,41,36,14	44.47119	
Region 14	36,31,13,23,46,3,40,37	101.34367	EMBANKMENT FILL, EL. +2.6 TO -6

Points

	X (ft)	Y (ft)
Point 1	102.4	-15
Point 2	189.2	-1.1
Point 3	207.5	1.9
Point 4	227.4	-4.5
Point 5	102.4	-40
Point 6	310	-40
Point 7	102.4	-70
Point 8	310	-70
Point 9	200	-21.5
Point 10	203.5	-21.5
Point 11	203.5	-6
Point 12	102.4	-21.5
Point 13	200	2.6
Point 14	200	-6
Point 15	227.4	-12
Point 16	227.4	-22
Point 17	200	-12
Point 18	200	-15
Point 19	310	-12
Point 20	310	-22
Point 21	203.5	-12
Point 22	203.5	-15
Point 23	201	2.6
Point 24	200	-7
Point 25	227.4	-8
Point 26	310	-8
Point 27	310	-6.3
Point 28	102.4	-14.2
Point 29	131.8	-12.5
Point 30	171.9	-7
Point 31	200	1.9

Point 32	200	12.9
Point 33	200.5	12.9
Point 34	200	-10
Point 35	199	1.9
Point 36	200	-4
Point 37	203.5	-4
Point 38	282.9	-6.3
Point 39	241.2	-5.9
Point 40	225.84531	-4
Point 41	180.69661	-4
Point 42	174.8322	-6
Point 43	160.7	-8.8
Point 44	135.70541	-12
Point 45	178	-15
Point 46	203.5	2.33077
Point 47	203.5	-51

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.08	(215.884, -3.442)	15.74698	(200, 12.9)	(237.153, -5.48942)
2	1	1.20	(215.884, -3.442)	14.953	(200, 12.9)	(233.846, -5.15395)

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	-11.994685	1247.2184	-3326.049	0	273.86
2	Optimized	200.75	-11.98406	1246.3986	1488.5439	0	271.58
3	Optimized	201.5598	-11.966855	1245.1857	1479.1491	0	267.88
4	Optimized	202.3894	-11.953685	1244.2836	1458.6344	0	264.1
5	Optimized	203.0796	-11.95776	1244.5022	1441.2154	0	260.95
6	Optimized	204.32605	-11.973625	1229.78536	1426.8905	0	255.26
7	Optimized	205.69825	-11.99137	1230.825	1410.9481	0	249
8	Optimized	206.8722	-11.99858	1231.24278	1403.4166	0	243.65
9	Optimized	208.08595	-11.99854	1231.22137	1374.2209	0	238.11
10	Optimized	209.2578	-11.9985	1231.21284	1331.8098	0	232.77
11	Optimized	210.42965	-11.99846	1231.19577	1289.4841	0	227.42
12	Optimized	211.60155	-11.99842	1231.18724	1247.073	0	222.07
13	Optimized	212.7734	-11.99838	1231.17017	1204.662	0	216.73
14	Optimized	213.45255	-11.99746	1231.11153	1184.0833	0	213.63

3/14/2012

3/14/2012

15	Optimized	214.2296	-11.99699	231.07499	1151.5727	0	210.08
16	Optimized	215.5972	-11.997845	231.11886	1102.1433	0	203.84
17	Optimized	216.9648	-11.9987	231.16273	1052.7139	0	197.61
18	Optimized	218.3324	-11.999555	231.21392	1003.3577	0	191.37
19	Optimized	219.58995	-11.996425	231.01117	960.01924	0	185.63
20	Optimized	220.73745	-11.989315	230.558	917.7526	0	180.39
21	Optimized	221.8374	-11.92499	226.54937	909.13295	0	175.38
22	Optimized	222.88985	-11.80345	218.9606	858.72992	0	170.58
23	Optimized	223.95705	-11.62087	207.57084	837.55102	0	165.71
24	Optimized	225.03895	-11.37725	192.36821	773.14275	0	160.77
25	Optimized	225.7126	-11.20971	181.90705	768.25706	0	157.7
26	Optimized	226.62265	-10.89608	162.33608	707.90573	0	153.55
27	Optimized	228.04055	-10.40742	131.83646	659.71361	0	150
28	Optimized	229.593	-9.846535	96.824872	598.35479	0	150
29	Optimized	231.1927	-9.2109475	57.158392	536.0887	0	150
30	Optimized	232.56825	-8.6200225	20.276494	464.80436	0	150
31	Optimized	233.48525	-8.16228	8.2920977	481.31586	0	150
32	Optimized	234.49045	-7.450735	-52.64222	825.88817	0	600
33	Optimized	235.738	-6.5484565	-109.00674	744.39986	0	600
34	Optimized	236.6812	-5.842429	-153.06607	654.50728	0	600

Slices of Slip Surface: **1**

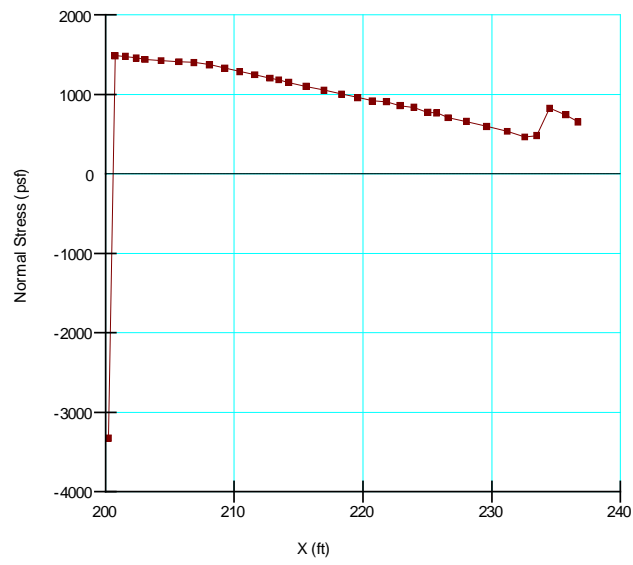
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	1	200.25	-12	1247.58	-3259.6	0	273.86
2	1	200.75	-12	1247.48	1473.28	0	271.58
3	1	201.625	-12	1247.44	1464.72	0	267.59
4	1	202.875	-12	1247.44	1449.04	0	261.88
5	1	204	-12	231.39	1434.9	0	256.75
6	1	205	-12	231.37	1422.3	0	252.19
7	1	206	-12	231.34	1409.8	0	247.63
8	1	207	-12	231.33	1397.2	0	243.07
9	1	208.0733	-12	231.31359	1370.2465	0	238.17
10	1	209.2199	-12	231.30487	1328.819	0	232.94
11	1	210.36645	-12	231.28743	1287.4788	0	227.71

12	1	211.513	-12	231.2787	1246.0513	0	222.48
13	1	212.6596	-12	231.26998	1204.711	0	217.25
14	1	213.8062	-12	231.26998	1163.2836	0	212.02
15	1	214.9528	-12	231.26126	1121.9433	0	206.78
16	1	216.0994	-12	231.25254	1080.5158	0	201.55
17	1	217.24595	-12	231.24382	1039.1756	0	196.32
18	1	218.3925	-12	231.2351	997.74809	0	191.09
19	1	219.5391	-12	231.2351	956.40783	0	185.86
20	1	220.6857	-12	231.22638	914.98035	0	180.63
21	1	221.8323	-12	231.22638	873.55287	0	175.4
22	1	222.97885	-12	231.21765	832.20389	0	170.17
23	1	224.1254	-12	231.20893	790.82002	0	164.94
24	1	225.272	-12	231.20893	749.43615	0	159.71
25	1	226.42265	-12	231.20491	711.9833	0	154.46
26	1	227.2	-11.8	218.72581	983.99216	0	150.91
27	1	228	-11	168.80409	916.35161	0	150
28	1	229.2	-9.8	93.927366	771.6304	0	150
29	1	230.4	-8.6	19.042389	626.90919	0	150
30	1	231.47435	-7.525658	-47.997156	1042.3794	0	600
31	1	232.42305	-6.576974	-107.197	918.57589	0	600
32	1	233.37175	-5.6282895	-166.40057	794.77238	0	600

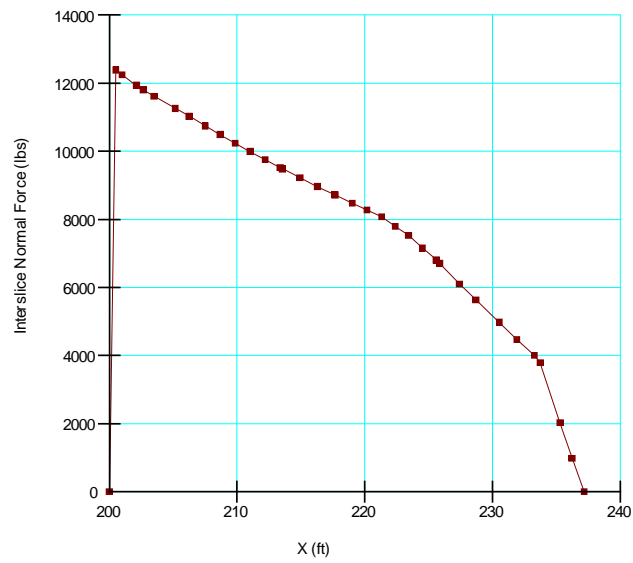
3/14/2012

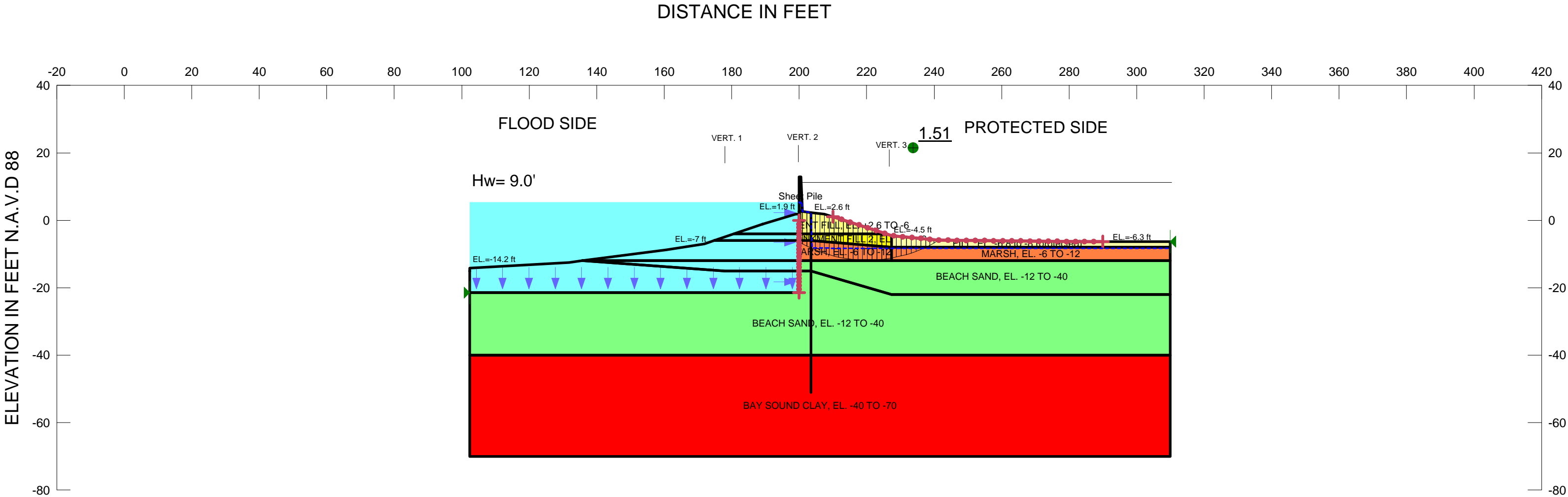
3/14/2012

Base Normal Stress Vs. X



Interslice Normal Stress Vs. X





Name: EMBANKMENT FILL, EL. +2.6 TO -6 Model: Undrained (Phi=0) Unit Weight: 110 pcf Cohesion: 450 psf
Name: MARSH, EL. -6 TO -12 Model: Spatial Mohr-Coulomb Unit Weight: 88 pcf Cohesion Fn: Marsh Phi: 0 °
Name: BEACH SAND, EL. -12 TO -40 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Sand
Name: BAY SOUND CLAY, EL. -40 TO -70 Model: Spatial Mohr-Coulomb Weight Fn: Clay Cohesion Spatial Fn: CLAY Phi: 0 °
Name: Sheet Pile Model: Undrained (Phi=0) Unit Weight: 0.1 pcf Cohesion: 0.01 psf
Name: FILL, EL. -6.8 to -8 (protected) Model: Undrained (Phi=0) Unit Weight: 96 pcf Cohesion: 600 psf
Name: EMBANKMENT FILL 2, EL. -4 TO -6 Model: Undrained (Phi=0) Unit Weight: 88 pcf Cohesion: 450 psf



GENERAL NOTES

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

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

Hw=CANAL WATER LEVEL

LONDON AVE CANAL
OUTFALL CANAL REEVALUATION REPORT
REACH 35A, STA. 102+42 TO 103+50 EAST
PROTECTED SIDE STABILITY ANALYSIS,
1% FLOWLINE WATER EL +5.4
CASE: Gap Stability (Entry/Exit)
MARCH 2012

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

Gap Stability (Entry/Exit)

Report generated using GeoStudio 2007, version 7.15. Copyright © 1991-2009 GEO-SLOPE International Ltd.

File Information

Created By: Lijegren, James
Revision Number: 382
Last Edited By: Schroeder, Danielle V MVN
Date: 2/15/2012
Time: 5:09:39 PM
File Name: Reach 35A Low water surf.gsz
Directory: G:\F&MHOME\London Ave Reevaluation 2011\East Side\Reach 35A 1% flowline\SlopeW\
Last Solved Date: 2/15/2012
Last Solved Time: 5:12:14 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 Stability (Entry/Exit)

Kind: SLOPE/W
Parent: Gap Analysis (Seepage)
Method: Spencer
Settings
PWP Conditions Source: Parent Analysis
SlipSurface
Direction of movement: Left to Right
Use Passive Mode: Yes
Slip Surface Option: Entry and Exit
Critical slip surfaces saved: 1
Optimize Critical Slip Surface Location: Yes
Tension Crack
Tension Crack Option: (none)
FOS Distribution
FOS Calculation Option: Constant
Advanced
Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft

3/9/2012

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (200, -21.5) ft
Left-Zone Right Coordinate: (200, 0) ft
Left-Zone Increment: 20
Right Projection: Range
Right-Zone Left Coordinate: (210, 1.09598) ft
Right-Zone Right Coordinate: (290, -6.3) ft
Right-Zone Increment: 30
Radius Increments: 20

Slip Surface Limits

Left Coordinate: (102.4, -21.5) ft
Right Coordinate: (310, -6.3) ft

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: (174.8, 150)
Data Point: (200, 275)
Data Point: (227.4, 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, 5773)
Estimation Properties
Intact Rock Param.: 10
Geological Strength: 100
Disturbance Factor: 0

3/9/2012

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. +2.6 TO -6

Model: Undrained (Phi=0)
Unit Weight: 110 pcf
Cohesion: 450 psf

MARSH, EL. -6 TO -12

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

BEACH SAND, EL. -12 TO -40

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

BAY SOUND CLAY, EL. -40 TO -70

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

Sheet Pile

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

FILL, EL. -6.8 to -8 (protected)

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

EMBANKMENT FILL 2, EL. -4 to -6

Model: Undrained (Phi=0)
Unit Weight: 88 pcf
Cohesion: 450 psf

3/9/2012

SigmaC: 600000 psf
Sigma3: 300000 psf
Num. Points: 20

Unit Weight Functions

Clay

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 107
Data Points: X (ft), Unit Weight (pcf)
Data Point: (103, 107)
Data Point: (174.8, 107)
Data Point: (200, 108)
Data Point: (227.4, 107)
Data Point: (310, 107)

Spatial Functions

CLAY

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (102.4, -40, 400)
Data Point: (102.4, -70, 700)
Data Point: (174.8, -40, 400)
Data Point: (174.8, -70, 700)
Data Point: (200, -40, 600)
Data Point: (200, -70, 900)
Data Point: (227.4, -40, 400)
Data Point: (227.4, -70, 700)
Data Point: (310, -40, 400)
Data Point: (310, -70, 700)

Regions

	Points	Area (ft²)	Material
Region 1	2,35,31,36,41	61.349915	
Region 2	40,4,25,11,14,36,37	78.311328	EMBANKMENT FILL 2, EL. -4 to -6
Region 3	1,28,29,44,45,18,9,12	757.09176	
Region 4	12,9,18,22,16,20,6,5	3893.75	BEACH SAND, EL. -12 TO -40
Region 5	5,6,8,7	6228	BAY SOUND CLAY, EL. -40 TO -70
Region 6	18,17,21,15,19,20,16,22	991.85	BEACH SAND, EL. -12 TO -40
Region 7	44,43,30,42,14,24,34,17	253.04524	

3/9/2012

Region 8	17,34,24,14,11,25,15,21	140.5	MARSH, EL. -6 TO -12
Region 9	44,17,18,45	129.44189	
Region 10	15,25,26,19	330.4	MARSH, EL. -6 TO -12
Region 11	4,25,26,27,38,39	163.94	FILL, EL. -6.8 to -8 (protected)
Region 12	13,32,33,23	7.725	Sheet Pile
Region 13	42,41,36,14	44.47119	
Region 14	36,31,13,23,46,3,40,37	101.34367	EMBANKMENT FILL, EL. +2.6 TO -6

Points

	X (ft)	Y (ft)
Point 1	102.4	-15
Point 2	189.2	-1.1
Point 3	207.5	1.9
Point 4	227.4	-4.5
Point 5	102.4	-40
Point 6	310	-40
Point 7	102.4	-70
Point 8	310	-70
Point 9	200	-21.5
Point 10	203.5	-21.5
Point 11	203.5	-6
Point 12	102.4	-21.5
Point 13	200	2.6
Point 14	200	-6
Point 15	227.4	-12
Point 16	227.4	-22
Point 17	200	-12
Point 18	200	-15
Point 19	310	-12
Point 20	310	-22
Point 21	203.5	-12
Point 22	203.5	-15
Point 23	201	2.6
Point 24	200	-7
Point 25	227.4	-8
Point 26	310	-8
Point 27	310	-6.3
Point 28	102.4	-14.2
Point 29	131.8	-12.5
Point 30	171.9	-7
Point 31	200	1.9
Point 32	200	12.9
Point 33	200.5	12.9

Point 34	200	-10
Point 35	199	1.9
Point 36	200	-4
Point 37	203.5	-4
Point 38	282.9	-6.3
Point 39	241.2	-5.9
Point 40	225.84531	-4
Point 41	180.69661	-4
Point 42	174.8322	-6
Point 43	160.7	-8.8
Point 44	135.70541	-12
Point 45	178	-15
Point 46	203.5	2.33077
Point 47	203.5	-51

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.51	(220.248, 29.179)	40.98098	(200, 12.9)	(241.432, -5.90222)
2	9372	1.51	(220.248, 29.179)	40.981	(200, 12.9)	(241.432, -5.90222)

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	-6.5897745	732.24443	-307.15303	0	273.86
2	Optimized	200.75	-6.8647885	746.95103	843.43792	0	271.58
3	Optimized	201.625	-7.318937	776.37207	882.76247	0	267.59
4	Optimized	202.875	-7.9304475	815.67652	932.32595	0	261.88
5	Optimized	204.16665	-8.507529	18.979714	978.71698	0	255.99
6	Optimized	205.5	-9.049206	51.058065	1021.7491	0	249.91
7	Optimized	206.83335	-9.537398	80.263453	1059.951	0	243.83
8	Optimized	208.2056	-9.9853565	107.20103	1078.445	0	237.57
9	Optimized	209.6168	-10.39189	131.95805	1076.77	0	231.13
10	Optimized	211.02795	-10.744415	153.50847	1069.8573	0	224.69
11	Optimized	212.4391	-11.04436	171.96199	1057.7888	0	218.25
12	Optimized	213.8503	-11.292895	187.29588	1040.6649	0	211.81
13	Optimized	215.2615	-11.490955	199.55027	1018.5356	0	205.38

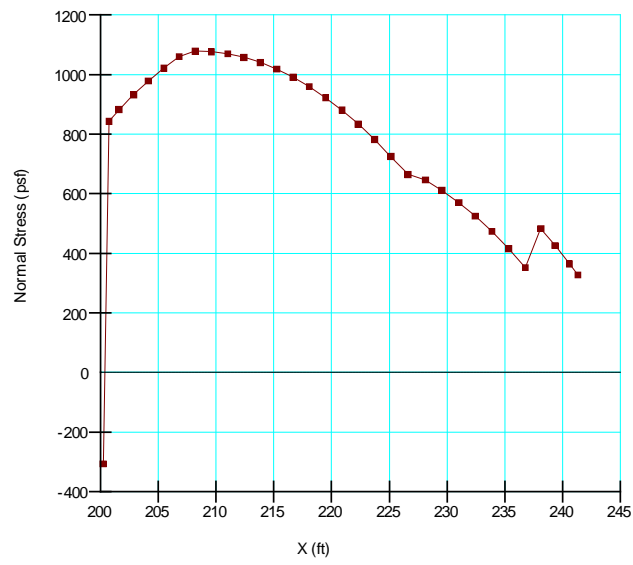
14	Optimized	216.67265	-11.63928	208.74189	991.47102	0	198.94
15	Optimized	218.0838	-11.738415	214.89565	959.48699	0	192.5
16	Optimized	219.495	-11.788715	218.0151	922.5487	0	186.06
17	Optimized	220.9062	-11.79036	218.10877	880.63995	0	179.63
18	Optimized	222.3174	-11.74336	215.16936	833.76976	0	173.19
19	Optimized	223.72855	-11.64754	209.17958	781.82864	0	166.75
20	Optimized	225.1397	-11.502555	200.12791	724.73812	0	160.31
21	Optimized	226.62265	-11.2953	187.19041	664.54787	0	153.55
22	Optimized	228.12045	-11.031835	170.74184	646.49512	0	150
23	Optimized	229.56135	-10.722645	151.44501	611.21388	0	150
24	Optimized	231.00225	-10.358545	128.71392	570.7143	0	150
25	Optimized	232.44315	-9.9379935	102.46594	524.78596	0	150
26	Optimized	233.884	-9.45915	72.586029	473.17373	0	150
27	Optimized	235.32485	-8.9198095	38.922873	415.59032	0	150
28	Optimized	236.76575	-8.317358	1.324428	351.67556	0	150
29	Optimized	238.10515	-7.700302	-37.184657	482.90468	0	600
30	Optimized	239.3431	-7.074599	-76.232706	426.42	0	600
31	Optimized	240.58105	-6.3948195	-118.6578	364.72597	0	600
32	Optimized	241.3158	-5.9716335	-145.06273	327.3234	0	600

Slices of Slip Surface: **9372**

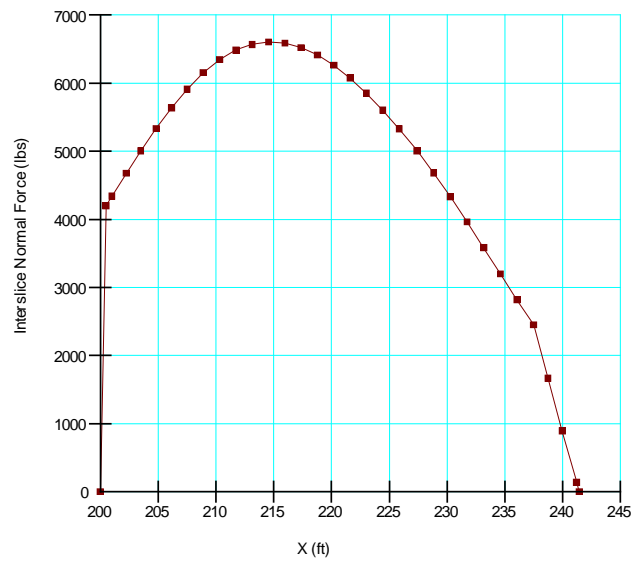
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	9372	200.25	-6.5897745	732.24443	-307.15303	0	273.86
2	9372	200.75	-6.8647885	746.95103	843.43792	0	271.58
3	9372	201.625	-7.318937	776.37207	882.76247	0	267.59
4	9372	202.875	-7.9304475	815.67652	932.32595	0	261.88
5	9372	204.16665	-8.507529	18.979714	978.71698	0	255.99
6	9372	205.5	-9.049206	51.058065	1021.7491	0	249.91
7	9372	206.83335	-9.537398	80.263453	1059.951	0	243.83

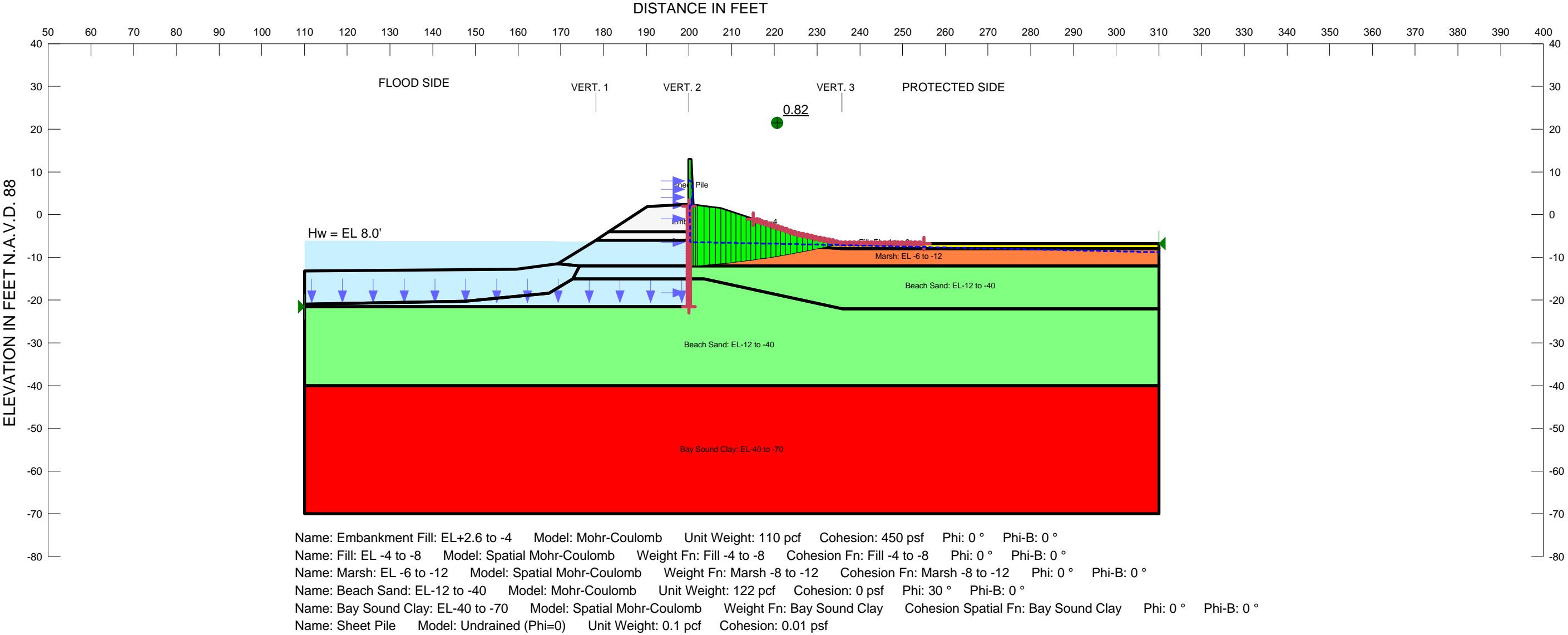
8	9372	208.2056	9.9853565	107.20103	1078.445	0	237.57
9	9372	209.6168	-10.39189	131.95805	1076.77	0	231.13
10	9372	211.02795	-10.744415	153.50847	1069.8573	0	224.69
11	9372	212.4391	-11.04436	171.96199	1057.7888	0	218.25
12	9372	213.8503	-11.292895	187.29588	1040.6649	0	211.81
13	9372	215.2615	-11.490955	199.55027	1018.5356	0	205.38
14	9372	216.67265	-11.63928	208.74189	991.47102	0	198.94
15	9372	218.0838	-11.738415	214.89565	959.48699	0	192.5
16	9372	219.495	-11.788715	218.0151	922.5487	0	186.06
17	9372	220.9062	-11.79036	218.10877	880.63995	0	179.63
18	9372	222.3174	-11.74336	215.16936	833.76976	0	173.19
19	9372	223.72855	-11.64754	209.17958	781.82864	0	166.75
20	9372	225.1397	-11.502555	200.12791	724.73812	0	160.31
21	9372	226.62265	-11.2953	187.19041	664.54787	0	153.55
22	9372	228.12045	-11.031835	170.74184	646.49512	0	150
23	9372	229.56135	-10.722645	151.44501	611.21388	0	150
24	9372	231.00225	-10.358545	128.71392	570.7143	0	150
25	9372	232.44315	-9.9379935	102.46594	524.78596	0	150
26	9372	233.884	-9.45915	72.586029	473.17373	0	150
27	9372	235.32485	-8.9198095	38.922873	415.59032	0	150
28	9372	236.76575	-8.317358	1.324428	351.67556	0	150
29	9372	238.10515	-7.700302	-37.184657	482.90468	0	600
30	9372	239.3431	-7.074599	-76.232706	426.42	0	600
31	9372	240.58105	-6.3948195	-118.6578	364.72597	0	600
32	9372	241.3158	-5.9716335	-145.06273	327.3234	0	600

Base Normal Stress Vs. X



Interslice Normal Stress Vs. X





GENERAL NOTES

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

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

Hw=CANAL WATER LEVEL

LONDON AVE CANAL
OUTFALL CANAL REEVALUATION REPORT
REACH 35B, STA. 103+50 TO 114+66
PROTECTED SIDE STABILITY ANALYSIS
CASE: GAP Stability (Entry/Exit)
MARCH 2012

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

GAP Stability (Entry/Exit)

Report generated using GeoStudio 2007, version 7.15. Copyright © 1991-2009 GEO-SLOPE International Ltd.

File Information

Revision Number: 52
Last Edited By: Haggerty, Daniel R MVN
Date: 3/16/2012
Time: 8:02:24 AM
File Name: Reach 35B.gsz
Last Solved Date: 3/16/2012
Last Solved Time: 8:03:36 AM

Project Settings

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

Analysis Settings

GAP Stability (Entry/Exit)

Kind: SLOPE/W
Parent: Steady-State Seepage
Method: Spencer
Settings
 PWP Conditions Source: Parent Analysis
SlipSurface
 Direction of movement: Left to Right
 Use Passive Mode: Yes
 Slip Surface Option: Entry and Exit
 Critical slip surfaces saved: 1
 Optimize Critical Slip Surface Location: Yes
 Tension Crack
 Tension Crack Option: (none)
FOS Distribution
 FOS Calculation Option: Constant
Advanced
 Number of Slices: 30
 Optimization Tolerance: 0.01
 Minimum Slip Surface Depth: 0.1 ft

Sheet Pile

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

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (200, -21.5) ft
Left-Zone Right Coordinate: (200, 2) ft
Left-Zone Increment: 40
Right Projection: Range
Right-Zone Left Coordinate: (215, -1.08466) ft
Right-Zone Right Coordinate: (255, -6.8) ft
Right-Zone Increment: 40
Radius Increments: 30

Slip Surface Limits

Left Coordinate: (110, -21.5) ft
Right Coordinate: (310, -6.8) ft

Cohesion Functions

Fill -4 to -8

Model: Spline Data Point Function
Function: Cohesion vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 600
Data Points: X (ft), Cohesion (psf)
 Data Point: (110, 600)
 Data Point: (178.1, 600)
 Data Point: (178.3, 450)
 Data Point: (200, 450)
 Data Point: (235.7, 450)
 Data Point: (235.9, 600)
 Data Point: (310, 600)

Marsh -8 to -12

Model: Spline Data Point Function
Function: Cohesion vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 150

Optimization Maximum Iterations: 5000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

Embankment Fill: EL+2.6 to -4

Model: Mohr-Coulomb
Unit Weight: 110 pcf
Cohesion: 450 psf
Phi: 0 °
Phi-B: 0 °

Fill: EL -4 to -8

Model: Spatial Mohr-Coulomb
Weight Fn: Fill -4 to -8
Cohesion Fn: Fill -4 to -8
Phi: 0 °
Phi-B: 0 °

Marsh: EL -6 to -12

Model: Spatial Mohr-Coulomb
Weight Fn: Marsh -8 to -12
Cohesion Fn: Marsh -8 to -12
Phi: 0 °
Phi-B: 0 °

Beach Sand: EL-12 to -40

Model: Mohr-Coulomb
Unit Weight: 122 pcf
Cohesion: 0 psf
Phi: 30 °
Phi-B: 0 °

Bay Sound Clay: EL-40 to -70

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

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

Data Point: (110, 150)
Data Point: (178.2, 150)
Data Point: (200, 275)
Data Point: (235.8, 150)
Data Point: (310, 150)

Unit Weight Functions

Fill -4 to -8

Model: Spline Data Point Function
Function: Unit Weight vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 96

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

Data Point: (110, 96)
Data Point: (178.1, 96)
Data Point: (178.3, 88)
Data Point: (200, 88)
Data Point: (235.7, 88)
Data Point: (235.9, 96)
Data Point: (310, 96)

Marsh -8 to -12

Model: Spline Data Point Function
Function: Unit Weight vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 96

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

Data Point: (110, 96)
Data Point: (178.2, 96)
Data Point: (200, 88)
Data Point: (235.8, 96)
Data Point: (310, 96)

Bay Sound Clay

Model: Spline Data Point Function
Function: Unit Weight vs. X
 Curve Fit to Data: 100 %
 Segment Curvature: 0 %
Y-Intercept: 107

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

Data Point: (110, 107)
Data Point: (178.2, 107)

Data Point: (200, 108)
Data Point: (235.8, 107)
Data Point: (310, 107)

Spatial Functions

Bay Sound Clay

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (110, -40, 400)
Data Point: (110, -70, 700)
Data Point: (178.2, -40, 400)
Data Point: (178.2, -70, 700)
Data Point: (200, -40, 600)
Data Point: (200, -70, 900)
Data Point: (235.8, -40, 400)
Data Point: (235.8, -70, 700)
Data Point: (310, -40, 400)
Data Point: (310, -70, 700)

Regions

	Material	Points	Area (ft²)
Region 1	Bay Sound Clay: EL-40 to -70	1,3,4,2	6000
Region 2	Beach Sand: EL-12 to -40	3,9,7,14,15,5,6,4	3782.9
Region 3		9,10,11,12,13,14,7	279.66
Region 4		13,18,20,14	79.2
Region 5	Beach Sand: EL-12 to -40	14,20,22,19,21,6,5,15	962.1
Region 6		10,16,17,23,18,13,12,11	446.445
Region 7		23,32,31,27,24,20,18	158.45
Region 8	Marsh: EL -6 to -12	20,24,27,31,30,25,26,21,19,22	479.3
Region 9		32,33,37,35,31	40.6
Region 10	Fill: EL -4 to -8	31,35,38,36,34,28,29,26,25,30	175.24
Region 11		37,41,46,45,43,35	87.07
Region 12	Embankment Fill: EL+2.6 to -4	43,44,42,40,39,36,38,35	87.9045
Region 13	Sheet Pile	43,45,47,48,44	8.025

Points

	X (ft)	Y (ft)
Point 1	110	-70
Point 2	310	-70
Point 3	110	-40
Point 4	310	-40
Point 5	235.9	-22
Point 6	310	-22
Point 7	200	-21.5
Point 8	203.5	-21.5
Point 9	110	-21.5
Point 10	110	-20.9
Point 11	147.6	-20.3
Point 12	167.2	-18.4
Point 13	172.8	-15
Point 14	200	-15
Point 15	203.5	-15
Point 16	110	-13.2
Point 17	159.5	-12.8
Point 18	174.4	-12
Point 19	235.8	-12
Point 20	200	-12
Point 21	310	-12
Point 22	203.5	-12
Point 23	169.3	-11.5
Point 24	200	-10
Point 25	235.8	-8
Point 26	310	-8
Point 27	200	-7
Point 28	235.8	-6.8
Point 29	310	-6.8
Point 30	203.5	-6
Point 31	200	-6
Point 32	178.2	-6
Point 33	178.8	-5.6

Point 34	225.3	-4.5
Point 35	200	-4
Point 36	223.8	-4
Point 37	181.2	-4
Point 38	203.5	-4
Point 39	207.5	1.4
Point 40	203.5	1.89
Point 41	190.2	1.9
Point 42	201.9	2.09
Point 43	200	2.2
Point 44	201	2.2
Point 45	200	2.4
Point 46	199	2.4
Point 47	200	12.9
Point 48	200.5	12.9

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	0.82	(186.878, 196.987)	209.4987	(200, 12.9)	(235.624, -6.76144)
2	20988	0.82	(186.878, 196.987)	209.499	(200, 12.9)	(235.624, -6.76144)

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	-12.08401	486.70556	-6479.7606	-4022.0911	0
2	Optimized	200.75	-12.05143	344.14309	1721.8729	795.43268	0
3	Optimized	201.2533	-12.01742	341.93309	1717.1095	793.95847	0
4	Optimized	201.7033	-11.986045	339.93744	1508.6863	0	269.05
5	Optimized	202.7	-11.9115	335.0156	1491.4788	0	265.57
6	Optimized	204.16665	-11.795705	327.20755	1465.3594	0	260.45
7	Optimized	205.5	-11.68101	319.31106	1440.7246	0	255.8
8	Optimized	206.83335	-11.55773	310.66362	1415.0123	0	251.14

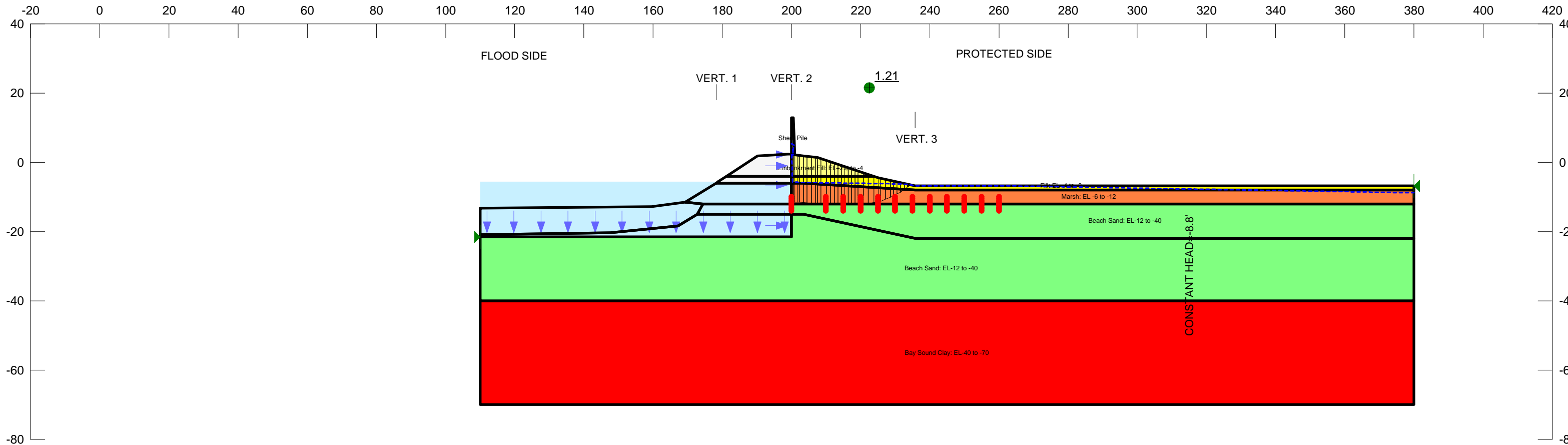
9	Optimized	208.08215	-11.434715	302.02641	1376.2342	0	246.78
10	Optimized	209.24645	-11.312975	293.36991	1324.5327	0	242.71
11	Optimized	210.41075	-11.184655	284.28754	1271.9115	0	238.65
12	Optimized	211.575	-11.04974	274.68718	1218.2921	0	234.58
13	Optimized	212.73925	-10.90822	264.67302	1163.8521	0	230.52
14	Optimized	213.90355	-10.76008	254.1615	1108.3421	0	226.45
15	Optimized	215.06785	-10.6053	243.23154	1051.9409	0	222.39
16	Optimized	216.23215	-10.44387	231.8424	994.57005	0	218.32
17	Optimized	217.39645	-10.275775	220.0301	936.23682	0	214.26
18	Optimized	218.56075	-10.100995	207.7461	876.86529	0	210.19
19	Optimized	219.725	-9.919516	195.04354	816.46329	0	206.13
20	Optimized	220.88925	-9.731324	181.88228	755.06446	0	202.06
21	Optimized	222.05355	-9.5363955	168.29911	692.6452	0	198
22	Optimized	223.21785	-9.334712	154.26232	629.1707	0	193.93
23	Optimized	224.55	-9.0950805	137.63923	560.78082	0	189.28
24	Optimized	225.9094	-8.8424195	120.13152	500.53323	0	184.53
25	Optimized	227.12825	-8.6075495	103.89912	452.36857	0	180.28
26	Optimized	228.3471	-8.365177	87.169465	403.0673	0	176.02
27	Optimized	229.5659	-8.115275	69.957549	352.60712	0	171.77
28	Optimized	230.78475	-7.857816	52.254276	300.98193	0	167.51
29	Optimized	231.9229	-7.61079	35.314056	424.97483	0	450
30	Optimized	232.98035	-7.375112	19.209073	385.1224	0	450
31	Optimized	234.0378	-7.133684	2.7037661	344.62329	0	450
32	Optimized	235.09525	-6.8864855	-14.253412	303.44638	0	450

Slices of Slip Surface: 20988

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	20988	200.25	-12.08401	486.70556	-6479.7606	-4022.0911	0
2	20988	200.75	-12.05143	344.14309	1721.8729	795.43268	0
3	20988	201.2533	-12.01742	341.93309	1717.1095	793.95847	0
4	20988	201.7033	-11.986045	339.93744	1508.6863	0	269.05
5	20988	202.7	-11.9115	335.0156	1491.4788	0	265.57
6	20988	204.16665	-11.795705	327.20755	1465.3594	0	260.45

7	20988	205.5	-11.68101	319.31106	1440.7246	0	255.8
8	20988	206.83335	-11.55773	310.66362	1415.0123	0	251.14
9	20988	208.08215	-11.434715	302.02641	1376.2342	0	246.78
10	20988	209.24645	-11.312975	293.36991	1324.5327	0	242.71
11	20988	210.41075	-11.184655	284.28754	1271.9115	0	238.65
12	20988	211.575	-11.04974	274.68718	1218.2921	0	234.58
13	20988	212.73925	-10.90822	264.67302	1163.8521	0	230.52
14	20988	213.90355	-10.76008	254.1615	1108.3421	0	226.45
15	20988	215.06785	-10.6053	243.23154	1051.9409	0	222.39
16	20988	216.23215	-10.44387	231.8424	994.57005	0	218.32
17	20988	217.39645	-10.275775	220.0301	936.23682	0	214.26
18	20988	218.56075	-10.100995	207.7461	876.86529	0	210.19
19	20988	219.725	-9.919516	195.04354	816.46329	0	206.13
20	20988	220.88925	-9.731324	181.88228	755.06446	0	202.06
21	20988	222.05355	-9.5363955	168.29911	692.6452	0	198
22	20988	223.21785	-9.334712	154.26232	629.1707	0	193.93
23	20988	224.55	-9.0950805	137.63923	560.78082	0	189.28
24	20988	225.9094	-8.8424195	120.13152	500.53323	0	184.53
25	20988	227.12825	-8.6075495	103.89912	452.36857	0	180.28
26	20988	228.3471	-8.365177	87.169465	403.0673	0	176.02
27	20988	229.5659	-8.115275	69.957549	352.60712	0	171.77
28	20988	230.78475	-7.857816	52.254276	300.98193	0	167.51
29	20988	231.9229	-7.61079	35.314056	424.97483	0	450
30	20988	232.98035	-7.375112	19.209073	385.1224	0	450
31	20988	234.0378	-7.133684	2.7037661	344.62329	0	450
32	20988	235.09525	-6.8864855	-14.253412	303.44638	0	450

ELEVATION IN FEET N.A.V.D. 88



Name: Embankment Fill: EL+2.6 to -4 Model: Mohr-Coulomb Unit Weight: 110 pcf Cohesion: 450 psf Phi: 0 ° Phi-B: 0 °
Name: Fill: EL -4 to -8 Model: Spatial Mohr-Coulomb Weight Fn: Fill -4 to -8 Cohesion Fn: Fill -4 to -8 Phi: 0 ° Phi-B: 0 °
Name: Marsh: EL -6 to -12 Model: Spatial Mohr-Coulomb Weight Fn: Marsh -8 to -12 Cohesion Fn: Marsh -8 to -12 Phi: 0 ° Phi-B: 0 °
Name: Beach Sand: EL-12 to -40 Model: Mohr-Coulomb Unit Weight: 122 pcf Cohesion: 0 psf Phi: 30 ° Phi-B: 0 °
Name: Bay Sound Clay: EL-40 to -70 Model: Spatial Mohr-Coulomb Weight Fn: Bay Sound Clay Cohesion Spatial Fn: Bay Sound Clay Phi: 0 ° Phi-B: 0 °
Name: Sheet Pile Model: Undrained (Phi=0) Unit Weight: 0.1 pcf Cohesion: 0.01 psf



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

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

Hw=CANAL WATER LEVEL

LONDON AVE CANAL
OUTFALL CANAL REEVALUATION REPORT
REACH 35B, STA. 103+50 TO 114+66 EAST
PROTECTED SIDE STABILITY ANALYSIS,
1% FLOWLINE WATER EL +5.4
CASE: GAP Stability (Block) (2)
MARCH 2012

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

GAP Stability (Block) (2)

Report generated using GeoStudio 2007, version 7.15. Copyright © 1991-2009 GEO-SLOPE International Ltd.

File Information

Created By: Haggerty, Daniel R MVN
Revision Number: 56
Last Edited By: Curran, Matthew MVN
Date: 2/10/2012
Time: 3:42:10 PM
File Name: Reach 35B Modified FOS min 078.gsz
Directory: Z:\Edf\F&MHOME\London Ave Reeevaluation 2011\East Side\Reach 35B 1% flowline\SlopeW\
Last Solved Date: 2/10/2012
Last Solved Time: 3:42:26 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) (2)

Kind: SLOPE/W
Parent: Steady-State 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

Cohesion Spatial Fn: Bay Sound Clay
Phi: 0 °
Phi-B: 0 °

Sheet Pile

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

Slip Surface Limits

Left Coordinate: (110, -21.5) ft
Right Coordinate: (380, -6.8) ft

Slip Surface Block

Left Grid
Upper Left: (200, -10) ft
Lower Left: (200, -14) ft
Lower Right: (200, -14) ft
X Increments: 0
Y Increments: 8
Starting Angle: 135 °
Ending Angle: 135 °
Angle Increments: 0
Right Grid
Upper Left: (210, -10) ft
Lower Left: (210, -14) ft
Lower Right: (260, -14) ft
X Increments: 10
Y Increments: 8
Starting Angle: 20 °
Ending Angle: 45 °
Angle Increments: 5

Cohesion Functions

Fill -4 to -8

Model: Spline Data Point Function
Function: Cohesion vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 600
Data Points: X (ft), Cohesion (psf)
Data Point: (110, 600)

Restrict Block Crossing: Yes
Advanced
Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 5000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

Embankment Fill: EL+2.6 to -4

Model: Mohr-Coulomb
Unit Weight: 110 pcf
Cohesion: 450 psf
Phi: 0 °
Phi-B: 0 °

Fill: EL -4 to -8

Model: Spatial Mohr-Coulomb
Weight Fn: Fill -4 to -8
Cohesion Fn: Fill -4 to -8
Phi: 0 °
Phi-B: 0 °

Marsh: EL -6 to -12

Model: Spatial Mohr-Coulomb
Weight Fn: Marsh -8 to -12
Cohesion Fn: Marsh -8 to -12
Phi: 0 °
Phi-B: 0 °

Beach Sand: EL-12 to -40

Model: Mohr-Coulomb
Unit Weight: 122 pcf
Cohesion: 0 psf
Phi: 30 °
Phi-B: 0 °

Bay Sound Clay: EL-40 to -70

Model: Spatial Mohr-Coulomb
Weight Fn: Bay Sound Clay

Data Point: (178.1, 600)
Data Point: (178.3, 450)
Data Point: (200, 450)
Data Point: (235.7, 450)
Data Point: (235.9, 600)
Data Point: (310, 600)

Marsh -8 to -12

Model: Spline Data Point Function
Function: Cohesion vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 150
Data Points: X (ft), Cohesion (psf)
Data Point: (110, 150)
Data Point: (178.2, 150)
Data Point: (200, 275)
Data Point: (235.8, 150)
Data Point: (310, 150)

Unit Weight Functions

Fill -4 to -8

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 96
Data Points: X (ft), Unit Weight (pcf)
Data Point: (110, 96)
Data Point: (178.1, 96)
Data Point: (178.3, 88)
Data Point: (200, 88)
Data Point: (235.7, 88)
Data Point: (235.9, 96)
Data Point: (310, 96)

Marsh -8 to -12

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 96
Data Points: X (ft), Unit Weight (pcf)
Data Point: (110, 96)
Data Point: (178.2, 96)

Data Point: (200, 88)
Data Point: (235.8, 96)
Data Point: (310, 96)

Bay Sound Clay

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 107
Data Points: X (ft), Unit Weight (pcf)
Data Point: (110, 107)
Data Point: (178.2, 107)
Data Point: (200, 108)
Data Point: (235.8, 107)
Data Point: (310, 107)

Spatial Functions

Bay Sound Clay

Model: Linear Interpolation
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Cohesion (psf)
Data Point: (110, -40, 400)
Data Point: (110, -70, 700)
Data Point: (178.2, -40, 400)
Data Point: (178.2, -70, 700)
Data Point: (200, -40, 600)
Data Point: (200, -70, 900)
Data Point: (235.8, -40, 400)
Data Point: (235.8, -70, 700)
Data Point: (310, -40, 400)
Data Point: (310, -70, 700)

Regions

	Material	Points	Area (ft²)
Region 1	Bay Sound Clay: EL-40 to -70	1,3,4,2	8100
Region 2	Beach Sand: EL-12 to -40	3,9,7,14,15,5,6,4	5042.9
Region 3		9,10,11,12,13,14,7	279.66
Region 4		13,18,20,14	79.2
Region 5	Beach Sand: EL-12 to -40	14,20,22,19,21,6,5,15	1662.1
Region 6		10,16,17,23,18,13,12,11	446.445

Region 7		23,32,31,27,24,20,18	158.45
Region 8	Marsh: EL -6 to -12	20,24,27,31,30,25,26,21,19,22	759.3
Region 9		32,33,37,35,31	40.6
Region 10	Fill: EL -4 to -8	31,35,38,36,34,28,29,26,25,30	259.24
Region 11		37,41,46,45,43,35	87.07
Region 12	Embankment Fill: EL+2.6 to -4	43,44,42,40,39,36,38,35	87.9045
Region 13	Sheet Pile	43,45,47,48,44	8.025

Points

	X (ft)	Y (ft)
Point 1	110	-70
Point 2	380	-70
Point 3	110	-40
Point 4	380	-40
Point 5	235.9	-22
Point 6	380	-22
Point 7	200	-21.5
Point 8	203.5	-21.5
Point 9	110	-21.5
Point 10	110	-20.9
Point 11	147.6	-20.3
Point 12	167.2	-18.4
Point 13	172.8	-15
Point 14	200	-15
Point 15	203.5	-15
Point 16	110	-13.2
Point 17	159.5	-12.8
Point 18	174.4	-12
Point 19	235.8	-12
Point 20	200	-12
Point 21	380	-12
Point 22	203.5	-12
Point 23	169.3	-11.5
Point 24	200	-10
Point 25	235.8	-8

Point 26	380	-8
Point 27	200	-7
Point 28	235.8	-6.8
Point 29	380	-6.8
Point 30	203.5	-6
Point 31	200	-6
Point 32	178.2	-6
Point 33	178.8	-5.6
Point 34	225.3	-4.5
Point 35	200	-4
Point 36	223.8	-4
Point 37	181.2	-4
Point 38	203.5	-4
Point 39	207.5	1.4
Point 40	203.5	1.89
Point 41	190.2	1.9
Point 42	201.9	2.09
Point 43	200	2.2
Point 44	201	2.2
Point 45	200	2.4
Point 46	199	2.4
Point 47	200	12.9
Point 48	200.5	12.9

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.21	(216.596, -5.144)	14.11687	(200, 12.9)	(234.495, -6.51405)
2	285	1.26	(216.596, -5.144)	14.302	(200, 12.9)	(234.5, -6.51522)

Slices of Slip Surface: Optimized

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

						(psf)	h (psf)
1	Optimized	200.25	11.428475	466.06342	-2422.3059	0	274.13
2	Optimized	200.75	11.436265	349.59756	1377.7927	0	272.38
3	Optimized	201.45	-11.44717	350.0242	1372.6112	0	269.94
4	Optimized	202.1213	-11.45763	350.39469	1364.9353	0	267.59
5	Optimized	202.9213	11.519725	353.93841	1317.0721	0	264.8
6	Optimized	203.99785	11.628825	360.28376	1313.1838	0	261.04
7	Optimized	205.12375	-11.74207	366.77871	1309.7655	0	257.11
8	Optimized	206.3798	-11.86765	373.91655	1305.2499	0	252.72
9	Optimized	207.2539	-11.94208	378.02108	1326.2904	0	249.67
10	Optimized	207.9892	-11.97686	379.73589	1309.0081	0	247.1
11	Optimized	209.31375	-12	380.25665	1286.436	0	242.48
12	Optimized	210.72015	-12	379.24	1235.8813	0	237.57
13	Optimized	211.86225	-12	378.3469	1194.8166	0	233.58
14	Optimized	212.94335	-12	377.48075	1155.8614	0	229.81
15	Optimized	213.96345	-12	376.6279	1119.1005	0	226.24
16	Optimized	214.9481	-12	375.80265	1083.5497	0	222.81
17	Optimized	215.8973	-12	374.9809	1049.3207	0	219.49

	d		-				
18	Optimize d	216.85995	11.998315	374.03217	1015.7644	0	216.13
19	Optimize d	217.83605	-11.99495	372.94621	980.13252	0	212.72
20	Optimize d	218.81215	11.991585	371.83976	944.48016	0	209.32
21	Optimize d	220.01305	11.982265	370.1462	902.69469	0	205.12
22	Optimize d	221.4388	11.966995	367.84581	849.46298	0	200.14
23	Optimize d	222.97585	11.796575	355.72506	841.5795	0	194.78
24	Optimize d	224.55	-11.48566	334.77264	756.06058	0	189.28
25	Optimize d	225.5452	-11.2891	321.49413	708.26738	0	185.81
26	Optimize d	226.49795	-10.9385	298.63948	727.60594	0	182.48
27	Optimize d	227.91305	-10.33416	259.36721	632.59344	0	177.54
28	Optimize d	229.1005	-9.803115	224.83597	564.5068	0	173.39
29	Optimize d	230.06025	-9.345365	195.06222	493.50498	0	170.04
30	Optimize d	231.02	-8.887615	165.26027	422.26805	0	166.69
31	Optimize d	232.0943	-8.233046	122.58707	384.97469	0	162.94
32	Optimize d	233.1402	7.4840265	73.610793	538.91687	0	450
33	Optimize d	234.04315	6.837375	27.454579	451.01828	0	450

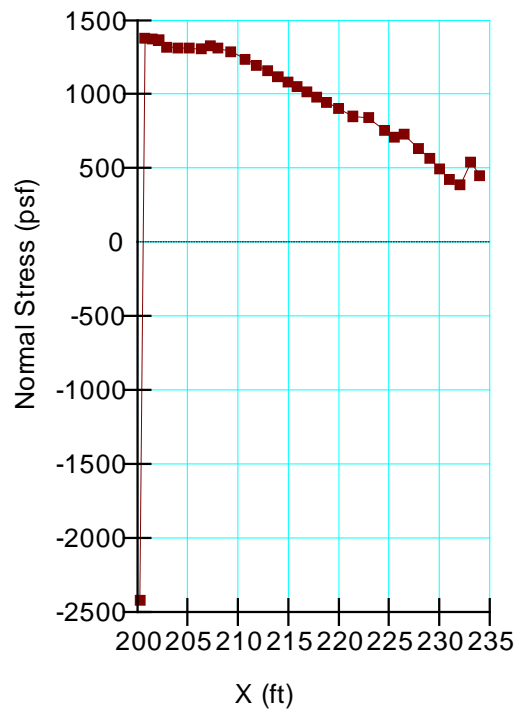
			5				
--	--	--	---	--	--	--	--

Slices of Slip Surface: 285

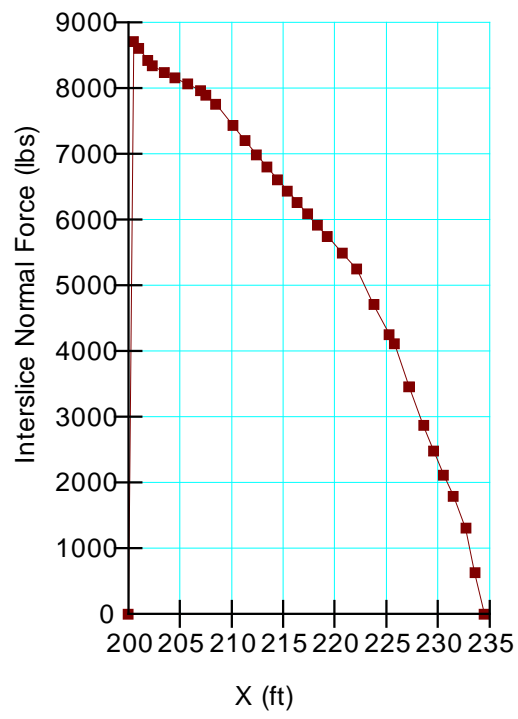
	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	285	200.25	-12	501.02	-2636.8	0	274.13
2	285	200.75	-12	384.04	1433.88	0	272.38
3	285	201.45	-12	383.96667	1427.7778	0	269.94
4	285	202.7	-12	383.69375	1411.6875	0	265.57
5	285	204.16665	-12	383.1976	1392.7503	0	260.45
6	285	205.5	-12	382.6126	1375.7253	0	255.8
7	285	206.83335	-12	381.8701	1358.5503	0	251.14
8	285	208.08215	-12	381.12629	1329.0549	0	246.78
9	285	209.24645	-12	380.30175	1287.3126	0	242.71
10	285	210.41075	-12	379.47721	1245.4844	0	238.65
11	285	211.575	-12	378.56678	1203.6561	0	234.58
12	285	212.73925	-12	377.65635	1161.742	0	230.52
13	285	213.90355	-12	376.67721	1119.8279	0	226.45
14	285	215.06785	-12	375.70666	1077.828	0	222.39
15	285	216.23215	-12	374.68457	1035.828	0	218.32
16	285	217.39645	-12	373.66248	993.82798	0	214.26
17	285	218.56075	-12	372.59745	951.7421	0	210.19
18	285	219.725	-12	371.52384	909.57033	0	206.13
19	285	220.88925	-12	370.42445	867.39856	0	202.06
20	285	222.05355	-12	369.31647	825.23538	0	198
21	285	223.21785	-12	368.17414	783.00349	0	193.93
22	285	224.4	-12	367.01667	744.35	0	189.8
23	285	225.15	-11.913395	360.84388	913.71443	0	187.19
24	285	225.8836	-11.48985	333.67686	849.17987	0	184.62
25	285	227.0508	-10.815965	290.398	748.94029	0	180.55
26	285	228.218	-	247.0301	648.18875	0	176.47

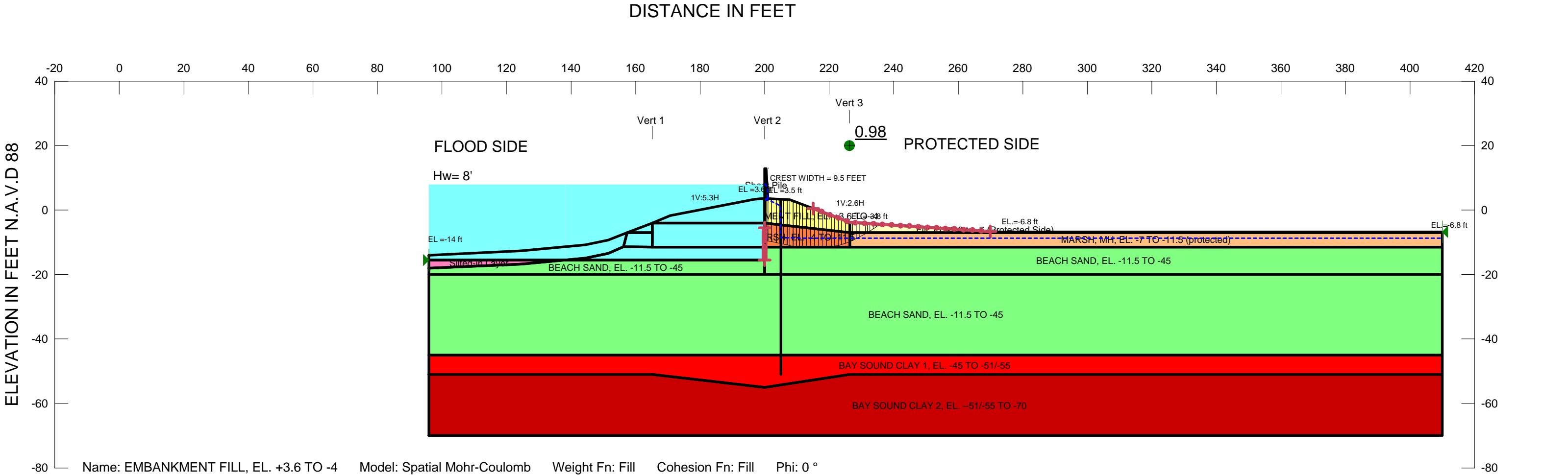
			10.142079				
27	285	229.3852	9.4681955	203.58058	547.02171	0	172.4
28	285	230.5524	-8.79431	160.02719	445.40949	0	168.32
29	285	231.7196	-8.120424	116.18443	343.35952	0	164.25
30	285	232.8524	-7.466416	73.082749	454.61463	0	450
31	285	233.95075	6.8322855	28.105414	366.69897	0	450

base normal



interslice normal





Name: EMBANKMENT FILL, EL. +3.6 TO -4 Model: Spatial Mohr-Coulomb Weight Fn: Fill Cohesion Fn: Fill Phi: 0 °
Name: MARSH, EL. -4 TO -11.5 Model: Spatial Mohr-Coulomb Weight Fn: Marsh Cohesion Fn: Marsh Phi: 0 °
Name: BEACH SAND, EL. -11.5 TO -45 Model: Shear/Normal Fn. Unit Weight: 122 pcf Strength Function: Beach Sand
Name: BAY SOUND CLAY 1, EL. -45 TO -51/-55 Model: Spatial Mohr-Coulomb Weight Fn: Clay1 Cohesion Fn: Clay1 Phi: 0 °
Name: Silted-in Layer Model: Mohr-Coulomb Unit Weight: 90 pcf Cohesion: 0 psf Phi: 20 °
Name: MARSH, MH, EL. -7 TO -11.5 (protected) Model: Undrained (Phi=0) Unit Weight: 74 pcf Cohesion: 175 psf
Name: Fill, EL -3.8 to -7 (Protected Side) Model: Undrained (Phi=0) Unit Weight: 108 pcf Cohesion: 250 psf
Name: Sheet Pile Model: Undrained (Phi=0) Unit Weight: 0.1 pcf Cohesion: 0.01 psf
Name: BAY SOUND CLAY 2, EL. -51/-55 TO -70 Model: Spatial Mohr-Coulomb Weight Fn: Clay2 Cohesion Fn: Clay2 Phi: 0 °

GENERAL NOTES

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

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

HW=CANAL WATER LEVEL

GAP Stability (Entry/Exit)

Report generated using GeoStudio 2007, version 7.19. Copyright © 1991-2012 GEO-SLOPE International Ltd.

File Information

Created By: Liljegren, James
Revision Number: 269
Last Edited By: Middleton, Mark C MVN
Date: 3/25/2013
Time: 4:49:47 PM
File Name: Reach 36.gsz
Directory: G:\F&M\HOME\London Ave Reevaluation 2011\East Side\Reach 36\Reach 36 SlopeW\
Last Solved Date: 3/25/2013
Last Solved Time: 4:50:40 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: Seepage Analysis (Gap)
Method: Spencer
Settings
PWP Conditions Source: Parent Analysis
Slip Surface
Direction of movement: Left to Right
Use Passive Mode: Yes
Slip Surface Option: Entry and Exit
Critical slip surfaces saved: 1
Optimize Critical Slip Surface Location: Yes
Tension Crack
Tension Crack Option: (none)
FOS Distribution
FOS Calculation Option: Constant
Advanced

Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 2000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 10
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

EMBANKMENT FILL, EL. +3.6 TO -4

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

MARSH, EL. -4 TO -11.5

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

BEACH SAND, EL. -11.5 TO -45

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

BAY SOUND CLAY 1, EL. -45 TO -51/-55

Model: Spatial Mohr-Coulomb
Weight Fn: Clay1
Cohesion Fn: Clay1
Phi: 0 °
Phi-B: 0 °

Silted-in Layer

Model: Mohr-Coulomb
Unit Weight: 90 pcf
Cohesion: 0 psf
Phi: 20 °
Phi-B: 0 °

MARSH, MH, EL. -7 TO -11.5 (protected)

Model: Undrained (Phi=0)
Unit Weight: 74 pcf
Cohesion: 175 psf

Fill, EL -3.8 to -7 (Protected Side)

Model: Undrained (Phi=0)
Unit Weight: 108 pcf
Cohesion: 250 psf

Sheet Pile

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

BAY SOUND CLAY 2, EL. --51/-55 TO -70

Model: Spatial Mohr-Coulomb
Weight Fn: Clay2
Cohesion Fn: Clay2
Phi: 0 °
Phi-B: 0 °

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (200, -15.5) ft
Left-Zone Right Coordinate: (200, -5.5) ft
Left-Zone Increment: 20
Right Projection: Range
Right-Zone Left Coordinate: (215, 0.49032) ft
Right-Zone Right Coordinate: (269.95765, -6.63455) ft
Right-Zone Increment: 20
Radius Increments: 20

Slip Surface Limits

Left Coordinate: (96, -15.5) ft
Right Coordinate: (410, -6.8) ft

Cohesion Functions

Marsh

Model: Spline Data Point Function
Function: Cohesion vs. X
Curve Fit to Data: 100 %

Segment Curvature: 0 %
Y-Intercept: 175
Data Points: X (ft), Cohesion (psf)
Data Point: (165.2, 175)
Data Point: (200, 250)
Data Point: (226.4, 175)

Clay2

Model: Spline Data Point Function
Function: Cohesion vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 710
Data Points: X (ft), Cohesion (psf)
Data Point: (0, 710)
Data Point: (153, 710)
Data Point: (200, 1000)
Data Point: (235, 710)
Data Point: (300, 710)

Fill

Model: Spline Data Point Function
Function: Cohesion vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 250
Data Points: X (ft), Cohesion (psf)
Data Point: (165.2, 250)
Data Point: (200, 625)
Data Point: (226.4, 250)

Clay1

Model: Spline Data Point Function
Function: Cohesion vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 710
Data Points: X (ft), Cohesion (psf)
Data Point: (0, 710)
Data Point: (153, 710)
Data Point: (200, 750)
Data Point: (235, 710)
Data Point: (300, 710)

Shear/Normal Strength Functions

Beach Sand

Model: Spline Data Point Function
Function: Shear Stress vs. Normal Stress
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
Data Point: (-100000, 0)
Data Point: (0, 0)
Data Point: (100000, 57735)
Estimation Properties
Intact Rock Param.: 10
Geological Strength: 100
Disturbance Factor: 0
SigmaC: 600000 psf
Sigma3: 300000 psf
Num. Points: 20

Unit Weight Functions

Marsh

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 74
Data Points: X (ft), Unit Weight (pcf)
Data Point: (165.2, 74)
Data Point: (200, 90)
Data Point: (226.4, 74)

Clay1

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 103
Data Points: X (ft), Unit Weight (pcf)
Data Point: (96, 103)
Data Point: (165.6, 103)
Data Point: (200, 107)
Data Point: (226.4, 103)
Data Point: (310, 103)

Region 12	3,27,38,15,43,14	261	
Region 13	14,12,13,15,43	158.4	MARSH, EL. -4 TO -11.5
Region 14	42,39,23,41,38,15,16	201.69026	
Region 15	16,31,32,1,2,42	403.57474	BEACH SAND, EL. -11.5 TO -45
Region 16	1,2,42,40	64.425264	Silted-in Layer
Region 17	20,29,46,44,45,30,21	5843.6	BAY SOUND CLAY 2, EL. --51/-55 TO -70

Points

	X (ft)	Y (ft)
Point 1	96	-18.1
Point 2	124.5	-16.8
Point 3	165.2	-4
Point 4	199	3.6
Point 5	200	3.6
Point 6	207.8	3.2
Point 7	410	-6.8
Point 8	410	-7
Point 9	410	-11.5
Point 10	96	-45
Point 11	410	-45
Point 12	226.4	-7
Point 13	226.4	-11.5
Point 14	200	-4
Point 15	200	-11.5
Point 16	200	-15.5
Point 17	200	12.9
Point 18	200.5	12.9
Point 19	201	3.5
Point 20	96	-70
Point 21	410	-70

Clay2

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 118
Data Points: X (ft), Unit Weight (pcf)
Data Point: (96, 118)
Data Point: (165.2, 118)
Data Point: (200, 120)
Data Point: (226.4, 118)
Data Point: (310, 118)

Fill

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 108
Data Points: X (ft), Unit Weight (pcf)
Data Point: (165.2, 108)
Data Point: (200, 118)
Data Point: (226.4, 108)

Regions

	Points	Area (ft²)	Material
Region 1	3,34,35,4,5,14	155.595	
Region 2	5,17,18,19	7	Sheet Pile
Region 3	5,19,6,36,12,14	165.95	EMBANKMENT FILL, EL. +3.6 TO -4
Region 4	27,28,3	11.7	
Region 5	37,7,8,12,36	105.87	Fill, EL. -3.8 to -7 (Protected Side)
Region 6	12,8,9,13	826.2	MARSH, MH, EL. -7 TO -11.5 (protected)
Region 7	29,10,11,30,45,44,46	2006.4	BAY SOUND CLAY 1, EL. -45 TO -51/-55
Region 8	22,25,26,24,28,41,23,39,42,40	184.19974	
Region 9	41,28,27,38	37.41	
Region 10	31,16,15,13,9,33	1785	BEACH SAND, EL. -11.5 TO -45
Region 11	10,32,31,33,11	7850	BEACH SAND, EL. -11.5 TO -45

Point 22	96	-14
Point 23	151.5	-13.4
Point 24	151.5	-9.3
Point 25	124.6	-12.7
Point 26	144.4	-10.8
Point 27	165.2	-7
Point 28	157.4	-7
Point 29	96	-51
Point 30	410	-51
Point 31	200	-20
Point 32	96	-20
Point 33	410	-20
Point 34	170.7	-1.7
Point 35	196.8	3.3
Point 36	226.4	-3.8
Point 37	272.5	-6.8
Point 38	165.2	-11.5
Point 39	144.4	-14.9
Point 40	96	-15.5
Point 41	156.2	-11.4
Point 42	138.11579	-15.5
Point 43	200	-6.9
Point 44	200	-55
Point 45	226.4	-51
Point 46	165.2	-51
Point 47	205	3
Point 48	205	-51

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	0.98	(213.868, 28.645)	15.11747	(200, 12.9)	(235.724, -4.40674)
2	S907	1.04	(213.868, 28.645)	40.118	(200, 12.9)	(236.53, -4.45923)

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	-9.6084475	1080.696	-2687.107	0	249.29
2	Optimized	200.75	-9.6563285	1081.5123	1396.7103	0	247.87
3	Optimized	201.55665	-9.7335745	1086.6581	1394.6027	0	245.58
4	Optimized	202.8772	-9.927565	1099.7217	1353.7314	0	241.83
5	Optimized	204.18945	-10.194335	1117.448	1342.2705	0	238.1
6	Optimized	205.28615	-10.44651	107.94148	1354.6225	0	234.98
7	Optimized	206.38285	-10.698685	122.39943	1366.6189	0	231.87
8	Optimized	207.3656	-10.912105	134.77177	1390.9377	0	229.07
9	Optimized	208.3347	-11.10694	146.17993	1379.3812	0	226.32
10	Optimized	209.34	-11.272475	155.95848	1387.2818	0	223.47
11	Optimized	210.2812	-11.38854	162.84428	1354.171	0	220.79
12	Optimized	211.2289	-11.472255	167.83493	1353.207	0	218.1
13	Optimized	212.33095	-11.49803	169.35674	1331.9573	0	214.97

			5				
14	Optimized	213.5809	-11.49822	169.33274	1274.5957	0	211.42
15	Optimized	214.8309	-11.498405	169.30874	1217.7941	0	207.87
16	Optimized	216.08085	-11.498595	169.29274	1161.5525	0	204.32
17	Optimized	217.3308	-11.49878	169.27674	1105.791	0	200.76
18	Optimized	218.5808	-11.498965	169.26874	1050.5894	0	197.21
19	Optimized	219.9011	-11.444465	165.87209	1021.4572	0	193.46
20	Optimized	221.1609	-11.295155	156.59625	990.95519	0	189.88
21	Optimized	222.28995	-11.105725	144.80436	925.18267	0	186.68
22	Optimized	223.3878	-10.85464	129.12803	906.46945	0	183.56
23	Optimized	224.45435	-10.541905	109.64007	832.85423	0	180.53
24	Optimized	225.6938	-10.085147	81.141057	790.43143	0	177.01
25	Optimized	226.8208	-9.605757	51.21444	715.53702	0	175
26	Optimized	227.80035	-9.1536375	22.988996	694.02728	0	175
27	Optimized	228.91785	-8.6073925	-11.141161	640.04193	0	175

28	Optimized	230.3583	-7.868625	-57.286302	580.93646	0	175
29	Optimized	231.57095	-7.20149	-98.949778	542.45341	0	175
30	Optimized	232.2428	-6.792475	-124.49149	566.49341	0	250
31	Optimized	233.10705	-6.221916	-160.10884	524.5007	0	250
32	Optimized	234.1537	-5.4958475	-205.42918	423.56815	0	250
33	Optimized	235.2003	-4.769779	-250.75737	322.64345	0	250

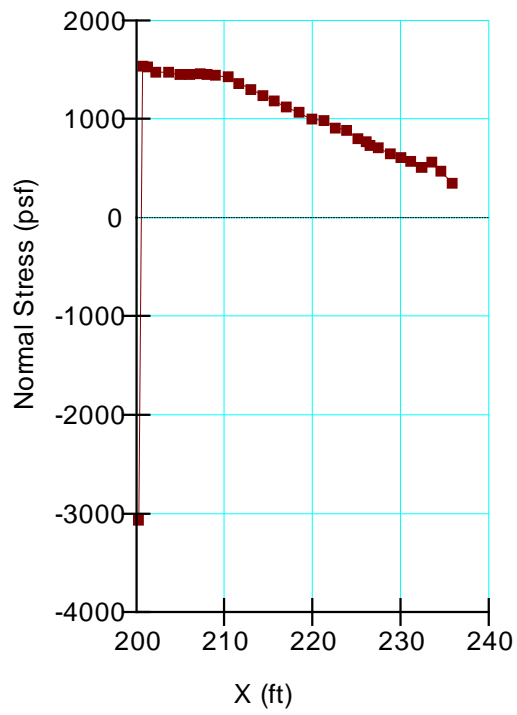
Slices of Slip Surface: **5907**

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	5907	200.25	-9.0902215	1045.8391	-2416.644	0	249.29
2	5907	200.75	-9.266947	1054.8573	1236.8315	0	247.87
3	5907	201.56665	-9.5360245	1073.1466	1262.6984	0	245.55
4	5907	202.7	-9.882859	1096.6223	1298.5736	0	242.33
5	5907	203.83335	-10.19353	1117.5933	1331.0825	0	239.11
6	5907	204.96665	-10.4689	123.51161	1360.2211	0	235.89
7	5907	206.1	-10.70971	123.13019	1386.1669	0	232.67
8	5907	207.23335	-10.916595	135.06376	1408.941	0	229.45
9	5907	208.42	-11.096625	145.55804	1406.6029	0	226.08
10	5907	209.66	-11.24702	154.40941	1378.5609	0	222.56
11	5907	210.9	-11.35842	161.00106	1346.9432	0	219.03
12	5907	212.14	-	165.32222	1311.6846	0	215.51

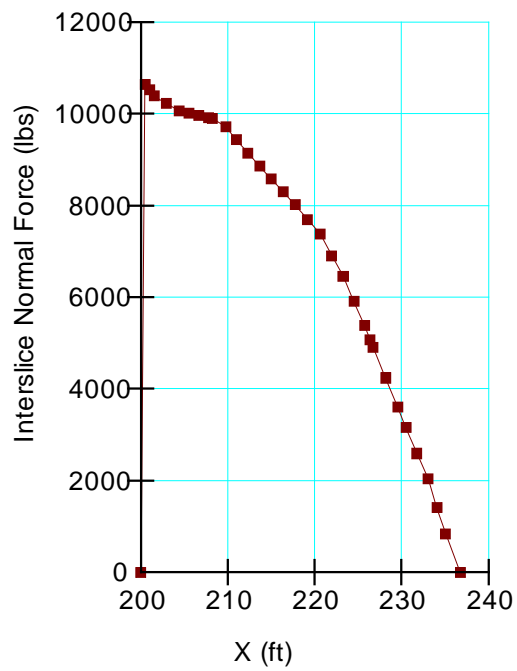
			11.431155				
13	5907	213.38	-11.46543	167.35049	1273.0507	0	211.99
14	5907	214.62	-11.461345	167.0674	1230.9126	0	208.47
15	5907	215.86	-11.418895	164.40172	1185.4709	0	204.94
16	5907	217.1	-11.33795	159.37526	1136.7756	0	201.42
17	5907	218.34	-11.218275	151.94197	1084.7273	0	197.9
18	5907	219.58	-11.059525	142.06963	1029.482	0	194.37
19	5907	220.82	-10.861225	129.72448	970.96786	0	190.85
20	5907	222.06	-10.622775	114.84199	909.29401	0	187.33
21	5907	223.3	-10.34344	97.352971	844.27444	0	183.81
22	5907	224.54	-10.022329	77.311052	775.98685	0	180.28
23	5907	225.78	-9.658391	54.568025	704.33804	0	176.76
24	5907	226.9877	-9.262161	29.799389	652.76307	0	175
25	5907	228.16315	-8.834582	3.0746289	621.18155	0	175
26	5907	229.3386	-8.3647375	-26.304449	586.04951	0	175
27	5907	230.51405	-7.850993	-58.392302	547.16417	0	175
28	5907	231.6895	-7.2914635	-93.342906	504.28949	0	175
29	5907	232.986	-6.615677	-135.53745	499.00875	0	250

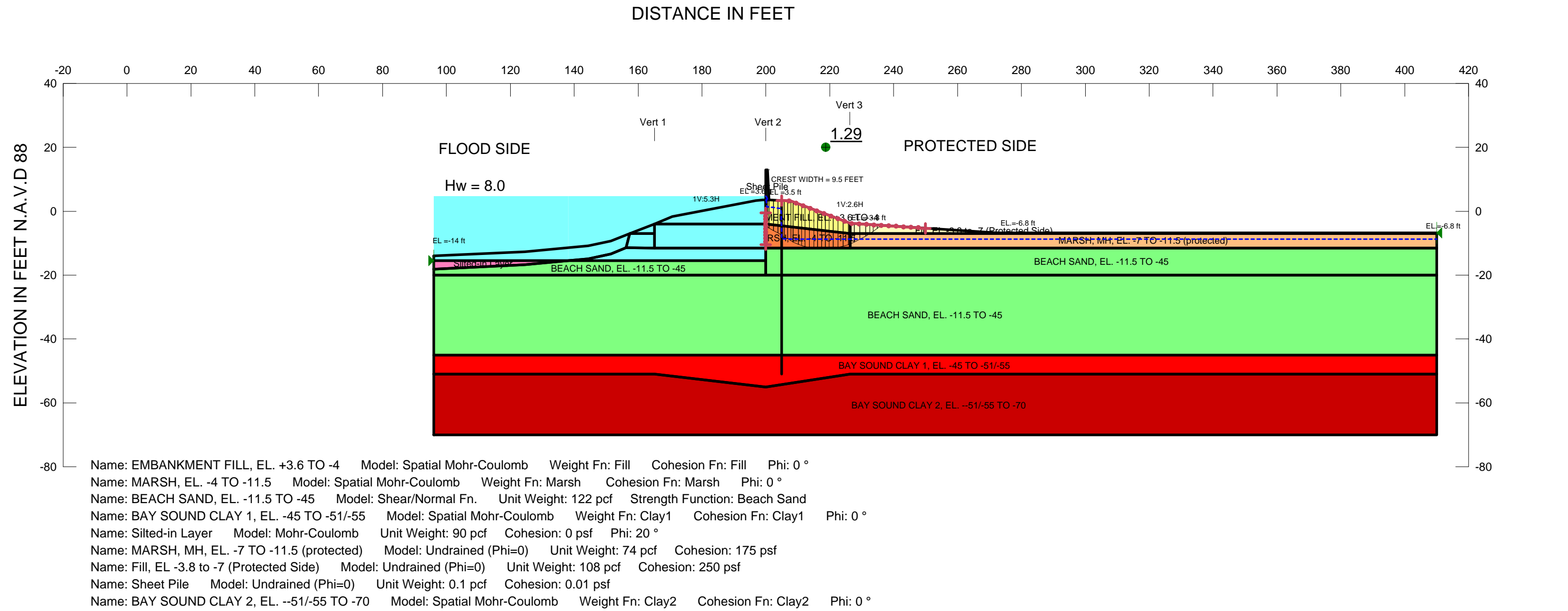
			5				
30	5907	234.40365	-5.808867	-185.90444	408.97644	0	250
31	5907	235.8213	- 4.922803 5	-241.22311	307.98585	0	250

Base Normal Stress Vs. X



Interslice Normal Stress
Vs. X





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

GENERAL NOTES

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

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

HW=CANAL WATER LEVEL

LONDON AVE CANAL
OUTFALL CANAL REEVALUATION REPORT
REACH 36, STA. 120+39 TO 126+67
PROTECTED SIDE STABILITY ANALYSIS,
1% FLOWLINE WATER EL +4.7
CASE: GAP Stability (Entry/Exit) (2)
MARCH 2012

LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION PROJECT

GAP Stability (Entry/Exit) (2)

Report generated using GeoStudio 2007, version 7.15. Copyright © 1991-2009 GEO-SLOPE International Ltd.

File Information

Created By: Liljegren, James
Revision Number: 242
Last Edited By: Schroeder, Danielle V MVN
Date: 2/22/2012
Time: 2:46:55 PM
File Name: Reach 36 global and gap.gsz
Directory: Z:\Edf\F&MHOME\London Ave Reeevaluation 2011\East Side\Reach 36 1% flowline\SlopeW\
Last Solved Date: 2/22/2012
Last Solved Time: 2:59:50 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

GAP Stability (Entry/Exit) (2)

Kind: SLOPE/W
Parent: Seepage Analysis (Gap)
Method: Spencer
Settings
 PWP Conditions Source: Parent Analysis
Slip Surface
 Direction of movement: Left to Right
 Use Passive Mode: Yes
 Slip Surface Option: Entry and Exit
 Critical slip surfaces saved: 1
 Optimize Critical Slip Surface Location: Yes
 Tension Crack
 Tension Crack Option: (none)
FOS Distribution
 FOS Calculation Option: Constant

Advanced
Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 2000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 10
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

EMBANKMENT FILL, EL. +3.6 TO -4

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

MARSH, EL. -4 TO -11.5

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

BEACH SAND, EL. -11.5 TO -45

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

BAY SOUND CLAY 1, EL. -45 TO -51/-55

Model: Spatial Mohr-Coulomb
Weight Fn: Clay1
Cohesion Fn: Clay1
Phi: 0 °
Phi-B: 0 °

Silted-in Layer

Model: Mohr-Coulomb
Unit Weight: 90 pcf
Cohesion: 0 psf
Phi: 20 °

Phi-B: 0 °

MARSH, MH, EL. -7 TO -11.5 (protected)

Model: Undrained (Phi=0)
Unit Weight: 74 pcf
Cohesion: 175 psf

Fill, EL -3.8 to -7 (Protected Side)

Model: Undrained (Phi=0)
Unit Weight: 108 pcf
Cohesion: 250 psf

Sheet Pile

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

BAY SOUND CLAY 2, EL. --51/-55 TO -70

Model: Spatial Mohr-Coulomb
Weight Fn: Clay2
Cohesion Fn: Clay2
Phi: 0 °
Phi-B: 0 °

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (200, -10.5) ft
Left-Zone Right Coordinate: (200, -0.5) ft
Left-Zone Increment: 10
Right Projection: Range
Right-Zone Left Coordinate: (205, 3.32353) ft
Right-Zone Right Coordinate: (250, -5.33579) ft
Right-Zone Increment: 20
Radius Increments: 20

Slip Surface Limits

Left Coordinate: (96, -15.5) ft
Right Coordinate: (410, -6.8) ft

Cohesion Functions

Marsh

Model: Spline Data Point Function

Function: Cohesion vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 175
Data Points: X (ft), Cohesion (psf)
Data Point: (165.2, 175)
Data Point: (200, 250)
Data Point: (226.4, 175)

Clay2

Model: Spline Data Point Function
Function: Cohesion vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 710
Data Points: X (ft), Cohesion (psf)
Data Point: (0, 710)
Data Point: (153, 710)
Data Point: (200, 1000)
Data Point: (235, 710)
Data Point: (300, 710)

Fill

Model: Spline Data Point Function
Function: Cohesion vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 250
Data Points: X (ft), Cohesion (psf)
Data Point: (165.2, 250)
Data Point: (200, 625)
Data Point: (226.4, 250)

Clay1

Model: Spline Data Point Function
Function: Cohesion vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 710
Data Points: X (ft), Cohesion (psf)
Data Point: (0, 710)
Data Point: (153, 710)
Data Point: (200, 750)
Data Point: (235, 710)
Data Point: (300, 710)

Shear/Normal Strength Functions

Beach Sand

Model: Spline Data Point Function
Function: Shear Stress vs. Normal Stress
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 0
Data Points: Normal Stress (psf), Shear Stress (psf)
Data Point: (-100000, 0)
Data Point: (0, 0)
Data Point: (100000, 57735)
Estimation Properties
Intact Rock Param.: 10
Geological Strength: 100
Disturbance Factor: 0
SigmaC: 600000 psf
Sigma3: 300000 psf
Num. Points: 20

Unit Weight Functions

Marsh

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 74
Data Points: X (ft), Unit Weight (pcf)
Data Point: (165.2, 74)
Data Point: (200, 90)
Data Point: (226.4, 74)

Clay1

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 103
Data Points: X (ft), Unit Weight (pcf)
Data Point: (96, 103)
Data Point: (165.6, 103)
Data Point: (200, 107)
Data Point: (226.4, 103)
Data Point: (310, 103)

Clay2

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 118
Data Points: X (ft), Unit Weight (pcf)
Data Point: (96, 118)
Data Point: (165.2, 118)
Data Point: (200, 120)
Data Point: (226.4, 118)
Data Point: (310, 118)

Fill

Model: Spline Data Point Function
Function: Unit Weight vs. X
Curve Fit to Data: 100 %
Segment Curvature: 0 %
Y-Intercept: 108
Data Points: X (ft), Unit Weight (pcf)
Data Point: (165.2, 108)
Data Point: (200, 118)
Data Point: (226.4, 108)

Regions

	Points	Area (ft²)	Material
Region 1	3,34,35,4,5,14	155.595	
Region 2	5,17,18,19	7	Sheet Pile
Region 3	5,19,6,36,12,14	165.95	EMBANKMENT FILL, EL. +3.6 TO -4
Region 4	27,28,3	11.7	
Region 5	37,7,8,12,36	105.87	Fill, EL. -3.8 to -7 (Protected Side)
Region 6	12,8,9,13	826.2	MARSH, MH, EL. -7 TO -11.5 (protected)
Region 7	29,10,11,30,45,44,46	2006.4	BAY SOUND CLAY 1, EL. -45 TO -51/-55
Region 8	22,25,26,24,28,41,23,39,42,40	184.19974	
Region 9	41,28,27,38	37.41	
Region 10	31,16,15,13,9,33	1785	BEACH SAND, EL. -11.5 TO -45
Region 11	10,32,31,33,11	7850	BEACH SAND, EL. -11.5 TO -45

Region 12	3,27,38,15,43,14	261	
Region 13	14,12,13,15,43	158.4	MARSH, EL. -4 TO -11.5
Region 14	42,39,23,41,38,15,16	201.69026	
Region 15	16,31,32,1,2,42	403.57474	BEACH SAND, EL. -11.5 TO -45
Region 16	1,2,42,40	64.425264	Silted-in Layer
Region 17	20,29,46,44,45,30,21	5843.6	BAY SOUND CLAY 2, EL. --51/-55 TO -70

Points

	X (ft)	Y (ft)
Point 1	96	-18.1
Point 2	124.5	-16.8
Point 3	165.2	-4
Point 4	199	3.6
Point 5	200	3.6
Point 6	207.8	3.2
Point 7	410	-6.8
Point 8	410	-7
Point 9	410	-11.5
Point 10	96	-45
Point 11	410	-45
Point 12	226.4	-7
Point 13	226.4	-11.5
Point 14	200	-4
Point 15	200	-11.5
Point 16	200	-15.5
Point 17	200	12.9
Point 18	200.5	12.9
Point 19	201	3.5
Point 20	96	-70
Point 21	410	-70

Point 22	96	-14
Point 23	151.5	-13.4
Point 24	151.5	-9.3
Point 25	124.6	-12.7
Point 26	144.4	-10.8
Point 27	165.2	-7
Point 28	157.4	-7
Point 29	96	-51
Point 30	410	-51
Point 31	200	-20
Point 32	96	-20
Point 33	410	-20
Point 34	170.7	-1.7
Point 35	196.8	3.3
Point 36	226.4	-3.8
Point 37	272.5	-6.8
Point 38	165.2	-11.5
Point 39	144.4	-14.9
Point 40	96	-15.5
Point 41	156.2	-11.4
Point 42	138.11579	-15.5
Point 43	200	-6.9
Point 44	200	-55
Point 45	226.4	-51
Point 46	165.2	-51
Point 47	205	3.32
Point 48	205	-51

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.29	(217.408, 17.321)	14.45697	(200, 12.9)	(236.191, -4.43715)
2	2507	1.35	(217.408, 17.321)	28.703	(200, 12.9)	(236.131, -4.43328)

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	-	572.37078	94.127269	0	249.29
2	Optimized	200.75	-	584.79676	852.28149	0	247.87
3	Optimized	201.70175	-	618.52013	888.39938	0	245.17
4	Optimized	203.1052	-	668.05775	943.72026	0	241.18
5	Optimized	204.3004	-	713.00111	966.52654	0	237.78
6	Optimized	205.2874	-	-55.037673	1010.9941	0	234.98
7	Optimized	206.28565	-	-19.99281	1070.2109	0	232.14
8	Optimized	207.2952	-	13.902507	1110.2051	0	229.27
9	Optimized	208.16575	-	43.290804	1131.3919	0	226.8
10	Optimized	209.35685	-	78.551417	1162.4928	0	223.42
11	Optimized	210.70915	-	111.47263	1195.7973	0	219.58
12	Optimized	211.76305	-	131.55037	1176.9773	0	216.58
13	Optimized	212.97225	-	148.48755	1195.3464	0	213.15
14	Optimized	214.3368	-	162.26638	1153.7063	0	209.27
15	Optimized	215.61985	-	169.15748	1159.7325	0	205.63

	d		11.49926				
16	Optimized	216.82135	-	169.10754	1106.2153	0	202.21
17	Optimized	218.02285	-	169.06592	1053.2808	0	198.8
18	Optimized	219.2243	-	169.01598	1000.7624	0	195.39
19	Optimized	220.42575	-11.4975	168.97437	948.82662	0	191.97
20	Optimized	221.804	-	163.94722	912.04037	0	188.06
21	Optimized	223.3909	-	148.15907	853.52769	0	183.55
22	Optimized	224.98495	-	121.97049	778.17039	0	179.02
23	Optimized	226.0848	-	97.712699	733.70999	0	175.9
24	Optimized	227.0367	-9.92766	71.070569	681.23536	0	175
25	Optimized	228.57055	-	26.434739	620.40303	0	175
26	Optimized	230.36715	-8.30399	-30.301187	547.0189	0	175
27	Optimized	231.9289	-7.41245	-85.961391	483.64337	0	175
28	Optimized	233.1066	-6.67904	-131.74408	451.64223	0	250
29	Optimized	234.26425	-	-181.74982	381.69957	0	250
30	Optimized	235.5487	-	-241.69921	255.46606	0	250

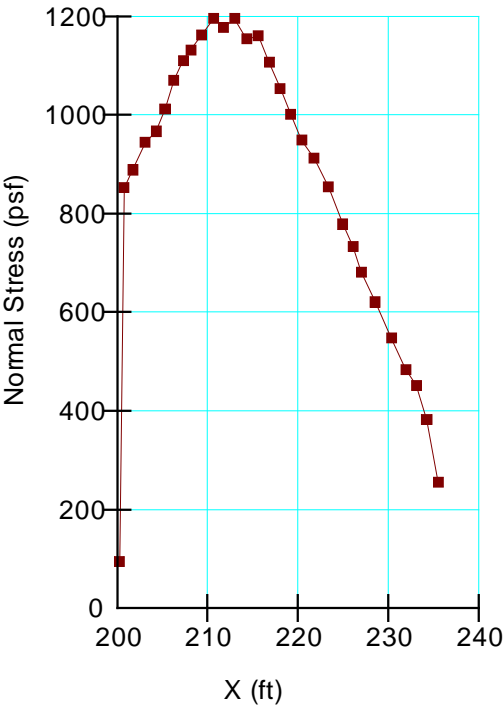
Slices of Slip Surface: **2507**

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

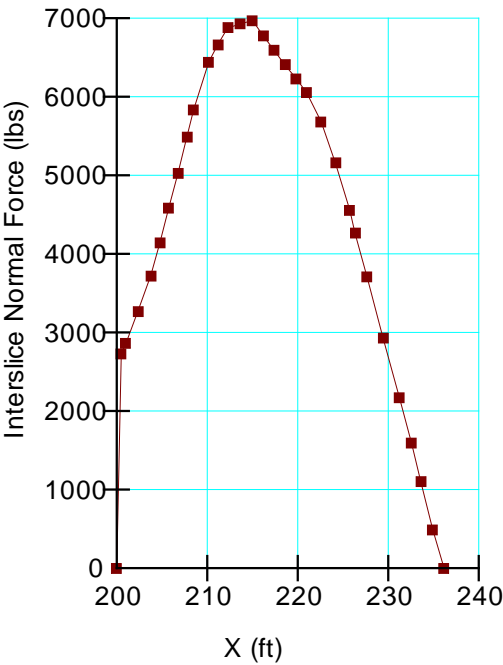
						(psf)	(psf)
1	2507	200.25	-	624.09024	15.015618	0	249.29
2	2507	200.75	-	643.50708	878.57422	0	247.87
3	2507	201.56665	-	680.19393	932.29255	0	245.55
4	2507	202.7	-	727.38472	1003.7935	0	242.33
5	2507	203.83335	-	769.73427	1068.0475	0	239.11
6	2507	204.96665	-	83.741359	1125.6423	0	235.89
7	2507	206.1	-	23.300492	1177.1079	0	232.67
8	2507	207.23335	-	50.026566	1222.8606	0	229.45
9	2507	208.42	-	74.724726	1242.3231	0	226.08
10	2507	209.66	-	97.241171	1235.2572	0	222.56
11	2507	210.9	-	116.29213	1222.3005	0	219.03
12	2507	212.14	-	131.94476	1203.7858	0	215.51
13	2507	213.38	-	144.25127	1180.136	0	211.99
14	2507	214.62	-	153.23948	1151.383	0	208.47
15	2507	215.86	-	158.88124	1117.8862	0	204.94
16	2507	217.1	-	161.32947	1079.6962	0	201.42
17	2507	218.34	-	160.46363	1037.0329	0	197.9
18	2507	219.58	-	156.26809	989.97401	0	194.37
19	2507	220.82	-	148.7035	938.53519	0	190.85
20	2507	222.06	-	137.72605	882.84094	0	187.33

			5				
21	2507	223.3	-10.76287	123.22829	822.89001	0	183.81
22	2507	224.54	-	105.18891	758.65528	0	180.28
23	2507	225.78	-	83.446017	690.0765	0	176.76
24	2507	227.02495	-9.71404	57.756756	638.81205	0	175
25	2507	228.27485	-9.235991	27.908551	604.44215	0	175
26	2507	229.5248	-	-6.2558743	564.78516	0	175
27	2507	230.77475	-	-44.9745	519.44843	0	175
28	2507	232.02465	-	-88.618462	467.95946	0	175
29	2507	233.2299	-	-135.65625	446.96195	0	250
30	2507	234.3905	-	-186.1918	360.64679	0	250
31	2507	235.55115	-	-242.35045	263.49638	0	250

Base Normal Stress Vs. X



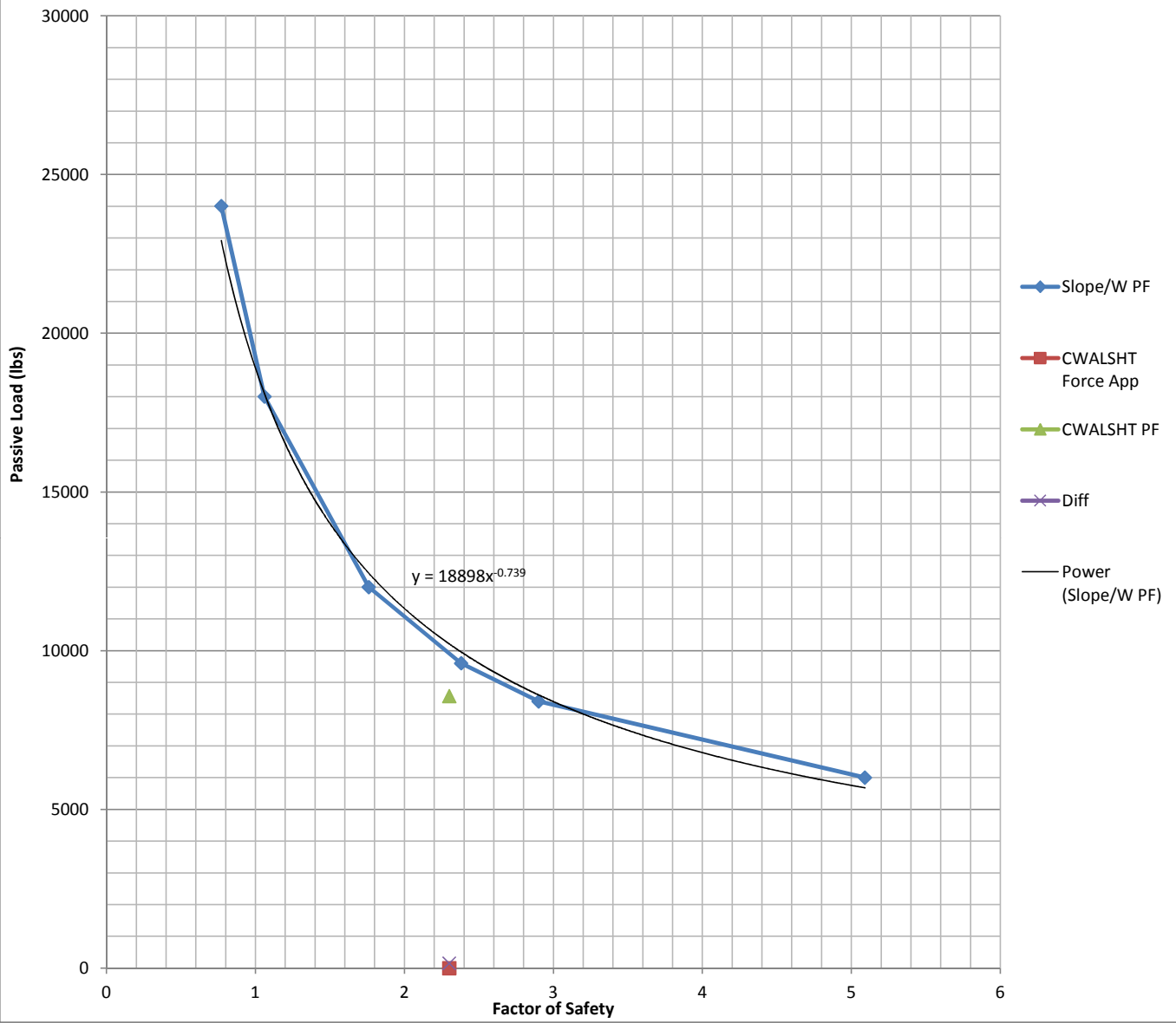
Interslice Normal Stress
Vs. X



APPENDIX C ETL 1110-2-575 ROTATIONAL ANALYSIS WITH CORRECTED PASSIVE PRESSURES

Reach 1 ETL Surcharge Summary							
Iteration	Distributed Load In CWALSHT (psf)	Force Applied in CWALSHT (lbs/ft)*	CWALSHT Passive Force Calculated (lbs/ft)	SLOPE/W Passive Force Based On FoS (lbs/ft)	Difference in Forces (lbs/ft)	Distributed Load for Next Iteration (psf)	CWALSHT Factor of Safety (FoS)
1	0	0	8570	10212	155	155	2.3

Reach 1



Reach 1, Iteration 1 - Shallow Failure

HORIZONTAL DISTRIBUTED LOAD 0 PSF
FACTOR OF SAFETY FOR ACTIVE PRESSURES = 2.3
FACTOR OF SAFETY FOR PASSIVE PRESSURES = 2.3
PILE TIP -17.4

III.--WATER AND SOIL PRESSURES

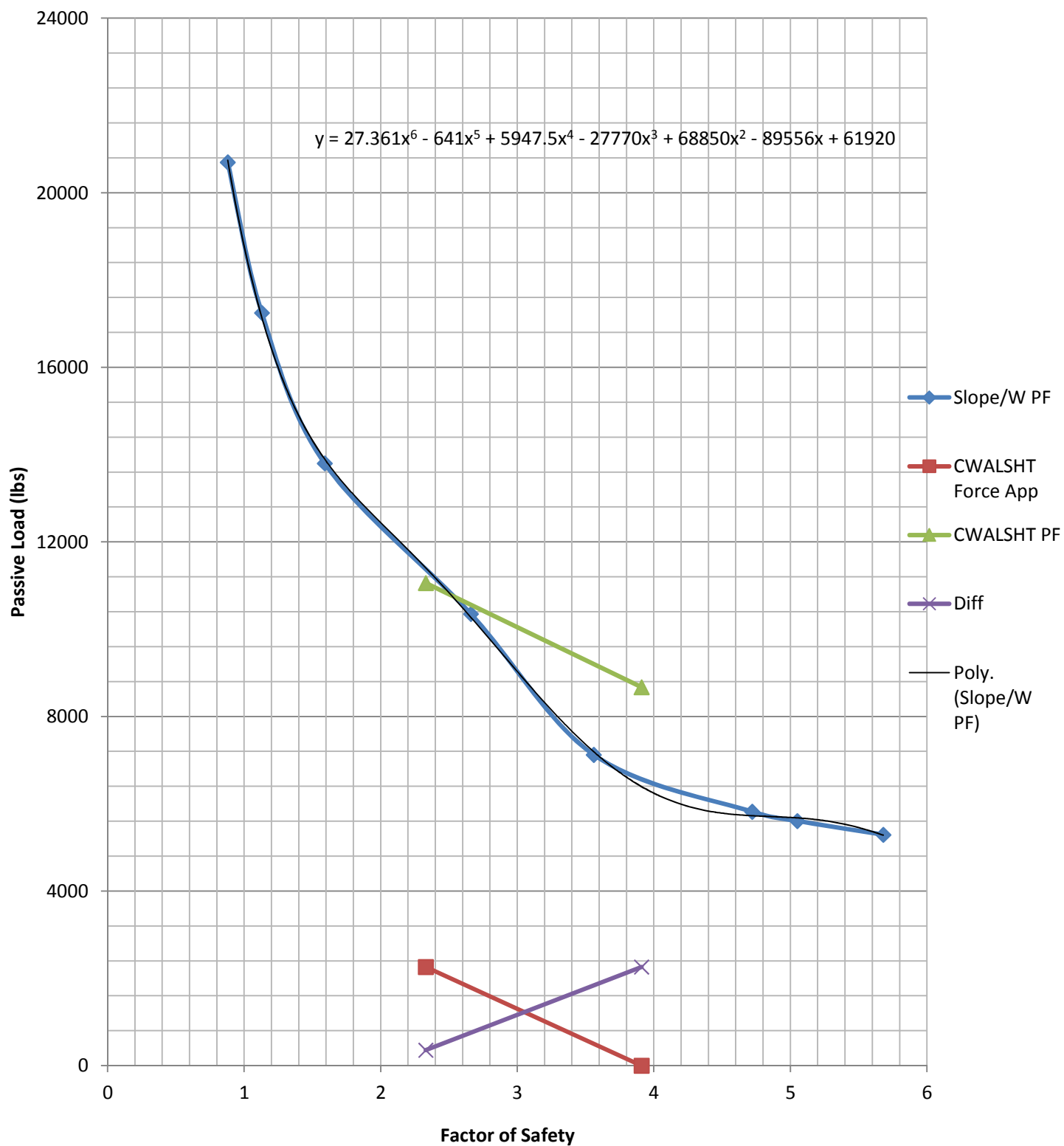
		<-----SOIL		PRESSURES----->							
		WATER	<----LEFTSIDE----->		<---RIGHTSIDE----->						
ELEVATION	PRESSURE	PASSIVE	ACTIVE	ACTIVE	PASSIVE						
(FT)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)						
13	0	0	0	0	0						
12	0	0	0	0	0						
11	0	0	0	0	0						
10	0	0	0	0	0						
9	0	0	0	0	0						
8	63	0	0	0	0						
7	125	0	0	0	0						
6	188	0	0	0	0						
5.4	225	0	0	0	0						
5.4	225	0	0	0	370						
5	250	0	0	0	432						
4	313	0	0	0	493						
3.6	338	0	0	0	517			Left P.P.	Area		
Ground Surface	3.6	338	370	0	517			370	229.8		
Water Surface	3	375	396	0	554			396	166.6		
	2.6	400	437	0	578			437	280.8		
	2	438	499	0	614			499	551		
	1	500	603	0	675	Water Press	Left P.P.	603	583.2		
	0.1	556	693	0	729	0	693	693	69.962		
Slip Surface Bottom	0	556	700	0	735	6.24	706.24		756.94		
	-1	556	739	0	735	68.64	807.64		858.84		
	-2	556	779	0	735	131.04	910.04		960.74		
	-3	556	818	0	735	193.44	1011.44		1062.14		
	-4	556	857	94	735	255.84	1112.84		1163.54		
	-5	556	896	232	735	318.24	1214.24		1124.388		
	-5.9	556	910	310	741	374.4	1284.4		128.402		
	-6	556	903	317	747	380.64	1283.64		633.17		
	-7	556	806	356	735	443.04	1249.04				
	-8	556	831	395	735						
	-9	556	880	434	735						
	-10	556	934	475	735						
	-11	556	989	517	735						
	-12	556	1054	563	735						
	-13	556	1105	609	735						
	-14	556	1146	652	735						
	-15	556	1194	691	735						
	-16	556	1242	722	735						
	-16.3	556	1255	734	735						
	-17	556	1287	762	1177	Total CWALSHT Passive Force			8,570	Exponential	
	-17.44	556	1330	800	1226		CWALSHT FoS		2.3	a	b
								Equation		18898	-0.739
						Total Slope/W Passive Force			10,212		
						Difference			(1,642)		
						Distributed Height			10.6		
						Distributed Load			(155)		

Reach 2 ETL Surcharge Summary							
Iteration	Distributed Load In CWALSHT (psf)	Force Applied in CWALSHT (lbs/ft)*	CWALSHT Passive Force Calculated (lbs/ft)	SLOPE/W Passive Force Based On FoS (lbs/ft)	Difference in Forces (lbs/ft)	Distributed Load for Next Iteration (psf)	CWALSHT Factor of Safety (FoS)
1	0	0	8670	6412	2259	228	3.91
2	228	2257	11059	11412	353**	N/A	2.33

*Distributed Height=9.9 ft

**Slope/W Passive Force more than CWALSHT Passive Force Calculated. No more iterations done.

Reach 2



-17.3

PRESSURES = 2.33

PRESSURES

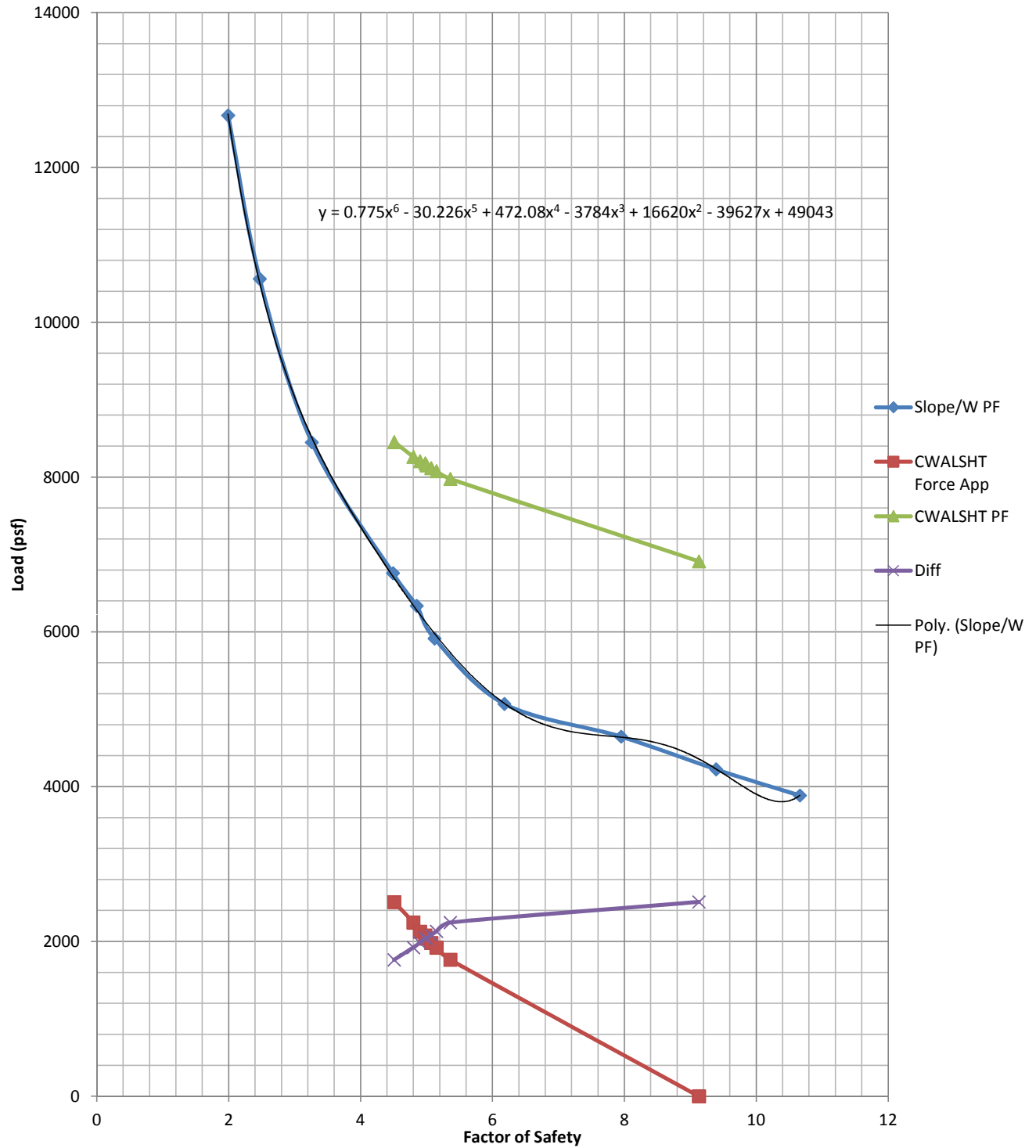
Water Surface

Total CWALSHT Passive Force	11058.86							
CWALSHT FoS	2.33	Sextic						
Equation		a	b	c	d	e	f	g
Total Slope/W Passive Force	11411.77	27.361	-641	5947.5	-27770	68850	-89556	61920
Difference	352.9145							
Distributed Height	9.9							
Distributed Load	35.64793							

Reach 3 ETL Surcharge Summary							
Iteration	Distributed Load In CWALSHT (psf)	Force Applied in CWALSHT (lbs/ft)*	CWALSHT Passive Force Calculated (lbs/ft)	SLOPE/W Passive Force Based On FoS (lbs/ft)	Difference in Forces (lbs/ft)	Distributed Load for Next Iteration (psf)	CWALSHT Factor of Safety (FoS)
1	0	0	6911	4400	2511	256	9.13
2	256	2509	8452	6689	1762	180	4.51
3	180	1764	7976	5733	2244	229	5.36
4	229	2244	8262	6339	1922	196	4.8
5	196	1921	8078	5948	2130	217	5.15
6	217	2127	8206	6224	1982	202	4.9
7	202	1980	8117	6034	2083	212	5.07
8	212	2078	8178	6133	2045	208	4.98
9	208	2038	8153	6111	2041	208	5

*Distributed Height=9.8 ft

Reach 3



I.--HEADING
'LONDON AVE REMEDIATION
'REACH 3 W LOAD
'12/12/11

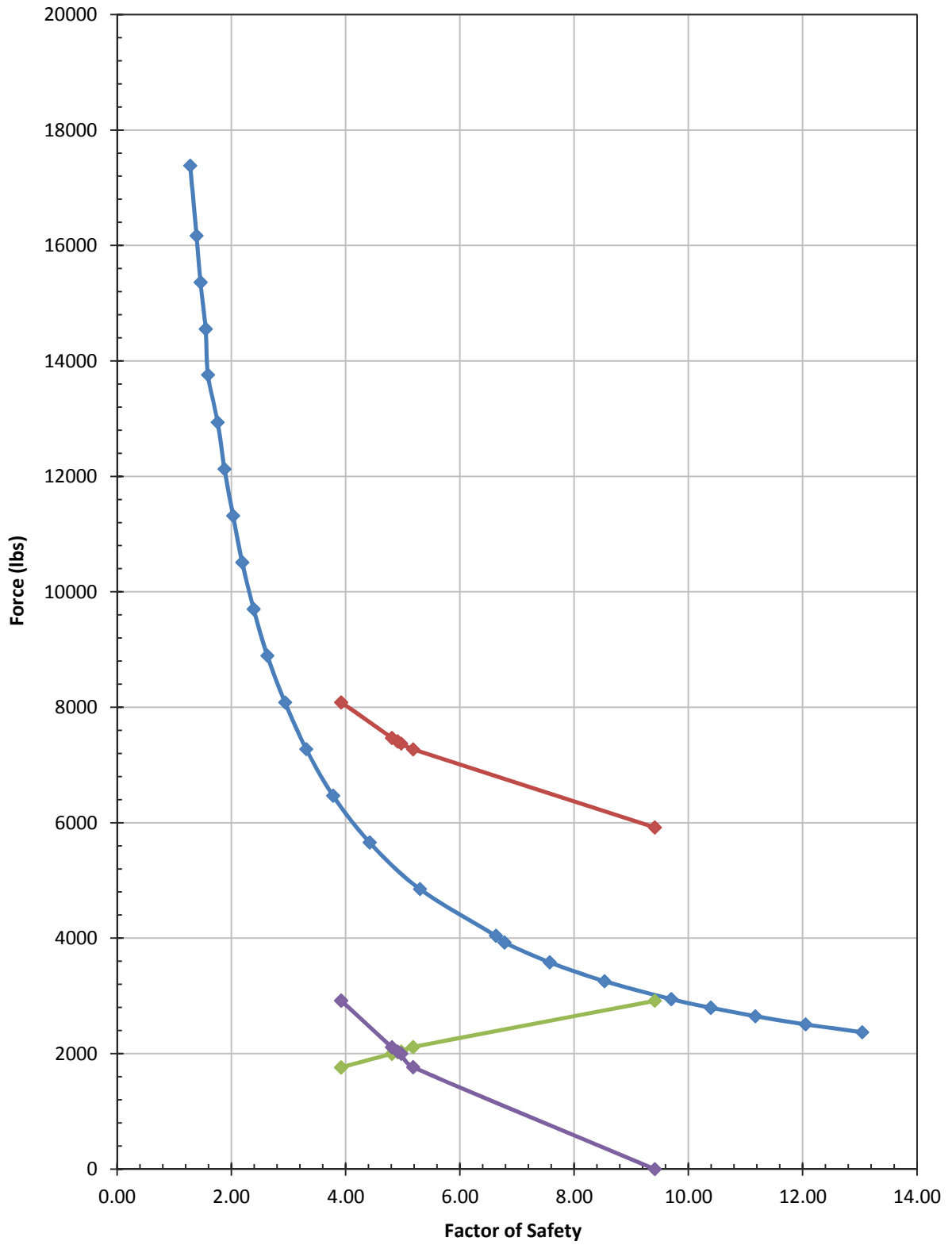
HORIZONTAL DISTRIBUTED LOAD 208 PSF
FACTOR OF SAFETY FOR ACTIVE PRESSURES = 5
FACTOR OF SAFETY FOR PASSIVE PRESSURES = 5
PILE TIP ELEVATION -13.3

III.--WATER AND SOIL PRESSURES

		<-----SOIL			PRESSURES----->					
	WATER	<---LEFTSIDE--->		<---RIGHTSIDE--->						
ELEVATION	PRESSURE	PASSIVE	ACTIVE	ACTIVE	PASSIVE					
(FT)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)					
12.9	0	0	0	0	0	0				
11.9	0	0	0	0	0	0				
10.9	0	0	0	0	0	0				
9.9	0	0	0	0	0	0				
8.9	0	0	0	0	0	0				
8	0	0	0	0	0	0				
7.9	6	0	0	0	0	0				
6.9	69	0	0	0	0	0				
5.9	131	0	0	0	0	0				
4.9	193	0	0	0	0	0		Left P.P.	Area	
Ground Surface	4.6	212	0	0	0	0		0	0	0
	4.6	212	304	0	0	0		304	94.65	
	4.3	231	327	0	0	0		327	0	
	4.3	231	327	0	0	304		327	139.8	
	3.9	256	372	0	0	312		372	243.6	
	3.3	293	440	0	0	343		440	185	
	2.9	318	485	0	0	364		485	381.96	
	2.18	363	576	0	0	402		576	105.66	
	2	374	598	0	0	411		598	0	
	2	374	587	0	0	411		587	59.25	
	1.9	381	598	11	0	416		598	654.5	
	0.9	443	711	124	0	469		711	767.5	
Water Surface	-0.1	505	824	237	0	521	Water Press	Left P.P.	824	785.7
	-1	562	922	335	0	568	0	922		92.912
	-1.1	562	930	343	0	573	6.24	936.24		160.82748
	-1.27	562	939	353	0	625	16.848	955.848		0
	-1.27	562	939	353	0	582	16.848	955.848		832.69252
	-2.1	562	982	394	43	625	68.64	1050.64		1105.84
	-3.1	562	1030	447	94	679	131.04	1161.04		1194.24
	-4.1	562	1034	537	169	709	193.44	1227.44		490.568
	-4.5	562	1007	596	222	697	218.4	1225.4		735.072
	-5.1	562	969	672	303	675	255.84	1224.84		122.846
Slip Surface	-5.2	562	970	678	311	678	262.08	1232.08		
	-6.1	562	1003	703	354	723				
	-7.1	562	1035	736	421	751				
	-8.1	562	1067	768	490	767				
	-9.1	562	1099	800	539	797				
	-10.1	562	1135	832	577	837				
	-11.1	562	1187	864	616	876				
	-11.94	562	1230	891	649	909				
	-12.1	562	1238	897	655	915				
	-13.1	562	1290	929	691	958				
	-13.34	562	1342	961	756	976				
	-15.1	562	1393	993	852	1027				
						Total CWALSHT Passive Force			8152.618	
						CWALSHT FoS			5	a
						Equation			0.775	b
						Total Slope/W Passive Force			-30.226	c
						Difference			472.08	d
						Height			-3784	e
						Distribution			16620	f
									-39627	g
									49043	

Reach 4 ETL Surcharge Summary							
Iteration	Distributed Load In CWALSHT (psf)	Force Applied in CWALSHT (lbs/ft)*	CWALSHT Passive Force Calculated (lbs/ft)	SLOPE/W Passive Force Based On FoS (lbs/ft)	Difference in Forces (lbs/ft)	Distributed Load for Next Iteration (psf)	CWALSHT Factor of Safety (FoS)
1	0	0	5919	3002	2917	314	9.41
2	314	2920.2	8087	6323	1763	190	3.92
3	190	1767	7272	5157	2115	227	5.18
4	227	2111.1	7470	5472	1998	215	4.81
5	215	1999.5	7372	5335	2037	219	4.97
6	219	2036.7	7410	5386	2024	218	4.91

London Ave Canal - Reach 4
FORCE PLOTS



—◆— Slope/W PF —◆— CWALSHT PF —◆— PF Difference —◆— CWALSHT Applied Force

ITERATION 6

APPLIED UNIFORM PSF: 219

PILE TIP: -14.06

FIXED SURFACE

<---NET--->

NET ELEV. (FT)	WATER (PSF)	<---LEFTSIDE--->		(SOIL+WATER)		<---RIGHTSIDE--->	
		PASSIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)
10	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0
7	62.5	0	0	62.5	62.5	0	0
6	125	0	0	125	125	0	0
5	187.5	0	0	187.5	187.5	0	0
4.6	212.5	0	0	212.5	212.5	0	0
4.6	212.5	309.6	0	121.9	431.5	0	0
4.3	231.3	324.4	0	125.9	450.3	0	0
4.3	231.3	324.4	0	125.9	759.8	0	309.6
4	250	357.4	0	111.6	793.7	0	324.7
3.3	293.8	434.5	0	78.2	844.8	0	332.1
3	312.5	467.6	0	63.9	862.7	0	331.2
2	375	577.7	0	16.3	952.2	0	358.2
2	375.9	610.5	0	0	953.6	0	358.8
2	377.9	687.8	0	-38.4	957.1	0	360.2
2	377.9	582.7	0	-38.4	957.1	0	360.2
1	437.5	687.8	105.1	-31.3	953.9	0	402.4
0	500	797.9	215.2	-78.9	949.9	0	446
-1	562.5	908	325.3	-126.5	945.8	0	489.6
-1.1	570.6	922.4	339.6	-132.7	964.3	0	533.2
-1.1	570.6	922.4	339.6	-132.7	964.3	0	495.3
-2	625	1018.2	435.4	-136.2	941.8	37.9	533.2
-3	687.5	1129	545.1	-141	938.3	81.5	576.8
-3.8	737.5	1196.1	640.2	-125.3	930.2	114.2	613.9
-4	737.5	1196.6	666.5	-113.5	908.9	126.6	618.9
-4.5	737.5	1148.4	751.5	11	790.8	202.9	585.8
-4.7	737.5	1123.3	789.2	76.2	729.6	243	562.4
-4.7	737.5	1123.3	789.2	-142.8	510.6	243	562.4
-5	737.5	1112.2	818.8	-99.2	472.9	275.6	554.2
-6	737.5	1145.5	847.3	-94.3	487.4	313.7	597.2
-7	737.5	1176.4	878.2	-84.6	497.2	354.3	637.8
-8	737.5	1207.3	909.1	-74.8	506.9	394.9	678.4
-9	737.5	1252.7	939.9	-80.3	517.3	434.9	719.7
-10	737.5	1304.2	970.8	-87.1	529.5	479.6	762.9

WATER PSF	PASSIVE	
	PSF	LBS
	309.6	95.1
	324.4	0
	324.4	102.27
	357.4	277.165
	434.5	135.315
	467.6	522.65
	577.7	0
	610.5	0
	687.8	0
	582.7	635.25
	687.8	742.85
	797.9	852.95
	908	91.52
	922.4	0
	922.4	873.27
	1018.2	1073.6
	1129	930.04
0	1196.1	240.518
12.48	1209.08	600.29
43.68	1192.08	237.154
56.16	1179.46	

Left Side
Ground Surface Elevation

Left Side
Water Surface Elevation

Entry failure at this elevation
Location per Geostudio

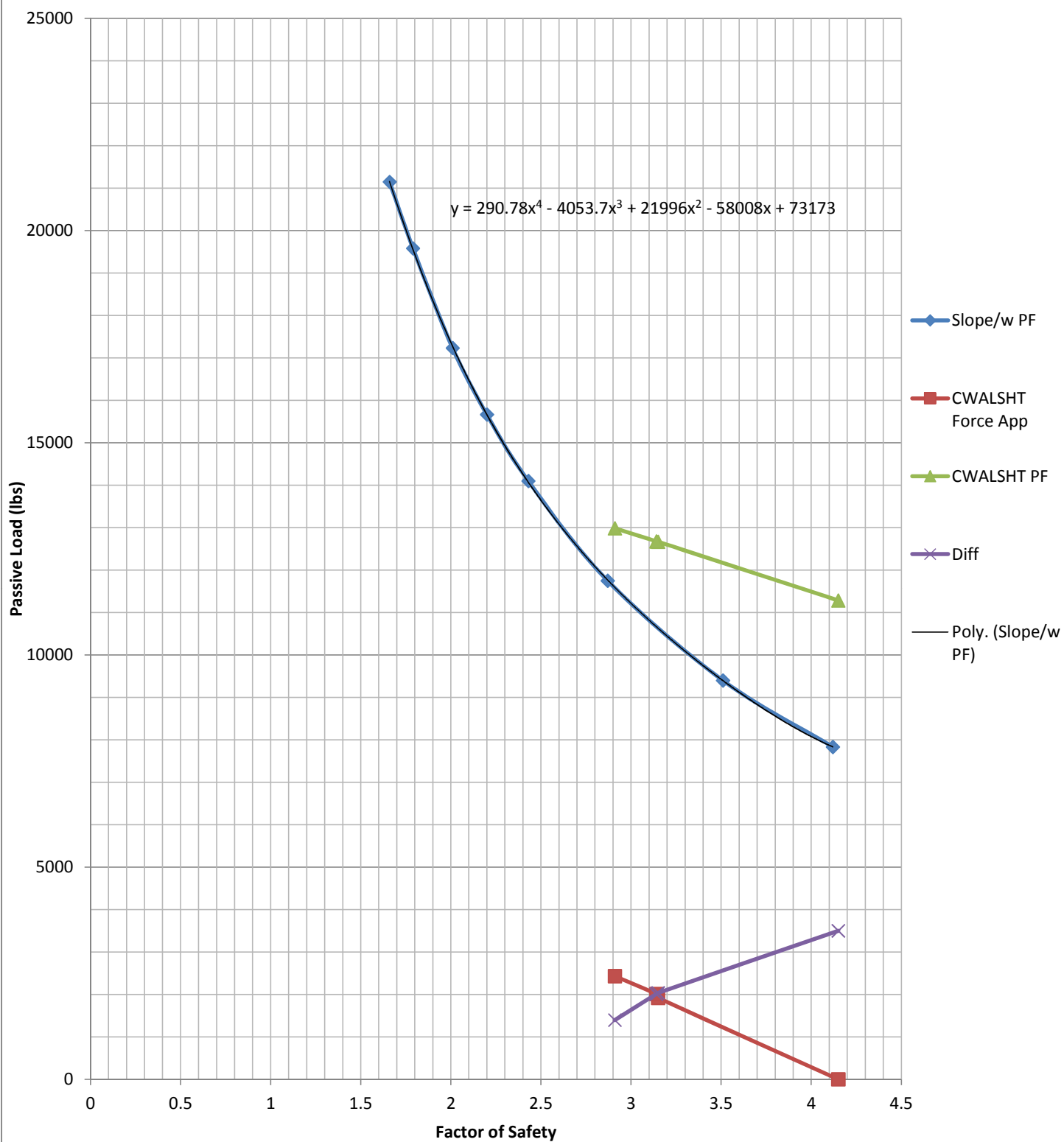
File Name: R4_C219.dat

	Sextic						
	a	b	c	d	e	f	g
CWALSHT PASSIVE FORCE= 7409.942							
CWALSHT FS= 4.91	0.2266	-10.743	203.77	-1977.7	10434	-29425	41472
GEOSTUDIO PASSIVE FORCE= 5386.3							
PASSIVE FORCE DIFFERENCE= 2023.6							
SHEET PILE LENGTH= 9.3							
UNIFORM PRESSURE= 218							

Reach 5 ETL Surcharge Summary							
Iteration	Distributed Load In CWALSHT (psf)	Force Applied in CWALSHT (lbs/ft)*	CWALSHT Passive Force Calculated (lbs/ft)	SLOPE/W Passive Force Based On FoS (lbs/ft)	Difference in Forces (lbs/ft)	Distributed Load for Next Iteration (psf)	CWALSHT Factor of Safety (FoS)
1	0	0	11283	7784	3499	273	4.15
2	190	2432	12985	11593	1394	109	2.91
3	150	1920	12666	10630	2036	159	3.15
4	157	2010	12676	10668	2008	157	3.14

*Distributed Height=12.8 ft

Reach 5



Iteration 4
157#
I.--HEADING
'LONDON AVENUE CANAL
'REACH 5
2/21/2013

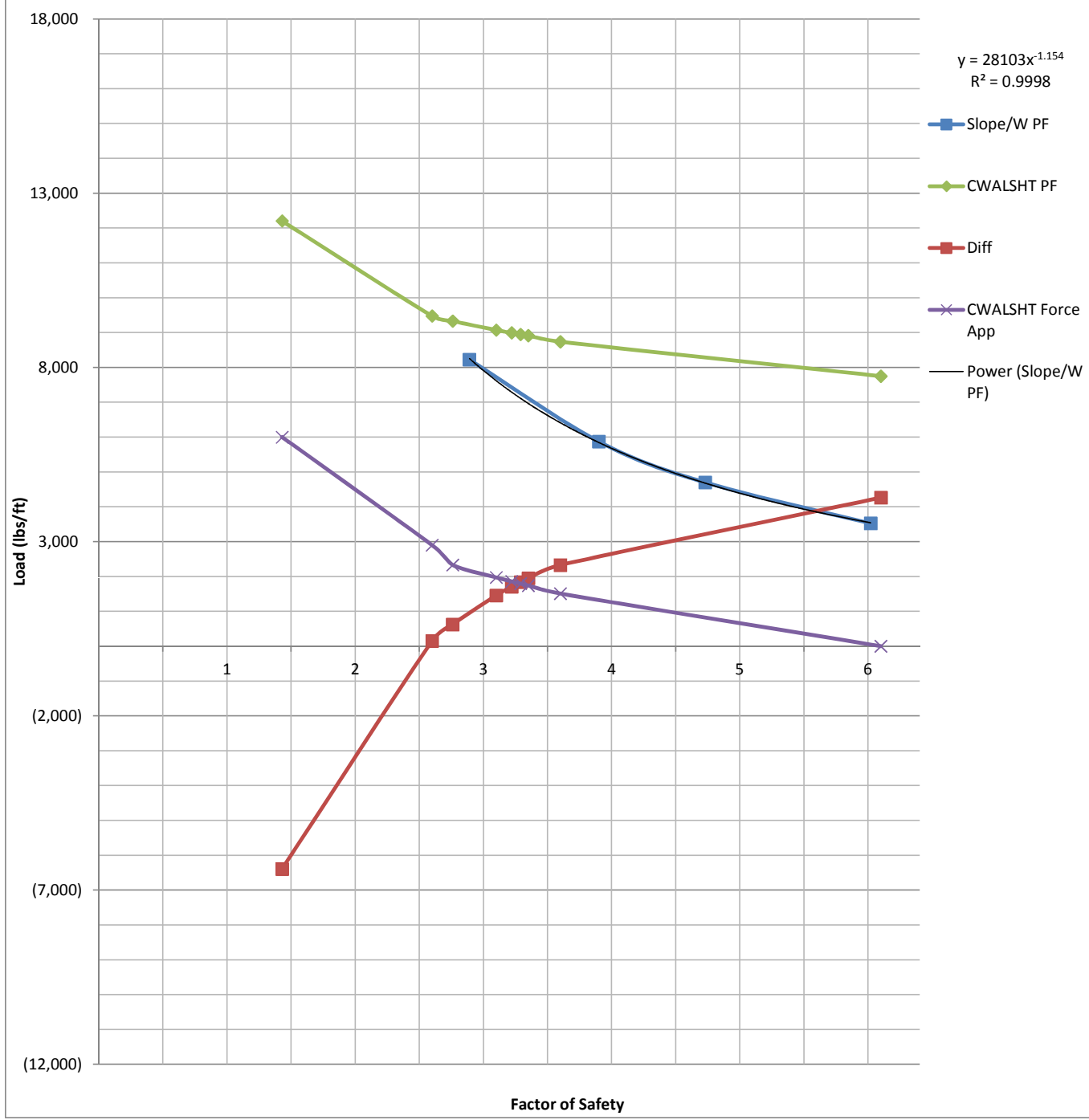
HORIZONTAL DISTRIBUTED LOAD 157 PSF
FACTOR OF SAFETY FOR ACTIVE PRESSURE 3.14
FACTOR OF SAFETY FOR PASSIVE PRESSURE 3.14
SHEET PILE TIP ELEVATION -13.3

		<-----PRESSURES----->							
		WATER	<---LEFTSIDE--->			<---RIGHTSIDE--->			
ELEVATION	PRESSURE	PASSIVE	ACTIVE	ACTIVE	PASSIVE				
(FT)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)				
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				
9	0	0	0	0	0				
8.8	12	0	0	0	0				
7.8	75	0	0	0	0				
6.8	137	0	0	0	0				
5.8	200	0	0	0	0				
4.8	262	0	0	0	0				
Ground Surface	4.1	306	0	0	0			Leftside	Area
								0	0
	4.1	306	398	0	0	398		398	130.2
	3.8	324	470	0	0	410		470	14.295
	3.77	326	483	0	0	410		483	417.075
	3.1	368	762	0	0	410		762	226.95
	2.8	387	751	0	0	406		751	708
	1.8	449	665	0	0	426		665	667.275
	0.87	507	770	0	0	458		770	0
	0.87	507	763	0	0	458		763	53.655
	0.8	512	770	7	0	461		770	625.2
	0	562	793	146	0	431	water pressure	corrected left side pressure	793 78.6
Water Surface	-0.1	568	779	177	0	413	0	779	77.762
	-0.2	568	770	197	0	402	6.24	776.24	825.94
	-1.2	568	807	242	0	442	68.64	875.64	910.84
	-2.2	568	815	311	0	480	131.04	946.04	85.35132
	-2.29	568	814	317	0	518	136.656	950.656	0
	-2.29	568	814	317	0	483	136.656	950.656	897.3037
	-3.2	568	828	353	35	518	193.44	1021.44	845.92
	-4	568	850	374	65	548	243.36	1093.36	220.42
	-4.2	568	855	379	72	555	255.84	1110.84	1154.54
	-5.2	568	880	404	107	590	318.24	1198.24	1241.44
	-6.2	568	904	429	142	625	380.64	1284.64	1056.08
	-7	568	925	449	171	654	430.56	1355.56	272.96
	-7.2	568	931	455	179	662	443.04	1374.04	1420.74
	-8.2	568	962	486	221	704	505.44	1467.44	745.52
Slip Surface	-8.7	568	978	502	242	725	536.64	1514.64	
	-9.2	568	993	518	263	746			
	-10.2	568	1025	549	305	788			
	-11.2	568	1057	580	346	831			
	-12.2	568	1084	617	393	868			
	-13	568	1066	682	466	860			
	-13.2	568	1055	703	489	851			
	-14.2	568	1075	754	580	818			
	-14.81	568	1098	766	622	837			
	-15.2	568	1112	774	649	850			
	-16.2	568	1149	787	683	887			
	-16.42	568	1228	748	668	916			
	-17.2	568	1280	732	661	928			

Total CWALSHT Passive Force		12676.07	Quartic				
	CWALSHT FoS	3.14	a	b	c	d	e
	Equation		290.78	-4053.7	21996	-58008	73173
Total Slope/W Passive Force		10667.78					
	Difference	-2008.29					
	Height	12.8					
	Distribution	-156.90					

Reach 6A ETL Surcharge Summary						
Iteration	Distributed Load In CWALSHT (psf)	Force Applied in CWALSHT (lbs/ft)	CWALSHT Passive Force Calculated (lbs/ft)	Spencer's Passive Force Calculated (lbs/ft)	Difference in Forces (lbs/ft)	Factor of Safety
3	517	5997.2	12204	18599	-6395	1.43
2	250	2900	9478	9330	148	2.6
6	201	2331.6	9332	8709	623	2.76
5	170	1972	9072	7616	1456	3.1
8	160	1856	8993	7289	1704	3.22
9	155	1798	8948	7111	1837	3.29
7	150	1740	8913	6964	1949	3.35
4	130	1508	8737	6409	2328	3.6
1	0	0	7749	3487	4262	6.1

Reach 6A



Reach 6A, Iteration 9

HORIZONTAL DISTRIBUTED LOAD 155 PSF
FACTOR OF SAFETY FOR ACTIVE PRESSURE:= 3.29
FACTOR OF SAFETY FOR PASSIVE PRESSURE:= 3.29
PILE TIP -13.2

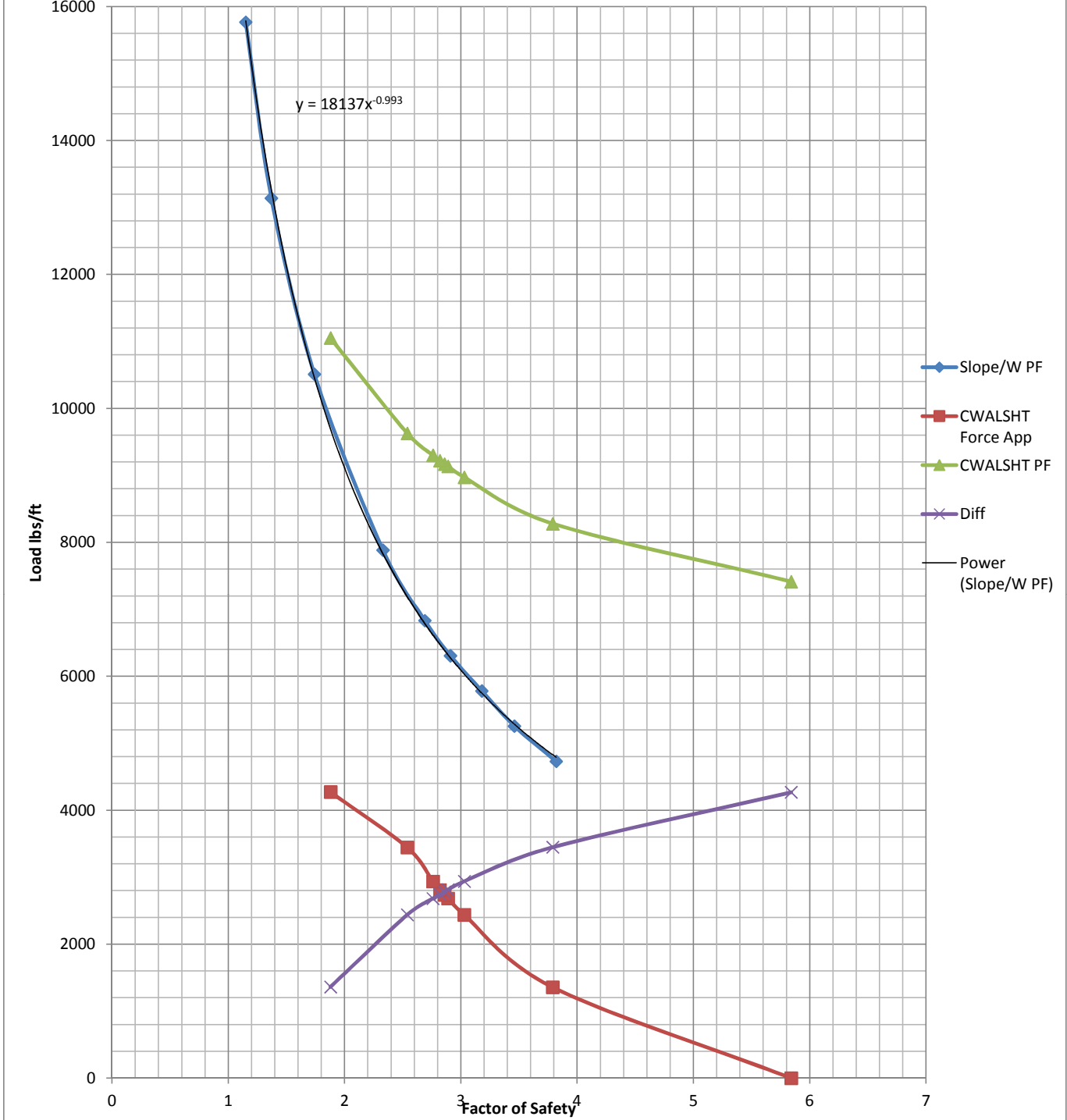
III.--WATER AND SOIL PRESSURES

		<-----SOIL		PRESSURES----->						
	WATER	<----LEFTSIDE----->		<---RIGHTSIDE----->						
ELEVATION	PRESSURE	PASSIVE	ACTIVE	ACTIVE	PASSIVE					
(FT)	(PSF)	(PSF)	(PSF)	(PSF)	(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	63	0	0	0	0					
6	125	0	0	0	0					
5	188	0	0	0	0			Left P.P.	Area	
Ground Surface	4.4	225	0	0	0			0	0	
	4.4	225	304	0	0			304	139.6	
	4	250	394	0	0			394	39.9	
	3.9	256	404	0	0			404	0	
	3.9	256	404	0	0	304		404	74.34	
	3.72	267	422	0	0	313		422	330.48	
	3	313	496	0	0	350		496	50.1	
	2.9	319	506	0	0	348		506	496.35	
	2	375	597	0	0	379		597	647.5	
	1	438	698	0	0	413		698	748.5	
	0	500	799	0	0	447		799	641.6	
	-0.8	550	805	0	0	397		805	158.4	
	-1	563	779	0	0	382		779	731	
	-2	625	683	195	0	404	Water Press	Left P.P.	683	733.5
	-3	688	784	455	0	428	0	784	784	834.2
Slip Surface Bottom	-4	688	822	536	0	337	62.4	884.4		932.6
	-5	688	856	559	0	371	124.8	980.8		1028.5
	-6	688	889	575	0	404	187.2	1076.2		1124.4
	-7	688	923	598	0	438	249.6	1172.6		236.568
	-7.2	688	931	602	0	445	262.08	1193.08		
	-8	688	961	621	0.*					
	-9	688	1000	644	0.*					
	-10	688	1107	754	228	553				
	-10.42	688	1212	746	309	578				
	-11	688	1356	736	422	613				
	-12	688	1328	635	402	672				
	-13	688	1364	662	435	732				
	-13.21	688	1398	686	467	791				
	-15	688	1428	714	500	851				
	Total CWALSHT Passive Force								8,948	Exponential
CWALSHT FoS								3.29	significand	exponent
Equation									28103	-1.154
Total Slope/W Passive Force								7,111		
Difference								1,837		
Distributed Height								11.6		
Distributed Load								158		

Reach 6B ETL Surcharge Summary							
Iteration	Distributed Load In CWALSHT (psf)	Force Applied in CWALSHT (lbs/ft)*	CWALSHT Passive Force Calculated (lbs/ft)	SLOPE/W Passive Force Based On FoS (lbs/ft)	Difference in Forces (lbs/ft)	Distributed Load for Next Iteration (psf)	CWALSHT Factor of Safety (FoS)
1	0	0	7413	3144	4269	403	5.84
2	403	4272	11051	9690	1361	128	1.88
3	128	1357	8278	4830	3448	325	3.79
4	325	3445	9627	7187	2439	230	2.54
5	230	2438	8971	6030	2939	277	3.03
6	277	2936	9300	6618	2681	253	2.76
7	253	2682	9135	6323	2813	265	2.89
8	265	2809	9221	6478	2743	258	2.82
9	258	2735	9169	6388	2780	262	2.86

*Distributed Height=10.6 ft

Reach 6B

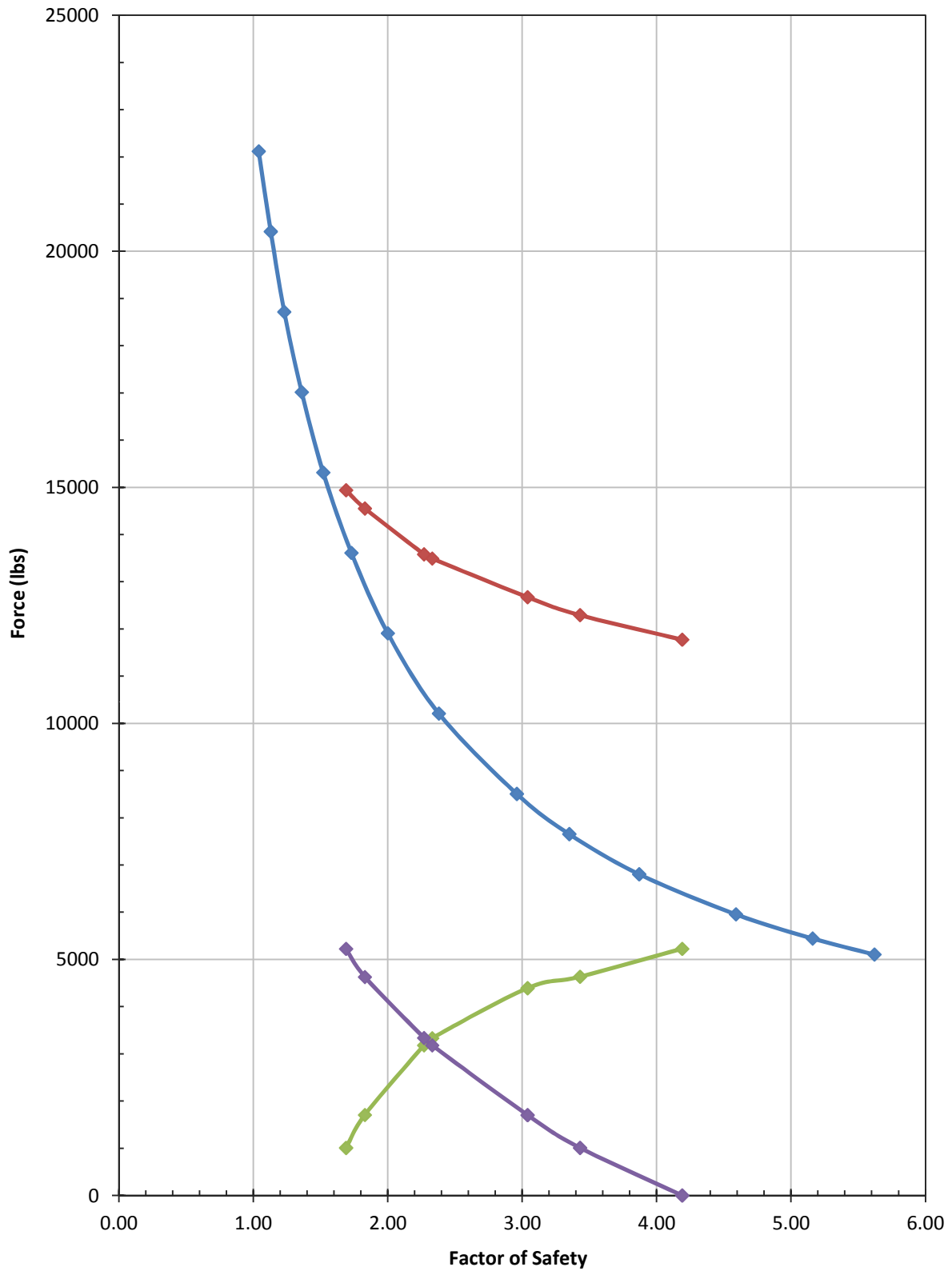


I.--HEADING
 'LONDON AVE CANAL REEVALUATION
 'REACH 6B
 '12/23/11
 HORIZONTAL DISTRIBUTED LOAD 258 PSF
 SHEET PILE TIP ELEVATION -13.2
 RIGHTSIDE SOIL PRESSURES DETERMIN BY FIXED SURFACE WEDGE
 LEFTSIDE SOIL PRESSURES DETERMIN BY FIXED SURFACE WEDGE
 NET SOIL PRESSURES INCLUDE APPLIED HORIZONT. DISTRIBUTED LOADS.

	<-----NET----->											
	NET	<---LEFTSIDE	(SOIL	+	(WATER)	<--RIGHTSIDE---						
	ELEV.	WATER	PASSIVE	ACTIVE	ACTIVE	PASSIVE	ACTIVE	PASSIVE				
	(FT)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)				
Ground Surface	11	0	0	0	0	0	0	0				
	10	0	0	0	0	0	0	0				
	9	0	0	0	0	0	0	0				
	8	0	0	0	0	0	0	0				
	7	62.4	0	0	62.4	62.4	0	0				
	6	124.8	0	0	124.8	124.8	0	0				
	5	187.2	0	0	187.2	187.2	0	0	Left P.P.	Water Pres		
	4.4	224.6	0	0	224.6	224.6	0	0	Left P.P.	Area		
	4.4	224.6	489.5	0	-264.9	224.6	0	0	0	0		
	4	249.6	535	0	-285.4	249.6	0	0	489.5	489.5		
3.9	255.8	544.8	0	-289	255.8	0	0	535	535			
3.9	255.8	544.8	0	-30.3	1004.1	0	489.5	544.8	544.8			
3	312	612.2	0	-41.5	1073.2	0	502.5	612.2	612.2			
2.9	318.2	621.1	0	-44.1	1077	0	500.1	621.1	621.1			
2	374.4	714.1	0	-81	1134.9	0	501.8	714.1	714.1			
1	436.8	817.9	0	-122.4	1236.4	0	540.9	817.9	817.9			
0	497.8	908.3	0	-150.8	1323.2	0	566.7	908.3	908.3			
0	497.8	906.2	0	-150.8	1323.2	0	566.7	906.2	906.2			
0	499.2	908.3	2.6	-150.4	1322.6	0	567.4	908.3	908.3			
Water Surface	-0.8	549.1	873.8	186.3	-66	1115.5	0	494.1	873.8	0		
Slip Surface	-1	549.1	840.1	244.5	-32.3	1025.2	0	461.9	840.1	12.48		
	-1.6	549.1	798.2	330.4	9.6	901.7	0	415.6	798.2	49.92		
	-1.6	549.1	798.2	330.4	9.6	901.7	0	432.9	798.2	49.92		
	-2	549.1	812.8	340.1	36.1	883.4	41.1	415.6	812.8	74.88		
	-3	549.1	838.3	380	40.2	877.4	70.7	449.6	838.3	137.28		
	-4	549.1	837.1	436.2	72.3	851.5	101.5	479.8	837.1	199.68		
	-5	549.1	825.9	482.3	116.2	828.4	134.3	502.9	825.9	262.08		
	-6	549.1	831	501.5	146.3	826.1	169.5	519.7	831	324.48		
	-6.2	549.1	833.8	503.5	149.4	828.4	175.4	524.1	833.8	336.96		
	-6.2	549.1	833.8	503.5	-109.3	569.7	175.4	524.1				
	-7	549.1	845.2	514.9	-99.4	581	196.6	546.8	Total CWALSHT Passive Force			
	-8	549.1	860.7	532.8	-85.2	594.2	226.3	577.9	CWALSHT FoS			
	-9	549.1	893.8	549.4	-77.3	607.5	267.3	607.7	Equation			
	-10	549.1	973.8	560.4	-92.6	630.3	332	641.6	Total Slope/W Passive Force			
	-11	549.1	1071.5	574.7	-124.8	667.5	397.7	693.1	Difference			
	-12	549.1	1140.5	598.1	-148.7	701.7	442.7	750.7	Height			
	-13	549.1	1193.7	624.8	-159.4	730.8	485.1	806.4	Distribution			
-14	549.1	1248.6	651.1	-168.9	769.3	530.6	871.3					
-15	549.1	1303.7	677.4	-186.5	813.8	568.1	942.1					
-16	549.1	1358.1	703.7	-207.9	857.5	601.1	1012.1					
-17	549.1	1409.8	730	-226	901	634.7	1081.9					
-18	549.1	1458.7	756.3	-241.3	942.7	668.3	1149.9					
-19	549.1	1506.7	782.7	-255.8	997.4	701.8	1231.1					
-20	549.1	1554.9	810	-270.3	1069.1	735.5	1329.9					
-21	549.1	1603.1	838.3	-284.7	1127.5	769.3	1416.8					
-22	549.1	1651.2	867.2	-298.9	1168.8	803.2	1486.9					
-23	549.1	1697.1	896	-310.7	1208.6	837.3	1555.4					
-24	549.1	1761.2	924.8	-351.3	1248.4	860.7	1624.1					
-25	549.1	1867.1	953.6	-443.6	1288.3	874.3	1692.8					
-26	549.1	1980.3	982.4	-531.3	1328.2	899.8	1761.5					
-27	549.1	2067.8	1011.3	-583.5	1368.1	935.2	1830.2					

Reach 7:Non-Remediated ETL Surcharge Summary							
Iteration	Distributed Load In CWALSHT (psf)	Force Applied in CWALSHT (lbs/ft)*	CWALSHT Passive Force Calculated (lbs/ft)	SLOPE/W Passive Force Based On FoS (lbs/ft)	Difference in Forces (lbs/ft)	Distributed Load for Next Iteration (psf)	CWALSHT Factor of Safety (FoS)
1	0	0	11774	6548	5226	368	4.19
2	368	5225.6	14941	13932	1009	71	1.69
3	71	1008.2	12294	7662	4632	326	3.43
4	326	4629.2	14553	12847	1706	120	1.83
5	120	1704	12675	8283	4391	309	3.04
6	235	3337	13582	10403	3180	224	2.27
7	224	3180.8	13492	10160	3332	235	2.33

London Ave Canal - Reach 7:Non-Remediated
FORCE PLOTS



◆ Slope/W PF ◆ CWALSHT PF ◆ PF Difference ◆ CWALSHT Applied Force

ITERATION **7**

APPLIED UNIFORM PSF: **224**

PILE TIP: **-17.15**

SWEEP SURFACE

Left Side
Ground Surface Elevation

Left Side
Water Surface Elevation

Entry failure at this elevation
Location per Geostudio

NET ELEV. (FT)	WATER (PSF)	<---NET--->					
		<---LEFTSIDE--->		(SOIL+WATER)		<---RIGHTSIDE--->	
		PASSIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)
10	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0
7	62.5	0	0	62.5	62.5	0	0
6	125	0	0	125	125	0	0
5	187.5	0	0	187.5	187.5	0	0
4	250	0	0	250	250	0	0
3.7	268.8	0	0	268.8	268.8	0	0
3.7	268.8	557.9	0	-65.2	492.8	0	0
3.5	281.3	562.9	0	-57.6	505.3	0	0
3.5	281.3	562.9	0	-57.6	1063.2	0	557.9
3	312.5	613.9	0	-77.4	1079.5	0	543
2.5	343.8	664.9	0	-97.2	1130.6	0	562.9
2	375	715.9	0	-116.9	1181.7	0	582.7
1	437.5	817.8	0	-156.3	1107.6	0	446.1
0	500	919.6	0	-195.6	1151.6	0	427.6
-1	562.5	935.5	0	-149	1312.9	0	526.4
-2	625	901.8	0	-52.8	1355	0	506
-3	687.5	903.6	0	7.9	1454.8	0	543.3
-4	750	808.5	40.1	165.5	1462.5	0	528.6
-5	812.5	898.5	366.5	138	1175.9	0	505.9
-6	812.5	926	658.3	110.5	904.6	0	526.4
-7	812.5	953.5	668	83	769.8	0	401.3
-8	812.5	981	678.9	55.5	786.4	0	428.8
-9	812.5	1016.5	696.4	20	804.4	0	464.3
-10	812.5	1052	714.7	-15.5	838.4	0	516.6
-10.5	812.5	1069.8	722.2	-33.3	855.6	0	541.3
-10.5	812.5	1069.8	722.2	-257.3	631.6	0	541.3
-11	812.5	1087.5	733.4	-275	614.3	0	535.3
-12	812.5	1180.2	683.4	-367.7	699.9	0	570.8

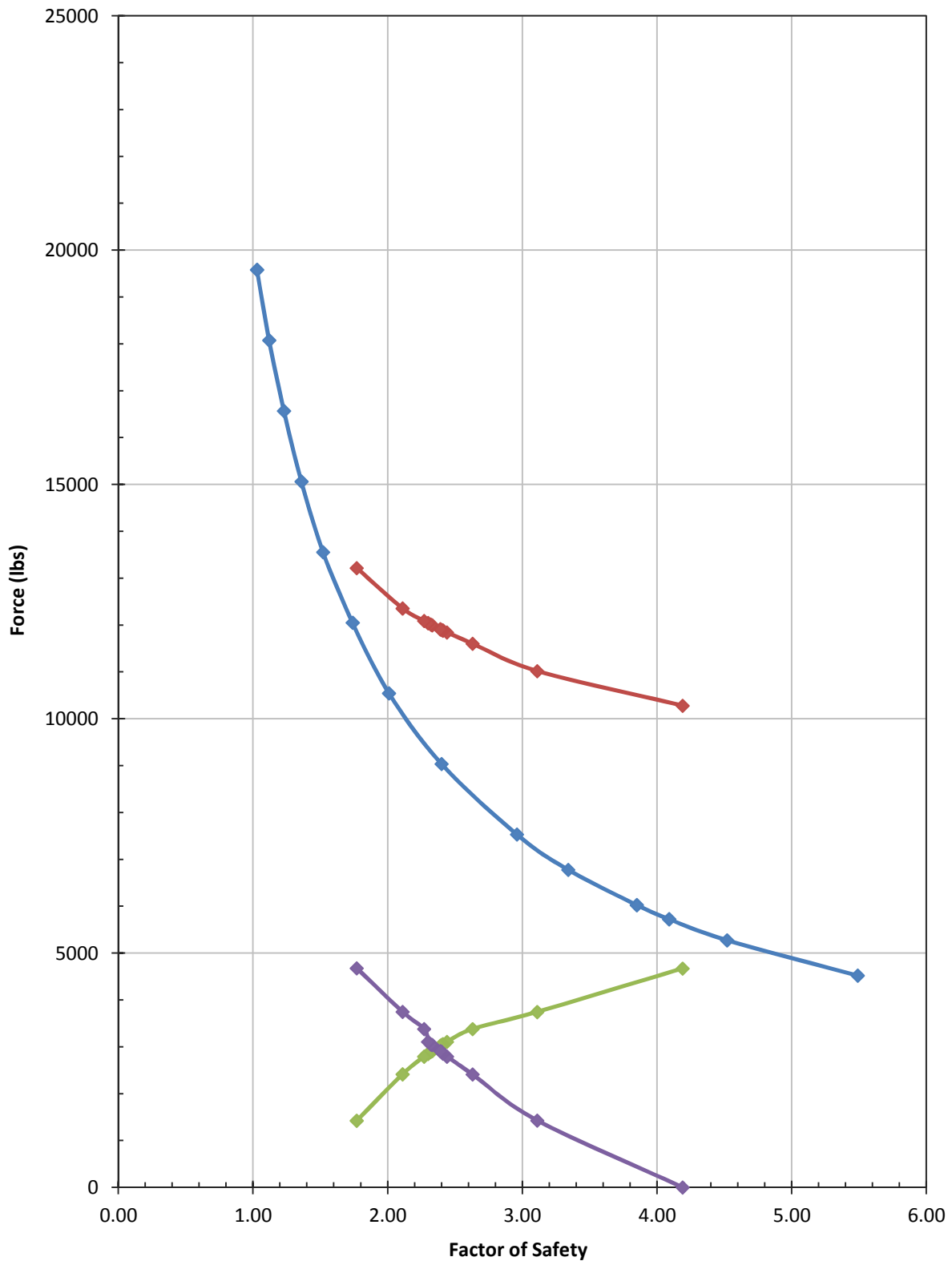
WATER	PASSIVE	
PSF	PSF	LBS
	557.9	112.08
	562.9	0
	562.9	294.2
	613.9	319.7
	664.9	345.2
	715.9	766.85
	817.8	868.7
	919.6	927.55
	935.5	918.65
	901.8	902.7
	903.6	856.05
	808.5	853.5
0	898.5	943.45
62.4	988.4	1033.35
124.8	1078.3	1123.25
187.2	1168.2	1217.15
249.6	1266.1	1315.05
312	1364	694.25
343.2	1413	

File Name: R7NR_C224.dat

	Quartic				
	a	b	c	d	e
CWALSHT PASSIVE FORCE=	13491.68				
CWALSHT FS=	2.33	153.47	-2445.4	14502	-39413
GEOSTUDIO PASSIVE FORCE=	10160.1				
PASSIVE FORCE DIFFERENCE=	3331.5				
SHEET PILE LENGTH=	14.2				
UNIFORM PRESSURE=	235				

Reach 7:Remediated ETL Surcharge Summary							
Iteration	Distributed Load In CWALSHT (psf)	Force Applied in CWALSHT (lbs/ft)*	CWALSHT Passive Force Calculated (lbs/ft)	SLOPE/W Passive Force Based On FoS (lbs/ft)	Difference in Forces (lbs/ft)	Distributed Load for Next Iteration (psf)	CWALSHT Factor of Safety (FoS)
1	0	0	10279	5608	4671	357	4.19
2	357	4676.7	13217	11794	1423	109	1.77
3	109	1427.9	11018	7274	3743	286	3.11
4	286	3746.6	12355	9941	2414	184	2.11
5	184	2410.4	11602	8223	3380	258	2.63
6	258	3379.8	12087	9297	2790	213	2.27
7	213	2790.3	11842	8735	3107	237	2.44
8	237	3104.7	12041	9189	2852	218	2.3
9	218	2855.8	11883	8826	3057	233	2.41
10	233	3052.3	12011	9120	2892	221	2.32
11	221	2895.1	11896	8857	3039	232	2.4
12	232	3039.2	11997	9086	2911	222	2.33
13	222	2908.2	11910	8889	3022	231	2.39

London Ave Canal - Reach 7:Remediated
FORCE PLOTS



◆ Slope/W PF ◆ CWALSHT PF ◆ PF Difference ◆ CWALSHT Applied Force

ITERATION 13

APPLIED UNIFORM PSF: 222

PILE TIP: -17.18

SWEEP SURFACE

Left Side
Ground Surface Elevation

Left Side
Water Surface Elevation

Entry failure at this elevation
Location per Geostudio

NET ELEV. (FT)	WATER (PSF)	<---NET--->					
		<---LEFTSIDE--->		(SOIL+WATER)		<---RIGHTSIDE--->	
		PASSIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)
10	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0
7	62.5	0	0	62.5	62.5	0	0
6	125	0	0	125	125	0	0
5	187.5	0	0	187.5	187.5	0	0
4	250	0	0	250	250	0	0
3.7	268.8	0	0	268.8	268.8	0	0
3.7	268.8	543.9	0	-53.2	490.8	0	0
3.5	281.3	549.2	0	-46	503.3	0	0
3.5	281.3	549.2	0	-46	1047.2	0	543.9
3	312.5	600.3	0	-65.8	1064.4	0	529.9
2.5	343.8	651.3	0	-85.6	1115.5	0	549.7
2	375	702.3	0	-105.3	1166.6	0	569.6
1	437.5	804.2	0	-144.7	1096.5	0	437
0	500	906	0	-184	1141.9	0	419.9
-1	562.5	924	0	-139.5	1301.6	0	517.1
-2	625	892.8	0	-45.8	1344.8	0	497.8
-3	687.5	895.1	0	14.4	1444.6	0	535.1
-4	750	808.5	86.6	163.5	1407.1	0	521.6
-5	812.5	898.5	415.2	136	1119.3	0	499.9
-6	812.5	926	663.2	108.5	891.7	0	520.4
-7	812.5	953.5	673	81	762.8	0	401.3
-8	812.5	981	684.3	53.5	778.9	0	428.8
-9	812.5	1016.5	703	18	795.8	0	464.3
-9.4	812.5	1030.7	710.4	3.8	802.6	0	478.5
-9.4	812.5	1030.7	710.4	-218.2	580.6	0	478.5
-10	812.5	1052	719.9	-239.5	607.6	0	515

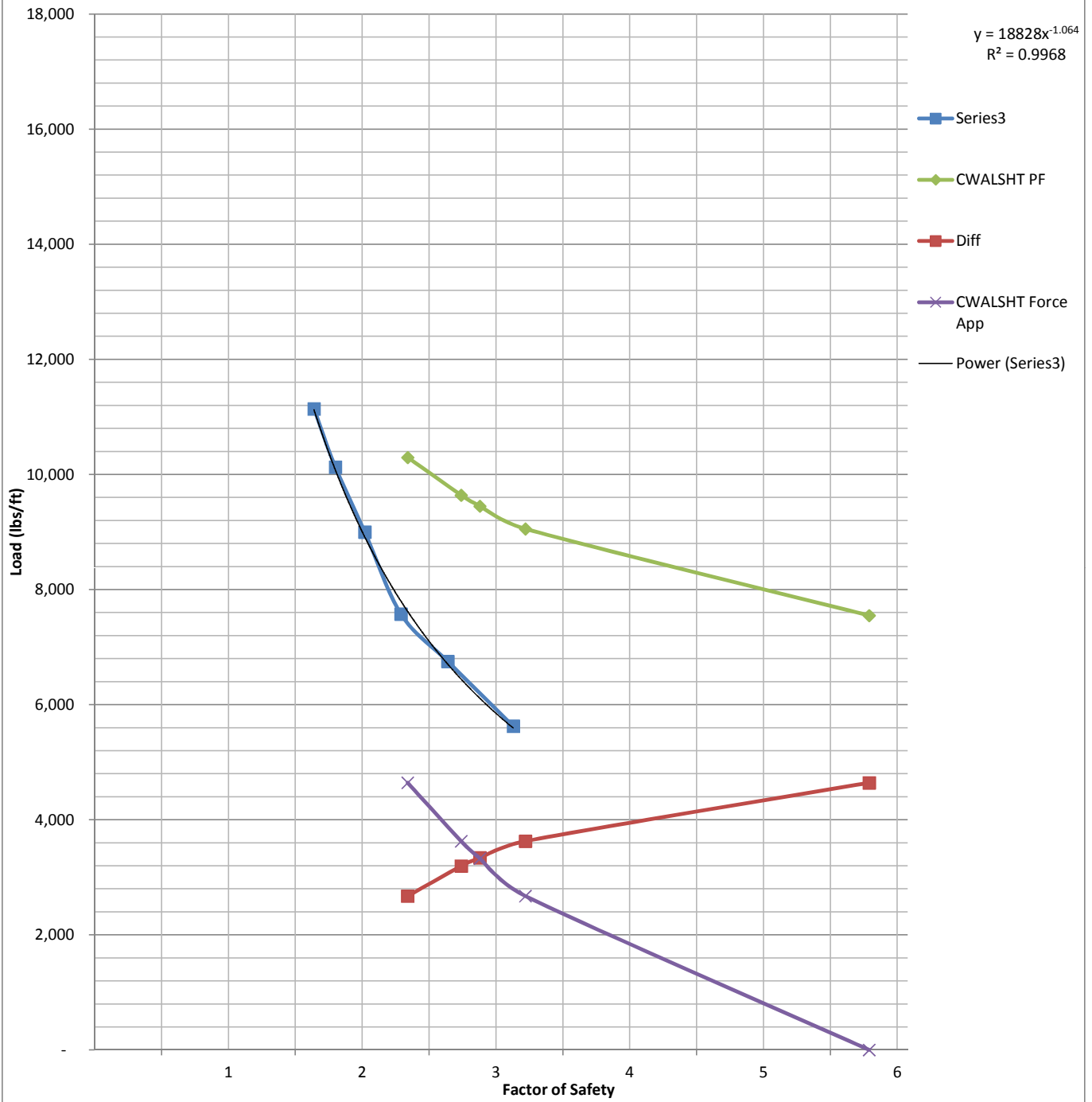
WATER	PASSIVE	
PSF	PSF	LBS
	543.9	109.31
	549.2	0
	549.2	287.375
	600.3	312.9
	651.3	338.4
	702.3	753.25
	804.2	855.1
	906	915
	924	908.4
	892.8	893.95
	895.1	851.8
	808.5	853.5
0	898.5	943.45
62.4	988.4	1033.35
124.8	1078.3	1123.25
187.2	1168.2	1217.15
249.6	1266.1	514.272
274.56	1305.26	

File Name: R7R_C222.dat

	Quartic				
	a	b	c	d	e
CWALSHT PASSIVE FORCE=	11910.46				
CWALSHT FS=	2.39	152.38	-2339.2	13392	-35418
GEOSTUDIO PASSIVE FORCE=	8888.7				
PASSIVE FORCE DIFFERENCE=	3021.7				
SHEET PILE LENGTH=	13.1				
UNIFORM PRESSURE=	231				

Reach 8 ETL Surcharge Summary						
Iteration	Distributed Load In CWALSHT (psf)	Force Applied in CWALSHT (lbs/ft)	CWALSHT Passive Force Calculated (lbs/ft)	Spencer's Passive Force Calculated (lbs/ft)	Difference in Forces (lbs/ft)	Factor of Safety
1	0	0	7548	2906	4642	5.79
2	434	4644	10294	7620	2674	2.34
3	250	2675	9053	5426	3627	3.22
4	339	3627	9638	6442	3196	2.74
B1	311	3328	9448	6110	3338	2.88

Reach 8



Reach 8, Iteration B1

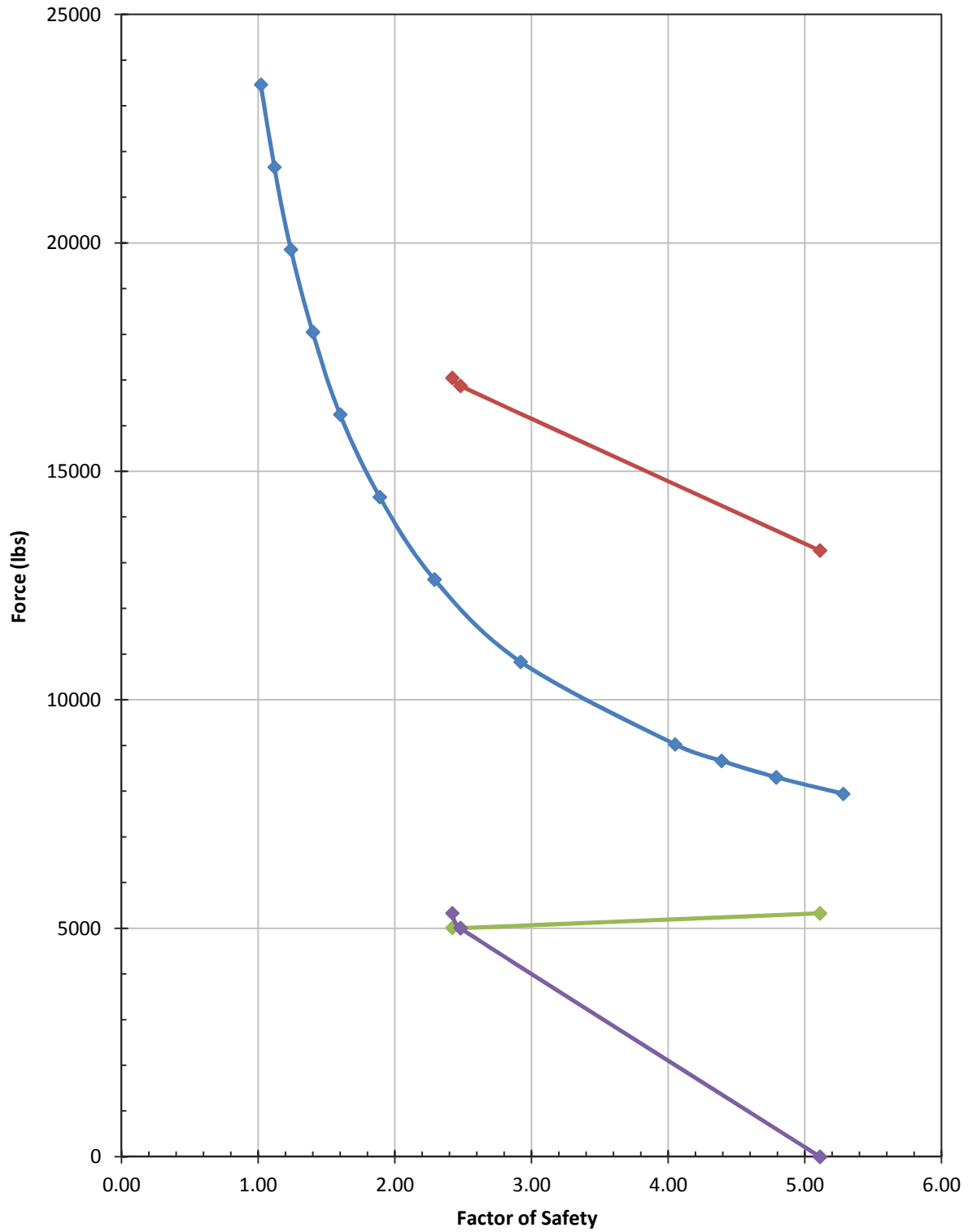
HORIZONTAL DISTRIBUTED LOAD		311	PSF		
FACTOR OF SAFETY	FOR ACTIVE	PRESSURE!=	2.88		
FACTOR OF SAFETY	FOR PASSIVE	PRESSURE!=	2.88		
PILE TIP	-17.3				

III.--WATER AND SOIL PRESSURES

	ELEVATION (FT)	<-----SOIL		PRESSURES----->					
		WATER	<----LEFTSIDE----->	<---RIGHTSIDE----->					
		PRESSURE	PASSIVE	ACTIVE	ACTIVE	PASSIVE			
		(PSF)	(PSF)	(PSF)	(PSF)	(PSF)			
Ground Surface	13	0.00E+00	0	0.00E+00	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	63	0	0	0	0			
	6	125	0	0	0	0			
	5	188	0	0	0	0			
	4	250	0	0	0	0		Left P.P.	Area
	3.7	269	0	0	0	0		0	0
Water Surface	3.7	269	626	0	0	0		626	125.7
	3.5	281	631	0	0	0		631	0
	3.5	281	631	0	0	626		631	328.5
	3	313	683	0	0	618		683	354.5
	2.5	344	735	0	0	639		735	380.25
	2	375	786	0	0	660		786	838
	1	438	890	0	0	701		890	941.5
	0	500	993	0	0	521		993	974.5
	-1	563	956	0	0	364		956	936
	-2	625	916	0	0	443	Water Press	Left P.P.	916 909
	-3	688	902	0	0	495	0	902	902 851.7
Slip Surface Bottom	-4	688	739	0	0	460	62.4	801.4	846.1
	-5	688	766	211	0	418	124.8	890.8	936
	-6	688	794	525	0	438	187.2	981.2	1025.9
	-7	688	821	631	0	394	249.6	1070.6	
	-8	688	971	513	0	421			
	-9	688	1363	397	0	707			
	-10	688	1141	507	0	492			
	-11	688	979	625	0	552			
	-12	688	1039	653	197	611			
	-13	688	1098	681	440	671			
	-14	688	1158	711	500	730			
	-15	688	1217	739	528	790			
	-15.03	688	1219	740	529	792			
	-16	688	1277	770	556	849			
	-17	688	1336	802	582	930			
	-17.31	688	1396	829	612	1043			
	-19	688	1455	864	646	1096			
	Total CWALSHT Passive Force						9,448	Exponential	
	CWALSHT FoS						2.88	significand	exponent
	Equation							18828	-1.064
	Total Slope/W Passive Force						6,110		
	Difference						3,338		
	Distributed Height						10.7		
	Distributed Load						312		

Reach 9 ETL Surcharge Summary							
Iteration	Distributed Load In CWALSHT (psf)	Force Applied in CWALSHT (lbs/ft)*	CWALSHT Passive Force Calculated (lbs/ft)	SLOPE/W Passive Force Based On FoS (lbs/ft)	Difference in Forces (lbs/ft)	Distributed Load for Next Iteration (psf)	CWALSHT Factor of Safety (FoS)
1	0	0	13270	7943	5328	378	5.11
2	378	5329.8	17046	12036	5009	355	2.42
3	355	5005.5	16871	11867	5004	355	2.48

London Ave Canal - Reach 9
FORCE PLOTS



—◆— Slope/W PF —◆— CWALSHT PF —◆— PF Difference —◆— CWALSHT Applied Force

ITERATION **3**

APPLIED UNIFORM PSF: **355**

PILE TIP: **-21.26**

FIXED SURFACE

Left Side
Ground Surface Elevation

Left Side
Water Surface Elevation

Entry failure at this elevation
Location per Geostudio

NET ELEV. (FT)	WATER (PSF)	<---NET--->					
		<---LEFTSIDE--->		(SOIL+WATER)		<---RIGHTSIDE--->	
		PASSIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)
10	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0
7	62.5	0	0	62.5	62.5	0	0
6	125	0	0	125	125	0	0
5	187.5	0	0	187.5	187.5	0	0
4	250	0	0	250	250	0	0
3.1	306.3	0	0	306.3	306.3	0	0
3.1	306.3	766.1	0	-104.9	1427.4	0	766.1
3	312.5	768.8	0	-101.3	1420.1	0	752.6
2.1	368.8	863.2	0	-139.5	1514.6	0	790.8
2	375	873.7	0	-143.7	1525	0	795
1	437.5	978.6	0	-186.1	1630	0	837.5
0.5	468.8	1031.1	0	-207.3	1687.3	0	863.6
0	500	1083.6	0	-228.6	1727.5	0	872.5
-1	562.5	1188.5	0	-271	1665.1	0	747.6
-2	625	1293.4	0	-313.4	1542.5	0	562.5
-3	687.5	1398.4	0	-355.9	1558.9	0	516.4
-3.5	718.5	1461.4	0	-387.9	1503	0	414.6
-3.5	718.5	1461.4	0	-387.9	1503	0	444.2
-3.7	731.3	1421	0	-298.4	1500.9	36.3	414.6
-3.7	731.3	1273	0	-222	1499.5	37.8	413.3
-3.7	731.3	1419.1	0	-222	1499.5	37.8	413.3
-4	731.3	1273	175.2	-27.8	1219.9	158.9	308.9
-5	731.3	1041.3	464.3	416.7	958.3	371.7	336.4
-6	731.3	1021	535.7	345.6	914.4	280.4	363.9
-7	731.3	987.9	609.1	266.2	868.5	167.9	391.4
-8	731.3	966.9	660	274.6	845.1	155.3	418.9
-9	731.3	976.5	680.4	292.7	860.2	182.9	454.4
-10	731.3	1020.9	688.8	283.6	887.3	218.3	489.9
-11	731.3	1145.2	674.9	220.8	936.7	279.7	525.4
-11	731.3	1145.2	674.9	-134.2	581.7	279.7	525.4
-12	731.3	1292.9	665.1	-217.8	651	343.8	584.9

WATER	PASSIVE	
PSF	PSF	LBS
	766.1	76.745
	768.8	734.4
	863.2	86.845
	873.7	926.15
	978.6	502.425
	1031.1	528.675
	1083.6	1136.05
	1188.5	1240.95
	1293.4	1345.9
	1398.4	714.95
	1461.4	0
	1461.4	288.24
	1421	0
	1273	0
0	1419.1	406.623
18.72	1291.72	1207.07
81.12	1122.42	1143.47
143.52	1164.52	1179.17
205.92	1193.82	1214.52
268.32	1235.22	1271.22
330.72	1307.22	1360.62
393.12	1414.02	1507.37
455.52	1600.72	

File Name: R9_C355.dat

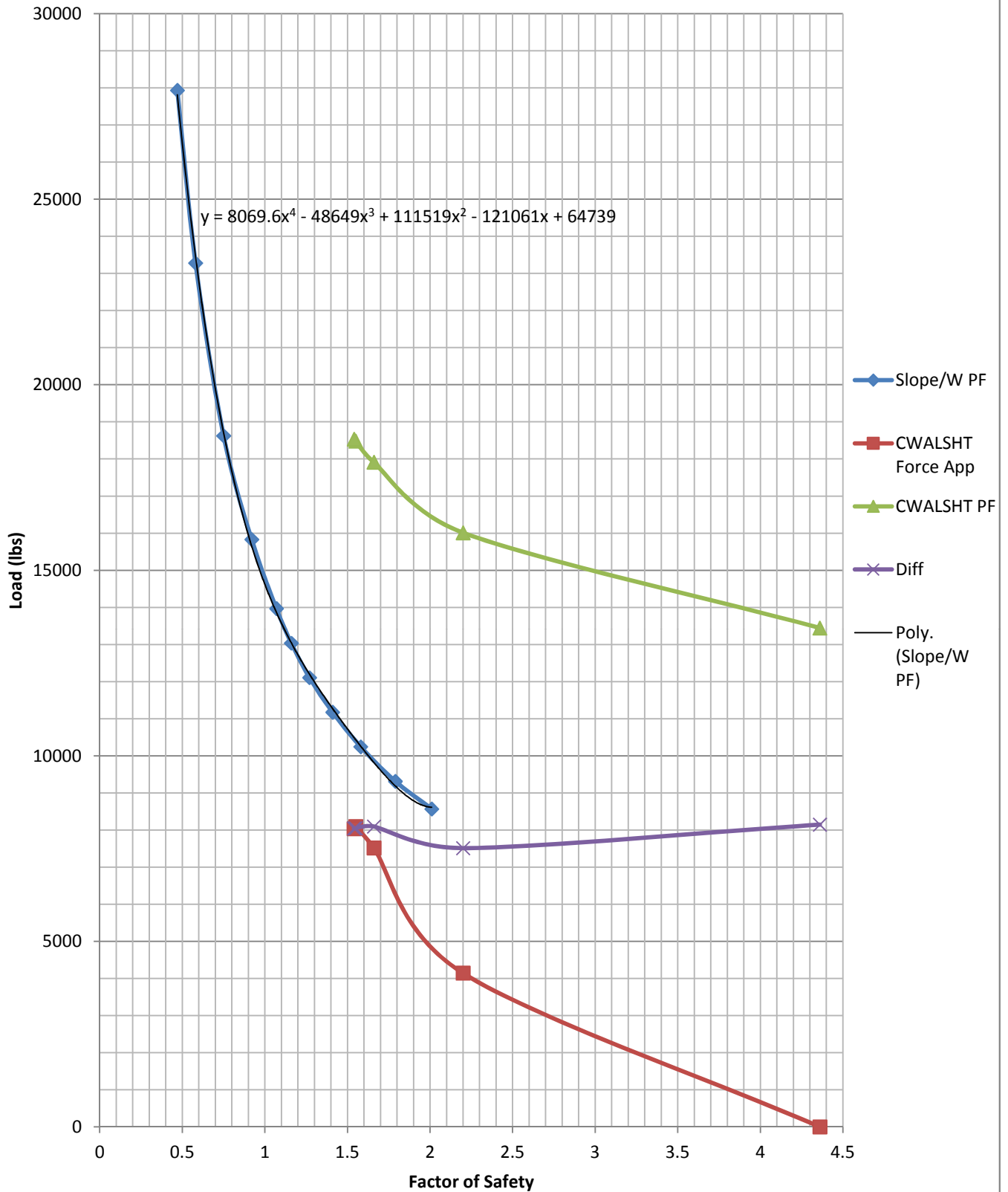
Quartic					
a	b	c	d	e	
188.97	-2829.4	15746	-40138	50574	
CWALSHT PASSIVE FORCE= 16871.39					
CWALSHT FS= 2.48					
GEOSTUDIO PASSIVE FORCE= 11867.4					
PASSIVE FORCE DIFFERENCE= 5004.0					
SHEET PILE LENGTH= 14.1					
UNIFORM PRESSURE= 355					

Reach 10 ETL Surcharge Summary							
Iteration	Distributed Load In CWALSHT (psf)	Force Applied in CWALSHT (lbs/ft)*	CWALSHT Passive Force Calculated (lbs/ft)	SLOPE/W Passive Force Based On FoS (lbs/ft)	Difference in Forces (lbs/ft)	Distributed Load for Next Iteration (psf)	CWALSHT Factor of Safety (FoS)
1	0	0	13445	5300**	8145	550	4.36
2	280	4144	16013	8500**	7513	508	2.2
3	508	7518	17915	9820	8095	547	1.66
4	547	8096	18536	10492	8044	543	1.54
5	543	8036	18482	10434	8048	543	1.55

*Distributed Height=14.8 ft

**Factor of Safety not on graph. Force estimated from graph.

Reach 10



I.--HEADING
'LONDON AVE REEVALUATION
'REACH 10
'12/29/11

HORIZONTAL DISTRIBUTED LOAD 543 PSF

PILE TIP ELEVATION -17.5

FACTOR OF SAFETY FOR ACTIVE PRESSURES = 1.55
FACTOR OF SAFETY FOR PASSIVE PRESSURES = 1.55

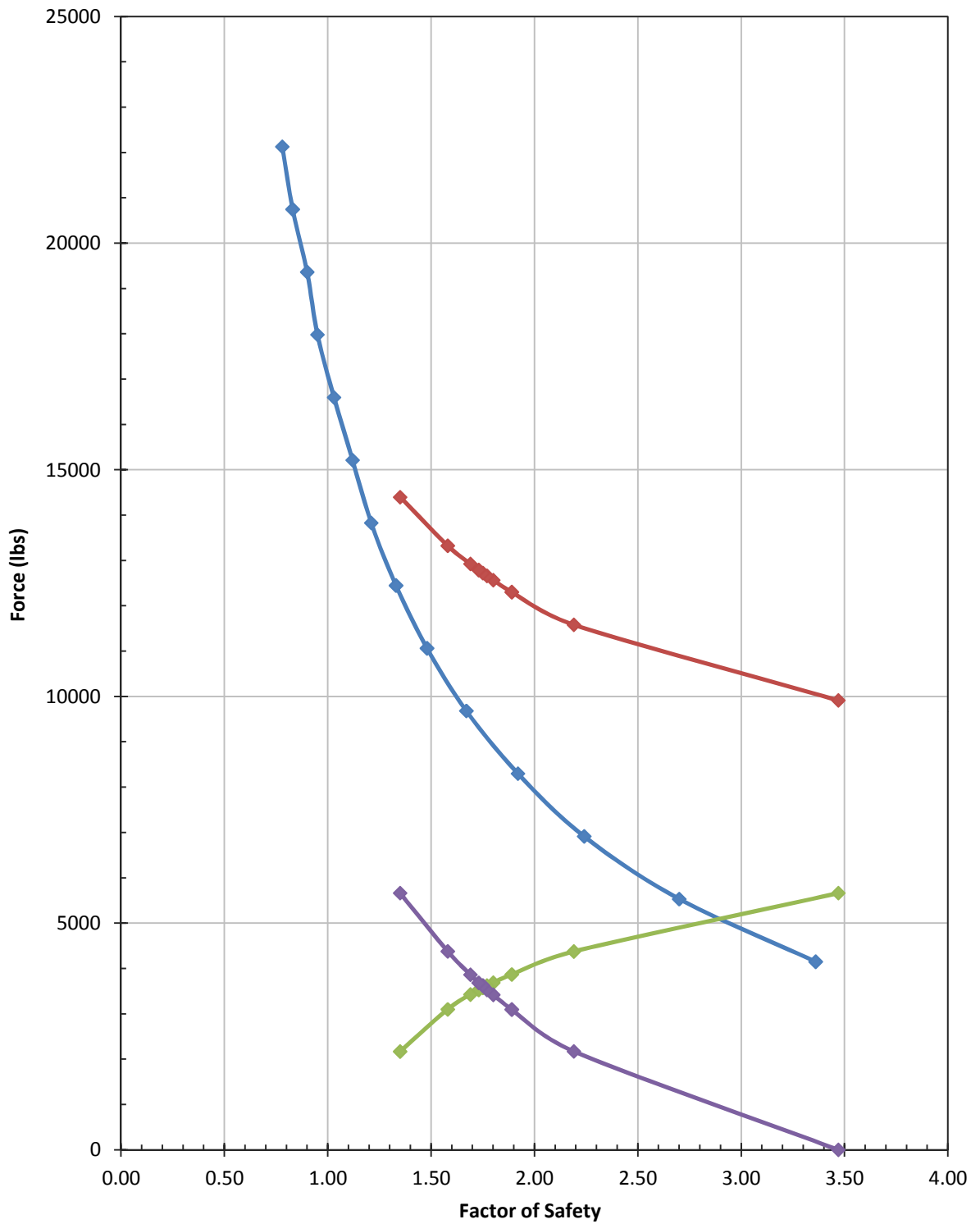
III.--WATEF AND SOIL PRESSURES

		<-----SOIL		PRESSURES----->					
	WATER	<----LEFTSIDE----->		<---RIGHTSIDE---->					
ELEVATION	PRESSURE	PASSIVE	ACTIVE	ACTIVE	PASSIVE				
(FT)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)				
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			Left P.P.	Area
Ground Surface	3.3	293	0	0	0			0	0
3.3	293	968	0	0	0			968	194.4
3.1	306	976	0	0	0			976	0
3.1	306	976	0	0	968			976	197.2
2.9	318	996	0	0	940			996	828.4
2.1	368	1075	0	0	970			1075	217
1.9	381	1095	0	0	977			1095	1145
0.9	443	1195	0	0	1015			1195	1245
-0.1	505	1295	0	0	1052			1295	1345
-1.1	568	1395	0	0	1089			1395	1446
-2.1	630	1497	0	0	1129			1497	1539.5
-3.1	693	1582	0	0	1151			1582	998.92
-3.78	735	1356	0	0	965			1356	0
-3.78	735	1411	0	0	965			1411	304.37
-4	749	1356	98	0	906			1356	132.55
-4.1	755	1295	178	0	846			1295	738.36
-4.73	794	1049	528	0	384			1049	0
-4.73	794	1049	528	0	556			1049	382.395
-5.1	817	1018	613	187	384			1018	1022.5
Water Surface	-6.1	880	1027	737	425	326	Water Press	Left P.P.	1027
	-7	936	1083	788	482	348	0	1083	108.762
-7.1	936	1086	791	481	350		6.24	1092.24	1010.988
-8	936	1092	797	485	372		62.4	1154.4	115.802
-8.1	936	1093	798	486	376		68.64	1161.64	1199.84
-9.1	936	1107	811	499	412		131.04	1238.04	1271.74
-10.1	936	1112	828	514	447		193.44	1305.44	1423.14
Slip Surface	-11.1	936	1285	786	523	483	255.84	1540.84	665.928
-11.5	936	1508	718	527	497		280.8	1788.8	
-12.1	936	1821	630	506	533				
-13.1	936	1989	617	421	592				
-14.1	936	2058	638	384	679				
-15.1	936	2136	657	404	773				
-16.1	936	2213	675	429	873				
-17.1	936	2284	694	453	956				
-18.1	936	2344	712	477	1054				
-19.1	936	2397	731	500	1223				
-20.1	936	2451	749	524	1403				
-21.1	936	2505	768	548	1522				
-21.43	936	2522	774	556	1552				
-22.1	936	2558	786	572	1614				
-23.1	936	2612	806	598	1710				
-24.1	936	2666	827	627	1806				
-25.1	936	2719	850	659	1905				
-26.1	936	2773	872	678	2006				
-27.1	936	2826	895	663	2106				
-27.56	936	2878	917	642	2207				
-29.1	936	2946	939	655	2304				

Total CWALSHT Passive Force	18482.3	Quartic				
CWALSHT FoS	1.55	a	b	c	d	e
Equation		8069.6	-48649	111519	-121061	64739
Total Slope/W Passive Force	10433.83					
Difference	-8048.46					
Height	14.8					
Distribution	-543.815					

Reach 11 ETL Surcharge Summary							
Iteration	Distributed Load In CWALSHT (psf)	Force Applied in CWALSHT (lbs/ft)*	CWALSHT Passive Force Calculated (lbs/ft)	SLOPE/W Passive Force Based On FoS (lbs/ft)	Difference in Forces (lbs/ft)	Distributed Load for Next Iteration (psf)	CWALSHT Factor of Safety (FoS)
1	0	0	9913	4251	5662	472	3.47
2	472	5664	14398	12229	2168	181	1.35
3	181	2172	11581	7207	4375	365	2.19
4	365	4380	13325	10226	3099	258	1.58
5	258	3096	12303	8435	3868	322	1.89
6	322	3864	12925	9499	3426	285	1.69
7	285	3420	12567	8879	3688	307	1.8
8	307	3684	12790	9263	3527	294	1.73
9	294	3528	12661	9039	3622	302	1.77
10	302	3624	12724	9149	3575	298	1.75

London Ave Canal - Reach 11
FORCE PLOTS



◆ Slope/W PF ◆ CWALSHT PF ◆ PF Difference ◆ CWALSHT Applied Force

ITERATION 10

APPLIED UNIFORM PSF: 302

PILE TIP: -17.63

FIXED SURFACE

Left Side
Ground Surface Elevation

Left Side
Water Surface Elevation

Entry failure at this elevation
Location per Geostudio

NET ELEV. (FT)	WATER (PSF)	<---NET--->					
		<---LEFTSIDE--->		(SOIL+WATER)		<---RIGHTSIDE--->	
		PASSIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)
10	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0
7	62.4	0	0	62.4	62.4	0	0
6	124.8	0	0	124.8	124.8	0	0
5	187.2	0	0	187.2	187.2	0	0
4	249.6	0	0	249.6	249.6	0	0
3.4	287	0	0	287	287	0	0
3.4	287	742.9	0	-153.8	589	0	0
3	312	759.4	0	-145.4	614	0	0
2.9	318.2	769.7	0	-149.4	620.2	0	0
2.9	318.2	769.7	0	-149.4	1363.1	0	742.9
2	374.4	862	0	-185.6	1442.5	0	766.1
1.9	380.6	872.9	0	-190.3	1449.8	0	767.2
1	436.8	945	0	-206.2	1503.6	0	764.8
0	499.2	952.6	0	-151.4	1511.2	0	710
-1	561.6	959.3	0	-95.7	1520.3	0	656.7
-1.5	591.8	1033.2	0	-120.3	1558.3	0	664.5
-1.5	591.8	995	0	-120.3	1558.3	0	664.5
-2	624	1033.2	65.4	-107.2	1533.5	0	672.9
-3	686.4	1123.5	174.4	-135.1	1517.1	0	703.1
-4	748.8	1167.8	319.3	-117	1439	0	707.6
-4.8	799.3	1156.1	465.6	-54.7	1201	0	550.3
-4.8	799.3	1156.1	465.6	-54.7	1201	0	580.2
-5	811.2	1151.5	497.7	-0.7	1165.8	37.7	550.3
-6	873.6	1168.4	626.2	382.5	881.4	375.3	332
-6.8	923.5	1199.5	710.5	523.9	877.1	497.9	362.1
-7	923.5	1206.7	722.5	513.8	872.7	495	369.6
-8	923.5	1234.1	746.1	498.5	886.7	507.1	407.2
-8.6	923.5	1248.1	760.1	411.6	895.2	434.2	429.8
-8.6	923.5	1248.1	760.1	109.6	593.2	434.2	429.8
-9	923.5	1257.5	769.5	-14.2	598.9	319.8	444.8

WATER	PASSIVE	
PSF	PSF	LBS
	742.9	300.46
	759.4	76.455
	769.7	0
	769.7	734.265
	862	86.745
	872.9	818.055
	945	948.8
	952.6	955.95
	959.3	498.125
	1033.2	0
	995	507.05
	1033.2	1078.35
	1123.5	1145.65
	1167.8	929.56
	1156.1	0
	1156.1	230.76
	1151.5	1159.95
	1168.4	947.16
0	1199.5	241.868
12.48	1219.18	1264.08
74.88	1308.98	800.82
112.32	1360.42	

File Name: R11_C302.dat

CWALSHT PASSIVE FORCE= 12724.1
 CWALSHT FS= 1.75
 GEOSTUDIO PASSIVE FORCE= 9149.3
 PASSIVE FORCE DIFFERENCE= 3574.8
 SHEET PILE LENGTH= 12
 UNIFORM PRESSURE= 298

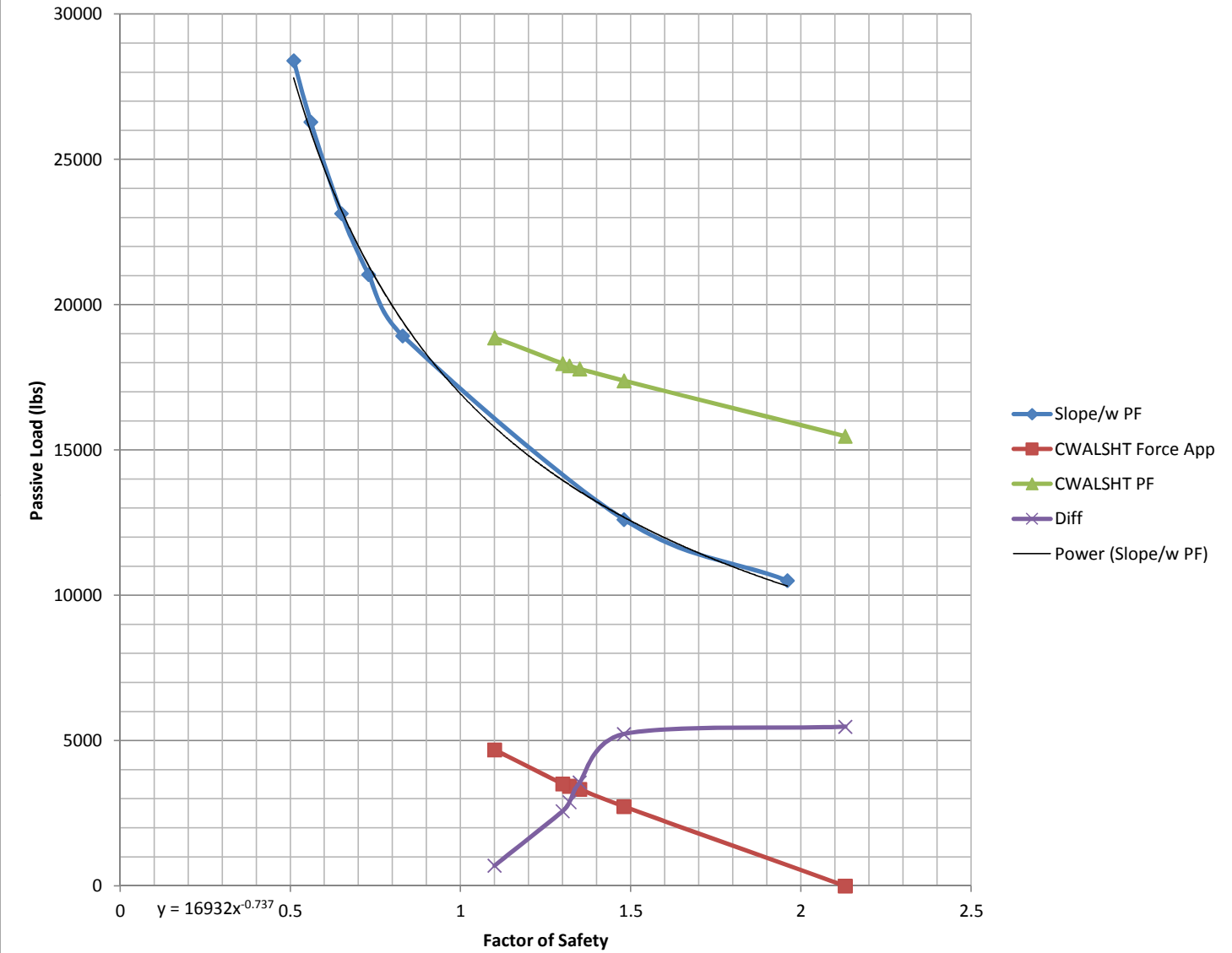
Quartic				
a	b	c	d	e
1094.6	-10856	40725	-71845	58073

Reach 12 ETL Surcharge Summary							
Iteration	Distributed Load In CWALSHT (psf)	Force Applied in CWALSHT (lbs/ft)*	CWALSHT Passive Force Calculated (lbs/ft)	SLOPE/W Passive Force Based On FoS (lbs/ft)	Difference in Forces (lbs/ft)	Distributed Load for Next Iteration (psf)	CWALSHT Factor of Safety (FoS)
1	0	0	15476	10000**	5476	338	2.13
2	410	6396	20192	15538	4654	298	0.89
3	300	4680	18860	18164	696	45	1.1
4	350	5460	19443	16932	2511	161	1
5	175	2730	17381	22604	5223	335	1.48
6	220	3432	17895	20776	2881	185	1.32
7	225	3510	17973	20544	2571	165	1.3
8	213	3323	17790	21123	3561	214	1.35

*Distributed Height = 15.6 ft

** Factor of Safety not on graph. Force estimated from graphs.

Reach 12



Trial 8-213

I.--HEADING
 'LONDON AVE REMEDIATION
 'REACH 12 W LOAD
 '12/12/11

HORIZONTAL DISTRIBUTED LOAD 213 PSF
 FACTOR OF SAFETY FOR ACTIVE PRESSURE= 1.35
 FACTOR OF SAFETY FOR PASSIVE PRESSURE= 1.35
 PILE TIP ELEVATION -15.5

III.--WATER AND SOIL PRESSURES

	<-----PRESSURES----->										
	WATER	<---LEFTSIDE---		<---RIGHTSIDE---							
	ELEVATION	PRESSURE	PASSIVE	ACTIVE	ACTIVE	PASSIVE					
	(FT)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)					
	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					
Ground Surface	3.1	306	0	0	0	0				Leftside	Area
	3.1	306	296	0	0	296				0	0
	2.9	318	338	0	0	305				296	63.4
	2.63	335	548	0	0	313				338	119.34
	2.1	368	960	0	0	327				546	399.09
	1.9	381	928	0	0	331				960	188.8
	1.07	432	635	0	0	357				928	648.645
	1.07	432	686	0	0	357				635	0
	0.9	443	635	77	0	363				686	112.285
	-0.1	505	747	173	0	404				635	691
	-1.1	568	851	276	0	444				747	799
	-2	624	942	367	0	478				851	806.85
	-2.1	630	951	376	0	481				942	94.65
	-3.1	693	1028	454	0	499				951	989.5
	-4.1	755	1105	531	0	487				1028	1066.5
	-4.21	762	1113	539	0	427				1105	121.99
	-4.21	762	1113	539	0	480	water pres	corrected left side pre		1113	0
Water Surface	-5	811	1169	595	66	427	0	1169		1113	901.39
	-5.1	811	1173	599	71	423	6.24	1179.24		1169	117.412
	-6	811	1190	618	70	426	62.4	1252.4		1179.24	1094.238
	-6.1	811	1190	622	71	427	68.64	1258.64		1252.4	125.552
	-7.1	811	1175	681	91	447	131.04	1306.04		1258.64	1282.34
	-8.1	811	1182	711	112	467	193.44	1375.44		1306.04	1340.74
	-9.1	811	1201	727	133	487	255.84	1456.84		1375.44	1416.14
	-10.1	811	1218	744	149	514	318.24	1536.24		1456.84	1496.54
	-11.1	811	1235	761	149	559	380.64	1615.64		1536.24	1575.94
	-12.1	811	1252	778	152	610	443.04	1695.04		1615.64	1655.34
Slip Surface	-12.5	811	1255	786	160	623	468	1723		1695.04	683.608
	-13.1	811	1283	791	179	644				1723	
	-13.8	811	1702	679	194	809					
	-14	811	1823	647	199	857					
	-14.1	811	1932	618	200	898					
	-15.1	811	2537	491	218	1158					
	-16.01	811	2647	494	240	1266					
	-17.1	811	2729	504	263	1376					

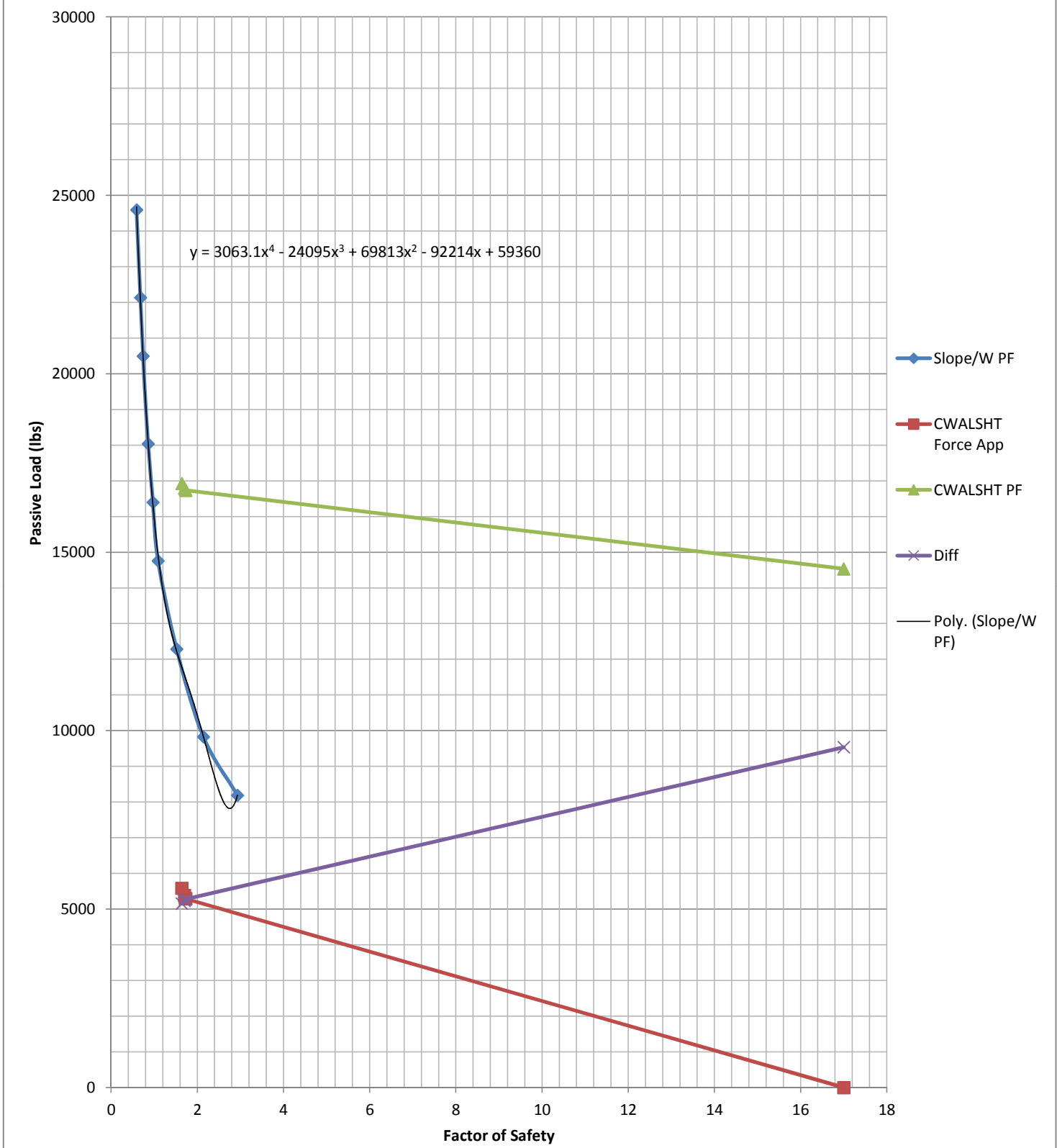
Total CWALSHT Passive Force	17790.29	Power	
CWALSHT FoS	1.35	a	exponential
Equation		16932	-0.737
Total Slope/W Passive Force	21123.42		
Difference	3333.131		
Height	15.6		
Distributio	213.6622		

Reach 12 1% Flowline ETL Surcharge Summary							
Iteration	Distributed Load In CWALSHT (psf)	Force Applied in CWALSHT (lbs/ft)*	CWALSHT Passive Force Calculated (lbs/ft)	SLOPE/W Passive Force Based On FoS (lbs/ft)	Difference in Forces (lbs/ft)	Distributed Load for Next Iteration (psf)	CWALSHT Factor of Safety (FoS)
1	0	0	14535	5000**	9535	611	17
2	400	6240	17438	12472	4966	318	1.46
3	385	6006	17271	12224	5047	324	1.52
4	358	5585	16928	11775	5153	330	1.64
5	345	5382	16796	11560	5235	336	1.7
6	340	5304	16755	11489	5266	338	1.72
7	339	5288	16734	11454	5280	338	1.73

*Distributed Height=15.6 ft

**Factor of Safety not on graph. Force estimated from graph.

Reach 12 1% Flowline



Trial 7-339

I.--HEADING
'LONDON AVENUE CANAL
'REACH 12A
3/1/2013

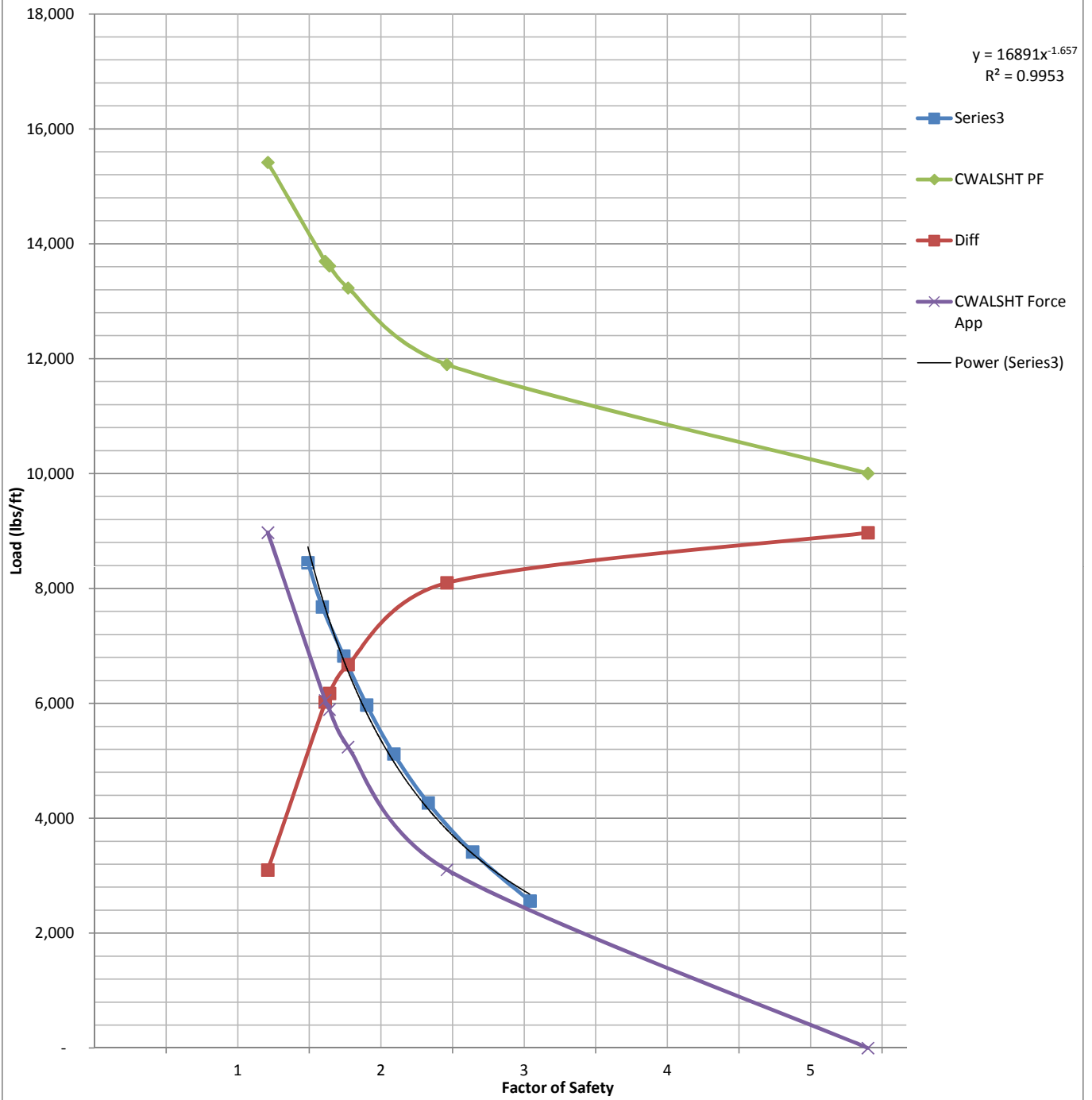
II.--CONTROL
HORIZONTAL DISTRIBUTED LOAD 339.00 PSF
FACTOR OF SAFETY FOR ACTIVE PRESSURE 1.73
FACTOR OF SAFETY FOR PASSIVE PRESSURE 1.73
SHEET PILE TIP ELEVATION -15.5

		<-----SOIL		PRESSURES----->			
		WATER	<---LEFTS	<---RIGHTSIDE---			
ELEVATION	PRESSURE	PASSIVE	ACTIVE	ACTIVE	PASSIVE		
(FT)	(PSF)	(PSF)	(PSF)	(PSF)	(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	0	0	0	0	0		
6	0	0	0	0	0		
5.6	0	0	0	0	0		
5	37	0	0	0	0		
4	100	0	0	0	0		
Ground Surface	3.1	156	0	0	0	Leftside	Area
						0	0
	3.1	156	231	0	0	231	21.9
	3	162	207	0	0	207	177.12
	2.52	192	531	0	0	531	281.82
	2.1	218	811	0	0	811	80.6
	2	225	801	0	0	801	464.78
	1.32	267	566	0	0	566	0
	1.32	267	642	0	0	642	193.28
	1	287	566	125	0	566	620
	0	349	674	225	0	674	725.5
	-1	412	777	329	0	777	827
	-2	474	877	429	0	877	303.28
	-2.34	496	907	459	0	907	0
	-2.34	496	907	459	0	907	615.45
	-3	537	958	510	12	958	996
	-4	599	1034	586	41	1034	1065
Water Surface	-5	661	1096	646	86	1096	1139.7
	-6	661	1121	690	114	1183.4	1214.1
	-7	661	1120	733	128	1244.8	1280.5
	-8	661	1129	761	149	1316.2	1356.4
	-9	661	1147	777	170	1396.6	1436.3
	-10	661	1164	794	188	1476	1515.7
	-11	661	1181	811	194	1555.4	1595.1
	-12	661	1198	829	200	1634.8	823.95
Slip Surface	-12.5	661	1193	842	212	1661	
	-13	661	1247	833	225		
	-13.7	661	1516	752	237		
	-14	661	1631	717	241		
	-15	661	2037	605	257		
	-15.67	661	2212	579	280		
	-17	661	2274	598	307		

Total Passive Force		16733.48	Quartic				
CWALSH FoS		1.73	a	b	c	d	e
Equation			3063.1	-24095	69813	-92214	59360
Total Slope/W Passive Force		11453.58					
Difference		-5279.9					
Distributed Height		15.6					
Distributed Load		-338.45					

Reach 12B ETL Surcharge Summary						
Iteration	Distributed Load In CWALSHT (psf)	Force Applied in CWALSHT (lbs/ft)	CWALSHT Passive Force Calculated (lbs/ft)	Spencer's Passive Force Calculated (lbs/ft)	Difference in Forces (lbs/ft)	Factor of Safety
1	0	0	10004	1033	8971	5.4
2	685	8973.5	15416	12316	3100	1.21
3	237	3104.7	11899	3801	8098	2.46
B1	400	5240	13232	6558	6674	1.77
B2	450	5895	13615	7441	6174	1.64
B3	462	6052.2	13696	7673	6023	1.61

Reach 12B



Reach 12B, Iteration B3

HORIZONTAL DISTRIBUTED LOAD 462 PSF
FACTOR OF SAFETY FOR ACTIVE PRESSURE:= 1.61
FACTOR OF SAFETY FOR PASSIVE PRESSURE:= 1.61
PILE TIP -18.5

III.--WATER AND SOIL PRESSURES

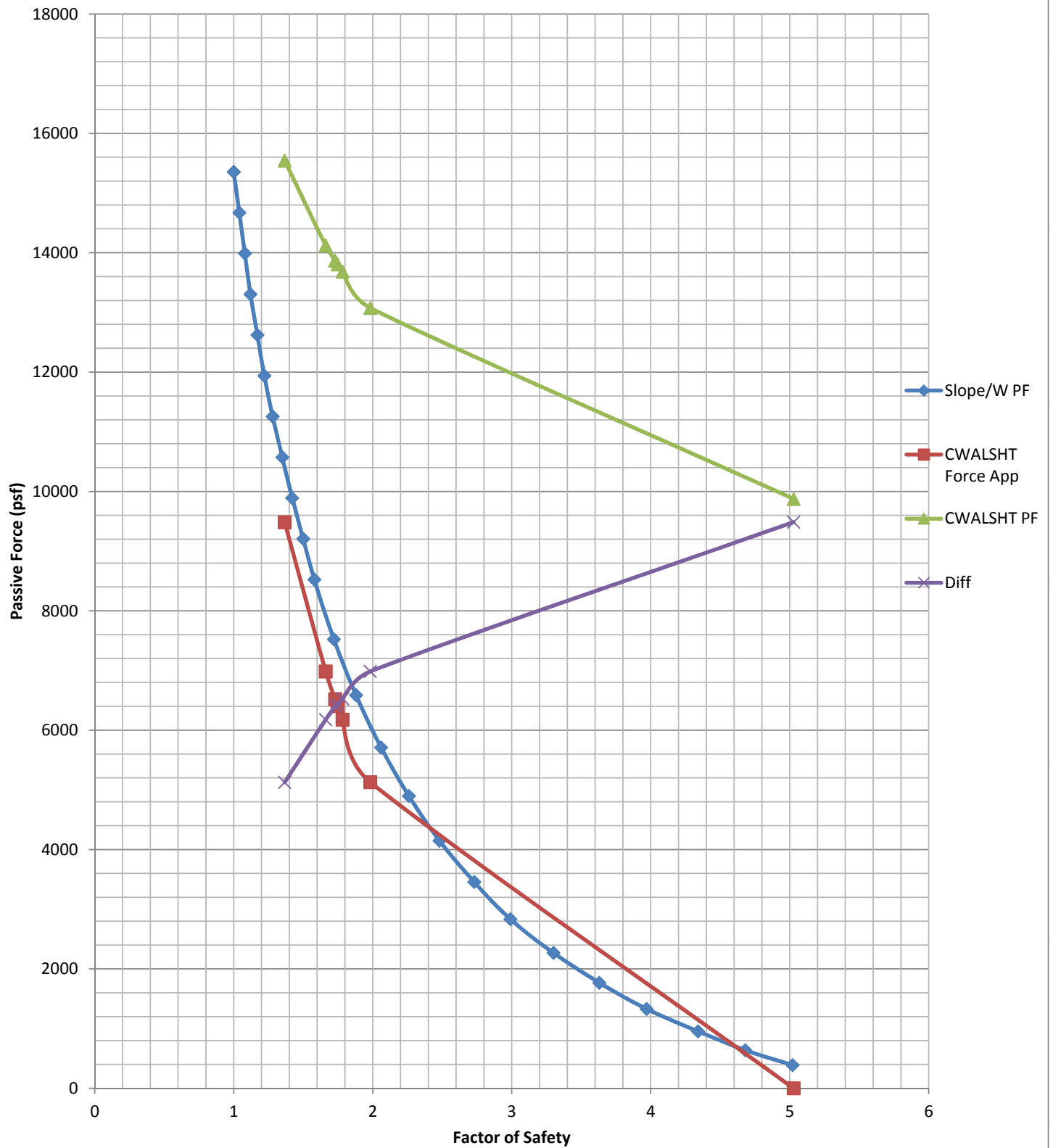
	ELEVATION (FT)	<-----SOIL PRESSURES----->							
		<----LEFTSIDE---->		<---RIGHTSIDE--->					
		WATER PRESSURE (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)				
Ground Surface	13	0	0	0	0	0			
	12	0	0	0	0	0			
	11	0	0	0	0	0			
	10	0	0	0	0	0			
	9	0	0	0	0	0			
	8	0	0	0	0	0			
	7	63	0	0	0	0			
	6	125	0	0	0	0			
	5	188	0	0	0	0		Left P.P.	Area
	4.3	231	0	0	0	0		0	0
Water Surface	4.3	231	745	0	0	0		745	225.15
	4	250	756	0	0	0		756	722.25
	3.1	306	849	0	0	0		849	0
	3.1	306	849	0	0	745		849	85.45
	3	313	860	0	0	749		860	815.85
	2.1	369	953	0	0	727		953	95.85
	2	375	964	0	0	724		964	1016
	1	438	1068	0	0	764		1068	1119.5
	0	500	1171	0	0	804		1171	1223
	-1	563	1275	0	0	844		1275	1196
	-2	625	1117	0	0	620		1117	1031
	-3	688	945	0	0	244		945	983.5
	-4	750	1022	0	0	262	Water Press	Left P.P.	1022 949.5
	-4.9	806	1088	0	0	305	0	1088	1088 100.112
Slip Surface Bottom	-5	806	908	0	0	317	6.24	914.24	953.94
	-6	806	925	368	0	297	68.64	993.64	1044.34
	-7	806	964	775	0	335	131.04	1095.04	1145.24
	-8	806	1002	822	0	374	193.44	1195.44	988.72
	-8.8	806	1033	841	0	405	243.36	1276.36	
	-9	806	1041	846	0	412			
	-10	806	1079	861	0	451			
	-11	806	1118	883	0	489			
	-12	806	1156	905	74	528			
	-13	806	1195	926	244	566			
	-14	806	1746	741	294.*	918			
	-14.45	806	2123	661	280	1089			
	-15	806	2587	561	262	1300			
	-16	806	2494	588	292	1083			
	-17	806	2497	613	321	1081			
	-18	806	2483	638	348	1167			
	-18.54	806	2469	663	373	1265			
	-20	806	2504	687	401	1352			
Total CWALSH Passive Force						13,695	Exponential		
CWALSH FoS						1.61	significand	exponent	
Equation							16891	-1.657	
Total Slope/W Passive Force						7,673			
Difference						6,023			
Distributed Height						13.1			
Distributed Load						460			

Reach 13 ETL 1110-2-575 Iterations Summary							
Iteration	Distributed Load In CWALSHT (psf)	Force Applied in CWALSHT (lbs/ft)*	CWALSHT Passive Force Calculated (lbs/ft)	SLOPE/W Passive Force Based On FoS (lbs/ft)**	Difference in Forces (lbs/ft)	Distributed Load for Next Iteration (psf)	CWALSHT Factor of Safety (FoS)
1	0	0	9875	388	9487	797	5.028
2	797	9484	15543	10417	5126	431	1.366
3	431	5129	13075	6090	6985	587	1.982
4	587	6985	14122	7945	6177	519	1.661
5	519	6176	13682	7155	6527	548	1.783
6	548	6521	13871	7471	6400	538	1.729
7	538	6402	13804	7366	6438	541	1.747

*Distributed Height=11.9 ft

**Passive force interpolated from graph. No trendline equation used.

Reach 13



Reach 13 ETL
HORIZONTAL DISTRIBUTED LOAD
SHEET PILE TIP ELEVATION

538 PSF
-15.5

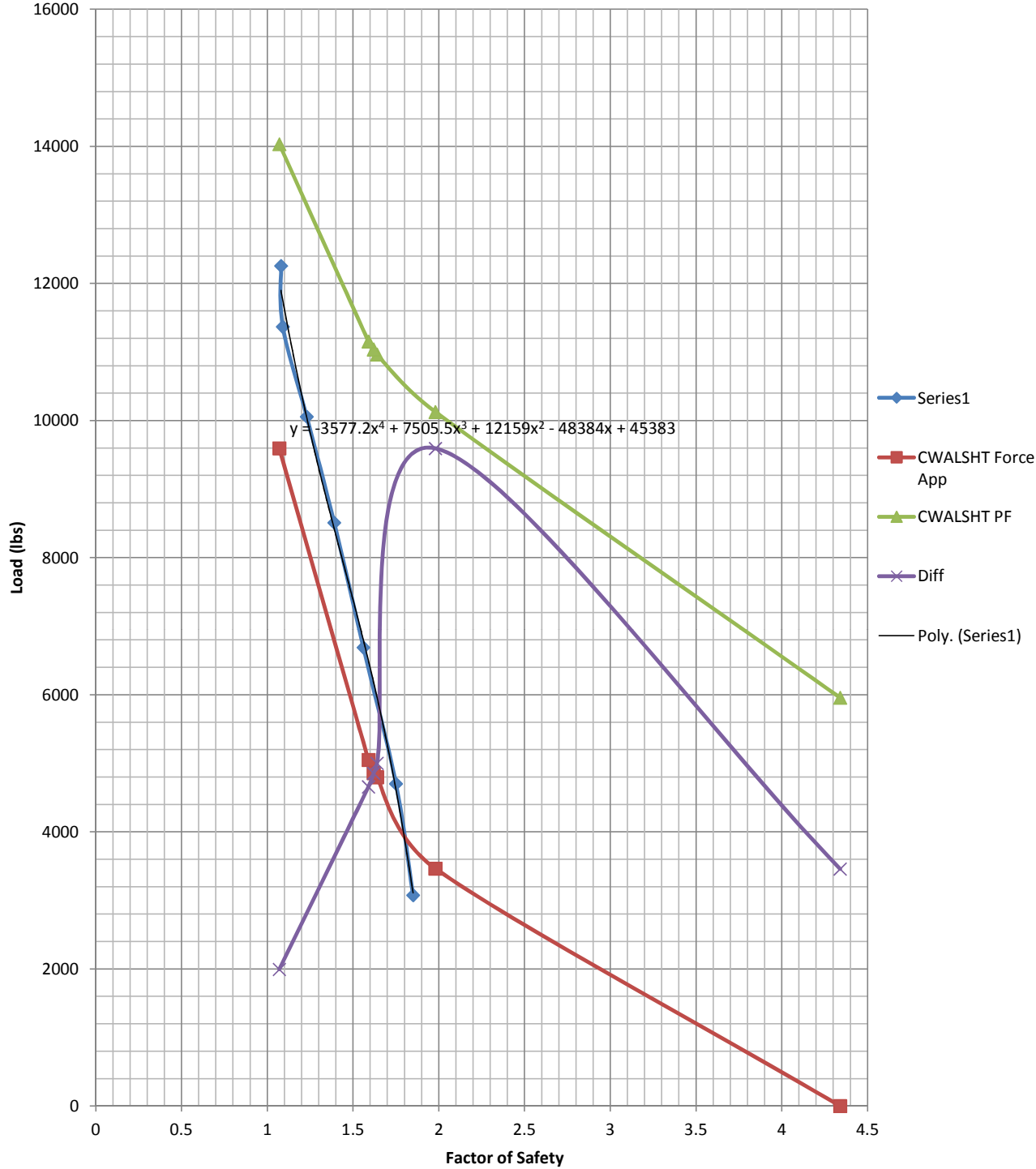
					<---NET----->		
	NET	<---LEFTSIDE---			(SOIL + WATER)	<--RIGHTSIDE-->	
ELEV.	WATER	PASSIVE	ACTIVE	PASSIVE	ACTIVE	PASSIVE	PASSIVE
(FT)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)
	13	0	0	0	0	0	0
	12	0	0	0	0	0	0
	11	0	0	0	0	0	0
	10	0	0	0	0	0	0
	9	0	0	0	0	0	0
	8	0	0	0	0	0	0
	7	62.5	0	0	62.5	62.5	0
	6	125	0	0	125	125	0
	5	187.5	0	0	187.5	187.5	0
Ground Surface	4	250	0	0	250	250	0
	4	250	801.4	0	-551.4	250	0
	3.4	287.5	849.8	0	-562.3	287.5	0
	3.4	287.5	849.8	0	-24.3	1626.9	0
	3	312.5	892.5	0	-42	1621.5	0
	2.4	350	956.6	0	-68.6	1685.3	0
	2	375	999.4	0	-86.4	1727.7	0
	1	437.5	1106.2	0	-130.7	1834	0
	0	500	1221	0	-183	1948.4	0
	-1	562.5	1276.9	0	-176.4	1999.6	0
	-1.6	602.7	1150.8	0	-32.5	1924	0
	-1.6	602.7	1195.7	0	-32.5	1924	0
	-2	625	1150.8	115.4	12.2	1766.7	0
	-2.9	680.2	969.5	442.3	248.8	1244.8	0
	-2.9	680.2	969.5	442.3	248.8	1244.8	0
	-3	687.5	966.1	462.6	294.1	1216.3	34.7
	-4	750	1057	516.7	440.7	1052.9	209.7
	-5	812.5	1135.1	584.7	456.7	1054.4	241.4
	-6	875	1172.1	699	460.8	1015.1	219.9
Water Surface	-6.4	900	1156.9	765.6	496.9	990.5	215.8
	-7	900	1145.5	820.3	517	961.3	224.5
	-8	900	1169.9	838.7	521.8	985.4	253.7
Slip Surface	-8.5	900	1180.5	849.4	509.5	996	252
	-8.5	900	1180.5	849.4	-28.5	458	252
	-9	900	1191.2	860.1	-60.9	468.5	230.3
	-10	900	1212.7	881.5	-99.7	503.8	212.9
	-11	900	1234.1	902.9	-96.5	522.1	237.6
	-12	900	1243.5	929.1	-72.6	527	270.9
	-13	900	1347.7	917.6	-143.5	583.2	304.2
	-14	900	1688.8	816.5	-449.9	786.6	338.9
	-15	900	2054.4	714.9	-783.7	1019.5	370.7
	-16	900	2208.7	702.4	-910.7	1138.5	398
	-17	900	2269	727.5	-945.2	1203.7	423.9
	-18	900	2341	747.9	-991	1272.2	450
	-19	900	2413	768.3	-1036.9	1346.9	476.1
	-20	900	2485.2	788.7	-1083	1464	502.2
	-21	900	2554.1	809	-1125.8	1601.8	528.3
	-22	900	2614.7	829.4	-1160.2	1700.6	554.5
	-23	900	2669.7	849.8	-1187.8	1775.6	581.9
	-24	900	2723.9	870.2	-1211.4	1854.1	612.6
	-25	900	2778.3	890.6	-1250.8	1934.4	627.5
	-26	900	2832.7	910.9	-1314.2	1999.1	618.5
	-27	900	2887	931.4	-1363.4	2042.4	623.6

Left Side Passive	Water	Corr Leftside	Applied Load
		Passive	Area
			#
0		0	0
801.4		801.4	495.4
849.8		849.8	0.0
849.8		849.8	348.5
892.5		892.5	554.7
956.6		956.6	391.2
999.4		999.4	1052.8
1106.2		1106.2	1163.6
1221		1221	1249.0
1276.9		1276.9	728.3
1150.8		1150.8	0.0
1195.7		1195.7	469.3
1150.8		1150.8	954.1
969.5		969.5	0.0
969.5		969.5	96.8
966.1		966.1	1011.6
1057		1057	1096.1
1135.1		1135.1	1153.6
1172.1		1172.1	465.8
1156.9	0	1156.9	702.0
1145.5	37.44	1182.94	1226.3
1169.9	99.84	1269.74	645.3
1180.5	131.04	1311.54	0.0
		Total	13804.24
		CWALSHT FoS	1.747
	Total Slope/W Passive Force		7366
	Difference		6438
	Distributed Height		11.9
	Distributed Load		541

Reach 14 ETL Surcharge Summary							
Iteration	Distributed Load In CWALSHT (psf)	Force Applied in CWALSHT (lbs/ft)*	CWALSHT Passive Force Calculated (lbs/ft)	SLOPE/W Passive Force Based On FoS (lbs/ft)	Difference in Forces (lbs/ft)	Distributed Load for Next Iteration (psf)	CWALSHT Factor of Safety (FoS)
1	0	0	5957	2500**	3457	343	4.34
2	343	3464	10125	532	9593	950	1.98
5	475	4798	10965	5965	5000	495	1.64
6	481	4858	11038	6183	4855	481	1.62
4	500	5050	11154	6498	4656	461	1.59
3	950	9595	14033	12039	1994	197	1.07

*Distributed Height=10.1 ft

Reach 14



I.--HEADING
'LONDON AVE REEVALUATION
'REACH 14 w load
'1/3/12

HORIZONTAL DISTRIBUTED LOAD 481 PSF

SHEET PILE TIP ELEVATION -15.5

FACTOR OF SAFETY FOR ACTIVE PRESSURE' = 1.62
FACTOR OF SAFETY FOR PASSIVE PRESSURE' = 1.62

III.--WATER AND SOIL PRESSURES

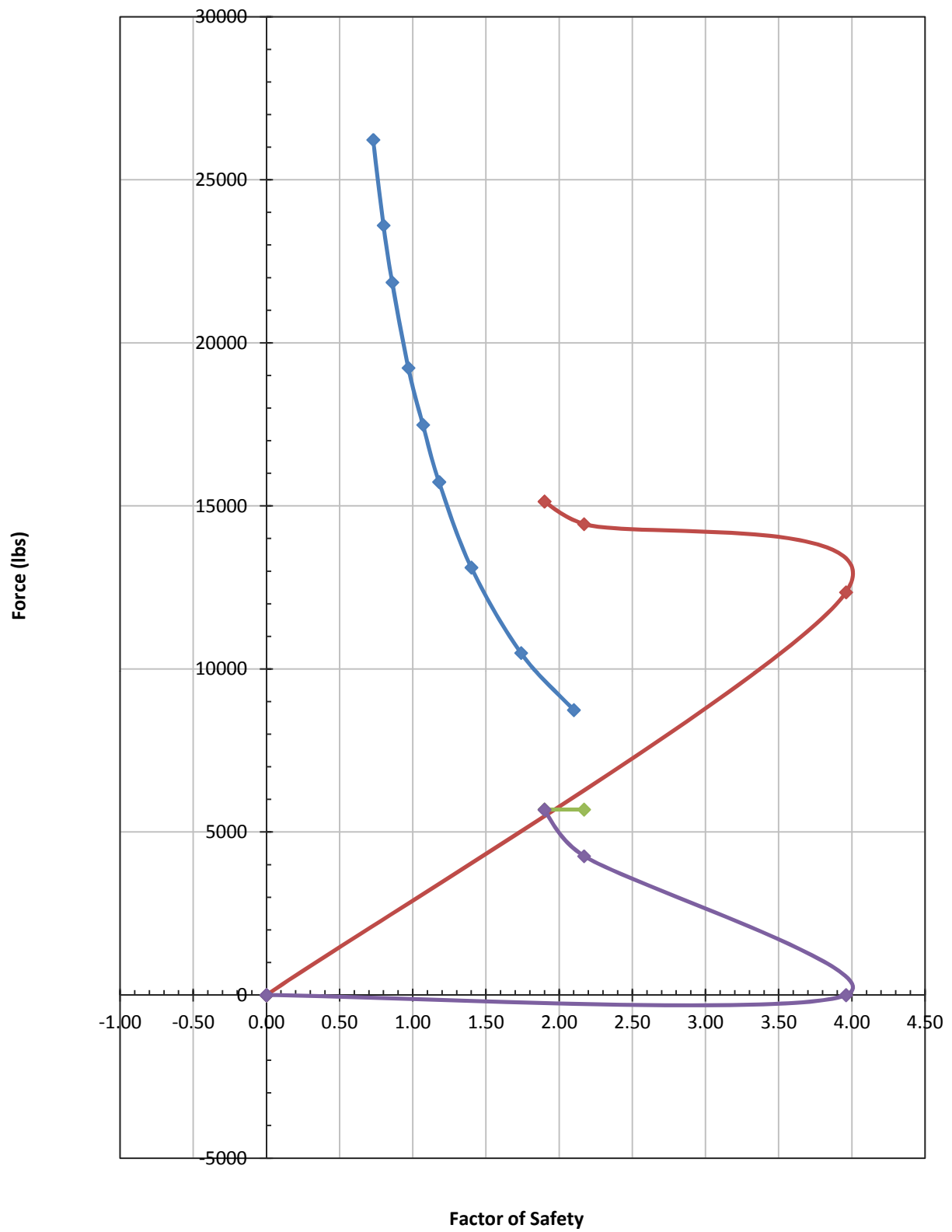
		<-----SOIL PRESSURES----->							
		<----LEFTSIDE----->		<---RIGHTSIDE----->					
ELEVATION	PRESSURE	PASSIVE	ACTIVE	ACTIVE	PASSIVE				
(FT)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)				
12.9	0	0	0	0	0				
11.9	0	0	0	0	0				
10.9	0	0	0	0	0				
9.9	0	0	0	0	0				
8.9	0	0	0	0	0				
8	0	0	0	0	0				
7.9	6	0	0	0	0				
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				
Ground Surface	3.8	262	0	0	0			Left P.P.	Area
								0	0
	3.8	262	864	0	0			864	348.6
	3.4	287	879	0	0			879	0
	3.4	287	879	0	0	864		879	452.5
	2.9	318	931	0	0	885		931	478.5
	2.4	349	983	0	0	897		983	504.5
	1.9	381	1035	0	0	906		1035	1087
	0.9	443	1139	0	0	941		1139	1191.5
	-0.1	505	1244	0	0	986		1244	1289
	-1.1	568	1334	0	0	1016		1334	998
	-1.9	618	1161	0	0	812		1161	0
	-1.9	618	1179	0	0	812		1179	117
	-2	624	1161	38	0	787		1161	114
	-2.1	630	1119	98	0	739		1119	1042
	-3.1	693	965	407	0	525		965	1005
	-4.1	755	1045	481	0	544	Water Press	Left P.P.	1045 316.5
Water Surface	-4.4	774	1065	500	0	553	0	1065	150.062
	-4.54	774	1070	505	0	529	8.736	1078.736	0
	-4.54	774	1070	505	0	548	8.736	1078.736	615.836
	-5.1	774	1077	515	37	529	43.68	1120.68	1001.93
	-6	774	1006	613	279	313	99.84	1105.84	109.796
	-6.1	774	984	639	316	316	106.08	1090.08	216.664
Slip Surface	-6.3	774	958	675	352	325	118.56	1076.56	
	-7.1	774	981	694	372	363			
	-8.1	774	1007	720	401	409			
	-9.1	774	1033	746	432	456			
	-10.1	774	1051	776	437	502			
	-11.1	774	1226	747	375	549	Total CWALSHT Passive Force		11038.4
	-11.5	774	1439	683	350	634	CWALSHT FoS		1.62
	-12.1	774	1735	601	351	754	Equation		
	-13.1	774	1895	589	378	869	Total Slope/W Passive Force		6182.97
	-14.1	774	1964	612	403	966	Difference		-4855.43
	-14.7	774	2009	624	418	1025	Distributed Height		10.1
	-15.1	774	2039	632	427	1064	Distributed Load		-480.735
	-16.1	774	2115	652	452	1163			
	-17.1	774	2191	672	477	1260			
	-18.1	774	2263	692	502	1348			
	-18.4	774	2326	712	527	1421			
	-20.1	774	2384	732	552	1544			
							Quartic		
							a	b	c
							d	e	
							-3577.2	7505.5	12159 -48384 45383

Reach 15 ETL Surcharge Summary							
Iteration	Distributed Load In CWALSHT (psf)	Force Applied in CWALSHT (lbs/ft)	CWALSHT Passive Force Calculated (lbs/ft)	SLOPE/W Passive Force Based On FoS (lbs/ft)	Difference in Forces (lbs/ft)	Distributed Load for Next Iteration (psf)	CWALSHT Factor of Safety (FoS)
1	0	0	12351	8000	4351	-306	3.96
2	300	4260	14442	8752	5690	401	2.17
3	400	5680	15137	9447	5689	401	1.9
4	401	5694.2	15137	9447	5689	401	1.9

Distributed Height=14.2 ft

London Ave Canal - Reach 15

FORCE PLOTS



◆ Slope/W PF ◆ CWALSHT PF ◆ PF Difference ◆ CWALSHT Applied Force

ITERATION 4

APPLIED UNIFORM PSF: 401

PILE TIP: -28

FIXED SURFACE

Left Side
Ground Surface Elevation

Left Side
Water Surface Elevation

Entry failure at this elevation
Location per Geostudio

NET ELEV. (FT)	WATER (PSF)	<--NET-->					
		<---LEFTSIDE--->		(SOIL+WATER)		<--RIGHTSIDE-->	
		PASSIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)
10	0	0	0			0	0
9	0	0	0			0	0
8	0	0	0			0	0
7	63	0	0			0	0
6	125	0	0			0	0
5	188	0	0			0	0
4	250	0	0			0	0
3.5	281	0	0			0	0
3.5	281	1053	0			0	0
3.1	306	985	0			0	0
3.1	306	985	0		1053		
3	313	995	0		0	940	
2.1	369	1087	0		0	981	
2	375	1098	0		0	987	
1	438	1149	0		0	981	
0	500	1033	0		0	809	
-1	563	912	0		0	602	
-1.17	573	936	0		0	586	
-1.17	573	916	0		0	586	
-2	625	936	128		0	507	
-3	688	982	254		0	473	
-3.45	716	980	329		0	450	
-3.45	716	980	329		0	462	
-4	750	972	418		31	450	
-5	813	965	556		57	452	
-6	875	1003	643		69	468	
-6.9	931	1055	689		81	480	
-7	931	1058	692		82	482	
-8	931	1065	699		113	491	
-9	931	1108	715		188	473	
-10	931	1155	736		269	485	
-10.7	931	1187	754		298	517	
-11	931	1201	755		308	531	
-12	931	1357	715		344	578	

WATER	PASSIVE	
	PSF	LBS
	1053	407.6
	985	0
	985	99
	995	936.9
	1087	109.25
	1098	1123.5
	1149	1091
	1033	972.5
	912	157.08
	936	0
	916	768.58
	936	959
	982	441.45
	980	0
	980	536.8
	972	968.5
	965	984
	1003	926.1
	0	1055
	1055	105.962
	6.24	1064.24
	68.64	1133.64
	131.04	1239.04
	193.44	1348.44
	237.12	1424.12

File Name: R15_C229.dat

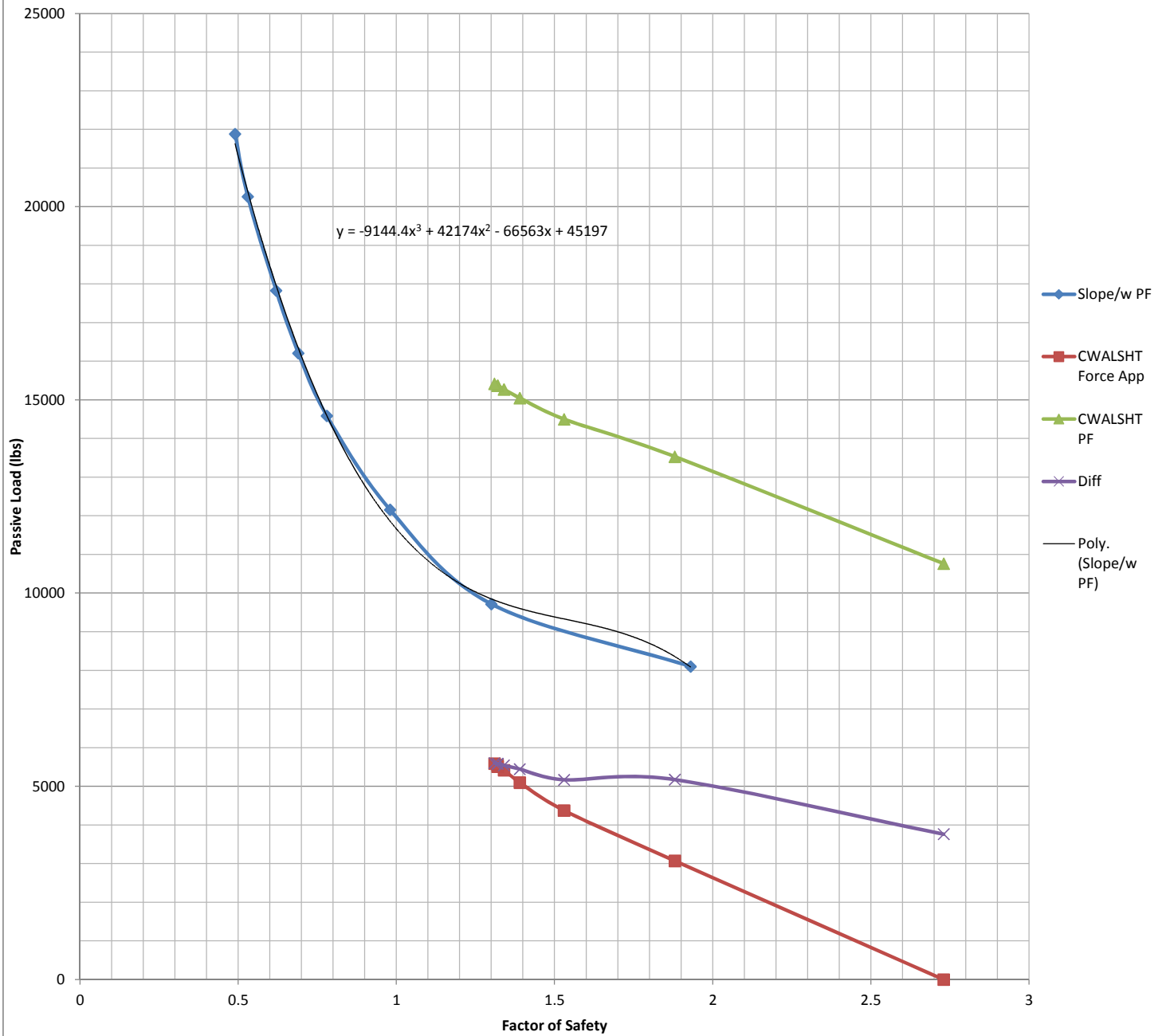
CWALSHT PASSIVE FORCE=	15136.64	Quartic				
		a	b	c	d	e
CWALSHT FS=	1.9	8576.3	-55626	138360	-163984	91309
GEOSTUDIO PASSIVE FORCE=	9447.5					
PASSIVE FORCE DIFFERENCE=	5689.2					
SHEET PILE LENGTH=	14.2					
UNIFORM PRESSURE=	401					

Reach 16 ETL Surcharge Summary							
Iteration	Distributed Load In CWALSHT (psf)	Force Applied in CWALSHT (lbs/ft)*	CWALSHT Passive Force Calculated (lbs/ft)	SLOPE/W Passive Force Based On FoS (lbs/ft)	Difference in Forces (lbs/ft)	Distributed Load for Next Iteration (psf)	CWALSHT Factor of Safety (FoS)
1	0	0	10763	7000**	3763	292	2.73
2	238	3070	13530	8357	5173	401	1.88
3	339	4373	14498	9329	5168	401	1.53
4	395	5096	15046	9600	5445	422	1.39
5	420	5418	15271	9728	5543	430	1.34
6	427	5508	15370	9786	5584	433	1.32
7	430	5547	15369	9786	5583	433	1.32
8	433	5586	15418	9817	5601	434	1.31

*Distributed Height=12.9 Ft

**Factor of Safety not on graph. Force estimated from graph.

Reach 16



Iteration 8-433

'LONDON AVENUE CANAL
'REACH 16
2/22/2013

HORIZONTAL DISTRIBUTED LOAD 433 PSF
FACTOR OF SAFETY FOR ACTIVE PRESSURE 1.31
FACTOR OF SAFETY FOR PASSIVE PRESSURE 1.31
SHEET PILE TIP ELEVATION -17.4

		<-----SOIL		PRESSURES----->			
		<----LEFTSIDE----->		<---RIGHTSIDE----->			
ELEVATION	PRESSURE	PASSIVE	ACTIVE	ACTIVE	PASSIVE		
(FT)	(PSF)	(PSF)	(PSF)	(PSF)	(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	62	0	0	0	0		
6	125	0	0	0	0		
5	187	0	0	0	0		
4	250	0	0	0	0		
3	312	0	0	0	0		
Ground Surface	2.9	318	0	0	0		Leftside Area
	2.9	318	458	0	458	458	380.335
	2.29	356	789	0	487	789	252.01
	2	374	949	0	501	949	97.95
	1.9	381	1010	0	506	1010	878.85
	1	437	943	0	552	943	894.5
	0	499	846	0	606	846	82.215
	-0.09	505	981	0	610	981	0
	-0.09	505	857	0	610	857	836.29
	-1	562	981	78	654	981	1027.5
	-2	624	1074	177	688	1074	1128.5
	-3	686	1183	245	740	1183	1268.5
Water Surface	-4	749	1354	245	859	water pressure corrected left side pressure	1354 837.3
	-4.6	786	1437	235	917	0 1437	1437 580.792
	-5	786	1442	242	912	24.96 1466.96	1466.96 1485.66
	-6	786	1417	249	890	87.36 1504.36	1504.36 1507.56
	-7	786	1361	285	843	149.76 1510.76	1510.76 733.18
	-7.5	786	1241	400	743	180.96 1421.96	1421.96 639.7283
	-7.97	786	1090	553	647	210.288 1300.288	1300.288 0
	-7.97	786	1090	553	0	654 210.288	1300.288 38.97672
	-8	786	1086	558	8	647 212.16	1298.16 1339.36
	-9	786	1106	553	81	616 274.56	1380.56 1408.76
Slip Surface	-10	786	1100	564	97	638 336.96	1436.96 1436.96
	-11	786	1196	552	127	682	
	-12	786	1569	491	182	807	
	-13	786	1995	428	235	975	
	-13.42	786	2073	421	248	1029	
	-14	786	2180	412	264	1104	
	-15	786	2243	424	283	1208	
	-16	786	2317	438	303	1316	
	-17	786	2384	452	323	1419	
	-17.46	786	2430	466	342	1518	
	-19	786	2464	480	362	1618	

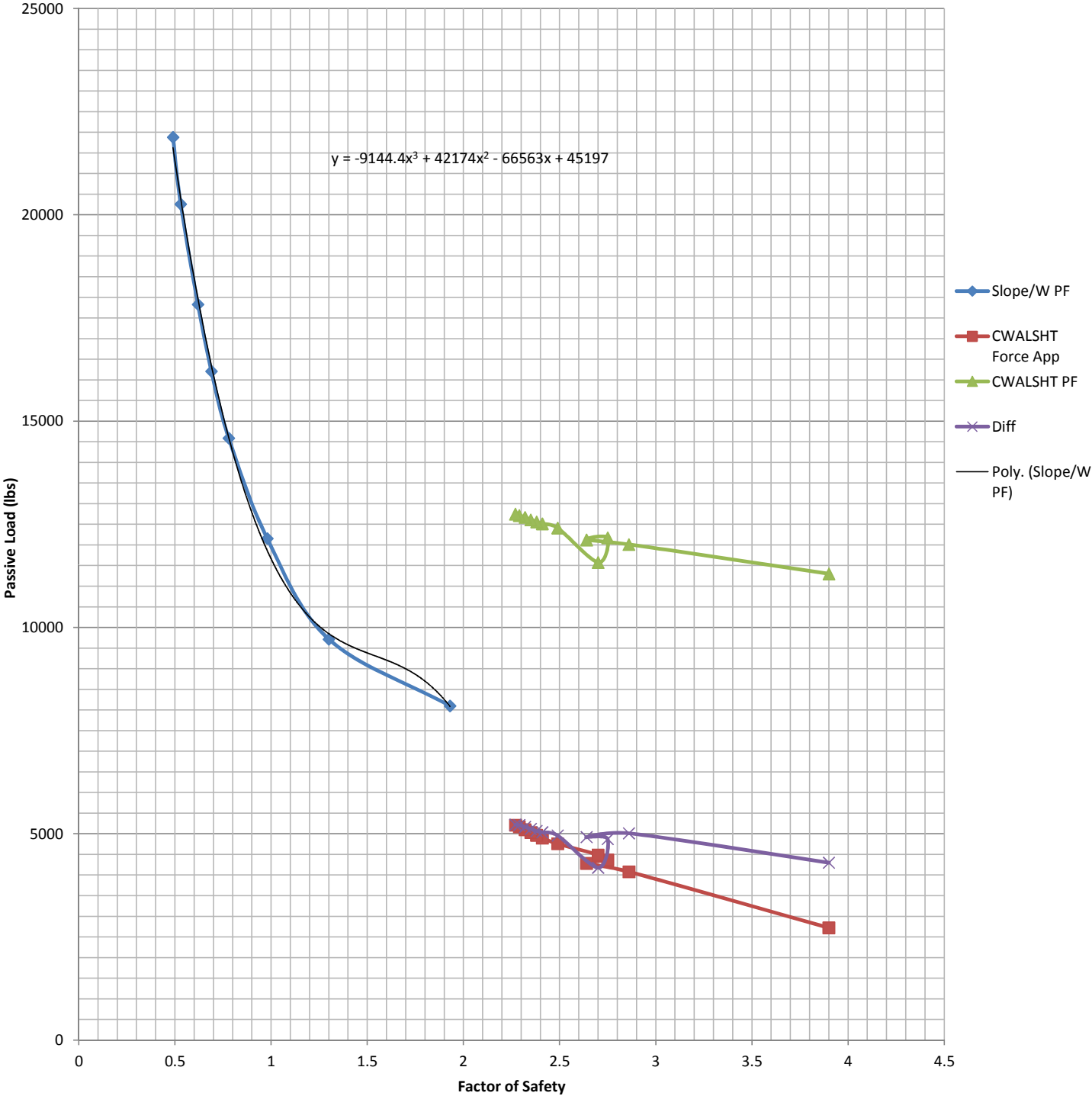
Total CWALSHT Passive Force		15417.97	Cubic			
	CWALSHT FoS	1.31	a	b	c	d
	Equation		-9144.4	42174	-66563	45197
Total Slope/W Passive Force		9816.828				
	Difference	-5601.14				
	Height	12.9				
	Distribution	-434.197				

Reach 16 1% Flowline ETL Surcharge Summary							
Iteration	Distributed Load In CWALSHT (psf)	Force Applied in CWALSHT (lbs/ft)*	CWALSHT Passive Force Calculated (lbs/ft)	SLOPE/W Passive Force Based On FoS (lbs/ft)	Difference in Forces (lbs/ft)	Distributed Load for Next Iteration (psf)	CWALSHT Factor of Safety (FoS)
1	0	0	9974	7000**	2974	219	14.23
2	200	2720	11300	7000**	4300	316	3.9
3	300	4080	12011	7000**	5011	368	2.86
4	330	4488	11577	7400**	4177	307	2.7
5	315	4284	12121	7200**	4921	362	2.64
6	321	4366	12173	7300**	4873	358	2.75
7	350	4760	12409	7450**	4959	365	2.49
8	360	4896	12513	7475**	5038	370	2.41
9	365	4964	12560	7490**	5070	373	2.38
10	370	5032	12608	7490**	5118	376	2.35
11	375	5100	12668	7500**	5168	380	2.32
12	380	5168	12714	7500**	5214	383	2.29
13	383	5209	12748	7525**	5223	384	2.27

*Distributed Height=13.6 ft

**Factor of Safety not on graph. Force estimated from graph.

Reach 16 1% Flowline



'LONDON AVE CANAL EAST SIDE
'REACH 16 ETL
'WATER EL 5.4

HORIZONTAL DISTRIBUTED LOAD 383 PSF
FACTOR OF SAFETY FOR ACTIVE PRESSURE 2.27
FACTOR OF SAFETY FOR PASSIVE PRESSURE 2.27
SHEET PILE TIP ELEVATION -17.4

		<-----SOIL		PRESSURES----->	
	WATER	<---LEFTSIDE--->		<---RIGHTSIDE--->	
ELEVATION	PRESSURE	PASSIVE	ACTIVE	ACTIVE	PASSIVE
(FT)	(PSF)	(PSF)	(PSF)	(PSF)	(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	0	0	0	0	0
6	0	0	0	0	0
5.4	0	0	0	0	0
5	25	0	0	0	0
4	87	0	0	0	0
3.6	112	0	0	0	0
3.6	112	264	0	0	0
3	150	331	0	0	0
2.9	156	343	0	0	0
2.9	156	343	0	0	264
2	212	448	0	0	310
1.9	218	459	0	0	315
1.36	252	564	0	0	344
1.36	252	522	0	0	344
1	275	564	42	0	363
0	337	681	159	0	417
-0.84	389	772	250	0	457
-1	399	790	268	0	464
-2	462	884	365	0	498
-3	524	984	442	0	540
-4	587	1120	479	0	619
-4.6	624	1183	489	0	657
-5	624	1188	496	0	656
-6	624	1168	498	0	645
-6.71	624	1166	486	0	620
-6.71	624	1166	486	0	627
-7	624	1149	498	10	620
-7.5	624	1071	571	74	564
-8	624	1008	636	143	512
-9	624	987	672	194	503
-10	624	998	680	213	525
-11	624	1041	669	237	554
-12	624	1223	612	270	618
-13	624	1426	561	306	708
-13.78	624	1502	562	330	774
-14	624	1522	562	337	792
-15	624	1569	584	365	867
-16	624	1622	604	393	943
-17	624	1675	624	421	1019
-17.53	624	1726	644	449	1093
-19	624	1768	664	477	1168

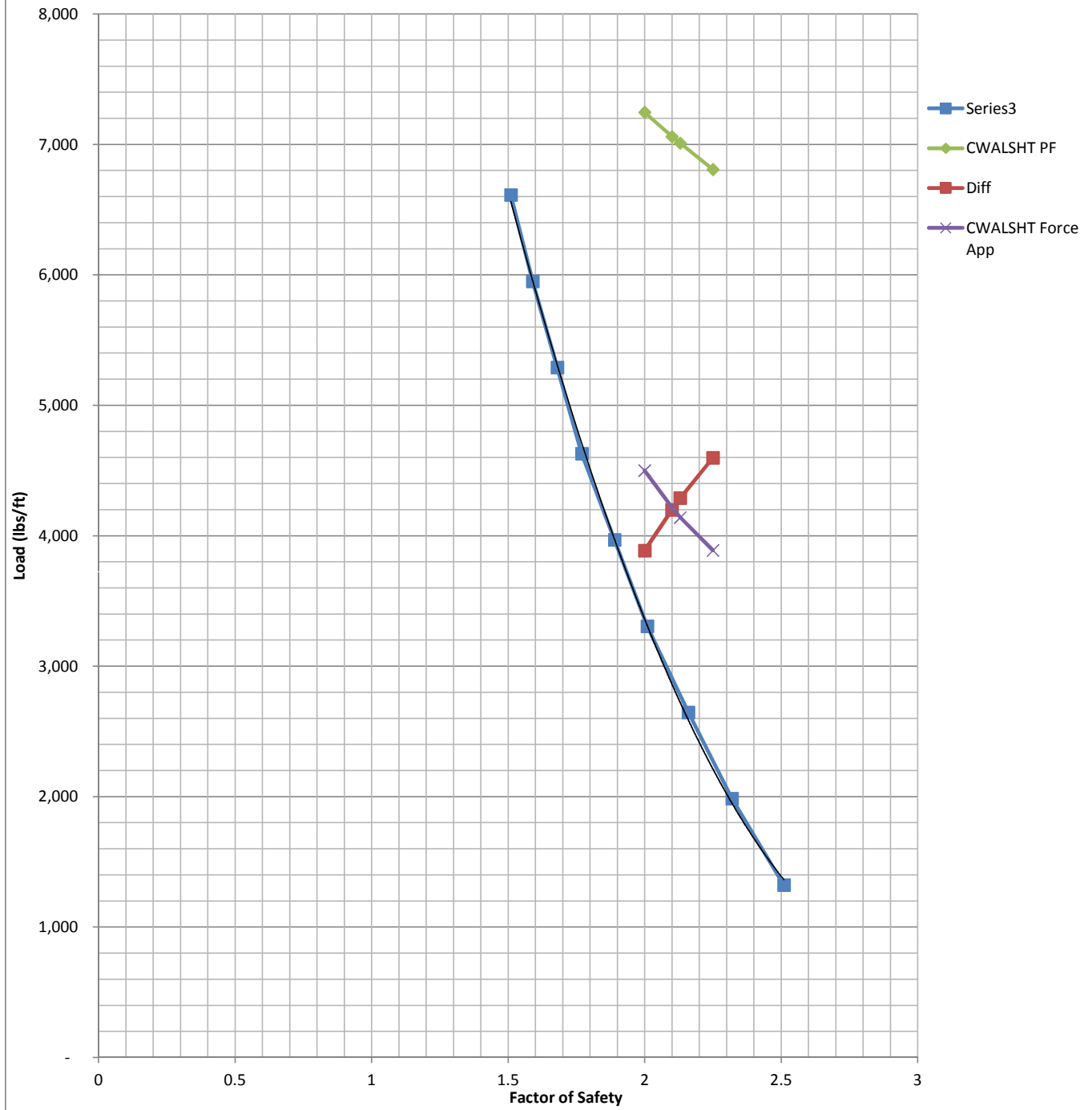
				Leftside	Area
				0	0
				264	178.5
				331	33.7
				343	0
				343	355.95
				448	45.35
				459	276.21
				564	0
				522	195.48
				564	622.5
				681	610.26
				772	124.96
				790	837
				884	934
				984	1052
	water pressure	corrected left side pressure		1120	690.9
	0	1183		1183	479.192
	24.96	1212.96		1212.96	1234.16
	87.36	1255.36		1255.36	906.32352
	131.664	1297.664		1297.664	0
	131.664	1297.664		1297.664	376.48148
	149.76	1298.76		1298.76	637.68
	180.96	1251.96		1251.96	618.03
	212.16	1220.16		1220.16	1240.86
	274.56	1261.56		1261.56	1298.26
	336.96	1334.96		1334.96	

Total CWALSHT Passive Force		12747.797	Cubic			
	CWALSHT FoS	2.27	a	b	c	d
	Equation		-9144.4	42174	-66563	45197
Total Slope/W Passive Force		4454.59	7525	*Fos is off graph. Force is estimated		
	Difference	-8293.21	-5222.797			
	Distributed Height	13.60	13.6			
	Distributed Load	-609.79	-384.0292			

Reach 17 ETL Surcharge Summary						
Iteration	Distributed Load In CWALSHT (psf)	Force Applied in CWALSHT (lbs/ft)	CWALSHT Passive Force Calculated (lbs/ft)	Spencer's Passive Force Calculated (lbs/ft)	Difference in Forces (lbs/ft)	Factor of Safety
2	500	4500	7246	3360	3886	2.00
B2	468.5	4216.5	7060	2861	4199	2.10
B1	460	4140	7010	2721	4289	2.13
3	432	3888	6808	2210	4598	2.25
1	0	0	4630	114659	-110029	9.60

Reach 17

$y = 2617.9x^2 - 15723x + 24334$
 $R^2 = 0.9994$



Reach 17, Iteration B2

HORIZONTAL DISTRIBUTED LOAD

468.5 PSF

FACTOR	OF	SAFETY	FOR	ACTIVE	PRESSURE!=	2.10
--------	----	--------	-----	--------	------------	------

FACTOR	OF	SAFETY	FOR	ACTIVE	PRESSURE!=	2.10
FACTOR	OF	SAFETY	FOR	PASSIVE	PRESSURE!=	2.10

PILE TIP	-17.6
----------	-------

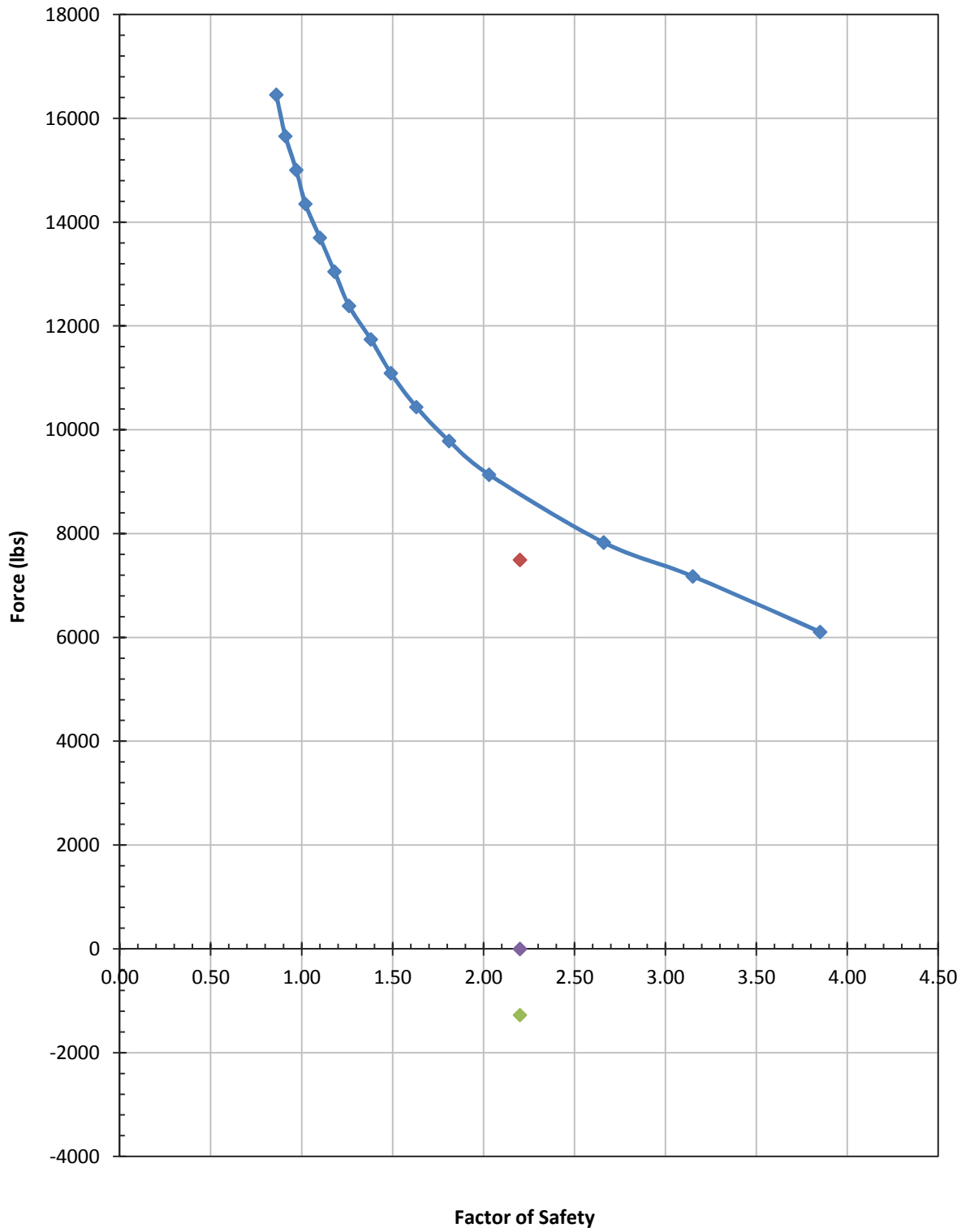
III.--WATER AND SOIL PRESSURES

		<-----SOIL		PRESSURES----->					
	WATER	<---LEFTSIDE--->		<---RIGHTSIDE--->					
ELEVATION	PRESSURE	PASSIVE	ACTIVE	ACTIVE	PASSIVE				
(FT)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)				
	13	0	0	0	0				
	12	0	0	0	0				
	11	0	0	0	0				
	10	0	0	0	0				
	9	0	0	0	0				
	8	0	0	0	0				
	7	63	0	0	0				
	6	125	0	0	0		Left P.P.	Area	
Ground Surface	5.5	156	0	0	0		0	0	
	5.5	156	381	0	0			381	205.5
	5	188	441	0	0			441	516.5
	4	250	592	0	0			592	380.4
	3.4	288	676	0	0			676	0
	3.4	288	676	0	0			676	279.6
	3	313	722	0	0			722	454.2
	2.4	350	792	0	0			792	326
	2	375	838	0	0			838	853
	1	438	868	0	0			868	858.5
	0	500	849	0	0			849	866
	-1	563	883	98	0			883	904
	-2	625	925	403	0			925	186.024
Water Surface	-2.2	638	929	449	0	598	Water Press	Left P.P.	935.24
	-3	638	913	473	0	628	56.16	969.16	468.88
Slip Surface Bottom	-3.5	638	819	575	0	550	87.36	906.36	
	-4	638	830	675	0	270			
	-5	638	853	682	0	293			
	-6	638	875	649	0	315			
	-7	638	929	632	0	429			
	-8	638	982	670	0	489			
	-9	638	1036	710	0	535			
	-10	638	1089	748	0	624			
	-11	638	1143	788	170	678			
	-12	638	1196	830	379	734			
	-13	638	1250	867	439	785			
	-13.94	638	1474	786	452	951			
	-14	638	1487	781	452	960			
	-15	638	2063	684	457	1166			
	-16	638	2097	706	487	1265			
	-17	638	2079	730	515	1362			
	-17.58	638	2115	747	543	1462			
							Total CWALSHT Passive Force	7,060	Quadratic
							CWALSHT FoS	2.10	a
							Equation		b
									c
							Total Slope/W Passive Force	2,861	2618
									-15723
									24334
							Difference	4,200	
							Distributed Height	9	
							Distributed Load	467	

[illegible]

London Ave Canal - Reach 20

FORCE PLOTS



—◆— Slope/W PF —◆— CWALSHT PF —◆— PF Difference —◆— CWALSHT Applied Force

ITERATION	1
-----------	---

APPLIED UNIFORM PSF:	0
----------------------	---

PILE TIP:	-17.97
-----------	--------

FIXED SURFACE

NET ELEV. (FT)	WATER (PSF)	<---NET--->					
		<---LEFTSIDE--->		(SOIL+WATER)		<---RIGHTSIDE--->	
		PASSIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)
9	0	0	0	0	0	0	0
8.9	6.2	0	0	6.2	6.2	0	0
7.9	68.6	0	0	68.6	68.6	0	0
6.9	131	0	0	131	131	0	0
6	187.2	0	0	187.2	187.2	0	0
6	187.2	0	0	187.2	778.1	0	590.9
5.9	193.4	0	0	193.4	789.6	0	596.2
4.9	255.8	0	0	255.8	904.6	0	648.8
3.9	318.2	0	0	318.2	1019.6	0	701.4
3.4	349.4	0	0	349.4	1077.1	0	727.7
3.4	349.4	590.9	0	-241.5	1077.1	0	727.7
2.9	380.6	645.7	0	-265.1	1139.2	0	758.6
2.4	411.8	691.3	0	-279.5	1166.1	0	754.2
1.9	443	736.5	0	-293.4	1098.3	0	655.2
1	496.2	845.9	0	-349.7	943.1	0	430.3
1	496.2	845.9	0	-349.7	943.1	0	463.5
0.9	505.4	846.8	0	-301.3	935.8	40.1	430.3
-0.1	565.7	709.3	0	-24.4	939.7	121.5	374
-0.1	565.7	714	0	-24.4	939.7	121.5	374
-0.1	567.8	709.3	10.1	-17.1	929.7	124.4	372
-1.1	630.2	671.4	161.5	69.4	878.2	110.6	409.5
-2.1	692.6	725	207.2	-11.9	1017.7	20.5	532.2
-2.2	701.7	732.7	214.3	-30.9	1111.7	0	688.1
-2.2	701.7	732.7	214.3	-30.9	1111.7	0	560.6
-2.9	742.6	759.5	241.2	-16.9	1189.5	0	688.1
-3.1	742.6	761.7	243.4	-19.2	1208.1	0	709
-4.1	742.6	787.6	233	-45.1	1245.7	0	736.1
-4.9	742.6	828.9	230.6	-86.3	1247	0	735
-4.9	742.6	828.9	230.6	-86.3	1247	0	735.2
-5.1	742.6	840.2	203.4	-82.3	1274.1	15.3	735
-5.5	742.6	861.3	118.7	-42.3	1323.9	76.4	700
-6.1	742.6	926.4	86.1	-27.5	1311.1	156.3	654.6
-7.1	742.6	962	135.1	-15.3	1283.7	204.1	676.3

WATER	PASSIVE	
PSF	PSF	LBS
	590.9	309.15
	645.7	334.25
	691.3	356.95
	736.5	712.08
	845.9	0
	845.9	84.635
	846.8	778.05
	709.3	0
	714	0
	709.3	690.35
	671.4	698.2
	725	72.885
	732.7	0
	732.7	522.27
0	759.5	153.368
12.48	774.18	818.33
74.88	862.48	726.472
124.8	953.7	0
124.8	953.7	193.118
137.28	977.48	400.204
162.24	1023.54	644.886
199.68	1126.08	

Left Side
Ground Surface Elevation

Left Side
Water Surface Elevation

Entry failure at this elevation
Location per Geostudio

File Name: R20.dat

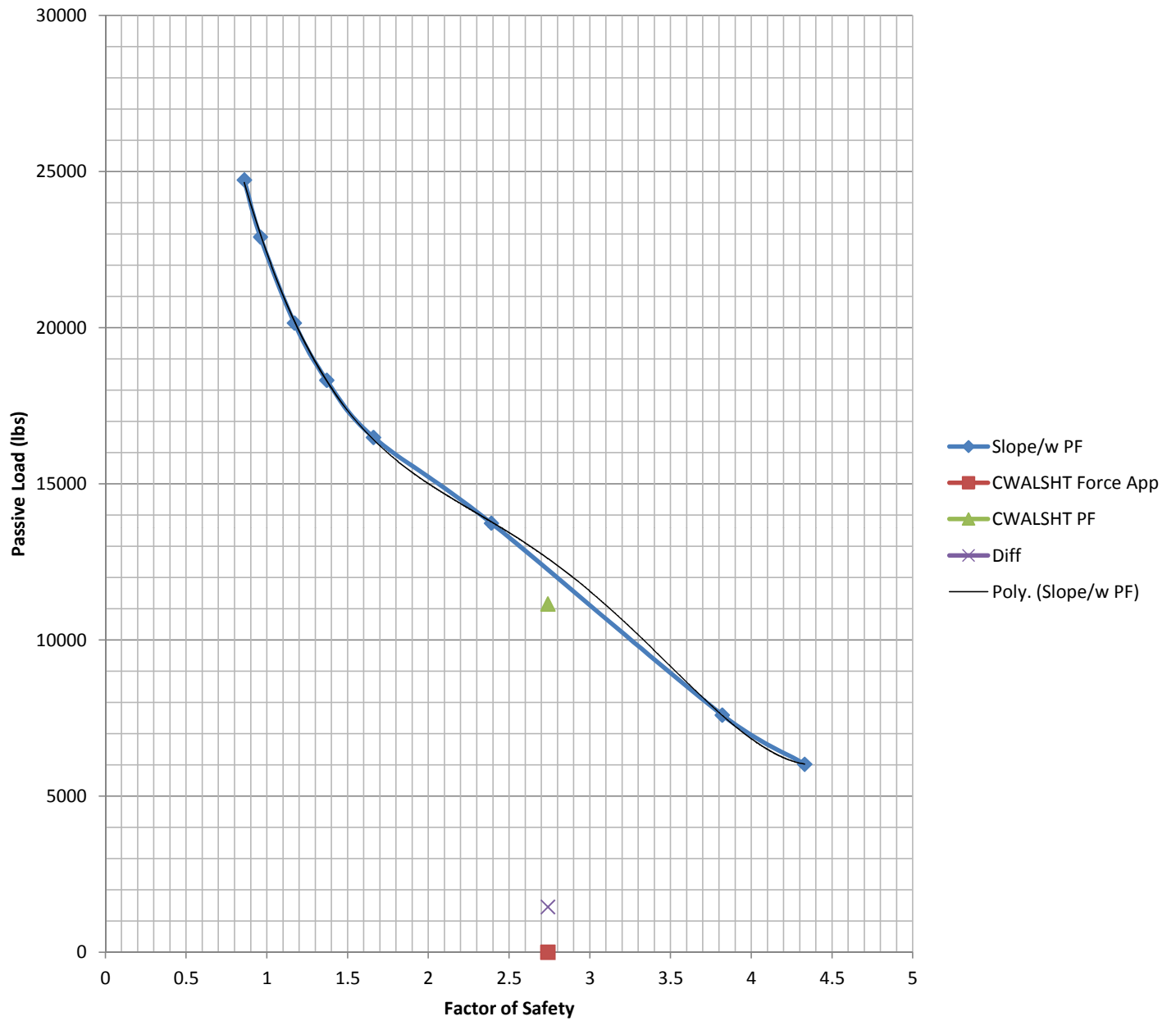
Quartic					
CWALSHT PASSIVE FORCE=	7495.198	a	b	c	d
CWALSHT FS=	2.2	338.32	-3892.9	16713	-33450
GEOSTUDIO PASSIVE FORCE=	8769.7	e			34995
PASSIVE FORCE DIFFERENCE=	-1274.5				
SHEET PILE LENGTH=	9.4				
UNIFORM PRESSURE=	-136				

Reach 21 ETL Surcharge Summary							
Iteration	Distributed Load In CWALSHT (psf)	Force Applied in CWALSHT (lbs/ft)*	CWALSHT Passive Force Calculated (lbs/ft)	SLOPE/W Passive Force Based On FoS (lbs/ft)	Difference in Forces (lbs/ft)	Distributed Load for Next Iteration (psf)	CWALSHT Factor of Safety (FoS)
1	0	0	11155	12605	1450**	N/A	2.74

*Distributed Height=11.9 ft

**Slope/W Passive Force more than CWALSHT Passive Force Calculated. No more iterations done.

Reach 21



I.--HEADING
 'LONDON AVE REMEDIATION
 'REACH 21 W/O LOAD
 '12/12/11

HORIZONTAL DISTRIBUTED LOAD 0 PSF
 FACTOR OF SAFETY FOR ACTIVE PRESSURE:= 2.74
 FACTOR OF SAFETY FOR PASSIVE PRESSURE:= 2.74
 PILE TIP ELEVATION -17.3

III.--WATER AND SOIL PRESSURES

			<-----PRESSURES----->									
		WATER	<---LEFTSIDE--->		<---RIGHTSIDE--->							
	ELEVATION	PRESSURE	PASSIVE	ACTIVE	ACTIVE	PASSIVE						
	(FT)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)						
	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						
	9	0	0	0	0	0						
	8.8	12	0	0	0	0						
	7.8	75	0	0	0	0						
	6.8	137	0	0	0	0						
	6	187	0	0	0	0						
	6	187	0	0	0	474						
	5.8	200	0	0	0	485						
	4.8	262	0	0	0	541						
	3.8	324	0	0	0	596						
Ground Surface	3.7	331	0	0	0	602				Leftside	Area	
	3.7	331	474	0	0	602				0	0	
	2.8	387	455	0	0	652				474	418.05	
	2.7	393	454	0	0	657	water pressure	corrected left side pressure		455	45.45	
Water Surface	2	437	525	0	0	696	0	525		454	342.65	
	1.8	437	534	0	0	707	12.48	546.48		525	107.148	
	0.8	437	553	0	0	763	74.88	627.88		534	587.18	
	-0.2	437	571	0	0	818	137.28	708.28		553	668.08	
	-1.2	437	585	0	0	400	199.68	784.68		571	746.48	
	-2.2	437	607	0	0	456	262.08	869.08		585	826.88	
	-3.2	437	641	0	0	512	324.48	965.48		607	917.28	
	-4.2	437	678	0	0	567	386.88	1064.88		641	1015.18	
	-5.2	437	715	0	0	623	449.28	1164.28		678	1114.58	
	-5.5	437	658	0	0	639	468	1126		715	1320.78	
	-6.2	437	649	0	0	671	511.68	1160.68		658	800.338	
	-7.2	437	693	0	210	715	574.08	1267.08		649	1213.88	
Slip Surface	-8.2	437	738	21	459	760	636.48	1374.48		693	1320.78	
	-9.2	437	783	220	509	804				760	687.24	
	-10.2	437	827	416	538	849				738	687.24	
	-11.2	437	872	446	568	894				783	804	
	-12.2	437	916	473	595	938				827	849	
	-13.2	437	961	500	626	983				872	894	
	-14.2	437	1006	525	657	1027				916	938	
	-15.2	437	1050	538	686	1072				961	983	
	-16.2	437	1095	564	719	1117				1006	1027	
	-17.2	437	1139	606	750	1161				1050	1072	
	-18.2	437	1184	649	780	1206				1095	1117	
	-19.2	437	1229	694	814	1250				1139	1161	
	-20.2	437	1273	738	848	1295				1184	1206	
	-21.2	437	1318	781	876	1340				1229	1250	
	-21.5	437	1351	762	851	1353				1273	1295	
	-22.2	437	1525	717	798	1391				1318	1340	
	-23.2	437	1584	763	837	1446				1351	1353	
	-24.2	437	1640	812	866	1500				1525	1391	
	-24.7	437	1668	837	881	1527				1584	1446	
	-25.2	437	1697	863	897	1555				1640	1500	
	-26.2	437	1753	912	938	1610				1668	1527	
	-26.42	437	1701	964	989	1626				1697	1555	
	-27.2	437	1630	1083	1091	1652				1753	1610	

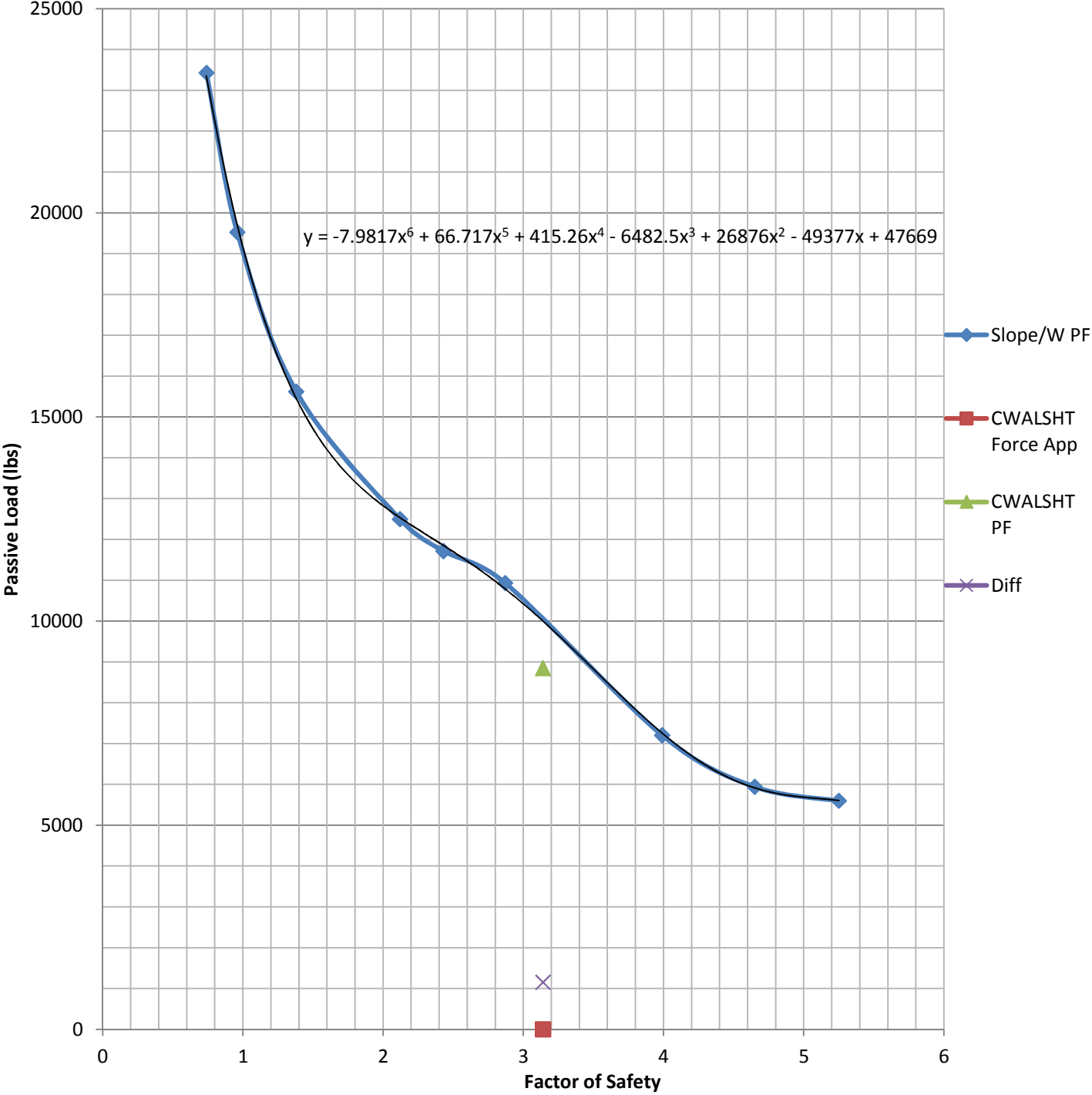
Total CWALSHT Passive Force		11154.74	Quartic				
	CWALSHT FoS	2.74	a	b	c	d	e
	Equation		565.72	-6528.8	27002	-51179	52532
Total Slope/W Passive Force		12605.23					
	Difference	1450.496					
	Height	11.9					
	Distributio	121.8904					

Reach 22 ETL Surcharge Summary							
Iteration	Distributed Load In CWALSHT (psf)	Force Applied in CWALSHT (lbs/ft)*	CWALSHT Passive Force Calculated (lbs/ft)	SLOPE/W Passive Force Based On FoS (lbs/ft)	Difference in Forces (lbs/ft)	Distributed Load for Next Iteration (psf)	CWALSHT Factor of Safety (FoS)
1	0	0	8849	10002	1153**	N/A	3.14

*Distributed Height=9.7 ft

**Slope/W Passive Force more than CWALSHT Passive Force Calculated. No more iterations done.

Reach 22



I.--HEADING
 'LONDON AVENUE CANAL
 'REACH 22
 12/7/11

II.--CONTROL
 CANTILEVE WALL DESIGN
 FACTOR OF SAFETY FOR ACTIVE PRESSURES = 3.14
 FACTOR OF SAFETY FOR PASSIVE PRESSURES = 3.14
 SHEET PILE TIP ELEVATION -17.2
 III.--WATEF AND SOIL PRESSURES

<-----SOIL PRESSURES----->									
WATER		<---LEFTSIDE--->			<---RIGHTSIDE--->				
ELEVATION	PRESSURE	PASSIVE	ACTIVE	ACTIVE	PASSIVE				
(FT)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)				
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				
9	0	0	0	0	0				
8.8	12	0	0	0	0				
7.8	75	0	0	0	0				
6.8	137	0	0	0	0				
6.1	181	0	0	0	0				
6.1	181	0	0	0	525				
5.8	200	0	0	0	539				
4.8	262	0	0	0	591				
3.8	324	0	0	0	642		Left P.P.	Area	
3.5	343	0	0	0	661		0	0.00	
3.5	343	525	0	0	661		525	389.20	
2.8	387	587	0	0	594		587	177.45	
2.5	406	596	0	0	478		596	197.34	
2.17	426	600	0	0	243		600	0.00	
2.17	426	600	0	0	369		600	226.81	
1.8	449	626	0	135	243	Water Press	New P.P.	626	126.70
1.6	462	641	0	151	232	0	641	641	545.97
0.8	462	674	0	145	273	49.92	723.92	674	772.62
-0.2	462	709	0	70	335	112.32	821.32	709	431.58
-0.71	462	727	0	0	514	144.144	871.144	727	0.00
-0.71	462	727	0	0	426	144.144	871.144	727	438.27
-1.2	462	743	0	0	514	174.72	917.72	743	966.42
-2.2	462	778	0	0	612	237.12	1015.12	778	1063.32
-3.2	462	812	0	0	638	299.52	1111.52	812	1160.22
-4.2	462	847	0	0	676	361.92	1208.92	847	97.03
-4.28	462	850	0	0	645	366.912	1216.912	850	146.78
-4.4	462	855	0	0	601	374.4	1229.4	855	0.00
-4.4	462	855	0	0	662	374.4	1229.4	855	312.91
-4.66	462	787	0	39	641	390.624	1177.624	787	0.00
-4.66	462	833	0	39	641	390.624	1223.624	833	657.43
-5.2	462	787	83	116	601	424.32	1211.32	787	352.70
-5.5	462	697	194	220	599	443.04	1140.04	697	786.72
-6.2	462	621	388	410	637	486.72	1107.72	621	
-7.2	462	676	460	482	691				
-8.2	462	730	495	515	746	Total CWALSHT Passive Force			8849.48
-8.91	462	785	523	552	801	CWALSHT FoS			3.14
-10.2	462	840	534	590	855	Equation			
						Total Slope/W Passive Force			10002.12
						Difference			1152.64
						Distributed Height			9.70
						Distributed Load			118.83

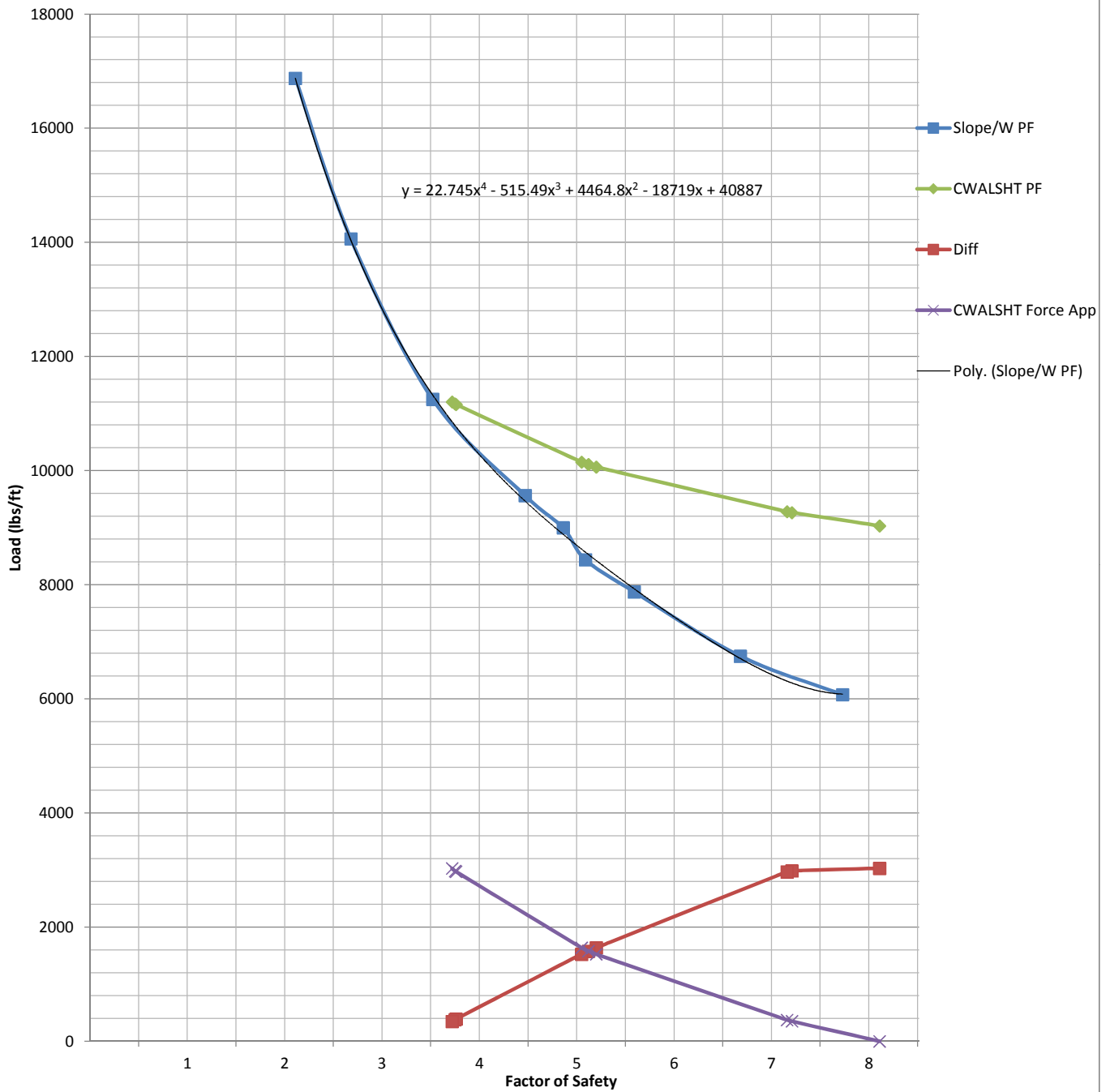
Sextic							
a	b	c	d	e	f	g	
-7.98	66.717	415.26	-6482.5	26876	-49377	47669	

Reach 23 ETL 1110-2-575 Iterations Summary							
Iteration	Distributed Load In CWALSHT (psf)	Force Applied in CWALSHT (lbs/ft)*	CWALSHT Passive Force Calculated (lbs/ft)	SLOPE/W Passive Force Based On FoS (lbs/ft)	Difference in Forces (lbs/ft)	Distributed Load for Next Iteration (psf)	CWALSHT Factor of Safety (FoS)
1	0	0	9031	6000**	3031	268	8.11
2	268	3028	11203	10857	346	31	3.72
3	31	350	9264	6278	2986	264	7.21
4	264	2983	11170	10791	379	33	3.75
5	33	373	9279	6311	2969	263	7.16
6	263	2972	11159	10769	390	35	3.76
7	135	1526	10062	8425	1638	145	5.2
8	145	1639	10150	8624	1526	135	5.05
9	140	1582	10108	8530	1578	140	5.12

*Distributed Height=11.3 ft

**Factor of Safety not on graph. Force estimated from graph.

Reach 23



HORIZONTAL DISTRIBUTED LOAD 140 PSF
 FACTOR OF SAFETY FOR ACTIVE PRESSURES = 5.12
 FACTOR OF SAFETY FOR PASSIVE PRESSURES = 5.12
 SHEET PILE TIP ELEVATION -13.2

III.--WATER AND SOIL PRESSURES

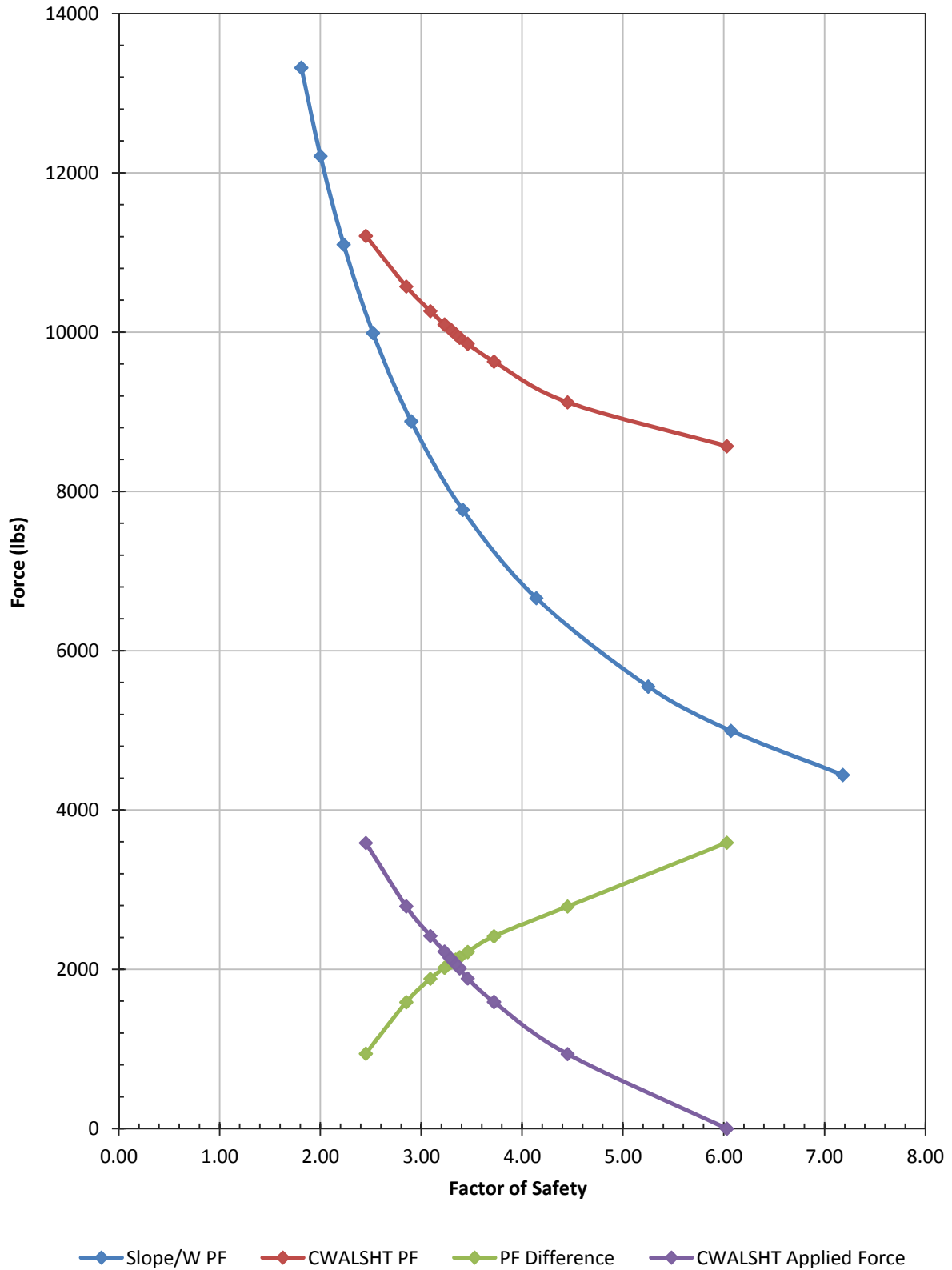
		<-----SOIL		PRESSURES----->						
	WATER	<----LEFTSIDE----->		<---RIGHTSIDE---->						
ELEVATION	PRESSURE	PASSIVE	ACTIVE	ACTIVE	PASSIVE					
(FT)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)					
12.9	0	0	0	0	0					
11.9	0	0	0	0	0					
10.9	0	0	0	0	0					
9.9	0	0	0	0	0					
8.9	0	0	0	0	0					
8	0	0	0	0	0					
7.9	6	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			Left P.P.	Area	
4.2	237	0	0	0	0			0	0	
Ground Surface	4.2	237	297	0	0	0			297	61.7
	4	250	320	0	0	0			320	0
	4	250	320	0	0	297			320	32.6
	3.9	256	332	0	0	303			332	343.35
	3	312	431	0	0	337			431	43.6
	2.9	318	441	0	0	339			441	180.18
	2.51	343	483	0	0	354			483	314.455
	1.9	381	548	0	0	377			548	108.72
	1.72	392	660	0	0	386			660	0
	1.72	392	569	0	0	386			569	503.89
	0.9	443	660	91	0	426			660	716
	-0.1	505	772	203	0	475			772	828
	-1.1	568	884	316	0	526			884	160.92
	-1.28	579	904	335	0	536			904	0
-1.28	579	904	335	0	531	Water Press	Left P.P.	904	201.08	
Water Surface	-1.5	593	924	355	16	536	0	924		576.132
	-2.1	593	959	390	78	527	37.44	996.44		1052.64
	-3.1	593	1009	439	155	521	99.84	1108.84		1150.04
	-4.1	593	1029	517	216	524	162.24	1191.24		478.288
	-4.5	593	1013	569	258	508	187.2	1200.2		726.252
	-5.1	593	996	636	315	495	224.64	1220.64		1266.34
Slip Surface Tip	-6.1	593	1025	690	357	547	287.04	1312.04		1364.24
	-7.1	593	1067	730	385	598	349.44	1416.44		
	-8.1	593	1108	771	415	650				
	-9.1	593	1150	812	444	701				
	-10.1	593	1191	853	473	753				
	-10.64	593	1213	875	489	781				
	-11.1	593	1232	894	503	805				
	-12.1	593	1273	935	532	856				
	-13.1	593	1314	977	561	908				
	-13.22	593	1355	1018	591	959				
	-15.1	593	1397	1059	620	1011				
Total CWALSHT Passive Force										10108.43
CWALSHT FoS										5.12
Equation										22.745
Total Slope/W Passive Force										8530.121
Difference										-1578.306
Distributed Height										11.3
Distributed Load										-139.6731
										Quartic
										a
										b
										c
										d
										e
										40887

Quartic

a	b	c	d	e
22.745	-515.49	4464.8	-18719	40887

Reach 24 ETL Surcharge Summary							
Iteration	Distributed Load In CWALSHT (psf)	Force Applied in CWALSHT (lbs/ft)*	CWALSHT Passive Force Calculated (lbs/ft)	SLOPE/W Passive Force Based On FoS (lbs/ft)	Difference in Forces (lbs/ft)	Distributed Load for Next Iteration (psf)	CWALSHT Factor of Safety (FoS)
1	0	0	8569	4980	3589	329	6.03
2	329	3586.1	11208	10265	943	86	2.45
3	86	937.4	9120	6332	2789	256	4.45
4	256	2790.4	10573	8984	1588	146	2.85
5	146	1591.4	9631	7216	2415	222	3.72
6	222	2419.8	10264	8380	1883	173	3.09
7	173	1885.7	9854	7635	2219	204	3.46
8	204	2223.6	10095	8075	2021	185	3.23
9	185	2016.5	9932	7780	2152	197	3.38
10	197	2147.3	10046	7973	2073	190	3.28
11	190	2071	9977	7855	2122	195	3.34
12	195	2125.5	10023	7933	2090	192	3.3

London Ave Canal - Reach 24
FORCE PLOTS



ITERATION 12

APPLIED UNIFORM PSF: 195

PILE TIP: -13.3

FIXED SURFACE

NET ELEV. (FT)	WATER (PSF)	<---NET--->					
		<---LEFTSIDE--->		(SOIL+WATER)		<---RIGHTSIDE--->	
		PASSIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)
10	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0
7	62.5	0	0	62.5	62.5	0	0
6	125	0	0	125	125	0	0
5	187.5	0	0	187.5	187.5	0	0
4	250	0	0	250	250	0	0
4	250	363.6	0	81.4	445	0	0
3.9	256.3	359.9	0	91.3	451.3	0	0
3.9	256.3	359.9	0	91.3	911.9	0	460.6
3	312.5	460.9	0	46.6	938.7	0	431.2
2.9	318.8	472.1	0	41.6	949.6	0	435.9
2.1	371.1	566.1	0	0	1040.6	0	474.5
2	375	573.1	0	-3.1	1047.4	0	477.4
1	437.5	685.3	0	-52.8	1156	0	523.5
0.9	444.3	797.5	0	-108.2	1167.7	0	528.5
0.9	444.3	697.4	0	-108.2	1167.7	0	528.5
0	500	797.5	100.1	-102.5	1164.5	0	569.6
-1	562.5	909.7	212.3	-152.2	1165.6	0	620.3
-2	625	1022.1	324.2	-202.1	1126.3	0	630.5
-2.7	670.6	1100.9	409.8	-235.4	1046.8	0	584.9
-2.7	670.6	1100.9	409.8	-235.4	1046.8	0	597.3
-3	687.5	1122.5	447.2	-207.2	1020.2	32.9	584.9
-4	750	1184.4	586.5	-134.9	931.1	104.5	572.6
-4.4	775	1196.3	644.1	-61.6	860	164.7	534.1
-4.5	775	1192.3	659.2	-28.5	821	193.8	510.2
-5	775	1179.5	703.7	71.2	749.8	280.7	483.6
-6	775	1205.6	736.6	78.6	768.4	314.2	535.1
-6.9	775	1232.5	762.9	73.1	788.5	335.6	581.4
-6.9	775	1232.5	762.9	-121.9	593.5	335.6	581.4
-7	775	1235.4	765.9	-122.4	595.7	338	586.6
-8	775	1264.9	795.4	-127.3	617.6	362.6	638.1

WATER	PASSIVE	
PSF	PSF	LBS
	363.6	36.175
	359.9	0
	359.9	369.36
	460.9	46.65
	472.1	415.28
	566.1	56.96
	573.1	629.2
	685.3	74.14
	797.5	0
	697.4	672.705
	797.5	853.6
	909.7	965.9
	1022.1	743.05
	1100.9	0
	1100.9	333.51
	1122.5	1153.45
	1184.4	476.14
0	1196.3	119.742
6.24	1198.54	603.87
37.44	1216.94	1261.19
99.84	1305.44	1212.273
156	1388.5	

Left Side
Ground Surface Elevation

Left Side
Water Surface Elevation

Entry failure at this elevation
Location per Geostudio

File Name: R24_C195.dat

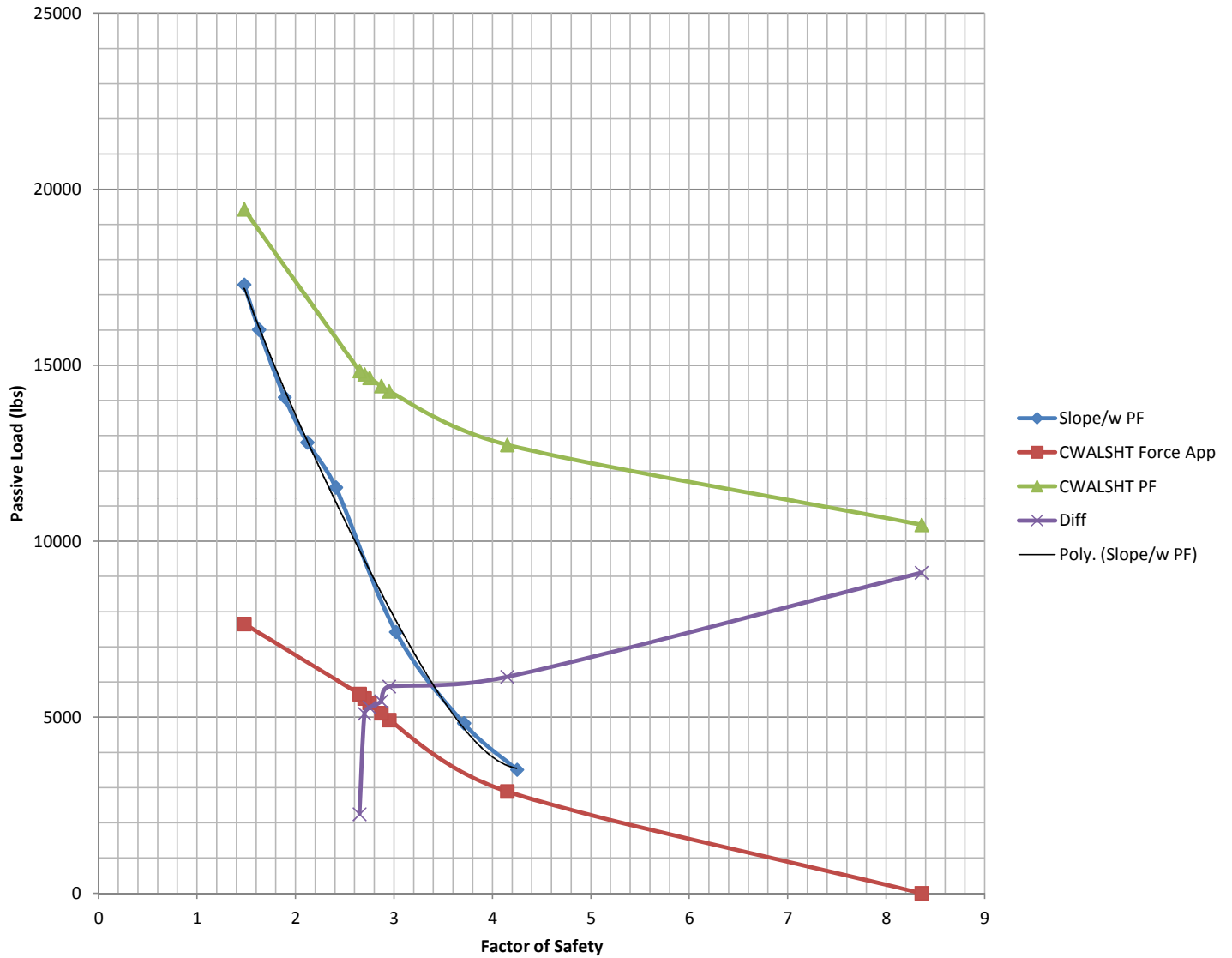
	Quartic				
	a	b	c	d	e
CWALSHT PASSIVE FORCE=	10023.2				
CWALSHT FS=	3.3	25.391	-545.9	4457.1	-17203
GEOSTUDIO PASSIVE FORCE=	7933.1				
PASSIVE FORCE DIFFERENCE=	2090.1				
SHEET PILE LENGTH=	10.9				
UNIFORM PRESSURE=	192				

Reach 25 ETL Surcharge Summary							
Iteration	Distributed Load In CWALSHT (psf)	Force Applied in CWALSHT (lbs/ft)*	CWALSHT Passive Force Calculated (lbs/ft)	SLOPE/W Passive Force Based On FoS (lbs/ft)**	Difference in Forces (lbs/ft)	Distributed Load for Next Iteration (psf)	CWALSHT Factor of Safety (FoS)
1	0	0	9751	1000**	8751	711	8.36
2	622	7651	18550	17186	1364	111	1.48
3	235	2891	12007	3632	8375	681	4.15
4	450	5535	13967	9465	4502	366	2.7
5	350	4305	13039	6605	6434	523	3.25
6	400	4920	13496	8114	5382	438	2.95
7	416	5117	13642	8539	5103	415	2.87

*Distributed Height=12.3 ft

**Factor of safety not on graph. Force estimated from graph.

Reach 25



$$y = 185.7x^4 - 1899.5x^3 + 7764.3x^2 - 20544x + 35851$$

I.--HEADING
'LONDON AVE REMEDIATION
'REACH 25 W LOAD
'12/12/11

PILE TIP ELEVATION	-13.3
--------------------	-------

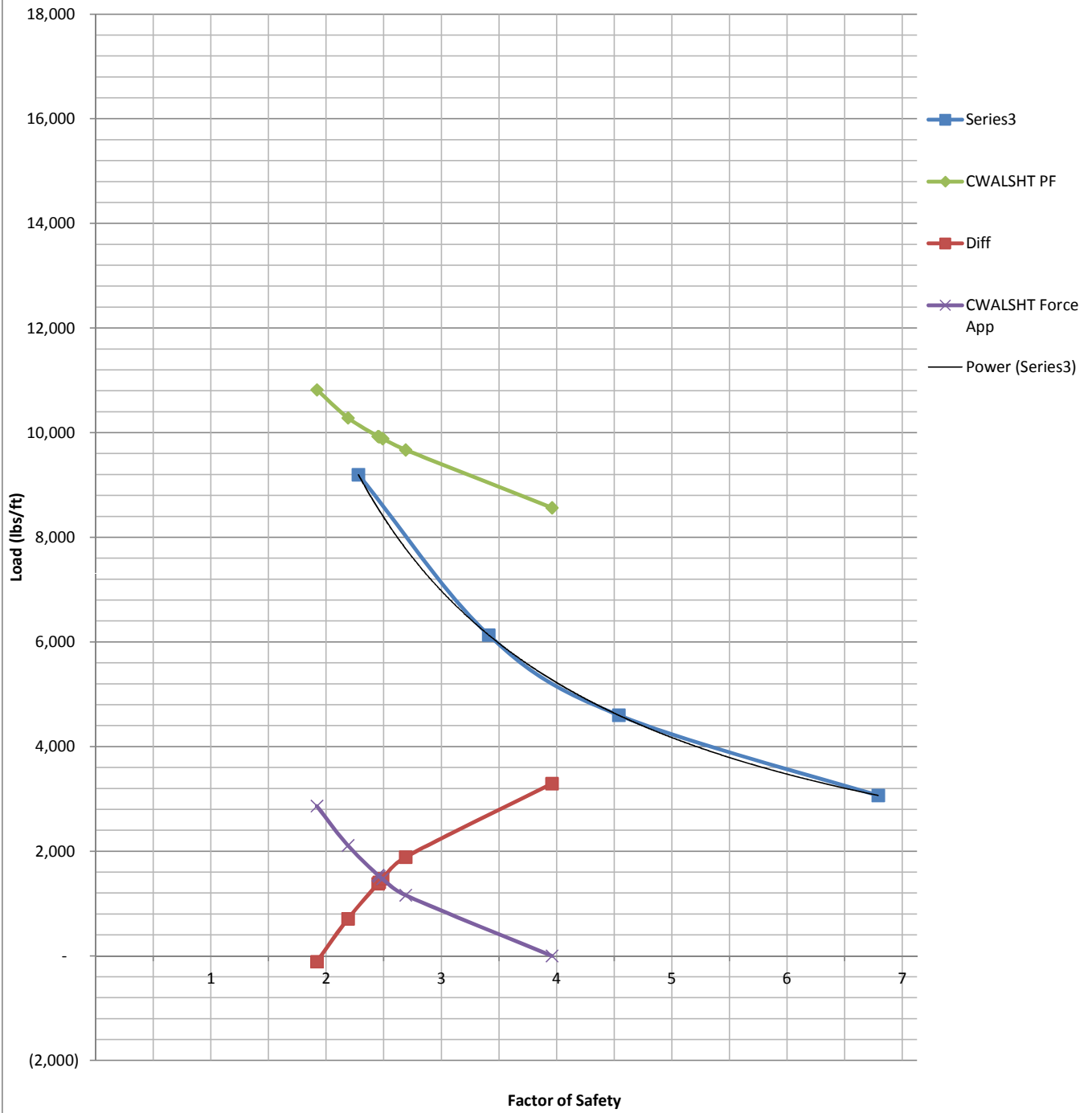
<-----PRESSURES----->			
WATER	<----LEFTSI	<---RIGHTSIDE----	
ELEVATION	PRESSURE	PASSIVE	ACTIVE
(FT)	(PSF)	(PSF)	(PSF)
12.9	0	0	0
11.9	0	0	0
10.9	0	0	0
9.9	0	0	0
8.9	0	0	0
8	0	0	0
7.9	6	0	0
6.9	69	0	0
5.9	131	0	0

Total CWALSHT Passive Force		13641.92					
	CWALSHT	Fo	2.87	a	b	c	d
		Equation		185.7	-1899.5	7764.3	-20544
Total slope/w Passive		Total	8538.586				35851
		Difference	-5103.33				
		Height	12.3				
		Distribution	-414.905				

Reach 26A ETL Surcharge Summary						
Iteration	Distributed Load In CWALSHT (psf)	Force Applied in CWALSHT (lbs/ft)	CWALSHT Passive Force Calculated (lbs/ft)	Spencer's Passive Force Calculated (lbs/ft)	Difference in Forces (lbs/ft)	Factor of Safety
2	247	2865.2	10820	10930	-110	1.92
4	182	2111.2	10282	9574	708	2.19
6	133	1542.8	9930	8551	1379	2.45
5	131	1519.6	9922	8516	1406	2.46
7	127	1473.2	9887	8413	1474	2.49
3	100	1160	9671	7783	1888	2.69
1	0	0	8565	5273	3292	3.96

Reach 26A

$y = 21082x^{-1.007}$
 $R^2 = 1$



Reach 26A, Iteration 7

HORIZONTAL DISTRIBUTED LOAD			127	PSF		
FACTOR	OF	SAFETY	FOR	ACTIVE	PRESSURE:=	2.49
FACTOR	OF	SAFETY	FOR	PASSIVE	PRESSURE:=	2.49
PILE TIP		-19.3				

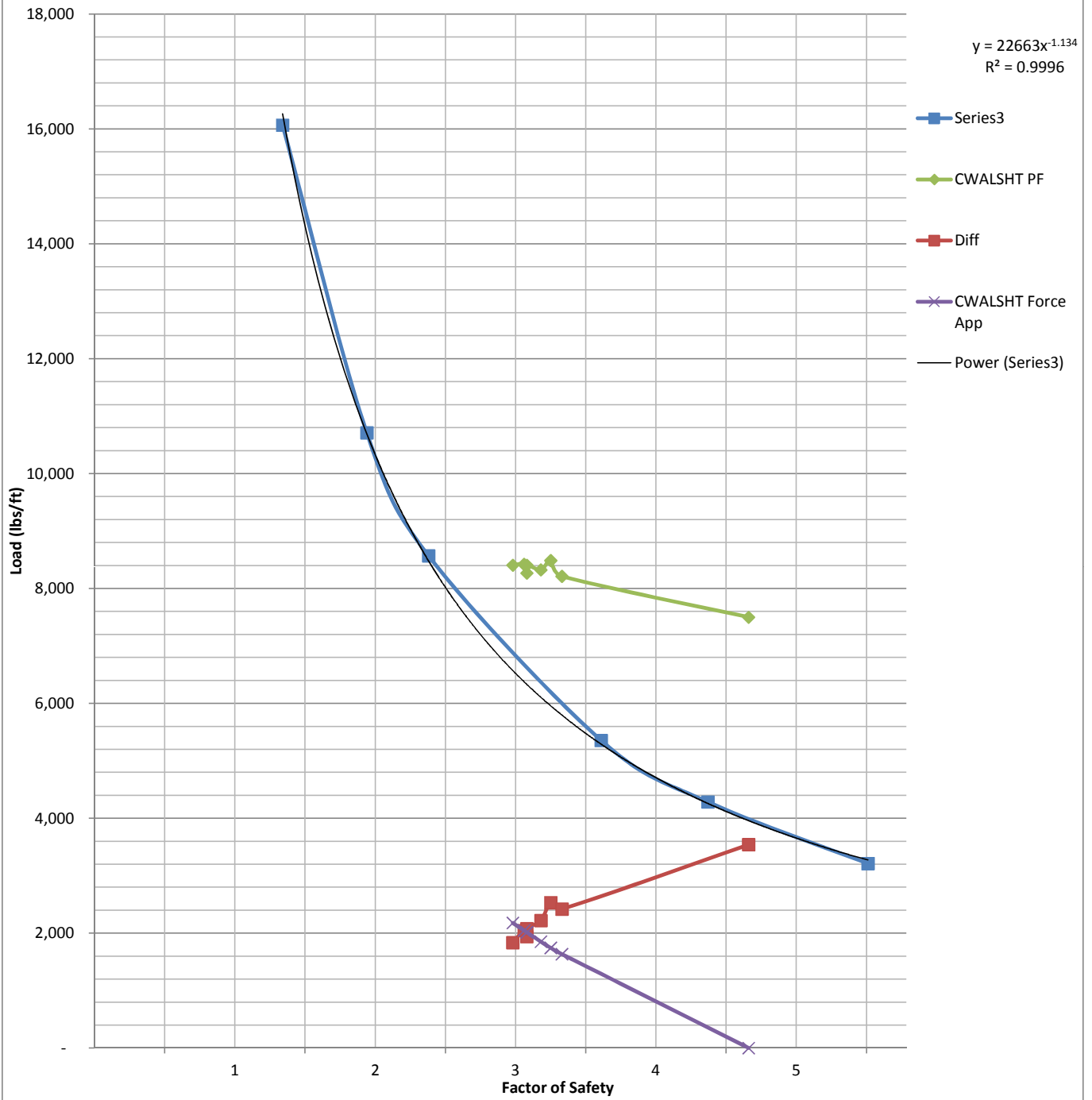
III.--WATER AND SOIL PRESSURES

			<-----SOIL		PRESSURES----->				
		WATER	<----LEFTSIDE----->		<---RIGHTSIDE----->				
	ELEVATION (FT)	PRESSURE (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)			
Ground Surface	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	63	0	0	0	0			
	6	125	0	0	0	0			
	5	188	0	0	0	0		Left P.P.	Area
	4	250	0	0	0	0		0	0
Water Surface	4	250	402	0	0	0		402	209.5
	3.5	281	436	0	0	0		436	0
	3.5	281	436	0	0	402		436	231.25
	3	313	489	0	0	423		489	257.5
	2.5	344	541	0	0	435		541	283.75
	2	375	594	0	0	447		594	646.5
	1	438	699	0	0	487		699	488.475
	0.35	478	804	0	0	516		804	0
	0.35	478	767	0	0	516		767	274.925
	0	500	804	37	0	531		804	763.65
Slip Surface Bottom	-0.9	556	893	126	0	571	Water Press	Left P.P.	893
	-1	556	900	133	0	576	0	900	954.2
	-2	556	946	178	0	589	62.4	1008.4	482.25212
	-2.49	556	867	299	0	534	92.976	959.976	0
	-2.49	556	867	299	0	535	92.976	959.976	9.58288
	-2.5	556	863	303	2	534	93.6	956.6	454.1
	-3	556	735	455	120	451	124.8	859.8	888.5
	-4	556	730	497	247	378	187.2	917.2	958.4
	-5	556	750	513	286	386	249.6	999.6	1040.3
	-6	556	769	529	305	427	312	1081	837.675
Slip Surface Bottom	-6.75	556	794	532	311	457	358.8	1152.8	291.4
	-7	556	804	530	311	467	374.4	1178.4	723.672
	-7.6	556	822	535	318	492	411.84	1233.84	
	-8	556	838	543	328	508			
	-9	556	878	562	351	548			
	-10	556	919	569	373	589			
	-11	556	1020	548	395	629			
	-12	556	1170	530	418	689			
	-13	556	1255	543	445	748			
	-14	556	1307	568	472	810			
Slip Surface Bottom	-15	556	1363	592	499	873			
	-16	556	1421	616	526	950			
	-16.62	556	1457	631	542	1013			
	-17	556	1479	640	553	1051			
	Total CWALSHT Passive Force							9,885	
	CWALSHT FoS							2.49	
	Equation								
	Total Slope/W Passive Force							8,413	
	Difference							1,473	
	Distributed Height							11.6	
Distributed Load							127		

Slope/W Exponential Interpolation	
significand	exponent
21082	-1.007

Reach 26B ETL Surcharge Summary						
Iteration	Distributed Load In CWALSHT (psf)	Force Applied in CWALSHT (lbs/ft)	CWALSHT Passive Force Calculated (lbs/ft)	Spencer's Passive Force Calculated (lbs/ft)	Difference in Forces (lbs/ft)	Factor of Safety
6	200	2180	8406	6570	1836	2.98
8	188	2049.2	8421	6375	2046	3.06
5	185	2016.5	8268	6329	1939	3.08
7	185	2016.5	8406	6329	2077	3.08
4	170	1853	8324	6103	2221	3.18
3	160	1744	8486	5954	2532	3.25
2	150	1635	8212	5792	2420	3.33
1	0	0	7499	3957	3542	4.66

Reach 26B



HORIZONTAL DISTRIBUTED LOAD			188	PSF		
FACTOR	OF	SAFETY	FOR	ACTIVE	PRESSURE: =	3.06
FACTOR	OF	SAFETY	FOR	PASSIVE	PRESSURE: =	3.06
PILE TIP		-19.3				

		<-----SOIL		PRESSURES----->	
	WATER	<----LEFTSIDE----->		<---RIGHTSIDE----->	
ELEVATION	PRESSURE	PASSIVE	ACTIVE	ACTIVE	PASSIVE
(FT)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)

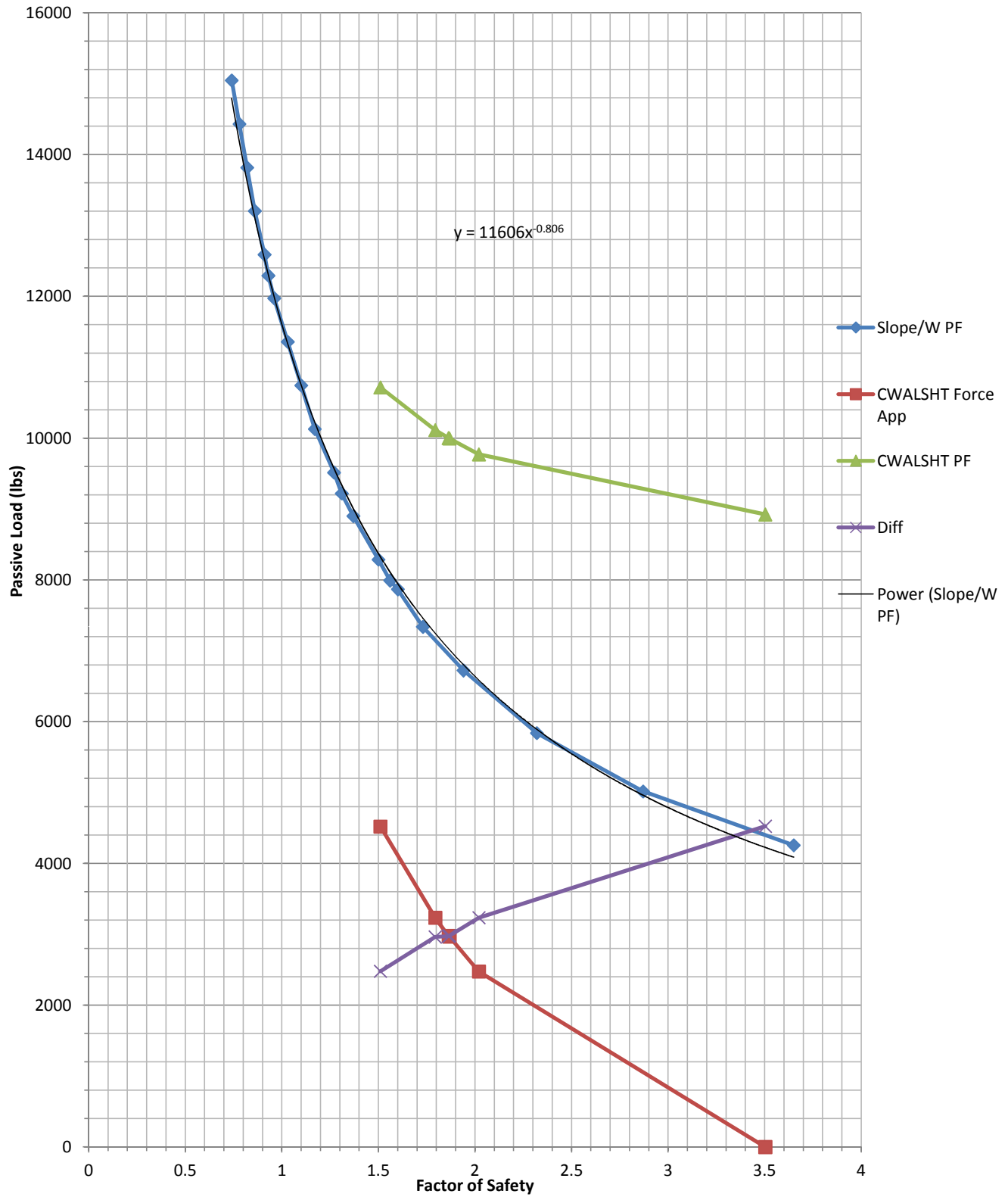
Ground Surface	13	0	0	0	0	0				
	12	0	0	0	0	0				
	11	0	0	0	0	0				
	10	0	0	0	0	0				
	9	0	0	0	0	0				
	8	0	0	0	0	0				
	7	63	0	0	0	0				
	6	125	0	0	0	0				
	5	188	0	0	0	0			Left P.P.	Area
	4	250	0	0	0	0			0	0
Water Surface	4	250	392	0	0	0			392	225.5
	3.5	281	510	0	0	0			510	0
	3.5	281	510	0	0	392			510	268
	3	313	562	0	0	496			562	293.75
	2.5	344	613	0	0	501			613	312.75
	2	375	638	0	0	486			638	663
	1	438	688	0	0	475			688	716.5
	0	500	745	0	0	518			745	657
	-0.9	556	715	0	0	556	Water Press	Left P.P.	715	71.1
	-1	556	707	0	0	520	0	707	707	731.7
Slip Surface Bottom	-2	556	694	0	0	266	62.4	756.4		366.25
	-2.5	556	615	0	0	285	93.6	708.6		367.1
	-3	556	635	89	0	305	124.8	759.8		811.5
	-4	556	676	369	0	346	187.2	863.2		914.4
	-5	556	716	481	0	386	249.6	965.6		1017.3
	-6	556	757	500	0	427	312	1069		830.55
	-6.75	556	787	492	0	487	358.8	1145.8		173.022
Total CWALSHT Passive Force	-6.9	556	793	496	0	507	368.16	1161.16		
	-7	556	797	501	0	491				
	-8	556	838	519	141	508				
	-9	556	878	541	288	548				
	-10	556	919	565	311	589				
	-11	556	1067	689	454	646				
	-12	556	1324	665	486	803				
	-13	556	1293	538	401	748				
	-14	556	1349	562	429	808				
	-15	556	1397	586	458	867				
	-15.44	556	1423	598	470	893				
	-16	556	1455	612	487	927				
	-17	556	1514	639	513	995				
	-18	556	1573	659	542	1065				
	-19	556	1641	685	573	1138				
-19.34	556	1719	712	600	1232					
-21	556	1804	738	631	1328					
Total CWALSHT Passive Force							8,419		Exponential	
CWALSHT FoS							3.06		significant exponent	
Equation							22663		-1.134	
Total Slope/W Passive Force							6,375			
Difference							2,044			
Distributed Height							10.9			
Distributed Load							188			

Reach 27 ETL Surcharge Summary							
Iteration	Distributed Load In CWALSHT (psf)	Force Applied in CWALSHT (lbs/ft)*	CWALSHT Passive Force Calculated (lbs/ft)	SLOPE/W Passive Force Based On FoS (lbs/ft)**	Difference in Forces (lbs/ft)	Distributed Load for Next Iteration (psf)	CWALSHT Factor of Safety (FoS)
1	0	0	8924	4399	4525	387	3.50
2	387	4520	10716	8237	2479	212	1.51
3	212	2476	9772	6537	3235	277	2.02
4	277	3235	10114	7151	2963	254	1.79
5	254	2967	9994	7014	2981	255	1.87
6	255	2978	10002	7029	2973	255	1.86

*Distributed Height=11.68 ft

**Passive force interpolated from graph. No trendline equation used.

Reach 27



255	PSF
-19.3	

	NET	<---LEFTSIDE---		<---NET----->		<---RIGHTSIDE---		
ELEV. (FT)	WATER (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)	
10	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0
7	62.5	0	0	62.5	62.5	0	0	0
6	125	0	0	125	125	0	0	0
5	187.5	0	0	187.5	187.5	0	0	0
4	250	0	0	250	250	0	0	0
4	250	644.1	0	-138.9	1149.3	0	644.1	0
3	312.5	721.3	0	-153.6	1163.5	0	595.8	0
2	375	672.3	0	-42.1	1110.5	0	480.3	0
1.2	422.6	594.6	0	74	1011.3	0	333.5	0
1.2	422.6	613.1	0	74	1011.3	0	333.5	0
1	437.5	594.6	71.4	98.1	908.9	0	287.6	0
0.9	446.2	601.9	95.1	99.5	816.7	0	152.3	0
0.9	446.2	601.9	95.1	99.5	816.7	0	268.4	0
0	500	712.3	176.5	216.9	772.7	174.1	194	0
-1	562.5	771.4	333.3	291.4	726.9	245	242.5	0
-2	625	787.7	510	343	661.2	250.4	291	0
-2.5	656.3	848.1	533	244.1	693.7	180.8	315.3	0
-3	687.5	924	534.2	94.8	798.4	76	389.9	0
-4	750	979.4	629.5	67	834.2	41.1	458.4	0
-5	812.5	1001.7	725.8	162.7	778.9	96.7	437	0
-6	812.5	1021.5	764.1	168.8	760.6	122.6	457	0
-7	812.5	1060	779.1	145.4	786.1	137.7	497.5	0
-7.68		1151.7						0
-7.7	812.5	1155.2	739.3	78.7	853.5	166.2	525	0
-7.7-	812.5	1155.2	739.3	-176.5	598.3	166.2	525	0
-8	812.5	1298.3	692.6	-297.6	657.9	188.2	538	0
-9	812.5	1655.4	601.4	-614.7	844.3	228.3	633.2	0
-10	812.5	1798.2	579.2	-744.6	958.9	241	725.6	0
-11	812.5	1868.5	570.8	-795.2	1027	260.9	785.3	0
-12	812.5	1918.7	580.9	-818.5	1056.2	287.7	824.6	0
-13	812.5	1959.5	599.3	-830.2	1068.5	316.7	855.3	0
-14	812.5	1994.3	616.6	-834.7	1102.4	347.1	906.5	0
-15	812.5	2029	634.7	-836.3	1159.4	380.2	981.6	0
-16	812.5	2063.8	655.2	-830.3	1226.9	420.9	1069.5	0
-17	812.5	2098.6	677.5	-823	1291.7	463.1	1156.7	0
-18	812.5	2133.3	700.1	-823	1346.4	497.8	1234	0
-19	812.5	2168.1	722.7	-827.6	1397.6	528	1307.8	0
-20	812.5	2202.8	745.3	-833.2	1449.3	557.1	1382.1	0
-21	812.5	2235.9	767.9	-837.2	1501	586.2	1456.4	0
-22	812.5	2291.4	790.5	-868.5	1552.7	610.4	1530.7	0
-23	812.5	2380.9	813.1	-940	1604	628.4	1604.6	0
-24	812.5	2467	835.7	-1003.2	1655.1	651.3	1678.3	0
-25	812.5	2540.4	858.3	-1048.4	1744.2	679.5	1790	0
-26	812.5	2617.2	880.9	-1097.1	1873	707.7	1941.4	0
-27	812.5	2701.8	903.4	-1153.6	1972.2	735.7	2063.2	0

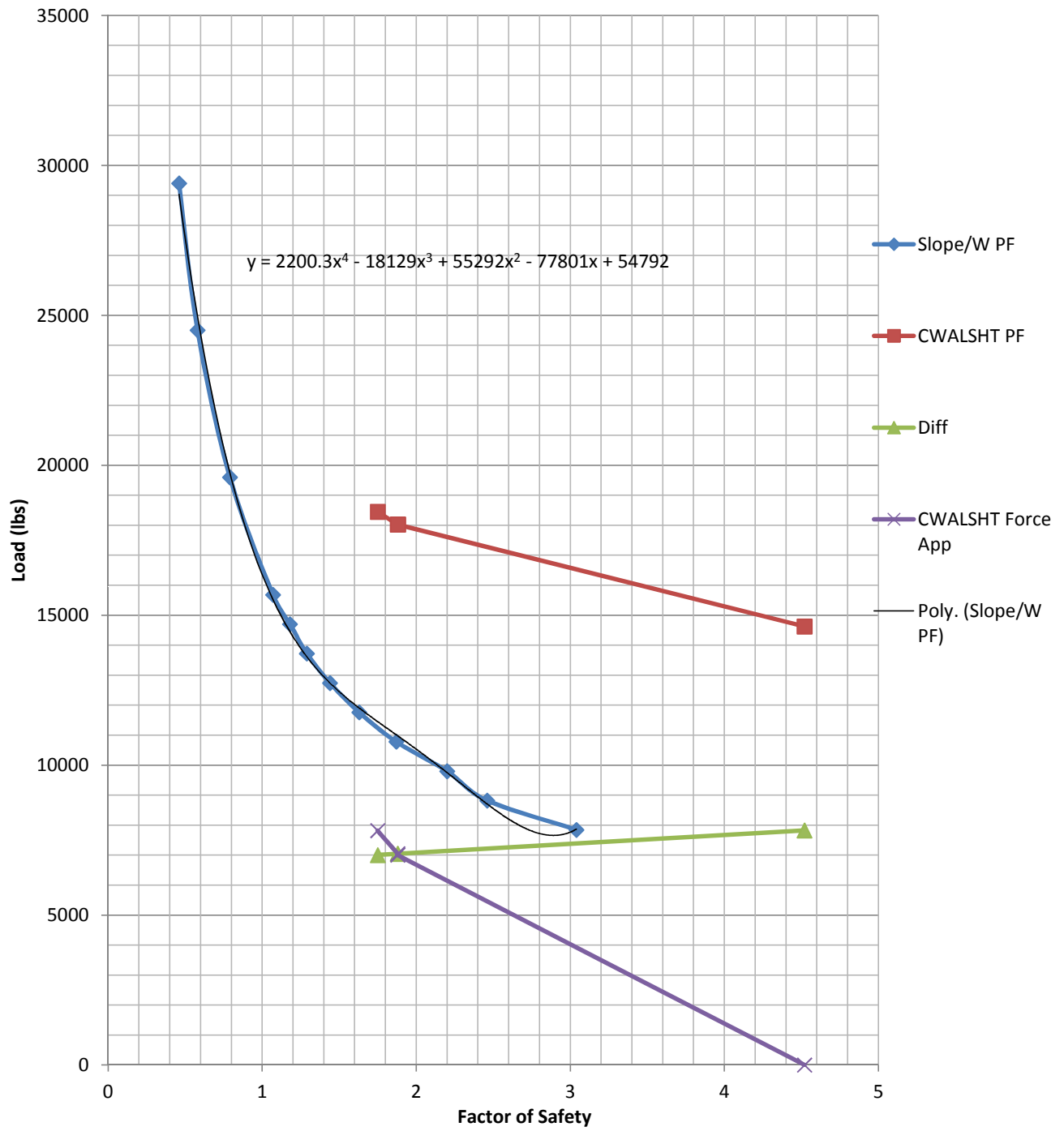
Left Side P	Water	Corr Leftside	Applied Load
		Passive	Area
			#
0		0	0
644.1		644.1	682.7
721.3		721.3	696.8
672.3		672.3	506.8
594.6		594.6	0.0
613.1		613.1	120.8
594.6		594.6	59.8
601.9		601.9	0.0
601.9		601.9	591.4
712.3		712.3	741.9
771.4		771.4	779.6
787.7		787.7	409.0
848.1		848.1	443.0
924		924	951.7
979.4		979.4	990.6
1001.7	0	1001.7	1042.8
1021.5	62.4	1083.9	1134.4
1060	124.8	1184.8	851.3
1151.7	167.232	1318.932	
		Total Passive Force	10002.3
		CWALSHT FoS	1.863
		Equation	
		Total Slope/W Passive Force	7029.0
		Difference	2973.3
		Distributed Height	11.68
		Distributed Load	254.6

Reach 28 ETL Surcharge Summary							
Iteration	Distributed Load In CWALSHT (psf)	Force Applied in CWALSHT (lbs/ft)*	CWALSHT Passive Force Calculated (lbs/ft)	SLOPE/W Passive Force Based On FoS (lbs/ft)	Difference in Forces (lbs/ft)	Distributed Load for Next Iteration (psf)	CWALSHT Factor of Safety (FoS)
1	0	0	14625	6800**	7825	498	4.52
2	498	7819	18450	11448	7002	446	1.75
3	446	7002	18022	10975	7047	449	1.88
4	449	7049	18022	10975	7047	449	1.88

*Distributed Height=15.7 ft

**Factor of Safety not on graph. Force estimated from graph.

Reach 28



I.--HEADING
'LONDON AVE REEVALUATION
'REACH 28 W LOAD
'1/9/12

HORIZONTAL DISTRIBUTED LOAD 449 PSF
FACTOR OF SAFETY FOR ACTIVE PRESSURE= 1.88
FACTOR OF SAFETY FOR PASSIVE PRESSURE= 1.88
PILE TIP -21.6

III.--WATEF AND SOIL PRESSURES

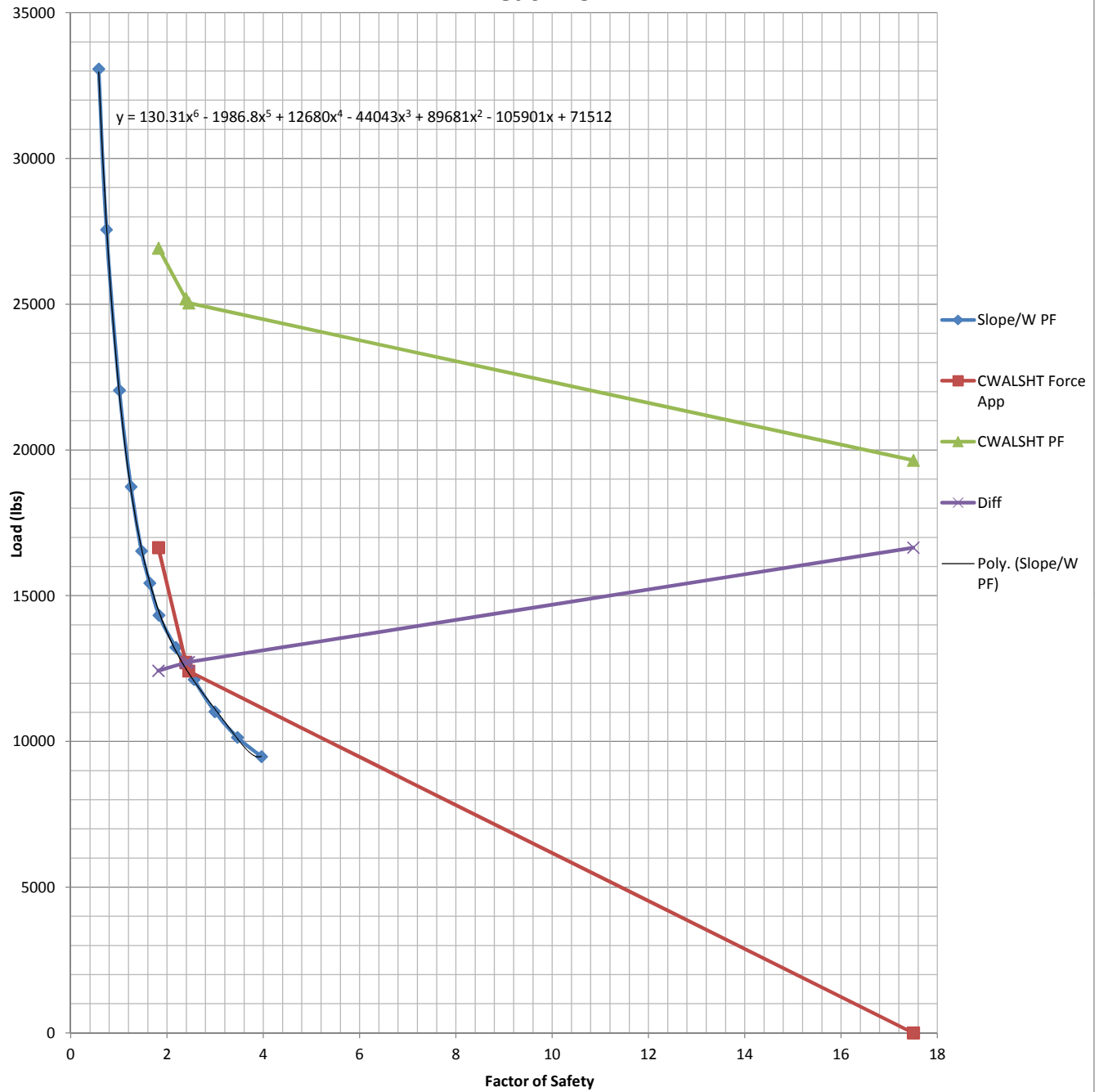
		<-----SOIL<----->				PRESSURES----->			
		<---LEFTSIDE--->		<---RIGHTSIDE--->					
ELEVATION	PRESSURE	PASSIVE	ACTIVE	ACTIVE	PASSIVE				
(FT)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)				
12.8	0	0	0	0	0				
11.8	0	0	0	0	0				
10.8	0	0	0	0	0				
9.8	0	0	0	0	0				
8.8	0	0	0	0	0				
8	0	0	0	0	0				
7.8	12	0	0	0	0				
6.8	75	0	0	0	0				
5.8	137	0	0	0	0				
4.8	200	0	0	0	0				
3.8	262	0	0	0	0			Left P.P.	Area
3.5	281	0	0	0	0			0	0
Ground Surface									
3.5	281	904	0	0	0			904	370.8
3.1	306	950	0	0	0			950	0
3.1	306	950	0	0	904			950	288.45
2.8	324	973	0	0	917			973	690.9
2.1	368	1001	0	0	899			1001	303.75
1.8	387	1024	0	0	887			1024	1077.5
0.8	449	1131	0	0	901			1131	937.6
0	499	1213	0	0	944			1213	244.6
-0.2	512	1233	0	0	945			1233	1281
-1.2	574	1329	0	0	829			1329	1382.5
-2.2	636	1436	0	0	570			1436	480.55
-2.55	658	1310	0	0	336			1310	0
-2.55	658	1310	0	0	406			1310	99.4
-2.63	663	1175	0	38	370			1175	0
-2.63	663	1241	0	38	370			1241	84.56
-2.7	668	1175	79	74	336			1175	526.25
-3.2	699	930	404	283	272			930	934
-4.2	761	938	554	389	296			938	933.5
-5.2	824	929	708	381	319	Water P.P.	Left P.P.	929	463.5
-5.7	855	925	774	383	331	0	925		473.05
-6.2	855	936	791	372	343	31.2	967.2		1010.4
-7.2	855	960	786	325	366	93.6	1053.6		870.448
-8	855	979	785	316	385	143.52	1122.52		226.452
-8.2	855	986	786	320	392	156	1142		1190.2
-9.2	855	1020	793	337	427	218.4	1238.4		1287.1
-10.2	855	1055	801	358	461	280.8	1335.8		1384.5
-11.2	855	1090	809	342	496	343.2	1433.2		1177.328
-12	855	1117	815	273	524	393.12	1510.12		303.872
-12.2	855	1123	815	264	529	405.6	1528.6		
Slip Surface									
-13.2	855	1149	817	245	556				
-14.2	855	1176	804	175	582				
-15	855	1203	699	164	604				
Total CWALSHT Passive Force						18022.21	Quartic		
CWALSHT FoS						1.88	a	b	c
Equation						2200.3	-18129	55292	-77801
Total Slope/W Passive Force						10975.02	d	e	54792
Difference						-7047.19			
Height						15.7			
Distribution						-448.866			

Reach 29 ETL Surcharge Summary							
Iteration	Distributed Load In CWALSHT (psf)	Force Applied in CWALSHT (lbs/ft)*	CWALSHT Passive Force Calculated (lbs/ft)	SLOPE/W Passive Force Based On FoS (lbs/ft)	Difference in Forces (lbs/ft)	Distributed Load for Next Iteration (psf)	CWALSHT Factor of Safety (FoS)
1	0	0	19650	3000**	16650	881	17.5
2	881	16651	26928	14502	12427	657	1.82
3	657	12417	25045	12324	12722	673	2.45
4	673	12720	25189	12482	12707	672	2.39
5	672	12701	25189	12482	12707	672	2.39

*Distributed Height=18.9 ft

**Factor of Safety not on graph. Force estimated from graph.

Reach 29



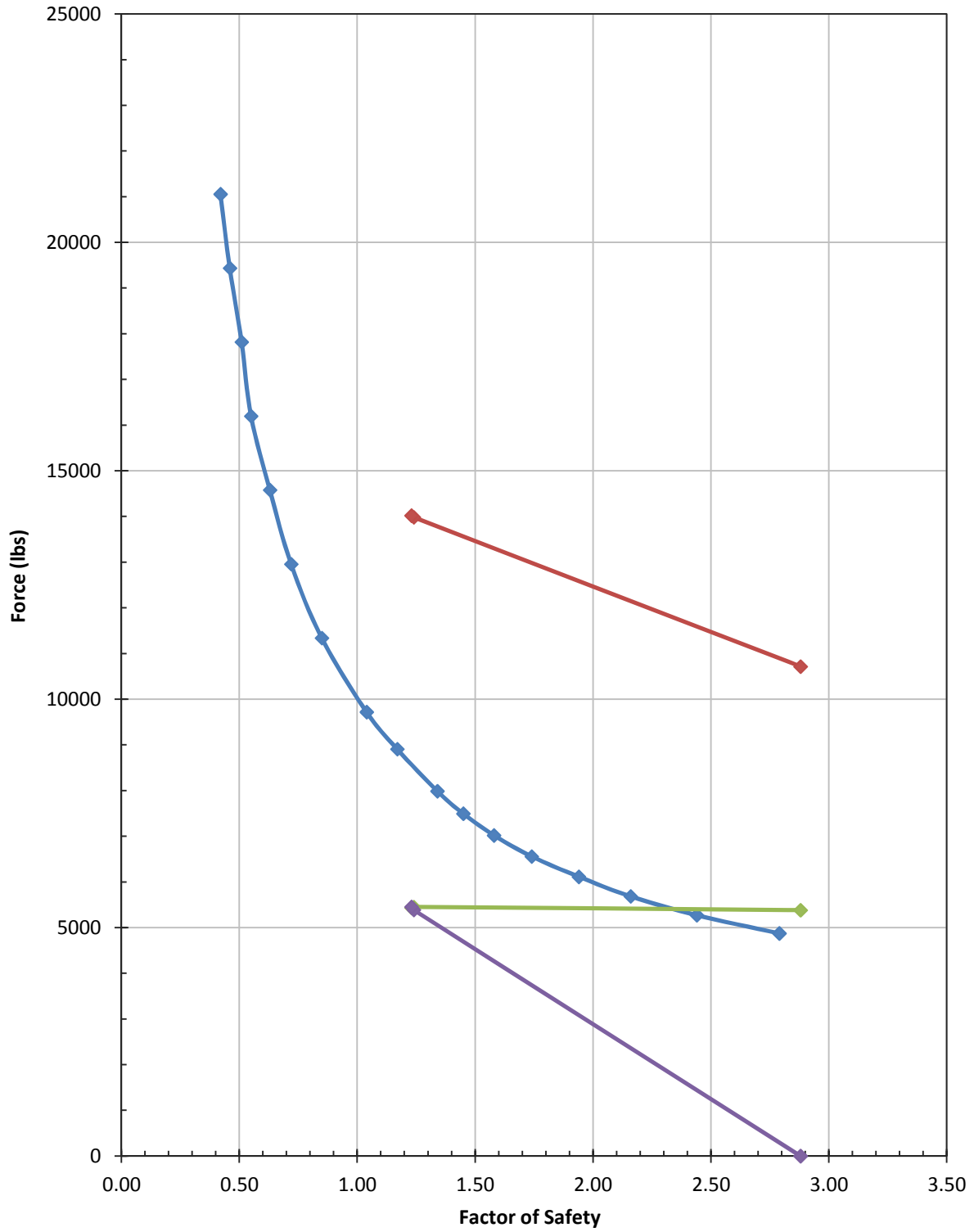
'LONDON AVE CANAL REEVALUATION
'REACH 29 W LOAD
'1/12/12

III.--WATER AND SOIL PRESSURES

	WATER		SOIL		PRESSURES						
	ELEVATION (FT)	PRESSURE (PSF)	←--LEFTSIDE--→		←--RIGHTSIDE--→						
			PASSIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)					
Ground Surface	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			Left P.P.	Area	
	5.8	137	0	0	0	0				0	0.00
Water Surface	5.8	137	711	0	0	0				711	678.60
	4.9	193	797	0	0	0				797	0.00
	4.9	193	797	0	0	711				797	852.50
	3.9	256	908	0	0	763				908	372.20
	3.5	281	953	0	0	784				953	591.90
	2.9	318	1020	0	0	817				1020	1076.00
	1.9	381	1132	0	0	852				1132	1187.50
	0.9	443	1243	0	0	826				1243	1163.70
	0	499	1343	0	0	779				1343	134.80
	-0.1	505	1353	0	0	779				1353	547.37
Slip Surface	-0.49	530	1454	0	0	793				1454	0.00
	-0.49	530	1393	0	0	793				1393	868.34
	-1.1	568	1454	61	0	814	Water Press	Left P.P.		1454	588.00
	-1.5	593	1486	94	0	827	0	1486			913.03
	-2.1	593	1520	122	0	836	37.44	1557.44			1222.32
	-2.9	593	1411	292	0	621	87.36	1498.36			0.00
	-2.9	593	1411	292	0	646	87.36	1498.36			145.25
	-3	593	1313	398	30	621	93.6	1406.6			136.02
	-3.1	593	1214	504	78	578	99.84	1313.84			1219.04
	-4.1	593	962	786	302	408	162.24	1124.24			1144.94
Water Surface	-5.1	593	941	839	317	439	224.64	1165.64			1211.84
	-6.1	593	971	839	336	470	287.04	1258.04			1304.74
	-7.1	593	1002	841	354	500	349.44	1351.44			1254.17
	-8	593	1030	844	371	528	405.6	1435.6			144.02
	-8.1	593	1033	845	373	531	411.84	1444.84			1493.54
	-9.1	593	1068	851	395	566	474.24	1542.24			1590.44
	-10.1	593	1102	857	417	600	536.64	1638.64			1687.34
	-11.1	593	1137	864	439	635	599.04	1736.04			1601.66
	-12	593	1168	869	459	666	655.2	1823.2			182.78
	-12.1	593	1171	869	461	669	661.44	1832.44			1877.14
Slip Surface	-13.1	593	1198	869	476	696	723.84	1921.84			
	-14.1	593	1226	870	492	724					
	-15.1	593	1254	863	505	752					
	-16	593	1278	756	487	776					
	-16.1	593	1284	736	483	782					
	-17.1	593	1429	661	483	858					
	-18.1	593	1477	682	512	924					
	-19.1	593	1526	702	541	971					
	-20.1	593	1576	722	579	1025					
	-21.1	593	1626	741	628	1093					
-22.1	593	1676	761	667	1162						
-23.1	593	1723	781	698	1232	Total CWALSH Passive Force		25189.17			
-24.1	593	1764	801	729	1301	CWALSH FoS		2.39		a	
-25.1	593	1821	821	761	1365	Equation		130.31		b	
-26.1	593	1880	841	792	1477	Total Slope/W Passive Force		-1986.8		c	
-27.1	593	1940	861	824	1648	Difference		12680		d	
-28.1	593	2000	882	855	1775	Height		-44043		e	
-29.1	593	2079	906	887	1849	Distribution		89681		f	
-30.1	593	2220	932	918	1923			-105901		g	
-31.1	593	2313	958	951	1997			71512			
-32.1	593	2388	984	975	2071						
-33.1	593	2466	1010	966	2145						
-34.1	593	2544	1036	945	2218						
-34.64	593	2586	1052	953	2258						
-35.1	593	2622	1065	960	2292						
-36.1	593	2700	1073	996	2366						
-37.1	593	2778	1050	1029	2440						
-38.1	593	2857	1045	1063	2515						
-39.1	593	2936	1078	1096	2596						
-40.1	593	3018	1120	1130	2692						
-41.1	593	3106	1161	1163	2792						
-42.1	593	3198	1202	1196	2881						
-43.1	593	3292	1243	1230	2963						
-43.37	593	3391	1284	1262	3051						
-45.1	593	3449	1332	1291	3103						

Reach 30 ETL Surcharge Summary							
Iteration	Distributed Load In CWALSHT (psf)	Force Applied in CWALSHT (lbs/ft)*	CWALSHT Passive Force Calculated (lbs/ft)	SLOPE/W Passive Force Based On FoS (lbs/ft)	Difference in Forces (lbs/ft)	Distributed Load for Next Iteration (psf)	CWALSHT Factor of Safety (FoS)
1	0	0	10715	5333	5382	408	2.88
2	408	5385.6	13981	8532	5450	413	1.24
3	413	5451.6	14020	8585	5435	412	1.23

London Ave Canal - Reach 30
FORCE PLOTS



◆ Slope/W PF ◆ CWALSHT PF ◆ PF Difference ◆ CWALSHT Applied Force

ITERATION **3**

APPLIED UNIFORM PSF: **413**

PILE TIP: **-20.56**

SWEEP SURFACE

NET ELEV. (FT)	WATER (PSF)	<---NET--->					
		<---LEFTSIDE--->		(SOIL+WATER)		<---RIGHTSIDE--->	
		PASSIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)
10	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0
7	62.4	0	0	62.4	62.4	0	0
6	124.8	0	0	124.8	124.8	0	0
5	187.2	0	0	187.2	187.2	0	0
4	249.6	0	0	249.6	249.6	0	0
3.4	287	0	0	287	287	0	0
3.4	287	0	0	287	1261.1	0	974
3.2	299.5	0	0	299.5	1284.1	0	984.5
3.2	299.5	974	0	-261.5	1697.1	0	984.5
3	312	997	0	-272	1714.9	0	989.9
2.2	361.9	1089	0	-314.1	1738.1	0	963.2
2	374.4	1112	0	-324.6	1748.5	0	961.1
1	436.8	1136	0	-286.2	1858.9	0	1009.1
0	499.2	1108.9	0	-196.7	1926.4	0	1014.2
-1	561.6	1111.9	0	-137.3	1949.8	0	975.2
-2	624	1133.9	0	-96.9	2005	0	968
-3	686.4	1184.3	0	-84.9	2092.7	0	993.3
-4	748.8	801.6	0	360.2	1827.9	0	666.1
-5	811.2	856	0	368.2	1579	0	354.8
-5.3	829.9	880	0	362.9	1603	0	360.1
-6	829.9	892.3	0	350.6	1615.4	0	372.4
-7	829.9	909.9	0	333	1633	0	390
-8	829.9	927.5	0	315.4	1674.4	0	431.4
-9	829.9	959.1	127	283.8	1672.9	0	557
-10	829.9	990.7	394.3	252.2	1369.1	0	520.4
-10	829.9	990.7	394.3	-160.8	956.1	0	520.4
-11	829.9	1022.3	535	-192.4	817.3	0	522.5
-12	829.9	1053.9	538.2	-224	832	0	540.3

WATER	PASSIVE	
PSF	PSF	LBS
	974	197.1
	997	834.4
	1089	220.1
	1112	1124
	1136	1122.45
	1108.9	1110.4
	1111.9	1122.9
	1133.9	1159.1
	1184.3	992.95
	801.6	828.8
	856	260.4
0	880	635.593
43.68	935.98	975.98
106.08	1015.98	1055.98
168.48	1095.98	1142.98
230.88	1189.98	1236.98
293.28	1283.98	

Left Side
Ground Surface Elevation

Left Side
Water Surface Elevation

Entry failure at this elevation
Location per Geostudio

File Name: R30_C413.dat

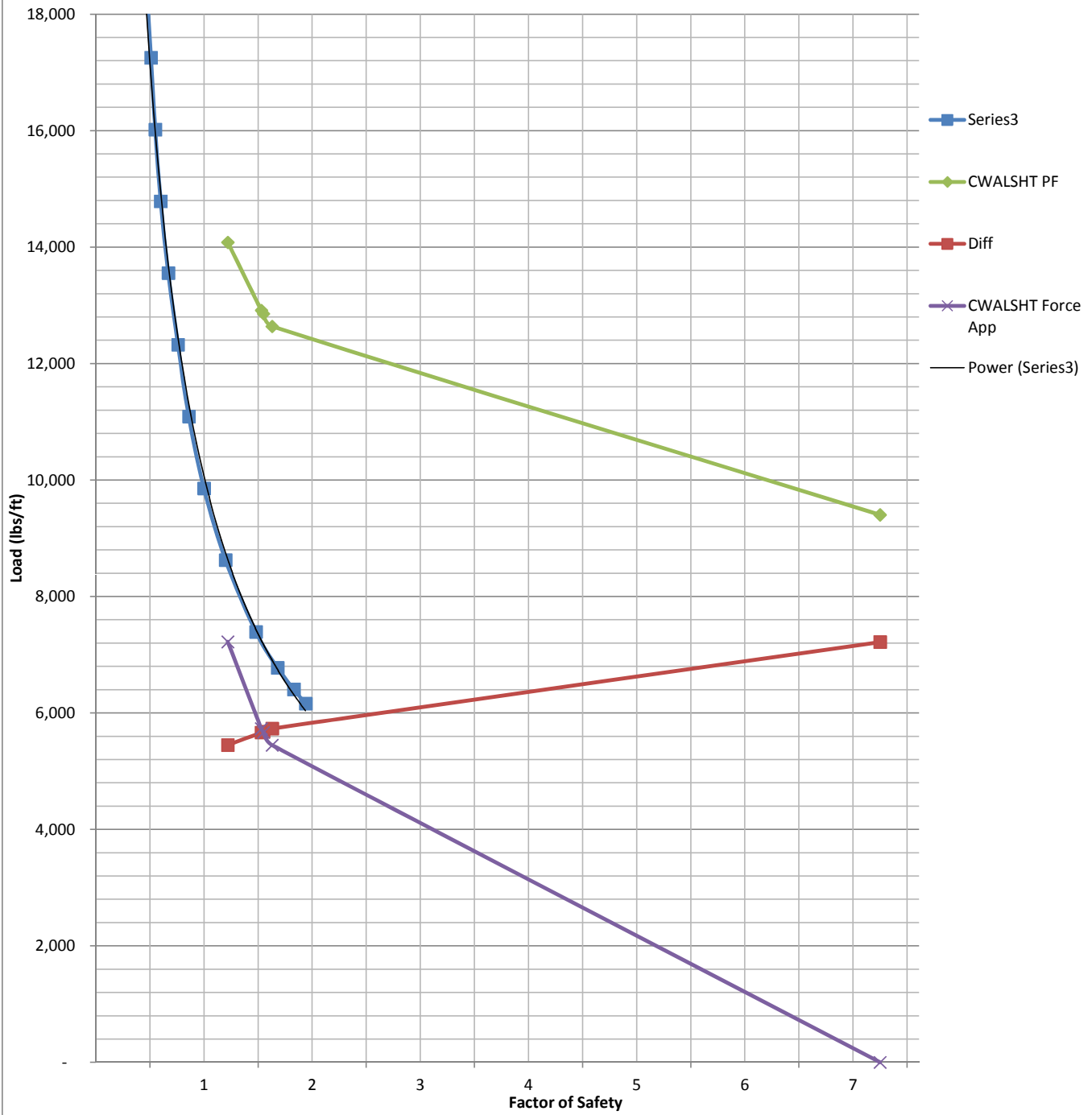
CWALSHT PASSIVE FORCE= 14020.11
 CWALSHT FS= **1.23**
 GEOSTUDIO PASSIVE FORCE= 8585.2
 PASSIVE FORCE DIFFERENCE= 5434.9
 SHEET PILE LENGTH= 13.2
 UNIFORM PRESSURE= **412**

Sextic						
a	b	c	d	e	f	g
2093.2	-22041	94023	-208714	257639	-174866	61875

Reach 30 (1% flowline) ETL Surcharge Summary						
Iteration	Distributed Load In CWALSHT (psf)	Force Applied in CWALSHT (lbs/ft)	CWALSHT Passive Force Calculated (lbs/ft)	Spencer's Passive Force Calculated (lbs/ft)	Difference in Forces (lbs/ft)	Factor of Safety
2	460	7222	14082	8633	5449	1.22
4	365	5730.5	12914	7250	5664	1.53
5	361	5667.7	12856	7178	5678	1.55
3	347	5447.9	12638	6904	5734	1.63
1	0	0	9403	2185	7218	7.25

Reach 30 (1% flowline)

$y = 10063x^{-0.771}$
 $R^2 = 0.9984$



Reach 30, Iteration 5

HORIZONTAL DISTRIBUTED LOAD 361 PSF
FACTOR OF SAFETY FOR ACTIVE PRESSURE: = 1.55
FACTOR OF SAFETY FOR PASSIVE PRESSURE: = 1.55
PILE TIP -16.9

III.--WATER AND SOIL PRESSURES

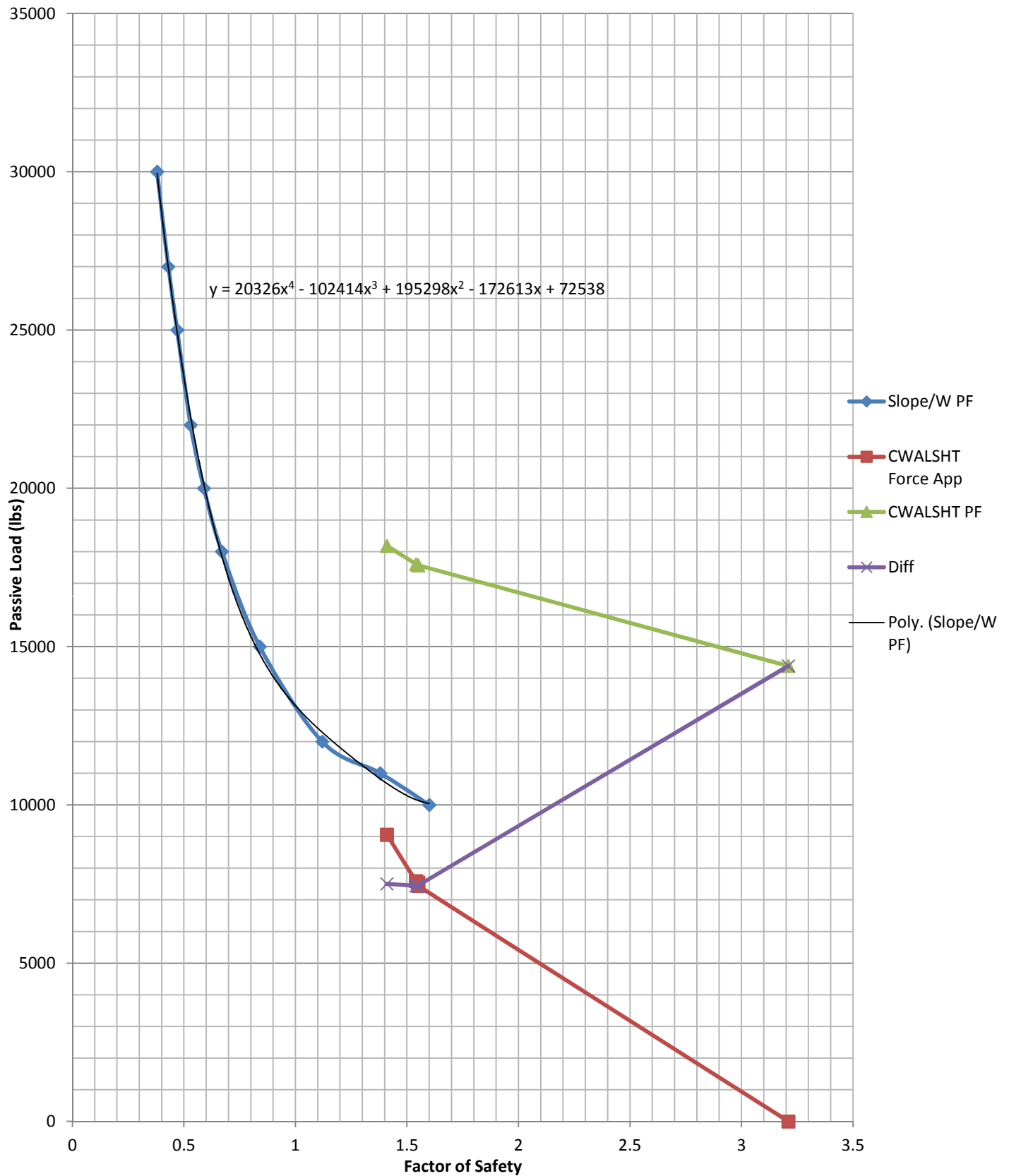
		<-----SOIL		PRESSURES----->						
	WATER	<----LEFTSIDE----->		<---RIGHTSIDE----->						
ELEVATION	PRESSURE	PASSIVE	ACTIVE	ACTIVE	PASSIVE					
(FT)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)					
10	0	0	0	0	0					
9	0	0	0	0	0					
8	0	0	0	0	0					
7	0	0	0	0	0					
6	0	0	0	0	0					
5.7	0	0	0	0	0					
5	44	0	0	0	0					
4	106	0	0	0	0					
3.4	144	0	0	0	0					
3.4	144	0	0	0	774					
3.2	156	0	0	0	785			Left P.P.	Area	
Ground Surface	3.2	156	774	0	0	785		774	157.1	
	3	168	797	0	0	791		797	674.4	
	2.2	218	889	0	0	778		889	180.1	
	2	231	912	0	0	779		912	932.5	
	1	293	953	0	0	827		953	950.5	
	0	356	948	0	0	839		948	953.5	
	-1	418	959	0	0	814		959	971	
	-2	480	983	0	0	813		983	1007.5	
	-3	543	1032	0	0	837		1032	904	
	-4	605	776	0	0	578		776	816	
	-5	668.*	856	0	0	355	Water Press	Left P.P.	856	260.4
Water Surface	-5.3	686.*	880	0	0	360	0	880	880	635.488
	-6	686	892	0	0	372	43.68	935.68		975.88
	-7	686	910	224	0	390	106.08	1016.08		1056.28
	-8	686	928	506	0	408	168.48	1096.48		1143.18
	-9	686	959	567	0	513	230.88	1189.88		1237.08
	-10	686	991	573	0	472	293.28	1284.28		
	-11	686	1022	580	0	502				
	-12	686	1054	589	0	534				
	-13	686	1086	597	0	566				
	-14	686	1117	609	0	597				
	-14.38	686	1216	561	9	663				
	-15	686	1379	483	24	771				
	-16	686	1953	361	165	1032				
	-16.93	686	1924	380	296	1117				
	-18	686	1906	399	325	1176				
	Total CWALSHT Passive Force							12,855		Exponential
CWALSHT FoS							1.55		significant exponent	
Equation									10063 -0.771	
Total Slope/W Passive Force							7,178			
Difference							5,677			
Distributed Height							15.7			
Distributed Load							362			

Reach 31 ETL 1110-2-575 Iterations Summary							
Iteration	Distributed Load In CWALSHT (psf)	Force Applied in CWALSHT (lbs/ft)*	CWALSHT Passive Force Calculated (lbs/ft)	SLOPE/W Passive Force Based On FoS (lbs/ft)	Difference in Forces (lbs/ft)	Distributed Load for Next Iteration (psf)	CWALSHT Factor of Safety (FoS)
1	0	0	14390	0**	14390	977	3.21
2	612	9058	18182	10676	7506	513	1.41
3	513	7592	17608	10163	7445	509	1.54
4	510	7548	17570	10136	7433	507	1.55
5	503	7444	17567	10112	7455	504	1.55

*Distributed Height = 14.8 ft.

**Factor of Safety not on graph. Force estimated from graph.

Reach 31



Trial 5-503

HORIZONTAL DISTRIBUTED LOAD
SHEET PILE TIP ELEVATION

503 PSF
-17.4

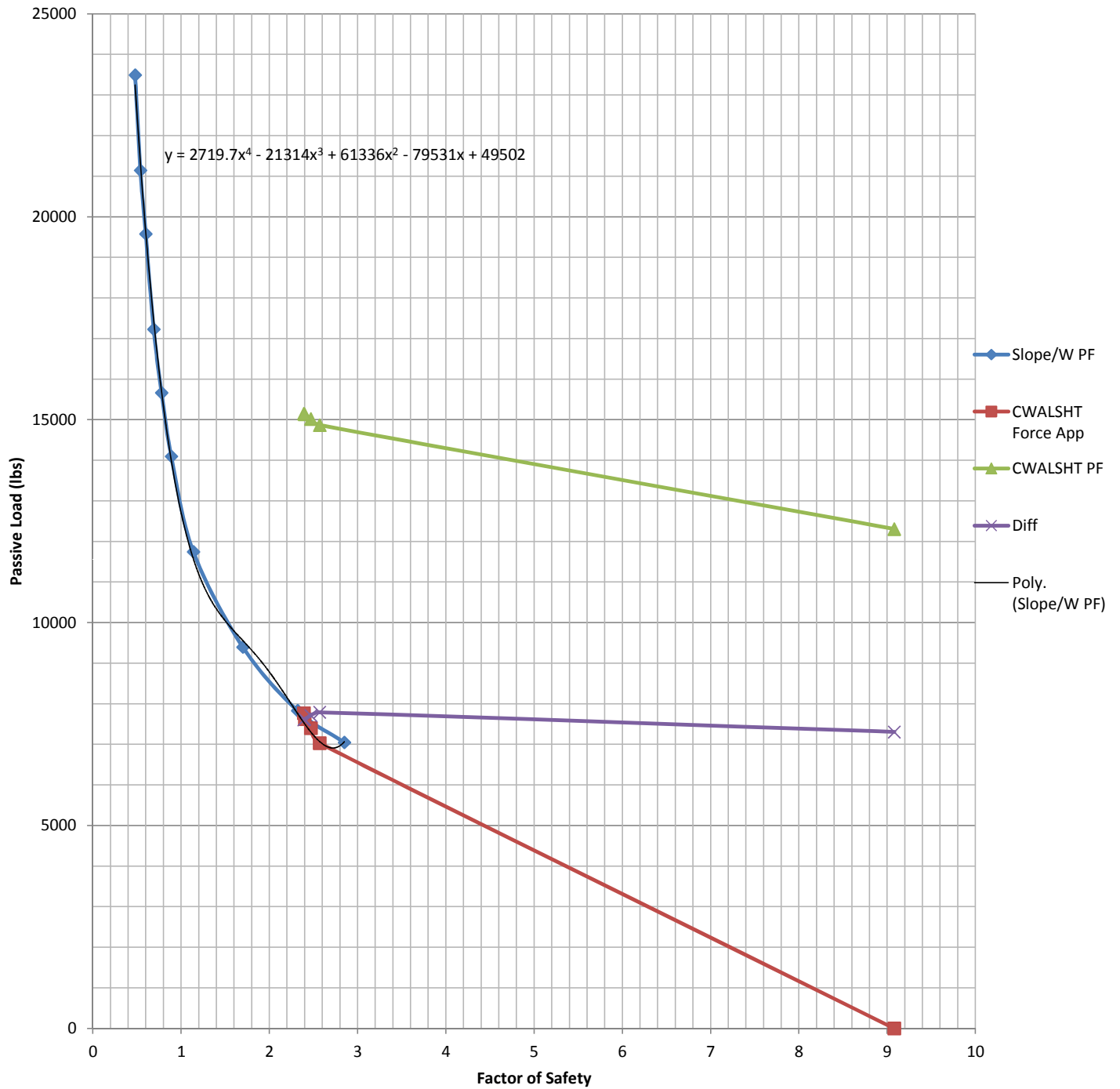
		<-----SOIL		PRESSURES----->										
	WATER	<----LEFTSIDE----->		<---RIGHTSIDE---->										
ELEVATION	PRESSURE	PASSIVE	ACTIVE	ACTIVE	PASSIVE									
(FT)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)									
12.9	0	0	0	0	0									
11.9	0	0	0	0	0									
10.9	0	0	0	0	0									
9.9	0	0	0	0	0									
8.9	0	0	0	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									
2.9	318	0	0	0	0				Leftside	Area				
Ground Surface	2.8	324	0	0	0				0	0				
	2.8	324	1154	0	0	1154			1161	1090.35				
	1.9	381	1255	0	0	1141			1262	126.75				
	1.8	387	1266	0	0	1146			1273	1192.05				
	0.9	443	1368	0	0	1190			1376	1427				
	-0.1	505	1471	0	0	1228			1478	1296.45				
	-1	562	1396	0	0	1058			1403	138.85				
	-1.1	568	1368	0	0	1012			1374	1273.5				
	-2.1	630	1168	0	0	720			1173	501.16				
	-2.54	631	1102	0	0	668			1105	0				
	-2.54	659	1139	0	0	668			1142	629.16				
	-3.1	693	1102	131	0	601			1105	331.04				
	-3.42	713	965	315	0	474			964	0				
	-3.42	713	965	315	0	498			964	74.8				
	-3.5	718	905	385	29	474			906	493.2				
	-4.1	755	738	677	224	308			738	784				
	-5.1	817	830	757	301	337			830	876				
	Water Surface	-6.1	880	922	818	312	367	water pres	Left P.P.	922	968			
		-7.1	942	1014	881	329	397	0	1014	1014	975.222			
		-8	998	1097	933	344	423	56.16	1153.16	1153.16	115.778			
		-8.1	998	1100	936	345	426	62.4	1162.4	1162.4	1208.6			
-9.1		998	1130	939	362	456	124.8	1254.8	1254.8	1166.292				
-10		998	1156	940	377	482	180.96	1336.96	1336.96	134.158				
-10.1		998	1159	940	378	485	187.2	1346.2	1346.2	1392.4				
-11.1		998	1189	934	394	515	249.6	1438.6	1438.6	1371.762				
-12		998	1304	773	391	542	305.76	1609.76	1609.76					
-12.1		998	1377	742	390	548								
-13.1		998	1750	614	396	607								
-14.1		998	1811	631	419	667								
						Total CWALSHT Passive Force		17566.52			Quartic			
						CWALSHT FoS		1.56		a	b	c	d	e
						Equation				20326	-102414	195298	-172613	72538
						Total Slope/W Passive Force		10111.67						
						Difference		-7454.85						
						Distributed Height		14.8						
						Distributed Load		-503.706						

Reach 31 1% Flowline ETL Surcharge Summary							
Iteration	Distributed Load In CWALSHT (psf)	Force Applied in CWALSHT (lbs/ft)*	CWALSHT Passive Force Calculated (lbs/ft)	SLOPE/W Passive Force Based On FoS (lbs/ft)	Difference in Forces (lbs/ft)	Distributed Load for Next Iteration (psf)	CWALSHT Factor of Safety (FoS)
1	0	0	12305	5000**	7305	494	9.08
2	475	7030	14867	7075	7792	527	2.57
3	500	7400	15019	7310	7709	521	2.47
4	525	7770	15150	7542	7608	514	2.39
5	515	7622	15133	7511	7622	515	2.4

*Distributed Height=14.8 ft

**Factor of safety not on graph. Force is estimated.

Reach 31 1% Flowline



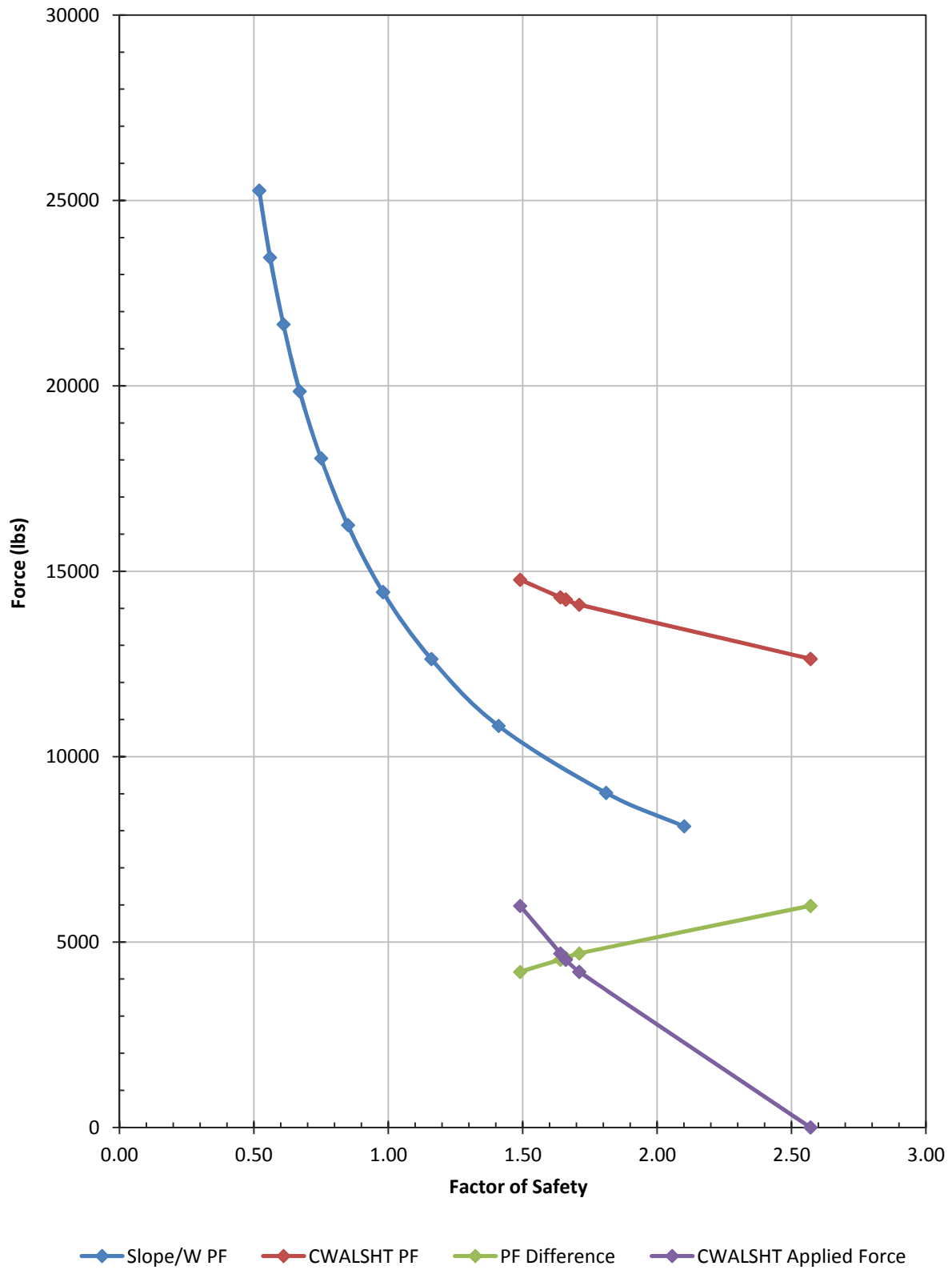
'LONDON AVENUE CANAL
'REACH 31

HORIZONTAL DISTRIBUTED LOAD 515 PSF
SHEET PILE TIP ELEVATION -17.4

			<-----SOIL		PRESSURES----->							
		WATER	<---LEFTSIDE--->		<---RIGHTSIDE--->							
	ELEVATION	PRESSURE	PASSIVE	ACTIVE	ACTIVE	PASSIVE						
(FT)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)						
	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						
	7.9	0	0	0	0	0						
	6.9	0	0	0	0	0						
	5.9	0	0	0	0	0						
	5.7	0	0	0	0	0						
	4.9	50	0	0	0	0						
	3.9	112	0	0	0	0						
Ground Surface	2.9	175	0	0	0	0				Leftside	Area	
	2.8	181	0	0	0	0				0	0	
	2.8	181	744	0	0	744				750	720.45	
	1.9	237	845	0	0	751				851	85.65	
	1.8	243	856	0	0	756				862	821.7	
	0.9	300	958	0	0	799				964	1017	
	-0.1	362	1063	0	0	841				1070	956.7	
	-1	418	1051	0	0	746				1056	104.9	
	-1.1	424	1037	0	0	717				1042	566.295	
	-1.67	460	941	0	0	617				945	0	
	-1.67	460	982	0	0	617				985	414.95	
	-2.1	487	941	126	0	540				945	860.2	
	-3.02	544	922	300	0	473				925	0	
	-3.02	544	922	300	0	479				925	73.68	
	-3.1	549	913	320	9	473				917	345	
	-3.5	574	806	483	108	394				808	463.8	
	-4.1	612	738	656	238	308				738	784	
	-5.1	674	830	756	293	337				830	876	
	-6.1	736	922	815	306	367				922	968	
	-7.1	799	1014	879	323	397	water pressure	Left P.P.		1014	949.95	
	Water Surface	-8	855	1097	930	338	423	0	1097		1097	110.162
		-8.1	855	1100	933	339	426	6.24	1106.24		1106.24	1152.44
	-9.1	855	1130	936	356	456	68.64	1198.64		1198.64	1115.748	
	-10	855	1156	937	371	482	124.8	1280.8		1280.8	128.542	
	-10.1	855	1159	937	372	485	131.04	1290.04		1290.04	1336.24	
	-11.1	855	1189	933	388	515	193.44	1382.44		1382.44	1281.618	
Slip Surface	-12	855	1216	814	391	542	249.6	1465.6		1465.6		
	-12.1	855	1221	792	390	548						
	-13.1	855	1407	706	407	607						
	-14.1	855	1453	726	437	667						
	-15.1	855	1515	745	466	726			Total CWALSHT Passive Force	15133.03		
	-16.1	855	1597	765	495	786			CWALSHT FoS	2.4	a	
	-17.1	855	1665	782	524	846			Equation		b	
	-18.1	855	1706	785	553	905			Total Slope/W Passive Force	7511.343	c	
	-19.1	855	1742	785	582	965			Difference	-7621.68	d	
	-20.1	855	1779	802	611	1103			Distributed Height	14.8	e	
	-21.1	855	1815	828	641	1200			Distributed Load	-514.979		
	-22.1	855	1849	854	673	1277						
	-23.1	855	1910	880	681	1363						
	-24.1	855	2005	906	660	1440						
	-25.1	855	2072	931	664	1510						
	-26.1	855	2118	957	696	1583						
	-27.1	855	2189	983	728	1656						
	-28.1	855	2271	1009	755	1732						
	-29.1	855	2346	1036	779	1810						
	-30.1	855	2417	1047	810	1888						
	-31.1	855	2489	1039	846	1966						
	-32.1	855	2562	1050	882	2044						
	-33.1	855	2639	1078	917	2122						
	-34.1	855	2721	1106	953	2199						
	-35.1	855	2804	1130	988	2286						
	-35.42	855	2831	1136	999	2319						
	-36.1	855	2888	1148	1023	2387						
	-37.1	855	2972	1172	1057	2482						
	-38.1	855	3055	1208	1091	2569						
	-39.1	855	3139	1246	1125	2658						
	-40.1	855	3223	1284	1159	2746						
	-41.1	855	3306	1322	1192	2835						
	-42.1	855	3391	1360	1226	2923						
	-43.1	855	3481	1398	1259	3012						
	-43.8	855	3578	1436	1293	3100						
	-45.1	855	3673	1473	1327	3192						

Reach 32 ETL Surcharge Summary							
Iteration	Distributed Load In CWALSHT (psf)	Force Applied in CWALSHT (lbs/ft)*	CWALSHT Passive Force Calculated (lbs/ft)	SLOPE/W Passive Force Based On FoS (lbs/ft)	Difference in Forces (lbs/ft)	Distributed Load for Next Iteration (psf)	CWALSHT Factor of Safety (FoS)
1	0	0	12637	6660	5977	433	2.57
2	433	5975.4	14770	10576	4194	304	1.49
3	304	4195.2	14097	9406	4692	340	1.71
4	340	4692	14295	9770	4525	328	1.64
5	328	4526.4	14238	9665	4573	331	1.66

London Ave Canal - Reach 32
FORCE PLOTS



ITERATION **5**

APPLIED UNIFORM PSF: **328**

PILE TIP: **-29.88**

FIXED SURFACE

NET ELEV. (FT)	WATER (PSF)	<---NET--->					
		<---LEFTSIDE--->		(SOIL+WATER)		<--RIGHTSIDE--->	
		PASSIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)
10	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0
7	62.5	0	0	62.5	62.5	0	0
6	125	0	0	125	125	0	0
5	187.5	0	0	187.5	187.5	0	0
4	250	0	0	250	250	0	0
3	312.5	0	0	312.5	312.5	0	0
2.9	318.8	0	0	318.8	318.8	0	0
2.9	318.8	0	0	318.8	1041.6	0	722.9
2.8	325	0	0	325	1011	0	686
2.8	325	722.9	0	-69.9	1339	0	686
2	375	781.2	0	-78.2	1426.3	0	723.3
1.8	387.5	802.8	0	-87.3	1448.1	0	732.6
1	437.5	888.9	0	-123.4	1535.4	0	769.9
0	500	995.4	0	-167.4	1642.8	0	814.8
-1	562.5	1099.6	0	-209.1	1746.7	0	856.2
-2	625	1148.3	0	-195.3	1853.4	0	900.4
-2.6	660.7	1061.6	0	-91.5	1876.5	0	887.8
-2.6	660.7	1098.8	0	-91.5	1876.5	0	887.8
-3	687.5	1061.6	110.9	-46.1	1782.8	0	878.3
-3.5	718.8	951.3	294.4	95.5	1526.1	0	773.7
-4	750	864.6	447.9	213.4	1297.6	0	667.4
-4.9	807.4	869.9	563.5	265.5	1211.4	0	638.4
-4.9	807.4	869.9	563.5	265.5	1211.4	0	640.8
-5	812.5	876.1	568.2	272.2	1210.7	7.7	638.4
-6	875	941.7	633.8	297.1	1244.7	35.9	675.5
-6.5	906.3	975.1	658.7	311.3	1267.4	52.2	691.9
-7	906.3	992.9	668.4	309.9	1274	68.5	708.2
-8	906.3	1028.4	672.1	307.1	1303	101.2	740.8
-9	906.3	1063.9	675.3	301.8	1334.9	131.4	775.9
-10	906.3	1099.4	678.6	315.8	1347.3	180.9	791.7
-11	906.3	1134.9	682.8	372.7	1310.6	273.3	759.2
-11	906.3	1134.9	682.8	44.7	982.6	273.3	759.2

WATER	PASSIVE	
PSF	PSF	LBS
	722.9	601.64
	781.2	158.4
	802.8	676.68
	888.9	942.15
	995.4	1047.5
	1099.6	1123.95
	1148.3	662.97
	1061.6	0
	1098.8	432.08
	1061.6	503.225
	951.3	453.975
	864.6	780.525
	869.9	0
	869.9	87.3
	876.1	908.9
	941.7	479.2
0	975.1	499.8
31.2	1024.1	1073.05
93.6	1122	1170.95
156	1219.9	1268.85
218.4	1317.8	1366.75
280.8	1415.7	

Left Side
Ground Surface Elevation

Left Side
Water Surface Elevation

Entry failure at this elevation
Location per Geostudio

File Name: R32_C328.dat

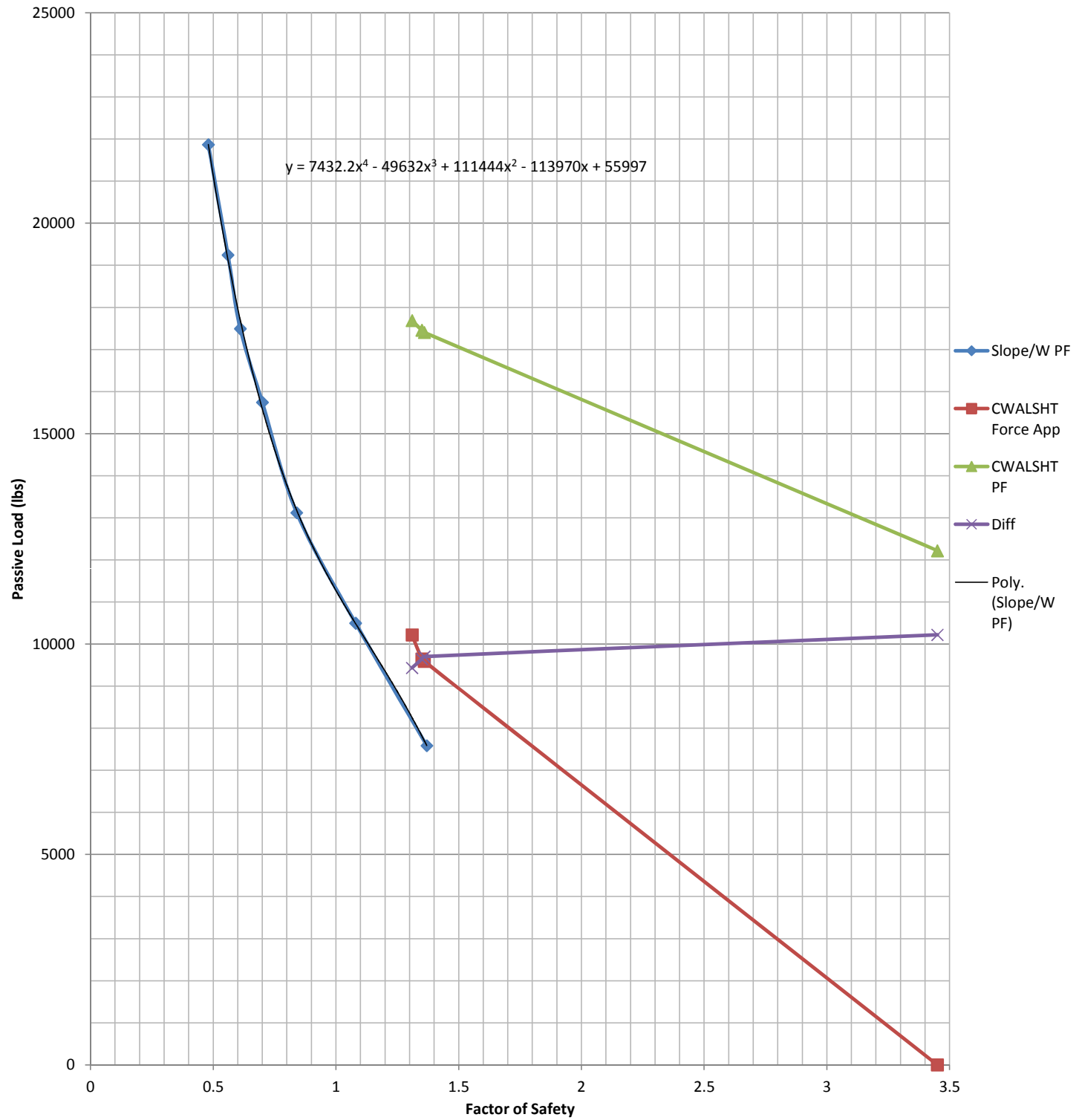
CWALSHT PASSIVE FORCE= 14237.9
 CWALSHT FS= **1.66**
 GEOSTUDIO PASSIVE FORCE= 9664.7
 PASSIVE FORCE DIFFERENCE= 4573.2
 SHEET PILE LENGTH= 13.8
 UNIFORM PRESSURE= **331**

Quartic				
a	b	c	d	e
7786	-48251	112619	-122716	64633

Reach 33 ETL Surcharge Summary							
Iteration	Distributed Load In CWALSHT (psf)	Force Applied in CWALSHT (lbs/ft)*	CWALSHT Passive Force Calculated (lbs/ft)	SLOPE/W Passive Force Based On FoS (lbs/ft)	Difference in Forces (lbs/ft)	Distributed Load for Next Iteration (psf)	CWALSHT Factor of Safety (FoS)
1	0	0	12219	2000**	10219	730	3.45
3	685	9590	17405	7703	9701	693	1.36
4	689	9646	17459	7817	9642	689	1.35
2	730	10220	17689	8256	9433	674	1.31

*Factor of Safety not on graph. Force estimated from graph.

Reach 33



'LONDON AVENUE CANAL
'REACH 33

HORIZONTAL DISTRIBUTED LOAD 689 PSF
SHEET PILE TIP ELEVATION -29.8

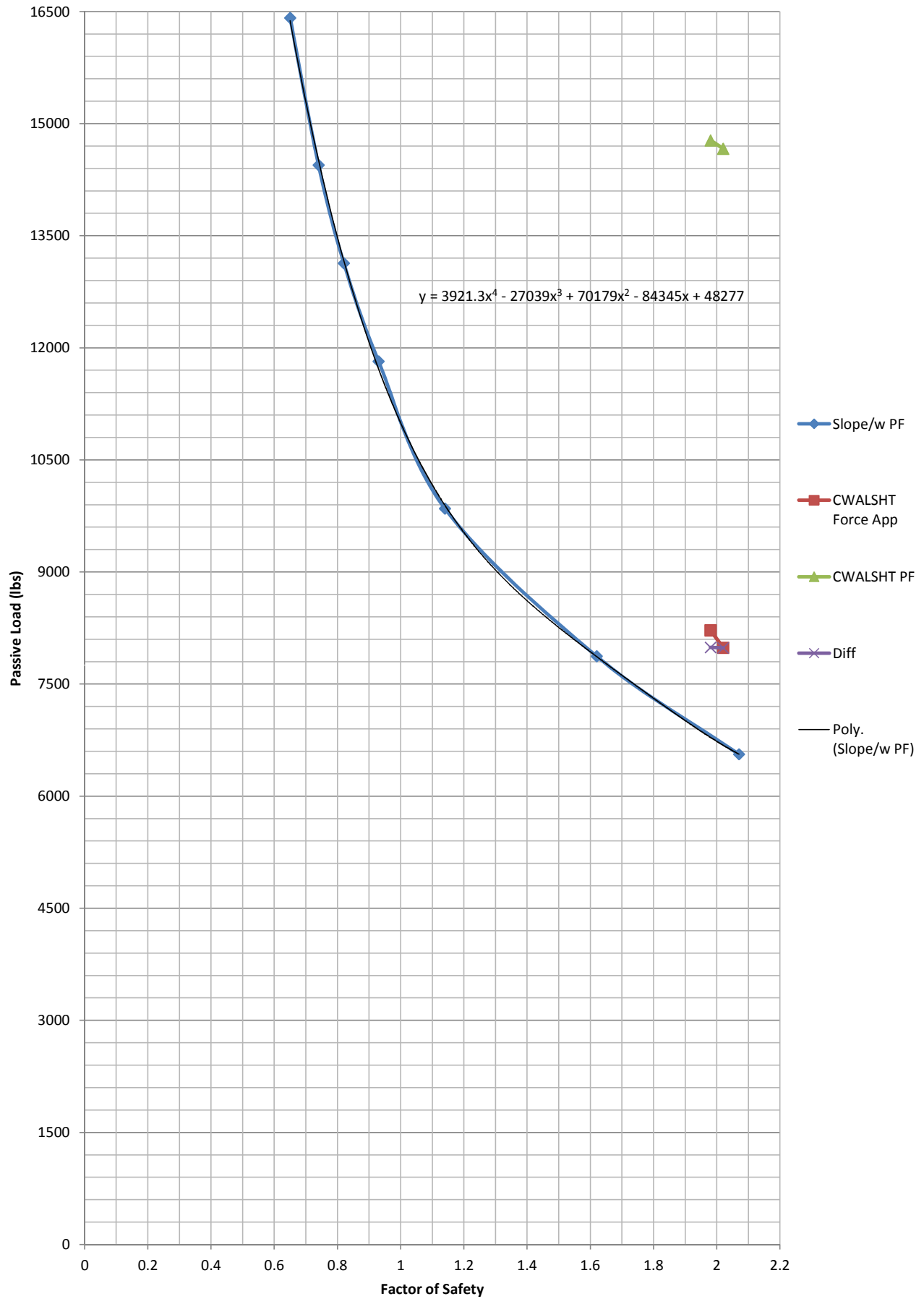
		<-----SOIL		PRESSURES----->					
		WATER <----LEFTSIDE----->		<---RIGHTSIDE--->					
ELEVATION	PRESSURE	PASSIVE	ACTIVE	ACTIVE	PASSIVE				
(FT)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)				
13.1	0	0	0	0	0				
12.1	0	0	0	0	0				
11.1	0	0	0	0	0				
10.1	0	0	0	0	0				
9.1	0	0	0	0	0				
8.1	0	0	0	0	0				
8	0	0	0	0	0				
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				
3.1	306	0	0	0	0			Leftside	Area
Ground Surface	3	312	0	0	0			0	0
	3	312	889	0	0	889		889	825.75
	2.1	368	946	0	0	905		946	94.65
	2	374	947	0	0	902		947	868.95
	1.1	431	984	0	0	908		984	1032
	0.1	493	1080	0	0	952		1080	108.45
	0	499	1089	0	0	956		1089	1017.45
	-0.9	555	1172	0	0	992		1172	1218
	-1.9	618	1264	0	0	1030		1264	1311
	-2.9	680	1358	0	0	1069		1358	1391.5
	-3.9	743	1425	0	0	1107		1425	934.05
	-4.55	783	1449	0	0	1132		1449	0
	-4.55	783	1441	0	0	1132		1441	505.75
	-4.9	805	1449	51	0	1146		1449	1471
	-5.9	867	1493	164	0	1188		1493	1407.5
Water Surface	-6.9	930	1322	484	0	984	water pressure	Left P.P.	1322 128.35
	-7	936	1245	571	0	934	0	1245	387.8477
	-7.33	936	1085	796	0	691	20.592	1105.592	0
	-7.33	936	1085	796	0	846	20.592	1105.592	646.8793
	-7.9	936	1108	852	198	691	56.16	1164.16	1216.36
	-8.9	936	1150	860	250	713	118.56	1268.56	1320.76
	-9.9	936	1192	852	265	773	180.96	1372.96	137.808
	-10	936	1196	849	265	782	187.2	1383.2	1286.802
	-10.9	936	1233	835	274	840	243.36	1476.36	148.148
Slip Surface	-11	936	1237	836	277	844	249.6	1486.6	
	-11.9	936	1275	848	312	878			
	-12.9	936	1316	863	349	912			
	-13.9	936	1581	723	360	1175			
	-14	936	1687	691	357	1231			
	-14.9	936	2268	528	350	1595			
	-15.9	936	2354	534	373	1659			
	-16.9	936	2406	551	398	1615	Total CWALSHT Passive Force		17459.01
	-17.9	936	2460	568	419	1655	CWALSHT FoS		1.35
	-18.9	936	2503	584	472	1718	Equation		7432.2 -49632 111444 -113970 55997
	-19.9	936	2534	600	560	1699	Total Slope/W Passive Force		7816.96
	-20.9	936	2561	617	613	1715	Difference		-9642.05
	-21.9	936	2589	633	631	1796	Distributed Height		14
	-22.9	936	2615	649	651	1885	Distributed Load		-688.72
	-23.72	936	2654	663	668	1956			
	-23.9	936	2662	666	672	1972			
	-24.9	936	2810	685	691	2059			
	-25.9	936	3020	704	722	2138			
	-26.9	936	3154	724	783	2272			
	-27.9	936	3233	744	842	2510			
	-28.9	936	3319	764	870	2714			
	-29.82	936	3404	784	887	2815			
	-30.9	936	3495	804	905	2884			

Reach 33 1% Flowline ETL Surcharge Summary							
Iteration	Distributed Load In CWALSHT (psf)	Force Applied in CWALSHT (lbs/ft)*	CWALSHT Passive Force Calculated (lbs/ft)	SLOPE/W Passive Force Based On FoS (lbs/ft)	Difference in Forces (lbs/ft)	Distributed Load for Next Iteration (psf)	CWALSHT Factor of Safety (FoS)
1	0	0	11034	2000**	9034	659	8.79
2	600	8220	14776	6785	7991	583	1.98
3	583	7987	14664	6680	7984	583	2.02

*Distributed Height=13.7 ft

**Factor of Safety not on graph. Force estimated from graph.

Reach 33 1%



Trial 3-583

I.--HEADING
'LONDON AVE REMEDIATION
'REACH 33 1% W LOAD
02/15/13

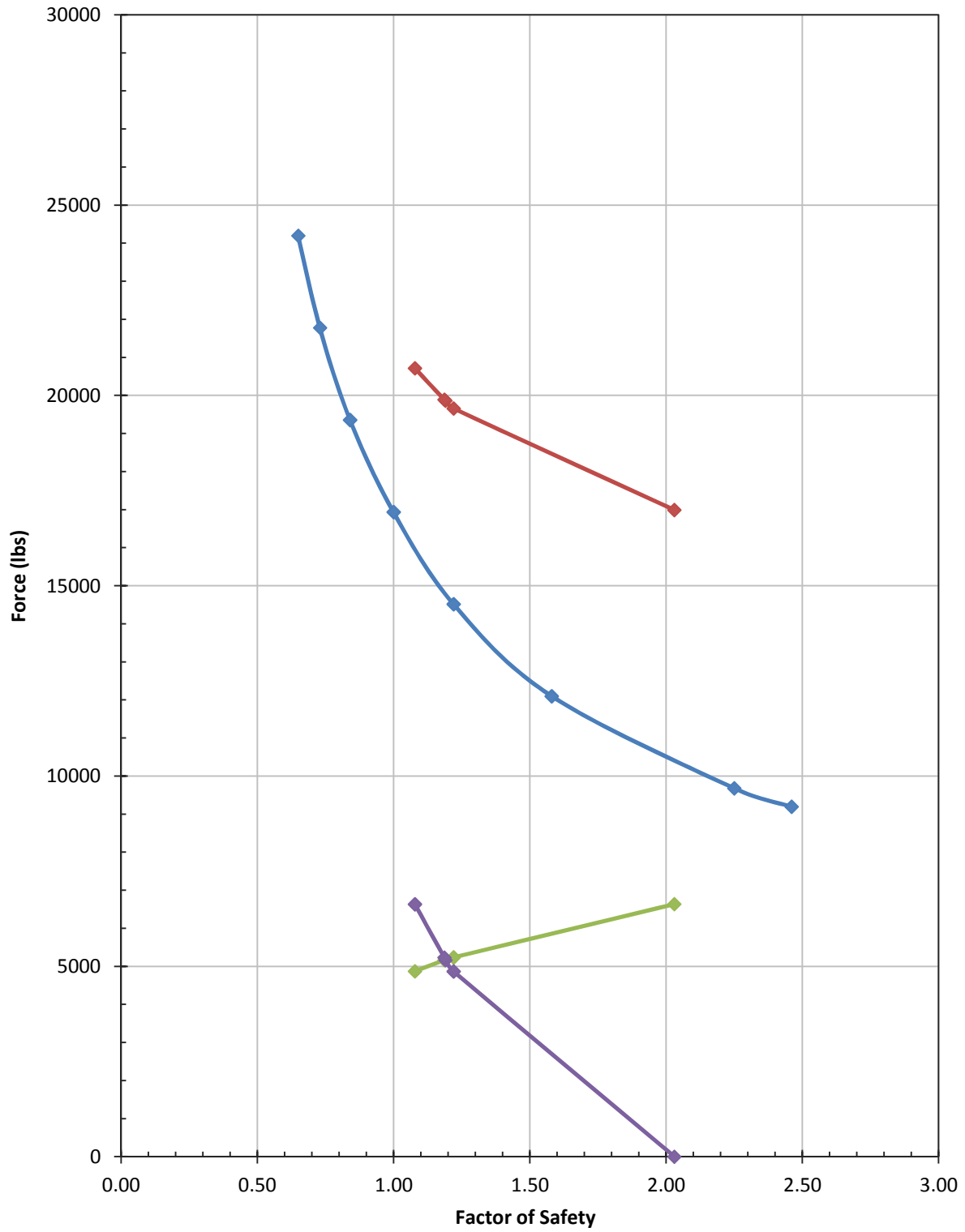
HORIZONTAL DISTRIBUTED LOAD 583 PSF
FACTOR OF SAFETY FOR ACTIVE PRESSURE= 2.02
FACTOR OF SAFETY FOR PASSIVE PRESSURE= 2.02
PILE TIP ELEVATION -29.8
III.--WATER AND SOIL PRESSURES

		<-----SOIL		PRESSURES----->			
		<----LEFTSIDE----->		<---RIGHTSIDE----->			
ELEVATION	PRESSURE	PASSIVE	ACTIVE	ACTIVE	PASSIVE		
(FT)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)		
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		
7.1	0	0	0	0	0		
6.1	0	0	0	0	0		
5.5	0	0	0	0	0		
5.1	25	0	0	0	0		
4.1	87	0	0	0	0		
3.1	150	0	0	0	0		
Ground Surface	3	156	0	0	0	Leftside	Area
	3	156	594	0	594	0	0
	2.1	212	666	0	619	594	567
	2	218	669	0	619	666	66.75
	1.1	275	724	0	637	669	626.85
	0.1	337	821	0	681	724	772.5
	0	343	830	0	686	821	82.55
	-0.9	399	913	0	721	830	784.35
	-1.9	462	1005	0	760	913	959
	-2.34	489	1098	0	777	1005	462.66
	-2.34	489	1046	0	777	1098	0
	-2.9	524	1098	50	798	1046	600.32
	-3.62	569	1152	127	826	1098	810
	-3.9	587	1173	157	837	1152	325.5
	-4.9	649	1217	283	875	1173	1195
	-5.9	711	1270	387	916	1217	1243.5
	-6.8	767	1343	450	792	1270	1175.85
	-6.8	767	1343	450	805	1343	0
	-6.9	774	1289	519	792	1343	131.6
Water Surface	-7	780	1208	608	61	1289	124.85
	-7.9	780	1108	866	280	1208	1067.472
	-8.9	780	1150	886	327	56.16	1164.16
	-9.9	780	1192	884	349	1164.16	1216.36
	-10	780	1196	881	350	118.56	1268.56
	-10.7	780	1225	875	360	1268.56	1320.76
Slip Surface	-10.9	780	1233	877	368	180.96	1372.96
	-11.9	780	1275	890	405	1372.96	137.808
	-12.9	780	1316	904	443	187.2	1383.2
	-13.9	780	1358	794	449	1383.2	993.678
	-14	780	1404	768	445	230.88	1455.88
	-14.9	780	1746	642	438	1455.88	
	-15.9	780	1812	654	468		
	-16.9	780	1857	676	498		
	-17.9	780	1905	696	544		
	-18.9	780	1951	717	615		
	-19.9	780	1990	737	676		
	-20.9	780	2025	758	709		
	-21.9	780	2060	778	735		
	-22.9	780	2094	800	761		
	-23.9	780	2129	822	788		
	-24.85	780	2158	845	834		
	-24.9	780	2160	846	836		
	-25.9	780	2228	870	900		
	-26.9	780	2365	894	940		
	-27.9	780	2496	918	962		
	-28.9	780	2582	942	985		
	-29.85	780	2659	966	1009		
	-30.9	780	2736	990	1032		
	-31.9	780	2814	1013	1056		

Total CWALSHT Passive Force		14664.36		Quartic				
	CWALSHT FoS	2.02	a	b	c	d	e	
	Equation		3921.3	-27039	70179	-84345	48277	
Total Slope/W Passive Force		6680.35						
	Difference	-7984.01						
	Height	13.7						
	Distribution	-582.77						

Reach 34 ETL Surcharge Summary							
Iteration	Distributed Load In CWALSHT (psf)	Force Applied in CWALSHT (lbs/ft)*	CWALSHT Passive Force Calculated (lbs/ft)	SLOPE/W Passive Force Based On FoS (lbs/ft)	Difference in Forces (lbs/ft)	Distributed Load for Next Iteration (psf)	CWALSHT Factor of Safety (FoS)
1	0	0	16991	10355	6636	402	2.03
2	402	6633	20712	15840	4873	295	1.078
3	295	4867.5	19660	14425	5235	317	1.22
4	317	5230.5	19888	14725	5163	313	1.186
5	313	5164.5	19861	14689	5173	313	1.19

London Ave Canal - Reach 34
FORCE PLOTS



◆ Slope/W PF ◆ CWALSHT PF ◆ PF Difference ◆ CWALSHT Applied Force

ITERATION	5
-----------	---

APPLIED UNIFORM PSF:	313
----------------------	-----

PILE TIP:	-21.49
-----------	--------

FIXED SURFACE

NET ELEV. (FT)	WATER (PSF)	<---NET--->					
		<---LEFTSIDE--->		(SOIL+WATER)		<---RIGHTSIDE--->	
		PASSIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)
10	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0
7	62.5	0	0	62.5	62.5	0	0
6	125	0	0	125	125	0	0
5	187.5	0	0	187.5	187.5	0	0
4	250	0	0	250	250	0	0
3	312.5	0	0	312.5	312.5	0	0
2.7	331.3	0	0	331.3	331.3	0	0
2.7	331.3	0	0	331.3	1339.7	0	1008.4
2.5	343.8	0	0	343.8	1313.6	0	969.8
2.5	343.8	1008.4	0	-351.7	1626.6	0	969.8
2	375	1064.4	0	-376.4	1681.4	0	993.4
1.5	406.3	1127.5	0	-408.3	1736.3	0	1017
1	437.5	1156.8	0	-406.3	1791.1	0	1040.6
0	500	1117.8	0	-304.8	1904.7	0	1091.7
-1	562.5	1119.5	0	-244	1943.2	0	1067.7
-2	625	1192.1	0	-254.1	1905.2	0	967.2
-3	687.5	1180.8	0	-180.3	1846.9	0	846.4
-3.5	717.6	1039.4	0	-11.4	1726.5	0	695.9
-3.5	717.6	1044.6	0	-11.4	1726.5	0	695.9
-3.5	718.8	1039.4	7.8	-7.7	1714.2	0	690.2
-4	750	883.8	238.1	179.2	1355.1	0	530.2
-4.6	786.4	866.2	343.9	233.2	1237.7	0	469.4
-4.6	786.4	866.2	343.9	233.2	1237.7	0	494.8
-5	812.5	904.2	369.2	267.9	1225.8	46.6	469.4
-6	875	979.9	444.9	273.8	1244.3	65.7	501.2
-7	937.5	1055.7	520.7	286	1256.4	91.2	526.6
-7.8	987.5	1109.5	574.5	302.6	1273	111.5	547
-8	987.5	1117	582	300	1270.5	116.6	552.1
-9	987.5	1132.1	597.1	310.6	1280.7	142.2	577.2
-10	987.5	1148.5	610.6	323.5	1289.8	171.5	599.9
-11	987.5	1188	625.7	317	1296.9	204.5	622.1
-12	987.5	1227.5	645.8	307.7	1299.2	234.7	644.5
-13	987.5	1302.5	635.8	266.9	1367.1	268.8	702.4
-14	987.5	1811.5	553.4	-195.8	1607.1	315.2	859.9
-14	987.5	1811.5	553.4	-508.8	1294.1	315.2	859.9

WATER	PASSIVE	
PSF	PSF	LBS
	1008.4	518.2
	1064.4	547.975
	1127.5	571.075
	1156.8	1137.3
	1117.8	1118.65
	1119.5	1155.8
	1192.1	1186.45
	1180.8	555.05
	1039.4	0
	1044.6	0
	1039.4	480.8
	883.8	525
	866.2	0
	866.2	354.08
	904.2	942.05
	979.9	1017.8
	1055.7	866.08
0	1109.5	223.898
12.48	1129.48	1168.23
74.88	1206.98	1246.38
137.28	1285.78	1336.73
199.68	1387.68	1438.63
262.08	1489.58	1558.28
324.48	1626.98	1912.68
386.88	2198.38	

Quartic				
a	b	c	d	e
3103.3	-23446	67092	-90065	60144

CWALSHT PASSIVE FORCE= 19861.14
CWALSHT FS= 1.19
GEOSTUDIO PASSIVE FORCE= 14688.6
PASSIVE FORCE DIFFERENCE= 5172.6
SHEET PILE LENGTH= 16.5
UNIFORM PRESSURE= 313

Left Side
Ground Surface Elevation

Left Side
Water Surface Elevation

Entry failure at this elevation
Location per Geostudio

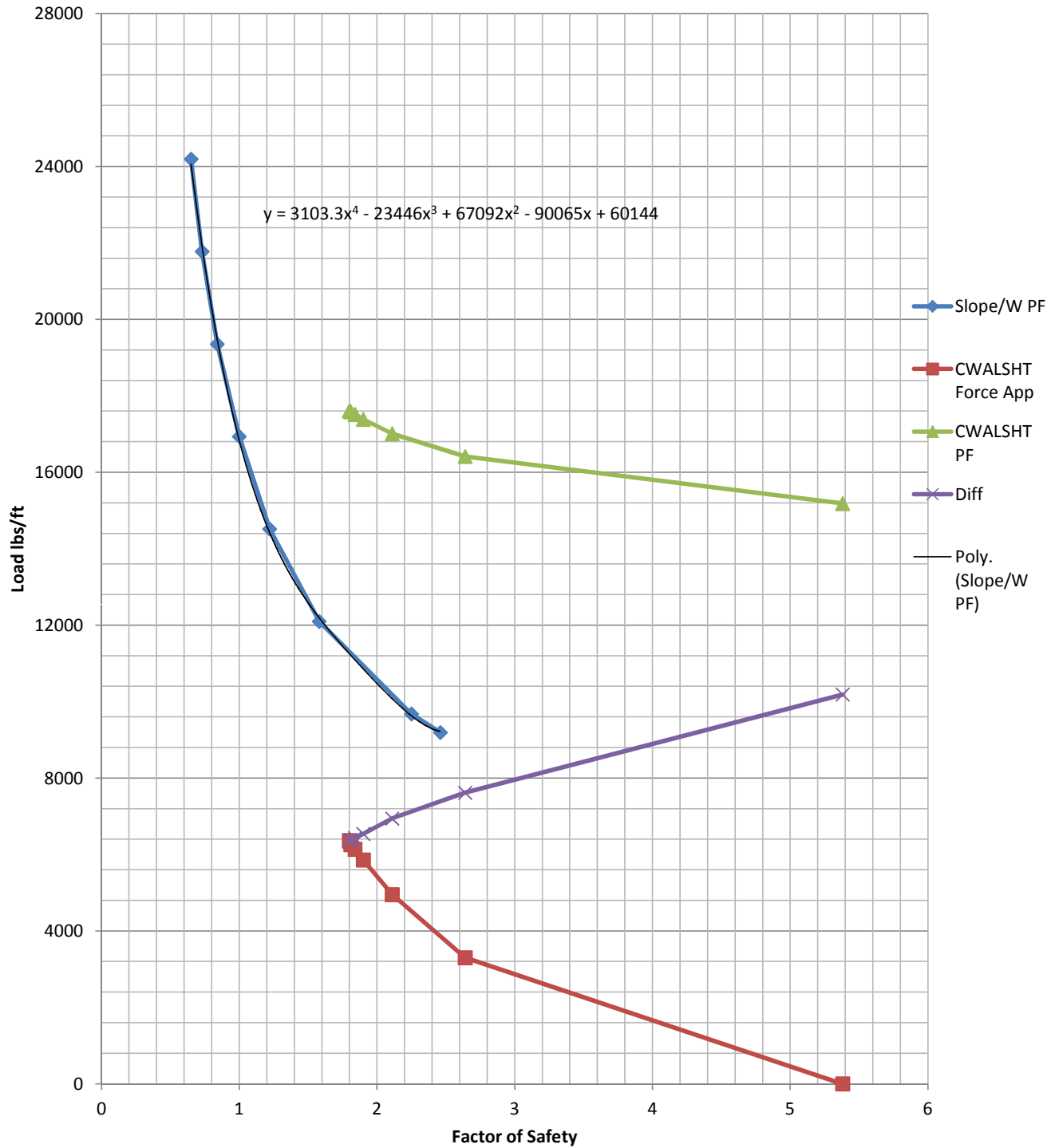
File Name: R34_C313.dat

Reach 34 1% Flowline ETL Surcharge Summary							
Iteration	Distributed Load In CWALSHT (psf)	Force Applied in CWALSHT (lbs/ft)*	CWALSHT Passive Force Calculated (lbs/ft)	SLOPE/W Passive Force Based On FoS (lbs/ft)	Difference in Forces (lbs/ft)	Distributed Load for Next Iteration (psf)	CWALSHT Factor of Safety (FoS)
1	0		15184	5000**	10184	617	5.38
2	200		16415	8800**	7615	462	2.64
3	300		17011	10068	6943	421	2.11
4	355		17387	10849	6538	396	1.9
5	372		17515	11085	6430	390	1.84
6	381		17585	11205	6380	387	1.81
7	385		17608	11245	6363	386	1.8
8	386		17608	11245	6363	386	1.8

*Distributed Height=16.5 ft

**Factor of Safety not on graph. Force estimated from graph.

Reach 34 1% Flowline



HORIZONTAL DISTRIBUTED LOAD

386 PSF

SHEET PILE TIP ELEVATION

-21.5

FACTOR OF SAFETY FOR ACTIVE PRESSURES = 1.8

FACTOR OF SAFETY FOR PASSIVE PRESSURES = 1.8

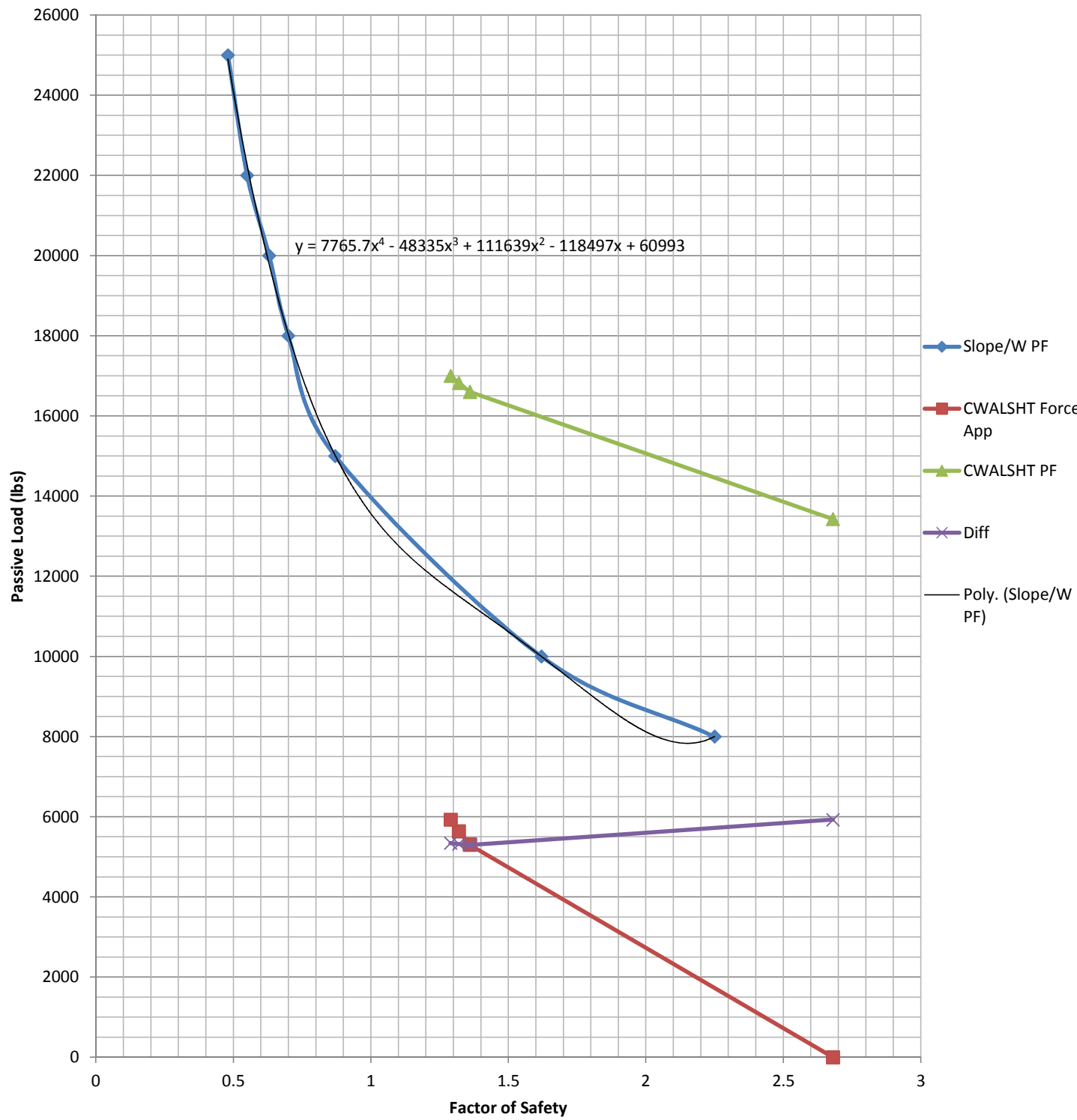
	NET	LEFTSIDE		RIGHTSIDE							
ELEV.	WATER	PASSIVE	ACTIVE	ACTIVE	PASSIVE						
(FT)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)						
12.9	0	0	0	0	0						
11.9	0	0	0	0	0						
10.9	0	0	0	0	0						
9.9	0	0	0	0	0						
8.9	0	0	0	0	0						
7.9	0	0	0	0	0						
6.9	0	0	0	0	0						
5.9	0	0	0	0	0						
5.5	0	0	0	0	0						
4.9	38	0	0	0	0						
3.9	100	0	0	0	0						
2.9	163	0	0	0	0						
2.7	175	0	0	0	0						
2.7	175	0	0	0	667	Water	Total Pressure	Passive Force			
2.5	188	0	0	0	644	(PSF)	(PSF)				
Ground Surface	2.5	188	0	0	644		0	0			
	2.5	188	667	0	644		667	420.3			
	1.9	225	734	0	673		734	303.4			
	1.5	250	783	0	691		783	483			
	0.9	288	827	0	720		827	733.95			
	0	344	804	0	762		804	80.35			
	-0.1	350	803	0	766		803	832			
	-1.1	413	861	0	755		861	899			
	-2.1	475	937	0	701		937	660.1			
	-2.8	519	949	0	642		949	-2651.6			
Water Surface		519	945	0	642		945	2935.7			
	-3.1	538	949	40	617		949	361.8			
	-3.5	563	860	187	530		860	305.52			
	-3.88	586	748	355	417		748	0			
	-3.88	586	748	355	459		748	163.24			
	-4.1	600	736	401	53		736	778.5			
	-5.1	663	821	467	120		821	859			
	-6.1	725	897	543	430		897	943.5			
	-7.1	788	990	619	455		990	718.2			
	-7.8	831	1062	664	473	0	1062	323.058			
Slip Surface	-8.1	831	1073	675	193	18.72	1091.72	1142.92			
	-9.1	831	1113	689	219	81.12	1194.12	1244.82			
	-10.1	831	1152	703	247	143.52	1295.52	1346.72			
	-11.1	831	1192	718	278	205.92	1397.92	1448.62			
	-12.1	831	1231	735	308	268.32	1499.32	1550.52			
	-13.1	831	1271	746	338	330.72	1601.72	1539.72			
	-14	831	1433	656	369	386.88	1819.88	185.4			
	-14.1	831	1495	637	373	393.12	1888.12				
	-15.1	831	1819	564	405						
	-16.1	831	1872	585	431						
	-17.1	831	1919	606	457						
	-18.1	831	1964	629	484						
	-19.1	831	2008	653	511						
	-20.1	831	2051	678	538						
	-21.1	831	2105	702	567						
	-22.1	831	2190	726	596						
	-23.1	831	2284	751	626						
	-23.71	831	2320	765	640	1689	Total CWALSHT Passive Force	17608	Quartic		
	-24.1	831	2344	775	649	1720	CWALSHT FoS	1.80	a	b	c
	-25.1	831	2393	799	651	1800	Equation		3103.3	-23446	67092
	-26.1	831	2476	824	648	1879	Total Slope/W Passive Force	11245 lb			
	-27.1	831	2583	848	667	1959	Difference	-6363 ft			
	-28.1	831	2675	872	696	2038	Distributed Height	16.5 lb/ft			
	-29.1	831	2755	879	724	2116	Distributed Load	-386			
	-29.18	831	2835	873	751	2194					
	-31.1	831	2915	884	779	2278					

Reach 35A ETL Surcharge Summary							
Iteration	Distributed Load In CWALSHT (psf)	Force Applied in CWALSHT (lbs/ft)*	CWALSHT Passive Force Calculated (lbs/ft)	SLOPE/W Passive Force Based On FoS (lbs/ft)	Difference in Forces (lbs/ft)	Distributed Load for Next Iteration (psf)	CWALSHT Factor of Safety (FoS)
1	0	0	13427	7500**	5927	406	2.68
2	406	5928	16999	11655	5344	366	1.29
3	386	5636	16824	11504	5320	364	1.32
4	364	5314	16601	11307	5295	363	1.36
5	363	5300	16601	11307	5295	363	1.36

*Distributed Height=14.6 ft

**Factor of Safety not on graph. Passive force estimated from graph.

Reach 35A



Trial 5-363

'LONDON AVENUE CANAL
'REACH 35A
2/15/2013

HORIZONTAL DISTRIBUTED LOAD 363 PSF
FACTOR OF SAFETY FOR ACTIVE PRESSURE 1.36
FACTOR OF SAFETY FOR PASSIVE PRESSURE 1.36
SHEET PILE TIP ELEVATION -21.5

	WATER	<-----SOIL		PRESSURES----->					
		<---LEFTSIDE--->		<---RIGHTSIDE--->					
	ELEVATION	PRESSURE	PASSIVE	ACTIVE	ACTIVE	PASSIVE			
(FT)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)			
13	0	0	0	0	0	0			
12	0	0	0	0	0	0			
11	0	0	0	0	0	0			
10	0	0	0	0	0	0			
9	0	0	0	0	0	0			
8	0	0	0	0	0	0			
7	62	0	0	0	0	0			
6	125	0	0	0	0	0			
5	187	0	0	0	0	0			
4	250	0	0	0	0	0			
3	312	0	0	0	0	0			
Ground Surface	2.6	337	0	0	0	0		Leftside	Area
	2.6	337	662	0	0	0		0	0
	2	374	725	0	0	0		662	416.1
	1.9	381	731	0	0	0		725	72.8
	1.9	381	731	0	0	662		731	0
	1	437	765	0	0	640		731	673.2
	0.9	443	773	0	0	629		765	76.9
	0.1	493	856	0	0	589		773	651.6
	0	499	866	0	0	584		856	86.1
	-1	562	966	0	0	616		866	916
	-2	624	1065	0	0	652		966	1015.5
	-3	686	1164	0	0	688		1065	1114.5
	-3.35	708	1265	0	0	700		1164	425.075
	-3.35	708	1200	0	0	700		1265	0
	-4	749	1265	56	0	723		1200	801.125
	-5	811	1298	187	0	714		1265	1281.5
	-6	874	1207	418	0	624		1298	1252.5
	-7	936	1109	642	0	533		1207	1158
	-7.03	938	1110	645	0	522		1109	33.285
	-7.03	938	1110	645	0	533		1110	0
Water Surface	-8	998	1178	692	38	522	water pressure	1178	1109.68
	-8.2	1011	1186	699	40	526	corrected left side pressure	1186	236.4
	-9	1011	1192	705	51	537	0	1186	971.168
	-10	1011	1176	707	63	550	49.92	1241.92	1265.12
	-11	1011	1275	680	91	571	112.32	1288.32	1369.02
Slip Surface	-12	1011	1665	587	158	633	174.72	1449.72	1675.92
	-13	1011	2087	501	230	734	237.12	1902.12	
	-14	1011	2250	491	266	835			
	-15	1011	2297	511	287	926			
	-16	1011	2358	527	310	1017			
	-16.27	1011	2373	531	316	1042			
	-17	1011	2412	543	333	1109			
	-18	1011	2452	559	357	1201			
	-19	1011	2486	575	380	1291			
	-20	1011	2520	591	403	1383			
	-21	1011	2553	607	427	1482			
	-21.59	1011	2587	623	450	1586			
	-23	1011	2619	640	473	1687			

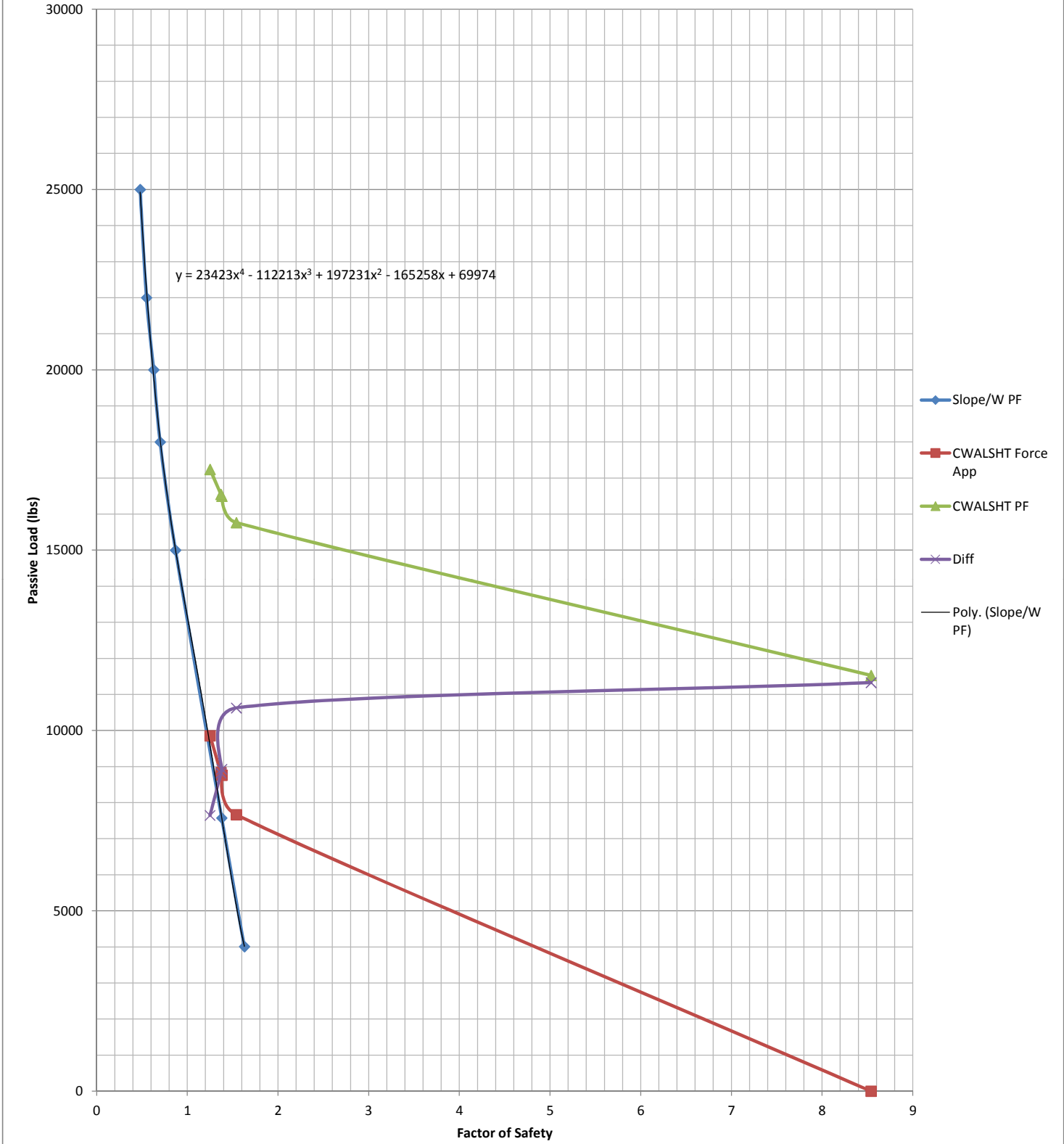
Total CWALSHT Passive Force		Quartic				
	CWALSHT FoS	1.36	a	b	c	d
	Equation		7765.7	-48335	111639	-118497
Total Slope/W Passive Force		11306.62				60993
	Difference	-5294.87				
	Distributed Height	14.6				
	Distributed Load	-362.66				

Reach 35 1% Flowline ETL Surcharge Summary							
Iteration	Distributed Load In CWALSHT (psf)	Force Applied in CWALSHT (lbs/ft)*	CWALSHT Passive Force Calculated (lbs/ft)	SLOPE/W Passive Force Based On FoS (lbs/ft)	Difference in Forces (lbs/ft)	Distributed Load for Next Iteration (psf)	CWALSHT Factor of Safety (FoS)
1	0	0	11527	200**	11327	776	8.54
2	675	9855	17240	9594	7646	524	1.25
3	525	7665	15765	5141	10625	727	1.54
4	600	8760	16495	7570	8925	611	1.38
5	605	8833	16546	7728	8818	604	1.37

*Distributed Height=14.6 ft

**Factor of Safety not on graph. Force estimated from graph.

Reach 35A 1% Flowline



Trial 5-605

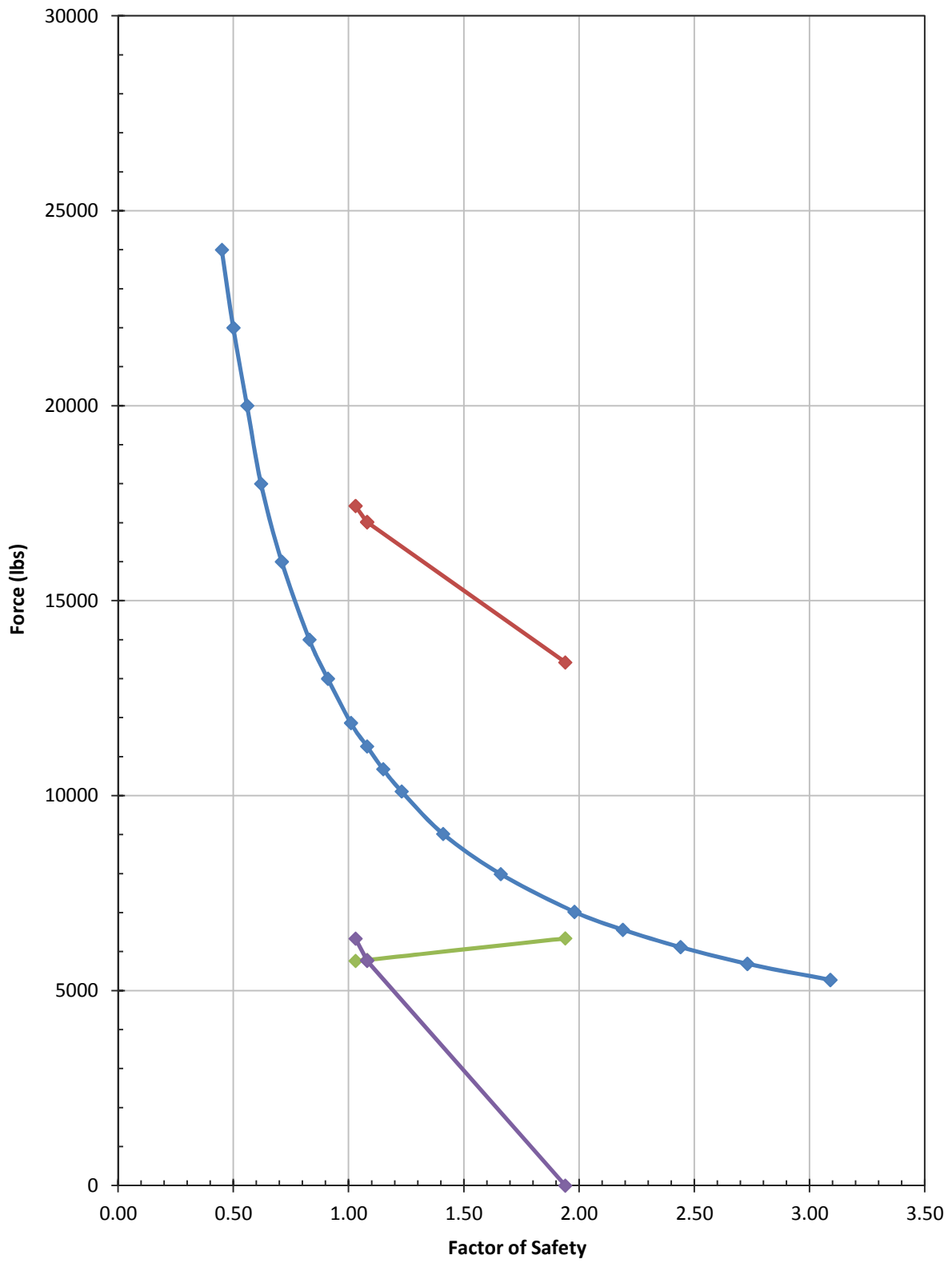
'LONDON AVENUE CANAL
'REACH 35A 1% Flowline
2/15/2013

HORIZONTAL DISTRIBUTED LOAD 605 PSF
SHEET PILE TIP ELEVATION -21.5

		<-----SOIL			PRESSURES----->									
	WATER	<---LEFTSIDE----->		<---RIGHTSIDE----->										
ELEVATION	PRESSURE	PASSIVE	ACTIVE	ACTIVE	PASSIVE									
(FT)	(PSF)	(PSF)	(PSF)	(PSF)	(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	0	0	0	0	0									
6	0	0	0	0	0									
5.4	0	0	0	0	0									
5	25	0	0	0	0									
4	87	0	0	0	0									
3	150	0	0	0	0									
Ground Surface	2.6	175	0	0	0				Leftside	Area				
									0	0				
	2.6	175	657	0	0				657	413.1				
	2	212	720	0	0				720	72.35				
	1.9	218	727	0	0				727	0				
	1.9	218	727	0	0	657			727	669.15				
	1	275	760	0	0	636			760	76.4				
	0.9	281	768	0	0	625			768	733.5				
	0	337	862	0	0	580			862	911.5				
	-1	399	961	0	0	612			961	1011				
-2	462	1061	0	0	649			1061	181.73					
-2.17	472	1077	0	0	655			1077	928.355					
-3	524	1160	0	0	685			1160	363					
-3.3	543	1260	0	0	695			1260	0					
-3.3	543	1190	0	0	695			1190	857.5					
-4	587	1260	61	0	719			1260	1277					
-5	649	1294	190	0	711			1294	1249					
-6	711	1204	421	0	621			1204	1143.45					
-6.99	773	1106	645	0	531			1106	0					
-6.99	773	1106	645	0	532			1106	11.06					
-7	774	1106	645	1	531			1106	1141.5					
Water Surface	-8	836	1177	693	40	520	water pressure	corrected left side pressure	1177	236.1				
	-8.2	849	1184	701	41	524	0	1184	1184	969.568				
Slip Surface	-9	849	1190	707	53	535	49.92	1239.92	1239.92	1263.12				
	-10	849	1174	709	65	548	112.32	1286.32	1286.32	1366.52				
	-11	849	1272	682	92	569	174.72	1446.72	1446.72	1670.92				
	-12	849	1658	589	160	630	237.12	1895.12	1895.12					
	-13	849	2076	504	230	731								
	-14	849	2238	493	266	831								
	-15	849	2285	513	288	921								
	-15.65	849	2324	523	303	981								
	-16	849	2345	529	311	1012								
	-17	849	2399	545	335	1104								
	-18	849	2440	561	358	1195								
	-19	849	2473	578	381	1285								
	-20	849	2507	594	405	1376								
	-21	849	2541	610	428	1475								
	-21.52	849	2575	626	452	1579								
	-23	849	2608	643	475	1679								
										Total CWALSHT Passive Force				
										16545.82				
										Quartic				
										CWALSHT FoS				
										1.37				
										Equation				
										23423 -112213 197231 -165258 69974				
										Total Slope/W Passive Force				
										7727.63				
										Difference				
										-8818.2				
										Distributed Height				
										14.6				
										Distributed Load				
										-603.99				

Reach 35B ETL Surcharge Summary							
Iteration	Distributed Load In CWALSHT (psf)	Force Applied in CWALSHT (lbs/ft)*	CWALSHT Passive Force Calculated (lbs/ft)	SLOPE/W Passive Force Based On FoS (lbs/ft)	Difference in Forces (lbs/ft)	Distributed Load for Next Iteration (psf)	CWALSHT Factor of Safety (FoS)
1	0	0	13417	7079	6338	446	1.94
2	446	6333.2	17431	11668	5763	406	1.03
3	406	5765.2	17016	11235	5781	407	1.08
4	407	5779.4	17016	11235	5781	407	1.08

London Ave Canal - Reach 35B
FORCE PLOTS



◆ Slope/W PF ◆ CWALSHT PF ◆ PF Difference ◆ CWALSHT Applied Force

ITERATION	4
-----------	---

APPLIED UNIFORM PSF:	407
----------------------	-----

PILE TIP:	-21.56
-----------	--------

FIXED SURFACE

<---NET--->

NET ELEV. (FT)	WATER (PSF)	<---LEFTSIDE--->		(SOIL+WATER)		<---RIGHTSIDE--->	
		PASSIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)
10	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0
7	62.5	0	0	62.5	62.5	0	0
6	125	0	0	125	125	0	0
5	187.5	0	0	187.5	187.5	0	0
4	250	0	0	250	250	0	0
3	312.5	0	0	312.5	312.5	0	0
2.4	350	0	0	350	350	0	0
2.4	350	0	0	350	1183.3	0	833.3
2.2	362.5	0	0	362.5	1165.6	0	803.1
2.2	362.5	833.3	0	-63.8	1572.6	0	803.1
2	375	761.6	0	20.4	1594.1	0	812.1
1.2	425	840	0	-8	1680.3	0	848.3
1	437.5	859.5	0	-15	1701.9	0	857.4
0	500	957.5	0	-50.5	1809.6	0	902.6
-1	562.5	1055.4	0	-85.9	1917.4	0	947.9
-2	625	1153.5	0	-121.5	2025.3	0	993.3
-3	687.5	1252.8	0	-158.3	2132.9	0	1038.4
-4	750	1340.8	0	-183.8	2240.1	0	1083.1
-4.9	804.7	1340.3	0	-128.7	2289.1	0	1077.4
-4.9	804.7	1340.4	0	-128.7	2289.1	0	1077.4
-5	812.5	1340.3	19.6	-120.8	2276.5	0	1076.6
-6	875	1222.1	268.5	59.9	1984	0	970.4
-7	937.5	1130.4	481.7	214.1	1716.2	0	853.4
-7.8	987.1	1153.7	554.5	240.4	1578.7	0	725.9
-7.8	987.1	1153.7	554.5	240.4	1578.7	0	752.3
-8	1000	1168.5	564.9	273.5	1568.1	35	725.9
-8.8	1050	1210.2	606.6	458.9	1420.7	212.1	570.3
-9	1050	1214.7	611.1	475.3	1398.2	233.1	552.4
-10	1050	1194.4	614.5	486.6	1412.5	224	570.1
-11	1050	1333	588.2	364	1457.4	240	588.6
-12	1050	1869.2	499.8	-128	1622.3	284.2	665
-12	1050	1869.2	499.8	-535	1215.3	284.2	665

Left Side
Ground Surface Elevation

Left Side
Water Surface Elevation

Entry failure at this elevation
Location per Geostudio

WATER	PASSIVE	
PSF	PSF	LBS
	833.3	159.49
	761.6	640.64
	840	169.95
	859.5	908.5
	957.5	1006.45
	1055.4	1104.45
	1153.5	1203.15
	1252.8	1296.8
	1340.8	1206.495
	1340.3	0
	1340.4	134.035
	1340.3	1281.2
	1222.1	1176.25
	1130.4	913.64
	1153.7	0
	1153.7	232.22
	1168.5	951.48
0	1210.2	243.738
12.48	1227.18	1248.23
74.88	1269.28	1369.78
137.28	1470.28	1769.58
199.68	2068.88	

File Name: R35B_C407.dat

CWALSHT PASSIVE FORCE= 17016.08
 CWALSHT FS= 1.08
 GEOSTUDIO PASSIVE FORCE= 11234.8
 PASSIVE FORCE DIFFERENCE= 5781.3
 SHEET PILE LENGTH= 14.2
 UNIFORM PRESSURE= 407

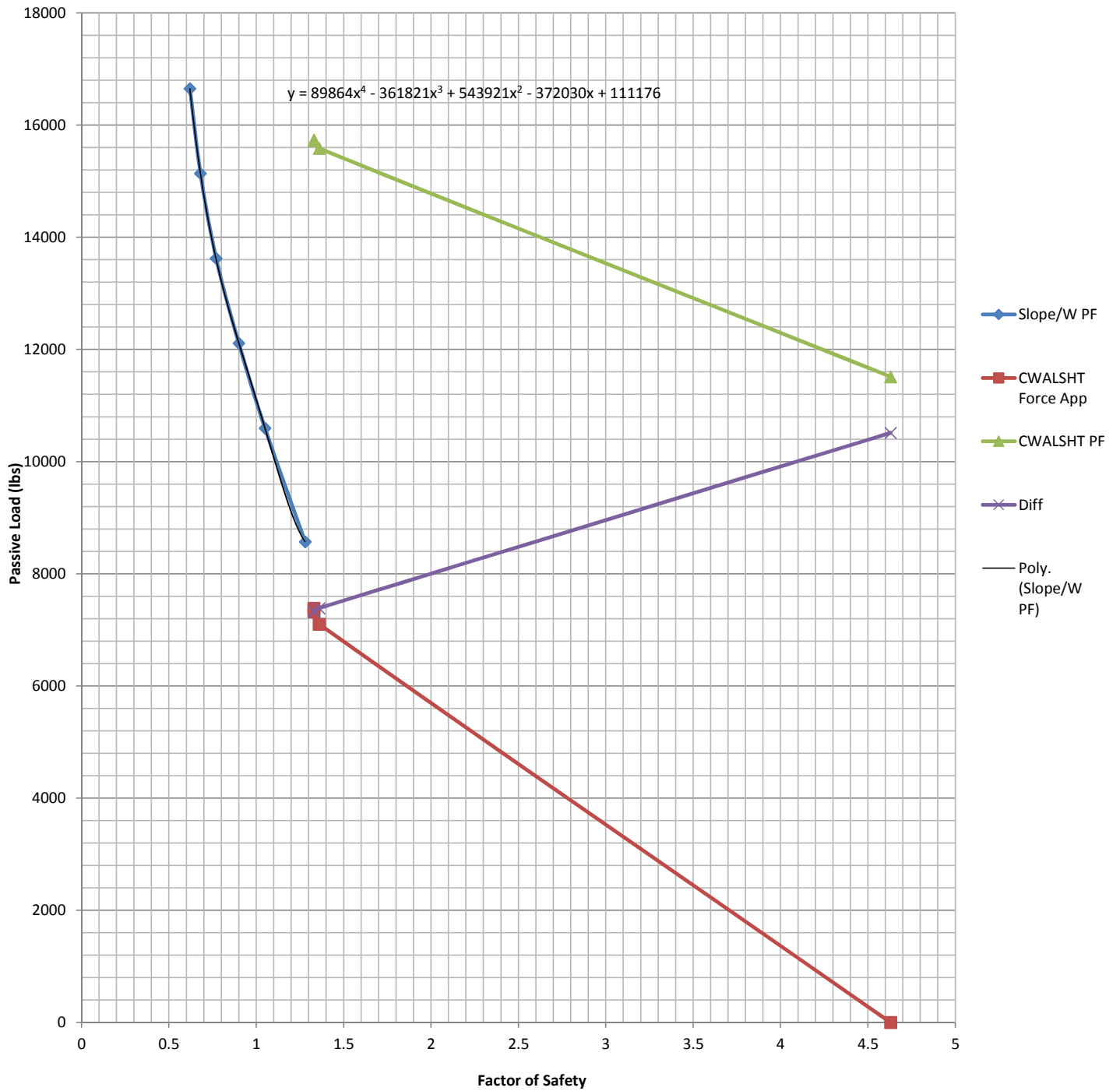
Sextic						
a	b	c	d	e	f	g
971.94	-11419	54575	-136685	192588	-151849	63768

Reach 35B 1% Flowline ETL Surcharge Summary							
Iteration	Distributed Load In CWALSHT (psf)	Force Applied in CWALSHT (lbs/ft)*	CWALSHT Passive Force Calculated (lbs/ft)	SLOPE/W Passive Force Based On FoS (lbs/ft)	Difference in Forces (lbs/ft)	Distributed Load for Next Iteration (psf)	CWALSHT Factor of Safety (FoS)
1	0	0	11512	1000**	10512	740	4.63
2	500	7100	15586	8200**	7386	520	1.36
3	520	7384	15731	8400**	7331	516	1.33
4	516	7327	15731	8400**	7331	516	1.33

*Distributed Height=14.2 ft

**Factor of Safety not on graph. Force estimated from graph.

Reach 35B 1% Flowline



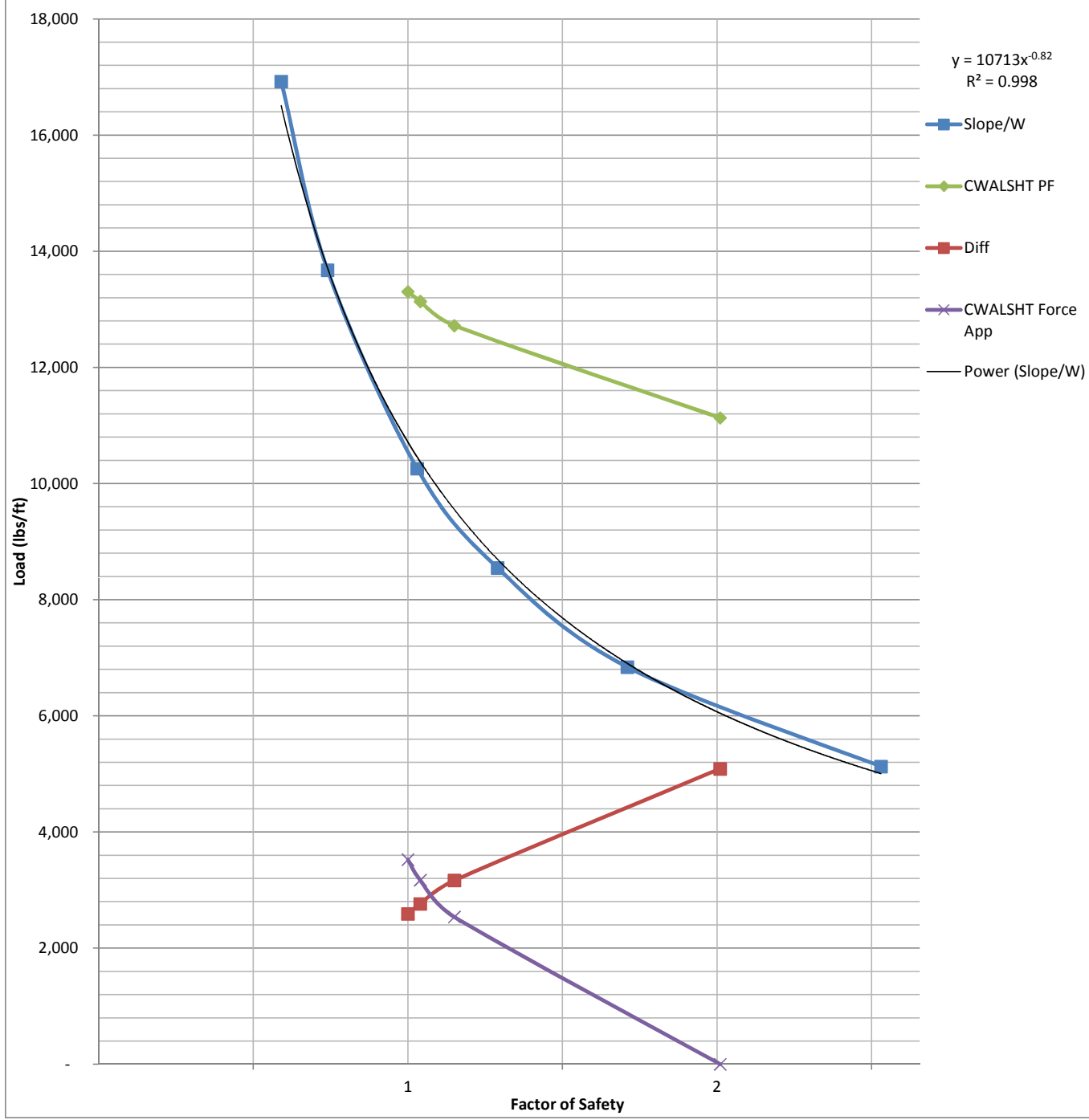
III.--WATER AND SOIL PRESSURES
'LONDON AVENUE CANAL
'REACH 35B 1% Flowline
2/15/2013

HORIZONTAL DISTRIBUTED LOAD	516 PSF
FACTOR OF SAFETY FOR ACTIVE PRESSURE	1.33
FACTOR OF SAFETY FOR PASSIVE PRESSURE	1.33
SHEET PILE TIP ELEVATION	-21.5

	ELEVATION (FT)	WATER		SOIL		PRESSURES												
		PRESSURE (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)											
Ground Surface	12.9	0	0	0	0	0	0											
	11.9	0	0	0	0	0	0											
	10.9	0	0	0	0	0	0											
	9.9	0	0	0	0	0	0											
	8.9	0	0	0	0	0	0											
	7.9	0	0	0	0	0	0											
	6.9	0	0	0	0	0	0											
	5.9	0	0	0	0	0	0											
	5.4	0	0	0	0	0	0											
	4.9	31	0	0	0	0	0											
	3.9	94	0	0	0	0	0											
	2.9	156	0	0	0	0	0											
	2.4	187	0	0	0	0	0											
	2.4	187	0	0	0	0	677					Leftside	Area					
	2.2	200	0	0	0	0	687					0	0					
	Water Surface	2.2	200	677	0	0	687						677	207.75				
		1.9	218	708	0	0	698						708	509.95				
1.2		262	749	0	0	707						749	226.65					
0.9		281	762	0	0	713						762	801.5					
-0.1		343	841	0	0	755						841	433					
-0.6		375	891	0	0	778						891	457.5					
-1.1		406	939	0	0	801						939	987.5					
-2.1		468	1036	0	0	846						1036	1084.5					
-3.1		530	1133	0	0	891						1133	858.48					
-3.83		576	1219	0	0	922						1219	0					
-3.83		576	1203	0	0	922						1203	205.87					
-4		587	1219	16	0	929						1219	122.35					
-4.1		593	1228	25	0	933						1228	1264					
-5.1		655	1300	106	0	951						1300	1123.2					
-6		711	1196	346	0	838						1196	118					
-6.1		718	1164	391	0	812	water pressure	corrected left side pressure				1164	778.05					
-6.8		761	1059	570	0	740	0	1059					321.558					
Slip Surface	-7.1	761	1066	576	0	733	18.72	1084.72					65.19552					
	-7.16	761	1066	576	0	618	22.464	1088.464					0					
	-7.16	761	1066	576	0	727	22.464	1088.464					1049.78448					
	-8.1	761	1064	574	141	618	81.12	1145.12					1175.32					
	-9.1	761	1062	572	234	544	143.52	1205.52					1234.72					
	-10.1	761	1058	571	252	539	205.92	1263.92					1303.62					
	-11.1	761	1075	565	258	549	268.32	1343.32					1402.11					
	-12	761	1448	487	297	595	324.48	1772.48										
	-12.1	761	1523	473	304	607												
	-13.1	761	1907	418	348	724												
	-14.1	761	1963	434	366	815												
	-15.1	761	2022	450	384	907												
	-16.1	761	2079	466	402	998												
	-16.73	761	2110	476	413	1056												
	-17.1	761	2128	481	420	1090												
	-18.1	761	2164	497	438	1176												
	-19.1	761	2194	513	456	1250												
-20.1	761	2224	529	473	1321													
-21.1	761	2255	545	491	1403													
-21.55	761	2284	561	509	1535													
-23.1	761	2340	577	527	1697													

Reach 36 ETL Surcharge Summary						
Iteration	Distributed Load In CWALSHT (psf)	Force Applied in CWALSHT (lbs/ft)	CWALSHT Passive Force Calculated (lbs/ft)	Spencer's Passive Force Calculated (lbs/ft)	Difference in Forces (lbs/ft)	Factor of Safety
2	250	3525	13303	10713	2590	1.00
4	225	3172.5	13136	10374	2762	1.04
3	180	2538	12719	9553	3166	1.15
1	0	0	11131	6044	5087	2.01

Reach 36



HORIZONTAL DISTRIBUTED LOAD			225 PSF		
FACTOR	OF	SAFETY	FOR	ACTIVE	PRESSURE:= 1.04
FACTOR	OF	SAFETY	FOR	PASSIVE	PRESSURE:= 1.04
PILE TIP		-15.4			

		<-----SOIL		PRESSURES----->	
	WATER	<----LEFTSIDE----->		<---RIGHTSIDE----->	
ELEVATION	PRESSURE	PASSIVE	ACTIVE	ACTIVE	PASSIVE
(FT)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)

Slip Surface Tip

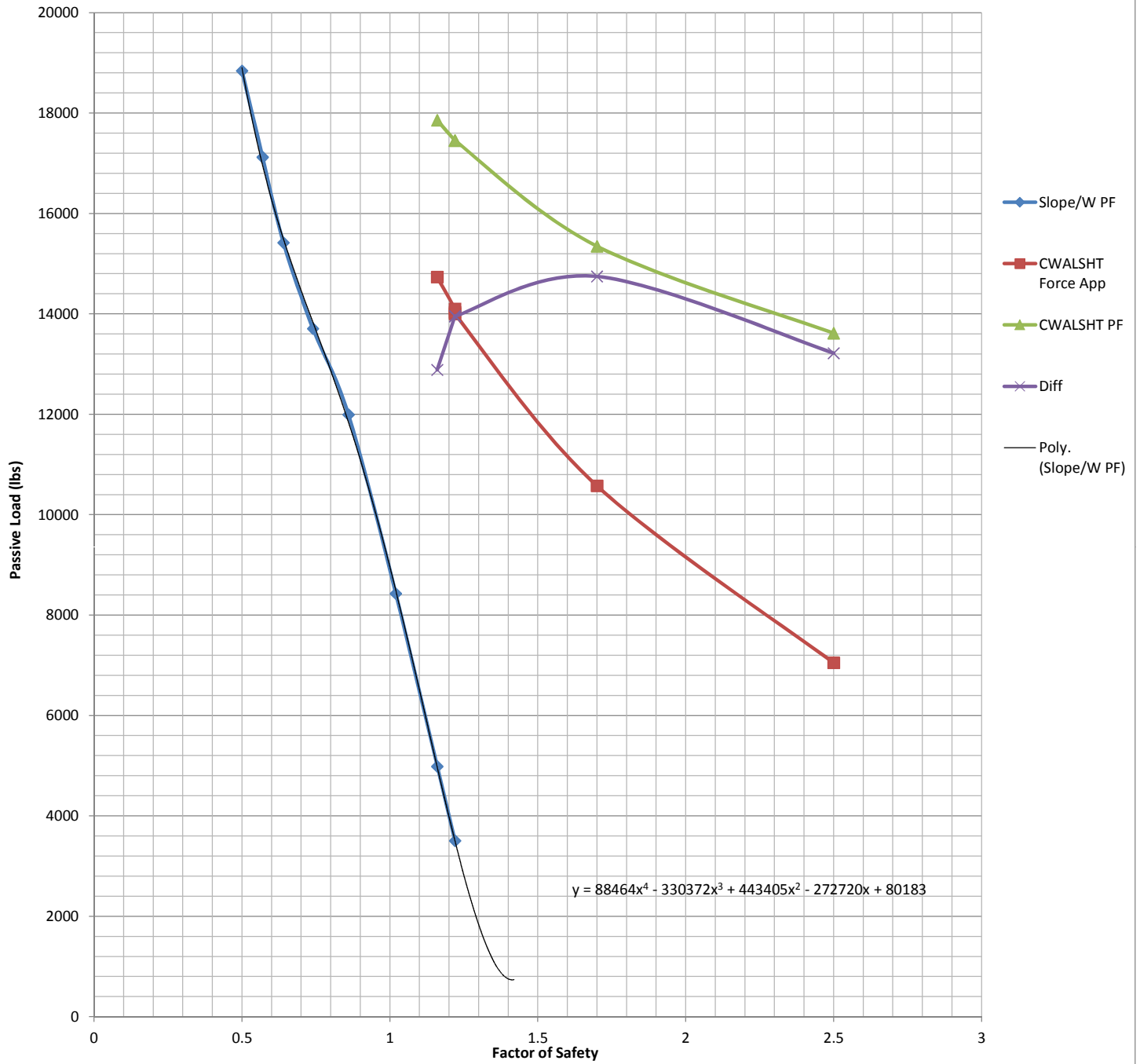
Total CWALSHT Passive Force		13,136	Exponential	
	CWALSHT FoS	1.04	significant	exponent
	Equation		10713	-0.82
Total Slope/W Passive Force		10,374		
	Difference	2,762		
	Distributed Height	14.1		
	Distributed Load	196		

Reach 36 1% Flowline ETL Surcharge Summary							
Iteration	Distributed Load In CWALSHT (psf)	Force Applied in CWALSHT (lbs/ft)*	CWALSHT Passive Force Calculated (lbs/ft)	SLOPE/W Passive Force Based On FoS (lbs/ft)	Difference in Forces (lbs/ft)	Distributed Load for Next Iteration (psf)	CWALSHT Factor of Safety (FoS)
1	0	0	10956	400**	10556	749	13.33
2	500	7050	13616	400**	13217	937	2.5
3	750	10575	15347	600**	14747	1046	1.7
4	1045	14734	17857	4974	12883	914	1.16
5	1000	14100	17454	3501	13954	990	1.22
6	995	14030	17454	3501	13953	990	1.22
7	993	14001	17454	3501	13954	990	1.22

*Distributed Height=14.1 feet

**Factor of Safety not on graph. Force estimated from graph.

Reach 36 1% Flowline



HORIZONTAL DISTRIBUTED LOAD	993	PSF
FACTOR OF SAFETY FOR ACTIVE PRESSURE	1.22	
FACTOR OF SAFETY FOR PASSIVE PRESSURE	1.22	
SHEET PILE TIP ELEVATION	-15.5	

Ground Surface

Total CWALSHT Passive Force	17453.688	Quartic				
CWALSHT FoS	1.22	a	b	c	d	e
Equation		88464	-330372	443405	-272720	80183
Total Slope/W Passive Force	3500.62					
Difference	-13953.06					
Distributed Height	14.1					
Distributed Load	-989.58					

APPENDIX D FAST LAGRANGIAN ANALYSIS OF CONTINUA (FLAC) RESULTS

APPENDIX D – FLAC Results

London Avenue Outfall Canal

Summary Soil Structure Interaction Analysis

General

Soil structure interaction (SSI) analyses were completed for the London Avenue Canal and are summarized in this appendix. Evaluations were completed using the FLAC (Fast Lagrangian Analys_is of Continua) v7.0 finite difference code (Itasca 2011). The 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. To support these analyses an evaluation of the full scale London Avenue Canal Site Specific Load Test (LLT) was completed to estimate the most likely values (MLV) for stress strain properties. The shear modulus to undrained shear strength ratios (G/S_u) from the London Load Test analysis were then used to estimate stress strain properties for other London Avenue Canal locations. All elevations are presented in NAVD88 unless otherwise stated.

This appendix includes calibration results associated with the LLT and presents results from soil-structure interaction (SSI) analyses performed for Reaches 12A, 16, 20, 30, 35B and 36. The locations, geometrics and foundation conditions for those reaches are described in the “Lake Pontchartrain and Vicinity Hurricane Protection Project MOWL for London Avenue Canal” report prepared by ECM-GEC Joint Venture in association with Black and Veatch Special Projects Corporation from March 2011, hereinafter termed the MOWL report.

All analyses presented in this appendix are based on the non-linear Mohr-Coulomb (MC) constitutive model. Albeit the MC model is not fully non-linear the results from the LLT calibration and Reach 35B have been checked via separate analyses by ERDC using the Plaxis (Brinkgreve 2004) software using the fully non-linear hardening soil model. All analyses are considered complete SSI analyses in that intrinsic material properties (soil and structural) are used to model the soil-structural response to applied load conditions without using pre-determined forces.

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 dependant 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)

Because of the over-simplification in specifying a piezometric surface in the FLAC template a function was added to allow the input of a more complex piezometric surface defined by any number of points selected by the analyst. To assign the pore-water pressure in the granular layers the total head computed using the live Black and Veatch Geo-Studio files at the top of the upper most granular layer was used as input for the FLAC models for corresponding canal water levels. Typically about 10 points were used to define the piezometric surface with more points used where there were greater changes in head.

Factor of safety (FoS) calculations were performed using the ‘c- ϕ ’ reduction technique built into FLAC. In these analyses 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. The interface shear strength properties were correspondingly reduced by the same SRF applied to the strength properties in the FoS calculations.

London Load Test Calibration

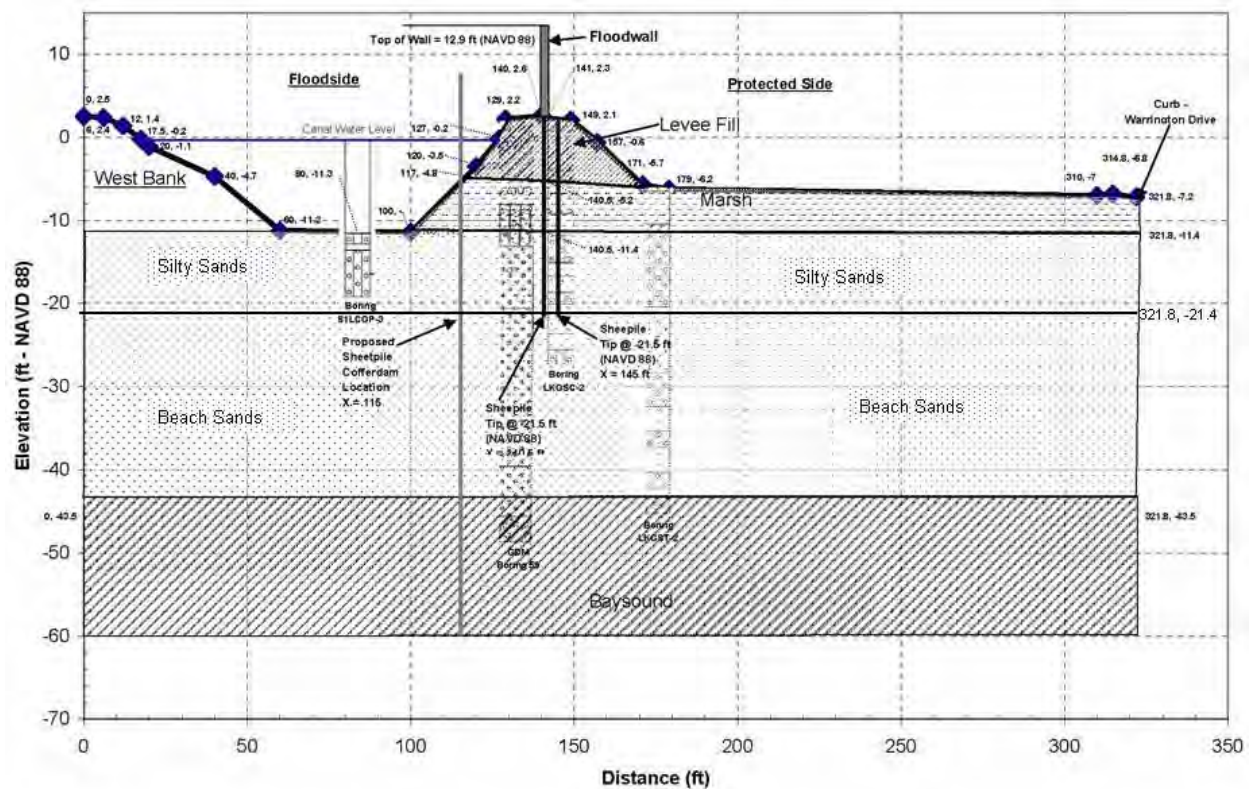
Introduction

SSI analyses were completed for the London Avenue Canal NE wall located within Reach 35B. Analyses were conducted to calibrate a FLAC model to conditions experienced and measured during the load test. Information from the load test used for this calibration includes:

- Center monolith wall displacement at the top of the wall and near the protected side ground surface
- Piezometer readings aligned with the center monolith
- Change in piezometer reading trends (likely indicating gap progression to the top of sand strata)
- Negligible movement at the land side levee toe

The calibrated model was used to estimate the canal water level associated with gap initiation and gap propagation to the marsh/sand interface for the existing I-wall using the soil stratigraphy from the LLT report dated August 2008 and shown in Figure D-1. Soil density and shear strength properties were obtained from the Reach 35B properties presented in the MOWL report with the exception that shear strength properties for the silty-sand and beach sand strata were increased from a friction angle of 30 degrees to 32 and 33 degrees respectively based on

judgment. Stress-strain properties were initially selected from pressuremeter test results and were adjusted to better fit the available data in a trial and error process.



Stratigraphy

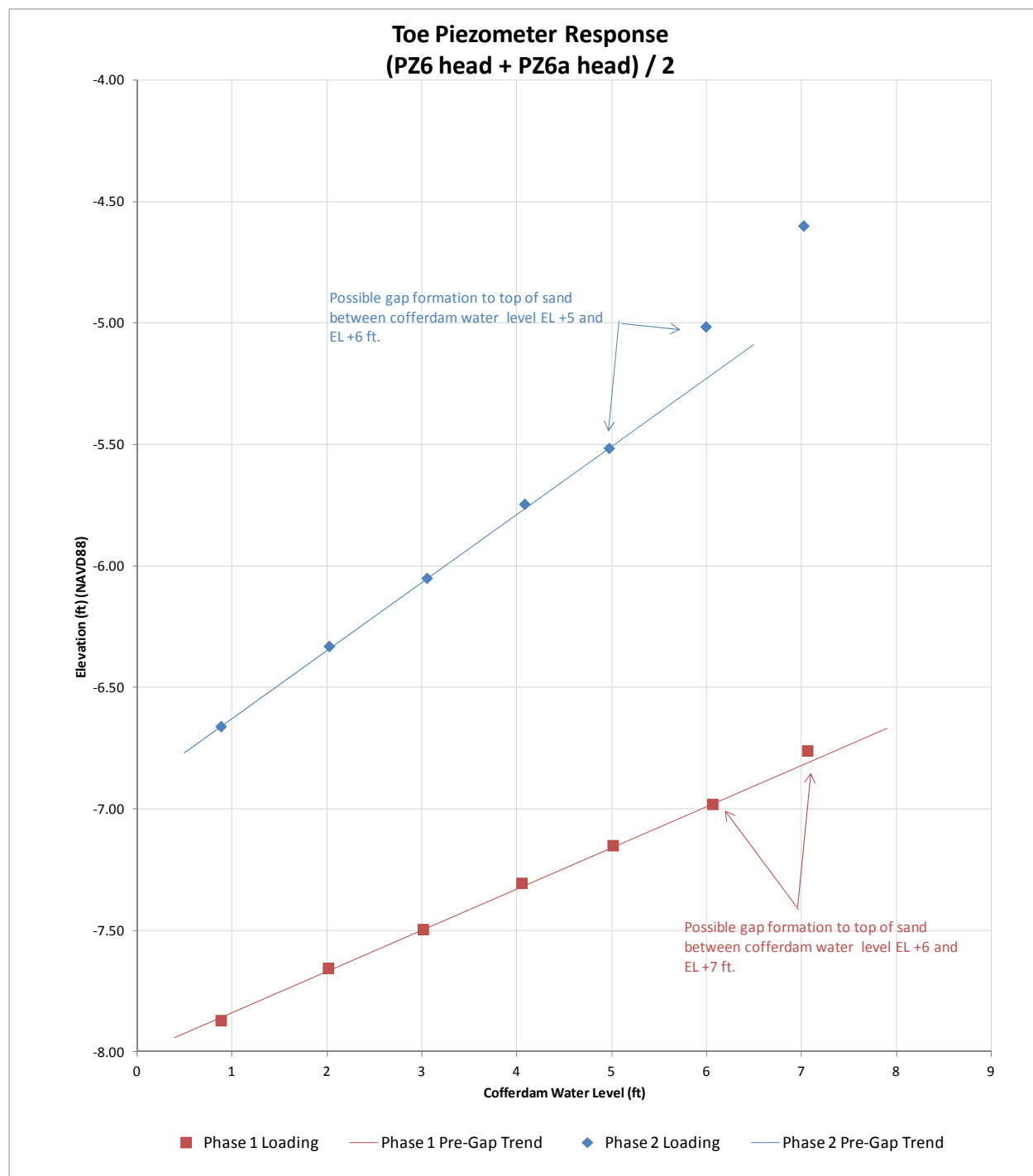


Figure D-2. LLT piezometer response at I-wall monolith 4 levee toe.

Table D-1. London Load Test Field Data.

London Load Test Piezometer and Wall Displacement Data																			
								Total Head											
Phase 1	Cofferdam	Top Wall	Bottom Wall	Top Wall	Bottom Wall	Top Wall	Bottom Wall	PZ 14	PZ 3A	PZ 16	PZ 17	PZ 18	PZ 16-18	PZ 6	PZ 6A	PZ 6-6A	PZ 7	PZ 7A	PZ 11
Date and Time	Water Level	SP-3	SP-3A	SP-4	SP-4A	SP-5	SP-5A	x = 134	x = 144	x = 158	x = 158	x = 158	x = 158	x = 171	x = 171	x = 171	x = 183	x = 183	x = 315
	(ft)	(in)	(in)	(in)	(in)	(in)	(in)	(ft)	(ft)	(ft)	(ft)	(ft)	Ave. (ft)	(ft)	(ft)	Ave. (ft)	(ft)	(ft)	(ft)
8/18/2007 12:00	0.88				0			-7.39	-7.48	-7.65	-7.67	-7.70	-7.67	-7.92	-7.82	-7.87	-7.93	-8.13	-8.75
8/18/2007 21:34	2.01		0.04		0.03		0.03	-7.19	-7.32	-7.52	-7.54	-7.55	-7.54	-7.66	-7.65	-7.66	-7.83	-7.92	-8.76
8/19/2007 8:29	3.01	0.33	0.21	0.24	0.16	0.23	0.13	-6.98	-7.13	-7.34	-7.35	-7.37	-7.35	-7.50	-7.49	-7.50	-7.69	-7.79	-8.71
8/19/2007 15:43	4.05	0.50	0.29	0.46	0.27	0.44	0.27	-6.68	-6.86	-7.11	-7.13	-7.16	-7.13	-7.31	-7.30	-7.31	-7.54	-7.64	-8.67
8/20/2007 12:28	5.01	0.78	0.54	0.72	0.50	0.73	0.54	-6.44	-6.65	-6.92	-6.95	-6.97	-6.95	-7.15	-7.15	-7.15	-7.41	-7.51	-8.62
8/21/2007 15:30	6.06	1.31	0.83	1.20	0.77	1.18	0.79	-6.19	-6.46	-6.73	-6.76	-6.78	-6.76	-6.99	-6.97	-6.98	-7.28	-7.38	-8.61
8/22/2007 20:15	7.06	2.02	1.29	1.86	1.19	1.84	1.22	-5.89	-6.16	-6.47	-6.47	-6.52	-6.49	-6.75	-6.77	-6.76	-7.08	-7.18	-8.46
Notes:	1) Bolded values used in model calibration.																		
	2) "x" location used in FLAC model with x = 140 ft at canal side face of wall.																		
Phase 2	Cofferdam							PZ 14	PZ 3A	PZ 16	PZ 17	PZ 18	PZ 16-18	PZ 6	PZ 6A	PZ 6-6A	PZ 7	PZ 7A	PZ 11
Date and Time	Water Level							x = 134	x = 144	x = 158	x = 158	x = 158	x = 158	x = 171	x = 171	x = 171	x = 183	x = 183	x = 315
	(ft)							(ft)	(ft)	(ft)	(ft)	(ft)	Ave. (ft)	(ft)	(ft)	Ave. (ft)	(ft)	(ft)	(ft)
8/26/2007 11:00	0.88							-5.57	-5.95	-6.28	-6.27	-6.38	-6.31	-6.65	-6.67	-6.66	-7.00	-7.12	-8.36
8/26/2007 15:30	2.02							-5.09	-5.52	-5.94	-5.92	-5.99	-5.95	-6.33	-6.33	-6.33	-6.74	-6.85	-8.33
8/26/2007 20:15	3.05							-4.65	-5.14	-5.62	-5.60	-5.68	-5.63	-6.04	-6.06	-6.05	-6.51	-6.62	-8.28
8/27/2007 17:00	4.08							-4.16	-4.72	-5.28	-5.25	-5.32	-5.28	-5.74	-5.75	-5.75	-6.29	-6.39	-8.26
8/28/2007 10:45	4.97							-3.76	-4.39	-5.02	-4.98	-5.04	-5.01	-5.52	-5.51	-5.52	-6.11	-6.21	-8.20
8/28/2007 18:00	5.99							-3.09	-3.77	-4.49	-4.41	-4.49	-4.46	-5.02	-5.01	-5.02	-5.70	-5.74	-7.88
8/28/2007 21:45	7.02							-2.42	-3.18	-4.02	-3.93	-4.01	-3.99	-4.62	-4.58	-4.60	-5.45	-5.42	-7.79
Notes:	1) Bolded values used in model calibration.																		
	2) "x" location used in FLAC model with x = 140 ft at canal side face of wall.																		

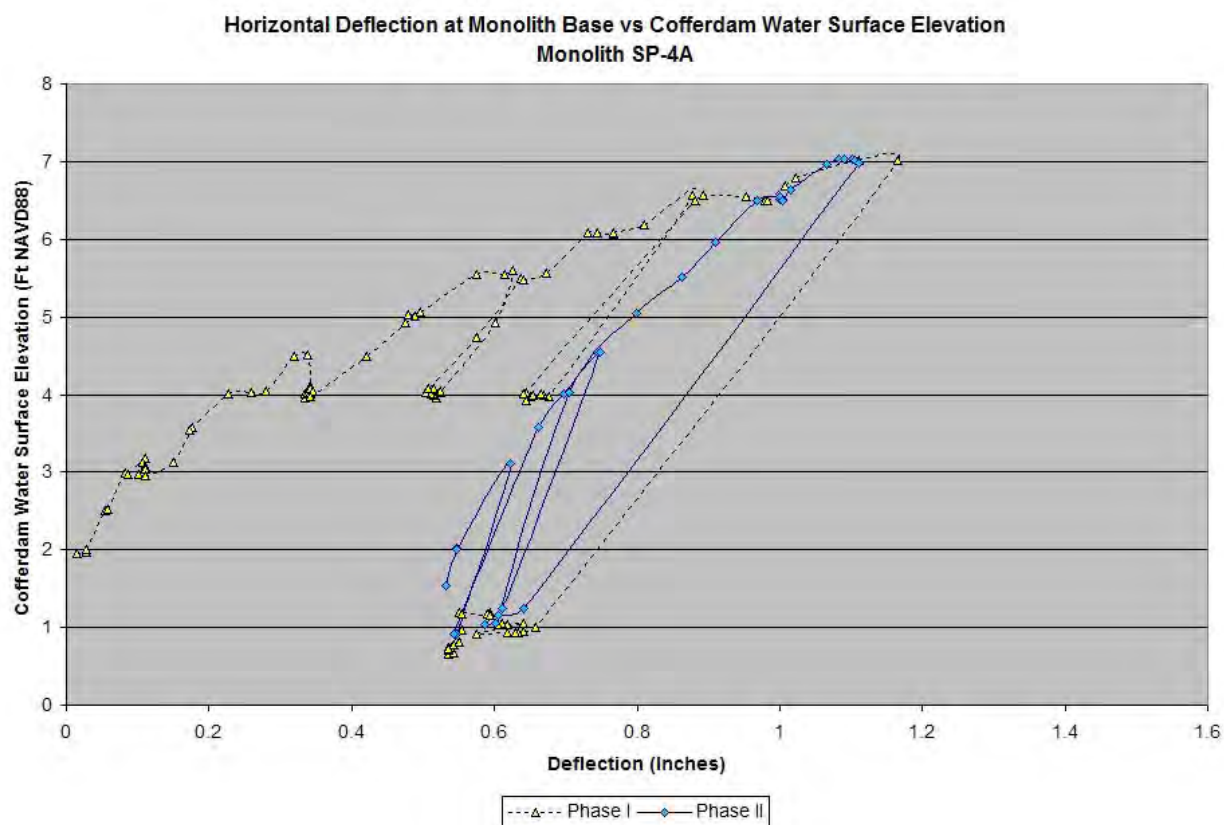


Figure D-3. LLT center monolith displacement (LLT report, August 2008).

Foundation Parameters

The FLAC calibration of the LLT is based on simple Mohr-Coulomb constitutive models (linearly elastic-perfectly plastic soil behavior). Inputs to the MC model include density (unit weight/gravity), cohesion, friction, and two elastic properties (typically shear and bulk modulus). Unit weight and shear strength parameters were based on values for Reach 35B from the MOWL report and are shown in Table D-2.

Soil modulus values were determined or selected assuming the soils are linearly elastic and isotropic with Poisson's ratios based on expected drainage conditions during loading. During loading, the cofferdam water levels were raised in ½ ft increments and held until piezometer and wall displacement readings became relatively constant. The levee and the marsh material beyond the levee toe are expected to be partly saturated over portions of their stratigraphy so a fully undrained (i.e. no volume change) condition was not assumed and lower Poisson's ratios were selected. The MLV modulus properties were determined from a trial and error process changing modulus values for one material at a time then completely re-analyzing the section, including the gap propagation, to find the computed displacements for comparison to measured results. Three dimensional effects, like tangential stresses at sheet pile interlocks and reduced pore-water pressures due to finite length cofferdam loading, are not considered. Since the back

calculation results are based on a simple model without a complete interpretation of the LLT data the results are considered a good estimate but not the highest level of accuracy possible.

Table D-2. LLT Foundation Parameters

Material	Strata bottom elevation (NAVD88)	unit wt. (pcf)	unit wt/g	Su (psf)	ϕ' (deg)
Levee	-6.0	109	3.385	450	0
Marsh (centerline)	-11.5	80	2.484	275	0
Marsh (toe)	-11.5	80	2.484	150	0
Silty Sand (SM)	-21.5	115	3.571	0	32
Beach Sand (SP)	-43.5	115	3.571	0	33
Bay Sound Clay	-70.0	102	3.168	450	0

Material	Stress-Strain Model Values					
	<i>E/Su</i>	<i>E (psf)</i>	<i>Poisson</i>	<i>G (psf)</i>	<i>K (psf)</i>	<i>ko</i>
Levee	<i>350</i>	1.58E+05	<i>0.40</i>	5.63E+04	2.63E+05	0.67
Marsh (centerline)	<i>200</i>	5.50E+04	<i>0.47</i>	1.87E+04	3.06E+05	0.89
Marsh (toe)	<i>200</i>	3.00E+04	<i>0.40</i>	1.07E+04	5.00E+04	0.67
Silty Sand (same as B Sand)	-	4.44E+05	0.32	<i>2.50E+05</i>	6.10E+05	0.47
Beach Sand	-	8.22E+05	0.31	3.13E+05	<i>7.32E+05</i>	0.46
Bay Sound Clay	<i>600</i>	2.70E+05	<i>0.50</i>	9.03E+04	9.00E+06	0.98

(Note the at-rest earth pressure coefficients are computed only to initialize stresses during model development so equilibrium can be reached in fewer computational steps. Italicized values are LLT values held constant in other reach models)

Structural Parameters

The single wall structure was modeled as two beams: (1) the upper concrete portion of the existing I-wall; and (2) the sheet pile supporting the existing wall. Interface elements were applied to the existing wall below the ground surface. These elements allow slip and separation of the soil and wall. The shear strength of the interfaces was set at 90% of the shear strength of the soil layer with the highest cohesion.

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 structure parameters presented in Table D-3 do not show the adjusted Young's modulus.

Table D-3. Summary of LLT Structural Parameters

Member	E (psi)	I (in ⁴ /ft)	EI (lbft ² /ft)	A (in ² /ft)	EA (lb/ft)	v
Concrete (1 ft wide)	3,000,000	1,728	3.60E+07	144	4.32E+08	0.20
CZ-101	29,000,000	65.01	1.31E+07	3.78*	1.10E+08	0.30

*Actual area is 6.08 in²/ft. As axial stiffness EA is not a critical factor in wall bending the model was not corrected for this error.

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. The zone directly below the gap tip is checked as canal water levels are incrementally raised. Canal water levels were raised in 1 ft increments and the gap was deepened in approximately 1 ft steps as needed. Figure D-4 shows a screen capture of the model progression at different water elevations and gap depths as recorded in the FLAC project tree. In this figure the wt1_gap0.sav step is the model run to equilibrium with a starting canal water near El. 1 ft. At step wt2_gap0, the canal water level is raised to El. 2.0 and the gap depth below the top of levee is 0 ft. After this state the canal water levels are raised in 1 ft increments and the gap is progressively deepened. The protocol for loading and gap initiation and progression was as follows:

1. The model is brought into equilibrium and nodal displacements and velocities are reset to zero at the initial canal water level of 0.88 ft (termed wt1 for water at EL 1).
2. Cofferdam water level is raised to EL 2.0 ft so water loading remains on the levee section (i.e. no gap is allowed to form until water levels touch the wall).
3. The cofferdam water level is raised to EL 3.0 ft and water now loads the wall. The gap criteria is checked and the gap is deepened in 1 ft increments until the horizontal stress exceeds the hydrostatic water pressure that would exist at that depth.
4. The cofferdam water level is raised another foot and the need for extending the gap is checked.
5. Once a gap has been extended to depth it is assumed the gap will not close (i.e. the depth of gap never reduces).

The file structure looks different between Phase I and Phase II because the project file for Phase I was inadvertently deleted and had to be rebuilt. Each reach and each analysis, for instance Phase I and Phase II models, are kept in separate folders allowing the use of a common naming protocol. So, for instance, while file "wt3_gap7.sav" shows up in each tree the files are not identical.

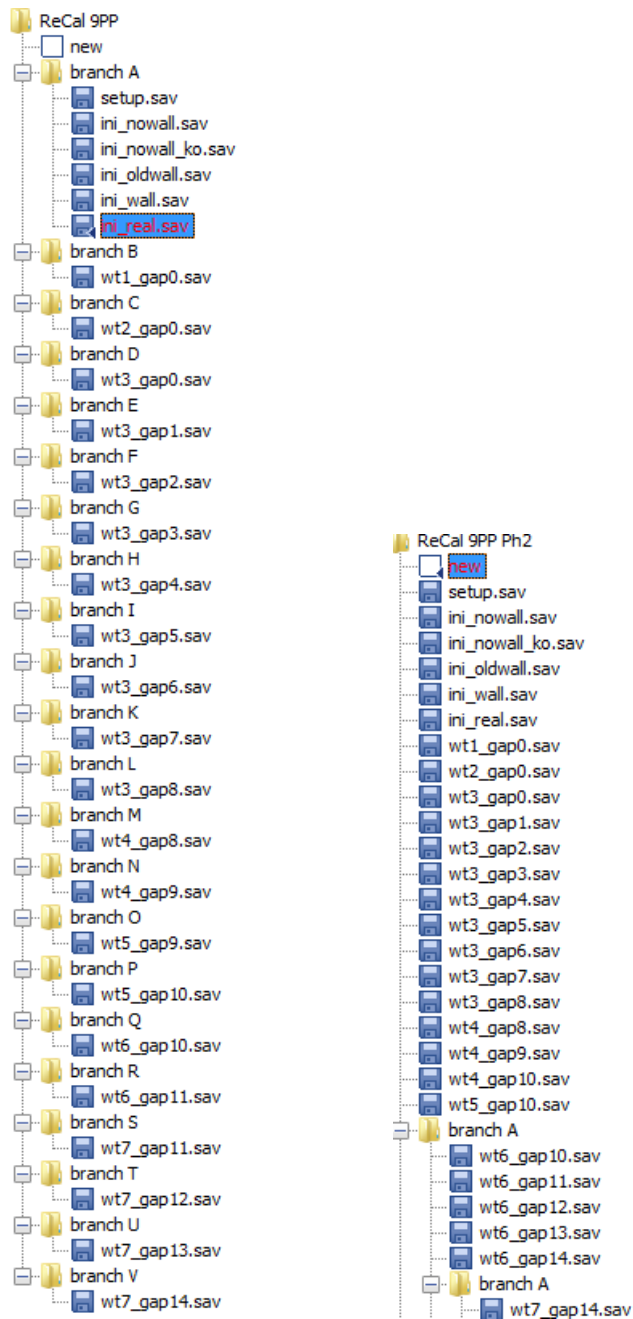


Figure D-4. FLAC model progression of water loading and gap development for LLT Phase 1 (left) and Phase 2 (right).

As assumed by IPET, the gap was limited to where the sheet pile intersected the top of the beach sand deposit (silty sand). It is assumed that the sand has no free standing height and will collapse against the wall. Also, there is assumed to be no head loss from the bottom of the gap to the sheet pile tip due to the relatively high permeability of the sand (no distinct drop in head across the sheet pile other than recorded by the linear head change between piezometers during testing). Water level raises and gap depths are presented in one foot increments. The FLAC model was discretized to a rectangular mesh size of very nearly 1 ft high by 1 ft wide so it is unrealistic to try to refine the gap propagation to finer increments without re-meshing the model. Figure D-5 presents the gap tip elevation vs. cofferdam water level. It is noted that the LLT Phase 1 gap propagated to El. -11.5, the marsh/sand interface, at a canal water level between El. +6 ft and El. +7 ft. This range of gap progression corresponds to a change in piezometer reading trends recorded during the test. The trend lines shown in Figure D-2 indicate that the gap has progressed to a material with a differing permeability at an elevation between El. +6 ft and El. +7 ft. In a similar manner the FLAC model gap progression for the Phase 2 loading, where the gap penetrates to the marsh/sand interface between canal water El. +5 ft and El. +6 ft, agrees with the piezometer trends observed in the field. The tendency in trends is for the gap to progress deeper for Phase II than for equivalent loading in Phase I. There may be a couple of reasons for this; first is that the pore-water pressure regime in the sand is higher in Phase II leading to less resistance to lateral loading and second is that the wall response is stiffer, see Fig. D-3. As the

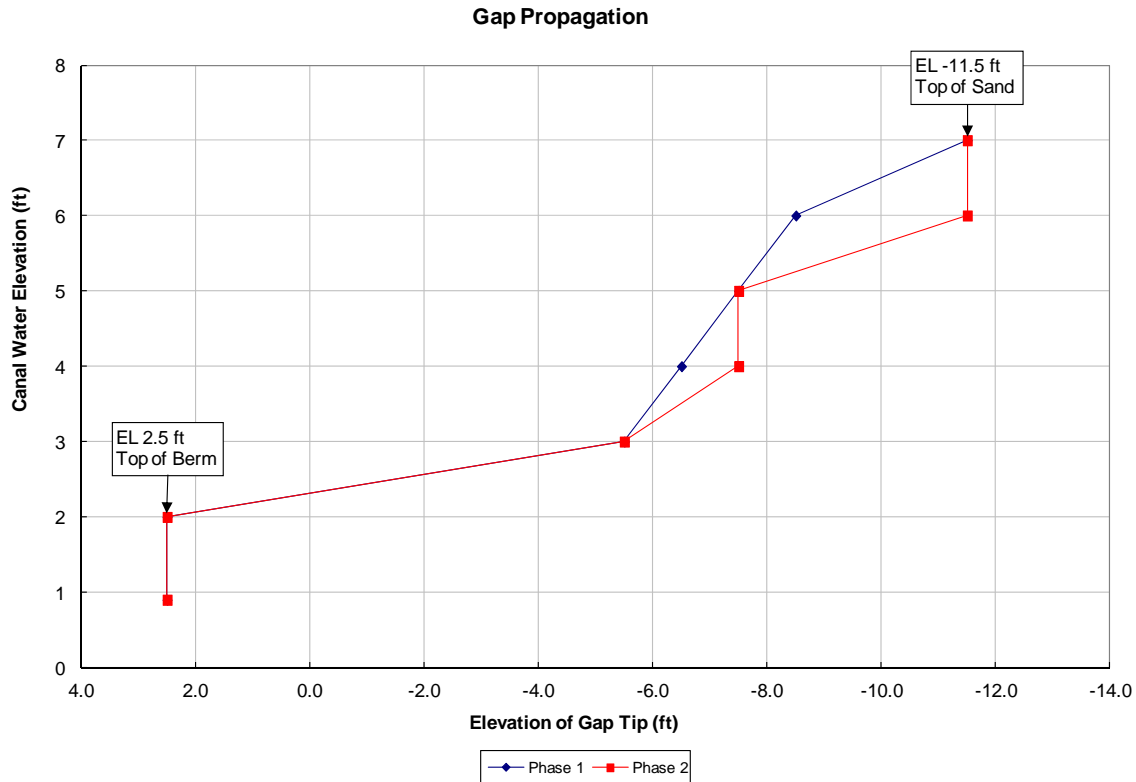


Figure D-5. LLT flood side gap progressions with cofferdam water level.

wall did not fully rebound at the start of Phase II loading there was likely some volume change leading to stiffer response. The deeper gap response shows up in the piezo plots in Fig. D-2. The gap development depth shown in Fig. D-2 was one of the aspects considered during calibration.

It is important to note that flood side gaps were observed beside portions of I-walls along London Canal and along Bayou St. John. A gap was also observed along a portion of the LLT site prior to loading the wall. Whether these gaps originated from past loading or from desiccation they offer a point of surface water entry allowing hydrostatic conditions to exist against the wall at some depth. In this way, a small height of water above the top of the flood side berm may initiate the gap or it may enhance loading to propagate the gap. As shown in Figure D-5 the gap progresses rapidly when canal water levels exceed the top of berm to EL +3 ft. The rate of progression slows at a gap depth of about 8 ft (gap tip EL -5.5 ft) and then increases again as the gap plunges to the top of marsh/sand interface.

Wall Displacement

Results of the final calibration model, ReCal 9PP, is presented in Figure D-6. These results are associated with the Phase 1 piezometer and wall displacement data. The material properties used result in an over prediction of the displacement between cofferdam water levels 3-5 ft but are reasonably close to other water loading conditions. These calibration results are considered acceptable for the LLT and the stress-strain property relationships from the LLT calibration can be reasonably applied for the foundation materials for other outfall canal reaches.

LLT SSI Calibration Conclusions

A calibration of the LLT was completed using FLAC with the MC constitutive model. Stratigraphy and material properties from the MOWL report and piezometric levels measured during the LLT were used as input parameters for the calibration process. Wall displacements at the top and bottom of the monolithic concrete stem at the center monolith were used as a basis for varying stress-strain foundation material properties to approximately match computed to measured conditions. The relationship of Young's modulus to undrained shear strength for marsh and underlying Pleistocene clay materials will be used in other reaches of the outfall canals. The Young's modulus of the levee material and foundation sands will be used directly in other models without correlation to undrained shear strength or mean effective stress.

Analysis of the gap initiation and gap propagation for the LLT indicates that the gap progressed quickly to El. -5.5 ft once water loads were applied on the wall. The analysis indicates that the gap reached the marsh/sand interface, El. -11.5 ft, at a cofferdam water level between El. +5 ft and El. +7 ft depending on which phase of the LLT is considered. The ability to calculate the gap progression relies on an accurate assessment of the lateral earth pressure in the SSI analysis. Although the lateral earth pressure can be calculated it is not known how accurate the results are or how properties can change in short distances along the wall. That said, the correlation of computed to predicted displacement and computed to measured cofferdam water level to gap formation to the marsh/sand interface offers reasonable support for using material properties presented in this calibration for other outfall canal SSI analyses.

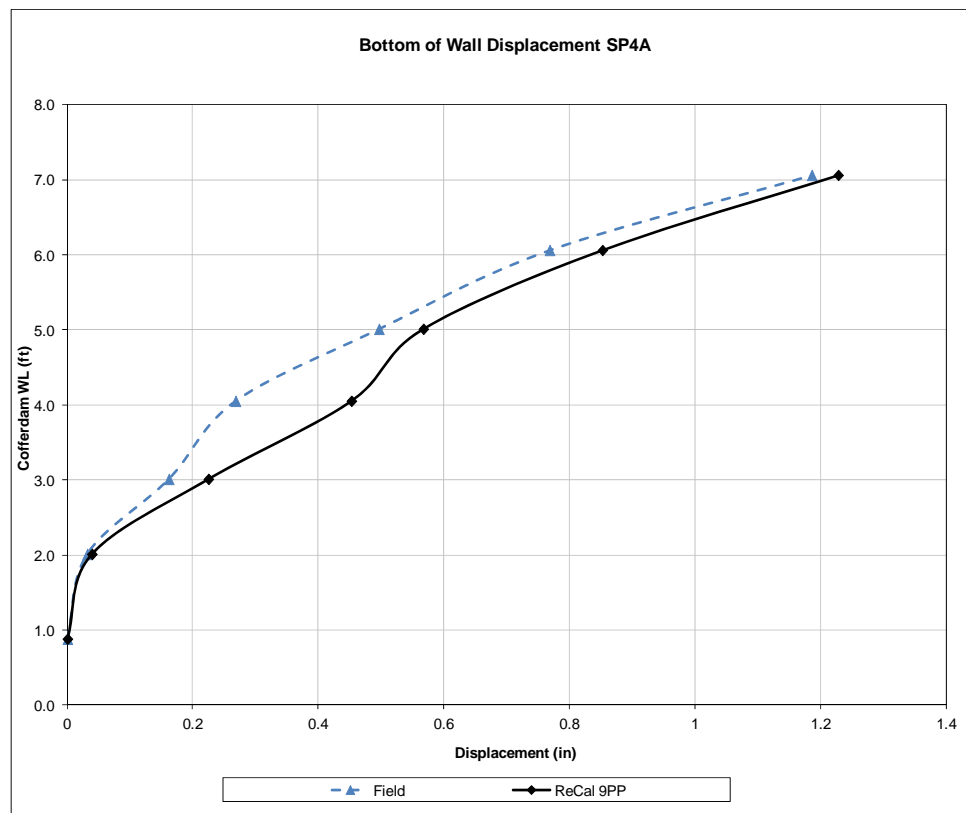
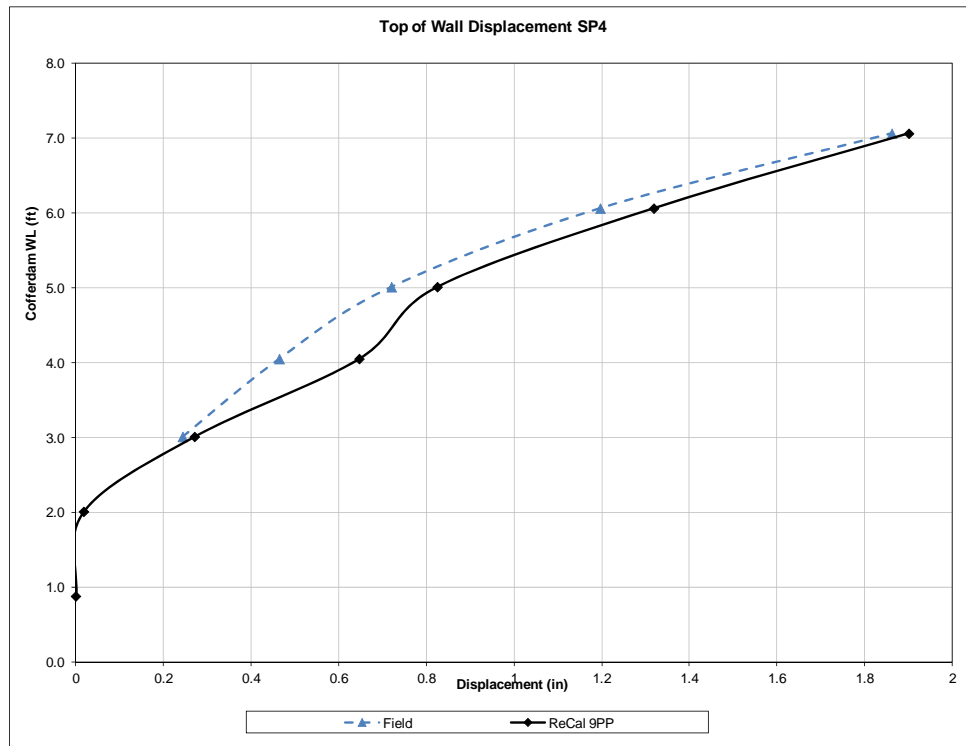


Figure D-6. LLT computed wall deflections and field measurements.

Reach 12A

Introduction

The design section includes: clay embankment (EL +4.3 ft), underlain by a shallow marsh deposit (EL -2 ft to EL -14 ft). The shallow marsh is underlain by a beach sand stratum (EL -14 ft to EL -48 ft) which mantles a lower clay deposit which extends at least until the bottom of the model (EL -60 ft). The clay embankment material was assigned a unit weight of 107 pcf with cohesion of 700 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 3.1 ft resulting in 1.2 ft difference in soil elevation across the wall. The existing I-wall has a top elevation of 12.9 ft consisting of a concrete cap and CZ101 sheet pile to tip elevation of -15.5 ft. Figures D-7 and D-8 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 top of the upper marsh strata was set at EL -2 ft, as it is shown on the flood side of the I-Wall in Figure D-7, without sloping to the levee toe to best capture the wall displacement behavior.

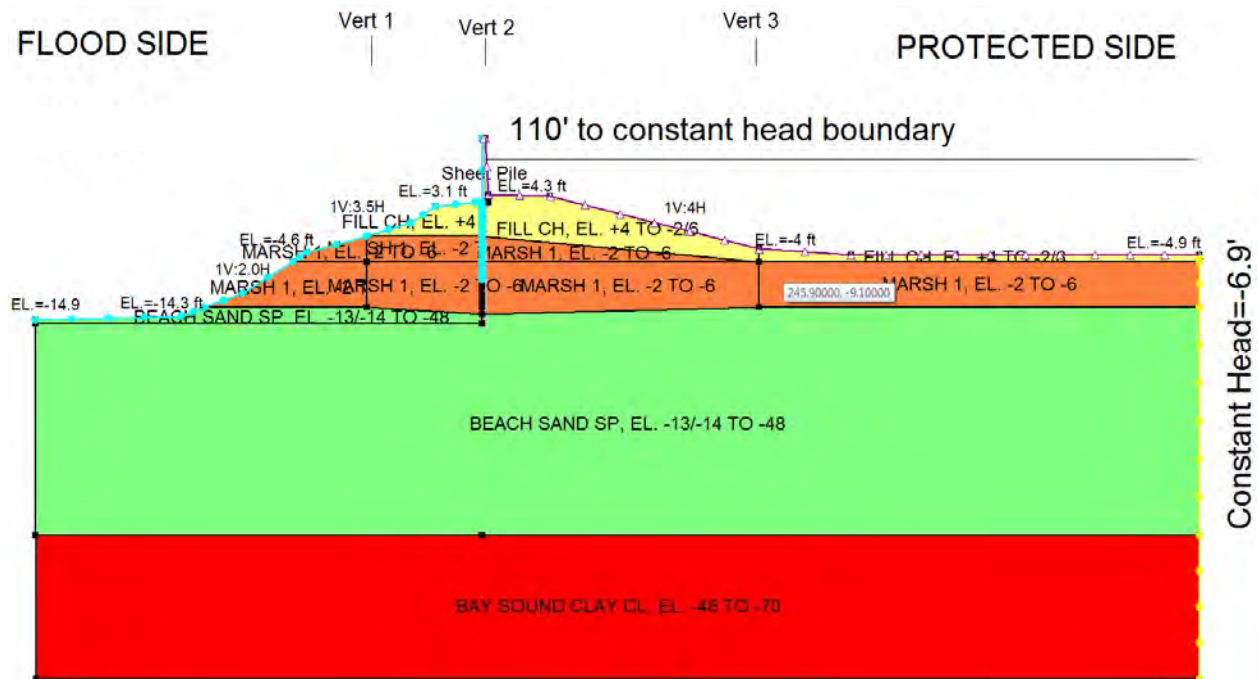


Figure D-7. Geo-Studio model for London Canal Reach 12A.

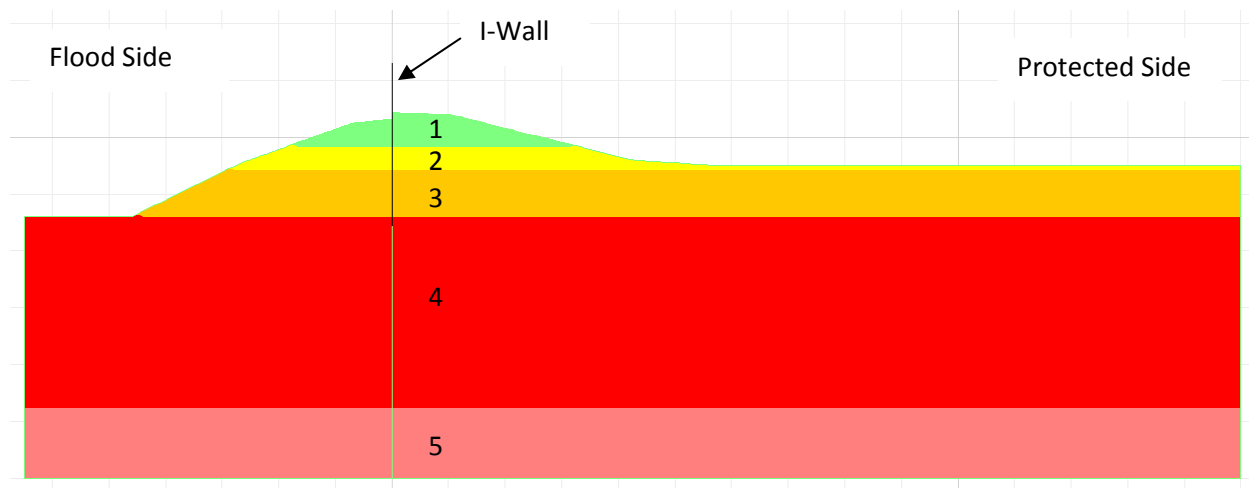


Figure D-8. FLAC Model for London Avenue Canal Reach 12A

Foundation Parameters

The FLAC analyses are based on simple Mohr-Coulomb constitutive models (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 is the Seep/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 Tables D-4 thru D-7. 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 are 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 London 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 total head at the marsh sand interface was then used as the basis for selecting piezometric lines to represent the head in the granular beach sand strata at each corresponding water level in the FLAC model. This piezometric line only affected the shear strength of the sand; modulus values in the sand were held constant in the FLAC model. Piezometric data is shown in Table D-8.

Table D-4. Summary of Centerline Soil Parameters Reach 12A

Material	Strata top elevation (NAVD88)	Strata bottom elevation (NAVD88)	unit wt. (pcf)	unit wt/g	Su (psf)*	ϕ' (deg)
1 - Levee	4.3	-2.0	107	3.323	700	0
2 - Marsh 1	-2.0	-6.0	80	2.484	200	0
3 - Marsh 2	-6.0	-14.0	101	3.137	200	0
4 - Beach Sand (SP)	-14.0	-48.0	122	3.789	0	30
5 - Bay Sound Clay	-48.0	-60.0	108	3.354	900	0

*Denotes Su at Top of Bay Sound Clay, Delta Su = 0. psf/ft

Table D-5. Centerline Most Likely Value Modulus Reach 12A

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	0.67
2 - Marsh 1	200	4.00E+04	0.47	1.36E+04	2.22E+05	0.89
3 - Marsh 2	200	4.00E+04	0.47	1.36E+04	2.22E+05	0.89
4 - Beach Sand (SP)	-	7.32E+05	0.33	2.75E+05	7.32E+05	0.50
5 - Bay Sound Clay	600	5.40E+05	0.495	1.81E+05	1.80E+07	0.98

Table D-6. Summary of Toe Soil Parameters Reach 12A

Material	Strata top elevation (NAVD88)	Strata bottom elevation (NAVD88)	unit wt. (pcf)	unit wt/g	Su (psf) *	ϕ' (deg)
1 - Levee	4.3	-2.0	107	3.323	600	0
2 - Marsh 1	-2.0	-6.0	80	2.484	200	0
3 - Marsh 2	-6.0	-14.0	101	3.137	190	0
4 - Beach Sand (SP)	-14.0	-48.0	122	3.789	0	30
5 - Bay Sound Clay	-48.0	-60.0	108	3.354	610	0

*Denotes Su at Top of Bay Sound Clay, Delta Su = 13.2 psf/ft

Table D-7. Toe Most Likely Value Modulus Reach 12A

Material	<i>E/Su</i>	E (psf)	<i>Poisson</i>	G (psf)	K (psf)	ko
1 - Levee	263	1.58E+05	0.40	5.63E+04	2.63E+05	0.67
2 - Marsh 1	200	4.00E+04	0.47	1.36E+04	2.22E+05	0.89
3 - Marsh 2	200	3.80E+04	0.47	1.29E+04	2.11E+05	0.89
4 - Beach Sand (SP)	-	7.32E+05	0.33	2.75E+05	7.32E+05	0.50
5 - Bay Sound Clay	600	3.66E+05	0.495	1.22E+05	1.22E+07	0.98

Table D-8. Piezometric Surface in Granular Material at Selected Coordinates Reach 12A

x-coor (ft)	WL 0.4 (ft) Gap 0	WL1.0 (ft) Gap 0	WL2.0 (ft) Gap 0	WL3.0 (ft) Gap 0	WL4.0 (ft) Gap 6	WL5.0 (ft) Gap 6	WL6.0 (ft) Gap 8	WL7.0 (ft) Gap 10	WL8.0 (ft) Gap 12
135	0.4	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0
155	0.4	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0
184	-1.4	-0.9	-0.2	0.6	1.3	2.1	2.8	3.6	4.4
195	-1.9	-1.5	-0.8	-0.1	0.6	1.3	2.0	2.7	3.4
200	-2.1	-1.7	-1.0	-0.3	0.3	1.0	1.7	2.3	3.0
200	-2.2	-1.8	-1.2	-0.5	0.1	0.8	1.4	2.0	2.7
214	-2.8	-2.4	-1.9	-1.3	-0.7	-0.2	0.4	1.0	1.5
236	-3.7	-3.5	-3.1	-2.6	-2.2	-1.8	-1.3	-0.9	-0.5
264	-4.9	-4.8	-4.5	-4.2	-4.0	-3.7	-3.4	-3.2	-2.9
290	-6.0	-6.0	-5.9	-5.7	-5.6	-5.5	-5.4	-5.3	-5.2
310	-6.9	-6.9	-6.9	-6.9	-6.9	-6.9	-6.9	-6.9	-6.9
350	-6.9	-6.9	-6.9	-6.9	-6.9	-6.9	-6.9	-6.9	-6.9

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 D-9.

Table D-9. Summary of Structural Parameters Reach 12A

Member	E (psi)	E* (psi)	E* (psf)	I (in4/ft)	E*I (lbft2/ft)	A (in2/ft)	E*A (lb/ft)	v
Concrete	3.00E+06	3.13E+06	4.50E+08	1728	3.75E+07	144	4.50E+08	0.2
CZ101	2.90E+07	3.19E+07	4.59E+09	65.01	1.44E+07	6.08	1.94E+08	0.3

E = Young's Modulus

E* = Adj. Young's Modulus for Plain Strain

I = Moment of Inertia per foot of wall

A = Cross Sectional Area per foot of wall

v = 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.

Results

The gap depth was checked following IPET guidance by hand and the results for the highest water table were shallower than predicted by FLAC. In order to manually calculate the gap, the flood side ground elevation was used and the elevation of the gap tip for water at EL +8 ft was approximately EL -3.0 ft. The FLAC analysis had the gap extending to approximate EL -8.9 ft. It is believed that the discrepancy is due to the hand calculation not being able to consider the slope of the crown or the unbalanced soil load on either side of the wall. It should be noted that for even the shallower water depths, the hand calculation resulted in a gap to approximate EL-3.0 ft. The gap tip at EL -8.9 ft is 5.1 ft above the marsh/sand interface.

The maximum protected side ground displacement for the MLV at water level EL 8.0 ft was about 2.4 inches. The maximum developed crack depth was 12 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 Figures D-9 and D-10.

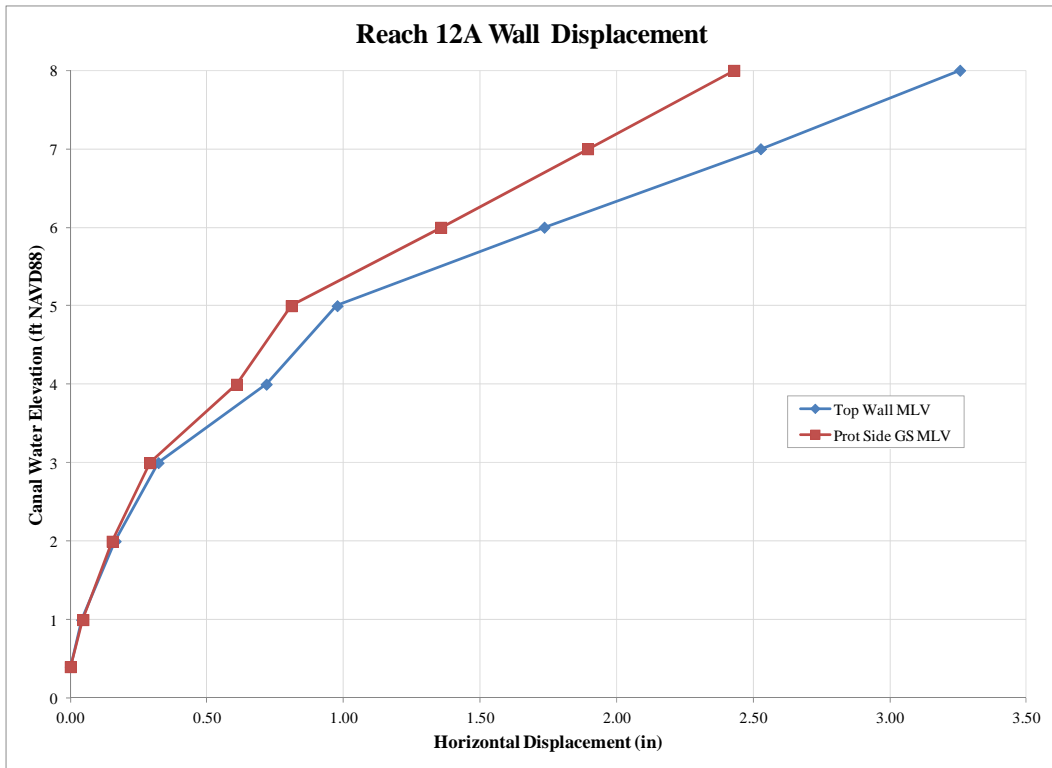


Figure D-9. FLAC computed I-wall displacement.

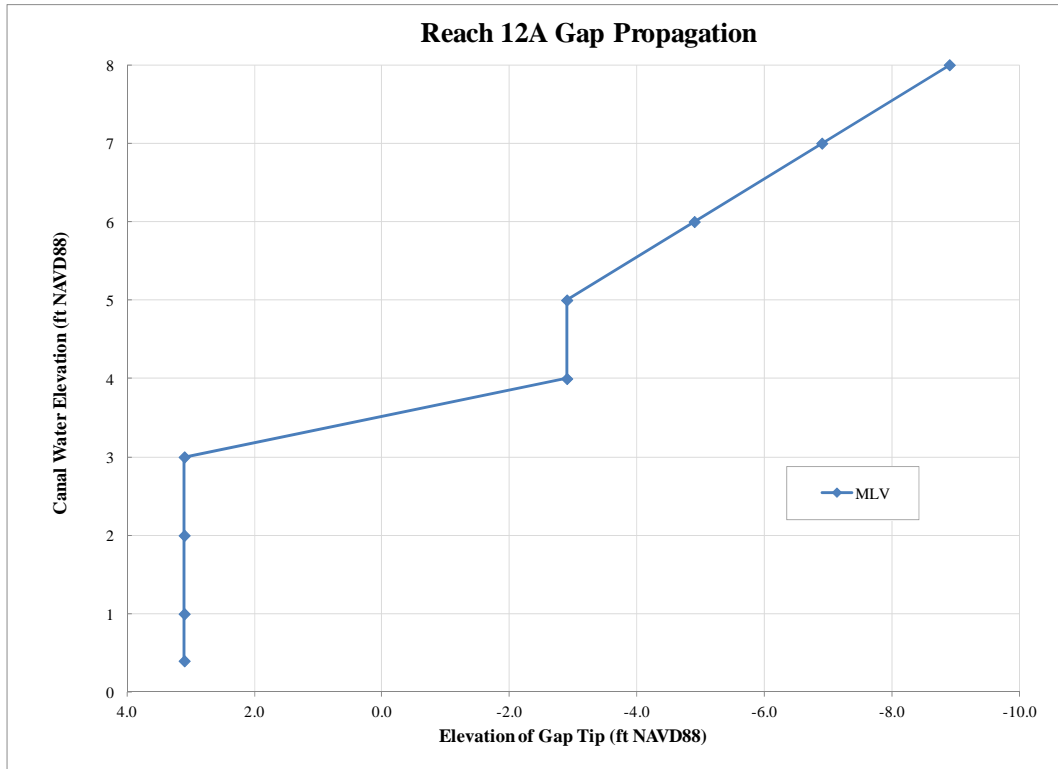


Figure D-10. FLAC computed gap propagation.

The automated $c-\phi$ reduction technique in FLAC was used for all factor of safety (FoS) calculations. Figure D-11 presents the computed factors of safety for differing canal water levels and Figures D-12 through D-17 show the shear strain increment (ssi) or rate (ssr) 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 D-10.

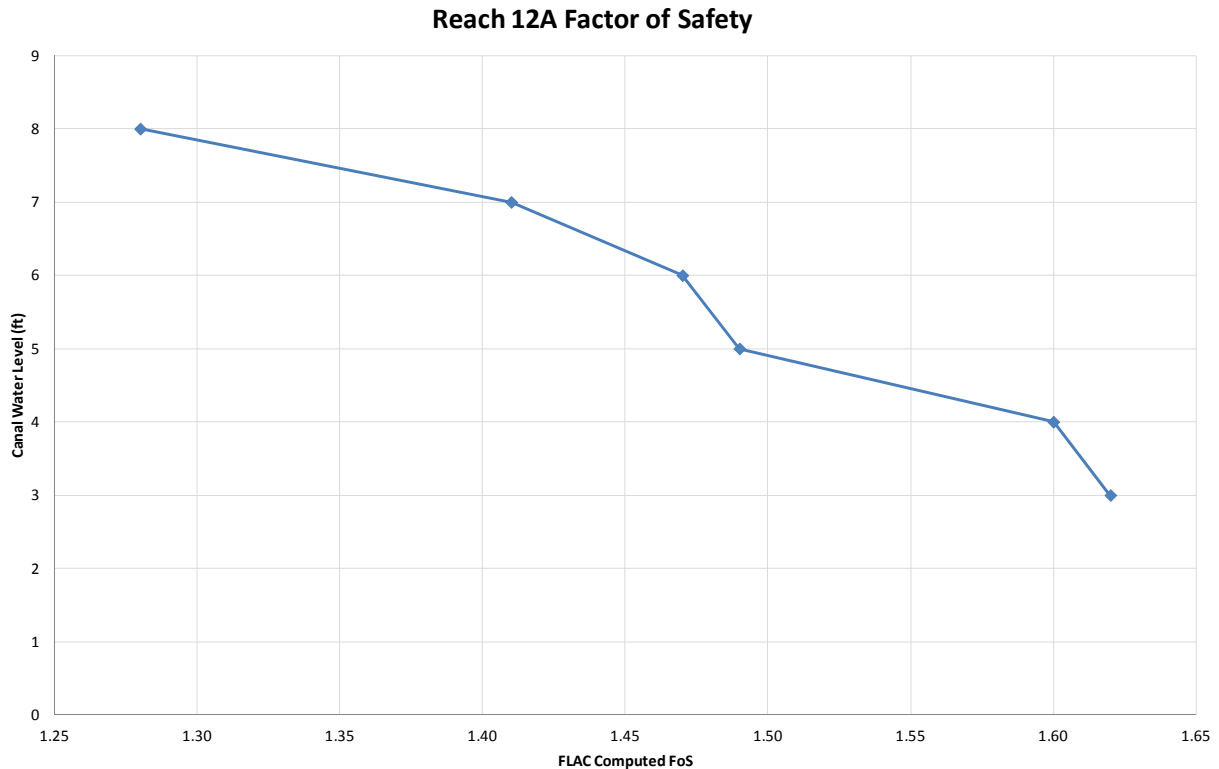


Figure D-11. FLAC computed factor of safety (automated $c-\phi$ reduction technique).

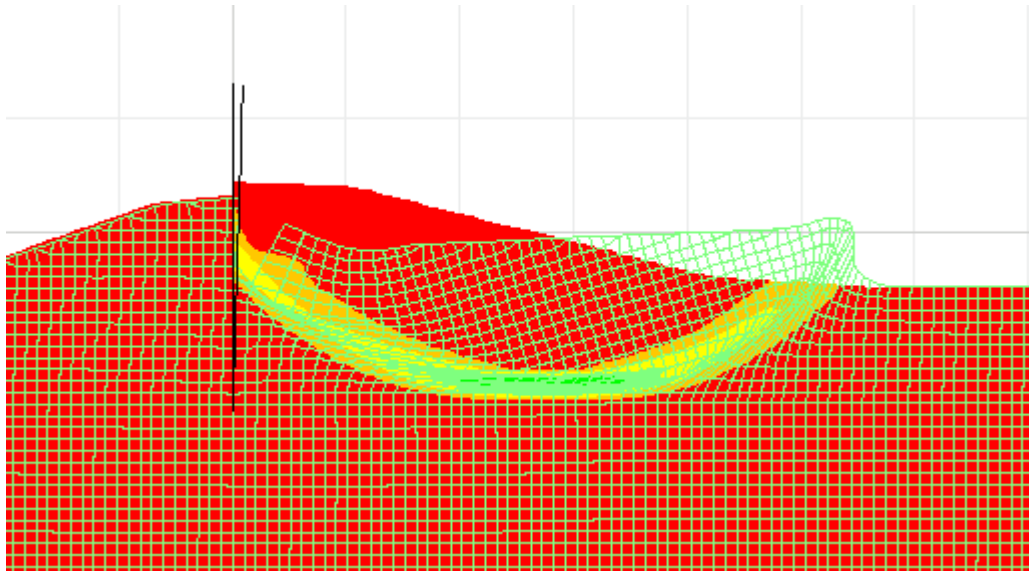


Figure D-12. Reach 12A WL+3 ft, FoS ssi and wall displacement magnified 5X .

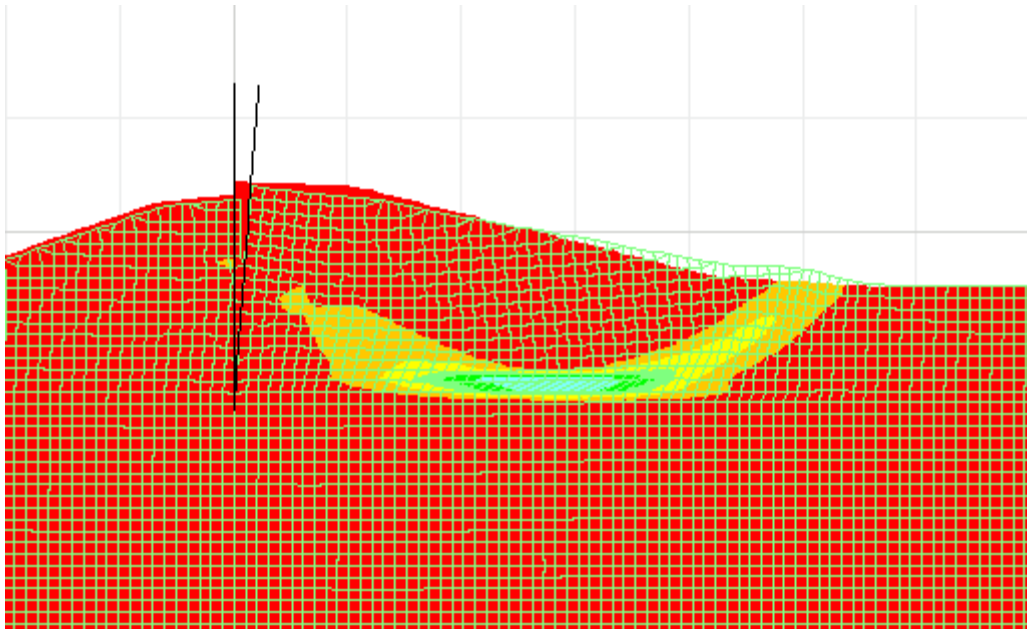


Figure D-13. Reach 12A WL+4 ft, FoS ssi and wall displacement magnified 5X.

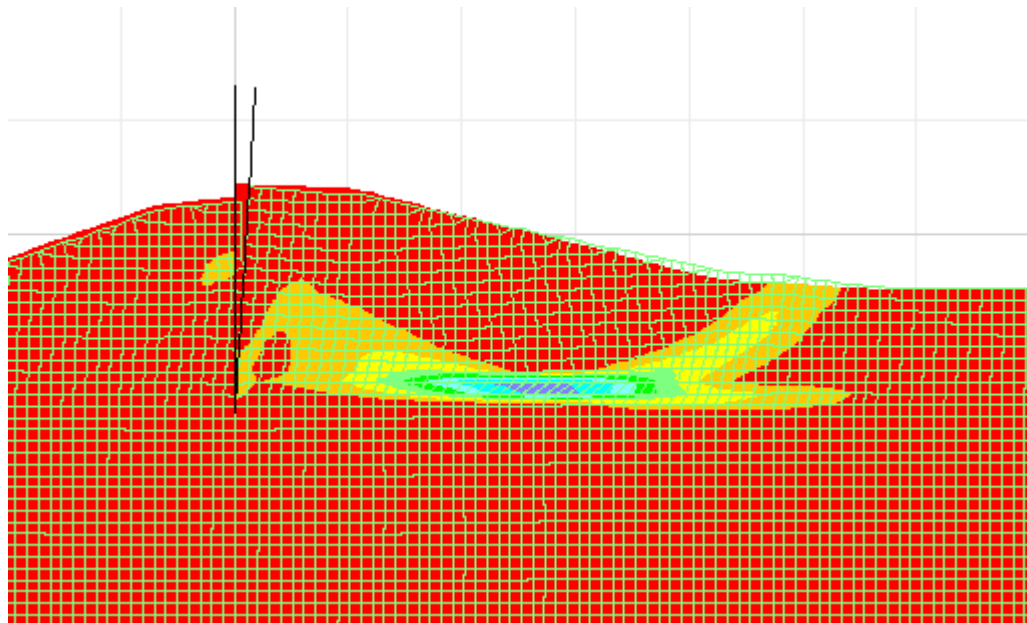


Figure D-14. Reach 12A WL+5 ft, FoS ssi and wall displacement magnified 5X.

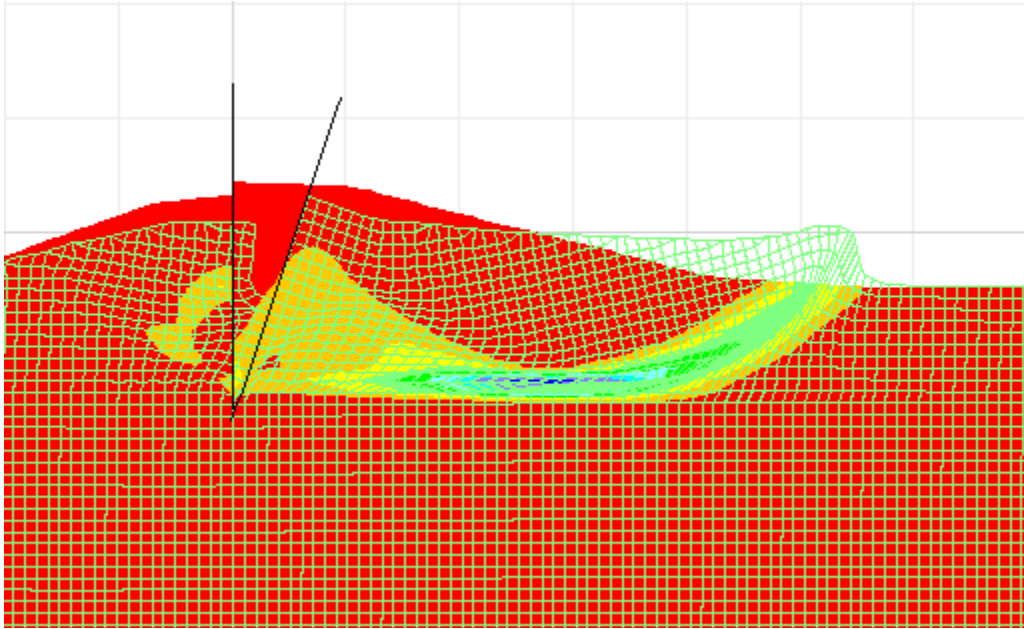


Figure D-15. Reach 12A WL+6 ft, FoS ssi and wall displacement magnified 5X.

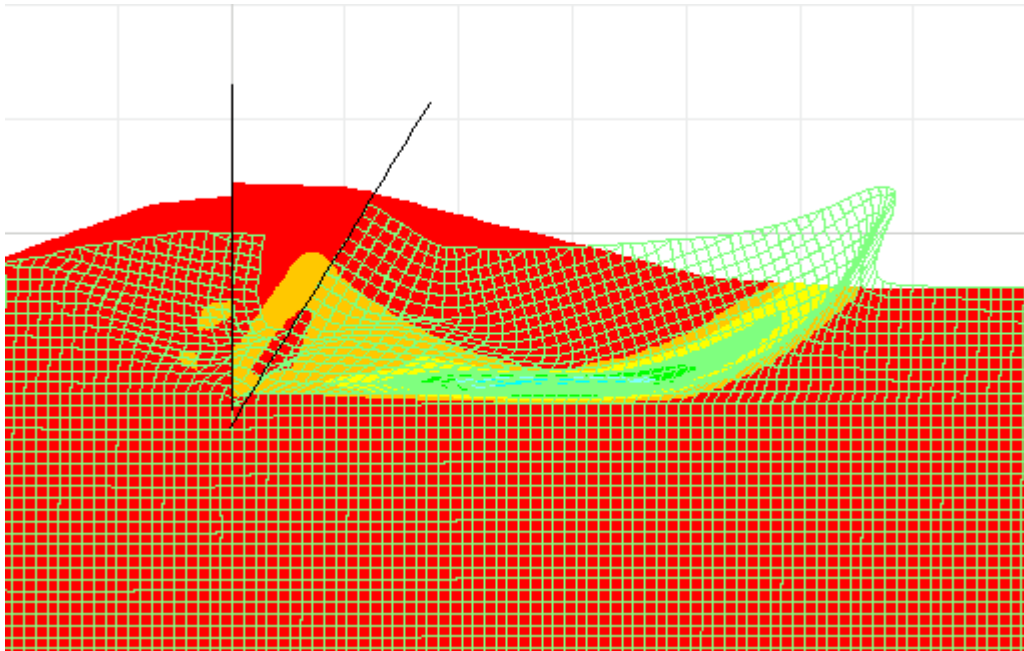


Figure D-16. Reach 12A WL+7 ft, FoS ssi and wall displacement magnified 5X.

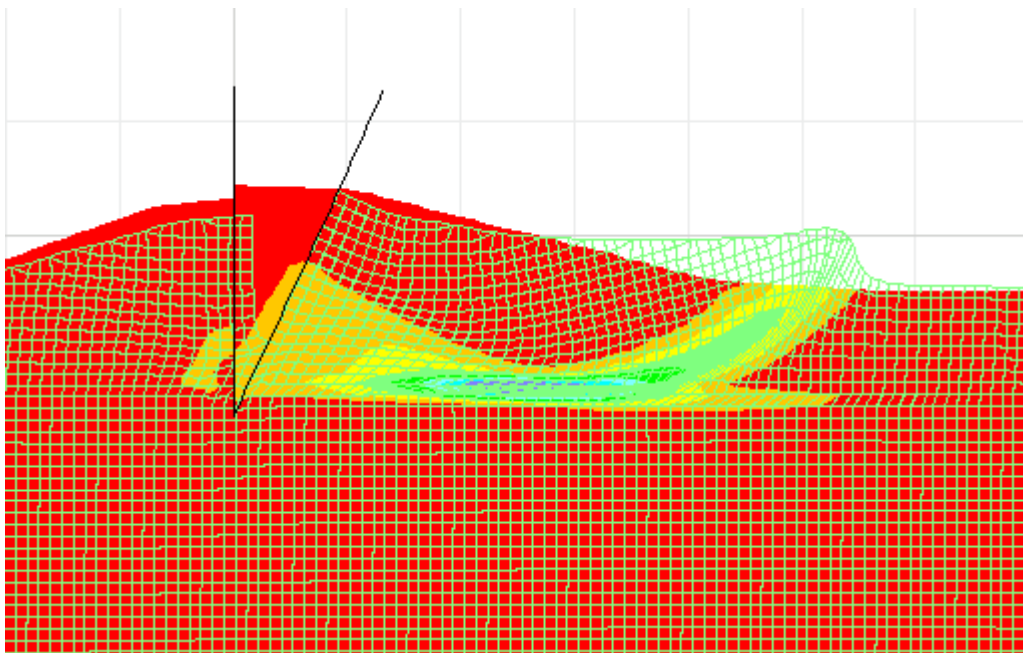


Figure D-17. Reach 12A WL+8 ft, FoS ssi and wall displacement magnified 10X.

Table D-10. Summary of FLAC FoS and Controlling Failure Mode Reach 12A.

Canal WL (ft)	FLACAuto FoS	Controlling Failure Mode*
3	1.62	Global Stability
4	1.60	Wall Rotation
5	1.49	Wall Rotation
6	1.47	Wall Rotation
7	1.41	Wall Rotation
8	1.28	Wall Rotation

*Determined by inspection of model displacement (i.e. wall rotating about a point, displacing with little wall rotation or both).

Reach 16

Introduction

The design section includes: clay embankment (EL +3.6 ft), underlain by a shallow marsh deposit (EL -4 ft to EL -12 ft). The shallow marsh is underlain by a silty beach sand stratum (EL -12 ft to about EL -22 ft) atop a clean beach sand stratum (EL -22 ft to EL -46 ft) which mantles a lower clay deposit which extends at least until the bottom of the model (EL -69 ft). The clay embankment material was assigned a unit weight of 118 pcf with cohesion of 1000 psf in the upper part of the levee and 300 psf in the lower. The elevation of the flood side ground line at the wall face is approximately EL 2.9 ft resulting in 0.7 ft difference in soil elevation across the wall. The existing I-wall has a top elevation of 12.9 ft consisting of a concrete cap and CZ101 sheet pile to tip elevation of -17.4 ft. Figures D-18 and D-19 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 top of the upper marsh strata was set at EL -4 ft, as it is shown on the flood side of the I-Wall in Figure D-18, without sloping to the levee toe to best capture the wall displacement behavior.

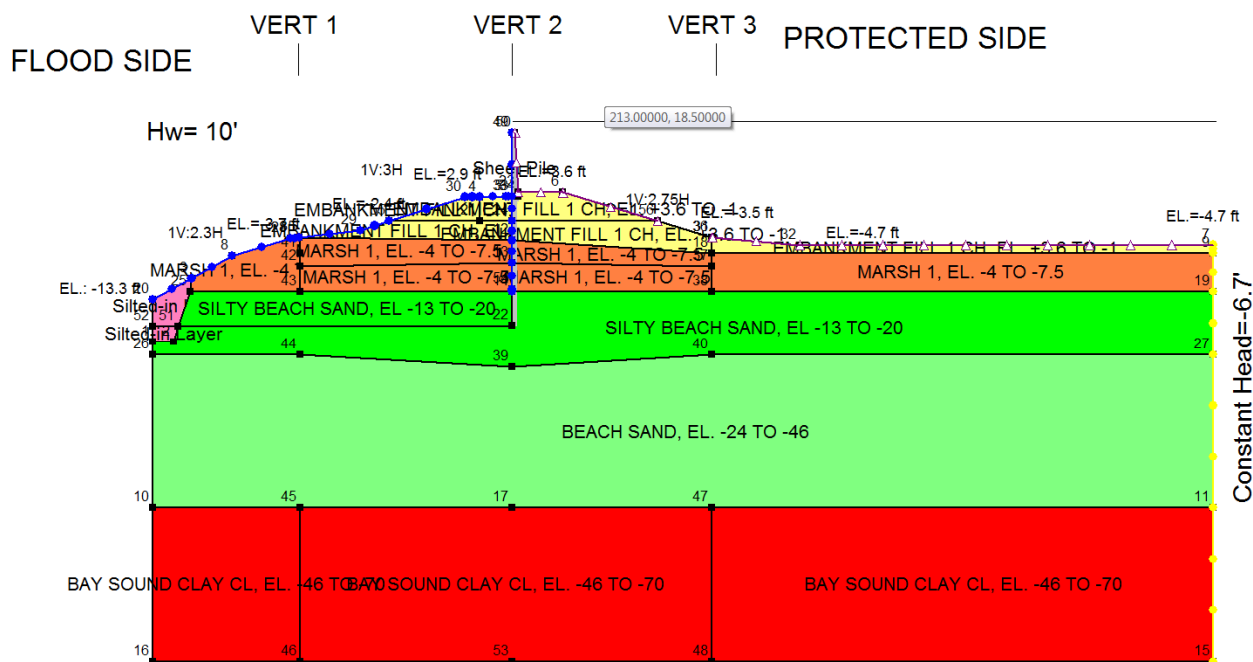


Figure D-18. Geo-Studio model for London Canal Reach 16.

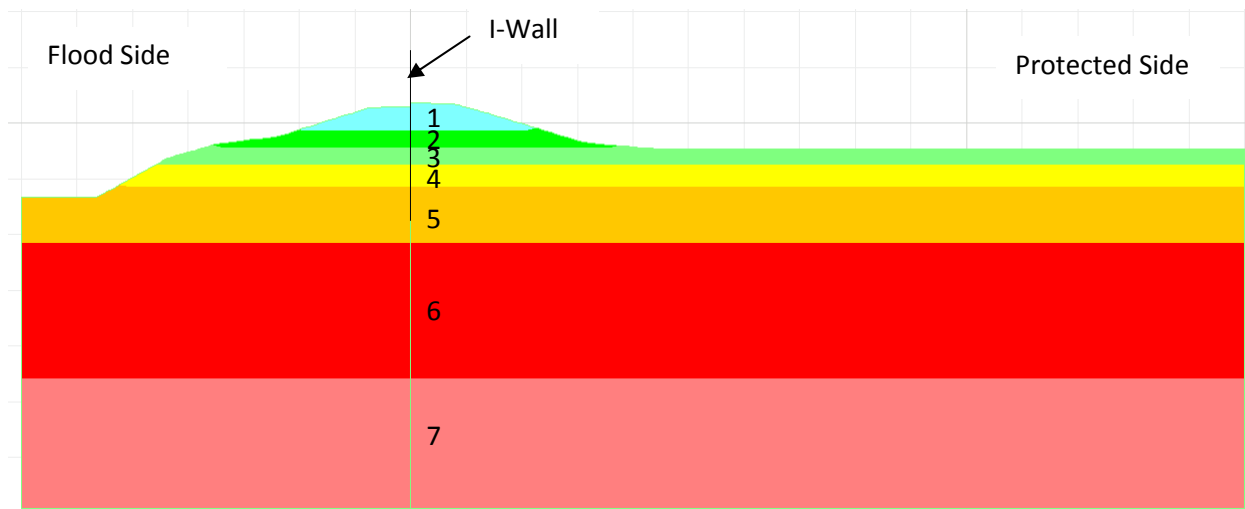


Figure D-19. FLAC Model for London Avenue Canal Reach 16

Foundation Parameters

The FLAC analyses are based on simple Mohr-Coulomb constitutive models (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 is the Seep/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 Tables D-11 thru D-14. 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 are 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 London 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 total head at the marsh sand interface was then used as the basis for selecting piezometric lines to represent the head in the granular beach sand strata at each corresponding water level in the FLAC model. This piezometric line only affected the shear strength of the sand; modulus values in the sand were held constant in the FLAC model. Piezometric data is shown in Table D-15.

Table D-11. Summary of Centerline Soil Parameters Reach 16

Material	Strata top elevation (NAVD88)	Strata bottom elevation (NAVD88)	unit wt. (pcf)	unit wt/g (slugs/cu.ft.)	Su (psf)	ϕ' (deg)
1 - Levee Fill 1	3.6	-1.0	118	3.665	1000	0
2 - Fill 2	-1.0	-4.0	90	2.795	300	0
3 - Marsh 1	-4.0	-7.5	80	2.484	450	0
4 - Marsh 2	-7.5	-12.0	97	3.012	250	0
5 - Silty Sand (SM)	-12.0	-22.0	122	3.789	0	30
6 - Beach Sand (SP)	-22.0	-46.0	122	3.789	0	30
7 - Bay Sound Clay*	-46.0	-70.0	104	3.230	650	0

*Denotes Su at Top of Bay Sound Clay, Delta Su = 9. psf/ft

Table D-12. Centerline Most Likely Value Modulus Reach 16

Material	E/Su	E (psf)	Poisson	G (psf)	K (psf)	ko
1 - Levee Fill 1	158	1.58E+05	0.40	5.63E+04	2.63E+05	0.67
2 - Fill 2	200	6.00E+04	0.47	2.04E+04	3.33E+05	0.89
3 - Marsh 1	200	9.00E+04	0.47	3.06E+04	5.00E+05	0.89
4 - Marsh 2	200	5.00E+04	0.47	1.70E+04	2.78E+05	0.89
5 - Silty Sand (SM)	-	5.00E+05	0.33	2.50E+05	6.67E+05	0.50
6 - Beach Sand (SP)	-	7.32E+05	0.33	2.75E+05	7.32E+05	0.50
7 - Bay Sound Clay*	600	3.90E+05	0.495	1.30E+05	1.30E+07	0.98

Table D-13. Summary of Toe Soil Parameters Reach 16

Material	Strata top elevation (NAVD88)	Strata bottom elevation (NAVD88)	unit wt. (pcf)	unit wt/g (slugs/cu.ft.)	Su (psf)	ϕ' (deg)
1 - Levee Fill 1						
2 - Fill 2		-4.0	90	2.795	600	0
3 - Marsh 1	-4.0	-7.5	80	2.484	450	0
4 - Marsh 2	-7.5	-12.0	80	2.484	200	0
5 - Silty Sand (SM)	-7.5	-22.0	122	3.789	0	30

6 - Beach Sand (SP)	-22.0	-46.0	122	3.789	0	30
7 - Bay Sound Clay*	-46.0	-70.0	104	3.230	650	0

*Denotes Su at Top of Bay Sound Clay, Delta Su = 9. psf/ft

Table D-14. Toe Most Likely Value Modulus Reach 16

Material	<i>E/Su</i>	E (psf)	<i>Poisson</i>	G (psf)	K (psf)	ko
1 - Levee Fill 1						
2 - Fill 2	200	1.20E+05	0.47	4.08E+04	6.67E+05	0.89
3 - Marsh 1	200	9.00E+04	0.47	3.06E+04	5.00E+05	0.89
4 - Marsh 2	200	4.00E+04	0.47	1.36E+04	2.22E+05	0.89
5 - Silty Sand (SM)	-	5.00E+05	0.33	2.50E+05	6.67E+05	0.50
6 - Beach Sand (SP)	-	7.32E+05	0.33	2.75E+05	7.32E+05	0.50
7 - Bay Sound Clay*	600	3.90E+05	0.495	1.30E+05	1.30E+07	0.98

Table D-15. Piezometric Surface in Granular Material at Selected Coordinates Reach 16

x-coor (ft)	WL 0.4 (ft) Gap 0	WL1.0 (ft) Gap 0	WL2.0 (ft) Gap 0	WL3.0 (ft) Gap 5	WL4.0 (ft) Gap 5	WL5.0 (ft) Gap 6	WL6.0 (ft) Gap 6	WL7.0 (ft) Gap 8	WL8.0 (ft) Gap 8
130	-6.0	-5.9	-5.8	-5.7	-5.6	-5.5	-5.4	-5.3	-5.2
150	-6.0	-5.9	-5.8	-5.7	-5.6	-5.5	-5.4	-5.3	-5.2
170	-6.4	-6.4	-6.3	-6.3	-6.3	-6.2	-6.2	-6.1	-6.1
200	-6.5	-6.5	-6.5	-6.5	-6.4	-6.4	-6.4	-6.3	-6.2
200	-6.5	-6.5	-6.5	-6.5	-6.4	-6.4	-6.4	-6.3	-6.2
222	-6.6	-6.6	-6.6	-6.5	-6.5	-6.5	-6.5	-6.5	-6.4
245	-6.6	-6.6	-6.6	-6.6	-6.6	-6.6	-6.5	-6.5	-6.5
275	-6.7	-6.6	-6.6	-6.6	-6.6	-6.6	-6.6	-6.6	-6.6
290	-6.7	-6.7	-6.7	-6.7	-6.7	-6.7	-6.7	-6.6	-6.6
310	-6.7	-6.7	-6.7	-6.7	-6.7	-6.7	-6.7	-6.7	-6.7
350	-6.7	-6.7	-6.7	-6.7	-6.7	-6.7	-6.7	-6.7	-6.7

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 D-16.

Table D-16. Summary of Structural Parameters Reach 16

Member	E (psi)	E* (psi)	E* (psf)	I (in4/ft)	E*I (lbft2/ft)	A (in2/ft)	E*A (lb/ft)	ν
Concrete	3.00E+06	3.13E+06	4.50E+08	1728	3.75E+07	144	4.50E+08	0.2
CZ101	2.90E+07	3.19E+07	4.59E+09	65.01	1.44E+07	6.08	1.94E+08	0.3

E = Young's Modulus

E* = Adj. Young's Modulus for Plain Strain

I = Moment of Inertia per foot of wall

A = Cross Sectional Area per foot of wall

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.

Results

The maximum protected side ground displacement for the MLV at water level EL 8.0 ft was about 1.1 inches. The maximum developed crack depth was 10 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 Figures D-20 and D-21. The gap tip at EL -7.1 ft is 4.9 ft above the marsh/sand interface.

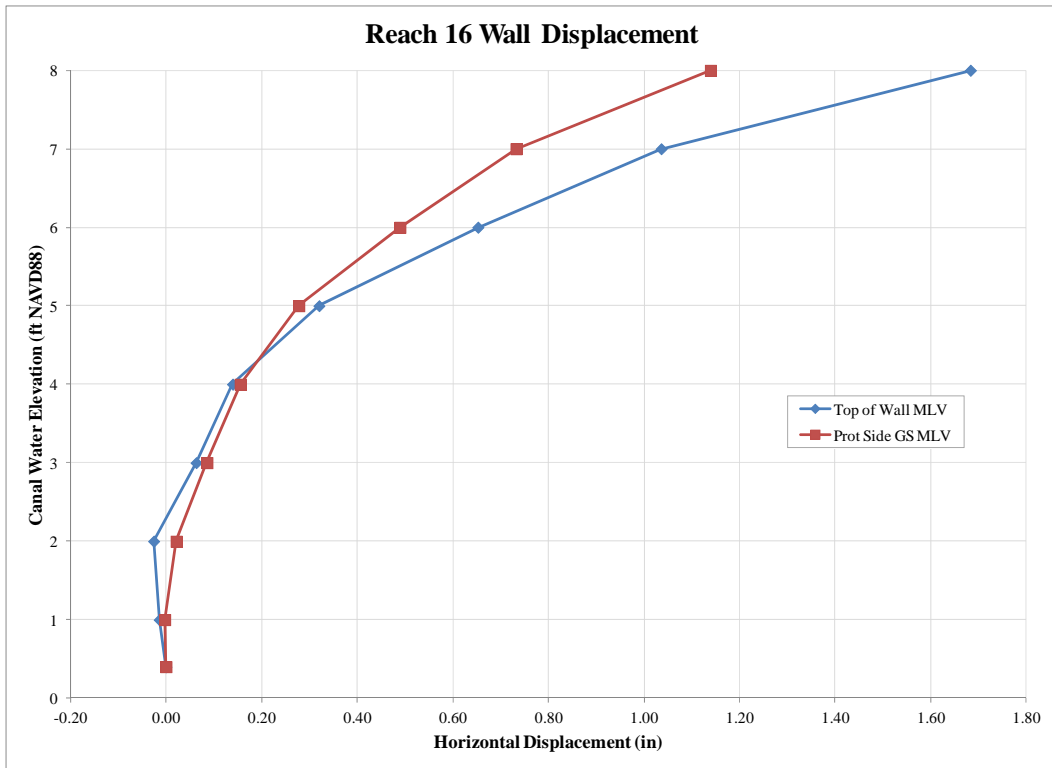


Figure D-20. FLAC computed I-wall displacement.

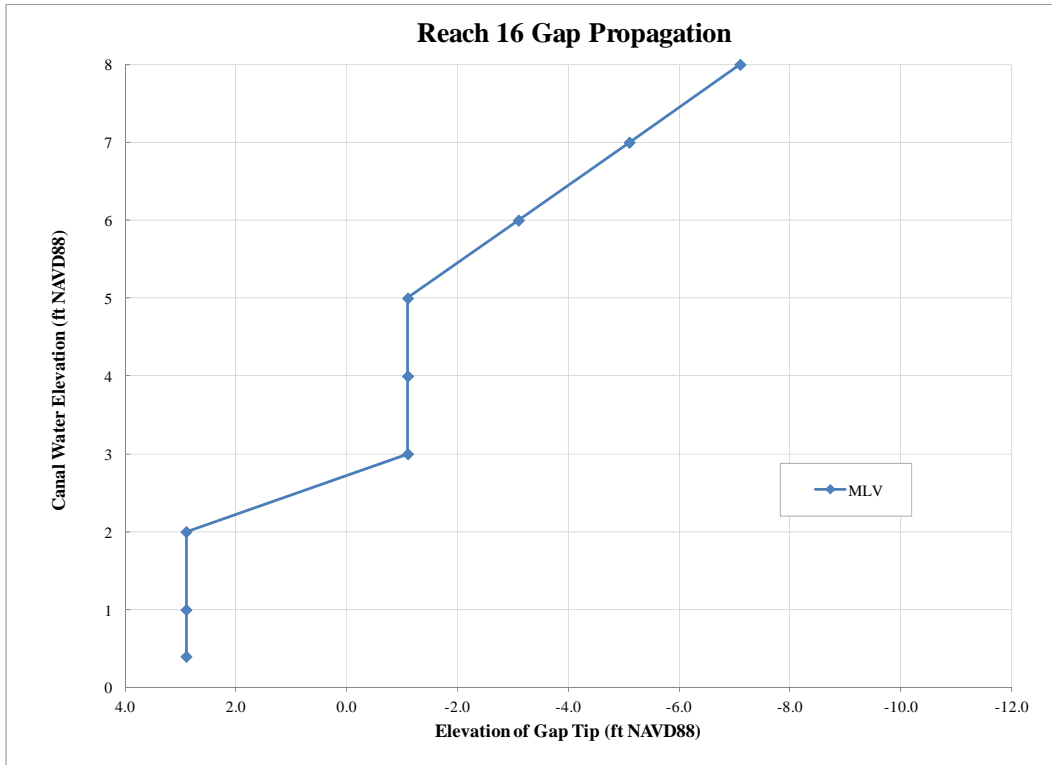


Figure D-21. FLAC computed gap propagation.

The automated $c-\phi$ reduction technique in FLAC was used for all factor of safety (FoS) calculations. Figure D-22 presents the computed factors of safety for differing canal water levels and Figures D-23 through D-28 show the shear strain increment (ssi) or rate (ssr) 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 D-17.

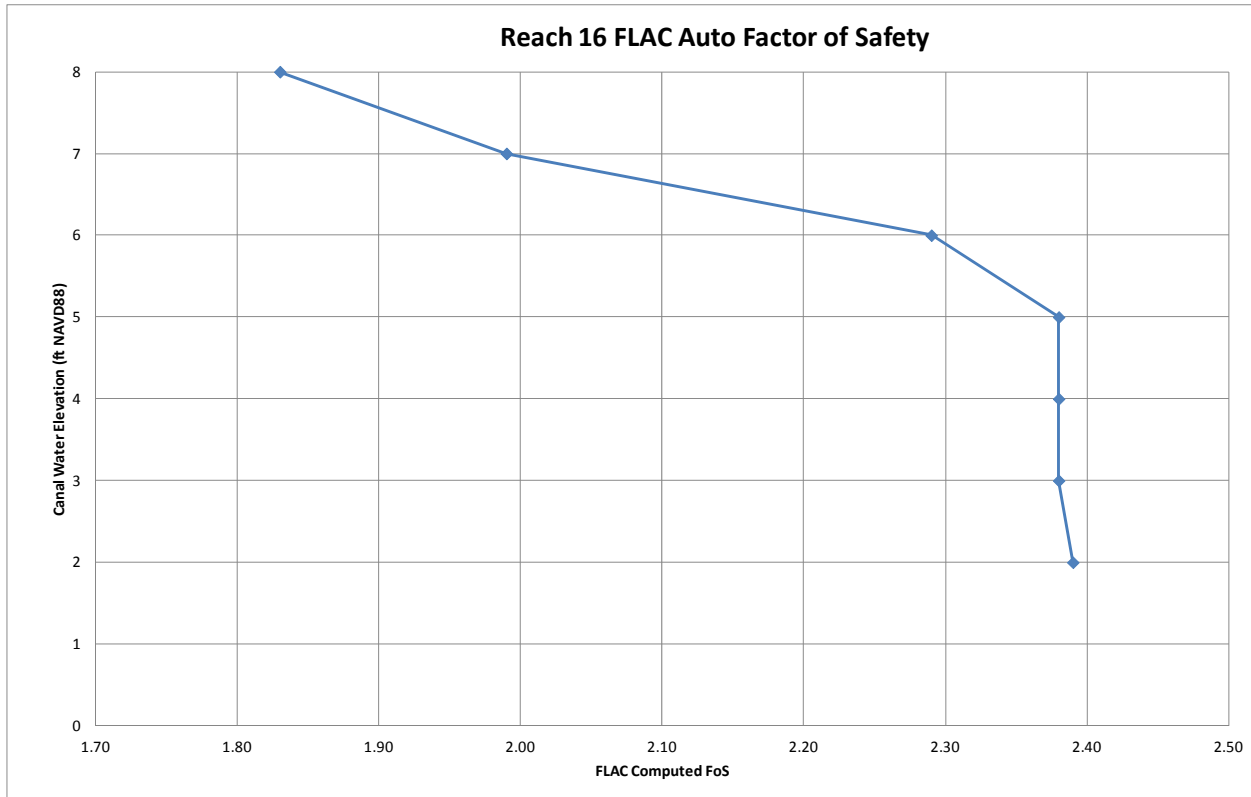


Figure D-22. FLAC computed factor of safety (automated $c-\phi$ reduction technique).

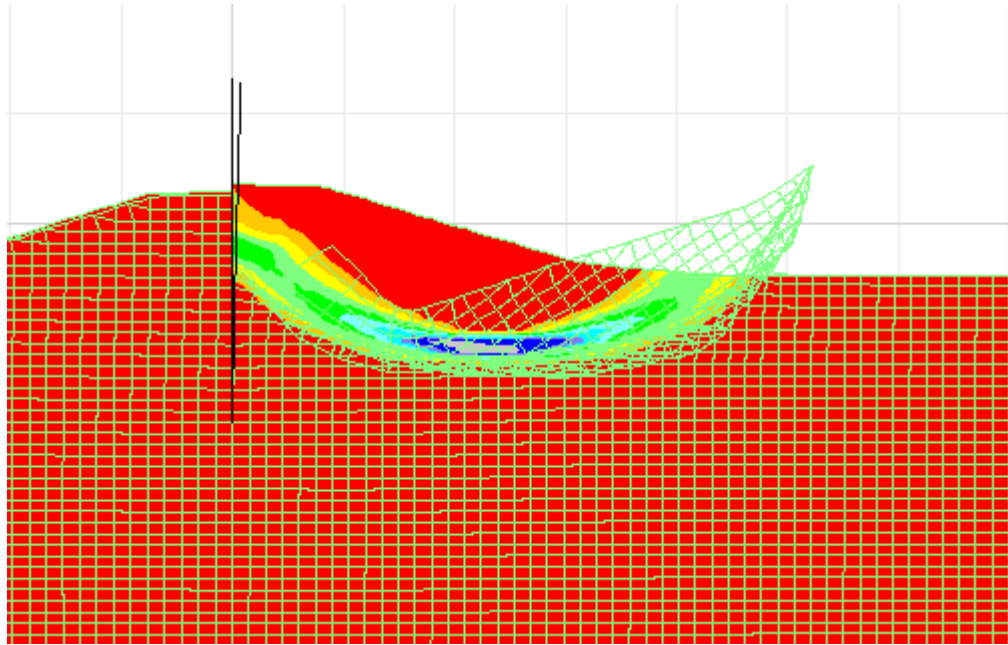


Figure D-23. Reach 16 WL+3 ft, FoS ssi and wall displacement magnified 5X.

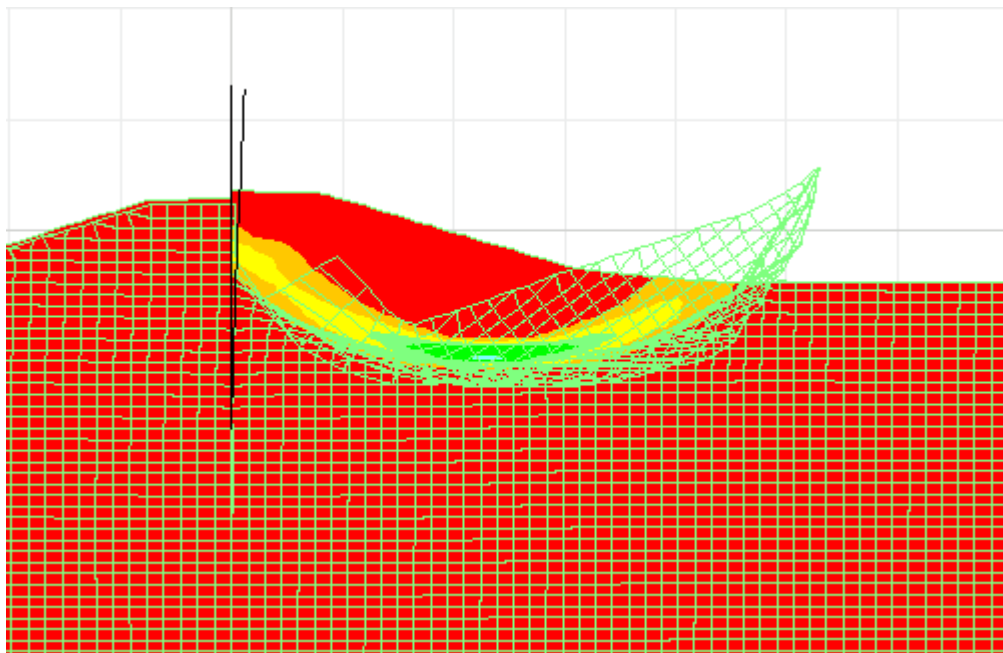


Figure D-24. Reach 16 WL+4 ft, FoS ssi and wall displacement magnified 5X.

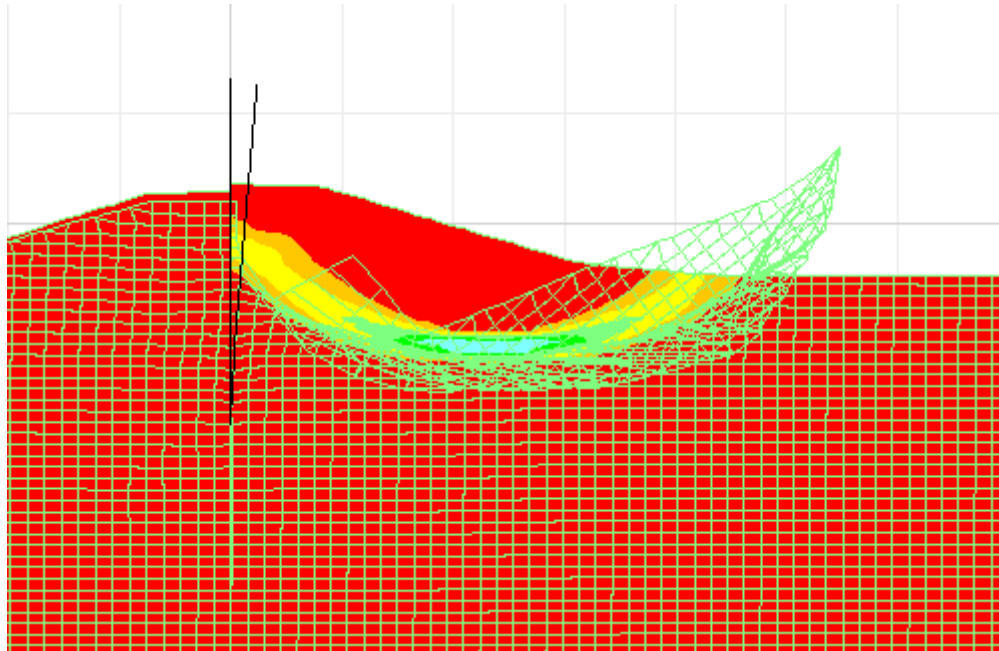


Figure D-25. Reach 16 WL+5 ft, FoS ssi and wall displacement magnified 5X.

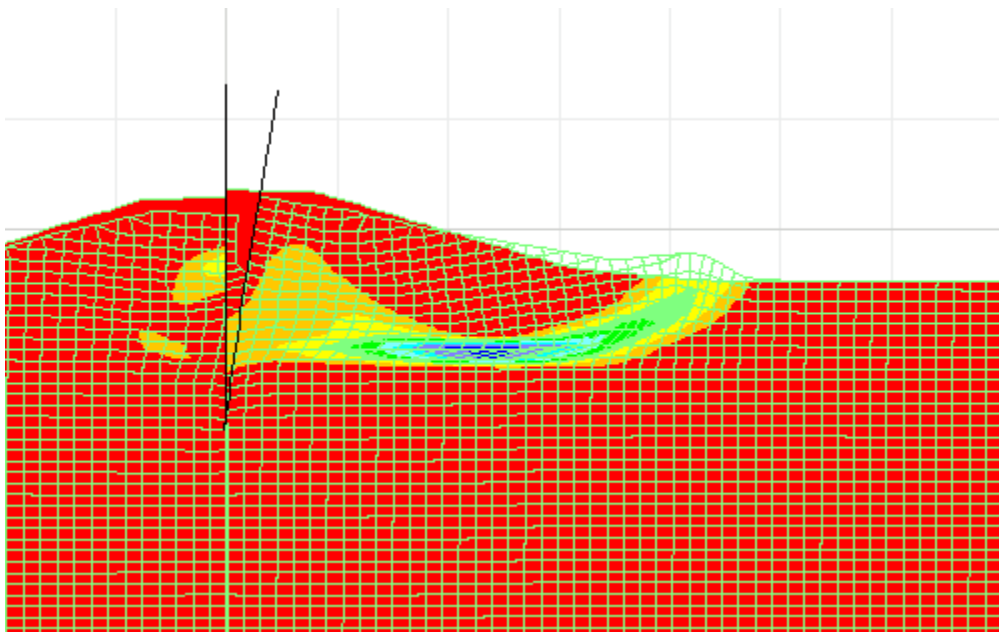


Figure D-26. Reach 16 WL+6 ft, FoS ssi and wall displacement magnified 5X.

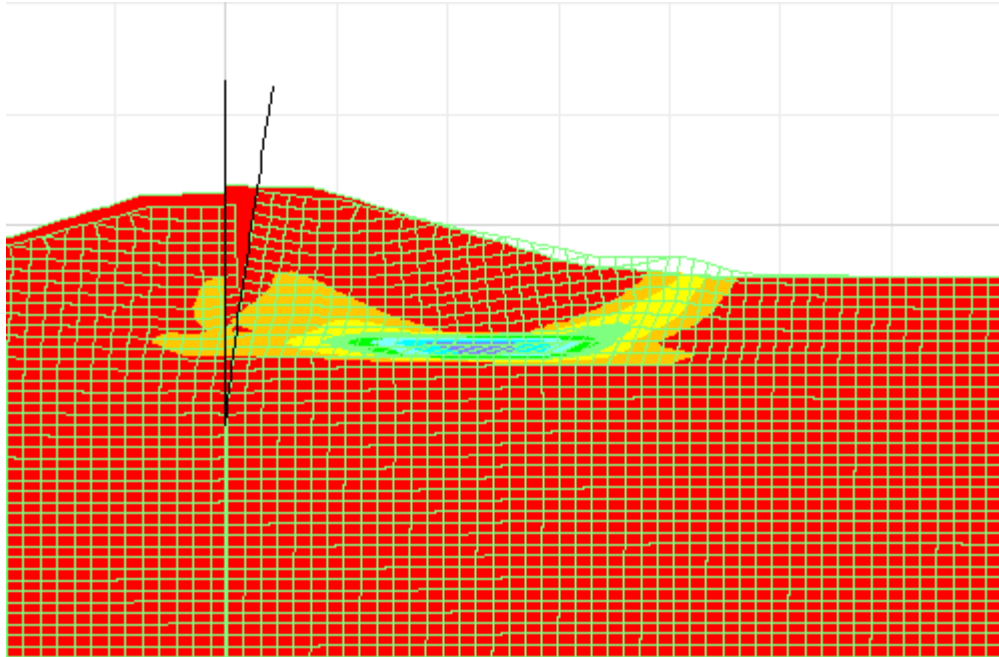


Figure D-27. Reach 16 WL+7 ft, FoS ssi and wall displacement magnified 10X.

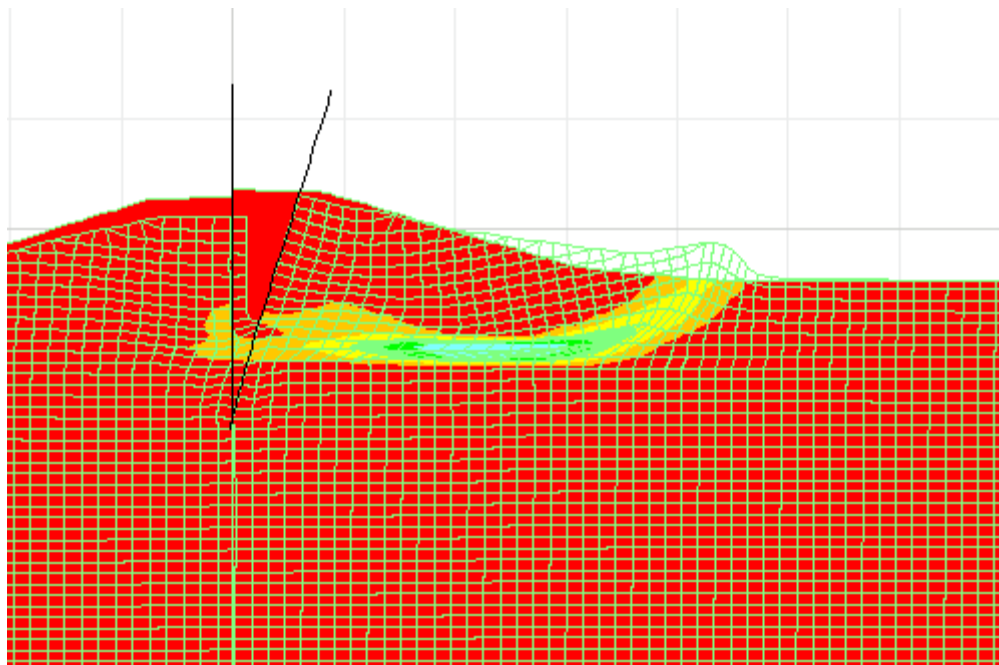


Figure D-28. Reach 16 WL+8 ft, FoS ssi and wall displacement magnified 10X.

Table D-17. Summary of FLAC FoS and Controlling Failure Mode Reach 16.

Canal WL (ft)	FLACAuto FoS	Controlling Failure Mode*
2	2.39	Global Stability
3	2.38	Global Stability
4	2.38	Global Stability
5	2.38	Global Stability
6	2.29	Wall Rotation
7	1.99	Wall Rotation
8	1.83	Wall Rotation

*Determined by inspection of model displacement (i.e. wall rotating about a point, displacing with little wall rotation or both).

Reach 20

Introduction

The design section includes: clay embankment (EL +3.4 ft), underlain by layers of clay and silt. The clay embankment material was assigned a unit weight of 118 pcf with cohesion of 650 psf. The levee and underlying clay materials will govern the wall response as the I-wall is contained within those strata. It follows then that the silt layers beneath the upper clay are expected to have little influence on wall rotation. In order to determine a modulus for the silt layers that exhibit cohesion and friction strength properties, an undrained shear strength (S_u) was assigned to the silt layers based on existing effective vertical stress conditions beneath the levee and at the levee toe. An E/S_u ratio was then selected and Young's modulus was determined based on the calculated S_u values. The elevation of the flood side ground line at the wall face is approximately EL 6.0 ft resulting in 2.6 ft difference in soil elevation across the wall. The existing I-wall has a top elevation of 12.9 ft consisting of a concrete cap and PZ 22 sheet pile to tip elevation of -17.6 ft. Figures D-29 and D-30 show the Geo-Studio and FLAC model cross sections. The FLAC model was terminated at EL -54 ft, the top of the silty sand layer in Figure D-29 as strata below this elevation would not impact wall response or global stability.

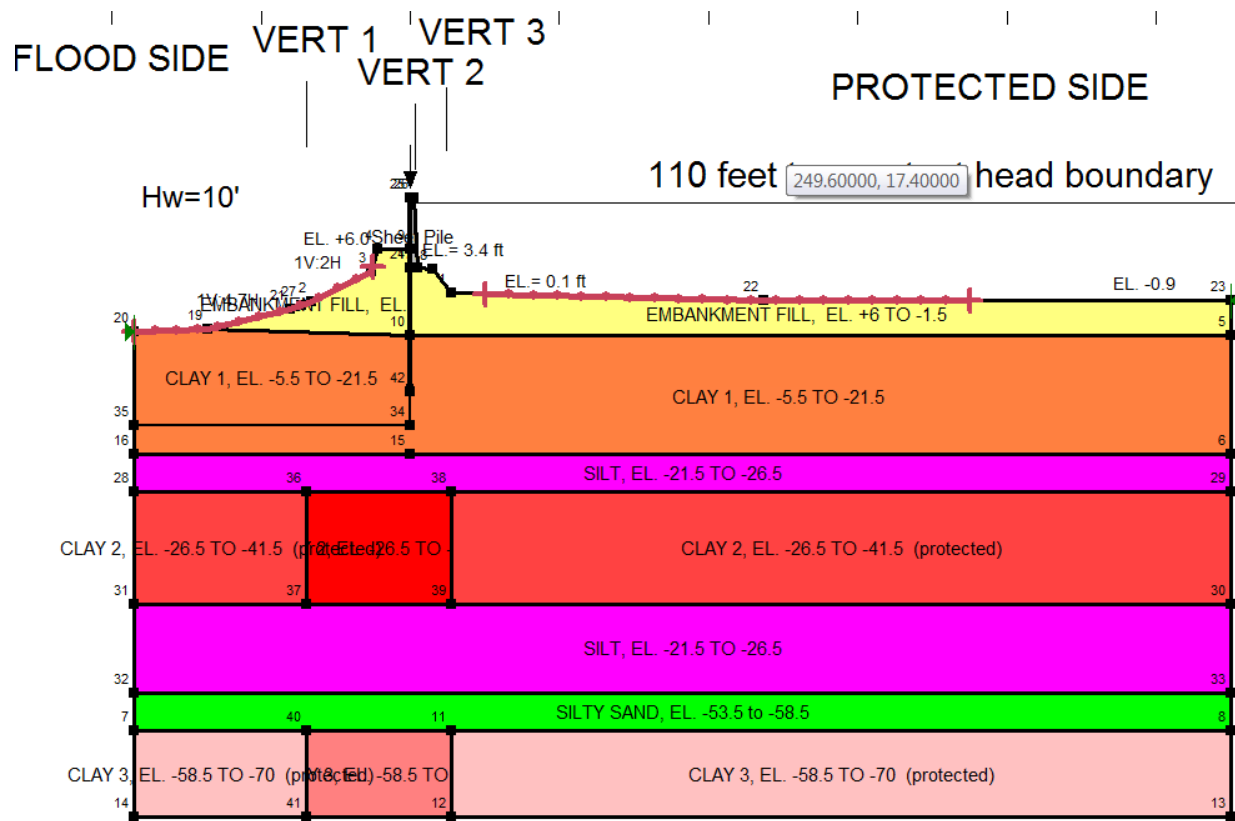


Figure D-29. Geo-Studio model for London Canal Reach 20.

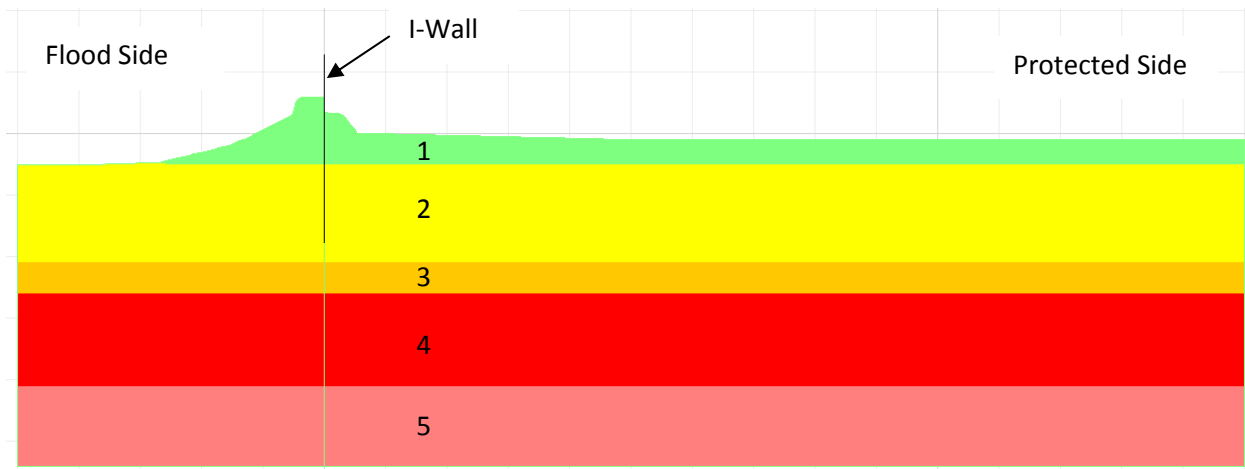


Figure D-30. FLAC Model for London Avenue Canal Reach 20

Foundation Parameters

The FLAC analyses are based on simple Mohr-Coulomb constitutive models (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 is the Seep/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 Tables D-18 thru D-21. 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 except for the silt material where E/Su was based on judgment. 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 are determined by multiplying the G/Su ratio for a given soil by its undrained shear strength. Young's Modulus for the levee was 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 Reach 20 of the London Avenue Canal the foundation materials are assigned undrained shear strengths based on total stresses so calculation of a piezometric surface for granular layers was not required. 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.

Table D-18. Summary of Centerline Soil Parameters Reach 20

Material	Strata top elevation (NAVD88)	Strata bottom elevation (NAVD88)	unit wt. (pcf)	unit wt/g (slugs/cu.ft.)	Su (psf)	ϕ' (deg)
1 - Levee	6.0	-5.5	115	3.571	650	0
2 - Clay 1	-5.5	-21.5	107	3.323	470	0
3 - Silt 1**	-21.5	-26.5	117	3.634	600	0
4 - Clay 2*	-26.5	-41.5	101	3.137	470	0
5 - Silt 2 ***	-41.5	-53.5	117	3.634	890	0

*Denotes Su at Top of Bay Sound Clay, Delta Su = 10. psf/ft

** Based on $S_u = 200 + 1524 \cdot \tan 15^\circ$. (estimated at center of layer)

*** Based on $S_u = 200 + 2567 \cdot \tan 15^\circ$.

Table D-19. Centerline Most Likely Value Modulus Reach 20

Material	E/S_u	E (psf)	ν	G (psf)	K (psf)	k_o
1 - Levee*	350	1.58E+05	0.40	5.63E+04	2.63E+05	0.67
2 - Clay 1	300	1.41E+05	0.50	4.72E+04	4.70E+06	0.98
3 - Silt 1	300	1.80E+05	0.47	6.12E+04	1.00E+06	0.89
4 - Clay 2	325	1.53E+05	0.50	5.11E+04	5.09E+06	0.98
5 - Silt 2	300	2.67E+05	0.47	9.08E+04	1.48E+06	0.89

*Used E directly from the London Load Test FLAC model (ReCal 9PP)

Table D-20. Summary of Toe Soil Parameters Reach 20

Material	Strata top elevation (NAVD88)	Strata bottom elevation (NAVD88)	unit wt. (pcf)	unit wt/g (slugs/cu.ft.)	Su (psf)	ϕ' (deg)
1 - Levee						
2 - Clay 1	-5.5	-21.5	107	3.323	445	0
3 - Silt 1**	-21.5	-26.5	117	3.634	500	0
4 - Clay 2*	-26.5	-41.5	101	3.137	280	0
5 - Silt 2 ***	-41.5	-53.5	117	3.634	780	0

*Denotes Su at Top of Bay Sound Clay, Delta Su = 10.4 psf/ft

** Based on $S_u = 200 + 1144 \cdot \tan 15^\circ$. (estimated at center of layer)

*** Based on $S_u = 200 + 2187 \cdot \tan 15^\circ$.

Table D-21. Toe Most Likely Value Modulus Reach 20

Material	E/Su	E (psf)	ν	G (psf)	K (psf)	k_o
1 - Levee						
2 - Clay 1	300	1.34E+05	0.50	4.46E+04	4.45E+06	0.98
3 - Silt 1	300	1.50E+05	0.47	5.10E+04	8.33E+05	0.89
4 - Clay 2	325	9.10E+04	0.50	3.04E+04	3.03E+06	0.98
5 - Silt 2	300	2.34E+05	0.47	7.96E+04	1.30E+06	0.89

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 D-16.

Table D-22. Summary of Structural Parameters Reach 20

Member	E (psi)	E* (psi)	E* (psf)	I (in4/ft)	E*I (lbft2/ft)	A (in2/ft)	E*A (lb/ft)	ν
Concrete	3.00E+06	3.13E+06	4.50E+08	1728	3.75E+07	144	4.50E+08	0.2
PZ22	2.90E+07	3.19E+07	4.59E+09	84.4	1.87E+07	6.47	2.06E+08	0.3

E = Young's Modulus

E* = Adj. Young's Modulus for Plain Strain

I = Moment of Inertia per foot of wall

A = Cross Sectional Area per foot of wall

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.

Results

The maximum protected side ground displacement for the MLV at water level EL 9.0 ft was about 1.6 inches. The maximum developed crack depth was 19 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 Figures D-31 and D-32.

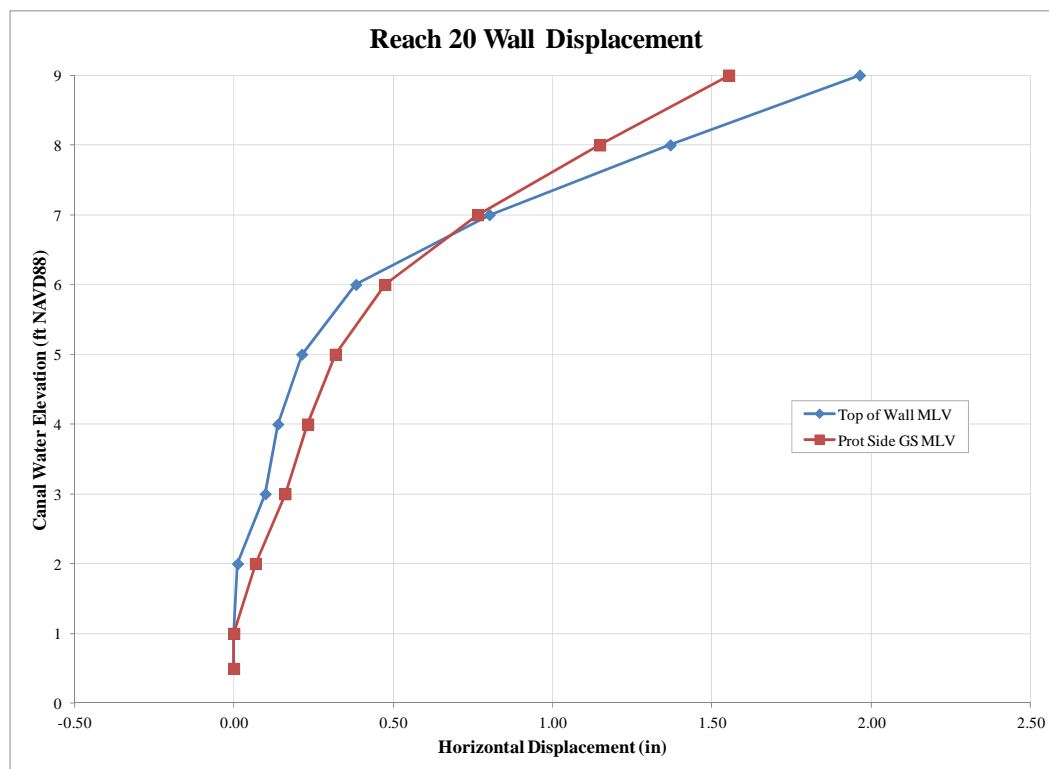


Figure D-31. FLAC computed I-wall displacement.

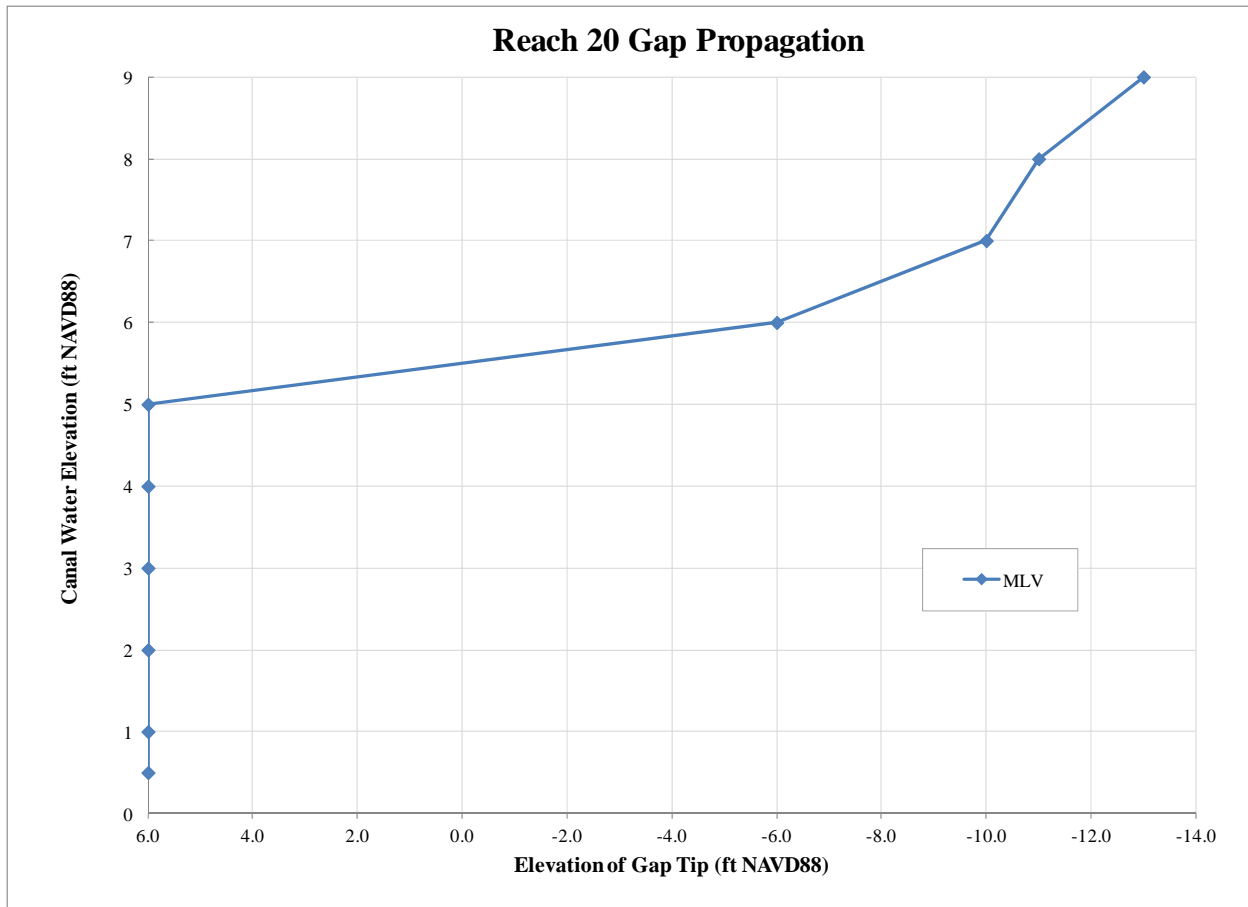


Figure D-32. FLAC computed gap propagation.

The automated $c-\phi$ reduction technique in FLAC was used for all factor of safety (FoS) calculations. Figure D-33 presents the computed factors of safety for differing canal water levels and Figures D-34 through D-41 show the shear strain increment (ssi) or rate (ssr) 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 D-23.

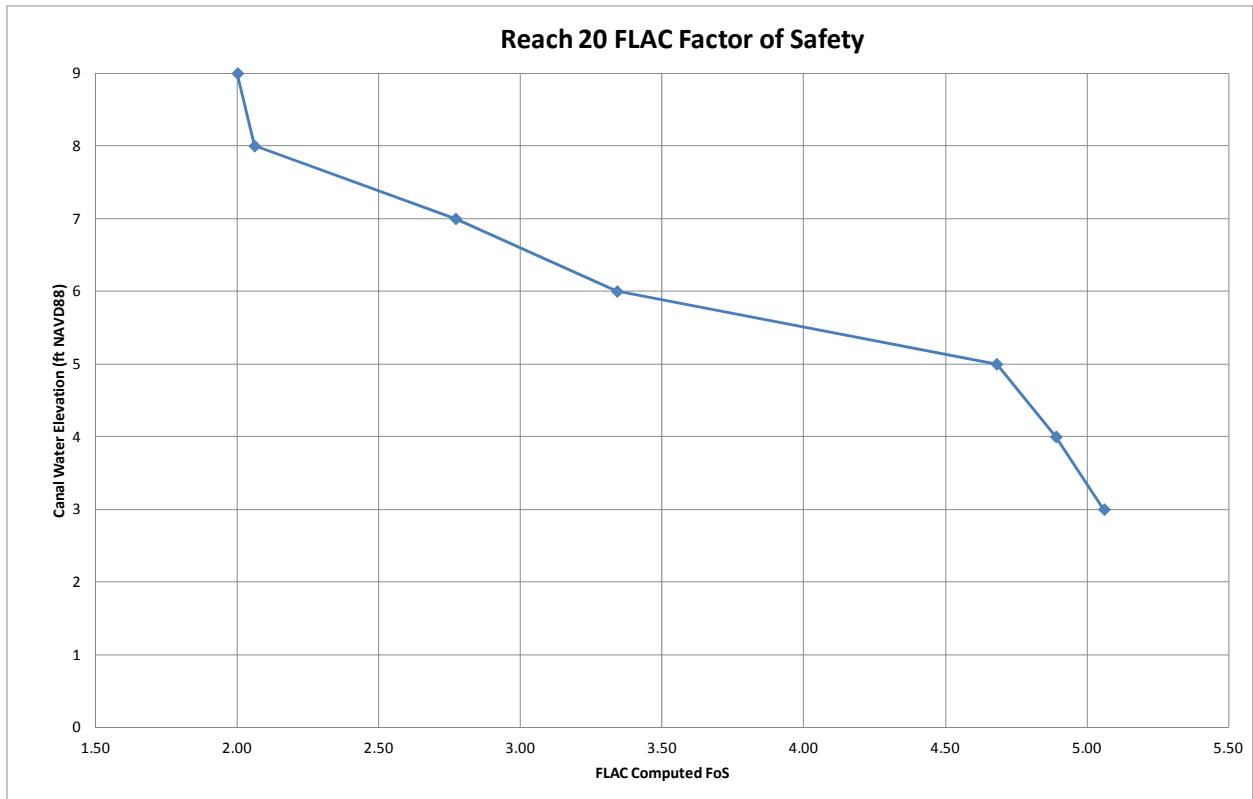


Figure D-33. FLAC computed factor of safety (automated c - ϕ reduction technique).

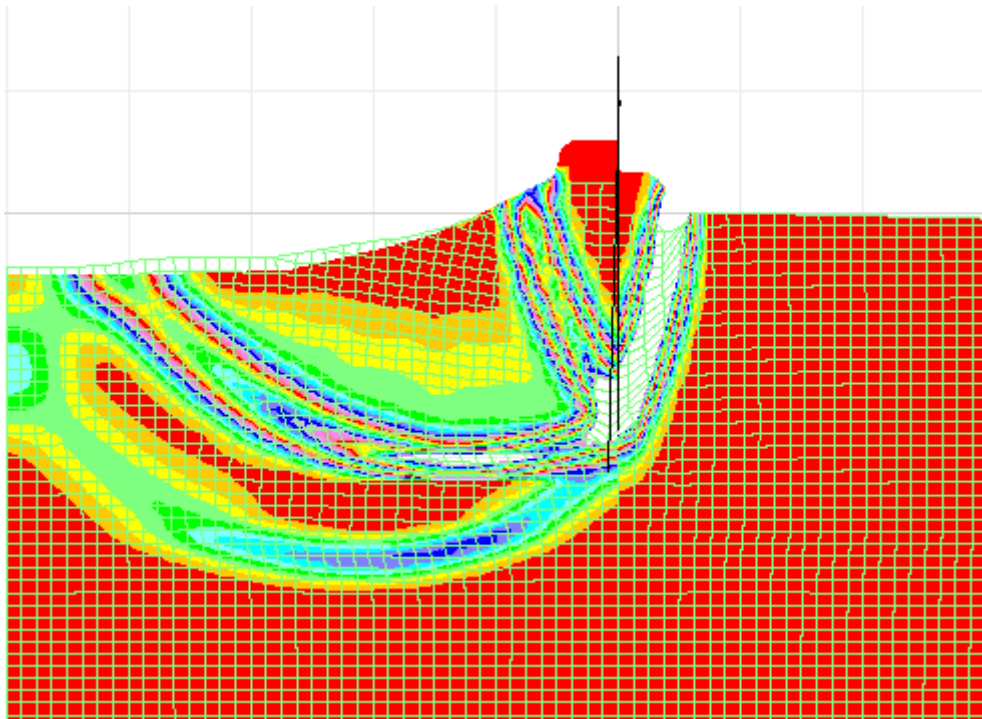


Figure D-33. Reach 20 WL+1 ft, FoS ssr and wall displacement magnified 5X.

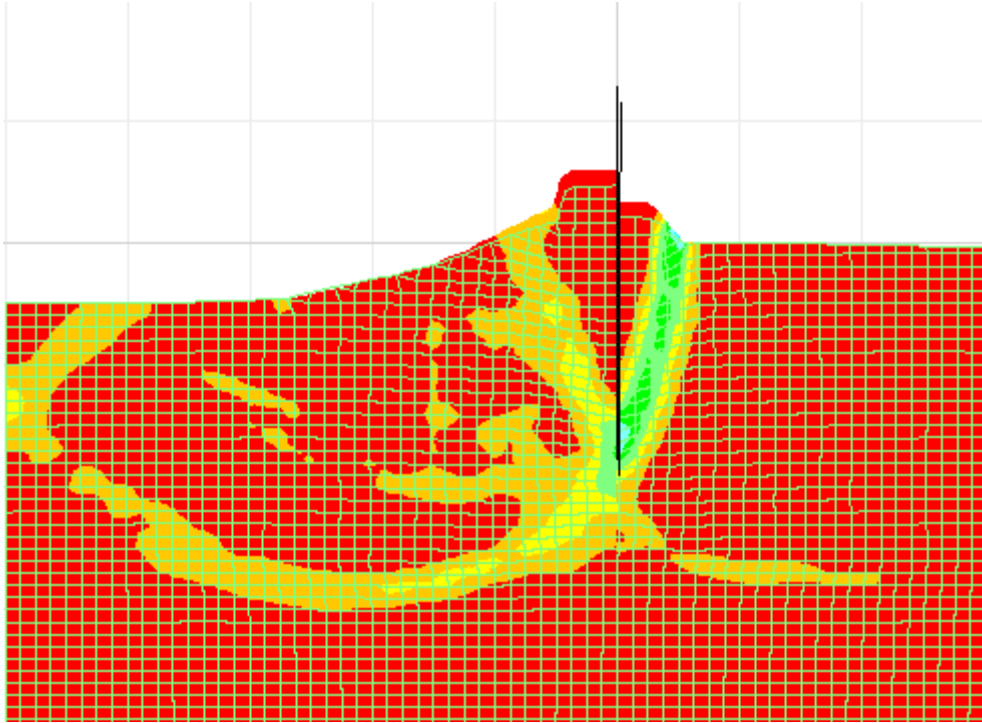


Figure D-34. Reach 20 WL+2 ft, FoS ssr and wall displacement magnified 5X.

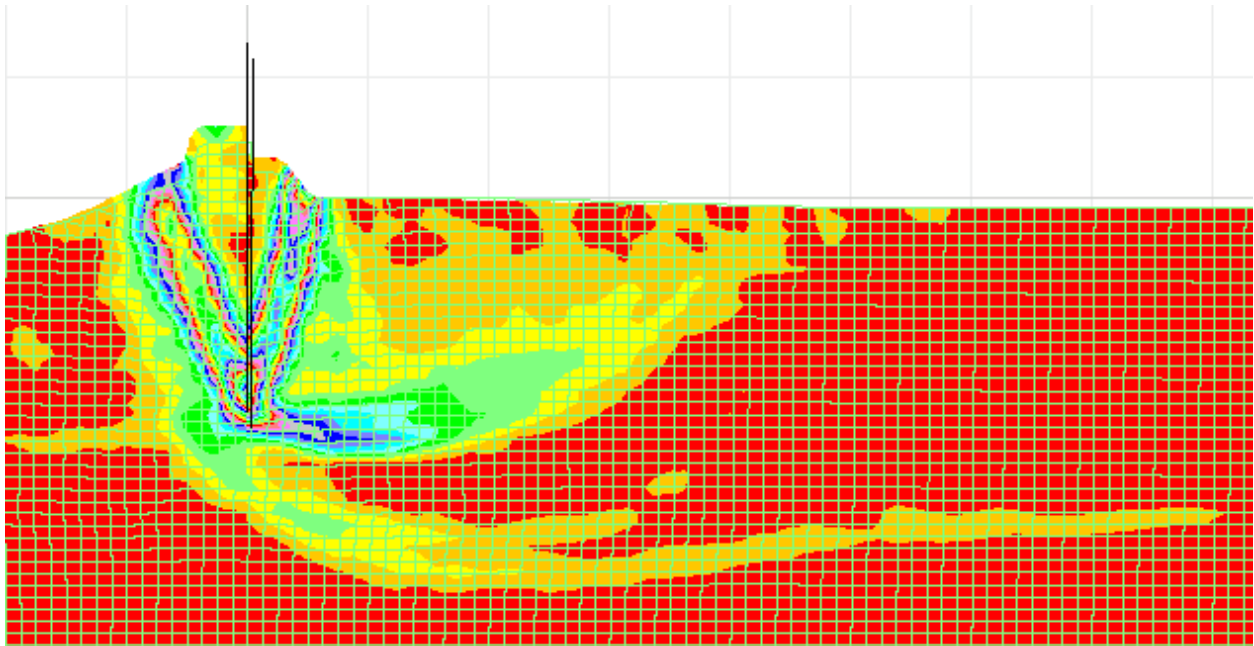


Figure D-35. Reach 20 WL+3 ft, FoS ssr and wall displacement magnified 5X.

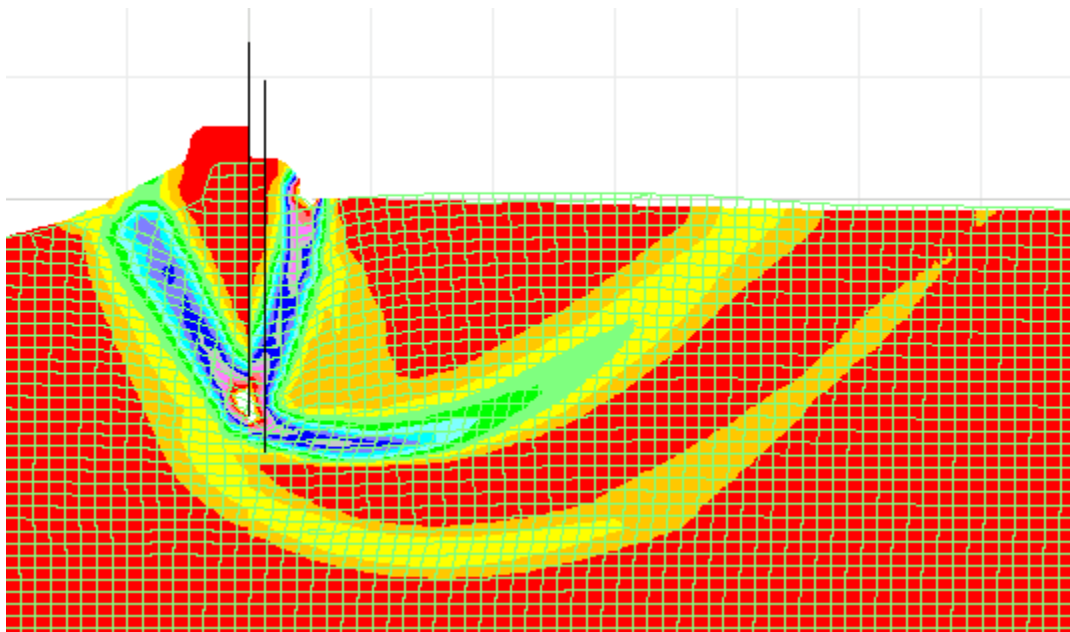


Figure D-36. Reach 20 WL+4 ft, FoS ssr and wall displacement magnified 5X.

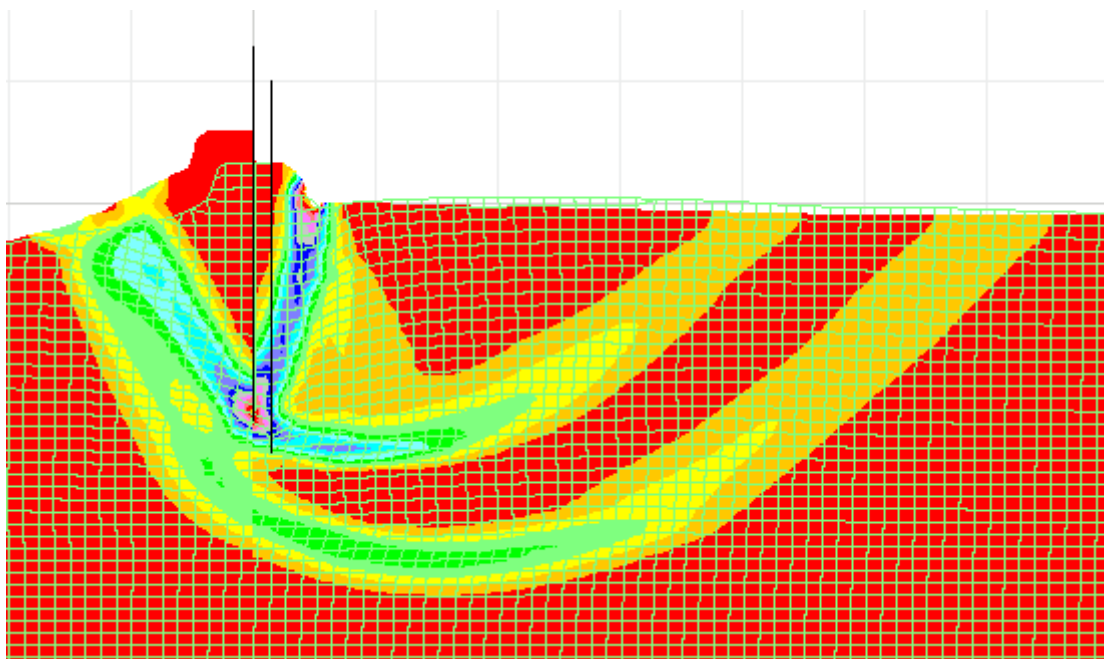


Figure D-37. Reach 20 WL+5 ft, FoS ssr and wall displacement magnified 5X.

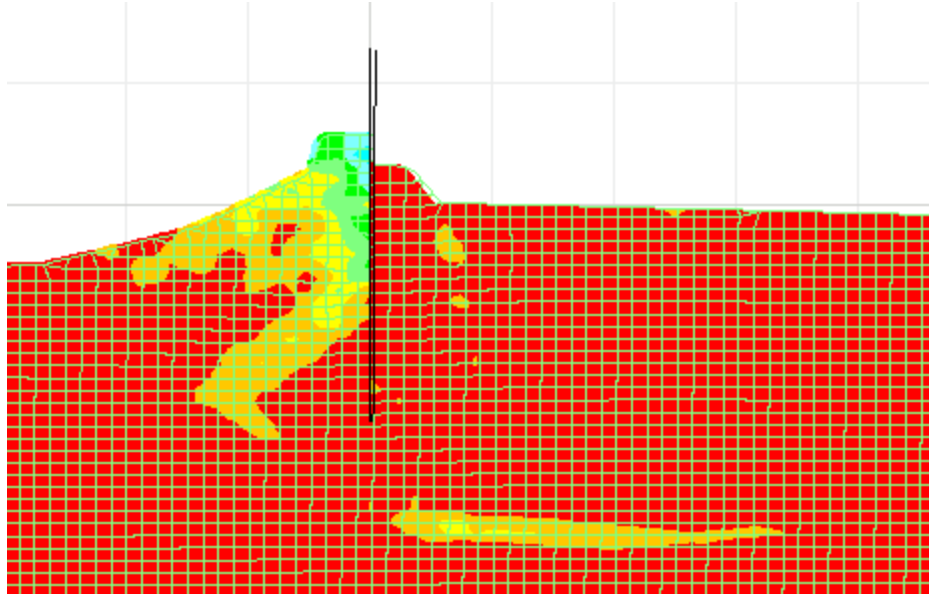


Figure D-38. Reach 20 WL+6 ft, FoS ssi and wall displacement magnified 5X.

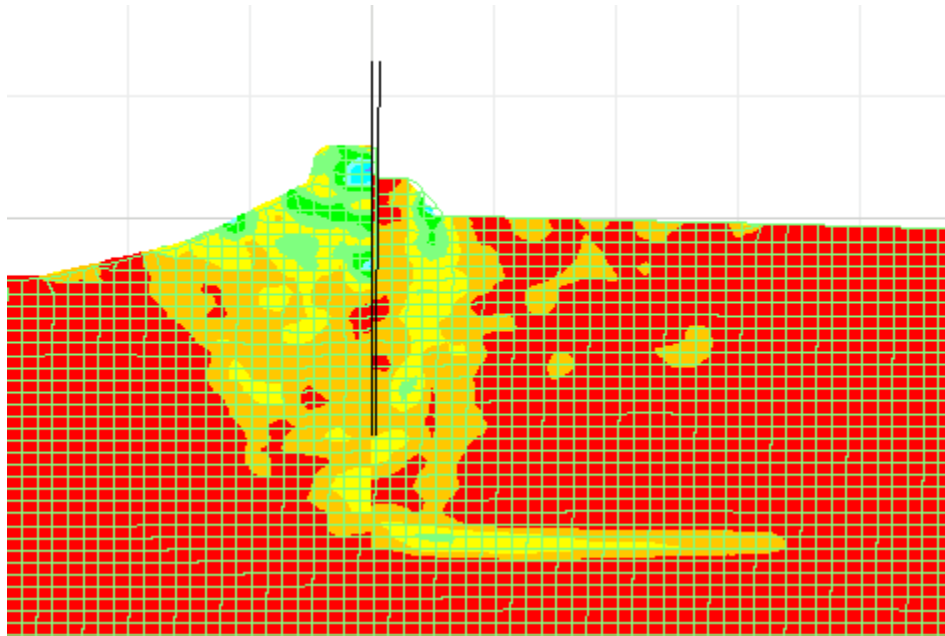


Figure D-39. Reach 20 WL+7 ft, FoS ssi and wall displacement magnified 5X.

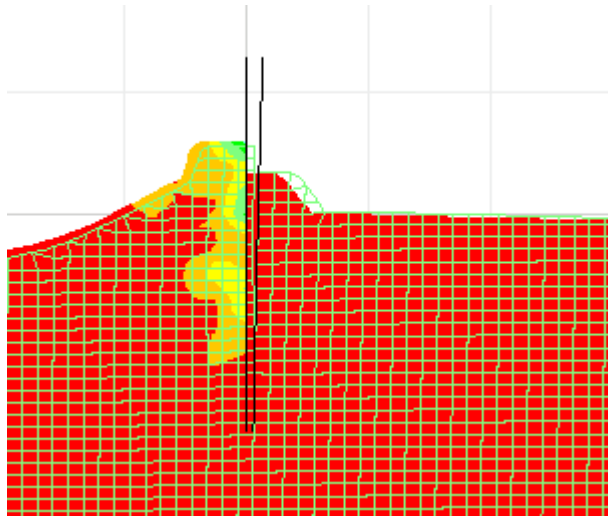


Figure D-40. Reach 20 WL+8 ft, FoS ssi and wall displacement magnified 10X.

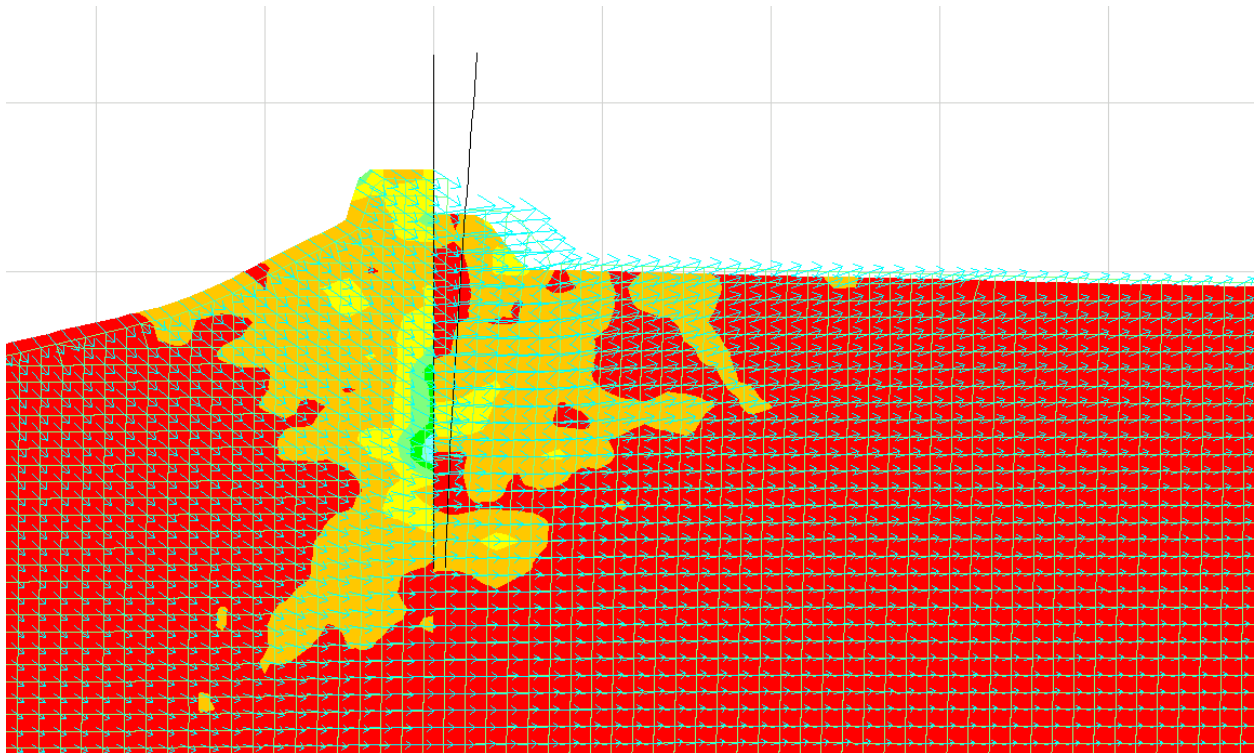


Figure D-41. Reach 20 WL+9 ft, FoS ssi and wall displacement magnified 10X.

Table D-23. Summary of FLAC FoS and Controlling Failure Mode Reach 20.

Canal WL (ft)	FLACAuto FoS	Controlling Failure Mode*
1	4.40	Global Stability (flood side)
2	4.80	Global Stability (flood side)
3	5.06	Global Stability
4	4.89	Global Stability
5	4.68	Global Stability
6	3.34	Global Stability (into gap)
7	2.77	Global Stability (minor rotation)
8	2.06	Global Stability (minor rotation)
9	2.00	Global Stability (minor rotation)

*Determined by inspection of model displacement (i.e. wall rotating about a point, displacing with little wall rotation or both).

Reach 30

Introduction

The design section includes: clay embankment (EL +3.2 ft), underlain by a marsh deposit (EL -4 ft to EL -15 ft). The marsh is underlain by a beach sand stratum (EL -15 ft to EL -44 ft) which mantles a lower clay deposit which extends at least until the bottom of the model (EL -65 ft). The clay embankment material was assigned a unit weight of 115 pcf with cohesion of 600 psf. The elevation of the flood side ground line at the wall face is approximately EL 3.4 ft resulting in little difference in soil elevation across the wall. The existing I-wall has a top elevation of 12.9 ft consisting of a concrete cap and CZ101 sheet pile to tip elevation of -17.5 ft. Figures D-42 and D-43 show the Geo-Studio and FLAC model cross sections. This is a remediated reach and PZ22 sheet pile was installed to at tip elevation of -55 ft.

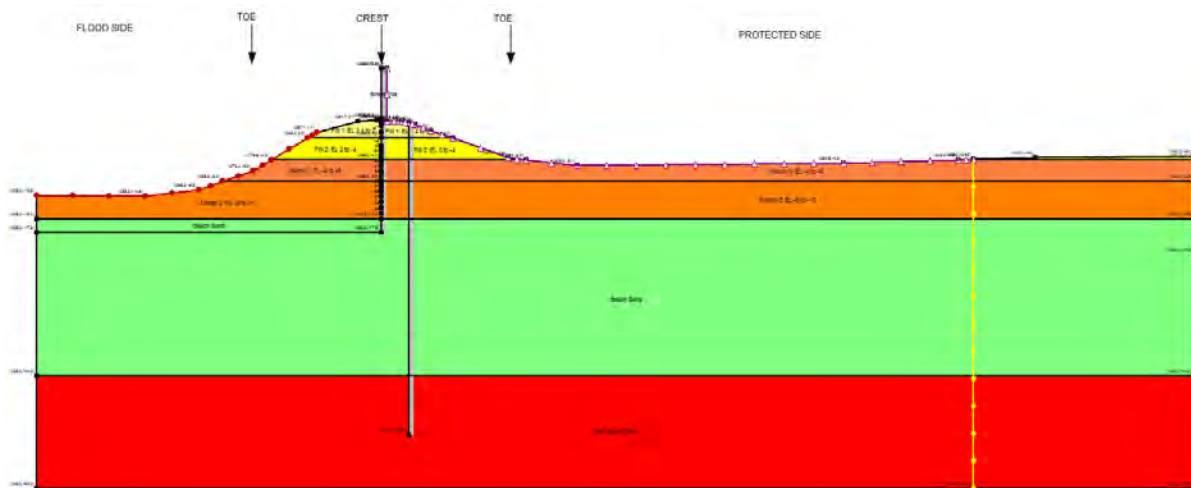


Figure D-42. Geo-Studio model for London Canal Reach 30.

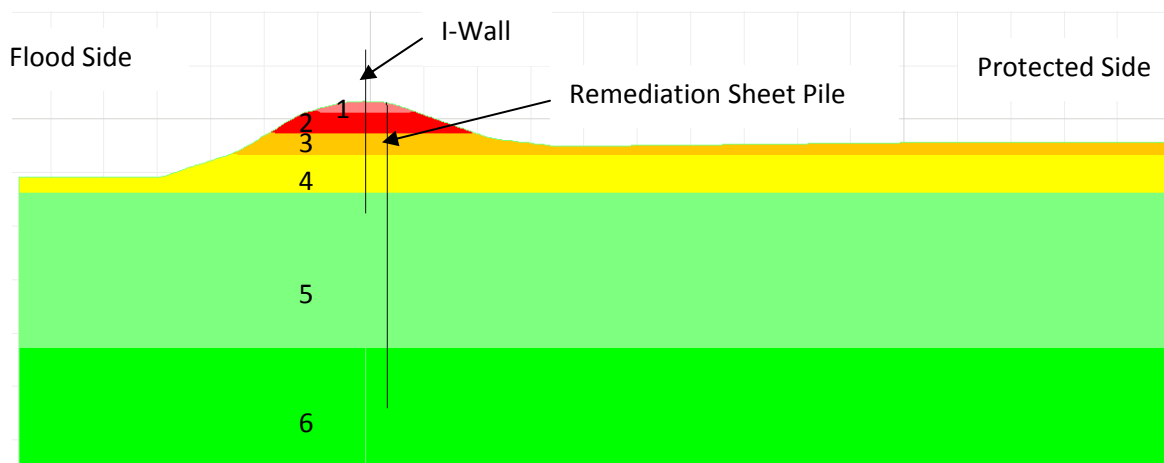


Figure D-43. FLAC Model for London Avenue Canal Reach 30

Foundation Parameters

The FLAC analyses are based on simple Mohr-Coulomb constitutive models (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 is the Seep/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 Tables D-24 thru D-27. 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 are determined by multiplying the G/Su ratio for a given soil by its undrained shear strength. Young's Modulus for the levee and sand was 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 London 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 total head at the marsh sand interface was then used as the basis for selecting piezometric lines to represent the head in the granular beach sand strata at each corresponding water level in the FLAC model. This piezometric line only affected the shear strength of the sand; modulus values in the sand were held constant in the FLAC model. Piezometric data is shown in Table D-28.

Table D-24. Summary of Centerline Soil Parameters Reach 30

Material	Strata top elevation (NAVD88)	Strata bottom elevation (NAVD88)	unit wt. (pcf)	unit wt/g	Su (psf)*	ϕ' (deg)
1 - Levee 1	3.4	0.0	115	3.571	600	0
2 - Levee 2	0.0	-4.0	102	3.168	600	0
3 - Marsh 1	-4.0	-8.0	80	2.484	200	0
4 - Marsh 2	-8.0	-15.0	94	2.919	250	0
5 - Beach Sand (SP)	-15.0	-44.0	122	3.789	0	30
6 - Bay Sound Clay	-44.0	-65.0	105	3.261	750	0

*Denotes Su at Top of Bay Sound Clay, Delta Su = 9.52 psf/ft

Table D-25. Centerline Most Likely Value Modulus Reach 30

Material	<i>E/Su</i>	E (psf)	<i>Poisson</i>	G (psf)	K (psf)	ko
1 - Levee 1	263	1.58E+05	0.40	5.63E+04	2.63E+05	0.67
2 - Levee 2	263	1.58E+05	0.40	5.63E+04	2.63E+05	0.67
3 - Marsh 1	200	4.00E+04	0.47	1.36E+04	2.22E+05	0.89
4 - Marsh 2	200	5.00E+04	0.47	1.70E+04	2.78E+05	0.89
5 - Beach Sand (SP)	-	7.32E+05	0.33	2.75E+05	7.32E+05	0.50
6 - Bay Sound Clay	600	4.50E+05	0.495	1.51E+05	1.50E+07	0.98

Table D-26. Summary of Toe Soil Parameters Reach 30

Material	Strata top elevation (NAVD88)	Strata bottom elevation (NAVD88)	unit wt. (pcf)	unit wt/g	Su (psf) *	φ' (deg)
1 - Levee 1	3.4	0.0	115	3.323	600	0
2 - Levee 2	0.0	-4.0	102	3.168	600	0
3 - Marsh 1	-4.0	-8.0	80	2.484	200	0
4 - Marsh 2	-8.0	-15.0	94	2.919	250	0
5 - Beach Sand (SP)	-15.0	-44.0	122	3.789	0	30
6 - Bay Sound Clay	-44.0	-65.0	105	3.261	750	0

*Denotes Su at Top of Bay Sound Clay, Delta Su = 13.2 psf/ft

Table D-27. Toe Most Likely Value Modulus Reach 30

Material	<i>E/Su</i>	E (psf)	<i>Poisson</i>	G (psf)	K (psf)	ko
1 - Levee 1	263	1.58E+05	0.40	5.63E+04	2.63E+05	0.67
2 - Levee 2	263	1.58E+05	0.40	5.63E+04	2.63E+05	0.67
3 - Marsh 1	200	4.00E+04	0.47	1.36E+04	2.22E+05	0.89
4 - Marsh 2	200	5.00E+04	0.47	1.70E+04	2.78E+05	0.89
5 - Beach Sand (SP)	-	7.32E+05	0.33	2.75E+05	7.32E+05	0.50
6 - Bay Sound Clay	600	4.50E+05	0.495	1.51E+05	1.50E+07	0.98

Table D-28. Piezometric Surface in Granular Material at Selected Coordinates Reach 30

x-coor (ft)	WL 0.4 (ft) Gap 0	WL1.0 (ft) Gap 0	WL2.0 (ft) Gap 0	WL3.0 (ft) Gap 0	WL4.0 (ft) Gap 1	WL5.0 (ft) Gap 7	WL6.0 (ft) Gap 7	WL7.0 (ft) Gap 7	WL8.0 (ft) Gap 7
235	0.33	0.93	1.92	2.90	3.89	4.89	5.88	6.86	7.85
285	0.33	0.93	1.92	2.90	3.89	4.89	5.87	6.86	7.85
298	0.33	0.93	1.92	2.90	3.89	4.89	5.87	6.86	7.85
300	0.33	0.93	1.92	2.90	3.89	4.89	5.87	6.86	7.85
304.0	0.33	0.93	1.92	2.90	3.89	4.88	5.87	6.86	7.85
304.5	-5.3	-5.3	-5.3	-5.3	-5.3	-5.3	-5.3	-5.3	-5.3
315	-5.3	-5.3	-5.3	-5.3	-5.3	-5.3	-5.3	-5.3	-5.3
335	-5.3	-5.3	-5.3	-5.3	-5.3	-5.3	-5.3	-5.3	-5.3
395	-5.3	-5.3	-5.3	-5.3	-5.3	-5.3	-5.3	-5.3	-5.3
449	-5.3	-5.3	-5.3	-5.3	-5.3	-5.3	-5.3	-5.3	-5.3

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 D-29.

Table D-29. Summary of Structural Parameters Reach 30

Member	E (psi)	E* (psi)	E* (psf)	I (in4/ft)	E*I (lbft2/ft)	A (in2/ft)	E*A (lb/ft)	ν
Concrete	3.00E+06	3.13E+06	4.50E+08	1728	3.75E+07	144	4.50E+08	0.2
CZ101	2.90E+07	3.19E+07	4.59E+09	65.01	1.44E+07	6.08	1.94E+08	0.3
PZC 18	2.90E+07	3.19E+07	4.59E+09	255.5	5.65E+07	7.12	2.27E+08	0.3

E = Young's Modulus

E* = Adj. Young's Modulus for Plain Strain

I = Moment of Inertia per foot of wall

A = Cross Sectional Area per foot of wall

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.

Results

The gap depth was checked following IPET guidance by hand and the results for the highest water table were deeper than predicted by FLAC. In order to manually calculate the gap, the flood side ground elevation was used and the elevation of the gap tip for water at EL +8 ft was approximately EL -15.0 ft (marsh/sand interface). The FLAC analysis had the gap extending to approximate EL -3.6 ft or 11.4 ft above the marsh/sand interface. It is believed that the discrepancy is due to the hand calculation not being able to consider the slope of the crown or the SSI or the two embedded sheet piles.

The maximum protected side ground displacement for the MLV at water level EL 8.0 ft was about 1.4 inches. The maximum developed crack depth was 7 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 Figures D-44 and D-45.

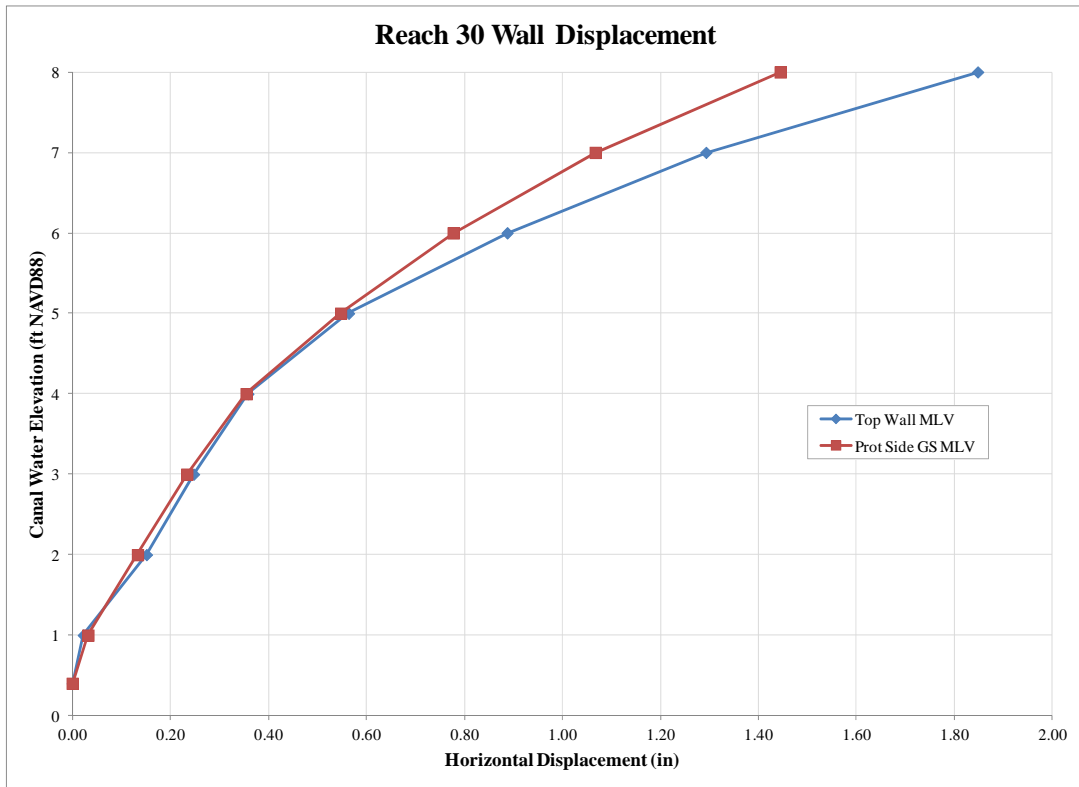


Figure D-44a. FLAC computed I-wall displacement.

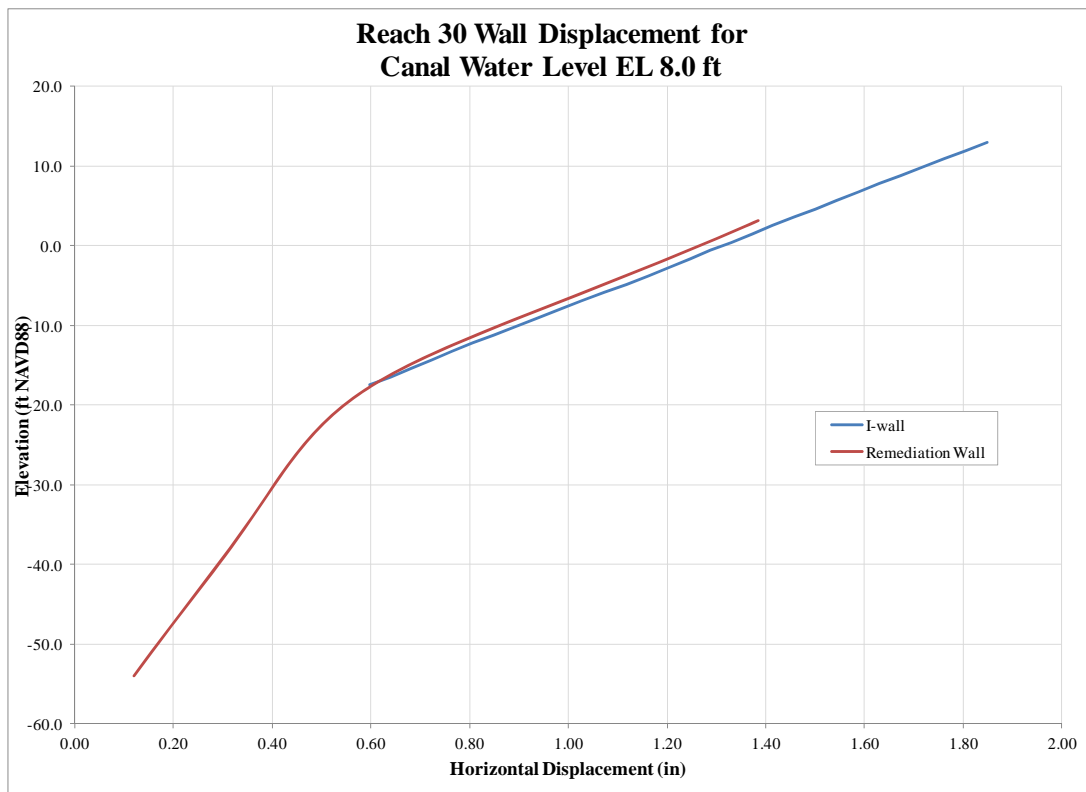


Figure D-44b. FLAC computed I-wall and remediation wall displacement.

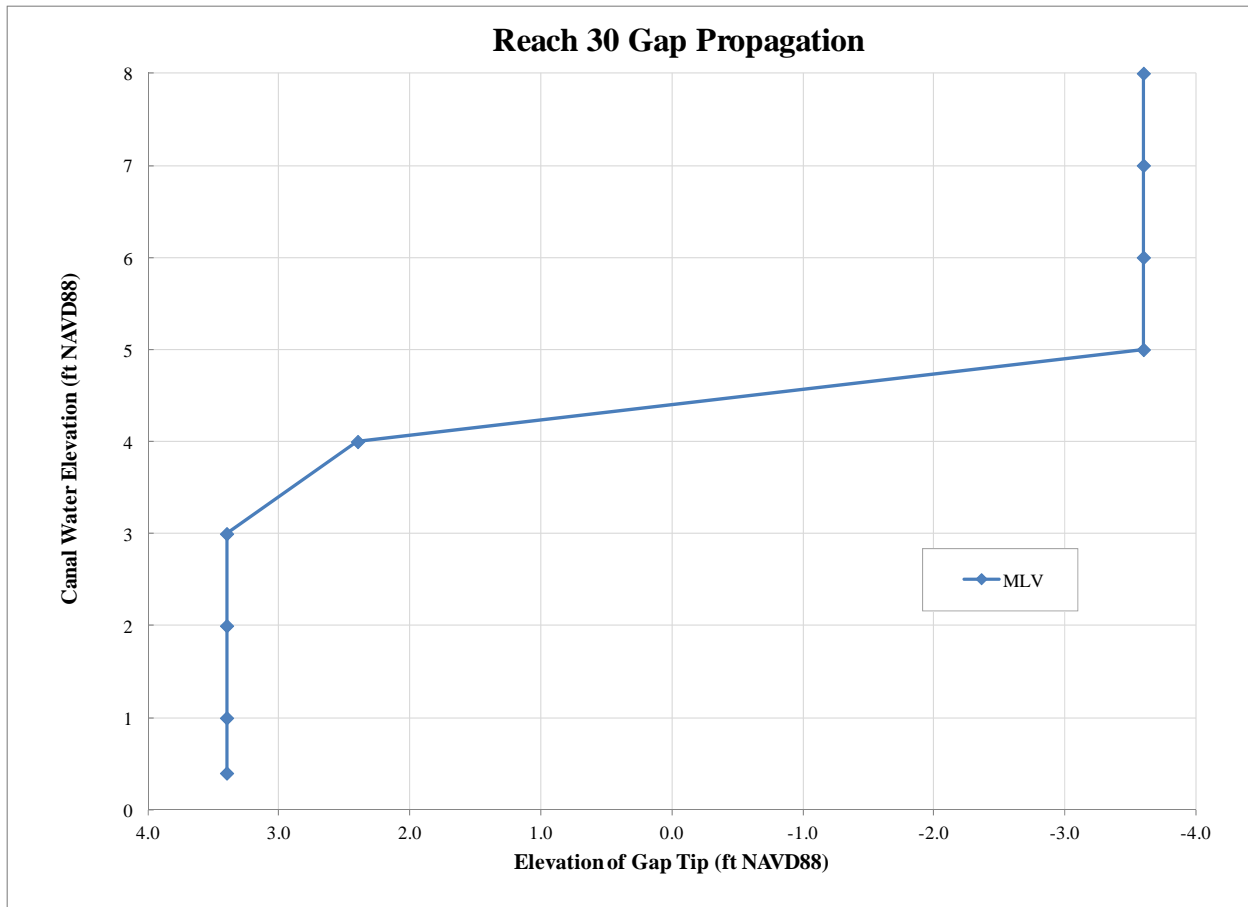


Figure D-45. FLAC computed gap propagation.

The automated $c-\phi$ reduction technique in FLAC was used for all factor of safety (FoS) calculations. Figure D-46 presents the computed factors of safety for differing canal water levels and Figures D-47 through D-28 show the shear strain increment (ssi) or rate (ssr) 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 D-30.

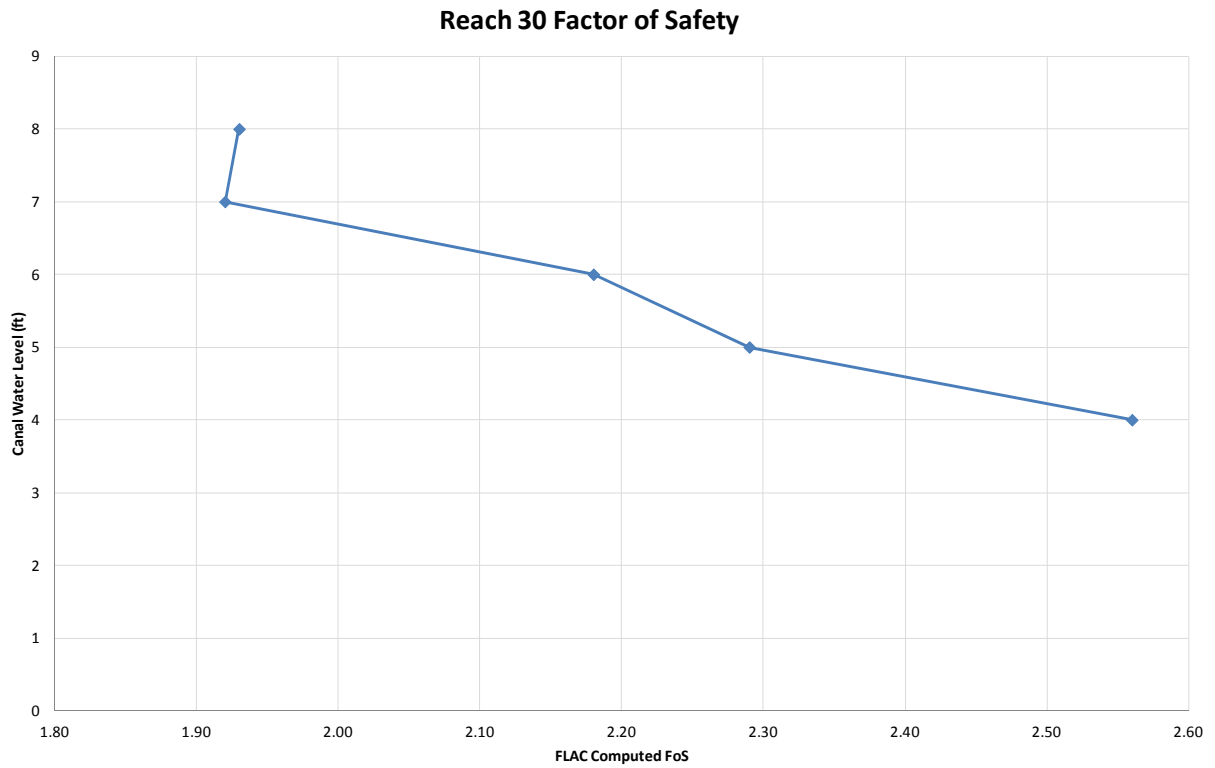


Figure D-46. FLAC computed factor of safety (automated $c-\phi$ reduction technique).

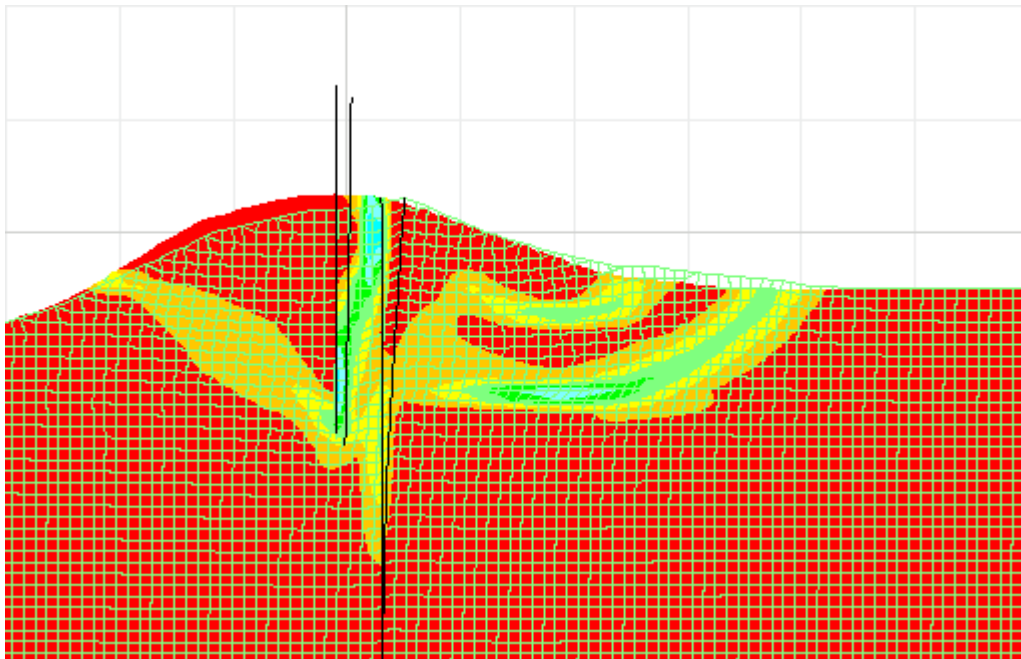


Figure D-47. Reach 30 WL+4 ft, FoS ssi and wall displacement magnified 5X.

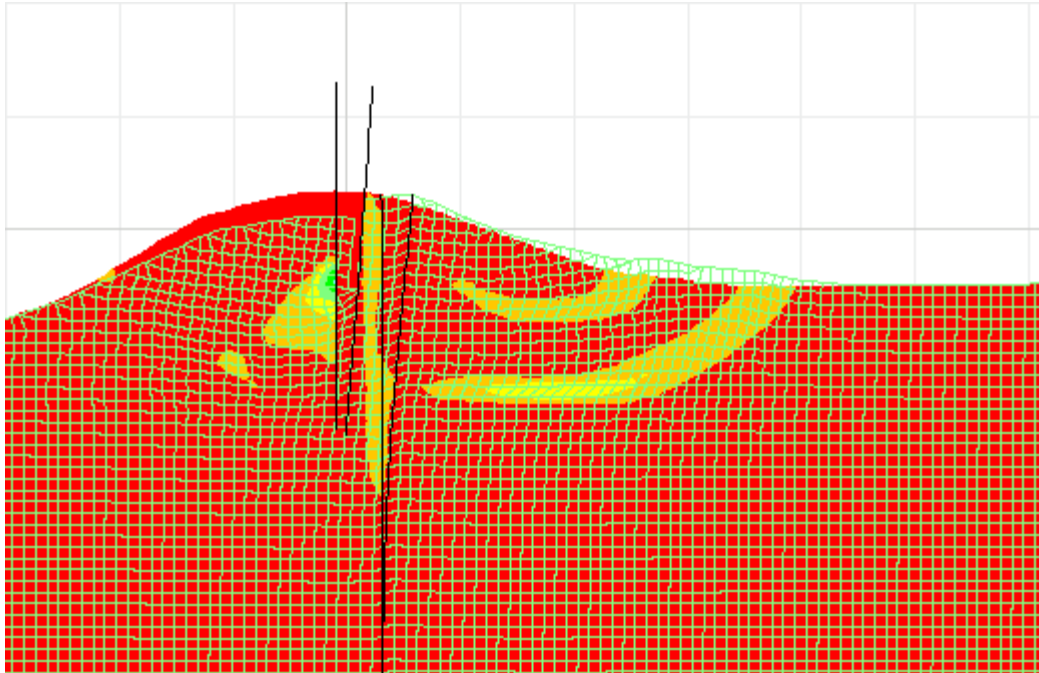


Figure D-48. Reach 30 WL+5 ft, FoS ssi and wall displacement magnified 5X.

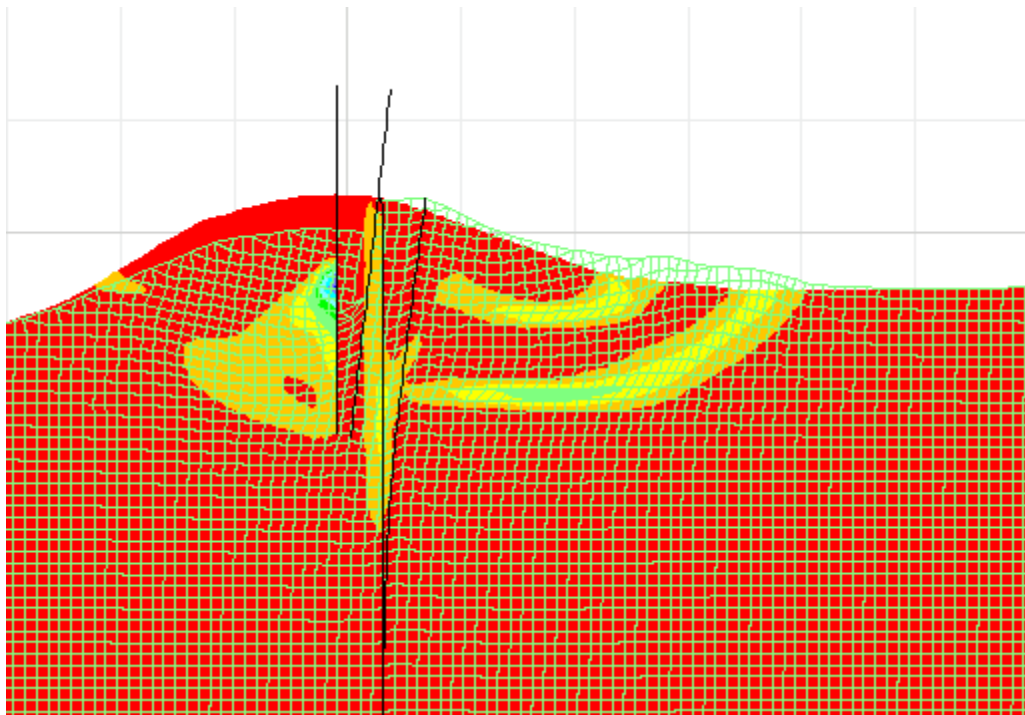


Figure D-49. Reach 30 WL+6 ft, FoS ssi and wall displacement magnified 5X.

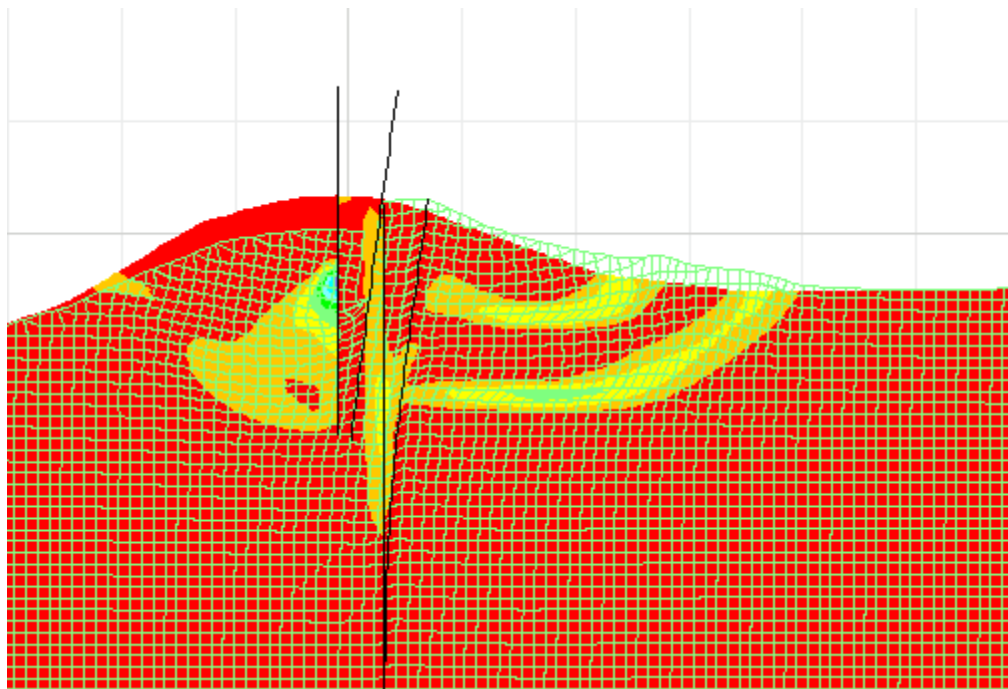


Figure D-50. Reach 30 WL+7 ft, FoS ssi and wall displacement magnified 5X.

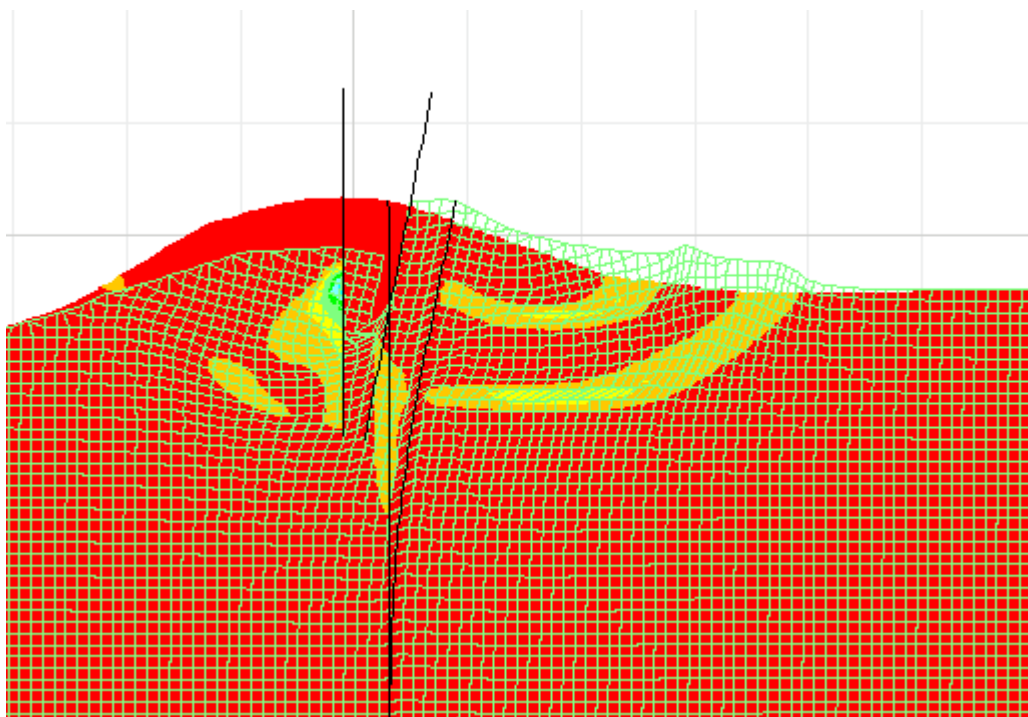


Figure D-51. Reach 30 WL+8 ft, FoS ssi and wall displacement magnified 5X.

Table D-30. Summary of FLAC FoS and Controlling Failure Mode Reach 30.

Canal WL (ft)	FLACAuto FoS	Controlling Failure Mode
4	2.56	Remediated wall acts as a long pile with a fixed tip and is bending. I-wall translates and rotates with remediated wall.
5	2.29	
6	2.18	
7	1.92	
8	1.93	

Notes:

- (1) At water level EL 8 ft the bending stress is 3.5 ksi using unfactored soil strengths.
- (2) At the limiting factor of safety the bending stress is 32.8 ksi using soil strengths factored by the FoS of 1.93. This is not a structural design load case but since the beams are modeled with elastic properties only (no limit on maximum stress) this check was made to verify that bending stresses were less than yield. If the maximum computed stress was greater than the yield stress the remediation pile would have provided too much resistance in the factor of safety analysis.

Reach 35B

Introduction

The design section includes: clay embankment (EL +2.2 ft), underlain by a shallow marsh deposit (EL -6 ft to EL -12 ft). The shallow marsh is underlain by a silty beach sand stratum (EL -12 ft to about EL -22 ft) atop a clean beach sand stratum (EL -22 ft to EL -40 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 assigned a unit weight of 110 pcf with cohesion of 450 psf. The elevation of the flood side ground line at the wall face is approximately EL 2.4 ft resulting in little difference in soil elevation across the wall. The existing I-wall has a top elevation of 12.9 ft consisting of a concrete cap and CZ101 sheet pile to tip elevation of -21.5 ft. Figures D-52 and D-53 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 top of the marsh strata was set at EL -6 ft, as it is shown on the flood side of the I-Wall in Figure D-52, without sloping to the levee toe to best capture the wall displacement behavior. Due to the horizontal layer requirement the sloping silty sand strata base is represented in FLAC conservatively with a horizontal bottom elevation of -22 ft. The silted in layer is far enough from the I-wall that neglecting this in the FLAC model is not expected to influence wall displacement or stability results. This layer was included in the seepage models used to establish the piezometric line in the granular materials.

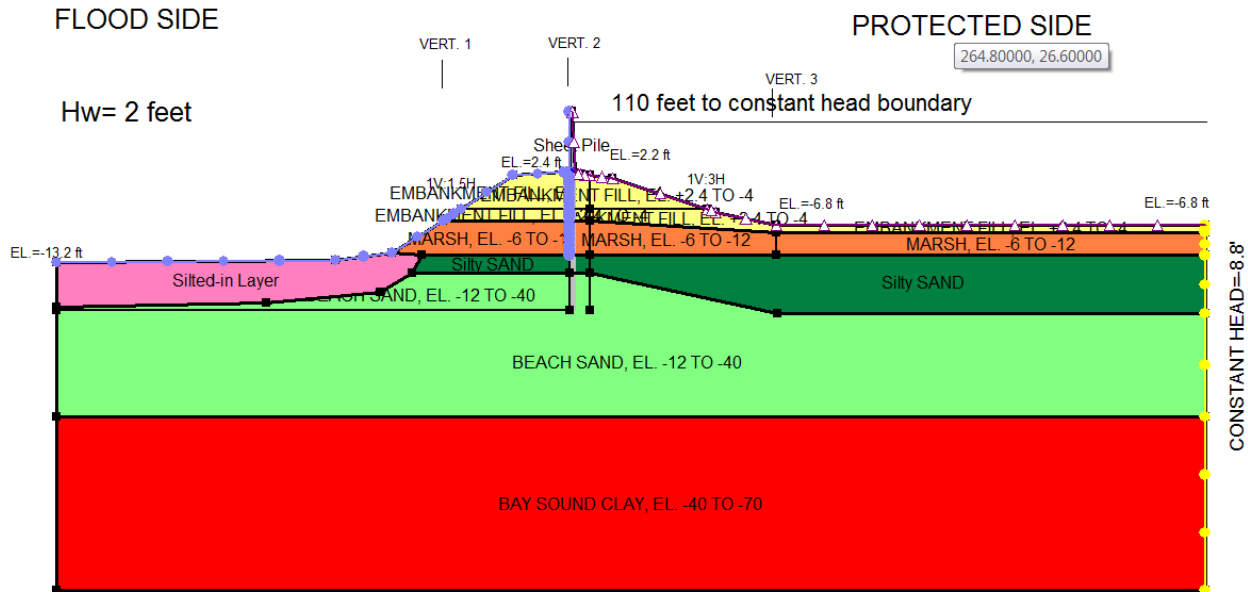


Figure D-52. Geo-Studio model for London Canal Reach 35B.

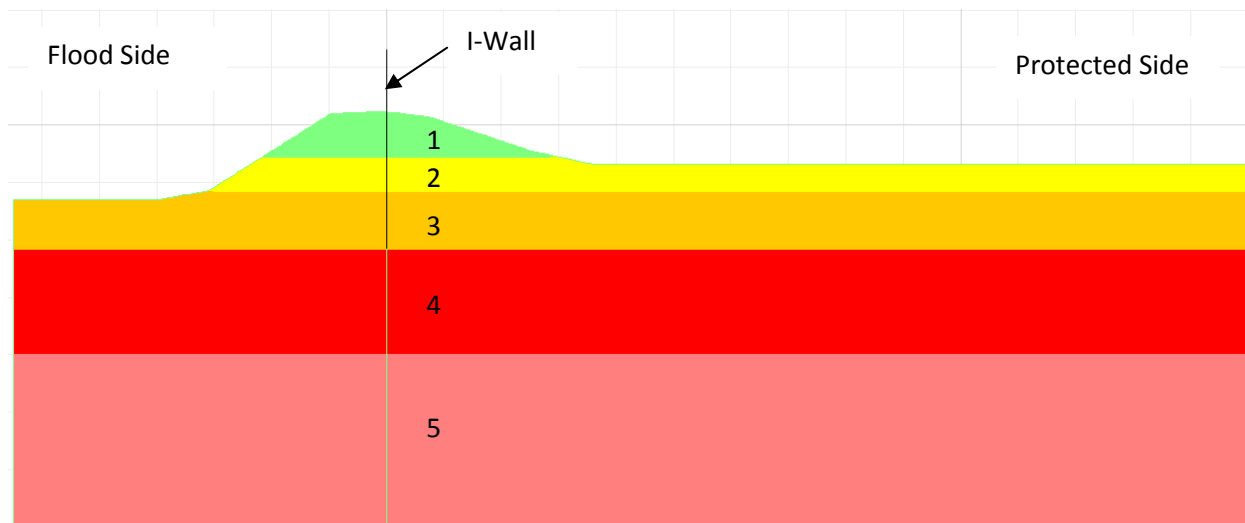


Figure D-53. FLAC Model for London Avenue Canal Reach 35B

Foundation Parameters

The FLAC analyses are based on simple Mohr-Coulomb constitutive models (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 is the Seep/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 Tables D-31 thru D-34. 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 are determined by multiplying the G/Su ratio for a given soil by its undrained shear strength. Young's Modulus for the levee and sand was 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 London 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 total head at the marsh sand interface was then used as the basis for selecting piezometric lines to represent the head in the granular beach sand strata at each corresponding water level in the FLAC model. This piezometric line only affected the shear strength of the sand; modulus values in the sand were held constant in the FLAC model. Piezometric data is shown in Table D-35.

Table D-31. Summary of Centerline Soil Parameters Reach 35B

Material	Strata top elevation (NAVD88)	Strata bottom elevation (NAVD88)	unit wt. (pcf)	unit wt/g	Su (psf)*	ϕ' (deg)
1 - Levee	2.4	-6.0	110	3.416	450	0
2 - Marsh	-6.0	-12.0	88	2.733	275	0
3 - Silty Sand (SM)	-12.0	-22.0	122	3.789	0	30
4 - Beach Sand (SP)	-22.0	-40.0	122	3.789	0	30
5 - Bay Sound Clay	-40.0	-70.0	108	3.354	700	0

*Denotes Su at Top of Bay Sound Clay, Delta Su = 10. psf/ft

Table D-32. Centerline Most Likely Value Modulus Reach 35B

Material	E/Su	E (psf)	Poisson	G (psf)	K (psf)	ko
1 - Levee	350	1.58E+05	0.40	5.63E+04	2.63E+05	0.67
2 - Marsh	200	5.50E+04	0.47	1.87E+04	3.06E+05	0.89
3 - Silty Sand (SM)	-	5.00E+05	0.33	2.50E+05	6.67E+05	0.50
4 - Beach Sand (SP)	-	7.32E+05	0.33	2.75E+05	7.32E+05	0.50
5 - Bay Sound Clay	600	4.20E+05	0.495	1.40E+05	1.40E+07	0.98

Table D-33. Summary of Toe Soil Parameters Reach 35B

Material	Strata top elevation (NAVD88)	Strata bottom elevation (NAVD88)	unit wt. (pcf)	unit wt/g	Su (psf) *	ϕ' (deg)
1 - Levee						
2 - Marsh	-6.0	-12.0	88	2.733	150	0
3 - Silty Sand (SM)	-12.0	-22.0	122	3.789	0	30
4 - Beach Sand (SP)	-22.0	-40.0	122	3.789	0	30
5 - Bay Sound Clay	-40.0	-70.0	108	3.354	400	0

*Denotes Su at Top of Bay Sound Clay, Delta Su = 10. psf/ft

Table D-34. Toe Most Likely Value Modulus Reach 35B

Material	<i>E</i>/<i>Su</i>	E (psf)	<i>Poisson</i>	G (psf)	K (psf)	ko
1 - Levee						
2 - Marsh	200	3.00E+04	0.47	1.02E+04	1.67E+05	0.89
3 - Silty Sand (SM)	-	5.00E+05	0.33	2.50E+05	6.67E+05	0.50
4 - Beach Sand (SP)	-	7.32E+05	0.33	2.75E+05	7.32E+05	0.50
5 - Bay Sound Clay	600	2.40E+05	0.495	8.03E+04	8.00E+06	0.98

Table D-35. Piezometric Surface in Granular Material at Selected Coordinates Reach 35B

x-coor (ft)	WL 0.4 (ft) Gap 0	WL1.0 (ft) Gap 0	WL2.0 (ft) Gap 0	WL3.0 (ft) Gap 8	WL4.0 (ft) Gap 8	WL5.0 (ft) Gap 8	WL6.0 (ft) Gap 8	WL7.0 (ft) Gap 12	WL8.0 (ft) Gap 14
135	-8.3	-8.2	-8.2	-8.1	-8.1	-8.0	-7.9	-7.8	-6.2
184	-8.3	-8.3	-8.3	-8.2	-8.1	-8.1	-8.0	-7.9	-6.3
195	-8.4	-8.4	-8.3	-8.2	-8.2	-8.1	-8.1	-7.9	-5.6
200	-8.4	-8.4	-8.3	-8.2	-8.2	-8.1	-8.1	-7.9	8.0
200	-8.4	-8.4	-8.4	-8.3	-8.3	-8.2	-8.2	-8.1	-6.6
215	-8.5	-8.4	-8.4	-8.3	-8.3	-8.3	-8.2	-8.2	-6.8
235	-8.5	-8.5	-8.5	-8.4	-8.4	-8.4	-8.3	-8.3	-7.2
265	-8.6	-8.6	-8.6	-8.6	-8.6	-8.5	-8.5	-8.5	-7.8
290	-8.7	-8.7	-8.7	-8.7	-8.7	-8.7	-8.7	-8.7	-8.4
310	-8.8	-8.8	-8.8	-8.8	-8.8	-8.8	-8.8	-8.8	-8.8
350	-8.8	-8.8	-8.8	-8.8	-8.8	-8.8	-8.8	-8.8	-8.8

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 D-36.

Table D-36. Summary of Structural Parameters Reach 35B

Member	E (psi)	E* (psi)	E* (psf)	I (in4/ft)	E*I (lbft2/ft)	A (in2/ft)	E*A (lb/ft)	ν
Concrete	3.00E+06	3.13E+06	4.50E+08	1728	3.75E+07	144	4.50E+08	0.2
CZ101	2.90E+07	3.19E+07	4.59E+09	65.01	1.44E+07	6.08	1.94E+08	0.3

E = Young's Modulus

E* = Adj. Young's Modulus for Plain Strain

I = Moment of Inertia per foot of wall

A = Cross Sectional Area per foot of wall

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.

Results

The gap depth was checked following IPET guidance by hand and the results for the highest water table were deeper than predicted by FLAC. In order to manually calculate the gap, the flood side ground elevation was used and the elevation of the gap tip for water at EL +8 ft was approximately EL -12.0 ft (marsh/sand interface). The FLAC analysis had the gap extending to the marsh/sand interface. The gap serves as a source of inflow to the silty sand strata and affects pore-water pressure as modeled with Seep/W.

The maximum protected side ground displacement for the MLV at water level EL 8.0 ft was about 2.1 inches. The maximum developed crack depth was 14 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 Figures D-54 and D-55.

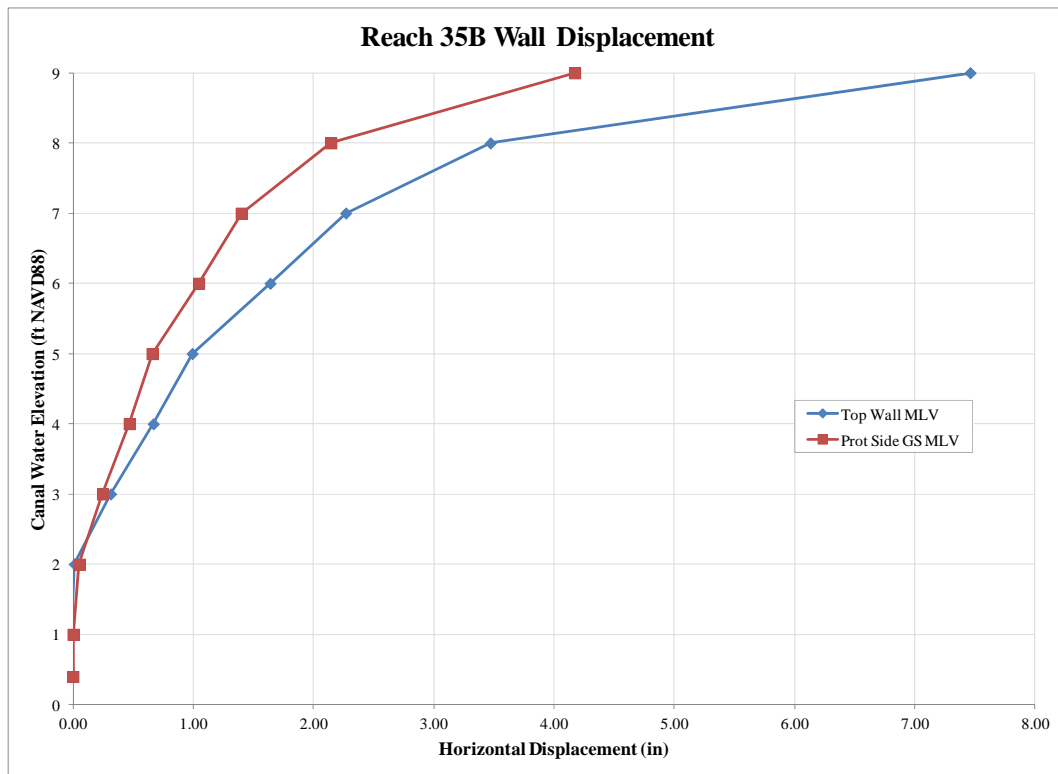


Figure D-54. FLAC computed I-wall displacement.

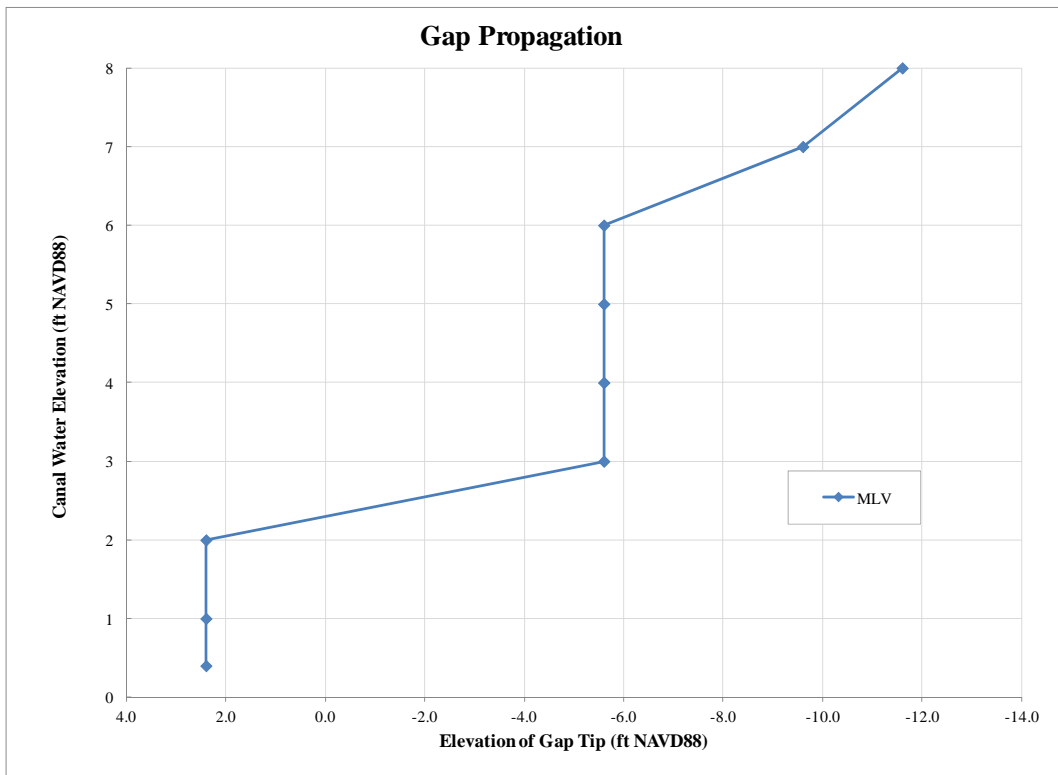


Figure D-55. FLAC computed gap propagation.

The automated $c-\phi$ reduction technique in FLAC was used for all factor of safety (FoS) calculations. Figure D-56 presents the computed factors of safety for differing canal water levels and Figures D-57 through D-63 show the shear strain increment (ssi) or rate (ssr) 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 D-37.

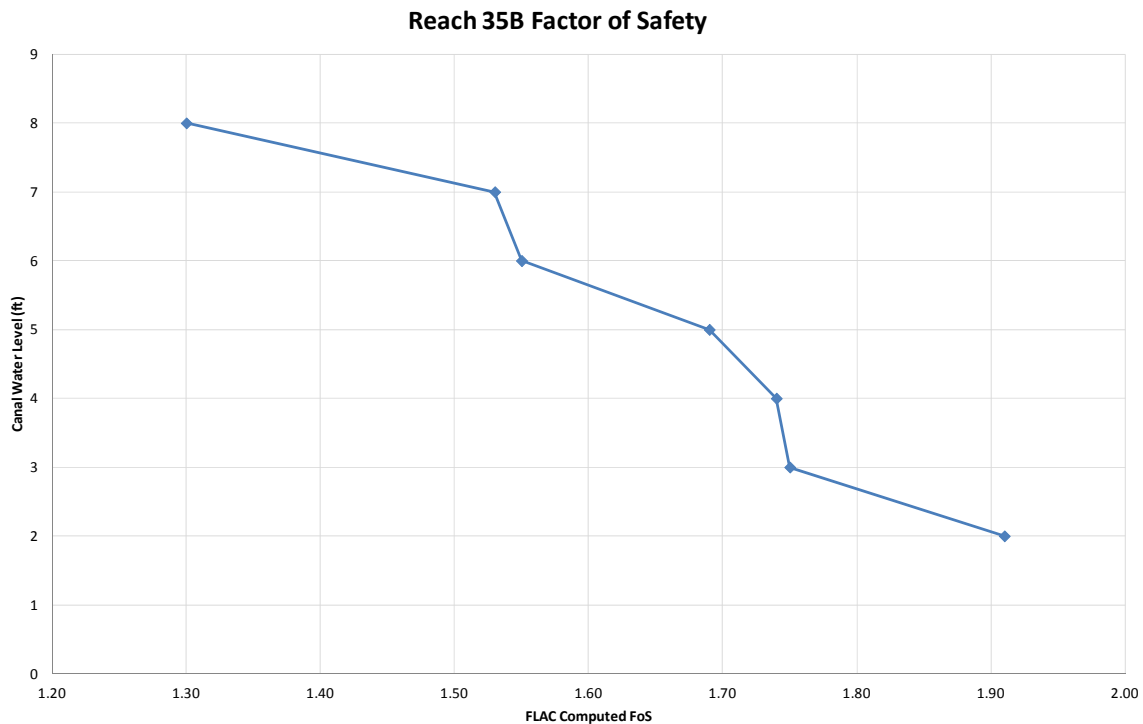


Figure D-56. FLAC computed factor of safety (automated $c-\phi$ reduction technique).

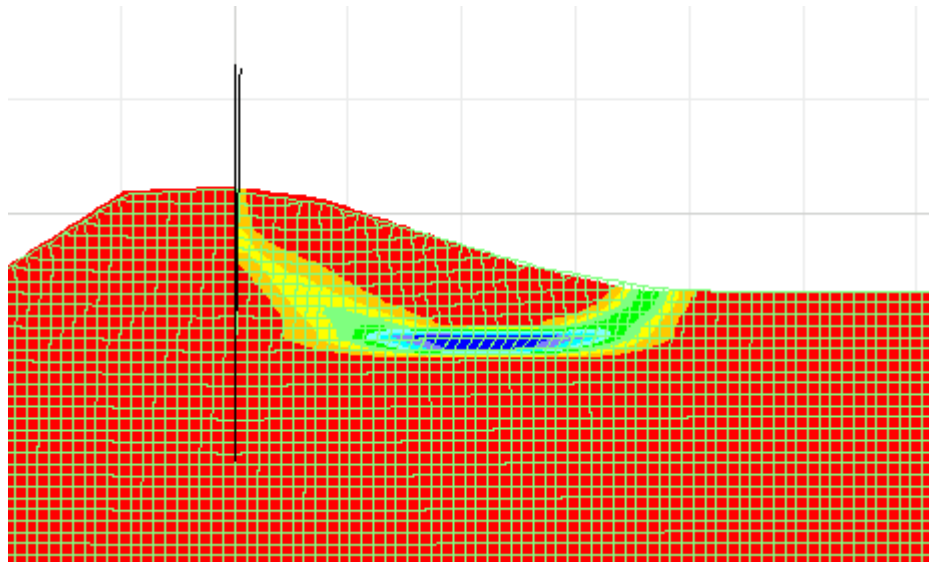


Figure D-57. Reach 35B WL+2 ft, FoS ssi and wall displacement magnified 5X.

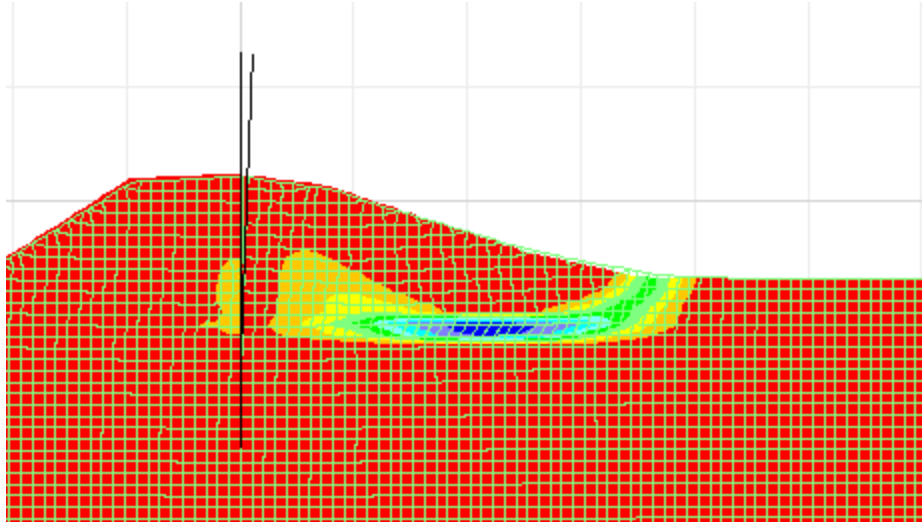


Figure D-58. Reach 35B WL+3 ft, FoS ssi and wall displacement magnified 5X.

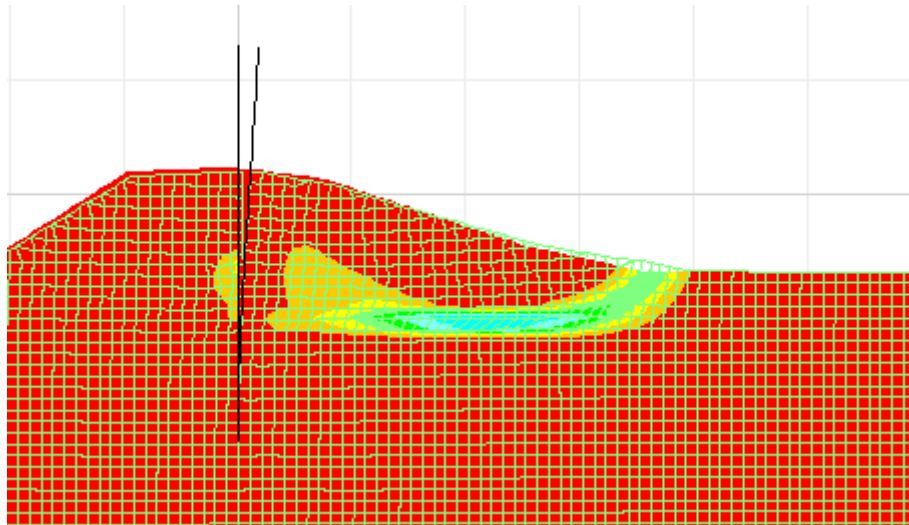


Figure D-59. Reach 35B WL+4 ft, FoS ssi and wall displacement magnified 5X.

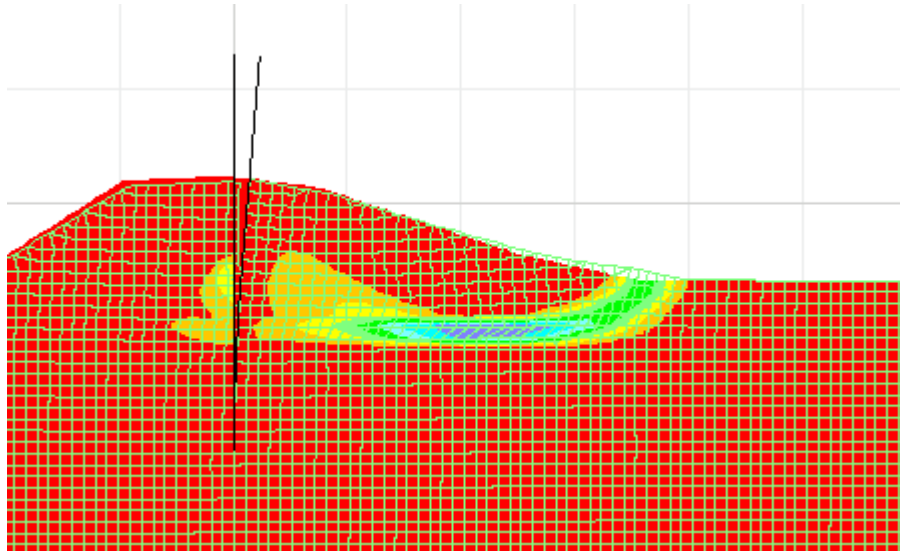


Figure D-60. Reach 35B WL+5 ft, FoS ssi and wall displacement magnified 5X.

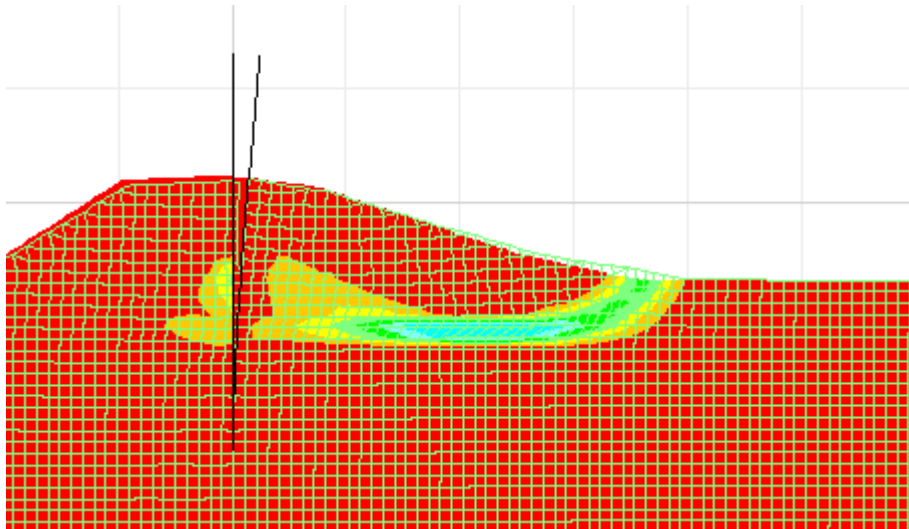


Figure D-61. Reach 35B WL+6 ft, FoS ssi and wall displacement magnified 5X.

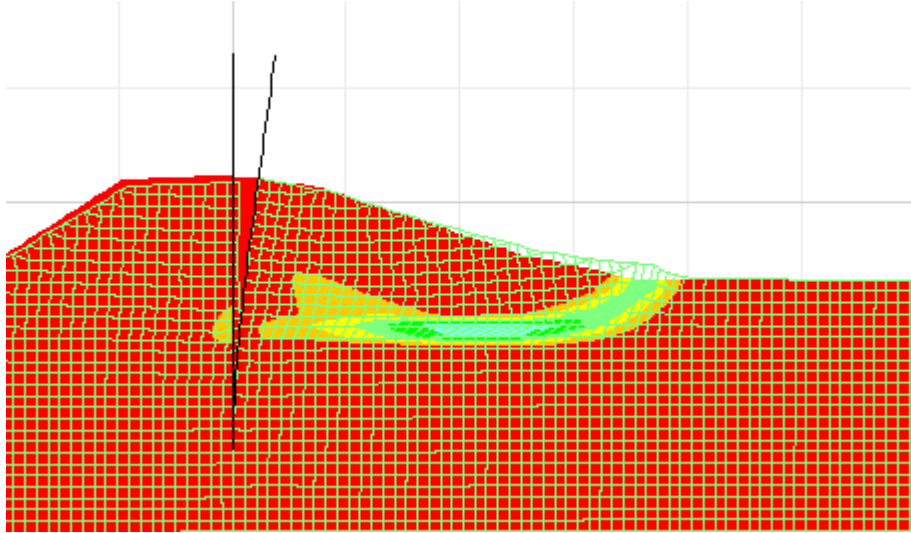


Figure D-62. Reach 35B WL+7 ft, FoS ssi and wall displacement magnified 10X.

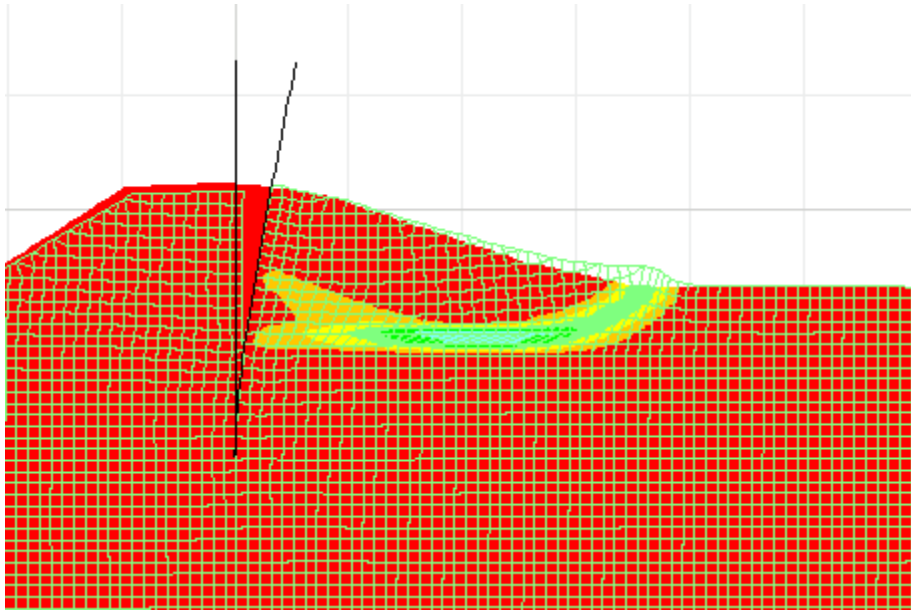


Figure D-63. Reach 35B WL+8 ft, FoS ssi and wall displacement magnified 10X.

Table D-37. Summary of FLAC FoS and Controlling Failure Mode Reach 35B.

Canal WL (ft)	FLACAuto FoS	Controlling Failure Mode*
2	1.91	Global Stability
3	1.75	Wall Rotation
4	1.74	Wall Rotation
5	1.69	Wall Rotation
6	1.55	Wall Rotation
7	1.53	Wall Rotation
8	1.30	Wall Rotation

*Determined by inspection of model displacement (i.e. wall rotating about a point, displacing with little wall rotation or both).

Reach 36

Introduction

The design section includes: clay embankment (EL +3.5 ft), underlain by a shallow marsh deposit (EL -4 ft to EL -11.5 ft). The shallow marsh is underlain by a silty beach sand stratum (EL -11.5 ft to about EL -20 ft) atop a clean beach sand stratum (EL -20 ft to EL -45 ft) which mantles a lower clay deposit which is separated into 2 layers and extends at least until the bottom of the model (EL -70 ft). The clay embankment material was assigned a unit weight of 118 pcf with cohesion of 625 psf. The elevation of the flood side ground line at the wall face is approximately EL 3.6 ft resulting in little difference in soil elevation across the wall. The existing I-wall has a top elevation of 12.9 ft consisting of a concrete cap and CZ101 sheet pile to tip elevation of -15.5 ft. Figures D-64 and D-65 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 top of the upper marsh strata was set at EL -4 ft, as it is shown on the flood side of the I-Wall in Figure D-64, without sloping to the levee toe to best capture the wall displacement behavior. This is a remediated reach and PZC18 sheet pile was installed to at tip elevation of -51 ft.

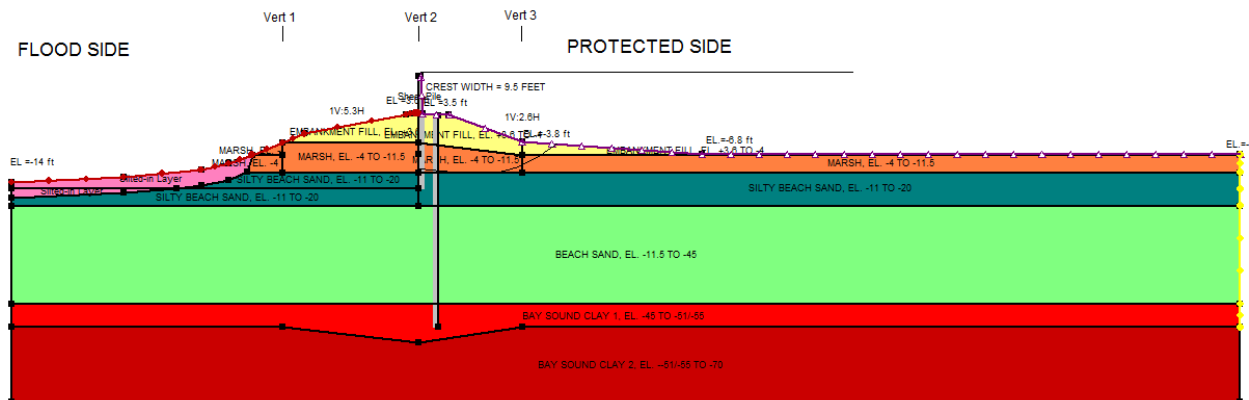


Figure D-64. Geo-Studio model for London Canal Reach 36.

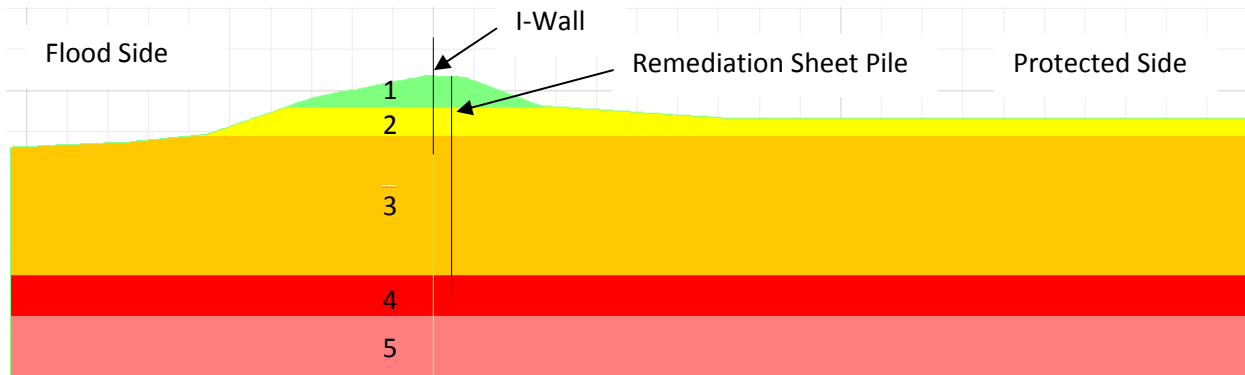


Figure D-65. FLAC Model for London Avenue Canal Reach 36

Foundation Parameters

The FLAC analyses are based on simple Mohr-Coulomb constitutive models (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 is the Seep/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 Tables D-38 thru D-41. 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 are determined by multiplying the G/Su ratio for a given soil by its undrained shear strength. Young's Modulus for the levee and sand was 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 London 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 total head at the marsh sand interface was then used as the basis for selecting piezometric lines to represent the head in the granular beach sand strata at each corresponding water level in the FLAC model. This piezometric line only affected the shear strength of the sand; modulus values in the sand were held constant in the FLAC model. Since the remediation sheet pile cut off the granular layers, and has a very low permeability, the heads on the flood side of the sheet pile were set equal to the canal water level and on the protected side equal to the right boundary condition. This assumption was verified by increasing canal water levels up to EL 3 ft and based on those results no further seepage runs were made.

Table D-38. Summary of Centerline Soil Parameters Reach 36

Material	Strata top elevation (NAVD88)	Strata bottom elevation (NAVD88)	unit wt. (pcf)	unit wt/g	Su (psf)*	ϕ' (deg)
1 - Levee Fill	3.6	-4.0	118	3.665	625	0
2 - Marsh	-4.0	-11.5	90	2.795	250	0
3 - Beach Sand (SP)	-11.5	-45.0	122	3.789	0	30
4 - Bay Sound Clay 1	-45.0	-55.0	107	3.323	750	0
5 - Bay Sound Clay 2	-55.0	-70.0	120	3.727	1000	0

*Denotes Su at Top of Bay Sound Clay, Delta Su = 0. psf/ft

Table D-39. Centerline Most Likely Value Modulus Reach 36

Material	E/Su	E (psf)	Poisson	G (psf)	K (psf)	ko
1 - Levee Fill	252	1.58E+05	0.40	5.63E+04	2.63E+05	0.67
2 - Marsh	200	5.00E+04	0.47	1.70E+04	2.78E+05	0.89
3 - Beach Sand (SP)	-	7.32E+05	0.33	2.75E+05	7.32E+05	0.50
4 - Bay Sound Clay 1	600	4.50E+05	0.495	1.51E+05	1.50E+07	0.98
5 - Bay Sound Clay 2	600	6.00E+05	0.495	2.01E+05	2.00E+07	0.98

Table D-40. Summary of Toe Soil Parameters Reach 36

Material	Strata top elevation (NAVD88)	Strata bottom elevation (NAVD88)	unit wt. (pcf)	unit wt/g	Su (psf) *	ϕ' (deg)
1 - Levee Fill	3.6	-4.0	108	3.323	250	0
2 - Marsh	-4.0	-11.5	74	2.298	175	0
3 - Beach Sand (SP)	-11.5	-45.0	122	3.789	0	30
4 - Bay Sound Clay 1	-45.0	-55.0	103	3.199	750	0
5 - Bay Sound Clay 2	-55.0	-70.0	118	3.665	750	0

*Denotes Su at Top of Bay Sound Clay, Delta Su = 0. psf/ft

Table D-41. Toe Most Likely Value Modulus Reach 36

Material	<i>E/Su</i>	E (psf)	<i>Poisson</i>	G (psf)	K (psf)	ko
1 - Levee Fill	630	1.58E+05	0.40	5.63E+04	2.63E+05	0.67
2 - Marsh	200	3.50E+04	0.47	1.19E+04	1.94E+05	0.89
3 - Beach Sand (SP)	-	7.32E+05	0.33	2.75E+05	7.32E+05	0.50
4 - Bay Sound Clay 1	600	4.50E+05	0.495	1.51E+05	1.50E+07	0.98
5 - Bay Sound Clay 2	600	4.50E+05	0.495	1.51E+05	1.50E+07	0.98

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 D-42.

Table D-42. Summary of Structural Parameters Reach 36

Member	E (psi)	E* (psi)	E* (psf)	I (in4/ft)	E*I (lbft2/ft)	A (in2/ft)	E*A (lb/ft)	ν
Concrete	3.00E+06	3.13E+06	4.50E+08	1728	3.75E+07	144	4.50E+08	0.2
CZ101	2.90E+07	3.19E+07	4.59E+09	65.01	1.44E+07	6.08	1.94E+08	0.3
PZC 18	2.90E+07	3.19E+07	4.59E+09	255.5	5.65E+07	7.12	2.27E+08	0.3

E = Young's Modulus

E* = Adj. Young's Modulus for Plain Strain

I = Moment of Inertia per foot of wall

A = Cross Sectional Area per foot of wall

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.

Results

The maximum protected side ground displacement for the MLV at water level EL 8.0 ft was about 1.3 inches. The maximum developed crack depth was 8 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 Figures D-66 and D-67. The gap tip at EL -4.4 ft is 7.1 ft above the marsh/sand interface.

The automated $c-\phi$ reduction technique in FLAC was used for all factor of safety (FoS) calculations. Figure D-68 presents the computed factors of safety for differing canal water levels and Figures D-69 through D-81 show the shear strain increment (ssi) or rate (ssr) 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 D-43.

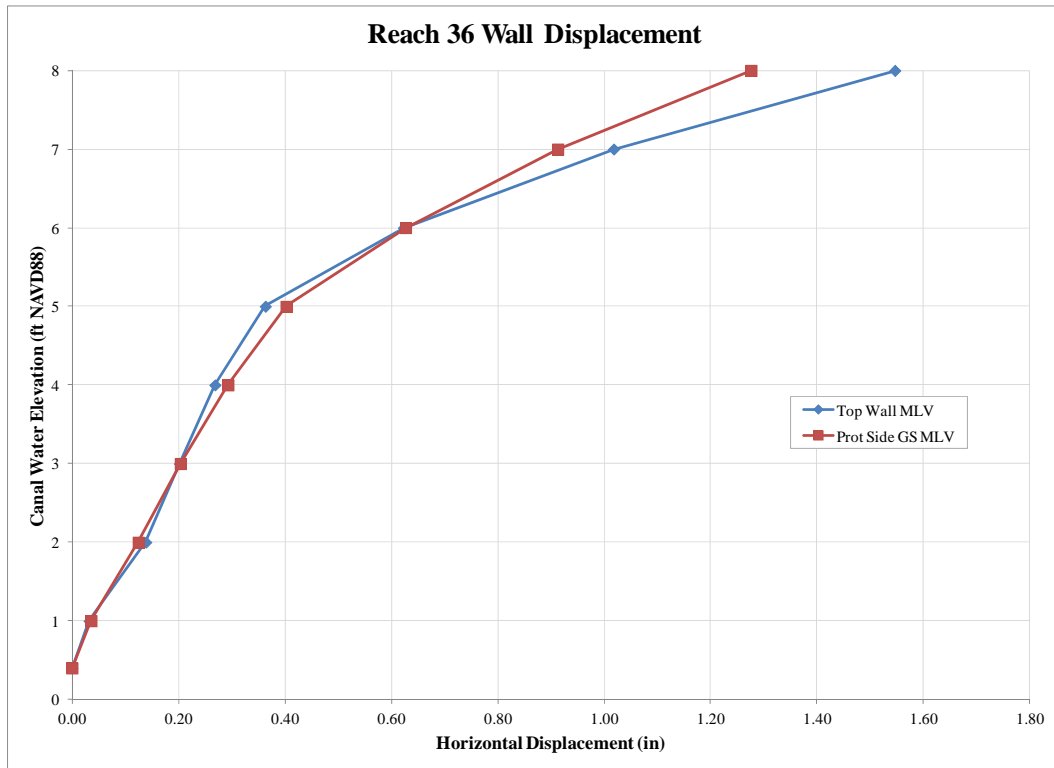


Figure D-66a. FLAC computed I-wall displacement.

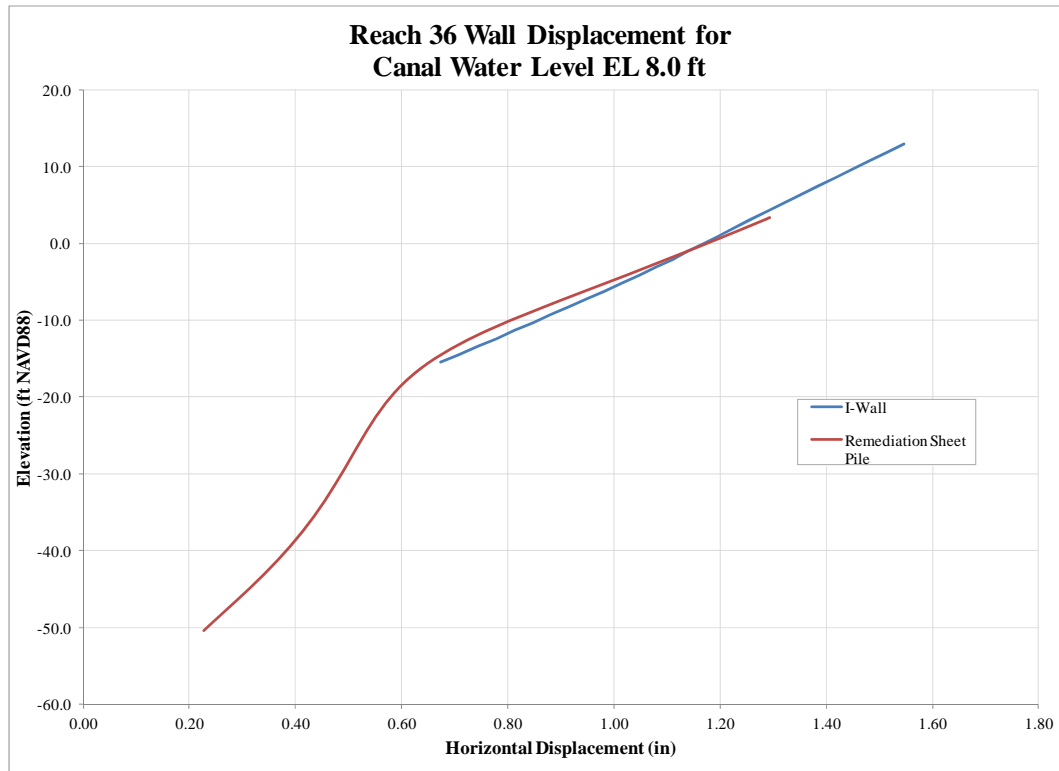


Figure D-66b. FLAC computed I-wall and remediation wall displacement.

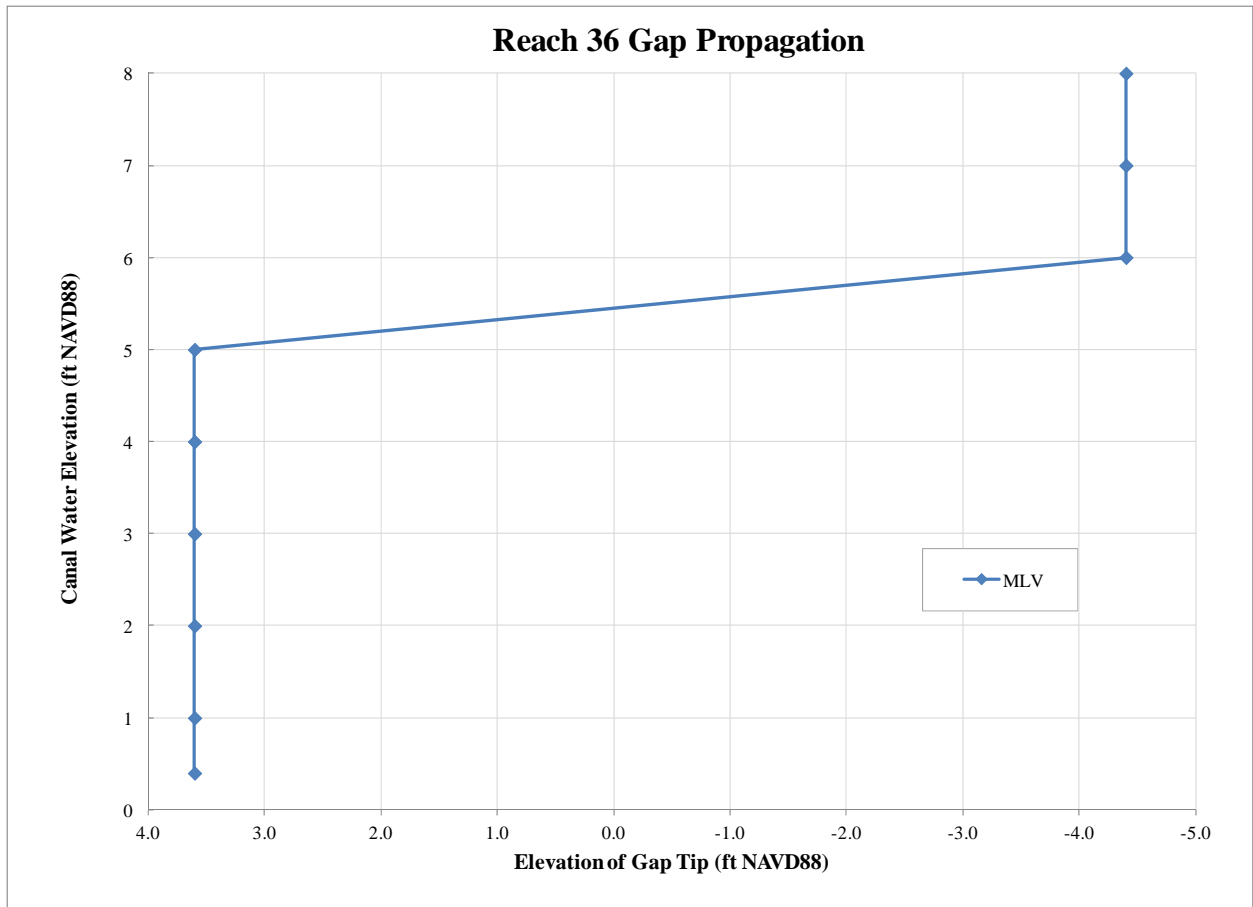


Figure D-67. FLAC computed gap propagation.

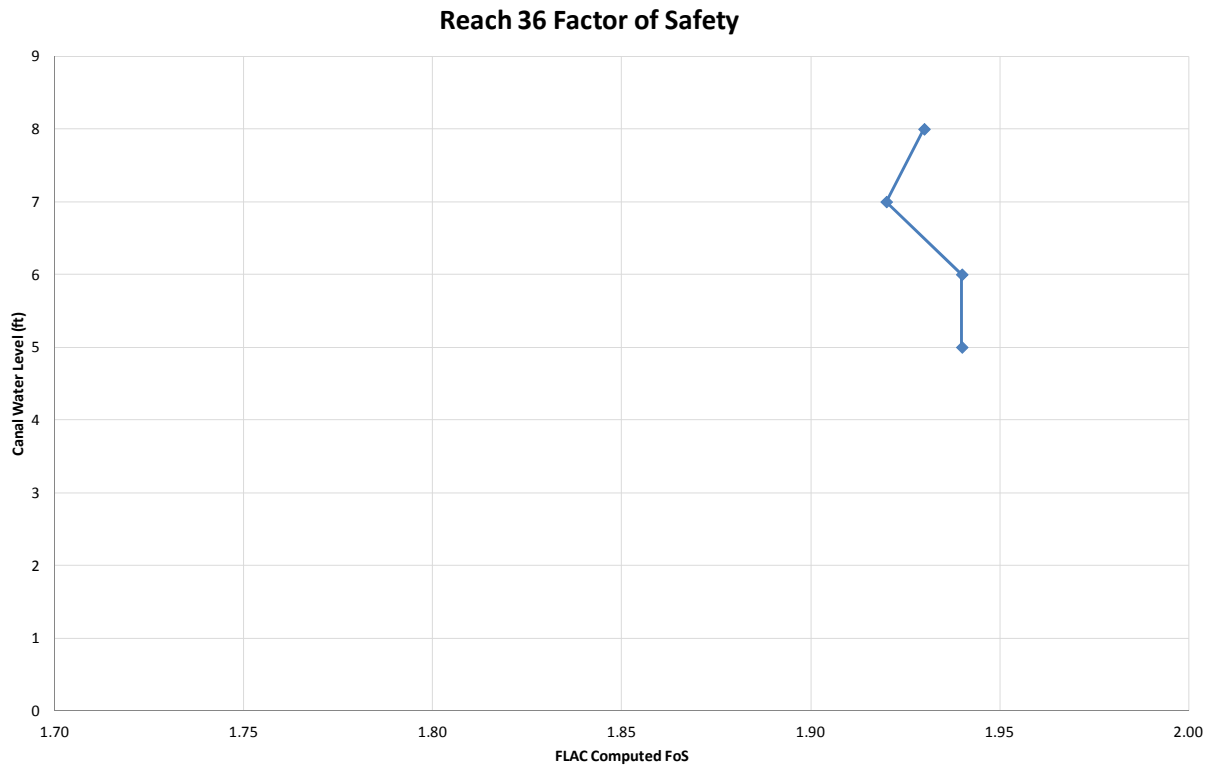


Figure D-68. FLAC computed factor of safety (automated c - ϕ reduction technique).

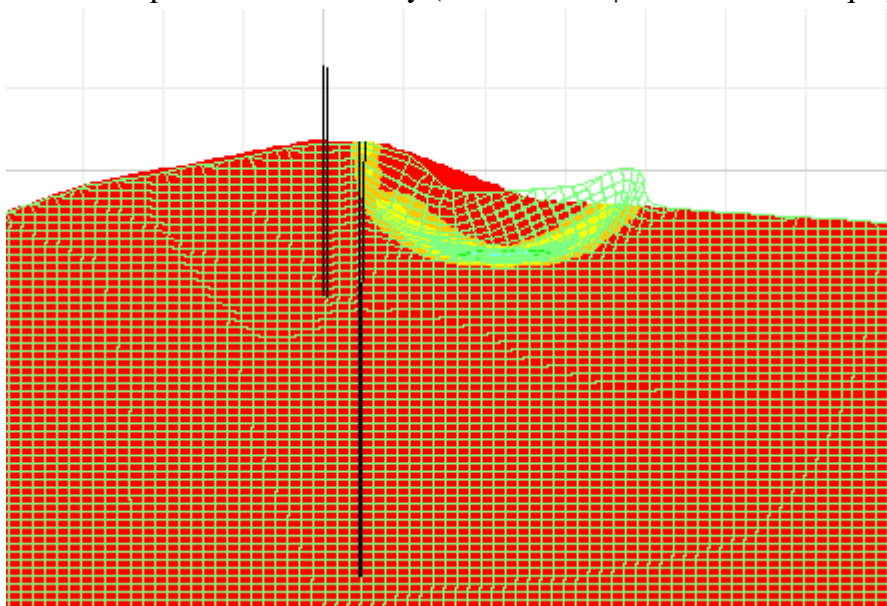


Figure D-69. Reach 36 WL+5 ft, FoS ssi and wall displacement magnified 5X.

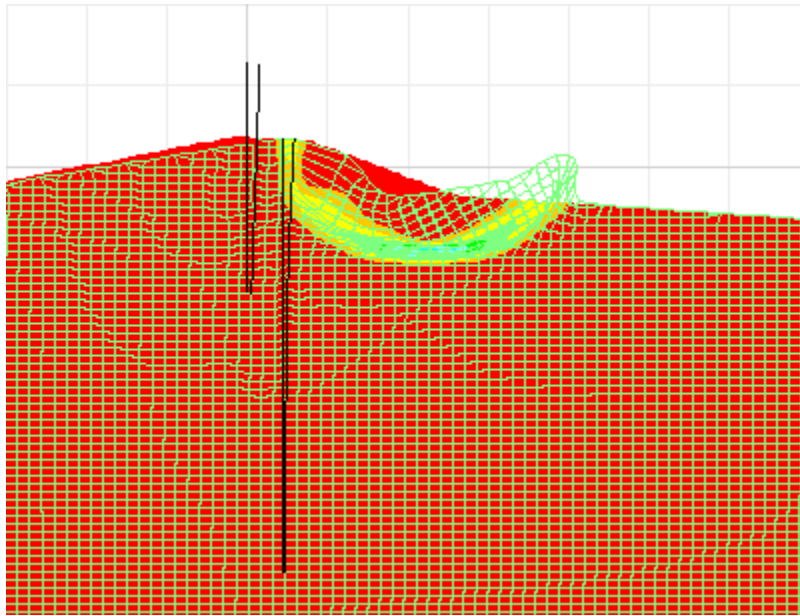


Figure D-70. Reach 36 WL+6 ft, FoS ssi and wall displacement magnified 5X.

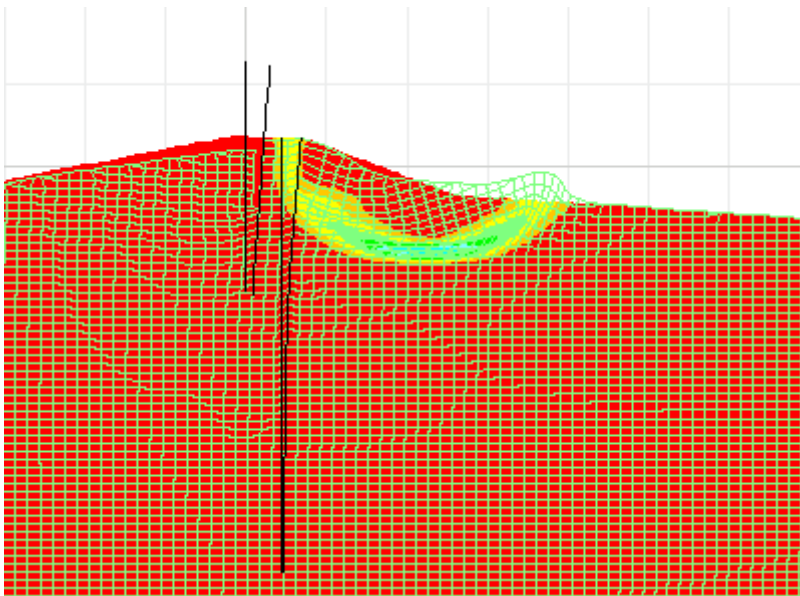


Figure D-80. Reach 36 WL+7 ft, FoS ssi and wall displacement magnified 5X.

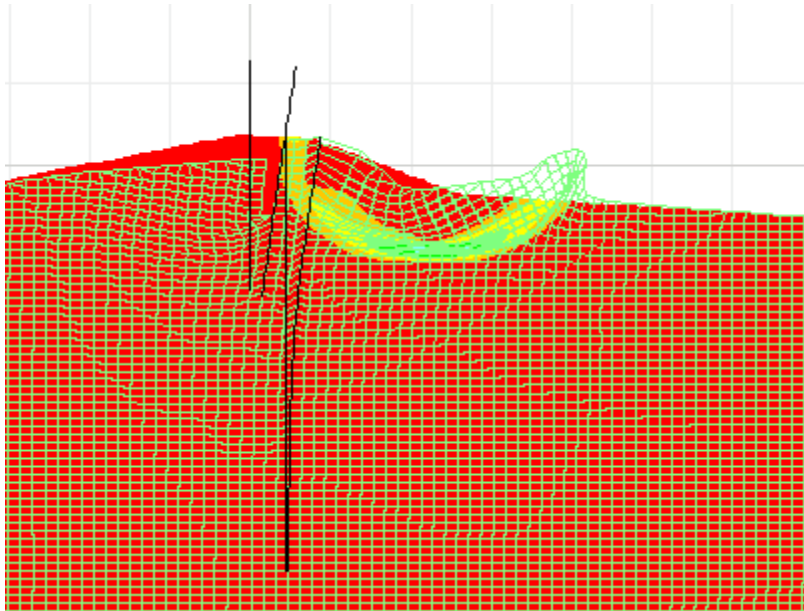


Figure D-81. Reach 36 WL+8 ft, FoS ssi and wall displacement magnified 5X.

Table D-43. Summary of FLAC FoS and Controlling Failure Mode Reach 36.

Canal WL (ft)	FLACAuto FoS	Controlling Failure Mode ⁽³⁾
5	1.94	Global Stability
6	1.94	Global Stability
7	1.92	Global Stability
8	1.93	Global Stability

Notes:

- (1) At water level EL 8 ft the bending stress is 1.3 ksi using unfactored soil strengths.
- (2) At the limiting factor of safety the bending stress is 24.8 ksi using soil strengths factored by the FoS of 1.93. This is not a structural design load case but since the beams are modeled with elastic properties only (no limit on maximum stress) this check was made to verify that bending stresses were less than yield. If the maximum computed stress was greater than the yield stress the remediation pile would have provided too much resistance in the factor of safety analysis.
- (3) Determined by inspection of model displacement (i.e. wall rotating about a point, displacing with little wall rotation or both).

Reach 16 Open Seepage Entrance

Introduction

The design section is the same as presented previously for Reach 16 except that the silted in layer is replaced with clean beach sand material as shown by the Geo-Studio model in Figure D-82. This condition is examined in consideration for potential channel erosion and the subsequent effects on I-wall levee system response. The FLAC model is the same as previously developed except that piezometric heads are based on results from the revised Seep/W analyses. Model parameters are the same as those presented for Reach 16 and are not reprinted in this section.

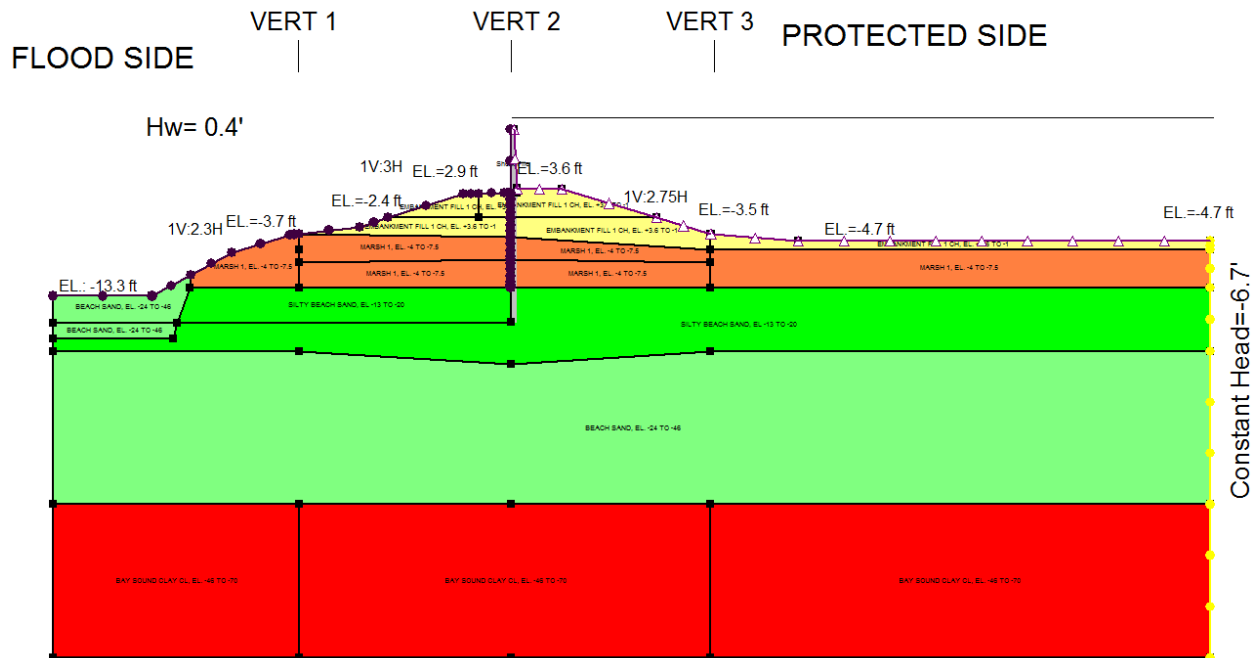


Figure D-82. Geo-Studio model for London Canal Reach 16 Open Seepage Entrance (OSE).

Results

The piezometric data from the Seep/W analyses is presented in Table D-44. The maximum protected side ground displacement for the MLV at water level EL 8.0 ft was about 3.3 inches. The maximum developed crack depth was nearly 15 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 Figures D-83 and D-64. The gap tip at EL -12. ft terminates at the marsh/sand interface and this provides a seepage source to the underlying granular materials.

Table D-44. Piezometric Surface in Granular Material at Selected Coordinates Reach 16 OSE.

x-coor (ft)	WL 0.4 (ft) Gap 0	WL1.0 (ft) Gap 0	WL2.0 (ft) Gap 0	WL3.0 (ft) Gap 4	WL4.0 (ft) Gap 4	WL5.0 (ft) Gap 5	WL6.0 (ft) Gap 7	WL7.0 (ft) Gap 10	WL8.0 (ft) Gap 13
130	0.4	1.0	2.0	2.9	3.9	4.9	5.9	6.9	7.9
150	0.4	1.0	2.0	2.9	3.9	4.9	5.9	6.9	7.9
170	-2.1	-1.7	-1.1	-0.4	0.2	0.9	1.5	2.2	3.1
200	-3.0	-2.7	-2.2	-1.7	-1.2	-0.7	-0.2	0.4	8.0
200	-3.0	-2.7	-2.2	-1.7	-1.2	-0.7	-0.2	0.4	8.0
222	-4.0	-3.7	-3.3	-2.9	-2.6	-2.2	-1.8	-1.4	-0.8
245	-4.7	-4.5	-4.2	-3.9	-3.6	-3.4	-3.1	-2.8	-2.4
275	-5.6	-5.5	-5.4	-5.2	-5.1	-4.9	-4.8	-4.6	-4.4
290	-6.1	-6.0	-5.9	-5.9	-5.8	-5.7	-5.6	-5.5	-5.4
310	-6.7	-6.7	-6.7	-6.7	-6.7	-6.7	-6.7	-6.7	-6.7
350	-6.7	-6.7	-6.7	-6.7	-6.7	-6.7	-6.7	-6.7	-6.7

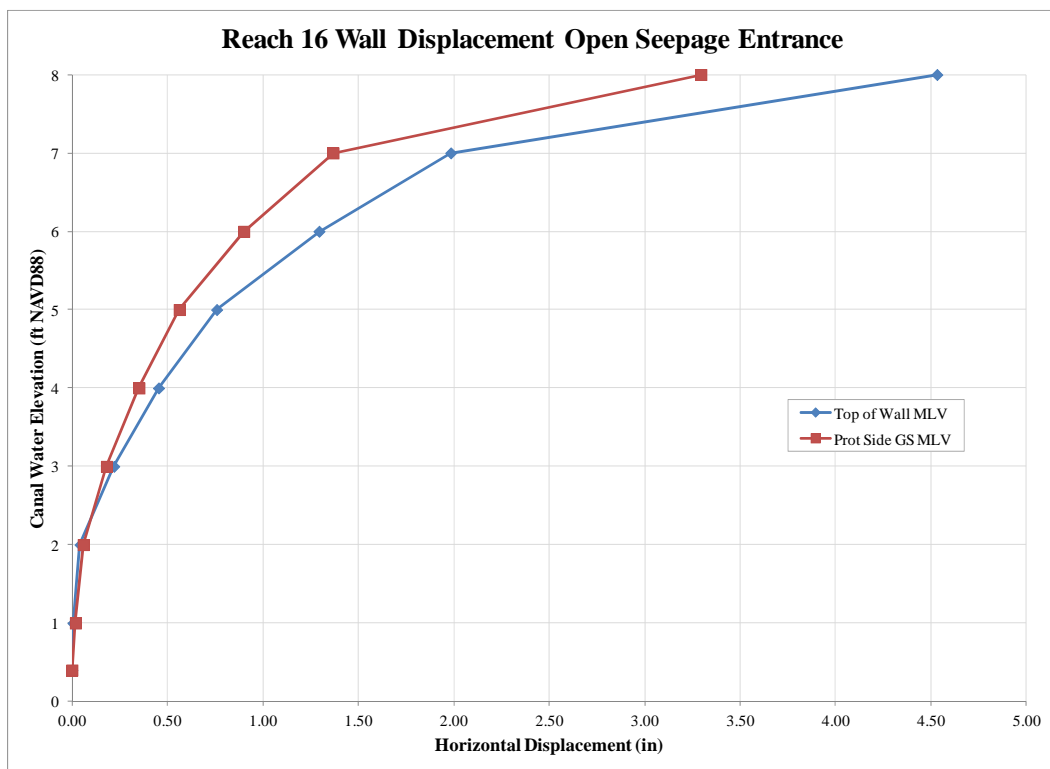


Figure D-83. FLAC computed I-wall displacement.

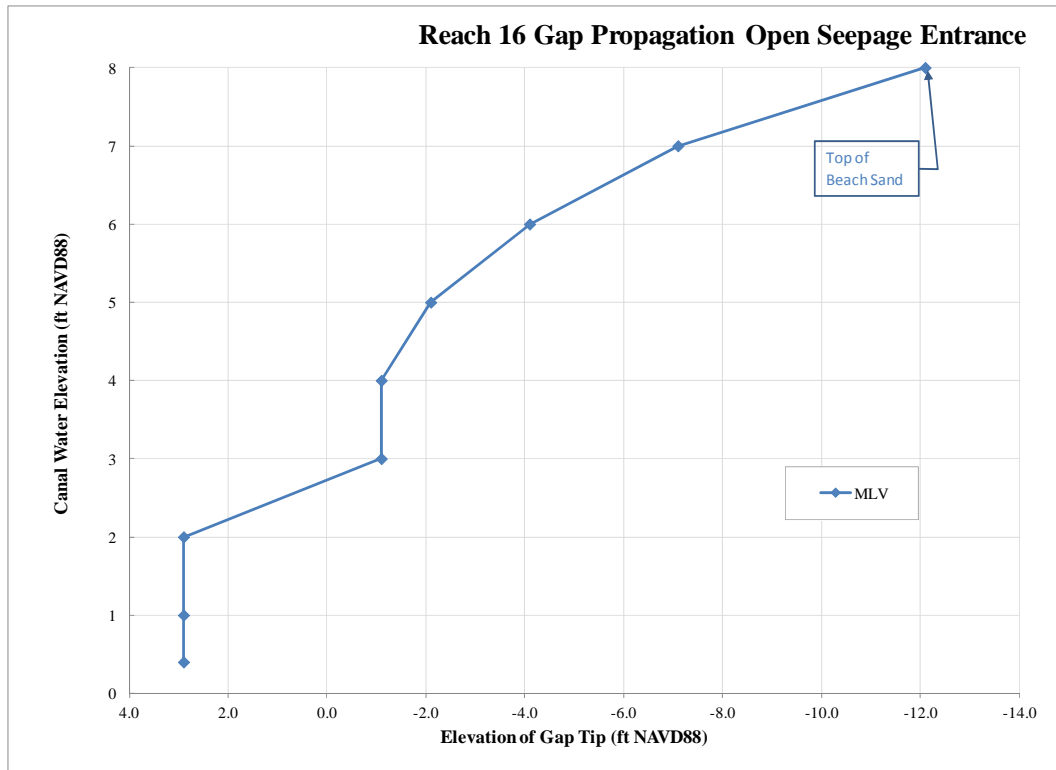


Figure D-84. FLAC computed gap propagation.

The automated $c-\phi$ reduction technique in FLAC was used for all factor of safety (FoS) calculations. Figure D-85 presents the computed factors of safety for differing canal water levels and Figures D-86 through D-91 show the shear strain increment (ssi) or rate (ssr) 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 D-45.

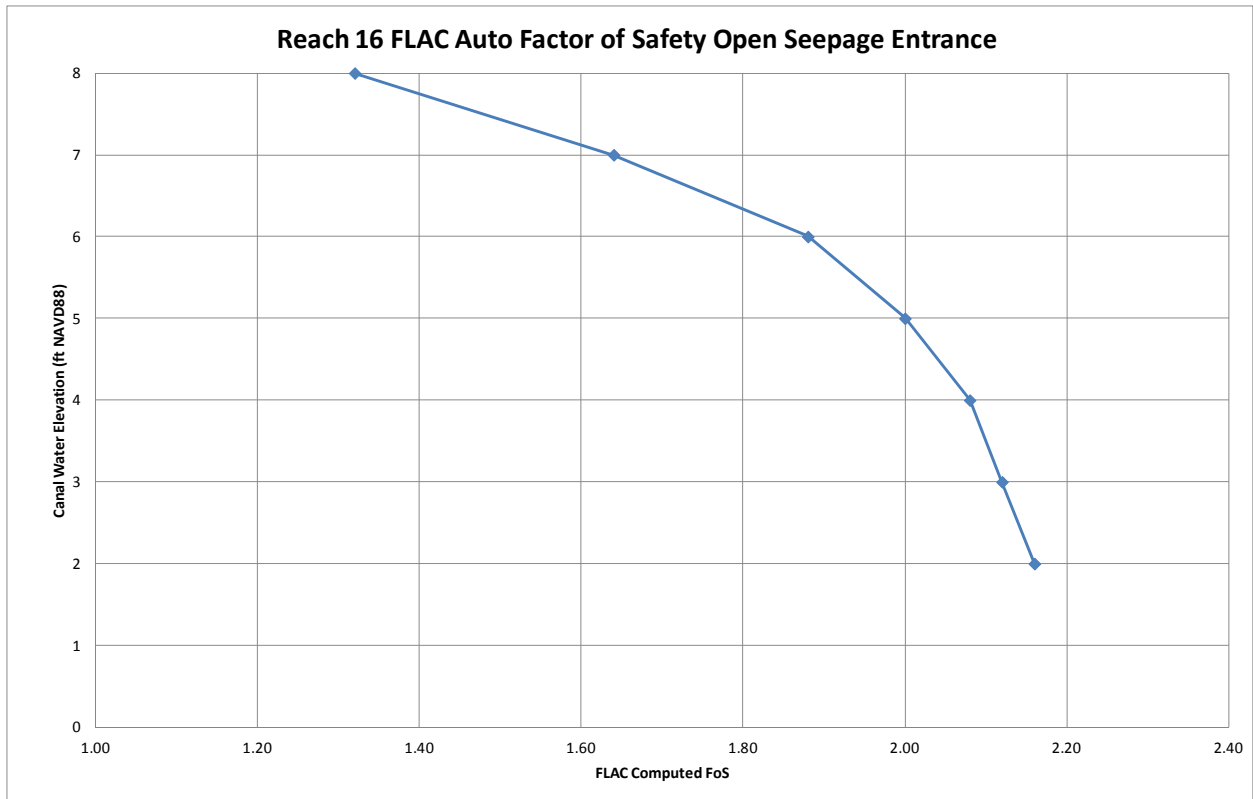


Figure D-85. FLAC computed factor of safety (automated $c-\phi$ reduction technique).

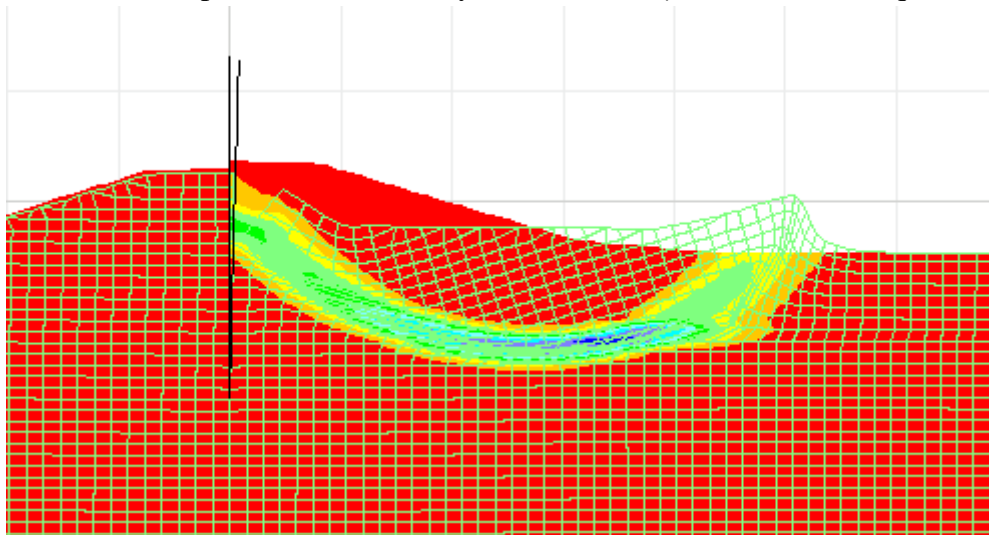


Figure D-86. Reach 16 OSE WL+3 ft, FoS ssi and wall displacement magnified 5X.

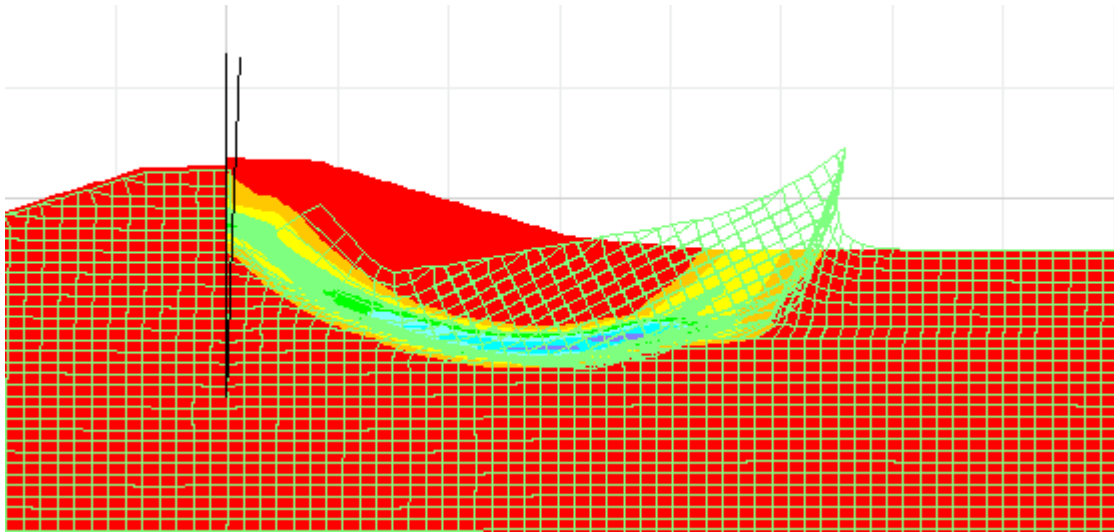


Figure D-87. Reach 16 OSE WL+4 ft, FoS ssi and wall displacement magnified 5X.

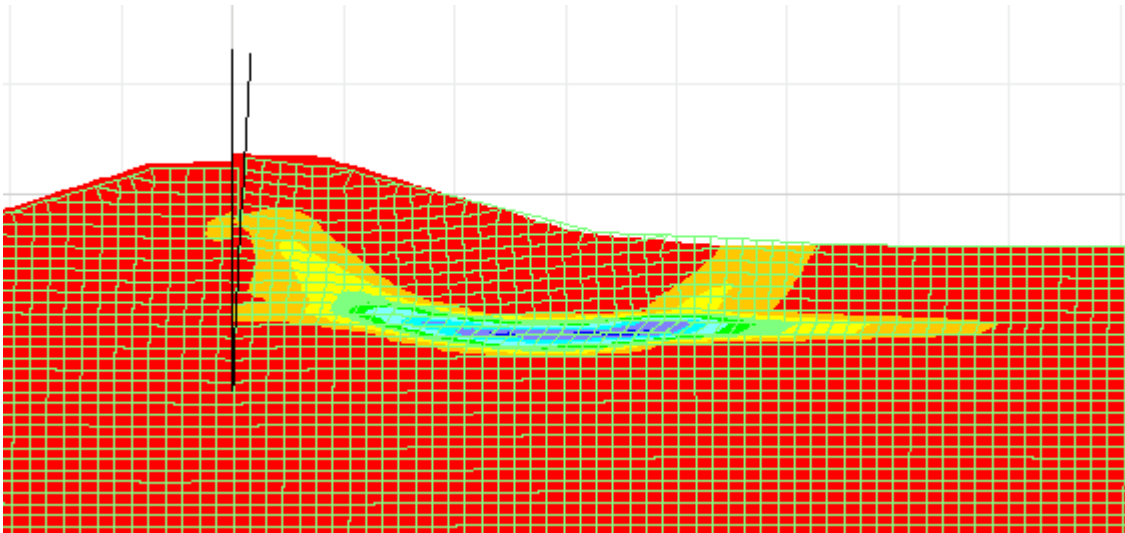


Figure D-88. Reach 16 OSE WL+5 ft, FoS ssi and wall displacement magnified 5X.

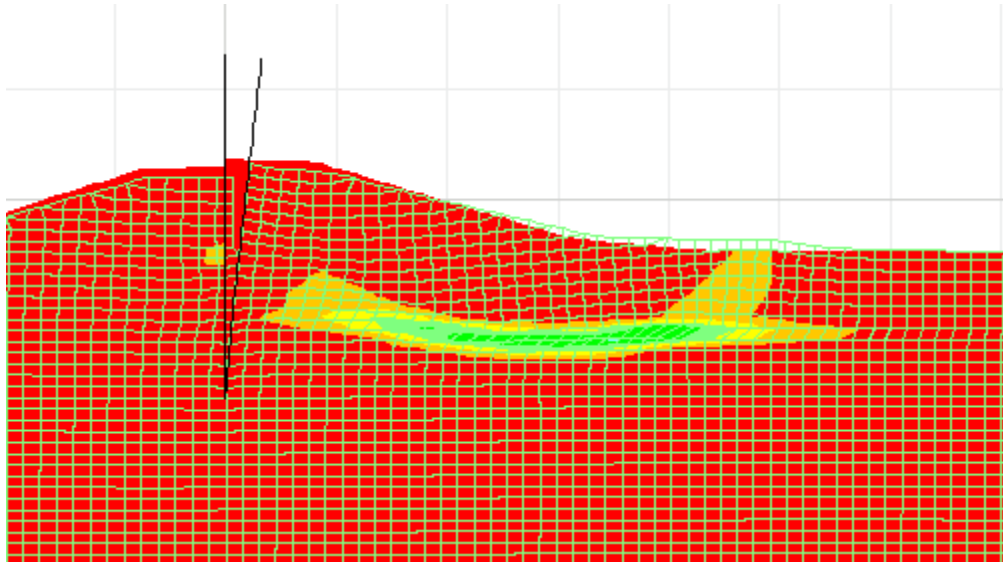


Figure D-89. Reach 16 OSE WL+6 ft, FoS ssi and wall displacement magnified 5X.

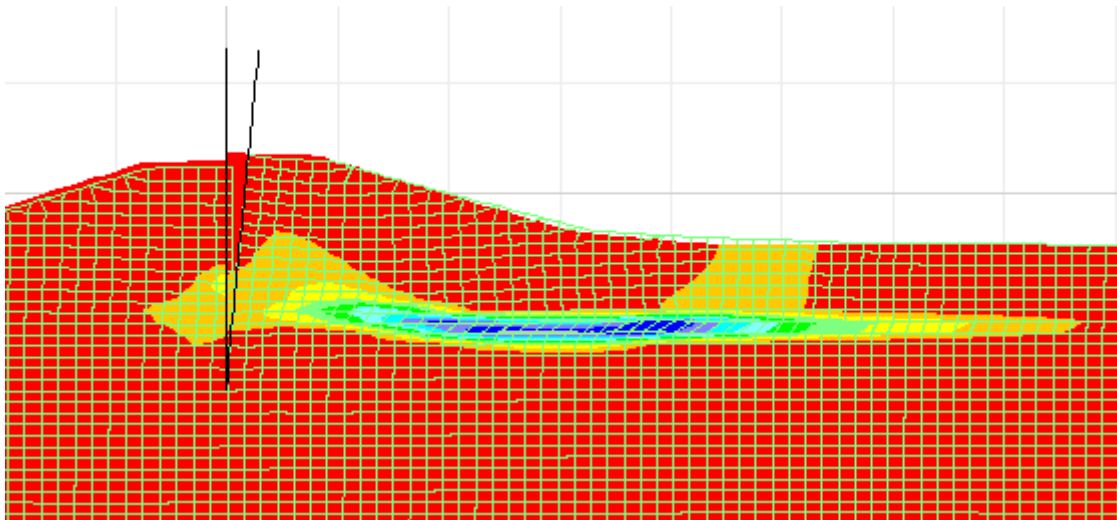


Figure D-90. Reach 16 OSE WL+7 ft, FoS ssi and wall displacement magnified 5X.

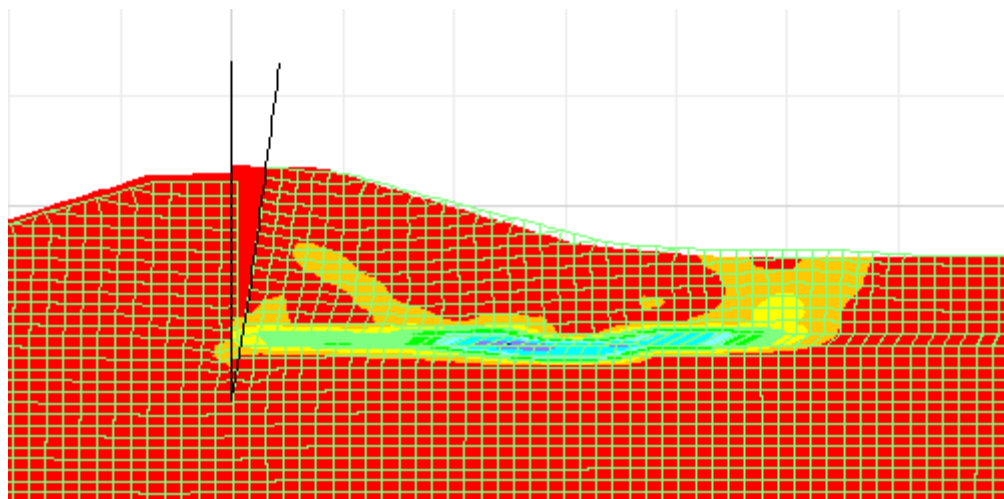


Figure D-91. Reach 16 OSE WL+8 ft, FoS ssr and wall displacement magnified 5X.

Table D-45. Summary of FLAC FoS and Controlling Failure Mode Reach 16 OSE.

Canal WL (ft)	FLACAuto FoS	Controlling Failure Mode*
3	2.12	Global Stability
4	2.08	Global Stability
5	2.00	Global Stability/Wall Rotation
6	1.88	Wall Rotation
7	1.64	Wall Rotation
8	1.32	Wall Rotation

*Determined by inspection of model displacement (i.e. wall rotating about a point, displacing with little wall rotation or both).

Reach 35B Open Seepage Entrance

Introduction

The design section is the same as presented previously for Reach 35B except that the silted in layer is replaced with clean beach sand material as shown by the Geo-Studio model in Figure D-92. This condition is examined in consideration for potential channel erosion and the subsequent effects on I-wall levee system response. The FLAC model is the same as previously developed except that piezometric heads are based on results from the revised Seep/W analyses. Model parameters are the same as those presented for Reach 35B and are not reprinted in this section.

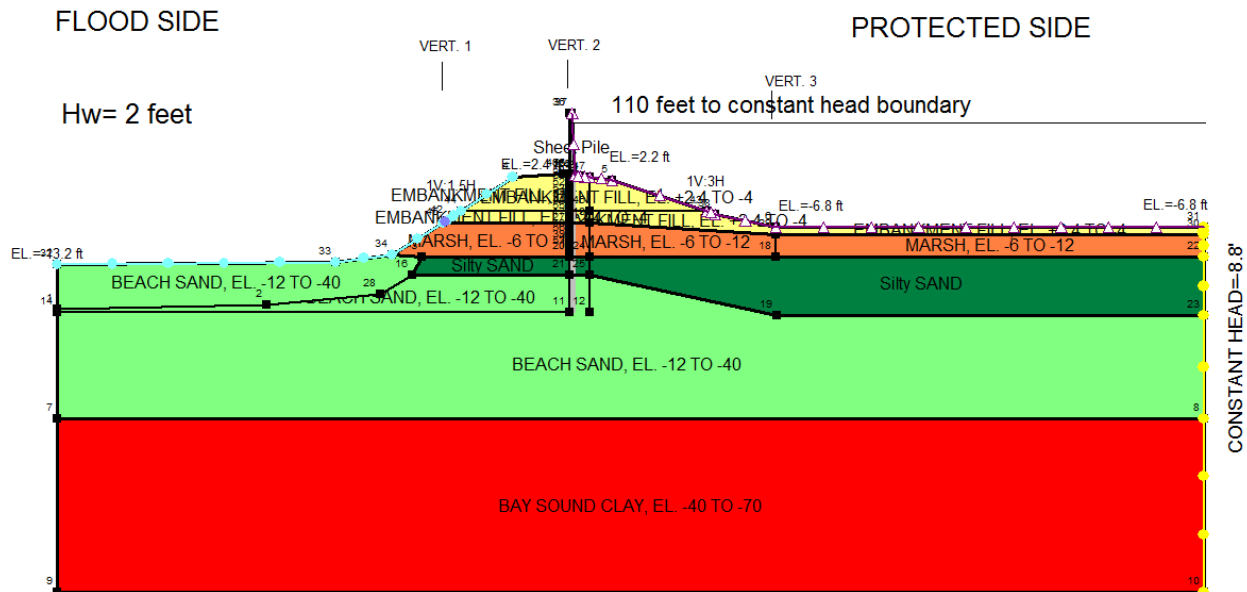


Figure D-92. Geo-Studio model for London Canal Reach 35B Open Seepage Entrance (OSE).

Results

The piezometric data from the Seep/W analyses is presented in Table D-46. With the open seepage condition the FLAC model was only able to be progressed to canal water loading of EL 2 ft before uplift at the levee toe became unstable (see Figure D-93) and no further analysis was done.

Table D-46. Piezometric Surface in Granular Material at Selected Coordinates Reach 35B OSE.

x-coor (ft)	WL 0.4 (ft) Gap 0	WL1.0 (ft) Gap 0	WL2.0 (ft) Gap 0	WL3.0 (ft) Gap 8	WL4.0 (ft) Gap 8	WL5.0 (ft) Gap 8	WL6.0 (ft) Gap 8	WL7.0 (ft) Gap 12	WL8.0 (ft) Gap 14
135	0.3	0.9	1.9	2.9	-8.1	-8.0	-7.9	-7.8	-6.2
184	-0.9	-0.3	0.5	1.4	-8.1	-8.1	-8.0	-7.9	-6.3
195	-1.3	-0.8	0.0	0.8	-8.2	-8.1	-8.1	-7.9	-5.6
200	-1.4	-0.9	-0.1	0.7	-8.2	-8.1	-8.1	-7.9	8.0
200	-2.1	-1.7	-0.9	-0.2	-8.3	-8.2	-8.2	-8.1	-6.6
215	-2.5	-2.1	-1.5	-0.8	-8.3	-8.3	-8.2	-8.2	-6.8
235	-3.8	-3.4	-2.9	-2.4	-8.4	-8.4	-8.3	-8.3	-7.2
265	-5.8	-5.6	-5.3	-5.0	-8.6	-8.5	-8.5	-8.5	-7.8
290	-7.5	-7.4	-7.2	-7.1	-8.7	-8.7	-8.7	-8.7	-8.4
310	-8.8	-8.8	-8.8	-8.8	-8.8	-8.8	-8.8	-8.8	-8.8
350	-8.8	-8.8	-8.8	-8.8	-8.8	-8.8	-8.8	-8.8	-8.8

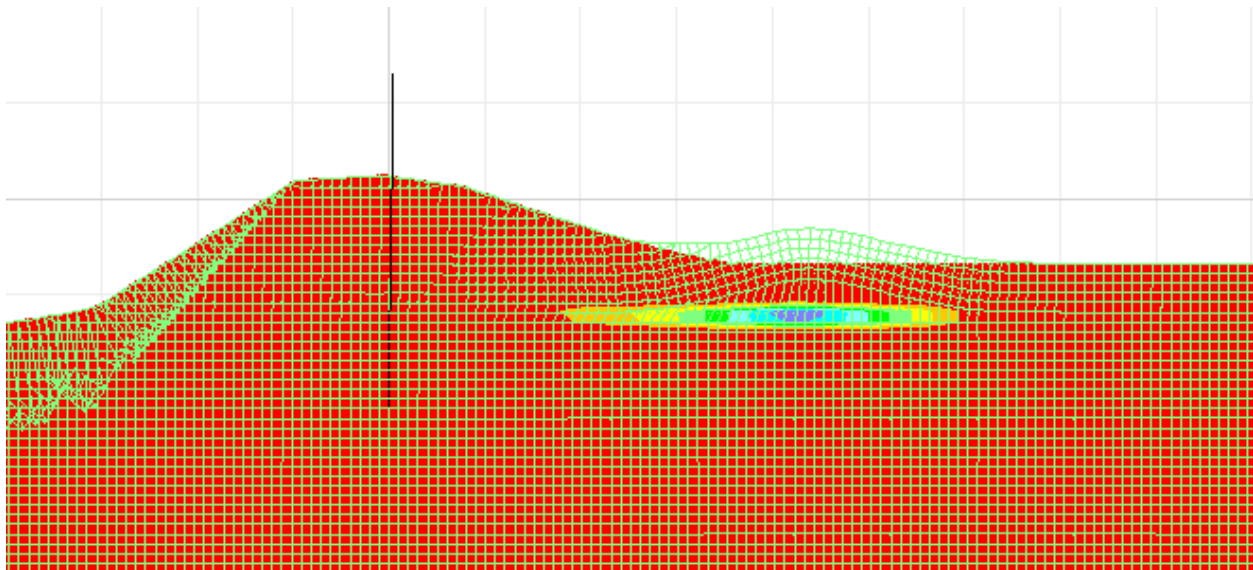


Figure D-93. Reach 35B OSE FLAC showing heave at levee toe for WL +2.0 ft.

Reach 14

Introduction

A complete soil-structure interaction (SSI) analysis was completed using FLAC for the London Canal Reach 14 I-wall assuming an open seepage entrance to the canal. The cross section used for the SSI modeling was based on the Black & Veatch Geo-Studio model shown in Fig. D-94 but was modified by changing the flood side stratigraphy to represent a sand canal bottom. The design section includes: clay embankment (EL +3.8 ft), underlain by a shallow marsh deposit (EL -2 ft to EL -11.5 ft). The shallow marsh is underlain by a beach sand stratum (EL -11.5 ft to EL -47 ft) which mantles a lower clay deposit which extends at least until the bottom of the model (EL -70 ft). In accordance with the B&V model the clay embankment material was assigned a unit weight of 107 pcf with cohesion of 700 psf at the levee centerline varying to 600 psf at the levee toe. The shear strength values used for the clay embankment are higher than those in the underlying marsh deposit, and correspondingly the soil modulus values in the embankment are higher than the marsh. The elevation of the flood side ground line at the wall face is approximately EL 3.4 ft resulting in 0.4 ft difference in soil elevation across the wall. The existing I-wall has a top elevation of 12.9 ft consisting of a concrete cap and CZ101 sheet pile to tip elevation of -15.5 ft. Figures D-94 through D-96 show the Geo-Studio and FLAC model cross sections. The FLAC model was generated using a template created by Itasca Consulting and is constrained to model horizontal soil layers. Due to this simplification the top of the upper marsh strata was set at EL -3 ft, instead of EL -2 ft, and is shown in Figure D-96 without sloping to the levee toes. This was done to reasonably capture the wall displacement behavior when working around the horizontal soil layer constraint. The ground surface landward of the wall is at EL -4.4 ft in the Geo-Studio models but was raised to EL -4.0 ft to approximate the total stress that would have existed from the thin higher density fill layer (not used in the FLAC model) atop the marsh.

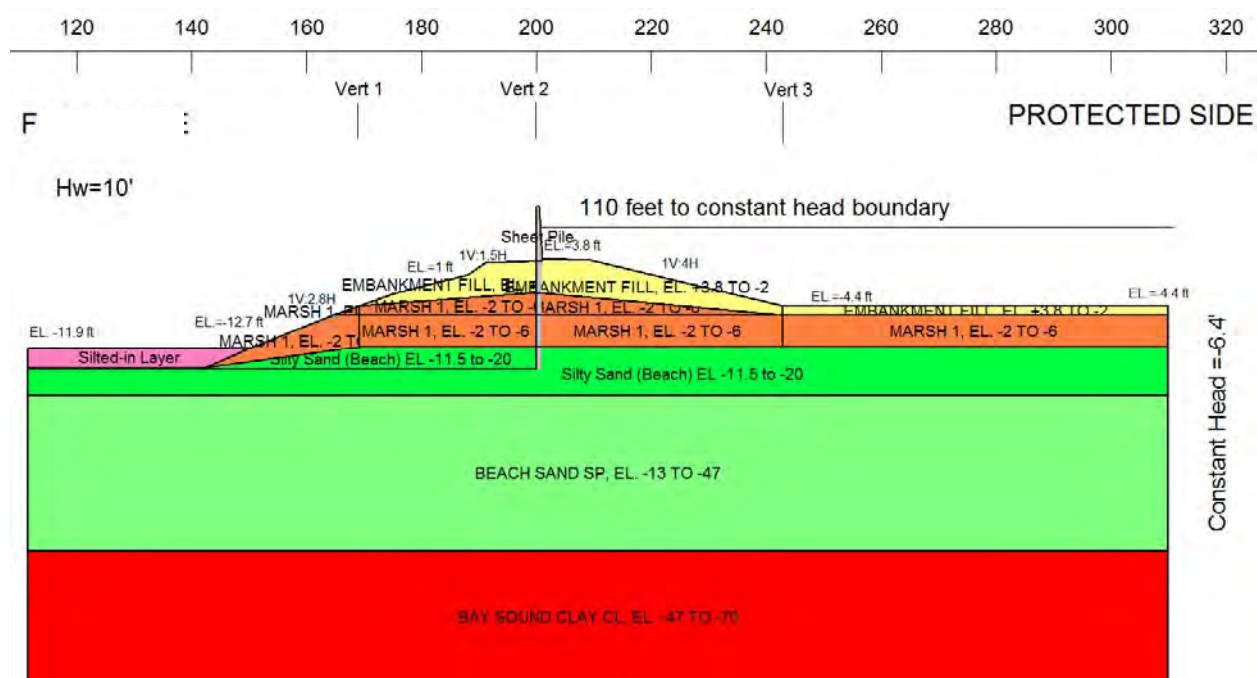


Figure D-94. Geo-Studio model for London Canal Reach 14 (B&V model).

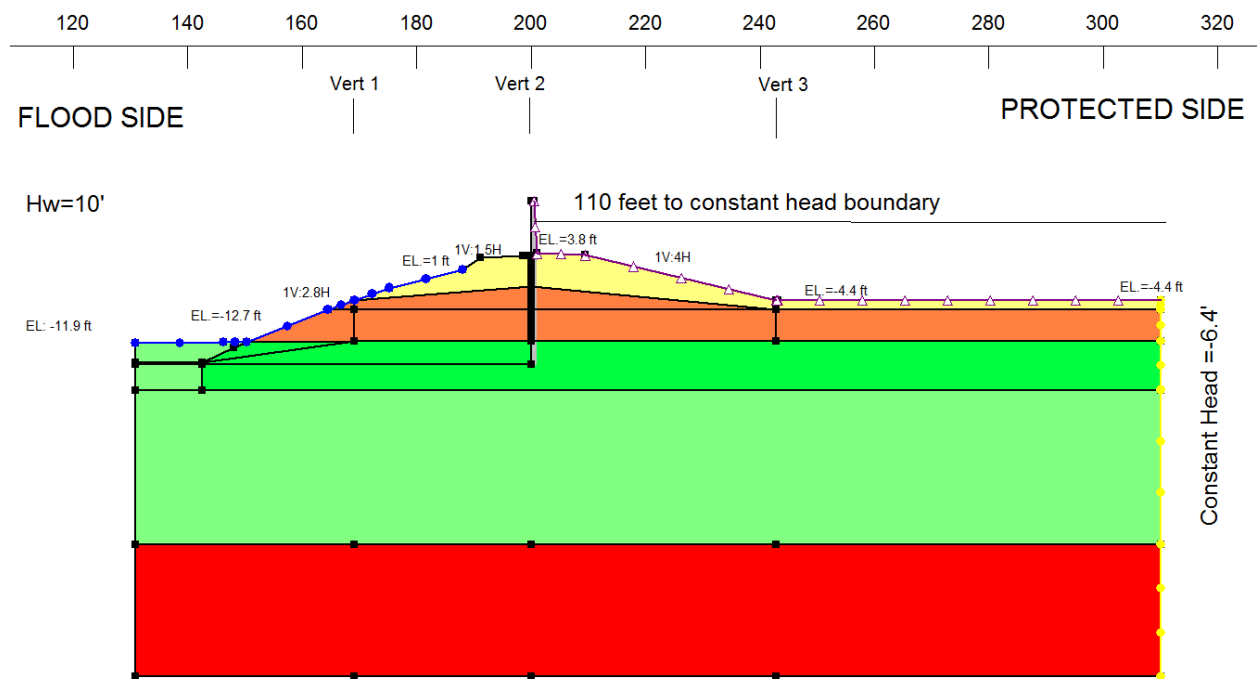


Figure D-94. Geo-Studio model for London Canal Reach 14 (revised seepage model for open seepage entrance and channel symmetry at x=130.9 ft).



Figure D-96. FLAC Model for London Avenue Canal Reach 14

Foundation Parameters

The FLAC analyses are based on simple Mohr-Coulomb constitutive models (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 is the Seep/W file from Black & Veatch as presented in the MOWL report modified as discussed above. 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 Tables D-47 thru D-50. 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 are 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 London 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 total head at the marsh sand interface was then used as the basis for selecting piezometric lines to represent the head in the granular beach sand strata at each corresponding water level in the FLAC model. This piezometric line only affected the shear strength of the sand; modulus values in the sand were held constant in the FLAC model. Piezometric data is shown in Table D-51.

Table D-47. Summary of Centerline Soil Parameters Reach 14

Material	Strata top elevation (NAVD88)	Strata bottom elevation (NAVD88)	unit wt. (pcf)	unit wt/g	Su (psf)*	ϕ' (deg)
1 - Levee	3.8	-3.0	107	3.323	700	0
2 - Marsh	-3.0	-11.5	109	3.385	250	0
3 - Beach Sand	-11.5	-47.0	122	3.789	0	30
4 - Bay Sound Clay	-47.0	-70.0	108	3.354	705	0

*Denotes Su at Top of Bay Sound Clay, Delta Su = 10. psf/ft

Table D-48. Centerline Modulus Parameters Reach 14

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	0.86
2 - Marsh	200	5.00E+04	0.47	1.70E+04	2.78E+05	0.95
3 - Beach Sand	-	7.32E+05	0.33	2.75E+05	7.32E+05	0.50
4 - Bay Sound Clay	600	4.23E+05	0.495	1.41E+05	1.41E+07	0.99

Table D-49. Summary of Toe Soil Parameters Reach 14

Material	Strata top elevation (NAVD88)	Strata bottom elevation (NAVD88)	unit wt. (pcf)	unit wt/g	Su (psf) *	ϕ' (deg)
1 - Levee	3.8	-3.0	107	3.323	600	
2 - Marsh	-3.0	-11.5	80	2.484	220	0
3 - Beach Sand	-11.5	-47.0	122	3.789	0	30
4 - Bay Sound Clay	-47.0	-70.0	108	3.354	630	0

*Denotes Su at Top of Bay Sound Clay, Delta Su = 11.74 psf/ft

Table D-50. Toe Modulus Parameters Reach 14

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	0.86
2 - Marsh	200	4.40E+04	0.47	1.50E+04	2.44E+05	0.98
3 - Beach Sand	-	7.32E+05	0.33	2.75E+05	7.32E+05	0.50
4 - Bay Sound Clay	600	3.78E+05	0.495	1.26E+05	1.26E+07	0.99

Table D-51. Piezometric Surface in Granular Material at Selected Coordinates Reach 14

x-coor (ft)	WL 0.4 (ft) Gap 0	WL1. (ft) Gap 0	WL2. (ft) Gap 0	WL3. (ft) Gap 0	WL4. (ft) Gap 0	WL5. (ft) Gap 7	WL6. (ft) Gap 8	WL7. (ft) Gap 10	WL8. (ft) Gap 11	WL9. (ft) Gap 15	WL10 (ft) Gap 15
130.9	0.4	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0
150	0.4	1.0	2.0	2.9	3.9	4.9	5.9	6.9	7.9	8.9	9.9
157	-0.8	-0.3	0.5	1.4	2.2	3.0	3.8	4.7	5.5	6.4	7.2
171	-1.6	-1.2	-0.5	0.2	0.9	1.6	2.3	3.1	3.8	4.6	5.3
190	-2.3	-1.9	-1.3	-0.7	-0.1	0.5	1.2	1.8	2.4	3.5	4.2
198	-2.5	-2.2	-1.6	-1.0	-0.4	0.2	0.7	1.3	1.9	4.7	5.4
202	-2.8	-2.5	-1.9	-1.4	-0.9	-0.3	0.2	0.7	1.3	2.3	2.8
241	-4.0	-3.8	-3.5	-3.1	-2.8	-2.4	-2.1	-1.8	-1.4	-1.0	-0.6
271	-5.1	-4.9	-4.7	-4.5	-4.3	-4.1	-3.9	-3.7	-3.6	-3.3	-3.1
310	-6.4	-6.4	-6.4	-6.4	-6.4	-6.4	-6.4	-6.4	-6.4	-6.4	-6.4
350	-6.4	-6.4	-6.4	-6.4	-6.4	-6.4	-6.4	-6.4	-6.4	-6.4	-6.4

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 D-52.

Table D-52. Summary of Structural Parameters Reach 14

Member	E (psi)	E* (psi)	E* (psf)	I (in4/ft)	E*I (lbft2/ft)	A (in2/ft)	E*A (lb/ft)	ν
Concrete	3.00E+06	3.13E+06	4.50E+08	1728	3.75E+07	144	4.50E+08	0.2
CZ101	2.90E+07	3.19E+07	4.59E+09	65.01	1.44E+07	6.08	1.94E+08	0.3

E = Young's Modulus

E* = Adj. Young's Modulus for Plain Strain

I = Moment of Inertia per foot of wall

A = Cross Sectional Area per foot of wall

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 a maximum water level of 10 ft in 1 ft increments (model did not converge at a water level of 11.0 ft indicating a factor of safety less than 1). Gaps were deepened in 1 ft increments as they developed.

Results

The maximum protected side ground displacement for the expected soil properties at water level EL 8.0 ft was about 1.8 inches with a maximum developed crack depth of about 10½ 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 Figures D-97 and D-98.

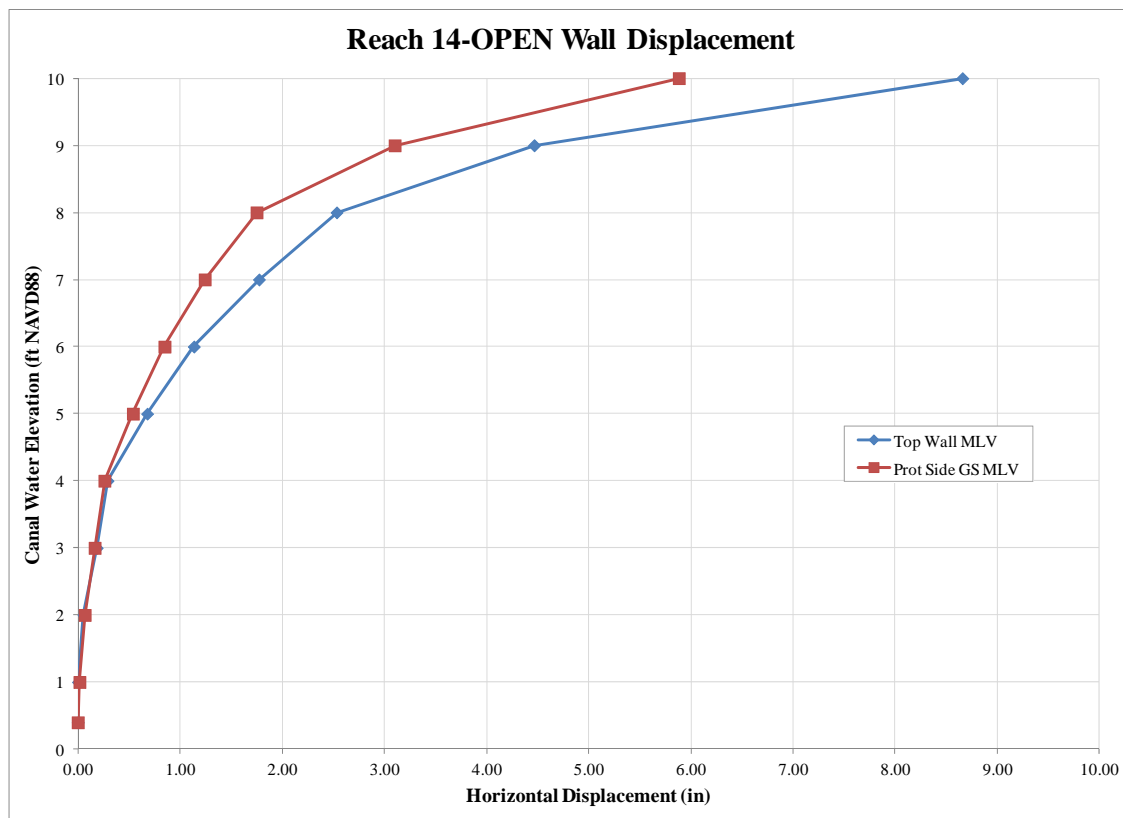


Figure D-97. FLAC computed I-wall displacement.

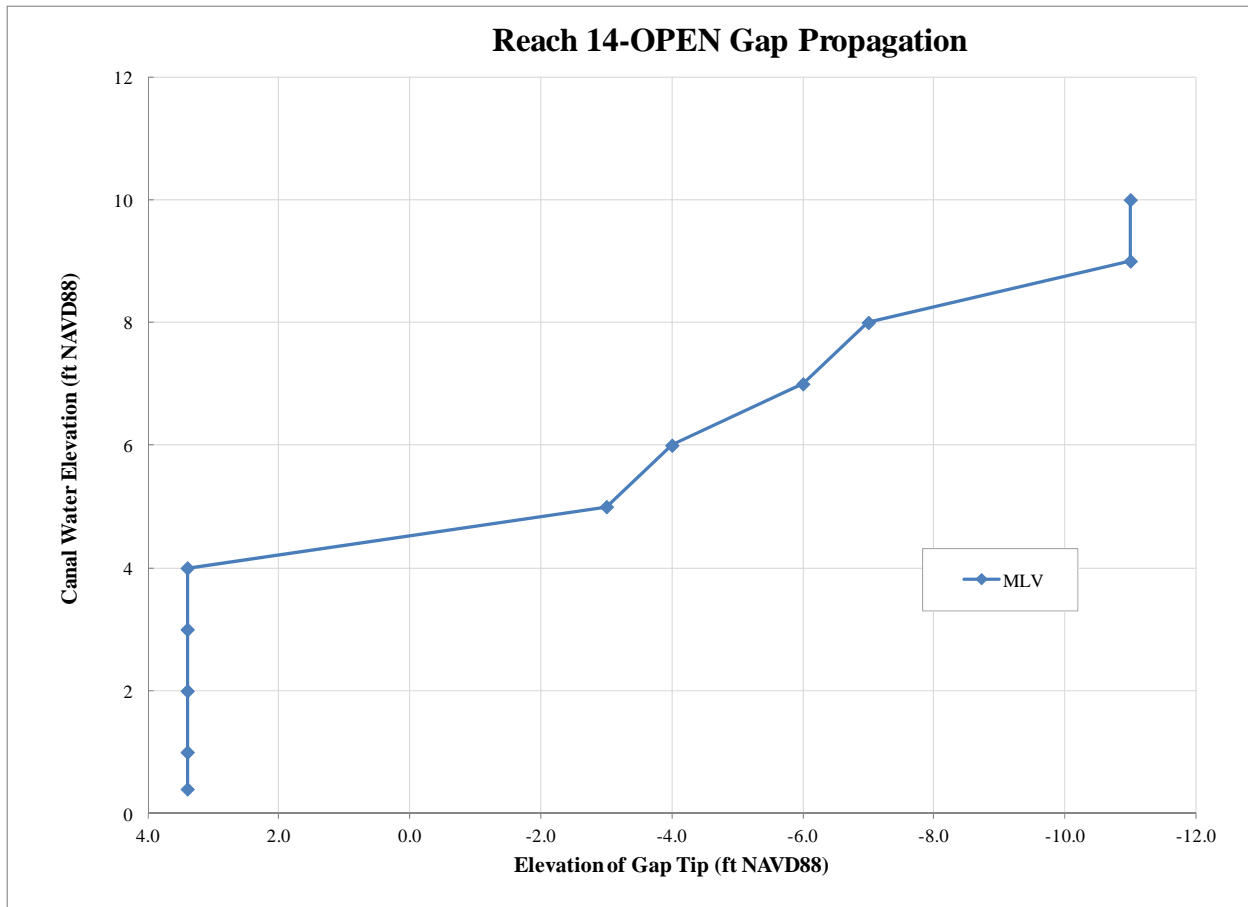


Figure D-98. FLAC computed gap propagation.

The automated “ $c-\phi$ ” reduction technique in FLAC was used for all factor of safety (FoS) calculations. Figure D-99 presents the computed factors of safety for differing canal water levels and Figures D-100 through D-107 show the shear strain increment (ssi) contours and displaced wall locations (displacements magnified) 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 D-53.

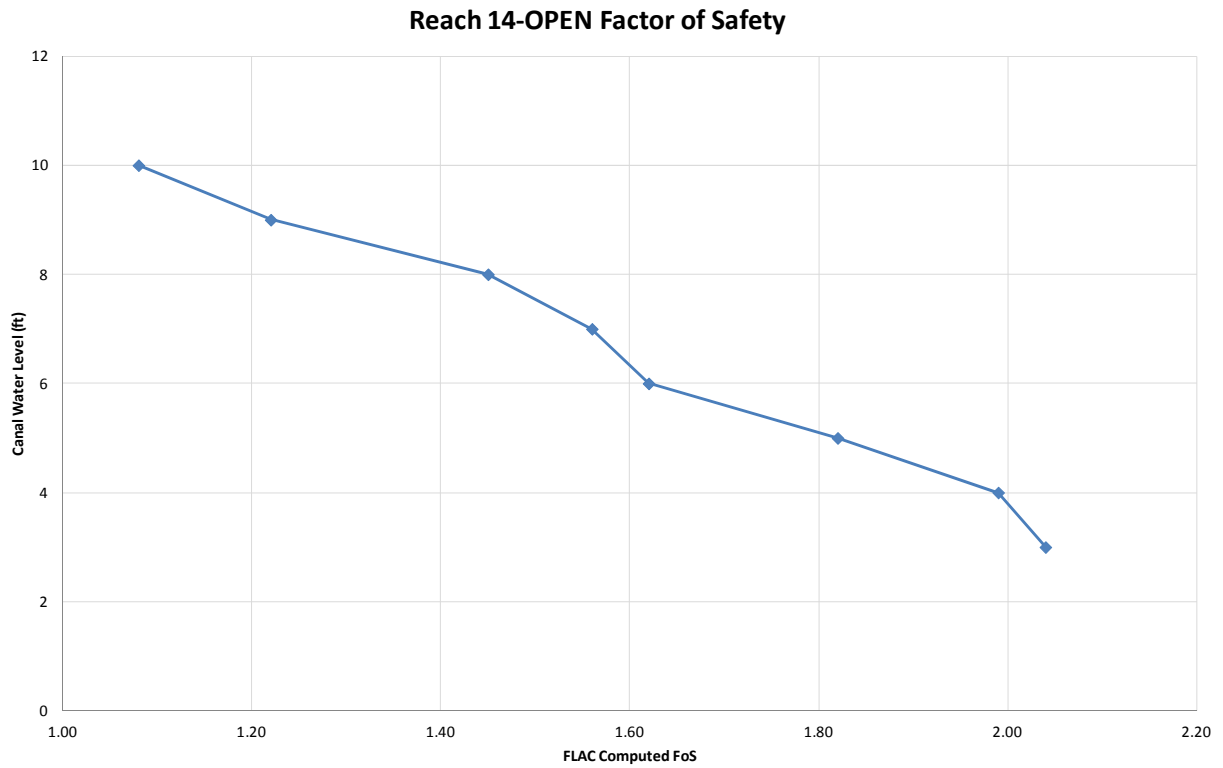


Figure D-99. FLAC computed factor of safety (automated c - ϕ reduction technique).

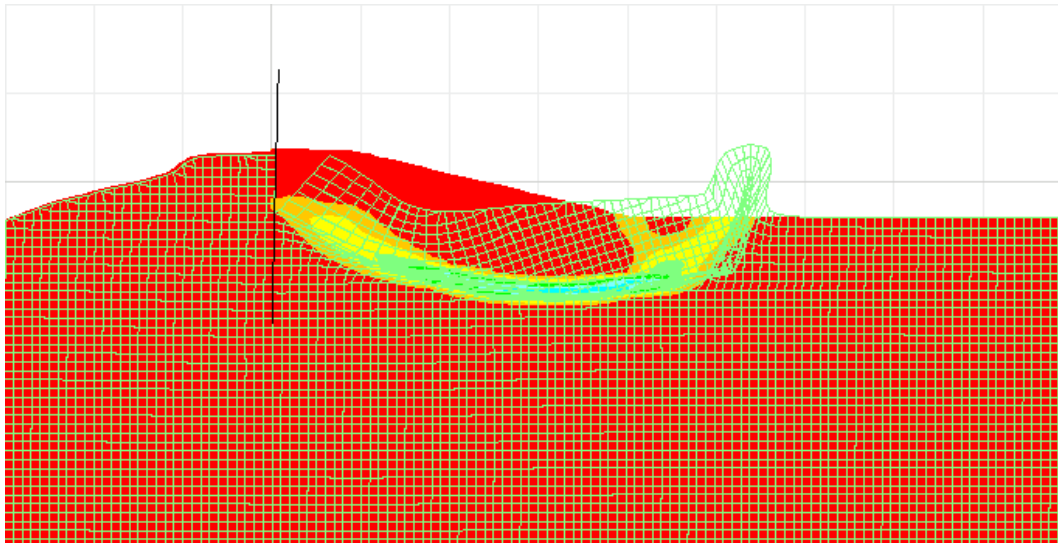


Figure D-100. Reach 14 WL+3 ft, FoS ssi and wall displacement magnified 5X .

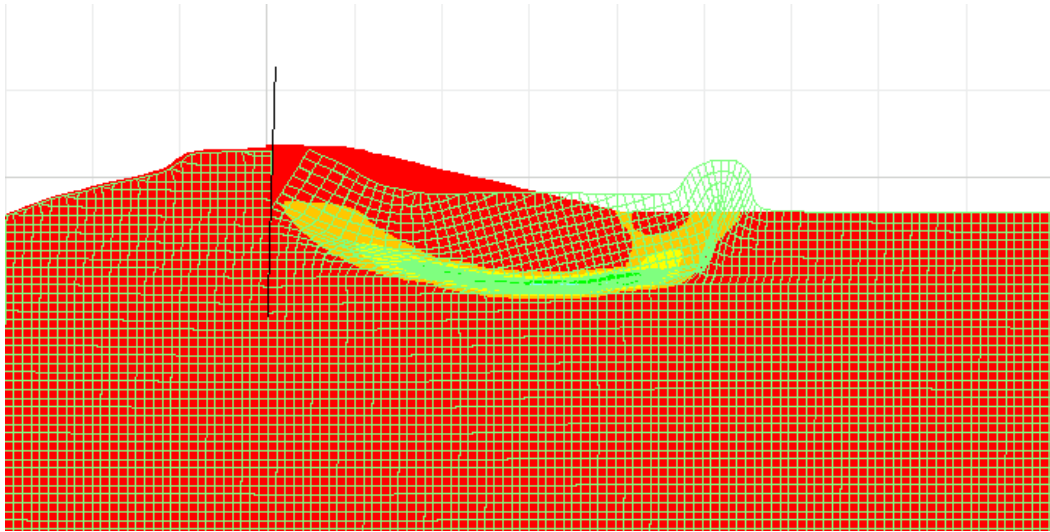


Figure D-101. Reach 14 WL+4 ft, FoS ssi and wall displacement magnified 5X.

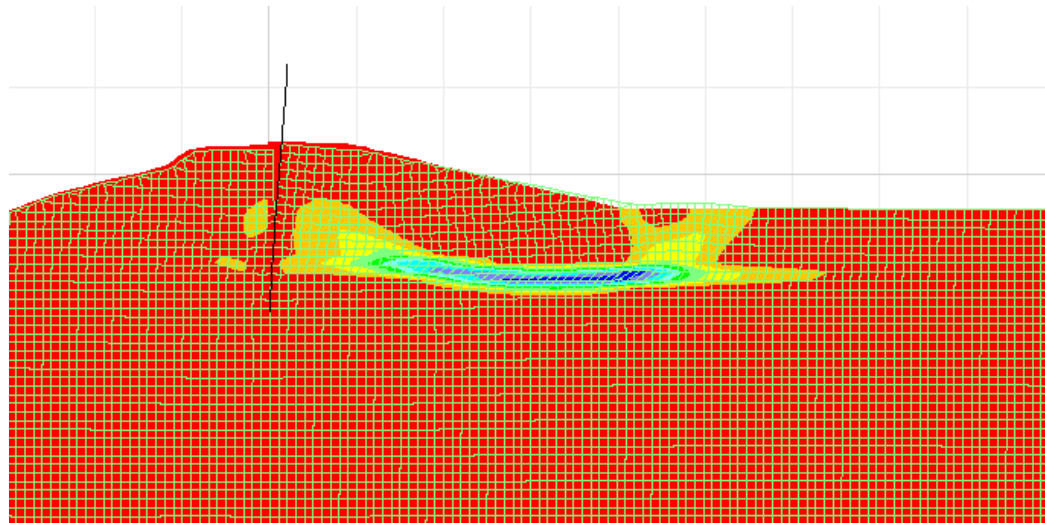


Figure D-102. Reach 14 WL+5 ft, FoS ssi and wall displacement magnified 5X.

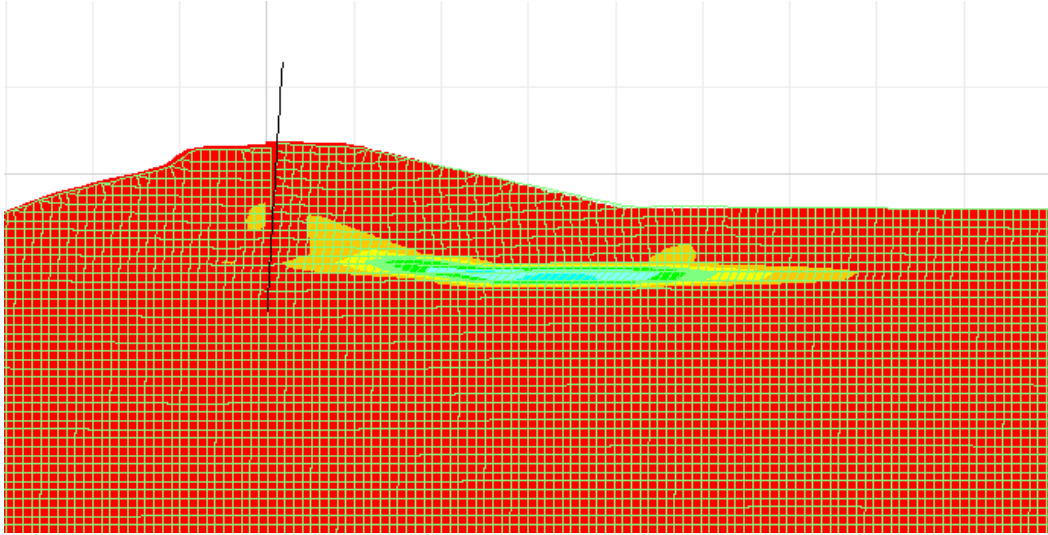


Figure D-103. Reach 14 WL+6 ft, FoS ssi and wall displacement magnified 5X.

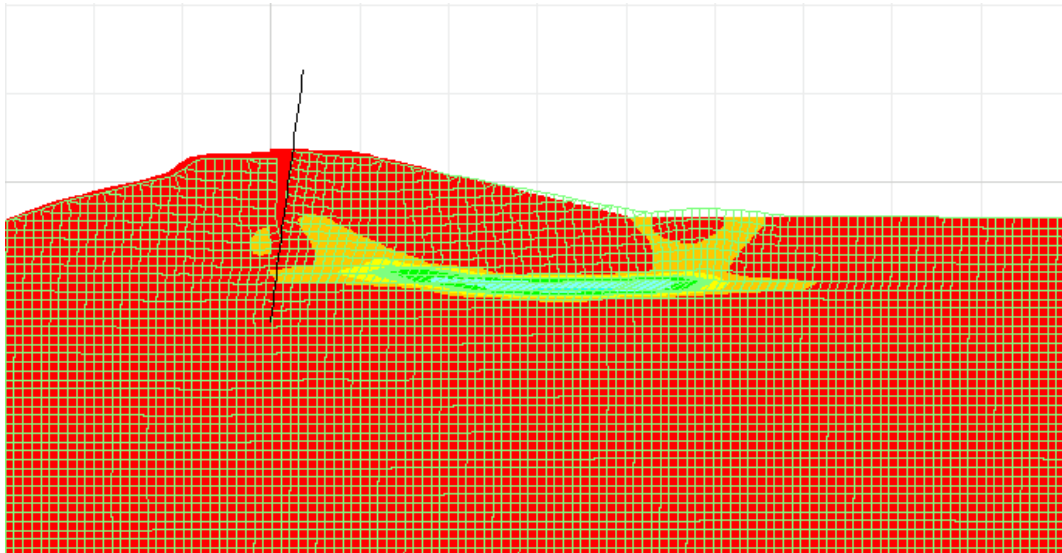


Figure D-104. Reach 14 WL+7 ft, FoS ssi and wall displacement magnified 5X.

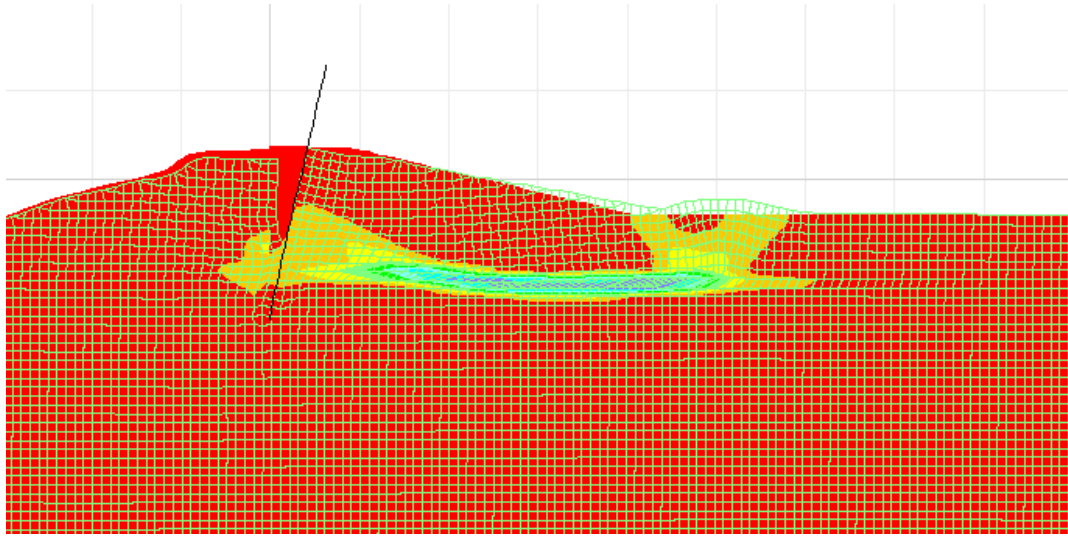


Figure D-105. Reach 14 WL+8 ft, FoS ssi and wall displacement magnified 5X.

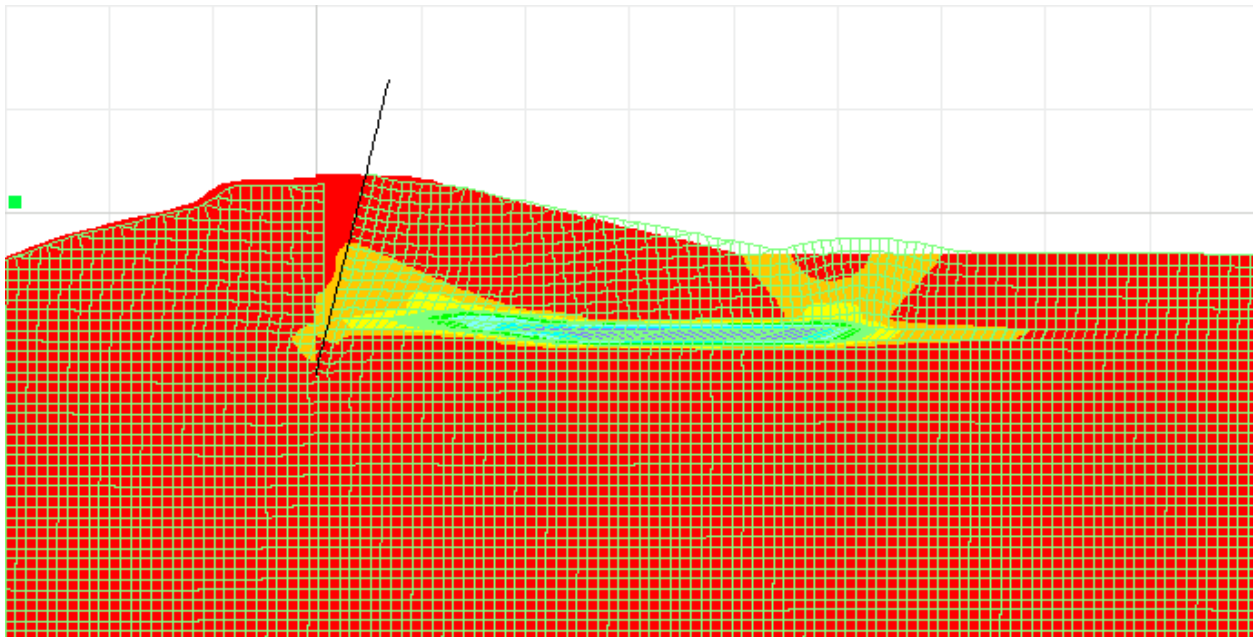


Figure D-106. Reach 14 WL+9 ft, FoS ssi and wall displacement magnified 5X.

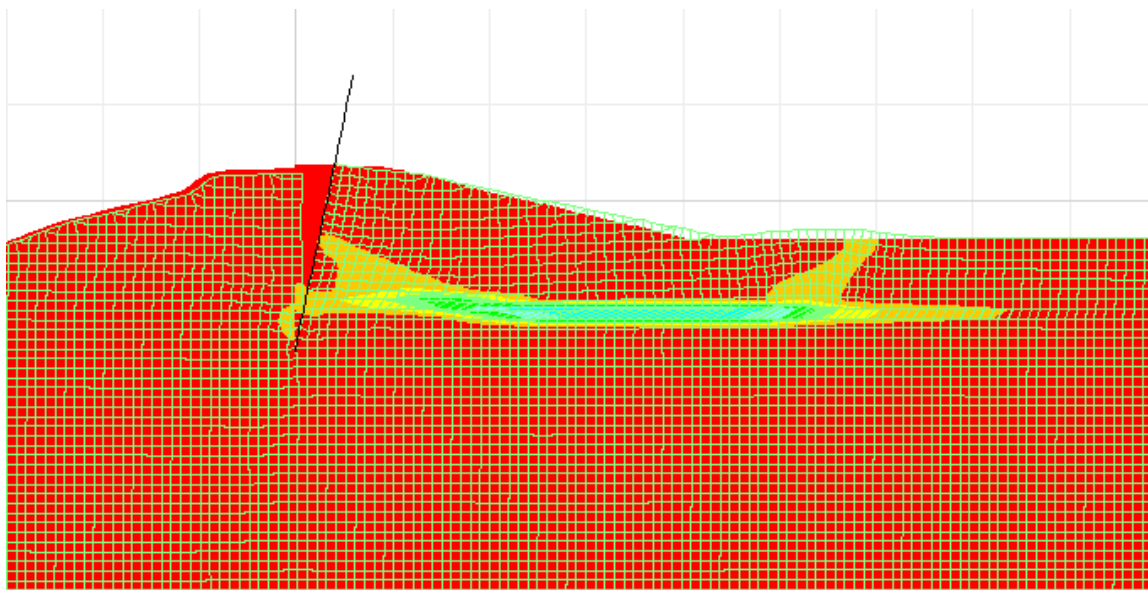


Figure D-107. Reach 14 WL+10 ft, FoS ssi and wall displacement magnified 5X.

Table D-53. Summary of FLAC FoS and Controlling Failure Mode Reach 14.

Canal WL (ft)	FLACAuto FoS	Controlling Failure Mode*
3	2.04	Global Stability
4	1.99	Global Stability
5	1.82	Wall Rotation
6	1.62	Wall Rotation
7	1.56	Wall Rotation
8	1.45	Wall Rotation
9	1.22	Wall Rotation
10	1.08	Wall Rotation

*Determined by inspection of model displacement (i.e. wall rotating about a point, displacing with little wall rotation or both).

References

Brinkgreve, R. B. J., Broere, W., and Waterman, D., ed. 2004. *Plaxis 2D – Version 8*. Plaxis B.V. The Netherlands: Delft University of Technology.

Itasca Consulting Group, Inc., (2011). *FLAC – Fast Lagrangian Analysis of Continua*, Version 7.0 User's Manual, Minneapolis, Minnesota.

APPENDIX E DOCUMENTATION OF CHANGES TO SOILS PROPERTIES