

TC202
N46L3P6
no. 13
1984
v. 1

Corps
Engineers
Orleans District



LAKE PONTCHARTRAIN, LA. AND VICINITY
**LAKE PONTCHARTRAIN
HIGH LEVEL PLAN**

DESIGN MEMORANDUM NO. 13
GENERAL DESIGN

US-CE-C Property of the
United States Government

**ORLEANS PARISH
LAKEFRONT LEVEE
WEST OF I.H.N.C.**

IN TWO VOLUMES
VOLUME I

DEPARTMENT OF THE ARMY
NEW ORLEANS DISTRICT, CORPS OF ENGINEERS
NEW ORLEANS, LOUISIANA
November, 1984

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TC 202
NH6 23P6
no. 13.
1984

LMVED-TD (DAEN-ECE-B/9 Apr 85) 3d End Mr. Bardwell/msm/5925 v. 1
SUBJECT: Lake Pontchartrain, Louisiana and Vicinity High Level Plan Design
Memorandum No. 13, General Design - Orleans Parish Lakefront West
of IHNC

DA, Lower Mississippi Valley Division, CE, Vicksburg, MS 39180-0080

25 JUN '85

TO: Commander, New Orleans District, ATTN: LMNED-SP

The action proposed in the 2d End is approved.

FOR THE COMMANDER:



FRED H. BAYLEY III
Acting Chief, Engineering Division

Encl
nc

CF w cy 2d End:
DAEN-ECE-B



DEPARTMENT OF THE ARMY

U.S. Army Corps of Engineers
WASHINGTON, D.C. 20314-1000

REPLY TO
ATTENTION OF:

DAEN-ECE-B

9 April 1985

SUBJECT: Lake Pontchartrain, Louisiana and Vicinity High Level Plan
Design Memorandum No. 13, General Design - Orleans Parish
Lakefront West of IHNC

Commander, Lower Mississippi Valley Division
ATTN: LMVED-TD

1. Reference 1st endorsement LMVED-TD, 22 February 1985, on letter LMNED-SP, 30 November 1984, subject as above.
2. Comments on the subject design memorandum, transmitted with the above referenced correspondence, are furnished for appropriate action.
3. Referenced 1st endorsement, paragraph 2j. All project features to be developed by local interests should be clearly identified and documented.
4. Table 5.
 - a. Page 44, Construction Cost Estimate for Seabrook Floodwall. Approximately 1,800 SF of PZ-27 sheet piling was shown as being driven in segments underneath the Seabrook Bridge. This as well as the minimal vertical clearance beneath the bridge would indicate a higher unit cost for that portion of sheet piling. The cost estimate does not reflect higher prices for the sheet piling beneath the bridge. The cost estimate should reflect increased unit cost for sheet piling in this area.
 - b. Page 45, Relocation Cost Estimate for Seabrook Floodwall. The costs for roadways including the access ramps should be broken down in accordance with pages B-28 and B-29 of Appendix B to EM 1110-2-1301 rather than as a lump sum as shown in this table.
 - c. Page 48, Relocation Cost Estimate for American Standard Floodwall. The costs for Lakeshore Drive and Ramps should be broken down in the manner specified in the above paragraph 4b; the costs for the following should also be broken down.
 - (1) Page 50. The costs for Ramps 3&4 in the "Relocation Cost Estimate for Pontchartrain Beach Floodwall".
 - (2) Page 57. The cost for Ramp No.1 at Leroy Johnson Drive in the "Relocation Cost Estimate for Levee Reach A".

9 April 1985 .

SUBJECT: Lake Pontchartrain, Louisiana and Vicinity High Level Plan
Design Memorandum No. 13, General Design - Orleans Parish
Lakefront West of IHNC

(3) Page 59. The costs for Ramps No. 5, 6, and 7 in the "Relocation Cost Estimate for Levee Reach B".

5. Table 7, Page 63. The schedule shows the dates and estimated costs broken down for seven contract packages. The cost estimate was broken down to the same seven contract packages. Since neither the plans as shown on the plates nor the cost estimate clearly shows the limits of the contract packages, it is difficult to determine the scope of each contract. The limits of each contract package should be clearly shown.

6. Paragraph 65. The estimate for annual operation and maintenance costs appears to be low; these costs should be supported by details which set forth the rationale for arriving at these costs. Also, these estimates should include replacement costs, periodic inspection costs, and any required reporting costs. (See ER 1110-2-1150, ER 1110-2-1405, and ER 1110-2-1301).

7. All engineering concerns regarding maintenance, operation, and/or replacement of project items, which are to be set forth in the operations and maintenance manual, should be included. (See ER 1110-2-1150 and ER 1110-2-1405).

8. Plate 34. The notes on this plate show that a No. 6 reinforcing rod is welded to the top of each steel sheet pile. This is not consistent with the drawing notation indicating the use of a No. 10 bar. If a No. 6 reinforcing rod is used, the welding procedure which will insure a weld which is equivalent in strength to the strength of the bar should be addressed.

9. It is noted that details of three outlet canals will be presented in separate design memorandum. A discussion should be included on how continuous high level protection will be maintained at the open canal outlets. Also, any alternative means of maintaining this protection should be outlined.

FOR THE COMMANDER:

for 
WILLIAM N. McCORMICK, JR.
Chief, Engineering Division
Directorate of Engineering and
Construction

LMVED-TD (OCE 9 Apr 85) 1st Ind
SUBJECT: Lake Pontchartrain, Louisiana and Vicinity High Level Plan, Design
Memorandum No. 13, General Design - Orleans Parish Lakefront West
of IHNC

DA, Lower Mississippi Valley Division, Corps of Engineers, Vicksburg, MS 39180-0080
15 MAY '85

TO: Commander, New Orleans District, ATTN: LMNED-SP

Referred for action.

FOR THE COMMANDER:

for *James R. Futho, P.E.*
ROBERT I. KAUFMAN, P.E.
Acting Chief, Engineering Division

LMNED-SP (OCE 9 Apr 85) 2nd End

Mr. Stutts/dn/2614

SUBJECT: Lake Pontchartrain, Louisiana and Vicinity High Level Plan,
Design Memorandum No. 13, General Design - Orleans Parish
Lakefront West of IHNC

DA, New Orleans District Corps of Engineers, P. O. Box 60267, New Orleans,
LA 70160-0267 28 May 85

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

1. The proposed disposition of comments present in the 1st Endorsement of this chain of correspondence is as follows:

a. Cmt 3. Those known project features that are to be constructed by the local sponsor and covered by this Design Memorandum have been identified in Table 7, page 63 of Volume I of the DM.

b. Cmt 4a. We concur in theory. However, that portion of the job for which the higher unit price applies, represents only a small percentage of the total sheet piling cost required at Seabrook. When this cost is prorated over the entire job, the effect on total unit price is negligible. The unit price of the sheet piling is estimated to the nearest \$.50.

c. Cmts 4b., 4c., 4c(1), 4c(2), and 4c(3). Do not concur. These relocations are the responsibility of the local interest. The lump sum payment for these relocation items was used to simplify the cost estimates presented in the GDM. A detailed cost breakdown for these items will be obtained from the local sponsor and the contracts for these relocations will be audited before credits are approved. This procedure and the level of detail presented in this GDM is the same as previously used and approved in numerous other GDMs on the Lake Pontchartrain project.

d. Cmt 5. Do not concur. The plans, Tables 5 and 7 and the narrative in the report, as presented, clearly identify the seven contract reaches.

e. Cmt 6. The estimated O&M costs were based upon actual costs incurred by the Orleans Levee Board for the existing lakefront levee west of IHNC. The O&M estimate presented in the Design Memorandum is considered to be sufficient. Replacement costs were not included in the estimate since none of the project features covered in the GDM are expected to require replacement. Periodic inspection costs and reporting costs were not considered in the O&M estimate. Periodic inspections for Lake Pontchartrain and Vicinity Hurricane Protection Project are conducted by the Corps of Engineers. (Reference multiple letter LMVED/LMVCO-0, dated 15 October 1984, from Brigadier General Sands, copy enclosed.)

LMNED-SP (OCE 9 Apr 85)

SUBJECT: Lake Pontchartrain, Louisiana and Vicinity High Level Plan,
Design Memorandum No. 13, General Design - Orleans Parish
Lakefront West of IHNC

f. Cmt 7. Concur. The project features covered in this DM include levees and floodwalls. Vehicular access through the floodwall reaches is provided by 12 gates: six steel swing gates; three steel miter swing gates and three bottom roller gates. Additionally, there is one steel vertical left roller gate to be installed as a means of providing positive cutoff at Pumping Station No. 12. The operation and maintenance of the gates will be addressed in the Project O&M Manual. A recommended schedule for mowing the 4.36 miles of levee covered in the DM will also be contained in the O&M Manual.

g. Cmt 8. Do not concur. Both the note and the drawings on this plate consistently indicate that a No. 6 reinforcing rod is to be welded to the top of each steel sheet pilings. The reinforcing rod is required to provide cathodic protection to the sheet piling, as described in paragraph 50, and not for structural strength. Minimum size welds are normally utilized for this work.

h. Cmt 9. Concur. Project protection at the three outfall canals will be the subject of a separate design memorandum for the Lake Pontchartrain Project. Conceptually there are only two alternatives for providing protection at these canals. One alternative would be to provide fronting protection at the lake ends of each canal. This alternative would call for constructing a gated structure in the canals. The gate would be closed to prevent the hurricane surge from entering the canals. The second alternative is to provide lateral parallel protection along each bank of the canals. This protection would be provided by constructing an optimal combination of levees and floodwalls. Protection across the canals in front of the pumping station would be achieved by T-wall construction. It is apparent that various combinations of the above two alternatives could be used to achieve the required protection at each canal. The GDM will address a full range of alternative methods of achieving each of the above two basic alternatives and recommend the most cost effective plan or plans that satisfy project objectives.

FOR THE COMMANDER:



FREDERIC M. CHATRY
Chief, Engineering Division

Enclosure



DEPARTMENT OF THE ARMY
LOWER MISSISSIPPI VALLEY DIVISION, CORPS OF ENGINEERS

P. O. BOX 80
VICKSBURG, MISSISSIPPI 39180

25 OCT 1984

REPLY TO
ATTENTION OF:

LMVED/LMVCO-0

15 OCT '84

SUBJECT: Periodic Inspection and Continuing Evaluation of Completed Civil Works Structures

Commander, St. Louis District
Commander, Memphis District
Commander, Vicksburg District
Commander, New Orleans District

1. Reference:

- a. ER 1110-2-100, 28 Feb 83, Periodic Inspection and Continuing Evaluation of Completed Civil Works Structures.
- b. DIVR 1110-1-310, 11 Nov 75, Periodic Inspection and Continuing Evaluation of Completed Civil Works Structures.
- c. ER 1130-2-339, 29 Oct 73, Inspection of Local Flood Protection Projects (RCS CWO-34).

2. It is the policy of the Corps of Engineers to place responsibility on the operating entity for operation, maintenance, surveillance, safety and integrity of those facilities constructed by the Corps and turned over to non-Federal operating entities for operation and maintenance. Participation by the Corps in inspection activities at such facilities is limited to assessment of these structures through annual compliance inspections managed by Operations elements and periodic inspections managed by Engineering elements to assess the safety and integrity of the water retaining features of structures the failure of which could produce catastrophic effects.

3. In accordance with the above, inspections of facilities constructed by the Corps and turned over to non-Federal operating entities should be accomplished in accordance with the following:

- a. Annual compliance inspections managed by Operations elements are to be made in accordance with reference 1c.
- b. Periodic inspections managed by Engineering elements are to be made in accordance with reference 1b. The selected critical local interest structures

Encl 1

15 OCT '84

SUBJECT: Periodic Inspection and Continuing Evaluation of Completed Civil Works Structures

to be periodically inspected by Engineering elements are listed in Incl 1. This list includes main stem Mississippi River levees, levees subject to Mississippi River backwater, Atchafalaya Basin Protection levees, and hurricane protection levees associated with the Lake Pontchartrain and vicinity and LaRose to Golden Meadow projects and selected critical local interest structures located in these lines of protection. The levees and structures included in this list were selected as facilities whose failure could produce catastrophic effects. Periodic inspection of these critical local interest structures shall include on-site inspection and instrumentation data collection and evaluation as are necessary to assure the integrity and safety of the facility with respect to its ability to function as a water retaining structure. Inspection of mechanical and electrical features such as motors, pumps, transformers, switches, etc. shall be included in the periodic inspection by Engineering elements only to the extent necessary to ensure the water retaining capability of the project, e.g., gates, etc.

c. The periodic inspections discussed in para 3b above should be combined with the annual compliance inspections discussed in para 3a above whenever feasible and possible. Several projects may also be grouped together for inspection when desirable.

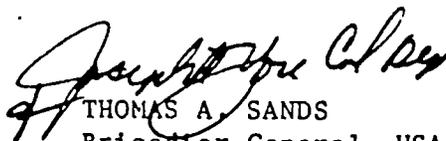
d. Any new structures transferred to local interests for operation and maintenance shall be inspected initially by the Corps in accordance with criteria in reference 1b prior to transfer. With approval of this office, ATTN: LMVED-G, such new structures located in any of the protection systems outlined above or any other structure deemed to be critical, can be added to the list for inspection.

e. Other local interest structures can be inspected on an as needed basis when the O&M Compliance Inspections or other data indicate a structure is in distress. Approval of this office, ATTN: LMVED-G, should be obtained prior to such inspection.

4. The operating entity for all facilities constructed by the Corps of Engineers and turned over to non-Federal operating entities for operation and maintenance shall be notified annually of their responsibility for operating and maintaining the facilities and for assuring the integrity and safety of the facilities.

5. Beginning FY 87, funding for inspection and evaluation efforts in conjunction with para 3b shall be included with the District Operations Division annual O&M compliance inspection program in the Inspection of Completed Works Project work function category and code: Inspection of Completed Works (10), E13.

1 Incl.
as


THOMAS A. SANDS
Brigadier General, USA
Commanding

List of Critical Local Interest Structures and
Levees for Periodic Inspection and Evaluation

Structures

St. Louis District

Cape Girardeau - Floodwall, Pumping Stations and Gravity Drain
Wood River Drainage & Levee District - Pumping Stations and Gravity Drains
Prairie du Pont Levee & Sanitary District - Gravity Drain and Pumping Stations
East St. Louis & Vicinity - Floodwall, Pumping Station, and Gravity Drains
Levee & Sanitary District
St. Louis, Mo. Flood Protection - Floodwall and Pumping Stations

Memphis District

Cairo - Levee, Floodwall, and Pump Plants
Mound City - Levee and Floodwall
Caruthersville Floodwall
Cottonwood Slough Pumping Station
Helena Floodwall
Hickman Floodwall
Goose Pond Pumping Station
Drinkwater Pumping Station and Dog Tooth Bend Culvert
Little Island Bayou and Deep Bayou Floodgate
Memphis - Cypress Creek, Marble Bayou, Nonconnah Creek and Workhouse Bayou
Pumping Stations, and Memphis Floodwall and Levee
Lake No. 9 Floodgate and Pump Plant
Ensley Pumping Plant and Levee
Long Lake Culvert
Walker Street Culvert
Peafield Floodgate
St. Johns Bayou Floodgate

Vicksburg District

Fairgrounds and East Jackson Pump Plant and Levee

Jonesville Floodwall, Levee and Pump Plant

Vicksburg Floodwall and Levee

Monroe-West Monroe Floodwall, Floodgate, Levee, Pump Plant

New Orleans District

Berwick Floodwall

Morgan City - Tiger Island Floodwall

Tiger Island Floodwall (new)

Bayou Bienvenue Control Structure

Bayou Dupre Control Structure

Golden Meadow Floodgate

LaRose Floodgate

Empire Floodgate

Levees

Main Stem Mississippi River Levees

Levees Subject to Mississippi River Backwater

Atchafalaya Basin Protection Levees

Red River Backwater Levees

Hurricane Protection Levees, Lake Pontchartrain & Vicinity and LaRose to

Golden Meadow

N.O. to Venice



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

REPLY TO
ATTENTION OF:

November 30, 1984

LMNED-SP

SUBJECT: Lake Pontchartrain, Louisiana and Vicinity High
Level Plan Design Memorandum No. 13, General
Design - Orleans Parish Lakefront West of IHNC

Commander, Lower Mississippi Valley Division
ATTN: LMVED-TD

1. The subject design memorandum is submitted for review and approval and has been prepared generally in accordance with the provisions of Appendix A of EC 1110-2-193, dated 20 April 1979.
2. A summary of the current status of the Section 404 (b)(1) evaluation, environmental analysis, and cultural resources investigation is as follows:
 - a. A Section 404 (b)(1) Public Notice was issued 28 March 1984 and State Water Quality Certification was received 29 June 1984.
 - b. No endangered or threatened species will be affected by the recommended construction.
 - c. An Environmental Impact Statement (EIS), Lake Pontchartrain, Louisiana and Vicinity Hurricane Protection project included the levee construction, and was filed with the Council on Environmental Quality in January of 1975. A Draft Supplement to this EIS was filed with the Environmental Protection Agency in December of 1983, and assessed the impacts associated with increased levee height for high level protection. The Final Supplemental EIS is scheduled to be filed with EPA in December of 1984.

LMNED-SP

November 30, 1984

SUBJECT: Lake Pontchartrain, Louisiana and Vicinity High
Level Plan Design Memorandum No. 13, General
Design - Orleans Parish Lakefront West of IHNC

d. Since the New Orleans Lakefront levee is located almost entirely on post-1930 land fill, no cultural resources are affected. No cultural resource surveys were, therefore, necessary. The finding was coordinated with the Louisiana State Historic Preservation Officer through distribution of the Draft EIS for Lake Pontchartrain, Louisiana, and Vicinity Hurricane Protection Project. The possible impacts of the Bayou St. John closure on significant cultural resources were addressed through the Section 404 permit process. No property eligible for the National Register will be adversely affected by the Bayou St. John closure.

3. The use of water conservation measures in construction of this project has been investigated. The interdisciplinary team review of the report found that no opportunities for water conservation measures exist.

4. In accordance with LMVED-TS letter dated 5 February 1981, this report has been reviewed by the District Security Officer. There were no review comments to be incorporated in the report.

5. This report is being submitted as scheduled. The current program calls for construction award in March 1985; therefore, a prompt review and approval of this General Design Memorandum is required.

6. Approval of the report as a basis for preparation of plans and specifications is recommended.


EUGENE S. WITHERSPOON
Colonel, CE
Commanding

1 Encl 2 vol (16 cys fwd sep)
as

LMVED-TD (NOD 30 Nov 84) 1st Ind
SUBJECT: Lake Pontchartrain, Louisiana and Vicinity High Level Plan Design
Memorandum No. 13, General Design - Orleans Parish Lakefront West
of IHNC

DA, Lower Mississippi Valley Division, Corps of Engineers, Vicksburg, MS 39180-0080

22 FEB '85

TO: Commander, New Orleans District, ATTN: LMNED-SP

1. The subject DM is approved as a basis for plans and specifications subject to the satisfactory resolution of the following comments.

2. Volume I.

a. Para 8. The current status of assurances should be revised to read the same as presented in the Lake Pontchartrain, Louisiana and Vicinity, Hurricane Protection Project, Reevaluation Study, July 1984, Volume 1, page 146.

b. Para 28a. The new and existing levees have design slopes of 1V-on-3H and construction slopes as steep as 1V-on-2.2H (See Plate 122) to allow for overbuild. Paragraph 35 indicates that the levee fill will be obtained from a borrow area located in Lake Pontchartrain close to the north shore. Because of the relatively steep levee side slopes, we are concerned with the possibility of shallow slope sloughs. We understand from conversation with your F&M Br personnel that they are unaware of slope sloughing problems on the existing levees and that these levees were constructed of hauled material from land pits in the Slidell area. However, due to the steep construction slopes and the uncertainty as to the actual borrow source, you should consider limiting the PI of the levee enlargement fill to help preclude levee slope slough problems. If it appears infeasible to limit the plasticity of the fill material, it may be desirable to flatten the levee slopes.

c. Para 28c. The estimated settlement for each levee design reach should be furnished. In future similar DMs, the estimated settlement for each design reach should be shown on the applicable stability plate and sample settlement computations furnished.

d. Para 28d(1). The reaches of levee listed in this paragraph have creep ratios of between 14 and 17 without seepage berms. In addition, the short reach of levee shown on Plate 107 has a creep ratio of 19 with no seepage berm. In view of these borderline creep ratios and the extremely short flood duration, you should delete the seepage control measures proposed for these reaches unless there is a known history of underseepage for a particular levee reach. In addition to the investigation of levee seepage history you should also determine whether cutoffs were included in the original levee construction. If you determine that underseepage control measures are necessary, an impervious clay berm should be constructed, or possibly an impervious blanket could be created by mixing bentonite with the in-situ

LMVED-TD (NOD 30 Nov 84) 1st Ind 22 FEB 85
SUBJECT: Lake Pontchartrain, Louisiana and Vicinity High Level Plan Design
Memorandum No. 13, General Design - Orleans Parish Lakefront West
of IHNC

sands. We do not consider that the 6 mil plastic lining covered with in-situ material would provide a satisfactory blanket because the permanence of the 6 mil plastic is questioned.

e. Para 28d(3). Unless there is a history of through or underseepage for the reaches of levee discussed in this paragraph, the proposed clay cutoffs should be deleted in view of the relatively impervious silty levee and foundation soils and extremely short flood duration. As discussed in the preceding paragraph, we do not consider the 6 mil plastic lining covered with in-situ material a satisfactory substitute for a clay cutoff. In addition, the proposed clay cutoffs should not be placed at the protected side levee toe as shown on Plate 129. This would cause a build up of hydrostatic pressures in the silt which could lead to levee failure. Instead, the clay cutoff should be placed at the floodside levee toe as shown on Plate 130.

f. Para 49c, Plate 43 and Vol II, Appendix B. Computations indicate that the X_p force shown on Figure 2 in Appendix B is in excess of 3 tons for the full height of the gate. This force must be resisted by the miter block seal, which is to be constructed of molded rubber. The narrative does not indicate if this rubber material is capable of withstanding the reaction force. Also, the drawings do not show any type of steel bearing bar, similar to that used on the swing gate, that would be used to resist the X_p force. This should be clarified.

g. Para 49e. The vertical lift roller gate proposed for the existing pumping station No. 12 discharge line closure should be provided with electric motor driven lifts, either permanent or portable type.

h. Para 58c. This paragraph discusses four existing neighborhood parks which the proposed levee work will traverse. The impacts on the four areas should be discussed. If the impacts are considered to be permanent, indicate what effort will be undertaken to replace the developed parks.

i. Para 61, Table 5. The Real Estate Estimates shown in Table 5, coincide with estimates on file in LMVRE-E, totalling \$14,255,000; however, Tables 6 and 9 reflect an \$18,257,000 estimate for lands and damages. The difference should be rectified.

j. Para 63, Table 7, Footnote 1. Plans and specifications prepared by local interest for structures to be incorporated into this project should be submitted to this office for review and approval.

k. Plates 2-6, 8 and 22-25. The top of the road ramp is as much as 3.5 ft below the net grade of the levee. This could present a serious problem during the design hurricane. It would appear that the road should be raised to

LMVED-TD (NOD 30 Nov 84) 1st Ind 22 FEB '85
SUBJECT: Lake Pontchartrain, Louisiana and Vicinity High Level Plan Design
Memorandum No. 13, General Design - Orleans Parish Lakefront West
of IHNC

prevent overtopping or overflow. We recognize that computations will demonstrate a reduction in the wave runup due to the much flatter slopes of the roads. However, the spill over on the roadway from the breaking wave against the adjacent levee may produce an unacceptable amount of overflow.

1. Plate 3 and 4. The right-of-way shown on Plates 3 and 4 is approximately 150 feet in width from Station 136+13.19 B/L to Station 152+44.64 B/L. Plate 27 Typical Section No. 5 shows a required levee and berm base width of 252 feet. Plate 115 shows a required levee and berm base width of approximately 257 feet. This discrepancy should be resolved.

m. Plate 17. The scale on the plan sheet should read "1 inch equals 40 feet". Also, the disposition, if any, of the slab shown on the plan should be identified on this plate.

n. Plate 34.

(1) The reasons for using steel H piles under one reach of wall, 408+28 to 411+08, while prestressed concrete piles are used in the rest of the job should be explained.

(2) Preliminary computations indicate that the thickness of the T-Wall Stem (both typical sections) at the point of maximum moment is excessive. This should be checked.

(3) The reasons for extending the full cross section of the stem to the top of the wall should be explained. It has been the practice in the past to taper the landside face to a minimum thickness of 12 inches at the top of the wall.

3. Volume II.

a. Para I-7d, Appendix A. The basis for the computations listed in Tables A-14 and A-15 is not identified. In view of the 29 November 1984 DAEN-ECE-B comments on GDM 14, Citrus Lakefront Levee, IHNC to Paris Road, relative to the derivation of the wave data, you should identify the basis of the computation and indicate the magnitude of the changes resulting from use of the latest design guidance.

b. Plates 99 and 115. Plate 115 indicates the need for large landside and floodside stability berms due to the presence of a stratum of very soft clay, C=80 psf, between elevations +3.0 and -2.0. See Plate 99 for design shear strength plot. The estimated cost of these stability berms is over \$3,000,000, most of which is for additional right-of-way. In view of this

LMVED-TD (NOD 30 Nov 84) 1st Ind 22 FEB '85
SUBJECT: Lake Pontchartrain, Louisiana and Vicinity High Level Plan Design
Memorandum No. 13, General Design - Orleans Parish Lakefront West
of IHNC

high berm cost and the fact that the presence of this material is not noted in any of the other borings in the reach in question, you should take the following action which may reduce or eliminate the need for the proposed stability berms:

(1) Additional undisturbed borings and testing should be made prior to preparation of plans and specifications for this reach which are scheduled for completion in Nov 86. The extremely low shear strength of 80 psf is based on one "Q" test on a sample from Boring 4U. This material is not noted in any of the other borings in this reach. It is suggested that one shallow, undisturbed boring be made near Boring 4U to confirm the presence of the soft layer plus one or two additional undisturbed borings to determine the limits of this very soft layer encountered only in Boring 4U.

(2) If the additional undisturbed boring and testing data still indicate low shear strengths which preclude the construction of the levees to gross grade without stability berms, the levee in this reach should be constructed to net in lieu of gross grade. cursory analyses performed by this office indicate that if the levee were built to net grade, the resulting minimum factor of safety, using a cohesion of 80 psf for the soft layer, would be about 1.2. Using a cohesion of 125 psf, which is reasonable based on a c/p ratio of 0.25 and the consolidation test data in this report, a levee built to net grade would have a factor of safety of about 1.3.

4. Minor comments are as follows:

- a. Para 31b. In the last sentence change the plate number 151 to 150.
- b. Plate 146. In the title block change cantilever sheetpile to Anchored Bulkhead.

FOR THE COMMANDER:

wd incl

CF w 10 cy Incl 1:
DAEN-ECE-B

for Robert J Kaufman, P.E.
R. H. RESTA, P.E.
Chief, Engineering Division

LMNED-SP (NOD/30 Nov 84) 4th End

Mr. Stutts/dn/2614

SUBJECT: Lake Pontchartrain, Louisiana and Vicinity High Level Plan Design
Memorandum No. 13, General Design - Orleans Parish Lakefront West
of IHNC

DA, New Orleans District Corps of Engineers, P.O. Box 60267, New Orleans,
LA 70160-0267 7 May 85

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

The District concurs with comments a. and b. of the 3d Endorsement. The information requested in paragraph b. will be submitted along with the plans and specifications for your review and approval.

FOR THE COMMANDER:

FREDERIC M. CHATRY
Chief, Engineering Division

LMNED-SP (NOD 30 Nov 84) 2nd End
SUBJECT: Lake Pontchartrain, Louisiana and Vicinity High
Level Plan Design Memorandum No. 13, General Design - Orleans
Parish Lakefront West of IHNC

DA, New Orleans District Corps of Engineers, P. O. Box 60267,
New Orleans, La. 70160 18 Mar 85

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

1. The proposed disposition of comments presented in the 1st
Endorsement of this chain of correspondence is presented in
the subsequent paragraphs (paragraph numbers refer to
like-numbered paragraphs in the endorsement).

2. Volume I.

a. Para 8. Concur, para 8 of the subject GDM is
replaced with the language presented in the Lake
Pontchartrain, Louisiana and Vicinity Hurricane Protection
Project; Reevaluation Study, July 1984, Volume 1, page 146.
Revised paragraph 8 is enclosed (Encl 2).

b. Para 28a. Concur. The limiting PI will be checked
during the preparation of the Plans & Specifications.

c. Para 28c. The difference between the Gross Elevation
and the Net Elevation is the computed settlement plus
estimated shrinkage and lateral spread. In the future, a
sample of settlement computations will be furnished along with
showing a tabulation of the estimated settlement on the
applicable stability plates.

d. Para 28d(1). An investigation with the Levee Board
reveals that there have never been underseepage problems along
the Lakefront levee and that no clay cutoffs were included in
the original levee construction. Based on these facts, we
concur to delete the seepage control measures on the levee at
stations: 42+60.00 to 78+55.24 B/L, 94+60 to 102+23.16 B/L
and 15+30.23 to 15+90.23 W/L. These sections have adequate
factors of safety without the seepage berm. For the levee
reach from B/L Sta. 88+19 to B /L Sta. 91+50, the seepage berm
is actually inside the stability berm; therefore, this section
will remain the same.

e. Para 28d(3). Concur. The clay cutoffs will be
eliminated from these sections.

f. Para 49c, Plate 43 and Vol II, Appendix B. The X_p force shown on Figure 2 of Appendix B will produce a compressive stress of 83 psi on the miter block seal. The miter block seal will be of molded rubber having a Durometer Hardness (Shore Type A) of 60 to 70. The compressive stress induced by the reaction X_p produces a compressive strain of less than 7%. The applied strain is well below the recommended allowable of 15%. The miter block seal was designed to withstand the force X_p , therefore a steel bearing bar is not required.

g. Para 49e. Concur. The vertical lift roller gate will be provided with electric motor driven lifts. Electricity will be supplied by the existing pumping station's standard as well as emergency power supply.

h. Para 58c. The first two sentences of paragraph 58c are revised to read as follows: "Proposed levee work traverses four neighborhood park areas (Lakeshore Park, Lake Vista Park, Lake Terrace Park, and Live Oaks Park). These linear park open spaces provide aesthetic areas conducive to active and passive recreation along the lakeshore. Impacts to the parks will be localized and temporary during construction. Recreational activities taking place within the right-of-way will be disrupted during the period of work. Adjacent areas will absorb recreational use during the levee reshaping and revegetation process. Recreation facilities...".

i. Para 61, Table 5. The Real Estate estimate shown in Table 5, \$14,255,000 is correct. This estimate represents the total cost of levee rights-of-way only. The Real Estate estimate in Table 6 and 9 represents the total Real Estate cost under the 01 account which also includes the rights-of-way cost for floodwalls at West End, Pontchartrain Beach, American Standard and Seabrook. Also included in the \$18,257,000 figure are rights-of-way cost for miscellaneous gates and road ramps located in the lakefront reach. Please refer to NOD Real Estate Cost Estimate Identification Number 40925 dated 25 September 1984. The report has unnumbered pages 2 through 7 which detail the floodwall and miscellaneous gates Real Estate estimates. Page 1 of the referenced Real Estate report gives only levee rights-of-way cost.

j. Para 63, Table 7 Footnote 1. Concur, when contract amount exceeds the District Engineer's authority, Plans and Specifications will be forwarded for concurrent Division and District Review. Otherwise, if contract amount is within the District Engineer's authority, a District review will be made and an information copy furnished to the Division.

k. Plates 2-6, 8 and 22-25. We have considered the effects of splash-over across the road ramps. Considering the number and size of the road ramps and the storage capacity on the protected side of the levee, the volume of splash-over would not significantly affect the flood stage on the inside. The volume of splash-over and added stress to the interior drainage system were taken into consideration during the hurricane protection study. The volume of overflow was found to be an insignificant amount when compared to the rainfall volume. The placement of a concrete block revetment was considered for protection of the ends of the levee at the road ramps, but was rejected since the roadways are paved, the sides of the roads are suitably protected by the sodding on the levee, and the erosive effects of the small amount of spill-over anticipated are minimal.

l. Plate 3 and 4. Typical Section No. 5 illustrates the worst possible case for the stability needs for the reach between Sta. 136+13.19 B/L and Sta. 159+70.00 B/L. This particular cross section happens to be located between Sta. 152+44.64 B/L and Sta. 157+70.00 B/L where the R/W is sufficient width for the complete section. When applying this section to the cross sections for the reach between Sta. 136+13.19 B/L and Sta. 152+44.64 B/L, the stability berms are below the existing natural ground line, therefore the R/W has been adjusted to minimize acreage requirements where no construction is required.

m. Plate 17. Do not concur. The full scale plan on Plate 17 was drawn to a scale of 1"=20' and was reduced to 1/2 scale when reproduced for the GDM. A bar scale is shown on the plate for conversion reference. The slab shown on the plan is part of Shelter House No. 3. The slab will not be disturbed. The levee right-of-way will be adjusted to follow the edge of the shelter.

n. Plate 34.

(1) Steel H piles in lieu of prestressed concrete piles will be used in the reach of T-wall between stations 408+28 W/L and 411+08 W/L because it is anticipated that the batter piles on the protected side will have to be driven in short segments due to the wall's proximity to the existing apartment building on the floodside of the wall. This detail will be evaluated during the preparation of contract plans for this work.

(2)(a). T-wall stem, Sta. 104+00 W/L to Sta. 107+00 W/L. Do not concur. The T-wall in this reach must resist an ultimate bending moment of 145.5 k.ft/ft (induced by

hydrostatic + dynamic wave loading) at the base of the stem, the net required thickness plus reinforcement cover equals 25.3 inches. The stem thickness was increased to 27 inches to facilitate construction details.

(2)(b) T-wall stem, Sta. 408+29+ W/L to Sta. 411+08+ W/L. Do not concur. The net required stem thickness to resist an ultimate bending moment of 22.9 k.ft/ft plus reinforcement cover equals 12.1 inches; however, to facilitate construction, to allow for architecture treatment (bush-hammer finish) on both sides of the wall and to match the details of the adjacent Orleans Marina Floodwall, the stem thickness was increased to 24 inches.

(3) The full cross-sections of the T-wall stems were extended to the top of the wall to facilitate the application of an architectural finish (bush-hammer finish or form-liner finish) on both sides of the walls. These floodwalls are in a highly recreational area of the city and the special finish is required to blend or improve the walls appearance.

3. Volume II.

a. Para I-7d, Appendix A. Wave characteristics in Tables A-14 and A-15 were determined from CERC Technical Report No. 4, which was the state-of-the-art technical tool for determination of wave parameters at the time the hurricane characteristics were developed. The wave characteristics are the same as those used along the Citrus Reach. However, the data given in Table A-14 and A-15 was developed for Lake Pontchartrain at the seawall on the lakeshore. The hurricane protection levees and floodwalls are mostly located several hundred feet landward of the seawall. At these locations the land elevation generally slopes downward from the seawall to the base of the levee. At stages higher than the top of the seawall, elevation +8 feet, water ponds between the seawall and the levee, wave setup causes superelevation of the water surface in the ponding area. During the SPH large waves are broken by the seawall; smaller waves are transmitted into the ponding area and waves are also generated in the ponding area. The smaller waves and the generated waves result in the wave runup used to determine the height of the levee. Design wave heights are given in Table A-16. Wave setup in the ponding area was determined using charts and tables in an article entitled, "Model Study of Wave Set-Up Induced by Hurricane Waves at Narragansett Pier, Rhode Island," from Beach Erosion Board Bulletin, Volume 12, July 1958. Maximum wave heights in the ponding area were determined from the formula: $H_{o_{max}} = (1.84(db)^{3/2})/T$. Design wave heights were determined from the formula $H_o = H_{o_{max}}/1.87$. These formulae,

from TR-4, give a conservative estimate of the wave heights which could be generated in the ponding area. These waves were used to design the heights of most of the levees. No new methodology for determination of wave heights in this situation has been developed. Runup curves used in the determination of levee heights have not changed noticeably over the years. In the cases where the wave heights determined in Lake Pontchartrain would impinge on the protective structure, for instance at American Standard Floodwall, runup elevations would vary approximately ± 1 ft from the current design height depending upon the date of the publication used.

b. Plates 99 and 115. The large landside and floodside stability berms were designed based on a minimum ground surface elevation. Actually the full section only applies from approximately B/L Sta. 152+00 to B/L Sta. 158+00. An estimate shows that the construction of these stability berms on this area will cost approximately \$610,000, of which, \$520,000 will be for the right-of-way and \$90,000 for borrow material. Since the weak material was found away from where the full section applies, new shallow undisturbed borings will be taken between B/L Sta. 152+00 to B/L Sta. 158+00. Based on these boring results, a new section will be designed for the preparation of plans and specifications.

4. Minor comments 4a and 4b of the 1st Endorsement are noted.

FOR THE COMMANDER:



FREDERIC M. CHATRY
Chief, Engineering Division

2 Encl

1. added 1 cy to Encl 1
2. Revised para 8

g. 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. (See footnote 1 on page 144).

CURRENT STATUS OF ASSURANCES. This project is authorized by the Flood Control Act, approved 27 October 1965, Section 204 of Public Law 298, 89th Congress, 1st Session, substantially in accordance with the Report of the Chief of Engineers, dated 4 March 1964, contained in House Document No. 231, 89th congress, 1st Session. Assurances were obtained from the various agencies incorporating the requirements of local cooperation established in said House Document 231. The assurances have subsequently been supplemented to include the provisions of the "Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970", Public Law 91-646, and the deferred payment plan authorized by Section 92 of the "Water Resources Development Act of 1974", Public Law 251, 93rd Congress. Supplemental assurances will be obtained to accommodate the High Level Plan.

Incl 2

LMVED-TD (NOD 30 Nov 84) 3d Ind
SUBJECT: Lake Pontchartrain, Louisiana and Vicinity High Level Plan Design
Memorandum No. 13, General Design - Orleans Parish Lakefront West
of IHNC

DA, Lower Mississippi Valley Division, Corps of Engineers, Vicksburg, MS 39180-0080

29 APR '85

TO: Commander, New Orleans District, ATTN: LMNED-SP

Resolution of the 1st Ind comments is satisfactory with the following exceptions.

a. Para 2a. The status of local assurances presented in the Reevaluation Report was revised during the review process. A copy of the revised status of local assurance is substituted for Incl 2.

b. Paras 2b and 3b. The limiting PI and levee stability analyses and the results of the new shallow undisturbed borings and testing discussed in these paragraphs should be submitted along with the plans and specifications for review and approval.

FOR THE COMMANDER:

William R. Hill, P.E., for
ROBERT I. KAUFMAN, P.E.
Acting Chief, Engineering Division

CF (10 cy) w 10 cys 2d Ind:
DAEN-ECE-B



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

REPLY TO
ATTENTION OF:

November 30, 1984

LMNED-SP

SUBJECT: Lake Pontchartrain, Louisiana and Vicinity High
Level Plan Design Memorandum No. 13, General
Design - Orleans Parish Lakefront West of IHNC

Commander, Lower Mississippi Valley Division
ATTN: LMVED-TD

1. The subject design memorandum is submitted for review and approval and has been prepared generally in accordance with the provisions of Appendix A of EC 1110-2-193, dated 20 April 1979.
2. A summary of the current status of the Section 404 (b)(1) evaluation, environmental analysis, and cultural resources investigation is as follows:
 - a. A Section 404 (b)(1) Public Notice was issued 28 March 1984 and State Water Quality Certification was received 29 June 1984.
 - b. No endangered or threatened species will be affected by the recommended construction.
 - c. An Environmental Impact Statement (EIS), Lake Pontchartrain, Louisiana and Vicinity Hurricane Protection project included the levee construction, and was filed with the Council on Environmental Quality in January of 1975. A Draft Supplement to this EIS was filed with the Environmental Protection Agency in December of 1983, and assessed the impacts associated with increased levee height for high level protection. The Final Supplemental EIS is scheduled to be filed with EPA in December of 1984.

LMNED-SP

November 30, 1984

SUBJECT: Lake Pontchartrain, Louisiana and Vicinity High
Level Plan Design Memorandum No. 13, General
Design - Orleans Parish Lakefront West of IHNC

d. Since the New Orleans Lakefront levee is located almost entirely on post-1930 land fill, no cultural resources are affected. No cultural resource surveys were, therefore, necessary. The finding was coordinated with the Louisiana State Historic Preservation Officer through distribution of the Draft EIS for Lake Pontchartrain, Louisiana, and Vicinity Hurricane Protection Project. The possible impacts of the Bayou St. John closure on significant cultural resources were addressed through the Section 404 permit process. No property eligible for the National Register will be adversely affected by the Bayou St. John closure.

3. The use of water conservation measures in construction of this project has been investigated. The interdisciplinary team review of the report found that no opportunities for water conservation measures exist.

4. In accordance with LMVED-TS letter dated 5 February 1981, this report has been reviewed by the District Security Officer. There were no review comments to be incorporated in the report.

5. This report is being submitted as scheduled. The current program calls for construction award in March 1985; therefore, a prompt review and approval of this General Design Memorandum is required.

6. Approval of the report as a basis for preparation of plans and specifications is recommended.


EUGENE S. WITHERSPOON
Colonel, CE
Commanding

1 Encl 2 vol (16 cys fwd sep)
as

LAKE PONTCHARTRAIN, LOUISIANA AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 13, GENERAL DESIGN
ORLEANS PARISH LAKEFRONT LEVEE
WEST OF IHNC

STATUS OF DESIGN MEMORANDUMS

<u>Design Memo No.</u>	<u>Title</u>	<u>Status</u>
1.1	Hydrology and Hydraulic Analysis Part I - Chalmette Part II - Barrier Part III - Lakeshore Part IV - Chalmette Extension	Approved 27 Oct 66 Approved 18 Oct 67 Approved 6 Mar 69 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 Sep 69
2	Lake Pontchartrain Barrier Plan, GDM, Supplement No. 3, Lake Pontchartrain Barrier, Chef Menteur Pass Complex	Approved 19 Sep 69
2	Lake Pontchartrain Barrier Plan, GDM, Supplement No. 4, New Orleans East Back Levees	Approved 18 Aug 71

STATUS OF DESIGN MEMORANDUMS (cont'd)

<u>Design Memo No.</u>	<u>Title</u>	<u>Status</u>
2	Lake Pontchartrain Barrier Plan, GDM, Supplement No. 5, Orleans Parish Lakefront Levees - West of IHNC	<u>1/</u>
2	Lake Pontchartrain Barrier Plan, GDM, Supplement No. 5A, Citrus Lakefront Levees - IHNC to Paris Road	Approved 12 Jul 76
2	Lake Pontchartrain Barrier Plan, GDM, Supplement No. 5B, New Orleans East Lakefront Levees - Paris Road to South Point	Approved 5 Dec 72
2	Lake Pontchartrain Barrier Plan, GDM, Supplement No. 5C, Orleans Parish Outfall Canals - West of the IHNC	<u>1/</u>
2	Lake Pontchartrain Barrier Plan, GDM, Supplement No. 5D, Orleans Parish Lakefront Levees, Orleans Marina	Approved 24 May 78
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	<u>1/</u>
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	Approved 1 May 73

1/ This Design Memorandum is no longer applicable due to the recommended change from a Barrier Plan of protection to a High Level Plan of protection. A High Level Plan Design Memorandum will be prepared for this project feature.

STATUS OF DESIGN MEMORANDUM (cont'd)

<u>Design Memo No.</u>	<u>Title</u>	<u>Status</u>
2	Lake Pontchartrain Barrier Plan, GDM, Supplement No. 10, Jefferson Parish Lakefront Levees	<u>1/</u>
3	Chalmette Area Plan, GDM	Approved 31 Jan 67
3	Chalmette Area Plan, GDM, Supplement No. 1, Chalmette Extension	Approved 31 Jan 67
4	Lake Pontchartrain Barrier Plan, and Chalmette Area Plan, GDM, Florida Avenue Complex, IHNC	Approved 31 Oct 80
5	Chalmette Area Plan, DDM, Bayous Bienvenue and Dupre Control Structures	Approved 29 Oct 68
6	Lake Pontchartrain Barrier Plan, DDM, Rigolets Control Structure and Closure	<u>2/</u>
7	Lake Pontchartrain Barrier Plan, DDM, Chef Menteur Control Structure and Closure	<u>2/</u>
8	Lake Pontchartrain Barrier Plan, DDM, Rigolets Lock	Approved 20 Dec 73
9	Lake Pontchartrain Barrier Plan, DDM, Chef Menteur Navigation Structure	<u>2/</u>
10	Lake Pontchartrain Barrier Plan, Corrosion Protection	Approved 21 May 69
12	Sources of Construction Materials	Approved 30 Aug 66

1/ This Design Memorandum is no longer applicable due to the recommended change from a Barrier Plan of protection to a High Level Plan of protection. A High Level Plan Design memorandum will be prepared for this project feature.

2/ Due to the recommendation for a change from the Barrier Plan of protection to a High Level plan of protection, this Detailed Design Memorandum is no longer applicable.

STATUS OF DESIGN MEMORANDUMS (cont'd)

<u>Design Memo No.</u>	<u>Title</u>	<u>Status</u>
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	Approved 17 Apr 81
Report	Lake Pontchartrain Barrier Plan, Seabrook Lock Breakwater	<u>3/</u>
12	Lake Pontchartrain and Vicinity, Louisiana, Sources of Construction Materials (Revised)	Approved Apr 79
13	Lake Pontchartrain, La. & Vicinity, High Level Plan, Orleans Parish Lakefront Levee West of IHNC	Submitted Nov 84
13	Lake Pontchartrain, La. & Vicinity, High Level Plan, Orleans Parish Lakefront Levee West of IHNC - Supplement No. 1 - Orleans Marina Floodwall	unscheduled
14	Lake Pontchartrain, La. & Vicinity, High Level Plan, Citrus Lakefront Levee IHNC to Paris Road	Approved 11 Oct 84
14	Lake Pontchartrain, La. & Vicinity, High Level Plan, Citrus Lakefront Levee IHNC to Parish Road - Supplement No. 1 - New Orleans Lakefront Airport and Lincoln Beach	unscheduled

3/ Since the Seabrook Lock is a part of the Barrier Plan of protection and it has been recommended to construct a High Level Plan, the need for Seabrook Lock under the High Level Plan is not required. However, construction of Seabrook Lock under the Mississippi River Gulf Outlet project remains an unresolved issue at this time.

STATUS OF DESIGN MEMORANDUMS (cont'd)

<u>Design Memo No.</u>	<u>Title</u>	<u>Status</u>
15	Lake Pontchartrain, La. & Vicinity, High Level Plan, New Orleans East Lakefront Levee Paris Road to South Point	Scheduled Feb 85
16	Lake Pontchartrain, La. & Vicinity, High Level Plan, New Orleans East Levee South Point to GIWW	unscheduled
17	Lake Pontchartrain, La. & Vicinity, High Level Plan, Jefferson Parish Lakefront Levee and Jefferson/ St. Charles Parish Return Levee	Scheduled Oct 86
18	Lake Pontchartrain, La. & Vicinity, High Level Plan, St. Charles Parish Levee (North of Airline Highway Alinement)	Scheduled Sep 87
19	Lake Pontchartrain, La. & Vicinity, High Level Plan, Orleans Parish Outfall Canals (London Avenue and Orleans Avenue Outfall Canals)	Scheduled Apr 86
20	Lake Pontchartrain, La. & Vicinity, High Level Plan, Orleans Parish Outfall Canal (Metairie Relief Canal)	unscheduled
21	Lake Pontchartrain, La. & Vicinity, High Level Plan, Orleans Parish Outfall Canal Detailed Design Memorandum (London Avenue Canal)	Scheduled Nov 87
22	Lake Pontchartrain, La. & Vicinity, High Level Plan, Orleans Parish Outfall Canal Detailed Design Memorandum (Orleans Avenue Canal)	Scheduled Mar 88
23	Lake Pontchartrain, La. & Vicinity, High Level Plan, Orleans Parish Outfall Canal Detailed Design Memorandum (Metairie Relief Canal)	unscheduled

LAKE PONTCHARTRAIN, LOUISIANA AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 13 - GENERAL DESIGN
ORLEANS PARISH LAKEFRONT LEVEE
WEST OF IHNC
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34	Typical Wall Sections
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36	Swing Gates - Table and Pile Schedule
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<u>No.</u>	<u>Title</u>
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65	Undisturbed Boring Data Boring 1-U
66	Undisturbed Boring Data Boring 2-U
67	Undisturbed Boring Data Boring 3-U
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<u>No.</u>	<u>Title</u>
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75	Undisturbed Boring Data Boring 11-U
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81	Undisturbed Boring Data Boring 3-ULO
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83	Undisturbed Boring Data Boring 5-ULO
84	Undisturbed Boring Data Boring 6-ULO
85	Undisturbed Boring Data Boring 7-ULO
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90	Undisturbed Boring Data Boring 6-OUW
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92	General Type Boring Logs
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94	General Type Boring Logs
95	General Type Boring Logs
96	General Type Boring Logs
97	General Type Boring Logs
98	Design Shear Strengths
99	Design Shear Strengths

PLATES (CONT'D)

<u>No.</u>	<u>Title</u>
100	Design Shear Strengths
101	Design Shear Strengths
102	I-Wall In Levee (Q) Shear Stability Sta 0+00 - Sta 1+13.57 W/L
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105	I-Wall In Levee (Q) Shear Stability Sta 7+25.87 - Sta 7+62.87 W/L and Sta 8+ 08.87 - Sta 8+53.90 W/L
106	Levee (Q) Shear Stability Sta 14+31.42 - Sta 14+40.23 W/L
107	Levee (Q) Shear Stability Sta 15+30.23 - Sta 15+90.23 W/L
108	Levee (Q) Shear Stability Sta 29+25.54 - Sta 42+10.00 B/L
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110	Levee (Q) Shear Stability Sta 42+60.00 - Sta 78+55.24 B/L
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112	I-Wall In Levee (Q) Shear Stability Sta 101+09 - Sta 103+65.42 W/L
113	Levee (Q) Shear Stability Sta 88+19 - Sta 91+50 B/L
114	Levee (Q) Shear Stability Sta 94+60 - Sta 102+23.16 B/L
115	Levee (Q) Shear Stability Sta 136+13.19 - Sta 159+70.00 B/L
116	Levee (Q) Shear Stability Sta 163+98.15 - Sta 196+50.00 B/L
117	Levee (Q) Shear Stability Sta 163+98.15 - Sta 196+50.00 B/L
118	Levee (Q) Shear Stability Sta 199+41.52 - Sta 246+37.17 B/L
119	Levee (Q) Shear Stability Sta 250+72.09 - Sta 288+49 B/L
120	Levee (Q) Shear Stability Sta 250+72.09 - Sta 288+49 B/L
121	Levee (Q) Shear Stability Sta 289+49 - Sta 303+51.39 B/L
122	Levee (Q) Shear Stability Sta 289+49 - Sta 303+51.39 B/L
123	Levee (Q) Shear Stability Sta 305+41.96 B/L
124	Levee (Q) Shear Stability Sta 305+41.96 B/L
125	Levee (Q) Shear Stability Sta 306+98.04 - Sta 308+50 B/L
126	Levee (Q) Shear Stability Sta 306+98.04 - Sta 308+50 B/L
127	Levee (Q) Shear Stability Sta 310+50 - Sta 311+00 B/L
128	Levee (Q) Shear Stability Sta 310+50 - Sta 311+00 B/L
129	Levee (Q) Shear Stability Sta 313+50 - Sta 314+05 B/L
130	Levee (Q) Shear Stability Sta 336+50.71 - Sta 340+90 B/L
131	Cantilever Sheetpile Analysis Sta 0+00 - Sta 1+13.57 W/L
132	Cantilever Sheetpile Analysis Sta 1+58.57 - Sta 2+54.51 W/L
133	Cantilever Sheetpile Analysis Sta 7+02.87 - Sta 7+62.87 W/L
134	Cantilever Sheetpile Analysis Sta 8+08.87 - Sta 8+59.15 W/L and Sta 8+95.15 - Sta 9+88.10 W/L
135	Cantilever Sheetpile Analysis Sta 9+88.10 - Sta 14+31.42 W/L
136	Cantilever Sheetpile Analysis
137	Cantilever Sheetpile Analysis Sta 101+09.00 - Sta 103+75.42 W/L and Sta 109+44.40 - Sta 109+68.40 W/L
138	Cantilever Sheetpile Analysis Sta 200+62.41 - Sta 204+58.21 W/L
139	Cantilever Sheetpile Analysis Sta 204+58.21 - Sta 218+65.08 W/L and Sta 219+39.08 - Sta 233+76.50 W/L

PLATES (CONT'D)

<u>No.</u>	<u>Title</u>
140	Cantilever Sheetpile Analysis Sta 233+76.50 - Sta 235+80.51 W/L
141	Cantilever Sheetpile Analysis
142	Cantilever Sheetpile Analysis Sta 350+00 - Sta 350+55.93 W/L and Sta 351+05.03 - Sta 351+60.98 W/L
143	Cantilever Sheetpile Analysis Sta 400+00 - Sta 401+13.22 W/L
144	Cantilever Sheetpile Analysis Sta 401+13.22 - Sta 402+18.22 W/L
145	Cantilever Sheetpile Analysis Sta 402+95.22 - Sta 404+16.06 W/L
146	Cantilever Sheetpile Analysis Sta 405+55.96 - Sta 406+74.96 W/L
147	Cantilever Sheetpile Analysis Sta 405+55.96 - Sta 406+74.96 W/L
148	Cantilever Sheetpile Analysis Sta 406+74.96 - Sta 406+94.00 W/L
149	Cantilever Sheetpile Analysis Sta 407+38.00 - Sta 408+28.96 W/L
150	Deep Seated Stability Analysis Sta 218+65.08 - Sta 219+99.08 W/L
151	Pile Capacities and Subgrade Moduli
152	Pile Capacities and Subgrade Moduli
153	Pile Capacities and Subgrade Moduli
154	Pile Capacities and Subgrade Moduli
155	Pile Capacities and Subgrade Moduli
156	Pile Capacities and Subgrade Moduli
157	Ramp (Q) Shear Stability Sta 200+62.41 - Sta 204+58.21 W/L
158	Borrow Area - Pit Area In Howze Beach
159	Borrow Area - Pit Area In Howze Beach
A	Soil Boring Legend

APPENDICES

Appendix A- Hydrology and Hydraulics

Appendix B- Structural Design Calculations for Typical
Mitered Swing Gate

Appendix C- Laboratory Test Data Sheets (Soil Samples)

LAKE PONTCHARTRAIN, LOUISIANA AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 13-GENERAL DESIGN
ORLEANS PARISH LAKEFRONT LEVEE
WEST OF IHNC

PERTINENT DATA

<u>Location of project</u>	Southeastern Louisiana in Orleans Parish along south shore of Lake Pontchartrain from IHNC to Metairie Relief Canal
<u>Datum Plane</u>	National Geodetic Vertical Datum (NGVD) ^{1/}
<u>Hydrologic data</u>	
Temperature: Maximum monthly	90.6 degrees Fahrenheit
Minimum monthly	45.3 degrees Fahrenheit
Average annual	69.5 degrees Fahrenheit
Annual precipitation: Maximum	83.54 inches
Minimum	40.11 inches
Average	61.55 inches
<u>Hydraulic design criteria-tidal</u>	
Design hurricane-Standard Project Hurricane (SPH)	
Frequency	1 in 300 years
Central Pressure Index (CPI)	27.6 inches of mercury
Maximum 5-min. average wind speed	100 m.p.h.
Radius of maximum winds	30 miles
Average forward speed	6 knots
Stillwater level	11.5 feet
<u>Levees</u>	
Method of construction	Hauled, semi-compacted clay fill
Levee length (approx.)	4.36 miles (non-continuous)
Crown elevation (varies)	13.5' to 19.5'
Crown width	10 feet
<u>Floodwalls (I and T)</u>	
Floodwall length	1.25 miles (non-continuous)
Elevation (varies)	13.5' to 20.5'

^{1/} Elevations herein are in feet referred to National Geodetic Vertical Datum (NGVD) unless otherwise noted.

PERTINENT DATA (CONT'D)

Road Ramps

Location:

W/L Station 6+46 and B/L Stations
42+00, 79+18, 102+23, 136+13, 166+70,
218+46, and 277+74

Elevation

Eight (8) road ramps
(enlargement of existing
ramps)
14.5' to 16.5' (net grade)

Gates

Location:

W/L Stations 1+36.07, 7+85.87,
8+77.87, 20+51.43, 250+57.00,
and 407+16.00

W/L Stations 16+53.23, 300+82.48,
and 350+80.48

W/L Stations 218+85.08, 219+19.08,
and 402+55.22

Six (6) steel swing
type in concrete
monoliths

Three (3) steel miter
swing type in concrete
monoliths

Three (3) steel bottom roller
type in concrete
monoliths

Drainage Structures

Location:

B/L Station 319+08+
(near Basin Canal Pumping Station-
pumping station no. 12)

One (1) steel vertical
lift roller gate in
concrete monolith
(to be added to
pumping station's
discharge culvert)

Rights-of-way

Permanent rights-of-way (Existing-prior to 1965)	20.95 acres
Permanent rights-of-way (New)	54.43 acres
Construction easements	11.47 acres

Estimated First Cost

Federal	\$ 8,805,000
Non-Federal	\$26,241,000 ^{1/}
Total	\$35,046,000

Economics

Benefit-to-cost ratio (project)	4.2 to 1
Benefit-to-cost ratio (New Orleans-Jefferson separable project area)	5.0 to 1

^{1/} Credit for monies in excess of 30% share will be applied to other project reaches so that overall 70%-30% cost sharing formula will be maintained.

LAKE PONTCHARTRAIN, LOUISIANA AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 13 - GENERAL DESIGN
ORLEANS PARISH LAKEFRONT LEVEE
WEST OF IHNC

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 US 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 sheetpile wall along the levee west of the Inner Harbor Canal in New Orleans."

c. BERH Recommendation. The report of the Chief of Engineers stated: "The Board (of Engineers of 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 memorandum presents the essential data, assumptions, criteria, and computations for developing the plan design and cost estimate for constructing the "High Level Plan" (i.e. no barriers in the Chef Menteur and Rigolets Passes) Orleans Parish Lakefront levee west of IHNC for the Lake Pontchartrain, Louisiana and Vicinity Hurricane Protection project. The recommended design contained in this DM reflects the least costly method of modifying the existing levee so that a high level of protection can be achieved. Modifications to in-place barrier plan features such as floodwalls and floodgates at the Orleans Marina (B/L Sta 322+80.99 to B/L Sta 336+50.71) are not covered in this design memorandum. The method of protection to be employed at Bayou St. John (B/L Sta. 196+50.00 to B/L Sta. 199+40.52) is also not covered in this design memorandum. The plan of protection at Bayou St. John is currently being coordinated by the Orleans Levee Board and Corps District office with the various local and civic organizations which have expressed an interest in the plan of protection to be used at this historic site. These features will be addressed at a later date in a supplement to this design memorandum. Also not covered in this design memorandum are the three Orleans Parish outfall canals. Metairie Relief, Orleans Avenue, and London Avenue. The Orleans Parish outfall canals will be addressed in design memorandum nos. 19 and 20.

3. Local Cooperation.

a. Flood Control Act of 1965 (Public Law 89-298).
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 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 interest 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, 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..."

b. Water Resources Development Act of 1974 (Public Law 93-251). The local interest payment procedures outlined in the original conditions of local cooperation were modified in 1974 as follows: "The hurricane-flood protection project on Lake Pontchartrain, Louisiana, authorized by Section 204 of the Flood Control Act of 1965 (Public Law 89-298) is hereby modified to provide that non-Federal public bodies may agree to pay the unpaid balance of the cash payment due, with interest, in yearly installments. The yearly installments will be initiated when the Secretary determines that the project is complete, but in no case shall the initial installment be delayed more than ten years after the initiation of project construction. Each installment shall not be less than one twenty-fifth of the remaining unpaid balance plus interest on such balance, and the total of such installments shall be sufficient to achieve full payment, including interest, within twenty-five years of the initiation of project construction."

4. Project Document Investigations. Studies and investigations made in connection with the report on which authorization is based (House Document 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. In December 1977, a Federal court injunction was issued stopping construction of portions of the authorized project. The injunction was issued on the basis that the 1975 final Environmental Impact Statement (EIS) for the Lake Pontchartrain project was inadequate. The court directed, among other things, that the EIS be rectified to include adequate development and analysis of alternatives to the then ongoing proposed action. The results of these studies are contained in a three volume report entitled "Lake Pontchartrain, Louisiana, and Vicinity Hurricane Protection Project, Reevaluation Study", dated July

1984. The reevaluation report recommended a "tentatively selected" high level plan of protection. This recommendation necessitated the preparation of this report and the engineering and environmental studies discussed herein. Surveys and studies accomplished in preparing this GDM include the following:

- a. Alternative plan studies to develop alternative methods of construction required to optimize the proposed plan of protection;
- b. Aerial and hydrographic surveys;
- c. Soils investigations including general and undisturbed type borings and associated laboratory investigations;
- d. Detailed design studies for alternative plans (including stability analyses);
- e. Tidal hydraulic studies required for establishing design grades for protective works based on the latest revised hurricane parameters furnished subsequent to project authorization by the National Weather Service;
- f. Real Estate requirements;
- g. Detailed cost estimates for the proposed plan of protection as well as alternative plans and necessary utility relocations.
- h. Environmental effects and evaluations;
- i. A comprehensive public meeting for the "tentatively selected" high level plan held on 12 April 1984.

6. Planned Future Investigations. Upon satisfactory approval of this GDM, additional detailed Engineering Designs and Specifications will be prepared to support construction of this project feature. Some additional soils investigations or field surveys are anticipated at this time to support these designs. Planned future investigations for completed barrier plan floodwall at the Orleans Marina will be accomplished in Supplement No. 1 to this GDM. This supplement will address deficiencies associated with the barrier plan floodwall for a high level plan of protection and recommend remedial measures to correct these deficiencies.

7. Local Cooperation Requirements. The conditions of local cooperation as specified in the authorizing laws are quoted in paragraph 3. These conditions are applicable to the "Barrier Plan." A post authorization report for a "High Level Plan" recommended that assurances be amended. A complete list of local assurance items (as amended) are set forth as follows:

a. Provide all lands, easements, and rights-of-way, including borrow and spoil-disposal areas necessary for construction, operation, and maintenance of the project; and

b. Accomplish all necessary alterations and relocations to roads, railroads, pipelines, cables, wharves, drainage structures, and other facilities required by the construction of the project; and

c. Hold and save the United States free from damages due to the construction works; and

d. Bear 30 percent of the first cost, to consist of the fair market value of the items listed in subparagraphs (a) and (b) above and a cash contribution as presently estimated below, 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:

COST TO ORLEANS LEVEE DISTRICT
(\$1,000,000's)

	FIRST COST ^{1/}	LOCAL SHARE
ORLEANS LEVEE DISTRICT		
Citrus New Orleans East	112.5	33.8
New Orleans	249.1	74.7
TOTAL	361.6	108.5

^{1/} Cost to complete after October 1979; October 1981 price levels.

e. This item has been deleted in full:

Provide an additional cash contribution equivalent to the estimated capitalized value of maintenance and operation of the Rigolets navigation lock and channel to be undertaken by the United States, presently estimated

at \$3,816,000, the final determination to be made after construction is complete, 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; and

f. Provide all interior drainage and pumping plants required for reclamation and development of the protected areas; and

g. Maintain and operate all features of the project in accordance with regulations prescribed by the Secretary of the Army, including levees, floodgates and approach channels, drainage structures, drainage ditches or canals, floodwalls, and stoplog structures (the remainder of this item is deleted); and

h. 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; and

i. Comply with the applicable provisions of the "Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970", Public Law 91-646; and

j. Assume the responsibility to pay its share of the non-Federal project costs (the remainder of this item is deleted); and

k. As a minimum, adhere to the payment schedule of the deferred payment plan, the apportionment of costs to be made as actual costs values and schedules are determined. The first payment under the deferred payment plan was due on 1 October 1976, with subsequent payments being due on 1 October of each succeeding year, up to and including 1 October 1990. Interest is charged on the unpaid balance during this period at the rate of 3.225 percent per annum. Cash contributions required subsequent to 30 September 1991 shall be computed in accordance with the basic 30 percent requirement stipulated in Section 204 of the Flood Control Act of 1965, Public Law 89-298 and House Document 231, 89th Congress; and

l. Recognizes that subsections (b) (c) and (e) of Section 221 of the "Flood Control Act of 1970", Public Law 91-611 shall apply to paragraph (k) above. This agreement is subject to and shall become effective upon the approval of the Secretary of the Army; and

m. Comply with Section 601 of Title VI of the Civil Rights Act of 1964, Public Law 88-352, that no person shall be excluded from participation in, denied the benefits of, or subjected to discrimination in connection with the Project on the grounds of race, creed, or national origin.

8. Status of Local Cooperation. The following subparagraphs capsulize the history of assurances for local cooperation on the Lake Pontchartrain barrier plan project. With the pending change to a high level plan of protection and approval of the revised EIS, amended or supplemental assurances will be requested from the local assuring agencies for this project. Final approval of the revised EIS and environmental clearance on the Lake Pontchartrain high level plan is currently estimated to be completed by the end of January 1985.

a. Assurances from the Board of Levee Commissioners of the Orleans Levee District for the Barrier Plan portion of the project, of which the Orleans Marina Floodwall is a part, were originally accepted on 10 October 1966. Because of the rising non-Federal cost of participation and the widespread benefits to be derived by surrounding parishes, the Orleans Levee District requested assistance in carrying out the assurances. Accordingly, the Governor of the State of Louisiana by Executive Order Number 80, dated 5 March 1971, designated the Louisiana Department of Public Works as the local coordinating agency. Through this procedure the Orleans Levee District, the Pontchartrain Levee District, and the St. Tammany Parish Police Jury were designated the assurers of local cooperation for the portions of the subject project within their respective jurisdictions. The designation was under the authority of Section 81, Title 38, Louisiana Revised Statutes of 1950.

b. Assurances from the Board of Levee Commissioners of the Orleans Levee District were accepted on 16 September 1971, assurances from the Pontchartrain Levee District were accepted on 7 October 1971. Due to the reluctance of the St. Tammany Parish Police Jury to furnish required assurances of local cooperation for that portion of the project within St. Tammany Parish, the Governor of the State of Louisiana executed assurances on behalf of the St. Tammany Parish Police Jury on 8 May 1972 under authority of Section 81, Title 38, Louisiana Revised Statutes of 1950.

c. Recognizing the increasing burden of providing required matching local funds, Representative F. Edward Hebert sponsored Congressional legislation to defer required local payments over an extended period of time. This legislation was enacted in March 1974 as

Section 92 of the Water Resources Development Act of 1974. This Act modified the authorizing law by providing that non-Federal public bodies may agree to pay the unpaid balance of their required cash payment due, with interest, in annual installments in accordance with a specified formula. A plan for the application of the provisions of this legislation is now being implemented.

d. We have received the necessary agreements, legal opinions, and resolutions from the Orleans Levee District, jointly from the Lake Borgne Basin Levee District and the St. Bernard Parish Police Jury, and from the Pontchartrain Levee District approving the deferred payment plan and incorporating the requirements of Public Law 91-646 ("Uniform Relocation and Real Property Acquisition Policies Act of 1970") and items (b) (c) and (e) of Section 221 of the "Flood Control Act of 1970", Public Law 91-611. We have also received the required agreements, legal opinions, and assurances from the Louisiana Department of Transportation, Office of Public Works and the Governor of Louisiana stating that the Office of Public Works is now the local sponsor on behalf of the St. Tammany Parish Police Jury and that the Office of Public Works will lend financial assistance, when required, to the Pontchartrain Levee District. All of these agreements and assurances (under the "Barrier Plan") are currently being reviewed by the Government and, where necessary, supplemental language developed to accommodate the recommended change to a high level plan.

9. Views of Local Interests. The Orleans Levee District 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 Orleans Levee District 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 West of IHNC levee segment of the Lake Pontchartrain, Louisiana and Vicinity hurricane protection project, as shown on Plate 1, is located in southeastern Louisiana in New Orleans and

roughly parallels the shoreline of Lake Pontchartrain between the Inner Harbor Navigation Canal on the East and the 17th Street Canal (Metairie Relief) on the West. 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 National Geodetic Vertical Datum (NGVD)^{1/}. Runoff from within the project area drains into either Lake Borgne or Lake Pontchartrain, generally by pumping from within the protected areas on the south shore of Lake Pontchartrain, although some developed areas located on alluvial ridges in St. Charles and St. Bernard Parish 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 High Level plan. This memorandum is concerned only with a segment of the latter, the New Orleans Lakefront levee west of IHNC. The overall Lake Pontchartrain High Level Plan is described in "Lake Pontchartrain, Louisiana and Vicinity Hurricane Protection Project" Reevaluation Study dated July 1984.

13. New Orleans Lakefront Levee, West of IHNC. This levee is located in the City of New Orleans and ranges on the average a distance of 400 to 600 feet south of the existing Lake Pontchartrain stepped seawall. The proposed line of protection extends from where it ties in on the east with the existing IHNC floodwall near Seabrook to where it ties in on the west with the 17th Street Canal eastside return levee. The project plan presented herein provided for enlarging the existing lakefront

^{1/}Elevations contained herein are in feet referred to National Geodetic Vertical Datum unless otherwise noted.

levee with hauled clay material. This clay will be obtained from a borrow pit on the bottom of Lake Pontchartrain in the vicinity of Howze Beach on the north shore of the lake. Supporting design for approximately 4.36 non-continuous miles of earthen levee work are detailed in the subject GDM. Net design levee grades vary from elevations 13.5 to 19.5 N.G.V.D. throughout the lakefront reach. The plan and profile for the levee is shown on plates 2 through 7. Drainage from the area on the protected side of the levee is provided by existing local interest pumping stations. The main drainage for the City is provided by pumping stations located some two to three miles inland from the lakefront. Discharge from these pumping stations is conveyed to Lake Pontchartrain via three outfall canals (London Avenue, Orleans Avenue, and 17th St.). Currently, the line of protection is provided by lateral parallel levees along each of these canals. Under either the high level plan or the barrier plan projects these lateral levees do not meet project standards and remedial measures are necessary to upgrade the protection. The proposed remedial measures for the outfall canals will be the subject matter for future design memorandum numbers 20, 21, and 22. The Basin-Canal Pumping Station, pumping station number 12, located at approximate station 405+20 W/L will be modified to provide a positive closure by installation of a vertical lift roller gate structure to the existing discharge culverts and by raising the existing concrete floodwall at the discharge end of the culvert. Floodwall construction in lieu of levee construction will be employed at the following locations: Seabrook Bridge (Station 0+00 W/L to Station 2+54.51 W/L); American Standard (Station 101+09 W/L to Station 109+68.40 W/L); Pontchartrain Beach (Station 200+00 W/L to Station 236+48.59 W/L); and West Lakeshore Parkway - Lake Marina Drive (Station 400+00 W/L to Station 411+08.06 W/L). Access over and through the proposed levee and floodwalls will be provided via installation of eight (8) road ramps and twelve (12) gates. Road ramps are to be located at the following stations: Station 6+46 W/L; Station 42+00 B/L; Station 79+18 B/L; Station 102+23 B/L; Station 136+13 B/L; Station 166+70 B/L; Station 218+46 B/L; and Station 277+74 B/L. Of the twelve gates, six (6) steel swing gates are proposed for the following locations: Station 1+36.07 W/L; Station 7+85.87 W/L; Station 8+77.87 W/L; Station 20+51.43 W/L; Station 250+57.00 W/L; and Station 407+16.00 W/L. Three (3) steel bottom roller gates are proposed for the following locations: Station 218+85.08 W/L; Station 219+19.08 W/L; and Station 402+55.22 W/L. Three (3) steel miter swing gates are proposed for the following

W/L Stations: 16+53.23, 300+82.48, and 350+80.48. Modifications to the existing barrier plan floodwall and floodgates at the Orleans Marina for the high level plan of protection are to be addressed in a subsequent supplement to this GDM. Also, the supplement will address the plan of improvement to be employed at Bayou St. John.

14. Departure from Project Document Plan. The project document plan (barrier plan) calls for raising the existing low levee landward of the stepped seawall in the approximate 4.36-mile lakefront reach to elevation 11.5. Subsequently, the net grade of all protective levees and structures except for the levees and structures adjacent to the Chef Menteur Pass and the Rigolets were revised upward by 1 to 2 feet in accordance with the results of tidal hydraulic studies utilizing more severe hurricane parameters developed by the U.S. Weather Bureau. This change as well as others were documented by a significant Post-Authorization Change Report dated 16 December 1969. In response to a 1977 Federal Court injunction which stopped construction of portions of the project on the basis that the 1975 final Environmental Impact Statement (EIS) was inadequate, a Reevaluation Study and Supplemental Environmental Impact Statement (SEIS) was prepared. The reevaluation study (dated July 1984) and SEIS recommended a change from the barrier plan of protection to a high level plan of protection. The proposed plan recommended herein does not differ substantially from the original project document plan except in height and at locations where floodwall work is more cost effective than earthen levee work. Paragraph 41 of this GDM explains the departures recommended herein for the plan recommended in the Lake Pontchartrain, Louisiana and Vicinity, Reevaluation Report.

HYDROLOGY AND HYDRAULICS

15. Hydrology and Hydraulics.

a. General. The Hydrology and Hydraulics 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". 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 the tidal hydraulic design of the

features of 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. The criteria applicable to this levee feature and the hydraulic design of the drainage facilities in this levee reach are presented in Appendix A of this memorandum.

b. Surface Drainage. Construction of the proposed levees and floodwalls recommended herein will not significantly affect existing surface drainage patterns. Only minor modifications to existing area storm and sanitary sewer utilities are required.

GEOLOGY

16. Physiography. The geology project area is located within the Central Gulf Coastal Plain on the Mississippi River deltaic plain. Specifically, the project is located within the Pontchartrain basin, along the south shore of Lake Pontchartrain from the Inner Harbor Navigational Canal to the Jefferson-Orleans Parish line. Dominant physiographic features of the area are the lake, the lake shoreline, drainage canals, ponds, and the Mississippi River to the south. Natural relief in the area is very slight, with minimum elevations slightly below sea level and maximum elevations slightly above sea level. The natural levees bordering the Mississippi River attain elevations of 10 feet above sea level.

17. General Geology. The oldest sediments encountered in the borings are Pleistocene in age. These deposits were laid down during the last major interglacial stage in a deltaic or shallow marine environment. During the last glacial stage, with sea level about 450 feet lower than its present level, the Mississippi River became deeply entrenched into the Pleistocene deposits west of the project area. In the project area, the Pleistocene remained relatively undissected as a shelf on the northeast side of the trench. The aerial exposure of these sediments resulted in a weathered, desiccated surface.

As the glaciers retreated and sea level rose, alluvial sedimentation occurred in the central portion of the entrenched valley while the Pontchartrain basin became a huge bay. Two prominent beaches began to develop as sea level approached its present level, one on the northern side of Lake Pontchartrain and the second along the south shore, trending northeast from New Orleans to the vicinity of the Pearl River.

About 5,000 years ago, sea level reached its present stand and the Mississippi River began to migrate back and forth across the deltaic plain. Approximately 4,500 years ago the first Holocene deltaic sediments were carried into the project area when the Mississippi River occupied the Cocodrie course. About 3,800 to 3,600 years ago, the river shifted westward and occupied the Teche course. During this period the project area was subjected to erosion and subsidence. When the Mississippi River abandoned the Teche course, about 2,800 years ago, it shifted eastward to occupy the St. Bernard course and additional sediments were brought into the project area. About 1,800 years ago, the river again shifted westward to occupy the LaFourche Course, and the project area was again subjected to erosion and subsidence. When the Mississippi River shifted eastward about 1,200 to 700 years ago to occupy its present course, sediments were again introduced into the project area though in lesser quantities than had been carried in by previous courses. At this time, the center of deposition had shifted southward of the project area and most sediments deposited into the project area consisted of clays and silts brought in by the floodwaters overtopping the natural levees along the Mississippi River. Construction of artificial levees along the Mississippi River have eliminated floodwaters and presently no sediments are being introduced into the project area.

18. Subsidence. Progressive subsidence and downwarping has been occurring in the project area since the end of the Pleistocene. As a result the Pleistocene surface has been downwarped towards the south and west. This surface outcrops along the north shore of Lake Pontchartrain and dips to an elevation of -500 feet at the edge of the continental shelf approximately 80 miles south of New Orleans. The overall regional subsidence rate is about .8 to 1.0 foot per century, though local variations are to be expected. Subsidence within the project area has accelerated in recent years due to groundwater withdrawal associated with extensive land reclamation projects.

19. Investigations Performed. General type and undisturbed type borings were used to develop the geologic profile of the area. In addition, geologic information from other sources was available for interpretation of the physiography, subsurface, and foundation conditions of the project area.

20. Foundation Conditions. The subsurface as shown on plates 59 through 64 consists of Holocene deposits approximately 50 to 60 feet thick underlain by sediment of Pleistocene age. The Pleistocene sediments encountered in the borings consist of clays, silts, and

silty sands, having low water contents and high cohesive strengths, and are typically oxidized near the contact surface with the Holocene sediments. The contact surface varies from an elevation of -50 to -80 feet. Overlying the Holocene sediment is a surface layer of fill material approximately 6 to 15 feet thick. From baseline station 313+00 to 351+00, a 10- to 12-foot thick layer of clays and organic marsh sediments underlies the fill material. These deposits are very soft clays with high water contents and low cohesive strengths. Underlying the marsh deposit and in the remaining portion of the project area underlying the fill material is a 25- to 35-foot thick layer of sediments deposited in a lacustrine environment. These deposits are clays and silts in the western and middle portion of the project area which grades laterally into silts, silty sands, and sands in the eastern portion of the project area. These clays have water contents that range from 50 to 70 percent, and are medium soft to very soft in consistency with occasional silt strata. Shell fragments are common throughout the lacustrine deposits.

A 6- to 12- foot thick layer of sand representing a buried beach underlies the lacustrine deposits. This sand deposit thickens to 22 to 25 feet from station 50+00 to the eastern limits of the section. It is composed of fine to medium grained sand, silty sand, and numerous shell fragments.

At the base of the Holocene is a layer of baysound clays. This layer is 12 to 18 feet thick, and thins eastward to 6 to 8 feet. The clays are generally stiff to medium with occasional soft zones. Water contents range between 40 and 60 percent. Shell fragments are found throughout the clay layer.

21. Mineral Resources. Oil and gas production, common to other areas around New Orleans, is not presently found in the immediate vicinity of the project area. However, 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 (Revised), Lake Pontchartrain, Louisiana and Vicinity, Sources of Construction Materials, dated December 1978, approved 18 December 1980, documents available sources of sand, gravel, shell, and stone. Suitable borrow materials for levee construction are available from the Howze Beach area borrow pit in Lake Pontchartrain near the north shoreline. The soil borings in this proposed borrow area are shown on Plates 158 and 159.

23. Conclusions. Current investigations indicate that favorable foundation conditions exist in the project area. However, some settlement problems may result from compaction of the Holocene sediments by the additional weight of the upgraded levees.

FOUNDATIONS INVESTIGATION AND DESIGN

24. General. This section covers the soils and foundation investigation, including the design for the enlargement of earthen levees and the construction of floodwalls and gates along the Orleans Parish Lakefront Levee west of Inner Harbor Navigation Canal (IHNC). The project extends from the existing floodwall on the western side of the IHNC near the Seabrook Bridge at France Road to the Jefferson-Orleans Parish line.

25. Field Investigations.

a. A total of eight new undisturbed borings were taken and tested by the Corps of Engineers along the centerline of the levee (borings 1-U, 3-U, 4-U, 6-U, 8-U, 9-U, 10-U, and 12-U) and at five locations (borings 2-U, 5-U, 7 U, 11-U, and 13-U) 50 to 105 feet lakeside of the baseline. Borings 1-U, 3-U, 4-U, 6-U, and 8-U thru 13-U extend to an approximate elevation of -65.0 N.G.V.D. Borings 2-U, 5-U, and 7-U extend to an approximate elevation of -95.0 N.G.V.D. The logs of these new borings are shown on plates 65 through 77.

b. Additional old borings considered in the design were:

(1) 1-UIYH, 2-UIYH, and 8-ULO. For reference see Design Memorandum No. 2 - General Design Supplement No. 5D, Orleans Parish Lakefront Levees, Orleans Marina.

(2) 2-WTA, 3W, 11-WU, and 1W. For reference see Design Memorandum No. 2 - General Supplement No. 8, Inner Harbor Navigation Canal Remaining Levees.

(3) Undisturbed borings 1-ULOA, 1-ULO through 8-ULO, 1-UJP, 3-JUE, 1-UOP, 6-OUW and 6-MUE. The logs of these borings are shown on plates 78 through 91. Boring 8-ULO is presented here for ready reference due to extensive use in design.

(4) General borings 1-L0 thru 15-L0, 1-LP, 2-LP, 3-JUE, 2-OP, 10-SW, 1-MP, and 2-MP. The logs of these borings are shown on plates 92 through 97.

c. The new and old undisturbed borings are presented as general type borings as shown on plates 92 through 97. Borings 1-SW through 9-SW, 6-LUE, 1-ULP, 2-JP, 1-JP and 1-OP shown on these plates were not used for design purposes because they were determined to have little or no impact on this project.

26. Laboratory Tests. Visual classifications were made on all samples obtained from the soil borings. Water content determinations were made on all cohesive soil samples. Consolidation (C) tests, Unconfined Compression (UCT), Unconsolidated-Undrained (Q), Consolidated-Undrained (R), and Consolidated-Drained (S) shear tests were performed on samples from the undisturbed borings that were representative of the soils encountered. Liquid and plastic limits were determined for all samples on which consolidation and shear tests were performed. The results of these tests are shown on plates 65 through 91 and also on the detailed test reports included in this report. Additional test results are presented in the reports referenced in paragraph 25.b. above.

27. Foundation and Soil Conditions. The soil types and general stratifications along the project alignment are shown on the soil and geologic profile on plates 59 through 64. Design shear strengths and stratifications are shown on plates 98 through 101.

28. Levee.

a. General. A conventional earthen levee enlargement will be the main protective feature for the project. The levee will be constructed by enlarging the existing levee which was built by the Orleans Levee Board. The levee enlargement will be constructed by placing semicompacted clay fill on the existing levee to the design grades and sections shown on plates 102 through 130.

b. Shear Stability. Using cross sections representative of existing conditions along the levee, the stability of the levees and the levees with I-walls was determined for the most critical conditions by the Method of Planes, using the design (Q) shear strengths and applying a minimum factor of safety of approximately 1.3 (see plates 102 through 130 for presentation of stability analyses).

c. Settlement. Using consolidation data from the borings, theoretical analyses indicate that between 6 and 54 inches of settlement is expected to occur on the levee crown. An estimate for lateral spread and shrinkage of fill is included in these figures. To compensate for this expected long term settlement, the levee crown will be overbuilt or grossed as shown on plates 102 through 130.

d. Seepage Control.

(1) Calculations were made to determine the need for a landside seepage berm. Based on a Bligh's creep ratio of 18 (very fine sand) it was determined that a landside seepage berm was needed from:

(a) B/L sta 42+60.00 to B/L sta 79+59.24

(b) B/L sta 88+19 to B/L sta 91+50

(c) B/L sta 94+60 to B/L sta 102+23.16

(2) From B/L sta 42+60.00 to B/L sta 79+59.24, due to limitations with the right-of-way, a floodside seepage berm was designed.

(3) From B/L sta 313+50 to B/L sta 314+05 and from B/L sta 336+50.71 to B/L sta 340+90, the existing levee is composed of silts and, therefore, a clay cutoff was used to penetrate this pervious stratum. As an alternative, a plastic lining was used in lieu of the clay cutoff.

(4) A sheetpile seepage cutoff was used from W/L sta 2+54.01 to W/L station 7+03.37 to penetrate the pervious stratum below the levee.

(5) References used for these analyses were:

(a) AD-A012-771 - Investigation of Underseepage and its Control, Lower Mississippi River Levees, Volume I, Army Engineer, Waterways Experiment Station, Vicksburg, Mississippi, October 1956.

(b) DIVR 1110-1-400, Section 8, Part 6, Item I, 30 Nov 76.

29. I-Walls.

a. General. The protection between the wall line (W/L) stations listed below will consist of a cantilever I-type floodwall of sheet piling driven through existing levees and/or fill and capped with a concrete wall.

TABLE 1
FLOODWALL DESIGN SECTIONS

Stationing Along Wall Line	Steel Sheet Pile Penetration		Recommended Sheet Piling Tip El. NGVD
	Stab. FOS=1.5	By Creep	
	Tip El. NGVD	WCR=3.0 to 8.5 Tip El.	
(1) 0+00.00 to 1+13.57	-9.41	- 4.0	-10.0
(2) 1+58.57 to 2+54.51	-6.07	+ 1.58 ^{1/}	-6.5
(3) 7+02.87 to 7+62.87	-5.46	- 8.42	-8.5
(4) 8+08.87 to 8+59.15	-5.87	- 5.10	-7.0
(5) 8+95.15 to 9+88.10	-5.87	- 5.10	-7.0
(6) 9+88.10 to 14+31.42	-7.18	- 1.63	-7.5
(7) 15+85.23 to 16+27.30	+1.45	- 2.0	-2.0
(8) 16+79.16 to 17+18.46	+1.45	- 2.0	-2.0
(9) 20+00.00 to 20+33.43	+1.45	- 2.0	-2.0
(10) 20+69.43 to 20+98.55	+1.45	- 2.0	-2.0
(11) 101+09.00 to 103+75.42	+5.54	-11.33	-12.0
(12) 109+44.40 to 109+68.40	+5.54	-11.33	-12.0
(13) 200+62.41 to 204+58.21	-13.44	-13.0	-14.0
(14) 204+58.21 to 218+65.08	-7.0	-13.0	-13.0
(15) 219+39.08 to 233+76.50	-7.00	-13.0	-13.0
(16) 233+76.50 to 235+80.51	-15.48	-12.0	-16.0
(17) 250+00.00 to 250+40.00	+5.16	- 3.0 ^{1/}	-14.5
(18) 250+74.00 to 251+14.00	+5.16	- 3.0 ^{1/}	-14.5
(19) 300+00.00 to 300+57.93	+5.16	- 7.6 ^{1/}	-14.5
(20) 301+07.03 to 301+67.96	+5.16	- 7.6 ^{1/}	-14.5
(21) 350+00.00 to 350+55.93	-13.93	- 5.5	-14.0
(22) 351+05.03 to 351+60.98	-13.93	- 5.5	-14.0
(23) 400+00.00 to 401+13.22	-13.57	- 9.4	-14.0
(24) 401+13.22 to 402+18.22	-13.53	-11.4	-14.0
(25) 402+95.22 to 404+16.06	-21.29	- 4.5 ^{2/}	-22.0
(26) 405+55.96 to 406+74.96	-35.11 ^{2/} to -43.43 ^{2/}	-	-35.5 to -43.5
(27) 406+74.96 to 406+94.00	-5.14	- 6.0	-6.0
(28) 407+38.00 to 408+28.96	-25.11	- 0.5	-31.0 ^{3/}

^{1/} Determined penetration placed tip in a pervious stratum. To avoid seepage through this stratum, the tip penetration was lowered.

^{2/} Tie-back wall, tip penetration varies with varying ground elevation.

^{3/} Existing steel sheet piling.

b. Cantilever I-Wall Analyses. The required penetrations for the stability of the sheet pile walls were determined by the method of planes analysis, using the soil classifications, stratifications, and unit weights presented on plates 65 through 91. The walls were analyzed for both the short term (Q) case, using shear strengths presented on plates 98 through 101, and the long term (S) case, using the shear strengths shown on plates 131 through 139, 141, and 143 through 150. Only the most critical cases are presented. The following factors-of-safety (FS) were used in the analyses with the corresponding loading conditions:

(1) For confined areas at Seabrook and Orleans Marina, FS used = 1.5 with static water at the top of the wall (still water level (SWL) plus freeboard) and no dynamic wave force.

(2) For unconfined areas along the lakefront with adjacent open water, FS used = 1.5 with static water at the SWL (and no dynamic wave force) and FS used = 1.25 with static water at the SWL and a dynamic wave force.

The factor-of-safety was applied to the design shear strengths. Using the resulting shear strengths, net horizontal water and earth pressure diagrams were determined for movements toward each side of the sheet pile. Using these distributions of pressure, summations of horizontal forces were equated to zero for various tip penetrations. At these penetrations, summations of overturning moments about the bottom of the pile were determined. The penetrations required to satisfy the stability criteria are determined as those where the summation of moments are equal to zero. These analyses are shown on plates 131 through 150.

c. Sheet Pile Penetration. The sheet pile penetration required to satisfy Lane's weighted creep ratio of 3.0 to 8.5 depending on soil type was determined for various I-wall sections. The deeper penetration of the two analyses (cantilever I-wall or creep ratio) was selected as the recommended tip elevation of the sheet pile floodwall except where the soil boring data indicated that a slightly deeper penetration would be preferable as shown on table 1, "Floodwall Design Sections".

d. Shear Stabilities. The stability of the levees with I-walls, where appropriate, was determined by the method of planes using the design shear strengths and appropriate hydraulic loading shown on the stability plates and applying a minimum factor-of-safety of approximately 1.3.

30. Anchored Bulkhead. Lateral soil pressures used for the analysis of the anchored sheet pile bulkhead portion of floodwall between sta 405+55.96 and sta 406+74.96 W/L were developed by a method of planes analysis. For determination of the required sheet pile penetration, a factor-of-safety of 1.5 was applied to the soil parameters. For determination of maximum bending moment and required anchor force, a factor-of-safety of 1.0 was applied to the soil parameters. Only the most critical analyses are presented (see plates 146 and 147 for results of the anchored bulkhead analyses).

31. T-Walls and Gates.

a. General. T-type floodwalls supported by bearing piles will provide the protection at the road gates, in the vicinity of American Standard from W/L sta 103+75.42 to W/L sta 109+44.40, and at the west end from W/L sta 408+28.96 to W/L sta 411+08.06.

b. Steel Sheet Pile Cutoff. A steel sheet pile cutoff will be used beneath the gates and T-walls to provide protection against hazardous seepage during a hurricane. The sheet pile penetration required to satisfy Lane's weighted creep ratio (LWCR) of 3.0 to 8.5 depending on soil type was determined for the gates and the T-wall sections respectively, as shown in Table 2. A sample calculation can be found on plate 151.

Table 2
Seepage Cutoff Data Table
T-Walls, Gates, Ramps

Stationing Along Wall Line	Penetration		Recommended Sheet Piling Tip El. NGVD
	Penetration For WCR=3.0 to 8.5 Tip El. NGVD	Type of Protective Feature	
1+13.57 to 1+58.57	- 8.5	Gate No. 1	-8.5
7+62.87 to 8+08.87	- 5.0	Gate No. 2	-7.0
8+59.15 to 8+95.15	- 5.0	Gate No. 3	-7.0
16+27.30 to 16+79.16	+ 6.12*	Gate No. 4	-2.0
20+33.43 to 20+69.43	- 1.54	Gate No. 5	-2.0
42+00 B/L perpendicular to B/L	- 2.2	Ramp No. 1	-3.5
100+00.00 to 101+09.00	+ 6.7*	Ramp No. 2	-9.0
103+75.42 to 109+44.40	-16.7	T-Wall	-17.0
200+00.00 to 200+63.41	-13.0	Ramp No. 3	-13.0
218+65.08 to 219+39.08	-13.0	Gate Nos. 6&7	-13.0
235+80.51 to 236+48.59	-12.0*	Ramp No. 4	-16.0
166+41.00 to 166+99.00 B/L	+ 1.0	Ramp No. 5	+1.0
250+40 to 250+74	- 8.90*	Gate No. 8	-14.5

218+18 to 218+74.00 B/L	- 2.2	Ramp No. 6	-2.5
300+57.93 to 301+07.03	- 7.6*	Gate No. 9	-14.5
276+79 to 277+28 B/L	- 4.5	Ramp No. 7	-4.5
278+20 to 278+68 B/L	- 4.5	Ramp No. 7	-4.5
350+55.93 to 351+05.03	- 2.75*	Gate No. 10	-5.0
402+18.22 to 402+95.22	- 3.4	Gate No. 11	-4.0
406+94 to 407+38	- 6.0	Gate No. 12	-6.0
408+28.96 to 411+08.06	-9.0	T-Wall	-31.0**

* Determined penetration placed tip in a pervious stratum. To avoid seepage this stratum the tip penetration was lowered.

** Existing sheet piling.

c. Deep Seated Stability Analysis. A conventional stability analysis utilizing a 1.30 factor of safety incorporated into the soil parameters was performed for various failure surfaces beneath the gates and the T-wall sections. In all cases below the base, the summation of horizontal driving and resisting forces indicated decreasing unbalanced loads. Therefore, the bearing piles are not required to carry any additional lateral load resulting from unbalanced loads transmitted to the structures. A typical analysis is shown on plate 151.

d. Bearing Pile Foundations. Ultimate compression and tension pile capacities versus tip elevations were developed for (1) timber, (2) 12- and 14-inch square concrete piles. In determining the normal pressure on the pile surface for the (Q) case and (S) case, lateral earth pressure coefficients of 1.0 and 0.70 were used in compression and tension, respectively. The results of pile design load versus tip elevations analysis are shown on plates 152 through 156.

During construction, 14-inch square prestressed concrete piles will be driven and tested at some locations along the project alignment. The results of the pile test will be used to determine the length of the service piles by applying a factor of safety of 2.0. In areas where no pile tests are anticipated, the service length of the pile will be determined by incorporating a factor of safety of 3.0.

e. Soil Moduli. Bearing pile subgrade moduli curves for estimating lateral restraint of the soil beneath the gates and T-walls are shown on plates 152 through 156. The procedures used in the development of this data are as stated in the notation on these plates.

f. Settlement. Since the bearing piles will penetrate through the consolidating strata, settlement is considered to be negligible.

32. Road Ramps.

a. Shear Stability. Using cross sections representative of existing conditions at each road ramp, the road ramps were designed for the most critical conditions with the shear stability being determined by the method of planes and incorporating a minimum factor of safety of 1.3 with respect to shear strength (see plate 157 for presentation of ramp cross section and stability analysis).

b. Settlement. Settlement calculations indicate that the crowns of the road ramps will settle approximately 6 to 22 inches after construction. To compensate for this long term settlement, the ramp crowns will be overbuilt or "grossed" except for ramp #7 between B/L sta 276+84 and B/L sta 278+63 which will be constructed by lift construction due to height restrictions.

33. Erosion Protection. Due to the short duration of hurricane flood stages and the resistant nature of the clay levee fill material to be used, no erosion protection other than grass cover is considered necessary on the levee slopes.

34. Settlement Reference Markers. Reference markers will be installed along the I-walls, T-wall, and gate monoliths to obtain data relative to vertical movement. Measurements of the settlement markers will be made promptly after construction and regularly thereafter to monitor settlements of the floodwalls.

35. Sources of Fill Material. The levee fill and structural backfill will be hauled clay which will be obtained from a borrow area of Pleistocene clays located in Lake Pontchartrain near Howze Beach along the north shore. The material will be transported to the project site on barges. Plates 158 and 159 show the location and soil boring data of this borrow area.

36. Sequence of Construction.

a. General. Seven separate contracts will be utilized for the construction of the project as shown in paragraph 63.

b. Levee. The levee in each of the two levee enlargement contracts will be constructed in one phase as follows:

In areas where seepage control is required, the ground near the floodside toe will be excavated so as to accommodate a 6-mils plastic lining. The excavation will then be backfilled with the excavated material. Clay material will be barged from the Howze Beach borrow site to two stockpile areas, one located near London Avenue outfall canal and the other near Orleans outfall canal. From these points the clay material will be truck hauled to the job sites. Spreading equipment placed on the existing levee crown will proceed to construct the levee enlargement along the entire reach. Construction of the levee will be as shown in the design sections on Plates 26 thru 29.

c. Floodwalls. The floodwall construction will be accomplished in five separate contracts as follows:

(1) Seabrook Bridge Floodwall - Sta. 0+00 W/L to Sta. 14+31.42 W/L.

(2) American Standard Floodwall - Sta. 101+09 W/L to Sta. 109+68.40 W/L.

(3) Pontchartrain Beach Floodwall - Sta. 200+62.41 W/L to Sta. 235+81.51 W/L.

(4) West End Floodwall - Sta. 400+00 W/L to Sta. 411+08.06 W/L.

(5) Floodwalls and gates at Sta. 14+31.42 W/L to Sta. 17+18.46 W/L (gate 4), Sta. 20+00 W/L to Sta. 20+98.55 W/L (gate 5), Sta. 250+00 W/L to Sta. 251+14.00 W/L (gate 8), Sta. 300+00 W/L to Sta. 301+67.96 W/L (gate 9), and at Sta. 350+00 W/L to Sta. 351+60.96 W/L (gate 10).

The general location and alinement of the proposed floodwalls are shown on Plates 2 through 7. The detailed alinement and profile of the floodwalls are shown on Plates 8 through 21.

d. Road Ramps. Eight road ramps will be constructed. The ramp locations are: Hayne Boulevard (access ramp, centerline at W/L Sta. 6+46±), Leroy Johnson Drive (ramp 1, vicinity of B/L Sta. 42+00), Franklin Avenue (ramp 2, vicinity of B/L Sta. 79+18), Lakeshore Drive at the east and west ends of the Pontchartrain Beach development (ramps 3 and 4, vicinity of B/L Sta. 102+23 and 136+13 respectively), Lakeshore Drive at Lake Terrace Drive (ramp 5, vicinity of B/L Sta. 166+70), Lakeshore Drive at Rail Street (ramp 6, vicinity of B/L Sta. 218+46), and Canal Boulevard (ramp 7, vicinity of B/L Sta. 277+74). The general locations of the proposed ramps are shown on Plates 2 through 6 and on Plate 8. Ramp details and profiles are shown on Plates 22 through 25.

DESCRIPTION OF PROPOSED STRUCTURES AND IMPROVEMENTS

37. Levees. The project levee will consist of an enlargement of the existing levee, built by the Orleans Levee Board, with hauled clay material and use of 6 mils plastic lining in some areas where seepage control is required. The levee enlargement will, in general, extend from west of I.H.N.C. to the Metairie outfall canal. The general location and alinement of the proposed levee will be along the existing alinement. The detailed alinement and profile of the levee are shown on Plates 2 thru 7. Typical levee design sections are shown on Plates 26 thru 29.

38. Floodwalls, gates, and ramps.

a. Floodwalls. I-type and T-type floodwalls will be provided in lieu of levees at the following locations.

(1) Sta. 0+00 W/L to Sta. 2+54.51 W/L, Sta. 7+02.87 to Sta. 14+31.42 W/L, Sta. 15+85.23 W/L to Sta. 17+18.46 W/L, and Sta. 20+00 W/L to Sta. 20+98.55 W/L (approximately between B/L Sta. -0+06 and Sta. 40+00, not continuous). These floodwalls are in the vicinity of the Seabrook Bridge. At Sta. 0+00 W/L the new floodwall will tie into the existing IHNC floodwall along the west side of France Road. The elevation of the top of the floodwall varies as shown on Plates 9 and 10. The general location and alinement of the proposed floodwall are shown on Plate 2. The detailed alinement and profile of the floodwalls and features contiguous thereto are shown on Plates 8 through 10. Typical design sections are shown on Plates 30 and 31.

(2) Sta. 101+09 W/L to Sta. 109+68.40 W/L (approximately between B/L Sta. 79+18 and Sta. 88+24). This floodwall is in the vicinity of the American Standard plant. The alinement follows the west side of Franklin Avenue and the south side of Lakeshore Drive. The elevation of the top of the floodwall varies as shown on Plate 12. The general location and alinement of the proposed floodwall are shown on Plates 2 and 3. The detailed alinement and profile of the floodwall and features contiguous thereto are shown on Plates 11 and 12. Typical design sections are shown on Plates 31 and 32.

(3) Sta. 200+62.41 W/L to Sta. 235+81.51 W/L (approximately between B/L Stations 102+23 and 136+13). This floodwall is in the vicinity of the Pontchartrain Beach development. The alinement follows the north side of Lakeshore Drive around Pontchartrain Beach. The elevation of the top of the floodwall varies

as shown on Plates 14 through 16. The general location and alinement of the proposed floodwall are shown on Plate 3. The detailed alinement and profile of the floodwall and features contiguous thereto are shown on Plates 13 through 16. Typical design sections are shown on Plate 32.

(4) Sta. 250+00 W/L to Sta. 251+14 W/L (approximately between baseline stations 203+13 and 204+33), Sta. 300+00 W/L to Sta. 301+67.96 W/L (approximately between B/L stations 244+54 and 246+15), and Sta. 350+00 W/L to Sta. 351+60.96 W/L (approximately between B/L stations 305+41 and 306+98). These floodwalls are located at the ramped access to the existing Shelter House No. 3 near the west bank of Bayou St. John, at Marconi Drive, and at Topaz Street, respectively. The elevation of the top of the floodwalls varies as shown on Plates 17 and 18. The general location and alinement of the proposed floodwalls are shown on Plates 5 through 7. The detailed alinements and profiles of these floodwalls and features contiguous thereto are shown on Plates 17 and 18.

(5) Sta. 400+00 W/L to Sta. 411+08.06 W/L (approximately between baseline stations 314+00 and 322+81). This floodwall is in the West End area of the New Orleans lakefront. The floodwall crosses Lakeshore Drive and Pontchartrain Boulevard near Lake Marina Avenue with a bottom roller gate and a swing gate, respectively, and for the most part it parallels the north side of Lake Marina Avenue. At Sta. 411+08.06 W/L the floodwall will tie into the existing Orleans Marina Floodwall. The elevation of the top of the floodwall varies as shown on Plates 20 and 21. The general location and alinement of the proposed floodwall are shown on Plate 7. The detailed alinement and profile of the floodwall and features contiguous thereto are shown on Plates 19 through 21. Typical design sections are shown on Plates 32 and 33.

b. Gates.

(1) Swing gates. Six steel swing gates will be included in the floodwall reaches. The locations are: across France Road (gate 1, centerline at W/L station 1+36.07); across the Southern Railway tracks near Hayne Blvd. and France Road (gate 2, centerline at W/L station 7+85.87); across the service road on the south side of the Seabrook Bridge (gate 3, centerline at W/L station 8+77.87); across the Leroy Johnson Drive entrance to the Naval Reserve Training Center (gate 5, centerline at W/L station 20+51.43); across the ramped

entrance to Shelter House No. 3 near the west bank of Bayou St. John (gate 8, centerline at W/L station 250+57.00); and across Pontchartrain Blvd. in the West End area (gate 12, centerline at W/L station 407+16.00). Horizontal clearances are 30 feet, 33 feet, 28 feet, 22 feet, 20 feet, and 30 feet, respectively. Details of these gates are shown on Plates 36 through 40.

(2) Miter swing gates. Three steel miter swing gates will be included in the floodwall reaches. The locations are: across the ramp between Leroy Johnson Drive and Lakeshore Drive near the Seabrook Bridge (gate 4, centerline at W/L station 16+53.23); across Marconi Drive (gate 9, centerline at W/L station 300+82.48); and across Topaz St. (gate 10, centerline at W/L station 350+80.48). Horizontal clearances are 34 feet (gate 4) and 38 feet (gates 9 and 10). Details of these gates are shown on Plates 41 through 45.

(3) Bottom roller gates. Three steel bottom roller gates will be included in the floodwall reaches. The locations are: across the main entrance to the Pontchartrain Beach development (gates 6 and 7, centerlines at W/L stations 218+85.08 and 219+19.08 respectively); and across Lakeshore Drive in the West End area (gate 11, centerline at W/L station 402+55.22). Horizontal clearances are 26 feet (gates 6 and 7) and 60 feet (gate 11). Details of these gates are shown on Plates 46 through 49.

c. Ramps. In lieu of gates, roadways will be ramped over the flood protection at eight locations. Hayne Blvd. will be closed with an earthen levee and an access ramp will be constructed over the levee with a crown to elevation 14.5 (net grade). The existing roadway ramps will be enlarged at the following locations: Leroy Johnson Drive, Franklin Ave., Lakeshore Drive at the east and west ends of the Pontchartrain Beach development, Lakeshore Drive near the west bank of London Ave. outfall canal, Lakeshore Drive in the vicinity of Rail Street, and at Canal Blvd. The net elevation for all ramps is 14.5 (Ramp 3 has a net elevation that varies from 14.5 to 16.5) but will be built to a higher grade to allow for settlement. Ramp 7 (at Canal Blvd.) will be constructed in two phases to allow an anticipated settlement of 1.8 feet. During the first phase, the ramp will be constructed to a gross elevation of 15.5 feet. This design is intended to provide for a design life of approximately 10 years, at which time, during the second phase, the ramp will be reconstructed to a new gross elevation to account for the remaining settlement. The design for phased construction of this ramp was selected as a practical alternative to constructing the roadway in a single lift with a much

higher elevation which would result in prohibitive approach grades. These ramps will include a steel sheet piling wall buried beneath the roadway for seepage cutoff. The general locations of these ramps are shown on Plates 2 through 6, and the details are shown on Plates 22 through 25.

39. Drainage facilities and utility lines.

a. Modifications to existing drainage facilities.

Pumping Station No. 12 will be modified by adding a vertical lift roller gate structure to the existing discharge culverts, and by raising the existing concrete retaining/floodwall at the discharge end of the culvert from elevation 8.5± to elevation 13.5. The vertical lift roller gate is a requisite for positive closure during hurricane conditions. Details of the vertical lift roller gate are shown on Plates 50 and 51. Details of the floodwall are shown on Plates 19, 20, and 33.

b. Utilities and subsurface drainage. The existing utility lines and drainage pipes crossing the flood protection alignment will be relocated over the earthen levees, through the floodwalls, or modified by installation of catch basins, knife valves, and new lines. At locations where these utilities are parallel to and fall within the levee base, the utilities will be relocated outside the levee rights-of-way. Locations, types, and details of utilities are shown on Plates 2 through 7 and Plates 52 through 58.

METHOD OF CONSTRUCTION

40. Recommended levee construction plan. The recommended plan of construction consists of enlarging the existing levee (built by the Orleans Levee Board). Floodwalls in lieu of levees will be provided at the existing gaps in the protection. The proposed levee enlargement will follow the existing alignment to maximize use of material already in place and to minimize relocations and disturbance to the aesthetical appearance of the project area.

OTHER PLANS CONSIDERED

41. Alternate plan - I-wall on levee with barge berm in lieu of levee enlargement. During the design of the recommended plan, the alternate plan (presented in the "Lake Pontchartrain, Louisiana and Vicinity Hurricane

Protection Project, Reevaluation Study"), providing an I-wall on levee with a barge berm in lieu of levee enlargement, was reconsidered. The "Reevaluation Study" report recommended the construction of an I-wall with top elevation of 14.5 on a levee with a very wide crown to elevation 12.0. The wide crown would act as a barrier to prevent the potential of loose barges from impacting the floodwall during hurricane conditions. This plan assumed field conditions as existed during October 1979 which consisted of an earthen levee with an approximate grade of 10.5 feet. However, since that date, local interests have raised most of the levee reach to a grade of 16.0 feet as a means of higher interim protection. The higher levee, together with additional soils information, rendered the plan recommended in this GDM more practical and economical than the I-wall on levee with barge berm recommended in the "Reevaluation Study". Because of the higher cost and aesthetic reasons, the I-wall on levee with barge berm plan was not recommended.

ACCESS ROADS

42. Access roads. Vehicular access to the project site is available via many roads. Lakeshore Drive traverses parallel to almost the entire reach of the project. Other major thoroughfares which provide access to the project area are Franklin Ave., Elysian Fields Ave., Canal Boulevard and West End Boulevard. Water access is available via Lake Pontchartrain and the Inner Harbor Navigation Canal (IHNC).

STRUCTURAL DESIGN

43. Criteria for structural design. The structural designs presented herein comply with standard engineering practice and criteria set forth in Engineering Manuals and Engineering Technical Letters for civil works construction published by the Office, Chief of Engineers, subject to modifications indicated by engineering judgment and experience to meet local conditions.^{1/}

44. Basic data. Basic data relevant to the design of the protective works are shown in the following table:

^{1/} The floodwall design is similar to the design presented in the Lake Pontchartrain Barrier Plan Citrus Lakefront Levee-IHNC to Paris Road, Design Memorandum No. 2, General Design, Supplement No. 5A, approved July 1976.

TABLE 3
RELEVANT STRUCTURAL DESIGN DATA

<u>a. Water elevations</u>	<u>Elevation</u> (feet N.G.V.D.)
Wind tide level (IHNC)	13.0
Wind tide level (Lake Pontchartrain)	11.5
Landside of Floodwall	0.0
<u>b. Floodwall Gross Grade</u> (stationing refers to W/L)	<u>Elevation</u> (feet N.G.V.D.)
I-wall (Sta. 0+00 to Sta. 1+13.57)	14.5
T-wall and gate 1 (Sta. 1+13.57 to Sta. 1+58.57)	
I-wall (Sta. 1+58.57 to Sta. 2+54.51)	14.5
I-wall (Sta. 7+02.87 to Sta. 7+62.87)	15.5
T-wall and gate 2 (Sta. 7+62.87 to Sta. 8+08.87)	20.5 - 15.0
I-wall (Sta. 8+08.87 to Sta. 8+59.15)	15.5
T-wall and gate 3 (Sta. 8+59.15 to Sta. 8+95.15)	20.75 - 15.0
I-wall (Sta. 8+95.15 to Sta. 14+31.42)	15.5
I-wall (Sta. 15+85.23 to Sta. 16+27.30)	18.5 - 18.0
T-wall and gate 4 (Sta. 16+27.30 to Sta. 16+79.16)	18.25
I-wall (Sta. 16+79.16 to Sta. 17+18.46)	18.0 - 18.5
I-wall (Sta. 20+00 to Sta. 20+33.43)	18.5 - 18.0
T-wall and gate 5 (Sta. 20+33.43 to Sta. 20+69.43)	18.25 - 17.5
I-wall (Sta. 101+12 to Sta. 103+75.42)	18.0 - 20.5
T-wall (Sta. 103+75.42 to Sta. 109+44.40)	20.0
I-wall (Sta. 109+44.40 to Sta. 109+68.40)	20.5
I-wall (Sta. 200+62.41 to Sta. 201+20)	17.5
I-wall (Sta. 201+20 to Sta. 204+80)	17.5 - 15.0
I-wall (Sta. 204+80 to Sta. 218+65.08)	15.0
T-wall and gates 6 & 7 (Sta. 218+65.08 to Sta. 219+39.08)	15.0 - 14.5
I-wall (Sta. 219+39.08 to Sta. 233+00)	15.0
I-wall (Sta. 233+00 to Sta. 235+00)	15.0 - 18.0
I-wall (Sta. 235+00 to Sta. 235+80.51)	18.0
I-wall (Sta. 250+00 to Sta. 250+40 and Sta. 250+73 to Sta. 251+14)	18.0
T-wall and gate 8 (Sta. 250+40 to Sta. 250+73)	18.25 - 17.5
I-wall (Sta. 300+00 to Sta. 300+57.93 and Sta. 301+07.03 to Sta. 301+67.96)	18.0
T-wall and gate 9 (Sta. 300+57.93 to 301+07.03)	18.25
I-wall (Sta. 350+00 to Sta. 350+30)	19.0 - 18.0
I-wall (Sta. 350+30 to Sta. 350+55.93 and Sta. 351+05.03 to Sta. 351+60.96)	18.0
T-wall and gate 10 (Sta. 350+55.93 to Sta. 351+05.03)	18.25
I-wall (Sta. 400+00 to Sta. 401+13.22)	15.0
I-wall (Sta. 401+13.22 to Sta. 401+25.22)	15.0 - 14.0
I-wall (Sta. 401+25.22 to Sta. 402+18.22)	14.0

TABLE 3 (continued)

T-wall and gate 11 (Sta. 402+18.22 to Sta. 402+95.22)	14.0 - 13.5
I-wall (Sta. 402+95.22 to Sta. 404+16.06)	14.0
T-wall (Sta. 404+16.06 to Sta. 405+55.96)	13.5
I-wall (Sta. 405+55.96 to Sta. 406+94)	14.0
T-wall and gate 12 (Sta. 406+94 to Sta. 407+38)	19.25 - 13.5
I-wall (Sta. 407+38 to Sta. 408+28.96)	14.0
T-wall (Sta. 408+28.96 to Sta. 411+08.06)	13.5

c. <u>Unit weights</u>	<u>Lb. per cu ft</u>
Water	64.0
Concrete	150
Steel	490
Earth	See Plates 102 thru 107 & Plate 112

d. <u>Design loads</u>	
Earth pressures (lateral)	See Plates 131 thru 150
Wind loads	50 p.s.f.
Water loads	See Plates 131 thru 150

45. Design methods

a. Structural steel. The design of steel structures is in accordance with the requirements of the allowable working stresses recommended in "Working Stresses for Structural Design", EM 1110-1-2101 dated 1 November 1963 and amendment No. 2 dated 17 January 1972. The basic working stress for ASTM A-36 steel is 18,000 psi. Steel for steel sheet piling will meet the requirements of ASTM 328, "Standard Specification for Steel Sheet Piling".

b. Reinforced concrete. The design of reinforced concrete structures is in accordance with the requirements of the strength design method of the current ACI Building Code, as modified by the guidelines of "Strength Design Criteria for Reinforced Concrete Hydraulic Structures", ETL 1110-2-265 dated 15 September 1981. The basic minimum 28-day compressive strength concrete will be 3,000 psi, except for prestressed concrete piling where the minimum will be 5,000 psi. For convenient reference, pertinent stresses are tabulated below:

TABLE 4
PERTINENT STRESSES FOR REINFORCED CONCRETE DESIGN

<u>Reinforced concrete</u>	
f'c	3,000 psi
fy (grade 40 steel)	40,000 psi
Maximum flexural reinforcement	0.25 x balance ratio
Minimum flexural reinforcement	200/fy
f'c (for prestressed concrete piles)	5,000 psi
fu (prestressing strands, Gr. 250)	250,000 psi

46. Location and alinement. The flood protection will consist of earthen levees and road ramps except for reaches of I-wall, T-wall, and gate monoliths as described in paragraph 38 above. At the east end of the lakefront, the new floodwall will tie into an existing floodwall along France Road (west bank of IHNC Floodwall), and at the west end, the new floodwall will tie into the existing Orleans Marina Floodwall. The general location and alinement of the proposed floodwalls are shown on Plates 2 through 7. The detailed alinement and profile of the floodwall and features contiguous thereto are shown on Plates 8 through 21.

47. I-type floodwall.

a. General. The I-wall will consist of steel sheet piling driven into the existing ground and in some cases into a new embankment. The upper portion of the sheet piling will be capped with concrete. The sheet piling will be driven to the required depth with 1 foot of the sheet piling extending above the finished ground elevation. The concrete portion of the floodwall will extend from 2 feet below the finished ground elevation to the required protection height. For details, see Plates 30 through 35.

b. Loading cases. In the design of the I-wall, two loading cases were considered.

Case I: (1) For confined areas at Seabrook and Orleans Marina, FS used = 1.5 with static water at the top of the wall (still water level (SWL) plus freeboard) and no dynamic wave force.

(2) For unconfined areas along the lakefront with adjacent open water, FS used = 1.5 with static water at the SWL (and no dynamic wave force) and FS used = 1.25 with static water at the SWL and a dynamic wave force.

Case II: No water, lateral soil pressure (where applicable).

c. Joints. Expansion joints in the I-wall will be spaced approximately 30 feet apart, adjusted to fall at sheet pile interlocks. To compensate for expansion, contraction, or displacement, three-bulb waterstops and premolded expansion joint fillers will be provided. Where the I-wall joins the T-wall, the deflection of the I-wall will produce a lateral displacement. To compensate for this displacement, a special seal located in a notch in the I-wall has been designed to prevent water from flowing through this joint (see Plates 34 and 35 for details).

48. T-type floodwall.

a. General. T-wall will be constructed at the American Standard Floodwall, between W/L Stations 103+75.42 and 109+44.40. T-wall will also be constructed at the West End Floodwall between W/L Stations 408+28.96 and 411+08.06. The T-wall will consist of a reinforced concrete stem on a monolithic concrete base of varying width supported on precast prestressed concrete piles or on steel H piles. The base of the T-wall will be constructed on a four inch concrete stabilization slab. A continuous steel sheet pile wall will be provided beneath the base for seepage cut-off purposes (see Plates 11, 12, 19, 21, 31, 33, and 34 for details).

b. Loading cases. These walls were designed for the following load conditions:

Case I. Static water pressure, no wind, impervious sheet pile cutoff, no dynamic wave force.

Case II. Static water pressure, no wind, pervious sheet pile cutoff, no dynamic wave force.

Case III. Still water pressure to elevation 11.5, dynamic wave force, impervious sheet pile cutoff (75% forces used).

Case IV. Still water pressure to elevation 11.5, dynamic wave force, pervious sheet pile cutoff (75% forces used).

Case V. No water, no wind.

Case VI. No water, wind from protected side (75% forces used).

Case VII. No water, wind from flood side (75% forces used).

c. Joints. Expansion joints in the T-wall will be spaced not more than sixty feet apart except at gate monoliths. The joints will be adjusted to fall at sheet pile interlocks. To compensate for expansion, contraction, or displacement, three-bulb waterstops and premolded expansion joint fillers will be provided.

49. Gates and gate monoliths.

a. General. Twelve gate monoliths will be constructed for access roads, railroad crossing, and street crossings in lieu of I-walls. In addition, a vertical lift roller gate will be constructed on the existing drainage discharge culvert of pumping station No. 12. Each gate monolith will include a steel gate which will be closed by local interests when a hurricane approaches. The locations and elevations for these gates are shown on Plates 8 through 21. Four types of gates will be used as described below.

b. Swing gates. Six swing gates will be constructed in the floodwalls along the lakefront area. The locations of these gates are described in paragraph 38b(1). To assure a proper seal, each gate will be constructed so that it can be adjusted in either the horizontal or vertical direction. The side and bottom seals can also be adjusted as alternate or supplemental means to assure that a proper seal is obtained. Details of these swing gates are shown on Plates 36 through 40.

c. Miter swing gates. Three mitered swing gates will be constructed. The locations of these gates are described in paragraph 38b(2). To assure a proper seal, each gate will be constructed so that it can be adjusted in either the horizontal or vertical direction. The side and bottom seals can also be adjusted as alternate or supplemental means to assure that a proper seal is obtained.^{1/} Details of these miter swing gates are shown on Plates 41 through 45.

^{1/} Design computations for a typical structural steel miter swing gate are shown in Appendix B. The design for the reinforced concrete monolith, while not included in the appendix, is similar to the design presented in the Citrus Lakefront GDM.

d. Bottom roller gates. Three bottom roller gates will be constructed. The locations of these gates are described in paragraph 38b(3). These gates will be constructed so that they can be adjusted in the horizontal direction, perpendicular to the tracks. The side and bottom seals can be adjusted in either the horizontal or vertical direction to assure that a proper seal is obtained. Details of these bottom roller gates are shown on Plates 46 through 49.

e. Vertical lift roller gate. One vertical lift roller gate will be constructed on the existing drainage discharge culvert of pumping station no. 12. The centerline of this gate is located at approximately B/L Station 319+08. This gate is required to assure that a proper positive cut-off is obtained in the event of a pumping station failure during hurricane conditions. Details of this gate are shown on Plates 50 and 51.

f. Loading cases. The gate structures were designed for the following load conditions:

(1) Swing gates.

Case I. Gate closed, still water to elevation 11.5, dynamic wave force, impervious sheet pile cutoff (75% forces used).

Case II. Gate closed, still water to elevation 11.5, dynamic wave force, pervious sheet pile cut-off (75% forces used).

Case III. Gate open, no wind, truck or train on protected edge of base slab.

Case IV. Gate open, no wind, truck or train on floodside edge of base slab.

Case V. Gate open, wind from protected side, truck or train on floodside edge of base slab (75% forces used).

Case VI. Gate open, wind from floodside, truck or train on protected side edge of base slab (75% forces used).

(2) Miter swing gates. Same load cases as swing gates.

(3) Bottom roller gates. Same load cases as swing gates.

(4) Vertical lift roller gate.

Case I. Gate closed, water to top of gate on floodside, no water on protected side.

50. Cathodic protection and corrosion control.

a. Cathodic protection for steel sheet piling. All steel sheet piling will be bonded together to obtain electrical continuity and no corrosion protection measures will be provided. Cathodic protection can be installed in the future if the need arises. The sheet piles will be bonded together with a no. 6 reinforcing bar welded to the top of each pile. Flexible jumpers insulated with cross-linked polyethelene will be welded or brazed to adjacent sheet piles at the monolith joints 3 inches below the bottom of the concrete.

b. Corrosion control. The steel gates, corner plates, and all ferrous metal components which are not galvanized or stainless steel will be coated with a 7-coat vinyl paint system as required for corrosion control.

REAL ESTATE REQUIREMENTS

51. General. All rights-of-way and construction easements required for construction of this 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 and construction easement limits are shown on Plates 2 through 7. Local interests are required to assume the cost of relocation assistance to persons and businesses displaced by such acquisition pursuant to the requirements of Public Law 91-646.

SOURCES OF CONSTRUCTION MATERIALS

52. Sources of construction materials. In addition to the information presented in this memorandum relative to borrow area location and materials, Design Memorandum "Lake Pontchartrain Hurricane Protection, Sources of Construction Materials", DM 12, contains a listing of the sources of sand, gravel, shell, and rock available in the region.

RELOCATIONS

53. 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,...". Included in the required modifications are road ramps, utilities, and drainage rectification work.

54. Road ramps. Road ramps will be constructed in eight locations as described in paragraph 38c. The locations of the ramps are shown on Plates 2 through 7. Details of the ramps are shown on Plates 22 through 25.

55. Utilities Crossing I-wall. Locations of known utilities that cross through the I-wall or parallel the I-wall are shown on Plates 52 through 56. Details of pipeline crossings through the I-wall are shown on Plates 57 and 58. Each utility crossing will be so constructed that any anticipated settlement or deflection of the I-wall or any small movements of the pipe will not seriously affect either the wall or the pipeline.

56. Utilities Crossing Levee. Locations of known utilities that cross through the levee or parallel the levee are shown on Plates 2 through 7. Those utility lines which will be relocated to cross over the levee will be constructed according to the "Hurricane Protection Levee Pipeline Crossing Standards".

COORDINATION WITH OTHER AGENCIES

57. 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. The entire Lake Pontchartrain hurricane protection project, including this project feature, has been discussed at numerous public and private meetings since its 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 latest public meeting was held in New Orleans on 12 April 1984. The project has also been described and discussed by the press and by communications media, as well as organizational and individual correspondence. This public meeting was held as part of the continuing coordination required for input to the Draft Supplemental Environmental Impact Statement (DSEIS) of the Lake Pontchartrain project as a whole. Comments received in connection with the proposed action described in this GDM are summarized in paragraphs a. and b. below.

a. The Board of Levee Commissioners of the Orleans Levee District. By letter dated 21 February 1984 responded to the DSEIS in connection with the New Orleans Lakefront reach by stating: "While we agree with the concept of the high level protection, we wish to comment on some of the specifics presented in the report...page 125; NEW ORLEANS AREA - The Tentatively Selected Plan between Jefferson Parish Lakefront and the west bank of the Inner Harbor Navigation Canal provides for an earthen levee topped by a floodwall. This is not an acceptable solution since this type of construction would be in conflict with the intended use of the lakefront park areas. We understand, however, that more detailed engineering analysis has proved that an all earthen levee and berm can and will be constructed in this reach".

b. City of New Orleans. By letter dated 22 February 1984 the City Planning Commission expressed the following opinion relative to use of I-wall in levee designs: "Wherever feasible, it is the staff's opinion that I-walls should not be constructed, in part due to esthetics..."

ENVIRONMENTAL ASSESSMENT

58. General. The project is within the Mississippi Deltaic plain and is characterized by near sea level elevations. The dominant topographic feature is Lake Pontchartrain, a large, shallow body of water lying within an extensive estuarine complex. The impact would be both temporary and long term. Most environmental features, including biological, recreational, cultural, and socioeconomic, would return to normal after construction.

a. Biological. The New Orleans lakefront consists of seawall backed by a low levee from the Jefferson Parish line to the IHNC. Currently, this area has been developed as residential on the protected side of the levee and recreational green space on the lakeward side of the levee. The area is used for jogging, picnicking, and recreational games. The existing vegetation is comprised of various lawn grasses and decorative flowering plants interspersed with sparse stands of pine and, in some cases, oak. The value of this area as a wildlife habitat is minimal due to the lack of food, cover, and its urban setting.

The trees in the area may provide some habitat for songbirds and squirrels. Some small mammals such as field mice and rabbits may intermittently utilize the green grassy areas. The tree line and green space may provide marginal resting areas for migratory species during seasonal migrations.

Impacts involved in the construction required to raise the existing lakefront levee approximately 2 to 4 feet would result in the loss of some trees and some expanses of grass-covered areas through burial or removal. These areas would be only temporarily denuded for they would be revegetated shortly after earth moving and shaping operations have been completed; therefore, minimal impact on wildlife is expected. There would be short-term impacts during the construction period related to increases in airborne dust and turbidity in adjacent waters. These impacts would be due to increased potential for soil erosion during the interim period between the shaping work and revegetation. Other

impacts associated with construction involve increases in background noise levels. The noise levels expected for the proposed construction would range between 78 - 84 dBA as measured at 100 feet from the center of the noise source.^{1/} Background noise levels for residential areas, such as the lakefront area, are estimated to be about 50 dBA. Therefore, during construction, the noise levels could increase approximately 30 dBA. Since the work would primarily be accomplished during the daylight hours and in most cases distances greater than 100 feet from the residences, these noise levels are expected to be much lower at the residences than the 30 dBA increase estimated. While the background noise levels would be somewhat higher than the ambient noise level, the proposed construction activities would produce much less noise and disruption than the construction activities with the I-wall and barge berms configuration previously described in the Lake Pontchartrain, Louisiana and Vicinity Reevaluation Report. These impacts would be minor and temporary and would neither significantly affect the surrounding environment nor the critical wildlife habitat. An endangered species assessment and a Coastal Zone Management Consistency Determination have been conducted.

b. Cultural. The New Orleans Lakefront levee is located almost entirely on post-1930 land fill and no cultural resources are affected. No cultural resource surveys are, therefore, necessary. The finding was coordinated with the Louisiana State Historic Preservation Officer through distribution of the Draft EIS for Lake Pontchartrain, Louisiana, and Vicinity Hurricane Protection Project. The possible impacts of the Bayou St. John closure on significant cultural resources were addressed through the Section 404 permit process. No property eligible for the National Register will be adversely affected by the Bayou St. John closure.

c. Recreation. Proposed levee work traverses four neighborhood park areas (Lakeshore Park, Lake Vista Park, Lake Terrace Park, and Live Oaks Park). These linear park open spaces provide aesthetic areas conducive to active and passive recreation along the lakeshore. Recreation facilities existing within the New Orleans lakefront area include: 4 picnic shelters, 2 covered pavilions, 3 children's play areas, 72 portable picnic tables, 1 fishing pier, and 26 boat launch lanes, satisfying 473,000 annual man-days of recreation. Also existing in the area are activities such as informal

^{1/} Canter, Lurry W. 1977. Environmental Impact Assessment, McGraw Hill Book Co., New York.

ball games, field sports, jogging, walking, sightseeing, fishing, crabbing, and observation of wildlife. These activities take place in the linear park space and are not dependent on recreation facilities. Man-day estimates have not been quantified for these open field sport activities; however, during weekends of the summer season, maximum use does occur. During levee construction, people will be discouraged from using the open space adjacent to the work area due to normal construction activity and temporarily higher noise and dust levels.

Aesthetic values in the area will be temporarily reduced, resulting in changes to the existing landscape. Levee areas that were once grass covered green slopes will be transformed into higher earthen levees. Impacts to localized aesthetics and recreational activity, i.e. jogging, will be short-term during construction and the revegetating process. Ninety trees existing within the project right-of-way will be removed and later replaced with similar species. Floodwalls planned for the area will be designed with an aesthetic surface treatment thereby softening the impacts to the visual environment. Revegetating in areas adjacent to floodwalls will be accomplished by use of shallow-root plant species where possible. Located at the Seabrook Bridge are 18 boat ramps which will not be impacted by the levee construction; however, parking areas for cars and boat trailers will be disrupted and partially unusable during construction activities in the area.

d. Socioeconomic. The Orleans Parish lakefront levee west of the IHNC is an element of the overall Lake Pontchartrain Hurricane Protection Plan designed to prevent the effects of overflows from a project hurricane. The process of levee construction and drainage maintenance has historically been the method used for land development and flood protection in the New Orleans urbanized areas. Since 1964, as many as nine tropical storms reaching hurricane force have passed through Louisiana's gulf coast (including Hurricanes Betsy and Camille) causing heavy damage and loss of life in the New Orleans area. The economic life of the area is supported largely by port activities, tourist trade, regional market activities, the production of minerals (including crude petroleum, natural gas, sulfur, natural gas liquids, and shell), commercial fishing, shipbuilding, and related service industries. The six parishes designated by the Bureau of the Census in 1983 as the New Orleans Metropolitan Statistical Area (MSA) include Jefferson, Orleans, St. Bernard, St. Charles, St. John the Baptist, and St.

Tammany Parishes. Portions of Plaquemines Parish are also designated as part of the New Orleans Urbanized Area. The statistical designation of the Port of New Orleans also includes the entire stretch of the Mississippi River adjacent to Plaquemines Parish. The combined population of the New Orleans MSA and Plaquemines Parish in 1980 totaled 1,283,000. In June of 1984, the estimated civilian labor force in this area totaled 600,700 while employment was 548,925 resulting in an 8.6 percent unemployment rate; it was somewhat less than the 9.4 percent unemployment figure for the state. In 1981, per capita personal income for the 7-parish area was approximately \$10,860, slightly higher than the \$9,517 estimate for the entire state. Appendix B of the Lake Pontchartrain, Louisiana and Vicinity Hurricane Protection Project Reevaluation Report provides a general assessment of socioeconomic impacts of remaining work through a brief outline of 16 social and economic parameters. In addition to the economic cost of remaining work, minor adverse impacts would probably include the following: temporary reductions in leisure opportunities and increased noise from the construction and development; reduced aesthetic values to the extent that changes in the existing landscape would occur; and community cohesion could be adversely affected to the extent that competition for land resources could be encouraged. One of the major benefits of completing the new project, however, could also be an increase in community cohesion resulting from the improved security provided by additional flood protection. The remaining work would provide net benefits to land use, property values, and business and industrial activity, as well as benefits to employment, housing, local tax revenues, public facilities and services, and overall community and regional growth.

59. Environmental Impact Statement. The final Environmental Impact Statement (EIS), for the entire Lake Pontchartrain, Louisiana, and Vicinity Hurricane Protection Project, was filed with the President's Council on Environmental Quality on 17 January 1975. A Draft supplement to this EIS was filed with the Environmental Protection Agency (EPA) in December of 1983. The Draft Supplement assessed the impacts associated with increased levee height for a high level plan of protection for the New Orleans Lakefront project reach. The Final Supplement is scheduled to be filed with EPA in December of 1984.

60. Local Interest Construction. In accordance with subparagraph (4) of the items of local assurances (see paragraph 3.a.(4) of this GDM) the Orleans Levee District has proceeded with a number of construction

contracts for the lakefront levee to expedite protection to the City of New Orleans. Review and approval of the plans and specifications for the work has been made by the New Orleans District. In general the credit for construction contracts accomplished by the Orleans Levee District can be classified into two categories: contracts which have been audited and credits established, and contracts which have been reviewed by the New Orleans District design personnel, but have not been officially audited and hence credits can only be approximated at this time. The former, work for which credit as work-in-kind is established, is for contracts carried out since project authorization and prior to 1970. The contracts and applicable monetary credits were established by District Audit Report Number 9-74. Credits in the amount of \$1,094,279.23 were established by this audit. Interim construction work carried out under contracts during 1980 by the Orleans Levee Board added an additional levee lift to the Lakefront Reach. This work was built in three separate phases or levee reaches. The construction increased the level of protection from approximate elevation +10.5 NGVD to its present elevation of +16.0 NGVD. Total contract cost excluding E&D was \$1,844,622.00. The estimated E&D cost for this work is approximately \$111,000. The creditable monies for this interim protection will be established by an audit report which will be conducted during FY 85.

ESTIMATE OF COST

61. General. Based on October 1984 price levels, the estimated first cost for construction of the New Orleans Lakefront high level plan levee is \$35,046,000. This estimate consists of \$2,895,000 for relocations, \$18,257,000 for lands and damages, \$10,947,000 for levees and floodwalls, \$1,563,000 for engineering and design, and \$1,384,000 for supervision and administration. The detailed estimate of first cost is shown in Table 5.

TABLE 5

LAKE PONTCHARTRAIN HIGH LEVEL PLAN
NEW ORLEANS LAKEFRONT LEVEE - WEST OF I.H.N.C.

ESTIMATE OF FIRST COST
(October 1984 price levels)

Cost Acct. No.	Item	Estimated Quantity	Unit	Unit Price \$	Estimated Amount \$
<u>I. Floodwall Reaches</u>					
A. Seabrook Floodwall					
CONSTRUCTION					
11 Levees and floodwalls					
	PZ-27 Steel sheet piling	16,725	s.f.	13.00	217,425
	PZ-22 Steel sheet piling	5,870	s.f.	12.00	70,440
	PSA-23 Steel sheet piling	312	s.f.	14.50	4,524
	12" x 12" Prestressed conc. piling	5,631	l.f.	20.00	112,620
	Concrete in stabilization slab	13	c.y.	100.00	1,300
	Concrete in T-wall base and gate sill	101	c.y.	250.00	25,250
	Concrete in walls and columns	439	c.y.	350.00	153,650
	Structural steel	22,500	lbs.	2.50	56,250
	Miscellaneous metal	1	job	L.S.	19,825
	Gate seals	124	l.f.	30.00	3,720
	Waterstops, L-type	55	l.f.	30.00	1,650
	Waterstops, 3-Bulb type	130	l.f.	10.00	1,300
	Expansion joint filler	446	s.f.	1.75	781
	Structural excavation	582	c.y.	7.00	4,074
	Structural backfill	362	c.y.	11.00	3,982
	Waterproof finish	3,920	s.f.	1.00	3,920
	Levee degrading	347	c.y.	1.50	521
	Levee fill, semi-compacted	4,932	c.y.	4.50	22,194
	Subtotal				\$703,426
	Contingencies (25%±)				175,574
	Subtotal				\$879,000
30	Engineering and design (12%±)				105,000
31	Supervision and administration (10%±)				88,000
	TOTAL, CONSTRUCTION FOR SEABROOK FLOODWALL				\$1,072,000

TABLE 5 (cont'd)

Cost Acct. No.	Item	Estimated Quantity	Unit	Unit Price \$	Estimated Amount \$
LANDS AND DAMAGES					
01 Lands & Damages					
	Floodwall R/W Lake Front Property	1.25	Acres	260,000	325,000
	Temporary Construction Lake Front Property (2 years)	0.65	Acres	260,000x.20	33,800
	Improvements				0
	Severance Damage				0
	Total (rounded)				359,000
	Contingencies, 25% (rounded)				90,000
	Acquisition Costs (Estimated 1 tract)				
	Non-Federal	1@\$1,400 per tract (rounded)			1,000
	Federal				1,000
	PL 91-646				0
	TOTAL, LANDS AND DAMAGES FOR SEABROOK FLOODWALL				451,000
RELOCATIONS					
02 Relocations					
	Access Ramp at Hayne Blvd.	1	job	L.S.	77,000
	Telephone cable thru I-wall	1	Ea.	1,500.00	1,500
	Underground electrical cable thru I-wall	2	Ea.	1,500.00	3,000
	12" Ø Water line thru I-wall	1	Ea.	2,500.00	2,500
	8" Ø Sewer line thru I-wall	1	Ea.	2,200.00	2,200
	Relocate 8" Ø H.P. Gas line	100	l.f	186.00	18,600
	18" Knife gate valve and structure	1	Ea.	4,900.00	4,900
	8" Knife gate valve and structure	1	Ea.	2,700.00	2,700

TABLE 5 (cont'd)

Cost Acct. No.	Item	Estimated Quantity	Unit	Unit Price \$	Estimated Amount \$
	Overhead power lines, temporary relocation	200	l.f.	10.00	<u>2,000</u>
	Subtotal				114,400
	Contingencies (25%±)				<u>28,600</u>
	Subtotal				\$143,000
30	Engineering and design (12%±)				17,000
31	Supervision and administration (10%±)				<u>14,000</u>
	TOTAL, RELOCATIONS FOR SEABROOK FLOODWALL				\$174,000
	TOTAL, SEABROOK FLOODWALL				\$1,697,000
B. American Standard Floodwall					
CONSTRUCTION					
11	Levees and floodwalls				
	PZ-22 Steel sheet piling	11,290	s.f.	12.00	135,480
	PZ-27 Steel sheet piling	7,905	s.f.	13.00	102,765
	PSA-23 Steel sheet piling	240	s.f.	14.50	3,480
	14" x 14" Prestressed conc. piling	10,986	l.f.	24.00	263,664
	Concrete in stabilization slab	85	c.y.	100.00	8,500
	Concrete in T-wall base	746	c.y.	250.00	186,500
	Concrete in walls	888	c.y.	350.00	310,800
	Structural excavation	2,039	c.y.	7.00	14,273
	Structural backfill	985	c.y.	10.00	9,850
	Waterstop, 3-Bulb type	498	l.f.	10.00	4,980
	Waterstop, L-type	40	l.f.	30.00	1,200
	Architectural finish	8,380	s.f.	3.25	27,235
	Compression Pile Test				
	Compression test	1	Ea.	16,000.00	16,000
	Additional compression test	1	Ea.	12,000.00	12,000

TABLE 5. (cont'd)

Cost Acct. No.	Item	Estimated Quantity	Unit	Unit Price \$	Estimated Amount \$
	Tension Pile Test				
	Tension Test	1	Ea.	17,000.00	17,000
	Additional tension test	1	Ea.	12,000.00	<u>12,000</u>
	Subtotal				\$1,125,727
	Contingencies (25%±)				<u>281,273</u>
	Subtotal				\$1,407,000
30	Engineering and design (12%±)				169,000
31	Supervision and administration (10%±)				<u>141,000</u>
	TOTAL, CONSTRUCTION FOR AMERICAN STANDARD FLOODWALL				\$1,717,000
LANDS AND DAMAGES					
01	Lands & Damages				
	Floodwall R/W				
	Lake Front Property	1.38	Acres	175,000	241,500
	Temporary Construction				
	Lake Front Property	2.41	Acres	175,000x.20	84,350
	Improvements				0
	Severance Damage				<u>0</u>
	Total (rounded)				326,000
	Contingencies, 25% (rounded)				82,000
	Acquisition Costs (Estimated 1 tract)				
	Non-Federal	1@\$1,400 per tract (rounded)			1,000
	Federal				1,000
	PL 91-646				<u>0</u>
	TOTAL, LANDS AND DAMAGES FOR AMERICAN STANDARD FLOODWALL				410,000

TABLE 5 (cont'd)

Cost Acct. No.	Item	Estimated Quantity	Unit	Unit Price \$	Estimated Amount \$
RELOCATIONS					
02	Relocations				
	Relocate Lakeshore Drive	1	job	L.S.	19,700
	Ramp No. 2 at Franklin Avenue	1	job	L.S.	294,300
	6" Ø H.P. gas line thru I-wall	1	Ea.	2,000.00	2,000
	6" Ø Water line thru I-wall	1	Ea.	2,000.00	2,000
	12" Ø Water line thru I-wall	1	Ea.	2,500.00	2,500
	Underground electrical cable thru sheet pile	1	Ea.	1,500.00	1,500
	Relocate 12" Ø Water line	900	l.f.	20.00	18,000
	Relocate 12" Ø Drainage line	450	l.f.	20.00	9,000
	Relocate 15" Ø Drainage line	450	l.f.	22.00	9,900
	Construct catch basins	12	Ea.	800.00	9,600
	Relocate water manholes	3	Ea.	1,200.00	3,600
	Relocate gas manhole	1	Ea.	1,200.00	1,200
	Relocate drain manhole	1	Ea.	1,200.00	1,200
	Subtotal				\$374,500
	Contingencies (25%±)				93,500
	Subtotal				\$468,000
30	Engineering and design (12%±)				56,000
31	Supervision and administration (10%±)				47,000
	TOTAL, RELOCATIONS FOR AMERICAN STANDARD FLOODWALL				\$571,000
	TOTAL, AMERICAN STANDARD FLOODWALL				\$2,698,000

C. Pontchartrain Beach Floodwall

CONSTRUCTION

11	Levees and floodwalls				
	PZ-27 Steel sheet piling	16,936	s.f.	13.00	220,168
	PZ-22 Steel sheet piling	56,714	s.f.	12.00	680,568
	PSA-23 Steel sheet piling	345	s.f.	14.50	5,003
	12" x 12" Prestressed conc. piling	1,200	l.f.	20.00	24,000
	12" Ø Timber piles	840	l.f.	10.00	8,400
	Concrete in stabilization slab	20	c.y.	100.00	2,000

TABLE 5 (cont'd)

Cost Acct. No.	Item	Estimated Quantity	Unit	Unit Price \$	Estimated Amount \$
	Concrete in T-wall base	110	c.y.	250.00	27,500
	Concrete in walls and columns	2,740	c.y.	350.00	959,000
	Structural steel	30,250	lbs.	2.50	75,625
	Gate seals	105	l.f.	30.00	3,150
	Waterstops, L-type	20	l.f.	30.00	600
	Waterstops, 3-Bulb type	1,170	l.f.	10.00	11,700
	Architectural finish	32,875	s.f.	3.25	106,844
	Waterproof finish	32,875	s.f.	1.00	32,875
	Levee fill, semi-compacted	240	c.y.	4.50	1,080
	Structural excavation	1,960	c.y.	7.00	13,720
	Structural backfill	1,260	c.y.	10.00	12,600
	Expansion joint filler	2,710	s.f.	1.75	4,743
	Miscellaneous metal	1	job	L.S.	45,500
	Subtotal				\$2,235,076
	Contingencies (25%±)				558,924
	Subtotal				\$2,794,000
30	Engineering and design (12%±)				335,000
31	Supervision and administration (10%±)				279,000
	TOTAL, CONSTRUCTION FOR PONTCHARTRAIN BEACH FLOODWALL				\$3,408,000
LANDS AND DAMAGES					
01	Lands & Damages				
	Floodwall R/W				
	Lake Front Property	1.98	Acres	260,000	514,800
	Temporary Construction				
	Lake Front Property	4.25	Acres	260,000x.20	221,000
	Improvements				0
	Severance Damage				0
	Total (rounded)				736,000
	Contingencies, 25% (rounded)				184,000

TABLE 5 (cont'd)

Cost Acct. No.	Item	Estimated Quantity	Unit	Unit Price \$	Estimated Amount \$
Acquisition Costs (Estimated 1 tract)					
Non-Federal	1@\$1,400 per tract (rounded)				1,000
Federal					1,000
PL 91-646					<u>0</u>
TOTAL, LANDS AND DAMAGES FOR PONTCHARTRAIN BEACH FLOODWALL					922,000
RELOCATIONS					
02 Relocations					
	Ramp No. 3 at east end of Pontchartrain Beach	1	job	L.S.	290,600
	Ramp No. 4 at west end of Pontchartrain Beach	1	job	L.S.	221,800
	Underground electric cable thru sheet piling	2	Ea.	1,500.00	3,000
	12" Ø Water line thru I-wall	1	Ea.	2,500.00	2,500
	21" Ø Drainage line thru I-wall	1	Ea.	3,200.00	3,200
	6" Ø Water line through I-wall	1	Ea.	2,000.00	2,000
	18" Ø Drainage line thru I-wall	1	Ea.	3,000.00	3,000
	10" Ø Sewer line thru I-wall	1	Ea.	2,200.00	2,200
	3" Ø Gas line thru I-wall	1	Ea.	2,000.00	2,000
	Underground electric cable thru I-wall	2	Ea.	2,500.00	5,000
	6" Ø Water line thru I-wall	1	Ea.	2,000.00	2,000
	6" Ø Water line thru steel sheet piling	1	Ea.	2,000.00	2,000
	24" Knife gate valve and structure	1	Ea.	6,600.00	6,600
	18" Knife gate valve and structure	1	Ea.	4,900.00	4,900
	10" Knife gate valve and structure	1	Ea.	3,500.00	3,500
	Relocate drainage collector line	3,400	l.f.	40.00	<u>136,000</u>
	Subtotal				\$690,300
	Contingencies (25%±)				<u>173,700</u>
	Subtotal				<u>864,000</u>

TABLE 5 (cont'd)

Cost Acct. No.	Item	Estimated Quantity	Unit	Unit Price \$	Estimated Amount \$
30	Engineering and design (12%±)				104,000
31	Supervision and administration (10%±)				<u>86,000</u>
	TOTAL, RELOCATIONS FOR PONTCHARTRAIN BEACH FLOODWALL				\$1,054,000
	TOTAL, PONTCHARTRAIN BEACH FLOODWALL				\$5,384,000

D. West End Floodwall

CONSTRUCTION

11	Levees and floodwalls				
	PZ-22 Steel sheet piling	1,615	s.f.	12.00	19,380
	PZ-27 Steel sheet piling	5,520	s.f.	13.00	71,760
	PZ-38 Steel sheet piling	2,950	s.f.	16.00	47,200
	PZ-40 Steel sheet piling	5,415	s.f.	17.00	92,055
	PSA-23 Steel sheet piling	141	s.f.	14.50	2,045
	HP 12 x 53 Steel piles	6,320	l.f.	24.00	151,680
	12" x 12" Prestressed concrete piles	1,820	l.f.	20.00	36,400
	12" Ø Timber piles	760	l.f.	10.00	7,600
	Structural excavation	960	c.y.	7.00	6,720
	Structural backfill	351	c.y.	10.00	3,510
	Degrade existing levee	1,100	c.y.	1.50	1,650
	Levee fill, semi-compacted	640	c.y.	4.50	2,880
	Riprap	270	tons	18.00	4,860
	Shell	164	c.y.	15.00	2,460
	Concrete in stabilization slab	64	c.y.	100.00	6,400
	Concrete in T-wall base	460	c.y.	250.00	115,000
	Concrete in walls and columns	785	c.y.	350.00	274,750
	Structural steel	54,600	lbs.	2.50	136,500
	Miscellaneous metal	1	job	L.S.	57,768
	Waterstops, L-type	83	l.f.	30.00	2,490
	Waterstops, 3-Bulb type	434	l.f.	10.00	4,340
	Gate seals	74	l.f.	30.00	2,220
	Expansion joint filler	995	s.f.	1.75	1,741
	Architectural Finish	8,315	s.f.	3.25	27,024
	Waterproof finish	8,315	s.f.	1.00	8,315
	Selective demolition	1	job	L.S.	31,150
	Relocate concrete curb	200	l.f.	2.50	<u>500</u>
	Subtotal				\$1,118,398

TABLE 5 (cont'd)

Cost Acct. No.	Item	Estimated Quantity	Unit	Unit Price \$	Estimated Amount \$
Vertical Lift Roller Gate Structure					
	Concrete in Walls	38	c.y.	300.00	11,400
	Concrete in roof	60	c.y.	350.00	21,000
	Structural steel	8,780	lbs.	2.50	21,950
	Lifting gate apparatus	1	Ea.	1,500.00	1,500
	Electric motor	1	Ea.	7,500.00	7,500
	Miscellaneous metal	1	Job	L.S.	1,760
	Neoprene seal pad	27	l.f.	10.00	270
	Gate seals	35	l.f.	30.00	1,050
	Remove existing concrete culvert	1	job	L.S.	<u>3,000</u>
	Subtotal				\$69,430
	Subtotal, Levees and Floodwalls				\$1,187,828
	Contingencies (25%±)				<u>297,172</u>
	Subtotal				\$1,485,000
30	Engineering and design (12%±)				178,000
31	Supervision and administration (10%±)				<u>148,000</u>
	TOTAL, CONSTRUCTION FOR WEST END FLOODWALL				\$1,811,000
LANDS AND DAMAGES					
01	Lands & Damages				
	Floodwall R/W				
	Lake Front Property	0.82	Acres	260,000	213,200
	Temporary Construction				
	Lake Front Property	0.55	Acres	260,000x.20	28,600
	Improvements				0
	Severance Damage				<u>0</u>
	Total (rounded)				242,000
	Contingencies, 25% (rounded)				60,000

TABLE 5 (cont'd)

Cost Acct. No.	Item	Estimated Quantity	Unit	Unit Price \$	Estimated Amount \$
Acquisition Costs (Estimated 1 tract)					
	Non-Federal	1@\$1,400 per tract (rounded)			1,000
	Federal				1,000
	PL 91-646				<u>0</u>
	TOTAL, LANDS AND DAMAGES FOR WEST END FLOODWALL				304,000
RELOCATIONS					
02	Relocations				
	6" Ø Water line thru T-wall	1	Ea.	2,000.00	2,000
	3" Ø H.P. gas line thru T-wall	1	Ea.	4,000.00	4,000
	8" Ø Sewer line thru T-wall	1	Ea.	2,400.00	2,400
	Electrical conduit thru T-wall	1	Ea.	2,000.00	2,000
	Underground telephone cables thru I-wall	2	Ea.	1,500.00	3,000
	6" Ø sewer line thru T-wall	1	Ea.	2,200.00	2,200
	4" Ø water line thru T-wall	1	Ea.	1,800.00	1,800
	3" Ø gas line thru T-wall	1	Ea.	2,000.00	2,000
	Underground electrical cables thru T-wall	3	Ea.	1,500.00	4,500
	Underground telephone cable thru T-wall	1	Ea.	1,500.00	1,500
	6" Knife gate valve and structure	1	Ea.	2,500.00	2,500
	8" Knife gate valve and structure	1	Ea.	2,700.00	2,700
	Temporary relocation of underground electrical cable	300	l.f.	6.00	<u>1,800</u>
	Subtotal				\$32,400
	Contingencies (25%±)				<u>7,600</u>
	Subtotal				\$40,000
30	Engineering and design (12%±)				5,000
31	Supervision and administration (10%±)				<u>4,000</u>
	TOTAL, RELOCATIONS FOR WEST END FLOODWALL				\$49,000
	TOTAL, WEST END FLOODWALL				\$2,164,000

TABLE 5 (cont'd)

Cost Acct. No.	Item	Estimated Quantity	Unit	Unit Price \$	Estimated Amount \$
E. Miscellaneous Gates (Leroy Johnson Dr. at Naval Reserve Center, Shelter House No. 3 near the west bank of Bayou St. John, Marconi Dr., and Topaz St.)					
CONSTRUCTION					
11	Levees and floodwalls				
	PZ-22 Steel sheet piling	6,154	s.f.	12.00	73,848
	PZ-27 Steel sheet piling	7,615	s.f.	13.00	98,995
	PZ-38 Steel sheet piling	2,791	s.f.	16.00	44,656
	PSA-23 Steel sheet piling	350	s.f.	14.50	5,075
	12" x 12" Prestressed concrete piling	4,190	l.f.	20.00	83,800
	Concrete in stabilization slab	26	c.y.	100.00	2,600
	Concrete in T-wall base	203	c.y.	250.00	50,750
	Concrete in walls and columns	257	c.y.	350.00	89,950
	Structural steel	49,700	lbs.	2.50	124,250
	Miscellaneous metal	1	job	L.S.	37,063
	Gate seals	236	l.f.	30.00	7,080
	Waterstops, L-type	89	l.f.	30.00	2,670
	Waterstops, 3-Bulb type	41	l.f.	10.00	410
	Expansion joint filler	185	s.f.	1.75	324
	Miter block seal	41	l.f.	30.00	1,230
	Structural excavation	506	c.y.	7.00	3,542
	Structural backfill	238	c.y.	10.00	2,380
	Waterproof finish	3,763	s.f.	1.00	3,763
	Levee degrading	641	c.y.	1.50	962
	Levee fill, semi-compacted	184	c.y.	4.50	828
	Relocate concrete curb	490	l.f.	2.50	1,225
	Subtotal				\$635,401
	Contingencies (25%±)				156,599
	Subtotal				\$792,000
30	Engineering and design (12%±)				97,000
31	Supervision and administration (10%±)				80,000
	TOTAL, CONSTRUCTION FOR MISCELLANEOUS GATES				\$969,000

TABLE 5 (cont'd)

Cost Acct. No.	Item	Estimated Quantity	Unit	Unit Price \$	Estimated Amount \$
LANDS AND DAMAGES					
01	Lands & Damages				
	Floodwall R/W Lake Front Property	0.93	Acres	260,000	241,800
	Temporary Construction Lake Front Property (2 years)	0.62	Acres	260,000x.20	32,240
	Improvements				0
	Severance Damage				<u>0</u>
	Total (rounded)				274,000
	Contingencies, 25% (rounded)				69,000
	Acquisition Costs (Estimated 1 tract)				
	Non-Federal	1@\$1,400 per tract (rounded)			1,000
	Federal				1,000
	PL 91-646				<u>0</u>
	TOTAL, LANDS AND DAMAGES FOR MISCELLANEOUS GATES				345,000
RELOCATIONS					
02	Relocations				
	18" \emptyset Drainage line thru T-wall (Gate 4)	1	Ea.	4,000.00	4,000
	6" \emptyset Water line thru I-wall (Gate 10)	1	Ea.	2,000.00	<u>2,000</u>
	Subtotal				\$6,000
	Contingencies (25%±)				<u>1,000</u>
	Subtotal				\$7,000

TABLE 5 (cont'd)

Cost Acct. No.	Item	Estimated Quantity	Unit	Unit Price \$	Estimated Amount \$
30	Engineering and design (12%±)				1,000
31	Supervision and administration (10%±)				<u>1,000</u>
	TOTAL, RELOCATIONS FOR MISCELLANEOUS GATES				\$9,000
	TOTAL, MISCELLANEOUS GATES				\$1,323,000
	TOTAL, FLOODWALL REACHES				\$13,266,000
II. <u>Levee Enlargement</u>					
A. Reach A (IHNC to London Ave. outfall canal)					
CONSTRUCTION					
11	Levees and floodwalls				
	Clearing and grubbing	1	job	L.S.	20,000
	Barge unloading facility	1	job	L.S.	2,000
	Semiconpacted clay embankment	64,000	c.y.	12.00	768,000
	Fertilizing and seeding	29	acres	1,000.00	29,000
	Mobilization and demobilization	1	job	L.S.	40,000
	6 mil plastic lining	262,000	s.f.	0.60	<u>157,200</u>
	Subtotal				\$1,016,200
	Contingencies (25%±)				<u>253,800</u>
	Subtotal				\$1,270,000
30	Engineering and design (10%±)				127,000
31	Supervision and administration (10%±)				<u>127,000</u>
	TOTAL, CONSTRUCTION FOR LEVEE REACH A				\$1,524,000
LANDS AND DAMAGES					
01	Lands & Damages				
	Ramp R/W				
	Lake Front Property	0.53	Acres	260,000	137,800
	Temporary Construction				
	Lake Front Property (2 years)	0.64	Acres	260,000x.20	33,280

TABLE 5 (cont'd)

Cost Acct. No.	Item	Estimated Quantity	Unit	Unit Price \$	Estimated Amount \$
	Improvements				0
	Severance Damage				<u>0</u>
	Total (rounded)				171,000
	Contingencies, 25% (rounded)				43,000
	Acquisition Costs (Estimated 1 tract)				
	Non-Federal	1	@\$1,400 per tract (rounded)		1,000
	Federal				1,000
	PL 91-646				<u>0</u>
	TOTAL, LANDS AND DAMAGES FOR LEVEE REACH A				216,000
RELOCATIONS					
02	Relocations				
	Ramp No. 1 at Leroy Johnson Dr.	1	job	L.S.	208,000
	Relocate 18" \emptyset Drainage line	130	l.f.	23.00	2,990
	Relocate 6" \emptyset Water line	130	l.f.	10.00	1,300
	Relocate telephone cable	130	l.f.	7.00	910
	Relocate 8" \emptyset H.P. gas line	160	l.f.	186.00	29,760
	Relocate 2" \emptyset H.P. gas line	160	l.f.	133.00	21,280
	Relocate 4" \emptyset H.P. gas line	160	l.f.	172.00	27,520
	Relocate 6" \emptyset Water line	160	l.f.	10.00	1,600
	Relocate 6" \emptyset H.P. gas line	480	l.f.	76.00	36,480
	Relocate 6" \emptyset Water line	480	l.f.	10.00	<u>4,800</u>
	Subtotal				\$334,640
	Contingencies (25% \pm)				<u>83,360</u>
	Subtotal				\$418,000
30	Engineering and design (10% \pm)				42,000
31	Supervision and administration (10% \pm)				<u>42,000</u>
	TOTAL, RELOCATIONS FOR LEVEE REACH A				\$502,000
	TOTAL, LEVEE REACH A				\$2,242,000
	B. Reach B (London Ave. outfall canal to West End Blvd.)				

TABLE 5 (cont'd)

Cost Acct. No.	Item	Estimated Quantity	Unit	Unit Price \$	Estimated Amount \$
CONSTRUCTION					
11	Levees and floodwalls				
	Clearing and grubbing	1	job	L.S.	20,000
	Barge unloading facility	1	job	L.S.	2,000
	Semi-compacted clay embankment	144,000	c.y.	12.25	1,764,000
	Fertilizing and seeding	29	acres	1,000.00	29,000
	Mobilization and demobilization	1	job	L.S.	40,000
	6 mil plastic lining	11,000	s.f.	0.60	6,600
	Subtotal				\$1,861,600
	Contingencies (25%)				458,400
	Subtotal				\$2,320,000
30	Engineering and design (10%±)				232,000
31	Supervision and administration (10%±)				232,000
	TOTAL, CONSTRUCTION FOR LEVEE REACH B				\$2,784,000
LANDS AND DAMAGES					
01	Lands & Damages				
	Ramp R/W				
	Lake Front Property	3.69	Acres	260,000	959,400
	Temporary Construction				
	Lake Front Property (2 years)	2.35	Acres	260,000x.20	122,200
	Improvements				0
	Severance Damage				0
	Total (rounded)				1,082,000
	Contingencies, 25% (rounded)				270,000
	Acquisition Costs (Estimated 1 tract)				
	Non-Federal	1	@\$1,400 per tract (rounded)		1,000
	Federal				1,000

TABLE 5 (cont'd)

Cost Acct. No.	Item	Estimated Quantity	Unit	Unit Price \$	Estimated Amount \$
	PL 91-646				0
	TOTAL, LANDS AND DAMAGES FOR LEVEE REACH B				1,354,000
RELOCATIONS					
02 Relocations					
	Ramp No. 5 (West of London Ave. Canal)	1	job	L.S.	131,800
	Ramp No. 6 (Lakeshore Dr. at Rail St.)	1	job	L.S.	146,700
	Ramp No. 7 (Canal Blvd)				
	Phase 1	1	job	L.S.	277,000
	Phase 2	1	job	L.S.	121,600
	Relocate 6" Ø H.P. gas line	120	l.f.	232.00	27,840
	Relocate 120/240 Volt power line	120	l.f.	12.00	1,440
	Relocate 6" Ø Water line	120	l.f.	10.00	1,200
	Relocate 6" Ø Water line	480	l.f.	10.00	4,800
	Relocate 120/240 Volt power line	120	l.f.	12.00	1,440
	Relocate 8" Ø Sewer line	100	l.f.	10.00	1,000
	Relocate 6" Ø Water line	100	l.f.	10.00	1,000
	Relocate telephone cable	100	l.f.	7.00	700
	Relocate 120/240 Volt power line	100	l.f.	12.00	1,200
	Relocate telephone cable	100	l.f.	7.00	700
	Relocate 8" Ø sewer line	100	l.f.	10.00	1,000
	Relocate 120/240 Volt power line	100	l.f.	12.00	1,200
	Relocate 6" Ø H.P. gas line	100	l.f.	274.00	27,400
	Relocate telephone cable	100	l.f.	7.00	700
	Relocate 6" Ø Water line	100	l.f.	10.00	1,000
	Relocate telephone cable	100	l.f.	7.00	700
	Relocate 6" Ø Water line	100	l.f.	10.00	1,000
	Relocate 6" Ø Water line	140	l.f.	10.00	1,400
	Relocate 8" Ø Sewer line	150	l.f.	10.00	1,500
	Relocate 6" Ø Water line	150	l.f.	10.00	1,500
	Relocate 8" Ø Sewer line	150	l.f.	10.00	1,500
	Relocate 2" Ø Gas line	140	l.f.	8.00	1,120
	Relocate 15" Ø Drainage line	120	l.f.	19.00	2,280
	Relocate 8" Ø Sewer line	120	l.f.	10.00	1,200
	Relocate 6" Ø Water line	120	l.f.	10.00	1,200
	Relocate telephone cable	120	l.f.	7.00	840
	Subtotal				\$763,960
	Contingencies (25%±)				191,040
	Subtotal				\$955,000

TABLE 5 (cont'd)

Cost Acct. No.	Item	Estimated Quantity	Unit	Unit Price \$	Estimated Amount \$
30	Engineering and design (10%±)				95,000
31	Supervision and administration (10%±)				<u>95,000</u>
	TOTAL, RELOCATIONS FOR LEVEE REACH B				\$1,145,000
	TOTAL, LEVEE REACH B				\$5,283,000
LANDS & DAMAGES					
01	Lands & Damages <u>Reaches A&B</u>				
	Perpetual Levee R/W				
	Lake Front Property	43.85	Acres	260,000	11,401,000
	Existing R/W (Prior to 1965)	20.95	Acres	0	0
	Improvements				0
	Severance Damage				<u>0</u>
	Total (rounded)				11,401,000
	Contingencies, 25% (rounded)				2,850,000
	Acquisition Costs (Estimated 2 tracts)				
	Non-Federal	2@\$1,400 per tract (rounded)			3,000
	Federal				1,000
	PL 91-646				<u>0</u>
	TOTAL, LANDS AND DAMAGES (PERPETUAL R/W) REACHES A&B				\$14,255,000
	TOTAL, LEVEE REACHES A&B				\$21,780,000
	FLOODWALL REACHES				\$13,266,000
	LEVEE REACHES				<u>\$21,780,000</u>
	TOTAL PROJECT COST				\$35,046,000

62. Comparison of Estimates. The current estimate of \$35,046,000 for the high level plan New Orleans Lakefront Levee West of IHNC represents a decrease of \$67,854,000 when compared to the cost contained in the current PB-3 effective 1 October 1984. The PB-3 estimate is based on survey scope estimates contained in the "Lake Pontchartrain, Louisiana and Vicinity Hurricane Protection Project, Reevaluation Study", dated July 1984. Estimates contained in the reevaluation report were published at October 1983 levels. These estimates were indexed to October 1984 levels for the current PB-3. The decrease in cost shown in Table 6 is explained in the following subparagraphs:

Table 6
COMPARISON OF ESTIMATES
(Remaining Costs)
High Level Reevaluation Study
New Orleans, La.

	Feature	PB-3 (eff Oct 84)	GDM (Oct 84 Prices)	Difference GDM and PB-3
11	LEVEES & FLOODWALLS	\$ 49,700,000	\$10,947,000	-\$38,753,000
30	ENGINEERING & DESIGN	5,700,000	1,563,000	- 4,137,000
31	SUPERVISION & ADMINISTRATION	5,000,000	1,384,000	- 3,616,000
	SUBTOTAL	60,400,000	13,894,000	- 46,506,000
01	LANDS & DAMAGES	36,600,000	18,257,000	- 18,343,000
02	RELOCATIONS	5,900,000	2,895,000	- 3,005,000
	SUBTOTAL	42,500,000	21,152,000	- 21,348,000
	TOTAL PROJECT COST	\$102,900,000	35,046,000	- 67,854,000

a. Levee and Floodwall. The net decrease in the levee and floodwall account of \$38,753,000 is due to several factors. As stated above, the PB-3 estimate is based on a survey scope estimate contained in the "Lake Pontchartrain, Louisiana and Vicinity Hurricane Protection Project, Reevaluation Study". This report recommends an I-wall in the levee coupled with a barge berm alternative as the "tentatively selected" plan. The designs contained in the reevaluation report were based on physical conditions that existed as of March 1979. It was further assumed that any on-going construction contracts at that time would be considered in place and that design of subsequent levee lift or floodwall construction would reflect these "existing conditions". The estimate contained in this GDM reflects the cost to complete the specific levee and floodwall items addressed in this GDM. Physical conditions are those

conditions that exist as of November 1984. The construction work accomplished by Orleans Levee District since March 1979 is discussed in paragraph 60. This construction raised the level of protection from approximate elevation 10.5 NGVD to its present elevation of 16.0+ NGVD. The plans presented in the Reevaluation Study were based on a limited number of soil borings. Testing of numerous new soils data collected for preparation of this GDM indicated soil strengths that are considerably better than those used in the reevaluation report designs. This factor, along with interim construction work by Orleans Levee District, caused the reduction in estimated cost.

b. Engineering and Design. The decrease of \$4,137,000 results from recomputing the E&D cost based on an analysis of actual work required rather than by using a fixed percentage of construction cost.

c. Supervision and Administration. A decrease of \$3,616,000 is based on an analysis of actual work required. The substantial decrease in construction cost detailed in paragraph a. above directly relates to the reduced S&A cost for this work.

d. Lands and Damages. The decrease of \$18,343,000 occurs as the result of a reduced need for rights-of-way to construct the plan recommended herein. The previous estimate contained in the Reevaluation Study was based on survey scope design data. The Lands and Damages account is influenced by a refinement of these designs (this is similar in nature to the Levee and Floodwall account discussed in paragraph 62.a.).

e. Relocations. The net decrease of \$3,005,000 in estimating relocations cost is based on reduced construction requirements which are directly related to the width of the proposed levee section and to more detailed information from field surveys obtained during the preparation of the GDM.

63. Schedule for Design and Construction. The sequence of contracts and schedules are as follows:

Table 7
SCHEDULE FOR DESIGN AND CONSTRUCTION

Contracts	Plans & Specs		Construction			Estimated Construction Cost ^{2/} (\$)
	Start	Complete	Adver.	Award	Complete	
N.O. Lakefront Levee (London Ave. Canal to West End)	Aug 84	Nov 84	Feb 85	Mar 85	Aug 86	2,528,800
N.O. Lakefront Floodwall (American Standard)	Jun 84	Nov 84	Feb 85	Mar 85	Jan 86	1,533,900
N.O. Lakefront Floodwalls & Gates (Marconi, Topaz, etc.)	Sep 84	N/A	Apr 85	May 85	Oct 85	864,000
N.O. Lakefront Floodwall (West End)	May 86	Sep 86	Dec 86	Jan 87	Nov 87	1,618,200
N.O. Lakefront Levee (Seabrook to London Ave. Canal)	Jul 86	Nov 86	Feb 87	Mar 87	Mar 88	1,384,300
N.O. Lakefront Floodwall (Pontchartrain Beach) ^{1/}	Jun 84	Dec 84	Dec 84	Mar 86	Mar 88	3,045,100
N.O. Lakefront Floodwall (Seabrook) ^{1/}	Jun 84	Feb 85	Feb 85	Aug 86	Jun 87	958,200

^{1/} Design and Construction to be accomplished by Orleans Levee Board. Work will be coordinated and reviewed by the New Orleans District.

^{2/} This cost includes contingencies, Federal and Non-Federal construction costs, and Federal and Non-Federal supervision and inspection (S & I) costs (S & I costs constitute 90% of the supervision and administration costs).

64. Funds Required by Fiscal Year. To maintain the schedule for design and construction of the New Orleans Lakefront Levee - west of IHNC, Federal funds will be required by fiscal years as follows:

TABLE 8
FEDERAL FUNDING BY FISCAL YEAR

Funds Required FY 85	\$2,170,000
Funds Required FY 86	3,510,000
Funds Required FY 87	2,385,000
Funds Required FY 88	740,000
TOTAL	\$8,805,000

OPERATION AND MAINTENANCE

65. General. The New Orleans Lakefront levee will be maintained and operated at the expense of local interests as a feature of local cooperation for the project. The estimate of the annual operation and maintenance costs for the levee and foreshore protection features which are detailed in this GDM are as follows:

a. Levee Maintenance (69 acres)	\$19,000 per year
b. Twelve (12) steel gates	10,000 per year
c. Floodwall maintenance (1.25 miles)	8,000 per year
d. Drainage structure	700 per year
Total	\$37,700 per year

ECONOMICS

66. Economic Justification. The current economic analysis for the entire Lake Pontchartrain, Louisiana and Vicinity Hurricane Protection Project is contained in the Reevaluation Study entitled "Lake Pontchartrain, Louisiana and Vicinity Hurricane Protection Project", dated December 1983. Based on October 1983 price levels and at the project interest rate of 3 1/8 percent, the benefit-cost ratio for the project as a whole is 4.2 to 1. The Reevaluation Study also breaks out separable project areas (SPA) for incremental justification. The New Orleans Lakefront reach is a part of the New Orleans-Jefferson SPA. The computed benefit-cost ratio for the New Orleans-Jefferson area is 5.0 to 1.

FEDERAL AND NON-FEDERAL COST BREAKDOWN

67. Federal and Non-Federal Cost Breakdown. The breakdown of Federal and non-Federal costs for the high level plan construction work described in this GDM are shown in Table 9 below:

Table 9
 FEDERAL AND NON-FEDERAL COST BREAKDOWN
 OCT 1984 PRICE LEVELS

<u>Item</u>	<u>Federal</u>	<u>Non-Federal</u>	<u>Total</u>
Levees & Floodwalls	8,805,000	4,480,000 ^{2/}	13,285,000
Lands & Damages	---	18,257,000	18,257,000
Relocations	---	3,504,000	3,504,000
TOTAL	8,805,000	26,241,000 ^{1/}	35,046,000

WATER CONSERVATION MEASURES

68. General. The use of water conservation measures in the construction and operation of work covered by the GDM were investigated during the preparation of this report. Because of the nature of the construction activity planned for the New Orleans Lakefront reach, it was concluded that the required construction does not afford the opportunity to use these measures. Furthermore, land use activities for the lands protected by this levee reach are not expected to change materially over the project life. The area in question is a highly developed urbanized area containing industrial, commercial, and residential development. Usage of potable water is not expected to increase as a result of project construction.

RECOMMENDATIONS

69. Recommendations. The plan of improvement for the high level plan presented herein consists of 4.36 miles of levee enlargement and 1.25 miles of floodwall construction along the New Orleans lakefront from IHNC to the Metairie Relief Canal. This plan includes suitable provisions for necessary relocations. This plan is considered to be the most economical means of providing high level plan, SPH - project protection and is recommended for approval as a basis for preparing plans and specifications for this project reach.

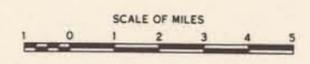
1/ Note that the Non-Federal share for the New Orleans Lakefront Project reach exceeds the 30% local interest requirement. Credit for monies in excess of the 30% share will be applied to other project reaches so that the overall 70-30 cost sharing formula will be maintained.

2/ Total construction cost for Seabrook Floodwall and Pontchartrain Beach Floodwall.



LEGEND

- EXISTING IMPROVEMENTS**
- LEVEE
 - SEAWALL
- AUTHORIZED IMPROVEMENTS**
- NEW LEVEE
 - ENLARGEMENT OF EXISTING LEVEE
 - FLOODWALL IN EXISTING LEVEE
 - SEAWALL STRENGTHENING
 - DRAINAGE STRUCTURE
 - STRUCTURE-NAVIGABLE
 - PUMPING STATION
 - PROJECT GRADES
 - LEVEE STATION
 - PARISH LINE
 - STATE LINE
 - LOCATION OF WORK COVERED IN THIS DOCUMENT

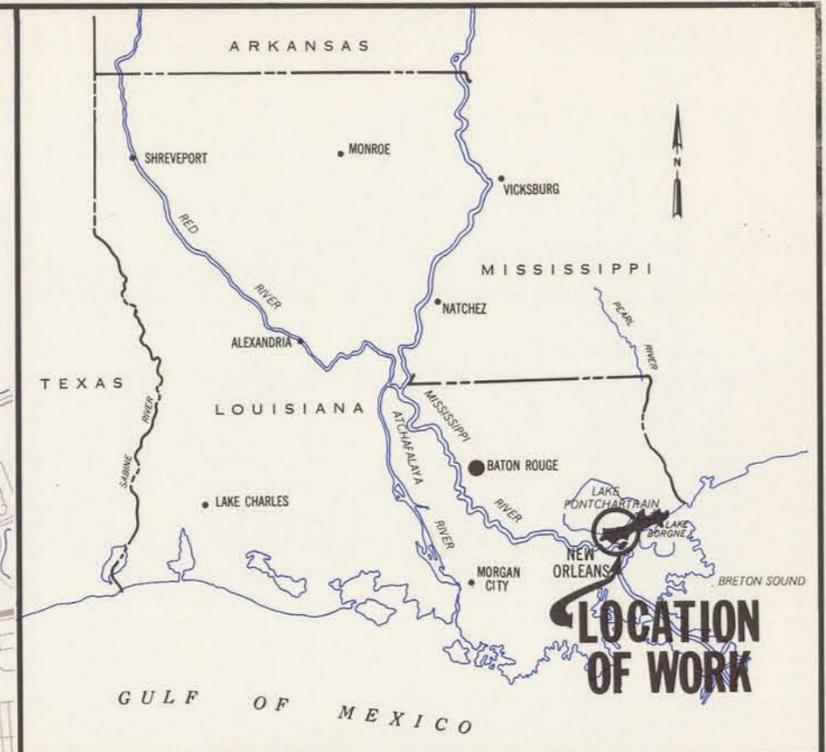


LAKE PONTCHARTRAIN, LA. AND VICINITY
HURRICANE PROTECTION

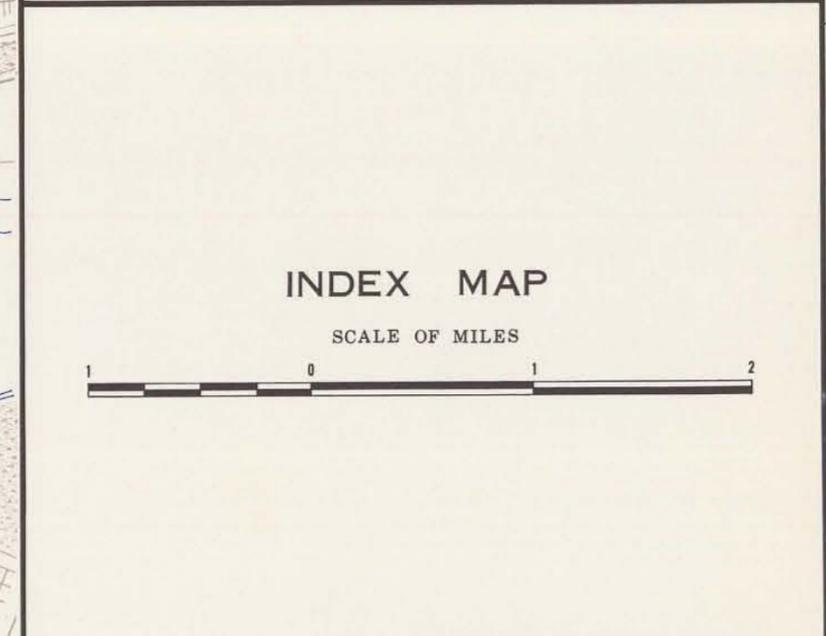
**AUTHORIZED
PLAN OF PROTECTION**

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

FILE NO. H-4-29540



VICINITY MAP
SCALE OF MILES
0 20 40 60



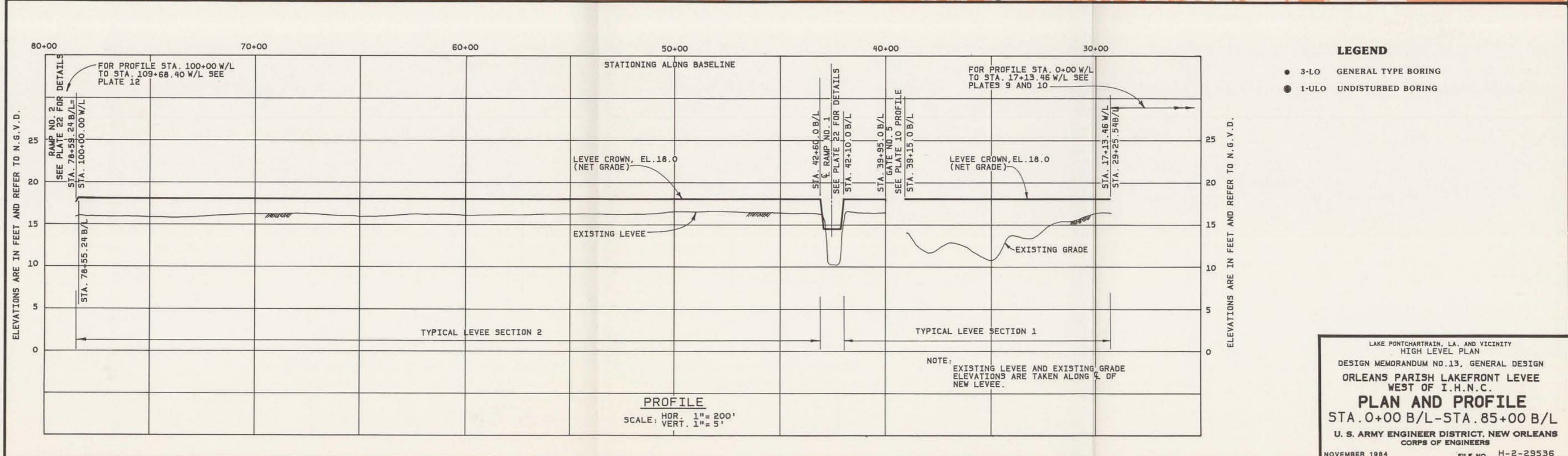
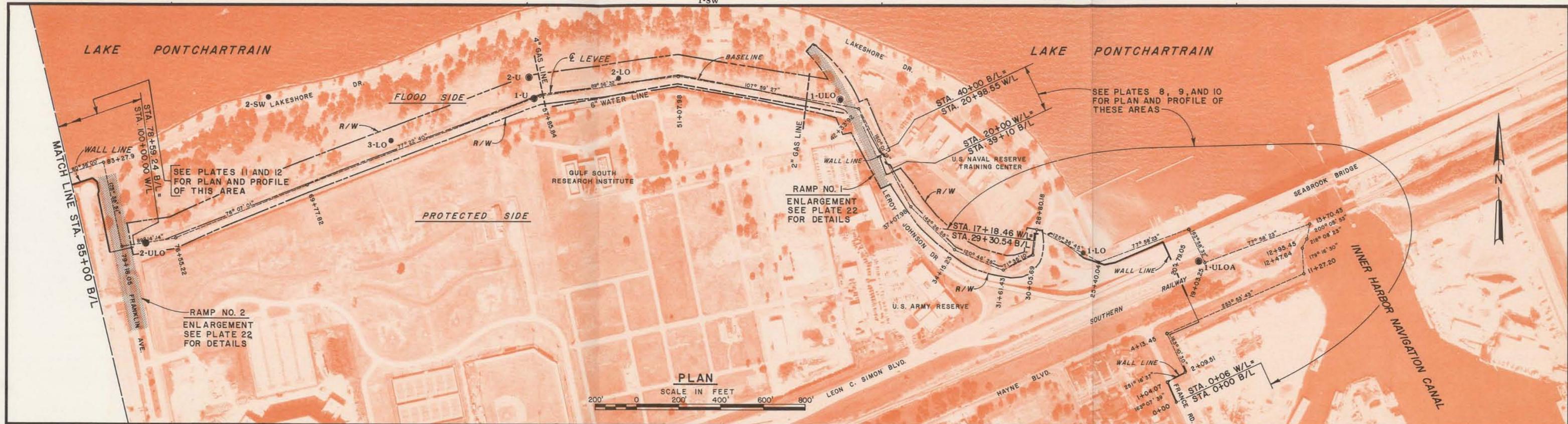
INDEX MAP
SCALE OF MILES
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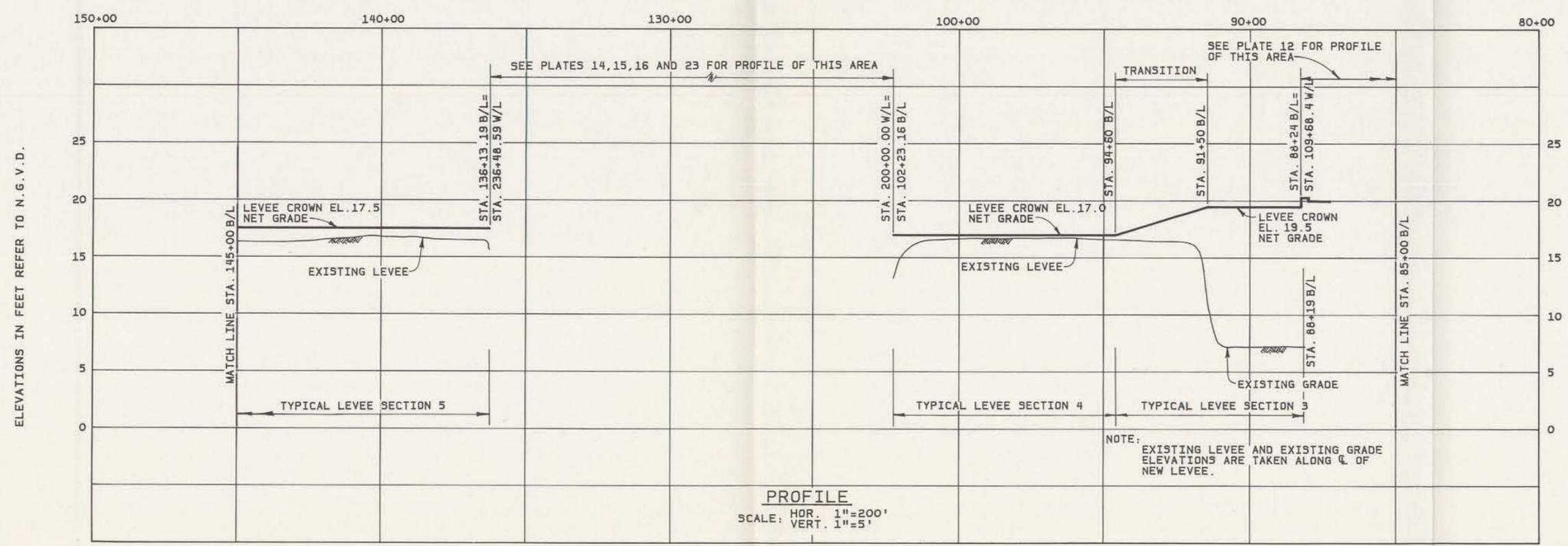
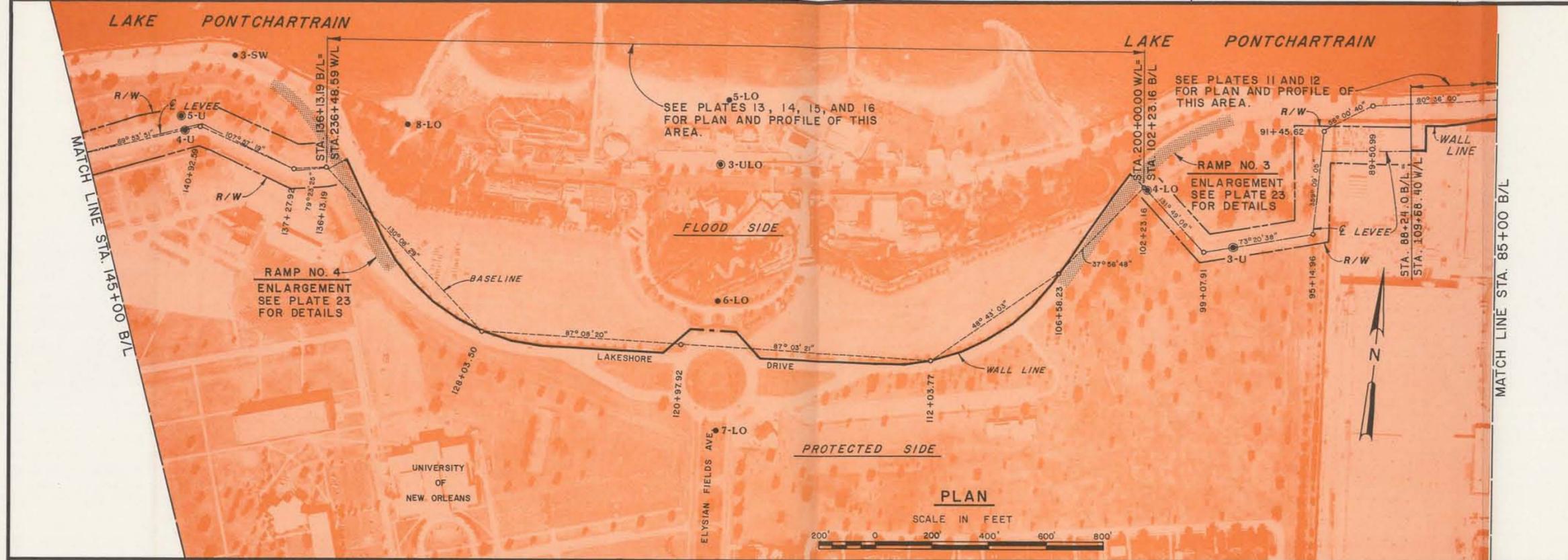
LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 13, GENERAL DESIGN
ORLEANS PARISH LAKEFRONT LEVEE
WEST OF I. H. N. C.

INDEX AND VICINITY MAP

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

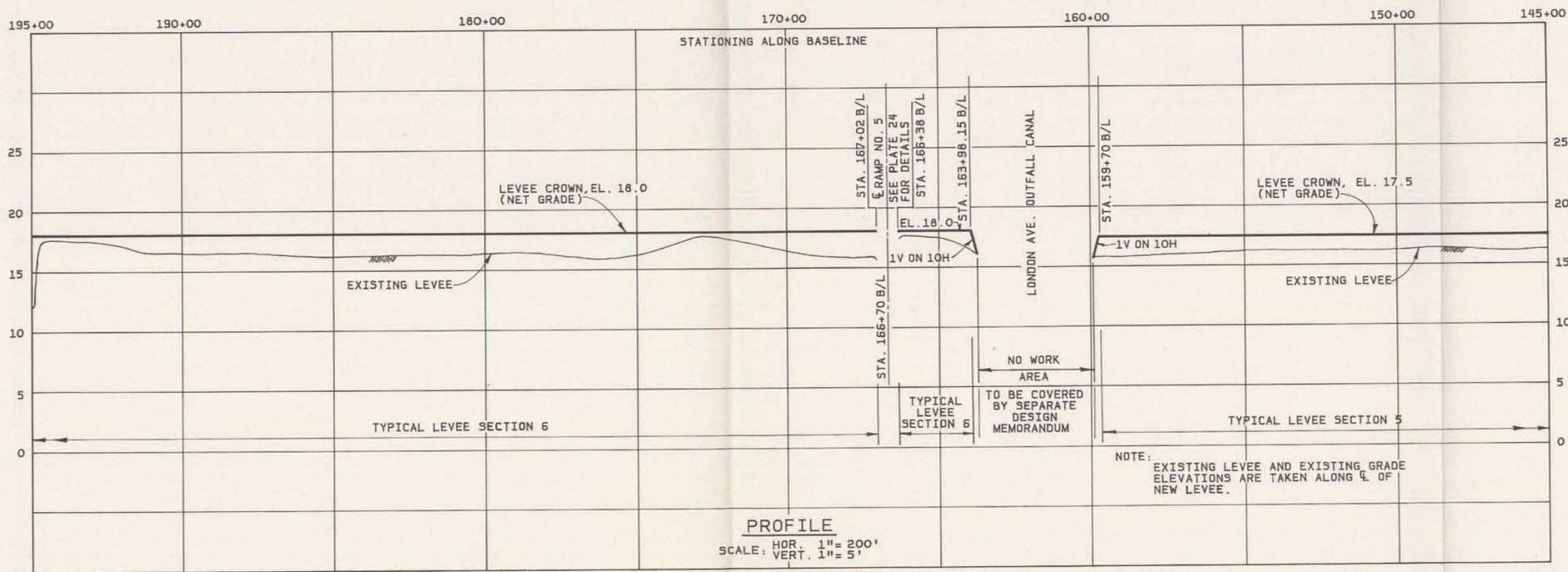
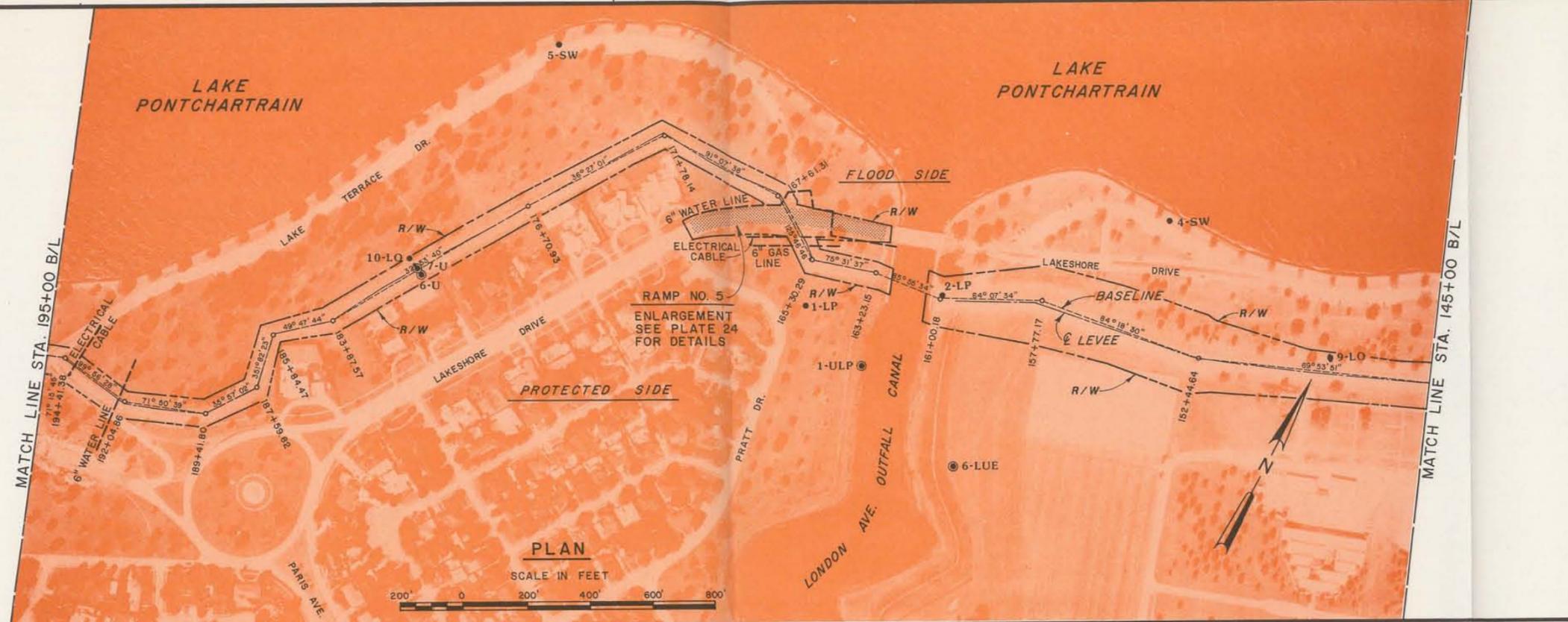
NOVEMBER 1984 FILE NO. H-2-29536





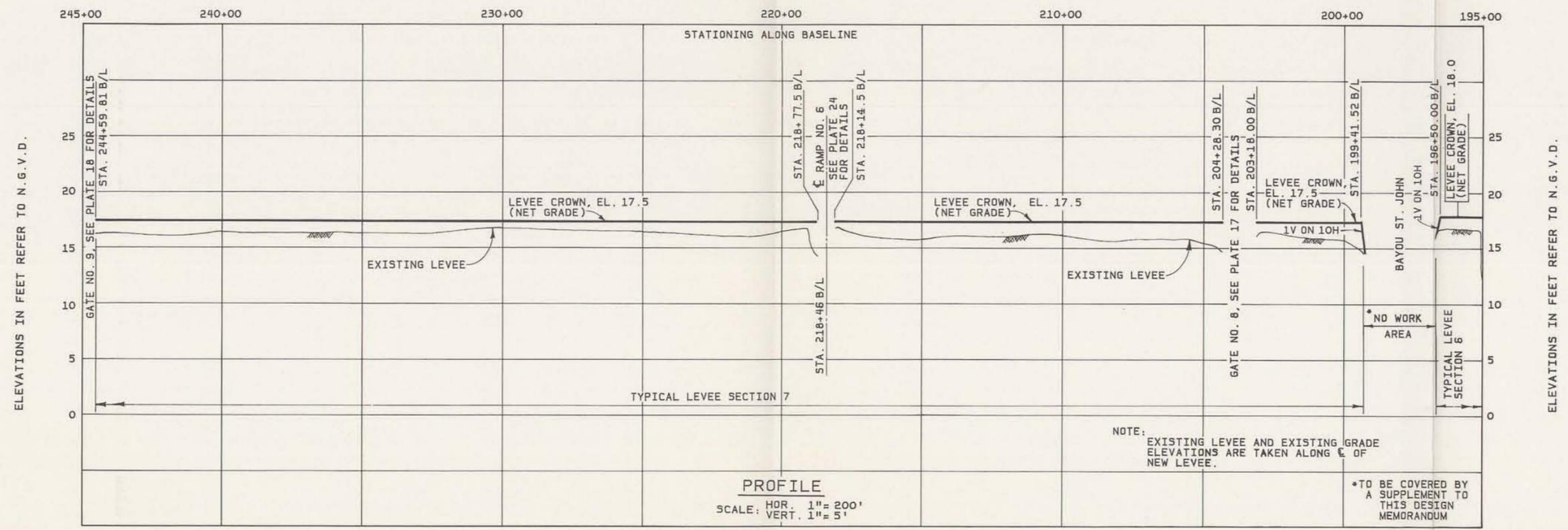
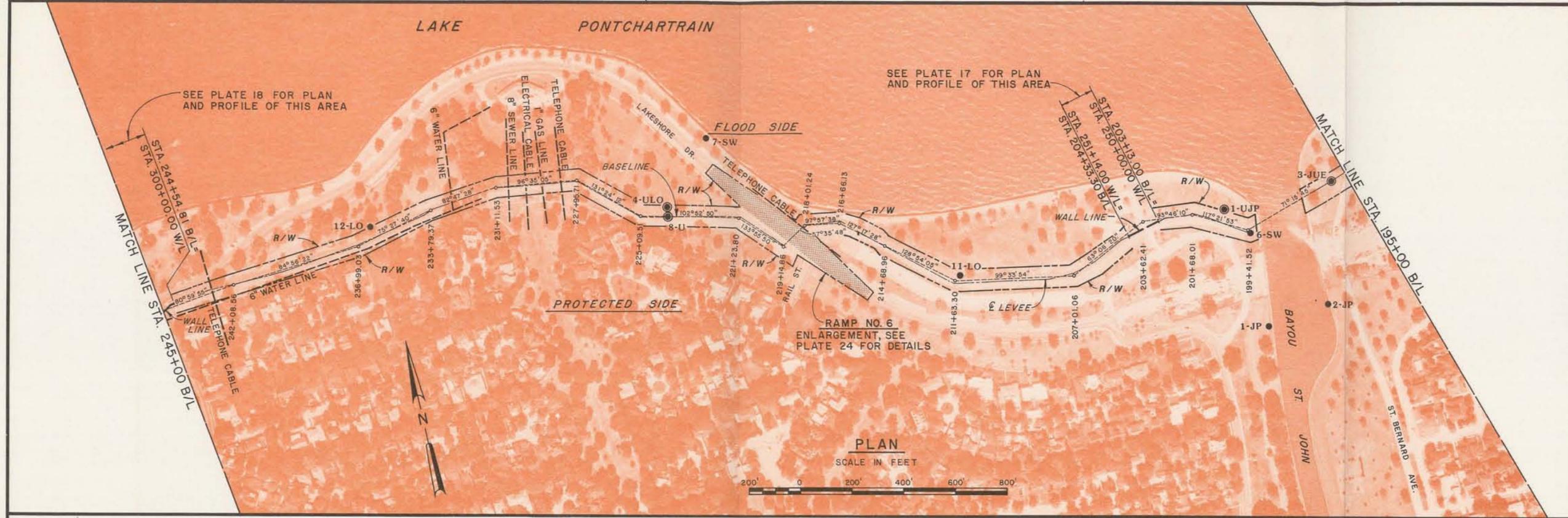
- LEGEND**
- 6-LO GENERAL TYPE BORING
 - 4-LO UNDISTURBED BORING

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 13, GENERAL DESIGN
ORLEANS PARISH LAKEFRONT LEVEE
WEST OF I.H.N.C.
PLAN AND PROFILE
STA. 85+00 B/L-STA. 145+00 B/L
U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NOVEMBER 1984 FILE NO. H-2-29536



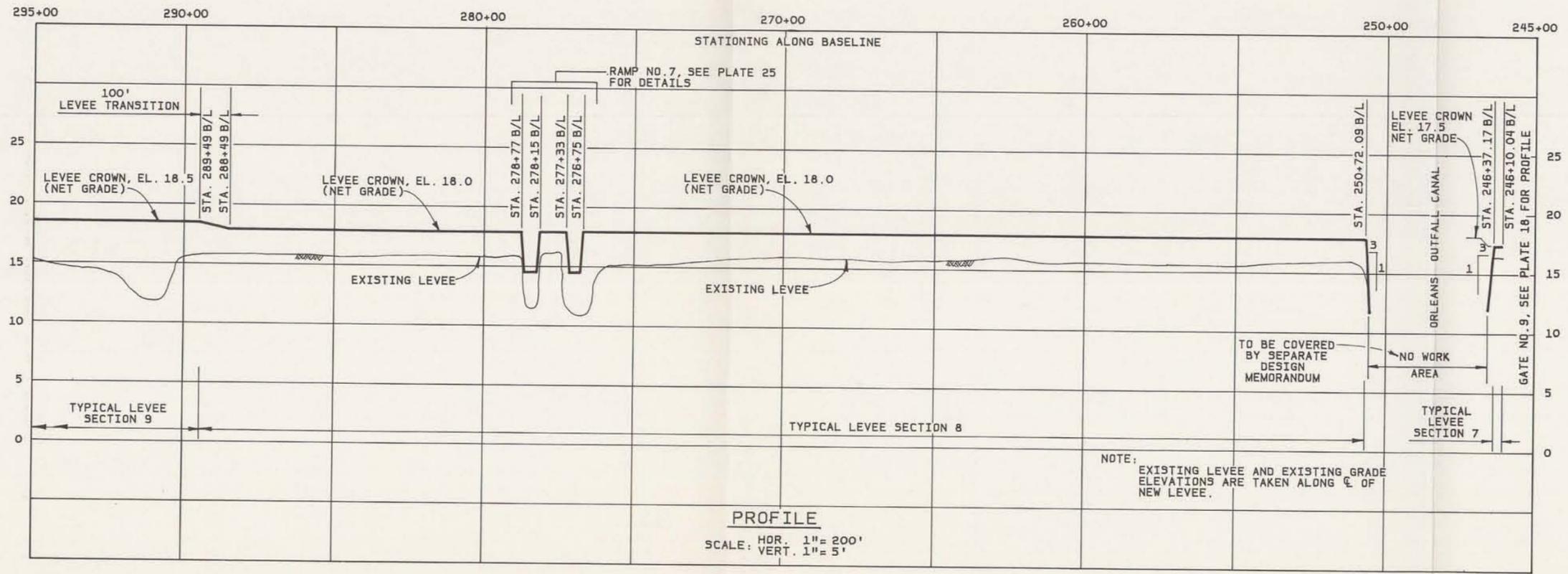
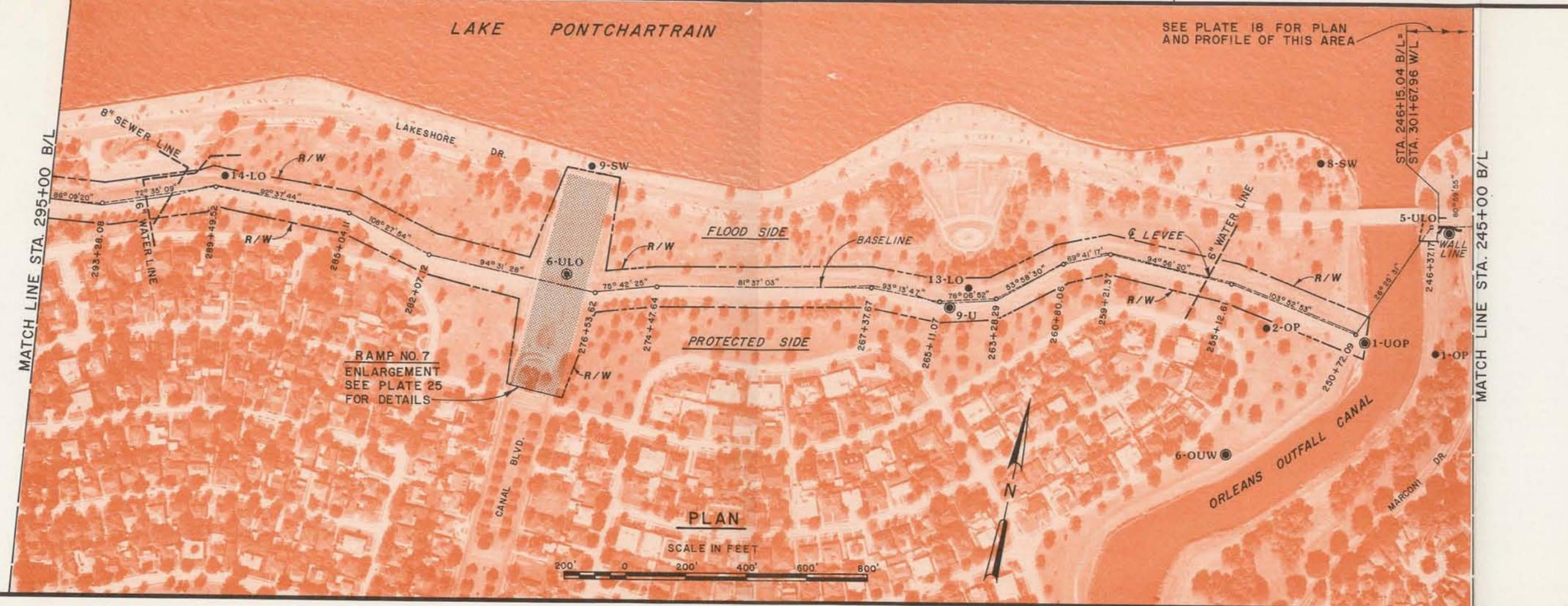
- LEGEND**
- 9-LO GENERAL TYPE BORING
 - ⊙ 2-LP UNDISTURBED BORING

LAKE PONTCHARTRAIN, LA. AND VICINITY
 HIGH LEVEL PLAN
 DESIGN MEMORANDUM NO. 13, GENERAL DESIGN
 ORLEANS PARISH LAKEFRONT LEVEE
 WEST OF I.H.N.C.
PLAN AND PROFILE
 STA. 145+00 B/L - STA. 195+00 B/L
 U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
 CORPS OF ENGINEERS
 NOVEMBER 1984 FILE NO. H-2-29536



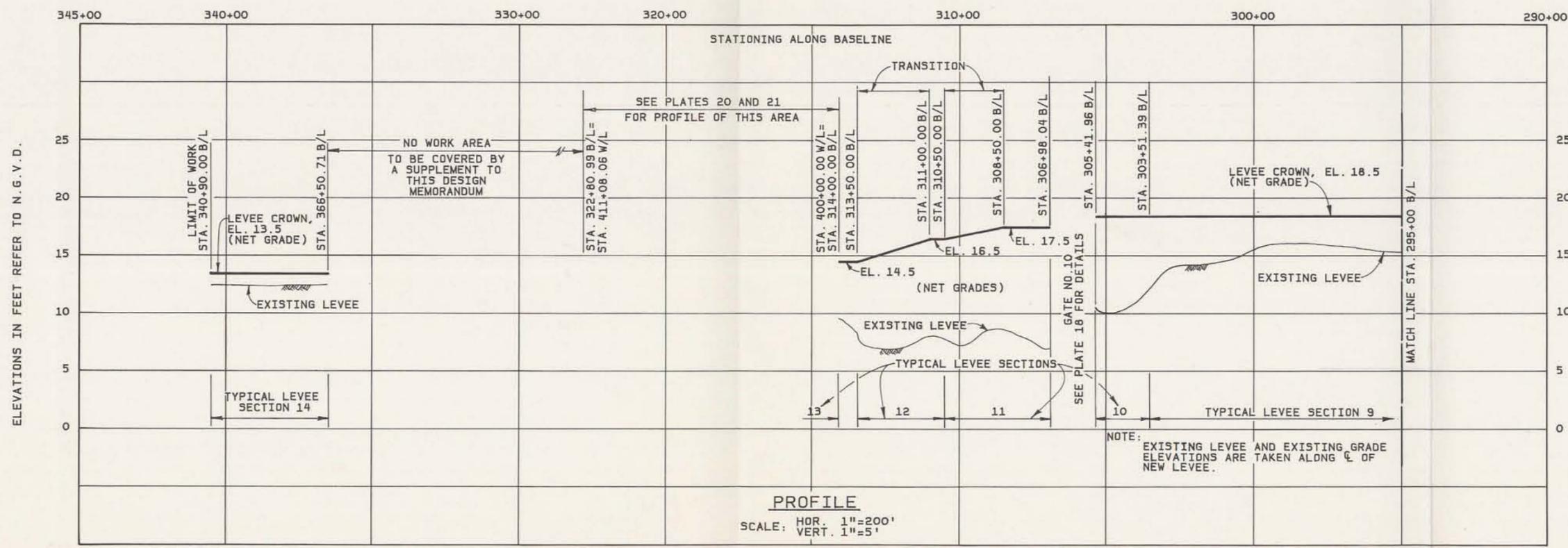
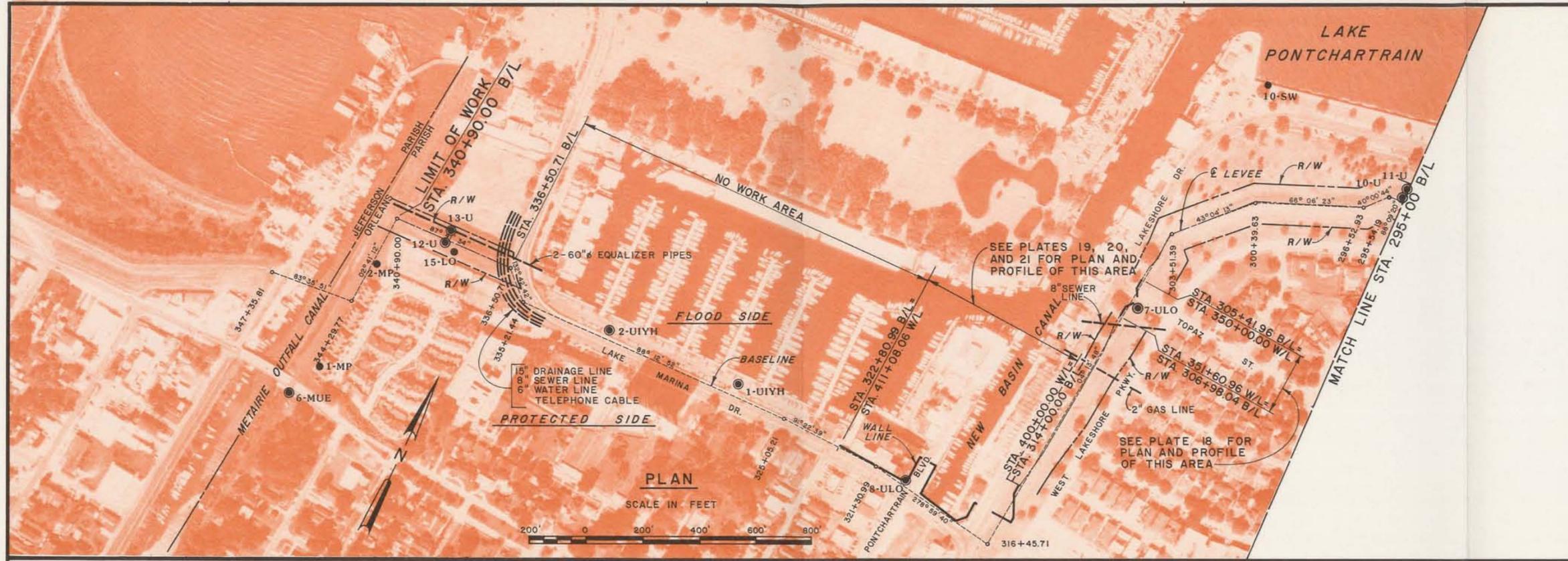
- LEGEND**
- 12-LO GENERAL TYPE BORING
 - ⊙ 4-ULO UNDISTURBED BORING

LAKE PONTCHARTRAIN, LA. AND VICINITY
 HIGH LEVEL PLAN
 DESIGN MEMORANDUM NO. 13, GENERAL DESIGN
 ORLEANS PARISH LAKEFRONT LEVEE
 WEST OF I.H.N.C.
PLAN AND PROFILE
 STA. 195+00 B/L-STA. 245+00 B/L
 U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
 CORPS OF ENGINEERS
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- LEGEND**
- 14-LO GENERAL TYPE BORING
 - ⊙ 1-UOP UNDISTURBED BORING

LAKE PONTCHARTRAIN, LA. AND VICINITY
 HIGH LEVEL PLAN
 DESIGN MEMORANDUM NO. 13, GENERAL DESIGN
 ORLEANS PARISH LAKEFRONT LEVEE
 WEST OF I.H.N.C.
PLAN AND PROFILE
 STA. 245+00 B/L - STA. 295+00 B/L
 U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
 CORPS OF ENGINEERS
 NOVEMBER 1984 FILE NO. H-2-29536

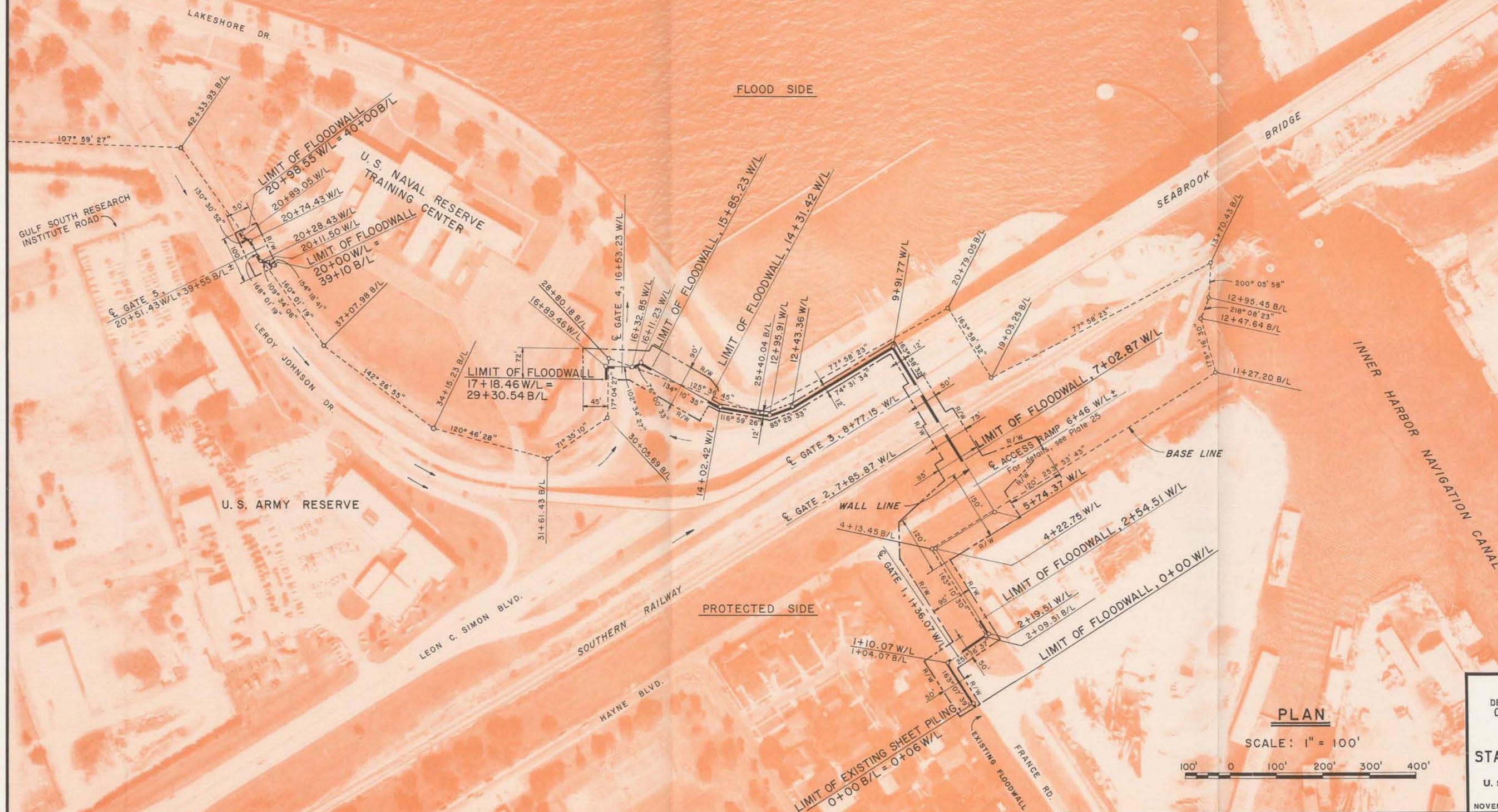


LEGEND

- 10-SW GENERAL TYPE BORING
- ⊙ 7-ULO UNDISTURBED BORING

LAKE PONTCHARTRAIN, LA. AND VICINITY
 HIGH LEVEL PLAN
 DESIGN MEMORANDUM NO. 13, GENERAL DESIGN
 ORLEANS PARISH LAKEFRONT LEVEE
 WEST OF I.H.N.C.
PLAN AND PROFILE
 STA. 295+00 B/L - STA. 340+90 B/L
 U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
 CORPS OF ENGINEERS
 NOVEMBER 1984 FILE NO. H-2-29536

LAKE PONTCHARTRAIN

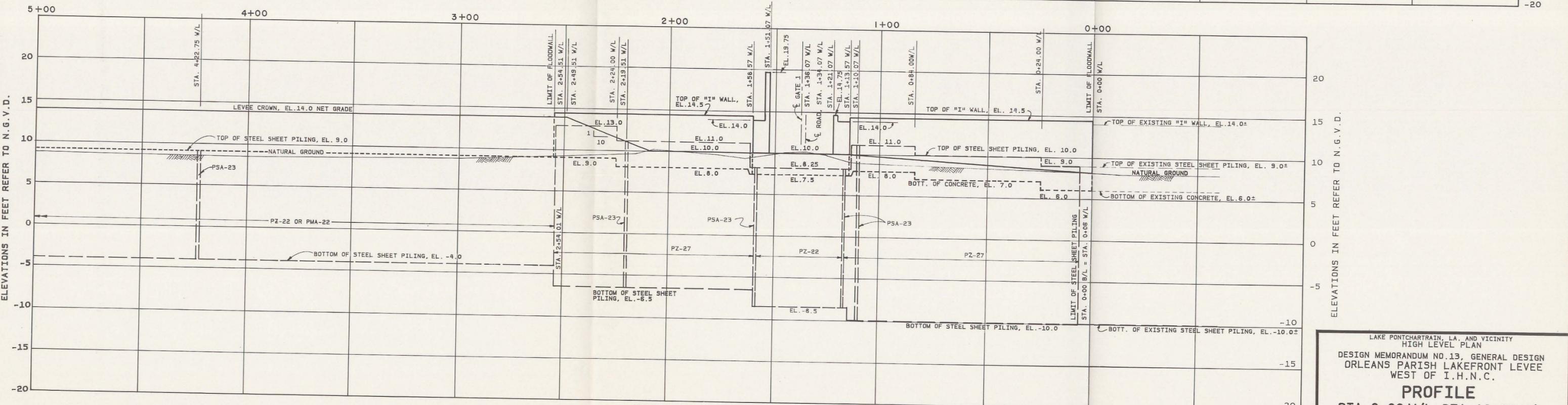
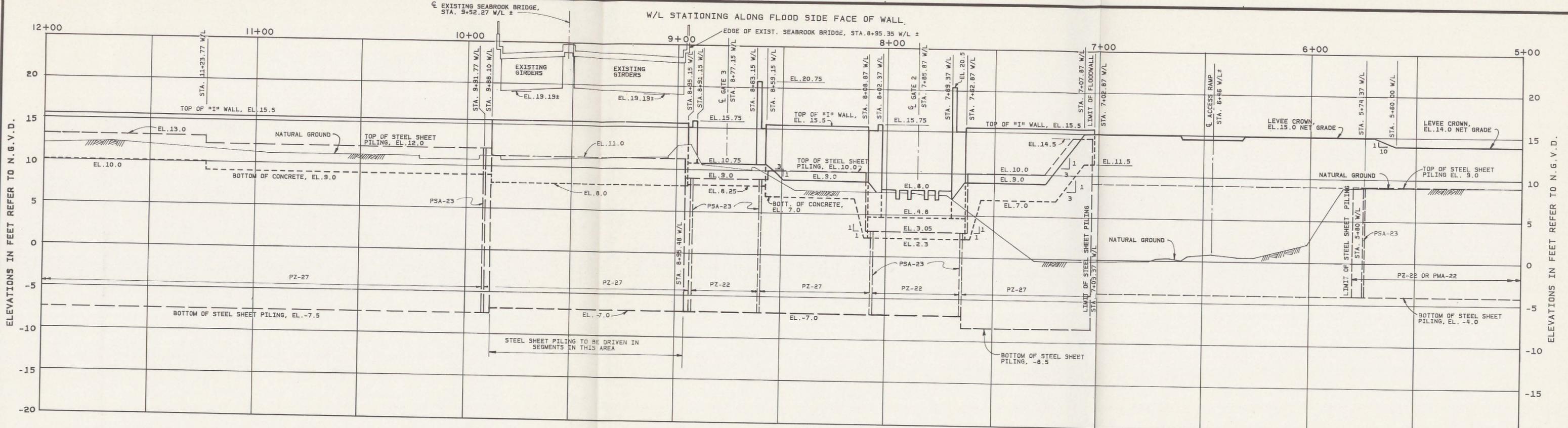


PLAN

SCALE: 1" = 100'



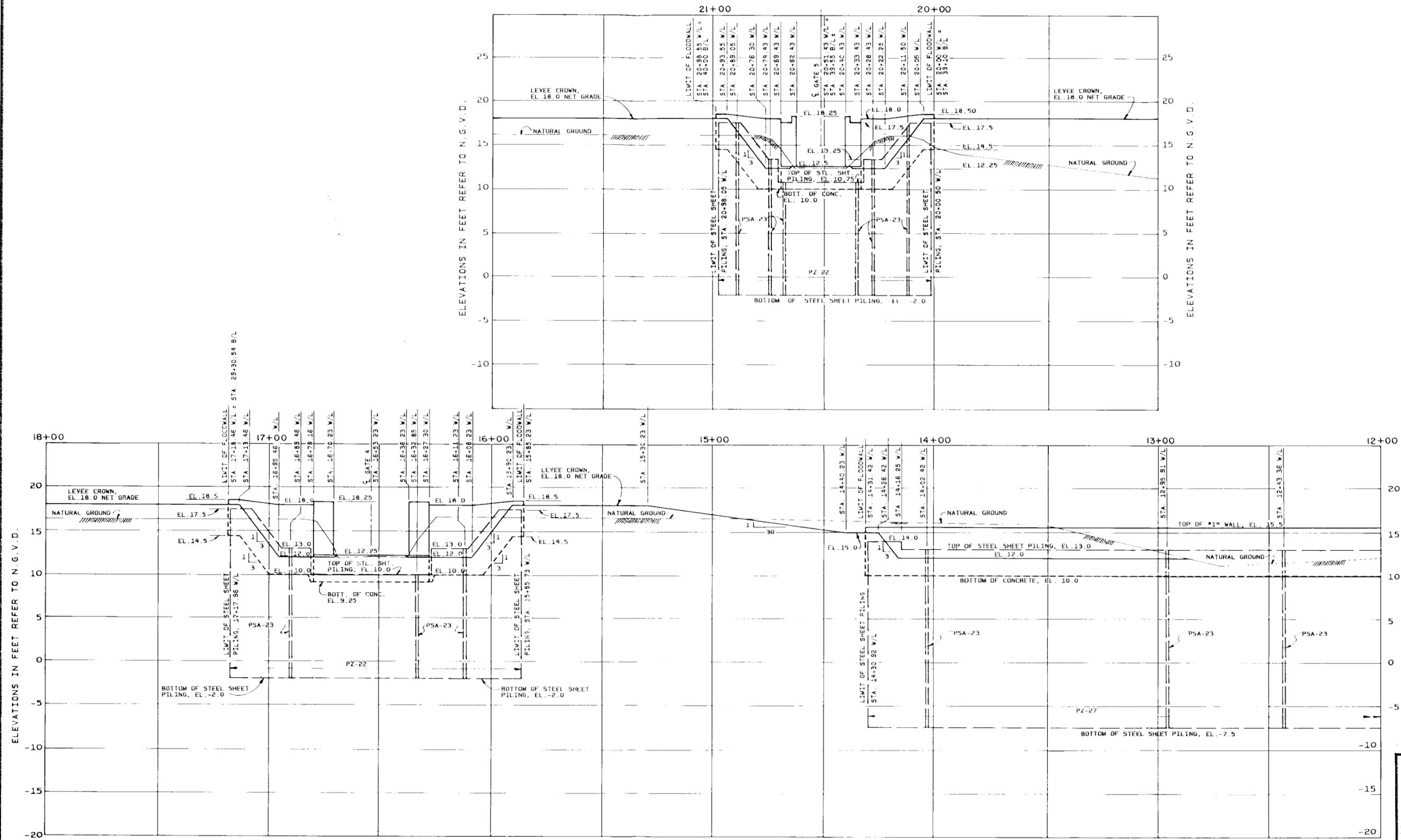
LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 13, GENERAL DESIGN
ORLEANS PARISH LAKEFRONT LEVEE
WEST OF I.H.N.C.
PLAN
STA. 0+00 W/L - STA. 20+98.55 W/L
(NOT CONTINUOUS)
U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
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PROFILE
 SCALE: HOR. 1" = 20'
 VERT. 1" = 5'

LAKE PONTCHARTRAIN, LA. AND VICINITY
 HIGH LEVEL PLAN
 DESIGN MEMORANDUM NO. 13, GENERAL DESIGN
 ORLEANS PARISH LAKEFRONT LEVEE
 WEST OF I.H.N.C.
PROFILE
 STA. 0+00 W/L - STA. 12+00 W/L
 U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
 CORPS OF ENGINEERS
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W/L STATIONING ALONG FLOOD SIDE FACE OF WALL



PROFILE

SCALE: HOR. 1" = 20'
VERT. 1" = 5'

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 13, GENERAL DESIGN
ORLEANS PARISH LAKEFRONT LEVEE
WEST OF I.H.N.C.
PROFILE
STA. 12+00 W/L-STA. 20+98.55 W/L
(NOT CONTINUOUS)
U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NOVEMBER 1984 FILE NO. H-2-29536

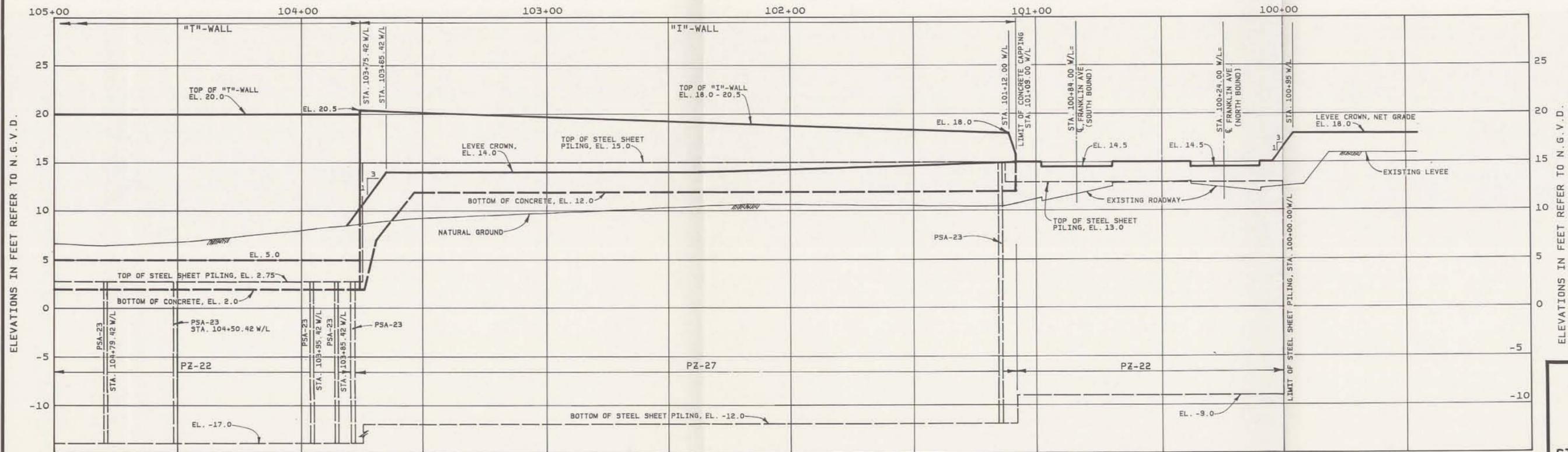
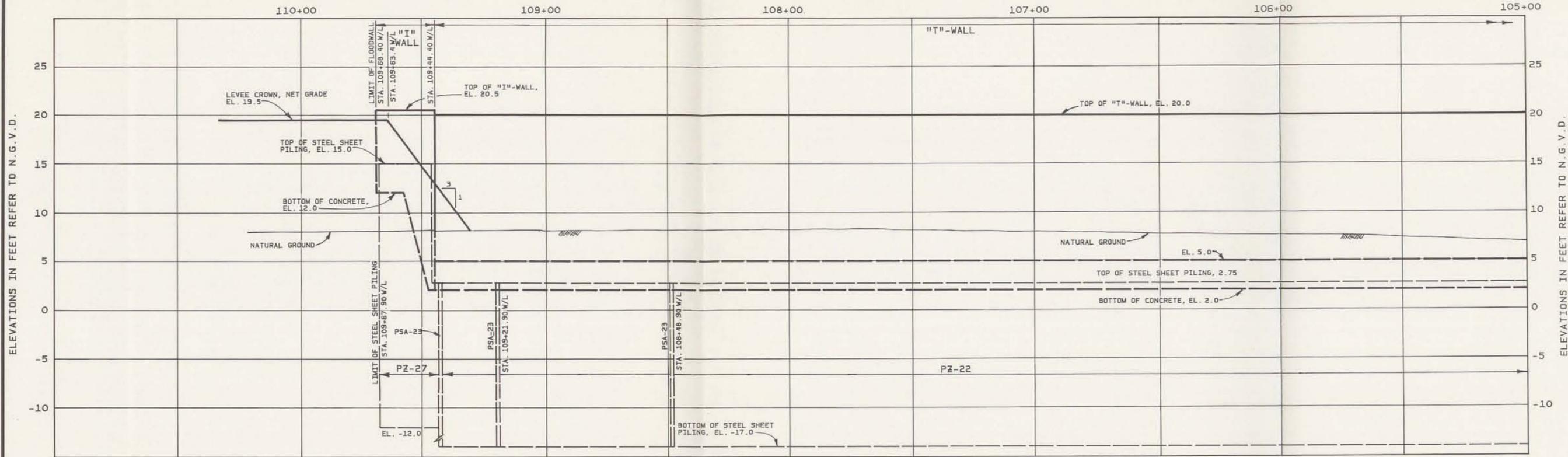


PLAN

SCALE: 1" = 50'



LAKE PONTCHARTRAIN, LA. AND VICINITY
 HIGH LEVEL PLAN
 DESIGN MEMORANDUM NO.13, GENERAL DESIGN
 ORLEANS PARISH LAKEFRONT LEVEE
 WEST OF I.H.N.C.
PLAN
 STA. 100+00 W/L-STA. 109+68.40 W/L
 U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
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 NOVEMBER 1984 FILE NO. H-2-29536



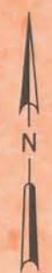
PROFILE
 SCALE: HOR. 1" = 20'
 vert. 1" = 5'

LAKE PONTCHARTRAIN, LA. AND VICINITY
 HIGH LEVEL PLAN
 DESIGN MEMORANDUM NO. 13, GENERAL DESIGN
 ORLEANS PARISH LAKEFRONT LEVEE
 WEST OF I.H.N.C.
PROFILE
 STA. 100+00 W/L-STA. 109+68.40 W/L
 U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
 CORPS OF ENGINEERS
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LAKE PONTCHARTRAIN

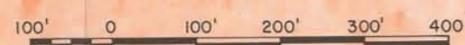


PROPOSED DEVELOPMENT



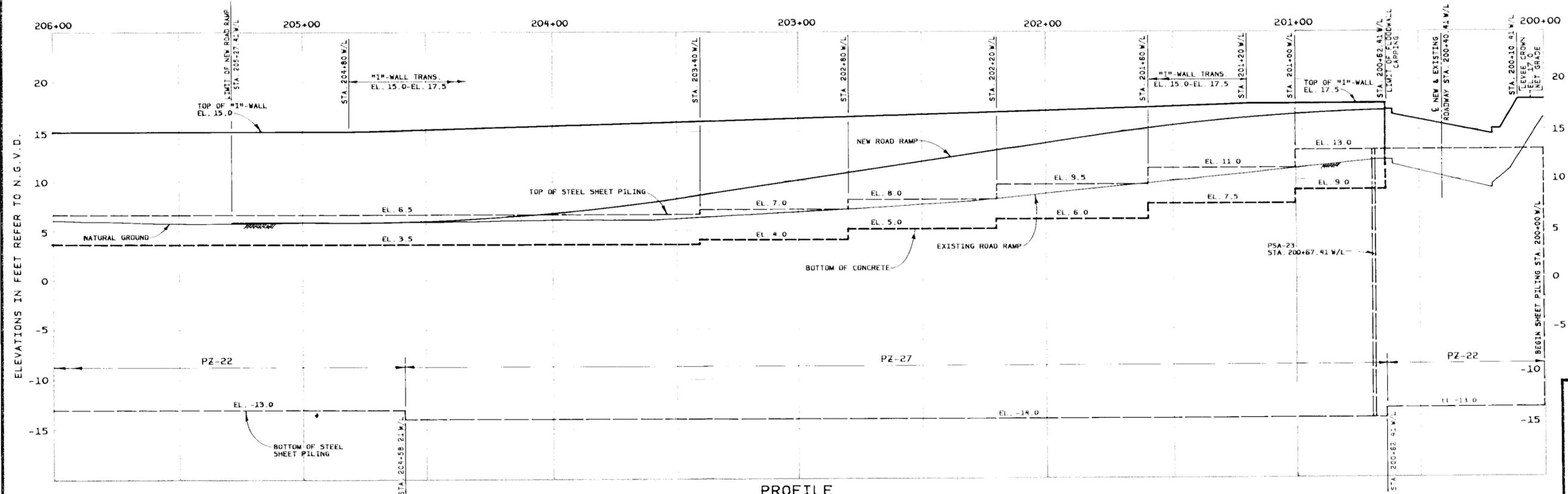
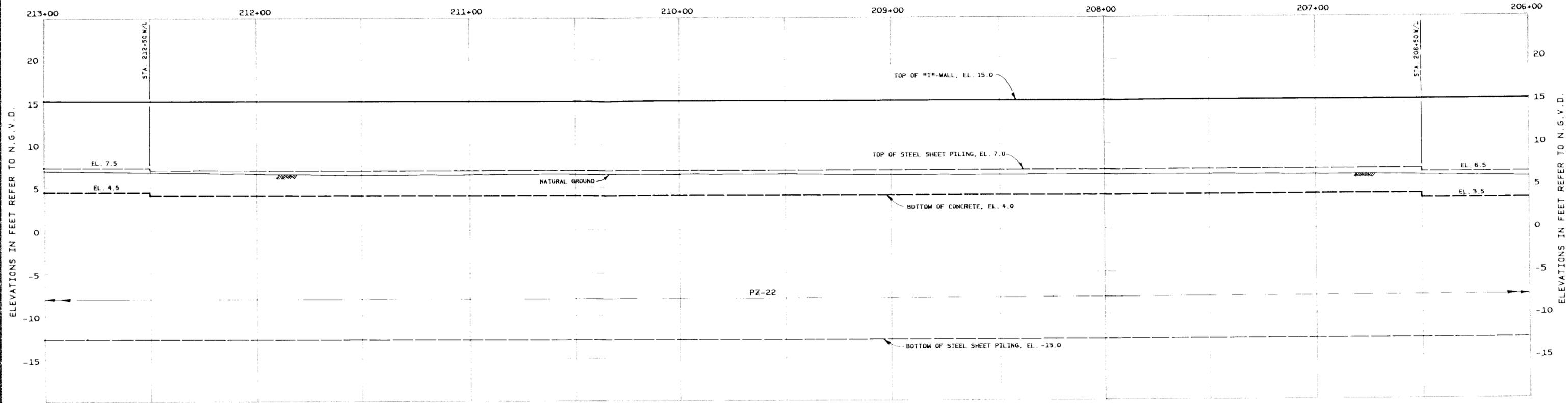
PLAN

SCALE: 1" = 100'



LAKE PONTCHARTRAIN, LA. AND VICINITY
 HIGH LEVEL PLAN
 DESIGN MEMORANDUM NO. 13, GENERAL DESIGN
 ORLEANS PARISH LAKEFRONT LEVEE
 WEST OF I.H.N.C.
PLAN
 STA. 200+00 W/L-STA. 236+48.59 W/L
 U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
 CORPS OF ENGINEERS
 NOVEMBER 1984 FILE NO. H-2-29536

W/L STATIONING ALONG FLOOD SIDE FACE OF WALL

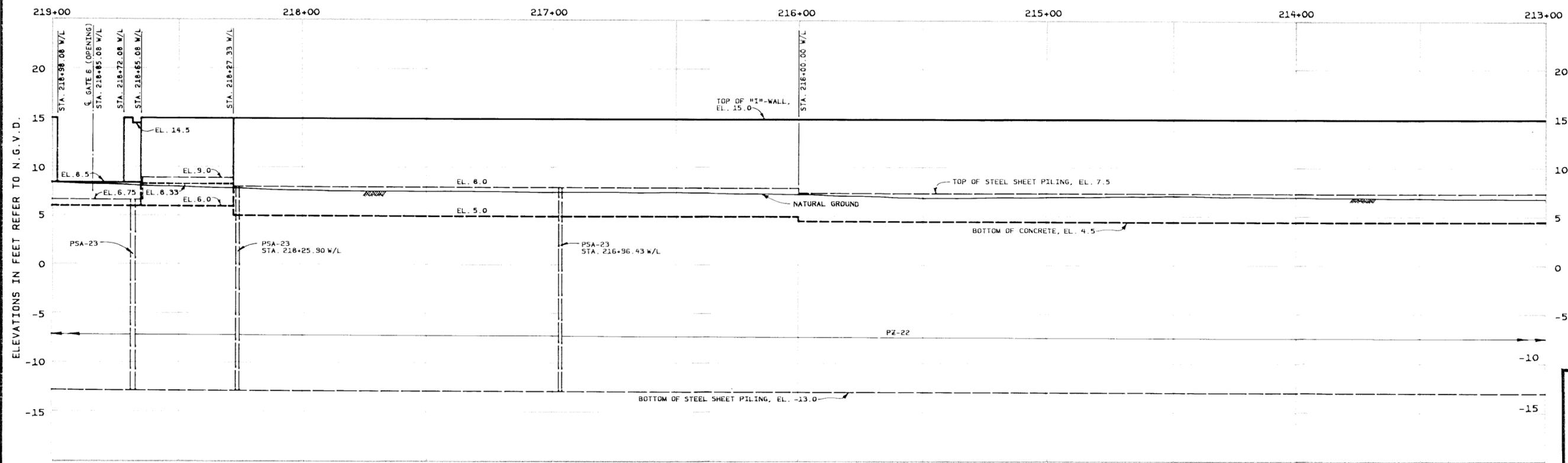
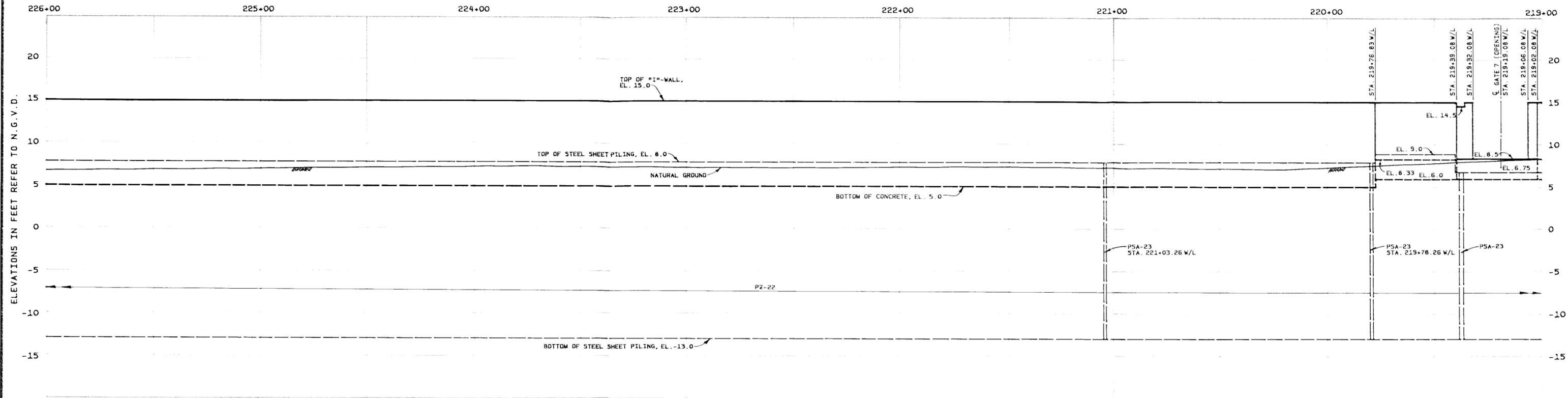


PROFILE

SCALE: HOR. 1" = 20'
VERT. 1" = 5'

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 13, GENERAL DESIGN
ORLEANS PARISH LAKEFRONT LEVEE
WEST OF I.H.N.C.
PROFILE
STA. 200+00 W/L-STA. 213+00 W/L
U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NOVEMBER 1984 FILE NO. H-2-29536

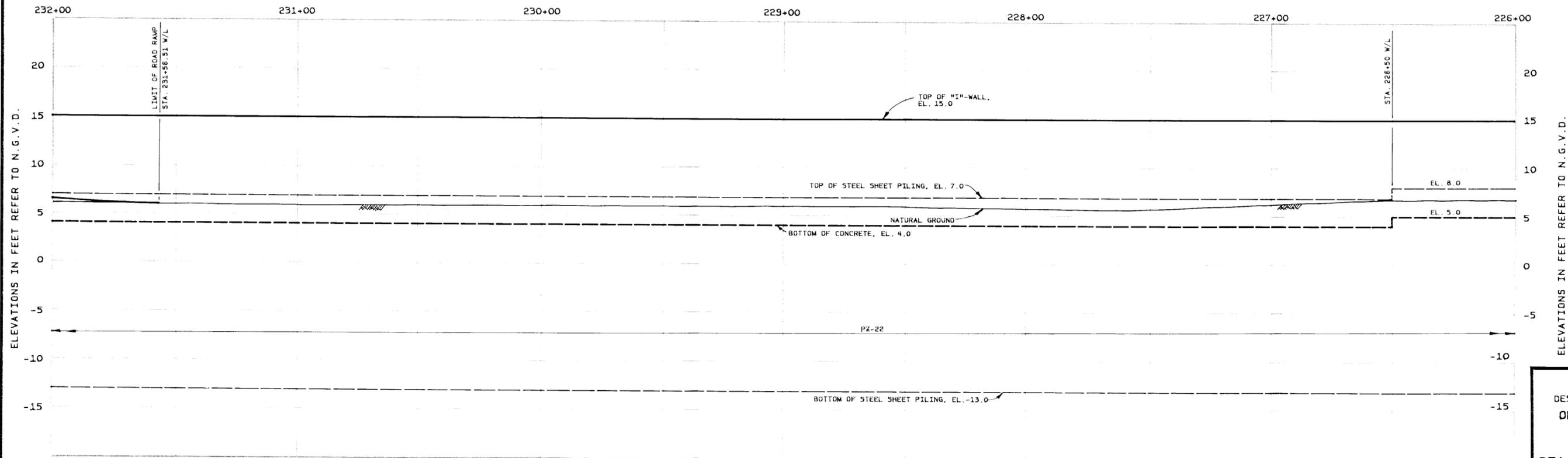
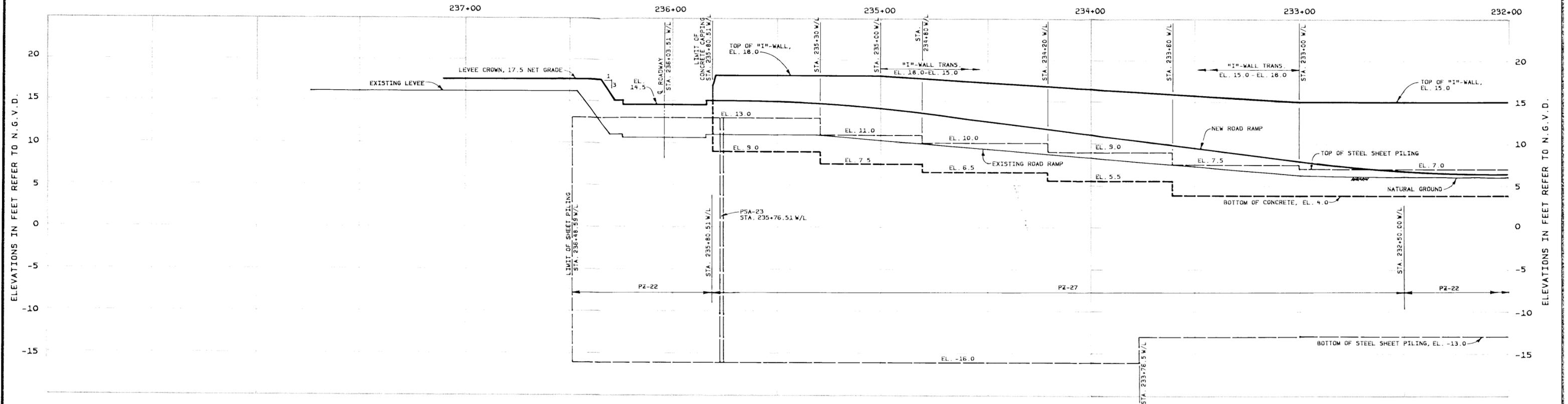
W/L STATIONING ALONG FLOOD SIDE FACE OF WALL



PROFILE
 SCALE: HOR. 1" = 20'
 VERT. 1" = 5'

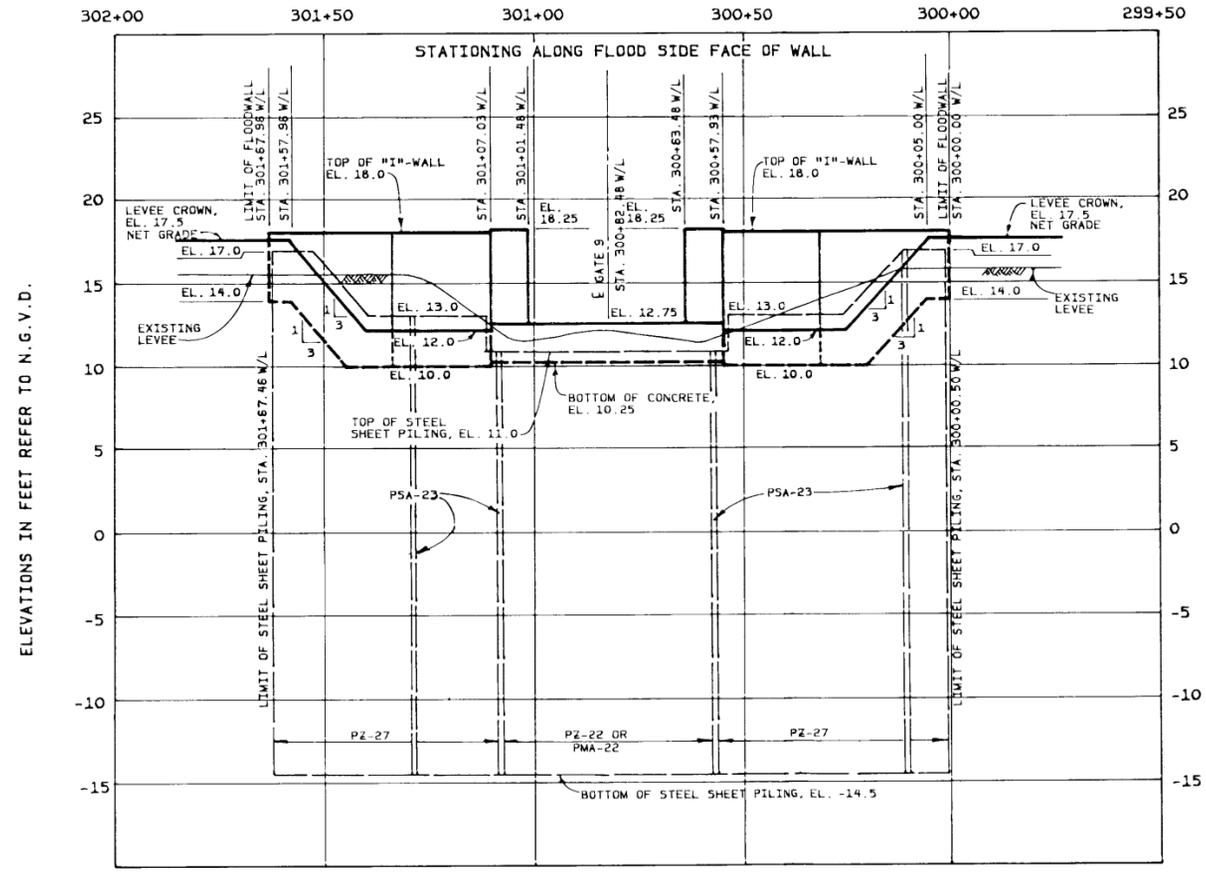
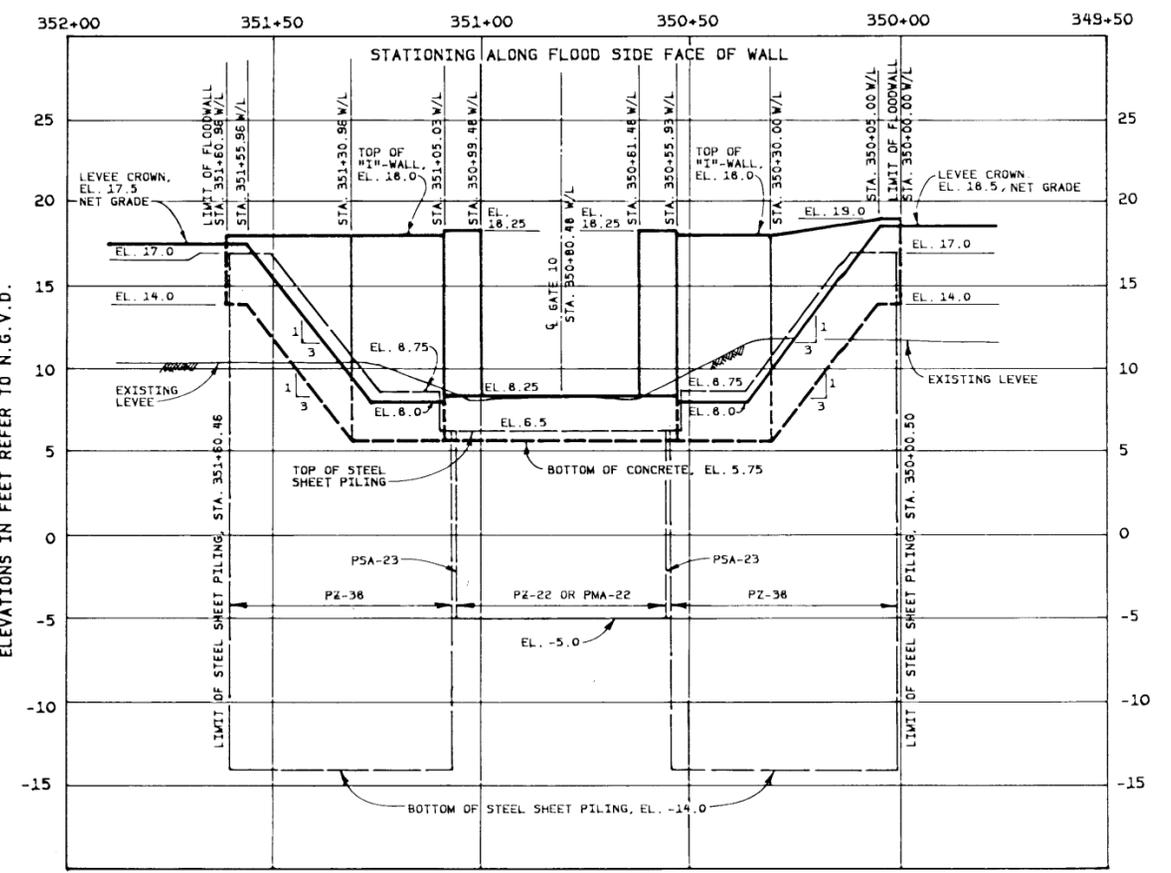
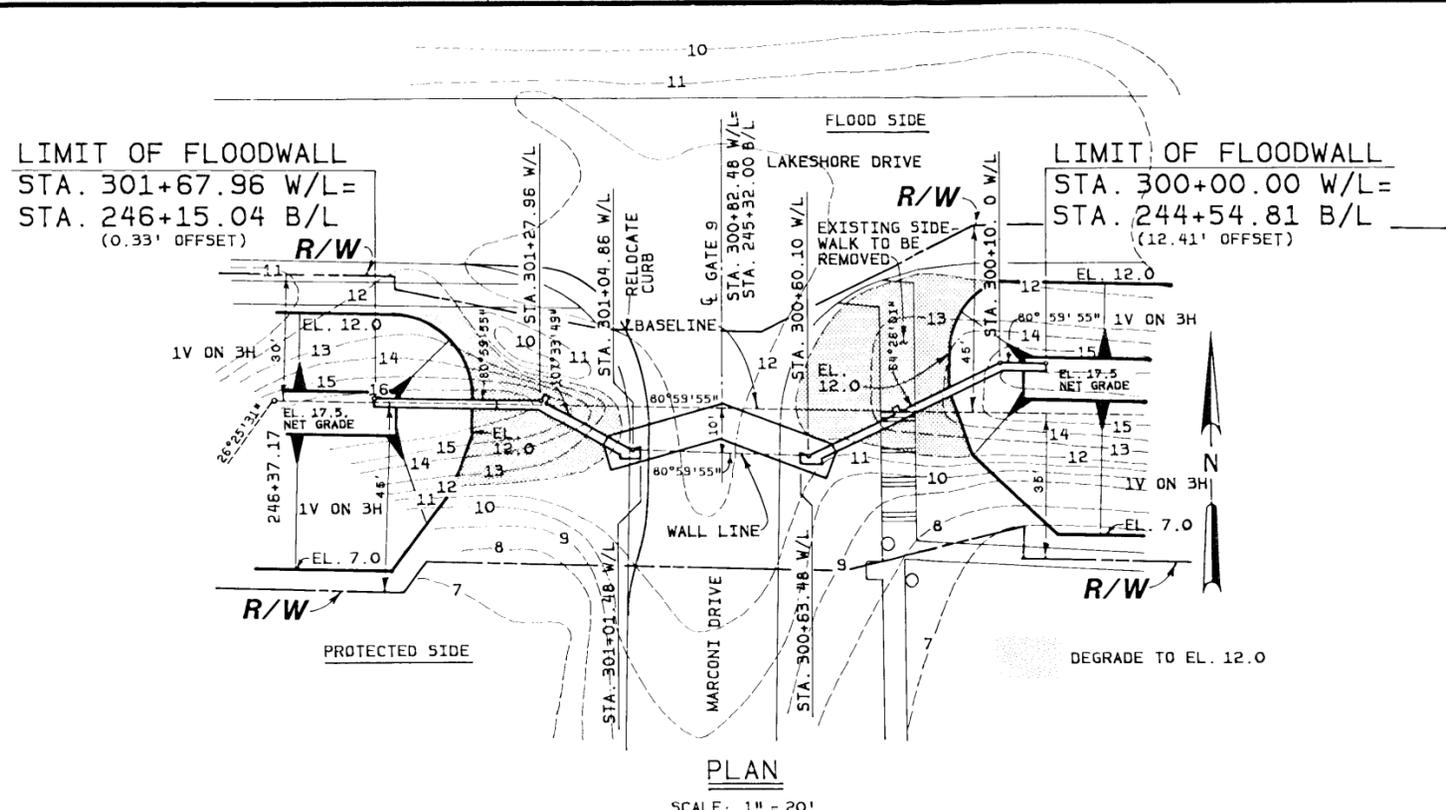
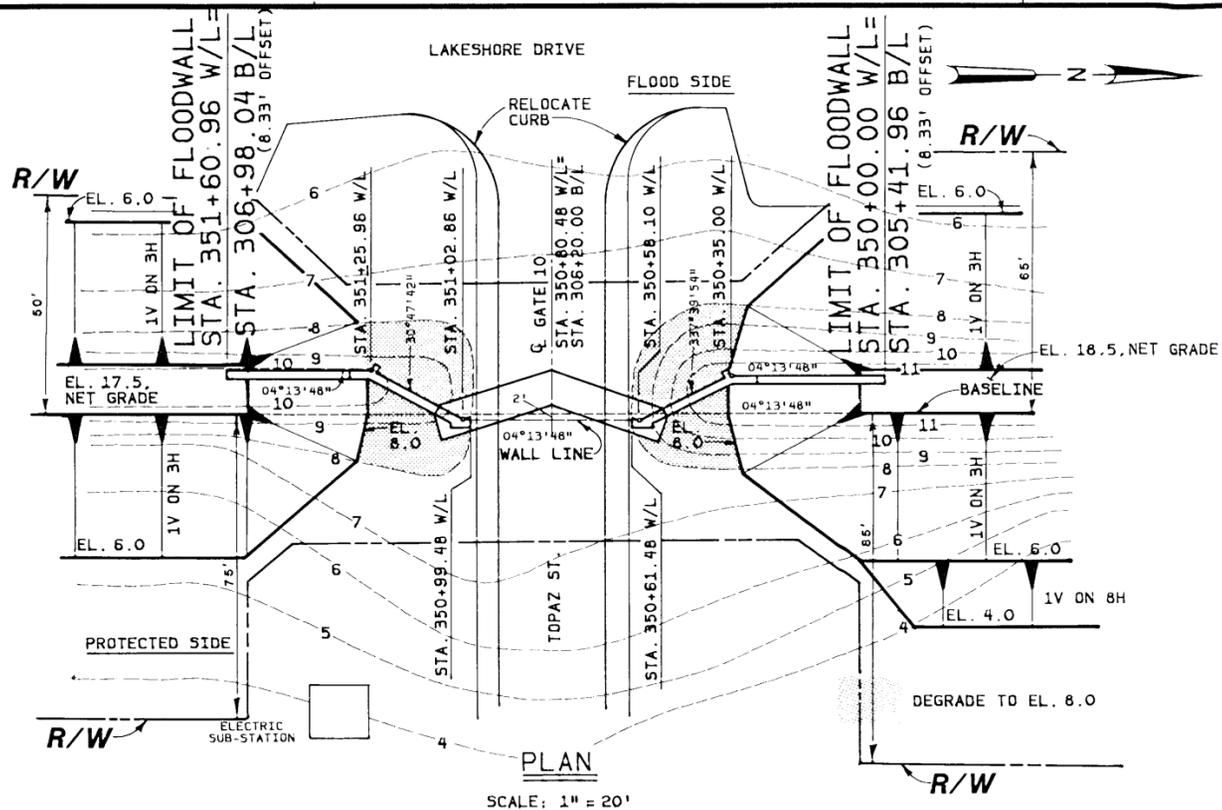
LAKE PONTCHARTRAIN, LA. AND VICINITY
 HIGH LEVEL PLAN
 DESIGN MEMORANDUM NO. 13, GENERAL DESIGN
 ORLEANS PARISH LAKEFRONT LEVEE
 WEST OF I.H.N.C.
PROFILE
 STA. 213+00 W/L-STA. 226+00 W/L
 U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
 CORPS OF ENGINEERS
 NOVEMBER 1984 FILE NO. H-2-29536

W/L STATIONING ALONG FLOOD SIDE FACE OF WALL



PROFILE
 SCALE: HOR 1" = 20'
 VERT 1" = 5'

LAKE PONTCHARTRAIN, LA. AND VICINITY
 HIGH LEVEL PLAN
 DESIGN MEMORANDUM NO. 13, GENERAL DESIGN
 ORLEANS PARISH LAKEFRONT LEVEE
 WEST OF I.H.N.C.
PROFILE
 STA. 226+00 W/L-STA. 236+48.59 W/L
 U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
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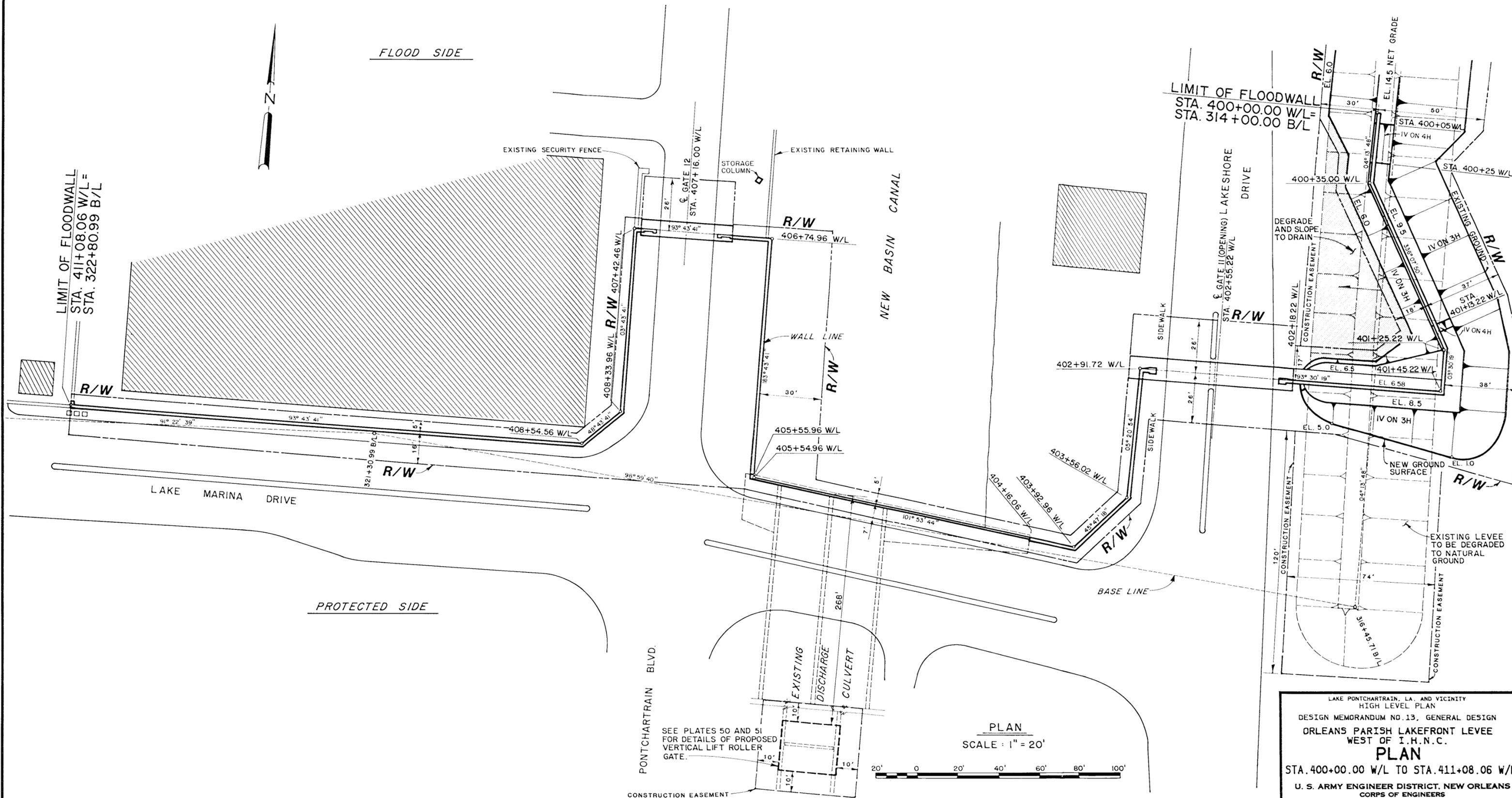


LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 13, GENERAL DESIGN
ORLEANS PARISH LAKEFRONT LEVEE
WEST OF I.H.N.C.
PLAN AND PROFILE
STA. 300+00 W/L-STA. 301+67.96 W/L AND
STA. 350+00 W/L-STA. 351+60.96 W/L
U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NOVEMBER 1984 FILE NO. H-2-29536

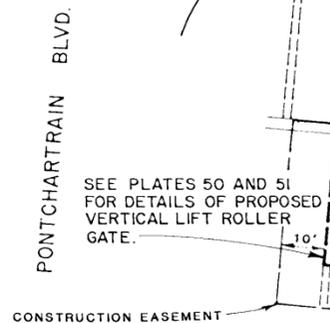
FLOOD SIDE



LIMIT OF FLOODWALL
STA. 411+08.06 W/L =
STA. 322+80.99 B/L

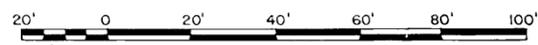


PROTECTED SIDE



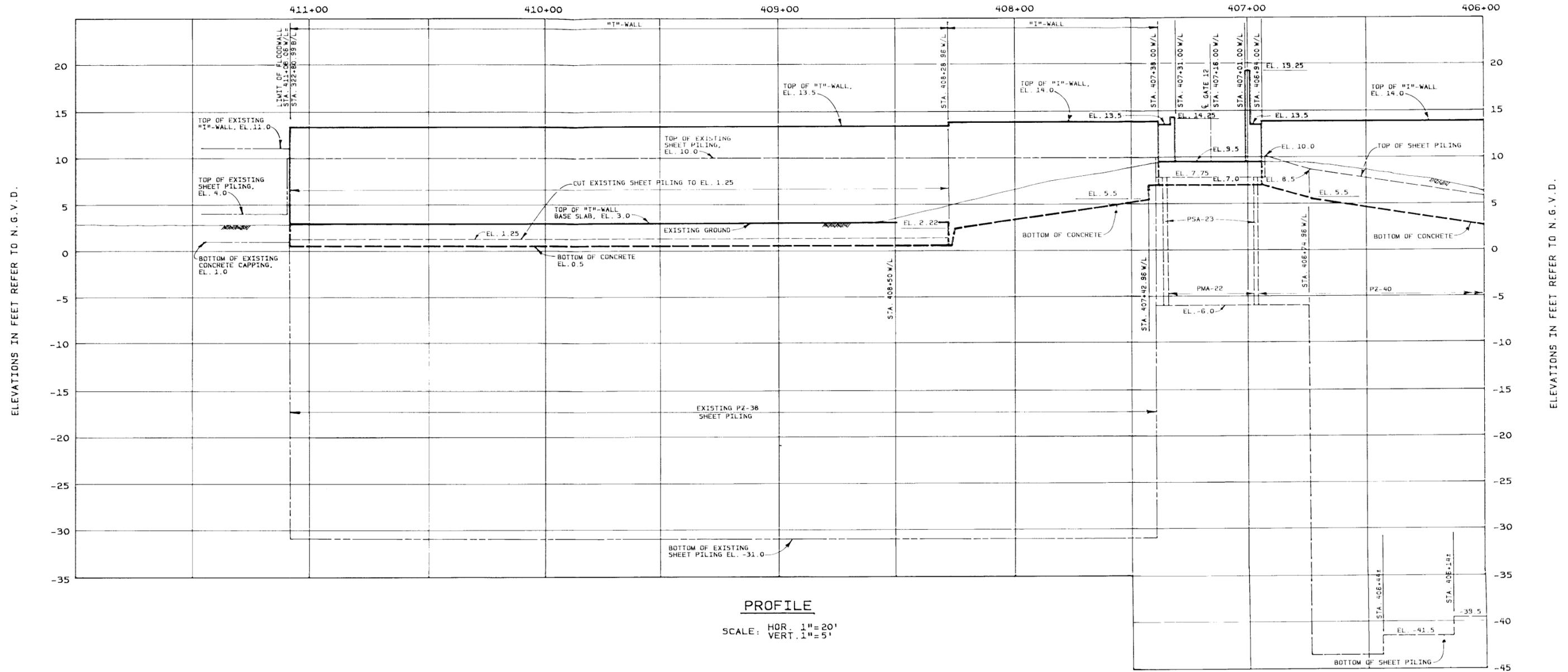
SEE PLATES 50 AND 51
FOR DETAILS OF PROPOSED
VERTICAL LIFT ROLLER
GATE.

PLAN
SCALE: 1" = 20'



LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 13, GENERAL DESIGN
ORLEANS PARISH LAKEFRONT LEVEE
WEST OF I.H.N.C.
PLAN
STA. 400+00.00 W/L TO STA. 411+08.06 W/L
U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NOVEMBER 1984 FILE NO. H-2-29536

W/L STATIONING ALONG FLOOD SIDE FACE OF WALL



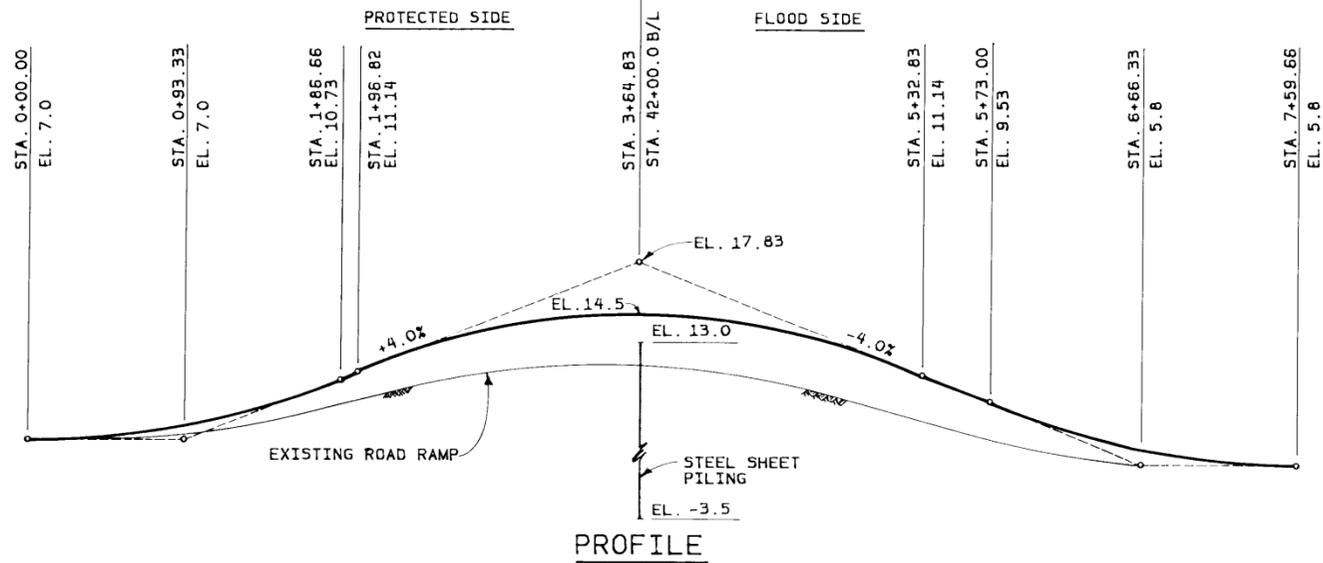
ELEVATIONS IN FEET REFER TO N.G.V.D.

ELEVATIONS IN FEET REFER TO N.G.V.D.

PROFILE

SCALE: HOR. 1"=20'
VERT. 1"=5'

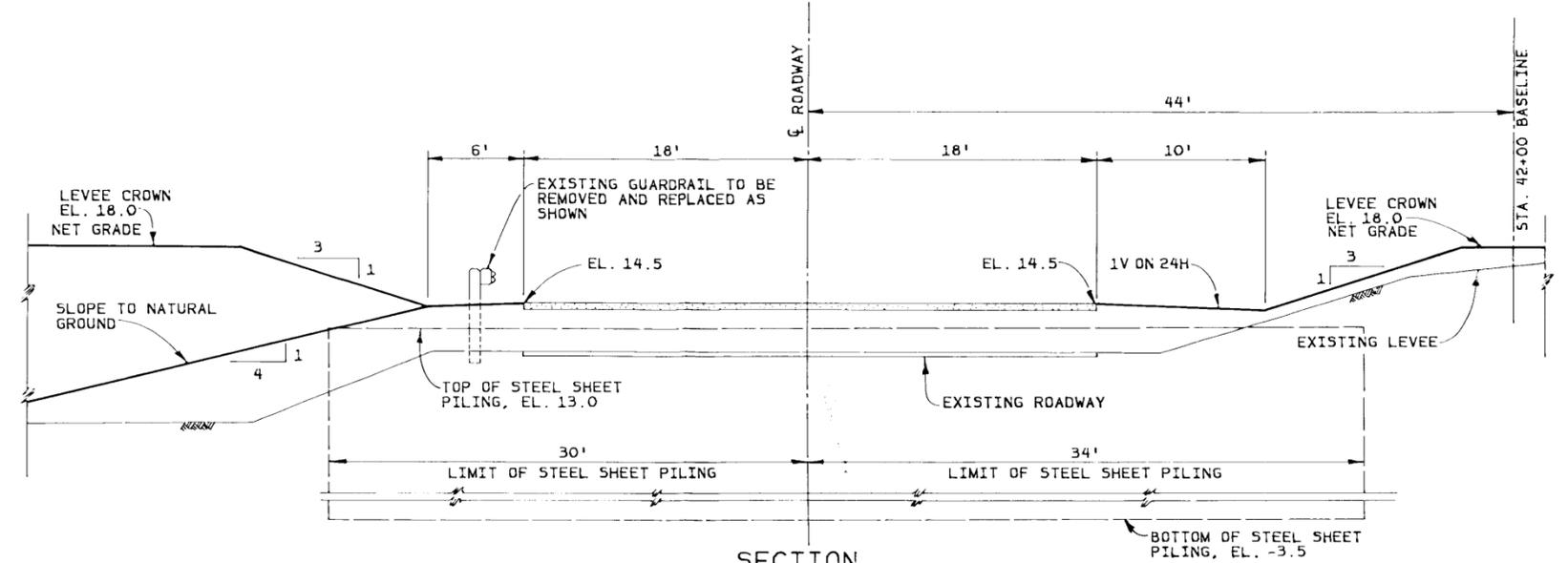
LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 13, GENERAL DESIGN
ORLEANS PARISH LAKEFRONT LEVEE
WEST OF I.H.N.C.
PROFILE
STA. 406+00 W/L-STA. 411+08.08 W/L
U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NOVEMBER 1984 FILE NO. H-2-29536



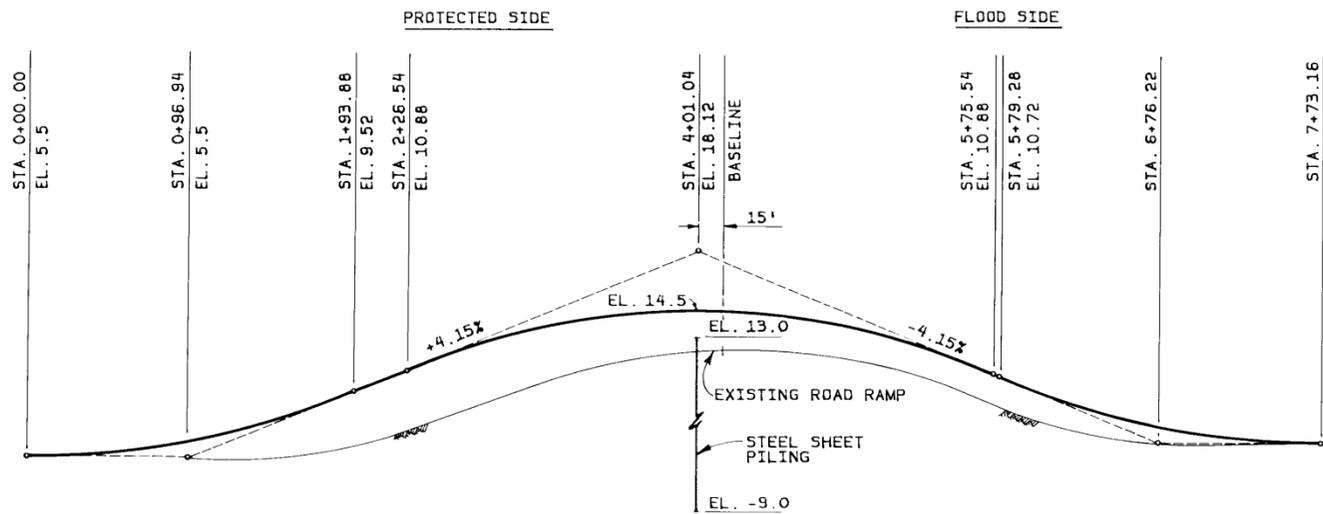
PROFILE

SCALE: HOR. 1" = 50'
VERT. 1" = 5'

RAMP NO. 1



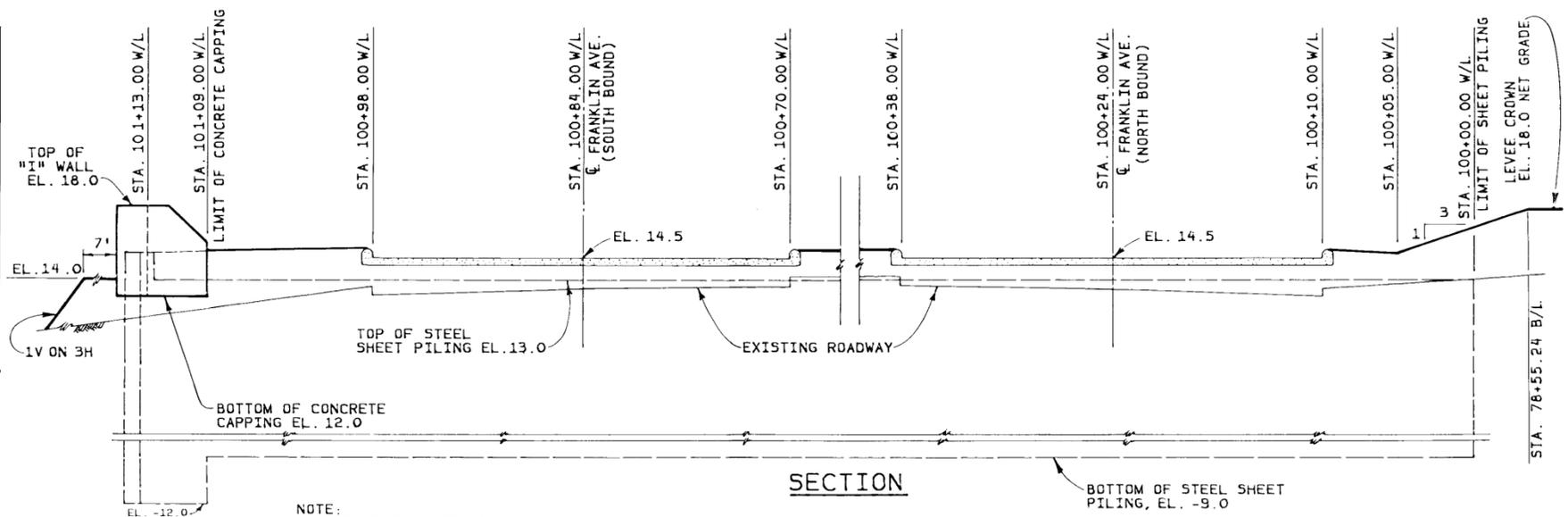
SECTION
STA. 42+00.00 B/L
SCALE: 1" = 5'



PROFILE

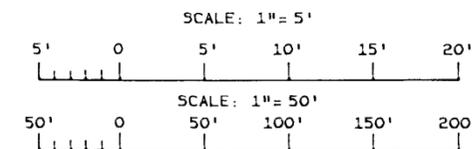
SCALE: HOR. 1" = 50'
VERT. 1" = 5'

RAMP NO. 2

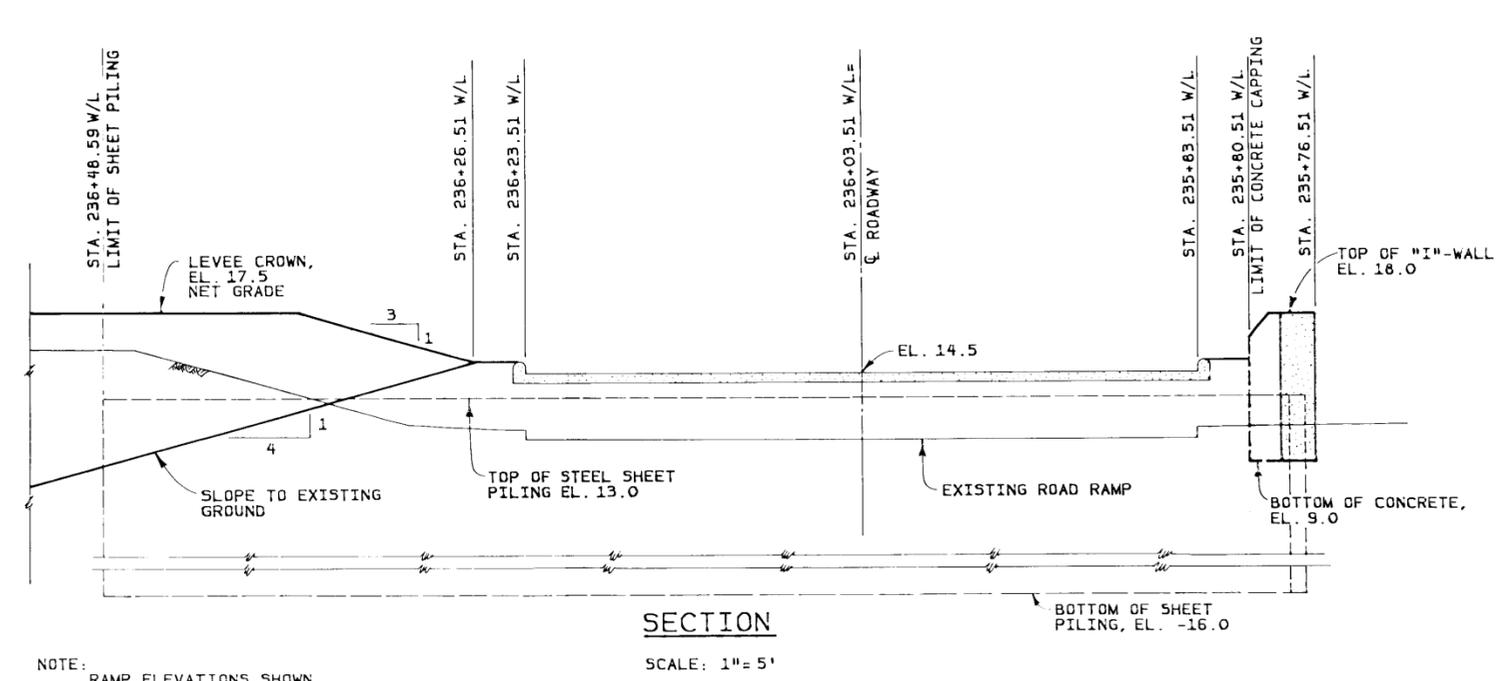
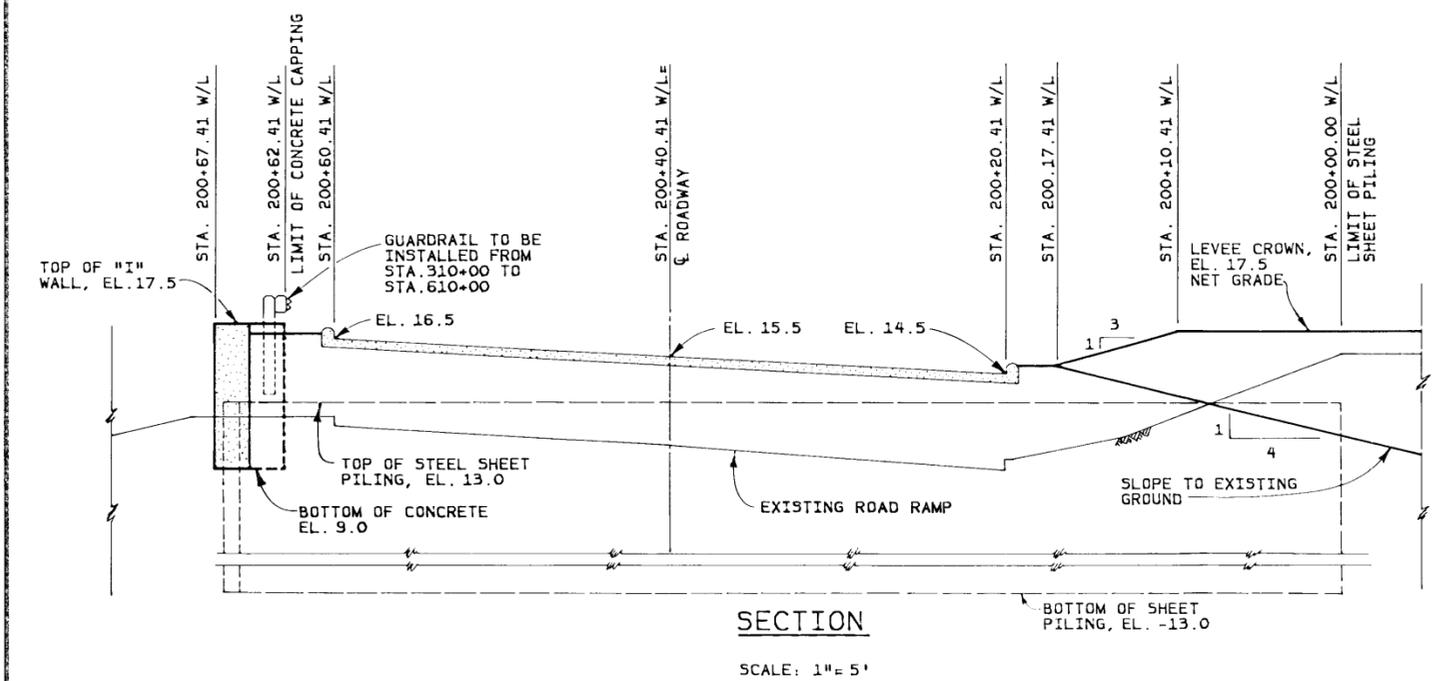
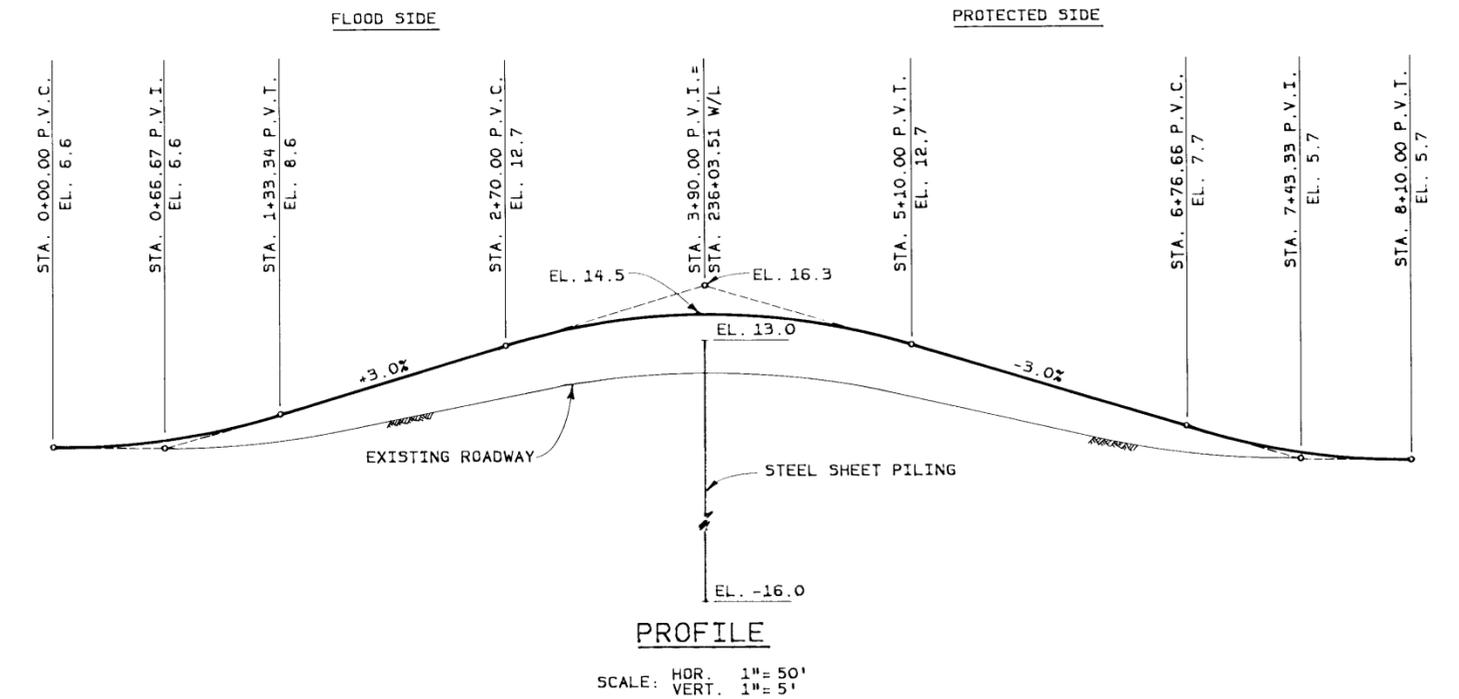
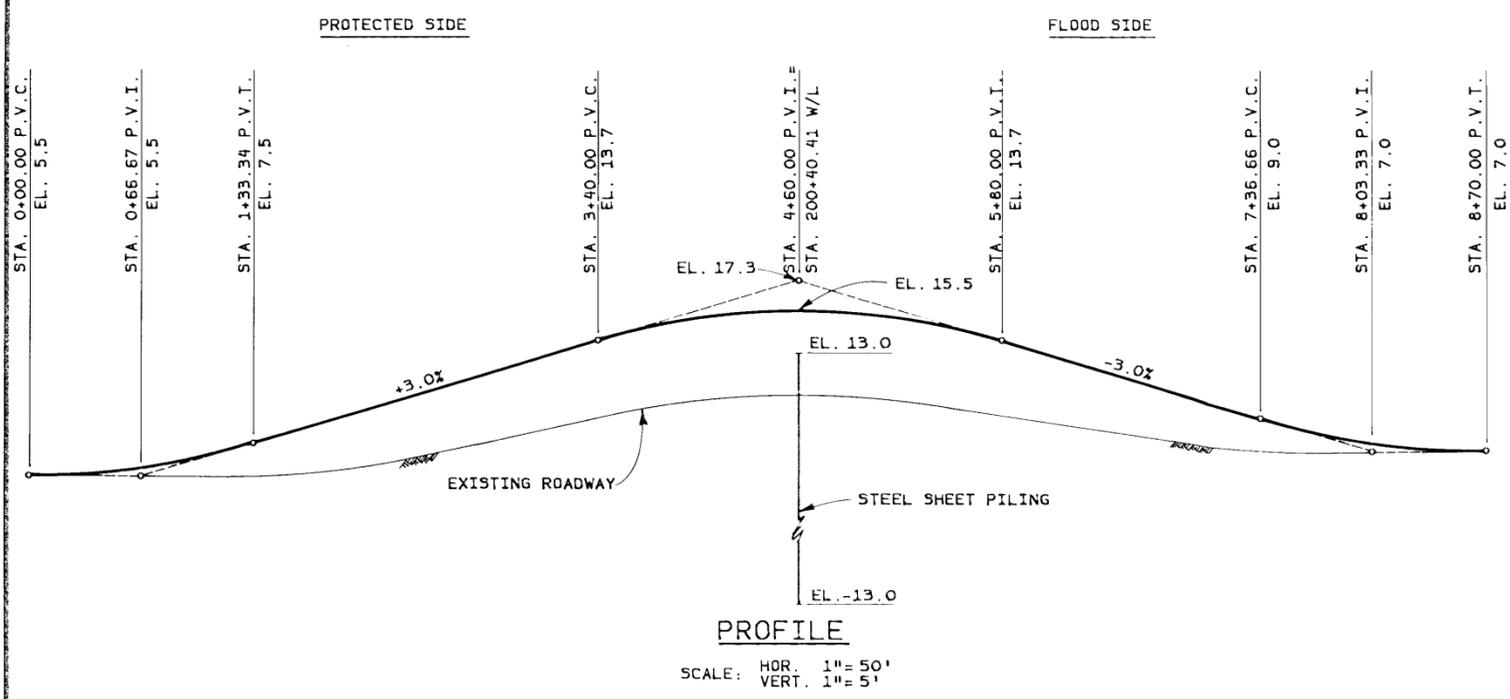


SECTION

SCALE: 1" = 5'



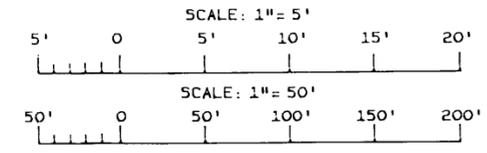
LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 13, GENERAL DESIGN
ORLEANS PARISH LAKEFRONT LEVEE
WEST OF I.H.N.C.
RAMPS NO. 1 AND 2
DETAILS
U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NOVEMBER 1984 FILE NO. H-2-29536



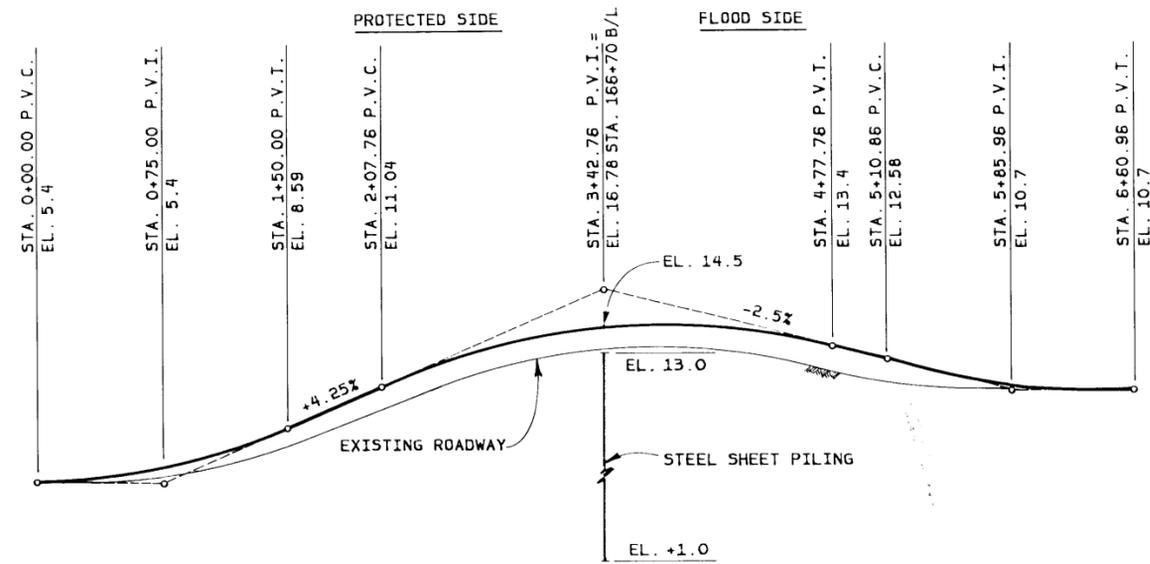
NOTE: RAMP ELEVATIONS SHOWN ARE NET GRADES.

RAMP NO. 3

RAMP NO. 4

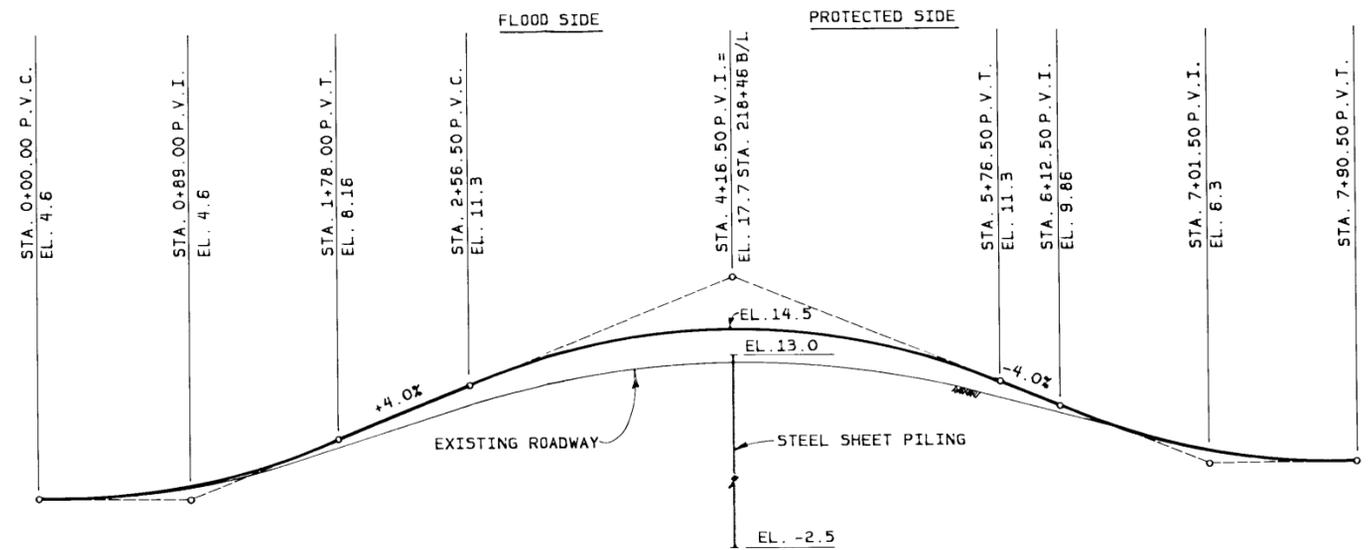


LAKE PONTCHARTRAIN, LA. AND VICINITY
 HIGH LEVEL PLAN
 DESIGN MEMORANDUM NO. 13, GENERAL DESIGN
 ORLEANS PARISH LAKEFRONT LEVEE
 WEST OF I.H.N.C.
RAMPS NO. 3 AND 4
 DETAILS
 U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
 CORPS OF ENGINEERS
 NOVEMBER 1984 FILE NO. H-2-29536



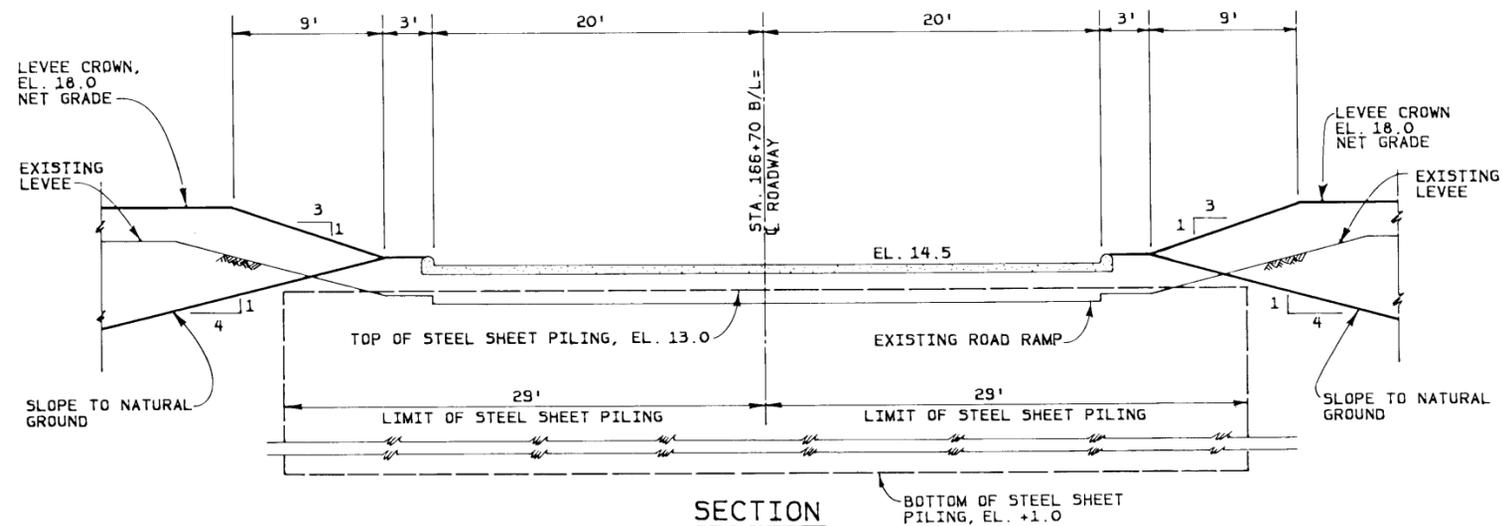
PROFILE

SCALE: HOR. 1" = 50'
VERT. 1" = 5'



PROFILE

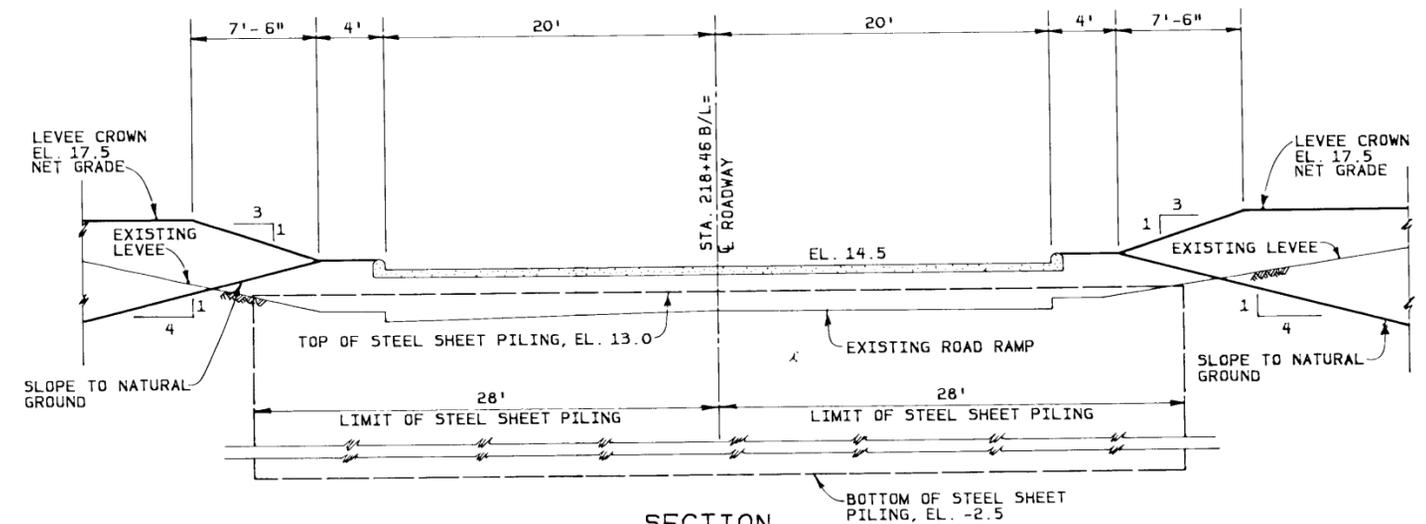
SCALE: HOR. 1" = 50'
VERT. 1" = 5'



SECTION

SCALE: 1" = 5'

RAMP NO. 5

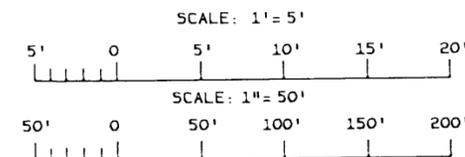


SECTION

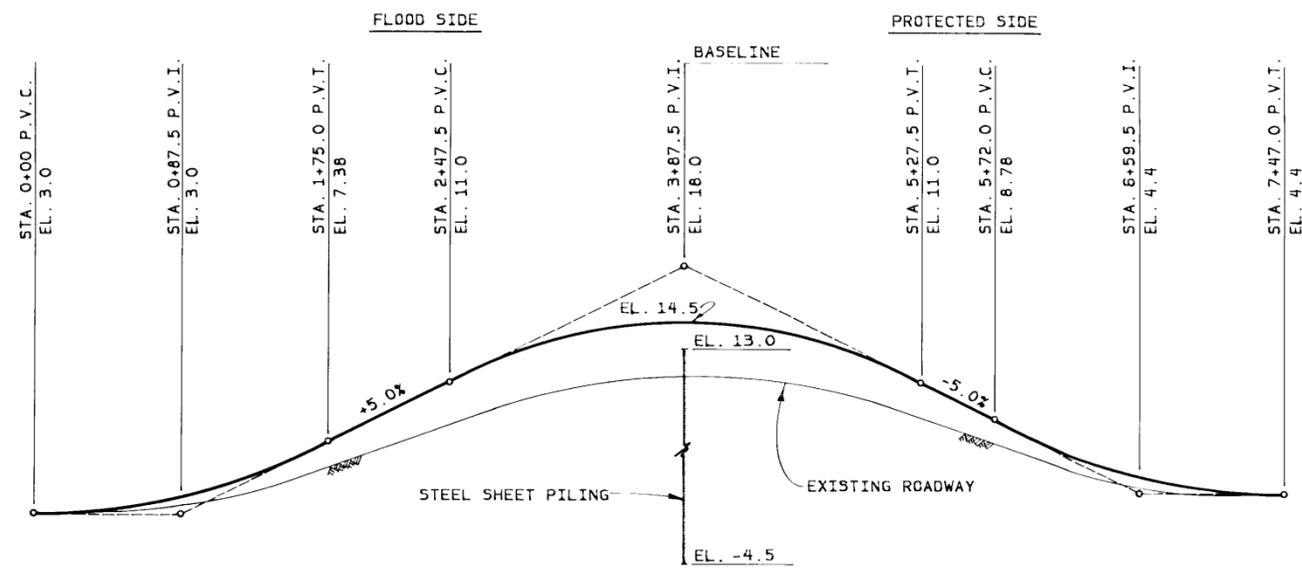
SCALE: 1" = 5'

RAMP NO. 6

NOTE:
RAMP ELEVATIONS SHOWN
ARE NET GRADES.

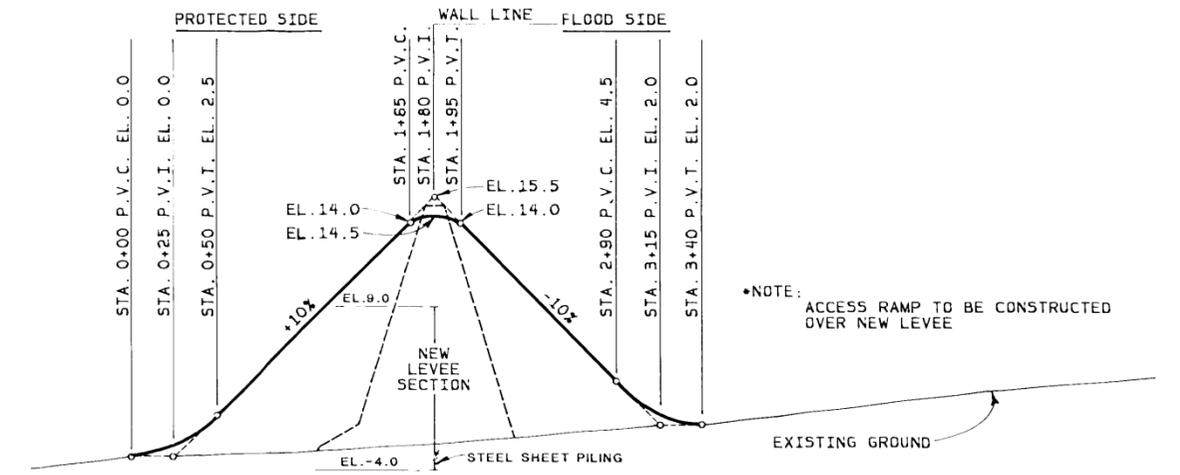


LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 13, GENERAL DESIGN
ORLEANS PARISH LAKEFRONT LEVEE
WEST OF I.H.N.C.
**RAMPS NO. 5 AND 6
DETAILS**
U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NOVEMBER 1984 FILE NO. H-2-29536



PROFILE

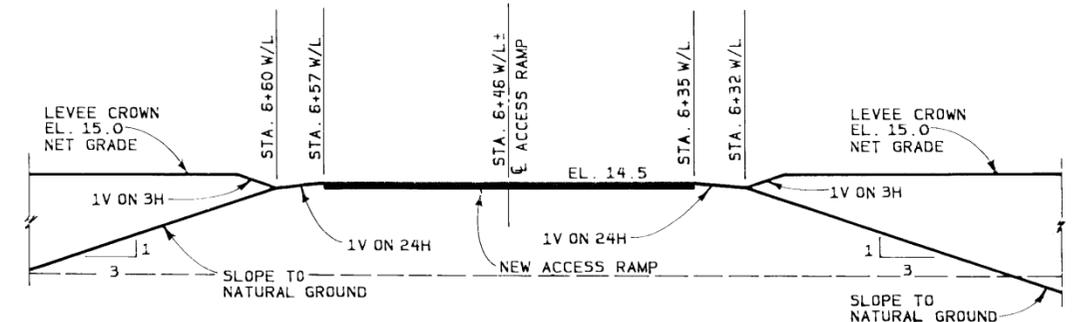
SCALE: HOR. 1" = 50'
VERT. 1" = 5'



PROFILE

SCALE: HOR. 1" = 50'
VERT. 1" = 5'

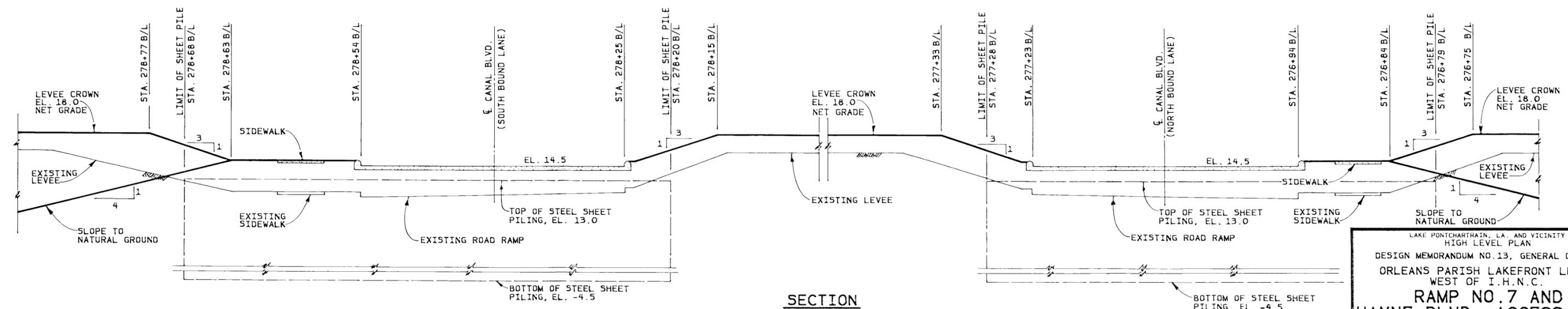
NOTE: RAMP ELEVATIONS SHOWN ARE NET GRADES.



SECTION

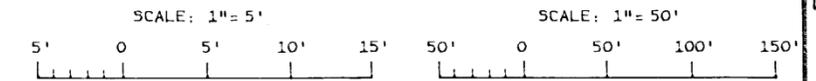
SCALE: 1" = 5'

HAYNE BLVD. ACCESS RAMP

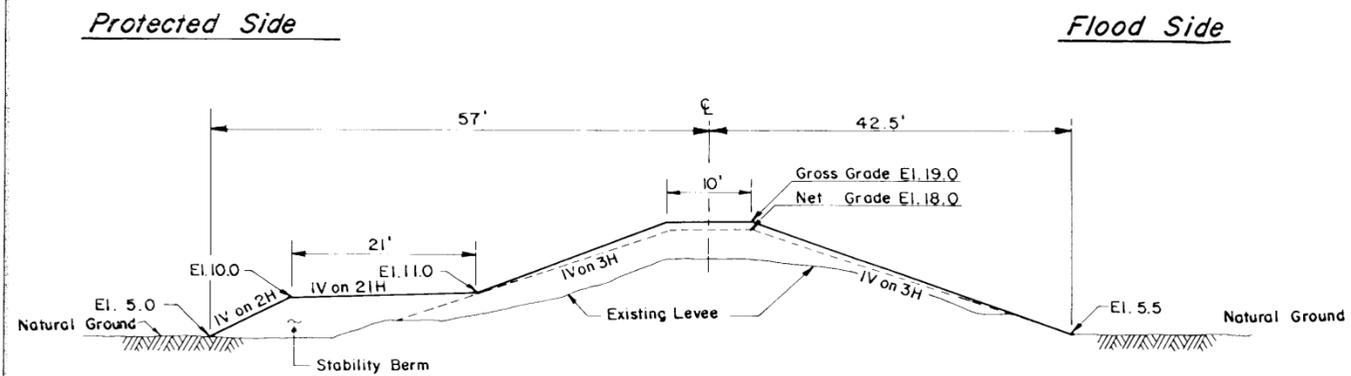


SECTION

SCALE: 1" = 5'
RAMP NO. 7



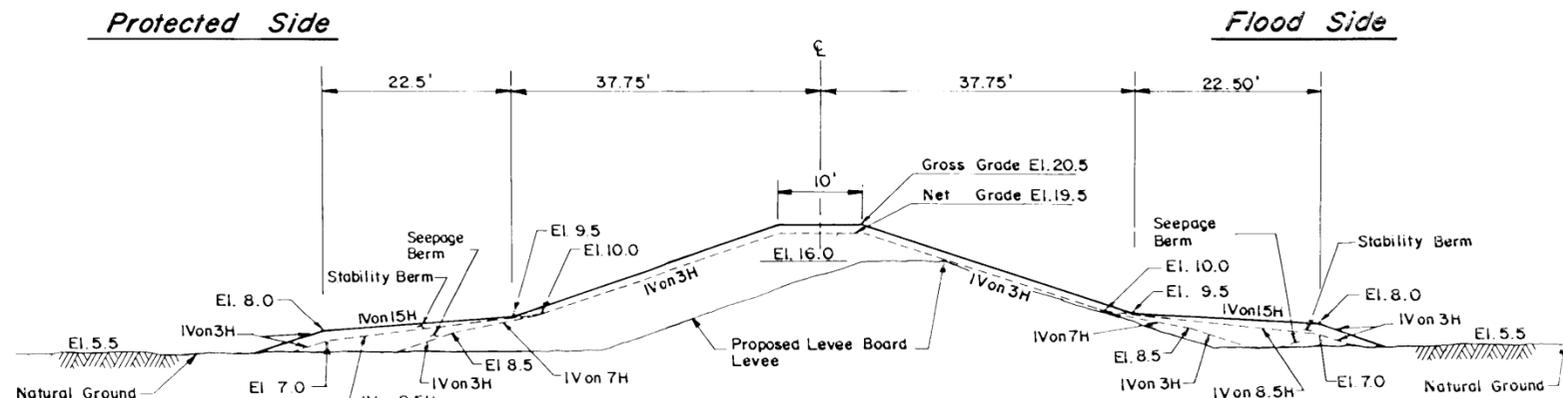
LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 13, GENERAL DESIGN
ORLEANS PARISH LAKEFRONT LEVEE
WEST OF I.H.N.C.
**RAMP NO. 7 AND
HAYNE BLVD. ACCESS RAMP
DETAILS**
U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
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SECTION 1

STA. 29 + 25.54 B/L TO STA. 39 + 15.00 B/L
 STA. 39 + 95.00 B/L TO STA. 42 + 10.00 B/L

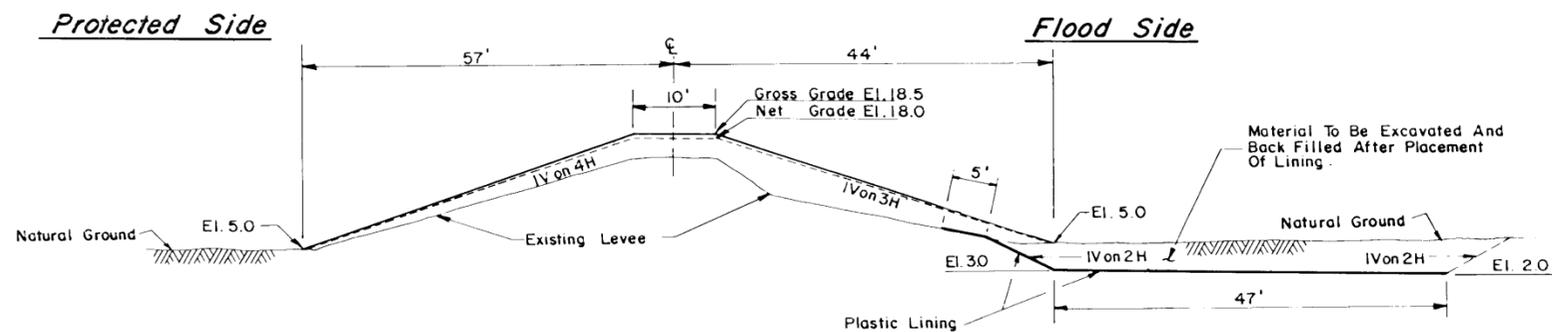
NOTE: STA. 39 + 15.00 B/L TO STA. 39 + 95.00 B/L (GATE 5)
 STA. 42 + 10.00 B/L TO STA. 42 + 60.00 B/L (RAMP 1)



SECTION 3

STA. 88 + 19.00 B/L TO STA. 91 + 50.00 B/L

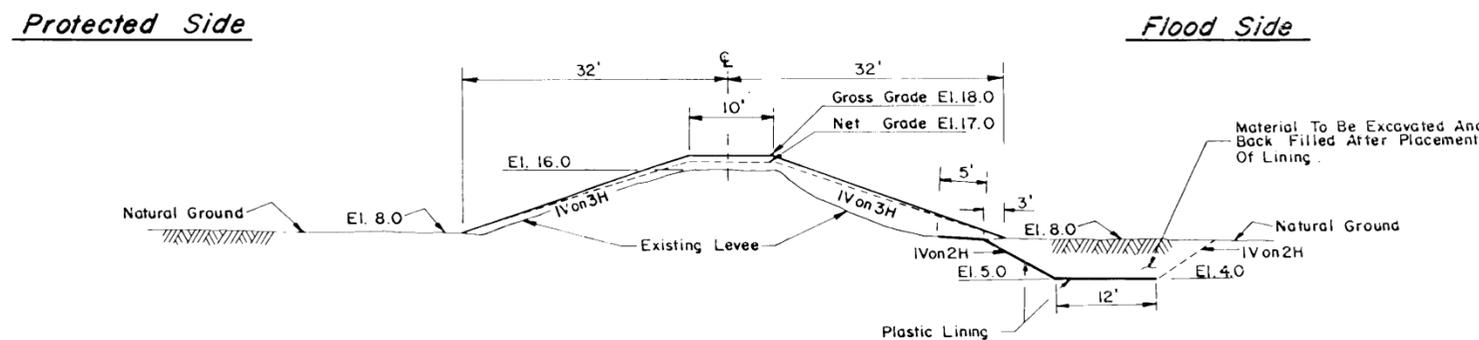
NOTE: STA. 91 + 50.00 B/L TO STA. 94 + 60.00 B/L (TRANSITION BETWEEN SECTIONS 3 AND 4)



SECTION 2

STA. 42 + 60.00 B/L TO STA. 78 + 55.24 B/L

NOTE: STA. 78 + 55.24 B/L TO STA. 88 + 19.00 B/L (RAMP 2 AND AMERICAN STANDARD FLOODWALL)

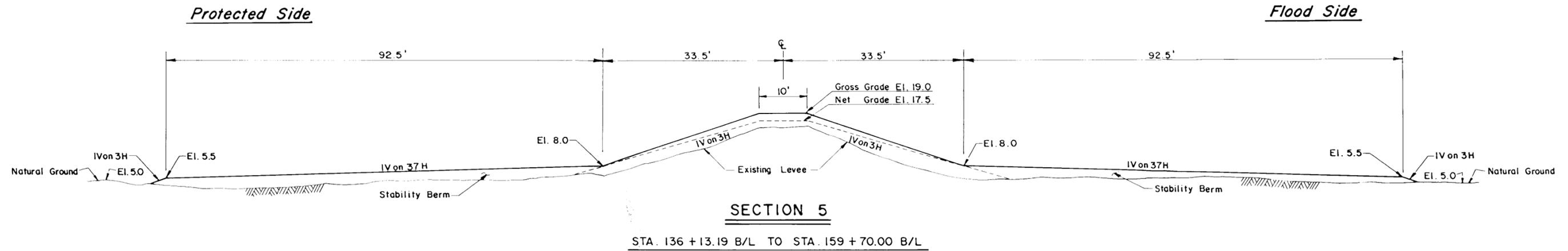


SECTION 4

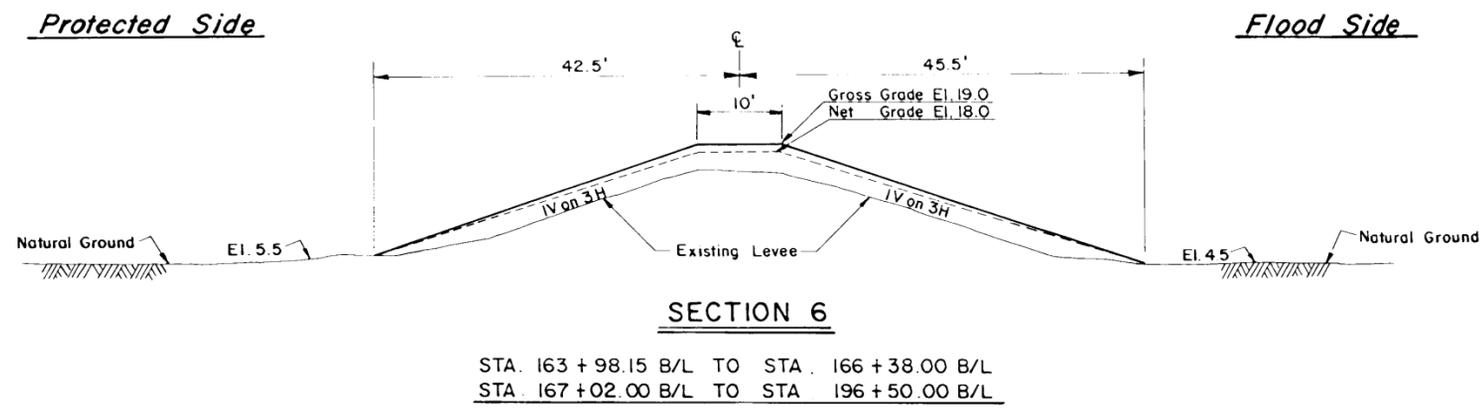
STA. 94 + 60.00 B/L TO STA. 102 + 23.16 B/L

NOTE: STA. 102 + 23.16 B/L TO STA. 136 + 13.19 B/L (PONTCHARTRAIN BEACH FLOODWALL, RAMPS 3 AND 4, AND GATES 6 AND 7)

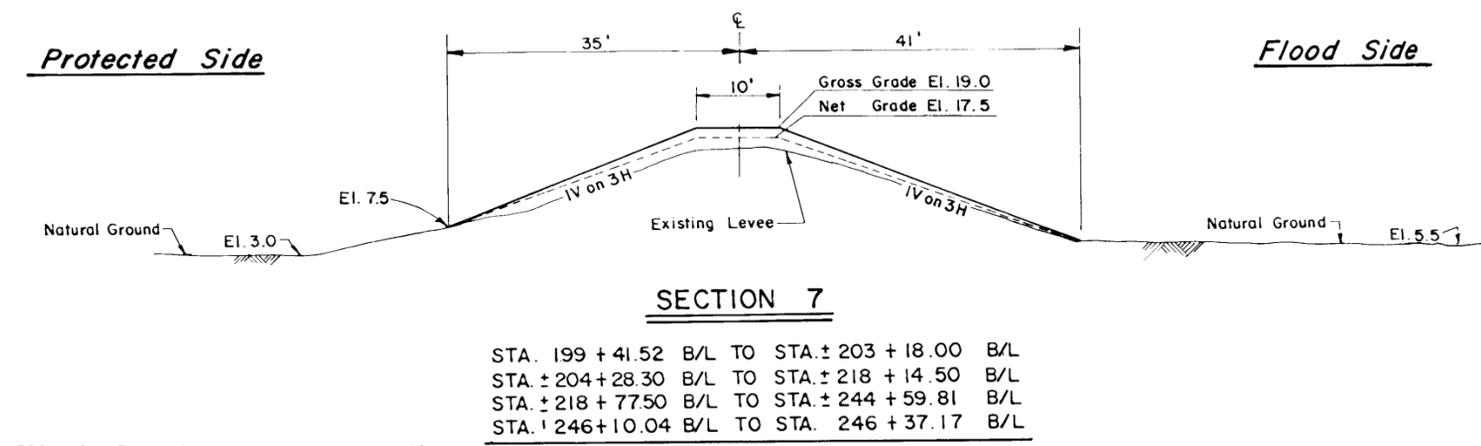
LAKE PONTCHARTRAIN, LA. AND VICINITY
 HIGH LEVEL PLAN
 DESIGN MEMORANDUM NO. 13, GENERAL DESIGN
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NOTE: STA. 159 + 70.00 B/L TO STA. 163 + 98.15 (TRANSITION TO AND FROM LONDON AVE. OUTFALL CANAL LEVEE)



NOTES: STA. 166 + 38.00 B/L TO STA. 167 + 02.00 B/L (RAMP 5)
STA. 196 + 50.00 B/L TO STA. 199 + 41.52 B/L (TRANSITION TO AND FROM BAYOU ST. JOHN LEVEES)



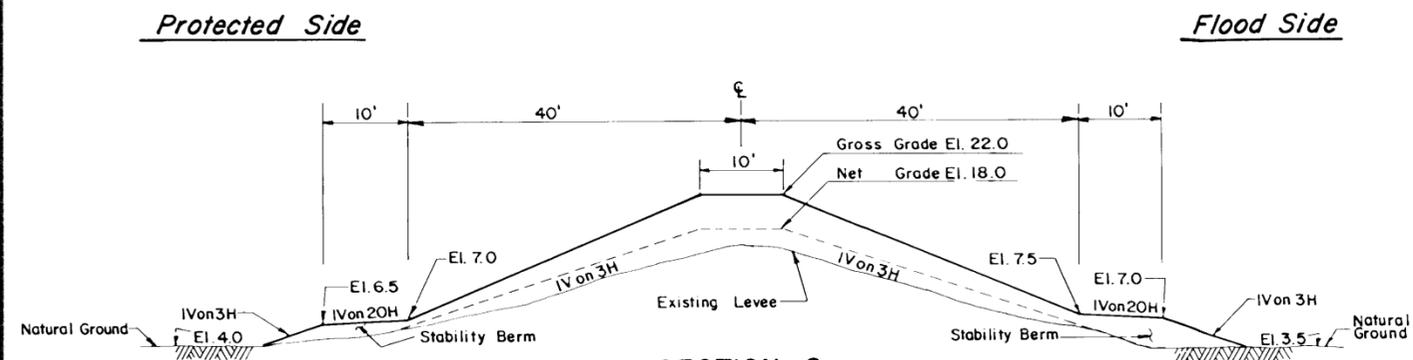
NOTES: STA. 203 + 18.00 B/L TO STA. 204 + 28.30 B/L (GATE 8)
STA. 218 + 14.50 B/L TO STA. 218 + 77.50 B/L (RAMP 6)
STA. 244 + 59.81 B/L TO STA. 246 + 10.04 B/L (GATE 9)
STA. 246 + 37.17 B/L TO STA. 250 + 72.09 B/L (TRANSITION TO AND FROM ORLEANS OUTFALL CANAL LEVEE)

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TYPICAL LEVEE SECTIONS

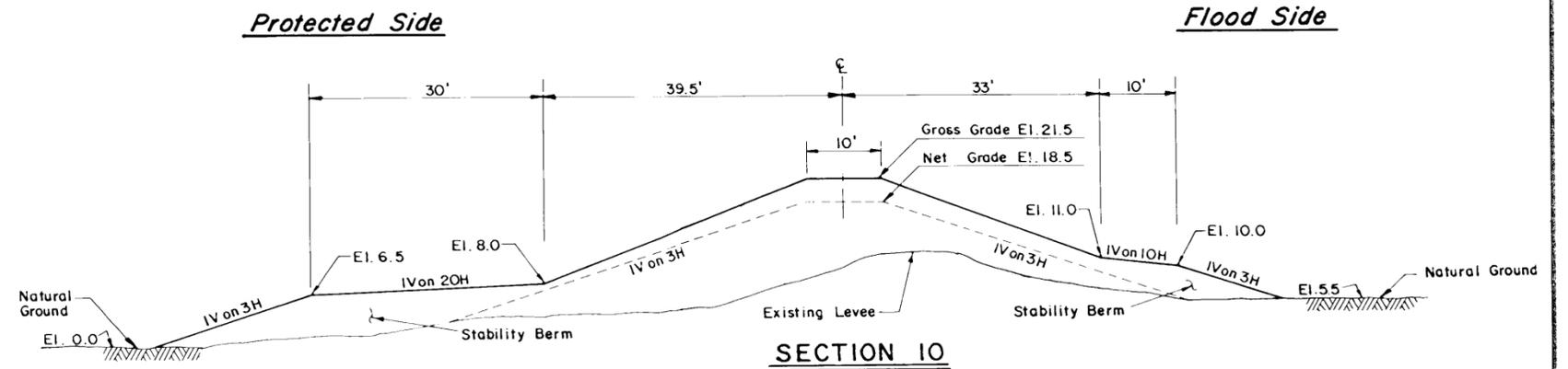
U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
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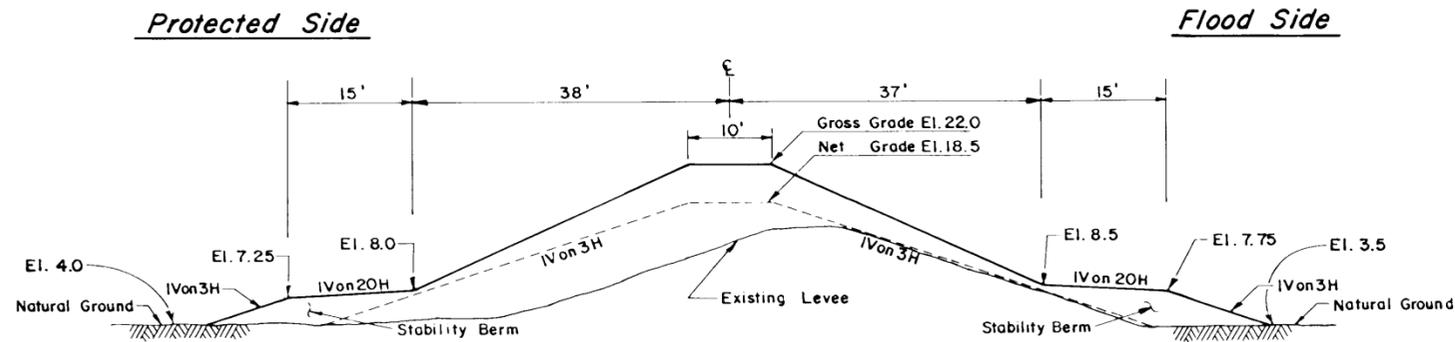
SECTION 8
 STA. 250 + 72.09 B/L TO STA. 276 + 75.00 B/L
 STA. 277 + 33.00 B/L TO STA. 278 + 15.00 B/L
 STA. 278 + 77.00 B/L TO STA. 288 + 49.00 B/L

NOTES: STA. 276 + 75.00 B/L TO STA. 277 + 33.00 B/L (RAMP 7)
 STA. 278 + 15.00 B/L TO STA. 278 + 77.00 B/L (RAMP 7)
 STA. 288 + 49.00 B/L TO STA. 289 + 49.00 B/L (TRANSITION BETWEEN SECTIONS 8 AND 9)



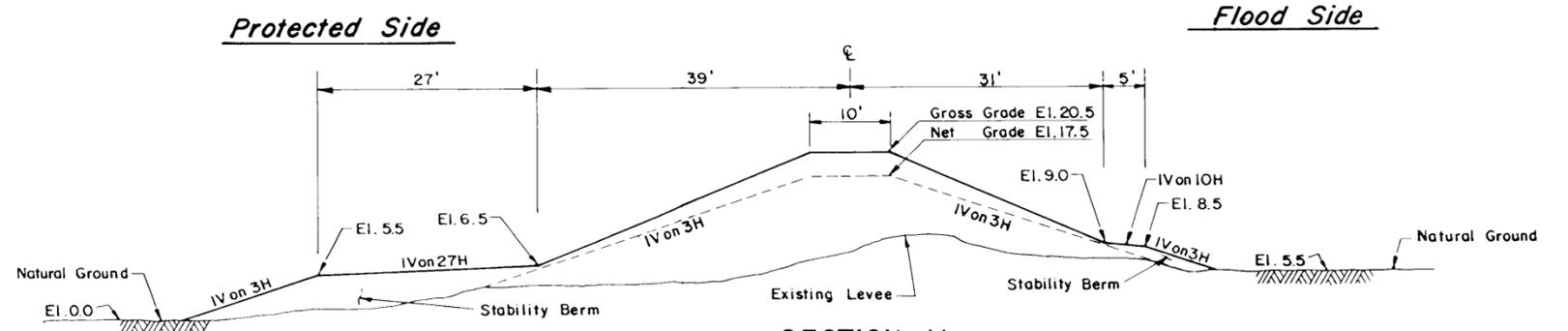
SECTION 10
 STA. 305 + 41.96 B/L TO STA. 305 + 46.96 B/L

NOTE: (1) STA. 305 + 41.96 B/L TO STA. 306 + 98.04 B/L (GATE 10)
 (2) EMBEDMENT OF 5' OF FLOODWALL IS NOT SHOWN FOR CLARITY IN SECTION 10; SEE PLATE 18 FOR FLOODWALL DETAIL



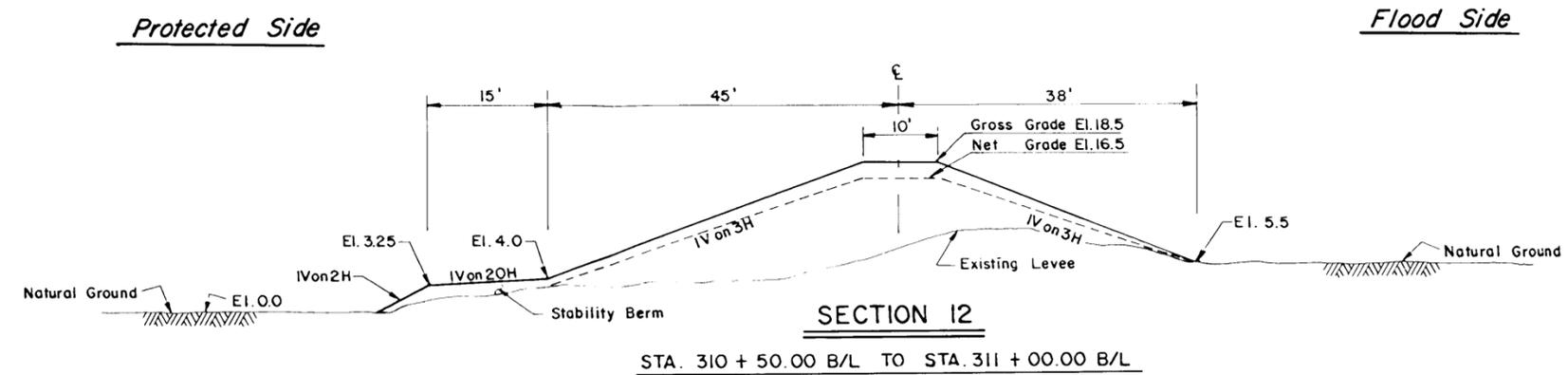
SECTION 9
 STA. 289 + 49.00 B/L TO STA. 303 + 51.39 B/L
 NOT TO SCALE

NOTE: Gross grade transition from Sta. 303+51.39 B/L to Sta. 305+41.96 B/L

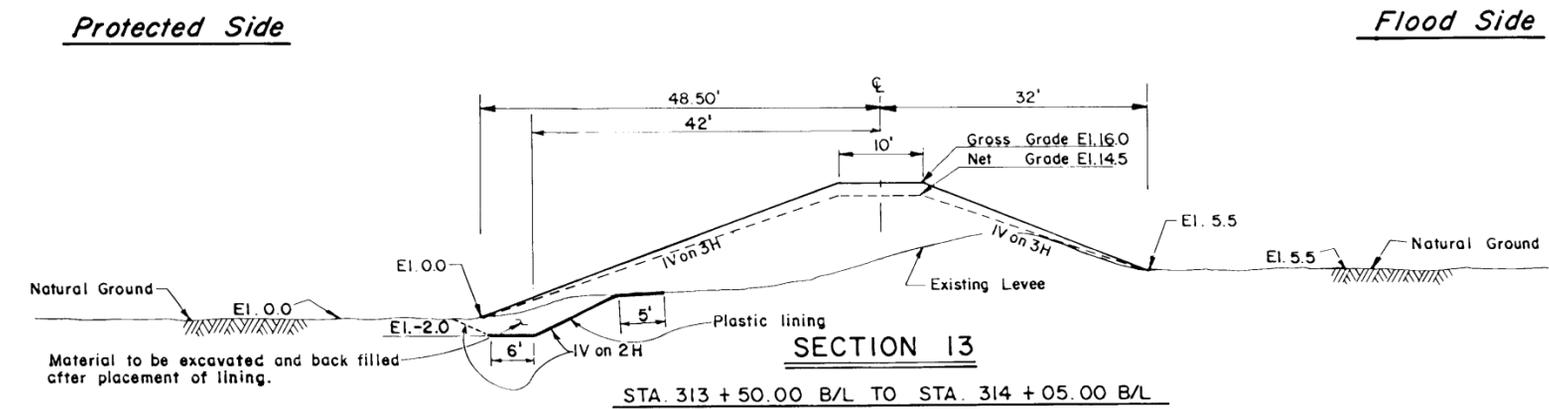


SECTION 11
 STA. 306 + 98.04 B/L TO STA. 308 + 50.00 B/L
 STA. 308 + 50.00 B/L TO STA. 310 + 50.00 B/L (TRANSITION BETWEEN SECTIONS 11 AND 12)

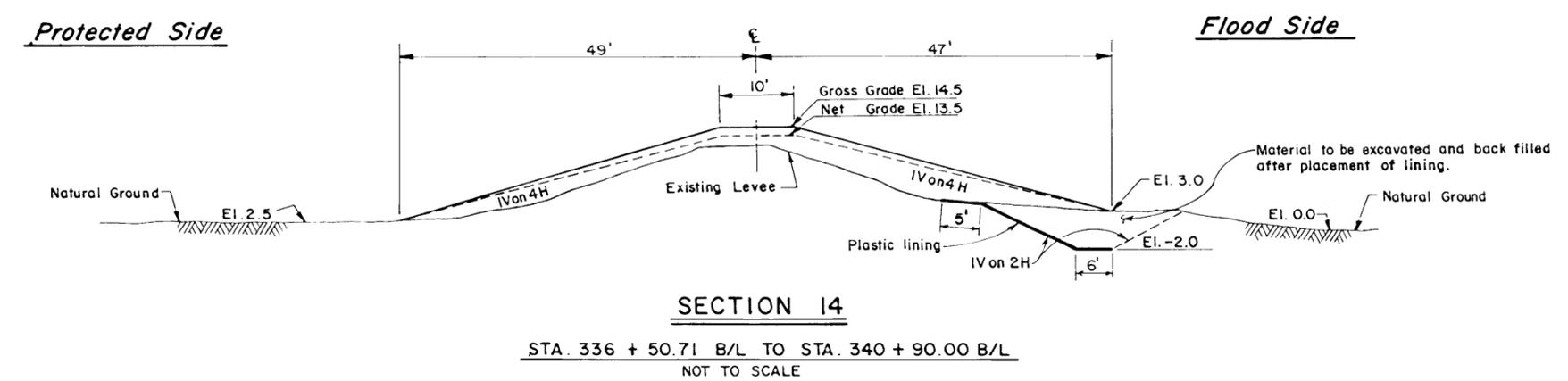
LAKE PONTCHARTRAIN, LA. AND VICINITY
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 DESIGN MEMORANDUM NO. 13, GENERAL DESIGN
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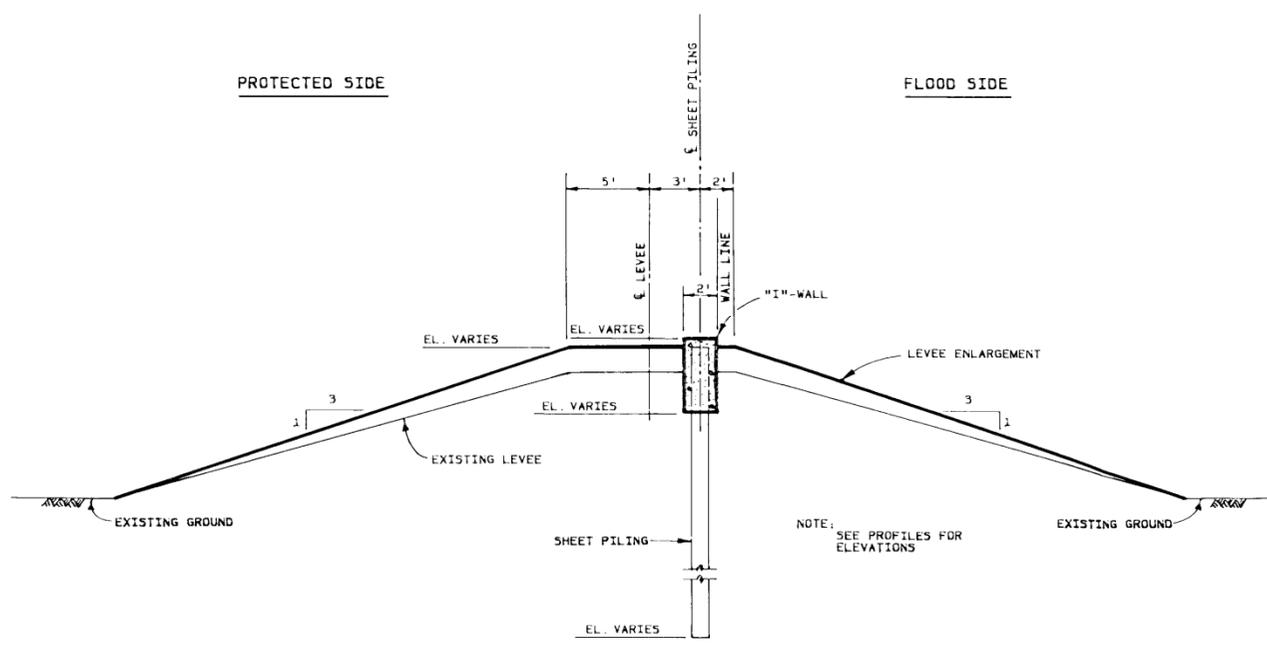
NOTE: STA. 311 + 00.00 B/L TO STA. 313 + 50.00 B/L (TRANSITION BETWEEN SECTIONS 12 AND 13)



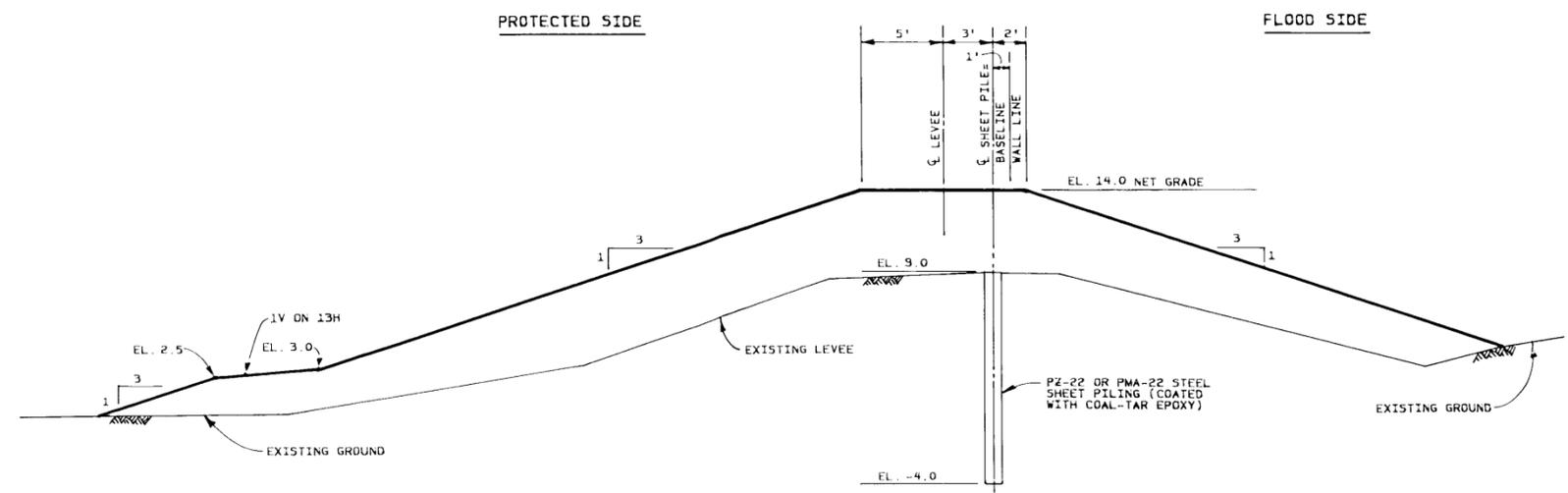
STA. 314 + 05.00 B/L TO STA. 322 + 80.99 B/L (WEST END FLOODWALL AND GATES 11 AND 12)



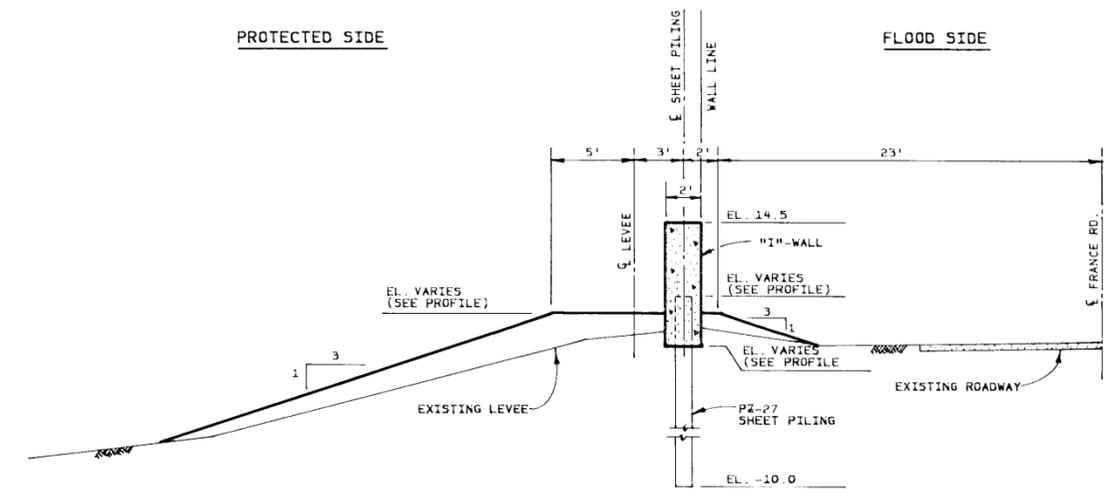
LAKE PONTCHARTRAIN, LA. AND VICINITY
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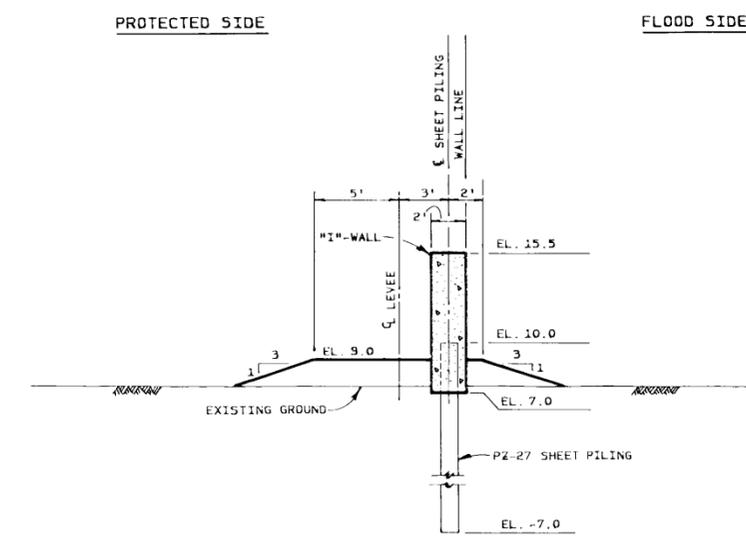
**TYPICAL SECTION
TRANSITION
"I"-WALL AND LEVEE ENLARGEMENT**



VICINITY STA. 5+00 W/L



STA. 0+00 W/L - STA. 1+10.07 W/L

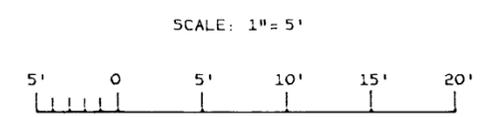


VICINITY STA. 8+25 W/L

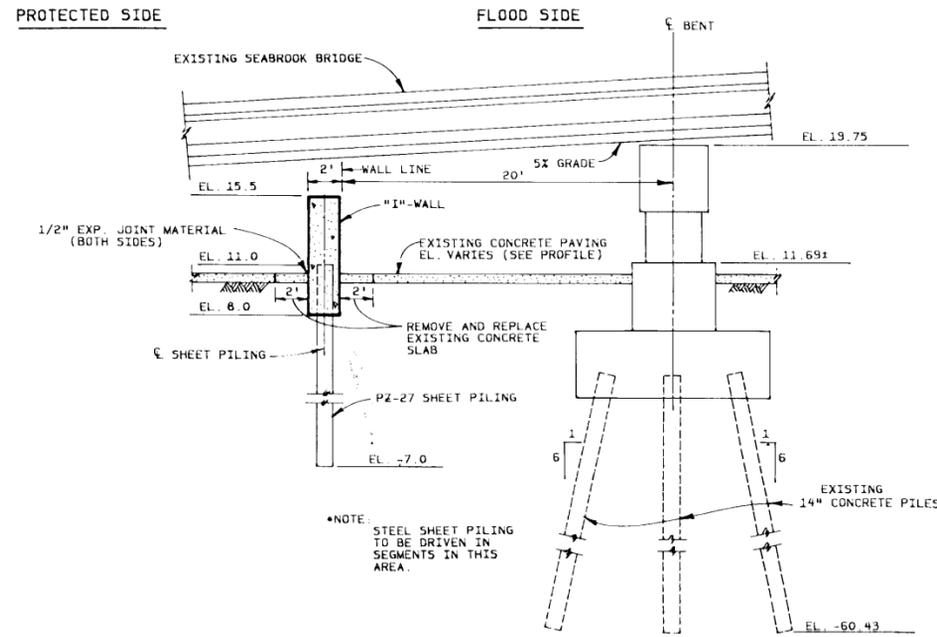
NOTE:
FOR TYPICAL LEVEE SECTION FROM
STA. 6+36 W/L TO STA. 7+02.87 W/L
SEE PLATE 104.

**FLOODWALL
DESIGN SECTIONS**

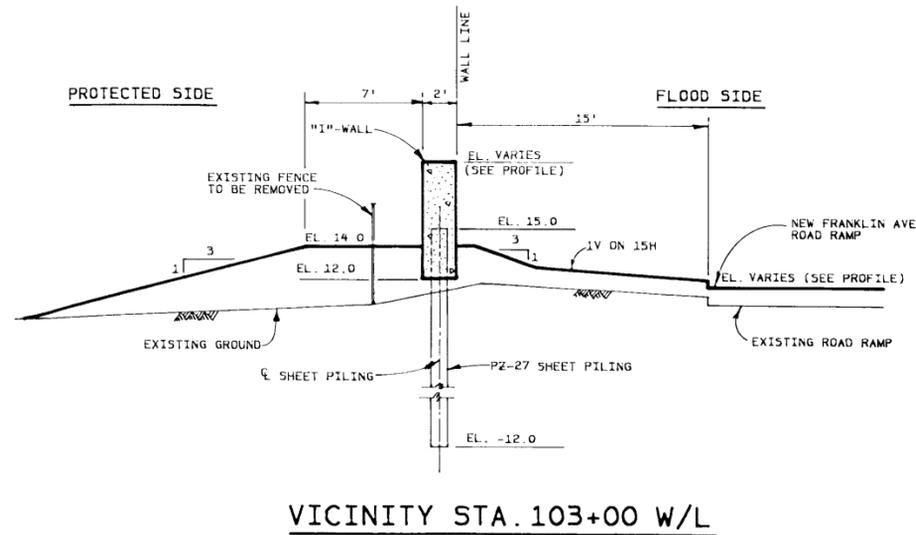
SCALE: 1" = 5'



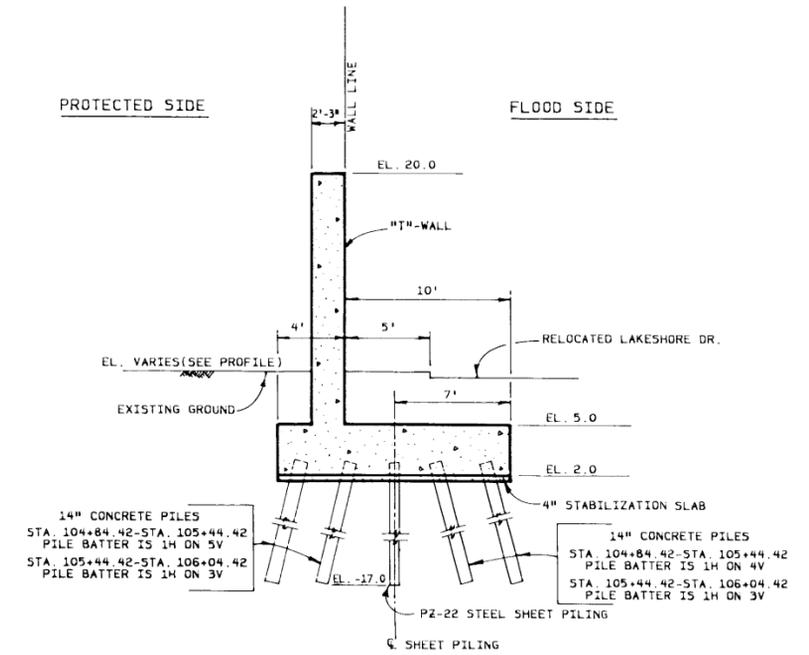
LAKE PONTCHARTRAIN, LA. AND VICINITY
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DESIGN MEMORANDUM NO. 13, GENERAL DESIGN
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WEST OF I.H.N.C.
FLOODWALL DESIGN SECTIONS
STA. 0+00 W/L - VIC. STA. 8+25 W/L
U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
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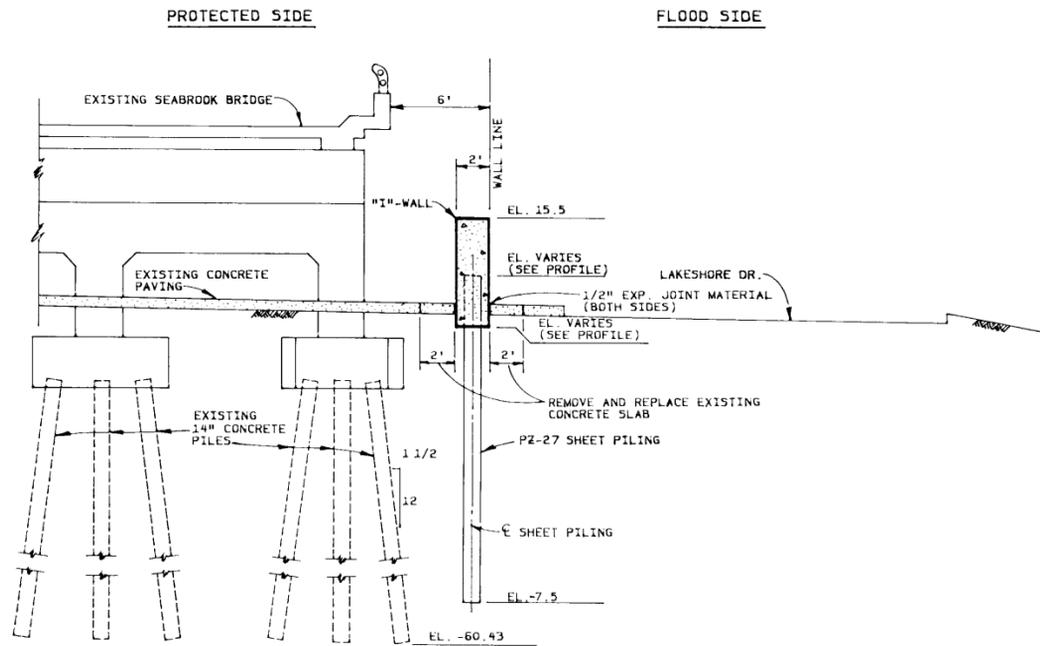
STA. 8+95.48 W/L-STA. 9+88.10 W/L



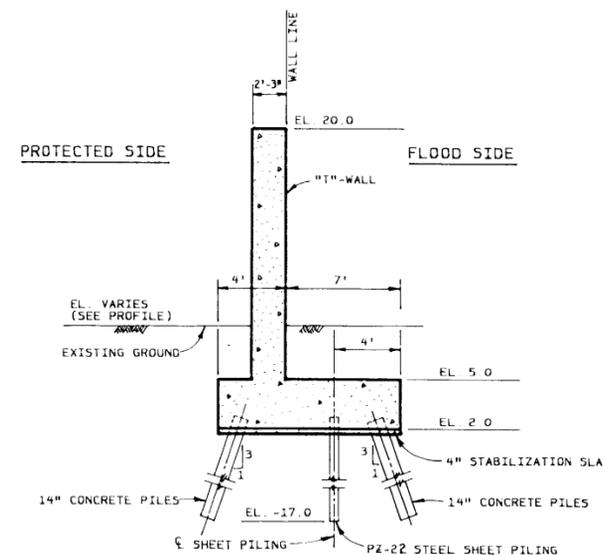
VICINITY STA. 103+00 W/L



STA. 104+84.42 W/L-STA. 106+04.42 W/L



VICINITY STA. 11+00 W/L

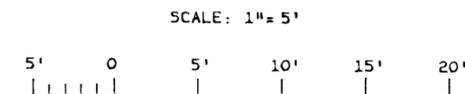


VICINITY STA. 104+00 W/L AND STA. 107+00 W/L

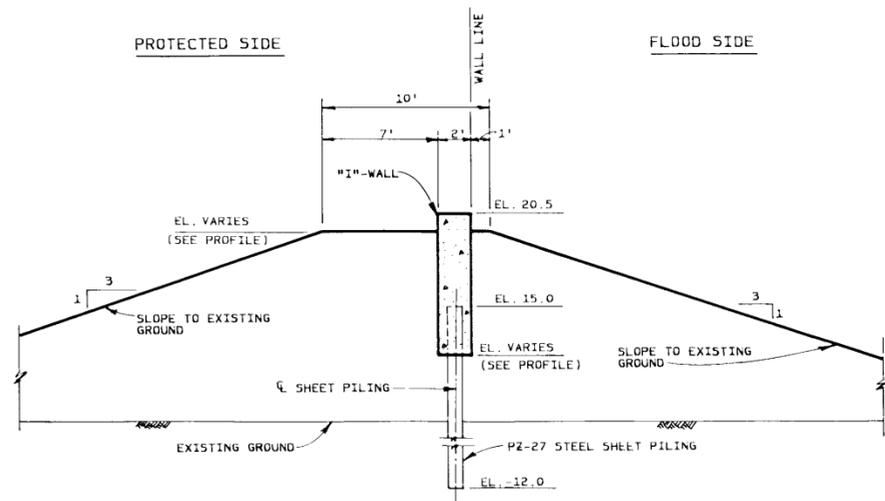
NOTE:
FOR TYPICAL LEVEE SECTIONS FROM
STA. 14+31.42 W/L TO STA. 15+85.23 W/L,
SEE PLATES 106 AND 107.

**FLOODWALL
DESIGN SECTIONS**

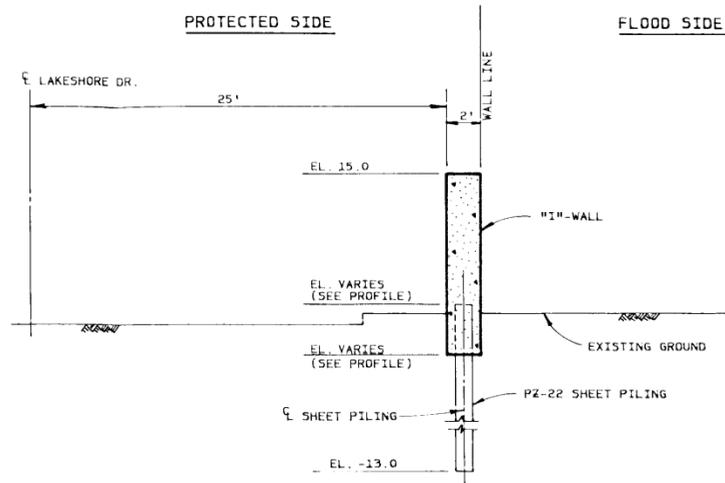
SCALE: 1" = 5'



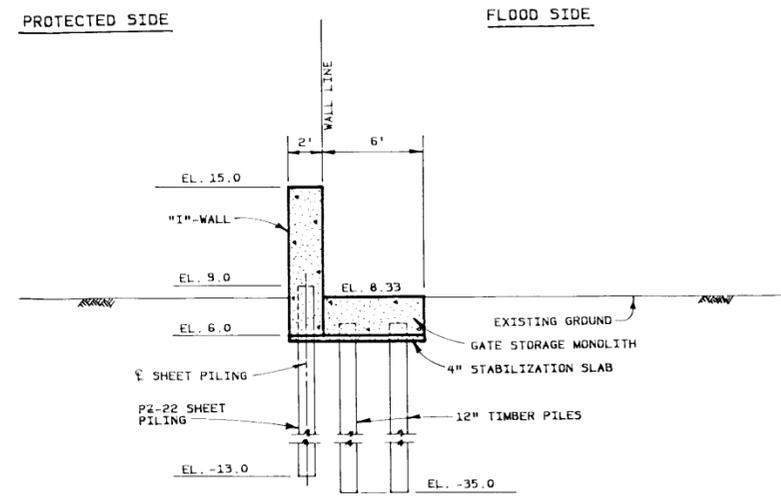
LAKE PONTCHARTRAIN, LA. AND VICINITY
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STA. 8+95.48 W/L-STA. 106+04.42 W/L
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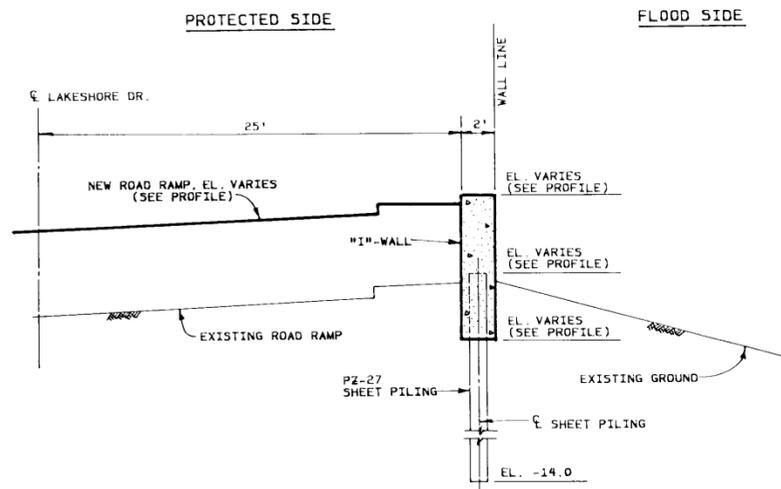
STA. 109+44.40 W/L-STA. 109+68.40 W/L



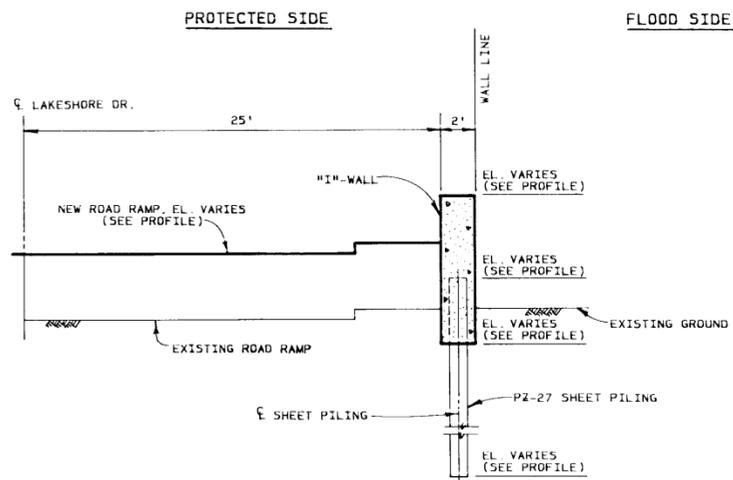
STA. 204+58± W/L-STA. 232+50± W/L



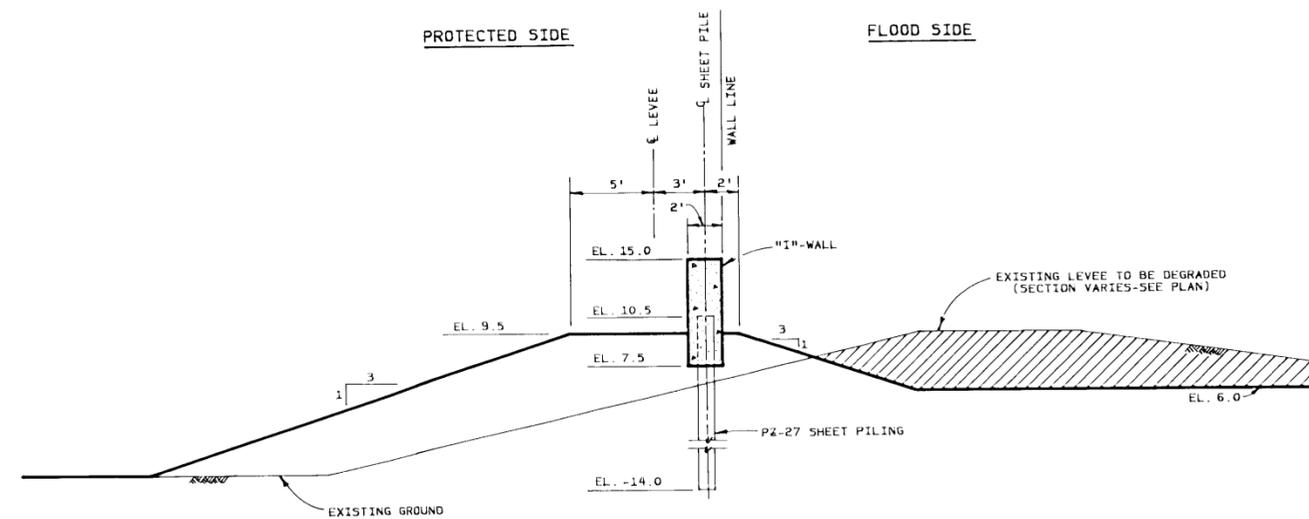
VICINITY STA. 218+50 W/L AND STA. 219+50 W/L



STA. 200+67.41 W/L-STA. 204+58± W/L



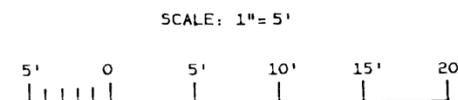
STA. 232+50± W/L-STA. 235+76.51 W/L



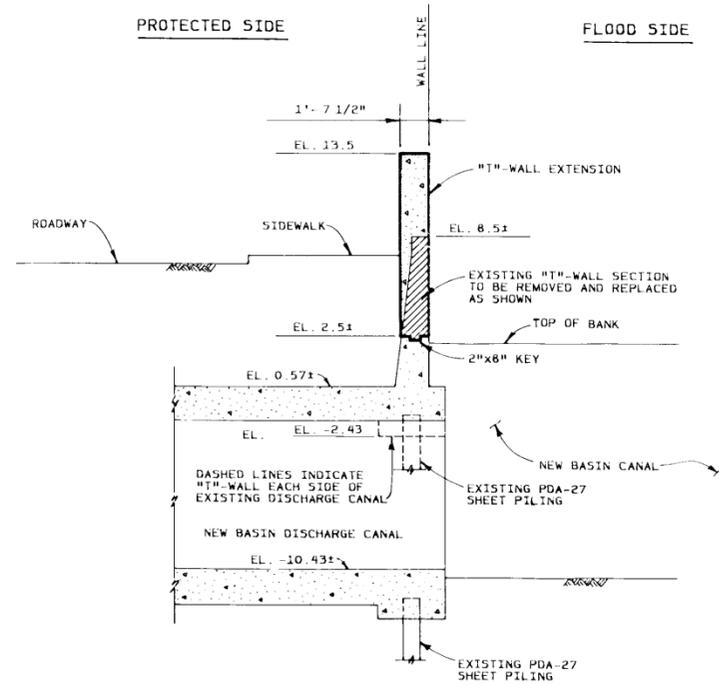
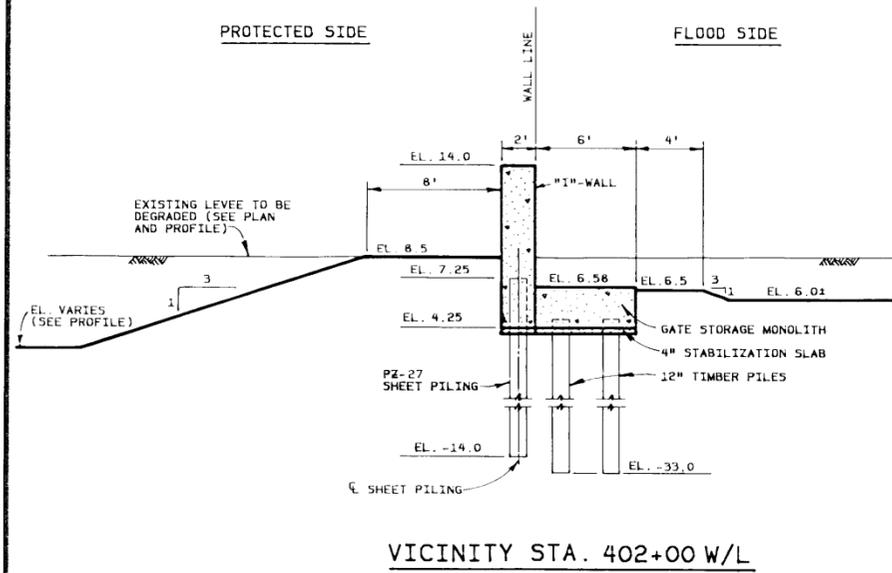
STA. 400+25± W/L-STA. 401+13± W/L

**FLOODWALL
DESIGN SECTIONS**

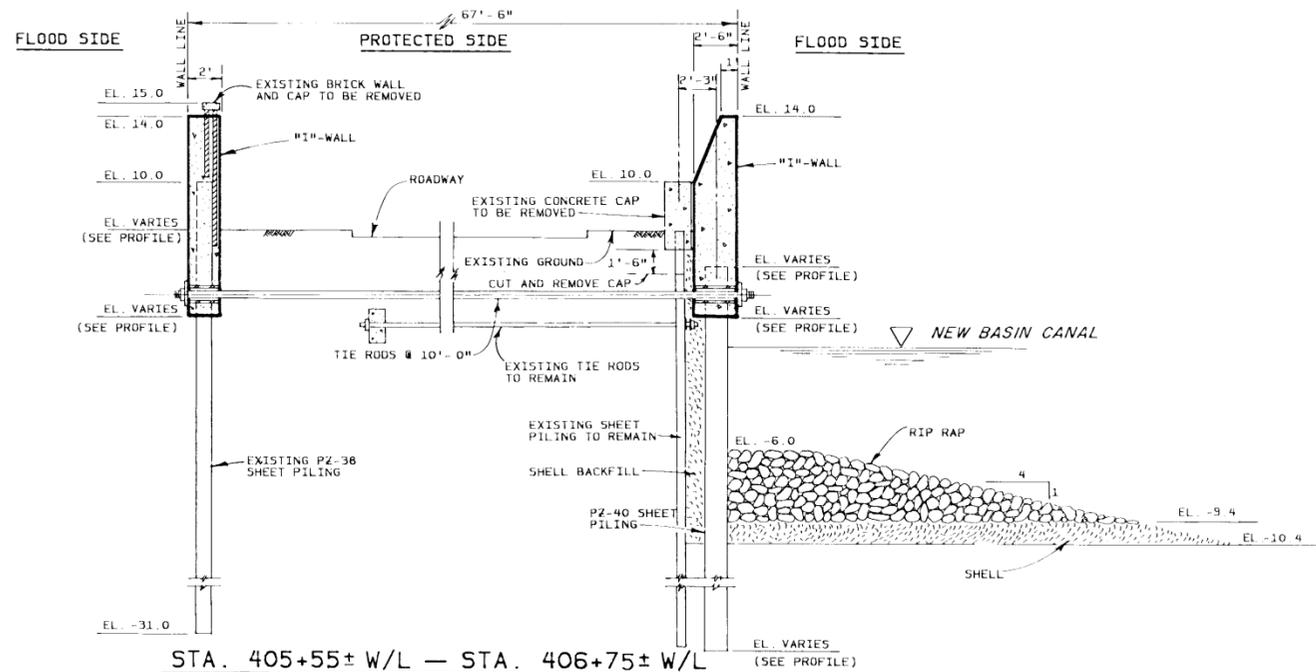
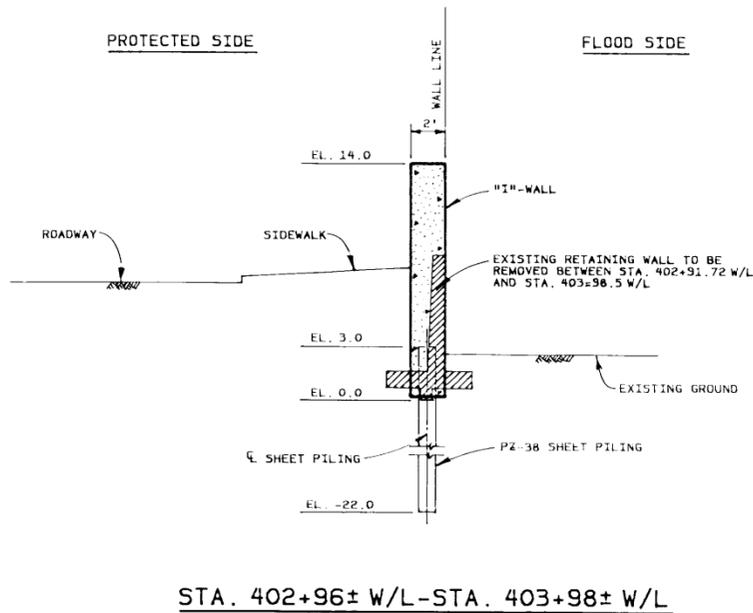
SCALE: 1" = 5'



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STA. 109+44.90 W/L-STA. 401+13± W/L
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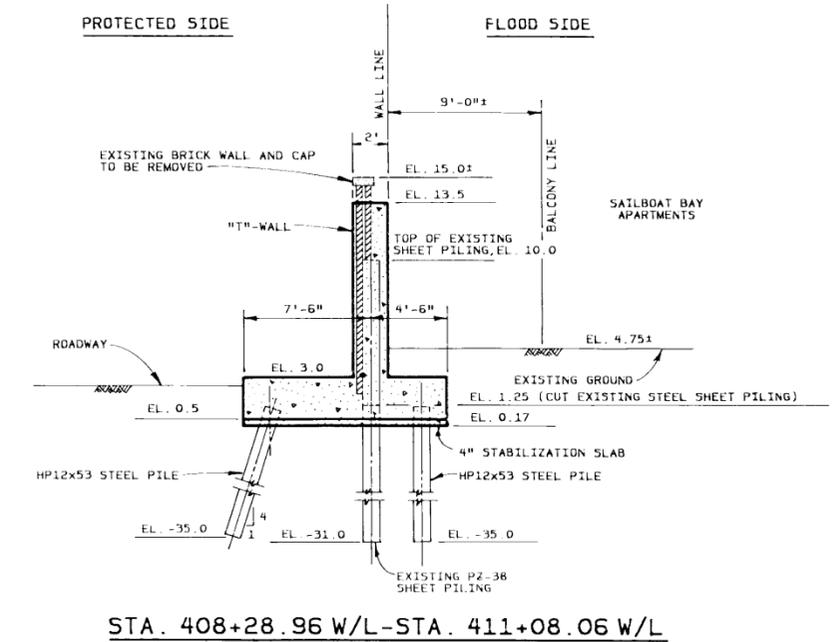
STA. 404+16.06 W/L-STA. 405+55.96 W/L



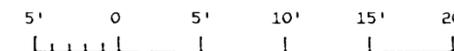
AND
STA. 407+42± W/L-STA. 408+29± W/L

**FLOODWALL
DESIGN SECTIONS**

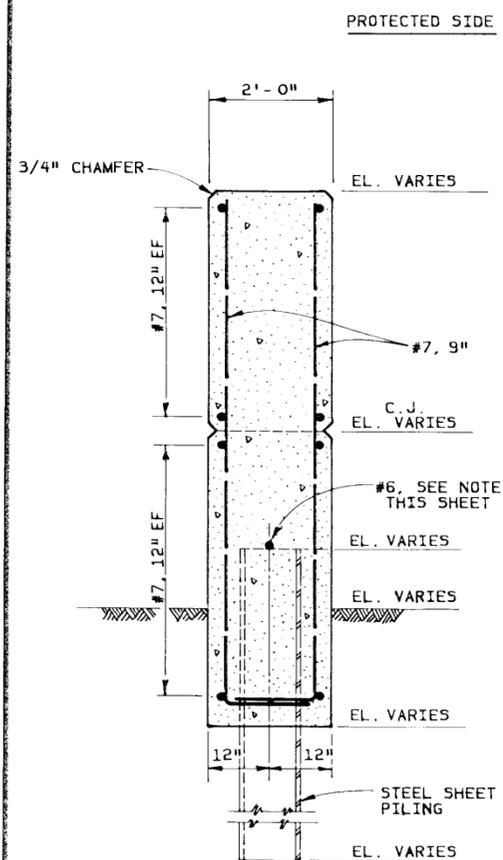
SCALE: 1" = 5'



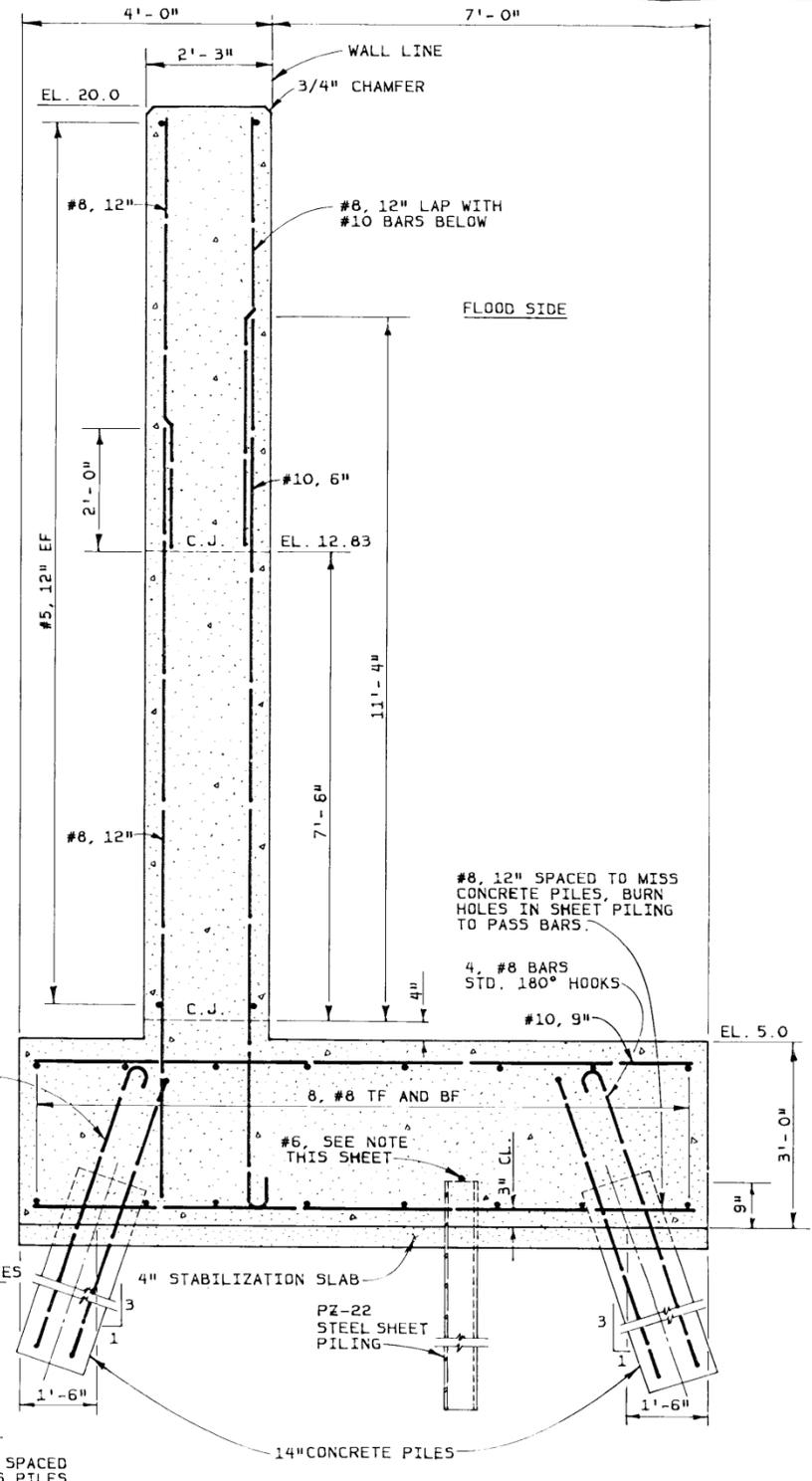
SCALE: 1" = 5'



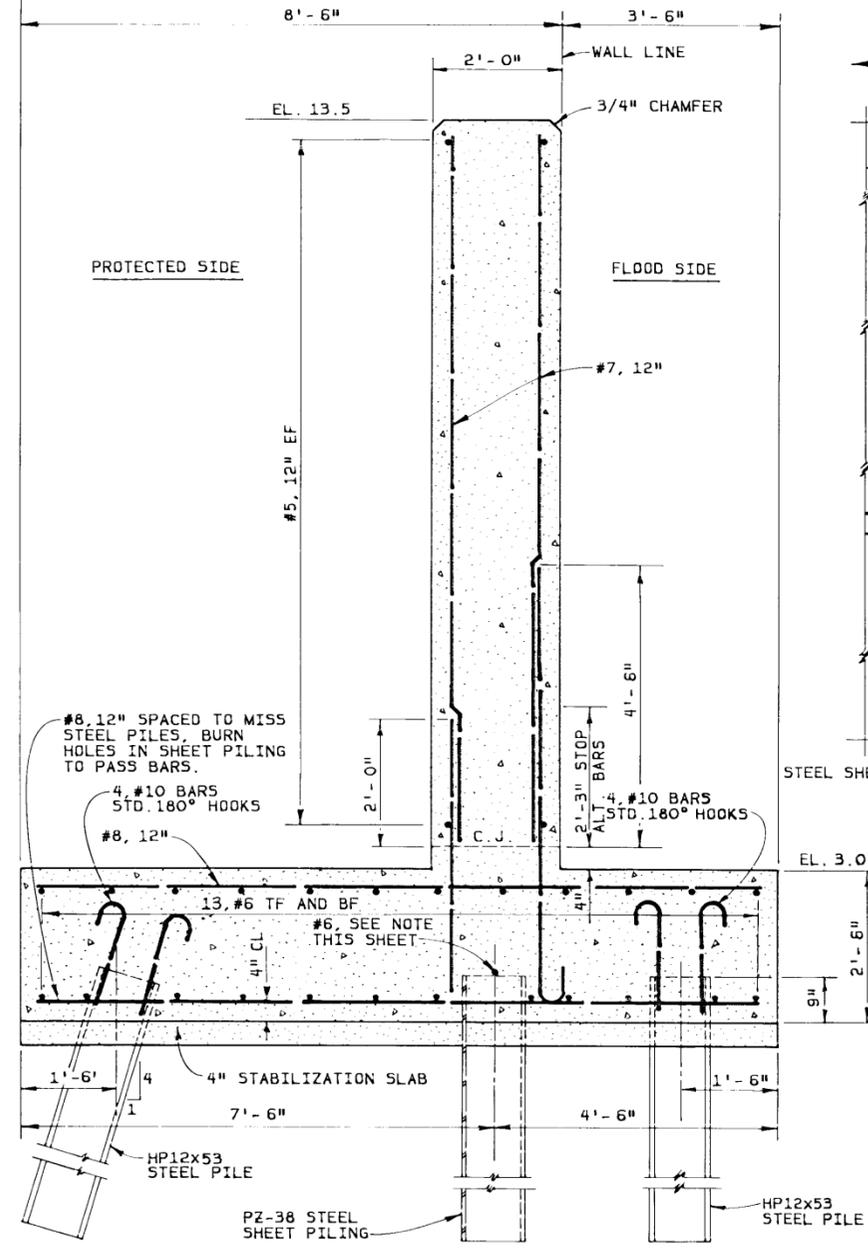
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VIC. STA. 402+00W/L-STA. 411+08.06W/L
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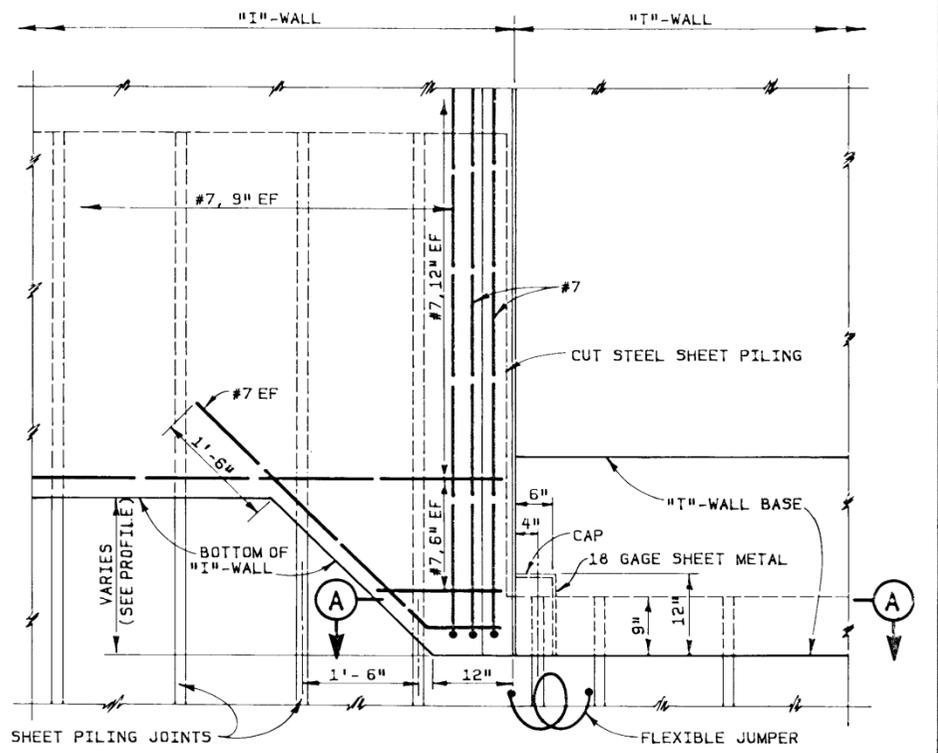
TYPICAL "I"-WALL SECTION
SCALE: 3/4" = 1'-0"



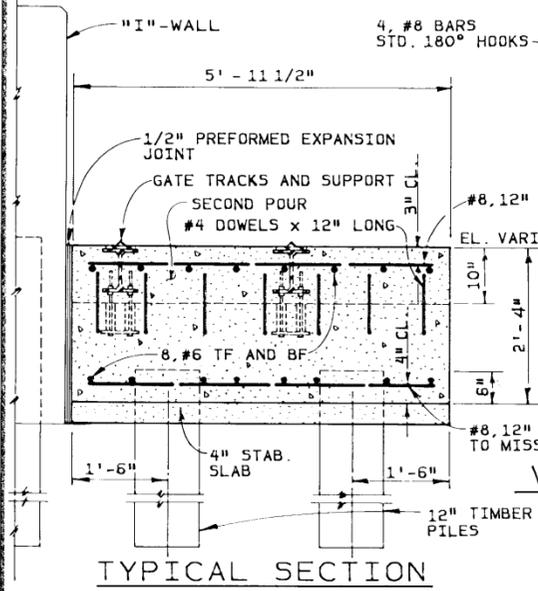
VICINITY STA. 104+00.00 & STA. 107+00.00
TYPICAL "T"-WALL SECTION
SCALE: 3/4" = 1'-0"



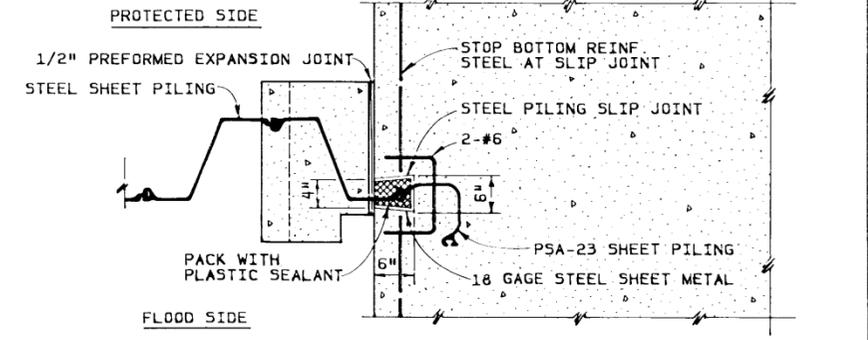
STA. 408+28.96 W/L - STA. 411+08.06 W/L
TYPICAL "T"-WALL SECTION
SCALE: 3/4" = 1'-0"



ELEVATION
TYPICAL DETAIL FOR TRANSITION
"I"-WALL TO "T"-WALL AT BASE
SCALE: 1" = 1'-0"

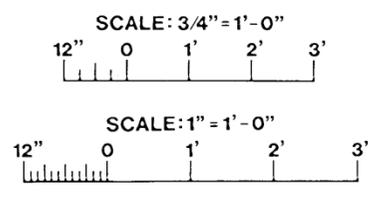


TYPICAL SECTION
STORAGE MONOLITHS
BOTTOM ROLLER GATES
SCALE: 3/4" = 1'-0"

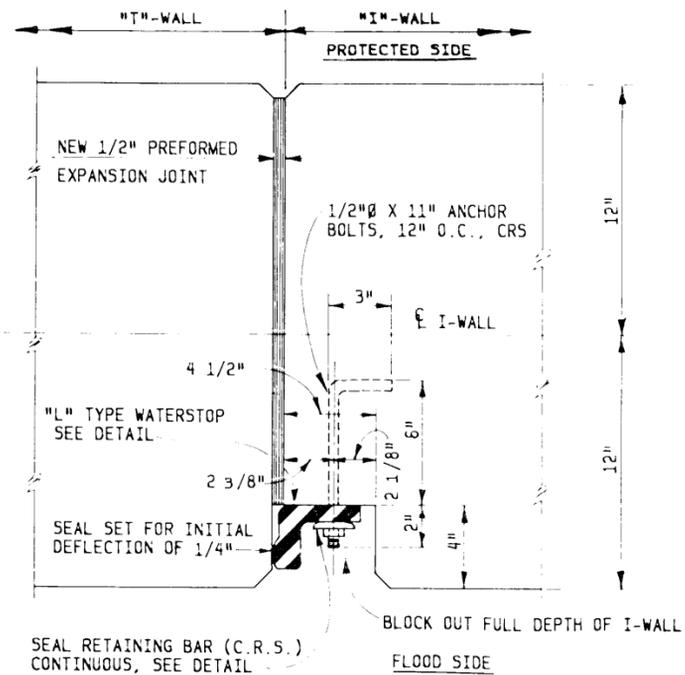


SECTION A
SCALE: 1" = 1'-0"

NOTES:
WELD A NO. 6 REINFORCING ROD TO THE TOP OF EACH STEEL SHEET PILE. INSTALL FLEXIBLE JUMPER AT ALL MONOLITH JOINTS. JUMPERS SHALL BE NO. 1/0 A.W.G. COPPER INSULATED WITH CROSS LINKED POLYETHYLENE IN AN 8" DIA. LOOP. JUMPER SHALL BE WELDED TO ADJACENT STEEL SHEET PILES 3 INCHES BELOW BOTTOM OF CONCRETE CAP. WELDED CONNECTIONS SHALL BE COATED WITH SPLICING EPOXY TO OBTAIN A MOISTURE PROOF CONNECTION.
HOLES CUT IN SHEET PILING SHALL NOT EXCEED 2" Ø AND SHALL MISS INTERLOCKS.

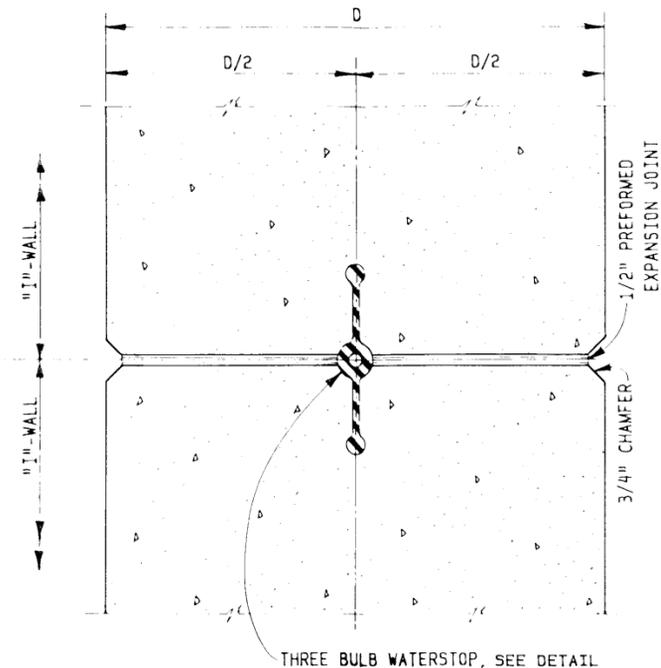


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WEST OF I.H.N.C.
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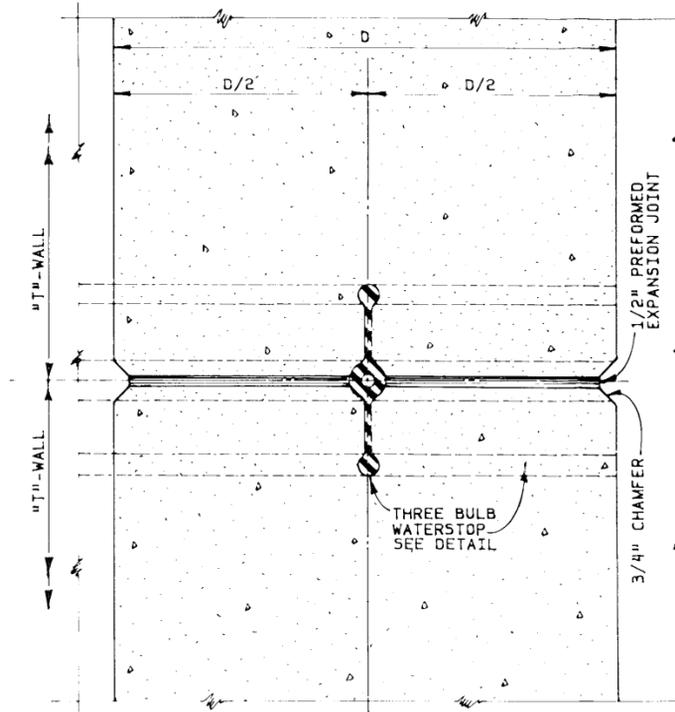
PLAN

SCALE: 3" = 1' - 0"



SECTION A

SCALE: 3" = 1' - 0"

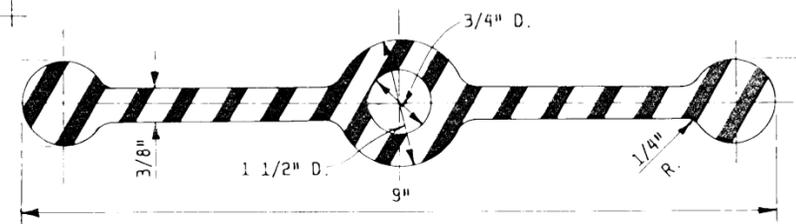


SECTION B

SCALE: 3" = 1' - 0"

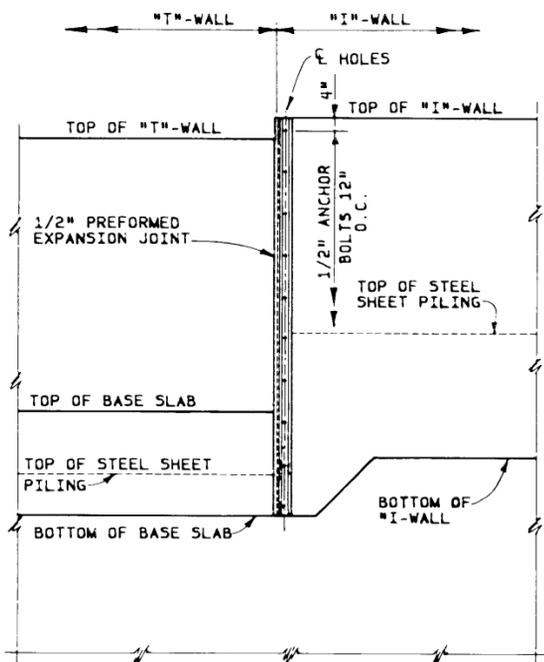
"L" TYPE WATERSTOP

SCALE: FULL SIZE



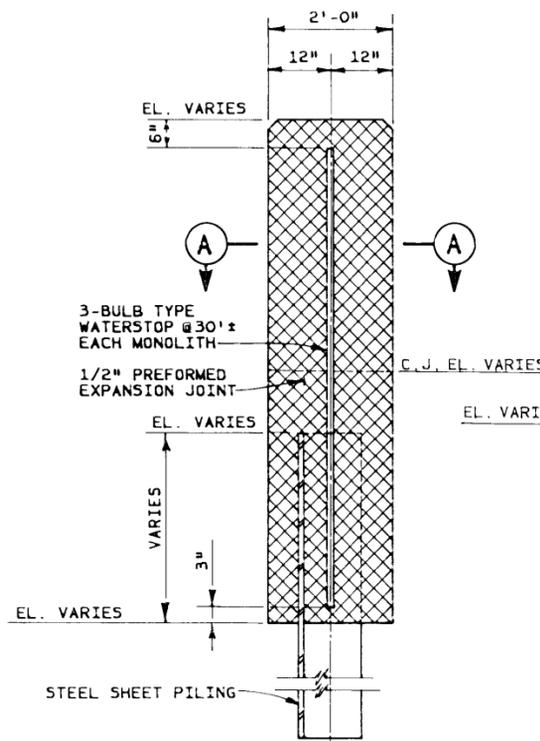
THREE BULB WATERSTOP

SCALE: FULL SIZE



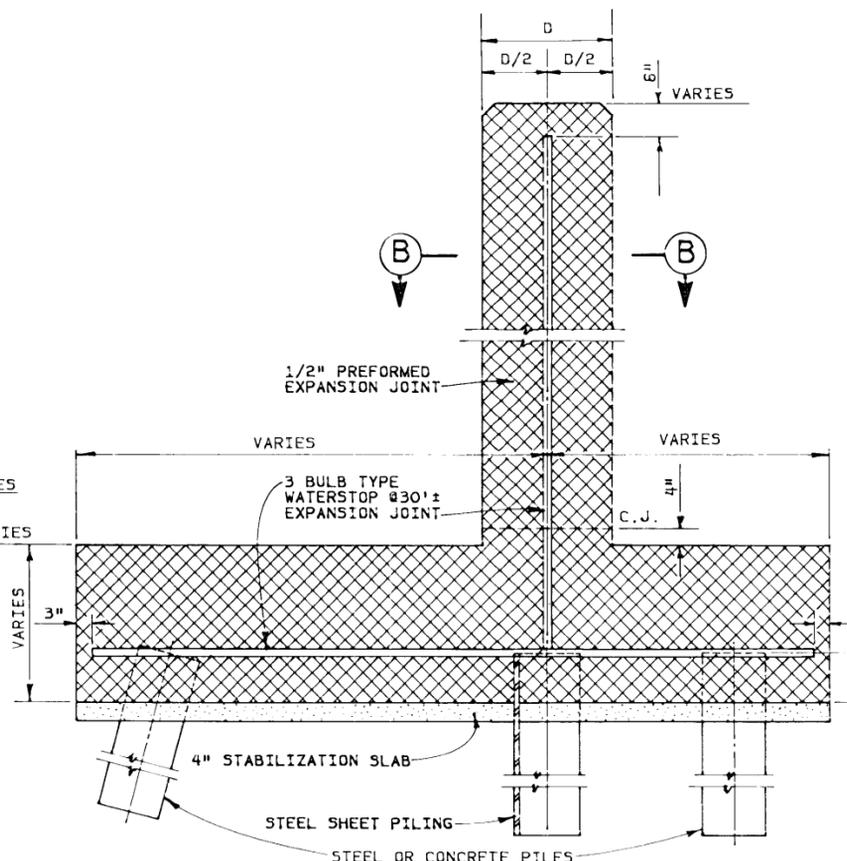
FLOOD SIDE ELEVATION

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



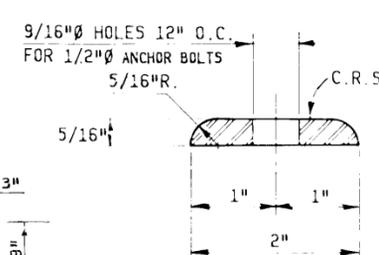
TYPICAL "I" WALL JOINT

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



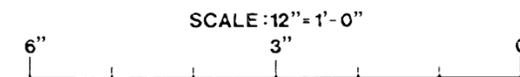
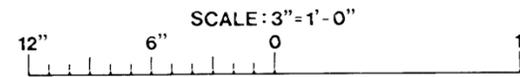
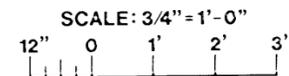
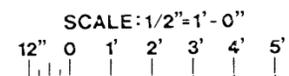
TYPICAL "T"-WALL JOINT

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



SEAL RETAINING BAR

SCALE: FULL SIZE



LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 13, GENERAL DESIGN
ORLEANS PARISH LAKEFRONT LEVEE
WEST OF I.H.N.C.
TYPICAL WALL JOINTS
U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NOVEMBER 1984 FILE NO. H-2-29536

SWING GATES

TABLE OF ELEVATIONS, DIMENSIONS AND MEMBER SIZES

		GATE NO. 1	GATE NO. 3	GATE NO. 5	GATE NO. 8	GATE NO. 12
ELEVATIONS	(A)	14.75	15.75	18.25	18.25	14.25
	(B)	14.00	15.00	17.50	17.50	13.50
	(C)	10.00	10.75	12.50	12.50	9.50
	(D)	20.00	21.00	19.00	19.00	20.00
	(E)	19.75	20.75	N/A	N/A	19.25
DIMENSIONS	(G)	2' - 9 3/4"	3' - 0 3/4"	3' - 9 3/4"	3' - 6 3/4"	2' - 9 3/4"
	(H)	7 1/2"	7 1/2"	7 1/2"	7 1/2"	7 1/2"
	(J)	N/A	N/A	1' - 10 7/8"	1' - 3 3/8"	N/A
	(K)	5' - 6"	2' - 0"	5' - 0"	5' - 0"	5' - 0"
	(L)	30' - 0"	28' - 0"	22' - 0"	20' - 0"	30' - 0"
	(M)	45' - 0"	36' - 0"	36' - 0"	34' - 0"	44' - 0"
	(N)	5' - 6"	2' - 0"	5' - 0"	5' - 0"	5' - 0"
MEMBERS	(R)	W14x34	W16x36	W14x30	W14x30	W14x34
	(S)	W14x34	W16x36	W14x30	W14x30	W14x34
	(T)	N/A	N/A	PL 3/8x6	PL 3/8x6	N/A
	(U)	PL 1/2x4	PL 1/2x4	PL 1/2x4	PL 1/2x4	PL 1/2x4
	(V)	PL 1/2x14	PL 1/2x14	PL 1/2x14	PL 1/2x14	PL 1/2x14
	(W)	TS14x6x3/8	TS16x8x3/8	N/A	N/A	TS14x6x3/8
	(X)	N/A	N/A	PL 1/2x14	PL 1/2x14	N/A

PILE SCHEDULE

GATE NO.	NUMBER OF PILES	PILE BATTER	TIP EL.	PAYMENT LENGTH		SPACING	
				FLOOD SIDE	PROTECTED SIDE	FLOOD SIDE	PROTECTED SIDE
1	4	1H ON 2V	-36.5	50'		6'	
	2	VERTICAL	-36.5	45'		8'	
	4	1H ON 2V	-36.5		50'		6'
	2	VERTICAL	-36.5		45'		8'
3	4	1H ON 2V	-31.0	45'		6'	
	2	VERTICAL	-31.0	40'		8'	
	4	1H ON 2V	-31.0		45'		6'
	2	VERTICAL	-31.0		40'		8'
5	4	1H ON 2V	-25.0	40'		6'	
	2	VERTICAL	-25.0	36'		7'	
	4	1H ON 2V	-25.0		40'		6'
	2	VERTICAL	-25.0		36'		7'
8	4	1H ON 2V	-34.0	50'		5'	
	2	VERTICAL	-34.0	45'		7'	
	4	1H ON 2V	-34.0		50'		5'
	2	VERTICAL	-34.0		45'		7'
12	4	1H ON 2V	-37.0	50'		6'	
	2	VERTICAL	-37.0	45'		8'	
	4	1H ON 2V	-37.0		50'		6'
	2	VERTICAL	-37.0		45'		8'

NOTES:

1. ELEVATIONS ARE IN FEET AND REFER TO NATIONAL GEODETIC VERTICAL DATUM. (N.G.V.D.)
2. THIS PLATE IS TO BE USED IN CONJUNCTION WITH PLATE 37.

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN

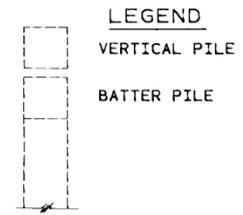
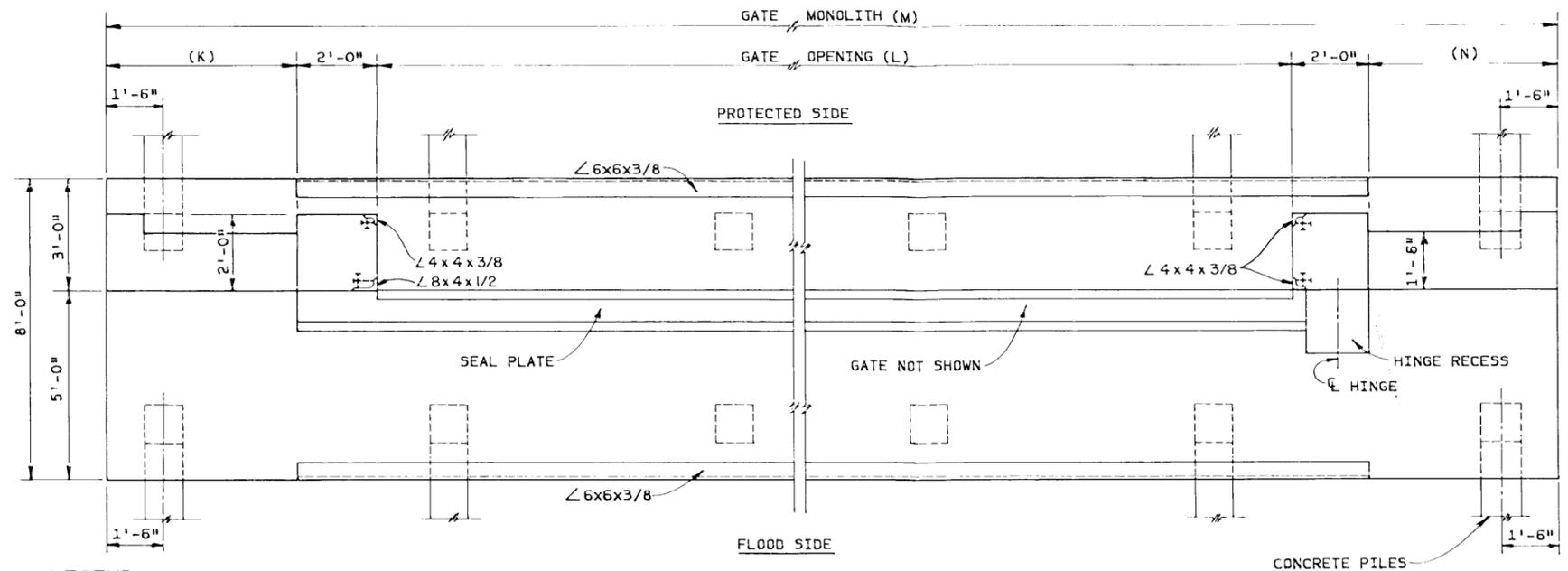
DESIGN MEMORANDUM NO. 13, GENERAL DESIGN
ORLEANS PARISH LAKEFRONT LEVEE
WEST OF I.H.N.C.

SWING GATES TABLE AND PILE SCHEDULE

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

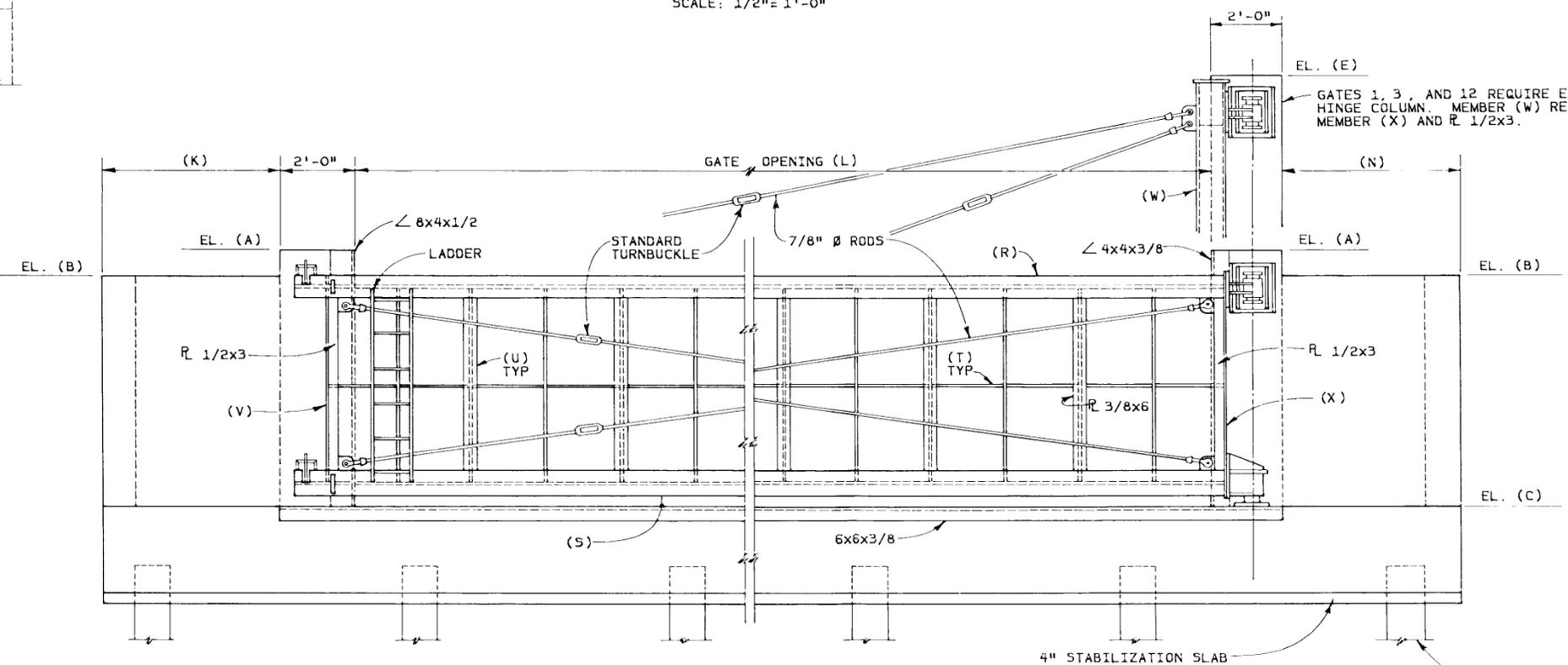
NOVEMBER 1984

FILE NO. H-2-29536



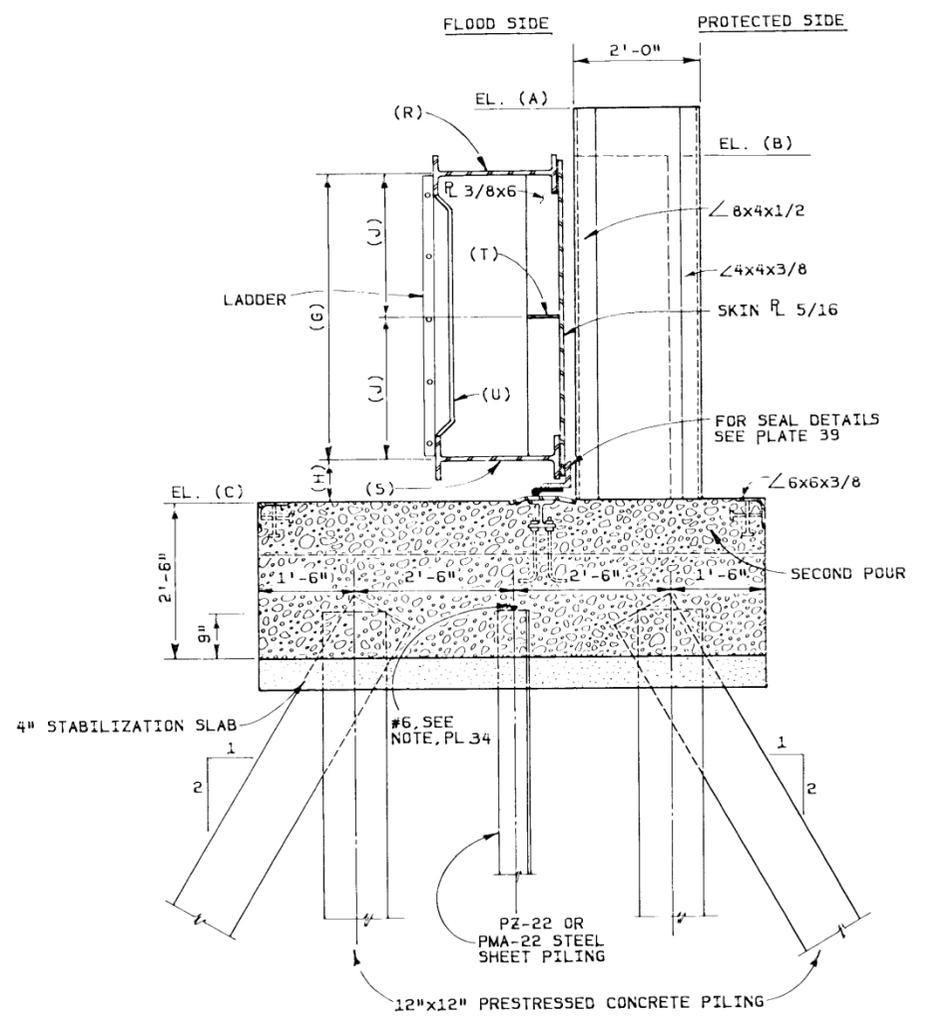
PLAN AT ELEVATION (D)

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



FLOOD SIDE ELEVATION

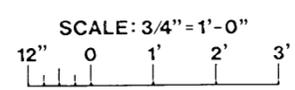
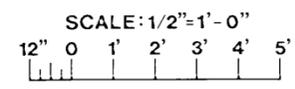
SCALE: 1/2" = 1'-0"



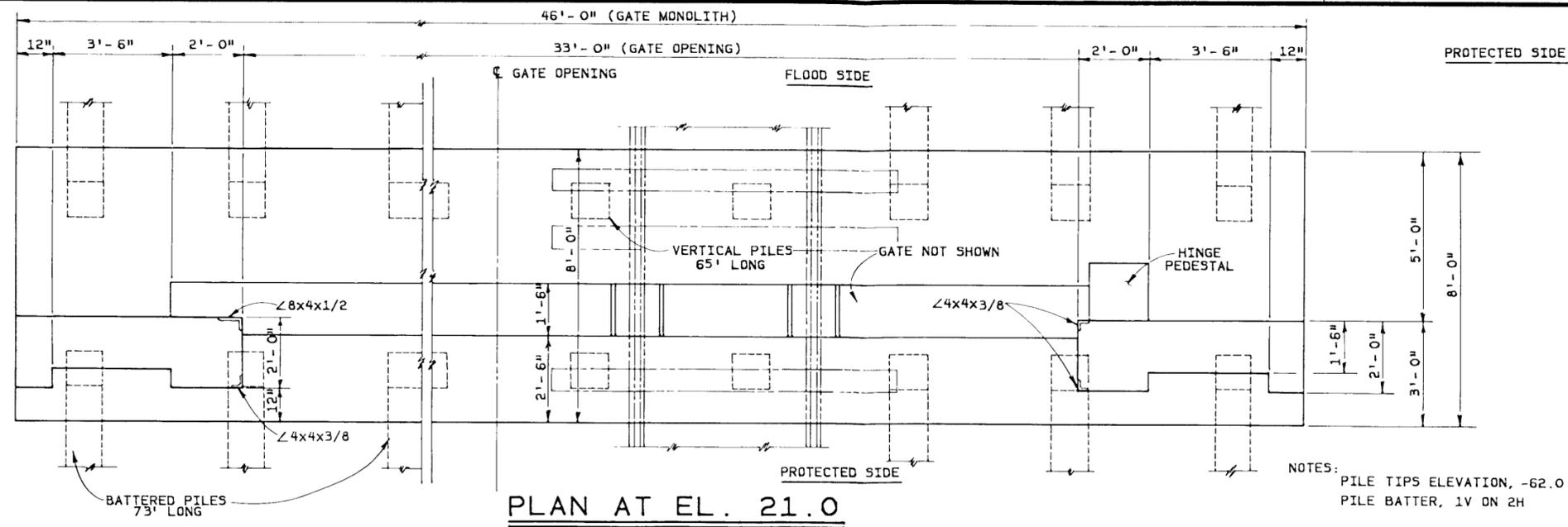
TYPICAL SECTION

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

NOTE:
FOR ELEVATIONS AND DIMENSIONS
SEE PLATE 36.

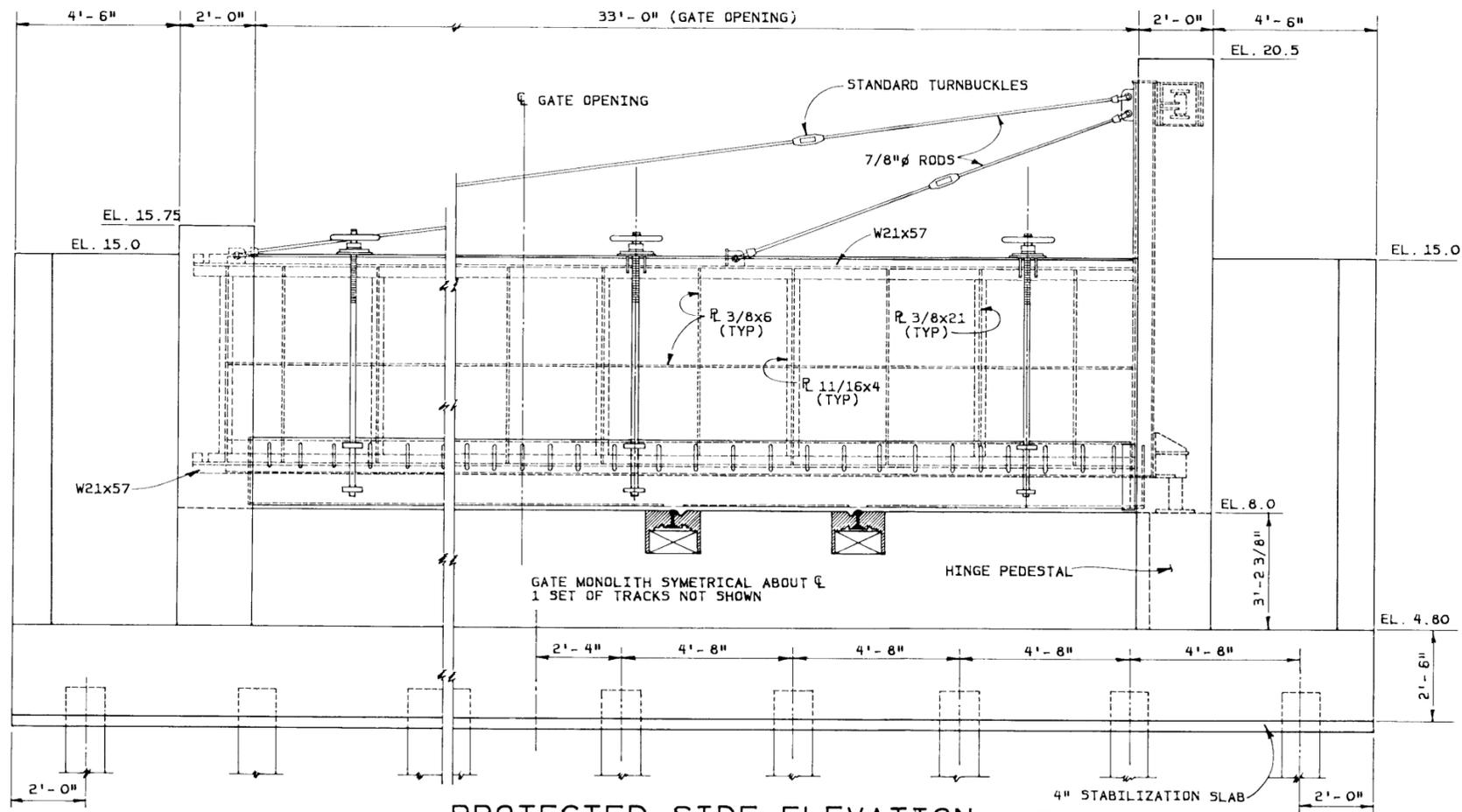


LAKE PONCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 13, GENERAL DESIGN
ORLEANS PARISH LAKEFRONT LEVEE
WEST OF I.H.N.C.
**SWING GATE
DETAILS**
U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NOVEMBER 1984 FILE NO. H-2-29536



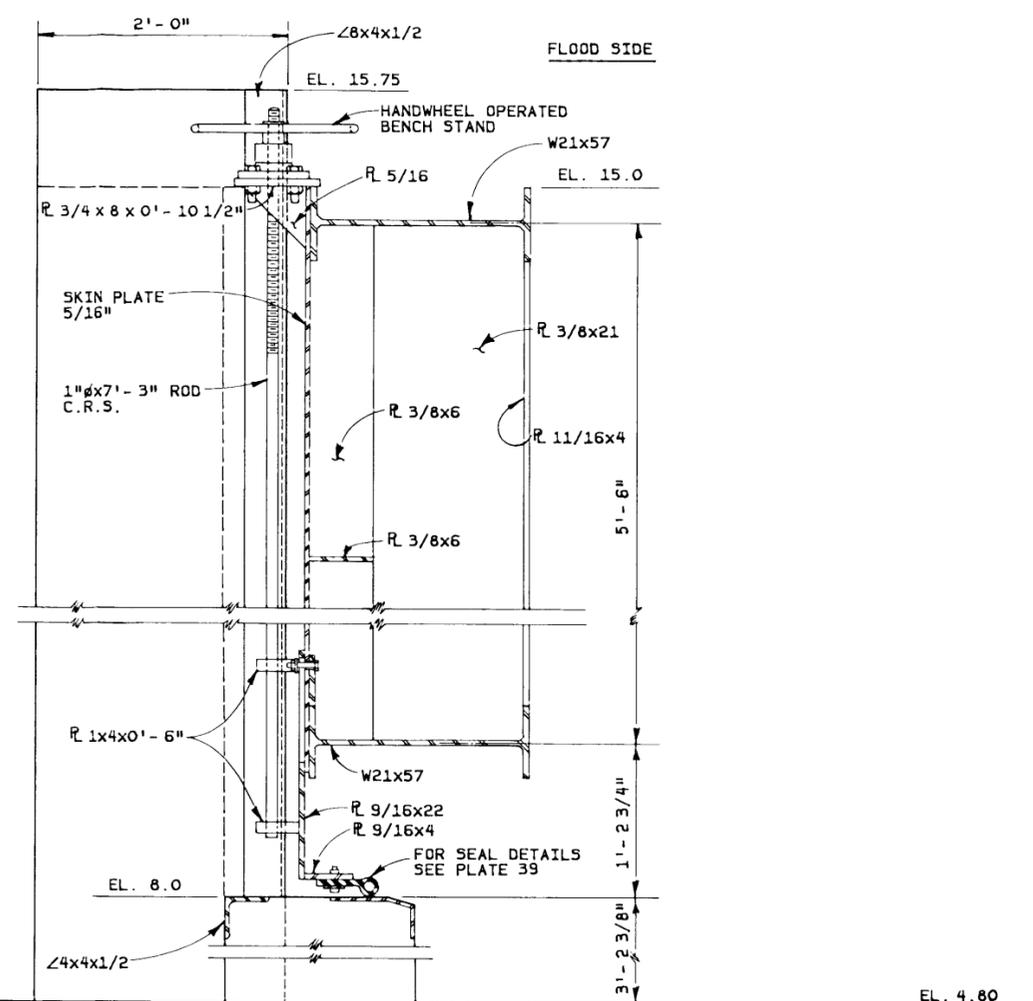
SCALE: 1/2" = 1'-0"

NOTES:
PILE TIPS ELEVATION, -62.0
PILE BATTER, 1V ON 2H



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

NOTE:
PILE SPACING IS THE SAME FOR BOTH THE FLOOD SIDE AND THE PROTECTED SIDE AND IS SYMMETRICAL ABOUT CL GATE MONOLITH

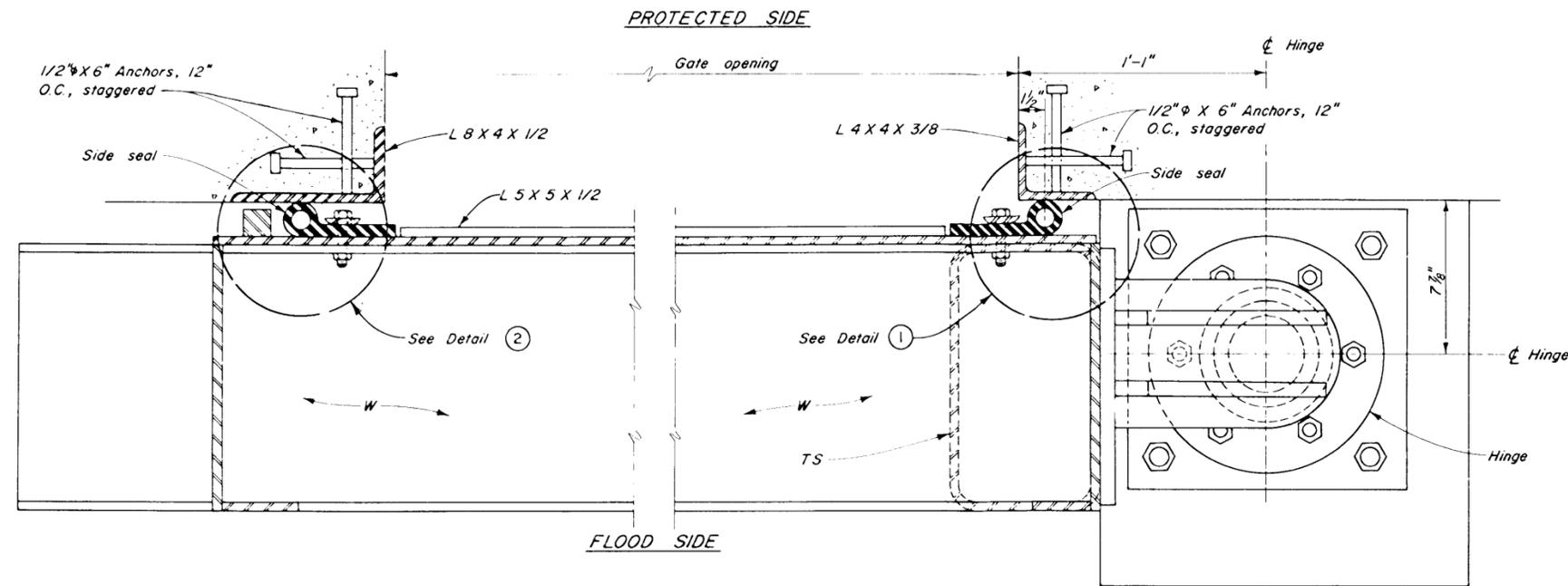


TYPICAL SECTION

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

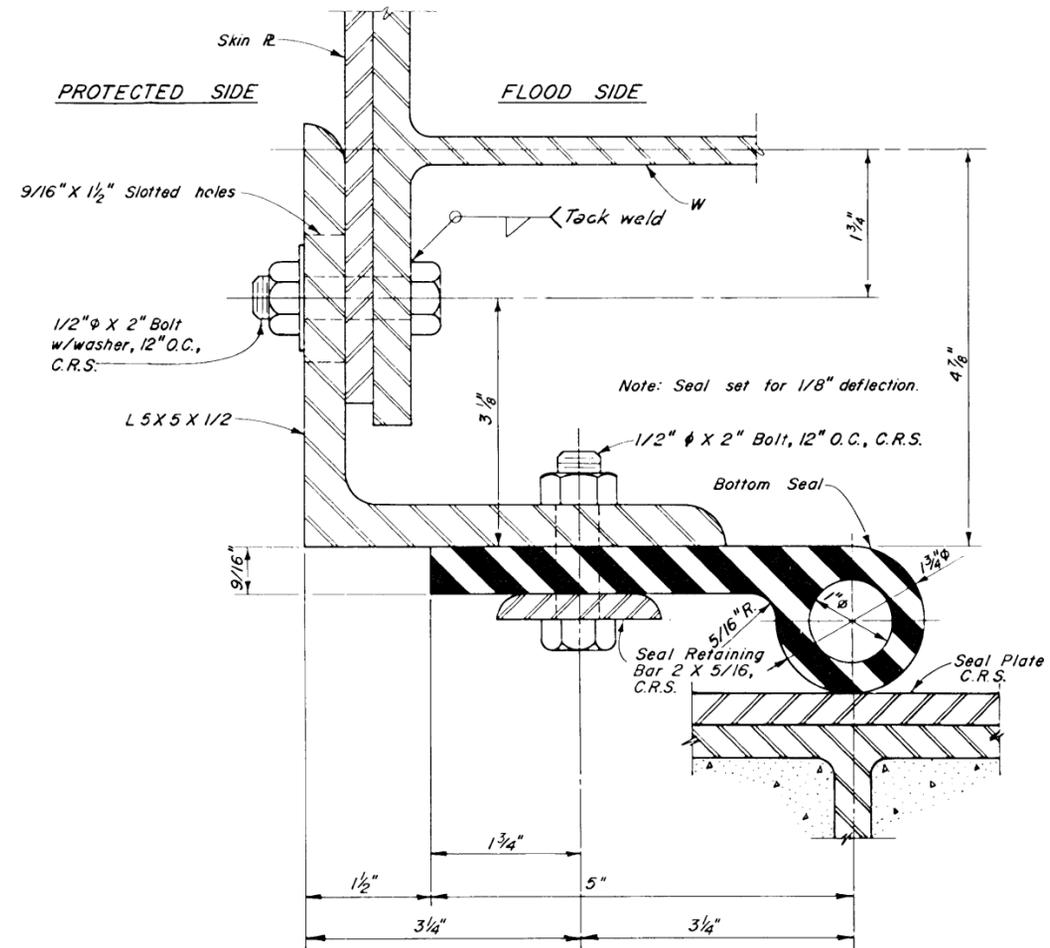


LAKE PONTCHARTRAIN, L.A. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 13, GENERAL DESIGN
ORLEANS PARISH LAKEFRONT LEVEE
WEST OF I.H.N.C.
**GATE NO. 2
DETAILS**
U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NOVEMBER 1984 FILE NO. H-2-29536



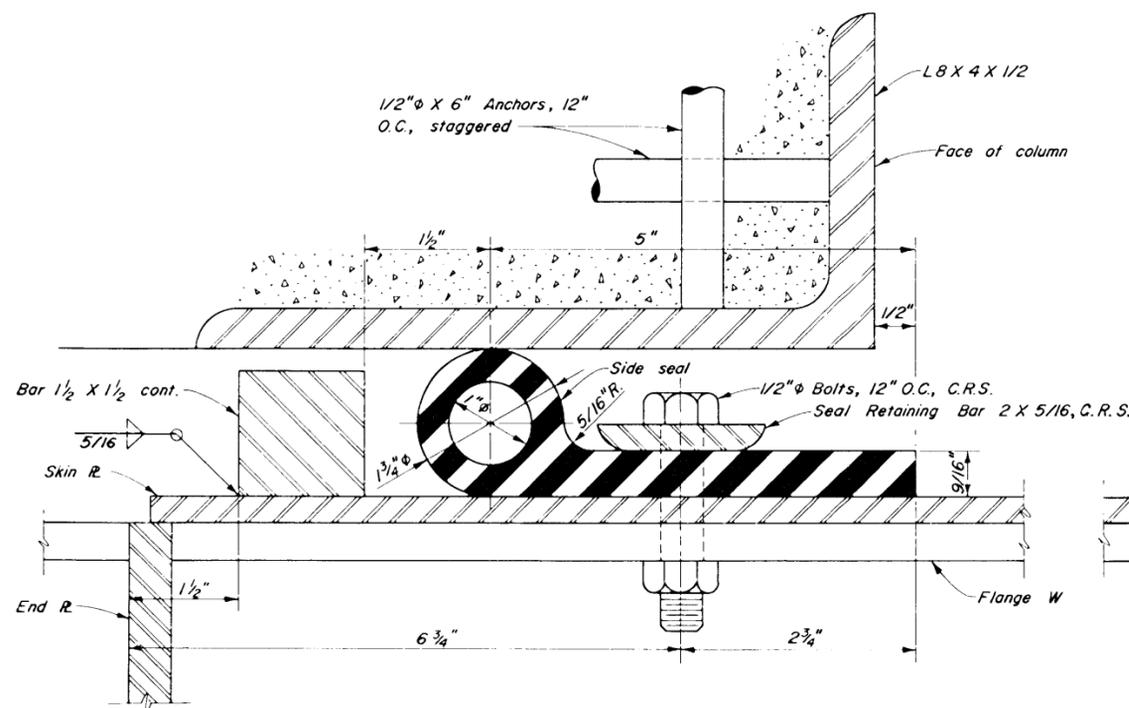
SECTION THRU SWING GATE

SCALE: 3" = 1'-0"



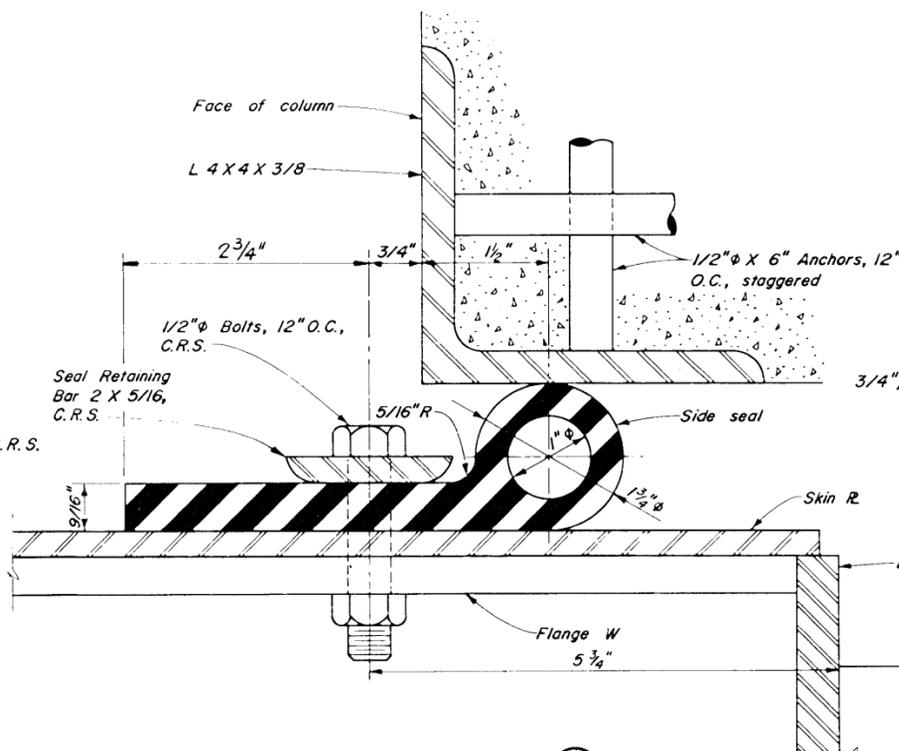
SECTION THRU BOTTOM SEAL

SCALE: FULL SIZE



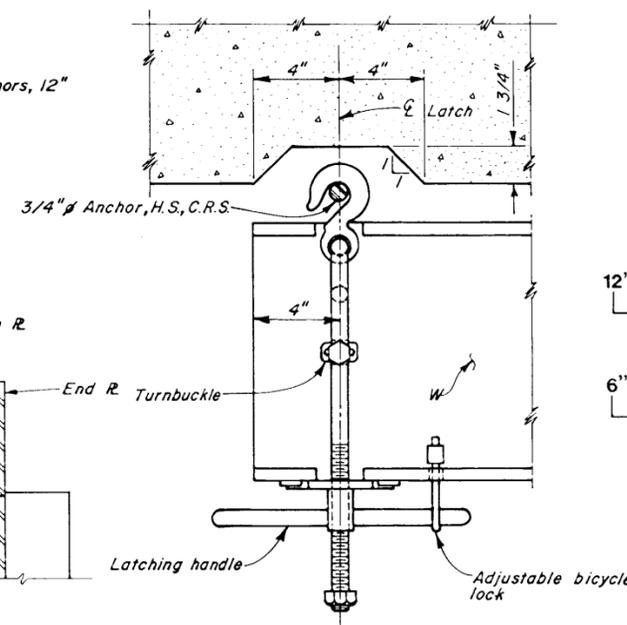
DETAIL 2

SCALE: FULL SIZE



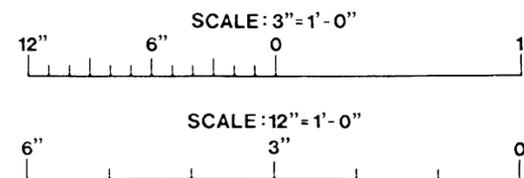
DETAIL 1

SCALE: FULL SIZE

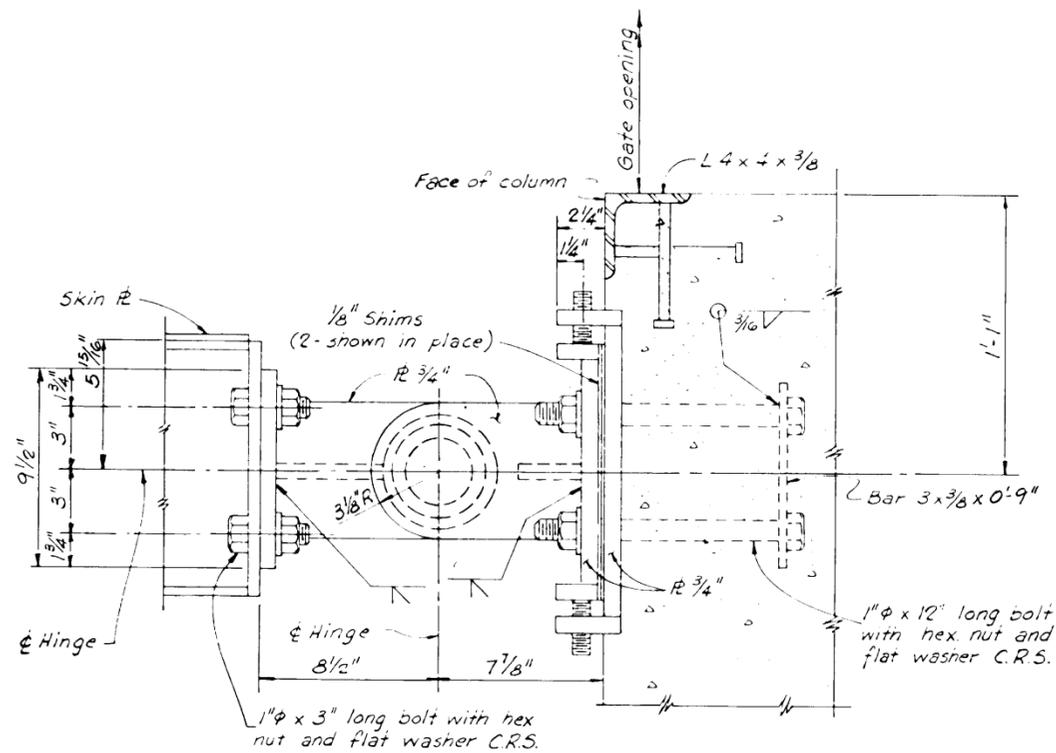


LATCHING ASSEMBLY

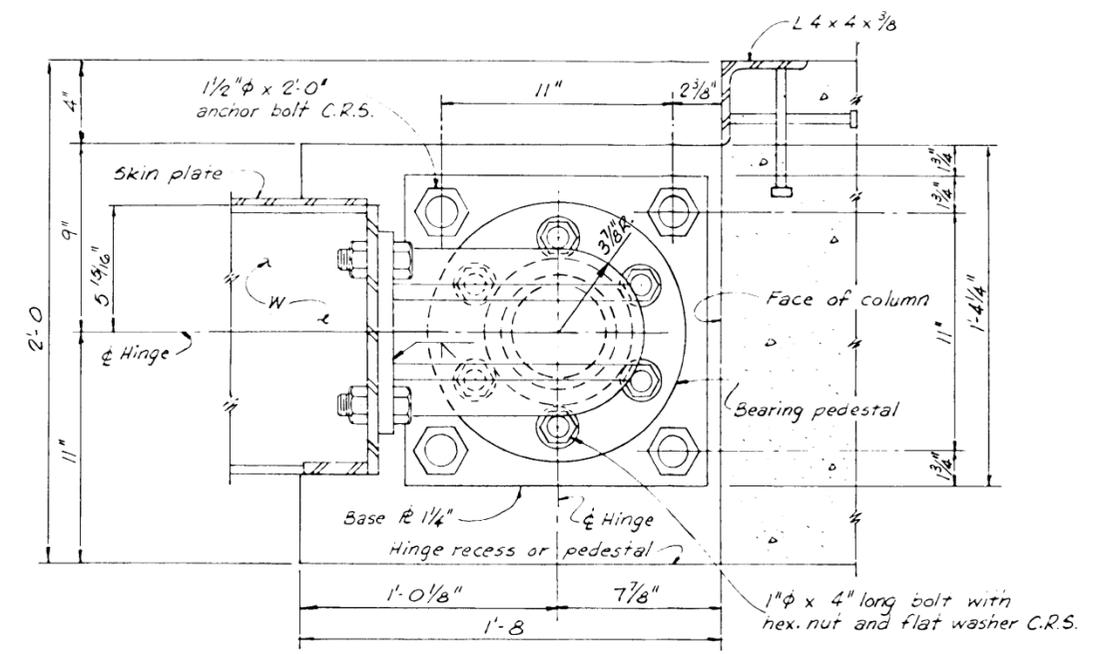
SCALE: 3" = 1'-0"



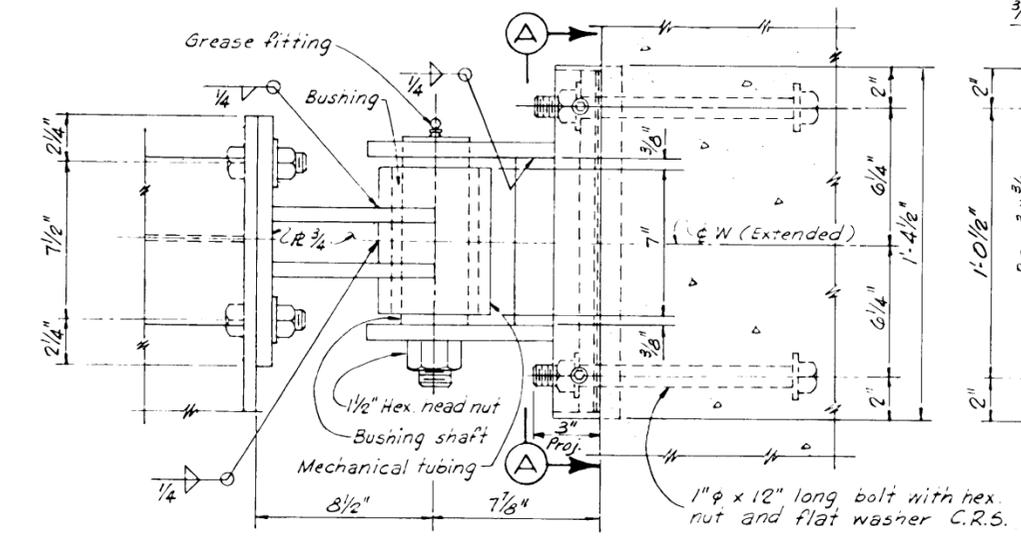
LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 13, GENERAL DESIGN
ORLEANS PARISH LAKEFRONT LEVEE
WEST OF I.H.N.C.
**SWING GATE SEAL DETAILS
AND LATCHING DEVICE**
U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NOVEMBER 1984 FILE NO. H-2-29536



PLAN



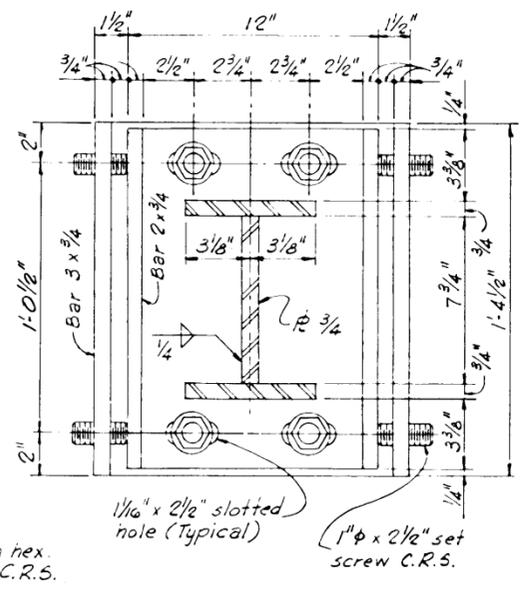
PLAN



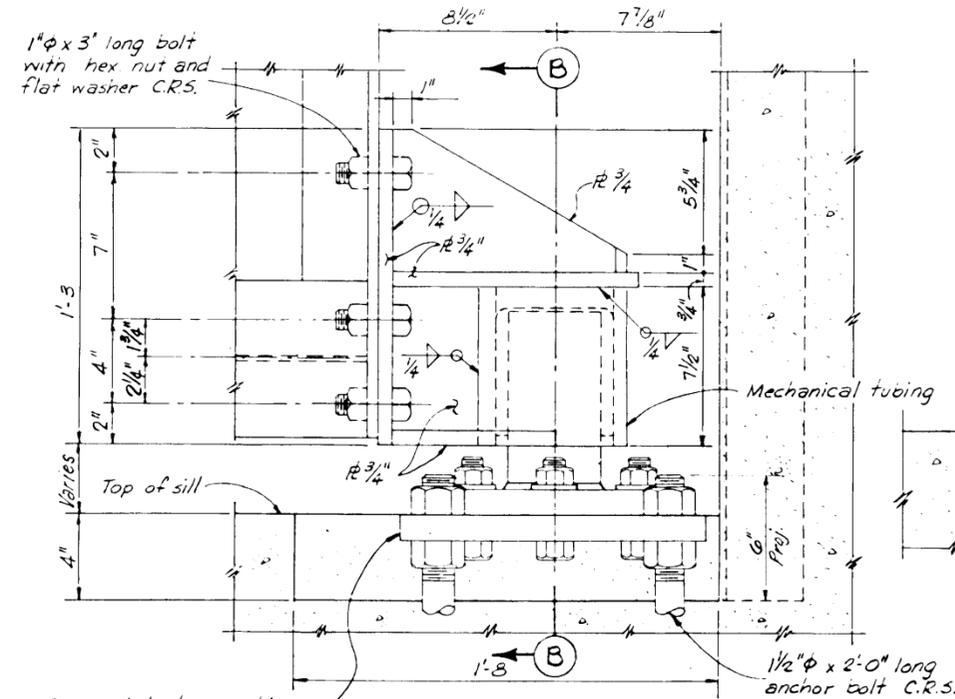
ELEVATION

UPPER HINGE

SCALE: 3" = 1'-0"



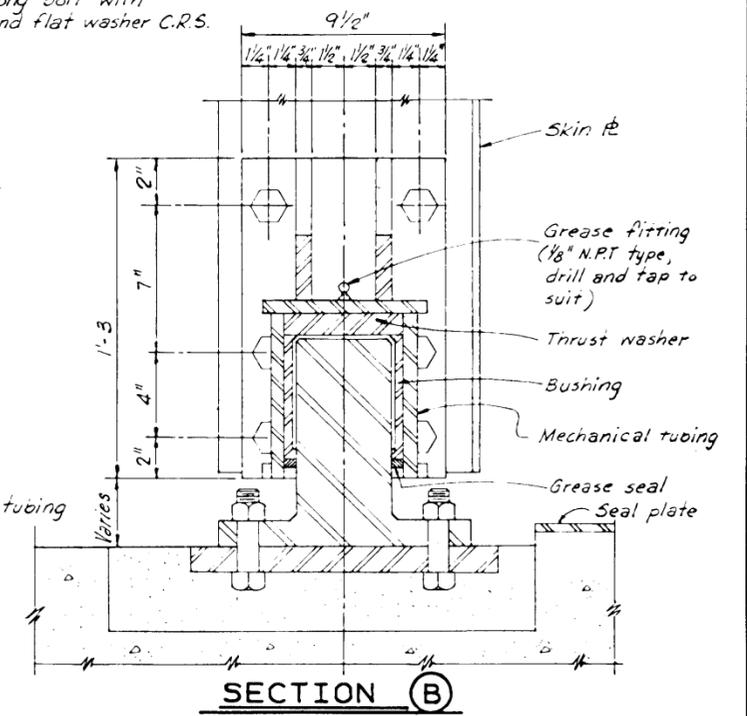
SECTION - (A)



ELEVATION

LOWER HINGE

SCALE: 3" = 1'-0"



SECTION (B)

SCALE: 3" = 1'-0"

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 13, GENERAL DESIGN
ORLEANS PARISH LAKEFRONT LEVEE
WEST OF I.H.N.C.
**SWING GATE
HINGE DETAILS**
U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NOVEMBER 1984 FILE NO. H-2-29536

MITER SWING GATES TABLE OF ELEVATIONS, DIMENSIONS AND MEMBER SIZES				
		GATE NO 4	GATE NO 9	GATE NO 10
ELEVATIONS	(A)	18.25	18.25	18.25
	(B)	17.50	17.50	17.50
	(C)	12.25	12.75	8.25
	(D)	19.00	19.00	19.00
DIMENSIONS	(F)	4'-2"	3'-8"	8'-2"
	(G)	2'-1"	1'-10"	4'-1"
	(K)	17'-0"	19'-0"	19'-0"
	(L)	5'-8"	6'-4"	6'-4"
	(M)	17'-11"	20'-0 3/8"	20'-0 3/8"
	(R)	22'-4 7/8"	23'-10 3/4"	23'-10 3/4"
	(S)	14'-3 1/4"	16'-4 5/8"	16'-4 5/8"
	(T)	1'-9 1/2"	1'-2"	1'-2"
MEMBERS				

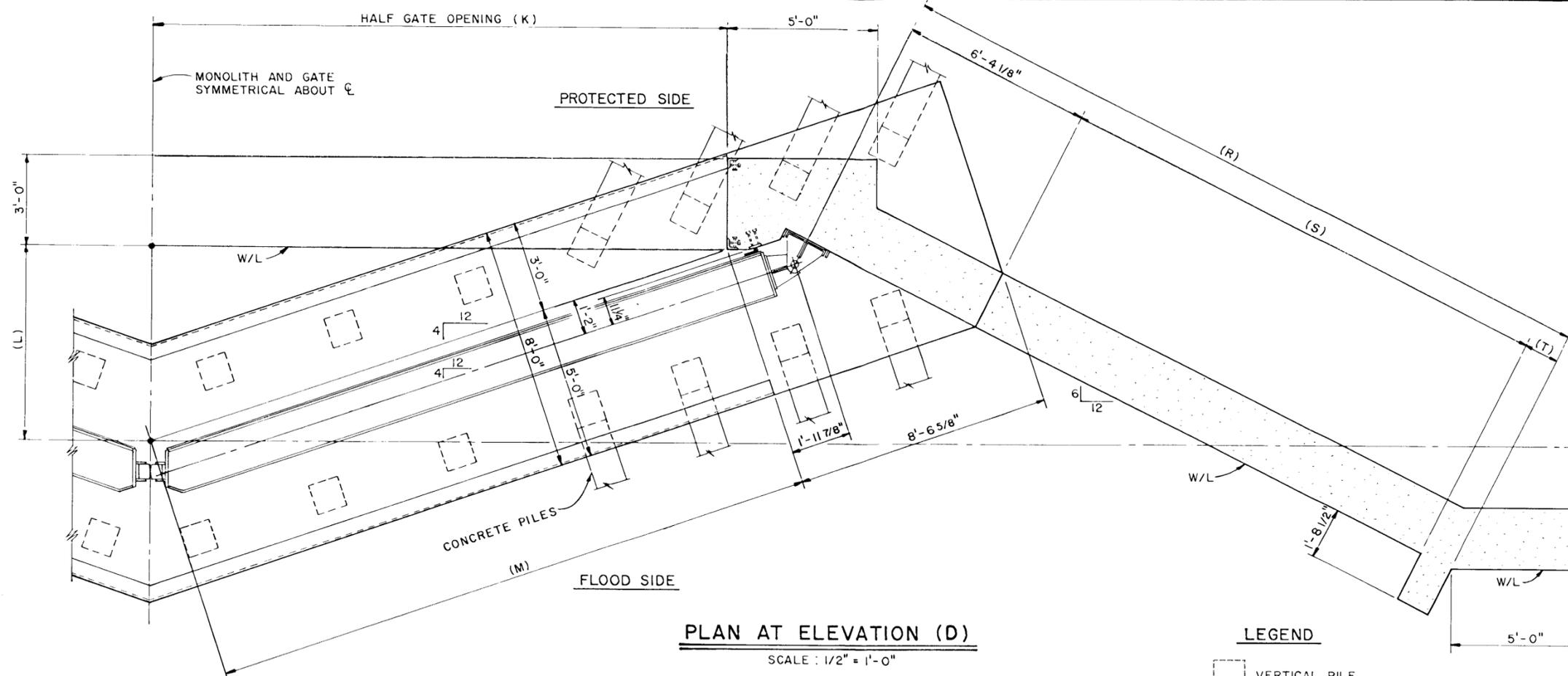
PILE SCHEDULE

GATE NO	NUMBER OF PILES	PILE BATTER	TIP EL.	PAYMENT LENGTH		SPACING	
				FLOOD SIDE	PROTECTED SIDE	FLOOD SIDE	PROTECTED SIDE
4	4	1H ON 2V	-30.0	45'		5'-9"	
	6	VERTICAL	-30.0	40'		5'-9"	
	6	1H ON 2V	-30.0		45'		5'-9"
	4	VERTICAL	-30.0		40'		5'-9"
9	4	1H ON 2V	-38.0	55'		5'-0"	
	6	VERTICAL	-38.0	50'		6'-0"	
	6	1H ON 2V	-38.0		55'		5'-0"
	4	VERTICAL	-38.0		50'		6'-0"
10	8	1H ON 2V	-38.5	50'		3'-6"	
	6	VERTICAL	-38.5	45'		4'-6"	
	8	1H ON 2V	-38.5		50'		3'-6"
	6	VERTICAL	-38.5		45'		4'-6"

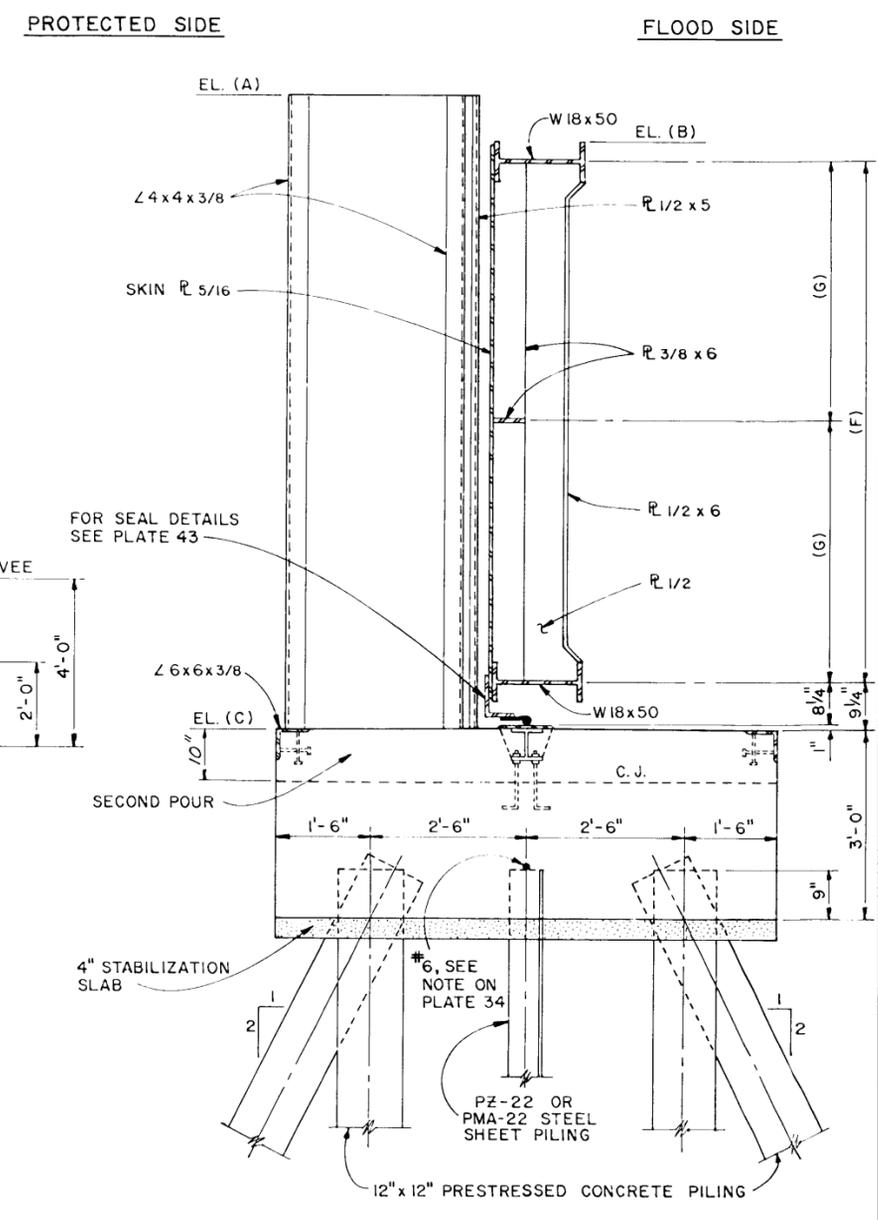
NOTES:

1. ELEVATIONS ARE IN FEET AND REFER TO NATIONAL GEODETIC VERTICAL DATUM. (N.G.V.D.)
2. THIS PLATE IS TO BE USED IN CONJUNCTION WITH PLATE 42.

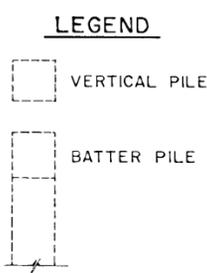
LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 13, GENERAL DESIGN
ORLEANS PARISH LAKEFRONT LEVEE
WEST OF I.H.N.C.
**MITER SWING GATES
TABLE AND PILE SCHEDULE**
U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NOVEMBER 1984 FILE NO. H-2-29536



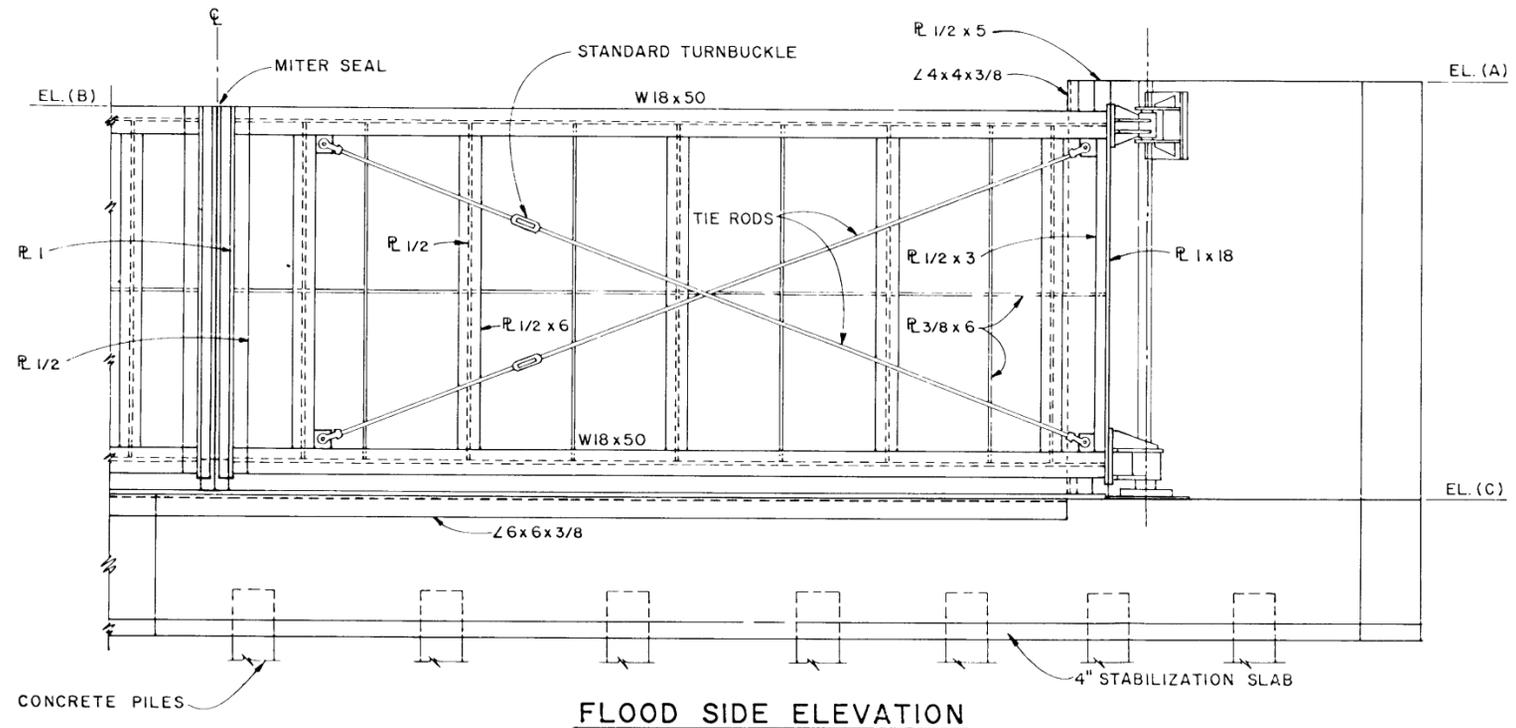
PLAN AT ELEVATION (D)
SCALE: 1/2" = 1'-0"



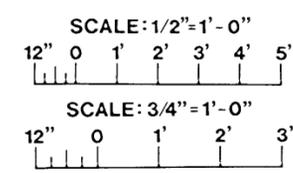
TYPICAL SECTION
SCALE: 3/4" = 1'-0"



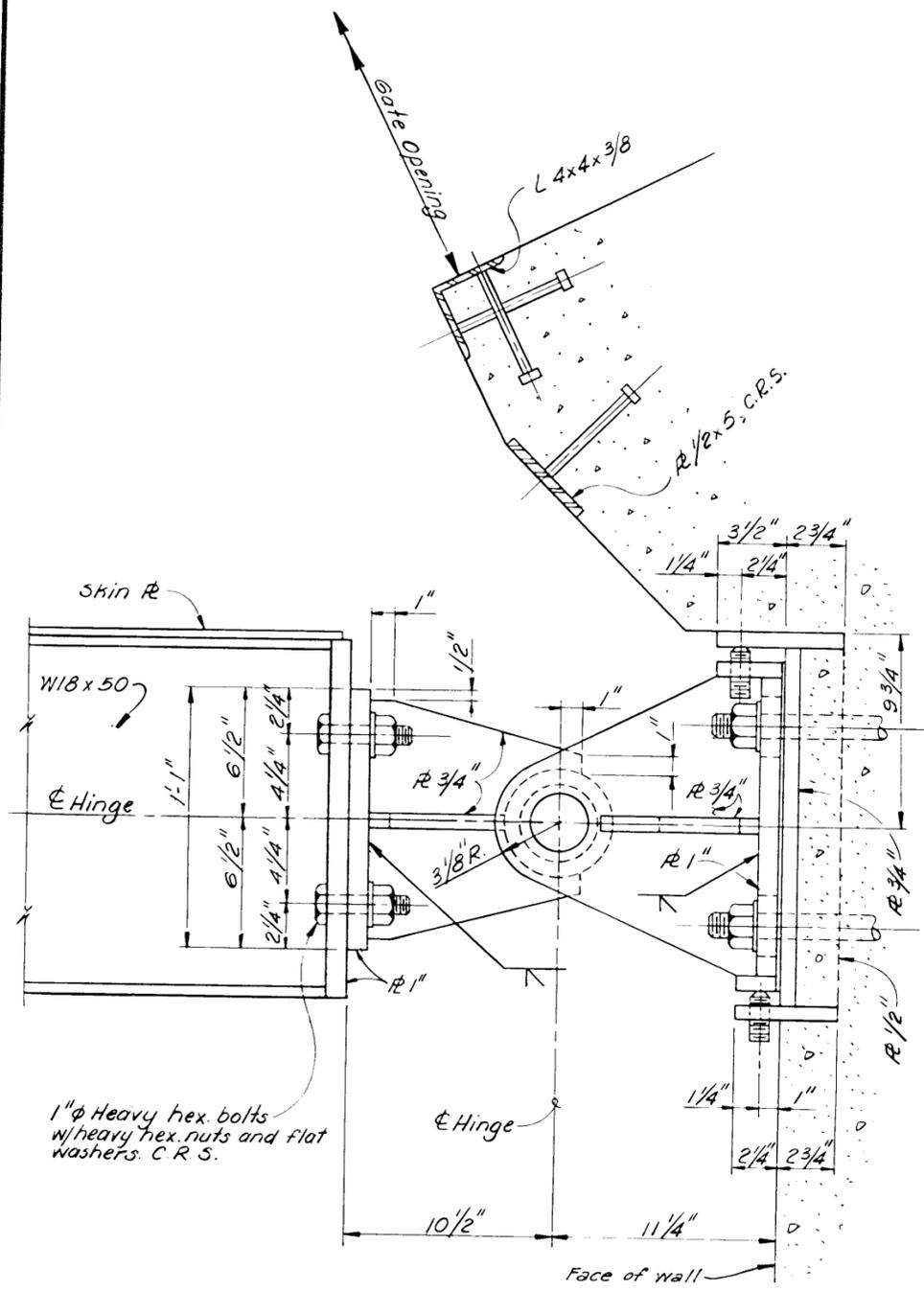
NOTE:
FOR ELEVATIONS AND DEMENSIONS
SEE PLATE 41



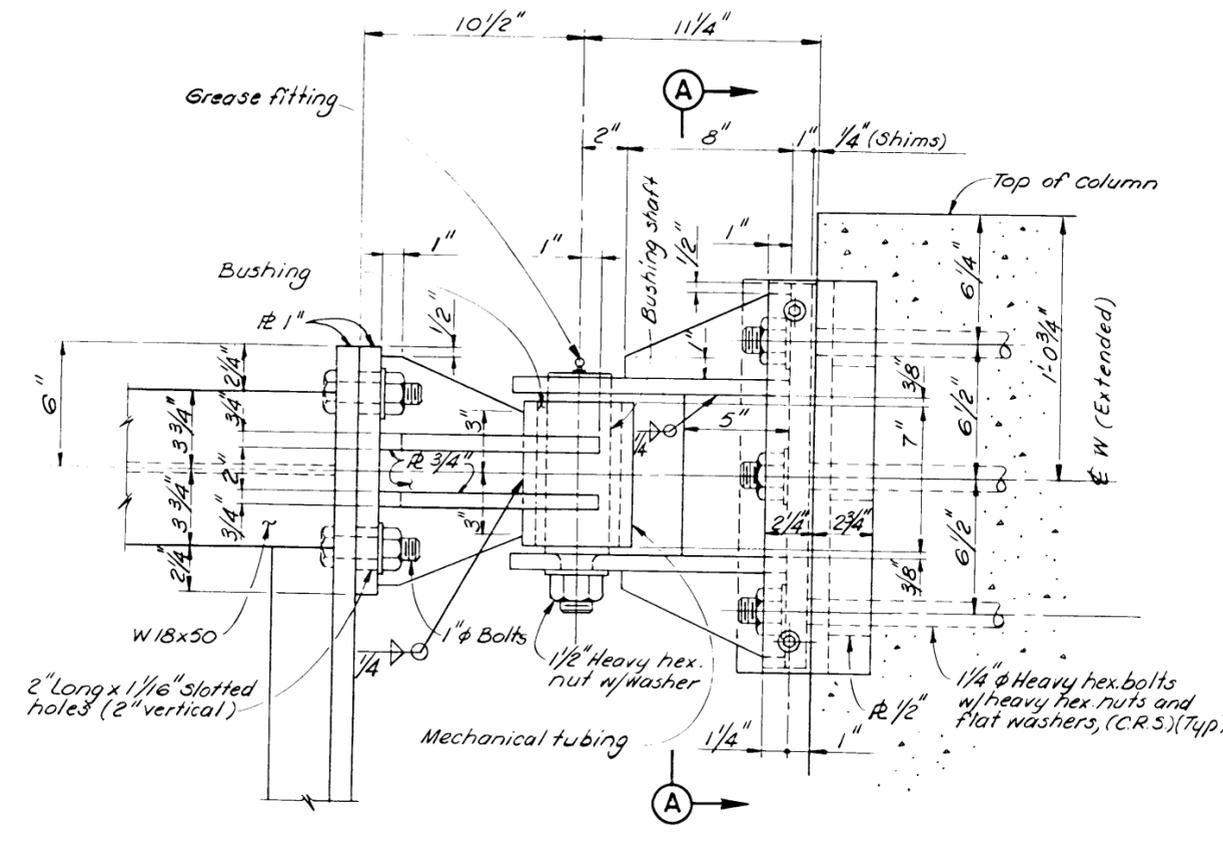
FLOOD SIDE ELEVATION
SCALE: 1/2" = 1'-0"



LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 13, GENERAL DESIGN
ORLEANS PARISH LAKEFRONT LEVEE
WEST OF I.H.N.C.
**MITER SWING GATE
DETAILS**
U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NOVEMBER 1984 FILE NO. H-2-29536

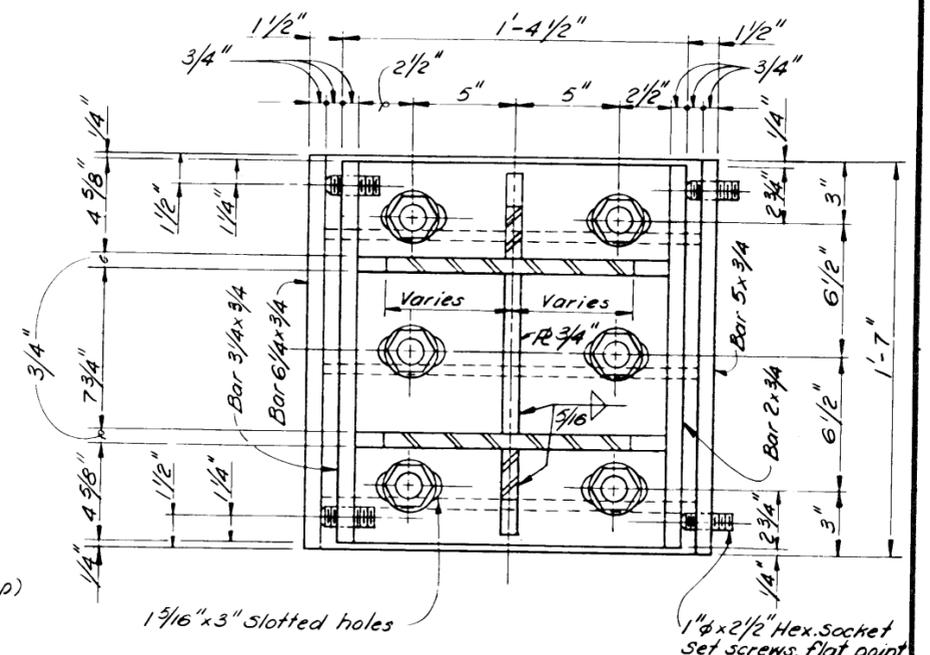


PLAN

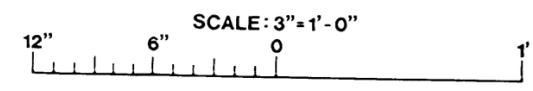


ELEVATION

UPPER HINGE
SCALE: 3" = 1'-0"



SECTION A



LAKE PONTCHARTRAIN, L.A. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 13, GENERAL DESIGN
ORLEANS PARISH LAKEFRONT LEVEE
WEST OF I.H.N.C.
**MITER SWING GATE
UPPER HINGE DETAILS**
U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NOVEMBER 1984 FILE NO. H-2-29536

BOTTOM ROLLER GATES TABLE OF ELEVATIONS, DIMENSIONS AND MEMBER SIZES

		GATE NO. 6	GATE NO. 7	GATE NO. 11
ELEVATIONS	(A)	14.50	14.50	13.50
	(B)	8.50	8.50	6.75
	(C)	15.00	15.00	14.00
	(D)	8.33	8.33	6.58
	(E)	15.50	15.50	14.50
DIMENSIONS	(G)	4' - 2 3/8"	4' - 2 3/8"	4' - 10 7/8"
	(H)	2' - 1 3/16"	2' - 1 3/16"	2' - 5 7/16"
	(J)	2' - 6"	2' - 6"	2' - 6"
	(K)	1' - 3 7/8"	1' - 3 7/8"	1' - 4 1/8"
	(L)	37' - 0"	37' - 0"	80' - 0"
	(M)	26' - 0"	26' - 0"	60' - 0"
	(N)	2' - 4 3/4"	2' - 4 3/4"	2' - 7 1/4"
	(P)	37' - 9"	37' - 9"	73' - 0"
MEMBERS	(R)	W33x118	W33x118	W36x135
	(S)	W33x118	W33x118	W36x135

PILE SCHEDULE

GATE NO	NUMBER OF PILES	PILE BATTER	TIP EL.	PAYMENT LENGTH		SPACING	
				FLOOD SIDE	PROTECTED SIDE	FLOOD SIDE	PROTECTED SIDE
6	4	1H ON 2V	-33.5	45'		6'-3"	
	3	VERTICAL	-33.0	40'		4'-6"	
	4	1H ON 2V	-33.5		45'		6'-3"
	3	VERTICAL	-33.0		40'		4'-6"
7	4	1H ON 2V	-33.5	45'		6'-3"	
	3	VERTICAL	-33.0	40'		4'-6"	
	4	1H ON 2V	-33.5		45'		6'-3"
	3	VERTICAL	-33.0		40'		4'-6"
11	9	1H ON 2V	-38.0	48'		6'-8"	
	4	VERTICAL	-38.0	43'		6'-0"	
	9	1H ON 2V	-38.0		48'		6'-8"
	4	VERTICAL	-38.0		43'		6'-0"

NOTES:

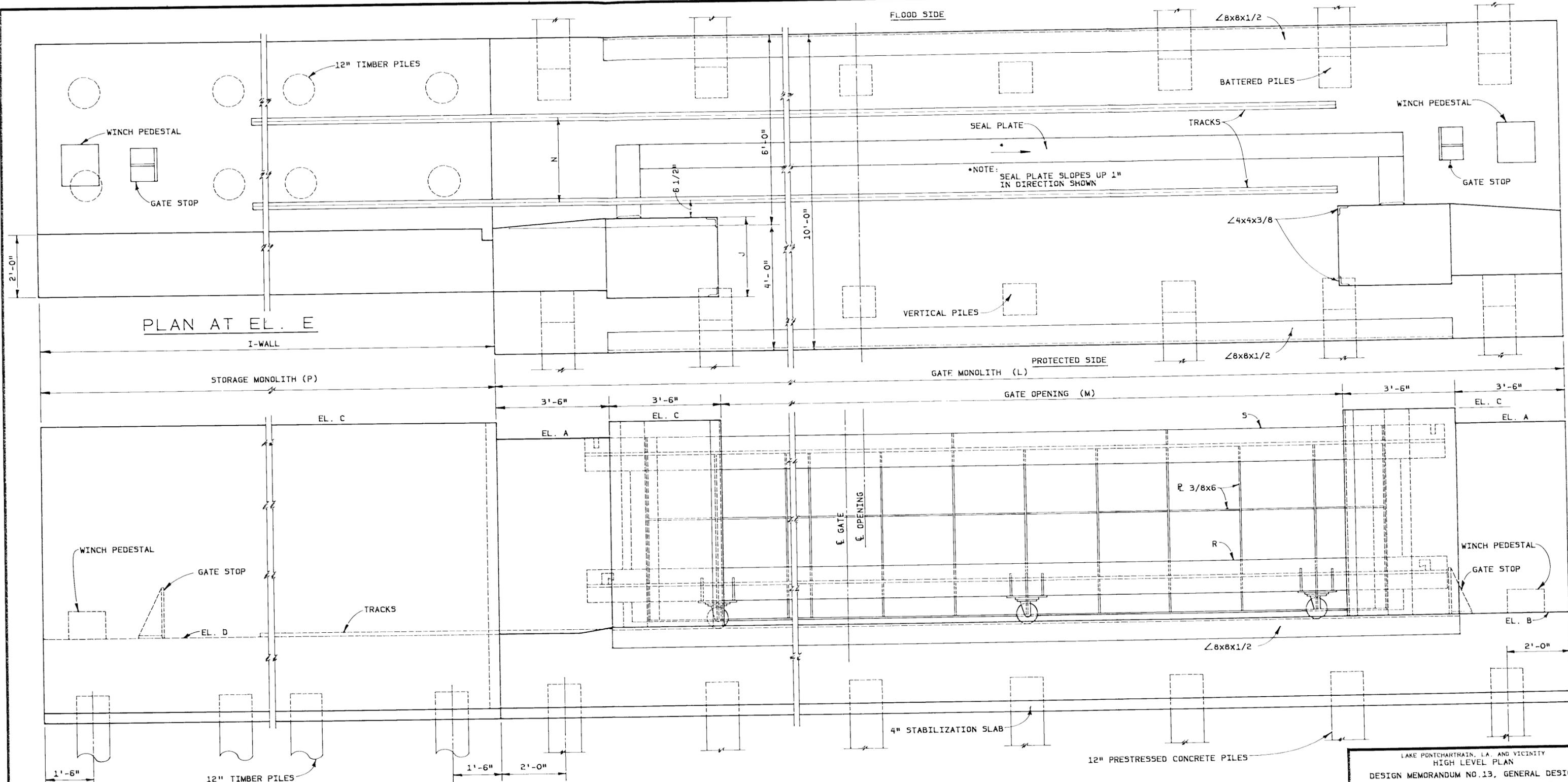
1. ELEVATIONS ARE IN FEET AND REFER TO NATIONAL GEODETIC VERTICAL DATUM. (N.G.V.D.)
2. THIS PLATE IS TO BE USED IN CONJUNCTION WITH PLATES 47 AND 48.

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO.13, GENERAL DESIGN
ORLEANS PARISH LAKEFRONT LEVEE
WEST OF I.H.N.C.

**BOTTOM ROLLER GATES
TABLE AND PILE SCHEDULE**

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

NOVEMBER 1984 FILE NO. H-2-29536



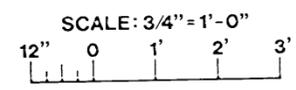
PLAN AT EL. E

PROTECTED SIDE ELEVATION

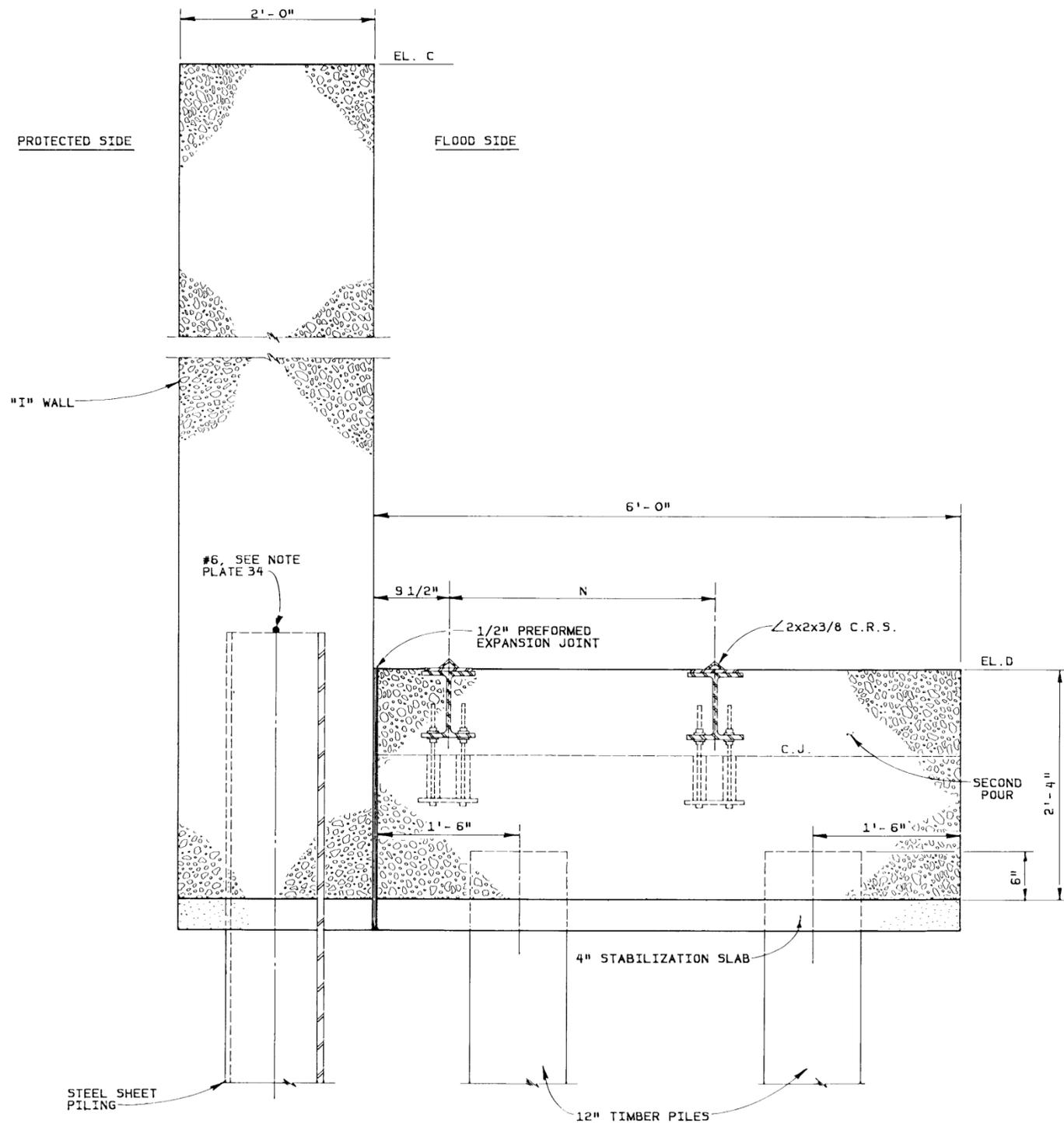
PLAN AND ELEVATION
 BOTTOM ROLLER GATE

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

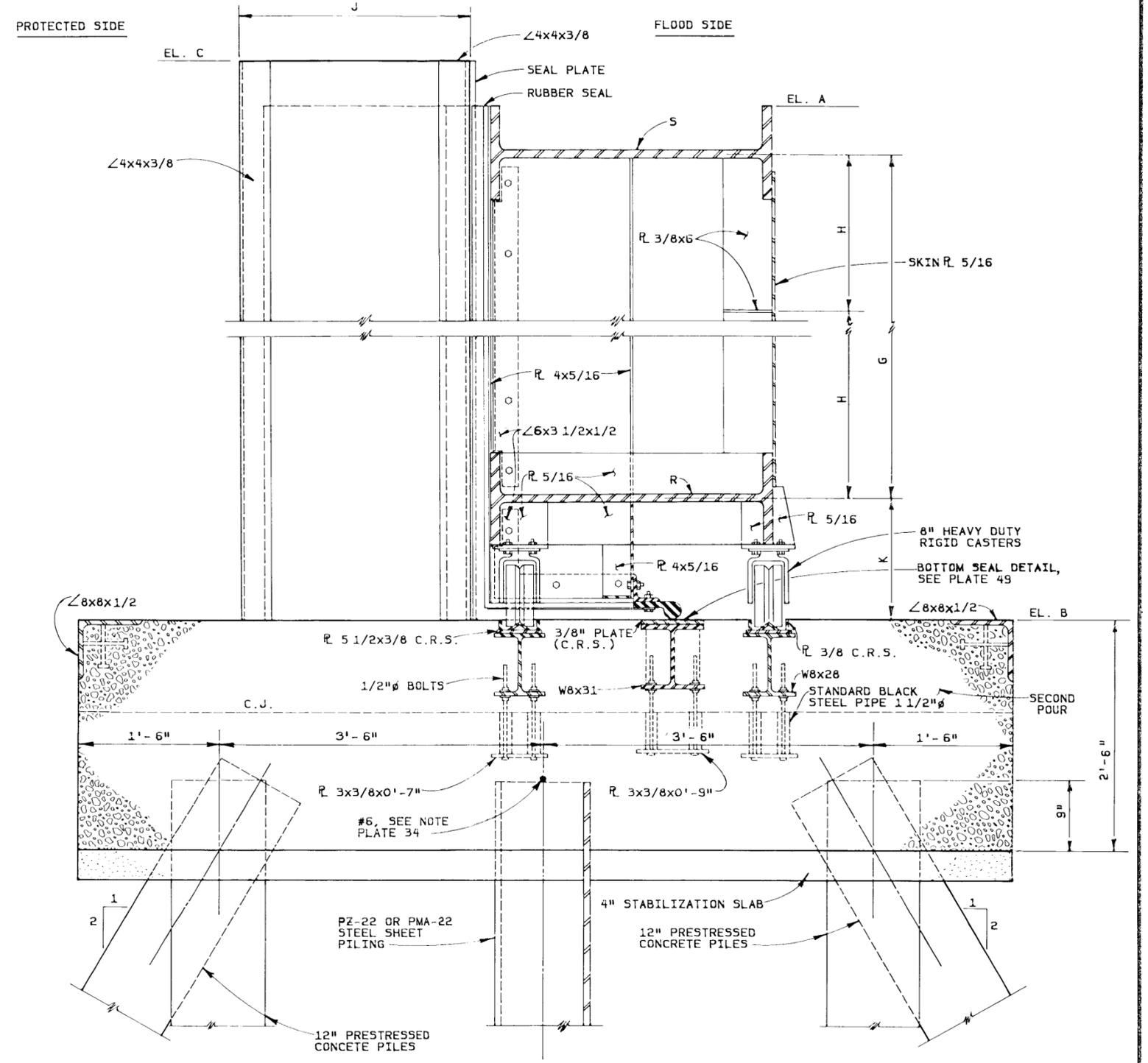
NOTE:
 FOR ELEVATIONS AND DIMENSIONS
 SEE PLATE 46



LAKE PONTCHARTRAIN, LA. AND VICINITY
 HIGH LEVEL PLAN
 DESIGN MEMORANDUM NO. 13, GENERAL DESIGN
 ORLEANS PARISH LAKEFRONT LEVEE
 WEST OF I.H.N.C.
**BOTTOM ROLLER GATE
 PLAN AND ELEVATION**
 U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
 CORPS OF ENGINEERS
 NOVEMBER 1984 FILE NO. H-2-29536



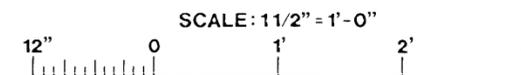
STORAGE MONOLITH



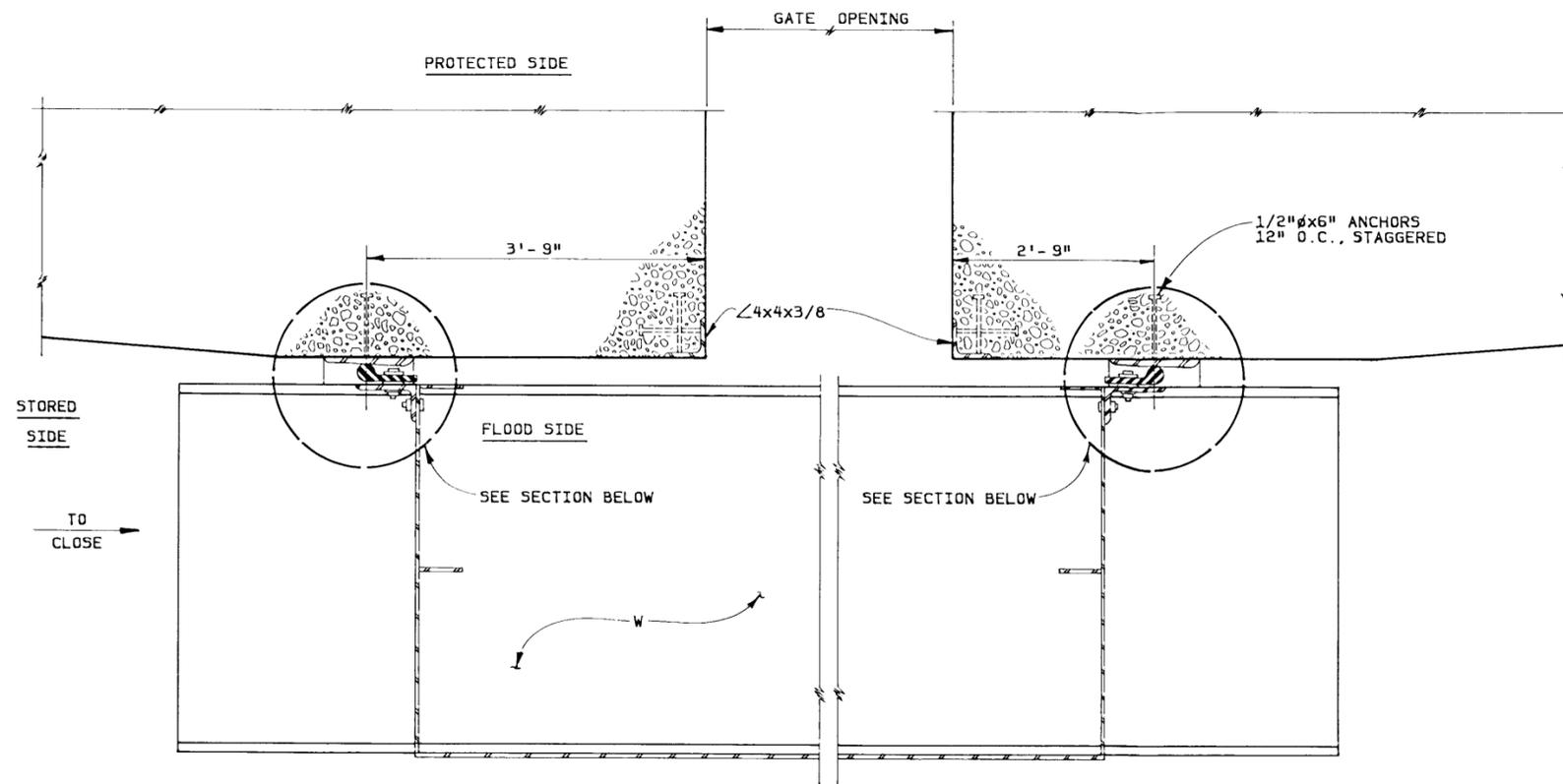
GATE MONOLITH

TYPICAL SECTIONS
BOTTOM ROLLER GATE

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

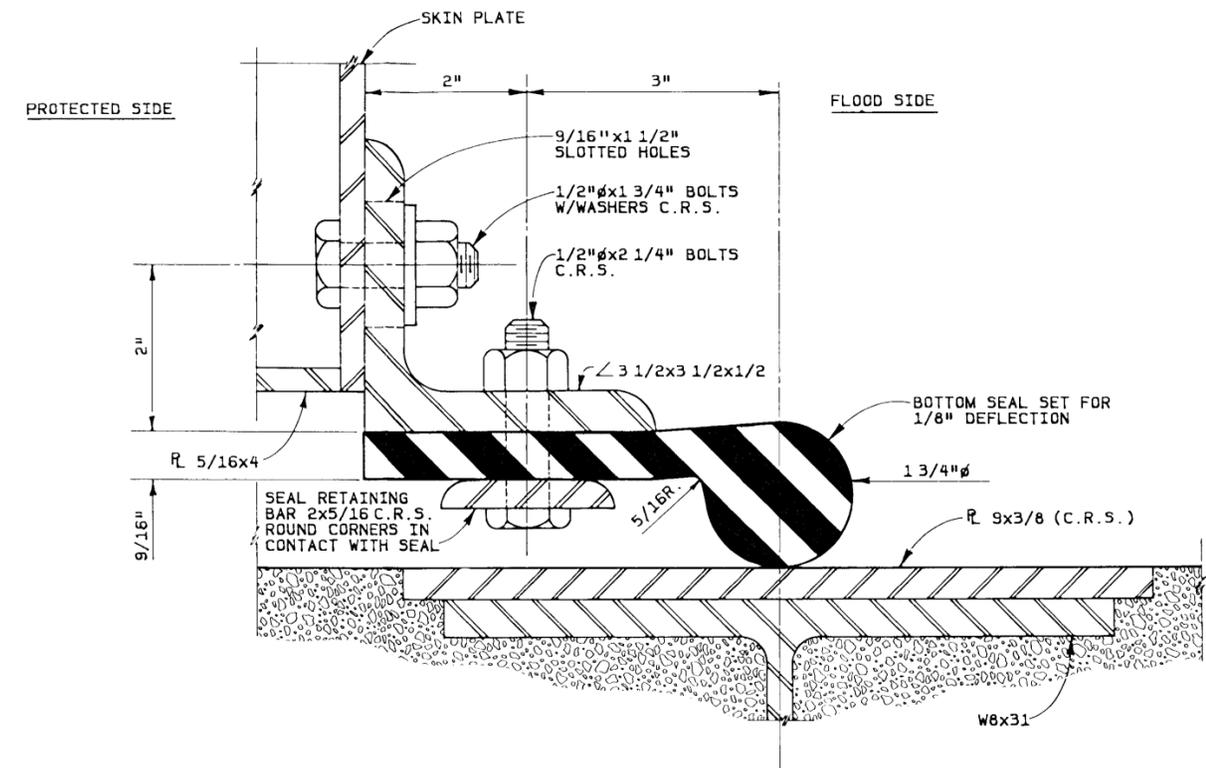


LAKE PONTCHARTRAIN, LA. AND VICINITY
 HIGH LEVEL PLAN
 DESIGN MEMORANDUM NO. 13, GENERAL DESIGN
 ORLEANS PARISH LAKEFRONT LEVEE
 WEST OF I.H.N.C.
BOTTOM ROLLER GATE
TYPICAL SECTIONS
 U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
 CORPS OF ENGINEERS
 NOVEMBER 1984 FILE NO. H-2-29536



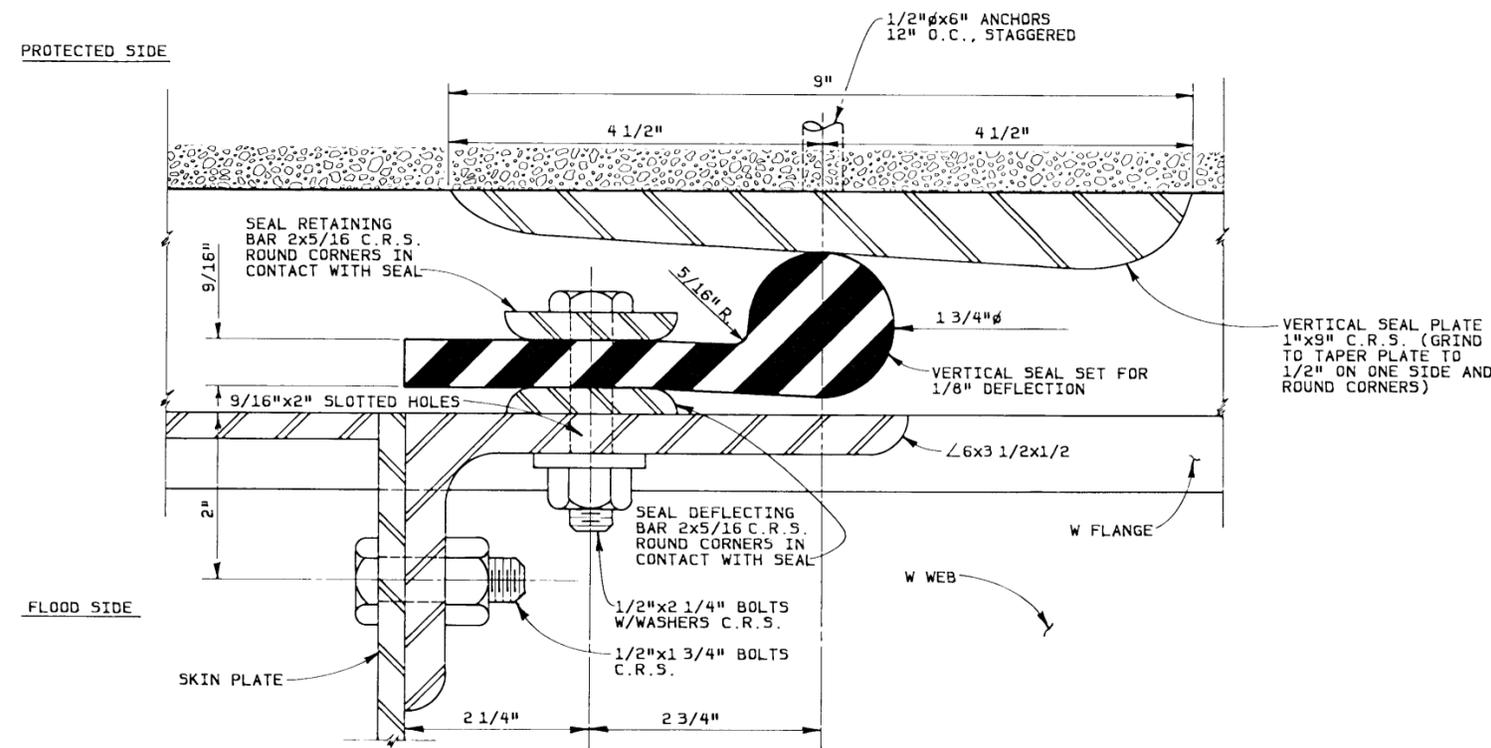
SECTION THRU BOTTOM ROLLER GATE

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



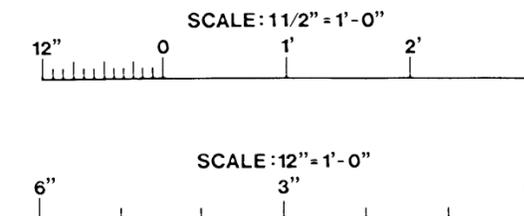
TYPICAL SECTION THRU BOTTOM SEAL

SCALE: FULL SIZE



TYPICAL SECTION THRU VERTICAL SEAL

SCALE: FULL SIZE

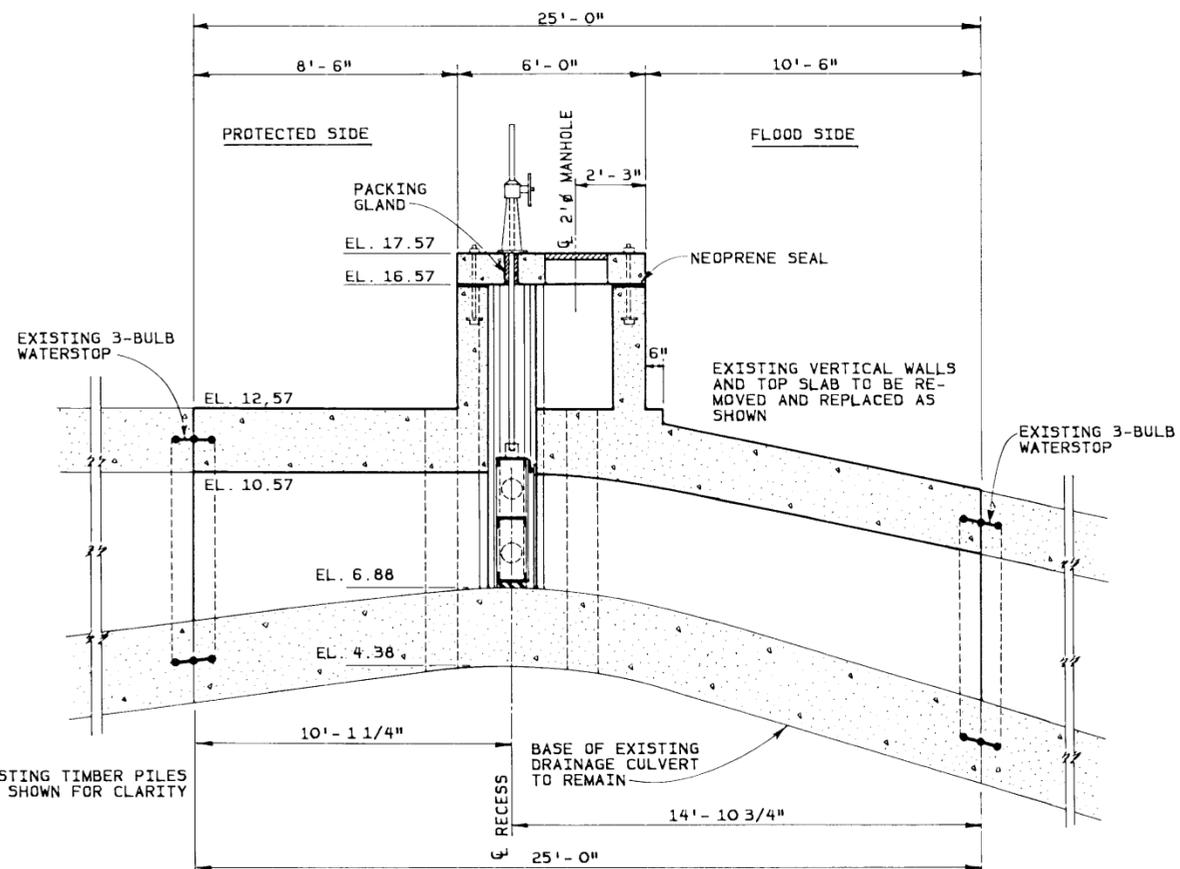


LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 13, GENERAL DESIGN
ORLEANS PARISH LAKEFRONT LEVEE
WEST OF I.H.N.C.

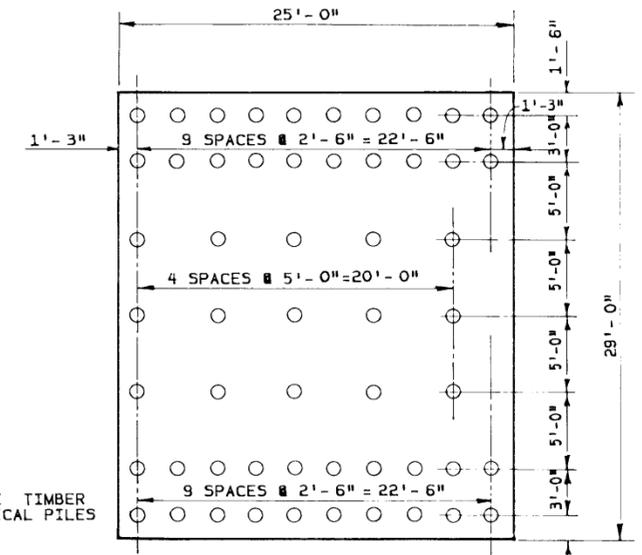
**BOTTOM ROLLER GATE
SEAL DETAILS**

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

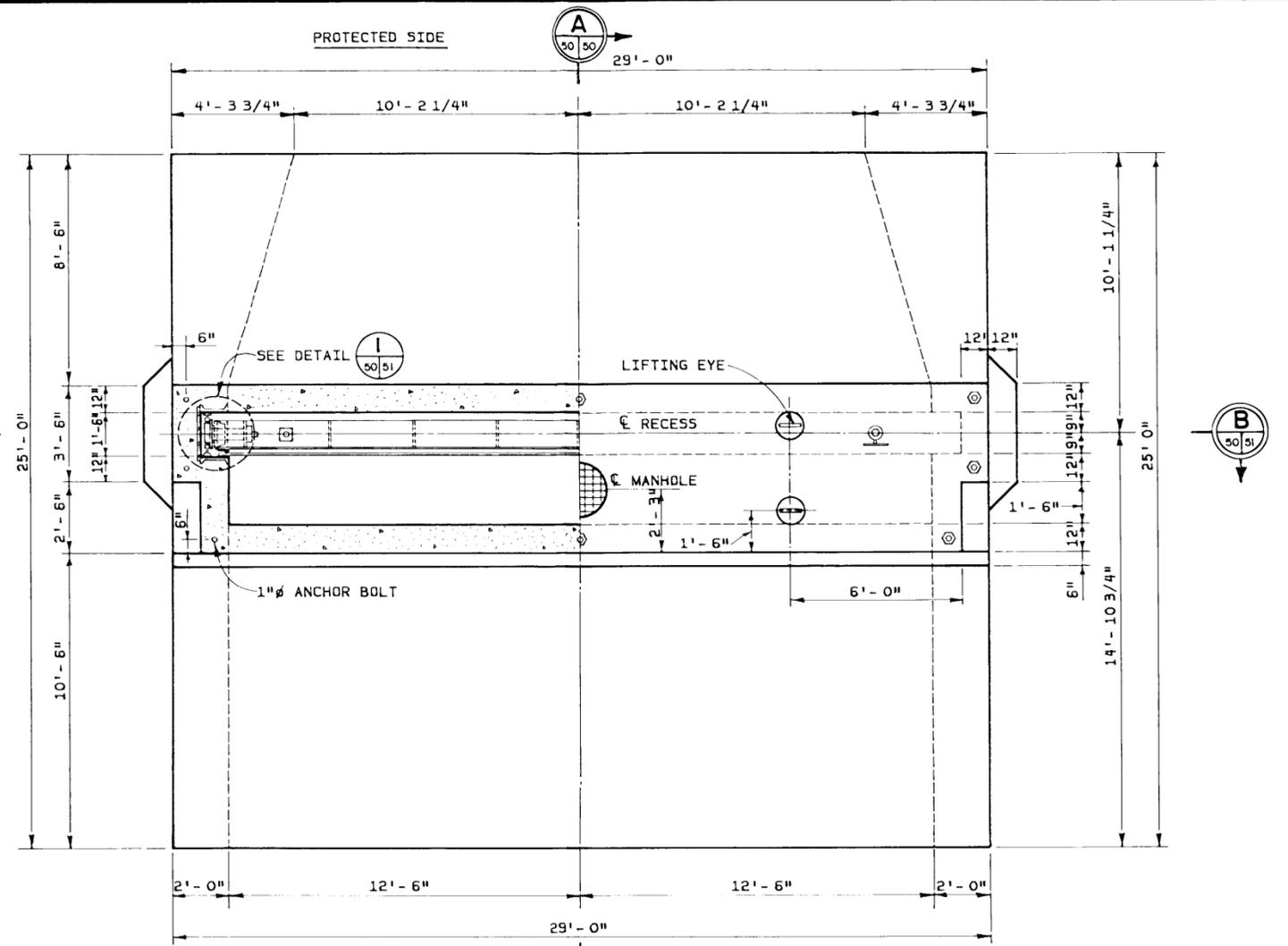
NOVEMBER 1984 FILE NO. H-2-29536



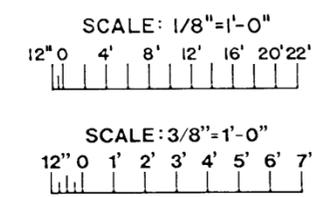
SECTION A
SCALE: 3/8" = 1'-0"



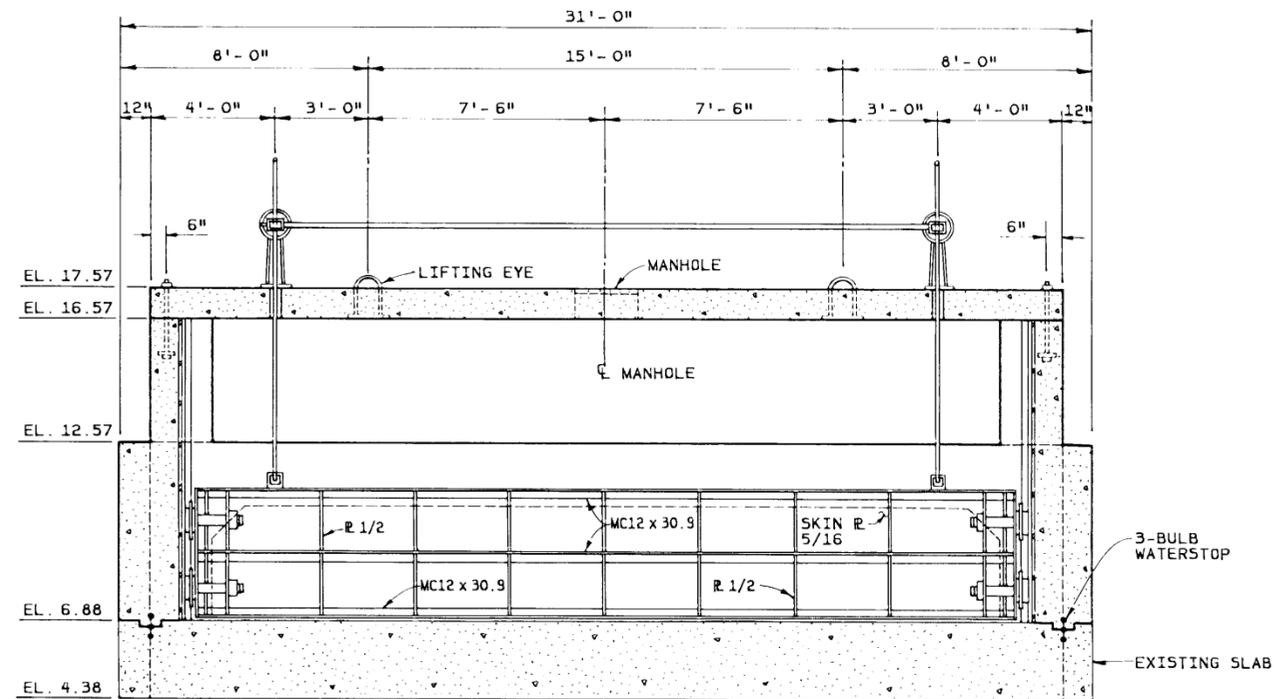
EXISTING PILE LAYOUT
SCALE: 1/8" = 1'-0"



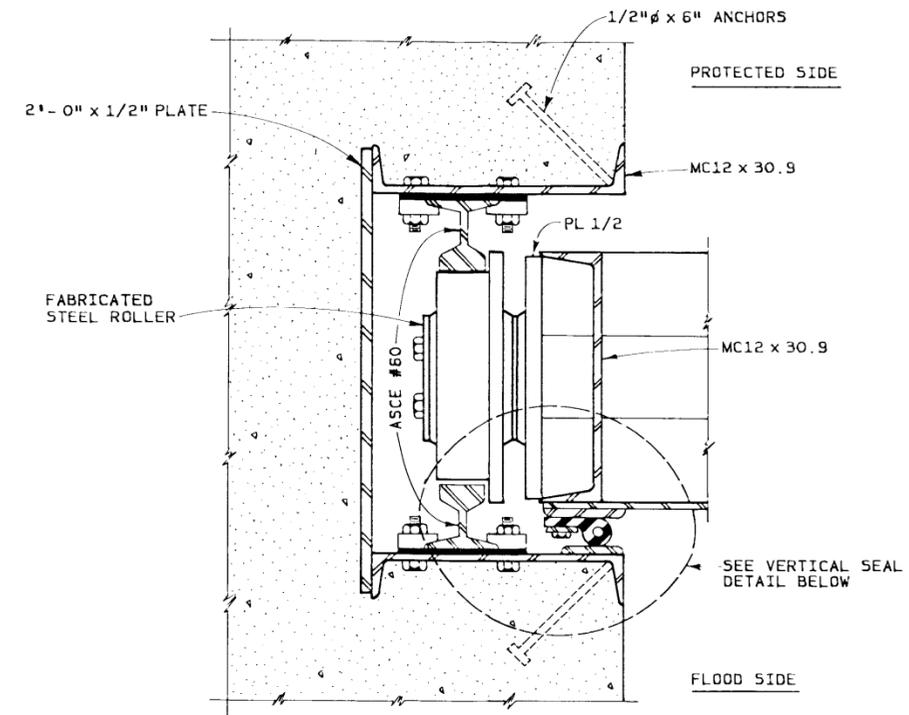
PLAN
SCALE: 3/8" = 1'-0"



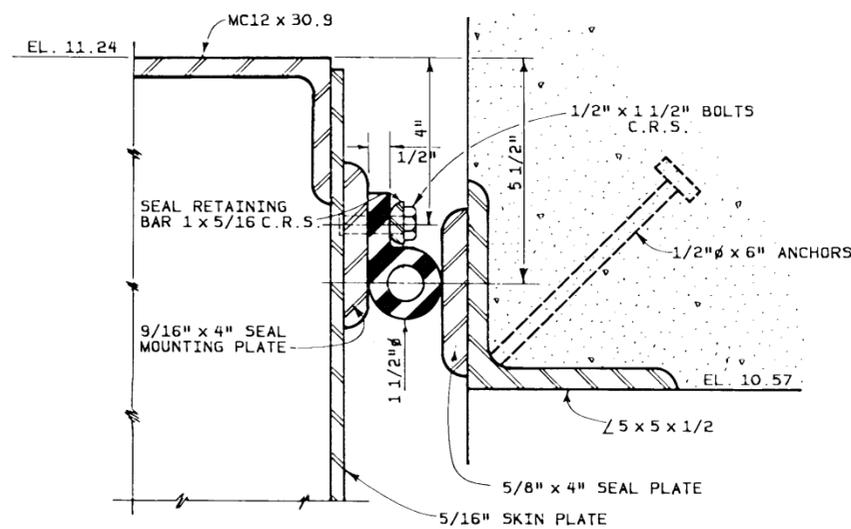
LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 13, GENERAL DESIGN
ORLEANS PARISH LAKEFRONT LEVEE
WEST OF I.H.N.C.
VERTICAL LIFT ROLLER GATE
PLAN AND SECTION
U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NOVEMBER 1984 FILE NO. H-2-29536



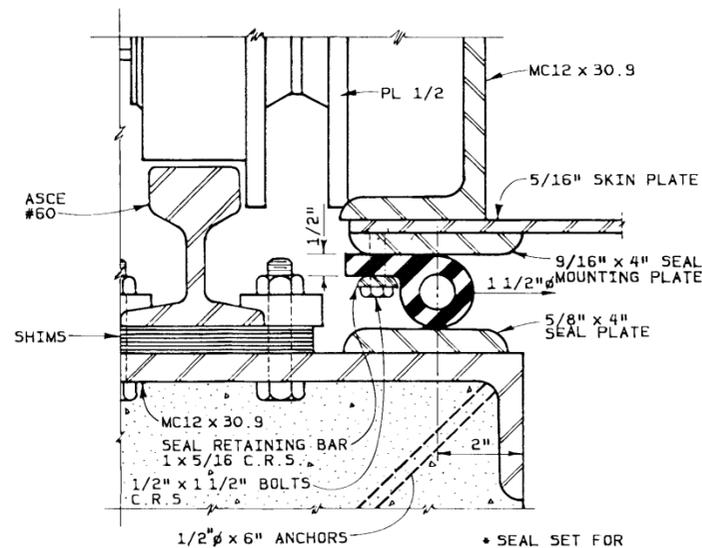
SECTION B
SCALE: 3/8" = 1'-0"



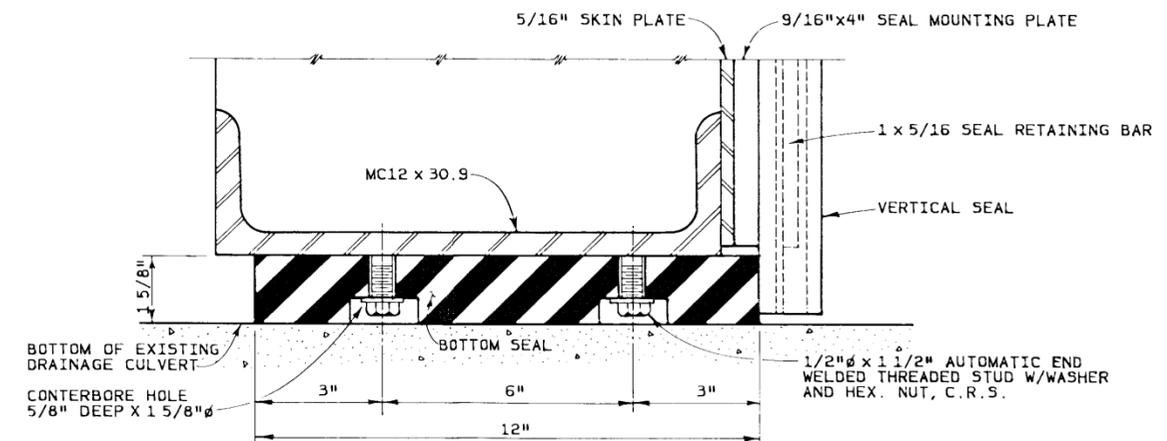
DETAIL 1
SCALE: 3" = 1'-0"



TOP SEAL DETAIL
SCALE: 6" = 1'-0"



VERTICAL SEAL DETAIL
SCALE: 6" = 1'-0"



BOTTOM SEAL DETAIL

SCALE: 6" = 1'-0"

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

SCALE: 3" = 1'-0"

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 13, GENERAL DESIGN
ORLEANS PARISH LAKEFRONT LEVEE
WEST OF I.H.N.C.
VERTICAL LIFT ROLLER GATE
SECTION AND DETAILS
U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NOVEMBER 1984 FILE NO. H-2-29536

LAKE PONTCHARTRAIN

FLOOD SIDE

PROTECTED SIDE

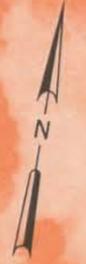
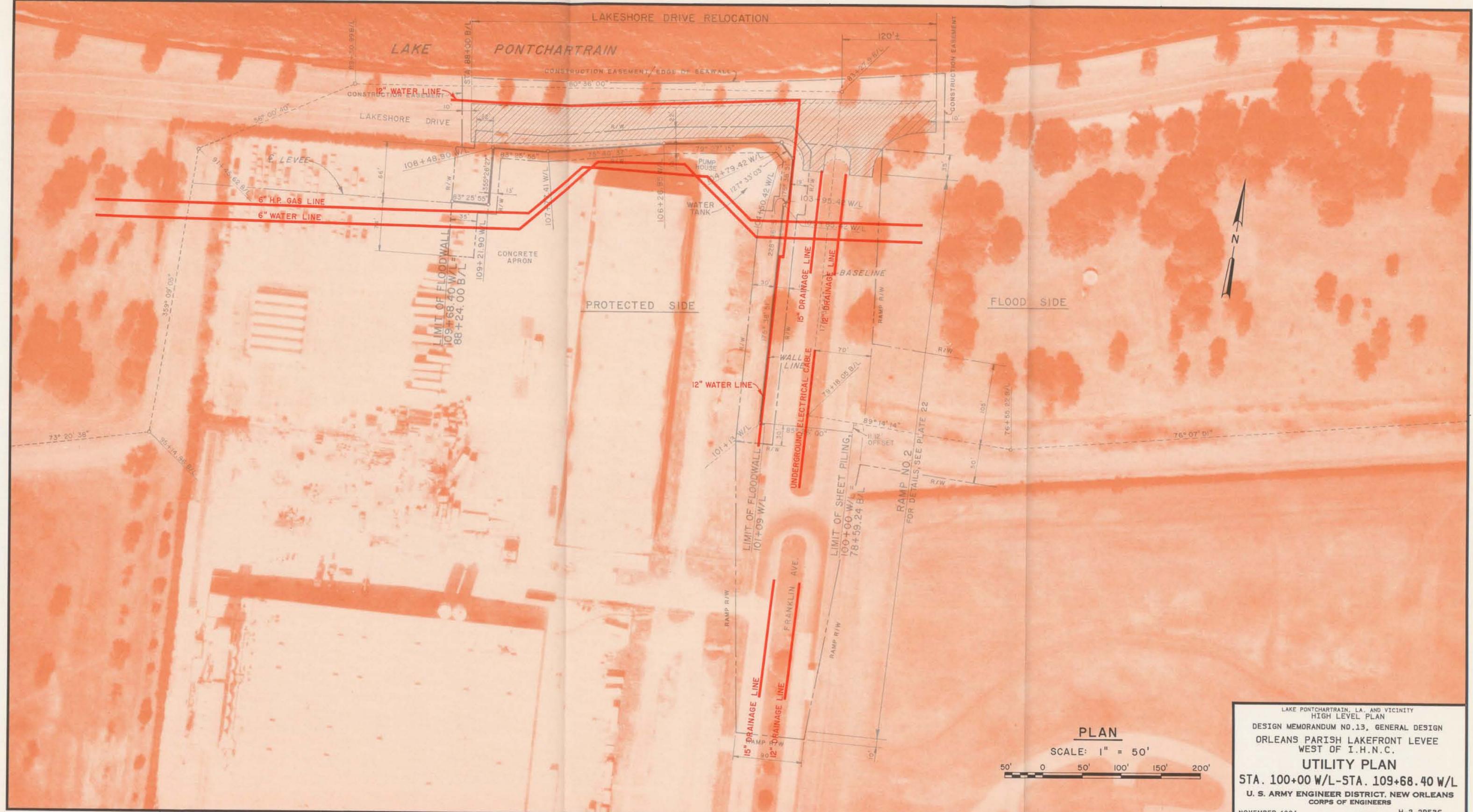


PLAN

SCALE: 1" = 100'

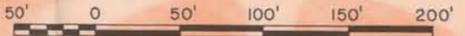


LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 13, GENERAL DESIGN
ORLEANS PARISH LAKEFRONT LEVEE
WEST OF I.H.N.C.
UTILITY PLAN
STA. 0+00 W/L - STA. 20+98.55 W/L
(NOT CONTINUOUS)
U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NOVEMBER 1984 FILE NO. H-2-29536

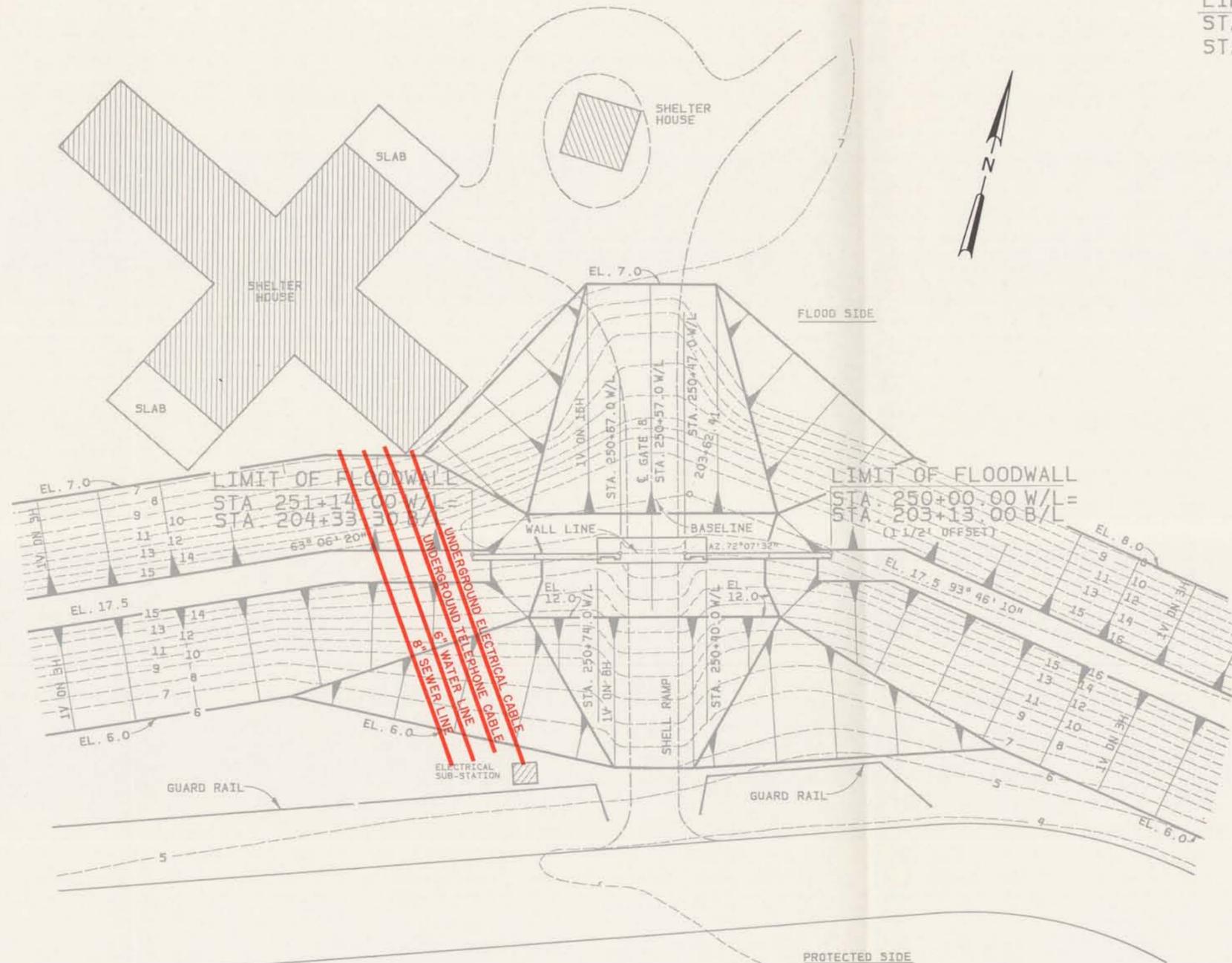


PLAN

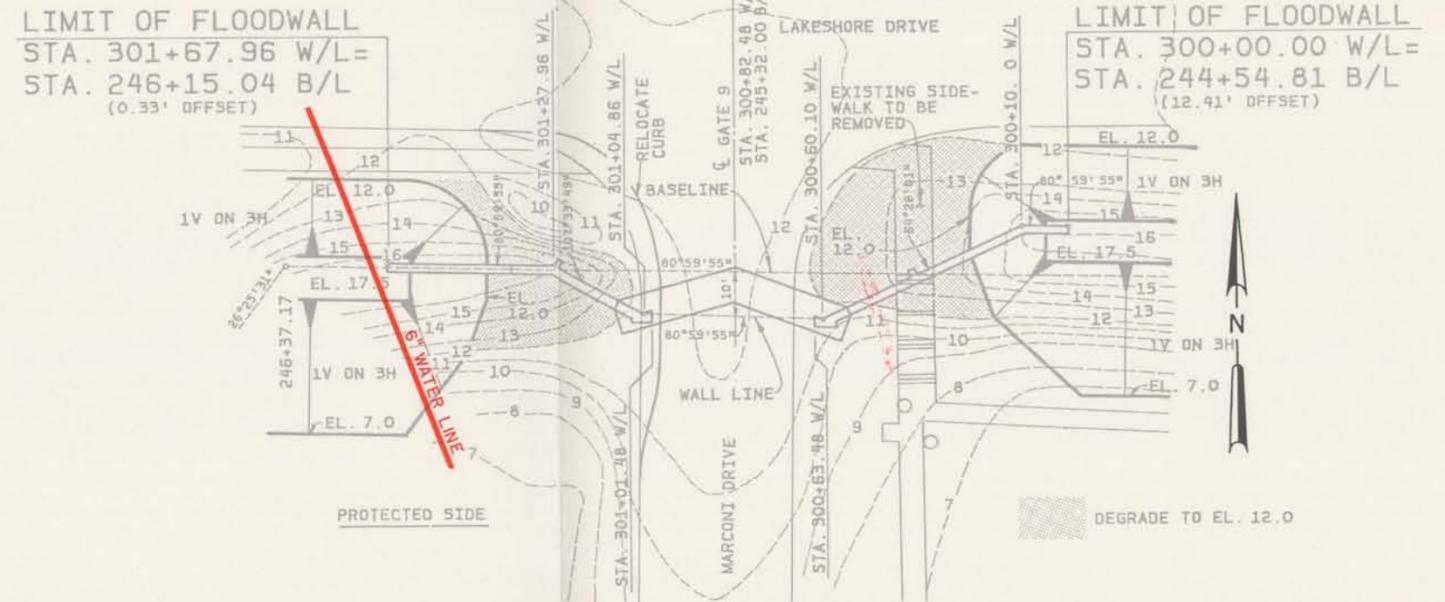
SCALE: 1" = 50'



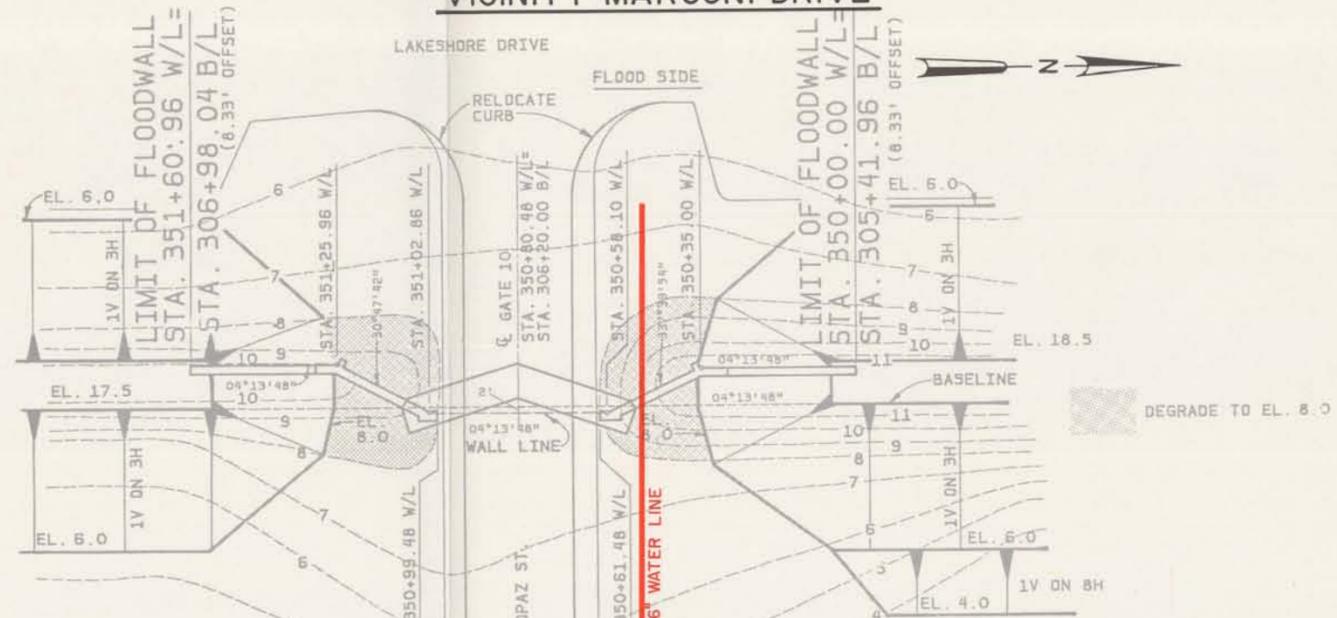
LAKE PONTCHARTRAIN, LA. AND VICINITY
 HIGH LEVEL PLAN
 DESIGN MEMORANDUM NO.13, GENERAL DESIGN
 ORLEANS PARISH LAKEFRONT LEVEE
 WEST OF I.H.N.C.
UTILITY PLAN
 STA. 100+00 W/L-STA. 109+68.40 W/L
 U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
 CORPS OF ENGINEERS
 NOVEMBER 1984 FILE NO. H-2-29536



PLAN
SCALE: 1" = 20'
VICINITY BASELINE STA. 204+50



PLAN
SCALE: 1" = 20'
VICINITY MARCONI DRIVE



PLAN
SCALE: 1" = 20'
VICINITY TOPAZ STREET

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 13, GENERAL DESIGN
ORLEANS PARISH LAKEFRONT LEVEE
WEST OF I.H.N.C.
UTILITY PLAN
U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
FILE NO. H-2-29536

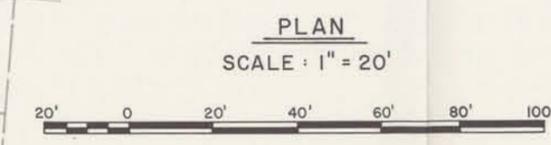


FLOOD SIDE

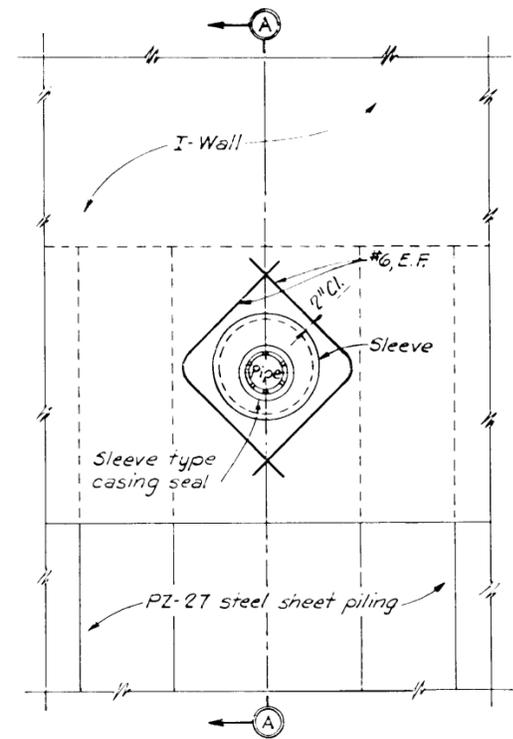
PROTECTED SIDE



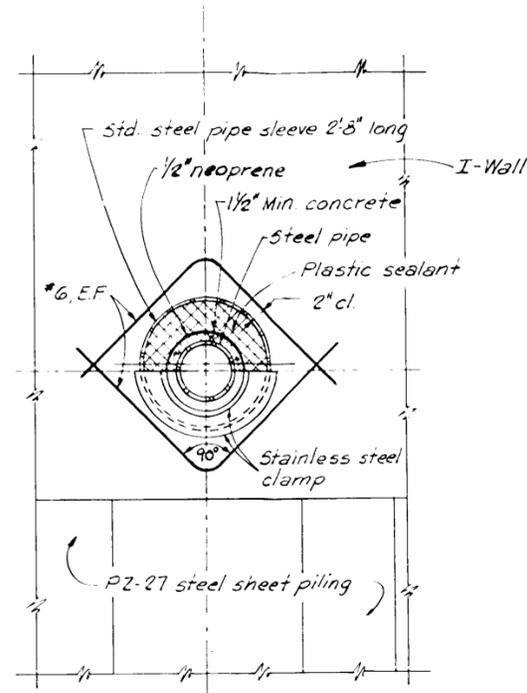
SEE PLATES 50 AND 51 FOR DETAILS OF PROPOSED VERTICAL LIFT ROLLER GATE.



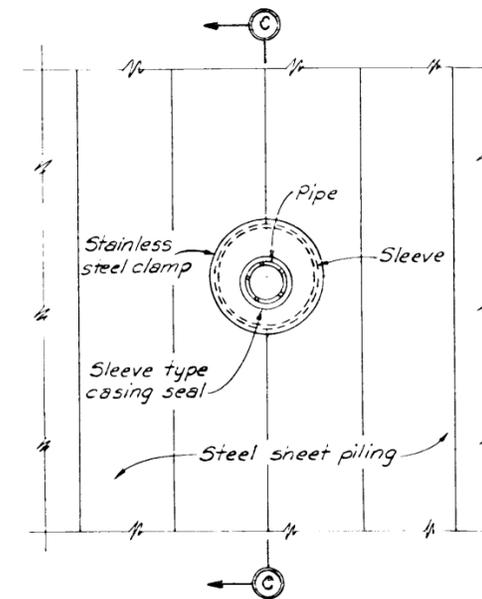
LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 13, GENERAL DESIGN
ORLEANS PARISH LAKEFRONT LEVEE
WEST OF I.H.N.C.
UTILITY PLAN
STA. 400+00.00 W/L TO STA. 411+08.06 W/L
U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NOVEMBER 1984 FILE NO. H-2-29536



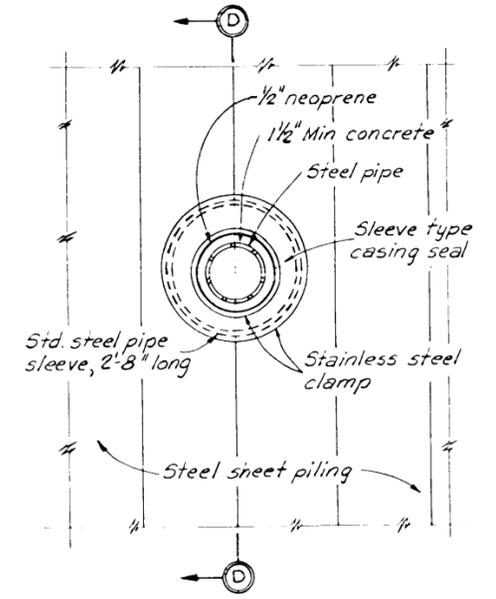
ELEVATION



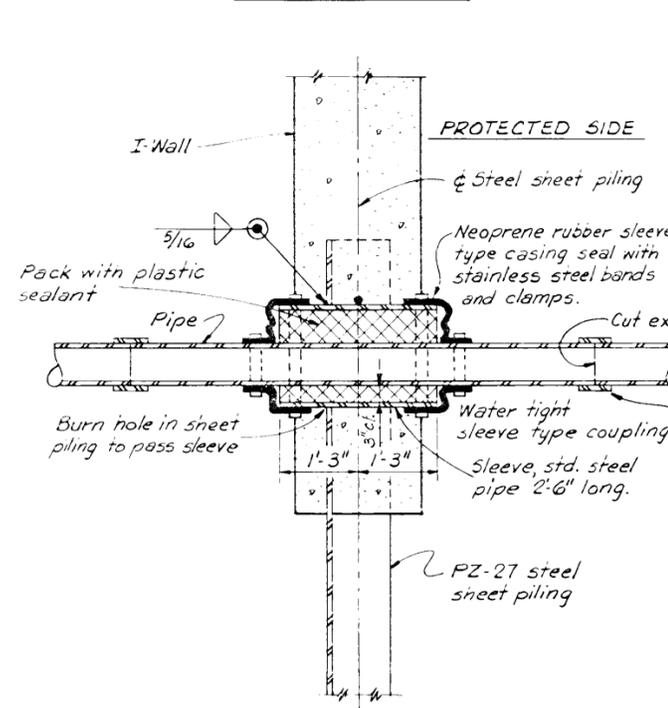
ELEVATION B-B



ELEVATION



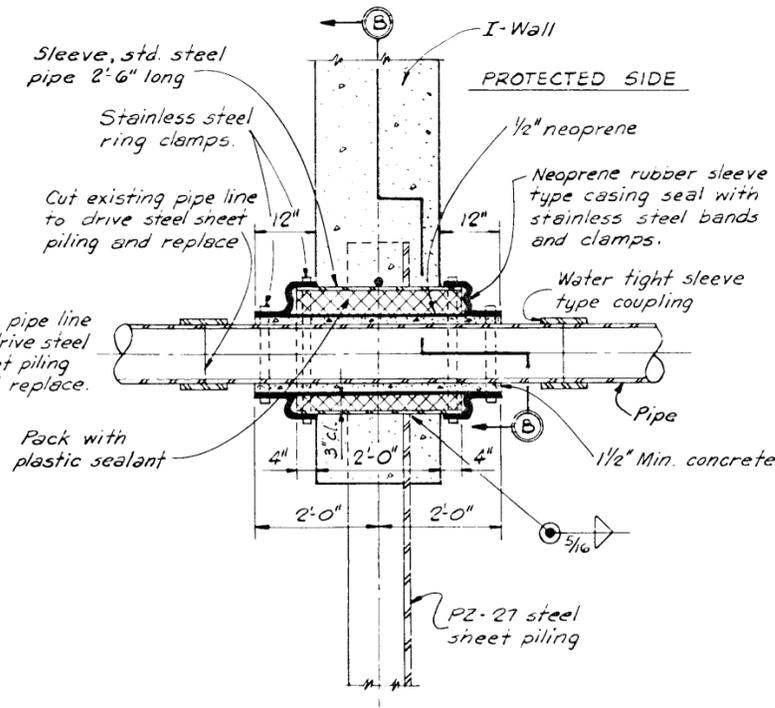
ELEVATION



SECTION A-A

TYPICAL PIPE THRU I-WALL

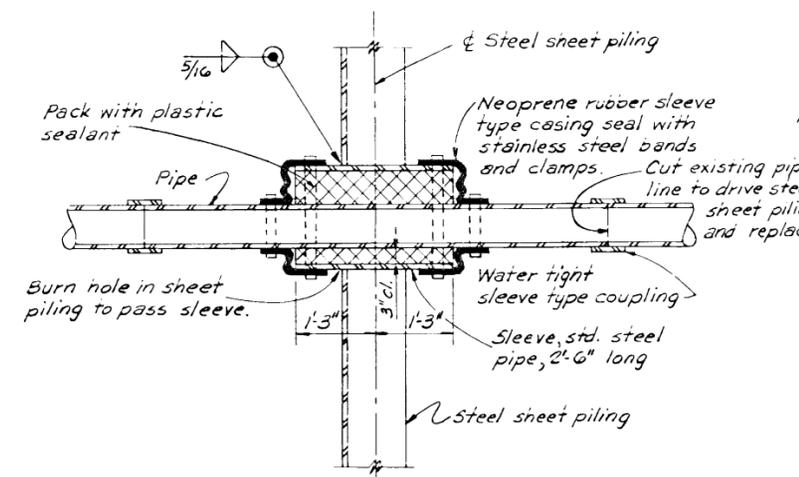
SCALE: 3/4" = 1'-0"



SECTION

TYPICAL GAS PIPE THRU I-WALL

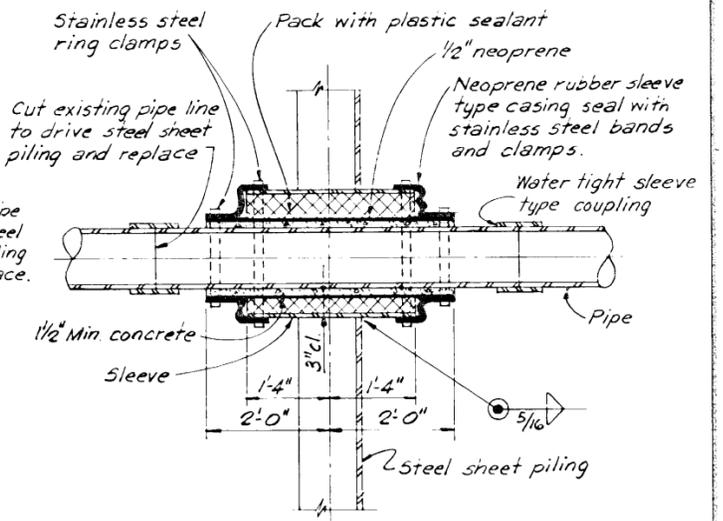
SCALE: 3/4" = 1'-0"



SECTION C-C

TYPICAL PIPE THRU STEEL SHEET PILING

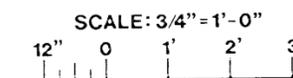
SCALE: 3/4" = 1'-0"



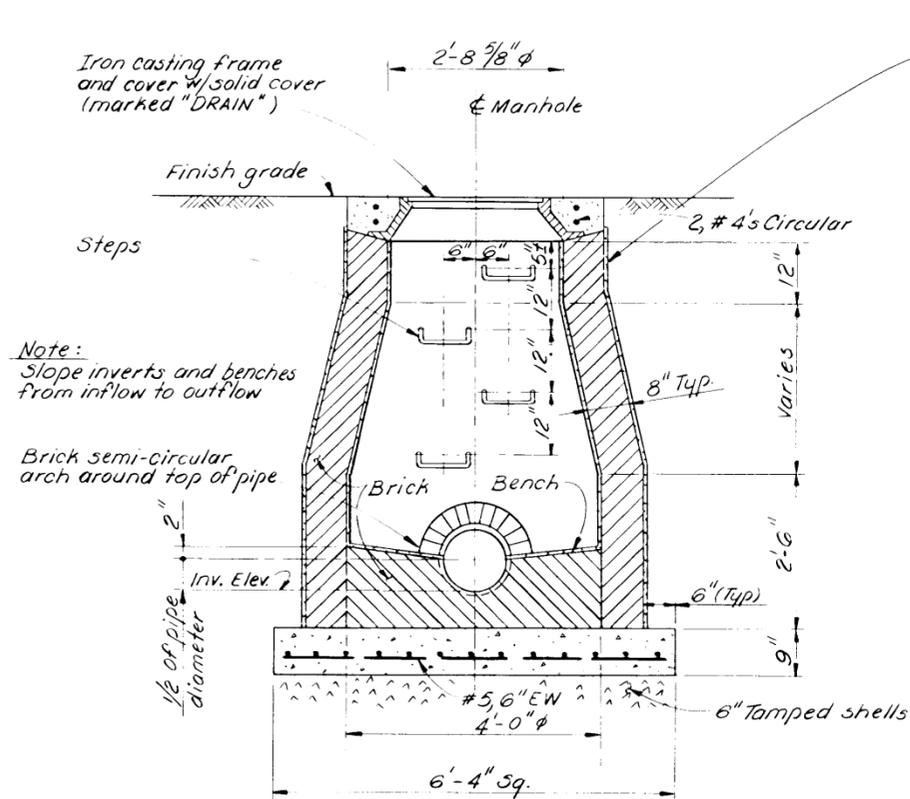
SECTION D-D

TYPICAL GAS PIPE THRU STEEL SHEET PILING

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

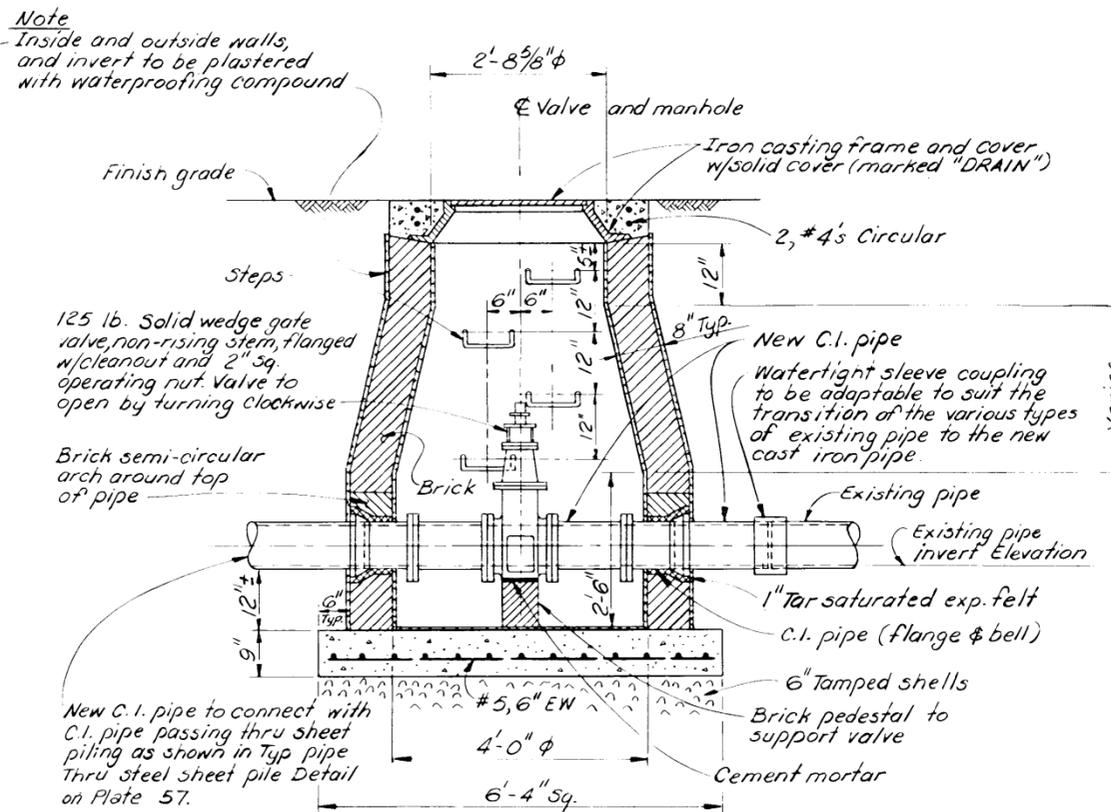


LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 13, GENERAL DESIGN
ORLEANS PARISH LAKEFRONT LEVEE
WEST OF I.H.N.C.
**UTILITY CROSSING
DETAILS**
U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NOVEMBER 1984 FILE NO. H-2-29536



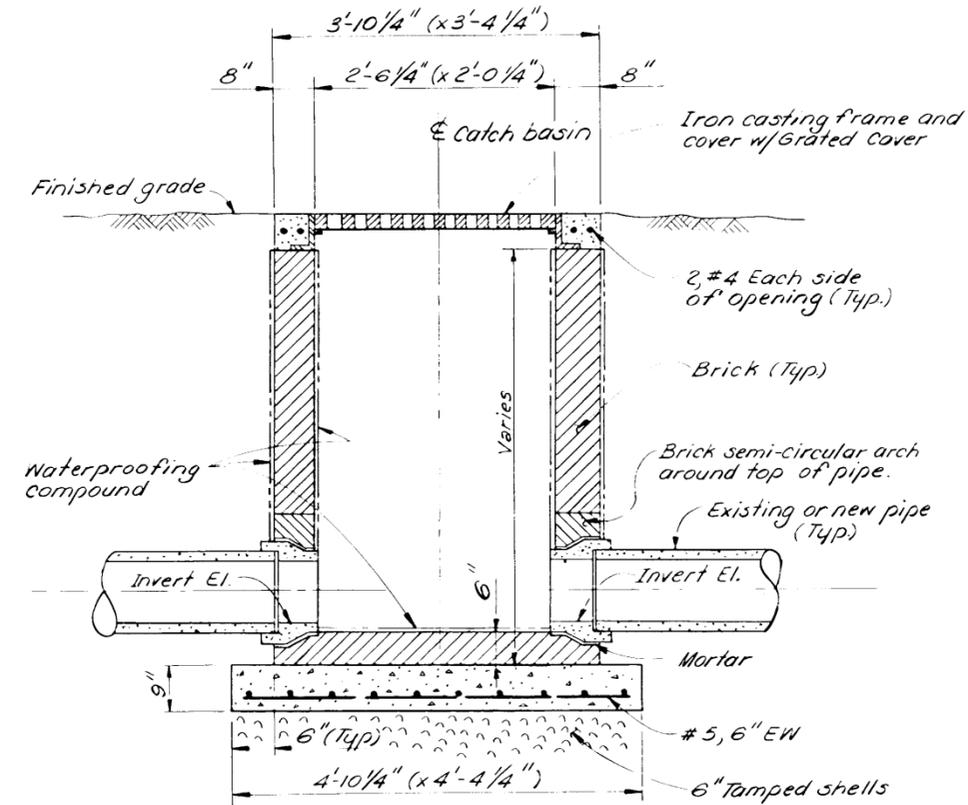
**SECTION
MANHOLE DETAIL**

N.T.S.



**SECTION
VALVE MANHOLE DETAIL**

N.T.S.



**SECTION
CATCH BASIN DETAIL**

N.T.S.

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 13, GENERAL DESIGN
ORLEANS PARISH LAKEFRONT LEVEE
WEST OF I.H.N.C.

MANHOLE DETAILS

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

NOVEMBER 1984 FILE NO. H-2-29536