

Planning

SUPPLEMENTAL DESIGN INFORMATION

IHNC REMAINING LEVEES

WEST LEVEE VICINITY FRANCE ROAD AND FLORIDA AVENUE

STATION 237+44.51

SUPPLEMENTAL DESIGN INFORMATION

IHNC REMAINING LEVEES

WEST LEVEE VICINITY FRANCE ROAD AND FLORIDA AVENUE

STATION 210+75 TO STATION 237+44.51

LMVED-TD (NOD 22 Dec 69) 7th Ind
SUBJECT: Lake Pontchartrain, La. and Vicinity, Lake Pontchartrain Barrier
Plan, Design Memorandum No. 2, General - Supplement No. 8 -
IHNC Remaining Levees

DA, Lower Mississippi Valley Division, Corps of Engineers, Vicksburg,
Miss. 39180 6 Nov 70

TO: District Engineer, New Orleans, ATTN: LMNED-PP

The disposition of comments presented in 6th Ind is considered satisfactory.

FOR THE DIVISION ENGINEER:

wd all incl

A. J. DAVIS
Chief, Engineering Division



DEPARTMENT OF THE ARMY
NEW ORLEANS DISTRICT, CORPS OF ENGINEERS
P. O. BOX 60267
NEW ORLEANS, LOUISIANA 70160

LMNED-PP

22 December 1969

SUBJECT: Lake Pontchartrain, La. and Vicinity, Lake Pontchartrain
Barrier Plan, Design Memorandum No. 2, General - Supplement
No. 8 - IHNC Remaining Levees

Division Engineer, Lower Mississippi Valley
ATTN: LMVED-TD

1. Reference is made to LMNED-PP letter dated 28 Feb 68, subject as above, and indorsements thereto, and specifically to the following comments: paragraphs 15a and 15b of incl 2 (LMVD comments), 1st Ind; paragraph 4 of the 2d Ind; paragraph 2 of the 3d Ind; and paragraph 1a (15) of the 4th Ind.
2. By letter dated 9 Oct 68, the Board of Levee Commissioners of the Orleans Levee District [the local agency officially designated by Executive Order of the State of Louisiana to provide the required local cooperation on the Lake Pontchartrain, La. and Vicinity Hurricane Protection Project in Orleans, Jefferson, St. Charles, and St. Tammany Parishes] forwarded a request (see incl 1) by the Board of Commissioners of the Port of New Orleans for an adjustment to the alignment of the protective works on the west bank of the IHNC just north of Florida Avenue. The Board of Levee Commissioners of the Orleans Levee District indorsed this new alignment and requested that consideration be given thereto.
3. The following factors are important to the evaluation of the request by local interests:
 - a. The plan of protection as covered in the project document for the inner harbor area consisted of raising the existing levee "by construction of a sheet piling wall with concrete cap at elevation 13 feet in the crown of the existing levee." The requested alignment change returns the alignment to that presented in the project document, i.e., parallel to France Road and thence easterly toward the IHNC parallel to the Florida Avenue Canal. See plate E-2, Appendix E, Interim Survey Report, Lake Pontchartrain, Louisiana and Vicinity, dated 21 Nov 62.

LMNED-PP

22 December 1969

SUBJECT: Lake Pontchartrain, La. and Vicinity, Lake Pontchartrain
Barrier Plan, Design Memorandum No. 2, General - Supplement
No. 8 - IHNC Remaining Levees

b. The proposed marine terminal development in the area in question consists of containerized shipping facilities estimated to cost about \$6,000,000. A contract to initiate construction of these facilities was let recently.

4. Forwarded herewith for review and approval is the supplemental design information, incl 2, for the protective works on the project document alignment. Local interests are in agreement with this alignment and, in addition, this plan of protection is the most economical means of providing the required protection. Approval of the supplemental design information is recommended.

FOR THE DISTRICT ENGINEER:


JEROME C. BAEHR
Chief, Engineering Division

- 2 Incl
- 1. Ltr
- 2. Design info (16 cys)

LMVED-TD (NOD 22 Dec 69) 1st Ind
SUBJECT: Lake Pontchartrain, La. and Vicinity, Lake Pontchartrain
Barrier Plan, Design Memorandum No. 2, General - Supplement
No. 8 - IHNC Remaining Levees

DA, Lower Mississippi Valley Division, Corps of Engineers, Vicksburg,
Miss. 39180 28 January 1970

TO: Chief of Engineers, ATTN: ENGCW-E/ENGCW-V

1. Pursuant to para 20, ER 1110-2-1150, supplemental design information to subject design memorandum (describing proposed alignment change) is forwarded for review and approval. Approval is recommended subject to the following comments.
2. Para 12. a. Table 2, Page 6. A contingency factor of 25% should be used, and the Cost Estimate should identify Federal and non-Federal costs.
 - b. A separate "Comparison of Cost Estimate" should be furnished comparing this estimate and: (1) the latest approved PB-3; (2) Design Memorandum No. 2, General - Supplement No. 8; and (3) the project document. Each comparison should specify the increase attributed to price level separate from changes for other reasons.

This comparison will be used to substantiate the statement in para 4, basic letter, that the plan presented is the most economical means of providing the required protection.

3. Plate 9. The relatively large design sheetpile penetration in this reach suggests that deflection of the wall could be excessive. To help limit such deflection, consideration should be given to constructing the levee in the reach along Florida Avenue Drainage Canal to el +9.0 instead of +8.0 as recommended, if this does not significantly complicate the overall stability of the levee and wall section. Based on the analysis shown on Plate 12, it does not appear that this would be a problem.
4. Plates 10 through 13. a. The shear strength data presented from the four undisturbed borings do not justify the 400 psf Q shear strength used above el -5.0. The only Q test performed on material in this zone was made on a sample from Boring 2-WUC at about el 0.0, and this test indicates a shear strength of only about 120 psf. The Q shear strength of this zone is particularly critical for Q stability design of the cantilever I-wall, and should be adequately verified. Additional Q tests should be performed to verify the validity of the assumed Q shear strength above el -5.0. This may require additional shallow undisturbed borings.

LMVED-TD (NOD 22 Dec 69) 1st Ind 28 Jan 70
SUBJECT: Lake Pontchartrain, La. and Vicinity, Lake Pontchartrain
Barrier Plan, Design Memorandum No. 2, General - Supplement
No. 8 - IHNC Remaining Levees

b. The section shown on Plate 10 from sta 223+73.08 to sta 237+42.51 indicates el 3 for the toe of the recommended levee on the protected side. Plates 12 and IV-36A indicate elevation 4.0 for the toe. This discrepancy should be resolved.

5. Plate 13. The piling arrangement shown on Plates IV-36A and IV-47 result in a wall which depends on the lateral resistance of the piling to resist the moment of resultant wall loads eccentric about the elastic center of the piling. The strata of weak soil indicated on Plate 13 may result in a very low lateral pile resistance. In fact the net load diagram for the "Q" case for Station 219+06.29 to 220+70.54 indicates that the earth rather than laterally supporting the piling may actually be supported by the sheet piling and bearing piling acting together. Such loading will tend to rotate the wall in a counterclockwise direction and may produce high bending stresses in the bearing piling. A pile arrangement in which the moment due to eccentric loads is resisted by axial pile loads may be desirable.

6. Plate IV-17A. The proposed levee crown elevation shown on the profile should be 8 instead of 9.

7. Plate IV-36A. The existing ground surface shown on the design section from sta 223+73.08 to sta 237+42.51 differs from that shown on Plates 10 and 12 for this reach. In the sections on Plates 10 and 12, the wall appears to be located at the south edge of the existing levee, whereas, on Plate IV-36A the wall is located on the north side of the existing levee. This apparent discrepancy in typical section should be clarified. If the section shown on Plate IV-36A between the above stations is typical, consider locating the new levee at and wall farther south to take better advantage of the existing levee.

FOR THE DIVISION ENGINEER:

2 Incl
wd 2 cy incl 2

CF:
NOD-LMNED-PP



A. J. DAVIS
Chief, Engineering Division

ENGW-EZ (LMNED-PP, 22 Dec 69) 2nd Ind
SUBJECT: Lake Pontchartrain, La. and Vicinity, Lake Pontchartrain
Barrier Plan, Design Memorandum No. 2, General - Supplement
No. 8 - IHNC Remaining Levees

DA, Office of the Chief of Engineers, Washington, D.C. 20314 11 March 1970

TO: Division Engineer, Lower Mississippi Valley

The supplemental design information to the subject design memorandum is approved, subject to the comments of the Division Engineer in the 1st indorsement.

FOR THE CHIEF OF ENGINEERS:

wd all incls


WENDELL E. JOHNSON
Chief, Engineering Division
Civil Works

LMVED-TD (NOD 22 Dec 69) 3d Ind
SUBJECT: Lake Pontchartrain, La. and Vicinity, Lake Pontchartrain
Barrier Plan, Design Memorandum No. 2, General - Supplement No. 8 -
IHNC Remaining Levees

DA, Lower Mississippi Valley Division, Corps of Engineers, Vicksburg,
Miss. 39180 18 Mar 70

TO: District Engineer, New Orleans, ATTN: LMVED-PP

Referred to note approval.

FOR THE DIVISION ENGINEER:



A. J. DAVIS
Chief, Engineering Division

LMNED-PP (NOD 22 Dec 69) 4th Ind
 SUBJECT: Lake Pontchartrain, La. and Vicinity, Lake Pontchartrain
 Barrier Plan, Design Memorandum No. 2, General - Supplement
 No. 8 - IHNC Remaining Levees

DA, New Orleans District, Corps of Engineers, PO Box 60267, New Orleans, La.
 70160 14 May 70

TO: Division Engineer, Lower Mississippi Valley, ATTN: LMVED-TD

1. The proposed disposition of comments in the 1st Ind of this chain of correspondence is as follows (paragraph numbers refer to like-numbered paragraphs of the 1st Ind):

2. Par 2a.

a. As stated in the current PB-3, a 20 percent contingency factor is allocated for all construction in the Lake Pontchartrain, La. and Vicinity project, and we feel that construction of this reach will pose no unique problems upon which an increased contingency factor would be justified.

b. This reach comprises an inseparable portion of the IHNC Remaining Levees feature of the Lake Pontchartrain hurricane protection project; consequently, a Federal--Non-Federal apportionment of costs is not appropriate. However, the following breakdown for this reach is presented in response to your request:

<u>Federal cost (70%)</u>		<u>Non-Federal cost (30%)</u>
\$648,000.00		\$278,000.00
-	Lands, damages, & relocations	-142,000.00
<u>\$648,000.00</u>	Cash contribution	<u>\$136,000.00</u>

3. Par 2b. The cost in the latest approved PB-3 is based on the alignment and type of construction presented in GDM No. 2, Supp. No. 8. Additionally, the protective works and alignment presented herein as the recommended plan are the same as described in the project document plan, with the exception that I-wall is used in lieu of concrete capping of the steel sheet pile for reasons stated in GDM No. 2, Supp. No. 8. Recent studies performed by NOD have disclosed that an earthen levee cannot be constructed along the project document alignment (recommended alignment) because of rail, wharf, and structural facilities of the containerization complex now under construction. Therefore, the plan recommended is considered to be the most practical plan for the reach. A comparison of cost for the plan presented in GDM No. 2, Supp. No. 8 (same as PB-3), and for the plan recommended (same as project document plan except I-wall is used in lieu of concrete capping) herein follows (prices shown are to January 1970 price levels):

LMNED-PP (NOD 22 Dec 69) 4th Ind 14 May 70
 SUBJECT: Lake Pontchartrain, La. and Vicinity, Lake Pontchartrain
 Barrier Plan, Design Memorandum No. 2, General - Supplement
 No. 8 - IHNC Remaining Levees

COMPARISON OF COSTS
 IHNC REMAINING LEVEES
 Sta. 210+75 to Sta. 237+44.51

Feature	GDM No. 2	Recommended	Recommended
	Supp.No. 8	Plan	Plan - GDM No. 2 Supp.No. 8
	\$	\$	\$
11 Levees & floodwalls	641,000	642,000	+1,000
30 Engineering & design	73,000	73,000	0
31 Supervision & administration	69,000	69,000	0
01 Lands & damages	320,000	110,000	-210,000
02 Relocations	69,000	32,000	-37,300
Total	1,172,000	926,000	-246,300

4. Par 3. The sheet piling from station 223+73.08 to station 237+42.51 extends to elevation -20.0 to cut off the organic clay layer from elevation -5.0 to elevation -17.0 (see plate 9). Being adjacent to the canal, this stratum presents a potential drainage path beneath the proposed levee if not cut off. Sheet pile design on the opposite side of the canal (refer to Lake Pontchartrain, La. and Vicinity, GDM No. 2, Advance Supplement, Inner Harbor Navigation Canal West Levee, Florida Avenue to IHNC Lock, approved 31 May 1967), which is nearly identical to this design, indicates that predicted deflection of the piling is not excessive.

5. Par 4a. Two additional (Q) tests were performed on the soil above elevation -5.0 with the following results:

<u>Boring</u>	<u>Elevation</u>	<u>Cohesion</u>	<u>Ø Angle</u>
1-WUC	3.2 m.s.l.	0.65 TSF = 1300 p.s.f.	0°
2-WUC	5.2 m.s.l.	0.38 TSF = 760 p.s.f.	0°

Based on these strengths, the design strength of 400 p.s.f. is acceptable.

6. Par 4b. Plate 10 is in error. The toe elevation on the protected side should be 4.0 as shown on plates 4 and 12.

LMNED-PP (NOD 22 Dec 69) 4th Ind 14 May 70
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Barrier Plan, Design Memorandum No. 2, General - Supplement
No. 8 - IHNC Remaining Levees

7. Par 5. Based on guidance from LMVD personnel, the net pressure diagram for the sheet pile cutoff was modified in accordance with the following procedure:

Hypothesis. The horizontal resistance due to shear (R_B) should be distributed along the length of the sheet pile cutoff, rather than applying it as a line force at the tip of the sheet pile. Accordingly, the net pressure diagram along the sheet pile cutoff utilizing the distribution of R_B was determined as follows:

a. Conventional stability analysis by the method of planes, utilizing a factor of safety of 1.3 incorporated in the soil strength parameters, was performed to determine the stability against rotational failure. The use of a factor of safety of 1.3 is also recommended by Mr. Gregory P. Tschebotarioff in Chapter 5 of Foundation Engineering, edited by G. A. Leonards and dated 1962. The analysis was performed at 1-foot intervals with the active wedge located at the flood side edge of the structure and the passive wedge located at the protected side edge of the structure.

b. The assumption was made that the value of (R_B) at the bottom of the base of the structure was zero.

c. For each analysis the net driving force, i.e., ($D_A - D_p$) - ($R_A + R_B + R_p$) was determined. The value of D_A included the weight of water between the tailwater elevation and the stillwater elevation located above the active wedge.

d. The assumption was made that the net driving force above the bottom of the base of the structure was carried by the structure.

e. Considering the driving force (D_A) positive and all resisting forces (D_p , R_p , R_B , & R_A) negative, in the expression $\Sigma D = D_A - D_p - R_p - R_B - R_A$, using the method of planes stability analyses, the ΣD was determined by assuming failure at the bottom of the base of the structure and at each foot in depth thereafter. The value of the algebraic difference in ΣD , between 1-foot intervals, was used to develop the pressure diagram. If the incremental difference is negative, the pressure diagram indicates an available horizontal resistance in excess of that required; and if the incremental difference is positive, the pressure diagram indicates an unbalanced horizontal pressure in excess of the available soil resistance. It is considered that such an excess must be carried by the sheet pile cutoff. The shear in the sheet pile at the base of the structure should be considered as

LMNED-PP (NOD 22 Dec 69) 4th Ind 14 May 70
SUBJECT: Lake Pontchartrain, La. and Vicinity, Lake Pontchartrain
Barrier Plan, Design Memorandum No. 2, General - Supplement
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an additional lateral load to be carried by the bearing piles. Inclosure 3 is the modified sheet pile pressure diagram for this reach and indicates that there are no unbalanced forces acting on the sheet pile cutoff. Therefore, the pile arrangement originally submitted is adequate.

8. Par 6. Concur.

9. Par 7. The existing levee runs parallel to and slightly north of the floodwall centerline from station 223+73 to approximately station 232+00. At station 232+00 it veers slightly to the south. The section shown on plate IV-36A was cut beyond station 232+00 and reflects the levee and an existing roadbed adjacent to the levee. The sections on plates 10 and 12 reflect ground conditions along the alignment west of station 232+00. The variation in cross sections through the area will be clearly illustrated on the contract plans by showing ground surface elevations on the plan view and plotted cross sections at 200-foot intervals.

10. Approval of the proposed disposition of comments presented herein is recommended.

FOR THE DISTRICT ENGINEER:

1 Incl
Added incl 3
3. Diagram (16 cys)

for *Walter S Mark*
RAYMOND J. FRANKLIN
Acting Chief, Engineering Division

LMVED-TD (NOD 22 Dec 69) 5th Ind
SUBJECT: Lake Pontchartrain, La. and Vicinity, Lake Pontchartrain
Barrier Plan, Design Memorandum No. 2, General - Supplement
No. 8 - IHNC Remaining Levees

DA, Lower Mississippi Valley Division, Corps of Engineers, Vicksburg,
Miss. 39180 16 Jun 70

TO: District Engineer, New Orleans, ATTN: LMNED-PP

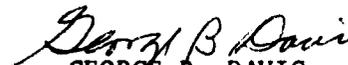
1. The explanations offered and actions proposed in the 4th Ind to satisfy comments in previous indorsements are satisfactory, except as indicated below.
2. Para 3. A comparison of the cost estimate prepared in GDM 2, Supplement No. 8, with the latest approved PB-3 (effective 1 Jul 69), and with the project document should be furnished in accordance with ER 1110-2-1150, Appendix I, para lu.
3. Para 4. We have no objection to extending the tip of the sheetpile to el -20.0 from sta 223+73.08 to sta 237+42.5 in order to cut off the organic clay layer as indicated. However, the sheetpile design presented on Plate 9 of the supplemental design information submitted with the basic letter indicates that the design tip elevation of the sheetpile in this reach is -20.04 to provide the design factor of safety of 1.50. This indicates that the pile tip elevation of -20.0 is required for stability, and not merely extended to this elevation to cut off the organic clay layer as is indicated. With this the case, the deflection of the wall in this reach would probably be approaching an excessive value, as we previously indicated in para 3, 1st Ind. In regard to the sheet pile design on the opposite side of the Florida Avenue Canal, it is not apparent which design is considered "nearly identical" to the design in question. If the reference is to the I-wall design for that portion of the protection south of and parallel to the Florida Avenue Canal, the two designs are not identical. The I-wall south of the canal is designed for a levee grade of +9.0 instead of +8.0 and has a design tip elevation of -8.5 in lieu of -20.0. The predicted deflection of the wall with the tip at el -8.5 would be much less than the wall with a tip at -20.0. In our comments on the I-wall designs in other areas of the protection south of Florida Avenue Canal, the possibility of excess deflection was pointed out for designs requiring pile tip elevations of -20 or lower. In view of the above, the reply to our comment in the 1st Ind is not considered adequate. The levee along the Florida Avenue Canal should be constructed to el +9.0 as was the levee on the south side of the canal to help limit deflections.
4. Para 5. The two additional Q tests performed on the soil above el -5.0 are not representative of most of the material in this zone based on water content and consistencies shown on the borings and consequently do not furnish verification of the 400 psf Q strength used. The tests from both borings

LWED-TD (NOD 22 Dec 69) 5th Ind 16 Jun 70
SUBJECT: Lake Pontchartrain, La. and Vicinity, Lake Pontchartrain
Barrier Plan, Design Memorandum No. 2, General - Supplement
No. 8 - IHNC Remaining Levees

1-WUC and 2-WUC were performed on stiff and medium consistency clays in the dried crust zone very near the ground surface. However, the borings indicate that most of the material above el -5.0 is soft and very soft. With a design Q shear strength of only 200 psf from el -5.0 to about el -20, it is most important that the Q shear strength of the material above el -5.0 be adequately determined. If the actual Q shear strength of the material above el -5.0 is in the order of 200-250 psf, an I-type floodwall may not be feasible. Therefore, efforts to obtain and justify the Q shear strength of the material above el -5.0, even if this requires additional shallow undisturbed borings, should be continued.

FOR THE DIVISION ENGINEER:

wd incl


GEORGE B. DAVIS

Acting Chief, Engineering Division

LMNED-PP (NOD 22 Dec 69) 6th Ind

SUBJECT: Lake Pontchartrain, La. and Vicinity, Lake Pontchartrain Barrier
Plan, Design Memorandum No. 2, General - Supplement No. 8 -
IHNC Remaining Levees

DA, New Orleans District, Corps of Engineers, PO Box 60267, New Orleans, La.
70160 30 Sept 70

TO: Division Engineer, Lower Mississippi Valley, ATTN: LMVED-TD

1. The proposed disposition of comments in the 5th Ind of this chain of correspondence is as follows (referenced paragraphs refer to those of the 5th Ind):

a. Par 2. A comparison of the GDM, PB-3, and project document cost estimates for that portion of the subject levee alignment located in the vicinity of the proposed containerized shipping facility is shown on inclosure 4.

b. Par 3. The stability of the cantilever sheet pile floodwall between stations 223+73.08 and 237+42.50 was reanalyzed based on the levee crown at elevation 9.0 and the revised stratification and shear strengths shown on inclosures 5 and 6. The revised analyses for the (Q) and (S) cases are shown on inclosures 7 and 8, respectively. The computed deflection of the wall, based on the (S) case pressure diagram with the pile tip located at elevation -9.71, is 0.65 inches. However, the sheet pile will extend to elevation -20.0 in order to cut off the organic clay layer.

c. Par 4. Two additional (Q) tests were performed on the soil above elevation -5.0 with the following results:

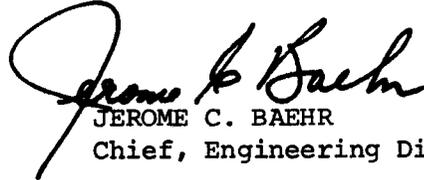
<u>Boring</u>	<u>Elevation</u>	<u>Cohesion</u>	<u>Ø Angle</u>
1-WUC	0.2	200 p.s.f.	0°
2-WUC	-2.6	240 p.s.f.	0°

Based on these test results, the stratification and design shear strengths were revised as shown on inclosures 5 and 6. The revised (Q) stability analysis of the levee, based on the levee crown at elevation 9.0 and the revised design shear strengths, is shown on inclosure 9.

LMNED-PP (NOD 22 Dec 69) 6th Ind 30 Sept 70
SUBJECT: Lake Pontchartrain, La. and Vicinity, Lake Pontchartrain Barrier
Plan, Design Memorandum No. 2, General - Supplement No. 8
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2. As a result of the aforementioned analyses, plates IV-16A, IV-17A, and IV-36A of the supplemental design were also revised and the revised plates are inclosed herewith (incl 10, 11, & 12, respectively).

FOR THE DISTRICT ENGINEER:



JEROME C. BAEHR
Chief, Engineering Division

- 9 Incl (16 cys)
- 4. Comparison of estimates
- 5. Revised plate 3
- 6. Revised plate 4
- 7. Revised (Q) case floodwall stability analysis
- 8. " (S) " " " " "
- 9. " (Q) " levee stability analysis
- 10-12 Revised plates IV-16A, IV-17A, IV-36A

SUPPLEMENTAL DESIGN INFORMATION
 IHNC REMAINING LEVEES
 WEST LEVEE VICINITY FRANCE ROAD AND FLORIDA AVENUE
 STATION 210+75 TO STATION 237+44.51

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SUPPLEMENTAL DESIGN INFORMATION
IHNC REMAINING LEVEES
WEST LEVEE VICINITY FRANCE ROAD AND FLORIDA AVENUE
STATION 210+75 TO STATION 237+44.51

GENERAL

1. The purpose of this report is to present the design information required to support the design of that section of protective works on the west bank of the IHNC (Inner Harbor Navigation Canal) located between station 210+75 and station 237+44.51. The alignment of the protective works recommended is shown on plate 1. Also shown on this drawing is the alignment that was presented in Design Memorandum No. 2 - General, Supplement No. 8 - IHNC Remaining Levees. The design information presented herein is supplemental to that presented in the aforementioned design memorandum.

GEOLOGY

2. General. The geology along the revised alignment is essentially the same as that described in the GDM, pages III-1, III-2, III-3, and plate III-2. The soil and geologic profile for the revised alignment is shown on plate 2 of this report.

SOILS AND FOUNDATION DESIGN

3. General. This section covers the soils and foundation design for the protective works on the revised alignment from station 210+75 to station 237+44.51. The following references in the GDM should be used as additional information to supplement that presented in this report:

	<u>Page</u>	<u>Plate</u>
Geology	III-1, III-2, III-3	III-2
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4. Field investigation. In addition to the borings given in the GDM, four 5-inch diameter undisturbed borings and five 1 7/8 inch ID general type borings were made for the protective works on the revised alignment. The locations of these borings, along with those previously made, which are within the limits of the protective works covered herein, are shown on plates IV-15A, IV-16A, IV-17A, and the boring logs are shown on plates 3, 4, 5, 6, and 7.

5. Laboratory tests. Results of the soil tests performed are shown on the respective logs.

6. Foundation conditions. The subsurface along the revised alignment consists generally of 8 to 14 feet of artificial fill overlying 60 to 70 feet of Recent deposits of clays, silts, and sands which are underlain by Pleistocene soils. The generalized soil and geologic profile is shown on plate 2.

7. Location and type of protection. Specific data relative to location and type of protection are listed in table 1, page 6.

8. Stability.

a. Cantilever I-type floodwall. The stability and required penetration of the steel sheet pile below ground surface were determined by the method of planes for both the (Q) and (S) shear strength cases. A factor of safety of 1.50 was applied to the design shear strengths as follows:

$$\phi' = \phi \text{ developed} = \tan^{-1} \frac{(\tan \phi \text{ available})}{(\text{factor of safety})}$$

$$C' = C \text{ developed} = \frac{(C \text{ available})}{(\text{factor of safety})}$$

The required depths of penetration were determined for hurricane water level 6 inches below the top of the floodside, and water level equal to the water table on the protected side. Factors of safety were also determined for the headwater level at the top of the walls. These are shown by note on stability plates 8, 9, and 10. Stability analyses of the levee, with the I-wall, were made for the (Q) condition. Results of these analyses are given on plates 11 and 12. From station 210+75.00 to station 219+06.29, the sheet pile penetrates to elevation -10.5¹ with the top of the levee at elevation 9.0. The sheet pile I-wall along the drainage canal, station 223+73.08 to 237+42.51, penetrates to elevation -20.0 in order to cut off the organic clay layer between elevations -5.0 and -17.0. This protection is equivalent to that provided on the opposite side of the drainage canal (Florida Avenue to IHNC Lock). With the sheet pile penetration at -20.0, the levee elevation of 8.0 is adequate to maintain the stability of the I-wall. See plate 9.

b. Sheet pile cutoff. In order to protect against seepage and completely cut off the organic clay layer along the drainage ditch, a sheet pile cutoff will be constructed beneath the T-wall and gates, station 219+06.29 to 223+73.08. As in the I-wall design, all sheet piling penetrates to elevation -20.0. Analyses of the unbalanced water load on the sheet piling are shown on plate 13.

¹Elevations herein are in feet referred to mean sea level.

9. Foundation for structures. Pile bearing capacities for the gated structures and T-walls were determined from the pile test performed at site 1 of the IHNC West Levee, Florida Avenue to IHNC Lock project, where subsurface conditions are similar to those at the proposed site of the T-wall and gates. Results of this test were taken from the Pile Test Report, September 1967, and are presented on plate 14 of this report. Results are given in terms of ultimate load versus tip elevation. Design loads should be multiplied by the proper safety factor, 1.75 for compression and 2.0 for tension, before using the graph. A minimum penetration elevation of -54.0 is required to assure adequate seating into the sand. Subgrade moduli for the bearing piles are also shown on plate 14. Sheet pile cutoffs to protect against seepage will be constructed beneath the gates and T-walls. See paragraph 8b above.

10. Methods of construction. The levee which supports the I-wall along the Florida Avenue drainage canal will be constructed by reshaping the existing levee and berms wherever possible. All sections of I-wall levee with insufficient material for reworking, and other levee sections where raising is required, will be completed with haul fill. Where earth filling is required, the fill will be placed using semicompacted methods in advance of installation of the steel sheet piling and wall construction to reduce the ultimate settlement of the walls. Borrow sources for fill material are discussed in paragraph 1a(3), 4th Ind to LMNED-PP letter dated 28 Feb 68 subject, "Lake Pontchartrain, La. & Vicinity, Lake Pontchartrain Barrier Plan, Design Memorandum No. 2, General - Supplement No. 8 - IHNC Remaining Levees." Since the required amount of haul fill is small, the Bonnet Carre' Spillway borrow source will be used.

STRUCTURAL DESIGN

11. General. The protective works consist of I-wall constructed in earthen levee between stations 210+75 and 219+06.29, T-wall with three gates between stations 219+06.29 and 223+73.08, and I-wall constructed in earthen levee between stations 223+73.08 and 237+42.51. The levee extends 2 feet to station 237+44.51, the terminus for this project. The plan and profile of the protective works is shown on plates IV-15A, IV-16A, and IV-17A. The Location Plan and Vicinity Map, plate IV-1, in the GDM has been revised to show the above plates and is attached. Design sections for the protective works are shown on plate IV-36A. Plate IV-47 of the GDM has been revised to include in the gate schedule the three gates required in this reach of the protective works. This plate is attached.

COST ESTIMATE

12. Cost estimate. A detailed estimate of first cost has been prepared for the reach of protective works covered herein. The price level for this estimate is November 1969. The estimate is shown in table 2, page 6.

TABLE 1
LOCATION AND TYPE OF PROTECTION
WEST LEVEE

Location along centerline from station to station	I-Wall		T-Wall		Gate		Analysis Plate	
	Top*	Sheet pile tip	Top	Sheet pile tip	Sheet pile tip	No.	I-Wall	Gate** and/or T-Wall**
210+75.00 - 219+06.29	14.5	-10.5					8, 10, 11	
219+06.29 - 220+70.54			14.0	-20.0				13
220+70.54 - 220+88.54					-20.0	10W		13
220+88.54 - 221+31.31			14.0	-20.0				13
221+31.31 - 221+66.31					-20.0	11W		13
221+66.31 - 222+46.94			14.0	-20.0				13
222+46.94 - 222+72.94					-20.0	12W		13
222+72.94 - 223+73.08			14.0	-20.0				13
223+73.08 - 237+42.51	14.5	-20.0					9, 10, 12	

Elevations are in feet m.s.l.

* Used for stability analyses purposes

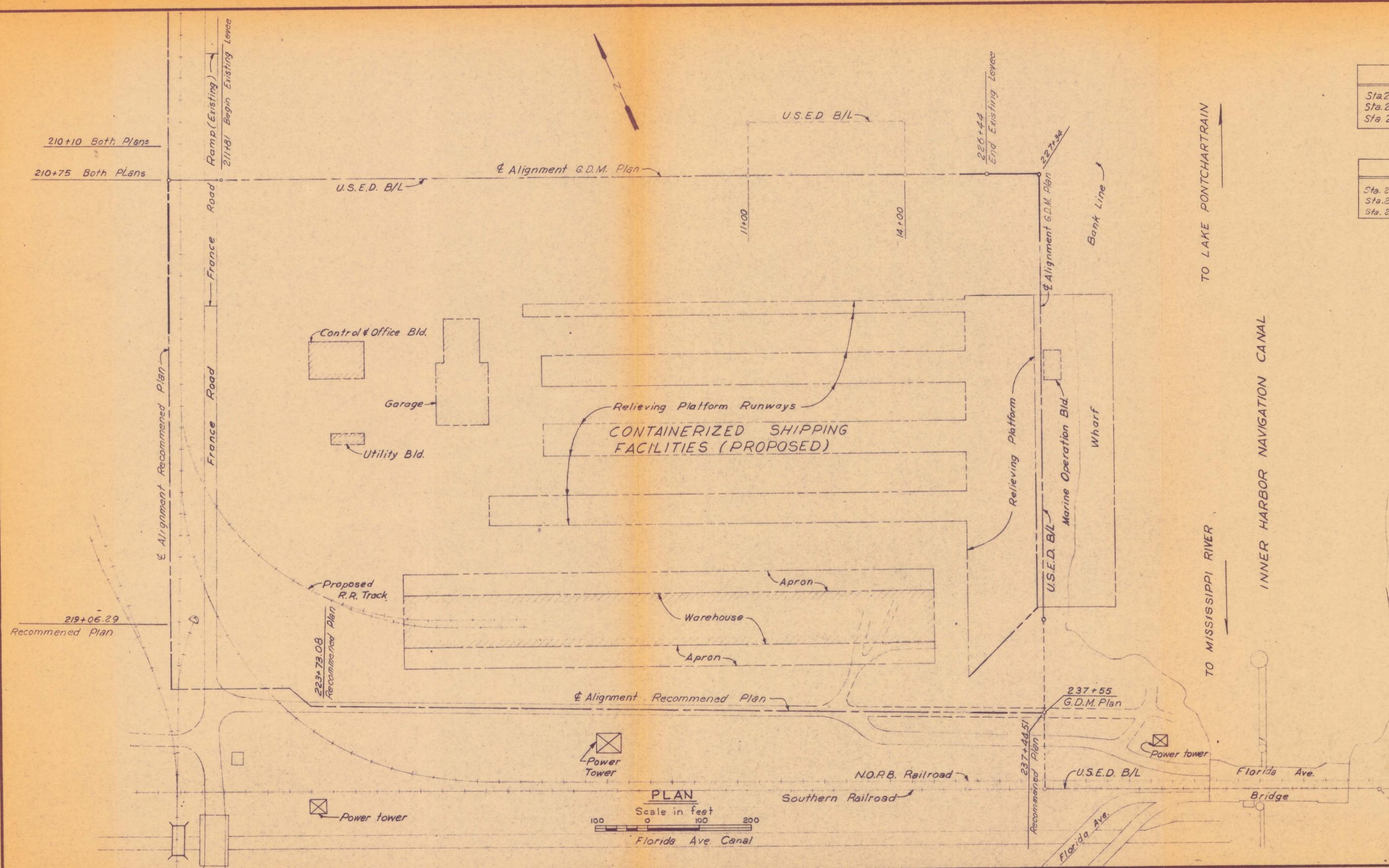
**Cutoff beneath structure

TABLE 2
DETAILED ESTIMATE OF FIRST COST

Item No.	Description	Estimated quantity	Unit	Unit price	Estimated amount
CONSTRUCTION					
11	Levees and floodwalls				
	Excavation	1,520	c.y.	\$ 0.20	\$ 304.00
	Levee fill	5,870	c.y.	3.00	17,610.00
	MA-22 steel sheet piling	8,216	s.f.	3.50	28,756.00
	Z-27 steel sheet piling	56,800	s.f.	4.00	227,200.00
	12"x12" prestressed concrete piling	9,130	l.f.	7.00	63,910.00
	Concrete in stabilization slab	46	c.y.	35.00	1,610.00
	Concrete in T-wall base	373	c.y.	35.00	13,055.00
	Concrete in walls, columns, and overhead beams	1,419	c.y.	70.00	99,330.00
	Portland cement	2,510	bb1.	5.00	12,550.00
	Reinforcing steel	170,030	lb.	0.18	30,605.40
	Waterstop (3 bulb type)	745	l.f.	4.00	2,980.00
	Waterstop (L type)	30	l.f.	4.00	120.00
	Expansion joint filler	1,352	s.f.	1.00	1,352.00
	Gate seals	122	l.f.	7.50	915.00
	Structural steel	24,390	l.b.	0.70	17,073.00
	Trolley, plain (2 ton)	1	ea.	300.00	300.00
	Trolley, plain (3 ton)	2	ea.	400.00	800.00
	Trolley, geared (2 ton)	1	ea.	500.00	500.00
	Trolley, geared (3 ton)	2	ea.	600.00	1,200.00
	Structural excavation	3,280	c.y.	2.50	8,200.00
	Structural backfill	2,453	c.y.	2.50	6,132.50
	Fertilizing & seeding	2.84	acre	150.00	426.00
	Subtotal				\$534,928.90
	Contingencies, 20%+				107,071.10
11	Levees & floodwalls, total construction cost				\$642,000.00
30	Engineering & design, 11.4%+				73,000.00
31	Supervision & administration, 10.8%+				69,000.00
	Total cost levees and floodwalls				\$784,000.00

TABLE 2 (cont'd)

Item No.	Description	Estimated quantity	Unit	Unit price	Estimated amount
01	LANDS				
	West of France Road	1.47	acre	\$8,000.00	\$ 11,760.00
	East of France Road	2.00	acre	40,000.00	80,000.00
	Subtotal				<u>\$ 91,760.00</u>
	Contingencies, 20%+				<u>18,240.00</u>
	Total cost lands				\$110,000.00
02	RELOCATIONS				
	Relocation of shell road				
	1. Compacted clay	2,010	c.y.	\$ 3.50	\$ 7,035.00
	2. Compacted shell	3,880	c.y.	3.75	14,550.00
	Subtotal				<u>\$ 21,585.00</u>
	Contingencies, 20%+				<u>4,315.00</u>
	Subtotal				<u>\$ 25,900.00</u>
	Engineering & design, 11.4%+				3,000.00
	Supervision & administration, 10.8%+				<u>2,800.00</u>
	Total cost relocations				\$ 31,700.00
	Total cost				\$925,700.00



G.D.M. PLAN	
Sta. 210+10 - 211+81	"T" Wall, Gate, Ramp
Sta. 211+81 - 226+44	Earth Levee
Sta. 226+44 - 237+55	"T" Wall

RECOMMENDED PLAN	
Sta. 210+75 - 219+06.29	"I" Wall w/Levee
Sta. 219+06.29 - 223+73.08	"T" Wall, 3 Gates
Sta. 223+73.08 - 237+44.51	"I" Wall w/Levee

LAKE PONTCHARTRAIN, L.A. AND VICINITY
 LAKE PONTCHARTRAIN BARRIER PLAN
 DESIGN MEMORANDUM NO 2 - GENERAL DESIGN
 SUPPLEMENT NO. 8
 IHNC REMAINING LEVEES
ALTERNATE PLANS
WEST LEVEE
 U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
 CORPS OF ENGINEERS
 NOVEMBER 1969

STATIONING ALONG E

210+75 215+00 220+00 225+00 230+00 235+00 237+43.22

64
(ROW 67')

32
W

1
WLC

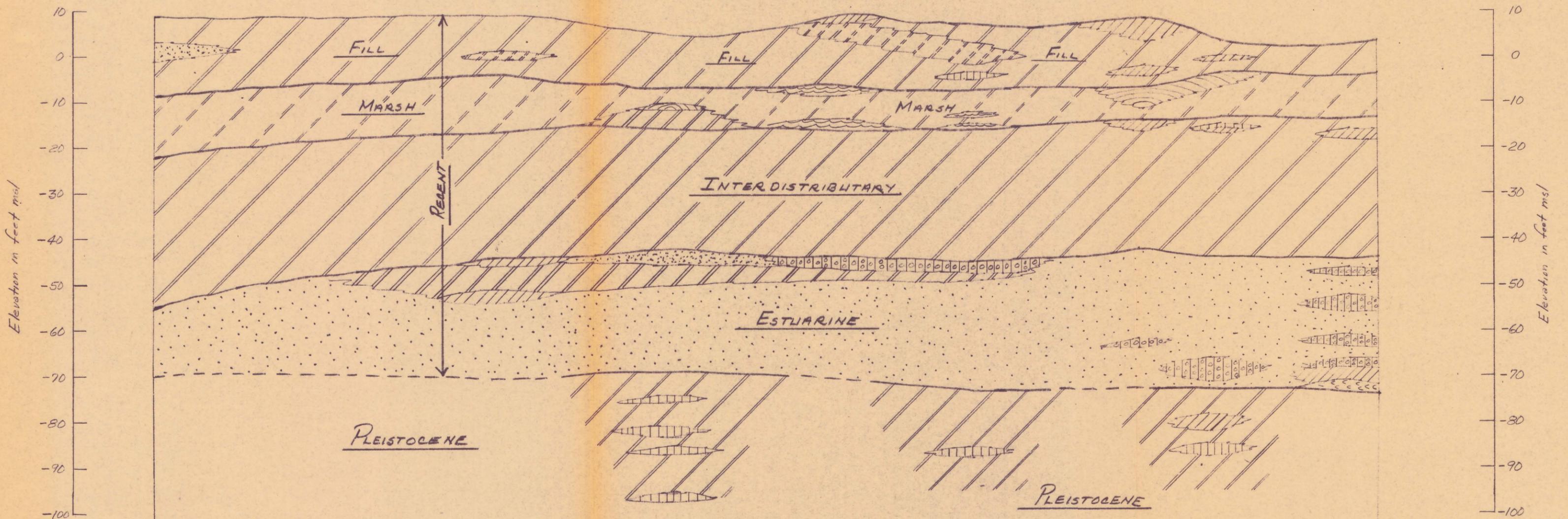
6
WC

2
WLC

35
W

3
WLC

3
WF

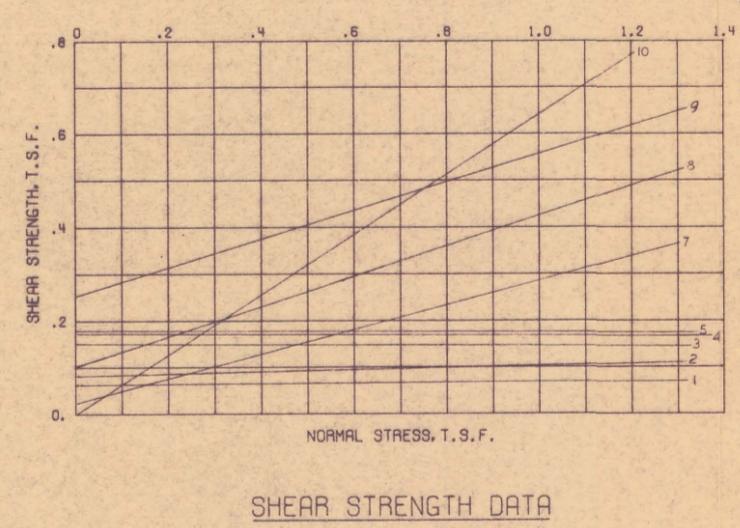
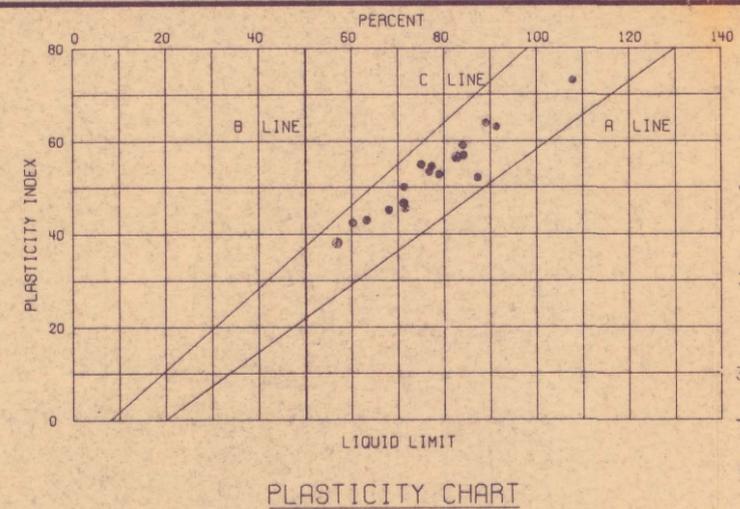
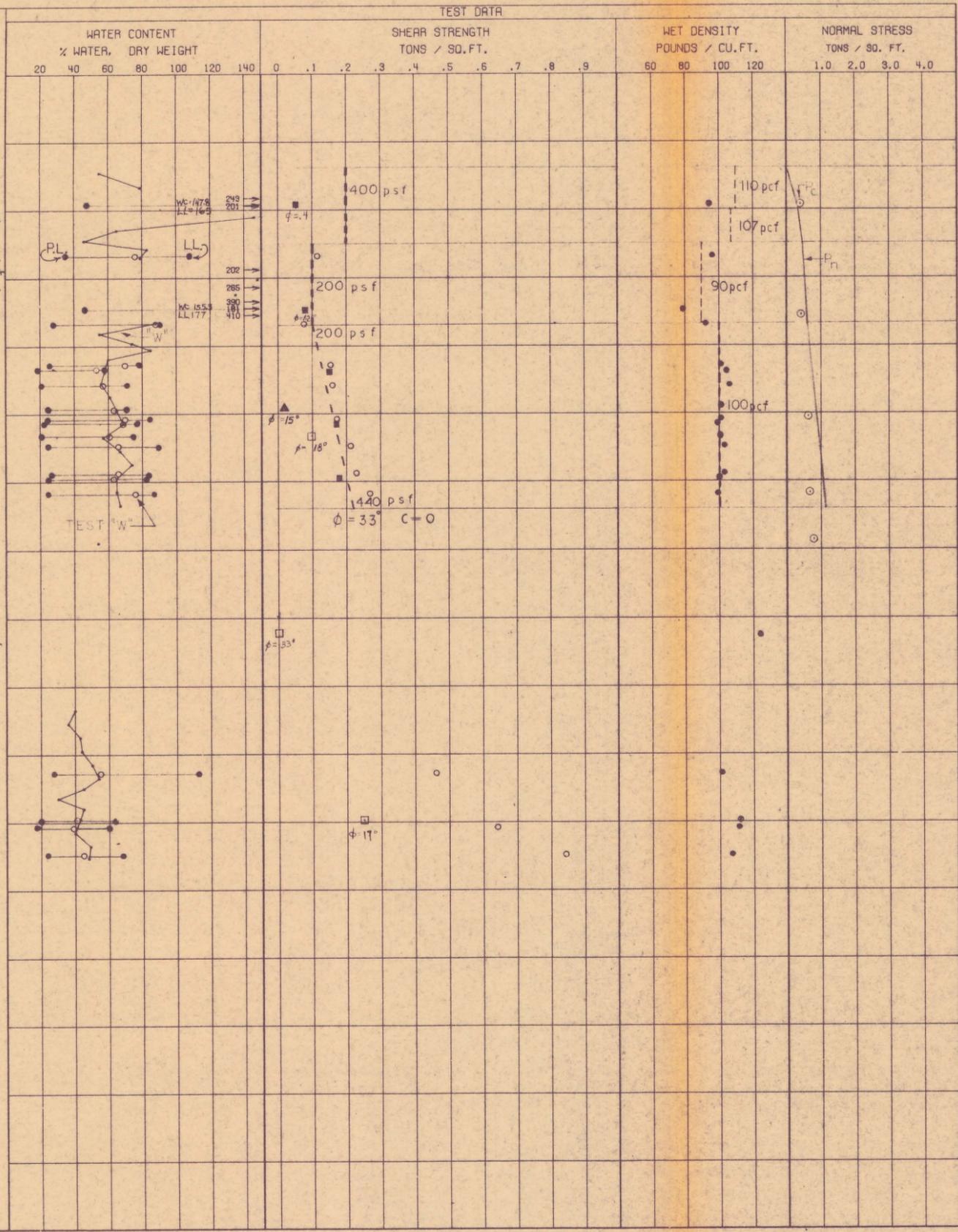
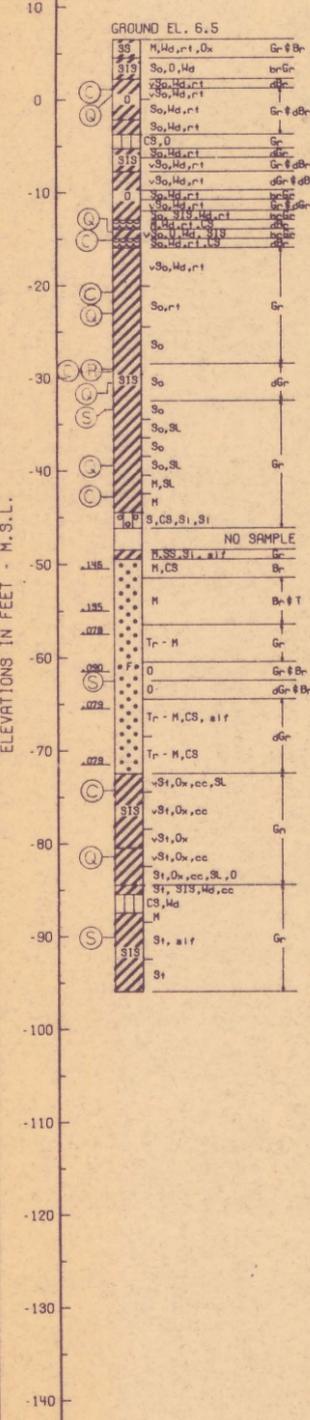


LEGEND

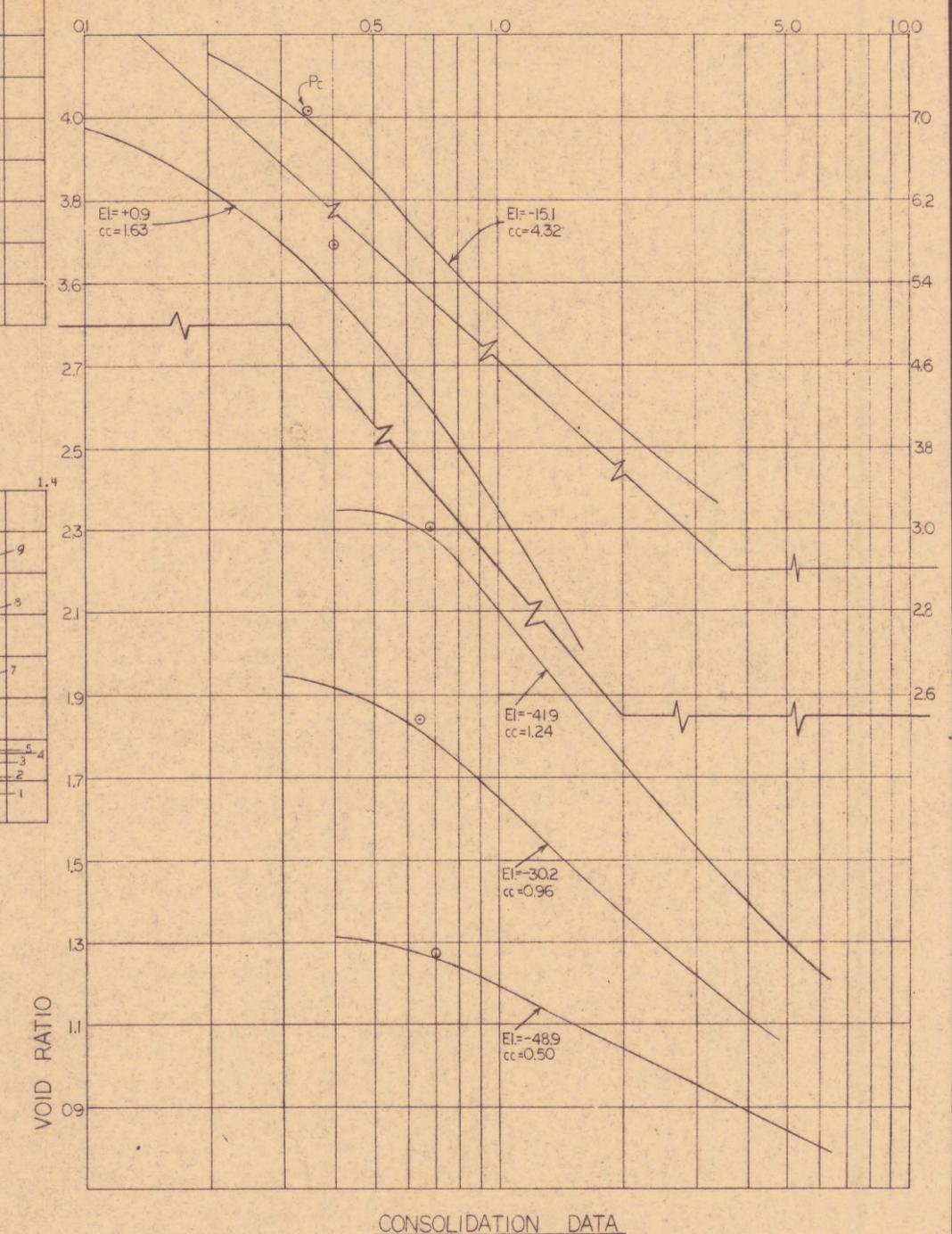
- | | | |
|-----------------------------------|-----------------|--|
| CH - FAT CLAY | ML - SILT | MARSH - VY SFT CLAY W/ ORG MAT & PEAT |
| CHC - FAT CLAY W/ ORG. MAT. & PT. | SM - SILTY SAND | INTERDISTRIBUTARY - VY SFT TO SFT CLAYS W/ SIS |
| WD - WOOD | SP - FINE SAND | ESTUARINE - SDS, SILTS, & CLAYS W/ SLF & ORG |
| PT - PEAT | SI - SHELLS | PLEISTOCENE - ST TO VY ST CLAYS W/ SIS |
| CL - LEAN CLAY | | |

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES
SOIL AND GEOLOGIC PROFILE
WEST LEVEE
U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NOVEMBER 1969 FILE NO. H-2-24111

BORING NO. 2-WUC
 STA. 226+93 173 FT. LEFT B/L
 13 FT. LEFT PROPOSED C/L LEVEE
 19-24 FEB. 1969



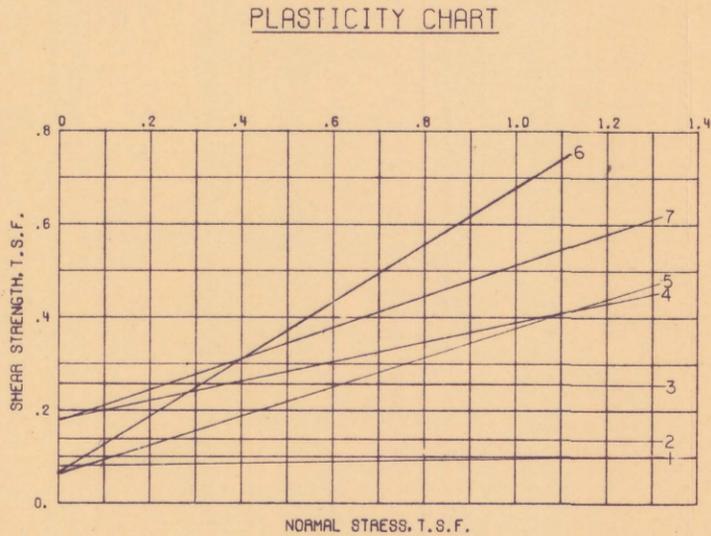
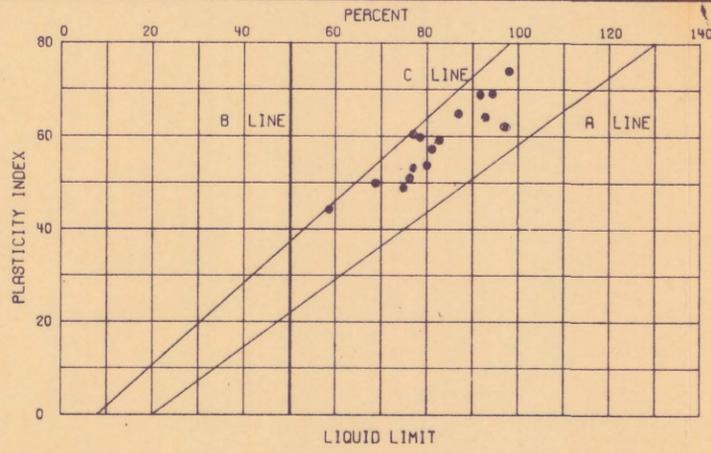
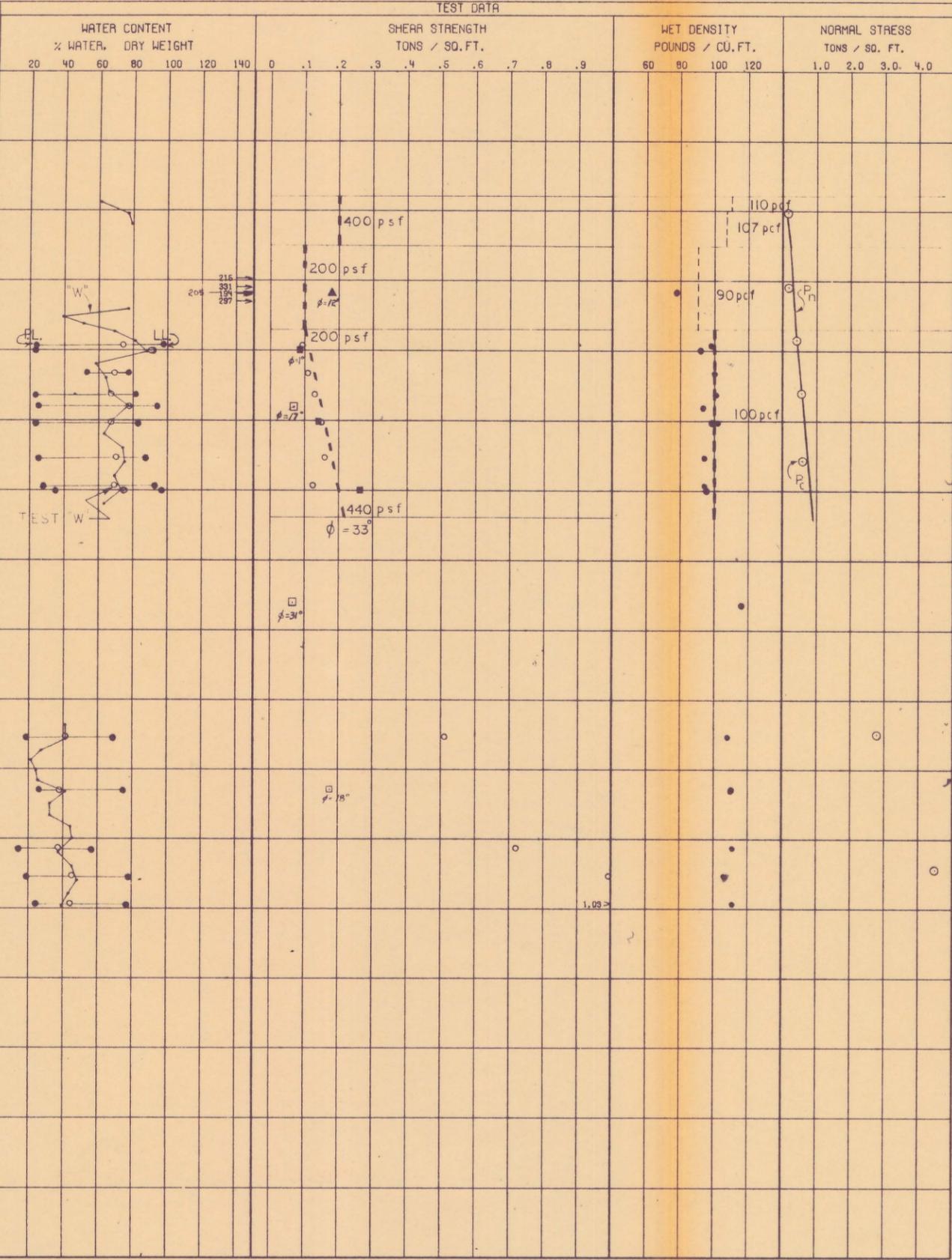
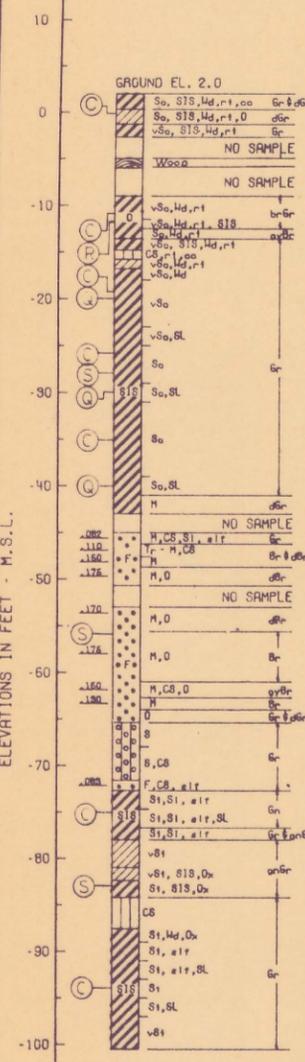
BORING NO.	ENVELOPE		TYPE	STRENGTH		CLASS
	NO.	EL.		ϕ	C - T3F	
2-WUC	1	-0.9	Q	0.4°	0.06	CH
	2	-14.4		1.2°	0.08	CH
	3	-23.2		0.0°	0.15	CH
	4	-31.2		0.0°	0.17	CH
	5	-39.5		0.0°	0.18	CH
	6	-53.2		NO TEST		
	7	-29.4	R	15.0°	0.02	CH
	8	-33.5		18.0°	0.10	CH
	9	-89.7		17.0°	0.25	CH
	10	-62.6		33.0°	0.00	SM



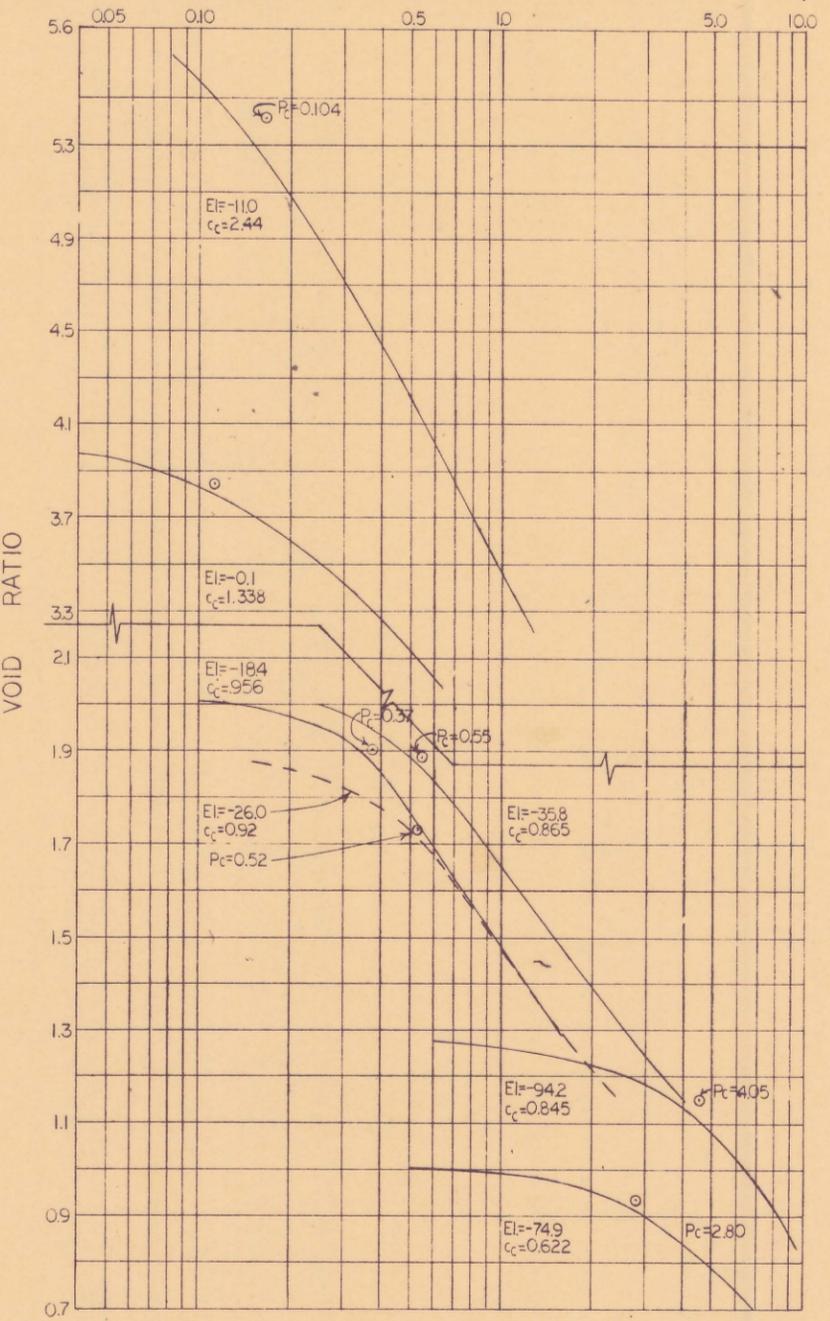
○ - (UC) UNCONFINED COMPRESSION TEST
 ■ - (Q) UNCONSOLIDATED - UNDRAINED SHEAR TEST
 ▲ - (R) CONSOLIDATED - UNDRAINED SHEAR TEST
 □ - (S) CONSOLIDATED - DRAINED SHEAR TEST
 BORINGS WERE TAKEN WITH A 5 INCH DIAMETER STEEL TUBE PISTON TYPE SAMPLER FOR SOIL BORING LEGEND SEE PLATE A FOR LOCATION OF BORINGS SEE PLATE IV-17A

LAKE PONTCHARTRAIN, LA. AND VICINITY
 LAKE PONTCHARTRAIN BARRIER PLAN
 DESIGN MEMORANDUM NO 2 - GENERAL DESIGN
 SUPPLEMENT NO. 8
 IHNC REMAINING LEVEES
UNDISTURBED BORING-2 WUC
 WEST LEVEE
 U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
 CORPS OF ENGINEERS
 NOVEMBER 1969

BORING NO. 3-WUC
 STA. 232+63 185 FT. LEFT B/L
 25 FT. LEFT PROPOSED C/L LEVEE
 25-26 FEB. 1969



BORING NO.	ENVELOPE		TYPE	STRENGTH		CLASS
	NO.	EL.		ϕ	C - TSF	
3-WUC	1	-200	↑	1°	.085	CH
	2	-301	Q	0°	.14	CH
	3	-400	↓	0°	.26	
	4	-118	R	12°	.18	
	5	-281	↑	17°	.07	SM
	6	-560	S	31°	.07	
	7	-830	↓	18°	.18	CH

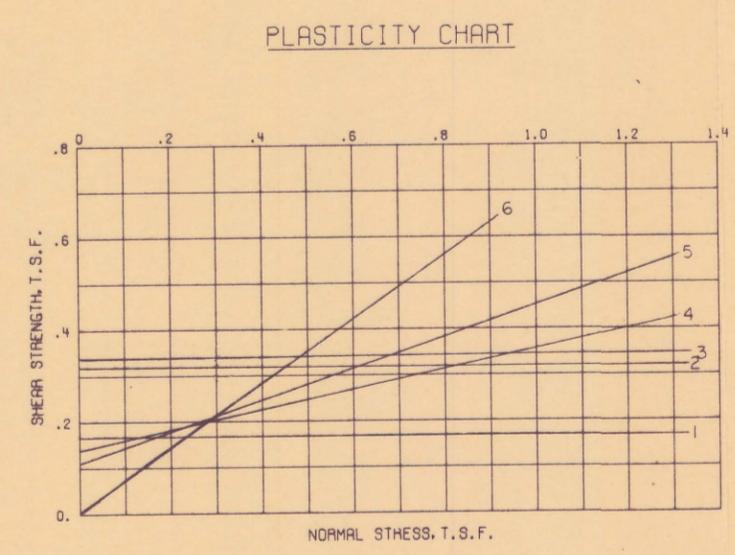
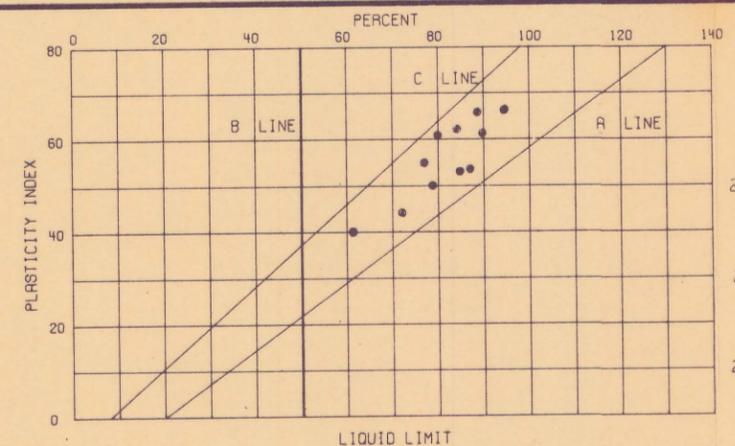
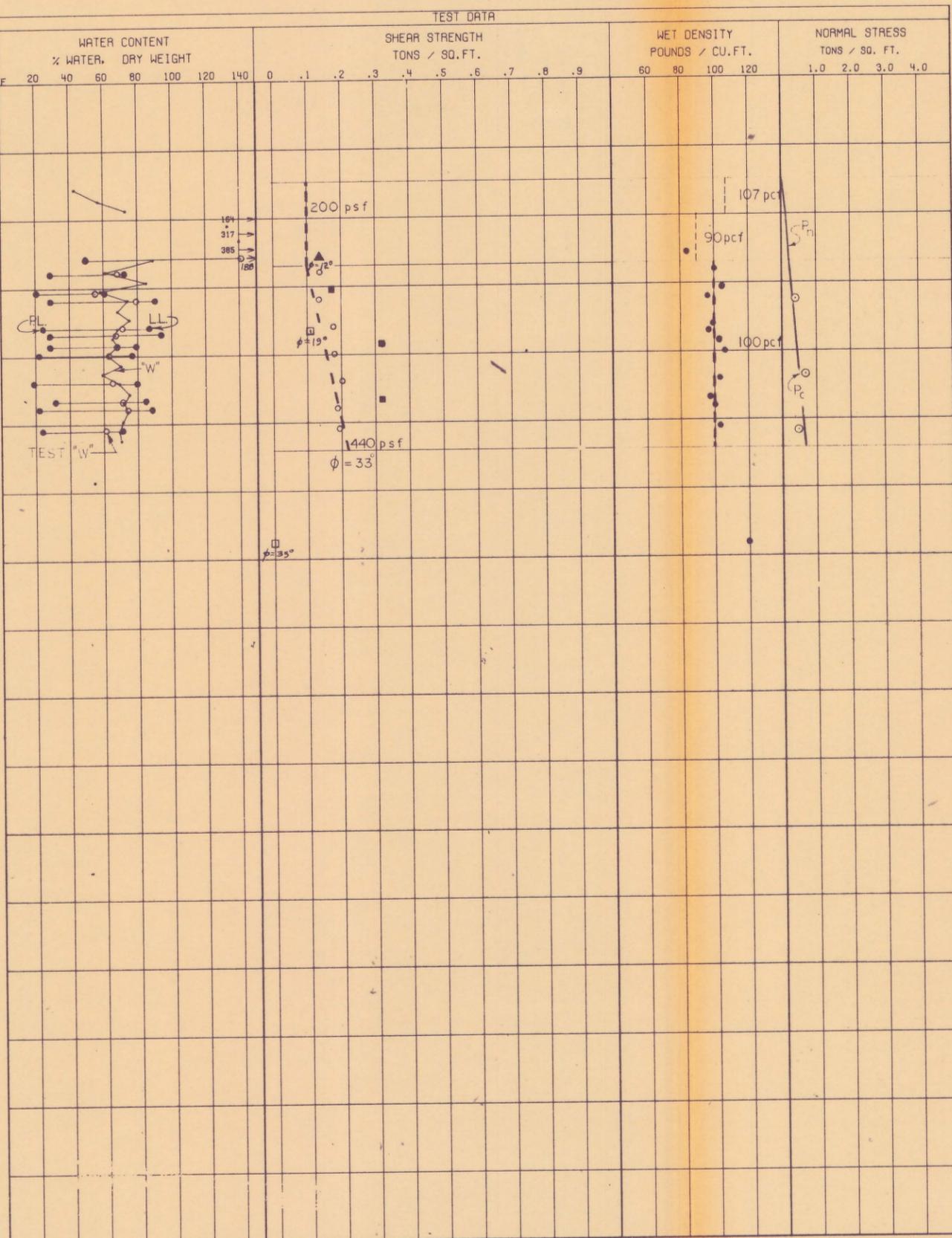
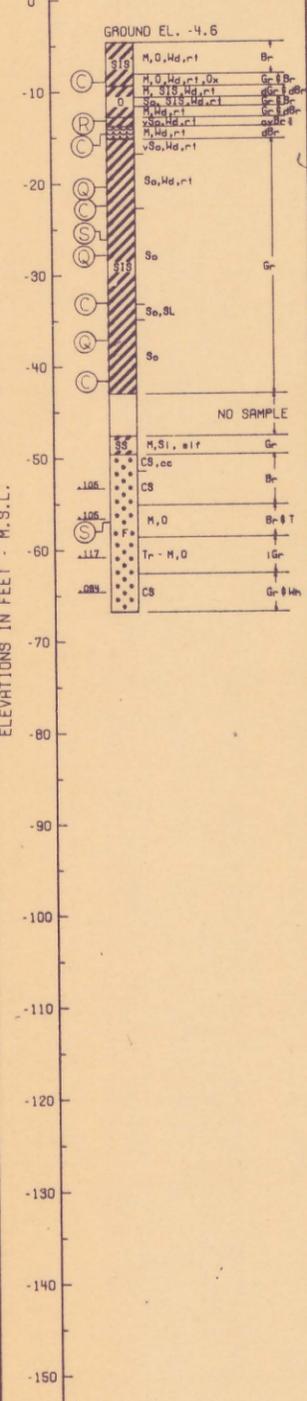


○ - (UC) UNCONFINED COMPRESSION TEST
 ■ - (Q) UNCONSOLIDATED - UNDRAINED SHEAR TEST
 ▲ - (R) CONSOLIDATED - UNDRAINED SHEAR TEST
 □ - (S) CONSOLIDATED - DRAINED SHEAR TEST

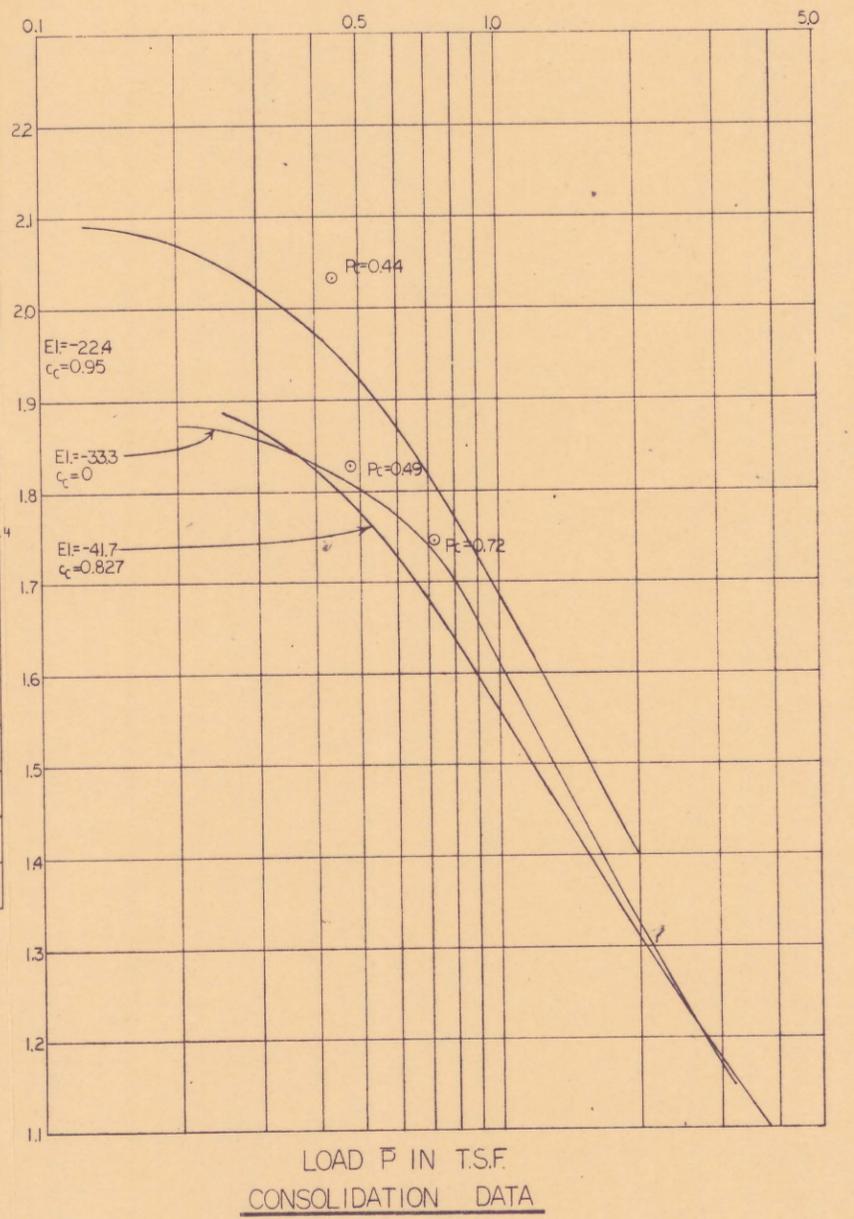
BORINGS WERE TAKEN WITH A 5 INCH DIAMETER STEEL TUBE PISTON TYPE SAMPLER FOR SOIL BORING LEGEND SEE PLATE A FOR LOCATION OF BORINGS SEE PLATE IV-17A

LAKE PONTCHARTRAIN, LA. AND VICINITY
 LAKE PONTCHARTRAIN BARRIER PLAN
 DESIGN MEMORANDUM NO 2 - GENERAL DESIGN
 SUPPLEMENT NO. B
IHNC REMAINING LEVEES
UNDISTURBED BORING-3 WUC
 WEST LEVEE
 U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS,
 CORPS OF ENGINEERS
 NOVEMBER 1969 FILE NO. H-2-24111

BORING NO. 4-WUCT
 STA. 223+93 36 FT. RIGHT B/L
 196 FT. RIGHT PROPOSED C/L LEVEE
 18-19 FEB. 1969



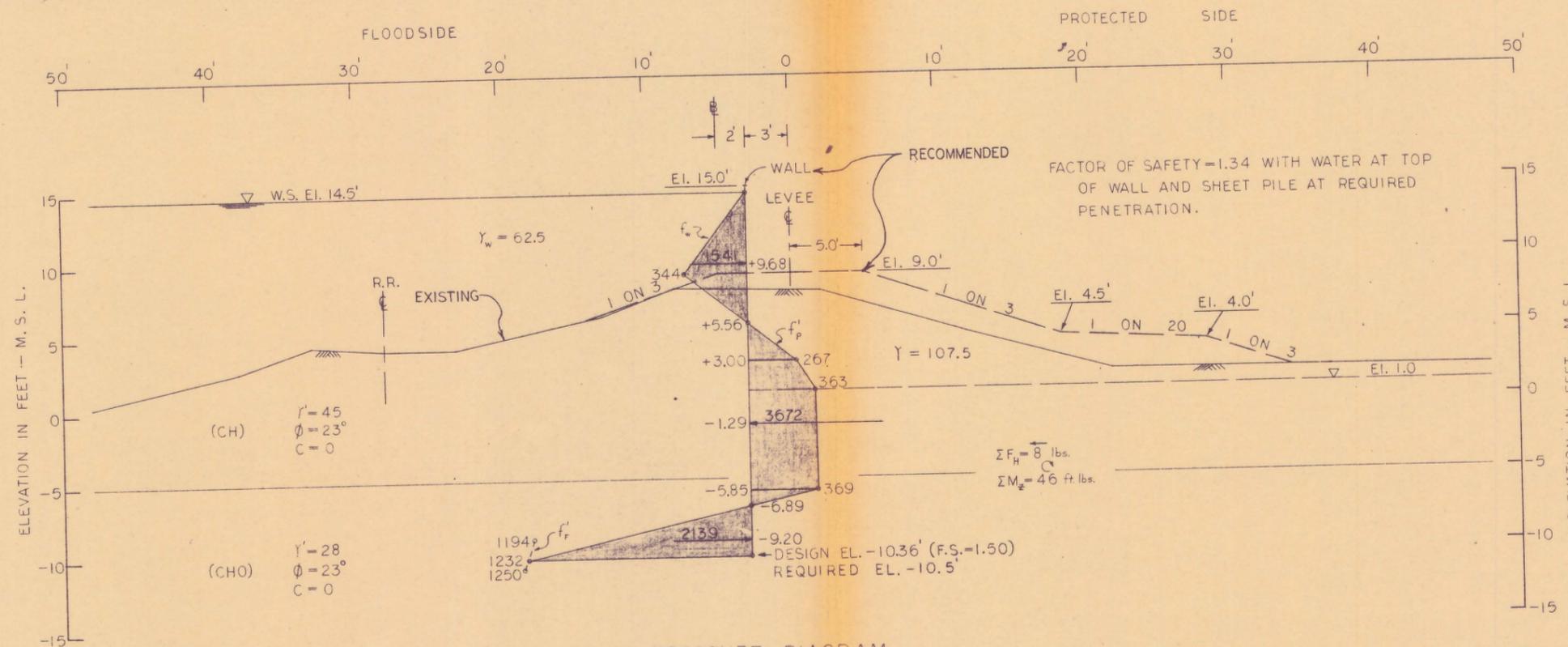
BORING NO.	ENVELOPE		TYPE	STRENGTH		CLASS
	NO.	EL.		Φ	C - TSF	
4WUCT	1	-20.5	↑	↑	.17	CH
	2	-28.4	Q	0°	.32	
	3	-36.8	↓	↓	.34	
	4	-13.2	R	12°	.14	SM
	5	-26.2	↑	19°	.11	
	6	-57.2	↓	35°	0	



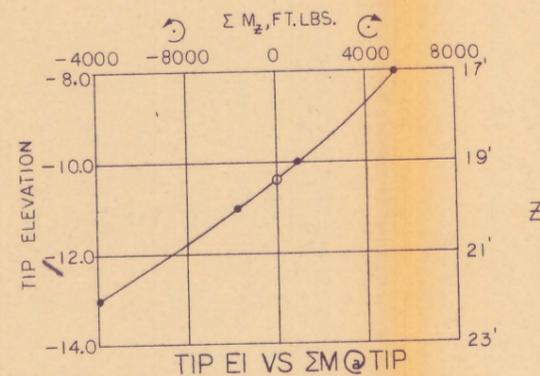
○ - (UC) UNCONFINED COMPRESSION TEST
 ■ - (Q) UNCONSOLIDATED - UNDRAINED SHEAR TEST
 ▲ - (R) CONSOLIDATED - UNDRAINED SHEAR TEST
 □ - (S) CONSOLIDATED - DRAINED SHEAR TEST

BORINGS WERE TAKEN WITH A 5 INCH DIAMETER STEEL TUBE PISTON TYPE SAMPLER FOR SOIL BORING LEGEND SEE PLATE A FOR LOCATION OF BORINGS SEE PLATE IV-16A

LAKE PONTCHARTRAIN, LA. AND VICINITY
 LAKE PONTCHARTRAIN BARRIER PLAN
 DESIGN MEMORANDUM NO 2 - GENERAL DESIGN
 SUPPLEMENT NO. 8
 IHNC REMAINING LEVEES
UNDISTURBED BORING-4 WUC
 WEST LEVEE
 U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
 CORPS OF ENGINEERS



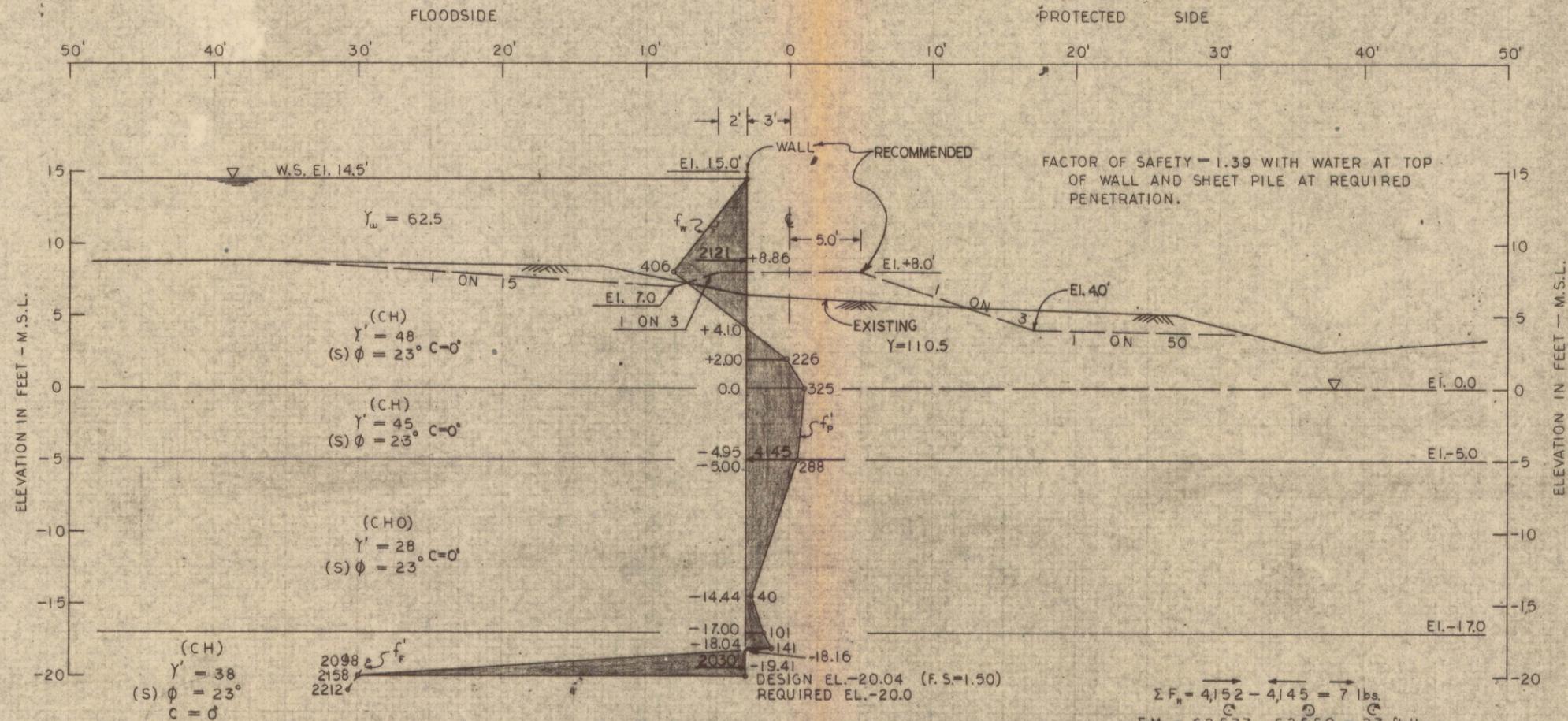
NET PRESSURE DIAGRAM
STATION 210+75 TO 219+06.29
 (ALONG FRANCE ROAD)



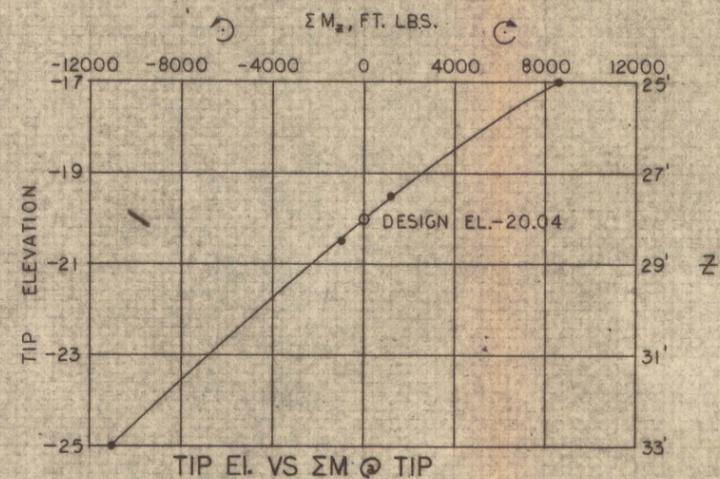
GENERAL NOTES

- (S) CONSOLIDATED-DRAINED SHEAR STRENGTH. CANTILEVER SHEET PILE STABILITY BY METHOD OF PLANES ANALYSIS.
- f_w LATERAL WATER PRESSURE.
- f_p NET LATERAL PRESSURE ON FLOODSIDE, EARTH AND WATER.
- f_p' NET LATERAL PRESSURE ON PROTECTED SIDE, EARTH AND WATER.
- γ_w UNIT WEIGHT OF WATER IN P.C.F.
- γ UNIT WEIGHT OF SOIL-WATER SYSTEM IN P.C.F.
- γ' UNIT WEIGHT OF SUBMERGED SOIL IN P.C.F.
- ϕ ANGLE OF INTERNAL FRICTION IN DEGREES.
- ΣF_H SUMMATION OF HORIZONTAL FORCES.
- ΣM_z SUMMATION OF MOMENTS ABOUT TIP.
- Z PENETRATION OF SHEET PILE BELOW LEVEE CROWN.
- F.S. FACTOR OF SAFETY WITH RESPECT TO (S) SHEAR STRENGTH, $\tan \phi' = \frac{\tan \phi}{F.S.}$
- (Q) ANALYSIS IS SHOWN ON PLATE 10.
- (S) CASE CONTROLS DESIGN.

LAKE PONTCHARTRAIN, LA AND VICINITY
 LAKE PONTCHARTRAIN BARRIER PLAN
 DESIGN MEMORANDUM NO 2 - GENERAL DESIGN
 SUPPLEMENT NO. 8
CANTILEVER SHEET PILE
(S) STABILITY
 STA. 210+75.00 TO STA. 219+06.29
 WEST LEVEE
 U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
 CORPS OF ENGINEERS



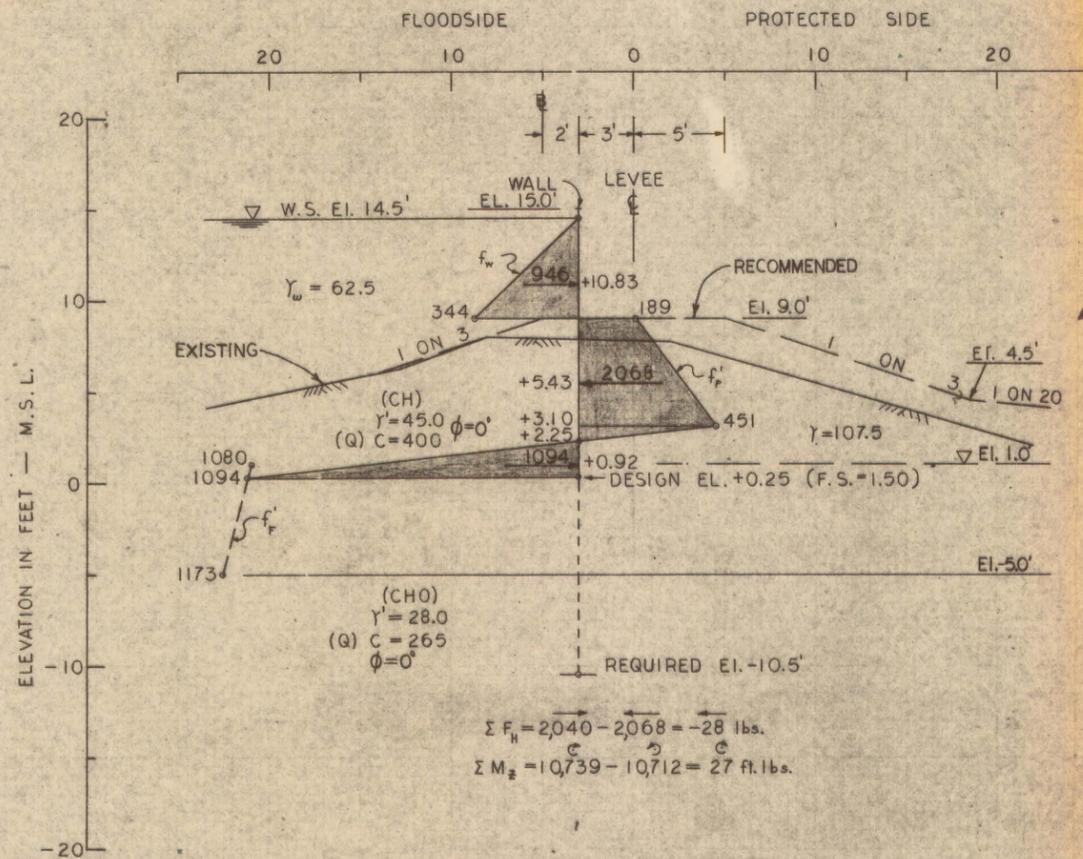
NET PRESSURE DIAGRAM
STATION 223+73.08 TO 237+42.51
(ALONG FLORIDA AVENUE DRAINAGE CANAL)



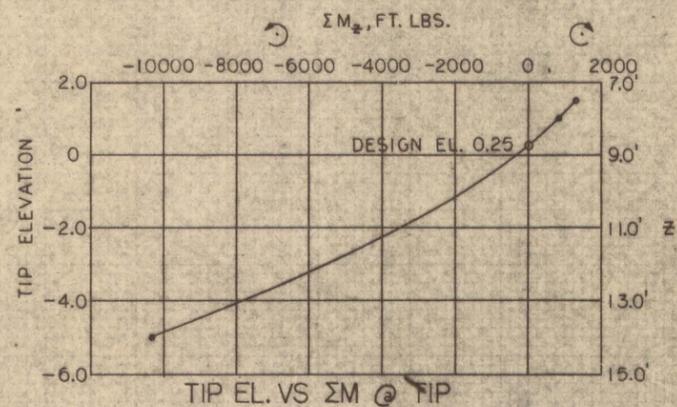
GENERAL NOTES

- (S) CONSOLIDATED-DRAINED SHEAR STRENGTH. CANTILEVER SHEET PILE STABILITY BY METHOD OF PLANES ANALYSIS.
- f_w LATERAL WATER PRESSURE.
- f_F NET LATERAL PRESSURE ON FLOODSIDE, EARTH AND WATER.
- f_P NET LATERAL PRESSURE ON PROTECTED SIDE, EARTH AND WATER.
- Y_w UNIT WEIGHT OF WATER IN P.C.F.
- Y UNIT WEIGHT OF SOIL-WATER SYSTEM IN P.C.F.
- Y' UNIT WEIGHT OF SUBMERGED SOIL IN P.C.F.
- φ ANGLE OF INTERNAL FRICTION IN DEGREES.
- Σ F_H SUMMATION OF HORIZONTAL FORCES.
- Σ M_z SUMMATION OF MOMENTS ABOUT TIP.
- Z PENETRATION OF SHEET PILE BELOW LEVEE CROWN.
- F.S. FACTOR OF SAFETY WITH RESPECT TO (S) SHEAR STRENGTH, $TAN \phi' = \left(\frac{TAN \phi}{F.S.} \right)$
- (Q) ANALYSIS SHOWN ON PLATE 10.
- (S) CASE CONTROLS DESIGN.

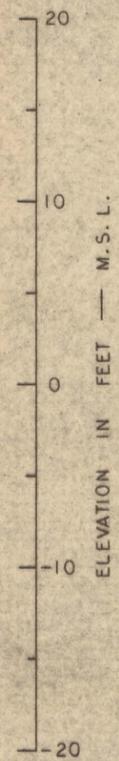
LAKE PONTCHARTRAIN, L.A. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO 2 - GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES
CANTILEVER SHEET PILE
(S) STABILITY
STA. 223+73.08 TO STA. 237+42.51
WEST LEVEE
U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS



NET PRESSURE DIAGRAM



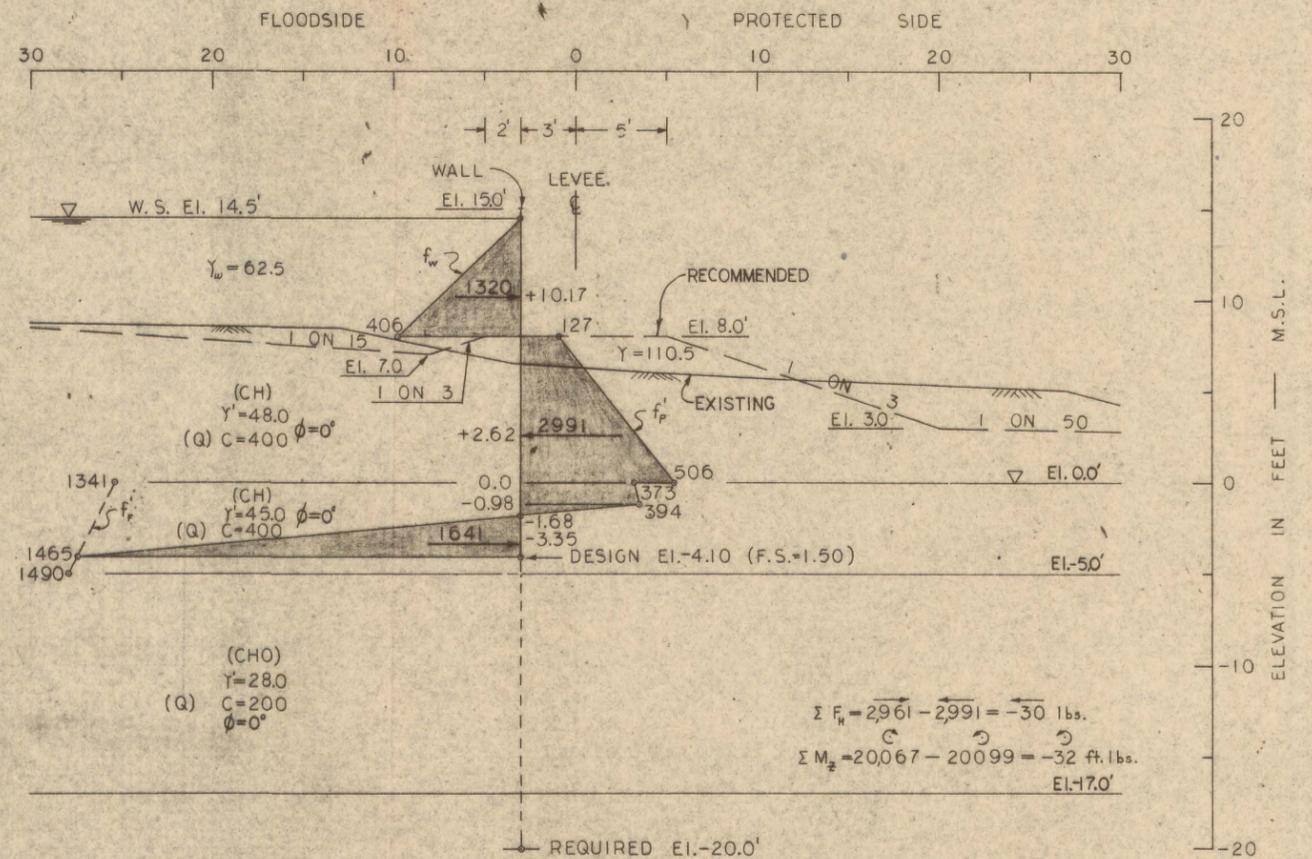
STATION 210+75 TO 219+06.29
(ALONG FRANCE ROAD)



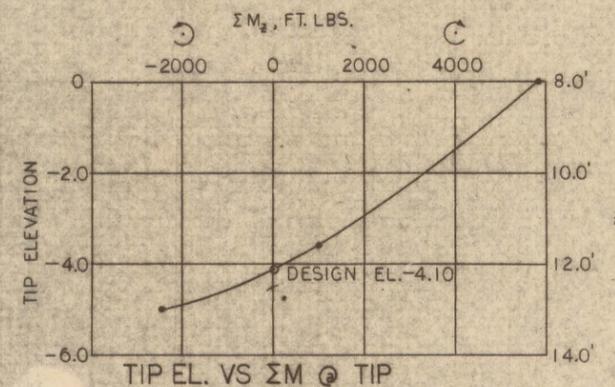
GENERAL NOTES

- (Q) UNCONSOLIDATED-UNDRAINED SHEAR STRENGTH. CANTILEVER SHEET PILE STABILITY BY METHOD OF PLANES ANALYSIS.
- f_w LATERAL WATER PRESSURE.
- f_f NET LATERAL PRESSURE ON FLOODSIDE, EARTH AND WATER.
- f_p NET LATERAL PRESSURE ON PROTECTED SIDE, EARTH AND WATER.
- γ_w UNIT WEIGHT OF WATER IN P.C.F.
- γ UNIT WEIGHT OF SOIL-WATER SYSTEM IN P.C.F.
- γ' UNIT WEIGHT OF SUBMERGED SOIL IN P.C.F.
- C UNIT COHESION IN P.S.F.
- ΣF_h SUMMATION OF HORIZONTAL FORCES.
- ΣM_z SUMMATION OF MOMENTS ABOUT TIP.
- Z PENETRATION OF SHEET PILE BELOW LEVEE CROWN.
- F.S. FACTOR OF SAFETY WITH RESPECT TO (Q) SHEAR STRENGTH, $c' = \left(\frac{C}{F.S.}\right)$

(S) ANALYSIS CONTROLS DESIGN; SEE PLATES 8 & 9.

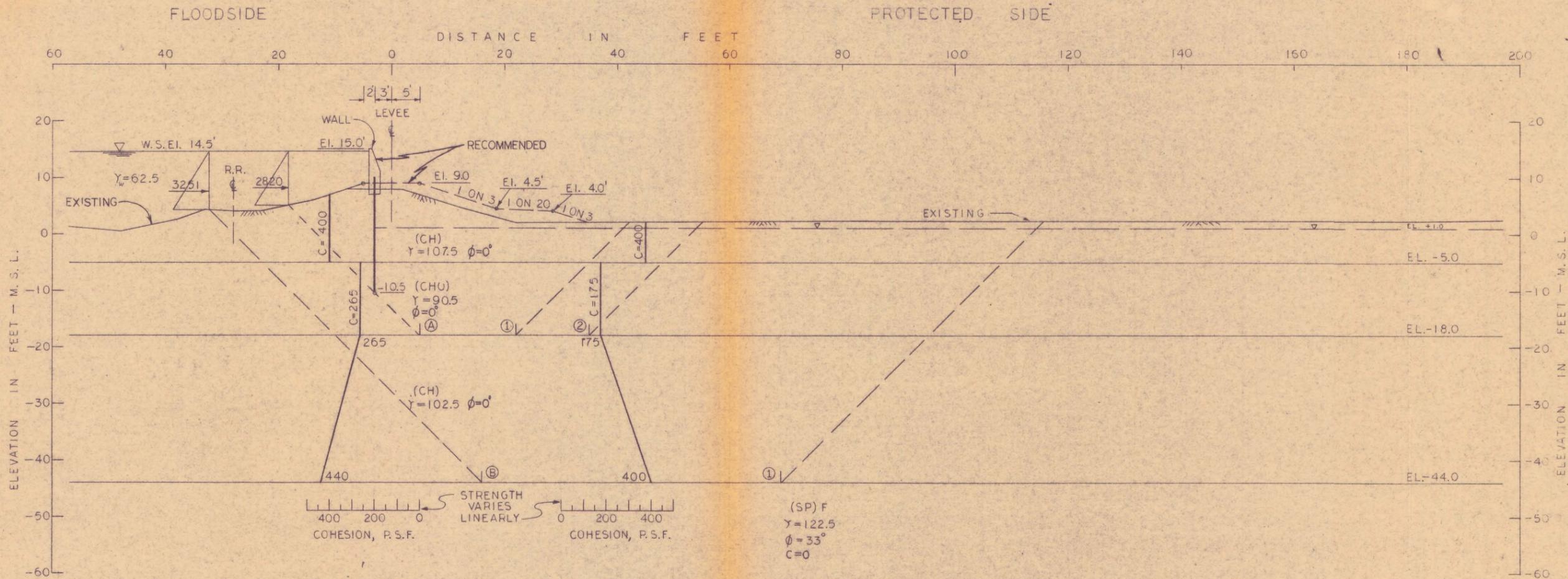


NET PRESSURE DIAGRAM



STATION 223+73.08 TO 237+42.51
(ALONG FLORIDA AVENUE DRAINAGE CANAL)

LAKE PONTCHARTRAIN, L.A. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO 2 - GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES
**CANTILEVER SHEET PILE
(Q) STABILITY
WEST LEVEE**
U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS



GENERAL NOTES

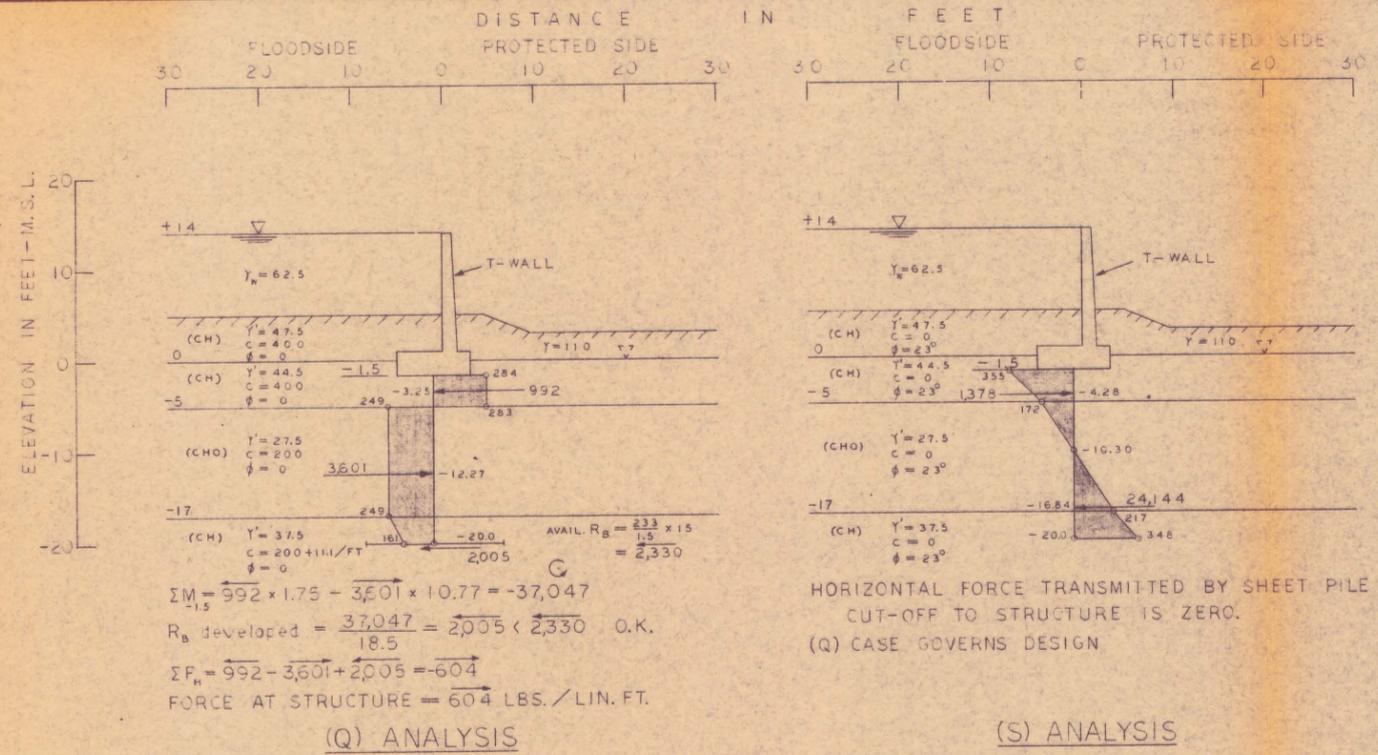
- (Q) UNCONSOLIDATED-UNDRAINED SHEAR STRENGTH IN P.S.F.
- Y UNIT WEIGHT OF SOIL WATER SYSTEM, P.C.F.
- C UNIT COHESION, P.S.F.
- φ ANGLE OF INTERNAL FRICTION, DEGREES.
- D HORIZONTAL DRIVING FORCE POUNDS.
- R HORIZONTAL RESISTING FORCE, POUNDS.
- Y_w UNIT WEIGHT OF WATER, P.C.F.
- F.O.S.= FACTOR OF SAFETY
- $$F.O.S. = \frac{R_A + R_B + R_P}{D_A - D_p} = \frac{\Sigma R}{\Sigma D}$$

**STA. 210+75.00 TO 219+06.29
(ALONG FRANCE ROAD)**

STABILITY ANALYSES										
STATION	FAILURE SURFACE	FAILURE ELEVATION	D _A *	D _P *	ΣD	R _A	R _B	R _P	ΣR	FACTOR OF SAFETY
210+75.0 TO	(A) ①	-18.0'	44,471	22,234	22,237	14,890	3,995	10,390	29,275	1.32
	(A) ②			20,063	24,408				31,655	1.30
219+78.50	(B) ①	-44.0'	145,579	106,394	39,185	32,623	21,354	25,500	79,477	2.03

* TOTAL WEIGHTS USED, INCLUDING SURFACE WATER.

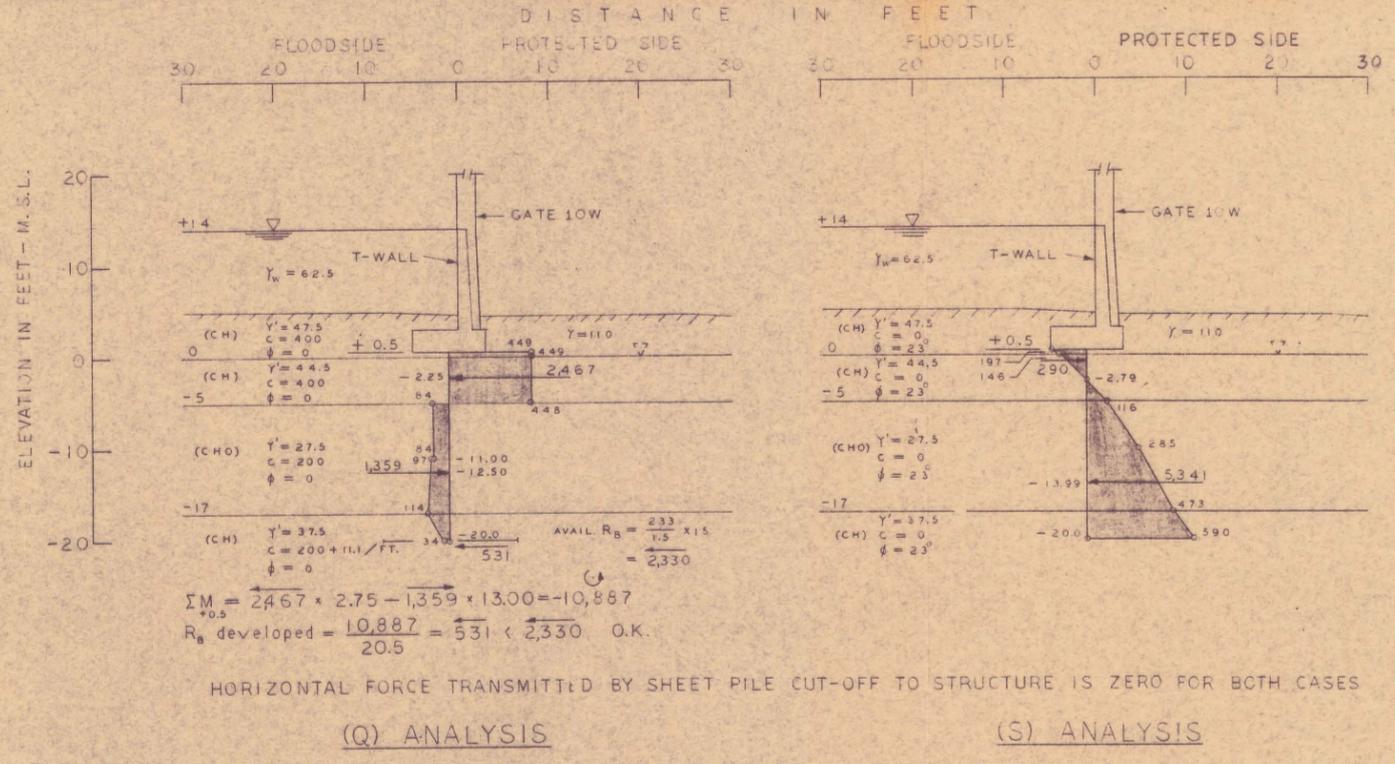
LAKE PONTCHARTRAIN, L.A. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO 2 - GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES
(Q) STABILITY ANALYSIS
STA. 210+75.00 TO STA. 219+06.29
WEST LEVEE
U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS



(Q) ANALYSIS

(S) ANALYSIS

T-WALL STATION 219+06.29 TO 220+70.54

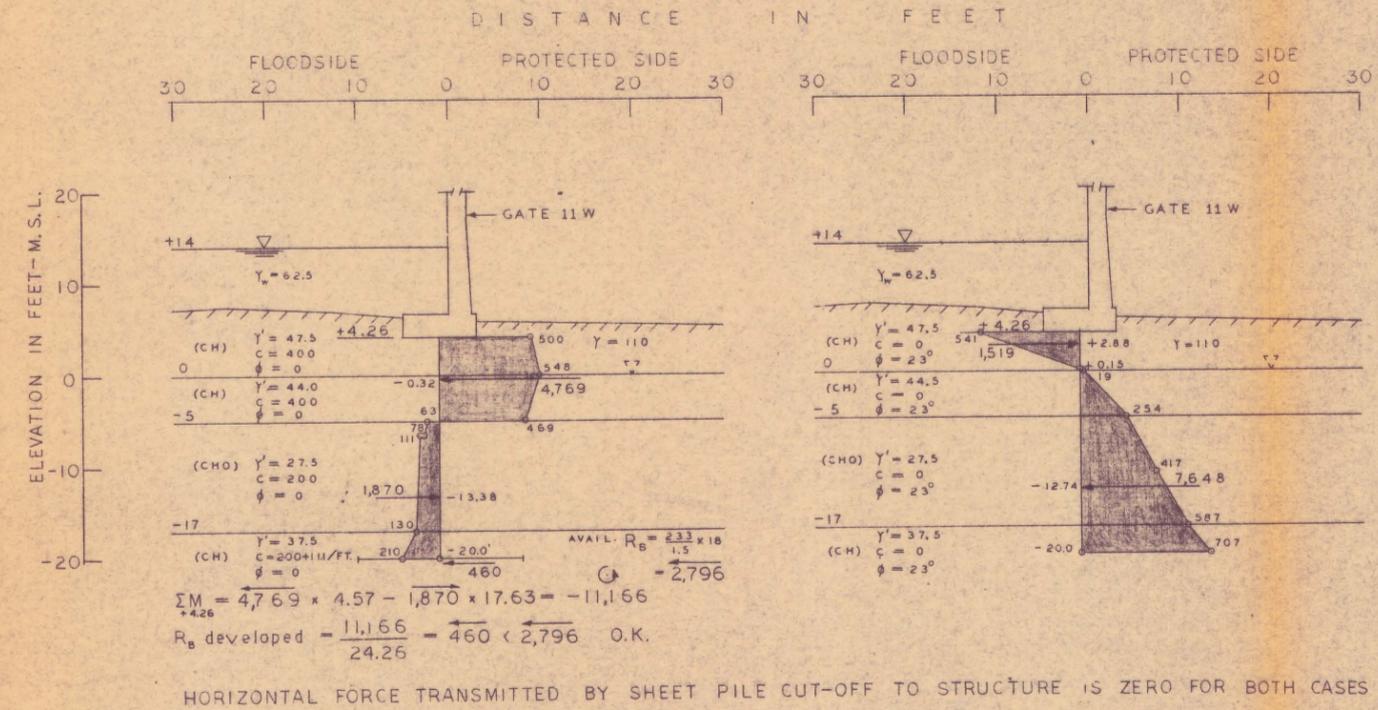


(Q) ANALYSIS

(S) ANALYSIS

GATE 10W AND T-WALL STA. 220+88.54 TO 221+31.31

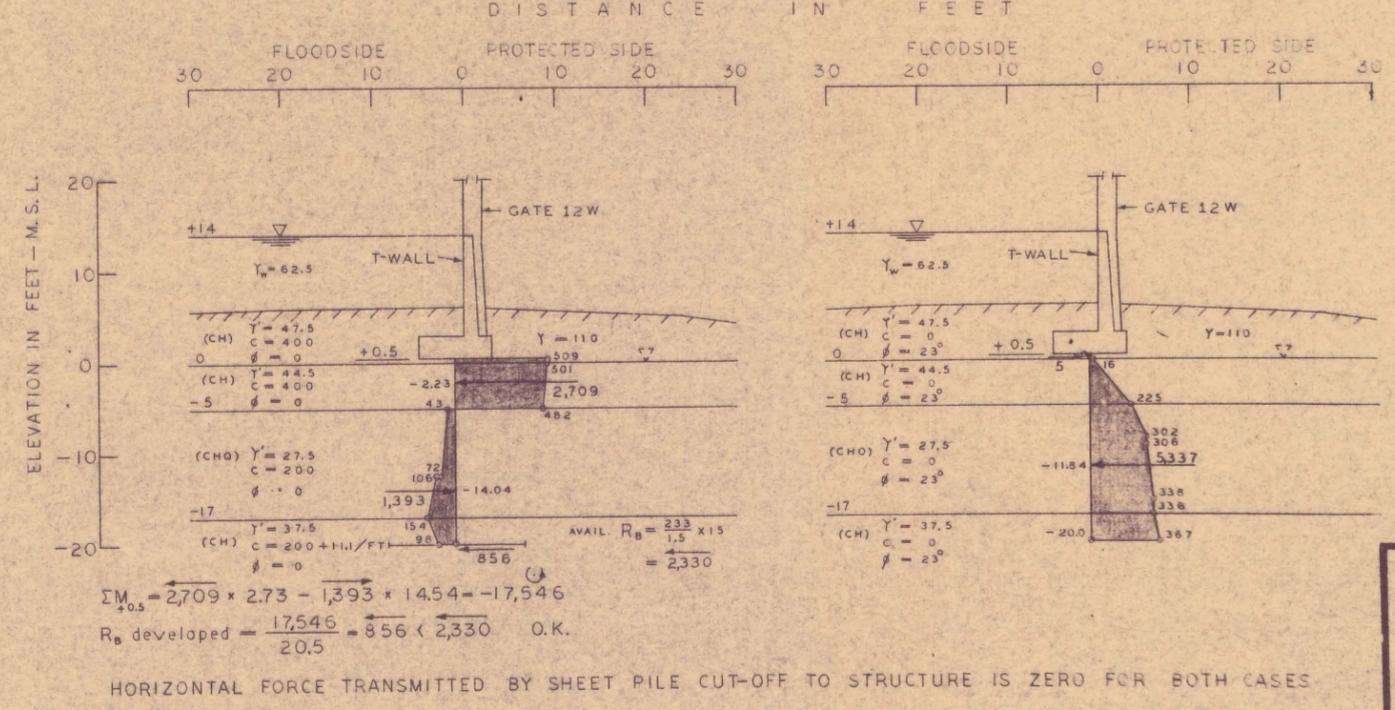
- GENERAL NOTES**
- BATTER PILES REQUIRED TO RESIST UNBALANCED WATER LOAD AT BASE OF STRUCTURE FOR STABILITY.
 - RESISTANCE DUE TO BEARING PILES WAS NEGLECTED, IN THESE ANALYSES.
 - TIP ELEVATION FOR ALL SHEET PILING IS -20.0 M.S.L.
 - ALL FORCES AND MOMENTS ARE IN POUNDS AND FOOT-POUNDS RESPECTIVELY.
 - γ UNIT WEIGHT OF SOIL WATER SYSTEM.
 - γ' SUBMERGED UNIT WEIGHT OF SOIL.
 - c UNIT COHESION, P.S.F.
 - φ ANGLE OF INTERNAL FRICTION, DEGREES.
 - γ_w UNIT WEIGHT OF WATER.
 - FACTOR OF SAFETY: 1.50
 - (Q) UNCONSOLIDATED-UNDRAINED SHEAR STRENGTH.
 - (S) CONSOLIDATED-DRAINED SHEAR STRENGTH.



(Q) ANALYSIS

(S) ANALYSIS

GATE 11W

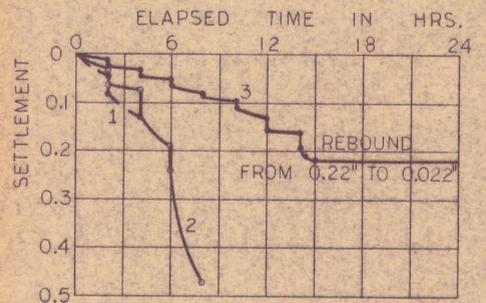
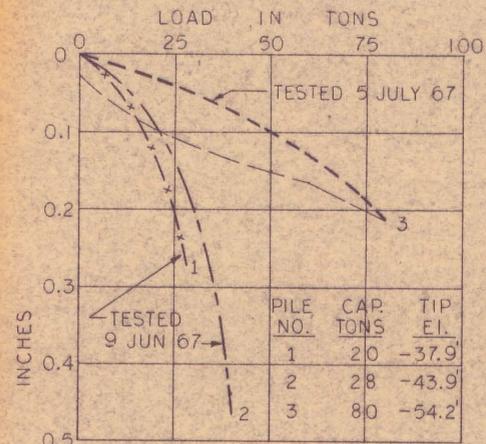
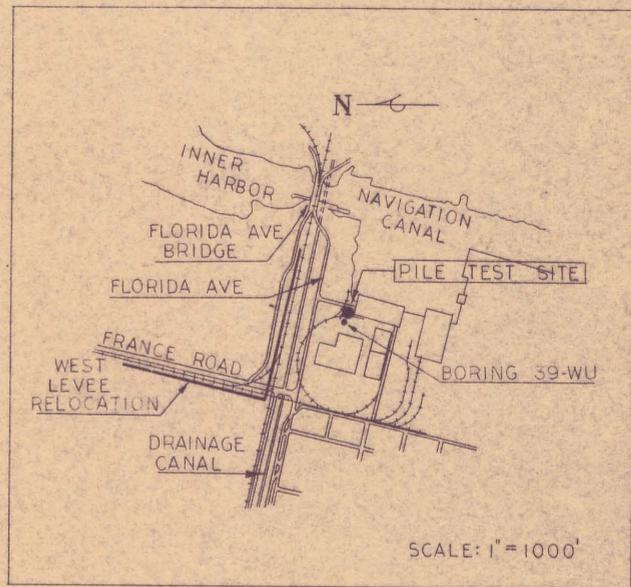


(Q) ANALYSIS

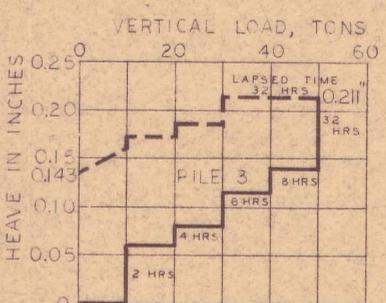
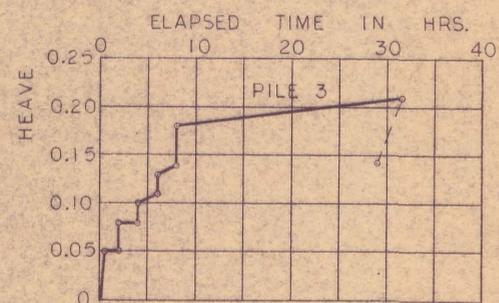
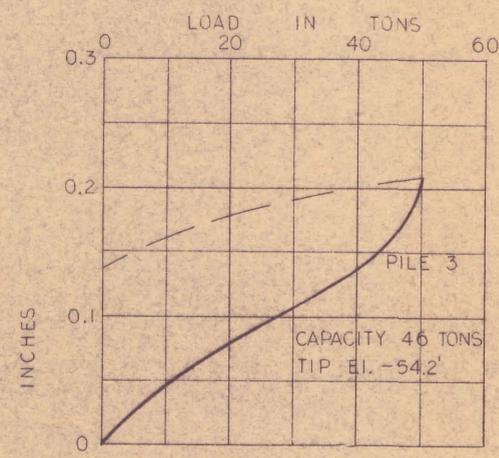
(S) ANALYSIS

T-WALL STA. 221+66.31 TO 222+46.94, STA. 222+72.94 TO 223+73.08, AND GATE 12W

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO 2 - GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES
SHEET PILE CUT-OFF
UNBALANCED WATER LOAD ANALYSIS
T-WALL AND GATES - WEST LEVEE
U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NOVEMBER 1969 FILE NO. H-2-24111



COMPRESSION TESTS



TENSION TEST

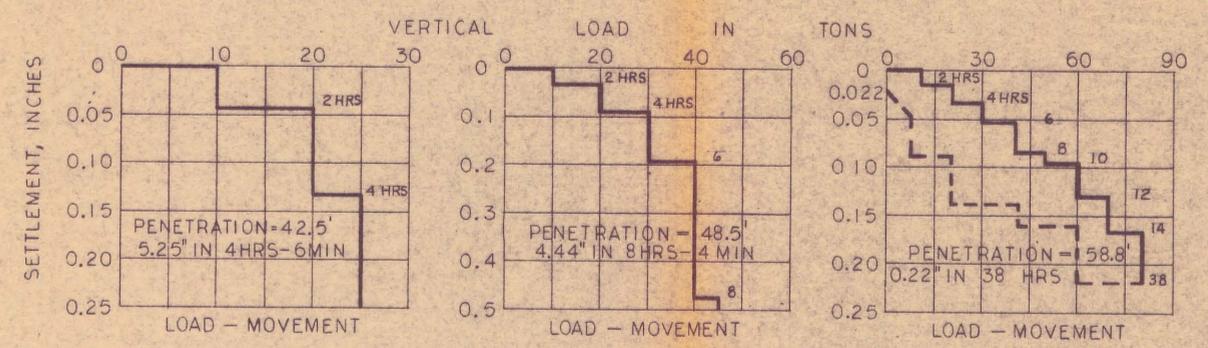
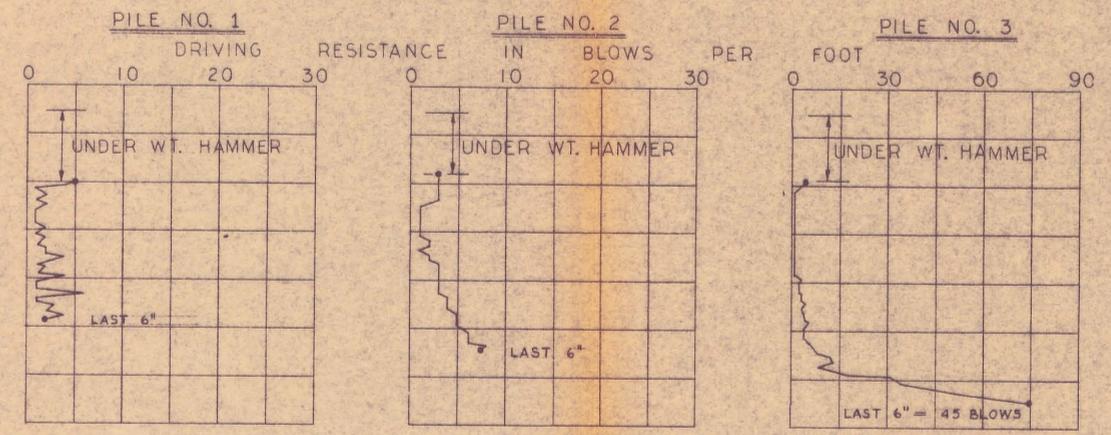
GENERAL NOTES

THE PILE TEST DATA SHOWN HERE ARE TAKEN FROM THE TESTS MADE FOR THE "I.H.N.C. WEST LEVEE, FLORIDA AVENUE TO THE I.H.N.C. LOCK" PROJECT, SITE NO. 1, WHICH IS ADJACENT TO THE "WEST LEVEE RELOCATION" PROJECT (SEE THE PILE TEST LOCATION MAP ON THIS PLATE).

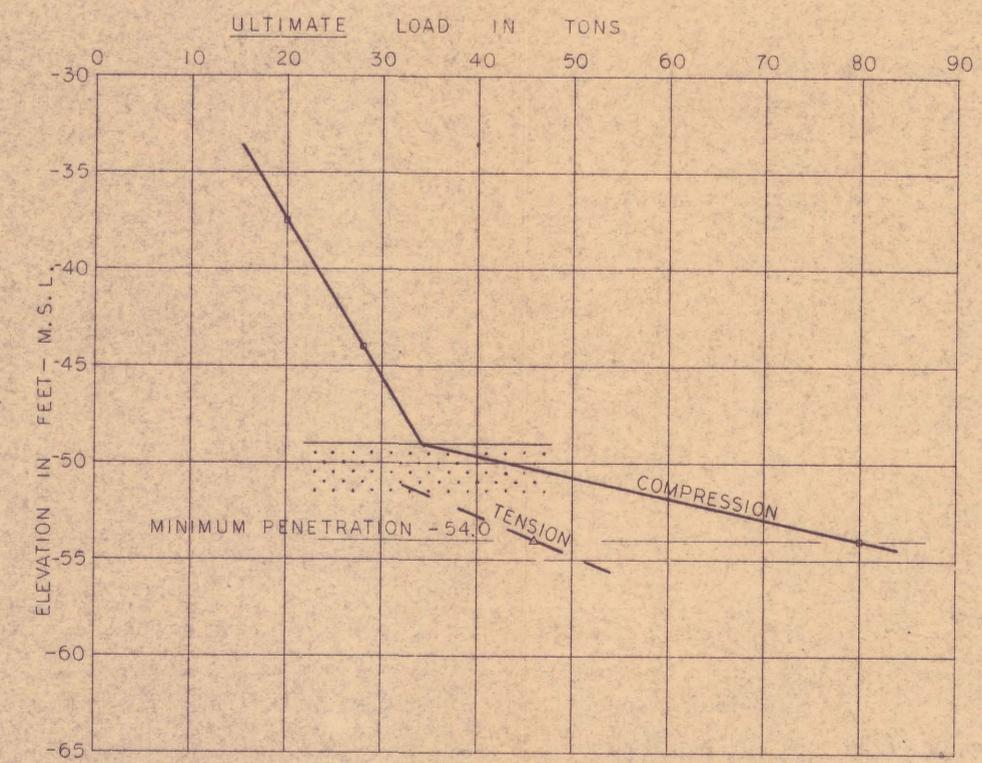
PIILING WAS DRIVEN USING A VOLCAN O6 HAMMER WITH MOVING HEAD WEIGHING 6,500 POUNDS AND OPERATING STEAM PRESSURE OF 115-120 P.S.I.

ALL PILES DRIVEN WERE 12" X 12" PRESTRESSED CONCRETE. DESIGN LOADS SHALL BE MULTIPLIED BY THE RESPECTIVE FACTOR OF SAFETY, 1.75 FOR COMPRESSION AND 2.00 FOR TENSION, BEFORE DETERMINING TIP ELEVATION FROM THE GRAPH.

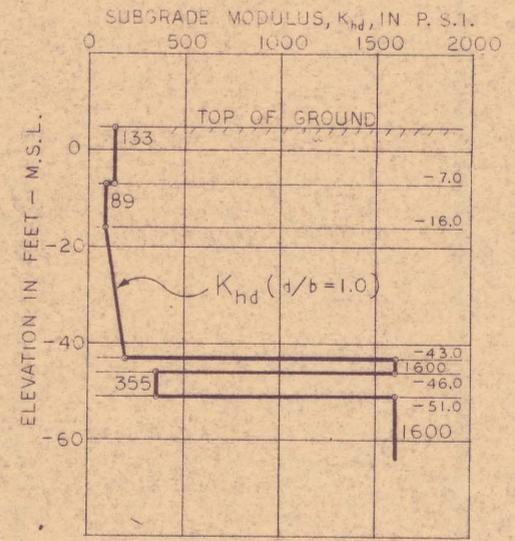
ELEVATION IN FEET - M.S.L.



PILE DRIVING AND LOADING DATA



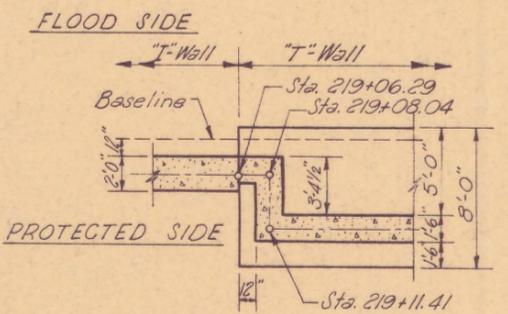
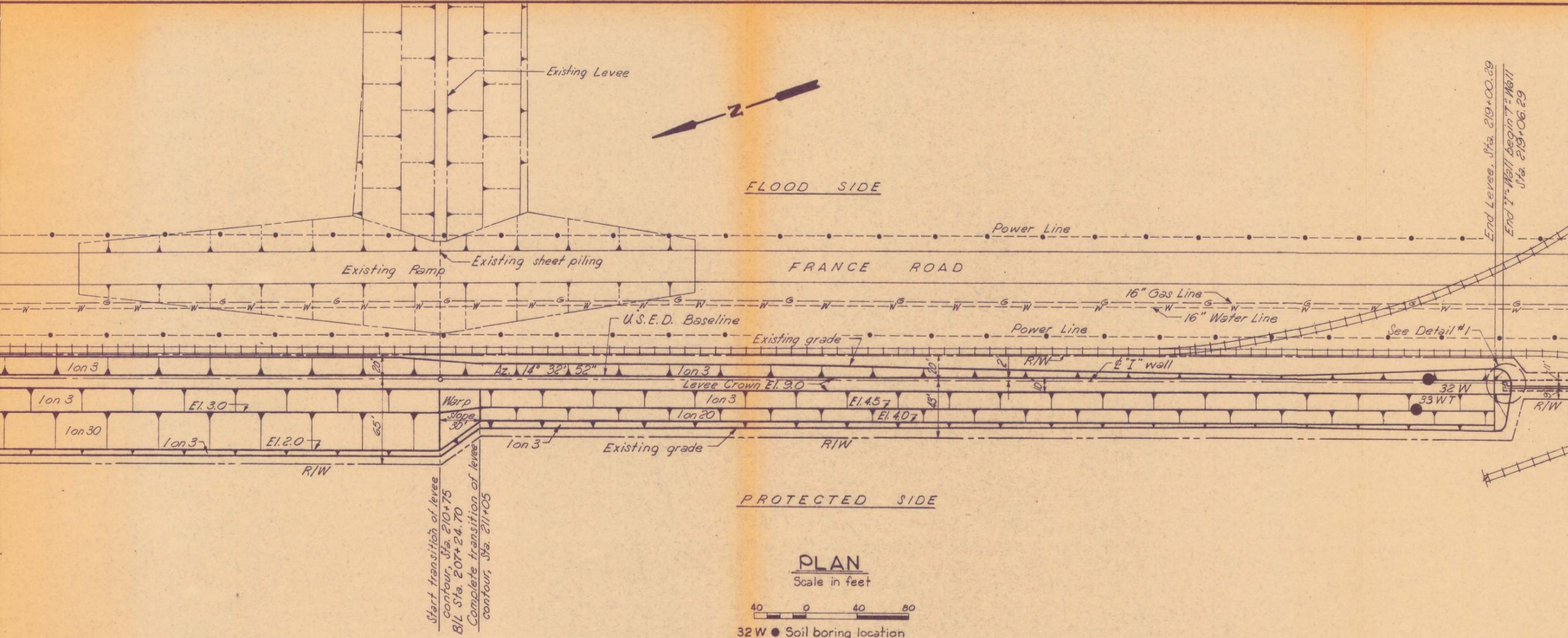
ULTIMATE LOAD VS TIP ELEVATION



SUBGRADE MODULUS VS. DEPTH* FOR GATES 10W, 11W, & 12W, AND T-WALL

* ADDITIONAL NOTES ARE SHOWN ON PLATE III-45 OF THE G.D.M., SUPPLEMENT NO. 8.

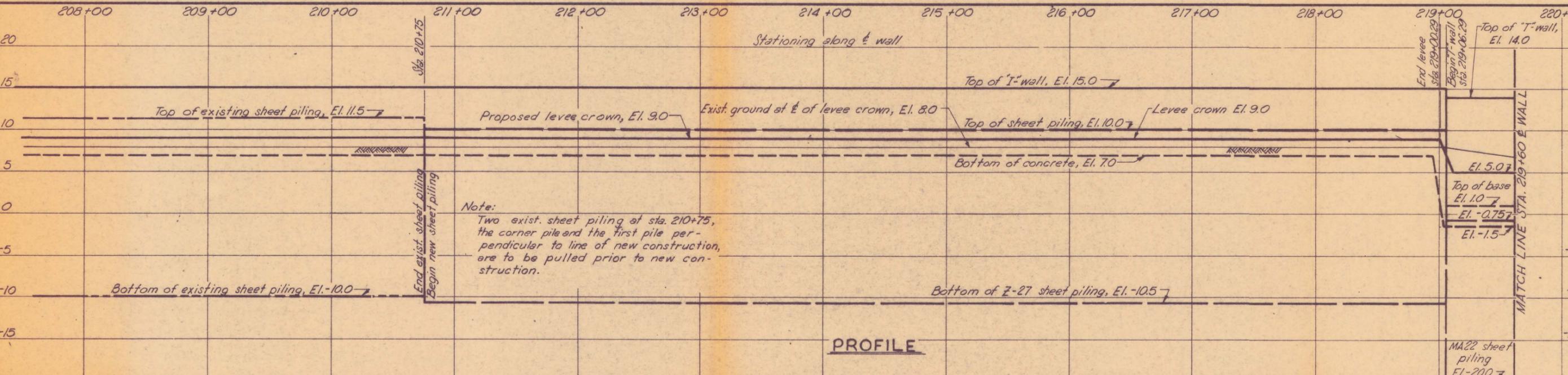
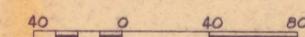
LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO 2 - GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES
BEARING PILES
PILE CAPACITIES & SUBGRADE MODULUS
WEST LEVEE
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS



DETAIL NO. 1
Scale: 1" = 5'

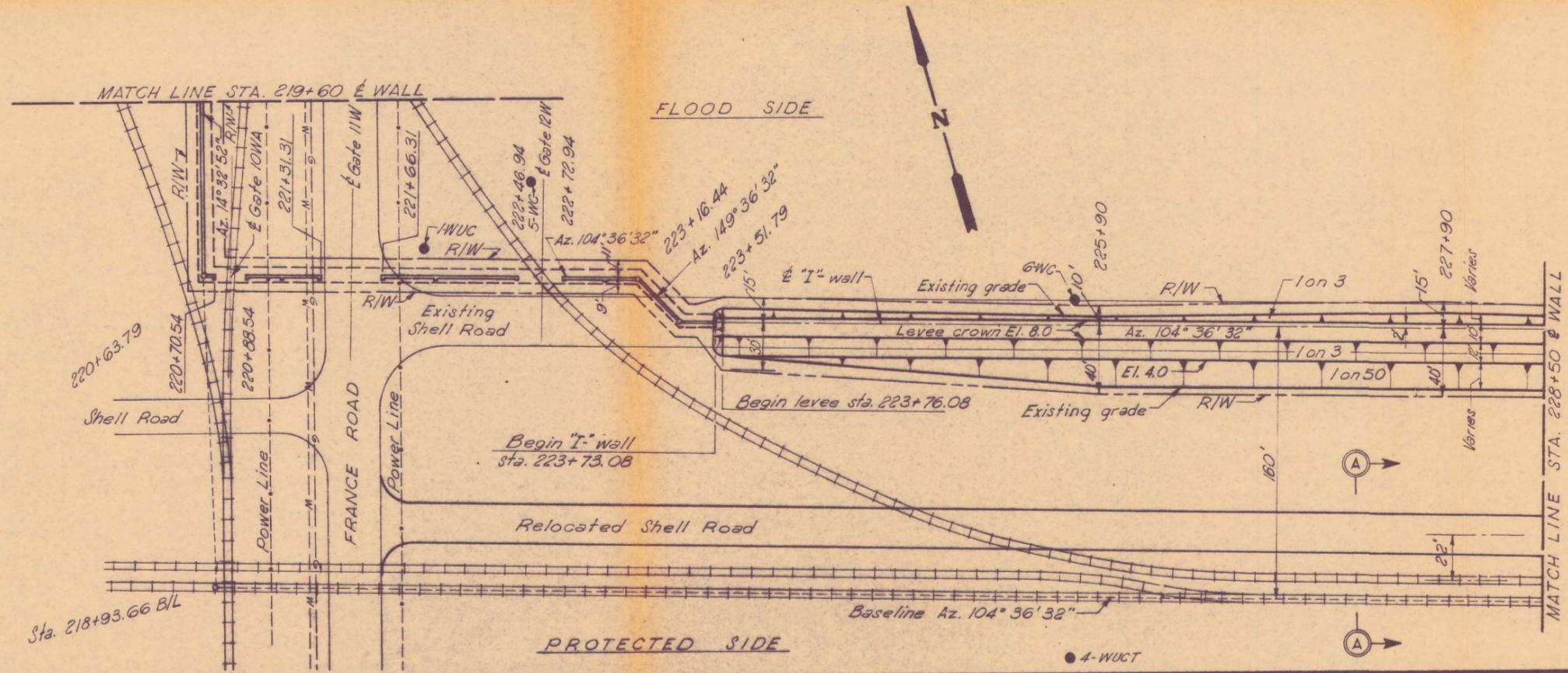
REFERENCE PLATES
Soil borings 7, (IV-33(G.D.M. No. 2 Supplement No. 8))
Design section IV-36A

PLAN
Scale in feet



PROFILE

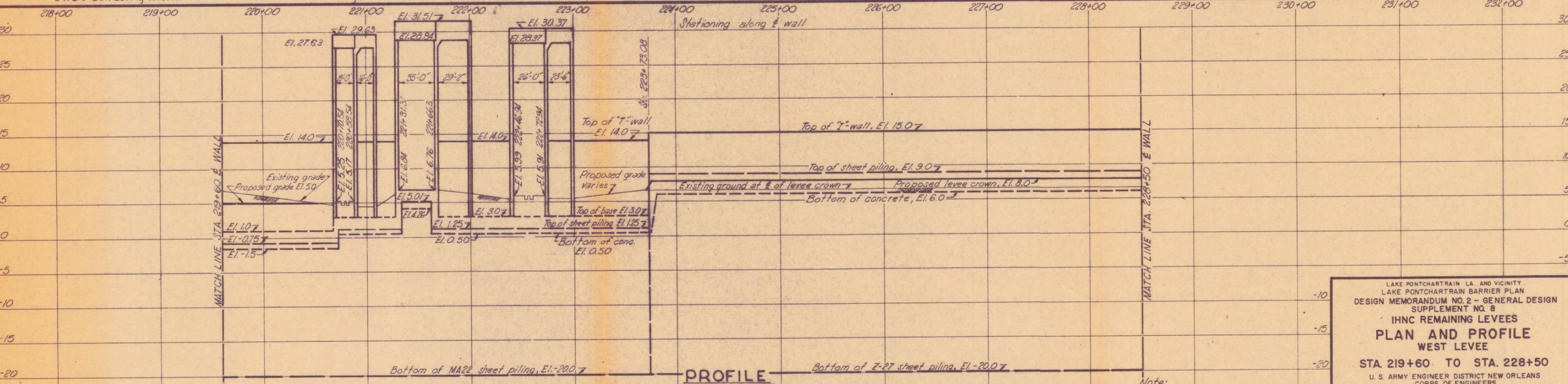
LAKE PONTCHARTRAIN LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES
PLAN AND PROFILE
WEST LEVEE
STA. 210+10 TO STA. 219+60
U. S. ARMY ENGINEER DISTRICT NEW ORLEANS
CORPS OF ENGINEERS
NOVEMBER 1969
FILE NO. H-2-24111



Note:
For typical section of relocated shell road see section "A-A", plate IV-17A.

REFERENCE PLATES

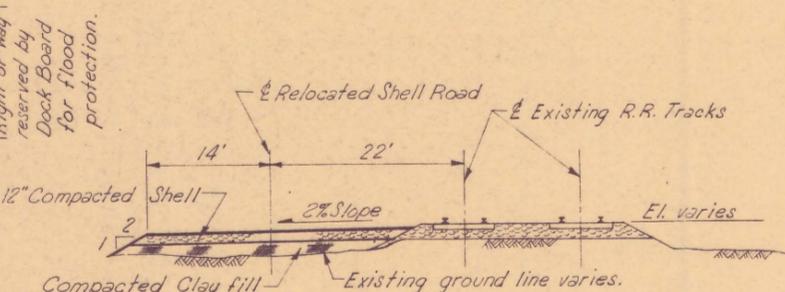
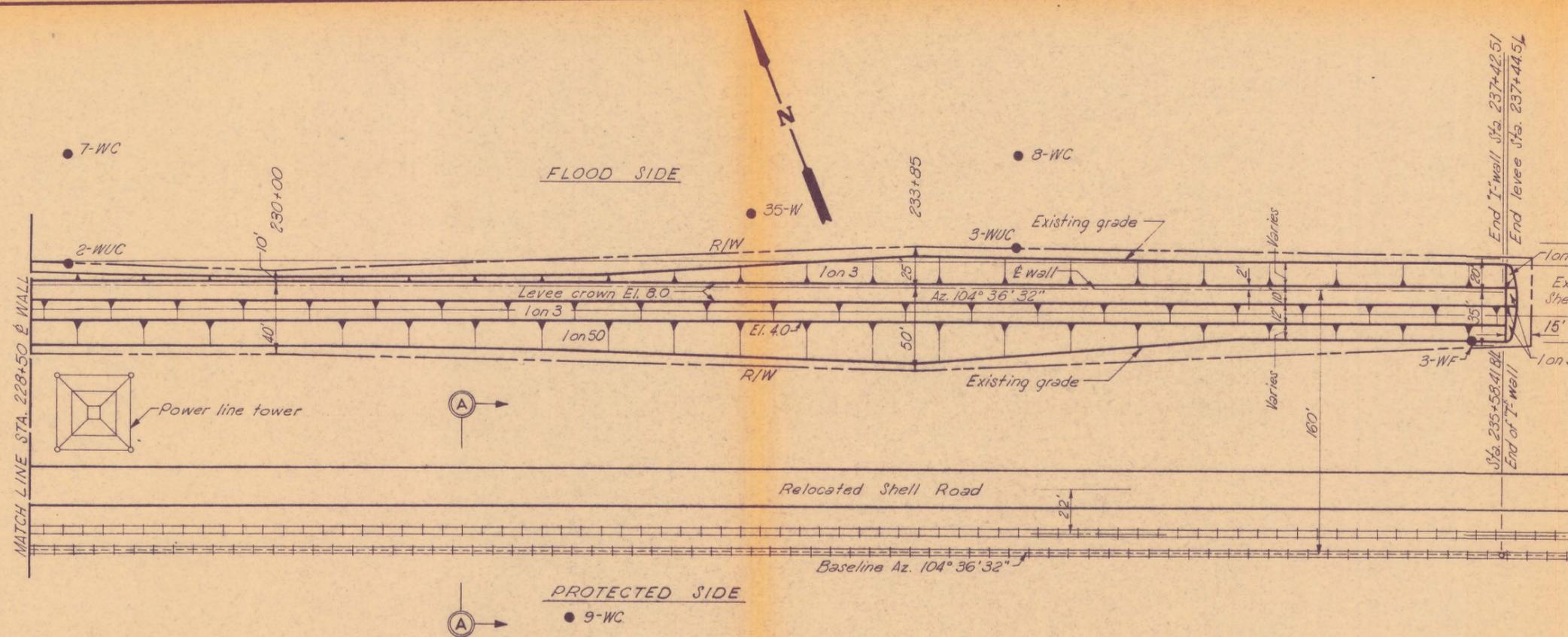
Soil borings	3, 6, 7
Design sections	IV-36 A
Overhead gate	IV-47



PROFILE

Note:
Elevations are in feet M.S.L.

LAKE PONTCHARTRAIN LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES
PLAN AND PROFILE
WEST LEVEE
STA. 219+60 TO STA. 228+50
U. S. ARMY ENGINEER DISTRICT NEW ORLEANS
CORPS OF ENGINEERS

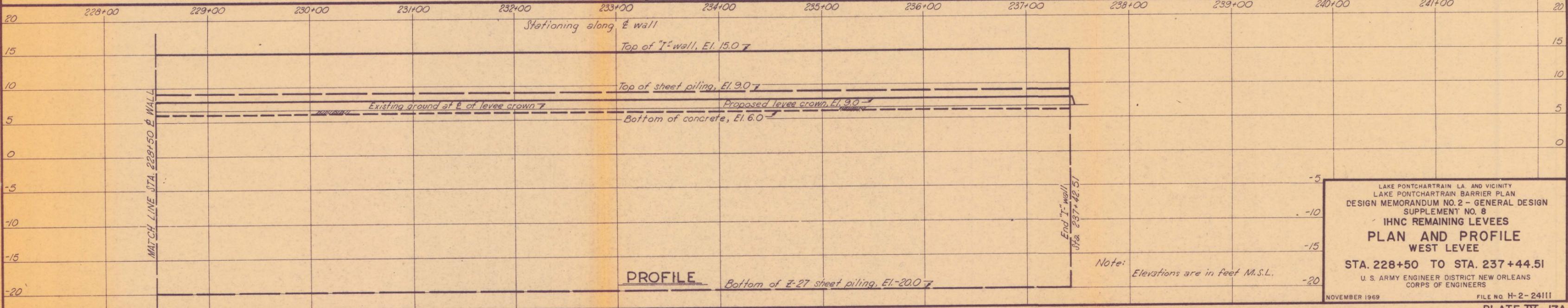


SECTION A-A
Scale: 1"=10'-0"

Note: Relocated shell road merges with existing shell road at B/L Sta. 237+70±.

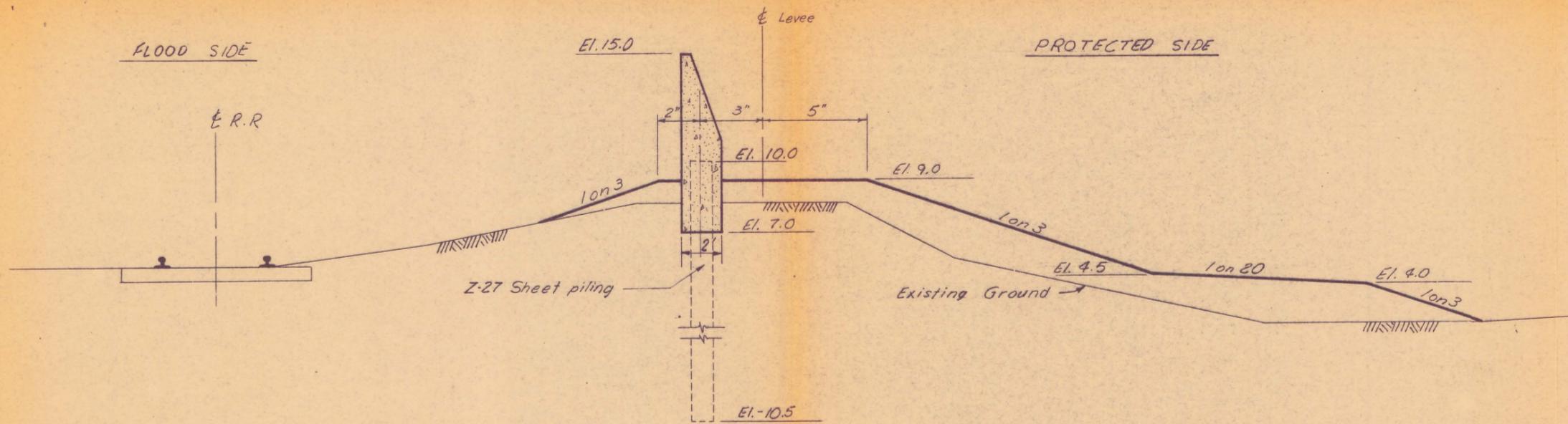
REFERENCE PLATES
Soil borings 4,5,7 (IV-33 G.D.M. No. 2 Supplement No. 8)
Design section IV-36A

PLAN
Scale in feet
40 0 40 80
35-W • Soil boring location

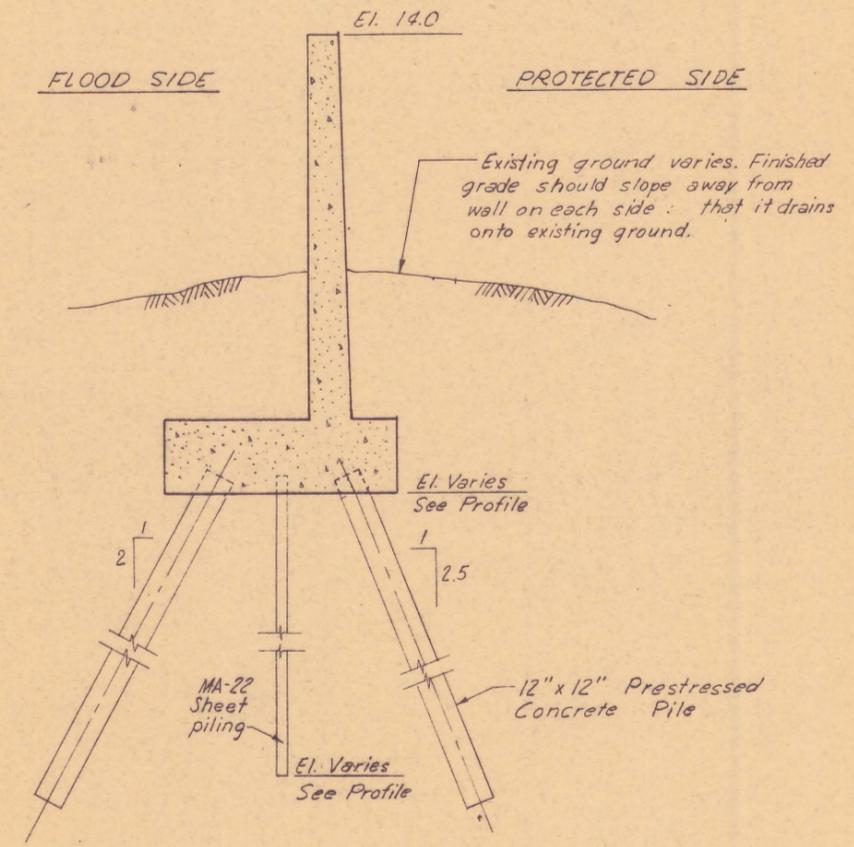


Note: Elevations are in feet M.S.L.

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES
PLAN AND PROFILE
WEST LEVEE
STA. 228+50 TO STA. 237+44.51
U. S. ARMY ENGINEER DISTRICT NEW ORLEANS
CORPS OF ENGINEERS

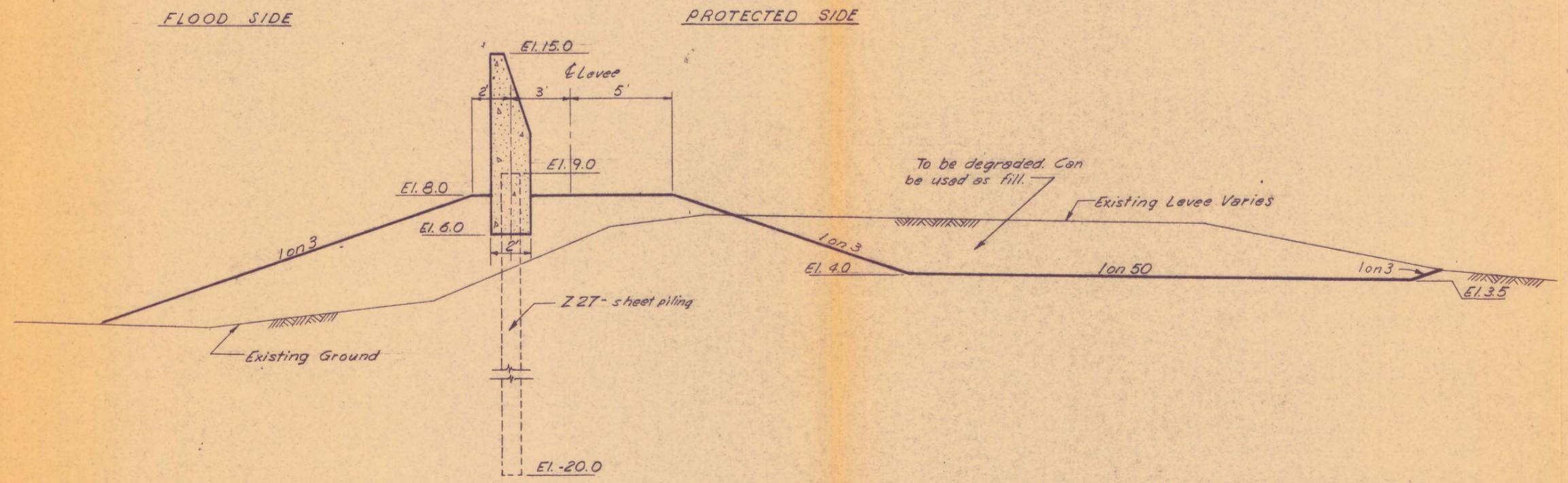


STA. 210+75 to STA. 219+06.29
Scale: 1" = 3'



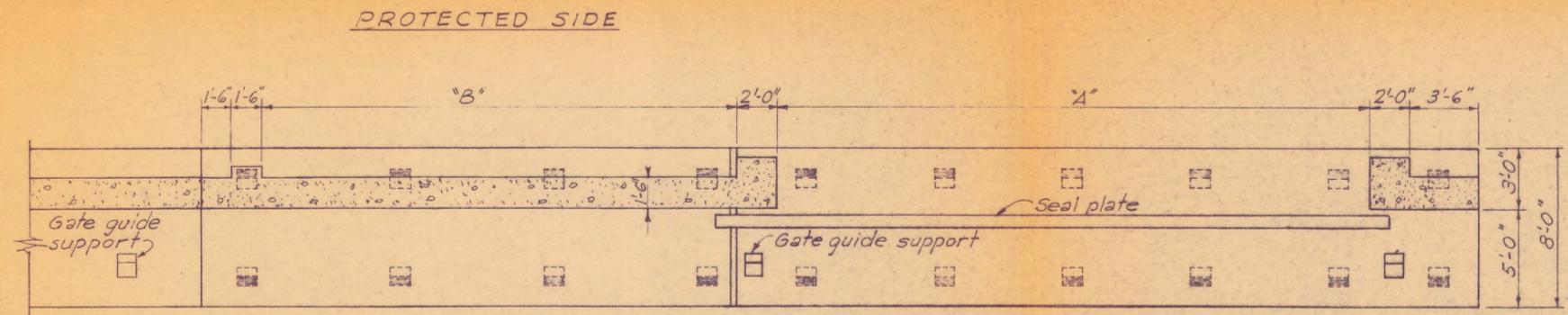
STA.	PILE TIP ELEV.
STA. 219+06.29 to 220+68.54	-54.0
STA. 220+90.54 to 221+29.31	-54.0
STA. 221+68.31 to 222+44.94	-54.0
STA. 222+74.94 to 223+73.08	-54.0

Scale: 1" = 3'



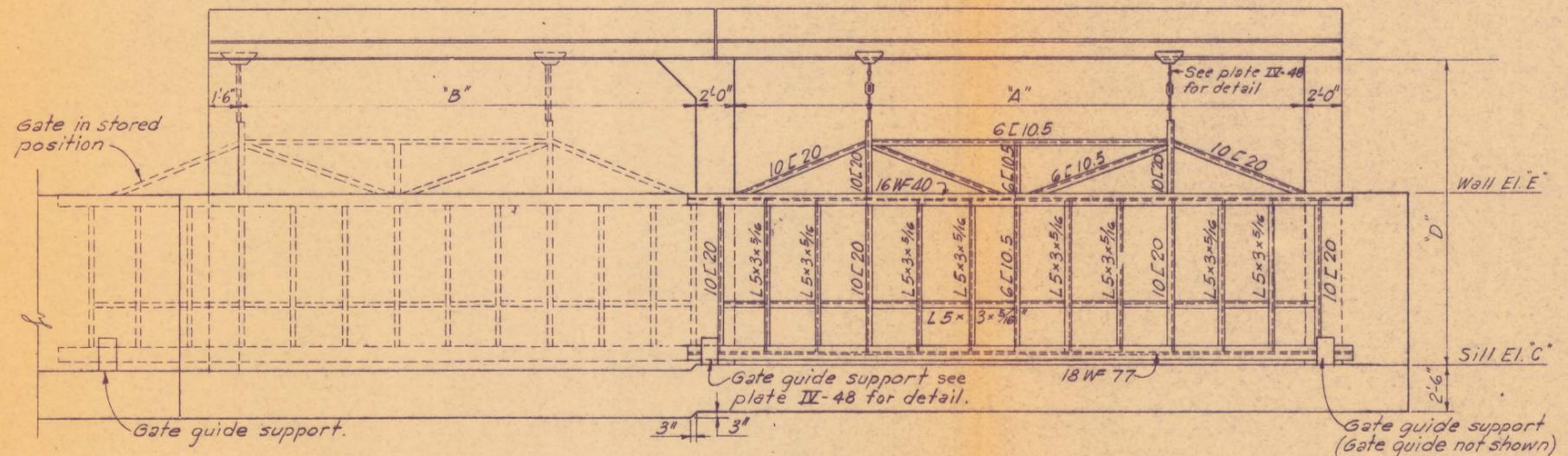
STA. 223+73.08 to STA. 237+42.51
Scale: 1" = 3'

LAKE PONTCHARTRAIN LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES
DESIGN SECTIONS
WEST LEVEE
U. S. ARMY ENGINEER DISTRICT NEW ORLEANS
CORPS OF ENGINEERS
NOVEMBER 1969
FILE NO. H-2-24111



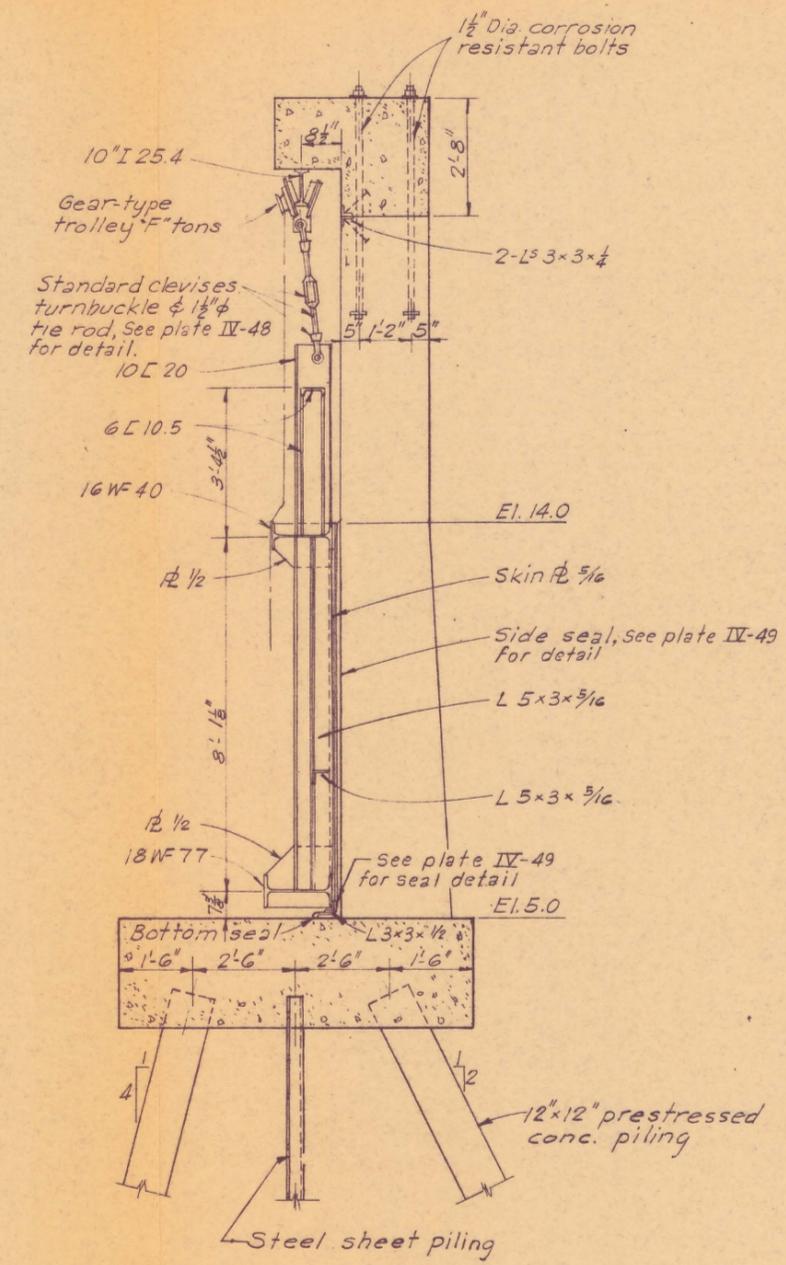
PLAN OF GATE MONOLITH
(GATE NOT SHOWN)
Scale 1/4" = 1'-0"

LEGEND
 [Symbol] 1 on 2 Batter (compression pile)
 [Symbol] 1 on 4 Batter (tension pile)
 Note: All piles 12"x12" prestressed concrete piles.



TYPICAL FLOOD SIDE GATE ELEVATION
(GATE 7W SHOWN)

GATE SCHEDULE							
GATE	GAP CLOSURE	HOR. CL. 'A'	STORAGE BAYS	SILL EL. 'C'	VER. CL. 'D'	WALL EL. 'E'	TROLLEY 'F' TONS
1-E	Railroad	17'-0"	15'-6"	3.1	22'-0"	13.25	2
2-E	Street	20'-0"	17'-1"	8.3	18'-0"	13.50	2
3-E	Railroad	17'-0"	15'-6"	6.0	22'-0"	13.75	2
4-E	Street	15'-0"	14'-10"	9.0	16'-0"	14.00	2
5-E	Street	30'-0"	25'-4"	8.3	22'-0"	14.00	3
6-E	Railroad	35'-0"	28'-6"	8.2	22'-0"	14.00	3
7-E	Street	20'-0"	17'-1"	9.0	16'-0"	14.00	2
8-E	Railroad	17'-0"	15'-6"	8.3	22'-0"	14.00	2
9-E	Street	20'-0"	17'-1"	8.5	16'-0"	14.50	2
10-E	Street	20'-0"	17'-1"	8.5	16'-0"	14.50	2
1W	Street	20'-0"	17'-1"	7.0	16'-0"	14.00	2
2W	Railroad	17'-0"	15'-6"	7.3	22'-0"	14.00	2
7W	Street	30'-0"	24'-0"	5.0	16'-0"	14.00	3
8W	Railroad	31'-0"	24'-5 1/2"	7.5	22'-0"	14.00	3
9W	Railroad	17'-0"	15'-6"	4.5	22'-0"	14.00	3
10WA	Railroad	18'-0"	16'-0"	4.0	22'-6"	14.00	2
11W	Street	35'-0"	29'-2"	6.84	22'-0"	14.00	3
12W	Railroad	26'-0"	23'-6"	4.74	22'-6"	14.00	3



SECTION
Scale 1/2" = 1'-0"

LAKE PONTCHARTRAIN, LA. AND VICINITY
 LAKE PONTCHARTRAIN BARRIER PLAN
 DESIGN MEMORANDUM NO 2 - GENERAL DESIGN
 SUPPLEMENT NO. 8
 IHNC REMAINING LEVEES
 TYPICAL GAP CLOSURE
 WEST AND EAST LEVEE
 OVERHEAD ROLLER GATE
 U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
 CORPS OF ENGINEERS

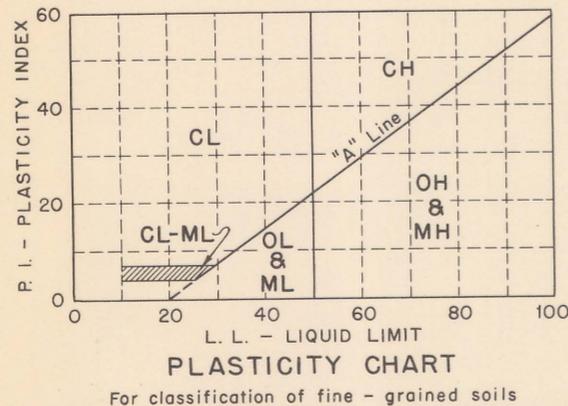
UNIFIED SOIL CLASSIFICATION

MAJOR DIVISION	TYPE	LETTER SYMBOL	SYM BOL	TYPICAL NAMES
COARSE - GRAINED SOILS More than half of material is larger than No. 200 sieve size.	GRAVELS More than half of coarse fraction is larger than No. 4 sieve size.	CLEAN GRAVEL (Little or No Fines)	GW	GRAVEL, Well Graded, gravel - sand mixtures, little or no fines
		GRAVEL WITH FINES (Appreciable Amount of Fines)	GM	SILTY GRAVEL, gravel - sand - silt mixtures
		CLEAN SAND (Little or No Fines)	SW	SAND, Well - Graded, gravelly sands
		SANDS WITH FINES (Appreciable Amount of Fines)	SM	SILTY SAND, sand - silt mixtures
			SC	CLAYEY SAND, sand - clay mixtures
	FINE - GRAINED SOILS More than half the material is smaller than No. 200 sieve size.	SILTS AND CLAYS (Liquid Limit < 50)	ML	SILT & very fine sand, silty or clayey fine sand or clayey silt with slight plasticity
			CL	LEAN CLAY; Sandy Clay; Silty Clay; of low to medium plasticity
			OL	ORGANIC SILTS and organic silty clays of low plasticity
		SILTS AND CLAYS (Liquid Limit > 50)	MH	SILT, fine sandy or silty soil with high plasticity
			CH	FAT CLAY, inorganic clay of high plasticity
OH	ORGANIC CLAYS of medium to high plasticity, organic silts			
HIGHLY ORGANIC SOILS	Pt	PEAT, and other highly organic soil		
WOOD	Wd	WOOD		
SHELLS	SI	SHELLS		
NO SAMPLE				

NOTE: Soils possessing characteristics of two groups are designated by combinations of group symbols

DESCRIPTIVE SYMBOLS

COLOR		CONSISTENCY FOR COHESIVE SOILS			MODIFICATIONS	
COLOR	SYMBOL	CONSISTENCY	COHESION IN LBS./SQ. FT. FROM UNCONFINED COMPRESSION TEST	SYMBOL	MODIFICATION	SYMBOL
TAN	T	VERY SOFT	< 250	vSo	Traces	Tr-
YELLOW	Y	SOFT	250 - 500	So	Fine	F
BLACK	BK	MEDIUM	500 - 1000	M	Medium	M
GRAY	Gr	STIFF	1000 - 2000	St	Coarse	C
LIGHT GRAY	lGr	VERY STIFF	2000 - 4000	vSt	Concretions	cc
DARK GRAY	dGr	HARD	> 4000	H	Rootlets	rt
BROWN	Br				Lignite fragments	lg
LIGHT BROWN	lBr				Shale fragments	sh
DARK BROWN	dBr				Sandstone fragments	sds
BROWNISH - GRAY	br Gr				Shell fragments	sif
GRAYISH - BROWN	gy Br				Organic matter	O
GREENISH - GRAY	gn Gr				Clay strata or lenses	CS
GRAYISH - GREEN	gy Gn				Silt strata or lenses	SIS
GREEN	Gn				Sand strata or lenses	SS
BLUE	Bl				Sandy	S
BLUE - GREEN	Bl Gn				Gravelly	G
WHITE	Wh				Boulders	B
MOTTLED	Mot				Slickensides	SL
					Wood	Wd
					Oxidized	Ox



NOTES:	
FIGURES TO LEFT OF BORING UNDER COLUMN "W OR D₁₀"	
Are natural water contents in percent dry weight	
When underlined denotes D ₁₀ size in mm *	
FIGURES TO LEFT OF BORING UNDER COLUMNS "LL" AND "PL"	
Are liquid and plastic limits, respectively	
SYMBOLS TO LEFT OF BORING	
▽ Ground-water surface and date observed	
⊙ Denotes location of consolidation test **	
⊙ Denotes location of consolidated - drained direct shear test **	
⊙ Denotes location of consolidated - undrained triaxial compression test **	
⊙ Denotes location of unconsolidated - undrained triaxial compression test **	
⊙ Denotes location of sample subjected to consolidation test and each of the above three types of shear tests **	
FW Denotes free water encountered in boring or sample	
FIGURES TO RIGHT OF BORING	
Are values of cohesion in lbs./sq. ft. from unconfined compression tests	
In parenthesis are driving resistances in blows per foot determined with a standard split spoon sampler (1 3/8" I.D., 2" O.D.) and a 140 lb. driving hammer with a 30" drop	
Where underlined with a solid line denotes laboratory permeability in centimeters per second of undisturbed sample	
Where underlined with a dashed line denotes laboratory permeability in centimeters per second of sample remoulded to the estimated natural void ratio	

* The D₁₀ size of a soil is the grain diameter in millimeters of which 10% of the soil is finer, and 90% coarser than size D₁₀.

**Results of these tests are available for inspection in the U.S. Army Engineer District Office, if these symbols appear beside the boring logs on the drawings.

GENERAL NOTES:

While the borings are representative of subsurface conditions at their respective locations and for their respective vertical reaches, local variations characteristic of the subsurface materials of the region are anticipated and, if encountered, such variations will not be considered as differing materially within the purview of clause 4 of the contract.

Ground-water elevations shown on the boring logs represent ground-water surfaces encountered on the dates shown. Absence of water surface data on certain borings implies that no ground-water data is available, but does not necessarily mean that ground water will not be encountered at the locations or within the vertical reaches of these borings.

Consistency of cohesive soils shown on the boring logs is based on driller's log and visual examination and is approximate, except within those vertical reaches of the borings where shear strengths from unconfined compression tests are shown.

REVISION	DATE	DESCRIPTION	BY
2	6-8-64	SYMBOL FW, NOTE REVISED	ORAL FROM L.M.V.G.G. 5 JUNE 1964
1	9-17-63	1ST. PAR. OF GENERAL NOTES REVISED	L.M.V.D. MULTIPLE LETTER, DATED 5 SEPT., 1963

SOIL BORING LEGEND

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
FILE NO. H-2-21800