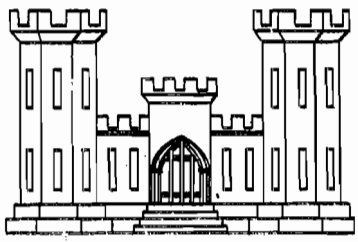
LAKE PONTCHARTRAIN, LOUISIANA AND VICINITY

LAKE PONTCHARTRAIN BARRIER PLAN

DESIGN MEMORANDUM NO. 2 – GENERAL DESIGN
SUPPLEMENT NO. 5B

NEW ORLEANS EAST LAKEFRONT LEVEE PARIS ROAD TO SOUTH POINT

PR-1ULN, PR-2N



DEPARTMENT OF THE ARMY
NEW ORLEANS DISTRICT, CORPS OF ENGINEERS
NEW ORLEANS, LOUISIANA

JUNE 1972

LMVED-TD (NOD 20 Jun 72) 1st Ind
SUBJECT: Lake Pontchartrain, Louisiana and Vicinity, Lake Pontchartrain Barrier Plan, General Design Memorandum No. 2, Supplement No. 5B, New Orleans East Lakefront Levee, Paris Road to South Point

DA, Lower Mississippi Valley Division, Corps of Engineers, Vicksburg, Miss. 39180 9 Aug 72

TO: HQDA (DAEN-CWE-B) WASH DC 20314

1. The subject design memorandum is forwarded for review pursuant to para 21a, ER 1110-2-1150. Our review indicates the District has done a thorough job of preparing the DM and approval is recommended subject to the following comments.

2. Para 30a, Page 13, and Plates 27 and 31. Since the riprap around the catch basins will be placed on clay, there is no need or advantage to placing the riprap on plastic filter cloth. A four-inch shell bedding would be adequate. This is also applicable to the filter cloth discussed in para 30b.

3. Paras 33a and 33b, Pages 16 and 17. It is not clear whether the settlement estimates are based on computations or experience. If settlement computations have not been made, this should be done.

4. Para 37, Pages 18 and 19. The anticipated time interval between each of the five stages of construction should be indicated.

5. Para 47, Page 23. a. This paragraph should refer to design computations in Appendix B.

b. The horizontal collar described in the seventh sentence and shown on Plate 54 should be deleted.

c. Consider deleting the stoplog support sill and baffle walls from the outlet structure (See Plates 34 and 56). Flap gates could be maintained by using a sandbag or earth dike cofferdam since the normal depth of water will be less than 3 ft.

6. Paras 53 and 54, Page 24. These paragraphs indicate that three high-pressure gas lines and one fluids line will be relocated. Since relocations are the responsibility of local interests, a detailed relocations DM will not be prepared. Based on past experience, the additional expenditures required to protect gas lines, and litigation resulting from damages to such lines during construction, detailed requirements for such relocations should be submitted to LMVD. Either the owners or local interests should bear the burden of rearranging the lines in such a manner that the possibility of damage during construction is minimal.

7. Table 1, Pages 29-32. The estimated mobilization and demobilization costs and pipeline relocation costs are considered high and should be reexamined.

8. Plates 34, 55, and 56. The training walls should be flared at a rate of 1 to 6 and the channels transitioned to the full section at the same rate of expansion as marked in red on Plate 34. This will reduce turbulence in the outlet structure due to eddy action.

9. Plates 27 and 31. The proposed method for disposing of the dredge effluent should be shown and/or discussed.

10. Plate 34. The ability of the 48-inch diameter CMP to resist loads from construction equipment on the riprap areas adjacent to the outflow and intake structures should be investigated.

11. Plate 35. Refer to discrepancies noted in red. These analyses should be verified.

12. Plate 37. a. A note on this plate states that Vertical 1 strengths were based on computed (R) gain in shear strength. The method used in increasing these strengths should be given and this procedure discussed in para 31. The insitu undrained shear strength beneath the railroad embankment should be determined by appropriate borings and tests.

b. The soil profile shown on this section is supposedly typical for the reach from Sta 430+00 to Sta 657+85. Plate 25, however, indicates that the sands are much higher from approximately Sta 582+00 to Sta 655+00. The most critical wedges may be located in the upper clays and further division of this reach for analysis purposes may not change the design sections. If this is the case, this should be discussed. If not, this reach should be divided into sections depicting more typical soil profiles and reanalyzed. This comment applies to Plate 40 also.

13. Plates 38, 39, 40, 42, 43, 44, 45, 46, and 47. a. The stability analyses indicate that the net section was analyzed instead of the gross section while para 33 states: "Stability analyses were performed on the levee at gross grades ...." If the analyses on the gross section have not been performed, this should be done.

LMVED-TD (NOD 20 Jun 72) 1st Ind 9 Aug 72
SUBJECT: Lake Pontchartrain, Louisiana and Vicinity, Lake Pontchartrain Barrier Plan, General Design Memorandum No. 2, Supplement No. 5B, New Orleans East Lakefront Levee, Paris Road to South Point

b. The note on several of these plates stating: "Stage construction will provide sufficient time-loading to meet a minimum F.O.S. of 1.3" should be discussed relative to anticipated time interval between each of the five stages of construction and estimated increase of shear strength with time. See para 4 above.

14. Plate 41. The section analyzed should be the gross section instead of the net section since the estimated settlement is from 1.0 to 1.5 ft.

15. Plate 44. The Vertical 2 shear strengths have been increased, apparently based on computed (R) gain in shear strength. This note should be added. Also see comment 12a above.

16. Plate 53. The 4'x4' inlet shown is considered larger than required for a 12-inch culvert.

17. Plates 56 and 57. The recess in the floor of the outlet structure should be deleted and the floor located at el -2.50. If a clearance is required for the flap gate frames, a 2-inch by 4-inch recess in the floor adjacent to the headwall should be adequate.

18. Appendix B, Fig B-7. This figure shows piles beneath the sluice gate structure; whereas, piles are not indicated in other portions of the DM. Piling is not considered necessary and should be deleted.

19. Minor comments in red on page 27, Plates 13, 29, 30, 34, 35, 38, 39, 40, 42, 45, 46, 47, 49, 50, and 51, and page C-6.

FOR THE DIVISION ENGINEER:

Homer B. Willis

HOMER B. WILLIS
Chief, Engineering Division

1 Incl (14 cy)
wd 2 cy

CF:
LMNED-PP

DAEN-CWE-B (LMNED-PP, 20 Jun 72) 2nd Ind
SUBJECT: Lake Pontchartrain, Louisiana and Vicinity, Lake Pontchartrain Barrier Plan, General Design Memorandum No. 2, Supplement No. 5B, New Orleans East Lakefront Levee, Paris Road to South Point

DA, Office of the Chief of Engineers, Washington, D.C. 20314 5 December 1972

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

1. Approved, subject to the comments of the Division Engineer and to the comments set down in the following paragraphs.

2. Paragraph 8c. Even though construction of the Lake Pontchartrain Project was commenced prior to 1 January 1972, it appears that Section 221 of Public Law 91-611 is applicable since the subject work is a new increment and paragraph 8a indicates that the State Department of Public Works was contacted about 5 March 1971 for the purpose of obtaining necessary assurances. The guidelines set forth in DAEN-CWO-C teletype, 12 January 1972, subject: "Applicability of Section 221, FCA of 1970, to Long Term Continuing Projects, DAEN-CWO-C" require compliance with Section 221 under circumstances described in the subject supplement.

3. Paragraph 60. An up-to-date letter should be obtained from the Environmental Protection Agency, prior to the preparation of plans and specifications, to insure that the project has been properly coordinated under current conditions.

4. Paragraph 69. The subject supplement does not present an economic analysis for the New Orleans East area, even by reference. Thus, there is no current information available for review of benefits, project formulation, or evaluation procedures. However, the authorizing document presented an economic analysis, including incremental costs and benefits for the New Orleans East area, that could have been expanded and updated for inclusion in the subject supplement. Although ER 1110-2-1150, dated 1 October 1971, need not be implemented in regard to combined Phase I/ Phase II General Design Memoranda which were substantially advanced, the subject supplement is unresponsive to the previous ER insofar as presentation of project economics is concerned, see paragraph 1m, Appendix I, ER 1110-2-1150, 19 June 1970. However, based on information in the survey report, there is no doubt that incremental economic justification can be demonstrated albeit based entirely on future development. The subject supplement would be strengthened by a discussion of the development that has taken place since the survey report was prepared 10 years ago, Then, a comparison of this observed development could be made with the projected development in the survey report studies and the subject economic analysis adjusted in accordance with those findings.

DAEN-CWE-B (LMNED-PP, 20 Jun 72) 2nd Ind 5 December 1972
SUBJECT: Lake Pontchartrain, Louisiana and Vicinity, Lake Pontchartrain Barrier Plan, General Design Memorandum No. 2, Supplement No. 5B, New Orleans East Lakefront Levee, Paris Road to South Point

Accordingly, the subject supplement should be modified to include both an overall economic analysis for the Lake Pontchartrain barrier plan and an incremental analysis for the New Orleans East area.

5. Paragraph 18 of ER 1110-2-1150 states that one or more public meetings or workshops should be held during post authorization planning studies; no indication of such a meeting or meetings have been noted. Additional information on this aspect should be furnished.

FOR THE CHIEF OF ENGINEERS:

1 Incl
wd

C. E. Slayton
for JOSEPH M. CALDWELL
Chief, Engineering Division
Directorate of Civil Works

LMVED-TD (NOD 20 Jun 72) 3d Ind
SUBJECT: Lake Pontchartrain, Louisiana and Vicinity, Lake Pontchartrain Barrier Plan, General Design Memorandum No. 2, Supplement No. 5B, New Orleans East Lakefront Levee, Paris Road to South Point

DA, Lower Mississippi Valley Division, Corps of Engineers, Vicksburg, Miss. 39180 11 Jan 73

TO: HQDA (DAEN-CWE-B) WASH DC 20314

1. Subject correspondence is returned for reconsideration of instructions in para 2 and 4 of your 2d Ind as discussed below.

2. Para 2, 2d Ind. By separate letter, same subject as above dated 3 Jan 73, to DAEN-REA-P we requested that para 2 of 2d Ind this chain be withdrawn. (Cy furnished as Incl 2 for ready reference).

3. Para 4, 2d Ind. a. This para requests an incremental analysis of benefits and costs for the proposed work and refers to such an analysis in the authorizing document. We understand that an incremental analysis could be made on the New Orleans East Area, however, since this area concerns only one segment of the Lake Pontchartrain Barrier Plan, we consider that an incremental analysis to be inappropriate and request that the comment be withdrawn.

b. New Orleans District has been given authority to negotiate an A-E contract for Collection of Economic Field Data to be used in updating the economic analysis of the Lake Pontchartrain and Vicinity Hurricane Protection Project. The analysis that will be prepared based on these data will satisfy your requirement for an overall economic analysis, and approval of this DM should not be contingent on submission thereof.

FOR THE DIVISION ENGINEER:

Fred E. Anderson Jr.

FERD E. ANDERSON, JR.
Colonel, CE
Deputy

1 Incl
2. LMVRE-A ltr dtd 3 Jan 73

CF:
LMNED-PP

DAEN-CWE-B (LMNED-PP, 20 Jun 72) 4th Ind
SUBJECT: Lake Pontchartrain, Louisiana and Vicinity, Lake Pontchartrain Barrier Plan, General Design Memorandum No. 2, Supplement No. 5B, New Orleans East Lakefront Levee, Paris Road to South Point

DA, Office of the Chief of Engineers, Washington, D.C. 20314 14 March 1973

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

1. The information furnished in the correspondence referenced in paragraph 2 of the 3rd Indorsement is satisfactory; therefore, concur that the subject work is exempt from the requirements of Section 221 of Public Law 91-611. Accordingly, the comment in paragraph 2 of the 2nd Indorsement, this chain, is withdrawn.

2. 3rd Indorsement.

a. Paragraph 3a. Since the New Orleans East Area is to receive protection from the considered levee segment and since this area was separately justified in the survey report, there appears to be no basis for omitting an incremental justification. Accordingly, the incremental justification for the New Orleans East Area should be updated and presented, in the subject design memorandum or in a separate submittal.

b. Paragraph 3b. Approval of the subject design memorandum is not contingent on submission of the overall economic analysis. However, this analysis should be expeditiously pursued and submitted for approval as soon as practicable.

FOR THE CHIEF OF ENGINEERS:

Charles E. Edgar III

1 Incl
wd

CHARLES E. EDGAR III
LTC, Corps of Engineers
Assistant Director of Civil Works
for Mississippi Valley

LMVED-TD (NOD 20 Jun 72) 5th Ind
SUBJECT: Lake Pontchartrain, Louisiana and Vicinity, Lake Pontchartrain Barrier Plan, General Design Memorandum No. 2, Supplement No. 5B, New Orleans East Lakefront Levee, Paris Road to South Point

DA, Lower Mississippi Valley Division, Corps of Engineers, Vicksburg, Miss. 39180 23 Mar 73

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

Referred for appropriate action.

FOR THE DIVISION ENGINEER:

HOMER B. WILLIS
Chief, Engineering Division

LMNED-MP (20 Jun 72) 6th Ind
SUBJECT: Lake Pontchartrain, Louisiana and Vicinity, Lake Pontchartrain Barrier Plan, General Design Memorandum No. 2, Supplement No. 5B, New Orleans East Lakefront Levee, Paris Road to South Point

DA, New Orleans District, Corps of Engineers, PO Box 60267, New Orleans, LA 70160 11 Apr 73

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

1. The proposed disposition of comments presented in the 1st, 2d, 3d, 4th, and 5th indorsements follows (paragraph numbers refer to like-numbered paragraphs in the respective indorsements):

2. 1st Ind, para 2. Concur.

3. Para 3. The settlement estimates were based on computations.

4. Para 4. The first stage of construction which consists of demucking the existing drainage ditch must be fully completed prior to the start of the remaining stages. This is necessary to provide a finished bed prior to pumping in the sand core and to provide dredge effluent drainage to the existing South Point drainage culverts. Immediately after the demucking operation, the sand core pumping can commence. The sand core can be shaped and covered almost immediately after it has been pumped into the bed, and other required work such as riprapping can be concurrently constructed. The actual intervals between these operations will be directly dependent upon the amount and type of equipment and labor the contractor uses on the job. Accordingly, there are actually no identifiable time intervals between these construction operations.

5. Para 5a and 5b. Concur.

6. Para 5c. Alternatives to the stoplogs have been considered. It is decided to retain the stoplog slots. Stoplogs are the easiest and most expeditious way to maintain the flap gates on a routine basis. An earthen dike or sandbag cofferdam would require special equipment. The stoplogs can be installed by an ordinary maintenance unit using hand tools resulting in an efficient and economical maintenance or repair operation.

7. Para 6. Local interests will bear the burden of rearranging the lines in such a manner that the possibility of damage during construction is minimal. Detailed requirements for subject pipeline relocations have been included in the plans and specifications.

8. Para 7. Estimated costs for mobilization and demobilization were based on recent actual contract prices. Costs for pipeline relocations were based on preliminary estimates furnished to NOD by the pipeline companies. It is recommended that no changes to these estimates be made at this time.

9. Para 8. Concur. The training walls on the outlet side of the structure will be flared at the rate of 1 on 6 with the channels likewise transitioned to full section. Inlet basin training walls will be flared at 1 on 2. These changes will be reflected in the plans and specifications.

10. Para 9. The dredge effluent from the pumped sand core will be disposed through the existing culvert at South Point. The sand pumping will begin at Paris Road and proceed eastward toward South Point. As the pumping continues, the effluent will be forced down the demucked channel toward South Point, and then pass through the existing structure. The existing structure will remain operational until the new structure has been fully completed. The dredged material from the borrow pit stripping will be deposited in the stockpile area as shown on plate 5. The effluent will run into the ponding area. Spill boxes in the southernmost dike of the ponding area will allow the effluent to flow into the ponding effluent drainage ditch and then flow to the existing culvert via the demucked channel.

11. Para 10. The plans and specifications will require that 12-gage 48-inch diameter CMP's be used for the culvert. This thickness of steel sheet metal is adequate to resist construction and service loads.

12. Para 11. The discrepancies noted on plate 35 were corrected and the stability analyses in question were verified to be above the 1.3 minimum factor of safety.

13. Para 12a. Two additional undisturbed borings were made in the railroad embankment adjacent to borings 2-ULN and 3-ULN. The available unconfined compression shear test results indicate that the in situ shear strength is greater than that used for design. Consequently, the stability analysis presented in the report is satisfactory.

14. Para 12b. Stability analyses were performed in the upper clays on the sections represented on plates 37 and 40, and the factors of safety were above the minimum required. The soil profile presented in these sections was not intended to be typical of the reach from sta. 430+00 to sta. 657+85, but rather it was shown to assimilate the most unfavorable soil conditions encountered in the reach.

15. Para 13a. Stability analyses for the gross levee sections were performed during preparation of the report and the minimum 1.3 factor of safety was met as noted on the plates.

16. Para 13b. The comments contained in this paragraph refer to plates 42, 45, and 46. The assumed gains in shear strengths due to the hydraulic fill sand being in-place for 6 months were sufficient to cause the minimum factor of safety of the levee to gross grade shown on plate 42 to be above 1.3. The assumed gains in shear strengths were based on the consolidated-undrained (R) test trend, i.e., $S = C+\bar{P} \tan 14°$; where

S = design shear strengths, c = cohesion based on (Q) tests, $\bar{P}$ = increase in intergranular pressure in the strata (based on the percent consolidation in 6 months) due to the hydraulically placed sand, and 14° = angle of internal friction based on the (R) test trend. The computed gains in shear strengths were reduced by 40 percent to compensate for possible lateral displacement of the foundation soils. The levee shown on plates 45 and 46 will be constructed by enlarging the existing levee with earthfill to the design grade and section, rather than by stage construction as indicated by the note shown. The gain in shear strength referred to is that which will develop from the lift constructed by the Orleans Levee District in 1970 (see para 33b of GDM). The assumed gain in shear strength was determined in the same manner as that previously discussed. Based on the assumed gain in shear strengths, the minimum factor of safety for the levee to gross grade in plates 45 and 46 is above 1.3.

17. Para 14. The gross section line and factor of safety notes were inadvertently omitted from plate 41. The stability analysis for the gross section indicated a factor of safety above the required minimum of 1.5.

18. Para 15. Concur.

19. Para 16. The 4-foot by 4-foot inlet basin is intended to be a manhole required to easily maintain the culvert.

20. Para 17. The recess is desirable for ease of installation and maintenance. The cost of the recess is negligible considering the cost of the entire installation. The recess also contributes a stilling effect to the initial flows when the gate first opens.

21. Para 18. Concur.

22. Para 19. The various discrepancies noted on the plates have been corrected without compromising any minimum factor of safety.

23. 2d Ind, para 2. Reference is made to para 2 of the 3d Ind and para 1 of the 4th Ind. This comment has been withdrawn.

24. Para 3. The final environmental statement for the entire Lake Pontchartrain hurricane protection project is nearing completion and will be forwarded to the CEQ in the third quarter of calendar year 1973. This statement will provide a complete description and environmental analysis of the proposed work covered by the subject supplement.

LMNED-MP (20 Jun 72) 6th Ind 11 Apr 73
SUBJECT: Lake Pontchartrain, Louisiana and Vicinity, Lake Pontchartrain Barrier Plan, General Design Memorandum No. 2, Supplement No. 5B, New Orleans East Lakefront Levee, Paris Road to South Point

The draft statement was reviewed by the Environmental Protection Agency and the comments of that agency by letter dated 7 June 1972 will be included in the final statement. The above letter does not provide any specific comments relative to the subject work.

25. Para 4. Reference is made to para 3a and 3b of the 3d Ind and to para 2a and 2b of the 4th Ind. A separate economic analysis for the New Orleans East area will be submitted by separate correspondence as suggested in para 2a of the 4th Ind. NOD is currently authorized to contract A-E services for a field canvass of all areas related to the Lake Pontchartrain project. This canvass will be performed in conjunction with a comprehensive updating of the economic analysis for the entire Lake Pontchartrain hurricane protection project. Accordingly, the overall analysis of the project will be submitted to higher authority when this work is completed.

26. Para 5. The entire Lake Pontchartrain hurricane protection project, including this project feature, has been discussed at numerous public and private meetings since authorization. Such meetings have been held before regional, state, local, community, social, and educational organizations and have served generally to inform the public of the proposed works, to explain project functions, and to solicit the public viewpoint. The project has also been described and discussed in press and by communications media, as well as by organizational and individual correspondence.

27. 3d Ind, para 3, and 4th Ind, para 2. Refer to response in paragraph 25 of this indorsement.

28. 5th Ind. No response required.

29. It is requested that the foregoing disposition of comments be approved as presented.

FOR THE DISTRICT ENGINEER:

Jerome C. Baehr
JEROME C. BAEHR
Chief, Engineering Division

LMVED-TD (NOD 20 Jun 72) 7th Ind
SUBJECT: Lake Pontchartrain, Louisiana and Vicinity, Lake Pontchartrain Barrier Plan, General Design Memorandum No. 2, Supplement No. 5B, New Orleans East Lakefront Levee, Paris Road to South Point

DA, Lower Mississippi Valley Division, Corps of Engineers, Vicksburg, Miss. 39180 4 May 73

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

The explanations furnished and actions described in the 6th Ind are satisfactory.

FOR THE DIVISION ENGINEER:

HOMER B. WILLIS
Chief, Engineering Division

CF:
DAEN-CWE-B

LMVED-TD (NOD 20 Jun 72) 1st Ind
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FOR THE DIVISION ENGINEER:

1 Incl (14 cy)
wd 2 cy

HOMER B. WILLIS
Chief, Engineering Division

CF:
LMNED-PP

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

IN REPLY REFER TO
LMNED-PP

20 June 1972

SUBJECT: Lake Pontchartrain, Louisiana and Vicinity, Lake Pontchartrain Barrier Plan, General Design Memorandum No. 2, Supplement No. 5B, New Orleans East Lakefront Levee, Paris Road to South Point

Division Engineer, Lower Mississippi Valley
ATTN: LMVED-TD

1. The subject general design memorandum is submitted herewith for review, and has been prepared generally in accordance with the provisions of ER 1110-2-1150 exclusive of the Phase I--Phase II planning procedure.

2. Approval of this general design memorandum is recommended.

William E. Lee, Jr.

1 Incl (16 cys) fwd sep
GDM No. 2, Supp. No. 5B

WILLIAM E. LEE, JR.
LTC, CE
Acting District Engineer

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

IN REPLY REFER TO
LMNED-PP

20 June 1972

SUBJECT: Lake Pontchartrain, Louisiana and Vicinity, Lake Pontchartrain Barrier Plan, General Design Memorandum No. 2, Supplement No. 5B, New Orleans East Lakefront Levee, Paris Road to South Point

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William E. Lee

WILLIAM E. LEE, JR.
LTC, CE
Acting District Engineer

LAKE PONTCHARTRAIN, LOUISIANA AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 5B
NEW ORLEANS EAST LAKEFRONT LEVEE
PARIS ROAD TO SOUTH POINT

STATUS OF DESIGN MEMORANDUMS

Design Memo No.	Title	Status
1	Hydrology and Hydraulic Analysis	
	Part I - Chalmette	Approved 27 Oct 66
	Part II - Barrier	Approved 18 Oct 67
	Part III - Lakeshore	Approved 6 Mar 69
	Part IV - Chalmette Extension	Approved 1 Dec 67
2	Lake Pontchartrain Barrier Plan, GDM, Advance Supplement, Inner Harbor Navigation Canal Levees	Approved 31 May 67
2	Lake Pontchartrain Barrier Plan, GDM, Citrus Back Levee	Approved 29 Dec 67
2	Lake Pontchartrain Barrier Plan, GDM, Supplement No. 1, Lake Pontchartrain Barrier, Rigolets Control Structure, Closure Dam, and Adjoining Levees	Approved 10 Nov 70
2	Lake Pontchartrain Barrier Plan, GDM, Supplement No. 2, Lake Pontchartrain Barrier, Rigolets Lock and Adjoining Levees	Approved 19 Oct 71
2	Lake Pontchartrain Barrier Plan, GDM, Supplement No. 3, Lake Pontchartrain Barrier, Chef Menteur Pass Complex	Approved 19 Sept 69
2	Lake Pontchartrain Barrier Plan, GDM, Supplement No. 4, New Orleans East Back Levees	Approved 18 Aug 71
2	Lake Pontchartrain Barrier Plan, GDM, Supplement No. 5, Orleans Parish Lakefront Levees - West of IHNC	Scheduled Apr 73

STATUS OF DESIGN MEMORANDUMS (cont'd)

Design Memo No.	Title	Status
2	Lake Pontchartrain Barrier Plan, GDM, Supplement 5A, Citrus Lakefront Levees - IHNC to Paris Road	Scheduled Feb 73
2	Lake Pontchartrain Barrier Plan, GDM, Supplement No. 5B, New Orleans East Lakefront Levee - Paris Road to South Point	Submitted 20 Jun 72
2	Lake Pontchartrain Barrier Plan, GDM, Supplement No. 5C, Orleans Parish Outfall Canals - West of the IHNC	Scheduled Jan 74
2	Lake Pontchartrain Barrier Plan, GDM, Supplement No. 6, St. Charles Parish Lakefront Levees	Approved 4 Nov 70
2	Lake Pontchartrain Barrier Plan, GDM, Supplement No. 7, St. Tammany Parish, Mandeville Seawall	Indefinite
2	Lake Pontchartrain Barrier Plan, GDM, Supplement No. 8, IHNC Remaining Levees	Approved 6 Jun 68
2	Lake Pontchartrain Barrier Plan, GDM, Supplement No. 9, New Orleans East Levee from South Point to GIWW	Scheduled Dec 72
3	Chalmette Area Plan, GDM	Approved 31 Jan 67
3	Chalmette Area Plan, GDM, Supplement No. 1, Chalmette Extension	Approved 12 Aug 69
4	Lake Pontchartrain Barrier Plan, and Chalmette Area Plan, GDM, Florida Avenue Complex, IHNC	Scheduled Jan 73
5	Chalmette Area Plan, DDM, Bayous Bienvenue and Dupre Control Structures	Approved 29 Oct 68

STATUS OF DESIGN MEMORANDUMS (cont'd)

Design Memo No.	Title	Status
6	Lake Pontchartrain Barrier Plan, DDM, Rigolets Control Structure and and Closure	Scheduled Aug 72
7	Lake Pontchartrain Barrier Plan, DDM, Chef Menteur Control Structure and Closure	Scheduled Dec 72
8	Lake Pontchartrain Barrier Plan, DDM, Rigolets Lock	Scheduled May 73
9	Lake Pontchartrain Barrier Plan, DDM, Chef Menteur Navigation Structure	Scheduled Oct 73
10	Lake Pontchartrain Barrier Plan, Corrosion Protection	Approved 21 May 69
12	Source of Construction Materials	Approved 30 Aug 66
1	Lake Pontchartrain, Louisiana and Vicinity, and Mississippi River-Gulf Outlet, Louisiana, GDM, Seabrook Lock	Approved 4 Nov 70
2	Lake Pontchartrain, Louisiana and Vicinity, and Mississippi River-Gulf Outlet, Louisiana, DDM, Seabrook Lock	Scheduled Apr 73

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LEGEND

EXISTING IMPROVEMENTS

Levee

Seawall

Location of work covered in this document.

Portion of U.S. Hwy 90 to serve as part of Barrier Embankment

AUTHORIZED IMPROVEMENTS

New Levee

Levee Enlargement

Control Structure

Drainage Structure

Lock

Floodgate

Navigation Channel

Floodwall

Seawall Strengthening

Rock Fill

Mandeville

Seawall

LAKE MAUREPAS

LAKE PONTCHARTRAIN

ST CHARLES PARISH

JEFFERSON PARISH

ST TAMMANY PARISH

ORLEANS PARISH

NEW ORLEANS

NEW ORLEANS EAST

CITRUS

Seabrook Lock

Seawall

MISSISSIPPI RIVER

INTRACOASTAL WATERWAY

Bayou Dupre

Verret

Chauvin

SCALE OF MILES

0 1 2 3 4 5

LAKE PONTCHARTRAIN
AND VICINITY, LA.
(HURRICANE PROTECTION)

AUTHORIZED PLAN OF PROTECTION

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

NOVEMBER 1965 FILE NO. H-2-23693

REV. DEC. 1970

LAKE PONTCHARTRAIN, LOUISIANA AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 5B
NEW ORLEANS EAST LAKEFRONT LEVEE
PARIS ROAD TO SOUTH POINT

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PERTINENT DATA

Location of project		Southeastern Louisiana in Orleans Parish
Hydrologic data		
Temperature:	Maximum monthly	87.1° Fahrenheit
	Minimum monthly	43.0° Fahrenheit
	Average annual	69.7° Fahrenheit
Annual precipitation:	Maximum	85.73 inches
	Minimum	31.07 inches
	Average	60.58 inches
Hydraulic design criteria--tidal		
Design hurricane--Standard Project Hurricane (SPH)		
Frequency		1 in 300 years
Central Pressure Index (CPI)		27.5 inches of mercury
Maximum 5-min. average wind		100 m.p.h.
Levee		
Method of construction		Hydraulic sand core & cast clay cover
Levee length		6.3 miles
Elevation		14.0[1]
Crown width		20 feet
Drainage structure		
Description		Flap-gated gravity structure with positive cutoff, five 48" Ø CMP culverts
Rights-of-way		
Permanent rights-of-way		126 acres
Construction easements		407 acres
Estimated first cost		
Levees and floodwalls		$8,680,000
Engineering and design		955,000
Supervision and administration		865,000
Relocations		2,780,000
Lands and damages		370,000
Total		$13,650,000

[1]Elevations contained herein are in feet referred to mean sea level datum unless otherwise noted.

LAKE PONTCHARTRAIN, LOUISIANA AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 5B
NEW ORLEANS EAST LAKEFRONT LEVEE
PARIS ROAD TO SOUTH POINT

PROJECT AUTHORIZATION

1. Authority.

a. Public Law. Public Law 298, 89th Congress, 1st Session, approved 27 October 1965, authorized the "Lake Pontchartrain, Louisiana and Vicinity," hurricane protection project, substantially in accordance with the recommendations of the Chief of Engineers in House Document No. 231, 89th Congress, 1st Session, except that the recommendations of the Secretary of the Army in that document shall apply with respect to the Seabrook Lock feature of the project.

b. House Document. The report of the Chief of Engineers dated 4 March 1964 printed in House Document No. 231, 89th Congress, 1st Session, submitted for transmission to Congress the report of the Board of Engineers for Rivers and Harbors, accompanied by the reports of the District and Division Engineers and the concurring report of the Mississippi River Commission for those areas under its jurisdiction. The report of the Board of Engineers for Rivers and Harbors stated: "For protection from hurricane flood levels, the reporting officers find that the most suitable plan would consist of a barrier extending generally along U. S. Highway 90 from the easternmost levee to high ground east of the Rigolets, together with floodgates and a navigation lock in the Rigolets, and flood and navigation gates in Chef Menteur Pass; construction of a new lakeside levee in St. Charles Parish extending from the Bonnet Carre Spillway guide levee to and along the Jefferson Parish line; extension upward of the existing riprap slope protection along the Jefferson Parish levee; enlargement of the levee landward of the seawall along the 4.1 mile lakefront, and construction of a concrete-capped sheet-pile wall along the levee west of the Inner Harbor Canal in New Orleans; raising the rock dikes and landward gate bay of the planned Seabrook Lock; construction of a new levee lakeward of the Southern Railway extending from the floodwall at New Orleans Airport to South Point; enlargement of the existing levee extending from U. S. Highway 90 to the Gulf Intracoastal Waterway, thence westward along the waterway to the Inner Harbor Canal, together with riprap slopes along the canal; construction of a concrete capped sheet-pile wall along the east levee of the Inner Harbor Canal between the Gulf Intracoastal Waterway and the New Orleans Airport...."

c. BERH recommendation. The report of the Chief of Engineers stated: "...The Board [of Engineers for Rivers and Harbors] recommends authorization for construction essentially as planned by the reporting officers...I concur in the recommendation of the Board of Engineers for Rivers and Harbors."

2. Purpose and scope. This supplement presents the essential data, assumptions, criteria, and computations for developing the plan, design, and cost for the levee reach from Paris Road to South Point, Louisiana, along the lakefront of New Orleans East. It presents sufficient detail to provide an adequate basis for preparing plans and specifications for the levee and drainage structure construction without additional design analysis.

3. Local cooperation. The conditions of local cooperation pertinent to this supplement and as specified in the report of the Board of Engineers for Rivers and Harbors and concurred in by the report of the Chief of Engineers are as follows: "...That the barrier plan for protection from hurricane floods of the shores of Lake Pontchartrain...be authorized for construction,...Provided that prior to construction of each separable independent feature local interests furnish assurances satisfactory to the Secretary of the Army that they will, without cost to the United States:

"(1) Provide all lands, easements, and rights-of-way, including borrow and spoil disposal areas, necessary for construction of the project;

"(2) Accomplish all necessary alterations and relocations to roads, railroads, pipelines, cables, wharves, drainage structures, and other facilities made necessary by the construction works;

"(3) Hold and save the United States free from damages due to the construction works;

"(4) Bear 30 percent of the first cost, to consist of the fair market value of the items listed in subparagraphs (1) and (2) above and a cash contribution presently estimated at $14,384,000 for the barrier plan...to be paid either in a lump sum prior to initiation of construction or in installments at least annually in proportion to the Federal appropriation prior to start of pertinent work items, in accordance with construction schedules as required by the Chief of Engineers, or, as a substitute for any part of the cash contribution, accomplish in accordance with approved construction schedules items of work of equivalent value as determined by the Chief of Engineers, the final apportionment of costs to be made after actual costs and values have been determined;

"(5) For the barrier plan, provide an additional cash contribution equivalent to the estimated capitalized value of operation and maintenance of the Rigolets navigation lock and channel to be undertaken by the United States, presently estimated at $4,092,000, said amount to be paid either in a lump sum prior to initiation of construction of the barrier or in installments at least annually in proportion to the Federal appropriation for construction of the barrier;

"(6) Provide all interior drainage and pumping plants required for reclamation and development of the protected areas;

"(7) Maintain and operate all features of the works in accordance with regulations prescribed by the Secretary of the Army, including levees, floodgates and approach channels, drainage structures, drainage ditches or canals, floodwalls, seawalls, and stoplog structures, but excluding the Rigolets navigation lock and channel and the modified dual purpose Seabrook Lock; and

"(8) Acquire adequate easements or other interest in land to prevent encroachment on existing ponding areas unless substitute storage capacity or equivalent pumping capacity is provided promptly;

"Provided that construction of any of the separable independent features of the plan may be undertaken independently of the others, whenever funds for that purpose are available and the prescribed local cooperation has been provided...."

INVESTIGATIONS

4. Project document investigations. Studies and investigations made in connection with the report on which authorization is based (H.D. No. 231, 89th Congress, 1st Session) consisted of: research of information which was available from previous reports and existing projects in the area; extensive research in the history and records of hurricanes; damage and characteristics of hurricanes; extensive tidal hydraulics investigations involving both office and model studies relating to the ecological impact of the project on Lakes Pontchartrain and Borgne; an economic survey; and survey-scope design and cost studies. A public hearing was held in New Orleans on 13 March 1956 to determine the views of local interests.

5. Investigations made subsequent to project authorization. Surveys and studies made subsequent to project authorization for this reach of levee include:

a. Alternate plan studies to include alternative alinement studies and alternative construction method studies;

b. Aerial and topographic surveys;

c. Soils investigations including general and undisturbed type borings and associated laboratory evaluations;

d. Detailed design studies for levee and gap closure construction including levee section stability determinations;

e. Tidal hydraulic studies required for establishing design grades for protective works based on revised hurricane parameters furnished subsequent to project authorization by the National Weather Service.

f. Real estate requirements and appraisals;

g. Cost estimates for the levee, the replacement drainage structure, and relocations.

h. Environmental effect and evaluations.

6. Planned future investigations. The recommended method of construction will allow all construction to be accomplished under initial contract. Upon completion of this contract, this feature will be turned over to local interests. Accordingly, any future investigations would be performed by local interests and no future investigations will be required by and/or for the Government.

LOCAL COOPERATION

7. Local cooperation requirements. The conditions of local cooperation as specified in the authorizing laws are quoted in paragraph 3.

8. Status of local cooperation.

a. On 5 March 1971, the Governor of the State of Louisiana, by executive order, designated the State of Louisiana, Department of Public Works (DPW) as the local coordinating agency for the Lake Pontchartrain Barrier Plan. The U. S. Army Corps of Engineers, on behalf of the United States Government, has contacted the DPW and requested that agency to obtain the necessary assurances for cooperation and cost sharing from local interests. To date, formal assurances have been received from the Board of Levee Commissioners of the Orleans Levee District (OLD) and the Board of Commissioners of the Pontchartrain Levee District. The St. Tammany Parish Police

Jury is reluctant to grant the assurances providing for its participation in the project. However, on 8 May 1972 Governor John J. McKeithen executed formal assurances on behalf of the Police Jury by virtue of his authority under Section 81 et seq of title 38 of Louisiana Revised Statutes of 1950, as amended. Such assurances are binding on the St. Tammany Parish Police Jury. Acceptance of all assurances are pending receipt of pertinent supporting documents. The principal officers currently responsible for the fulfillment of the conditions of local cooperation are as follows:

Mr. Roy Aguillard, Director
State of Louisiana
Department of Public Works
P. O. Box 44155, Capitol Station
Baton Rouge, Louisiana 70804

Mr. Guy F. LeMieux, President
Board of Levee Commissioners of the
Orleans Levee District
Room 200, Wild Life and Fisheries Building
418 Royal Street
New Orleans, Louisiana 70130

Mr. Robert R. Faucheux, President
Board of Commissioners of the
Pontchartrain Levee District
P. O. Box 426
Lutcher, Louisiana 70071

Mr. Wilbert N. Abney, President
St. Tammany Parish Police Jury
P. O. Box 628
Covington, Louisiana 70433

b. The Orleans and Pontchartrain Levee Districts lacked adequate legal authority to comply with Public Law 91-646 (the "Uniform Relocation and Real Property Acquisition Policies Act of 1970") at the time assurances were requested. This determination was based on a legal opinion of the State Attorney General rendered on 7 April 1971. However, with the passage on 1 February 1972 of a constitutional amendment they can now acquiesce and have agreed to execute the appropriate supplemental assurances. This is to be accomplished in the near future. The assurance executed by Governor McKeithen on behalf of St. Tammany Parish Police Jury incorporates the requirements of this act.

c. Section 221 of the Flood Control Act of 1970 (Public Law 91-611) is not applicable to this project since construction of the Lake Pontchartrain, Louisiana and Vicinity project commenced prior to 1 January 1972.

9. Views of local interests. The OLD is the agency responsible for providing local interest assurances for this feature of the project. The plan presented herein was coordinated in detail with the OLD engineering staff and bears the approval of that agency. The intention and capability of this sponsor to provide the required non-Federal contribution for this feature have been amply demonstrated; in fact, considerable work on other completed features of the overall project has already been accomplished by this sponsor.

LOCATION OF PROJECT AND TRIBUTARY AREA

10. Project location. The Paris Road to South Point levee segment of the Lake Pontchartrain, Louisiana and Vicinity hurricane protection project, as shown on plate 1, is located in southeastern Louisiana along the New Orleans East lakefront of Lake Pontchartrain. The project area covered in this memorandum is located in Orleans Parish.

11. Tributary area. The tributary area of Lake Pontchartrain varies in character from flat tidal marsh at or near sea level to upland areas of significant relief with natural ground elevations as high as 250 feet above m.s.l. (mean sea level).[1] Runoff from within the project area is disposed of into either Lake Borgne or Lake Pontchartrain, generally by pumping from within the protected areas, although some developed areas located on alluvial ridges in St. Charles, St. Bernard, and St. Tammany Parishes are drained by gravity. In addition to runoff from the project area, Lake Pontchartrain receives the runoff of 4,700 square miles located to the north and west of the lake. During major floods on the Mississippi River and its tributaries, floodflows may be diverted from the Mississippi River to Lake Pontchartrain through the Bonnet Carre' Spillway, a controlled overbank floodway constructed under the Flood Control, Mississippi River and Tributaries project.

PROJECT PLAN

12. General. The project, as shown on the flyleaf map, consists of two separate and distinct major features--the Chalmette Area Plan and the Lake Pontchartrain Barrier Plan. This memorandum is concerned only with a segment of the latter, the New Orleans East lakefront levee from Paris Road to South Point. The overall Lake Pontchartrain Barrier Plan is described in GDM No. 2, Citrus Back Levee, approved 29 December 1967.

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[1] Elevations contained herein are in feet referred to mean sea level datum unless otherwise noted.

13. New Orleans East lakefront levee, Paris Road to South Point. This levee is located along the New Orleans East lakefront of Lake Pontchartrain and extends from the junction of Paris Road and Hayne Boulevard to a point just southward of South Point, La. This levee segment adjoins the Citrus lakefront levee, IHNC (Inner Harbor Navigation Canal) to Paris Road on its west end, and the New Orleans East levee, South Point to GIWW (Gulf Intracoastal Waterway) on its east end. The project plan presented herein provides for a hydraulically pumped sand core levee with a cast clay cover. The sand will be pumped from a borrow pit on the bottom of Lake Pontchartrain north of the site. The clay will be obtained from material to be excavated for a replacement drainage canal south of the site and additional clay materials, if required, will be obtained from clay stripping over the borrow pit which will be stockpiled at the east end of the site. The levee is located just landward of the Southern Railway System railroad embankment and is laterally contiguous with that embankment for the majority of its reach. This arrangement bears the approval of the Southern Railway System. Drainage will be provided for the depression between the railroad embankment and new levee by means of catch basins and culverts spaced at 600-foot intervals. A flap-gated drainage structure will be constructed in the vicinity of South Point. This will be a gravity-type drainage structure which will replace-in-kind the drainage culverts now serving the project area. A sluice gate is included in the structure for positive cutoff. The project plan also provides for riprapping of the lakeward face of the railroad embankment. The function of the riprap blanket is twofold: (1) to serve as a wave berm allowing a reduction in levee height; and (2) to protect the levee indirectly by protecting the railroad embankment from daily wave and backwash erosion, thus insuring levee integrity when a hurricane strikes. The plan also includes the relocation of four pipelines which cross the levee alinement. Owners of these lines have been contacted and have furnished preliminary relocations plans.

14. Departures from project document plan. The project document plan contemplated construction of a levee lakeside of the Southern Railway embankment in the shallow waters of Lake Pontchartrain. At that time, the levee was to have a crest at elevation 10.0, a 20-foot crown width and riprap slope protection below elevation 6.5. Additionally, two pipelines were to be relocated. The most significant departure from the project document has been to change the alinement of the levee from lakeside of the railroad embankment to the landside. Several reasons governed this modification; namely, a reduction in the first cost of construction, a shorter construction period, the preservation of campsites protruding into the lake, and environmental considerations of disruption of natural state during construction. These and other pertinent considerations are discussed in detail later in this memorandum. The second departure from the project document arises from the

alinement change described above. The net levee grade was revised upward from elevation 10 to 14.0. These revisions evolved from the results of tidal hydraulic studies utilizing more severe hurricane parameters developed by the National Weather Service subsequent to project authorization; from a readjustment of datum by the U. S. Coast and Geodetic Survey (now the National Ocean Survey); and by more detailed design. The levee grades presented in Design Memorandum No. 1, Hydrology and Hydraulic Analysis, Part III - Lakeshore, approved 25 February 1969 do not reflect the change in levee alinement and such information, therefore, cannot be directly related to this feature. Rather, the levee grade was established by recent and detailed tidal hydraulic study to reflect the new alinement and riprap configurations. The project plan differs lastly from the project document in that four pipelines must now be relocated rather than the original two.

HYDROLOGY AND HYDRAULICS

15. General. The Hydrology and Hydraulic Analysis design memorandum for the Lake Pontchartrain Barrier Plan was presented in a series of three separate reports entitled Design Memorandum No. 1 and subtitled Part I - Chalmette, Part II - Barrier, and Part III - Lakeshore, respectively. Part I - Chalmette was approved on 27 October 1966; Part II - Barrier was approved on 18 October 1967; and Part III - Lakeshore was approved on 6 March 1969. These documents present detailed descriptions and analyses of the tidal hydraulic methods and procedures used in tidal hydraulic design of the features for the plan, and include the essential data, assumptions, and criteria used, and results of studies which provide the bases for determining surges, routing, wind tides, runup, overtopping, and frequencies. After approval of the above memorandums, the protective alinement for the New Orleans East lakefront levee was changed. Consequently, revisions to portions of the hydraulic design criteria previously submitted are necessary. The revised criteria, applicable to this new levee alinement, and the hydraulic design of the drainage facilities in this levee reach are presented in appendix C of this memorandum.

GEOLOGY

16. Physiography. The project area is located within the central gulf coastal plain on the extreme flank of the Mississippi River delta plain. The primary physiographic features of the study area include Lake Pontchartrain, many smaller lakes and ponds, lagoons, bayous, canals, abandoned distributaries, and small natural levees. Relief in the area is very slight with elevations ranging from a few feet below mean sea level in the marshlands to a few feet above mean sea level along the narrow natural levees of the abandoned distributaries.

17. General geology. Only the geologic history since the end of the Pleistocene epoch is relevant to this project. At that time with sea level about 400-450 feet below its present level, the Mississippi River began to migrate laterally back and forth across the alluvial valley. Delta lobes of the Mississippi River system began a series of progradations to the south of the project area about 4,700 years ago with the initiation of the St. Bernard delta complex. As the river continued to shift to steeper gradient courses, the Bayou Sauvage delta was formed and subsequently became the primary source of sediments in the project area, beginning about 1,900 years ago. Deposition at first was concentrated in a depression between the older St. Bernard delta lobes to the south and Pine Island, a relict beach trend to the north. Pine Island was gradually buried by deltaic deposits of Bayou Sauvage and its distributaries which ultimately crossed the beach trend to the north and deposited the sediments existing in the project area. Deposition from this source continued at a decreasing rate until about 700 years ago. By this time the major stream course had shifted back south and west to the Plaquemine-Modern and Lafourche delta complexes. Finally the levee systems constructed along the Mississippi River eliminated seasonal flooding of lands adjacent to the river, and consequently the annual sediment supply formally introduced into the project area was halted. As a result, the land masses formed from sediments transported to the area by the shifting network of distributaries are presently in a state of retreat and deterioration.

18. Subsidence and erosion. The project area lies in a region of active subsidence and downwarping which have been occurring since the end of the Pleistocene epoch. The Pleistocene surface has been downwarped toward the south and west from zero at the Pleistocene outcropping on the north shore of Lake Pontchartrain to about 500 feet near the edge of the continental shelf, about 80 miles south of New Orleans. The overall rate of regional subsidence has been about 0.39 foot per century. Local subsidence within the project area has not been critical to date as land reclamation projects have not extended quite this far east of New Orleans and the area still maintains some natural drainage and a relatively high-water table. However, the Lake Pontchartrain shoreline in this area is eroding faster than any other area in the eastern portion of the Pontchartrain Basin, which may be attributed to the relatively young unconsolidated sediments forming this area. The rates of shoreline erosion varies from 2.1 feet in 18 years on the western end of the project near Paris Road, to 7.6 feet and 13.0 feet in 14 years at South Point and Pointe aux Herbes, respectively.

19. Investigations performed. General type and 5-inch undisturbed borings to a maximum depth of about 80 feet were made for this project. In addition, the logs of borings made

in conjunction with other projects as well as geologic information were available for the interpretation of the subsurface and foundation conditions of the area.

20. Foundation conditions. The subsurface along the project alinement is represented by the soil and geologic profiles on plates 22 through 25. The legend on plate 22 describes the various geologic environments of deposition and the general nature of the soils contained within each environment. Generally, the area consists of Holocene deposits varying in thickness from about 40 feet at the beginning of the project (station 331+50) to about 33 feet at station 577+60. From station 577+60 to project terminus (station 666+00) the thickness of the Holocene varies from a minimum of 20 feet at station 603+86 to a maximum of 35 feet at station 663+50. The entire sequence of Holocene deposits is underlain throughout the project area by older, more durable sediments of the Pleistocene epoch. These materials, although deposited under deltaic conditions similar to the younger overlying Holocene sediments, are generally much firmer and more resistant as a result of considerable weathering and oxidation. Consequently, the Pleistocene deposits, which may reach several thousand feet in thickness, provide the best load bearing formation in the area.

21. Mineral resources. Gas pipelines, originating from the south, cross the eastern portion of the project, but oil and gas production, common to other areas around New Orleans, is not presently found in the immediate vicinity of the project area. Any future exploration or production of these natural resources will not be adversely affected by the project, nor will the project be adversely affected by oil and gas operations.

22. Sources of construction materials. Design Memorandum No. 12, Lake Pontchartrain, Louisiana and Vicinity, Sources of Construction Materials, approved 30 August 1966, documents available sources of sand, gravel, shell, and stone. Suitable borrow materials for levee construction are available from a borrow pit in Lake Pontchartrain near the shoreline. The soil and geologic profile of the borrow pit subsurface is shown on plate 26.

23. Conclusions. The subsurface investigations and analyses of all existing and new data indicate that geologic conditions for construction of the proposed earthen levee along the established alinement are better than average for the area. Suitable sand borrow can be obtained from the designated borrow area in the lake and clay materials can be obtained from a new drainage ditch excavation adjacent to the site with additional materials available from the borrow pit stripping if needed. Because of the compressive nature of the interdistributary deposits between stations 331+50 and 577+60, some settlement can be expected in

this area. Between station 577+60 and the end of the project (station 666+00) no settlement problems are anticipated. Wave-wash protection will be necessary along the lakeward side of the railroad embankment because the railroad embankment forms part of the levee berm and because of the susceptibility of this area to normal daily erosion.

FOUNDATIONS INVESTIGATION AND DESIGN

24. General. This section covers the soils, foundation exploration and conditions, and the design for the New Orleans East lakefront levee extending from Paris Road to South Point. The levee will be built by filling the existing landside canal (Little Woods Canal), after demucking, with hydraulic sandfill, protected by an erosion resistant clay blanket. Soils and foundations coverage for other features of the Lake Pontchartrain Barrier Plan are included or will be included in the various supplements to the basic design memorandum.

25. Field exploration. Undisturbed borings 5 inches in diameter extending to approximate elevation -55.0 were made at five locations (borings 1-ULN through 3-ULN, 6-USPT, and 9-USP) along the levee alinement. The logs and results of laboratory soils tests of these borings are shown on plates 11 through 16. General-type core borings 1 7/8 inch I.D., extending between approximate elevations -60.0 and -90.0 were made at eight locations (borings 1-N through 8-N) along the levee alinement, at three locations (borings 6-L, 7-L, and 8-L) along a line parallel to and approximately 500 feet north of the baseline, at nine locations (borings 1-NB through 9-NB) along a line parallel to and approximately 2,500 feet north of the baseline, and at six locations (borings 10-NB through 15-NB) in the lake bottom borrow area, the center of which is located approximately 3,500 feet north of baseline station 596+75. The location of the borings is shown on plates 1 through 5, and soil boring logs of the undisturbed and general type borings are shown on plates 6 through 16. Standard split spoon driving resistances were obtained in the foundation sands and are shown on the plates adjacent to the boring logs.

26. Laboratory tests. Visual classifications were made for all samples obtained from the borings. Water content determinations were made on all cohesive soil samples. Unconfined compression (UC), unconsolidated-undrained (Q), consolidated-undrained (R), and consolidated-drained (S) shear tests, and consolidation (C) tests were performed on representative soil samples from the undisturbed borings. Liquid and plastic limits were also determined for these test samples. The logs of the undisturbed borings and the results of the soil tests are shown on plates 11 through 16. The detail shear strength data sheets for borings 1-ULN, 2-ULN, 3-ULN, 6-USPT, and 9-USP are shown on plates 17 through 21.

27. Foundation conditions. The subsurface along this levee alinement consists generally of 6 to 12 feet of very soft organic clays extending from approximate elevation 1.0, overlying 25 to 30 feet of Recent deposits of very soft and soft clays and silts which are underlain by a Pleistocene deposit encountered at approximate elevations -25.0 to -45.0. A generalized soil and geologic profile along the levee alinement is shown on plates 22 through 25. The subsurface soils above the Pleistocene deposit which directly affect this design consist generally of the following:

a. Station 331+50 (beginning of work) to station 430+00. The upper subsurface soils in this reach are composed of a very soft organic clay from approximate elevation 1.0 to elevation -4.0, which overlies a very soft clay layer of organic matter extending down to elevation -22.0, and underlain by a layer of soft clay with sand lenses down to elevation -37.0 at the top of the Pleistocene formation.

b. Station 430+00 to station 661+60. The upper subsurface soils in this reach are composed of a very soft organic clay with areas of peat from approximate elevation 1.0 to elevation -4.0, underlain by a layer of very soft organic clay down to elevation -8.0, which overlies a very soft clay layer with silt lenses extending down to elevation -15.0, underlain by a layer of soft clay with sand lenses down to elevation -22.0, which overlies a soft to medium clay layer with sand lenses extending down to elevation -33.0 at the top of the Pleistocene formation.

c. Station 661+60 to station 666+00 (end of work). The existing levee soils in this reach are composed of medium clay fill down to elevation -6.0 which overlies a silt fill layer extending down to elevation -10.0 underlain by a soft to medium clay with sand lenses down to elevation -22.0, which overlies a medium clay with silt lenses extending down to elevation -32.0 at the top of the Pleistocene formation.

d. Sand borrow area. Using available geologic and soil boring data in the vicinity of the borrow area, the top of the sand stratum was contoured and the designated borrow area was located such that a minimum thickness of stripping would be required. Approximately one-half of the borrow area surface consists of a 4- to 6-foot layer of very soft fat clay underlain by a layer of soft lean clay 4 to 13 feet thick, which overlies the sand stratum at least 65 feet thick. The other half of the borrow area surface consists of a 5- to 9-foot layer of very soft fat clay, which overlies a layer of soft lean clay 7 to 16 feet thick, underlain by a 4- to 10-foot layer of medium fat clay, which overlies the sand stratum at least 50 feet thick. A generalized soil and geologic profile through the borrow area is shown on plate 26. The logs of the borrow area soil borings are shown on plate 9.

28. Design and construction problems. The low shear strengths and highly compressible nature of Recent foundation clays, relocation of utilities and interior drainage pipes which cross the levee alinement, and access to the levee alinement, all combine to produce major design and construction problems in the following areas:

a. Types of protective works

b. Types of drainage works

c. Stability

d. Settlement

e. Erosion protection

f. Sources of fill material

g. Method of construction

29. Types of protective works. A levee with a sand core and a clay cover will be constructed along the entire length of the project (see plates 27 and 31) except for the tie-in of Paris Road (see plate 28) and at South Point (see plate 32) where the existing levees will be enlarged with earthfill to the design grade and section. The centerline of the new levee will be located 60 feet south of the southernmost rail of the Southern Railway System's mainline tracks, except in the vicinity of the pipeline relocations where for a limited length, the levee centerline will be located 120 feet south of the southernmost rail.

30. Types of drainage works.

a. Catch basins. Catch basins and drain pipes will be installed on 600-foot centers from station 332+00 to station 656+00 to collect and dispose of surface runoff from the lakeside levee slope. The catch basins will be 4 feet square and made of concrete. A 12-inch diameter corrugated metal drain pipe, sloped 1 on 60, will extend from the catch basin with invert at elevation 4.0 under the railroad embankment into a narrow ditch in the riprap blanket (see plates 27 and 31). The catch basins and drain pipes will be installed after the pumped sand has been shaped but prior to placement of the clay cover. The clay around each catch basin will be compacted with power tampers to the density of semicompacted fill. A 12-inch layer of riprap on plastic filter cloth will surround each catch basin to prevent scour of the clay cover.

b. Drainage control at Little River. The existing culverts located at station 413+58 in the proximity of Little River no longer function, have been abandoned, and will be removed prior to construction of the levee. The flood side slope of the net levee will extend under the railroad trestle which will serve as an outlet for draining surface runoff from the lakeside levee slope into Lake Pontchartrain. A 12-inch layer of riprap on plastic filter cloth will be placed on the flood side slope of this segment of levee from the toe to elevation 6.0. This cover will extend from station 413+33 to station 413+83. The plan and sections of the Little River area are shown on plates 29 and 30.

c. Drainage structure at South Point. The existing culverts at station 663+05 consist of six 42-inch corrugated metal pipes with flap gates. These culverts do not meet Corps of Engineers requirements for drainage pipes through levees, i.e., positive cutoff capability, seepage collars, and drainage fill around the pipe on the landside. Consequently, a new drainage structure meeting established Corps of Engineers criteria will be constructed at station 665+00. The plan of construction (see plate 32) is such that the new structure can be constructed coincident with construction of the sand core portion of the new levee. The new structure can be constructed in the dry with temporary protection dikes to elevation 6.0 surrounding the excavation (see plate 33); accordingly, the schedule for constructing the new structure dictates that the construction period not extend into the hurricane season (June through November). The new drainage structure will have seepage collars, flap gates, sluice gates for positive cutoff, and drainage fill blankets around the pipes as shown on plate 34. The existing culverts will remain in operation throughout the construction period of the new levee and drainage structure. The existing culverts will be removed and the levee backfilled as the last item of work.

31. Shear stabilities.

a. Station 331+50 to station 661+60. Using surveyed cross sections representative of existing conditions, the slopes and berm distances for the new levee and demucked canal were designed for the following conditions: water level to elevation 1.0 with anticipated failure toward the demucked canal (see plates 35, 36, and 37); water level to project hurricane wind tide level (WTL) elevation 8.5 on the flood side, water level to elevation 0.0 on the protected side, and anticipated failure toward the protected side (see plates 38, 39, 40, 41, and 42); and water to elevation 0.0 on both sides of the levee and anticipated failure toward the flood side (see plates 43 and 44). The stability of the levee was determined by the method of planes using the design (Q) shear strengths shown on plates 11 and 14 and applying

a minimum factor of safety with respect to shear strength of approximately 1.3. Current design practice is to preclude potential movement of pipelines conveying high pressure volatile liquids and/or gases; accordingly, a factor of safety of 1.5 with respect to shear strength was utilized to design the levee at the pipeline relocations. Undisturbed boring 1-ULN, taken in the reach between stations 331+50 and 430+00, is representative of the soils conditions in that reach, and the corresponding shear strength trend was used for design. Two undisturbed borings (2-ULN & 3-ULN) were taken in the reach from station 430+00 to station 661+60. Boring 3-ULN was taken in an abandoned distributary (see plate 24) and is not considered necessarily representative of the soils condition on either side of the distributary. In order to arrive at a more representative shear strength trend for this reach, the results of (Q) triaxial shear tests for borings 2-ULN and 3-ULN were used to develop a composite strength versus depth profile with an assigned shear strength trend superimposed thereon (see plate 14). The composite shear strength trend was then used for design of this reach of levee.

b. Existing railroad embankment. The railway system along the lakefront was originally supported on a timber trestle (see section B-B plate 30). When the embankment was constructed, the stringers were removed but the pile bents and caps were left in place. The stability of the existing railroad embankment was analyzed for the condition of water to elevation 1.0, ignoring any shear resistance due to the piles, and assuming failure toward the demucking channel (see plates 35 and 37). The intermittent train loads will be transferred into the foundation sand by the pile bents and do not affect the shear stability analyses in the overlying clays. The embankment was analyzed for a minimum factor of safety with respect to shear strength of approximately 1.3.

c. Station 661+60 to station 666+00. The slopes and berm distances for the levee enlargement were designed for the following conditions: water level at elevation 0.0 on the protected side, water level at the existing minimum ground elevation on the flood side, and assumed failure toward the flood side (see plates 45 and 46); water level to project hurricane WTL elevation 8.5 on the flood side, water level to elevation 0.0 on the protected side, and assumed failure toward the protected side (see plates 47 and 48). The slopes and berm distances for the levee crossing the relocated drainage culvert were designed for the following conditions: hurricane floodwater at elevation 8.5 on the flood side, water at elevation 0.0 on the protected side, and assumed failure toward the protected side; and water level at elevation 0.0 on the protected side, hurricane low water at elevation -2.0 on the flood side, and assumed failure toward the flood side (see plate 48). The stability of the levee was determined by the method of planes using the design (Q) shear strengths shown on plates 15 and 16 and applying a minimum factor

of safety with respect to shear strength of approximately 1.3. See plate 33 for the drainage structure excavation stability analyses.

d. Stockpile area--stripped clay. The stability of the stockpile area and stockpile retention dikes was determined by the method of planes using the design (Q) shear strengths shown on plate 14 and applying a minimum factor of safety with respect to shear strength of approximately 1.3 (see plates 49 and 50).

32. Pipeline relocations. Pipeline relocations will be required in two areas. Collins Pipeline Company has a 16-inch pipeline which crosses the levee alinement in the vicinity of station 394+35, and Southern Natural Gas Company has a 20-inch, 24-inch, and 30-inch pipeline crossing the alinement in the vicinity of station 593+00. The levee centerline at the pipeline relocations will be shifted southward an additional 60 feet to allow enough room for the pipelines to be relocated over the new levee. The pipelines will remain above the 1 on 4 levee slope and will pass beneath the railroad embankment with a minimum clearance of 5 feet 6 inches from base of rail to top of pipeline casing. Relocation plans and detailed sections are shown on plates 51 and 52. The relocations will be accomplished by the utility companies owning the pipelines prior to construction of the levee. The utility companies will be required to place granular fill material to elevation 2.0 along the pipeline alinement for a distance of 20 feet on each side of the centerline of the relocated pipelines. Details of these relocations will be presented in the plans and specifications.

33. Settlement.

a. Station 331+50 to station 661+60. As shown on plates 27 and 31, the quantities of pumped sand and clay cover have been increased by 5 and 10 percent, respectively, to allow for settlement of the foundation and consolidation of the fill during construction. Settlement estimates indicate that the levee crown will settle an additional 1.5 feet after construction between stations 331+50 and 430+00 and 1.0 foot between stations 430+00 and 661+00. To compensate for this long-term settlement, the levee crown will be overbuilt or "grossed," as shown on plates 27 and 31. Stability analyses were performed on the levee at gross grades and the resulting factors of safety were above the minimum 1.3.

b. Station 661+60 to station 666+00. The existing levee in this reach was constructed in 1956 by the Orleans Levee District (OLD). The initial construction consisted of demucking the organic clay along the levee centerline, constructing retaining

dikes, pumping hydraulic fill between the retaining dikes, and shaping the in-place fill to elevation 11.5 with a 10-foot crown and 1 on 5 side slopes. The second lift consisted of placing approximately 2.5 feet of hauled fill on the existing levee (to a construction grade of approximately elevation 11.0), and was constructed by the OLD in 1970. After constructing this levee reach to the project design grade of 12.5, it is estimated that the levee crown will settle an additional foot. To compensate for this long-term settlement, the levee crown between South Point and station 666+00 will be overbuilt 1 foot above net grade to elevation 13.5. Stability analysis of this levee reach at the new drainage structure, including the inlet and outlet basins as a surcharge, indicates that the overbuilt levee shear stability equals or exceeds the minimum factor of safety of 1.3 (see plate 48). The new drainage structure culverts will be cambered 1 foot at the levee centerline to allow for the expected settlement beneath the embankment.

34. Erosion protection. Thirty-inch riprap on shell will cover the lakeside slope of the existing railroad embankment as shown on plates 27 and 31. This riprap serves as a wave berm for the new levee section at net grade, and also protects the railroad embankment and thus the levee from wave and backwash erosion.

35. Clay stripping stockpile. As previously stated, the sand stratum in the sand borrow area is overlain by a clay layer varying in thickness from 15 to 25 feet. To prevent wasting this material in the lake and also to provide an alternate source of clay borrow, the clay layer will be stripped and stockpiled in a storage area located just south of South Point. The plans and details of the stockpile and adjacent ponding areas are depicted on plate 5. The stored clay will be available and saved for the Government's use as an alternate borrow source for the protective works covered in this supplement, and also for other features of the Lake Pontchartrain hurricane protection project.

36. Sources of fill material.

a. Hydraulic sandfill. The sand core portion of the levee will be constructed with hydraulic sandfill obtained from a borrow area located in Lake Pontchartrain as shown on plate 5. The area is 550 feet wide by 3,000 feet long with an available depth of borrow to elevation -90.0 and side slopes no steeper than 1 on 2. General type boring logs (for borings 10-NB through 15-NB) and a geologic soil profile of the sand borrow area are shown on plates 9 and 26, respectively.

b. Clay blanket. The material available from demucking along the levee centerline and from constructing the interim and final drainage ditches will be used as fill material for the clay blanket portion of the levee. Additional clay material is available, if needed, from the clay stripping stockpile area located in the vicinity of South Point as shown on plate 5.

c. Levee enlargement--South Point to station 666+00. Fill material is available from the clay stripping stockpile area located in the vicinity of South Point (see plate 5).

37. Method and sequence of construction.

a. Levee. Construction of the levee will be accomplished in five stages as shown on plates 27 and 31 and as described below:

(1) First stage. Excavate the demucking channel and use the excavated material in constructing the fill retaining dike. Excavate the interim drainage ditch and place the excavated material as a storage berm on the landside of the retaining dike.

(2) Second stage. After the clay overburden is stripped from the borrow area and pumped into the stockpile area, pump sand from the borrow area into the demucked channel forming the sand core.

(3) Third stage. Shape the hydraulically placed sand into the design sand core configuration.

(4) Fourth stage. Install catch basins and drain pipes on 600-foot centers starting at station 332+00 and ending at station 656+00. Place semicompacted clay fill around the catch basins. Place a 12-inch layer of riprap on a plastic filter cloth around each catch basin.

(5) Fifth stage. Place a semicompacted clay blanket on shaped sand core. Obtain material for the clay blanket from the fill retaining dike and storage berm and from material wasted during excavation of the permanent drainage canal. To provide vehicular access during construction, the clay cover on the levee crown will be placed last. Additional clay material is available, if needed, from the clay stripping in the stockpile area near South Point.

b. Drainage structure at South Point. The drainage structure just below South Point can be constructed prior to or concurrent with levee construction stages 1 through 4 above. However, this structure must be in-place and operating before the existing culverts can be removed (see plate 32). The new structure will be constructed as follows:

(1) Degrade the existing levee and use this material for the excavation protection dikes as shown on plate 33. Conventional sumps and pumps will be utilized to collect and dispose of surface water during construction.

(2) Construct the new drainage structure to include the corrugated metal pipes, flap gates, sluice gates, inlet and outlet basins, seepage collars, and the drainage fill around the protected side one-third of the pipes (see plate 34).

(3) Backfill the levee with semicompacted fill to the grossed grade and section shown on plate 34.

(4) Place shell and riprap protection at the locations shown on plate 34.

c. Erosion protection. The riprap and shell cover on the lakeside slope of the existing railroad embankment can be placed prior to, concurrent with, or after the levee construction stages described above. If the erosion protection is constructed prior to installation of the CMP drain pipes, the drainage ditch through the riprap will be formed as the riprap is placed. The riprap will be barged to a stockpile area at the construction site, loaded into trucks, hauled, and then placed.

DESCRIPTION OF PROPOSED STRUCTURES AND IMPROVEMENTS

38. Levees. The project levee will consist of a hydraulic sand core with a cast clay cover and extend from the junction (station 331+50) of Paris Road and Hayne Boulevard for about 6.3 miles to a point just southward of South Point, La. (station 666+00). The centerline of the proposed levee will be located 60 feet south of the southernmost rail of the Southern Railway System's main line tracks, except in the vicinity of the pipeline relocations where the levee centerline will be located 120 feet south of the southernmost rail. The net design elevation of the levee is 14.0. The general location and alinement of the proposed levee are shown on plate 1. The detailed alinement and profile of the levee and features contiguous thereto are shown on plates 2 through 4. Typical levee design sections are shown on plates 27 and 31.

39. Drainage facilities.

a. Catch basins. Catch basins and drain pipes will be installed on 600-foot centers from station 332+00 to station 656+00 to drain the depression between the project levee and the railroad embankment. The catch basins will be 4 feet square, made of concrete, and covered with steel gratings. A 12-inch diameter corrugated metal drain pipe, sloped 1 on 60, will extend from the catch

basin with invert at elevation 4.0 under the railroad embankment into a narrow ditch in the riprap blanket (see plates 27 and 31). A 12-inch layer of riprap on plastic filter cloth will surround each catch basin to prevent scour of the clay cover. Details of the catch basins are shown on plate 53.

b. Drainage structure. The existing drainage structure consisting of six 42-inch drainage culverts located at station 663+05 does not fulfill project design standards and conflicts with the levee alinement. This structure will be replaced by a drainage structure located at station 665+00. The new structure will have five 48-inch corrugated metal pipe (CMP) culverts complete with inlet and outlet basins (see plate 34 for structure plan layout). The new structure is located to aline with the new permanent drainage ditch to be constructed south of the proposed levee. Each of the CMP culverts will be cambered 1 foot at the levee centerline to compensate for the 1-foot anticipated settlement. Four seepage collars each 96 inches in diameter will be equally spaced on each of the culverts. A seepage collar will also be placed around the drainage structure. The structure will be equipped with flap gates, sluice gates for positive cutoff, and a trash rack on the inlet basin to prevent debris from passing through the structure jeopardizing proper operation. A stoplog support will be provided on the outlet basin to enable the flap gates to be maintained periodically. Complete details for the above-described structure are illustrated on plates 34, 54, 55, 56, and 57.

c. Drainage ditch. The drainage ditch adjacent to the railroad embankment which now serves the project area will be covered by the project levee and, therefore, a new drainage ditch will be constructed adjacent to and south of the project levee. The new drainage ditch, with a bottom width of 20 feet at elevation -10 and side slopes of 1 vertical on 2 horizontal will, however, be provided incident to construction of the proposed levee and no additional costs are anticipated.

OTHER PLANS CONSIDERED

40. Recommended construction plan. The plan recommended for construction is a pumped-sand core levee with a cast clay blanket. This levee will be constructed parallel to and abreast of the Southern Railway System railroad embankment. The plan includes the relocation of four pipelines which cross the alinement, removal of existing culverts, and also the construction of a drainage structure. The recommended plan also includes riprap erosion protection and appurtenant levee drainage works.

41. Alternate alinement plan. During project formulation and planning, consideration was given to constructing the levee along the alinement presented in the project document, namely lakeside of the railroad embankment in the shallow waters of Lake Pontchartrain. This alternate included the additional works required such as riprap protection, pipeline relocations, a new drainage structure, and other associated items similar to the recommended plan. This alternate was rejected for the following reasons:

a. Excessive cost. The lakeside levee plan was estimated to cost in excess of $16 million excluding lands, damages, and relocations. This estimate represents an additional cost of about $6 million when comparing the same work items with the recommended plan. Studies also reveal that no inherent advantages were availed by this added expenditure and that the recommended project plan fulfills all requisites for the least costly plan for hurricane protection.

b. Campsite relocations. This alternate would have necessitated removal of about 45 shoreline campsites for levee construction. This relocation was considered a hardship which was avoidable by the recommended alinement. In the recommended plan, the walkways to these campsites will be removed for riprap placement and then replaced.

c. Ecological consideration. The lakeside levee alinement was considered to have permanent effects on the natural environment of the lake. This effect derives from the permanent loss of the lake bottomland and wildlife habitat beneath the embankment. Both this alternate and the recommended plan will cause temporary ecological disruptions due to turbidity in pumping borrow materials.

d. Construction problems. The alternate plan would create problems in construction; namely; involving pipeline relocations, campsite relocations, lift construction requiring a lengthy construction period, tie-ins with adjacent lines of protection, and interior drainage.

ACCESS ROADS

42. Access roads. Vehicular access to the job site is available at each end of the levee alinement. At the west end of the job is the intersection of Paris Road and Hayne Boulevard. Access at the east end can be obtained from Interstate Highway 10 by a shell road atop the South Point to GIWW levee (see plates 1 and 5). Floating plant can reach the project area by Lake Pontchartrain. The Southern Railway System parallels the proposed levee.

STRUCTURAL DESIGN

43. Criteria for structural design. The structural design presented herein complies with standard engineering practice and criteria set forth in Engineering Manuals for Civil Works construction published by the Office, Chief of Engineers, subject to modifications indicated by engineering judgment and experience to meet local conditions.

44. Basic data. Basic data relevant to the design of the drainage structure are as follows:

a. Water elevations

	Elevations ft. m.s.l.
Wind tide level (WTL)	8.5
Landside of structure	0.0

b. Unit weights

	Lb. per cu.ft.
Water	62.5
Concrete	150
Steel	490
Earth	117

c. Design loads

Earth pressures (lateral)	100 p.s.f.
Windloads	50 p.s.f.

45. Allowable working stresses. The allowable working stresses for concrete and structural steel are in accordance with those recommended in "Working Stresses for Structural Design," EM 1110-1-2101 dated 14 April 1965. The basic minimum 28-day compressive strength for concrete will be 3,000 p.s.i. Steel for steel sheet piling will meet the requirements of ASTM A328-69, "Standard Specification for Steel Sheet Piling." For convenient reference, pertinent allowable stresses are tabulated below:

a. Reinforced concrete

f'c	3,000 p.s.i.
fc	1,050 p.s.i.
v_c (without web reinforcement)	60 p.s.i.
v_c (with web reinforcement)	274 p.s.i.
fs	20,000 p.s.i.
Minimum tensile steel	0.0025 bd sq.in.
Shrinkage and temperature steel area	0.0020 bt sq.in.

b. Structural steel (ASTM A-36)

Basic working stress	18,000 p.s.i.

46. Foundation. The results of subsurface exploration, soils tests, and foundation studies are presented in previous paragraphs. Locations of borings are shown on plates 1 through 5. The general type boring logs are shown on plates 6 through 10. Undisturbed boring logs and data are shown on plates 11 through 21.

47. Drainage structure at South Point. The existing six 42-inch drainage culverts located at station 663+05 do not fulfill project design standards, conflict with the levee alinement, and will be removed. These culverts will be replaced by a new drainage structure located at station 665+00. The new structure will have five 48-inch corrugated metal pipe (CMP) culverts complete with inlet and outlet basins (see plate 34 for structure plan layout). The new structure is located to aline with the new permanent drainage ditch to be constructed south of the new lakefront levee. Each of the CMP culverts will be cambered 1 foot at the levee centerline to compensate for the 1 foot anticipated settlement. Four seepage collars each 96 inches in diameter will be equally spaced on each of the culverts. A seepage collar will also be placed around the drainage structure. The structure will be equipped with flap gates, sluice gates for positive cutoff, and a trash rack on the inlet basin to prevent debris from passing through the structure jeopardizing proper operation. A stoplog support will be provided on the outlet basin to enable the flap gates to be maintained periodically. No stoplogs will be furnished. Complete details for the above-described structure are illustrated on plates 34, 54, 55, 56, and 57. The plan of construction is described in paragraph 37b of this memorandum.

48. Levee drainage facilities. The depression between the levee and railroad embankment will be drained by installing 12-inch CMP culverts with catch basins at 600-foot intervals. The concrete catch basins will be covered with steel gratings to prevent debris from clogging the pipes. The CMP drain inverts will be even with the bottom inside surface of the catch basins to eliminate all water and prevent mosquito breeding. The drain pipes will be sloped such that they will be self-cleaning. Details of these drainage works are shown on plate 53. The plan of construction is described in paragraph 37a of this memorandum.

49. Corrosion control. No specific measures, other than painting of exposed ferrous metal surfaces, are required for corrosion control.

SOURCES OF CONSTRUCTION MATERIALS

50. Sources of construction materials. In addition to the information presented in this memorandum relative to borrow area location and materials, information relating to material sources is also contained in Design Memorandum No. 12, "Sources of Construction Materials," approved 30 August 1966.

REAL ESTATE REQUIREMENTS

51. General. All rights-of-way required for construction of the New Orleans East lakefront levee will be acquired by the Orleans Levee District and furnished without cost to the United States. There will be no acquisition by the United States. Rights-of-way limits and spoil-disposal areas are shown on plates 2, 3, 4, and 5. After 30 June 1972, local interests will assume the cost of relocation assistance to persons and businesses displaced by such acquisition pursuant to the requirements of PL 91-646.

RELOCATIONS

52. General. Under the authorizing law, local interests are responsible for the accomplishment of "...all necessary alterations and relocations to roads, railroads, pipelines, cables, wharves, drainage structures, and other facilities made necessary by the construction work;...."

53. Southern Natural Gas Company pipelines. At station 593+00, one 20-inch, one 24-inch, and one 30-inch Southern Natural Gas Company high pressure gas lines pass through the existing railroad embankment and cross the new levee alinement (see plate 4). These lines pass through the railroad embankment at about elevation 1.0. These lines will be relocated and raised above the new levee crown. Southern Natural Gas Company will perform the required relocations. See plates 51 and 52 for details of these relocations.

54. Collins Pipeline Company pipeline. At station 394+35, one 16-inch Collins Pipeline Company fluids line passes through the railroad embankment and crosses the new levee alinement (see plate 2). This line passes through the railroad embankment at approximate elevation 1.0. This line will be relocated and raised above the new levee crown by the Collins Pipeline Company. See plates 51 and 52 for details of this relocation.

55. Campsite walkways. Numerous walkways leading from campsites to the existing railroad embankment will be removed to facilitate construction and will be replaced following construction. See plate 2.

56. Drainage structure. As a result of constructing the proposed project levee, the existing drainage structure located at station 663+05 will require relocation and major modifications. The new structure is described in paragraph 39b of this design memorandum and construction details are shown on plates 34, and 54 through 57.

57. Drainage ditch. The existing drainage ditch adjacent to the railroad embankment which now serves the project area will be relocated adjacent to and south of the proposed levee. The new drainage ditch will be provided incident to construction of the levee and, therefore, no additional costs are anticipated. See plates 27 through 32.

COORDINATION WITH OTHER AGENCIES

58. General. As previously mentioned, the State of Louisiana, Department of Public Works, was appointed project coordinator for the State by the Governor of Louisiana. This agency has functioned to coordinate the needs, desires, and interests of state agencies and the Corps of Engineers. The Orleans Levee District will provide the local cooperation for this feature of the hurricane protection project. The project plan presented herein is acceptable to both of the above agencies.

59. U. S. Department of the Interior, Fish and Wildlife Service. Extensive coordination with the U. S. Fish and Wildlife Service was accomplished during preauthorization studies and subsequent to authorization of the project. By letter dated 2 April 1968, the Regional Director, U. S. Fish and Wildlife Service, Atlanta, Georgia, was informed of the current layout for the Lake Pontchartrain Barrier Plan feature of the Lake Pontchartrain, Louisiana and Vicinity hurricane protection project and requested to furnish views and comments on the entire Lake Pontchartrain Barrier Plan. By letter dated 15 May 1968, the Acting Regional Director states "...We are of the opinion that hurricane control structures in the Rigolets and Chef Menteur tidal passes have little appreciable effect on salinities in Lakes Maurepas, Pontchartrain, and Borgne. Therefore, no adverse effects on fish and wildlife resources in these areas are expected." Any significant modification to the current plan will be forwarded to the Regional Director for further review and comment. Copies of the above letter and the response of the Acting Regional Director are included in appendix A.

60. U. S. Department of the Interior, Federal Water Pollution Control Administration (now Environmental Protection Agency).

a. Review and recommendations. By letter dated 8 April 1968, the Regional Director, Federal Water Pollution Control Administration, was informed of the current layout for

the Lake Pontchartrain Barrier Plan feature of the Lake Pontchartrain, Louisiana and Vicinity hurricane protection project and requested to furnish views and comments on the project. The Regional Director requested in his letter of response dated 15 May 1968 that consideration be given to the following:

(1) Minimizing water quality degradation during construction.

(2) Minimizing the accidental spillage of petroleum products or other harmful materials and maintenance of sanitary facilities to adequately treat domestic wastes.

(3) Constructing and operating water quality control structures so as to insure that ecological conditions remain unchanged.

b. Project incorporation of recommendations. Provisions relative to water quality degradation during construction, control of accidental spillages, and maintenance of adequate sanitary facilities by construction contractors will be incorporated into the construction plans and specifications. The Seabrook Lock will be operated to provide a desirable salinity regimen in Lake Pontchartrain to the end that deleterious alterations in the lake ecology will be avoided. The Regional Director has been advised of the action to be taken in connection with his comments. Copies of correspondence with the Regional Director are included in appendix A.

ENVIRONMENTAL ANALYSIS

61. Environmental quality.

a. General. The engineering treatment required for preserving and maintaining the environmental quality of the project has been considered during preparation of this memorandum. Specifically, levee erosion protection and the disposition of stripped clay spoil are discussed in paragraphs 34 and 35 above. As indicated previously, extensive coordination has been accomplished with the appropriate agencies relative to effects of the project on fish and wildlife resources and water quality control during and subsequent to construction.

b. Enhancement. Construction of the protective works covered herein alters the existing terrain only to the extent of constructing an earthen levee and appurtenances immediately abreast of a railroad embankment in a predominantly marshland area. Essentially all borrow material needed to construct the levee will come from a borrow pit in Lake Pontchartrain. Additional beautification measures beyond those normally associated with

levee construction, i.e., grading and sodding, are not warranted. The logic behind this statement is that the adjacent area is privately owned and undeveloped marshland which precludes the commitment of public funds for beautification.

62. Environmental statement. The environmental statement for the entire Lake Pontchartrain, Louisiana and Vicinity hurricane protection project will be made available to the President, Council on Environmental Quality in about October 1972. This statement, in part, describes effects of the Paris Road to South Point levee construction essentially as follows: December

a. Most of the area in New Orleans East is partially drained marsh protected from normal flooding on the south, east, and west by levees along the GIWW and across the marsh, and on the north by the Southern Railway embankment. It is partially protected from tidal overflow and consists of low-lying undeveloped marshland with an average elevation of about 1.5 feet.

b. The Southern Railway embankment currently prevents detritus flow into Lake Pontchartrain. The proposed levee should have no effect on this environ. The project will provide drainage equal to that which presently exists. Willow thickets will continue to become abundant on the margins of the marsh and will result in conversion of wetland habitats and associated organisms to terrestrial environment.

c. Excavation of borrow material from Lake Pontchartrain will result in temporary turbidity which will cause some damage. The submerged aquatic plants which grow in the South Point area between the shoreline and about 6-foot depths are excellent habitat for fish, shrimp, crab, and the food organisms which support these sport and commercial animals. The temporary turbidity caused by the dredging process will shade the bottom so that the desirable vegetation will be destroyed in the disturbed area. This damage will not be permanent.

63. Historical and cultural environment. There are no known sites, structures, or objects of historical, architectural, or archeological significance in this project area which would fall within the provisions of Executive Order 11593, "Protection and Enhancement of the Cultural Environment."

ESTIMATE OF COST

64. General. Based on projected July 1972 price levels, the estimated first cost of construction of the New Orleans East lakefront levee, Paris Road to South Point, is $13,650,000. This estimate consists of $370,000 for lands and damages, $2,780,000 for relocations, $8,680,000 for levees, $955,000 for engineering and design, and $865,000 for supervision and administration. The detailed estimate of first cost is shown on table 1.

65. Comparison of estimates.

a. GDM versus PB-3. The current estimate of $13,650,000 for the New Orleans East lakefront levee represents an increase of $36,000 when compared to the latest PB-3, effective 1 July 1971. The PB-3 estimate is based on the estimate included in Design Memorandum No. 2, Citrus Back Levee, approved 29 December 1967, and escalated to July 1971 price levels. Table 2 shows a comparison of the project document, PB-3, and general design memorandum estimates. Reasons for the difference between the general design memorandum and PB-3 estimates follow:

(1) Levees and floodwalls. The net decrease of $2,802,000 is the result of locating the levee on the landside of the railroad embankment rather than in Lake Pontchartrain (lakeside) as originally contemplated by the project document plans. This basic reason for cost difference negates direct comparison of specific construction items as well as price level fluctuation.

(2) Engineering and design. The net increase of $48,000 results from recomputing the E&D cost based on an analysis of actual work required rather than using a fixed percentage of the construction cost.

(3) Supervision and administration. The net increase of $84,000 results from recomputing the S&A costs based on an analysis of actual work required rather than using a fixed percentage of the construction cost.

(4) Lands and damages. The net increase of $176,000 results from locating the levee landside of the railroad embankment rather than in Lake Pontchartrain. Considering the lakeside alinement, rights-of-way were not required, but it was necessary to destroy and thus purchase several shoreline camps. Under the recommended plan, rights-of-way and construction easements are required and it is not necessary to remove the camps.

(5) Relocations. The net increase of $2,530,000 is due to the need to relocate two additional pipelines, relocate and modify the South Point drainage structure, and remove and replace various campsite walkways that were not included in the PB-3 estimate. The net increase also reflects refinements in the cost estimate based on more detailed information available during preparation of the GDM.

b. GDM versus project document. The estimated cost of $13,650,000 for the New Orleans East lakefront levee represents a net increase of $6,918,000 over the project document estimate. Reasons for the difference between the design memorandum and project document estimates follow:

(1) Levees and floodwalls. The net increase of $2,682,000 is comprised of a decrease of $2,802,000 as described in paragraph 65a(1) above and an increase of $5,484,000 due to price level increases between December 1961 and July 1971. As described previously, the basic reason for cost estimate difference is the relocated levee alinement. This basic fact prohibits valid and meaningful cost comparisons between the GDM and project document.

(2) Engineering and design. The increase of $715,000 results from recomputing the E&D cost based on an analysis of actual work required rather than by using a fixed percentage of the construction cost.

(3) Supervision and administration. The increase of $505,000 is based on an analysis of actual work required rather than using a fixed percentage of the construction cost.

(4) Lands and damages. The increase of $370,000 is due to the change in project alinement. The project document alinement (lakeside) did not require the purchase of rights-of-way or easements and further did not include removal of the shoreline camps. The PB-3 estimate (GDM No. 2, Citrus Back Levee) which updated the project document did include removal of the camps as indicated in paragraph 65a(4) above.

(5) Relocations. The net increase of $2,646,000 is comprised of an increase of $2,530,000 as described in paragraph 65a(5) above, and an increase of $116,000 due to price level increases between December 1961 and July 1971.

TABLE 1

LAKE PONTCHARTRAIN BARRIER PLAN
NEW ORLEANS EAST LAKEFRONT LEVEE

ESTIMATE OF FIRST COST
(Projected July 1972 price levels)

Cost acct. No.	Item	Estimated quantity	Unit	Unit price	Estimated amount
				$	$
CONSTRUCTION					
11	Levees and floodwalls				
	Ponding & stockpile area				
	Dikes	104,000	c.y.	0.30	31,200
	Ditch excavation	6,000	c.y.	0.30	1,800
	Ditch maintenance	1	job	L.S.	5,000
	Borrow area stripping	1,900,000	c.y.	0.35	665,000

TABLE 1 (cont'd)

Cost acct. No.	Item	Estimated quantity	Unit	Unit price $	Estimated amount $
11	Levees and floodwalls (cont'd)				
	Embankment				
	Demucking excavation	560,000	c.y.	0.30	168,000
	Drainage ditch excav.	560,000	c.y.	0.35	196,000
	Sandfill (hydraulic)	2,030,000	c.y.	1.25	2,537,500
	Clay fill (cast)	870,000	c.y.	0.75	652,500
	Clearing and grubbing	1	job	L.S.	50,000
	Fertilizing & seeding	150	acre	150.00	22,500
	Structure removal				
	Little River structure	1	job	L.S.	5,000
	Drainage facilities				
	12-inch CMP culvert	3,000	l.f.	12.00	36,000
	Catch basins	55	job	L.S.	11,000
	Plastic filter cloth	1,230	s.y.	1.35	1,700
	Riprap - 12"	600	ton	15.00	9,000
	Erosion protection				
	Shell (haul)	32,000	c.y.	4.65	148,800
	Riprap - 30"				
	Barge to stockpile	255,000	ton	6.50	1,657,500
	1st handling	255,000	ton	1.00	255,000
	2d handling	255,000	ton	0.70	178,500
	Haul (0 to 6 miles)	255,000	ton	0.50	127,500
	Place	255,000	ton	0.80	204,000
	Mobilization and demobilization	1	job	L.S.	250,000
	Environmental protection	1	job	L.S.	20,000
	Subtotal				7,233,500
	Contingencies 20%±				1,446,500
	Subtotal, levees				8,680,000
30	Engineering and design 11%± (based on estimate of actual E&D required)				955,000
31	Supervision and administration 10%± (based on estimate of actual S&A required)				865,000
	TOTAL, CONSTRUCTION				10,500,000

TABLE 1 (cont'd)

Cost acct. No.	Item	Estimated quantity	Unit	Unit price $	Estimated amount $
LANDS AND DAMAGES					
01	Lands				
	Marshland	126	acres	1500.00	189,000
	Easement (construction)	300	acres	300.00	90,000
	Easement (riprap)	107	acres	225.00	24,000
	Subtotal				303,000
	Contingencies 20%+				60,000
	Real estate hired labor				2,000
	Acquisition costs by others				5,000
	TOTAL, LANDS AND DAMAGES				370,000
RELOCATIONS					
02	Relocations				
	Pipelines				
	30-inch gas pipeline	1	ea.	L.S.	500,000
	24-inch gas pipeline	1	ea.	L.S.	450,000
	20-inch gas pipeline	1	ea.	L.S.	400,000
	16-inch fluids pipeline	1	ea.	L.S.	350,000
	Subtotal				1,700,000
	Drainage structure				
	Excavation	6,100	c.y.	3.50	21,350
	Dewatering	1	job	L.S.	10,000
	Backfill	4,040	c.y.	4.00	16,160
	Sandfill	260	c.y.	10.00	2,600
	Shell fill	120	c.y.	8.00	960
	Riprap - 12"	330	ton	15.00	4,950
	Steel sheet piling	750	s.f.	6.00	4,500
	Concrete slab	80	c.y.	50.00	4,000
	Concrete walls	80	c.y.	100.00	8,000
	Portland cement	810	cwt	1.40	1,140
	Steel reinforcement	21,600	lb.	0.25	5,400
	Miscellaneous metal	1	job	L.S.	2,000
	48-inch CMP culvert	600	l.f.	48.00	28,800
	Sluice gate, 48-inch	5	ea.	6,000.00	30,000
	Flap gate, 48-inch	5	ea.	1,000.00	5,000
	Remove existing culverts	1	job	L.S.	5,000
	Subtotal				149,860
	Remove & replace campsite walkways	1	job	L.S.	75,000

TABLE 1 (cont'd)

Cost acct. No.	Item	Estimated quantity	Unit	Unit price $	Estimated amount $
	Subtotal, relocations				1,924,860
	Contingencies 20%+				385,140
	Subtotal, relocations				2,310,000
	Engineering & design 11%+ (based on est. of act. work required)				245,000
	Supervision & administration 10%+ (based on est. of act. work required)				225,000
	TOTAL, RELOCATIONS				2,780,000
	TOTAL PROJECT COST				13,650,000

TABLE 2

COMPARISON OF ESTIMATES

Feature		Project document (Dec 61 prices) $	PB-3 (eff.Jul 71) $	GDM No. 2 Supp. No.5B (projected Jul 72 prices) $	Difference Supp. No.5B - PB-3 $	Difference Supp. No.5B - Proj.document $
11	Levees and floodwalls	5,998,000	11,482,000	8,680,000	-2,802,000	+2,682,000
30	Engineering and design	240,000	907,000	955,000	+ 48,000	+ 715,000
31	Supervision and administration	360,000	781,000	865,000	+ 84,000	+ 505,000
	Subtotal	6,598,000	13,170,000	10,500,000	-2,670,000	+3,902,000
01	Lands and damages	0	194,000	370,000	+ 176,000	+ 370,000
02	Relocations	134,000	250,000	2,780,000	+2,530,000	+2,646,000
	Subtotal	134,000	444,000	3,150,000	+2,706,000	+3,016,000
	TOTAL PROJECT COST	6,732,000	13,614,000	13,650,000	+ 36,000	+6,918,000

SCHEDULES FOR DESIGN AND CONSTRUCTION

66. Schedules for design and construction. The sequence of contracts and the schedules for design and construction are tabulated below:

	P&S		Construction			Estimated Construction Cost Includes Contingencies and 6% ± S&I
Contracts	Start	Complete	Advertise	Award	Complete	
Levee, Sta. 331+00 to Sta. 666+00 (including South Point drainage structure)	Sept 72	Aug 73	Sept 73	Oct 73	May 75	$9,392,000

67. Funds required by fiscal year. To maintain the schedules for design and construction of the New Orleans East lakefront levee, Federal funds[2] will be required by fiscal year as follows:

Funds required by FY	1972	$ 235,000[3]
	1973	475,000
	1974	5,000,000
	1975	5,010,000
Total		$10,720,000

OPERATION AND MAINTENANCE

68. General. The drainage structure will be maintained and operated at the expense of local interests as a feature of local cooperation in the hurricane protection project. This structure will have an estimated life of 50 years but it is anticipated that local interests will replace the structure with a pumping station as the New Orleans East area develops. It is estimated that the flap gates will be replaced at 10-year intervals and the sluice gates and culverts at 25-year intervals. The annual charge for these replacements is estimated to be $5,400. The annual operation and maintenance cost for the structure is estimated to be $1,100. The annual maintenance cost for the levee and erosion protection is estimated to be $10,000.

---

[2]Includes cost for constructing levee and South Point drainage structure (including contingencies 20%), supervision & administration, and engineering & design. Approximately $220,000 will be reimbursed by local interests for construction, engineering & design, and supervision & administration associated with the South Point drainage structure.

[3]Includes cost to date and cost for preparation of plans and specifications in the remainder of FY 72.

PROJECT FORMULATION AND EVALUATION

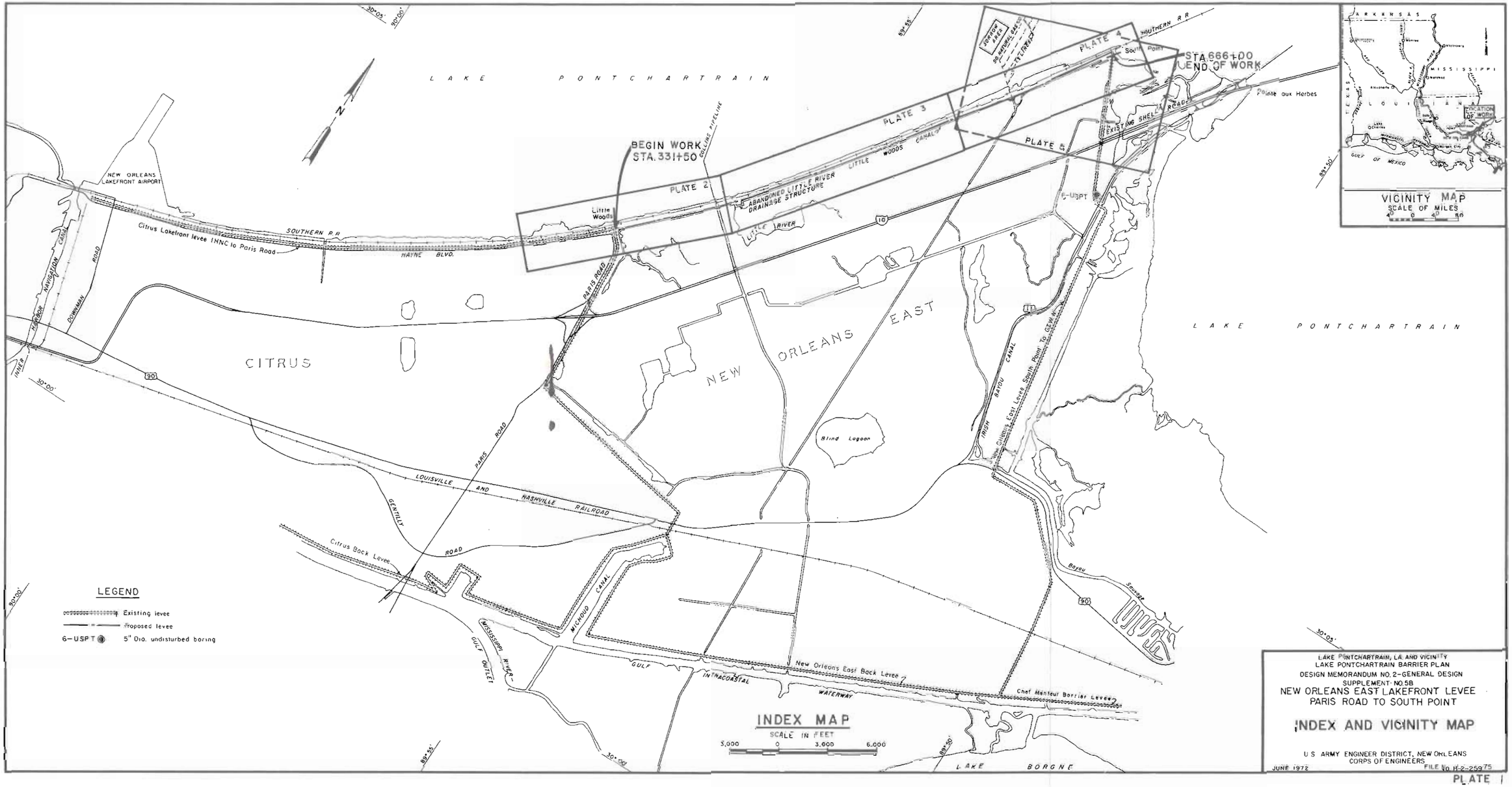
69. Project formulation and evaluation. The New Orleans East lakefront levee is not a separable unit of Lake Pontchartrain Barrier Plan; therefore, an incremental justification and independent economic analysis is not practicable.

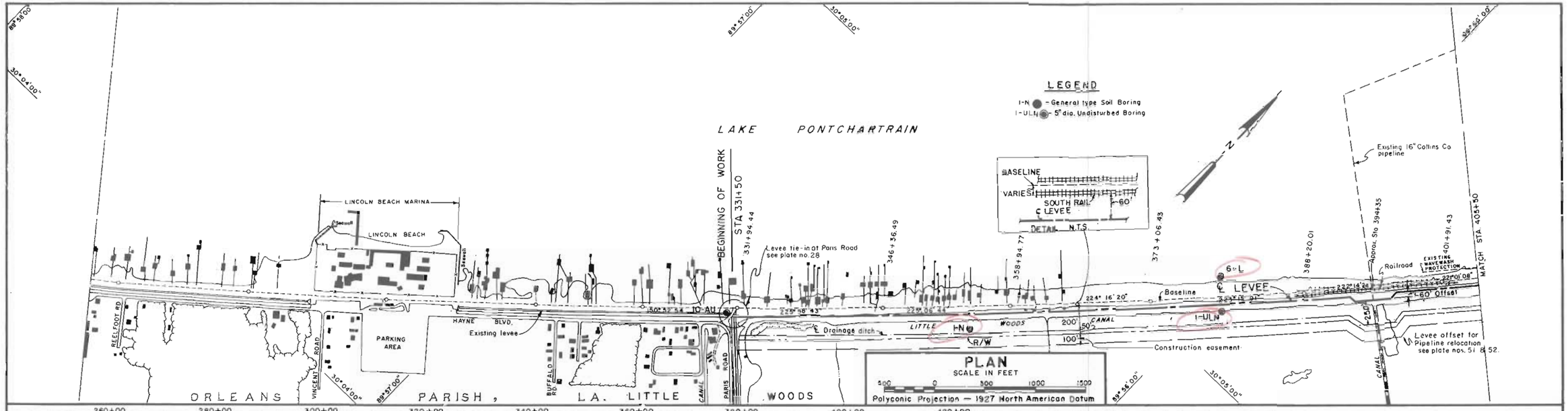
ECONOMICS

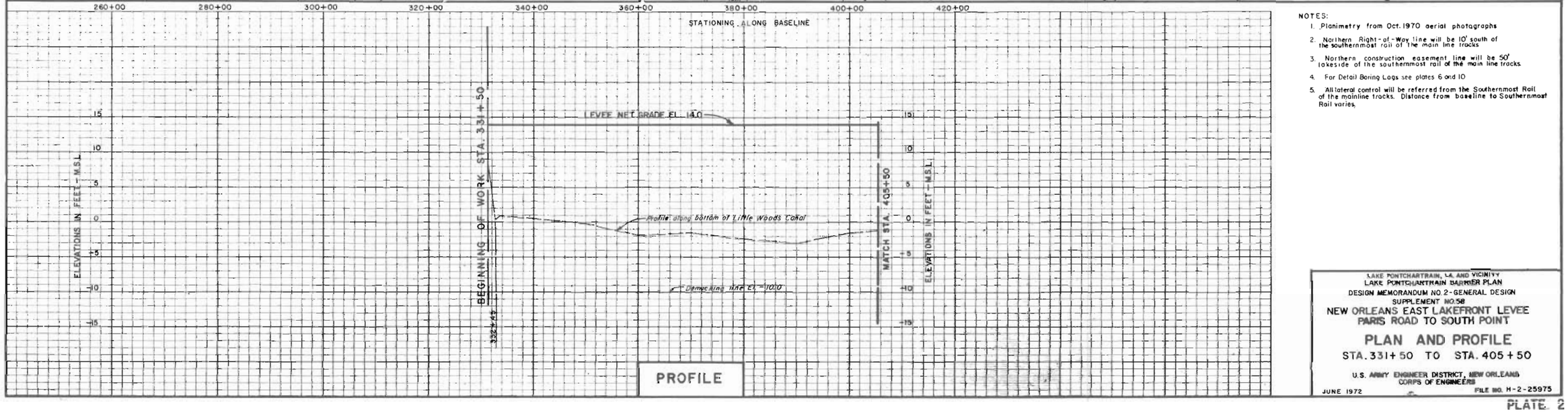
70. Economic justification. The current economic analysis for the entire Lake Pontchartrain, Louisiana and Vicinity hurricane protection project, based on the July 1971 PB-3 costs, indicates a benefit-cost ratio of 11.5 to 1. As stated in paragraph 69 above, an independent economic analysis for the project feature presented herein is not practicable. The slightly increased costs of the New Orleans East lakefront levee protective works presented in this memorandum above that shown in the current PB-3 will not significantly change the approved benefit-cost ratio for the entire project.

RECOMMENDATIONS

71. Recommendations. The plan of improvement presented herein consists of 6.3 miles of new levee construction along the New Orleans East lakefront from Paris Road to South Point, La. The plan includes suitable provision for replacement of drainage facilities, erosion protection, and necessary relocations. This plan is considered to be the best means of accomplishing project objectives and is recommended for approval.


LAKE PONTCHARTRAIN
BEGIN WORK STA. 331+50
STA 666+00 END OF WORK
PLATE 1
PLATE 2
PLATE 3
PLATE 4
PLATE 5
NEW ORLEANS LAKEFRONT AIRPORT
Citrus Lakefront levee INNC to Paris Road
SOUTHERN R.R.
HAYNE BLVD.
ORLEANS PIPELINE
ABANDONED LITTLE RIVER DRAINAGE STRUCTURE
LITTLE WOODS CANAL
Little Woods
LITTLE RIVER
PARIS ROAD
INNER HARBOR NAVIGATION CANAL
DOWNMAN ROAD
CITRUS
NEW ORLEANS EAST
Blind Lagoon
LOUISVILLE AND NASHVILLE RAILROAD
GENTILLY ROAD
Citrus Back Levee
MICHOUD CANAL
MISSISSIPPI RIVER GULF OUTLET
GULF INTRACOASTAL WATERWAY
New Orleans East Back Levee
Chef Menteur Barrier Levee
IRISH BAYOU
New Orleans East Levee South Point to GIWW
Bayou Sauvage
EXISTING SHELL ROAD
South Point
Pointe aux Herbes
6-USPT
LAKE BORGNE
LEGEND
Existing levee
Proposed levee
6-USPT 5" Dia. undisturbed boring
INDEX MAP
SCALE IN FEET
3,000 0 3,000 6,000
VICINITY MAP
SCALE OF MILES
ARKANSAS
MISSISSIPPI
LOUISIANA
TEXAS
GULF OF MEXICO
LOCATION OF WORK
LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2-GENERAL DESIGN
SUPPLEMENT NO. 5B
NEW ORLEANS EAST LAKEFRONT LEVEE
PARIS ROAD TO SOUTH POINT
INDEX AND VICINITY MAP
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
JUNE 1972
FILE No. H-2-25975
PLATE 1





NOTES:

1. Planimetry from Oct. 1970 aerial photographs
2. Northern Right-of-Way line will be 10' south of the southernmost rail of the main line tracks
3. Northern construction easement line will be 50' lakeside of the southernmost rail of the main line tracks.
4. For Detail Boring Logs see plates 6 and 10
5. All lateral control will be referred from the Southernmost Rail of the mainline tracks. Distance from baseline to Southernmost Rail varies.

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2-GENERAL DESIGN
SUPPLEMENT NO. 58
NEW ORLEANS EAST LAKEFRONT LEVEE
PARIS ROAD TO SOUTH POINT

PLAN AND PROFILE

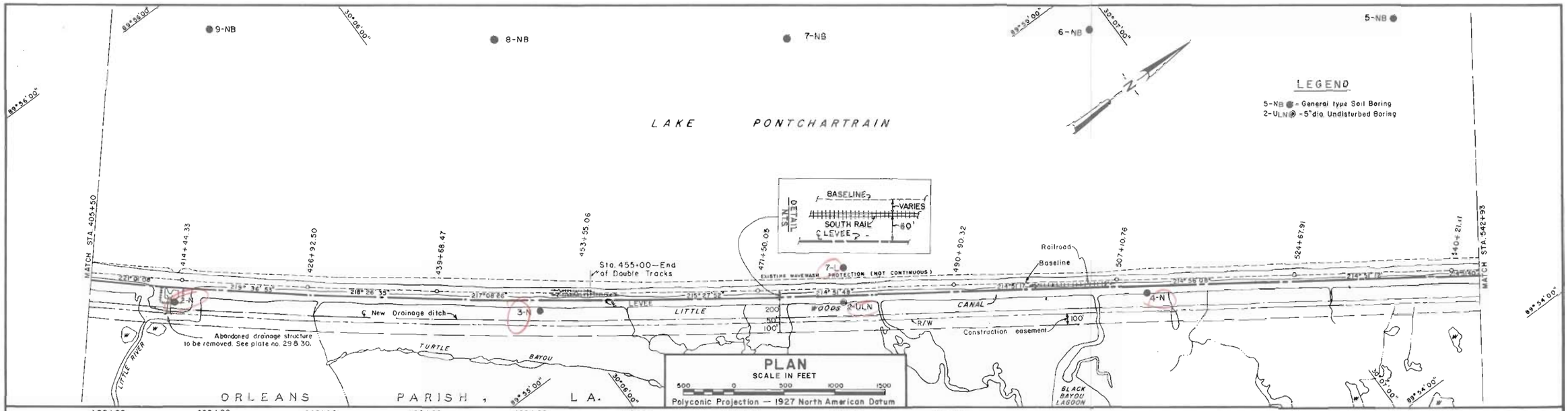
STA. 331+50 TO STA. 405+50

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

JUNE 1972

FILE NO. H-2-25975

PLATE 2



NOTES:

1. Planimetry from Oct. 1970 aerial photographs
2. Northern Right-of-Way line will be 10' south of the southernmost rail of the main line tracks
3. Northern construction easement line will be 50' lakeside of the southernmost rail of the main line tracks
4. For Detail Boring Logs see plates 6,7,8,&10
5. All lateral control will be referred from the Southernmost Rail of the mainline tracks. Distance from baseline to Southernmost Rail varies.

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2- GENERAL DESIGN
SUPPLEMENT NO. 5B

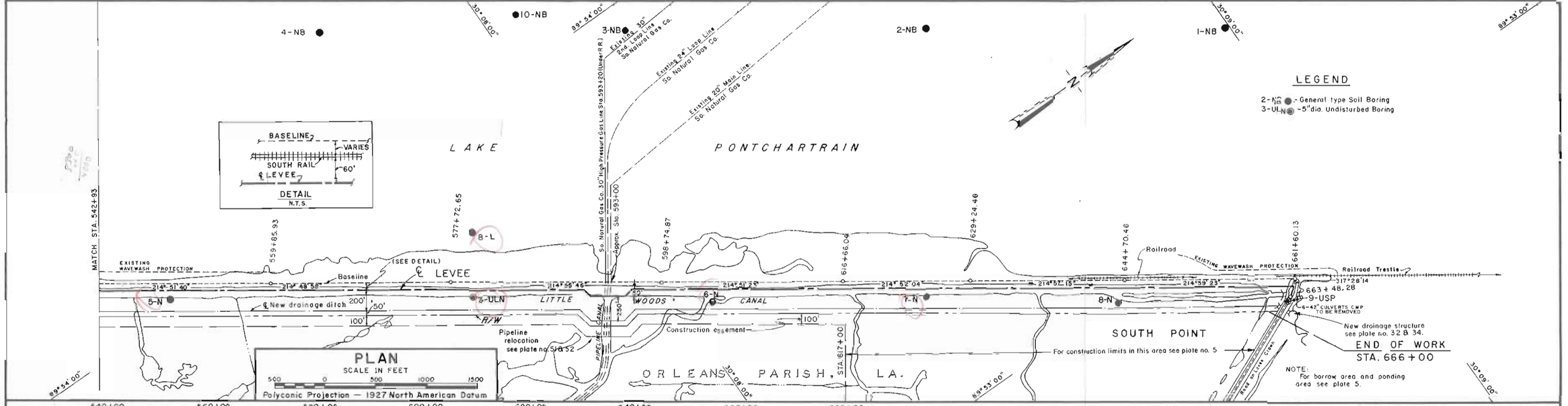
NEW ORLEANS EAST LAKEFRONT LEVEE
PARIS ROAD TO SOUTH POINT

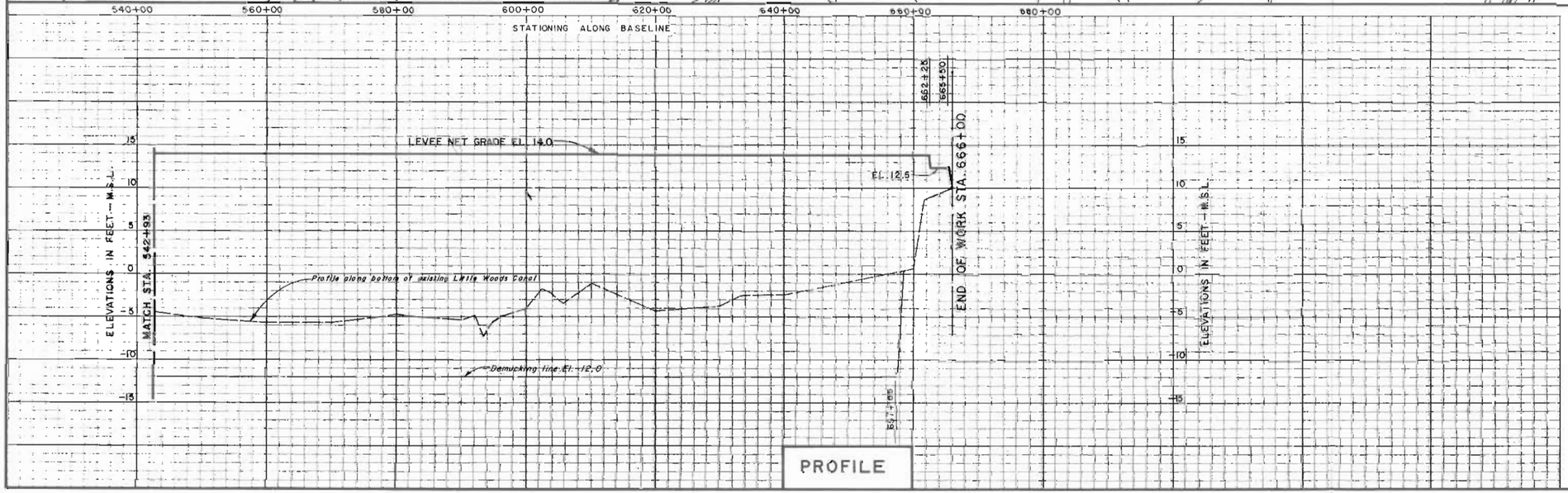
PLAN AND PROFILE
STA. 405+50 TO STA. 542+93

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

JUNE 1972 FILE NO. H-2-25975

PLATE 3





NOTES:

1. Planimetry from Oct. 1970 aerial photographs
2. Northern Right-of-Way line will be 10' south of the southernmost rail of the main line tracks.
3. Northern construction easement line will be 50' lakeside of the southernmost rail of the main line tracks.
4. For detail boring logs see plates 6 and 10.
5. All lateral control will be referenced from the southernmost rail of the mainline tracks. Distance from baseline to southernmost rail varies.

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2-GENERAL DESIGN
SUPPLEMENT NO. 5B
NEW ORLEANS EAST LAKEFRONT LEVEE
PARIS ROAD TO SOUTH POINT

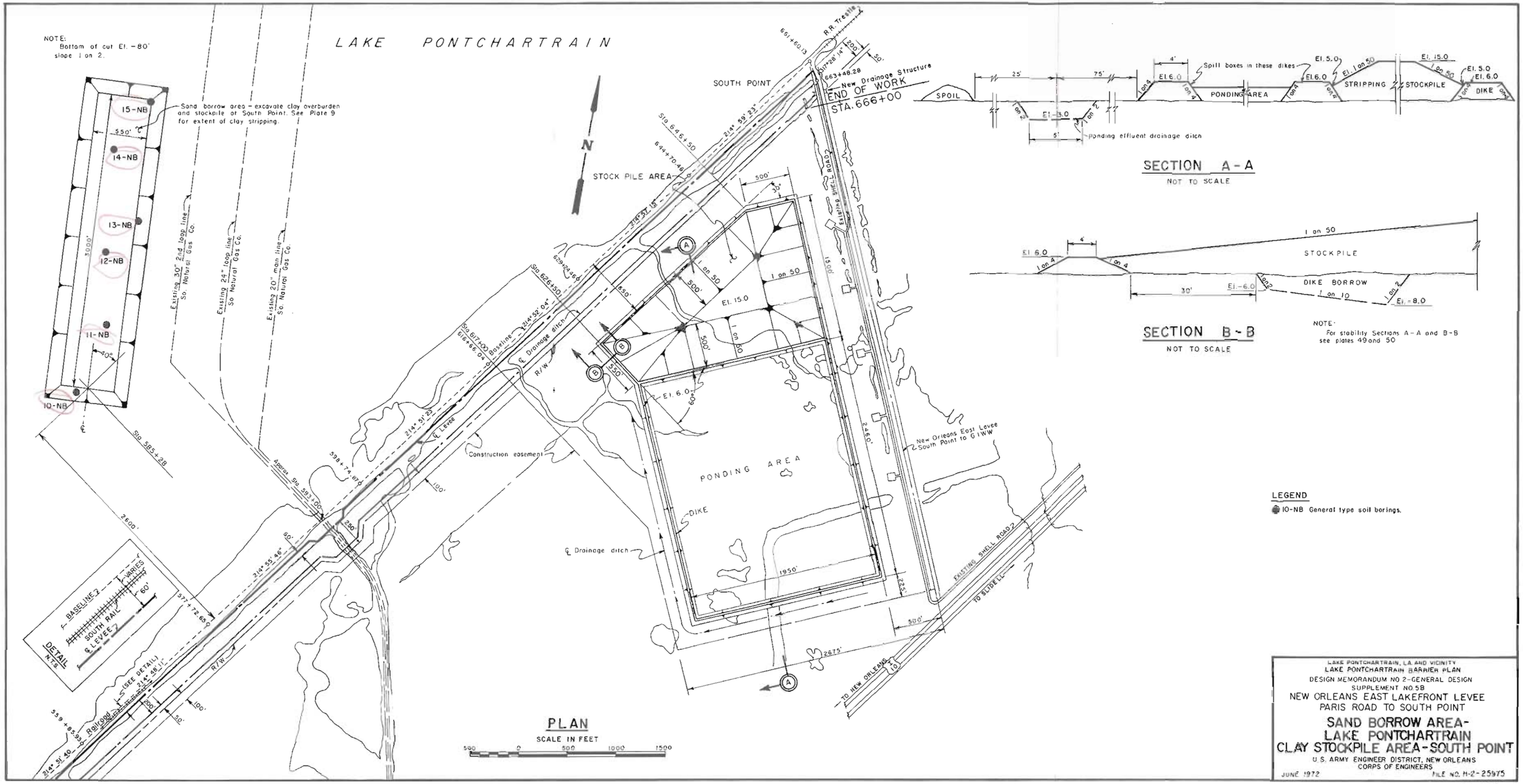
PLAN AND PROFILE
STA. 542+93 TO STA. 666+00

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

JUNE 1972

FILE NO. [illegible]

PLATE 4



LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO 2-GENERAL DESIGN
SUPPLEMENT NO.5B
NEW ORLEANS EAST LAKEFRONT LEVEE
PARIS ROAD TO SOUTH POINT

SAND BORROW AREA-LAKE PONTCHARTRAIN CLAY STOCKPILE AREA-SOUTH POINT

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
JUNE 1972 FILE NO. H-2-25975

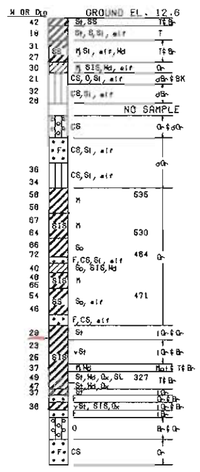
PLATE 5

BOR. 10-AU

STA. 331+00

52 FT L.S. C.L. EXISTING LEVEE

12 NOV 70

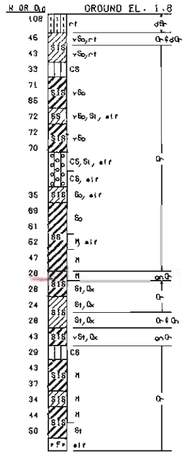


BOR. 1-N

STA. 355+00

200 FT. L.S. OF B.L.

26 MAY 71

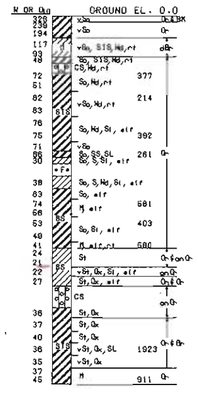


BOR. 1-ULN

STA. 380+00

125 FT L.S. OF B.L.

27 FEB 70 TO 2 MAR 70

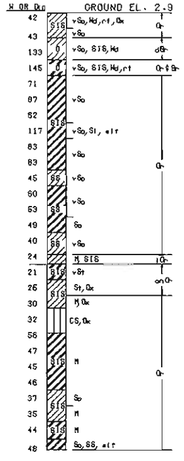


BOR. 2-N

STA. 413+89

295 FT L.S. OF B.L.

25 MAY 71

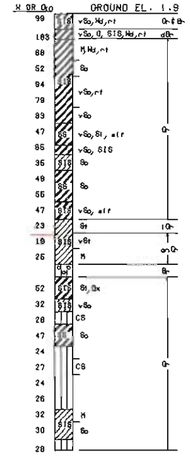


BOR. 3-N

STA. 450+00

175 FT. L.S. OF B/L

24 MAY 71

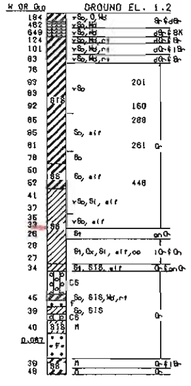


BOR. 2-ULN

STA. 480+00

145 FT L.S. OF B.L.

3-4 MAR 70



ELEVATIONS IN FEET M.S.L.

20 10 0 -10 -20 -30 -40 -50 -60 -70 -80 -90 -100 -110

NOTES:

General type borings were made with a 1 7/8" ID core barrel sampler.
Undisturbed type borings were taken with a 5" diameter steel tube piston type sampler.
For locations of borings see plates 2, 3 and 4
See plate A for boring legend.

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2-GENERAL DESIGN
SUPPLEMENT NO.5B

NEW ORLEANS EAST LAKEFRONT LEVEE PARIS ROAD TO SOUTH POINT

GENERAL TYPE BORINGS ALONG LEVEE ALINEMENT

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

JUNE 1972

FILE NO. H-2-25975

PLATE 6

BOR. 4-N
STA. 510+00
150 FT. P.S. OF B/L
21-24 MAY 71

BOR. 5-N
STA. 550+00
150 FT. P.S. OF B/L
21 MAY 71

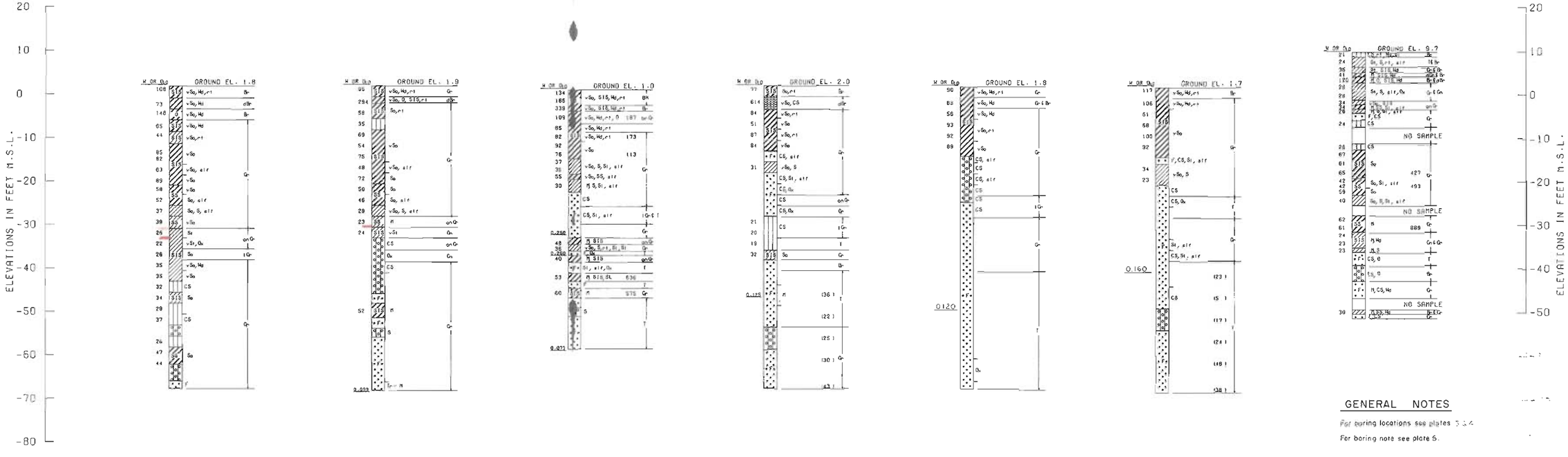
BOR. 3-ULN
STA. 580+00
137 FT. P.S. OF B/L
5-6 MAR 70

BOR. 6-N
STA. 603+86
197 FT. P.S. OF B/L
20 MAY 71

BOR. 7-N
STA. 625+00
150 FT. P.S. OF B/L
18 MAY 71

BOR. 8-N
STA. 644+00
217 FT. P.S. OF B/L
17 MAY 71

BOR. 9-USP
STA. 663+50
ON C/L LEVEE
28-29 SEPT 70



GENERAL NOTES

For boring locations see plates 3 & 4

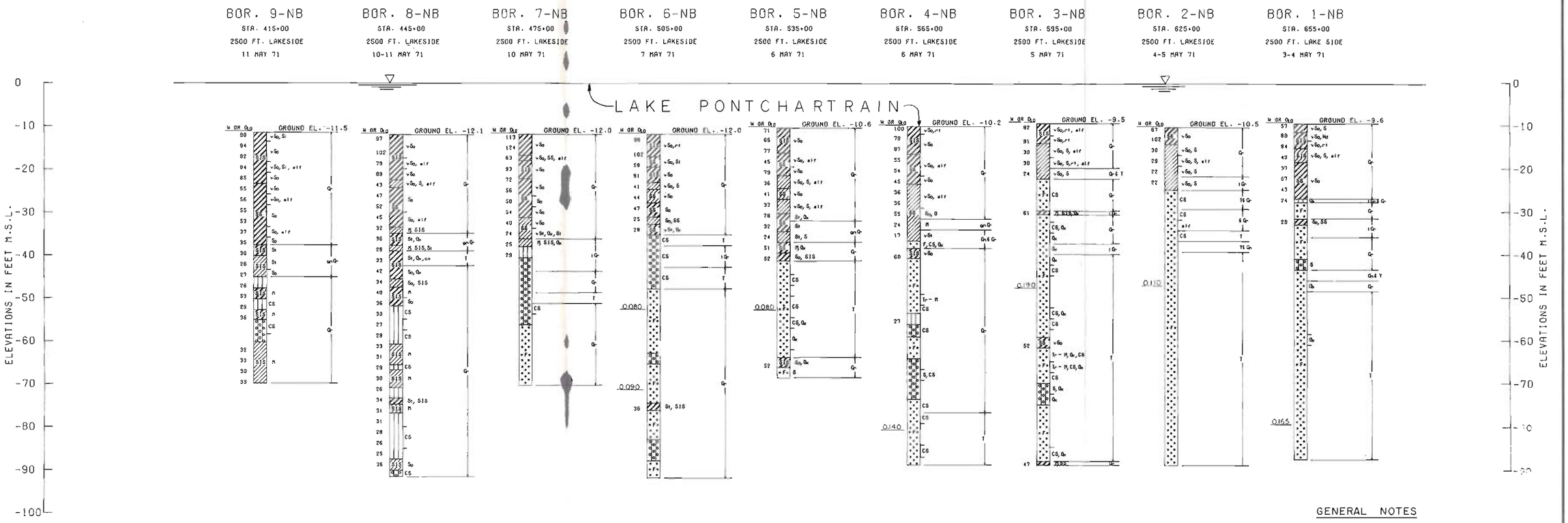
For boring note see plate 5.

LAKE PONTCHARTRAIN, LA AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO 2-GENERAL DESIGN
SUPPLEMENT NO 5B
NEW ORLEANS EAST LAKEFRONT LEVEE
PARIS ROAD TO SOUTH POINT

GENERAL TYPE BORINGS
ALONG LEVEE ALINEMENT

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
JUNE 1972 FILE NO H-2-25975

PLATE 7



GENERAL NOTES

For boring locations see plates 3 & 4
For boring note see plate 6

LAKE PONTCHARTRAIN, LA AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2-GENERAL DESIGN
SUPPLEMENT NO.58
NEW ORLEANS EAST LAKEFRONT LEVEE
PARIS ROAD TO SOUTH POINT

GENERAL TYPE BORINGS 2500
LAKESIDE OF LEVEE ALINEMENT

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
JUNE 1972
FILE NO. H-2-25975

PLATE 8

BOR. 10-NB
STA. 584+00
2650 FT. LAKESIDE
3 SEPT. 71

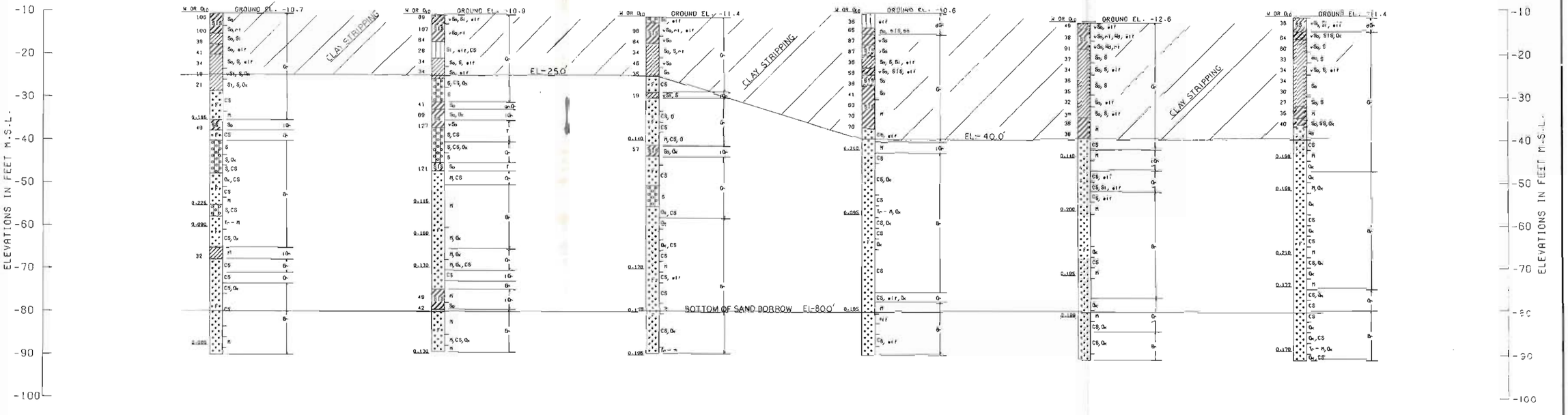
BOR. 11-NB
STA. 591+00
2950 FT. LAKESIDE
9 SEPT 71

BOR. 12-NB
STA. 596+00
3500 FT. LAKESIDE
7 SEPT. 71

BOR. 13-NB
STA. 601+00
3500 FT. LAKESIDE
10 SEPT. 1971

BOR. 14-NB
STA. 604+00
4200 FT. LAKESIDE
13 SEPT 71

BOR. 15-NB
STA. 610+00
4300 FT. LAKESIDE
14 SEPT. 71



GENERAL NOTES

For boring locations see plate 5
For boring note see plate 6
For clay stripping stockpile see plate 5

LAKE PONTCHARTRAIN, LA AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO 2-GENERAL DESIGN
SUPPLEMENT NO.5B
NEW ORLEANS EAST LAKEFRONT LEVEE
PARIS ROAD TO SOUTH POINT
BORROW BORINGS IN
LAKE PONTCHARTRAIN

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
JUNE 1972

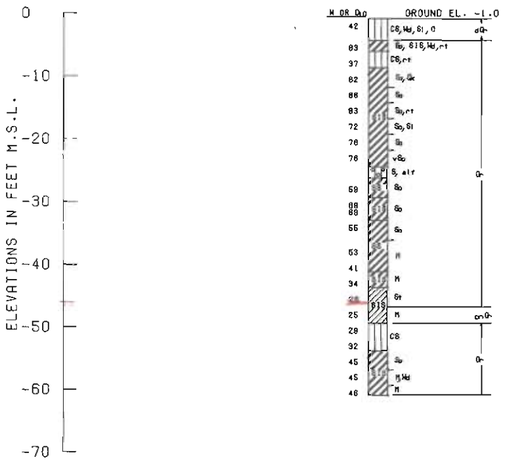
PLATE 9

BOR. 6-L

STA. 380+00

200 FT. LAKESIDE

15 SEPT 71

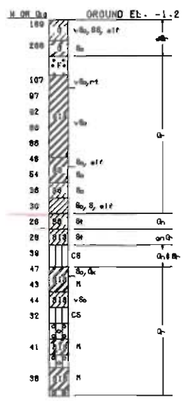


BOR. 7-L

STA. 480+00

200 FT. LAKESIDE OF B/L

23 DEC 69

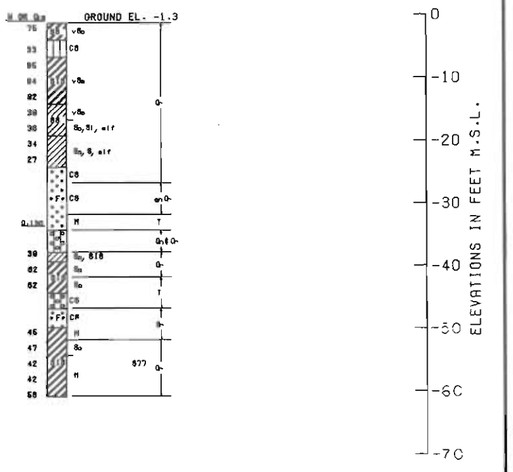


BOR. 8-L

STA. 580+00

500 FT. LAKESIDE OF B/L

22 DEC 69



GENERAL NOTES

For boring locations see plates 2, 3, 4

For boring note see plate 6

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2-GENERAL DESIGN
SUPPLEMENT NO.5B
NEW ORLEANS EAST LAKEFRONT LEVEE
PARIS ROAD TO SOUTH POINT

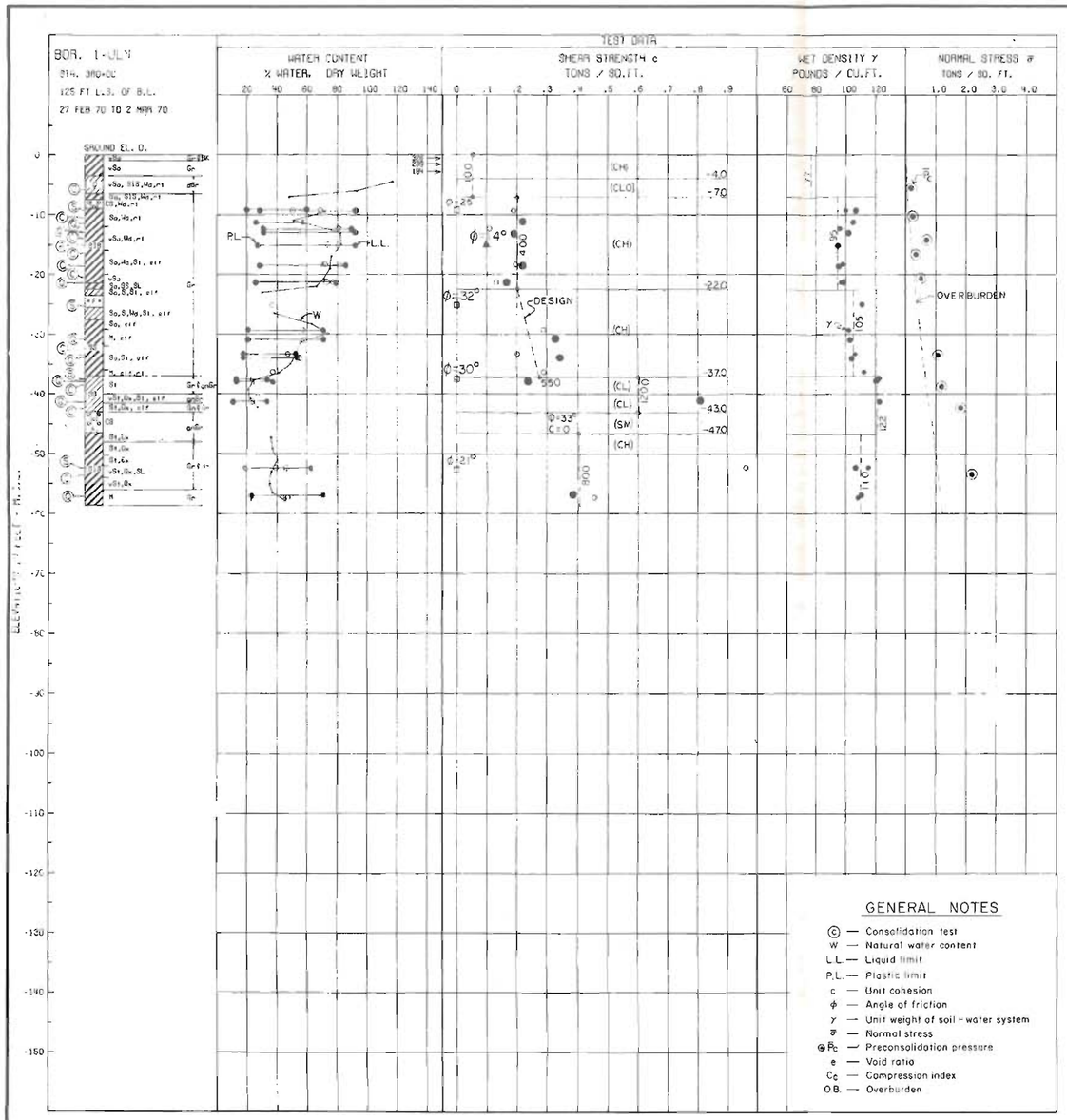
GENERAL TYPE BORINGS
LAKESIDE OF LEVEE ALINEMENT

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

JUNE 1972

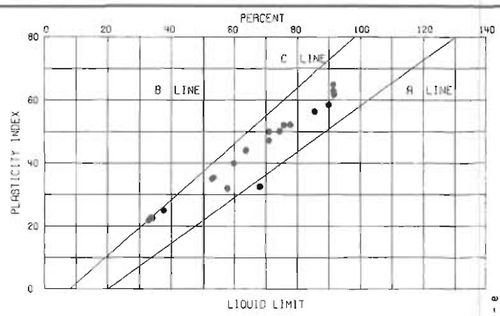
FILE NO. H-2-25975

PLATE 10

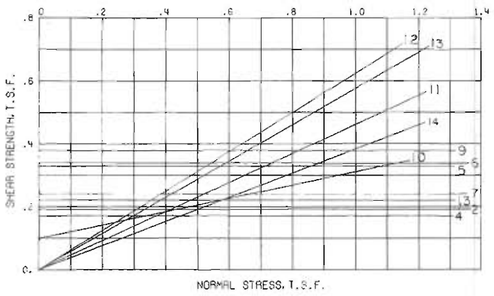


GENERAL NOTES

- (C) — Consolidation test
- W — Natural water content
- L.L. — Liquid limit
- P.L. — Plastic limit
- c — Unit cohesion
- ϕ — Angle of friction
- γ — Unit weight of soil - water system
- $\bar{\sigma}$ — Normal stress
- $\bar{P}_c$ — Preconsolidation pressure
- e — Void ratio
- C_c — Compression index
- O.B. — Overburden



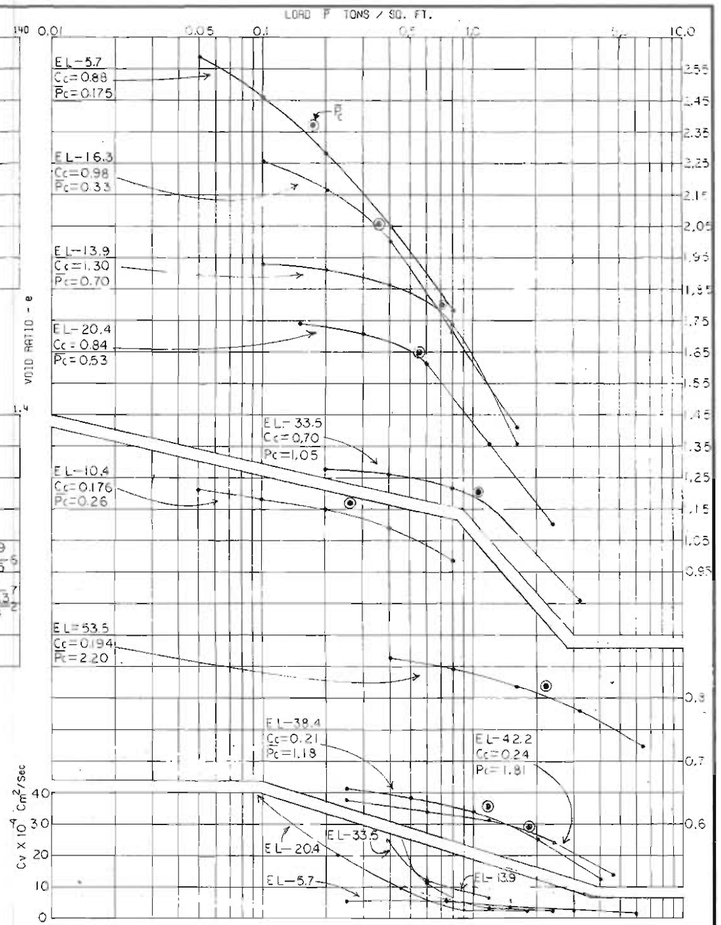
PLASTICITY CHART



SHEAR STRENGTH DATA

BORING NO.	ENVELOPE NO.	ENVELOPE EL.	TYPE	STRENGTH Φ	STRENGTH c - TSF	CLASS
I-ULN	1	-11.3	Q	0	0.22	CH
	2	-13.0		0	0.19	CH
	3	-18.5		0	0.22	CH
	4	-21.3		0	0.17	CH
	5	-30.8		0	0.33	CH
	6	-33.9		0	0.34	CH
	7	-37.9		0	0.24	CL
	8	-41.3		9.3	0.81	CL
	9	-57.0		0	0.38	CH
	10	-15.0	R	14	0.10	CH
	11	-9.2	S	25	0	CH
	12	-25.1		32	0	SP
	13	-37.5		30	0	CL
	14	-52.3		21	0	CH

NOTE: THE ABOVE DESIGN SHEAR STRENGTHS AND STRATIFICATION APPLY TO THE REACH BETWEEN STA. 331+00 AND STA 430+00.



CONSOLIDATION DATA

NOTES

- ○ - (UC) UNCONFINED COMPRESSION TEST
- ● - (U) 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 BORING SEE PLATE 2

FOR DETAIL SHEAR STRENGTH DATA SEE PLATE 17

LAKE PONTCHARTRAIN, LA AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2-GENERAL DESIGN
SUPPLEMENT NO. 5B

NEW ORLEANS EAST LAKEFRONT LEVEE
PARIS ROAD TO SOUTH POINT

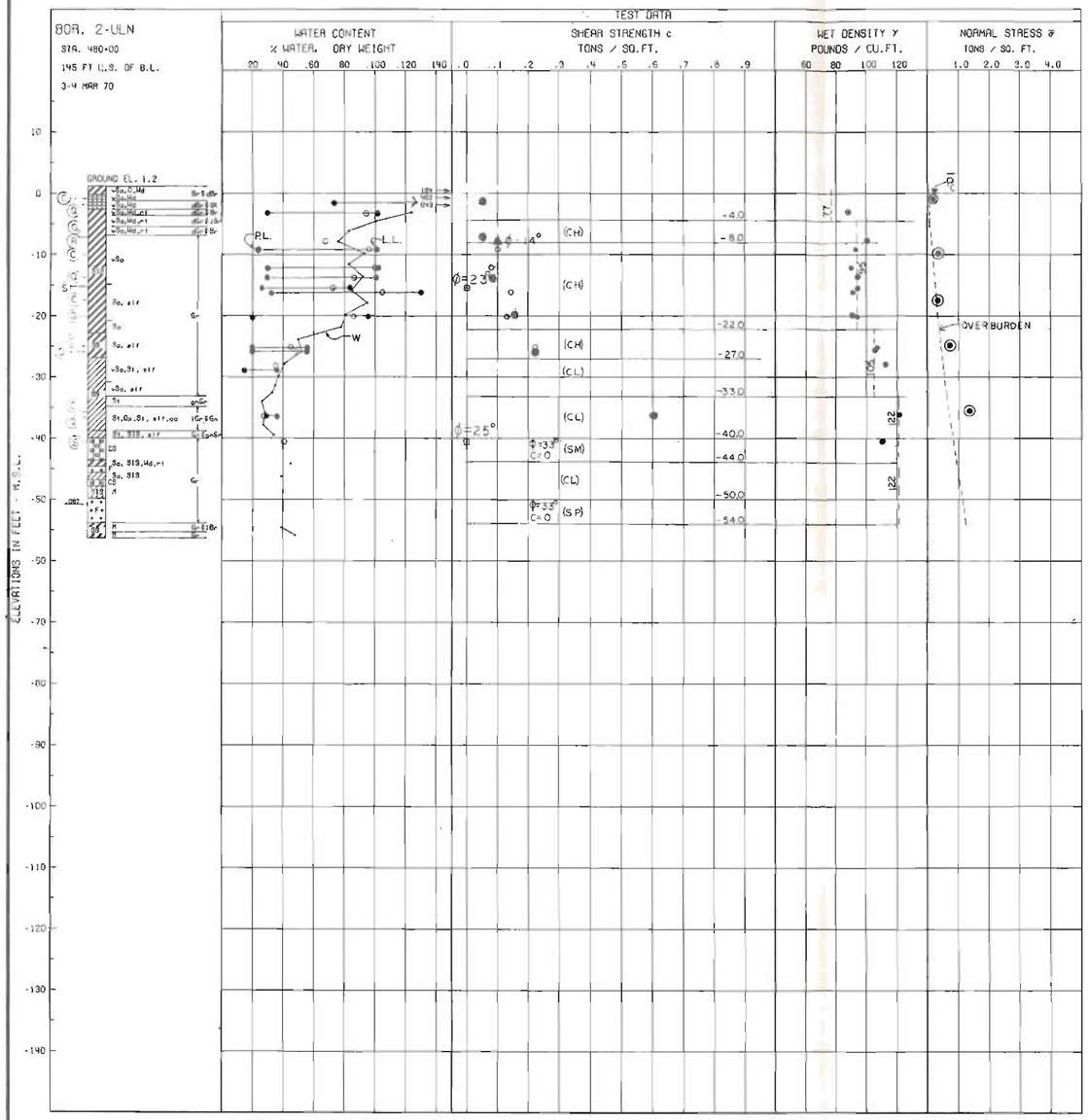
UNDISTURBED BORING I-ULN DATA

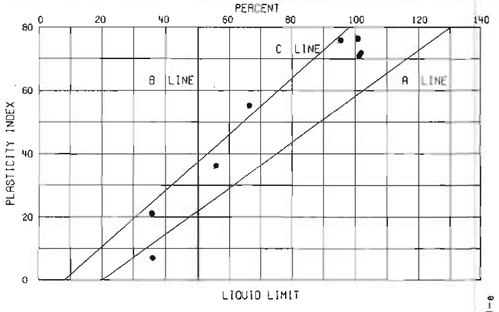
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

JUNE 1972

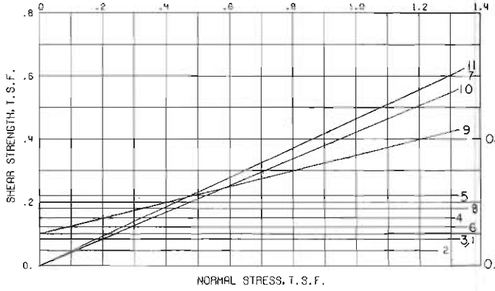
FILE NO. H-2-25975

PLATE 11





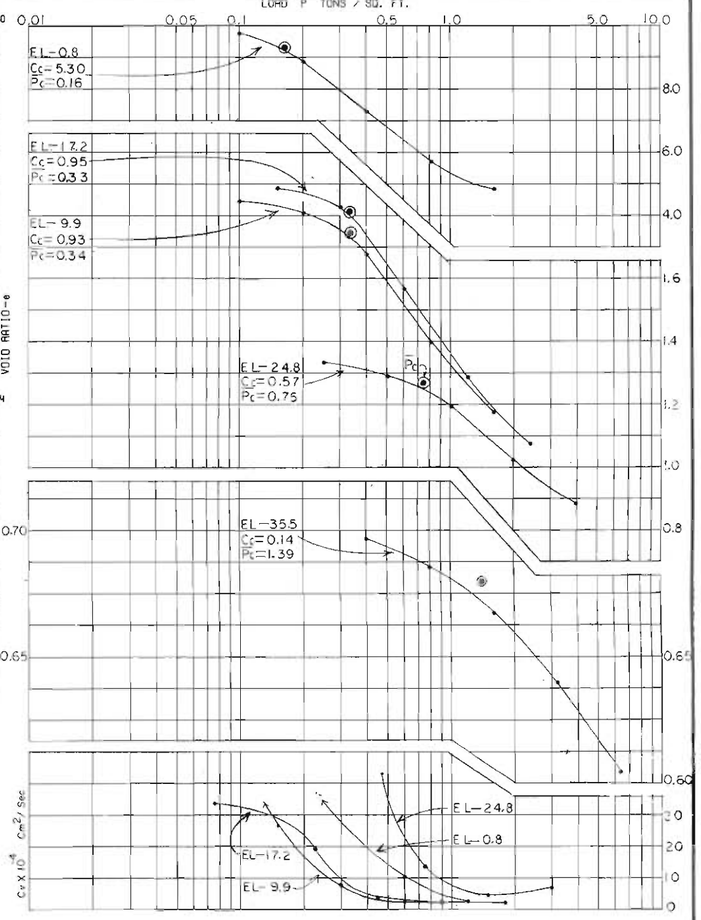
PLASTICITY CHART



SHEAR STRENGTH DATA

BORING NO.	ENVELOPE NO.	ENVELOPE EL.	TYPE	STRENGTH Φ	STRENGTH C - TSF	CLASS
2-ULN	1	-1.8	Q	0	0.05	PT
	2	-7.0		0	0.05	CH
	3	-13.6		0	0.08	CH
	4	-20.0		0	0.15	CH
	5	-25.8		0	0.22	CH
	6	-36.4		0	0.60	CL
	7	-7.9	R	14	0.10	CH
	8	-15.2	S	23	0	CH
	9	-40.7		25	0	CH

NOTE: SEE PLATE 14 FOR DESIGN SHEAR STRENGTHS.



CONSOLIDATION DATA

NOTES

- ○ - (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 BORING SEE PLATE 3

FOR GENERAL NOTES SEE PLATE 11

FOR DETAIL SHEAR STRENGTH DATA SEE PLATE 18

LAKE PONTCHARTRAIN, LA AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2-GENERAL DESIGN
SUPPLEMENT NO. 5B
NEW ORLEANS EAST LAKEFRONT LEVEE
PARIS ROAD TO SOUTH POINT

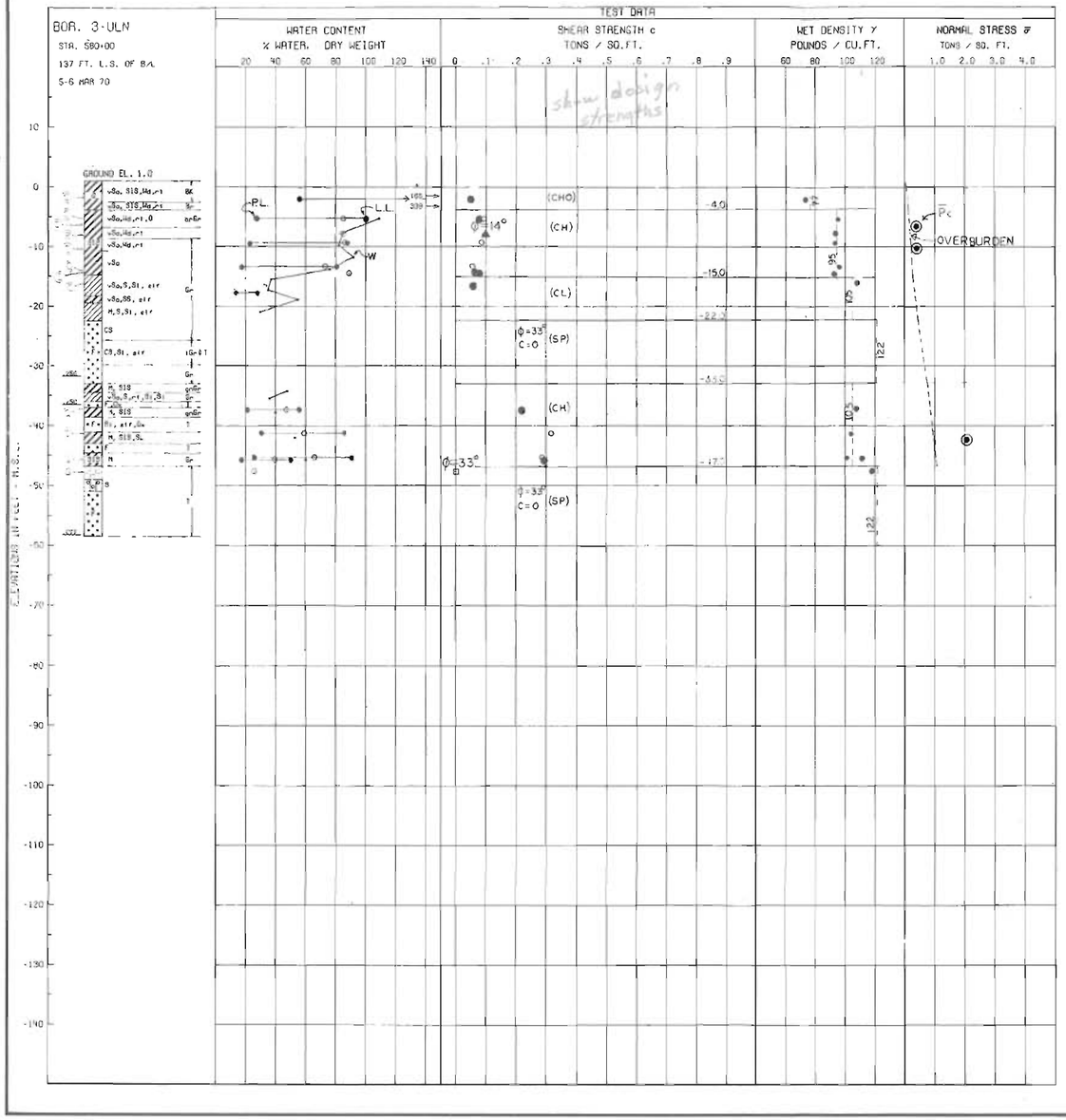
UNDISTURBED BORING 2-ULN DATA

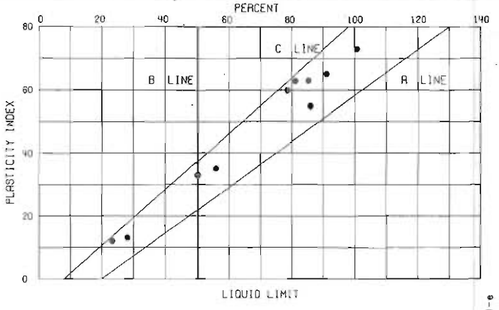
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

JUNE 1972

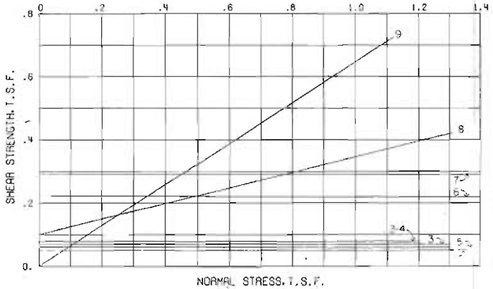
FILE NO. H-2-25975

PLATE 12





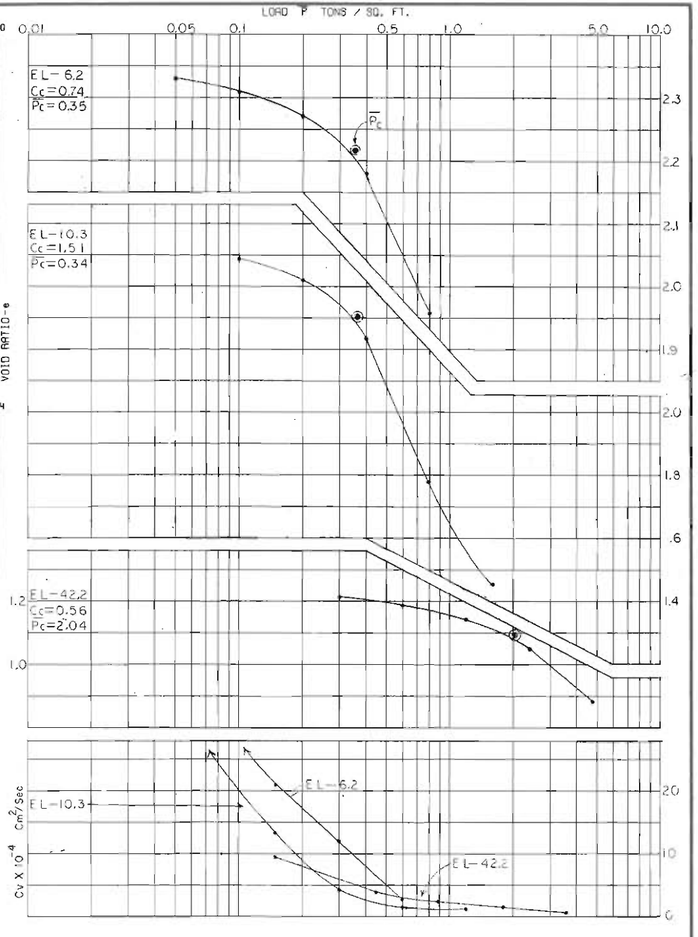
PLASTICITY CHART



SHEAR STRENGTH DATA

BORING NO.	ENVELOPE NO.	ENVELOPE EL.	TYPE	STRENGTH Φ°	STRENGTH C - TSF	CLASS
3-ULN	1	-1.7	Q	0	0.05	CH
	2	-5.1		0	0.08	CH
	3	-14.0		0	0.07	CH
	4	-14.3		0	0.08	CH
	5	-16.2		0	0.06	CL
	6	-37.1		0	0.22	CH
	7	-45.6		0	0.29	CH
	8	-8.0	R	14	0.10	CH
	9	-47.0	S	33	0.00	SM

NOTE: SEE PLATE 14 FOR DESIGN SHEAR STRENGTHS.



CONSOLIDATION DATA

NOTES

○ - (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 BORING SEE PLATE 4
FOR GENERAL NOTES SEE PLATE 11
FOR DETAIL SHEAR STRENGTH DATA SEE PLATE 19

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO 2-GENERAL DESIGN
SUPPLEMENT NO 5B
NEW ORLEANS EAST LAKEFRONT LEVEE
PARIS ROAD TO SOUTH POINT

UNDISTURBED BORING 3-ULN DATA

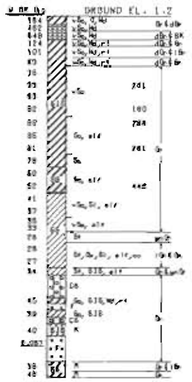
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
JUNE 1972
FILE NO. H-2-25975

BOR. 2-ULN

STA. 480+00

145 FT. (+) S. OF B.L.

3-4 MAR 70

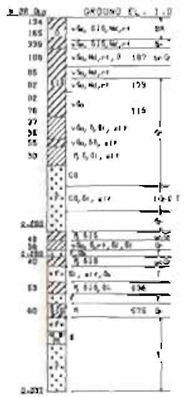


BOR. 3-ULN

STA. 580+00

137 FT. (+) S. OF B/L

5-6 MAR 70

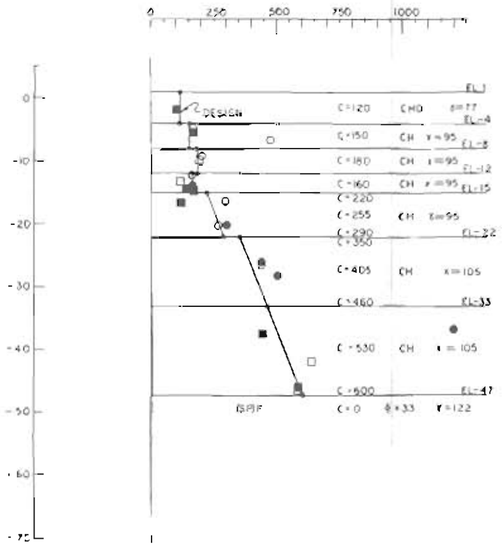


COMPOSITE

BORINGS 2 & 3 - ULN

(Q) SHEAR STRENGTH (C)

POUNDS / SQ. FT.



GENERAL NOTES

● Q'S
○ UCT
BORING 2 - ULN

■ Q'S
□ UCT
BORING 3 - ULN

Q - UNCONSOLIDATED UNDRAINED TEST

UCT - UNCONFINED COMPRESSION TEST

For boring locations see plates 3&4

For boring note see plate 6.

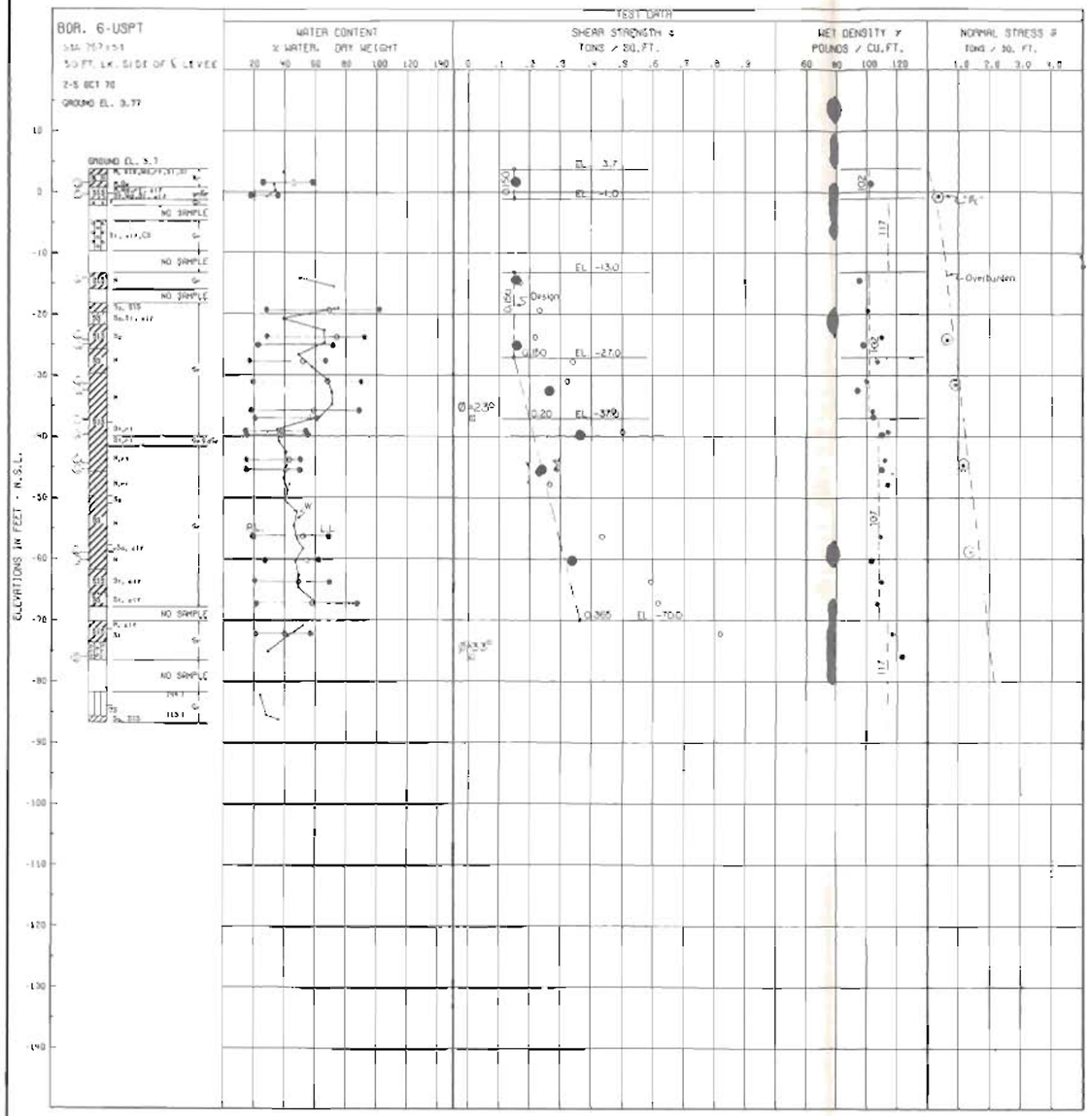
NOTE: THE ABOVE DESIGN SHEAR STRENGTHS AND STRATIFICATION APPLY TO THE REACH BETWEEN STA 430+00 AND STA 661+60.

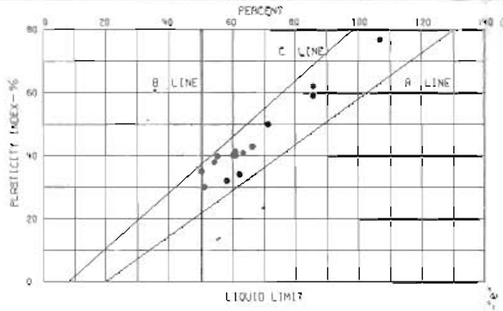
LAKE PONTCHARTRAIN, LA AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO 2-GENERAL DESIGN
SUPPLEMENT NO 58
NEW ORLEANS EAST LAKEFRONT LEVEE
PARIS ROAD TO SOUTH POINT

UNDISTURBED BORINGS 2 & 3-ULN COMBINED DATA

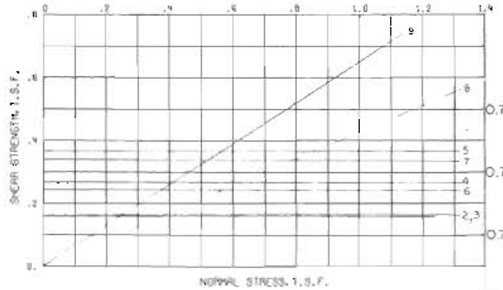
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

JUNE 1972 FILE NO H-2-25975





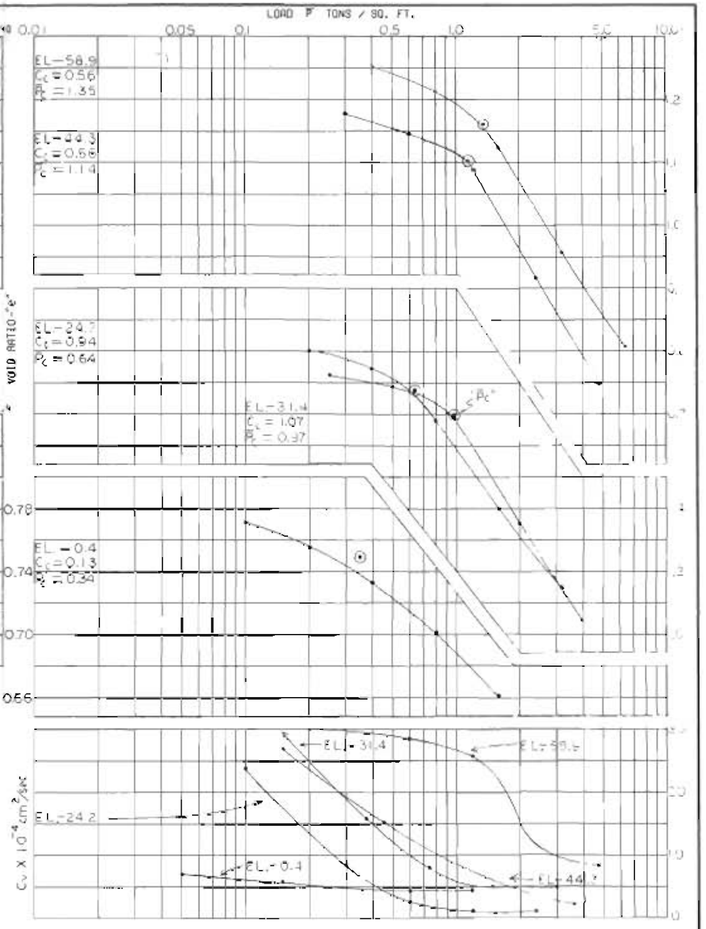
PLASTICITY CHART



SHEAR STRENGTH DATA

BORING NO.	ENVELOPE NO.	ENVELOPE EL.	TYPE	STRENGTH Φ°	STRENGTH C - TSF	CLASS
6-USPT	1	17		0	.155	CH
	2	-14.0		0	.160	CH
	3	-25.1		0	.160	CH
	4	-32.3	Q	0	.265	CH
	5	-39.7		0	.365	CH
	6	-45.2		0	.240	CH
	7	-60.3		0	.335	CH
	8	-36.9	S	23	0	CH
	9	-76.0	S	33	0	SM

NOTE THE ABOVE DESIGN SHEAR STRENGTHS AND STRATIFICATION APPLY TO THE REACH BETWEEN STA 661+60 AND STA 666+00.



CONSOLIDATION DATA

NOTES

- ○ - (UC) UNCONFINED COMPRESSION TEST
- ● - (U) 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

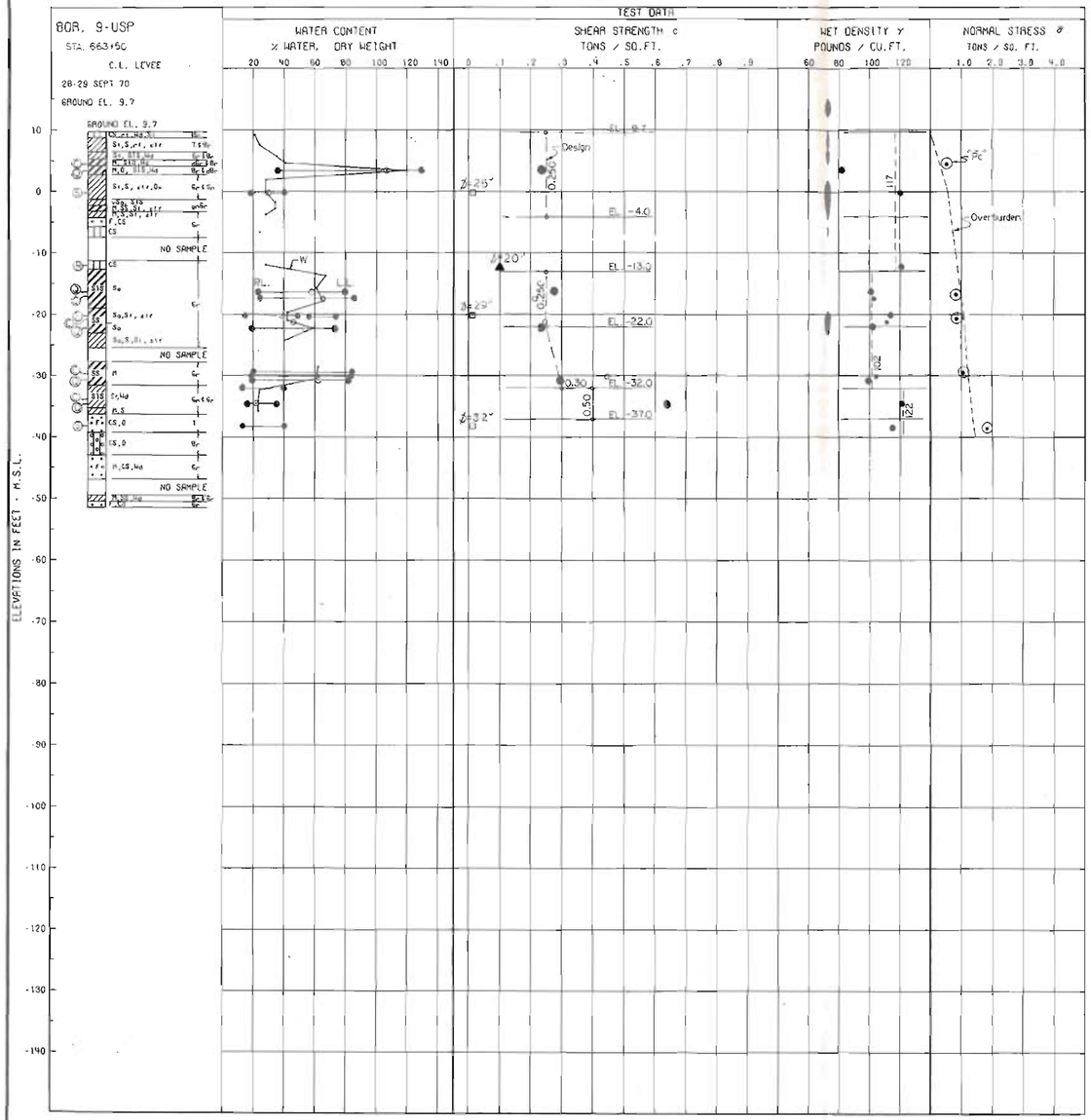
FOR SOIL BORING LEGEND SEE PLATE R
FOR LOCATION OF BORING SEE PLATE I
FOR GENERAL NOTES SEE PLATE II
FOR DETAIL SHEAR STRENGTH DATA SEE PLATE 20

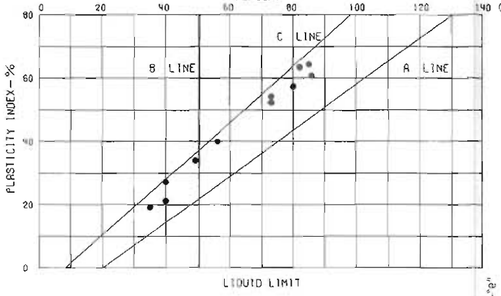
LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 58
NEW ORLEANS EAST LAKEFRONT LEVEE
PARIS ROAD TO SOUTH POINT

UNDISTURBED BORING 6-USPT DATA

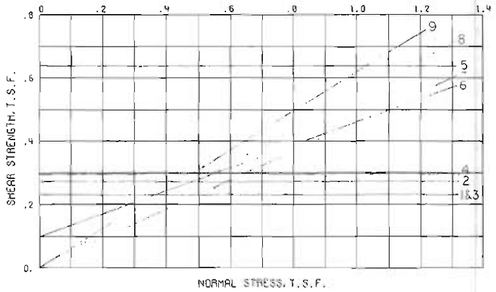
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
JUNE 1972
FILE NO. H-2-25975

PLATE 15





PLASTICITY CHART

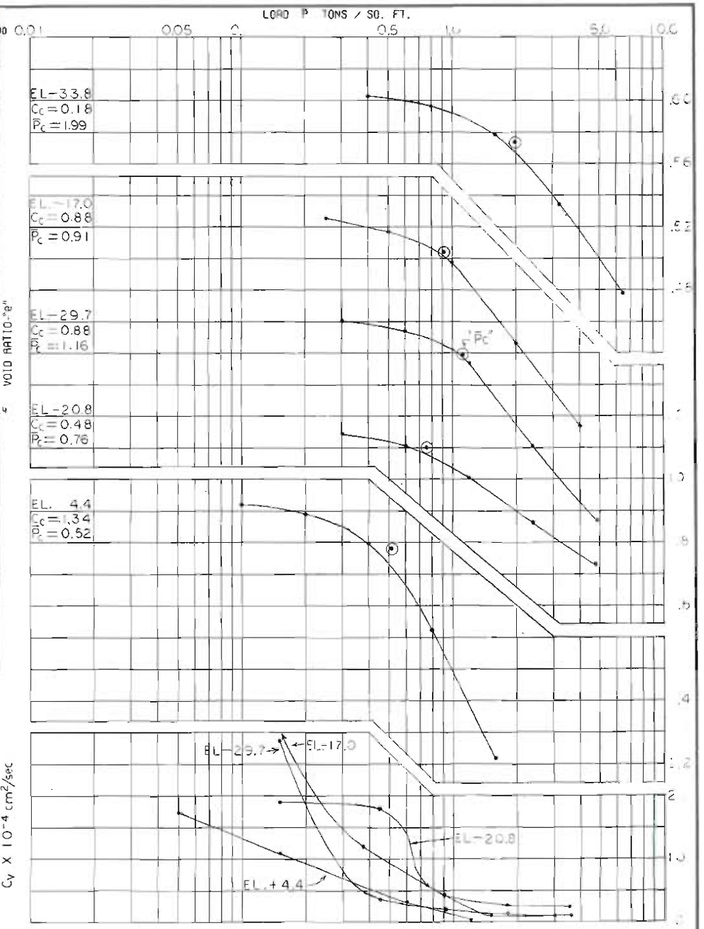


SHEAR STRENGTH DATA

BORING NO.	ENVELOPE NO.	ENVELOPE EL.	TYPE	STRENGTH Φ°	STRENGTH C - TSF	CLASS
9-USP	1	3.5		0	.235	CH
	2	-16.3		0	.275	CH
	3	-22.2	Q	0	.235	CH
	4	-30.8		0	.295	CH
	5	-34.7		0	.640	CL
	*6	-12.4	R	20	.10	ML
	7	-0.5		25	0	CL
	8	-20.1	S	29	0	CH
	9	-36.3		32	0	SP

*BASED ON $(\sigma_1 - \sigma_3)$ AT MAXIMUM PORE PRESSURE

NOTE: THE ABOVE DESIGN SHEAR STRENGTHS AND STRATIFICATION APPLY TO THE REACH BETWEEN STA 661+60 AND STA 666+00.



C_v X 10^{-4} cm^2/sec

CONSOLIDATION DATA

NOTES

- ○ - (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 4

FOR GENERAL NOTES SEE PLATE 11

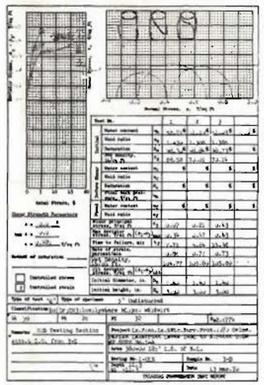
FOR DETAIL SHEAR STRENGTH DATA SEE PLATE 21

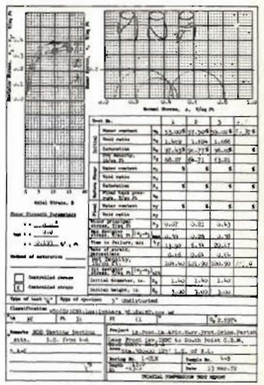
LAKE PONTCHARTRAIN, LA AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2-GENERAL DESIGN
SUPPLEMENT NO. 58
NEW ORLEANS EAST LAKEFRONT LEVEE
PARIS ROAD TO SOUTH POINT

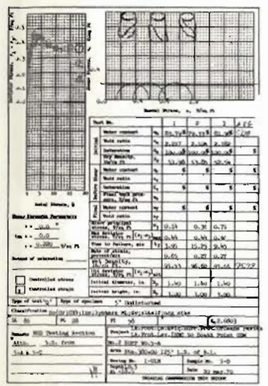
UNDISTURBED BORING 9-USP DATA

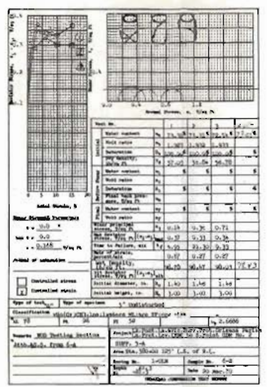
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

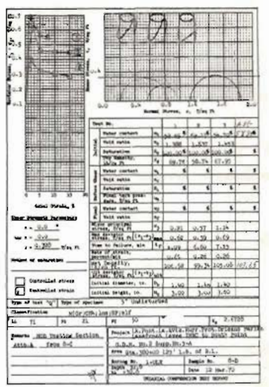
JUNE 1972 FILE NO. H-2-25975

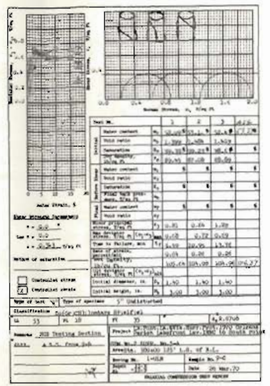


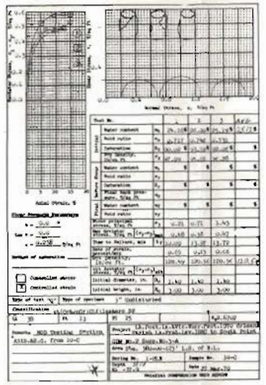


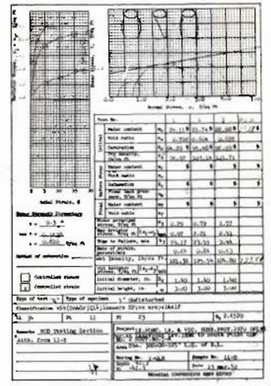


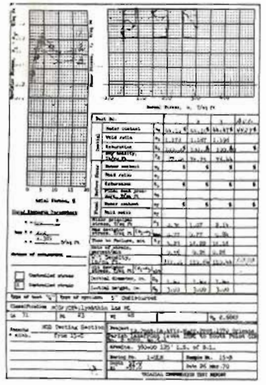


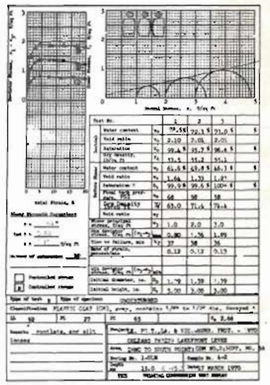


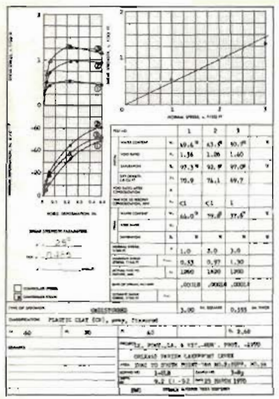


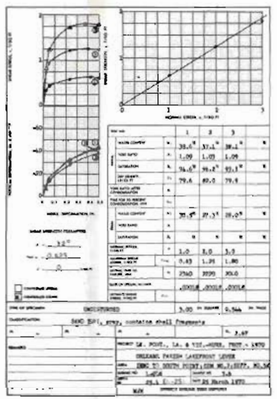


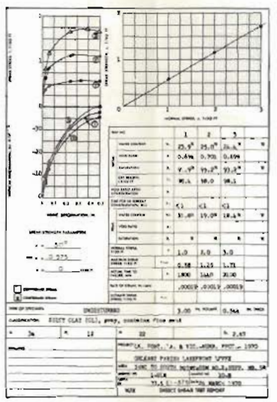


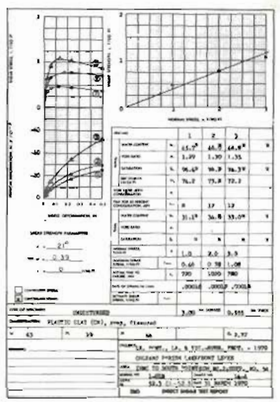












GENERAL NOTES:

(Q) UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TEST.

(R) CONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TEST.

(S) CONSOLIDATED-DRAINED DIRECT SHEAR TEST.

LAKE PONTCHARTRAIN, LA AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO 2-GENERAL DESIGN
SUPPLEMENT NO 5B
NEW ORLEANS EAST LAKEFRONT LEVEE
PARIS ROAD TO SOUTH POINT

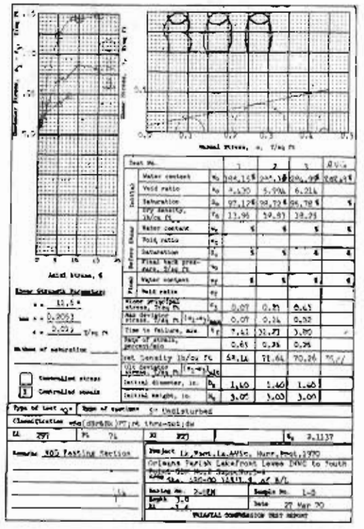
DETAIL SHEAR STRENGTH DATA
BORING 1-ULN

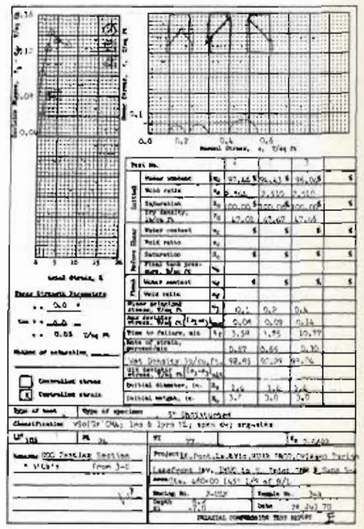
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

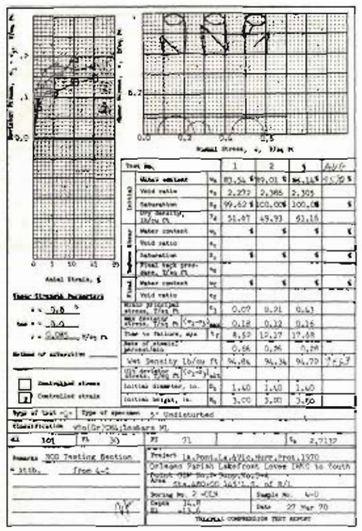
JUNE 1972

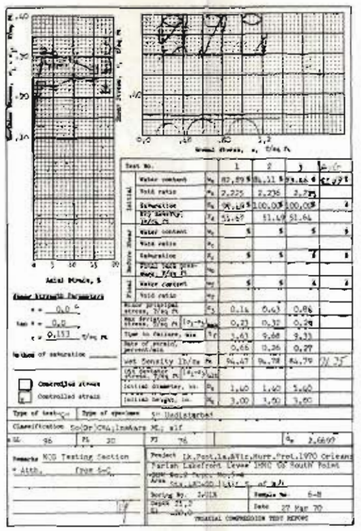
FILE NO B-2-25975

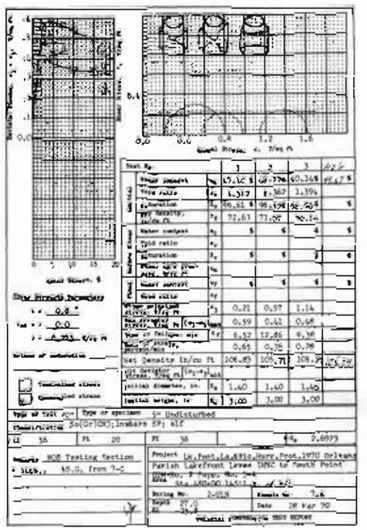
PLATE 17

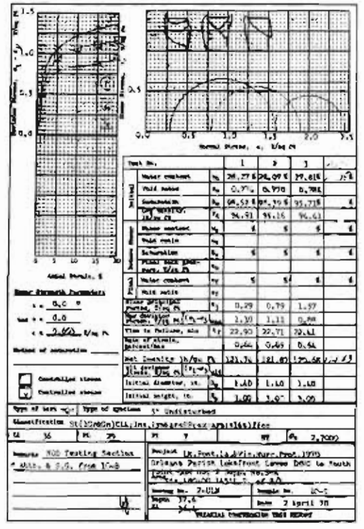


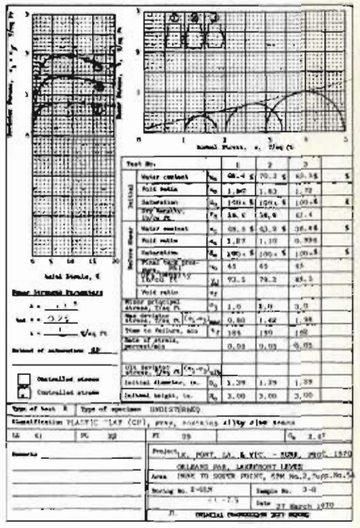


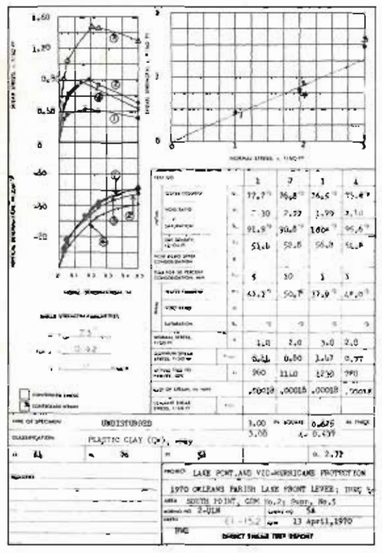


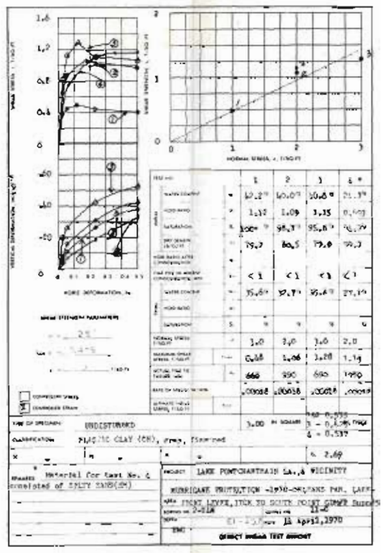












SEE PLATE 17 FOR GENERAL NOTES.

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO 2-GENERAL DESIGN
SUPPLEMENT NO.5B
NEW ORLEANS EAST LAKEFRONT LEVEE
PARIS ROAD TO SOUTH POINT

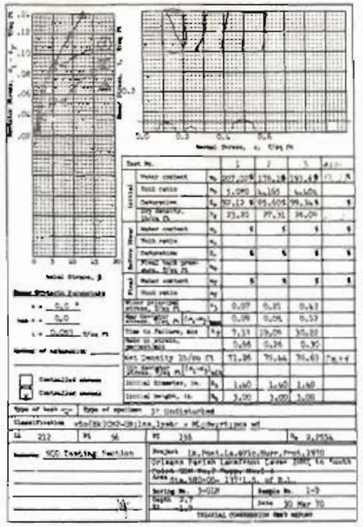
DETAIL SHEAR STRENGTH DATA
BORING 2-ULN

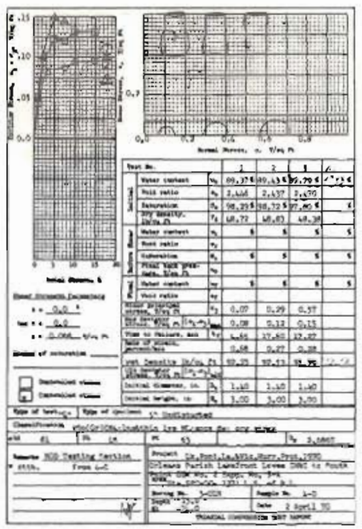
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

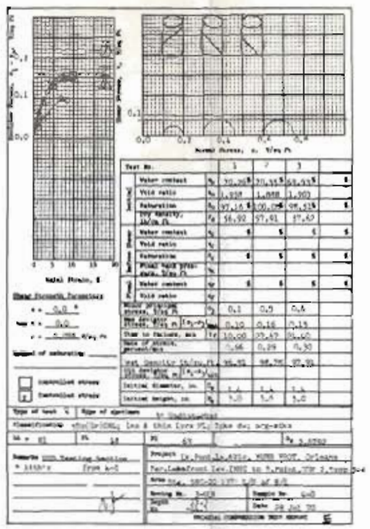
JUNE 1972

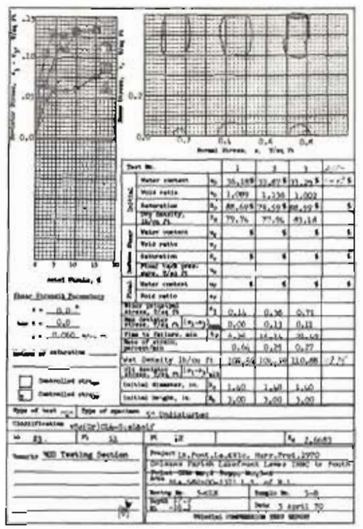
FILE NO. H-2-25975

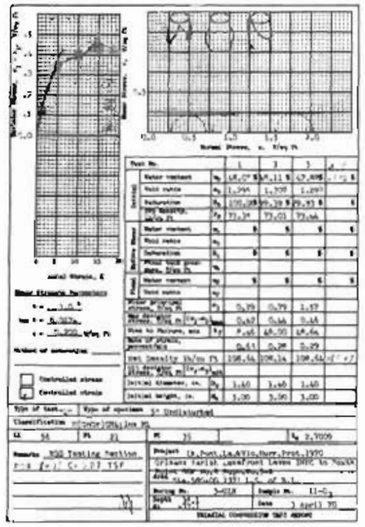
PLATE 18

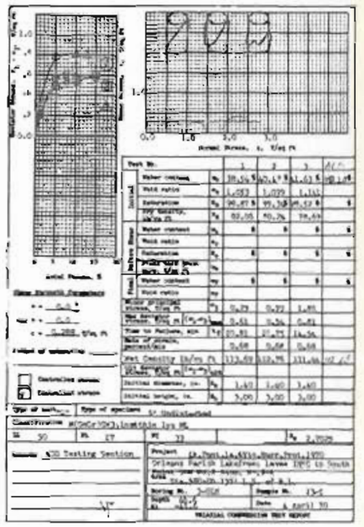


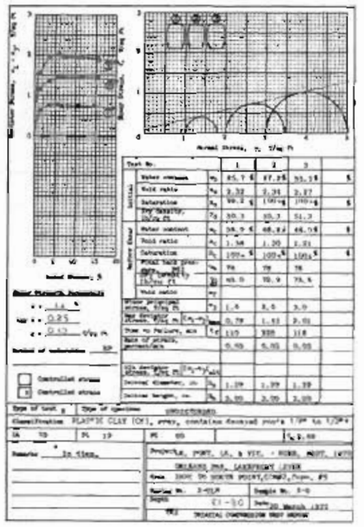


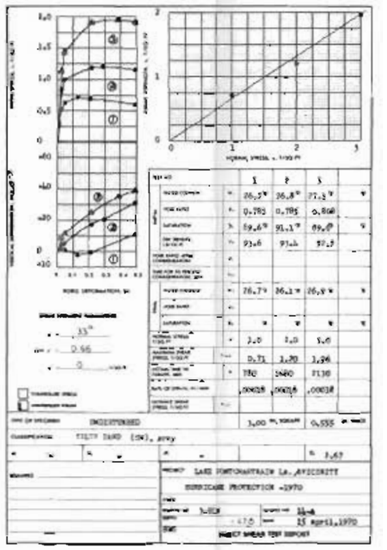












SEE PLATE 17 FOR GENERAL NOTES.

LAKE PONTCHARTRAIN, LA AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO 3-GENERAL DESIGN
SUPPLEMENT NO 5B
NEW ORLEANS EAST LAKEFRONT LEVEE
PARIS ROAD TO SOUTH POINT

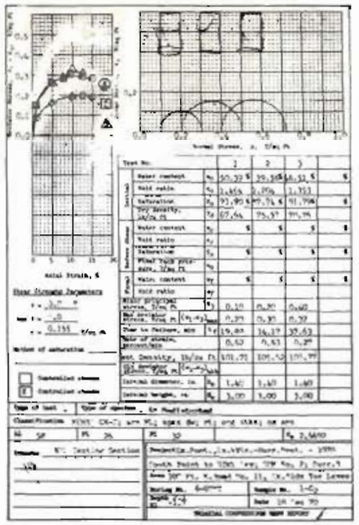
DETAIL SHEAR STRENGTH DATA
BORING 3 - ULN

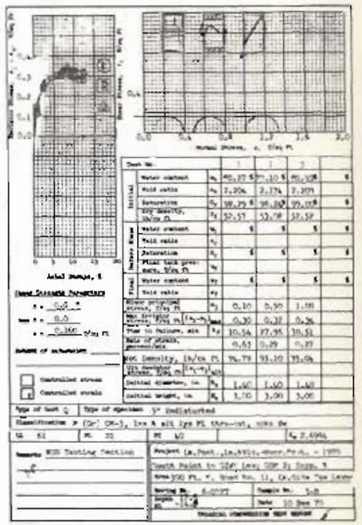
U S ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

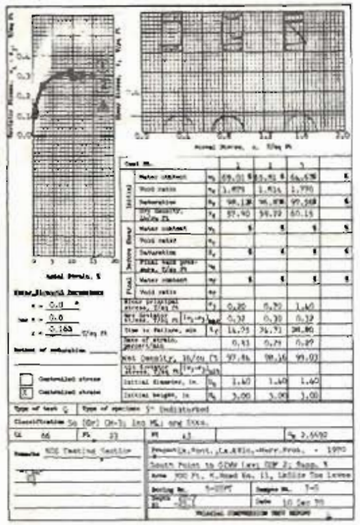
JUNE 1972

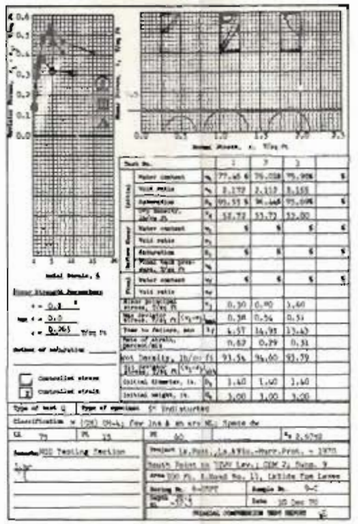
FILE NO H-2-25976

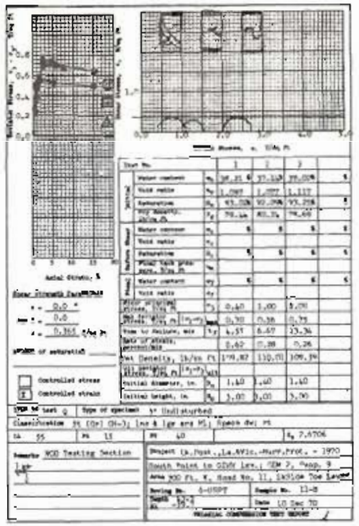
PLATE 19

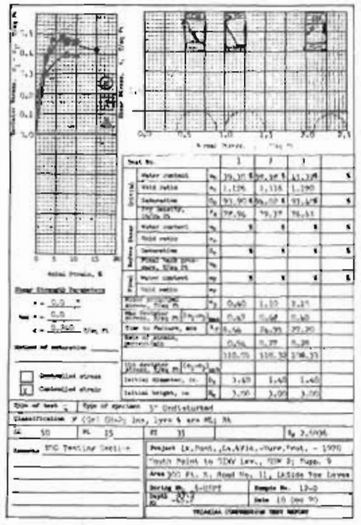


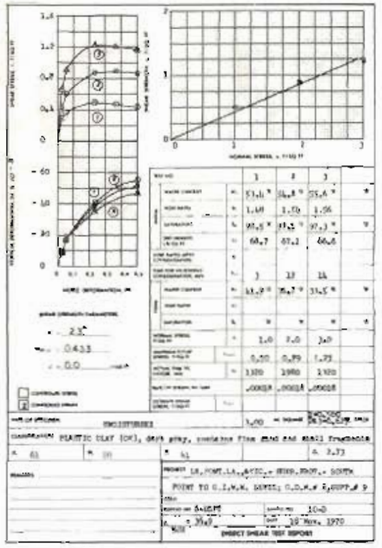


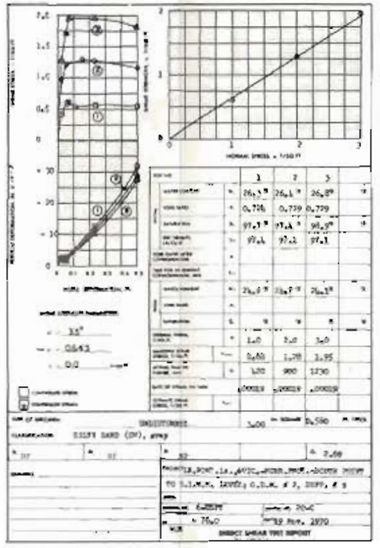












SEE PLATE 17 FOR GENERAL NOTES.

LAKE PONTCHARTRAIN, LA AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO 2-GENERAL DESIGN
SUPPLEMENT NO 5B
NEW ORLEANS EAST LAKEFRONT LEVEE
PARIS ROAD TO SOUTH POINT

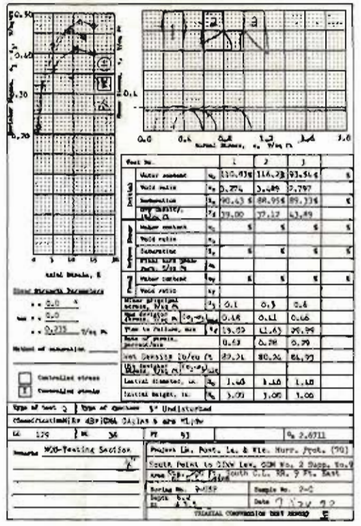
DETAIL SHEAR STRENGTH DATA
BORING 6 -USPT

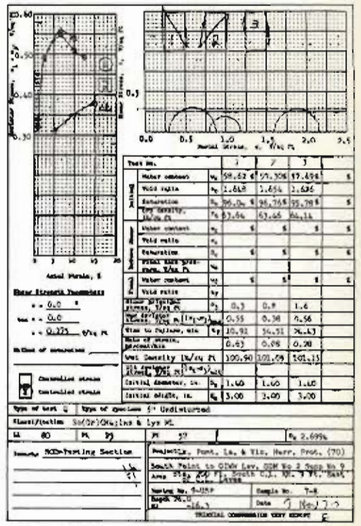
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

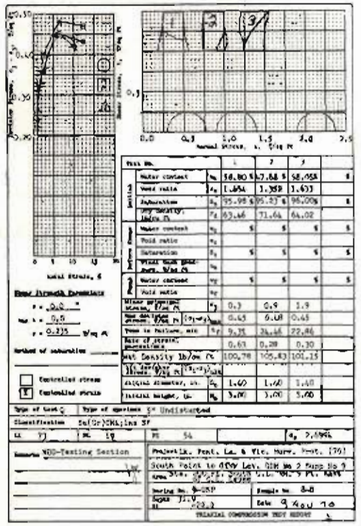
JUNE 1972

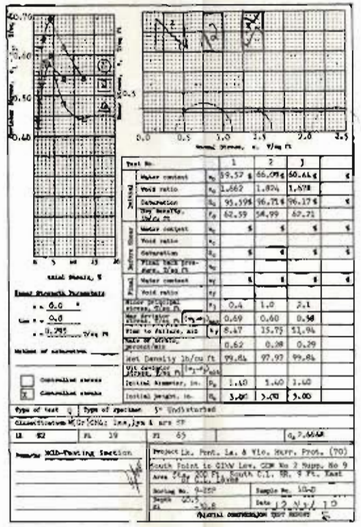
FILE NO H-2-25975

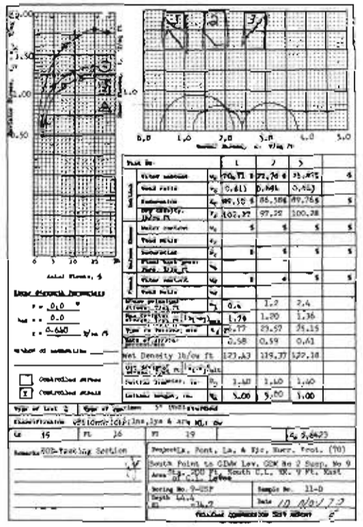
PLATE 20

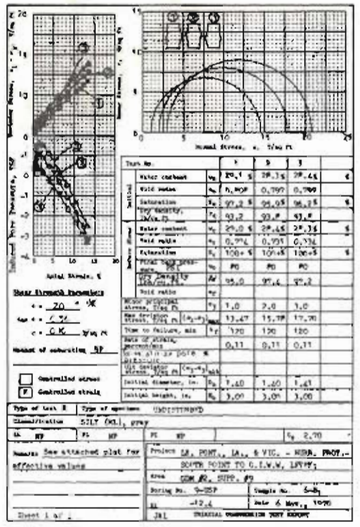


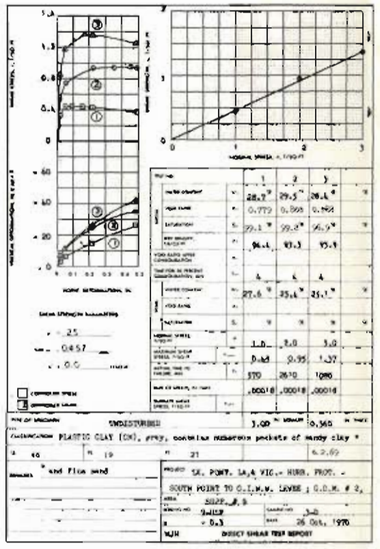


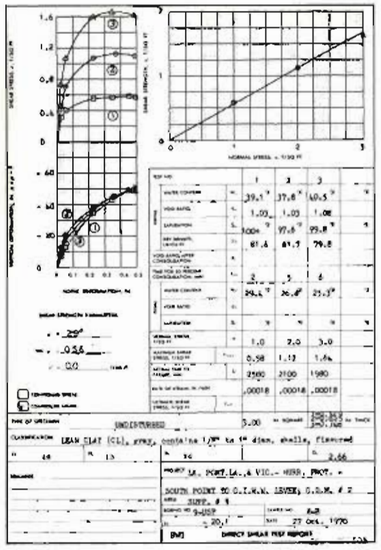


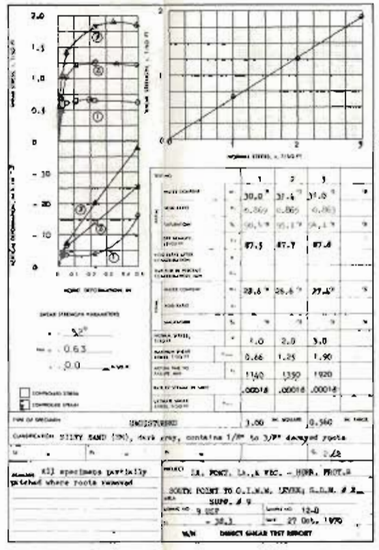












SEE PLATE 17 FOR GENERAL NOTES.

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2-GENERAL DESIGN
SUPPLEMENT NO. 5B
NEW ORLEANS EAST LAKEFRONT LEVEE
PARIS ROAD TO SOUTH POINT

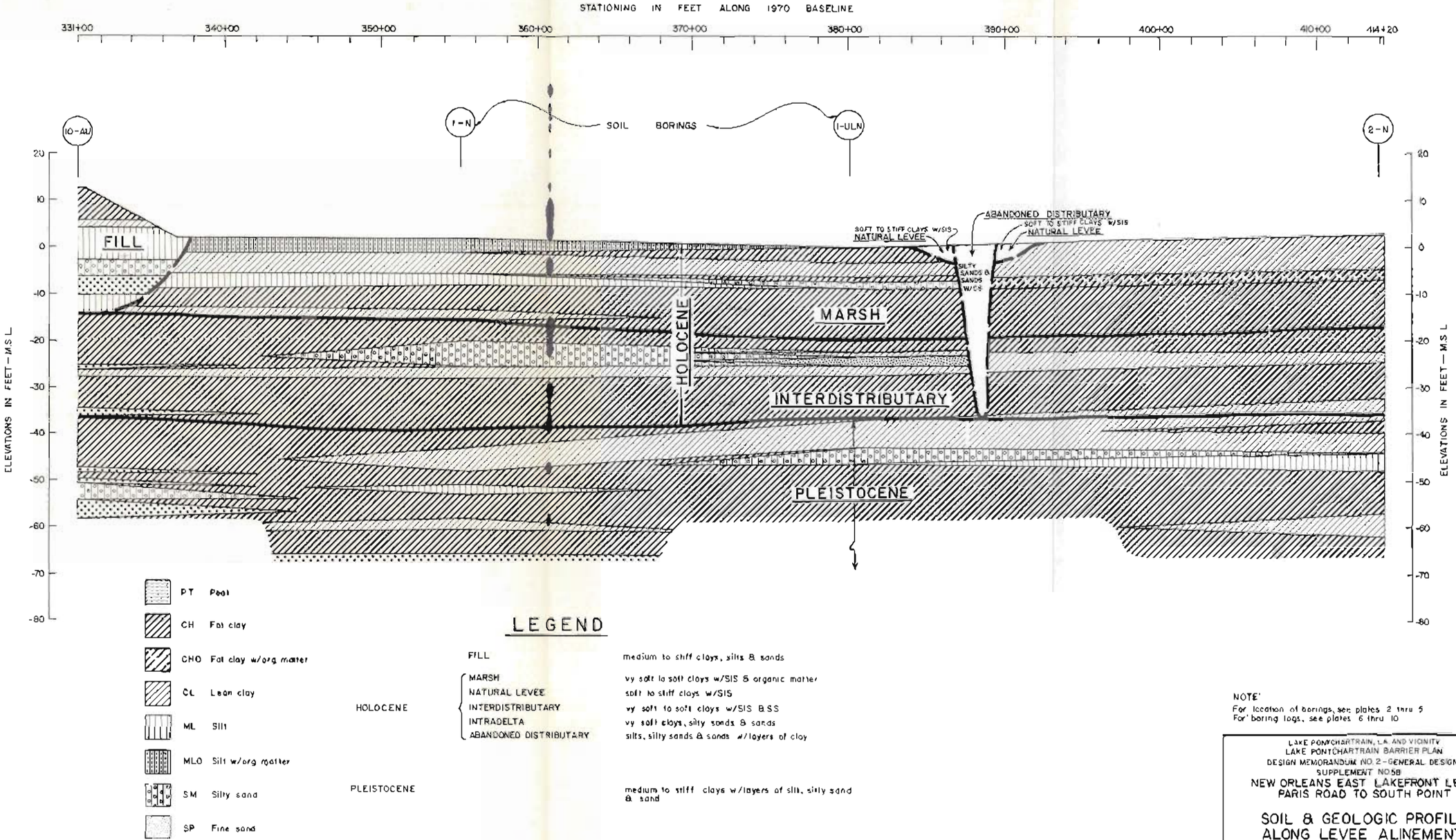
DETAIL SHEAR STRENGTH DATA
BORING 9-USP

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

JUNE 1972

FILE NO. H-2-25975

PLATE 21



LEGEND

FILL		medium to stiff clays, silts & sands
HOLOCENE	MARSH	vy soft to soft clays w/SIS & organic matter
	NATURAL LEVEE	soft to stiff clays w/SIS
	INTERDISTRIBUTARY	vy soft to soft clays w/SIS & SS
	INTRADELTA	vy soft clays, silty sands & sands
	ABANDONED DISTRIBUTARY	silts, silty sands & sands w/layers of clay
PLEISTOCENE		medium to stiff clays w/layers of silt, silty sand & sand

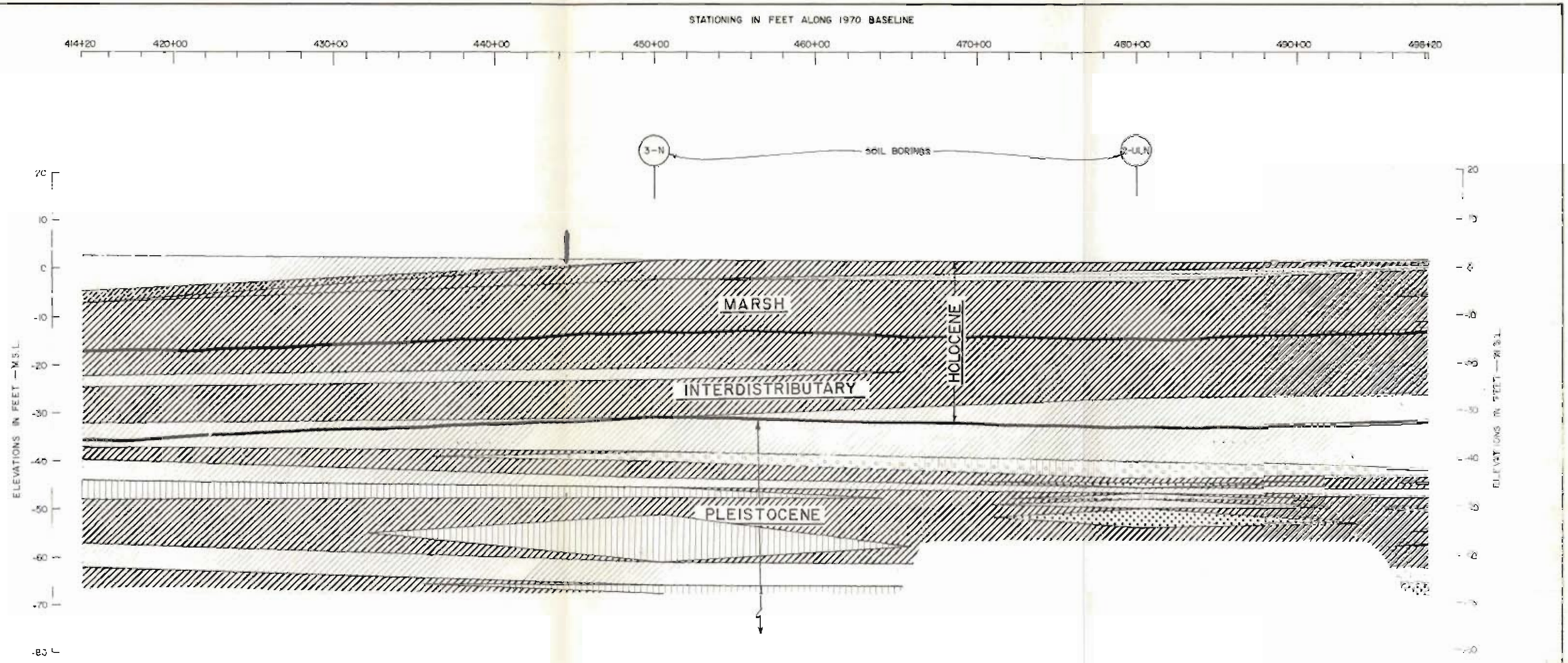
NOTE:
For location of borings, see plates 2 thru 5
For boring logs, see plates 6 thru 10

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2-GENERAL DESIGN
SUPPLEMENT NO 5B
NEW ORLEANS EAST LAKEFRONT LEVEE
PARIS ROAD TO SOUTH POINT

SOIL & GEOLOGIC PROFILE ALONG LEVEE ALINEMENT

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
JUNE 1972 FILE NO. [illegible]

PLATE 22



NOTE:
For location of borings, see plates 3 thru 5
For boring logs, see plates 6 thru 10
For legend, see plate 22

LAKE PONTCHARTRAIN, LA AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO 2-GENERAL DESIGN
SUPPLEMENT NO.58
NEW ORLEANS EAST LAKEFRONT LEVEE
PARIS ROAD TO SOUTH POINT

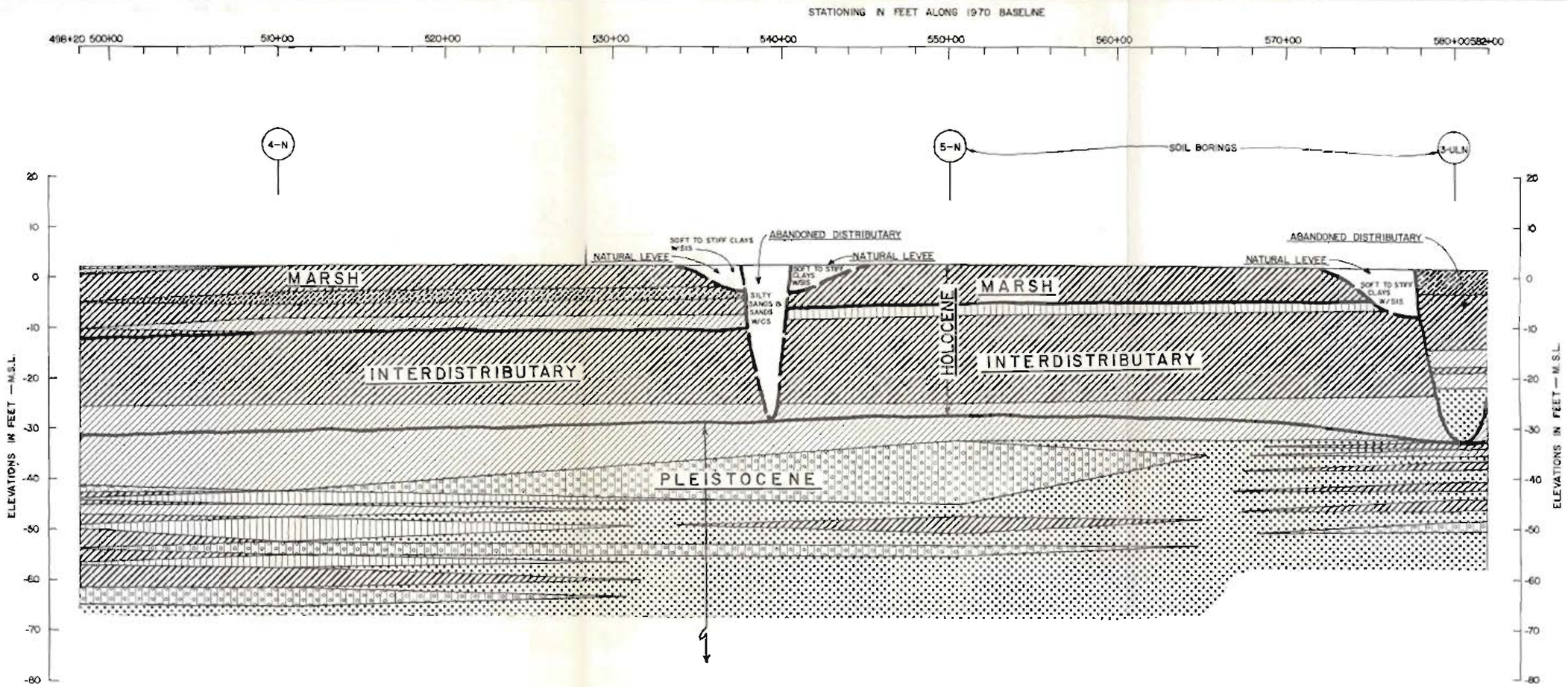
SOIL & GEOLOGIC PROFILE ALONG LEVEE ALINEMENT

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

JUNE 1972

FILE NO 4-2-25975

PLATE 23



NOTE:
For location of borings, see plates 2 thru 5
For boring, logs, see plates 6 thru 10
For legend, see plate 22

LAKE PONTCHARTRAIN, LA AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO 2-GENERAL DESIGN
SUPPLEMENT NO 5B
NEW ORLEANS EAST LAKEFRONT LEVEE
PARIS ROAD TO SOUTH POINT

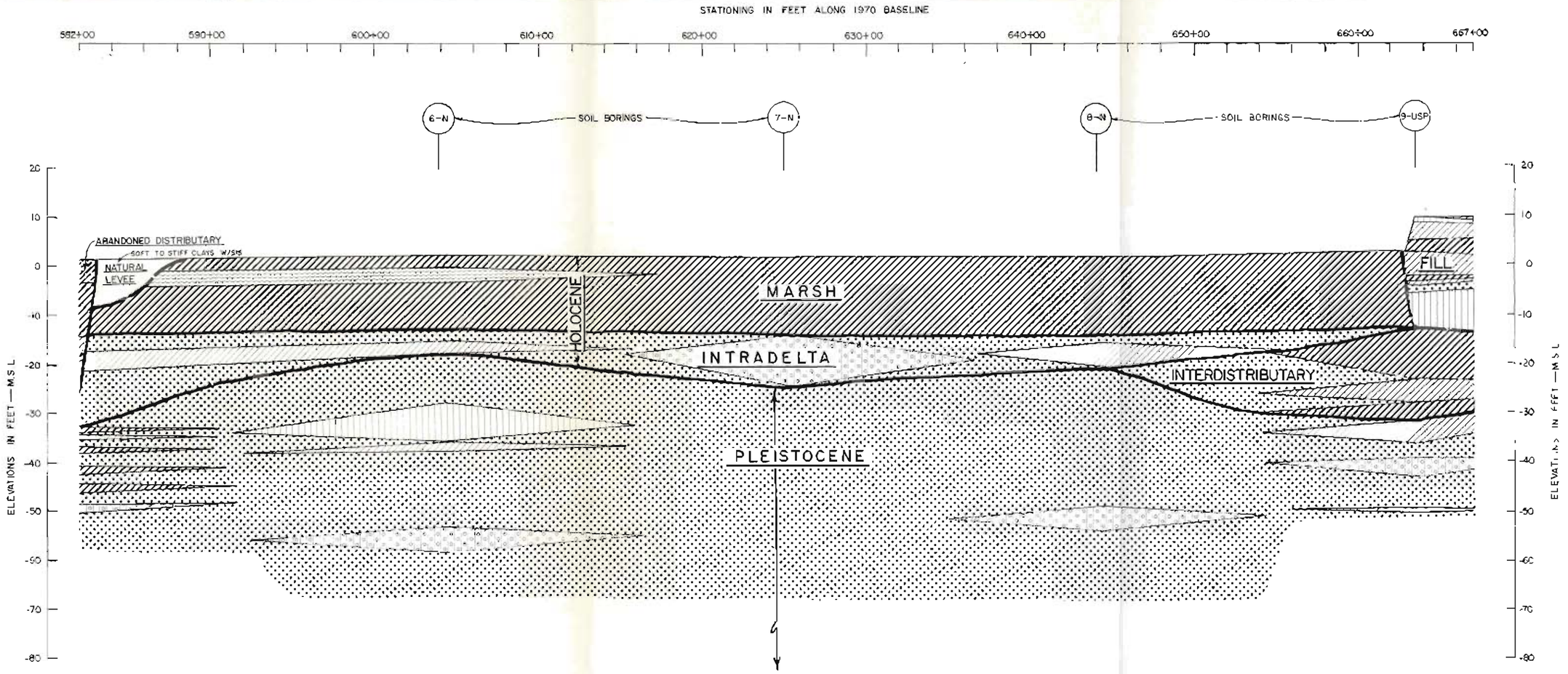
SOIL & GEOLOGIC PROFILE ALONG LEVEE ALINEMENT

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

JUNE 1972

FILE NO. H-2-25975

PLATE 24



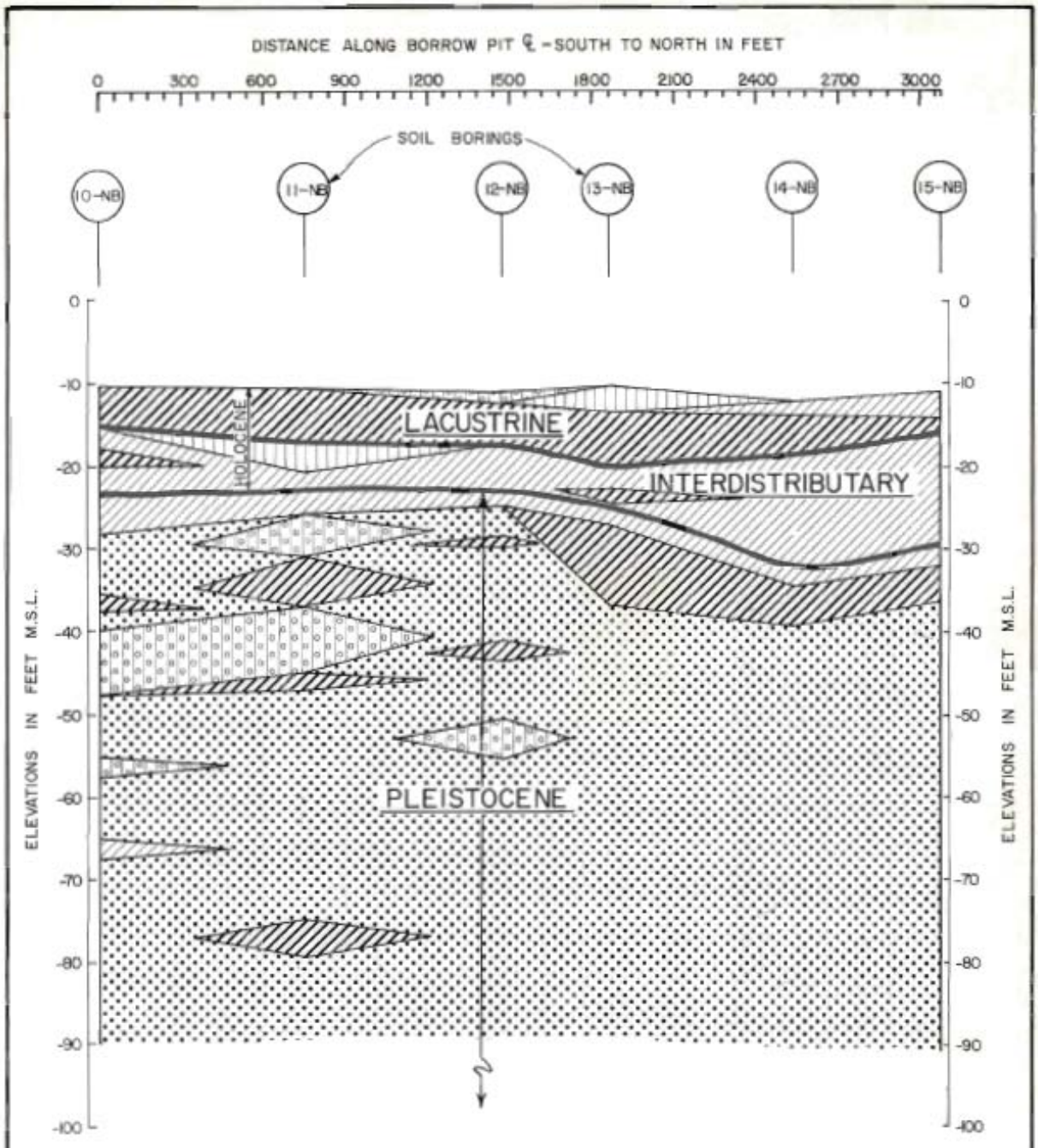
NOTE
For location of borings, see plates 2 thru 5
For boring logs, see plates 6 thru 10
For legend, see plate 22

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO 2-GENERAL DESIGN
SUPPLEMENT NO 5B
NEW ORLEANS EAST LAKEFRONT LEVEE
PARIS ROAD TO SOUTH POINT

SOIL & GEOLOGIC PROFILE ALONG LEVEE ALINEMENT

U S ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
JUNE 1972
FILE NO H-2-25975

PLATE 25



NOTE:
For location of borings, see plate 5
For boring logs, see plate 9
For legend see plate 22

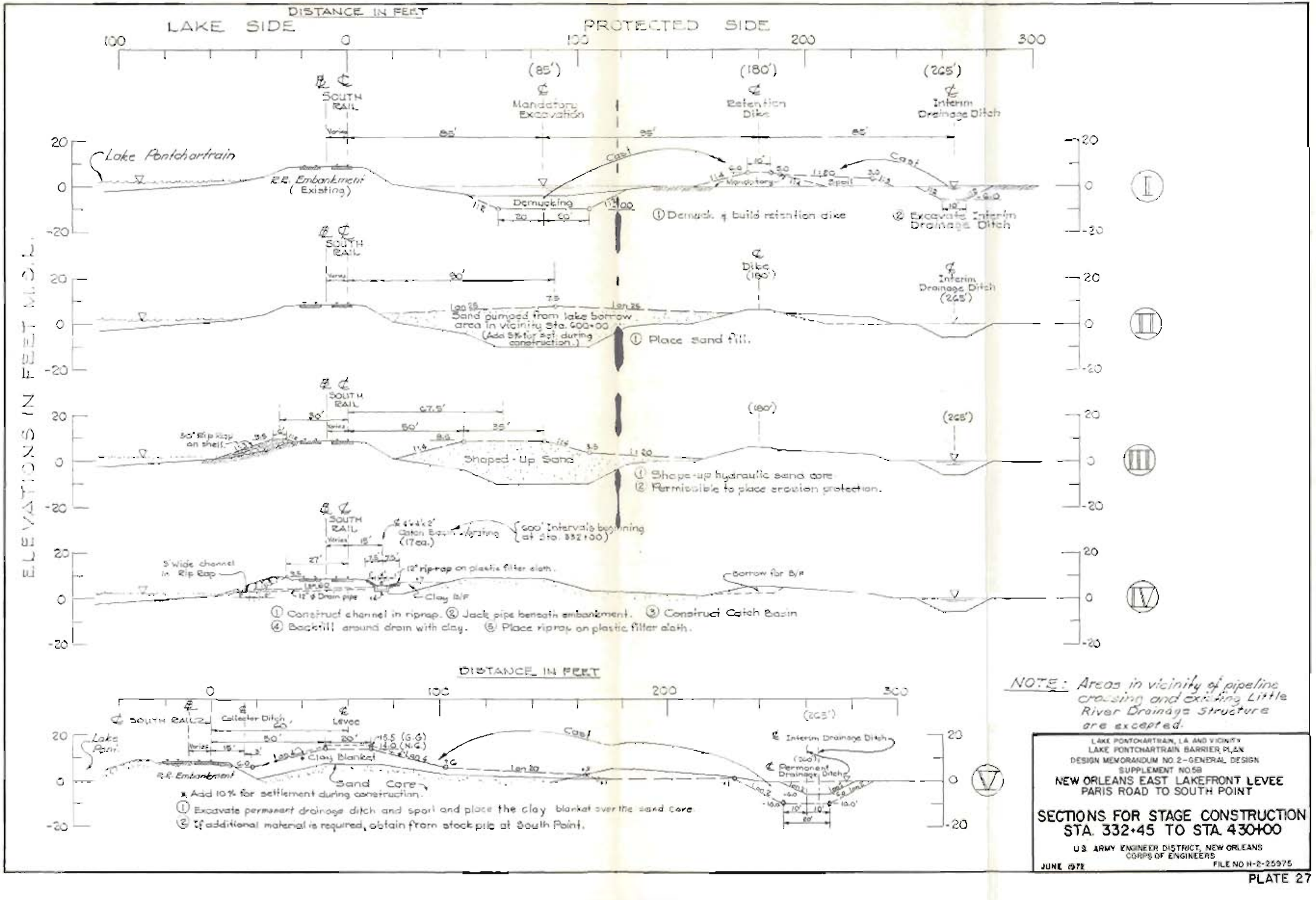
LAKE PONTCHARTRAIN, LA AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO 2-GENERAL DESIGN
SUPPLEMENT NO.58
NEW ORLEANS EAST LAKEFRONT LEVEE
PARIS ROAD TO SOUTH POINT

SOIL & GEOLOGIC PROFILE BORROW AREA

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

JUNE 1972 FILE NO. H-2-25975

PLATE 26



NOTE: Areas in vicinity of pipeline crossing and existing Little River Drainage structure are excepted.

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2-GENERAL DESIGN
SUPPLEMENT NO. 5B

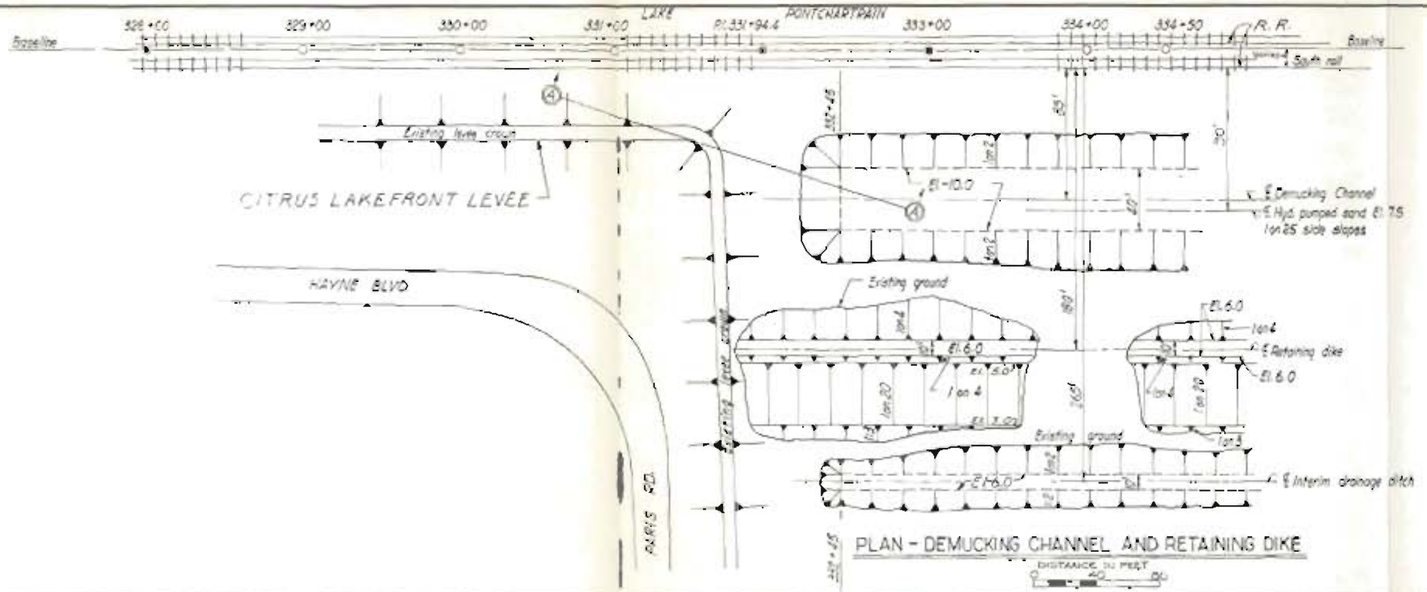
NEW ORLEANS EAST LAKEFRONT LEVEE PARIS ROAD TO SOUTH POINT

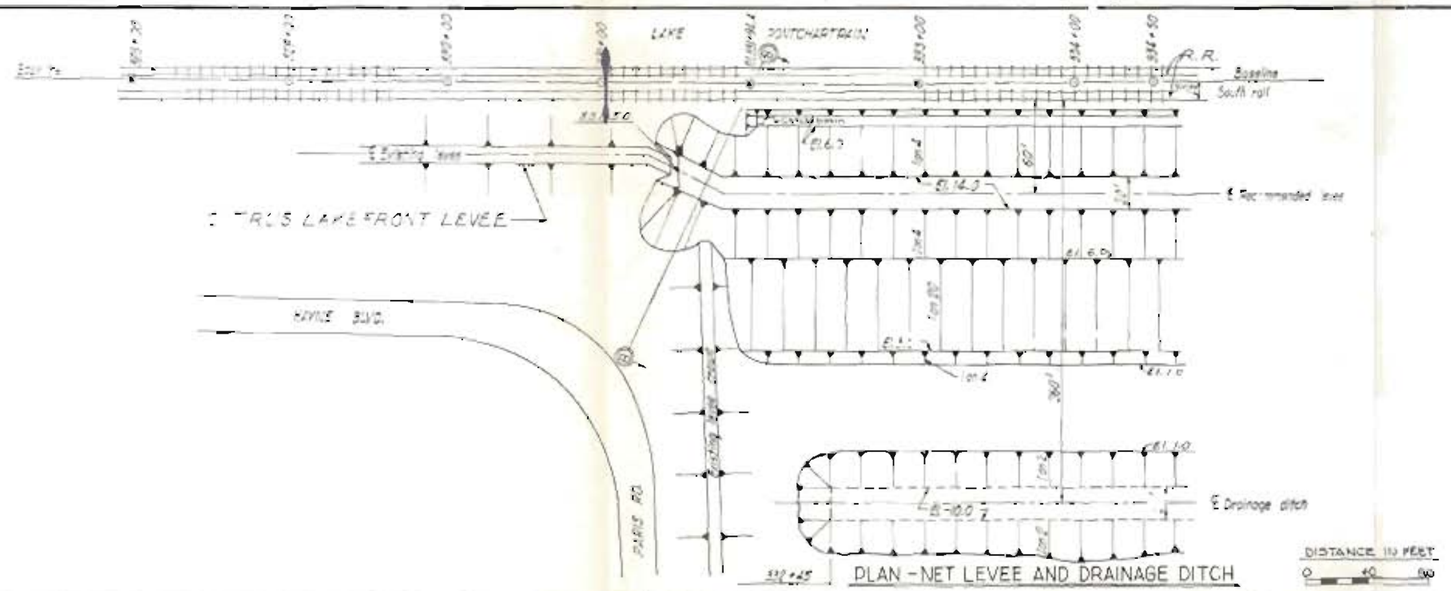
SECTIONS FOR STAGE CONSTRUCTION STA. 332+45 TO STA. 430+00

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

JUNE 1972 FILE NO. H-2-25975

PLATE 27





GENERAL NOTES

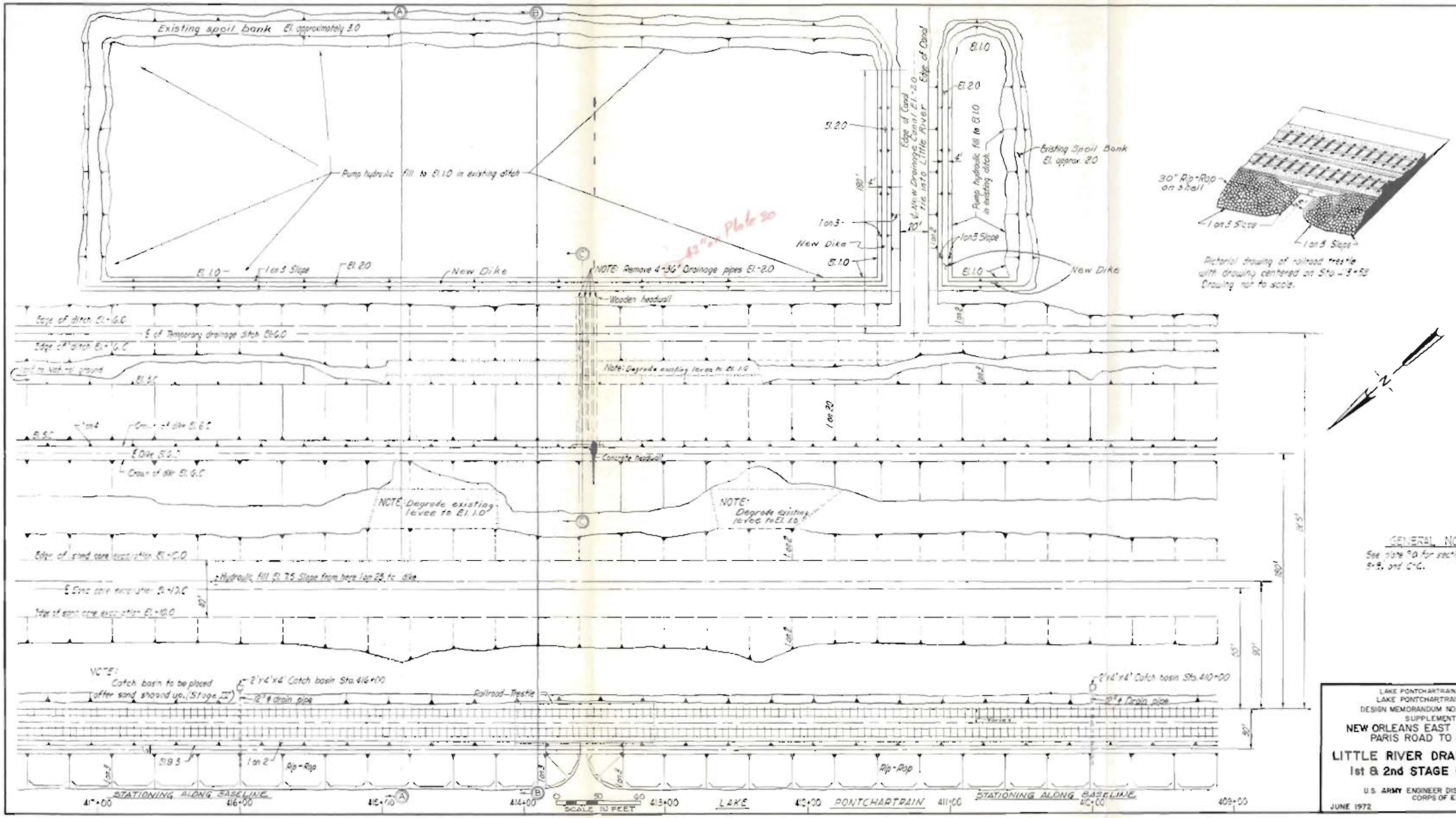
For stability section 4+2 and 5+8 see Plates 7-5, 7-6
For stage construction sections see Plate 5-7

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO 2-GENERAL DESIGN
SUPPLEMENT NO 5B
NEW ORLEANS EAST LAKEFRONT LEVEE
PARIS ROAD TO SOUTH POINT

LEVEE TIE-IN AT PARIS ROAD

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
JUNE 1972
FILE NO H-2-25975

PLATE 28



LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2-GENERAL DESIGN
SUPPLEMENT NO. 5B

NEW ORLEANS EAST LAKEFRONT LEVEE
PARIS ROAD TO SOUTH POINT

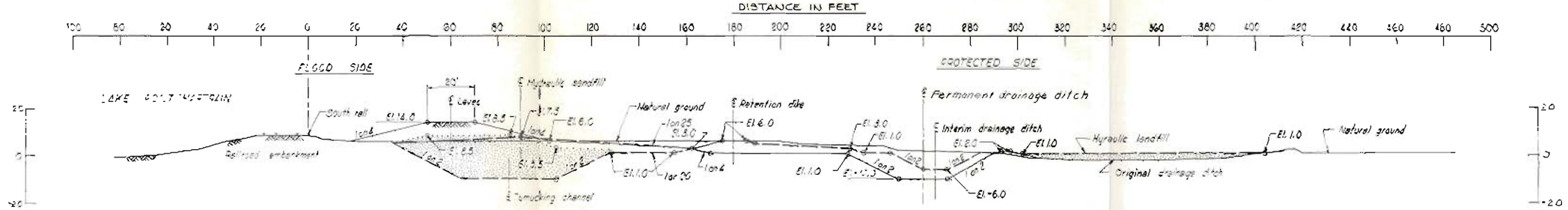
LITTLE RIVER DRAINAGE STRUCTURE
1st & 2nd STAGE CONSTRUCTION

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

JUNE 1972

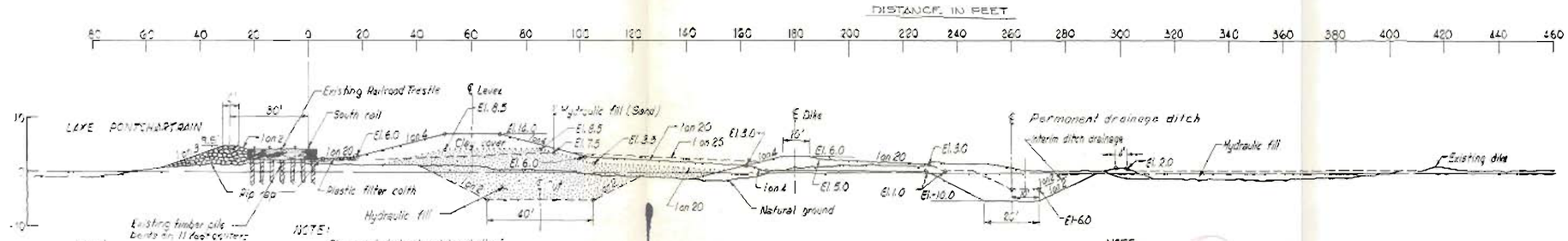
FILE NO. H-2-25975

PLATE 29



SECTION A-A

STA. 416+00



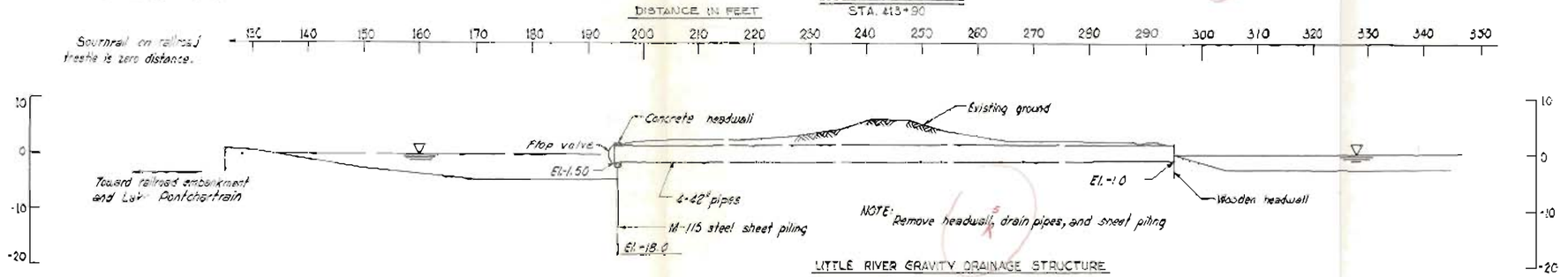
NOTE:
See plate 27 for stage construction

NOTE:
Rip-rap is to be placed to a depth of one foot for 50' from Sta. 413+85 to Sta 413+85 on floodside slope of levee starting at El 6.0 to railroad trestle

NOTE:
Use material excavated from interim drainage ditch to build retaining dike to fill existing drainage canal

SECTION B-B

STA. 413+90



NOTE: Remove headwall, drain pipes, and sheet piling

LITTLE RIVER GRAVITY DRAINAGE STRUCTURE

SECTION C-C

STA. 413+59

GENERAL NOTES

FOR LOCATION OF SECTIONS SEE PLATE 29

LEGEND

- 1&2 STAGE CONSTRUCTION
- 3 STAGE CONSTRUCTION
- 4&5 STAGE CONSTRUCTION

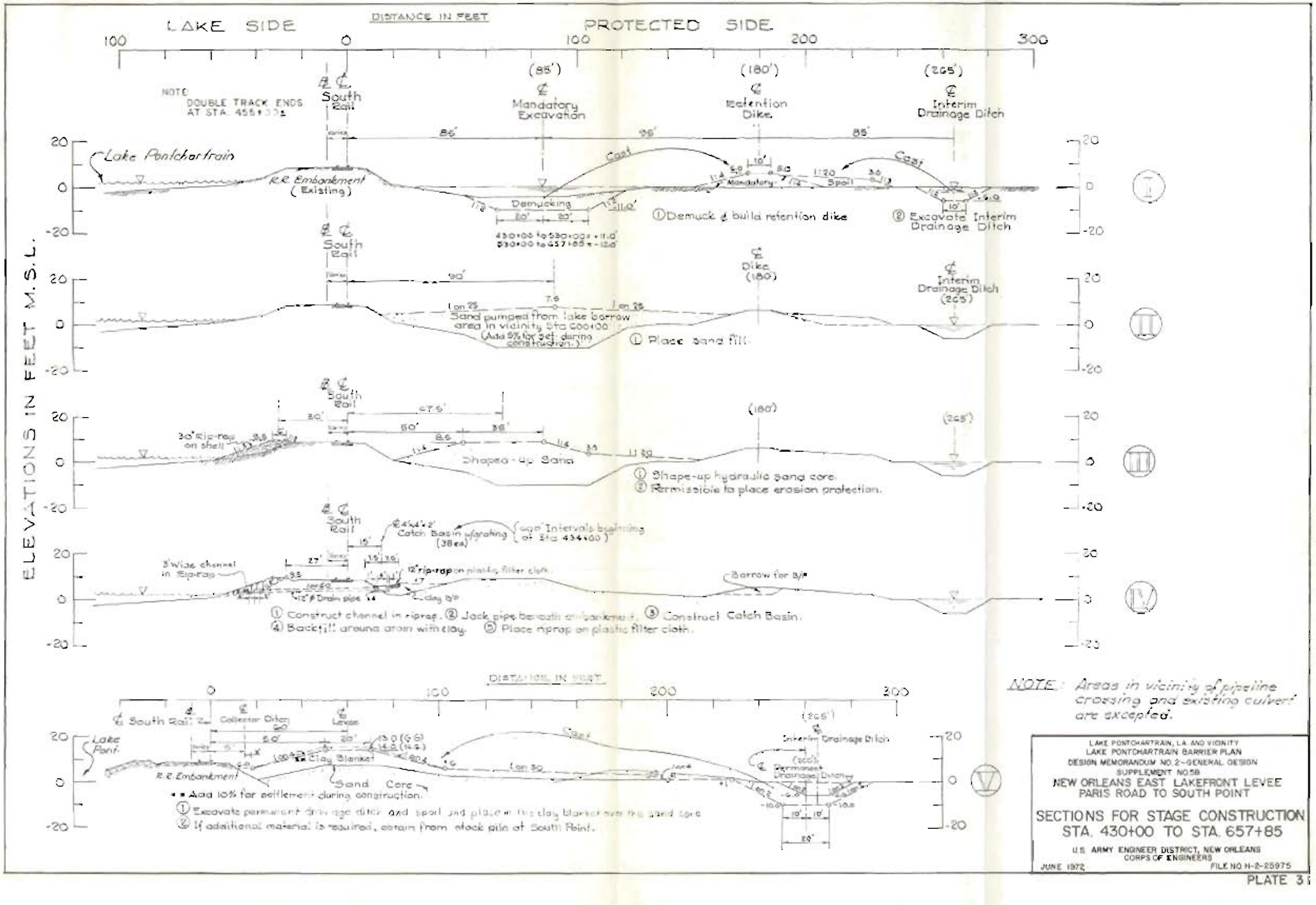
LAKE PONTCHARTRAIN, LA AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2-GENERAL DESIGN
SUPPLEMENT NO 5B
NEW ORLEANS EAST LAKEFRONT LEVEE
PARIS ROAD TO SOUTH POINT

LITTLE RIVER DRAINAGE STRUCTURE SPECIAL SECTIONS

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

JUNE 1972 FILE NO. H-2-25975

PLATE 30



NOTE: Areas in vicinity of pipeline crossing and existing culvert are excepted.

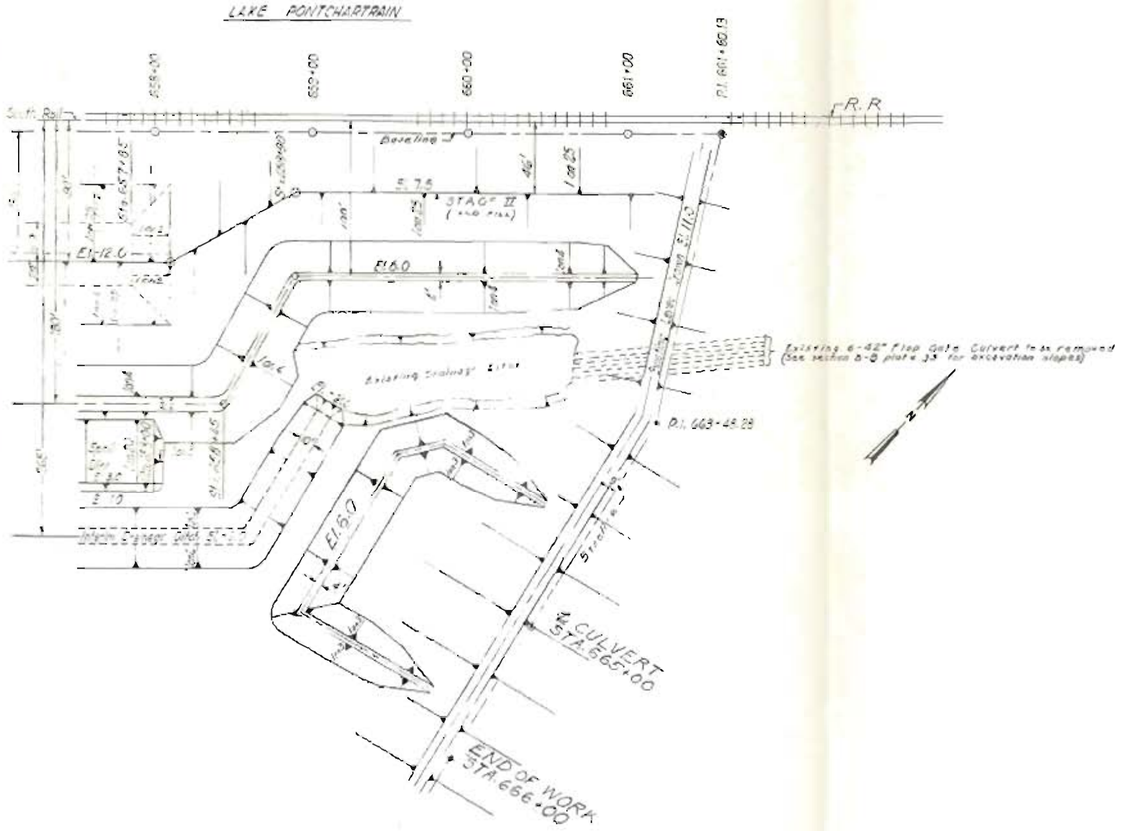
LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2-GENERAL DESIGN
SUPPLEMENT NO 5B
NEW ORLEANS EAST LAKEFRONT LEVEE
PARIS ROAD TO SOUTH POINT

SECTIONS FOR STAGE CONSTRUCTION STA. 430+00 TO STA. 657+85

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

JUNE 1972 FILE NO H-2-25975

PLATE 3

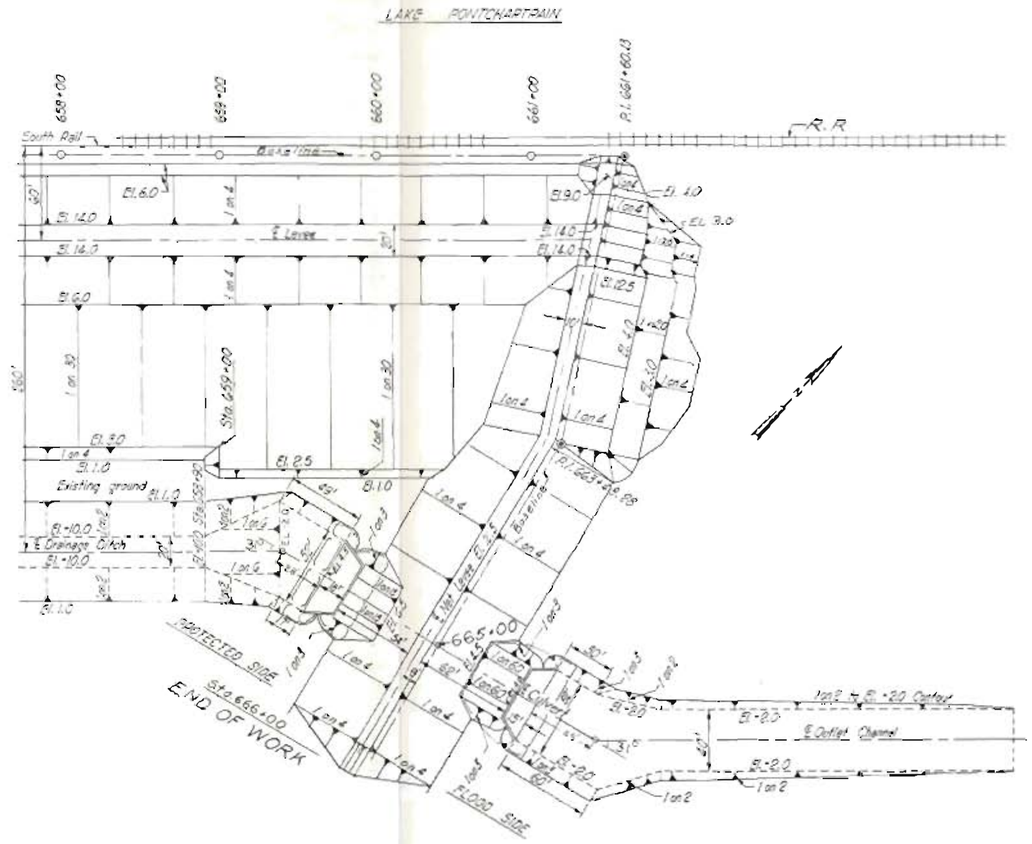


PLAN-LEVEE CONSTRUCTION STAGE II VICINITY OF SOUTH POINT

Note: Levee construction stage II will be constructed as soon as possible to pre load the foundation soils between station 658+00 and station 661+00.

SCALE IN FEET

40 0 40 80



LEVEE PLAN - VICINITY OF SOUTH POINT

SCALE IN FEET

40 0 40 80

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2-GENERAL DESIGN
SUPPLEMENT NO. 5B
NEW ORLEANS EAST LAKEFRONT LEVEE
PARIS ROAD TO SOUTH POINT

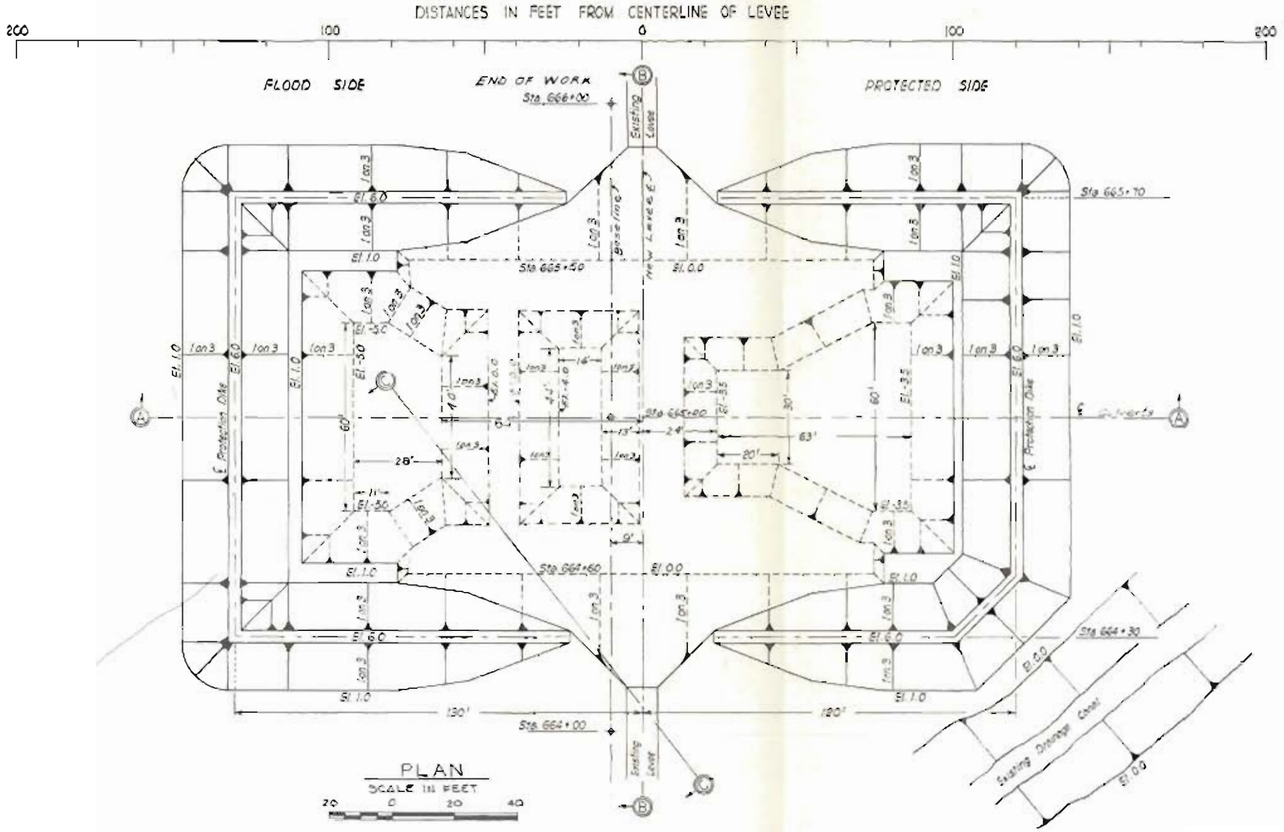
LEVEE TIE-IN AT SOUTH POINT

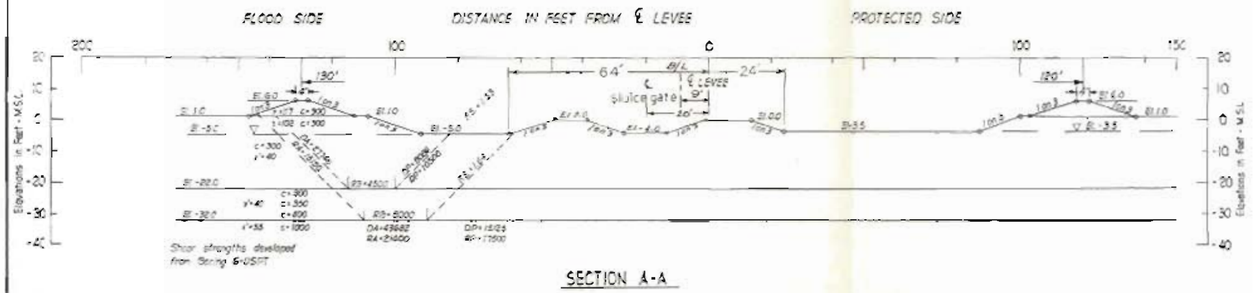
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

JUNE 1972

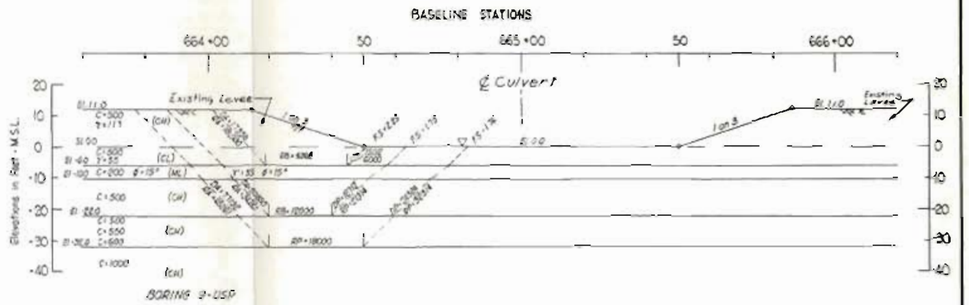
FILE NO. H-2-23973

PLATE 32

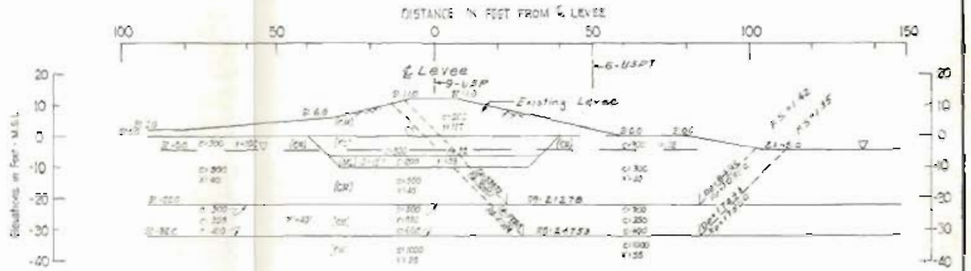




SECTION A-A



SECTION B-B



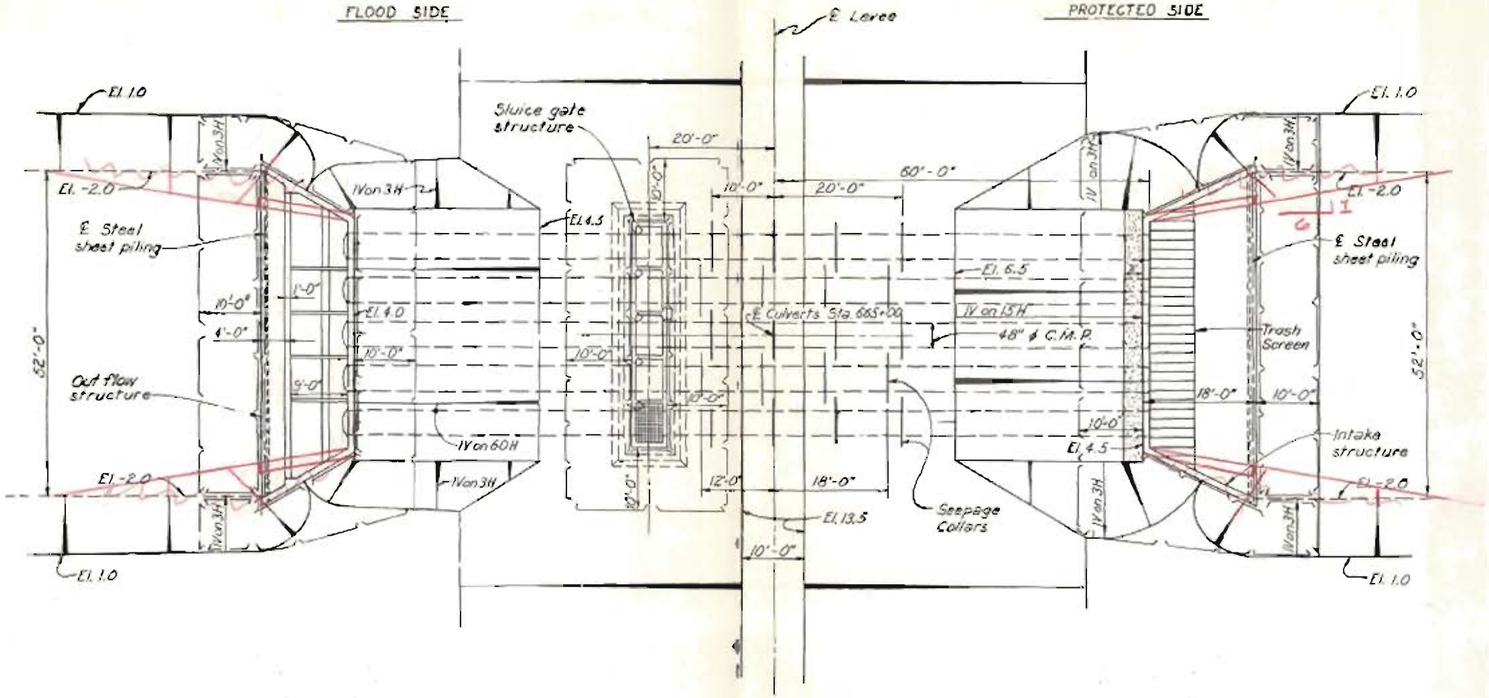
SECTION C-C

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2-GENERAL DESIGN
SUPPLEMENT NO. 58
NEW ORLEANS EAST LAKEFRONT LEVEE
PARIS ROAD TO SOUTH POINT

STRUCTURAL EXCAVATION FOR DRAINAGE STRUCTURE AT SO. POINT

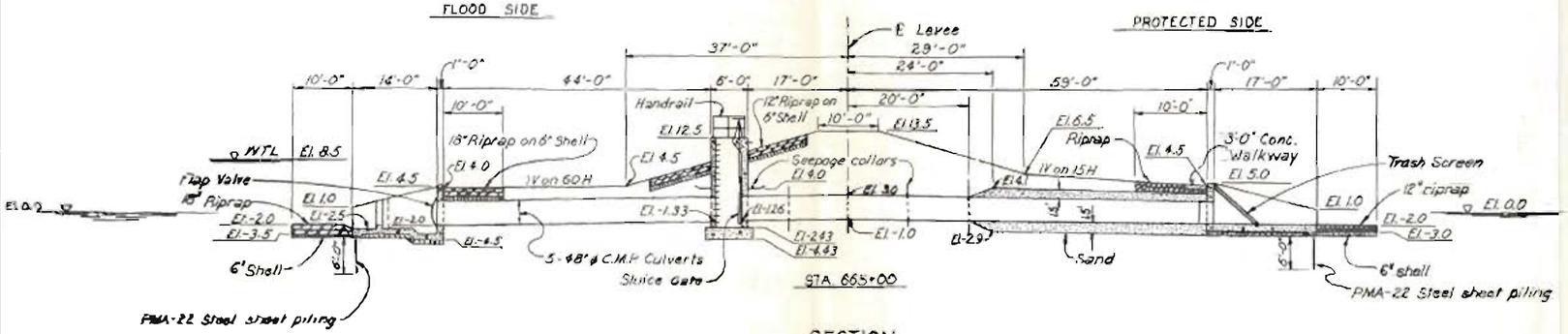
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
JUNE 1972 FILE NO. H-2-25975

PLATE 33



PLAN

Scale: 1" =20'-0"



SECTION

Scale: 1" =20'-0"

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2-GENERAL DESIGN
SUPPLEMENT NO. 5B

NEW ORLEANS EAST LAKEFRONT LEVEE
PARIS ROAD TO SOUTH POINT

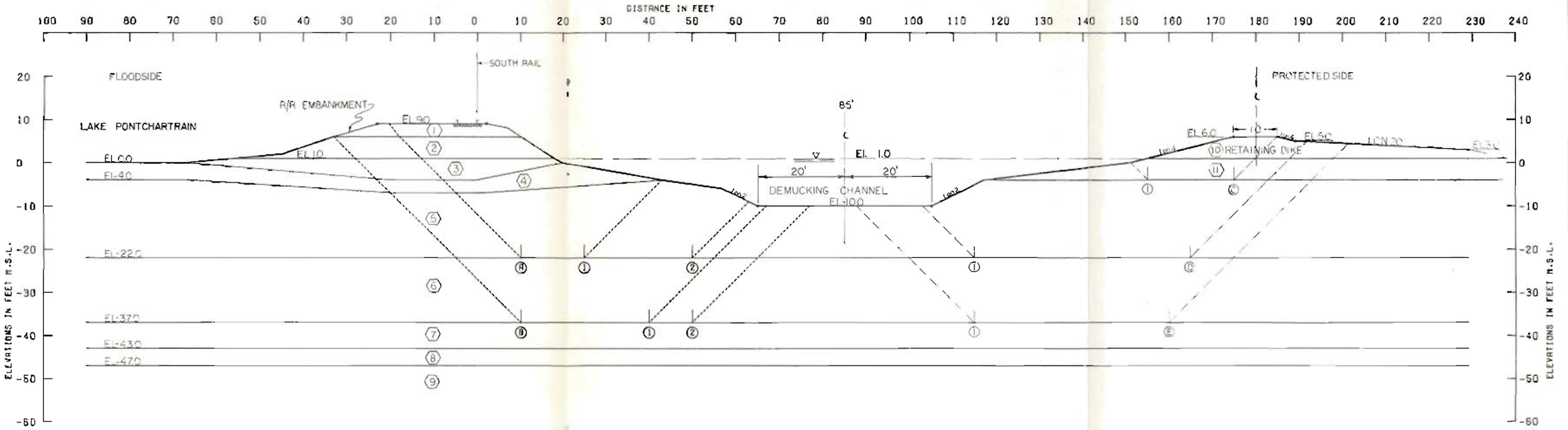
PLAN AND CROSS SECTION OF RELOCATED CULVERT AT SOUTH POINT VICINITY OF STA. 665+00

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

JUNE 1972

FILE NO. H-2-25975

PLATE 34



GENERAL NOTES

CLASSIFICATION, STRATIFICATION, SHEAR STRENGTHS, AND UNIT WEIGHTS OF THE SOIL WERE BASED ON THE RESULTS OF THE UNDISTURBED BORINGS. SEE BORING I-ULN DATA PLATES.

SHEAR STRENGTHS BETWEEN VERTICALS 1 AND 2 WERE ASSUMED TO VARY LINEARLY BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

STRATUM NO.	SOIL TYPE	EFFECTIVE UNIT WT. P.C.F.		C - UNIT COHESION - P.S.F.				FRICTION ANGLE
				CENTER OF STRATUM		BOTTOM OF STRATUM		
		VERT. 1	VERT. 2	VERT. 1	VERT. 2	VERT. 1	VERT. 2	DEGREES
(1)	ML	117.0	117.0	200.0	200.0	200.0	200.0	15.0
(2)	CH	95.0	95.0	400.0	400.0	400.0	400.0	0.0
(3)	CH	33.0	33.0	400.0	400.0	400.0	400.0	0.0
(4)	CHO	15.0	15.0	300.0	300.0	300.0	300.0	0.0
(5)	CH	33.0	33.0	400.0	400.0	400.0	400.0	0.0
(6)	CH	43.0	43.0	475.0	475.0	550.0	550.0	0.0
(7)	CH	60.0	60.0	1200.0	1200.0	1200.0	1200.0	0.0
(8)	SM	60.0	60.0	0.0	0.0	0.0	0.0	33.0
(9)	CH	48.0	48.0	800.0	800.0	800.0	800.0	0.0
(10)	CH	90.0	90.0	120.0	120.0	120.0	120.0	0.0
(11)	CH	15.0	15.0	120.0	120.0	120.0	120.0	0.0

BORING I-ULN

ASSUMED FAILURE SURFACE NO.	ASSUMED FAILURE SURFACE ELEV.	RESISTING FORCES R_A	R_B	R_P	DRIVING FORCES D_B	$-D_P$	SUMMATION OF FORCES RESISTING	DRIVING	FACTOR OF SAFETY
(A) (1)	-22.00	22938	6000	14400	29199	5563	43338	23636	1.834
(A) (2)	-22.00	22938	16000	10400	29199	3892	49338	25307	1.950
(B) (1)	-37.00	35994	16500	23850	54715	16586	76344	38128	2.002
(B) (2)	-37.00	35994	22000	23850	54715	14718	81844	39999	2.046
(C) (1)	- 4.00	2700	~~3000~~ 2400	1200	3827	150	~~3900~~ 4300	3677	~~1.877~~ 1.71
(D) (1)	-22.00	16826	20000	9600	18335	3035	46426	15300	3.034
(E) (1)	-37.00	28712	~~18000~~ 24700	21600	37309	12686	~~68312~~ 73012	24623	~~2.774~~ 3.05

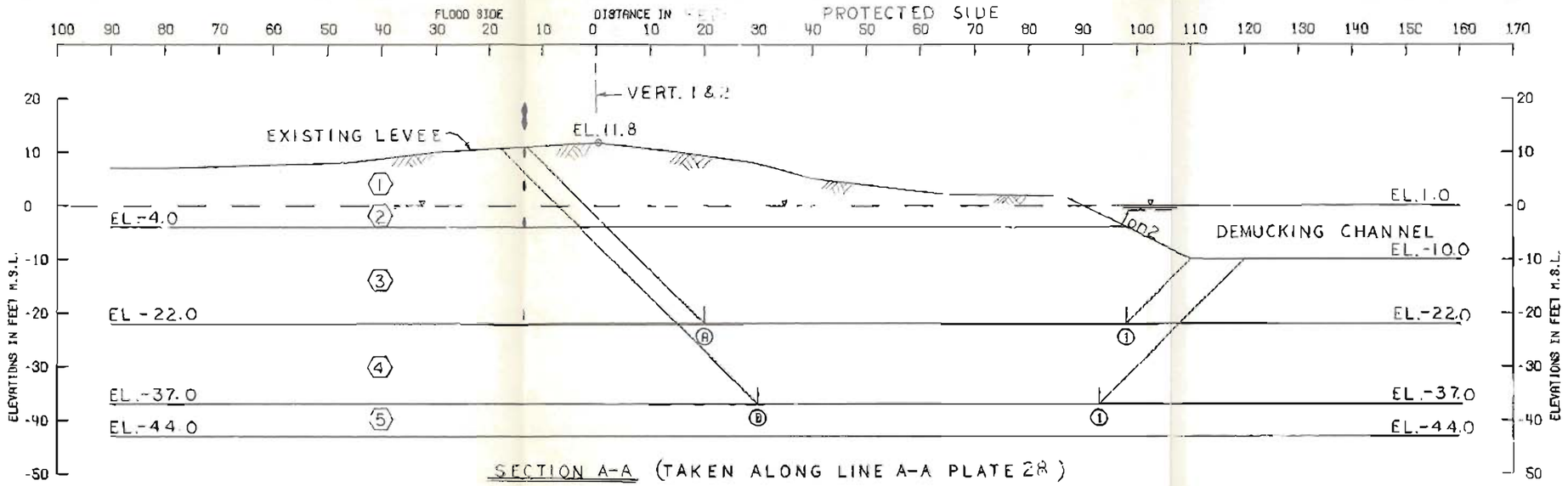
NOTES

ϕ -- ANGLE OF INTERNAL FRICTION, DEGREES
C -- UNIT COHESION, P.S.F.
Σ -- STATIC WATER SURFACE
D -- HORIZONTAL DRIVING FORCE IN POUNDS
R -- HORIZONTAL RESISTING FORCE IN POUNDS
A -- AS A SUBSCRIPT, REFERS TO ACTIVE WEDGE
B -- AS A SUBSCRIPT, REFERS TO CENTRAL BLOCK
P -- AS A SUBSCRIPT, REFERS TO PASSIVE WEDGE

FACTOR OF SAFETY = $\frac{R_A + R_B + R_P}{D_B - D_P}$

LAKE PONTCHARTRAIN, LA AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2-GENERAL DESIGN
SUPPLEMENT NO.5B
NEW ORLEANS EAST LAKEFRONT LEVEE
PARIS ROAD TO SOUTH POINT
(Q) SHEAR STABILITY
RELATIVE TO DEMUCKING CHANNEL
STA. 332+45 TO 430+00
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
JUNE 1972
FILE NO. H-2-25975

PLATE 35



SECTION A-A (TAKEN ALONG LINE A-A PLATE 28)

GENERAL NOTES

CLASSIFICATION, STRATIFICATION, SHEAR STRENGTHS, AND UNIT WEIGHTS OF THE SOIL WERE BASED ON THE RESULTS OF THE UNDISTURBED BORINGS. SEE BORING 1-ULN DATA PLATE.

SHEAR STRENGTHS BETWEEN VERTICALS 1 AND 2 WERE ASSUMED TO VARY LINEARLY BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

FOR LOCATION OF SECTION SEE PLATE 23

STRATUM NO.	SOIL TYPE	EFFECTIVE UNIT WT. P.C.F.		C - UNIT COHESION - P.S.F. CENTER OF STRATUM		C - UNIT COHESION - P.S.F. BOTTOM OF STRATUM		FRICTION ANGLE
		VERT. 1	VERT. 2	VERT. 1	VERT. 2	VERT. 1	VERT. 2	DEGREES
①	CH	100.0	100.0	300.0	300.0	300.0	300.0	0.
②	CH	98.0	98.0	300.0	300.0	300.0	300.0	0.
③	CH	98.0	98.0	400.0	400.0	400.0	400.0	0.
④	CH	98.0	98.0	475.0	475.0	550.0	550.0	0.
⑤	CH	60.0	60.0	1200.0	1200.0	1200.0	1200.0	0.

SHEAR STRENGTHS DEVELOPED FROM BOR. 1-ULN

ASSUMED FAILURE SURFACE NO.	ASSUMED FAILURE SURFACE ELEV.	RESISTING FORCES R_A	R_B	R_P	DRIVING FORCES D_A	$-D_P$	SUMMATION OF FORCES RESISTING	DRIVING	FACTOR OF SAFETY
Ⓐ ①	-22.00	29411	31200	9800	96348	3561	64211	34786	1.846
Ⓑ ①	-37.00	37491	84650	23850	68382	15563	95991	52819	1.817

NOTES

Φ -- ANGLE OF INTERNAL FRICTION, DEGREES
C -- UNIT COHESION, P.S.F.
Ω -- STATIC WATER SURFACE
D -- HORIZONTAL DRIVING FORCE IN POUNDS
R -- HORIZONTAL RESISTING FORCE IN POUNDS
A -- AS A SUBSCRIPT, REFERS TO ACTIVE WEDGE
B -- AS A SUBSCRIPT, REFERS TO CENTRAL BLOCK
P -- AS A SUBSCRIPT, REFERS TO PASSIVE WEDGE

FACTOR OF SAFETY = $\frac{R_A + R_B + R_P}{D_B - D_P}$

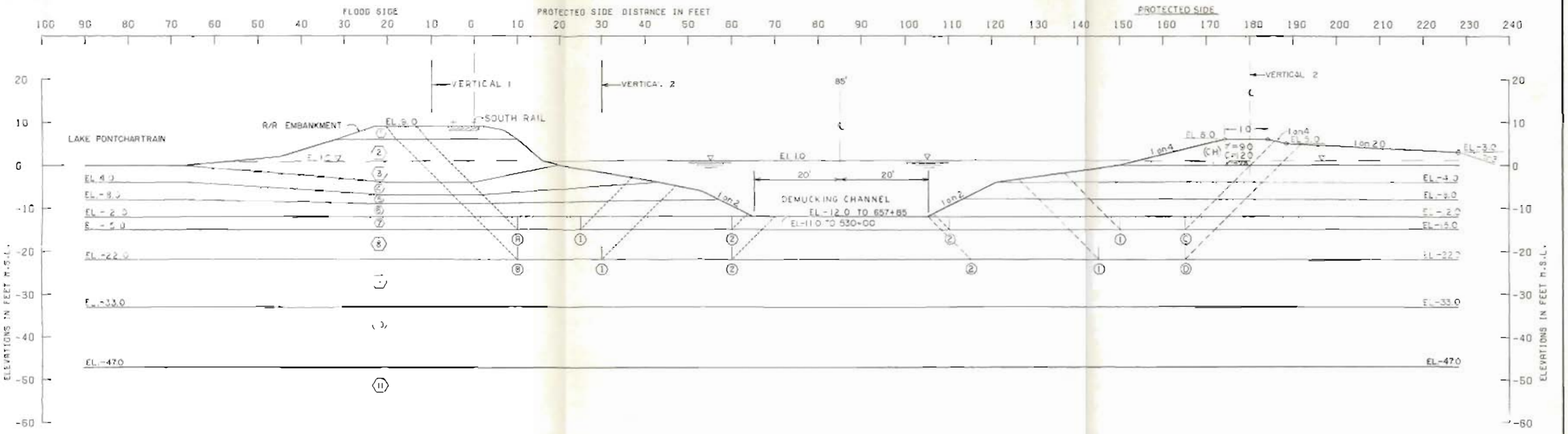
LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2-GENERAL DESIGN
SUPPLEMENT NO. 5B
NEW ORLEANS EAST LAKEFRONT LEVEE
PARIS ROAD TO SOUTH POINT

LEVEE (Q) SHEAR STABILITY VICINITY OF PARIS ROAD

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

JUNE 1972

FILE NO. H-2-25975



GENERAL NOTES

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

SHEAR STRENGTHS BETWEEN VERTICALS 1 AND 2 WERE ASSUMED TO VARY LINEARLY BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

STRATUM NO.	SOIL TYPE	EFFECTIVE UNIT WT. P.C.F.		C - UNIT COHESION - P.S.F.				FRICTION ANGLE
				CENTER OF STRATUM		BOTTOM OF STRATUM		
		VERT. 1	VERT. 2	VERT. 1	VERT. 2	VERT. 1	VERT. 2	DEGREES
1	ML	117.0	117.0	200.0	200.0	200.0	200.0	15.0
2	CH	95.0	95.0	350.0	350.0	350.0	350.0	0.0
3	CH	33.0	33.0	350.0	350.0	350.0	350.0	0.0
4	CHO	15.0	15.0	275.0	120.0	275.0	120.0	0.0
5	CH	33.0	33.0	275.0	150.0	275.0	150.0	0.0
6	CH	33.0	33.0	275.0	180.0	275.0	180.0	0.0
7	CH	33.0	33.0	275.0	160.0	275.0	160.0	0.0
8	CH	33.0	33.0	305.0	255.0	335.0	290.0	0.0
9	CH	43.0	43.0	405.0	405.0	460.0	460.0	0.0
10	CH	43.0	43.0	530.0	530.0	600.0	600.0	0.0
11	SM	60.0	60.0	0.0	0.0	0.0	0.0	33.0

VERTICAL 2 BASED ON BORINGS 2 AND 3 ULN
VERTICAL 1 BASED ON COMPUTED (R) GAIN IN SHEAR STRENGTH.

ASSUMED FAILURE SURFACE NO.		ELEV.	R_A	R_B	R_P	D_A	$-D_P$	RESISTING	DRIVING	FACTOR OF SAFETY
Ⓐ	①	-15.00	13649	3447	4948	19287	2193	22044	17094	1.290
Ⓐ	②	-15.00	13649	10054	1200	19287	332	24903	18955	1.314
Ⓑ	①	-22.00	18021	6314	7745	29199	5389	32080	23810	1.347
Ⓑ	②	-22.00	18021	15304	4530	29199	1854	37855	27344	1.384
Ⓒ	①	-15.00	5904	2400	4124	10590	2571	12429	8019	1.550
Ⓒ	②	-15.00	5904	8800	1200	10590	332	15904	10258	1.550
Ⓓ	①	22.00	9284	5800	7345	17123	5907	22429	11216	2.000
Ⓓ	②	22.00	9284	14500	4530	17123	2474	28314	14649	1.933

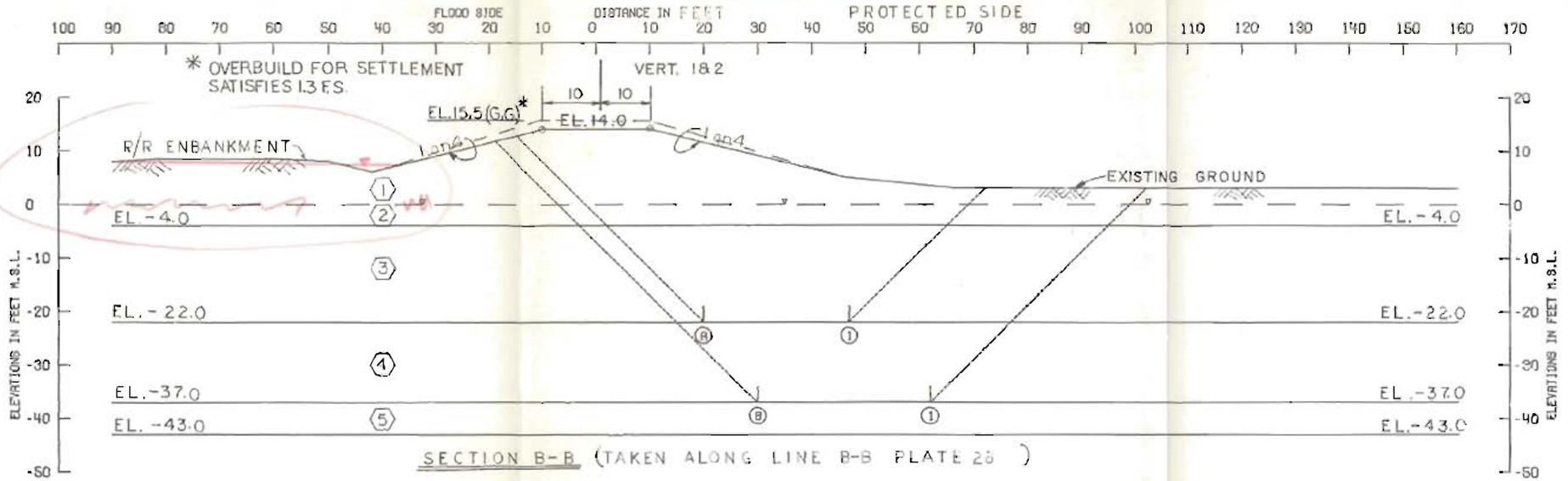
NOTES

Φ -- ANGLE OF INTERNAL FRICTION, DEGREES
C -- UNIT COHESION, P.S.F.
▽ -- STATIC WATER SURFACE
D -- HORIZONTAL DRIVING FORCE IN POUNDS
R -- HORIZONTAL RESISTING FORCE IN POUNDS
A -- AS A SUBSCRIPT, REFERS TO ACTIVE WEDGE
B -- AS A SUBSCRIPT, REFERS TO CENTRAL BLOCK
P -- AS A SUBSCRIPT, REFERS TO PASSIVE WEDGE

FACTOR OF SAFETY = $\frac{R_A + R_B + R_P}{D_A - D_P}$

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2-GENERAL DESIGN
SUPPLEMENT NO. 5B
NEW ORLEANS EAST LAKEFRONT LEVEE
PARIS ROAD TO SOUTH POINT
(Q) SHEAR STABILITY
RELATIVE TO DEMUCKING CHANNEL
STA. 430+00 TO STA. 657+85
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
JUNE 1972
FILE NO H-2-25975

PLATE 37



SECTION B-B (TAKEN ALONG LINE B-B PLATE 28)

GENERAL NOTES

CLASSIFICATION, STRATIFICATION, SHEAR STRENGTHS, AND UNIT WEIGHTS OF THE SOIL WERE BASED ON THE RESULTS OF THE UNDISTURBED BORINGS. SEE BORING I-ULN DATA PLATES.

SHEAR STRENGTHS BETWEEN VERTICALS 1 AND 2 WERE ASSUMED TO VARY LINEARLY BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

FOR LOCATION OF SECTION SEE PLATE 28

STRATUM NO.	SOIL TYPE	EFFECTIVE UNIT WT. P.C.F.		C - UNIT COHESION - P.S.F. CENTER OF STRATUM		C - UNIT COHESION - P.S.F. BOTTOM OF STRATUM		FRICTION ANGLE
		VERT. 1	VERT. 2	VERT. 1	VERT. 2	VERT. 1	VERT. 2	DEGREES
1	CH	100.0	100.0	300.0	300.0	300.0	300.0	0.
2	CH	98.0	98.0	300.0	300.0	300.0	300.0	0.
3	CH	93.0	93.0	400.0	400.0	400.0	400.0	0.
4	CH	98.0	98.0	476.0	476.0	550.0	550.0	0.
5	CH	60.0	60.0	1200.0	1200.0	1200.0	1200.0	0.

SHEAR STRENGTHS DEVELOPED FROM BOR. I-ULN

ASSUMED FAILURE SURFACE NO.	ASSUMED FAILURE SURFACE ELEV.	RESISTING FORCES R_A	R_B	R_P	DRIVING FORCES D_A	$-D_P$	SUMMATION OF FORCES RESISTING	DRIVING	FACTOR OF SAFETY
A 1	-22.00	24480	10800	18600	47884	17235	53880	30149	1.787
B 1	-37.00	38130	17600	32850	79814	35036	88580	43777	2.023

NOTES

ϕ -- ANGLE OF INTERNAL FRICTION, DEGREES
C -- UNIT COHESION, P.S.F.
∇ -- STATIC WATER SURFACE
D -- HORIZONTAL DRIVING FORCE IN POUNDS
R -- HORIZONTAL RESISTING FORCE IN POUNDS
A -- AS A SUBSCRIPT, REFERS TO ACTIVE WEDGE
B -- AS A SUBSCRIPT, REFERS TO CENTRAL BLOCK
P -- AS A SUBSCRIPT, REFERS TO PASSIVE WEDGE

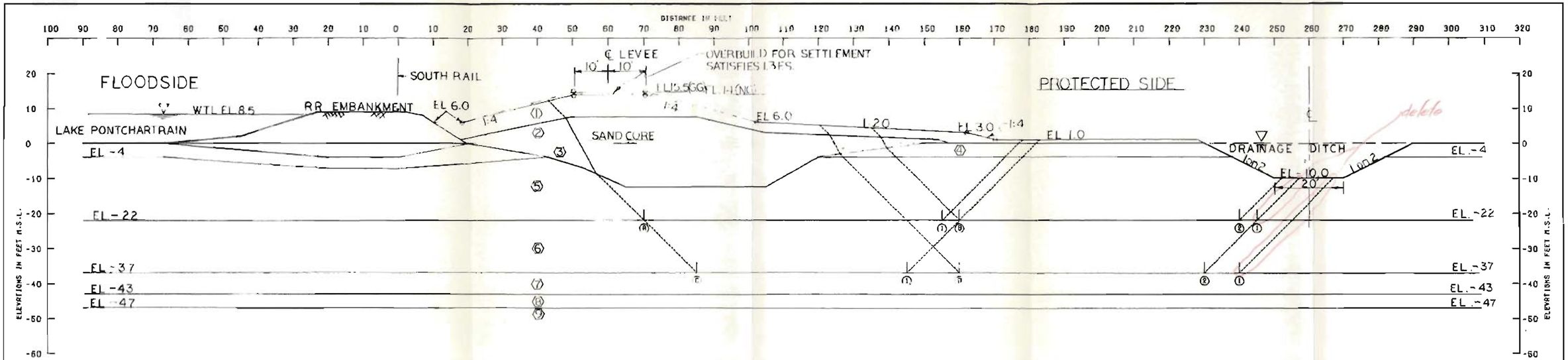
FACTOR OF SAFETY = $\frac{R_A + R_B + R_P}{D_A - D_P}$

LAKE PONTCHARTRAIN, LA AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2-GENERAL DESIGN
SUPPLEMENT NO 58
NEW ORLEANS EAST LAKEFRONT LEVEE
PARIS ROAD TO SOUTH POINT

LEVEE (Q) SHEAR STABILITY VICINITY OF PARIS RD.

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
JUNE 1972
FILE NO. H-2-25975

PLATE 38



GENERAL NOTES

CLASSIFICATION, STRATIFICATION, SHEAR STRENGTHS, AND UNIT WEIGHTS OF THE SOIL WERE BASED ON THE RESULTS OF THE UNDISTURBED BORINGS, SEE BORING I-ULN DATA PLATE

SHEAR STRENGTHS BETWEEN VERTICALS 1 AND 2 WERE ASSUMED TO VARY LINEARLY BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

STRATUM NO.	SOIL TYPE	EFFECTIVE UNIT WT. P.C.F. VERT. 1	EFFECTIVE UNIT WT. P.C.F. VERT. 2	C - UNIT COHESION - P.S.F. CENTER OF STRATUM VERT. 1	C - UNIT COHESION - P.S.F. CENTER OF STRATUM VERT. 2	C - UNIT COHESION - P.S.F. END OF STRATUM VERT. 1	C - UNIT COHESION - P.S.F. END OF STRATUM VERT. 2	FRICTION ANGLE DEGREES
(1)	CH	100.0	100.0	300.0	300.0	300.0	300.0	0.0
(2)	SP	122.0	122.0	0.0	0.0	0.0	0.0	33.0
(3)	SP	60.0	60.0	0.0	0.0	0.0	0.0	33.0
(4)	CH	15.0	15.0	150.0	150.0	150.0	150.0	0.0
(5)	CH	33.0	33.0	400.0	400.0	400.0	400.0	0.0
(6)	CH	43.0	43.0	475.0	475.0	550.0	550.0	0.0
(7)	CH	60.0	60.0	1200.0	1200.0	1200.0	1200.0	0.0
(8)	SM	60.0	60.0	0.0	0.0	0.0	0.0	33.0
(9)	CH	48.0	48.0	800.0	800.0	800.0	800.0	0.0

BORING I-ULN

ASSUMED FAILURE NO.	ASSUMED SURFACE ELEV.	RESISTING FORCES R_A	R_B	R_P	DRIVING FORCES D_A	$-D_P$	SUMMATION OF FORCES RESISTING	DRIVING	FACTOR OF SAFETY
(R) (1)	-22.00	30631	34000	16200	57113	11129	80731	45984	1.756
(R) (2)	-22.00	30631	68000	9600	57113	3199	108131	53916	2.006
(B) (1)	-22.00	17699	34000	9600	16443	2580	61299	13863	4.422
(C) (1)	-37.00	44781	33000	30450	98567	30231	108231	68336	1.584
(C) (2)	-37.00	44781	79750	23850	99567	16150	148381	82407	1.801
(D) (1)	-37.00	32642	44000	23850	40530	13973	100492	26556	3.784

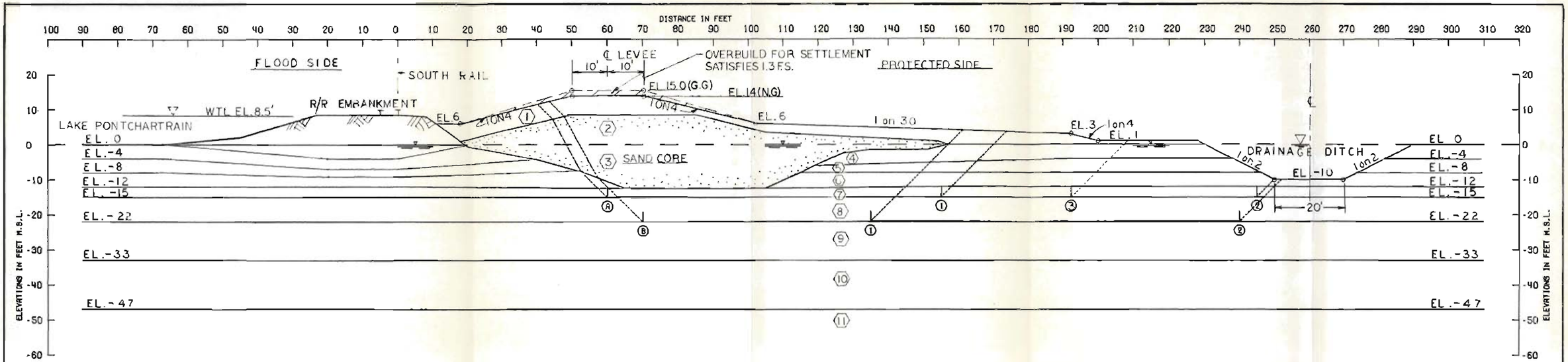
NOTES

ϕ — ANGLE OF INTERNAL FRICTION. DEGREES
C — UNIT COHESION, P.S.F.
∇ — STATIC WATER SURFACE
D — HORIZONTAL DRIVING FORCE IN POUNDS
R — HORIZONTAL RESISTING FORCE IN POUNDS
A — AS A SUBSCRIPT, REFERS TO ACTIVE WEDGE
B — AS A SUBSCRIPT, REFERS TO CENTRAL BLOCK
P — AS A SUBSCRIPT, REFERS TO PASSIVE WEDGE

FACTOR OF SAFETY = $\frac{R_A + R_B + R_P}{D_A - D_P}$

LAKE PONTCHARTRAIN, LA AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO.2-GENERAL DESIGN
SUPPLEMENT NO.5B
NEW ORLEANS EAST LAKEFRONT LEVEE
PARIS ROAD TO SOUTH POINT
(Q) SHEAR STABILITY OF
FINAL LEVEE SECTION
STA 332+45 TO STA 430+00
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
JUNE 1978
FILE NO. H-2-23875

PLATE 39



GENERAL NOTES

CLASSIFICATION, STRATIFICATION, SHEAR STRENGTHS, AND UNIT WEIGHTS OF THE SOIL WERE BASED ON THE RESULTS OF THE UNDISTURBED BORINGS, SEE COMPOSITE OF BORINGS 2-ULN AND 3-ULN

SHEAR STRENGTHS BETWEEN VERTICALS 1 AND 2 WERE ASSUMED TO VARY LINEARLY BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

STRATUM NO.	SOIL TYPE	EFFECTIVE UNIT WT. P.C.F. VERT. 1	EFFECTIVE UNIT WT. P.C.F. VERT. 2	C - UNIT COHESION - P.S.F. CENTER OF STRATUM VERT. 1	CENTER OF STRATUM VERT. 2	BOTTOM OF STRATUM VERT. 1	BOTTOM OF STRATUM VERT. 2	FRICTION ANGLE DEGREES
1	CH	100.0	100.0	800.0	800.0	800.0	800.0	0.
2	SP	122.0	122.0	0.	0.	0.	0.	33.0
3	SP	60.0	60.0	0.	0.	0.	0.	33.0
4	CHO	15.0	15.0	120.0	120.0	120.0	120.0	0.
5	CH	99.0	99.0	150.0	150.0	150.0	150.0	0.
6	CH	99.0	99.0	180.0	180.0	180.0	180.0	0.
7	CH	99.0	99.0	160.0	160.0	160.0	160.0	0.
8	CH	99.0	99.0	225.0	225.0	290.0	290.0	0.
9	CH	49.0	49.0	405.0	405.0	460.0	460.0	0.
10	CH	49.0	49.0	530.0	530.0	600.0	600.0	0.
11	SP	60.0	60.0	0.	0.	0.	0.	33.0

COMPOSITE OF BORINGS 2 & 3-ULN

255?
See strength profile of Plate 14

ASSUMED FAILURE SURFACE NO.	ASSUMED FAILURE SURFACE ELEV.	RESISTING FORCES R_A	R_B	R_P	DRIVING FORCES D_A	$-D_P$	SUMMATION OF FORCES RESISTING	SUMMATION OF FORCES DRIVING	FACTOR OF SAFETY
Ⓐ ①	-15.00	20216	15200	6689	38739	9293	42100	29446	1.430
Ⓐ ②	-15.00	20216	29600	1680	38739	617	51496	38121	1.351
Ⓐ ③	-15.00	20216	21120	5160	38739	5127	46496	33612	1.380
Ⓑ ①	-22.00	26128	16850	10068	57899	18874	55046	39024	1.411
Ⓑ ②	-22.00	26128	49300	4829	57899	3198	80257	54700	1.467

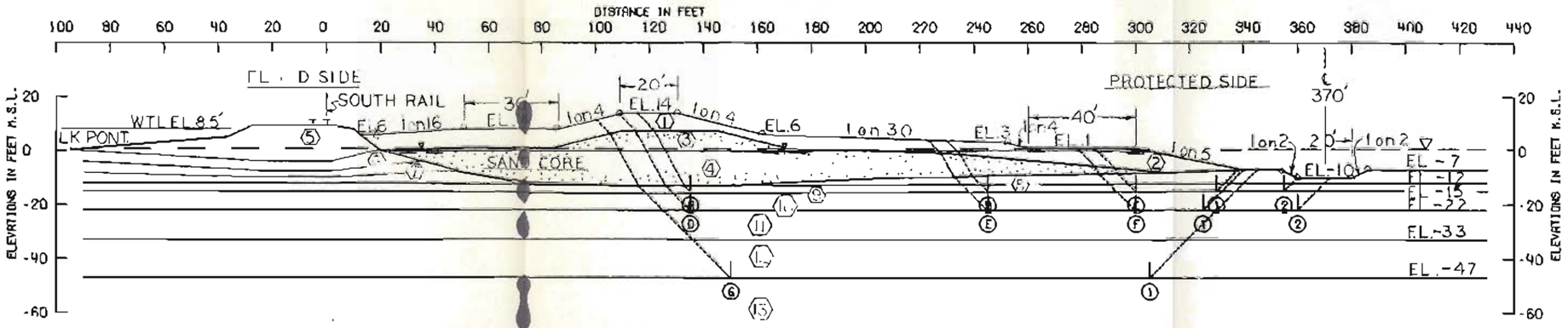
NOTES

Φ -- ANGLE OF INTERNAL FRICTION, DEGREES
C -- UNIT COHESION, P.S.F.
℄ -- STATIC WATER SURFACE
D -- HORIZONTAL DRIVING FORCE IN POUNDS
R -- HORIZONTAL RESISTING FORCE IN POUNDS
A -- AS A SUBSCRIPT, REFERS TO ACTIVE WEDGE
B -- AS A SUBSCRIPT, REFERS TO CENTRAL BLOCK
P -- AS A SUBSCRIPT, REFERS TO PASSIVE WEDGE

FACTOR OF SAFETY = $\frac{R_A + R_B + R_P}{D_A - D_P}$

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2-GENERAL DESIGN
SUPPLEMENT NO. 5B
NEW ORLEANS EAST LAKEFRONT LEVEE
PARIS ROAD TO SOUTH POINT
(Q) SHEAR STABILITY OF FINAL LEVEE SECTION
STA. 430+00 TO STA. 659+00
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
JUNE 1972 FILE NO. H-2-25975

PLATE 40



(SEE PLATE 52 FOR PLAN DRAWING AT PIPELINE RELOCATIONS.)

GENERAL NOTES

CLASSIFICATION, STRATIFICATION, SHEAR STRENGTHS, AND UNIT WEIGHTS OF THE SOIL WERE BASED ON THE RESULTS OF THE UNDISTURBED BORINGS, SEE COMPOSITE OF BORINGS 2-ULN AND 3-ULN

SHEAR STRENGTHS BETWEEN VERTICALS 1 AND 2 WERE ASSUMED TO VARY LINEARLY BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

STRATUM NO.	SOIL TYPE	EFFECTIVE UNIT WT. P.C.F.		C - UNIT COHESION - P.S.F.				FRICTION ANGLE
				CENTER OF STRATUM		BOTTOM OF STRATUM		
		VERT. 1	VERT. 2	VERT. 1	VERT. 2	VERT. 1	VERT. 2	DEGREES
1	CH	100.0	100.0	800.0	800.0	800.0	800.0	0.
2	CH	98.0	98.0	800.0	800.0	800.0	800.0	0.
3	SP	122.0	122.0	0.	0.	0.	0.	38.0
4	SP	60.0	60.0	0.	0.	0.	0.	38.0
5	ML	117.0	117.0	200.0	200.0	200.0	200.0	15.0
6	CHO	15.0	15.0	120.0	120.0	120.0	120.0	0.
7	CH	98.0	98.0	150.0	150.0	150.0	150.0	0.
8	CH	98.0	98.0	180.0	180.0	180.0	180.0	0.
9	CH	98.0	98.0	160.0	160.0	160.0	160.0	0.
10	CH	98.0	98.0	255.0	255.0	290.0	290.0	0.
11	CH	98.0	98.0	405.0	405.0	460.0	460.0	0.
12	CH	98.0	98.0	590.0	590.0	600.0	600.0	0.
13	SP	60.0	60.0	0.	0.	0.	0.	38.0

COMPOSITE OF BORINGS 2&3-ULN

ASSUMED FAILURE SURFACE		RESISTING FORCES			DRIVING FORCES		SUMMATION OF FORCES		FACTOR OF SAFETY*
NO.	ELEV.	R_A	R_B	R_P	D_A	$-D_P$	RESISTING	DRIVING	
Ⓐ ①	-15.00	28184	51200	2978	40199	1490	82362	38769	1.609
Ⓐ ②	-15.00	28184	55200	1660	40199	617	85044	39582	1.644
Ⓑ ①	-15.00	8595	19600	2978	11629	1490	26174	10122	2.470
Ⓑ ②	-15.00	8595	17600	1660	11629	617	27675	11005	2.583
Ⓒ ①	-15.00	7261	4800	2978	5982	1490	15040	4551	3.304
Ⓒ ②	-15.00	7261	8800	1660	5982	617	17741	5984	3.307
Ⓓ ①	-22.00	31522	55100	6324	57954	4584	92946	53570	1.742
Ⓓ ②	-22.00	31522	55250	5250	57954	2574	102022	55580	1.836
Ⓔ ①	-22.00	12921	29200	6324	20349	4584	41845	15765	2.654
Ⓔ ②	-22.00	12921	33950	5250	20349	2874	50921	17975	2.833
Ⓕ ①	-22.00	10677	7260	6324	11691	4584	24151	7047	3.427
Ⓕ ②	-22.00	10577	17400	5250	11691	2874	33227	8257	3.689
Ⓢ ①	-47.00	58705	99000	30077	190892	34918	176765	96576	1.831

NOTES

Φ -- ANGLE OF INTERNAL FRICTION, DEGREES
C -- UNIT COHESION, P.S.F.
℄ -- STATIC WATER SURFACE
D -- HORIZONTAL DRIVING FORCE IN POUNDS
R -- HORIZONTAL RESISTING FORCE IN POUNDS
A -- AS A SUBSCRIPT, REFERS TO ACTIVE WEDGE
B -- AS A SUBSCRIPT, REFERS TO CENTRAL BLOCK
P -- AS A SUBSCRIPT, REFERS TO PASSIVE WEDGE

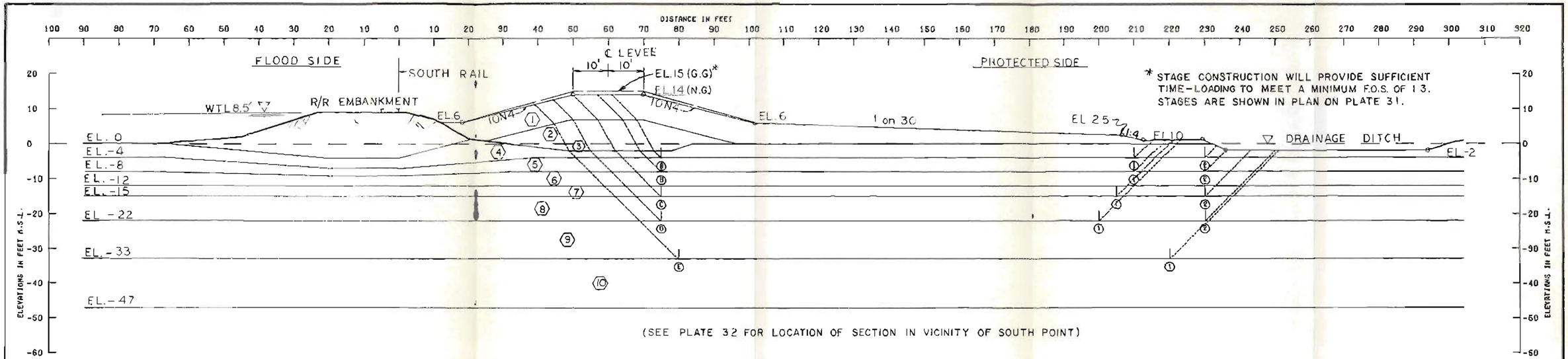
FACTOR OF SAFETY = $\frac{R_A + R_B + R_P}{D_A - D_P}$

* MINIMUM OF 1.50 REQUIRED, SEE TEXT

SEE NOTE ON PLATE 52 RELATIVE TO OVERBUILDING LEVEE CROWN.

LAKE PONTCHARTRAIN, LA AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2-GENERAL DESIGN
SUPPLEMENT NO.5A
NEW ORLEANS EAST LAKEFRONT LEVEE
PARIS ROAD TO SOUTH POINT
(Q) SHEAR STABILITY OF FINAL LEVEE SECTION ALONG RELOCATED PIPELINES
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
JUNE 1972 FILE NO. II-2-25979

PLATE 41



(SEE PLATE 32 FOR LOCATION OF SECTION IN VICINITY OF SOUTH POINT)

GENERAL NOTES

CLASSIFICATION, STRATIFICATION, SHEAR STRENGTHS, AND UNIT WEIGHTS OF THE SOIL WERE BASED ON THE RESULTS OF THE UNDISTURBED BORINGS, SEE BORINGS 2 & 3 ULN

SHEAR STRENGTHS BETWEEN VERTICALS 1 AND 2 WERE ASSUMED TO VARY LINEARLY BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

STRATUM NO.	SOIL TYPE	EFFECTIVE UNIT WT. P.C.F. VERT. 1	EFFECTIVE UNIT WT. P.C.F. VERT. 2	C - UNIT COHESION - P.S.F. CENTER OF STRATUM VERT. 1	C - UNIT COHESION - P.S.F. CENTER OF STRATUM VERT. 2	C - UNIT COHESION - P.S.F. BOTTOM OF STRATUM VERT. 1	C - UNIT COHESION - P.S.F. BOTTOM OF STRATUM VERT. 2	FRICTION ANGLE DEGREES
1	CH	100.0	100.0	300.0	300.0	300.0	300.0	0.0
2	SP	122.0	122.0	0.0	0.0	0.0	0.0	33.0
3	SP	60.0	60.0	0.0	0.0	0.0	0.0	33.0
4	CHO	15.0	15.0	120.0	120.0	120.0	120.0	0.0
5	CH	53.0	53.0	150.0	150.0	150.0	150.0	0.0
6	CH	53.0	53.0	180.0	180.0	180.0	180.0	0.0
7	CH	53.0	53.0	160.0	160.0	160.0	160.0	0.0
8	CH	53.0	53.0	225.0	225.0	290.0	290.0	0.0
9	CH	43.0	43.0	405.0	405.0	460.0	460.0	0.0
10	CH	43.0	43.0	530.0	530.0	600.0	600.0	0.0

COMPOSITE OF BORINGS 2 & 3-ULN

255 ?

ASSUMED FAILURE NO.	ASSUMED SURFACE ELEV.	RESISTING FORCES R_A	R_B	R_P	DRIVING FORCES D_B	$-D_P$	SUMMATION OF FORCES RESISTING	DRIVING	FACTOR OF SAFETY
Ⓐ ①	-4.00	12946	16200	1560	16486	682	30106	15774	1.909
Ⓐ ②	-4.00	12345	18600	800	16456	209	31745	16246	1.954
Ⓑ ①	-8.00	13726	20250	2760	23653	1685	36736	22068	1.665
Ⓑ ②	-8.00	13726	23250	1650	23653	633	38656	23020	1.679
Ⓒ ①	-15.00	16126	20800	5160	37314	6080	42086	32234	1.305
Ⓒ ②	-15.00	16126	24600	4080	37314	2574	46006	34740	1.296
Ⓓ ①	-22.00	16449	36250	8310	62119	10374	63009	41745	1.509
Ⓓ ②	-22.00	16449	44850	7230	62119	6133	70629	45986	1.536
Ⓔ ①	-33.00	25891	64400	16140	77026	16696	106531	60130	1.772

NOTES

ϕ -- ANGLE OF INTERNAL FRICTION, DEGREES
C -- UNIT COHESION, P.S.F.
▽ -- STATIC WATER SURFACE
D -- HORIZONTAL DRIVING FORCE IN POUNDS
R -- HORIZONTAL RESISTING FORCE IN POUNDS
A -- AS A SUBSCRIPT, REFERS TO ACTIVE WEDGE
B -- AS A SUBSCRIPT, REFERS TO CENTRAL BLOCK
P -- AS A SUBSCRIPT, REFERS TO PASSIVE WEDGE

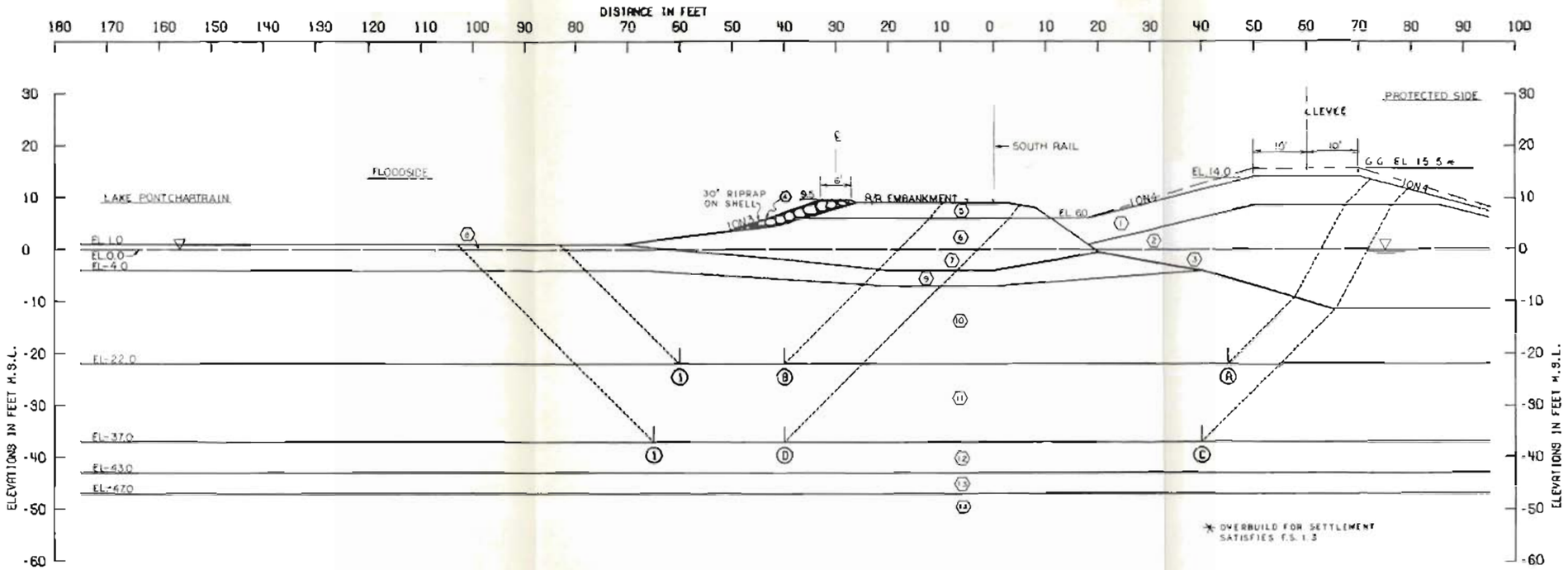
FACTOR OF SAFETY = $\frac{R_A + R_B + R_P}{D_B - D_P}$

LAKE PONTCHARTRAIN, LA AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO 2-GENERAL DESIGN
SUPPLEMENT NO.5B
NEW ORLEANS EAST LAKEFRONT LEVEE
PARIS ROAD TO SOUTH POINT

(Q) SHEAR STABILITY AT LEVEE STA.659+40

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
JUNE 1972
FILE NO. M-2-23975

PLATE 42



GENERAL NOTES

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

SHEAR STRENGTHS BETWEEN VERTICALS 1 AND 2 WERE ASSUMED TO VARY LINEARLY BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

STRATUM NO.	SOIL TYPE	EFFECTIVE UNIT WT. P.C.F.		C - UNIT COHESION - P.S.F.				FRICTION ANGLE DEGREES
				CENTER OF STRATUM		BOTTOM OF STRATUM		
		VERT. 1	VERT. 2	VERT. 1	VERT. 2	VERT. 1	VERT. 2	
1	CH	100.0	100.0	300.0	300.0	300.0	300.0	0.0
2	SP	122.0	122.0	0.0	0.0	0.0	0.0	33.0
3	SP	60.0	60.0	0.0	0.0	0.0	0.0	33.0
4	RIPRAP	122.0	122.0	0.0	0.0	0.0	0.0	40.0
5	ML	117.0	117.0	200.0	200.0	200.0	200.0	15.0
6	CH	96.0	96.0	400.0	400.0	400.0	400.0	0.0
7	CH	99.0	99.0	400.0	400.0	400.0	400.0	0.0
8	CHO	77.0	77.0	900.0	900.0	900.0	900.0	0.0
9	CHO	15.0	15.0	900.0	900.0	900.0	900.0	0.0
10	CH	99.0	99.0	400.0	400.0	400.0	400.0	0.0
11	CH	49.0	49.0	475.0	476.0	550.0	550.0	0.0
12	CH	60.0	60.0	1200.0	1200.0	1200.0	1200.0	0.0
13	SH	60.0	60.0	0.0	0.0	0.0	0.0	39.0
14	CH	98.0	98.0	800.0	800.0	800.0	800.0	0.0

BORING PLAN

ASSUMED FAILURE NO.	ASSUMED SURFACE ELEV.	RESISTING FORCES R_A	R_B	R_P	DRIVING FORCES D_B	$-D_P$	SUMMATION OF FORCES RESISTING	DRIVING	FACTOR OF SAFETY
(A) (1)	-22.00	31710	42000	17400	56710	9079	91110	47637	1.913
(B) (1)	-22.00	22959	8000	17400	31461	9079	48359	22388	2.160
(C) (1)	-37.00	45804	67750	91650	96703	24818	135204	72385	1.868
(D) (1)	-37.00	36994	15750	91650	60084	24818	82394	35766	2.304

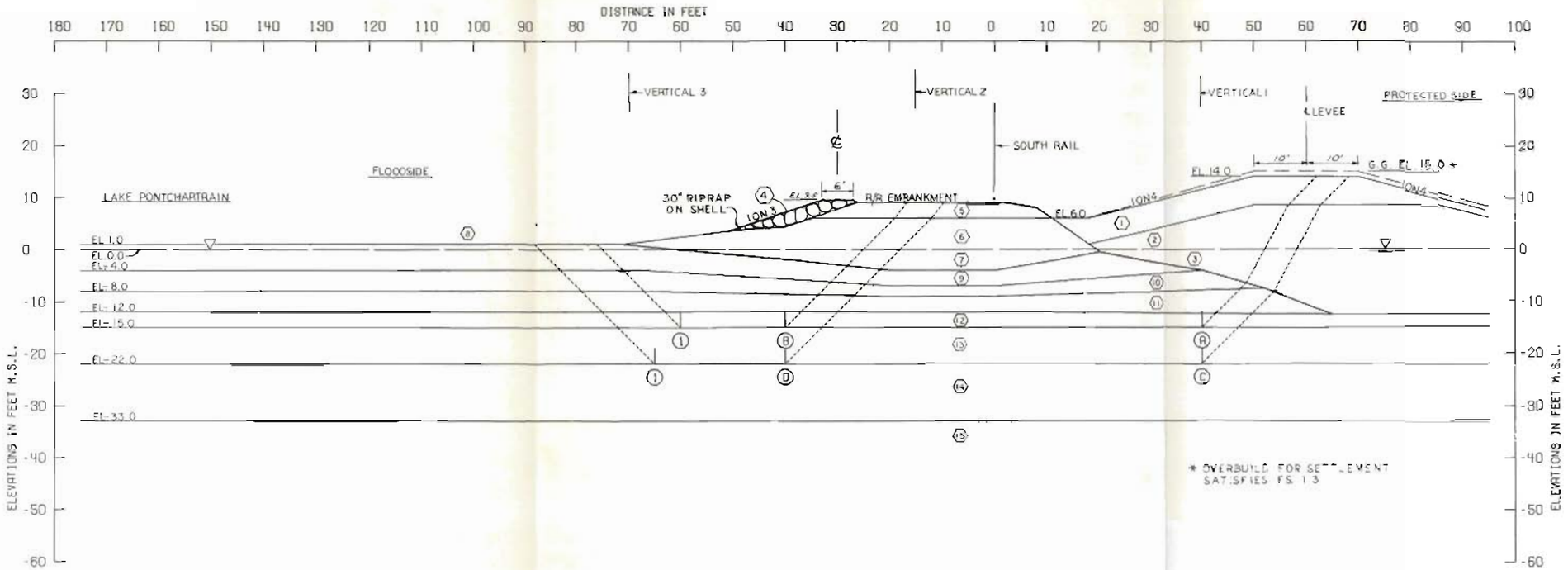
NOTES

Φ -- ANGLE OF INTERNAL FRICTION, DEGREES
C -- UNIT COHESION, P.S.F.
$\underline{\mathcal{Q}}$ -- STATIC WATER SURFACE
D -- HORIZONTAL DRIVING FORCE IN POUNDS
R -- HORIZONTAL RESISTING FORCE IN POUNDS
A -- AS A SUBSCRIPT, REFERS TO ACTIVE WEDGE
B -- AS A SUBSCRIPT, REFERS TO CENTRAL BLOCK
P -- AS A SUBSCRIPT, REFERS TO PASSIVE WEDGE

$$\text{FACTOR OF SAFETY} = \frac{R_B + R_B + R_P}{D_B \cdot D_P}$$

LAKE PONTCHARTRAIN, LA AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2-GENERAL DESIGN
SUPPLEMENT NO. 58
NEW ORLEANS EAST LAKEFRONT LEVEE
PARIS ROAD TO SOUTH POINT
(Q) SHEAR STABILITY
OF LEVEE-FLOODSIDE
STA. 332+45 TO STA. 430+00
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
JUNE 1972
FILE NO. H-2-25975

PLATE 43



GENERAL NOTES

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

SHEAR STRENGTHS BETWEEN VERTICALS 1,2,&3 WERE ASSUMED TO VARY LINEARLY BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

STRATUM NO.	SOIL TYPE	EFFECTIVE UNIT WT. P.C.F.		C - UNIT COHESION - P.S.F.				FRICTION ANGLE
				CENTER OF STRATUM		BOTTOM OF STRATUM		
		VERT.1&3	VERT. 2	VERT.1&3	VERT. 2	VERT.1&3	VERT. 2	DEGREES
①	CH	100.0	100.0	300.0	300.0	300.0	300.0	0.0
②	SP	122.0	122.0	0.0	0.0	0.0	0.0	33.0
③	SP	60.0	60.0	0.0	0.0	0.0	0.0	33.0
④	RIPRAP	122.0	122.0	0.0	0.0	0.0	0.0	40.0
⑤	ML	117.0	117.0	200.0	200.0	200.0	200.0	15.0
⑥	CH	95.0	95.0	350.0	350.0	350.0	350.0	0.0
⑦	CH	33.0	33.0	350.0	350.0	350.0	350.0	0.0
⑧	CHO	77.0	77.0	120.0	275.0	120.0	275.0	0.0
⑨	CHO	15.0	15.0	120.0	275.0	120.0	275.0	0.0
⑩	CH	33.0	33.0	150.0	275.0	150.0	275.0	0.0
⑪	CH	33.0	33.0	180.0	275.0	180.0	275.0	0.0
⑫	CH	33.0	33.0	160.0	275.0	160.0	275.0	0.0
⑬	CH	33.0	33.0	255.0	305.0	290.0	355.0	0.0
⑭	CH	49.0	49.0	405.0	405.0	460.0	460.0	0.0
⑮	CH	49.0	49.0	530.0	530.0	600.0	600.0	0.0

BASED ON BORINGS 2&3-U.L.N

ASSUMED FAILURE SURFACE		RESISTING FORCES			DRIVING FORCES		SUMMATION OF FORCES		FACTOR OF SAFETY
NO.	ELEV.	R_A	R_B	R_P	D_A	$-D_P$	RESISTING	DRIVING	
Ⓐ ①	-15.00	20695	22220	4994	36346	4767	33579	47909	1.427
Ⓑ ①	-15.00	13079	4036	4994	21120	4767	22109	16353	1.352
Ⓒ ①	-22.00	26209	34010	8389	55135	8521	68608	46614	1.471
Ⓓ ①	-22.00	17562	7767	8389	31461	8521	33718	22940	1.470

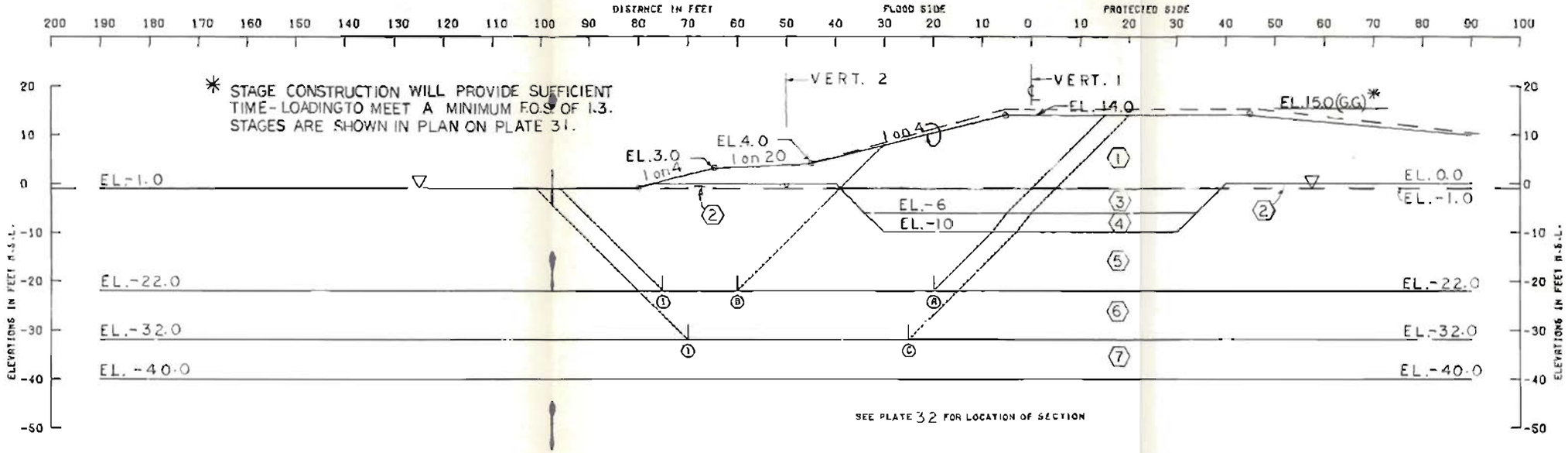
NOTES

ϕ -- ANGLE OF INTERNAL FRICTION, DEGREES
C -- UNIT COHESION, P.S.F.
∇ -- STATIC WATER SURFACE
D -- HORIZONTAL DRIVING FORCE IN POUNDS
R -- HORIZONTAL RESISTING FORCE IN POUNDS
A -- AS A SUBSCRIPT, REFERS TO ACTIVE WEDGE
B -- AS A SUBSCRIPT, REFERS TO CENTRAL BLOCK
P -- AS A SUBSCRIPT, REFERS TO PASSIVE WEDGE

$$\text{FACTOR OF SAFETY} = \frac{R_A + R_B + R_P}{D_A - D_P}$$

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2-GENERAL DESIGN
SUPPLEMENT NO. 5B
NEW ORLEANS EAST LAKEFRONT LEVEE
PARIS ROAD TO SOUTH POINT
(Q) SHEAR STABILITY OF LEVEE-FLOODSIDE
STA. 430+00 TO STA. 661+60
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
JUNE 1972 FILE NO. H-2-20975

PLATE 44



SEE PLATE 32 FOR LOCATION OF SECTION

GENERAL NOTES

CLASSIFICATION, STRATIFICATION, SHEAR STRENGTHS, AND UNIT WEIGHTS OF THE SOIL WERE BASED ON THE RESULTS OF THE UNDISTURBED BORINGS. SEE BORING DATA PLATES 9 USP AND 6 USPT

SHEAR STRENGTHS BETWEEN VERTICALS 1 AND 2 WERE ASSUMED TO VARY LINEARLY BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

BORING 9-USP (VERTICAL 1)
BORING 6-USPT (VERTICAL 2)

STRATUM NO.	SOIL TYPE	EFFECTIVE UNIT WT., P.C.F.		C - UNIT COHESION - P.S.F.				FRICTION ANGLE DEGREES
				CENTER OF STRATUM		BOTTOM OF STRATUM		
		VERT. 1	VERT. 2	VERT. 1	VERT. 2	VERT. 1	VERT. 2	
1	CH	117.0	117.0	500.0	500.0	500.0	500.0	0.0
2	CH	102.0	102.0	300.0	300.0	300.0	300.0	0.0
3	CL	55.0	55.0	500.0	500.0	500.0	500.0	0.0
4	ML	55.0	55.0	200.0	200.0	200.0	200.0	15.0
5	CH	40.0	40.0	500.0	300.0	500.0	300.0	0.0
6	CH	40.0	40.0	550.0	350.0	600.0	400.0	0.0
7	CH	55.0	55.0	1000.0	1000.0	1000.0	1000.0	0.0

C 400 C 440

ASSUMED FAILURE SURFACE NO.		ELEV.	RESISTING FORCES R_A	R_B	R_P	DRIVING FORCES D_A	$-D_P$	SUMMATION OF FORCES RESISTING	DRIVING	FACTOR OF SAFETY
A	1	-22.00	35374	18300	12600	57745	9282	66234	48463	1.367
B	1	-22.00	21351	4500	12600	23867	9282	38451	14685	2.618
C	1	-32.00	45284	18250	18600	84527	20848	84134	63879	1.321

NOTES

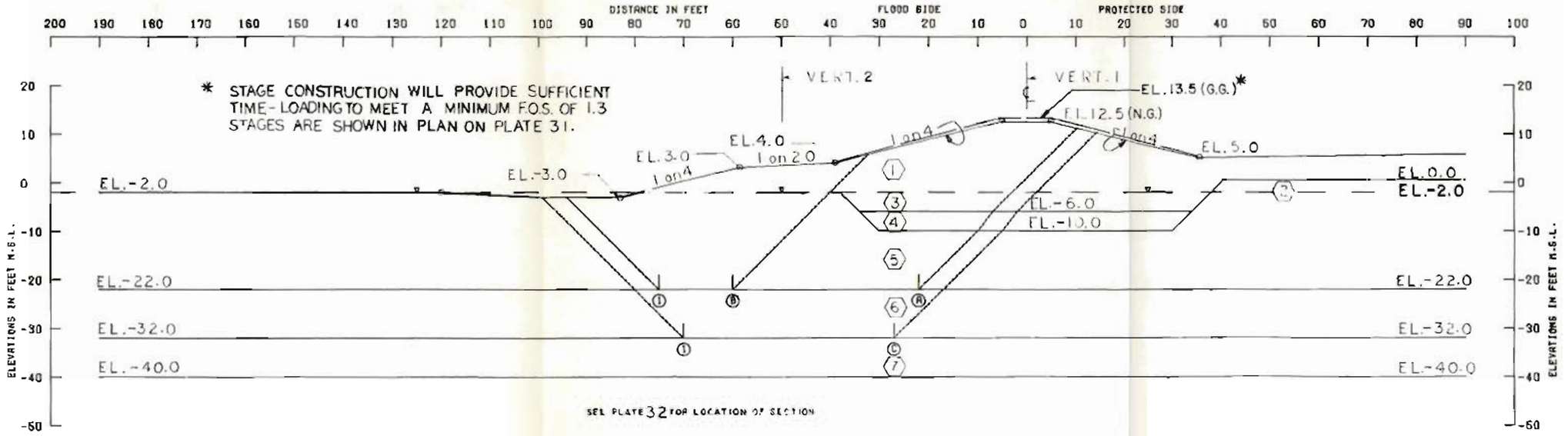
Φ -- ANGLE OF INTERNAL FRICTION, DEGREES
C -- UNIT COHESION, P.S.F.
∇ -- STATIC WATER SURFACE
D -- HORIZONTAL DRIVING FORCE IN POUNDS
R -- HORIZONTAL RESISTING FORCE IN POUNDS
A -- AS A SUBSCRIPT, REFERS TO ACTIVE WEDGE
B -- AS A SUBSCRIPT, REFERS TO CENTRAL BLOCK
P -- AS A SUBSCRIPT, REFERS TO PASSIVE WEDGE

FACTOR OF SAFETY = $\frac{R_A + R_B + R_P}{D_A - D_P}$

LAKE PONTCHARTRAIN, LA AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO 2-GENERAL DESIGN
SUPPLEMENT NO.5B
NEW ORLEANS EAST LAKEFRONT LEVEE
PARIS ROAD TO SOUTH POINT

LEVEE (Q) SHEAR STABILITY STA. 662+65

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
JUNE 1972
FILE NO. H-2-25975



GENERAL NOTES

CLASSIFICATION, STRATIFICATION, SHEAR STRENGTHS, AND UNIT WEIGHTS OF THE SOIL WERE BASED ON THE RESULTS OF THE UNDISTURBED BORINGS, SEE BORING DATA PLATES. 9 USP AND 6 USPT

SHEAR STRENGTHS BETWEEN VERTICALS 1 AND 2 WERE ASSUMED TO VARY LINEARLY BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

BORING 9-USP (VERTICAL 1)
BORING 6-USPT (VERTICAL 2)

STRATUM NO.	SOIL TYPE	EFFECTIVE UNIT WT. P.C.F. VERT. 1	EFFECTIVE UNIT WT. P.C.F. VERT. 2	C - UNIT COHESION - P.S.F. CENTER OF STRATUM VERT. 1	C - UNIT COHESION - P.S.F. CENTER OF STRATUM VERT. 2	C - UNIT COHESION - P.S.F. BOTTOM OF STRATUM VERT. 1	C - UNIT COHESION - P.S.F. BOTTOM OF STRATUM VERT. 2	FRICTION ANGLE DEGREES
1	CH	117.0	117.0	500.0	500.0	500.0	500.0	0.0
2	CH	102.0	102.0	500.0	300.0	500.0	300.0	0.0
3	CL	55.0	55.0	500.0	500.0	500.0	500.0	0.0
4	ML	55.0	55.0	200.0	200.0	200.0	200.0	15.0
5	CH	40.0	40.0	500.0	300.0	500.0	300.0	0.0
6	CH	40.0	40.0	550.0	350.0	600.0	400.0	0.0
7	CH	55.0	55.0	1000.0	1000.0	1000.0	1000.0	0.0

ASSUMED FAILURE NO.	ASSUMED SURFACE ELEV.	RESISTING FORCES R_A	R_B	R_P	DRIVING FORCES D_A	$-D_P$	SUMMATION OF FORCES RESISTING	DRIVING	FACTOR OF SAFETY
(A) (1)	-22.00	32070	17488	11480	51347	7690	60947	43657	1.398
(B) (1)	-22.00	19667	4500	11400	23338	7690	35567	15648	2.273
(C) (1)	-32.00	40992	18258	18400	76722	18498	77650	57284	1.356

NOTES

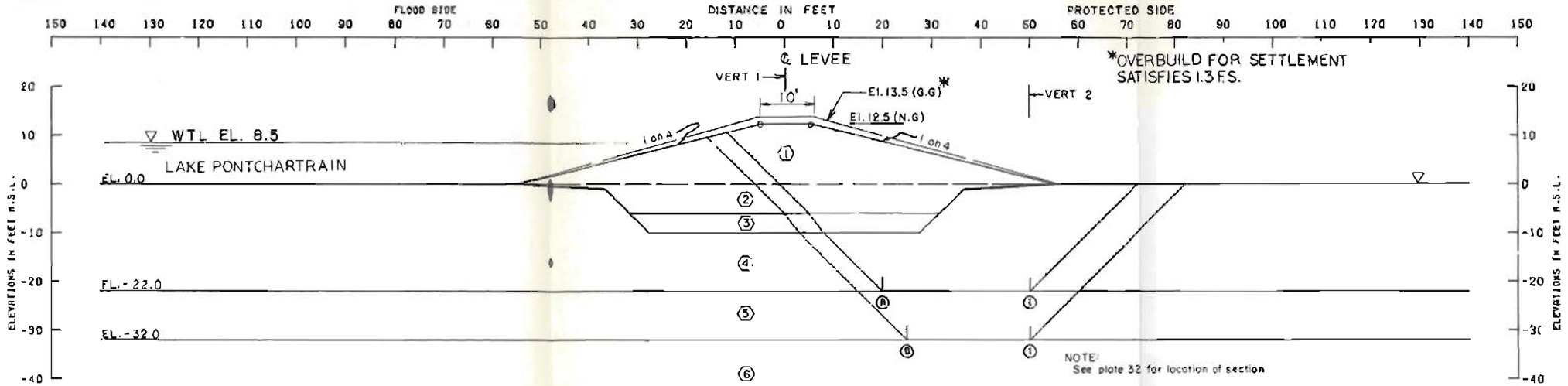
ϕ -- ANGLE OF INTERNAL FRICTION, DEGREES
C -- UNIT COHESION, P.S.F.
∇ -- STATIC WATER SURFACE
D -- HORIZONTAL DRIVING FORCE IN POUNDS
R -- HORIZONTAL RESISTING FORCE IN POUNDS
A -- AS A SUBSCRIPT, REFERS TO ACTIVE WEDGE
B -- AS A SUBSCRIPT, REFERS TO CENTRAL BLOCK
P -- AS A SUBSCRIPT, REFERS TO PASSIVE WEDGE

FACTOR OF SAFETY = $\frac{R_A + R_B - R_P}{D_A - D_P}$

LAKE PONTCHARTRAIN, LA AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO 2-GENERAL DESIGN
SUPPLEMENT NO.5B
NEW ORLEANS EAST LAKEFRONT LEVEE
PARIS ROAD TO SOUTH POINT

LEVEE (Q) SHEAR STABILITY
STA 662+90

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
JUNE 1972
FILE NO. M-2-25973



LEVEE SECTION AT
STATION 664 + 50

GENERAL NOTES

CLASSIFICATION, STRATIFICATION, SHEAR STRENGTHS, AND UNIT WEIGHTS OF THE SOIL WERE BASED ON THE RESULTS OF THE UNDISTURBED BORINGS. SEE BORINGS 9-USP & 6-USPT

SHEAR STRENGTHS BETWEEN VERTICALS 1 AND 2 WERE ASSUMED TO VARY LINEARLY BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

STRATUM NO.	SOIL TYPE	EFFECTIVE UNIT WT. P.C.F.		C - UNIT COHESION - P.S.F.				FRICTION ANGLE
				CENTER OF STRATUM		BOTTOM OF STRATUM		
		VERT. 1	VERT. 2	VERT. 1	VERT. 2	VERT. 1	VERT. 2	DEGREES
①	CL	117.0	117.0	500.0	500.0	500.0	500.0	0.0
②	CL	55.0	55.0	500.0	500.0	500.0	500.0	0.0
③	ML	55.0	55.0	200.0	200.0	200.0	200.0	15.0
④	CH	40.0	40.0	500.0	300.0	500.0	300.0	0.0
⑤	CH	40.0	40.0	550.0	350.0	600.0	400.0	0.0
⑥	CL	55.0	55.0	1000.0	1000.0	1000.0	1000.0	0.0

BORINGS 9-USP & 6-USPT
VERT. 1 VERT. 2

ASSUMED FAILURE SURFACE		RESISTING FORCES			DRIVING FORCES		SUMMATION OF FORCES		FACTOR OF SAFETY
NO.	ELEV.	R_A	R_B	R_P	D_A	$-D_P$	RESISTING	DRIVING	
Ⓐ ①	-22.00	31720	10800	13200	48351	10037	55720	38314	1.418
Ⓑ ①	-32.00	40660	11250	20200	72451	20636	72130	51616	1.397

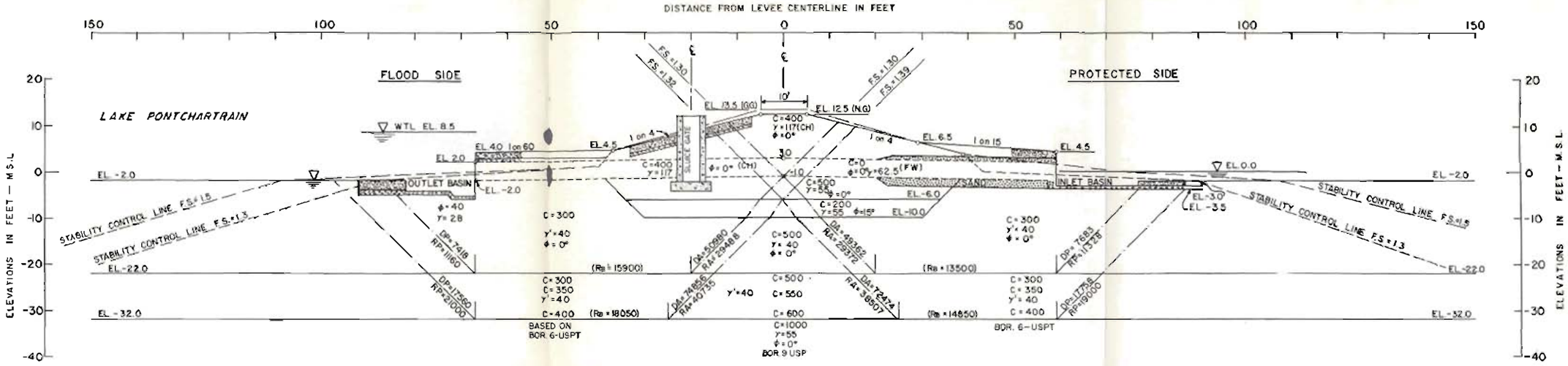
NOTES

ϕ -- ANGLE OF INTERNAL FRICTION, DEGREES
C -- UNIT COHESION, P.S.F.
∇ -- STATIC WATER SURFACE
D -- HORIZONTAL DRIVING FORCE IN POUNDS
R -- HORIZONTAL RESISTING FORCE IN POUNDS
A -- AS A SUBSCRIPT, REFERS TO ACTIVE WEDGE
B -- AS A SUBSCRIPT, REFERS TO CENTRAL BLOCK
P -- AS A SUBSCRIPT, REFERS TO PASSIVE WEDGE

FACTOR OF SAFETY = $\frac{R_P + R_B + R_P}{D_A - D_P}$

LAKE PONTCHARTRAIN, LA AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2-GENERAL DESIGN
SUPPLEMENT NO 5B
NEW ORLEANS EAST LAKEFRONT LEVEE
PARIS ROAD TO SOUTH POINT
(Q) SHEAR STABILITY OF FINAL LEVEE AT STATION 664+50
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
JUNE 1972
FILE NO. H-2-25975

PLATE 47



LEVEE CONFIGURATION AT STA. 665+00 (ALONG ℄ CULVERT)

NOTES:
FOR DRAINAGE CULVERT DETAILS SEE PLATE NO. 34
FOR GENERAL NOTES SEE PLATE NO. 35
* MEETS A MINIMUM FACTOR OF SAFETY OF 1.3, INCLUDING THE INLET AND OUTLET BASINS AS A SURCHARGE

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 5B

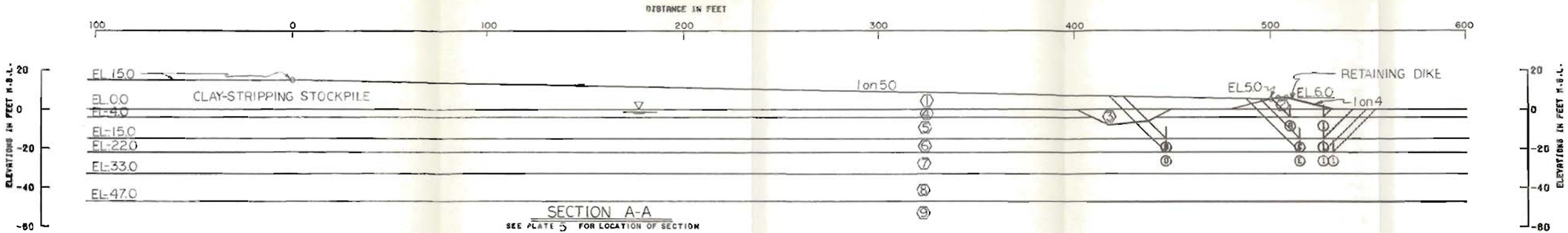
NEW ORLEANS EAST LAKEFRONT LEVEE
PARIS ROAD TO SOUTH POINT

DRAINAGE STRUCTURE AT STA. 665+00
LEVEE (Q) SHEAR STABILITY

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

JUNE 1972 FILE NO. H-2-25975

PLATE 48



GENERAL NOTES

CLASSIFICATION, STRATIFICATION, SHEAR STRENGTHS, AND UNIT WEIGHTS OF THE SOIL WERE BASED ON THE RESULTS OF THE UNDISTURBED BORINGS. SEE BORING 3-ULN DATA PLATE 13

SHEAR STRENGTHS BETWEEN VERTICALS 1 AND 2 WERE ASSUMED TO VARY LINEARLY BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

STRATUM NO.	SOIL TYPE	EFFECTIVE UNIT WT. P.C.F.		C - UNIT COHESION - P.S.F.				FRICTION ANGLE
				CENTER OF STRATUM		BOTTOM OF STRATUM		
		VERT. 1	VERT. 2	VERT. 1	VERT. 2	VERT. 1	VERT. 2	DEGREES
①	CH	85.0	95.0	50.0	50.0	50.0	50.0	0.0
②	CH	77.0	77.0	120.0	120.0	120.0	120.0	0.0
③	CH	33.0	33.0	50.0	50.0	50.0	50.0	0.0
④	CH	15.0	15.0	150.0	150.0	150.0	150.0	0.0
⑤	CH	33.0	33.0	150.0	150.0	150.0	150.0	0.0
⑥	CL	43.0	43.0	185.0	185.0	220.0	220.0	0.0
⑦	SP	60.0	60.0	0.0	0.0	0.0	0.0	33.0
⑧	CH	43.0	43.0	500.0	500.0	570.0	570.0	0.0
⑨	SP	80.0	60.0	0.0	0.0	0.0	0.0	33.0

BORING 3-ULN

ASSUMED FAILURE SURFACE NO.		ASSUMED FAILURE SURFACE ELEV.	RESISTING FORCES R_A	R_B	R_P	DRIVING FORCES D_B	$-D_P$	SUMMATION OF FORCES RESISTING	DRIVING	FACTOR OF SAFETY
Ⓐ	①	-4.00	2448	2550	1248	3195	352	6248	2842	2.198
Ⓑ	①	-15.00	3949	12000	4600	14415	3015	20449	11400	1.794
Ⓒ	①	-15.00	5570	1800	4500	10115	3015	11870	7101	1.672
Ⓓ	①	-22.00	8428	17600	7090	23298	7028	31116	16270	1.913
Ⓔ	①	-22.00	7979	3740	7090	17156	6788	18809	10369	1.814

NOTES

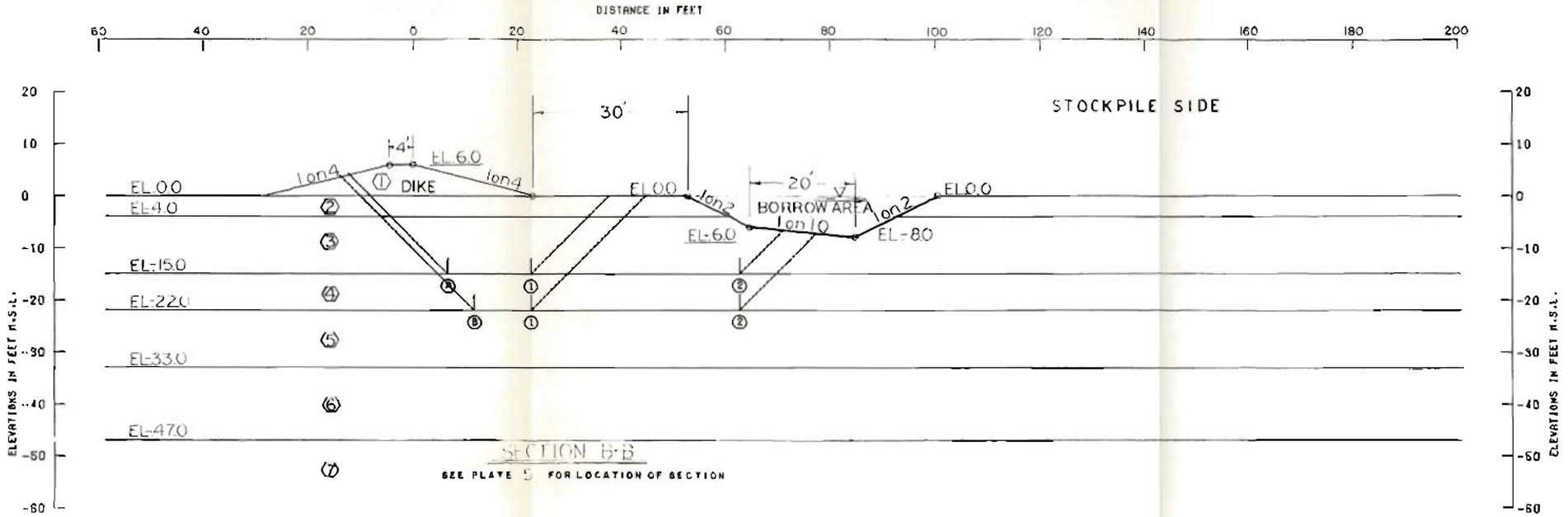
ϕ — ANGLE OF INTERNAL FRICTION, DEGREES
C — UNIT COHESION, P.S.F.
∇ — STATIC WATER SURFACE
D — HORIZONTAL DRIVING FORCE IN POUNDS
R — HORIZONTAL RESISTING FORCE IN POUNDS
A — AS A SUBSCRIPT, REFERS TO ACTIVE WEDGE
B — AS A SUBSCRIPT, REFERS TO CENTRAL BLOCK
P — AS A SUBSCRIPT, REFERS TO PASSIVE WEDGE

FACTOR OF SAFETY = $\frac{R_P + R_B > \overline{D_P}}{D_P - D_P}$

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2-GENERAL DESIGN
SUPPLEMENT NO. 5B
NEW ORLEANS EAST LAKEFRONT LEVEE
PARIS ROAD TO SOUTH POINT

(Q) SHEAR STABILITY OF CLAY STOCKPILE AREA

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
JUNE 1972
FILE NO. H-2-25975



GENERAL NOTES

CLASSIFICATION, STRATIFICATION, SHEAR STRENGTHS, AND UNIT WEIGHTS OF THE SOIL WERE BASED ON THE RESULTS OF THE UNDISTURBED BORINGS. SEE BORING 3 - ULN DATA PLATE 13

SHEAR STRENGTHS BETWEEN VERTICALS 1 AND 2 WERE ASSUMED TO VARY LINEARLY BETWEEN THE VALUES INDICATED FOR THESE LOCATIONS.

STRATUM NO.	SOIL TYPE	EFFECTIVE UNIT WT. P.C.F.		C - UNIT COHESION - P.S.F. CENTER OF STRATUM		C - UNIT COHESION - P.S.F. BOTTOM OF STRATUM		FRICTION ANGLE
		VERT. 1	VERT. 2	VERT. 1	VERT. 2	VERT. 1	VERT. 2	DEGREES
⟨1⟩	CH	77.0	77.0	120.0	120.0	120.0	120.0	0.0
⟨2⟩	CH	15.0	15.0	150.0	150.0	150.0	150.0	0.0
⟨3⟩	CH	33.0	33.0	150.0	150.0	150.0	150.0	0.0
⟨4⟩	CL	43.0	43.0	185.0	185.0	220.0	220.0	0.0
⟨5⟩	SP	60.0	60.0	0.0	0.0	0.0	0.0	33.0
⟨6⟩	CH	43.0	43.0	500.0	500.0	570.0	570.0	0.0
⟨7⟩	SP	60.0	60.0	0.0	0.0	0.0	0.0	33.0

BORING 3-ULN

ASSUMED FAILURE NO.	ASSUMED SURFACE ELEV.	RESISTING FORCES R_A	R_B	R_P	DRIVING FORCES D_A	$-D_P$	SUMMATION OF FORCES RESISTING	DRIVING	FACTOR OF SAFETY
Ⓐ ①	-15.00	5508	2400	4500	9856	2775	12408	7082	1.752
Ⓐ ②	-15.00	5508	8400	2509	9856	1295	16417	8562	1.918
Ⓑ ①	-22.00	8002	2420	7090	15787	6788	17512	8999	1.946
Ⓑ ②	-22.00	8002	11220	4908	15787	4206	24130	11582	2.083

NOTES

ϕ -- ANGLE OF INTERNAL FRICTION, DEGREES
C — UNIT COHESION, P.S.F.
∇ — STATIC WATER SURFACE
D -- HORIZONTAL DRIVING FORCE IN POUNDS
R -- HORIZONTAL RESISTING FORCE IN POUNDS
A -- AS A SUBSCRIPT, REFERS TO ACTIVE WEDGE
B -- AS A SUBSCRIPT, REFERS TO CENTRAL BLOCK
P -- AS A SUBSCRIPT, REFERS TO PASSIVE WEDGE

FACTOR OF SAFETY = $\frac{R_A + R_B + R_P}{D_A - D_P}$

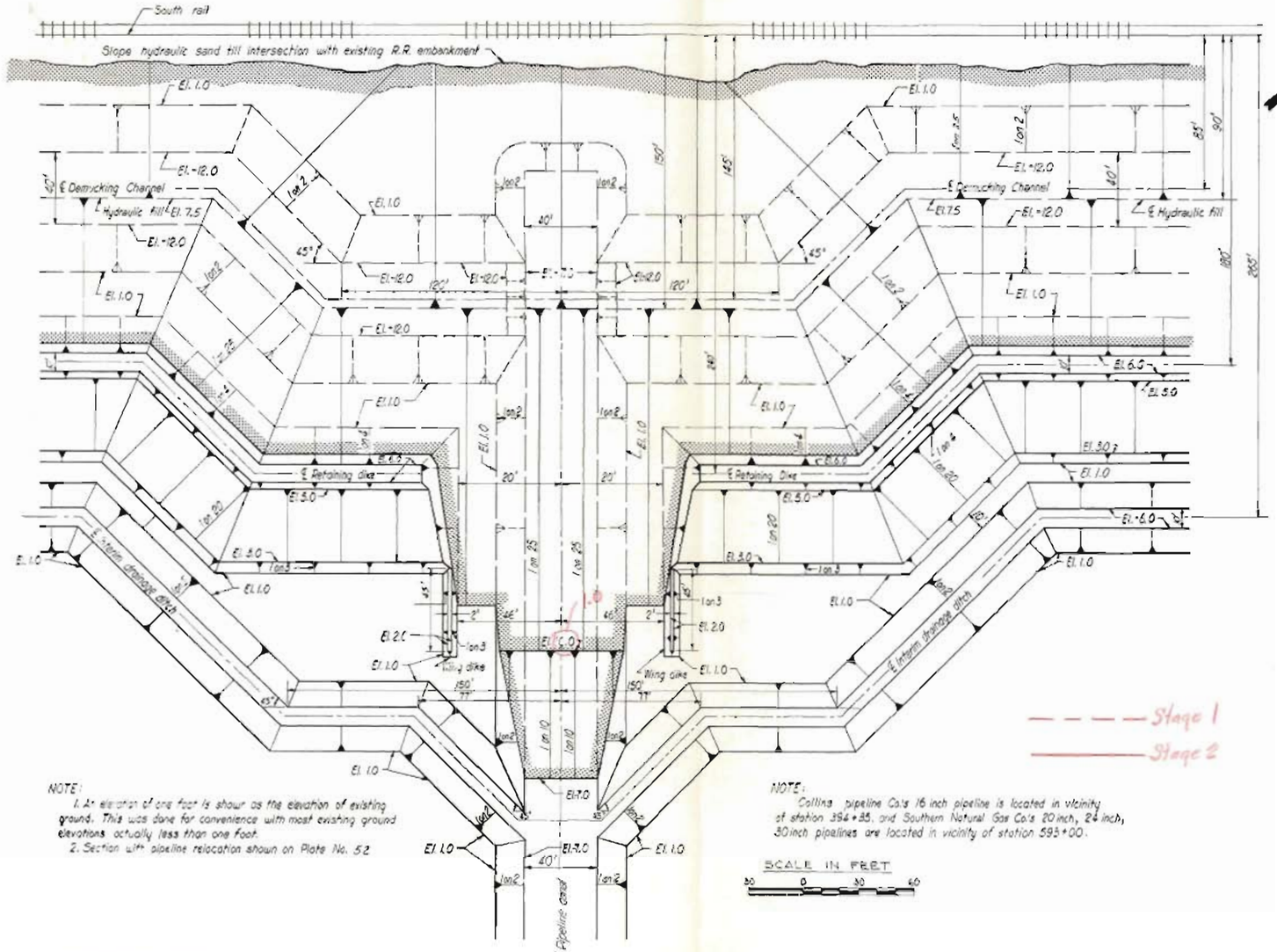
LAKE PONTCHARTRAIN, LA AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO 2-GENERAL DESIGN
SUPPLEMENT NO 5B
NEW ORLEANS EAST LAKEFRONT LEVEE
PARIS ROAD TO SOUTH POINT

(Q) SHEAR STABILITY OF STOCKPILE RETAINING DIKE

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

JUNE 1972 FILE NO H-2-25975

PLATE 50



PIPELINE CANAL CENTERLINE SECTION

LAKE PONTCHARTRAIN, LA AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 5B
NEW ORLEANS EAST LAKEFRONT LEVEE
PARIS ROAD TO SOUTH POINT

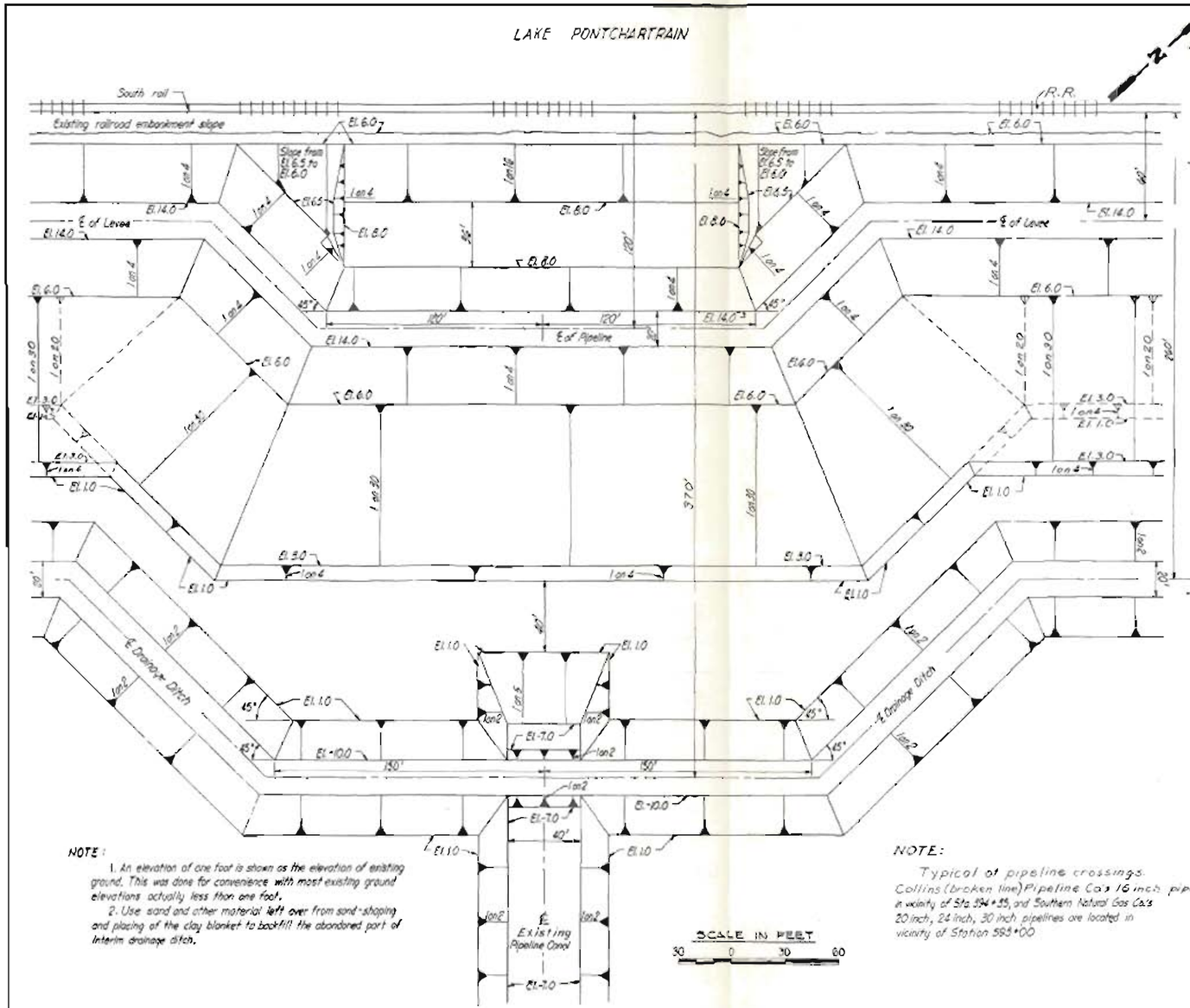
1st & 2nd STAGE LEVEE CONSTRUCTION AT PROPOSED PIPELINE CROSSING

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

JUNE 1972

FILE NO. H-2-25975

PLATE 51

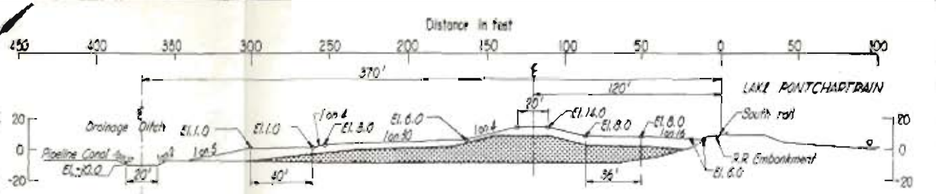


NOTE:

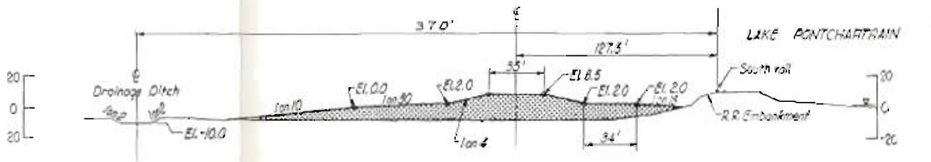
1. An elevation of one foot is shown as the elevation of existing ground. This was done for convenience with most existing ground elevations actually less than one foot.
2. Use sand and other material left over from sand-shaping and placing of the clay blanket to backfill the abandoned part of interim drainage ditch.

NOTE:

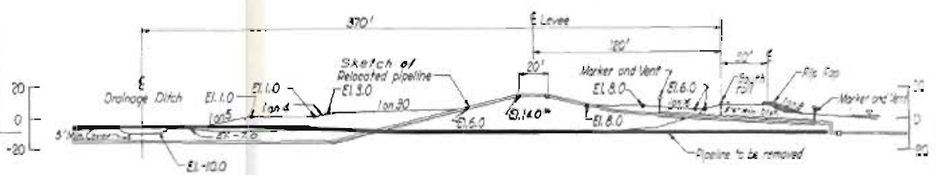
Typical of pipeline crossings. Collins (broken line) Pipeline Co's 16 inch pipeline is located in vicinity of Sta 594+55, and Southern Natural Gas Co's 20 inch, 24 inch, 30 inch pipelines are located in vicinity of Station 585+00



PIPELINE CANAL CENTERLINE SECTION - FINAL LEVEE



PIPELINE CANAL CENTERLINE SECTION - SHAPED SAND



NOTE: Elevation in feet M.S.L.

PIPELINE CANAL CENTERLINE SECTION
FINAL LEVEE WITH PROPOSED PIPELINE RELOCATION SHOWN

* The bottom of the Collins and Southern Natural relocated pipelines will be constructed to levee crown grade elevations of 13.5 and 15.0 ft, m.s.l, respectively.

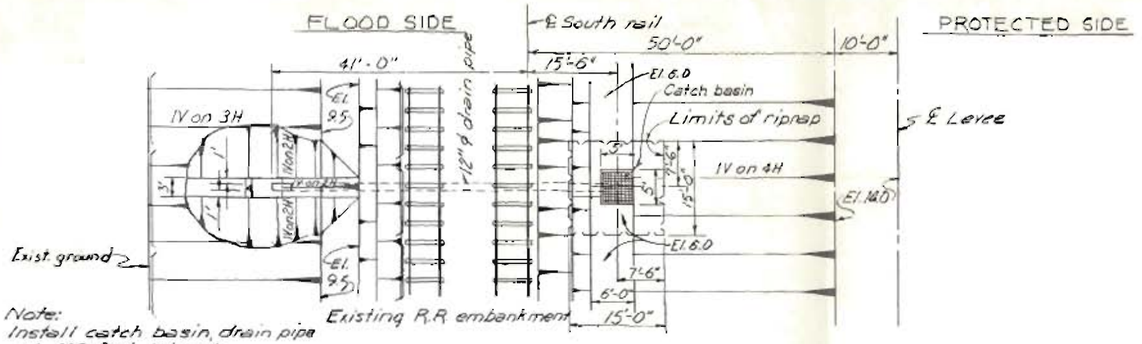
40 20 0 40 60
SCALE IN FEET

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2-GENERAL DESIGN
SUPPLEMENT NO. 5B
NEW ORLEANS EAST LAKEFRONT LEVEE
PARIS ROAD TO SOUTH POINT

FINAL LEVEE SECTION AT PROPOSED PIPELINE CROSSINGS

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
JUNE 1972 FILE NO. H-2-25975

PLATE 52



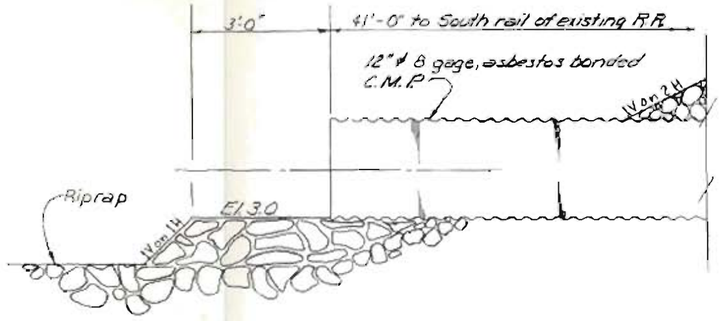
Note:
Install catch basin drain pipe at 600 foot intervals beginning at Sta. 332+00 and ending at Sta. 656+00. (55 Req'd.)

PLAN

TYPICAL AT 600' INTERVALS BEGINNING AT STA. 332+00

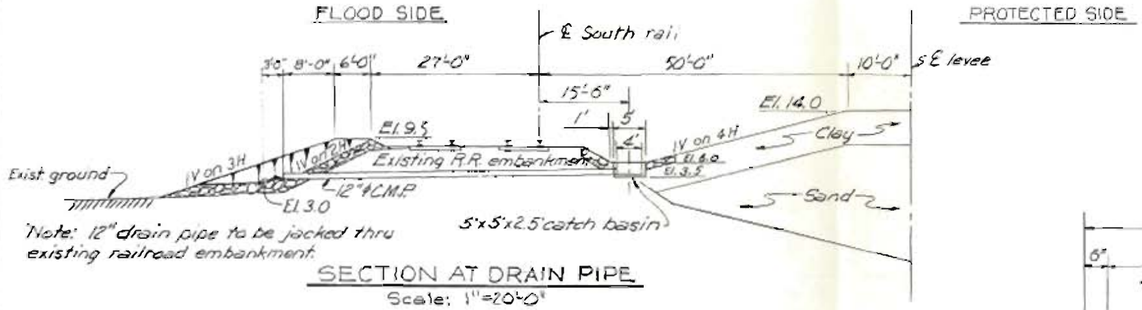
Scale: 1"=20'-0"

Note:
15"ϕ piles and caps on 11'-0" centers are in place under railroad embankment.



DRAINAGE OUTLET DETAIL

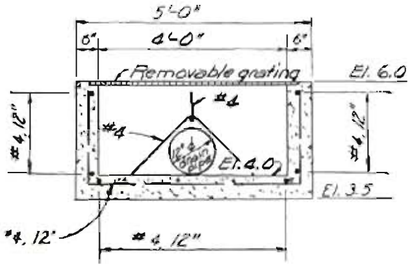
Scale: 3/4"=1'-0"



Note: 12" drain pipe to be jacked thru existing railroad embankment.

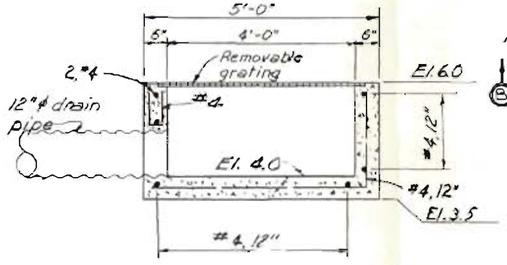
SECTION AT DRAIN PIPE

Scale: 1"=20'-0"



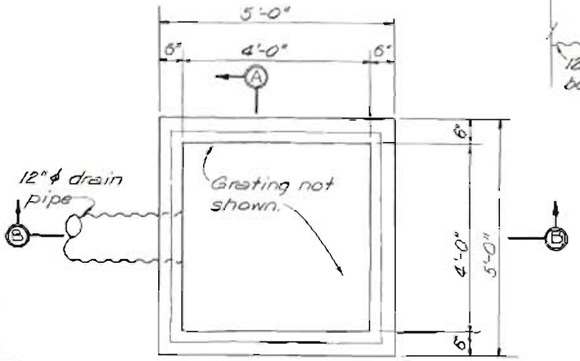
SECTION A-A

Scale: 3/8"=1'-0"



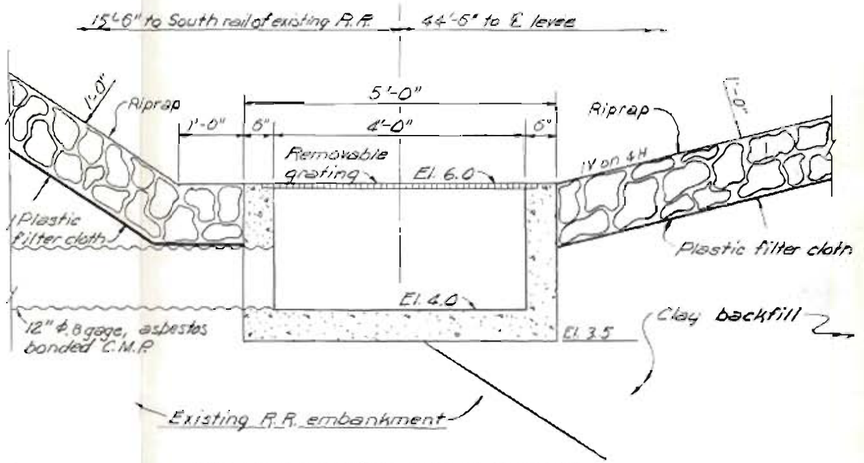
SECTION B-B

Scale: 3/8"=1'-0"



PLAN-CATCH BASIN

Scale: 3/8"=1'-0"



SECTION THRU CATCH BASIN

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

LAKE PONTCHARTRAIN, LA AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2-GENERAL DESIGN
SUPPLEMENT NO. 5B
NEW ORLEANS EAST LAKEFRONT LEVEE
PARIS ROAD TO SOUTH POINT

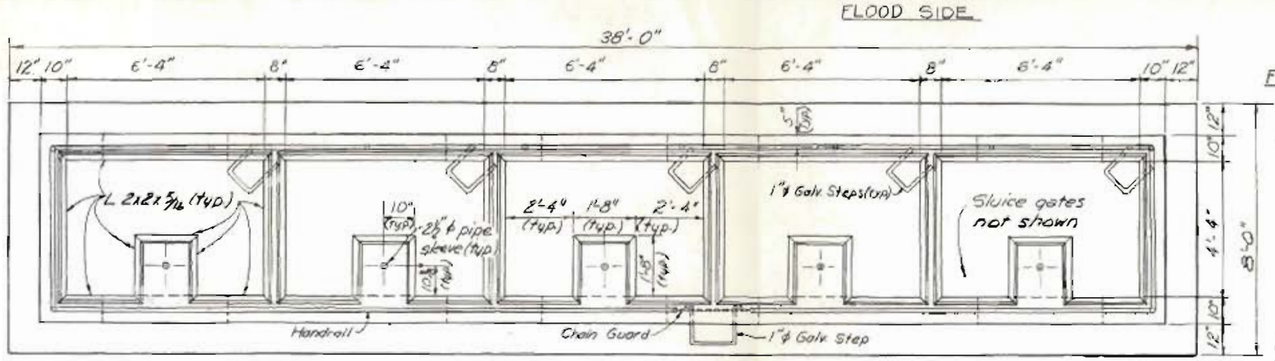
LEVEE DRAINAGE DETAILS

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

JUNE 1972

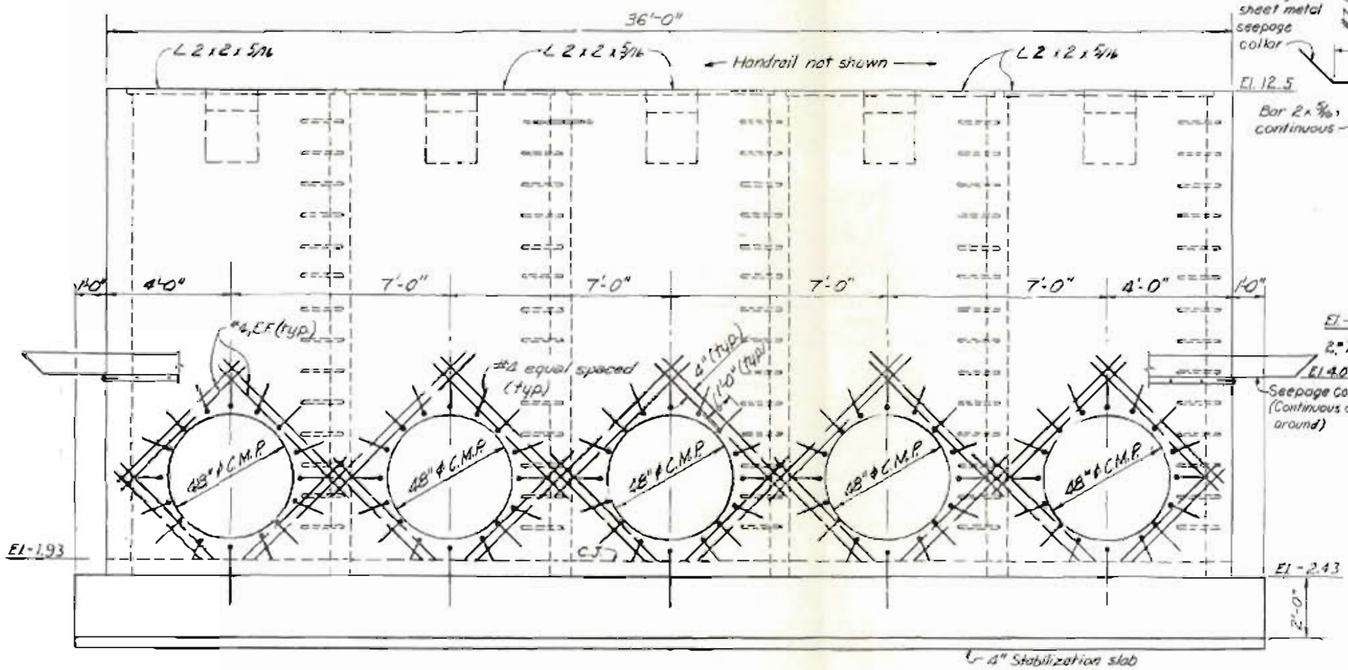
FILE NO. II-2-25975

PLATE 53

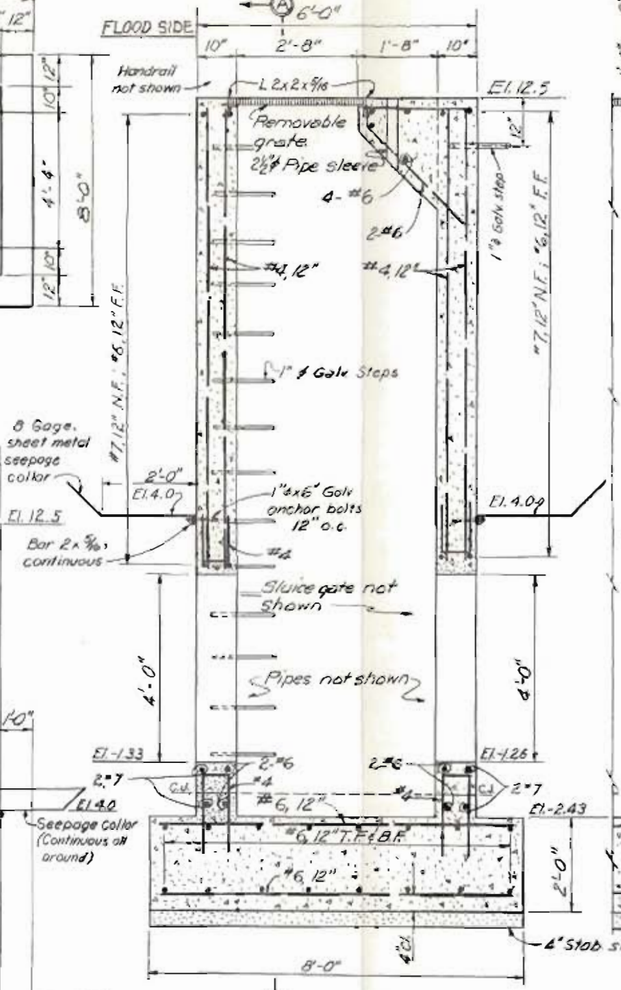


Note: Seepage collar not shown

PLAN
SLUICE GATE STRUCTURE
Scale: ¼"=1'-0"

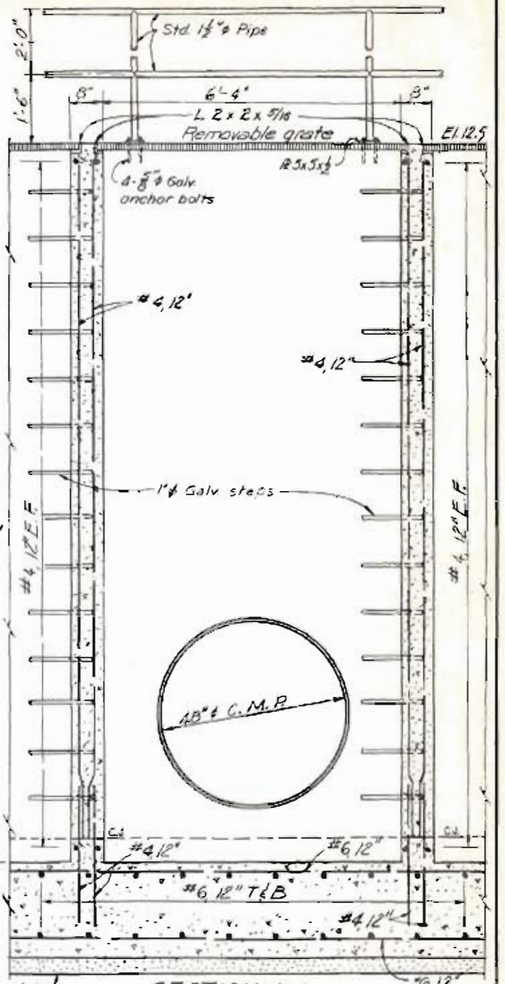


ELEVATION
Scale: ½"=1'-0"



TYPICAL SECTION AT ℄ PIPE
Scale: ⅜"=1'-0"

Note: See plate 34 for overall drainage structure plan and section.



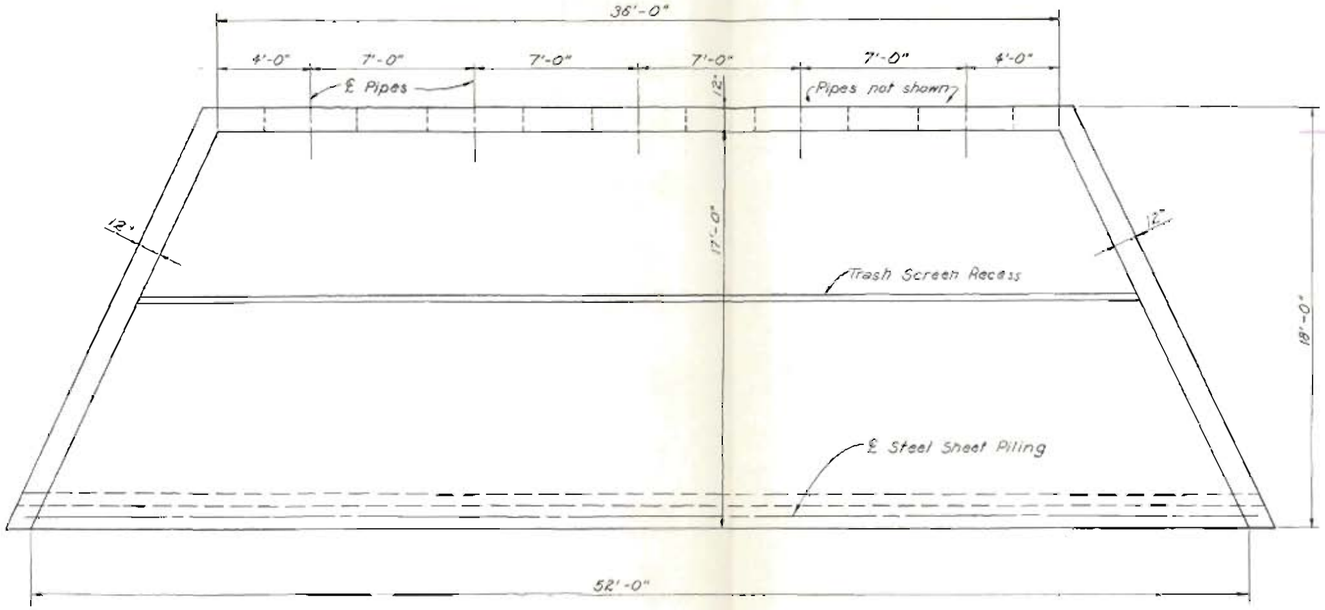
SECTION A-A
Scale ⅜"=1'-0"

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2-GENERAL DESIGN
SUPPLEMENT NO. 5B
NEW ORLEANS EAST LAKEFRONT LEVEE
PARIS ROAD TO SOUTH POINT

DRAINAGE STRUCTURE DETAILS

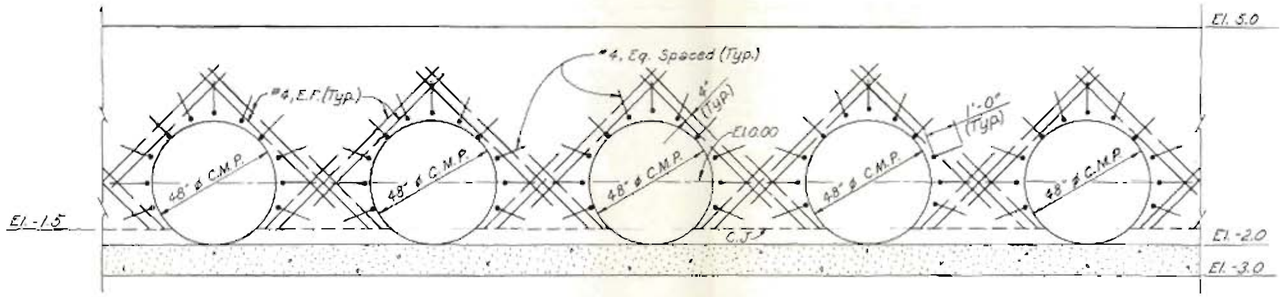
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
JUNE 1972
FILE NO. H-2-25975

PLATE 54



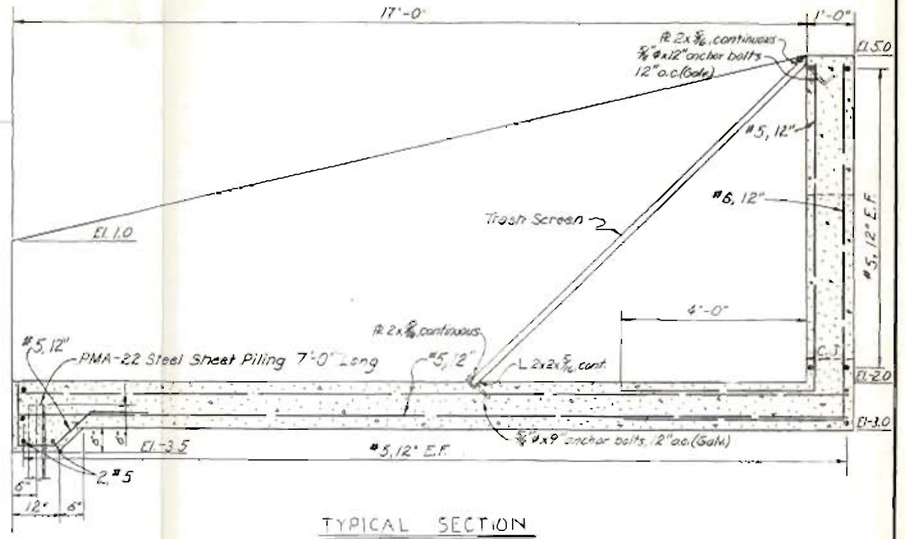
PLAN

Scale: 3/16" = 1'-0"



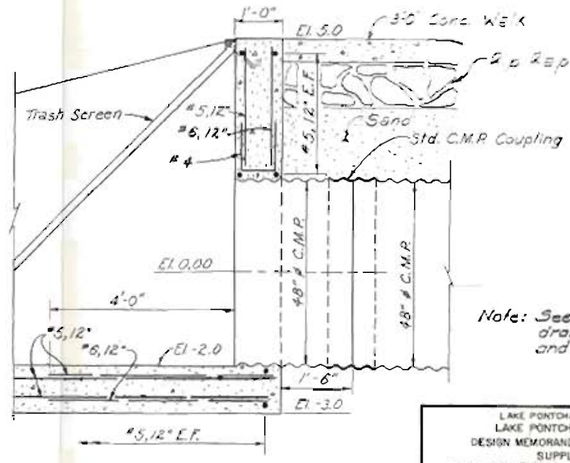
HEADWALL ELEVATION

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



TYPICAL SECTION

Scale: 3/8" = 1'-0"



Note: See plate 34 for overall drainage structure plan and section.

SECTION AT ℄ OF PIPES

Scale: 3/8" = 1'-0"

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 5B
NEW ORLEANS EAST LAKEFRONT LEVEE
PARIS ROAD TO SOUTH POINT

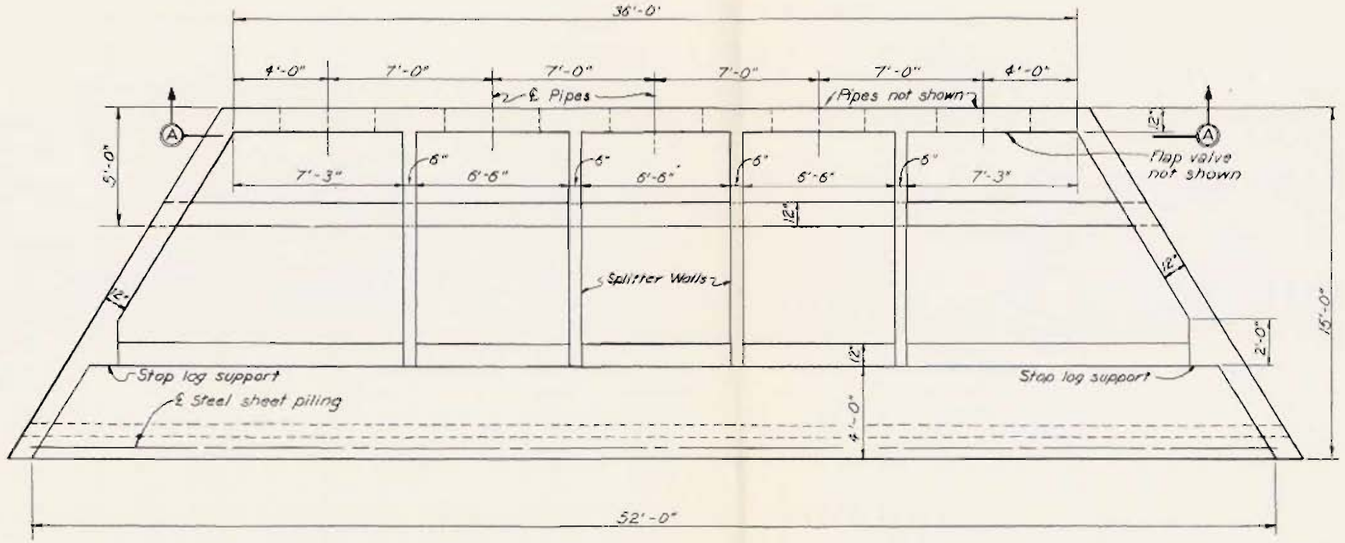
DRAINAGE STRUCTURE INLET DETAILS

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

JUNE 1972

FILE NO. H-2-25975

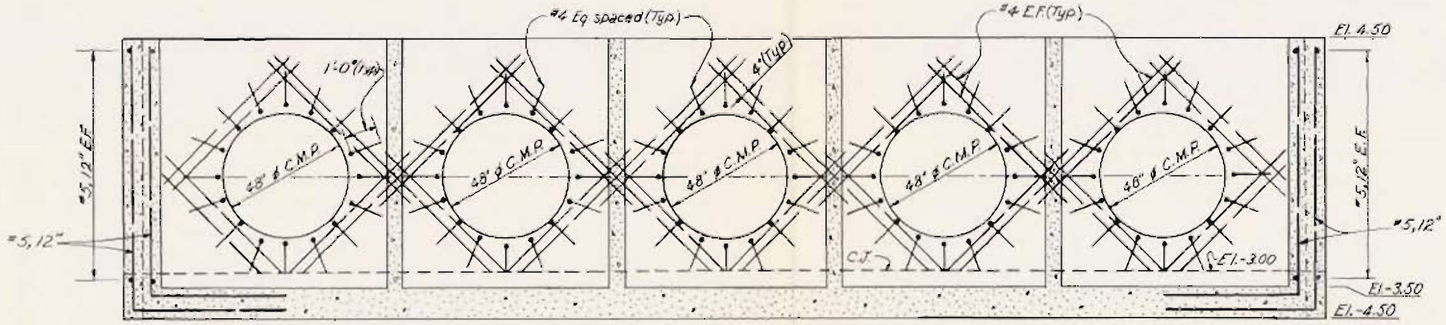
PLATE 55



PLAN

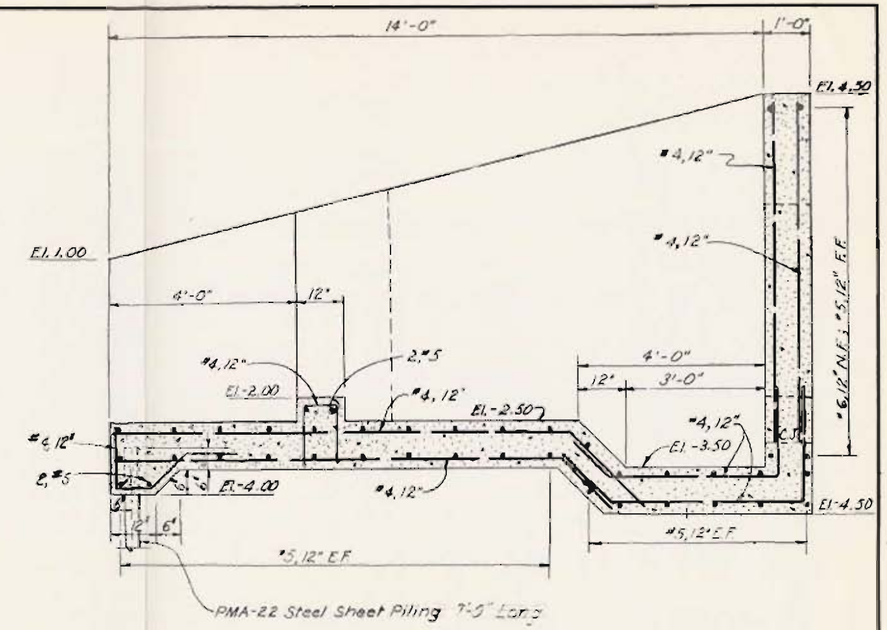
Scale: 3/16" = 1'-0"

Note: See plate 34 for overall drainage structure plan and section.



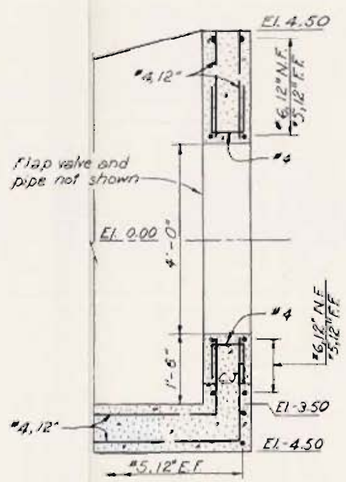
SECTION A-A

Scale: 1/4" = 1'-0"



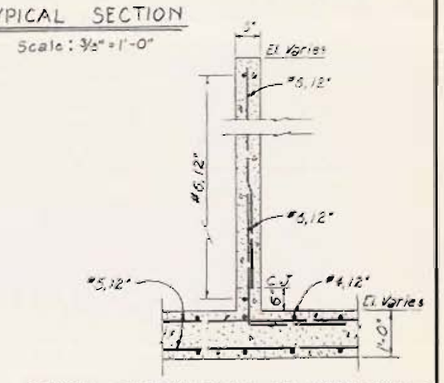
TYPICAL SECTION

Scale: 3/16" = 1'-0"



SECTION AT ℄ OF PIPES

Scale: 3/16" = 1'-0"



TYPICAL SECTION THRU SPLITTER WALLS

Scale: 3/16" = 1'-0"

LAKE PONTCHARTRAIN, LA AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO 2-GENERAL DESIGN
SUPPLEMENT NO 58
NEW ORLEANS EAST LAKEFRONT LEVEE
PARIS ROAD TO SOUTH POINT

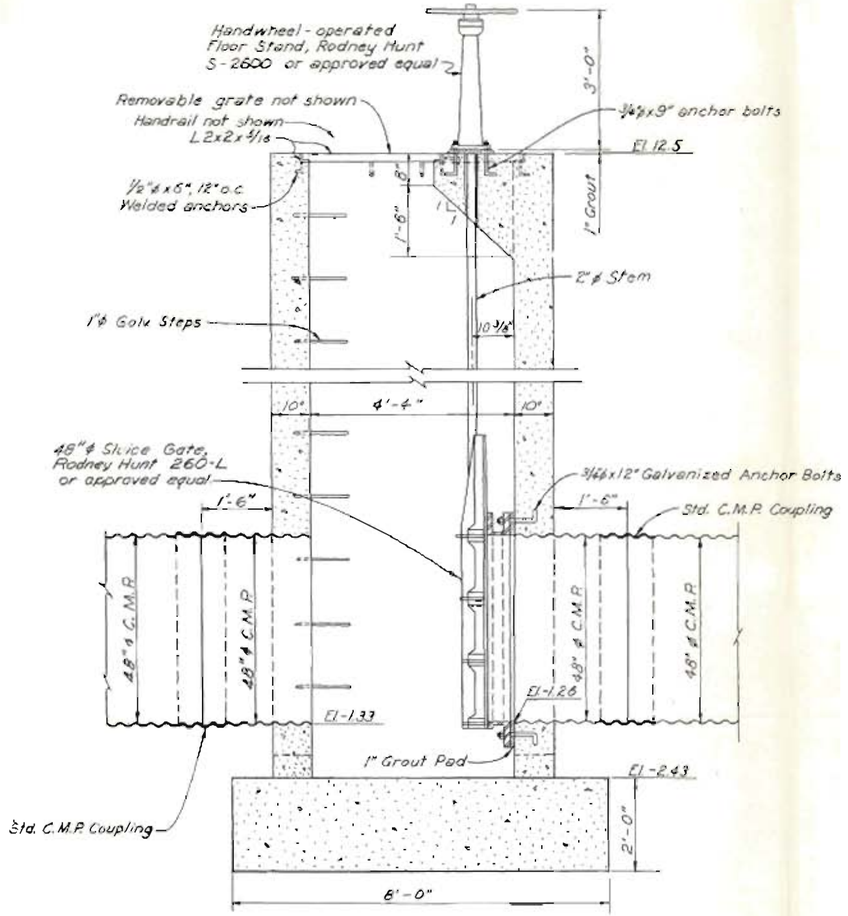
DRAINAGE STRUCTURE OUTLET DETAILS

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

JUNE 1972

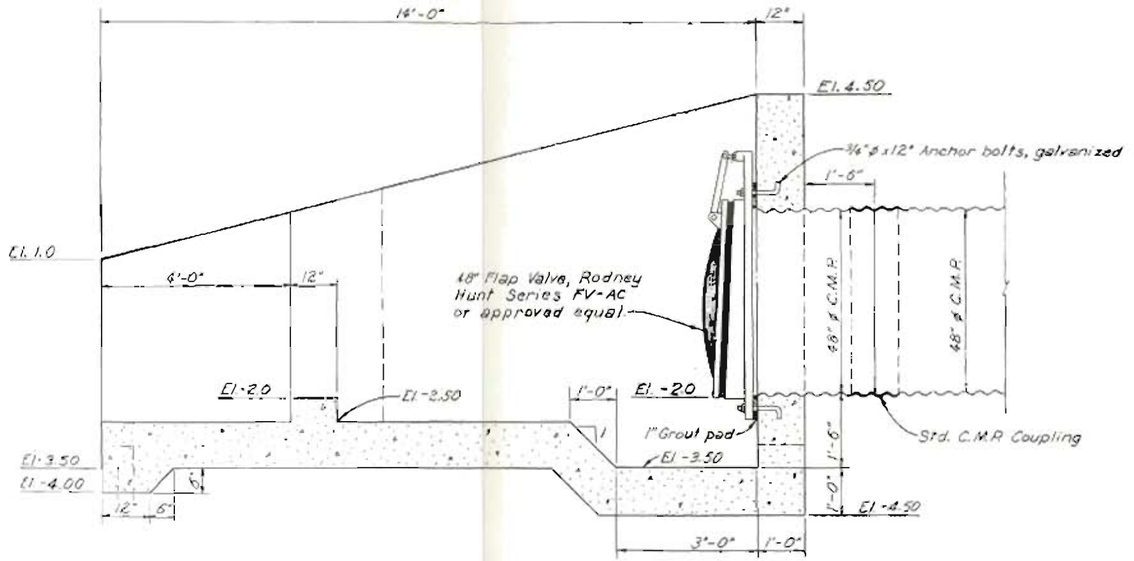
FILE NO. H-2-25975

PLATE 56



SLUICE GATE DETAIL

Scale: 3/8" = 1'-0"



FLAP VALVE DETAIL

Scale: 3/8" = 1'-0"

Note: See plate 34 for overall drainage structure plan and section.

LAKE PONTCHARTRAIN, LA AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2-GENERAL DESIGN
SUPPLEMENT NO 5B
NEW ORLEANS EAST LAKEFRONT LEVEE
PARIS ROAD TO SOUTH POINT

SLUICE AND FLAP GATE DETAILS

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
JUNE 1972
FILE NO. H-2-25975

LAKE PONTCHARTRAIN, LOUISIANA AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL
NEW ORLEANS EAST LAKEFRONT LEVEE
PARIS ROAD TO SOUTH POINT

APPENDIX A
CORRESPONDENCE RELATIVE TO COORDINATION WITH OTHER AGENCIES

COPY

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

LMNED-PP

2 April 1968

Mr. C. Edward Carlson, Regional Director
U. S. Department of the Interior
Fish and Wildlife Service
Peachtree-Seventh Building
Atlanta, Georgia 30323

Dear Mr. Carlson:

Please refer to our letter dated 21 April 1967 requesting your views and comments on the general design memorandum for the Lake Pontchartrain Barrier Plan feature of the "Lake Pontchartrain, La. and Vicinity" project.

Our letter dated 21 April 1967 indicated that your views and comments would be requested for each supplement to the general design memorandum. However, we now feel that your views on the entire Lake Pontchartrain Barrier Plan would be preferable. The layout of the Lake Pontchartrain Barrier Plan, as described in House Document No. 231, 89th Congress, 1st Session, is shown in inclosure 1. The plan, layout of which is shown on inclosure 2, now under consideration is essentially the same as that presented in the House Document, with the following exceptions:

a. Barrier. The Chief of Engineers has approved a change in the alignment of the barrier in the Chef Menteur Pass area to that shown on inclosure 3. The barrier elevation will be 9 feet mean sea level or the elevation of existing U. S. Highway 90, whichever is higher. The remaining structures sites will remain as specified in the House Document, except that consideration is being given to widening the Rigolets Lock from 84 feet to 110 feet. The modification of the width of the Rigolets Lock is not for public release.

b. Seabrook Lock. The Chief of Engineers has approved a change in the controlling elevation of the Seabrook Lock from 13.2 feet to 7.2 feet mean sea level. This change will be effected by lowering the crown of the rock dike which will tie the lock to the levee system. In addition, auxiliary control structures, located on each side of the lock, will be added to provide for passage of flows or salinity control and riparian use when the lock is passing traffic.

c. Levees. Based on revised parameters for the standard project hurricane, as developed by the U. S. Weather Bureau, the levee grades recommended in House Document No. 231 were increased by as much as 1 to 2 feet.

d. St. Charles Parish Levees. The St. Charles Parish Lakefront levee will extend across the Parish Line Canal and tie into the Jefferson Parish Lakefront levee, rather than having a levee extending south approximately 3.5 miles along the west side of the Parish Line Canal to the Illinois Central Railroad. Drainage structures will be provided in the Lakefront levee to allow gravity drainage of the area.

We have received your comments on Seabrook Lock and the Citrus Back Levee, i.e., the levee along the north bank of the Gulf Intracoastal Waterway from the Inner Harbor Navigation Canal to the Michoud Canal, by letters dated 7 June 1967 and 22 June 1967, respectively. Your views, recommendations, and comments on the remainder of the Lake Pontchartrain Barrier Plan are requested.

Because of the urgency of providing protection to the areas vulnerable to hurricane flooding, we are operating on a much compressed planning schedule. Accordingly, it would be very much appreciated if your comments are provided not later than 1 June 1968.

Sincerely yours,

3 Incl
1. Gen map (file H-2-23693) dtd Nov 65
2. Gen map (file H-2-23693) rev May 67
3. Map - barrier alignment (file H-2-24066, plate 2)

THOMAS J. BOWEN
Colonel, CE
District Engineer

UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
BUREAU OF SPORT FISHERIES AND WILDLIFE
PEACHTREE-SEVENTH BUILDING
ATLANTA, GEORGIA 30323

May 15, 1968

District Engineer
U. S. Army, Corps of Engineers
P. O. Box 60267
New Orleans, Louisiana 70160

Dear Sir:

Reference is made to your letter of April 2, 1968, (LMNED-PP), requesting our views on the Lake Pontchartrain Barrier Plan feature of the Lake Pontchartrain, Louisiana, and Vicinity project.

The overall barrier plan and its influence on fish and wildlife resources have been discussed in prior Bureau reports, most recently our letter report of June 21, 1967.

As indicated in past reports, we are of the opinion that hurricane control structures in the Rigolets and Chef Menteur tidal passes will have little appreciable effect on salinities in Lakes Maurepas, Pontchartrain, and Borgne. Therefore, no adverse effects on fish and wildlife resources in these areas are expected.

Previous model tests have indicated that acceptable salinity levels for the preservation of fish and wildlife resources in Lake Pontchartrain can be obtained by utilization of the Seabrook Lock facility, which includes an auxiliary control structure on each side of the lock. Use of these auxiliary structures should insure that adequate diversion flows for salinity control and riparian use can be provided. The capability for adjusting salinities as may be required for fish and wildlife would tend to prevent the occurrence of detrimental effects.

New levee construction and levee enlargement works as planned, including the modified St. Charles Parish levee, are not expected to directly affect fish and wildlife resources to any great degree. Indirectly, the levee system will hasten urban and industrial development of additional marshland that now provides moderate quality habitat for wildlife. Your staff has indicated that the Parish Line Canal is no longer classed as a navigable waterway. Blockage of the channel, however, will inconvenience boat owners who now use the canal.

We are pleased with your previous recognition of the need for a salinity surveillance system at the Seabrook Lock upon its completion. This Bureau and the Louisiana Wild Life and Fisheries Commission will be glad to participate in the development and monitoring of such a system.

We appreciate the opportunity to provide these comments at this time. If current plans are modified, we request the opportunity for further review and comment.

A copy of this letter has been sent to the Louisiana Wild Life and Fisheries Commission. Any comments that agency wishes to make will be forwarded to you.

Sincerely yours,

W. L. Towns

W. L. Towns
Acting Regional Director

C O P Y

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

LMNED-PP

8 April 1968

Mr. William C. Galegar, Regional Director
Federal Water Pollution Control Administration
Third Floor--1402 Elm Street
Dallas, Texas 75202

Dear Mr. Galegar:

Please refer to our letter dated 21 April 1967 requesting your views and comments on the general design memorandum for the Lake Pontchartrain Barrier Plan feature of the "Lake Pontchartrain, La. and Vicinity" project.

Our letter dated 21 April 1967 indicated that your views and comments would be requested for each supplement to the general design memorandum. However, we now feel that your views on the entire Lake Pontchartrain Barrier Plan would be preferable. The layout of the Lake Pontchartrain Barrier Plan, as described in House Document No. 231, 89th Congress, 1st Session, is shown in inclosure 1. The plan, layout of which is shown on inclosure 2, now under consideration is essentially the same as that presented in the House Document, with the following exceptions:

a. Barrier. The Chief of Engineers has approved a change in the alignment of the barrier in the Chef Menteur Pass area to that shown on inclosure 3. The barrier elevation will be 9 feet mean sea level or the elevation of existing U. S. Highway 90, whichever is higher. The remaining structures sites will remain as specified in the House Document, except that consideration is being given to widening the Rigolets Lock from 84 feet to 110 feet. The modification of the width of the Rigolets Lock is not for public release.

b. Seabrook Lock. The Chief of Engineers has approved a change in the controlling elevation of the Seabrook Lock from 13.2 feet to 7.2 feet mean sea level. This change will be effected by lowering the crown of the rock dike which will tie the lock to the levee system. In addition, auxiliary control structures, located on each side of the lock, will be added to provide for passage of flows or salinity control and riparian use when the lock is passing traffic.

c. Levees. Based on revised parameters for the standard project hurricane, as developed by the U. S. Weather Bureau, the levee grades recommended in House Document No. 231 were increased by as much as 1 to 2 feet.

d. St. Charles Parish Levees.. The St. Charles Parish Lakefront levee will extend across the Parish Line Canal and tie into the Jefferson Parish Lakefront levee, rather than having a levee extending south approximately 3.5 miles along the west side of the Parish Line Canal to the Illinois Central Railroad. Drainage structures will be provided in the Lakefront levee to allow gravity drainage of the area.

We have received your comments on Seabrook Lock and the Citrus Back Levee, i.e., the levee along the north bank of the Gulf Intracoastal Waterway from the Inner Harbor Navigation Canal to the Michoud Canal, by letter dated 23 June 1967. Your views, recommendations, and comments on the remainder of the Lake Pontchartrain Barrier Plan are requested.

Because of the urgency of providing protection to the areas vulnerable to hurricane flooding, we are operating on a much compressed planning schedule. Accordingly, it would be very much appreciated if your comments are provided not later than 1 June 1968.

Sincerely yours,

THOMAS J. BOWEN
Colonel, CE
District Engineer

3 Incl
1. Gen Map (file H-2-23693) dtd Nov 65
2. Gen map (file H-2-23693) rev May 67
3. Map - barrier alignment (file H-2-24-66, plate 2)

UNITED STATES
DEPARTMENT OF THE INTERIOR
FEDERAL WATER POLLUTION CONTROL ADMINISTRATION
SOUTH CENTRAL REGION
1402 ELM STREET, 3RD FLOOR
DALLAS, TEXAS 75202

May 15, 1968

Your Ref: LMNED-PP

Colonel Thomas J. Bowen, District Engineer
Department of the Army
New Orleans District, Corps of Engineers
P. O. Box 60267
New Orleans, Louisiana 70160

Dear Sir:

Reference is made to your letter of April 8, 1968 requesting review and comment on the remainder of the Lake Pontchartrain Barrier Plan.

We have reviewed the information submitted in accordance with Executive Order 11288, Sections 1(3) and 1(7) in regard to water pollution control measures and find as follows:

a. All contractors should perform construction operations in a manner that will reduce turbidity and siltation to the lowest practicable level.

b. All contractors should take precautions to prevent water pollution by accidental spillage of hazardous materials which would result in substantial harm to fish or shellfish. Also, all contractors should provide and maintain sanitation facilities that will adequately treat domestic wastes to conform with Federal and local health regulations.

c. It is desirable that the water quality control structures be constructed and operated so as to prevent changes in the present water quality and to ensure that ecological conditions remain unchanged.

The comments of the Louisiana Stream Control Commission have been incorporated in our review.

Colonel Thomas J. Bowen
C/E, New Orleans, Louisiana

5/15/68

Your cooperation in carrying out the requirements of the Order is appreciated.

Sincerely yours,

for WILLIAM C. GALEGAR
Regional Director

cc: Louisiana Stream Control Commission

C O P Y

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

LMNED-PP

15 July 1969

Mr. William C. Galegar, Regional Director
Federal Water Pollution Control Administration
Third Floor - 1402 Elm Street
Dallas, Texas 75202

Dear Mr. Galegar:

Please refer to our letter dated 8 April 1968 requesting your views on the entire Lake Pontchartrain Barrier Plan and your reply dated 15 May 1968. We are now considering a modification to that portion of the current plan located in the vicinity of the Rigolets Pass.

The layout of the Lake Pontchartrain Barrier Plan, provided with our letter of 8 April 1968, and the plan now under consideration are essentially the same; however, two additional schemes for the Rigolets Control Structure and Closure are presently being evaluated. The new schemes are as follows:

a. A control structure with sixteen 50-foot bays and a sill elevation of -30 feet m.s.l. (mean sea level). The structure would be located in the main channel of the Rigolets and constructed inside a cellular sheet pile cofferdam. A closure dam would extend from the east end of the structure thence across the Rigolets. This scheme required no approach channels. (Refer to inclosed layout.)

b. A control structure with twenty-three 50-foot bays and a sill elevation of -20 feet m.s.l. The layout is the same as for the above scheme.

It is requested that you furnish your views and comments on the above schemes at your earliest conveniience.

Sincerely yours,

Incl
Layout

HERBERT R. HAAR, JR.
Colonel, CE
District Engineer

UNITED STATES
DEPARTMENT OF THE INTERIOR
FEDERAL WATER POLLUTION CONTROL ADMINISTRATION
SOUTH CENTRAL REGION
1402 ELM STREET, 3RD FLOOR
DALLAS, TEXAS 75202

August 5, 1969

Your Ref: LMNED-PP

Colonel Herbert R. Haar, Jr.
District Engineer
U. S. Army Engineer District, New Orleans
P. O. Box 60267
New Orleans, Louisiana 70160

Attention: LMNED-PP

Dear Sir:

Reference is made to your letter of July 15, 1969 requesting our comments on the modifications to your Lake Pontchartrain Barrier Plan in the vicinity of the Rigolets Pass.

We have reviewed this modification in regard to water pollution control measures and recommend that the final plans and specifications for the project require the contractors to:

1. Provide and maintain sanitation facilities that will adequately treat domestic wastes to conform with Federal and State health regulations.

2. Perform construction operations in a manner that will reduce turbidity and siltation to the lowest practicable level.

3. Take precautions to prevent water pollution by accidental spillage of hazardous materials which would result in substantial harm to fish or shellfish.

The comments of the Louisiana Stream Control Commission and Louisiana State Department of Health have been incorporated in our review.

Your cooperation in carrying out the requirements of the Order is appreciated.

Sincerely yours,

JERRY T. THORNHILL, Assistant Chief
Federal Activities Coordination

cc: Louisiana Stream Control Commission

Louisiana State Department of Health

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

LMNED-PP

3 July 1969

Mr. C. Edward Carlson, Regional Director
U. S. Department of the Interior
Fish and Wildlife Service
Peachtree-Seventh Building
Atlanta, Georgia 30323

Dear Mr. Carlson:

Please refer to our letter dated 2 April 1968 requesting your views on the entire Lake Pontchartrain Barrier Plan and your reply dated 15 May 1968. We are now considering a modification to that portion of the current plan located in the vicinity of the Rigolets Pass.

The layout of the Lake Pontchartrain Barrier Plan, provided with our letter of 2 April 1968, and the plan now under consideration are essentially the same; however, two additional schemes for the Rigolets Control Structure and Closure are presently being evaluated. The new schemes are as follows:

a. A control structure with sixteen 50-foot bays and a sill elevation of -30 feet m.s.l. (mean sea level). The structure would be located in the main channel of the Rigolets and constructed inside a cellular sheet pile cofferdam. A closure dam would extend from the east end of the structure thence across the Rigolets. This scheme required no approach channels. (Refer to inclosed layout.)

b. A control structure with twenty-three 50-foot bays and a sill elevation of -20 feet m.s.l. The layout is the same as for the above scheme.

It is requested that you furnish your views and comments on the above schemes at your earliest conveniience.

Sincerely yours,

HERBERT R. HAAR, JR.
Colonel, CE
District Engineer

UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
BUREAU OF SPORT FISHERIES AND WILDLIFE
PEACHTREE-SEVENTH BUILDING
ATLANTA, GEORGIA 30323

August 21, 1969

District Engineer
U.S. Army, Corps of Engineers
P.O. Box 60267
New Orleans, Louisiana 70160

Dear Sir:

This is in reply to your letter of July 3, 1969, (LMNED-PP), requesting our comments on the two additional schemes you are considering in modifying plans for the Rigolets Control Structure and Closure, a part of the Lake Pontchartrain Barrier Plan. The new schemes described in your letter are as follows:

a. A control structure with sixteen 50-foot bays and a sill elevation of -30 feet mean sea level. The structure would be located in the main channel of the Rigolets and constructed inside a cellular sheet pile cofferdam. A closure dam would extend from the east end of the structure across the Rigolets. This scheme requires no approach channels.

b. A control structure with twenty-three 50-foot bays and a sill elevation of -20 feet m.s.l. The layout is the same as for the above scheme.

The control structure described under "b" above is identical in dimensions to the structure originally planned. The influence of the original structure on fish and wildlife was discussed in prior Bureau reports and most recently in our letter of May 15, 1968. Apparently, the structure described under "a" above is designed to pass approximately the same volume of water as structure "b". Therefore, we are of the opinion that the proposed modifications to the planned structure will have little effect on salinities in adjacent waters and no significant adverse effects on fish and wildlife resources. The proposed location of the structures in the main channel of the Rigolets does not alter our views.

We appreciate the opportunity to provide these comments at this time. If current plans are further modified, we request the opportunity for further review and comment.

A copy of this letter has been sent to the Louisiana Wild Life and Fisheries Commission. Any comments that agency wishes to make will be forwarded to you.

Sincerely yours,

W. L. Towns
Acting Regional Director

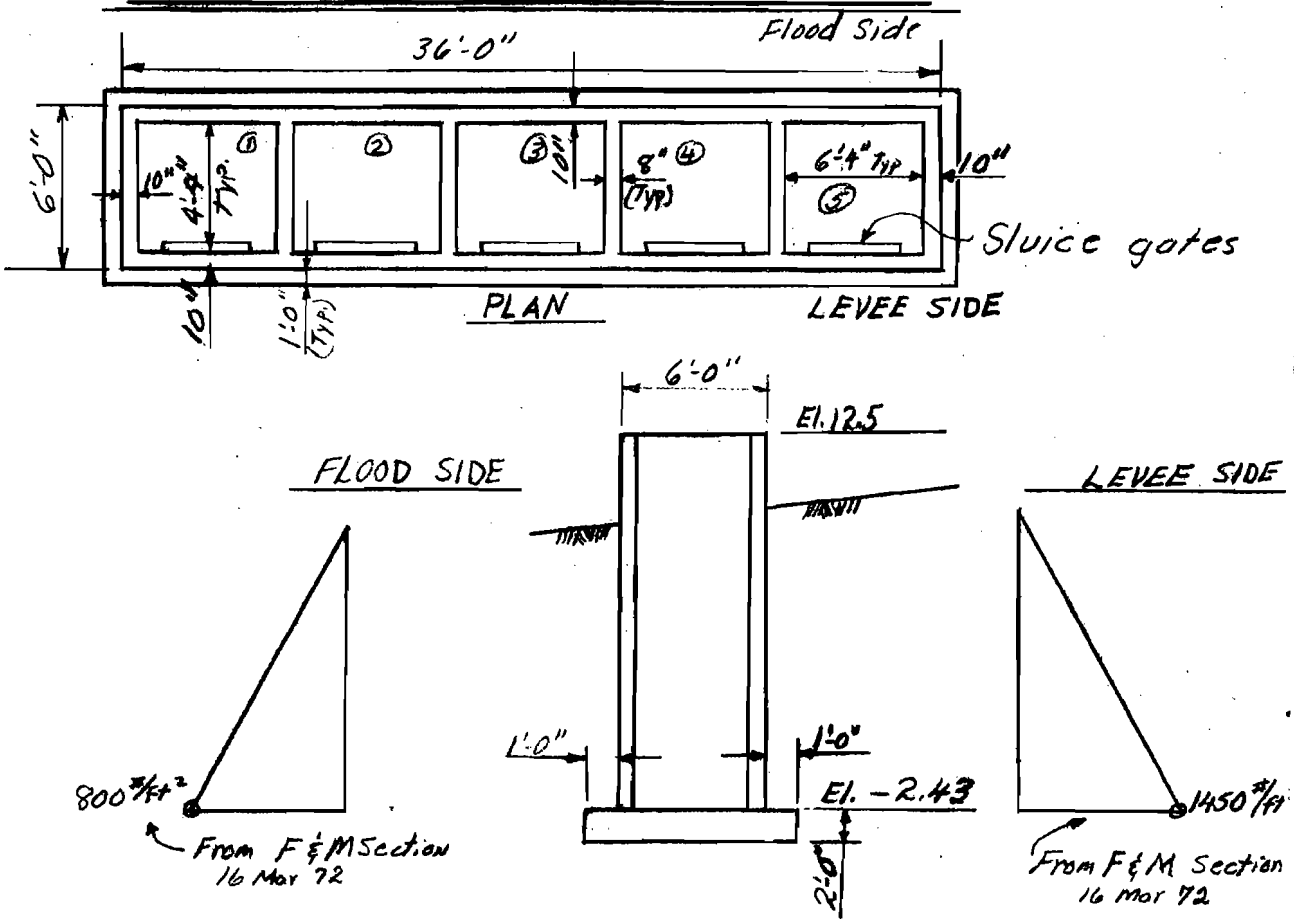
LAKE PONTCHARTRAIN, LOUISIANA AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL
NEW ORLEANS EAST LAKEFRONT LEVEE
PARIS ROAD TO SOUTH POINT

APPENDIX B
DESIGN COMPUTATIONS

LAKE POINT & VIC (HURR PROT)
PARIS RD TO SOUTH PT LEVEE

Sheet 1
Comp by LLW
Chkd by TST
DATE 21 Mar 72

SLUICE Gate STRUCTURE Sta. 665+00



Criteria Recieved From F & M Section - 16 March 1972

1. Loading as shown above
2. No Horizontal Movement due to Active Earth Pressure, Levee Side and Passive Earth Pressure - Flood side.
3. Use No Piles - Allow Entire Structure (Levee, pipes, structure) to settle as a unit.
4. Horizontal Earth Pressure = 100 PSF

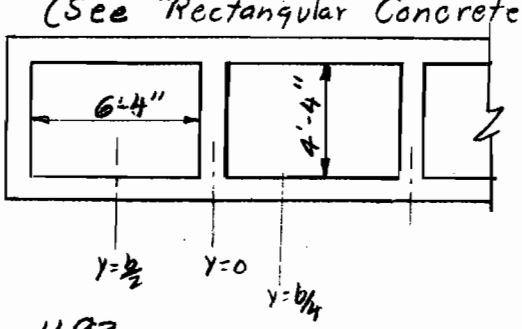
Fig. B-1

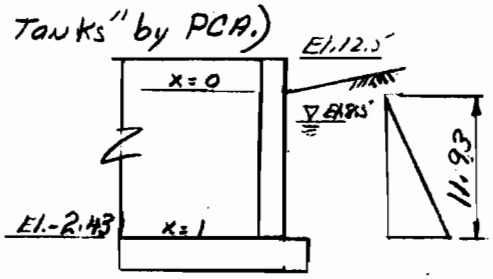
LAKE PONT. & VIC (HURR PROT)
PARIS RD TO SOUTH PT LEVEE

Sheet No. 2
Comp. by LLW
Chkd by JSJ
Date 21 Mar. 72

WALL DESIGN

Design as "Multicell Tank. (See "Rectangular Concrete Tanks" by PCA.)





$a = 11.93$

$b = 6.33$

$c = 4.33$

$w = 100$ (see Page 1)

$$\frac{b}{a} = \frac{6.33}{11.93} = 0.53$$

$$\frac{c}{a} = \frac{4.33}{11.93} = 0.36$$

$$\frac{wa^3}{1000} = \frac{100 \times 11.93^3}{1000} = 170$$

From Table III, Page 2 of "Rect. Conc. Tanks by PCA, for $\frac{b}{a} = 0.50$ and $\frac{x}{a} = 1$, Max. Coeff. $= 0.015^-$

Max. Mom. $=$ Coeff. $\times \frac{wa^3}{1000} = 0.015^- \times 170 = \mathbf{2.55}^{1K}$

$$A_s = \frac{M}{ad} = \frac{2.55}{1.44 \times 7.5} = 0.24^{\square"}$$

Min. $A_s = 0.0025 \times 12 \times 7.5^- = 0.23^{\square"}$

Check long wall as continous member.

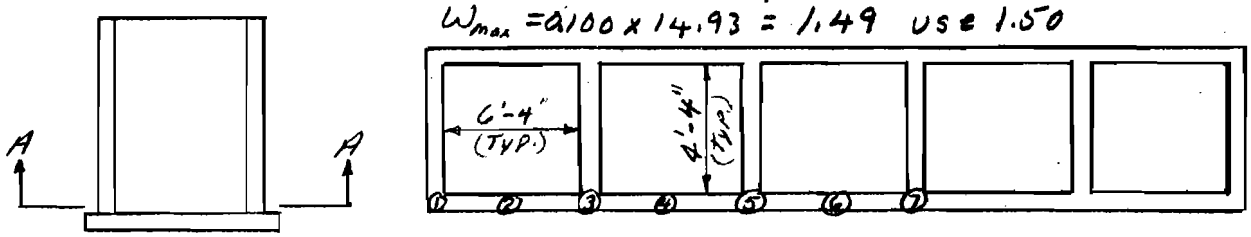
Fig. B-2

LAKE PONT & VIC (HURR PROT)
PARIS RD TO SOUTH PT LEVEE

Sheet No. 3
Comp. by LLW
Chkd by 757
Date 21 Mar 72

WALL DESIGN Con't

Height of shear plane = 12.5 + 2.43 = 14.93
W_{max} = .0100 x 14.93 = 1.49 use 1.50



$$M_1 = \frac{Wl^2}{16} = \frac{1.50 \times 6.33^2}{16} = 3.76^{IK}$$

$$M_2 = \frac{Wl^2}{14} = \frac{1.50 \times 6.33^2}{14} = 4.29^{IK}$$

$$M_3 = \frac{Wl^2}{10} = \frac{1.50 \times 6.33^2}{10} = 6.01^{IK}$$

$$M_4 = \frac{Wl^2}{16} = \frac{1.50 \times 6.33^2}{16} = 3.76^{IK}$$

$$M_5 = \frac{Wl^2}{11} = \frac{1.50 \times 6.33^2}{11} = 5.46^{IK}$$

$$M_6 = \frac{Wl^2}{16} = \frac{1.50 \times 6.33^2}{16} = 3.76^{IK}$$

$$A_s = \frac{M}{ad} = \frac{6.01}{1.44 \times 7.5} = 0.56^{\square"}$$ (Max For Outside Face)

$$A_s = \frac{M}{ad} = \frac{4.29}{1.44 \times 7.5} = 0.40^{\square"}$$ (Max For Inside Face)

Try #7, 12" Outside Face; #6, 12" Inside Face

$A_s = 0.60$, $\Sigma_o = 2.8$ $\quad$ $A_s = 0.44^{\square"}$, $\Sigma_o = 2.4$

Fig. B-3

LAKE PONT & VIC (HURR PRO)
PARIS RD TO SOUTH PT LEVEE

Sheet No. 4
Comp. by LLW
Chkd by TST
Date 21 Mar 72

Wall design Con't

$$v = \frac{V}{bd} = \frac{1.50\times\left(\frac{6.33}{2}\right)}{12(7.5)} = 0.053 < 0.060 \quad \underline{OK}$$

$$u = \frac{V}{\Sigma_0 jd} = \frac{1.50\times\frac{6.33}{2}}{9.8\times0.875\times7.5} = 0.258 < 0.300 \quad \underline{OK}$$

Shear at face of slab = $\frac{1.50}{12\times7.5} = 0.017 < 0.060$ ok

Use #7, 12" Outside Face; #6, 12" Inside Face

Temperature Reinforcing

$A_s = 0.0025\times12\times10 = 0.30\ \square"$; $0.15\ \square"$ Each Face

Use #4, 12" Each Face

Reinf For Interior Walls

$W = 0.0625\times10.93 = 0.68\ ^{K}/_{\square"}$

$L = 4.33'$

$M = \frac{WL^2}{12} = \frac{0.68\times4.33^2}{12} = 1.06\ ^{IK}$

$A_s = \frac{1.06}{1.44\times5.5} = 0.13\ \square"$ (E.F.)

Temp. $A_s = 0.0025\times12\times8 = 0.24\ \square"$; $0.12\ \square"$ E.F.

Use #4, 12", E.F. Each direction.

Fig. B-4

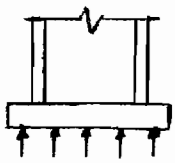
LAKE PONT & VIC (HURR PROT)
PARIS RD TO SOUTH PT LEVEE

Sheet no. 5
Comp by LLW
Chkd by 757
Date 22 Mar 72

SLUICE GATE STRUCTURE

SLAB REINFORCEMENT

Design slab as Two-Way slab



Since Wall were designed for No moment transfer to slab, Critical load on slab will be soil pressure from dead load. (Construction Condition)

$$\text{Soil Pressure} = \frac{[(80.8\times0.83)+(17.6\times0.67)]\times 14.93\times 0.15}{8\times38} + \frac{38\times8\times2\times0.15}{8\times38} + \frac{1\times12.0\times88\times0.117}{8\times38} = 1.29^{K}$$

Assume additional 150 psf for Grating, Handrail, Gates and Live load

$w = 1.29^{K} + 0.15^{K} = 1.44$ KSF

A = 4.33 ; B = 6.33

A/B = 0.68

From ACI code P. 318-133 Table 1 - Method 3

$M_{A\,neg} = C_{A\,neg} \times w \times A^2$

$M_{B\,neg} = C_{B\,neg} \times w \times B^2$

CASE 2 (Negative Moment)

$C_{A\,neg} = 0.076$

$C_{B\,neg} = 0.015$

$M_{A\,neg} = 0.076 \times 1.44 \times (4.33)^2 = 2.05^{IK}$

$M_{B\,neg} = 0.015 \times 1.44 \times (6.33)^2 = 0.87^{IK}$

CASE 2 (Positive Moment) Live load - Table 3

$M_{A\,pos.\,L.L.} = C_{A\,L.L.} \times w \times A^2$

$M_{B\,pos.\,L.L.} = C_{B\,L.L.} \times w \times B^2$

$C_{A\,LL} = 0.051$

$C_{B\,LL} = 0.011$

Fig. B-5

LAKE PONT & VIC (HURR PROT)
PARIS RD TO SOUTH PT LEVEE

Sheet no. 6
Comp. by LLW
Chkd by 757
Date 22 Mar 72

SLAB REINFORCEMENT Con't

$M_{A\ pos.} = 0.051 \times 1.44 \times (4.33)^2 = 1.38$ ^IK

$M_{B\ pos} = 0.011 \times 1.44 \times (6.33)^2 = 0.63$ ^IK

CASE 2 (Positive Moment) - Dead load - Table 2

$M_{A\ pos.\ D.L.} = C_{A\ D.L} \times w \times A^2$

$M_{B\ pos.\ D.L.} = C_{B\ D.L.} \times w \times B^2$

$C_{A\ DL} = 0.031$

$C_{B\ D.L.} = 0.006$

$w = 2' \times 0.15 = 0.30$ K/ft'

$M_{A\ pos} = 0.031 \times 0.30 \times 4.33^2 = 0.17$ ^IK

$M_{B\ pos} = 0.006 \times 0.30 \times 6.33^2 = 0.07$ ^IK

Neg. $A_s = \frac{2.05}{1.44 \times 20} = 0.07$ □"

Temp. $A_s = 0.0025 \times 12 \times 24 = 0.72$ □" half in E.F. = 0.36 □"

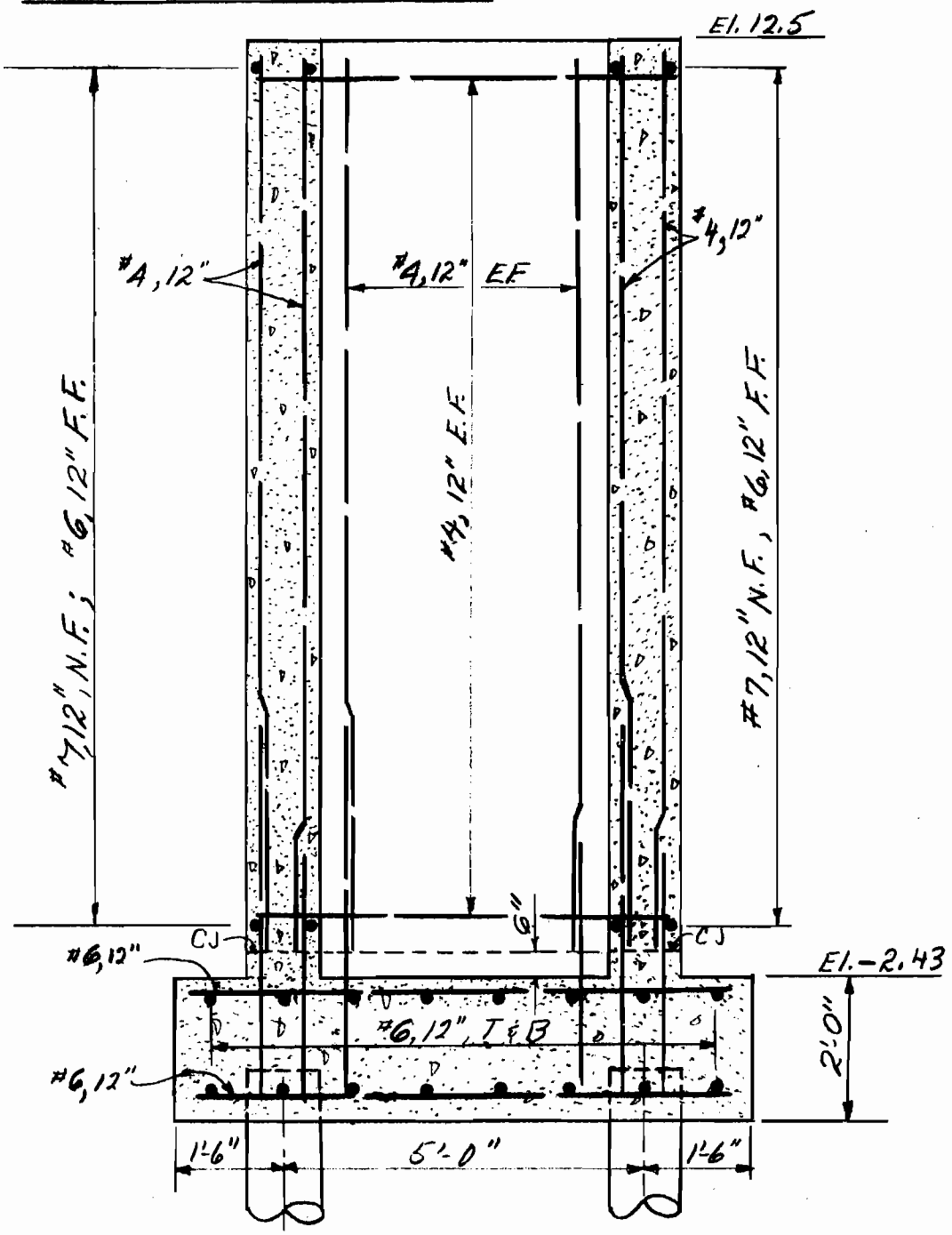
Use #6, 12" Each Face, Each Direction

Fig. B-6

LAKE PONT & VIC (HURR PROT)
PARIS RD TO SOUTH RD. LEVEE

Sheet no. 7
Comp. by LLW
Chkd by TST
DATE: 22 Mar 72

SLUICE GATE STRUCTURE



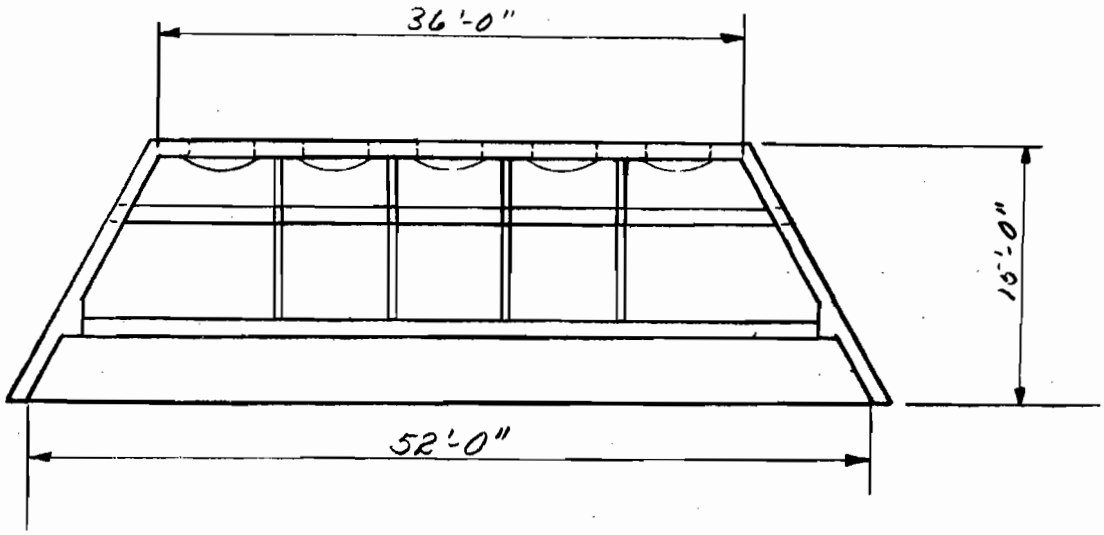
TYPICAL SECTION

Fig. B-7

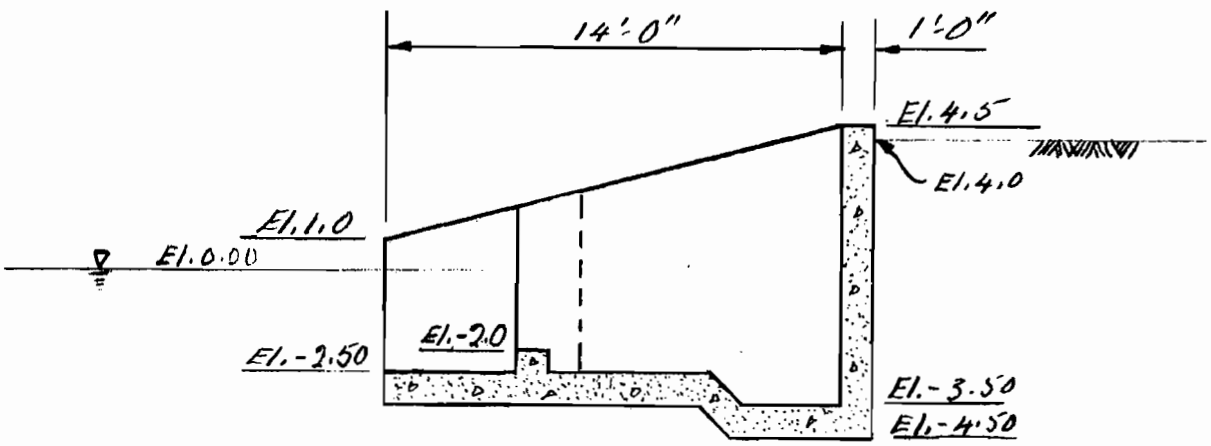
LAKE PONT. & VIC (HURR PROT)
PARIS Rd TO SOUTH PT. LEVEE

Sheet No. 8
Comp by LLW
Chkd by JSJ
DATE 30 Sept 71

DRAINAGE OUTLET Sta. 665+00



PLAN



TYPICAL SECTION

Fig. B-8

LAKE PONT & VIC (HURR PROT)
PARIS Rd TO SOUTH PT. LEVEE

Sheet No. 9
Comp. by LLW
Chkd by TST
Date 6 Oct. 71

DRAINAGE OUTLET Con't

SIDE Wall REINFORCING

Design as Cantilever section

Consider all water removed (During Construction, Hurr. etc.)

$W = (0.100 \times 6.07 \times 6.07 \times 0.5 \times 1 = 1.84^{K}$ @ 4' from Headwall

$M = 1.84 \times \frac{6.07}{3} = 3.72^{IK}$ (Same moment is applied to slab)

$b = 12"$

$F = \frac{3.72}{152} = 0.025$

$d \cong 5"$; $t = 5" + 2\frac{1}{2}" = 7\frac{1}{2}" < 12"$ OK Use: $d = 9\frac{1}{2}"$

$A_s = \frac{3.72}{144 \times 9.5} = 0.27 \square"$

$Min.\ A_s = 0.0025 \times 9.5 \times 12 = 0.29 \square"$

Try #5, 12"; $A_s = 0.31 \square"$, $\Sigma_o = 2.0$

$v = \frac{V}{bd} = \frac{1.84}{12(9.5)} = 0.016 < 0.060$ OK

$u = \frac{V}{\Sigma_o jd} = \frac{1.84}{2.0 \times 0.875 \times 9.5} = 0.111^{Ksi} < 0.421$ Ksi OK

Use #5, 12" Outside Face, #5 @ 12", Inside Face

Temperature Reinforcing (Wall Restrained one edge)

$A_s = 0.004 \times 12 \times 12 = 0.58 \square"$; $0.29 \square"$ Ea. Face.

Use #5 @ 12" Ea. Face.

Fig. B-9

LAKE PONT & VIC (HURR PROT)
PARIS RD TO SOUTH PT LEVEE

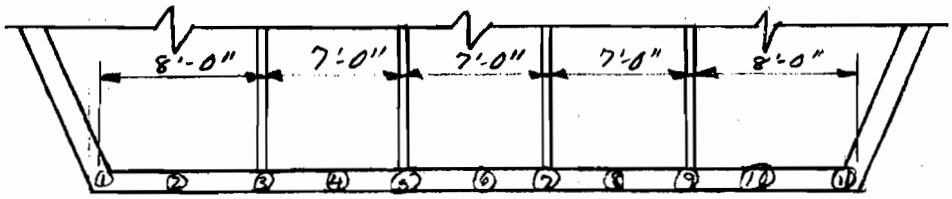
Sheet No. 10
Comp. by LLW
Chkd by TST
Date 24 Mar 72

DRAINAGE OUTLET Con't

Headwall

Design as Continuous Beam

$w_{max.} = 0.100 \times 7.5' = 0.750$ KSF



$M_1 = M_{11} = \frac{wl^2}{16} = \frac{0.750 \times 8^2}{16} = 3.00^{IK}$

$M_2 = M_{10} = \frac{wl^2}{14} = \frac{0.750 \times 8^2}{14} = 3.43^{IK}$

$M_3 = M_9 = \frac{wl^2}{10} = \frac{0.750 \times 8^2}{10} = 4.80^{IK}$

$M_4 = M_6 = m_8 = \frac{wl^2}{16} = \frac{0.750 \times 7^2}{16} = 2.30^{IK}$

$M_5 = m_7 = \frac{wl^2}{11} = \frac{0.750 \times 7^2}{11} = 3.34^{IK}$

$A_s = \frac{4.80}{1.44 \times 9.5} = 0.35^{\square"}$ (Max. For Outside Face)

$A_s = \frac{3.43}{1.44 \times 9.5} = 0.25^{\square"}$ (Max. For Inside Face)

Try #6, 12" Outside F. & #5, 12" Inside F.

$v = \frac{V}{bd} = \frac{0.750 \times 8/2}{12 \times 9.5} = 0.026 < 0.060$ OK

$u = \frac{V}{\Sigma_0 jd} = \frac{0.750 \times 8/2}{2.4 \times .875 \times 9.5} = 0.150 < 0.351$ OK

Shear at Face of Slab = $\frac{0.750}{12 \times 9.5} = 0.007 < 0.060$ OK

Use: #6, 12" O.F & #5, 12" I.F

Temp. Reinf. (Vertical)

$A_s = 0.0025 \times 12 \times 12 = 0.36^{\square"}$; $0.18^{\square"}$ E.F.

Use: #4, 12"

Fig. B-10

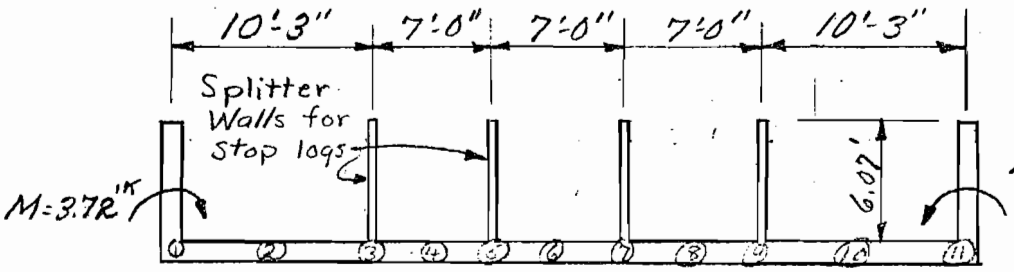
LAKE PONT. & VIC (HURR PROT)
PARIS RD. TO SOUTH PT. LEVEE

Sheet No. 11
Comp by LLW
Ch'kd by TSJ
Date 20 March 72

DRAINAGE OUTLET Con't

Slab Reinforcement

Design as Continuous Beam



Section 4'-0" from Headwall

Earth Pressure = $W = (6.07' \times 1') 2 + 4 (6.07 \times 0.5) + 42.5' \times 1' = 66.78$ cu ft

$W = 66.78$ cu. ft. $\times 0.15 = \frac{10.02 \text{ Kips}}{42.5' \times 1'} = 0.236$ KSF

Earth Pressure = $W = 0.236$ KSF

$M_1 = M_{11}$ = Applied Moments = $3.72^{'K}$ → Reinf. furnished w/sidewall (See Typ. Section Page)

$M_2 = M_{10} = \frac{wl^2}{14} = \frac{0.236 \times 10.25^2}{14} = 1.77^{'K}$

$M_3 = M_9 = \frac{wl^2}{10} = \frac{0.236 \times 10.25^2}{10} = 2.50^{'K}$

$M_4 = M_6 = M_8 = \frac{wl^2}{16} = \frac{0.236 \times 7.0^2}{16} = 0.72^{'K}$

$M_5 = M_7 = \frac{wl^2}{11} = \frac{0.236 \times 7.0^2}{11} = 1.05^{'K}$

(+) $M_{max} = 2.50^{'K}$; (−) $M_{max} = 1.77^{'K}$

$A_s = \frac{2.50}{1.44 \times 8} = 0.22 \square''$ Ext. Face

$A_s = \frac{1.27}{1.44 \times 8} = 0.15 \square''$

Min. $A_s = 0.0025 \times 12 \times 8 = 0.24 \square''$

Use #5, 12" E.F. To end of Splitter Walls (9'-0" from Hdwall)

Fig. B-11

LAKE PONT & VIC (HURR PROT)
PARIS RD TO SOUTH PT LEVEE

Sheet No 12
Comp by LAW
Chkd by TSJ
Date 20 Mar 72

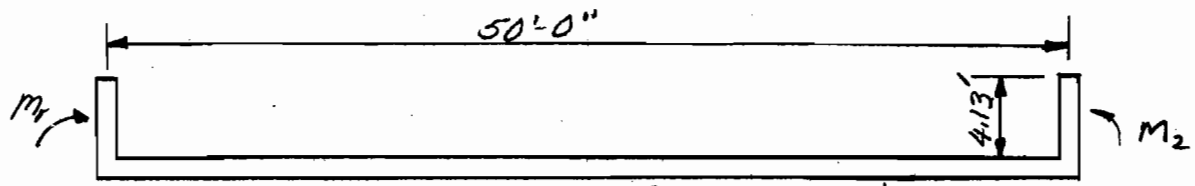
DRAINAGE OUTLET Con't

Slab Reinforcement Con't.

Temp. Reinf = $0.0025 \times 12 \times 12 = 36^{\#}$"; $18^{\#}$" E.F.

Use #4, 12"

Slab Reinforcement Beyond end of Splitter Walls



Section @ 11.5' From Headwall

Earth Pressure = $(4.13 \times 1)2 + (51.0' \times 1') = 59.26$ Cu. ft.

$W = 59.26 \times 0.15 = \frac{8.89^{K}}{51' \times 1'} = 0.174$ KSF

External End Moments Provided For by Sidwall Reinf

(Ext. Moments) $M_1 = M_2 = \left[(0.117 \times 4.13) \times 4.13' \times 0.5' \times 1'\right] \times \frac{4.13}{3} = 1.37^{IK}$

Net Earth Pressure = Total E.P. − Conc. Slab wt.
$= 0.174 - 0.150 = 0.024$ KSF

Mom @ Center = $\frac{wl^2}{24} = \frac{0.024 \times 50^2}{24} = 2.50^{IK}$

$A_S = \frac{2.50}{1.44 \times 8} = 0.22^{\#}$"

Min. $A_S = 0.0025 \times 12 \times 8 = 0.024$

Use #5, 12" E.F.

Temp. Reinf: Use #4, 12" E.F (See above)

Fig. B-12

LAKE PONT & VIC (HURR PROT)
PARIS RD TO SOUTH PT LEVEE

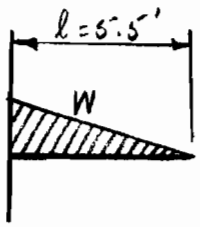
Sheet No. 13
Comp by LLW
Chkd by TJT
Date 20 Mar 72

DRAINAGE OUTLET Con't

Splitter Wall

Consider one cell with no water with ajoining cell water to top of pipe (El. 2.0)

Load differential = 5.5'



$W = (5.5 \times 0.0625) \times 5.5 \times 0.5 \times 1 = 0.95^{K}$

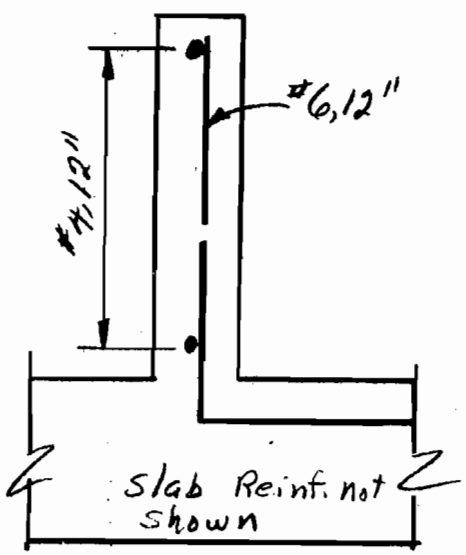
$M = \frac{Wl}{3} = \frac{0.95 \times 5.5}{3} = \frac{5.23}{3} = 1.74^{'K}$

$A_s = \frac{1.74}{1.144 \times 3} = 0.40^{\square''}$

Use #6, 12" Vertical Reinf. at Center of Wall

Temp. Reinf. $= 0.0025 \times 12 \times 6 = 0.18^{\square''}$

Use #4, 12" Horizontal @ Center of Wall



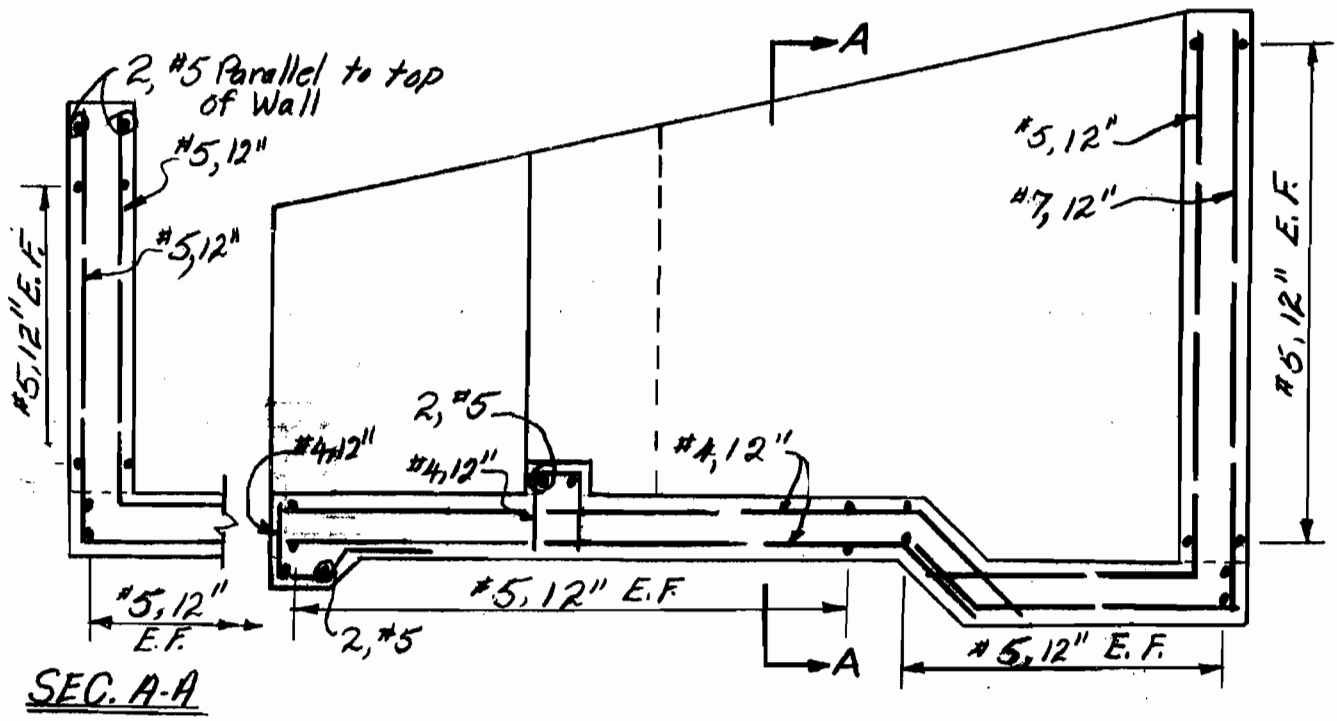
Typ. Section-Splitter Wall

Fig. B-13

LAKE PONT & VIC (HURR PROT),
PARIS RD TO SOUTH PT LEVEE

Sheet no 14
Comp by LLW
Chkd by TST
Date 6 Oct 71

DRAINAGE OUTLET



SEC. A-A

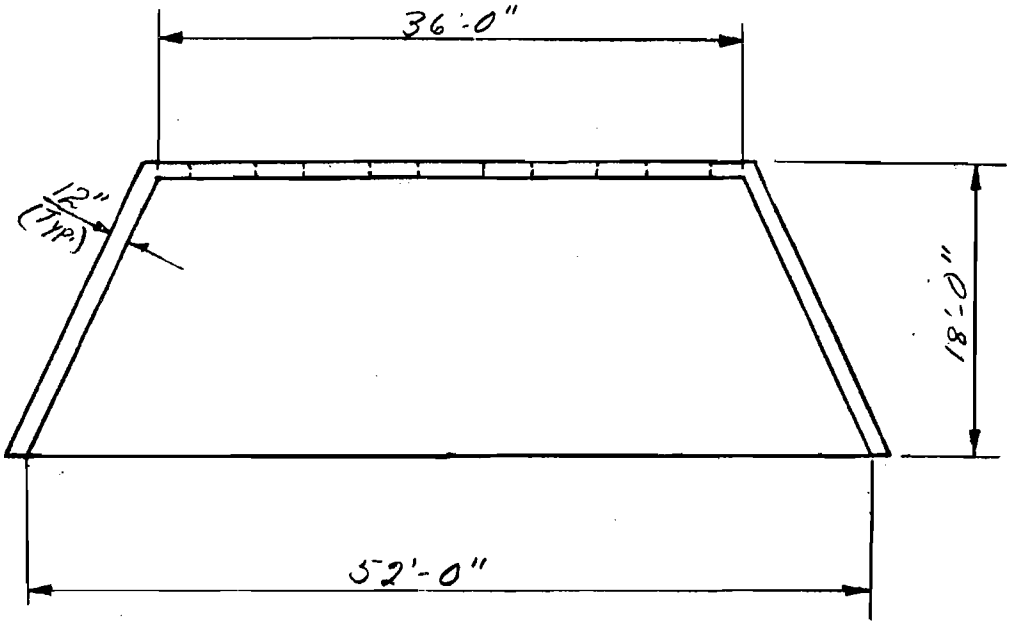
TYPICAL SECTION

Fig. B-14

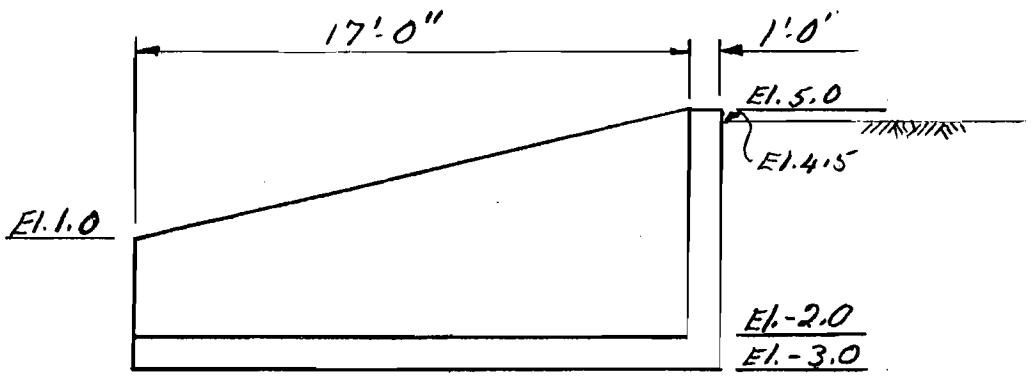
LAKE PONT. & VIC. (HURR. PROT)
PARIS RD. TO SOUTH PT. LEVEE

Sheet No. 15
Comp. by - LLW
Chkd by - TST
Date 20 Nov. 71

DRAINAGE INLET Sta. 633+05



PILE PLAN



TYPICAL SECTION

Fig. B-15

LAKE PONT & VIC (HURR PROT)
PARIS RD. TO SOUTH PT. LEVEE

Sheet no. 16
Comp. by LLW
Chkd by TST
Date 20 Oct. 71

DRAINAGE INLET REINFORCING

Max. Moment: 1' section of Headwall as cantilever section

Soil Pressure:

$W = (0.100 \times 6.5) \times 6.5' \times 0.5' \times 1 = 2.11^{K}$

$M = 2.11 \times \frac{6.5}{3} = 4.57'^{K}$

$A_s = \frac{4.57}{1.44 \times 9.5'} = 0.33^{\square''}$

Min. $A_s = 0.002 \times 12 \times 12 = 0.29^{\square''}$

Headwall and side walls

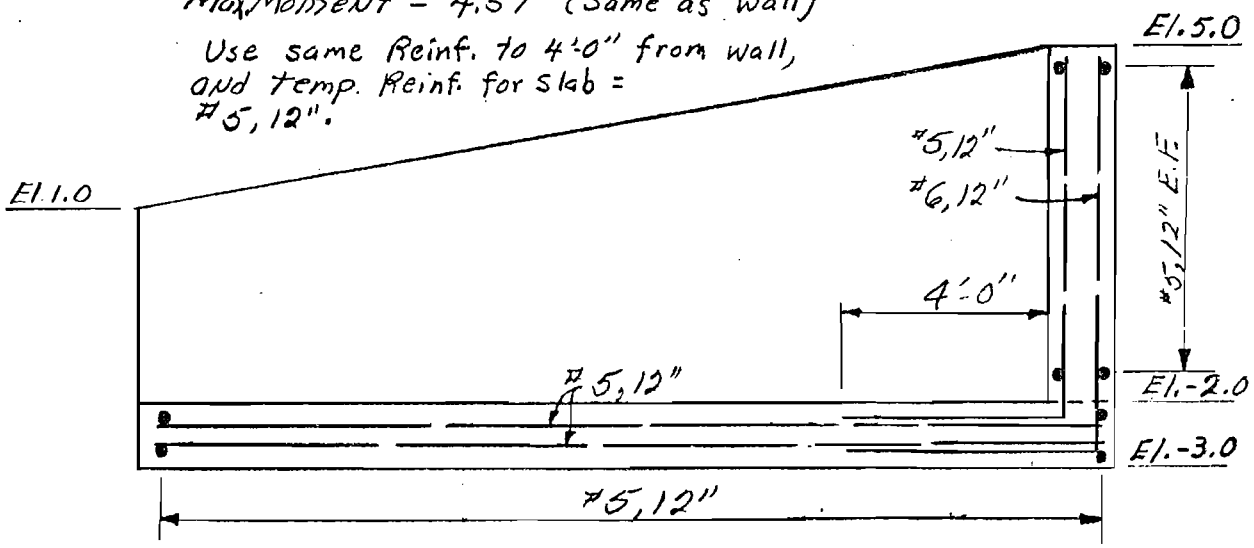
Walls: #6@12 Outside Face, #5,12" Inside Face

Temp. reinf. #5, 12"

Slab Reinforcement

Max Moment = 4.57'K (Same as wall)

Use same Reinf. to 4'-0" from wall, and temp. Reinf. for slab = #5, 12".



TYPICAL SECTION

Fig. B-16

LAKE PONTCHARTRAIN, LOUISIANA AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL
SUPPLEMENT NO. 5B
NEW ORLEANS EAST LAKEFRONT LEVEE
PARIS ROAD TO SOUTH POINT

APPENDIX C
HYDROLOGY AND HYDRAULICS

LAKE PONTCHARTRAIN, LOUISIANA AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL
SUPPLEMENT NO. 5B
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APPENDIX C
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PARIS ROAD TO SOUTH POINT

APPENDIX C
HYDROLOGY AND HYDRAULICS

1. General. This appendix presents all hydrologic and hydraulic design criteria and analyses associated with the New Orleans East lakefront levee. The overall plan of improvement is described in detail in the main body of this memorandum and references to the main text are cited where appropriate.

2. Tidal hydraulics. The Hydrology and Hydraulic Analysis design memorandum for the Lake Pontchartrain Barrier Plan was presented in a series of three separate reports entitled "Design Memorandum No. 1" and subtitled "Part I - Chalmette," "Part II - Barrier," and "Part III - Lakeshore," respectively. Part I - Chalmette was approved on 27 October 1966; Part II - Barrier was approved on 18 October 1967; and Part III - Lakeshore was approved on 6 March 1969. These documents present detailed descriptions and analyses of the tidal hydraulic methods and procedures used in tidal hydraulic design of the features for the plan and include the essential data, assumptions, and criteria used, and results of studies which provide the bases for determining surges, routing, wind tides, runup, overtopping, and frequencies. After approval of the above memorandums, the protective alinement for the New Orleans East lakefront levee was changed. Consequently, revisions to portions of the hydraulic design criteria previously submitted are necessary. The revised criteria, applicable to this new levee alinement, are presented below.

a. Design hurricane.

(1) Selection of design hurricane. The standard project hurricane (SPH) was selected as the design hurricane (Des H) due to the urban nature of the project area. A design hurricane of lesser intensity would indicate a lower net levee grade and expose the project area to disastrous flooding in the event of the occurrence of a hurricane approximating SPH character.

(2) Design hurricane characteristics. The characteristics of the Des H are as follows: central pressure index, 27.5 inches; radius of maximum winds, 30 nautical miles; forward speed, 6 knots; maximum overwater windspeed, 100 miles per hour; and a critical track from the southerly direction (Track A, refer to plate C-1).

b. Wave runup. The method for computing wave runup was presented in DM No. 1, Hydrology and Hydraulic Analysis, Part III -Lakeshore. Accordingly, only the results of the wave runup computations for this alinement are presented. These computations are based on the levee configuration shown on plates 27 and 31.

c. Wave characteristics. Table C-1 summarizes the data used to develop wave characteristics for the Des H; the summary of wave characteristics used in computing the runup from the significant wave is presented in table C-2. The results of wave runup computations used in determining the final design elevation of the protective levee are presented in table C-3.

d. Frequency estimates. The procedure used for determining frequency estimates is described in paragraph 9a of DM No. 1, Hydrology and Hydraulic Analysis, Part I - Chalmette. The Des H has a frequency of once in 300 years for the south shore of Lake Pontchartrain, including this feature area.

3. Description of drainage area. The New Orleans East unpumped drainage area is comprised of partially submerged marsh at an average elevation of 0.0. About 22 square miles of this drainage area are almost entirely undeveloped and are now gravity-drained through four existing drainage structures. Three of these structures are in the levee reach from South Point to the Gulf Intracoastal Waterway and will be discussed in another design memorandum. One operating structure exists in the subject reach at station 663+05 and consists of six 42-inch Ø CMP culverts with flap gates. Another structure at approximate station 419+60 has been abandoned and no longer provides drainage relief to the area. The entire drainage area is subject to periodic inundation from extreme high tides or by hurricane flooding.

4. Proposed drainage improvements. After construction of this new levee, several drainage improvements will be required. These improvements consist of replacing existing drainage facilities and constructing additional drainage works. During construction of the levee, drainage culverts spaced at 600-foot intervals will be installed to provide permanent drainage for the lakeside slope of the levee between the levee and the railroad embankment. The drainage ditch adjacent to the railroad embankment (Little Woods canal) which now serves the area will be covered by the new levee, and a new permanent drainage ditch will be constructed running adjacent and to the south of the new levee. This ditch will tie into a drainage structure which will be constructed at station 655+00. This structure replaces-in-kind the existing culverts at station 663+05. The new structure will consist of five 48-inch Ø CMP culverts with flap gates, and will also include sluice gates for positive cutoff. This new structure is shown on plate 34 of this memorandum.

TABLE C-1
DATA USED TO DETERMINE WAVE CHARACTERISTICS
DESIGN HURRICANE

Pertinent Factors		N. O. East Lakefront Levee
F	- Length of fetch, miles	5
U	- Windspeed, m.p.h.	83
s.w.l.	- Stillwater elevation, feet	8.5
d	- Average depth of fetch, feet	21.4
d_t	- Depth at toe of structure, feet	11.5

TABLE C-2
WAVE CHARACTERISTICS
DESIGN HURRICANE

Characteristics		N. O. East Lakefront Levee
H_S	- Significant wave height, feet	7.5
T	- Wave period, seconds	6.8
L_o	- Deepwater wave length, feet	236.8
d/L_o	- Relative depth	0.0904
H_S/H_o'	- Shoaling coefficient	0.9418
H_o'	- Deepwater wave height, feet	7.97
H_o'/T^2	- Wave steepness	0.172

TABLE C-3
DESIGN WIND TIDE, WAVE, AND WAVE RUNUP DATA
FOR SIGNIFICANT WAVE

TRACK A - N.O. EAST LAKEFRONT

Hour	Wind tide	Wind	Fetch	Av.depth	d_b	T	H'_o	Hypothetical slope	Runup	Levee design elevation
	ft. m.s.l.	m.p.h.	miles	ft.	ft.	sec.	ft.	vert.to hor.	ft.	ft. m.s.l.
+9	8.5	83	5	21.4	9.60	6.8	7.97	1 on 7.4	5.5	14.0

5. Drainage system design. Construction of this new reach of levee necessitates a thorough analysis of the existing drainage pattern for the project area as well as a new drainage system design. This new system is designed to insure that the postproject drainage will at least replace-in-kind the preproject drainage capabilities.

a. Hydraulic Computations.

(1) Embankment runoff. Runoff from the lakeside levee slope was computed using the rational method because the area is small. The formula used was $Q = CIA$ in which Q is the runoff in cubic feet per second (c.f.s.); C is the coefficient of imperviousness; I is the rainfall intensity in inches per hour; and A is the drainage area in acres. The values of "C" were estimated from a table of typical values shown in a publication by the U. S. Army Engineer School, Fort Belvoir, Virginia, entitled "Student Reference Drainage," dated January 1964. All the surfaces were considered to be impervious with vegetal cover. Values of "C" used were 0.43 for the levee crown and 0.58 for the levee slope. The values of "I" were obtained from the U. S. Weather Bureau Technical Paper No. 25, "Rainfall Intensity - Duration - Frequency Curves" dated December 1955. The curves used are shown on plate C-4.

(2) Collector ditch and drainage culvert spacing. The Manning formula with a roughness coefficient of 0.070 was used to determine friction losses in the collector ditch between the levee and the railroad embankment. This formula and coefficient was also used to verify the velocity which had been assumed to determine the time of concentration needed to determine the value of "I" in the use of the rational method. C, the coefficient of imperviousness, was assumed to be 0.53 for the collector ditch. The spacing between the levee drainage culverts (600 feet center to center) was determined on the assumption that water ponded in the collector ditch should not be allowed to overtop the railroad embankment.

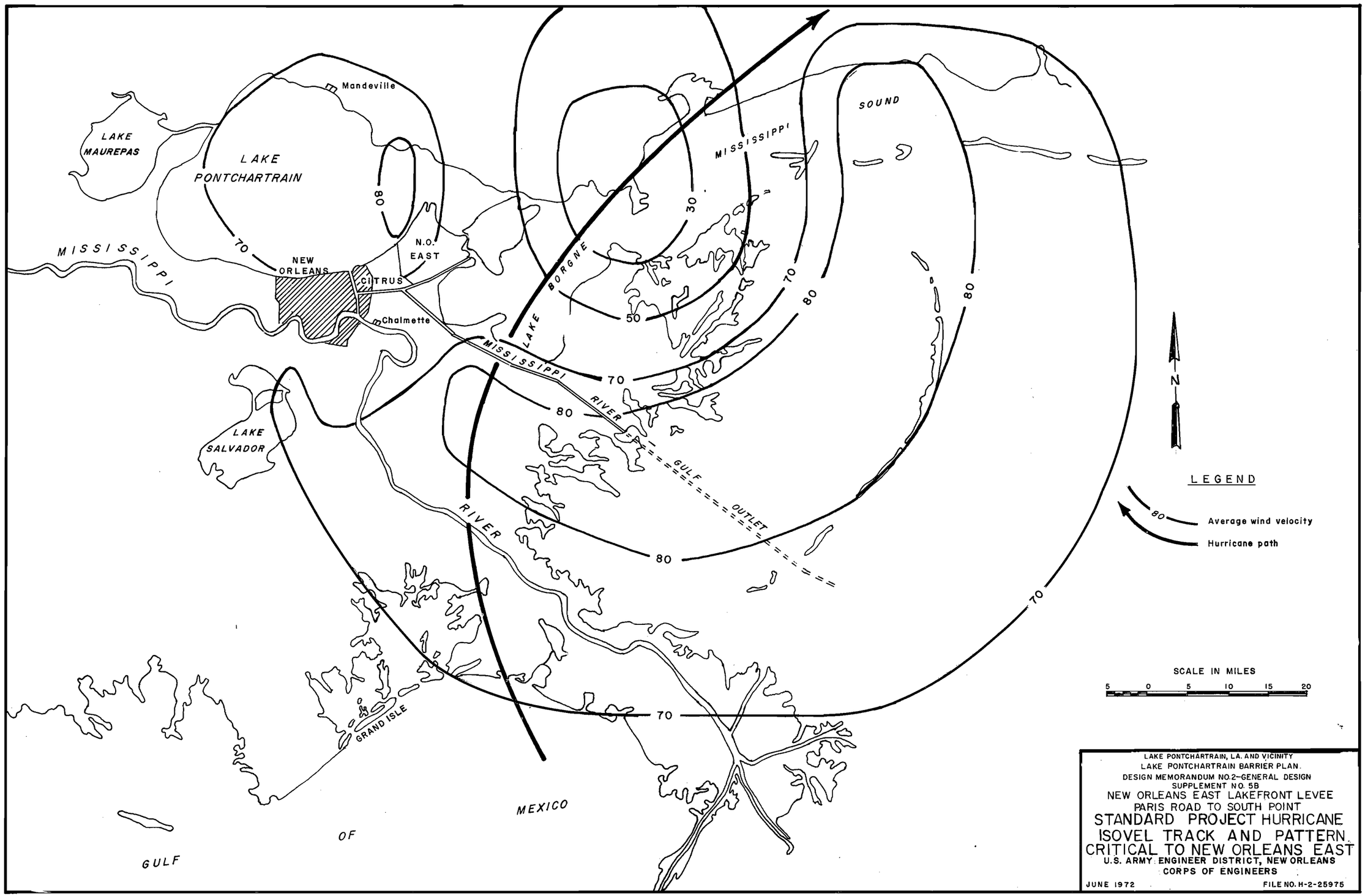
(3) Drainage culvert rating curves. Rating curves for the levee drainage culverts and for the new drainage structure at South Point were computed using the orifice flow equation, $Q = CA(2gh)^{0.50}$, where Q is the discharge in c.f.s., C is the discharge coefficient, A is the cross-sectional area in square feet, and h is the differential head, in feet, on the culvert. Using submerged outlet conditions, an entrance loss of 20 percent difference in velocity heads and a roughness coefficient of 0.023 the friction losses were evaluated and "C" values were calculated as follows: South Point structure, -0.57; the embankment culverts, 0.40. The rating curves for these improvements are shown on plates C-2 and C-3, respectively.

b. Levee drainage culverts. The levee drainage culverts consist of 12-inch centerline CMP with a catch basin 4 feet by 4 feet by 2 feet collecting for each structure. A grating on the catch basin will be provided. The slope of the pipe is approximately 1 vertical to 60 horizontal sloping from a landside invert elevation of 4.0 to the lakeside invert elevation of 3.0. These structures were designed to convey the flows from a 25-year frequency flood without overtopping the railroad embankment. Losses through the grating were considered minimal. Riprap protection will be provided around the catch basin to protect against localized scouring. Details are shown on plate 53 of the main report.

c. Drainage structure at South Point. The existing structure at South Point (levee station 663+05) consists of six 42-inch Ø corrugated metal pipes (CMP) 120 feet in length. This structure cannot be modified to meet current standard design criteria and will, therefore, be replaced by a new structure at least hydraulically equivalent. In conjunction with this criteria, five 48-inch Ø CMP 128 feet in length will be used. The invert elevation will be -2.0 which is the same as the existing structure and its location will be levee station 665+00. A trash screen will be provided on the inlet side and flap gates will be provided on the outlet end. Details of the structure are shown on plate 34 in the main report.

-2.0 msl

d. Permanent drainage ditch. The new drainage ditch south of the levee has been designed to replace-in-kind the ditch which now exists (Little Woods canal). The new drainage ditch will be excavated to a bottom width of 20 feet at elevation -10 and side slopes of 1V on 2H. This ditch will extend along the full length of the levee and will carry design flows to the new drainage structure within its banks.



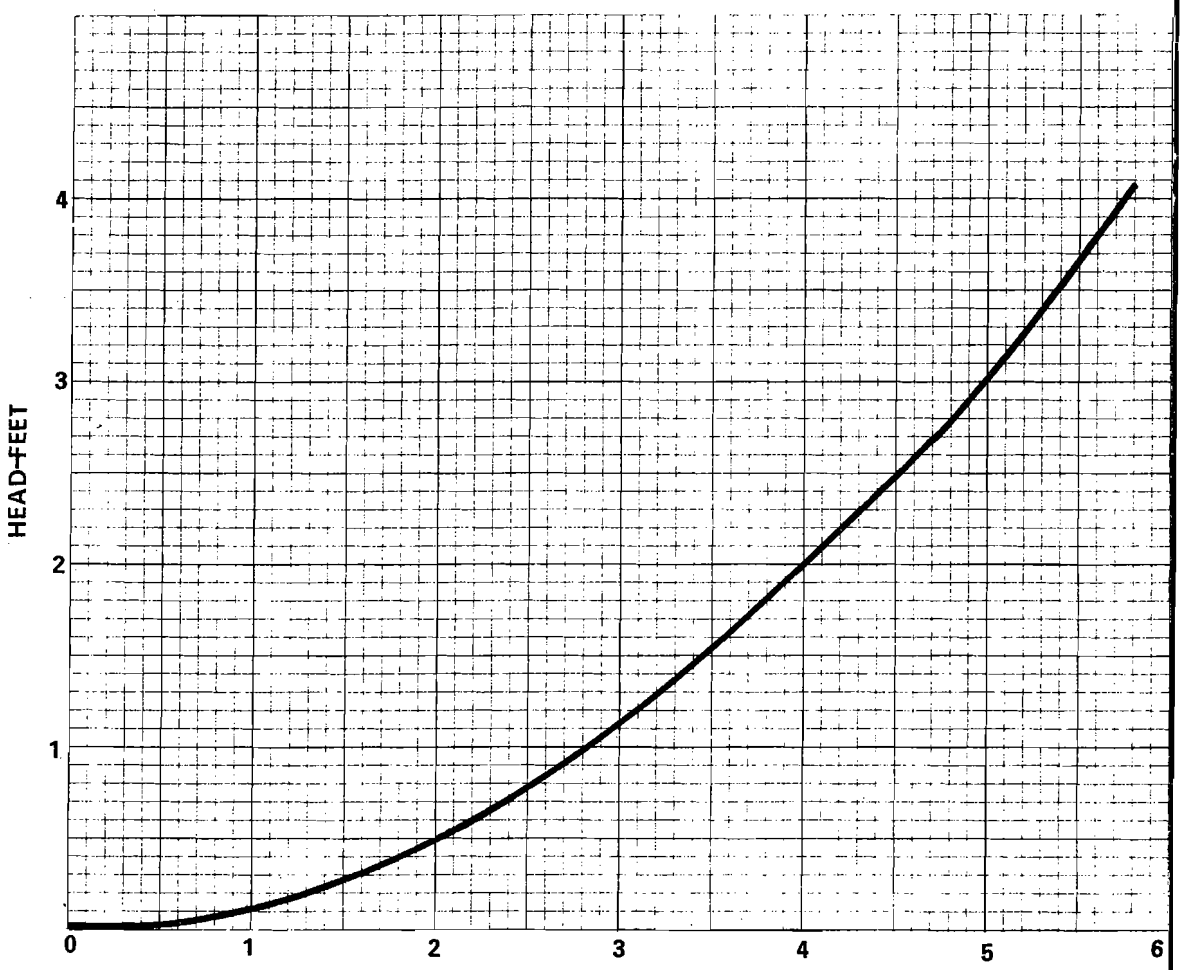
LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO.2-GENERAL DESIGN
SUPPLEMENT NO. 5B
NEW ORLEANS EAST LAKEFRONT LEVEE
PARIS ROAD TO SOUTH POINT

STANDARD PROJECT HURRICANE ISOVEL TRACK AND PATTERN CRITICAL TO NEW ORLEANS EAST

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

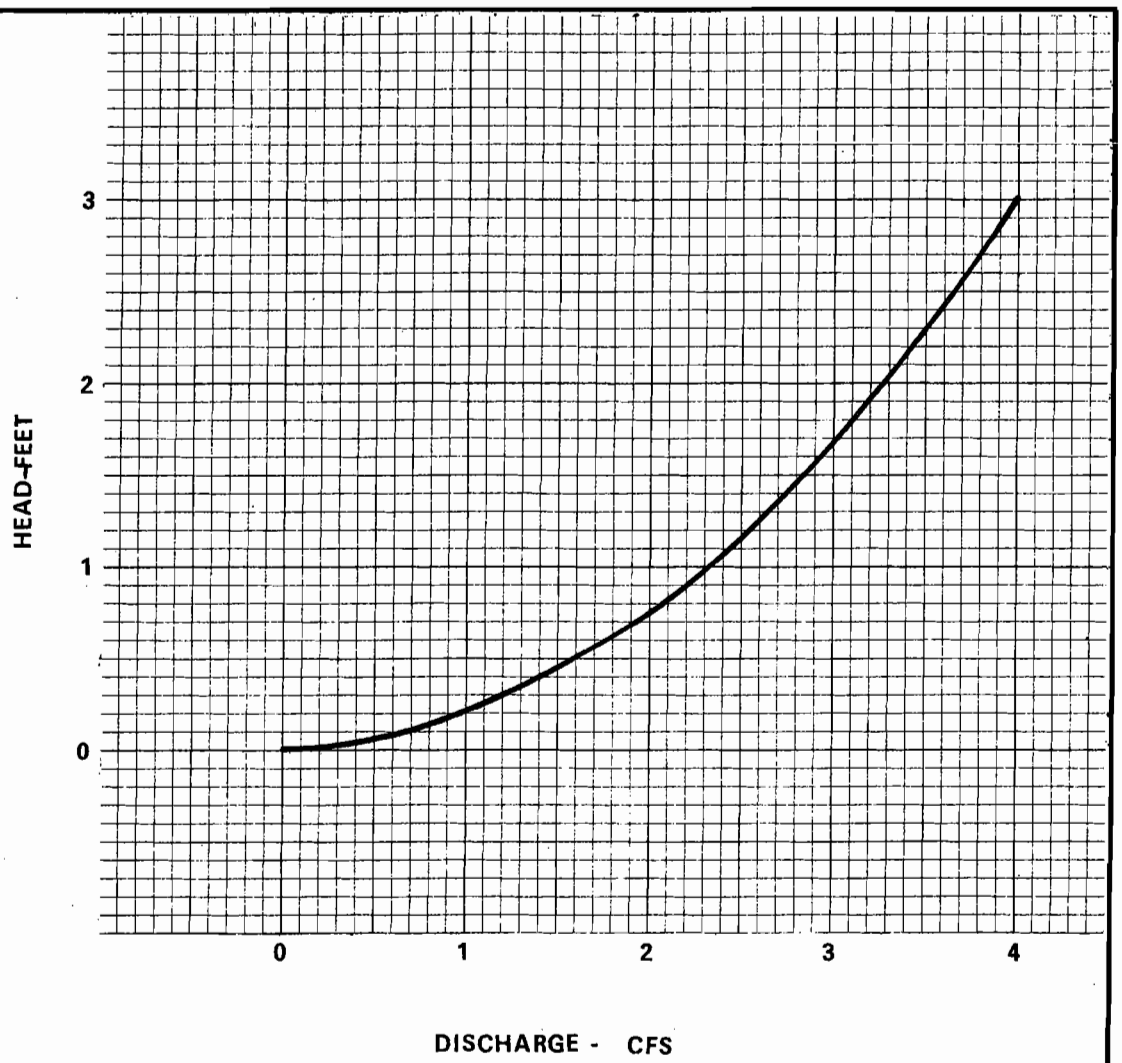
JUNE 1972 FILE NO. H-2-25975

PLATE C-1



LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 – GENERAL DESIGN
SUPPLEMENT NO. 58
NEW ORLEANS EAST LAKEFRONT LEVEE
PARIS ROAD TO SOUTH POINT
RATING CURVE
SOUTH POINT DRAINAGE STRUCTURE
5-48" CMP LENGTH -128'
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
JUNE 1972 FILE NO. H-2-25975

PLATE C-2



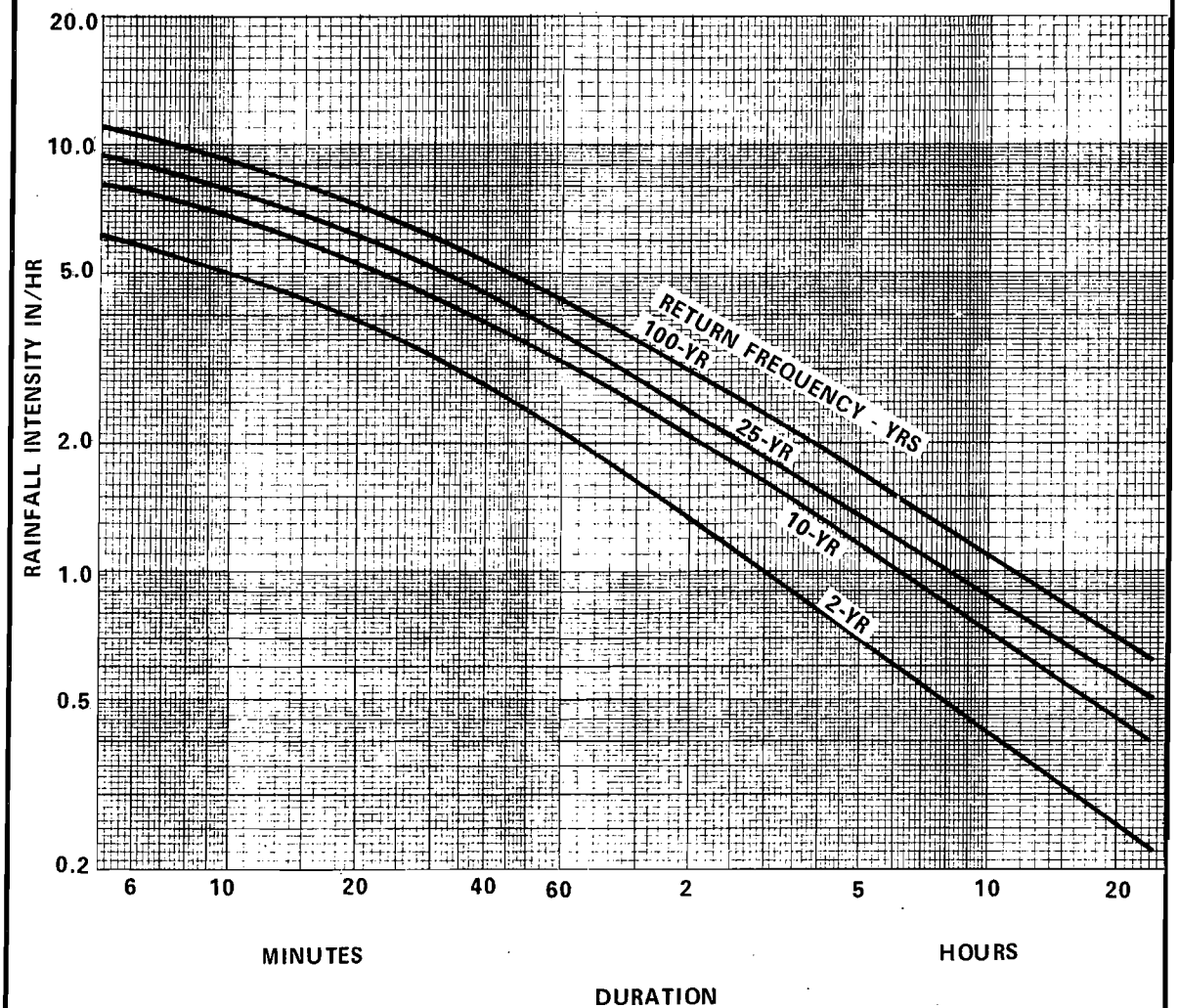
LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2—GENERAL DESIGN
SUPPLEMENT NO. 5B
NEW ORLEANS EAST LAKEFRONT LEVEE
PARIS ROAD TO SOUTH POINT

RATING CURVES
12" ϕ X 60' LEVEE DRAINAGE OUTLET PIPES

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

JUNE 1972 FILE NO. H-2-25975

PLATE C-3



LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2—GENERAL DESIGN
SUPPLEMENT NO. 5B
NEW ORLEANS EAST LAKEFRONT LEVEE
PARIS ROAD TO SOUTH POINT

RAINFALL INTENSITY—DURATION—FREQUENCY CURVES

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

JUNE 1972 FILE NO. H-2-25975

PLATE C-4

UNIFIED SOIL CLASSIFICATION

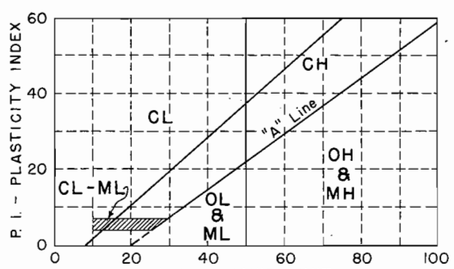
MAJOR DIVISION		TYPE	LETTER SYMBOL	SYMBOL	TYPICAL NAMES
COARSE – GRAINED SOILS More than half of material is larger than No. 200 sieve size.	GRAVELS More than half of coarse fraction is larger than No.4 sieve size.	CLEAN GRAVEL (Little or No Fines)	GW		GRAVEL, Well Graded, gravel-sand mixtures, little or no fines
			GP		GRAVEL, Poorly Graded, gravel-sand mixtures, little or no fines
		GRAVEL WITH FINES (Appreciable Amount of Fines)	GM		SILTY GRAVEL, gravel-sand-silt mixtures
			GC		CLAYEY GRAVEL, gravel-sand-clay mixtures
	SANDS More than half of coarse fraction is smaller than No.4 sieve size.	CLEAN SAND (Little or No Fines)	SW		SAND, Well-Graded, gravelly sands
			SP		SAND, Poorly-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			Sl		SHELLS
NO SAMPLE					

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

DESCRIPTIVE SYMBOLS

COLOR	
COLOR	SYMBOL
TAN	T
YELLOW	Y
RED	R
BLACK	BK
GRAY	Gr
LIGHT GRAY	lGr
DARK GRAY	dGr
BROWN	Br
LIGHT BROWN	lBr
DARK BROWN	dBr
BROWNISH-GRAY	br Gr
GRAYISH-BROWN	gy Br
GREENISH-GRAY	gn Gr
GRAYISH-GREEN	gy Gn
GREEN	Gn
BLUE	Bl
BLUE-GREEN	Bl Gn
WHITE	Wh
MOTTLED	Mot

CONSISTENCY FOR COHESIVE SOILS		
CONSISTENCY	COHESION IN LBS./SQ.FT. FROM UNCONFINED COMPRESSION TEST	SYMBOL
VERY SOFT	< 250	vSo
SOFT	250 - 500	So
MEDIUM	500 - 1000	M
STIFF	1000 - 2000	St
VERY STIFF	2000 - 4000	vSt
HARD	> 4000	H



PLASTICITY CHART

For classification of fine – grained soils

MODIFICATIONS	
MODIFICATION	SYMBOL
Traces	Tr-
Fine	F
Medium	M
Coarse	C
Concretions	cc
Rootlets	rt
Lignite fragments	lg
Shale fragments	sh
Sandstone fragments	sds
Shell fragments	slf
Organic matter	O
Clay strata or lenses	CS
Silt strata or lenses	SIS
Sand strata or lenses	SS
Sandy	S
Gravelly	G
Boulders	B
Slickensides	SL
Wood	Wd
Oxidized	Ox

NOTES:

FIGURES TO LEFT OF BORING UNDER COLUMN "W OR D_{10}"

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

(C) Denotes location of consolidation test **

(S) Denotes location of consolidated-drained direct shear test **

(R) Denotes location of consolidated-undrained triaxial compression test **

(Q) Denotes location of unconsolidated-undrained triaxial compression test **

(T) 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 ($1\frac{3}{8}$" 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 D_{10} size of a soil is the grain diameter in millimeters of which 10% of the soil is finer, and 90% coarser than size D_{10}.

**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
3	5-3-71	ADDED UPPER LIMIT LINE (P.I.=0.9(LL-8)) ON PLASTICITY CHART	LMVED-G LETTER D'T'D 29 APRIL 1971
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

PLATE A