WEST BANK OF THE MISSISSIPPI RIVER
IN THE VICINITY OF NEW ORLEANS, LA
EAST OF HARVEY CANAL
HURRICANE PROTECTION PROJECT

DESIGN MEMORANDUM NO. 3

COUSINS PUMPING STATION COMPLEX

IN TWO VOLUMES
VOLUME II

DEPARTMENT OF THE ARMY

NEW ORLEANS DISTRICT, CORPS OF ENGINEERS

NEW ORLEANS, LOUISISANA

OCTOBER 1999

WEST BANK OF THE MISSISSIPPI RIVER IN THE VICINITY OF NEW ORLEANS, LA EAST OF HARVEY CANAL HURRICANE PROTECTION
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GEOTECHNICAL INVESTIGATION

WEST JEFFERSON LEVEE DISTRICT

COUSINS PUMPING STATION TO FIRST AVENUE CANAL

HARVEY, LOUISIANA

FOR
WEST JEFFERSON ENGINEERING SERVICES
A JOINT VENTURE
WESTWEGO, LOUISIANA

VOLUME 1

7 OCTOBER 1997

EUSTIS ENGINEERING COMPANY, INC.
GEOTECHNICAL ENGINEERS
CONSTRUCTION QUALITY CONTROL & MATERIALS TESTING
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7 October 1997

West Jefferson Engineering Services
A Joint Venture
615 Fourth Street
Westwego, Louisiana 70094

Attention Mr. Oscar Pena

Gentlemen:

Geotechnical Investigation
West Jefferson Levee District
Cousins Pumping Station to First Avenue Canal
Harvey, Louisiana

Transmitted are three copies of our engineering report covering a geotechnical investigation for the subject project. This report is divided into two volumes. The first volume includes the written report and figures. Volume 2 contains the Appendices.

A copy of this report is being forwarded to Design Engineering, Inc., to the attention of Mr. John Holtgreve and Burk-Kleinpeter, Inc., to the attention of Mr. Jens Nielson, Jr.

Thank you for asking us to perform these services.

Yours very truly,

EUSTIS ENGINEERING COMPANY, INC.

THOMAS H. STREMLAU, P.E.

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GEOTECHNICAL INVESTIGATION

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By
Eustis Engineering Company, Inc.
Metairie, Louisiana

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INTRODUCTION

1. This report contains the results of a geotechnical investigation performed for a hurricane flood protection project. The project consists of the addition of pump capacity and raising of flood protection at Cousins Pump Station and improvement of flow capacity of Cousins and First Avenue Canals. Cousins Pump Station is located north of Lapalco Boulevard and west of the Harvey Canal. The work was performed in accordance with Eustis Engineering Company, Inc.'s proposal dated 3 July 1996. Consultants to the West Jefferson Levee District for the project are West Jefferson Engineering Services, A Joint Venture. Members of the joint venture are Coastal Engineering and Environmental Consultants, Inc., Design Engineering, Inc., and Burk-Kleinpeter, Inc. The project was authorized by the chairman of the joint venture on 9 August 1996.

2. This report has been prepared in accordance with generally accepted geotechnical engineering practice for the exclusive use of West Jefferson Engineering Services, for specific application to the subject site. In the event any changes in the nature, design, or location of the proposed structures are planned, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed and the conclusions of this report are modified or verified in writing. Should these data be used by anyone other than

West Jefferson Engineering Services, they should contact Eustis Engineering for interpretation of data and to secure other information pertinent to this project.

3. The analyses and recommendations contained in this report are based, in part, on data obtained from the soil borings. The nature and extent of variations in subsoil conditions between and away from the boring locations may not become evident until construction. If variations then appear, it will be necessary to reevaluate the recommendations contained in this report.

4. Recommendations and conclusions contained in this report are to some degree subjective and should be used for design purposes only. This report should not be included in the contract plans and specifications. However, the results of the soil borings and laboratory tests contained in the Appendix of this report may be included in the plans and specifications.

SCOPE

5. Eustis Engineering's scope of services included drilling undisturbed borings, soil mechanics laboratory tests, and engineering analyses. Engineering analyses, based on the soil borings and laboratory test results, were made to determine recommendations regarding allowable pile load capacities, estimates of settlement, wall pressures, levee stability analyses, I-wall and T-wall analyses, overall pump station stability, canal stability, and construction recommendations. The results of the soil borings, laboratory tests, and analyses, together with appropriate recommendations, are included in our report of this investigation.

SOIL BORINGS

6. Eleven undisturbed sample type soil test borings were drilled for the project. Borings 1 and 4 through 6 were drilled to 100 feet below the existing ground surface, Boring 7 was drilled to 70 feet, and Borings 2 and 8 through 11 were drilled to 60 feet. Boring 3 was drilled from a barge in the Cousins outfall canal to 100 feet beneath the water surface. All of the borings were drilled during the period 11-26 July 1996 using a truck mounted rotary type drill rig. The approximate boring locations are shown on Figures 1 and 2. Descriptive logs are given in both tabular and graphical form in Appendix A.

7. Cohesive or semi-cohesive subsoils were sampled at close intervals or changes in stratum using a 5-in. diameter thinwall Shelby tube sampling barrel in Borings 1 through 8. For Borings 9, 10, and 11, a 3-in. diameter thinwall Shelby tube sampling barrel was used. The undisturbed samples were immediately extruded from the sampling barrels in the field. Pocket penetrometer tests were performed on trimmed ends of the extruded samples to provide a general indication of the soil's shear strength or consistency. The results of these tests are shown on the boring logs in Appendix A under the column heading "PP." All samples were inspected and visually classified by Eustis Engineering's soil technician. Representative portions of the samples were placed in moisture proof containers and returned to our laboratory for additional testing.

8. Cohesionless soils were obtained during the performance of in situ Standard Penetration Tests. This test consists of driving a 2-in. diameter splitspoon sampler 1 foot into the soil after first seating the sampler 6 inches. A 140-lb weight dropped 30 inches is used to advance the sampler. The number of blows required

to drive the sampler through the final 1-ft increment is indicative of the relative density or approximate consistency of the subsoils tested. The results of the Standard Penetration Tests are recorded on the boring logs in Appendix A under the column heading "SPT." Representative samples were placed in glass jars for preservation of their natural moisture content.

LABORATORY TESTS

9. Soil mechanics laboratory tests consisting of natural water content, unit weight, unconfined compression shear (UC), one-point unconsolidated undrained triaxial compression shear (OB), and three-point unconsolidated undrained triaxial compression shear (UU) were performed on undisturbed samples obtained from the borings. In addition, Atterberg liquid and plastic limits and moisture contents were performed on selected representative samples. These tests are necessary to confirm the classification of the subsoils and to give an indication of their relative strength and compressibility. The results of these laboratory tests are tabulated on the borings logs in Appendix A. Detailed results of the three-point UU tests are shown on individual test data sheets following the boring logs in Appendix A.

DESCRIPTION OF SUBSOIL CONDITIONS

Geology

10. Approximately 2 to 10 feet of fill were encountered in the borings. Beneath this fill, the site is characterized by Holocene Age deposits that overlie Pleistocene Age soils. The Holocene Age soils consist of swamp/marsh, deltaic plain, and nearshore Gulf deposits.

Topography

11. Topographic and hydrographic survey information developed by BFM Corporation were provided to Eustis Engineering. The survey data indicates generally a nearly level ground surface varying from approximately el -4 to 2 (NGVD) except for levees and roadways. The Cousins Pump Station discharge canal invert varies from el -4 to -9. Cousins Canal and First Avenue Canal generally have thalweg elevations between -13 and -16.5.

Stratigraphy

12. Subsoil Profiles AA, BB, and CC have been developed and are presented on Figures 3 through 5. The locations of the profiles are shown on Figures 1 and 2.

13. Fill. Reference to the subsoil profiles shows no fill at Boring 3. Fill (identified as Stratum 1 on Figures 3 through 5) at the other boring locations varied between 2 and 10 feet. The fill was highly variable and consisted of soft to very stiff gray, dark gray and tan clay, silty clay and sandy clay, loose to medium dense gray and tan clayey silt, clayey sand, fine sand, and loose to medium dense shells.

14. Swamp/Marsh. Underlying the fill and at the ground surface in Boring 3 are swamp/marsh deposits (Stratum 2). These deposits extend to depths between 17 and 31 feet beneath the ground surface. The swamp/marsh deposits consist of extremely soft to soft gray, brown, and dark gray clay and organic clay with organic matter, decayed wood, roots, and humus layers.

15. Deltaic Plain. Deltaic plain deposits extend below the swamp/marsh deposits to depths between 60 and 66 feet beneath the ground surface. These deposits are identified as Stratum 3 on Figures 3 through 5. As indicated on the subsoil profiles, this deposit is divided into two substrata. Stratum 3A occurs in all of the borings except Boring 11 and exists immediately beneath the swamp/marsh deposits. This stratum varies in thickness from 4 to 20 feet. Stratum 3A consists of very loose to medium dense gray clayey silt, sandy silt, and sand, and very soft to soft gray clay and silty clay with clayey silt, sandy silt, and silty sand layers. Beneath Stratum 3A is Stratum 3B which consists of very soft to medium stiff gray and dark gray clay with fine sand, silty sand, silt, and clay lenses, layers, and pockets.

16. Nearshore Gulf. The nearshore Gulf deposits (Stratum 4) extend below the deltaic plain and define the base of the Holocene soils. These deposits extend to depths between 67 and 74 feet. The nearshore Gulf deposits consist of very loose to very dense gray fine sand, silty sand, and clayey sand with shell fragments and clay layers.

17. Pleistocene Deposits. Pleistocene deposits extend below the Holocene soils to the full depth of the 100-ft borings and consist of soft to stiff gray and greenish-gray sandy clay and clay with sand and clayey silt pockets and layers, and loose to dense gray, greenish-gray, and tan clayey sand, fine sand, and silty sand. Pleistocene soils were encountered only in the 100-ft borings.

Ground Water

18. At several of the undisturbed borings, an additional auger boring was drilled to 11 feet without the addition of water. Ground water was encountered between 4 and 8 feet beneath the ground surface. After observation periods up to 22 hours, ground water had risen to depths of 3 to 6 feet beneath the ground surface. The depth to ground water will fluctuate with changes in climatic conditions, site drainage, and other factors. For this reason, the depth to ground water should be determined by those persons responsible for construction immediately prior to beginning work. Ground water readings are listed on the following tabulation.

UNDISTURBED BORING LOCATION	DEPTH TO GROUND WATER IN FEET	OBSERVATION PERIOD IN HOURS
B-1	6	5
B-9	3	22

FOUNDATION ANALYSES

Furnished Information

19. Cousins Pump Station currently consists of two separate pump stations, a north station, and a south station. The north station was built in 1973 and contains three vertical pumps. The south station was built in 1987 and contains two horizontal pumps. A third pump station is being planned to be placed north of the existing north pump station to add additional pump capacity to Cousins Pump

Station. The new station will have one horizontal pump of the same design as the horizontal pumps at the existing south pump station.

20. The discharge canal will be widened and deepened to accommodate the increased design flow from Cousins Pump Station. The invert elevation will be approximately el -11 at the pump discharge and slope to el -9 near the Destrehan Avenue bridge. The discharge canal will have an invert of el -9 from the Destrehan Avenue bridge to Harvey Canal.

21. Flood protection, consisting of cantilevered I-walls and/or T-walls, will be placed on the north and south banks of the discharge canal from the Cousins Pump Station to Destrehan Avenue. Design storm water level is el 7.5. Two feet of freeboard will be added to the floodwalls and levees and provide protection to el 9.5. Frontal protection for the existing and new pump stations will be raised to accommodate the new design flood level at el 9.5.

22. The Destrehan Avenue bridge will be lengthened approximately 60 feet on the north end because of planned widening of the discharge canal. Floodgates will be installed near both ends of the bridge at each of the bridge abutments.

23. Similar flood protection will continue on the north bank of the discharge canal from the Destrehan Avenue bridge to Harvey Canal. At the Harvey Canal, the flood protection will tie into flood protection (not determined). This flood protection will then tie into a sector gate structure to be placed in the Harvey Canal.

24. To the east of the Destrehan Avenue bridge on the south side of the discharge canal, flood protection improvements will consist of raising an existing levee or placing an I-wall in the existing levee. This levee currently crosses under the Lapalco Boulevard bridge and continues south.

25. The low water design elevation in the discharge canal is el 0. Low water during pumping conditions at the intake will be el -6.7. The extreme low water level in the First Avenue Canal and Cousins Canal is el -11.

26. The design invert of First Avenue Canal and Cousins Canal is el -16.5. First Avenue Canal will be widened to approximately 68 feet at its bottom. The canal bottom and slopes of the First Avenue Canal and Cousins Canal will not be lined.

Fill and Backfill

27. Structural Fill. Structural sand fill should be used as fill and backfill for the project. Structural sand fill should be locally available hydraulically pumped river sand. The select granular fill should be non-plastic and free of all wood, roots, clay lumps, and any other deleterious materials, and should not contain more than 10% (by weight) of material passing a U.S. Standard No. 200 mesh sieve. Structural sand fill should be compacted to 95% of the maximum dry density at optimum water content in accordance with ASTM D 698.

Soil Parameters

28. Using laboratory and field test data from the soil borings, design soil parameters have been developed for the project site and are given on Figures 6 through 12. The following table summarizes the design soil parameters given on the various figures:

BORINGS REPRESENTED BY DESIGN SOIL PARAMETERS	FIGURE NUMBER
1, 4, 5, and 6	6
2	7
3	8
7	9
8	10
9	11
10 and 11	12

29. These design soil parameters were presented to West Jefferson Engineering Services on 21 November 1996 and to the Corps of Engineers on 4 February 1997. Subsequent evaluations and analyses indicate soil undrained shear strength values below 26.5 feet on Figure 12 for Borings 10 and 11 were unrealistically conservative. A shear strength line representative of an undrained shear strength to effective stress ratio of 0.25 is plotted on Figure 12 between depths of 26.5 and 60 feet. Assuming the soils are normally consolidated, the undisturbed shear strengths should be approximated by this relationship. We believe this adjusted design shear strength line is conservative and reasonable.

Pile Foundations

30. Allowable Pile Load Capacity. Computations were made to determine the estimated allowable single pile load capacity for timber piles, timber composite piles, and square, precast prestressed concrete piles. All computations include a factor of safety of 2 against actual failure of the pile through the soil. The allowable pile load capacities are presented on Figures 13 through 24. A table summarizing the pile butt elevations, ground surface elevations, and intended use of the various piles is summarized below.

FIGURE NUMBER	ELEVATION OF PILE BUTT (NGVD)	ELEVATION OF GROUND SURFACE (NGVD)	DESCRIPTION
13	2 to -26.5	2 to -26.5	Existing timber piles at the south pump station
14	-11	-11	12, 14, and 16-in. square concrete piles for support of new T-walls for the existing North Pump Station
15	2.5	2.5	Treated timber, timber composite, 12 and 14-in. square concrete piles for support of new pump station and appurtenant structures
16	-8.5	-8.5	
17	-13	-13	
18	-20.5	-20.5	
19	-26.5	-26.5	
20	2	2	Treated timber, timber composite, 12 and 14-in. square concrete piles for support of T-wall from the Cousins Pump Station to Destrehan Avenue bridge and other structures
21	-9	-9	14 and 16-in. square concrete piles for support of Destrehan Avenue bridge in the canal

FIGURE NUMBER	ELEVATION OF PILE BUTT (NGVD)	ELEVATION OF GROUND SURFACE (NGVD)	DESCRIPTION
22	7	7	14 and 16-in. square concrete piles for support of the Destrehan Avenue bridge at its abutments
23	4	4	Treated timber, timber composite, and 12 and 14-in. square concrete piles for support of the Destrehan Avenue bridge floodgates and appurtenant structures
24	2	2	Treater timber, timber composite, and 12 and 14-in. square concrete piles for support of the T-wall east of Destrehan Avenue bridge and appurtenant structures

31. Composite piles should not be used to support tension loads or lateral loads. Composite timber piles should consist of an untreated ASTM D 25 quality timber pile lower section and a 12-in. diameter concrete filled metal can upper section. The metal can upper section should extend a minimum distance of 10 feet below the existing ground surface. For piles supporting the pump station, the metal can should extend 5 feet below the base of the lower excavated level of the pump station.

32. Structural Capacity. The estimated pile load capacities given on Figures 13 through 24 are based on a soil-pile relationship only. The structural capacity of the individual piles to transmit these loads, and any connections between the piles and the structure, especially in tension, should be determined by a structural engineer.

33. Lateral Capacity of Piles. The horizontal and axial component of batter piles can be determined from geometry using the formula shown on Figure 25. The moduli of horizontal subgrade reaction required for lateral support for vertical and batter piles are tabulated on Figures 26 and 27. The information provided on Figure 26 is applicable to pile foundations from Cousins Pump Station to the Destrehan Avenue bridge. The information provided on Figure 27 is applicable for structures east of the Destrehan Avenue bridge. Note that composite piles should not be used to support lateral loads.

34. Pile Group Capacity and Spacing. For piles driven to high driving resistance bearing in sand, a large portion of their capacity will be derived through end bearing and a reduction is not required for group effects. These pile lengths are indicated on the tabulation of allowable capacities. A reduction of the single pile load capacity for the effective group action is required when skin friction piles are driven in rows or groups. In this regard, the capacity of the group or row of piles should be evaluated on the basis of group perimeter shear by the formula shown on Figure 28. The minimum center to center spacing between piles in a row or group of piles should be determined in accordance with Figure 28 but should not be less than 3 feet.

35. Estimated Settlement. If piles are used in small isolated groups or rows, we estimate settlement of foundation due to sustained loads supported on vertical piles will be ¼ to ¾ inch. Our estimate of settlement is based on the following assumptions:

- the largest group dimension will be no greater than 20% of the pile embedment,

- the center to center spacing between groups will be no closer than twice the largest group dimension,
- the center to center spacing between rows of single piles will be no closer than 8 to 10 feet,
- all piles are driven to the same tip embedment, and
- no more than 12 inches of additional fill will be placed around or under the foundations.

Should any of these assumptions not be valid, Eustis Engineering should be notified to provide additional analyses.

36. Initial elastic settlement will depend on the elastic properties of the pile selected for support and is anticipated to be ½ inch or less. This elastic deformation can be better evaluated by static pile load tests.

37. Estimated Settlement of New Pump Station. The new pump station will be supported by large concrete mats on piling. The pump station will consist of a suction basin, pump station area, and a horizontal discharge tube. The suction basin mat will be 40 feet wide and 59 feet long supported at el -20.5 by 60-ft long ASTM D 25 quality timber piles. The pump station area mat will be 46 feet wide and 85 feet long supported at el -26.5 by 57-ft long ASTM D 25 quality timber piles. Lastly, the reinforced concrete discharge tube will be 28 feet wide by 95 feet long supported at elevations varying between el -2.5 and -13 by 60-ft long ASTM D 25 quality timber piles.

38. Settlement analyses of these large pile supported mat foundations were performed assuming the following long term unit mat pressures:

STRUCTURE	LONG TERM UNIT MAT PRESSURE IN PSF
Suction Basin	1,100
Pump Station Area	3,000
Discharge Tube	1,430

39. Assuming these structures will be very rigid reinforced concrete structures and rigidly tied together, we estimate the settlement due to the sustained loads indicated above will vary between ½ and 1 inch. Maximum settlement is anticipated in the pump station area.

40. Prepunching and Predrilling. Based on the soil conditions developed from the borings, predrilling or prepunching may be required to approximately 10 feet below the existing ground surface in order to penetrate miscellaneous fill consisting of clay, sand, and shell. The prepunch and predrill bit should be no larger than the tip diameter of the pile to be driven. Prepunching or predrilling should only be necessary for piles being driven through existing grade.

41. For piles driven in excavations, prepunching or predrilling will not be necessary to penetrate surface soils. Predrilling may be required if pile design tip elevations are required below 60 and 74 feet beneath the existing ground surface. If predrilling is required to avoid damage to the piles due to excessive driving resistance, predrilling should be accomplished by wet rotary methods using a bit no larger than 85% of the pile tip width or diameter. Predrilling should be no deeper than 10 feet above the required termination depth of the pile tip. The need for predrilling should be fully assessed by a test pile program.

42. Pile Driving. All pile driving operations should be supervised by experienced personnel to ensure proper procedures are followed and accurate records are kept during all pile driving operations. The driving record should include the date, type of pile, side dimension or diameter of the pile tip and butt, hammer model, driving energy, and number of blows per foot of penetration for the full embedment of the pile. An accurate driving record is especially important to verify piles are installed to the required tip embedment, and to give an indication of any unusual driving characteristics which may indicate pile breakage.

43. Treated ASTM D 25 quality timber or timber composite piles should be driven with a single acting air hammer having a manufacturer's rated energy of 15,000 ft-lbs per blow. When driving with this hammer, piles should be driven no harder than 25 blows per foot or damage may occur to the timber piles. Concrete piles should be driven with a single acting air hammer with a manufacturer's rated energy of at least 19,500 ft-lbs per blow for allowable compressive capacities up to 60 tons. For allowable capacities up to 100 tons, we recommend a single acting air hammer delivering 24,000 ft-lbs of energy per blow. For concrete piles, we recommend the ram stroke be limited to 3 feet and the ram weight be approximately one-half of the pile weight. Concrete piles should have a strand prestressed that is structurally sufficient to facilitate driving the piles without damage.

44. A diesel hammer may be used for installation of concrete piles. However, if a diesel hammer is used, it should have an energy of 1.5 times the energy required for comparable installation with a single acting air hammer.

45. Test Piles and Load Tests. Several test piles of the different types proposed for use should be driven to develop more definitive information regarding

exact pile lengths, proper pile driving equipment, anticipated driving resistance, necessity for predrilling or prepunching, and the effects of vibrations. The test piles should be driven using the same equipment and techniques that will be used to drive the job piles. After all test piles have been driven, the pile of each type showing the least resistance to penetration should be selected for performance of a pile load test to failure. The loading procedures should be in accordance with ASTM D 1143. The load test should not begin sooner than 14 days after all test piles are driven. This recommendation is necessary in order to allow for the dissipation of pore pressures and to develop adhesion and friction of the soil to the pile. Compressive capacities should be verified by load tests. If tension capacities are a consideration in determining pile lengths, tension load tests should also be performed.

46. Dynamic Pile Tests. Dynamic Pile Tests should be performed during installation of concrete test piles using a Pile Driving Analyzer®. The PDA will provide information on the efficiency of the pile hammer and pile stresses. If the pile is "retapped" after setup in 14 days, the PDA can be used to interpret compressive pile capacity.

47. Vibrations. It is recommended vibrations should be monitored during the test pile program. This monitoring should be performed with a seismograph to evaluate peak particle velocities during pile driving at critical structures. The record of peak particle velocities will provide information in assessing potential damage and the need for changes in driving operations.

48. Peak particle velocities, measured at a structure, exceeding 0.5 in./sec may induce damage to the structure. Peak particle velocities between 0.25 and 0.5

in./sec may be sensed as being detrimental by human perception. In addition, available literature indicates peak particle velocities of 0.25 in./sec may densify loose cohesionless soil. Such densification may result in settlement of pavements, structures, or utilities founded over or in these materials. If sustained peak particle velocities exceed 0.25 in./sec, pile driving operations or other construction activities should be terminated and consideration given to altering construction procedures.

Wall Pressures

49. Lateral pressures against the rigid walls of the existing pump stations and the planned new station will consist of earth and water pressure. The water pressure in psf is simply the depth of water times 62.4 pcf. The earth pressure, P, against the rigid wall should be determined using at-rest pressure coefficient, K_o. The earth pressure can be calculated using the following equation.

$$P = K_o \gamma' Z$$

Where:

- P = pressure in psf
- K_o = at-rest earth pressure coefficient. Use 0.95 for in situ soils and 0.55 for granular structural backfill.
- γ' = effective unit weight of soil in psf. For in situ soils at the pump station, total unit weight can be obtained from Figure 6. The effective unit weight is equal to the total unit weight above the water table. Below the water table, the effective unit weight is equal to the total unit weight minus 62.4 pcf. The total unit weight of granular structural backfill can be taken as 122 pcf.
- Z = depth in feet.

Existing North Pump Station

50. Global Stability. Global stability of the existing North Pump Station was assessed using the LMVD Method of Planes Stability Analysis. The Corps of Engineers "Uplift" program, which incorporates this design procedure, was used for our analyses. We have assumed the storm water level at el 7.5, and the discharge canal and intake water level at el -6.7. The results of the analyses are shown on Figure 29. To increase the factor of safety against a stability failure to an acceptable 1.3, required vertical pressure distribution across the top of the selected passive wedges was calculated and is shown on Figure 29. The required pressure on the passive wedge would have to be contributed by dead weight of the structure or from tension piles. The required vertical pressure is 1,943 psf. We understand it is not feasible to provide the necessary vertical pressure. Therefore, it will be necessary to install a new frontal protection T-wall to support the unbalanced storm water load.

51. T-wall Frontal Protection. An analysis of a T-wall, 35 feet east of the face of the existing pump station, has been performed and is shown on Figure 30. After applying a factor of safety of 1.3 to the soil parameters, a series of failure surfaces were evaluated using the Corps of Engineers Uplift program. A net pressure diagram was then developed for the sheetpiles under the T-wall and is presented on Figure 30. We have assumed batter piles support the T-wall base at el -13. Summing moments approximately el -13 indicates the sheetpiles must penetrate to el -38. The computed anchor force load at the base of the T-wall, F_a, is 4.2 kips per foot of wall. The maximum computed bending moment in the sheetpile is 14.7 ft-kips per foot of wall at el -20.

52. The T-wall analysis assumes the storm water level on the discharge side (east) is el 7.5 and on the west side of the wall is empty of soil and water to el -5. Also, sand fill is placed from el -10.5 to -5 between the existing pump station and the T-wall. It is further assumed the water level between the pump station and the T-wall is at el -5. Based on these assumptions, the pressures acting on the T-wall above el -13 due to water and soil pressures are shown as a pressure diagram on Figure 30. The resulting load due to these pressures above el -13 and the anchor load, F_a, must be supported by driven batter piles. Allowable pile load capacities for this design are given on Figure 14.

53. Stability Of Pump Station With New T-wall. Assuming the new T-wall is installed 35 feet from the face of the pump station and the sheetpile cutoff installed to el -38 or below, stability analyses were performed on the existing pump station. The intent of the analyses was to determine the maximum level to which the fill can be placed between the pump station and the T-wall and maintain a minimum factor of safety of 1.3 against a stability failure. The analyses indicate the fill can be placed no higher than el -5. Failure Surfaces G7 and H8 provided on Figure 30 show a minimum factor of safety of 1.32 for this condition.

54. Seepage Analyses. Assuming the new T-wall is installed, a seepage analysis by the Harr method indicates a factor of safety of approximately 4 against piping. If the new T-wall is not installed with the associated sheetpile cutoff wall, seepage must be controlled by the existing sheetpile below the face of the existing structure. This sheetpile penetrates to el -36. The calculated factor of safety against piping is 3 or greater for this condition.

Existing South Pump Station

55. Global Stability. Global stability of the existing South Pump Station was also evaluated. The results of our analyses are presented on Figure 31. Storm water level was assumed to be at el 7.5 east of the sheetpile cutoff. The elevation of the intake water level was assumed to be at el -6.7. The results of the analysis indicate additional vertical pressure is required across the top of the selected passive wedges to achieve a calculated factor of safety of 1.3 or more against a stability failure. In this case, the maximum required pressure is 555 psf. We understand dead weight of the pump structure and pumps will be adequate to provide more than the necessary vertical pressure.

56. Seepage Analysis. Using the Harr Method of seepage analysis, the calculated factor of safety against piping is 4 or greater.

New Pump Station

57. It is our understanding the new pump station will be built to the same design and configuration as the existing South Pump Station. Therefore, separate analyses have not been performed for the proposed new pump station.

T-wall Between Existing Pump Stations

58. The analysis of the T-wall between the two existing pump stations is shown on Figure 32. After applying a factor of safety of 1.3 to the soil parameters, a series of soil surfaces were evaluated using the Corps of Engineers' Uplift program. The analysis indicates no unbalanced forces on the sheetpile wall.

59. Global stability of the T-wall system was also analyzed using unfactored soil parameters. The minimum calculated factor of safety against a stability failure was 1.98.

60. Seepage analysis indicates the sheets extending to el -36 have a factor of safety greater than 3 against piping using the Harr method of analysis.

Sheetpile Walls

61. Analyses of cantilevered and anchored sheetpile walls were performed using the Corps of Engineers' "CWALSHT" program. Computer generated output files from all of the governing analyses are included in Appendix B. Results of sheetpile wall analyses are summarized on Figures 33 through 36. The calculated maximum moments, deflections, and anchor loads are based on unfactored soil parameters. The design engineer should incorporate a suitable factor of safety when sizing sheetpiles and anchors.

62. Anchored Sheetpile Walls. An anchored sheetpile wall is planned as a guide wall at the north intake area of the new pump station. The top of the wall and the adjacent ground surface will be at approximately el -1.5. For our analysis, the anchor was assumed to be at el -2.5 and the invert of the canal was assumed to be at el -16.5. The lowest intake canal water level was assumed to be at el -6.7 for the S-case, long term conditions. The water level was assumed to be at el -11 for the Q-case short term conditions. The results of the anchored sheetpile analysis for the Q-case and S-cases are given on Figure 33. A factor of safety of 1.5 was applied to soil parameters to determine the required tip elevation of the sheets. Anchor loads and maximum moments are based on unfactored soil parameters. The

structural engineer must use a suitable factor of safety in the structural design of the members. Anchor loads should be supported by batter piles. Allowable pile load capacities given on Figure 20 can be used for the design of anchor piles.

63. I-walls. Cantilevered I-walls may be used as flood protection along the north and south banks of the discharge canal between Cousins Pump Station and Destrehan Avenue bridge. I-walls may also be used as flood protection on the north bank of the discharged canal between the Destrehan Avenue bridge and the Harvey Canal. Flood protection south and east of the south end of the Destrehan Avenue bridge may include an I-wall in the existing levee. Results of the analyses for the possible I-wall locations are presented on Figures 34 through 36 for the three respective locations for possible I-wall use. The ground surface for the I-wall analysis on Figures 34 and 35 was assumed to be at el 2. For the analyses on Figure 36, the top of the existing levee was assumed to be at el 5.5 with the levee sloping to existing grade at el 2. We have assumed the storm water level for all cases to be at el 7.5 with a 2-ft freeboard water level of 9.5. A factor of safety of 1 was applied to soil parameters when analyzing the 2-ft freeboard level at el 9.5. A factor of safety of 1.5 was applied to the soil parameters for the analysis with a storm water level of el 7.5. A factor of safety of 1 on the 2-ft freeboard level governs the design section of the I-walls.

64. Seepage for I-wall. The Harr method of seepage analysis was used to evaluate piping along the I-wall sheetpiles. Our analyses indicate the sheetpiles must penetrate to at least el -16.5 or below to have a factor of safety of 2 or greater against piping for the I-walls along the discharged canal. For the I-wall in the earthen levee given on Figure 36, sheetpiles must extend to at least el -12 or below to have a factor of safety of 2 or greater against piping.

T-walls and Floodgates

65. T-walls may be used between the Cousins Pump Station and the Destrehan Avenue bridge on the north and south banks, and on the north bank of the discharge channel east of the Destrehan Avenue bridge. Floodgates will be required at the north and south ends of the Destrehan Avenue bridge. After applying a factor of safety of 1.3 to the soil parameters, a series of failure surfaces were evaluated using the Corps of Engineers' Uplift program. Analyses for the T-wall from the Cousins Pump Station to the Destrehan Avenue bridge are presented on Figure 37, and the analysis for the T-wall on the north bank east of the Destrehan Avenue bridge are presented on Figure 38. Floodgate analysis is presented on Figure 39. These analyses indicate no unbalanced force against the sheetpile wall beneath the foundation sill of the T-wall and floodgates. Batter piles should be used to support the lateral load due to the water pressure against the T-wall and floodwall. Water pressure is the depth in feet times the unit weight of water which is 62.4 pcf.

66. Seepage Analysis. Based on Harr's method, sheetpiles should extend to at least el -16.5 or below to have a factor of safety of 2 or greater against piping.

Stability of Canal Slopes

67. Stability of the canal slopes were analyzed by using the LMVD Method of Planes Stability Analysis. The Corps of Engineers' Uplift program was used for this purpose. Results of the stability analyses for the discharge canal are given on Figures 40 through 43. Figures 40 and 41 present stability analyses for the north and south banks of the discharge canal between the pump station and Destrehan

Avenue bridge. Figure 40 considers a dredged depth at el -9 in the canal and Figure 41 assumes a dredged depth at el -11. Assuming the low water in the canal is el 0.0, the analyses indicate a 1 vertical to 3 horizontal slope results in a minimum calculated factor of safety using Q-case soil parameter of 1.57. Similar stability analyses are presented on Figure 42 for the north bank of the discharge canal east of the Destrehan Avenue bridge assuming dredge depth is el -9. A minimum calculated factor of safety under this condition with a 1 vertical to 3 horizontal slope is 1.32. Slope stability analyses of the south bank of the discharge canal east of the Destrehan Avenue bridge is shown on Figure 43. This analysis indicates the slope must be flattened to a 1 vertical to 3.5 horizontal to achieve a factor of safety of 1.32 against a stability failure. For comparison, a minimum factor of safety of 1.2 is calculated for a slope of 1 vertical to 3 horizontal.

68. Stability analyses were also performed on First Avenue Canal and Cousins Canal. First Avenue Canal will be widened considerably to a base width of 68 feet with an invert elevation of -16.5. With low water elevation at -11, stability analyses for First Avenue Canal from Stations 9+00 to 20+00 is given on Figure 44. The analyses indicate a 1 vertical to 3 horizontal slope will provide a minimum calculated factor of safety of 1.34. Figure 45 provides the results of the stability analyses for First Avenue Canal from Stations 20+00 to 51+00. This analysis indicates a minimum factor of safety of 1.29 with a side slope of 1 vertical to 6 horizontal. The results of slope stability analyses for Cousins Canal from Stations 50+00 to 52+00 are provided on Figure 46. The analysis indicates a minimum factor of safety of 1.28 for canal side slopes of 1 vertical to 4 horizontal.

Earth Levee

69. Stability. The existing earth levee southeast of the Destrehan Avenue bridge may be raised to el 9.5 for flood protection rather than using an I-wall. Results of stability analyses performed on the raised levee indicate a minimum factor of safety of 1.54 if the levee is raised to el 9.5 with 1 vertical to 3 horizontal slopes.

70. Settlement. Raising the existing levee to el 9.5 will require the addition of approximately 4 feet of fill. This fill will induce consolidation settlement in underlying clays. It is estimated that 2 to 3 inches of settlement can be expected. The levee should be overbuilt to compensate for the anticipated settlement.

71. Levee Fill. The fill for raising the levee should be a cohesive inorganic soil classified as CL or CH (Unified Soil Classification). Fill should have a plasticity index no less than 15 and a liquid limit between 30 and 75%.

72. Placement of Fill. Before placement of fill to raise the levee grade, the surface should be thoroughly scarified. Fill should be placed in 8 to 10-in. thick lifts and compacted to 95% of the maximum dry density at optimum water content in accordance with ASTM D 698.

CONSTRUCTION RECOMMENDATIONS

Temporary Cofferdams

73. We understand design and construction of temporary cofferdams necessary for the construction of the new pump station and any modifications to the existing pump stations will be the contractor's responsibility and cofferdam design is not part of this report.

74. The construction contractor should have the responsibility for adequacy of sheeting, bracing, and shoring systems, and the design of these systems should be made by a registered professional engineer. The construction contractor's engineer should make an independent interpretation of subsoil conditions encountered at the boring locations from the information included in Appendix A of this report. The design should be submitted to the owner for review of adequacy and to evaluate the designs' impact on adjacent structures. The responsibility for adequacy of sheeting, bracing, and shoring systems should be directed to the construction contractor. The boring logs and laboratory test results contained in Appendix A may be used in determining the structural requirements for the cofferdam materials.

75. Dewatering and Pressure Relief. The use of sump pumps should adequately dewater excavations founded in clay strata which are relatively impermeable. The excavation for the new pump station will be founded over deposits of cohesionless and semi-cohesionless soils (Stratum 3A of the deltaic plain deposits). It may be necessary to relieve excessive hydrostatic pressure to prevent failure due to blowout and boiling by the use of wells or wellpoints.

76. Details regarding pumping capacity and pressure relief methods are dependent on the size and depth of the excavations. These estimates cannot be made on the basis of information currently available to Eustis Engineering. We recommend the necessity for pressure relief system as well as system requirements be determined by the registered professional engineer designing the cofferdam system. If a pressure relief system is used, it should be designed, installed, and operated by a contractor experienced and qualified in the field of pressure relief. The requirements for dewatering and pressure relief should be part of the design submitted to the owner. The results of the borings located in Appendix A may be used for the design of the relief systems. Sump pumps will also be required to remove incidental seepage through sheetpiles and rainwater from construction areas.

77. Excavations should be kept dry at all times during construction. However, it is recommended construction proceed expeditiously in order that the dewatering system can be used for the shortest period of time. This will minimize possible effects on adjacent structures, particularly those bearing at the ground surface. The hydrostatic pressure relief system should be installed and operated by a contractor experienced and qualified in the field of pressure relief.

78. Dewatering operations may lower the ground water level in the immediate vicinity of the sheetpiles and result in settlement of the adjacent ground surface. The magnitude and lateral extent of ground settlement will depend in a large measure on the duration of the dewatering and pressure operations. It is important that construction proceed without interruptions so that operations can occur for the shortest period of time, therefore minimizing the effects on adjacent structures. The design of the dewatering system should evaluate the effects on adjacent structures and should take appropriate steps to minimize these effects.

79. Lateral Movement and Soil Subsidence. The cofferdam and dewatering systems employed by the contractor during construction should be properly designed to maintain a dry, stable excavation in order to prevent lateral movement of the inplace soils. The subsidence and lateral movements of the soils surrounding the excavation should be controlled and minimized by careful attention to all details of excavation, bracing, dewatering, backfilling, and installation and removal of sheetpiles. Even with careful attention, some movement should be anticipated. Available literature indicates settlement adjacent to sheetpile cofferdams can be as much as 2% of the excavation depth for an adequately braced cofferdam.

80. Removal of sheetpiles may result in additional settlement of the surrounding ground surface and structures. If such settlement is of concern, consideration should be given to leaving the sheetpiles in place.

81. The installation of sheetpiles for cofferdams will cause vibrations that may affect nearby structures, pavements, and underground utilities. These vibrations should be monitored in accordance with the same procedures set forth for pile driving operations discussed previously.

82. Preconstruction Survey. Eustis Engineering recommends a preconstruction survey of existing structures, pavements, and utilities. This survey should include videotape and photographic documents of the preconstruction condition of these facilities. The survey should be conducted by a registered engineer.

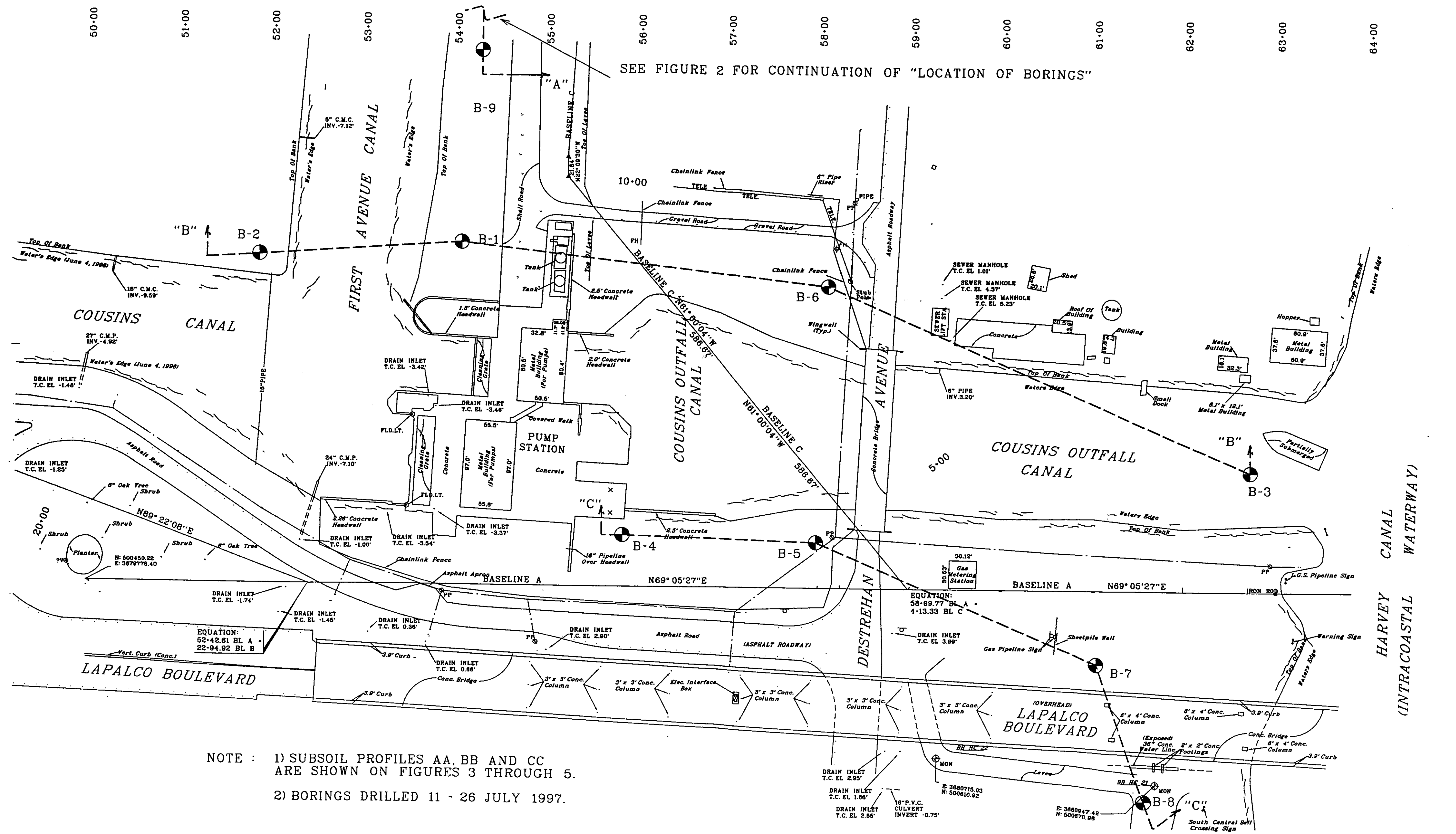
83. Monitoring. Subsidence due to construction activities at adjacent structures, pavements, or utilities is of concern and these facilities should be monitored during all phases of construction. Settlement points and piezometers should be established at and away from the excavation. Initial readings and piezometers should be made prior to construction activities and continued at regular intervals throughout construction. These data should be evaluated on a periodic basis.

GEOTECHNICAL SERVICES DURING CONSTRUCTION

84. In order to provide continuity between the investigation, design, and construction phases, Eustis Engineering can provide additional geotechnical services which may include consultation during design and construction and performance of the preconstruction survey. We can provide consultation regarding the establishment of a monitoring program and obtain and evaluate monitoring data. We can also provide steel, concrete, and soil inspection services, including compaction and inplace density determinations on fill materials. We can perform appropriate laboratory tests to determine the gradation and quality of material proposed for use on the project. Eustis Engineering can also log the installation of job piles and test piles and monitor vibrations. Eustis Engineering can provide DPT during the test pile program.

85. Eustis Engineering should be retained to monitor the geotechnical related work performed by the contractor. This permits the geotechnical engineer that prepared the report to be on hand and quickly evaluate unanticipated conditions, conduct additional tests if required, and when necessary, recommend alternative

solutions to problems. This is recommended to avoid major construction cost overruns or contractual disputes on the project.



NOTE :
1) SUBSOIL PROFILES AA, BB AND CC ARE SHOWN ON FIGURES 3 THROUGH 5.
2) BORINGS DRILLED 11 - 26 JULY 1997.

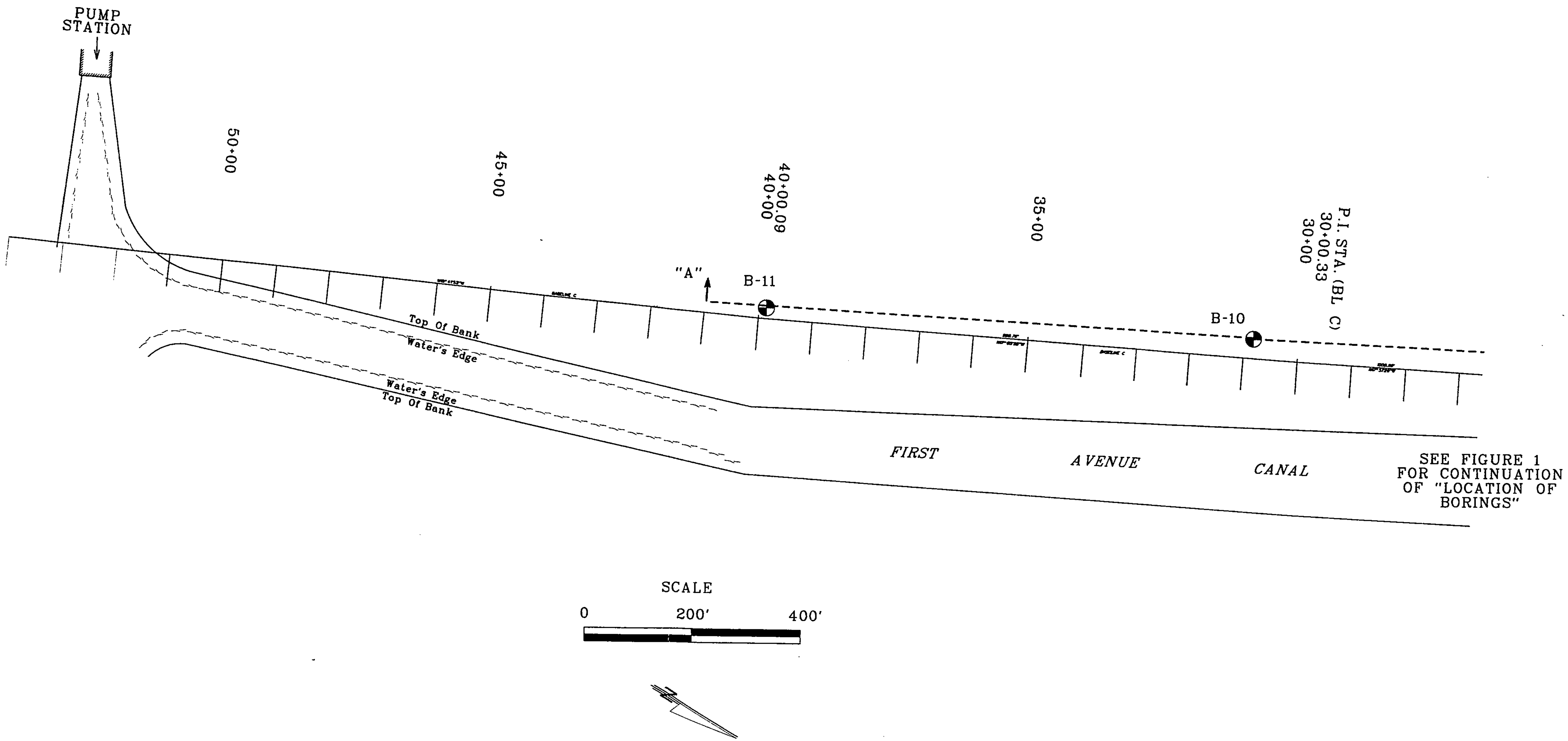
0 50' 100'
SCALE

LOCATION OF BORINGS

WEST JEFFERSON LEVEE DISTRICT
COUSINS PUMP STATION TO FIRST AVENUE CANAL
HARVEY, LOUISIANA

EUSTIS ENGINEERING COMPANY, INC.

FIGURE 1



NOTE : 1) SUBSOIL PROFILES AA, BB AND CC ARE SHOWN ON FIGURES 3 THROUGH 5.

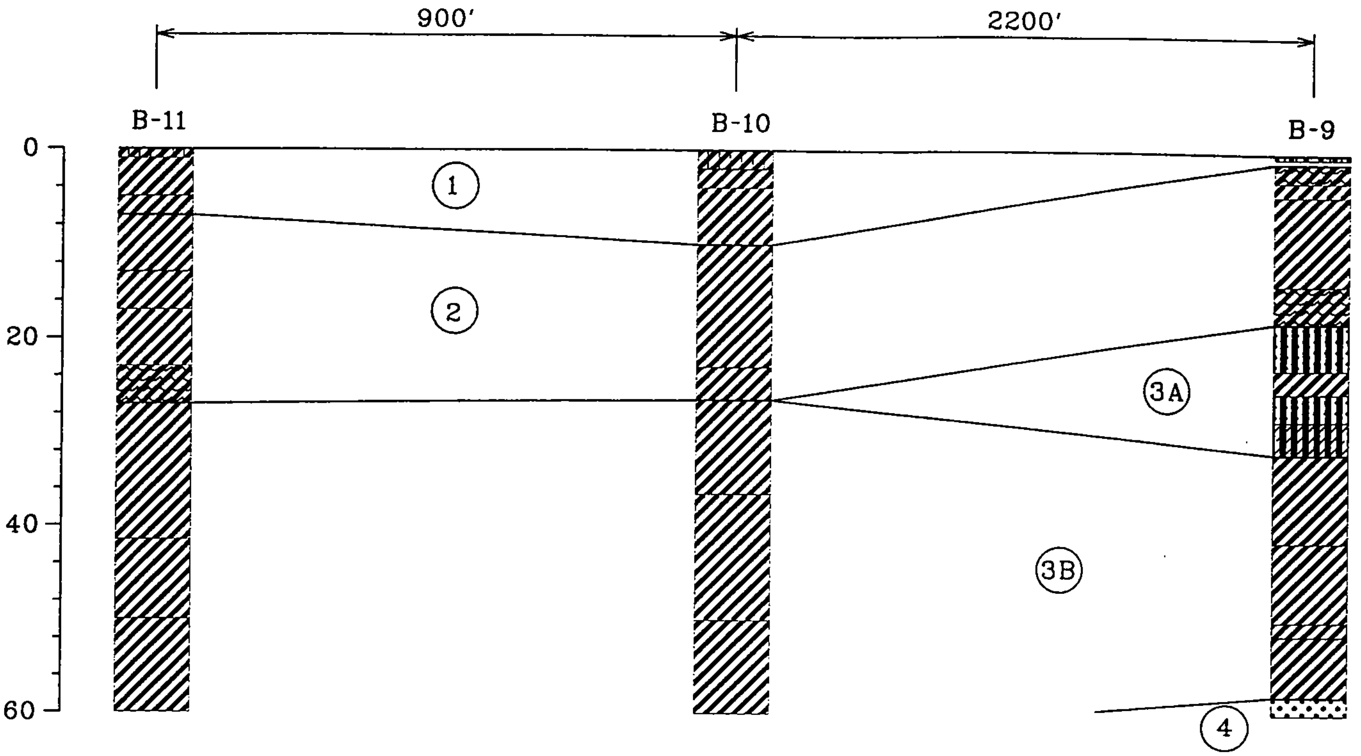
2) BORINGS DRILLED 11 - 26 JULY 1997. SEE FIGURE 1.

LOCATION OF BORINGS

WEST JEFFERSON LEVEE DISTRICT
COUSINS PUMP STATION TO FIRST AVENUE CANAL
HARVEY, LOUISIANA

EUSTIS ENGINEERING COMPANY, INC.

FIGURE 2



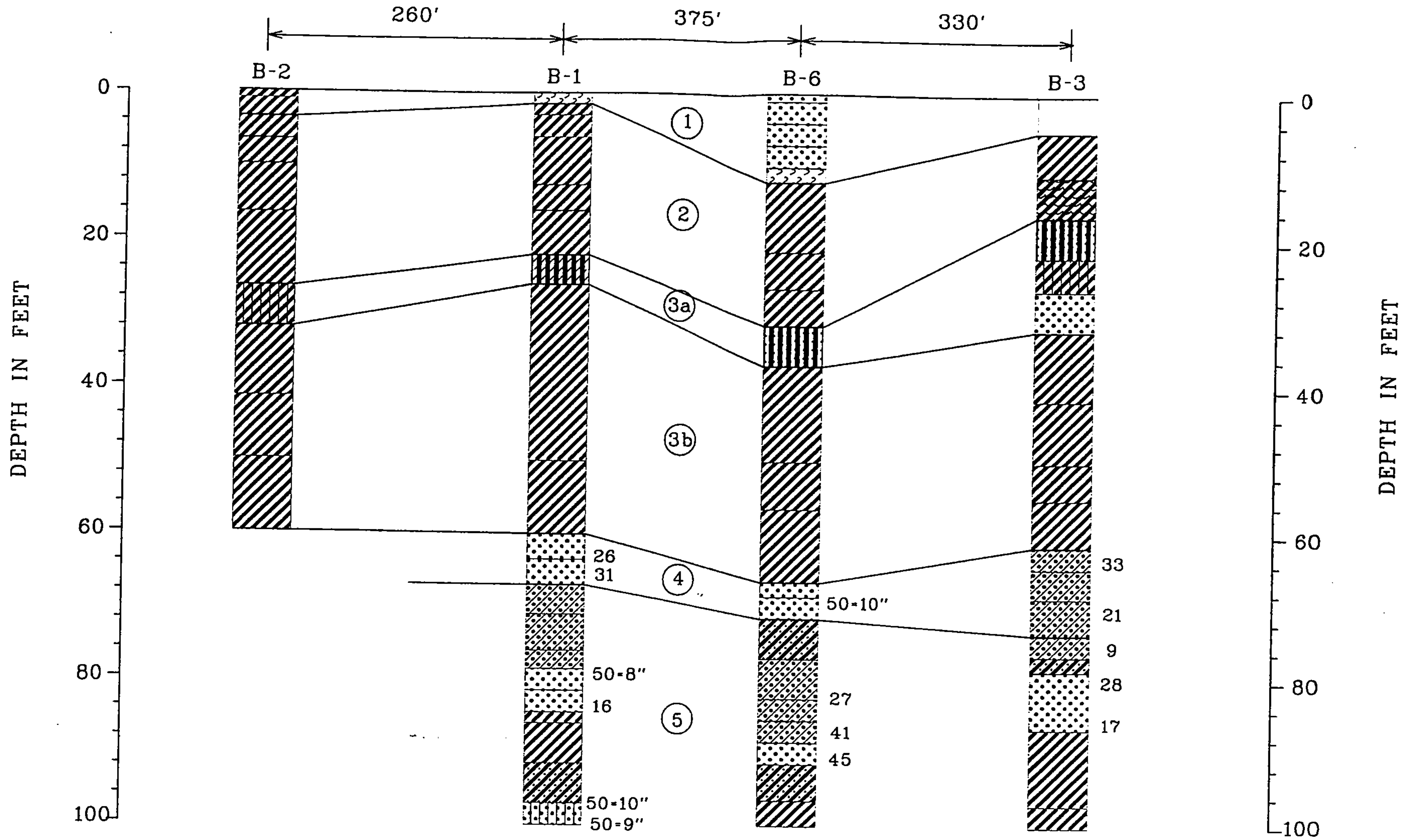
1	FILL	MEDIUM DENSE TAN & GRAY SILTY SAND, AND SOFT TO VERY STIFF BROWN, GRAY AND DARK GRAY CLAY AND SILTY CLAY.
2	SWAMP/MARSH DEPOSITS	VERY SOFT TO SOFT GRAY AND BROWN CLAY AND ORGANIC CLAY WITH DECAYED WOOD, ORGANIC MATTER, ROOTS & HUMUS LAYERS.
3A	DELTAIC PLAIN DEPOSITS	VERY LOOSE TO LOOSE GRAY SANDY SILT AND VERY SOFT GRAY CLAY WITH SANDY SILT LAYERS.
3B	DELTAIC PLAIN DEPOSITS	VERY SOFT TO SOFT GRAY AND DARK GRAY CLAY WITH CLAYEY SILT AND SILTY SAND LENSES AND LAYERS.
4	NEARSHORE GULF DEPOSITS	MEDIUM DENSE GRAY FINE SAND WITH SHELL FRAGMENTS.

SUBSOIL PROFILE AA

WEST JEFFERSON LEVEE DISTRICT
COUSINS PUMPING STATION TO FIRST AVENUE CANAL
HARVEY, LOUISIANA

EUSTIS ENGINEERING COMPANY, INC.

FIGURE 3



STRATUM NO.	GEOLOGIC FORMATION	DESCRIPTION
1	FILL	STIFF DARK GRAY AND TAN CLAY, LOOSE TO MEDIUM DENSE SHELL AND LOOSE TO MEDIUM DENSE GRAY AND TAN FINE SAND
2	SWAMP/MARSH	VERY SOFT TO MEDIUM STIFF GRAY AND DARK GRAY CLAY AND ORGANIC CLAY WITH ORGANIC MATTER, WOOD, ROOTS AND HUMUS LAYERS
3a	DELTAIC PLAIN DEPOSITS	VERY SOFT GRAY SILTY CLAY, LOOSE TO MEDIUM COMPACT GRAY CLAYEY SILT AND SANDY SILT, AND LOOSE TO MEDIUM DENSE GRAY FINE SAND
3b	DELTAIC PLAIN DEPOSITS	VERY SOFT TO MEDIUM STIFF GRAY CLAY WITH SILTY SAND AND SILT LENSES AND POCKETS
4	NEARSHORE GULF DEPOSITS	LOOSE TO VERY DENSE GRAY FINE SAND AND CLAYEY SAND WITH SHELL FRAGMENTS AND CLAY LAYERS
5	PLEISTOCENE DEPOSITS	SOFT TO MEDIUM STIFF GRAY AND GREENISH-GRAY SANDY CLAY AND LOOSE TO DENSE GRAY, GREENISH-GRAY AND TAN CLAYEY SAND, FINE SAND AND SILTY SAND

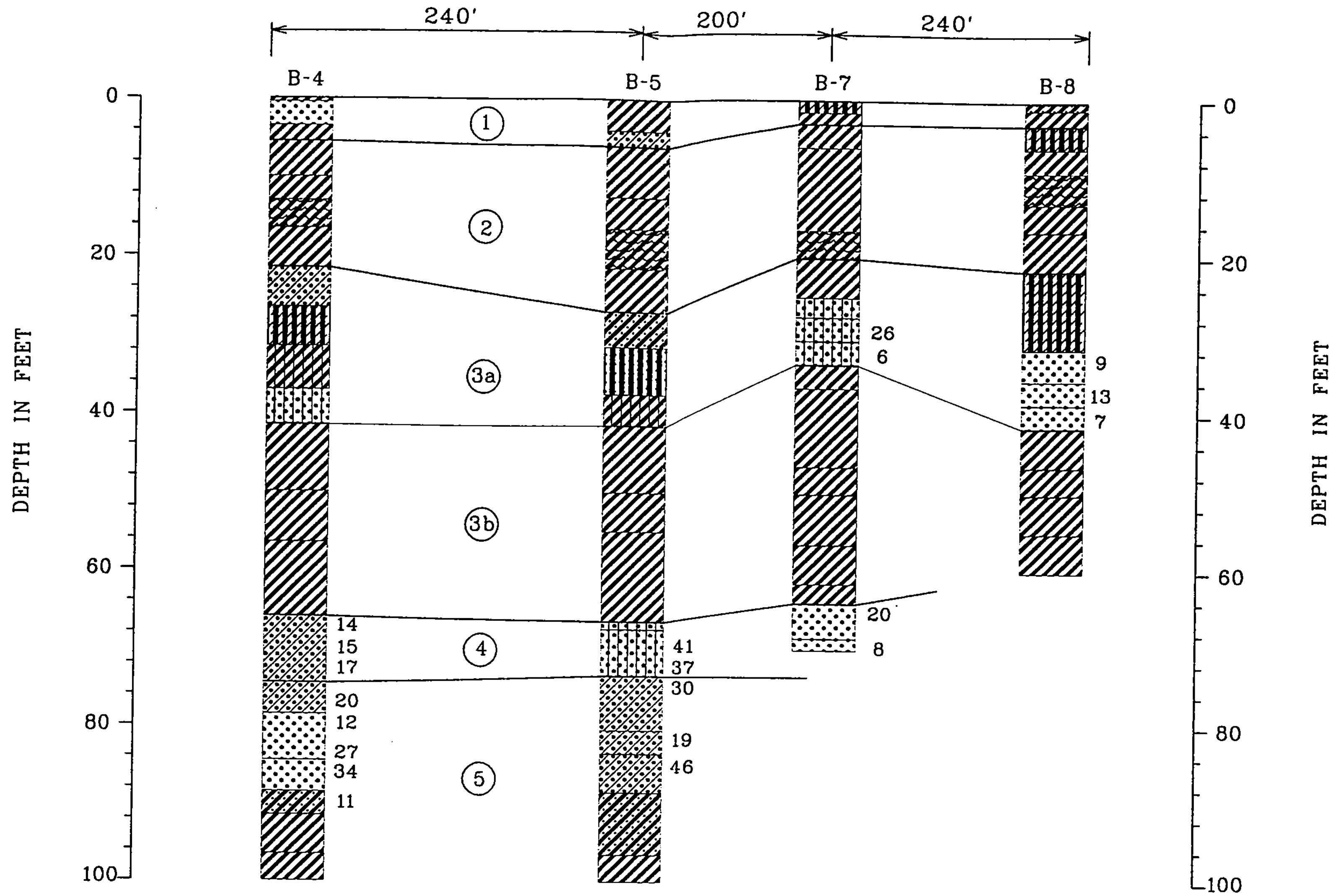
NOTE : NUMBERS TO RIGHT OF LOGS ARE RESULTS OF STANDARD PENETRATION TESTS.

SUBSOIL PROFILE BB

WEST JEFFERSON LEVEE DISTRICT
COUSINS PUMPING STATION TO FIRST AVENUE CANAL
HARVEY, LOUISIANA

FIGURE 4

EUSTIS ENGINEERING COMPANY, INC.



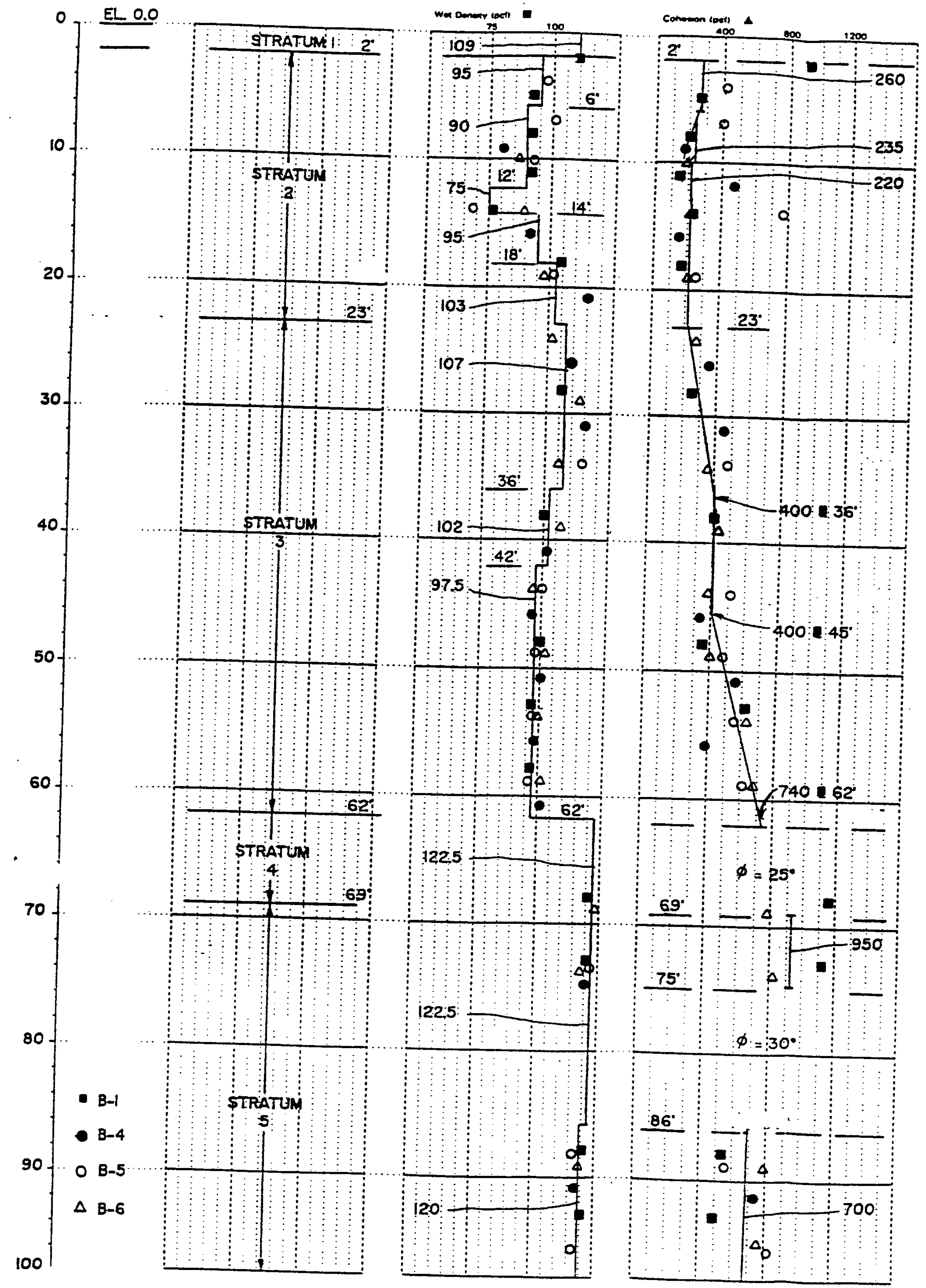
STRATUM NO.	GEOLOGIC FORMATION	DESCRIPTION
1	FILL	SOFT TO VERY STIFF GRAY AND TAN CLAY AND SANDY CLAY AND LOOSE TO MEDIUM DENSE TAN AND GRAY CLAYEY SILT, CLAYEY SAND AND FINE SAND
2	SWAMP/MARSH	EXTREMELY SOFT TO SOFT GRAY, BROWN AND DARK GRAY CLAY AND ORGANIC CLAY WITH ORGANIC MATTER, WOOD, ROOTS AND HUMUS LAYERS
3a	DELTAIC PLAIN DEPOSITS	LOOSE TO MEDIUM DENSE GRAY CLAYEY SILT, SANDY SILT, CLAYEY SAND, SILTY SAND AND FINE SAND AND SOFT GRAY SILTY CLAY WITH CLAYEY SILT AND SILTY SAND LAYERS
3b	DELTAIC PLAIN DEPOSITS	SOFT TO MEDIUM STIFF GRAY CLAY WITH FIND SAND, SILTY SAND AND CLAYEY SILT LAYERS AND POCKETS
4	NEARSHORE GULF DEPOSITS	VERY LOOSE TO MEDIUM DENSE GRAY FINE SAND, SILTY SAND AND CLAYEY SAND WITH SHELL FRAGMENTS
5	PLEISTOCENE DEPOSITS	SOFT TO STIFF GRAY SANDY CLAY AND CLAY WITH SAND AND CLAYEY SILT POCKETS AND LAYERS AND MEDIUM DENSE TO DENSE GREENISH-GRAY, TAN AND GRAY FINE SAND AND CLAYEY SAND

NOTE : NUMBERS TO RIGHT OF LOGS ARE RESULTS OF STANDARD PENETRATION TESTS.

SUBSOIL PROFILE CC

WEST JEFFERSON LEVEE DISTRICT
COUSINS PUMPING STATION TO FIRST AVENUE CANAL
HARVEY, LOUISIANA

FIGURE 5

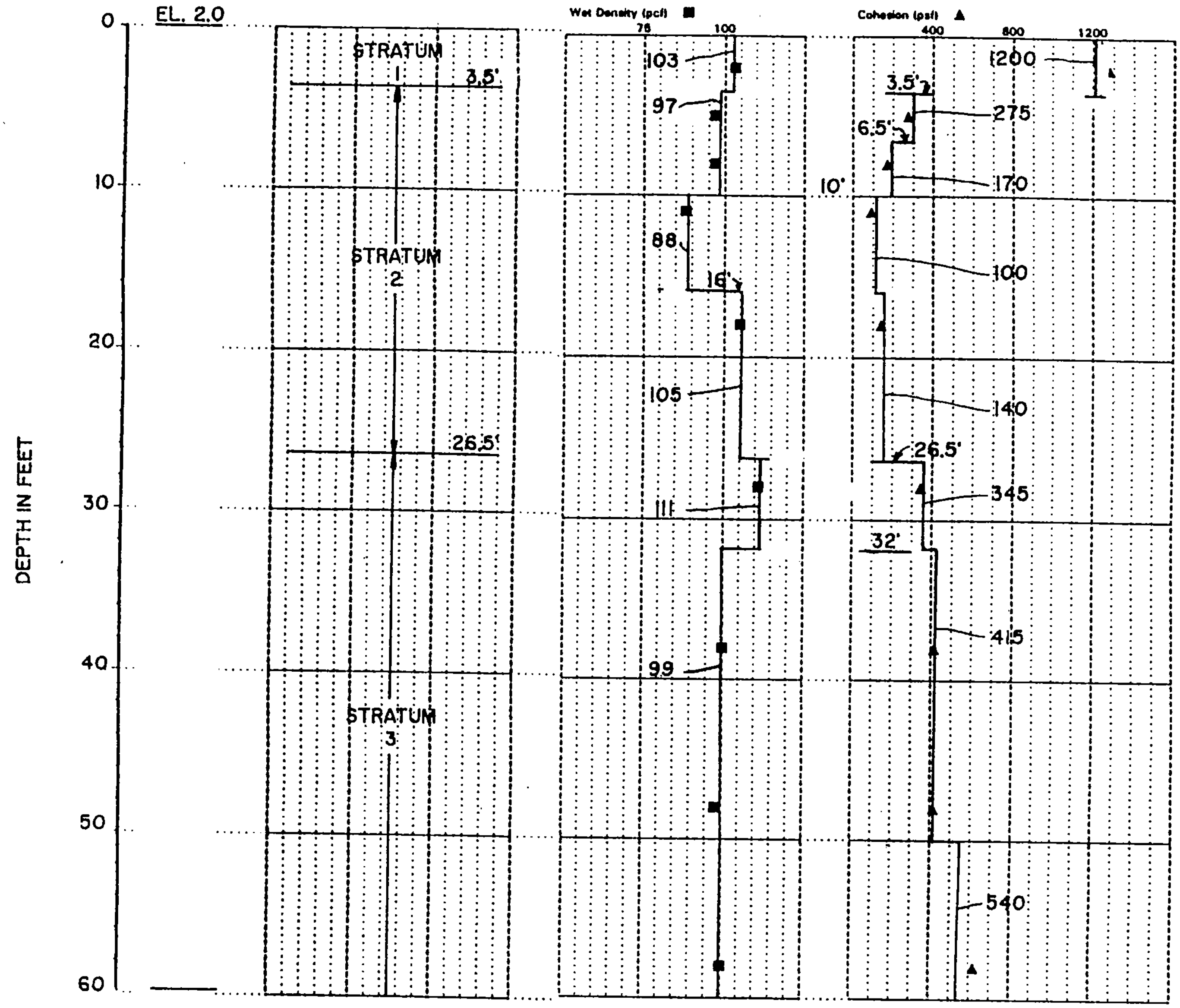


NOTE : SEE FIGURES 4 & 5 FOR GEOLOGIC DESCRIPTIONS

DESIGN SOIL PARAMETERS
BORINGS B-1, B-4, B-5 AND B-6

WEST JEFFERSON LEVEE DISTRICT
COUSINS PUMP STATION TO FIRST AVENUE CANAL
HARVEY, LOUISIANA

EUSTIS ENGINEERING COMPANY, INC.



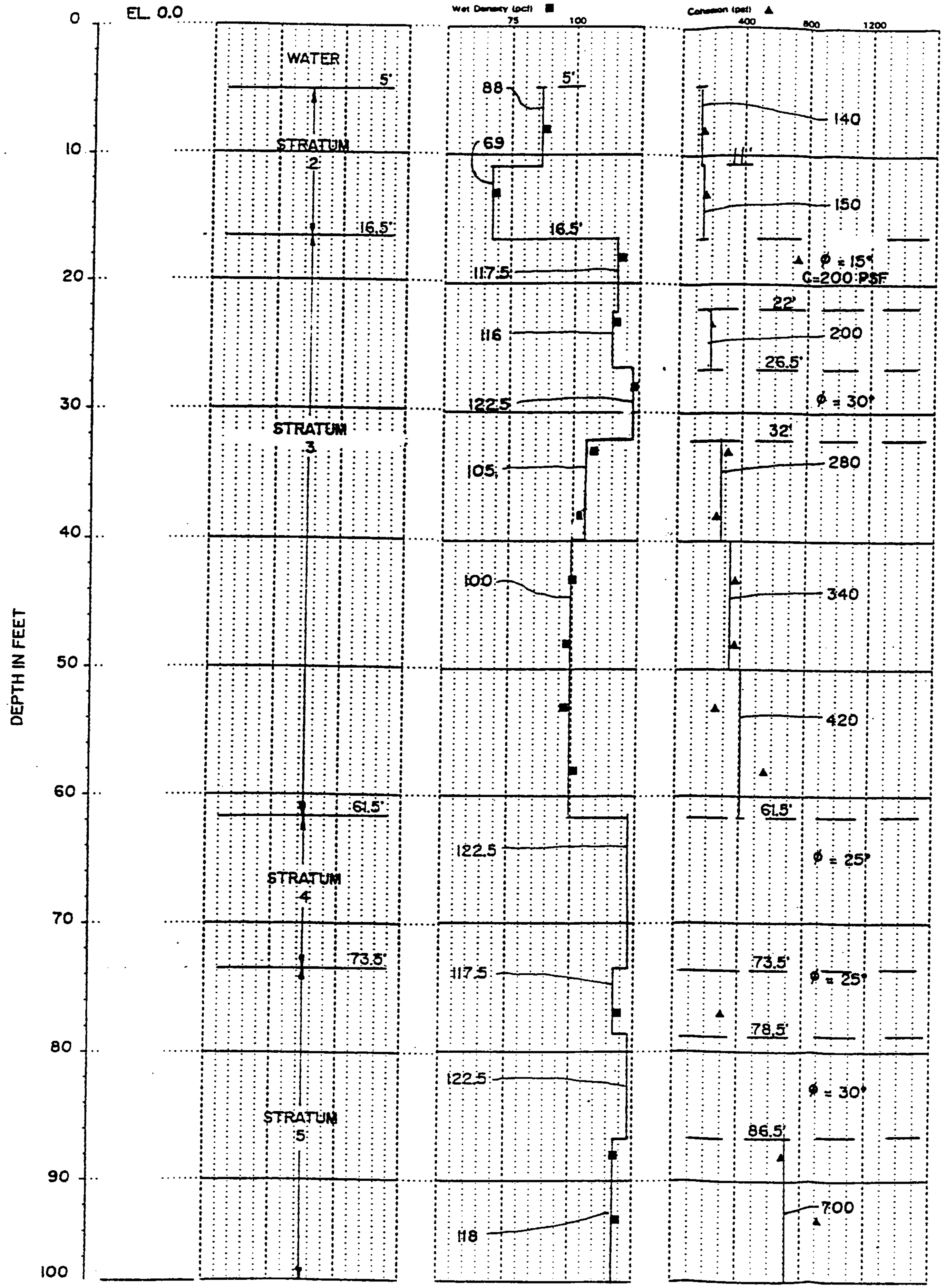
NOTE : SEE FIGURE 4 FOR GEOLOGIC DESCRIPTIONS

DESIGN SOIL PARAMETERS
BORING B-2

WEST JEFFERSON LEVEE DISTRICT
COUSINS PUMP STATION TO FIRST AVENUE CANAL
HARVEY, LOUISIANA

EUSTIS ENGINEERING COMPANY, INC.

FIGURE 7



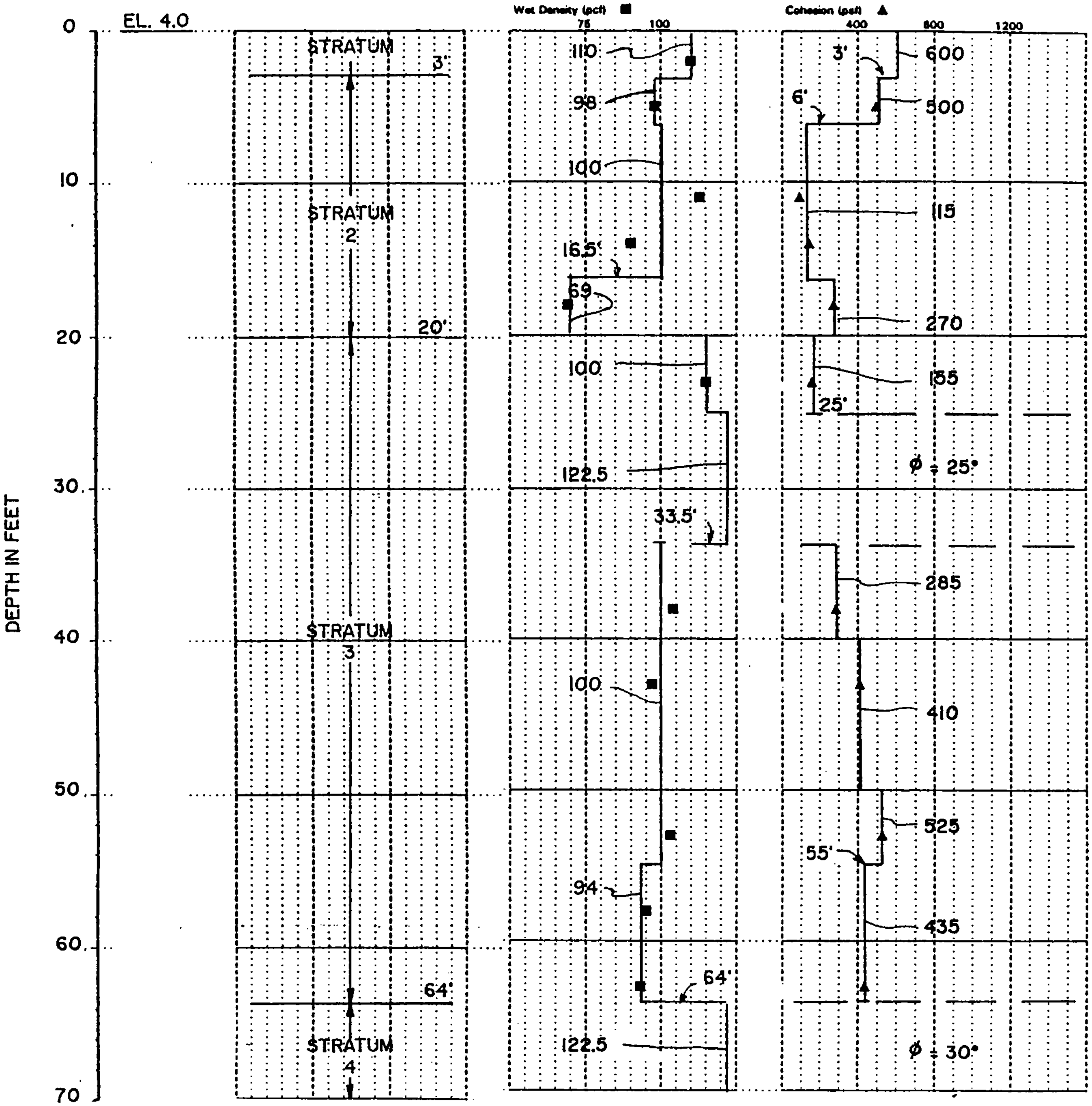
NOTE : SEE FIGURE 4 FOR GEOLOGIC DESCRIPTIONS

DESIGN SOIL PARAMETERS
BORING B-3

WEST JEFFERSON LEVEE DISTRICT
COUSINS PUMP STATION TO FIRST AVENUE CANAL
HARVEY, LOUISIANA

EUSTIS ENGINEERING COMPANY, INC.

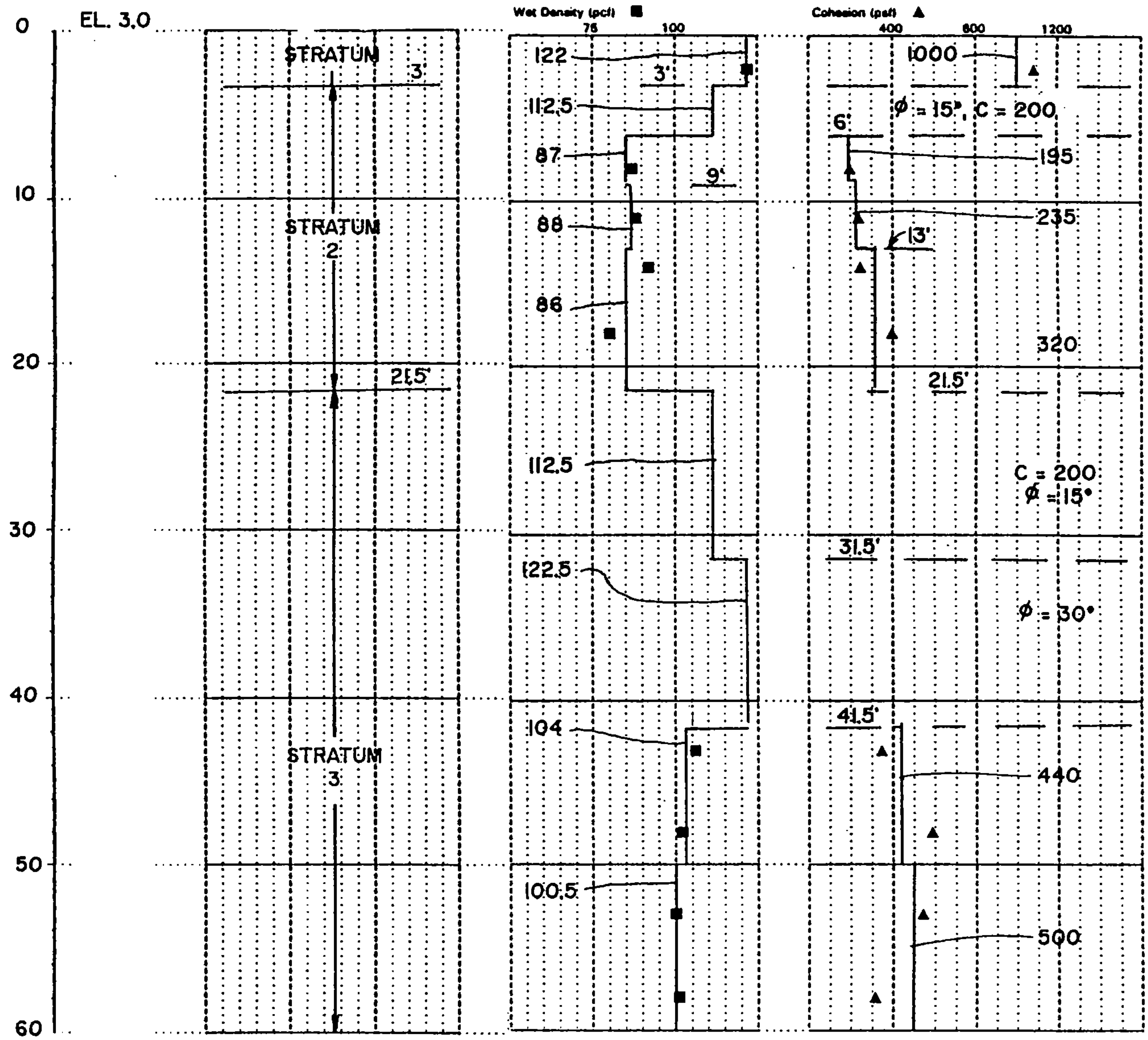
FIGURE 8



NOTE : SEE FIGURE 5 FOR GEOLOGIC DESCRIPTIONS

DESIGN SOIL PARAMETERS
BORING B-7

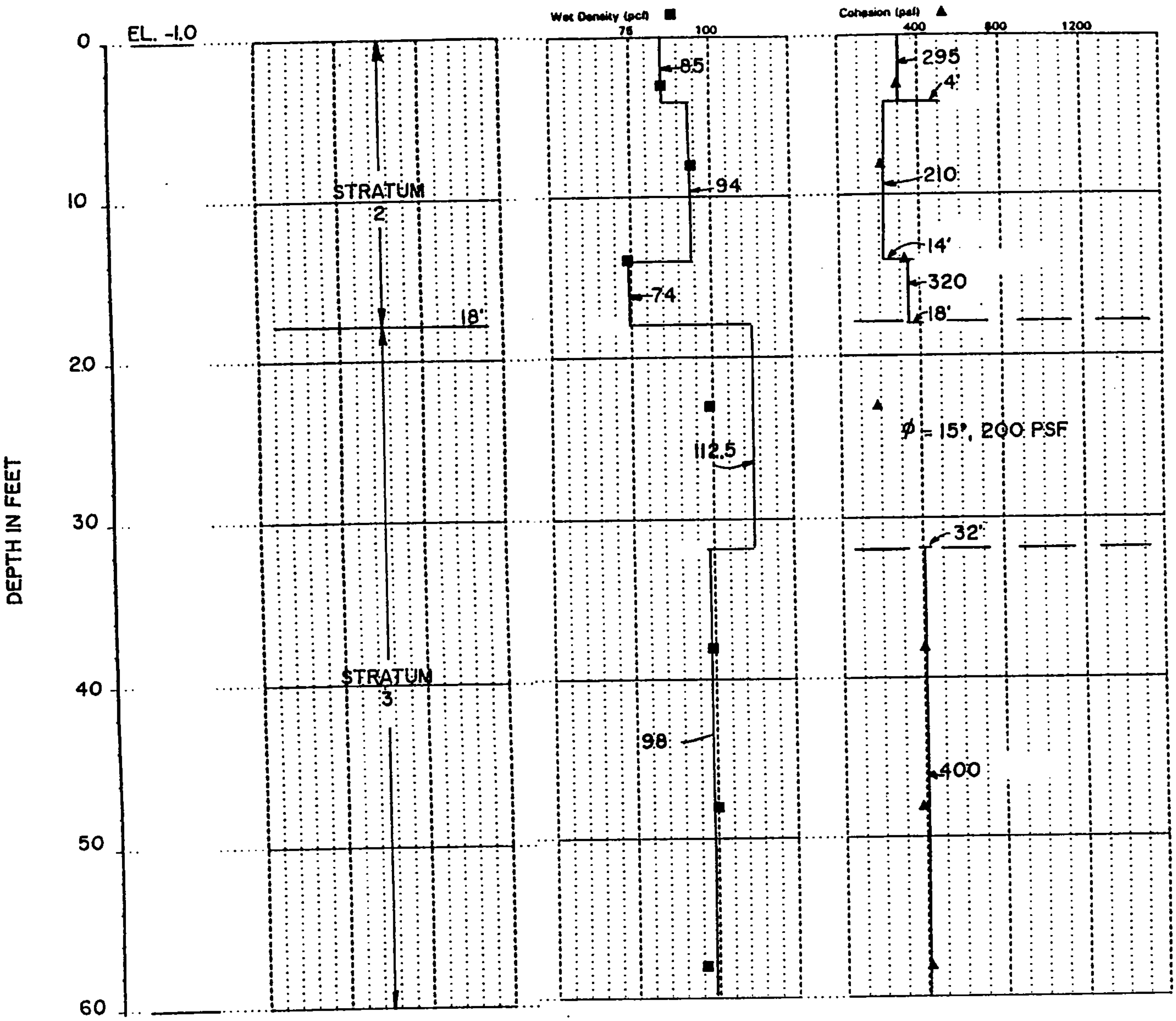
WEST JEFFERSON LEVEE DISTRICT
COUSINS PUMP STATION TO FIRST AVENUE CANAL
HARVEY, LOUISIANA



NOTE : SEE FIGURE 5 FOR GEOLOGIC DESCRIPTIONS

DESIGN SOIL PARAMETERS
BORING B-8

WEST JEFFERSON LEVEE DISTRICT
COUSINS PUMP STATION TO FIRST AVENUE CANAL
HARVEY, LOUISIANA



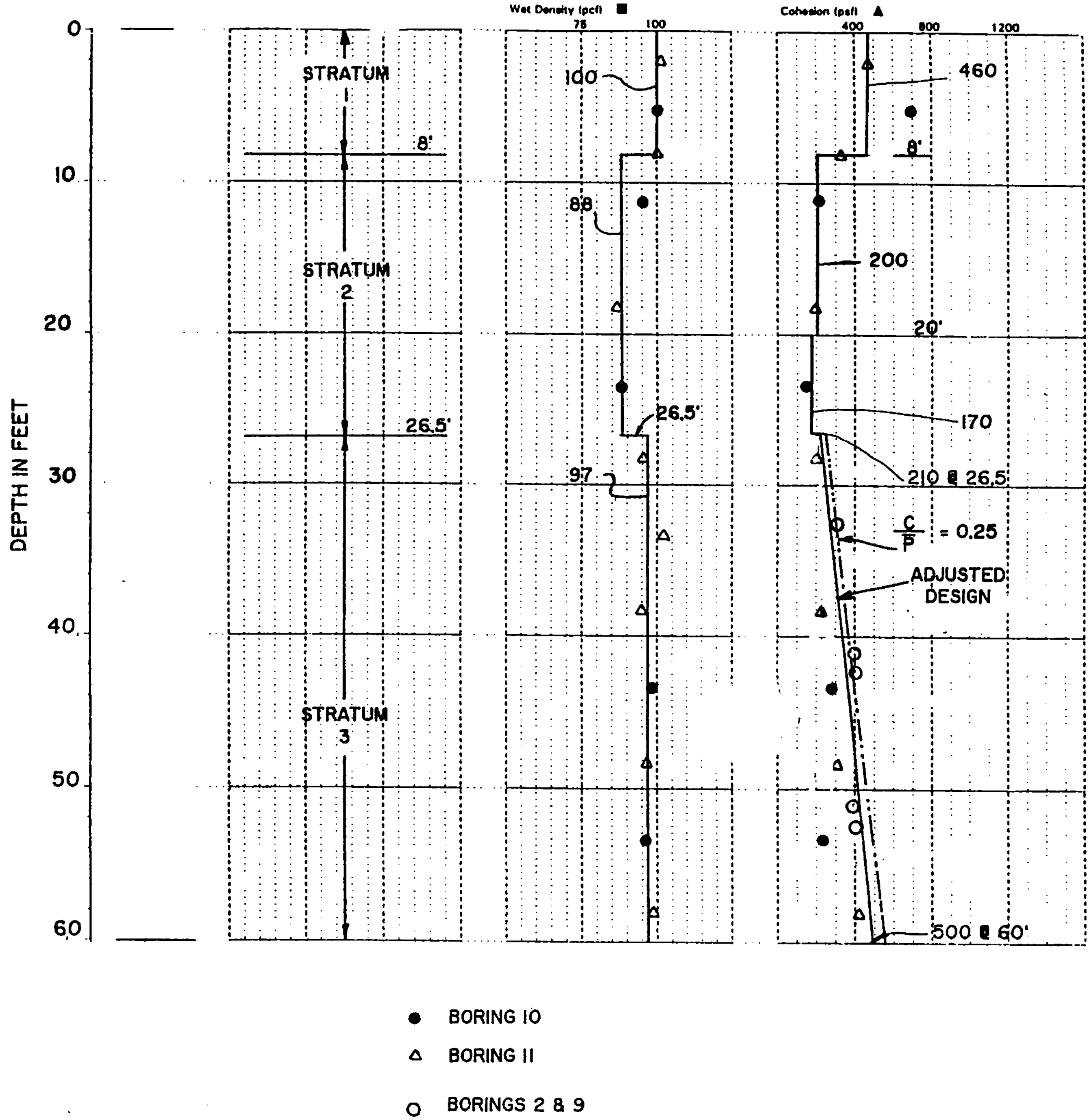
NOTE : SEE FIGURE 3 FOR GEOLOGIC DESCRIPTIONS

DESIGN SOIL PARAMETERS
BORING B-9

WEST JEFFERSON LEVEE DISTRICT
COUSINS PUMP STATION TO FIRST AVENUE CANAL
HARVEY, LOUISIANA

EUSTIS ENGINEERING COMPANY, INC.

FIGURE 11



NOTE : SEE FIGURE 3 FOR GEOLOGIC DESCRIPTIONS

DESIGN SOIL PARAMETERS
BORINGS B-10 AND B-11

WEST JEFFERSON LEVEE DISTRICT
COUSINS PUMP STATION TO FIRST AVENUE CANAL
HARVEY, LOUISIANA

WEST JEFFERSON LEVEE DISTRICT
COUSINS PUMP STATION TO FIRST AVENUE
HARVEY, LOUISIANA

ALLOWABLE PILE LOAD CAPACITIES
EXISTING TIMBER PILES AT SOUTH PUMP STATION

ELEVATION OF PILE CUTOFF IN FEET	ELEVATION OF PILE TIP IN FEET	PILE LENGTH IN FEET	ESTIMATED ALLOWABLE SINGLE PILE LOAD CAPACITY IN TONS FACTOR OF SAFETY = 2.0	
			COMPRESSION	TENSION
2	-66.5	68.5	19	13
-4	-75.5	71.5	26*	16
-8.5	-68.5	60	19	12
-13	-72	59	19	13
-20.5	-83.5	63	29*	18
-23.5	-83.5	60	28*	18
-26.5	-83.5	57	27*	17

*Pile tips assumed to be bearing in sand.

Note:

1. Pile tips are assumed to be 7 inches in diameter and pile butts are assumed to be 13 inches in diameter.
2. Used soil parameters on Figure 6.

WEST JEFFERSON LEVEE DISTRICT
COUSINS PUMP STATION TO FIRST AVENUE CANAL
HARVEY, LOUISIANA

ALLOWABLE PILE LOAD CAPACITIES
NEW T-WALL FOUNDATION FOR EXISTING NORTH PUMP STATION

PILE DESCRIPTION	PILE TIP EMBEDMENT BELOW FOOTING TOP AT EL -11 IN FEET	ESTIMATED ALLOWABLE SINGLE PILE LOAD CAPACITY IN TONS FACTOR OF SAFETY = 2	
		COMPRESSION	TENSION
12-In. Square Precast, Prestressed Concrete Pile	65.5 72.5	40* 53*	21 30
14-In. Square Precast, Prestressed Concrete Pile	65.5 72.5	48* 65*	25 35
16-In. Square Precast, Prestressed Concrete Pile	65.5 72.5	58* 77*	28 39

* Pile tips assumed to be bearing in sand.

Note:

1. Capacity contribution above el -38 has been ignored.
2. Used soil parameters on Figure 6.

WEST JEFFERSON LEVEE DISTRICT
COUSINS PUMP STATION TO FIRST AVENUE
HARVEY, LOUISIANA

ALLOWABLE PILE LOAD CAPACITIES
FOR NEW COUSINS PUMP STATION AND OTHER STRUCTURES

PILE DESCRIPTION	PILE TIP EMBEDMENT BELOW MUDLINE AT EL 2.5 IN FEET	ESTIMATED ALLOWABLE SINGLE PILE LOAD CAPACITY IN TONS FACTOR OF SAFETY = 2.0	
		COMPRESSION	TENSION
Treated ASTM D 25 Quality Timber (or Composite) 7-In. Tip 12-In. Butt	50 55	10 11	6.5 8
Treated ASTM D 25 Quality Timber (or Composite) 7-In. Tip 13-In. Butt	60 65 70	14 17 20	9 11 13
12-In. Square, Precast, Prestressed Concrete	50 55 60 65 70 75 80 85	17 20 23 31 37 38 58* 69*	13 15 17 20 24 28 33 40
14-In. Square, Precast, Prestressed Concrete	50 55 60 65 70 75 80 85	21 24 27 37 45 46 70* 83*	15 18 20 23 28 33 39 47

*Pile tips assumed to be bearing in sand.

Note:

1. Composite piles cannot be used in tension.
2. Used soil parameters on Figure 6.

WEST JEFFERSON LEVEE DISTRICT
COUSINS PUMP STATION TO FIRST AVENUE
HARVEY, LOUISIANA

ALLOWABLE PILE LOAD CAPACITIES FOR NEW COUSINS PUMP STATION AND OTHER STRUCTURES

PILE DESCRIPTION	PILE TIP EMBEDMENT BELOW MUDLINE AT EL -8.5 IN FEET	ESTIMATED ALLOWABLE SINGLE PILE LOAD CAPACITY IN TONS FACTOR OF SAFETY = 2.0	
		COMPRESSION	TENSION
Treated ASTM D 25 Quality Timber (or Composite) 7-In. Tip 12-In. Butt	50 55	12 15	8.5 10
Treated ASTM D 25 Quality Timber (or Composite) 7-In. Tip 13-In. Butt	50 65 70	19 21 28*	12 14 17
12-In. Square, Precast, Prestressed Concrete	50 55 60 65 70 75	21 28 31 36 54* 64*	16 19 22 25 31 37
14-In. Square, Precast, Prestressed Concrete	50 55 60 65 70 75	25 34 37 42 65* 77*	19 22 26 29 36 43

*Pile tips assumed to be bearing in sand.

Note:

1. Composite piles cannot be used in tension.
2. Used soil parameters on Figure 6.

WEST JEFFERSON LEVEE DISTRICT
COUSINS PUMP STATION TO FIRST AVENUE
HARVEY, LOUISIANA

ALLOWABLE PILE LOAD CAPACITIES
FOR NEW COUSINS PUMP STATION AND OTHER STRUCTURES

PILE DESCRIPTION	PILE TIP EMBEDMENT BELOW MUDLINE AT EL -13 IN FEET	ESTIMATED ALLOWABLE SINGLE PILE LOAD CAPACITY IN TONS FACTOR OF SAFETY = 2.0	
		COMPRESSION	TENSION
Treated ASTM D 25 Quality Timber (or Composite) 7-In. Tip 12-In. Butt	50 55	14 17	9 11
Treated ASTM D 25 Quality Timber (or Composite) 7-In. Tip 13-In. Butt	60 65 70	20 26* 30*	13 16 19
12-In. Square, Precast, Prestressed Concrete	50 55 60 65 70	26 30 33 50* 61*	17 21 24 29 35
14-In. Square, Precast, Prestressed Concrete	50 55 60 65 70	31 36 40 61* 74*	20 25 28 34 41

*Pile tips assumed to be bearing in sand.

Note:

1. Composite piles cannot be used in tension.
2. Used soil parameters on Figure 6.

WEST JEFFERSON LEVEE DISTRICT
COUSINS PUMP STATION TO FIRST AVENUE
HARVEY, LOUISIANA

ALLOWABLE PILE LOAD CAPACITIES FOR NEW COUSINS PUMP STATION AND OTHER STRUCTURES

PILE DESCRIPTION	PILE TIP EMBEDMENT BELOW MUDLINE AT EL -20.5 IN FEET	ESTIMATED ALLOWABLE SINGLE PILE LOAD CAPACITY IN TONS FACTOR OF SAFETY = 2.0	
		COMPRESSION	TENSION
Treated ASTM D 25 Quality Timber (or Composite) 7-In. Tip 12-In. Butt	50 55	16 21	11 13
Treated ASTM D 25 Quality Timber (or Composite) 7-In. Tip 13-In. Butt	60 63	26* 29*	16 18
12-In. Square, Precast, Prestressed Concrete	50 55 60 63	28 35 50* 56*	20 24 30 33
14-In. Square, Precast, Prestressed Concrete	50 55 60 65	34 42 60* 67*	23 28 35 39

*Pile tips assumed to be bearing in sand.

Note:

1. Composite piles cannot be used in tension.
2. Used soil parameters on Figure 6.

WEST JEFFERSON LEVEE DISTRICT
COUSINS PUMP STATION TO FIRST AVENUE
HARVEY, LOUISIANA

ALLOWABLE PILE LOAD CAPACITIES
FOR NEW COUSINS PUMP STATION AND OTHER STRUCTURES

PILE DESCRIPTION	PILE TIP EMBEDMENT BELOW MUDLINE AT EL -26.5 IN FEET	ESTIMATED ALLOWABLE SINGLE PILE LOAD CAPACITY IN TONS FACTOR OF SAFETY = 2.0	
		COMPRESSION	TENSION
Treated ASTM D 25 Quality Timber (or Composite) 7-In. Tip 12-In. Butt	50 57	20* 26*	12 16
12-In. Square, Precast, Prestressed Concrete	50 57	39* 51*	23 30
14-In. Square, Precast, Prestressed Concrete	50 57	47* 61*	27 35

*Pile tips assumed to be bearing in sand.

Note:

1. Composite piles cannot be used in tension.
2. Used soil parameters on Figure 6.

WEST JEFFERSON LEVEE DISTRICT
COUSINS PUMP STATION TO FIRST AVENUE CANAL
HARVEY, LOUISIANA

ALLOWABLE PILE LOAD CAPACITIES
T-WALL FROM PUMP STATION TO
DESTREHAN AVENUE BRIDGE AND OTHER STRUCTURES

PILE DESCRIPTION	PILE TIP EMBEDMENT BELOW EXISTING GROUND SURFACE IN FEET	ESTIMATED ALLOWABLE SINGLE PILE LOAD CAPACITY IN TONS FACTOR OF SAFETY = 2	
		COMPRESSION	TENSION
Treated ASTM D 25 Quality Timber (or Composite) 7-In. Tip 13-In. Butt	58 63 67	13 15 18	9 10 12
12-In. Square, Precast, Prestressed, Concrete	66 71 76 84	33 35 40 68*	20 25 29 40
14-In. Square, Precast, Prestressed Concrete	66 71 76 84	39 41 47 83*	24 30 34 46

* Pile tips assumed to be bearing in sand.

Note:

1. Top of pile assumed to be at el 2 with 2 feet of cutoff.
2. Composite piles cannot be used in tension.
3. Used soil parameters on Figure 6.

WEST JEFFERSON LEVEE DISTRICT
COUSINS PUMP STATION TO FIRST AVENUE CANAL
HARVEY, LOUISIANA

ALLOWABLE PILE LOAD CAPACITIES
FOR PILES IN CANAL
DESTREHAN AVENUE BRIDGE

PILE DESCRIPTION	PILE TIP EMBEDMENT BELOW MUDLINE IN FEET	ESTIMATED ALLOWABLE SINGLE PILE LOAD CAPACITY IN TONS FACTOR OF SAFETY = 2	
		COMPRESSION	TENSION
14-In. Square, Precast, Prestressed Concrete	55	35	22
	60	37	26
	65	42	31
	73	73*	41
16-In. Square, Precast, Prestressed Concrete	55	40	25
	60	42	30
	65	49	35
	73	87*	47

* Pile tips assumed to be bearing in sand.

Note:

1. Mudline assumed at el -9.
2. The 16-in. square pile with an embedment of 73 feet (el -82) is representative of existing piles.
3. Used soil parameters on Figure 6.

WEST JEFFERSON LEVEE DISTRICT
COUSINS PUMP STATION TO FIRST AVENUE CANAL
HARVEY, LOUISIANA

ALLOWABLE PILE LOAD CAPACITIES
ABUTMENT AREA DESTREHAN AVENUE BRIDGE

PILE DESCRIPTION	PILE TIP EMBEDMENT BELOW EXISTING GROUND SURFACE IN FEET	ESTIMATED ALLOWABLE SINGLE PILE LOAD CAPACITY IN TONS FACTOR OF SAFETY = 2	
		COMPRESSION	TENSION
14-In. Square, Precast, Prestressed Concrete	71 76 81 89	40 42 47 85*	25 31 34 47
16-In. Square, Precast, Prestressed Concrete	71 76 81 89	48 49 56 100*	28 35 40 54

* Pile tips assumed to be bearing in sand.

Note:

1. Top of pile assumed to be at el 7 with 2 feet of cutoff.
2. The 16-in. square pile with an embedment of 89 feet is representative of existing piles.
3. Used soil parameters on Figure 6.

WEST JEFFERSON LEVEE DISTRICT
COUSINS PUMP STATION TO FIRST AVENUE CANAL
HARVEY, LOUISIANA

ALLOWABLE PILE LOAD CAPACITIES
FLOODGATES AT DESTREHAN AVENUE AND OTHER STRUCTURES

PILE DESCRIPTION	PILE TIP EMBEDMENT BELOW EXISTING GROUND SURFACE IN FEET	ESTIMATED ALLOWABLE SINGLE PILE LOAD CAPACITY IN TONS FACTOR OF SAFETY = 2	
		COMPRESSION	TENSION
Treated ASTM D 25 Quality Timber (or Composite) 7-In. Tip 13-In. Butt	60 65 69	13 15 20	9 10 12
12-In. Square, Precast, Prestressed Concrete	68 73 78 86	33 35 40 68*	21 26 29 40
14-In. Square, Precast, Prestressed Concrete	68 73 78 86	39 41 47 83*	24 30 34 46

* Pile tips assumed to be bearing in sand.

Note:

1. Top of pile assumed to be at el 4 with 2 feet of cutoff.
2. Composite piles *cannot* be used in tension.
3. Used soil parameters on Figure 6.

WEST JEFFERSON LEVEE DISTRICT
COUSINS PUMP STATION TO FIRST AVENUE CANAL
HARVEY, LOUISIANA

ALLOWABLE PILE LOAD CAPACITIES
T-WALL EAST OF DESTREHAN AVENUE BRIDGE AND OTHER STRUCTURES

PILE DESCRIPTION	PILE TIP EMBEDMENT BELOW EXISTING GROUND SURFACE IN FEET	ESTIMATED ALLOWABLE SINGLE PILE LOAD CAPACITY IN TONS FACTOR OF SAFETY = 2	
		COMPRESSION	TENSION
Treated ASTM D 25 Quality Timber (or Composite) 7-In. Tip 13-In. Butt	57 62 67	13 14 18	9 10 11
12-In. Square, Precast, Prestressed Concrete	64 75 80 85	28 46 61* 70*	17 28 33 39
14-In. Square, Precast, Prestressed Concrete	64 75 80 85	33 54 74* 85*	20 33 39 46

* Pile tips assumed to be bearing in sand.

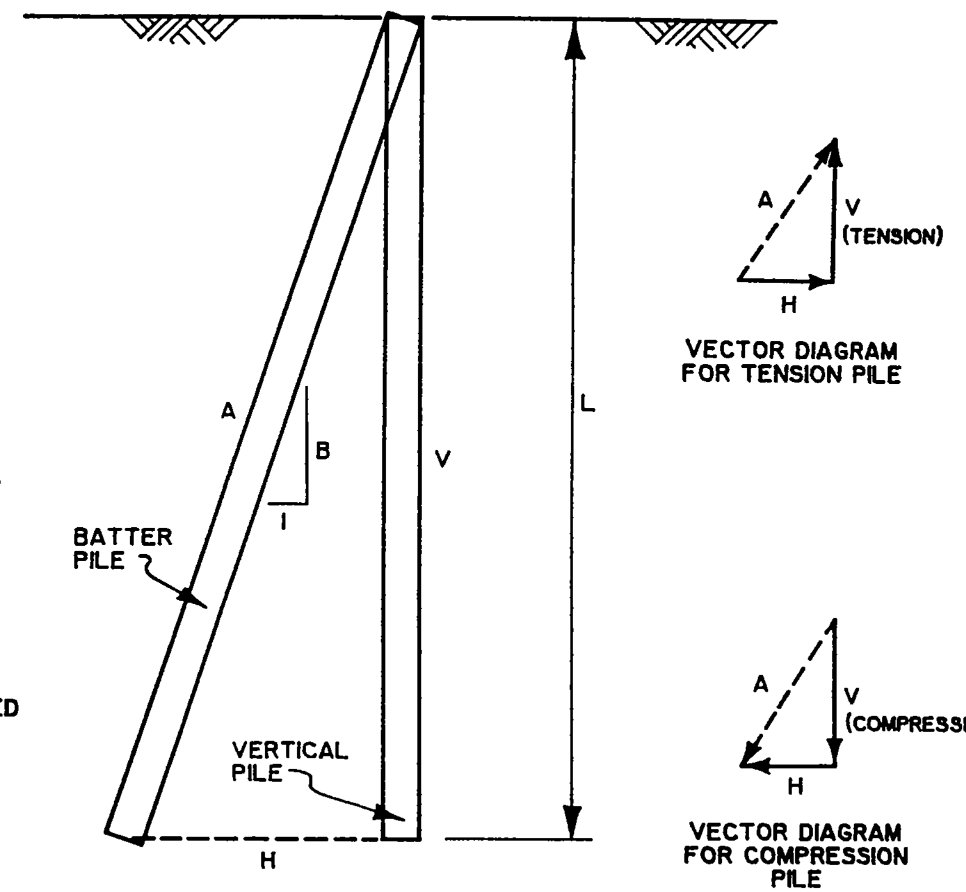
Note:

1. Top of pile assumed to be at el 2 with 2 feet of cutoff.
2. Composite piles cannot be used in tension.
3. Used soil parameters from Figure 6 to el -10 and from Figure 8 below el -10.

AXIAL AND HORIZONTAL RESISTANCE OF BATTER PILES

ESTIMATED FROM ALLOWABLE VERTICAL LOAD CAPACITY

L = VERTICAL COMPONENT OF BATTER PILE EMBEDMENT LENGTH.



V = ESTIMATED ALLOWABLE SINGLE PILE LOAD CAPACITY OF A PILE DRIVEN VERTICALLY WITH EMBEDMENT LENGTH, L.

B = BATTER OF PILE EXPRESSED AS A RATIO OF VERTICAL DISTANCE TO ONE FOOT HORIZONTAL DISTANCE.

H = HORIZONTAL RESISTANCE OF BATTER PILE ESTIMATED AS FOLLOWS:

$$H = \frac{V}{B}$$

A = ALLOWABLE AXIAL PILE LOAD CAPACITY OF A SINGLE BATTER PILE ESTIMATED AS FOLLOWS:

$$A = \sqrt{V^2 \left(1 + \frac{1}{B^2}\right)}$$

NOTE: THE AXIAL LOAD RESISTANCE OF A VERTICAL PILE, V, IS DEPENDENT ON THE TYPE OF LOADING--TENSION OR COMPRESSION. CAUTION SHOULD BE EXERCISED TO INSURE THAT THE CORRECT VERTICAL CAPACITY IS USED.

WEST JEFFERSON LEVEE DISTRICT
COUSINS PUMP STATION TO FIRST AVENUE CANAL
HARVEY, LOUISIANA

MODULUS OF HORIZONTAL SUBGRADE REACTION
COUSINS PUMP STATION TO DESTREHAN AVENUE BRIDGE

ELEVATION IN FEET	$\frac{K_h \times B}{DC}$
0 to -6	114
-6 to -10	103
-10 to -23	97
-23 to -36	136
-36 to -45	176
-45 to -62	251
-62 to -69	11,790
-69 to -75	418
-75 to -86	24,150

Where: K_h = Modulus of horizontal subgrade reaction (lbs/in.^{3})

B = Diameter of pile (inches)

C = Reduction factor for cyclic loading

C = 0.5 for cyclic loading
C = 1.0 for initial loading

D = Reduction factor for effect of group action

D	PILE SPACING IN DIRECTION OF LOADING
1.0	8B
0.85	7B
0.7	6B
0.55	5B
0.40	4B
0.25	3B

WEST JEFFERSON LEVEE DISTRICT
COUSINS PUMP STATION TO FIRST AVENUE CANAL
HARVEY, LOUISIANA

MODULUS OF HORIZONTAL SUBGRADE REACTION
EAST OF DESTREHAN AVENUE BRIDGE

ELEVATION IN FEET	$\frac{K_h \times B}{DC}$
0 to -6	114
-6 to -10	103
-10 to -16.5	66
-16.5 to -26.5	88
-26.5 to -32	3,510
-32 to -40	123
-40 to -50	150
-50 to -61.5	185
-61.5 to -78.5	16,800
-78.5 to -86.5	22,770

Where: K_h = Modulus of horizontal subgrade reaction (lbs/in.^{3})

B = Diameter of pile (inches)

C = Reduction factor for cyclic loading

C = 0.5 for cyclic loading
C = 1.0 for initial loading

D = Reduction factor for effect of group action

D	PILE SPACING IN DIRECTION OF LOADING
1.0	8B
0.85	7B
0.7	6B
0.55	5B
0.40	4B
0.25	3B

CAPACITY OF PILE GROUPS

The maximum allowable load carrying capacity of a pile group is no greater than the sum of the single pile load capacities, but may be limited to a lower value if so indicated by the result of the following formula.

$$Q_a = \frac{P \times L \times c}{(FSF)} + \frac{2.6\, q_u \left(1 + 0.2 \frac{w}{b}\right) A}{(FSB)}$$

In Which:

Q_a	=	Allowable load carrying capacity of pile group, lb
P	=	Perimeter distance of pile group, ft
L	=	Length of pile, ft
c	=	Average (weighted) cohesion or shear strength of material between surface and depth of pile tip, psf
q_u	=	Average unconfined compressive strength of material in the zone immediately below pile tips, psf (unconfined compressive strength = cohesion x 2)
w	=	Width of base of pile group, ft
b	=	Length of base of pile group, ft
A	=	Base area of pile group, sq ft
(FSF)	=	Factor of safety for the friction area = 2
(FSB)	=	Factor of safety for the base area = 3

The values of c and q_u used in this formula should be based on applicable soil data shown on the Log of Boring and Test Results for this report. In the application of this formula, the weight of the piles, pile caps and mats, considering the effect of buoyancy, should be included.

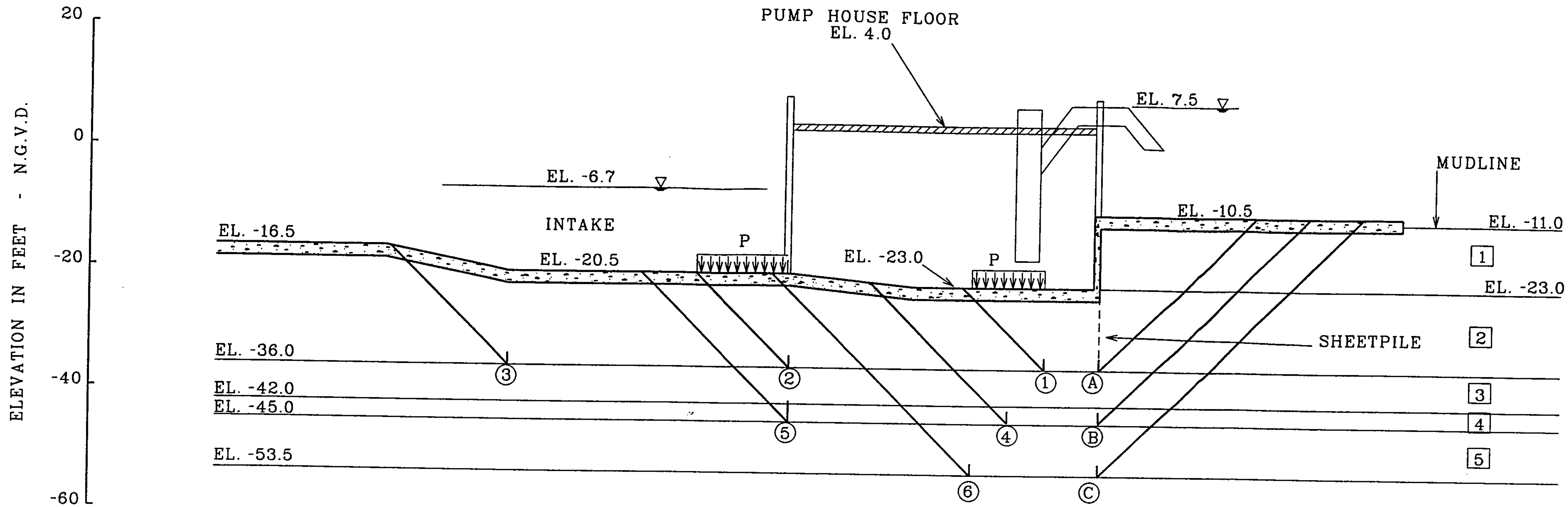
SPACING WITHIN PILE GROUPS

$$SPAC = 0.05\,(L_1) + 0.025\,(L_2) + 0.0125\,(L_3)$$

In Which:

SPAC	=	Center to center of piles, feet
L_1	=	Pile penetration up to 100 feet
L_2	=	Pile penetration from 101 to 200 feet
L_3	=	Pile penetration beyond 200 feet

NOTE: Minimum pile spacing = 3 feet or 3 pile diameters, whichever is greater



STRATA NO.	SOIL TYPE	UNIT WEIGHT PCF	FRICTION ANGLE DEGREES	COHESION - PSF	
				AVERAGE	BOTTOM
1	CLAY	94	0	220	220
2	CLAY CLAYEY/SILT	107	0	310	400
3	CLAY	102	0	400	400
4	CLAY	97.5	0	400	400
5	CLAY	97.5	0	485	570

FAILURE SURFACE	SUMMATION OF FORCES LBS/FT		FACTOR OF SAFETY	VERTICAL PRESSURE, P, IN PSF TO ACHIEVE FACTOR OF SAFETY = 1.3
	RESISTING	DRIVING		
Ⓐ ①	24600	38351	0.64	1943
Ⓐ ②	42950	36818	1.17	317
Ⓐ ③	63675	35563	1.79	-
Ⓑ ④	42552	50405	0.84	1044
Ⓑ ⑤	57971	47927	1.21	177
Ⓒ ⑥	65480	59513	1.10	396

NOTE : 1) "P" IS REQUIRED VERTICAL PRESSURE ACROSS TOP OF PASSIVE WEDGES TO ACHIEVE A CALCULATED FACTOR OF SAFETY OF 1.3 OR MORE AGAINST A STABILITY FAILURE.

2) SOIL PARAMETERS ARE TAKEN FROM FIGURE 6.

20′ 0 20′

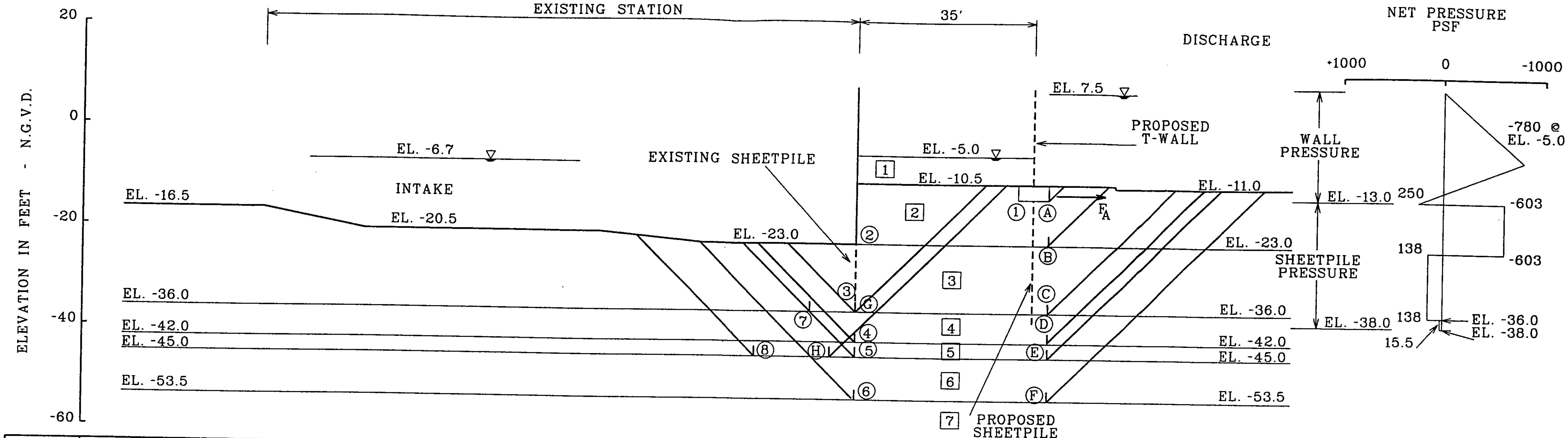
SCALE

SLOPE STABILITY ANALYSIS
EXISTING NORTH PUMP STATION

WEST JEFFERSON LEVEE DISTRICT
COUSINS PUMP STATION TO FIRST AVENUE CANAL
HARVEY, LOUISIANA

EUSTIS ENGINEERING COMPANY, INC.

FIGURE 29



STRATA NO.	SOIL TYPE	UNIT WEIGHT PCF	UNFACTORED FRICTION ANGLE DEGREES	UNFACTORED COHESION - PSF AVERAGE	UNFACTORED COHESION - PSF BOTTOM	SAFETY FACTOR OF 1.3 FRICTION ANGLE DEGREES	SAFETY FACTOR OF 1.3 COHESION - PSF AVERAGE	SAFETY FACTOR OF 1.3 COHESION - PSF BOTTOM
1	SAND	120	30	0	0	24	0	0
2	CLAY	94	0	220	220	0	169	169
3	CLAY CLAYEY SILT	107	0	310	400	0	238	308
4	CLAY	102	0	400	400	0	308	308
5	CLAY	97.5	0	400	400	0	308	308
6	CLAY	97.5	0	485	570	0	373	438
7	CLAY	97.5	0	655	740	0	504	569

T - WALL ANALYSIS

SUMMATION OF FORCES (USING FACTORED SHEAR STRENGTHS)

FAILURE SURFACE	ΣR RESISTANCE LBS/FT	ΣD DRIVING LBS/FT	ΣR - ΣD	CHANGE IN NET FORCE	EQUIVALENT PRESSURE PSF
Ⓐ ①	3734	8118	-4384	-	-
Ⓑ ②	10586	21000	-10414	-6030	-603
Ⓒ ③	28142	36761	-8619	1795	138
Ⓓ ④	35534	44060	-8526	93	15.5
Ⓔ ⑤	39230	47717	-8487	39	13
Ⓕ ⑥	57127	58096	-969	7518	884

STABILITY OF PUMP STATION

FAILURE SURFACE	SUMMATION OF FORCES RESISTING	SUMMATION OF FORCES DRIVING	FACTOR OF * SAFETY
Ⓖ ⑦	25801	19615	1.32
Ⓗ ⑧	43575	22636	1.93

* USING UNFACTORED SOIL PARAMETERS

NOTE :

1) TO SATISFY MOMENT EQUILIBRIUM, SUMMING MOMENTS ABOUT BASE OF FOOTING AT EL. -13.0, REQUIRES SHEET PENETRATION TO EL. -38.0.

2) MAXIMUM MOMENT OCCURS AT EL. -20.0 AND IS 14.7 FT. KIPS/FT OF WALL.

3) CALCULATED ANCHOR FORCE, F_A, IS 4.2 KIPS/FT OF WALL AT EL. -13.0.

4) THE ANCHOR LOAD AND INDICATED T-WALL PRESSURE MUST BE SUPPORTED BY DRIVEN BATTER PILES.

5) USING THE HARR METHOD OF SEEPAGE ANALYSIS, FACTOR OF SAFETY AGAINST PIPING FAILURE IS 4 OR MORE IF THE T-WALL CUTOFF SHEETPILE IS DRIVEN TO EL-. -38.0

6) SOIL PARAMETERS ARE TAKEN FROM FIGURE 6.

20' 0 20'

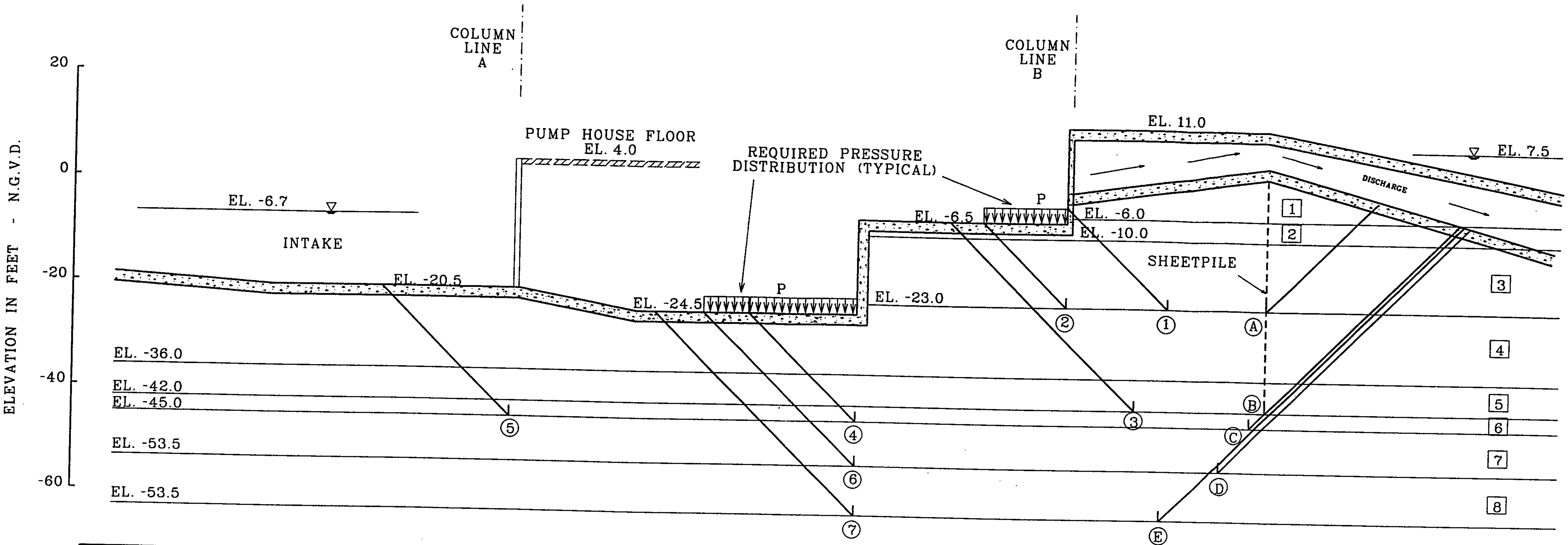
SCALE

SLOPE STABILITY ANALYSIS AND PROPOSED T-WALL ANALYSES EXISTING NORTH PUMP STATION

WEST JEFFERSON LEVEE DISTRICT
COUSINS PUMP STATION TO FIRST AVENUE CANAL
HARVEY, LOUISIANA

EUSTIS ENGINEERING COMPANY, INC.

FIGURE 30



STRATA NO.	SOIL TYPE	UNIT WEIGHT PCF	FRICTION ANGLE DEGREES	COHESION - PSF	
				AVERAGE	BOTTOM
1	CLAY	95	0	260	260
2	CLAY	90	0	235	220
3	CLAY	94	0	220	220
4	CLAY/ CLAYEY SILT	107	0	310	400
5	CLAY	102	0	400	400
6	CLAY	97.5	0	400	400
7	CLAY	97.5	0	485	570
8	CLAY	97.5	0	655	740

FAILURE SURFACE	SUMMATION OF FORCES LBS/FT		FACTOR OF SAFETY	VERTICAL PRESSURE, P, IN PSF TO ACHIEVE FACTOR OF SAFETY = 1.3
	RESISTING	DRIVING		
Ⓐ ①	22581	12966	1.74	-
Ⓐ ②	25442	24975	1.02	327
Ⓑ ③	50681	36597	1.38	-
Ⓒ ④	67191	63073	1.07	555
Ⓒ ⑤	95051	60266	1.58	-
Ⓓ ⑥	92800	75554	1.23	144
Ⓔ ⑦	118622	86896	1.37	-

NOTE : 1) "P", IS REQUIRED VERTICAL PRESSURE ACROSS TOP OF PASSIVE WEDGES TO ACHIEVE A CALCULATED FACTOR OF SAFETY OF 1.3 OR MORE AGAINST A STABILITY FAILURE.

2) USING THE HARR METHOD OF SEEPAGE ANALYSIS, THE UNCALCULATED FACTOR OF SAFETY AGAINST PIPING IS GREATER THEN 4.

3) SOIL PARAMETERS ARE TAKEN FROM FIGURE 6.

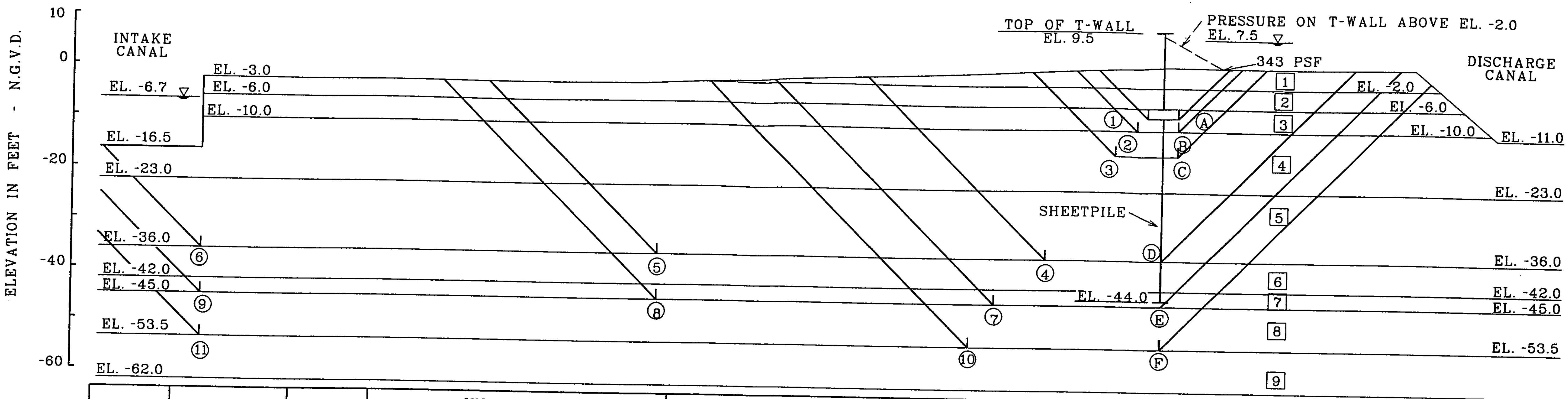
20' 0 20'
SCALE

SLOPE STABILITY ANALYSIS
EXISTING SOUTH PUMP STATION
AND NEW PUMP STATION

WEST JEFFERSON LEVEE DISTRICT
COUSINS PUMP STATION TO FIRST AVENUE CANAL
HARVEY, LOUISIANA

EUSTIS ENGINEERING COMPANY, INC.

FIGURE 31



STRATA NO.	SOIL TYPE	UNIT WEIGHT PCF	UNFACTORED FRICTION ANGLE DEGREES	UNFACTORED COHESION - PSF AVERAGE	UNFACTORED COHESION - PSF BOTTOM	SAFETY FACTOR OF 1.3 FRICTION ANGLE DEGREES	SAFETY FACTOR OF 1.3 COHESION - PSF AVERAGE	SAFETY FACTOR OF 1.3 COHESION - PSF BOTTOM
1	CLAY	95	0	260	260	0	200	200
2	CLAY	95	0	260	260	0	200	200
3	CLAY	90	0	235	220	0	181	169
4	CLAY	94	0	220	220	0	169	169
5	CLAY/ CLAYEY SILT	107	0	310	400	0	238	308
6	CLAY	102	0	400	400	0	308	308
7	CLAY	97.5	0	400	400	0	308	308
8	CLAY	97.5	0	485	570	0	373	438
9	CLAY	97.5	0	655	740	0	504	569

* USING UNFACTORED SOIL PARAMETERS

GLOBAL STABILITY			
FAILURE SURFACE	SUMMATION OF FORCES RESISTING	SUMMATION OF FORCES DRIVING	FACTOR OF * SAFETY
Ⓓ④	47330	20372	2.32
Ⓓ⑤	77240	28259	2.73
Ⓓ⑥	106740	48004	2.22
Ⓔ⑦	65259	28179	2.32
Ⓔ⑧	91586	35326	2.59
Ⓔ⑨	121140	61156	1.98
Ⓕ⑩	87932	34850	2.52
Ⓕ⑪	167805	72677	2.31

T - WALL ANALYSIS SUMMATION OF FORCES (USING FACTORED SHEAR STRENGTHS)				
FAILURE SURFACE	ΣR RESISTANCE LBS/FT	ΣD DRIVING LBS/FT	ΣR - ΣD	CHANGE IN NET FORCE
Ⓐ ①	7226	3512	3714	-
Ⓑ ②	10357	5088	5269	1555
Ⓒ ③	14917	7761	7156	1887

NOTE : 1) T-WALL ANALYSIS SHOWS NO UNBALANCED FORCE BENEATH THE T-WALL FOOTING TO MAINTAIN STABILITY WITH RESPECT TO A FACTOR OF SAFETY OF 1.3.

2) EXISTING SHEETPILES PENETRATE TO EL. -36.0 AND -44.0.

3) SEEPAGE ANALYSIS INDICATES THE SHEETS EXTENDING TO ELEVATION -36.0 HAVE A FACTOR OF SAFETY GREATER THEN 3 AGAINST PIPING USING THE HARR METHOD OF ANALYSIS.

4) SOIL PARAMETERS ARE TAKEN FROM FIGURE 6.

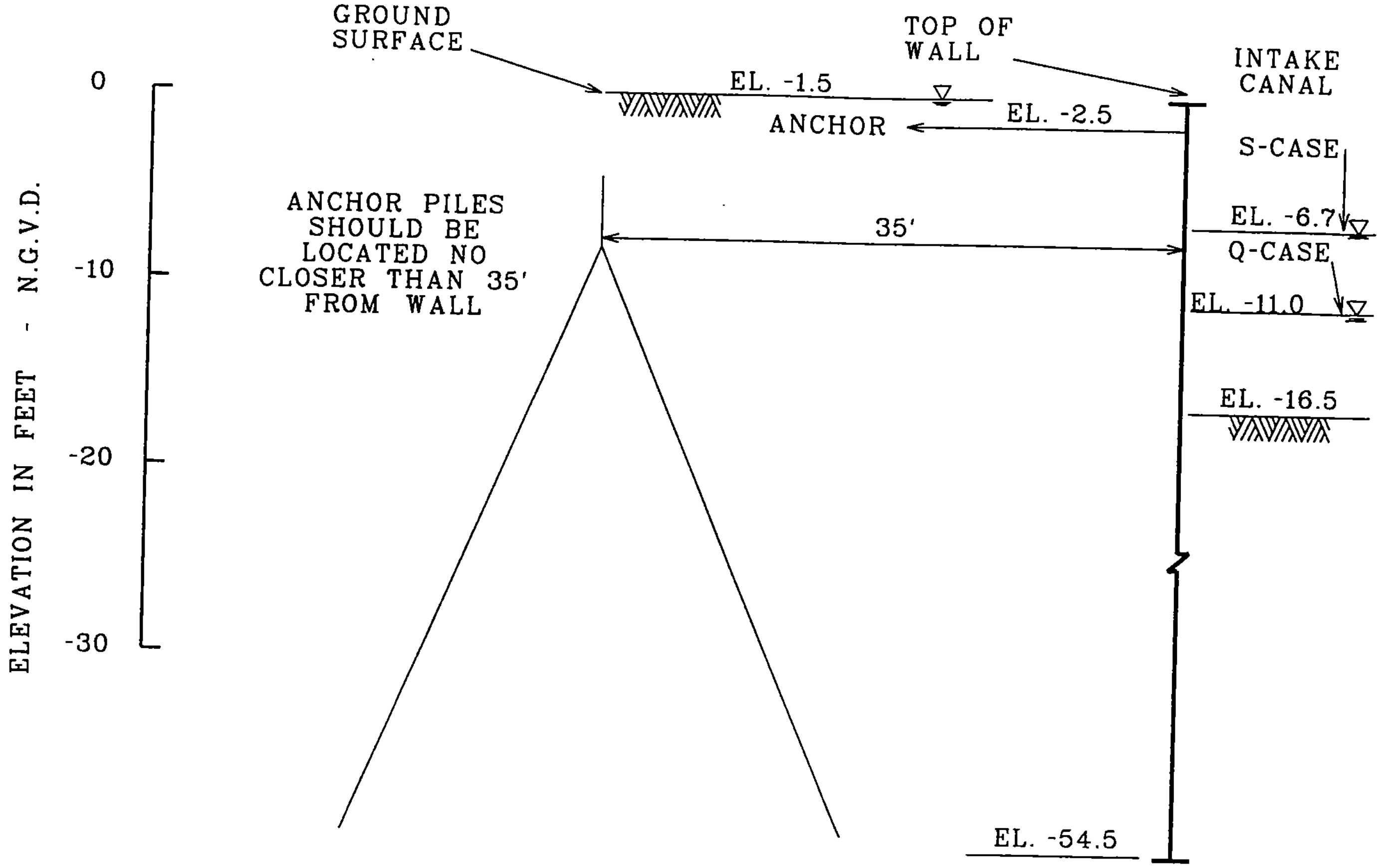
20' 0 20'
SCALE

EXISTING T-WALL STABILITY ANALYSES BETWEEN EXISTING PUMP STATIONS

WEST JEFFERSON LEVEE DISTRICT
COUSINS PUMP STATION TO FIRST AVENUE CANAL
HARVEY, LOUISIANA

EUSTIS ENGINEERING COMPANY, INC.

FIGURE 32



CASE	FACTOR OF SAFETY	MAX. MOMENT FT-KIPS	WALL BOTTOM ELEVATION	MAX. DEFLECTION SCALE FACTOR LB-IN 3	ANCHOR LOAD KIPS/FT OF WALL
Q	1.0	30.4	-	4.4×10^9 @ EL. -17.5	4.4
Q	1.5	-	-54.5	-	-
S	1.0	33.1	-	4.8×10^9 @ EL. -16.5	4.7
S	1.5	-	-40.5		-

S-CASE GOVERNS DESIGN OF SHEETPILE SECTION AND ANCHOR. Q-CASE GOVERNS REQUIRED PENETRATION WITH A FACTOR OF SAFETY OF 1.5 APPLIED TO SOIL PARAMETERS.

NOTE : 1) ANCHOR LOADS AND MAXIMUM MOMENTS PROVIDED ARE UNFACTORED.

2) DIVIDE SCALED DEFLECTION BY MODULUS OF ELASTICITY IN PSI TIMES PILE MOMENT OF INERTIA IN INCHES TO 4th POWER TO OBTAIN DEFLECTION IN INCHES.

3) SOIL PARAMETERS TAKEN FROM FIGURE 6 FOR Q-CASE. ANGLE OF INTERNAL FRICTION FOR COHESIVE SOILS IN S-CASE ANALYSIS WAS TAKEN TO BE 22 DEGREES.

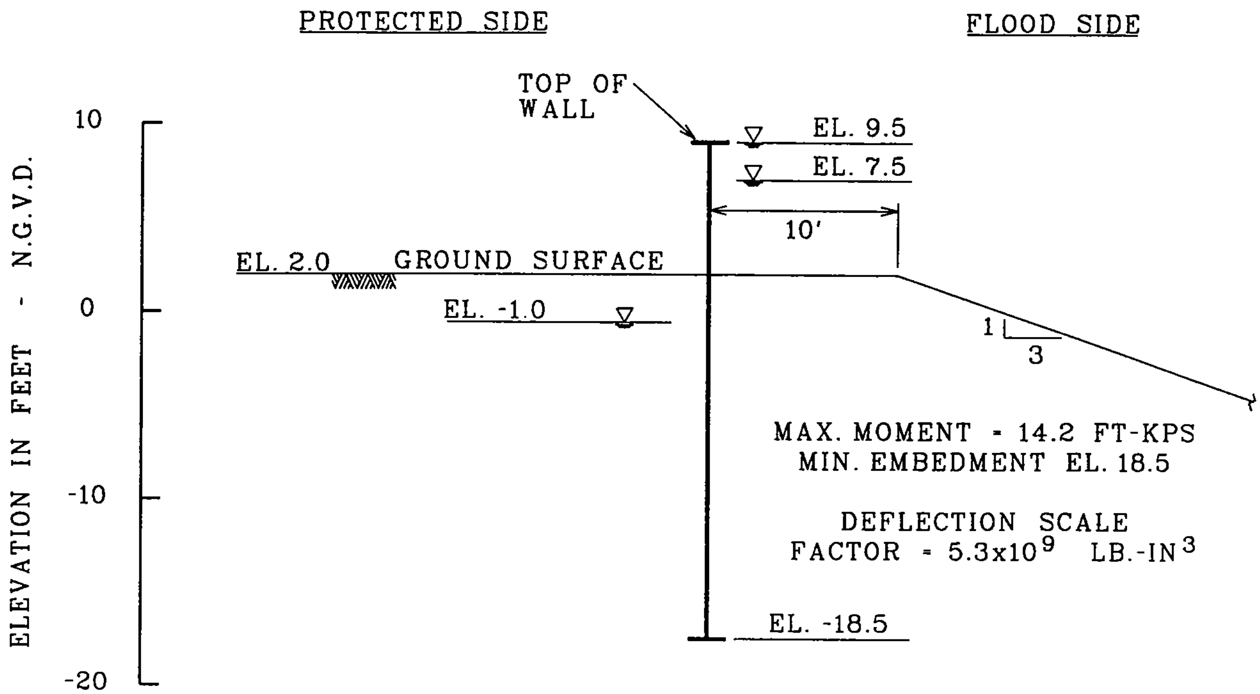
4) SEE APPENDIX B FOR COMPUTER ANALYSES OF GOVERNING SHEETPILE DESIGN GIVEN ABOVE.

ANCHOR SHEETPILE DESIGN FOR GUIDE WALL AT INTAKE CANAL IN VICINITY OF BORING 1

WEST JEFFERSON LEVEE DISTRICT
COUSINS PUMP STATION TO FIRST AVENUE CANAL
HARVEY, LOUISIANA

EUSTIS ENGINEERING COMPANY, INC.

FIGURE 33



DESIGN CONSIDERATION SUMMARY					
FLOOD SIDE WATER ELEVATION	PROTECTED SIDE WATER ELEVATION	FACTOR OF SAFETY	MAX. MOMENT FT-KIPS	WALL BOTTOM ELEVATION	DEFLECTION SCALE FACTOR LB-IN^3 AT EL. 9.5
7.5	-1.0	1.5	6.4	-14.5	1.7×10^9
9.5*	-1.0	1.0	14.2	-18.5	5.3×10^9

* GOVERNS DESIGN

NOTE : 1) DIVIDE SCALE DEFLECTION BY MODULUS OF ELASTICITY IN PSI TIMES PILE MOMENT OF INERTIA IN INCHES TO 4th POWER TO OBTAIN DEFLECTION IN INCHES.

2) USING THE HARR METHOD OF SEEPAGE ANALYSIS, SHEETPILE TIPS MUST PENETRATE TO EL. -16.5 OR BELOW TO HAVE A FACTOR OF SAFETY OF 2 OR GREATER AGAINST PIPING.

4) SOIL PARAMETERS ARE TAKEN FROM FIGURE 6.

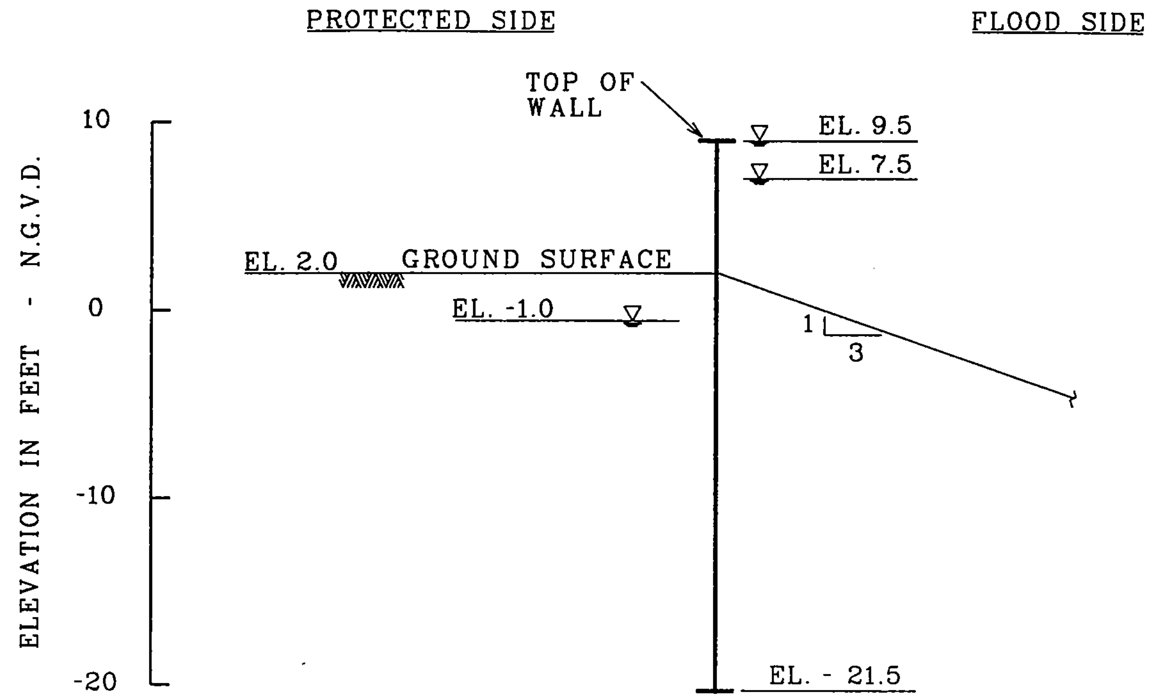
5) SEE APPENDIX B FOR COMPUTER ANALYSES OF GOVERNING SHEETPILE DESIGN GIVEN ABOVE.

I-WALL DESIGN
COUSINS PUMP STATION
DISCHARGE TO DESTREHAN AVENUE BRIDGE

WEST JEFFERSON LEVEE DISTRICT
COUSINS PUMP STATION TO FIRST AVENUE CANAL
HARVEY, LOUISIANA

EUSTIS ENGINEERING COMPANY, INC.

FIGURE 34



DESIGN CONSIDERATION SUMMARY					
FLOOD SIDE WATER ELEVATION	PROTECTED SIDE WATER ELEVATION	FACTOR OF SAFETY	MAX. MOMENT FT-KIPS	WALL BOTTOM ELEVATION	DEFLECTION SCALE FACTOR LB-IN^3 AT EL. 9.5
7.5	-1.0	1.5	10.4	-17.3	3.4×10^9
9.5*	-1.0	1.0	20.0	-21.4	9.4×10^9

* GOVERNS DESIGN

NOTE : 1) DIVIDE SCALE DEFLECTION BY MODULUS OF ELASTICITY IN PSI TIMES PILE MOMENT OF INERTIA IN INCHES TO 4th POWER TO OBTAIN DEFLECTION IN INCHES.

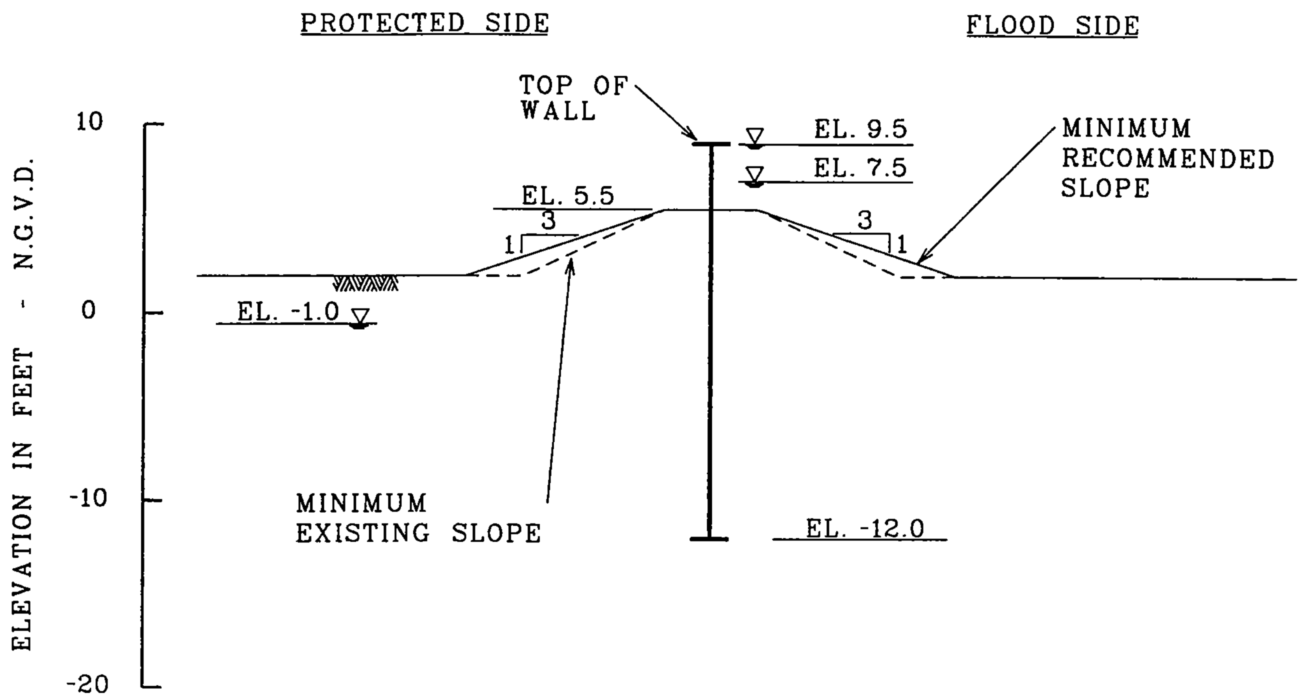
2) USING THE HARR METHOD OF SEEPAGE ANALYSIS, SHEETPILE TIPS MUST PENETRATE EL. -16.5 OR BELOW TO HAVE A FACTOR OF SAFETY OF 2 OR GREATER AGAINST PIPING.

3) SOIL PARAMETERS ARE TAKEN FROM FIGURE 8 EXCEPT ABOVE EL.-10.0 WHERE PARAMETERS WERE TAKEN FROM FIGURE 6.

4) SEE APPENDIX B FOR COMPUTER ANALYSES OF GOVERNING SHEETPILE DESIGN GIVEN ABOVE.

I-WALL DESIGN
NORTH BANK OF DISCHARGE CANAL
EAST OF DESTREHAN AVENUE BRIDGE

WEST JEFFERSON LEVEE DISTRICT
COUSINS PUMP STATION TO FIRST AVENUE CANAL
HARVEY, LOUISIANA



DESIGN CONSIDERATION SUMMARY					
FLOOD SIDE WATER ELEVATION	PROTECTED SIDE WATER ELEVATION	FACTOR OF SAFETY	MAX. MOMENT FT-KIPS	WALL BOTTOM ELEVATION	DEFLECTION SCALE FACTOR LB-IN^3 AT EL. 9.5
7.5	-1.0	1.5	0.5	-0.5	2.3×10^7
9.5*	-1.0	1.0	3.0	-4.0	2.4×10^8

*GOVERNS DESIGN

NOTE : 1) DIVIDE SCALE DEFLECTION FACTOR BY MODULUS OF ELASTICITY IN PSI TIMES PILE MOMENT OF INERTIA IN INCHES TO 4th POWER TO OBTAIN DEFLECTION IN INCHES.

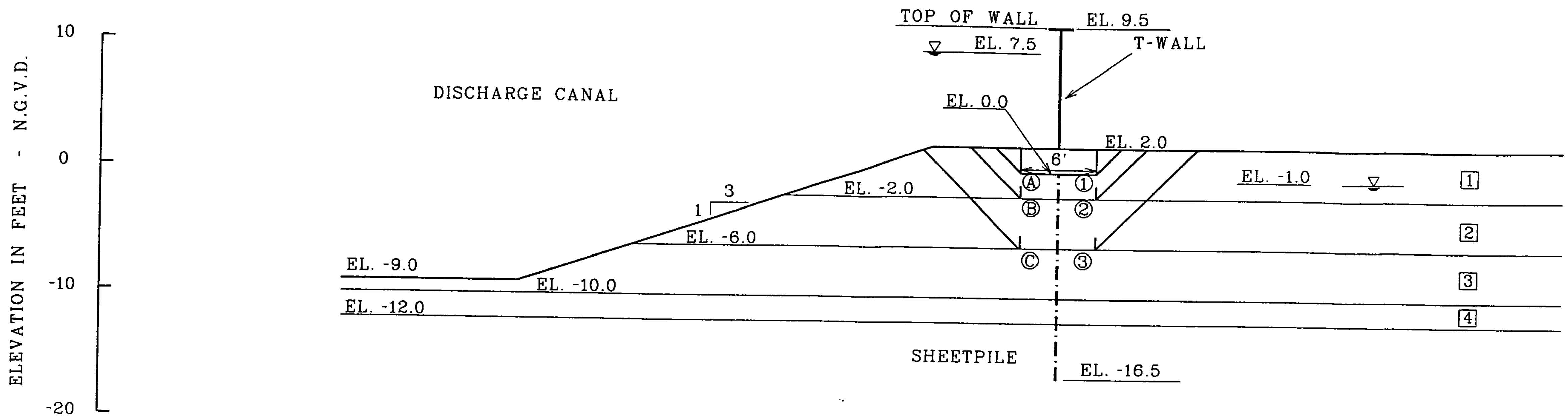
2) USING THE HARR METHOD OF SEEPAGE ANALYSIS, SHEETPILE TIPS MUST PENETRATE TO EL. -12.0 OR BELOW TO HAVE A FACTOR OF SAFETY OF 2 OR GREATER AGAINST PIPING.

3) SOIL PARAMETERS TAKEN ARE FROM FIGURE 10.

4) SEE APPENDIX B FOR COMPUTER ANALYSES OF GOVERNING SHEETPILE DESIGN ABOVE.

I-WALL DESIGN
SOUTHEAST OF DESTREHAN AVENUE BRIDGE

WEST JEFFERSON LEVEE DISTRICT
COUSINS PUMP STATION TO FIRST AVENUE CANAL
HARVEY, LOUISIANA



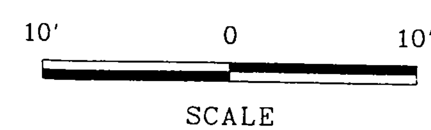
STRATA NO.	SOIL TYPE	UNIT WEIGHT PCF	UNFACTORED			SAFETY FACTOR OF 1.3		
			FRICTION ANGLE DEGREES	COHESION - PSF AVERAGE	COHESION - PSF BOTTOM	FRICTION ANGLE DEGREES	COHESION - PSF AVERAGE	COHESION - PSF BOTTOM
1	SHELL/SAND	118	23	0	0	18	0	0
2	CLAY	95	0	260	260	0	200	200
3	CLAY	90	0	235	220	0	181	169
4	CLAY	90	0	220	220	0	196	169

SUMMATION OF FORCES (USING FACTORED SHEAR STRENGTHS)					
FAILURE SURFACE		ΣR RESISTANCE LBS/FT	ΣD DRIVING LBS/FT	ΣR - ΣD	CHANGE IN NET FORCE
Ⓐ	①	917	1617	-700	-
Ⓑ	②	1899	2303	-404	296
Ⓒ	③	5096	3669	1770	2174

NOTE : 1) ANALYSIS SHOWS NO UNBALANCED FORCE BENEATH THE T-WALL FOOTING TO MAINTAIN STABILITY WITH RESPECT TO A FACTOR OF SAFETY OF 1.3.

2) SHEETPILE CUT OFF MUST PENETRATE TO EL.-16.5 OR BELOW TO HAVE A FACTOR OF SAFETY OF 2 OR GREATER AGAINST PIPING.

3) SOIL PARAMETERS ARE TAKEN FROM FIGURE 6.

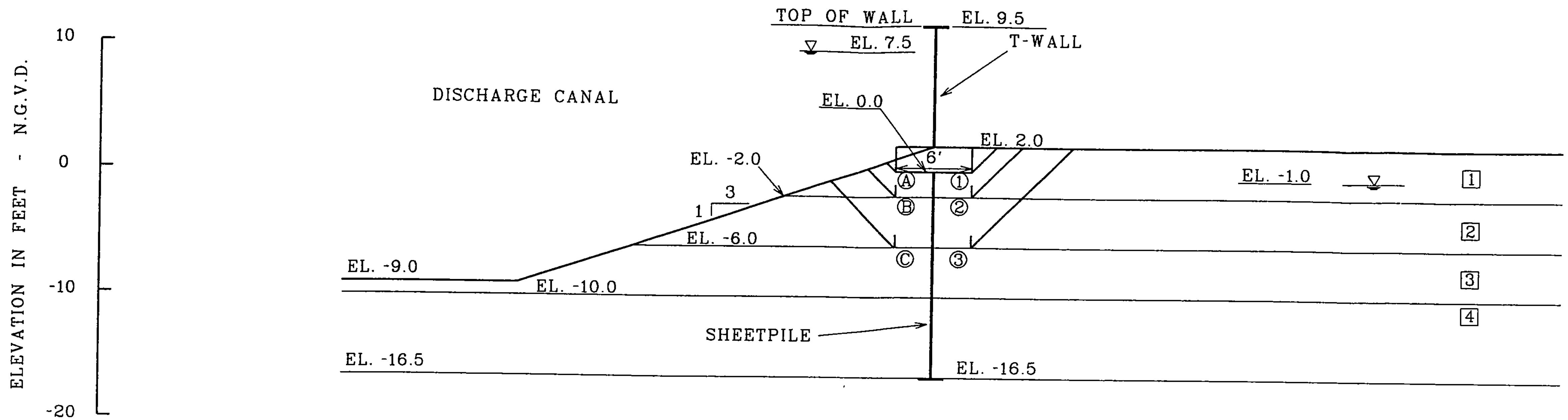


T-WALL STABILITY ANALYSIS
COUSINS PUMP STATION
DISCHARGE TO DESTREHAN AVENUE BRIDGE

WEST JEFFERSON LEVEE DISTRICT
COUSINS PUMP STATION TO FIRST AVENUE CANAL
HARVEY, LOUISIANA

EUSTIS ENGINEERING COMPANY, INC.

FIGURE 37



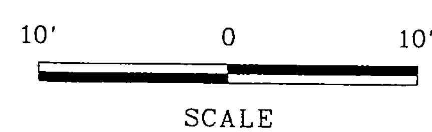
STRATA NO.	SOIL TYPE	UNIT WEIGHT PCF	UNFACTORED			SAFETY FACTOR OF 1.3		
			FRICTION ANGLE DEGREES	COHESION - PSF		FRICTION ANGLE DEGREES	COHESION - PSF	
				AVERAGE	BOTTOM		AVERAGE	BOTTOM
1	SHELL/SAND	118	23	0	0	18	0	0
2	CLAY	95	0	260	260	0	200	200
3	CLAY	90	0	235	150	0	181	115
4	ORGANIC CLAY	69	0	150	150	0	115	115

SUMMATION OF FORCES (USING FACTORED SHEAR STRENGTHS)					
FAILURE SURFACE		ΣR RESISTANCE LBS/FT	ΣD DRIVING LBS/FT	ΣR - ΣD	CHANGE IN NET FORCE
Ⓐ	①	323	1609	-1286	-
Ⓑ	②	946	2230	-1284	2
Ⓒ	③	4361	3256	1105	2389

NOTE : 1) ANALYSIS SHOWS NO UNBALANCED FORCE BENEATH THE T-WALL FOOTING TO MAINTAIN STABILITY WITH RESPECT TO A FACTOR OF SAFETY OF 1.3.

2) SHEETPILE CUT OFF MUST PENETRATE TO EL. -16.5 OR BELOW TO HAVE A FACTOR OF SAFETY OF 2 OR GREATER AGAINST PIPING.

3) DESIGN SOIL PARAMETERS ARE TAKEN FROM FIGURE 8 EXCEPT ABOVE EL. -10.0 WHERE FIGURE 6 WAS USED.

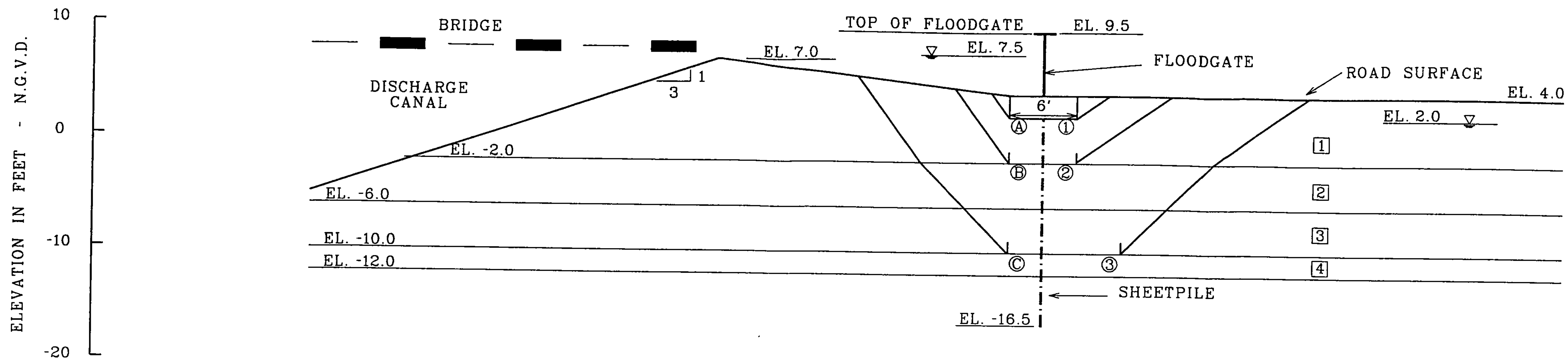


T-WALL STABILITY ANALYSIS
NORTH BANK OF DISCHARGE CANAL EAST OF DESTREHAN AVENUE BRIDGE

WEST JEFFERSON LEVEE DISTRICT
COUSINS PUMP STATION TO FIRST AVENUE CANAL
HARVEY, LOUISIANA

EUSTIS ENGINEERING COMPANY, INC.

FIGURE 38



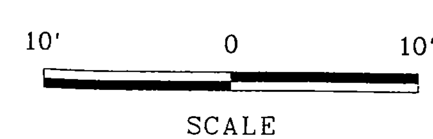
STRATA NO.	SOIL TYPE	UNIT WEIGHT PCF	UNFACTORED			SAFETY FACTOR OF 1.3		
			FRICTION ANGLE DEGREES	COHESION - PSF		FRICTION ANGLE DEGREES	COHESION - PSF	
				AVERAGE	BOTTOM		AVERAGE	BOTTOM
1	FILL:CLAY, SAND & SHELL	120	25	0	0	20	0	0
2	CLAY	95	0	260	260	0	200	200
3	CLAY	90	0	235	220	0	181	169
4	CLAY	90	0	220	220	0	169	169

SUMMATION OF FORCES (USING FACTORED SLOPE STRENGTHS)					
FAILURE SURFACE		ΣR RESISTANCE LBS/FT	ΣD DRIVING LBS/FT	ΣR - ΣD	CHANGE IN NET FORCE
Ⓐ	①	638	830	-192	0
Ⓑ	②	3131	1787	1344	1536
Ⓒ	③	10286	4147	6139	4795

NOTE : 1) ANALYSIS INDICATES NO UNBALANCED FORCE BENEATH THE FLOODGATE FOOTING TO MAINTAIN STABILITY WITH RESPECT TO A FACTOR OF SAFETY OF 1.3.

2) SHEETPILE CUT OFF MUST PENETRATE TO EL. -16.5 OR BELOW TO HAVE A FACTOR OF SAFETY OF 2 OR GREATER AGAINST PIPING.

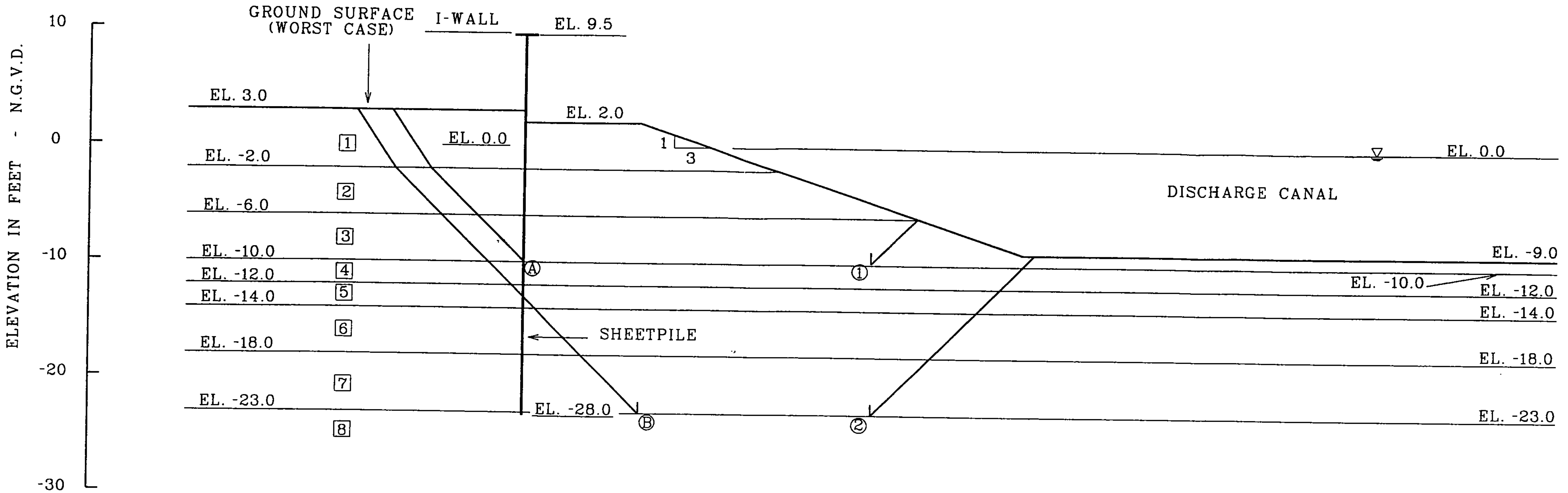
3) SOIL PARAMETERS ARE TAKEN FROM FIGURE 6.



FLOODGATE STABILITY ANALYSIS
DESTREHAN AVENUE

WEST JEFFERSON LEVEE DISTRICT
COUSINS PUMP STATION TO FIRST AVENUE CANAL
HARVEY, LOUISIANA

EUSTIS ENGINEERING COMPANY, INC.



STRATA NO.	SOIL TYPE	UNIT WEIGHT PCF	FRICTION ANGLE DEGREES	COHESION - PSF	
				AVERAGE	BOTTOM
1	SHELL/SAND	118	23	0	0
2	CLAY	95	0	260	260
3	CLAY	90	0	235	220
4	CLAY	90	0	220	220
5	CLAY	75	0	220	220
6	CLAY	95	0	220	220
7	CLAY	103	0	220	220
8	CLAY	107	0	310	400

NOTE : DESIGN SOIL PARAMETERS ARE TAKEN FROM FIGURE 6.

PROPOSED CONDITIONS			
FAILURE SURFACE	SUMMATION OF FORCES LBS/FT		FACTOR OF SAFETY
	RESISTING	DRIVING	
Ⓐ ①	12975	5741	2.26
Ⓑ ②	20804	12904	1.61

10' 0 10'

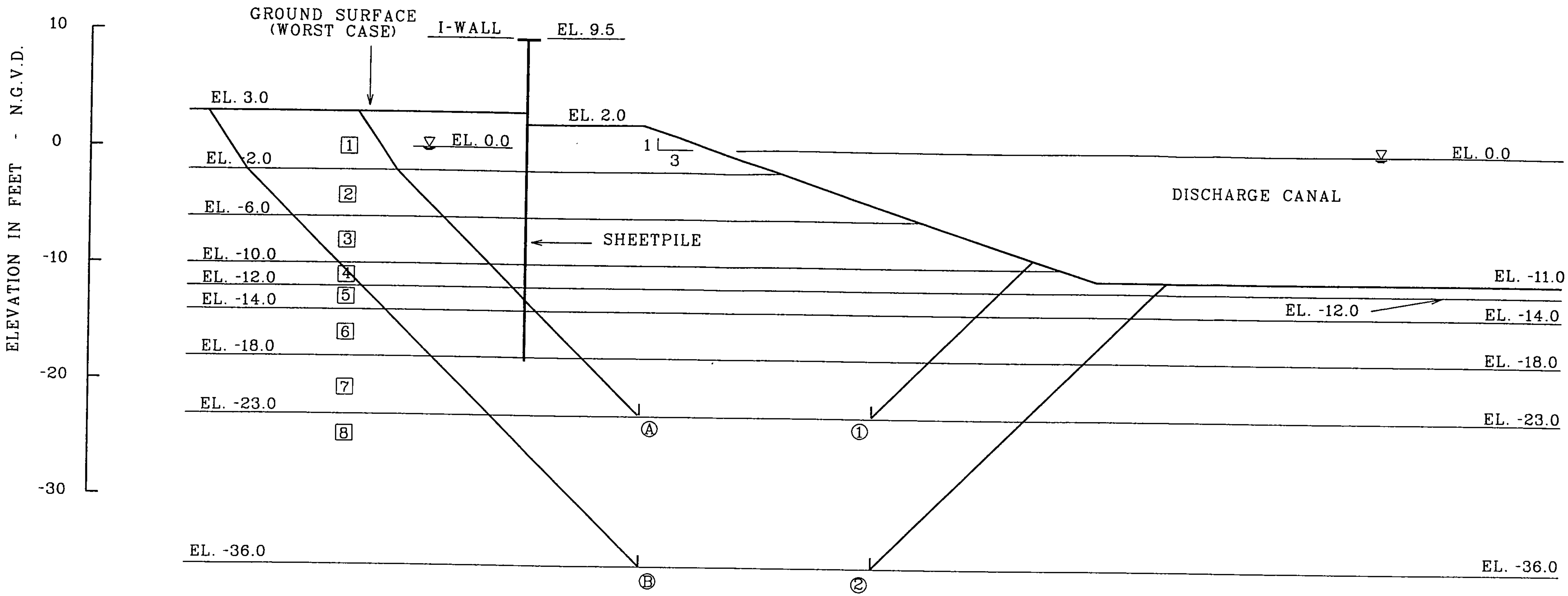
SCALE

SLOPE STABILITY ANALYSIS
DISCHARGE CANAL BASE AT EL -9.0
PUMP STATION TO DESTREHAN AVENUE BRIDGE

WEST JEFFERSON LEVEE DISTRICT
COUSINS PUMP STATION TO FIRST AVENUE CANAL
HARVEY, LOUISIANA

EUSTIS ENGINEERING COMPANY, INC.

FIGURE 40



STRATA NO.	SOIL TYPE	UNIT WEIGHT PCF	FRICTION ANGLE DEGREES	COHESION - PSF	
				AVERAGE	BOTTOM
1	SHELL/SAND	118	23	0	0
2	CLAY	95	0	260	260
3	CLAY	90	0	235	220
4	CLAY	90	0	220	220
5	CLAY	75	0	220	220
6	CLAY	95	0	220	220
7	CLAY	103	0	220	220
8	CLAY	107	0	310	400

NOTE : DESIGN SOIL PARAMETERS ARE TAKEN FROM FIGURE 6.

PROPOSED CONDITIONS				
FAILURE SURFACE		SUMMATION OF FORCES LBS/FT		FACTOR OF SAFETY
		RESISTING	DRIVING	
Ⓐ	①	22094	14040	1.57
Ⓑ	②	41605	23023	1.81

10′ 0 10′

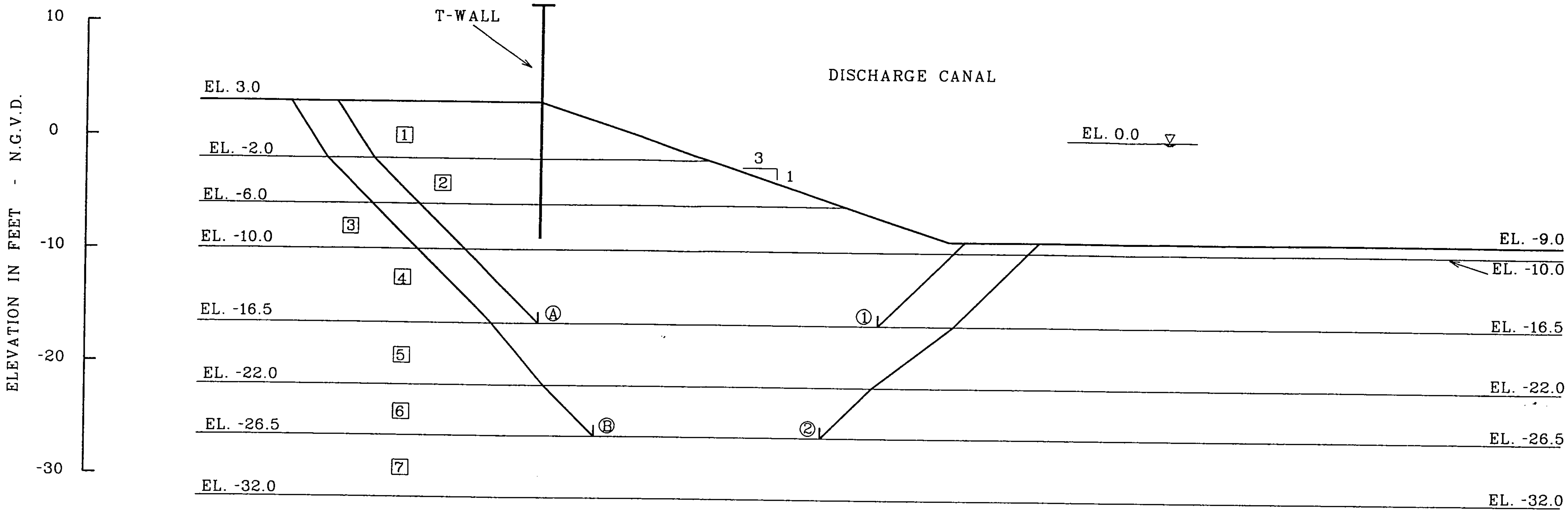
SCALE

SLOPE STABILITY ANALYSIS
DISCHARGE CANAL BASE AT EL -11.0
PUMP STATION TO DESTREHAN AVENUE BRIDGE

WEST JEFFERSON LEVEE DISTRICT
COUSINS PUMP STATION TO FIRST AVENUE CANAL
HARVEY, LOUISIANA

EUSTIS ENGINEERING COMPANY, INC.

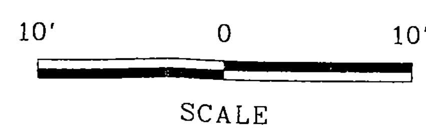
FIGURE 41



STRATA NO.	SOIL TYPE	UNIT WEIGHT PCF	FRICTION ANGLE DEGREES	COHESION - PSF	
				AVERAGE	BOTTOM
1	SHELL/SAND	118	23	0	0
2	CLAY	95	0	260	260
3	CLAY	90	0	235	150
4	ORGANIC CLAY	69	0	150	150
5	SANDY SILT	117.5	15	200	200
6	SILTY CLAY	116	0	200	200
7	SAND	122.5	30	0	0

NOTE : DESIGN SOIL PARAMETERS ARE TAKEN FROM FIGURE 8 EXCEPT ABOVE EL. -10.0 WHERE FIGURE 6 WAS USED.

PROPOSED CONDITIONS				
FAILURE SURFACE		SUMMATION OF FORCES LBS/FT		FACTOR OF SAFETY
		RESISTANCE	DRIVING	
Ⓐ	①	13572	10303	1.32
Ⓑ	②	24198	16243	1.49

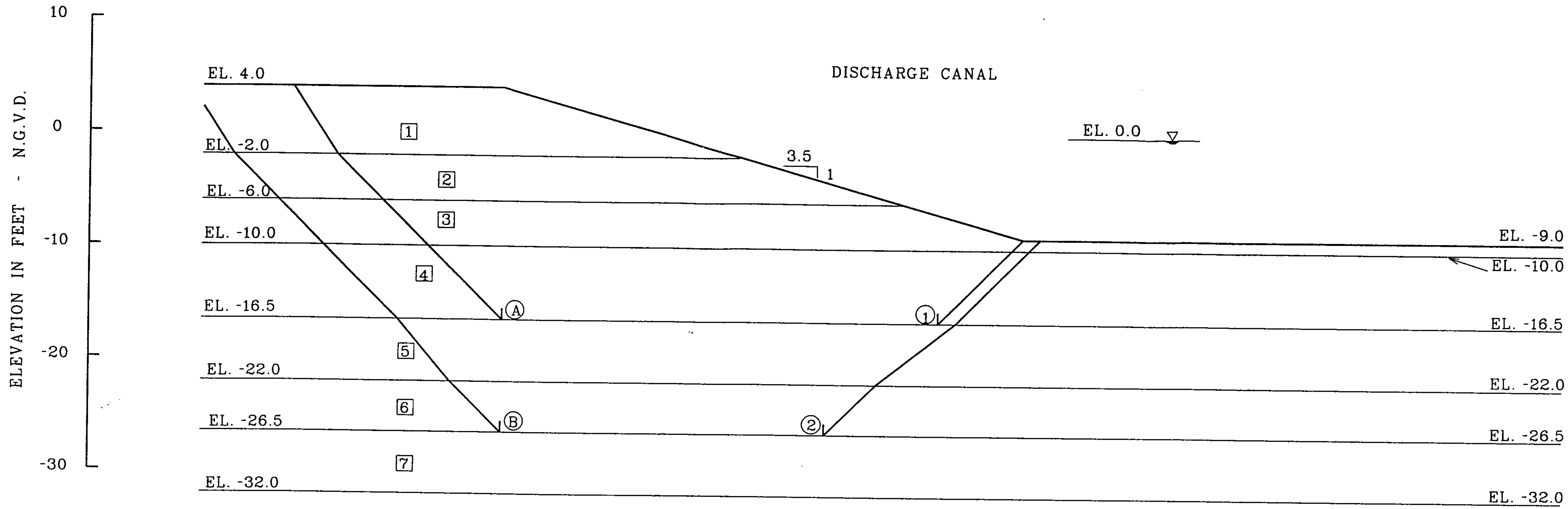


SLOPE STABILITY ANALYSIS
NORTH BANK OF DISCHARGE CANAL
EAST OF DESTREHAN AVENUE BRIDGE

WEST JEFFERSON LEVEE DISTRICT
COUSINS PUMP STATION TO FIRST AVENUE CANAL
HARVEY, LOUISIANA

EUSTIS ENGINEERING COMPANY, INC.

FIGURE 42

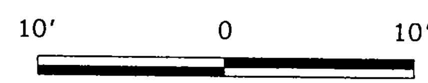


STRATA NO.	SOIL TYPE	UNIT WEIGHT PCF	FRICTION ANGLE DEGREES	COHESION - PSF	
				AVERAGE	BOTTOM
1	SHELL/SAND	118	23	0	0
2	CLAY	95	0	260	260
3	CLAY	90	0	235	150
4	ORGANIC CLAY	69	0	150	150
5	SANDY SILT	117.5	15	200	200
6	SILTY CLAY	116	0	200	200
7	SAND	122.5	30	0	0

NOTE : DESIGN SOIL PARAMETERS ARE TAKEN FROM FIGURE 8 EXCEPT ABOVE EL. -10.0 WHERE FIGURE 6 AS USED.

2) FOR COMPARISON, MINIMUM FACTOR OF SAFETY IV:3H SLOPE IS 1.2. (ANALYSIS NOT SHOWN).

PROPOSED CONDITIONS				
FAILURE SURFACE		SUMMATION OF FORCES LBS/FT		FACTOR OF SAFETY
		RESISTANCE	DRIVING	
Ⓐ	①	14498	11415	1.32
Ⓑ	②	25685	17928	1.49

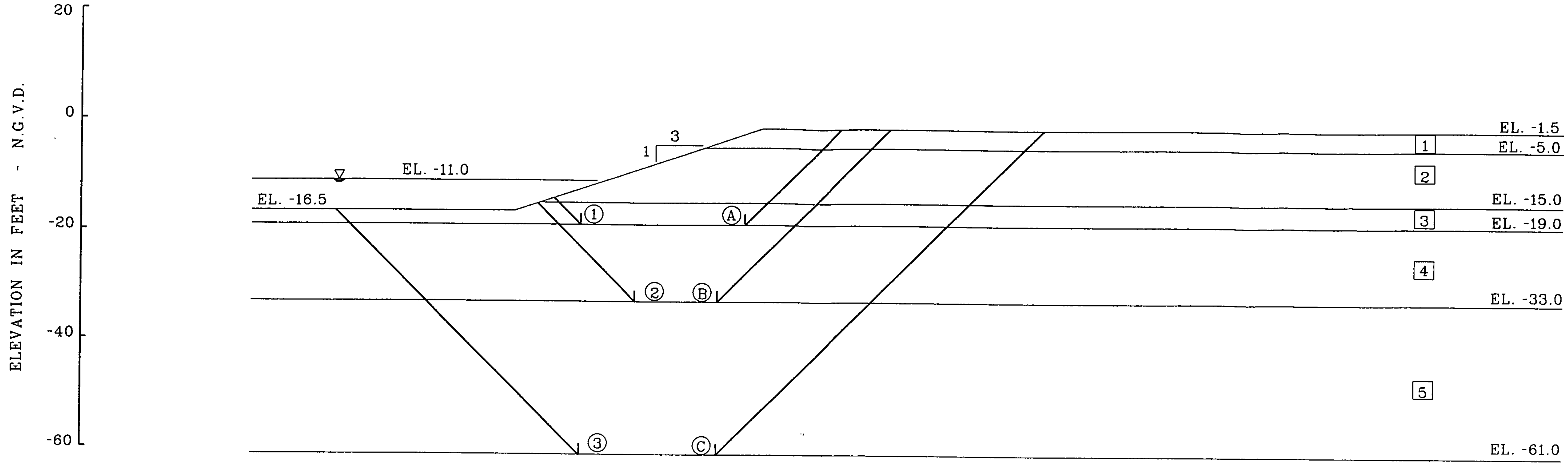


SLOPE STABILITY ANALAYSIS
SOUTH BANK OF DISCHARGE CANAL
EAST OF DESTREHAN AVENUE BRIDGE

WEST JRFFERSON LEVEE DISTRICT
COUSINS PUMP STATION TO FIRST AVENUE CANAL
HARVEY, LOUISIANA

EUSTIS ENGINEERING COMPANY, INC.

FIGURE 43



STRATA NO.	SOIL TYPE	UNIT WEIGHT PCF	FRICTION ANGLE DEGREES	COHESION - PSF	
				AVERAGE	BOTTOM
1	CLAY/ ORGANIC CLAY	85	0	295	210
2	CLAY	94	0	210	210
3	CLAY/ ORGANIC CLAY	74	0	320	320
4	CLAYEY/ SANDY SILT	112.5	15	200	200
5	CLAY	98	0	400	400

FAILURE SURFACE	SUMMATION OF FORCES LBS/FT		FACTOR OF SAFETY
	RESISTANCE	DRIVING	
Ⓐ ①	18103	11333	1.60
Ⓑ ②	31053	23101	1.34
Ⓒ ③	80824	52615	1.54

20' 0 20'

SCALE

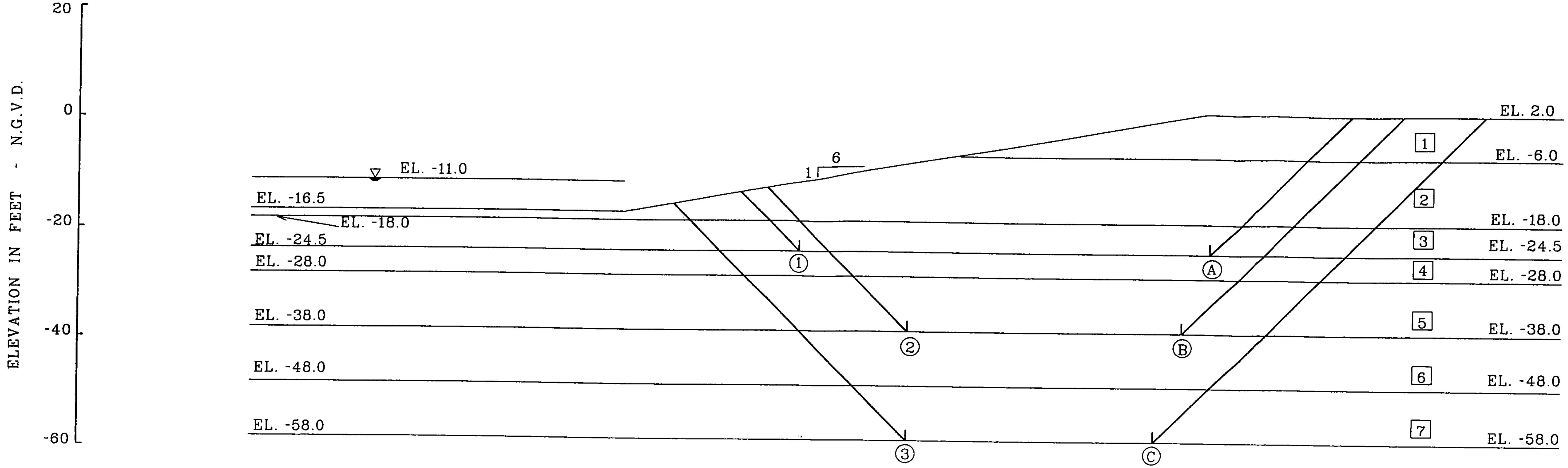
NOTE : 1) SOIL PARAMETERS USED ARE TAKEN FROM FIGURE 11.

SLOPE STABILITY ANALYSIS
FIRST AVENUE CANAL, STATION 9+00 TO 20+00

WEST JEFFERSON LEVEE DISTRICT
COUSINS PUMP STATION TO FIRST AVENUE CANAL
HARVEY, LOUISIANA

EUSTIS ENGINEERING COMPANY, INC.

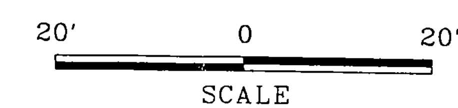
FIGURE 44



STRATA NO.	SOIL TYPE	UNIT WEIGHT PCF	FRICTION ANGLE DEGREES	COHESION - PSF	
				AVERAGE	BOTTOM
1	CLAY	100	0	460	200
2	CLAY/ ORGANIC CLAY	88	0	200	185
3	CLAY/ ORGANIC CLAY	88	0	170	190
4	CLAY	97	0	225	240
5	CLAY	97	0	284	327
6	CLAY	97	0	370	413
7	CLAY	97	0	457	500

NOTE : 1) SOIL PARAMETERS ARE TAKEN FROM FIGURE 12.

FAILURE SURFACE	SUMMATION OF FORCES LBS/FT		FACTOR OF SAFETY
	RESISTANCE	DRIVING	
Ⓐ ①	32800	25285	1.30
Ⓑ ②	49782	38571	1.29
Ⓒ ③	86985	63057	1.38

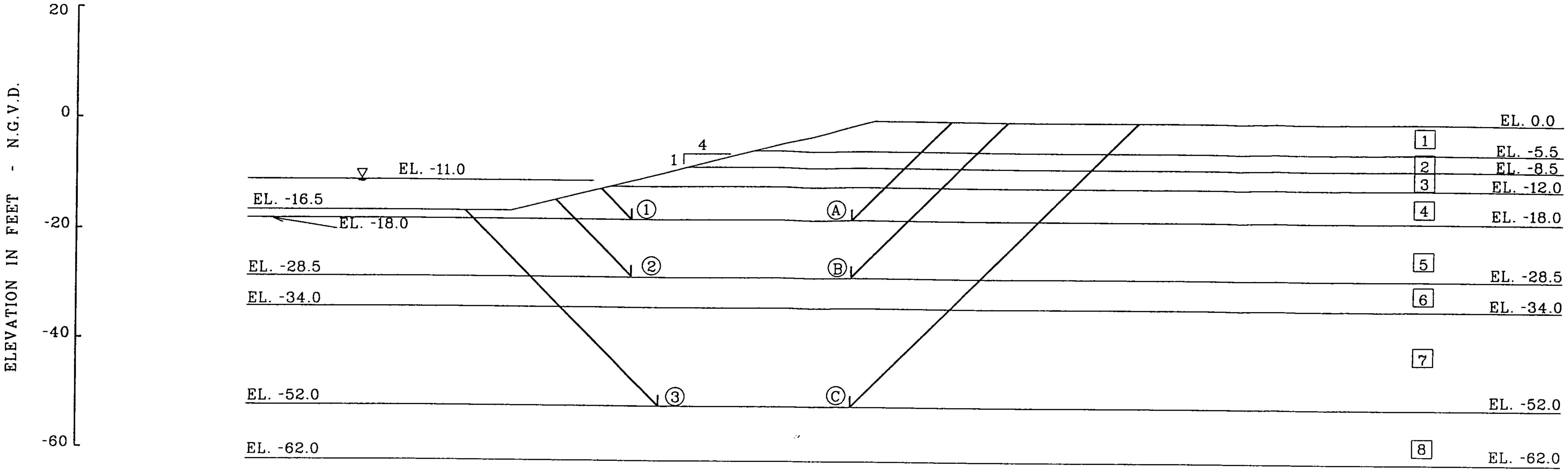


SLOPE STABILITY ANALYSIS
FIRST AVENUE CANAL, STATION 20+00 TO 51+00

WEST JEFFERSON LEVEE DISTRICT
COUSINS PUMP STATION TO FIRST AVENUE CANAL
HARVEY, LOUISIANA

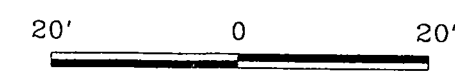
EUSTIS ENGINEERING COMPANY, INC.

FIGURE 45



STRATA NO.	SOIL TYPE	UNIT WEIGHT PCF	FRICTION ANGLE DEGREES	COHESION - PSF	
				AVERAGE	BOTTOM
1	CLAY	103	0	1200	1200
2	CLAY	97	0	275	170
3	CLAY	97	0	170	135
4	CLAY	88	0	100	120
5	CLAY	105	0	140	240
6	SILTY CLAY	111	0	345	380
7	CLAY	99	0	415	478
8	CLAY	99	0	540	600

FAILURE SURFACE	SUMMATION OF FORCES LBS/FT		FACTOR OF SAFETY
	RESISTANCE	DRIVING	
(A) (1)	23155	13797	1.68
(B) (2)	33416	26098	1.28
(C) (3)	75227	53319	1.41



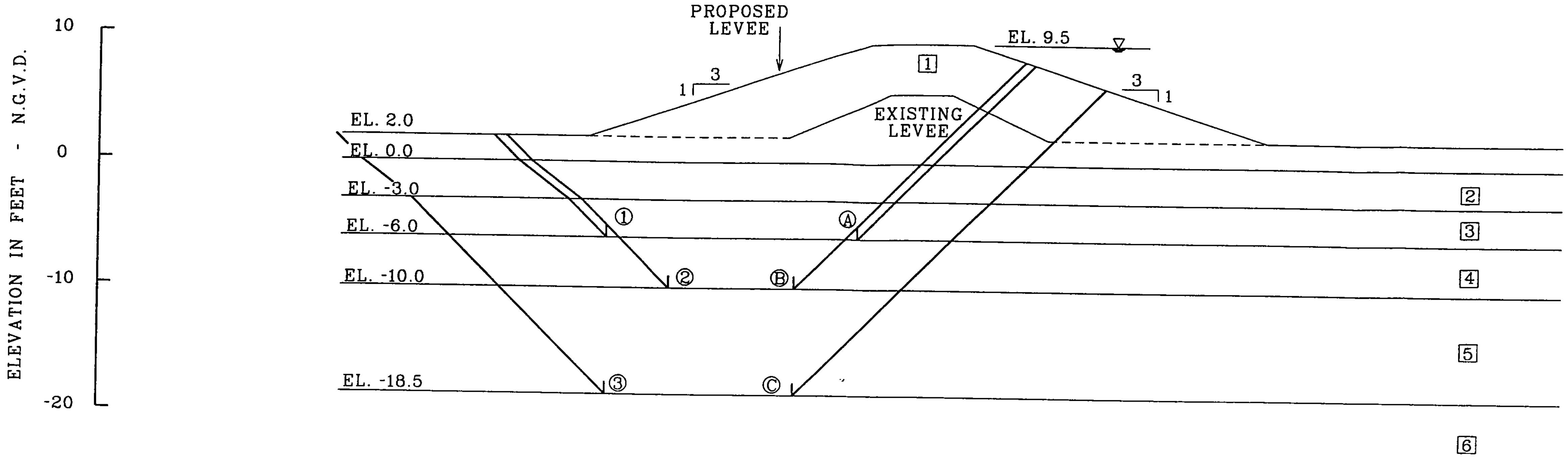
NOTE : 1) SOIL PARAMETERS USED ARE TAKEN FROM FIGURE 7.

SLOPE STABILITY ANALYSIS
COUSINS CANAL, STATIONS 50+00 TO 52+00

WEST JEFFERSON LEVEE DISTRICT
COUSINS PUMP STATION TO FIRST AVENUE CANAL
HARVEY, LOUISIANA

EUSTIS ENGINEERING COMPANY, INC.

FIGURE 46



STRATA NO.	SOIL TYPE	UNIT WEIGHT PCF	FRICTION ANGLE DEGREES	COHESION - PSF	
				AVERAGE	BOTTOM
1	CLAY	122	0	300	300
2	CLAYEY SILT	112.5	15	200	200
3	CLAY	87	0	195	215
4	CLAY	88	0	235	278
5	CLAY	86	0	320	320
6	CLAYEY SILT	112.5	15	200	200

NOTE : SOIL PARAMETERS USED ARE TAKEN FROM FIGURE 10.

FAILURE SURFACE		SUMMATION OF FORCES LBS/FT		FACTOR OF SAFETY
		RESISTANCE	DRIVING	
Ⓐ	①	17036	10441	1.63
Ⓑ	②	19449	12652	1.54
Ⓒ	③	30891	20097	1.54

10' 0 10'

SCALE

SLOPE STABILITY ANALYSIS
EARTH LEVEE SOUTHEAST OF DESTREHAN AVENUE BRIDGE

WEST JEFFERSON LEVEE DISTRICT
COUSINS PUMP STATION TO FIRST AVENUE CANAL
HARVEY, LOUISIANA

EUSTIS ENGINEERING COMPANY, INC.

GEOTECHNICAL INVESTIGATION

WEST JEFFERSON LEVEE DISTRICT

COUSINS PUMPING STATION TO FIRST AVENUE CANAL

HARVEY, LOUISIANA

FOR
WEST JEFFERSON ENGINEERING SERVICES
A JOINT VENTURE
WESTWEGO, LOUISIANA

VOLUME 2

7 OCTOBER 1997

EUSTIS ENGINEERING COMPANY, INC.
GEOTECHNICAL ENGINEERS
CONSTRUCTION QUALITY CONTROL & MATERIALS TESTING
3011 28th Street • Metairie, Louisiana 70002 • 504-834-0157 / FAX 504-834-0354

APPENDIX A

LOGS OF BORINGS AND TEST RESULTS

LEGEND AND NOTES FOR LOG OF BORING AND TEST RESULTS

PP	Pocket penetrometer resistance in tons per square foot
TV	Torvane shear strength in tons per square foot
SPT	Standard Penetration Test. Number of blows of a 140-lb. hammer dropped 30 inches required to drive 2-in O.D., 1.4-in. I.D. sampler a distance of one foot into the soil, after first seating it 6 inches
SPLR	Type of Sampling — Shelby, SPT, Auger, No Sample
SYMBOL	Clay, Silt, Sand, Humus — Predominant type shown heavy; Modifying type shown light
DENSITY	Unit weight in pounds per cubic foot
USC	Unified Soil Classification

TYPE

UC	Unconfined compression shear
OB	Unconsolidated undrained triaxial compression shear on one specimen confined at the approximate overburden pressure
UU	Unconsolidated undrained triaxial compression shear
CU	Consolidated undrained triaxial compression shear
DS	Direct shear
CON	Consolidation
PD	Particle size distribution
k	Coefficient of permeability in centimeters per second
SP	Swelling pressure in pounds per square foot

ϕ	Angle of internal friction in degrees
c	Cohesion in pounds per square foot

Other laboratory test results reported on separate figure

Ground Water Measurements — ▼ Initial — ▽ Final

GENERAL NOTES

(1) At the time the borings were made, ground water levels were measured below existing ground surface. These observations are shown on the boring logs. However, ground water levels may vary due to seasonal and other factors. If important to construction, the depth to ground water should be determined by those persons responsible for construction, immediately prior to beginning work.

(2) While the individual logs of borings are considered to be representative of subsurface conditions at their respective locations on the dates shown, it is not warranted that they are representative of subsurface conditions at other locations and times.

EUSTIS ENGINEERING COMPANY, INC.

LOG OF BORING AND TEST RESULTS

WEST JEFFERSON LEVEE DISTRICT
COUSINS PUMPING STATION TO 1ST AVENUE CANAL
HARVEY, LOUISIANA

Ground Elev.: **Datum:** **Gr. Water Depth:** See Text **Job No.:** 14149 **Date Drilled:** 7/22-23/96 **Boring:** 1 **Refer to "Legends & Notes"**

Scale In Feet	PP	SPT	SPLR	Symbol	Visual Classification	USC	Sample Number	Depth In Feet	Water Content Percent	Density		Shear Tests			Atterberg Limits				Other Tests
										Dry	Wet	Type	φ	C	LL	PL	PI		
0					Loose to medium dense white shells w/crushed rock & fine sand	SL	1	0-0.5											
	1.80				Medium stiff gray clay w/organic matter & thin humus layers	CH	2	2-3	42	77	109	UC	--	915					
	0.50				Soft gray clay w/small roots, trace of organic matter & organic clay layers	CH	3	5-6	88	49	92	UU	0	260					
	0.40				Very soft dark gray clay w/trace of organic matter	CH	4	8-9	87	49	92	UC	--	200					
10	0.30				w/organic matter, roots & thin humus layers		5	11-12	92	48	92	UC	--	145					
	0.30				Very soft dark gray clay w/organic clay layers & wood	CH	6	14-15	175	28	77	UC	--	230					
	0.30				Very soft gray clay w/silty sand & sandy silt lenses	CH	7	18-19	51	68	104	UU	0	175					
20																			
	0.30				Loose gray clayey silt w/sandy silt layers & organic matter	ML	8	23-24											
	0.30				Soft gray clay w/silt lenses	CH	9	28-29	55	68	106	UC	--	260					
30																			
	0.25				w/many clayey silt lenses		10	33-34											
	0.30				Soft gray clay		11	38-39	64	61	100	UU	0	400					
40																			
	0.40						12	43-44											
	0.50				w/few clayey silt lenses		13	48-49	64	61	100	UC	--	360					
50																			

Comments:

EUSTIS ENGINEERING COMPANY, INC.

LOG OF BORING AND TEST RESULTS

WEST JEFFERSON LEVEE DISTRICT
COUSINS PUMPING STATION TO 1ST AVENUE CANAL
HARVEY, LOUISIANA

Ground Elev.: **Datum:** **Gr. Water Depth:** See Text **Job No.:** 14149 **Date Drilled:** 7/22-23/96 **Boring:** 1 **Refer to "Legends & Notes"**

Scale In Feet	PP	SPT	SPLR	Symbol	Visual Classification	USC	Sample Number	Depth In Feet	Water Content Percent	Density		Shear Tests			Atterberg Limits				Other Tests
										Dry	Wet	Type	φ	C	LL	PL	PI		
50					Medium stiff gray clay w/silt lenses	CH													
	0.60						14	53-54	67	57	97	UU	0	625					
	0.75						15	58-59	69	57	97								
60		26			Medium dense gray fine sand w/shell fragments	SP	16	61-62											
		31			Dense gray fine sand w/clay layers	SP	17	64-65											
	2.20				Dense greenish-gray & tan clayey sand	SC	18	68-69	21	100	121	UU	0	1170					
70																			
					Dense tan & gray clayey sand	SC	19	73-74	28	94	121	OB	--	1135					
					Loose to medium dense gray & tan clayey sand	SC	20	77-78											
		50=8"			Very dense gray fine sand w/trace of silt	SP	21	79-80											
80																			
		16			Medium dense gray fine sand	SP	22	82-83											
		3			Soft gray clay	CH	23	85-86											
	0.60				Medium stiff gray clay w/fine sand pockets	CH	24	88-89	31	92	121	UC	--	550					
90																			
	0.90				Medium stiff gray sandy clay w/concretions	CL	25	93-94	29	94	121	UC	--	505					
		50=10"			Very dense gray silty sand	SM	26	97.5-98.5											
100		50=9"					27	99-100											

Comments:

EUSTIS ENGINEERING COMPANY, INC.

LOG OF BORING AND TEST RESULTS

WEST JEFFERSON LEVEE DISTRICT
COUSINS PUMPING STATION TO 1ST AVENUE CANAL
HARVEY, LOUISIANA

Ground Elev.: **Datum:** **Gr. Water Depth:** See Text **Job No.:** 14149 **Date Drilled:** 7/11/96 **Boring:** 2 **Refer to "Legends & Notes"**

Scale In Feet	PP	SPT	SPLR	Symbol	Visual Classification	USC	Sample Number	Depth In Feet	Water Content Percent	Density		Shear Tests			Atterberg Limits				Other Tests
										Dry	Wet	Type	φ	C	LL	PL	PI		
0					Stiff dark gray clay w/roots	CH	1	0-1											
	2.00				Stiff dark gray & tan clay w/organic matter & humus layers	CH	2	2-3	40	74	103	OB	--	1280					
	0.50				Soft gray & tan clay w/roots & organic matter	CH	3	5-6	79	54	97	OB	--	275					
	0.30				Very soft gray clay w/organic matter & wood	CH	4	8-9	80	54	97	UC	--	170					
10	0.25				Extremely soft gray clay w/organic matter	CH	5	11-12	100	44	88	UU	0	90					
	0.25						6	14-15											
	0.20				Very soft gray clay w/sandy silt layers	CH	7	18-19	61	66	105	UC	--	140					
20	0.20				w/silty sand layers		8	23-24											
	0.20				Very soft gray silty clay w/silty sand layers	CL	9	28-29	37	81	111	UU	0	344					
30	0.20				Soft gray clay w/silty sand lenses	CH	10	33-34											
	0.20						11	38-39	66	61	100	UC	--	415					
40	0.25				Soft gray clay	CH	12	43-44											
50	0.30						13	48-49	64	60	98	UU	0	416					

Comments:

EUSTIS ENGINEERING COMPANY, INC.

LOG OF BORING AND TEST RESULTS

WEST JEFFERSON LEVEE DISTRICT
COUSINS PUMPING STATION TO 1ST AVENUE CANAL
HARVEY, LOUISIANA

Ground Elev.: **Datum:** **Gr. Water Depth:** See Text **Job No.:** 14149 **Date Drilled:** 7/11/96 **Boring:** 2 **Refer to "Legends & Notes"**

Scale In Feet	PP	SPT	SPLR	Symbol	Visual Classification	USC	Sample Number	Depth In Feet	Water Content Percent	Density		Shear Tests			Atterberg Limits				Other Tests
										Dry	Wet	Type	φ	C	LL	PL	PI		
50					Medium stiff gray clay	CH													
	0.30				w/silty sand layers		14	53-54											
	0.40				w/clayey sand & fine sand layers		15	58-59	64	61	100	UC	--	620					
60																			
70																			
80																			
90																			
100																			

Comments:

EUSTIS ENGINEERING COMPANY, INC.

LOG OF BORING AND TEST RESULTS

WEST JEFFERSON LEVEE DISTRICT
COUSINS PUMPING STATION TO 1ST AVENUE CANAL
HARVEY, LOUISIANA

Ground Elev.: **Datum:** **Gr. Water Depth:** 0.0 **Job No.:** 14149 **Date Drilled:** 7/17/96 **Boring:** 3 **Refer to "Legends & Notes"**

Scale In Feet	PP	SPT	SPLR	Symbol	Visual Classification	USC	Sample Number	Depth In Feet	Water Content Percent	Density Dry	Density Wet	Shear Tests Type	Shear Tests φ	Shear Tests C	Atterberg Limits LL	Atterberg Limits PL	Atterberg Limits PI		Other Tests
0					Water														
10					Very soft dark gray clay w/roots & organic matter	CH	1	8-9	90	46	88	OB	--	140					
					Very soft dark gray organic clay w/roots & wood	OH	2	13-14	259	20	69	UU	0	155					
20					Medium compact gray sandy silt w/clayey silt layers & wood	ML	3	18-19	32	89	118	OB	--	735					
	0.20				Very soft gray silty clay	CL	4	23-24	37	85	116	UC	--	200					
					Loose to medium dense gray fine sand	SP	5	28-29	29	95	123								
30		5					6	31-32											
	0.20				Very soft to soft gray clay w/fine sand lenses	CH	7	33-34	44	75	108	UU	0	315					
40	0.20						8	38-39	55	67	103	UC	--	245					
	0.25				Soft gray clay	CH	9	43-44	62	62	100	UC	--	365					
50	0.30						10	48-49	61	60	98	UC	--	365					

Comments:

EUSTIS ENGINEERING COMPANY, INC.

LOG OF BORING AND TEST RESULTS

WEST JEFFERSON LEVEE DISTRICT
COUSINS PUMPING STATION TO 1ST AVENUE CANAL
HARVEY, LOUISIANA

Ground Elev.: **Datum:** **Gr. Water Depth:** 0.0 **Job No.:** 14149 **Date Drilled:** 7/17/96 **Boring:** 3 **Refer to "Legends & Notes"**

Scale In Feet	PP	SPT	SPLR	Symbol	Visual Classification	USC	Sample Number	Depth In Feet	Water Content Percent	Density		Shear Tests			Atterberg Limits				Other Tests
										Dry	Wet	Type	φ	C	LL	PL	PI		
50					Soft gray clay	CH													
	0.30						11	53-54	61	60	97	UC	--	250					
					Medium stiff gray clay	CH													
	0.30						12	58-59	58	64	101	UU	0	555					
60																			
					Loose gray clayey sand w/shells	SC	13	63-64											
		33			Dense gray clayey sand w/shells	SC	14	65-66	25										
		21			Medium dense gray clayey sand	SC	15	69-70											
70																			
		9			Loose gray & tan clayey sand w/fine sand layers	SC	16	74-75											
	0.25				Soft greenish-gray & tan sandy clay w/clayey sand layers	CL	17	77-78	27	93	119	OB	--	300					
		28			Medium dense gray fine sand w/clay layers	SP	18	79-80											
80																			
		17					19	84-85											
	0.60				Medium stiff gray clay w/sand pockets & shells	CH	20	88-89	32	89	118	UC	--	685					
90																			
	0.60						21	93-94	31	91	119	UU	0	920					
	0.50				Soft gray clay w/shells & sand pockets	CH	22	98-99	33	88	117	UC	--	475					
100																			

Comments:

EUSTIS ENGINEERING COMPANY, INC.

LOG OF BORING AND TEST RESULTS

WEST JEFFERSON LEVEE DISTRICT
COUSINS PUMPING STATION TO 1ST AVENUE CANAL
HARVEY, LOUISIANA

Ground Elev.: **Datum:** **Gr. Water Depth:** See Text **Job No.:** 14149 **Date Drilled:** 7/15/96 **Boring:** 4 **Refer to "Legends & Notes"**

Scale In Feet	PP	SPT	SPLR	Symbol	Visual Classification	USC	Sample Number	Depth In Feet	Water Content Percent	Density		Shear Tests			Atterberg Limits				Other Tests
										Dry	Wet	Type	φ	C	LL	PL	PI		
0		11			Soft dark gray clay w/fine sand layers & roots	CH	1	0-0.5											
					Medium dense gray fine sand	SP	2	0.5-2											
		15			Stiff gray clay w/shell layers	CH	3	3.5-5	21										
					Soft dark gray clay w/shells & humus layers	CH	4	8-9	111										
10	0.20				Very soft dark gray clay w/humus layers	CH	5	11-12	133	34	80	UC	--	165					
	0.20				Soft dark gray organic clay w/wood & roots	OH	6	14-15	242	21	73	UU	0	455					
20	0.20				Very soft gray clay w/silt lenses	CH	7	18-19	91	48	92	UC	--	140					
	0.20				Loose gray clayey sand w/clay layers	SC	8	23-24	35	85	115	UU	9.0	95					
30	0.20				Loose gray clayey silt w/clay layers	ML	9	28-29	37	79	109	OB	--	340					
	0.20				Soft gray silty clay w/clayey silt layers	CL	10	33-34	31	88	115	UC	--	445					
40					Loose gray silty sand w/clay layers	SM	11	38-39											
	0.25				Soft gray clay w/silty sand pockets	CH	12	43-44	56	65	101	UU	0	430					
50	0.25						13	48-49	67	57	96	UC	--	340					

Comments:

EUSTIS ENGINEERING COMPANY, INC.

LOG OF BORING AND TEST RESULTS

WEST JEFFERSON LEVEE DISTRICT
COUSINS PUMPING STATION TO 1ST AVENUE CANAL
HARVEY, LOUISIANA

Ground Elev.: **Datum:** **Gr. Water Depth:** See Text **Job No.:** 14149 **Date Drilled:** 7/15/96 **Boring:** 4 **Refer to "Legends & Notes"**

Scale In Feet	PP	SPT	SPLR	Symbol	Visual Classification	USC	Sample Number	Depth In Feet	Water Content Percent	Density		Shear Tests			Atterberg Limits				Other Tests
										Dry	Wet	Type	φ	C	LL	PL	PI		
50					Medium stiff gray clay	CH													
	0.25				w/clayey silt layers		14	53-54	59	62	100	UU	0	545					
					Soft to medium stiff gray clay	CH													
	0.50						15	58-59	63	60	98	UC	--	375					
60																			
	0.75				w/clayey sand layers, pockets & shells		16	63-64	60	63	101	UU	0	770					
		14			Medium dense gray clayey sand w/shells	SC	17	66-67	27										
		15			w/clay layers		18	69-70											
70																			
		17					19	72-73											
		20			Medium dense tan & gray clayey sand w/clay layers	SC	20	75-76											
							21	77-78	28	94	120	OB	--	325					
		12			Medium dense dark gray fine sand w/clay layers	SP	22	79-80											
80																			
		27					23	82-83											
		34			Dense dark gray fine sand	SP	24	85-86											
		11			Stiff gray sandy clay w/shells	CL	25	89-90	30										
90																			
	0.60				Medium stiff gray clay w/sand pockets & shells	CH	26	93-94	31	90	118	UC	--	740					
					Medium stiff gray clay w/clayey silt pockets & concretions	CH	27	98-99	33										
100																			

Comments:

EUSTIS ENGINEERING COMPANY, INC.

LOG OF BORING AND TEST RESULTS

WEST JEFFERSON LEVEE DISTRICT
COUSINS PUMPING STATION TO 1ST AVENUE CANAL
HARVEY, LOUISIANA

Ground Elev.: **Datum:** **Gr. Water Depth:** See Text **Job No.:** 14149 **Date Drilled:** 7/16/96 **Boring:** 5 **Refer to "Legends & Notes"**

Scale In Feet	PP	SPT	SPLR	Symbol	Visual Classification	USC	Sample Number	Depth In Feet	Water Content Percent	Density		Shear Tests			Atterberg Limits				Other Tests
										Dry	Wet	Type	φ	C	LL	PL	PI		
0					Medium stiff dark gray clay w/shells & concrete fragments	CH	1	0-1											
	0.60				w/silt pockets, roots & shells		2	2-3	38	81	111	UC	--	655					
					Loose gray clayey sand w/sand layers & shells	SC	3	5-6	33										
	0.20				Soft dark gray clay w/organic clay layers	CH	4	8-9	59	61	97	UU	0	410					
10																			
	0.20				w/roots & organic matter		5	11-12	62	62	100	UC	--	380					
	0.20				Very soft gray clay w/silt pockets & wood	CH	6	14-15	92	48	92	UC	--	185	134	36	98		
	0.20				Medium stiff dark gray organic clay w/roots	OH	7	18-19	286	18	68	UC	--	765					
20																			
	0.20				Soft gray clay w/clayey silt & silty sand layers & wood	CH	8	23-24	60	63	101	UU	0	250					
					Soft gray sandy clay w/sand layers	CL	9	28-29	45										
30																			
					Loose gray sandy silt w/clay & fine sand layers	ML	10	33-34	40										
	0.20				Soft gray silty clay w/silty sand & sandy silt layers	CL	11	38-39	30	88	115	OB	--	475					
40																			
	0.25				Soft to medium stiff gray clay w/clayey silt layers	CH	12	43-44											
	0.25						13	48-49	63	60	98	UU	0	525	89	29	60		
50																			

Comments:

EUSTIS ENGINEERING COMPANY, INC.

LOG OF BORING AND TEST RESULTS

WEST JEFFERSON LEVEE DISTRICT
COUSINS PUMPING STATION TO 1ST AVENUE CANAL
HARVEY, LOUISIANA

Ground Elev.: **Datum:** **Gr. Water Depth:** See Text **Job No.:** 14149 **Date Drilled:** 7/16/96 **Boring:** 5 **Refer to "Legends & Notes"**

Scale in Feet	PP	SPT	SPLR	Symbol	Visual Classification	USC	Sample Number	Depth In Feet	Water Content Percent	Density Dry	Density Wet	Shear Tests Type	Shear Tests φ	Shear Tests C	Atterberg Limits LL	Atterberg Limits PL	Atterberg Limits PI		Other Tests
50					Soft to medium stiff gray clay	CH													
	0.30						14	53-54	61	61	98	UC	--	470					
					Medium stiff gray clay	CH													
	0.30						15	58-59	64	59	97	UC	--	550					
60																			
	0.50						16	63-64	57	61	96	UC	--	610					
					Very loose gray silty sand	SM	17	66.5-67.5											
		41			Dense gray silty sand	SM	18	68-69											
70																			
		37					19	71-72											
		30			Medium dense greenish-gray & tan clayey sand	SC	20	74-75											
							21	78-79	30	92	120	UU	10	230					
80																			
		19			Medium dense greenish-gray & tan clayey sand	SC	22	81-82											
		46			Dense greenish-gray & tan clayey sand	SC	23	84-85											
		4			Soft gray sandy clay w/fine sand layers	CL	24	89-90											
90					w/clay layers														
	0.75						25	93-94	32	90	118	UC	--	560					
	0.60				Medium stiff gray clay w/sand pockets & shell fragments	CH	26	98-99	33	89	118	UU	0	830					
100																			

Comments:

EUSTIS ENGINEERING COMPANY, INC.

LOG OF BORING AND TEST RESULTS

WEST JEFFERSON LEVEE DISTRICT
COUSINS PUMPING STATION TO 1ST AVENUE CANAL
HARVEY, LOUISIANA

Ground Elev.: **Datum:** **Gr. Water Depth:** See Text **Job No.:** 14149 **Date Drilled:** 7/12/96 **Boring:** 6 **Refer to "Legends & Notes"**

Scale In Feet	PP	SPT	SPLR	Symbol	Visual Classification	USC	Sample Number	Depth In Feet	Water Content Percent	Density		Shear Tests			Atterberg Limits				Other Tests
										Dry	Wet	Type	φ	C	LL	PL	PI		
0		14			Loose gray fine sand w/roots & shells	SP	1	0-1											
					Medium dense tan fine sand	SP	2	1-2.5											
		6			Loose gray & tan fine sand	SP	3	4-5.5											
		6			Loose gray fine sand	SP	4	7-8.5											
10		7			Loose white shells w/clay layers	SL	5	10-11.5											
	0.25				Very soft dark gray clay w/wood, roots & organic matter	CH	6	14-15	106	42	87	UC	--	170					
20	0.25						7	18-19	99	45	89	UU	0	205					
	0.30				Very soft clay w/roots & wood	CH	8	23-24	69	58	98	UC	--	205					
30	0.25				Soft gray clay w/silty sand lenses & pockets	CH	9	28-29	61	63	102	UC	--	255					
					Compact gray sandy silt	ML	10	33-34	35	84	113	OB	--	1175					
40	0.30				Soft gray clay w/sand lenses	CH	11	38-39	43	75	107	UU	0	360					
	0.30				w/silty sand lenses		12	43-44	44	75	107	UC	--	445					
50	0.30						13	48-49	65	59	97	UC	--	390					

Comments:

EUSTIS ENGINEERING COMPANY, INC.

LOG OF BORING AND TEST RESULTS

WEST JEFFERSON LEVEE DISTRICT
COUSINS PUMPING STATION TO 1ST AVENUE CANAL
HARVEY, LOUISIANA

Ground Elev.: **Datum:** **Gr. Water Depth:** See Text **Job No.:** 14149 **Date Drilled:** 7/12/96 **Boring:** 6 **Refer to "Legends & Notes"**

Scale In Feet	PP	SPT	SPLR	Symbol	Visual Classification	USC	Sample Number	Depth In Feet	Water Content Percent	Density Dry	Density Wet	Shear Tests Type	Shear Tests φ	Shear Tests C	Atterberg Limits LL	Atterberg Limits PL	Atterberg Limits PI		Other Tests
50					Soft gray clay w/silty sand lenses	CH													
	0.30				w/sand pockets		14	53-54	55	65	102	UC	--	415					
	0.30				Medium stiff gray clay	CH	15	58-59	61	62	100	UU	0	640					
60																			
	0.50						16	63-64	57	64	101	UC	--	695					
					Loose gray fine sand	SP	17	67-68											
		50=10"			Very dense gray fine sand	SP	18	69-70											
70																			
	1.60				Medium stiff greenish-gray & tan sandy clay	CL	19	73-74	22	100	124	UU	0	795					
					Medium dense greenish-gray & tan clayey sand w/clay lenses	SC	20	78-79	28	92	118	OB	--	835					
80																			
							21	81.5-82.5											
		27			Medium dense greenish-gray & tan clayey sand	SC	22	83-84											
		41			Dense greenish-gray & tan clayey sand	SC	23	86-87											
		45			Dense gray fine sand	SP	24	89-90											
90																			
	0.80				Medium stiff greenish-gray & tan sandy clay w/shells	CL	25	93-94	31	91	119	UU	0	805					
	0.80				Medium stiff gray clay w/silt pockets & shell fragments	CH	26	98-99	32	91	119	UC	--	780					
100																			

Comments:

EUSTIS ENGINEERING COMPANY, INC.

LOG OF BORING AND TEST RESULTS

WEST JEFFERSON LEVEE DISTRICT
COUSINS PUMPING STATION TO 1ST AVENUE CANAL
HARVEY, LOUISIANA

Ground Elev.: **Datum:** **Gr. Water Depth:** See Text **Job No.:** 14149 **Date Drilled:** 7/23-24/96 **Boring:** 7 **Refer to "Legends & Notes"**

Scale In Feet	PP	SPT	SPLR	Symbol	Visual Classification	USC	Sample Number	Depth In Feet	Water Content Percent	Density		Shear Tests			Atterberg Limits				Other Tests
										Dry	Wet	Type	φ	C	LL	PL	PI		
0					Loose tan & gray clayey silt w/fine sand layers, shells & concrete fragments	ML	1	0-0.5											
	2.75					CH	2	2-3	44	77	110								
	0.30				Very stiff gray & brown clay w/clayey silt pockets & roots	CH	3	5-6	60	62	98	UC	--	495					
	0.20				Soft gray clay w/thin humus layers & roots	CH	4	8-9											
10					Extremely soft to very soft gray clay w/roots, humus layers & organic matter														
	0.20				w/organic matter & roots		5	11-12	113	41	113	UU	0	90					
	0.20				w/organic matter		6	14-15	111	42	90	UC	--	140					
	0.25				Soft brown organic clay w/clay & humus layers	OH	7	18-19	289	18	69	UC	--	270					
20					Very soft gray clay w/clayey silt layers	CH													
	0.25						8	23-24	39	82	115	UC	--	155					
					Loose gray silty sand	SM	9	26.5-27.5											
		26			Medium dense gray silty sand	SM	10	28-29											
30		6			Loose gray silty sand	SM	11	31-32											
		WOH			Very soft gray clay	CH	12	34-35											
	0.30				Soft gray clay w/silt lenses	CH	13	38-39	53	68	104	UC	--	285					
40																			
	0.40				w/silt lenses		14	43-44	68	57	97	UU	0	410					
50	0.60				Medium stiff gray clay w/few clayey silt lenses	CH	15	48-49											

Comments:

EUSTIS ENGINEERING COMPANY, INC.

LOG OF BORING AND TEST RESULTS

WEST JEFFERSON LEVEE DISTRICT
COUSINS PUMPING STATION TO 1ST AVENUE CANAL
HARVEY, LOUISIANA

Ground Elev.: **Datum:** **Gr. Water Depth:** See Text **Job No.:** 14149 **Date Drilled:** 7/23-24/96 **Boring:** 7 **Refer to "Legends & Notes"**

Scale In Feet	PP	SPT	SPLR	Symbol	Visual Classification	USC	Sample Number	Depth In Feet	Water Content Percent	Density		Shear Tests			Atterberg Limits				Other Tests
										Dry	Wet	Type	φ	C	LL	PL	PI		
50					Medium stiff gray clay w/few clayey silt lenses	CH													
	0.60						16	53-54	59	65	103	UC	--	525					
	0.70				Soft gray flocculated clay	CH	17	58-59	58	60	95								
60																			
	0.75				Soft gray clay w/sandy clay layers	CH	18	63-64	64	57	93	UU	0	435					
		20			Medium dense gray fine sand w/shell fragments	SP	19	66-67											
		8			Loose gray fine sand w/clay layers	SP	20	69-70											
70																			
80																			
90																			
100																			

Comments:

EUSTIS ENGINEERING COMPANY, INC.

LOG OF BORING AND TEST RESULTS

WEST JEFFERSON LEVEE DISTRICT
COUSINS PUMPING STATION TO 1ST AVENUE CANAL
HARVEY, LOUISIANA

Ground Elev.: **Datum:** **Gr. Water Depth:** See Text **Job No.:** 14149 **Date Drilled:** 7/24/96 **Boring:** 8 **Refer to "Legends & Notes"**

Scale In Feet	PP	SPT	SPLR	Symbol	Visual Classification	USC	Sample Number	Depth In Feet	Water Content Percent	Density Dry	Density Wet	Shear Tests Type	Shear Tests φ	Shear Tests C	Atterberg Limits LL	Atterberg Limits PL	Atterberg Limits PI		Other Tests
0					Very stiff gray & tan sandy clay w/shells & roots	CL	1	0-0.5											
	3.20				Stiff gray & tan clay w/silt pockets	CH	2	2-3	25	97	122	UC	--	1085					
	0.75				Loose gray clayey silt w/clay pockets & organic matter	ML	3	5-6											
	0.40				Very soft gray clay w/wood & organic matter	CH	4	8-9	89	46	87	UU	0	195					
10	0.50				Very soft gray organic clay w/roots	OH	5	11-12	100	44	88	UC	--	235					
	0.40				Very soft gray clay w/organic matter	CH	6	14-15	87	49	92	UU	0	245					
	0.50				Soft gray clay w/wood & organic matter	CH	7	18-19	142	33	80	UC	--	395					
20	0.50				Loose gray clayey silt w/clay layers	ML	8	23-24											
	0.30				w/clay layers & trace of organic matter		9	28-29											
30					Loose gray fine sand	SP	10	31.5-32.5											
		9					11	33-34											
		13			Medium dense gray fine sand	SP	12	36-37											
		7			Loose gray fine sand	SP	13	39-40											
40	0.40				Soft gray clay w/fine sand layers	CH	14	43-44	47	72	106	UC	--	345					
	0.50				Medium stiff gray clay	CH	15	48-49	54	66	102	UU	0	585					
50																			

Comments:

EUSTIS ENGINEERING COMPANY, INC.

LOG OF BORING AND TEST RESULTS

WEST JEFFERSON LEVEE DISTRICT
COUSINS PUMPING STATION TO 1ST AVENUE CANAL
HARVEY, LOUISIANA

Ground Elev.: **Datum:** **Gr. Water Depth:** See Text **Job No.:** 14149 **Date Drilled:** 7/24/96 **Boring:** 8 **Refer to "Legends & Notes"**

Scale In Feet	PP	SPT	SPLR	Symbol	Visual Classification	USC	Sample Number	Depth In Feet	Water Content Percent	Density		Shear Tests			Atterberg Limits				Other Tests
										Dry	Wet	Type	φ	C	LL	PL	PI		
50					Medium stiff gray clay	CH													
	0.60						16	53-54	62	62	100	UC	--	540					
					Soft gray clay	CH													
	0.70				w/few clayey silt lenses		17	58-59	54	66	101	UC	--	315					
60																			
70																			
80																			
90																			
100																			

Comments:

EUSTIS ENGINEERING COMPANY, INC.

LOG OF BORING AND TEST RESULTS

WEST JEFFERSON LEVEE DISTRICT
COUSINS PUMPING STATION TO 1ST AVENUE CANAL
HARVEY, LOUISIANA

Ground Elev.: **Datum:** **Gr. Water Depth:** See Text **Job No.:** 14149 **Date Drilled:** 7/09/96 **Boring:** 9 **Refer to "Legends & Notes"**

Scale In Feet	PP	SPT	SPLR	Symbol	Visual Classification	USC	Sample Number	Depth In Feet	Water Content Percent	Density		Shear Tests			Atterberg Limits				Other Tests
										Dry	Wet	Type	φ	C	LL	PL	PI		
0	0.90				Medium dense tan & gray silty sand w/many shells	SM	1	0-0.5											
					Soft gray & brown organic clay w/decayed wood	OH	2	1-2											
	0.25				Large concrete pieces	CH	3	3-4	78	48	85	UC	--	295					
					Soft dark gray clay w/decayed wood	CH	4	5-6											
					Very soft gray clay w/organic matter		5	8-9	82	52	94	UC	--	210	124	28	96		
10							6	11-12											
					Soft gray & brown organic clay w/humus lenses	OH	7	14-15	234	22	74	UC	--	325					
					Loose gray sandy silt	ML	8	18-19											
20																			
					Very soft gray clay w/sandy silt layers	CH	9	23-24	63	60	99	UC	--	180					
		6			Loose gray sandy silt	ML	10	26-27											
		1			Very loose gray clayey silt	ML	11	29-30											
30																			
					Soft gray clay w/silty sand lenses & fine sand layers	CH	12	33-34											
					Soft gray clay		13	38-39	62	61	99	UC	--	400	84	24	60		
40																			
					Soft dark gray clay	CH	14	43-44											
							15	48-49	58	64	100	UC	--	380					
50																			

Comments:

EUSTIS ENGINEERING COMPANY, INC.

LOG OF BORING AND TEST RESULTS

WEST JEFFERSON LEVEE DISTRICT
COUSINS PUMPING STATION TO 1ST AVENUE CANAL
HARVEY, LOUISIANA

Ground Elev.: **Datum:** **Gr. Water Depth:** See Text **Job No.:** 14149 **Date Drilled:** 7/09/96 **Boring:** 9 **Refer to "Legends & Notes"**

Scale In Feet	PP	SPT	SPLR	Symbol	Visual Classification	USC	Sample Number	Depth In Feet	Water Content Percent	Density		Shear Tests			Atterberg Limits				Other Tests
										Dry	Wet	Type	φ	C	LL	PL	PI		
50					Soft dark gray clay	CH													
					Soft gray clay	CH	16	53-54											
					Medium dense gray fine sand w/shell fragments	SP	17	58-59	66	58	96	UC	--	415					
60							18	59.75-60											
70																			
80																			
90																			
100																			

Comments:

EUSTIS ENGINEERING COMPANY, INC.

LOG OF BORING AND TEST RESULTS

WEST JEFFERSON LEVEE DISTRICT
COUSINS PUMPING STATION TO 1ST AVENUE CANAL
HARVEY, LOUISIANA

Ground Elev.: **Datum:** **Gr. Water Depth:** See Text **Job No.:** 14149 **Date Drilled:** 7/10/96 **Boring:** 10 **Refer to "Legends & Notes"**

Scale In Feet	PP	SPT	SPLR	Symbol	Visual Classification	USC	Sample Number	Depth In Feet	Water Content Percent	Density		Shear Tests			Atterberg Limits				Other Tests
										Dry	Wet	Type	φ	C	LL	PL	PI		
0	4.50				Very stiff brown & gray silty clay w/organic matter & shells	CL	1	0-0.5											
	0.75				Soft brown & gray clay w/silty clay layers & organic matter	CH	2	2-3											
	1.25				Medium stiff dark gray clay w/silt pockets & organic matter	CH	3	5-6	49	67	100	UC	--	680					
	1.50						4	8-9											
10	0.25				Very soft gray & brown clay w/organic matter & wood	CH	5	11-12	60	59	95	UC	--	215	94	24	70		
	0.25						6	14-15											
							7	18-19											
20																			
					Very soft gray clay w/organic clay layers & decayed wood	CH	8	23-24	107	42	88	UC	--	145					
					Very soft gray clay w/clayey silt layers	CH	9	28-29											
30																			
					w/sandy silt layers		10	33-34	56	66	102								
					Soft gray clay	CH	11	38-39											
40																			
							12	43-44	68	58	98	UC	--	275					
							13	48-49											
50																			

Comments:

EUSTIS ENGINEERING COMPANY, INC.

LOG OF BORING AND TEST RESULTS

WEST JEFFERSON LEVEE DISTRICT
COUSINS PUMPING STATION TO 1ST AVENUE CANAL
HARVEY, LOUISIANA

Ground Elev.: **Datum:** **Gr. Water Depth:** See Text **Job No.:** 14149 **Date Drilled:** 7/10/96 **Boring:** 10 **Refer to "Legends & Notes"**

Scale In Feet	PP	SPT	SPLR	Symbol	Visual Classification	USC	Sample Number	Depth In Feet	Water Content Percent	Density		Shear Tests			Atterberg Limits				Other Tests
										Dry	Wet	Type	φ	C	LL	PL	PI		
50					Very soft gray clay w/silt lenses	CH													
							14	53-54	69	57	96	UC	--	230	88	26	62		
					Very soft gray clay		15	58-59											
60																			
70																			
80																			
90																			
100																			

Comments:

EUSTIS ENGINEERING COMPANY, INC.

LOG OF BORING AND TEST RESULTS

WEST JEFFERSON LEVEE DISTRICT
COUSINS PUMPING STATION TO 1ST AVENUE CANAL
HARVEY, LOUISIANA

Ground Elev.: **Datum:** **Gr. Water Depth:** See Text **Job No.:** 14149 **Date Drilled:** 7/10/96 **Boring:** 11 **Refer to "Legends & Notes"**

Scale In Feet	PP	SPT	SPLR	Symbol	Visual Classification	USC	Sample Number	Depth In Feet	Water Content Percent	Density		Shear Tests			Atterberg Limits				Other Tests
										Dry	Wet	Type	φ	C	LL	PL	PI		
0	4.50				Very stiff brown & gray silty clay w/organic matter	CL	1	0-0.5											
	1.20				Soft to medium stiff dark gray clay w/organic matter & silt pockets	CH	2	2-3	46	69	101	UC	--	460					
	1.10				Medium stiff brown & gray clay w/silt pockets & organic matter	CH	3	5-6											
	0.50				Soft gray & brown clay w/organic matter	CH	4	8-9	60	63	100	UC	--	325					
10	0.30						5	11-12											
					Very soft gray & brown clay w/decayed wood, organic matter & roots	CH	6	14-15											
					Very soft gray clay w/humus layers & organic matter	CH	7	18-19	111	41	87	UC	--	190					
20																			
					Very soft brown & gray organic clay w/decayed wood	OH	8	23-24											
					Very soft gray clay w/clayey silt lenses	CH	9	28-29	74	55	95	UC	--	205	96	22	74		
30																			
							10	33-34											
					Very soft gray clay		11	38-39	75	55	95	UC	--	225					
40																			
					Soft gray clay	CH	12	43-44											
							13	48-49	63	60	97	UC	--	305					
50																			

Comments:

EUSTIS ENGINEERING COMPANY, INC.

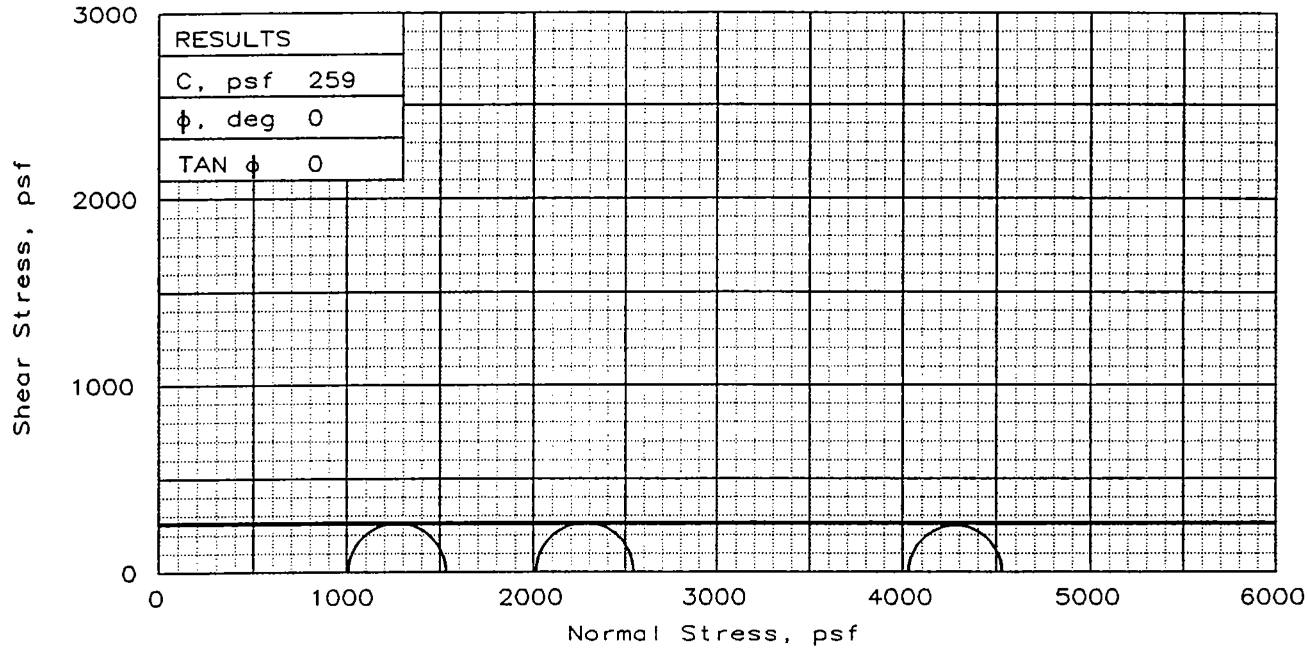
LOG OF BORING AND TEST RESULTS

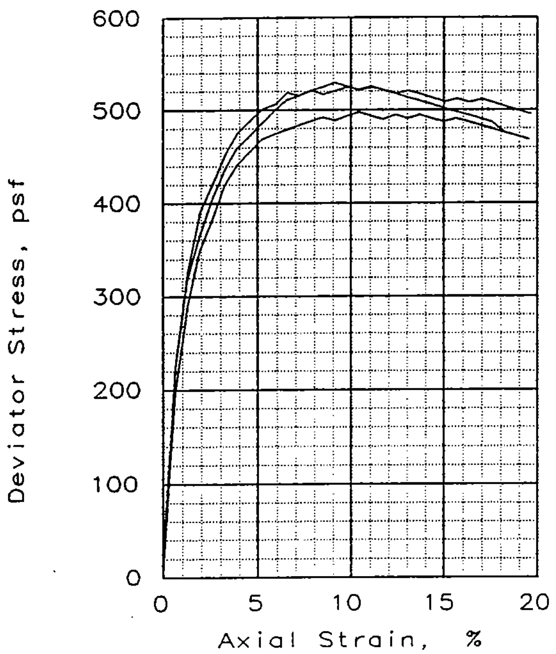
WEST JEFFERSON LEVEE DISTRICT
COUSINS PUMPING STATION TO 1ST AVENUE CANAL
HARVEY, LOUISIANA

Ground Elev.: **Datum:** **Gr. Water Depth:** See Text **Job No.:** 14149 **Date Drilled:** 7/10/96 **Boring:** 11 **Refer to "Legends & Notes"**

Scale In Feet	PP	SPT	SPLR	Symbol	Visual Classification	USC	Sample Number	Depth In Feet	Water Content Percent	Density		Shear Tests			Atterberg Limits				Other Tests
										Dry	Wet	Type	φ	C	LL	PL	PI		
50					Soft gray clay	CH													
							14	53-54											
					w/clayey silt lenses		15	58-59	61	61	99	UC	--	420					
60																			
70																			
80																			
90																			
100																			

Comments:





SPECIMEN NO.:		1	2	3
INITIAL	WATER CONTENT, %	85.8	88.4	93.8
	DRY DENSITY, pcf	50.0	49.0	46.4
	SATURATION, %	97.2	97.2	95.8
	VOID RATIO	2.419	2.494	2.683
	DIAMETER, in	1.40	1.40	1.40
	HEIGHT, in	3.00	2.99	2.99
AT TEST	WATER CONTENT, %	88.7	91.0	97.9
	DRY DENSITY, pcf	49.9	49.0	46.5
	SATURATION, %	100.0	100.0	100.0
	VOID RATIO	2.430	2.493	2.681
	DIAMETER, in	1.40	1.40	1.40
	HEIGHT, in	2.99	2.99	2.99
Strain rate, in/min		0.1078	0.1095	0.1110
BACK PRESSURE, psf		0	0	0
CELL PRESSURE, psf		1008	2016	4032
FAILURE STRESS, psf		525	529	497
ULTIMATE STRESS, psf		495	468	468
σ_1 FAILURE, psf		1533	2545	4529
σ_3 FAILURE, psf		1008	2016	4032

TYPE OF TEST:
Unconsolidated Undrained

SAMPLE TYPE: Undisturbed

DESCRIPTION: So gray Clay w/ trace organic matter

SPECIFIC GRAVITY= 2.74

REMARKS:

FIG. NO.: ______

CLIENT:

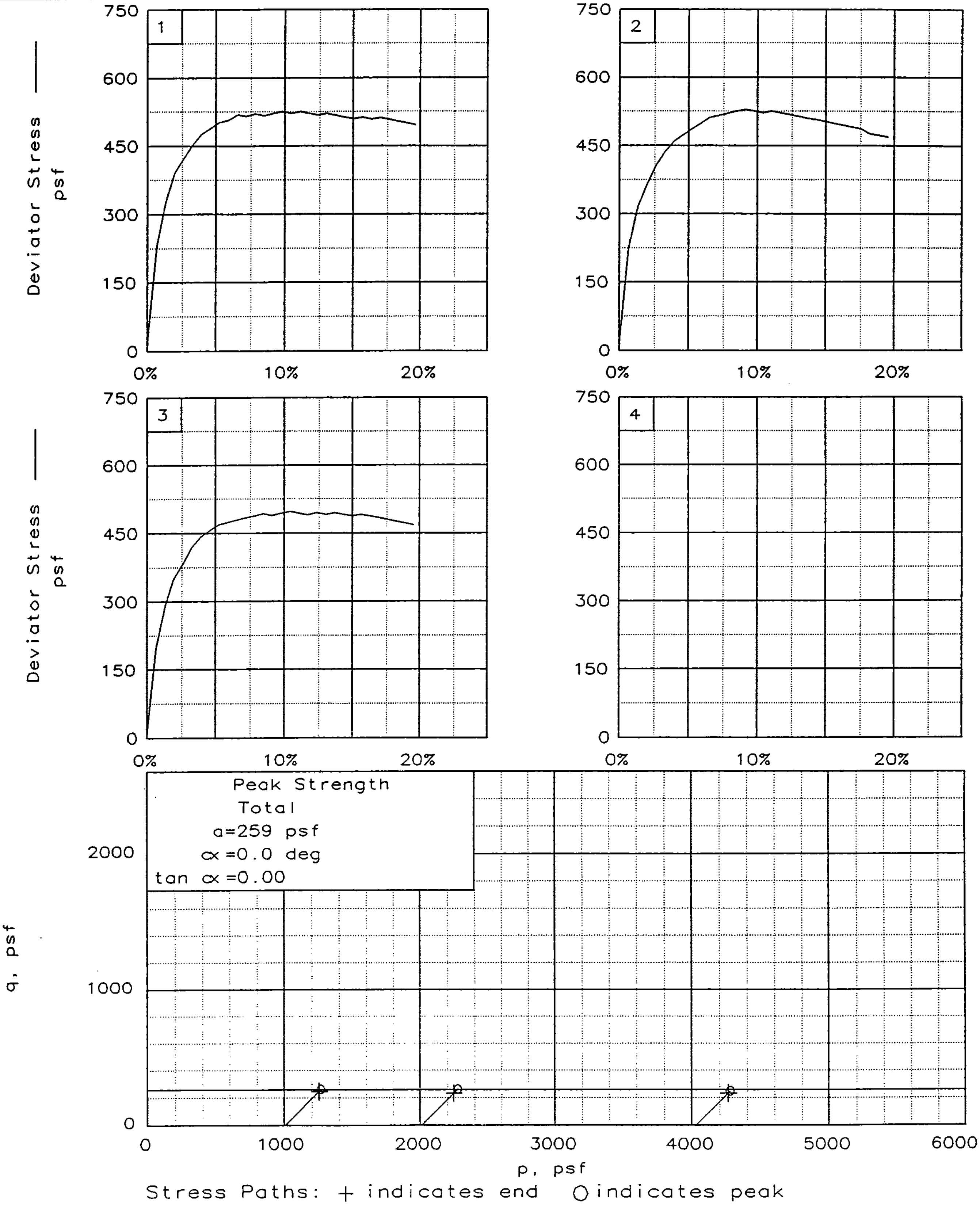
PROJECT: WJLD

SAMPLE LOCATION: Boring 1, Sample 3, Depth 5'-6'

PROJ. NO.: 14149 DATE: 7-29-96

TRIAXIAL SHEAR TEST REPORT

Eustis Engineering Company, Inc.

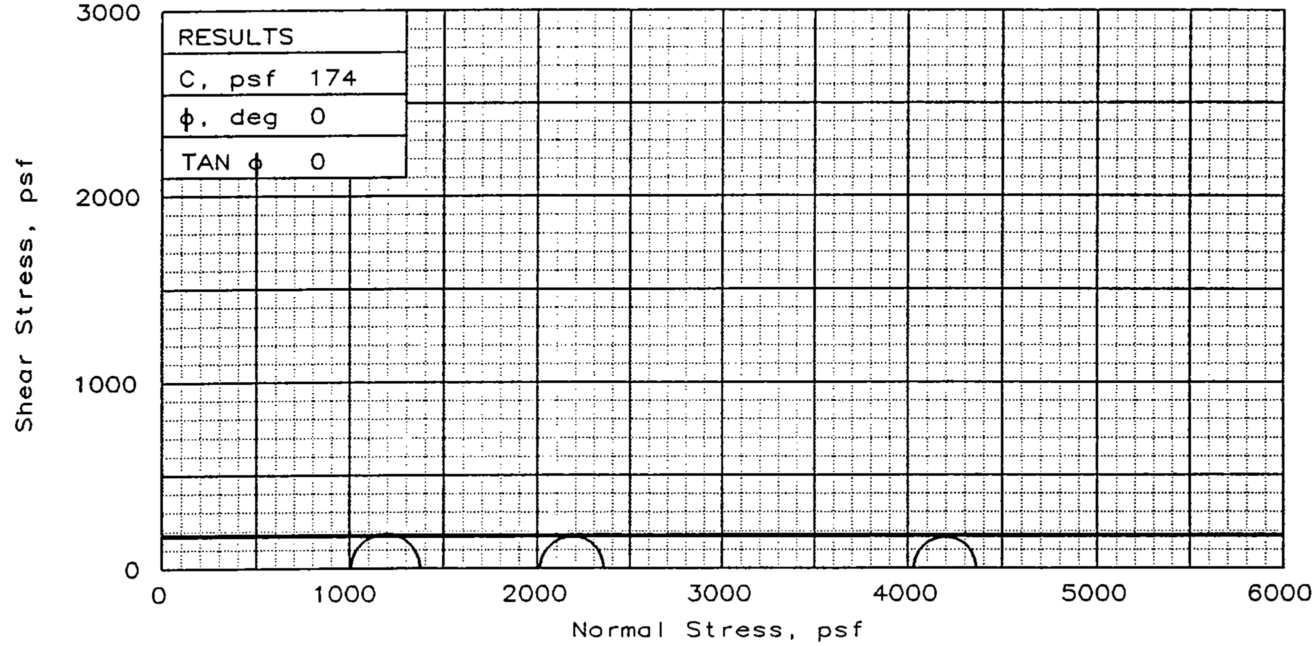


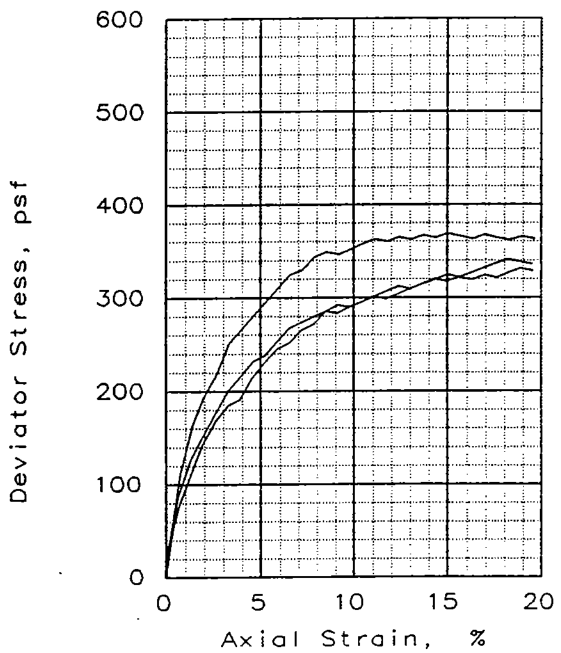
Client:

Project: WJLD

Location: Boring 1, Sample 3, Depth 5'-6'

File: UU-7159 Project No.: 14149 FIG. NO.: _____





SPECIMEN NO.:		1	2	3
INITIAL	WATER CONTENT, %	51.2	49.1	51.4
	DRY DENSITY, pcf	68.4	71.0	68.3
	SATURATION, %	93.6	95.5	93.4
	VOID RATIO	1.499	1.409	1.506
	DIAMETER, in	1.40	1.40	1.40
	HEIGHT, in	3.00	3.00	3.00
AT TEST	WATER CONTENT, %	55.2	52.3	55.5
	DRY DENSITY, pcf	68.1	70.3	67.9
	SATURATION, %	100.0	100.0	100.0
	VOID RATIO	1.514	1.432	1.520
	DIAMETER, in	1.40	1.40	1.40
	HEIGHT, in	2.99	2.99	2.99
Strain rate, in/min		0.1073	0.1114	0.1069
BACK PRESSURE, psf		0	0	0
CELL PRESSURE, psf		1008	2016	4032
FAILURE STRESS, psf		369	341	331
ULTIMATE STRESS, psf		363	336	329
σ_1 FAILURE, psf		1377	2357	4363
σ_3 FAILURE, psf		1008	2016	4032

TYPE OF TEST:
Unconsolidated Undrained

SAMPLE TYPE: Undisturbed

DESCRIPTION: Vso gray Clay w/ silty sand lenses

SPECIFIC GRAVITY= 2.74

REMARKS:

FIG. NO.: ______

CLIENT:

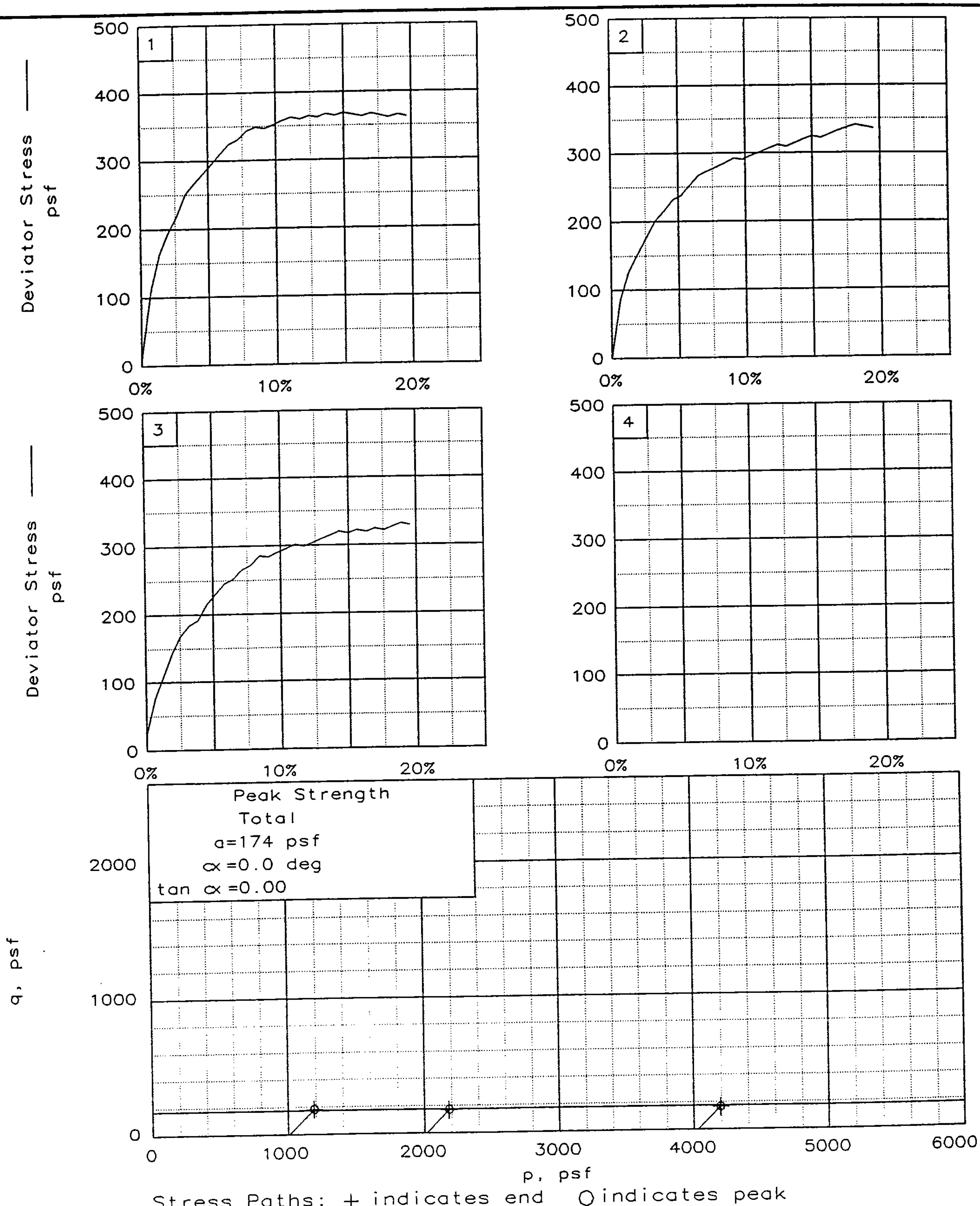
PROJECT: WJLD

SAMPLE LOCATION: Boring 1, Sample 7, Depth 18'-19'

PROJ. NO.: 14149 DATE: 7-29-96

TRIAXIAL SHEAR TEST REPORT

Eustis Engineering Company, Inc.

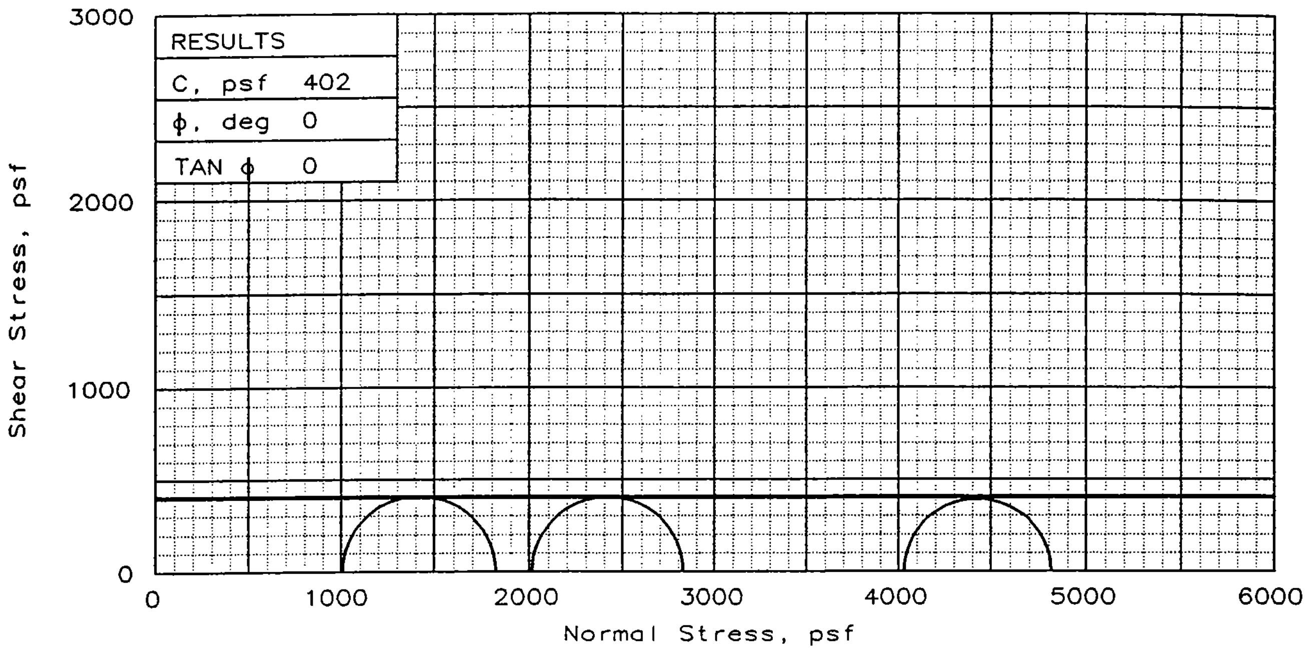


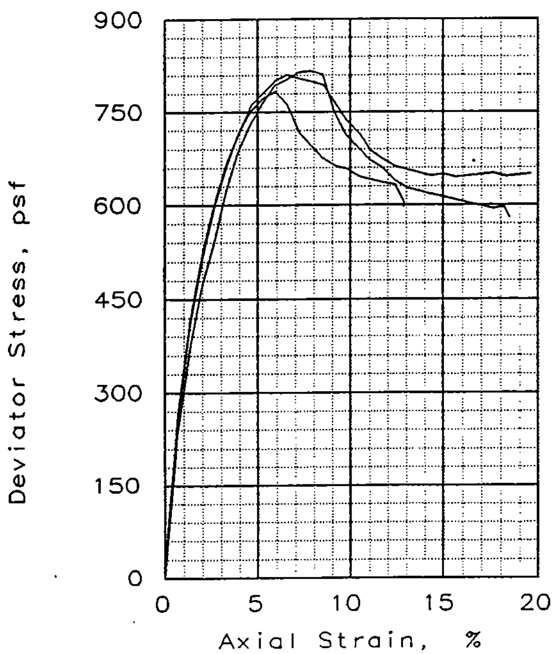
Client:

Project: WJLD

Location: Boring 1, Sample 7, Depth 18'-19'

File: UU-7160 Project No.: 14149 FIG. NO.: ____





SPECIMEN NO.:		1	2	3
INITIAL	WATER CONTENT, %	64.7	63.2	64.1
	DRY DENSITY, pcf	60.5	61.3	59.8
	SATURATION, %	97.0	96.7	94.5
	VOID RATIO	1.827	1.791	1.858
	DIAMETER, in	1.40	1.40	1.40
	HEIGHT, in	2.99	2.99	2.98
AT TEST	WATER CONTENT, %	66.1	65.3	66.1
	DRY DENSITY, pcf	60.8	61.3	60.9
	SATURATION, %	100.0	100.0	100.0
	VOID RATIO	1.811	1.790	1.810
	DIAMETER, in	1.40	1.40	1.40
	HEIGHT, in	2.99	2.99	2.99
Strain rate, in/min		0.1110	0.1028	0.1082
BACK PRESSURE, psf		0	0	0
CELL PRESSURE, psf		1008	2016	4032
FAILURE STRESS, psf		817	811	784
ULTIMATE STRESS, psf		580	650	597
σ_1 FAILURE, psf		1825	2827	4816
σ_3 FAILURE, psf		1008	2016	4032

TYPE OF TEST:
Unconsolidated Undrained

SAMPLE TYPE: Undisturbed

DESCRIPTION: So gray Clay

SPECIFIC GRAVITY= 2.74

REMARKS:

FIG. NO.: ______

CLIENT:

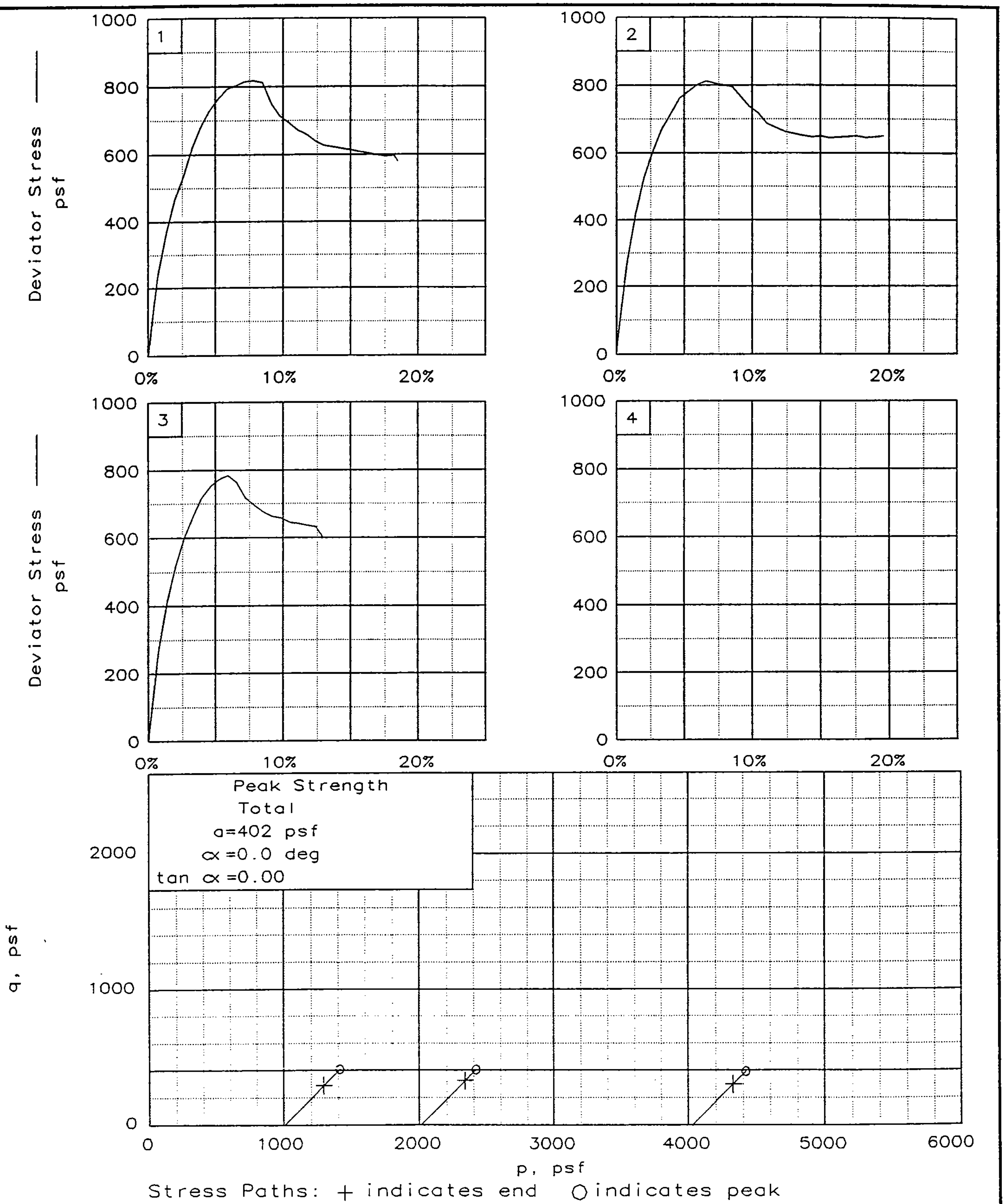
PROJECT: WJLD

SAMPLE LOCATION: Boring 1, Sample 11,
Depth 38'-39'

PROJ. NO.: 14149 DATE: 7-29-96

TRIAXIAL SHEAR TEST REPORT

Eustis Engineering Company, Inc.

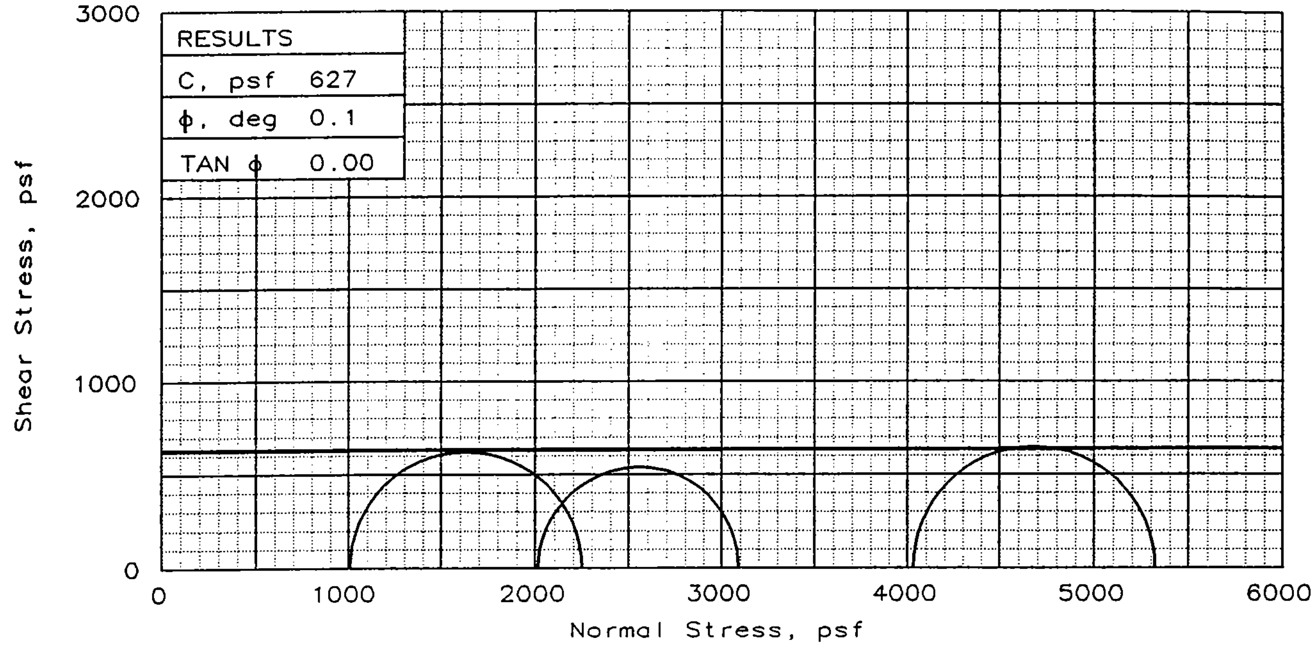


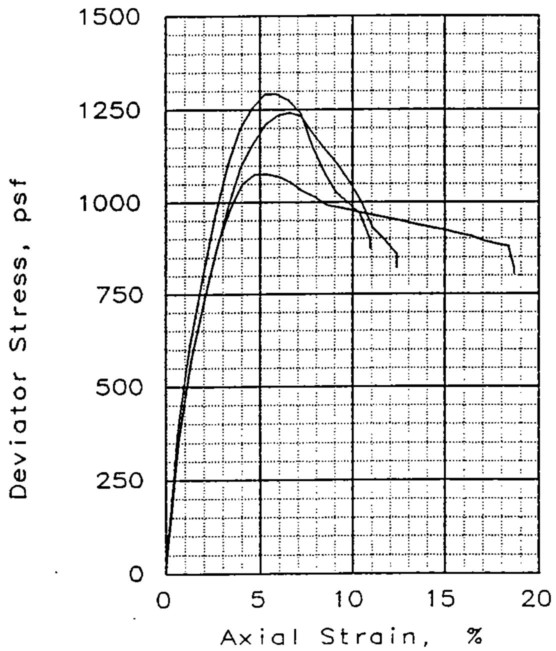
Client:

Project: WJLD

Location: Boring 1, Sample 11, Depth 38'-39'

File: UU-7161 Project No.: 14149 FIG. NO.: _____





SPECIMEN NO.:		1	2	3
INITIAL	WATER CONTENT, %	67.0	69.1	68.3
	DRY DENSITY, pcf	59.1	55.9	57.4
	SATURATION, %	97.0	92.0	94.6
	VOID RATIO	1.894	2.060	1.980
	DIAMETER, in	1.40	1.40	1.40
	HEIGHT, in	2.99	2.99	2.98
AT TEST	WATER CONTENT, %	69.0	75.2	70.9
	DRY DENSITY, pcf	59.2	55.9	58.2
	SATURATION, %	100.0	100.0	100.0
	VOID RATIO	1.891	2.061	1.941
	DIAMETER, in	1.40	1.40	1.40
	HEIGHT, in	2.99	2.99	2.99
Strain rate, in/min		0.1068	0.1103	0.1073
BACK PRESSURE, psf		0	0	0
CELL PRESSURE, psf		1008	2016	4032
FAILURE STRESS, psf		1241	1077	1292
ULTIMATE STRESS, psf		822	805	874
σ_1 FAILURE, psf		2249	3093	5324
σ_3 FAILURE, psf		1008	2016	4032

TYPE OF TEST:
Unconsolidated Undrained
SAMPLE TYPE: Undisturbed
DESCRIPTION: Mst gray Clay
w/ silt lenses

SPECIFIC GRAVITY= 2.74
REMARKS:

FIG. NO.: ______

CLIENT:

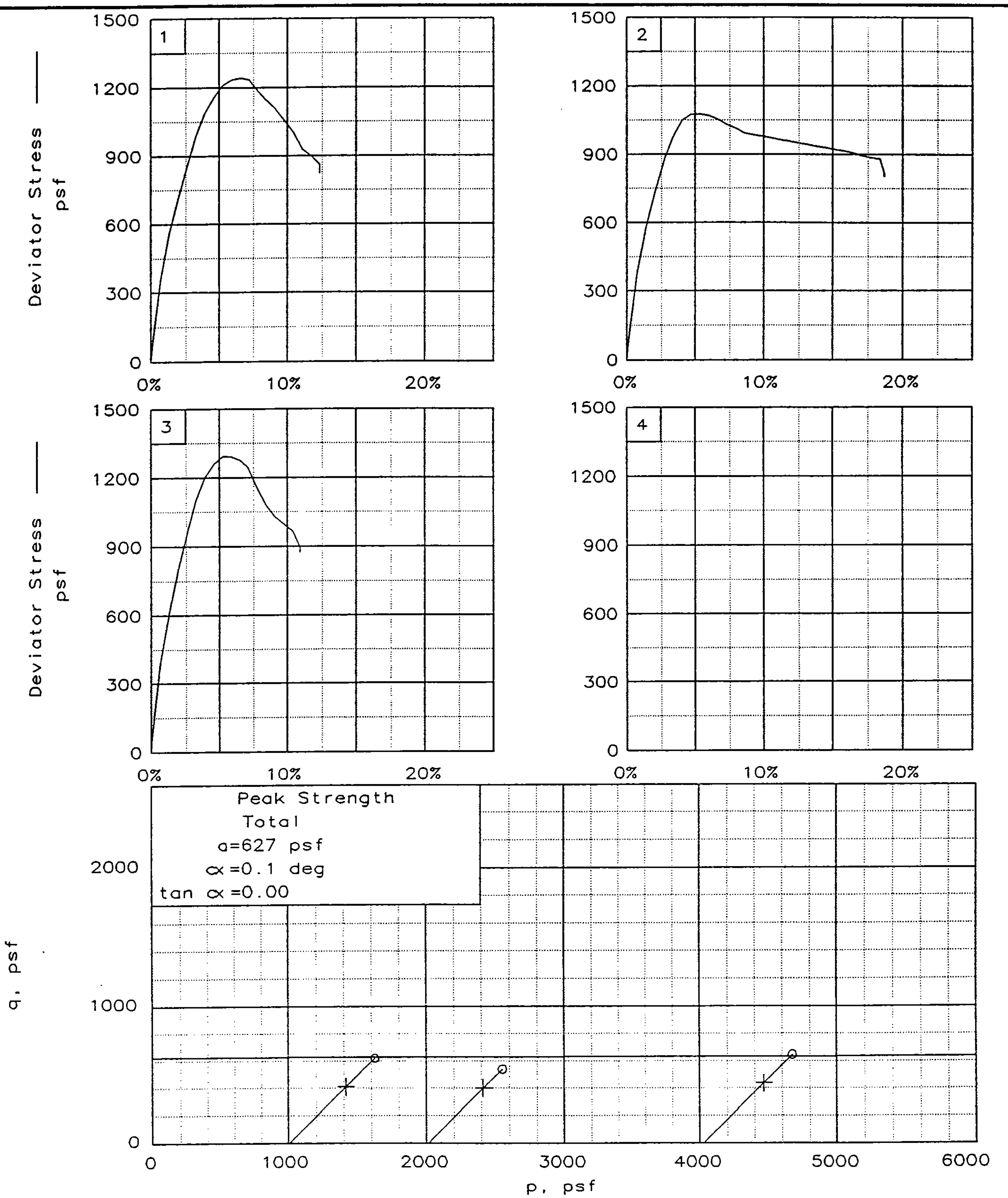
PROJECT: WJLD

SAMPLE LOCATION: Boring 1, Sample 14,
Depth 53'-54'

PROJ. NO.: 14149 DATE: 7-29-96

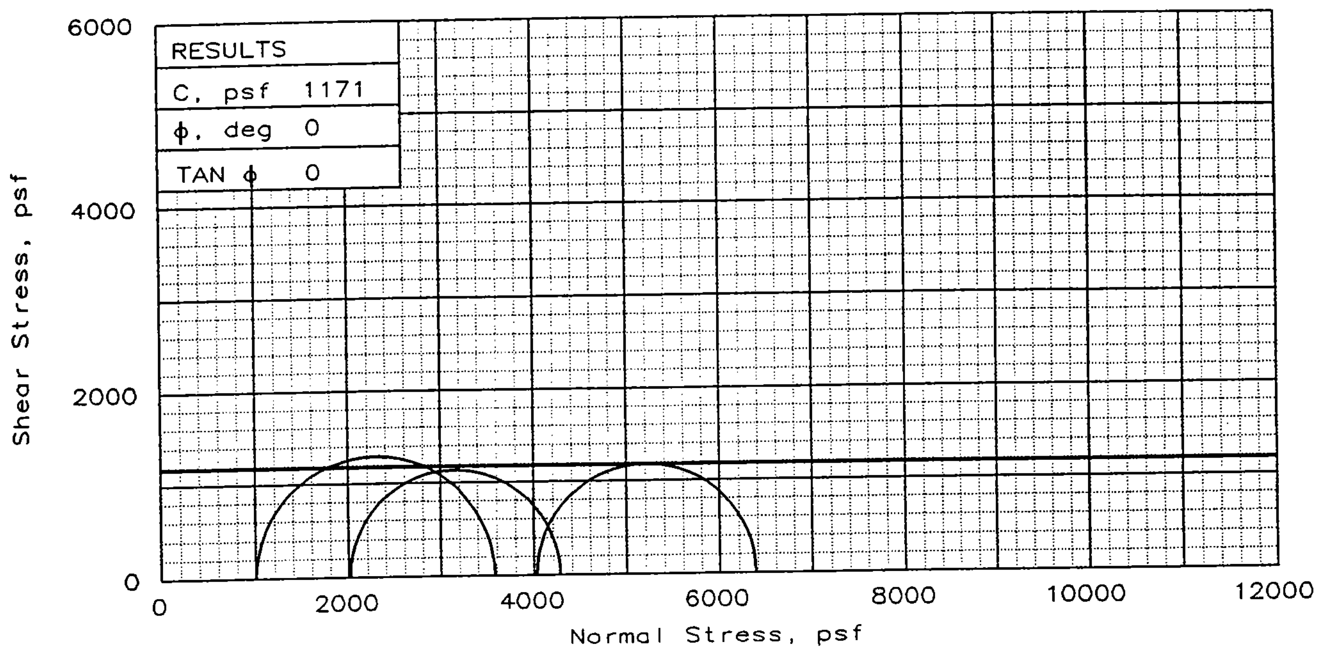
TRIAXIAL SHEAR TEST REPORT

Eustis Engineering Company, Inc.

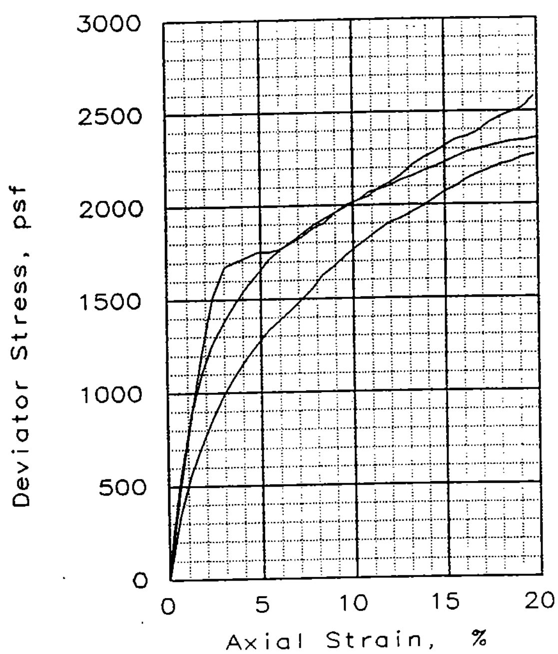


Stress Paths: + indicates end ○ indicates peak

Client:
Project: WJLD
Location: Boring 1, Sample 14, Depth 53'-54'
File: UU-7162 Project No.: 14149 FIG. NO.: _____



RESULTS	
C, psf	1171
ϕ, deg	0
TAN ϕ	0



SPECIMEN NO.:		1	2	3
INITIAL	WATER CONTENT, %	19.5	21.1	22.2
	DRY DENSITY, pcf	102.0	100.0	97.9
	SATURATION, %	80.7	83.2	82.8
	VOID RATIO	0.653	0.685	0.722
	DIAMETER, in	1.40	1.40	1.40
	HEIGHT, in	2.99	2.99	2.98
AT TEST	WATER CONTENT, %	24.2	25.0	25.8
	DRY DENSITY, pcf	102.0	100.6	99.3
	SATURATION, %	100.0	100.0	100.0
	VOID RATIO	0.653	0.675	0.697
	DIAMETER, in	1.40	1.40	1.40
	HEIGHT, in	2.99	2.99	2.99
Strain rate, in/min		0.0964	0.1021	0.0970
BACK PRESSURE, psf		0	0	0
CELL PRESSURE, psf		1008	2016	4032
FAILURE STRESS, psf		2579	2265	2354
ULTIMATE STRESS, psf		2579	2265	2354
σ_1 FAILURE, psf		3587	4281	6386
σ_3 FAILURE, psf		1008	2016	4032

TYPE OF TEST:
Unconsolidated Undrained
SAMPLE TYPE: Undisturbed
DESCRIPTION: D grn-g & t
Clayey Sand

SPECIFIC GRAVITY= 2.7
REMARKS:

FIG. NO.: ______

CLIENT:

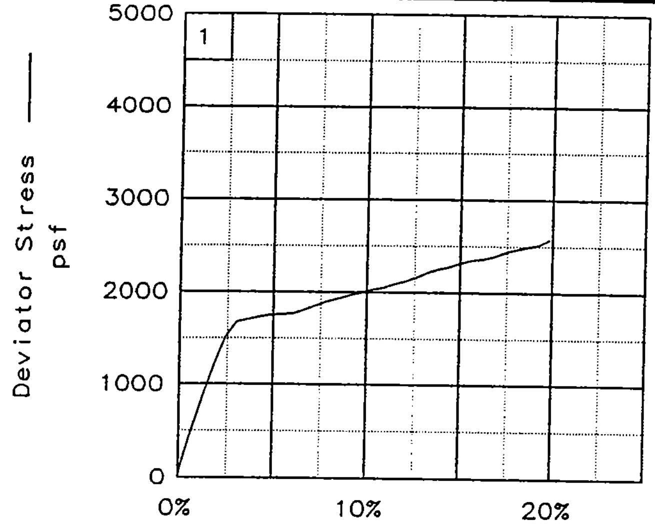
PROJECT: WJLD

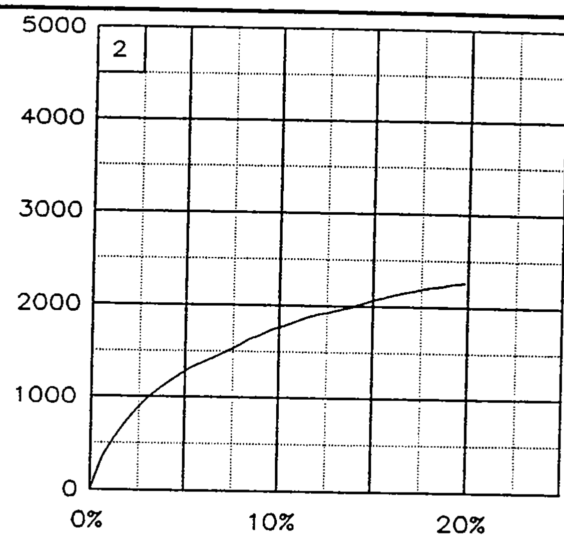
SAMPLE LOCATION: Boring 1, Sample 18,
Depth 68'-69'

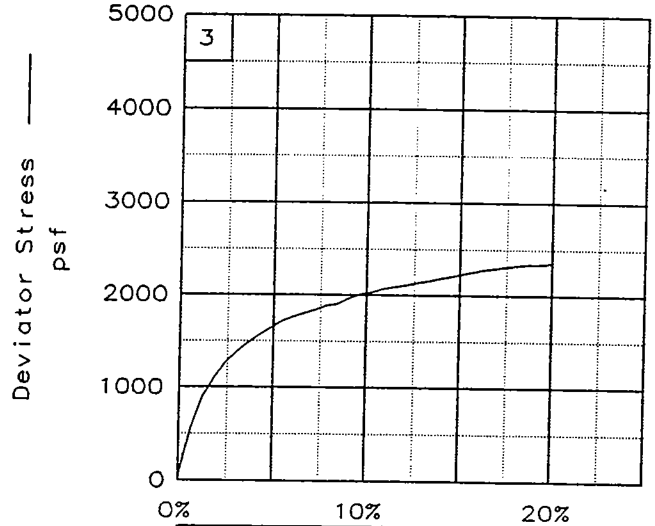
PROJ. NO.: 14149 DATE: 7-29-96

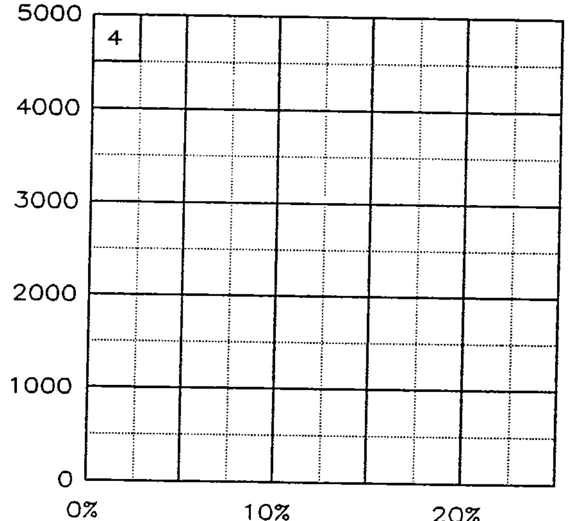
TRIAXIAL SHEAR TEST REPORT

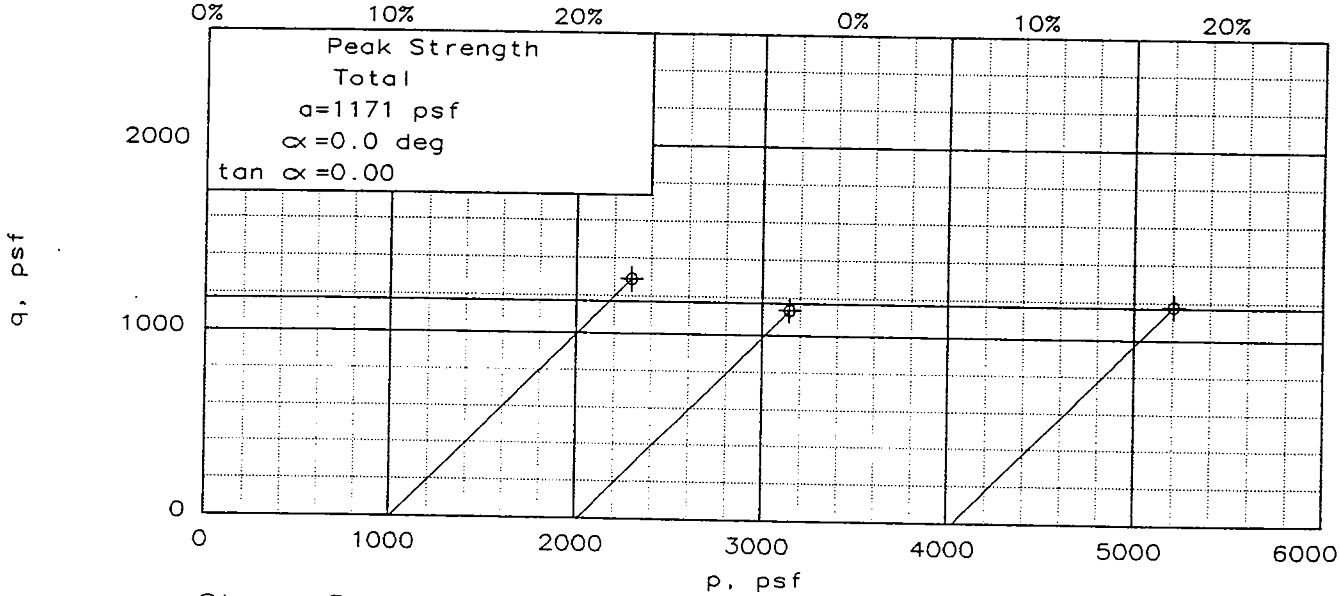
Eustis Engineering Company, Inc.











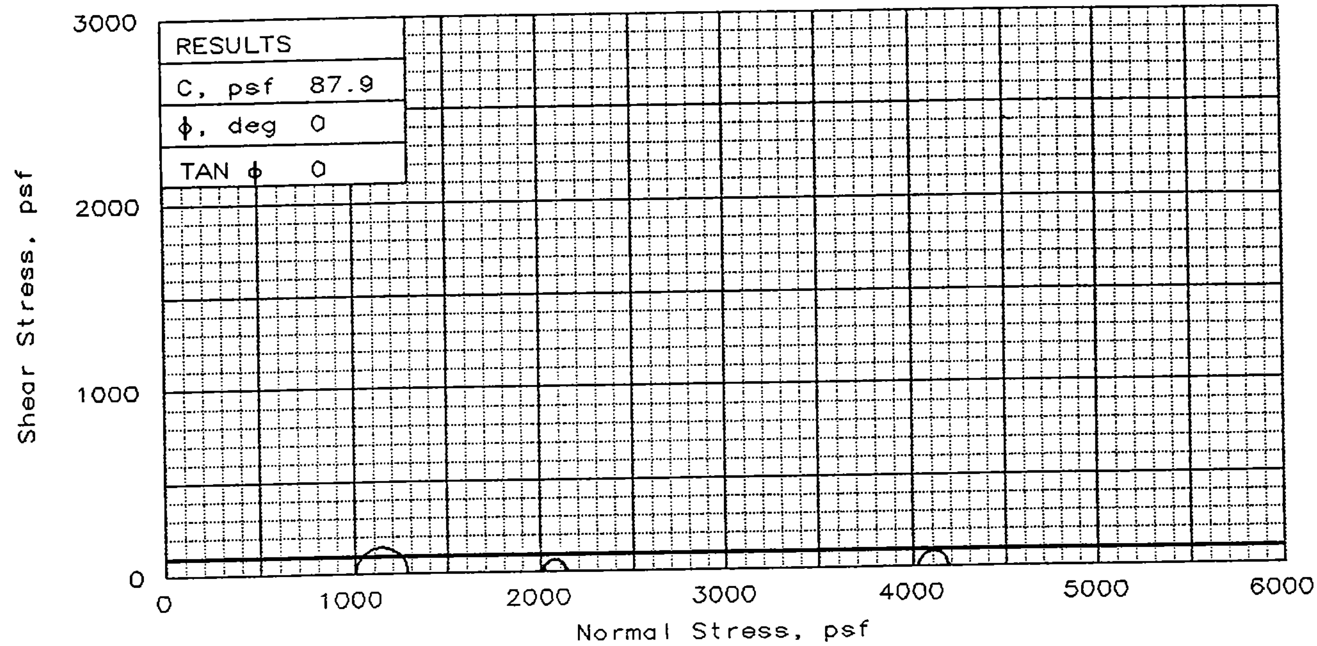
Stress Paths: + indicates end ○ indicates peak

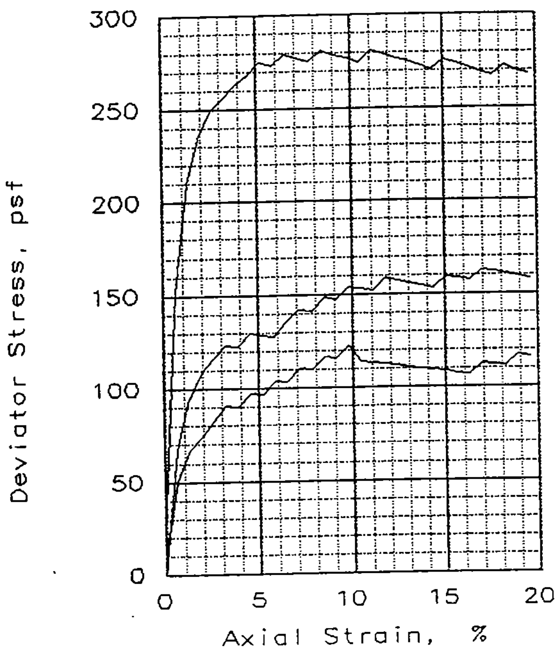
Client:

Project: WJLD

Location: Boring 1, Sample 18, Depth 68'-69'

File: UU-7163 Project No.: 14149 FIG. NO.: _____





SPECIMEN NO.:		1	2	3
INITIAL	WATER CONTENT, %	101.3	108.7	102.4
	DRY DENSITY, pcf	46.4	42.5	43.6
	SATURATION, %	103.4	98.4	96.1
	VOID RATIO	2.685	3.028	2.921
	DIAMETER, in	1.40	1.40	1.40
	HEIGHT, in	2.99	3.00	3.00
AT TEST	WATER CONTENT, %	97.9	111.1	107.2
	DRY DENSITY, pcf	46.4	42.3	43.5
	SATURATION, %	100.0	100.0	100.0
	VOID RATIO	2.683	3.045	2.937
	DIAMETER, in	1.40	1.40	1.40
	HEIGHT, in	2.99	2.99	2.99
Strain rate, in/min		0.1073	0.1041	0.1083
BACK PRESSURE, psf		0	0	0
CELL PRESSURE, psf		1008	2016	4032
FAILURE STRESS, psf		279	123	158
ULTIMATE STRESS, psf		268	116	158
σ_1 FAILURE, psf		1287	2139	4190
σ_3 FAILURE, psf		1008	2016	4032

TYPE OF TEST:
Unconsolidated Undrained

SAMPLE TYPE: Undisturbed

DESCRIPTION: Xso gray Clay w/ trace organic matter

SPECIFIC GRAVITY= 2.74

REMARKS:

FIG. NO.: ______

CLIENT:

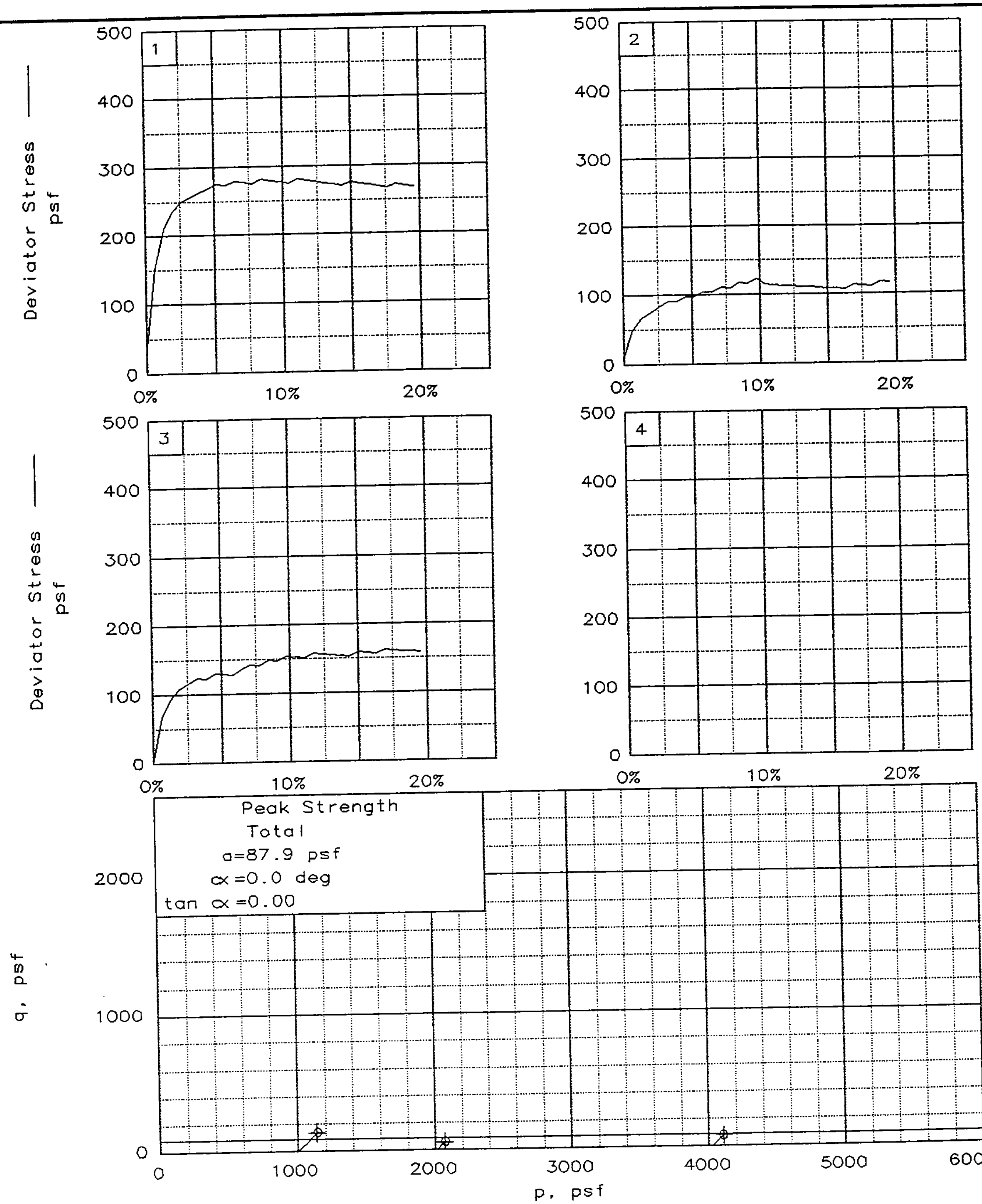
PROJECT: WJLD

SAMPLE LOCATION: Boring 2, Sample 5, Depth 11'-12'

PROJ. NO.: 14149 DATE: 7-15-96

TRIAXIAL SHEAR TEST REPORT

Eustis Engineering Company, Inc.



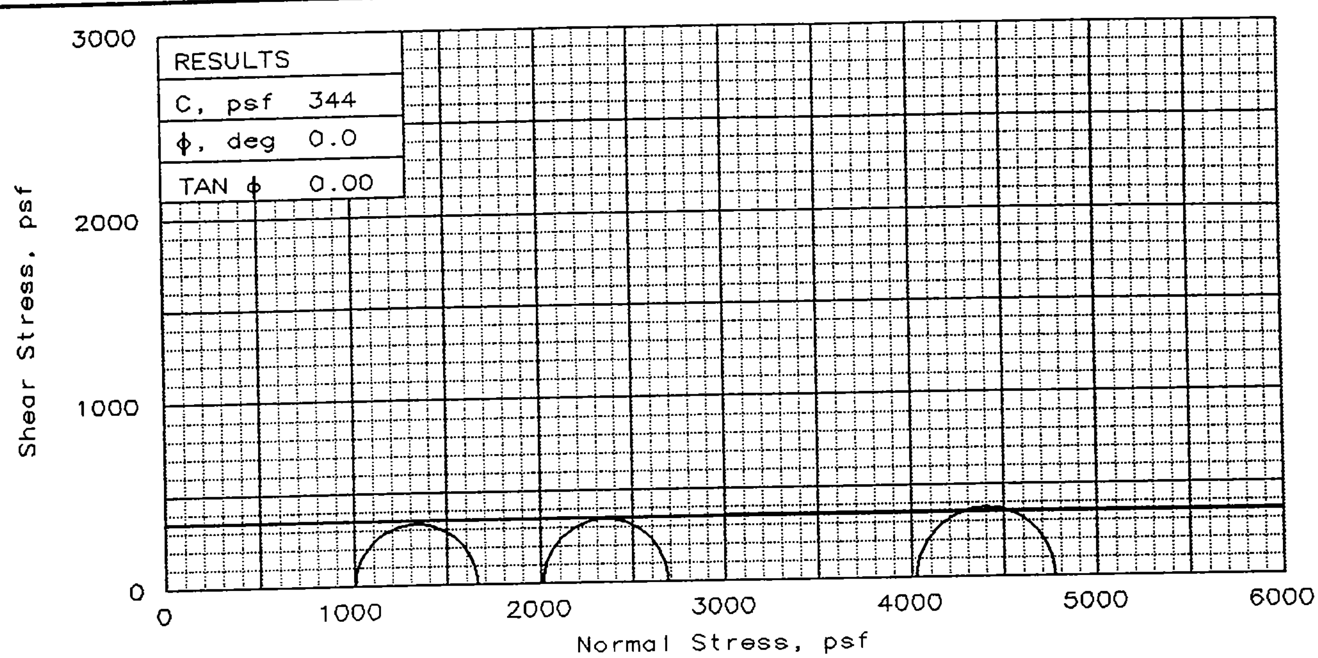
Stress Paths: + indicates end ○ indicates peak

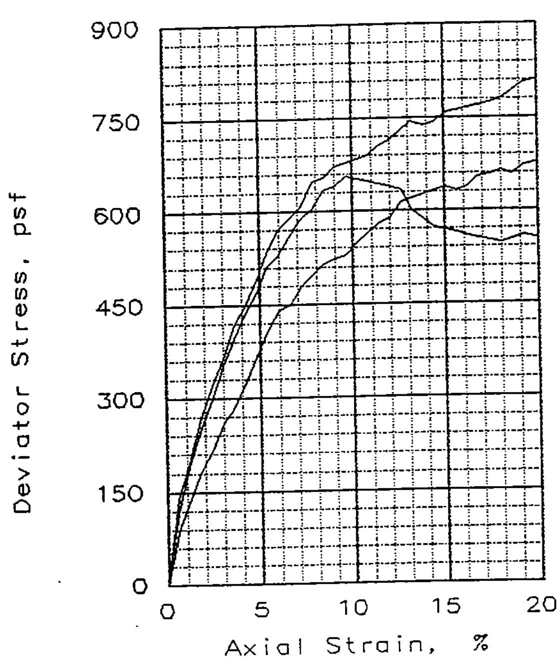
Client:

Project: WJLD

Location: Boring 2, Sample 5, Depth 11'-12'

File: UU-6960 Project No.: 14149 FIG. NO.: ____





SPECIMEN NO.:		1	2	3
INITIAL	WATER CONTENT, %	34.7	36.9	35.1
	DRY DENSITY, pcf	84.3	81.3	81.4
	SATURATION, %	94.9	94.0	89.5
	VOID RATIO	0.977	1.049	1.047
	DIAMETER, in	1.40	1.40	1.40
	HEIGHT, in	3.00	3.00	3.00
AT TEST	WATER CONTENT, %	36.8	39.9	39.7
	DRY DENSITY, pcf	84.0	80.7	80.9
	SATURATION, %	100.0	100.0	100.0
	VOID RATIO	0.984	1.065	1.061
	DIAMETER, in	1.40	1.40	1.40
	HEIGHT, in	2.99	2.99	2.99
Strain rate, in/min		0.0921	0.1015	0.1015
BACK PRESSURE, psf		0	0	0
CELL PRESSURE, psf		1008	2016	4032
FAILURE STRESS, psf		657	677	743
ULTIMATE STRESS, psf		554	677	808
σ_1 FAILURE, psf		1665	2693	4775
σ_3 FAILURE, psf		1008	2016	4032

TYPE OF TEST:
Unconsolidated Undrained

SAMPLE TYPE: Undisturbed

DESCRIPTION: Lo gray Clayey Silt w/ silty sand lay, rts

SPECIFIC GRAVITY= 2.67

REMARKS:

FIG. NO.: ______

CLIENT:

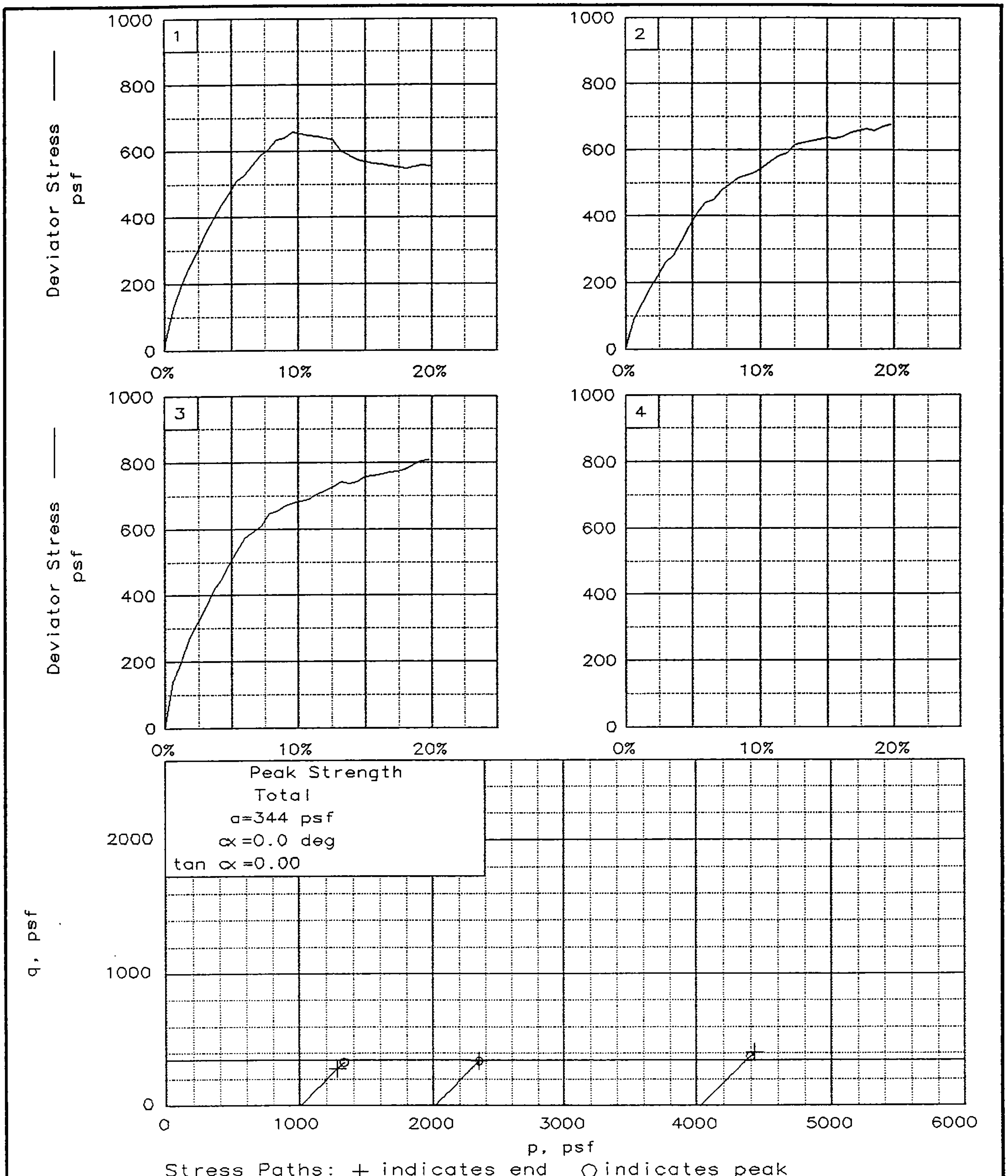
PROJECT: WJLD

SAMPLE LOCATION: Boring 2, Sample 9, Depth 28'-29'

PROJ. NO.: 14149 DATE: 7-15-96

TRIAXIAL SHEAR TEST REPORT

Eustis Engineering Company, Inc.

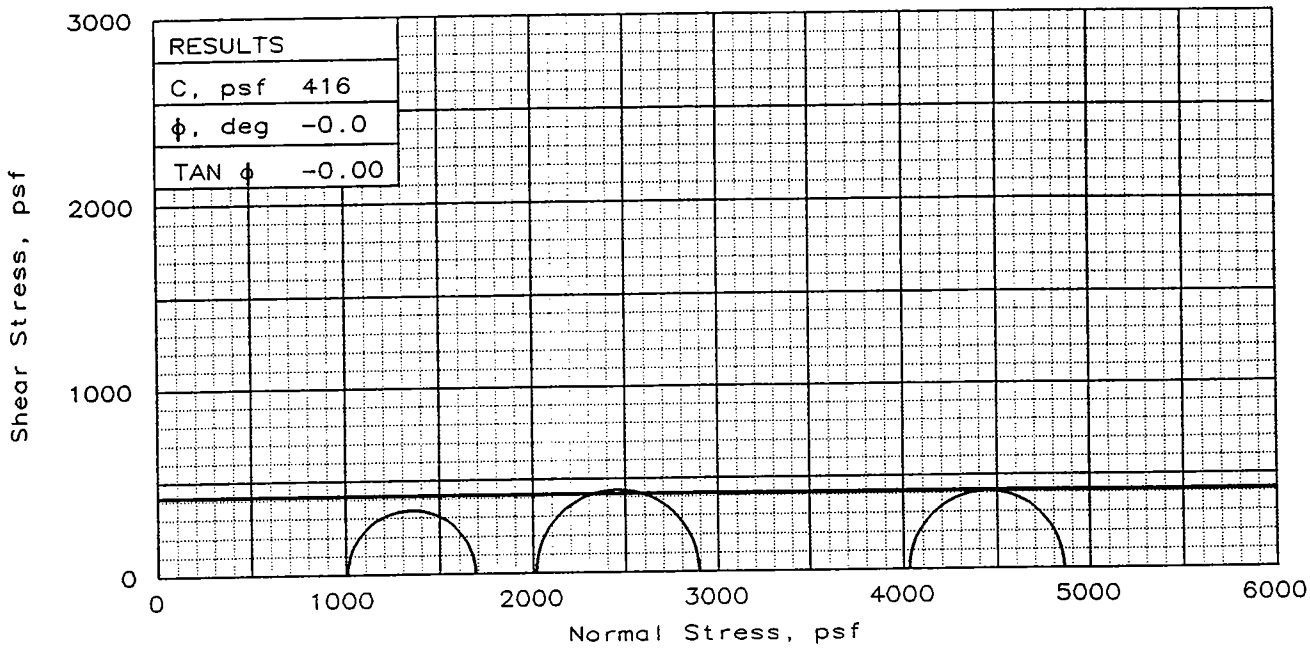


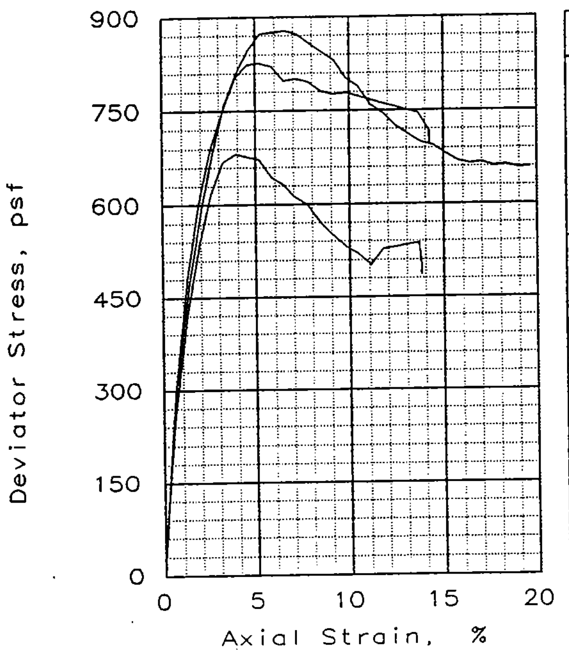
Client:

Project: WJLD

Location: Boring 2, Sample 9, Depth 28'-29'

File: UU-6961 Project No.: 14149 FIG. NO.: ____





SPECIMEN NO.:		1	2	3
INITIAL	WATER CONTENT, %	62.0	65.3	63.7
	DRY DENSITY, pcf	61.1	59.3	60.0
	SATURATION, %	94.5	94.8	94.3
	VOID RATIO	1.798	1.886	1.853
	DIAMETER, in	1.40	1.40	1.40
	HEIGHT, in	3.00	2.99	3.00
AT TEST	WATER CONTENT, %	66.0	69.1	68.1
	DRY DENSITY, pcf	60.9	59.1	59.7
	SATURATION, %	100.0	100.0	100.0
	VOID RATIO	1.809	1.892	1.865
	DIAMETER, in	1.40	1.40	1.40
	HEIGHT, in	2.99	2.99	2.99
Strain rate, in/min		0.1013	0.1053	0.1089
BACK PRESSURE, psf		0	0	0
CELL PRESSURE, psf		1008	2016	4032
FAILURE STRESS, psf		681	878	826
ULTIMATE STRESS, psf		486	659	696
σ_1 FAILURE, psf		1689	2894	4858
σ_3 FAILURE, psf		1008	2016	4032

TYPE OF TEST:
Unconsolidated Undrained

SAMPLE TYPE: Undisturbed

DESCRIPTION: So gray Clay

SPECIFIC GRAVITY= 2.74

REMARKS:

FIG. NO.: ______

CLIENT:

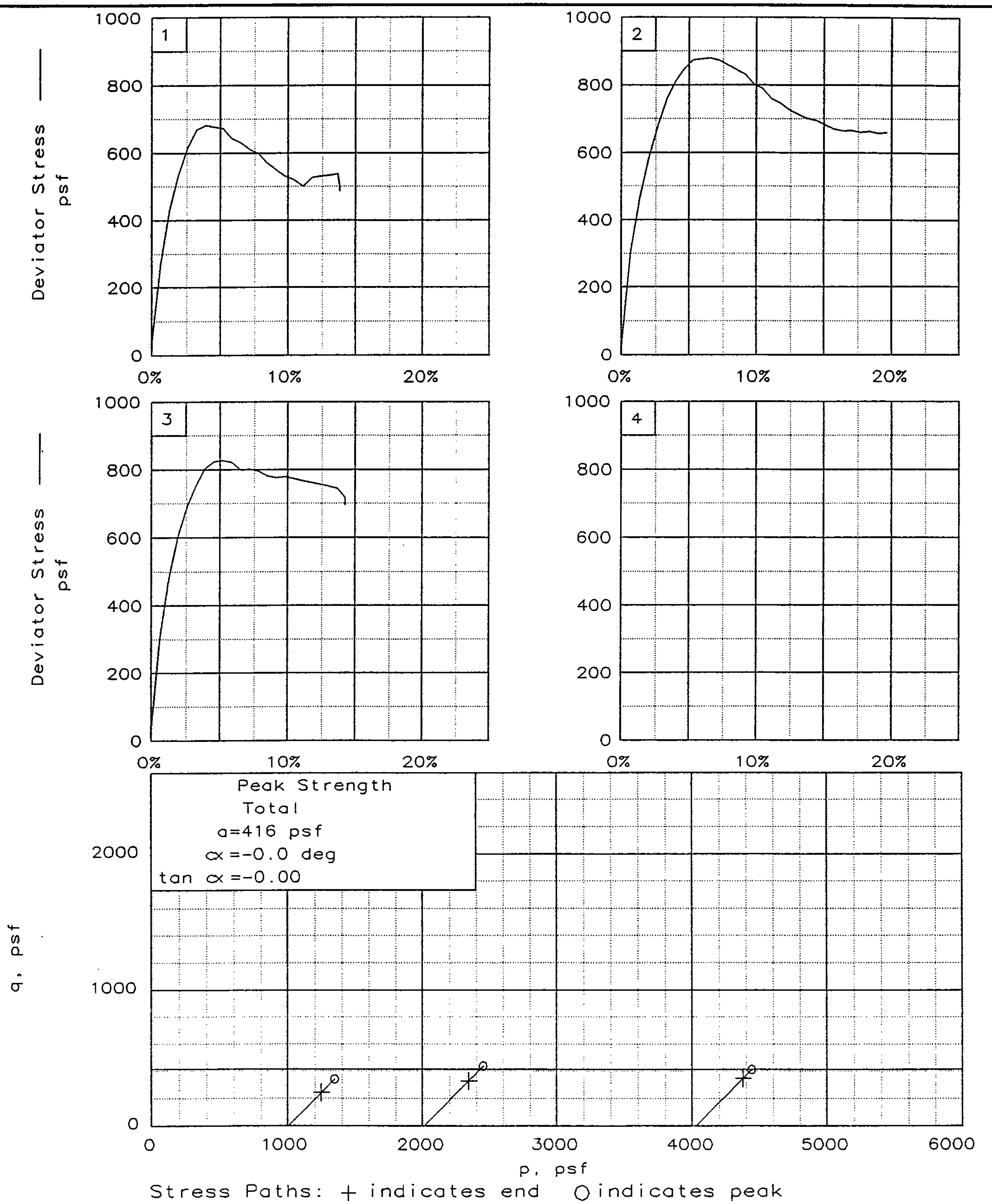
PROJECT: WJLD

SAMPLE LOCATION: Boring 2, Sample 13, Depth 48'-49'

PROJ. NO.: 14149 DATE: 7-15-96

TRIAXIAL SHEAR TEST REPORT

Eustis Engineering Company, Inc.

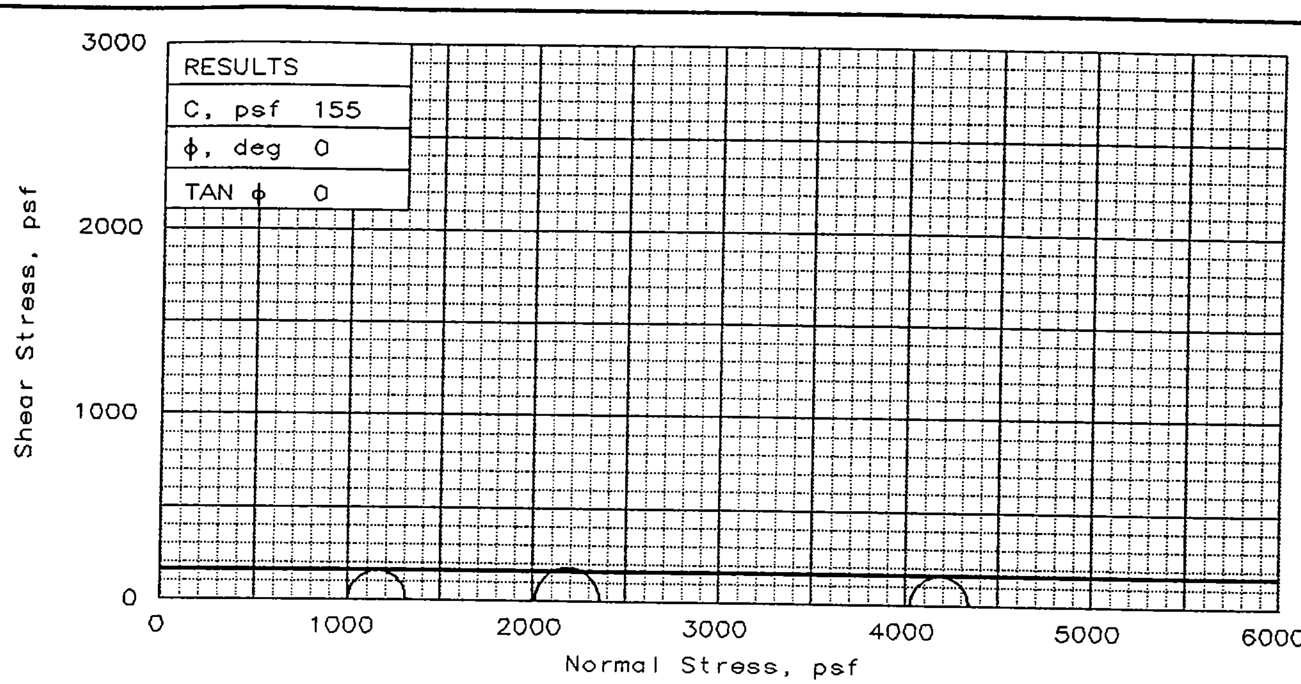


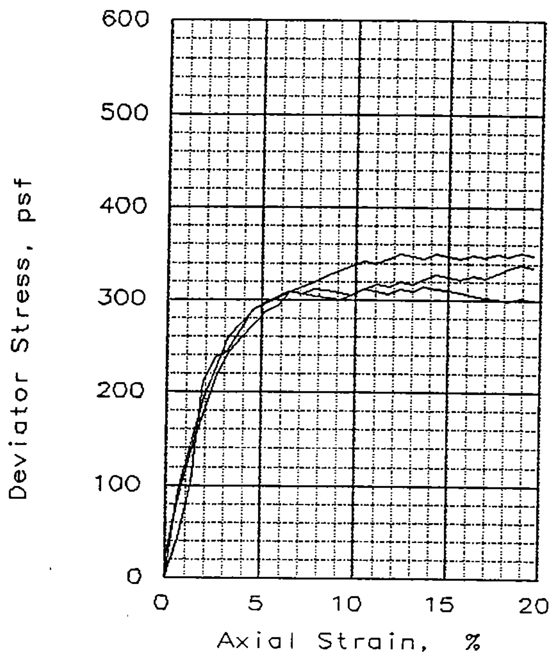
Client:

Project: WJLD

Location: Boring 2, Sample 13, Depth 48'-49'

File: UU-6962 Project No.: 14149 FIG. NO.: _____





SPECIMEN NO.:		1	2	3
INITIAL	WATER CONTENT, %	252.4	259.3	231.7
	DRY DENSITY, pcf	19.7	19.0	21.5
	SATURATION, %	89.9	88.8	91.1
	VOID RATIO	7.691	8.003	6.967
	DIAMETER, in	1.40	1.40	1.40
	HEIGHT, in	2.99	3.00	2.99
AT TEST	WATER CONTENT, %	280.9	294.7	254.4
	DRY DENSITY, pcf	19.7	18.9	21.5
	SATURATION, %	100.0	100.0	100.0
	VOID RATIO	7.696	8.074	6.970
	DIAMETER, in	1.40	1.40	1.40
	HEIGHT, in	2.99	2.99	2.99
Strain rate, in/min		0.1069	0.1124	0.1112
BACK PRESSURE, psf		0	0	0
CELL PRESSURE, psf		1008	2016	4032
FAILURE STRESS, psf		308	350	312
ULTIMATE STRESS, psf		335	349	300
σ_1 FAILURE, psf		1316	2366	4344
σ_3 FAILURE, psf		1008	2016	4032

TYPE OF TEST:
Unconsolidated Undrained

SAMPLE TYPE: Undisturbed

DESCRIPTION: Vso dark gray
Organic Clay w/ roots & wood

SPECIFIC GRAVITY= 2.74

REMARKS:

FIG. NO.: ______

CLIENT:

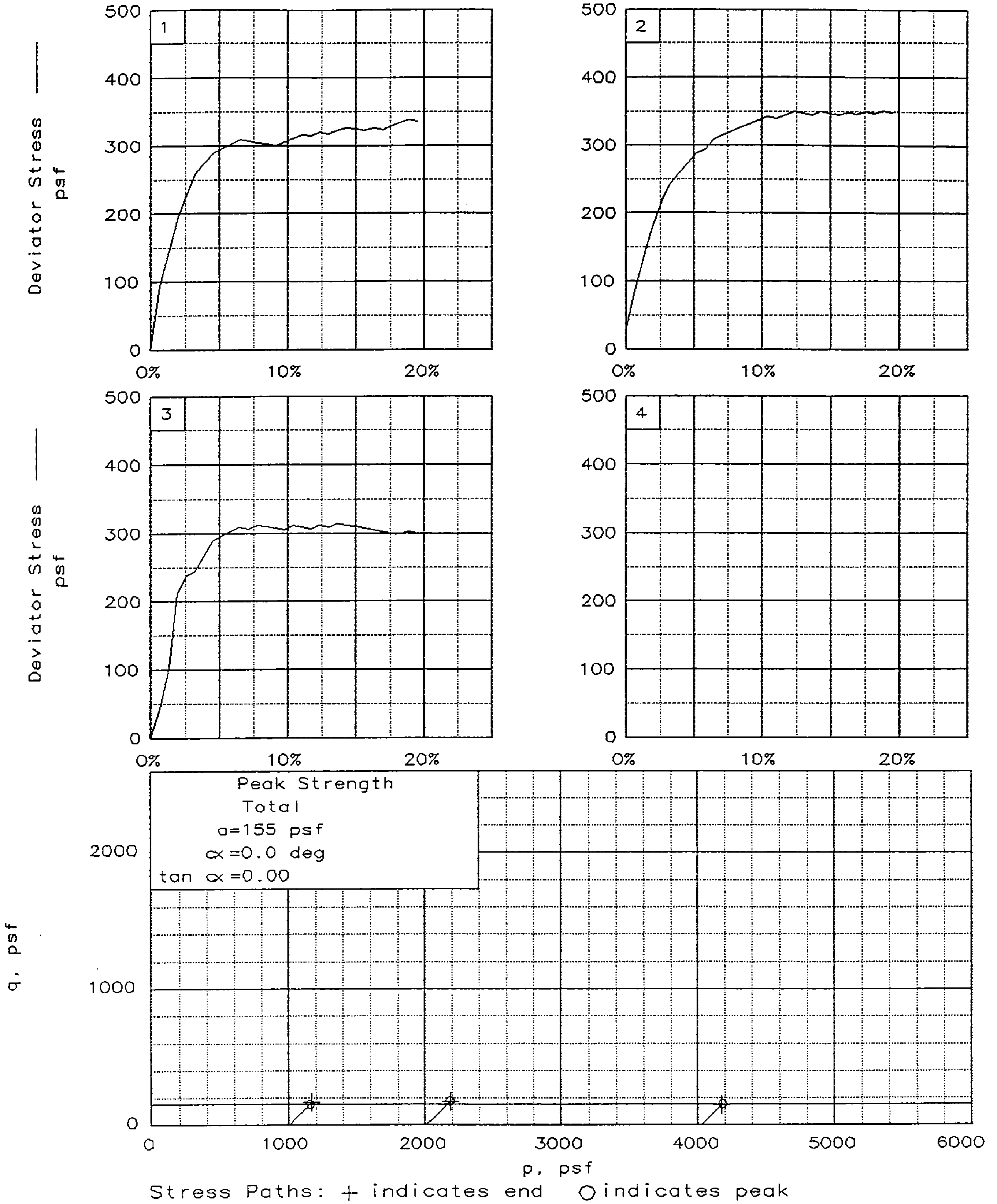
PROJECT: WJLD

SAMPLE LOCATION: Boring 3, Sample 2,
Depth 13'-14'

PROJ. NO.: 14149 DATE: 7-23-96

TRIAXIAL SHEAR TEST REPORT

Eustis Engineering Company, Inc.

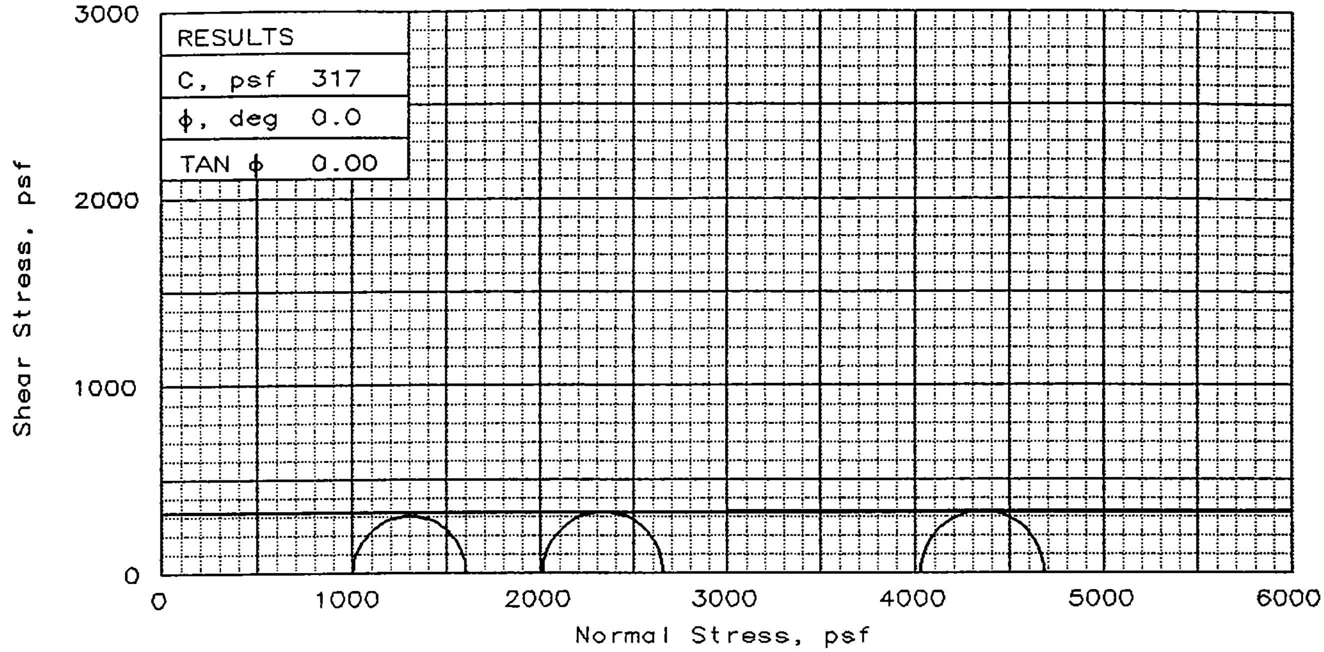


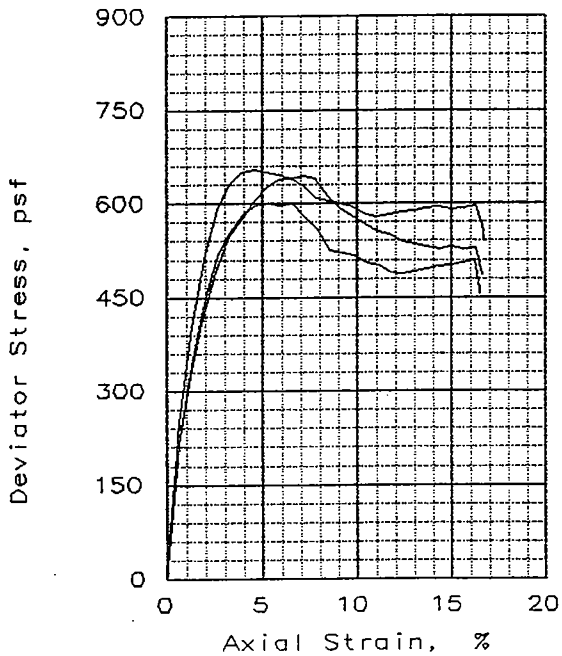
Client:

Project: WJLD

Location: Boring 3, Sample 2, Depth 13'-14'

File: UU-7091 Project No.: 14149 FIG. NO.: _____





SPECIMEN NO.:		1	2	3
INITIAL	WATER CONTENT, %	45.9	44.4	46.4
	DRY DENSITY, pcf	73.7	74.8	73.4
	SATURATION, %	95.3	94.7	95.6
	VOID RATIO	1.321	1.286	1.331
	DIAMETER, in	1.40	1.40	1.40
	HEIGHT, in	3.00	2.99	2.99
AT TEST	WATER CONTENT, %	48.9	46.4	48.7
	DRY DENSITY, pcf	73.1	75.3	73.3
	SATURATION, %	100.0	100.0	100.0
	VOID RATIO	1.339	1.271	1.334
	DIAMETER, in	1.40	1.40	1.40
	HEIGHT, in	2.99	2.99	2.99
Strain rate, in/min		0.1081	0.1101	0.1110
BACK PRESSURE, psf		0	0	0
CELL PRESSURE, psf		1008	2016	4032
FAILURE STRESS, psf		601	645	655
ULTIMATE STRESS, psf		456	485	543
σ_1 FAILURE, psf		1609	2661	4687
σ_3 FAILURE, psf		1008	2016	4032

TYPE OF TEST:
Unconsolidated Undrained
SAMPLE TYPE: Undisturbed
DESCRIPTION: So gray Clay w/ few sand lenses

SPECIFIC GRAVITY= 2.74
REMARKS:

FIG. NO.: ______

CLIENT:

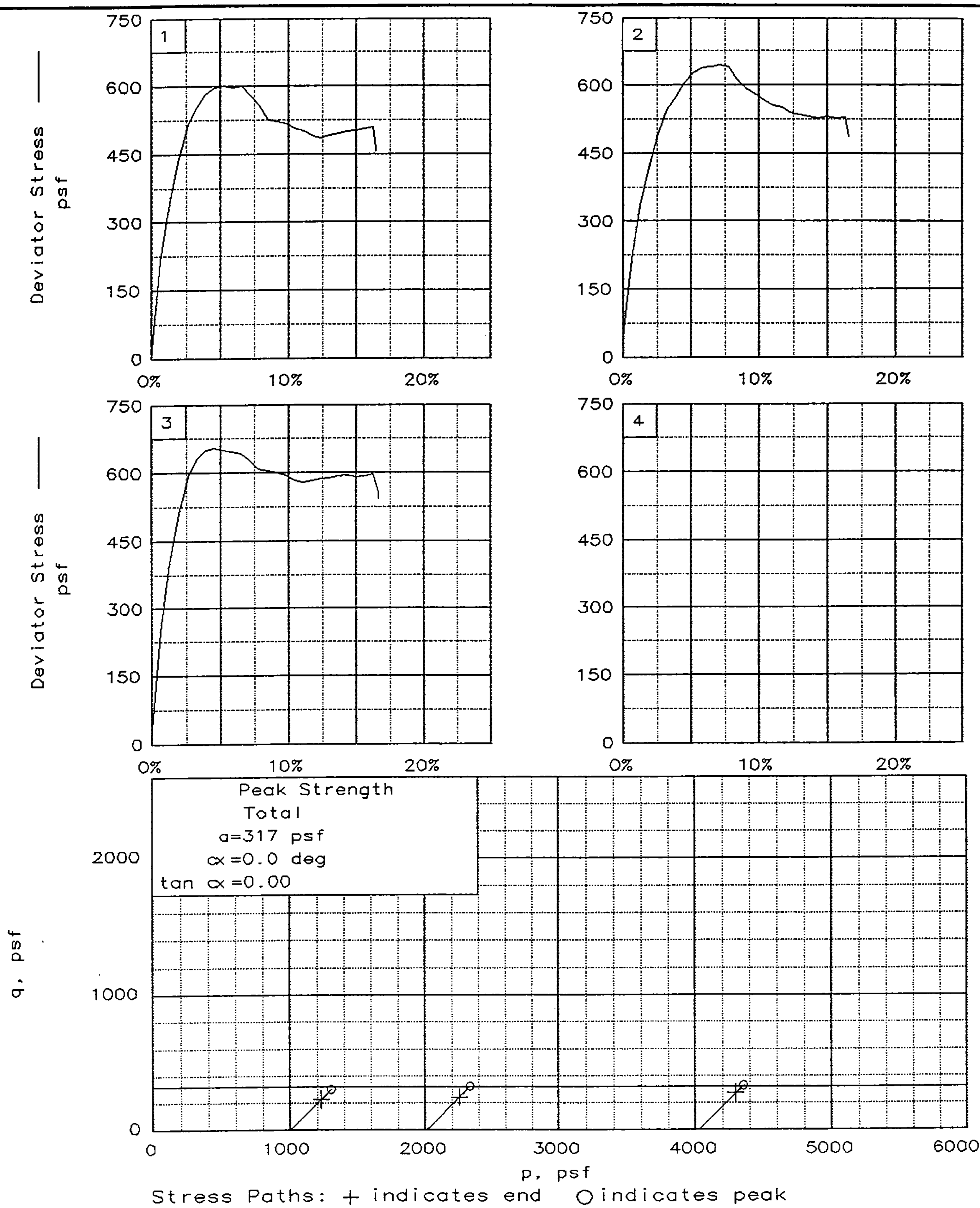
PROJECT: WJLD

SAMPLE LOCATION: Boring 3, Sample 7, Depth 33'-34'

PROJ. NO.: 14149 DATE: 7-24-96

TRIAXIAL SHEAR TEST REPORT

Eustis Engineering Company, Inc.

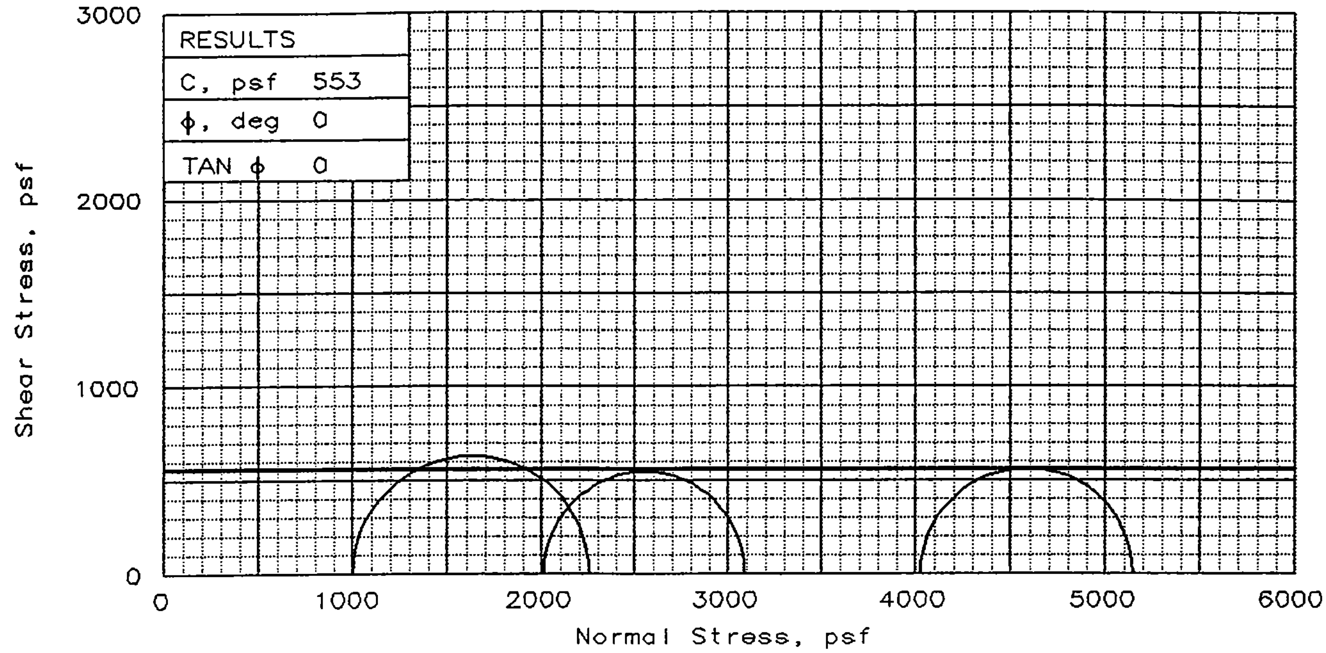


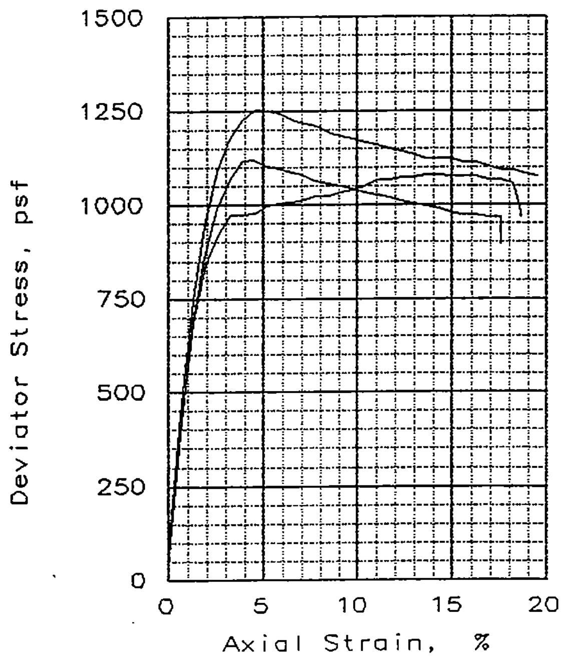
Client:

Project: WJLD

Location: Boring 3, Sample 7, Depth 33'-34'

File: UU-7095 Project No.: 14149 FIG. NO.: ______





SPECIMEN NO.:		1	2	3
INITIAL	WATER CONTENT, %	56.6	57.3	57.5
	DRY DENSITY, pcf	64.7	63.4	63.6
	SATURATION, %	94.4	92.5	93.1
	VOID RATIO	1.644	1.696	1.691
	DIAMETER, in	1.40	1.40	1.40
	HEIGHT, in	2.99	2.99	2.99
AT TEST	WATER CONTENT, %	60.3	61.6	62.0
	DRY DENSITY, pcf	64.5	63.6	63.4
	SATURATION, %	100.0	100.0	100.0
	VOID RATIO	1.652	1.689	1.698
	DIAMETER, in	1.40	1.40	1.40
	HEIGHT, in	2.99	2.99	2.99
Strain rate, in/min		0.1111	0.1117	0.1089
BACK PRESSURE, psf		0	0	0
CELL PRESSURE, psf		1008	2016	4032
FAILURE STRESS, psf		1251	1080	1119
ULTIMATE STRESS, psf		1076	967	894
σ_1 FAILURE, psf		2259	3096	5151
σ_3 FAILURE, psf		1008	2016	4032

TYPE OF TEST:
Unconsolidated Undrained

SAMPLE TYPE: Undisturbed

DESCRIPTION: Mst gray Clay

SPECIFIC GRAVITY= 2.74

REMARKS:

FIG. NO.: ______

CLIENT:

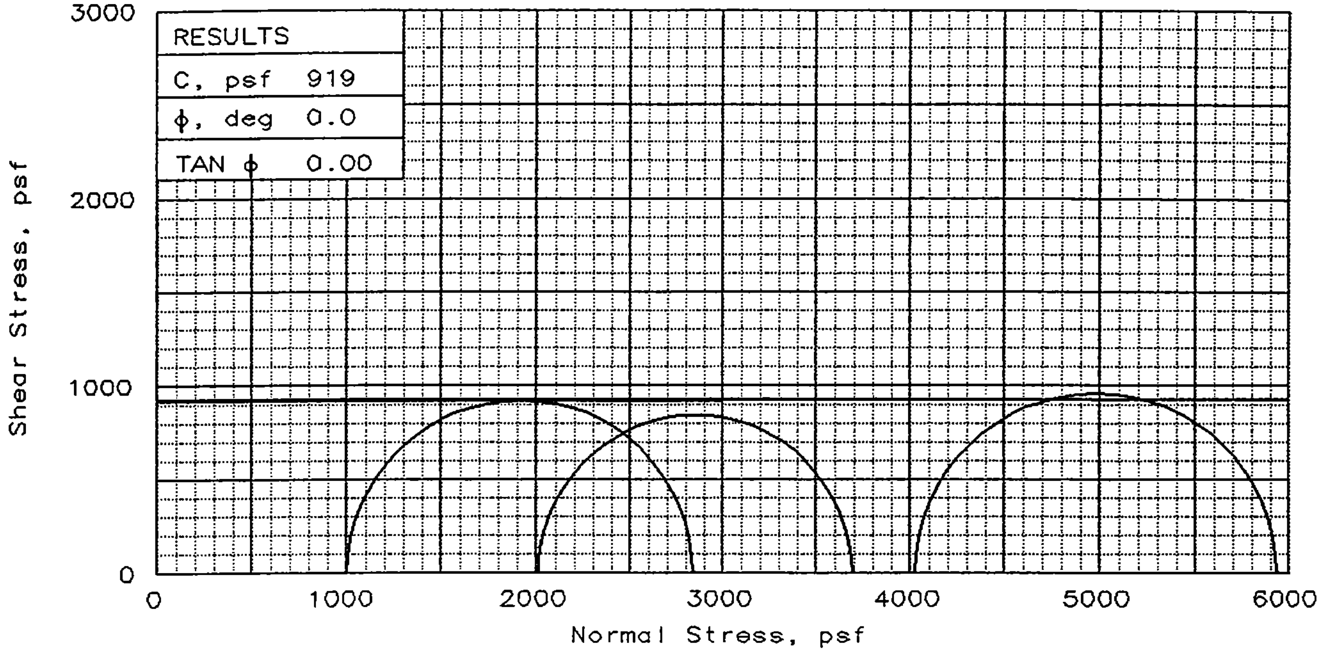
PROJECT: WJLD

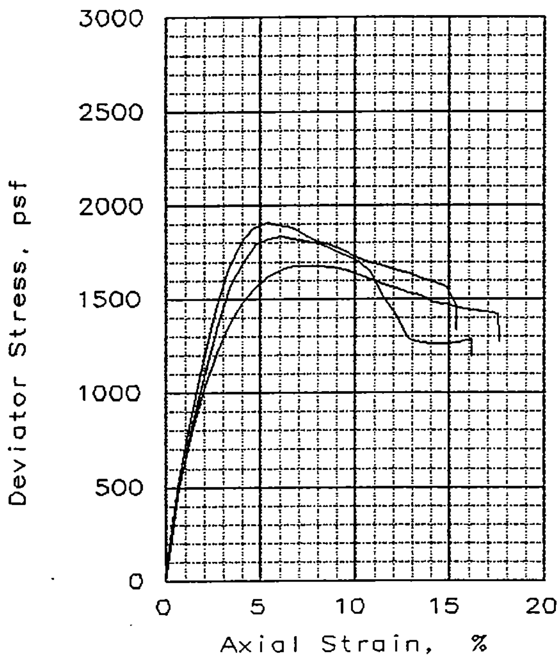
SAMPLE LOCATION: Boring 3, Sample 12, Depth 58'-59'

PROJ. NO.: 14149 DATE: 7-24-96

TRIAXIAL SHEAR TEST REPORT

Eustis Engineering Company, Inc.





SPECIMEN NO.:		1	2	3
INITIAL	WATER CONTENT, %	31.3	31.1	30.4
	DRY DENSITY, pcf	91.1	91.4	90.7
	SATURATION, %	98.7	98.8	94.9
	VOID RATIO	0.863	0.858	0.872
	DIAMETER, in	1.40	1.40	1.40
	HEIGHT, in	3.00	2.99	2.99
AT TEST	WATER CONTENT, %	32.0	31.4	31.9
	DRY DENSITY, pcf	90.8	91.5	90.9
	SATURATION, %	100.0	100.0	100.0
	VOID RATIO	0.869	0.855	0.869
	DIAMETER, in	1.40	1.40	1.40
	HEIGHT, in	2.99	2.99	2.99
Strain rate, in/min		0.1133	0.1021	0.0978
BACK PRESSURE, psf		0	0	0
CELL PRESSURE, psf		1008	2016	4032
FAILURE STRESS, psf		1835	1680	1908
ULTIMATE STRESS, psf		1193	1273	1330
σ_1 FAILURE, psf		2843	3696	5940
σ_3 FAILURE, psf		1008	2016	4032

TYPE OF TEST:
Unconsolidated Undrained
SAMPLE TYPE: Undisturbed
DESCRIPTION: Mst gray Clay w/ sand, few shell fragments

SPECIFIC GRAVITY= 2.72
REMARKS:

FIG. NO.: ______

CLIENT:

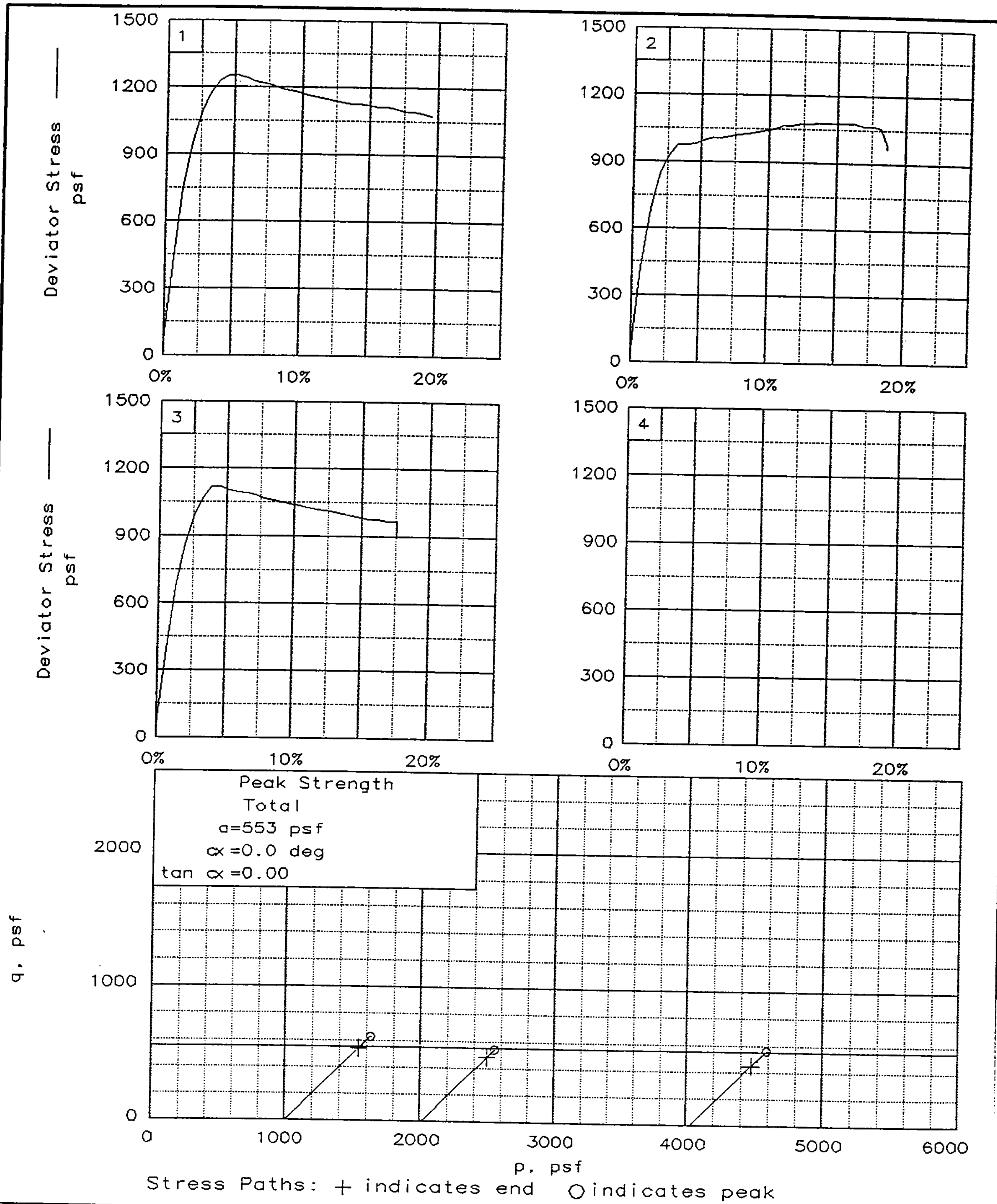
PROJECT: WJLD

SAMPLE LOCATION: Boring 3, Sample 21, Depth 93'-94'

PROJ. NO.: 14149 DATE: 7-24-96

TRIAXIAL SHEAR TEST REPORT

Eustis Engineering Company, Inc.



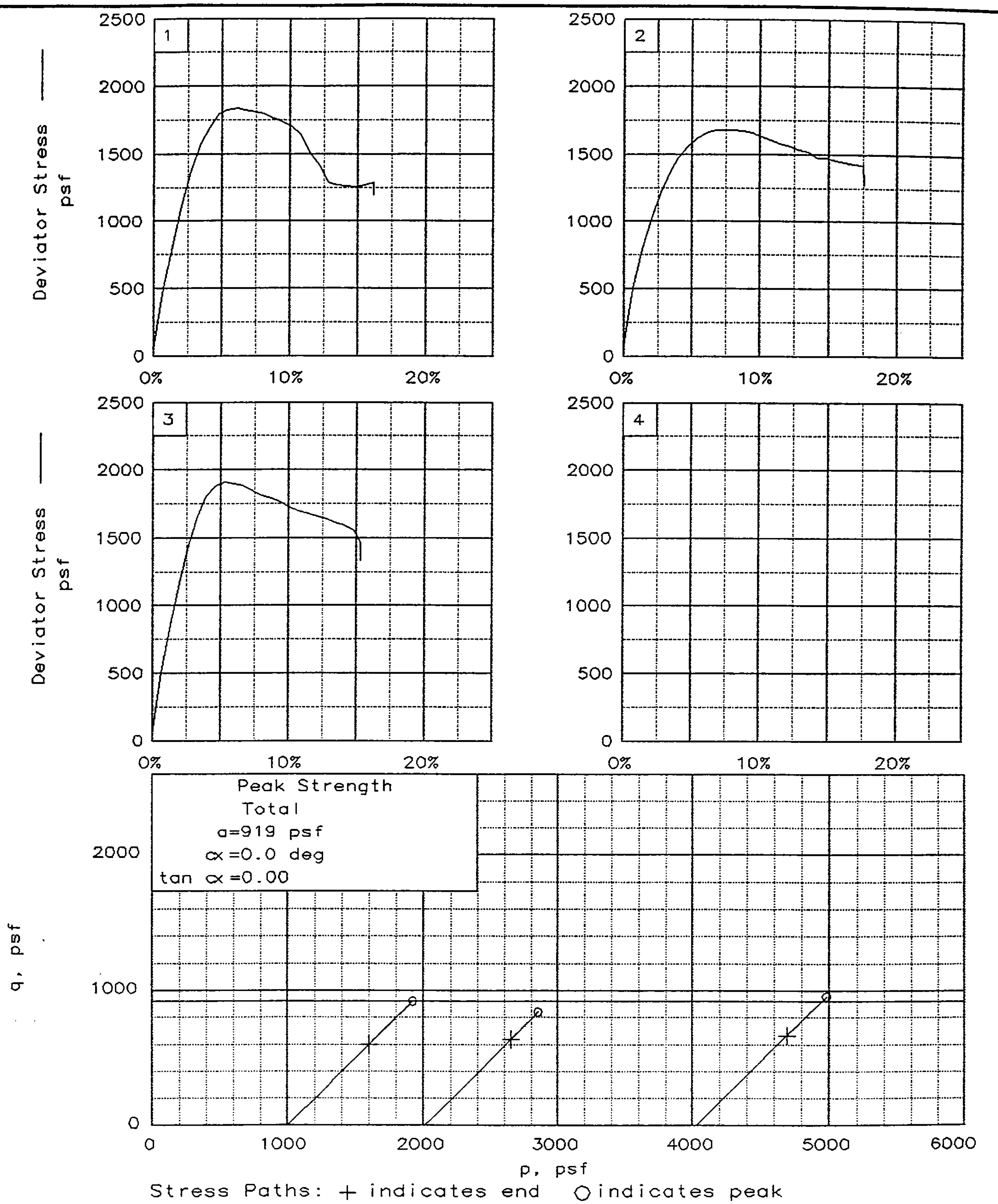
Client:

Project: WJLD

Location: Boring 3, Sample 12, Depth 58'-59'

File: UU-7096 Project No.: 14149

FIG. NO.: ____

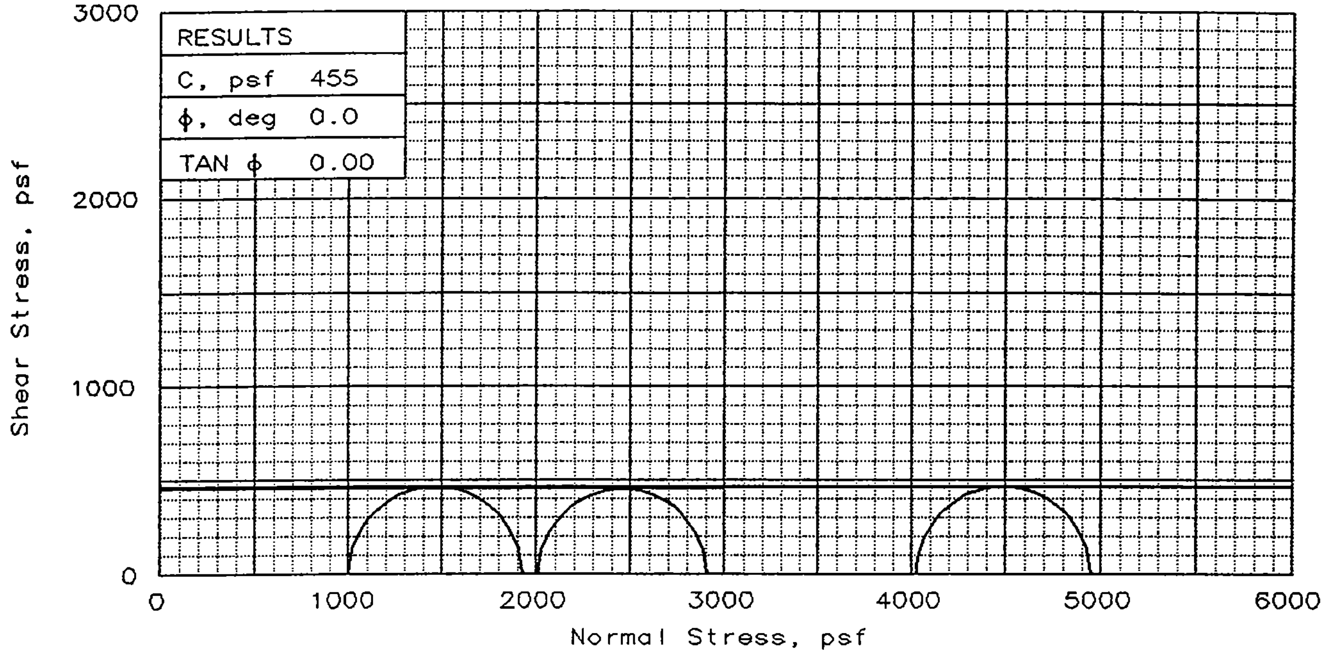


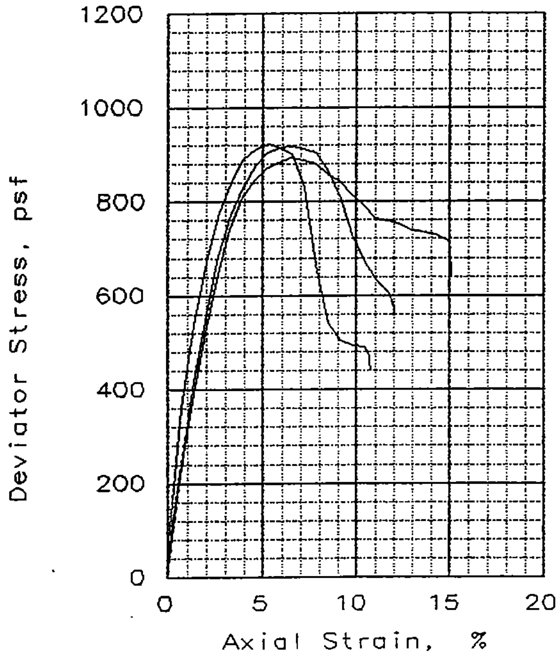
Client:

Project: WJLD

Location: Boring 3, Sample 21, Depth 93'-94'

File: UU-7097 Project No.: 14149 FIG. NO.: ____





SPECIMEN NO.:		1	2	3
INITIAL	WATER CONTENT, %	222.2	242.2	249.1
	DRY DENSITY, pcf	23.2	21.3	20.8
	SATURATION, %	95.4	94.5	94.7
	VOID RATIO	6.382	7.018	7.210
	DIAMETER, in	1.40	1.40	1.40
	HEIGHT, in	3.00	2.99	2.99
AT TEST	WATER CONTENT, %	235.4	256.5	262.0
	DRY DENSITY, pcf	23.0	21.3	20.9
	SATURATION, %	100.0	100.0	100.0
	VOID RATIO	6.450	7.029	7.180
	DIAMETER, in	1.40	1.40	1.40
	HEIGHT, in	2.99	2.99	2.99
Strain rate, in/min		0.0839	0.1030	0.1025
BACK PRESSURE, psf		0	0	0
CELL PRESSURE, psf		1008	2016	4032
FAILURE STRESS, psf		921	893	917
ULTIMATE STRESS, psf		442	641	557
σ_1 FAILURE, psf		1929	2909	4949
σ_3 FAILURE, psf		1008	2016	4032

TYPE OF TEST:
Unconsolidated Undrained

SAMPLE TYPE: Undisturbed

DESCRIPTION: So dark gray Clay w/ organic matter, roots

SPECIFIC GRAVITY= 2.74

REMARKS: Torvane = 0.250 tsf

FIG. NO.: ______

CLIENT:

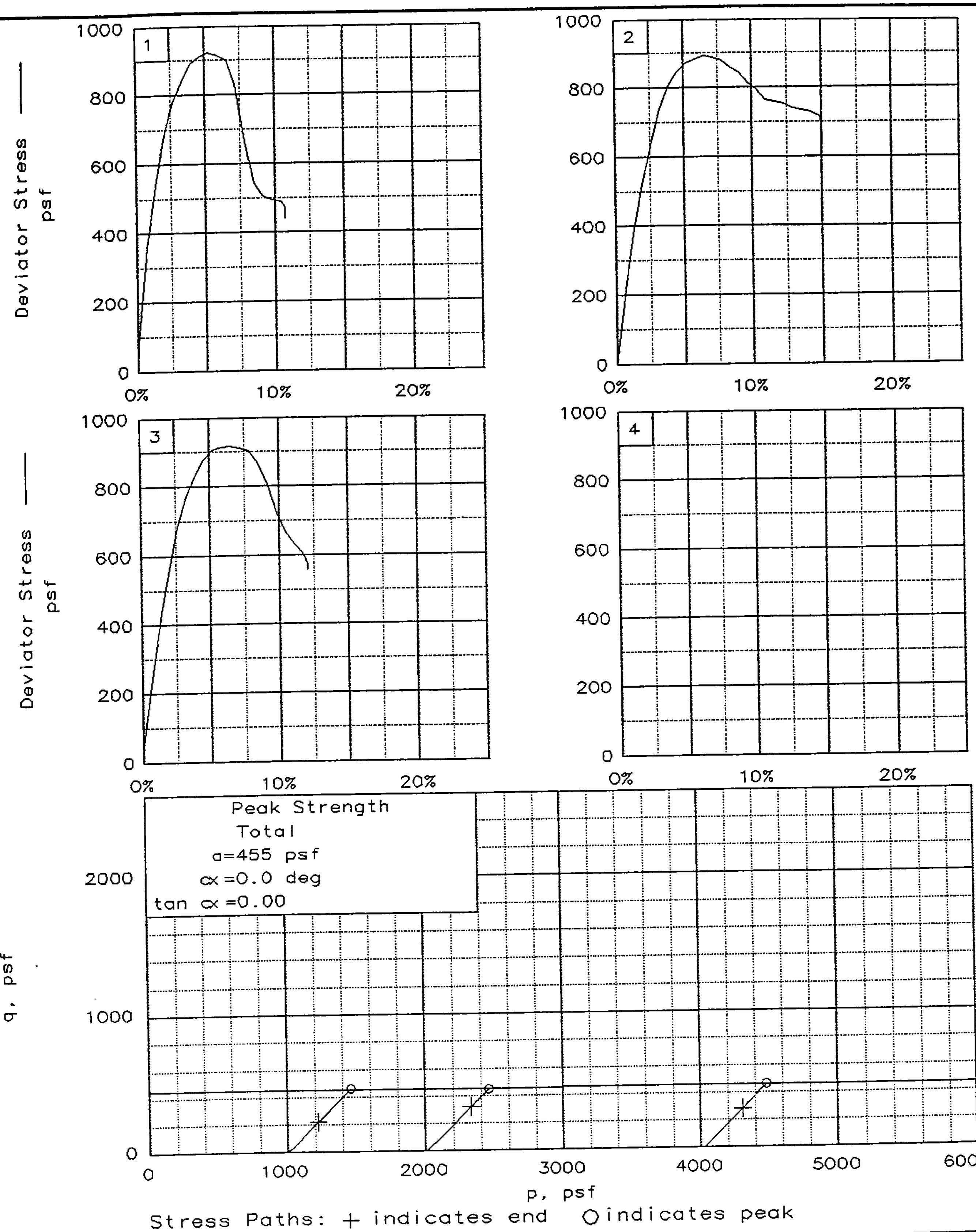
PROJECT: WJLD

SAMPLE LOCATION: Boring 4, Sample 6, Depth 14'-15'

PROJ. NO.: 14149 DATE: 7-18-96

TRIAXIAL SHEAR TEST REPORT

Eustis Engineering Company, Inc.

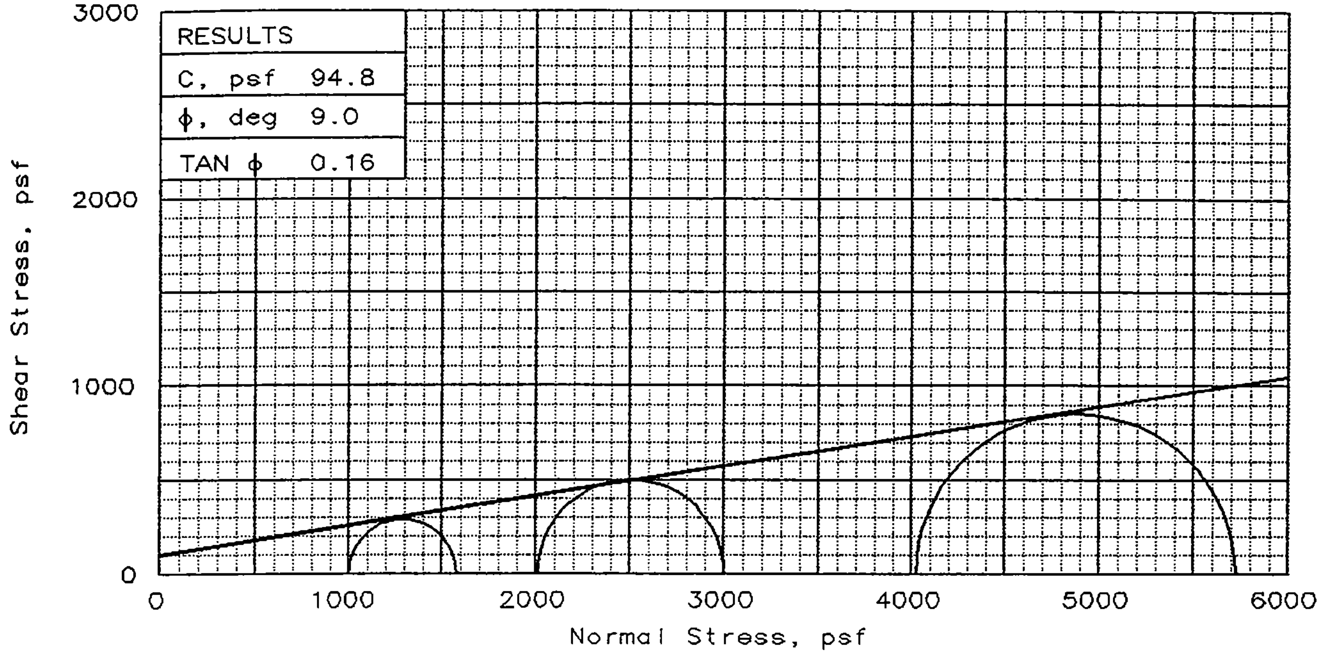


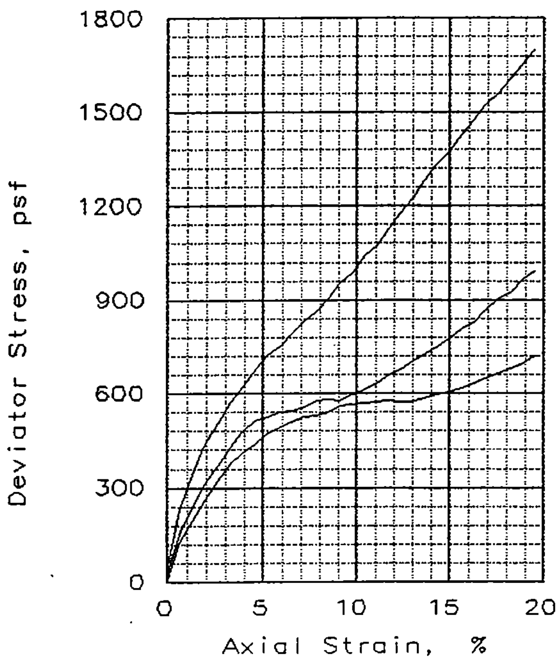
Client:

Project: WJLD

Location: Boring 4, Sample 6, Depth 14'-15'

File: UU-7019 Project No.: 14149 FIG. NO.: _____





SPECIMEN NO.:		1	2	3
INITIAL	WATER CONTENT, %	35.8	35.4	32.6
	DRY DENSITY, pcf	85.3	84.5	87.0
	SATURATION, %	99.2	96.1	93.8
	VOID RATIO	0.975	0.994	0.938
	DIAMETER, in	1.40	1.40	1.40
	HEIGHT, in	2.99	2.99	2.99
AT TEST	WATER CONTENT, %	36.3	37.0	34.7
	DRY DENSITY, pcf	85.2	84.3	87.0
	SATURATION, %	100.0	100.0	100.0
	VOID RATIO	0.979	1.000	0.938
	DIAMETER, in	1.40	1.40	1.40
	HEIGHT, in	2.99	2.99	2.99
Strain rate, in/min		0.1105	0.1042	0.1110
BACK PRESSURE, psf		0	0	0
CELL PRESSURE, psf		1008	2016	4032
FAILURE STRESS, psf		575	992	1698
ULTIMATE STRESS, psf		720	992	1698
σ_1 FAILURE, psf		1583	3008	5730
σ_3 FAILURE, psf		1008	2016	4032

TYPE OF TEST:
Unconsolidated Undrained

SAMPLE TYPE: Undisturbed

DESCRIPTION: Lo gray Clayey Sand w/ clay layer

SPECIFIC GRAVITY= 2.7

REMARKS:

FIG. NO.: ______

CLIENT:

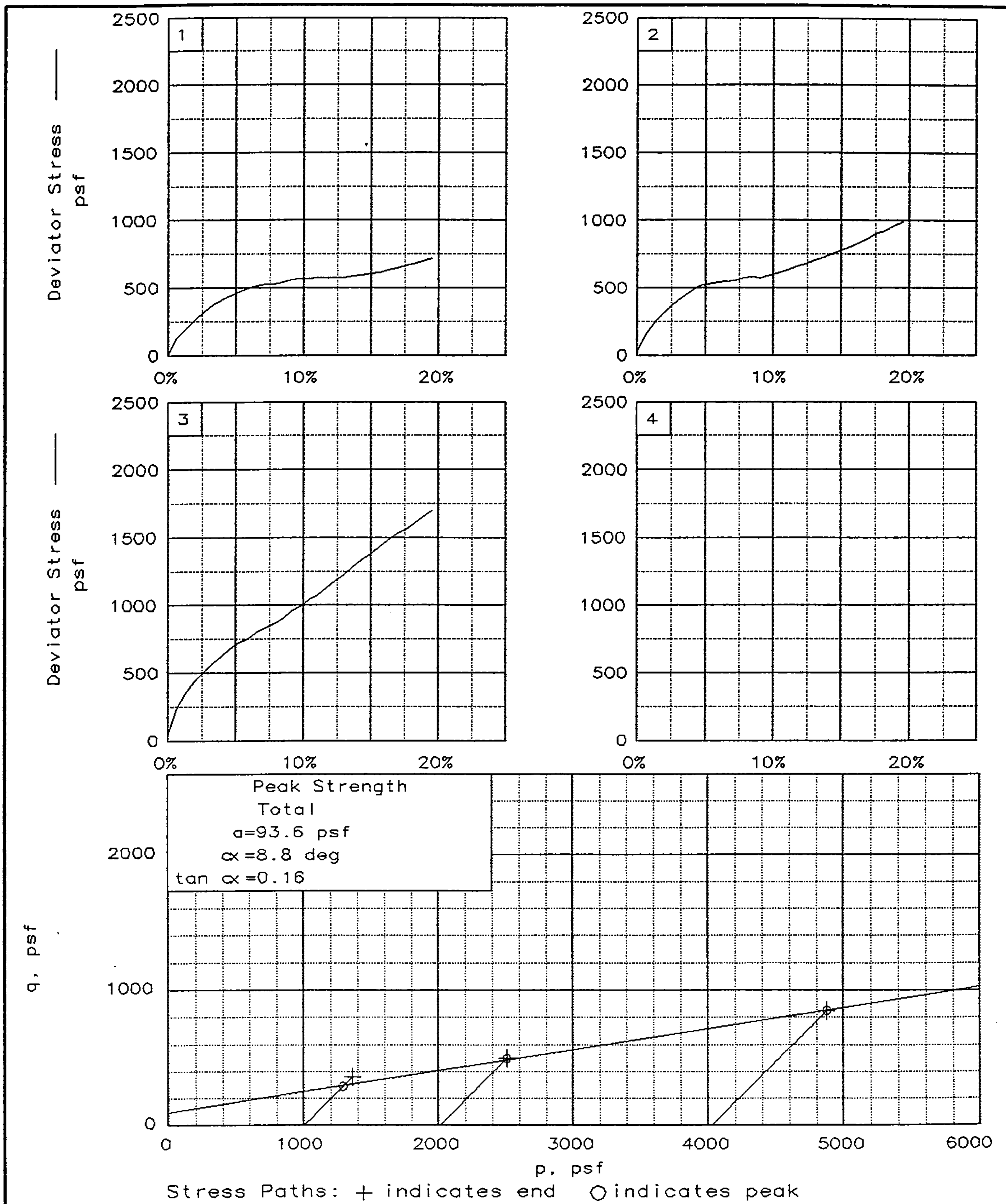
PROJECT: WJLD

SAMPLE LOCATION: Boring 4, Sample 8, Depth 23'-24'

PROJ. NO.: 14149 DATE: 7-18-96

TRIAXIAL SHEAR TEST REPORT

Eustis Engineering Company, Inc.

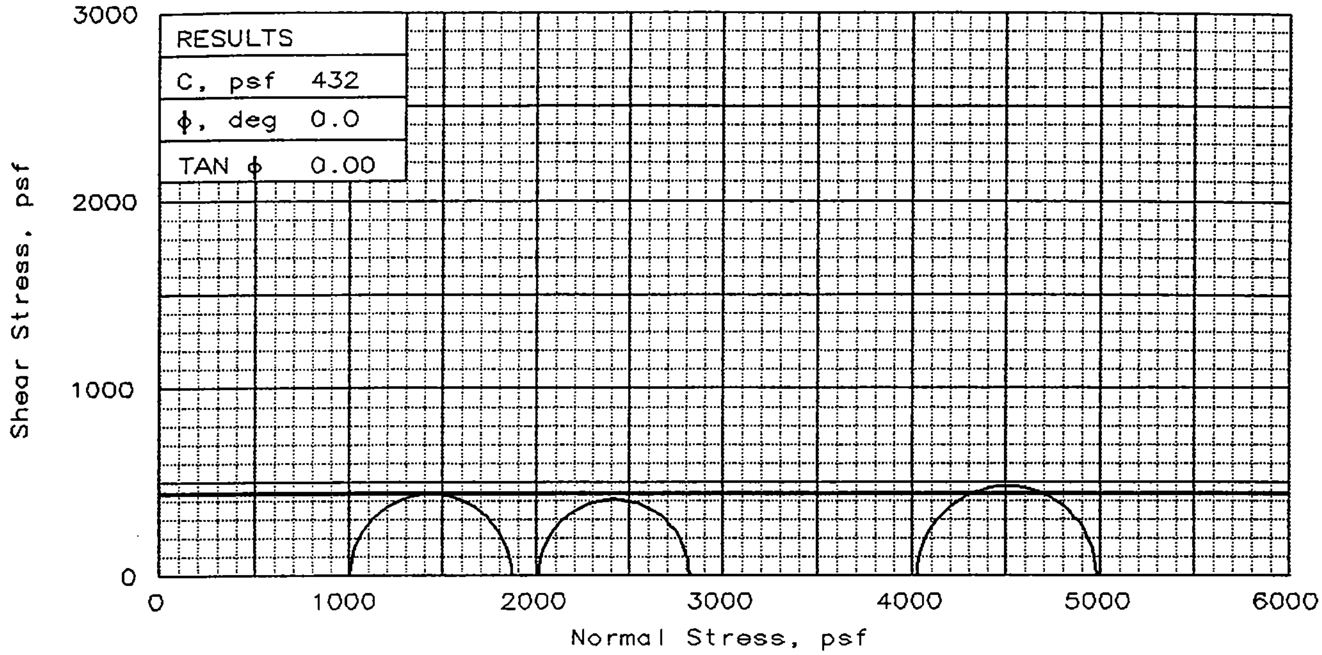


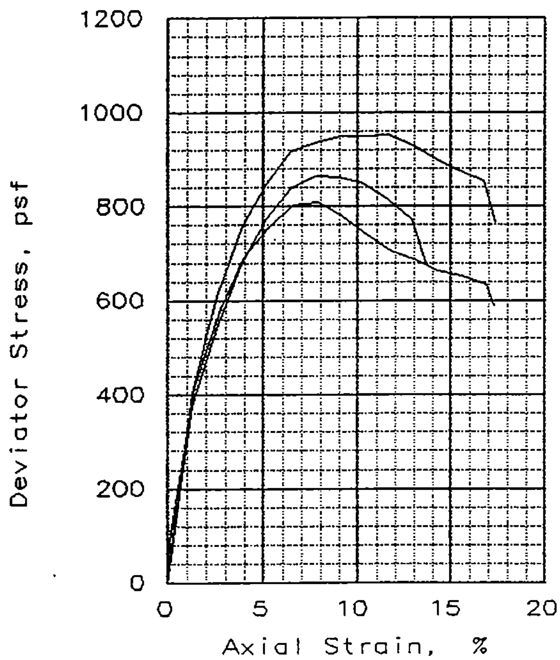
Client:

Project: WJLD

Location: Boring 4, Sample 8, Depth 23'-24'

File: UU-7020 Project No.: 14149 FIG. NO.: _____





SPECIMEN NO.:		1	2	3
INITIAL	WATER CONTENT, %	55.2	56.2	56.3
	DRY DENSITY, pcf	65.3	64.7	64.0
	SATURATION, %	93.4	93.7	92.3
	VOID RATIO	1.618	1.643	1.672
	DIAMETER, in	1.40	1.40	1.40
	HEIGHT, in	2.98	2.99	2.99
AT TEST	WATER CONTENT, %	57.8	59.5	61.1
	DRY DENSITY, pcf	66.2	65.0	64.0
	SATURATION, %	100.0	100.0	100.0
	VOID RATIO	1.583	1.631	1.674
	DIAMETER, in	1.40	1.40	1.40
	HEIGHT, in	2.99	2.99	2.99
Strain rate, in/min		0.2067	0.2089	0.2098
BACK PRESSURE, psf		0	0	0
CELL PRESSURE, psf		1008	2016	4032
FAILURE STRESS, psf		865	808	952
ULTIMATE STRESS, psf		674	588	767
σ_1 FAILURE, psf		1873	2824	4984
σ_3 FAILURE, psf		1008	2016	4032

TYPE OF TEST:
Unconsolidated Undrained

SAMPLE TYPE: Undisturbed

DESCRIPTION: So gray Clay

SPECIFIC GRAVITY= 2.74

REMARKS:

FIG. NO.: ______

CLIENT:

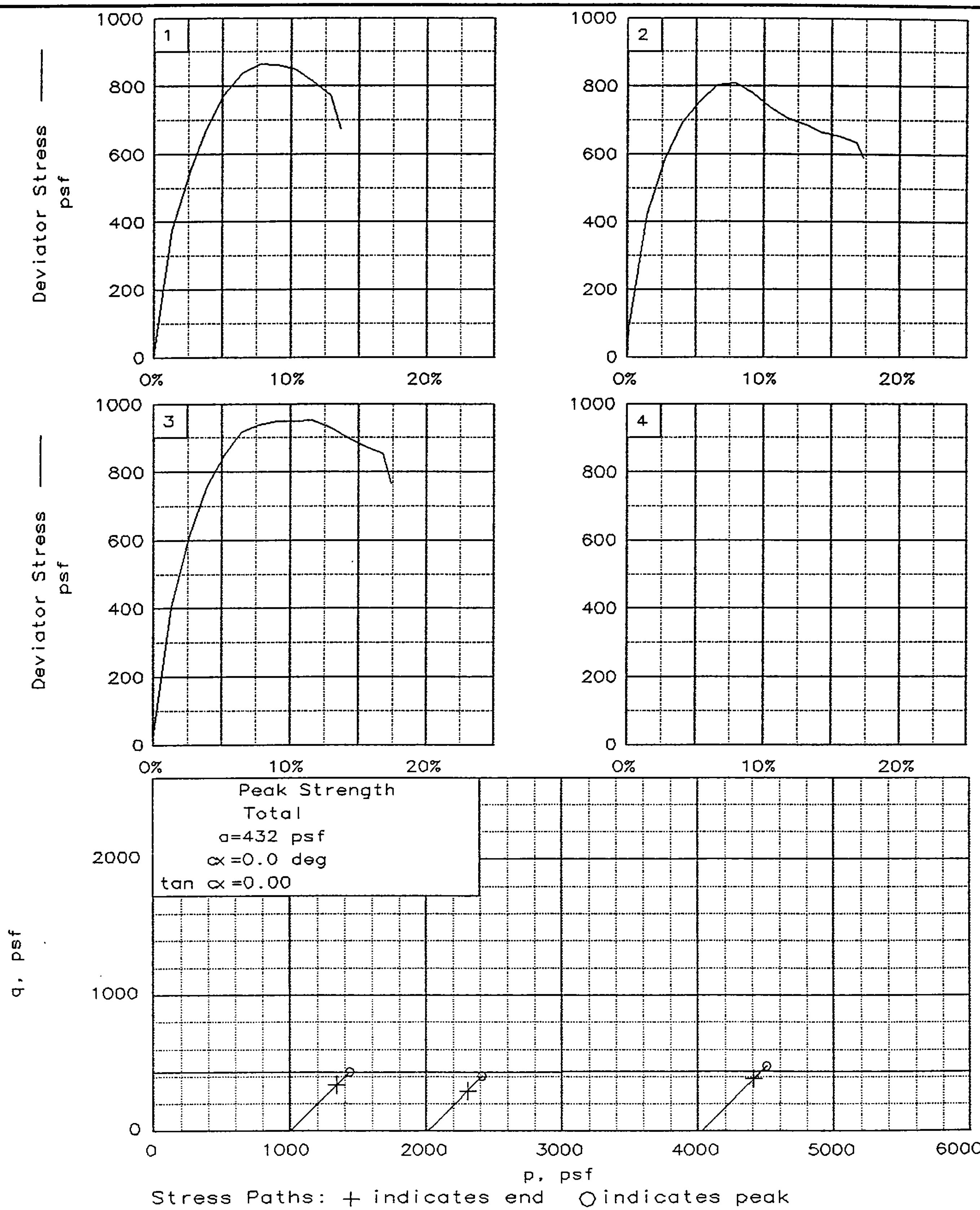
PROJECT: WJLD

SAMPLE LOCATION: Boring 4, Sample 12, Depth 43'-44'

PROJ. NO.: 14149 DATE: 7-18-96

TRIAXIAL SHEAR TEST REPORT

Eustis Engineering Company, Inc.

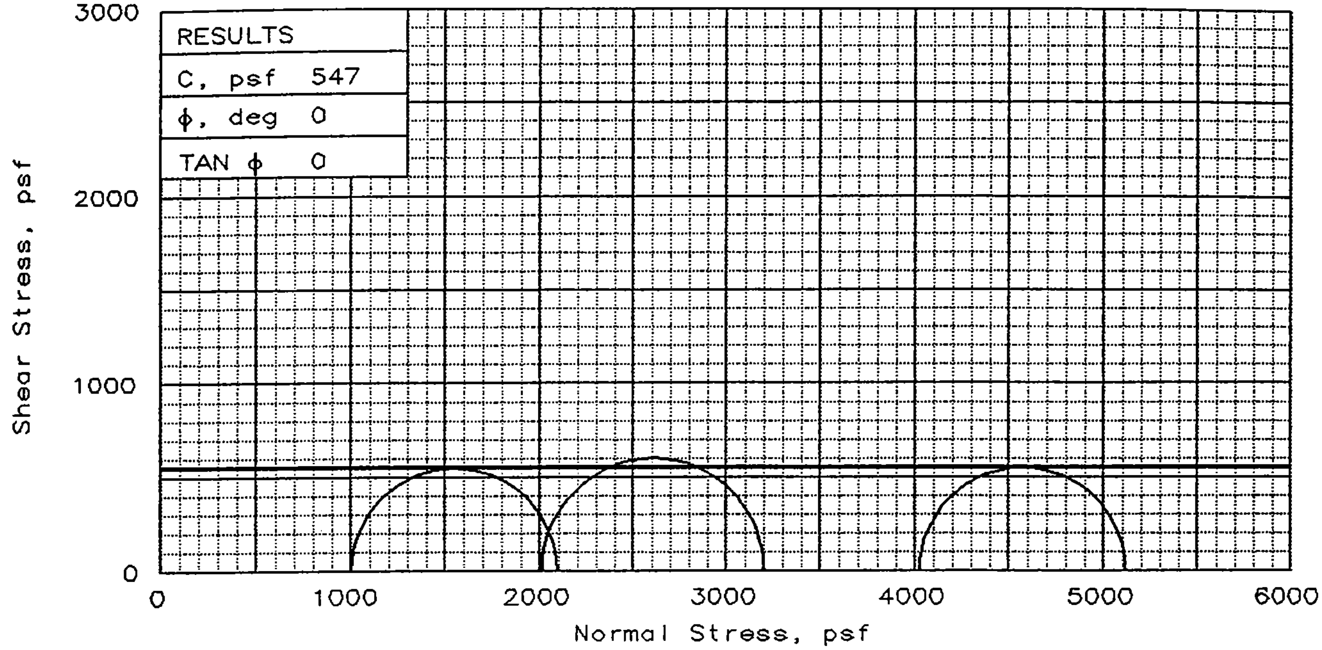


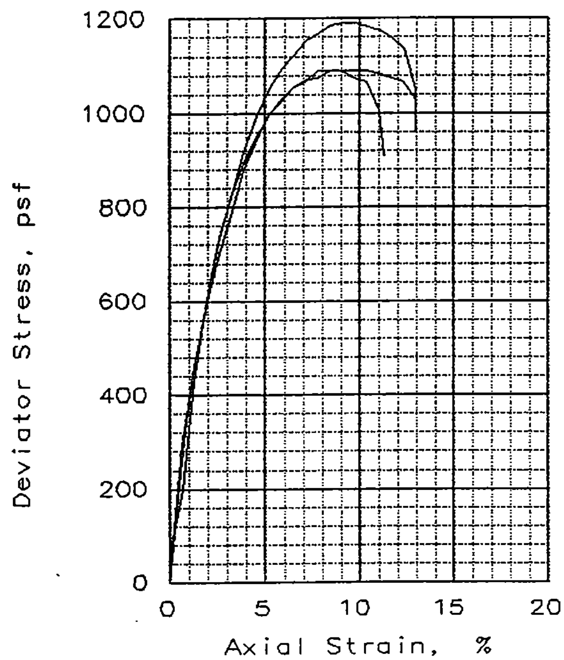
Client:

Project: WJLD

Location: Boring 4, Sample 12, Depth 43'-44'

File: UU-7021 Project No.: 14149 FIG. NO.: _____





SPECIMEN NO.:		1	2	3
INITIAL	WATER CONTENT, %	60.2	59.4	58.9
	DRY DENSITY, pcf	62.7	62.4	62.3
	SATURATION, %	95.3	93.6	92.5
	VOID RATIO	1.730	1.740	1.745
	DIAMETER, in	1.40	1.40	1.40
	HEIGHT, in	2.99	2.99	2.97
AT TEST	WATER CONTENT, %	62.8	63.7	61.1
	DRY DENSITY, pcf	62.9	62.3	64.0
	SATURATION, %	100.0	100.0	100.0
	VOID RATIO	1.720	1.746	1.673
	DIAMETER, in	1.40	1.40	1.40
	HEIGHT, in	2.99	2.99	2.99
Strain rate, in/min		0.1100	0.1104	0.1100
BACK PRESSURE, psf		0	0	0
CELL PRESSURE, psf		1008	2016	4032
FAILURE STRESS, psf		1089	1192	1090
ULTIMATE STRESS, psf		908	1028	959
σ_1 FAILURE, psf		2097	3208	5122
σ_3 FAILURE, psf		1008	2016	4032

TYPE OF TEST:
Unconsolidated Undrained
SAMPLE TYPE: Undisturbed
DESCRIPTION: Mst gray Clay

SPECIFIC GRAVITY= 2.74
REMARKS:

FIG. NO.: ______

CLIENT:

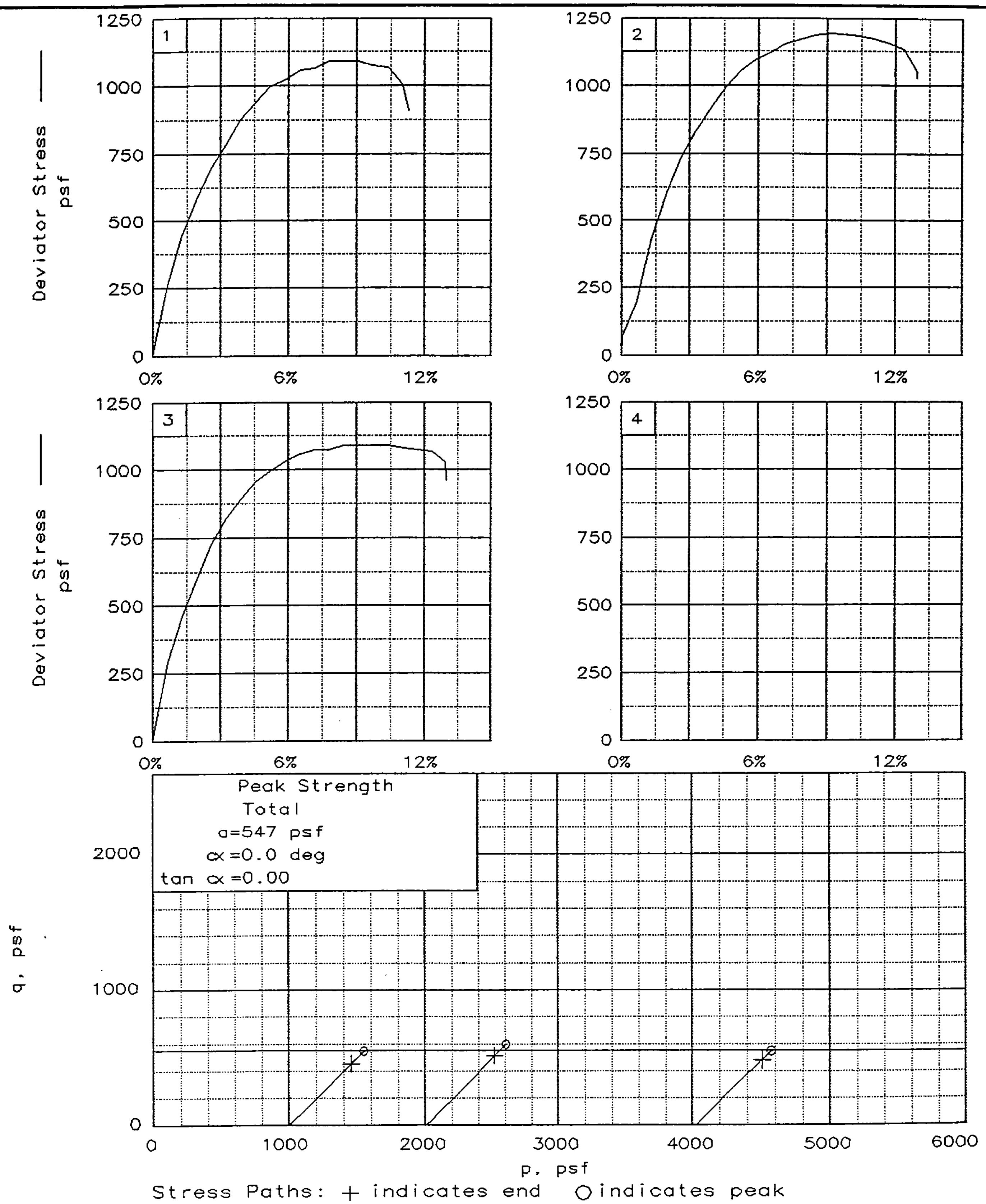
PROJECT: WJLD

SAMPLE LOCATION: Boring 4, Sample 14, Depth 53'-54'

PROJ. NO.: 14149 DATE: 7-18-96

TRIAXIAL SHEAR TEST REPORT

Eustis Engineering Company, Inc.

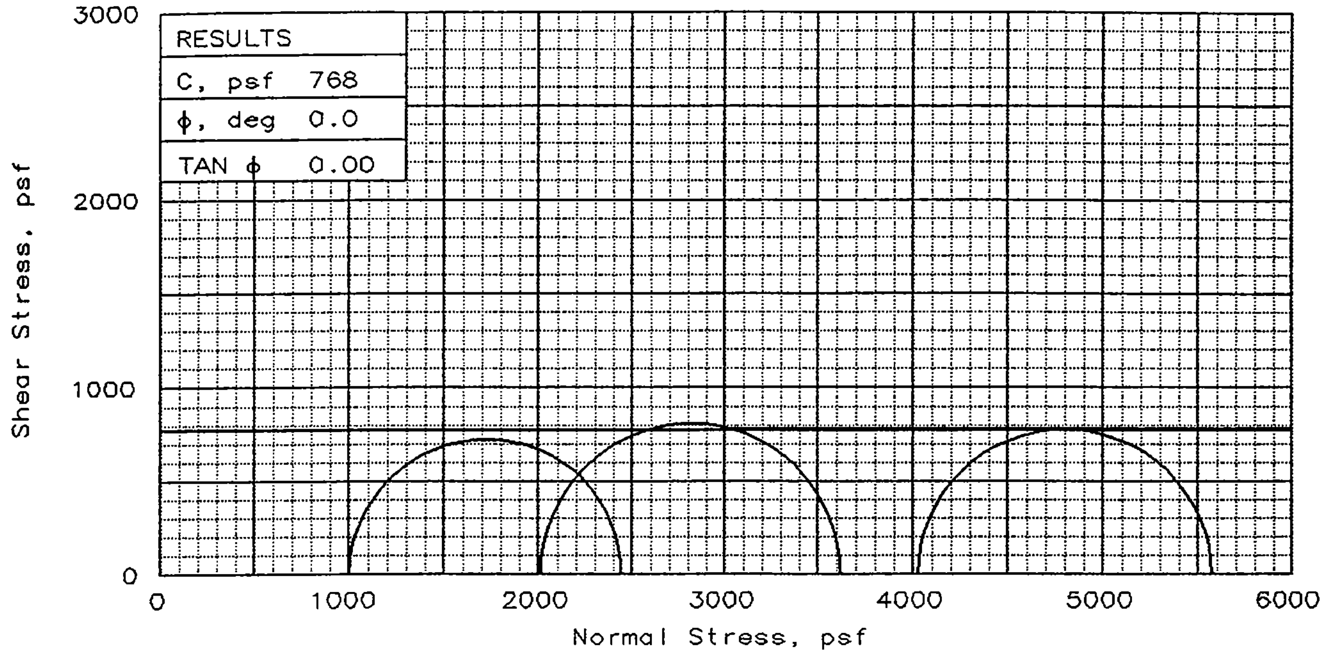


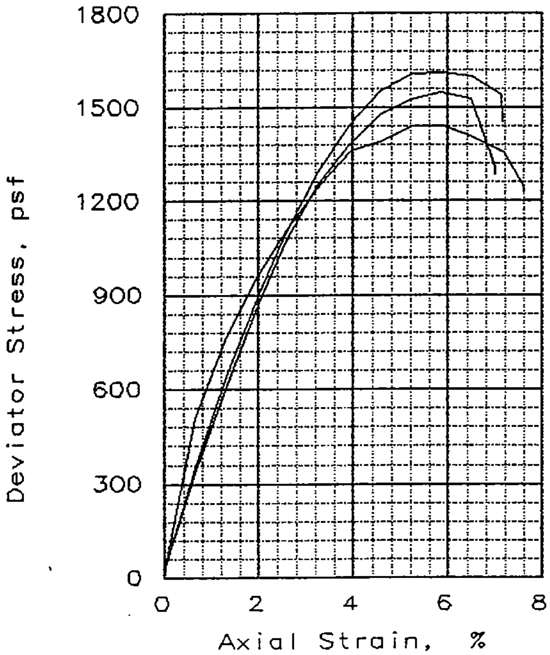
Client:

Project: WJLD

Location: Boring 4, Sample 14, Depth 53'-54'

File: UU-7022 Project No.: 14149 FIG. NO.: ____





SPECIMEN NO.:		1	2	3
INITIAL	WATER CONTENT, %	59.0	59.8	60.9
	DRY DENSITY, pcf	63.6	63.1	61.8
	SATURATION, %	95.8	95.8	94.4
	VOID RATIO	1.688	1.712	1.768
	DIAMETER, in	1.40	1.40	1.40
	HEIGHT, in	2.99	2.99	2.99
AT TEST	WATER CONTENT, %	61.7	62.7	64.0
	DRY DENSITY, pcf	63.5	62.9	62.1
	SATURATION, %	100.0	100.0	100.0
	VOID RATIO	1.692	1.717	1.753
	DIAMETER, in	1.40	1.40	1.40
	HEIGHT, in	2.99	2.99	2.99
Strain rate, in/min		0.1067	0.1053	0.1049
BACK PRESSURE, psf		0	0	0
CELL PRESSURE, psf		1008	2016	4032
FAILURE STRESS, psf		1441	1610	1545
ULTIMATE STRESS, psf		1228	1451	1284
σ_1 FAILURE, psf		2449	3626	5577
σ_3 FAILURE, psf		1008	2016	4032

TYPE OF TEST:
Unconsolidated Undrained

SAMPLE TYPE: Undisturbed

DESCRIPTION: Mst gray Clay

SPECIFIC GRAVITY= 2.74

REMARKS:

FIG. NO.: ______

CLIENT:

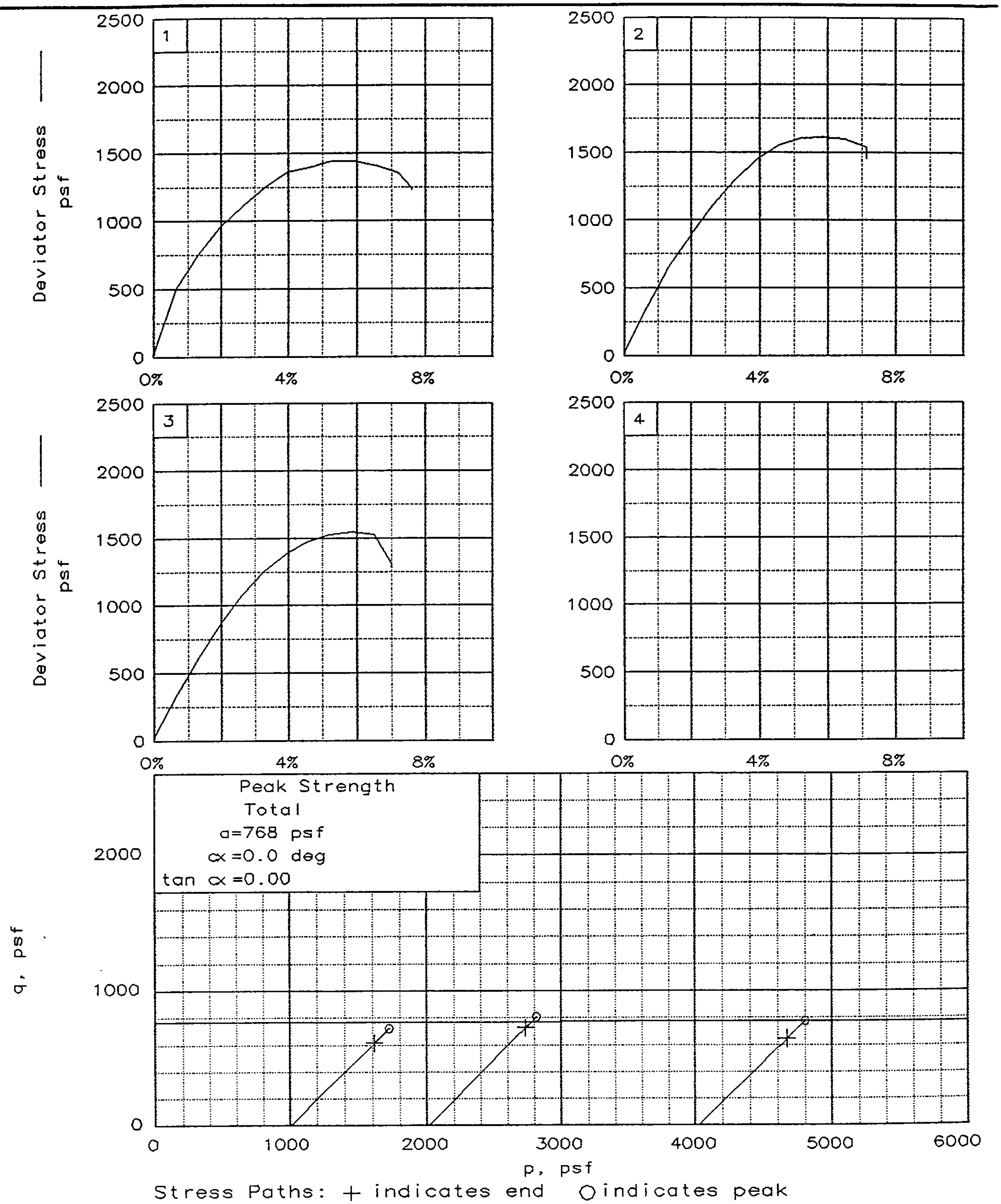
PROJECT: WJLD

SAMPLE LOCATION: Boring 4, Sample 16, Depth 63'-64'

PROJ. NO.: 14149 DATE: 7-18-96

TRIAXIAL SHEAR TEST REPORT

Eustis Engineering Company, Inc.

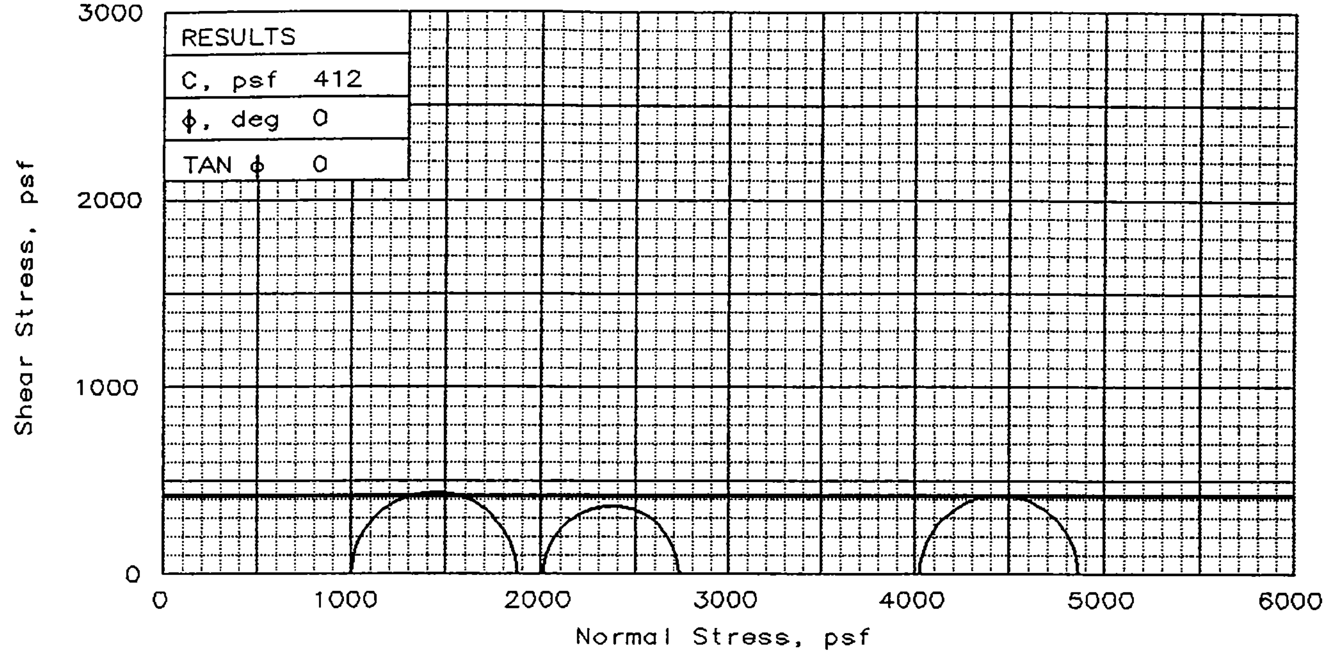


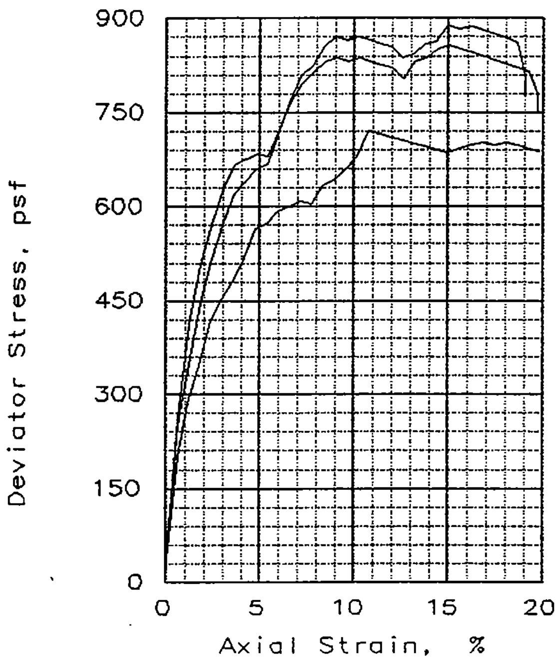
Client:

Project: WJLD

Location: Boring 4, Sample 16, Depth 63'-64'

File: UU-7023 Project No.: 14149 FIG. NO.: ____





SPECIMEN NO.:		1	2	3
INITIAL	WATER CONTENT, %	61.9	59.9	59.4
	DRY DENSITY, pcf	58.8	60.3	60.8
	SATURATION, %	88.9	89.3	89.8
	VOID RATIO	1.907	1.838	1.812
	DIAMETER, in	1.40	1.40	1.40
	HEIGHT, in	2.99	2.99	2.98
AT TEST	WATER CONTENT, %	69.8	66.8	64.8
	DRY DENSITY, pcf	58.7	60.4	61.6
	SATURATION, %	100.0	100.0	100.0
	VOID RATIO	1.912	1.831	1.776
	DIAMETER, in	1.40	1.40	1.40
	HEIGHT, in	2.99	2.99	2.99
Strain rate, in/min		0.1010	0.0990	0.1023
BACK PRESSURE, psf		0	0	0
CELL PRESSURE, psf		1008	2016	4032
FAILURE STRESS, psf		872	720	837
ULTIMATE STRESS, psf		776	687	749
σ_1 FAILURE, psf		1880	2736	4869
σ_3 FAILURE, psf		1008	2016	4032

TYPE OF TEST:
Unconsolidated Undrained

SAMPLE TYPE: Undisturbed

DESCRIPTION: So gray Clay w/ organic clay lay, wd, sh.frag

SPECIFIC GRAVITY= 2.74

REMARKS:

FIG. NO.: ______

CLIENT:

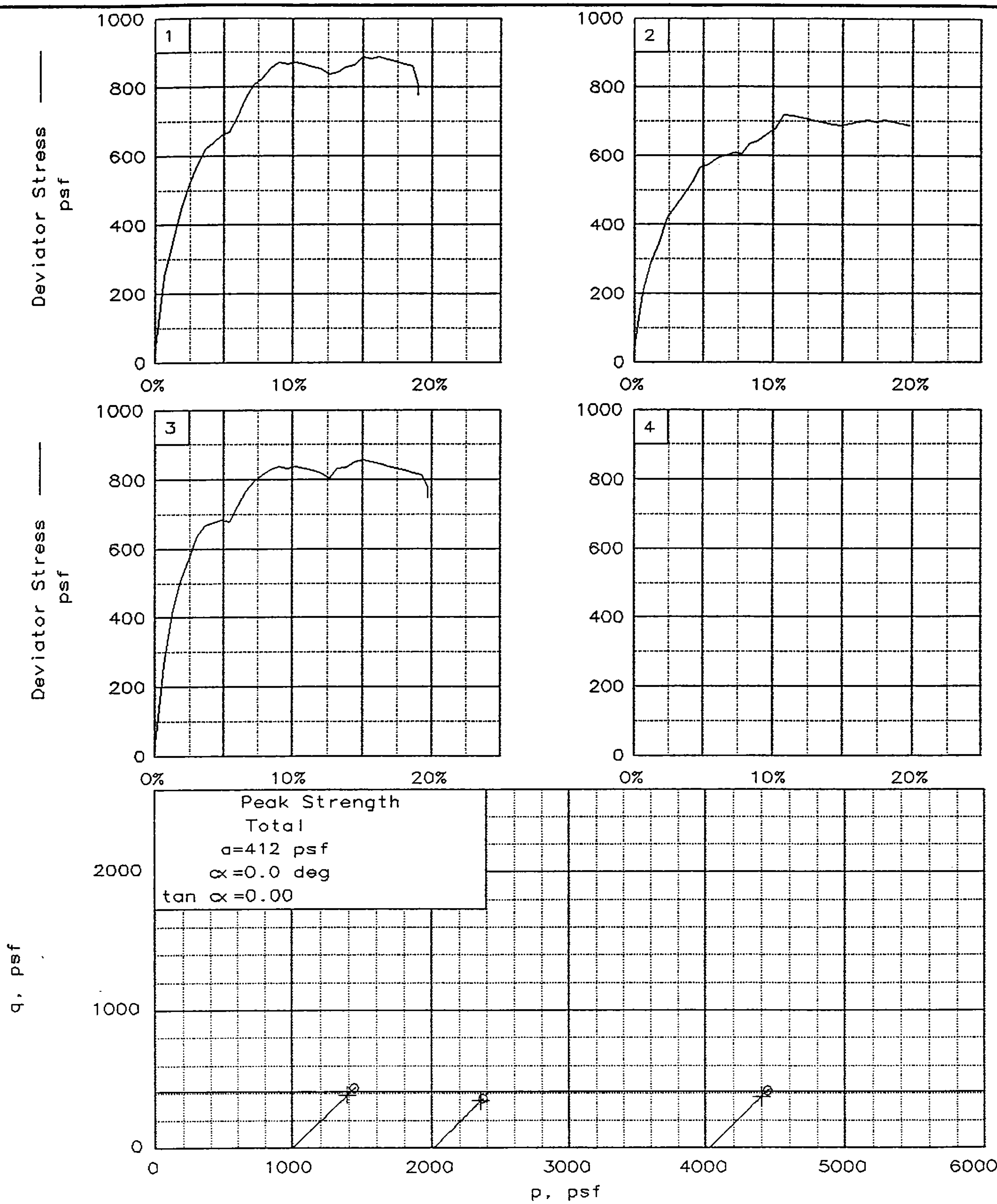
PROJECT: WJLD

SAMPLE LOCATION: Boring 5, Sample 4, Depth 8'-9'

PROJ. NO.: 14149 DATE: 7-22-96

TRIAXIAL SHEAR TEST REPORT

Eustis Engineering Company, Inc.



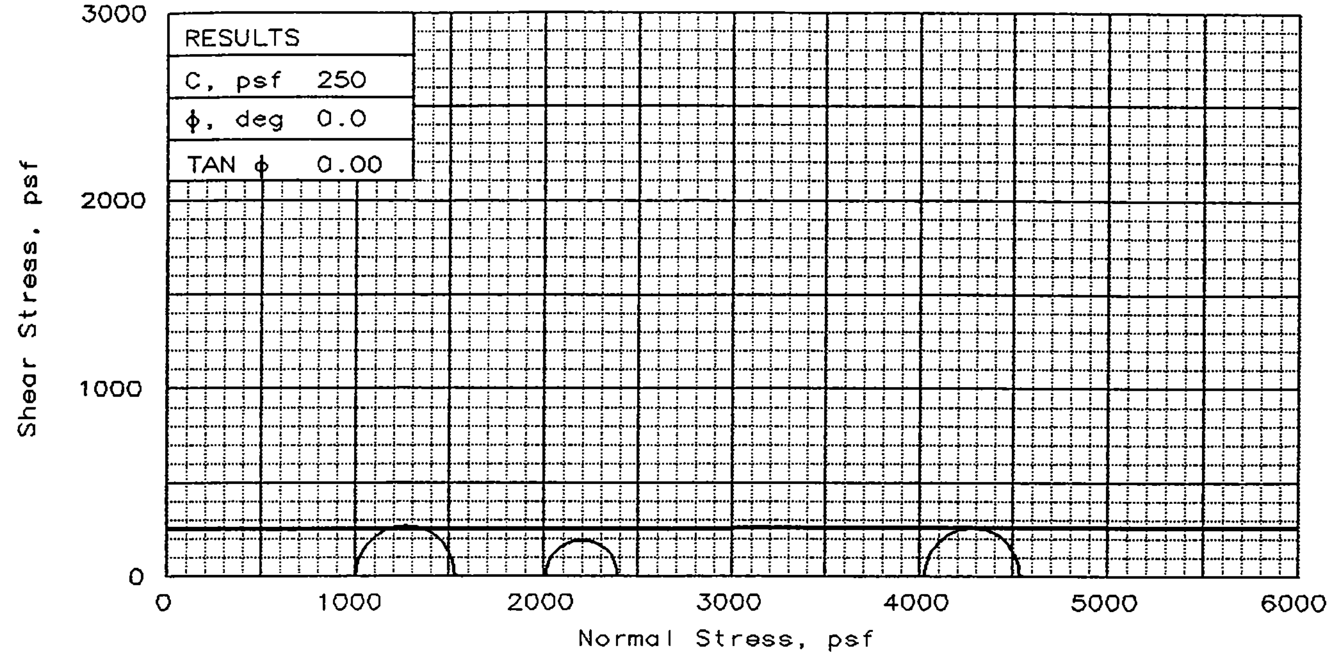
Stress Paths: + indicates end ○ indicates peak

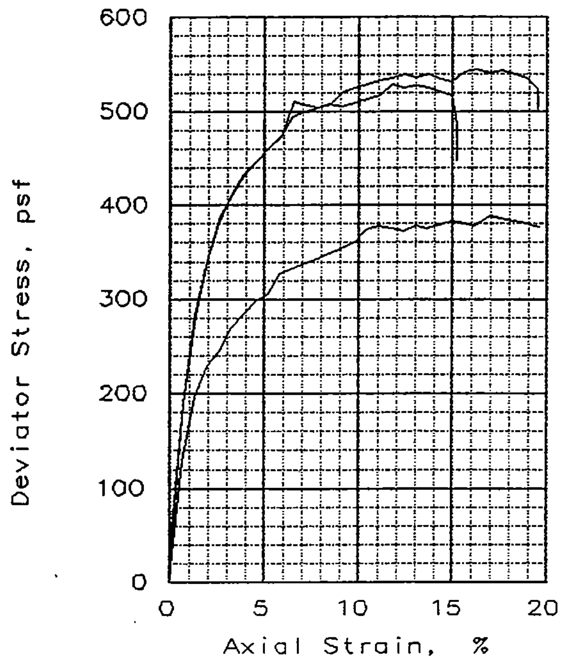
Client:

Project: WJLD

Location: Boring 5, Sample 4, Depth 8'-9'

File: UU-7067 Project No.: 14149 FIG. NO.: ____





SPECIMEN NO.:		1	2	3
INITIAL	WATER CONTENT, %	56.8	60.3	60.3
	DRY DENSITY, pcf	66.2	63.2	62.7
	SATURATION, %	98.2	96.8	95.6
	VOID RATIO	1.585	1.707	1.726
	DIAMETER, in	1.40	1.40	1.40
	HEIGHT, in	3.00	2.99	2.99
AT TEST	WATER CONTENT, %	58.8	62.4	62.8
	DRY DENSITY, pcf	65.5	63.1	62.9
	SATURATION, %	100.0	100.0	100.0
	VOID RATIO	1.611	1.711	1.720
	DIAMETER, in	1.40	1.40	1.40
	HEIGHT, in	2.99	2.99	2.99
Strain rate, in/min		0.0968	0.1094	0.1123
BACK PRESSURE, psf		0	0	0
CELL PRESSURE, psf		1008	2016	4032
FAILURE STRESS, psf		529	378	511
ULTIMATE STRESS, psf		449	377	503
σ_1 FAILURE, psf		1537	2394	4543
σ_3 FAILURE, psf		1008	2016	4032

TYPE OF TEST:
Unconsolidated Undrained
SAMPLE TYPE: Undisturbed
DESCRIPTION: So gray Clay

SPECIFIC GRAVITY= 2.74
REMARKS:

FIG. NO.: ______

CLIENT:

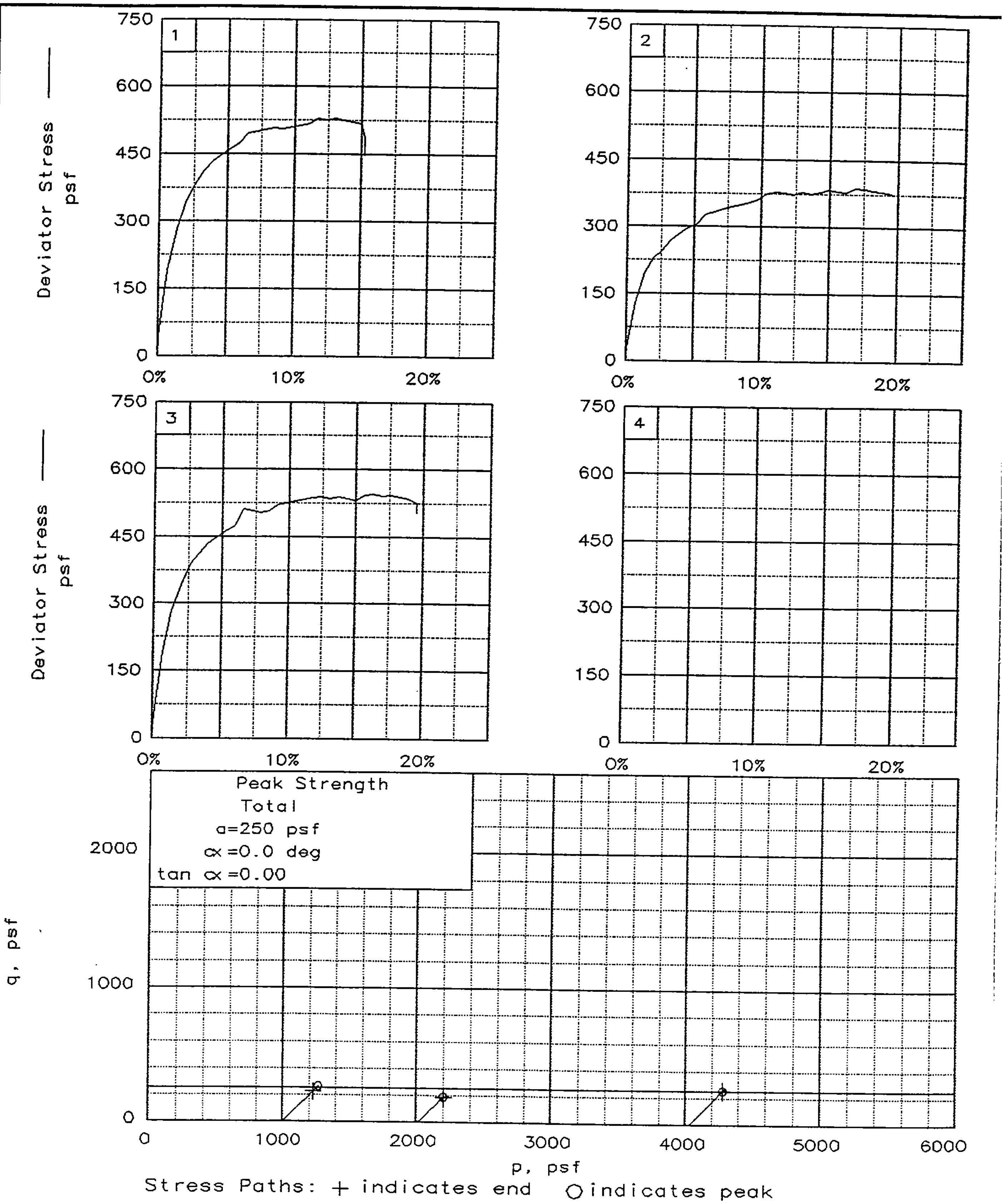
PROJECT: WJLD

SAMPLE LOCATION: Boring 5, Sample 8, Depth 23'-24'

PROJ. NO.: 14149 DATE: 7-22-96

TRIAXIAL SHEAR TEST REPORT

Eustis Engineering Company, Inc.

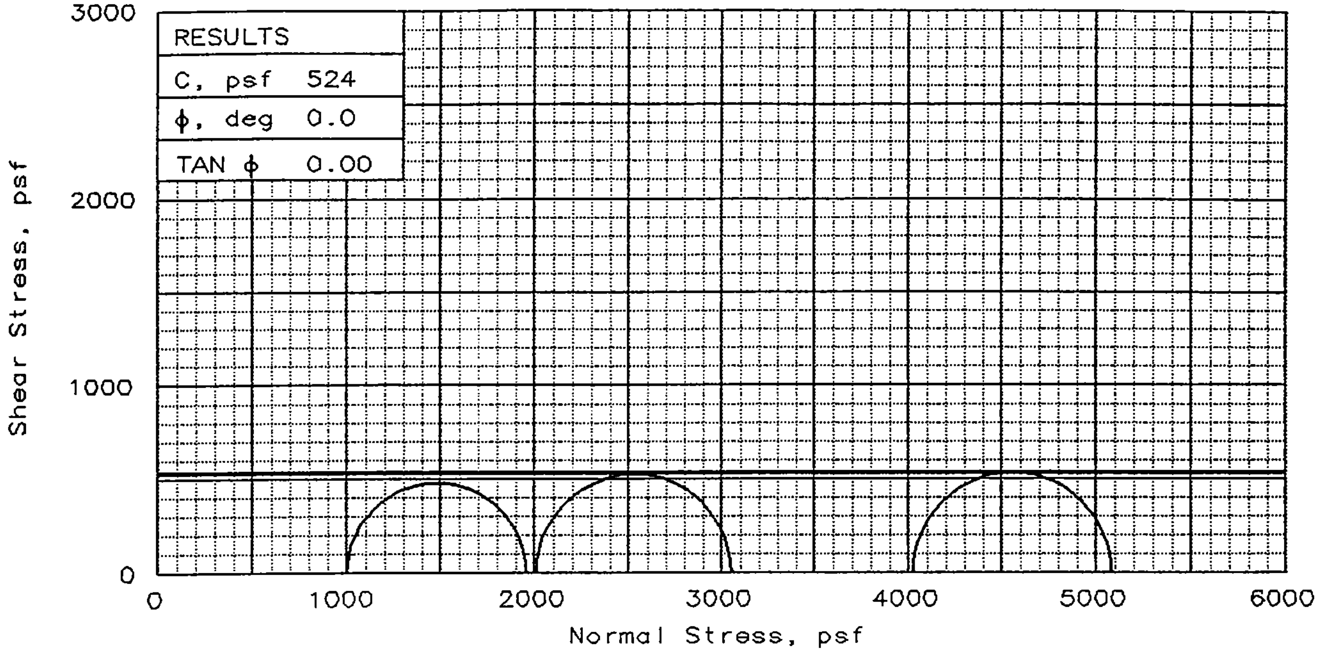


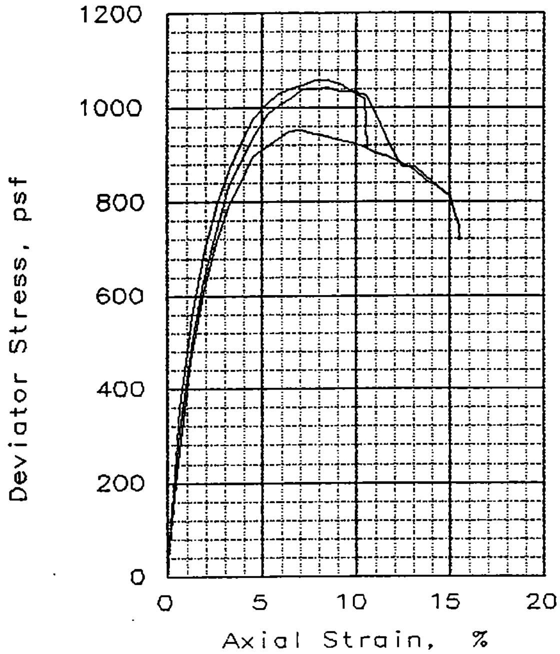
Client:

Project: WJLD

Location: Boring 5, Sample 8, Depth 23'-24'

File: UU-7068 Project No.: 14149 FIG. NO.: ____





SPECIMEN NO.:		1	2	3
INITIAL	WATER CONTENT, %	62.3	62.8	62.8
	DRY DENSITY, pcf	60.7	60.3	60.4
	SATURATION, %	94.0	93.6	93.8
	VOID RATIO	1.816	1.838	1.834
	DIAMETER, in	1.40	1.40	1.40
	HEIGHT, in	2.99	2.98	2.98
AT TEST	WATER CONTENT, %	65.7	66.2	65.6
	DRY DENSITY, pcf	61.1	60.8	61.1
	SATURATION, %	100.0	100.0	100.0
	VOID RATIO	1.801	1.815	1.798
	DIAMETER, in	1.40	1.40	1.40
	HEIGHT, in	2.99	2.99	2.99
Strain rate, in/min		0.1097	0.1097	0.1057
BACK PRESSURE, psf		0	0	0
CELL PRESSURE, psf		1008	2016	4032
FAILURE STRESS, psf		951	1040	1057
ULTIMATE STRESS, psf		719	772	916
σ_1 FAILURE, psf		1959	3056	5089
σ_3 FAILURE, psf		1008	2016	4032

TYPE OF TEST:
Unconsolidated Undrained

SAMPLE TYPE: Undisturbed

DESCRIPTION: Mst gray Clay

SPECIFIC GRAVITY= 2.74

REMARKS:

FIG. NO.: ______

CLIENT:

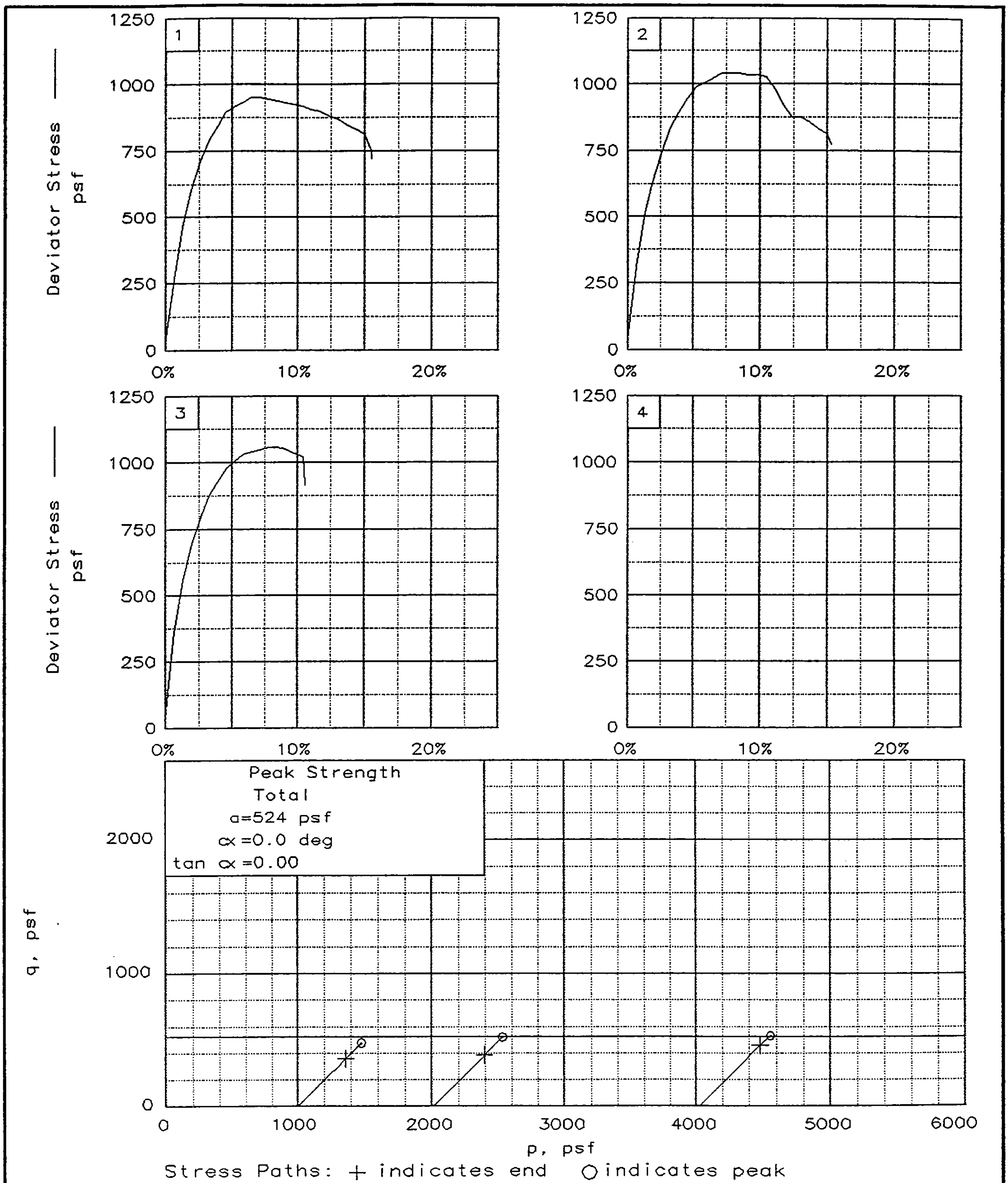
PROJECT: WJLD

SAMPLE LOCATION: Boring 5, Sample 13, Depth 48'-49'

PROJ. NO.: 14149 DATE: 7-22-96

TRIAXIAL SHEAR TEST REPORT

Eustis Engineering Company, Inc.

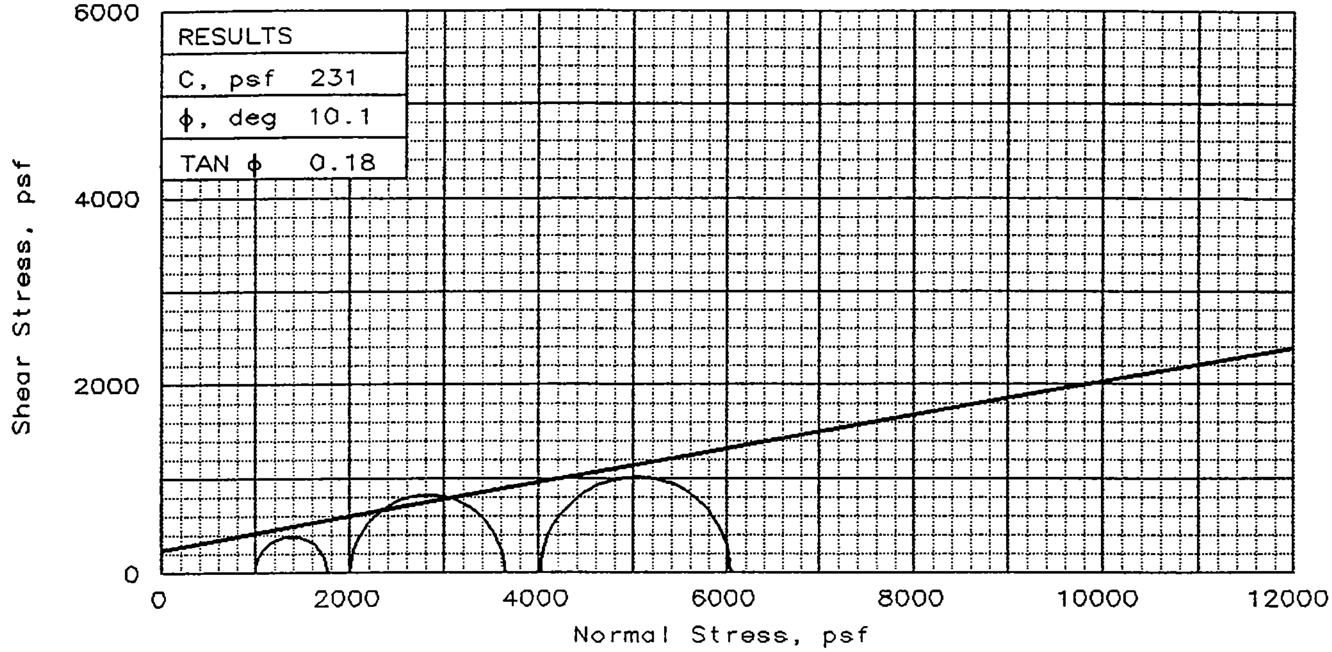


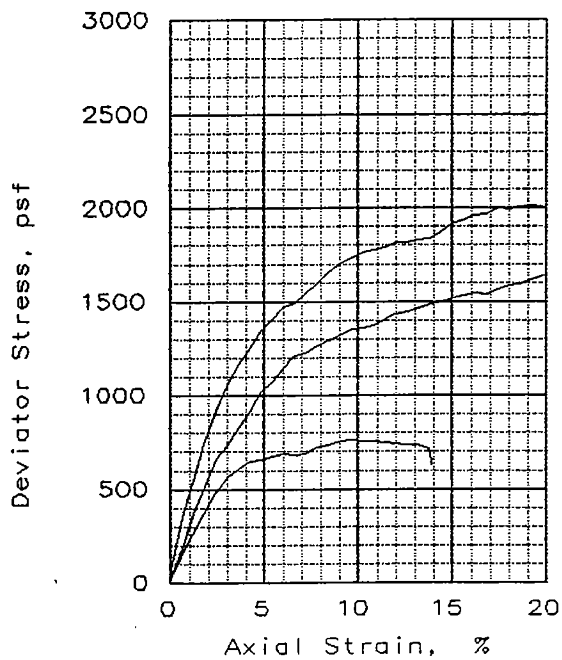
Client:

Project: WJLD

Location: Boring 5, Sample 13, Depth 48'-49'

File: UU-7069 Project No.: 14149 FIG. NO.: _____





SPECIMEN NO.:		1	2	3
INITIAL	WATER CONTENT, %	32.3	29.7	29.4
	DRY DENSITY, pcf	89.2	91.7	91.7
	SATURATION, %	98.0	95.7	94.6
	VOID RATIO	0.889	0.838	0.839
	DIAMETER, in	1.40	1.40	1.40
	HEIGHT, in	2.99	2.99	2.99
AT TEST	WATER CONTENT, %	32.5	31.1	30.9
	DRY DENSITY, pcf	89.8	91.7	91.9
	SATURATION, %	100.0	100.0	100.0
	VOID RATIO	0.878	0.839	0.833
	DIAMETER, in	1.40	1.40	1.40
	HEIGHT, in	2.99	2.99	2.99
Strain rate, in/min		0.0974	0.1003	0.1010
BACK PRESSURE, psf		0	0	0
CELL PRESSURE, psf		1008	2016	4032
FAILURE STRESS, psf		763	1637	2016
ULTIMATE STRESS, psf		629	1637	2012
σ_1 FAILURE, psf		1771	3653	6048
σ_3 FAILURE, psf		1008	2016	4032

TYPE OF TEST:
Unconsolidated Undrained

SAMPLE TYPE: Undisturbed

DESCRIPTION: D light gray & tan Clayey Sand

SPECIFIC GRAVITY= 2.7

REMARKS:

CLIENT:

PROJECT: WJLD

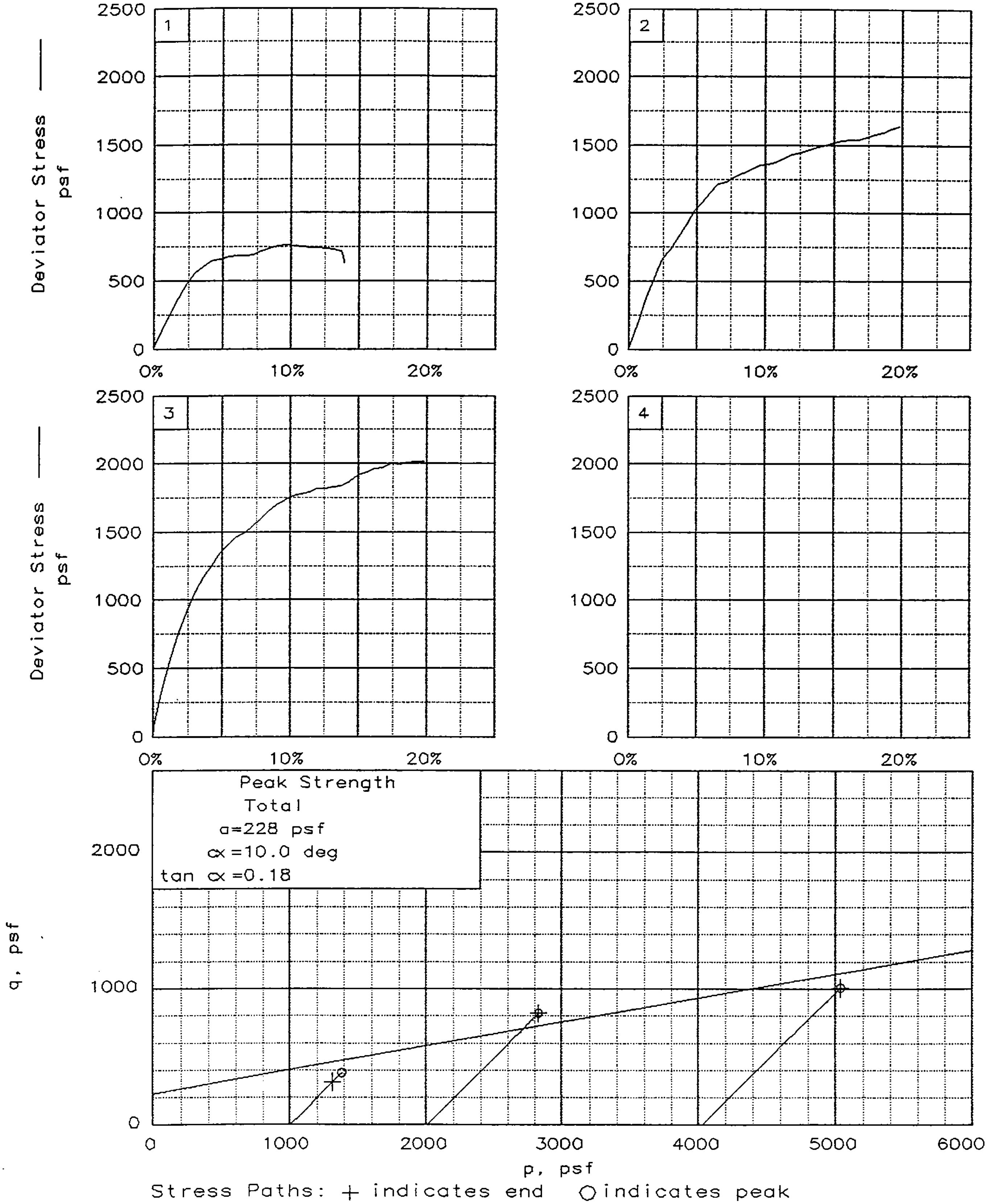
SAMPLE LOCATION: Boring 5, Sample 21, Depth 78'-79'

PROJ. NO.: 14149 DATE: 7-22-96

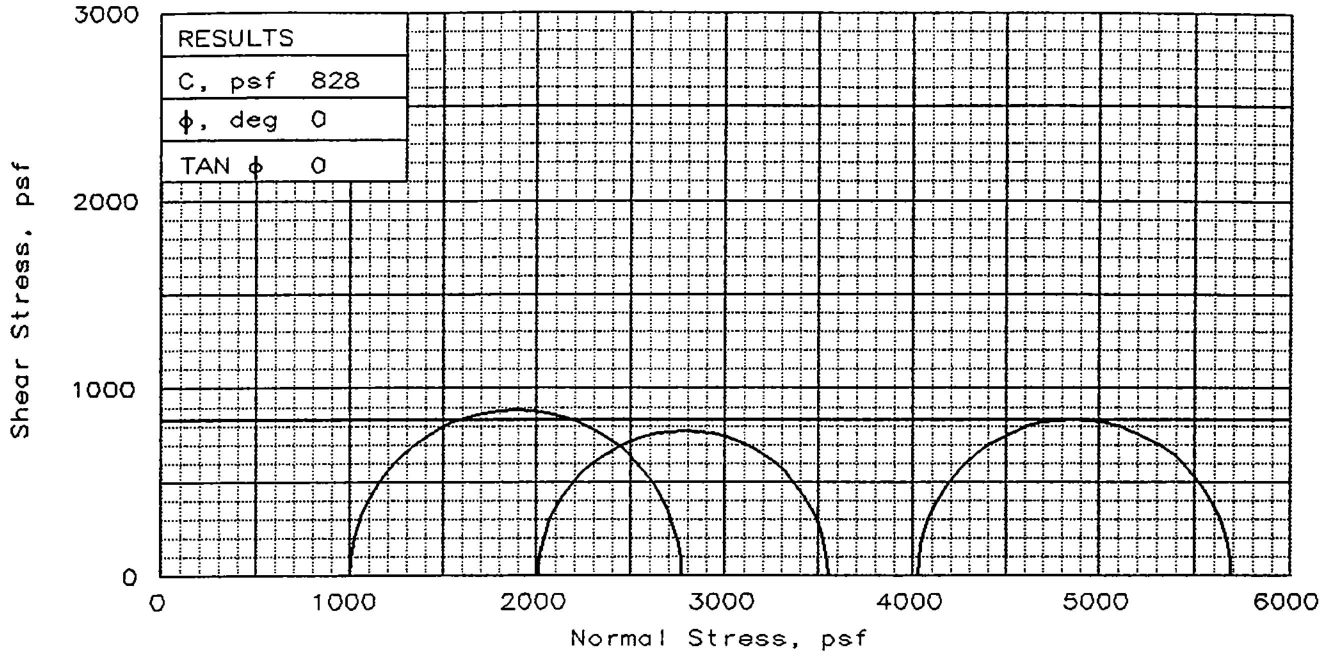
TRIAXIAL SHEAR TEST REPORT

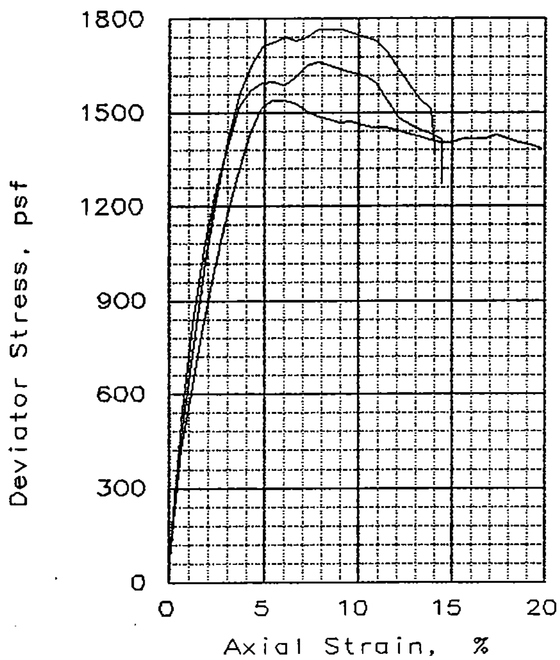
Eustis Engineering Company, Inc.

FIG. NO.: ______



Client:
Project: WJLD
Location: Boring 5, Sample 21, Depth 78'-79'
File: UU-7070 Project No.: 14149 FIG. NO.: _____





SPECIMEN NO.:		1	2	3
INITIAL	WATER CONTENT, %	32.4	30.9	33.1
	DRY DENSITY, pcf	89.9	91.0	88.7
	SATURATION, %	99.1	97.0	98.5
	VOID RATIO	0.889	0.866	0.914
	DIAMETER, in	1.40	1.40	1.40
	HEIGHT, in	2.99	2.99	2.99
AT TEST	WATER CONTENT, %	32.7	31.8	33.6
	DRY DENSITY, pcf	89.9	91.0	88.8
	SATURATION, %	100.0	100.0	100.0
	VOID RATIO	0.890	0.866	0.913
	DIAMETER, in	1.40	1.40	1.40
	HEIGHT, in	2.99	2.99	2.99
Strain rate, in/min		0.0966	0.1004	0.0970
BACK PRESSURE, psf		0	0	0
CELL PRESSURE, psf		1008	2016	4032
FAILURE STRESS, psf		1765	1541	1661
ULTIMATE STRESS, psf		1365	1385	1272
σ_1 FAILURE, psf		2773	3557	5693
σ_3 FAILURE, psf		1008	2016	4032

TYPE OF TEST:
Unconsolidated Undrained

SAMPLE TYPE: Undisturbed

DESCRIPTION: Mst gray Clay w/ sand pockets, few shells

SPECIFIC GRAVITY= 2.72

REMARKS:

FIG. NO.: ______

CLIENT:

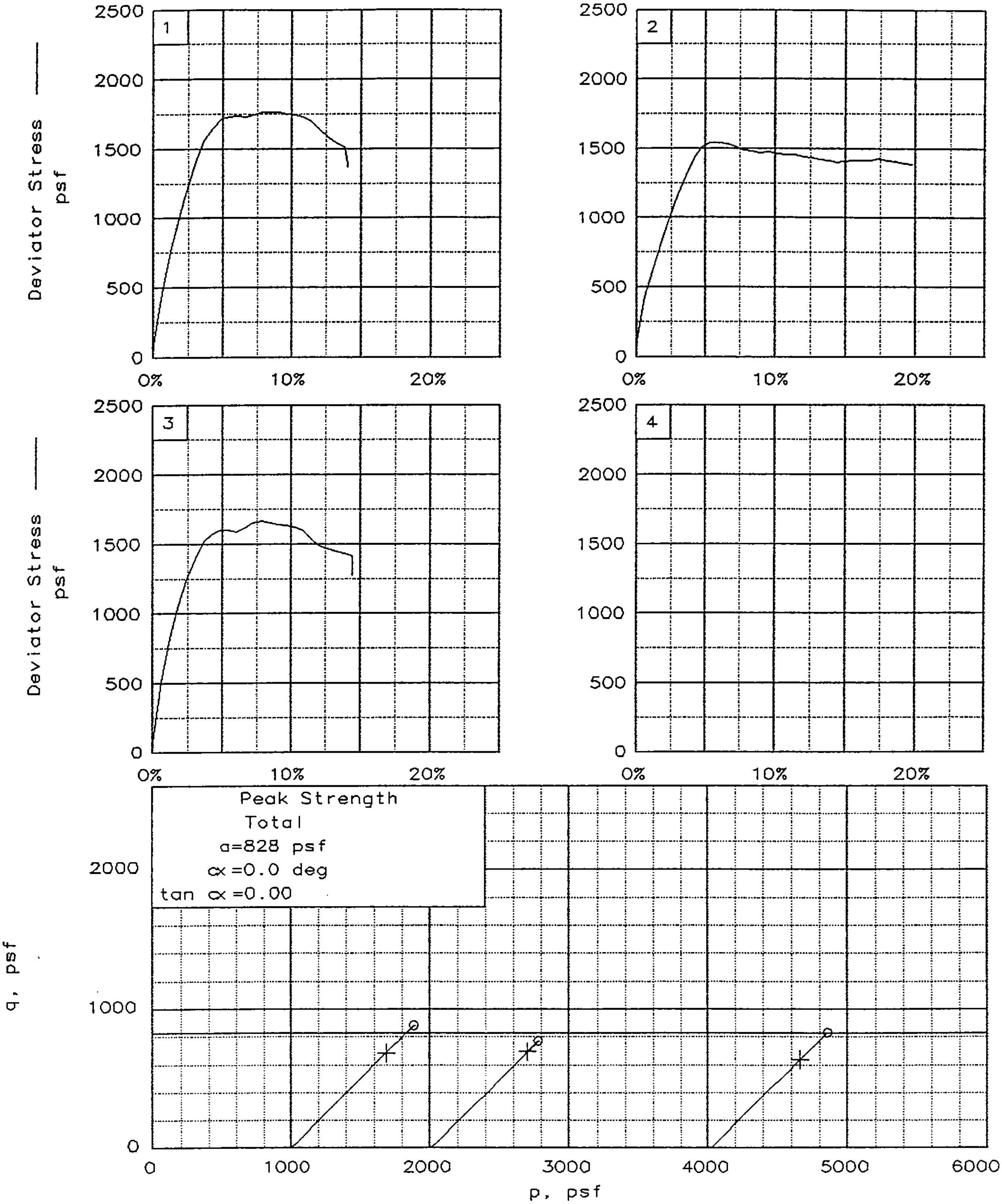
PROJECT: WJLD

SAMPLE LOCATION: Boring 5, Sample 26, Depth 98'-99'

PROJ. NO.: 14149 DATE: 7-23-96

TRIAXIAL SHEAR TEST REPORT

Eustis Engineering Company, Inc.



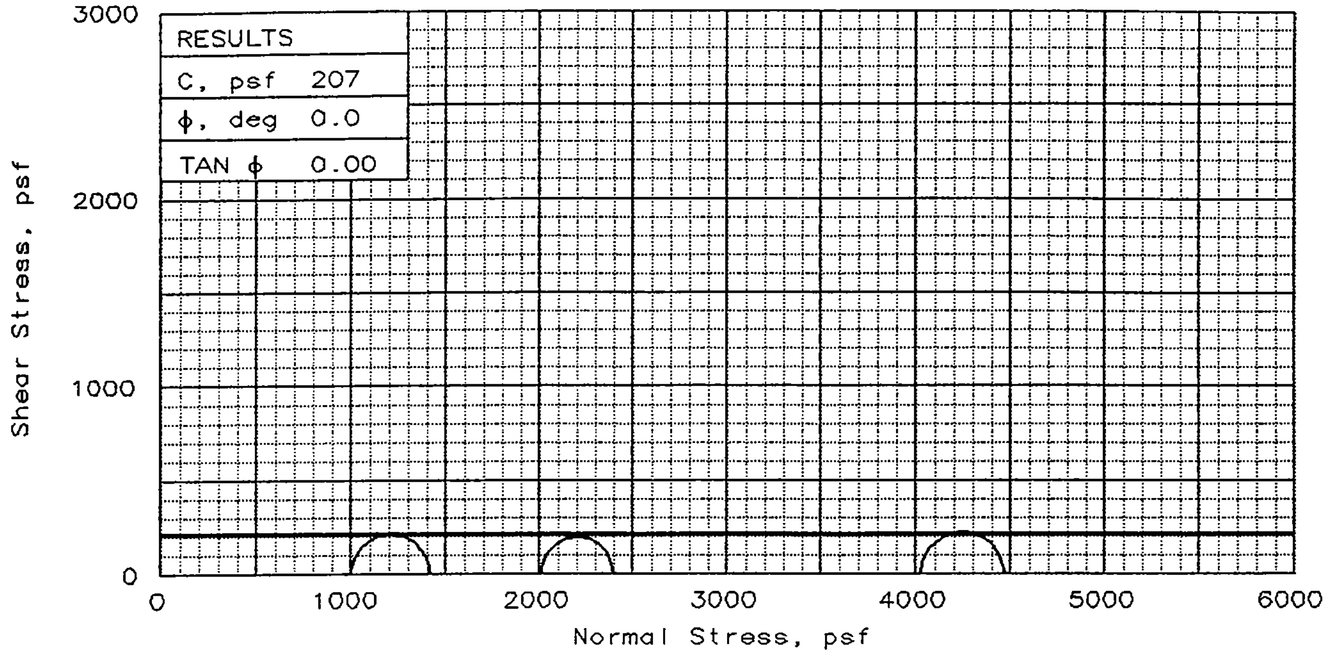
Stress Paths: + indicates end ○ indicates peak

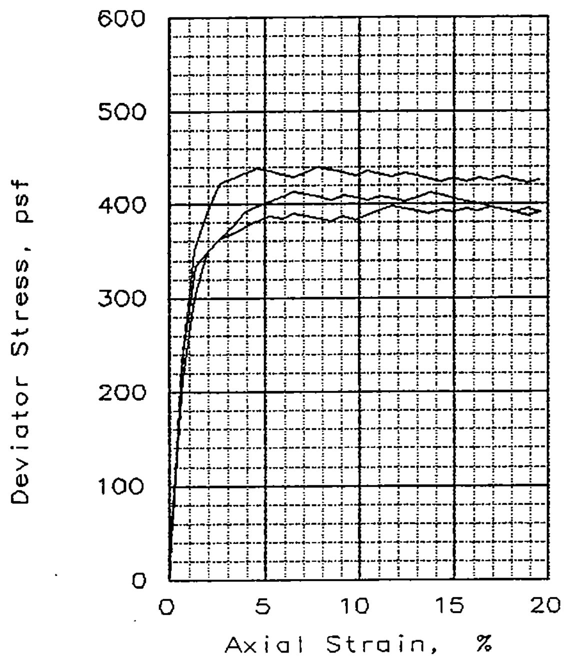
Client:

Project: WJLD

Location: Boring 5, Sample 26, Depth 98'-99'

File: UU-7086 Project No.: 14149 FIG. NO.: _____





SPECIMEN NO.:		1	2	3
INITIAL	WATER CONTENT, %	97.9	99.4	98.6
	DRY DENSITY, pcf	44.6	44.6	44.7
	SATURATION, %	94.7	96.1	95.5
	VOID RATIO	2.831	2.832	2.829
	DIAMETER, in	1.40	1.40	1.40
	HEIGHT, in	2.99	2.99	2.99
AT TEST	WATER CONTENT, %	102.9	103.7	103.4
	DRY DENSITY, pcf	44.8	44.5	44.6
	SATURATION, %	100.0	100.0	100.0
	VOID RATIO	2.819	2.842	2.833
	DIAMETER, in	1.40	1.40	1.40
	HEIGHT, in	2.99	2.99	2.99
Strain rate, in/min		0.1080	0.1052	0.1112
BACK PRESSURE, psf		0	0	0
CELL PRESSURE, psf		1008	2016	4032
FAILURE STRESS, psf		414	387	439
ULTIMATE STRESS, psf		391	391	426
σ_1 FAILURE, psf		1422	2403	4471
σ_3 FAILURE, psf		1008	2016	4032

TYPE OF TEST:
Unconsolidated Undrained

SAMPLE TYPE: Undisturbed

DESCRIPTION: Vso gray Clay w/ wood

SPECIFIC GRAVITY= 2.74

REMARKS:

FIG. NO.: ______

CLIENT:

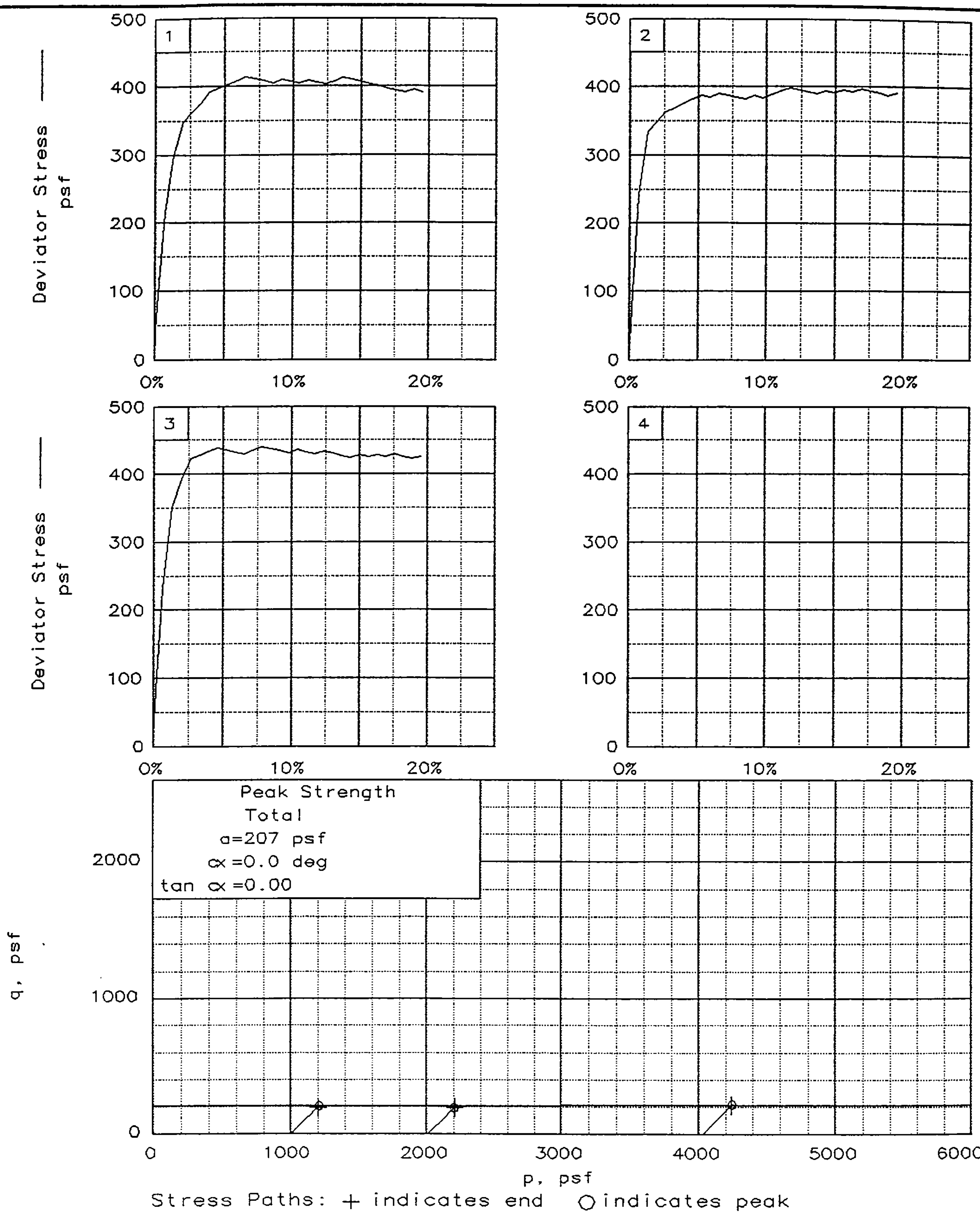
PROJECT: WJLD

SAMPLE LOCATION: Boring 6, Sample 7, Depth 18'-19'

PROJ. NO.: 14149 DATE: 7-17-96

TRIAXIAL SHEAR TEST REPORT

Eustis Engineering Company, Inc.

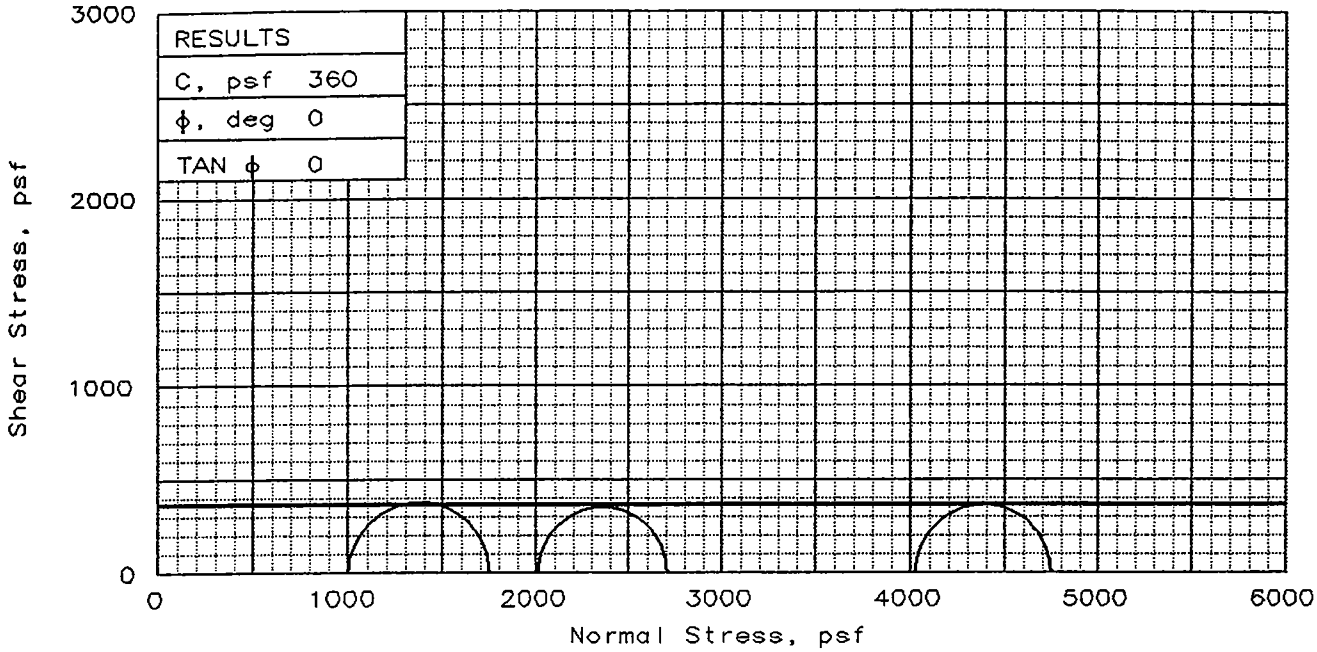


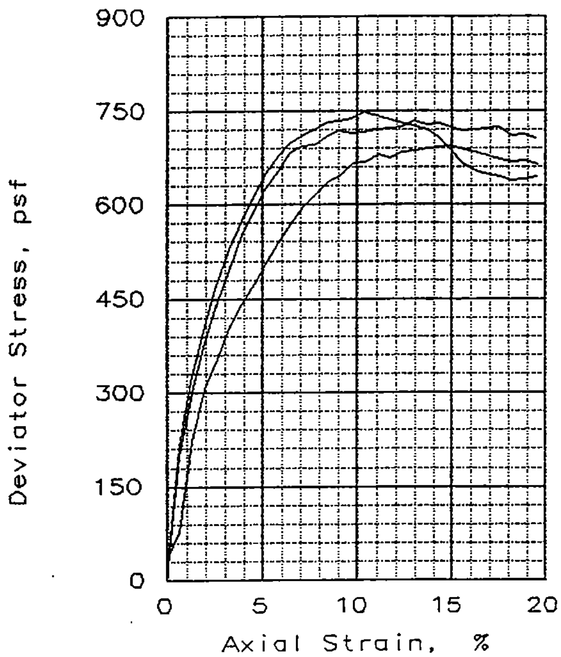
Client:

Project: WJLD

Location: Boring 6, Sample 7, Depth 18'-19'

File: UU-7000 Project No.: 14149 FIG. NO.: _____





SPECIMEN NO.:		1	2	3
INITIAL	WATER CONTENT, %	43.0	42.4	43.1
	DRY DENSITY, pcf	75.8	75.4	73.1
	SATURATION, %	93.8	91.6	88.1
	VOID RATIO	1.257	1.270	1.340
	DIAMETER, in	1.40	1.40	1.40
	HEIGHT, in	3.00	2.99	2.99
AT TEST	WATER CONTENT, %	46.4	46.3	48.6
	DRY DENSITY, pcf	75.3	75.4	73.3
	SATURATION, %	100.0	100.0	100.0
	VOID RATIO	1.271	1.270	1.333
	DIAMETER, in	1.40	1.40	1.40
	HEIGHT, in	2.99	2.99	2.99
Strain rate, in/min		0.1101	0.1073	0.1099
BACK PRESSURE, psf		0	0	0
CELL PRESSURE, psf		1008	2016	4032
FAILURE STRESS, psf		747	694	718
ULTIMATE STRESS, psf		643	664	707
σ_1 FAILURE, psf		1755	2710	4750
σ_3 FAILURE, psf		1008	2016	4032

TYPE OF TEST:
Unconsolidated Undrained

SAMPLE TYPE: Undisturbed

DESCRIPTION: So gray Clay w/ clayey sand lenses

SPECIFIC GRAVITY= 2.74

REMARKS:

FIG. NO.: ______

CLIENT:

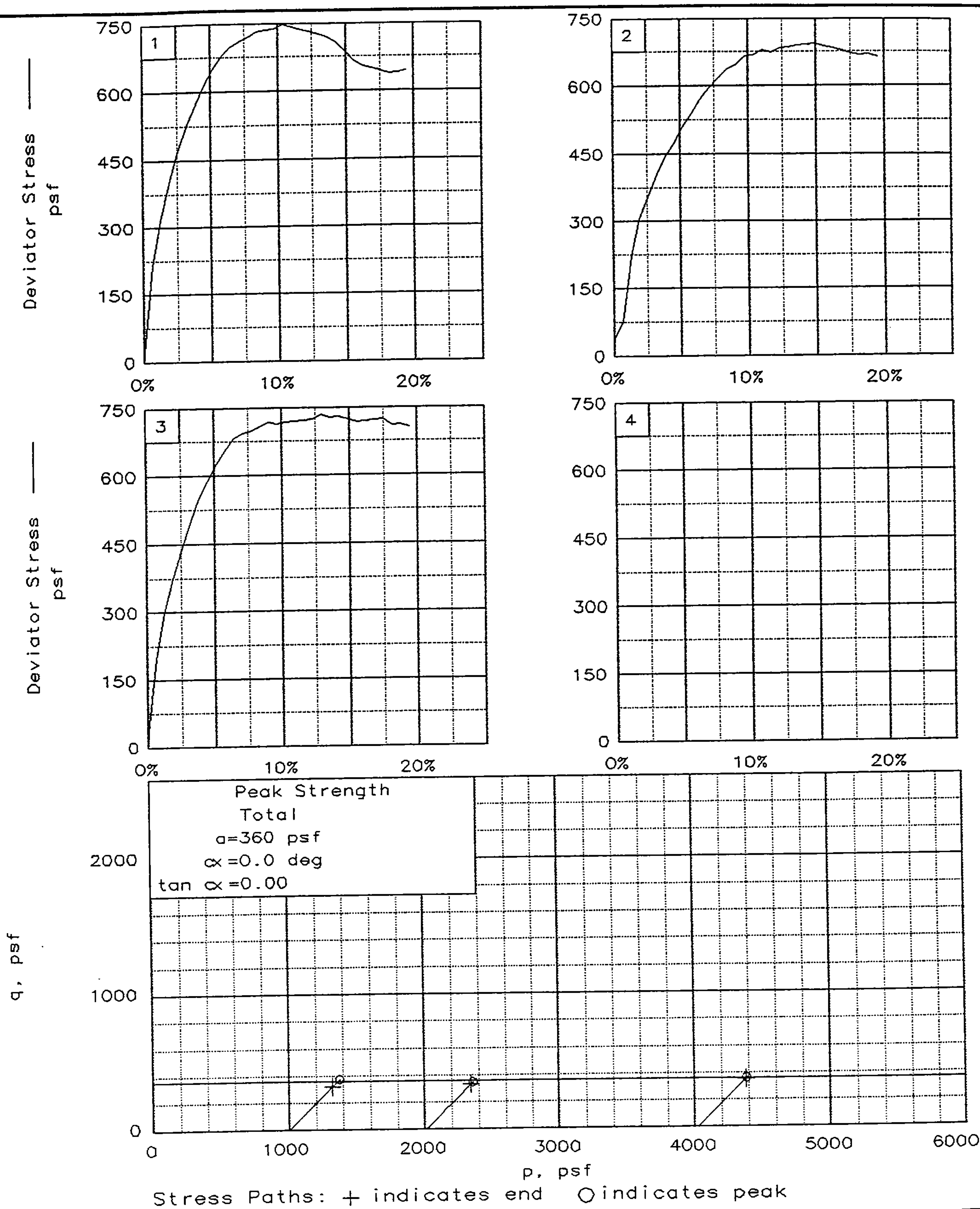
PROJECT: WJLD

SAMPLE LOCATION: Boring 6, Sample 11, Depth 38'-39'

PROJ. NO.: 14149 DATE: 7-17-96

TRIAXIAL SHEAR TEST REPORT

Eustis Engineering Company, Inc.

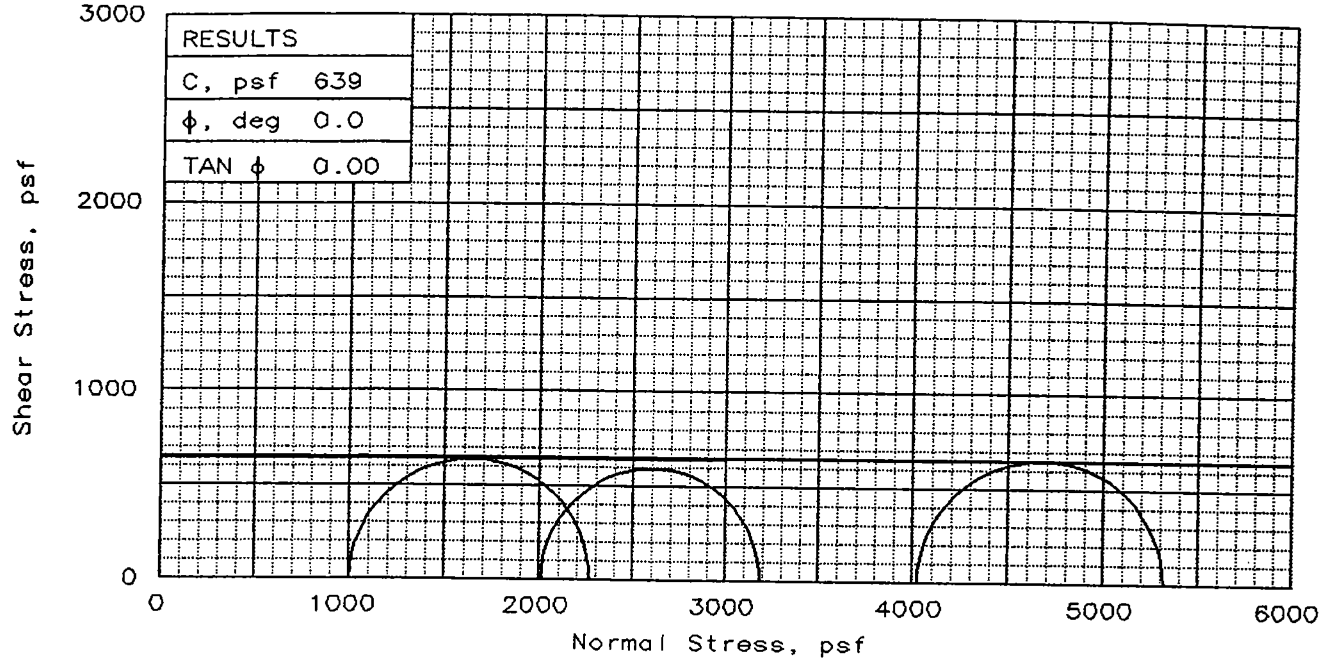


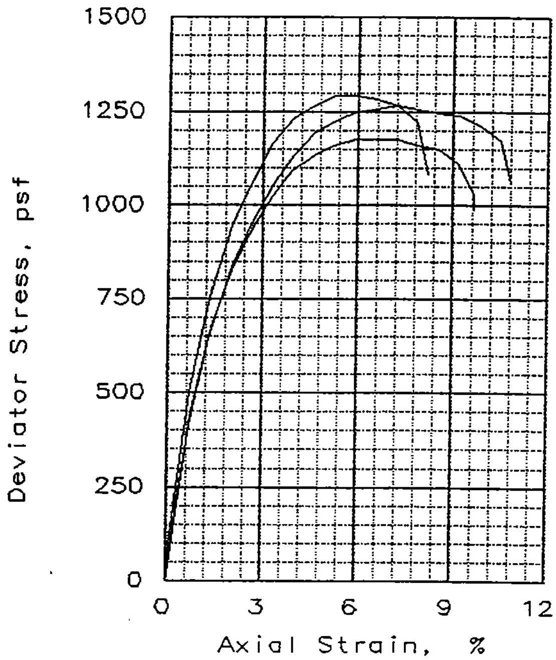
Client:

Project: WJLD

Location: Boring 6, Sample 11, Depth 38'-39'

File: UU-7001 Project No.: 14149 FIG. NO.: _____





SPECIMEN NO.:		1	2	3
INITIAL	WATER CONTENT, %	61.3	60.9	59.7
	DRY DENSITY, pcf	62.1	61.9	62.7
	SATURATION, %	95.7	94.6	94.6
	VOID RATIO	1.754	1.764	1.728
	DIAMETER, in	1.40	1.40	1.40
	HEIGHT, in	2.99	2.99	2.99
AT TEST	WATER CONTENT, %	64.3	64.7	63.1
	DRY DENSITY, pcf	62.0	61.7	62.7
	SATURATION, %	100.0	100.0	100.0
	VOID RATIO	1.761	1.772	1.728
	DIAMETER, in	1.40	1.40	1.40
	HEIGHT, in	2.99	2.99	2.99
Strain rate, in/min		0.1087	0.1066	0.1063
BACK PRESSURE, psf		0	0	0
CELL PRESSURE, psf		1008	2016	4032
FAILURE STRESS, psf		1266	1176	1292
ULTIMATE STRESS, psf		1061	988	1084
σ_1 FAILURE, psf		2274	3192	5324
σ_3 FAILURE, psf		1008	2016	4032

TYPE OF TEST:
Unconsolidated Undrained

SAMPLE TYPE: Undisturbed

DESCRIPTION: Mst gray Clay

SPECIFIC GRAVITY= 2.74

REMARKS:

FIG. NO.: ______

CLIENT:

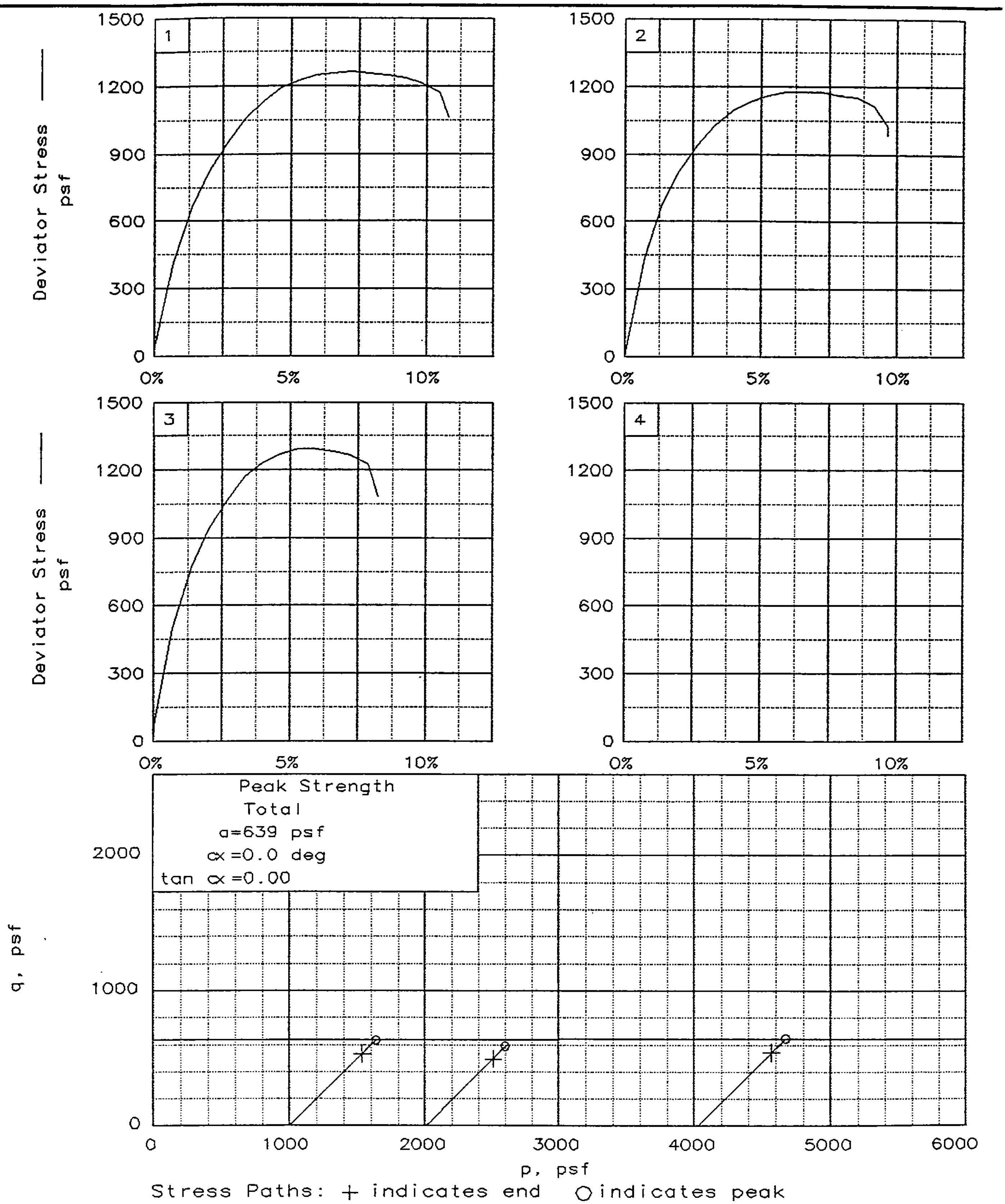
PROJECT: WJLD

SAMPLE LOCATION: Boring 6, Sample 15, Depth 58'-59'

PROJ. NO.: 14149 DATE: 7-17-96

TRIAXIAL SHEAR TEST REPORT

Eustis Engineering Company, Inc.

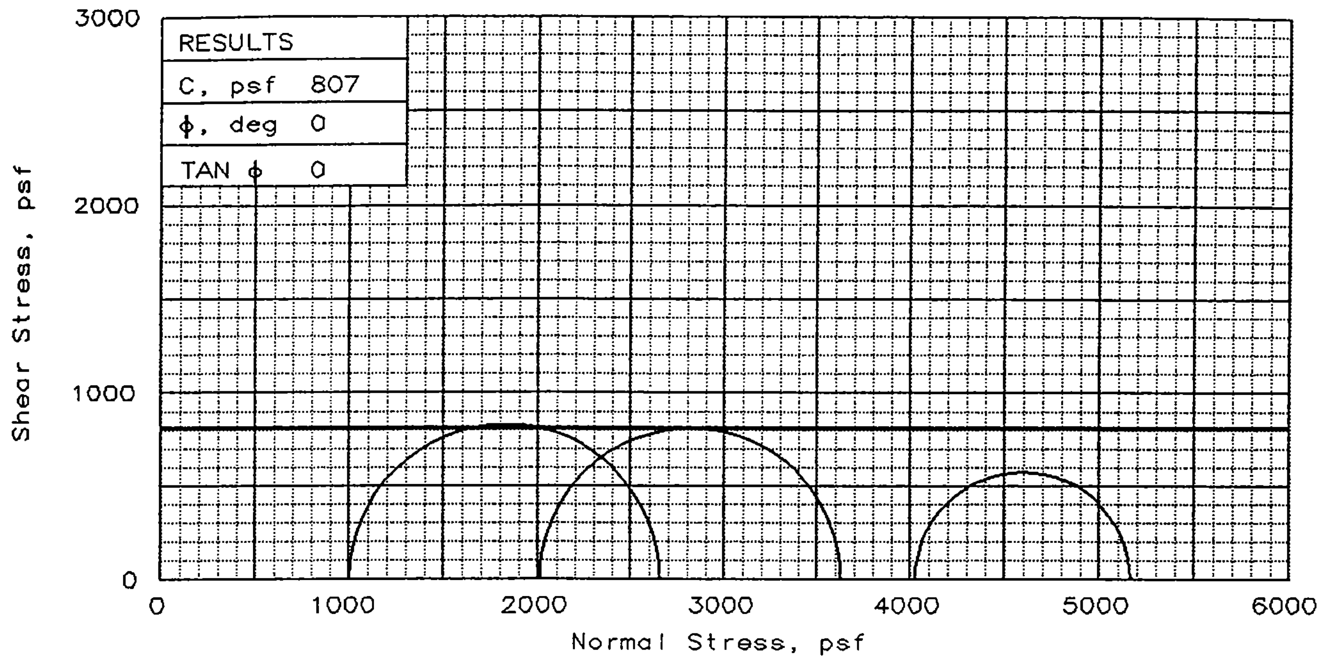


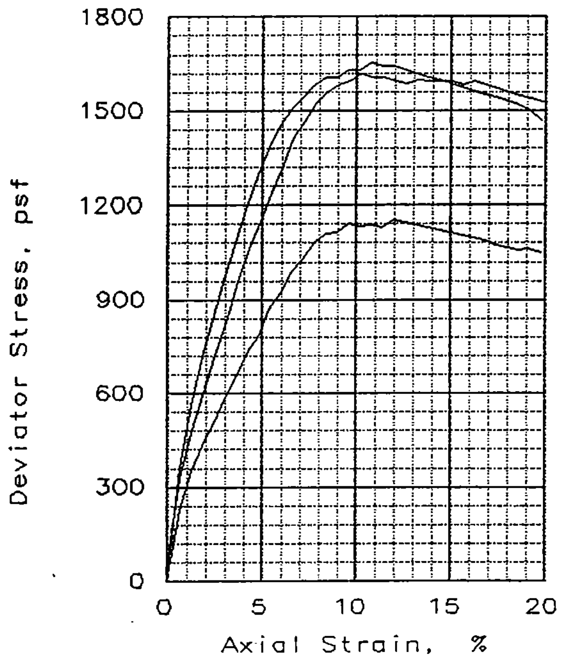
Client:

Project: WJLD

Location: Boring 6, Sample 15, Depth 58'-59'

File: UU-7002 Project No.: 14149 FIG. NO.: _____





SPECIMEN NO.:		1	2	3
INITIAL	WATER CONTENT, %	31.5	30.7	31.5
	DRY DENSITY, pcf	91.3	91.2	88.7
	SATURATION, %	100.5	97.6	94.5
	VOID RATIO	0.846	0.849	0.901
	DIAMETER, in	1.40	1.40	1.40
	HEIGHT, in	3.00	2.99	2.99
AT TEST	WATER CONTENT, %	31.6	31.4	33.0
	DRY DENSITY, pcf	90.9	91.2	89.1
	SATURATION, %	100.0	100.0	100.0
	VOID RATIO	0.854	0.848	0.892
	DIAMETER, in	1.40	1.40	1.40
	HEIGHT, in	2.99	2.99	2.99
Strain rate, in/min		0.0961	0.0873	0.0998
BACK PRESSURE, psf		0	0	0
CELL PRESSURE, psf		1008	2016	4032
FAILURE STRESS, psf		1653	1618	1140
ULTIMATE STRESS, psf		1466	1526	1052
σ_1 FAILURE, psf		2661	3634	5172
σ_3 FAILURE, psf		1008	2016	4032

TYPE OF TEST:
Unconsolidated Undrained

SAMPLE TYPE: Undisturbed

DESCRIPTION: Mst greenish-gray Sandy Clay

SPECIFIC GRAVITY= 2.7

REMARKS:

FIG. NO.: ______

CLIENT:

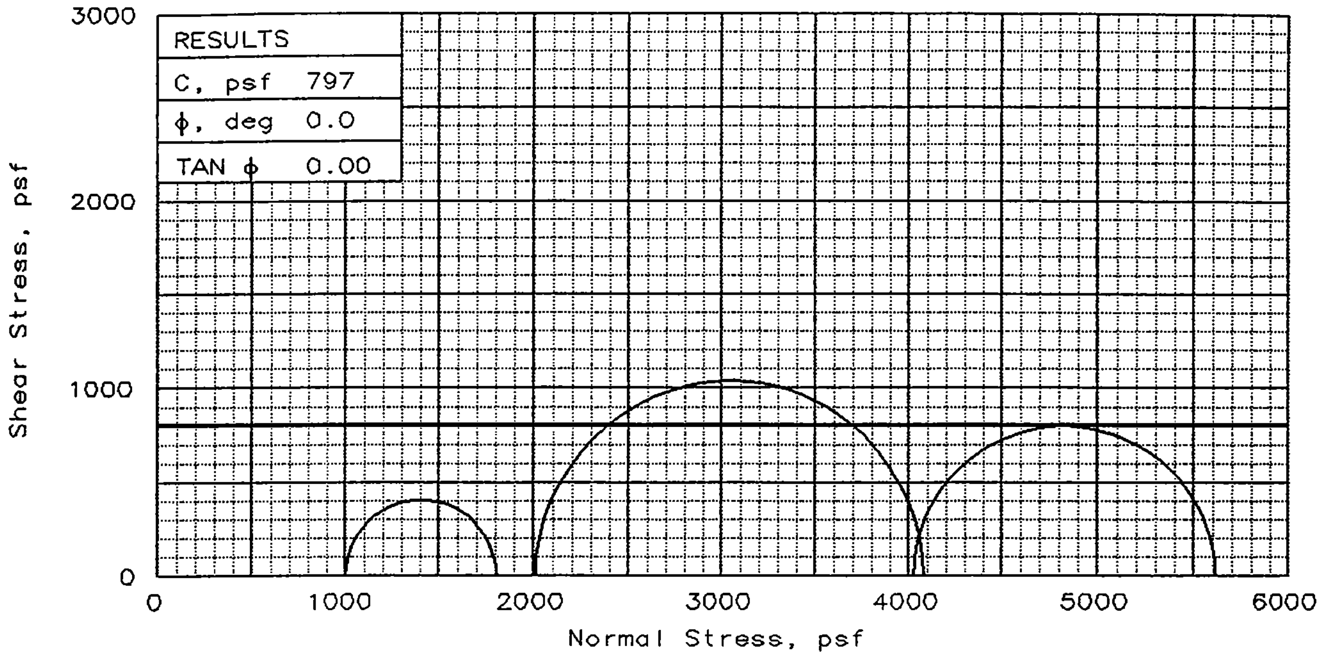
PROJECT: WJLD

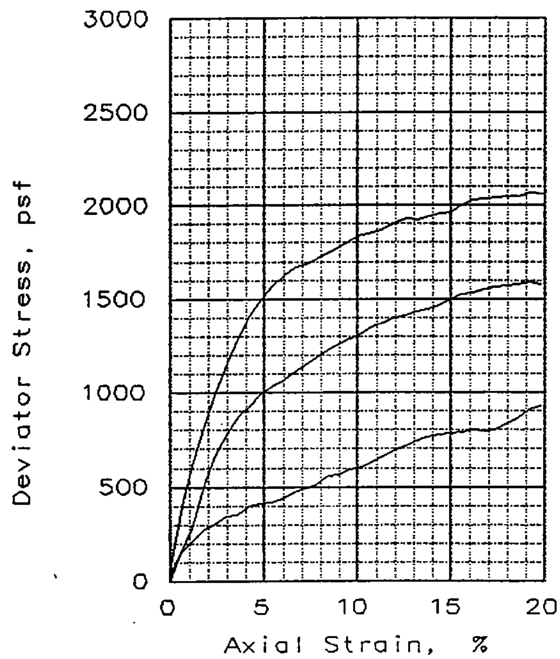
SAMPLE LOCATION: Boring 6, Sample 25, Depth 93'-94'

PROJ. NO.: 14149 DATE: 7-18-96

TRIAXIAL SHEAR TEST REPORT

Eustis Engineering Company, Inc.





SPECIMEN NO.:		1	2	3
INITIAL	WATER CONTENT, %	23.8	22.0	21.8
	DRY DENSITY, pcf	100.2	102.5	96.8
	SATURATION, %	94.1	92.1	79.6
	VOID RATIO	0.683	0.644	0.741
	DIAMETER, in	1.40	1.40	1.40
	HEIGHT, in	2.99	2.99	3.00
AT TEST	WATER CONTENT, %	25.0	23.6	27.7
	DRY DENSITY, pcf	100.7	102.9	96.5
	SATURATION, %	100.0	100.0	100.0
	VOID RATIO	0.675	0.637	0.747
	DIAMETER, in	1.40	1.40	1.40
	HEIGHT, in	2.99	2.99	2.99
Strain rate, in/min		0.0981	0.1017	0.1004
BACK PRESSURE, psf		0	0	0
CELL PRESSURE, psf		1008	2016	4032
FAILURE STRESS, psf		803	2067	1589
ULTIMATE STRESS, psf		930	2061	1578
σ_1 FAILURE, psf		1811	4083	5621
σ_3 FAILURE, psf		1008	2016	4032

TYPE OF TEST:
Unconsolidated Undrained

SAMPLE TYPE: Undisturbed

DESCRIPTION: St greenish - gray Sandy Clay

SPECIFIC GRAVITY= 2.7

REMARKS:

FIG. NO.: ______

CLIENT:

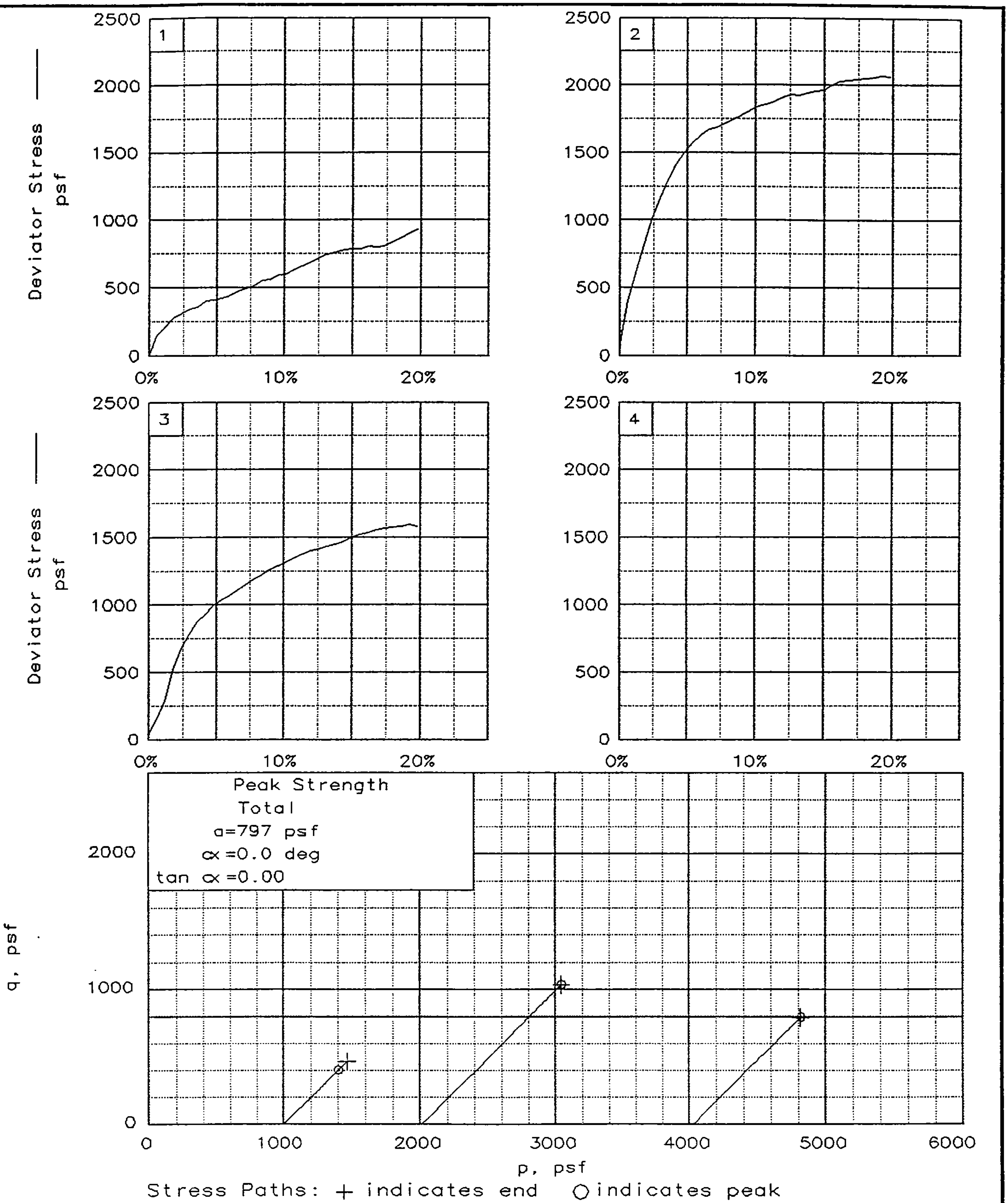
PROJECT: WJLD

SAMPLE LOCATION: Boring 6, Sample 19, Depth 73'-74'

PROJ. NO.: 14149 DATE: 7-18-96

TRIAXIAL SHEAR TEST REPORT

Eustis Engineering Company, Inc.

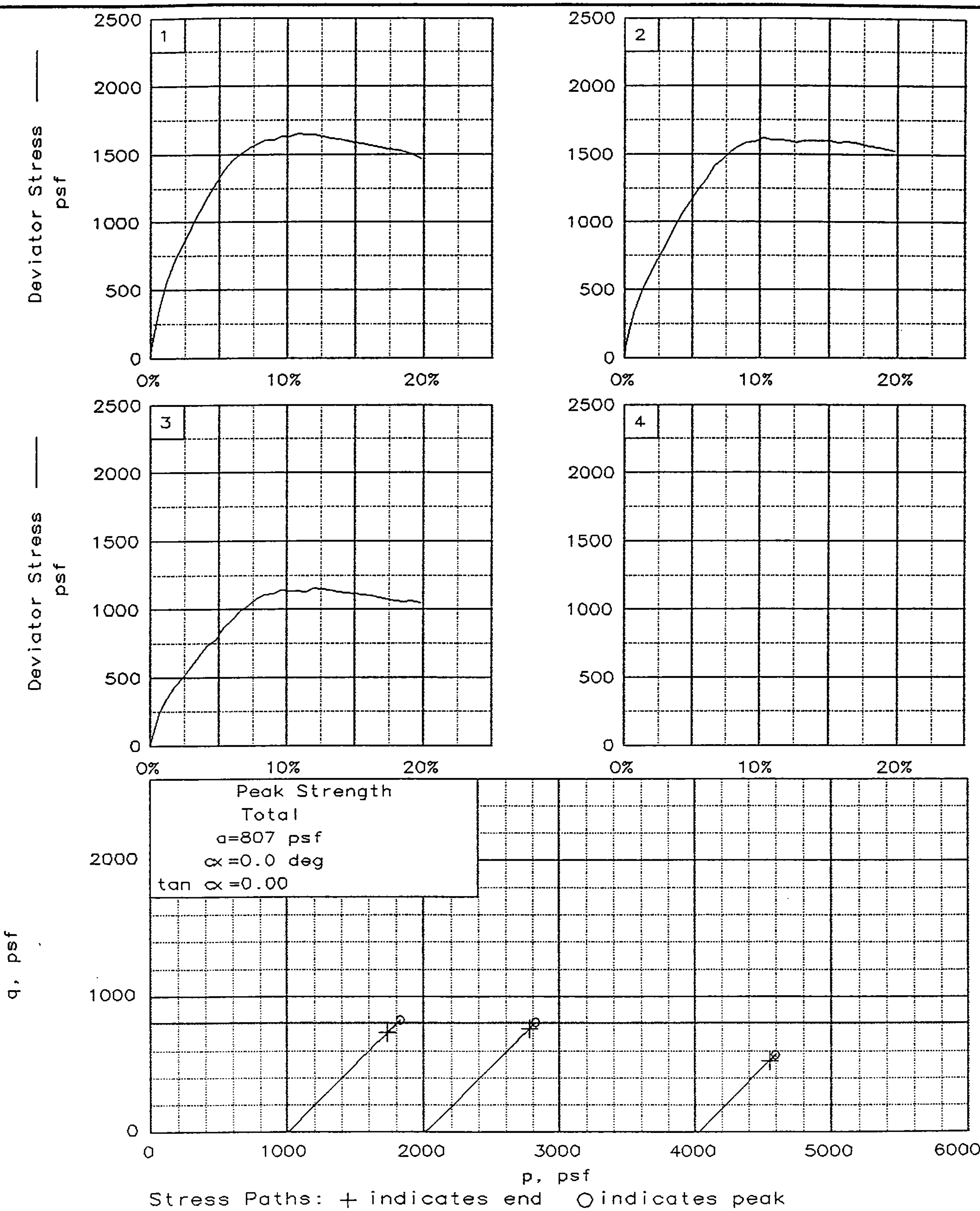


Client:

Project: WJLD

Location: Boring 6, Sample 19, Depth 73'-74'

File: UU-7015 Project No.: 14149 FIG. NO.: _____

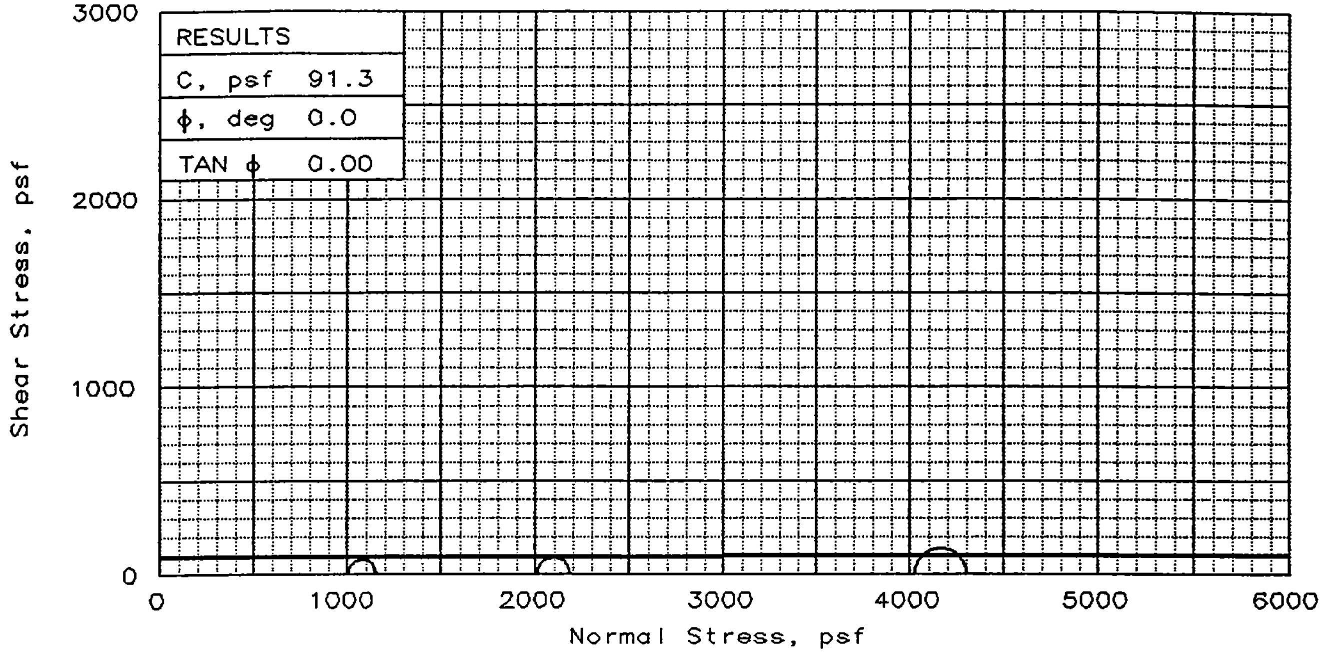


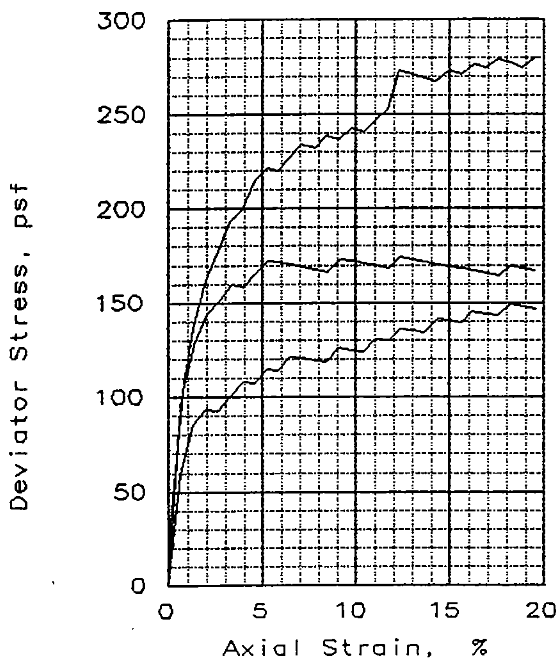
Client:

Project: WJLD

Location: Boring 6, Sample 25, Depth 93'-94'

File: UU-7016 Project No.: 14149 FIG. NO.: _____





SPECIMEN NO.:		1	2	3
INITIAL	WATER CONTENT, %	117.3	113.2	112.6
	DRY DENSITY, pcf	40.0	40.5	40.7
	SATURATION, %	98.0	96.3	96.5
	VOID RATIO	3.278	3.222	3.198
	DIAMETER, in	1.40	1.40	1.40
	HEIGHT, in	2.99	3.00	2.99
AT TEST	WATER CONTENT, %	120.0	118.4	116.5
	DRY DENSITY, pcf	39.9	40.3	40.8
	SATURATION, %	100.0	100.0	100.0
	VOID RATIO	3.287	3.243	3.192
	DIAMETER, in	1.40	1.40	1.40
	HEIGHT, in	2.99	2.99	2.99
Strain rate, in/min		0.1087	0.1112	0.1105
BACK PRESSURE, psf		0	0	0
CELL PRESSURE, psf		1008	2016	4032
FAILURE STRESS, psf		149	173	273
ULTIMATE STRESS, psf		147	167	279
σ_1 FAILURE, psf		1157	2189	4305
σ_3 FAILURE, psf		1008	2016	4032

TYPE OF TEST:
Unconsolidated Undrained
SAMPLE TYPE: Undisturbed
DESCRIPTION: Xso gray Clay w/ trace organic matter

SPECIFIC GRAVITY= 2.74
REMARKS:

FIG. NO.: ______

CLIENT:

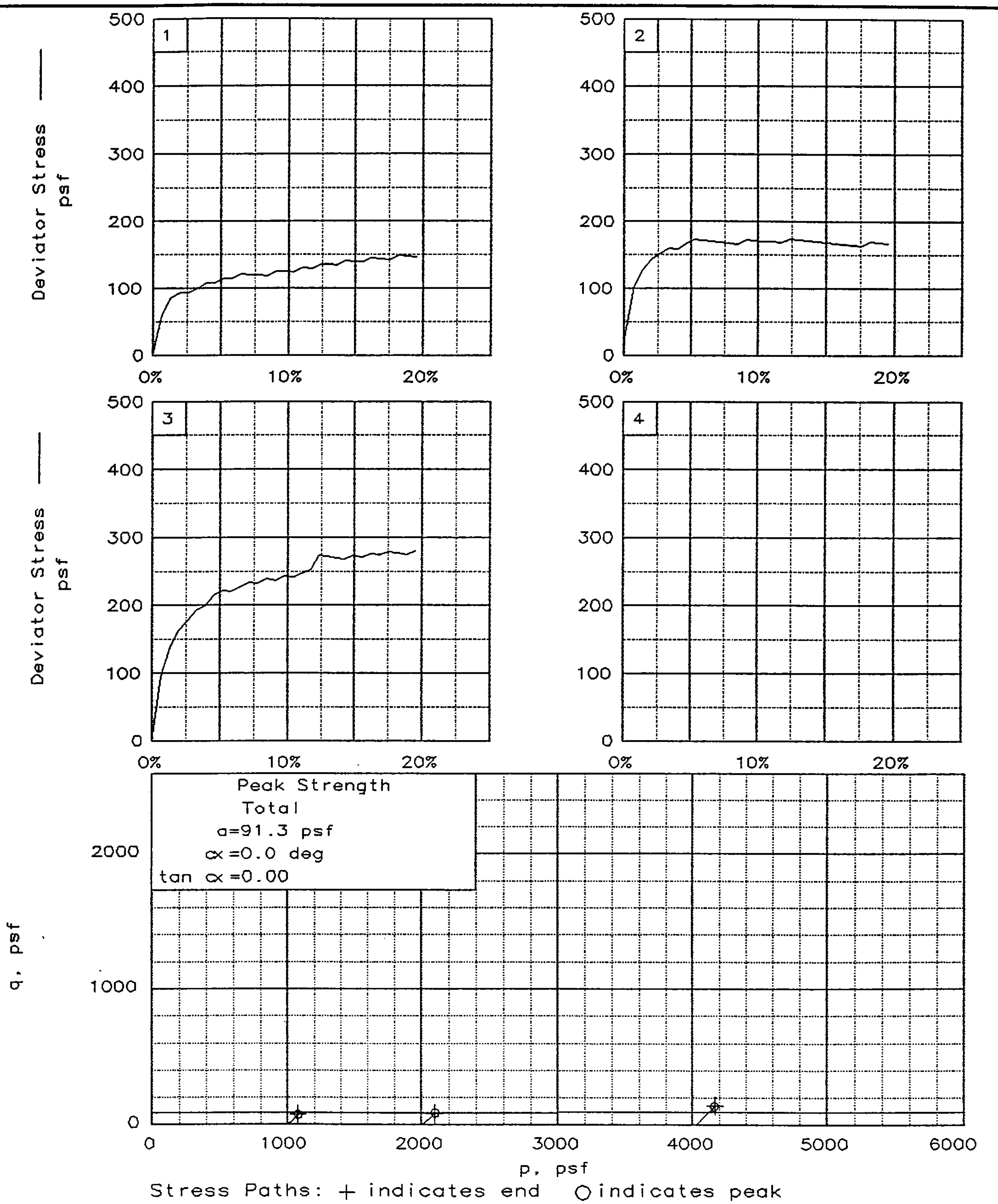
PROJECT: WJLD

SAMPLE LOCATION: Boring 7, Sample 5, Depth 11'-12'

PROJ. NO.: 14149 DATE: 8-2-96

TRIAXIAL SHEAR TEST REPORT

Eustis Engineering Company, Inc.

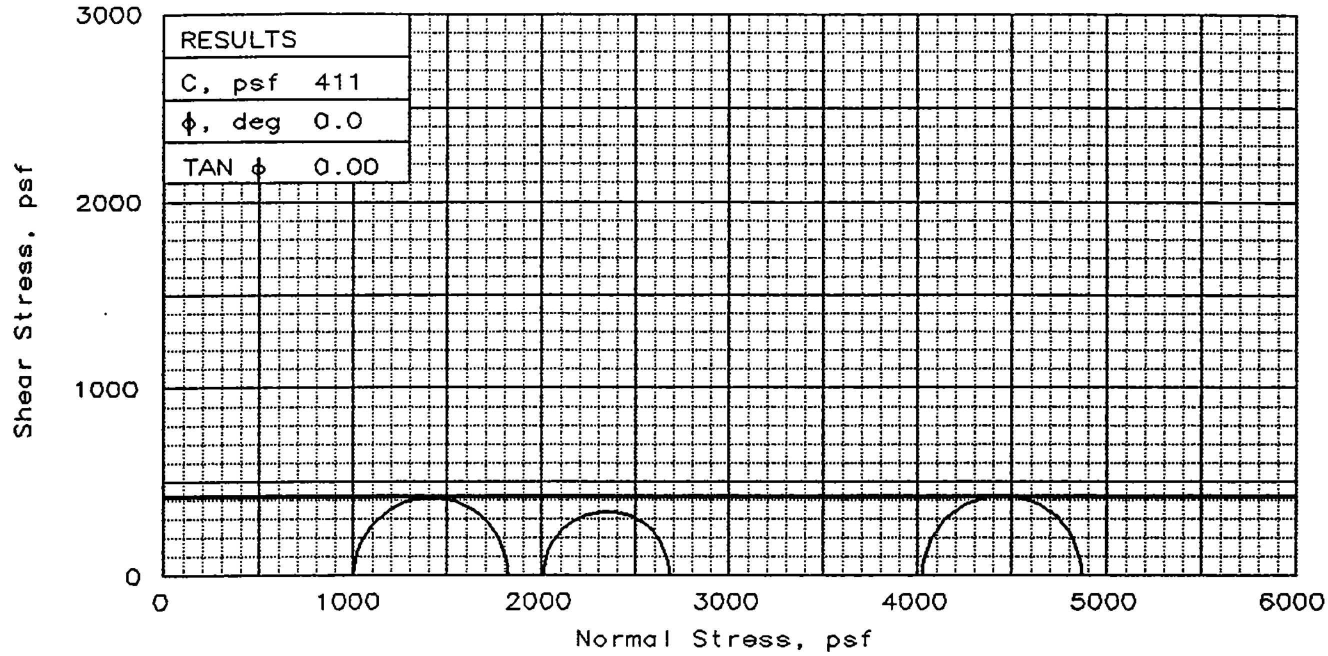


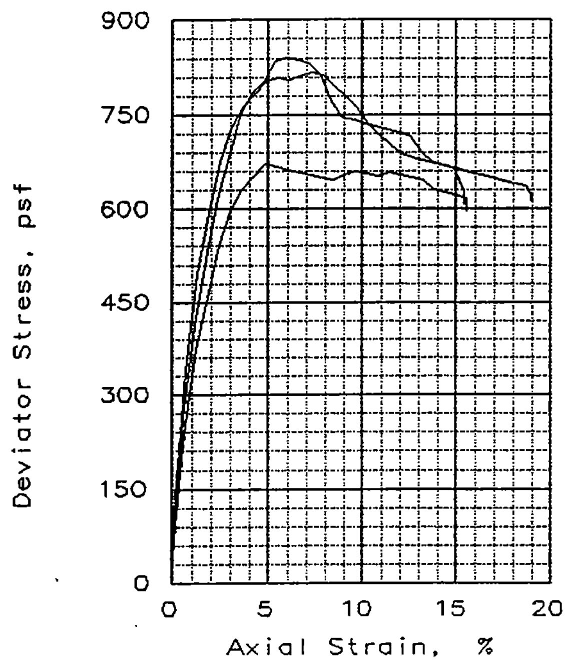
Client:

Project: WJLD

Location: Boring 7, Sample 5, Depth 11'-12'

File: UU-7228 Project No.: 14149 FIG. NO.: ____





SPECIMEN NO.:		1	2	3
INITIAL	WATER CONTENT, %	67.7	67.9	70.0
	DRY DENSITY, pcf	58.4	57.4	57.1
	SATURATION, %	96.2	93.9	96.1
	VOID RATIO	1.930	1.981	1.995
	DIAMETER, in	1.40	1.40	1.40
	HEIGHT, in	3.00	2.98	2.99
AT TEST	WATER CONTENT, %	70.8	71.2	72.2
	DRY DENSITY, pcf	58.2	58.0	57.4
	SATURATION, %	100.0	100.0	100.0
	VOID RATIO	1.939	1.952	1.978
	DIAMETER, in	1.40	1.40	1.40
	HEIGHT, in	2.99	2.99	2.99
Strain rate, in/min		0.0995	0.0989	0.0991
BACK PRESSURE, psf		0	0	0
CELL PRESSURE, psf		1008	2016	4032
FAILURE STRESS, psf		818	672	841
ULTIMATE STRESS, psf		613	596	607
σ_1 FAILURE, psf		1826	2688	4873
σ_3 FAILURE, psf		1008	2016	4032

TYPE OF TEST:
Unconsolidated Undrained

SAMPLE TYPE: Undisturbed

DESCRIPTION: So gray Clay
w/ few clayey silt lenses

SPECIFIC GRAVITY= 2.74

REMARKS:

FIG. NO.: ______

CLIENT:

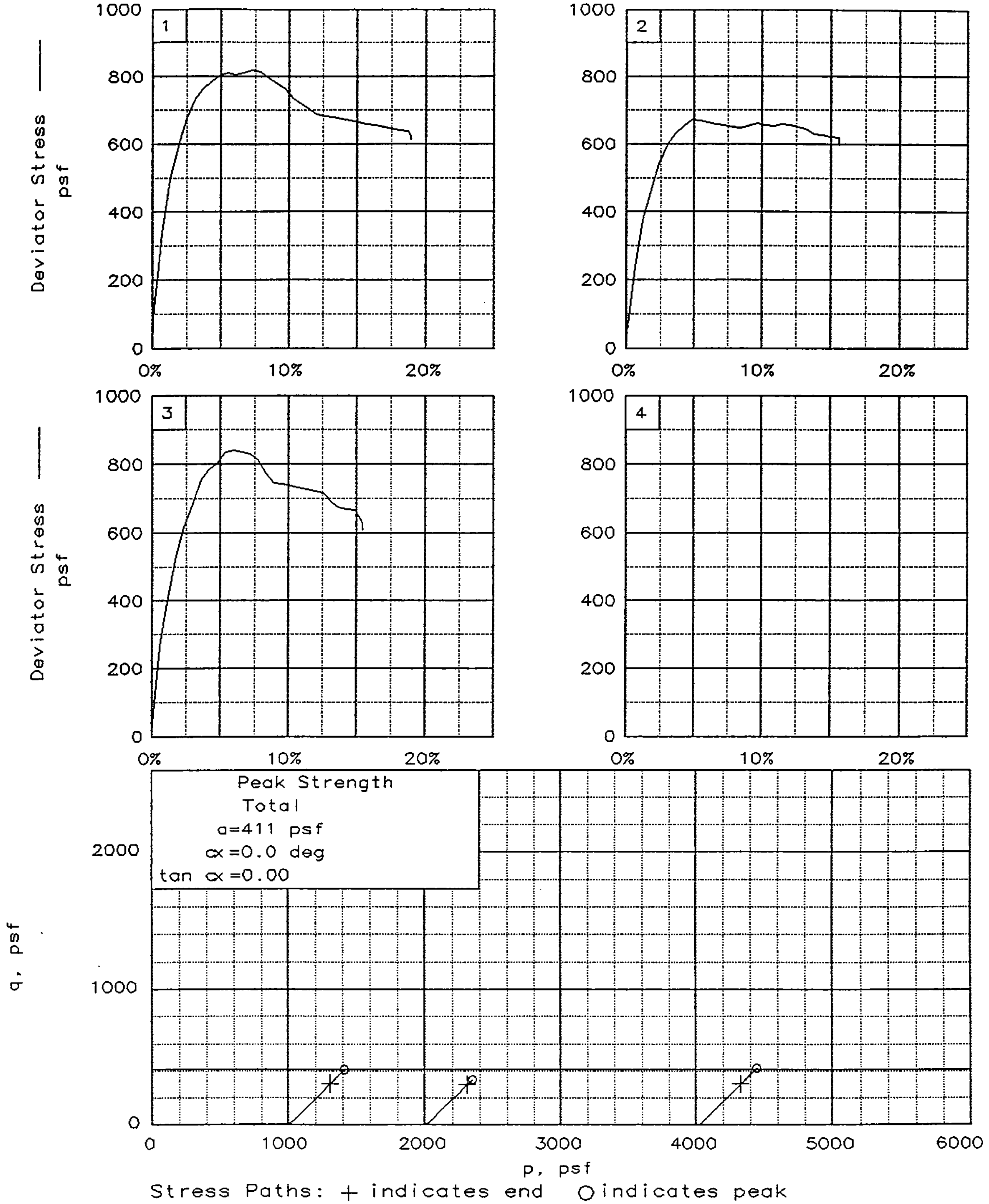
PROJECT: WJLD

SAMPLE LOCATION: Boring 7, Sample 14,
Depth 43'-44'

PROJ. NO.: 14149 DATE: 8-2-96

TRIAXIAL SHEAR TEST REPORT

Eustis Engineering Company, Inc.

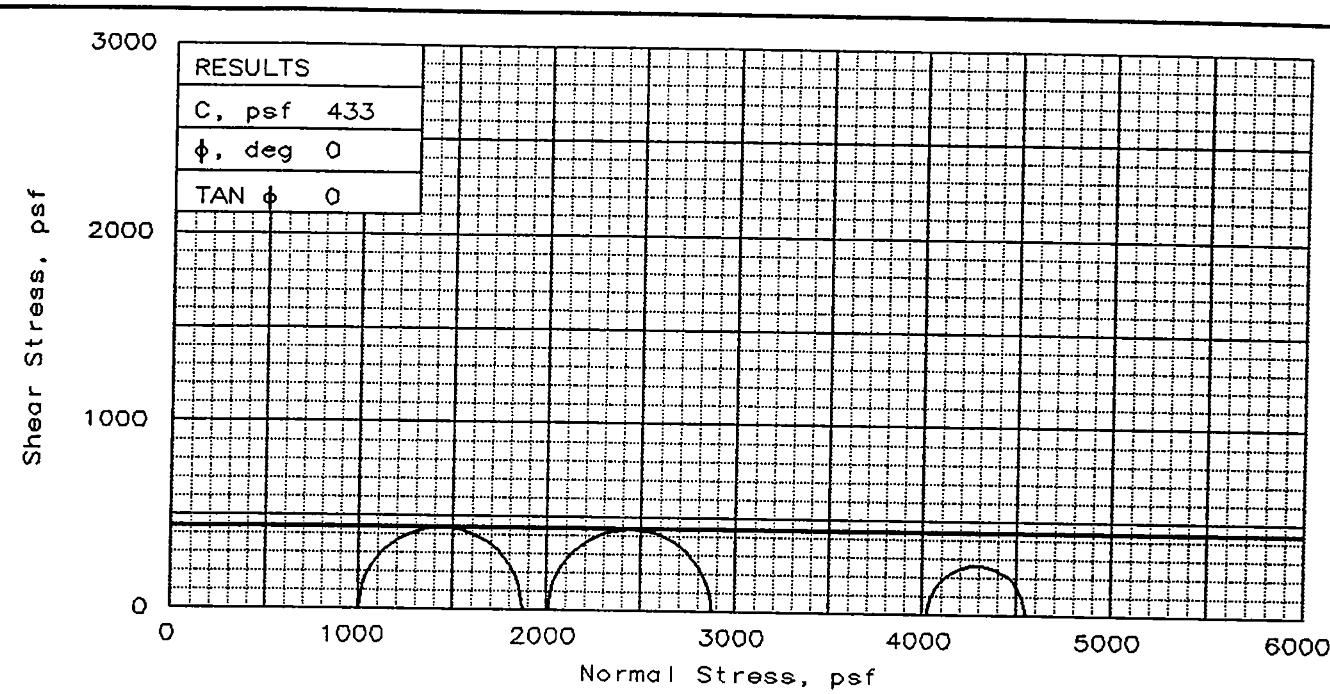


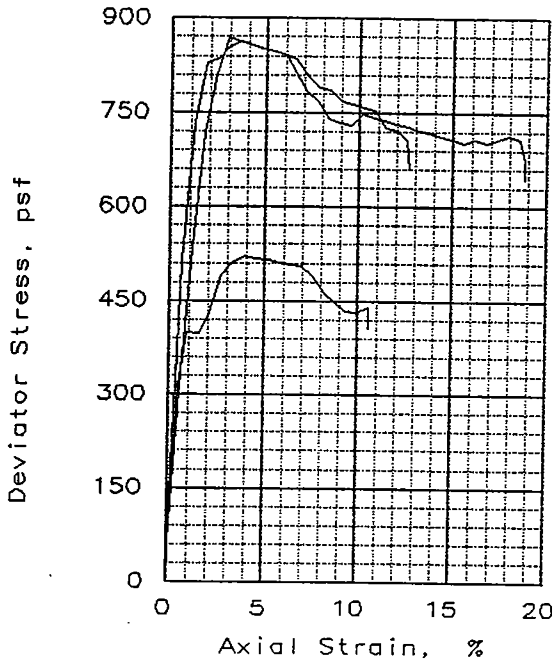
Client:

Project: WJLD

Location: Boring 7, Sample 14, Depth 43'-44'

File: UU-7229 Project No.: 14149 FIG. NO.: _____





SPECIMEN NO.:		1	2	3
INITIAL	WATER CONTENT, %	50.0	63.6	63.7
	DRY DENSITY, pcf	66.7	56.7	52.7
	SATURATION, %	87.6	86.3	77.7
	VOID RATIO	1.564	2.018	2.247
	DIAMETER, in	1.40	1.40	1.40
	HEIGHT, in	2.99	3.00	2.99
AT TEST	WATER CONTENT, %	57.2	74.3	81.7
	DRY DENSITY, pcf	66.6	56.4	52.8
	SATURATION, %	100.0	100.0	100.0
	VOID RATIO	1.568	2.035	2.238
	DIAMETER, in	1.40	1.40	1.40
	HEIGHT, in	2.99	2.99	2.99
Strain rate, in/min		0.0988	0.0986	0.0899
BACK PRESSURE, psf		0	0	0
CELL PRESSURE, psf		1008	2016	4032
FAILURE STRESS, psf		868	862	521
ULTIMATE STRESS, psf		644	660	406
σ_1 FAILURE, psf		1876	2878	4553
σ_3 FAILURE, psf		1008	2016	4032

TYPE OF TEST:
Unconsolidated Undrained
SAMPLE TYPE: Undisturbed
DESCRIPTION: So gray Clay

SPECIFIC GRAVITY= 2.74
REMARKS:

FIG. NO.: ______

CLIENT:

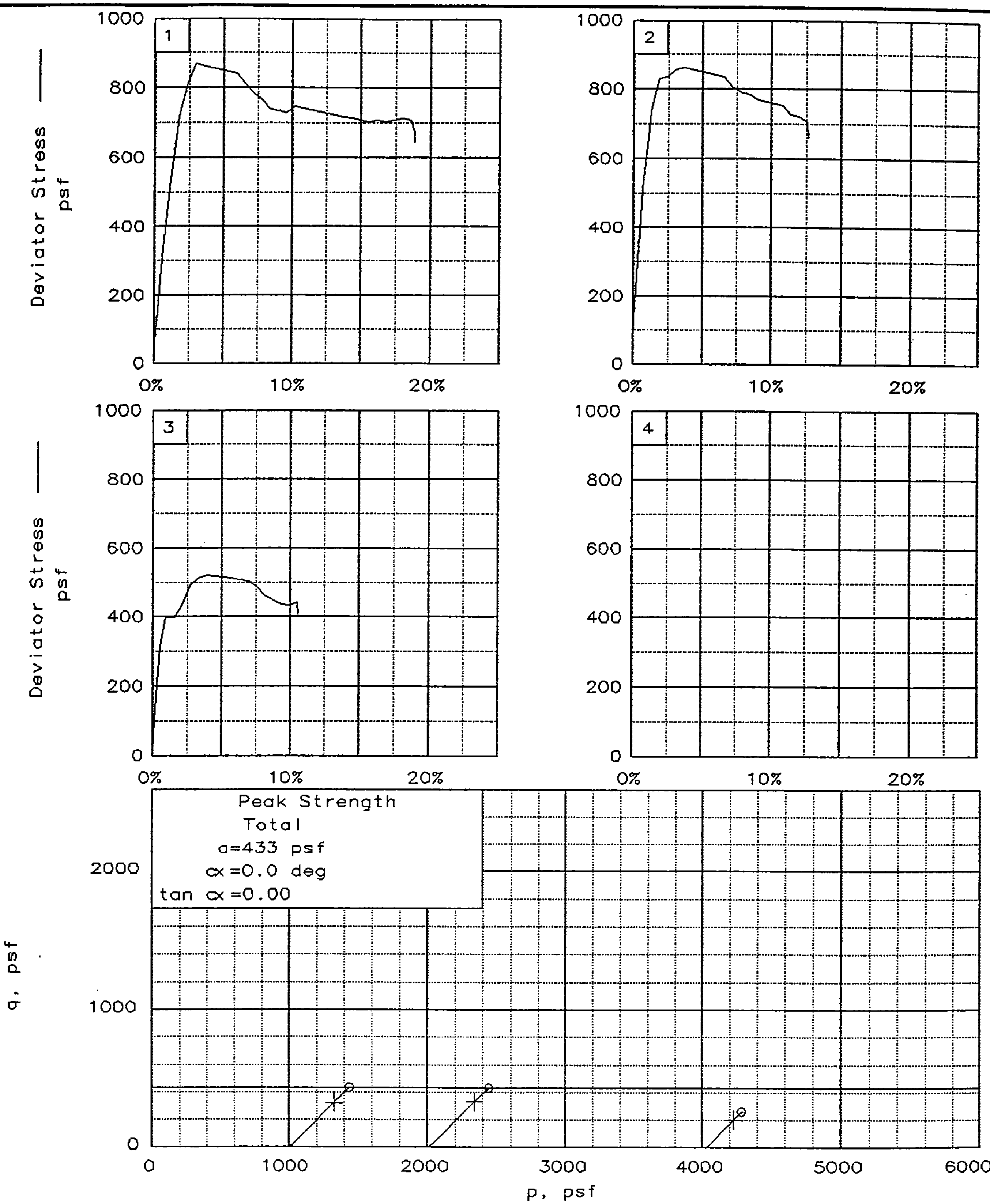
PROJECT: WJLD

SAMPLE LOCATION: Boring 7, Sample 18, Depth 63'-64'

PROJ. NO.: 14149 DATE: 8-2-96

TRIAXIAL SHEAR TEST REPORT

Eustis Engineering Company, Inc.



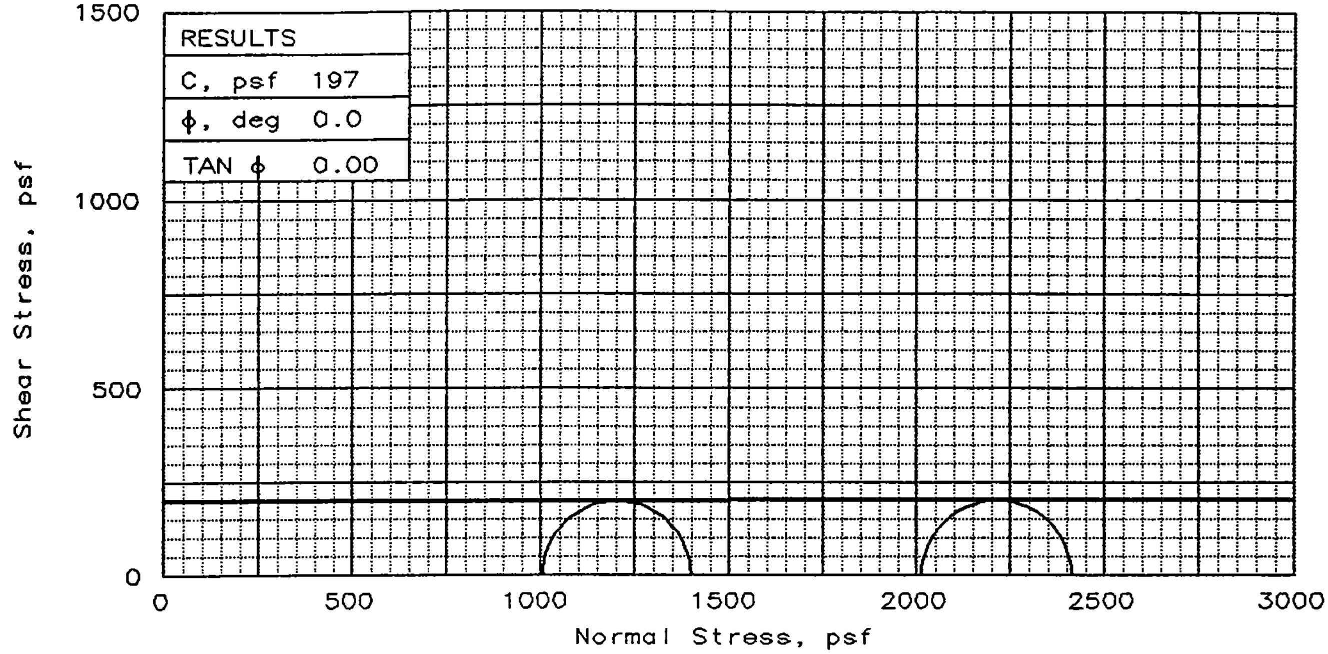
Stress Paths: + indicates end ○ indicates peak

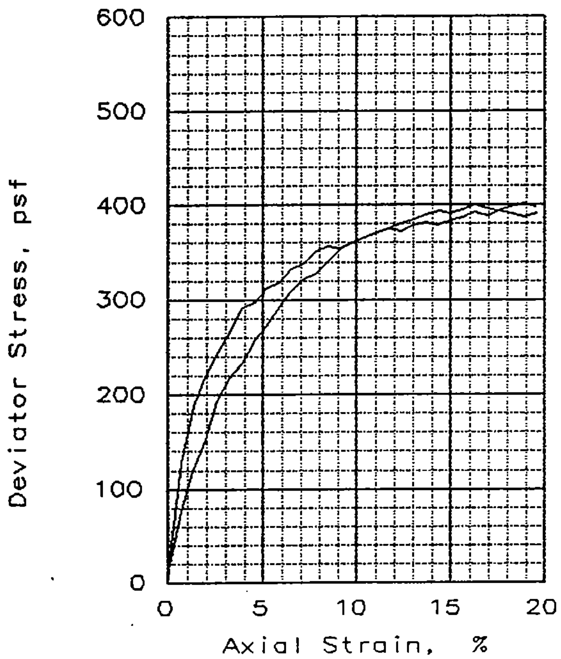
Client:

Project: WJLD

Location: Boring 7, Sample 18, Depth 63'-64'

File: UU-7230 Project No.: 14149 FIG. NO.: _____





SPECIMEN NO.:		1	2
INITIAL	WATER CONTENT, %	109.7	88.4
	DRY DENSITY, pcf	40.3	46.2
	SATURATION, %	92.7	89.7
	VOID RATIO	3.243	2.700
	DIAMETER, in	1.40	1.40
	HEIGHT, in	2.99	2.99
AT TEST	WATER CONTENT, %	118.3	98.9
	DRY DENSITY, pcf	40.3	46.1
	SATURATION, %	100.0	100.0
	VOID RATIO	3.240	2.709
	DIAMETER, in	1.40	1.40
	HEIGHT, in	2.99	2.99
Strain rate, in/min		0.1111	0.1091
BACK PRESSURE, psf		0	0
CELL PRESSURE, psf		1008	2016
FAILURE STRESS, psf		394	400
ULTIMATE STRESS, psf		391	398
σ_1 FAILURE, psf		1402	2416
σ_3 FAILURE, psf		1008	2016

TYPE OF TEST:
Unconsolidated Undrained
SAMPLE TYPE: Undisturbed
DESCRIPTION: Vso gray Clay
w/ wood, organic matter

SPECIFIC GRAVITY= 2.74
REMARKS:

FIG. NO.: ______

CLIENT:

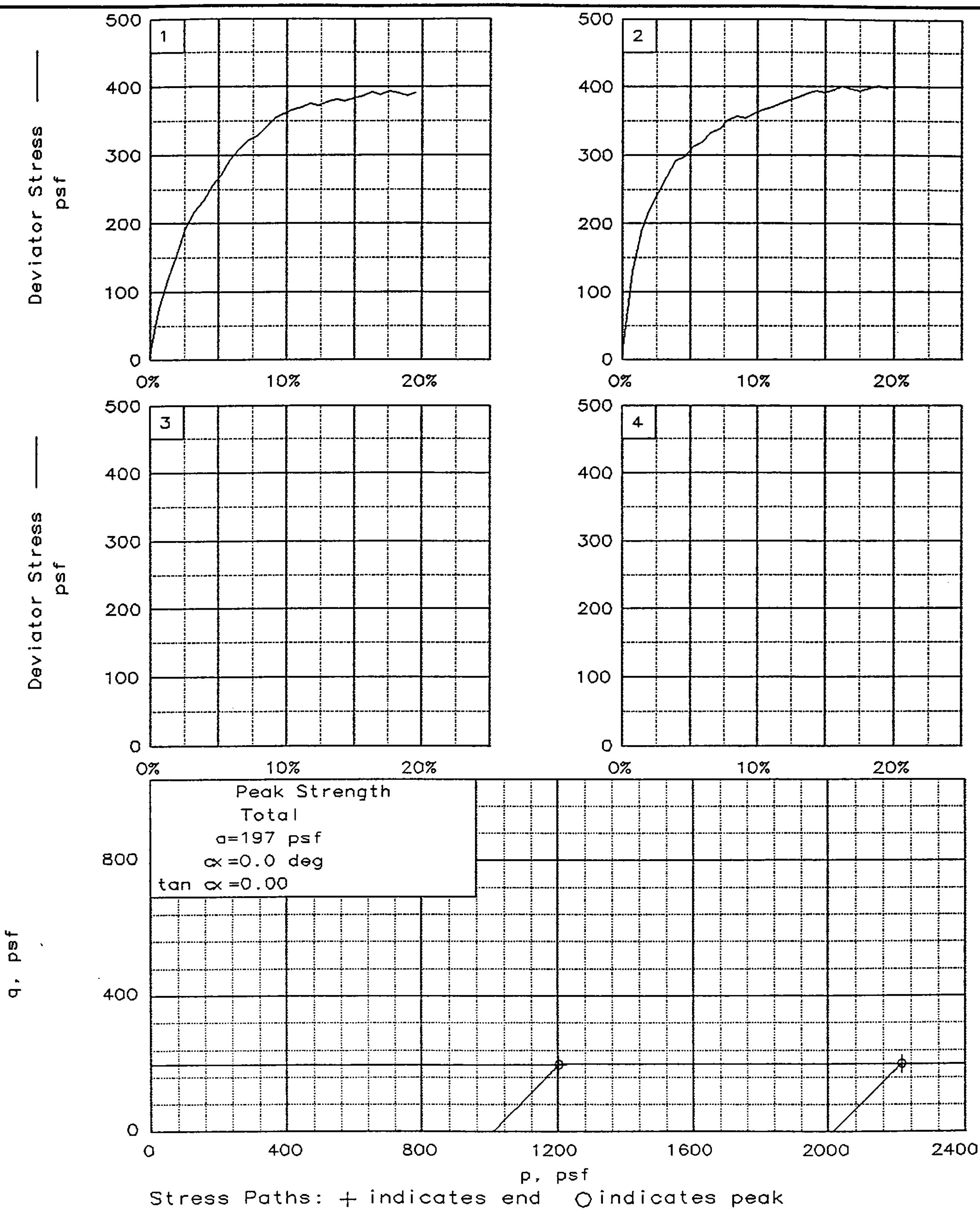
PROJECT: WJLD

SAMPLE LOCATION: Boring 8, Sample 4,
Depth 8'-9'

PROJ. NO.: 14149 DATE: 8-5-96

TRIAXIAL SHEAR TEST REPORT

Eustis Engineering Company, Inc.

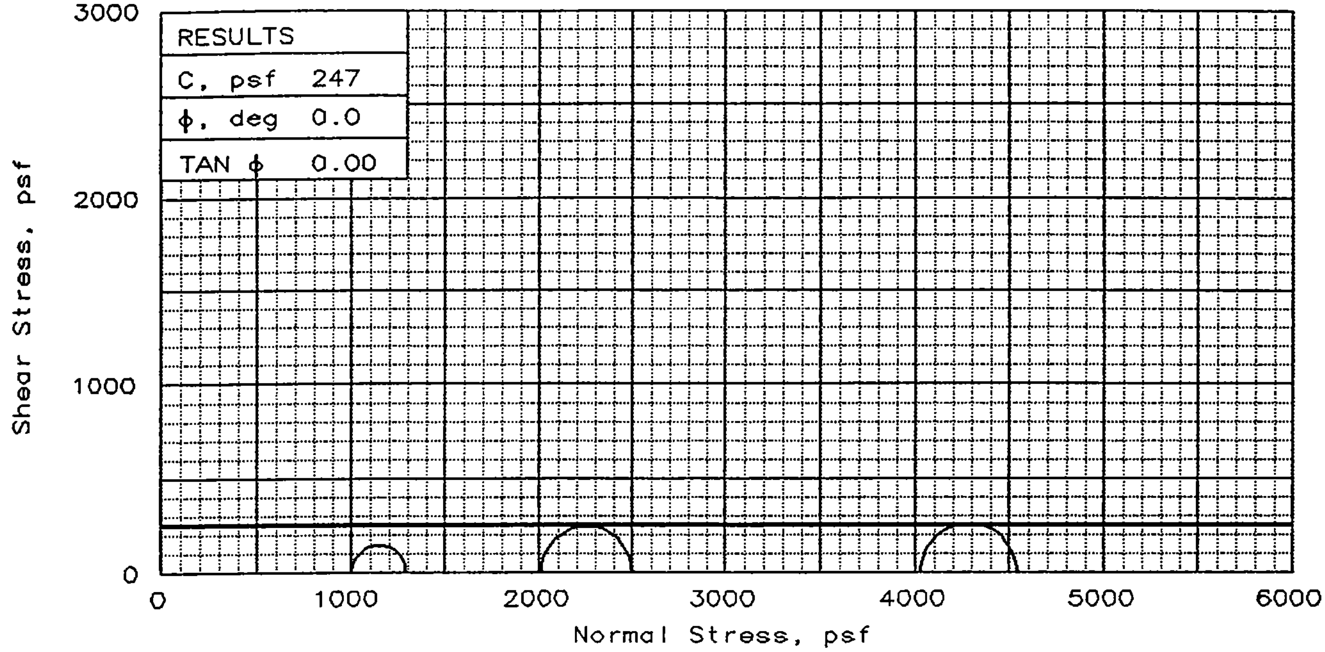


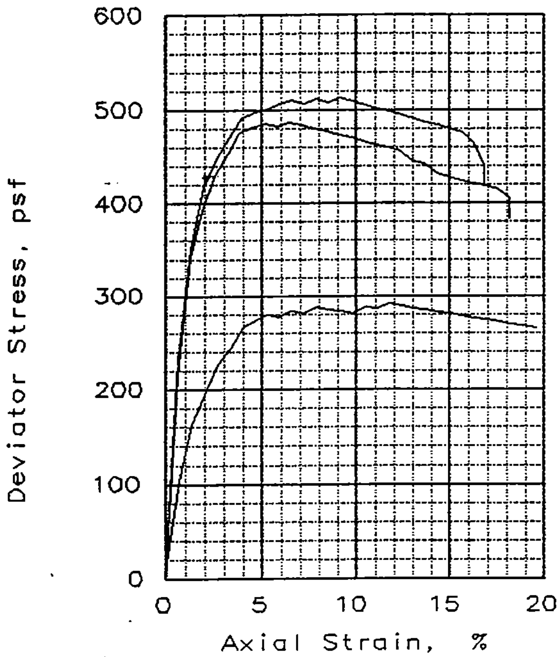
Client:

Project: WJLD

Location: Boring 8, Sample 4, Depth 8'-9'

File: UU-7243 Project No.: 14149 FIG. NO.: ____





SPECIMEN NO.:		1	2	3
INITIAL	WATER CONTENT, %	106.7	87.0	85.1
	DRY DENSITY, pcf	43.4	49.4	50.0
	SATURATION, %	99.4	96.6	96.2
	VOID RATIO	2.940	2.466	2.422
	DIAMETER, in	1.40	1.40	1.40
	HEIGHT, in	2.99	3.00	2.99
AT TEST	WATER CONTENT, %	107.3	90.4	88.2
	DRY DENSITY, pcf	43.4	49.2	50.1
	SATURATION, %	100.0	100.0	100.0
	VOID RATIO	2.939	2.478	2.417
	DIAMETER, in	1.40	1.40	1.40
	HEIGHT, in	2.99	2.99	2.99
Strain rate, in/min		0.1042	0.1106	0.1082
BACK PRESSURE, psf		0	0	0
CELL PRESSURE, psf		1008	2016	4032
FAILURE STRESS, psf		287	487	513
ULTIMATE STRESS, psf		265	383	419
σ_1 FAILURE, psf		1295	2503	4545
σ_3 FAILURE, psf		1008	2016	4032

TYPE OF TEST:
Unconsolidated Undrained

SAMPLE TYPE: Undisturbed

DESCRIPTION: So gray Clay w/ organic matter

SPECIFIC GRAVITY= 2.74

REMARKS:

FIG. NO.: ______

CLIENT:

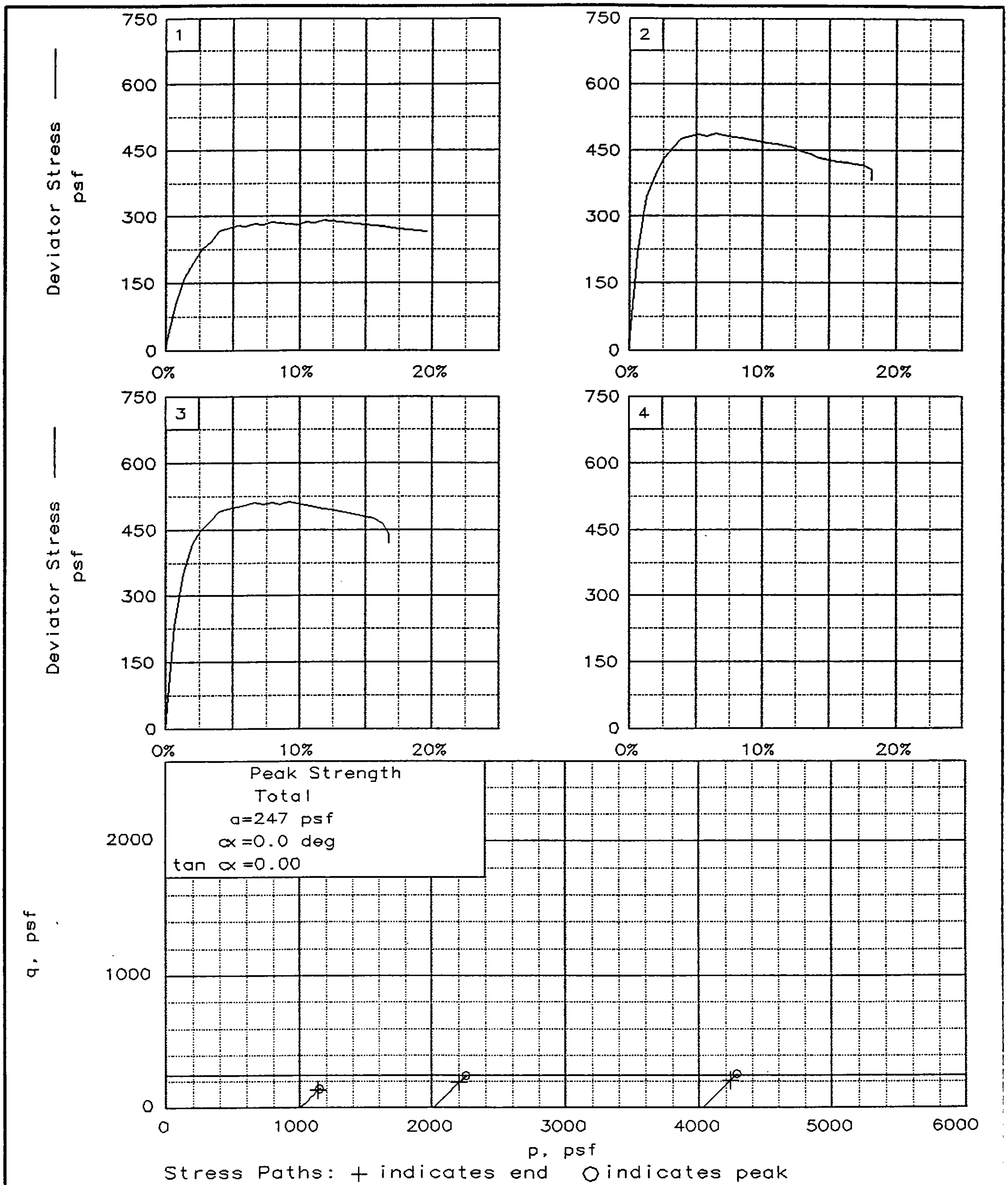
PROJECT: WJLD

SAMPLE LOCATION: Boring 8, Sample 6, Depth 14'-15'

PROJ. NO.: 14149 DATE: 8-5-96

TRIAXIAL SHEAR TEST REPORT

Eustis Engineering Company, Inc.

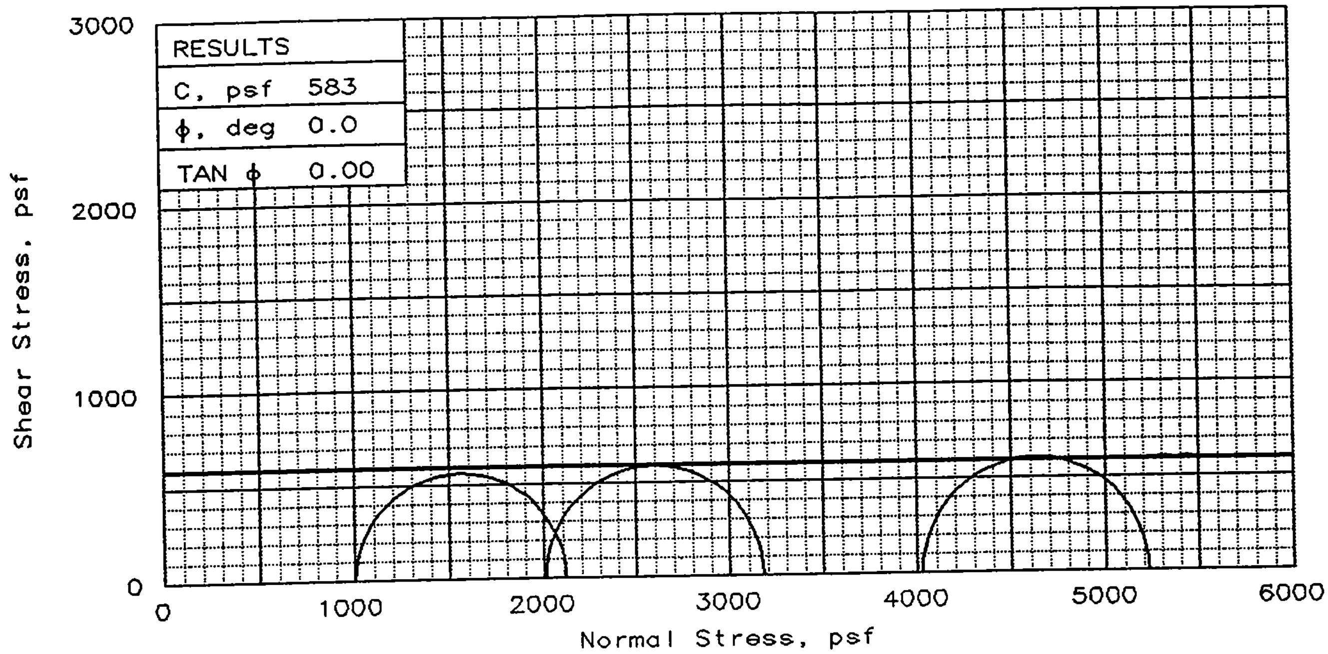


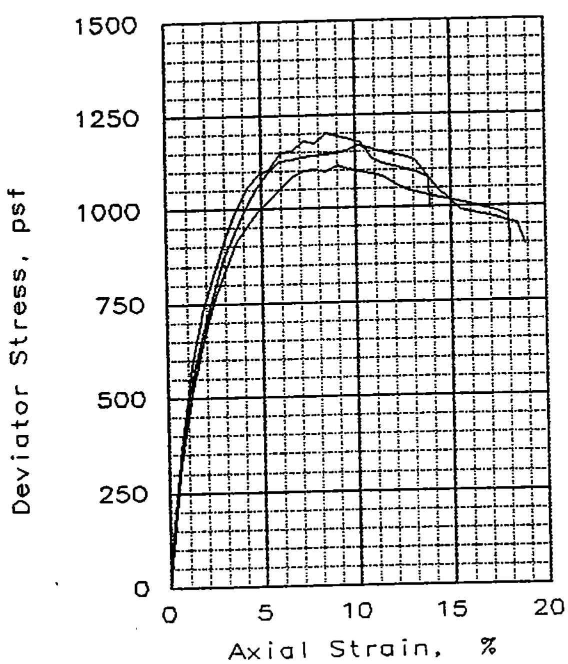
Client:

Project: WJLD

Location: Boring 8, Sample 6, Depth 14'-15'

File: UU-7244 Project No.: 14149 FIG. NO.: ____





SPECIMEN NO.:		1	2	3
INITIAL	WATER CONTENT, %	54.1	54.0	54.9
	DRY DENSITY, pcf	66.6	66.4	65.2
	SATURATION, %	94.5	93.7	92.8
	VOID RATIO	1.567	1.578	1.622
	DIAMETER, in	1.40	1.40	1.40
	HEIGHT, in	2.99	2.98	2.99
AT TEST	WATER CONTENT, %	56.7	56.8	58.6
	DRY DENSITY, pcf	67.0	66.9	65.7
	SATURATION, %	100.0	100.0	100.0
	VOID RATIO	1.553	1.555	1.605
	DIAMETER, in	1.40	1.40	1.40
	HEIGHT, in	2.99	2.99	2.99
Strain rate, in/min		0.0962	0.0997	0.0999
BACK PRESSURE, psf		0	0	0
CELL PRESSURE, psf		1008	2016	4032
FAILURE STRESS, psf		1112	1167	1200
ULTIMATE STRESS, psf		888	900	999
σ_1 FAILURE, psf		2120	3183	5232
σ_3 FAILURE, psf		1008	2016	4032

TYPE OF TEST:
Unconsolidated Undrained

SAMPLE TYPE: Undisturbed

DESCRIPTION: Mst gray Clay

SPECIFIC GRAVITY= 2.74

REMARKS:

FIG. NO.: ______

CLIENT:

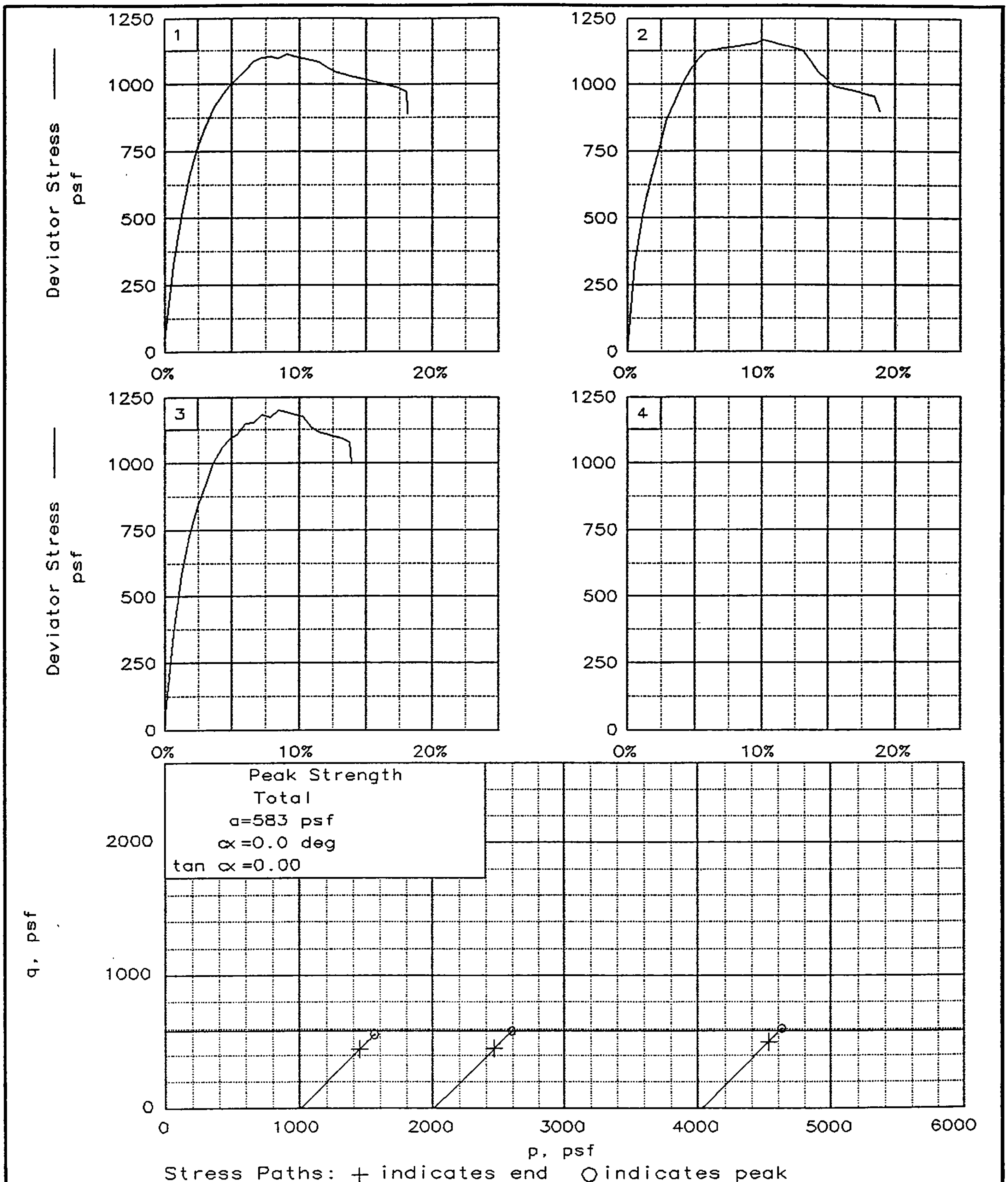
PROJECT: WJLD

SAMPLE LOCATION: Boring 8, Sample 15, Depth 48'-49'

PROJ. NO.: 14149 DATE: 8-5-96

TRIAXIAL SHEAR TEST REPORT

Eustis Engineering Company, Inc.



Client:

Project: WJLD

Location: Boring 8, Sample 15, Depth 48'-49'

File: UU-7245 Project No.: 14149 FIG. NO.: _____

APPENDIX B

COMPUTER ANALYSES OUTPUT

Anchor Sheetpile Guide Wall
"Q" Case FS = 1.5

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 21-JUL-1997 TIME: 13.08.54

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¤ INPUT DATA ¤
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I.--HEADING:
'COUSINS P STA, EE14149
'ANCHOR GUIDE WALL NEAR B-1

II.--CONTROL
ANCHORED WALL DESIGN

LEVEL 1 FACTOR OF SAFETY FOR ACTIVE PRESSURES = 1.50
LEVEL 1 FACTOR OF SAFETY FOR PASSIVE PRESSURES = 1.50

III.--WALL DATA
ELEVATION AT TOP OF WALL = -1.50 (FT)
ELEVATION AT ANCHOR = -2.50 (FT)

IV.--SURFACE POINT DATA

IV.A--RIGHTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
.00	-1.50
100.00	-1.50

IV.B-- LEFTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
.00	-16.50
100.00	-16.50

V.--SOIL LAYER DATA

V.A.--RIGHTSIDE LAYER DATA
LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURES = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURES = DEFAULT

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH-ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH-ESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.
95.00	95.00	.00	260.0	.00	.0	-6.00	.00	DEF	DEF
90.00	90.00	.00	235.0	.00	.0	-10.00	.00	DEF	DEF

90.00	90.00	.00	220.0	.00	.0	-12.00	.00	DEF	DEF
75.00	75.00	.00	220.0	.00	.0	-14.00	.00	DEF	DEF
95.00	95.00	.00	220.0	.00	.0	-18.00	.00	DEF	DEF
103.00	103.00	.00	220.0	.00	.0	-23.00	.00	DEF	DEF
107.00	107.00	.00	310.0	.00	.0	-36.00	.00	DEF	DEF
102.00	102.00	.00	400.0	.00	.0	-42.00	.00	DEF	DEF
97.50	97.50	.00	400.0	.00	.0	-45.00	.00	DEF	DEF
97.50	97.50	.00	485.0	.00	.0	-53.50	.00	DEF	DEF
97.50	97.50	.00	655.0	.00	.0			DEF	DEF

V.B.-- LEFTSIDE LAYER DATA
LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURES = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURES = DEFAULT

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH-ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH-ESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.
95.00	95.00	.00	220.0	.00	.0	-18.00	.00	DEF	DEF
103.00	103.00	.00	220.0	.00	.0	-23.00	.00	DEF	DEF
107.00	107.00	.00	310.0	.00	.0	-36.00	.00	DEF	DEF
102.00	102.00	.00	400.0	.00	.0	-42.00	.00	DEF	DEF
97.50	97.50	.00	400.0	.00	.0	-45.00	.00	DEF	DEF
97.50	97.50	.00	485.0	.00	.0	-53.50	.00	DEF	DEF
97.50	97.50	.00	655.0	.00	.0			DEF	DEF

VI.--WATER DATA

UNIT WEIGHT = 62.40 (PCF)
RIGHTSIDE ELEVATION = -1.50 (FT)
LEFTSIDE ELEVATION = -11.00 (FT)
NO SEEPAGE

VII.--SURFACE LOADS
NONE

VIII.--HORIZONTAL LOADS
NONE

¤ SOIL PRESSURES FOR ¤
¤ ANCHORED WALL DESIGN ¤
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I.--HEADING

'COUSINS P STA, EE14149
'ANCHOR GUIDE WALL NEAR B-1

II.--SOIL PRESSURES

RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

	<-LEFTSIDE PRESSURES->		<---NET PRESSURES----> (SOIL PLUS WATER)	<RIGHTSIDE PRESSURES->	
ELEV. (FT)	PASSIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)
-1.50	.00	.00	.000	.00	346.67
-2.50	.00	.00	62.400	.00	379.27
-3.50	.00	.00	124.800	.00	411.87
-4.50	.00	.00	187.200	.00	444.89
-5.50	.00	.00	249.600	.00	471.77
-6.00	.00	.00	280.800	.00	476.04
-6.50	.00	.00	312.000	.00	479.10
-7.50	.00	.00	374.400	.00	501.02
-8.50	.00	.00	436.800	.00	529.28
-9.50	.00	.00	499.200	.00	553.55
-10.00	.00	.00	530.400	.00	560.25
-10.50	.00	.00	561.600	.00	566.17
-11.00	.00	.00	592.800	.00	577.75
-11.50	.00	.00	594.632	1.83	591.84
-12.00	.00	.00	603.424	10.62	603.68
-12.50	.00	.00	615.168	22.37	611.86
-13.50	.00	.00	630.874	38.07	624.61
-14.00	.00	.00	639.592	46.79	633.46
-14.50	.00	.00	653.329	60.53	647.20
-15.50	.00	.00	685.835	93.04	679.70
-16.50+	.00	.00	718.454	125.65	712.32
16.50-	293.33	.00	425.121	125.65	712.32
-17.50	325.96	.00	425.133	158.29	744.96
-18.00	343.28	.00	425.133	175.62	762.28
-18.50	362.56	.00	425.133	194.89	781.56
19.50	403.12	.00	425.133	235.45	822.12
-20.50	443.73	.00	425.133	276.07	862.73
21.50	482.83	.00	428.133	318.16	901.83
-22.50	543.95	.00	387.133	338.28	962.95
-23.00	605.76	.00	305.133	318.09	1024.76
-23.50	668.55	.00	223.133	298.88	1087.55
-24.50	733.63	.00	182.133	322.96	1152.63
-25.50	776.73	.00	185.133	369.07	1195.73
-26.50	821.33	.00	185.133	413.67	1240.33
27.50	865.93	.00	185.133	458.27	1284.93
-28.50	910.53	.00	185.133	502.87	1329.53
-29.50	955.13	27.13	185.133	547.47	1374.13
-30.50	999.73	118.33	185.133	592.07	1418.73

-31.50	1044.33	212.35	185.133	636.67	1463.33
-32.50	1088.93	263.43	185.133	681.27	1507.93
33.50	1133.53	306.87	185.133	725.87	1552.53
-34.50	1176.64	352.97	188.133	771.97	1595.64
-35.50	1241.72	377.05	147.133	796.05	1660.72
-36.00	1304.38	357.71	65.133	776.71	1723.38
-36.40	1353.18	341.38	.000	760.38	1772.18
-36.45	1359.50	339.27	-8.433	758.27	1778.50
-36.50	1365.82	337.15	-16.867	756.15	1784.82
-37.50	1425.94	356.27	-57.867	775.27	1844.94
-38.50	1464.03	397.37	-54.867	816.37	1883.03
-39.50	1503.63	436.97	-54.867	855.97	1922.63
-40.50	1543.24	476.57	-54.867	895.57	1962.24
-41.50	1582.82	516.15	-54.867	935.15	2001.82
-42.00	1602.04	535.38	-54.867	954.38	2021.04
-42.50	1620.17	553.50	-54.867	972.50	2039.17
-43.50	1653.87	590.04	-52.033	1009.04	2072.87
-44.50	1708.33	605.77	-90.756	1024.77	2127.33
-45.00	1764.60	584.60	-168.200	1003.60	2183.60
-45.50	1820.87	563.43	-245.644	982.43	2239.87
-46.50	1875.33	579.17	-284.367	998.17	2294.33
-47.50	1909.02	615.68	-281.533	1034.68	2328.02
-48.50	1944.12	650.78	-281.533	1069.78	2363.12
-49.50	1979.22	685.88	-281.533	1104.88	2398.22
-50.50	2014.32	720.98	-281.533	1139.98	2433.32
-51.50	2045.87	759.62	-274.450	1178.62	2464.88
-52.50	2105.77	769.93	-324.033	1188.93	2524.77
-53.50	2232.95	712.95	-508.200	1131.95	2651.95
54.50	2360.13	655.97	-692.367	1074.97	2779.13
-55.50	2420.03	666.27	-741.950	1085.28	2839.03
-56.50	2451.58	704.92	-734.867	1123.92	2870.58
-57.50	2486.68	740.02	-734.867	1159.02	2905.68
-58.50	2521.78	775.12	-734.867	1194.12	2940.78
-59.50	2556.88	810.22	-734.867	1229.22	2975.88
-60.50	2591.98	845.32	-734.867	1264.32	3010.98
-61.50	2627.08	880.42	-734.867	1299.42	3046.08
-62.50	2662.18	915.52	-734.867	1334.52	3081.18

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 21-JUL-1997 TIME: 13.09.18

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¤ SUMMARY OF RESULTS FOR ¤
¤ ANCHORED WALL DESIGN ¤
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I.--HEADING

'COUSINS P STA, EE14149
'ANCHOR GUIDE WALL NEAR B-1

II.--SUMMARY

RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

METHOD	:	FREE EARTH	EQUIV. BEAM	FIXED EARTH
WALL BOTTOM ELEV. (FT)	:	-54.47	-70.19	-65.61
PENETRATION (FT)	:	37.97	53.69	49.11
MAX. BEND. MOMENT (LB-FT)	:	-79779.	70831.	-67676.
AT ELEVATION (FT)	:	-20.10	-56.31	-18.50
MAX. SCALED DEFL. (LB-IN3)	:	3.3670E+10	1.1611E+10	2.4359E+10
AT ELEVATION (FT)	:	-25.50	-18.50	-24.50
ANCHOR FORCE (LB)	:	7910.	6571.	7190.

(NOTE: PENETRATION FOR EQUIVALENT BEAM METHOD DOES NOT INCLUDE INCREASE PRESCRIBED BY DRAFT EM 1110-2-2906.)

(NOTE: DIVIDE SCALED DEFLECTION BY MODULUS OF ELASTICITY IN PSI TIMES PILE MOMENT OF INERTIA IN IN**4 TO OBTAIN DEFLECTION IN INCHES.)

```
.000 'COUSINS P STA, EE14149
.010 'ANCHOR GUIDE WALL NEAR B-1
.020 CONTROL   A   D     1.50     1.50
.030 WALL        -1.50      -2.50
.040 SURFACE RIGHTSIDE    2
1050        .00      -1.50     100.00      -1.50
1060 SURFACE  LEFTSIDE    2
.070        .00     -16.50     100.00     -16.50
.080 SOIL RIGHTSIDE  STRENGTH    11        .00        .00
1090   95.00    95.00    .00  260.00     .00        .00     -6.00     .00   .00   .00
.100   90.00    90.00    .00  235.00     .00        .00    -10.00     .00   .00   .00
.110   90.00    90.00    .00  220.00     .00        .00    -12.00     .00   .00   .00
1120   75.00    75.00    .00  220.00     .00        .00    -14.00     .00   .00   .00
1130   95.00    95.00    .00  220.00     .00        .00    -18.00     .00   .00   .00
.140  103.00   103.00    .00  220.00     .00        .00    -23.00     .00   .00   .00
.150  107.00   107.00    .00  310.00     .00        .00    -36.00     .00   .00   .00
1160  102.00   102.00    .00  400.00     .00        .00    -42.00     .00   .00   .00
.170   97.50    97.50    .00  400.00     .00        .00    -45.0      .00   .00   .00
.172   97.5     97.5      0    485         0          0      -53.5      0      0    0
1178     97.5     97.5      0    655      0          0                         0    0
.180 SOIL  LEFTSIDE  STRENGTH     7        .00        .00
.190   95.00    95.00    .00  220.00     .00        .00    -18.00     .00   .00   .00
.200  103.00   103.00    .00  220.00     .00        .00    -23.00     .00   .00   .00
1210  107.00   107.00    .00  310.00     .00        .00    -36.00     .00   .00   .00
.220  102.00   102.00    .00  400.00     .00        .00    -42.00     .00   .00   .00
.230   97.50    97.50    .00  400.00     .00        .00    -45         0    .00   .00
1334     97.5     97.5      0     485      0          0      -53.5      0     0    0
.238     97.5      97.5     0     655      0          0                       0     0
.240 WATER ELEVATIONS     62.40    -1.50    -11.0
.250 FINISH
```

Anchor Sheet pile Guide wall
"S" Case FS=1.0

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 15-MAY-1997

TIME: 16.00.17

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¤ INPUT DATA ¤
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I.--HEADING:
'COUSINS P STA, EE14149
'ANCHOR GUIDE WALL NEAR B-1,S CASE

II.--CONTROL
ANCHORED WALL DESIGN

LEVEL 1 FACTOR OF SAFETY FOR ACTIVE PRESSURES = 1.00
LEVEL 1 FACTOR OF SAFETY FOR PASSIVE PRESSURES = 1.00

III.--WALL DATA
ELEVATION AT TOP OF WALL = -1.50 (FT)
ELEVATION AT ANCHOR = -2.50 (FT)

IV.--SURFACE POINT DATA

IV.A--RIGHTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
.00	-1.50
100.00	-1.50

IV.B-- LEFTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
.00	-16.50
100.00	-16.50

V.--SOIL LAYER DATA

V.A.--RIGHTSIDE LAYER DATA
LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURES = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURES = DEFAULT

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH-ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH-ESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.
95.00	95.00	22.00	.0	.00	.0	-6.00	.00	DEF	DEF
90.00	90.00	22.00	.0	.00	.0	-10.00	.00	DEF	DEF

90.00	90.00	22.00	.0	.00	.0	-12.00	.00	DEF	DEF
75.00	75.00	22.00	.0	.00	.0	-14.00	.00	DEF	DEF
95.00	95.00	22.00	.0	.00	.0	-18.00	.00	DEF	DEF
103.00	103.00	22.00	.0	.00	.0	-23.00	.00	DEF	DEF
107.00	107.00	22.00	.0	.00	.0	-36.00	.00	DEF	DEF
102.00	102.00	22.00	.0	.00	.0	-42.00	.00	DEF	DEF
97.50	97.50	22.00	.0	.00	.0			DEF	DEF

V.B.-- LEFTSIDE LAYER DATA

LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURES = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURES = DEFAULT

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH-ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH-ESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.
95.00	95.00	22.00	.0	.00	.0	-18.00	.00	DEF	DEF
103.00	103.00	22.00	.0	.00	.0	-23.00	.00	DEF	DEF
107.00	107.00	22.00	.0	.00	.0	-36.00	.00	DEF	DEF
102.00	102.00	22.00	.0	.00	.0	-42.00	.00	DEF	DEF
97.50	97.50	22.00	.0	.00	.0			DEF	DEF

VI.--WATER DATA

UNIT WEIGHT = 62.40 (PCF)
RIGHTSIDE ELEVATION = -1.50 (FT)
LEFTSIDE ELEVATION = -6.70 (FT)
NO SEEPAGE

VII.--SURFACE LOADS
NONE

VIII.--HORIZONTAL LOADS
NONE

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 15-MAY-1997 TIME: 16.00.48

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¤ SOIL PRESSURES FOR ¤
¤ ANCHORED WALL DESIGN ¤
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I.--HEADING

'COUSINS P STA, EE14149
'ANCHOR GUIDE WALL NEAR B-1,S CASE

II.--SOIL PRESSURES

RIGHTSIDE SOIL PRESSURES DETERMINED BY SWEEP SEARCH WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY SWEEP SEARCH WEDGE METHOD.

	<-LEFTSIDE PRESSURES->		<---NET PRESSURES----> (SOIL PLUS WATER)	<RIGHTSIDE PRESSURES->	
ELEV. (FT)	PASSIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)
-1.50	.00	.00	.000	.00	.00
-2.50	.00	.00	77.224	14.82	71.69
-3.50	.00	.00	154.448	29.65	143.38
-4.50	.00	.00	231.672	44.47	215.08
-5.50	.00	.00	308.896	59.30	286.77
-6.00	.00	.00	347.223	66.42	321.24
-6.50	.00	.00	384.983	72.98	352.96
-6.70	.00	.00	399.973	75.49	365.10
-7.50	.00	.00	410.013	85.53	413.66
-8.50	.00	.00	422.563	98.08	474.36
-9.50	.00	.00	435.113	110.63	535.05
-10.00	.00	.00	441.389	116.91	565.40
10.50	.00	.00	447.664	123.18	595.75
-11.50	.00	.00	460.214	135.73	656.45
-12.00	.00	.00	465.636	141.16	682.67
-12.50	.00	.00	469.354	144.87	700.65
-13.50	.00	.00	475.083	150.60	728.36
-14.00	.00	.00	479.085	154.60	747.71
-14.50	.00	.00	485.360	160.88	778.06
-15.50	.00	.00	500.184	175.70	849.75
-16.50	.00	.00	515.008	190.53	921.45
-17.50	71.69	14.82	458.139	205.35	993.14
-18.00	109.74	22.69	427.960	213.22	1031.18
-18.50	152.18	31.47	394.293	221.99	1073.63
-19.50	241.47	49.93	323.469	240.46	1162.91
-20.50	330.75	68.39	252.645	258.92	1252.20
-21.50	420.04	86.85	181.821	277.38	1341.48
-22.50	509.32	105.31	110.997	295.84	1430.77
-23.00	555.07	114.77	74.712	305.30	1476.51
-23.50	603.01	124.68	36.684	315.21	1524.45
-23.97	649.25	134.25	.000	324.77	1570.70
-24.24	675.17	139.61	-20.559	330.13	1596.62
-24.50	701.09	144.96	-41.118	335.49	1622.54
-25.50	799.17	165.25	-118.920	355.77	1720.62
-26.50	897.26	185.53	-196.722	376.05	1818.70
-27.50	995.34	205.81	-274.524	396.33	1916.78
-28.50	1093.42	226.09	-352.325	416.61	2014.87
-29.50	1191.50	246.37	-430.127	436.90	2112.95
30.50	1289.58	266.65	-507.929	457.18	2211.03
31.50	1387.67	286.93	-585.731	477.46	2309.11
-32.50	1485.75	307.21	-663.533	497.74	2407.20
-33.50	1583.83	327.49	-741.334	518.02	2505.28

-34.50	1681.91	347.77	-819.136	538.30	2603.36
-35.50	1780.00	368.05	-896.938	558.58	2701.44
-36.00	1827.66	377.91	-934.749	568.43	2749.11
-36.50	1872.58	387.19	-970.379	577.72	2794.03
-37.50	1959.67	405.20	-1039.458	595.73	2881.11
-38.50	2046.75	423.21	-1108.538	613.74	2968.20
-39.50	2133.84	441.21	-1177.618	631.74	3055.29
-40.50	2220.93	459.22	-1246.697	649.75	3142.37
-41.50	2308.01	477.23	-1315.777	667.76	3229.46
-42.00	2350.32	485.98	-1349.335	676.50	3271.77
-42.50	2390.15	494.21	-1380.931	684.74	3311.60
-43.50	2467.34	510.17	-1442.161	700.70	3388.79
-44.50	2544.53	526.13	-1503.391	716.66	3465.98
-45.50	2621.72	542.09	-1564.620	732.62	3543.17
-46.50	2698.91	558.06	-1625.850	748.58	3620.36
-47.50	2776.10	574.02	-1687.080	764.54	3697.55
-48.50	2853.29	589.98	-1748.309	780.50	3774.74
-49.50	2930.48	605.94	-1809.539	796.46	3851.93
-50.50	3007.67	621.90	-1870.769	812.43	3929.12
-51.50	3084.86	637.86	-1931.998	828.39	4006.31
-52.50	3162.06	653.82	-1993.228	844.35	4083.50
-53.50	3239.25	669.78	-2054.458	860.31	4160.69
-54.50	3316.44	685.74	-2115.687	876.27	4237.88
-55.50	3393.63	701.70	-2176.917	892.23	4315.07
-56.50	3470.82	717.66	-2238.147	908.19	4392.26
-57.50	3548.01	733.62	-2299.376	924.15	4469.45
-58.50	3625.20	749.58	-2360.606	940.11	4546.64
-59.50	3702.39	765.54	-2421.836	956.07	4623.83
-60.50	3779.58	781.50	-2483.065	972.03	4701.02
-61.50	3856.77	797.47	-2544.295	987.99	4778.21
-62.50	3933.96	813.43	-2605.525	1003.95	4855.40

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 15-MAY-1997 TIME: 16.01.05

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¤ SUMMARY OF RESULTS FOR ¤
¤ ANCHORED WALL DESIGN ¤
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I.--HEADING

'COUSINS P STA, EE14149
'ANCHOR GUIDE WALL NEAR B-1,S CASE

II.--SUMMARY

RIGHTSIDE SOIL PRESSURES DETERMINED BY SWEEP SEARCH WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY SWEEP SEARCH WEDGE METHOD.

METHOD	:	FREE EARTH	EQUIV. BEAM	FIXED EARTH
WALL BOTTOM ELEV. (FT)	:	-32.53	-40.67	-39.34
PENETRATION (FT)	:	16.03	24.17	22.84
MAX. BEND. MOMENT (LB-FT)	:	-33148.	-24413.	-26907.
AT ELEVATION (FT)	:	-14.83	-13.25	-13.73
MAX. SCALED DEFL. (LB-IN3)	:	4.8002E+09	-1.9966E+09	3.4767E+09
AT ELEVATION (FT)	:	-16.50	-34.50	-15.50
ANCHOR FORCE (LB)	:	4684.	3928.	4155.

(NOTE: PENETRATION FOR EQUIVALENT BEAM METHOD DOES NOT INCLUDE INCREASE PRESCRIBED BY DRAFT EM 1110-2-2906.)

(NOTE: DIVIDE SCALED DEFLECTION BY MODULUS OF ELASTICITY IN PSI TIMES PILE MOMENT OF INERTIA IN IN**4 TO OBTAIN DEFLECTION IN INCHES.)

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1000 'COUSINS P STA, EE14149
1010 'ANCHOR GUIDE WALL NEAR B-1,s case
1020 CONTROL   A  D    1.0     1.0
1030 WALL         -1.50      -2.50
1040 SURFACE RIGHTSIDE    2
1050         .00      -1.50    100.00       -1.50
1060 SURFACE  LEFTSIDE    2
1070         .00     -16.50    100.00      -16.50
1080 SOIL RIGHTSIDE  STRENGTH     9        .00        .00
1090    95.00    95.00    22.00  0.00      .00        .00      -6.00     .00    .00    .00
1100    90.00    90.00    22.00  0.00      .00        .00     -10.00     .00    .00    .00
1110    90.00    90.00    22.00  0.00      .00        .00     -12.00     .00    .00    .00
1120    75.00    75.00    22.00  0.00      .00        .00     -14.00     .00    .00    .00
1130    95.00    95.00    22.00  0.00      .00        .00     -18.00     .00    .00    .00
1140   103.00   103.00    22.00  0.00      .00        .00     -23.00     .00    .00    .00
1150   107.00   107.00    22.00  0.00      .00        .00     -36.00     .00    .00    .00
1160   102.00   102.00    22.00  0.00      .00        .00     -42.00     .00    .00    .00
1170    97.50    97.50    22.00  0.00      .00        .00        .00     .00
1180 SOIL  LEFTSIDE  STRENGTH     5        .00        .00
1190    95.00    95.00    22.00  0.00      .00        .00     -18.00     .00    .00    .00
1200   103.00   103.00    22.00  0.00      .00        .00     -23.00     .00    .00    .00
1210   107.00   107.00    22.00  0.00      .00        .00     -36.00     .00    .00    .00
1220   102.00   102.00    22.00  0.00      .00        .00     -42.00     .00    .00    .00
1230    97.50    97.50    22.00  0.00      .00        .00        .00     .00
1240 WATER ELEVATIONS     62.40    -1.50     -6.70
1250 FINISH
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I Wall
North + South Discharge Bank
Pump Station to Destrehan Ave Bridge

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 27-MAY-1997 TIME: 10.27.16

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¤ INPUT DATA ¤
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I.--HEADING:
'COUSINS PUMP STA, EE14149
'NORTH I WALL BANK

II.--CONTROL
CANTILEVER WALL DESIGN

LEVEL 1 FACTOR OF SAFETY FOR ACTIVE PRESSURES = 1.00
LEVEL 1 FACTOR OF SAFETY FOR PASSIVE PRESSURES = 1.00

III.--WALL DATA
ELEVATION AT TOP OF WALL = 9.50 (FT)

IV.--SURFACE POINT DATA

IV.A--RIGHTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
.00	2.00
10.00	2.00
43.00	-9.00
80.00	-9.00

IV.B-- LEFTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
.00	2.00
80.00	2.00

V.--SOIL LAYER DATA

V.A.--RIGHTSIDE LAYER DATA
LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURES = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURES = DEFAULT

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH-ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH-ESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.
95.00	95.00	.00	260.0	.00	.0	-6.00	.00	DEF	DEF

90.00	90.00	.00	235.0	.00	.0	-10.00	.00	DEF	DEF
90.00	90.00	.00	220.0	.00	.0	-12.00	.00	DEF	DEF
75.00	75.00	.00	220.0	.00	.0	-14.00	.00	DEF	DEF
95.00	95.00	.00	220.0	.00	.0	-18.00	.00	DEF	DEF
103.00	103.00	.00	220.0	.00	.0	-23.00	.00	DEF	DEF
107.00	107.00	.00	310.0	.00	.0	-36.00	.00	DEF	DEF
102.00	102.00	.00	400.0	.00	.0	-42.00	.00	DEF	DEF
97.50	97.50	.00	400.0	.00	.0			DEF	DEF

V.B.-- LEFTSIDE LAYER DATA

LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURES = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURES = DEFAULT

		ANGLE OF		ANGLE OF				<-SAFETY->	
SAT.	MOIST	INTERNAL	COH-	WALL	ADH-	<--BOTTOM-->		<-FACTOR->	
WGHT. (PCF)	WGHT. (PCF)	FRICTION (DEG)	ESION (PSF)	FRICTION (DEG)	ESION (PSF)	ELEV. (FT)	SLOPE (FT/FT)	ACT.	PASS.
95.00	95.00	.00	260.0	.00	.0	-6.00	.00	DEF	DEF
90.00	90.00	.00	235.0	.00	.0	-10.00	.00	DEF	DEF
90.00	90.00	.00	220.0	.00	.0	-12.00	.00	DEF	DEF
75.00	75.00	.00	220.0	.00	.0	-14.00	.00	DEF	DEF
95.00	95.00	.00	220.0	.00	.0	-18.00	.00	DEF	DEF
103.00	103.00	.00	220.0	.00	.0	-23.00	.00	DEF	DEF
107.00	107.00	.00	310.0	.00	.0	-36.00	.00	DEF	DEF
102.00	102.00	.00	400.0	.00	.0	-42.00	.00	DEF	DEF
97.50	97.50	.00	400.0	.00	.0			DEF	DEF

VI.--WATER DATA

UNIT WEIGHT = 62.40 (PCF)
RIGHTSIDE ELEVATION = 9.50 (FT)
LEFTSIDE ELEVATION = -1.00 (FT)
NO SEEPAGE

VII.--SURFACE LOADS
NONE

VIII.--HORIZONTAL LOADS
NONE

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¤ SOIL PRESSURES FOR ¤
¤ CANTILEVER WALL DESIGN ¤
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I.--HEADING

'COUSINS PUMP STA, EE14149
'NORTH I WALL BANK

II.--SOIL PRESSURES

RIGHTSIDE SOIL PRESSURES DETERMINED BY SWEEP SEARCH WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY SWEEP SEARCH WEDGE METHOD.

	<-LEFTSIDE PRESSURES->		<---NET PRESSURES----> (SOIL PLUS WATER)		<RIGHTSIDE PRESSURES->	
ELEV. (FT)	PASSIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)
9.50	.00	.00	.000	.000	.00	.00
8.50	.00	.00	62.400	62.400	.00	.00
7.50	.00	.00	124.800	124.800	.00	.00
6.50	.00	.00	187.200	187.200	.00	.00
5.50	.00	.00	249.600	249.600	.00	.00
4.50	.00	.00	312.000	312.000	.00	.00
3.50	.00	.00	374.400	374.400	.00	.00
2.50	.00	.00	436.800	436.800	.00	.00
2.00+	.00	.00	468.000	468.000	.00	.00
2.00-	520.00	.00	-52.000	988.000	.00	520.00
1.75	543.75	.00	-60.150	1011.750	.00	528.15
1.50	567.50	.00	-68.300	1035.500	.00	536.30
1.00	615.00	.00	-84.600	1083.000	.00	552.60
.50	662.50	.00	-100.900	1130.500	.00	568.90
-.50	757.50	.00	-133.500	1225.500	.00	601.50
-1.00	797.20	.00	-142.000	1273.000	.00	617.80
-1.50	821.30	.00	-166.100	1289.300	.00	634.10
-2.50	853.90	.00	-198.700	1321.900	.00	666.70
-3.50	886.50	.00	-231.300	1354.500	.00	699.30
-4.50	919.10	.00	-263.900	1387.100	.00	731.90
-5.50	951.70	.00	-296.500	1419.700	.00	764.50
-6.00	942.38	.00	-287.175	1410.375	.00	755.18
-6.50	931.80	.00	-276.600	1343.166	.00	687.97
-7.50	959.40	15.63	-304.200	1233.146	.00	593.57
-8.50	987.00	46.02	-331.800	1214.035	.00	604.86
-9.50	1014.60	74.60	-359.400	1197.414	.00	616.81
-10.00	1013.40	103.40	-358.200	1158.486	.00	606.69
10.50	1012.20	132.20	-357.000	1118.417	.00	595.42
-11.50	1039.80	159.80	-384.600	1100.094	.00	604.69
-12.00	1051.73	171.73	-396.525	1091.925	.00	608.45
12.50	1059.90	179.90	-404.700	1081.821	.00	606.52
13.50	1072.50	192.50	-417.300	1060.992	.00	598.29
-14.00	1081.30	201.30	-416.225	1049.227	9.87	595.33
.4.50	1095.10	215.10	-412.000	1036.749	27.90	596.65
ı5.50	1127.70	247.70	-412.000	1012.493	60.50	604.99
-16.50	1160.30	280.30	-412.000	981.201	93.10	606.30
-17.50	1192.90	312.90	-412.000	967.480	125.70	625.18

-18.00	1210.20	330.20	-412.000	970.421	143.00	645.42
-18.50	1229.50	349.50	-412.000	967.726	162.30	662.03
19.50	1270.10	390.10	-412.000	963.159	202.90	698.06
-20.50	1310.70	430.70	-412.000	954.646	243.50	730.15
-21.50	1351.30	471.30	-412.000	935.619	284.10	751.72
-22.50	1391.90	511.90	-412.000	921.299	324.70	778.00
-23.00	1502.70	442.70	-592.000	1150.696	255.50	938.20
-23.50	1614.50	374.50	-772.453	1384.948	186.85	1104.25
-24.50	1659.10	419.10	-778.113	1369.441	225.79	1133.34
-25.50	1703.70	463.70	-786.799	1361.597	261.70	1170.10
-26.50	1748.30	508.30	-793.656	1380.419	299.44	1233.52
-27.50	1792.90	552.90	-801.647	1349.372	336.05	1247.07
-28.50	1837.50	597.50	-811.781	1357.357	370.52	1299.66

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 27-MAY-1997 TIME: 10.27.49

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¤ SUMMARY OF RESULTS FOR ¤
¤ CANTILEVER WALL DESIGN ¤
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I.--HEADING

'COUSINS PUMP STA, EE14149
'NORTH I WALL BANK

II.--SUMMARY

RIGHTSIDE SOIL PRESSURES DETERMINED BY SWEEP SEARCH WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY SWEEP SEARCH WEDGE METHOD.

WALL BOTTOM ELEV. (FT) : -18.35
PENETRATION (FT) : 20.35

MAX. BEND. MOMENT (LB-FT) : 14168.
AT ELEVATION (FT) : -7.08

MAX. SCALED DEFL. (LB-IN3): 5.3463E+09
AT ELEVATION (FT) : 9.50

(NOTE: DIVIDE SCALED DEFLECTION BY MODULUS OF ELASTICITY IN PSI TIMES PILE MOMENT OF INERTIA IN IN**4 TO OBTAIN DEFLECTION IN INCHES.)

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 27-MAY-1997 TIME: 10.27.49

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¤ COMPLETE RESULTS FOR ¤
¤ CANTILEVER WALL DESIGN ¤
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I.--HEADING

'COUSINS PUMP STA, EE14149
'NORTH I WALL BANK

II.--RESULTS

ELEVATION (FT)	BENDING MOMENT (LB-FT)	SHEAR (LB)	SCALED DEFLECTION (LB-IN3)	NET PRESSURE (PSF)
9.50	0.	0.	5.3463E+09	.00
8.50	10.	31.	5.0102E+09	62.40
7.50	83.	125.	4.6741E+09	124.80
6.50	281.	281.	4.3382E+09	187.20
5.50	666.	499.	4.0028E+09	249.60
4.50	1300.	780.	3.6686E+09	312.00
3.50	2246.	1123.	3.3367E+09	374.40
2.50	3567.	1529.	3.0087E+09	436.80
2.00	4387.	1755.	2.8468E+09	468.00
2.00	4387.	1755.	2.8468E+09	-52.00
1.75	4825.	1741.	2.7666E+09	-60.15
1.50	5258.	1725.	2.6869E+09	-68.30
1.00	6111.	1687.	2.5292E+09	-84.60
.50	6943.	1640.	2.3742E+09	-100.90
-.50	8528.	1523.	2.0735E+09	-133.50
-1.00	9272.	1454.	1.9285E+09	-142.00
-1.50	9980.	1377.	1.7875E+09	-166.10
-2.50	11269.	1195.	1.5188E+09	-198.70
-3.50	12359.	980.	1.2694E+09	-231.30
-4.50	13218.	732.	1.0414E+09	-263.90
-5.50	13813.	452.	8.3624E+08	-296.50
-6.00	14002.	306.	7.4253E+08	-287.18
-6.50	14120.	165.	6.5487E+08	-276.60
-7.50	14142.	-125.	4.9786E+08	-304.20
-8.50	13860.	-443.	3.6525E+08	-331.80
-9.50	13246.	-789.	2.5653E+08	-359.40
-10.00	12807.	-968.	2.1083E+08	-358.20
-10.50	12278.	-1147.	1.7066E+08	-357.00
-11.50	10948.	-1518.	1.0595E+08	-384.60

-12.00	10141.	-1713.	8.0837E+07	-396.53
-12.14	9894.	-1769.	7.4530E+07	-398.84
-12.50	9236.	-1898.	6.0102E+07	-320.00
-13.50	7214.	-2108.	3.0169E+07	-99.89
-14.00	6152.	-2131.	2.0100E+07	10.16
-14.50	5093.	-2098.	1.2688E+07	120.21
-15.50	3092.	-1868.	4.0255E+06	340.31
-16.50	1431.	-1417.	7.5403E+05	560.41
-17.50	330.	-747.	3.5532E+04	780.51
-18.00	59.	-329.	1.0546E+03	890.56
-18.35	0.	0.	0.0000E+00	968.51

(NOTE: DIVIDE SCALED DEFLECTION BY MODULUS OF ELASTICITY IN PSI TIMES PILE MOMENT OF INERTIA IN IN**4 TO OBTAIN DEFLECTION IN INCHES.)

III.--SOIL PRESSURES

ELEVATION	< LEFTSIDE PRESSURE (PSF)>		<RIGHTSIDE PRESSURE (PSF)>	
(FT)	PASSIVE	ACTIVE	ACTIVE	PASSIVE
9.50	0.	0.	0.	0.
8.50	0.	0.	0.	0.
7.50	0.	0.	0.	0.
6.50	0.	0.	0.	0.
5.50	0.	0.	0.	0.
4.50	0.	0.	0.	0.
3.50	0.	0.	0.	0.
2.50	0.	0.	0.	0.
2.00+	0.	0.	0.	0.
2.00-	520.	0.	0.	520.
1.75	544.	0.	0.	528.
1.50	568.	0.	0.	536.
1.00	615.	0.	0.	553.
.50	662.	0.	0.	569.
-.50	757.	0.	0.	601.
-1.00	797.	0.	0.	618.
-1.50	821.	0.	0.	634.
-2.50	854.	0.	0.	667.
-3.50	886.	0.	0.	699.
-4.50	919.	0.	0.	732.
-5.50	952.	0.	0.	765.
-6.00	942.	0.	0.	755.
-6.50	932.	0.	0.	688.
-7.50	959.	16.	0.	594.
-8.50	987.	46.	0.	605.
-9.50	1015.	75.	0.	617.
-10.00	1013.	103.	0.	607.
-10.50	1012.	132.	0.	595.
-11.50	1040.	160.	0.	605.
-12.00	1052.	172.	0.	608.
-12.14	1054.	174.	0.	608.
-12.50	1060.	180.	0.	607.
-13.50	1073.	192.	0.	598.
-14.00	1081.	201.	10.	595.
-14.50	1095.	215.	28.	597.
-15.50	1128.	248.	61.	605.
-16.50	1160.	280.	93.	606.
-17.50	1193.	313.	126.	625.

-18.00	1210.	330.	143.	645.
-18.35	1230.	350.	162.	662.
-19.50	1270.	390.	203.	698.

```
1000 'COUSINS PUMP STA, EE14149
1010 'NORTH I WALL BANK
1020 CONTROL  C  D    1.00     1.00
1030 WALL        9.50
1040 SURFACE RIGHTSIDE   4
1050        .00       2.00     10.00       2.00      43.00      -9.00
1060     80.00      -9.00
1070 SURFACE  LEFTSIDE   2
1080        .00       2.00     80.00       2.00
1090 SOIL RIGHTSIDE  STRENGTH     9       .00       .00
1100    95.00   95.00   .00  260.00     .00       .00     -6.00     .00   .00   .00
1110    90.00   90.00   .00  235.00     .00       .00    -10.00     .00   .00   .00
1120    90.00   90.00   .00  220.00     .00       .00    -12.00     .00   .00   .00
1130    75.00   75.00   .00  220.00     .00       .00    -14.00     .00   .00   .00
1140    95.00   95.00   .00  220.00     .00       .00    -18.00     .00   .00   .00
1150   103.00  103.00   .00  220.00     .00       .00    -23.00     .00   .00   .00
1160   107.00  107.00   .00  310.00     .00       .00    -36.00     .00   .00   .00
1170   102.00  102.00   .00  400.00     .00       .00    -42.00     .00   .00   .00
1180    97.50   97.50   .00  400.00     .00       .00       .00     .00
1190 SOIL  LEFTSIDE  STRENGTH     9       .00       .00
1200    95.00   95.00   .00  260.00     .00       .00     -6.00     .00   .00   .00
1210    90.00   90.00   .00  235.00     .00       .00    -10.00     .00   .00   .00
1220    90.00   90.00   .00  220.00     .00       .00    -12.00     .00   .00   .00
1230    75.00   75.00   .00  220.00     .00       .00    -14.00     .00   .00   .00
1240    95.00   95.00   .00  220.00     .00       .00    -18.00     .00   .00   .00
1250   103.00  103.00   .00  220.00     .00       .00    -23.00     .00   .00   .00
1260   107.00  107.00   .00  310.00     .00       .00    -36.00     .00   .00   .00
1270   102.00  102.00   .00  400.00     .00       .00    -42.00     .00   .00   .00
1280    97.50   97.50   .00  400.00     .00       .00       .00     .00
1290 WATER ELEVATIONS     62.40     9.50      -1.00
1300 FINISH
```

I Wall
North Bank Discharge Canal
East of Destrehan Ave Bridge

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 08-JUL-1997 TIME: 15.49.00

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¤ INPUT DATA ¤
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I.--HEADING:
'COUSINS PUMP STA,EE14149
'I WALL EAST OF DESTREHAN AVE

II.--CONTROL
CANTILEVER WALL DESIGN

LEVEL 1 FACTOR OF SAFETY FOR ACTIVE PRESSURES = 1.00
LEVEL 1 FACTOR OF SAFETY FOR PASSIVE PRESSURES = 1.00

III.--WALL DATA
ELEVATION AT TOP OF WALL = 9.50 (FT)

IV.--SURFACE POINT DATA

IV.A--RIGHTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
.00	2.00
33.00	-9.00
80.00	-9.00

IV.B-- LEFTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
.00	2.00
80.00	2.00

V.--SOIL LAYER DATA

V.A.--RIGHTSIDE LAYER DATA
LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURES = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURES = DEFAULT

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH-ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH-ESION (PSF)	<--BOTTOM--> ELEV. (FT)	<--BOTTOM--> SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	<-SAFETY-> <-FACTOR-> PASS.
118.00	118.00	23.00	.0	.00	.0	-2.00	.00	DEF	DEF
95.00	95.00	.00	260.0	.00	.0	-6.00	.00	DEF	DEF

90.00	90.00	.00	235.0	.00	.0	-10.00	.00	DEF	DEF
69.00	69.00	.00	150.0	.00	.0	-16.50	.00	DEF	DEF
117.50	117.50	15.00	200.0	.00	.0	-22.00	.00	DEF	DEF
116.00	116.00	.00	200.0	.00	.0	-26.50	.00	DEF	DEF
122.50	122.50	30.00	.0	.00	.0			DEF	DEF

V.B.-- LEFTSIDE LAYER DATA

LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURES = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURES = DEFAULT

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH- ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH- ESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.
118.00	118.00	23.00	.0	.00	.0	-2.00	.00	DEF	DEF
95.00	95.00	.00	260.0	.00	.0	-6.00	.00	DEF	DEF
90.00	90.00	.00	235.0	.00	.0	-10.00	.00	DEF	DEF
69.00	69.00	.00	150.0	.00	.0	-16.50	.00	DEF	DEF
117.50	117.50	15.00	200.0	.00	.0	-22.00	.00	DEF	DEF
116.00	116.00	.00	200.0	.00	.0	-26.50	.00	DEF	DEF
122.50	122.50	30.00	.0	.00	.0			DEF	DEF

VI.--WATER DATA

UNIT WEIGHT = 62.40 (PCF)
RIGHTSIDE ELEVATION = 9.50 (FT)
LEFTSIDE ELEVATION = -1.00 (FT)
NO SEEPAGE

VII.--SURFACE LOADS
NONE

VIII.--HORIZONTAL LOADS
NONE

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS BY CLASSICAL METHODS

DATE: 08-JUL-1997 TIME: 15.49.08

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¤ SOIL PRESSURES FOR ¤
¤ CANTILEVER WALL DESIGN ¤
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I.--HEADING

'COUSINS PUMP STA,EE14149
'I WALL EAST OF DESTREHAN AVE

II.--SOIL PRESSURES

RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

	<-LEFTSIDE PRESSURES->		<---NET PRESSURES----> (SOIL PLUS WATER)		<RIGHTSIDE PRESSURES->	
ELEV. (FT)	PASSIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)
9.50	.00	.00	.000	.000	.00	.00
8.50	.00	.00	62.400	62.400	.00	.00
7.50	.00	.00	124.800	124.800	.00	.00
6.50	.00	.00	187.200	187.200	.00	.00
5.50	.00	.00	249.600	249.600	.00	.00
4.50	.00	.00	312.000	312.000	.00	.00
3.50	.00	.00	374.400	374.400	.00	.00
2.50	.00	.00	436.800	436.800	.00	.00
2.00	.00	.00	468.000	468.000	.00	.00
1.50	134.67	25.85	374.503	515.556	9.98	42.20
1.00	269.35	51.69	281.006	563.111	19.96	84.41
.50	404.17	77.57	187.360	610.638	29.93	126.61
-.50	672.77	129.12	1.121	705.894	49.89	211.01
-.51	674.65	129.48	.000	706.644	50.15	211.62
-.75	732.19	140.52	-34.165	729.524	58.17	230.20
-1.00	789.72	151.57	-68.330	752.405	66.19	248.77
-1.50	872.61	176.48	-191.924	802.479	25.49	323.76
-1.62+	887.49	163.36	-232.286	908.222	.00	473.07
-1.62-	887.49	163.36	-232.286	908.222	.00	359.69
-2.00	922.01	44.24	-266.810	1084.035	.00	473.07
-2.22+	946.39	.00	-284.341	1182.284	.00	527.08
-2.22-	932.69	.00	-284.341	1182.284	.00	527.08
-2.50	946.39	.00	-291.188	1251.506	.00	596.31
-3.50	978.54	.00	-323.341	1323.975	.00	668.77
-4.50	1011.73	.00	-356.533	1344.304	.00	689.10
-5.22+	1035.77	.00	-377.177	1354.986	.00	699.79
-5.22-	1028.99	.00	-377.177	1354.986	.00	699.79
-5.50	1035.77	11.60	-380.568	1347.583	.00	703.98
-6.00	1034.34	44.34	-379.144	1308.839	.00	697.98
-6.50	1031.70	75.87	-376.501	1270.095	.00	690.76
-7.50	1050.78	112.03	-395.583	1243.857	.00	700.69
-8.50	1081.16	136.91	-425.958	1240.202	.00	721.91
-9.50	1079.62	193.45	-402.658	1172.964	21.76	711.21
-10.00	1032.64	262.64	-301.453	1052.220	75.99	659.66
-10.50	980.55	326.72	-193.995	931.475	131.36	602.99
11.50	958.21	362.46	-155.649	864.237	147.36	571.50
12.50	966.90	366.90	-178.333	863.379	133.37	575.08
-13.50	973.50	373.50	-196.867	821.818	121.43	540.12
14.50	979.44	380.37	-211.962	767.729	112.28	492.90
15.50	989.64	385.46	-254.408	769.239	80.03	499.50
-16.50	1355.22	247.75	-698.614	1090.127	1.41	682.68
-16.52+	1372.32	241.61	-717.122	1218.653	.00	921.95

16.52-	1372.32	241.61	-717.122	1218.653	.00	688.18
17.50	1793.33	133.30	-1138.131	1443.848	.00	921.95
-18.50	1885.95	166.16	-1230.752	1531.400	.00	1042.36
19.50	1979.53	198.60	-1324.333	1562.219	.00	1105.62
20.50	2073.11	231.05	-1417.915	1606.803	.00	1182.65
-20.63+	2088.23	234.20	-1433.034	1590.782	.00	1159.89
-20.63-	2088.23	234.20	-1433.034	1590.782	.00	1179.67
21.50	2047.69	309.62	-1342.190	1505.474	50.30	1159.89
-22.00	1801.38	440.14	-1014.973	1221.202	131.20	1006.15
-22.50	1551.65	573.38	-682.487	928.192	213.96	846.37
23.50	1466.60	680.67	-515.574	864.075	295.82	889.55
24.50	1497.43	737.12	-461.976	861.228	380.26	943.15
-25.50	1778.49	744.10	-685.751	932.011	437.54	1020.91
26.50	2707.76	616.38	-1667.602	1666.245	384.96	1627.42
27.50	3698.41	472.40	-2725.334	2461.072	317.88	2278.27
-28.50	4105.18	446.07	-3124.531	2766.247	325.45	2557.12

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 08-JUL-1997 TIME: 15.49.21

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¤ SUMMARY OF RESULTS FOR ¤
¤ CANTILEVER WALL DESIGN ¤
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I.--HEADING

'COUSINS PUMP STA,EE14149
'I WALL EAST OF DESTREHAN AVE

II.--SUMMARY

RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

WALL BOTTOM ELEV. (FT) : -21.40
PENETRATION (FT) : 23.40

MAX. BEND. MOMENT (LB-FT) : 19996.
AT ELEVATION (FT) : -8.03

MAX. SCALED DEFL. (LB-IN3) : 9.3939E+09
AT ELEVATION (FT) : 9.50

(NOTE: DIVIDE SCALED DEFLECTION BY MODULUS OF

ELASTICITY IN PSI TIMES PILE MOMENT OF INERTIA
IN IN**4 TO OBTAIN DEFLECTION IN INCHES.)

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 08-JUL-1997 TIME: 15.49.21

COMPLETE RESULTS FOR
CANTILEVER WALL DESIGN

I.--HEADING

'COUSINS PUMP STA,EE14149
'I WALL EAST OF DESTREHAN AVE

II.--RESULTS

ELEVATION (FT)	BENDING MOMENT (LB-FT)	SHEAR (LB)	SCALED DEFLECTION (LB-IN3)	NET PRESSURE (PSF)
9.50	0.	0.	9.3939E+09	.00
8.50	10.	31.	8.8634E+09	62.40
7.50	83.	125.	8.3329E+09	124.80
6.50	281.	281.	7.8026E+09	187.20
5.50	666.	499.	7.2728E+09	249.60
4.50	1300.	780.	6.7442E+09	312.00
3.50	2246.	1123.	6.2179E+09	374.40
2.50	3567.	1529.	5.6955E+09	436.80
2.00	4388.	1755.	5.4365E+09	468.00
1.50	5320.	1966.	5.1794E+09	374.50
1.00	6345.	2130.	4.9246E+09	281.01
.50	7441.	2247.	4.6725E+09	187.36
-.50	9751.	2341.	4.1785E+09	1.12
-.51	9769.	2341.	4.1745E+09	.00
-.75	10345.	2337.	4.0555E+09	-34.17
-1.00	10918.	2324.	3.9375E+09	-68.33
-1.50	12067.	2259.	3.7013E+09	-191.92
-1.62	12337.	2233.	3.6452E+09	-232.29
-2.00	13167.	2139.	3.4703E+09	-266.81
-2.22	13629.	2078.	3.3708E+09	-284.34
-2.50	14202.	1997.	3.2449E+09	-291.19
-3.50	16048.	1690.	2.8131E+09	-323.34
-4.50	17571.	1350.	2.4089E+09	-356.53
-5.22	18447.	1087.	2.1374E+09	-377.18
-5.50	18739.	980.	2.0351E+09	-380.57
-6.00	19181.	790.	1.8602E+09	-379.14

-6.50	19529.	601.	1.6936E+09	-376.50
-7.50	19939.	215.	1.3857E+09	-395.58
-8.50	19951.	-196.	1.1123E+09	-425.96
-9.50	19546.	-610.	8.7327E+08	-402.66
-10.00	19195.	-786.	7.6647E+08	-301.45
-10.50	18769.	-910.	6.6797E+08	-193.99
-11.50	17769.	-1085.	4.9507E+08	-155.65
-12.50	16602.	-1252.	3.5285E+08	-178.33
-13.50	15259.	-1439.	2.3929E+08	-196.87
-14.50	13718.	-1644.	1.5208E+08	-211.96
-15.50	11962.	-1877.	8.8537E+07	-254.41
-16.34	10253.	-2247.	5.1269E+07	-627.21
-16.50	9884.	-2342.	4.5623E+07	-559.13
-16.52	9830.	-2355.	4.4851E+07	-549.38
-17.50	7333.	-2689.	1.9713E+07	-135.56
-18.50	4646.	-2613.	6.4553E+06	288.00
-19.50	2248.	-2113.	1.2683E+06	711.57
-20.50	561.	-1190.	6.7957E+04	1135.13
-20.63	415.	-1038.	3.6524E+04	1190.69
-21.40	1.	0.	0.0000E+00	1515.49

(NOTE: DIVIDE SCALED DEFLECTION BY MODULUS OF ELASTICITY IN PSI TIMES PILE MOMENT OF INERTIA IN IN**4 TO OBTAIN DEFLECTION IN INCHES.)

III.--SOIL PRESSURES

ELEVATION (FT)	< LEFTSIDE PRESSURE (PSF)> PASSIVE	ACTIVE	<RIGHTSIDE PRESSURE (PSF)> ACTIVE	PASSIVE
9.50	0.	0.	0.	0.
8.50	0.	0.	0.	0.
7.50	0.	0.	0.	0.
6.50	0.	0.	0.	0.
5.50	0.	0.	0.	0.
4.50	0.	0.	0.	0.
3.50	0.	0.	0.	0.
2.50	0.	0.	0.	0.
2.00	0.	0.	0.	0.
1.50	135.	26.	10.	42.
1.00	269.	52.	20.	84.
.50	404.	78.	30.	127.
-.50	673.	129.	50.	211.
-.51	675.	129.	50.	212.
-.75	732.	141.	58.	230.
-1.00	790.	152.	66.	249.
-1.50	873.	176.	25.	324.
-1.62+	887.	163.	0.	473.
-1.62-	887.	163.	0.	360.
-2.00	922.	44.	0.	473.
-2.22+	946.	0.	0.	527.
-2.22-	933.	0.	0.	527.
-2.50	946.	0.	0.	596.
-3.50	979.	0.	0.	669.
-4.50	1012.	0.	0.	689.
-5.22+	1036.	0.	0.	700.
-5.22-	1029.	0.	0.	700.
-5.50	1036.	12.	0.	704.
-6.00	1034.	44.	0.	698.

-6.50	1032.	76.	0.	691.
-7.50	1051.	112.	0.	701.
-8.50	1081.	137.	0.	722.
-9.50	1080.	193.	22.	711.
-10.00	1033.	263.	76.	660.
-10.50	981.	327.	131.	603.
-11.50	958.	362.	147.	571.
-12.50	967.	367.	133.	575.
-13.50	974.	373.	121.	540.
-14.50	979.	380.	112.	493.
-15.50	990.	385.	80.	500.
-16.34	1296.	270.	14.	653.
-16.50	1355.	248.	1.	683.
-16.52+	1372.	242.	0.	922.
-16.52-	1372.	242.	0.	688.
-17.50	1793.	133.	0.	922.
-18.50	1886.	166.	0.	1042.
-19.50	1980.	199.	0.	1106.
-20.50	2073.	231.	0.	1183.
-20.63+	2088.	234.	0.	1160.
-20.63-	2088.	234.	0.	1180.
-21.40	2048.	310.	50.	1160.
-22.00	1801.	440.	131.	1006.

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1000 'COUSINS PUMP STA,EE14149
1010 'I WALL EAST OF DESTREHAN AVE
1020 CONTROL  C  D     1.00     1.00
1030 WALL         9.50
1040 SURFACE RIGHTSIDE   3
1050         .00      2.00     33.00      -9.00     80.00      -9.00
1060 SURFACE  LEFTSIDE   2
1070         .00      2.00     80.00       2.00
1080 SOIL RIGHTSIDE  STRENGTH     7       .00      .00
1090  118.00  118.00 23.00      .00      .00      .00    -2.00    .00   .00   .00
1100   95.00   95.00   .00   260.00      .00      .00    -6.00    .00   .00   .00
1110   90.00   90.00   .00   235.00      .00      .00   -10.00    .00   .00   .00
1120   69.00   69.00   .00   150.00      .00      .00   -16.50    .00   .00   .00
1130  117.50  117.50 15.00   200.00      .00      .00   -22.00    .00   .00   .00
1140  116.00  116.00   .00   200.00      .00      .00   -26.50    .00   .00   .00
1150  122.50  122.50 30.00      .00      .00      .00      .00    .00
1160 SOIL  LEFTSIDE  STRENGTH     7       .00      .00
1170  118.00  118.00 23.00      .00      .00      .00    -2.00    .00   .00   .00
1180   95.00   95.00   .00   260.00      .00      .00    -6.00    .00   .00   .00
1190   90.00   90.00   .00   235.00      .00      .00   -10.00    .00   .00   .00
1200   69.00   69.00   .00   150.00      .00      .00   -16.50    .00   .00   .00
1210  117.50  117.50 15.00   200.00      .00      .00   -22.00    .00   .00   .00
1220  116.00  116.00   .00   200.00      .00      .00   -26.50    .00   .00   .00
1230  122.50  122.50 30.00      .00      .00      .00      .00    .00
1240 WATER ELEVATIONS     62.40     9.50    -1.00
1250 FINISH
```

I Wall
Southeast of Destrehan Ave Bridge
in Existing Levee

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 17-JUL-1997 TIME: 8.56.35

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¤ INPUT DATA ¤
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I.--HEADING:
'COUSINS P STA, EE 14149
'I WALL SOUTH OF LAPALCO

II.--CONTROL
CANTILEVER WALL DESIGN

LEVEL 1 FACTOR OF SAFETY FOR ACTIVE PRESSURES = 1.00
LEVEL 1 FACTOR OF SAFETY FOR PASSIVE PRESSURES = 1.00

III.--WALL DATA
ELEVATION AT TOP OF WALL = 9.50 (FT)

IV.--SURFACE POINT DATA

IV.A--RIGHTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
.00	5.50
2.50	5.50
13.50	2.00
80.00	2.00

IV.B-- LEFTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
.00	5.50
2.50	5.50
13.50	2.00
80.00	2.00

V.--SOIL LAYER DATA

V.A.--RIGHTSIDE LAYER DATA
LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURES = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURES = DEFAULT

SAT. WGHT.	MOIST WGHT.	ANGLE OF INTERNAL FRICTION	COH- ESION	ANGLE OF WALL FRICTION	ADH- ESION	<--BOTTOM--> ELEV.	SLOPE	<-SAFETY-> <-FACTOR-> ACT.	PASS.

(PCF)	(PCF)	(DEG)	(PSF)	(DEG)	(PSF)	(FT)	(FT/FT)		
122.00	122.00	23.00	.0	.00	.0	.00	.00	DEF	DEF
112.50	112.50	15.00	200.0	.00	.0	-3.00	.00	DEF	DEF
87.00	87.00	.00	195.0	.00	.0	-6.00	.00	DEF	DEF
88.00	88.00	.00	235.0	.00	.0	-10.00	.00	DEF	DEF
86.00	86.00	.00	320.0	.00	.0	-18.50	.00	DEF	DEF
112.50	112.50	15.00	200.0	.00	.0	-28.50	.00	DEF	DEF
122.50	122.50	30.00	.0	.00	.0			DEF	DEF

V.B.-- LEFTSIDE LAYER DATA

LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURES = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURES = DEFAULT

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH-ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH-ESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.
122.00	122.00	23.00	.0	.00	.0	.00	.00	DEF	DEF
112.50	112.50	15.00	200.0	.00	.0	-3.00	.00	DEF	DEF
87.00	87.00	.00	195.0	.00	.0	-6.00	.00	DEF	DEF
88.00	88.00	.00	235.0	.00	.0	-10.00	.00	DEF	DEF
86.00	86.00	.00	320.0	.00	.0	-18.50	.00	DEF	DEF
112.50	112.50	15.00	200.0	.00	.0	-28.50	.00	DEF	DEF
122.50	122.50	30.00	.0	.00	.0			DEF	DEF

VI.--WATER DATA

UNIT WEIGHT = 62.40 (PCF)
RIGHTSIDE ELEVATION = 9.50 (FT)
LEFTSIDE ELEVATION = -1.00 (FT)
NO SEEPAGE

VII.--SURFACE LOADS

NONE

VIII.--HORIZONTAL LOADS

NONE

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 17-JUL-1997 TIME: 8.56.46

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¤ SOIL PRESSURES FOR ¤

¤ CANTILEVER WALL DESIGN ¤
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I.--HEADING

'COUSINS P STA, EE 14149
'I WALL SOUTH OF LAPALCO

II.--SOIL PRESSURES

RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

	<-LEFTSIDE PRESSURES->		<---NET PRESSURES----> (SOIL PLUS WATER)		<RIGHTSIDE PRESSURES->	
ELEV. (FT)	PASSIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)
9.50	.00	.00	.000	.000	.00	.00
8.50	.00	.00	62.400	62.400	.00	.00
7.50	.00	.00	124.800	124.800	.00	.00
6.50	.00	.00	187.200	187.200	.00	.00
5.50	.00	.00	249.600	249.600	.00	.00
4.50	274.21	53.45	63.904	392.509	26.11	133.96
4.08	375.27	75.91	.000	445.609	37.08	183.33
3.79	445.14	91.44	-44.177	482.317	44.67	217.46
3.50	515.01	106.97	-88.354	519.025	52.26	251.60
2.50	715.39	160.09	-200.386	626.199	78.21	349.49
1.50	901.68	210.52	-296.541	724.940	105.93	436.26
.50	1092.44	253.08	-445.676	895.286	85.16	586.76
.00	1271.48	172.49	-674.467	1173.427	4.21	753.12
-.02+	1283.01	164.33	-688.758	1272.173	.00	923.45
-.02-	1283.01	164.33	-688.758	1272.173	.00	761.05
-.50	1423.51	95.89	-799.512	1451.560	.00	923.45
-1.00	1470.81	118.54	-815.612	1525.886	.00	989.23
-1.50	1494.39	131.50	-839.188	1537.320	.00	1013.62
-2.50	1513.21	151.66	-858.015	1504.624	.00	1001.09
-3.00	1212.43	290.18	-557.231	1248.927	.00	883.90
-3.02+	1190.93	299.34	-535.729	1172.993	.00	754.91
-3.02-	1190.93	299.34	-535.729	1172.993	.00	879.36
-3.50	896.00	421.74	-199.265	988.379	41.54	754.91
-4.50	920.60	421.40	-187.029	927.113	78.37	693.31
-5.50	945.20	405.40	-183.499	972.044	106.50	722.24
-6.00	957.50	374.89	-197.038	1036.494	105.26	756.18
-6.50	970.30	343.13	-225.296	1103.369	89.80	791.30
-7.50	995.90	320.66	-259.329	1155.456	81.37	820.92
-8.50	1021.50	313.91	-275.163	1174.945	91.14	833.65
-9.50	1047.10	293.79	-323.177	1242.877	68.72	881.47
-10.00	1094.72	210.13	-425.817	1398.179	13.70	953.11
10.12+	1134.36	174.55	-479.164	1480.267	.00	1027.71
10.12-	1134.36	174.55	-479.164	1480.267	.00	971.52
-10.50	1199.97	121.70	-544.766	1561.215	.00	1027.71
-11.50	1240.72	111.25	-585.520	1634.159	.00	1090.21
.2.50	1282.36	119.46	-627.157	1656.235	.00	1120.50
13.50	1320.11	158.11	-664.912	1648.105	.00	1151.01
-14.50+	1355.46	178.53	-700.260	1657.073	.00	1180.44
14.50-	1355.46	178.53	-700.260	1657.073	.00	1180.36

-14.50	1355.56	178.50	-700.277	1657.147	.08	1180.44
15.50	1390.93	161.52	-724.464	1703.432	11.27	1209.75
.6.50	1413.15	157.63	-735.379	1728.464	22.57	1230.89
-17.50	1509.16	161.85	-795.456	1794.969	58.51	1301.62
-18.50	1805.58	151.91	-1049.192	2013.060	101.18	1509.78
-19.50	2131.30	145.14	-1348.170	2257.549	127.93	1747.49
-20.50	2279.45	165.14	-1478.436	2364.948	145.81	1874.89
-21.50	2339.42	196.87	-1519.723	2404.497	164.50	1946.17
-22.50	2404.44	229.70	-1568.276	2446.948	180.96	2021.45
-23.50	2469.48	264.30	-1584.878	2487.649	229.41	2096.75
-24.50	2534.58	299.16	-1563.118	2528.109	316.26	2172.07
-25.50	2599.68	333.98	-1572.695	2568.616	371.79	2247.40

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 17-JUL-1997 TIME: 8.57.05

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¤ SUMMARY OF RESULTS FOR ¤
¤ CANTILEVER WALL DESIGN ¤
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I.--HEADING

'COUSINS P STA, EE 14149
'I WALL SOUTH OF LAPALCO

II.--SUMMARY

RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

WALL BOTTOM ELEV. (FT) : -3.80
PENETRATION (FT) : 9.30

MAX. BEND. MOMENT (LB-FT) : 2980.
AT ELEVATION (FT) : .78

MAX. SCALED DEFL. (LB-IN3) : 2.4343E+08
AT ELEVATION (FT) : 9.50

(NOTE: DIVIDE SCALED DEFLECTION BY MODULUS OF ELASTICITY IN PSI TIMES PILE MOMENT OF INERTIA IN IN**4 TO OBTAIN DEFLECTION IN INCHES.)

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 17-JUL-1997 TIME: 8.57.05

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¤ COMPLETE RESULTS FOR ¤
¤ CANTILEVER WALL DESIGN ¤
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I.--HEADING

'COUSINS P STA, EE 14149
'I WALL SOUTH OF LAPALCO

II.--RESULTS

ELEVATION (FT)	BENDING MOMENT (LB-FT)	SHEAR (LB)	SCALED DEFLECTION (LB-IN3)	NET PRESSURE (PSF)
9.50	0.	0.	2.4343E+08	.00
8.50	10.	31.	2.1324E+08	62.40
7.50	83.	125.	1.8307E+08	124.80
6.50	281.	281.	1.5307E+08	187.20
5.50	666.	499.	1.2359E+08	249.60
4.50	1259.	656.	9.5279E+07	63.90
4.08	1538.	669.	8.3985E+07	.00
3.79	1731.	663.	7.6445E+07	-44.18
3.50	1921.	644.	6.9158E+07	-88.35
2.50	2502.	499.	4.6344E+07	-200.39
1.50	2885.	251.	2.7825E+07	-296.54
.50	2963.	-120.	1.4249E+07	-445.68
.00	2838.	-400.	9.3760E+06	-674.47
-.02	2828.	-416.	9.1797E+06	-688.76
-.11	2788.	-480.	8.4395E+06	-709.83
-.50	2554.	-720.	5.7234E+06	-533.98
-1.00	2137.	-930.	3.1693E+06	-306.22
-1.50	1643.	-1026.	1.5356E+06	-78.47
-2.50	654.	-877.	1.7581E+05	377.05
-3.00	272.	-631.	2.6621E+04	604.80
-3.02	261.	-620.	2.4398E+04	612.83
-3.50	42.	-272.	5.5660E+02	832.56
-3.80	0.	0.	0.0000E+00	969.91

(NOTE: DIVIDE SCALED DEFLECTION BY MODULUS OF
ELASTICITY IN PSI TIMES PILE MOMENT OF INERTIA
IN IN**4 TO OBTAIN DEFLECTION IN INCHES.)

III.--SOIL PRESSURES

ELEVATION (FT)	< LEFTSIDE PRESSURE (PSF) > PASSIVE	ACTIVE	<RIGHTSIDE PRESSURE (PSF) > ACTIVE	PASSIVE
9.50	0.	0.	0.	0.
8.50	0.	0.	0.	0.
7.50	0.	0.	0.	0.
6.50	0.	0.	0.	0.
5.50	0.	0.	0.	0.
4.50	274.	53.	26.	134.
4.08	375.	76.	37.	183.
3.79	445.	91.	45.	217.
3.50	515.	107.	52.	252.
2.50	715.	160.	78.	349.
1.50	902.	211.	106.	436.
.50	1092.	253.	85.	587.
.00	1271.	172.	4.	753.
-.02+	1283.	164.	0.	923.
-.02-	1283.	164.	0.	761.
-.11	1310.	151.	0.	792.
-.50	1424.	96.	0.	923.
-1.00	1471.	119.	0.	989.
-1.50	1494.	132.	0.	1014.
-2.50	1513.	152.	0.	1001.
-3.00	1212.	290.	0.	884.
-3.02+	1191.	299.	0.	755.
-3.02-	1191.	299.	0.	879.
-3.50	896.	422.	42.	755.
-3.80	921.	421.	78.	693.
-5.50	945.	405.	107.	722.

```
1000 'COUSINS P STA, EE 14149
 010 'I WALL SOUTH OF LAPALCO
 020 CONTROL  C  D    1.00     1.00
1030 WALL        9.50
1040 SURFACE RIGHTSIDE    4
1050         .00       5.50       2.50       5.50      13.50      2.00
1060     80.00       2.00
1070 SURFACE  LEFTSIDE    4
1080         .00       5.50       2.50       5.50      13.50      2.00
1090     80.00       2.00
1100 SOIL RIGHTSIDE  STRENGTH     7       .00      .00
1110  122.00  122.00  23.00  0.00     .00      .00       .00     .00   .00   .00
1120  112.50  112.50 15.00  200.00    .00      .00     -3.00     .00   .00   .00
1130   87.00   87.00   .00  195.00    .00      .00     -6.00     .00   .00   .00
1140   88.00   88.00   .00  235.00    .00      .00    -10.00     .00   .00   .00
1150   86.00   86.00   .00  320.00    .00      .00    -18.50     .00   .00   .00
1160  112.50  112.50 15.00  200.00    .00      .00    -28.5      0    .00   .00
1162   122.5   122.5   30     0        0        0                      0     0
1170 SOIL  LEFTSIDE  STRENGTH     7       .00      .00
1180  122.00  122.00  23.00  0.00     .00      .00       .00     .00   .00   .00
1190  112.50  112.50 15.00  200.00    .00      .00     -3.00     .00   .00   .00
1200   87.00   87.00   .00  195.00    .00      .00     -6.00     .00   .00   .00
1210   88.00   88.00   .00  235.00    .00      .00    -10.00     .00   .00   .00
1220   86.00   86.00   .00  320.00    .00      .00    -18.50     .00   .00   .00
1230  112.50  112.50 15.00  200.00    .00      .00    -28.5      .00   0     .00
1232   122.5    122.5   30     0        0        0                      0     0
1240 WATER ELEVATIONS    62.40     9.50    -1.00
1250 FINISH
```

Letter Dated 30 December 1997

EUSTIS ENGINEERING COMPANY, INC.
GEOTECHNICAL ENGINEERS
CONSTRUCTION QUALITY CONTROL & MATERIALS TESTING
3011 28th Street • Metairie, Louisiana 70002 • 504-834-0157 / Fax 504-834-0354 / E-mail EustisEngr@aol.com

30 December 1997

West Jefferson Engineering Services
A Joint Venture
615 Fourth Street
Westwego, Louisiana 70094

Attention Mr. Oscar Pena

Gentlemen:

Supplemental Geotechnical Information
West Jefferson Levee District
Cousins Pumping Station to First Avenue Canal
Harvey, Louisiana

As requested, Eustis Engineering Company, Inc., has reanalyzed the stability of the pump stations and T-wall at Cousins Pumping Station considering a still stormwater level at el 9.5. Results from previous analyses provided in our report dated 7 October 1997 considered the still stormwater level at el 7.5. These reanalyses were authorized by Mr. Oscar Pena of West Jefferson Engineering Services on 18 December 1997.

Based on the reanalyses, we have enclosed the following revised figures for our referenced report dated 7 October 1997 entitled "Geotechnical Investigation, West Jefferson Levee District, Cousins Pumping Station to First Avenue Canal, Harvey, Louisiana."

- Allowable Pile Load Capacities for New T-Wall Foundation at Existing North Pump Station (Revised Figure 14)

- Slope Stability Analysis and Proposed T-Wall Analyses of Existing North Pump Station (Revised Figure 30)
- Slope Stability Analysis of Existing South Pump Station and New Pump Station (Revised Figure 31)
- Existing T-Wall Stability Analyses Between Existing Pump Stations (Revised Figure 32)

The change of the still stormwater elevations from 7.5 to 9.5 will also affect other structures. These include I-walls, T-walls, and floodgates along the discharge canal. These structures should be reanalyzed in addition to the analyses provided in this letter.

If you have any questions regarding the enclosed information, please do not hesitate to call.

Yours very truly,

EUSTIS ENGINEERING COMPANY, INC.

THOMAS H. STREMLAU, P.E.

STATE OF LOUISIANA
THOMAS H. STREMLAU
REG. NO. 16248
REGISTERED
PROFESSIONAL ENGINEER
IN
CIVIL ENGINEERING

THS:aln/srb

Enclosures

30 December 1997

Copy to:
Design Engineering, Inc.
3330 West Esplanade Avenue
Metairie, Louisiana 70002
Attention Mr. John Holtgreve

Burk-Kleinpeter, Inc.
4176 Canal Street
New Orleans, Louisiana 70119-5994
Attention Mr. Jens Nielsen, Jr.

EE 14149

WEST JEFFERSON LEVEE DISTRICT
COUSINS PUMP STATION TO FIRST AVENUE CANAL
HARVEY, LOUISIANA

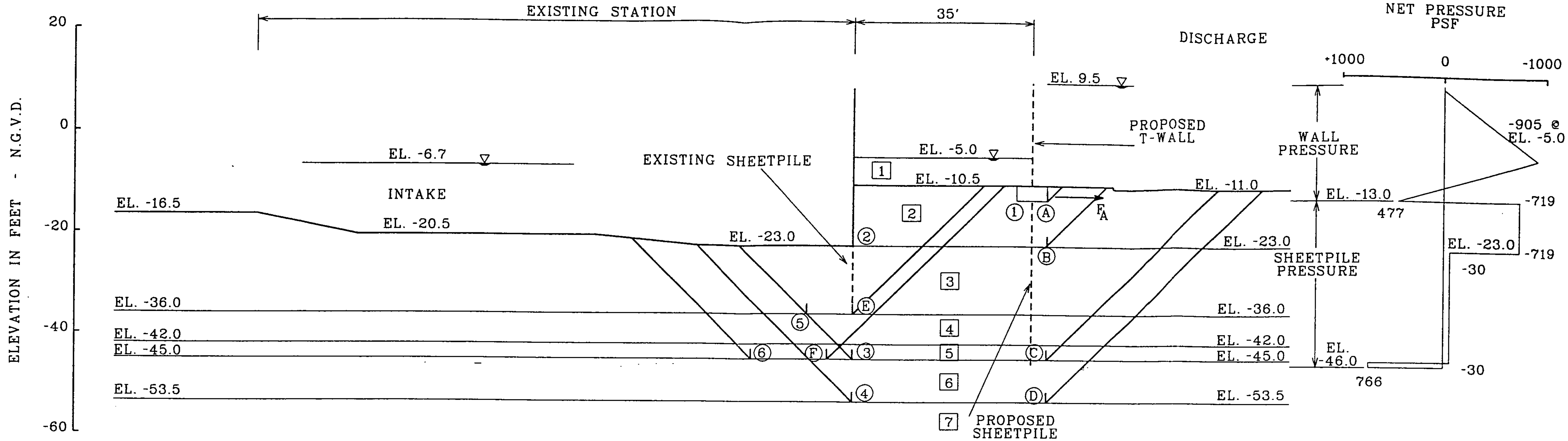
ALLOWABLE PILE LOAD CAPACITIES
NEW T-WALL FOUNDATION AT EXISTING NORTH PUMP STATION

PILE DESCRIPTION	PILE TIP EMBEDMENT BELOW FOOTING TOP AT EL -11 IN FEET	ESTIMATED ALLOWABLE SINGLE PILE LOAD CAPACITY IN TONS FACTOR OF SAFETY = 2	
		COMPRESSION	TENSION
12-In. Square Precast, Prestressed Concrete Pile	65.5 72.5	36* 50*	18 27
14-In. Square Precast, Prestressed Concrete Pile	65.5 72.5	44* 61*	21 31
16-In. Square Precast, Prestressed Concrete Pile	65.5 72.5	53* 73*	24 36

* Pile tips assumed to be bearing in sand

Note:

1. Capacity contribution above el -46 has been ignored.
2. Used soil parameters on Figure 6 of Eustis Engineering's report dated 7 October 1997 for the subject project.



STRATA NO.	SOIL TYPE	UNIT WEIGHT PCF	UNFACTORED			SAFETY FACTOR OF 1.3		
			FRICTION ANGLE DEGREES	COHESION - PSF AVERAGE	COHESION - PSF BOTTOM	FRICTION ANGLE DEGREES	COHESION - PSF AVERAGE	COHESION - PSF BOTTOM
1	SAND	120	30	0	0	24	0	0
2	CLAY	94	0	220	220	0	169	169
3	CLAY CLAYEY SILT	107	0	310	400	0	238	308
4	CLAY	102	0	400	400	0	308	308
5	CLAY	97.5	0	400	400	0	308	308
6	CLAY	97.5	0	485	570	0	373	438
7	CLAY	97.5	0	655	740	0	504	569

T - WALL ANALYSIS

SUMMATION OF FORCES (USING FACTORED SHEAR STRENGTHS)

FAILURE SURFACE	ΣR RESISTANCE LBS/FT	ΣD DRIVING LBS/FT	ΣR - ΣD	CHANGE IN NET FORCE	EQUIVALENT PRESSURE PSF
Ⓐ ①	3734	10455	-6721	-	-
Ⓑ ②	10586	24499	-13913	-7192	-719
Ⓒ ③	39230	53798	-14568	-655	-30
Ⓓ ④	57127	65184	-8057	6511	766

STABILITY OF PUMP STATION

FAILURE SURFACE	SUMMATION OF FORCES RESISTING	SUMMATION OF FORCES DRIVING	FACTOR OF * SAFETY
Ⓔ⑤	25801	19615	1.32
Ⓕ⑥	43575	22636	1.93

* USING UNFACTORED SOIL PARAMETERS

NOTE :
1) TO SATISFY MOMENT EQUILIBRIUM, SUMMING MOMENTS ABOUT BASE OF FOOTING AT EL. -13.0, REQUIRES SHEET PENETRATION TO EL. -46.0.
2) MAXIMUM MOMENT OCCURS AT EL. -23.0 AND IS 34.9 FT. KIPS/FT OF WALL.
3) CALCULATED ANCHOR FORCE, F_A, IS 7.1 KIPS/FT OF WALL AT EL. -13.0.
4) THE ANCHOR LOAD AND INDICATED T-WALL PRESSURE MUST BE SUPPORTED BY DRIVEN BATTER PILES. AXIAL CAPACITY OF THESE BATTER PILES MUST IGNORE CAPACITY CONTRIBUTION ABOVE EL. -46.0
5) USING THE HARR METHOD OF SEEPAGE ANALYSIS, FACTOR OF SAFETY AGAINST PIPING FAILURE IS 4.5 OR MORE IF THE T-WALL CUTOFF SHEETPILE IS DRIVEN TO EL-. -46.0.
6) SOIL PARAMETERS ARE TAKEN FROM FIGURE 6 OF EUSTIS ENGINEERING REPORT DATED 7 OCTOBER 1997 FOR SUBJECT PROJECT.

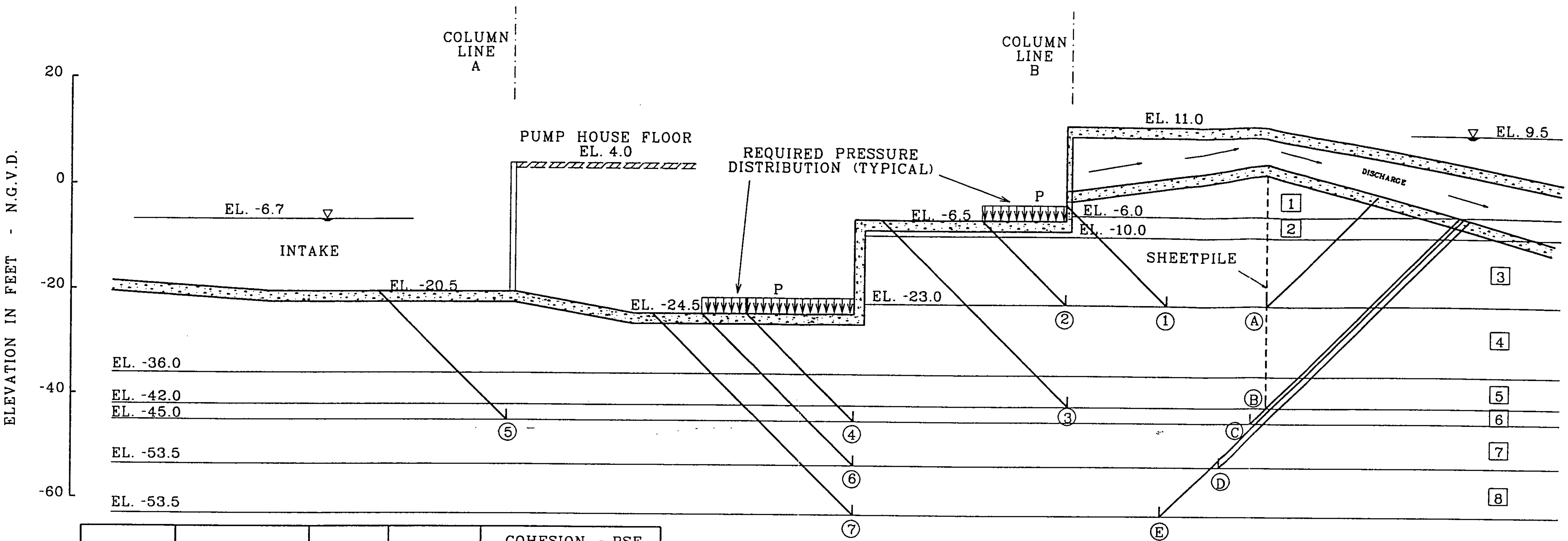
20' 0 20'
SCALE

SLOPE STABILITY ANALYSIS AND PROPOSED T-WALL ANALYSES EXISTING NORTH PUMP STATION

WEST JEFFERSON LEVEE DISTRICT
COUSINS PUMP STATION TO FIRST AVENUE CANAL
HARVEY, LOUISIANA

EUSTIS ENGINEERING COMPANY, INC.

REVISED FIGURE 30



STRATA NO.	SOIL TYPE	UNIT WEIGHT PCF	FRICTION ANGLE DEGREES	COHESION - PSF	
				AVERAGE	BOTTOM
1	CLAY	95	0	260	260
2	CLAY	90	0	235	220
3	CLAY	94	0	220	220
4	CLAY/ CLAYEY SILT	107	0	310	400
5	CLAY	102	0	400	400
6	CLAY	97.5	0	400	400
7	CLAY	97.5	0	485	570
8	CLAY	97.5	0	655	740

FAILURE SURFACE	SUMMATION OF FORCES LBS/FT		FACTOR OF SAFETY	VERTICAL PRESSURE, P, IN PSF TO ACHIEVE FACTOR OF SAFETY - 1.3
	RESISTING	DRIVING		
A 1	22585	18519	1.22	60
A 2	25466	28698	0.89	552
B 3	55879	49221	1.14	176
C 4	67191	69176	0.97	853
C 5	95051	66369	1.43	-
D 6	92800	82018	1.13	367
E 7	118622	92987	1.28	46

NOTE : 1) "P", IS REQUIRED VERTICAL PRESSURE ACROSS TOP OF PASSIVE WEDGES TO ACHIEVE A CALCULATED FACTOR OF SAFETY OF 1.3 OR MORE AGAINST A STABILITY FAILURE.

2) IF PILES ARE USED TO PROVIDE THIS HOLD DOWN PRESSURE, AXIAL CAPACITY OF THE PILES ABOVE EL. -53.5 SHOULD BE IGNORED.

3) USING THE HARR METHOD OF SEEPAGE ANALYSIS, THE CALCULATED FACTOR OF SAFETY AGAINST PIPING IS GREATER THEN 4.

4) SOIL PARAMETERS ARE TAKEN FROM FIGURE 6 OF EUSTIS ENGINEERING REPORT DATED 7 OCTOBER 1997 FOR THE SUBJECT PROJECT.

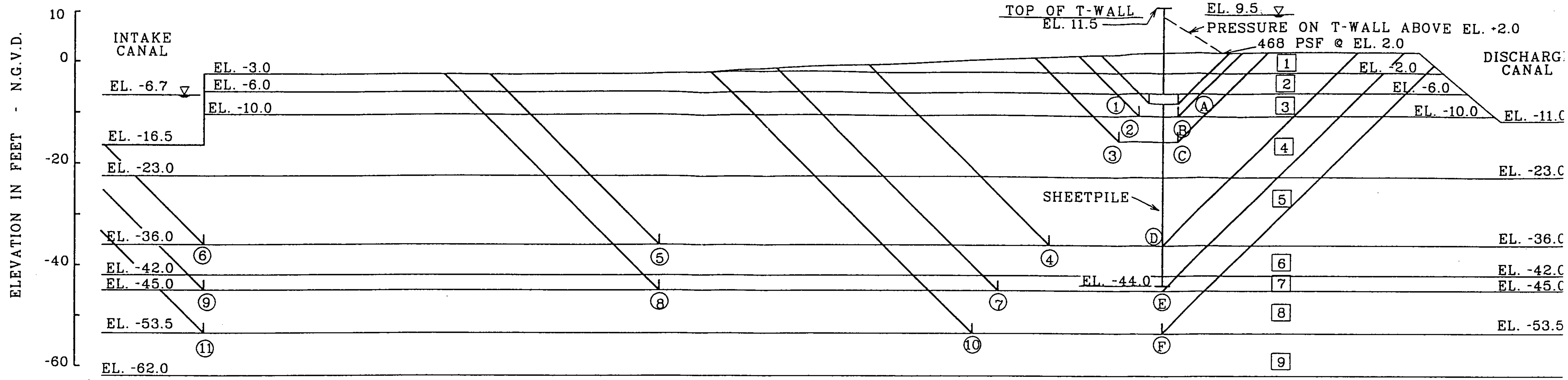
20' 0 20'
SCALE

SLOPE STABILITY ANALYSIS
EXISTING SOUTH PUMP STATION
AND NEW PUMP STATION

WEST JEFFERSON LEVEE DISTRICT
COUSINS PUMP STATION TO FIRST AVENUE CANAL
HARVEY, LOUISIANA

EUSTIS ENGINEERING COMPANY, INC.

REVISED FIGURE 31



STRATA NO.	SOIL TYPE	UNIT WEIGHT PCF	UNFACTORED			SAFETY FACTOR OF 1.3		
			FRICTION ANGLE DEGREES	COHESION - PSF AVERAGE	COHESION - PSF BOTTOM	FRICTION ANGLE DEGREES	COHESION - PSF AVERAGE	COHESION - PSF BOTTOM
1	CLAY	95	0	260	260	0	200	200
2	CLAY	95	0	260	260	0	200	200
3	CLAY	90	0	235	220	0	181	169
4	CLAY	94	0	220	220	0	169	169
5	CLAY/ CLAYEY SILT	107	0	310	400	0	238	308
6	CLAY	102	0	400	400	0	308	308
7	CLAY	97.5	0	400	400	0	308	308
8	CLAY	97.5	0	485	570	0	373	438
9	CLAY	97.5	0	655	740	0	504	569

* USING UNFACTORED SOIL PARAMETERS

GLOBAL STABILITY

FAILURE SURFACE	SUMMATION OF FORCES LB/FT RESISTING	SUMMATION OF FORCES LB/FT DRIVING	FACTOR OF * SAFETY
Ⓓ④	47330	25637	1.85
Ⓓ⑤	77240	33524	2.30
Ⓓ⑥	106740	53269	2.00
Ⓔ⑦	65259	34571	1.89
Ⓔ⑧	91586	41718	2.20
Ⓔ⑨	121140	67548	1.79
Ⓕ⑩	87932	42240	2.08
Ⓕ⑪	167805	80067	2.10

T - WALL ANALYSIS

SUMMATION OF FORCES (USING FACTORED SHEAR STRENGTHS)

FAILURE SURFACE	ΣR RESISTANCE LBS/FT	ΣD DRIVING LBS/FT	ΣR - ΣD	CHANGE IN NET FORCE
Ⓐ ①	7226	5112	2114	-
Ⓑ ②	10357	7139	3218	1104
Ⓒ ③	14917	10502	4415	1197

NOTE :
1) T-WALL ANALYSIS SHOWS NO UNBALANCED FORCE BENEATH THE T-WALL FOOTING TO MAINTAIN STABILITY WITH RESPECT TO A FACTOR OF SAFETY OF 1.3.
2) EXISTING SHEETPILES PENETRATE TO EL. -36.0 AND -44.0.
3) SEEPAGE ANALYSIS INDICATES THE SHEETS EXTENDING TO ELEVATION -36.0 HAVE A FACTOR OF SAFETY GREATER THEN 3 AGAINST PIPING USING THE HARR METHOD OF ANALYSIS.
4) SOIL PARAMETERS ARE TAKEN FROM FIGURE 6 OF EUSTIS ENGINEERING REPORT DATED 7 OCTOBER 1997 FOR THE SUBJECT PROJECT.

20' 0 20'
SCALE

EXISTING T-WALL STABILITY ANALYSES BETWEEN EXISTING PUMP STATIONS

WEST JEFFERSON LEVEE DISTRICT
COUSINS PUMP STATION TO FIRST AVENUE CANAL
HARVEY, LOUISIANA

EUSTIS ENGINEERING COMPANY, INC.

REVISED FIGURE 3

EUSTIS ENGINEERING COMPANY, INC.
GEOTECHNICAL ENGINEERS
CONSTRUCTION QUALITY CONTROL & MATERIALS TESTING
3011 28th Street • Metairie, Louisiana 70002 • 504-834-0157 / Fax 504-834-0354 / E-mail EustisEngr@aol.com

12 February 1998

West Jefferson Engineering Services
A Joint Venture
615 Fourth Street
Westwego, Louisiana 70094

Attention Mr. Oscar Pena

Gentlemen:

West Jefferson Levee District
Cousins Pumping Station to First Avenue Canal
Harvey, Louisiana

At this time, Eustis Engineering Company, Inc., is submitting to you its final report and letters for the referenced project. These items include:

- our geotechnical report dated 7 October 1997,
- supplemental geotechnical information letter dated 30 December 1997, and
- supplemental geotechnical information letter dated 10 February 1998.

Eustis Engineering has enjoyed working with you on this project. Should you have any questions or require additional information, please do not hesitate to contact us.

Yours very truly,

EUSTIS ENGINEERING COMPANY, INC.

THOMAS H. STREMLAU, P.E.

STATE OF LOUISIANA
THOMAS H. STREMLAU
REG. NO. 16248
REGISTERED PROFESSIONAL ENGINEER
IN
CIVIL ENGINEERING

THS:kdl

EE14149

Letter Dated 10 February 1998

EUSTIS ENGINEERING COMPANY, INC.
GEOTECHNICAL ENGINEERS
CONSTRUCTION QUALITY CONTROL & MATERIALS TESTING
3011 28th Street • Metairie, Louisiana 70002 • 504-834-0157 / Fax 504-834-0354 / E-mail EustisEngr@aol.com

10 February 1998

West Jefferson Engineering Services
A Joint Venture
615 Fourth Street
Westwego, Louisiana 70094

Attention Mr. Oscar Pena

Gentlemen:

Supplemental Geotechnical Information
West Jefferson Levee District
Cousins Pumping Station to First Avenue Canal
Harvey, Louisiana

Reference is made to our report dated 7 October 1997 entitled "Geotechnical Investigation, West Jefferson Levee District, Cousins Pumping Station at First Avenue Canal, Harvey, Louisiana." As requested, Eustis Engineering Company, Inc., has made additional analyses of I-walls, T-walls, and floodgates for the subject project. These additional analyses assume a static storm water level at el 9.5 (NGVD) rather than el 7.5. We have also developed designs for features not previously analyzed.

Design methods and parameters, as well as other pertinent assumptions, are described in our previous report. This letter includes revised figures for our report. These revised figures provide the results of reviewed engineering analyses for a static storm water level at el 9.5 and are summarized in the following table.

ENCLOSURE NUMBER	FIGURE NUMBER FROM REVISED REPORT	DESCRIPTION
1	34	I-Wall Design, Cousins Pump Station Discharge to Destrehan Avenue Bridge
2	35	I-Wall Design, North Bank of Discharge Canal, East of Destrehan Avenue Bridge
3	36	I-Wall Design, South of Lapalco Boulevard
4	37	T-Wall Stability Analysis, Cousins Pump Station Discharge to Destrehan Avenue Bridge
5	38	T-Wall Stability Analysis, North Bank of Discharge Canal, East of Destrehan Avenue Bridge
6	39	Floodgate Stability Analysis, Destrehan Avenue

Additional Analyses

Furnished Information. Beneath the Lapalco Boulevard bridge, a prefabricated barge will be installed to serve as a flume. A diversion wall will tie into the floodwall on the north side of the discharge canal and curve toward the south to tie into the east wingwall of the flume. The diversion wall will continue south of the bridge from the flume wingwall to a sector gate in the Harvey Canal.

East of the Destrehan Avenue Bridge, a floodwall will be constructed on the south bank of the discharge canal. The alignment of the wall will curve toward the south to tie into the west wingwall of the flume structure. The floodwall will continue to the south of the Lapalco Boulevard bridge. It will be tied into the west wingwall of the flume structure and continue south and west to tie into the existing levee system on the west side of the Harvey Canal.

The discharge channel flume barge will be installed beneath the Lapalco Boulevard bridge. The ground surface varies from el 0 on the west side to el -9 on the east. A descriptive plan and elevation view of the barge are shown on Enclosure 12.

Anchored sheetpile walls will be installed along the west and east side of the barge site for installation of the barge. This sheetpile system will be designed by others. An excavation will then be made to el -18. At that time, a 2-ft thick crushed stone bed will be placed as a leveling bed.

The barge structure will be 126.67 feet long by 110.67 feet wide and will be 7 feet high. Wingwalls will extend 20.5 feet above the top side of the barge section. The barge structure will be constructed of lightweight concrete panels and will displace approximately 5.25 feet of water without any ballast. The barge will be floated into place and slowly flooded and sunk to bear on the crushed stone pad at el -16.

After installation, the east and west sheetpile walls will be left in place and used to provide seepage cutoff along the east and west edges of the barge. High density cement grout will be placed between the sheetpiles and barge hull to block off potential seepage coming up from the crushed stone pad beneath the barge. Flood protection walls will tie directly into the wingwalls of the barge.

I-Walls Analyses. Analyses of an I-wall applicable to the south bank of the discharge canal east of Destrehan Avenue Bridge is presented on Enclosure 7. This analysis assumes a 1 vertical to 3.5 horizontal slope (or flatter) exists on the flood side of the wall from el 4.

An additional I-wall analysis was performed for the I-wall near the entrance and exit areas of the flume. For this analysis, the ground surface elevation on the flood side of the wall was assumed to be at el -9. This I-wall analysis is shown on Enclosure 8. Two design cases were analyzed. The first case assumes high water flood conditions and the second case assumes short term and long term low water conditions. The results of the analyses indicate flood conditions govern the design of the wall.

<u>Diversion Wall Analyses.</u> The diversion wall is intended to be an anchored wall. A summary of our analyses for this structure is presented on Enclosure 9. The analyses assume the ground surface on the protected and flood sides are el -11 and -9, respectively, and the static storm water level at el 9.5. The low water level on the protected side was assumed at el -1. These analyses assume a horizontal anchor on the wall at el 10.5. The anchor reaction will be provided by batter piles. The analyses indicate the wall bottom elevation should penetrate to at least el -52. Maximum anchor force, moment, and scaled deflection are also given on Enclosure 9.

The diversion anchor wall must be supported by a horizontal reaction from the battered anchor piles. During loading, the battered anchor piles will be subjected to compressive horizontal and vertical components. The anchored wall must provide adequate uplift capacity to balance the vertical component in the battered anchor pile system. Assuming the wall is a PA 36-18 section, we have calculated the allowable vertical uplift capacity for the diversion wall. Results of the analyses are presented on Enclosure 10. A factor of safety of 2 is incorporated into the analyses to provide the allowable uplift loads.

We have also developed allowable pile load capacities for 14 and 16-in. square, precast prestressed concrete piles that may be used as batter piles for support of the wall. Results of the analyses are presented on Enclosure 11. Axial capacity above el -35 has been ignored and a factor of safety of 2 has been incorporated into the analyses to provide the allowable compressive loads. Our analyses assume a batter of 3 vertical to 1 horizontal or less (i.e., 2 vertical to 1 horizontal). The allowable compressive loads presented are for vertical piles. Axial and horizontal resistance of batter piles can be determined following Figure 25 of our referenced report.

<u>Flume Barge Analyses.</u> Once the barge is flooded, we understand the anticipated bearing pressure at the base of the flume barge will vary between 155 and 175 psf. The ultimate bearing capacity of foundation soils is estimated to be 1,200 psf. Therefore, the factor of safety against a bearing failure is above acceptable limits. Assuming a sustained bearing pressure of 175 psf, we estimate the barge will experience long term settlement of approximately 1 to 1.5 inches due to consolidation of underlying clay strata.

Crushed stone used to construct the pad should also be used as backfill along the north and south ends of the barge to promote good hydraulic connection with the barge bottom. The crushed stone should have a minimum apparent specific gravity of at least 2.71. A suitable gradation for the crushed stone bedding is as follows. Other gradations may be acceptable but should be reviewed by Eustis Engineering.

U.S. SIEVE	PERCENT PASSING
1.5-In.	95 to 100
0.75-In.	40 to 85
No. 4	0 - 15

The sheetpile walls on the east and west side will be designed by others for construction. However, permanent control of underseepage and piping is a design consideration for these sheetpiles. Using the Harr method of analysis, our analyses indicate the sheets should penetrate to at least el -32 to provide a desirable factor of safety of 4 against piping.

High density grout will be placed between the barge and the east and west sheetpile walls. The grout will provide a seal against water leakage during storm conditions. The grout column must be designed to withstand a water pressure head of 12.5 feet of water which is 780 psf. The total weight of the grout column should exceed 1.5 times 780 psf per foot of area. In addition, the grout should be a non-shrink grout.

West Jefferson
Engineering Services

10 February 1998

If you have any questions regarding the enclosed information, please do not hesitate to contact us.

Yours very truly,

EUSTIS ENGINEERING COMPANY, INC.

THOMAS H. STREMLAU, P.E.

STATE OF LOUISIANA
THOMAS H. STREMLAU
REG. NO. 16248
REGISTERED
PROFESSIONAL ENGINEER
IN
CIVIL ENGINEERING

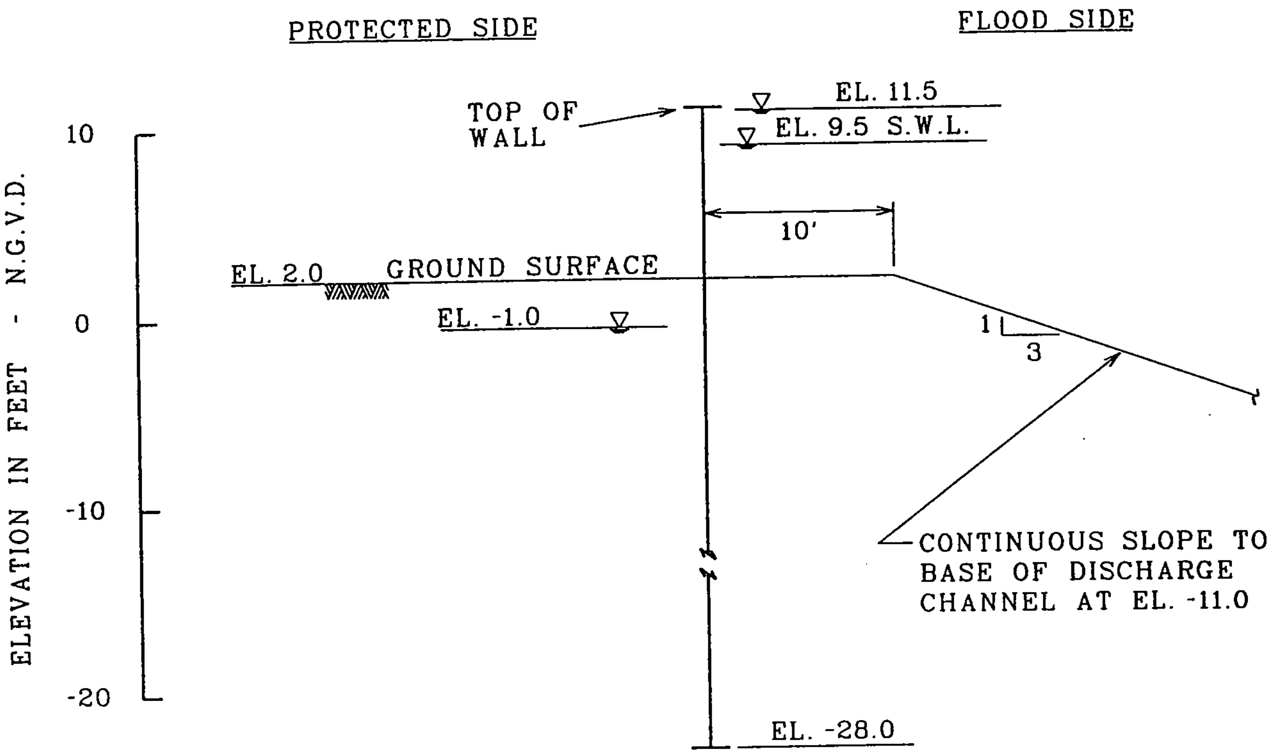
THS:aln/mcp

Enclosures 1 through 12
Appendix (Computer Output)

Copy to:
Design Engineering, Inc.
3330 West Esplanade Avenue
Metairie, Louisiana 70002
Attention Mr. John Holtgreve

Burk-Kleinpeter, Inc.
4176 Canal Street
New Orleans, Louisiana 70119-5994
Attention Mr. Jens Nielsen, Jr.

EE 14149



DESIGN SUMMARY					
FLOOD SIDE WATER ELEVATION	PROTECTED SIDE WATER ELEVATION	FACTOR OF SAFETY	MAX. MOMENT FT-KIPS	WALL BOTTOM ELEVATION	SCALED DEFLECTION LB-IN^3 AT EL. 11.5
9.5	-1.0	1.5	21.3	-25.5	7.4×10^{10}
11.5	-1.0	1.0	36.1	-28.0	2.9×10^{10}

NOTE :
1) DIVIDE SCALED DEFLECTION BY MODULUS OF ELASTICITY IN PSI TIMES PILE MOMENT OF INERTIA IN INCHES TO 4th POWER TO OBTAIN DEFLECTION IN INCHES.

2) BASED ON HARR'S ANALYSIS,SHEETPILE TIPS PENETRATING TO EL. -28.0 PROVIDE A FACTOR OF SAFETY OF 5 OR MORE AGAINST PIPING.

3) SOIL PARAMETERS ARE TAKEN FROM FIGURE 6 OF 7 OCTOBER 1997 REPORT.

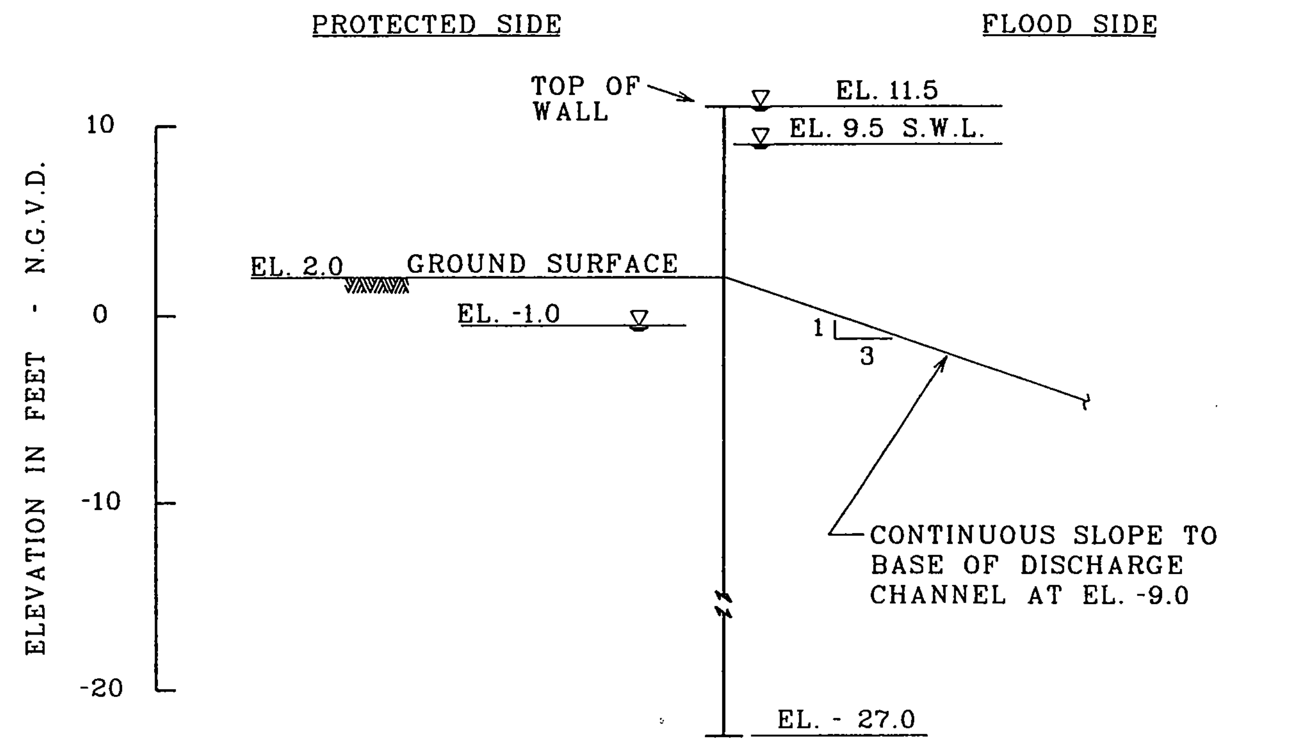
4) SEE APPENDIX FOR COMPUTER ANALYSES OF GOVERNING SHEETPILE DESIGN GIVEN ABOVE.

I-WALL DESIGN
COUSINS PUMP STATION
DISCHARGE TO DESTREHAN AVENUE BRIDGE

WEST JEFFERSON LEVEE DISTRICT
COUSINS PUMP STATION TO FIRST AVENUE CANAL
HARVEY, LOUISIANA

EUSTIS ENGINEERING COMPANY, INC.

ENCLOSURE 1
(REVISED FIGURE 34)



DESIGN SUMMARY					
FLOOD SIDE WATER ELEVATION	PROTECTED SIDE WATER ELEVATION	FACTOR OF SAFETY	MAX. MOMENT FT-KIPS	WALL BOTTOM ELEVATION	SCALED DEFLECTION LB-IN^3 AT EL. 11.5
9.5	-1.0	1.5	25.1	-26.0	$7.8x10^{10}$
11.5	-1.0	1.0	41.6	-27.0	$3.2x10^{10}$

NOTE : 1) DIVIDE SCALED DEFLECTION BY MODULUS OF ELASTICITY IN PSI TIMES PILE MOMENT OF INERTIA IN INCHES TO 4th POWER TO OBTAIN DEFLECTION IN INCHES.

2) BASED ON HARR'S ANALYSIS,SHEETPILE TIPS AT EL. -27.0 PROVIDE A FACTOR OF SAFETY OF 5 OR MORE AGAINST PIPING.

3) SOIL PARAMETERS ARE TAKEN FROM FIGURE 8 OF 7 OCTOBER 1997 REPORT EXCEPT ABOVE EL. -10.0 WHERE PARAMETERS ARE TAKEN FROM FIGURE 6.

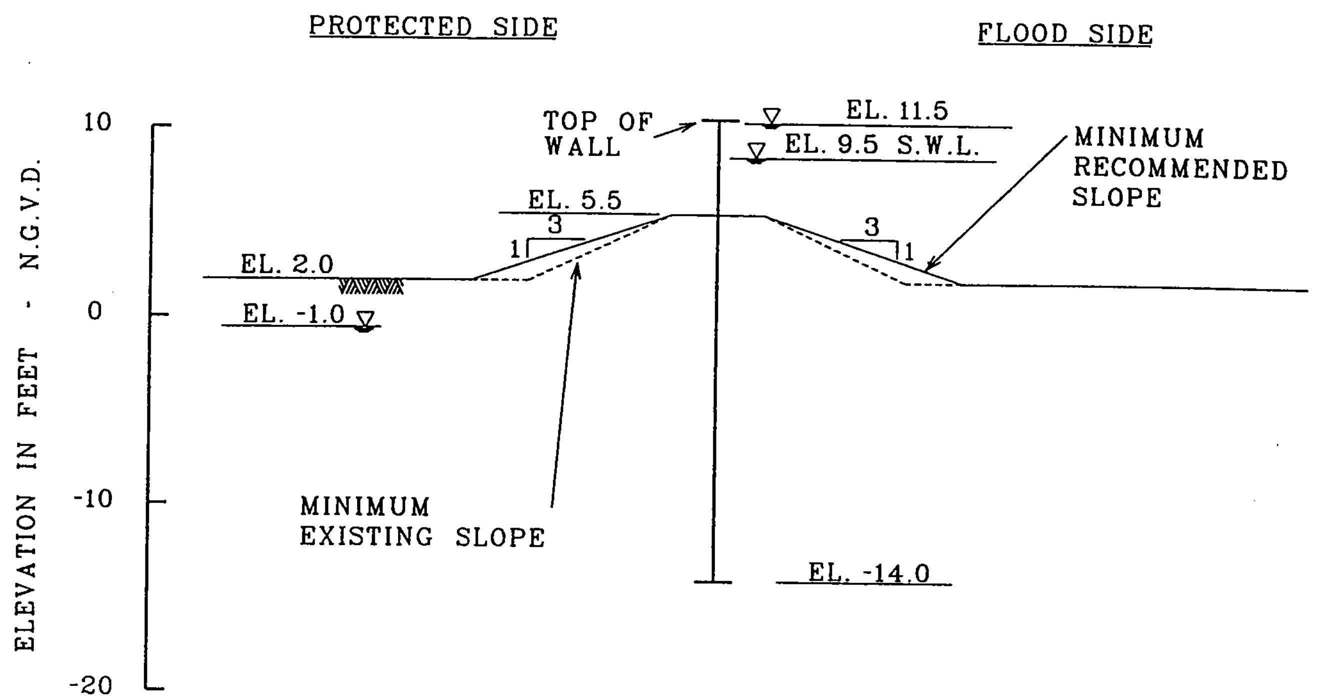
4) SEE APPENDIX FOR COMPUTER ANALYSES OF GOVERNING SHEETPILE DESIGN GIVEN ABOVE.

I-WALL DESIGN
NORTH BANK OF DISCHARGE CANAL
EAST OF DESTREHAN AVENUE BRIDGE

WEST JEFFERSON LEVEE DISTRICT
COUSINS PUMP STATION TO FIRST AVENUE CANAL
HARVEY, LOUISIANA

EUSTIS ENGINEERING COMPANY, INC.

ENCLOSURE 2
(REVISED FIGURE 35)



DESIGN SUMMARY					
FLOOD SIDE WATER ELEVATION	PROTECTED SIDE WATER ELEVATION	FACTOR OF SAFETY	MAX. MOMENT FT-KIPS	WALL BOTTOM ELEVATION	SCALED DEFLECTION LB-IN^3 AT EL. 11.5
9.5	-1.0	1.5	4.7	-7.5	7.3×10^8
11.5	-1.0	1.0	11.6	-13.5	3.5×10^9

NOTE : 1) DIVIDE SCALED DEFLECTION BY MODULUS OF ELASTICITY IN PSI TIMES PILE MOMENT OF INERTIA IN INCHES TO 4th POWER TO OBTAIN DEFLECTION IN INCHES.

2) BASED ON HARR'S ANALYSIS,SHEETPILE TIPS PENETRATING TO EL. -14.0 PROVIDE A FACTOR OF SAFETY OF 2 OR MORE AGAINST PIPING.

3) SOIL PARAMETERS ARE TAKEN FROM FIGURE 10 OF 7 OCTOBER 1997 REPORT.

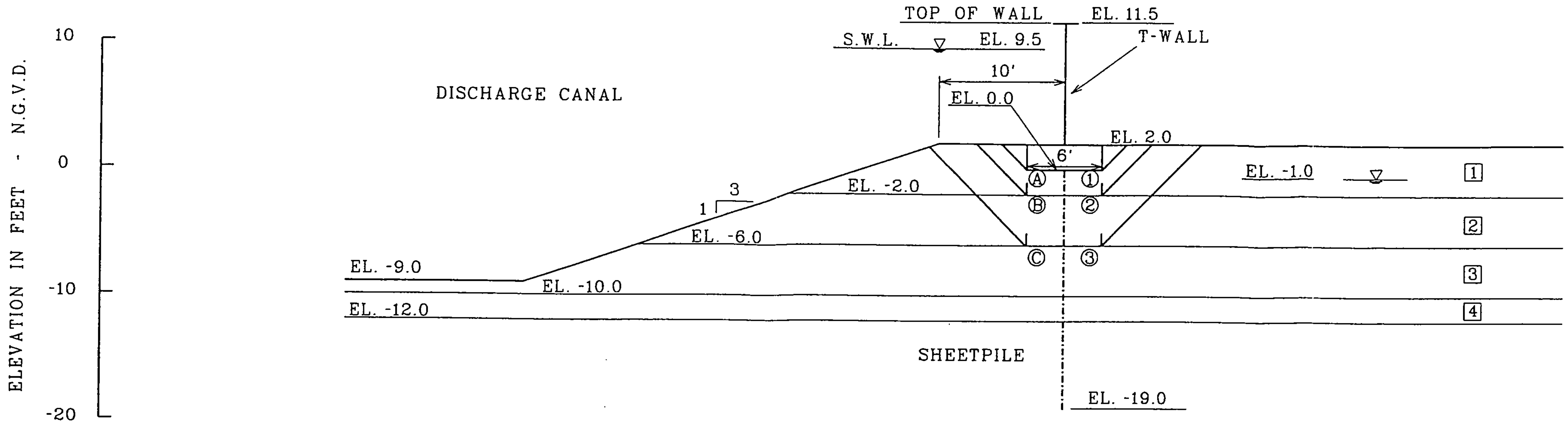
4) SEE APPENDIX FOR COMPUTER ANALYSES OF GOVERNING SHEETPILE DESIGN GIVEN ABOVE.

I-WALL DESIGN
SOUTH OF LAPALCO BOULEVARD

WEST JEFFERSON LEVEE DISTRICT
COUSINS PUMP STATION TO FIRST AVENUE CANAL
HARVEY, LOUISIANA

EUSTIS ENGINEERING COMPANY, INC.

ENCLOSURE 3
(REVISED FIGURE 36)



STRATA NO.	SOIL TYPE	UNIT WEIGHT PCF	UNFACTORED			SAFETY FACTOR OF 1.3		
			FRICTION ANGLE DEGREES	COHESION - PSF AVERAGE	COHESION - PSF BOTTOM	FRICTION ANGLE DEGREES	COHESION - PSF AVERAGE	COHESION - PSF BOTTOM
1	SHELL/SAND	118	23	0	0	18	0	0
2	CLAY	95	0	260	260	0	200	200
3	CLAY	90	0	235	220	0	181	169
4	CLAY	90	0	220	220	0	196	169

SUMMATION OF FORCES (USING FACTORED SHEAR STRENGTHS)

FAILURE SURFACE		ΣR RESISTANCE LBS/FT	ΣD DRIVING LBS/FT	ΣR - ΣD	CHANGE IN NET FORCE, LB
A	1	1177	2651	-1474	-
B	2	2244	3585	-1341	133
C	3	5315	5467	-152	1189

10' 0 10'

SCALE

NOTE : 1) ANALYSIS SHOWS NO UNBALANCED FORCE BENEATH THE T-WALL FOOTING TO MAINTAIN STABILITY WITH RESPECT TO A FACTOR OF SAFETY OF 1.3.

2) BASED ON HARR'S ANALYSIS, SHEETPILE CUT OFF MUST PENETRATE TO EL. -19.0 OR BELOW TO HAVE A FACTOR OF SAFETY OF 2 OR GREATER AGAINST PIPING.

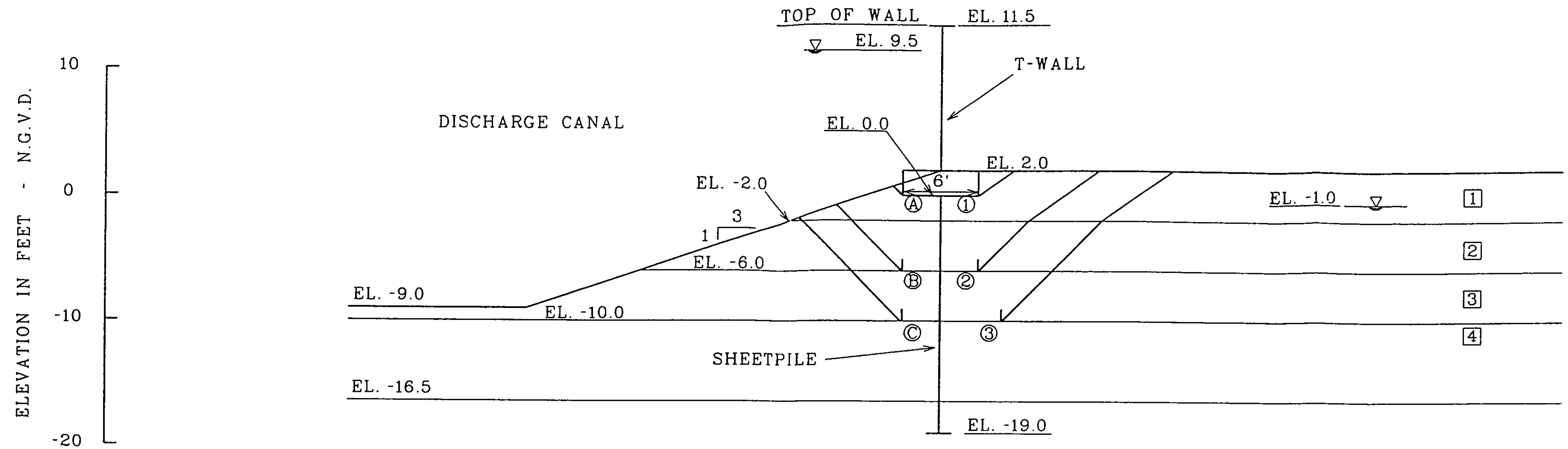
3) SOIL PARAMETERS ARE TAKEN FROM FIGURE 6 OF 7 OCTOBER 1997 REPORT.

T-WALL STABILITY ANALYSIS
COUSINS PUMP STATION
DISCHARGE TO DESTREHAN AVENUE BRIDGE

WEST JEFFERSON LEVEE DISTRICT
COUSINS PUMP STATION TO FIRST AVENUE CANAL
HARVEY, LOUISIANA

EUSTIS ENGINEERING COMPANY, INC.

ENCLOSURE 4
(REVISED FIGURE 37)



STRATA NO.	SOIL TYPE	UNIT WEIGHT PCF	UNFACTORED			SAFETY FACTOR OF 1.3		
			FRICTION ANGLE DEGREES	COHESION - PSF AVERAGE	COHESION - PSF BOTTOM	FRICTION ANGLE DEGREES	COHESION - PSF AVERAGE	COHESION - PSF BOTTOM
1	SHELL/SAND	118	23	0	0	18	0	0
2	CLAY	95	0	260	260	0	200	200
3	CLAY	90	0	235	150	0	181	115
4	ORGANIC CLAY	69	0	150	150	0	115	115

SUMMATION OF FORCES (USING FACTORED SHEAR STRENGTHS)

FAILURE SURFACE	ΣR RESISTANCE LBS/FT	ΣD DRIVING LBS/FT	ΣR - ΣD	CHANGE IN NET FORCE,LB
Ⓐ ①	318	2669	-2351	-
Ⓑ ②	4361	5065	-704	1647
Ⓒ ③	7431	6873	1058	1762

NOTE : 1) ANALYSIS SHOWS NO UNBALANCED FORCE BENEATH THE T-WALL FOOTING TO MAINTAIN STABILITY WITH RESPECT TO A FACTOR OF SAFETY OF 1.3.

2) BASED OH HARR'S ANALYSIS,SHEETPILE CUT OFF MUST PENETRATE TO EL. -19.0 OR BELOW TO HAVE A FACTOR OF SAFETY OF 2 OR GREATER AGAINST PIPING.

3) DESIGN SOIL PARAMETERS ARE TAKEN FROM FIGURE 8 OF 7 OCTOBER 1997 REPORT, EXCEPT ABOVE EL. -10.0 WHERE FIGURE 6 WAS USED.

10' 0 10'

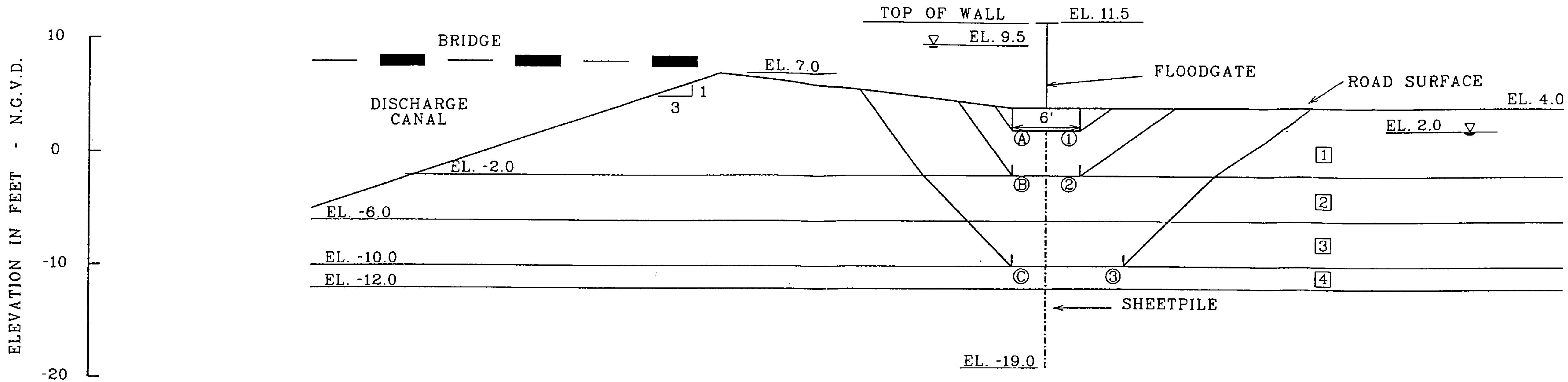
SCALE

T-WALL STABILITY ANALYSIS
NORTH BANK OF DISCHARGE CANAL EAST OF DESTREHAN AVENUE BRIDGE

WEST JEFFERSON LEVEE DISTRICT
COUSINS PUMP STATION TO FIRST AVENUE CANAL
HARVEY, LOUISIANA

EUSTIS ENGINEERING COMPANY, INC.

ENCLOSURE 5
(REVISED FIGURE 38)



STRATA NO.	SOIL TYPE	UNIT WEIGHT PCF	UNFACTORED			SAFETY FACTOR OF 1.3		
			FRICTION ANGLE DEGREES	COHESION - PSF AVERAGE	COHESION - PSF BOTTOM	FRICTION ANGLE DEGREES	COHESION - PSF AVERAGE	COHESION - PSF BOTTOM
1	FILL:CLAY, SAND & SHELL	120	25	0	0	20	0	0
2	CLAY	95	0	260	260	0	200	200
3	CLAY	90	0	235	220	0	181	169
4	CLAY	90	0	220	220	0	169	169

SUMMATION OF FORCES (USING FACTORED SLOPE STRENGTHS)

FAILURE SURFACE	ΣR RESISTANCE LBS/FT	ΣD DRIVING LBS/FT	ΣR - ΣD	CHANGE IN NET FORCE, LB
Ⓐ ①	628	1641	-1013	-
Ⓑ ②	3122	3098	24	1037
Ⓒ ③	10285	6455	3830	3806

NOTE : 1) ANALYSIS INDICATES NO UNBALANCED FORCE BENEATH THE FLOODGATE FOOTING TO MAINTAIN STABILITY WITH RESPECT TO A FACTOR OF SAFETY OF 1.3.

2) BASED ON HARR'S ANALYSIS,SHEETPILE CUT OFF MUST PENETRATE TO EL. -19.0 OR BELOW TO HAVE A FACTOR OF SAFETY OF 2 OR GREATER AGAINST PIPING.

3) SOIL PARAMETERS ARE TAKEN FROM FIGURE 6 OF 7 OCTOBER 1997 REPORT.

10' 0 10'

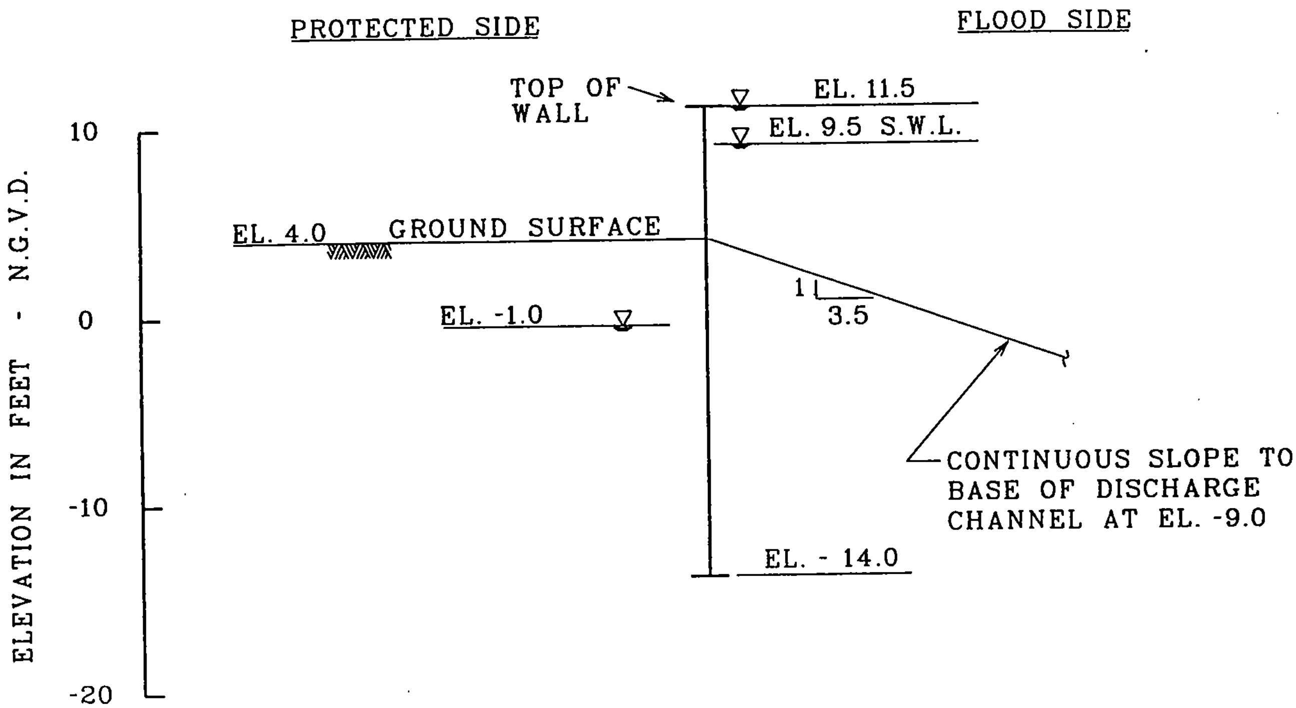
SCALE

FLOODGATE STABILITY ANALYSIS
DESTREHAN AVENUE

WEST JEFFERSON LEVEE DISTRICT
COUSINS PUMP STATION TO FIRST AVENUE CANAL
HARVEY, LOUISIANA

EUSTIS ENGINEERING COMPANY, INC.

ENCLOSURE 6
(REVISED FIGURE 39)



DESIGN SUMMARY					
FLOOD SIDE WATER ELEVATION	PROTECTED SIDE WATER ELEVATION	FACTOR OF SAFETY	MAX. MOMENT FT-KIPS	WALL BOTTOM ELEVATION	SCALED DEFLECTION LB-IN ^{3} AT EL. 11.5
9.5	-1.0	1.5	8.4	-12.0	$2.0x10^9$
11.5	-1.0	1.0	15.1	-14.0	$4.3x10^9$

NOTE : 1) DIVIDE SCALED DEFLECTION BY MODULUS OF ELASTICITY IN PSI TIMES PILE MOMENT OF INERTIA IN INCHES TO 4th POWER TO OBTAIN DEFLECTION IN INCHES.

2) USING THE HARR METHOD OF SEEPAGE ANALYSIS,SHEETPILE TIPS AT EL. -14.0 PROVIDE A FACTOR OF SAFETY OF 4 OR MORE AGAINST PIPING.

3) SOIL PARAMETERS ARE TAKEN FROM FIGURE 8 OF 7 OCTOBER 1997 REPORT, EXCEPT ABOVE EL. -10.0 WHERE FIGURE 6 WAS USED.

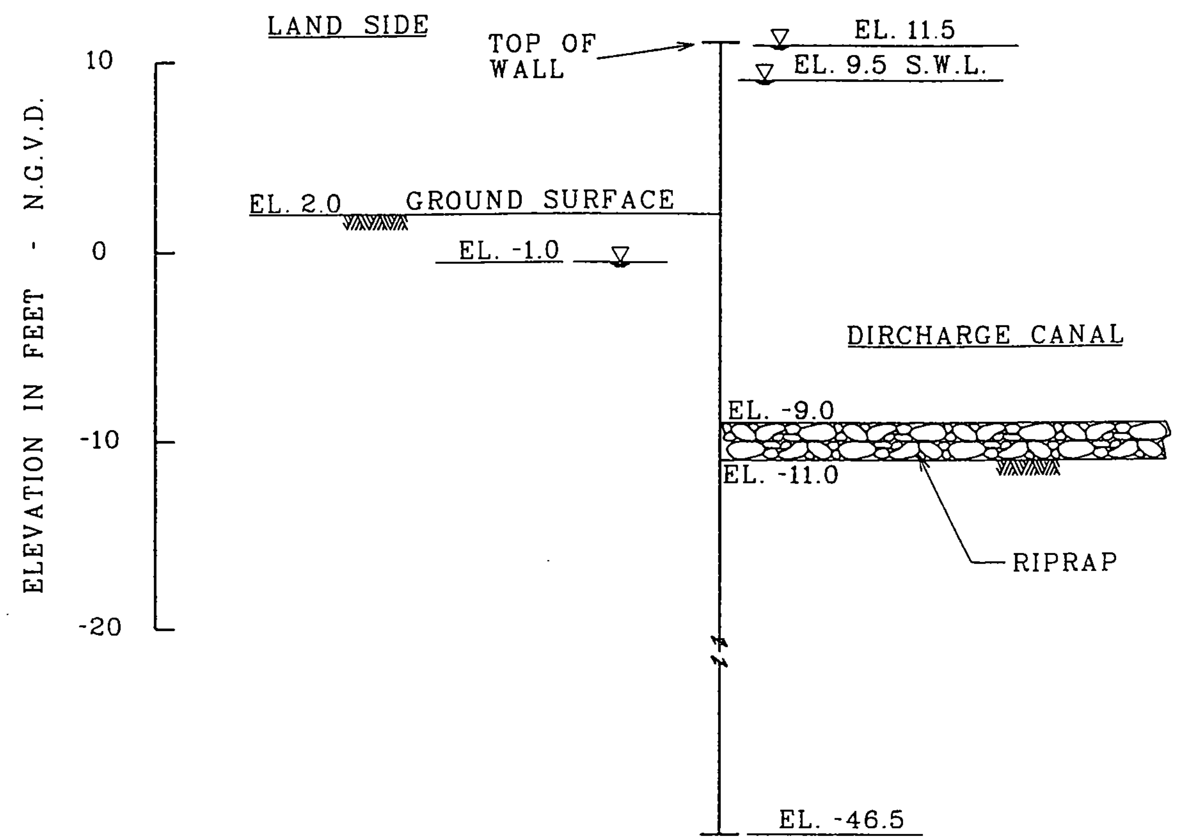
4) SEE APPENDIX FOR COMPUTER ANALYSES OF GOVERNING SHEETPILE DESIGN GIVEN ABOVE.

I-WALL DESIGN
SOUTH BANK OF DISCHARGE CANAL
EAST OF DESTREHAN AVENUE BRIDGE

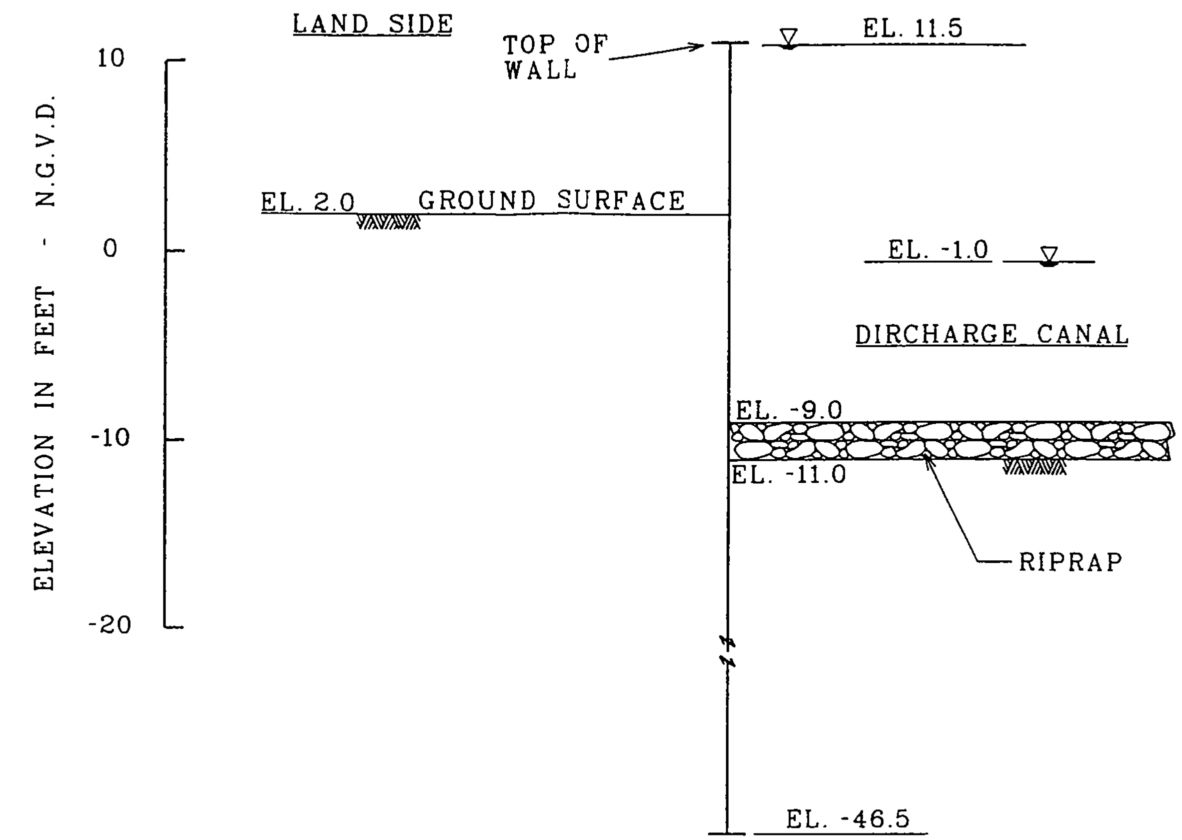
WEST JEFFERSON LEVEE DISTRICT
COUSINS PUMP STATION TO FIRST AVENUE CANAL
HARVEY, LOUISIANA

EUSTIS ENGINEERING COMPANY, INC.

CASE-1, ANALYSIS DURING FLOOD



CASE-2, ANALYSIS TOWARD DISCHARGE CANAL AT LOW WATER



CASE-1 DESIGN SUMMARY

FLOOD SIDE WATER ELEVATION	PROTECTED SIDE WATER ELEVATION	FACTOR OF SAFETY	MAX. MOMENT FT-KIPS	WALL BOTTOM ELEVATION	SCALED DEFLECTION LB-IN^3 AT EL. 11.5	TYPE OF ANALYSIS
11.5	-1.0	1.0	102.3	-46.5	1.72×10^{11}	"Q"
9.5	-1.0	1.5	60.8	-43.5	9.20×10^{10}	"Q"

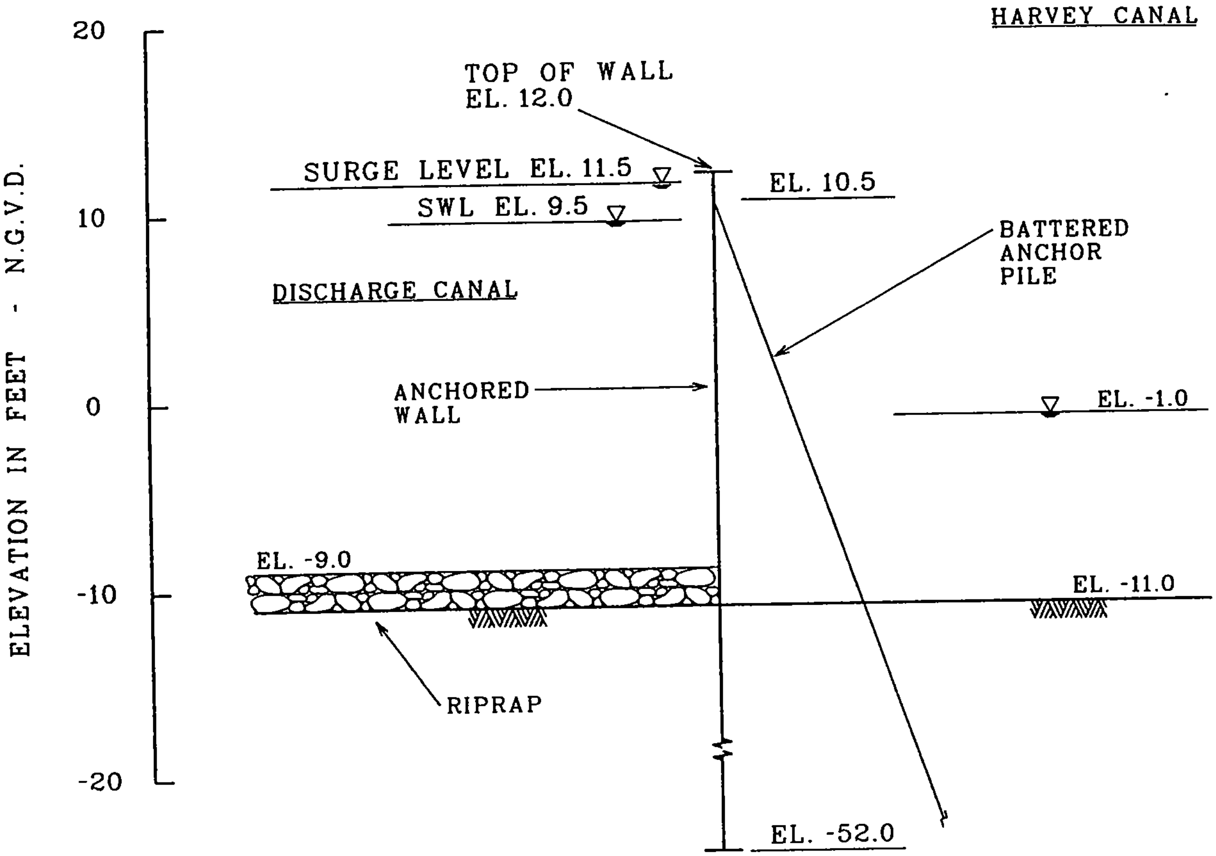
CASE-2 DESIGN SUMMARY

LAND SIDE WATER ELEVATION	CANAL WATER ELEVATION	FACTOR OF SAFETY	MAX. MOMENT FT-KIPS	WALL BOTTOM ELEVATION	SCALED DEFLECTION LB-IN^3 AT EL. 11.5	TYPE OF ANALYSIS
2.0	-1.0	1.5	26.5	-41.0	3.7×10^{10}	"Q"
-1.0	-1.0	1.2	33.8	-34.0	3.1×10^{10}	"S"

NOTE :
1) CASE-1 ANALYSIS GOVERNS DESIGN.
2) DIVIDE SCALED DEFLECTION BY MODULUS OF ELASTICITY IN PSI TIMES PILE MOMENT OF INERTIA IN INCHES TO 4th POWER TO OBTAIN DEFLECTION IN INCHES.
3) SOIL PARAMETERS ARE TAKEN FROM FIGURE 8 OF OCTOBER 1997 REPORT.
4) USING THE HARR METHOD OF ANALYSIS, THE FACTOR OF SAFETY AGAINST A PIPING FAILURE IS 5 OR MORE.
5) SEE COMPUTER ANALYSIS OUTPUT FOR GOVERNING CASE IN APPENDIX.

I-WALL DESIGN
ENTRY AND EXIT TO DISCHARGE CHANNEL FLUME

WEST JEFFERSON LEVEE DISTRICT
COUSINS PUMP STATION TO FIRST AVENUE CANAL
HARVEY, LOUISIANA



DESIGN SUMMARY						
FACTOR OF SAFETY	MAXIMUM MOMENT FT-KIPS	WALL BOTTOM ELEVATION NGVD	MAXIMUM SCALED DEFLECTION LB-IN^3 x10^{10}	HORIZONTAL ANCHOR FORCE KIPS/FT OF WALL	FLOOD SIDE WATER ELEVATION NGVD	PROTECTED SIDE WATER ELEVATION NGVD
1.5	127.2	-52.0	7.45 @ EL. -17.0	9.6	+9.5	-1.0
1.0	123.0	-42.0	5.2 @ EL. -13.0	10.6	+11.5	-1.0

1) ANCHOR LOADS AND MAXIMUM MOMENTS SHOULD BE CONSIDERED UNFACTORED. THE STRUCTURAL ENGINEER SHOULD USE A SUITABLE FACTOR OF SAFETY WHEN SIZING THE COMPONENTS.

2) DIVIDE SCALED DEFLECTION BY MODULUS OF ELASTICITY IN PSI TIMES PILE MOMENT OF INERTIA IN INCHES TO THE 4TH POWER TO OBTAIN DEFLECTION IN INCHES.

3) SOIL PARAMETERS ARE TAKEN FROM B-3 OF EUSTIS ENGINEERING COMPANY, INC. REPORT DATED OCTOBER 7 1997.

4) USING THE HARR METHOD OF ANALYSIS, THE FACTOR OF SAFETY AGAINST PIPING IS LEAST 7 OR MORE.

5) SEE COMPUTER OUTPUT ANALYSIS IN APPENDIX.

ANCHOR SHEETPILE DIVERSION WALL

WEST JEFFERSON LEVEE DISTRICT
COUSINS PUMP STATION TO FIRST AVENUE CANAL
HARVEY, LOUISIANA

ENCLOSURE 9

EUSTIS ENGINEERING COMPANY, INC.

WEST JEFFERSON LEVEE DISTRICT
COUSINS PUMP STATION TO FIRST AVENUE CANAL
HARVEY, LOUISIANA

ALLOWABLE VERTICAL UPLIFT CAPACITY
DIVERSION WALL SHEETPILES

WALL SECTION	SHEETPILE TIP EMBEDMENT ELEVATION (NGVD)	ESTIMATED ALLOWABLE UPLIFT CAPACITY IN TONS/FT OF WELL FACTOR OF SAFETY ≈ 2
PA 36-18	-52	6.5
	-62	8.5
	-73	14
	-78	17
	-86	24

NOTES:

1) Used Boring 3 soil parameters from Eustis Engineering's report dated 7 October 1997.

2) Mudline is assumed to be at el -11.

WEST JEFFERSON LEVEE DISTRICT
COUSINS PUMP STATION TO FIRST AVENUE CANAL
HARVEY, LOUISIANA

ALLOWABLE PILE LOAD CAPACITIES
ANCHOR PILES FOR DIVERSION WALL

PILE DESCRIPTION	PILE TIP EMBEDMENT ELEVATION (NGVD)	ESTIMATED ALLOWABLE SINGLE PILE COMPRESSION LOAD CAPACITY IN TONS FACTOR OF SAFETY ≈ 2
14-In. Square, Precast Prestressed Concrete	-62 -73 -78 -83	19* 37* 54* 66*
16-In. Square, Precast Prestressed Concrete	-62 -73 -78 -83	22* 43* 64* 79*

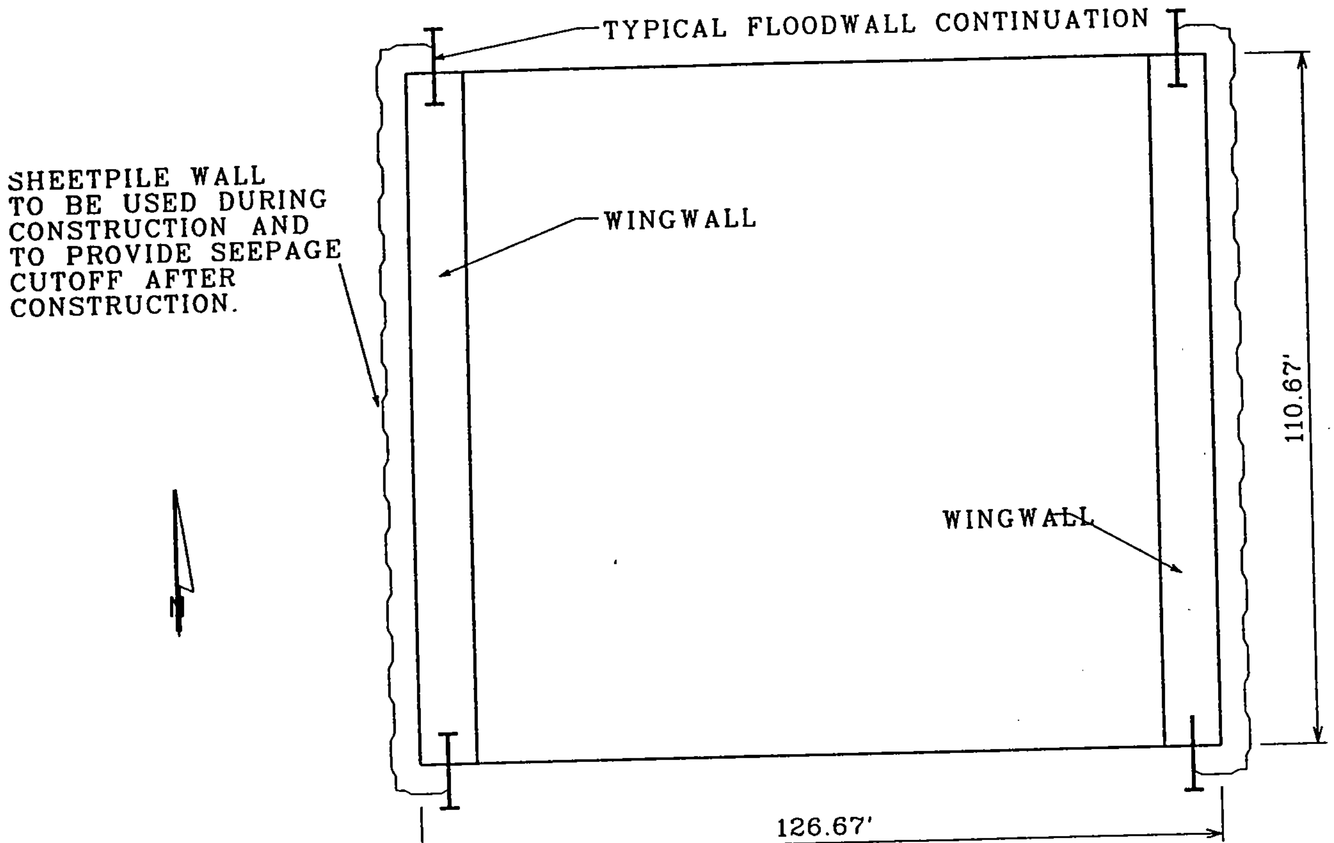
NOTES:

1) Used Boring 3 soil parameters from Eustis Engineering's report dated 7 October 1997.

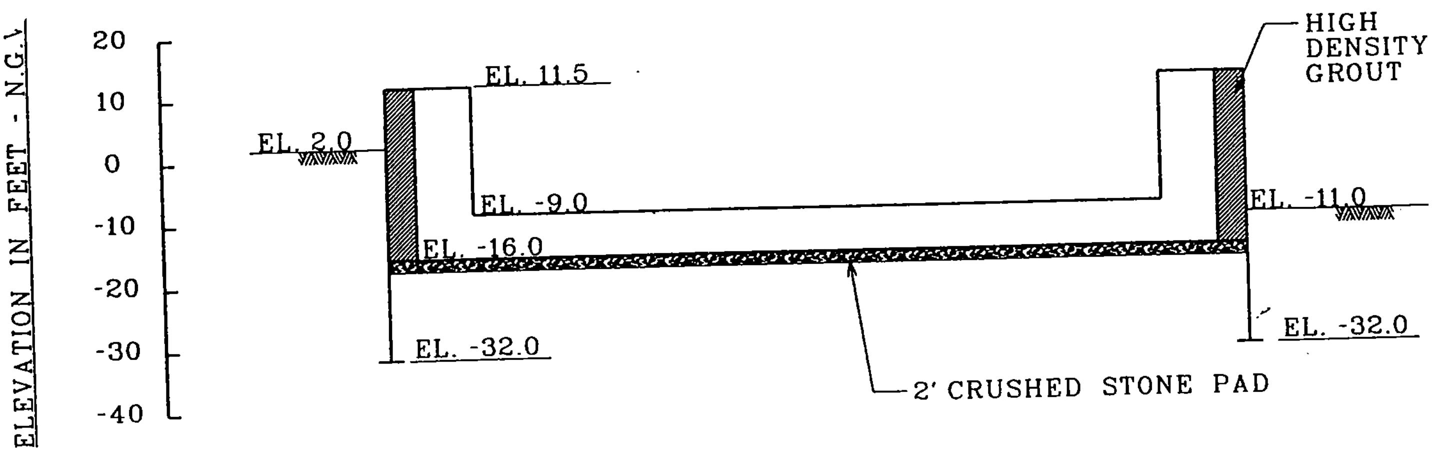
2) Mudline is assumed to be at el -11.

3) Axial capacity above el -35 has been ignored.

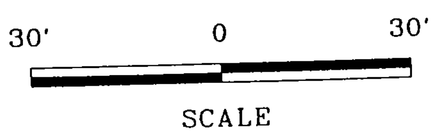
4) The above allowable pile capacities are for vertical piles. Axial and horizontal resistance of batter piles can be determined following Figure 25 of Eustis Engineering's 7 October 1997 report.



PLAN VIEW



ELEVATION VIEW



DISCHARGE CHANNEL FLUME BARGE

WEST JEFFERSON LEVEE DISTRICT
COUSINS PUMP STATION TO FIRST AVENUE CANAL
HARVEY, LOUISIANA

ENCLOSURE 12

EUSTIS ENGINEERING COMPANY, INC.

APPENDIX

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 29-JAN-1998 TIME: 8.20.51

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¤ INPUT DATA ¤
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Reference Enclosure 1

I.--HEADING:
'COUSINS PUMP STA, EE14149
'NORTH I WALL BANK

II.--CONTROL
CANTILEVER WALL DESIGN

LEVEL 1 FACTOR OF SAFETY FOR ACTIVE PRESSURES = 1.00
LEVEL 1 FACTOR OF SAFETY FOR PASSIVE PRESSURES = 1.00

III.--WALL DATA
ELEVATION AT TOP OF WALL = 11.50 (FT)

IV.--SURFACE POINT DATA

IV.A--RIGHTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
.00	2.00
10.00	2.00
43.00	-9.00
80.00	-9.00

IV.B-- LEFTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
.00	2.00
80.00	2.00

V.--SOIL LAYER DATA

V.A.--RIGHTSIDE LAYER DATA
LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURES = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURES = DEFAULT

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH-ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH-ESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.
95.00	95.00	.00	260.0	.00	65.0	-6.00	.00	DEF	DEF

90.00	90.00	.00	235.0	.00	59.0	-10.00	.00	DEF	DEF
90.00	90.00	.00	220.0	.00	55.0	-12.00	.00	DEF	DEF
75.00	75.00	.00	220.0	.00	55.0	-14.00	.00	DEF	DEF
.00	95.00	.00	220.0	.00	55.0	-18.00	.00	DEF	DEF
103.00	103.00	.00	220.0	.00	55.0	-23.00	.00	DEF	DEF
107.00	107.00	.00	310.0	.00	78.0	-36.00	.00	DEF	DEF
102.00	102.00	.00	400.0	.00	100.0	-42.00	.00	DEF	DEF
97.50	97.50	.00	400.0	.00	100.0			DEF	DEF

V.B.-- LEFTSIDE LAYER DATA

LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURES = DEFAULT

LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURES = DEFAULT

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH-ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH-ESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.
95.00	95.00	.00	260.0	.00	65.0	-6.00	.00	DEF	DEF
90.00	90.00	.00	235.0	.00	59.0	-10.00	.00	DEF	DEF
90.00	90.00	.00	220.0	.00	55.0	-12.00	.00	DEF	DEF
75.00	75.00	.00	220.0	.00	55.0	-14.00	.00	DEF	DEF
95.00	95.00	.00	220.0	.00	55.0	-18.00	.00	DEF	DEF
103.00	103.00	.00	220.0	.00	55.0	-23.00	.00	DEF	DEF
107.00	107.00	.00	310.0	.00	78.0	-36.00	.00	DEF	DEF
102.00	102.00	.00	400.0	.00	100.0	-42.00	.00	DEF	DEF
97.50	97.50	.00	400.0	.00	100.0			DEF	DEF

VI.--WATER DATA

UNIT WEIGHT = 62.40 (PCF)
RIGHTSIDE ELEVATION = 11.50 (FT)
LEFTSIDE ELEVATION = -1.00 (FT)
NO SEEPAGE

VII.--SURFACE LOADS
NONE

VIII.--HORIZONTAL LOADS
NONE

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¤ SOIL PRESSURES FOR ¤
¤ CANTILEVER WALL DESIGN ¤
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I.--HEADING

'COUSINS PUMP STA, EE14149
'NORTH I WALL BANK

II.--SOIL PRESSURES

RIGHTSIDE SOIL PRESSURES DETERMINED BY SWEEP SEARCH WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY SWEEP SEARCH WEDGE METHOD.

	<-LEFTSIDE PRESSURES->		<---NET PRESSURES----> (SOIL PLUS WATER)		<RIGHTSIDE PRESSURES->	
ELEV. (FT)	PASSIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)
11.50	.00	.00	.000	.000	.00	.00
10.50	.00	.00	62.400	62.400	.00	.00
9.50	.00	.00	124.800	124.800	.00	.00
8.50	.00	.00	187.200	187.200	.00	.00
7.50	.00	.00	249.600	249.600	.00	.00
6.50	.00	.00	312.000	312.000	.00	.00
[illegible]50	.00	.00	374.400	374.400	.00	.00
[illegible]50	.00	.00	436.800	436.800	.00	.00
3.50	.00	.00	499.200	499.200	.00	.00
2.50	.00	.00	561.600	561.600	.00	.00
2.00+	.00	.00	592.800	592.800	.00	.00
2.00-	520.00	.00	72.800	1112.800	.00	520.00
1.53	621.95	.00	.000	1214.752	.00	592.80
1.52	625.53	.00	-2.557	1218.333	.00	595.36
1.50	629.11	.00	-5.114	1221.914	.00	597.91
1.00	676.61	.00	-21.414	1269.414	.00	614.21
.50	724.11	.00	-37.714	1316.914	.00	630.51
-.50	819.11	.00	-70.314	1411.914	.00	663.11
-1.00	858.81	.00	-78.814	1459.414	.00	679.41
-1.50	882.91	.00	-102.914	1475.714	.00	695.71
-2.50	915.51	.00	-135.514	1508.314	.00	728.31
-3.50	948.11	.00	-168.114	1540.914	.00	760.91
-4.50	980.71	.00	-200.714	1573.514	.00	793.51
-5.50	1013.31	.00	-233.314	1606.114	.00	826.11
-6.00	1003.74	.00	-223.743	1428.047	.00	648.05
-6.50	991.18	.00	-211.184	1290.260	.00	510.26
-7.50	1015.31	.00	-235.307	1392.606	.00	612.61
-8.50	1042.91	.00	-262.907	1402.740	.00	622.74
-9.50	1070.51	.00	-290.507	1412.676	.00	632.68
-10.00	1069.16	.00	-289.159	1400.456	.00	620.46
-10.50	1066.65	.00	-286.653	1384.854	.00	604.85
-11.50	1091.93	.00	-311.935	1389.842	.00	609.84
-[illegible]0	1103.86	.00	-323.860	1388.343	.00	608.34
[illegible].50	1112.03	.00	-332.035	1381.998	.00	602.00
[illegible]3.50	1124.63	.00	-344.635	1369.904	.00	589.90
-14.00	1133.43	.00	-353.435	1364.612	.00	584.61
-14.50	1147.23	58.27	-367.235	1303.258	.00	581.53

-15.50	1179.83	192.22	-399.835	1169.446	.00	581.67
-16.50	1212.43	225.93	-432.435	1167.831	.00	613.76
50	1245.03	258.53	-465.035	1171.311	.00	649.84
00	1262.33	275.83	-482.335	1172.276	.00	668.11
-18.50	1281.63	295.13	-501.635	1169.489	.00	684.62
-19.50	1322.23	336.58	-542.235	1145.598	.00	702.17
-20.50	1362.83	378.29	-582.835	1130.572	.00	728.87
-21.50	1403.43	419.17	-569.272	1144.440	54.16	783.60
-22.50	1444.03	459.77	-455.820	1130.743	208.21	810.51
-23.00	1555.72	389.68	-597.366	1347.453	178.35	957.13
-23.50	1675.07	313.93	-793.683	1612.736	101.39	1146.67
-24.50	1733.00	345.20	-830.347	1627.802	122.65	1193.00
-25.50	1777.60	389.80	-837.391	1625.517	160.21	1235.32
-26.50	1822.20	434.40	-843.281	1648.343	198.92	1302.75
-27.50	1866.80	479.00	-855.087	1620.784	231.71	1319.79
-28.50	1911.40	523.60	-866.678	1632.927	264.72	1376.53

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 29-JAN-1998 TIME: 8.21.30

SUMMARY OF RESULTS FOR
CANTILEVER WALL DESIGN

I.--HEADING

'COUSINS PUMP STA, EE14149
'NORTH I WALL BANK

II.--SUMMARY

RIGHTSIDE SOIL PRESSURES DETERMINED BY SWEEP SEARCH WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY SWEEP SEARCH WEDGE METHOD.

```
WALL BOTTOM ELEV. (FT)       :      -28.15
     PENETRATION (FT)        :       30.15

MAX. BEND. MOMENT (LB-FT)    :      36133.
     AT ELEVATION (FT)       :      -12.86

MAX. SCALED DEFL. (LB-IN3)   :  2.9066E+10
     AT ELEVATION (FT)       :       11.50
```

(NOTE: DIVIDE SCALED DEFLECTION BY MODULUS OF

ELASTICITY IN PSI TIMES PILE MOMENT OF INERTIA
IN IN**4 TO OBTAIN DEFLECTION IN INCHES.)

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 29-JAN-1998 TIME: 8.21.30

COMPLETE RESULTS FOR
CANTILEVER WALL DESIGN

I.--HEADING

'COUSINS PUMP STA, EE14149
'NORTH I WALL BANK

II.--RESULTS

ELEVATION (FT)	BENDING MOMENT (LB-FT)	SHEAR (LB)	SCALED DEFLECTION (LB-IN3)	NET PRESSURE (PSF)
11.50	0.	0.	2.9066E+10	.00
10.50	10.	31.	2.7796E+10	62.40
9.50	83.	125.	2.6527E+10	124.80
8.50	281.	281.	2.5258E+10	187.20
7.50	666.	499.	2.3989E+10	249.60
6.50	1300.	780.	2.2721E+10	312.00
5.50	2246.	1123.	2.1456E+10	374.40
4.50	3567.	1529.	2.0194E+10	436.80
3.50	5325.	1997.	1.8939E+10	499.20
2.50	7582.	2527.	1.7693E+10	561.60
2.00	8917.	2816.	1.7075E+10	592.80
2.00	8917.	2816.	1.7075E+10	72.80
1.53	10237.	2833.	1.6501E+10	.00
1.52	10284.	2833.	1.6480E+10	-2.56
1.50	10330.	2833.	1.6460E+10	-5.11
1.00	11745.	2826.	1.5850E+10	-21.41
.50	13155.	2811.	1.5245E+10	-37.71
-.50	15942.	2757.	1.4053E+10	-70.31
-1.00	17312.	2720.	1.3467E+10	-78.81
-1.50	18661.	2675.	1.2889E+10	-102.91
-2.50	21279.	2555.	1.1756E+10	-135.51
-3.50	23761.	2404.	1.0661E+10	-168.11
-4.50	26075.	2219.	9.6060E+09	-200.71
-5.50	28188.	2002.	8.5964E+09	-233.31
-6.00	29160.	1888.	8.1097E+09	-223.74
-6.50	30077.	1779.	7.6355E+09	-211.18

-7.50	31746.	1556.	6.7266E+09	-235.31
-8.50	33180.	1307.	5.8724E+09	-262.91
-9.50	34351.	1030.	5.0756E+09	-290.51
-10.00	34830.	885.	4.6993E+09	-289.16
-10.50	35236.	741.	4.3380E+09	-286.65
-11.50	35830.	442.	3.6613E+09	-311.93
-12.00	36011.	283.	3.3462E+09	-323.86
-12.50	36112.	119.	3.0465E+09	-332.03
-13.50	36063.	-219.	2.4941E+09	-344.63
-14.00	35910.	-394.	2.2412E+09	-353.43
-14.50	35668.	-574.	2.0039E+09	-367.23
-15.50	34905.	-958.	1.5752E+09	-399.83
-16.50	33742.	-1374.	1.2069E+09	-432.43
-17.50	32147.	-1822.	8.9678E+08	-465.03
-18.00	31176.	-2059.	7.6273E+08	-482.33
-18.50	30086.	-2305.	6.4215E+08	-501.63
-19.50	27523.	-2827.	4.3943E+08	-542.23
-20.50	24418.	-3390.	2.8420E+08	-582.83
-21.08	22354.	-3726.	2.1384E+08	-574.97
-21.50	20743.	-3940.	1.7107E+08	-444.09
-22.50	16633.	-4228.	9.3731E+07	-132.45
-23.00	14509.	-4255.	6.6287E+07	23.37
-23.50	12391.	-4204.	4.5111E+07	179.19
-24.50	8328.	-3869.	1.7927E+07	490.83
-25.50	4756.	-3223.	5.2047E+06	802.47
-26.50	1986.	-2264.	8.1620E+05	1114.11
-27.50	331.	-995.	2.0492E+04	1425.74
-28.15	0.	0.	0.0000E+00	1628.69

(NOTE: DIVIDE SCALED DEFLECTION BY MODULUS OF ELASTICITY IN PSI TIMES PILE MOMENT OF INERTIA IN IN**4 TO OBTAIN DEFLECTION IN INCHES.)

III.--SOIL PRESSURES

ELEVATION (FT)	< LEFTSIDE PRESSURE (PSF)> PASSIVE	ACTIVE	<RIGHTSIDE PRESSURE (PSF)> ACTIVE	PASSIVE
11.50	0.	0.	0.	0.
10.50	0.	0.	0.	0.
9.50	0.	0.	0.	0.
8.50	0.	0.	0.	0.
7.50	0.	0.	0.	0.
6.50	0.	0.	0.	0.
5.50	0.	0.	0.	0.
4.50	0.	0.	0.	0.
3.50	0.	0.	0.	0.
2.50	0.	0.	0.	0.
2.00+	0.	0.	0.	0.
2.00-	520.	0.	0.	520.
1.53	622.	0.	0.	593.
1.52	626.	0.	0.	595.
1.50	629.	0.	0.	598.
1.00	677.	0.	0.	614.
.50	724.	0.	0.	631.
-.50	819.	0.	0.	663.
-1.00	859.	0.	0.	679.
-1.50	883.	0.	0.	696.
-2.50	916.	0.	0.	728.

-3.50	948.	0.	0.	761.
-4.50	981.	0.	0.	794.
-5.50	1013.	0.	0.	826.
-6.00	1004.	0.	0.	648.
-6.50	991.	0.	0.	510.
-7.50	1015.	0.	0.	613.
-8.50	1043.	0.	0.	623.
-9.50	1071.	0.	0.	633.
-10.00	1069.	0.	0.	620.
-10.50	1067.	0.	0.	605.
-11.50	1092.	0.	0.	610.
-12.00	1104.	0.	0.	608.
-12.50	1112.	0.	0.	602.
-13.50	1125.	0.	0.	590.
-14.00	1133.	0.	0.	585.
-14.50	1147.	58.	0.	582.
-15.50	1180.	192.	0.	582.
-16.50	1212.	226.	0.	614.
-17.50	1245.	259.	0.	650.
-18.00	1262.	276.	0.	668.
-18.50	1282.	295.	0.	685.
-19.50	1322.	337.	0.	702.
-20.50	1363.	378.	0.	729.
-21.08	1386.	402.	31.	761.
-21.50	1403.	419.	54.	784.
-22.50	1444.	460.	208.	811.
-23.00	1556.	390.	178.	957.
-23.50	1675.	314.	101.	1147.
-24.50	1733.	345.	123.	1193.
-25.50	1778.	390.	160.	1235.
-26.50	1822.	434.	199.	1303.
-27.50	1867.	479.	232.	1320.
-28.15	1911.	524.	265.	1377.
-29.50	1956.	568.	303.	1415.

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 29-JAN-1998 TIME: 8.42.37

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¤ INPUT DATA ¤
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Reference Enclosure 2

I.--HEADING:
'COUSINS PUMP STA,EE14149
'I WALL EAST OF DESTREHAN AVE

II.--CONTROL
CANTILEVER WALL DESIGN

LEVEL 1 FACTOR OF SAFETY FOR ACTIVE PRESSURES = 1.00
LEVEL 1 FACTOR OF SAFETY FOR PASSIVE PRESSURES = 1.00

III.--WALL DATA
ELEVATION AT TOP OF WALL = 11.50 (FT)

IV.--SURFACE POINT DATA

IV.A--RIGHTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
.00	2.00
33.00	-9.00
80.00	-9.00

IV.B-- LEFTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
.00	2.00
80.00	2.00

V.--SOIL LAYER DATA

V.A.--RIGHTSIDE LAYER DATA
LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURES = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURES = DEFAULT

AT. GHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH-ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH-ESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.
118.00	118.00	23.00	.0	6.00	.0	-2.00	.00	DEF	DEF
95.00	95.00	.00	260.0	.00	65.0	-6.00	.00	DEF	DEF

90.00	90.00	.00	235.0	.00	59.0	-10.00	.00	DEF	DEF
69.00	69.00	.00	150.0	.00	38.0	-16.50	.00	DEF	DEF
[illegible]7.50	117.50	15.00	200.0	.00	50.0	-22.00	.00	DEF	DEF
[illegible].00	116.00	.00	200.0	.00	50.0	-26.50	.00	DEF	DEF
122.50	122.50	30.00	.0	8.00	.0			DEF	DEF

V.B.-- LEFTSIDE LAYER DATA

LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURES = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURES = DEFAULT

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH-ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH-ESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.
118.00	118.00	23.00	.0	6.00	.0	-2.00	.00	DEF	DEF
95.00	95.00	.00	260.0	.00	65.0	-6.00	.00	DEF	DEF
90.00	90.00	.00	235.0	.00	59.0	-10.00	.00	DEF	DEF
69.00	69.00	.00	150.0	.00	38.0	-16.50	.00	DEF	DEF
117.50	117.50	15.00	200.0	.00	50.0	-22.00	.00	DEF	DEF
116.00	116.00	.00	200.0	.00	50.0	-26.50	.00	DEF	DEF
122.50	122.50	30.00	.0	8.00	.0			DEF	DEF

VI.--WATER DATA

UNIT WEIGHT = 62.40 (PCF)
RIGHTSIDE ELEVATION = 11.50 (FT)
LEFTSIDE ELEVATION = -1.00 (FT)
NO SEEPAGE

VII.--SURFACE LOADS
NONE

VIII.--HORIZONTAL LOADS
NONE

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 29-JAN-1998 TIME: 8.43.01

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¤ SOIL PRESSURES FOR ¤
¤ CANTILEVER WALL DESIGN ¤
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I.--HEADING

'COUSINS PUMP STA,EE14149
'I WALL EAST OF DESTREHAN AVE

II.--SOIL PRESSURES

RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

	<-LEFTSIDE PRESSURES->		<---NET PRESSURES----> (SOIL PLUS WATER)		<RIGHTSIDE PRESSURES->	
ELEV. (FT)	PASSIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)
11.50	.00	.00	.000	.000	.00	.00
10.50	.00	.00	62.400	62.400	.00	.00
9.50	.00	.00	124.800	124.800	.00	.00
8.50	.00	.00	187.200	187.200	.00	.00
7.50	.00	.00	249.600	249.600	.00	.00
6.50	.00	.00	312.000	312.000	.00	.00
5.50	.00	.00	374.400	374.400	.00	.00
4.50	.00	.00	436.800	436.800	.00	.00
3.50	.00	.00	499.200	499.200	.00	.00
2.50	.00	.00	561.600	561.600	.00	.00
2.00	.00	.00	592.800	592.800	.00	.00
50	160.10	24.17	473.231	650.003	9.33	50.17
00	320.19	48.33	353.662	707.207	18.66	100.34
.50	480.47	72.53	233.917	764.384	27.99	150.51
-.48	793.98	119.85	.000	876.858	46.31	249.03
-.49	796.86	120.28	-2.153	877.893	46.47	249.94
-.50	799.75	120.72	-4.307	878.928	46.64	250.85
-1.00	938.83	141.71	-95.901	937.008	62.93	298.72
-1.50	1060.79	169.42	-265.688	972.427	15.10	361.85
-1.57+	1047.03	159.57	-267.027	1064.158	.00	504.92
-1.57-	1047.03	159.57	-267.027	1064.158	.00	382.52
-2.00	886.68	3.25	-106.678	1281.676	.00	504.92
-2.01+	929.44	.00	-128.692	1289.575	.00	509.58
-2.01-	887.94	.00	-128.692	1289.575	.00	509.58
-2.50	929.44	.00	-149.440	1442.052	.00	662.05
-3.50	1079.21	.00	-299.210	1549.993	.00	769.99
-4.50	1098.31	.00	-318.308	1558.418	.00	778.42
-5.50	1116.76	.00	-336.759	1566.420	.00	786.42
-6.00	1110.89	.00	-330.889	1555.524	.00	775.52
-6.21+	1104.24	.00	-326.181	1550.710	.00	770.71
-6.21-	1108.12	.00	-326.181	1550.710	.00	770.71
-6.50	1104.24	4.09	-324.240	1539.864	.00	763.96
-7.50	1120.49	34.54	-340.486	1515.980	.00	770.52
-8.50	1150.37	71.97	-370.365	1498.880	.00	790.85
-9.50	1143.34	133.80	-363.337	1420.575	.00	774.38
-10.00	1086.59	207.66	-306.590	1285.274	.00	712.93
-10.50	1024.86	277.11	-244.861	1149.415	.00	646.53
- [illegible] 50	997.68	316.41	-217.676	1073.610	.00	610.02
-[illegible].50	1006.66	321.57	-226.659	1072.297	.00	613.86
-13.50	1013.21	328.90	-233.211	1029.022	.00	577.92
-14.50	993.90	331.31	-208.069	941.593	5.83	492.90
-15.50	1193.92	385.50	-357.049	984.458	56.87	589.96

-16.50	1700.07	330.62	-864.129	1360.974	55.94	911.60
-17.05+	1858.02	158.96	-1078.025	1656.677	.00	1072.12
[illegible]05-	1858.02	158.96	-1078.025	1656.677	.00	999.14
-1[illegible]50	1881.92	80.34	-1101.921	1771.784	.00	1072.12
-18.50	1975.25	127.88	-1195.246	1763.456	.00	1111.34
-19.50	2068.96	159.85	-1288.960	1804.307	.00	1184.15
-20.50	2197.00	200.41	-1417.000	1862.007	.00	1282.42
-21.50	1758.97	82.63	-978.969	1619.958	.00	922.59
-22.00	1304.71	96.93	-524.706	1492.215	.00	809.15
-22.50	1250.31	329.78	-470.315	1286.170	.00	835.95
-23.50	1544.86	635.17	-683.819	1034.383	81.04	889.55
-24.50	1506.01	661.21	-466.213	1061.936	259.79	943.15
-25.50	2198.31	829.18	-893.820	1332.939	524.49	1382.12
-26.50	3691.06	891.04	-2261.059	2321.878	650.00	2432.92
-27.50	4436.73	587.27	-3219.189	3007.922	437.55	2815.19
-28.50	4554.49	407.03	-3473.583	3190.537	300.90	2817.57

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 29-JAN-1998 TIME: 8.43.18

SUMMARY OF RESULTS FOR
CANTILEVER WALL DESIGN

I.--HEADING

'COUSINS PUMP STA,EE14149
'I WALL EAST OF DESTREHAN AVE

II.--SUMMARY

RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

WALL BOTTOM ELEV. (FT) : -26.72
PENETRATION (FT) : 28.72

MAX. BEND. MOMENT (LB-FT) : 41575.
AT ELEVATION (FT) : -13.64

MAX. SCALED DEFL. (LB-IN3) : 3.2351E+10
AT ELEVATION (FT) : 11.50

(NOTE: DIVIDE SCALED DEFLECTION BY MODULUS OF

ELASTICITY IN PSI TIMES PILE MOMENT OF INERTIA
IN IN**4 TO OBTAIN DEFLECTION IN INCHES.)

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 29-JAN-1998 TIME: 8.43.18

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¤ COMPLETE RESULTS FOR ¤
¤ CANTILEVER WALL DESIGN ¤
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I.--HEADING

'COUSINS PUMP STA,EE14149
'I WALL EAST OF DESTREHAN AVE

II.--RESULTS

ELEVATION (FT)	BENDING MOMENT (LB-FT)	SHEAR (LB)	SCALED DEFLECTION (LB-IN3)	NET PRESSURE (PSF)
11.50	0.	0.	3.2351E+10	.00
10.50	10.	31.	3.0929E+10	62.40
9.50	83.	125.	2.9506E+10	124.80
8.50	281.	281.	2.8084E+10	187.20
7.50	666.	499.	2.6662E+10	249.60
6.50	1300.	780.	2.5242E+10	312.00
5.50	2246.	1123.	2.3824E+10	374.40
4.50	3567.	1529.	2.2409E+10	436.80
3.50	5325.	1997.	2.1001E+10	499.20
2.50	7582.	2527.	1.9602E+10	561.60
2.00	8917.	2816.	1.8908E+10	592.80
1.50	10394.	3082.	1.8217E+10	473.23
1.00	11989.	3289.	1.7530E+10	353.66
.50	13673.	3436.	1.6849E+10	233.92
-.48	17122.	3551.	1.5529E+10	.00
-.49	17154.	3551.	1.5517E+10	-2.15
-.50	17186.	3551.	1.5505E+10	-4.31
-1.00	18957.	3526.	1.4844E+10	-95.90
-1.50	20701.	3435.	1.4191E+10	-265.69
-1.57	20948.	3416.	1.4097E+10	-267.03
-2.00	22390.	3336.	1.3547E+10	-106.68
-2.01	22439.	3334.	1.3528E+10	-128.69
-2.50	24041.	3267.	1.2912E+10	-149.44
-3.50	27208.	3043.	1.1675E+10	-299.21
-4.50	30098.	2734.	1.0485E+10	-318.31
-5.50	32670.	2406.	9.3472E+09	-336.76

-6.00	33831.	2239.	8.7991E+09	-330.89
-6.21	34290.	2171.	8.5753E+09	-326.18
-6.50	34910.	2076.	8.2656E+09	-324.24
-7.50	36821.	1744.	7.2442E+09	-340.49
-8.50	38389.	1388.	6.2864E+09	-370.37
-9.50	39593.	1021.	5.3949E+09	-363.34
-10.00	40061.	854.	4.9747E+09	-306.59
-10.50	40452.	716.	4.5718E+09	-244.86
-11.50	41050.	485.	3.8185E+09	-217.68
-12.50	41425.	263.	3.1361E+09	-226.66
-13.50	41573.	33.	2.5253E+09	-233.21
-14.50	41493.	-188.	1.9863E+09	-208.07
-15.50	41177.	-471.	1.5189E+09	-357.05
-16.50	40443.	-1081.	1.1226E+09	-864.13
-17.05	39714.	-1611.	9.3608E+08	-1078.02
-17.50	38870.	-2106.	7.9615E+08	-1101.92
-18.50	36197.	-3255.	5.3667E+08	-1195.25
-19.40	32761.	-4372.	3.5619E+08	-1279.83
-19.50	32329.	-4494.	3.3956E+08	-1229.84
-20.50	27306.	-5467.	1.9814E+08	-716.96
-21.50	21565.	-5928.	1.0380E+08	-204.07
-22.00	18586.	-5966.	7.1236E+07	52.37
-22.50	15621.	-5876.	4.6700E+07	308.81
-23.50	9985.	-5310.	1.6635E+07	821.70
-24.50	5171.	-4232.	3.9419E+06	1334.59
-25.50	1692.	-2641.	3.7666E+05	1847.47
-26.50	60.	-537.	4.0507E+02	2360.36
-26.72	-1.	0.	0.0000E+00	2474.34

(NOTE: DIVIDE SCALED DEFLECTION BY MODULUS OF ELASTICITY IN PSI TIMES PILE MOMENT OF INERTIA IN IN**4 TO OBTAIN DEFLECTION IN INCHES.)

III.--SOIL PRESSURES

ELEVATION	< LEFTSIDE PRESSURE (PSF)>		<RIGHTSIDE PRESSURE (PSF)>	
(FT)	PASSIVE	ACTIVE	ACTIVE	PASSIVE
11.50	0.	0.	0.	0.
10.50	0.	0.	0.	0.
9.50	0.	0.	0.	0.
8.50	0.	0.	0.	0.
7.50	0.	0.	0.	0.
6.50	0.	0.	0.	0.
5.50	0.	0.	0.	0.
4.50	0.	0.	0.	0.
3.50	0.	0.	0.	0.
2.50	0.	0.	0.	0.
2.00	0.	0.	0.	0.
1.50	160.	24.	9.	50.
1.00	320.	48.	19.	100.
.50	480.	73.	28.	151.
-.48	794.	120.	46.	249.
-.49	797.	120.	46.	250.
-.50	800.	121.	47.	251.
-1.00	939.	142.	63.	299.
-1.50	1061.	169.	15.	362.
-1.57+	1047.	160.	0.	505.
-1.57-	1047.	160.	0.	383.

-2.00	887.	3.	0.	505.
-2.01+	929.	0.	0.	510.
-2.01-	888.	0.	0.	510.
-2.50	929.	0.	0.	662.
-3.50	1079.	0.	0.	770.
-4.50	1098.	0.	0.	778.
-5.50	1117.	0.	0.	786.
-6.00	1111.	0.	0.	776.
-6.21+	1104.	0.	0.	771.
-6.21-	1108.	0.	0.	771.
-6.50	1104.	4.	0.	764.
-7.50	1120.	35.	0.	771.
-8.50	1150.	72.	0.	791.
-9.50	1143.	134.	0.	774.
-10.00	1087.	208.	0.	713.
-10.50	1025.	277.	0.	647.
-11.50	998.	316.	0.	610.
-12.50	1007.	322.	0.	614.
-13.50	1013.	329.	0.	578.
-14.50	994.	331.	6.	493.
-15.50	1194.	386.	57.	590.
-16.50	1700.	331.	56.	912.
-17.05+	1858.	159.	0.	1072.
-17.05-	1858.	159.	0.	999.
-17.50	1882.	80.	0.	1072.
-18.50	1975.	128.	0.	1111.
-19.40	2060.	157.	0.	1177.
-19.50	2069.	160.	0.	1184.
-20.50	2197.	200.	0.	1282.
-21.50	1759.	83.	0.	923.
-22.00	1305.	97.	0.	809.
-22.50	1250.	330.	0.	836.
-23.50	1545.	635.	81.	890.
-24.50	1506.	661.	260.	943.
-25.50	2198.	829.	524.	1382.
-26.50	3691.	891.	650.	2433.
-26.72	4437.	587.	438.	2815.
-28.50	4554.	407.	301.	2818.

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PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 29-JAN-1998 TIME: 9.13.18

Reference Enclosure 3

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¤ INPUT DATA ¤
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I.--HEADING:
'COUSINS P STA, EE 14149
'I WALL SOUTH OF LAPALCO

II.--CONTROL
CANTILEVER WALL DESIGN

LEVEL 1 FACTOR OF SAFETY FOR ACTIVE PRESSURES = 1.00
LEVEL 1 FACTOR OF SAFETY FOR PASSIVE PRESSURES = 1.00

III.--WALL DATA
ELEVATION AT TOP OF WALL = 11.50 (FT)

IV.--SURFACE POINT DATA

IV.A--RIGHTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
.00	5.50
2.50	5.50
13.50	2.00
80.00	2.00

IV.B-- LEFTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
.00	5.50
2.50	5.50
13.50	2.00
80.00	2.00

V.--SOIL LAYER DATA

V.A.--RIGHTSIDE LAYER DATA
LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURES = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURES = DEFAULT

SAT. WGHT.	MOIST WGHT.	ANGLE OF INTERNAL FRICTION	COH-ESION	ANGLE OF WALL FRICTION	ADH-ESION	<--BOTTOM--> ELEV.	SLOPE	<-SAFETY-> <-FACTOR-> ACT.	PASS.

(PCF)	(PCF)	(DEG)	(PSF)	(DEG)	(PSF)	(FT)	(FT/FT)		
122.00	122.00	23.00	.0	.00	.0	.00	.00	DEF	DEF
[illegible].50	112.50	15.00	200.0	.00	.0	-3.00	.00	DEF	DEF
[illegible].00	87.00	.00	195.0	.00	.0	-6.00	.00	DEF	DEF
88.00	88.00	.00	235.0	.00	.0	-10.00	.00	DEF	DEF
86.00	86.00	.00	320.0	.00	.0	-18.50	.00	DEF	DEF
112.50	112.50	15.00	200.0	.00	.0	-28.50	.00	DEF	DEF
122.50	122.50	30.00	.0	.00	.0			DEF	DEF

V.B.-- LEFTSIDE LAYER DATA

LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURES = DEFAULT

LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURES = DEFAULT

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH-ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH-ESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.
122.00	122.00	23.00	.0	.00	.0	.00	.00	DEF	DEF
112.50	112.50	15.00	200.0	.00	.0	-3.00	.00	DEF	DEF
87.00	87.00	.00	195.0	.00	.0	-6.00	.00	DEF	DEF
88.00	88.00	.00	235.0	.00	.0	-10.00	.00	DEF	DEF
86.00	86.00	.00	320.0	.00	.0	-18.50	.00	DEF	DEF
112.50	112.50	15.00	200.0	.00	.0	-28.50	.00	DEF	DEF
122.50	122.50	30.00	.0	.00	.0			DEF	DEF

VI.--WATER DATA

UNIT WEIGHT = 62.40 (PCF)
RIGHTSIDE ELEVATION = 11.50 (FT)
LEFTSIDE ELEVATION = -1.00 (FT)
NO SEEPAGE

VII.--SURFACE LOADS
NONE

VIII.--HORIZONTAL LOADS
NONE

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 29-JAN-1998 TIME: 9.13.32

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¤ SOIL PRESSURES FOR ¤

¤ CANTILEVER WALL DESIGN ¤
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I.--HEADING

'COUSINS P STA, EE 14149
'I WALL SOUTH OF LAPALCO

II.--SOIL PRESSURES

RIGHTSIDE SOIL PRESSURES DETERMINED BY SWEEP SEARCH WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY SWEEP SEARCH WEDGE METHOD.

	<-LEFTSIDE PRESSURES->		<---NET PRESSURES----> (SOIL PLUS WATER)		<RIGHTSIDE PRESSURES->	
ELEV. (FT)	PASSIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)
11.50	.00	.00	.000	.000	.00	.00
10.50	.00	.00	62.400	62.400	.00	.00
9.50	.00	.00	124.800	124.800	.00	.00
8.50	.00	.00	187.200	187.200	.00	.00
7.50	.00	.00	249.600	249.600	.00	.00
6.50	.00	.00	312.000	312.000	.00	.00
5.50	.00	.00	374.400	374.400	.00	.00
4.50	269.28	53.44	193.628	514.909	26.11	131.55
3.50	467.65	106.88	83.767	620.777	52.21	228.46
2.50	612.48	160.27	27.418	700.542	78.29	299.21
2.10	674.92	180.68	.000	735.679	88.27	329.71
1.80	721.47	195.90	-20.442	761.876	95.70	352.46
1.50	768.02	211.13	-40.884	788.074	103.14	375.20
.50	927.07	258.64	-114.321	880.660	126.35	452.90
.00	1571.04	73.90	-848.154	1428.187	5.29	784.48
-.02+	1591.12	65.84	-872.139	1572.655	.00	1043.11
-.02-	1591.12	65.84	-872.139	1572.655	.00	795.92
-.50	1426.65	93.53	-677.853	1698.389	.00	1043.11
-1.00	1409.52	118.63	-629.518	1651.304	.00	989.94
-1.50	1413.74	133.99	-633.741	1645.738	.00	999.73
-2.50	1413.25	154.13	-633.247	1667.422	.00	1041.56
-3.00	883.70	388.07	-103.700	1222.258	.00	830.33
-3.06+	885.13	415.13	-105.130	1070.023	.00	606.06
-3.06-	885.13	415.13	-105.130	1070.023	.00	804.26
-3.50	896.00	422.03	-66.408	964.025	49.59	606.06
-4.50	920.60	437.28	-64.868	956.730	75.73	614.01
-5.50	945.20	450.04	-34.064	973.398	131.14	643.44
-6.00	957.50	413.00	-64.838	1079.506	112.66	712.51
-6.50	970.30	374.59	-113.081	1187.019	77.22	781.61
-7.50	1000.93	377.57	-133.946	1222.161	86.98	819.73
-8.50	1054.26	378.17	-179.364	1259.960	94.90	858.13
-9.50	1090.29	378.75	-204.500	1293.246	105.79	892.00
-10.00	1259.94	240.99	-454.414	1534.258	25.53	995.25
-10.16+	1316.75	197.92	-536.748	1646.972	.00	1101.45
-10.16-	1316.75	197.92	-536.748	1646.972	.00	1028.33
-10.50	1332.13	197.43	-552.127	1684.017	.00	1101.45
-11.50	1360.39	196.02	-580.393	1714.909	.00	1130.93
-12.50	1384.49	194.95	-604.494	1743.759	.00	1158.70
-13.50	1399.10	196.35	-619.104	1772.473	.00	1188.82

-14.50	1420.17	198.26	-640.174	1790.406	.00	1208.67
-14.78+	1426.71	198.34	-646.711	1803.819	.00	1229.80
78-	1426.71	198.34	-646.711	1803.819	.00	1214.52
.50	1443.77	198.54	-640.752	1811.253	23.02	1229.80
-16.50	1460.55	198.83	-644.823	1834.571	35.73	1253.40
-17.50	1476.51	204.69	-653.666	1852.309	42.84	1277.00
-18.50	1882.72	160.01	-1032.003	2169.039	70.72	1549.05
-19.50	2320.38	119.85	-1433.298	2512.023	107.08	1851.88
-20.50	2394.39	136.85	-1483.021	2576.277	131.37	1933.13
-21.50	2450.53	145.72	-1516.406	2640.482	154.13	2006.20
-22.50	2499.65	156.98	-1544.799	2697.993	174.85	2074.97
-23.50	2548.76	182.23	-1526.167	2741.510	242.59	2143.74
-24.50	2597.87	206.10	-1487.159	2786.411	330.71	2212.51
-25.50	2646.99	227.84	-1495.148	2833.285	371.84	2281.12

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 29-JAN-1998 TIME: 9.13.50

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¤ SUMMARY OF RESULTS FOR ¤
¤ CANTILEVER WALL DESIGN ¤
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I.--HEADING

'COUSINS P STA, EE 14149
'I WALL SOUTH OF LAPALCO

II.--SUMMARY

RIGHTSIDE SOIL PRESSURES DETERMINED BY SWEEP SEARCH WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY SWEEP SEARCH WEDGE METHOD.

WALL BOTTOM ELEV. (FT) : -13.49
PENETRATION (FT) : 18.99

MAX. BEND. MOMENT (LB-FT) : 11617.
AT ELEVATION (FT) : -1.89

MAX. SCALED DEFL. (LB-IN3) : 3.4784E+09
AT ELEVATION (FT) : 11.50

(NOTE: DIVIDE SCALED DEFLECTION BY MODULUS OF ELASTICITY IN PSI TIMES PILE MOMENT OF INERTIA IN IN**4 TO OBTAIN DEFLECTION IN INCHES.)

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 29-JAN-1998 TIME: 9.13.50

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¤ COMPLETE RESULTS FOR ¤
¤ CANTILEVER WALL DESIGN ¤
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I.--HEADING

'COUSINS P STA, EE 14149
'I WALL SOUTH OF LAPALCO

II.--RESULTS

ELEVATION (FT)	BENDING MOMENT (LB-FT)	SHEAR (LB)	SCALED DEFLECTION (LB-IN3)	NET PRESSURE (PSF)
11.50	0.	0.	3.4784E+09	.00
10.50	10.	31.	3.2371E+09	62.40
9.50	83.	125.	2.9958E+09	124.80
8.50	281.	281.	2.7547E+09	187.20
7.50	666.	499.	2.5141E+09	249.60
6.50	1300.	780.	2.2747E+09	312.00
5.50	2246.	1123.	2.0376E+09	374.40
4.50	3527.	1407.	1.8044E+09	193.63
3.50	5012.	1546.	1.5773E+09	83.77
2.50	6591.	1602.	1.3589E+09	27.42
2.10	7235.	1607.	1.2743E+09	.00
1.80	7716.	1604.	1.2125E+09	-20.44
1.50	8195.	1595.	1.1519E+09	-40.88
.50	9757.	1517.	9.5905E+08	-114.32
.00	10470.	1277.	8.6878E+08	-848.15
-.02	10498.	1258.	8.6489E+08	-872.14
-.50	11007.	887.	7.8303E+08	-677.85
-1.00	11368.	560.	7.0202E+08	-629.52
-1.50	11569.	245.	6.2592E+08	-633.74
-2.50	11497.	-389.	4.8872E+08	-633.25
-3.00	11246.	-573.	4.2758E+08	-103.70
-3.06	11212.	-579.	4.2079E+08	-105.13
-3.50	10947.	-617.	3.7131E+08	-66.41
-4.50	10297.	-683.	2.7280E+08	-64.87
-5.50	9587.	-732.	1.9207E+08	-34.06
-6.00	9215.	-757.	1.5800E+08	-64.84
-6.50	8826.	-801.	1.2791E+08	-113.08
-7.50	7965.	-925.	7.8984E+07	-133.95

-8.50	6965.	-1082.	4.3801E+07	-179.36
-9.50	5790.	-1274.	2.0629E+07	-204.50
-10.00	5117.	-1438.	1.2924E+07	-454.41
-10.16	4887.	-1516.	1.0989E+07	-536.75
-10.50	4333.	-1703.	7.4255E+06	-552.13
-10.60	4160.	-1759.	6.5584E+06	-554.96
-11.50	2451.	-1932.	1.6388E+06	169.58
-12.50	738.	-1360.	1.1153E+05	974.98
-13.49	0.	0.	0.0000E+00	1772.18

(NOTE: DIVIDE SCALED DEFLECTION BY MODULUS OF ELASTICITY IN PSI TIMES PILE MOMENT OF INERTIA IN IN**4 TO OBTAIN DEFLECTION IN INCHES.)

III.--SOIL PRESSURES

ELEVATION (FT)	< LEFTSIDE PRESSURE (PSF)> PASSIVE	ACTIVE	<RIGHTSIDE PRESSURE (PSF)> ACTIVE	PASSIVE
11.50	0.	0.	0.	0.
10.50	0.	0.	0.	0.
9.50	0.	0.	0.	0.
8.50	0.	0.	0.	0.
7.50	0.	0.	0.	0.
6.50	0.	0.	0.	0.
5.50	0.	0.	0.	0.
4.50	269.	53.	26.	132.
3.50	468.	107.	52.	228.
2.50	612.	160.	78.	299.
2.10	675.	181.	88.	330.
1.80	721.	196.	96.	352.
1.50	768.	211.	103.	375.
.50	927.	259.	126.	453.
.00	1571.	74.	5.	784.
-.02+	1591.	66.	0.	1043.
-.02-	1591.	66.	0.	796.
-.50	1427.	94.	0.	1043.
-1.00	1410.	119.	0.	990.
-1.50	1414.	134.	0.	1000.
-2.50	1413.	154.	0.	1042.
-3.00	884.	388.	0.	830.
-3.06+	885.	415.	0.	606.
-3.06-	885.	415.	0.	804.
-3.50	896.	422.	50.	606.
-4.50	921.	437.	76.	614.
-5.50	945.	450.	131.	643.
-6.00	957.	413.	113.	713.
-6.50	970.	375.	77.	782.
-7.50	1001.	378.	87.	820.
-8.50	1054.	378.	95.	858.
-9.50	1090.	379.	106.	892.
-10.00	1260.	241.	26.	995.
-10.16+	1317.	198.	0.	1101.
-10.16-	1317.	198.	0.	1028.
-10.50	1332.	197.	0.	1101.
-10.60	1335.	197.	0.	1104.
-11.50	1360.	196.	0.	1131.
-12.50	1384.	195.	0.	1159.
-13.49	1399.	196.	0.	1189.

-14.50	1420.	198.	0.	1209.

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 30-JAN-1998 TIME: 14.37.15

Reference Encl :

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¤ INPUT DATA ¤
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I.--HEADING:
'COUSINS PUMP STATION, EE 14149
'I WALL, S BANK DISCHARGE, EAST OF DESTREHAN AVE

II.--CONTROL
CANTILEVER WALL DESIGN

LEVEL 1 FACTOR OF SAFETY FOR ACTIVE PRESSURES = 1.00
LEVEL 1 FACTOR OF SAFETY FOR PASSIVE PRESSURES = 1.00

III.--WALL DATA
ELEVATION AT TOP OF WALL = 11.50 (FT)

IV.--SURFACE POINT DATA

IV.A--RIGHTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
.00	4.00
21.00	-2.00
35.00	-6.00
45.50	-9.00
100.00	-9.00

IV.B-- LEFTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
.00	4.00
100.00	4.00

V.--SOIL LAYER DATA

V.A.--RIGHTSIDE LAYER DATA
LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURES = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURES = DEFAULT

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH- ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH- ESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.

118.00	118.00	23.00	.0	6.00	.0	-2.00	.00	DEF	DEF
95.00	95.00	.00	260.0	.00	65.0	-6.00	.00	DEF	DEF
[illegible].00	90.00	.00	235.0	.00	59.0	-10.00	.00	DEF	DEF
[illegible].00	69.00	.00	150.0	.00	38.0	-16.50	.00	DEF	DEF
117.50	117.50	15.00	200.0	.00	50.0	-22.00	.00	DEF	DEF
116.00	116.00	.00	200.0	.00	50.0	-26.50	.00	DEF	DEF
122.50	122.50	30.00	.0	8.00	.0			DEF	DEF

V.B.-- LEFTSIDE LAYER DATA

LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURES = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURES = DEFAULT

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH-ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH-ESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.
118.00	118.00	23.00	.0	6.00	.0	-2.00	.00	DEF	DEF
95.00	95.00	.00	260.0	.00	65.0	-6.00	.00	DEF	DEF
90.00	90.00	.00	235.0	.00	59.0	-10.00	.00	DEF	DEF
69.00	69.00	.00	150.0	.00	38.0	-16.50	.00	DEF	DEF
117.50	117.50	15.00	200.0	.00	50.0	-22.00	.00	DEF	DEF
116.00	116.00	.00	200.0	.00	50.0	-26.50	.00	DEF	DEF
122.50	122.50	30.00	.0	8.00	.0			DEF	DEF

VI.--WATER DATA

UNIT WEIGHT = 62.40 (PCF)
RIGHTSIDE ELEVATION = 11.50 (FT)
LEFTSIDE ELEVATION = -1.00 (FT)
NO SEEPAGE

VII.--SURFACE LOADS
NONE

VIII.--HORIZONTAL LOADS
NONE

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 30-JAN-1998 TIME: 14.37.22

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¤ SOIL PRESSURES FOR ¤
¤ CANTILEVER WALL DESIGN ¤

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I.--HEADING

'COUSINS PUMP STATION, EE 14149
'I WALL, S BANK DISCHARGE, EAST OF DESTREHAN AVE

II.--SOIL PRESSURES

RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

	<-LEFTSIDE PRESSURES->		<---NET PRESSURES----> (SOIL PLUS WATER)		<RIGHTSIDE PRESSURES->	
ELEV. (FT)	PASSIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)
11.50	.00	.00	.000	.000	.00	.00
10.50	.00	.00	62.400	62.400	.00	.00
9.50	.00	.00	124.800	124.800	.00	.00
8.50	.00	.00	187.200	187.200	.00	.00
7.50	.00	.00	249.600	249.600	.00	.00
6.50	.00	.00	312.000	312.000	.00	.00
5.50	.00	.00	374.400	374.400	.00	.00
4.50	.00	.00	436.800	436.800	.00	.00
4.00	.00	.00	468.000	468.000	.00	.00
3.50	160.10	24.17	348.678	527.725	9.58	52.69
.00	320.19	48.33	229.357	587.449	19.15	105.38
2.50	480.29	72.50	110.035	647.174	28.73	158.07
2.04	627.93	94.78	.000	702.250	37.56	206.66
1.77	714.21	107.81	-64.304	734.437	42.72	235.06
1.50	800.49	120.83	-128.608	766.623	47.88	263.45
.50	1120.95	169.20	-367.515	886.032	67.03	368.84
-.50	1440.19	217.39	-605.203	1005.625	86.18	474.22
-1.00	1579.12	238.36	-696.876	1072.894	102.24	531.26
-1.50	1723.06	260.71	-878.875	1061.740	64.18	542.45
-1.71+	1507.60	227.20	-727.595	1122.117	.00	580.09
-1.71-	1507.60	227.20	-727.595	1122.117	.00	558.54
-2.00	1039.42	134.68	-259.423	1225.412	.00	580.09
-2.50	984.47	75.39	-204.470	1412.227	.00	707.62
-3.50	1326.90	111.17	-546.900	1516.665	.00	847.83
-4.50	1336.88	140.63	-556.876	1496.507	.00	857.14
-5.50	1356.21	180.38	-576.211	1465.530	.00	865.91
-6.00	1350.36	213.44	-570.364	1421.584	.00	855.02
-6.50	1343.62	245.58	-563.618	1377.788	.00	843.37
-7.50	1359.89	281.92	-579.887	1348.140	.00	850.06
-8.50	1389.86	306.38	-609.861	1344.284	.00	870.66
-9.50	1382.49	364.94	-602.491	1269.137	.00	854.07
-10.00	1325.02	438.67	-545.024	1133.371	.00	792.04
-10.50	1262.55	507.73	-482.554	997.316	.00	725.05
-11.50	1234.94	547.18	-419.782	921.261	35.16	688.44
-12.50	1243.88	552.76	-332.637	915.686	131.25	688.44
`.50	1250.38	560.44	-276.432	905.610	193.95	686.05
.50	1227.28	567.16	-258.997	875.293	188.28	662.45
-15.50	1468.45	594.11	-485.858	1015.771	202.59	829.88
-16.50	2023.64	514.94	-1080.170	1476.327	163.47	1211.27
-17.50	2320.63	292.58	-1509.399	1889.718	31.24	1402.30

-18.13+	2356.30	245.29	-1576.305	1966.989	.00	1439.17
-18.13-	2356.30	245.29	-1576.305	1966.989	.00	1425.40
.50	2391.55	267.53	-1611.552	1951.640	.00	1439.17
.05+	2442.96	284.98	-1662.962	1992.145	.00	1513.94
-19.05-	2442.96	284.98	-1662.962	1992.145	.00	1480.30
-19.50	2485.02	299.27	-1689.784	1994.672	15.24	1513.94
-20.50	2578.50	331.09	-1749.586	2053.824	48.92	1604.92
-20.88+	2664.84	359.48	-1884.844	1677.524	.00	1100.29
-20.88-	2664.84	359.48	-1884.844	1677.524	.00	1413.71
-21.50	2099.04	160.83	-1319.043	1719.454	.00	1100.29
-22.00	1259.07	175.25	-479.067	1525.096	.00	920.35
-22.23	1408.50	524.24	-628.502	1188.190	.00	932.43
-22.50	1749.90	834.51	-860.650	892.645	109.25	947.15
-23.50	1769.73	850.71	-610.022	930.036	379.71	1000.75
-24.50	1724.81	893.39	-555.664	940.962	389.15	1054.35
-25.50	2573.02	1060.44	-1239.491	1270.098	553.53	1550.54
-26.50	4404.83	1074.22	-2963.878	2470.588	660.96	2764.81

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 30-JAN-1998 TIME: 14.37.38

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¤ SUMMARY OF RESULTS FOR ¤
¤ CANTILEVER WALL DESIGN ¤
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I.--HEADING

'COUSINS PUMP STATION, EE 14149
'I WALL, S BANK DISCHARGE, EAST OF DESTREHAN AVE

II.--SUMMARY

RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

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WALL BOTTOM ELEV. (FT)      :      -13.89
     PENETRATION (FT)       :       17.89

MAX. BEND. MOMENT (LB-FT)   :      15097.
     AT ELEVATION (FT)      :       -3.35

MAX. SCALED DEFL. (LB-IN3)  :  4.3383E+09
     AT ELEVATION (FT)      :       11.50
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(NOTE: DIVIDE SCALED DEFLECTION BY MODULUS OF ELASTICITY IN PSI TIMES PILE MOMENT OF INERTIA IN IN**4 TO OBTAIN DEFLECTION IN INCHES.)

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS BY CLASSICAL METHODS

DATE: 30-JAN-1998 TIME: 14.37.38

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¤ COMPLETE RESULTS FOR ¤
¤ CANTILEVER WALL DESIGN ¤
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I.--HEADING

'COUSINS PUMP STATION, EE 14149
'I WALL, S BANK DISCHARGE, EAST OF DESTREHAN AVE

II.--RESULTS

ELEVATION (FT)	BENDING MOMENT (LB-FT)	SHEAR (LB)	SCALED DEFLECTION (LB-IN3)	NET PRESSURE (PSF)
11.50	0.	0.	4.3383E+09	.00
10.50	10.	31.	4.0396E+09	62.40
9.50	83.	125.	3.7409E+09	124.80
8.50	281.	281.	3.4424E+09	187.20
7.50	666.	499.	3.1444E+09	249.60
6.50	1300.	780.	2.8476E+09	312.00
5.50	2246.	1123.	2.5530E+09	374.40
4.50	3567.	1529.	2.2624E+09	436.80
4.00	4387.	1755.	2.1193E+09	468.00
3.50	5319.	1959.	1.9781E+09	348.68
3.00	6337.	2104.	1.8391E+09	229.36
2.50	7412.	2189.	1.7029E+09	110.04
2.04	8429.	2214.	1.5802E+09	.00
1.77	9025.	2205.	1.5098E+09	-64.30
1.50	9616.	2179.	1.4406E+09	-128.61
.50	11691.	1931.	1.1949E+09	-367.52
-.50	13399.	1445.	9.6936E+08	-605.20
-1.00	14042.	1119.	8.6509E+08	-696.88
-1.50	14507.	725.	7.6687E+08	-878.88
-1.71	14643.	554.	7.2680E+08	-727.60
-2.00	14778.	412.	6.7491E+08	-259.42
-2.50	14954.	296.	5.8934E+08	-204.47
-3.50	15091.	-79.	4.3761E+08	-546.90
-4.50	14737.	-631.	3.1188E+08	-556.88
-5.50	13824.	-1198.	2.1154E+08	-576.21

-5.70	13578.	-1310.	1.9472E+08	-573.92
-6.00	13154.	-1477.	1.7044E+08	-519.48
-6.50	12355.	-1714.	1.3501E+08	-429.91
-7.50	10456.	-2054.	7.9763E+07	-250.77
-8.50	8306.	-2215.	4.2549E+07	-71.63
-9.50	6085.	-2198.	1.9676E+07	107.52
-10.00	5003.	-2121.	1.2424E+07	197.09
-10.50	3971.	-2000.	7.3340E+06	286.66
-11.50	2143.	-1624.	1.8944E+06	465.80
-12.50	782.	-1069.	2.2575E+05	644.95
-13.50	66.	-334.	1.4075E+03	824.09
-13.89	0.	0.	0.0000E+00	893.81

(NOTE: DIVIDE SCALED DEFLECTION BY MODULUS OF ELASTICITY IN PSI TIMES PILE MOMENT OF INERTIA IN IN**4 TO OBTAIN DEFLECTION IN INCHES.)

III.--SOIL PRESSURES

ELEVATION	< LEFTSIDE PRESSURE (PSF)>		<RIGHTSIDE PRESSURE (PSF)>	
(FT)	PASSIVE	ACTIVE	ACTIVE	PASSIVE
11.50	0.	0.	0.	0.
10.50	0.	0.	0.	0.
9.50	0.	0.	0.	0.
8.50	0.	0.	0.	0.
7.50	0.	0.	0.	0.
6.50	0.	0.	0.	0.
5.50	0.	0.	0.	0.
4.50	0.	0.	0.	0.
4.00	0.	0.	0.	0.
3.50	160.	24.	10.	53.
3.00	320.	48.	19.	105.
2.50	480.	72.	29.	158.
2.04	628.	95.	38.	207.
1.77	714.	108.	43.	235.
1.50	800.	121.	48.	263.
.50	1121.	169.	67.	369.
-.50	1440.	217.	86.	474.
-1.00	1579.	238.	102.	531.
-1.50	1723.	261.	64.	542.
-1.71+	1508.	227.	0.	580.
-1.71-	1508.	227.	0.	559.
-2.00	1039.	135.	0.	580.
-2.50	984.	75.	0.	708.
-3.50	1327.	111.	0.	848.
-4.50	1337.	141.	0.	857.
-5.50	1356.	180.	0.	866.
-5.70	1354.	193.	0.	862.
-6.00	1350.	213.	0.	855.
-6.50	1344.	246.	0.	843.
-7.50	1360.	282.	0.	850.
-8.50	1390.	306.	0.	871.
-9.50	1382.	365.	0.	854.
-10.00	1325.	439.	0.	792.
-10.50	1263.	508.	0.	725.
-11.50	1235.	547.	35.	688.
-12.50	1244.	553.	131.	688.
-13.50	1250.	560.	194.	686.

-13.89	1227.	567.	188.	662.
-15.50	1468.	594.	203.	830.

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 03-FEB-1998 TIME: 11.49.14

Reference Encl 8

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¤ INPUT DATA ¤
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I.--HEADING:
'COUSIN P STATION ENTRY WALL TO BARGE FLUME,EE14149
'BORING 3 SOIL PARAMETERS, 2 FT SURGE WATER LEVEL EL 11.5

II.--CONTROL
CANTILEVER WALL DESIGN

LEVEL 1 FACTOR OF SAFETY FOR ACTIVE PRESSURES = 1.00
LEVEL 1 FACTOR OF SAFETY FOR PASSIVE PRESSURES = 1.00

III.--WALL DATA
ELEVATION AT TOP OF WALL = 12.00 (FT)

IV.--SURFACE POINT DATA

IV.A--RIGHTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
.00	-11.00
100.00	-11.00

IV.B-- LEFTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
.00	2.00
100.00	2.00

V.--SOIL LAYER DATA

V.A.--RIGHTSIDE LAYER DATA
LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURES = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURES = DEFAULT

SAT. 3HT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH-ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH-ESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.
69.00	69.00	.00	150.0	.00	38.0	-16.50	.00	DEF	DEF
117.50	117.50	.00	175.0	.00	44.0	-22.00	.00	DEF	DEF
116.00	116.00	.00	200.0	.00	50.0	-26.50	.00	DEF	DEF

116.00	116.00	.00	240.0	.00	60.0	-32.00	.00	DEF	DEF
105.00	105.00	.00	280.0	.00	70.0	-40.00	.00	DEF	DEF
.00	100.00	.00	340.0	.00	85.0	-50.00	.00	DEF	DEF
100.00	100.00	.00	420.0	.00	105.0	-61.50	.00	DEF	DEF
122.50	122.50	25.00	.0	10.00	.0			DEF	DEF

V.B.-- LEFTSIDE LAYER DATA

LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURES = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURES = DEFAULT

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH- ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH- ESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.
88.00	88.00	.00	140.0	.00	35.0	-11.00	.00	DEF	DEF
69.00	69.00	.00	150.0	.00	38.0	-16.50	.00	DEF	DEF
117.50	117.50	.00	175.0	.00	44.0	-22.00	.00	DEF	DEF
116.00	116.00	.00	200.0	.00	50.0	-26.50	.00	DEF	DEF
116.00	116.00	.00	240.0	.00	60.0	-32.00	.00	DEF	DEF
105.00	105.00	.00	280.0	.00	70.0	-40.00	.00	DEF	DEF
100.00	100.00	.00	340.0	.00	85.0	-50.00	.00	DEF	DEF
100.00	100.00	.00	420.0	.00	105.0	-61.50	.00	DEF	DEF
122.50	122.50	25.00	.0	10.00	.0			DEF	DEF

VI.--WATER DATA

UNIT WEIGHT = 62.40 (PCF)
RIGHTSIDE ELEVATION = 11.50 (FT)
LEFTSIDE ELEVATION = -1.00 (FT)
NO SEEPAGE

VII.--SURFACE LOADS

VII.A.--RIGHTSIDE SURFACE LOADS

VII.A.1.--SURFACE LINE LOADS
NONE

VII.A.2.--SURFACE DISTRIBUTED LOADS
UNIFORM LOAD = 135.00 (PSF)

VII.B.-- LEFTSIDE SURFACE LOADS
NONE

VIII.--HORIZONTAL LOADS
NONE

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 03-FEB-1998 TIME: 11.49.27

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¤ SOIL PRESSURES FOR ¤
¤ CANTILEVER WALL DESIGN ¤
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I.--HEADING

'COUSIN P STATION ENTRY WALL TO BARGE FLUME,EE14149
'BORING 3 SOIL PARAMETERS, 2 FT SURGE WATER LEVEL EL 11.5

II.--SOIL PRESSURES

RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

	<-LEFTSIDE PRESSURES->		<---NET PRESSURES----> (SOIL PLUS WATER)		<RIGHTSIDE PRESSURES->	
ELEV. (FT)	PASSIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)
.00	.00	.00	.000	.000	.00	.00
11.50	.00	.00	.000	.000	.00	.00
11.00	.00	.00	31.200	31.200	.00	.00
10.00	.00	.00	93.600	93.600	.00	.00
9.00	.00	.00	156.000	156.000	.00	.00
8.00	.00	.00	218.400	218.400	.00	.00
7.00	.00	.00	280.800	280.800	.00	.00
6.00	.00	.00	343.200	343.200	.00	.00
5.00	.00	.00	405.600	405.600	.00	.00
4.00	.00	.00	468.000	468.000	.00	.00
3.00	.00	.00	530.400	530.400	.00	.00
2.00+	.00	.00	592.800	592.800	.00	.00
2.00-	280.00	.00	312.800	592.800	.00	.00
1.00	403.24	.00	251.956	655.200	.00	.00
.00	491.00	.00	226.600	717.600	.00	.00
-1.00	562.91	.00	217.088	780.000	.00	.00
-2.00	604.60	.00	175.400	780.000	.00	.00
-3.00	630.44	.00	149.556	780.000	.00	.00
-4.00	655.80	.00	124.200	780.000	.00	.00
-5.00	681.40	.00	98.600	780.000	.00	.00
-6.00	707.00	.00	73.000	780.000	.00	.00
-7.00	732.60	.00	47.400	780.000	.00	.00
-8.00	758.20	.00	21.800	780.000	.00	.00
-9.00	783.51	24.45	-3.515	755.548	.00	.00
-10.00	811.56	106.54	-31.556	673.459	.00	.00
[illegible].00+	841.60	178.98	-61.602	601.017	.00	.00
[illegible].00-	841.60	178.98	-61.602	1036.017	.00	435.00
-11.50	852.02	185.77	-72.023	1051.529	.00	457.30
-12.00	862.44	192.56	-82.444	1067.041	.00	479.60
-13.00	871.63	194.91	-91.634	1071.285	.00	486.20

-14.00	877.80	201.80	-97.800	1071.000	.00	492.80
-15.00	883.62	209.02	-103.624	1069.600	.00	498.62
.00	900.02	206.28	-120.018	1088.733	.00	515.02
.50	928.67	196.67	-148.666	1127.000	.00	543.67
-17.00	969.13	198.87	-189.135	1165.267	.00	584.13
-18.00	1033.57	244.17	-253.574	1184.400	.00	648.57
-19.00	1088.05	300.05	-308.050	1183.000	.00	703.05
-20.00	1142.28	356.03	-362.281	1181.250	.00	757.28
-21.00	1203.50	405.00	-423.500	1193.500	.00	818.50
-22.00	1280.96	436.96	-500.963	1239.000	.00	895.96
-23.00	1357.70	468.20	-577.700	1284.500	.00	972.70
-24.00	1417.43	515.68	-637.431	1296.750	.00	1032.43
-25.00	1469.02	571.27	-647.717	1292.750	41.31	1084.03
-26.00	1538.00	609.50	-585.914	1323.500	172.09	1153.00
-26.50	1595.55	605.55	-600.165	1385.000	215.38	1210.55
-27.00	1653.10	601.60	-654.834	1446.500	218.27	1268.10
-28.00	1722.08	639.83	-687.250	1477.250	254.83	1337.08
-29.00	1774.55	694.55	-685.000	1475.000	309.55	1389.55
-30.00	1826.79	749.60	-682.188	1472.187	364.60	1441.79
-31.00	1890.19	793.31	-701.875	1491.875	408.31	1505.19
-32.00	1977.51	807.51	-775.000	1565.000	422.51	1592.51
-33.00	2059.51	816.39	-848.125	1638.125	431.39	1674.51
-34.00	2112.00	849.19	-867.812	1657.812	464.19	1727.00
-35.00	2153.15	893.15	-865.000	1655.000	508.15	1768.15
-36.00	2195.75	935.75	-865.000	1655.000	550.75	1810.75
-37.00	2238.35	978.35	-865.000	1655.000	593.35	1853.35
-38.00	2278.86	1023.08	-860.781	1650.781	638.08	1893.86
[illegible].00	2336.21	1050.89	-890.312	1680.313	665.89	1951.21
.00	2432.36	1037.36	-1000.000	1790.000	652.36	2047.36
-41.00	2526.09	1021.41	-1109.688	1899.687	636.41	2141.09
-42.00	2578.48	1044.26	-1139.219	1929.219	659.26	2193.48
-43.00	2613.95	1083.95	-1135.000	1925.000	698.95	2228.95
-44.00	2651.55	1121.55	-1135.000	1925.000	736.55	2266.55
-45.00	2689.15	1159.15	-1135.000	1925.000	774.15	2304.15
-46.00	2726.75	1196.75	-1135.000	1925.000	811.75	2341.75
-47.00	2764.35	1234.35	-1135.000	1925.000	849.35	2379.35
-48.00	2799.14	1274.76	-1129.375	1919.375	889.76	2414.14
-49.00	2856.43	1292.67	-1168.750	1958.750	907.67	2471.42
-50.00	2967.15	1257.15	-1315.000	2105.000	872.15	2582.15
-51.00	3077.88	1221.63	-1461.250	2251.250	836.63	2692.88
-52.00	3135.16	1239.54	-1500.625	2290.625	854.54	2750.16
-53.00	3169.95	1279.95	-1495.000	2285.000	894.95	2784.95
-54.00	3207.55	1317.55	-1495.000	2285.000	932.55	2822.55
-55.00	3245.15	1355.15	-1495.000	2285.000	970.15	2860.15
-56.00	3282.75	1392.75	-1495.000	2285.000	1007.75	2897.75
-57.00	3320.35	1430.35	-1495.000	2285.000	1045.35	2935.35
-58.00	3357.95	1467.95	-1495.000	2285.000	1082.95	2972.95
-59.00	3395.55	1505.55	-1495.000	2285.000	1120.55	3010.55
-60.00	3275.52	1477.25	-1398.132	2213.513	1097.39	2910.76
-61.00	5774.67	2613.09	-2853.658	3265.575	2141.02	5098.67
-61.50	7946.58	3050.46	-4574.517	4688.798	2592.07	6959.25
-62.00	8142.14	2201.54	-5462.290	5646.882	1899.85	7068.42
-63.00	6998.12	905.73	-5437.006	5911.999	781.11	6037.73
.00	7264.56	1011.23	-5609.751	6068.538	874.81	6299.77
[illegible].00	7456.23	1034.58	-5778.492	6238.188	897.74	6492.76
-66.00	7648.31	1057.86	-5947.703	6408.363	920.61	6686.22
-67.00	7840.79	1081.07	-6117.360	6579.034	943.43	6880.11
-68.00	8033.63	1104.23	-6287.443	6750.176	966.19	7074.40

-69.00	8226.84	1127.33	-6457.933	6921.764	988.91	7269.09
-70.00	8420.40	1150.37	-6628.812	7093.776	1011.59	7464.15
.00	8614.29	1173.37	-6800.064	7266.190	1034.22	7659.56
.00	8808.49	1196.32	-6971.673	7438.987	1056.82	7855.30
-73.00	9003.01	1219.22	-7143.622	7612.147	1079.38	8051.37
-74.00	9197.82	1242.09	-7315.900	7785.654	1101.92	8247.74
-75.00	9392.91	1264.91	-7488.491	7959.491	1124.42	8444.40
-76.00	9588.27	1287.70	-7661.383	8133.643	1146.89	8641.34
-77.00	9783.90	1310.45	-7834.564	8308.094	1169.34	8838.54
-78.00	9979.78	1333.17	-8008.023	8482.831	1191.76	9036.00
-79.00	10175.91	1355.86	-8181.749	8657.842	1214.16	9233.70
-80.00	10372.26	1378.51	-8355.732	8833.113	1236.53	9431.63
-81.00	10568.85	1401.14	-8529.961	9008.634	1258.89	9629.78

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 03-FEB-1998 TIME: 11.50.50

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¤ SUMMARY OF RESULTS FOR ¤
¤ CANTILEVER WALL DESIGN ¤
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I.--HEADING

'COUSIN P STATION ENTRY WALL TO BARGE FLUME,EE14149
'BORING 3 SOIL PARAMETERS, 2 FT SURGE WATER LEVEL EL 11.5

II.--SUMMARY

RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

WALL BOTTOM ELEV. (FT) : -46.63
PENETRATION (FT) : 48.63

MAX. BEND. MOMENT (LB-FT) : 102308.
AT ELEVATION (FT) : -25.30

MAX. SCALED DEFL. (LB-IN3) : 1.7241E+11
AT ELEVATION (FT) : 12.00

(NOTE: DIVIDE SCALED DEFLECTION BY MODULUS OF
ELASTICITY IN PSI TIMES PILE MOMENT OF INERTIA
IN IN**4 TO OBTAIN DEFLECTION IN INCHES.)

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 03-FEB-1998 TIME: 11.50.50

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¤ COMPLETE RESULTS FOR ¤
¤ CANTILEVER WALL DESIGN ¤
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I.--HEADING

'COUSIN P STATION ENTRY WALL TO BARGE FLUME,EE14149
'BORING 3 SOIL PARAMETERS, 2 FT SURGE WATER LEVEL EL 11.5

II.--RESULTS

ELEVATION (FT)	BENDING MOMENT (LB-FT)	SHEAR (LB)	SCALED DEFLECTION (LB-IN3)	NET PRESSURE (PSF)
12.00	0.	0.	1.7241E+11	.00
11.50	0.	0.	1.6991E+11	.00
11.00	1.	8.	1.6740E+11	31.20
10.00	35.	70.	1.6239E+11	93.60
9.00	162.	195.	1.5737E+11	156.00
8.00	446.	382.	1.5236E+11	218.40
7.00	948.	632.	1.4735E+11	280.80
6.00	1730.	944.	1.4234E+11	343.20
5.00	2856.	1318.	1.3733E+11	405.60
4.00	4387.	1755.	1.3233E+11	468.00
3.00	6387.	2254.	1.2733E+11	530.40
2.00	8917.	2816.	1.2235E+11	592.80
2.00	8917.	2816.	1.2235E+11	312.80
1.00	11879.	3098.	1.1738E+11	251.96
.00	15099.	3337.	1.1243E+11	226.60
-1.00	18548.	3559.	1.0751E+11	217.09
-2.00	22209.	3756.	1.0262E+11	175.40
-3.00	26048.	3918.	9.7770E+10	149.56
-4.00	30036.	4055.	9.2963E+10	124.20
-5.00	34149.	4166.	8.8209E+10	98.60
-6.00	38360.	4252.	8.3514E+10	73.00
-7.00	42645.	4312.	7.8885E+10	47.40
-8.00	46976.	4347.	7.4330E+10	21.80
-9.00	51330.	4356.	6.9856E+10	-3.51
-10.00	55680.	4339.	6.5471E+10	-31.56
-11.00	59997.	4292.	6.1182E+10	-61.60
-11.50	62135.	4259.	5.9076E+10	-72.02
-12.00	64255.	4220.	5.6996E+10	-82.44
-13.00	68432.	4133.	5.2922E+10	-91.63

-14.00	72518.	4038.	4.8966E+10	-97.80
-15.00	76506.	3937.	4.5135E+10	-103.62
-16.00	80389.	3826.	4.1436E+10	-120.02
-16.50	82286.	3758.	3.9639E+10	-148.67
-17.00	84145.	3674.	3.7876E+10	-189.13
-18.00	87714.	3453.	3.4462E+10	-253.57
-19.00	91030.	3172.	3.1199E+10	-308.05
-20.00	94039.	2837.	2.8094E+10	-362.28
-21.00	96684.	2444.	2.5150E+10	-423.50
-22.00	98904.	1982.	2.2374E+10	-500.96
-23.00	100622.	1442.	1.9769E+10	-577.70
-24.00	101765.	835.	1.7337E+10	-637.43
-25.00	102279.	192.	1.5082E+10	-647.72
-26.00	102158.	-425.	1.3003E+10	-585.91
-26.50	101872.	-721.	1.2029E+10	-600.17
-27.00	101434.	-1035.	1.1100E+10	-654.83
-28.00	100066.	-1706.	9.3723E+09	-687.25
-29.00	98017.	-2392.	7.8177E+09	-685.00
-30.00	95282.	-3076.	6.4323E+09	-682.19
-31.00	91862.	-3768.	5.2114E+09	-701.87
-32.00	87731.	-4506.	4.1492E+09	-775.00
-33.00	82825.	-5318.	3.2384E+09	-848.13
-34.00	77080.	-6176.	2.4707E+09	-867.81
-34.36	74791.	-6489.	2.2265E+09	-866.80
-35.00	70481.	-6996.	1.8361E+09	-721.46
-36.00	63162.	-7604.	1.3231E+09	-493.83
-37.00	55349.	-7984.	9.1918E+08	-266.20
-38.00	47270.	-8136.	6.1089E+08	-38.57
-39.00	39152.	-8061.	3.8427E+08	189.05
-40.00	31223.	-7758.	2.2533E+08	416.68
-41.00	23711.	-7228.	1.2040E+08	644.31
-42.00	16843.	-6470.	5.6540E+07	871.94
-43.00	10848.	-5484.	2.1910E+07	1099.56
-44.00	5951.	-4271.	6.1836E+06	1327.19
-45.00	2382.	-2830.	9.3201E+05	1554.82
-46.00	368.	-1161.	2.0981E+04	1782.44
-46.63	0.	0.	0.0000E+00	1925.00

(NOTE: DIVIDE SCALED DEFLECTION BY MODULUS OF ELASTICITY IN PSI TIMES PILE MOMENT OF INERTIA IN IN**4 TO OBTAIN DEFLECTION IN INCHES.)

III.--SOIL PRESSURES

ELEVATION	< LEFTSIDE PRESSURE (PSF)>		<RIGHTSIDE PRESSURE (PSF)>	
(FT)	PASSIVE	ACTIVE	ACTIVE	PASSIVE
12.00	0.	0.	0.	0.
11.50	0.	0.	0.	0.
11.00	0.	0.	0.	0.
10.00	0.	0.	0.	0.
9.00	0.	0.	0.	0.
8.00	0.	0.	0.	0.
7.00	0.	0.	0.	0.
6.00	0.	0.	0.	0.
5.00	0.	0.	0.	0.
4.00	0.	0.	0.	0.
3.00	0.	0.	0.	0.
2.00+	0.	0.	0.	0.

2.00-	280.	0.	0.	0.
1.00	403.	0.	0.	0.
.00	491.	0.	0.	0.
-1.00	563.	0.	0.	0.
-2.00	605.	0.	0.	0.
-3.00	630.	0.	0.	0.
-4.00	656.	0.	0.	0.
-5.00	681.	0.	0.	0.
-6.00	707.	0.	0.	0.
-7.00	733.	0.	0.	0.
-8.00	758.	0.	0.	0.
-9.00	784.	24.	0.	0.
-10.00	812.	107.	0.	0.
-11.00+	842.	179.	0.	0.
-11.00-	842.	179.	0.	435.
-11.50	852.	186.	0.	457.
-12.00	862.	193.	0.	480.
-13.00	872.	195.	0.	486.
-14.00	878.	202.	0.	493.
-15.00	884.	209.	0.	499.
-16.00	900.	206.	0.	515.
-16.50	929.	197.	0.	544.
-17.00	969.	199.	0.	584.
-18.00	1034.	244.	0.	649.
-19.00	1088.	300.	0.	703.
-20.00	1142.	356.	0.	757.
-21.00	1204.	405.	0.	819.
-22.00	1281.	437.	0.	896.
-23.00	1358.	468.	0.	973.
-24.00	1417.	516.	0.	1032.
-25.00	1469.	571.	41.	1084.
-26.00	1538.	609.	172.	1153.
-26.50	1596.	606.	215.	1211.
-27.00	1653.	602.	218.	1268.
-28.00	1722.	640.	255.	1337.
-29.00	1775.	695.	310.	1390.
-30.00	1827.	750.	365.	1442.
-31.00	1890.	793.	408.	1505.
-32.00	1978.	808.	423.	1593.
-33.00	2060.	816.	431.	1675.
-34.00	2112.	849.	464.	1727.
-34.36	2127.	865.	480.	1742.
-35.00	2153.	893.	508.	1768.
-36.00	2196.	936.	551.	1811.
-37.00	2238.	978.	593.	1853.
-38.00	2279.	1023.	638.	1894.
-39.00	2336.	1051.	666.	1951.
-40.00	2432.	1037.	652.	2047.
-41.00	2526.	1021.	636.	2141.
-42.00	2578.	1044.	659.	2193.
-43.00	2614.	1084.	699.	2229.
-44.00	2652.	1122.	737.	2267.
-45.00	2689.	1159.	774.	2304.
-46.00	2727.	1197.	812.	2342.
-46.63	2764.	1234.	849.	2379.
-48.00	2799.	1275.	890.	2414.

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 27-JAN-1998 TIME: 16.03.41

Reference Encl 9

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¤ INPUT DATA ¤
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I.--HEADING:
'COUSIN P STATION DISCHARGE DIVERSION WALL,EE14149
'BORING 3 SOIL PARAMETERS, STATIC WATER LEVEL EL 9.5,ANCHOR WALL

II.--CONTROL
ANCHORED WALL DESIGN

LEVEL 1 FACTOR OF SAFETY FOR ACTIVE PRESSURES = 1.50
LEVEL 1 FACTOR OF SAFETY FOR PASSIVE PRESSURES = 1.50

III.--WALL DATA
ELEVATION AT TOP OF WALL = 12.00 (FT)
ELEVATION AT ANCHOR = 10.50 (FT)

IV.--SURFACE POINT DATA

IV.A--RIGHTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
.00	-11.00
100.00	-11.00

IV.B-- LEFTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
.00	-11.00
100.00	-11.00

V.--SOIL LAYER DATA

V.A.--RIGHTSIDE LAYER DATA
LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURES = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURES = DEFAULT

AT. wGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH-ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH-ESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.
69.00	69.00	.00	150.0	.00	38.0	-16.50	.00	DEF	DEF
117.50	117.50	.00	175.0	.00	44.0	-22.00	.00	DEF	DEF

116.00	116.00	.00	200.0	.00	50.0	-26.50	.00	DEF	DEF
116.00	116.00	.00	240.0	.00	60.0	-32.00	.00	DEF	DEF
.00	105.00	.00	280.0	.00	70.0	-40.00	.00	DEF	DEF
.00	100.00	.00	340.0	.00	85.0	-50.00	.00	DEF	DEF
100.00	100.00	.00	420.0	.00	105.0	-61.50	.00	DEF	DEF
122.50	122.50	25.00	.0	10.00	.0			DEF	DEF

V.B.-- LEFTSIDE LAYER DATA
LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURES = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURES = DEFAULT

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH-ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH-ESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.
69.00	69.00	.00	150.0	.00	38.0	-16.50	.00	DEF	DEF
117.50	117.50	.00	175.0	.00	44.0	-22.00	.00	DEF	DEF
116.00	116.00	.00	200.0	.00	50.0	-26.50	.00	DEF	DEF
116.00	116.00	.00	240.0	.00	60.0	-32.00	.00	DEF	DEF
105.00	105.00	.00	280.0	.00	70.0	-40.00	.00	DEF	DEF
100.00	100.00	.00	340.0	.00	85.0	-50.00	.00	DEF	DEF
100.00	100.00	.00	420.0	.00	105.0	-61.50	.00	DEF	DEF
122.50	122.50	25.00	.0	10.00	.0			DEF	DEF

VI.--WATER DATA

UNIT WEIGHT = 62.40 (PCF)
RIGHTSIDE ELEVATION = 9.50 (FT)
LEFTSIDE ELEVATION = -1.00 (FT)
NO SEEPAGE

VII.--SURFACE LOADS

VII.A.--RIGHTSIDE SURFACE LOADS

VII.A.1.--SURFACE LINE LOADS
NONE

VII.A.2.--SURFACE DISTRIBUTED LOADS
UNIFORM LOAD = 135.00 (PSF)

VII.B.-- LEFTSIDE SURFACE LOADS
NONE

VIII.--HORIZONTAL LOADS
NONE

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 27-JAN-1998 TIME: 16.03.56

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¤ SOIL PRESSURES FOR ¤
¤ ANCHORED WALL DESIGN ¤
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I.--HEADING

'COUSIN P STATION DISCHARGE DIVERSION WALL,EE14149
'BORING 3 SOIL PARAMETERS, STATIC WATER LEVEL EL 9.5,ANCHOR WALL

II.--SOIL PRESSURES

RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

	<-LEFTSIDE PRESSURES->		<---NET PRESSURES----> (SOIL PLUS WATER)	<RIGHTSIDE PRESSURES->	
ELEV. (FT)	PASSIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)
.00	.00	.00	.000	.00	.00
11.00	.00	.00	.000	.00	.00
10.50	.00	.00	.000	.00	.00
10.00	.00	.00	.000	.00	.00
9.50	.00	.00	.000	.00	.00
9.00	.00	.00	31.200	.00	.00
8.00	.00	.00	93.600	.00	.00
7.00	.00	.00	156.000	.00	.00
6.00	.00	.00	218.400	.00	.00
5.00	.00	.00	280.800	.00	.00
4.00	.00	.00	343.200	.00	.00
3.00	.00	.00	405.600	.00	.00
2.00	.00	.00	468.000	.00	.00
1.00	.00	.00	530.400	.00	.00
.00	.00	.00	592.800	.00	.00
-1.00	.00	.00	655.200	.00	.00
-2.00	.00	.00	655.200	.00	.00
-3.00	.00	.00	655.200	.00	.00
-4.00	.00	.00	655.200	.00	.00
-5.00	.00	.00	655.200	.00	.00
-6.00	.00	.00	655.200	.00	.00
-7.00	.00	.00	655.200	.00	.00
-8.00	.00	.00	655.200	.00	.00
-9.00	.00	.00	655.200	.00	.00
-10.00	.00	.00	655.200	.00	.00
.00+	.00	.00	655.200	.00	.00
-11.00-	200.00	.00	455.200	.00	335.00
-12.00	244.60	.00	410.600	.00	379.60
-13.00	251.20	.00	404.000	.00	386.20
-14.00	257.80	.00	397.400	.00	392.80

-15.00	263.83	.00	391.367	.00	398.83
-16.00	277.38	.00	377.821	.00	412.38
[illegible]50	300.33	.00	354.868	.00	435.33
[illegible]00	335.11	.00	320.093	.00	470.11
-18.00	396.70	.00	258.501	.00	531.70
-19.00	451.38	.00	203.817	.00	586.38
-20.00	505.87	.00	149.325	.00	640.87
-21.00	565.27	.00	115.013	25.08	700.27
-22.00	635.96	.00	131.114	111.88	770.96
-23.00	705.93	.00	156.072	206.80	840.93
-24.00	763.84	.00	157.213	265.85	898.84
-25.00	816.02	38.59	158.450	319.28	951.02
-26.00	880.44	170.82	136.811	362.06	1015.44
-26.50	928.88	225.16	93.533	367.22	1063.88
-27.00	977.32	239.30	50.256	372.38	1112.32
-28.00	1041.74	280.16	28.617	415.16	1176.74
-29.00	1094.55	334.55	30.200	469.55	1229.55
-30.00	1147.20	389.18	32.179	524.18	1282.20
-31.00	1207.69	435.81	18.325	570.81	1342.69
-31.36	1234.93	444.73	.000	579.73	1369.93
-31.68	1259.55	452.79	-16.567	587.79	1394.55
-32.00	1284.18	460.85	-33.133	595.85	1419.18
-33.00	1355.35	480.55	-84.592	615.55	1490.35
-34.00	1404.92	516.27	-98.446	651.27	1539.92
-35.00	1446.48	559.82	-96.467	694.82	1581.48
-36.00	1489.08	602.42	-96.467	737.42	1624.08
-37.00	1531.68	645.02	-96.467	780.02	1666.68
-[illegible]00	1572.82	689.12	-93.498	824.12	1707.82
[illegible]00	1625.79	721.31	-114.279	856.31	1760.79
40.00	1705.69	724.03	-191.467	859.03	1840.69
-41.00	1783.18	724.32	-268.654	859.32	1918.18
-42.00	1831.19	751.55	-289.435	886.55	1966.19
-43.00	1867.28	790.62	-286.467	925.62	2002.28
-44.00	1904.88	828.22	-286.467	963.22	2039.88
-45.00	1942.48	865.82	-286.467	1000.82	2077.48
-46.00	1980.08	903.42	-286.467	1038.42	2115.08
-47.00	2017.68	941.02	-286.467	1076.02	2152.68
-48.00	2053.30	980.60	-282.508	1115.60	2188.30
-49.00	2104.76	1004.34	-310.217	1139.34	2239.76
-50.00	2193.82	990.48	-413.133	1125.48	2328.82
-51.00	2282.88	976.63	-516.050	1111.62	2417.88
-52.00	2334.33	1000.37	-543.758	1135.37	2469.33
-53.00	2369.95	1039.95	-539.800	1174.95	2504.95
-54.00	2407.55	1077.55	-539.800	1212.55	2542.55
-55.00	2445.15	1115.15	-539.800	1250.15	2580.15
-56.00	2482.75	1152.75	-539.800	1287.75	2617.75
-57.00	2520.35	1190.35	-539.800	1325.35	2655.35
-58.00	2557.95	1227.95	-539.800	1362.95	2692.95
-59.00	2595.55	1265.55	-539.800	1400.55	2730.55
-60.00	2550.69	1259.61	-499.921	1395.57	2683.86
-61.00	3886.64	2019.77	-1088.803	2142.64	4044.76
-61.50	4956.77	2336.36	-1868.485	2433.09	5164.95
-6[illegible]00	4926.30	1823.17	-2377.282	1893.82	5184.85
-[illegible]00	4240.29	1015.60	-2511.672	1073.42	4525.08
[illegible].00	4424.06	1097.76	-2612.064	1156.80	4708.29
-65.00	4560.64	1127.87	-2718.294	1187.14	4846.06
-66.00	4697.59	1157.90	-2824.992	1217.40	4984.17
-67.00	4834.90	1187.86	-2932.130	1247.57	5122.58

-68.00	4972.54	1217.76	-3039.681	1277.66	5261.29
-69.00	5110.51	1247.59	-3147.622	1307.69	5400.27
.00	5248.78	1277.37	-3255.931	1337.64	5539.52
.00	5387.33	1307.11	-3364.588	1367.54	5679.01
-72.00	5526.15	1336.79	-3473.574	1397.38	5818.74
-73.00	5665.24	1366.43	-3582.871	1427.17	5958.70
-74.00	5804.57	1396.03	-3692.463	1456.91	6098.87
-75.00	5944.13	1425.58	-3802.334	1486.60	6239.24
-76.00	6083.92	1455.11	-3912.470	1516.25	6379.80
-77.00	6223.92	1484.60	-4022.858	1545.86	6520.55
-78.00	6364.12	1514.06	-4133.485	1575.44	6661.47
-79.00	6504.51	1543.49	-4244.339	1604.97	6802.57
-80.00	6645.09	1572.89	-4355.410	1634.48	6943.82
-81.00	6785.84	1602.27	-4466.687	1663.96	7085.22

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 27-JAN-1998 TIME: 16.04.07

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¤ SUMMARY OF RESULTS FOR ¤
¤ ANCHORED WALL DESIGN ¤
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I.--HEADING

'COUSIN P STATION DISCHARGE DIVERSION WALL,EE14149
'BORING 3 SOIL PARAMETERS, STATIC WATER LEVEL EL 9.5,ANCHOR WALL

II.--SUMMARY

RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

METHOD	:	FREE EARTH	EQUIV. BEAM	FIXED EARTH
WALL BOTTOM ELEV. (FT)	:	-51.74	-67.80	-65.31
PENETRATION (FT)	:	40.74	56.80	54.31
MAX. BEND. MOMENT (LB-FT)	:	-127253.	-98537.	-109620.
AT ELEVATION (FT)	:	-10.00	-8.00	-9.00
MAX. SCALED DEFL. (LB-IN3)	:	7.4565E+10	-3.0065E+10	5.5608E+10
AT ELEVATION (FT)	:	-17.00	-53.00	-15.00
ANCHOR FORCE (LB)	:	9599.	8146.	8725.

(NOTE: PENETRATION FOR EQUIVALENT BEAM METHOD DOES NOT INCLUDE INCREASE PRESCRIBED BY DRAFT EM 1110-2-2906.)

(NOTE: DIVIDE SCALED DEFLECTION BY MODULUS OF ELASTICITY IN PSI TIMES PILE MOMENT OF INERTIA IN IN**4 TO OBTAIN DEFLECTION IN INCHES.)

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 27-JAN-1998 TIME: 16.04.07

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¤ COMPLETE RESULTS FOR ¤
¤ ANCHORED WALL DESIGN ¤
¤ BY FREE EARTH METHOD ¤
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I.--HEADING

'COUSIN P STATION DISCHARGE DIVERSION WALL,EE14149
'BORING 3 SOIL PARAMETERS, STATIC WATER LEVEL EL 9.5,ANCHOR WALL

II.--RESULTS (ANCHOR FORCE = 9599. (LB))

ELEVATION (FT)	BENDING MOMENT (LB-FT)	SHEAR (LB)	SCALED DEFLECTION (LB-IN3)	NET PRESSURE (PSF)
12.00	0.	0.	-6.6154E+09	.00
11.00	0.	0.	-2.2051E+09	.00
10.50	0.	0.	0.0000E+00	.00
10.50	0.	-9599.	0.0000E+00	.00
10.00	-4800.	-9599.	2.2048E+09	.00
9.50	-9599.	-9599.	4.4075E+09	.00
9.00	-14398.	-9592.	6.6060E+09	31.20
8.00	-23963.	-9529.	1.0982E+10	93.60
7.00	-33435.	-9404.	1.5317E+10	156.00
6.00	-42751.	-9217.	1.9595E+10	218.40
5.00	-51849.	-8968.	2.3798E+10	280.80
4.00	-60665.	-8656.	2.7912E+10	343.20
3.00	-69139.	-8281.	3.1921E+10	405.60
2.00	-77207.	-7844.	3.5811E+10	468.00
1.00	-84807.	-7345.	3.9567E+10	530.40
.00	-91876.	-6784.	4.3177E+10	592.80
-1.00	-98353.	-6160.	4.6628E+10	655.20
-2.00	-104185.	-5504.	4.9909E+10	655.20

-3.00	-109362.	-4849.	5.3010E+10	655.20
-4.00	-113883.	-4194.	5.5923E+10	655.20
-5.00	-117750.	-3539.	5.8639E+10	655.20
-6.00	-120961.	-2884.	6.1151E+10	655.20
-7.00	-123517.	-2228.	6.3454E+10	655.20
-8.00	-125417.	-1573.	6.5545E+10	655.20
-9.00	-126663.	-918.	6.7418E+10	655.20
-10.00	-127253.	-263.	6.9073E+10	655.20
-11.00	-127188.	392.	7.0508E+10	655.20
-11.00	-127188.	392.	7.0508E+10	455.20
-12.00	-126576.	825.	7.1723E+10	410.60
-13.00	-125546.	1233.	7.2720E+10	404.00
-14.00	-124113.	1633.	7.3499E+10	397.40
-15.00	-122281.	2028.	7.4064E+10	391.37
-16.00	-120060.	2412.	7.4418E+10	377.82
-16.50	-118808.	2596.	7.4517E+10	354.87
-17.00	-117467.	2764.	7.4565E+10	320.09
-18.00	-114553.	3054.	7.4509E+10	258.50
-19.00	-111379.	3285.	7.4254E+10	203.82
-20.00	-108002.	3461.	7.3808E+10	149.33
-21.00	-104472.	3593.	7.3175E+10	115.01
-22.00	-100818.	3717.	7.2361E+10	131.11
-23.00	-97032.	3860.	7.1373E+10	156.07
-24.00	-93093.	4017.	7.0217E+10	157.21
-25.00	-88998.	4175.	6.8901E+10	158.45
-26.00	-84748.	4322.	6.7430E+10	136.81
-26.50	-82571.	4380.	6.6640E+10	93.53
-27.00	-80371.	4416.	6.5814E+10	50.26
-28.00	-75934.	4455.	6.4058E+10	28.62
-29.00	-71464.	4485.	6.2171E+10	30.20
-30.00	-66964.	4516.	6.0161E+10	32.18
-31.00	-62435.	4541.	5.8035E+10	18.33
-31.36	-60817.	4544.	5.7252E+10	.00
-31.68	-59354.	4542.	5.6532E+10	-16.57
-32.00	-57893.	4534.	5.5801E+10	-33.13
-33.00	-53385.	4475.	5.3467E+10	-84.59
-34.00	-48955.	4383.	5.1041E+10	-98.45
-35.00	-44620.	4286.	4.8531E+10	-96.47
-36.00	-40383.	4189.	4.5943E+10	-96.47
-37.00	-36242.	4093.	4.3285E+10	-96.47
-38.00	-32196.	3998.	4.0565E+10	-93.50
-39.00	-28249.	3894.	3.7789E+10	-114.28
-40.00	-24425.	3741.	3.4964E+10	-191.47
-41.00	-20792.	3511.	3.2097E+10	-268.65
-42.00	-17419.	3232.	2.9194E+10	-289.44
-43.00	-14331.	2944.	2.6261E+10	-286.47
-44.00	-11530.	2658.	2.3303E+10	-286.47
-45.00	-9016.	2371.	2.0325E+10	-286.47
-46.00	-6788.	2085.	1.7332E+10	-286.47
-47.00	-4847.	1798.	1.4326E+10	-286.47
-48.00	-3191.	1514.	1.1313E+10	-282.51
-49.00	-1823.	1217.	8.2933E+09	-310.22
-50.00	-778.	856.	5.2708E+09	-413.13
-51.00	-146.	391.	2.2470E+09	-516.05
-51.74	0.	0.	0.0000E+00	-536.64

(NOTE: DIVIDE SCALED DEFLECTION BY MODULUS OF
ELASTICITY IN PSI TIMES PILE MOMENT OF INERTIA

IN IN**4 TO OBTAIN DEFLECTION IN INCHES.)

III.--SOIL PRESSURES

ELEVATION (FT)	< LEFTSIDE PRESSURE (PSF)> PASSIVE	ACTIVE	<RIGHTSIDE PRESSURE (PSF)> ACTIVE	PASSIVE
12.00	0.	0.	0.	0.
11.00	0.	0.	0.	0.
10.50	0.	0.	0.	0.
10.00	0.	0.	0.	0.
9.50	0.	0.	0.	0.
9.00	0.	0.	0.	0.
8.00	0.	0.	0.	0.
7.00	0.	0.	0.	0.
6.00	0.	0.	0.	0.
5.00	0.	0.	0.	0.
4.00	0.	0.	0.	0.
3.00	0.	0.	0.	0.
2.00	0.	0.	0.	0.
1.00	0.	0.	0.	0.
.00	0.	0.	0.	0.
-1.00	0.	0.	0.	0.
-2.00	0.	0.	0.	0.
-3.00	0.	0.	0.	0.
-4.00	0.	0.	0.	0.
-5.00	0.	0.	0.	0.
-6.00	0.	0.	0.	0.
-7.00	0.	0.	0.	0.
-8.00	0.	0.	0.	0.
-9.00	0.	0.	0.	0.
-10.00	0.	0.	0.	0.
-11.00+	0.	0.	0.	0.
-11.00-	200.	0.	0.	335.
-12.00	245.	0.	0.	380.
-13.00	251.	0.	0.	386.
-14.00	258.	0.	0.	393.
-15.00	264.	0.	0.	399.
-16.00	277.	0.	0.	412.
-16.50	300.	0.	0.	435.
-17.00	335.	0.	0.	470.
-18.00	397.	0.	0.	532.
-19.00	451.	0.	0.	586.
-20.00	506.	0.	0.	641.
-21.00	565.	0.	25.	700.
-22.00	636.	0.	112.	771.
-23.00	706.	0.	207.	841.
-24.00	764.	0.	266.	899.
-25.00	816.	39.	319.	951.
-26.00	880.	171.	362.	1015.
-26.50	929.	225.	367.	1064.
-27.00	977.	239.	372.	1112.
-28.00	1042.	280.	415.	1177.
-29.00	1095.	335.	470.	1230.
-30.00	1147.	389.	524.	1282.
-31.00	1208.	436.	571.	1343.
-31.36	1235.	445.	580.	1370.
-31.68	1260.	453.	588.	1395.
-32.00	1284.	461.	596.	1419.

-33.00	1355.	481.	616.	1490.
-34.00	1405.	516.	651.	1540.
-35.00	1446.	560.	695.	1581.
-36.00	1489.	602.	737.	1624.
-37.00	1532.	645.	780.	1667.
-38.00	1573.	689.	824.	1708.
-39.00	1626.	721.	856.	1761.
-40.00	1706.	724.	859.	1841.
-41.00	1783.	724.	859.	1918.
-42.00	1831.	752.	887.	1966.
-43.00	1867.	791.	926.	2002.
-44.00	1905.	828.	963.	2040.
-45.00	1942.	866.	1001.	2077.
-46.00	1980.	903.	1038.	2115.
-47.00	2018.	941.	1076.	2153.
-48.00	2053.	981.	1116.	2188.
-49.00	2105.	1004.	1139.	2240.
-50.00	2194.	990.	1125.	2329.
-51.00	2283.	977.	1112.	2418.
-52.00	2334.	1000.	1135.	2469.

Letter Dated 6 April 1998

EUSTIS ENGINEERING COMPANY, INC.
GEOTECHNICAL ENGINEERS
CONSTRUCTION QUALITY CONTROL & MATERIALS TESTING
3011 28th Street • Metairie, Louisiana 70002 • 504-834-0157 / Fax 504-834-0354 / E-mail EustisEngr@aol.com

6 April 1998

West Jefferson Engineering Services
A Joint Venture
615 Fourth Street
Westwego, Louisiana 70094

Attention Mr. Oscar Pena

Gentlemen:

Additional Engineering Analyses
West Jefferson Levee District
Cousins Pumping Station to First Avenue Canal
Harvey, Louisiana

On 19 March 1998, Mr. Jens Nielson of Burk-Kleinpeter, Inc., requested analyses for specific sheetpile guide walls proposed for Cousins Pumping Station. Reference is made to Eustis Engineering Company, Inc.'s geotechnical report dated 7 October 1997 entitled "Geotechnical Investigation, West Jefferson Levee District, Cousins Pumping Station to First Avenue Canal, Harvey, Louisiana." The results of analyses contained in this letter are based on geotechnical data developed for that report.

Two new guide walls are planned. One wall will be built to extend the existing guide wall between the two existing pump station intakes. The second guide wall will be built between the existing north pump station intake and the intake of the proposed new station.

Guide Wall Between Existing Stations

The results of the analyses of the proposed intake guide wall between the existing pump stations are shown on Enclosure 1. The new guide wall will be curved in shape and extend approximately 40 feet into the existing intake basin area. The analyses were performed assuming a reinforced concrete frame work will tie the walls together at el -1.0 (NGVD). It was also assumed the walls would function as anchored walls with active soil pressures developing inside the walls and passive pressures outside. Sand fill was assumed to be placed inside the sheetpiles from the existing mudline at el 16.5 to the top of the sheetpiles at el -1.0. Because of the limited width of the structure, earth pressures were calculated using the U.S. Army Corps of Engineers' "Uplift" program. Both Q and S-cases were analyzed. Resulting calculated moments, sheet tip penetrations, and anchor forces are shown on Enclosure 1. Net earth and water pressure diagrams developed for the analyses are given on Enclosure 2. The reinforced concrete caps and bracing on the sheetpiles must be designed to support the anchor load. Anchor loads shown on Enclosure 1 are unfactored. An adequate factor of safety must be included in the structural design of the bracing elements.

An additional analysis was performed to evaluate potential internal shear failure of the structure due to differential pressure caused by water elevation differences in the intake basins. For our analysis, we assumed the water level at one intake basin would be at el -6.2, and the elevation in the adjacent intake basin at el -6.7, resulting in a 0.5-ft head difference. The analysis indicates, if the dimension between the sheetpile walls is 1.6 feet or more, the factor of safety against tilting due to internal shear failure is 1.5 or greater. If the differential water head exceeds the 0.5 foot assumed, Eustis Engineering must be contacted to reevaluate the conditions.

Placement of the sand fill inside the sheetpile structure will induce consolidation settlement in the underlying clays. We have estimated 7 to 9 inches of settlement should be anticipated at the center of the filled area. Settlement near the edges, including the sheetpiles, will likely be one-third to one-half the value estimated for the center.

Guide Wall Between the Proposed New Station
and the Existing North Station

The results of our analyses on the intake guide walls between the proposed new station and the existing north station are presented on Enclosure 3. Our analyses assume the new structure will be approximately 41' wide by 65' long. The west end of the sheetpile structure will be round with a radius equivalent to one-half the dimension between the two sheetpile walls running east to west. The top of the wall is planned to be at el -2 and will be tied together with reinforced concrete beams at the top. The existing ground surface generally varies from approximately el -3 at the east end of the planned structure to slightly below el -10 at the west end of the structure. The dredge depth on the north side of the structure will vary from el -16.5 near the west end and slope to el -20 to the point of the beginning of the pile supported intake slab of the new pump station. The dredge depth on the south side of the structure will be el -16.5.

Sheetpile analyses were also performed assuming sheetpiles will act as anchored sheetpile walls with active soil pressures inside of the structure and resisting passive soil pressures outside. Since this structure is significantly wider than the other, the Corps of Engineers' "CWALSHT" program was used for the sheetpile analyses and both Q and S-cases were analyzed. Resulting calculated maximum moment, anchor loads, and required sheetpile tip penetrations are shown on Enclosure 3. The reinforced concrete caps and bracing on the sheetpiles must be designed to support the indicated anchor load. Anchor loads shown on Enclosure 3 are unfactored. An adequate factor of safety must be included in the structural design of the bracing elements. Computer output copies for the governing CWALSHT program analysis for this structure are included in the Appendix.

Consideration must also be given to providing anchorage for the cellular portion of the guide wall between the new and old stations. This anchor load must be supported by the walls running east to west as frictional resistance. The sheetpiles in the wall running east to west should be designed so they cannot slide relative to each other and will function as large plates. The sheetpiles must, therefore, be fixed to each other by welding the top portion together. The welds should be designed to provide sufficient shearing resistance to counter the moment included in the interlocks by the anchor load. The anchor load may be estimated as 101 kips per wall applied at el -2. The reinforced concrete beams should be designed to distribute the estimated anchor load to each of the walls running east to west. This load is unfactored and the structural engineer should incorporate an adequate factor of safety. If the above considerations are followed, sufficient resistance will be mobilized to provide an adequate factor of safety against pullout.

The maximum interlock tension around the circular west end of the sheetpile structure has been calculated to be 965 pounds per linear inch. Both the interlock and web of "Z" section of sheetpiles should be designed to support the load.

Potential tilting of the structure due to internal shear failure caused by unbalanced hydrostatic pressure was also analyzed. The analysis indicates a very high factor of safety against internal shear caused by a 0.5-ft differential head of water. If this differential head will be larger than 0.5 foot, Eustis Engineering must be notified to reevaluate the new conditions.

Placement of sand fill inside the sheetpile structure will induce consolidation settlement in the underlying clays. Assuming existing grade at approximately el -10 resulting in the addition of 8 feet of sand fill, we have estimated 6 to 8 inches of settlement can be expected near the center of the filled area. Settlement near the edges, including the sheetpiles, will likely be one-third to one-half the value estimated for the center.

We appreciate the opportunity to provide these further analyses. If you have any questions, please do not hesitate to contact us.

Yours very truly,

EUSTIS ENGINEERING COMPANY, INC.

THOMAS H. STREMLAU, P.E.

STATE OF LOUISIANA
THOMAS H. STREMLAU
REG. NO. 16248
REGISTERED
PROFESSIONAL ENGINEER
IN
CIVIL ENGINEERING

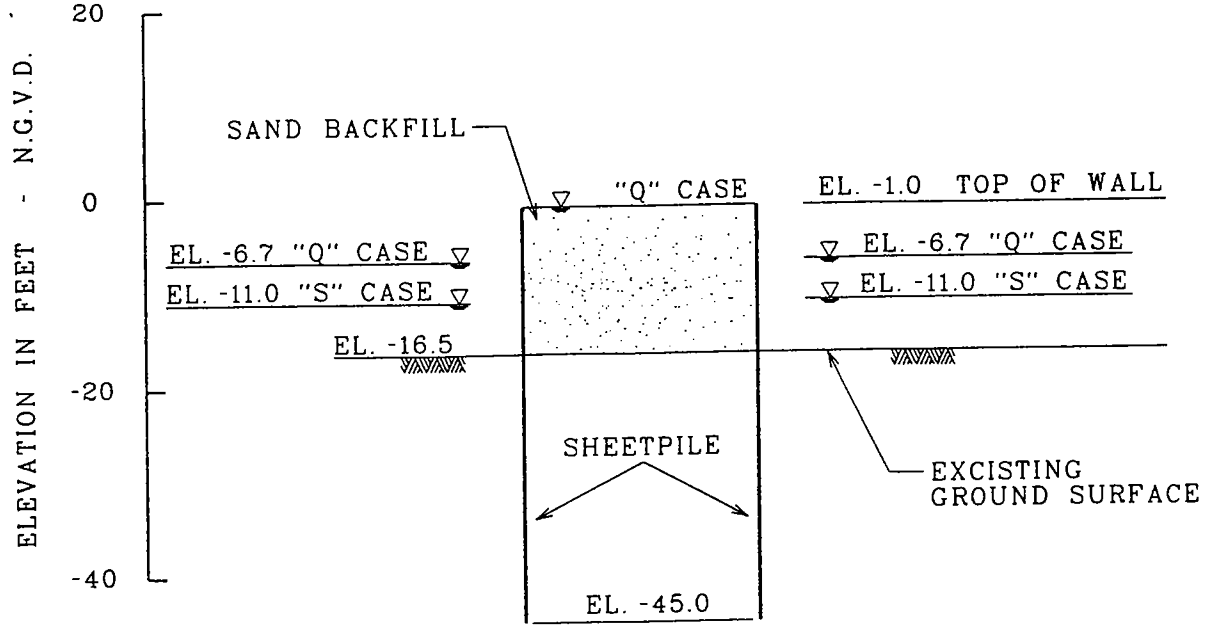
THS:srb/aln

Enclosures 1 through 3
Appendix

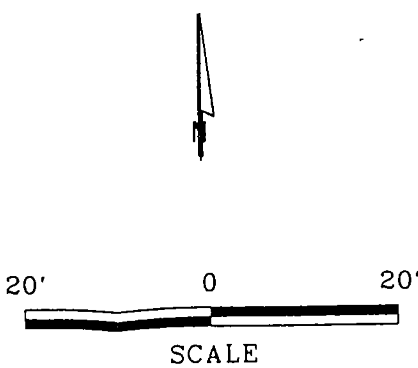
Copy w/Enclosures to:
Design Engineering, Inc.
3330 West Esplanade Avenue
Metairie, Louisiana 70002
Attention Mr. John Holtgreve

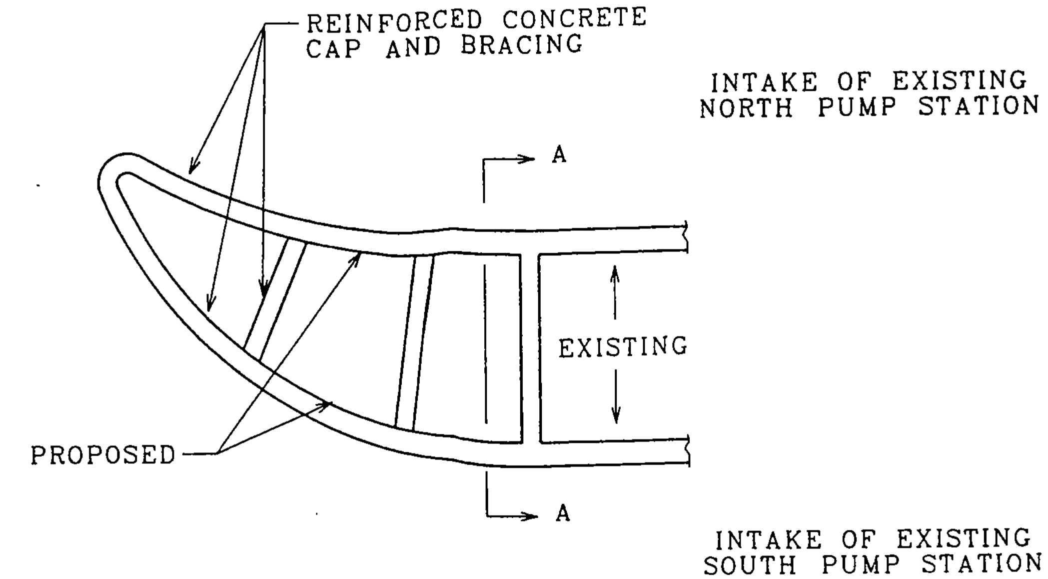
Burk-Kleinpeter, Inc.
4176 Canal Street
New Orleans, Louisiana 70119-5994
Attention Mr. Jens Nielsen, Jr.

EE 14149



SECTION AA



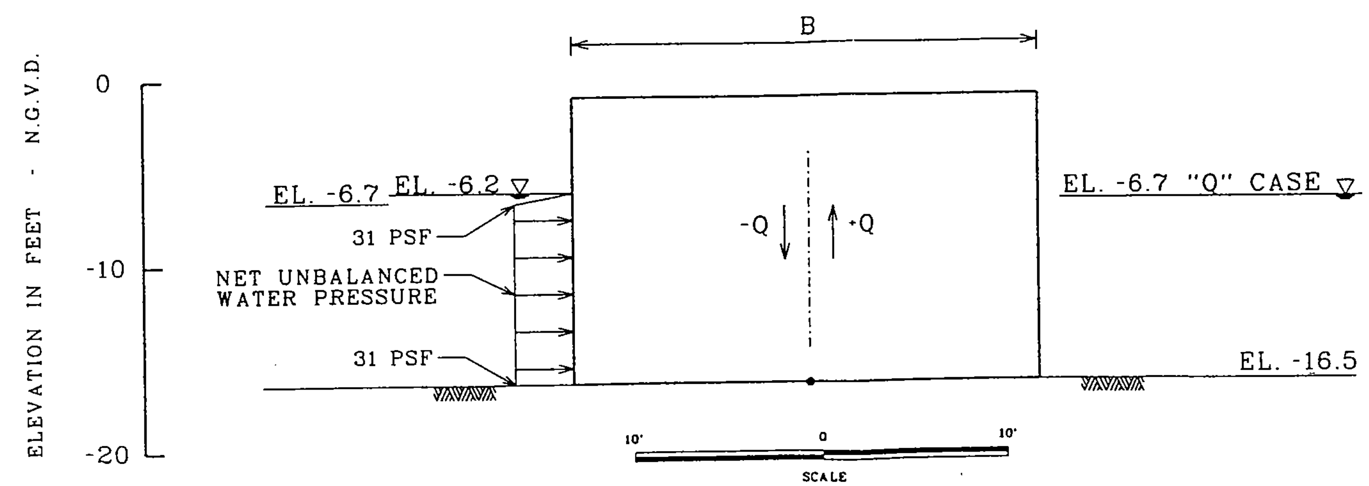


PLAN VIEW

SHEETPILE ANALYSES				
CASE	FACTOR OF SAFETY	MAX. MOMENT FT-KIPS	WALL BOTTOM ELEVATION	ANCHOR LOAD KIPS/FT OF WALL
"Q"	1.0	32.6	-37.0	4.4
"Q"	1.5	-	-42.0	-
"S"	1.0	33.8	-35.0	3.3
"S"	1.5	-	-45.0	-

NOTE :
1) ANCHOR LOAD AND MAXIMUM MOMENT PROVIDED ARE UNFACTORED.
2) SOIL PARAMETERS ARE TAKEN FROM FIGURE 6 OF 7 OCTOBER 1997 REPORT.
3) THESE ANALYSES WERE PERFORMED USING THE CORPS OF ENGINEERS "UPLIFT" PROGRAM.
4) SEE ENCLOSURE 2 FOR NET PRESSURE DIAGRAMS DEVELOPED FROM THE "UPLIFT PROGRAM.
5) REINFORCED CONCRETE CAP AND BRACING MUST BE DESIGNED TO CARRY THE INDICATED ANCHOR LOAD WITH AN ADEQUATE FACTOR OF SAFETY.

INTERNAL SHEAR FAILURE ANALYSIS



M, MOMENT ABOUT BASE CENTER = 4.9 (9.8)(31) +9.95 (7.75) = 1566 FT-LB

$Q = \frac{3M}{2B} = \frac{2349}{B}$ LB PER FOOT LENGTH SHEAR FORCE

FACTOR OF SAFETY, F.S. = $\frac{\text{SHEAR RESISTANCE}}{\text{SHEAR FORCE}}$

SHEAR RESISTANCE = 2193 LBS (SAND BACKFILL, SUBMERGED)

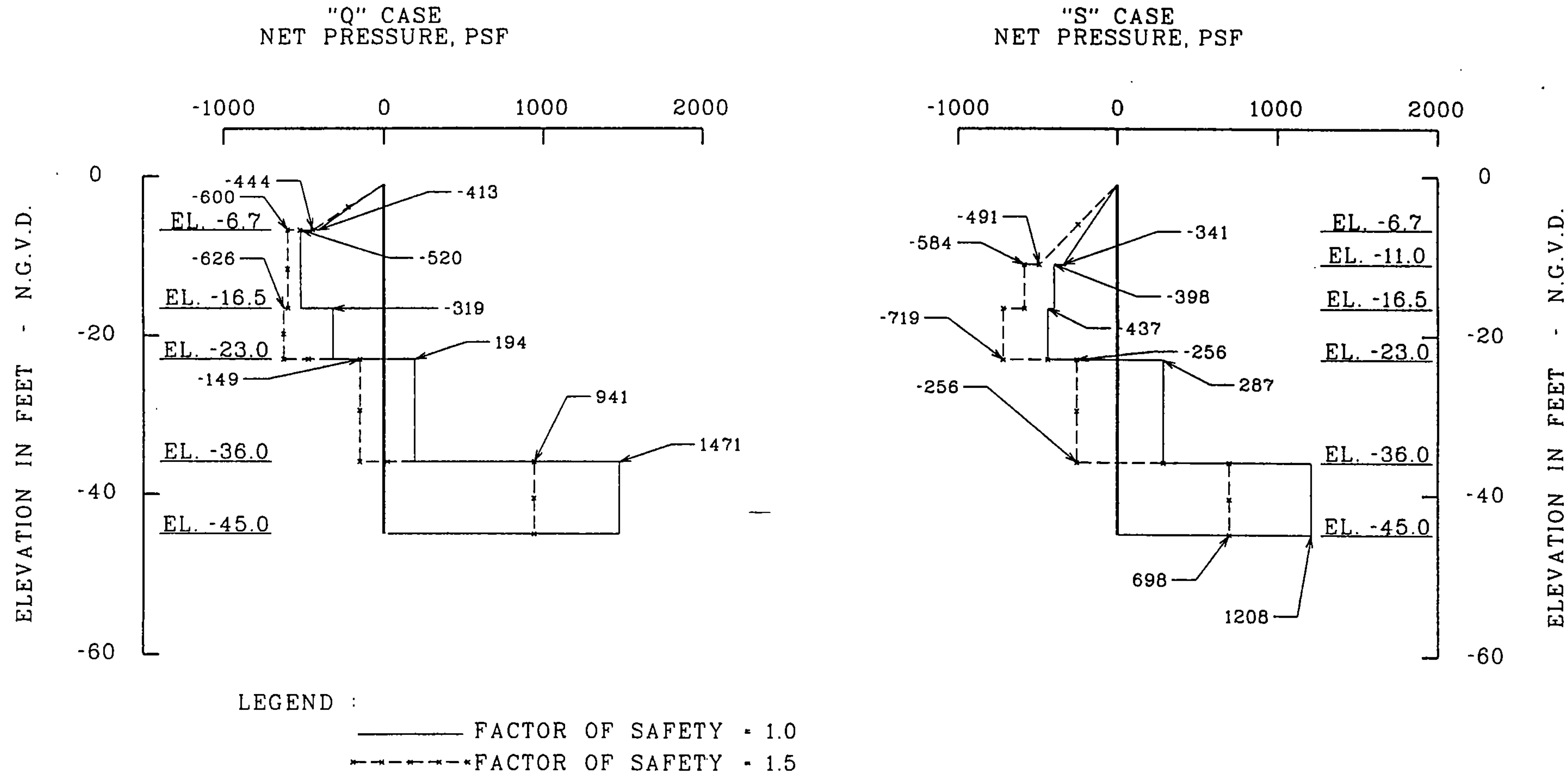
THIS ANALYSIS INDICATES THAT IF B IS 1.6 FT OR MORE, THE COMPUTED FACTOR OF SAFETY AGAINST TILTING OF THE WALL DUE INTERNAL SHEAR FAILURE IS 1.5 OR GREATER. IF DIFFERENTIAL WATER LEVELS WILL EXCEED 0.5 FT, EUSTIS ENGINEERING MUST BE NOTIFIED TO REEVALUATE.

INTAKE GUIDE WALL ANALYSES
BETWEEN EXISTING PUMP STATIONS

WEST JEFFERSON LEVEE DISTRICT
COUSINS PUMP STATION TO FIRST AVENUE CANAL
HARVEY, LOUISIANA

ENCLOSURE 1

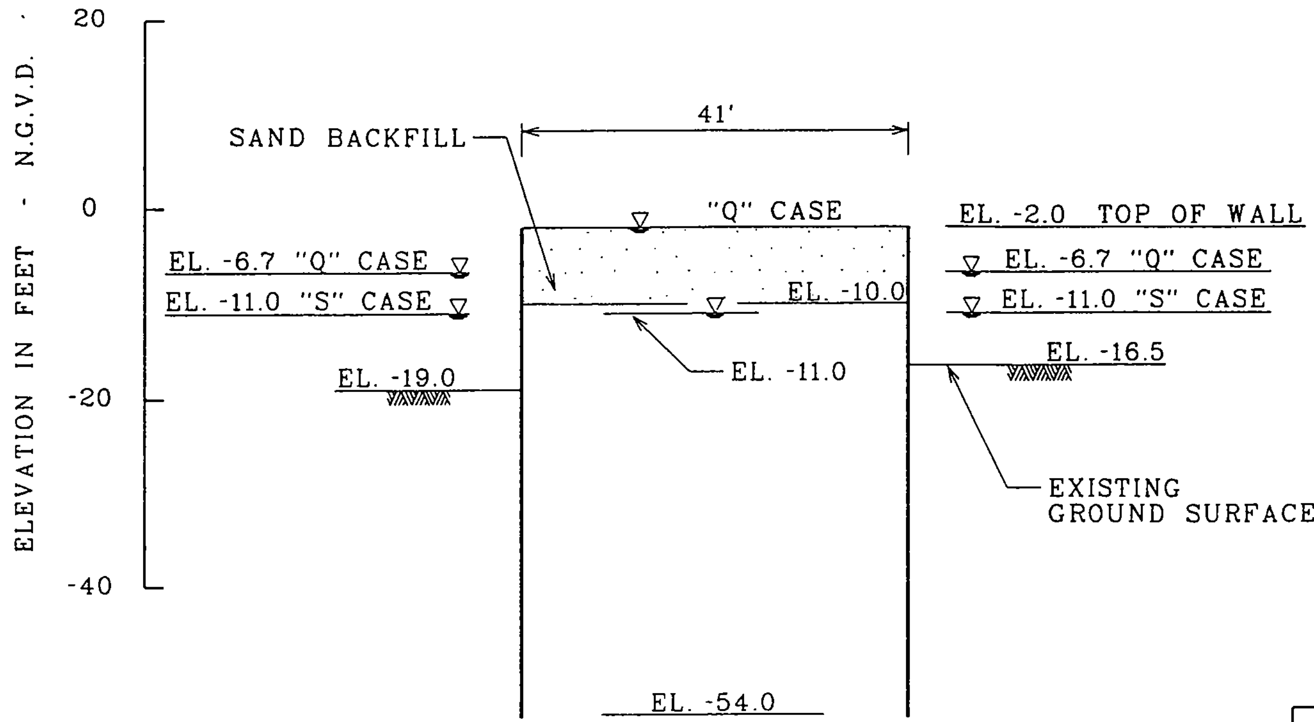
EUSTIS ENGINEERING COMPANY, INC.



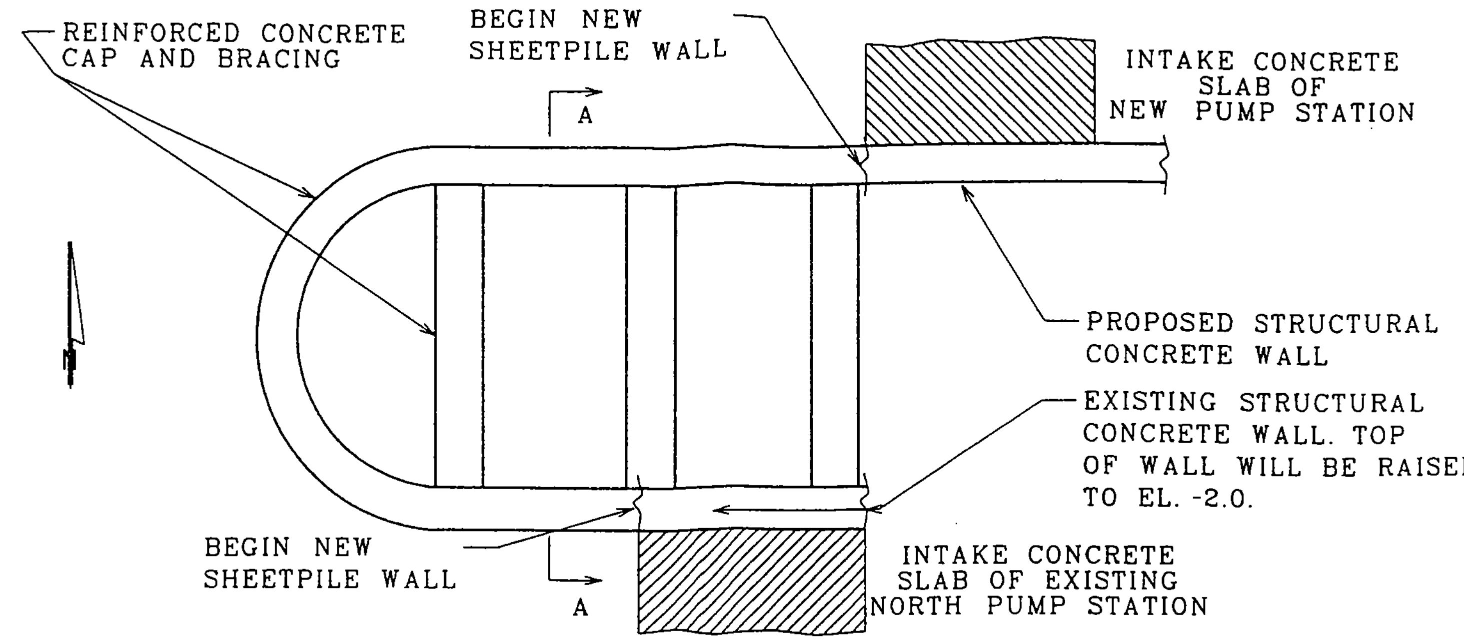
NOTE : 1) THESE PRESSURE DIAGRAMS WERE USED TO DEVELOP THE CALCULATED MAXIMUM MOMENTS, ANCHOR LOADS, AND REQUIRED SHEETPILE TIP ELEVATIONS ON ENCLOSURE 1.

NET EARTH AND WATER PRESSURE DIAGRAMS
INTAKE GUIDE WALL BETWEEN EXISTING PUMP STATIONS

WEST JEFFERSON LEVEE DISTRICT
COUSINS PUMP STATION TO FIRST AVENUE CANAL
HARVEY, LOUISIANA



SECTION AA



PLAN VIEW

SHEETPILE ANALYSES				
CASE	FACTOR OF SAFETY	MAX. MOMENT FT-KIPS	WALL BOTTOM ELEVATION	ANCHOR LOAD KIPS/FT OF WALL
"Q"	1.0	27.9	-34.0	4.0
"Q"	1.5	-	-54.0	-
"S"	1.0	44.4	-36.0	4.7
"S"	1.5	-	-49.0	-

NOTE :

1) ANCHOR LOAD AND MAXIMUM MOMENT PROVIDED ARE UNFACTORED.

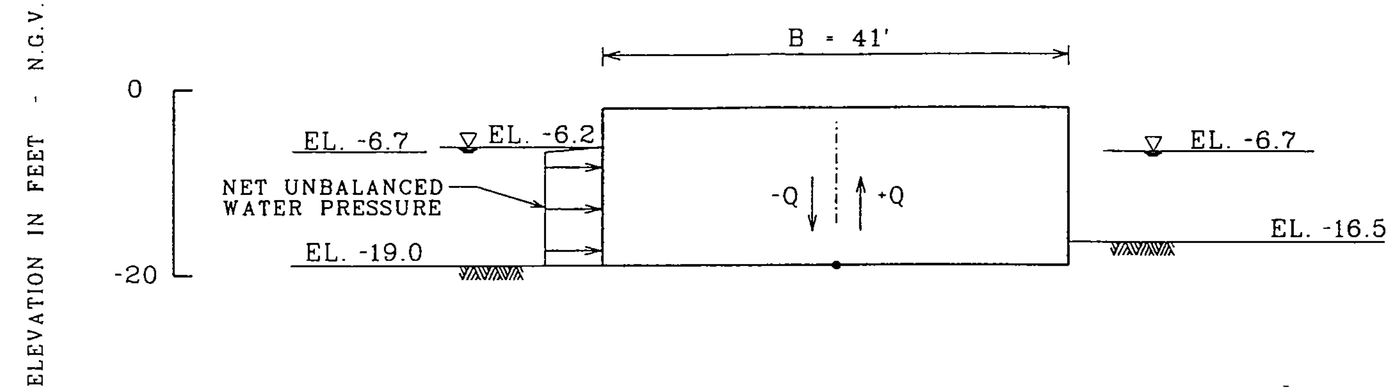
2) SOIL PARAMETERS ARE TAKEN FROM FIGURE 6 OF 7 OCTOBER 1997 REPORT.

3) REINFORCED CONCRETE CAP AND BRACING MUST BE DESIGNED TO CARRY THE INDICATED ANCHOR LOAD WITH AN ADEQUATE FACTOR OF SAFETY.

4) INTERLOCK TENSION IN SHEETPILE AROUND CIRCULAR END IS 965 LB/LINEAL INCH.

5) SHEETPILE ANALYSES WERE PERFORMED USING THE CORPS OF ENGINEERS "CWALSHT" PROGRAM. COMPUTER ANALYSES OUTPUT OF GOVERNING DESIGN ABOVE ARE INCLUDED IN APPENDIX.

INTERNAL SHEAR FAILURE ANALYSIS



M, MOMENT ABOUT BASE CENTER = 6.15(12.3)(31)- 12.5 (7.75) = 2442 FT-LB

$Q = \frac{3M}{2B} = $ 89 LBS PER FOOT SHEAR FORCE, IF B IS 41 FT

SHEAR RESISTANCE ≥ 3400 LB PER FOOT

THEREFORE, FACTOR OF SAFETY AGAINST INTERNAL SHEAR IS VERY HIGH. IF DIFFERENTIAL WATER LEVELS EXCEED 0.5 FT, EUSTIS ENGINEERING MUST BE NOTIFIED TO REEVALUATE.

INTAKE GUIDE WALL ANALYSES
BETWEEN NEW PUMP STATION AND EXISTING NORTH PUMP STATION

WEST JEFFERSON LEVEE DISTRICT
COUSINS PUMP STATION TO FIRST AVENUE CANAL
HARVEY, LOUISIANA

EUSTIS ENGINEERING COMPANY, INC.

ENCLOSURE 3

APPENDIX

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 01-APR-1998 TIME: 10.46.07

èëëëëëëëëëëëëëë£
¤ INPUT DATA ¤
àëëëëëëëëëëëëëë¥

I.--HEADING:
'COUSINS P STA, EE14149
'BULLNOSE GUIDE WALL BETWEEN NEW AND EXISTING NORTH STA,NEAR B-1

II.--CONTROL
ANCHORED WALL DESIGN

LEVEL 1 FACTOR OF SAFETY FOR ACTIVE PRESSURES = 1.50
LEVEL 1 FACTOR OF SAFETY FOR PASSIVE PRESSURES = 1.50

III.--WALL DATA
ELEVATION AT TOP OF WALL = -2.00 (FT)
ELEVATION AT ANCHOR = -2.50 (FT)

IV.--SURFACE POINT DATA

IV.A--RIGHTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
.00	-2.00
100.00	-2.00

IV.B-- LEFTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
.00	-19.00
100.00	-19.00

V.--SOIL LAYER DATA

V.A.--RIGHTSIDE LAYER DATA
LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURES = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURES = DEFAULT

.T. .HT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH- ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH- ESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.
120.00	120.00	30.00	.0	.00	.0	-10.00	.00	DEF	DEF
90.00	90.00	.00	220.0	.00	.0	-12.00	.00	DEF	DEF

75.00	75.00	.00	220.0	.00	.0	-14.00	.00	DEF	DEF
95.00	95.00	.00	220.0	.00	.0	-18.00	.00	DEF	DEF
[illegible]	103.00	.00	220.0	.00	.0	-23.00	.00	DEF	DEF
[illegible]	107.00	.00	310.0	.00	.0	-36.00	.00	DEF	DEF
102.00	102.00	.00	400.0	.00	.0	-42.00	.00	DEF	DEF
97.50	97.50	.00	400.0	.00	.0	-45.00	.00	DEF	DEF
97.50	97.50	.00	485.0	.00	.0	-53.50	.00	DEF	DEF
97.50	97.50	.00	655.0	.00	.0			DEF	DEF

V.B.-- LEFTSIDE LAYER DATA

LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURES = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURES = DEFAULT

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH-ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH-ESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.
103.00	103.00	.00	220.0	.00	.0	-23.00	.00	DEF	DEF
107.00	107.00	.00	310.0	.00	.0	-36.00	.00	DEF	DEF
102.00	102.00	.00	400.0	.00	.0	-42.00	.00	DEF	DEF
97.50	97.50	.00	400.0	.00	.0	-45.00	.00	DEF	DEF
97.50	97.50	.00	485.0	.00	.0	-53.50	.00	DEF	DEF
97.50	97.50	.00	655.0	.00	.0			DEF	DEF

VI.--WATER DATA

UNIT WEIGHT = 62.40 (PCF)
RIGHTSIDE ELEVATION = -2.00 (FT)
LEFTSIDE ELEVATION = -6.70 (FT)
NO SEEPAGE

VII.--SURFACE LOADS
NONE

VIII.--HORIZONTAL LOADS
NONE

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 01-APR-1998 TIME: 10.46.16

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¤ SOIL PRESSURES FOR ¤
¤ ANCHORED WALL DESIGN ¤

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I.--HEADING

'COUSINS P STA, EE14149
'BULLNOSE GUIDE WALL BETWEEN NEW AND EXISTING NORTH STA,NEAR B-1

II.--SOIL PRESSURES

RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

	<-LEFTSIDE PRESSURES->		<---NET PRESSURES----> (SOIL PLUS WATER)	<RIGHTSIDE PRESSURES->	
ELEV. (FT)	PASSIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)
-2.00	.00	.00	.000	.00	.00
-2.50	.00	.00	44.778	13.58	61.09
-3.00	.00	.00	89.555	27.16	122.18
-4.00	.00	.00	179.110	54.31	244.36
-5.00	.00	.00	268.665	81.47	366.53
-6.00	.00	.00	358.220	108.62	488.71
-6.70	.00	.00	420.909	127.63	574.24
-7.00	.00	.00	429.055	135.78	610.89
-8.00	.00	.00	456.986	163.71	736.93
-[illegible]0	.00	.00	478.699	185.42	834.31
[illegible]0	.00	.00	485.807	192.53	841.45
[illegible]1.00	.00	.00	493.013	199.73	802.67
-12.00	.00	.00	511.222	217.94	802.27
-13.00	.00	.00	528.547	235.27	821.93
-14.00	.00	.00	546.362	253.08	839.75
-15.00	.00	.00	573.747	280.47	867.13
-16.00	.00	.00	606.237	312.96	899.62
-17.00	.00	.00	638.947	345.67	932.33
-18.00	.00	.00	673.609	380.33	967.00
-19.00+	.00	.00	712.147	418.87	1005.53
-19.00-	293.33	.00	418.813	418.87	1005.53
-20.00	333.93	.00	418.782	459.44	1046.10
-21.00	372.64	.00	422.563	501.93	1084.84
-22.00	426.38	.00	396.313	529.42	1138.58
-23.00	516.76	.00	298.813	522.30	1228.96
-24.00	609.08	.00	201.313	517.12	1321.28
-25.00	666.79	.00	175.063	548.58	1378.99
-26.00	709.53	.00	178.813	595.07	1421.73
-27.00	754.13	.00	178.813	639.67	1466.33
-28.00	798.73	.00	178.813	684.27	1510.93
-29.00	843.33	.00	178.813	728.87	1555.53
-30.00	887.93	.00	178.813	773.47	1600.13
-31.00	932.53	.00	178.813	818.07	1644.73
-32.00	977.13	.00	178.813	862.67	1689.33
-33 00	1021.73	6.98	178.813	907.27	1733.93
-3[illegible]	1064.48	96.39	182.563	953.76	1776.68
[illegible]5.00	1122.18	235.06	156.313	985.22	1834.38
[illegible]6.00	1214.24	273.08	58.813	979.78	1926.44
-36.60	1268.32	265.02	.000	975.04	1980.52
-36.80	1286.10	262.37	-19.343	973.48	1998.30

-37.00	1303.88	259.72	-38.687	971.92	2016.08
-38.00	1356.63	286.21	-64.937	998.41	2068.83
[illegible]	1394.33	327.67	-61.187	1039.87	2106.53
[illegible]	1433.95	367.28	-61.187	1079.48	2146.15
-41.00	1473.53	406.87	-61.187	1119.07	2185.73
-42.00	1511.97	445.31	-61.187	1157.51	2224.17
-43.00	1546.46	483.34	-57.645	1195.54	2258.66
-44.00	1593.98	506.06	-82.437	1218.26	2306.18
-45.00	1675.10	495.10	-174.520	1207.30	2387.30
-46.00	1756.24	484.16	-266.603	1196.36	2468.44
-47.00	1803.74	506.86	-291.395	1219.06	2515.94
-48.00	1837.07	543.73	-287.853	1255.93	2549.27
-49.00	1872.17	578.83	-287.853	1291.03	2584.37
-50.00	1907.27	613.93	-287.853	1326.13	2619.47
-51.00	1942.37	649.03	-287.853	1361.23	2654.57
-52.00	1974.63	686.97	-282.187	1399.17	2686.83
-53.00	2048.46	683.34	-359.631	1395.54	2760.66
-53.50	2143.45	623.45	-514.520	1335.65	2855.65
-54.00	2238.44	563.56	-669.409	1275.76	2950.64
-55.00	2312.27	559.93	-746.853	1272.13	3024.47
-56.00	2344.53	597.87	-741.187	1310.07	3056.73
-57.00	2379.63	632.97	-741.187	1345.17	3091.83
-58.00	2414.73	668.07	-741.187	1380.27	3126.93
-59.00	2449.83	703.17	-741.187	1415.37	3162.03
-60.00	2484.93	738.27	-741.187	1450.47	3197.13
-61.00	2520.03	773.37	-741.187	1485.57	3232.23
-62.00	2555.13	808.47	-741.187	1520.67	3267.33
-6[illegible]	2590.23	843.57	-741.187	1555.77	3302.43
[illegible]	2625.33	878.67	-741.187	1590.87	3337.53
[illegible]5.00	2660.43	913.77	-741.187	1625.97	3372.63
-66.00	2695.53	948.87	-741.187	1661.07	3407.73
-67.00	2730.63	983.97	-741.187	1696.17	3442.83
-68.00	2765.73	1019.07	-741.187	1731.27	3477.93
-69.00	2800.83	1054.17	-741.187	1766.37	3513.03
-70.00	2835.93	1089.27	-741.187	1801.47	3548.13
-71.00	2871.03	1124.37	-741.187	1836.57	3583.23

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 01-APR-1998 TIME: 10.46.26

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¤ SUMMARY OF RESULTS FOR ¤
¤ ANCHORED WALL DESIGN ¤
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I.--HEADING

'COUSINS P STA, EE14149
'BULLNOSE GUIDE WALL BETWEEN NEW AND EXISTING NORTH STA,NEAR B-1

II.--SUMMARY

RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

METHOD	:	FREE EARTH	EQUIV. BEAM	FIXED EARTH
WALL BOTTOM ELEV. (FT)	:	-54.38	-69.76	-65.48
PENETRATION (FT)	:	35.38	50.76	46.48
MAX. BEND. MOMENT (LB-FT)	:	-80974.	****************	-68993.
AT ELEVATION (FT)	:	-19.82	****************	-18.46
MAX. SCALED DEFL. (LB-IN3)	:	3.3757E+10	1.2025E+10	2.4445E+10
AT ELEVATION (FT)	:	-26.00	-19.00	-24.00
ANCHOR FORCE (LB)	:	8024.	6723.	7300.

(NOTE: PENETRATION FOR EQUIVALENT BEAM
METHOD DOES NOT INCLUDE INCREASE
PRESCRIBED BY DRAFT EM 1110-2-2906.)

(NOTE: DIVIDE SCALED DEFLECTION BY MODULUS OF
ELASTICITY IN PSI TIMES PILE MOMENT OF INERTIA
IN IN**4 TO OBTAIN DEFLECTION IN INCHES.)

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 01-APR-1998 TIME: 10.46.26

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¤ COMPLETE RESULTS FOR ¤
¤ ANCHORED WALL DESIGN ¤
¤ BY FREE EARTH METHOD ¤
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I.--HEADING

'COUSINS P STA, EE14149
'BULLNOSE GUIDE WALL BETWEEN NEW AND EXISTING NORTH STA,NEAR B-1

II.--RESULTS (ANCHOR FORCE = 8024. (LB))

ELEVATION (FT)	BENDING MOMENT (LB-FT)	SHEAR (LB)	SCALED DEFLECTION (LB-IN3)	NET PRESSURE (PSF)
-2.00	0.	0.	-1.1962E+09	.00
-2.50	2.	11.	0.0000E+00	44.78
-2.50	2.	-8013.	0.0000E+00	44.78
-3.00	-3997.	-7979.	1.1959E+09	89.56
-4.00	-11917.	-7845.	3.5808E+09	179.11
-5.00	-19657.	-7621.	5.9451E+09	268.67
-6.00	-27129.	-7308.	8.2755E+09	358.22
-6.70	-32151.	-7035.	9.8796E+09	420.91
-7.00	-34243.	-6907.	1.0559E+10	429.06
-8.00	-40931.	-6464.	1.2783E+10	456.99
-9.00	-47163.	-5997.	1.4937E+10	478.70
-10.00	-52919.	-5514.	1.7010E+10	485.81
-11.00	-58190.	-5025.	1.8991E+10	493.01
-12.00	-62965.	-4523.	2.0871E+10	511.22
-13.00	-67229.	-4003.	2.2643E+10	528.55
-14.00	-70965.	-3465.	2.4299E+10	546.36
-15.00	-74153.	-2905.	2.5832E+10	573.75
-16.00	-76766.	-2315.	2.7237E+10	606.24
-17.00	-78772.	-1693.	2.8509E+10	638.95
-18.00	-80140.	-1037.	2.9646E+10	673.61
-19.00	-80833.	-344.	3.0644E+10	712.15
-19.00	-80833.	-344.	3.0644E+10	418.81
-20.00	-80968.	75.	3.1502E+10	418.78
-21.00	-80682.	496.	3.2221E+10	422.56
-22.00	-79980.	905.	3.2800E+10	396.31
-23.00	-78892.	1253.	3.3241E+10	298.81
-24.00	-77506.	1503.	3.3546E+10	201.31
-25.00	-75907.	1691.	3.3717E+10	175.06
-26.00	-74128.	1868.	3.3757E+10	178.81
-27.00	-72171.	2047.	3.3669E+10	178.81
-28.00	-70034.	2226.	3.3456E+10	178.81
-29.00	-67719.	2404.	3.3122E+10	178.81
-30.00	-65226.	2583.	3.2671E+10	178.81
-31.00	-62553.	2762.	3.2107E+10	178.81
-32.00	-59701.	2941.	3.1436E+10	178.81
-33.00	-56671.	3120.	3.0661E+10	178.81
-34.00	-53461.	3300.	2.9788E+10	182.56
-35.00	-50074.	3470.	2.8823E+10	156.31
-36.00	-46542.	3577.	2.7772E+10	58.81
-36.60	-44377.	3595.	2.7098E+10	.00
-36.80	-43664.	3593.	2.6870E+10	-19.34
-37.00	-42952.	3587.	2.6640E+10	-38.69
-38.00	-39388.	3536.	2.5433E+10	-64.94
-39.00	-35884.	3473.	2.4159E+10	-61.19
-40.00	-32442.	3411.	2.2823E+10	-61.19
-41.00	-29061.	3350.	2.1430E+10	-61.19
-42.00	-25742.	3289.	1.9988E+10	-61.19
-43.00	-22483.	3230.	1.8501E+10	-57.64
-44.00	-19286.	3160.	1.6975E+10	-82.44
-45.00	-16183.	3031.	1.5416E+10	-174.52
-46.00	-13255.	2811.	1.3828E+10	-266.60
-47.00	-10581.	2532.	1.2218E+10	-291.39
-48.00	-8195.	2242.	1.0590E+10	-287.85
-49.00	-6097.	1954.	8.9468E+09	-287.85

-50.00	-4287.	1666.	7.2935E+09	-287.85
-51.00	-2765.	1378.	5.6327E+09	-287.85
-52.00	-1529.	1093.	3.9671E+09	-282.19
-53.00	-590.	772.	2.2988E+09	-359.63
-53.50	-255.	554.	1.4642E+09	-514.52
-54.00	-49.	258.	6.2946E+08	-669.41
-54.38	0.	0.	0.0000E+00	-698.61

(NOTE: DIVIDE SCALED DEFLECTION BY MODULUS OF ELASTICITY IN PSI TIMES PILE MOMENT OF INERTIA IN IN**4 TO OBTAIN DEFLECTION IN INCHES.)

III.--SOIL PRESSURES

ELEVATION	< LEFTSIDE PRESSURE (PSF)>		<RIGHTSIDE PRESSURE (PSF)>	
(FT)	PASSIVE	ACTIVE	ACTIVE	PASSIVE
-2.00	0.	0.	0.	0.
-2.50	0.	0.	14.	61.
-3.00	0.	0.	27.	122.
-4.00	0.	0.	54.	244.
-5.00	0.	0.	81.	367.
-6.00	0.	0.	109.	489.
-6.70	0.	0.	128.	574.
-7.00	0.	0.	136.	611.
-8.00	0.	0.	164.	737.
-9.00	0.	0.	185.	834.
-10.00	0.	0.	193.	841.
-11.00	0.	0.	200.	803.
-12.00	0.	0.	218.	802.
-13.00	0.	0.	235.	822.
-14.00	0.	0.	253.	840.
-15.00	0.	0.	280.	867.
-16.00	0.	0.	313.	900.
-17.00	0.	0.	346.	932.
-18.00	0.	0.	380.	967.
-19.00+	0.	0.	419.	1006.
-19.00-	293.	0.	419.	1006.
-20.00	334.	0.	459.	1046.
-21.00	373.	0.	502.	1085.
-22.00	426.	0.	529.	1139.
-23.00	517.	0.	522.	1229.
-24.00	609.	0.	517.	1321.
-25.00	667.	0.	549.	1379.
-26.00	710.	0.	595.	1422.
-27.00	754.	0.	640.	1466.
-28.00	799.	0.	684.	1511.
-29.00	843.	0.	729.	1556.
-30.00	888.	0.	773.	1600.
-31.00	933.	0.	818.	1645.
-32.00	977.	0.	863.	1689.
-33.00	1022.	7.	907.	1734.
-34.00	1064.	96.	954.	1777.
-35.00	1122.	235.	985.	1834.
-36.00	1214.	273.	980.	1926.
-36.60	1268.	265.	975.	1981.
-36.80	1286.	262.	973.	1998.
-37.00	1304.	260.	972.	2016.
-38.00	1357.	286.	998.	2069.

-39.00	1394.	328.	1040.	2107.
-40.00	1434.	367.	1079.	2146.
-41.00	1474.	407.	1119.	2186.
-42.00	1512.	445.	1158.	2224.
-43.00	1546.	483.	1196.	2259.
-44.00	1594.	506.	1218.	2306.
-45.00	1675.	495.	1207.	2387.
-46.00	1756.	484.	1196.	2468.
-47.00	1804.	507.	1219.	2516.
-48.00	1837.	544.	1256.	2549.
-49.00	1872.	579.	1291.	2584.
-50.00	1907.	614.	1326.	2619.
-51.00	1942.	649.	1361.	2655.
-52.00	1975.	687.	1399.	2687.
-53.00	2048.	683.	1396.	2761.
-53.50	2143.	623.	1336.	2856.
-54.00	2238.	564.	1276.	2951.
-55.00	2312.	560.	1272.	3024.

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1000 'COUSINS P STA, EE14149
1010 'bullnose GUIDE WALL between new and existing north sta,NEAR B-1
   ) CONTROL  A  D    1.50    1.50
   / WALL       -2.0      -2.5
1040 SURFACE RIGHTSIDE   2
1050        .00     -2.0    100.00     -2.0
1060 SURFACE  LEFTSIDE   2
1070        .00    -19.0    100.00    -19.0
1080 SOIL RIGHTSIDE  STRENGTH   10      .00       .00
1100   120.00 120.00  30.00 0.00     .00      .00   -10.00    .00  .00  .00
1110    90.00   90.00   .00  220.00    .00       .00   -12.00    .00  .00  .00
1120    75.00   75.00   .00  220.00    .00       .00   -14.00    .00  .00  .00
1130    95.00   95.00   .00  220.00    .00       .00   -18.00    .00  .00  .00
1140   103.00  103.00   .00  220.00    .00       .00   -23.00    .00  .00  .00
1150   107.00  107.00   .00  310.00    .00       .00   -36.00    .00  .00  .00
1160   102.00  102.00   .00  400.00    .00       .00   -42.00    .00  .00  .00
1170    97.50   97.50   .00  400.00    .00       .00   -45.0     .00  .00  .00
1172    97.5     97.5    0    485        0         0     -53.5     0     0    0
1178     97.5    97.5     0    655      0          0                      0    0
1180 SOIL  LEFTSIDE  STRENGTH    6      .00       .00
1200   103.00  103.00   .00  220.00    .00       .00   -23.00    .00  .00  .00
1210   107.00  107.00   .00  310.00    .00       .00   -36.00    .00  .00  .00
1220   102.00  102.00   .00  400.00    .00       .00   -42.00    .00  .00  .00
1230    97.50   97.50   .00  400.00    .00       .00   -45        0   .00  .00
1334     97.5    97.5    0     485      0          0     -53.5     0     0    0
1238     97.5     97.5   0     655      0          0                      0     0
1240 WATER ELEVATIONS    62.40    -2.0    -6.7
1‾ ) FINISH
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PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 01-APR-1998 TIME: 10.46.57

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¤ INPUT DATA ¤
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I.--HEADING:
'COUSINS P STA, EE14149
'BULLNOSE GUIDE WALL BETWEEN NEW AND EXISTING NORTH STA,NEAR B-1,"S"

II.--CONTROL
ANCHORED WALL DESIGN

LEVEL 1 FACTOR OF SAFETY FOR ACTIVE PRESSURES = 1.00
LEVEL 1 FACTOR OF SAFETY FOR PASSIVE PRESSURES = 1.00

III.--WALL DATA
ELEVATION AT TOP OF WALL = -2.00 (FT)
ELEVATION AT ANCHOR = -2.50 (FT)

IV.--SURFACE POINT DATA

IV.A--RIGHTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
.00	-2.00
100.00	-2.00

IV.B-- LEFTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
.00	-19.00
100.00	-19.00

V.--SOIL LAYER DATA

V.A.--RIGHTSIDE LAYER DATA
LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURES = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURES = DEFAULT

AT. HT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH-ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH-ESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.
120.00	120.00	30.00	.0	.00	.0	-10.00	.00	DEF	DEF
90.00	90.00	22.00	.0	.00	.0	-12.00	.00	DEF	DEF

75.00	75.00	22.00	.0	.00	.0	-14.00	.00	DEF	DEF
95.00	95.00	22.00	.0	.00	.0	-18.00	.00	DEF	DEF
1[illegible].00	103.00	22.00	.0	.00	.0	-23.00	.00	DEF	DEF
[illegible]00	107.00	22.00	.0	.00	.0	-36.00	.00	DEF	DEF
10[illegible].00	102.00	22.00	.0	.00	.0	-42.00	.00	DEF	DEF
97.50	97.50	22.00	.0	.00	.0	-45.00	.00	DEF	DEF
97.50	97.50	22.00	.0	.00	.0	-53.50	.00	DEF	DEF
97.50	97.50	22.00	.0	.00	.0			DEF	DEF

V.B.-- LEFTSIDE LAYER DATA

LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURES = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURES = DEFAULT

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH-ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH-ESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.
103.00	103.00	22.00	.0	.00	.0	-23.00	.00	DEF	DEF
107.00	107.00	22.00	.0	.00	.0	-36.00	.00	DEF	DEF
102.00	102.00	22.00	.0	.00	.0	-42.00	.00	DEF	DEF
97.50	97.50	22.00	.0	.00	.0	-45.00	.00	DEF	DEF
97.50	97.50	22.00	.0	.00	.0	-53.50	.00	DEF	DEF
97.50	97.50	22.00	.0	.00	.0			DEF	DEF

VI.--WATER DATA

UNIT WEIGHT = 62.40 (PCF)
RIGHTSIDE ELEVATION = -11.00 (FT)
LEFTSIDE ELEVATION = -11.00 (FT)
NO SEEPAGE

VII.--SURFACE LOADS
NONE

VIII.--HORIZONTAL LOADS
NONE

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 01-APR-1998 TIME: 10.47.14

SOIL PRESSURES FOR
ANCHORED WALL DESIGN

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I.--HEADING

'COUSINS P STA, EE14149
'BULLNOSE GUIDE WALL BETWEEN NEW AND EXISTING NORTH STA,NEAR B-1,"S"

II.--SOIL PRESSURES

RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

	<-LEFTSIDE PRESSURES->		<---NET PRESSURES----> (SOIL PLUS WATER)	<RIGHTSIDE PRESSURES->	
ELEV. (FT)	PASSIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)
-2.00	.00	.00	.000	.00	.00
-2.50	.00	.00	20.000	20.00	180.00
-3.00	.00	.00	40.000	40.00	360.00
-4.00	.00	.00	80.000	80.00	720.00
-5.00	.00	.00	120.000	120.00	1080.00
-6.00	.00	.00	160.000	160.00	1440.00
-7.00	.00	.00	200.000	200.00	1800.00
-8.00	.00	.00	238.172	238.17	2172.66
-9.00	.00	.00	291.057	291.06	2448.35
-[illegible]0	.00	.00	378.652	378.65	2453.35
[illegible]0	.00	.00	459.444	459.44	2344.71
[illegible]2.00	.00	.00	490.293	490.29	2348.48
-13.00	.00	.00	496.110	496.11	2396.78
-14.00	.00	.00	504.104	504.10	2435.40
-15.00	.00	.00	516.564	516.56	2495.59
-16.00	.00	.00	531.346	531.35	2567.01
-17.00	.00	.00	546.227	546.23	2638.90
-18.00	.00	.00	561.997	562.00	2715.09
-19.00	.00	.00	579.530	579.53	2799.80
-20.00	89.24	18.47	508.749	597.99	2888.97
-21.00	178.44	36.94	438.024	616.47	2978.24
-22.00	267.71	55.41	367.230	634.94	3067.51
-23.00	359.22	74.35	294.665	653.89	3159.02
-24.00	454.98	94.18	218.724	673.71	3254.78
-25.00	552.98	114.46	141.012	693.99	3352.78
-26.00	651.04	134.76	63.246	714.29	3450.84
-26.81	730.80	151.27	.000	730.80	3530.59
-26.91	739.94	153.16	-7.246	732.69	3539.73
-27.00	749.07	155.05	-14.493	734.58	3548.87
-28.00	847.10	175.34	-92.232	754.87	3646.90
-29.00	945.13	195.63	-169.971	775.16	3744.93
-30.00	1043.16	215.92	-247.710	795.46	3842.96
-31.00	1141.19	236.22	-325.448	815.75	3940.99
-32.00	1239.23	256.51	-403.187	836.04	4039.02
-3[illegible]00	1337.26	276.80	-480.926	856.33	4137.05
-[illegible]0	1435.33	297.10	-558.699	876.63	4235.12
[illegible]5.00	1533.32	317.38	-636.404	896.91	4333.11
36.00	1628.51	337.09	-711.896	916.62	4428.31
-37.00	1718.39	355.69	-783.167	935.22	4518.18
-38.00	1805.47	373.71	-852.225	953.24	4605.27

-39.00	1892.47	391.72	-921.215	971.25	4692.26
-40.00	1979.55	409.75	-990.269	989.28	4779.34
[illegible]00	2066.55	427.76	-1059.262	1007.29	4866.34
[illegible]00	2151.04	445.24	-1126.264	1024.77	4950.83
-43.00	2230.74	461.74	-1189.466	1041.27	5030.53
-44.00	2307.93	477.72	-1250.677	1057.25	5107.72
-45.00	2385.04	493.68	-1311.826	1073.21	5184.83
-46.00	2462.19	509.65	-1373.007	1089.18	5261.98
-47.00	2539.33	525.62	-1434.187	1105.15	5339.13
-48.00	2616.48	541.59	-1495.367	1121.12	5416.28
-49.00	2693.63	557.56	-1556.547	1137.09	5493.43
-50.00	2770.78	573.52	-1617.727	1153.06	5570.58
-51.00	2847.93	589.49	-1678.908	1169.02	5647.73
-52.00	2925.08	605.46	-1740.088	1184.99	5724.88
-53.00	3002.23	621.43	-1801.268	1200.96	5802.03
-53.50	3040.81	629.42	-1831.858	1208.95	5840.60
-54.00	3079.38	637.40	-1862.448	1216.93	5879.18
-55.00	3156.53	653.37	-1923.628	1232.90	5956.33
-56.00	3233.68	669.34	-1984.809	1248.87	6033.47
-57.00	3310.83	685.31	-2045.989	1264.84	6110.62
-58.00	3387.98	701.28	-2107.169	1280.81	6187.77
-59.00	3465.13	717.25	-2168.349	1296.78	6264.92
-60.00	3542.28	733.22	-2229.529	1312.75	6342.07
-61.00	3619.43	749.19	-2290.709	1328.72	6419.22
-62.00	3696.57	765.15	-2351.890	1344.68	6496.37
-63.00	3773.72	781.12	-2413.070	1360.65	6573.52
-64.00	3850.87	797.09	-2474.250	1376.62	6650.67
-[illegible]00	3928.02	813.06	-2535.430	1392.59	6727.82
[illegible]00	4005.17	829.03	-2596.610	1408.56	6804.97
[illegible]7.00	4082.32	845.00	-2657.791	1424.53	6882.12
-68.00	4159.47	860.97	-2718.971	1440.50	6959.27
-69.00	4236.62	876.94	-2780.151	1456.47	7036.42
-70.00	4313.77	892.91	-2841.331	1472.44	7113.57
-71.00	4390.92	908.88	-2902.511	1488.41	7190.71

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 01-APR-1998 TIME: 10.47.29

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¤ SUMMARY OF RESULTS FOR ¤
¤ ANCHORED WALL DESIGN ¤
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I.--HEADING

'COUSINS P STA, EE14149
'BULLNOSE GUIDE WALL BETWEEN NEW AND EXISTING NORTH STA,NEAR B-1,"S"

II.--SUMMARY

RIGHTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY FIXED SURFACE WEDGE METHOD.

METHOD	FREE EARTH	EQUIV. BEAM	FIXED EARTH
WALL BOTTOM ELEV. (FT) :	-36.29	-45.37	-43.91
PENETRATION (FT) :	17.29	26.37	24.91
MAX. BEND. MOMENT (LB-FT) :	-44353.	-32067.	-35540.
AT ELEVATION (FT) :	-16.92	-15.22	-15.73
MAX. SCALED DEFL. (LB-IN3) :	8.1099E+09	-3.3173E+09	5.8247E+09
AT ELEVATION (FT) :	-18.00	-39.00	-17.00
ANCHOR FORCE (LB) :	4733.	3828.	4096.

(NOTE: PENETRATION FOR EQUIVALENT BEAM METHOD DOES NOT INCLUDE INCREASE PRESCRIBED BY DRAFT EM 1110-2-2906.)

(NOTE: DIVIDE SCALED DEFLECTION BY MODULUS OF ELASTICITY IN PSI TIMES PILE MOMENT OF INERTIA IN IN**4 TO OBTAIN DEFLECTION IN INCHES.)

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 01-APR-1998 TIME: 10.47.29

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¤ COMPLETE RESULTS FOR ¤
¤ ANCHORED WALL DESIGN ¤
¤ BY FREE EARTH METHOD ¤
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I.--HEADING

'COUSINS P STA, EE14149
'BULLNOSE GUIDE WALL BETWEEN NEW AND EXISTING NORTH STA,NEAR B-1,"S"

II.--RESULTS (ANCHOR FORCE = 4733. (LB))

BENDING SCALED NET

ELEVATION (FT)	MOMENT (LB-FT)	SHEAR (LB)	DEFLECTION (LB-IN3)	PRESSURE (PSF)
-2.00	0.	0.	-4.0496E+08	.00
-2.50	1.	5.	0.0000E+00	20.00
-2.50	1.	-4728.	0.0000E+00	20.00
-3.00	-2360.	-4713.	4.0479E+08	40.00
-4.00	-7047.	-4653.	1.2103E+09	80.00
-5.00	-11653.	-4553.	2.0036E+09	120.00
-6.00	-16140.	-4413.	2.7769E+09	160.00
-7.00	-20467.	-4233.	3.5222E+09	200.00
-8.00	-24594.	-4014.	4.2322E+09	238.17
-9.00	-28480.	-3750.	4.8998E+09	291.06
-10.00	-32070.	-3415.	5.5182E+09	378.65
-11.00	-35282.	-2996.	6.0812E+09	459.44
-12.00	-38043.	-2521.	6.5833E+09	490.29
-13.00	-40317.	-2028.	7.0198E+09	496.11
-14.00	-42096.	-1528.	7.3866E+09	504.10
-15.00	-43369.	-1017.	7.6808E+09	516.56
-16.00	-44126.	-493.	7.9001E+09	531.35
-17.00	-44351.	45.	8.0433E+09	546.23
-18.00	-44030.	600.	8.1099E+09	562.00
-19.00	-43146.	1170.	8.1005E+09	579.53
-20.00	-41698.	1714.	8.0166E+09	508.75
-21.00	-39741.	2188.	7.8607E+09	438.02
-22.00	-37346.	2591.	7.6362E+09	367.23
-23.00	-34584.	2921.	7.3473E+09	294.67
-24.00	-31528.	3178.	6.9986E+09	218.72
-25.00	-28253.	3358.	6.5955E+09	141.01
-26.00	-24837.	3460.	6.1435E+09	63.25
-26.81	-22008.	3486.	5.7439E+09	.00
-26.91	-21683.	3486.	5.6965E+09	-7.25
-27.00	-21359.	3485.	5.6487E+09	-14.49
-28.00	-17894.	3431.	5.1169E+09	-92.23
-29.00	-14522.	3300.	4.5543E+09	-169.97
-30.00	-11320.	3091.	3.9665E+09	-247.71
-31.00	-8366.	2805.	3.3591E+09	-325.45
-32.00	-5737.	2440.	2.7372E+09	-403.19
-33.00	-3511.	1998.	2.1053E+09	-480.93
-34.00	-1766.	1478.	1.4673E+09	-558.70
-35.00	-580.	881.	8.2616E+08	-636.40
-36.00	-30.	207.	1.8393E+08	-711.90
-36.29	0.	0.	0.0000E+00	-732.30

(NOTE: DIVIDE SCALED DEFLECTION BY MODULUS OF ELASTICITY IN PSI TIMES PILE MOMENT OF INERTIA IN IN**4 TO OBTAIN DEFLECTION IN INCHES.)

III.--SOIL PRESSURES

ELEVATION	< LEFTSIDE PRESSURE (PSF) >		<RIGHTSIDE PRESSURE (PSF) >	
(FT)	PASSIVE	ACTIVE	ACTIVE	PASSIVE
-2.00	0.	0.	0.	0.
-2.50	0.	0.	20.	180.
-3.00	0.	0.	40.	360.
-4.00	0.	0.	80.	720.
-5.00	0.	0.	120.	1080.
-6.00	0.	0.	160.	1440.
-7.00	0.	0.	200.	1800.

-8.00	0.	0.	238.	2173.
-9.00	0.	0.	291.	2448.
-10.00	0.	0.	379.	2453.
-11.00	0.	0.	459.	2345.
-12.00	0.	0.	490.	2348.
-13.00	0.	0.	496.	2397.
-14.00	0.	0.	504.	2435.
-15.00	0.	0.	517.	2496.
-16.00	0.	0.	531.	2567.
-17.00	0.	0.	546.	2639.
-18.00	0.	0.	562.	2715.
-19.00	0.	0.	580.	2800.
-20.00	89.	18.	598.	2889.
-21.00	178.	37.	616.	2978.
-22.00	268.	55.	635.	3068.
-23.00	359.	74.	654.	3159.
-24.00	455.	94.	674.	3255.
-25.00	553.	114.	694.	3353.
-26.00	651.	135.	714.	3451.
-26.81	731.	151.	731.	3531.
-26.91	740.	153.	733.	3540.
-27.00	749.	155.	735.	3549.
-28.00	847.	175.	755.	3647.
-29.00	945.	196.	775.	3745.
-30.00	1043.	216.	795.	3843.
-31.00	1141.	236.	816.	3941.
-32.00	1239.	257.	836.	4039.
-33.00	1337.	277.	856.	4137.
-34.00	1435.	297.	877.	4235.
-35.00	1533.	317.	897.	4333.
-36.00	1629.	337.	917.	4428.
-37.00	1718.	356.	935.	4518.

```
1000 'COUSINS P STA, EE14149
1010 'bullnose GUIDE WALL between new and existing north sta,NEAR B-1,"S"
     CONTROL   A  D     1.00     1.00
     WALL       -2.0      -2.5
1040 SURFACE RIGHTSIDE   2
1050       .00      -2.0     100.00      -2.0
1060 SURFACE  LEFTSIDE   2
1070       .00     -19.0     100.00     -19.0
1080 SOIL RIGHTSIDE  STRENGTH   10       .00       .00
1100   120.00 120.00  30.00 0.00     .00       .00    -10.00    .00   .00   .00
1110    90.00   90.00  22.00  0.00     .00       .00    -12.00    .00   .00   .00
1120    75.00   75.00   22.00  0.00     .00       .00    -14.00    .00   .00   .00
1130    95.00   95.00  22.00  0.00     .00       .00    -18.00    .00   .00   .00
1140   103.00  103.00  22.00  0.00     .00       .00    -23.00    .00   .00   .00
1150   107.00  107.00  22.00  0.00     .00       .00    -36.00    .00   .00   .00
1160   102.00  102.00  22.00  0.00     .00       .00    -42.00    .00   .00   .00
1170    97.50   97.50  22.00  0.00     .00       .00    -45.0     .00   .Q0   .00
1172    97.5     97.5  22.00   0.0      0        0       -53.5     0     0     0
1178     97.5    97.5  22.0   0         0        0                       0     0
1180 SOIL  LEFTSIDE  STRENGTH    6      .00       .00
1200   103.00  103.00  22.00  0.00     .00       .00    -23.00    .00   .00   .00
1210   107.00  107.00  22.00  0.00     .00       .00    -36.00    .00   .00   .00
1220   102.00  102.00  22.00  0.00     .00       .00    -42.00    .00   .00   .00
1230    97.50   97.50  22.00  0.00     .00       .00    -45        0    .00   .00
1334     97.5    97.5  22.0   0.0       0        0       -53.5     0     0     0
1238     97.5     97.5 22.0   0.0       0        0                       0     0
1240 WATER ELEVATIONS    62.40    -11.0    -11.0
1250 FINISH
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Letter Dated 21 May 1999

EUSTIS ENGINEERING COMPANY, INC.
GEOTECHNICAL ENGINEERS
CONSTRUCTION QUALITY CONTROL & MATERIALS TESTING
3011 28th Street • Metairie, Louisiana 70002 • 504-834-0157 / Fax 504-834-0354 / E-mail EustisEngr@aol.com

21 May 1999

West Jefferson Engineering Services
A Joint Venture
615 Fourth Street
Westwego, Louisiana 70094

Attention Mr. Oscar Pena

Gentlemen:

Geotechnical Information
Flume Barge Structure
West Jefferson Levee District
Cousins Pumping Station to First Avenue Canal
Harvey, Louisiana

As requested, Eustis Engineering Company, Inc., is providing in this letter geotechnical information regarding the flume barge structure planned in the Harvey Canal beneath the Lapalco Bridge. Eustis Engineering will provide a final report on the selected alternatives. This letter is limited in scope to respond to Comments 1 through 3 of the 95% design memorandum and is provided as a basis for you and the U.S. Army Corps of Engineers to decide a final design selection for support of the barge.

Three borings were made to investigate the barge design and entry guide walls. Borings 12 and 13 were completed in March 1999. Boring 3 was drilled in July 1997. A boring location plan is provided on Enclosure 1. Copies of these three boring logs are presented in the Appendix of this letter.

Subsoil Profile DD is shown on Enclosure 2. This profile delineates subsurface conditions at the proposed barge flume location. Selected design soil parameters for Borings 3, 12, and 13 are given graphically on Enclosure 3.

Flume Barge

We understand the flume barge will be installed beneath the Lapalco Boulevard bridge. The barge structure will be 124-ft wide and 111-ft long (parallel with the canal). The barge hull will be 7-ft high with wingwalls extending 20.5 feet above the top side of the barge section. The barge structure will be constructed of light weight concrete panels and will displace approximately 5.25 feet of water without any ballast. The barge will be floated into place and slowly flooded and sunk to bear on a 2-ft thick crushed stone pad. The top of this crushed stone pad will be at el -16 (NGVD).

To provide the necessary excavation to el -18 for placement of the crushed stone pad, sheetpile walls will be placed on the west and east sides of the excavation to retain the soil in these areas. The north and south ends of the excavation will be sloped at 1 vertical to 10 horizontal.

After installation of the barge is complete, the east and west sheetpile walls will be left in place and used to provide seepage cutoff along the east and west edges of the barge. High density cement grout will be placed between the sheetpiles and barge hull to block off potential seepage coming up from the crushed stone pad beneath the barge. Flood protection walls will tie directly into the wingwalls of the barge.

After the barge is in place and flooded with water, we understand the effective unit bearing pressure at the base of the barge will vary between 155 and 195 psf. The average long term effective pressure will be 175 psf.

The barge may be grade supported. However, we understand the more likely plan is to install twenty-four 24-in. diameter open end steel pipe piles through the barge hull as pin piles. There will be two rows of 12 piles each. The pile rows will be perpendicular to the canal centerline and will have center to center spacings of 76 feet. The center to center pile spacing in the two rows will be 10.83 feet. The piles will be grouted to the barge hull fixing the piles to the barge. The estimated maximum compressive load per pile to carry the buoyant load of the water-flooded barge is 60 tons per pile.

Consideration is also being given to designing the barge foundation for future dewatering and maintenance. For this design, the pile sizes will be increased to 36 inches in diameter to support hydrostatic uplift loads of 154 tons per pile.

Another alternative will be to ballast the barge with concrete rather than water. For this case, the effective unit bearing pressure at the base of the barge would vary between 621 and 646 psf. We understand if the barge is fully displaced with concrete, the barge will be supported on twenty-four 36-in. diameter pipe piles with an estimated required design compressive load of 189 tons per pile.

Grade Supported Barge

Bearing Capacity. The ultimate recommended gross allowable bearing capacity for the barge seated at el -16 is 760 psf. This includes a factor of safety of 3 against a bearing failure.

Settlement. If the barge is grade supported with no piles, we have estimated long term settlement for the barge. Assuming a sustained effective bearing pressure of 175 psf, the long term settlement is estimated to be 0.75 to 1.25 inches. If the sustained load is 630 psf, the expected long term settlement is 8 to 9 inches.

Sliding. If the barge is grade supported, lateral loads will be imposed on the barge due to currents in the canal. The total drag load on the barge base due to flow of the water through the flume is 27.2 kips. This results in an imposed uniformly distributed load of 2 psf along the base of the barge. The factor of safety against sliding in this direction due to the current is 50 or more.

Lateral loading from west to east will be imposed on the barge from differential earth and/or water pressure. Ignoring the presence of the sheetpile walls immediately to the west and east of the barge and assuming the ground surface is at el 2 and -6 on the west and east sides, respectively, there is no net earth pressure load on the barge. However, anticipating the water surface could be at el 2 on the west side of the barge and el -1 on the east, we estimate this resultant net lateral load on the barge due to differential water head is 336 kips. This will result in an imposed uniformly distributed load of 24 psf on the base of the barge. The minimum calculated factor of safety against sliding for this condition is 4 or more.

Sheetpile Analyses

West Sheetpile Wall. The sheetpile wall to be used on the west side of the excavation for the barge was assumed to be an anchored structure. The ground surface was assumed to be at el 2 on the west side of the wall and to an excavation depth of el -18 on the canal side of the wall. Infinite surcharges of zero and 200 psf were assumed at the top of the wall. Ground water was assumed to be at el 0 on the west side and at el -1.0 on the east side of the wall. On the basis of these assumptions, anchored sheetpile analyses were performed by the free earth support method using the Corps of Engineers CWALSHT program. Factors of safety of 1.0 and 1.5 applied to the soil parameters were considered. Results of the computer analyses are presented on Enclosure 4. The calculated maximum sheetpile moment, wall tip elevation, horizontal anchor force, maximum scaled deflection, and net pressure diagrams are also presented on Enclosure 4.

Assuming a cantilevered sheetpile wall will be used as a tie-back wall to provide anchor support, a cantilever wall analysis was performed assuming a tie-back force of 4.95 kips per foot. This force represents a load 1.5 times the calculated (unfactored) horizontal anchor force with an infinite surcharge of 200 psf on the anchored wall. The resulting cantilevered wall net pressure diagram is given on Enclosure 4 along with the calculated maximum moment in the sheetpile. The analysis shows the sheetpile should penetrate to el -19.5. Note the cantilevered tie-back sheetpile should be 55 feet or more away from the anchored wall in order that the cantilever wall can develop full passive pressures.

East Sheetpile Wall. A sheetpile wall will be installed to maintain the existing bank on the east side of the excavation for the flume barge. For the analyses, we assumed the mudline east of the sheetpile wall will be at el -6 for 35 feet and will slope down to el -15.5 at a location 55 feet beyond the break in the slope at el -6. It was further assumed the water level on both sides of the sheetpile wall will be at el 0 and at no time will the wall be subjected to differential water head.

Cantilevered sheetpile wall analyses were performed using the CWALSHT program. Results of the analyses are given on Enclosure 5. Analyses were performed for both a factor of safety of 1.0 and 1.5 applied to the soil parameters. The calculated maximum moment, required sheetpile tip elevation, maximum scaled deflection and net pressure diagrams are also presented on Enclosure 5.

Pile Supported Barge

Axial Pile Load Capacity. Using the selected soil parameters presented on Enclosure 3, we have developed allowable axial pile load capacities for 24 and 36-in. diameter open end pipe piles for support of the barge. Results of the analyses are presented graphically on Enclosure 6. A factor of safety of 2.0 has been incorporated into the analyses to provide the allowable compressive and tensile loads.

For the consideration of future dewatering, the 36-in. diameter piles will not have adequate uplift capacity with the tip at el -100. No borings were drilled below this elevation. Assuming normally consolidated clay soils continue below el -100, the pile tips will need to penetrate to el -133 to support the uplift load of 154 tons per pile. Similarly, if the barge is ballasted with concrete rather than water, the required allowable compressive capacity for individual 36-in diameter pipe piles is 189 tons. This capacity is estimated to be achieved at el -123.

Group Lateral Load Analyses. If the barge structure is supported on piling, lateral loads will be imposed on the piling. Assuming the lateral load from west to east on the barge is 336 kips, we have performed lateral load analyses on the pile group using the program Group 4.0 developed by Ensoft, Inc. This program incorporates p-y (lateral load-deflection) and t-z (axial load-deflection) data. For the analyses, the pile group was assumed to contain 12 piles in a row. Center to center spacing of the piles was taken to be 10 feet, 10 inches. The lateral load was assumed to be in the direction concentric and parallel with a line through the centerline of the pile group. Pile heads were assumed to be fixed from rotation and the pile wall thicknesses were assumed to be 0.75 inches.

Three cases were analyzed. The first case assumes the barge ballast will be water and the barge will be supported entirely by twenty-four 24-in. diameter pipe piles. The lateral load for the 12-pile group was assumed to be 168 kips. The vertical axial load to be supported by the pile group for the lateral load analyses was assumed to be 1,400 kips. Results of the group analyses indicate the pile must extend to el -100 to support the added induced axial load to satisfy moment equilibrium. The calculated lateral displacement of the group is 0.17 inch. The maximum pile moment is 2,050 kip-inches and the maximum pile stress is 12.1 ksi.

The second case analyzed is the dewatering case where the pile size will be 36-in. diameter. The lateral load was taken to be 168 kips for the 12-pile group with an uplift vertical group axial load of 3,696 kips. The calculated lateral displacement of the pile group is 0.30 inch. The maximum pile moment is 1,980 kip-inches and the maximum pile stress is 11.4 ksi. For this case, the pile tip must extend to el -133 to support the added induced vertical load in the lateral group analysis.

The third case assumes the barge will have been filled with concrete as ballast. It was assumed the vertical load imposed on the 12-pile (36-in. diameter) group is 4,536 kips (buoyant weight of the ballasted barge) and the group lateral load is 168 kips. The analyses show the calculated lateral displacement is 0.14 inch, the maximum moment in the piles is 4,320 kip-inches and the maximum stress in the piles is 16.4 ksi. The pile tips must reach el -150 to provide adequate axial capacity for induced loads in the lateral group analysis.

Our group analyses indicate additional penetration is necessary to support axial loads induced by overturning moments. Your structural engineer should further evaluate these design cases.

West Jefferson Engineering Services
A Joint Venture

21 May 1999

Additional Boring

At least one soil boring will be necessary to confirm soil conditions below el -100 if piles are planned below this level. Based on the group lateral load analyses, a boring to at least el -150 may be necessary.

This letter is presented for your use in refining your selection of the design for the barge. If you have any questions, please do not hesitate to call.

Very truly yours,

EUSTIS ENGINEERING COMPANY, INC.

THOMAS H. STREMLAU, P.E.

STATE OF LOUISIANA
THOMAS H. STREMLAU
REG. NO. 16249
REGISTERED
PROFESSIONAL ENGINEER
IN
CIVIL ENGINEERING

THS:aln/mcp

Enclosures 1 through 6 and Appendix

Copy w/Enclosures to:
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Attention Mr. Jens Nielsen
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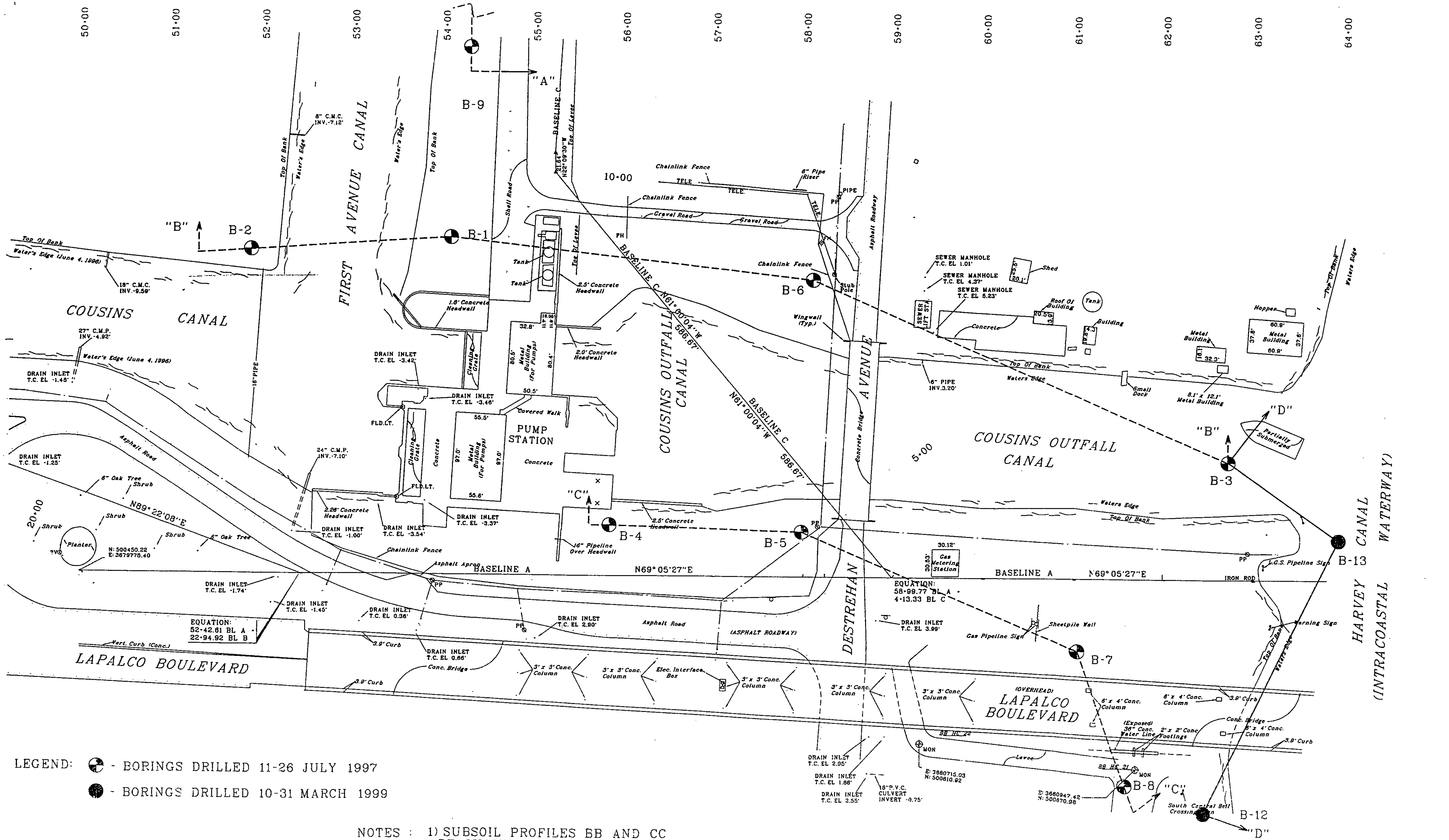
Design Engineering, Inc.
Suite 205
3330 West Esplanade Avenue
Metairie, Louisiana 70002
Attention Mr. John Holtgreve
Fax Number 836-2159

EE 15845



LEGEND: - BORINGS DRILLED 11-26 JULY 1997

- BORINGS DRILLED 10-31 MARCH 1999

NOTES :
1) SUBSOIL PROFILES BB AND CC ARE SHOWN ON FIGURES 4 AND 5 OF REPORT DATED 7 OCTOBER 1997.
2) SUBSOIL PROFILE DD IS SHOWN ON FIGURE 4.

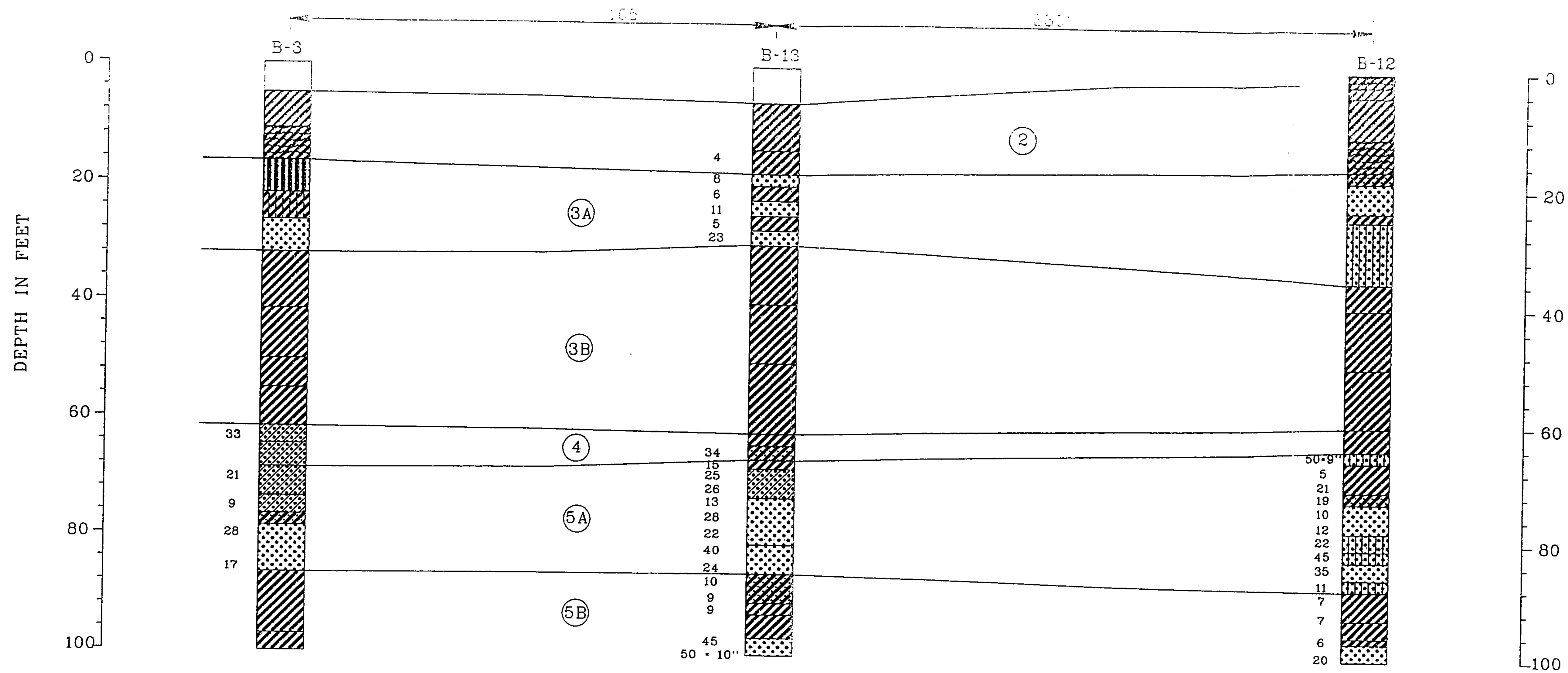
0 50' 100'
SCALE

LOCATION OF BORINGS

WEST JEFFERSON LEVEE DISTRICT
COUSINS PUMPING STATION TO FIRST AVENUE CANAL
HARVEY, LOUISIANA

FIGURE 1

EUSTIS ENGINEERING COMPANY, INC.



STRATUM NO.	GEOLOGIC FORMATION	DESCRIPTION
(1)	FILL	NONE PRESENT
(2)	SWAMP/MARSH	VERY SOFT TO SOFT GRAY AND DARK GRAY CLAY AND ORGANIC CLAY WITH ORGANIC MATTER, WOOD, ROOTS AND HUMUS LAYERS.
(3a)	DELTAIC PLAIN DEPOSITS	LOOSE TO MEDIUM DENSE GRAY SAND, SILTY SAND AND SANDY SILT, WITH LAYERS OF VERY SOFT TO SOFT GRAY CLAY AND SILTY CLAY.
(3b)	DELTAIC PLAIN DEPOSITS	VERY SOFT TO MEDIUM STIFF GRAY CLAY WITH SAND LENSES AND POCKETS.
(4)	NEARSHORE GULF DEPOSITS	MEDIUM STIFF TO VERY STIFF GRAY CLAY AND SANDY CLAY AND LOOSE TO DENSE CLAYEY SAND.
(5a)	PLEISTOCENE DEPOSITS	LOOSE TO DENSE GREENISH GRAY, GRAY AND TAN AND GRAY SAND, SILTY SAND AND CLAYEY SAND WITH ISOLATED LAYERS OF MEDIUM STIFF TO STIFF GREEENISH GRAY CLAY AND SANDY CLAY.
(5b)	PLEISTOCENE DEPOSITS	MEDIUM STIFF TO STIFF GRAY AND GRAY AND TAN CLAY AND SANDY CLAY WITH ISOLATED LAYERS OF MEDIUM DENSE TO VERY DENSE GRAY SILTY SAND AND SAND.

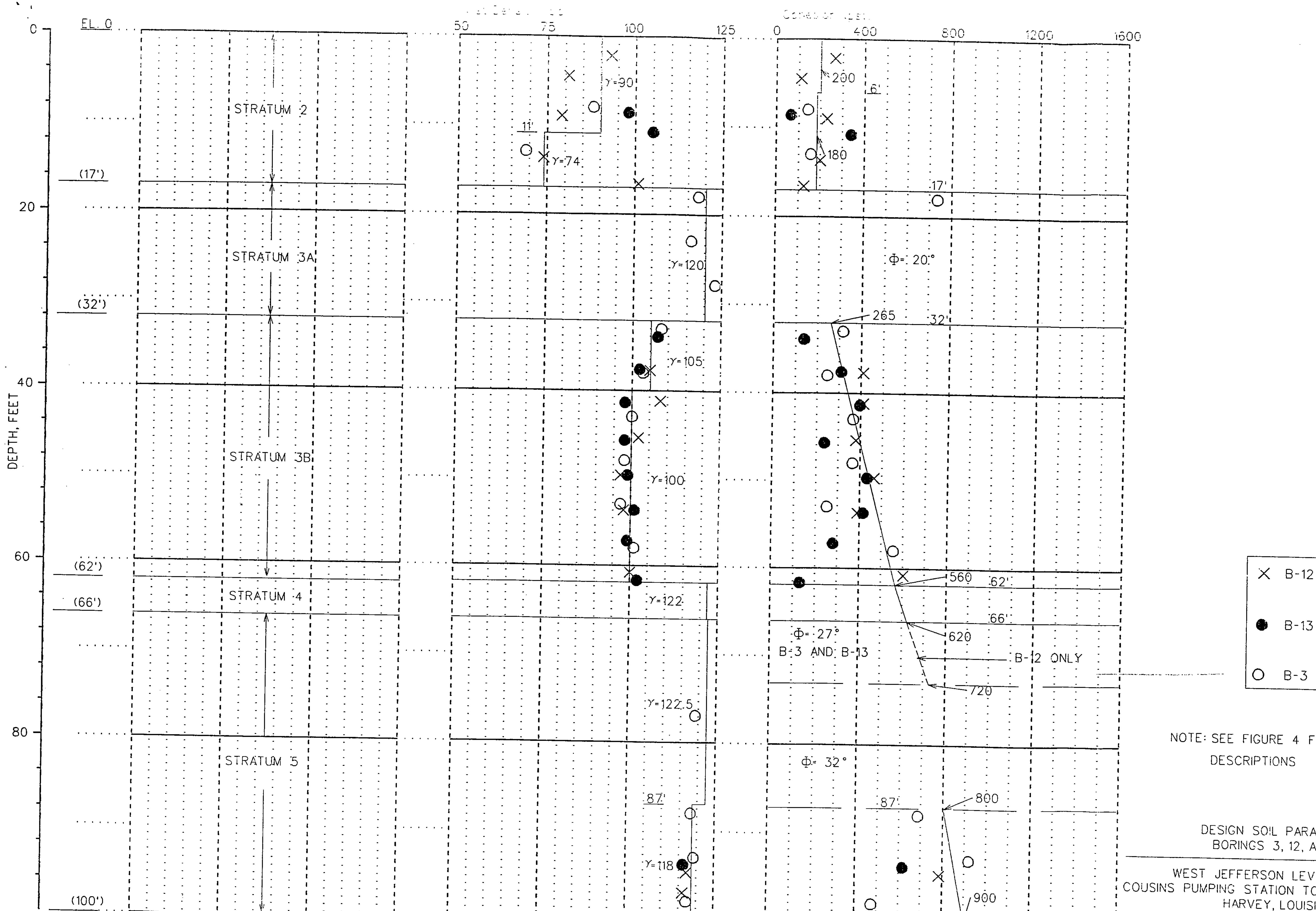
NOTE : NOTE NUMBERS TO LEFT OF LOGS ARE RESULTS OF STANDARD PENETRATION TESTS.

SUBSOIL PROFILE DD

WEST JEFFERSON LEVEE DISTRICT
COUSINS PUMPING STATION TO FIRST AVENUE CANAL
HARVEY, LOUISIANA

EUSTIS ENGINEERING COMPANY, INC.

ENCLOSURE 2



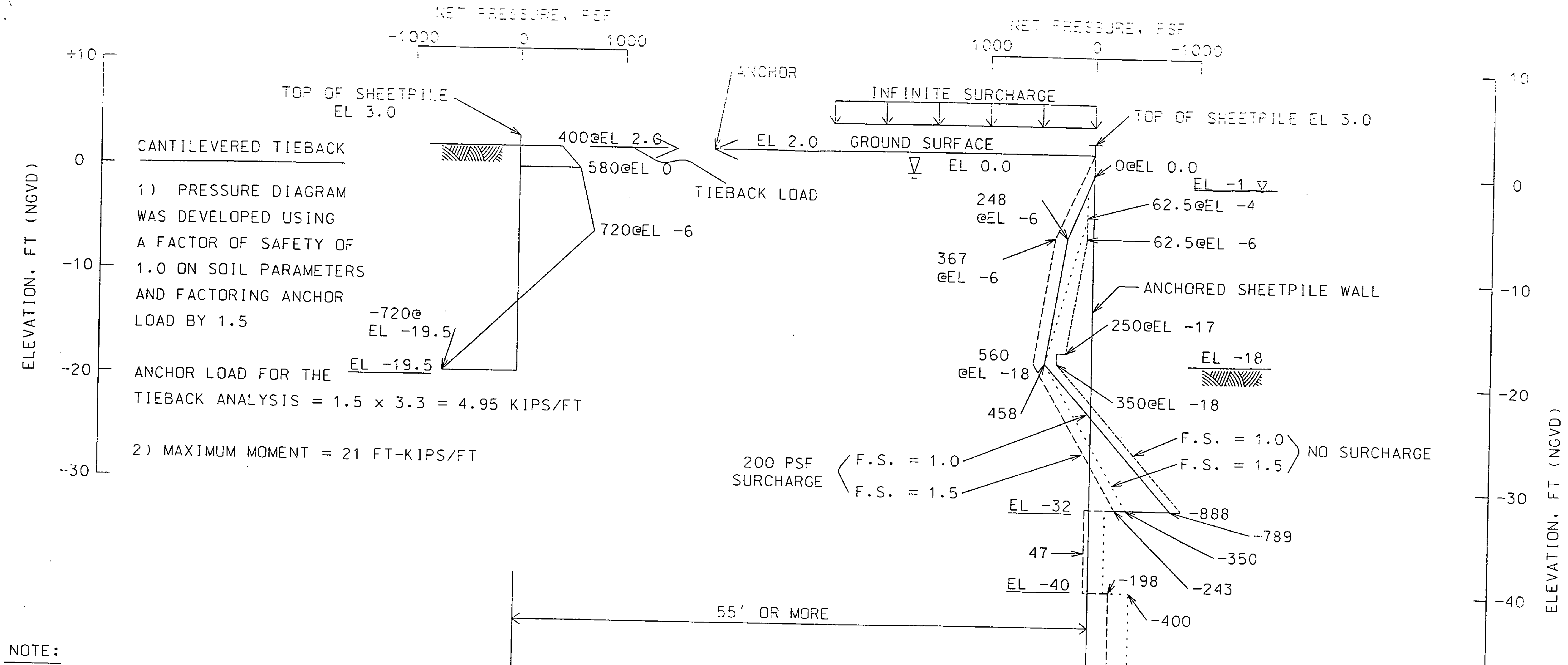
EUSTIS ENGINEERING COMPANY, INC.

NOTE: SEE FIGURE 4 FOR GEOLOGIC DESCRIPTIONS

DESIGN SOIL PARAMETERS
BORINGS 3, 12, AND 13

WEST JEFFERSON LEVEE DISTRICT
COUSINS PUMPING STATION TO FIRST AVE CANAL
HARVEY, LOUISIANA

ENCLOSURE 3



NOTE:

1) ANCHOR WALL ANALYSIS HAS BEEN PERFORMED BY THE FREE EARTH SUPPORT METHOD.
2) DIVIDE SCALED DELFECTION BY MODULUS OF ELASTICITY IN PSI TIMES THE PILE MOMENT OF INERTIA IN INCHES TO THE 4TH POWER TO OBTAIN DEFLECTION IN INCHES.
3) THE ANCHOR SHEETPILE WALL WILL REMAIN IN PLACE AFTER CONSTRUCTION FOR CONTROL OF UNDER SEEPAGE AND PIPING. IF THE SHEETPILES PENETRATE TO AT LEAST EL -32, A FACTOR OF SAFETY OF 4 OR MORE WILL BE ACHIEVED AGAINST PIPING CONDITIONS USING THE HARR METHOD.
4) SOIL PARAMETERS HAVE BEEN TAKEN FROM FIGURE 6.

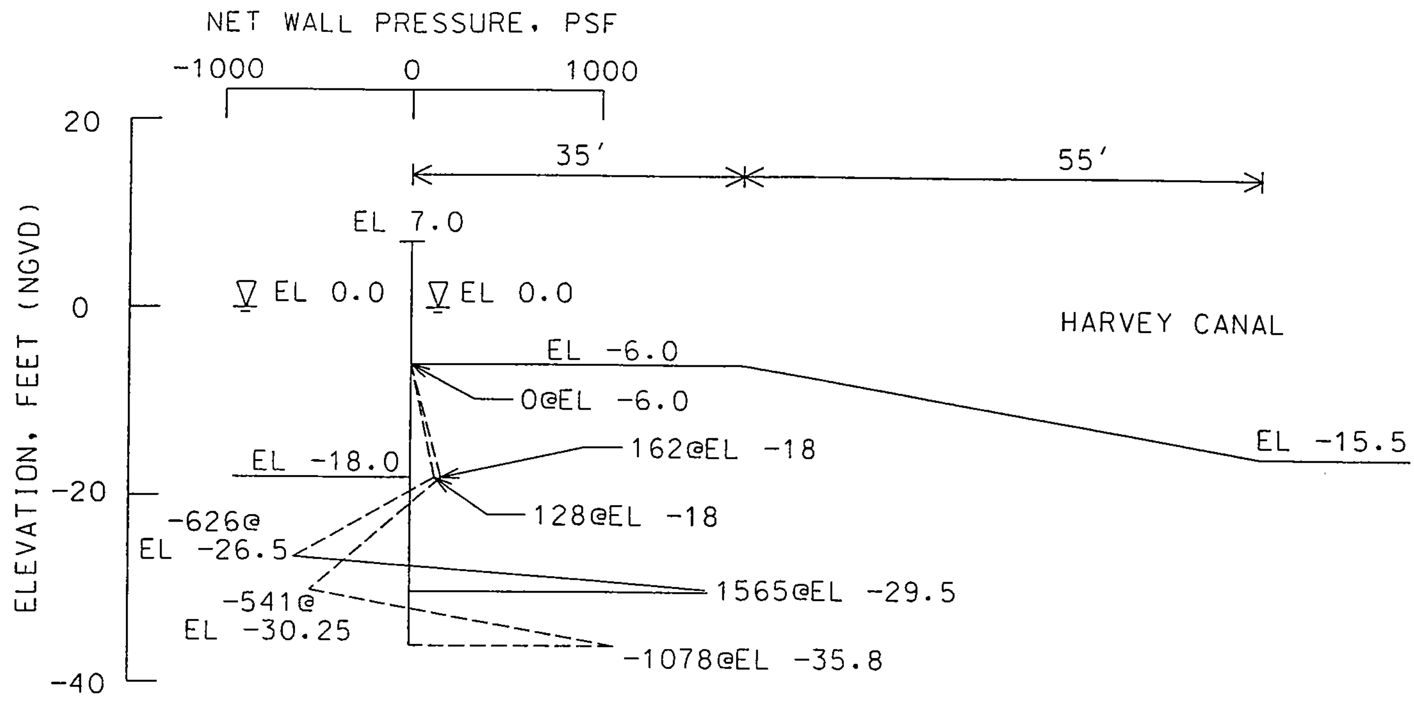
ANCHOR WALL SUMMARY

INFINITE SURCHARGE PSF	FACTOR OF SAFETY	MAXIMUM MOMENT FT-KIPS PER FT OF WALL	WALL BOTTON ELEVATION	HORIZONTAL ANCHOR FORCE KIPS/FT OR WALL	SCALED DEFLECTION LB-IN^3 PER FT OF WALL
200	1.0	35.8	-32.0	3.3	6.6×10^{9} @EL -14.0
200	1.5	84.3	-52.7	7.0	3.8×10^{10} @EL -22.0
0	1.0	17.5	-28.0	1.5	3.6×10^{9} @EL -13.0
0	1.5	35.1	-40.3	2.9	1.1×10^{10} @EL -18.0

EUSTIS ENGINEERING COMPANY, INC.

ANCHORED SHEETPILE WALL DESIGN
WEST SIDE OF BARGE FLUME EXCAVATION

WEST JEFFERSON LEVEE DISTRICT
COUSINS PUMPING STATION TO FIRST AVE CANAL
HARVEY, LOUISIANA



FACTOR OF SAFETY	MAX MOMENT FT-KIPS PER FT OF WALL	WALL BUTTON ELEVATION	SCALED DEFLECTION LB-IN^3@EL 7.0 PER FT OF WALL
1.0	5.8	-29.5	2.6×10^9
1.5	10.5	-35.8	7.2×10^9

NOTE: 1) THE SHEETPILE WILLBE LEFT IN PLACE FOR CONTROL OF UNDER SEEPAGE AND PIPING. THE SHEET PILES PENETRATING TO EL -35.8 WILL PROVIDE AT LEAST A FACTOR OF SAFETY OF 4 AGAINST PIPING USING THE HARR METHOD OF ANALYSIS.

2) DIVIDE SCALED DEFLECTION BY MODULUS OF ELASTICITY IN PSI TIMES THE PILE MOMENT OF INERTIA IN INCHES TO THE 4TH POWER TO OBTAIN DEFLECTION IN INCHES.

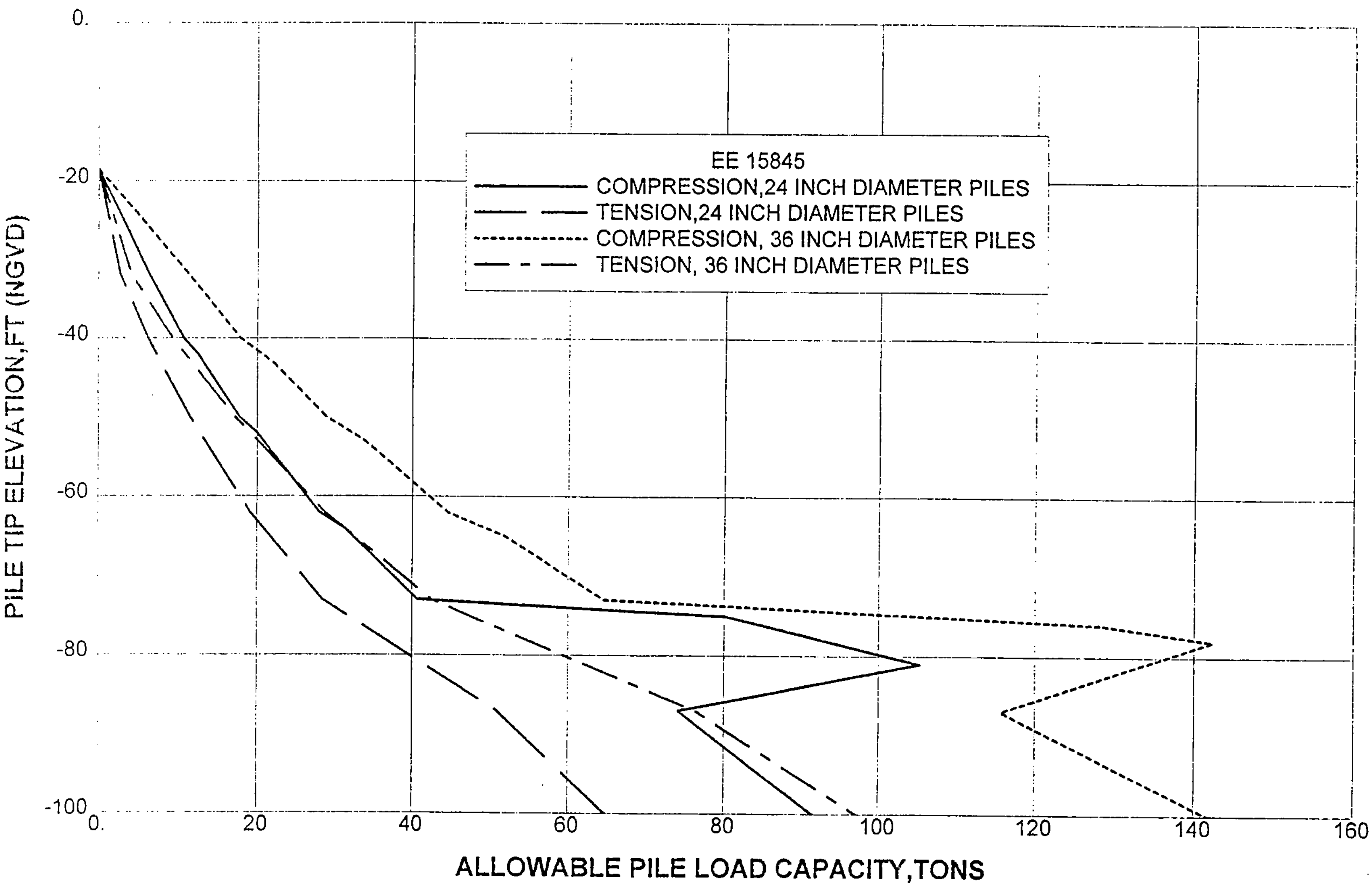
3) SOIL PARAMETERS ARE TAKEN FROM ENCLOSURE 3.

CANTILEVERED SHEETPILE WALL DESIGN
EAST SIDE OF BARGE FLUME EXCAVATION

WEST JEFFERSON LEVEE DISTRICT
COUSINS PUMPING STATION TO FIRST AVE CANAL
HARVEY, LOUISIANA

ALLOWABLE PILE LOAD CAPACITIES,(FS = 2)

OPEN END STEEL PIPE PILES
FLUME BARGE STRUCTURE



APPENDIX

LEGEND AND NOTES FOR LOG OF BORING AND TEST RESULTS

PP — Pocket penetrometer resistance in tons per square foot

TV — Torvane shear strength in tons per square foot

SPT — Standard Penetration Test. Number of blows of a 140-lb. hammer dropped 30 inches required to drive 2-in O.D., 1.4-in. I.D. sampler a distance of one foot into the soil, after first seating it 6 inches

SPLR — Type of Sampling: Shelby, SPT, Auger, No Sample

SYMBOL — Clay, Silt, Sand, Humus. Predominant type shown heavy; Modifying type shown light

DENSITY — Unit weight in pounds per cubic foot

USC — Unified Soil Classification

TYPE

UC	Unconfined compression shear
OB	Unconsolidated undrained triaxial compression shear on one specimen confined at the approximate overburden pressure
UU	Unconsolidated undrained triaxial compression shear
CU	Consolidated undrained triaxial compression shear
DS	Direct shear
CON	Consolidation
PD	Particle size distribution
k	Coefficient of permeability in centimeters per second
SP	Swelling pressure in pounds per square foot

ϕ — Angle of internal friction in degrees

c — Cohesion in pounds per square foot

Other laboratory test results reported on separate figure

Ground Water Measurements — ▼ Initial — ▽ Final

GENERAL NOTES

(1) At the time the borings were made, ground water levels were measured below existing ground surface. These observations are shown on the boring logs. However, ground water levels may vary due to seasonal and other factors. If important to construction, the depth to ground water should be determined by those persons responsible for construction, immediately prior to beginning work.

(2) While the individual logs of borings are considered to be representative of subsurface conditions at their respective locations on the dates shown, it is not warranted that they are representative of subsurface conditions at other locations and times.

EUSTIS ENGINEERING COMPANY, INC.

LOG OF BORING AND TEST RESULTS

WEST JEFFERSON LEVEE DISTRICT
COUSINS PUMPING STATION TO 1ST AVENUE CANAL
HARVEY, LOUISIANA

Ground Elev.: **Datum:** **Gr. Water Depth:** 0.0 **Job No.:** 14149 **Date Drilled:** 7/17/96 **Boring:** 3 **Refer to "Legends & Notes"**

Scale In Feet	PP	SPT	SPLR	Symbol	Visual Classification	USC	Sample Number	Depth In Feet	Water Content Percent	Density Dry	Density Wet	Shear Tests Type	Shear Tests φ	Shear Tests C	Atterberg Limits LL	Atterberg Limits PL	Atterberg Limits PI		Other Tests
0					Water														
					Very soft dark gray clay w/roots & organic matter	CH	1	8-9	90	46	88	OB	--	140					
10																			
					Very soft dark gray organic clay w/roots & wood	OH	2	13-14	259	20	69	UU	0	155					
					Medium compact gray sandy silt w/clayey silt layers & wood	ML	3	18-19	32	89	118	OB	--	735					
20																			
	0.20				Very soft gray silty clay	CL	4	23-24	37	85	116	UC	--	200					
					Loose to medium dense gray fine sand	SP	5	28-29	29	95	123								
30																			
		5					6	31-32											
	0.20				Very soft to soft gray clay w/fine sand lenses	CH	7	33-34	44	75	108	UU	0	315					
	0.20						8	38-39	55	67	103	UC	--	245					
40																			
	0.25				Soft gray clay	CH	9	43-44	62	62	100	UC	--	365					
	0.30						10	48-49	61	60	98	UC	--	365					
50																			

Comments:

EUSTIS ENGINEERING COMPANY, INC.

LOG OF BORING AND TEST RESULTS

WEST JEFFERSON LEVEE DISTRICT
COUSINS PUMPING STATION TO 1ST AVENUE CANAL
HARVEY, LOUISIANA

Ground Elev.: Datum: **Gr. Water Depth:** 0.0 **Job No.:** 14149 **Date Drilled:** 7/17/96 **Boring:** 3 Refer to "Legends & Notes"

Scale In Feet	PP	SPT	SPLR	Symbol	Visual Classification	USC	Sample Number	Depth In Feet	Water Content Percent	Density Dry	Density Wet	Shear Tests Type	Shear Tests φ	Shear Tests C	Atterberg Limits LL	Atterberg Limits PL	Atterberg Limits PI		Other Tests
50					Soft gray clay	CH													
	0.30						11	53-54	61	60	97	UC	--	250					
					Medium stiff gray clay	CH													
	0.30						12	58-59	58	64	101	UU	0	555					
60																			
					Loose gray clayey sand w/shells	SC	13	63-64											
		33			Dense gray clayey sand w/shells	SC	14	65-66	25										
		21			Medium dense gray clayey sand	SC	15	69-70											
70																			
		9			Loose gray & tan clayey sand w/fine sand layers	SC	16	74-75											
	0.25				Soft greenish-gray & tan sandy clay w/clayey sand layers	CL	17	77-78	27	93	119	OB	--	300					
		28			Medium dense gray fine sand w/clay layers	SP	18	79-80											
80																			
		17					19	84-85											
	0.60				Medium stiff gray clay w/sand pockets & shells	CH	20	88-89	32	89	118	UC	--	685					
90																			
	0.60						21	93-94	31	91	119	UU	0	920					
	0.50				Soft gray clay w/shells & sand pockets	CH	22	98-99	33	88	117	UC	--	475					
100																			

Comments:

EUSTIS ENGINEERING COMPANY, INC.

LOG OF BORING AND TEST RESULTS

WEST JEFFERSON LEVEE DISTRICT
COUSINS PUMPING STATION TO FIRST AVENUE CANAL
HARVEY, LOUISIANA

Ground Elev.: **Datum:** **Gr. Water Depth:** See Text **Job No.:** 15845 **Date Drilled:** 3/10-11/99 **Boring:** 12 **Refer to "Legends & Notes"**

Scale In Feet	PP	SPT	SPLR	Symbol	Visual Classification	USC	Sample Number	Depth In Feet	Water Content Percent	Density		Shear Tests			Atterberg Limits				Other Tests
										Dry	Wet	Type	φ	C	LL	PL	PI		
0					Soft dark gray organic clay w/roots & shell fragments	OH	1	0-0.5	38										
					Soft gray & tan clay w/roots, shell fragments, & organic clay layers	CH	2C	2.2-3.12	56	59	93	UU	0	265	104	37	67		
					Very soft gray clay w/humus, roots, decayed wood, & organic clay	CH	3B	4.5-5.42	154	32	81	UC	--	110					
10							4C	9-9.92	126	35	79	UC	--	230					
					Very soft gray organic clay w/decayed wood & humus	OH	5C	13.7-14.62	149	30	74	UU	0	200	224	72	152		
					Very soft gray sandy clay	CL	6B	16.6-17.52	62	62	101	UC	--	125					
20					Loose gray sand w/clay layers	SP	7A	20-20.92	38										
					Soft gray clay w/sand pockets	CH	8A	24-24.92	64										
					Loose gray silty sand w/decayed wood	SM	9A	28-28.92	47										
30							10A	32-32.92	35										
					Soft gray clay w/sand lenses	CH	11C	37.7-38.62	47	71	105	UC	--	410					
40					Soft gray clay	CH	12C	41.2-42.12	42	76	108	UU	--	412	60	20	40		
							13C	45.4-46.32	48	69	102	UC	--	380					
50																			

Comments: Undisturbed samples obtained with 5-in. diameter fixed piston device.

EUSTIS ENGINEERING COMPANY, INC.

LOG OF BORING AND TEST RESULTS

WEST JEFFERSON LEVEE DISTRICT
COUSINS PUMPING STATION TO FIRST AVENUE CANAL
HARVEY, LOUISIANA

Ground Elev.: Datum: **Gr. Water Depth:** See Text **Job No.:** 15845 **Date Drilled:** 3/10-11/99 **Boring:** 12 **Refer to "Legends & Notes"**

Scale In Feet	PP	SPT	SPLR	Symbol	Visual Classification	USC	Sample Number	Depth In Feet	Water Content Percent	Density		Shear Tests			Atterberg Limits				Other Tests
										Dry	Wet	Type	φ	C	LL	PL	PI		
50					Soft gray clay w/sand lenses	CH	14C	49.7-50.62	65	59	97	UC	--	465	100	26	74		
							15C	53.7-54.62	58	62	98	UC	--	390					
							16A	56-56.92	60										
60					Medium stiff gray clay w/shell fragments	CH	17B	60.8-61.72	67	64	100	UU	0	603	88	26	62		
		50=9"			Very dense gray & tan silty sand	SM	18	64-65.5	23										
		5			Medium stiff to stiff greenish-gray clay w/sand pockets	CH	19	66.5-68											
70		21					20	69-70.5	20										
		19			Stiff gray & brown sandy clay	CL	21	71.5-73	25										
		10			Medium dense gray sand	SP	22	74-75.5	26										
		12					23	76.5-78	26										
80		22			Medium dense gray silty sand	SM	24	79-80.5	28										
		45			Dense gray silty sand	SM	25	81.5-83	28										
		35			Dense gray sand	SP	26	84-85.5	23										
		11			Medium dense gray silty sand	SM	27	86.5-88	26										
90		7			Medium stiff gray clay w/sand pockets & shell fragments	CH	28	89-90.5	32										
		7					29	91.5-93	32										
					Medium stiff gray & tan clay w/sand pockets & shell fragments	CH	30C	94.7-95.62	32	88	117	UU	--	785	54	17	37		
		6			Medium stiff gray clay w/sand pockets & concretions	CH	31A	97-97.92	39	84	116	UC	--	150					
100		20			Med. dense gr. silty sand & sand	SP-SM	32	98.5-100	28										

Comments: Undisturbed samples obtained with 5-in. diameter fixed piston device.

EUSTIS ENGINEERING COMPANY, INC.

LOG OF BORING AND TEST RESULTS

WEST JEFFERSON LEVEE DISTRICT
COUSINS PUMPING STATION TO FIRST AVENUE CANAL
HARVEY, LOUISIANA

Ground Elev.: Datum: Gr. Water Depth: Job No.: 15845 Date Drilled: 3/30-31/99 Boring: 13 Refer to "Legends & Notes"

Scale In Feet	PP	SPT	SPLR	Symbol	Visual Classification	USC	Sample Number	Depth In Feet	Water Content Percent	Density Dry	Density Wet	Shear Tests Type	Shear Tests φ	Shear Tests C	Atterberg Limits LL	Atterberg Limits PL	Atterberg Limits PI		Other Tests
0					Water														
					Very soft & soft gray clay w/sand lenses & layers, shell fragments, humus layers, & roots	CH	1D	8.6-9.52	73	56	98	UC	–	65					
10							2B	10.8-11.72	49	70	105	UU	0	339	60	19	41		
		4			Soft gray clay w/sand pockets	CH	3	14.0-15.5	73										
		8					4	16.5-18	35										
					Loose gray sand w/silt pockets	SP	5	18.5-20	37										
20		6			Soft gray clay w/sand pockets	CH	6	21.0-22.5	53										
		11			Medium dense gray sand	SP	7	23.5-25	38										
		5			Soft gray clay w/sand pockets	CH	8	26.0-27.5	37										
		23			Medium dense gray sand	SP	9	28.5-30	44										
30		3			Very soft to soft gray clay w/sand pockets & lenses, & shell fragments	CH	10	31.0-32.5	68										
							11C	33.9-34.82	47	73	107	UU	0	136	61	20	41		
							12C	37.6-38.52	56	66	102	UU	0	309	78	21	57		
40					Soft gray clay	CH	13C	41.4-42.32	66	59	98	UC	--	395					
							14C	45.7-46.62	71	57	98	UC	--	235					
50					w/sand lenses														

Comments: Undisturbed samples obtained with 5-in. diameter fixed piston device.

EUSTIS ENGINEERING COMPANY, INC.

LOG OF BORING AND TEST RESULTS

WEST JEFFERSON LEVEE DISTRICT
COUSINS PUMPING STATION TO FIRST AVENUE CANAL
HARVEY, LOUISIANA

Ground Elev.: Datum: Gr. Water Depth: Job No.: 15845 Date Drilled: 3/30-31/99 Boring: 13 Refer to "Legends & Notes"

Scale In Feet	PP	SPT	SPLR	Symbol	Visual Classification	USC	Sample Number	Depth In Feet	Water Content Percent	Density Dry	Density Wet	Shear Tests Type	Shear Tests φ	Shear Tests C	Atterberg Limits LL	Atterberg Limits PL	Atterberg Limits PI		Other Tests
50					Soft gray clay w/sand lenses	CH	15C	49.7-50.62	62	61	99	UU	0	431	85	23	62		
							16C	53.7-54.62	63	62	101	UC	--	415					
							17C	57.2-58.12	58	63	99	UC	--	280					
60					w/sand pockets														
					Soft gray clay w/sand pockets & layers, & shell fragments	CH	18C	61.7-62.62	56	66	102	UC	--	130					
		34			Very stiff gray sandy clay w/shell fragments	CL	19	64.0-65.5	27										
		15			Stiff greenish-gray clay w/sand pockets & shell fragments	CH	20	66.5-68	26										
70		25			Medium dense gray & tan clayey sand	SC	21	69.0-70.5	24										
		26					22	71.5-73	24										
		13			Medium dense gray & tan sand	SP	23	74.0-75.5	22										
		28					24	76.5-78	26										
80		22					25	79.0-80.5	26										
		40			Medium dense to dense gray sand	SP	26	81.5-83	26										
		24					27	84.0-85.5	30										
		10			Stiff gray sandy clay	CL	28	86.5-88	30										
90		9					29	89.0-90.5	32										
		9			Medium stiff gray clay w/sand pockets	CH	30	91.5-93	34										
					Medium stiff greenish-gray clay w/sand lenses & shell fragments	CH	31B	93.8-94.72	33	87	116	UU	0	617	46	16	30		
		45			Very dense gray sand	SP	32	97.0-98.5	32										
100		50=10"					33	98.5-100	34										

Comments: Undisturbed samples obtained with 5-in. diameter fixed piston device.