LAKE PONTCHARTRAIN, LA.
AND VICINITY

LAKE PONTCHARTRAIN
HIGH LEVEL PLAN

DESIGN MEMORANDUM NO. 16
GENERAL DESIGN

NEW ORLEANS EAST LEVEE
SOUTH POINT TO GIWW

US Army Corps
of Engineers
New Orleans District

DEPARTMENT OF THE ARMY

NEW ORLEANS DISTRICT,
CORPS OF ENGINEERS
NEW ORLEANS, LOUISIANA

SEPTEMBER,1987

SERIAL NO. 34

DEPARTMENT OF THE ARMY
NEW ORLEANS DISTRICT, CORPS OF ENGINEERS
P.O. BOX 60267
NEW ORLEANS, LOUISIANA 70160-0267

REPLY TO
ATTENTION OF

CELMN-ED-SP 24 September 1987

MEMORANDUM FOR: Commander, Lower Mississippi Valley Division,
ATTN: CELMV-ED-TD

SUBJECT: Lake Pontchartrain, Louisiana and Vicinity, High Level Plan, Design Memorandum No. 16 - General Design, New Orleans East Levee, South Point to GIWW

1. The subject design memorandum is submitted for review and approval, and has been prepared generally in accordance with the provisions of ER 1110-2-1150, dated 15 November 1984.

2. A summary of the current status of the Clean Water Act, endangered species, EIS, and cultural resources investigations is as follows:

a. Since there is deposition of dredged or fill material into waters of the U.S. associated with the subject work, a Section 404(b)(1) Evaluation has been prepared and an application for a Water Quality Certificate has been made.

b. Based on studies and investigations at this stage of design, the proposed action is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of critical habitat of such species.

c. A final EIS for the barrier plan for the subject project was filed with CEQ on 17 January 1975. A final supplement to this EIS was filed with EPA on 7 December 1984. This supplement addressed the impacts associated with raising the height of the subject levee. The proposed levee work described in this GDM resulted in an increase in acreage over that covered in the EIS Supplement. A Supplemental Information Report (SIR) has been prepared to address the impacts associated with this increased acreage.

d. A cultural resources survey of the subject levee item was conducted in 1982, by New World Research, Inc., under contract to the New Orleans District, U.S. Army Corps of Engineers. No significant cultural resources were located in the project impact zone. The survey report was coordinated with the Louisiana SHPO and he concurred with the survey findings. No further cultural resources investigation is necessary.

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

CELMV-ED-TD (CELMN-ED-SP/24 Sep 87) 3d End Mr. Burttschell/jm/7246
SUBJECT: Lake Pontchartrain, Louisiana and Vicinity, High Level Plan, Design Memorandum No. 16 - General Design, New Orleans East Levee, South Point to GIWW

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

23 Dec 87

FOR: Commander, New Orleans District, ATTN: CELMN-ED-SP

The responses to 1st End comments are satisfactory. Note pen and ink correction on para 5 of 2d End.

FOR THE COMMANDER:

Fred H. Bayley III

Encl
nc

FRED H. BAYLEY, III
Chief, Engineering Division

CELMN-ED-SP (CELMN-ED-SP/24 Sep 87) 2d End Ms. DeLoach/saj/2621
SUBJECT: Lake Pontchartrain, Louisiana and Vicinity, High Level Plan, Design Memorandum No. 16 - General Design, New Orleans East Levee, South Point to GIWW

DA, New Orleans District, Corps of Engineers, P. O. Box 60267, New Orleans, LA 70160-0267 2 Dec 87

FOR: Commander, Lower Mississippi Valley Division
ATTN: CELMV-ED-TD

1. The proposed disposition of comments contained in the 1st Endorsement of this chain of correspondence, subject as above, is presented in the following paragraphs.

2. Para a. The maximum computed deflection in the H-pile supported monolith was 1.5 inches. The maximum computed deflection in the adjacent standard I-wall monolith was 1.0 inch. This results in a differential deflection of 0.5 inch, which is well within the maximum 3 inches of deflection allowed in a 3-bulb waterstop.

3. Para b. Concur.

4. Para c. Concur. The typical levee design section shown in the GDM as covering Sta. 1043+00 to Sta. 1065+00 will be extended 100 feet to Sta. 1066+00.

5. Para d. Concur. The first sentence of Para A-4c.(1)(a) has been rewritten as follows: The Bonnet Carre' Spillway is operated as required during major high water seasons on the Mississippi River to divert flows through Lake Pontchartrain to ensure that the flow passing New Orleans does not exceed ~~1,230,000~~ cfs.
1,250,000

6. Para e. Concur. The invert of the drainage structure at Sta. 664+99.27 is -2.0 NGVD.

7. Para f. Noted.

8. Approval of the proposed disposition of comments, as presented herein, is recommended.

FOR THE COMMANDER:

FREDERIC M. CHATRY
Chief, Engineering Division

CELMV-ED-TD (CELMN-ED-SP/24 Sep 87) 1st End Mr. Bardwell/bj/5925
SUBJECT: Lake Pontchartrain, Louisiana and Vicinity, High Level Plan, Design Memorandum No. 16 - General Design, New Orleans East Levee, South Point to GIWW

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

06 NOV 8

FOR: Commander, New Orleans District, ATTN: CELMN-ED

The subject design memorandum is approved subject to the following comments:

a. Para 48c, page 27 and Dwgs 17 and 18. Because of the possible difference in stiffness between the monolith in question and the adjacent standard I-wall monoliths, the adequacy of the three-bulb type water stop should be checked in the event the monoliths do not experience uniform lateral movement. If relative movements are excessive, an "L" type waterstop could be used.

b. Plate 8. This profile plate indicates that as much as 8 ft of fill will be placed on the existing levee. This considerable height of new fill increases the importance of obtaining good quality semicompacted fill with a minimum shear strength of 400 psf. In order to minimize slough slides, maximum semicompacted fill placement moisture limits specified in the plans and specifications should be no higher than about 5 percent wet of optimum.

c. Plates 8 and 15. These drawings indicate that the levee crosses the old channel of Bayou Thomas near Sta 1065+00. If the existing levee closure fill is questionable as to shear strength, you should ensure that the typical levee design section shown between Stas 1043+00 and 1065+00, which has larger berms, extends downstream past the old Bayou Thomas channel limits.

APPENDIX A.

d. This paragraph should be rewritten to show that the operation of the Bonnet Carre' spillway is to limit the flow at New Orleans to 1,250,000 cfs. Due to the improved flow carrying capacity of the river, the 20 ft NGVD stage at New Orleans is no longer a hard and fast rule for operation of the spillway.

e. Para A-9. The invert of the drainage structures at Sta 664+99.27 should be -2.0 NGVD in lieu of the stated +2.0 NGVD.

CELMV-ED-TD (CELMN-ED-SP/24 Sep 87) 1st End 06 NOV 87
SUBJECT: Lake Pontchartrain, Louisiana and Vicinity, High Level Plan, Design Memorandum No. 16 - General Design, New Orleans East Levee, South Point to GIWW

Appendix B.

f. Item C on pages 4, 7, and 10 appear to have been lined through; however, based on conversation with your personnel, it was determined that this was due to the reproduction from a copy where this item had been highlighted. This item is still a valid part of the assurances.

FOR THE COMMANDER:

Encl
wd 16 cys

Fred H Bayley III
FRED H. BAYLEY III
Chief, Engineering Division

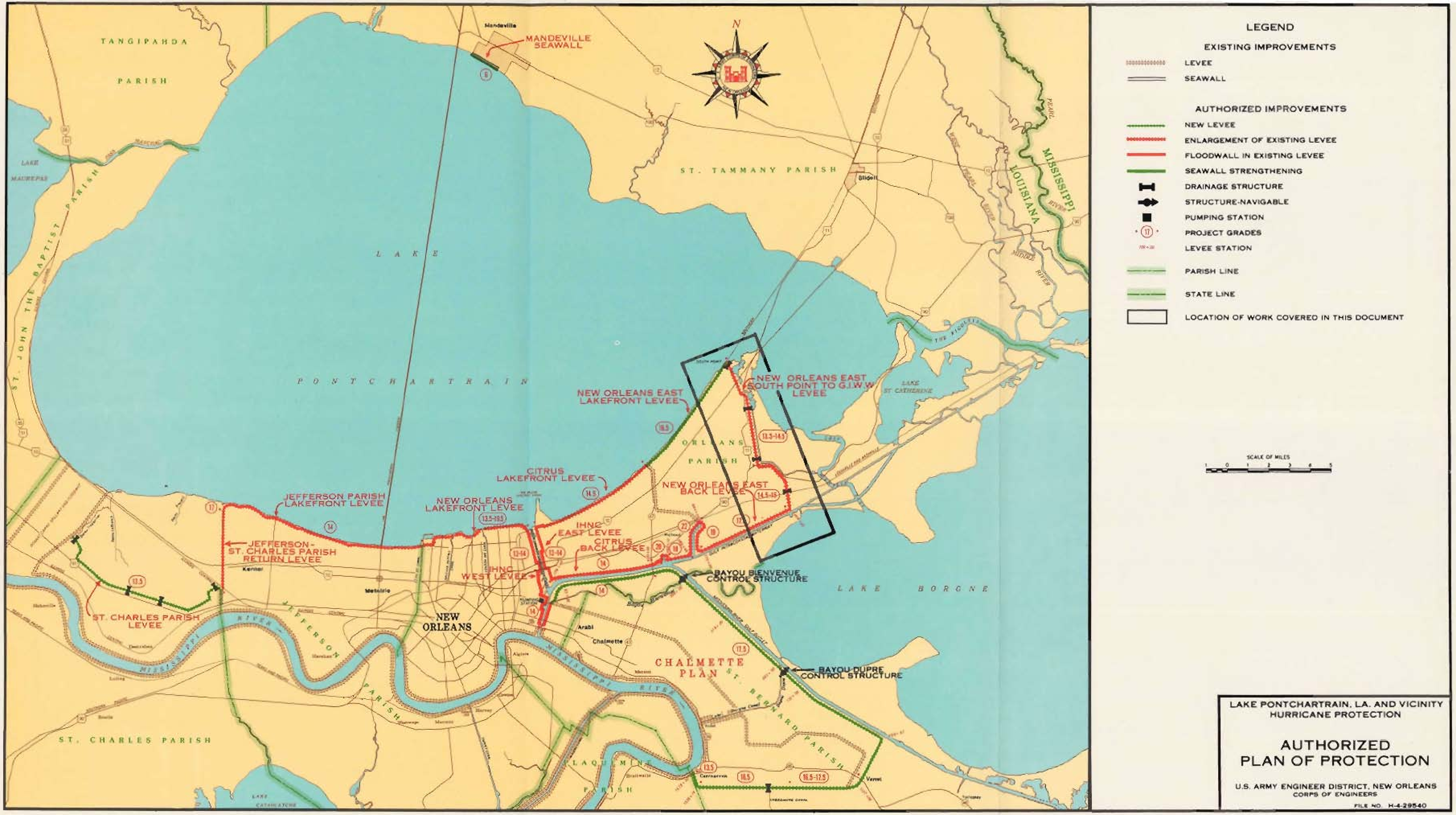
CF w 10 cys encl:
CEEC-EB

4. This report is submitted to LMVD on schedule.

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

Encl (16 cys, fwd sep)

LLOYD K. BROWN
Colonel, CE
Commanding


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
SCALE OF MILES
N
TANGIPAHOA PARISH
MANDEVILLE SEAWALL
ST. TAMMANY PARISH
LOUISIANA
MISSISSIPPI
ST. JOHN THE BAPTIST PARISH
LAKE MAUREPAS
LAKE PONTCHARTRAIN
NEW ORLEANS EAST LAKEFRONT LEVEE
NEW ORLEANS EAST SOUTH POINT TO G.I.W.W. LEVEE
ORLEANS PARISH
CITRUS LAKEFRONT LEVEE
NEW ORLEANS EAST BACK LEVEE
JEFFERSON PARISH LAKEFRONT LEVEE
NEW ORLEANS LAKEFRONT LEVEE
IHNC EAST LEVEE
CITRUS BACK LEVEE
JEFFERSON-ST. CHARLES PARISH RETURN LEVEE
IHNC WEST LEVEE
BAYOU BIENVENUE CONTROL STRUCTURE
LAKE BORGNE
ST. CHARLES PARISH LEVEE
NEW ORLEANS
JEFFERSON PARISH
MISSISSIPPI RIVER
CHALMETTE PLAN
ST. BERNARD PARISH
BAYOU DUPRE CONTROL STRUCTURE
PLAQUEMINES PARISH
ST. CHARLES PARISH
LAKE ST. CATHERINE
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

LAKE PONTCHARTRAIN, LOUISIANA AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 16 - GENERAL DESIGN
NEW ORLEANS EAST LEVEE
SOUTH POINT TO GIWW

STATUS OF DESIGN MEMORANDUMS

Design Memo No.	Title	Status
1	Hydrology and Hydraulic Analysis	
	Part I - Chalmette	Approved 27 Oct 66
	Part II - Barrier	Approved 18 Oct 67
	Part III - Lakeshore	Approved 6 Mar 69
	Part IV - Chalmette Extension	Approved 1 Dec 67
2	Lake Pontchartrain Barrier Plan, GDM, Advance Supplement, Inner Harbor Navigation Canal Levees	Approved 31 May 67
2	Lake Pontchartrain Barrier Plan, GDM, Citrus Back Levee	Approved 29 Dec 67
2	Lake Pontchartrain Barrier Plan, GDM, Supplement No. 1, Lake Pontchartrain Barrier, Rigolets Control Structure, Closure Dam, and Adjoining Levees	Approved 10 Nov 70
2	Lake Pontchartrain Barrier Plan, GDM, Supplement No. 2, Lake Pontchartrain Barrier, Rigolets Lock and Adjoining Levees	Approved 19 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
2	Lake Pontchartrain Barrier Plan, GDM, Supplement No. 5, Orleans Parish Lakefront Levees - West of IHNC	1/
2	Lake Pontchartrain Barrier Plan, GDM, Supplement No. 5A, Citrus Lakefront Levees - IHNC to Paris Road	Approved 12 Jul 76

STATUS OF DESIGN MEMORANDUMS (cont'd)

Design Memo No.	Title	Status
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	1/
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	1/
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
2	Lake Pontchartrain Barrier Plan, GDM, Supplement No. 10, Jefferson Parish Lakefront Levees	1/
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	

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 MEMORANDUMS (cont'd)

Design Memo No.	Title	Status
	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	2/
7	Lake Pontchartrain Barrier Plan, DDM, Chef Menteur Control Structure and Closure	2/
8	Lake Pontchartrain Barrier Plan, DDM, Rigolets Lock	Approved 20 Dec 73
9	Lake Pontchartrain Barrier Plan, DDM, Chef Menteur Navigation Structure	2/
10	Lake Pontchartrain Barrier Plan, Corrosion Protection	Approved 21 May 69
12	Sources of Construction Materials	Approved 30 Aug 66
1	Lake Pontchartrain, Louisiana and Vicinity, and Mississippi River - Gulf Outlet, Louisiana, GDM, Seabrook Lock	Approved 4 Nov 70
2	Lake Pontchartrain, Louisiana and Vicinity, and Mississippi River - Gulf Outlet, Louisiana, DDM, Seabrook Lock	Approved 17 Apr 81
Report	Lake Pontchartrain Barrier Plan, Seabrook Lock Breakwater	3/

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)

Design Memo No.	Title	Status
12	Lake Pontchartrain and Vicinity, Louisiana, Sources of Construction Materials (Revised)	Approved 23 Oct 79
13	Lake Pontchartrain, La. & Vicinity, High Level Plan, Orleans Parish Lakefront Levee West of IHNC	Approved Feb 85
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 Paris Road - Supplement No. 1 - New Orleans Lakefront Airport and Lincoln Beach	Unscheduled
15	Lake Pontchartrain, La. & Vicinity, High Level Plan, New Orleans East Lakefront Levee, Paris Road to South Point	Approved 19 Jun 85
16	Lake Pontchartrain, La. & Vicinity, High Level Plan, New Orleans East Levee, South Point to GIWW	Submitted Sep 87
17	Lake Pontchartrain, La. & Vicinity, High Level Plan, Jefferson Parish Lakefront Levee	Scheduled Aug 87
17A	Lake Pontchartrain, La. & Vicinity, High Level Plan, Jefferson - St. Charles Return Levee	Submitted Jul 87

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)

Design Memo No.	Title	Status
18	Lake Pontchartrain, La. & Vicinity, High Level Plan, St. Charles Parish Levee (North of Airline Highway Alignment)	Scheduled Jun 88
19	Lake Pontchartrain, La. & Vicinity, High Level Plan, Orleans Avenue Outfall Canal	Scheduled Aug 87
19A	Lake Pontchartrain, La. & Vicinity, High Level Plan, London Avenue Outfall Canal	Scheduled Apr 88
20	Lake Pontchartrain, La. & Vicinity, High Level Plan, 17th Street Outfall Canal	Scheduled Nov 87
21	Lake Pontchartrain, La. & Vicinity, High Level Plan, Orleans Parish Outfall Canal, Detailed Design Memorandum (London Avenue Canal)	Scheduled Sep 89
22	Lake Pontchartrain, La. & Vicinity, High Level Plan, Orleans Parish Outfall Canal, Detailed Design Memorandum (Orleans Avenue Canal)	Scheduled Jan 89
23	Lake Pontchartrain, La. & Vicinity, High Level Plan, Orleans Parish Outfall Canal, Detailed Design Memorandum (17th Street Canal)	Unscheduled

LAKE PONTCHARTRAIN, LOUISIANA AND VICINITY
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HIGH LEVEL PLAN
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PERTINENT DATA

Location of Project	Southeastern Louisiana in Orleans Parish
Datum Plane	
Vertical	National Geodetic Datum (NGVD)1/
Hydrologic Data	
Temperature: Maximum monthly	90.7
Minimum monthly	43.0
Average annual	68.2
Annual Precipitation: Maximum	83.54
Minimum	39.00
Average	59.74
Hydraulic Design Criteria - Tidal	
Design Hurricane	Standard Project Hurricane
Frequency in Lake Pontchartrain	1 in 300 yrs
Frequency in Lake Borgne	1 in 200 yrs
Lake Pontchartrain South Shore	
Central Pressure Index (CPI)	27.6 inches of mercury
Maximum 5-min average wind speed	100 mph
Radius of maximum winds	30 miles
Average forward speed	6 knots
Stillwater level	11.5 ft
Wind direction	South
Lake Borgne, Rigolets, and Chef Menteur Pass	
Central Pressure Index (CPI)	27.6 inches of mercury
Maximum 5-min average wind speed	100 mph
Radius of maximum winds	30 miles
Average forward speed	11 knots
Stillwater level	13.0 ft
Wind direction	West - Northwest
Levee	
Method of construction	Hauled, semi-compacted clay fill
Levee length (approx.)	8.3 miles

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

LAKE PONTCHARTRAIN, LOUISIANA AND VICINITY
HIGH LEVEL PLAN
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PERTINENT DATA
(cont'd)

Crown elevation (varies)	13.5' to 17.5'
Crown width	10 feet
Floodwall	
Floodwall length (approx.)	126 feet
Top elevation	20.5'
Rights-of-Way	
	14.4 acres additional
Estimated First Cost	
Federal	$11,066,000
Non-Federal	$ 2,434,000
TOTAL	$13,500,000

LAKE PONTCHARTRAIN, LOUISIANA AND VICINITY
HIGH LEVEL PLAN
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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 sheet pile wall along the levee west of the Inner Harbor Canal in New Orleans; raising the rock dikes and landward gate bay of the planned Seabrook Lock; construction of a new levee lakeward of the Southern Railway extending from the floodwall at New Orleans Airport to South Point; enlargement of the existing levee extending from US Highway 90 to the Gulf Intracoastal Waterway, thence westward along the waterway to the Inner Harbor Canal, together with riprap slopes along the canal; construction of a concrete capped sheet pile wall along the east levee of the Inner Harbor Canal between the Gulf Intracoastal Waterway and the New Orleans Airport..."

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

2. Purpose and Scope. This 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), New Orleans East levee, South Point to GIWW, 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 barrier plan levee so that a high level plan of protection can be achieved.

3. Local Cooperation.

a. Flood Control Act of 1965 (Public Law 89-298). The conditions of local cooperation pertinent to this GDM 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."

INVESTIGATIONS

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 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 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 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 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 field surveys are anticipated at this time to support these designs.

LOCAL COOPERATION

7. Local Cooperation Requirements. The conditions of local cooperation as specified in the authorizing laws are quoted in paragraph 3. These conditions were applicable to the "Barrier Plan." Amended assurances

were required for the High Level Plan. A list of the amended local assurance items 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;

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;

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

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 because it pertains only to the barrier plan: 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,

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

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);

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;

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

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

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;

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.

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. New agreements of assurances covering all local cooperation requirements and a deferred payment plan for the Barrier Plan as authorized by Public Law 93-251 were executed by the Orleans Levee District on 30 March 1976. These assurances were accepted on behalf of the United States on 7 December 1977. Amended assurances for the High Level Plan were executed by the local sponsor on 29 May 1985, and accepted by the United States on 21 June 1985 (see Appendix B).

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 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 South Point to GIWW 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 East. 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 East Levee from South Point to the GIWW. 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 East Levee, South Point to GIWW. This levee is located in Eastern New Orleans and extends from South Point, La. (Station 661+70.46 B/L) southward approximately 8.3 miles to its juncture with the New Orleans East Back Levee embankment at the GIWW (Station 1102+98.06 B/L). The project plan presented herein provides for enlarging the existing levee with hauled clay material. The clay will be obtained from a borrow area located in the Bonnet Carre' Spillway. The alignment and profile for the levee are shown on plates 2-8. Typical design sections are shown on plates 9-11. The ramps at U.S. Highways 11 and 90 will be raised. Existing drainage structures at

baseline Stations 664+99.27, 798+98.61, 927+04.70, and 1054+05.99 will not be modified. The protection at the structures at baseline Stations 664+99.27, 798+98.61, and 927+04.70 will be increased by raising the levee on top of the structures. The protection for the structure at Station 1054+05.55 B/L will be modified from an earthen levee to an I-type floodwall. The railroad swing gate at Station 1057+99.15 B/L will not be modified as some wave overtopping will be allowed. Riprap will be placed on both sides of the floodgate to protect against erosion from the wave overtopping.

14. Departures from Project Document Plan. Departures from the project document plan are discussed in detail in paragraph 14, page 7 of GDM No. 2, Supplement No. 9, "New Orleans East Levee - South Point to GIWW." The proposed plan of protection recommended herein builds on the barrier plan of protection and does not structurally or procedurally depart from the barrier
plan. The high level plan, of course, requires a higher levee and floodwall to protect against the design storm. The Lake Pontchartrain, Louisiana and Vicinity, Reevaluation Study recommended a net levee elevation of from 14.5- 15.0 for the reach from U.S. Hwy 90 to the GIWW. The hydraulic analysis done for this GDM resulted in an increase in the net levee elevation for this reach. The plan presented in this GDM calls for an elevation of from 14.5 to 17.5 in this reach, with a wave berm from Station 1030+00 to the GIWW.

HYDROLOGY AND HYDRAULICS

15. 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.

16. Surface Drainage. Construction of the proposed levee and foreshore protection recommended herein will not affect existing surface drainage patterns. Interior drainage is discussed in Appendix A.

GEOLOGY

17. General.

a. Scope. The geology presented herein is based on regional and local surface and subsurface information. It is intended to present a general project overview of the pertinent geologic data and interpretation.

b. Physiography and Topography. The project site is located within the Central Gulf Coastal Plain region on the flanks of the Mississippi River Deltaic Plain in east Orleans Parish from South Point to the Gulf Intracoastal Waterway. Pronounced physiographic features of the area are lakes, shorelines, canals, an abandoned Mississippi River delta, the Mississippi River, beach ridges, marshes, and swamps. Elevations in the vicinity vary from -15.0 feet NGVD in Lake Pontchartrain to +20.0 feet NGVD along the crown of the mainline Mississippi River levees.

c. Surface Investigation. Aerial photographs, topographic maps, and geologic maps were used in conjunction with published literature to define the geologic setting of the project area.

d. Subsurface Investigation. A total of 44 borings have been drilled at the site. This includes the recent addition of nine 5-inch undisturbed borings. Individual boring depths vary from approximately 15 to 100 feet and generally encounter artificial fill, Holocene soils, and the Pleistocene horizon. The boring data, used in conjunction with other available data, was the primary source for site specific geologic foundation interpretations.

e. Geophysical Investigation. No geophysical methods were used at the project site. Present retroactive methods would not have delineated the various Holocene environments.

18. Regional Geology.

a. Geologic Structure. The project site is located within the Gulf Coastal Plain province. The province extends east to west from Georgia to Texas and north to south from southern Illinois to the Gulf of Mexico continental shelf. The central portion of the province and area of project location is the Mississippi Embayment. The embayment is structurally oriented in a north-south direction with its axis passing locally through a point east of Houma, Louisiana.

The development of the embayment, an approximate 60 million year process, is continuous with the influx of additional sediment. Tertiary and Quaternary sediment thicknesses presently exceed 40,000 feet near the gulf coastline. This tremendous accumulation of sediments has caused a downwarping of the underlying basement rock that has resulted in the deformation and faulting of that sediment. Such massive accumulations are also associated with higher than normal Quaternary sediment consolidations and stresses that also produce both regional and local faults and structural deformations such as folds. Salt domes, diapiric formations of deeply seated Triassic-Jurassic evaporitic deposits, have also produced a locally faulted and massively deformed subsurface. These surficial extrusions or near surficial intrusions usually result in large easily mined halite and gypsum deposits. Diapiric movement appears to be pre-Quaternary in age.

b. Faulting. A series of subsurface normal faults trending NE to SW and NW to SE are common in the area, but lack surface expression in the immediate project area. Most of these faults, classic down to the basin normal faults, are associated with the structural deformation of the sedimentary deposits, resulting from differential settlement of the subsiding sediments. Local faulting is somewhat responsible for the north shoreline orientation of Lake Pontchartrain. As previously stated, diapiric salt movement has caused local, generally radial type normal faulting.

c. General Historical Geology and Geomorphology. The Holocene geologic history of the project area is directly related to the developing Mississippi River. The Mississippi River was formed during the Nebraskan stage, the first glacial advance of the Pleistocene Epoch. Sea level at that time was approximately 450 feet below present level due to the massive continental accumulations of ice. Subsequent to this first glacial period, three other major cycles of continental glacial advancement and recession occurred. These advances (waxing glaciation) and retreats (waning glaciation) have respectively resulted in periods of Mississippi River degradation (erosion or stream entrenchment) and aggradation (sediment deposition or channel filling).

During the last glacial cycle (Wisconsin), the lower Mississippi Embayment experienced a major Mississippi River entrenchment and stratigraphic incision of older Pleistocene and Tertiary deposits. The axis of this ancestral trench runs southeast to northwest between Baton Rouge and Lafayette and southward through a point near Houma, Louisiana. This orientation and location approximates the present central portion of the alluvial valley. During this period, the various tributaries of the Mississippi River also experienced entrenchment.

As glacial meltwaters returned to the oceanic basins, sea level rose and eventually stream gradients decreased. Decreased Mississippi River gradients and associated energy losses resulted in a massive coarse grained alluviation of the entrenched valley. A braided river system resulted from these factors. Continued deposition of coarse grained material within the valley directly above the incised and formerly exposed Pleistocene surface resulted in a massive course grain blanket that is now referred to as the Holocene substratum.

As stream gradients stabilized, grain size and sediment load decreased to such an extent that a single meandering channel, forerunner of the modern Mississippi, formed and the braiding characteristic ceased. A topstratum comprised of the finer grain size sediment and representing the various deltaic and fluvial environments developed within the Mississippi River floodplain.

Lateral and southern deltaic progradation resulted from a meandering Mississippi River. As a result of continued meandering, channel shifts, and massive deposition, a series of seven delta lobes were built gulfward. The seven major courses and associated delta lobes are presently identifiable in the region. The oldest course that can be detected is the Sale'-Cypremort (Maringouin), which is located along the present western boundary of the Mississippi River Deltaic Plain. The Sale'-Cypremort was active approximately 5,500 to 4,400 years before present. Concurrent with the abandonment of that course, the Mississippi River shifted eastward and occupied the Cocodrie course. It was during this period, approximately 4,600-3,500 years before present, that the first Holocene sediments of any significance were introduced into the study area. However, when the Mississippi River again shifted, this time to the west to occupy the Teche course (3,800 to 2,700 years before present), most of the residual Cocodrie delta began to subside and was eventually destroyed by advancing gulf waters. Continuing to seek a shorter route to the gulf because of decreased channel gradient, the Mississippi River again shifted eastward to occupy the St. Bernard course. It was during this period, 2,800 to 1,700 years before present, that maximum Holocene deposition occurred in the study area, Lake Pontchartrain was encapsulated in its present form, and major physiographic features of the New Orleans area were developed. The Mississippi River, shifting briefly to the west once again, occupied the Lafourche Course from 1,900 to 1,300 years before present, and then finally shifted eastward to occupy the Plaquemines course (1,200 to 450 years before present) and the Balize or Modern course (450 years before present). (Refer to Figure 1, Deltaic Plain of the Mississippi River.)

At present, the Mississippi River is discharging most sediment near or at the edge of the continental shelf and into deep gulfwaters where dissipation occurs over a relatively large geographical area. Construction of flood protection levees and major flood control projects restrains the river from migrating laterally and prevents the development of crevasses; thus, preventing the replenishment of much needed sediment in southeastern Louisiana.

When course abandonment occurs, deltaic accretion and sedimentation ceases. These processes are then replaced by the effects of subsidence and coastal erosion. This destructive phase is characterized by a series of environmental changes that includes landform deformation and shoreline retreat.

d. Regional Subsidence and Land Loss. The project area lies in a region of active subsidence. Regional subsidence rates vary from less than 0.5 foot to greater than 5.0 feet per century. Estimated project site rates vary from 0.49 to 0.82 foot per century (McFarlan, 1961 and Frazier, 1967). Rates of 5.00 or more feet per century are found in the active delta to the south. The high subsidence and land loss rates result from five major processes. They are:

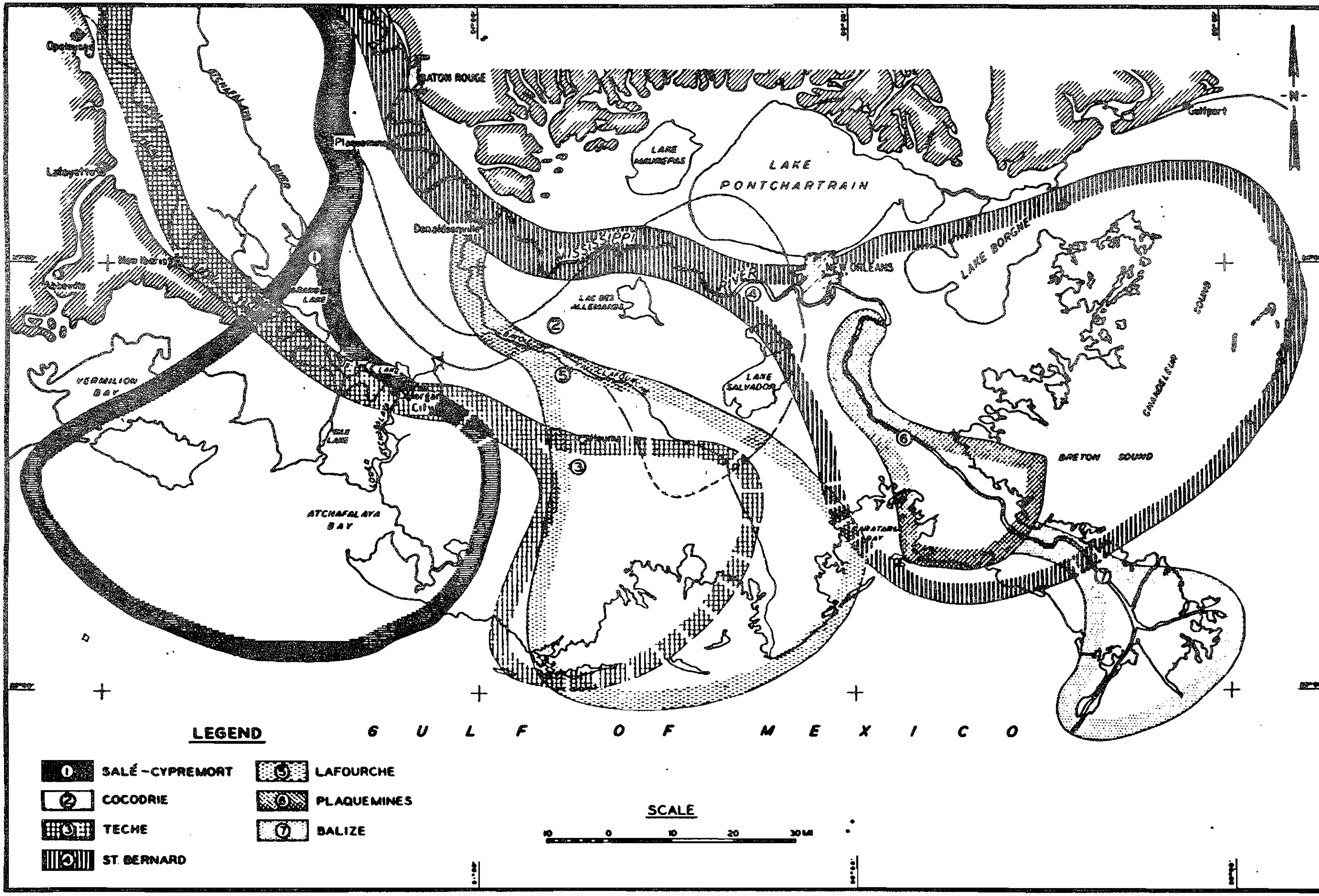


Figure 1 Mississippi River deltas (From Kolb, et al, 1958)

(1) Tectonic

(a) Sea level rise

(b) Basement sinking

(c) Faulting

(2) Consolidation or sediment compaction

(3) Human influences

(a) Water and hydrocarbon withdrawal

(b) Commercial activities

(c) Construction

(4) Vegetative modifications

(5) Erosion

Subsidence within the deltaic plain is a natural process and can be expected to continue. The effects may be mitigated by controlled sediment replenishment within marsh environments and areas of prior marsh existence by such methods as breached levees, strategically placed drainage structures, and pumping stations.

Local conditions indicate serious shoreline and land loss within the Pontchartrain Basin. Saucier (1963) estimated shoreline retreat at 2 feet per year along Lake Maurepas and 5.4 feet per year along Lake Pontchartrain. Gagliano's basin calculations (1981) indicate land losses of 50 to 100 acres per year.

e. Earthquake History. The region is located in a stable area of low seismicity. The Mississippi River Deltaic Plain is encompassed by "Zone 1" on the Seismic Zone Map of the United States (Figure 2). This indicates that earthquake activity is a relatively rare event and usually less severe than average. Resulting damage to structures or levees in the immediate area can expected to be minimal.

The only events that are known to have produced motion in the region were a series of New Madrid, Missouri, earthquakes dated 1811 to 1812. These earthquakes were felt in the New Orleans area. However, no direct report or geologic evidence suggests that the zone of damage extended to the study site. A few minor quakes have occurred in south Louisiana and southwest Texas which may have transmitted vibrations to the area. Calculated ground accelerations show that the greatest ground motions would likely occur from a major earthquake in the New Madrid Zone of the northern Mississippi Embayment. However, none of the calculated motions would exceed 0.05 g.

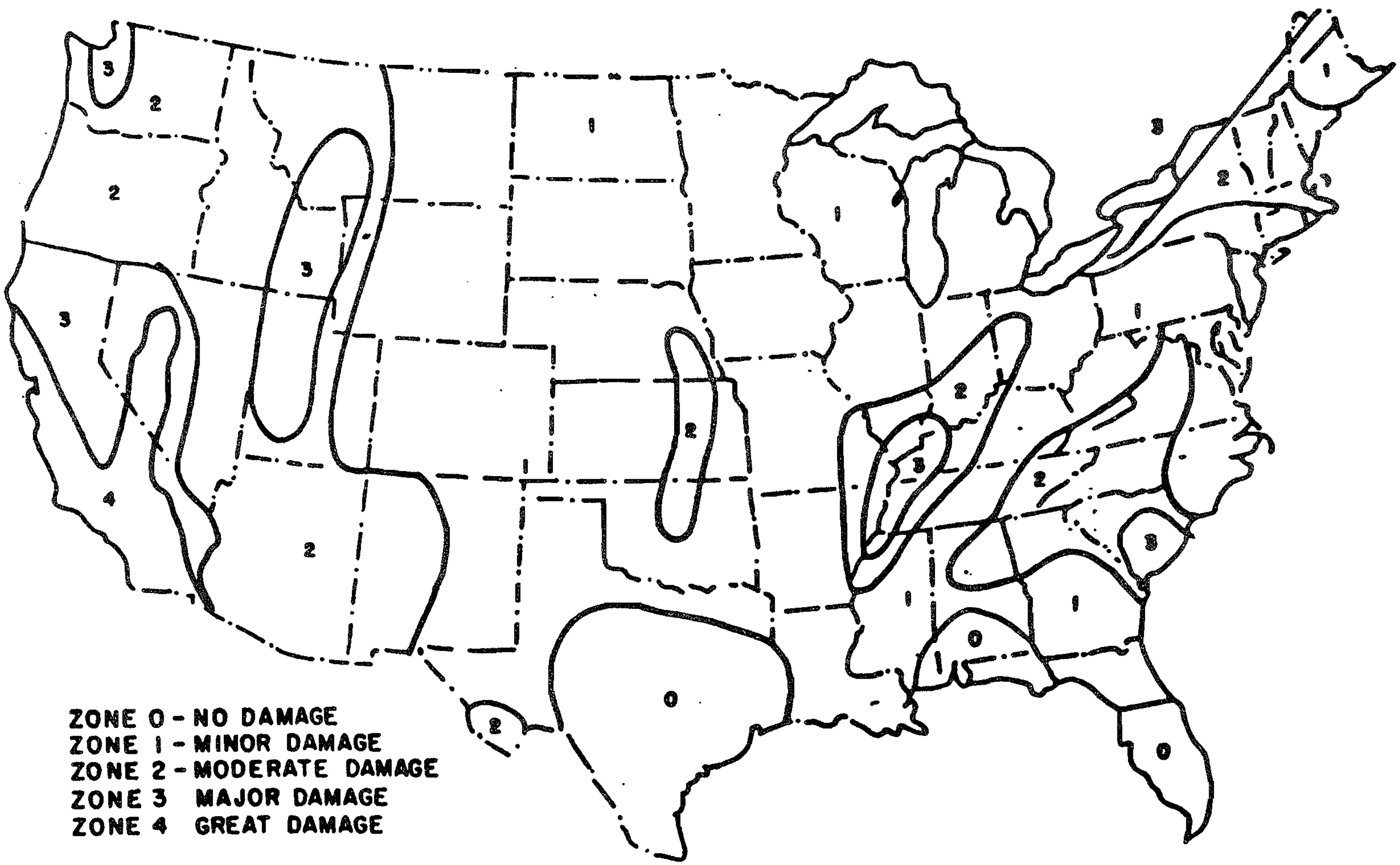


FIG. 2 Seismic Zone Map of the United States

f. Groundwater. The shallow aquifers of the New Orleans area consist of discontinuous near-surface sands, such as former and present Mississippi River accretionary and distributary-channel deposits. These sands, because of quality and quantity constraints, are of little importance as aquifers. Where present, they are capable of supplying only small quantities of water (less than 50 gal/min).

Two deep freshwater aquifers in close proximity to the project area are: the Gonzales-New Orleans (700-foot sand) and the "1,200-foot" sand. The Gonzales-New Orleans aquifer, as determined by the Louisiana Geological Survey, is a good source of potable water and is presently being used in various cooling systems in the New Orleans metropolitan area. Stratigraphically equivalent sands upriver from New Orleans are without similar nomenclature and are historically referred to simply as older deltaic or pre-Holocene deposits. The project effect on the water quality or volume per local aquifer will be minimal.

g. Mineral Resources. Several hydrocarbon reservoirs are located in the region. However, no producing reservoirs are within the project limits. Production pipelines originating outside the project limits cross the alignment at various locations.

Any future levee construction would not preclude future oil and gas production or exploration, since directional drilling methods could be utilized. No other major mineral resources are presently being developed in the area.

19. Site Geology.

a. Site Location and Description. The project is confined to eastern Orleans Parish and extends from its junction with the New Orleans East lakefront levee to its junction with the New Orleans East back levee and the Chef Menteur Pass barrier embankment at the GIWW. This represents approximately 8.5 miles of levee. The project alignment is nearly normal to the regional geologic strike and traverses Holocene surficial deltaic and subsurface deltaic, beach, and marine deposits. A review of geologic Profile A-A through F-F (Plates 21 through 26) further details site geology. Subsurface elevations at the top of Pleistocene average -40 feet, but vary from approximately -20 feet near the northern end of the project to approximately -65 feet parallel to Bayou Sauvage.

Historically, the site stratigraphic sequence indicates a period of aerially exposed Pleistocene prior to an early Holocene marine transgression. The transgression is evident by the development of a locally extensive basal marine sequence comprised of bay-sound and nearshore gulf type soils. The clayey bay-sound deposit averages 5 to 10 feet in thickness and is the predominant marine strata north of the Pine Island beach trend. A nearshore gulf type deposit predominates south of the trend. Estimated ages of the marine and beach deposits are respectively 7,000 and 5,000 years.

The prograding St. Bernard delta, 2,800-1,700 years ago, represented the last major period of active deltaic sedimentation at the site. This period is represented by a sequence of prodelta clays, intradelta sands, interdistributary clays, abandoned distributary plugs, and point bar type soils. All are related to the eastward migration and bifurcation of the Bayou Sauvage distributary.

A surficial marsh veneer, 5 to 15 feet thick, was excavated prior to initial levee construction of the 1950's. The marsh veneer is a result of annular Mississippi River overbank flooding and the subsequent deposition of silt and clay size particles landward of the natural levees.

b. Detailed Holocene Environmental Descriptions.

(1) Nearshore gulf/estuarine deposits are generally found at the borders of open ocean and seaward of barrier beaches. Thickness appears to increase with distance from shore. Estuarine type deposits are usually a result of infilling of minor entrenched valleys during transgressive marine phases. Generally, they are coarse grain deposits and well suited for founding projects.

(2) Bay-sound deposits are fine to coarse grain sediments bottoming bays and sounds. Average thicknesses are 5 to 10 feet in the project area. Reworking of the deposits basal portion by burrowing marine organisms produces a mottled appearance and inclusions of materials that are distinct from the surrounding sediment. Colors are typically light grey to grey.

(3) Beach deposits are typically composed of fine sands with large quantities of shells and shell fragments. The sands are typically well sorted with few clay lenses. These relatively shallow occurring sands are evident from approximate baseline Station 835+00 to 885+00. This represents the east-west trending Pine Island beach trend.

(4) Prodelta deposits are offshore homogeneous fat clays that precede aerial deltaic development. Thickness is generally related to Pleistocene depth and distributary activity. Cohesive strengths are generally greater than overlying deltaic deposits.

(5) Intradelta deposits are relatively coarse grained and associated with delta advance. They represent that portion of the subaqueous delta containing distributary channel soils and associated mouth bar sands. Within the St. Bernard delta, intradelta and interdistributary soils are relatively indistinguishable and are often described only as coarse and fine grained deposits.

(6) Interdistributary soils are generally wedge shaped clay deposits between major distributaries. They result when sedimentcharged water spills over subaqueous or low, subaerial natural levees leaving the coarsest sediment near the distributary as part of the intradelta.

The finest sediment settles in the basins between distributaries as interdistributary soils. Typical thicknesses for both interdistributary and intradelta soils are 10 to 15 feet in the immediate area.

(7) Marsh deposits are highly compressible organic soils that typically cover 95 percent of area. They grade vertically downward from peat to organic clays and silts. Generally, soil moistures exceed 100 percent, color varies from light grey to black, and consistencies vary from very soft to medium. A majority of marsh type soils were excavated prior to initial fill placement.

c. Detailed Pleistocene Soil Descriptions. The Pleistocene soils are a result of both deltaic and marine deposition. They represent both the regressive and transgressive phases and associated environments of an earlier Mississippi River deltaic system. The soils are therefore similar to the overlying Holocene. However, due to dessication, Pleistocene deposits are distinguished by a decrease in moisture contents, a stiffening of consistencies, a decrease in sampling penetration rates, an increase in oxidized sediments, and calcareous concretions.

d. Foundation Conditions. Representative geologic site conditions are displayed on Profile A-A through F-F (Plates 21 through 26). The stratigraphy is basically tabular and relatively extensive throughout except for minor entrenchments resulting from fluvial activity or undulations resulting from artificial or naturally occurring sediment loads. Potential for additional differential settlement, structural uplift, or need for construction dewatering and its effect on foundation conditions prior to, during, and after construction must be addressed.

e. Future Investigations. Subsurface field investigations have been completed, and only occasional future investigations are anticipated if it becomes necessary to verify anomalous subsurface conditions.

20. Conclusion. Current geologic information indicates favorable foundation conditions with regard to future construction. Further addition of fill, may result in increased settlement rates, particularly in those few remaining areas of high organic concentrations and poorly consolidated soils. Should future construction in the immediate project vicinity require dewatering, local settlement may occur due to the oxidation of organics and the consolidation of sediment.

SOURCES OF CONSTRUCTION MATERIALS

21. Sources of Construction Materials. In addition to the information presented in this memorandum relative to borrow area locations and materials, information relating to material sources is also contained in Design Memorandum No. 12, Revised "Sources of Construction Materials" approved 23 October 1979.

22. General. This section covers the soils and foundations investigation, including the design for the enlargement of the New Orleans East levee extending from the eastern end of the New Orleans East lakefront levee at Station 662+35 B/L (South Point) southward to Station 1101+90 B/L at the intersection of the New Orleans East back levee. The foundation and design section from Design Memorandum No. 2 - General Supplement No. 9, New Orleans East Levee South Point to G.I.W.W., dated Jan 1973 was extensively used as a reference in the preparation of this report.

23. Field Investigations.

a. A total of nine new 5-inch diameter undisturbed borings were taken and tested by the Corps of Engineers along the centerline of the levee. Borings 10-USP thru 18-USP extend to elevations varying from elevation -37.0 to -78.0 N.G.V.D. The logs of these new borings are shown on plates 27 through 35.

b. Additional old borings considered in the design were:

1-USP, 1-USPT, 2-USP and 8-SP. For reference see Design Memorandum No. 2 - General Design Supplement No. 9, New Orleans East Levee South Point to G.I.W.W.

c. The new undisturbed borings are presented in profile on plate 36.

24. Laboratory Tests. Visual classifications were made on all samples obtained from the soil borings. Water content determination were made on all cohesive soil samples. Unconfined compression (UCT) and Uncolidated-Undrained (Q) Shear tests and Consolidation (C) tests were performed on representative soil samples from the undisturbed borings. 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 27 through 35 and also on the detailed tests reports included in this report.

25. Foundation and Soil Conditions. The soil types and general stratification along the project alignment are shown on the soil and geologic profile on plates 21 through 26. Design shear strengths and stratification are shown on plates 37 and 38.

26. Types of Protective Works. The South Point to GIWW levee will be straddle enlarged over its entire length with hauled clay fill. The centerline of the new levee will be coincident with the levee which now exists over the entire reach. The project plan will include construction of highway ramps and an I-wall.

27. Levee.

a. General. A conventional earthen levee enlargement will be the main protective feature for the project except at the drainage structure at Sta. 1054+05.55 B/L where a combination of Levee and I-wall will be used. This levee crosses four interior drainage facilities, earth ramps at U. S. Highways 11 and 90, and a swing gate supported on 12-inch by 12-inch prestressed concrete piles with connecting I-type floodwalls at the railroad track. The levee enlargement will be constructed by placing semicompacted clay fill on the existing levee to the design grades and sections shown on plates 39 through 48.

b. Shear Stability.

(1) General. Using available geologic and soil boring test data, shear strength trends were assigned to each reach as shown on plates 37 and 38.

(2) Station 662+35 B/L to Station 939+60 B/L. In this area a general strength and stratification was selected based on the borings taken in this reach. A sand strata varies in depth and thickness from elevation -14.0 to elevation -22.0 and from 3 feet to 8 feet, respectively. For design purposes two shear strengths were compared for this depth, (a sand strength versus a clay strength) and the most critical (clay strength) was used in the design. From Sta. 746+00 B/L to Sta. 770+00 B/L a weaker strength was used from elevation -22.0 to elevation -60.0 based on boring 11-USP. Based on this observation the reach was divided in two sub-reaches as shown on plate 37. Using cross sections representative of existing conditions along the levee the stability of the levee 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. The net levee grade from Station 662+35 B/L to Station 939+60 B/L varies from elevation 13.5 to elevation 14.5. Only two analyses (the most critical) were performed in this reach for the net levee grade at elevations of 14.0 and 14.5. Both analyses show no need for a berm; therefore, the levee will be built from Station 662+35 B/L to Station 939+60 B/L up to gross elevation with a 1V on 3H slopes as shown on plates 39 and 40.

(3) Station 939+60 B/L to Station 1101+90 B/L. The recommended levee between baseline Station 939+60 and Station 1101+90 B/L was designed using cross sections representative of existing conditions along the levee alignment. The net levee grade for this reach varies from elevation 14.5 to elevation 17.5. From Sta. 1030+00 to Sta. 1101+90 B/L a wave berm was used in the design of this section. The stability of the levee was determined by the method of planes using the design (Q) shear strength and applying a minimum factor-of-safety of approximately 1.3. (See plates 41 through 48 for presentation of stability analysis.)

c. Settlement. Using consolidation data from the borings, theoretical analyses indicate that between 18 and 30 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 39 through 48.

28. <u>I-Walls</u>.

a. <u>General</u>. The protection at the drainage structure from baseline Sta. 1053+42.55 to Sta. 1054+68.55 will consist of a cantilever I-type floodwall of sheet piling driven through existing levee and/or fill and capped with a concrete wall. The I-wall protection was selected instead of an earthen levee because the pipes under the structure could not handle the weight of the fill.

b. <u>Cantilever I-Wall Analysis</u>. The required penetration for the stability of the sheet pile wall was determined by the method of planes analysis, using the soil classification stratification, and unit weight presented on plate 34. The wall was analyzed for both the short term (Q) case, using the shear strengths presented on plate 34 and the long term (S) case, using the shear strengths shown on plate 49. Only the most critical case is presented. The factor-of-safety (FS) used in the analysis equals 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 penetration required to satisfy the stability criteria are determined as those where the summation of moments is equal to zero. Two I-wall analyses were performed at this location: one under the structure taking into consideration the empty pipes, and the other away from the structure without the pipes. The most critical case is presented on plate 49.

c. <u>Shear Stability</u>. The stability of the levee with I-wall was determined by the method of planes using the design shear strengths and appropriate hydraulic loading shown on plate 50 and applying a minimum factor-of-safety of approximately 1.3.

d. <u>Settlement</u>. Using consolidation data from boring 17-USP theoretical analyses indicate that approximately 12 inches of settlement is expected to occur on the levee crown at this location. 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 plate 50.

29. <u>Road Ramps</u>.

a. <u>Shear Stability</u>. The strengths and stratifications used for the shear stability analysis at each ramp were taken from the borings closest to the location of each ramp. 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 applying a minimum factor-of-safety of 1.3 (see plates 51 and 52 for presentation of ramp cross section and stability analyses.

b. Settlement. Settlement calculations indicate that the crowns of the road ramps will settle approximately 12 inches after construction. To compensate for this long term settlement the ramp crowns will be overbuilt or grossed.

30. Drainage Structures.

a. Shear Stability. The strengths and stratifications used for the shear stability analyses of the levee crossing the four drainage structures were taken from the boring closest to each structure. Using cross sections representative of existing conditions at each structure, the levee crossing the structures were designed for the most critical conditions with the shear stability being determined by the method of planes and applying a minimum factor-of-safety of 1.3 (see plates 53 through 56 for presentation of drainage structure cross sections and stability analysis).

b. Settlement. After the levee is enlarged to the project design grades across the drainage structures, settlement computations indicate that between 12 and 18 inches of settlement is expected to occur on the levee crown at these locations. 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 53 through 56.

31. Utility Lines.

a. General. Two utility lines cross the levee at approximate sta. 938+00.

b. Shear Stability. The strengths and stratifications used for the shear stability analysis were taken from the borings closest to this location. Using cross sections representative of existing conditions at this location, the section was designed for the most critical conditions with the shear stability being determined by the method of planes and applying a minimum factor-of-safety of 1.5 (see plate 57 for presentation of section and stability analysis).

c. Settlement. Settlement computations indicate that approximately 18 inches of settlement is expected to occur on the levee crown at this location. 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 plate 57.

32. 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.

33. Settlement Reference Markers. Reference markers will be installed along the I-wall, to obtain data relative to vertical movement. Measurements of the settlement markers will be made promptly after construction and regularly thereafter to monitor settlement of the floodwall.

34. Source of Fill Material. The levee will be constructed of semi-compacted clay fill which will be obtained from a borrow area located in the Bonnet Carre' Spillway. The material will be transported by the truck-haul method, and placed in the levee section. See plates 58 and 59 for location of and soil boring data for the borrow area.

35. Sequence of Construction.

a. General. One contract will be utilized for the levee enlargement and I-type floodwall construction. The highways 11 and 90 ramp raising will be constructed in a follow-up contract approximately one year after levee completion.

b. Levee. The levee will be constructed in one phase by straddle enlarging the existing levee with semicompacted hauled fill to the levee design sections shown on plates 9, 10, and 11.

c. I-Type Floodwall. The construction of a sheet pile cutoff wall with a concrete cap will be constructed on the levee crown in the vicinity of the drainage structure located at Sta. 1054+55.05 B/L. The floodwall alignment and typical design sections are shown on plates 16, 17, and 18. Shell and riprap protection will be placed on the flood side slope at the thickness and location as shown on plate 17. Floodwall construction will be performed under a separate contract after the levee subsidence period.

d. Shell Ramp. A shell access ramp crossing the levee in the vicinity of Station 717+62 B/L will be constructed and will consist of semicompacted fill built to the configuration shown on plate 12. The ramp will be surfaced with 9 inches of compacted shell.

e. Highway Ramps. The ramp raising at U.S. Highway 11 and 90 will be constructed under a separate contract and the Government will be reimbursed for each ramp relocation by local interests (Orleans Levee District). Raising of the ramp at Interstate 10 Highway will not be required. Therefore, a levee tie-in on both sides of the Highway will be constructed using semicompacted fill hauled in conjunction with the levee construction operation as shown on plate 12.

f. Shell Road (Levee Crown). Construction of a shell road extending from Highway 90 (approx. Sta. 939+50 B/L) to the Railroad Floodgate (approx. Sta. 1057+99.5 B/L) will be constructed on the completed levee crown and will consist of 9 inches of compacted shell. For typical cross-section detail, see plate 19.

g. Vicinity of Railroad Floodgate.

(1) By-Pass Ramp (Protected Side). Construction of the by-pass ramp on the protected side levee slope will be constructed with semicompacted fill and surfaced with 9 inches of compacted shell to the elevation and slope shown on plate 19.

(2) Vehicular Turnaround Pad. Construction of the vehicular turnaround pad in the vicinity of baseline station 1057+40.77 will consist of shaping semicompacted fill and surfacing with 9 inches compacted shell. The construction of the turnaround and ramp will coincide with the levee construction and will be constructed at the location shown on plate 19.

(3) Temporary Timber Railroad Mat. A temporary Timber R/R Mat Crossing will be built for placement at the CSX Transportation System track. The mat will be placed at the time of levee construction and will provide access for hauling material to the southern portion (toward GIWW) of the levee work. See plate 15 and 19 for the location and detail insert of the temporary timber railroad mat crossing.

(4) Riprap Protection. Shell and riprap protection will be placed on both sides of the floodgate in the areas of levee tie-in. The shell and riprap will be truck-hauled to the placement site and coincide with the levee tie-in construction as shown on plate 19.

DESCRIPTION OF PROPOSED STRUCTURES AND IMPROVEMENTS

36. Recommended Construction Plan. The recommended plan of construction consists of enlarging to design grade, as shown on plates 9, 10, and 11, the existing levee with a semicompacted clay cover from Baseline Station 662+35 to Baseline Station 1102+40, excluding Interstate Highway 10 and the CSX Railroad Floodgate. The levee will be constructed by using clay material from the Bonnet Carre Spillway and truck hauling it via the existing levee. This plan also includes the construction of an I-type floodwall between stations 1053+42.55 B/L and 1054+68.55 B/L to span the drainage structure at Station 1054+05 B/L, the relocation of utilities, and the raising of Hwy 11 and Hwy 90 road ramps.

37. Levees. The existing levee was constructed to the grades and sections outlined in the Lake Pontchartrain Barrier Plan, Design Memorandum No. 2 - General Design, Supplement No. 9, New Orleans East Levee, South Point to GIWW. The proposed levee construction will be accomplished by straddle enlarging the existing levee by using hauled

clay material. The levee will be enlarged over the reach from South Point, LA (Station 662+35 B/L) southward approximately 8.3 miles to its junction with the New Orleans East Back Levee embankment at the Gulf Intracoastal Waterway (GIWW), approximate station 1102+40 B/L. The levee centerline is contiguous with the centerline of the existing levee. The net design elevation varies from 13.5 at South Point to 17.5 at the GIWW over a 10-foot wide crown.

The general location and alignment of the levee are shown on plate 1. The detailed alignment and profile of the levee are shown on plates 2-8. Typical levee design sections are shown on plates 9, 10, and 11.

38. Existing Drainage Structures. The design details of the existing drainage structures, located at approximate Stations 664+99.27 B/L, 798+98.61 B/L, 927+04.70 B/L, and 1054+05.55 B/L, were included in the GDM's for the Paris Road to South Point Levee, and in the South Point to GIWW Levee, previously authorized under the Lake Pontchartrain, LA and Vicinity Hurricane Protection Project, Barrier Plan. Surveys made in 1985 indicate that the structures are in good condition. No changes to the design of the drainage structures are required under the High Level Plan. The drainage structure at Sta. 664+99.27 B/L, described in GDM No. 2, General Design Supplement No. 5B, Paris Road to South Point Levee, was constructed during 1974 under an NOD contract with no major modifications. The net grade of the existing levee at the structure will be increased from El. 12.5 to El. 13.5 to meet the Lake Pontchartrain High Level Plan Project design grade. The additional levee fill will not jeopardize the integrity of the existing structure. The remaining drainage structures, located at Stations 798+98.61 B/L, 927+04.70 B/L, and 1054+05.55 B/L, as described in GDM No. 2, General Design Supplement No. 9, South Point to GIWW Levee, were constructed during 1973 under an NOD contract with no major modifications.

The existing levee at the drainage structures, located at Stas. 798+98.61 B/L and 927+04.70 B/L, will be raised to El. 14.0 and El. 14.5, respectively to meet the Lake Pontchartrain High Level Plan design grades. The additional levee fill over these structures will not jeopardize their integrity. The existing levee in the vicinity of the drainage structure located at Station 1054+05.55 B/L will be raised to a net grade of El. 17.5 to meet the Lake Pontchartrain High Level Plan design grade. The flood protection will be modified from an earthen levee to an I-type floodwall with a top elevation of 20.5. This modification is required to eliminate problems associated with excessive settlement of the structure, since the levee in the vicinity of the structure will be raised an average of 5 feet. The general location and alignment of the proposed floodwall are shown on plate 8. The detailed alignment and profile of the floodwall and features contiguous thereto are shown on plates 15, 16 and 17; typical design sections are shown on plate 18.

39. Railroad Swing Gate. The existing steel swing gate at Station 1057+99.15 B/L across the railroad tracks was built to the Lake Pontchartrain Barrier Plan Standards as described in Design Memorandum No. 2 - General Design, Supplement No. 9, South Point to GIWW Levee. The swing gate was built to a net grade of El. 13.5 during 1981 under an NOD contract with no major modifications.

A visual inspection of the swing gate made in March 1987, found the structure to be in good condition. The present structure does not meet project design grades requiring a wall height to El. 20.0. To avoid an expensive modification to the existing floodwall and swing gate (Sta. 1057+63 to Sta. 1058+34), some wave overtopping will be allowed within this small reach. The small amount of wave overtopping within this reach will pose no threat to the public, since the region on the protected side of the project area south of U.S. Hwy. 90 is the newly designated Bayou Sauvage National Wildlife Area. Commercial and residential development will be prohibited in this area. To prevent erosion from the wave overtopping, riprap will be placed on both sides of the floodwall at locations shown on plate 19.

OTHER PLANS CONSIDERED

40. Alternative Plan - I-Wall on Levee in Lieu of Levee Enlargement. An I-Type floodwall on the existing levee protection was considered from U.S. Highway 90 (vic. Sta. 939+20.06 B/L) to the GIWW (Sta. 1102+98.06 B/L). The floodwall height would vary from El. 15.5 to El. 20.5 in this area. Because of the higher cost, the I-wall on levee alternative was not recommended.

ACCESS ROADS

41. CSX Railroad Floodgate Service Road. Access from Highway 90 (vicinity Station 939+50 B/L) to the Railroad Swing Gate at station 1057+99.29 B/L and the drainage structure at Baseline Station 1054+55.05 will be provided along the South Point to GIWW Levee. Therefore, a 10-foot wide access road surfaced with 9 inches of compacted shell will be constructed on the project levee crown from U.S. Highway 90 (vicinity of Station 939+50 B/L) to the tie-in at the Railroad Swing Gate (vicinity of 1057+99.15 B/L). The access road will be ramped around the protected side of the railroad gate (see plate 19). The access road will be connected by a ramp to the crown of the southern portion of the levee (see plate 19). The levee tie-in with the New Orleans East Back Levee is shown on plate 20.

42. Construction Access. Vehicular access to the job site is available from the levee crossings at Interstate Highway 10, U.S. Highway 90, and U.S. Highway 11. Access is also available on the shell road on top of or adjacent to the existing levee over its entire length (see plates 2 through 8). The CSX Transportation System Railroad track crosses the levee alignment at baseline station 1057+99.29.

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 judgement and experience to meet local conditions.

44. Basic Data. Basic data relevant to the design of the I-wall between Stations 1053+42.55 B/L and 1054+68.55 B/L at the drainage structure is shown below:

a. Water Elevations	Elevations feet (NGVD)
Wind tide level (WTL)	
Drainage Structure (Sta 1054+05.55 B/L)	13.0
Landside of Structure	0.0

b. Unit Weights	
Water	64.0
Concrete	150
Steel	490
Earth	See plate 34

c. Design Loads	
Earth Pressures (lateral)	See plate 49
Wind Loads	50 psf
Water Loads	See plates 49 and 50

45. Design Methods

a. Structural Steel. The design of structural steel 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. For convenient reference, pertinent stresses are tabulated below:

PERTINENT STRESSES FOR REINFORCED CONCRETE DESIGN

Reinforced concrete	
f'c	3,000 psi
fy (grade 60 steel)	60,000 psi
Maximum flexural reinforcement	0.25 x balance ratio
Minimum flexural reinforcement	200/fy

46. Location and Alignment. The flood protection will consist of earthen levees and road ramps except for reaches of I-wall and gate monoliths as described in paragraphs 37 and 38 above. A new I-wall will be provided between Stations 1053+42.55 B/L and 1054+68.55 B/L spanning over the existing drainage structure at Station 1054+05.55 B/L. The general location and alignment of the proposed floodwall is shown on plate 8. The detailed alignment and profile of the floodwall and features contiguous thereto are shown on plates 15 and 17.

47. Foundation. The results of subsurface exploration, soils tests, and foundation studies are presented in previous paragraphs. Locations of borings are shown on plates 2 through 8. The general type boring logs are shown on plate 36.

48. I-Type Floodwall.

a. General. The I-wall will consist of steel sheet piling and W-shape piles driven into the existing embankment. The upper portion of the pilings will be capped with concrete. The piling will be driven to the required depth with 1 foot of the 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 17 and 18.

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

Case I: FS used = 1.5 with static water at the SWL and no dynamic wave force.

Case II: FS used = 1.25 with static water at the SWL and a dynamic wave force.

c. I-Wall Design.

The I-wall analysis requires a sheet pile tip penetration to El. -5.0 to resist the overturning moments induced by the environmental loadings. However, between Stas. 0+40.5 W/L and 0+85.50 W/L, this penetration would require the installation of costly slip joints to pass the existing discharge culverts through the steel sheet piling. In lieu of sheet piling with slipjoints, the concrete monolith in this area will be founded on two groups of W-shape piles spaced to miss the discharge culverts. Between the two W-shape pile groups, steel sheet piling driven to a tip penetration of El. +5.0, above the discharge culverts, will function as a seepage cutoff for the floodwall in this area. A concrete cap above the sheet piling will function as a beam transferring all overturning loads to the W-shape pile groups. The W-shape pile groups will require a penetration to El. -21.0 to resist these loadings.

d. Joints. Expansion joints in the I-wall will be as shown on plate 18 and will fall at sheet pile interlocks. To compensate for expansion, contraction, or displacement, three-bulb waterstops and premolded expansion joint fillers will be provided.

e. Cathodic Protection for Steel Sheet Piling. All steel sheet piling and steel W-shape piles 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 and the W-shape 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.

REAL ESTATE REQUIREMENTS

49. General. All rights-of-way and construction easements required to construct the High Level Plan described in this GDM document will be acquired by the Local Sponsor (Orleans Levee District) and furnished without cost to the United States. Rights-of-way and construction easement limits are shown on the plan and profile plates 2 through 8. Local interests are required to assume the cost of relocation assistance to persons and businesses displaced by such acquisition pursuant to the requirement of Public Law 91-646.

RELOCATIONS

50. 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.

51. New Orleans Public Service, Inc. At approximate Baseline Station 703+10, aerial powerlines cross above the existing levee at approx. Elevation 42.0. These powerlines will not require raising or relocation and will not interfere with levee construction. For general location of powerlines, see plan and profile on plate 2.

52. Highway Ramps. U.S. Highways 11 and 90 will be raised to Net Elevations 15.0 and 15.5, repectively, to cross the levee. The vertical curves for these ramps were designed using the Louisiana Department of Highway "Road Design Manual" for non-passing sight distances for 50 mph

design speed for U.S. Highway 11 and 60 mph design speed for U.S. Highway 90. Also, the Bell-Halter Inc. plant access ramps will be raised in conjunction with the Highway 90 ramp raising construction.

In order to obtain these sight distances, the following grades and curves are required: an floodside grade of 2.64 percent and a protected side grade of 2.40 percent with 300-foot sag curves and a 640-foot crest curve for U.S. Highway 11; a grade of 2.85 percent with 300-foot sag curves and a 1,100-foot crest curve for U.S. Highway 90. Highway ramp plans and profiles are shown on plates 13 and 14.

Interstate Highway 10 will not require raising. Levee tie-in with highway shoulder will be constructed. The junction of the levee and the Interstate Highway 10 embankment is shown on plate 12.

53. Relocations in the Vicinity of U.S. Highway 90 (Sta. 939+29.06 B/L).

a. New Orleans Sewerage and Water Board.

(1) At Baseline Station 938+68 paralleling U.S. Highway 90, one 12-inch water line crosses the existing levee. This line will be raised above the new levee design grade by local interests. The relocation will conform to the criteria set forth for hurricane protection levee crossings. These criteria will be furnished to local interests.

(2) There are fire hydrants located on the north side of, and parallel to, U.S. Highway 90 that will be relocated or extended as necessary to accommodate the levee construction and the ramp raising of the highway (see plate 14 for locations of fire hydrants).

b. New Orleans Public Service, Inc.

(1) 8-inch High Pressure Gas Line. At Baseline Station 938+86, one 8-inch High Pressure gas line crosses the existing levee alignment and is in the existing highway ramp slope. The gas line will be relocated over the levee design section, and out of the highway ramp slope, by local interests in accordance with the criteria set forth for hurricane protection levee crossings. These criteria will be furnished to local interests. For location of gas line, see plate 14.

(2) Aerial Powerlines. The overhead electrical powerlines located on the north and south sides of, and parallel to, U.S. Highway 90 and the two (2) aerial powerlines that cross over the highway ramp will be relocated as necessary to construct the levee enlargement and the highway ramp raising. The powerlines will be either raised, relocated or de-energized by local interests. All relocation will conform to criteria set forth for hurricane protection levee crossings. These criteria will be furnished to local interests. For location of aerial powerlines, see plate 14.

c. American Telephone and Telegraph Company (AT&T).

(1) One 2-inch Lightguide Fiber Optic Cable. At Baseline Station 939+01, one 2-inch "Lightguide" fiber optic cable crosses the existing levee alignment and is located within the U.S. Highway 90 rights-of-way limit on the north shoulder. This cable was installed by permit from local interests (Orleans Levee Board) and will be relocated above the levee design section by local interests. The relocation will conform to criteria set forth for hurricane protection levee crossings. These criteria will be furnished to local interests (see plate 14). This work will be accomplished without cost to the project.

(2) Two 2-inch Cables, AT&T (Underground Communication). At Baseline Station 939+55.56, two 2-inch coaxial telephone cables cross the existing levee alignment within the U.S. Highway 90 rights-of-way limit on the south shoulder. These lines will be raised by local interests and placed on the levee design section in accordance with the criteria set forth for hurricane protection levee crossings. These criteria will be furnished to local interests (see plan and profile of U.S. Highway 90 ramp on plate 14). This work will be accomplished without cost to the project.

(3) Manhole "L-50 (South of Picayune)". Located approximately 200 feet west of the existing levee centerline and within the highway ramp south shoulder is Manhole L-50. This manhole will be raised or relocated as necessary by local interests.

d. South Central Bell Telephone Company (SCB).

(1) Two 4-inch PVC Conduit, SCB. At approximate Baseline Station 939+75, two 4-inch PVC conduits encased in concrete with two 2-inch cables inside crosses the existing levee ramp at approximate El. 9.0 NGVD. This line will be raised above the new levee design grade by local interests. The installation shall conform to the criteria set forth for hurricane protection levee crossings. These criteria will be furnished to local interests. This work will be accomplished without cost to the project.

(2) SCB Manhole (South Highway Shoulder). Located approximately 65 feet west of the existing levee centerline is the SCB manhole that will be relocated by local interests.

e. Cox Cable of New Orleans, Inc. At approximate Baseline Station 939+94, one 4-inch PVC conduit with communication cable encased crosses the existing levee crown. The line will be raised above the new levee design grade by local interests (OLD). The installation shall conform to the criteria set forth for hurricane protection levee crossings. These criteria will be furnished to local interests.

f. Plant Entrance Signal Light (Approximate B/L Station 940+30). Highway sign located on the flood side of the levee and on the north highway shoulder will be removed and replaced during ramp raising construction.

g. Levee Barricades. Timber post and cable barricades, located on both sides of the highway ramp and crossing the levee, will be removed and replaced during levee construction operations by local interests.

h. Drainage Ditch and Culverts (Front of Bell Halter, Inc.). Drainage ditch located on the north side of, and parallel to, U.S. Highway 90 and the drainage culvert (CMP pipe) located beneath the plant's access ramps will be relocated and raised, respectively, by local interest.

54. Relocations in the Vicinity of U.S. Highway 11 (Sta. 760+89.6 B/L).

a. New Orleans Public Service, Inc. The aerial electrical powerline located on the west side of, and parallel to, U.S. Highway 90 in the vicinity of baseline station 760+61 will be relocated, if necessary, to accommodate the ramp raising construction. The powerline will be raised and poles relocated by local interests. The relocation will conform to criteria set forth for hurricane protection levee crossings. These criteria will be furnished to local interests (see plate 13).

b. South Central Bell Telephone Company (SCB). Aerial communication lines located on the east side of, and parallel to, U.S. Highway 90 in the vicinity of Baseline Station 761+23 will be relocated, if necessary, to accommodate the ramp raising construction. The lines will be raised and poles relocated by local interests. The relocation will conform to criteria set forth for hurricane protection levee crossings. These criteria will be furnished to local interests (see plate 13).

c. Cox Cable of New Orleans, Inc. Cox Cable, attached to the South Central Bell telephone poles parallel to U.S. Highway 11 in the vicinity of baseline station 761+23, will be raised by local interests in accordance with levee crossings criteria.

d. Cable Fence and Iron Post (Levee Barricades). On both sides of the highway ramp are located levee barricades that cross the levee design section. These barricades will be removed and replaced by local interests prior to, and upon completion of, the levee construction.

55. Relocations at Railroad Floodgate (Vicinity of Sta. 1057+99.5 B/L).

a. CSX Transportation System. Aerial railroad communication and signal lines located on the south side of, and parallel to, the railroad track in the vicinity of Baseline Station 1058+25 will not require relocation or raising of lines.

b. TEI, Inc. Lightnet Fiber Optic Cable. At Baseline Station 1058+50, one 4-inch dia. galvanized pipe with a 2-inch fiber optic cable encased crosses the existing levee crown. The line was installed by U.S. Telecom by permit granted by local interests (Orleans Levee District). This line will be raised over the new design grade and covered in accordance with the criteria set forth for hurricane protection levee crossings. These criteria will be furnished to local interests. This work will be accomplished without cost to the project.

COORDINATION WITH OTHER AGENCIES

56. General. 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 in press and by communications media, as well as organizational and individual correspondence. This 12 April 1984 public meeting was held as part of the continuing coordination required for input to the Draft Supplemental Environmental Impact Statement (DEIS) on the Lake Pontchartrain project as a whole. Comments received in connection with the proposed action described in this GDM and the official response to each of these comments are contained in the "Lake Pontchartrain High Level Plan Design Memorandum No. 15-General Design, New Orleans East Lakefront Levee, Paris Road to South Point."

ENVIRONMENTAL EVALUATION

57. Affected Environment. The study area specifically involves those wetlands immediately adjacent to the South Point to GIWW levee segment. Lands on both sides of the levee are presently being purchased and transferred to the U.S. Fish and Wildlife Service for the purpose of creating the Bayou Sauvage National Wildlife Refuge. Those wetlands immediately adjacent to the levee are brackish in nature. They comprise valuable habitat for wildlife, including waterfowl, small game, commercially utilized furbearers, and the American alligator. These wetlands are of great importance to wildlife as spawning, nursery, nesting, or overwintering areas for fish and waterfowl. In addition, these wetlands serve as barriers to storm surge (flood side only), and as sumps for excess flood waters.

The surface water quality in the adjacent marshes is generally acceptable for the propagation of fish and wildlife. The surface waters receive little storm drainage or pesticide influxes.

Recreational activities along this reach are limited due to access. Pedestrian access to the area is via crossings of I-10 and U.S. Highway 11 to the north and the crossing of U.S. Highway 90 to the south. In the vicinity of these crossings, sport fishermen and crabbers fish the lake shore. Hiking has some potential along the levee but no hunting is allowed in Orleans Parish.

58. Environmental Effects.

a. Biological - Impacts involved with the construction required to widen portions of the South Point to GIWW levee would result in the loss of approximately 4.2 acres of brackish marsh and 8.4 acres of wet scrub/shrub habitat. These habitats would no longer function as productive wetlands since they would be filled and replaced by levee. Short-term losses to wildlife would occur to the specific area during construction. When levee vegetation is established, some wildlife benefit would be realized. The area would be potentially utilized by small game animals and birds for for aging.

Long-term and short-term wetland functions associated with water storage, vegetative diversity, and wildlife and fishery production would be diminished.

Impacts during construction related to increases in noise, airborne dust, and localized increases in turbidity in adjacent waters would also occur. There would also be increased potential for soil erosion during the interim period between shaping work and revegetation.

Due to the small amount of the wildlife habitat affected and the duration of the impacts, the-long term adverse effects on the wildlife populations in the area are not expected to be substantial.

b. Recreation. The levee construction would impact 4.2 acres of brackish marsh and 8.4 acres of scrub/shrub wildlife and fisheries habitat, which would temporarily affect fishing resources in the vicinity of work. The proposed Bayou Sauvage National Wildlife Refuge will have minimal linear impacts during construction; however, these impacts are not considered significant because construction will be relatively short-lived.

c. Status of Cultural Resources Investigation. A comprehensive survey of the Lake Pontchartrain and Vicinity Hurricane Protection project was conducted in 1982 by New World Research, Inc., under contract to this office. Survey of the subject reach adequate to cover the expanded right-of-way failed to identify any significant cultural resources in the potential impact zone. Therefore, no impacts to cultural resources are anticipated and no further investigation is necessary.

d. Socioeconomic. The New Orleans East-South Point to GIWW levee 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 hurricanes 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 Supplement to the Environmental Impact Statement (FEIS) for the Lake Pontchartrain, Louisiana and Vicinity Hurricane Protection Project (Reevaluation Study) was filed with the U.S. Environmental Protection Agency on 4 December 1984. This final supplement addressed the High Level Plan of hurricane protection along with its associated impacts. While the South Point to GIWW levee was addressed in this document, the new work noted in this GDM is not covered.

Since impacts associated with the present work are not substantial, a Supplemental Information Report is being prepared to note the change in impacts previously addressed in the FEIS. A Supplemental Section 404(b)(1) Evaluation is also being prepared.

ESTIMATE OF COST

60. General. Based on May 1987 price levels, the estimated first cost for constructing the New Orleans East-South Point to GIWW high level plan levee and floodwall is $13,500,000. This estimate consists of $82,000 for lands and damages, $1,909,000 for relocations, $9,221,000 for levees and floodwalls, $1,154,000 for engineering and design, and $1,134,000 for supervision and administration. The detailed estimate of first cost is shown in Table 1.

TABLE 1

DETAILED ESTIMATE OF FIRST COST
(May 87 Price Levels)

Cost Acct. No.		Description	Estimated Quantity	Unit	Unit Price $	Estimated Amount $
01	Lands & Damages					
	a.	Perpetual Levee Right-of-Way Marsh/Wetlands	12.46	Acres	500.00	6,230
	b.	Perpetual Road Right-of-Way Residential/ Commercial/ Industrial	1.92	Acres	10,000.00	19,200
	c.	Improvements				5,000
	d.	Severance Damage				0
		SUBTOTAL: LANDS & DAMAGES (Rounded)				30,000
		Contingencies (25%) (Rounded)				8,000
		Acquisition Costs (Estimated 22 tracts)				
		Non-Federal 22 @ $1,500 per tract				33,000
		Federal				10,000
		PL-91-646				1,000
		TOTAL: LANDS & DAMAGES				82,000

TABLE 1 (cont'd)

DETAILED ESTIMATE OF FIRST COST
(May 87 Price Levels)

Cost Acct. No.	Description	Estimated Quantity	Unit	Unit Price $	Estimated Amount $
02	RELOCATIONS				
	a. U.S. Highway 11-Ramp Raising				
	Mobilization and Demobilization	L.S.	L.S.	-	4,000
	Clay Core	78	CY	13.00	1,014
	5" Asphaltic Concrete				
	3 1/2 Binder Course	780	TN	52.00	40,560
	1 1/2 Wearing Course (Type 1, 2, or 4)	4,053	SY	4.30	17,428
	Tack Coat	338	GAL	1.50	507
	2" Asphalt Shoulders (8' Wide)	2,702	SY	6.00	16,212
	Road Embankment (Sand-Shell) Avg. Ht. 2.7 ft.	6,400	SY	20.00	128,000
	Road Base Course (Cement Stabilized Sand-Shell 8 1/2")	4,888	SY	13.00	63,544
	Removal of Existing Road Surface at Clay Core Crossing	66	SY	6.00	396
	Road Signs	L.S.	L.S.	-	10,000
	Embankment, Semi-Compacted Side Slopes	2,560	C.Y.	11.00	28,160
	Subtotal: Item a.				309,821
	Contingencies (20%±)				63,179
	SUBTOTAL: Item a.				373,000
30	Engineering and Design (12%±)				46,000
31	Supervision and Administration (11%±)				42,000
	SUBTOTAL: Item a.				461,000

TABLE 1 (cont'd)

DETAILED ESTIMATE OF FIRST COST
(May 87 Price Levels)

Cost Acct. No.	Description	Estimated Quantity	Unit	Unit Price	Estimated Amount
				$	$
	b. U.S. Highway 11 - Utilities				
	Aerial Powerlines (4 poles/4 lines) Approx. 1,420' (Sta. 760+61)	L.S.	L.S.	-	17,040
	Communications Lines (5 poles/2 lines) (Sta. 761+23)	L.S.	L.S.	-	14,200
	Levee Barricades Approx. 100' Cable and Iron Post	L.S.	L.S.	-	1,000
	Road Signs (Existing)	L.S.	L.S.	-	5,000
	Subtotal: Item b.				37,240
	Contingencies (20%±)				7,760
	SUBTOTAL: Item b.				45,000
30	Engineering and Design (12±)				5,000
31	Supervision and Administration (11±)				5,000
	SUBTOTAL: Item b.				55,000
	c. U.S. Highway 90 - Ramp Raising				
	Mobilization and Demobilization	L.S.	L.S.	-	4,000
	Clay Core	165	CY	11.00	1,815
	Concrete Road Pavement (10" Thickness) (40' Wide)	630	SY	40.00	25,200
	Embankment, Semi-Compact. (Side Slopes)	4,500	CY	11.00	49,500
	Road Embankment (Sand-Shell) 3.8' Avg. Ht.	18,890	SY	28.00	528,920
	Road Base Course (Cement Stabilized Sand Shell 8 1/2")	11,900	SY	13.00	154,700

TABLE 1 (cont'd)

DETAILED ESTIMATE OF FIRST COST
(May 87 Price Levels)

Cost Acct. No.	Description	Estimated Quantity	Unit	Unit Price	Estimated Amount
				$	$
	Road Shoulders and 4-Driveways (2" Asphaltic Concrete) (wearing course, type 1, 2, or 4)	4,110	SY	6.00	24,660
	Road Signs (DOTD Manual Item 727)	L.S.	L.S.	-	10,000
	Removal of Existing Road at Transition Areas (approx. 150' x 2 = 300')	1,400	SY	6.00	8,400
	Relocation of Existing Drainage Ditch and Culverts (700'± and 4 culverts)	L.S.	L.S.	-	25,000
	Compacted Shell for Driveway Access	14	CY	18.00	252
	Subtotal: Item c.				832,447
	Contingencies (20%±)				167,553
	SUBTOTAL: Item c.				1,000,000
30	Engineering and Design (12%±)				120,000
31	Supervision and Administration (11%±)				110,000
	SUBTOTAL: Item c.				1,230,000
	d. U.S. Highway 90 - Utilities				
	8" High Pressure Gas Line-140' Crosses Levee, 1120' Remove & Replace in New Hwy Shoulder 2 Gas Valves	L.S.	L.S.	-	380,000
	Overhead Powerline (mainline) with poles, and powerlines across Hwy 90 (938+76)	L.S.	L.S.	-	2,000
	1 manhole (L-50 so. of Picayune) Extend or Relocate	L.S.	L.S.	-	4,000

TABLE 1 (cont'd)

DETAILED ESTIMATE OF FIRST COST
(May 87 Price Levels)

Cost Acct. No.	Description	Estimated Quantity	Unit	Unit Price	Estimated Amount
				$	$
	1 manhole				
	Extend or Relocate	L.S.	L.S.	-	4,000
	3 Fire Hydrants				
	to be Extended or				
	Relocated	L.S.	L.S.	-	5,000
	Levee Barricades - 2 ea				
	Remove & Replace	L.S.	L.S.	-	1,000
	Plant Entrance Signal				
	Light, Remove & Replace	L.S.	L.S.	-	2,000
	1-12" Waterline				
	to be raised (938+68)	L.S.	L.S.	-	10,000
	Subtotal: Item d.				408,000
	Contingencies (20% ±)				83,000
	SUBTOTAL: Item d.				491,000
30	Engineering and Design (12% ±)				60,000
31	Supervision and Administration (11% ±)				55,000
	SUBTOTAL: Item d.				606,000
	TOTAL: RELOCATIONS				2,352,000

TABLE 1 (cont'd)

DETAILED ESTIMATE OF FIRST COST
(May 87 Price Levels)

Cost Acct. No.	Description	Estimated Quantity	Unit	Unit Price $	Estimated Amount $
11	LEVEES AND FLOODWALLS				
	a. I-Wall at Drainage Structure				
	Mob. and Demob.	L.S.	L.S	30,000.00	30,000
	Steel Sheet Piling, PZ-27	2,540	SF	13.00	33,020
	Fabricated HP 14X117	220	LF	50.00	11,000
	Concrete in I-Walls	67	CY	300.00	20,100
	Stabilization Slab Concrete	5	CY	70.00	350
	Waterstops, 3-Bulb Type	30	LF	10.00	300
	Expansion Joint Filler	65	SF	2.00	130
	Structural Excavation	67	CY	8.00	536
	Structural Backfill	45	CY	12.00	540
	Subtotal: Item a.				95,976
	Contingencies (20% ±)				19,024
	SUBTOTAL: Item a.				115,000
30	Engineering and Design (12%±)				14,000
31	Supervision and Administration (10%±)				12,000
	SUBTOTAL: Item a.				141,000
	b. Levee Enlargement				
	Mob. and Demob.	L.S.	L.S	60,000.00	60,000
	Clearing	165	AC	1,200.00	198,000
	Embankment (semi-compacted)	639,000	CY	11.00	7,029,000
	Ramp Crossing at Sta. 771+62 B/L Shell 50 c.y. Fill 150 c.y.	L.S.	L.S.	5,000.00	5,000
	Shell, Levee Crown (Hwy 90 to Floodgate) Compacted Shell	7,220	CY	18.00	129,960

TABLE 1 (cont'd)

DETAILED ESTIMATE OF FIRST COST
(May 87 Price Levels)

Cost Acct. No.	Description	Estimated Quantity	Unit	Unit Price	Estimated Amount
				$	$
	Fertilizing, Seeding, and Mulch	113	AC	1,200.00	135,600
	Riprap (12") (Floodgate and Drainage Structures	505	TN	20.00	10,100
	Shell fill (6")	150	CY	25.00	3,750
	Subtotal: Item b.				7,572,410
	Contingencies (20% ±)				1,533,590
	SUBTOTAL: Item b.				9,105,000
30	Engineering and Design (10% ±)				910,000
31	Supervision and Administration (10% ±)				910,000
	SUBTOTAL: Item b.				10,925,000
	TOTAL: LEVEES AND FLOODWALLS				11,066,000
	TOTAL PROJECT COST				13,500,000

61. Comparison of Estimates. The current estimate of $13,500,000 for the high level plan for the South Point to GIWW Levee represents an increase of $8,659,000 when compared to the PB-3 estimate effective 1 October 1986. The PB-3 estimate is based on cost estimates contained in the "Lake Pontchartrain, Louisiana and Vicinity Hurricane Protection Project Reevaluation Study" dated July 1984, escalated to October 1986 price levels. Table 2 shows a comparison by accounts of remaining incremental costs necessary to complete the high level plan South Point to GIWW Levee.

Table 2
COMPARISON OF ESTIMATES

Cost Acct No.	Feature	PB-3 (eff Oct 86) $	GDM (May 87 Prices) $	Difference GDM & PB-3 $
01	Lands & Damages	220,000	82,000	-138,000 1/
02	Relocations	1,220,000	1,909,000	+689,000 2/
11	Levees & Floodwalls	2,567,000	9,221,000	+6,654,000 3/
30	Engineering & Design	455,000	1,154,000	+699,000 4/
31	Supervision & Administration	379,000	1,134,000	+755,000 5/
		4,841,000	13,500,000	+8,659,000

1/ This decrease is due to a decrease in the number of additional right-of-way acres needed for levee enlargement.

2/ This increase is due to further refinements in design of the two highway ramps.

3/ This increase is due to an increase in the net levee grade of the reach of levee from Hwy 90 to GIWW over that in the reevaluation report. Paragraph 14 of this GDM explains the reasons for this increase.

4/ This increase is due to the more detailed estimate done for this GDM.

5/ This increase is due to the more detailed estimate done for this GDM.

SCHEDULE FOR DESIGN AND CONSTRUCTION

62. Schedule for Design and Construction. The sequence of contracts and the schedules for design, construction, relocations, and land acquisition are shown in Table 3.

TABLE 3
SCHEDULES FOR DESIGN, CONSTRUCTION, RELOCATIONS, AND LAND ACQUISITION

Contracts	P&S Start	P&S Complete	Construction Advertise	Construction Award	Construction Complete	Estimated Construction Cost 1/ $
Levee Enlargement (Sta. 662+35 to 1102+98 B/L)	Jun 87	Apr 88	May 88	Jun 88	Jul 89	9,929,000
Highway 90 Ramp Raising	Feb 88	May 88	Jun 89	Jul 89	Dec 89	1,099,000
Highway 11 Ramp Raising	Apr 89	Nov 89	Dec 89	Feb 90	Apr 89	410,800
Floodwall at Sta. 1054+55 B/L	Aug 91	Aug 92	Sep 92	Oct 92	Jan 93	121,800
					Total	11,560,600

1/ 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).

63. Funds Required by Fiscal Year. To maintain the schedule for design, construction, relocations, and land acquisition as shown in Table 3, funds will be required by fiscal year as shown in Table 4.

TABLE 4
FUNDS REQUIRED BY FISCAL YEAR

	Federal $	Non-Federal $	Total $
Funds Required FY 87	810,000	-	810,000
" " FY 88	266,000	113,000	379,000
" " FY 89	9,854,000	1,878,100	11,732,100
" " FY 90	-	442,900	442,900
" " FY 91	5,000	-	5,000
" " FY 92	39,900	-	39,900
" " FY 93	91,100	-	91,100
TOTAL	11,066,000	2,434,000	13,500,000

OPERATION AND MAINTENANCE

64. General. The drainage structures and railroad swing gate will be maintained and operated at the expense of local interests as a feature of local cooperation in the hurricane protection project. It is estimated that the drainage structures will be replaced at 50 year intervals. The annual charge for these replacements is estimated to be $12,500 per structure. The annual operation and maintenance cost for the drainage structures is estimated to be $6,500. The annual maintenance cost for the levee is estimated to be $20,000. The annual operation and maintenance cost for the railroad swing gate is estimated to be $2,500.

ECONOMICS

65. 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 the separable economic areas of the project for incremental justification. The South Point to GIWW reach is a part of the New Orleans East economic area. The computed benefit-cost ratio for the New Orleans East area is also 4.2 to 1.

FEDERAL AND NON-FEDERAL COST BREAKDOWN

66. Federal and Non-Federal Cost Breakdown. The breakdown of the high level plan construction cost for the work described in this GDM are shown in Table 5 below:

TABLE 5
FEDERAL AND NON-FEDERAL COST BREAKDOWN
(May 87 Price Levels)

Item	Federal	Non-Federal	Total
Lands and Damages	-0-	$ 82,000	$ 82,000
Relocations	-0-	$2,352,000	$ 2,352,000
Levees & Floodwalls	$11,066,000	-0- 1/	$11,066,000
Total	$11,066,000	$2,434,000	$13,500,000

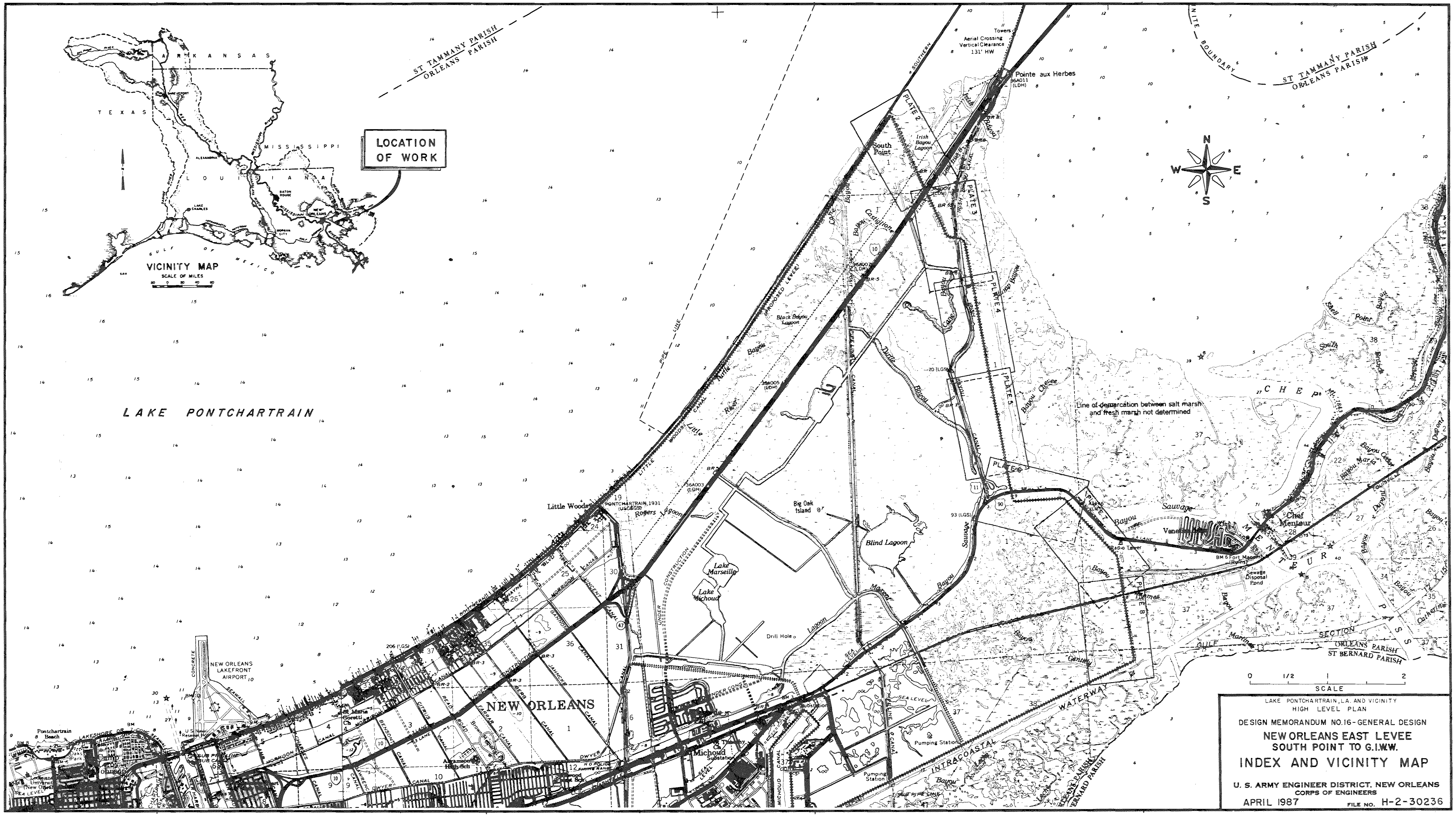
1/ Local interests have sufficient credits from other reaches of the Lake Pontchartrain and Vicinity Hurricane Protection Project such that a cash contribution will not be required for the construction of the levees and floodwalls portion of this work.

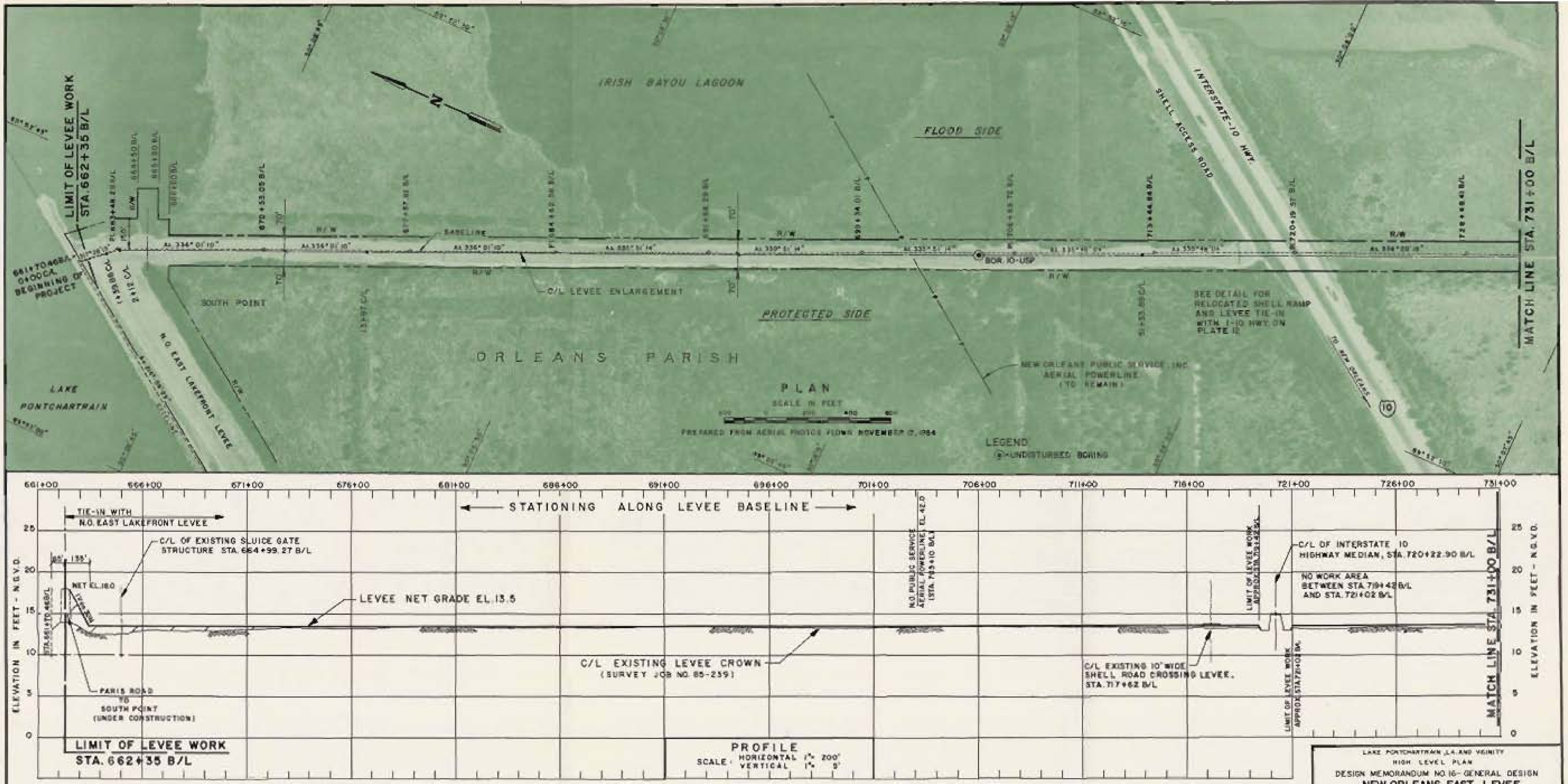
WATER CONSERVATION MEASURES

67. 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 South Point to GIWW Reach, it was concluded that the required construction does not afford the opportunity to use these measures. Future demands for increased consumptive use of water will depend on future population density trends and future industrial development in the area.

RECOMMENDATIONS

68. Recommendations. The plan of improvement presented herein consists of 8.3 miles of levee enlargement in eastern New Orleans from South Point to the GIWW. 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.


LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO.16-GENERAL DESIGN
NEW ORLEANS EAST LEVEE
SOUTH POINT TO G.I.W.W.
INDEX AND VICINITY MAP
U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
APRIL 1987
FILE NO. H-2-30236
LOCATION OF WORK
VICINITY MAP
SCALE OF MILES
ARKANSAS
TEXAS
MISSISSIPPI
LOUISIANA
GULF OF MEXICO
LAKE PONTCHARTRAIN
NEW ORLEANS
NEW ORLEANS LAKEFRONT AIRPORT
ST TAMMANY PARISH
ORLEANS PARISH
ST BERNARD PARISH
Pointe aux Herbes
South Point
Irish Bayou Lagoon
Towers
Aerial Crossing
Vertical Clearance
131' HW
PLATE 2
PLATE 3
PLATE 4
PLATE 5
PLATE 6
PLATE 7
PLATE 8
Black Bayou Lagoon
Little Woods
Rogers Lagoon
Big Oak Island
Blind Lagoon
Lake Marseille
Lake Michoud
Drill Hole
Line of demarcation between salt marsh
and fresh marsh not determined
Chef Menteur
Bayou Sauvage
Sewage Disposal Pond
Pumping Station
Michoud Substation
INTRACOASTAL WATERWAY
SCALE
0
1/2
1
2
N
S
E
W



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2+12	663+75	9'
13+97	675+60	9'
51+33.89	712+96.84	9.09'

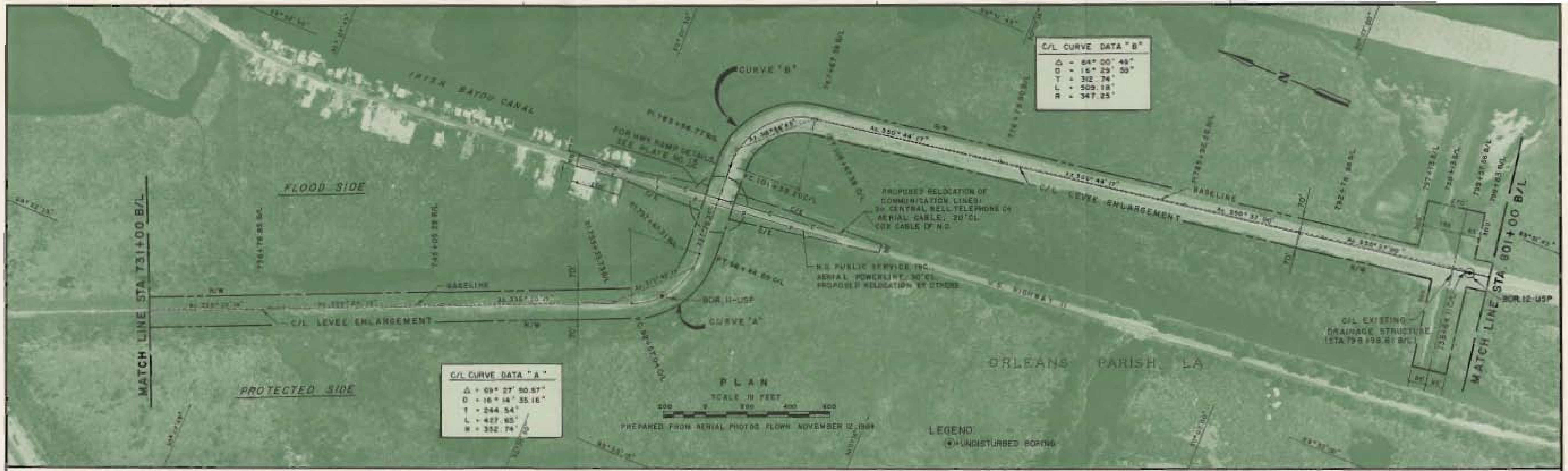
LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 16 - GENERAL DESIGN

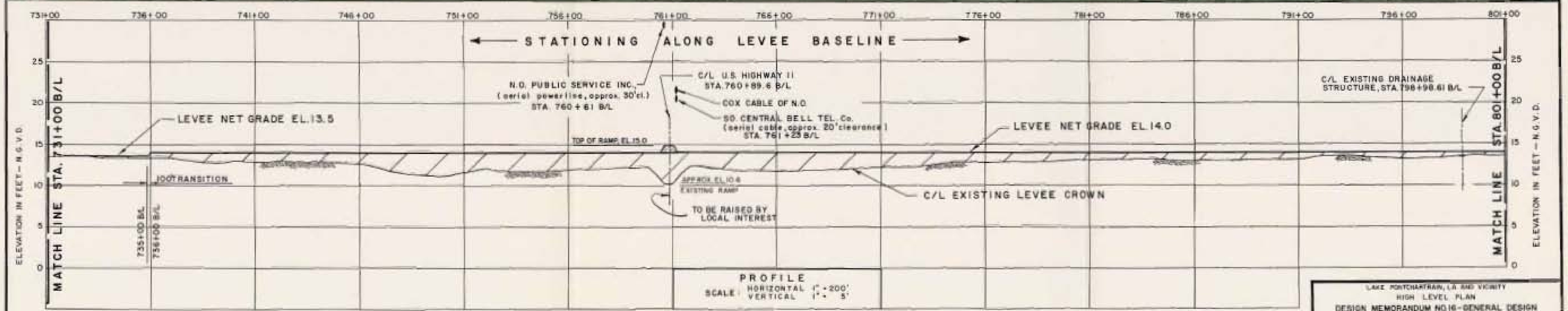
NEW ORLEANS EAST LEVEE
SOUTH POINT TO G.I.W.W.

PLAN AND PROFILE
STA. 662+35 TO STA. 731+00

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

DATE APRIL 1987 FILE NO. H-2-30236





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P.T. 96+84.89	758+21.17	8.3'
101+38.20	762+74.64	2.44'
106+47.38	767+65.25	- 4.58'
138+64.11	799+85.00	- 6.80'

LAKE PONTCHARTRAIN, LA AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO.16 – GENERAL DESIGN

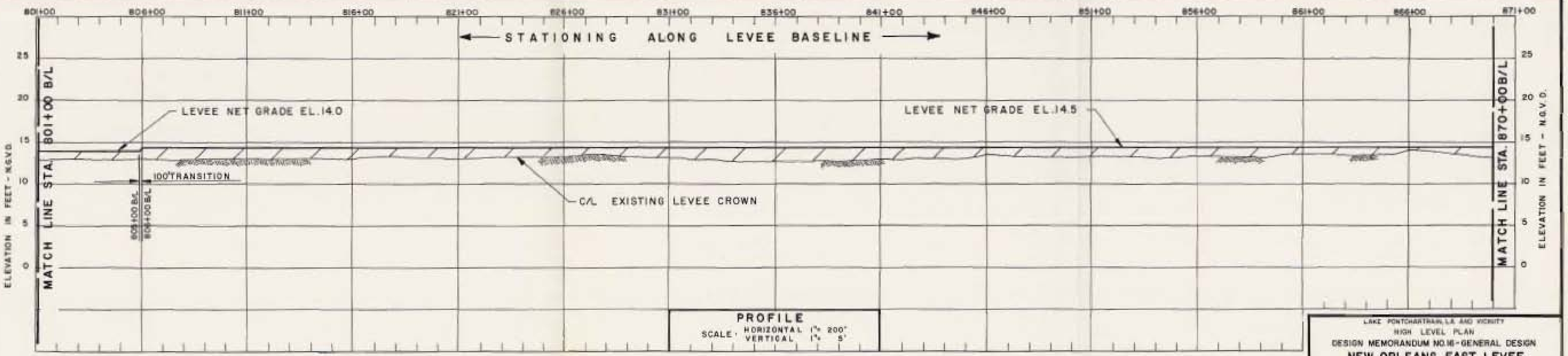
NEW ORLEANS EAST LEVEE

SOUTH POINT TO G.I.W.W.

PLAN AND PROFILE
STA. 731+00 TO STA. 801+00

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

DATE: APRIL 1987 FILE NO. H-2-30236



PROFILE

SCALE: HORIZONTAL 1" = 200'
VERTICAL 1" = 5'

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199+39.11	860+60.00	6.96'

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO.16 - GENERAL DESIGN

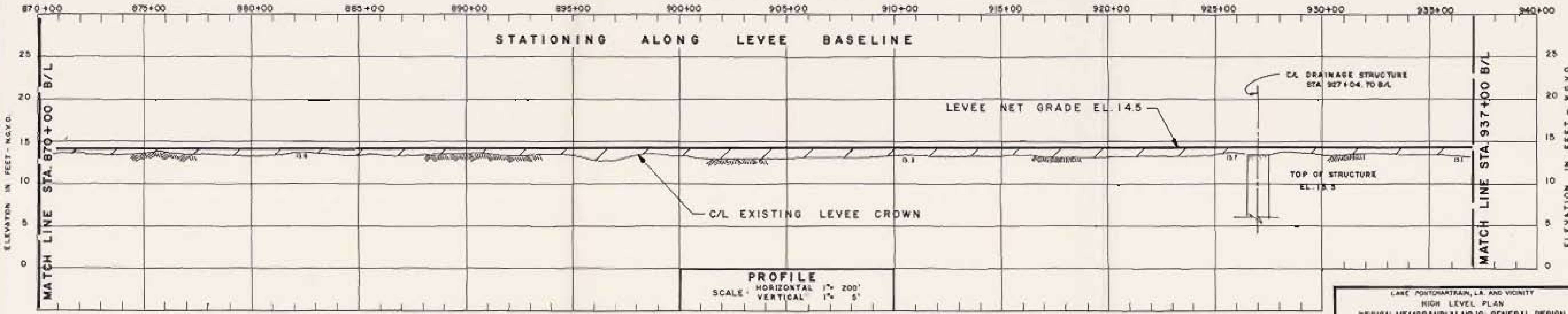
NEW ORLEANS EAST LEVEE

SOUTH POINT TO G.I.W.W.

PLAN AND PROFILE
STA. 801+00 TO STA. 870+00

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

DATE: APRIL 1987 FILE NO. H-2-30236



CENTERLINE DATA

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267+04.14	928+25.00	10.00'
275+91.45	937+12.51	10.00'

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO.16-GENERAL DESIGN

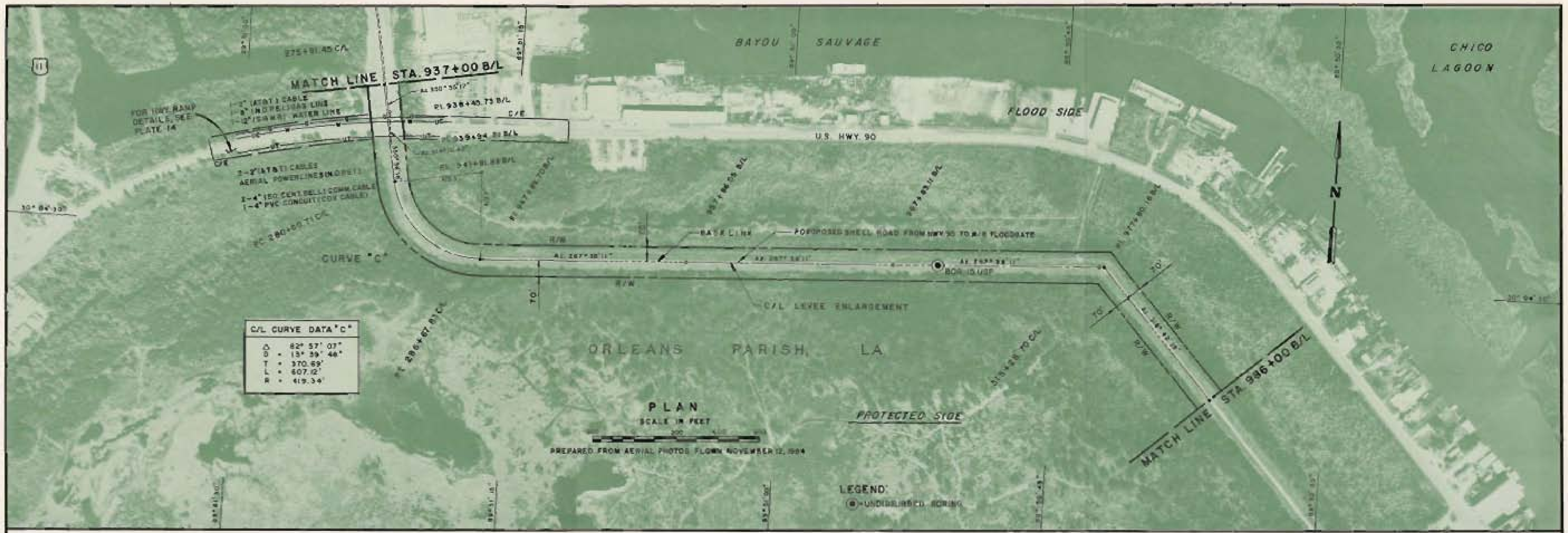
NEW ORLEANS EAST LEVEE

SOUTH POINT TO G.I.W.W.

PLAN AND PROFILE
STA. 870+00 TO STA. 937+00

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

DATE: APRIL 1987 FILE NO. H-2-30236



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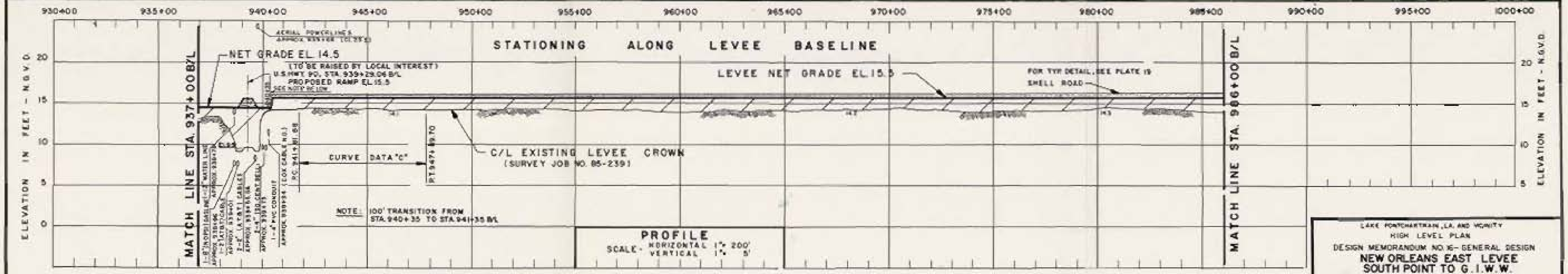
T	370.69'
L	607.12'
R	419.34'



CENTERLINE DATA

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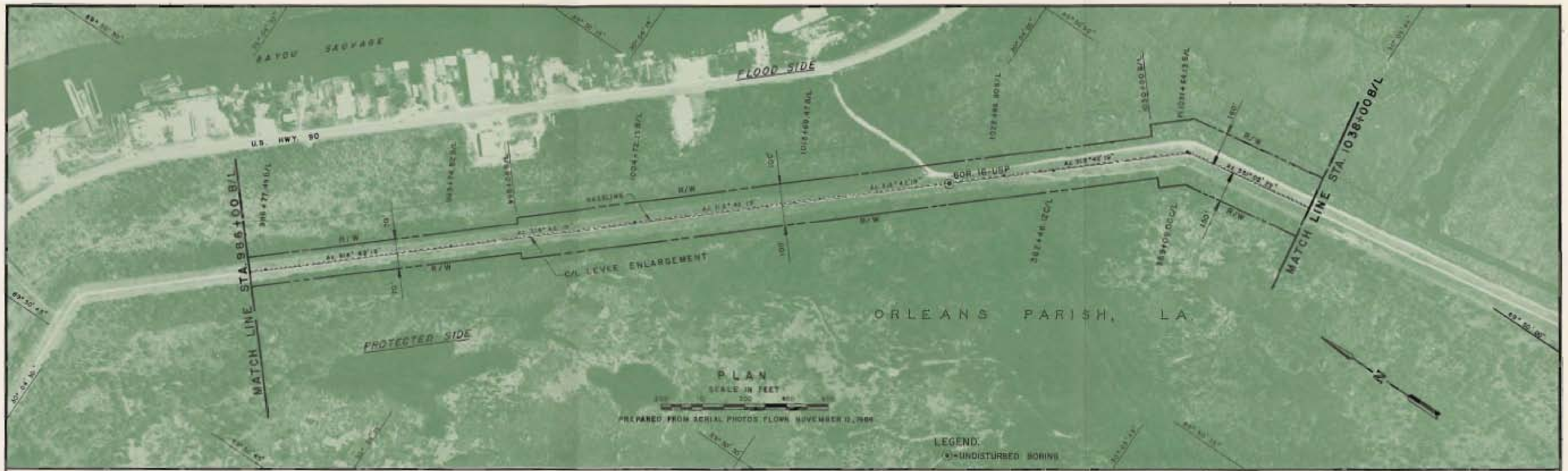
P.T. 286+67.83	949+23.14	0.01'
315+28.70	977+80.16	3.85'

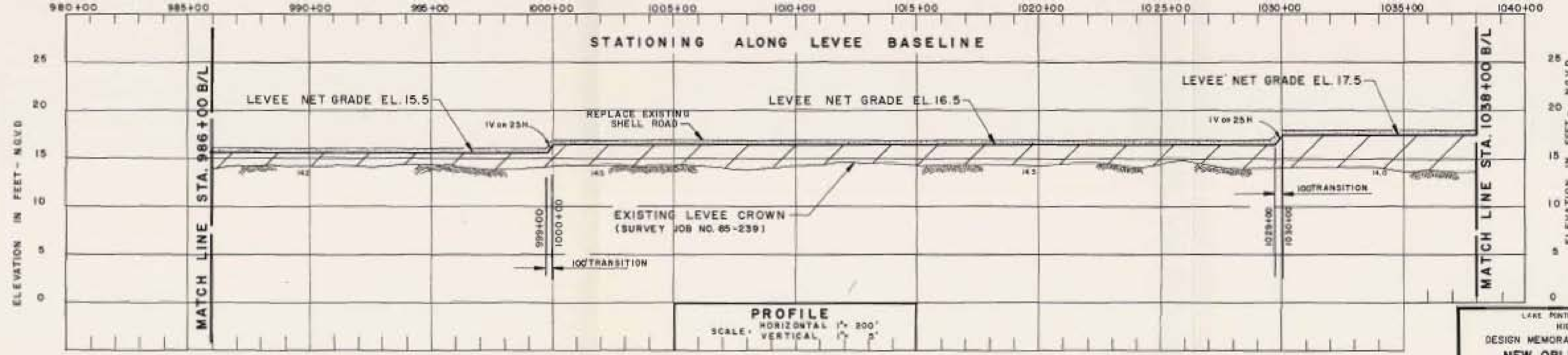
LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 16 - GENERAL DESIGN
NEW ORLEANS EAST LEVEE
SOUTH POINT TO G.I.W.W.

PLAN AND PROFILE
STA. 937+00 TO STA. 986+00

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

DATE APRIL 1987 FILE NO. H-2-30236





CENTERLINE DATA

C/L STA.	B/L STA.	OFFSET
362+46.12	1025+00	-3'
369+09.00	1031+62.88	-4.5'

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO.16 - GENERAL DESIGN

NEW ORLEANS EAST LEVEE

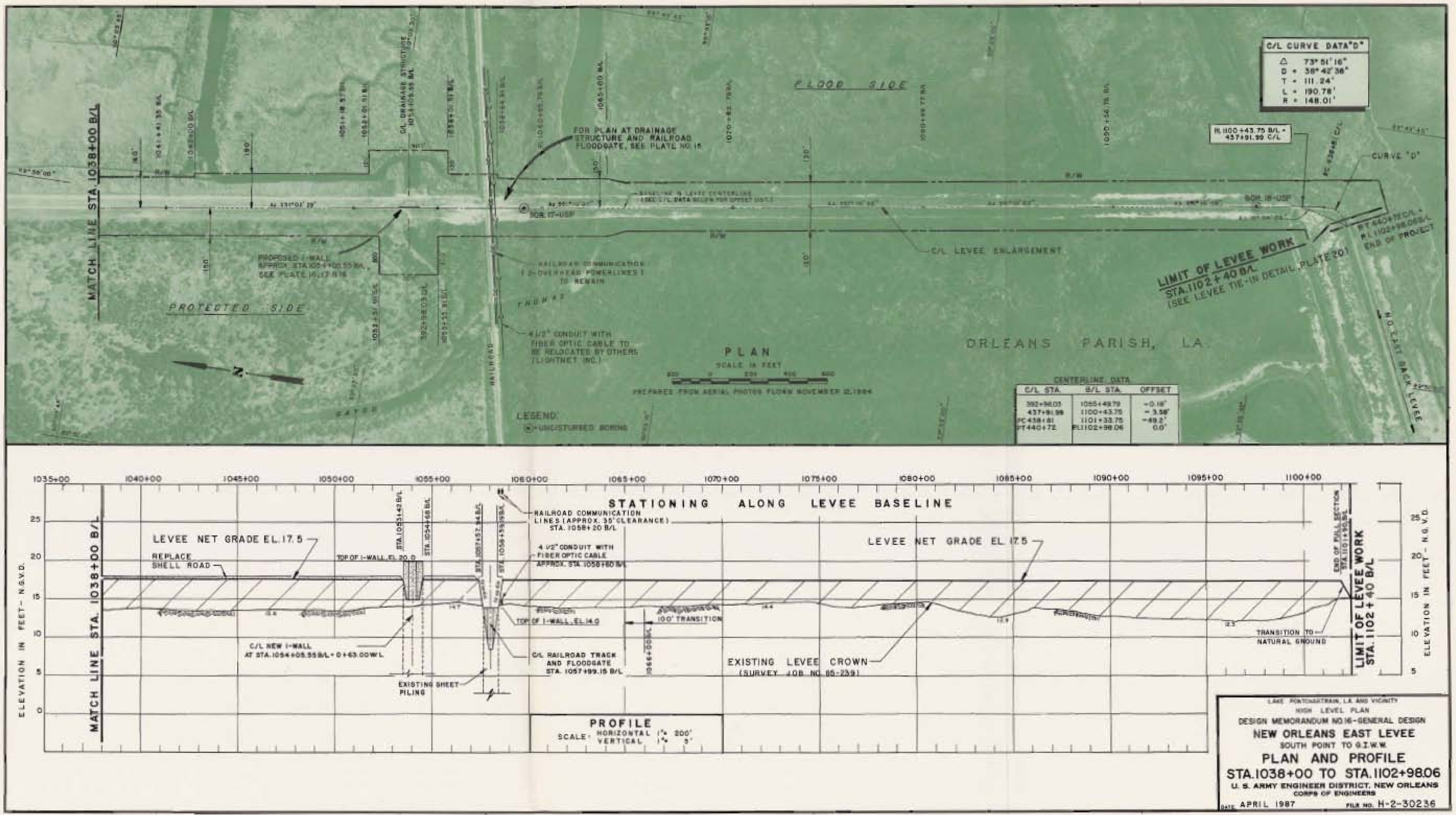
SOUTH POINT TO G.I.W.W.

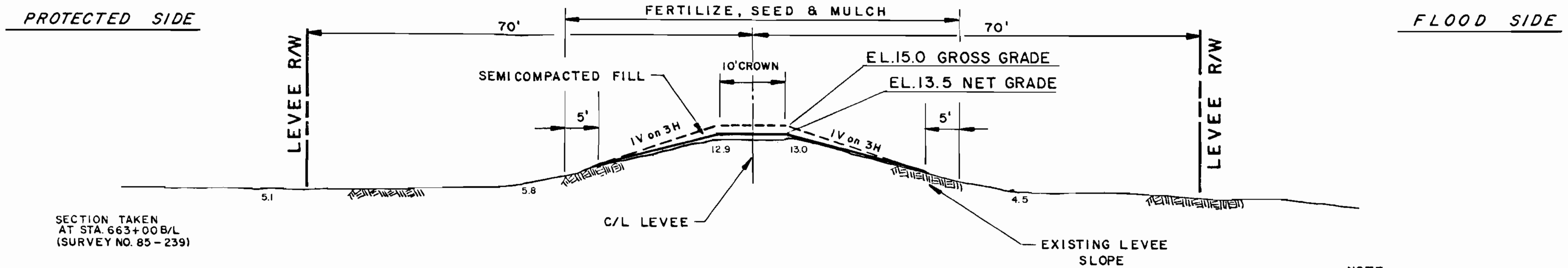
PLAN AND PROFILE
STA. 986+00 TO STA. 1038+00

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

DATE: APRIL 1987 FILE NO. H-2-30236

PLATE 7

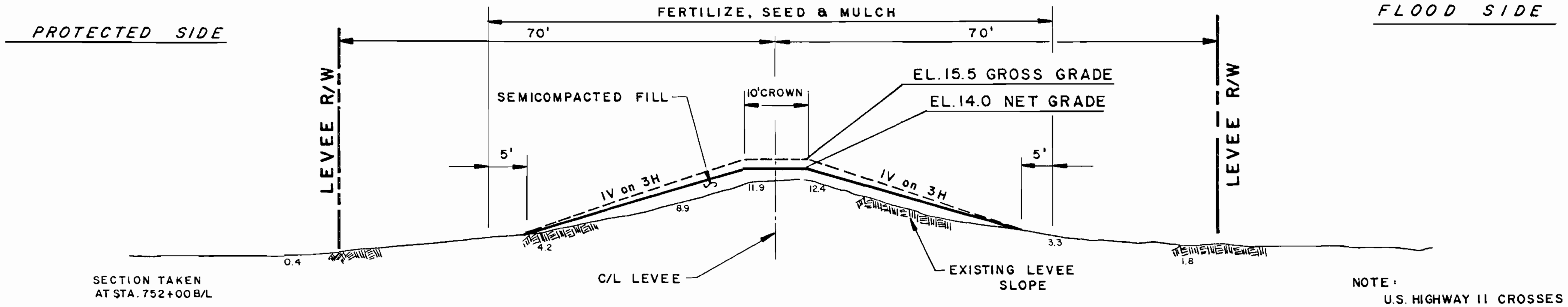

C/L CURVE DATA "D"
Δ = 73° 51' 16"
D = 38° 42' 36"
T = 111.24'
L = 190.78'
R = 148.01'
FLOOD SIDE
PROTECTED SIDE
MATCH LINE STA. 1038+00 B/L
FOR PLAN AT DRAINAGE STRUCTURE AND RAILROAD FLOODGATE, SEE PLATE NO. 15
PROPOSED I-WALL APPROX. STA. 1054+00.55 B/L SEE PLATE 16, 17 & 18
RAILROAD COMMUNICATION (2-OVERHEAD POWERLINES) TO REMAIN
4 1/2" CONDUIT WITH FIBER OPTIC CABLE TO BE RELOCATED BY OTHERS (LIGHTNET INC.)
C/L LEVEE ENLARGEMENT
BOR. 17-USP
BOR. 18-USP
R/W
RAILROAD
CURVE "D"
LIMIT OF LEVEE WORK STA. 1102+40 B/L (SEE LEVEE TIE-IN DETAIL PLATE 20)
N.O. EAST BACK LEVEE
ORLEANS PARISH, LA.
PLAN
SCALE IN FEET
PREPARED FROM AERIAL PHOTOS FLOWN NOVEMBER 12, 1984
LEGEND:
UNDISTURBED BORING
CENTERLINE DATA
C/L STA. | B/L STA. | OFFSET
392+98.03 | 1055+49.79 | -0.18'
437+91.99 | 1100+43.75 | -3.58'
PC 438+81 | 1101+33.75 | -49.2'
PT 440+72 | P.I. 1102+98.06 | 0.0'
STATIONING ALONG LEVEE BASELINE
1035+00
1040+00
1045+00
1050+00
1055+00
1060+00
1065+00
1070+00
1075+00
1080+00
1085+00
1090+00
1095+00
1100+00
ELEVATION IN FEET - N.G.V.D.
LEVEE NET GRADE EL. 17.5
REPLACE SHELL ROAD
TOP OF I-WALL, EL. 20.0
TOP OF I-WALL, EL. 14.0
RAILROAD COMMUNICATION LINES (APPROX. 35' CLEARANCE) STA. 1058+20 B/L
4 1/2" CONDUIT WITH FIBER OPTIC CABLE APPROX. STA. 1058+60 B/L
C/L NEW I-WALL AT STA. 1054+05.55 B/L - 0+63.00 W/L
EXISTING SHEET PILING
C/L RAILROAD TRACK AND FLOODGATE STA. 1057+99.15 B/L
100' TRANSITION
EXISTING LEVEE CROWN (SURVEY JOB NO. 85-239)
TRANSITION TO NATURAL GROUND
END OF FULL SECTION STA. 1101+90 B/L
LIMIT OF LEVEE WORK STA. 1102+40 B/L
PROFILE
SCALE: HORIZONTAL 1" = 200'
VERTICAL 1" = 5'
LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 16 - GENERAL DESIGN
NEW ORLEANS EAST LEVEE
SOUTH POINT TO G.I.W.W.
PLAN AND PROFILE
STA. 1038+00 TO STA. 1102+98.06
U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
DATE APRIL 1987
FILE NO. H-2-30236



TYPICAL DESIGN SECTION

APPROX. STA. 662 + 25 B/L TO APPROX. STA. 736 + 00 B/L
(TRANSITION 100' BETWEEN STAS. 735+00 B/L AND 736+00B/L)
NOT TO SCALE

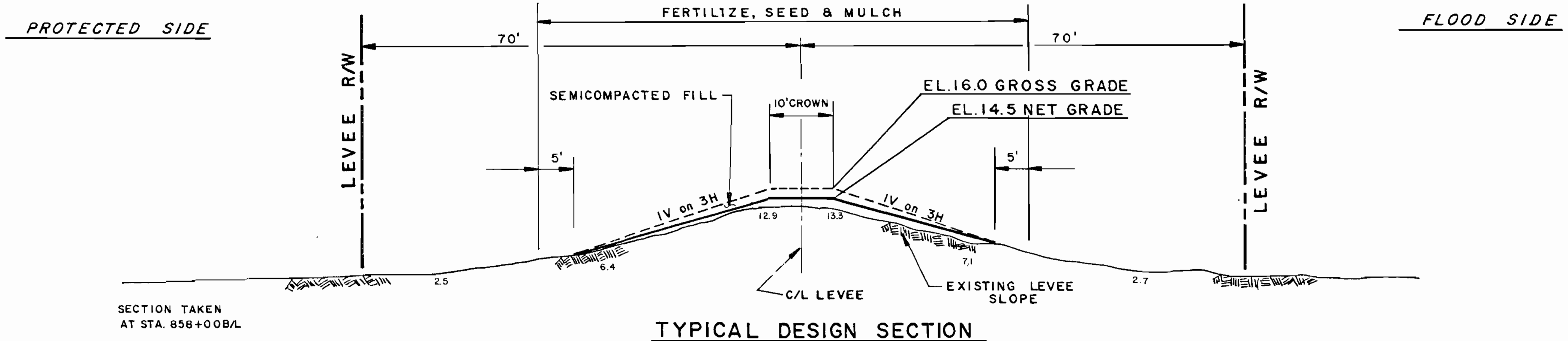
NOTE:
INTERSTATE 10 CROSSES LEVEE ALINEMENT IN THE VICINITY OF STA. 720+22.90 B/L. FOR DETAILS OF LEVEE TIE-IN WITH INTERSTATE-10 SEE, PLATE 12.



NOTE:
U.S. HIGHWAY 11 CROSSES LEVEE DESIGN SECTION AT THE INTERSECTION OF LEVEE STA. 760 + 40.30 B/L. FOR U.S HWY. 11 RAMP DETAIL, SEE PLATE 13

TYPICAL DESIGN SECTION

APPROX. STA. 736 + 00 B/L TO APPROX. STA. 806 + 00 B/L
(TRANSITION 100' BETWEEN STAS. 805+00 B/L AND 806+00B/L)
NOT TO SCALE



TYPICAL DESIGN SECTION

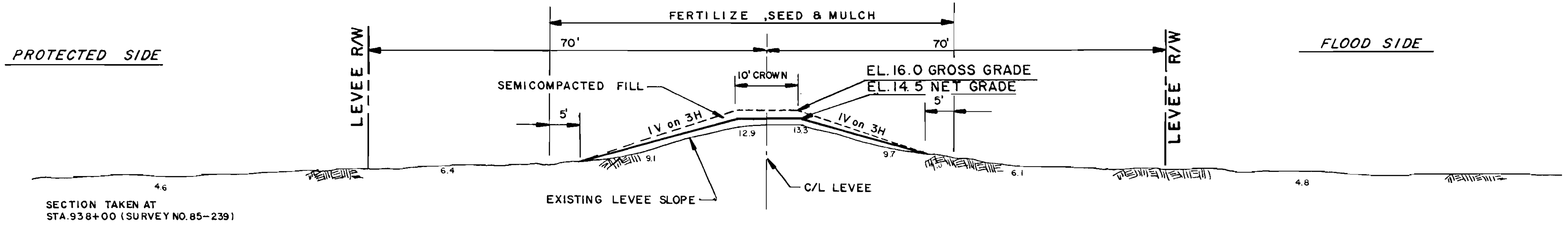
APPROX. STA. 806 + 00 B/L TO APPROX. STA. 937 + 78 B/L

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 16- GENERAL DESIGN
NEW ORLEANS EAST LEVEE
SOUTH POINT TO G.I.W.W.

LEVEE DESIGN SECTIONS

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

DATE APRIL 1987 FILE NO. H-2-30236

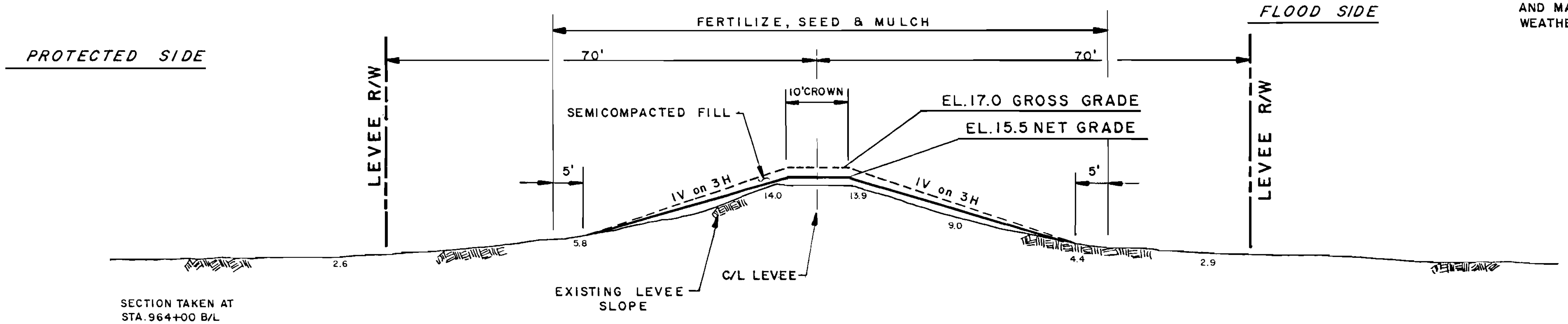


TYPICAL DESIGN SECTION

APPROX. STA. 937 + 78 B/L TO APPROX. STA. 940+35 B/L
NOT TO SCALE

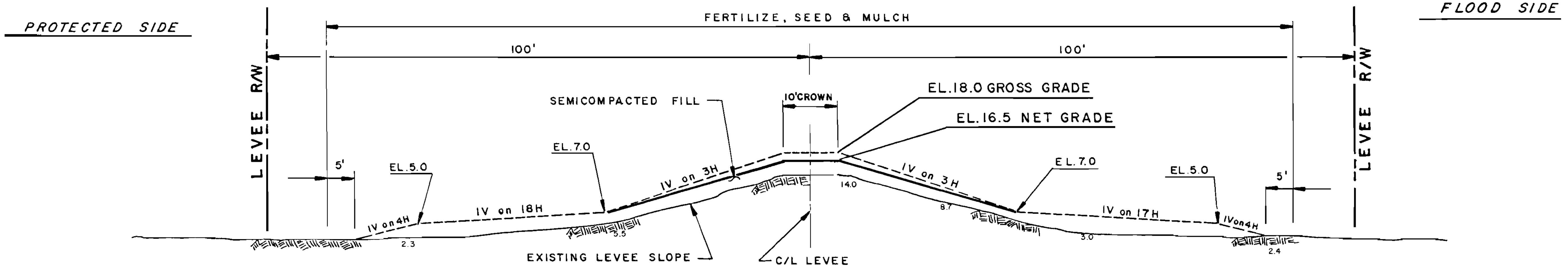
NOTE :

1. U.S. HIGHWAY 90 CROSSES LEVEE DESIGN SECTION AT THE INTERSECTION OF LEVEE STA. 939+29.06 B/L, FOR DETAILS OF RAISING U.S.HWY 90 RAMP, SEE PLATE 14.
2. A SHELL ROAD IS TO BE CONSTRUCTED ON THE CROWN OF THE LEVEE FROM VICINITY STA. 939+50 B/L (HWY. 90) TO VICINITY STA. 1057+60 B/L TO PROVIDE ACCESS TO THE RAILROAD FLOODGATE FOR OPERATION AND MAINTENANCE DURING INCLEMENT WEATHER. FOR TYPICAL SECTION, SEE PLATE 19.



TYPICAL DESIGN SECTION

APPROX. STA. 940 +35 B/L TO APPROX. STA 1000+00B/L
(TRANSITION 100' BETWEEN STAS. 940+35 B/L AND 941+35B/L)
(TRANSITION 100' BETWEEN STAS. 999+00 B/L AND 1000+00B/L)
NOT TO SCALE



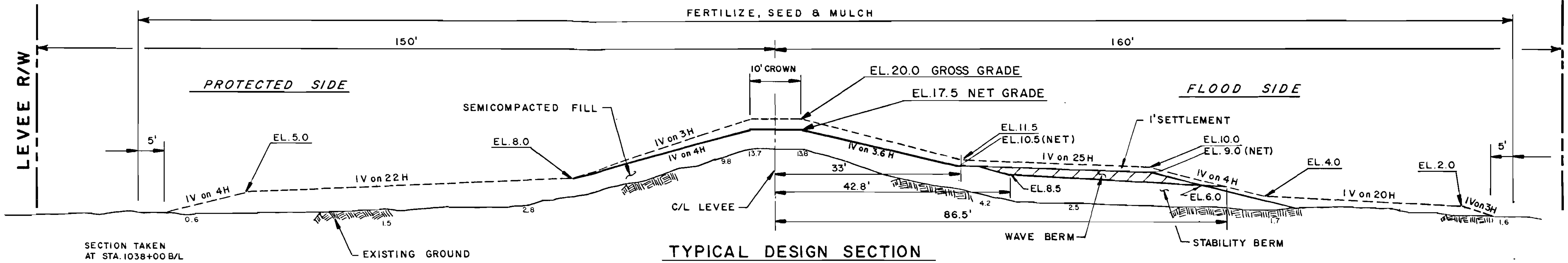
TYPICAL DESIGN SECTION

APPROX. STA. 1000+00 B/L TO APPROX. STA. 1030+00 B/L
(TRANSITION 100' BETWEEN STAS. 1029+00B/L AND 1030+00 B/L)
NOT TO SCALE

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 16-GENERAL DESIGN
NEW ORLEANS EAST LEVEE
SOUTH POINT TO G.I.W.W.

LEVEE DESIGN SECTIONS

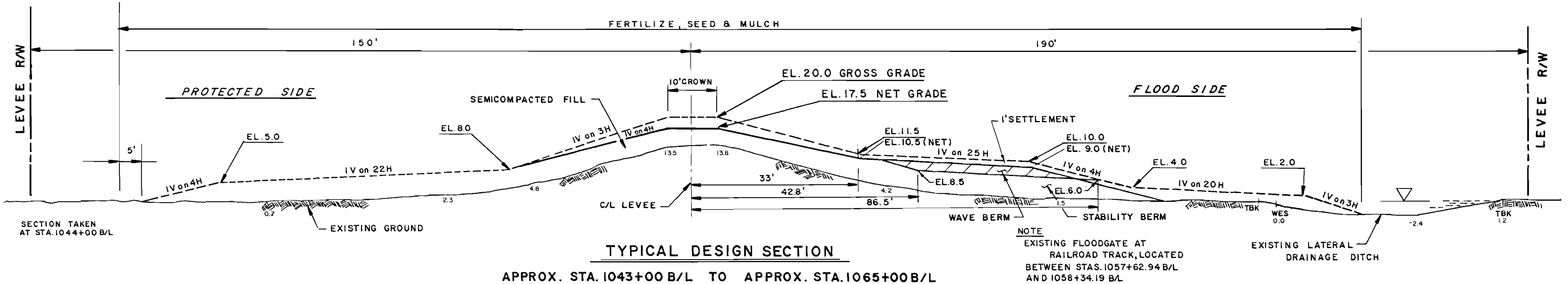
U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
DATE APRIL 1987 FILE NO. H-2-30236



TYPICAL DESIGN SECTION

APPROX. STA. 1030+00 B/L TO APPROX. STA. 1043+00 B/L

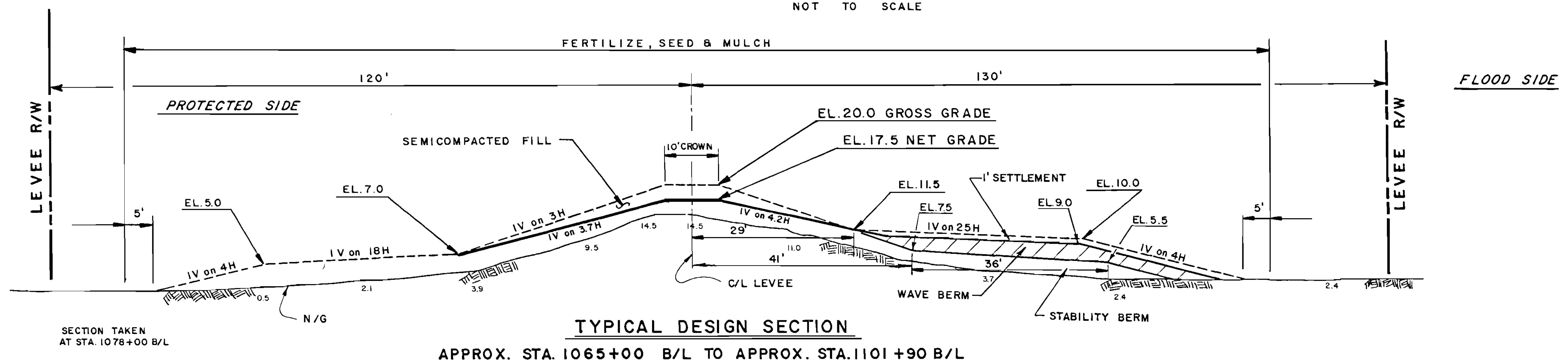
NOT TO SCALE



TYPICAL DESIGN SECTION

APPROX. STA. 1043+00 B/L TO APPROX. STA. 1065+00 B/L

NOT TO SCALE



TYPICAL DESIGN SECTION

APPROX. STA. 1065+00 B/L TO APPROX. STA. 1101+90 B/L

NOT TO SCALE

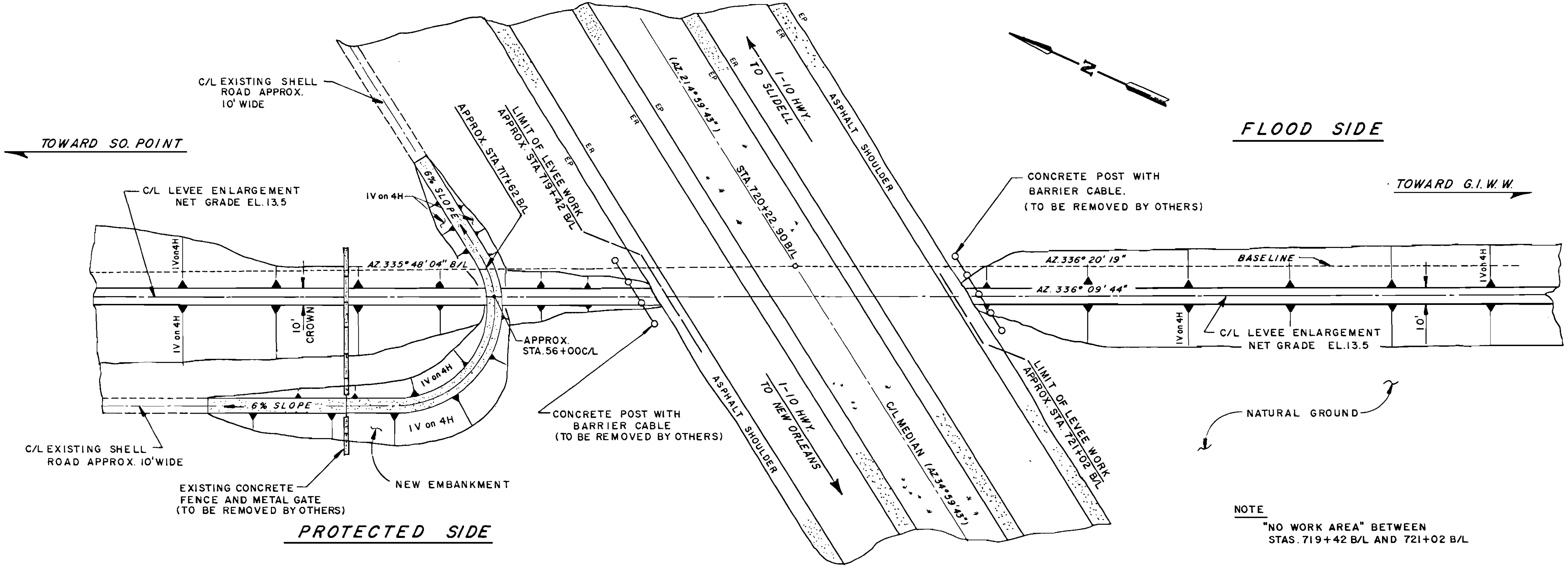
LAKE PONTCHARTRAIN, LA AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 16-GENERAL DESIGN

NEW ORLEANS EAST LEVEE
SOUTH POINT TO G.I.W.W.

LEVEE DESIGN SECTIONS

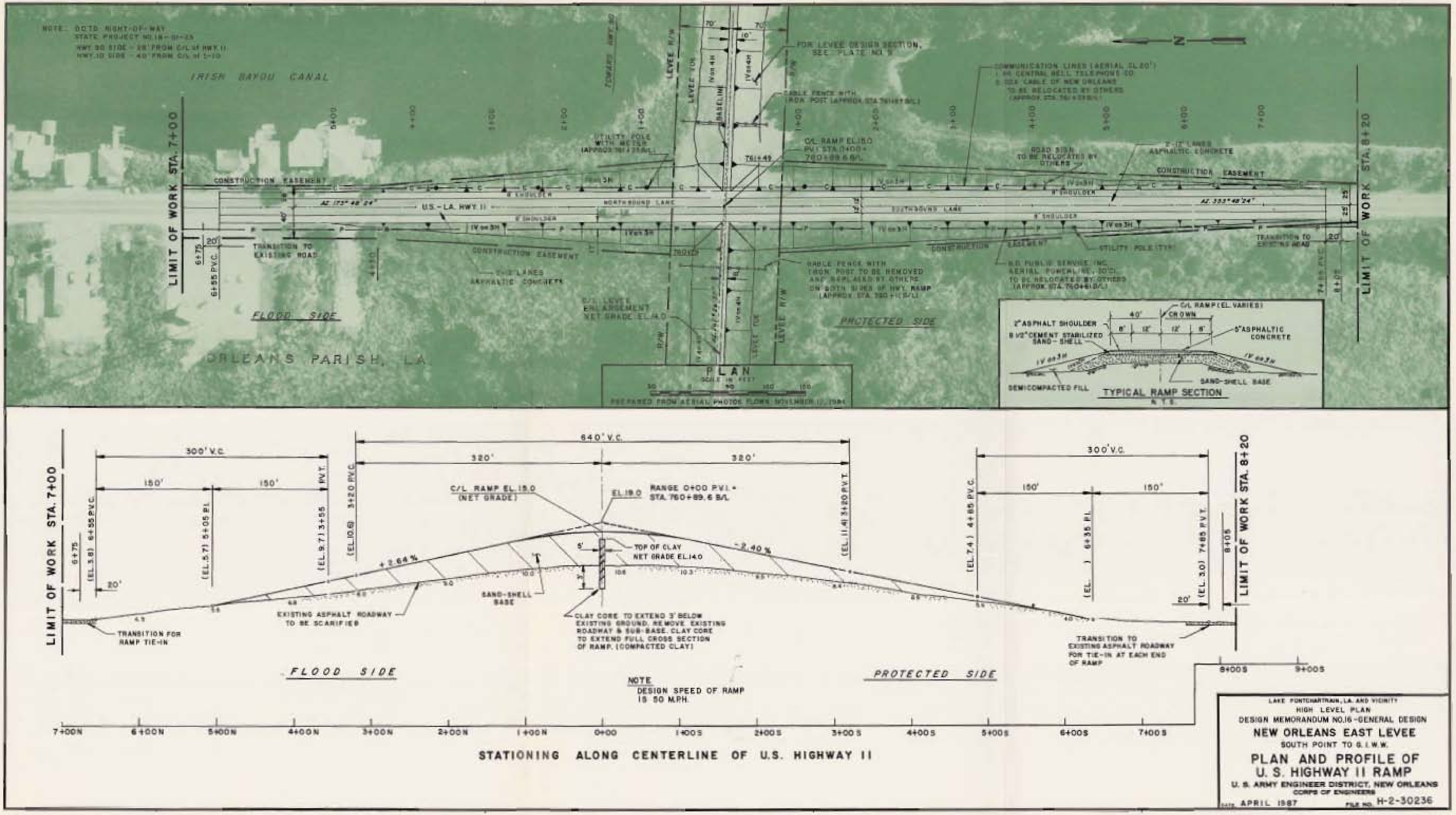
U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

DATE APRIL 1987 FILE NO. H-2-30236



SHELL RAMP AND INTERSTATE-10 HIGHWAY
LEVEE TIE-IN DETAIL
NOT TO SCALE

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 16-GENERAL DESIGN
NEW ORLEANS EAST LEVEE
SOUTH POINT TO G.I.W.W.
LEVEE TIE-IN DETAIL
AT INTERSTATE-10 HWY.
U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
DATE APRIL 1987 FILE NO. H-2-30236



LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO.16-GENERAL DESIGN

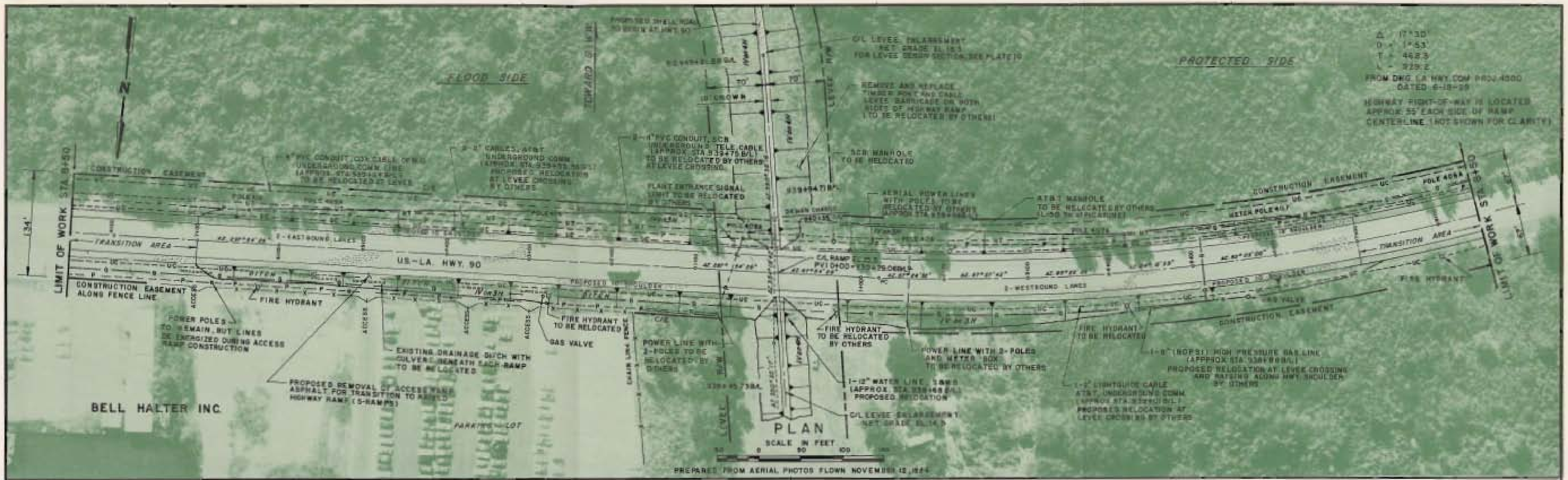
NEW ORLEANS EAST LEVEE

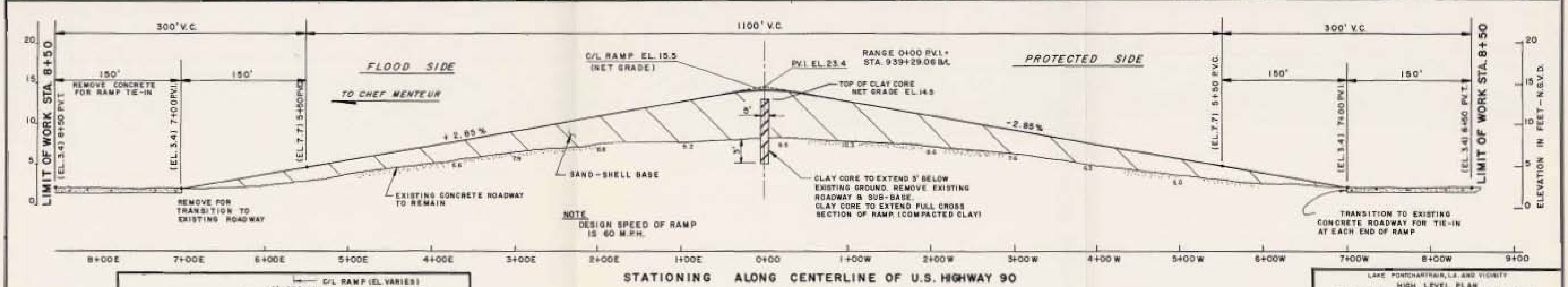
SOUTH POINT TO G.I.W.W.

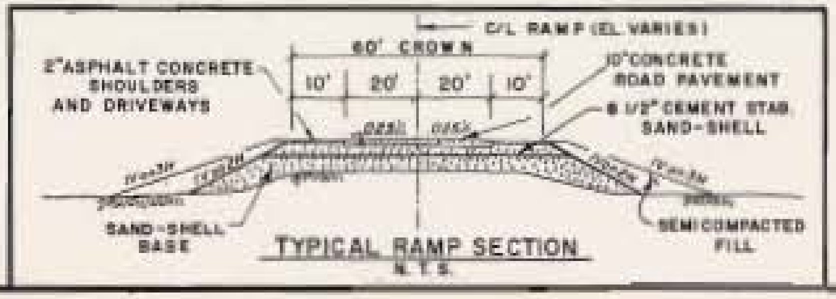
PLAN AND PROFILE OF U. S. HIGHWAY 11 RAMP

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

DATE APRIL 1987 FILE NO. H-2-30236







LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO.16-GENERAL DESIGN

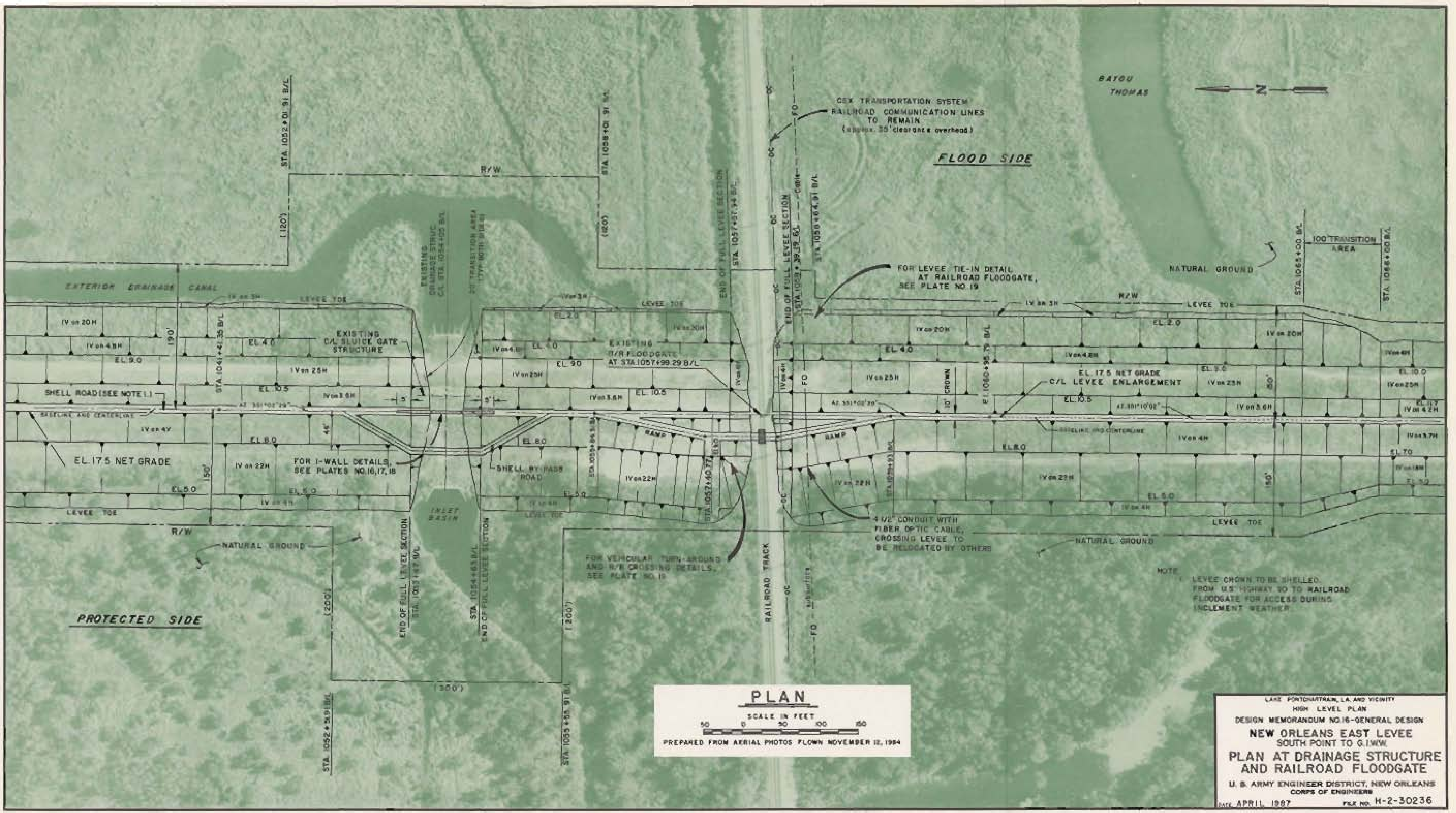
NEW ORLEANS EAST LEVEE

SOUTH POINT TO G.I.W.W.

PLAN AND PROFILE OF U. S. HIGHWAY 90 RAMP

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

DATE APRIL 1987 FILE NO. H-2-30236



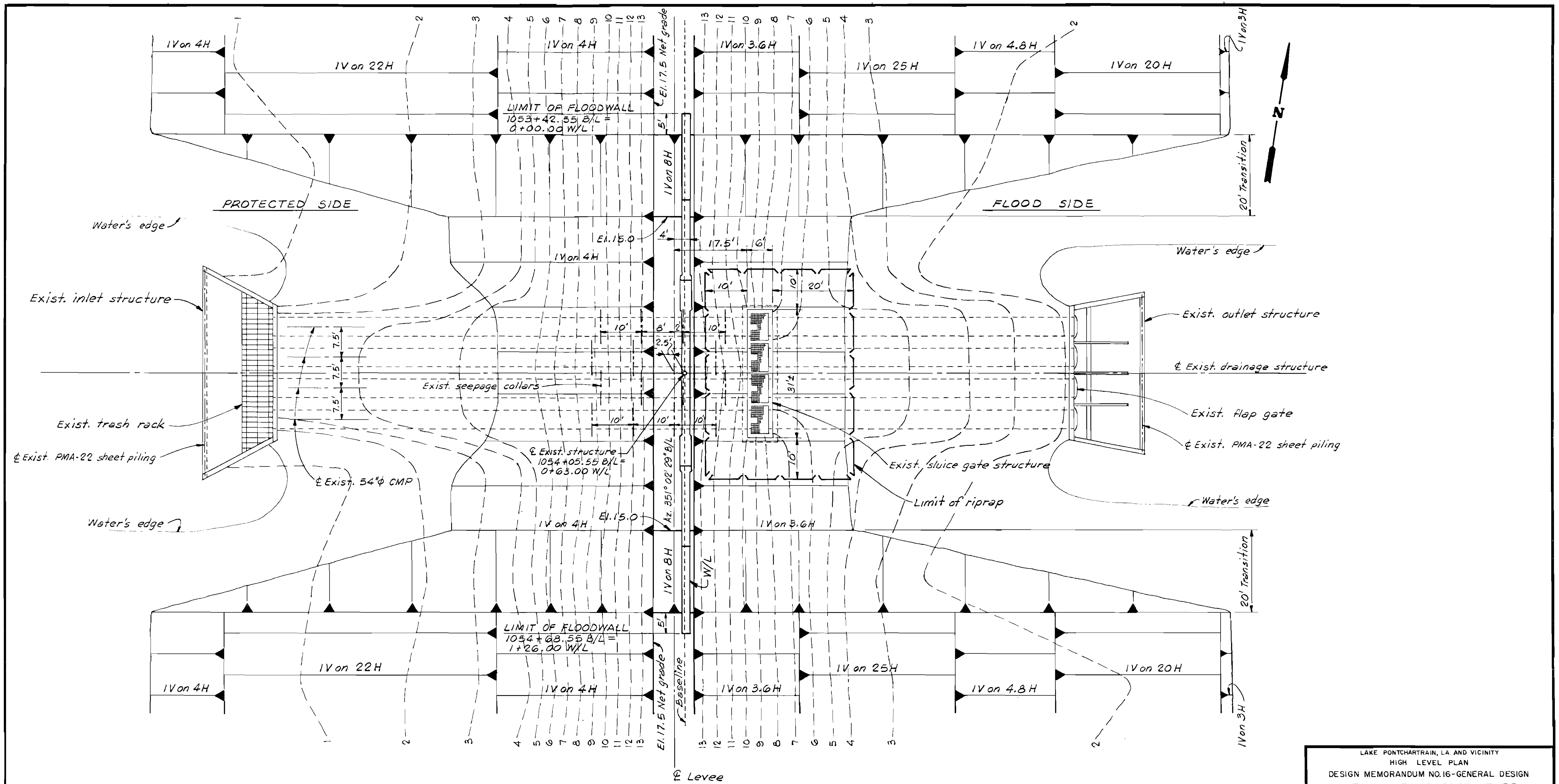
LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 16 - GENERAL DESIGN

NEW ORLEANS EAST LEVEE
SOUTH POINT TO G.I.W.W.

PLAN AT DRAINAGE STRUCTURE AND RAILROAD FLOODGATE

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

DATE APRIL 1987 FILE NO. H-2-30236



PLAN

SCALE: 1" = 10'

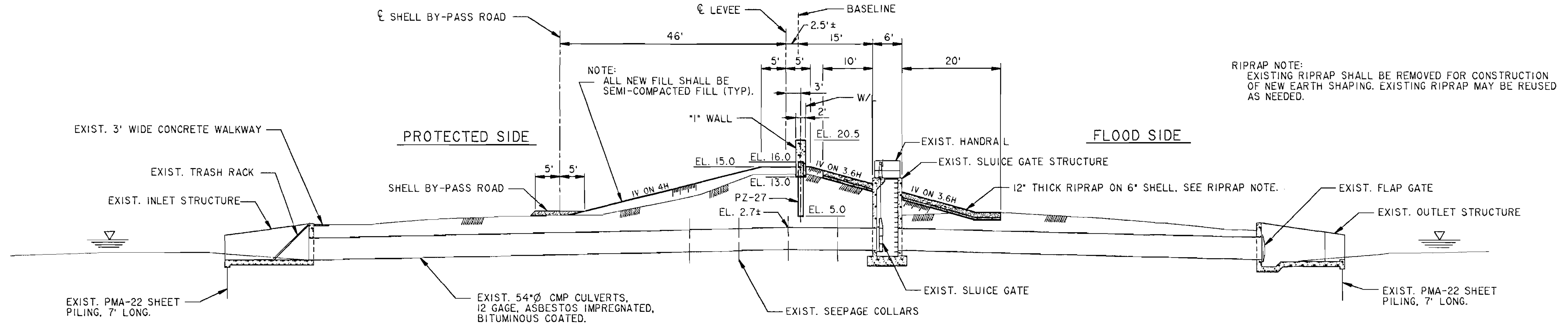
LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 16 - GENERAL DESIGN
NEW ORLEANS EAST LEVEE
SOUTH POINT TO G.I.W.W.

PLAN

STA. 1053+42.55 TO STA. 1054+68.55

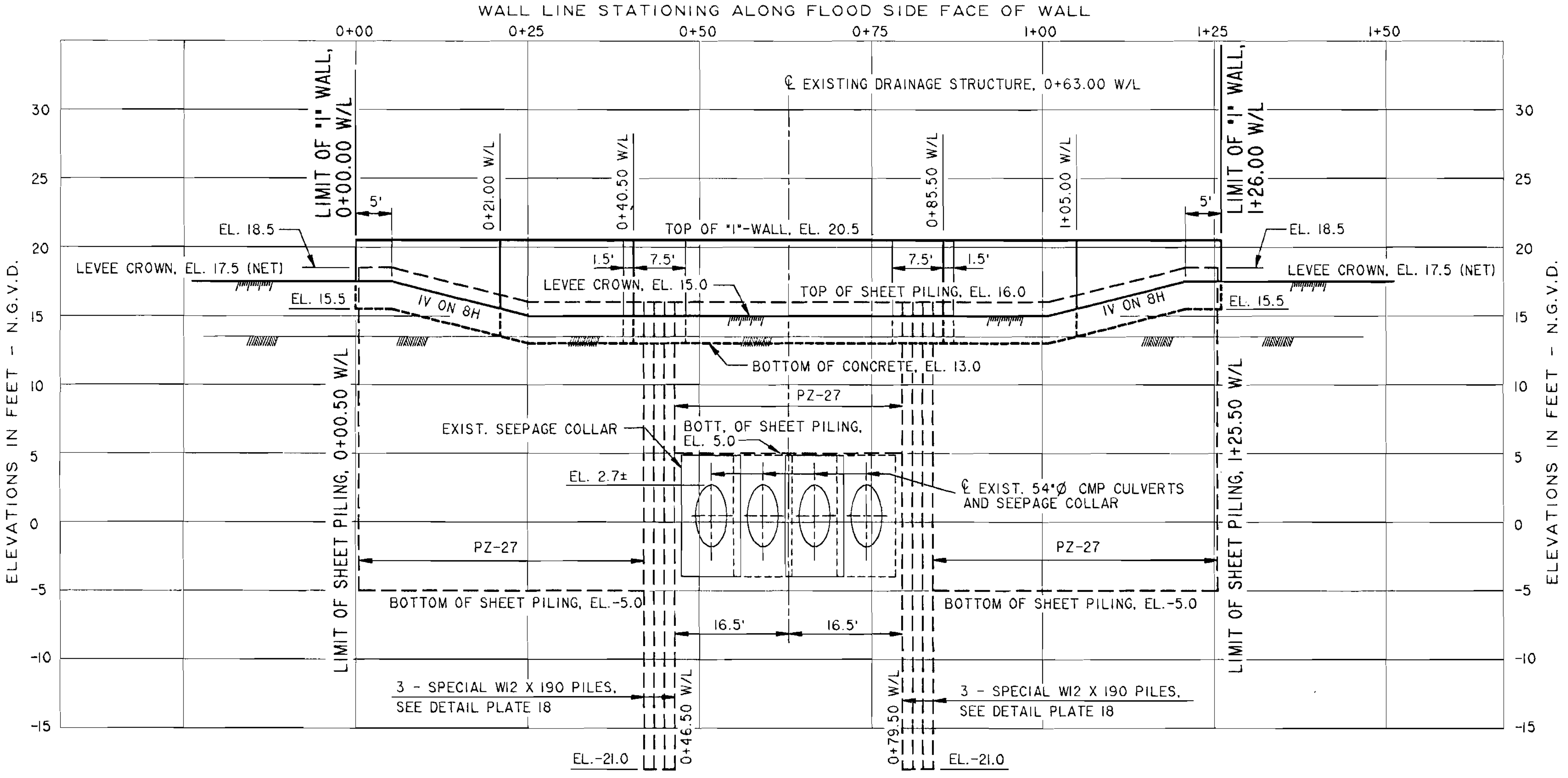
U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

DATE: APRIL 1987 FILE NO. H-2-30210



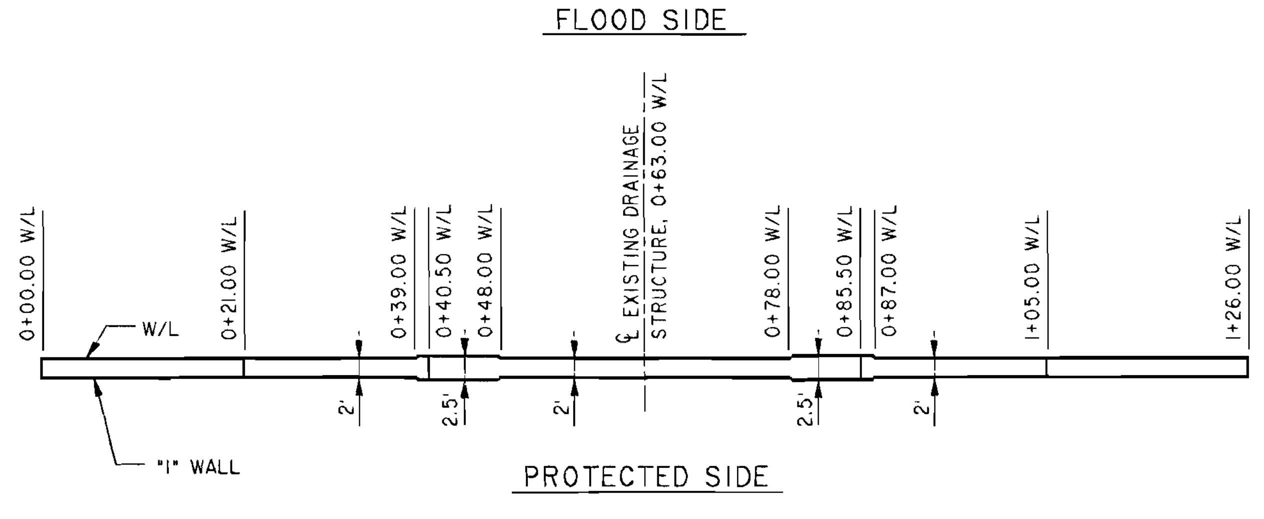
SECTION STA. 0+63.00 W/L

SCALE: 1" = 10'



PROFILE

SCALE: VERT: 1" = 5'
HORIZ: 1" = 10'



PLAN AT EL. 20.50

PLAN - TOP OF "I" WALL

SCALE: 1" = 10'

SCALE: 1" = 10'
10' 0 10' 20' 30'

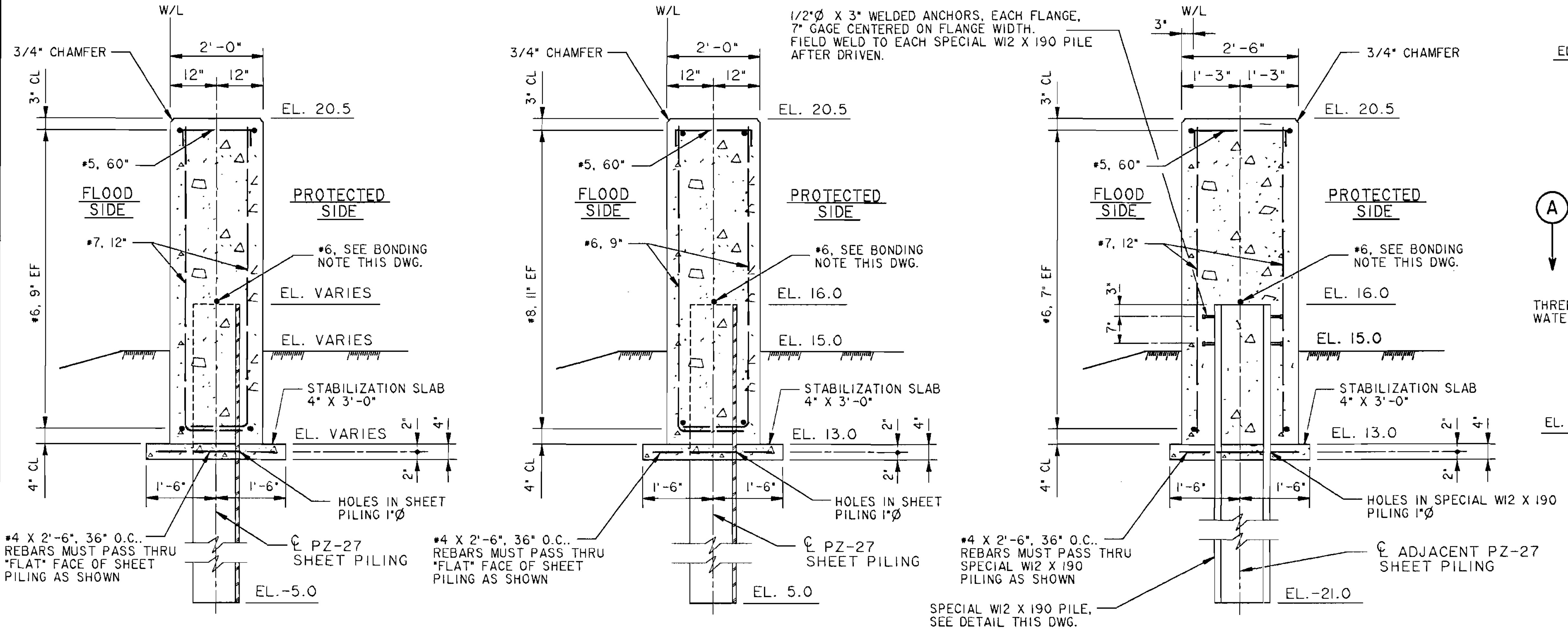
Computer
Aided
Design
Drafting

LAKE PONTCHARTRAIN, LA AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO.16-GENERAL DESIGN
NEW ORLEANS EAST LEVEE
SOUTH POINT TO G.I.W.W.

DESIGN SECTION AND PROFILE

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

DATE: APRIL 1987 FILE NO. H-2-30210



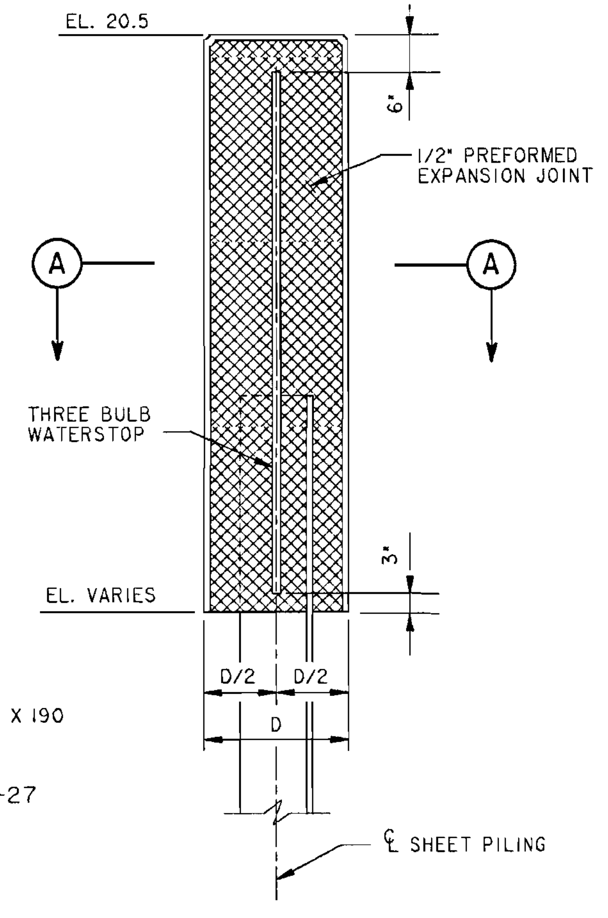
STA. 0+00 W/L TO STA. 0+39 W/L
STA. 0+87 W/L TO STA. 1+26 W/L

STA. 0+48 W/L TO STA. 0+78 W/L

STA. 0+39 W/L TO STA. 0+48 W/L
STA. 0+78 W/L TO STA. 0+87 W/L

TYPICAL I-WALL SECTIONS

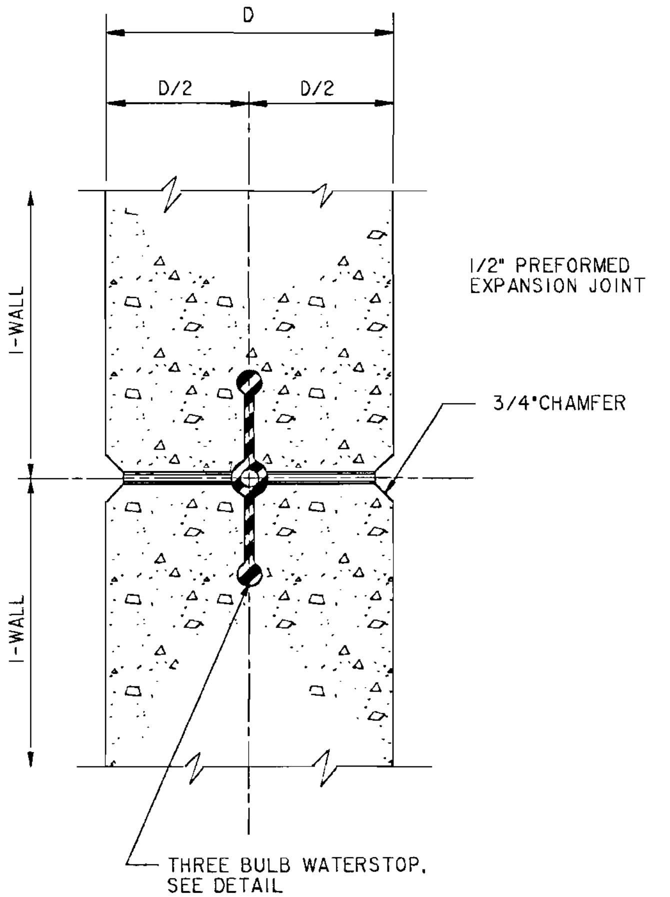
SCALE: 3/4" = 1'-0"



TYPICAL I-WALL JOINT

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

NOTE:
I-WALL MONOLITHS SHALL BE AS INDICATED ON THE PROFILE.
EACH MONOLITH SHALL END AT CENTER OF NEAREST SHEET PILE INTERLOCK.

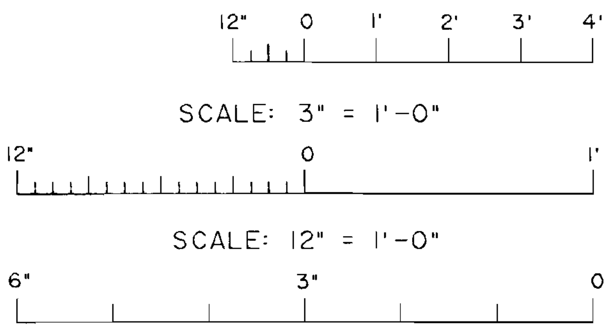


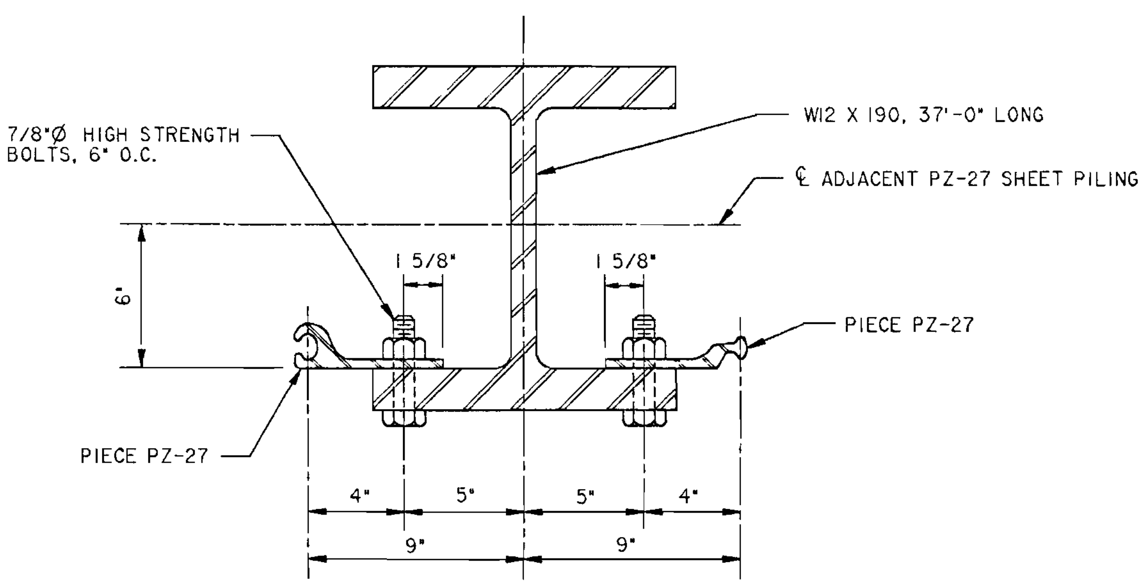
SECTION (A)

SCALE: 3" - 1'-0"

BONDING NOTE:

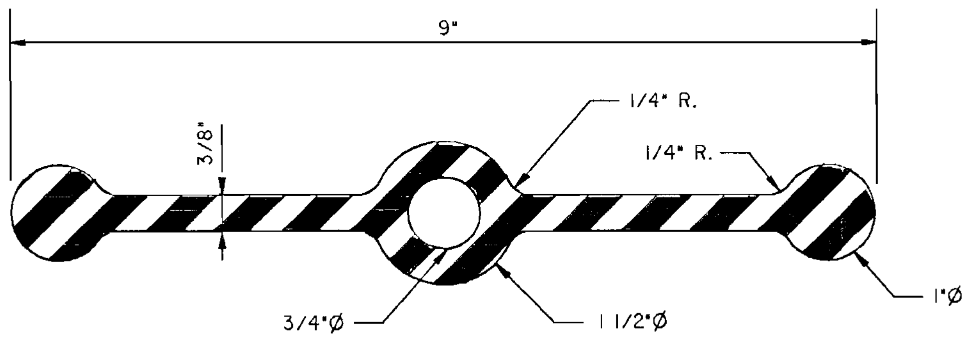
#6 REINFORCING BAR SHALL BE WELDED ACROSS THE TOP OF EACH SHEET PILE. #6 REINFORCING BAR SHALL NOT EXTEND ACROSS THE MONOLITH JOINT. INSTALL FLEXIBLE JUMPER AT ALL MONOLITH JOINTS. JUMPERS SHALL BE INSULATED NO. 1/0 AWG COPPER TYPE. USE INSULATED WITH A MINIMUM OF 95 MILS OF CROSS LINKED POLYETHYLENE IN A 8" DIA. LOOP. JUMPER SHALL BE WELDED AS SPECIFIED TO ADJACENT STEEL SHEET PILES 3" BELOW THE BOTTOM OF THE CONCRETE CAP. WELDED CONNECTIONS SHALL BE COATED WITH SPLICING EPOXY TO OBTAIN MOISTURE PROOF JOINTS.





SPECIAL W12 X 190 PILE DETAIL

SCALE: 3" = 1'-0"



THREE BULB WATERSTOP

SCALE: 12" = 1'-0"

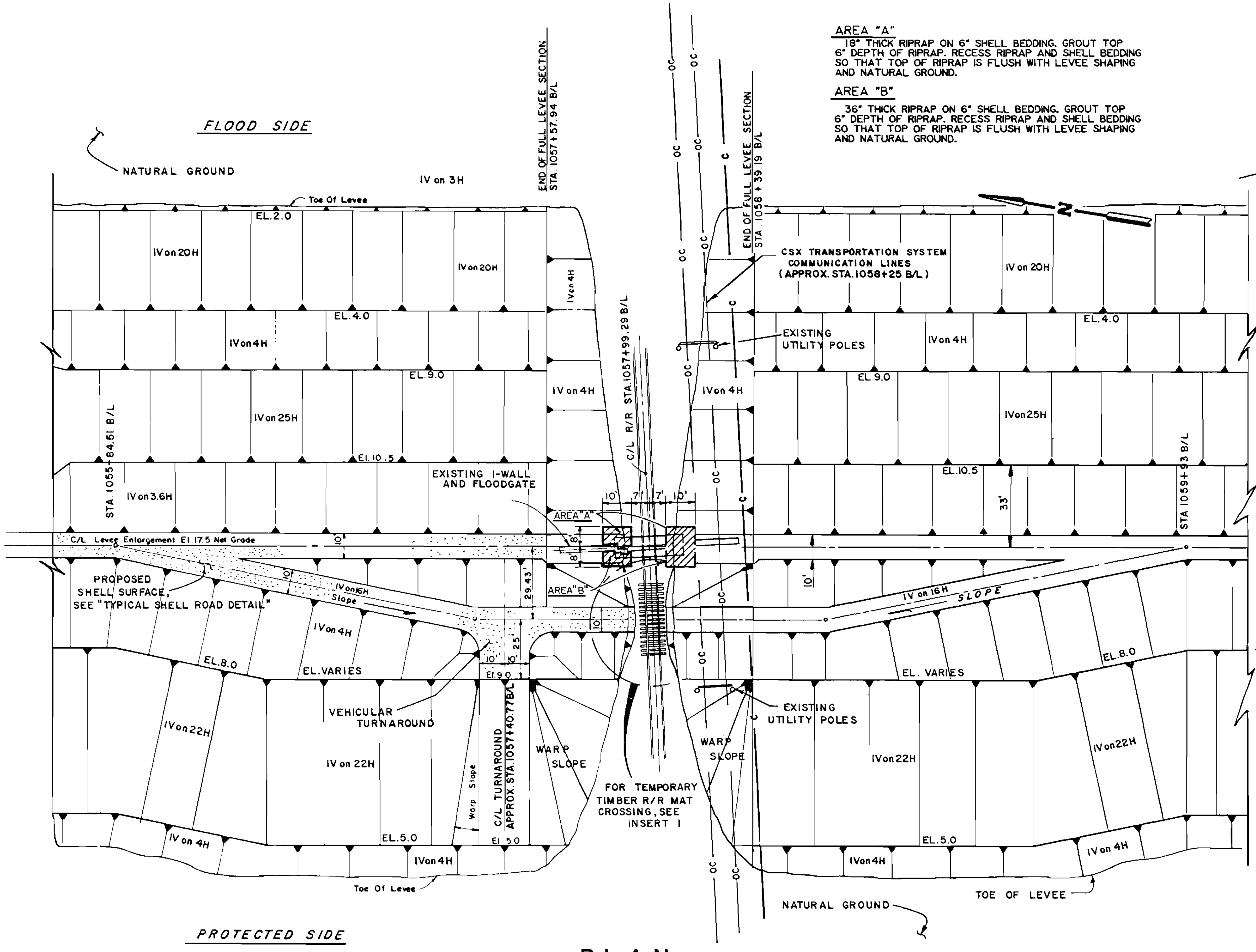
Computer Aided Design Drafting

LAKE PONTCHARTRAIN, LA AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO.16-GENERAL DESIGN
NEW ORLEANS EAST LEVEE
SOUTH POINT TO G.I.W.W.

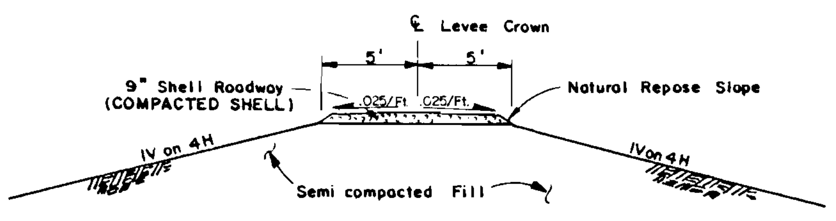
DETAILS

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

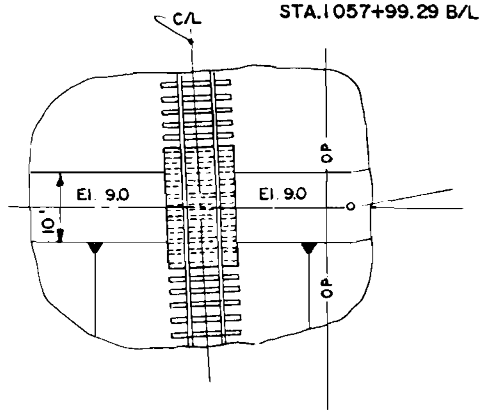
DATE: APRIL 1987 FILE NO. H-2-30210



PLAN
NOT TO SCALE



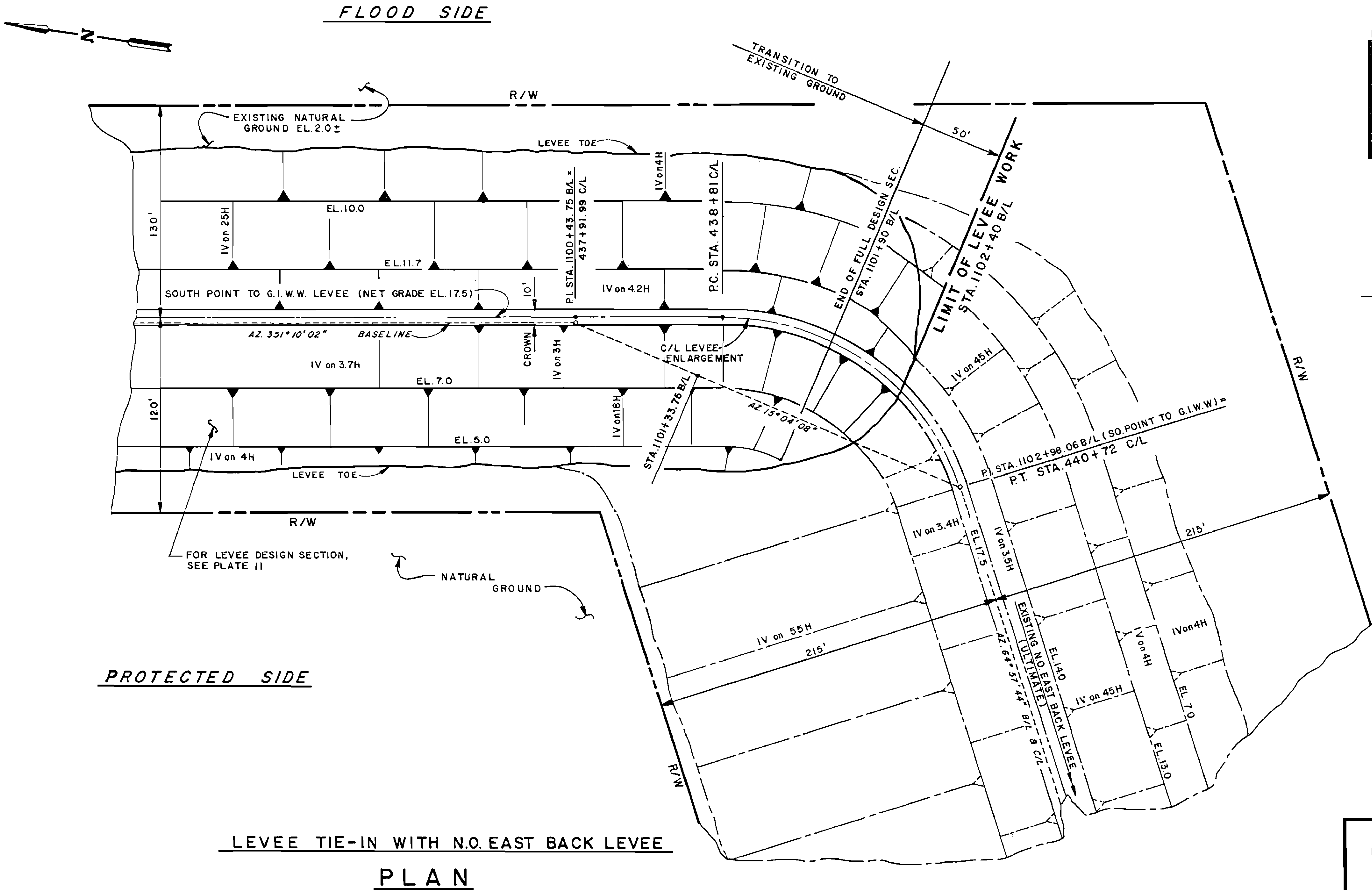
TYPICAL SHELL ROAD DETAIL
APPROX. STA. 939 + 60 B/L TO APPROX. STA. 1057 + 90 B/L
NOT TO SCALE



PLAN
TEMPORARY TIMBER R/R MAT CROSSING

INSERT I
NOT TO SCALE

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO.16 - GENERAL DESIGN
NEW ORLEANS EAST LEVEE
SOUTH POINT TO G.I.W.W.
LEVEE TIE-IN DETAIL AT RAILROAD FLOODGATE
U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
DATE APRIL 1987 FILE NO. H-2-30210



C/L CURVE DATA	
△	= 73°51'16"
D	= 38°42'38"
T	= 111.24'
L	= 190.78'
R	= 148.01'

LEVEE TIE-IN WITH N.O. EAST BACK LEVEE

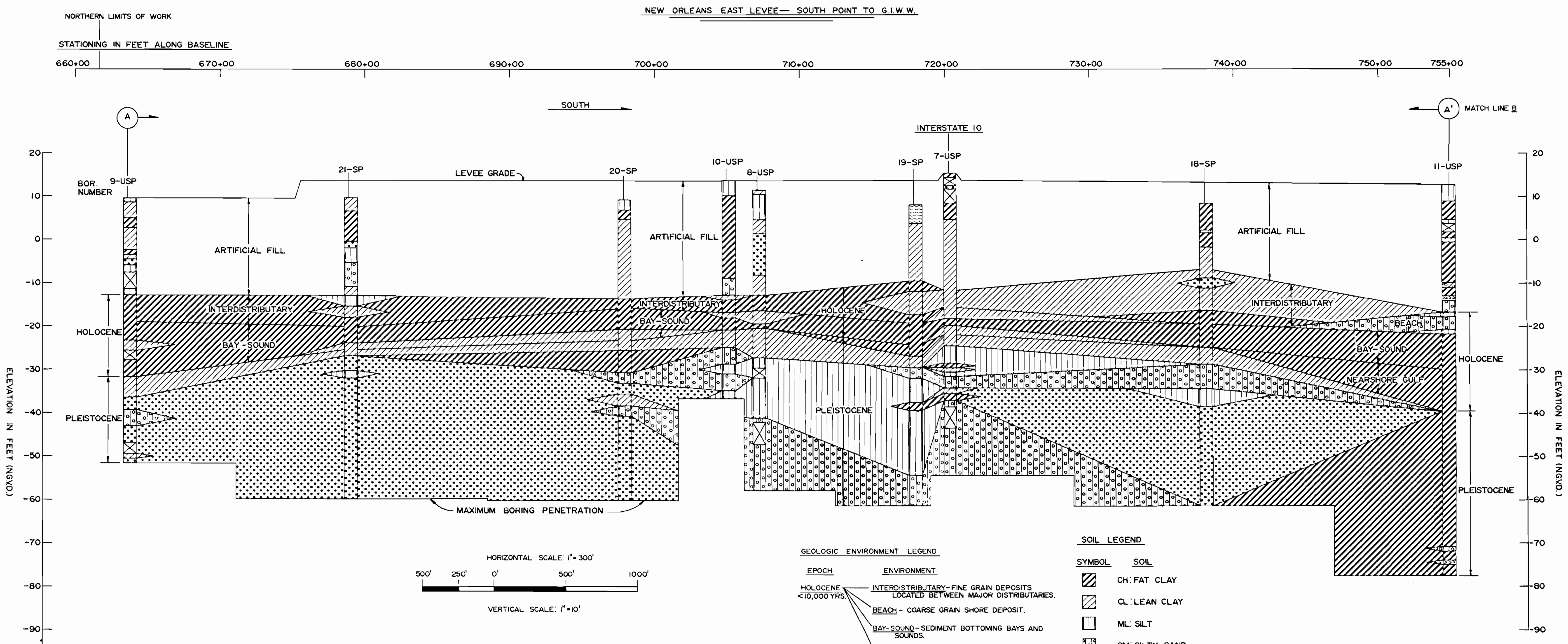
PLAN

SCALE IN FEET
0 60 120 180 240

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 16-GENERAL DESIGN
NEW ORLEANS EAST LEVEE
SOUTH POINT TO G.I.W.W.

LEVEE TIE-IN DETAIL

U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
DATE APRIL 1987 FILE NO. H-2-30210



HORIZONTAL SCALE: 1" = 300'

500' 250' 0' 500' 1000'

VERTICAL SCALE: 1" = 10'

BORINGS 21-SP, 20-SP, 8-USP, 19-SP AND 18-SP COMPLETED PRIOR TO LIFT PLACEMENT.

GEOLOGIC ENVIRONMENT LEGEND

EPOCH	ENVIRONMENT
HOLOCENE <10,000 YRS.	INTERDISTRIBUTARY – FINE GRAIN DEPOSITS LOCATED BETWEEN MAJOR DISTRIBUTARIES.
	BEACH – COARSE GRAIN SHORE DEPOSIT.
	BAY-SOUND – SEDIMENT BOTTOMING BAYS AND SOUNDS.
	NEARSHORE GULF – SEDIMENT BORDERING OPEN OCEAN.
PLEISTOCENE	DELTAIC AND MARINE DEPOSITS OLDER THAN 10,000 YRS. SEDIMENT IS TYPICALLY MORE CONSOLIDATED THAN OVERLYING HOLOCENE DEPOSITS.
ARTIFICIAL FILL	SOILS PLACED BY MECHANICAL MEANS DUE TO PLACEMENT METHODS AND USE OF VARIOUS BORROW SITES. THE SOIL TYPES ARE NOT CORRELATABLE.

SOIL LEGEND

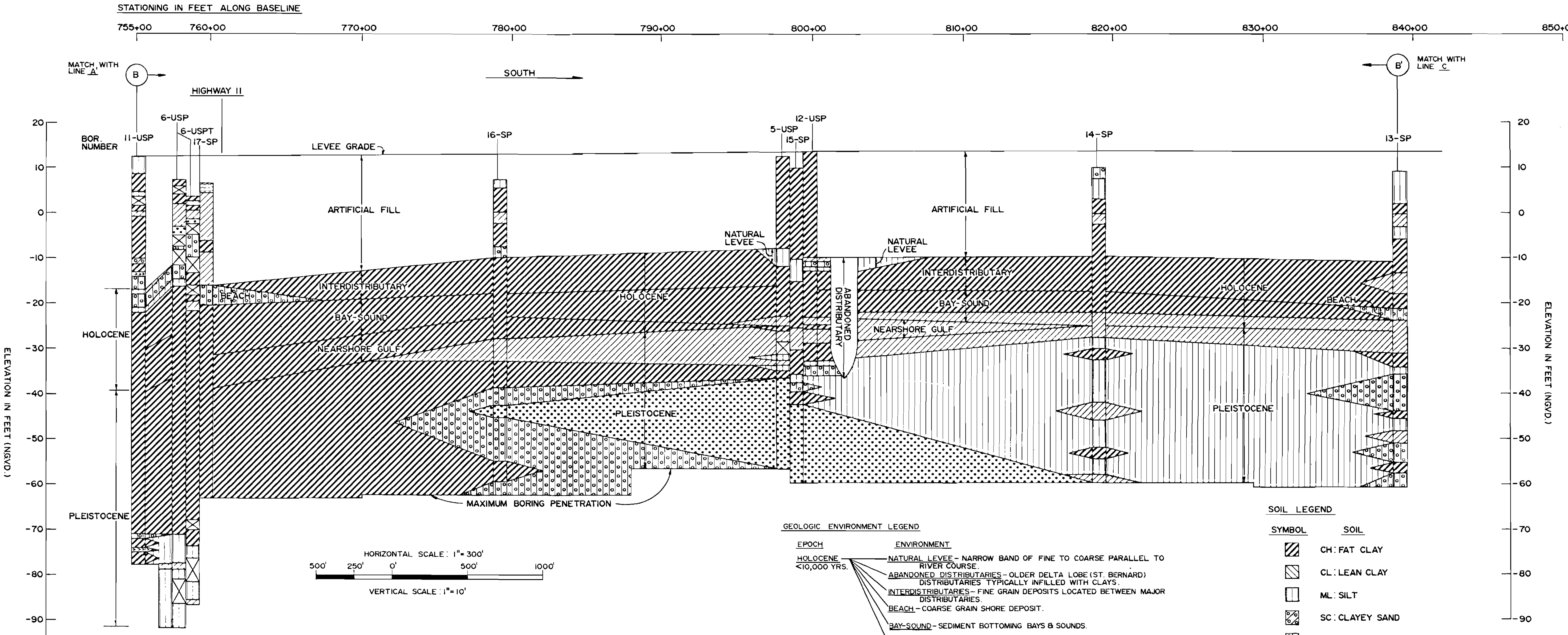
SYMBOL	SOIL
	CH: FAT CLAY
	CL: LEAN CLAY
	ML: SILT
	SM: SILTY SAND
	SP: SAND
	PT: PEAT
	SI: SHELLS
	NO SAMPLE

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 16, GENERAL DESIGN
NEW ORLEANS EAST LEVEE
SOUTH POINT TO GIWW

GEOLOGIC PROFILE

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS, LA.
CORPS OF ENGINEERS
APRIL 1987 FILE NO. H-2-30236

NEW ORLEANS EAST LEVEE- SOUTH POINT TO G.I.W.W.



HORIZONTAL SCALE: 1" = 300'

500' 250' 0' 500' 1000'

VERTICAL SCALE: 1" = 10'

BORINGS 6-USP, 6-USPT, 17-SP, 16-SP, 5-USP, 15-SP, 14-SP AND 13-SP COMPLETED PRIOR TO LIFT PLACEMENT.

GEOLOGIC ENVIRONMENT LEGEND

EPOCH	ENVIRONMENT
HOLOCENE <10,000 YRS.	NATURAL LEVEE - NARROW BAND OF FINE TO COARSE PARALLEL TO RIVER COURSE.
	ABANDONED DISTRIBUTARIES - OLDER DELTA LOBE (ST. BERNARD) DISTRIBUTARIES TYPICALLY INFILLED WITH CLAYS.
	INTERDISTRIBUTARIES - FINE GRAIN DEPOSITS LOCATED BETWEEN MAJOR DISTRIBUTARIES.
	BEACH - COARSE GRAIN SHORE DEPOSIT.
	BAY-SOUND - SEDIMENT BOTTOMING BAYS & SOUNDS.
	NEARSHORE GULF - SEDIMENT BORDERING OPEN OCEAN.
PLEISTOCENE	DELTAIC AND MARINE DEPOSITS OLDER THAN 10,000 YEARS. SEDIMENT IS TYPICALLY MORE CONSOLIDATED THAN OVERLYING HOLOCENE DEPOSITS.
ARTIFICIAL FILL	SOILS PLACED BY MECHANICAL MEANS. DUE TO PLACEMENT METHODS AND USE OF VARIOUS BORROW SITES, THE SOILS ARE NOT CORRELATABLE BETWEEN BORINGS.

SOIL LEGEND

SYMBOL	SOIL
	CH: FAT CLAY
	CL: LEAN CLAY
	ML: SILT
	SC: CLAYEY SAND
	SM: SILTY SAND
	SP: SAND
	PT: PEAT
	SI: SHELLS
	NO SAMPLE

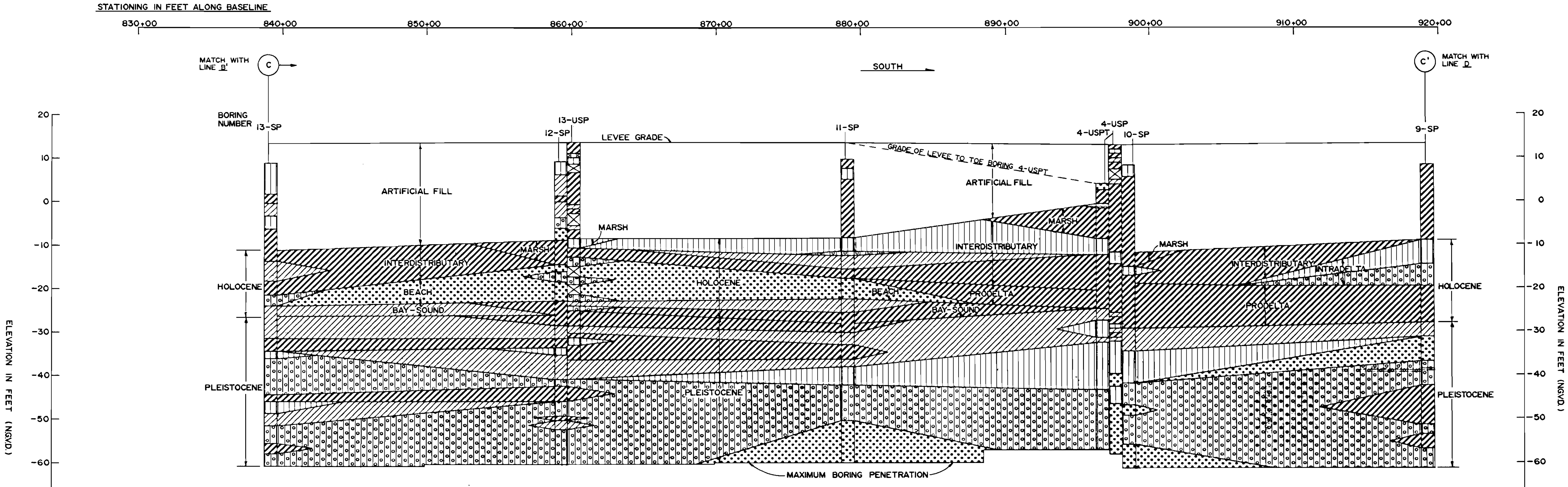
LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 16, GENERAL DESIGN
NEW ORLEANS EAST LEVEE
SOUTH POINT TO GIWW

GEOLOGIC PROFILE

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

APRIL 1987 FILE NO. H-2-30236

NEW ORLEANS EAST LEVEE — SOUTH POINT TO G. I. W. W.



HORIZONTAL SCALE: 1" = 300'

500' 250' 0' 500' 1000'

VERTICAL SCALE: 1" = 10'

BORINGS 13-SP, 12-SP, 11-SP, 10-SP, 4-USPT, 4-USP AND 9-SP COMPLETED PRIOR TO LIFT PLACEMENT.

GEOLOGIC ENVIRONMENT LEGEND

EPOCH	ENVIRONMENT
HOLOCENE <10,000 YEARS	MARSH - HIGHLY ORGANIC FINE SOILS, EXHIBITING HIGH MOISTURE CONTENTS.
	INTERDISTRIBUTARY - FINE GRAIN DEPOSITS LOCATED BETWEEN MAJOR DISTRIBUTARIES.
	BEACH - COARSE GRAIN SHORE DEPOSIT
	PRODELTA - HOMOGENEOUS FAT CLAYS IN FORMER OR PRESENT OFFSHORE AREAS.
	BAY-SOUND - SEDIMENT BOTTOMING BAYS AND SOUNDS.
	INTRADELTA - RELATIVELY COARSE PORTION OF SUBAQUEOUS DELTA.
PLEISTOCENE	DELTAIC AND MARINE DEPOSITS OLDER THAN 10,000 YEARS. SEDIMENT IS TYPICALLY MORE CONSOLIDATED THAN OVERLYING HOLOCENE DEPOSITS.
ARTIFICIAL FILL	SOILS PLACED BY MECHANICAL MEANS. DUE TO PLACEMENT METHODS AND USE OF VARIOUS BORROW SITES, THE SOILS ARE NOT CORRELATABLE BETWEEN BORINGS.

SOIL LEGEND

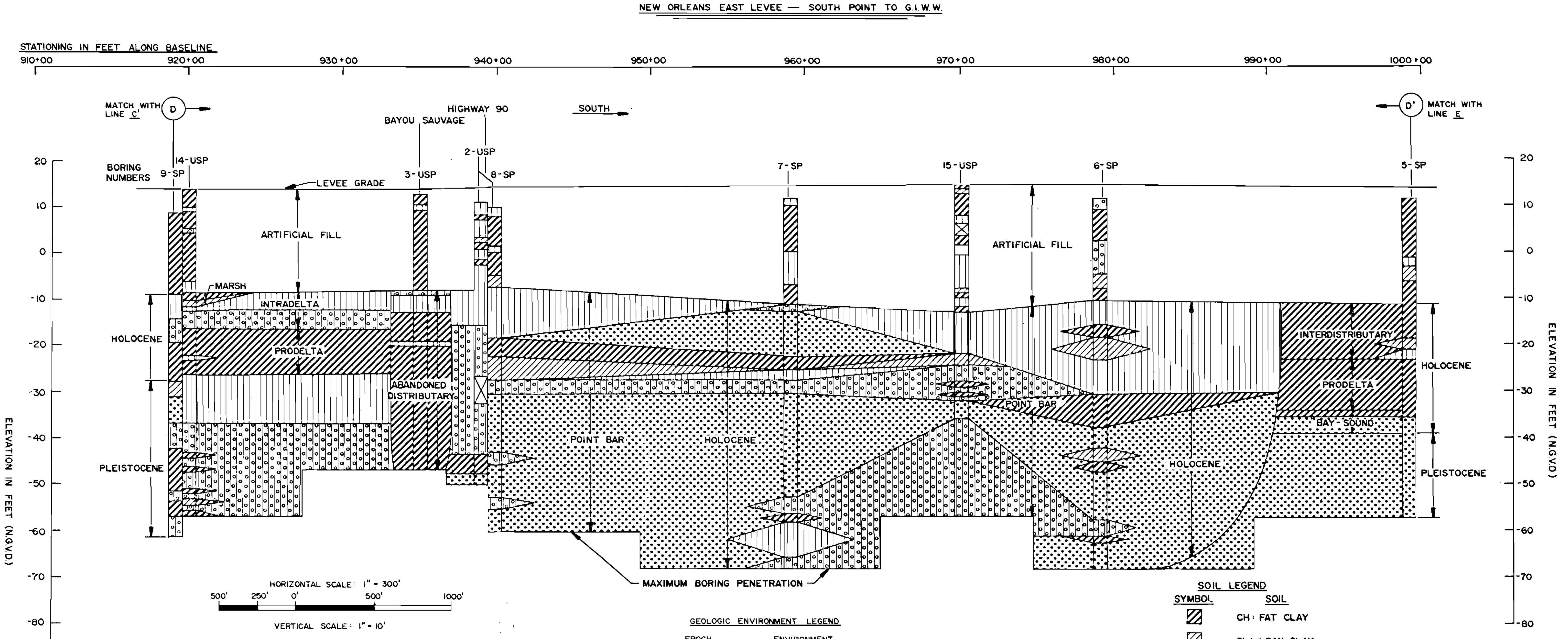
SYMBOL	SOIL
	CH: FAT CLAY
	CL: LEAN CLAY
	ML: SILT
	SC: CLAYEY SAND
	SM: SILTY SAND
	SP: SAND
	PT: PEAT
	NO SAMPLE

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 16, GENERAL DESIGN
NEW ORLEANS EAST LEVEE
SOUTH POINT TO GIWW

GEOLOGIC PROFILE

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

APRIL 1987 FILE NO. H-2-30236



BORINGS 9-SP, 3-USP, 2-USP, 8-SP, 7-SP, 6-SP AND 5-SP DRILLED PRIOR TO LIFT PLACEMENT

GEOLOGIC ENVIRONMENT LEGEND

EPOCH	ENVIRONMENT
HOLOCENE <10,000 YEARS	MARSH — HIGHLY ORGANIC FINE SOILS. EXHIBIT HIGH MOISTURE CONTENTS.
	ABANDONED DISTRIBUTARY — OLDER DELTA LOBE (ST. BERNARD) DISTRIBUTARIES, TYPICALLY INFILLED WITH CLAY.
	POINT BAR — TYPICALLY COARSE GRAIN ARCUATE DEPOSITS ON CONVEX SIDE OF RIVER BEND.
	INTERDISTRIBUTARY — FINE GRAIN DEPOSITS LOCATED BETWEEN MAJOR DISTRIBUTARIES.
	INTRADELTA — RELATIVELY COARSE PORTION OF SUBAQUEOUS DELTA.
	BAY - SOUND — SEDIMENT BOTTOMING BAYS AND SOUNDS.
	PRODELTA — HOMOGENEOUS FAT CLAYS IN FORMER OR PRESENT OFFSHORE AREAS
PLEISTOCENE	DELTAIC AND MARINE DEPOSITS OLDER THAN 10,000 YEARS. SEDIMENT IS TYPICALLY MORE CONSOLIDATED THAN OVERLYING HOLOCENE DEPOSITS.
ARTIFICIAL FILL	SOILS PLACED BY MECHANICAL MEANS. DUE TO PLACEMENT METHODS AND USE OF VARIOUS BORROW SITES THE SOILS ARE NOT CORRELATABLE BETWEEN BORING.

SOIL LEGEND

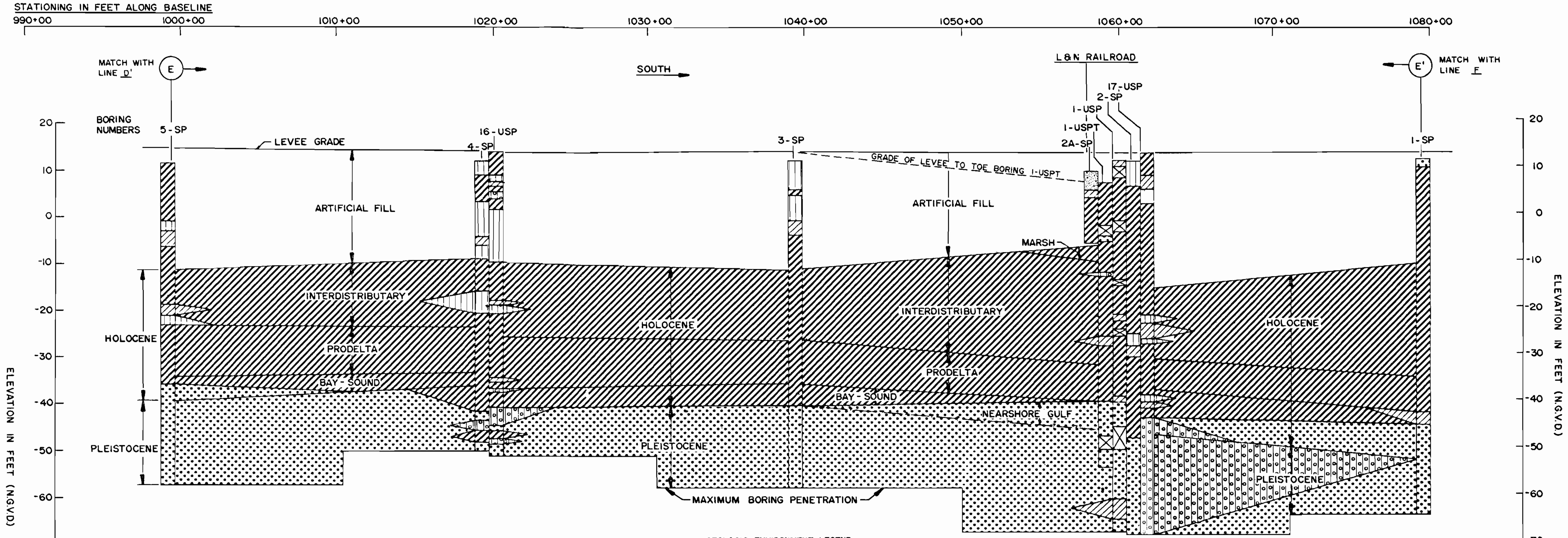
SYMBOL	SOIL
	CH: FAT CLAY
	CL: LEAN CLAY
	ML: SILT
	SM: SILTY SAND
	SP: SAND
	NO SAMPLE

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 16, GENERAL DESIGN
NEW ORLEANS EAST LEVEE
SOUTH POINT TO GIWW

GEOLOGIC PROFILE

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS, LA.
CORPS OF ENGINEERS
APRIL 1987 FILE NO. H-2-30236

NEW ORLEANS EAST LEVEE — SOUTH POINT TO G.I.W.W.



HORIZONTAL SCALE: 1" = 300'

500' 250' 0' 500' 1000'

VERTICAL SCALE: 1" = 10'

BORINGS 5-SP, 4-SP, 3-SP, 2A-SP, 1-USPT, 1-USP, 2-SP, AND 1-SP DRILLED PRIOR TO LIFT PLACEMENT.

GEOLOGIC ENVIRONMENT LEGEND

EPOCH	ENVIRONMENT
HOLOCENE <10,000 YEARS	MARSH — HIGHLY ORGANIC FINE SOILS. EXHIBIT HIGH MOISTURE CONTENTS.
	INTERDISTRIBUTARY — FINE GRAIN DEPOSITS LOCATED BETWEEN MAJOR DISTRIBUTARIES.
	PRODELTA — HOMOGENEOUS FAT CLAYS IN FORMER OR PRESENT OFFSHORE AREAS.
	BAY-SOUND — SEDIMENT BOTTOMING BAYS AND SOUNDS.
	NEARSHORE GULF — TYPICALLY FOUND NEAR OPEN OCEAN. SEAWARD OF BARRIER BEACHES.
PLEISTOCENE	DELTAIC AND MARINE DEPOSITS OLDER THAN 10,000 YEARS. SEDIMENT IS TYPICALLY MORE CONSOLIDATED THAN OVERLYING HOLOCENE DEPOSITS.
ARTIFICIAL FILL	SOILS PLACED BY MECHANICAL MEANS. DUE TO PLACEMENT METHODS AND USE OF VARIOUS BORROW SITES, THE SOILS ARE NOT CORRELATABLE BETWEEN BORINGS.

SOIL LEGEND

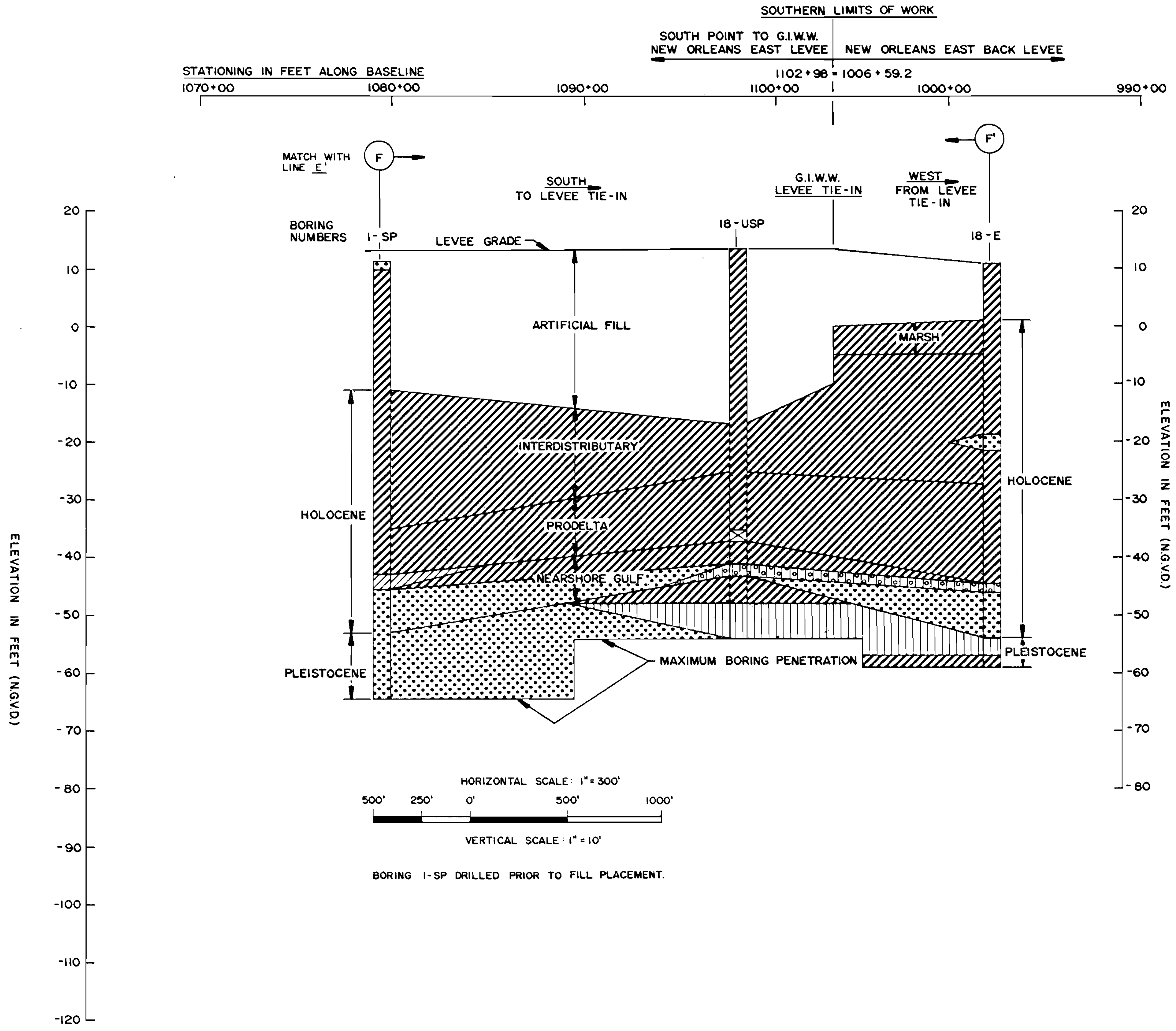
SYMBOL	SOIL
	CH: FAT CLAY
	CL: LEAN CLAY
	ML: SILT
	SM: SILTY SAND
	SP: SAND
	GP: GRAVEL
	NO SAMPLE

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 16, GENERAL DESIGN
NEW ORLEANS EAST LEVEE
SOUTH POINT TO GIWW

GEOLOGIC PROFILE

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

APRIL 1987 FILE NO H-2-30236



NEW ORLEANS EAST LEVEE — SOUTH POINT TO G.I.W.W.

GEOLOGIC ENVIRONMENT LEGEND

EPOCH	ENVIRONMENT
HOLOCENE <10,000 YEARS	MARSH — HIGHLY ORGANIC SOILS. EXHIBIT HIGH MOISTURE CONTENTS.
	INTERDISTRIBUTARY — FINE GRADE DEPOSITS LOCATED BETWEEN MAJOR DISTRIBUTARIES.
	PRODELTA — HOMOGENEOUS FAT CLAYS IN FORMER OR PRESENT OFFSHORE AREAS.
	NEARSHORE GULF — TYPICALLY FOUND NEAR OPEN OCEAN, SEAWARD OF BARRIER BEACHES, UPPER FINE GRAIN PORTION OF NEARSHORE GULF IS VERY SIMILAR AND MAY BE BAY-SOUND.
PLEISTOCENE	DELTAIC AND MARINE DEPOSITS OLDER THAN 10,000 YEARS. SEDIMENT IS TYPICALLY MORE CONSOLIDATED THAN OVERLYING HOLOCENE.
ARTIFICIAL FILL	SOILS PLACED BY MECHANICAL MEANS. DUE TO PLACEMENT METHODS AND USE OF VARIOUS BORROW SITES, THE SOILS ARE NOT CORRELATABLE BETWEEN BORINGS.

SOIL LEGEND

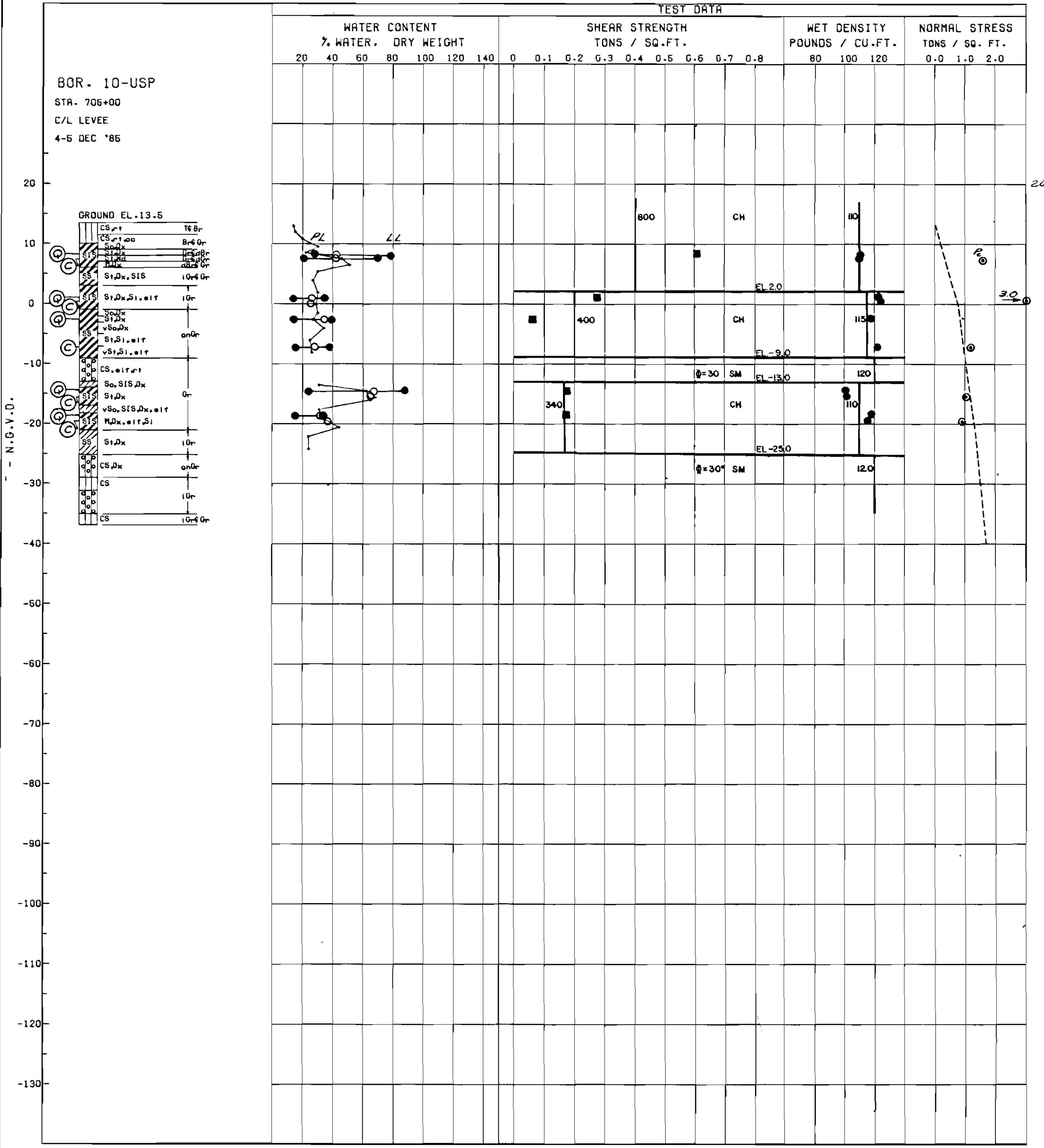
SYMBOL	SOIL
	CH: FAT CLAY
	CL: LEAN CLAY
	ML: SILT
	SM: SILTY SAND
	SP: SAND
	NO SAMPLE

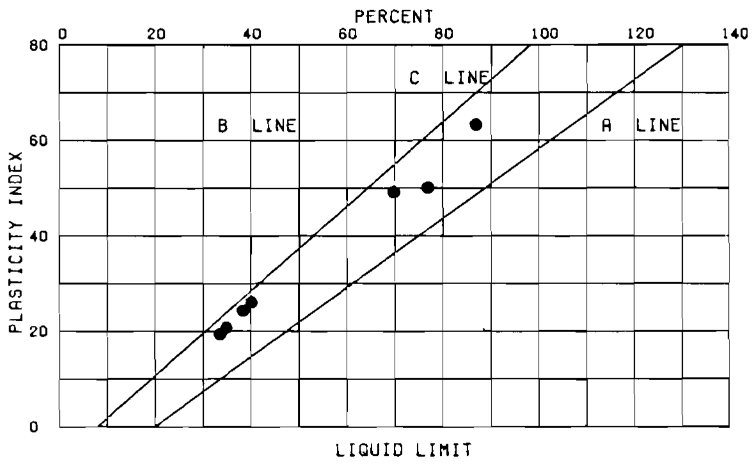
LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 16, GENERAL DESIGN
NEW ORLEANS EAST LEVEE
SOUTH POINT TO GIWW

GEOLOGIC PROFILE

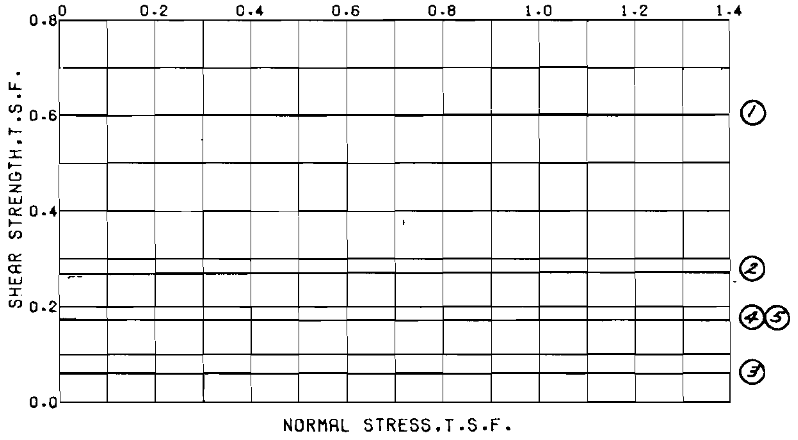
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS, LA.
CORPS OF ENGINEERS

APRIL 1987 FILE NO. H-2-30236





PLASTICITY CHART



SHEAR STRENGTH DATA

ENVELOPE		TYPE	STRENGTH		CLASS
NO.	EL.		Φ	C - TSF	
1.	8.2	Q	0	0.60	CH
2.	1.2	Q	0	0.27	CL
3.	-2.7	Q	0	0.06	CL
4.	-14.8	Q	0	0.17	CH
5.	-18.8	Q	0	0.17	CL

NOTE:
THE C VALUE ON THE SHEAR STRENGTH LINE IS EXPRESSED IN POUNDS/SQUARE FOOT.

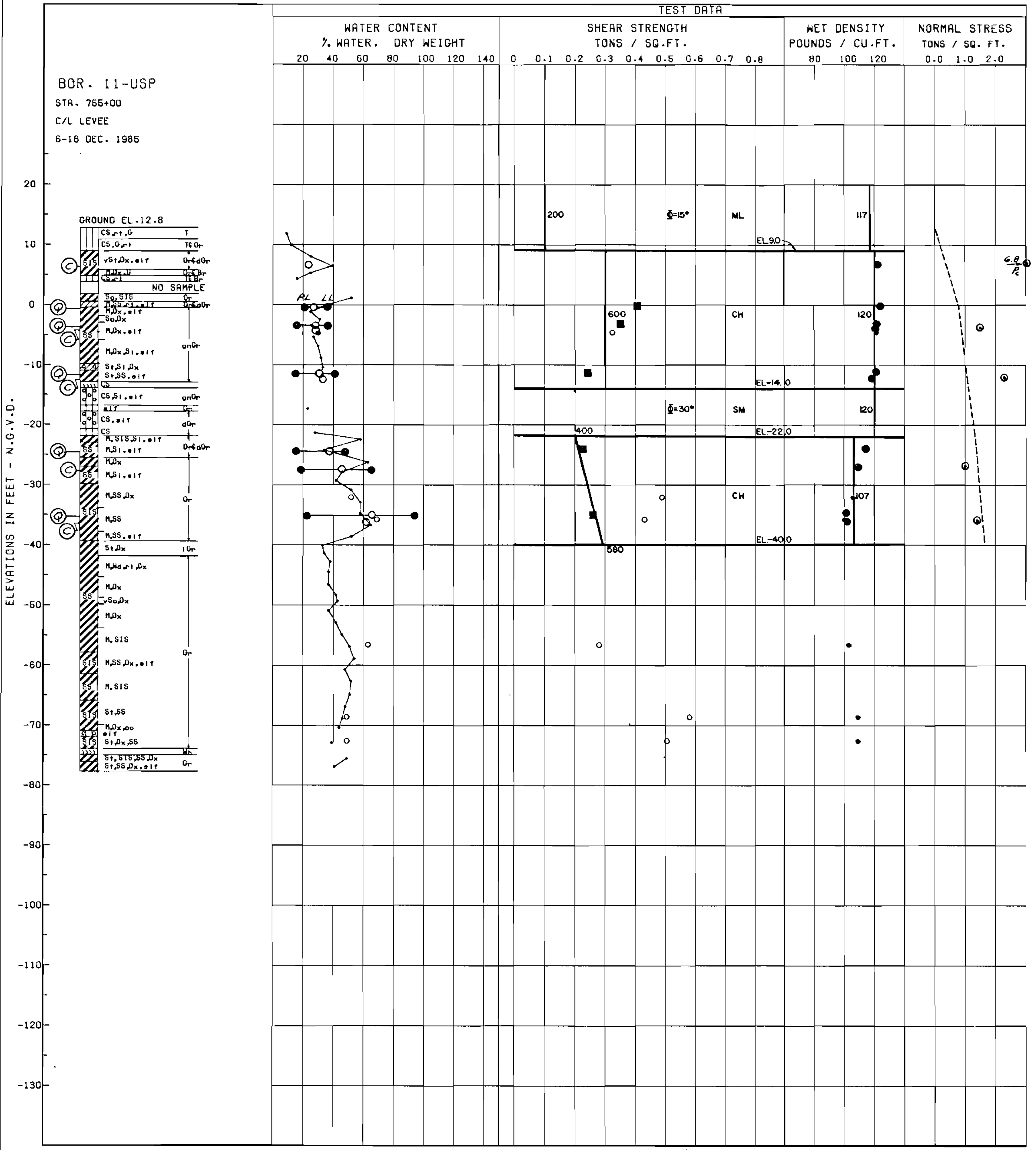
○ - (UC) UNCONFINED COMPRESSION TEST
■ - (Q) UNCONSOLIDATED - UNDRAINED SHEAR TEST
▲ - (R) CONSOLIDATED - UNDRAINED SHEAR TEST
⊡ - (S) CONSOLIDATED - DRAINED SHEAR TEST
BORINGS WERE TAKEN WITH A 5 INCH DIAMETER STEEL TUBE PISTON TYPE SAMPLER
FOR SOIL BORING LEGEND SEE PLATE A
FOR LOCATION OF BORING SEE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

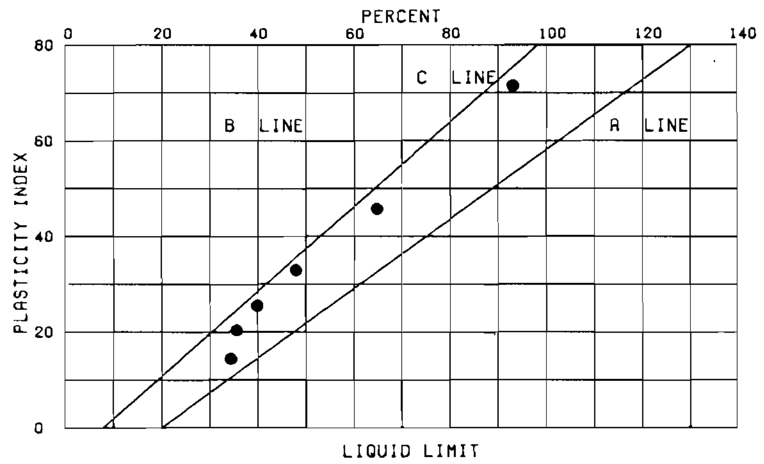
LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 16, GENERAL DESIGN
NEW ORLEANS EAST LEVEE
SOUTH POINT TO GIWW

UNDISTURBED BORING DATA 10-USP

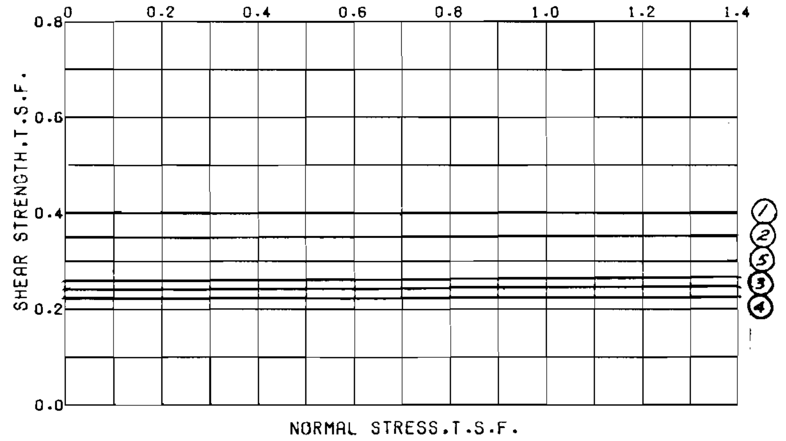
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS, LA.
CORPS OF ENGINEERS

APRIL 1987 FILE NO. H-2-30236





PLASTICITY CHART



SHEAR STRENGTH DATA

ENVELOPE		TYPE	STRENGTH		CLASS
NO.	EL.		Φ	C - TSF	
1.	-0.5	Q	0	0.40	CL
2.	-3.5	Q	0	0.35	CL
3.	-11.5	Q	0	0.24	CL
4.	-24.3	Q	0	0.22	CH
5.	-35.1	Q	0	0.26	CH

NOTE:
THE C VALUE ON THE SHEAR STRENGTH LINE IS EXPRESSED IN POUNDS/SQUARE FOOT.

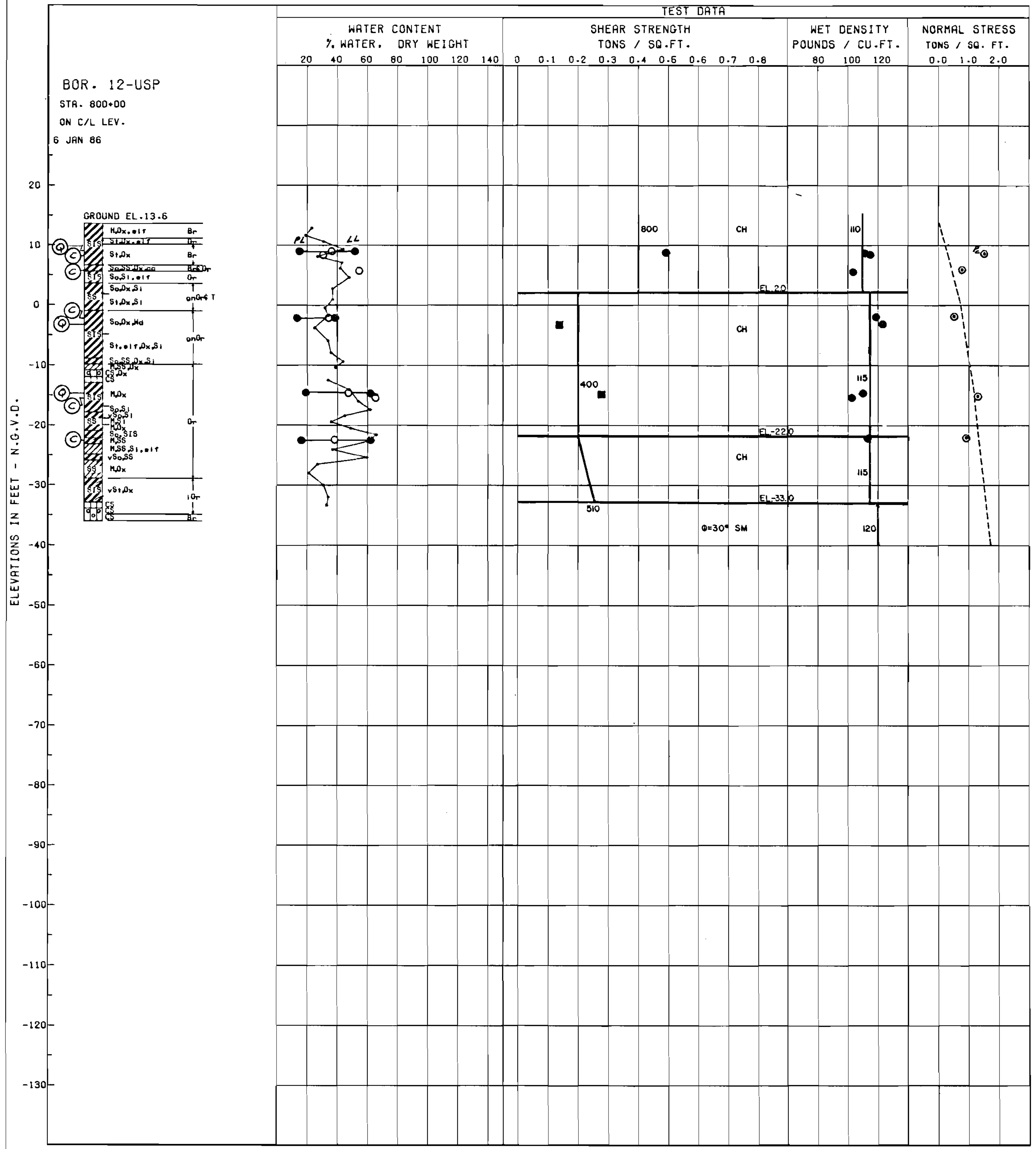
○ - (UC) UNCONFINED COMPRESSION TEST
■ - (Q) UNCONSOLIDATED - UNDRAINED SHEAR TEST
▲ - (R) CONSOLIDATED - UNDRAINED SHEAR TEST
⊡ - (S) CONSOLIDATED - DRAINED SHEAR TEST

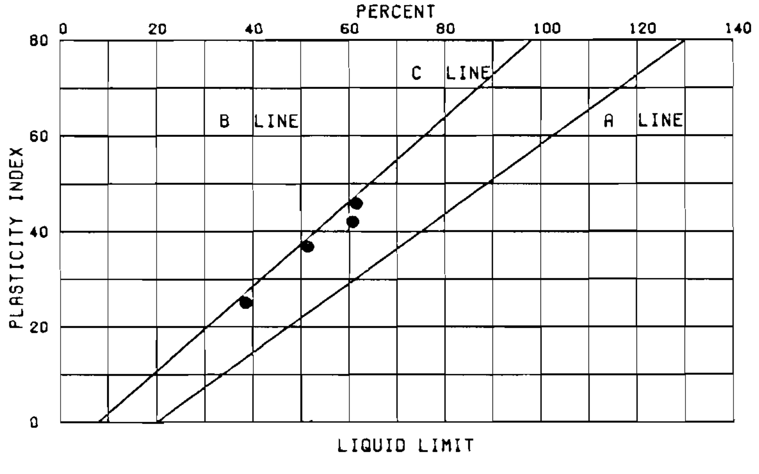
BORINGS WERE TAKEN WITH A 5 INCH DIAMETER STEEL TUBE PISTON TYPE SAMPLER
FOR SOIL BORING LEGEND SEE PLATE A
FOR LOCATION OF BORING SEE PLATE

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 16, GENERAL DESIGN
NEW ORLEANS EAST LEVEE
SOUTH POINT TO GIWW

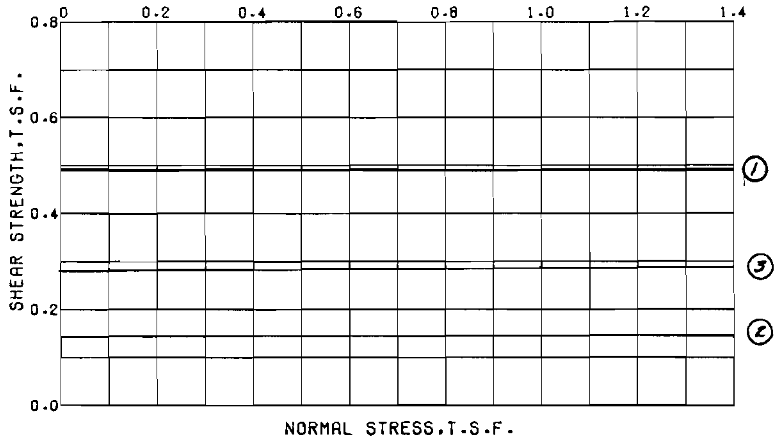
UNDISTURBED BORING DATA 11-USP

U.S ARMY ENGINEER DISTRICT, NEW ORLEANS, L.A.
CORPS OF ENGINEERS
APRIL 1987 FILE NO. H-2-30236





PLASTICITY CHART



SHEAR STRENGTH DATA

ENVELOPE		TYPE	STRENGTH		CLASS
NO.	EL.		Φ	C - TSF	
1.	9.0	Q	0	0.49	CH
2.	-22	Q	0	0.14	CL
3.	-14.7	Q	0	0.28	CH

NOTE:
THE C VALUE. ON THE SHEAR STRENGTH LINE IS EXPRESSED IN POUNDS/SQUARE FOOT.

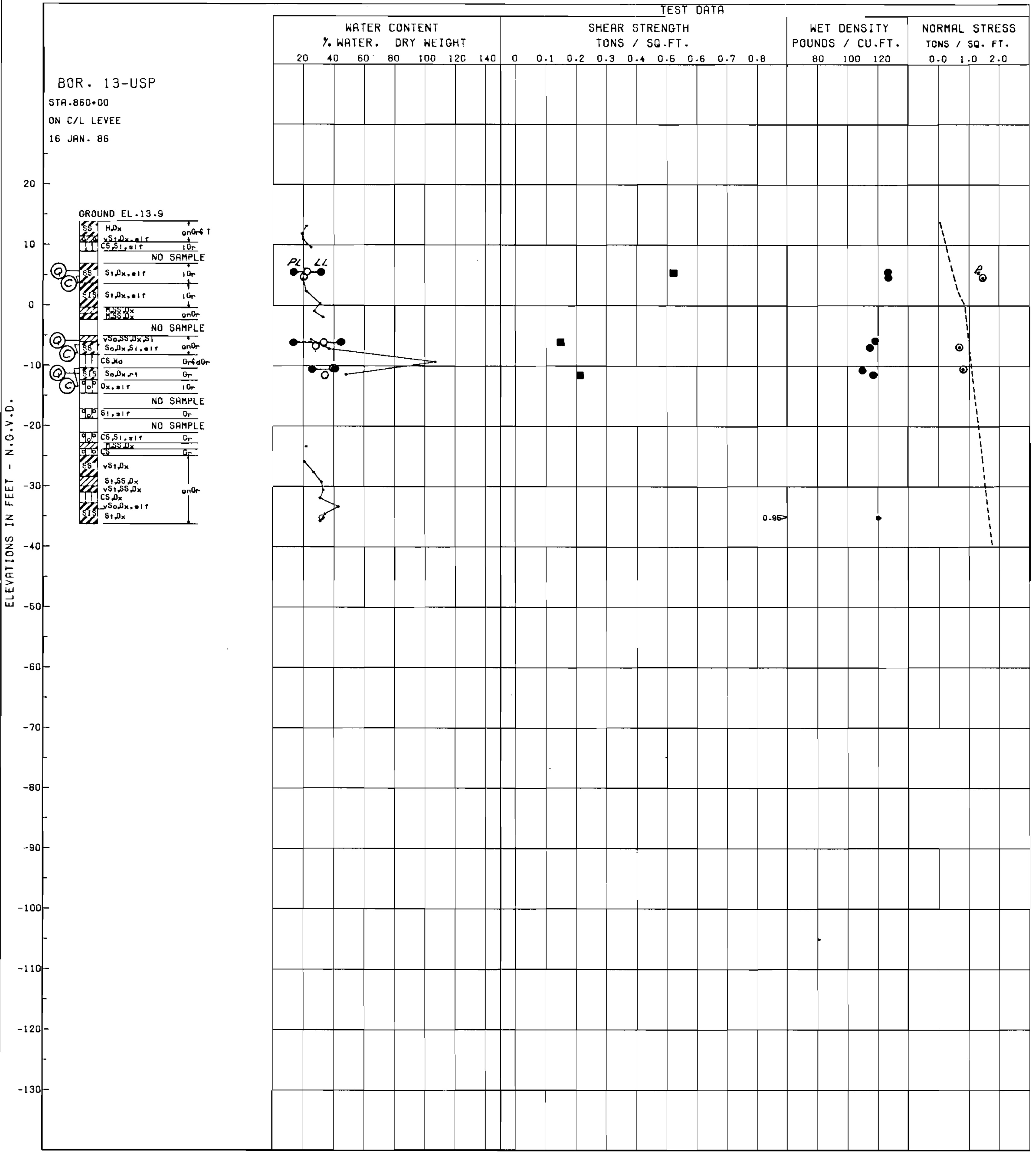
○ - (UC) UNCONFINED COMPRESSION TEST
■ - (Q) UNCONSOLIDATED - UNDRAINED SHEAR TEST
▲ - (R) CONSOLIDATED - UNDRAINED SHEAR TEST
◻ - (S) CONSOLIDATED - DRAINED SHEAR TEST
BORINGS WERE TAKEN WITH A 5 INCH DIAMETER STEEL TUBE PISTON TYPE SAMPLER
FOR SOIL BORING LEGEND SEE PLATE A
FOR LOCATION OF BORING SEE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

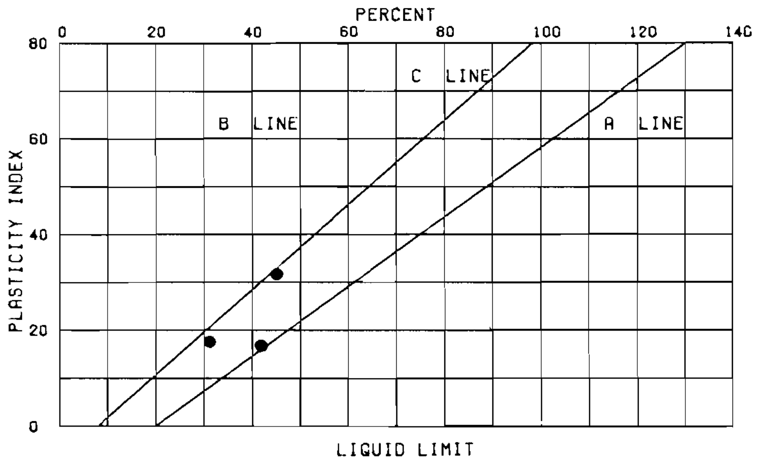
LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 16, GENERAL DESIGN
NEW ORLEANS EAST LEVEE
SOUTH POINT TO GIWW

UNDISTURBED BORING DATA 12-USP

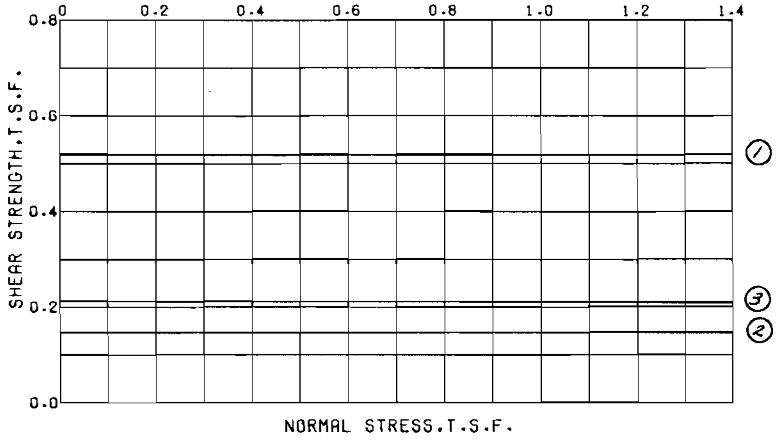
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS, LA.
CORPS OF ENGINEERS

APRIL 1987 FILE NO H-2-30236





PLASTICITY CHART



SHEAR STRENGTH DATA

ENVELOPE NO.	ENVELOPE EL.	TYPE	STRENGTH Φ	STRENGTH C - TSF	CLASS
1.	5.6	Q	0	0.52	CL
2.	-6.0	Q	0	0.15	CL
3.	-11.3	Q	0	0.21	CL

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

BORINGS WERE TAKEN WITH A 5 INCH DIAMETER STEEL TUBE PISTON TYPE SAMPLER

FOR SOIL BORING LEGEND SEE PLATE A

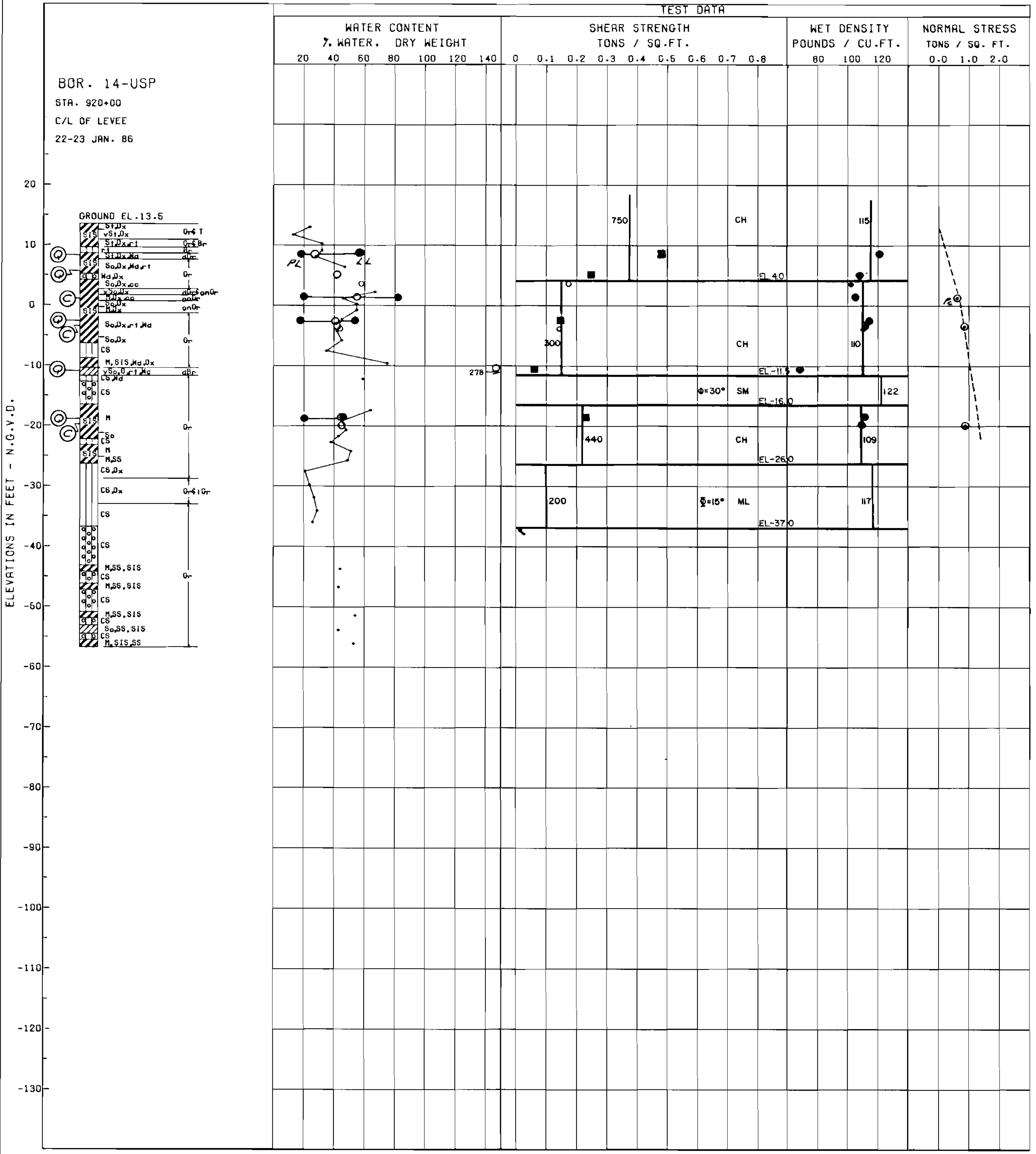
FOR LOCATION OF BORING SEE PLATE

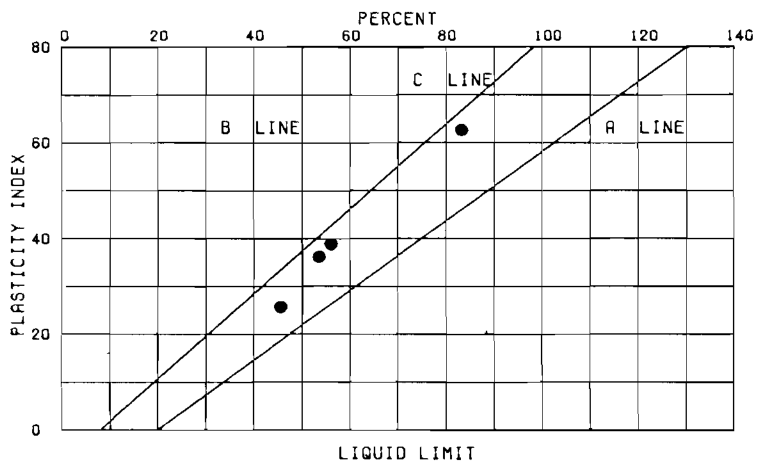
LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 16, GENERAL DESIGN
NEW ORLEANS EAST LEVEE
SOUTH POINT TO GIWW

UNDISTURBED BORING DATA 13-USP

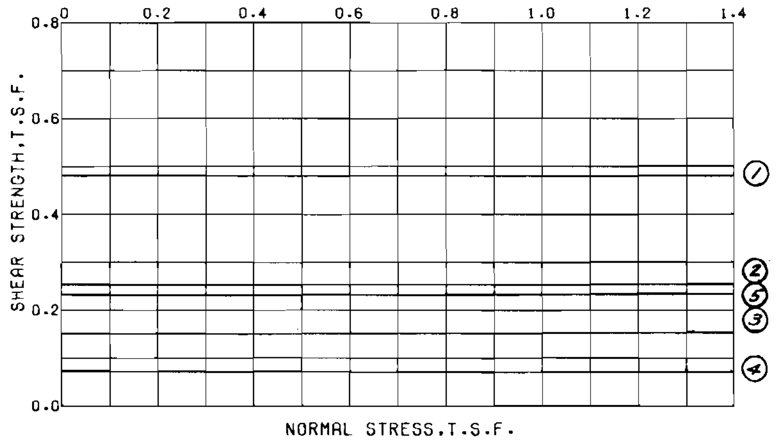
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS, LA.
CORPS OF ENGINEERS

APRIL 1987 FILE NO. H-2-30236





PLASTICITY CHART



SHEAR STRENGTH DATA

ENVELOPE		TYPE	STRENGTH		CLASS
NO.	EL.		Φ	C - TSF	
1.	8.7	Q	0	0.48	CH
2.	5.0	Q	0	0.25	CH
3.	-2.3	Q	0	0.15	CH
4.	-10.8	Q	0	0.07	PT
5.	-18.8	Q	0	0.23	CL

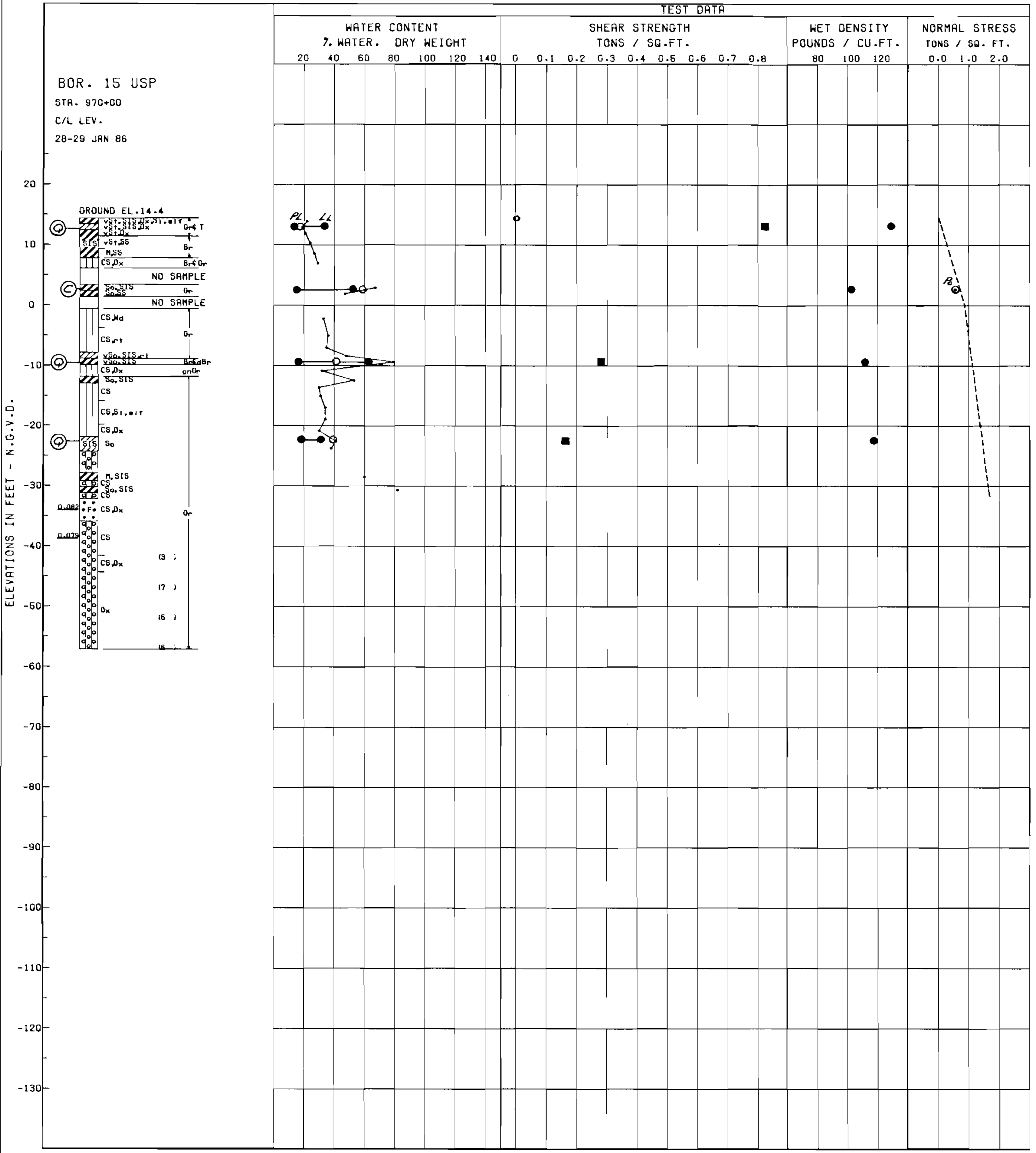
NOTE:
THE C VALUE ON THE SHEAR STRENGTH LINE IS EXPRESSED IN POUNDS/SQUARE FOOT.

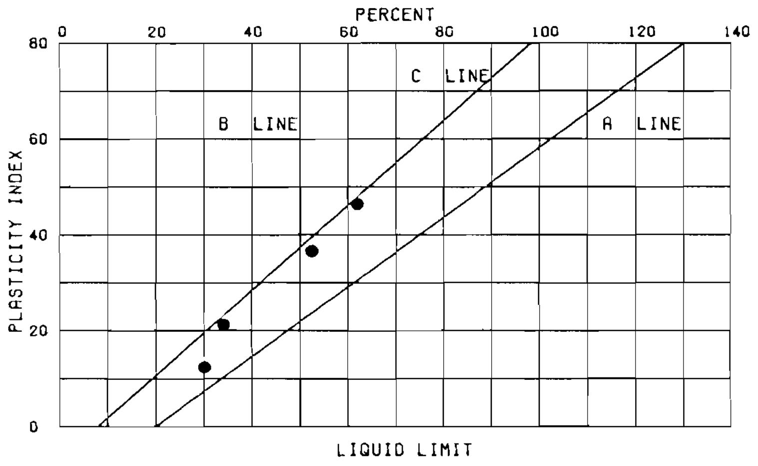
○ - (UC) UNCONFINED COMPRESSION TEST
■ - (Q) UNCONSOLIDATED - UNDRAINED SHEAR TEST
▲ - (R) CONSOLIDATED - UNDRAINED SHEAR TEST
◘ - (S) CONSOLIDATED - DRAINED SHEAR TEST
BORINGS WERE TAKEN WITH A 5 INCH DIAMETER STEEL TUBE PISTON TYPE SAMPLER
FOR SOIL BORING LEGEND SEE PLATE A
FOR LOCATION OF BORING SEE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

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 16, GENERAL DESIGN
NEW ORLEANS EAST LEVEE
SOUTH POINT TO GIWW

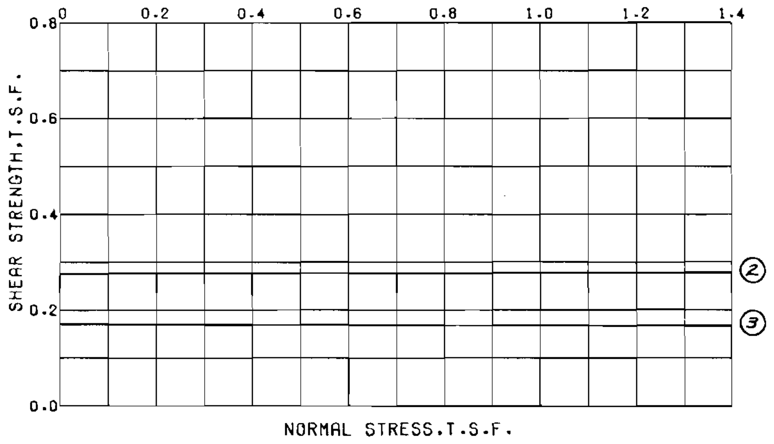
UNDISTURBED BORING DATA 14-USP

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS, LA.
CORPS OF ENGINEERS
APRIL 1987 FILE NO. H-2-30236





PLASTICITY CHART



SHEAR STRENGTH DATA

ENVELOPE		TYPE	STRENGTH		CLASS
NO.	EL.		Φ	C - TSF	
1.	12.4	Q	0	0.82	CL
2.	-9.9	Q	0	0.28	CH
3	-22.8	Q	0	0.17	CL

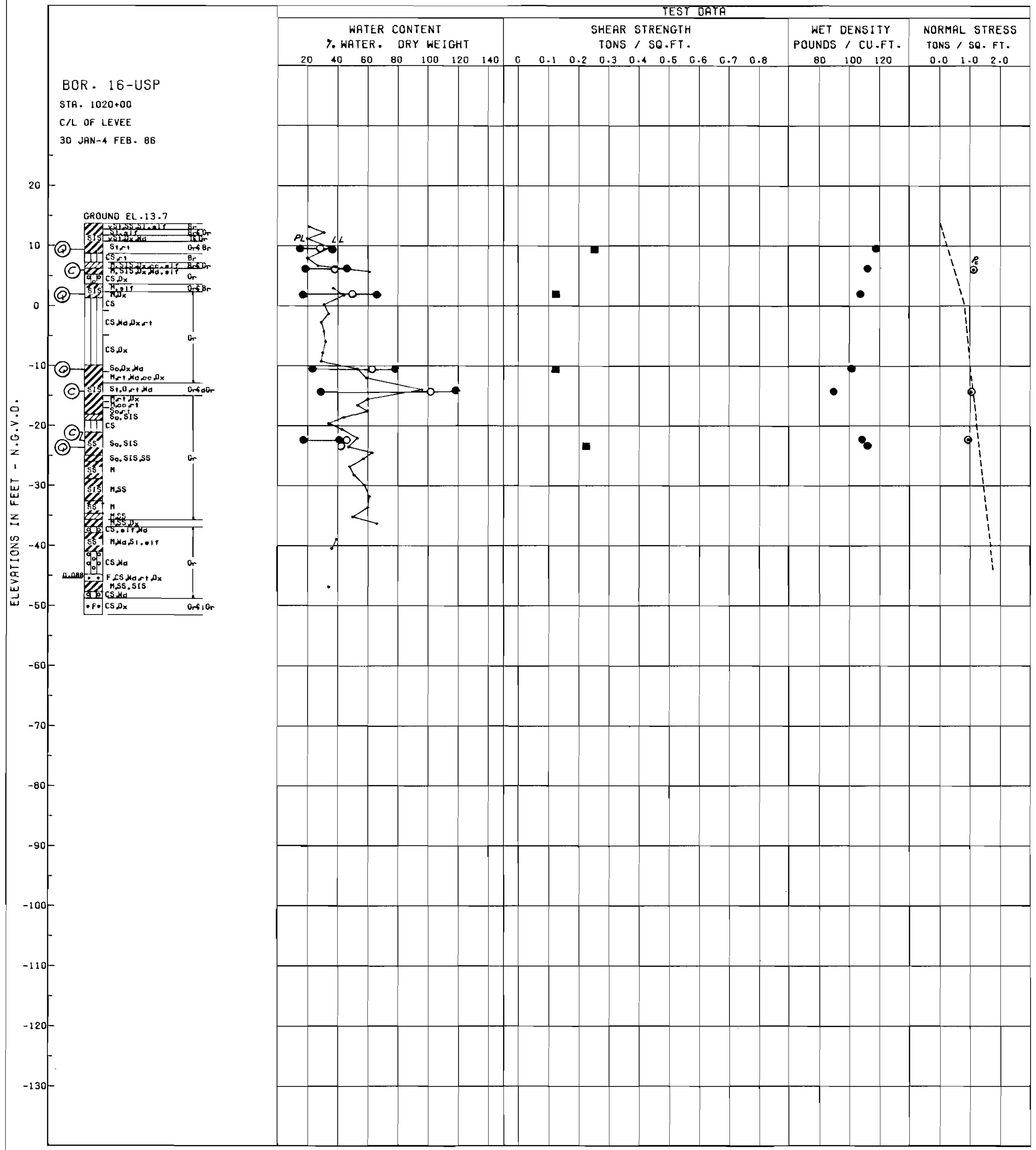
○ - (UC) UNCONFINED COMPRESSION TEST
■ - (Q) UNCONSOLIDATED - UNDRAINED SHEAR TEST
▲ - (R) CONSOLIDATED - UNDRAINED SHEAR TEST
⊡ - (S) CONSOLIDATED - DRAINED SHEAR TEST
BORINGS WERE TAKEN WITH A 5 INCH DIAMETER STEEL TUBE PISTON TYPE SAMPLER
FOR SOIL BORING LEGEND SEE PLATE A
FOR LOCATION OF BORING SEE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

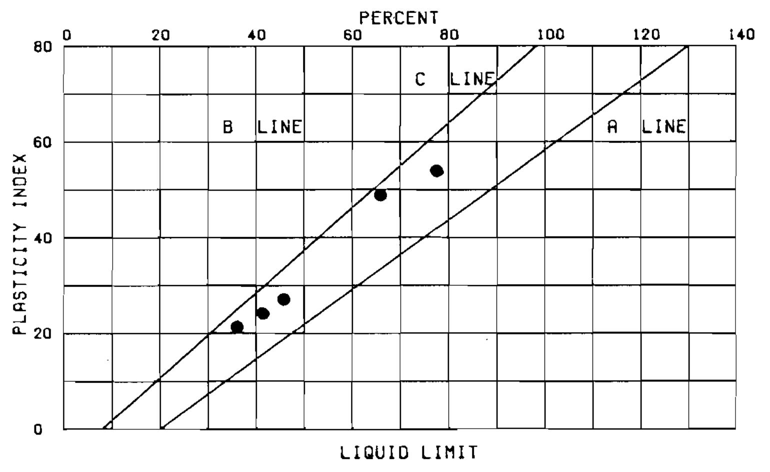
LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 16, GENERAL DESIGN
NEW ORLEANS EAST LEVEE
SOUTH POINT TO GIWW

UNDISTURBED BORING DATA 15-USP

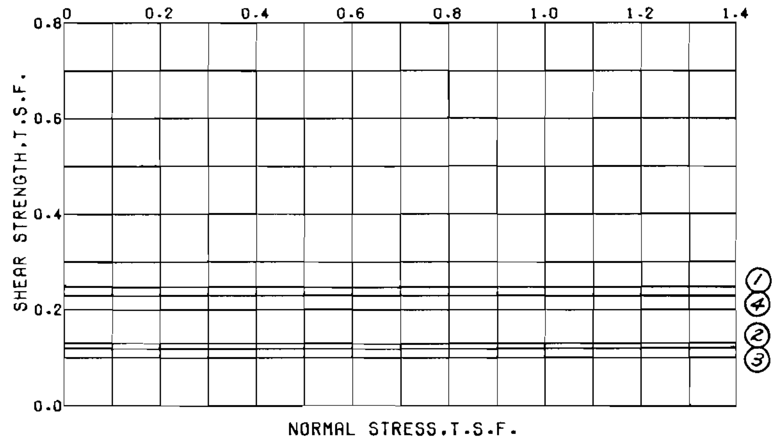
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS, LA.
CORPS OF ENGINEERS

APRIL 1987 FILE NO. H-2-30236





PLASTICITY CHART



SHEAR STRENGTH DATA

ENVELOPE		TYPE	STRENGTH		CLASS
NO.	EL.		Φ	C - TSF	
1.	9.1	Q	0	0.25	CL
2.	2.0	Q	0	0.13	CH
3.	-10.3	Q	0	0.12	CH
4.	-23.4	Q	0	0.23	CL

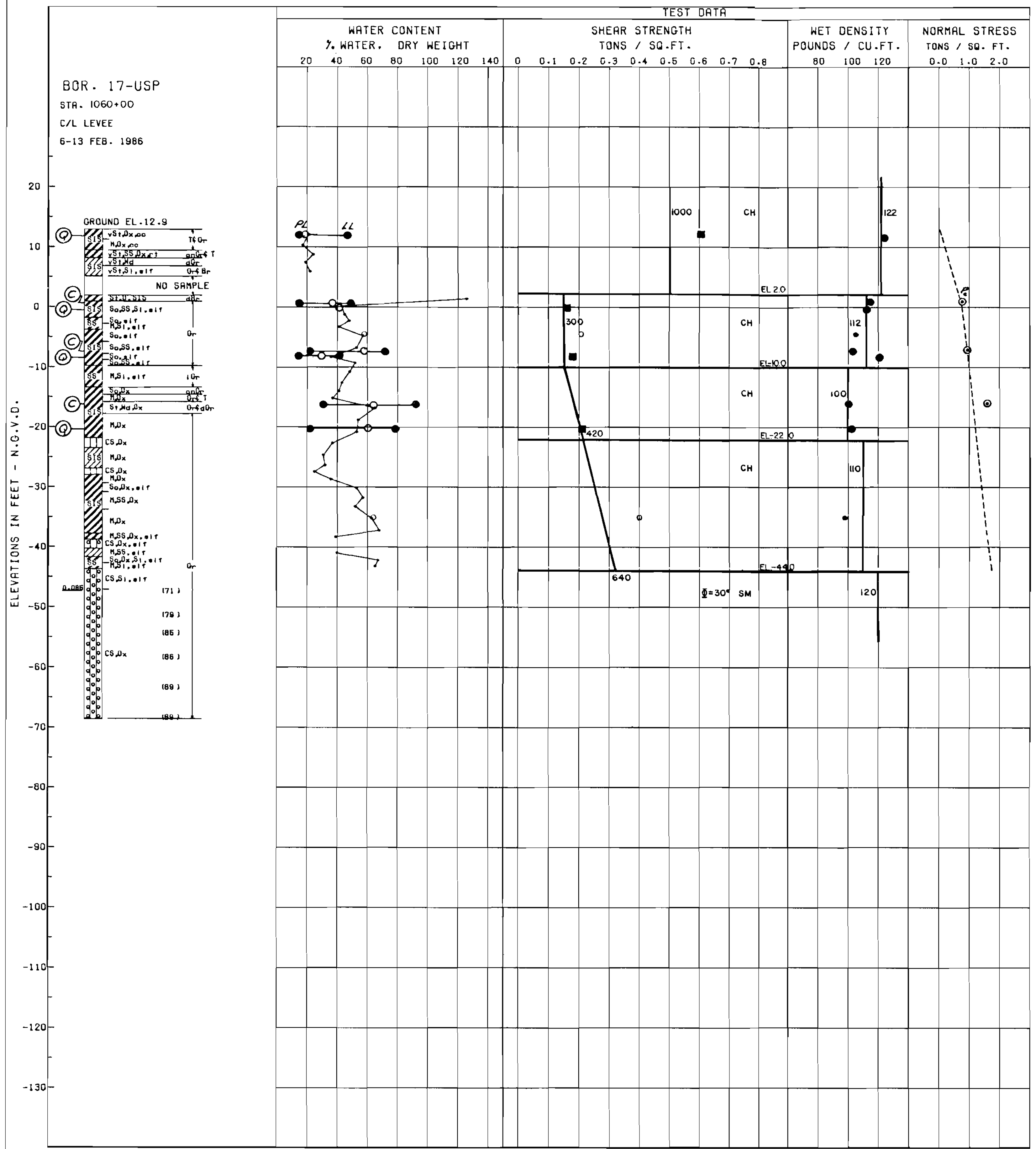
○ - (UC) UNCONFINED COMPRESSION TEST
■ - (Q) UNCONSOLIDATED - UNDRAINED SHEAR TEST
▲ - (R) CONSOLIDATED - UNDRAINED SHEAR TEST
⊡ - (S) CONSOLIDATED - DRAINED SHEAR TEST
BORINGS WERE TAKEN WITH A 5 INCH DIAMETER
STEEL TUBE PISTON TYPE SAMPLER
FOR SOIL BORING LEGEND SEE PLATE A
FOR LOCATION OF BORING SEE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

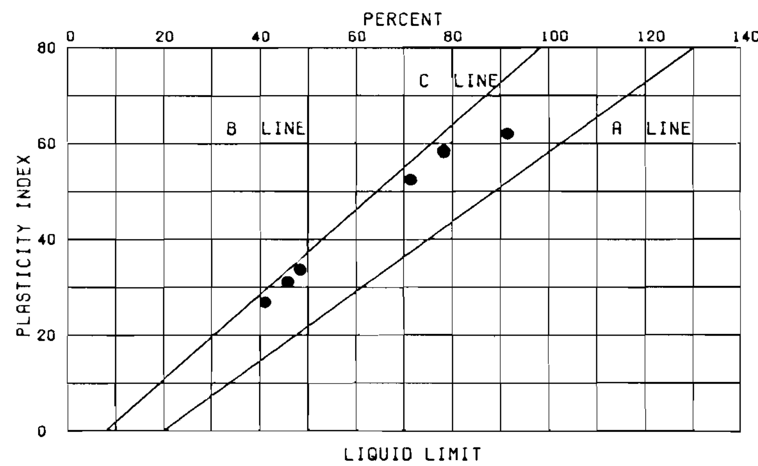
LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 16, GENERAL DESIGN
NEW ORLEANS EAST LEVEE
SOUTH POINT TO GIWW

UNDISTURBED BORING DATA 16-USP

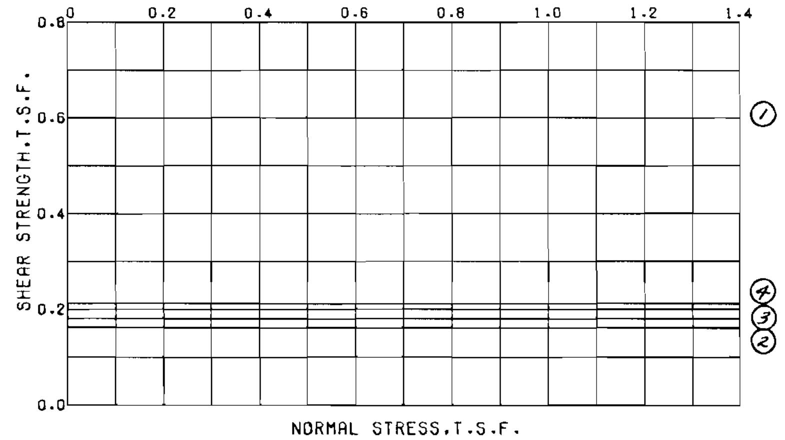
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS, LA.
CORPS OF ENGINEERS

APRIL 1987 FILE NO. H-2-30236





PLASTICITY CHART



SHEAR STRENGTH DATA

ENVELOPE NO.	ENVELOPE EL.	TYPE	STRENGTH Φ	STRENGTH C - TSF	CLASS
1.	11.7	Q	0	0.60	CL
2.	-0.2	Q	0	0.16	CH
3.	-8.3	Q	0	0.18	CL
4.	-20.2	Q	0	0.21	CH

NOTE:
THE C VALUE ON THE SHEAR STRENGTH LINE IS EXPRESSED IN POUNDS/SQUARE FOOT.

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

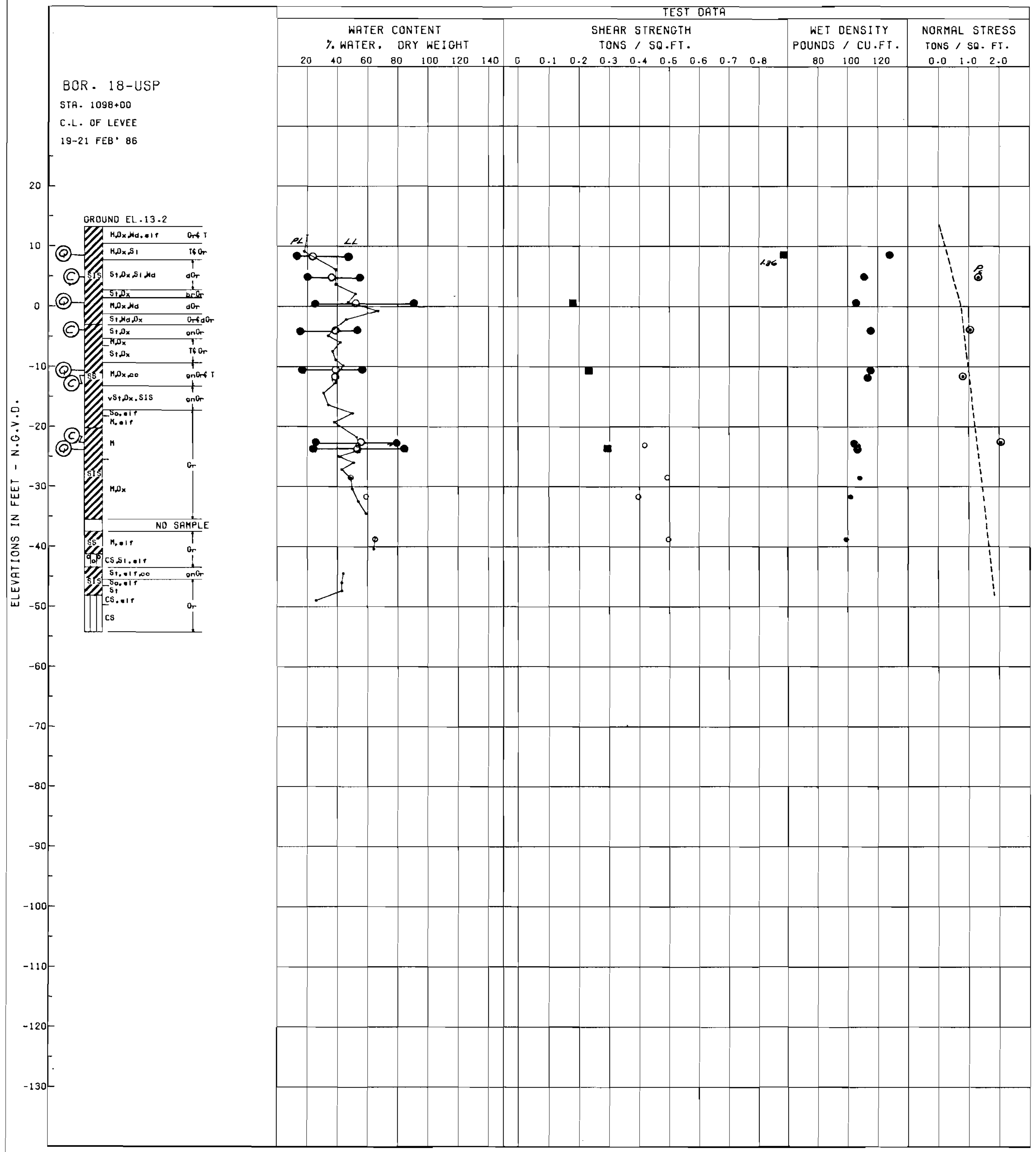
BORINGS WERE TAKEN WITH A 5 INCH DIAMETER STEEL TUBE PISTON TYPE SAMPLER
FOR SOIL BORING LEGEND SEE PLATE A
FOR LOCATION OF BORING SEE PLATE

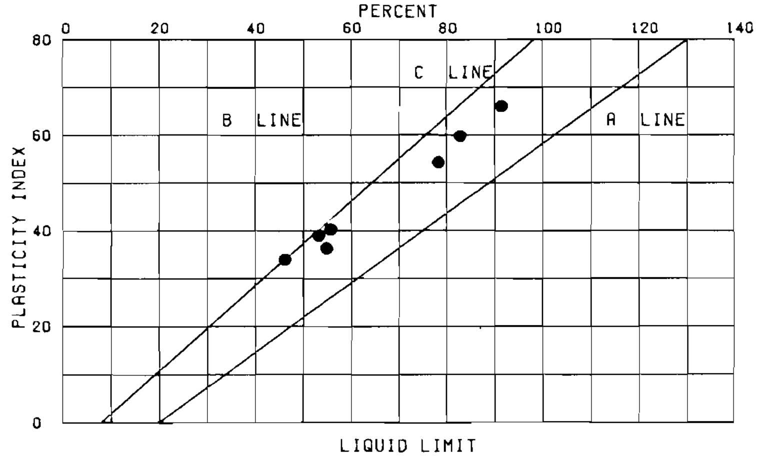
LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO 16, GENERAL DESIGN
NEW ORLEANS EAST LEVEE
SOUTH POINT TO GIWW

UNDISTURBED BORING DATA 17-USP

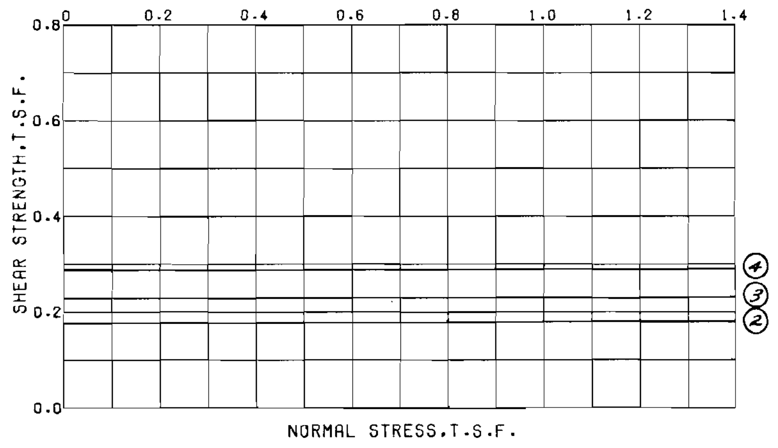
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS, LA
CORPS OF ENGINEERS

APRIL 1987 FILE NO H-2-30236





PLASTICITY CHART



SHEAR STRENGTH DATA

ENVELOPE NO.	ENVELOPE EL.	TYPE	STRENGTH Φ	STRENGTH C - TSF	CLASS
1.	8.4	Q	0	1.36	CH
2.	0.3	Q	0	0.18	CH
3.	-10.8	Q	0	0.23	CH
4.	-23.8	Q	0	0.29	CH

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

BORINGS WERE TAKEN WITH A 5 INCH DIAMETER STEEL TUBE PISTON TYPE SAMPLER

FOR SOIL BORING LEGEND SEE PLATE A

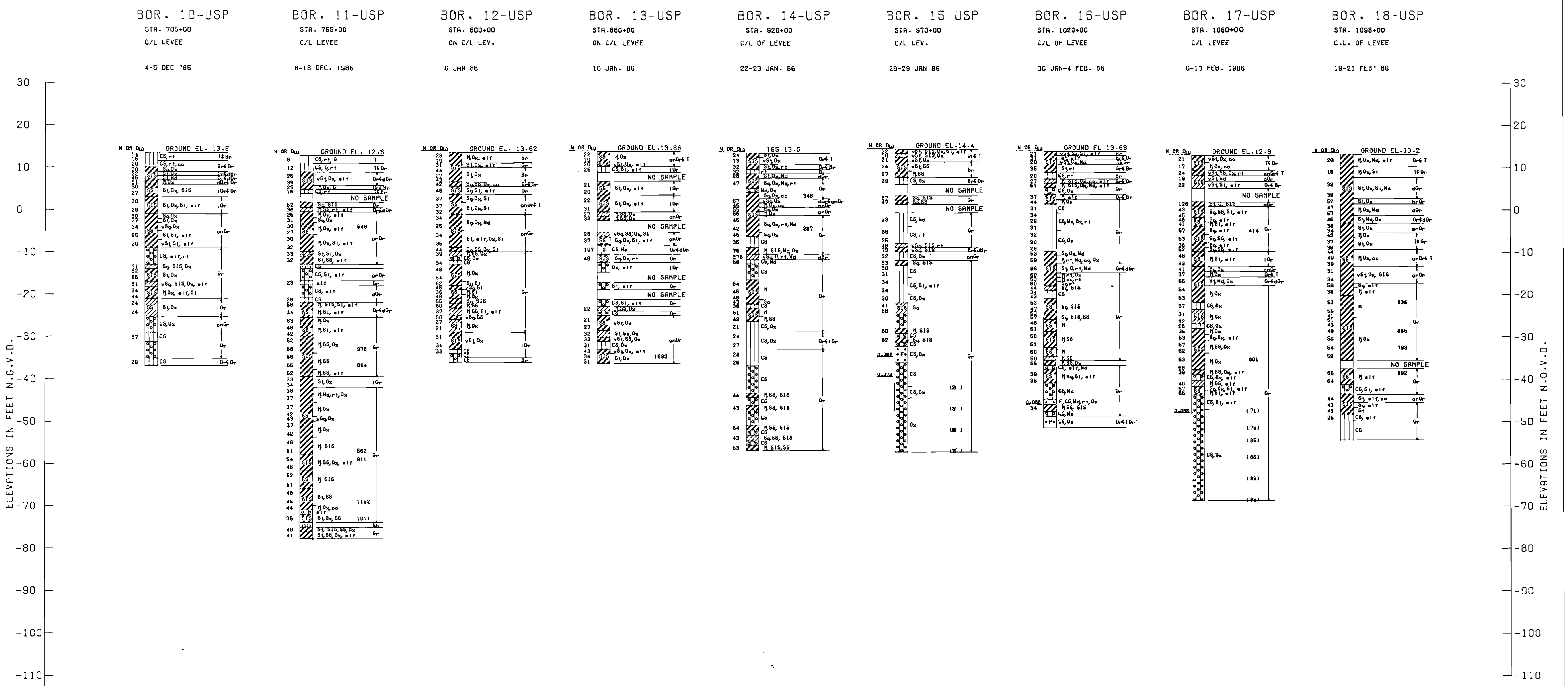
FOR LOCATION OF BORING SEE PLATE

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 16, GENERAL DESIGN
NEW ORLEANS EAST LEVEE
SOUTH POINT TO GIWW

UNDISTURBED BORING DATA 18-USP

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

APRIL 1987 FILE NO. H-2-30236



NOTES:
GENERAL TYPE BORINGS OBTAINED WITH 1-7/8 IN. I.D. X 29 INCH SAMPLER. UNDISTURBED BORINGS INDICATED BY THE LETTER "U" TAKEN WITH 5 IN. I.D. X 4 FOOT PISTION TYPE SAMPLER.

FOR BORING LOCATIONS SEE PLATE

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 16, GENERAL DESIGN
NEW ORLEANS EAST LEVEE
SOUTH POINT TO GIWW

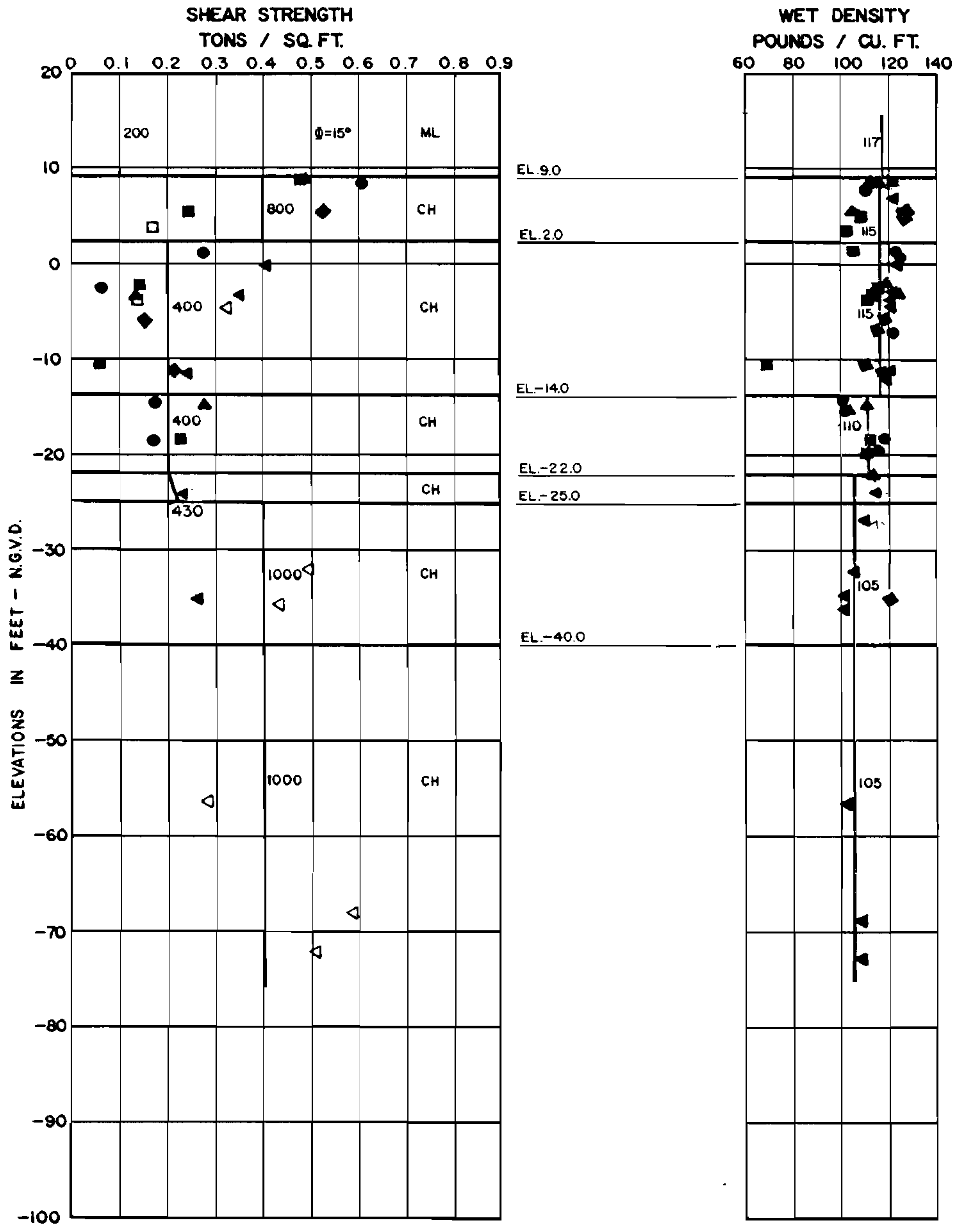
BORING LOGS

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

APRIL 1987 FILE NO H-2-30236

STA. 662+35 B/L TO STA. 746+00 B/L

STA. 770+00 B/L TO STA. 939+60 B/L

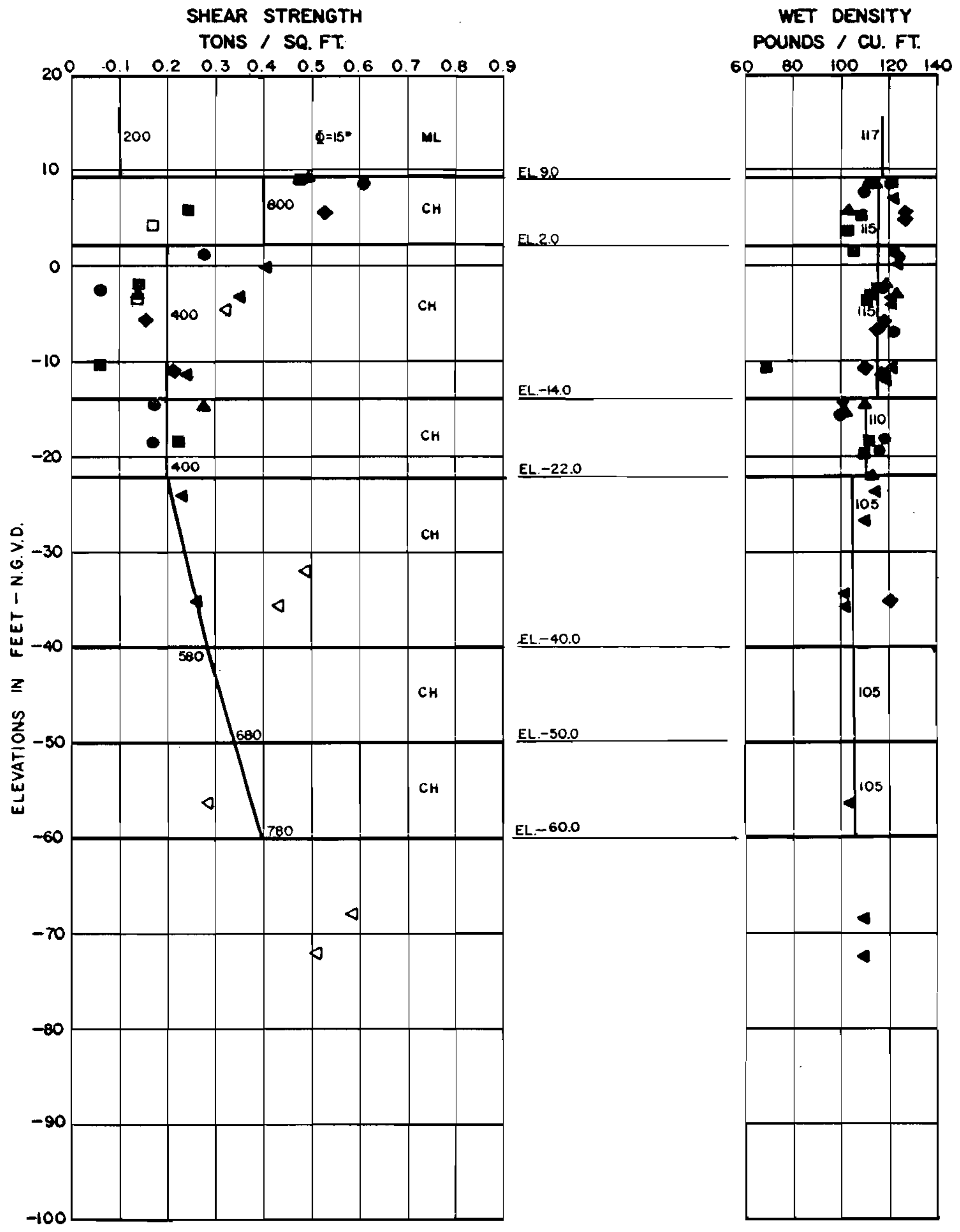


BORING LEGEND:

SHEAR STRENGTHS, STRATIFICATIONS, AND UNIT WEIGHTS

● 10 – USP
◁ ◀ 11 – USP
▲ 12 – USP
◆ 13 – USP
□ ■ 14 – USP

STA. 746+00 B/L TO STA. 770+00 B/L



BORING LEGEND:

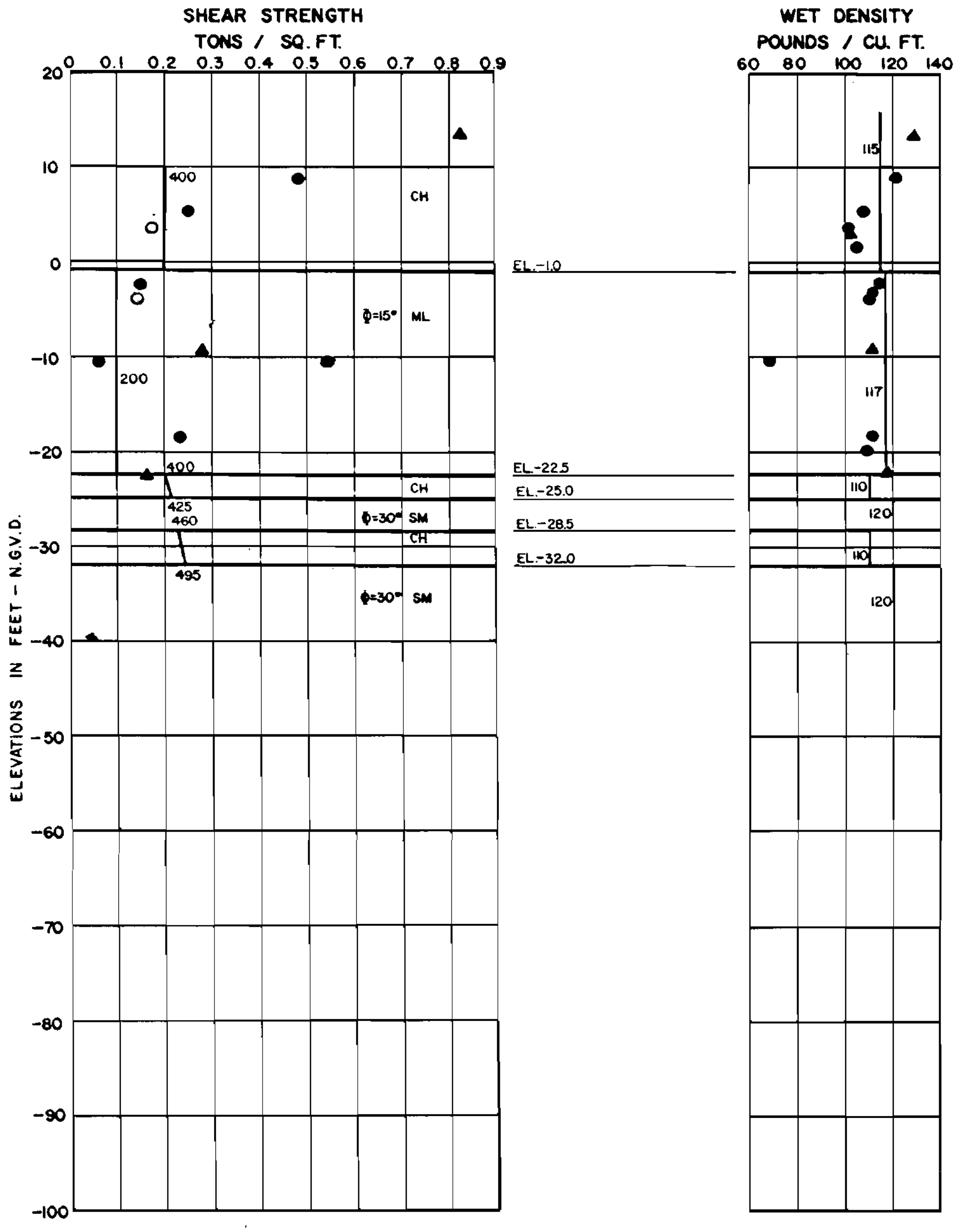
SHEAR STRENGTHS, STRATIFICATIONS, AND UNIT WEIGHTS

● 10 – USP
◁ ◀ 11 – USP
▲ 12 – USP
◆ 13 – USP
□ ■ 14 – USP

NOTE:
FROM ELEVATION -22.0 TO ELEVATION -60.0 THE STRENGTH AND STRATIFICATION WAS BASED ON BORING 11-USP.

STA. 938+78 B/L & STA. 938+87 B/L

(UTILITY LINES)



BORING LEGEND:

SHEAR STRENGTHS, STRATIFICATIONS, AND UNIT WEIGHTS

○ ● 14 – USP
▲ 15 – USP

GENERAL NOTES:

SOLID SYMBOLS INDICATE UNCONSOLIDED UNDRAINED TRIAXIAL COMPRESSION TESTS (Q-TESTS)

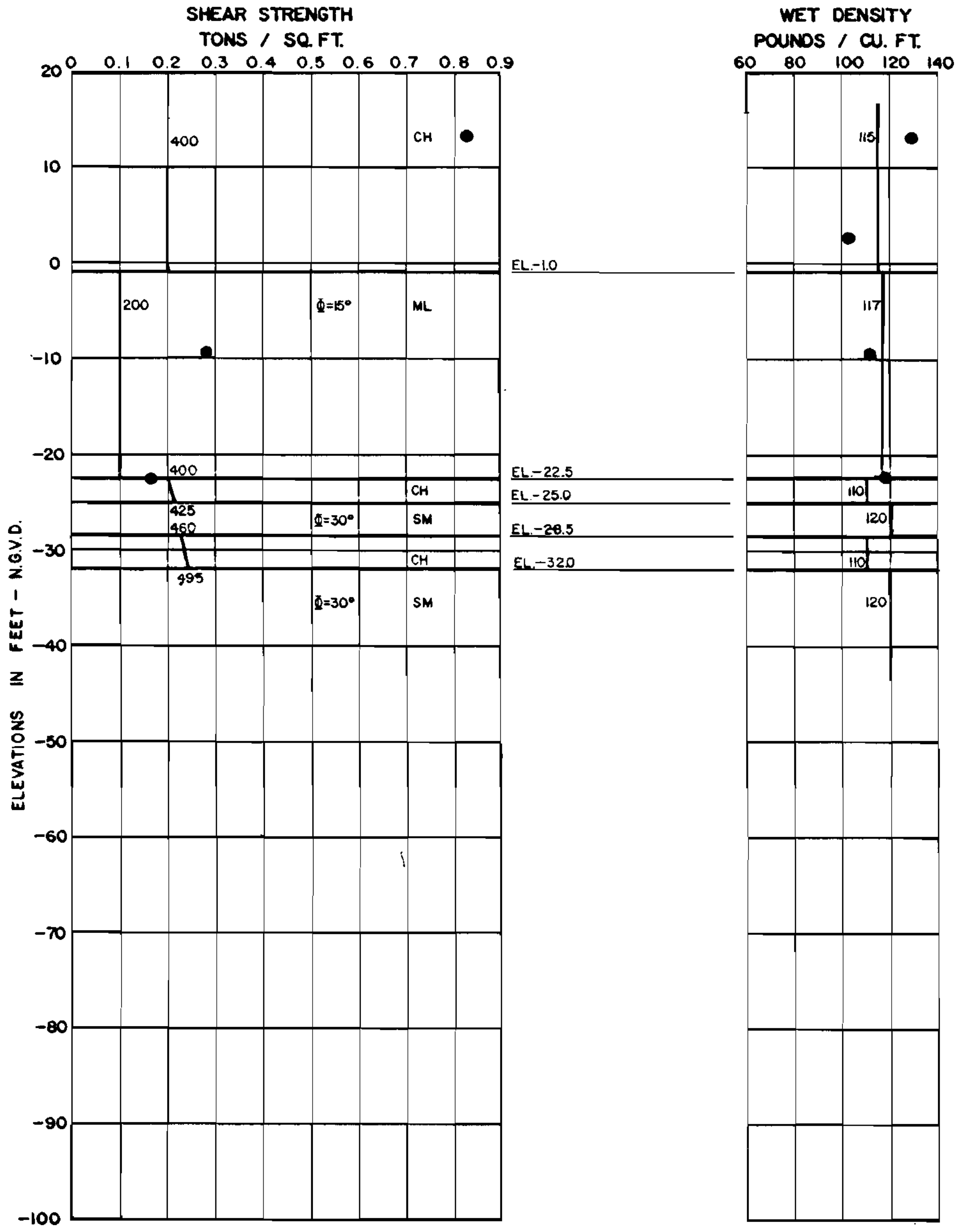
OPEN SYMBOLS INDICATE UNCONFINED COMPRESSION TESTS (UCT'S)
THE C VALUE ON THE SHEAR STRENGTH LINE EXPRESSED IN LBS/SQ.FT.

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 16, GENERAL DESIGN
NEW ORLEANS EAST LEVEE
SOUTH POINT TO GIWW
SHEAR STRENGTH AND WET DENSITIES
STA. 662+35 TO STA. 938+67

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

APRIL 1987 FILE NO. H-2-30236

STA. 939+60 B/L TO STA. 1000+00 B/L

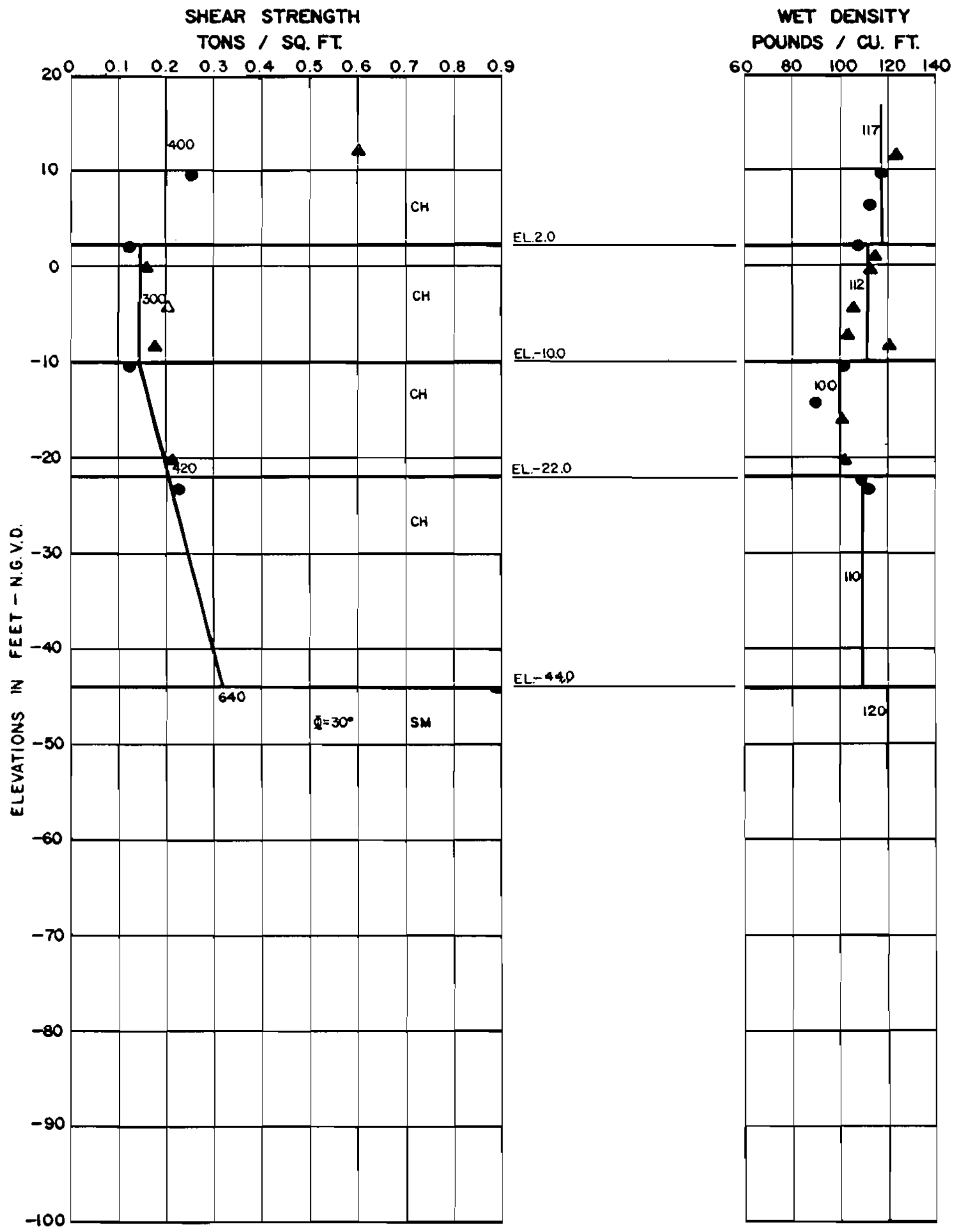


BORING LEGEND:

SHEAR STRENGTHS, STRATIFICATIONS, AND UNIT WEIGHTS

● 15-USP

STA. 1000+00 B/L TO STA. 1065+00 B/L

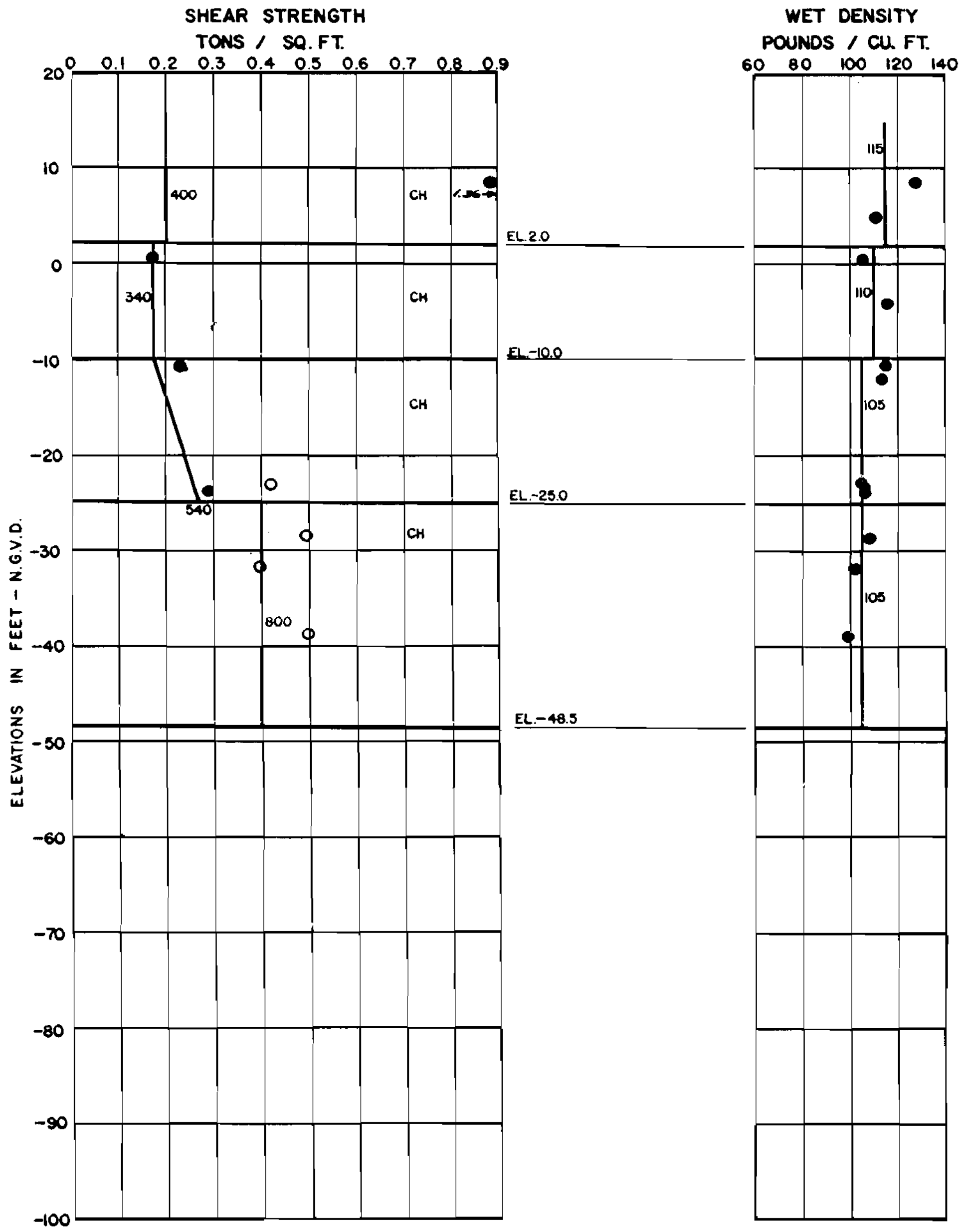


BORING LEGEND:

SHEAR STRENGTHS, STRATIFICATIONS, AND UNIT WEIGHTS

● 16-USP △ ▲ 17-USP

STA. 1065+00 B/L TO STA. 1102+98 B/L



BORING LEGEND:

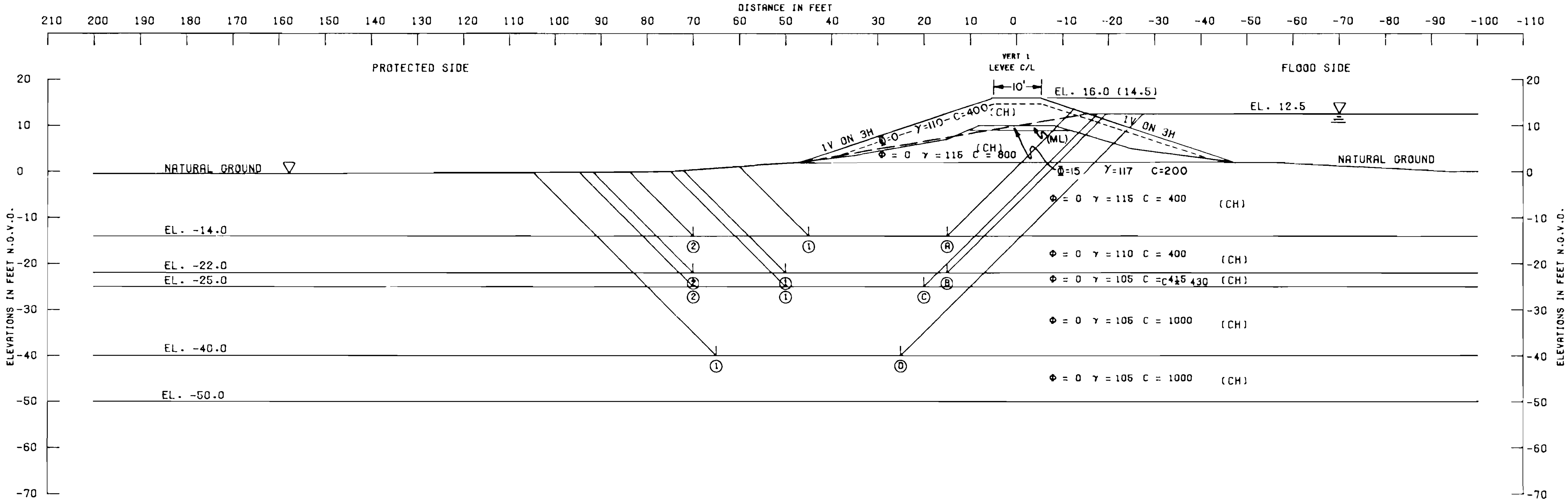
SHEAR STRENGTHS, STRATIFICATIONS, AND UNIT WEIGHTS

○ ● 18-USP

FOR GENERAL NOTES SEE PLATE 37.

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 16, GENERAL DESIGN
NEW ORLEANS EAST LEVEE
SOUTH POINT TO GIWW
SHEAR STRENGTH AND WET DENSITIES
STA. 939+60 TO STA. 1102+98

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS, LA
CORPS OF ENGINEERS
APRIL 1987 FILE NO. H-2-30236



ASSUMED FAILURE SURFACE		RESISTING FORCES			DRIVING FORCES		SUMMATION OF FORCES		FACTOR OF SAFETY
NO.	ELEV.	R_A	R_B	R_P	D_A	$-D_P$	RESISTING	DRIVING	
Ⓐ ①	-14.0	27401	12000	12093	47740	14111	51494	33629	1.53
Ⓐ ②	-14.0	27401	22000	11152	47740	11347	60553	36393	1.66
Ⓑ ①	-22.0	31581	14000	17767	75595	30309	63348	45286	1.40
Ⓑ ②	-22.0	31581	22000	17510	75595	27667	71091	47928	1.48
Ⓒ ①	-25.0	34836	12900	20090	87447	38288	67826	49159	1.38
Ⓒ ②	-25.0	34836	21500	19984	87447	35567	76320	51880	1.47
Ⓓ ①	-40.0	61008	40000	49931	160349	89586	150939	70763	2.13

GENERAL NOTES:

1. CLASSIFICATION, STRATIFICATION, SHEAR STRENGTHS AND UNIT WEIGHTS OF THE SOIL WERE BASED ON THE RESULTS OF UNDISTURBED BORINGS. SEE PLATE 37.
2. CROWN ELEVATION LISTED AS GROSS(NET).

NOTES

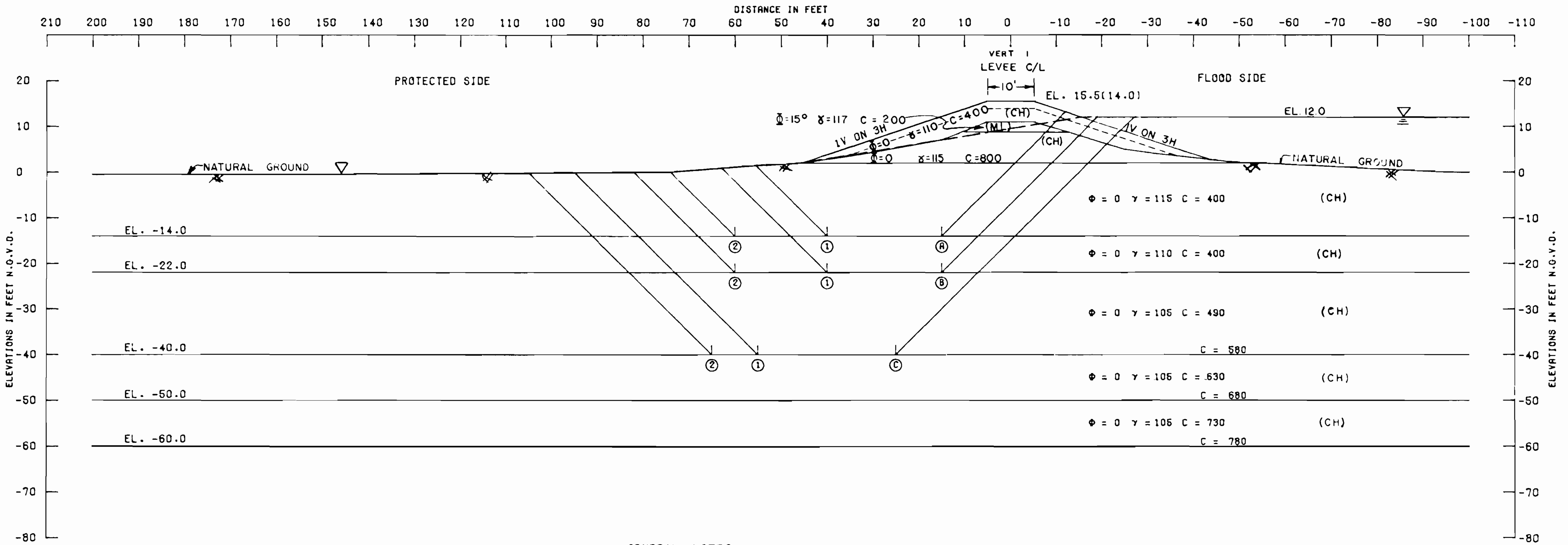
Φ -- ANGLE OF INTERNAL FRICTION, DEGREES
C -- UNIT COHESION, P.S.F.
▽ -- STATIC WATER SURFACE
D -- HORIZONTAL DRIVING FORCE IN POUNDS
R -- HORIZONTAL RESISTING FORCE IN POUNDS
A -- AS A SUBSCRIPT, REFERS TO ACTIVE WEDGE
B -- AS A SUBSCRIPT, REFERS TO CENTRAL BLOCK
P -- AS A SUBSCRIPT, REFERS TO PASSIVE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

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

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 16, GENERAL DESIGN
NEW ORLEANS EAST LEVEE
SOUTH POINT TO GIWW

PROTECTED SIDE STABILITY
STA. 770+00 TO STA. 939+60

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS, LA.
CORPS OF ENGINEERS
APRIL 1987 FILE NO. H-2-30236



ASSUMED FAILURE SURFACE		RESISTING FORCES			DRIVING FORCES		SUMMATION OF FORCES		FACTOR OF SAFETY
NO.	ELEV.	R_A	R_B	R_P	D_A	$-D_P$	RESISTING	DRIVING	
A 1	-14.0	27060	10000	12372	46323	14966	49432	31357	1.58
A 2	-14.0	27060	18000	11256	46323	12236	56316	34087	1.65
B 1	-22.0	31354	10000	18325	73824	32457	59679	41367	1.44
B 2	-22.0	31354	18000	17563	73824	28620	66917	45204	1.48
C 1	-40.0	45895	17400	35134	157641	91070	98429	66571	1.48
C 2	-40.0	45895	23200	35081	157641	89586	104176	68055	1.53

GENERAL NOTES:

1. CLASSIFICATION, STRATIFICATION, SHEAR STRENGTHS AND UNIT WEIGHTS OF THE SOIL WERE BASED ON THE RESULTS OF UNDISTURBED BORINGS. SEE PLATE 37.
2. CROWN ELEVATION LISTED AS GROSS(NET).

NOTES

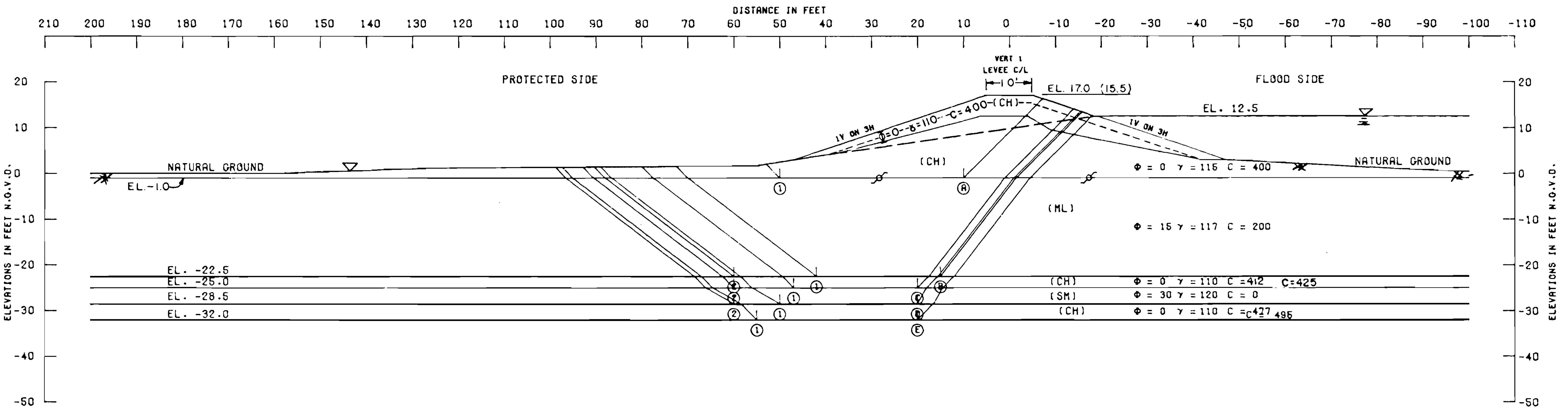
Φ -- ANGLE OF INTERNAL FRICTION, DEGREES
C -- UNIT COHESION, P.S.F.
∇ -- STATIC WATER SURFACE
D -- HORIZONTAL DRIVING FORCE IN POUNDS
R -- HORIZONTAL RESISTING FORCE IN POUNDS
A -- AS A SUBSCRIPT, REFERS TO ACTIVE WEDGE
B -- AS A SUBSCRIPT, REFERS TO CENTRAL BLOCK
P -- AS A SUBSCRIPT, REFERS TO PASSIVE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

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

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 16, GENERAL DESIGN
NEW ORLEANS EAST LEVEE
SOUTH POINT TO GIWW

PROTECTED SIDE STABILITY
STA. 661+70 TO STA. 770+00

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS, LA.
CORPS OF ENGINEERS
APRIL 1987 FILE NO. H-2-30236



ASSUMED FAILURE SURFACE		RESISTING FORCES			DRIVING FORCES		SUMMATION OF FORCES		FACTOR OF SAFETY
NO.	ELEV.	R_A	R_B	R_P	D_A	$-D_P$	RESISTING	DRIVING	
A 1	-1.0	13801	14206	2417	17680	610	30424	17070	1.78
B 1	-22.5	34958	10800	24177	83877	35377	69935	48500	1.44
B 2	-22.5	34958	18000	23905	83877	33611	76863	50266	1.53
C 1	-25.0	37144	11475	25844	93889	41787	74463	52102	1.43
C 2	-25.0	37144	17000	25935	93889	40949	80079	52940	1.51
D 1	-28.5	42666	13800	36802	110284	52768	93268	57516	1.62
D 2	-28.5	42666	18400	36575	110284	52367	97641	57917	1.69
E 1	-32.0	45879	17325	39930	128326	65396	103134	62930	1.64

GENERAL NOTES:

1. CLASSIFICATION, STRATIFICATION, SHEAR STRENGTHS AND UNIT WEIGHTS OF THE SOIL WERE BASED ON THE RESULTS OF UNDISTURBED BORINGS. SEE PLATE 38.
2. CROWN ELEVATION LISTED AS GROSS(NET).

NOTES

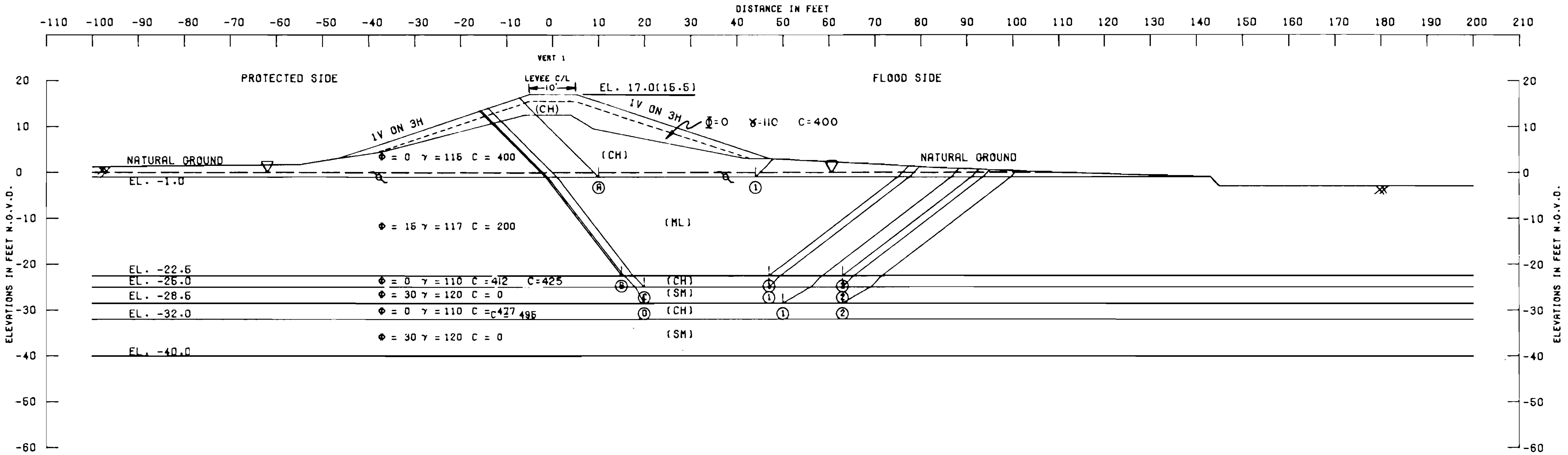
Φ -- ANGLE OF INTERNAL FRICTION, DEGREES
C -- UNIT COHESION, P.S.F.
∇ -- STATIC WATER SURFACE
D -- HORIZONTAL DRIVING FORCE IN POUNDS
R -- HORIZONTAL RESISTING FORCE IN POUNDS
A -- AS A SUBSCRIPT, REFERS TO ACTIVE WEDGE
B -- AS A SUBSCRIPT, REFERS TO CENTRAL BLOCK
P -- AS A SUBSCRIPT, REFERS TO PASSIVE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

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

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 16, GENERAL DESIGN
NEW ORLEANS EAST LEVEE
SOUTH POINT TO GIWW

PROTECTED SIDE STABILITY
STA. 939+60 TO STA. 1000+00

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS, LA.
CORPS OF ENGINEERS
APRIL 1987 FILE NO. H-2-30236



ASSUMED FAILURE SURFACE		RESISTING FORCES			DRIVING FORCES		SUMMATION OF FORCES		FACTOR OF SAFETY
NO.	ELEV.	R_A	R_B	R_P	D_A	$-D_P$	RESISTING	DRIVING	
A 1	-1.0	13802	13394	3160	17639	1082	30356	16557	1.83
B 1	-22.5	39767	12800	26618	83825	35455	79185	48370	1.64
B 2	-22.5	39767	19200	24612	83825	33216	83579	50609	1.65
C 1	-25.0	41742	11475	28348	93766	42857	81565	50909	1.60
C 2	-25.0	41742	18275	26380	93766	40413	86397	53353	1.62
D 1	-28.5	48440	13800	39460	110172	53420	101700	56752	1.79
D 2	-28.5	48440	19780	37410	110172	51278	105630	58894	1.79

GENERAL NOTES:

1. CLASSIFICATION, STRATIFICATION, SHEAR STRENGTHS AND UNIT WEIGHTS OF THE SOIL WERE BASED ON THE RESULTS OF UNDISTURBED BORINGS. SEE PLATE **38**.
2. CROWN ELEVATION LISTED AS GROSS(NET).

NOTES

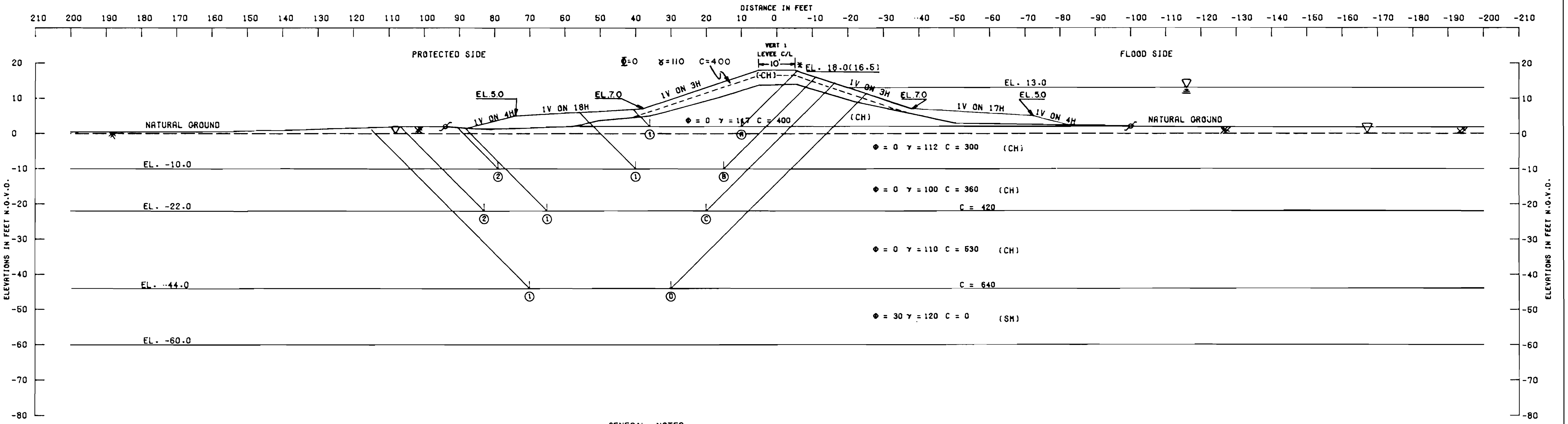
Φ -- ANGLE OF INTERNAL FRICTION, DEGREES
C -- UNIT COHESION, P.S.F.
∇ -- STATIC WATER SURFACE
D -- HORIZONTAL DRIVING FORCE IN POUNDS
R -- HORIZONTAL RESISTING FORCE IN POUNDS
A -- AS A SUBSCRIPT, REFERS TO ACTIVE WEDGE
B -- AS A SUBSCRIPT, REFERS TO CENTRAL BLOCK
P -- AS A SUBSCRIPT, REFERS TO PASSIVE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

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

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 16, GENERAL DESIGN
NEW ORLEANS EAST LEVEE
SOUTH POINT TO GIWW

FLOOD SIDE STABILITY
STA. 939+60 TO STA. 1000+00

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS, LA.
CORPS OF ENGINEERS
APRIL 1987 FILE NO. H-2-30236



ASSUMED FAILURE SURFACE		RESISTING FORCES			DRIVING FORCES		SUMMATION OF FORCES		FACTOR OF SAFETY
NO.	ELEV.	R_A	R_B	R_P	D_A	$-D_P$	RESISTING	DRIVING	
Ⓐ ①	2.0	12602	7800	3873	14071	1451	24275	12620	1.92
Ⓑ ①	-10.0	18402	7500	10400	41922	15188	36302	26734	1.36
Ⓑ ②	-10.0	18402	19200	7037	41922	8549	44639	33373	1.34
Ⓒ ①	-22.0	25642	18900	15568	82650	36466	60110	46184	1.30*
Ⓒ ②	-22.0	25642	26460	15805	82650	31280	67907	51370	1.32
Ⓓ ①	-44.0	46562	25600	38966	191175	116880	111128	74295	1.50

GENERAL NOTES:

1. CLASSIFICATION, STRATIFICATION, SHEAR STRENGTHS AND UNIT WEIGHTS OF THE SOIL WERE BASED ON THE RESULTS OF UNDISTURBED BORINGS. SEE PLATE 38.
2. CROWN ELEVATION LISTED AS GROSS(NET).

*3. THE ADDITION OF THE 9" SHELL ROAD WILL TEMPORARILY REDUCE THE FACTOR OF SAFETY TO 1.29 WHICH IS CONSIDERED ACCEPTABLE

NOTES

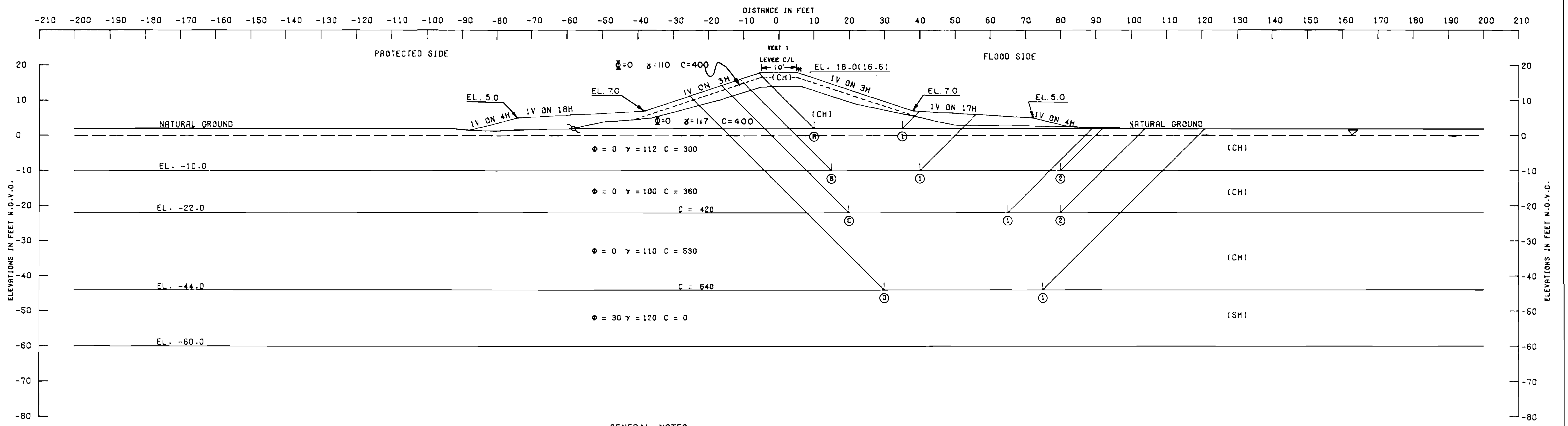
Φ -- ANGLE OF INTERNAL FRICTION, DEGREES
C -- UNIT COHESION, P.S.F.
▽ -- STATIC WATER SURFACE
D -- HORIZONTAL DRIVING FORCE IN POUNDS
R -- HORIZONTAL RESISTING FORCE IN POUNDS
A -- AS A SUBSCRIPT, REFERS TO ACTIVE WEDGE
B -- AS A SUBSCRIPT, REFERS TO CENTRAL BLOCK
P -- AS A SUBSCRIPT, REFERS TO PASSIVE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

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

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 16, GENERAL DESIGN
NEW ORLEANS EAST LEVEE
SOUTH POINT TO GIWW

PROTECTED SIDE STABILITY
STA. 1000+00 TO STA. 1030+00

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS, LA.
CORPS OF ENGINEERS
APRIL 1987 FILE NO. H-2-30236



ASSUMED FAILURE SURFACE		RESISTING FORCES			DRIVING FORCES		SUMMATION OF FORCES		FACTOR OF SAFETY
NO.	ELEV.	R_A	R_B	R_P	D_A	$-D_P$	RESISTING	DRIVING	
A 1	2.0	12600	7500	3911	14096	1580	24011	12516	1.92
B 1	-10.0	18401	7500	10355	41955	15109	36256	26846	1.35
B 2	-10.0	18401	19500	7373	41955	8661	45274	33294	1.36
C 1	-22.0	25642	18900	16078	82685	36192	60620	46493	1.30*
C 2	-22.0	25642	25200	15816	82685	32081	66658	50604	1.32
D 1	-44.0	46562	28800	39040	190836	115344	114402	75492	1.52

GENERAL NOTES:

1. CLASSIFICATION, STRATIFICATION, SHEAR STRENGTHS AND UNIT WEIGHTS OF THE SOIL WERE BASED ON THE RESULTS OF UNDISTURBED BORINGS. SEE PLATE 38.
2. CROWN ELEVATION LISTED AS GROSS(NET).

*3. THE ADDITION OF THE 9" SHELL ROAD WILL TEMPORARILY REDUCE THE FACTOR OF SAFETY TO 1.29, WHICH IS CONSIDERED ACCEPTABLE.

NOTES

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

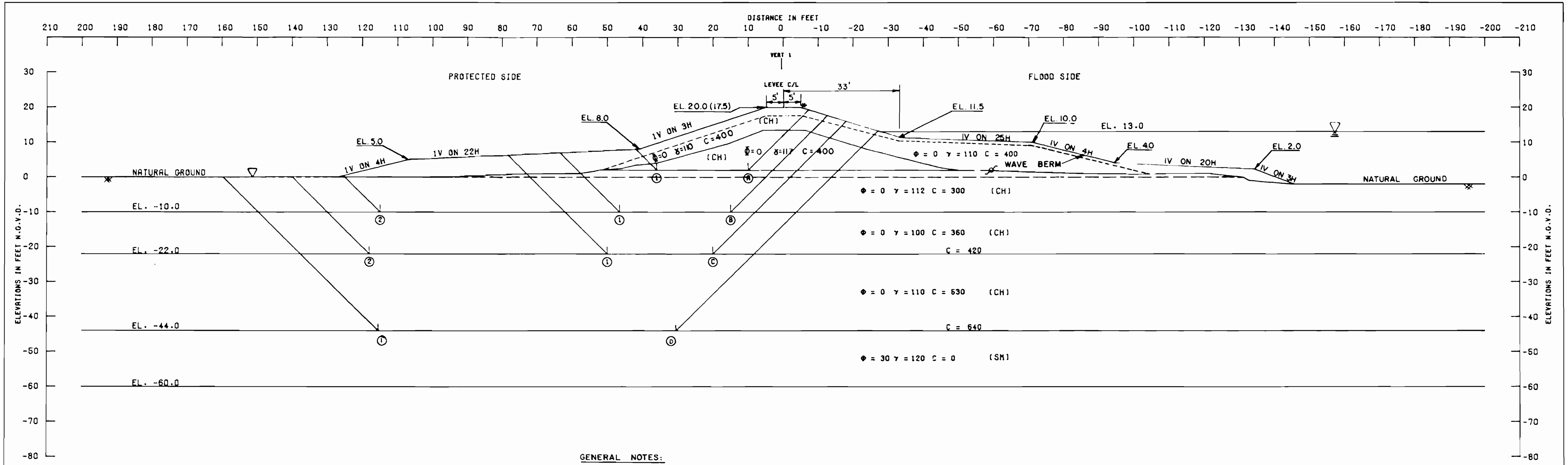
$$\text{FACTOR OF SAFETY} = \frac{R_A + R_B + R_P}{D_A - D_P}$$

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 16, GENERAL DESIGN
NEW ORLEANS EAST LEVEE
SOUTH POINT TO GIWW

FLOOD SIDE STABILITY

STA. 1000 + 00 TO STA. 1030 + 00

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS, LA.
CORPS OF ENGINEERS
APRIL 1987 FILE NO. H-2-30236



ASSUMED FAILURE SURFACE NO.		ELEV.	RESISTING FORCES R_A	R_B	R_P	DRIVING FORCES D_A	$-D_P$	SUMMATION OF FORCES RESISTING	DRIVING	FACTOR OF SAFETY
A	1	2.0	13842	7800	4765	17680	2448	26407	15232	1.73
B	1	-10.0	19737	9450	11368	47829	16721	40555	31108	1.30
B	2	-10.0	19737	30000	6320	47829	7535	56057	40294	1.39
C	1	-22.0	27072	12600	19495	90944	45739	59167	45205	1.31
C	2	-22.0	27072	41160	14714	90944	27541	82946	63403	1.31*
D	1	-44.0	48154	54446	37960	203692	106110	140560	97582	1.44

GENERAL NOTES:

1. CLASSIFICATION, STRATIFICATION, SHEAR STRENGTHS AND UNIT WEIGHTS OF THE SOIL WERE BASED ON THE RESULTS OF UNDISTURBED BORINGS. SEE PLATE 38.
2. CROWN ELEVATION LISTED AS GROSS(NET).

*3. THE ADDITION OF THE 9" SHELL ROAD WILL TEMPORARLY REDUCE THE FACTOR OF SAFETY TO 1.29, WHICH IS CONSIDERED ACCEPTABLE

NOTES

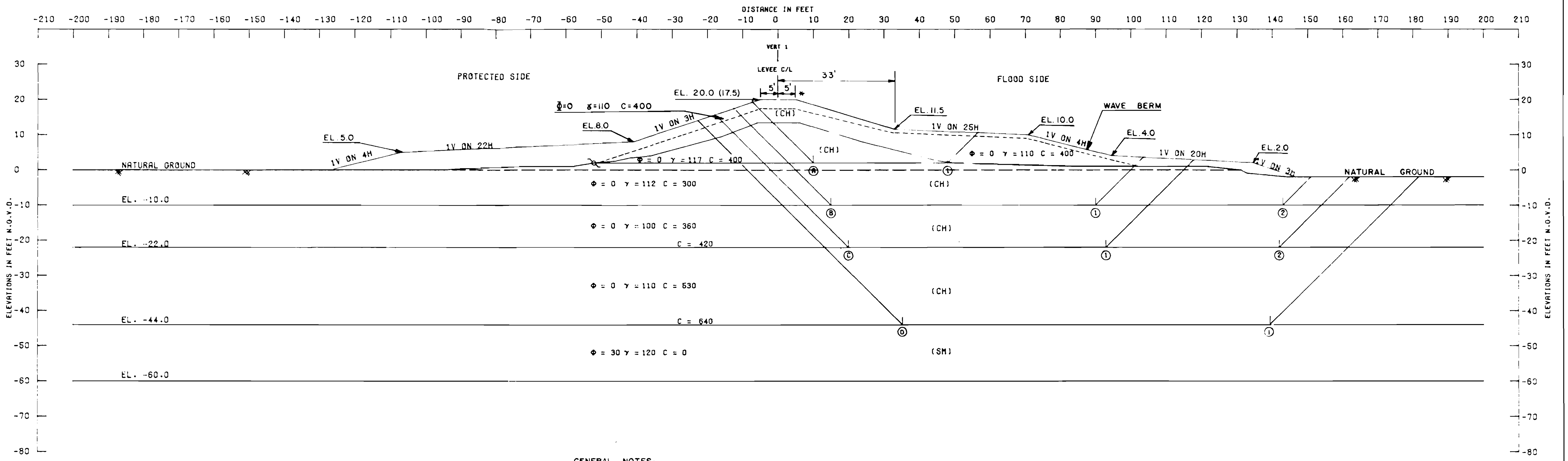
Φ -- ANGLE OF INTERNAL FRICTION, DEGREES
C -- UNIT COHESION, P.S.F.
∇ -- STATIC WATER SURFACE
D -- HORIZONTAL DRIVING FORCE IN POUNDS
R -- HORIZONTAL RESISTING FORCE IN POUNDS
A -- AS A SUBSCRIPT, REFERS TO ACTIVE WEDGE
B -- AS A SUBSCRIPT, REFERS TO CENTRAL BLOCK
P -- AS A SUBSCRIPT, REFERS TO PASSIVE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

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

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 16, GENERAL DESIGN
NEW ORLEANS EAST LEVEE
SOUTH POINT TO GIWW

PROTECTED SIDE STABILITY
STA. 1030+00 TO STA. 1065+00

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS, LA.
CORPS OF ENGINEERS
APRIL 1987 FILE NO. H-2-30236



ASSUMED FAILURE SURFACE			RESISTING FORCES			DRIVING FORCES		SUMMATION OF FORCES		FACTOR OF SAFETY
NO.		ELEV.	R_A	R_B	R_P	D_A	$-D_P$	RESISTING	DRIVING	
A	1	2.0	13802	11400	6845	17722	4189	32047	13533	2.37
B	1	-10.0	19602	22500	8638	47930	10942	50740	36988	1.37
B	2	-10.0	19602	38400	4800	47930	3808	62802	44122	1.42
C	1	-22.0	26842	30660	16707	91087	35302	74209	55785	1.33
C	2	-22.0	26842	51240	13440	91087	21906	91522	69181	1.32*
D	1	-44.0	48762	66393	36760	202995	95369	151915	107626	1.41

GENERAL NOTES:

1. CLASSIFICATION, STRATIFICATION, SHEAR STRENGTHS AND UNIT WEIGHTS OF THE SOIL WERE BASED ON THE RESULTS OF UNDISTURBED BORINGS. SEE PLATE 38.
2. CROWN ELEVATION LISTED AS GROSS(NET).

*3. THE ADDITION OF THE 9" SHELL ROAD WILL REDUCE THE FACTOR OF SAFETY TO 1.31

NOTES

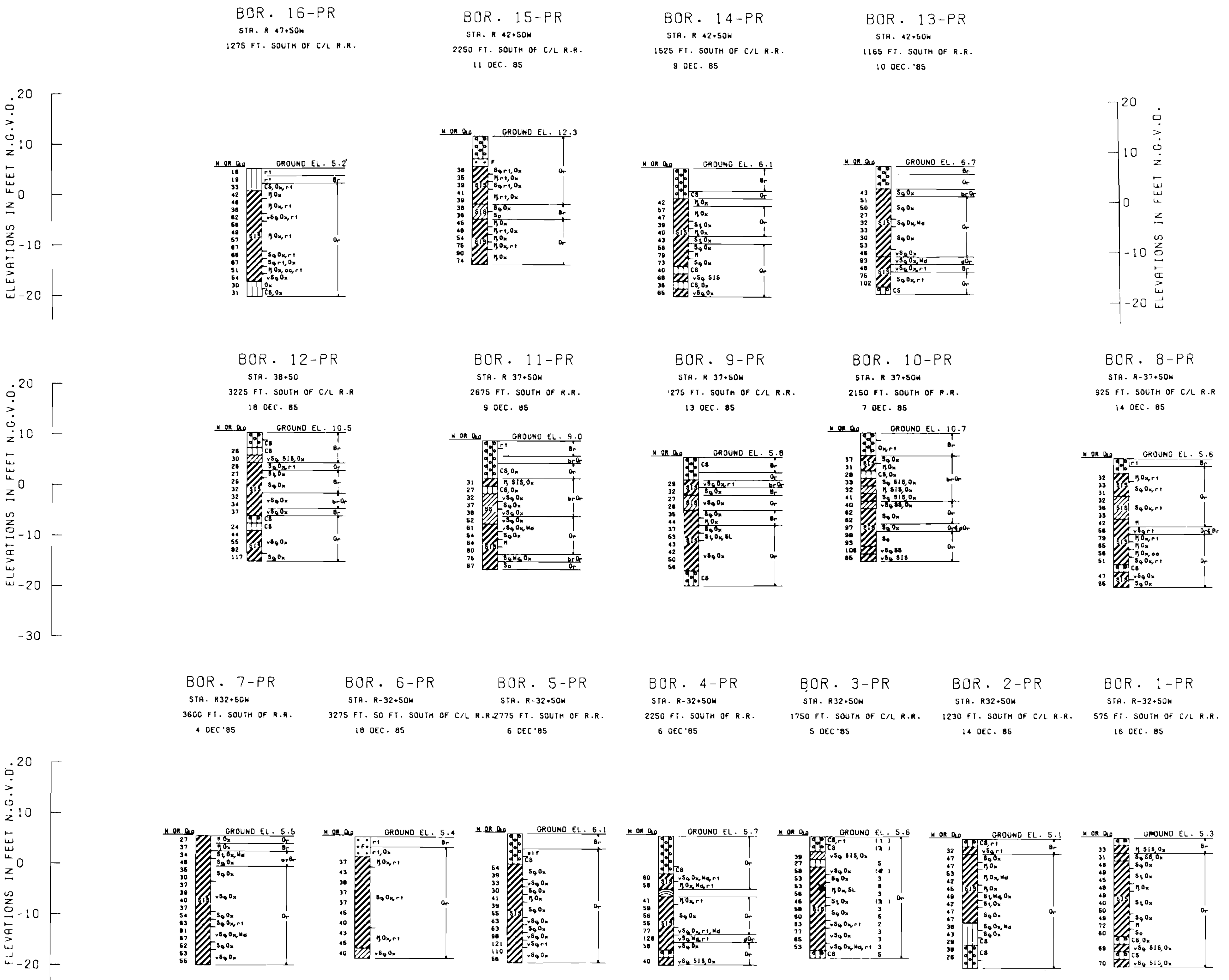
Φ -- ANGLE OF INTERNAL FRICTION, DEGREES
C -- UNIT COHESION, P.S.F.
∇ -- STATIC WATER SURFACE
D -- HORIZONTAL DRIVING FORCE IN POUNDS
R -- HORIZONTAL RESISTING FORCE IN POUNDS
A -- AS A SUBSCRIPT, REFERS TO ACTIVE WEDGE
B -- AS A SUBSCRIPT, REFERS TO CENTRAL BLOCK
P -- AS A SUBSCRIPT, REFERS TO PASSIVE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

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

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 16, GENERAL DESIGN
NEW ORLEANS EAST LEVEE
SOUTH POINT TO GIWW

FLOOD SIDE STABILITY
STA. 1030 + 00 TO STA. 1065 + 00

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS, LA.
CORPS OF ENGINEERS
APRIL 1987 FILE NO. H-2-30236



NOTE:

1. FOR LOCATION OF SOIL BORING IN THE BORROW PIT, SEE PLATE 58
2. BORINGS WERE TAKEN WITH A HAND AUGER OR SPLIT SPOON.

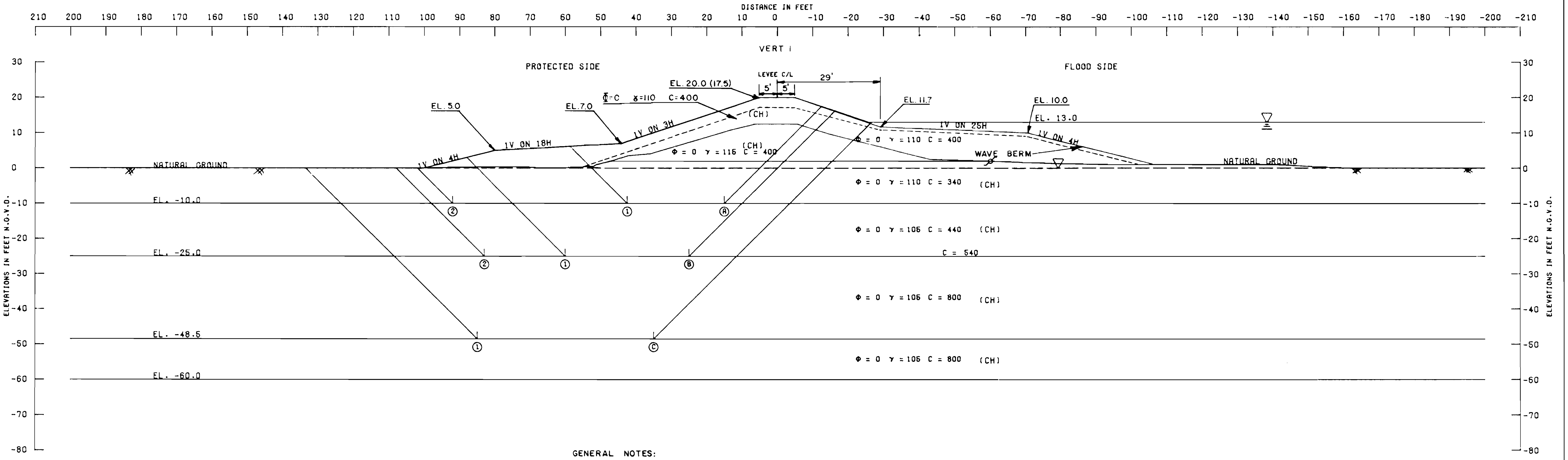
LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO.16 - GENERAL DESIGN

NEW ORLEANS EAST LEVEE
SOUTH POINT TO G.I.W.W.

BORROW BORING LOGS

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

DATE APRIL 1987 FILE NO. H-2-30236



ASSUMED FAILURE SURFACE		RESISTING FORCES			DRIVING FORCES		SUMMATION OF FORCES		FACTOR OF SAFETY
NO.	ELEV.	R_A	R_B	R_P	D_A	$-D_P$	RESISTING	DRIVING	
A 1	-10.0	20499	9350	11693	47123	15255	41542	31868	1.30
A 2	-10.0	20499	26180	6800	47123	6378	53479	40745	1.31
B 1	-25.0	32668	18900	22362	101762	49055	73930	52707	1.40
B 2	-25.0	32668	31320	20000	101762	37781	83988	63981	1.31
C 1	-48.5	67483	40000	57600	228652	128755	165083	99897	1.65

GENERAL NOTES:

1. CLASSIFICATION, STRATIFICATION, SHEAR STRENGTHS AND UNIT WEIGHTS OF THE SOIL WERE BASED ON THE RESULTS OF UNDISTURBED BORINGS. SEE PLATE 38.
2. CROWN ELEVATION LISTED AS GROSS(NET).

NOTES

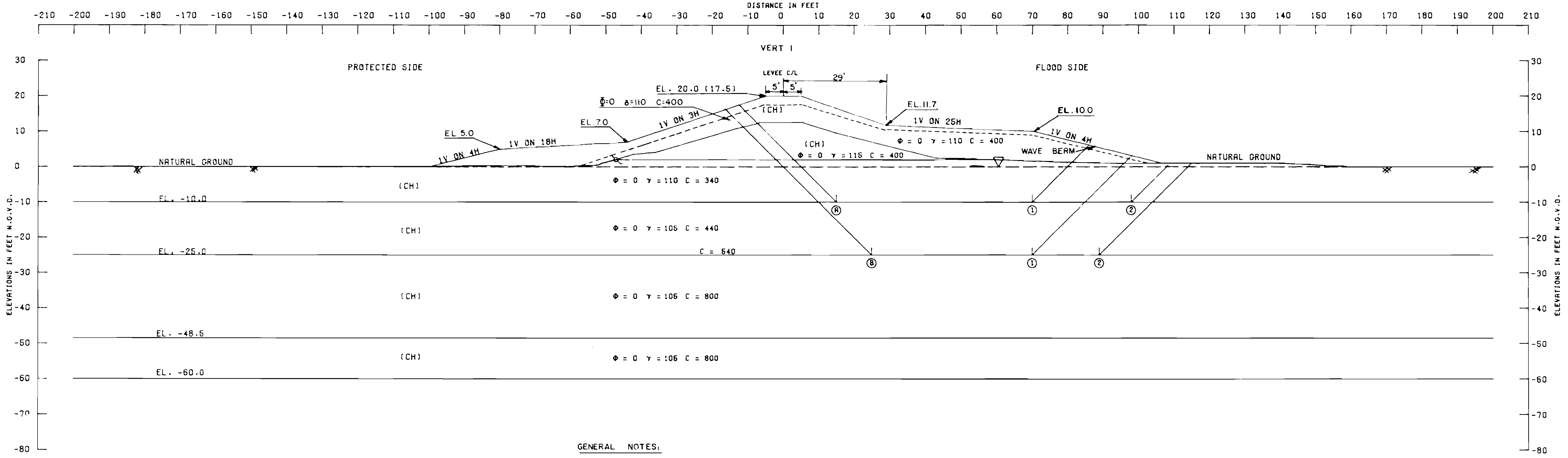
Φ -- ANGLE OF INTERNAL FRICTION, DEGREES
C -- UNIT COHESION, P.S.F.
∇ -- STATIC WATER SURFACE
D -- HORIZONTAL DRIVING FORCE IN POUNDS
R -- HORIZONTAL RESISTING FORCE IN POUNDS
A -- AS A SUBSCRIPT, REFERS TO ACTIVE WEDGE
B -- AS A SUBSCRIPT, REFERS TO CENTRAL BLOCK
P -- AS A SUBSCRIPT, REFERS TO PASSIVE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

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

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 16, GENERAL DESIGN
NEW ORLEANS EAST LEVEE
SOUTH POINT TO GIWW

PROTECTED SIDE STABILITY
STA. 1065+00 TO STA. 1101+90

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS, LA.
CORPS OF ENGINEERS
APRIL 1987 FILE NO. H-2-30236



GENERAL NOTES:

1. CLASSIFICATION, STRATIFICATION, SHEAR STRENGTHS AND UNIT WEIGHTS OF THE SOIL WERE BASED ON THE RESULTS OF UNDISTURBED BORINGS. SEE PLATE 38.
2. CROWN ELEVATION LISTED AS GROSS(NET).

ASSUMED FAILURE NO.	SURFACE ELEV.	RESISTING FORCES R_A	R_B	R_P	DRIVING FORCES D_A	$-D_P$	SUMMATION OF FORCES RESISTING	DRIVING	FACTOR OF SAFETY
Ⓐ ①	-10.0	20562	18700	11526	47045	17813	50788	29232	1.74
Ⓐ ②	-10.0	20562	28220	7480	47045	7647	56262	39398	1.43
Ⓑ ①	-25.0	32762	24300	22368	101462	53712	79430	47750	1.66
Ⓑ ②	-25.0	32762	34560	20680	101462	40824	88002	60638	1.45

NOTES

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

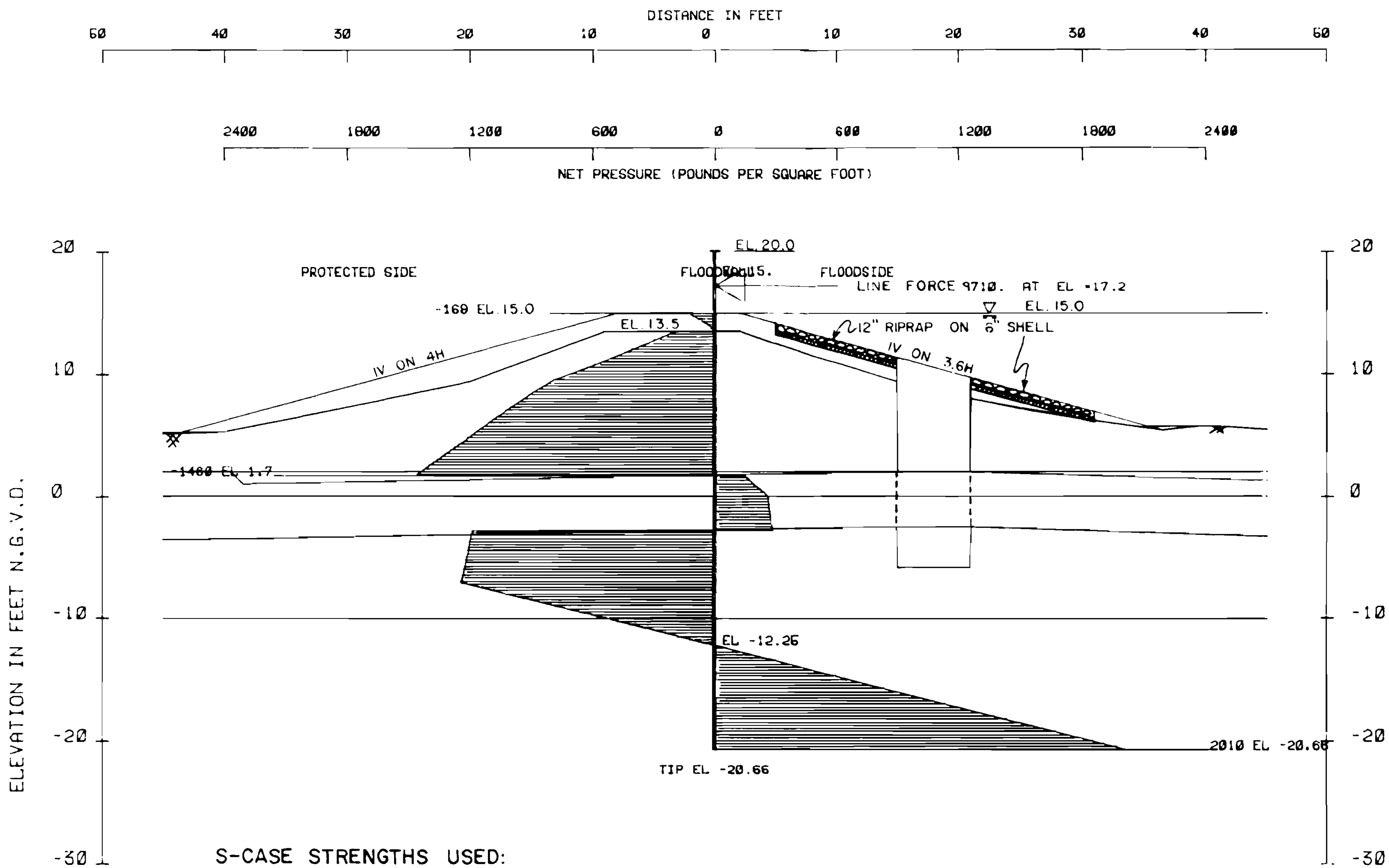
$$\text{FACTOR OF SAFETY} = \frac{R_A + R_B + R_P}{D_A - D_P}$$

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 16, GENERAL DESIGN
NEW ORLEANS EAST LEVEE
SOUTH POINT TO GIWW

FLOOD SIDE STABILITY

STA. 1065 + 00 TO STA. 1101 + 90

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS, LA.
CORPS OF ENGINEERS
APRIL 1987 FILE NO. H-2-30236



ELEVATION	PRESSURE
15.00	0.0
14.99	0.6
14.99	0.0
14.98	-2.5
14.98	-0.7
14.97	-167.7
14.96	-153.7
14.96	-131.4
13.96	-28.8
13.50	0.0
13.60	-191.1
9.50	-781.8
8.50	-886.1
7.60	-976.6
6.60	-1062.8
4.50	-1227.6
3.50	-1315.6
2.00	-1439.3
1.70	-1459.7
1.70	138.8
0.00	259.3
-2.80	281.2
-2.79	-1182.9
-7.06	-1239.1
-12.25	0.0
-20.66	2009.7
-20.66	0.0

S-CASE STRENGTHS USED:

CH Ø=23 C=0
ML Ø=30 C=0
SM Ø=30 C=0
SP Ø=33 C=0

SEE PLATE 34 FOR SOIL CLASSIFICATION STRATIFICATION, AND UNIT WEIGHTS.

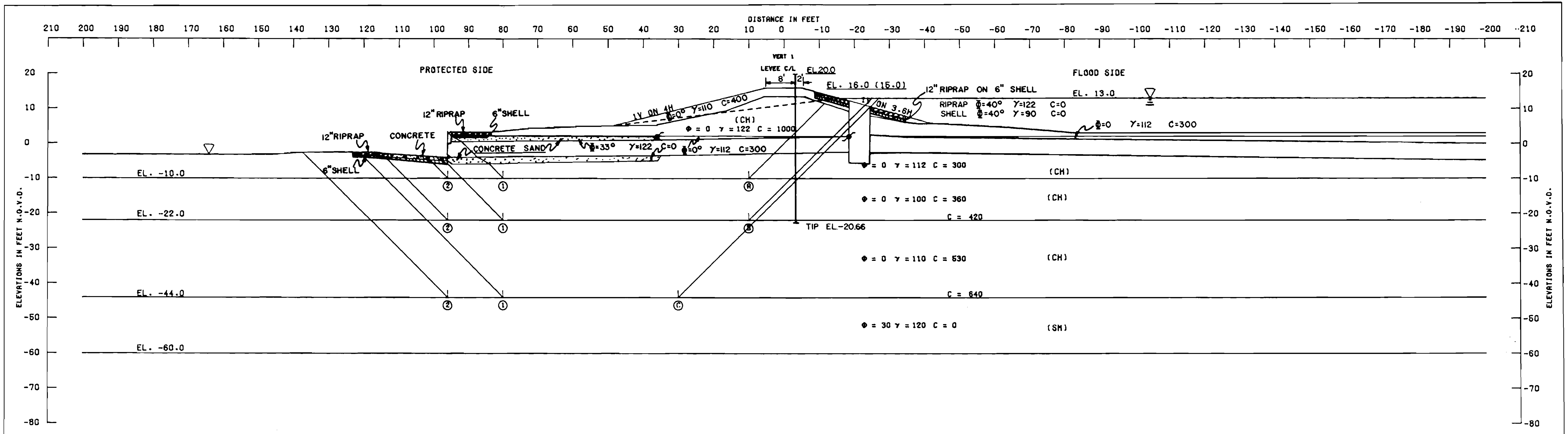
NET DIAGRAM

(S) CASE F.S.=1.25

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 16, GENERAL DESIGN
NEW ORLEANS EAST LEVEE
SOUTH POINT TO GIWW

CANTILEVER SHEETPILE ANALYSIS
STRUCTURE AT STA. 1054+00

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS, LA.
CORPS OF ENGINEERS
APRIL 1987 FILE NO. H-2-30236



ASSUMED FAILURE SURFACE		RESISTING FORCES			DRIVING FORCES		SUMMATION OF FORCES		FACTOR OF SAFETY
NO.	ELEV.	R_A	R_B	R_P	D_A	$-D_P$	RESISTING	DRIVING	
A 1	-10.0	23277	21000	3675	34705	7998	47952	26707	1.80
A 2	-10.0	23277	25800	2988	34705	2299	52065	32406	1.61
B 1	-22.0	23643	29400	11528	68725	27064	64571	41661	1.55
B 2	-22.0	23643	36120	12300	68725	18800	72063	49925	1.44
C 1	-44.0	42960	32000	35796	170330	97230	110756	73100	1.52
C 2	-44.0	42960	42240	36421	170330	90226	121621	80104	1.52

GENERAL NOTES:

1. CLASSIFICATION, STRATIFICATION, SHEAR STRENGTHS AND UNIT WEIGHTS OF THE SOIL WERE BASED ON THE RESULTS OF UNDISTURBED BORINGS. SEE PLATE 34.
2. CROWN ELEVATION LISTED AS GROSS(NET).

NOTES

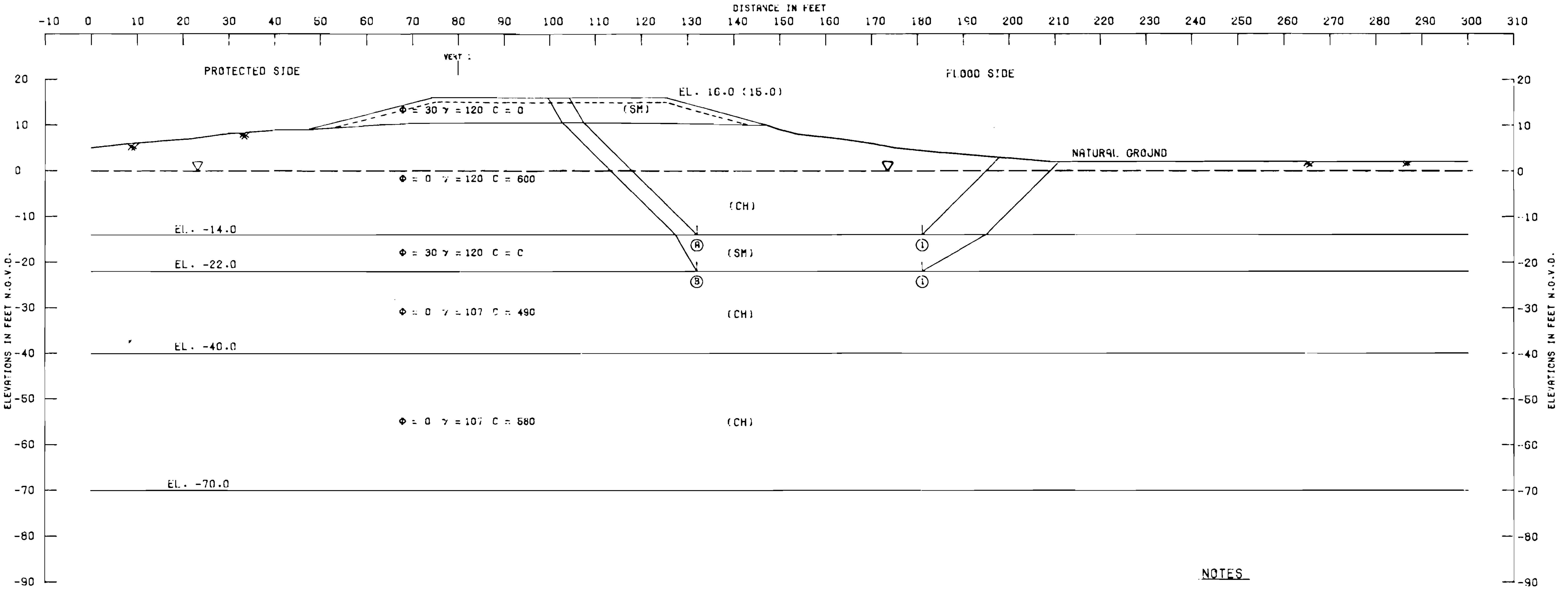
Φ -- ANGLE OF INTERNAL FRICTION, DEGREES
C -- UNIT COHESION, P.S.F.
∇ -- STATIC WATER SURFACE
D -- HORIZONTAL DRIVING FORCE IN POUNDS
R -- HORIZONTAL RESISTING FORCE IN POUNDS
A -- AS A SUBSCRIPT, REFERS TO ACTIVE WEDGE
B -- AS A SUBSCRIPT, REFERS TO CENTRAL BLOCK
P -- AS A SUBSCRIPT, REFERS TO PASSIVE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

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

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 16, GENERAL DESIGN
NEW ORLEANS EAST LEVEE
SOUTH POINT TO GIWW

STABILITY ANALYSIS
I-WALL AT STA. 1054+00

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS, LA.
CORPS OF ENGINEERS
APRIL 1987 FILE NO. H-2-30236



ASSUMED FAILURE SURFACE		RESISTING FORCES			DRIVING FORCES		SUMMATION OF FORCES		FACTOR OF SAFETY
NO.	ELEV.	R_A	R_B	R_P	D_A	$-D_P$	RESISTING	DRIVING	
A 1	-14.0	30846	29400	20307	53193	18629	80553	34564	2.32
B 1	-22.0	45610	28420	42987	85312	37253	117017	48059	2.43

GENERAL NOTES:

1. CLASSIFICATION, STRATIFICATION, SHEAR STRENGTHS AND UNIT WEIGHTS OF THE SOIL WERE BASED ON THE RESULTS OF UNDISTURBED BORINGS. SEE PLATE 28.
2. CROWN ELEVATION LISTED AS GROSS(NET).

NOTES

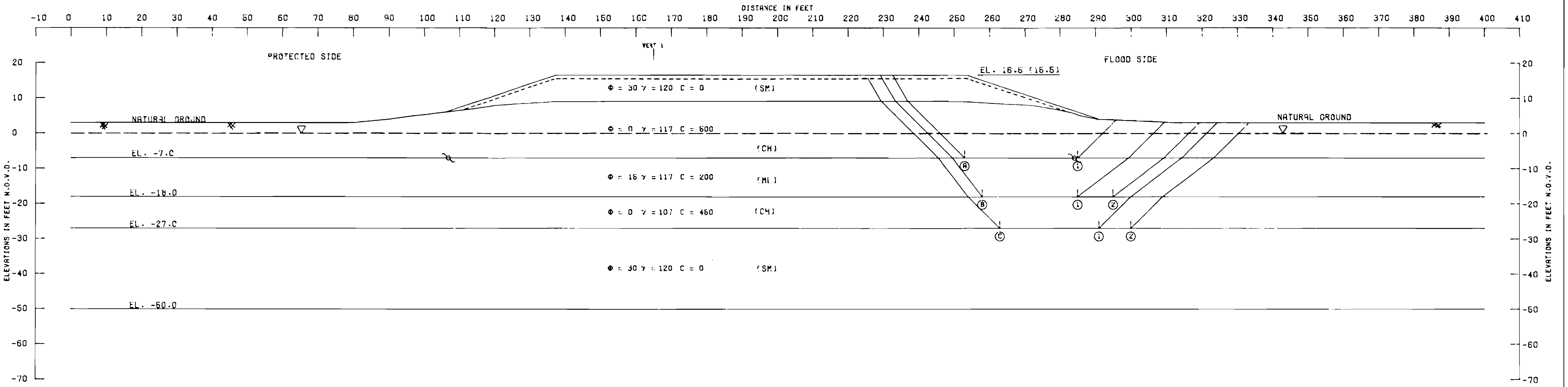
Φ -- ANGLE OF INTERNAL FRICTION, DEGREES
C -- UNIT COHESION, P.S.F.
∇ -- STATIC WATER SURFACE
D -- HORIZONTAL DRIVING FORCE IN POUNDS
R -- HORIZONTAL RESISTING FORCE IN POUNDS
A -- AS A SUBSCRIPT, REFERS TO ACTIVE WEDGE
B -- AS A SUBSCRIPT, REFERS TO CENTRAL BLOCK
P -- AS A SUBSCRIPT, REFERS TO PASSIVE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

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

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 16, GENERAL DESIGN
NEW ORLEANS EAST LEVEE
SOUTH POINT TO GIWW

RAMPS (Q) SHEAR STABILITY
HWY. 11

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS, LA.
CORPS OF ENGINEERS
APRIL 1987 FILE NO. H-2-30236



ASSUMED FAILURE SURFACE		RESISTING FORCES			DRIVING FORCES		SUMMATION OF FORCES		FACTOR OF SAFETY
NO.	ELEV.	R_A	R_B	R_P	D_A	$-D_P$	RESISTING	DRIVING	
Ⓐ ①	-7.0	18331	15990	10797	32743	7726	45118	25018	1.80
Ⓑ ①	-18.0	33400	12160	26041	69783	27986	70597	41797	1.69
Ⓑ ②	-18.0	33400	16660	24126	69783	26616	74182	43266	1.71
Ⓒ ①	-27.0	41719	12600	32031	109369	53473	86360	55896	1.64
Ⓒ ②	-27.0	41719	16660	31798	109369	52727	90107	56642	1.59

GENERAL NOTES:

1. CLASSIFICATION AND STRATIFICATION WERE BASE ON GENERAL BORING 8-SP. SHEAR STRENGTHS AND UNIT WEIGHTS OF THE SOIL WERE BASED ON THE RESULTS OF UNDISTURBED BORING 2-USP. FOR REFERENCE SEE DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN SUPPLEMENT NO. 9, NEW ORLEANS EAST LEVEE SOUTH POINT TO GIWW, PLATE 21, DATED JAN 1973.
2. CROWN ELEVATION LISTED AS GROSS (NET).

NOTES

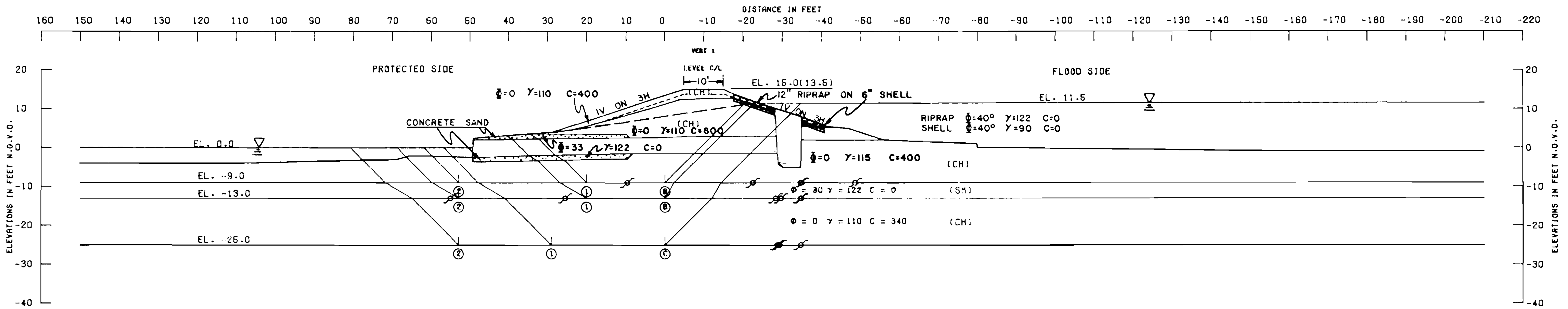
Φ -- ANGLE OF INTERNAL FRICTION, DEGREES
C -- UNIT COHESION, P.S.F.
▽ - STATIC WATER SURFACE
D -- HORIZONTAL DRIVING FORCE IN POUNDS
R -- HORIZONTAL RESISTING FORCE IN POUNDS
A -- AS A SUBSCRIPT, REFERS TO ACTIVE WEDGE
B -- AS A SUBSCRIPT, REFERS TO CENTRAL BLOCK
P - AS A SUBSCRIPT, REFERS TO PASSIVE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

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

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 16, GENERAL DESIGN
NEW ORLEANS EAST LEVEE
SOUTH POINT TO GIWW

RAMPS (Q) SHEAR STABILITY
HWY. 90

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS, LA.
CORPS OF ENGINEERS
APRIL 1987 FILE NO. H-2-30236



ASSUMED FAILURE SURFACE		RESISTING FORCES			DRIVING FORCES		SUMMATION OF FORCES		FACTOR OF SAFETY
NO.	ELEV.	R_A	R_B	R_P	D_A	$-D_P$	RESISTING	DRIVING	
A 1	-9.0	17858	7176	4585	26186	6810	29619	19376	1.53
A 2	-9.0	17858	13258	5467	26186	3718	36583	22468	1.63
B 1	-13.0	19991	6800	8435	35335	11758	35226	23577	1.49
B 2	-13.0	19991	17298	9088	35335	8414	46357	26921	1.72
C 1	-25.0	20804	9860	16594	70645	35616	47258	35029	1.35
C 2	-25.0	20804	18020	16376	70645	32789	55200	37856	1.46

GENERAL NOTES:

1. CLASSIFICATION, STRATIFICATION, SHEAR STRENGTHS AND UNIT WEIGHTS OF THE SOIL WERE BASED ON THE RESULTS OF UNDISTURBED BORINGS. SEE PLATE 27.
2. CROWN ELEVATION LISTED AS GROSS(NET).
3. STABILITY ANALYSES WERE PERFORMED FOR THE STRUCTURE FAILING TOWARDS BOTH THE FLOOD SIDE AND THE PROTECTED SIDE. ONLY THE MOST CRITICAL ANALYSIS IS PRESENTED.

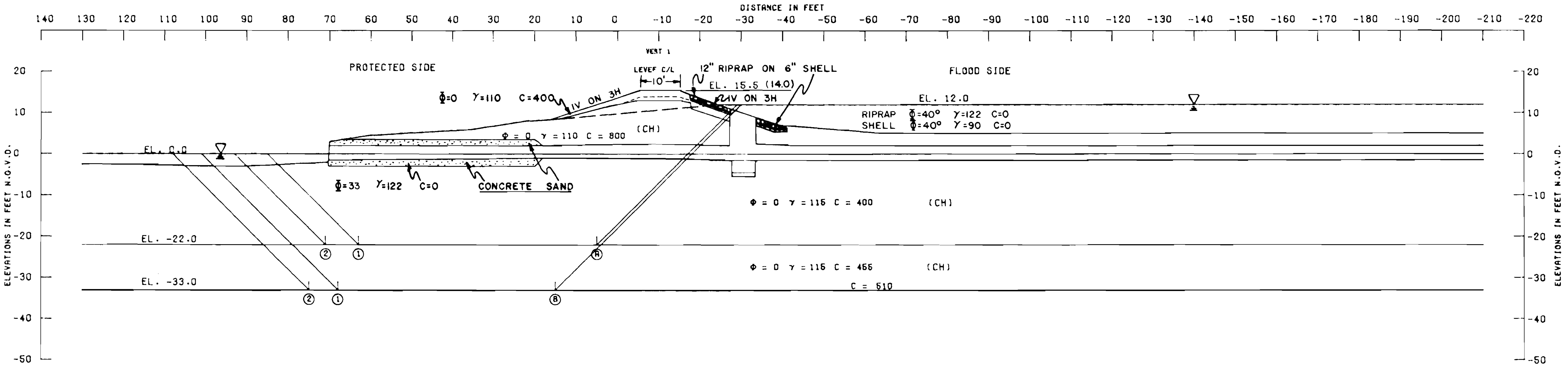
NOTES

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

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

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 16, GENERAL DESIGN
NEW ORLEANS EAST LEVEE
SOUTH POINT TO GIWW
DRAINAGE STRUCTURES (Q)
SHEAR STABILITY
STA. 664 + 99

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS, LA.
CORPS OF ENGINEERS
APRIL 1987 FILE NO. H-2-30236



ASSUMED FAILURE SURFACE		RESISTING FORCES			DRIVING FORCES		SUMMATION OF FORCES		FACTOR OF SAFETY
NO.	ELEV.	R_A	R_B	R_P	D_A	$-D_P$	RESISTING	DRIVING	
A 1	-22.0	16668	23200	15505	67733	27006	55373	40727	1.36
A 2	-22.0	16668	26400	15200	67733	25079	58268	42654	1.37
B 1	-33.0	26656	27030	25210	110169	58653	78896	51516	1.53
B 2	-33.0	26656	30600	25313	110169	57968	82569	52201	1.58

GENERAL NOTES:

1. CLASSIFICATION, STRATIFICATION, SHEAR STRENGTHS AND UNIT WEIGHTS OF THE SOIL WERE BASED ON THE RESULTS OF UNDISTURBED BORINGS. SEE PLATE 29.
2. CROWN ELEVATION LISTED AS GROSS(NET).
3. STABILITY ANALYSES WERE PERFORMED FOR THE STRUTURE FAILING TOWARDS BOTH THE FLOOD SIDE AND THE PROTECTED SIDE. ONLY THE MOST CRITICAL ANALYSIS IS PRESENTED.

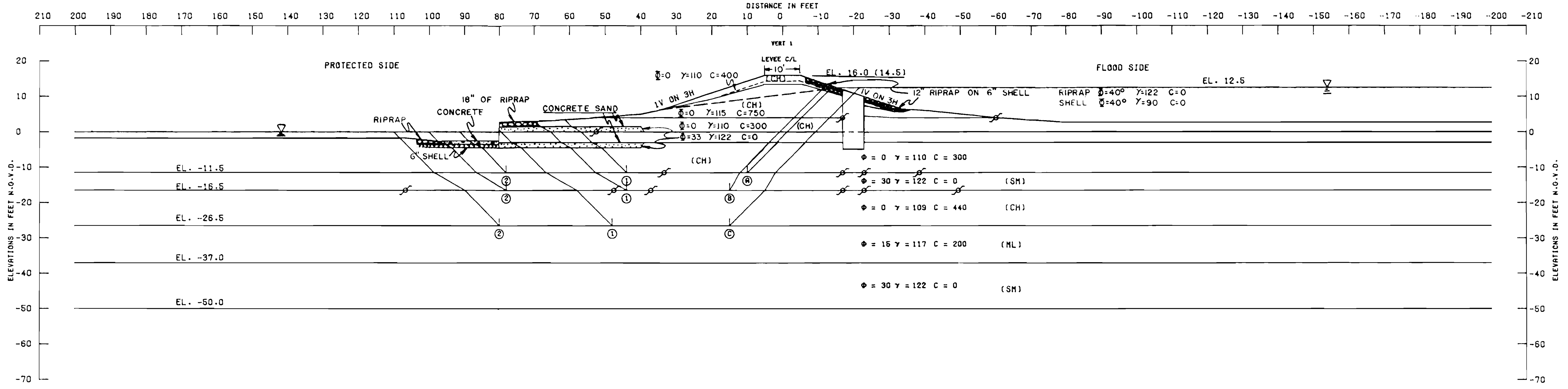
NOTES

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

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

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 16, GENERAL DESIGN
NEW ORLEANS EAST LEVEE
SOUTH POINT TO GIWW
DRAINAGE STRUCTURES (Q)
SHEAR STABILITY
STA. 798 + 98

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS, LA.
CORPS OF ENGINEERS
APRIL 1987 FILE NO. H-2-30236



ASSUMED FAILURE SURFACE		RESISTING FORCES			DRIVING FORCES		SUMMATION OF FORCES		FACTOR OF SAFETY
NO.	ELEV.	R_A	R_B	R_P	D_A	$-D_P$	RESISTING	DRIVING	
A 1	-11.5	19396	9952	7660	36811	10378	37008	26433	1.40
A 2	-11.5	19396	18395	4535	36811	6307	42326	30504	1.39
B 1	-16.5	24469	12740	12745	50462	18212	49954	32250	1.55
B 2	-16.5	24469	27009	9699	50462	13394	61177	37068	1.65
C 1	-26.5	27124	14520	19601	85398	42344	61245	43054	1.42
C 2	-26.5	27124	28600	20384	85398	36470	76108	48928	1.56

GENERAL NOTES:

1. CLASSIFICATION, STRATIFICATION, SHEAR STRENGTHS AND UNIT WEIGHTS OF THE SOIL WERE BASED ON THE RESULTS OF UNDISTURBED BORINGS. SEE PLATE 31.
2. CROWN ELEVATION LISTED AS GROSS(NET).
3. STABILITY ANALYSES WERE PERFORMED FOR THE STRUCTURE FAILING TOWARDS BOTH THE FLOOD SIDE AND THE PROTECTED SIDE. ONLY THE MOST CRITICAL ANALYSIS IS PRESENTED.

NOTES

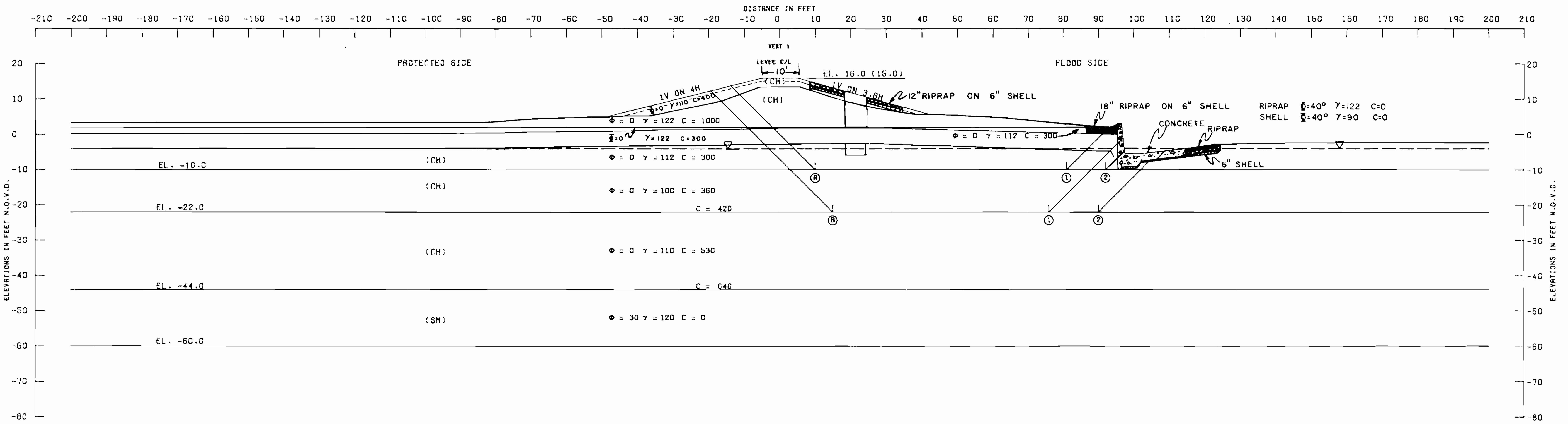
Φ -- ANGLE OF INTERNAL FRICTION, DEGREES
C -- UNIT COHESION, P.S.F.
∇ -- STATIC WATER SURFACE
D -- HORIZONTAL DRIVING FORCE IN POUNDS
R -- HORIZONTAL RESISTING FORCE IN POUNDS
A -- AS A SUBSCRIPT, REFERS TO ACTIVE WEDGE
B -- AS A SUBSCRIPT, REFERS TO CENTRAL BLOCK
P -- AS A SUBSCRIPT, REFERS TO PASSIVE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

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

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 16, GENERAL DESIGN
NEW ORLEANS EAST LEVEE
SOUTH POINT TO GIWW

DRAINAGE STRUCTURES (Q)
SHEAR STABILITY
STA. 927 + 00

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS, LA.
CORPS OF ENGINEERS
APRIL 1987 FILE NO. H-2-30236



ASSUMED FAILURE SURFACE		RESISTING FORCES			DRIVING FORCES		SUMMATION OF FORCES		FACTOR OF SAFETY
NO.	ELEV.	R_A	R_B	R_P	D_A	$-D_P$	RESISTING	DRIVING	
A 1	-10.0	25203	21300	4086	33151	4706	50589	28445	1.78
A 2	-10.0	25203	24600	1724	33151	3252	51527	29899	1.72
B 1	-22.0	30454	25620	11758	66820	22558	67832	44262	1.53
B 2	-22.0	30454	31500	10486	66820	18089	72440	48731	1.49

GENERAL NOTES:

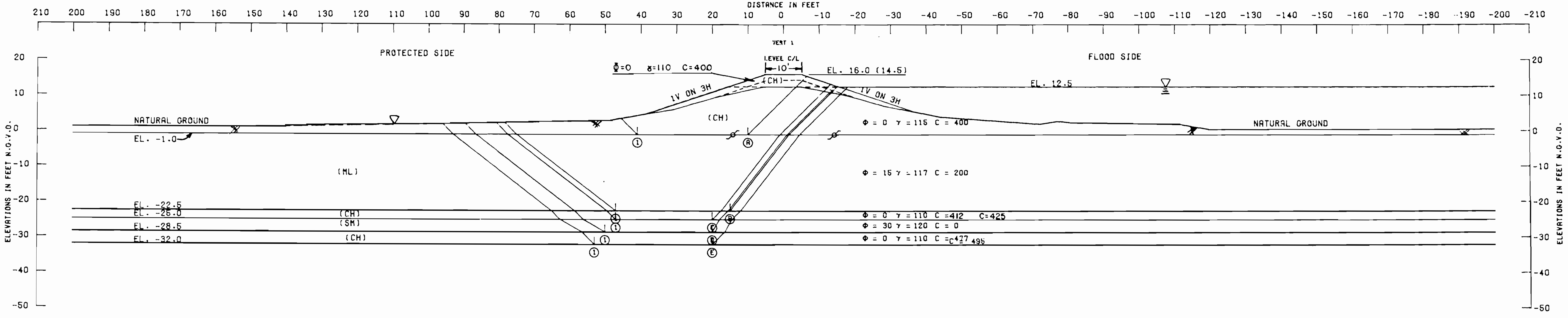
1. CLASSIFICATION, STRATIFICATION, SHEAR STRENGTHS AND UNIT WEIGHTS OF THE SOIL WERE BASED ON THE RESULTS OF UNDISTURBED BORINGS. SEE PLATE 34.
2. CROWN ELEVATION LISTED AS GROSS(NET).
3. STABILITY ANALYSES WERE PERFORMED FOR THE STRUCTURE FAILING TOWARDS BOTH THE FLOOD SIDE AND THE PROTECTED SIDE. ONLY THE MOST CRITICAL ANALYSIS IS PRESENTED.

NOTES

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

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

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 16, GENERAL DESIGN
NEW ORLEANS EAST LEVEE
SOUTH POINT TO GIWW
DRAINAGE STRUCTURES (Q)
SHEAR STABILITY
STA. 1054 + 00
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS, LA.
CORPS OF ENGINEERS
APRIL 1987 FILE NO. H-2-30236



ASSUMED FAILURE NO.	SURFACE ELEV.	RESISTING FORCES R_A	R_B	R_P	DRIVING FORCES D_A	$-D_P$	SUMMATION OF FORCES RESISTING	DRIVING	FACTOR OF SAFETY
A 1	-1.0	13200	10573	3633	15822	1403	27406	14419	1.90
B 1	-22.5	31338	12800	25526	80042	36938	69664	43104	1.62
C 1	-25.0	33512	11475	27600	89695	44573	72587	45122	1.61
D 1	-28.5	38127	13800	38463	105781	56011	90390	49770	1.82
E 1	-32.0	41544	16335	41527	123614	68983	99406	54631	1.82

GENERAL NOTES:

1. CLASSIFICATION, STRATIFICATION, SHEAR STRENGTHS AND UNIT WEIGHTS OF THE SOIL WERE BASED ON THE RESULTS OF UNDISTURBED BORINGS. SEE PLATE 37.
2. CROWN ELEVATION LISTED AS GROSS(NET).

NOTES

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

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

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 16, GENERAL DESIGN
NEW ORLEANS EAST LEVEE
SOUTH POINT TO GIWW

UTILITY LINE STABILITY
STA. 938 + 87 AND STA. 938 + 78

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS, LA.
CORPS OF ENGINEERS
APRIL 1987 FILE NO. H-2-30236

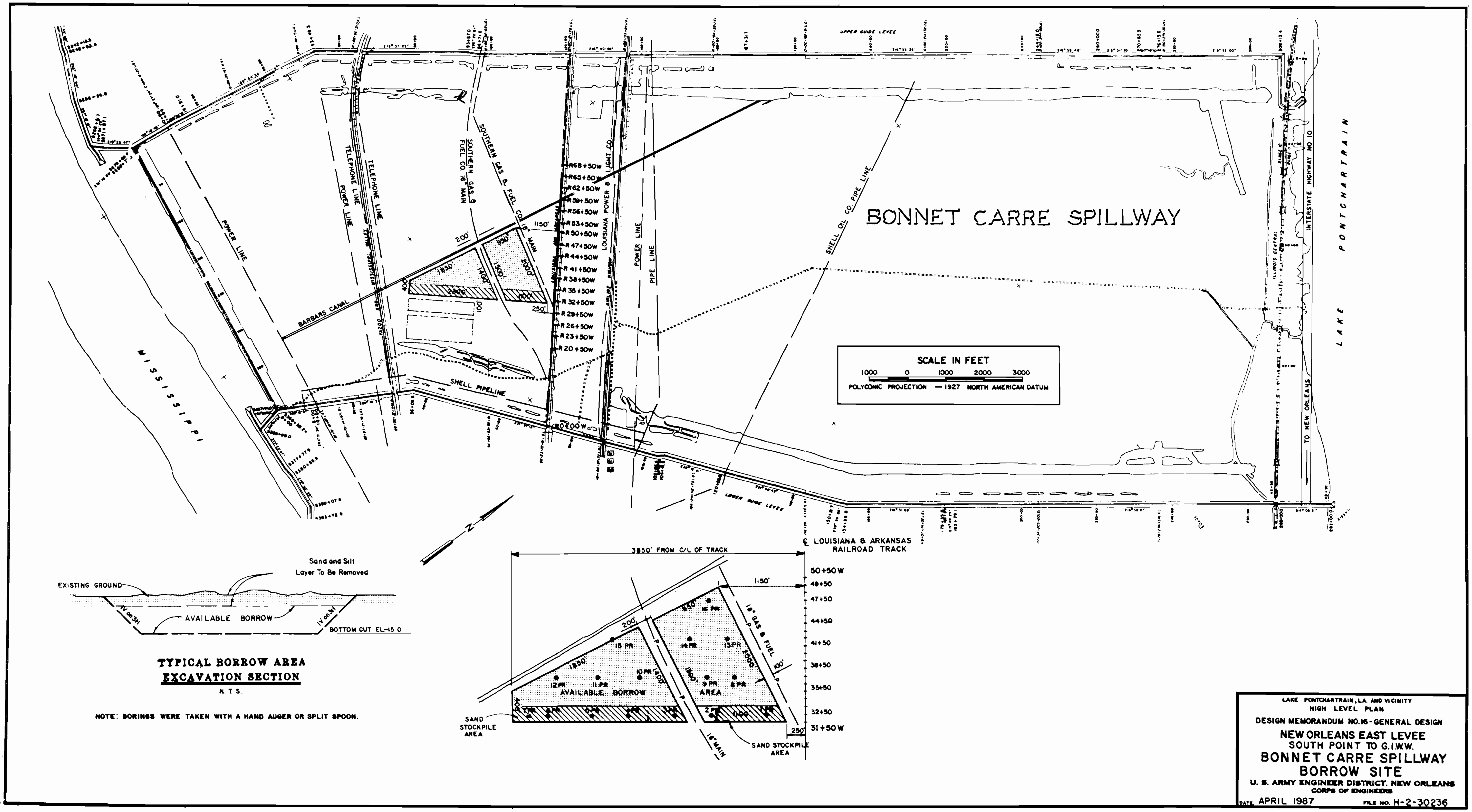

BONNET CARRE SPILLWAY
MISSISSIPPI
LAKE PONTCHARTRAIN
POWER LINE
TELEPHONE LINE
POWER LINE
TELEPHONE LINE
SOUTHERN GAS & FUEL CO. 16" MAIN
SOUTHERN GAS & FUEL CO. 18" MAIN
LOUISIANA POWER & LIGHT CO.
POWER LINE
PIPE LINE
SHELL OIL CO. PIPE LINE
SHELL PIPELINE
BARBARS CANAL
UPPER GUIDE LEVEE
LOWER GUIDE LEVEE
INTERSTATE HIGHWAY NO. 10
TO NEW ORLEANS
ILLINOIS CENTRAL
SCALE IN FEET
1000 0 1000 2000 3000
POLYCONIC PROJECTION — 1927 NORTH AMERICAN DATUM
R 68+50W
R 65+50W
R 62+50W
R 59+50W
R 56+50W
R 53+50W
R 50+50W
R 47+50W
R 44+50W
R 41+50W
R 38+50W
R 35+50W
R 32+50W
R 29+50W
R 26+50W
R 23+50W
R 20+50W
R 0+00W
N
Sand and Silt
Layer To Be Removed
EXISTING GROUND
AVAILABLE BORROW
1V on 3H
1V on 3H
BOTTOM CUT EL-15.0
TYPICAL BORROW AREA
EXCAVATION SECTION
N.T.S.
NOTE: BORINGS WERE TAKEN WITH A HAND AUGER OR SPLIT SPOON.
3850' FROM C/L OF TRACK
℄ LOUISIANA & ARKANSAS
RAILROAD TRACK
1150'
200'
250'
1850'
1400'
1500'
2000'
400'
100'
18" GAS & FUEL
16" MAIN
AVAILABLE BORROW
AREA
SAND STOCKPILE AREA
SAND STOCKPILE AREA
50+50 W
49+50
47+50
44+50
41+50
38+50
35+50
32+50
31+50 W
LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 16 - GENERAL DESIGN
NEW ORLEANS EAST LEVEE
SOUTH POINT TO G.I.W.W.
BONNET CARRE SPILLWAY
BORROW SITE
U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
DATE APRIL 1987
FILE NO. H-2-30236

PLATE 58

UNIFIED SOIL CLASSIFICATION

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

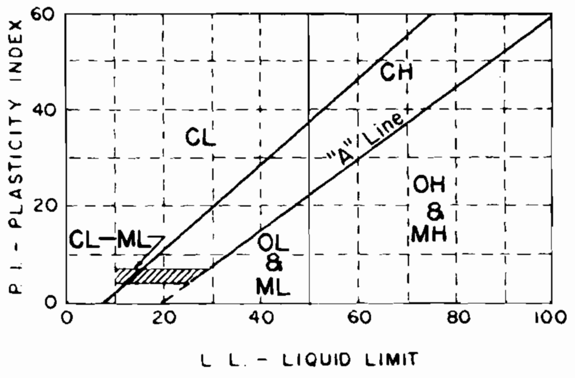
NOTE: Soils possessing characteristics of two groups are designated by combinations of group symbols

DESCRIPTIVE SYMBOLS

COLOR	SYMBOL
TAN	T
YELLOW	Y
RED	R
BLACK	BK
GRAY	Gr
LIGHT GRAY	lGr
DARK GRAY	dGr
BROWN	Br
LIGHT BROWN	lBr
DARK BROWN	dBr
BROWNISH-GRAY	br Gr
GRAYISH-BROWN	gy Br
GREENISH-GRAY	gn Gr
GRAYISH-GREEN	gy Gn
GREEN	Gn
BLUE	Bl
BLUE-GREEN	Bl Gn
WHITE	Wh
MOTTLED	Mot

CONSISTENCY FOR COHESIVE SOILS

CONSISTENCY	COHESION IN LBS./SQ. FT. FROM UNCONFINED COMPRESSION TEST	SYMBOL
VERY SOFT	< 250	vSo
SOFT	250 - 500	So
MEDIUM	500 - 1000	M
STIFF	1000 - 2000	St
VERY STIFF	2000 - 4000	vSt
HARD	> 4000	H



PLASTICITY CHART
For classification of fine-grained soils

MODIFICATIONS

MODIFICATION	SYMBOL
Traces	Tr-
Fine	F
Medium	M
Coarse	C
Concretions	cc
Rootlets	rt
Lignite fragments	lg
Shale fragments	sh
Sandstone fragments	sds
Shell fragments	slf
Organic matter	O
Clay strata or lenses	CS
Silt strata or lenses	SIS
Sand strata or lenses	SS
Sandy	S
Gravelly	G
Boulders	B
Slickensides	SL
Wood	Wd
Oxidized	Ox

NOTES:

FIGURES TO LEFT OF BORING UNDER COLUMN "W OR D_{10}"

Are natural water contents in percent dry weight

When underlined denotes D_{10} size in mm*

FIGURES TO LEFT OF BORING UNDER COLUMNS "LL" AND "PL"

Are liquid and plastic limits, respectively

SYMBOLS TO LEFT OF BORING

- ▽ Ground-water surface and date observed
- Ⓒ Denotes location of consolidation test**
- Ⓢ Denotes location of consolidated-drained direct shear test**
- Ⓡ Denotes location of consolidated-undrained triaxial compression test**
- Ⓠ Denotes location of unconsolidated-undrained triaxial compression test**
- Ⓣ Denotes location of sample subjected to consolidation test and each of the above three types of shear tests**
- FW Denotes free water encountered in boring or sample

FIGURES TO RIGHT OF BORING

Are values of cohesion in lbs./sq. ft. from unconfined compression tests

In parenthesis are driving resistances in. blows per foot determined with a standard split spoon sampler ($1\frac{3}{8}$" I.D., 2" O.D.) and a 140 lb. driving hammer with a 30" drop

Where underlined with a solid line denotes laboratory permeability in centimeters per second of undisturbed sample

Where underlined with a dashed line denotes laboratory permeability in centimeters per second of sample remoulded to the estimated natural void ratio

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

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

TYPICAL NOTES

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

Ground-water elevations shown on the boring logs represents ground-water surfaces encountered in such borings on the dates shown. Absence of water surface data on certain borings indicates that no ground-water data are available from the boring but does not necessarily mean that ground-water will not be encountered at the locations or within the vertical reaches of such borings.

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

SOIL BORING LEGEND

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

1 JUNE 1987 FILE NO. H-2-21800

PLATE A

LAKE PONTCHARTRAIN, LOUISIANA AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 16 - GENERAL DESIGN
NEW ORLEANS EAST LEVEE
SOUTH POINT TO GIWW

APPENDIX A

HYDROLOGY AND HYDRAULICS

Lake Pontchartrain, Louisiana and Vicinity
High Level Plan
Design Memorandum No. 16 General Design
New Orleans East Levee
South Point to GIWW
Hydrology and Hydraulics

Appendix A

TABLE OF CONTENTS

TABLE OF CONTENTS (cont'd)

PLATES

TABLE OF CONTENTS (cont'd)

TABLES

LAKE PONTCHARTRAIN, LOUISIANA AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORADUM NO. 16, GENERAL DESIGN
SOUTH POINT TO GIWW LEVEE

APPENDIX A
HYDROLOGY AND HYDRAULICS

ANALYSIS

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

A-2. Description.

The project area is located in southeastern Louisiana in the vicinity of New Orleans. The dominant topographic feature is Lake Pontchartrain, a shallow tidal basin approximately 640 square miles in area and averaging 12 feet in depth. Lake Pontchartrain is connected to the Gulf of Mexico through the Rigolets and Chef Menteur Pass, Lake Borgne and the Mississippi and Chandeleur Sounds.

The levee of interest forms the eastern side of the ring of protection levees surrounding the eastern New Orleans metropolitan area. To the west of this levee the deep channels of the Rigolets and Chef Menteur Passes provide the normal tidal flows and discharge of tributary flow for Lake Pontchartrain. These channels are also susceptible to flooding from wind driven hurricane tides emanating from the Gulf of Mexico. A hurricane surge can enter Lake Pontchartrain through the Rigolets and Chef Menteur Passes, and also the Inner Harbor Navigation Canal, raising the average lake level by as much as 6 feet. This hurricane surge overtops the highway and railroad embankments and impinges on the South Point GIWW levee. This situation can occur in reverse if the hurricane track causes a lower gulf level and allows wind stress to force water out of Lake Pontchartrain.

Terrain adjacent to this levee is generally characteristic of Louisiana marshland, having elevations of approximately 1 foot. Higher elevations exist at the U.S. Highway 90 embankment. The protected area adjacent to this levee is predominantly undeveloped wetlands. A wildlife sanctuary is currently proposed for a part of the undeveloped area south of I-10. Drainage from the protected area is through several gravity drainage structures which usually remain open to allow the ebb and flow of tides. When high stages threaten, these structures are closed to prevent flooding inside the leveed area.

The new levee, which is in fact an enlargement of the existing system, will protect the area to its west from inundation by Gulf of Mexico or Lake Pontchartrain flood waters. The study area is depicted on Plate A-1.

A-3. Climatology.

a. Climate. The project area is located in a subtropical latitude having mild winters and hot, humid summers. During the summer, prevailing southerly winds produce conditions favorable for convective thundershowers. In the colder seasons, the area experiences frontal passages which produce squalls and sudden temperature drops. River fogs are prevalent in the winter and spring when the temperature of the Mississippi River is somewhat colder than the air temperature. Climatological data for the area are contained in monthly and annual publications by the U.S. Department of Commerce, Weather Bureau, titled "Climatological Data for Louisiana, and "Local Climatological Data, New Orleans, La." Table A-1 lists active meteorological stations in and adjacent to the study area. These stations are also shown on the map in Plate A-2.

TABLE A-1
METEOROLOGIC STATIONS

MAP INDEX NO. (PLATE A-2)	PRECIPITATION & TEMPERATURE STATIONS	LENGTH OF RECORDS (YRS.) TO 1985 Precipitation	Temperature
1	NEW ORLEANS - AUDUBON - PARK	97	97
2	NEW ORLEANS - MOISANT AIRPORT	33	33
3	RESERVE (NR)	85	85
4	SLIDELL	30	30
5	DONALDSONVILLE (NR)	97	98
6	LOUISIANA NATURE CENTER	7	7
7	PARADIS (NR)	72	32
OMS	HAMMOND (NR)	90	91
OMS	ST. BERNARD (NR)	21	21
OMS	COVINGTON	93	93
OMS	CARVILLE (NR)	48	47
OMS	BATON ROUGE AIRPORT	118	98
	RECORDING PRECIPITATION STATIONS		
8	NEW ORLEANS ALGIERS	87	-
9	NEW ORLEANS DPS 14 - CITRUS	32	-
10	NEW ORLEANS WATER PLANT - DUBLIN	93	-
11	NEW ORLEANS DPS 5 - JOURDAN	53	-
12	NEW ORLEANS DPS 3 - LONDON	93	-
13	NEW ORLEANS DPS 6 - METAIRIE	38	-
14	GONZALES	9	-

NON-RECORDING PRECIPITATION STATIONS

15	NEW ORLEANS CITY HALL	9	-
OMS	BATON ROUGE CENTRAL	8	-
OMS	ABITA SPRINGS FIRE TOWER	14	-

LEGEND: NR NON-RECORDING
OMS OFF MAP STATION

b. Temperature. New Orleans at Moisant Airport has temperature records from 1946. From temperature normals over the period 1951-1980, the mean annual temperature is 68.2° F. Extremes over the period of record are 14° and 102°F. The average temperature in summer is 81.4° F and in the winter is 53.9° F. Temperature normals (1951-1980) for the New Orleans gage at Moisant Airport are shown in Table A-2. Station locations are provided on the map in Plate A-2.

TABLE A-2
MONTHLY TEMPERATURE (°F)
NEW ORLEANS AT MOISANT AIRPORT
30-YEAR NORMALS (1951-80)

MONTH	MEAN	MAXIMUM	MINIMUM
JAN	52.4	61.8	43.0
FEB	54.7	64.6	44.8
MAR	61.4	71.2	51.6
APR	68.7	78.6	58.8
MAY	74.9	84.5	65.3
JUN	80.3	89.5	70.9
JUL	82.1	90.7	73.5
AUG	81.7	90.2	73.1
SEP	78.5	86.8	70.1
OCT	69.2	79.4	59.0
NOV	60.0	70.1	49.9
DEC	54.6	64.4	44.8
ANNUAL	68.2		

EXTREME MINIMUM: 14°F., 24 January 1963 and 25 December 1983
EXTREME MAXIMUM: 102°F, 22 August 1980
(P.O.R. 1946-1985)

c. Rainfall. Precipitation is generally heavy in two fairly definite rainy periods. Summer showers occur from about mid-June to mid-September, and heavy winter rains generally occur from mid-December to mid-March. The drainage area tributary to Lake Pontchartrain is served by 34 precipitation stations of the U.S. Weather Bureau, with periods of record ranging from 7 to 118 years. Based on the 30-year normals for the period 1951-1980 and from the U.S. Weather Bureau station New Orleans at Moisant Airport, the annual normal precipitation is 59.7 inches, with variations of plus or minus 50 percent.

Extreme monthly rainfalls exceeding 12 inches are not uncommon. Average monthly normal rainfalls range from a normal 6.73 inches in July to a normal of 2.66 inches in October. Several stations have experienced calendar months in which no rainfall was recorded. Snow occurs infrequently in the area. An 8.2-inch snowfall occurred in New Orleans on 14-15 February 1895. The last measurable snowfall occurred on 31 December 1963 when 4.5 inches fell in New Orleans. Table A-3 gives the 30 year normals for the New Orleans at Moisant Airport along with the monthly maximum and minimum totals during the normal period. Location of the precipitation stations are shown on Plate A-2.

TABLE A-3
MONTHLY RAINFALL (INCHES)
NEW ORLEANS AT MOISANT AIRPORT
30-YEAR NORMALS (1951-1980)

MONTH	NORMAL	MAXIMUM	MINIMUM
JAN	4.97	13.63	0 54
FEB	5.23	12.49	1.02
MAR	4.73	12.17	0.24
APR	4.50	16.12	0.28
MAY	5.07	14.33	0.99
JUN	4.63	12.28	0.23
JUL	6.73	11.46	2.91
AUG	6.02	16.12	1.68
SEP	5.87	16.74 a/	0.24
OCT	2.66	6.45	0 0 b/
NOV	4.06	11.35	0.45
DEC	5.27	10.77	1.46
ANNUAL	59.74	83.54 c/	39.0 d/

Legend: T - Trace
a/ - Sep 1971
b/ - Oct 1952, Oct 1963
c/ - 1961
d/ - 1962

d. Wind. The U.S. Weather Bureau anemometer coverage at Moisant Airport in Kenner, Louisiana, was installed in 1949. This anemometer provides the longest record available adjacent to the lake. Table A-4 shows the average monthly wind speeds and its resultant direction for the years 1966-1984. The average wind velocity over this period is 7.8 mph, but winds over 100 mph are experienced occasionally in hurricanes. The predominant wind directions are north-northeast from September through February and south-southeast from March through June. Plate A-3 is a wind rose for New Orleans at Moisant based on the period of record of 1949-1978. The frequency of wind speeds and direction from this wind rose is summarized in Table A-5.

TABLE A-4

WINDS SUMMARIES, NEW ORLEANS AT MOISANT AIRPORT (1966-1984)

AVERAGE WIND SPEED

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
1966	9.6	10.5	9.7	10.7	8.7	7.3	6.2	6.4	5.7	7.6	7.4	8.6	8.2
1967	8.3	9.5	9.0	9.3	9.1	6.8	6.2	5.9	7.0	7.4	8.0	9.8	8.0
1968	9.2	10.0	9.3	9.1	8.4	5.6	5.7	5.2	6.4	6.8	8.9	9.3	7.8
1969	9.7	9.8	10.0	8.6	7.3	7.2	6.5	6.8	6.8	9.7	8.0	9.1	8.3
1970	9.5	9.2	9.8	9.9	8.5	6.8	5.4	6.0	6.7	7.7	8.0	7.4	7.9
1971	8.4	9.8	9.8	8.5	7.9	5.3	5.7	5.0	6.5	4.8	8.0	8.7	7.4
1972	8.9	8.6	9.1	10.2	7.3	9.3	7.5	6.4	7.0	8.3	9.9	9.4	8.5
1973	9.6	10.2	12.0	11.5	10.0	6.7	6.7	6.3	7.9	7.0	9.6	11.4	9.1
1974	9.2	11.0	10.8	10.7	8.2	7.4	5.0	5.2	8.6	7.4	8.5	8.5	8.4
1975	9.4	8.6	11.0	10.0	7.4	6.5	6.5	4.9	6.3	6.4	8.0	7.8	7.7
1976	9.6	8.8	10.5	7.6	8.4	6.9	5.4	5.7	6.0	8.5	7.9	8.2	7.8
1977	9.8	8.5	8.5	7.3	5.7	5.3	4.4	5.5	5.4	6.6	8.1	8.8	7.0
1978	9.1	8.9	8.5	8.6	7.9	5.9	5.5	5.3	6.3	6.1	6.7	10.0	7.4
1979	10.5	9.0	9.3	8.0	7.2	6.5	6.7	4.4	8.0	6.7	8.1	6.3	7.6
1980	7.6	8.0	9.8	8.8	7.5	7.4	5.6	5.7	5.3	5.9	6.4	5.9	7.0
1981	7.6	8.3	7.7	7.3	7.8	6.9	5.7	4.8	5.7	7.0	7.3	8.6	7.1
1982	9.8	8.3	8.9	9.4	6.5	6.2	4.6	4.4	7.1	7.5	7.6	10.0	7.5
1983	8.0	10.0	8.8	10.4	7.8	6.3	5.8	5.3	6.0	6.8	8.3	10.0	7.8
1984	8.0	8.7	7.8	9.4	8.2	4.7	4.1	5.8	9.2	7.6	9.6	8.8	7.7
Average	9.1	9.2	9.5	9.2	7.9	6.6	5.7	5.5	6.7	7.1	8.1	8.8	7.8

WINDS SUMMARIES, NEW ORLEANS AT MOISANT AIRPORT (1966-1984)

RESULTANT DIRECTION*

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
1966	02	04	07	16	07	07	23	15	02	03	03	05	05
1967	03	02	13	15	16	11	21	02	05	06	05	08	09
1968	03	35	12	16	15	19	12	05	06	04	04	06	07
1969	07	02	02	13	09	18	24	09	04	05	36	01	05
1970	03	03	08	17	10	21	20	12	08	03	32	06	09
1971	02	12	13	15	13	23	20	01	07	04	04	12	09
1972	07	07	12	15	04	20	14	34	12	06	02	06	08
1973	02	36	16	16	20	18	24	04	10	07	13	20	12
1974	12	24	16	13	16	16	25	13	05	06	06	16	12
1975	09	21	14	11	15	18	25	17	03	05	08	04	10
1976	04	19	15	15	15	13	25	01	04	02	02	02	07
1977	01	09	13	14	13	21	20	12	15	03	10	13	11
1978	01	01	28	15	16	12	19	11	08	03	08	07	07
1979	01	04	15	14	13	15	17	13	04	11	03	03	08
1980	06	06	09	20	15	22	27	13	09	04	02	02	08
1981	02	02	21	15	13	16	22	11	05	06	10	04	09
1982	11	01	12	10	13	22	21	21	06	06	06	10	09
1983	04	05	29	18	15	12	10	11	07	05	10	03	08
1984	03	08	16	18	14	17	13	18	06	13	04	12	12

* Wind direction - Numerals indicate tens of degrees clockwise from true north. 00 indicates calm, 09 east, 18 south, 27 west, 36 north. Resultant wind is the vector sum of wind directions and speed divided by number of observations.

TABLE A-4 (cont'd)
WIND SUMMARIES, NEW ORLEANS AT MOISANT AIRPORT (1966-1984)
RESULTANT DIRECTION*

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
1966	02	04	07	16	07	07	23	15	02	03	03	05	05
1967	03	02	13	15	16	11	21	02	05	06	05	08	09
1968	03	35	12	16	15	19	12	05	06	04	04	06	07
1969	07	02	02	13	09	18	24	09	04	05	36	01	05
1970	03	03	08	17	10	21	20	12	08	03	32	06	09
1971	02	12	13	15	13	23	20	01	07	04	04	12	09
1972	07	07	12	15	04	20	14	34	12	06	02	06	08
1973	02	36	16	16	20	18	24	04	10	07	13	20	12
1974	12	24	16	13	16	16	25	13	05	06	06	16	12
1975	09	21	14	11	15	18	25	17	03	05	08	04	10
1976	04	19	15	15	15	13	25	01	04	02	02	02	07
1977	01	09	13	14	13	21	20	12	15	03	10	13	11
1978	01	01	28	15	16	12	19	11	08	03	08	07	07
1979	01	04	15	14	13	15	17	13	04	11	03	03	08
1980	06	06	09	20	15	22	27	13	09	04	02	02	08
1981	02	02	21	15	13	16	22	11	05	06	10	04	09
1982	11	01	12	10	13	22	21	21	06	06	06	10	09
1983	04	05	29	18	15	12	10	11	07	05	10	03	08
1984	03	08	16	18	14	17	13	18	06	13	04	12	12

* Wind Direction - Numerals indicate tens of degrees clockwise from true north. 00 indicates calm, 09 east, 18 south, 27 west, 36 north. Resultant wind is the vector sum of wind directions and speed divided by number of observations.

TABLE A-5
WINDSPEED
NEW ORLEANS AT MOISANT AIRPORT
PERCENTAGE FREQUENCY (1949-1978)

SPEED GROUPS (MPH)

DIRECTION	0-3	4-13	14-19	20-25	26-32	32+	TOTAL
N	0.0	4.9	2.1	0.3	0.1	0.0	7.4
NNE		4.0	1.5	0.2	0.0	0 0	5.7
NE	0.0	5.0	1.6	0.2	0.0	0.0	6.8
ENE	0.0	4.9	1.4	0.1	0.0		6.4
E		4.3	1.0	0.1	0.0	0.0	5.4
ESE	0.0	3.6	0.7	0.1		0.0	4.4
SE	0.0	4.0	0.9	0.1	0.0		5.0
SSE	0.0	4.5	1.6	0.2		0.0	6.3
S	0.0	6.2	2.1	0.3	0.1	0.0	8.7
SSW		4.0	0.8	0.2	0.0		5.0
SW		3.0	0.4	0.0	0.0	0.0	3.4
WSW	0.0	2.1	0.4	0.0	0.0	0.0	2.5
W	0.0	2.4	0.5	0.1	0.0	0.0	3.0
WNW	0.0	2.0	0.5	0.1	0.0		2.6
NW	0.0	2.0	0.8	0.2	0.1		3.1
NNW	0.0	2.7	1.4	0.3	0.1	0.0	4.5
CALM	20.0	-	-	-	-	-	20.00
TOTAL	20.0	59.6	17.7	2.5	0.4	0.0	100.00

A-4. Hydrologic Regimen.

a. General. The water level in Lake Pontchartrain is subject to variations from direct rainfall, tributary inflow, wind-driven water movements, and flow through the Rigolets and Chef Menteur Passes and the Inner Harbor Navigation Canal caused by tidal variations originating in the Gulf of Mexico. Infrequently, lake level is influenced by diversion of Mississippi River floodflow through Bonnet Carre' Spillway. Combinations of these factors determine the salinity regimen in the lake. Locations and periods of record of hydrologic stations are shown in Table A-6.

b. Runoff and Streamflow. Runoff from the 4,700 square miles north and west of Lakes Pontchartrain and Maurepas, estimated to average five million acre-feet annually, drains into the lakes via the Amite, Tickfaw, Natalbany, Tangipahoa, and Tchefuncta Rivers, and Bayous Lacombe, Bonfouca, and Liberty. Streamflow records are available at six locations on these streams and four locations on Pearl River for the periods of record listed in Table A-7. New Orleans and adjacent parishes are drained by outfall canals that discharge directly into Lake Pontchartrain. Yearly fresh water inflow records show considerable variations, as shown in Table A-7.

TABLE A-6
HYDROLOGIC STATIONS

MAP INDEX NO. (PLATE A-2)	STATION	TYPES OF WATER LEVEL GAGE	PERIODS OF RECORD: RECORDS AVAILABLE THRU 1985	STAGE EXTREMES (NGVD) MAXIMUM	DATE	MINIMUM	DATE
16	Amite River at Port Vincent	Auto Recorder and Staff	Gage Heights, Dec 1954 to Jun 1974 and Jun 1975 to date. Discharge, last observation - Apr 1980	14.59	Apr 83	-1.16	Aug 83
17	Amite River at French Settlement	Auto Recorder and staff	Gage Heights, intermittent 1947-1951 and daily. Dec 1954 to date. Discharge, last observation - 8 in 1977	7.4	Apr 78	-1.5	Dec 54
18	Petite Amite River NR St. Paul	Auto Recorder and Staff	Gage Heights, intermittent Mar 1950 to May 1951 and daily Oct 1951 to date	4.72	Apr 73	-1.6	Dec 56
19	Reserve Canal near Lake Maurepas	Auto Recorder and Staff	Gage Heights, Jan 1979 to date	5.5*	Oct 85**	-1.14	Mar 81
20	Tickfaw River near Springfield	Auto Recorder and Staff	Gage Heights, May 1947 to date. Discharge, last observation - 7 in 1977	6.51*	Oct 85	-1.43	Dec 54
21	Pass Manchac near Pontchatoula	Staff	Gage Heights, July 1955 to date	5.4	Oct 85	-2.0	Jan 61
22	Bayou Bonfouca at Slidell	Staff	Gage Heights, Aug 1962 to date	6.8 (affected by Hurricane)	Aug 69	-0.6	Feb 63
23	Lake Pontchartrain at Frenier	Auto Recorder and Staff	Gage Heights, Sep 1931 to Sep 1965 and Jan 1969 to date	12.09* (watermark)	Sep 65	-2.1	Jan 38

* Caused by hurricane

** From Incomplete Record

TABLE A-6
HYDROLOGIC STATIONS
(CONT'D)

MAP INDEX NO. (PLATE A-2)	STATION	PERIODS OF RECORD: TYPES OF WATER LEVEL GAGE	PERIODS OF RECORD: RECORDS AVAILABLE THRU 1985	STAGE EXTREMES (NGVD): MAXIMUM	DATE	MINIMUM	DATE
24	Lake Pontchartrain at Mandeville	Auto Recorder and Wire Weights	Gage Heights, Sep 1931 to date	6.95*	Sep 47	-2.25	Jan 38
25	Lake Pontchartrain at Midlake near New Orleans	Auto Recorder and Wire Weights	Gage Heights, Aug 1957 to date	6.14*	Oct 85	-1.28	Mar 65
26	Lake Pontchartrain at West End	Auto Recorder and Staff	Gage Heights, Sep 1931 to Nov 1946 and Mar 1949 to date	6.11*	Oct 85	-2.2	Jan 38
27	Lake Pontchartrain (Irish Bayou) near South Shore	Auto Recorder and Staff	Gage Heights, May 1949 to date	7.16*	Aug 69	-1.30	Jul 54
28	Rigolets near Lake Pontchartrain	Auto Recorder and Staff	Gate Heights, Sep 1931 to date	9.0*	Aug 69	-1.90	Jan 38
29	Lake Borgne at Rigolets	Auto Recorder and Staff	Gage Heights, Dec 1957 to Sep 1965 and Jul 1967 to date	12.25* (watermark)	Aug 69	-2.04	Feb 78
30	Chef Menteur Pass near Lake Borgne	Auto Recorder and Staff	Gage Heights, Apr-Jun 1945, Feb & Mar 1950, Jul 57-Sep 65 and Oct 67 to date. Discharge, 1937 and 1945	9.07*	Sep 65	-1.69	Feb 78

* Caused by hurricane

TABLE A-6
HYDROLOGIC STATIONS
(CONT'D)

MAP INDEX NO. (PLATE A-2)	STATION	PERIODS OF RECORD: TYPES OF WATER LEVEL GAGE	PERIODS OF RECORD: RECORDS AVAILABLE THRU 1985	STAGE EXTREMES (NGVD): MAXIMUM	DATE	MINIMUM	DATE
31	Mississippi River - Gulf Outlet at Shell Beach	Auto Recorder and Staff	Gage Heights, Jun 1961 to date	11.06*	Aug 69	-2.7	Mar 65
32	Bayou Dupre at Floodgate (west)	Auto Recorder and staff	Gage Heights, Aug 1975 to date	3.53*	Oct 85	-1.94	Jan 79
33	Bayou Dupre at Floodgate (east)	Auto Recorder and Staff	Gage Heights, Aug 1975 to date	7.61*	Oct 85	-1.78	Feb 78
34	Bayou Bienvenue at Paris Road	Auto Recorder and wire height	Gage Heights, Dec 1974 to date	4.82	May 78	-1.78	Jan 77
35	Bayou Bienvenue at Floodgate (west)	Auto Recorder and Staff	Gage Heights, May 1975 to date	3.91	Apr 80	-2.03**	May 78
36	Bayou Bienvenue at Floodgate (east)	Auto Recorder and Staff	Gage Heights, Dec 1974 to date	7.98	Oct 85	-1.89	Jan 79
37	Intracoastal Waterway near Paris Road Bridge	Auto Recorder and Staff	Gage Heights, Apr 1948 to date	10.04*	Sep 65	-2.19	Mar 65
38	Inner Harbor Navigation Canal near Seabrook Bridge	Auto Recorder and Staff	Gage Heights, Daily, Aug 1962 to date	6.47*	Aug 69	-1.53	Mar 65

* Caused by huricane
** From incomplete record

TABLE A-6
HYDROLOGIC STATIONS
(CONT'D)

MAP INDEX NO. (PLATE A-2)	STATION	PERIODS OF RECORD: TYPES OF WATER LEVEL GAGE	PERIODS OF RECORD: RECORDS AVAILABLE THRU 1985	STAGE EXTREMES (NGVD): MAXIMUM	DATE	MINIMUM	DATE
39	Inner Harbor Navigation Canal (IWW) at Florida Ave. Bridge	Auto Recorder and wire weight	Gage Heights, July 1944 to date	9.82*	Aug 69	-1.45	Jan 81
40	Inner Harbor Navigation Canal (IWW) at New Orleans	Staff	Gage heights, May 1922 to date	10.61* (Highwater mark)	Sep 65	-1.90	Feb 85
41	Intracoastal Waterway at Harvey Lock	Wire Weight	Gage Heights, Jan 1925 to date	4.74*	Oct 85	-1.28	Jan 40
42	Intracoastal Waterway at Algier's Lock	Auto Recorder and Wire Weight	Gage Heights, May 1956 to date	4.45*	Oct 85	-1.64*	Sep 65
OMS	Bayou Terre Aux Bouefs at Delacroix	Auto Recorder and Staff	Gage Heights, May 1975 to date	6.86*	Oct 85	-1.29	Feb 78
OMS	Bayou Barataria at Barataria	Auto Recorder and Staff	Gage Heights, Jan-Sep 1950, 1950, and Nov 1951 to date	4.25*	Oct 85	-0.58	Sep 65
OMS	Bayou Barataria at Lafitte	Auto Recorder and Staff	Gage Heights, Oct 1955 to Dec 1960 and May 1963 to date	5.05*	Oct 85	-0.60	Jan 56

* caused by hurricane
OMS - off map station

TABLE A-7

PERTINENT STREAMFLOW DATA (1938-1984)

INFLOW POINT	TOTAL DRAINAGE AREA MI^2	GAGED LOCATION*	GAGED DRAINAGE AREA MI^2	PERIOD OF RECORD	AVERAGE DISCHARGE (cfs)	MAXIMUM DISCHARGE RATE (cfs)	MAXIMUM DISCHARGE DATE	MINIMUM DISCHARGE RATE (cfs)	MINIMUM DISCHARGE DATE
Amite River	2,373	NR Denham Springs	1,280	9/38 to date	2,015	112,000	4/8/83 10/18/56	271	10/17/56
Tickfaw River	735	At Holden	247	10/40 to date	372	22,470	4/7/83	65	10/1-4/69
		Natalbany River At Baptist	79.5	8/43 to date	116	9,810	4/7/83	1.8	11/2-5/63
Tangipahoa River	895	At Robert	646	10/38 to date	1,151	85,000	4/7/83	245	10/30/68 thru 11/3/68
Tchefunta River	459	NR Folsom	95.5	1/43 to date	161	29,800	4/5/83	26	9/4/68 and 9/15/68
		Bogue Falaya at Covington	88.2	1964 to date	-	12,700**	4/8/83	-	-
Pearl River	8,689	At Bogalusa	6,573	10/38 to date	9,904	129,000	4/24/79	1,020	10/29/63 thru 11/1/63
		Bogue Chitto NR Bush	1,213	10/37 to date	1,916	131,700	4/8/83	366	10/22, 23, 26, 29/68
		At Pearl River	3,494	10/63-9/70 10/75 to date	9,470 (1964-70)	230,000	4/9/83	1,580	10/24/63 and 11/10/63
		Bogue Lusa Creek At Bogalusa	72.7	10/63 to date	118	9,350	4/7/83	5	10/27-28/67

*U.S. Geological Survey Gage Stations

**Previous Flood Discharge - 8,610 CFS 4/27/64

c. Stages, Salinities, Waves and Tides.

(1) Lake stages.

a) The Bonnet Carre' Spillway is operated as required during major high water seasons on the Mississippi River to divert flows through Lake Pontchartrain in order to insure that a stage of 20 feet on the Carrollton gage is not exceeded at New Orleans. Studies indicate that the operations of the spillway produced maximum increases in lake level of about 0.8 foot in 1937, 1.5 feet in 1945, 1.0 foot in 1950, and 0.7 foot in 1973 and again in 1979. The effects of Bonnet Carre' operation on stages in Lake Pontchartrain were evaluated as part of a physical model study made by the U.S. Army Engineer Waterways Experiment Station in Vicksburg, Mississippi, in 1963 ([1]). The report indicates that for the passage of flows at or near the design discharge of 250,000 cfs, the operation of the spillway would increase stages in Lake Pontchartrain by about 0.7 foot for average high water stages in Lake Borgne. An analysis of the effects of Bonnet Carre' on lake stages during the 1973 and 1979 operations indicates that these model results are generally valid.

(b) For the 1983 flood, analysis of observed tidal data of a comparable period before and during the Bonnet Carre' Spillway operation indicated the actual rise in lake level was approximately 0.5 foot.

(c) The maximum recorded stage in Lake Pontchartrain of 13.0 feet occurred at Frenier on 29 September 1915. The minimum of minus 2.25 feet occurred at Mandeville on 26 January 1938. The mean lake stage for the period from 1961 through 1985 was 1.5 feet.

(d) Maximum stages occur in Lake Pontchartrain during hurricane activity in the vicinity. A list of high stages recorded during hurricanes is presented in Table A-8.

TABLE A-8
MAXIMUM STAGES - LAKE PONTCHARTRAIN

LOCATION	DATE	STAGE- FT. NGVD	
Mandeville	20 Sep 1909	8.0	
West End	20 Sep 1909	6.2	
Frenier	29 Sep 1915	13.0	
West End	29 Sep 1915	6.0	
West End	19 Sep 1947	5.4	
Mandeville	19 Sep 1947	6.8	
New Orleans	4 Sep 1948	4.9	
Frenier	24 Sep 1956	6.8	"Flossy"
Little Woods	24 Sep 1956	7.0	
West End	24 Sep 1956	5.3	
Mandeville	27 Jun 1957	4.1*	"Audrey"
Frenier	9 Aug 1957	3.3	"Bertha"
Frenier	18 Sep 1957	4.5	"Esther"

TABLE A-8 (cont'd)
MAXIMUM STAGES - LAKE PONTCHARTRAIN

LOCATION	DATE	STAGE- FT. NGVD	
Mandeville	10 Sep 1961	5.5	"Carla"
Frenier	17 Sep 1963	4.0	"Cindy"
Mandeville	4 Oct 1964	6.4	"Hilda"
Frenier	10 Sep 1965	12.1	"Betsy"
Frenier	Aug 1969 (Watermark)	4.6	"Camille"
Mandeville	18 Aug 1969	4.6	
West End	17 Aug 1969	5.2	
Irish Bayou	18 Aug 1969	7.2**	
Rigolets	18 Aug 1969	9.0**	
Shell Beach	17 Aug 1969	11.1**	
Mandeville	8 Sep 1974	5.0	"Carmen"
Frenier	8 Sep 1974	4.5	
West End	8 Sep 1974	5.2	
Frenier	5 Sep 1977	4.2	"Babe"
Little Woods	4 Sep 1977	4.5	
Frenier	28 Oct 1985	7.58	"Juan"
Mandeville	28 Oct 1985	6.5	
Midlake	29 Oct 1985	6.14**	
West End	28 Oct 1985	6.1**	
Irish Bayou	28 Oct 1985	6.0 (FIR)	

* Possibly higher, gauge failed during storm.
** New record established.

FIR - From Incomplete Record

(2) Salinities. Diluted saline gulf water enters Lake Pontchartrain from Lake Borgne via the Rigolets and the Chef Menteur Pass and the Mississippi River - Gulf Outlet and Inner Harbor Navigation Canal in large quantities and mixes with the fresh water inflow. The salinity in the eastern portion of Lake Pontchartrain averages about 4.5 parts per thousand with a low of 1.1 part per thousand, and a high of 16.5 parts per thousand. The salinity in the western portion of the lake averages about 1.5 parts per thousand with a low of 0.05 part per thousand, and a high of 8.0 parts per thousand. Salinity is subject to considerable variation with respect to location, seasonal trends, and short-term fluctuations. More intensive data on salinities, tides and currents in Lake Pontchartrain and vicinity are shown in U.S. Army Waterways Experiment Station Report of January 1982 entitled "Lake Pontchartrain and Vicinity Hurricane Protection Plan - Prototype Data Acquisition and Analysis."(2)

(3) Waves. In August 1957, two wave gages were installed on the east side of the Greater New Orleans Expressway Bridge, Station Ten at the north end, and Station Four on the south end. Both are

approximately one-quarter mile from shore. In 1958, Station Nine was established at Frenier, with the gage on a tower approximately 1,200 feet from shore. Locations are shown on Plate A-2. Pertinent observed data are listed in Table A-9.

TABLE A-9
WAVE DATA

Station	Significant Waves Range ft.	Significant Waves Wind m.p.h.	Maximum Waves Height ft.	Maximum Waves Date
4	0.1 to 4.9	30	8.3	9 October 1958
9	0.1 to 4.9	29	7.8	9 October 1958
10	0.1 to 5.3	40	9.0	10 May 1959

(4) Tides. The normal tide has a general range of one-half foot in Lake Pontchartrain and is diurnal in nature. However, wind effects usually mask the daily ebb and flood variations. Because of the annual volume of freshwater inflow (estimated to average 5 million acre-feet), tides and storm surges, enormous volumes of water pass in both directions through the Rigolets, Chef Menteur Pass, Lake Borgne, Mississippi Sound, Inner Harbor Navigation Canal, and Mississippi River-Gulf Outlet. With so many variables operating on the several elements of the system, the current patterns are continually changing.

A-5. Description and Verification of Procedures.

a. Hurricane Memorandums. The Hydrometeorological Section (HMS), U.S. Weather Bureau, cooperated in the development of hurricane criteria for experienced and potential hurricanes in the study area. The HMS memorandums provided frequency data, isovel and rainfall patterns, pressure profiles, hurricane paths, and other parameters required for the hydraulic computations. Those relative to experienced hurricanes are based on reevaluation of historic meteorologic and hydrologic data. Those relative to potential hurricanes contain generalized estimates of hurricane parameters that are based on the latest research and concept of hurricane theory. Memorandums pertinent to the study are listed in Section III, Bibliography.

b. Historical Storms Used for Verifications. Three observed storms, with known parameters and effects, were used to establish and verify procedures and relationships for determining surge heights, wind tide levels (WTL's), inflow into Lake Pontchartrain, overtopping flows, and ultimately, flood elevations that would result from synthetic hurricanes. Two storms which occurred in September of 1915 (4) and September 1947 (5) are shown on Plates A-4 and A-5. The third storm occurred on 16 September 1957.

(1) The hurricane of 29 September 1915 had a central pressure index (CPI) of 27.87 inches, an average forward speed of 10 knots, and a maximum wind speed of 99 mph at a radius of 29 nautical miles. This hurricane approached the mainland from the south. At the Lake Borgne entrance to the Rigolets, a high water elevation of about 10 feet was experienced and the average elevation in Lake Pontchartrain rose to 6 feet. This storm was not used for verification of levee overtopping because the present lakefront levee system was not in existence in 1915.

(2) The 19 September 1947 hurricane had a CPI of 28.57 inches, an average forward speed of 16 knots, and a maximum windspeed of 72 mph at a radius of 33 nautical miles. The direction of approach of this hurricane was approximately from the east. In Lake Borgne, at the entrance to the Rigolets, the maximum water surface elevation was 10 feet NGVD, and in Lake Pontchartrain, the maximum elevation was 5 feet NGVD. However, because of the rapid forward speed of this storm, the average water elevation in Lake Pontchartrain did not reach its maximum at the time that the winds were critical to the south shore. The step-type seawall was in place along the New Orleans lakefront during this storm, and a fairly reliable flood line of overtopping flows was available for verification.

(3) Tropical storm Esther occurred on 16 September 1957, and the resultant elevations were accurately registered by stage recording gages at many locations within the study area. These records were available for verification of routing procedures. This storm was not severe enough to cause flooding.

c. Synthetic storms. Computed flood elevations, resulting from synthetic storms, are necessary for frequency and design computations. Parameters for certain synthetic storms and methods for derivation of others were furnished by the National Weather Service. The standard project hurricane (SPH) for the entire Louisiana coast was used for all locations in the study area with changes only in path and forward speed.

(1) SPH for the Louisiana coast was derived by the National Weather Service from a study of 42 hurricanes that occurred in the region over a period of 57 years (6). SPH paths critical to different locations in the study area and isovel patterns at critical hours are shown on Plates A-6 and A-7. Based on subsequent studies of more recent hurricanes, the National Weather Service has revised the SPH wind field patterns and other characteristics over the years. Wind field patterns were revised after Hurricane Betsy in 1965 to reflect the intensified wind speeds (7), (8), (9). After Hurricane Camille in 1969, the Weather Service completely revised hurricane characteristics for the SPH, including the wind speeds, central pressure and radii. (10) In their latest publication (11) NOAA has expanded and generalized the latest SPH characteristics. For design of the Lake Pontchartrain and Vicinity Hurricane Protection Project High Level Plan, the SPH, as defined after Hurricane Betsy, was used. To assure that all the segments of the project would be compatible, SPH parameters have not been changed since

construction began. Modifications and adjustments of these parameters subsequent to Hurricane Betsy have not significantly changed the characteristics of the SPH.

(a) The SPH for the Louisiana coastal region has a frequency of once in 100 years. The CPI that corresponds to this frequency is 27.6 inches. CPI probabilities are based on the following relationship. (12):

$$P = \frac{100 \quad (M-0.5)}{Y}$$

Where P = percent change of occurrence per year
M = number of the event (rank)
Y = number of years of record

(b) Radius of maximum winds is an index of hurricane size. The average radius of 12 hurricanes occurring in the New Orleans area is 36 nautical miles. From relationships of CPI and radius of maximum winds of gulf coast hurricanes (12), a radius of 30 nautical miles is considered representative for an SPH having a CPI of 27.6 inches.

(c) Different forward speeds are necessary to produce SPH effects at various locations within the study area. In Lake Pontchartrain, the forward speed is a particularly critical factor and may be as important as the track itself. Sufficient time must elapse between the time of maximum elevation at the entrances to Chef Menteur Pass and the Rigolets and the time of maximum critical winds at the Lake Pontchartrain shore in question to allow for maximum inflow into the lake. The SPH for the south shore, patterned after the September 1915 hurricane, has an average forward speed of 6 knots. An average forward speed of 11 knots was used for the SPH along the west shore of Lake Borgne at the entrance to the passes into Lake Pontchartrain.

(d) Maximum theoretical gradient wind (12) is expressed as:

$$V = 73 \sqrt{Pn - Po} - R \ (0.575 \ f)$$

where Vgx = maximum gradient wind speed in miles per hour
Pn = asymptotic pressure in inches
Po = central pressure in inches
R = radius of maximum winds in nautical miles
f = coriolis parameter in units of hour $^{-1}$

The estimated wind speed (30 feet above ground level) (Vx) (13) in the region of highest speeds is obtained as follows:

$$V_x = 0.885 \, V_{gx} + 0.5T$$

where T = forward speed in miles per hour.

From these relationships, a wind speed of approximately 100 mph was obtained.

(2) Other synthetic storms of different frequency and CPI are derived from SPH. Other CPI's for desired frequencies are obtained from the graph shown on Plate A-8. V_{gx}'s corresponding to any other CPI are determined similarly by use of the method described for the SPH. Variations in CPI 's of historic storms were accomplished by the same procedure (12). Characteristics of synthetic storms and some historic storms are listed in Table A-10

TABLE A-10
HURRICANE CHARACTERISTICS

Hurricane*	CPI inches	Radius of max. winds nautical miles	Forward speed knots	Vx m.p.h.
Sep 1915	27.87	29	10	99
Sep 1947	28 57	33	16	72
Sep 1956	28.76	30	10	80
Sep 1965	27.79	32	20	122
Track A PMH	26.90	30	6	114
Track A SPH	27.60	30	6	100
Track A Mod H	28.30	30	6	83
Track F PMH	26.90	30	11	114
Track F SPH	27.60	30	11	100
Track F Mod H	28.30	30	11	80

* Tracks are shown on Plate A-9.

d. Surges.

(1) Maximum hurricane surge heights along the western shores of Lake Borgne were obtained from computations made for ranges extending from the shores out to the continental shelf by use of a general wind tide formula that is based on the steady state conception of water superelevation (14) (15) (16). In order to reach agreement between computed maximum surge heights and observed high water marks, it was necessary to introduce a calibration coefficient or surge adjustment factor into the general equation which, in its modified form, is as follows:

$$S = 1.165 \times 10^{-3} \frac{V^2 F}{D} N Z \cos 0$$

where S = wind setup in feet
V = windspeed in statute miles per hour
F = fetch length in statute miles

D = average depth of fetch in feet
θ = angle between direction of wind and the fetch
N = planform factor, generally equal to unity
Z = surge adjustment factor

(2) Water surface elevations along a range were determined by incremental summation of wind setup above the water elevation at the gulf end of the range. The low strip of marshland between Lake Borgne and the gulf was considered already submerged prior to the time of maximum elevation at shore. Initial elevation at the beginning of each range was determined from the predicted normal tide and the setup due to atmospheric pressure anomaly. Typical tidal cycles for the project area are shown on plate A-10. An adjustment was made at the shoreward end of the range to compensate for the difference in pressure setup between both ends of the range. This procedure for the determination of surge height at the coastline was developed for an area along the Mississippi Gulf coast where reliable data were available at several locations for more than one severe hurricane. The procedure was then used for the entire coastal Louisiana region. Due to dissimilar shoreline configurations, different surge adjustment factors were required at each location, but identical factors were used at particular location for each storm. The value of the factor is apparently a function of the distance between the shoreline and deep water and varies inversely with this distance. Comparative computed maximum elevations and observed high water elevations for the locations of the 1915 and 1947 hurricanes that were used in the development of the procedure are shown in Table A-11.

TABLE A-11

HURRICANE SURGE HEIGHTS

Location	Surge Adjustment factor (Z)	1915 Observed	1915 Computed	1947 Observed	1947 Computed
		feet	m.s.l.	feet	m.s.l.
Bay St. Louis, Miss.	0.46	11.8	11.8	15.2	15.1
Gulfport, Miss.	0.60	10.2*	9.9	14.1	14.3
Biloxi, Miss.	0.65	10.1*	9.8	12.2*	12.6

*Average of several high water marks.

(3) The incremental step computation was used to check experienced maximum hurricane surge heights at several locations within the project area. Verification of these surge heights and the surge adjustment factors used in the computations are shown on Table A-12.

TABLE A-12

VERIFICATION OF HURRICANE SURGE HEIGHTS

Location	Surge adjustment factor (Z)	Sep 1915 Observed	Sep 1915 Computed	Sep 1947 Observed	Sep 1947 Computed	Sep 1956 Observed	Sep 1956 Computed
		feet m.s.1.		feet m.s.1.		feet m.s.1.	
Shell Beach	0.30	8.3	8.4	11.2	10.5	10.9	10.7
Violet	0.30	-	-	7.3	7.9	6.5	7.7
Michoud	0.30	11.0	11.4	-	-	-	-
Long Point	0.21	9.8	9.6	10.0	10.1	-	-

(4) Computed surge heights for hurricane "Betsy," September 1965, at the location listed in Table A-11 and using the same Z factors averaged about 2.2 feet higher than the observed surge heights. This apparently was the effect of the high forward speed of "Betsy." A fast moving hurricane does not allow enough time for the surge heights to approach the steady state of water superelevation (14) 15) (16). However, it was determined that the Z factors derived from the slow moving hurricanes should be used for design purposes because this type of hurricane is more nearly representative of hurricanes in the project area, and the resulting design elevations are conservative (high).

(5) An example of the setup computation for one increment (F) along a range radiating from the vicinity of Chalmette for an SPH along Track F at one hour before landfall of the hurricane is as follows:

(a) Initial elevation:

Normal pressure	30.14 inches of mercury
Pressure at beginning of range, 57 miles from center =	29.05 inches of mercury
Deviation from normal pressure	1.09 inches of mercury
Pressure setup 1.09 x 1.14 feet	1.24 feet of water
Normal predicted tide	1.60 feet above mean low water (m.1.w.)
Initial elevation	2.84 feet m.1.w.

(b) Incremental setup (for setup between adjacent stations on range):

Sta. mile	F miles	m.p.h.	Cos 0		Avg. V2Cos 0	Depth feet m.l.w.	D= S+ Av.D+2.84 + S/2	S feet	S feet
4.0		90	0.766	6200					9.86
	4.0				5090		12.98	0.55	
0.0		75	0.707	3980					10.41

$$S = 1.165 \times 10\text{-}3 \times \frac{5{,}090 \times 4.0}{12.98} \times 1 \times 0.31 = 0.55'$$

(c) Setup for pressure differential:

Normal pressure	=	30.14 inches of mercury
Pressure at end of range, 34 miles from center	=	28.69 inches of mercury
Deviation from normal	=	1.45 inches of mercury
(1.45 x 1.14 feet)	=	1.65 feet of water
Deviation at beginning	=	1.24 feet of water
Differential setup	=	0.41 foot

(d) Final surge height:

Pressure setup at beginning of range	=	1.24 feet
Normal predicted tide	=	1.60 feet m.l.w.
Correction m.l.w. to m.s.l.	=	-0.60 foot
S (wind setup)	=	10.41 feet
Pressure differential setup	=	0.41 foot
Surge height at shore	=	13.06 feet m.s.l.

(6) The storms under consideration are accompanied by strong winds. The average windspeed and average depth were determined from isovel and hydrographic charts for each surge computation. The storm isovel patterns were furnished by the U.S. Weather Bureau (17) (18) (19).

e. Routing.

Since the major hurricane damage in the study area results from storm induced effects on Lake Pontchartrain, it was necessary to establish a method to determine the hydraulic regimen in the lake at any time during the hurricane occurrence. This procedure involves the construction of a stage hydrograph for Lake Borgne, and the simultaneous hourly calculations of flows through Lake Pontchartrain's natural inlet and outlet passes, tilt and stage-volume relationships in Lake Pontchartrain and Lake Maurepas, accumulated rainfall, and overflow from the lake to the land areas.

(1) Prerequisite to any routing is the choice of an actual or hypothetical hurricane of known or designated characteristics. It is then possible to develop surge heights for any point in Lake Borgne for selected storm. For routing purposes, Long Point, which is east of the mouth of the Rigolets, was selected as the critical point for a hydrograph. The hydrograph for Long Point reflects stages at the mouths of both the Rigolets and Chef Menteur Pass. Construction of such a hydrograph of hourly stages at the mouth of the two passes was based on a method developed by R. O. Reid (20) that was modified by using the maximum surge elevation computed by the incremental setup method as the peak of the hydrograph for the critical period. A comparison of the rising portion of the hydrograph thus derived, with one obtained by computing surge elevations at hourly intervals, indicated agreement between the two methods. Final stages for the recession portion of the hydrograph could not be computed by the incremental setup method because of the offshore wind directions prevailing after the peak stage. The recession produced by Reid's method (20), obtained by rotating the hydrograph about the peak ordinate, indicated stages considerably lower than corresponding stages for the 1947 hurricane surge. The observed stages of the 1957 storm surge also indicated that the recession was somewhat slower at intermediate stages in Lake Borgne. It was therefore necessary to estimate the recession portion of the hydrograph to verify routing procedures. Storm surge hydrographs for Long Point for each storm investigated were determined by identical procedures.

(2) Storms tides flow in and out of Lake Pontchartrain through three major natural passes and an artificial canal. Rating tables, derived by reverse routing of observed storms, were developed for use in routing through the passes and canal. The elevation of Lake Borgne at Long Point was determined from the average of records obtained from automatic tide gage recorders located at the mouths of the passes and at Shell Beach. Elevations of Lake Pontchartrain were determined from records of the automatic tide gages located in Lake Pontchartrain at U.S. Highway 11 and at West End. Although there was a fairly consistent relationship between head and flow, there was no consistency when a parameter of stage was introduced.

(a) The combined rating of the Rigolets, Chef Menteur Pass, flow over U.S. Highway 90 in vicinity of the passes, and Inner Harbor Navigation Canal was based on the period 25 July to 11 August 1957, during which time a minor storm accompanied by moderate stages was experienced. The empirical relationship, $Q = 560H^{0.935}$ was derived from plots of the data, and used to compute a rating table.

(3) Storage tables for the range of stages were made for Lake Pontchartrain. The storage amounts include the volumes contained in the adjacent marsh areas when the stages exceed the surface elevation of these marshes.

(4) Cumulative amount of rainfall that is coincident with the storm significantly affects the lake elevations and hence the routing procedure. The amount of this rainfall was calculated by the methods described in U.S. Weather Bureau memorandums (21), (22), using a moderate rainfall that would be coincident with a tropical storm. For routing purposes, rainfall was considered as additional inflow into Lake Pontchartrain. The effect of cumulative rainfall is to raise the lake level.

(5) Stages, wind tide elevations, and waves induce flow over the shore protective structures. Adjustments were made in the routing procedure to account for the quantities that overtopped these structures.

(6) With the above-mentioned items resolved, the routing procedure was reduced to the successive approximation type problem in which the variable factors were manipulated until a condition of balance between flows and storages was obtained for the incremental time intervals. A typical routing computation is illustrated on Plate A-10. The 1947 and 1915 hurricanes were routed by this procedure. Routed average stages for Lake Pontchartrain were found to be in reasonable agreement with the observed average stages for the two hurricanes. The degree of agreement between the observed and computed stages that were obtained by use of the routing procedure verifies the methods and rating tables used. Observed and computed average stages for the 1947 and 1957 hurricanes are shown on Plates A-11 and A-12. All other hurricanes studied were routed using similar procedures. The resultant stage hydrograph for the SPH critical to the south shore of Lake Pontchartrain is shown on Plate A-13.

f. Wind Tides. The storms under consideration are accompanied by strong winds. The effect of strong winds blowing over a shallow enclosed body of water, such as Lake Pontchartrain, is to drive large quantities of water ahead of the winds. It was necessary for purposes of routing and overflow computations to determine the windtide levels for Lake Pontchartrain. This was accomplished by dividing the lake into four or five segments that are roughly parallel to the wind directions, and by calculating setup and set down for each of the segments. The average windspeed and average depth in each segment were determined from isovel and hydrographic charts for each wind tide computation. The storm isovel patterns were furnished by the U.S. Weather Bureau (17), (19). The computation of wind along each zone was based on the segmental integration method (11) and was calculated by use of the step-method formulas (23) that were modified as follows:

$$\text{Setup} = d_t \left(\sqrt{\frac{0.00266\, u^2\, FN + 1}{d_t^2}} - 1 \right)$$

$$\text{Setdown} = d_t \left(1 - \sqrt{\frac{1 - 0.0026\, u^2\, FN}{d_t^2}} \right)$$

Where: Setup or setdown in feet is measured above or below mean water level (m.w.l.) of the surge in the lake.

d_t = av. depth of fetch in feet below m.w.l.
u = windspeed in m.p.h. over fetch
F = fetch length in miles, node to shoreline
N = planform factor, equal generally to unity

(1) Graphs were constructed from the above formulas to determine setup and setdown quickly about any nodal elevation, Plate A-15. Volumes of water along the zones, represented by the setup and setdown with respect to a nodal elevation, were determined and the water surface profiles adjusted until the setup and setdown volumes balanced within 5 percent. Water surface contours were then drawn for several even-foot nodal elevations, and the tilt and WTL's were determined from the contour sketch. In the routing of surges, pertinent wind tides and tilts for other nodal elevations were interpolated from the contour sketches for the even-foot nodes. Typical wind tide computations are illustrated on Plate A-15.

(2) Maximum computed and observed setup elevations for the 1947 hurricane, were 4.9 feet and 5.4 feet at West End. Computed stages for the 1915 hurricane compared favorably with observed high water marks. Wind tide levels for all hurricanes studied were computed by applying the same methods and procedures described above. Maximum surge height contours in the Lake Borgne area and maximum WTL contours in the Lake Pontchartrain area were developed for the SPH. These contours are shown on Plate A-16. The contours represent the maximum elevations that would be experienced for the occurrence of a hurricane in the SPH category for the most critical storm path.

A-6. Frequency estimates.

a. Procedure.

(1) The area along the south shore of Lake Pontchartrain was used in developing a procedure for making frequency estimates since more historical hurricane data were available for this area than for any other location. The maximum WTL or stage for a specific area is a measure of the character of storm that produces it. In order to use data from early hurricanes which caused high wind tides along the south shore of Lake Pontchartrain, it was necessary to analyze meteorologic factors and to adjust the observed data to represent stages that would have occurred had presently existing protective works then been in place. It was found that adjustments were required for the 1983 and 1901 hurricanes. Along the south shore of Lake Pontchartrain, determinations of maximum WTL's were from the adjusted historical data from the locus of points through which a representative WTL-frequency curve would pass in the low-stage, high-frequency region. Probabilities for historical data on the curve shown on Plate A-17 were calculated by means of the formula:

$$P = \frac{100 \quad (M-0.5)}{Y}$$

The WTL for the PMH, which has an infinite return period, establishes an other limit for the frequency curve in the high-stage, low frequency region. However, because of the lack of historical data for the region of the curve between these two extremes, the synthetic WTL-frequency relationships were developed to show the shape of the curve in this region. In the process of formulating such relationships, it was necessary to correlate the following hurricane parameters: central pressure index, paths of approach, wind velocities, radii to maximum winds, and forward speeds of translation.

(2) Prior to 1900, information of record dealt primarily with loss of life and damage in the more densely populated areas, with practically no reference to water surface elevations caused by hurricanes. Only since 1900 has detailed information been available on flooding in coastal Louisiana and in adjacent areas. Subsequent to the widely destructive September 1915 hurricane, Charles W. Oakey, Senior Drainage Engineer, Office of Public Roads and Rural Engineering, U.S. Department of Agriculture, made a thorough survey of the coastal areas between Biloxi, Mississippi, and Palacios, Texas. The 1915 investigation is the only known area-wide study containing reliable stages until the investigation of hurricane "Flossy", September 1956, was completed. The data indicate that there is no locality along the Louisiana coast which is more prone to hurricane attack than other localities.

(3) The first requirement in the development of synthetic frequency relationships for localities within the study area was to select representative critical hurricane paths of approach for the particular locale in question For the passes into Lake Pontchartrain, track F is the critical path for the design hurricane. For the south shore of Lake Pontchartrain, track A was selected to represent the hurricane situation that would produce critical conditions. These tracks are shown on Plate A-9.

(4) After hurricane paths were selected, surge heights and wind tides were developed, as described previously, for at least three storms of different CPI values for each track. Each hurricane selected for the representative paths were assumed to have the same radius of maximum winds, he same forward speed of translation, and the same adjustment for any land effects. Only CPI's and wind velocities were adjusted to develop these three storms. Results of these computations for the New Orleans reach of Lake Pontchartrain are shown in Table A-13. Wind tide elevations for storms with other CPI values were obtained graphically by plotting the above data and reading from the resulting curves.

TABLE A-13

CENTRAL PRESSURE INDEX VS. WIND TIDE LEVEL

LAKE PONTCHARTRAIN REACH - NEW ORLEANS

PATH A		PATH F	
Central pressure index (CPI) inches	Max. wind tide level NGVD	Central pressure index (CPI) inches	Max. wind tide level NGVD
26.9	12.7	27.6	7.7
27.6	11.2	27.87	6.6
28.5	8.2	28.57	4.8

(5) Hurricane characteristics of area-representative storms were developed in cooperation with U.S. Weather Bureau. This agency has made a generalized study of hurricane frequencies for a 400-mile zone along the central gulf coast, Zone B, from Cameron, La., to Pensacola, Fla., and has presented the results in a memorandum. (12) Frequencies for hurricane central pressure indexes that were presented in the report, as shown on Plate A-8, reflect the probability of hurricane recurrence from any direction in the midgulf coastal area. In order to establish frequencies for the localities under study, it was assumed that a hurricane whose track is perpendicular to the coast will ordinarily cause high tides and inundation for a distance of about 50 miles along the coast. Thus, the number of occurrences in the 50-mile subzone would be 12.5 percent of the number of occurrences in the 400-mile zone, provided that all hurricanes traveled in a direction normal to the coast. However, the usual hurricane track is oblique to the shoreline as shown in table 2 of the HMS memorandum (12). The average projection along the coast of this 50-mile swath for the azimuths of 42 Zone B hurricanes is 80 miles. Since this is 1.6 times the width of the normal 50-mile strip affected by a hurricane, the probability of occurrence of any hurricane in the 50-mile subzone would be 1.6 times the 12.5 percent, or 20 percent of the probability for the entire midgulf Zone B. Thus, 20 percent of the Zone B frequency shown on Plate A-8 was used to represent the CPI-frequencies in the 50-mile subzone that is critical for each study locality

(6) The azimuths of tracks observed in the vicinity of landfall were divided into quadrants corresponding to the four cardinal points. In Zone B, 24 tracks were from the south, 14 from the east, 3 from the west, and 1 from the north. Hurricanes with tracks having major components from the south or east are more critical relative to WTL's within the study area than hurricanes from other directions. Approximately two-thirds of all experienced hurricanes have come from a southerly direction, whereas about one-third have come from the east. The average azimuth of tracks from the south are 180°. Tracks from the east had an average azimuth of 115°. Approximately these azimuths were used in computing WTL's. Further adjustment of the probability of occurrence was made by using two-thirds of the probability for WTL'scomputed for hurricanes approaching from the south and one-third of the probability for WTL's computed for hurricanes approaching from the

east. The probabilities of equal stages for both groups of tracks were then added arithmetically to develop a curve representing a synthetic probability of recurrence of maximum wind tide levels for hurricanes from all directions. Table A-14 presents these computations and those of the previous paragraph for the New Orleans reach.

TABLE A-14

STAGE-FREQUENCY
SOUTH-SHORE - LAKE PONTCHARTRAIN

CPI	ZONE B	New Orleans Reach 80-mi. subzone	WTL	PATH A Freq.* (67% Col. 3)	WTL	PATH F Freq.* (33% Col. 3)
1	2	3	4	5	6	7
in.	occc/100 years		NGVD	occ/100 yrs.	ft. NGVD	occ/100 - yrs.
27.6	1	0.2	11.5	0.13	8.0	0.07
27.8	2	0.4	10.9	0.27	7.0	0.13
28.1	5	1.0	9.8	0.67	6.1	0.33
28.3	10	2.0	9.1	1.34	5.6	0.66
28.6	20	4.0	8.0	2.68	4.9	1.32
29.0	40	8.0	6.5	5.36	4.1	2.64

$$*\text{Freq.} = \frac{100}{\text{Return period years}}$$

(7) Using the shape of the synthetic stage-frequency curve as a guide, it was then possible to complete a final curve for the New Orleans reach between the predetermined limits mentioned previously.

(8) Lack of historical data prevented the similar development of WTL-frequency relationships for other localities within the study area. For the remaining reaches, wind tide levels were calculated for Zone B hurricanes of different frequencies by using different combinations of critical paths and distribution of azimuths of incidence. It followed that a Zone B hurricane of a particular frequency would have the same recurrence period for any locale in the study area since all are within the same subzone. Therefore, the final stage - frequency curves for the remaining areas were developed by plotting the computed stages for several different Zone B hurricanes at the corresponding frequencies indicated for the south shore of Lake Pontchartrain. Only two-thirds of the hurricanes from the south or east are most critical relative to WTL's along the south shore of Lake Pontchartrain, while all of the hurricanes from the south or east are equally critical to the area affected by Lake Borgne Therefore, the most critical WTL along the south shore of Lake Pontchartrain for a Zone B hurricane of given frequency occurs only two-thirds as often as the most critical WTL along the shores of Lake Borgne for the same hurricane.

b. Relationships. Based on the above described procedures, stage-frequency relationships were established for the south shore of

Lake Pontchartrain and the passes into Lake Pontchartrain from Lake Borgne. Stage-frequency curves are shown on Plate A-18.

A-7. Design Hurricane.

a. Selection of the design hurricane. The standard project hurricane was selected as the design hurricane (Des H) due to the urban nature of the study area. A design hurricane of lesser intensity which would indicate a lower levee grade and an increased frequency would expose the protected areas to hazards to life and property that would be disastrous in event of the occurrence of a hurricane of the intensity and destructive capability of the standard project hurricane.

b. Characteristics. The characteristics of the Des H for the proposed plan of protection are identical to the standard project hurricane described in detail in paragraph A-5. However, due to transposition of the regional SPH to the smaller study area the design hurricane would have a probability of recurrence of only once in about 300 years in the study area. The path of the Des H's was located to produce maximum hurricane tides along the entire length of the proposed structure. The Des H is a theoretical hurricane but ones of similar intensity have been experienced in the area. Table A-15 is a summary of the Des H characteristics.

TABLE A-15
DESIGN HURRICANE CHARACTERISTICS

Location	CPI (inches)	Max. winds (m.p.h)	Radius of max. winds (miles)	Forward speed (knots)	Direction of approach	Trac (plate A-6 and A-7)
Lake Pontchartrain South Shore	27.6	100	30	6	South	A
Lake Borgne Rigolets and Chef Menteur Pass	27.6	100	30	11	East	F

c. Normal predicted tides. The average tidal range in Lake Pontchartrain is 0.5 foot. Lake Pontchartrain has an average elevation of about 1.0 foot. In determining the elevation of design surges and wind tide levels, the mean normal predicted tide was assumed to occur at the critical period.

d. Design windtide levels and levee heights. The hurricane tide is the maximum stillwater surface elevation experienced at a given location during the passage of a hurricane. It reflects the combined effects of the hurricane surge and wind tide. Design hurricane tides were computed for conditions reflecting the proposed protective works. The resulting elevations, which are identical to those for an SPH, are the same for existing or project conditions. During the time maximum windtide levels are against the protective levee, the winds are generally parallel to or leeward of the levee from South Point to station 1030+00 and no wave runup will occur. Prior and subsequent to that time, the winds will be generally perpendicular to the protective embankment, but the height of the wave runup at such time will not exceed the levee design grade. Consequently, wave runup is not the controlling factor in determining the design elevation of the levee in the reach from South Point to station 1030+00. The design elevation was determined by providing 2 feet of freeboard above the maximum windtide level. The reach from station 1030+00 to the GIWW is exposed to waves generated in Lake Borgne and its levee cross section is designed to attenuate wave runup. The design hurricane data used to generate the wave characteristics is given in Table A-16.

TABLE A-16
DATA USED TO DETERMINE WAVE CHARACTERISTICS
DESIGN HURRICANE

F	Length of fetch, miles	5
U	Windspeed, mph	83
SWL	Stillwater elevation, feet NGVD	13.0
d	Average depth of fetch, feet	13.1
d_t	Depth at toe structure, feet	11.0

e. Wave characteristics. Using the design hurricane characteristics given above and the charts and nomographs published by CERC in Technical Report No. 4 (24), wave heights and periods and their associated characteristics were developed. To determine the wave characteristics for the design hurricane, Technical Report No. 4 (24) was selected, since it was the state-of-the-art technical aid at the time the hurricane parameters were developed. Wave characteristics thus determined are compatible with the SPH hurricane characteristics. Table A-17 lists some of the wave characteristic associated with the design hurricane.

TABLE A-17
WAVE CHARACTERISTICS - DESIGN HURRICANE

H_s	Significant wave height, feet	4.7
T	Wave period, seconds	5.4
Lo	Deepwater wave length, feet	150
d/Lo	Relative depth	.0877
H_s/H_0'	Shoaling coefficient	.9449
H_0'	Deepwater wave height, feet	5.0
H_0'/T^2	Wave steepness	.172

f. Wave runup.

(1) Wave runup on a protective structure depends upon the physical characteristics (i.e., configuration and surface roughness), the depth of water at the structure, and the wave characteristics. Computation of maximum runup was necessary in order to determine the heights to which existing shore protective structures would have to be raised to prevent all overflow for the significant wave accompanying the SPH. Wave runup was considered to be the ultimate height to which water in a wave ascended on the proposed slope of a protective structure. This condition occurred when the WTL was at a maximum, and was calculated by the interpolation of model study data developed by Saville (25), (26), (27), which relates runup(R/H_0'), wave steepness (H_0'/T^2), relative depth (d/H_0'), and structure slope. The technique for computing wave runup is explained in detail in the Shore Protection Manual (SPM) (28).

(2) Protective structures exposed to wave runup will be constructed to an elevation and cross-section that is sufficient to prevent all overtopping from the significant wave and waves smaller than the significant wave accompanying the SPH. Waves larger than the significant wave will be allowed to overtop the protective structures; however, such overtopping will not endanger the security of the structure or cause material flooding. In the case of the South Point to GIWW levee, runup was computed for wave breaking on each berm to determine the required levee height in the reach from station 1030+00 to the GIWW. Table A-18 summarizes the elevations of the design windtide levels and the design elevation of the protective levees.

TABLE A-18

DESIGN HURRICANE
WINDTIDE LEVELS AND
DESIGN ELEVATIONS OF PROTECTIVE STRUCTURES

Location	Windtide level	Runup or Freeboard	Elev. of protective levees	Track
	ft. n.g.v.d.	ft.	ft. n.g.v.d.	
South Point to Hwy. 90	11.5 - 12.2	2.0	13.5 - 14.5	A & F
Hwy 90 to * Sta. 1030+00	12.2 - 12.8	2.0 - 4.5	14.5 - 17.5	F
Sta. 1030+00 to GIWW	12.8	4.5	17.5	F

* Transition

g. Residual flooding. The procedures described in the SPM (28) are used to determine wave runup and wave overtopping for the significant wave that would be experienced during hurricane occurrences. However, 14 percent of the waves in a spectrum are higher than the significant wave and the maximum wave heights to be expected are about 1.87 times the significant wave height. Thus a structure designed to prevent all overtopping by a significant wave would be overtopped by that portion of the spectrum that is higher than the significant wave. It was therefore necessary to assure that this residual overtopping would not produce flooding and subsequent damage to the extent that only partial protection was afforded to an area for the design hurricane. A determination of the residual overtopping was made for the New Orleans East area and it was concluded that no material following results if the design cross section is overtopped by waves higher than the significant wave. It was therefore concluded that the use of the significant wave runup would result in design grades for protective structures that would permit residual flooding only to a negligible degree.

A-8. Embankment Design.

a. Levee cross section. The levee alignment is divided into three distinct reaches of different cross sections. The reach from South Point to Highway 90 has a cross section with no wave berms. Since this levee is not subjected to wave attack, it is designed with 2 feet of freeboard. The reach from Highway 90 to Station 1030+00 is a transition reach which varies in cross section, the Station 1030+00 to GIWW reach is subject to wave attack similar to that experienced by the New Orleans East back levee. Therefore, this reach is designed with the same cross section, wave berms and net height, as the adjacent New Orleans East back levee (see Plate A-19).

b. I-10 Embankment. The embankment of I-10 at its intersection with the project levee alignment will not be raised to conform to the height requirements of the adjacent levee. The roadway and shoulder range from 1 to 2 feet above the design stillwater level of 11.5 ft. n.g.v.d. The reach of levee from South Point to U.S. Highway 90 is not subject to waves during the peak hour of the design storm when the stillwater level is 11.5 feet n.g.v.d. Additionally, the floodside slope of highway embankment is extemely mild. Therefore, waves which impinge on this embankment during other hours of the design storm, when stillwater stages are lower, are easily dissipated without overtopping. For these reasons, raising the highway embankment at the levee alignment was not considered.

c. Railroad gate at Station 1057+99.15. The existing railroad gate at Station 1057+99.15 is at elevation 13.5 feet n.g.v.d. It was constructed to this elevation as part of the barrier plan of protection which is no longer a viable alternative for hurricane protection of Lake Pontchartrain. This gate will not be raised to provide SPH protection, since the area behind the gate is not urbanized. Overtopping during the passage of the SPH will allow 150 acre - feet of water into the sump area behind the gate. This volume of overtopping will create approximately 0.1 feet of flooding in the protected area. For these reasons, replacing the gate at this time as part of the plan of protection is not considered.

INTERIOR DRAINAGE

A-9. Intercepted Drainage. No runoff will be intercepted by this work. Currently a levee already exists along the proposed alignment. Modifications to the existing drainage system to accommodate the high level plan levee are not required. Four drainage structures are currently in the GIWW to South Point levee. The four structures provide gravity drainage and tidal flow into the undeveloped areas of New Orleans East. A brief description of these structures follows. At station 664+99.27, near South Point, the drainage structure consists of five 48-inch CMP culverts 128 feet in length; the invert is at +2 feet n.g.v.d. The drainage structure at station 798+98.61 is composed of three 42-inch 0 CMP culverts 160 feet in length with an invert at -2.0 feet n.g.v.d. The drainage structure at station 927+04.70 consists of three 48-inch CMP culverts 160 feet in length at an invert of -2.0 feet n.g.v.d. The fourth drainage structure is located at station 1054+05.55; its four 54-inch culverts are 192 feet long and have an invert at -2.0 feet n.g.v.d. All of these drainage structures were replaced by the Corps under the Lake Pontchartrain barrier plan several years ago. They all have sluice gates for positive cutoff, trash racks on the inlet end and flap gates on the outlet end.

A-10. Bibliography.

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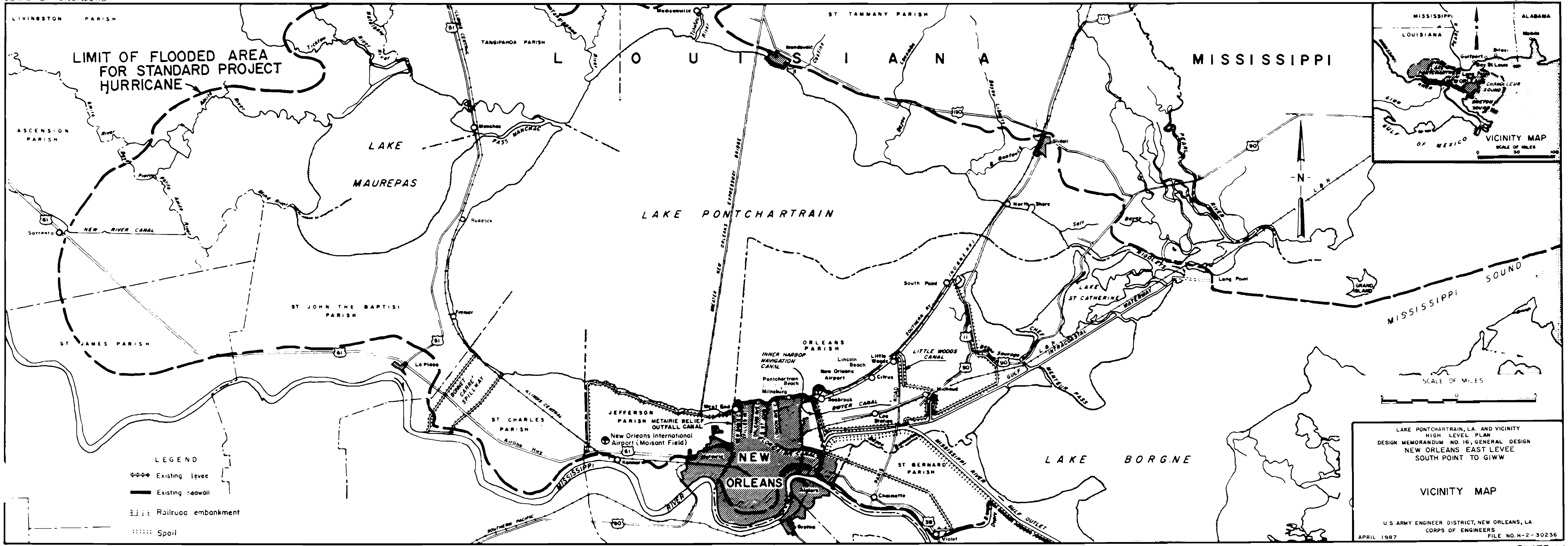


PLATE A-1

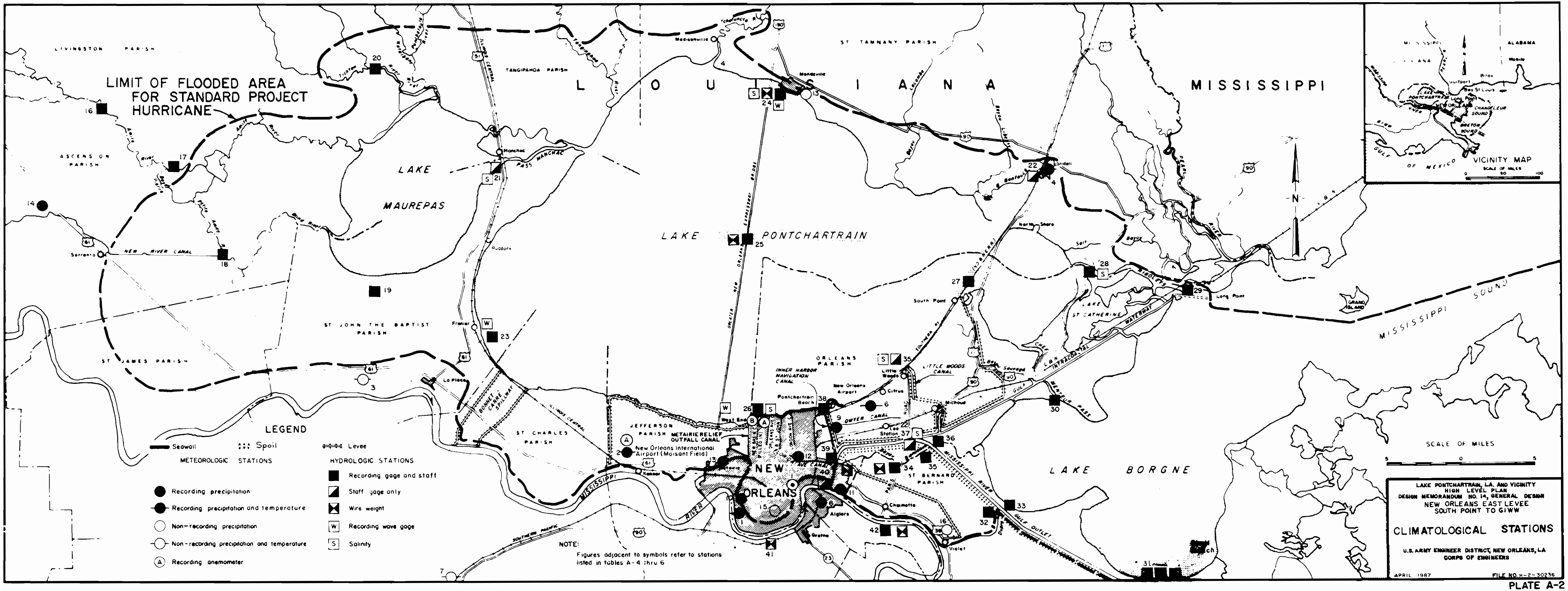
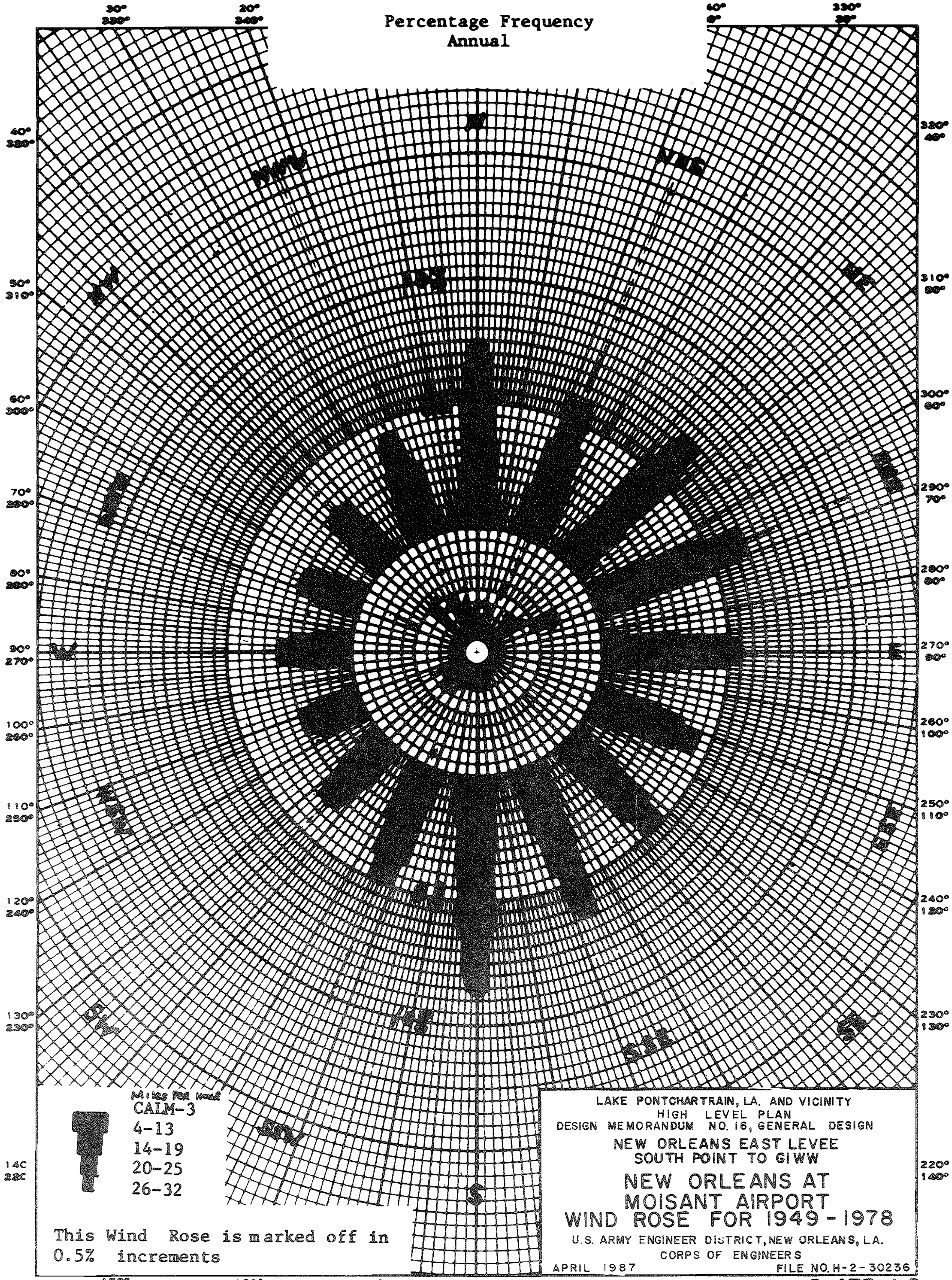

LIMIT OF FLOODED AREA
FOR STANDARD PROJECT
HURRICANE
LOUISIANA
MISSISSIPPI
LIVINGSTON PARISH
ASCENSION PARISH
TANGIPAHOA PARISH
ST TAMMANY PARISH
ST JOHN THE BAPTIST PARISH
ST JAMES PARISH
ST CHARLES PARISH
JEFFERSON PARISH
ORLEANS PARISH
ST BERNARD PARISH
LAKE MAUREPAS
LAKE PONTCHARTRAIN
LAKE BORGNE
LAKE ST CATHERINE
MISSISSIPPI SOUND
NEW ORLEANS
INNER HARBOR NAVIGATION CANAL
LITTLE WOODS CANAL
DWYER CANAL
METAIRIE RELIEF OUTFALL CANAL
BONNET CARRE SPILLWAY
GULF INTRACOASTAL WATERWAY
MISSISSIPPI RIVER GULF OUTLET
New Orleans International Airport (Moisant Field)
LEGEND
Seawall
Spoil
Levee
METEOROLOGIC STATIONS
Recording precipitation
Recording precipitation and temperature
Non-recording precipitation
Non-recording precipitation and temperature
Recording anemometer
HYDROLOGIC STATIONS
Recording gage and staff
Staff gage only
Wire weight
Recording wave gage
Salinity
NOTE:
Figures adjacent to symbols refer to stations listed in tables A-4 thru 6
VICINITY MAP
SCALE OF MILES
LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 14, GENERAL DESIGN
NEW ORLEANS EAST LEVEE
SOUTH POINT TO GIWW
CLIMATOLOGICAL STATIONS
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS, LA
CORPS OF ENGINEERS
APRIL 1987
FILE NO. H-2-30236

PLATE A-2

WIND ROSE

Percentage Frequency
Annual



LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 16, GENERAL DESIGN
NEW ORLEANS EAST LEVEE
SOUTH POINT TO GIWW

NEW ORLEANS AT
MOISANT AIRPORT
WIND ROSE FOR 1949 - 1978

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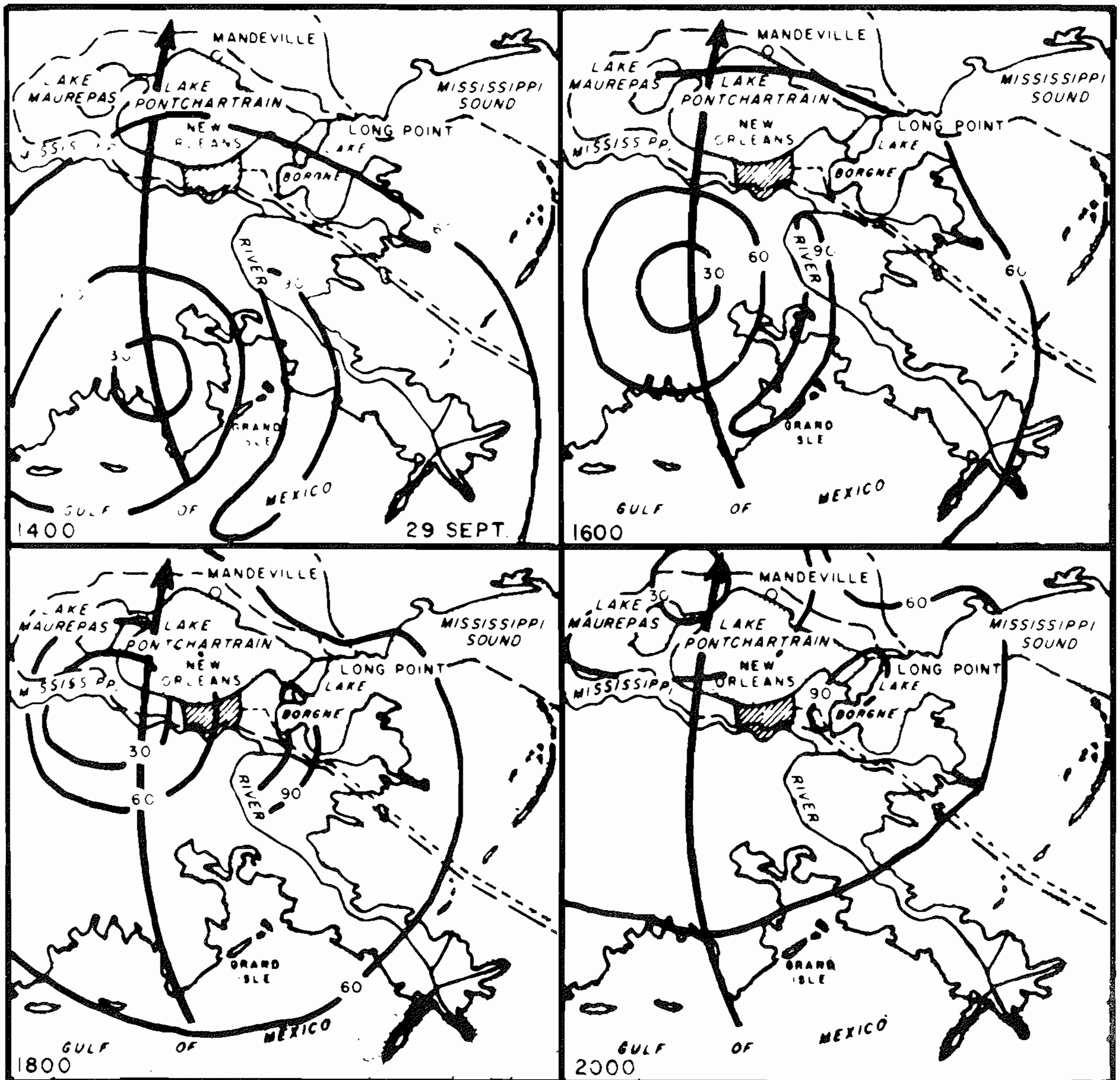
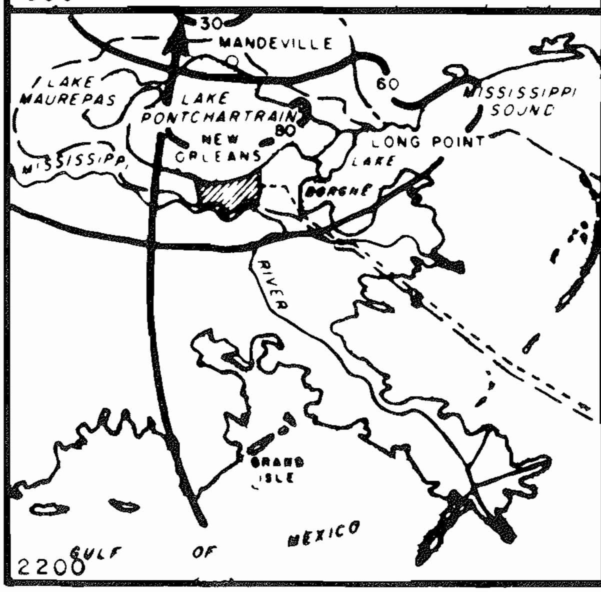
PLATE A-3





LEGEND

Study area

30 Average wind velocity

Hurricane path

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 16, GENERAL DESIGN
NEW ORLEANS EAST LEVEE
SOUTH POINT TO GIWW

ISOVEL PATTERNS
HURRICANE OF 28 SEP.
TO 1 OCT. 1915

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS, LA.
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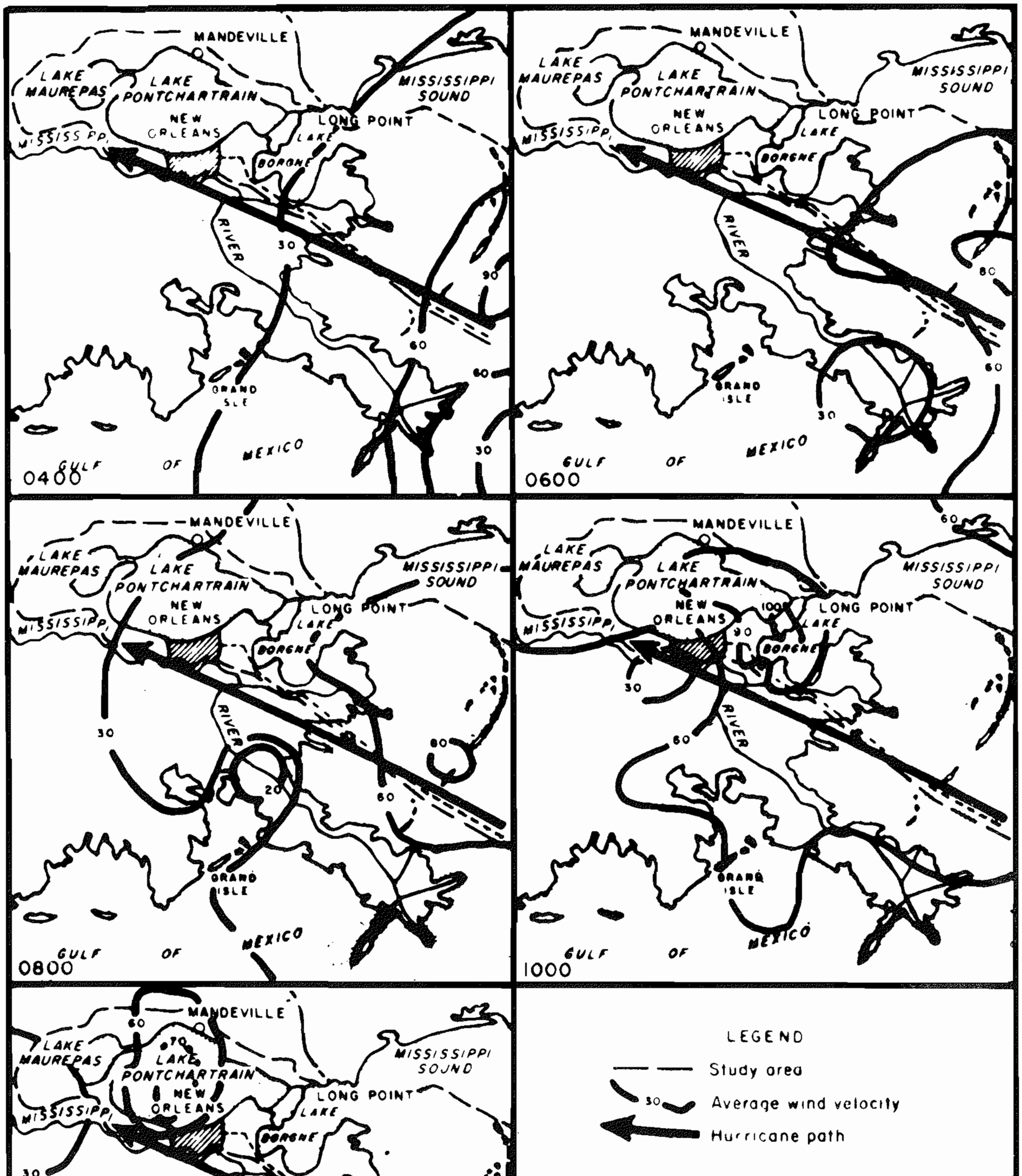
APRIL 1987 FILE NO. H-2-30236

PLATE A-4



LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 16, GENERAL DESIGN
NEW ORLEANS EAST LEVEE
SOUTH POINT TO GIWW

ISOVEL PATTERNS
HURRICANE OF 19 SEP. 1947

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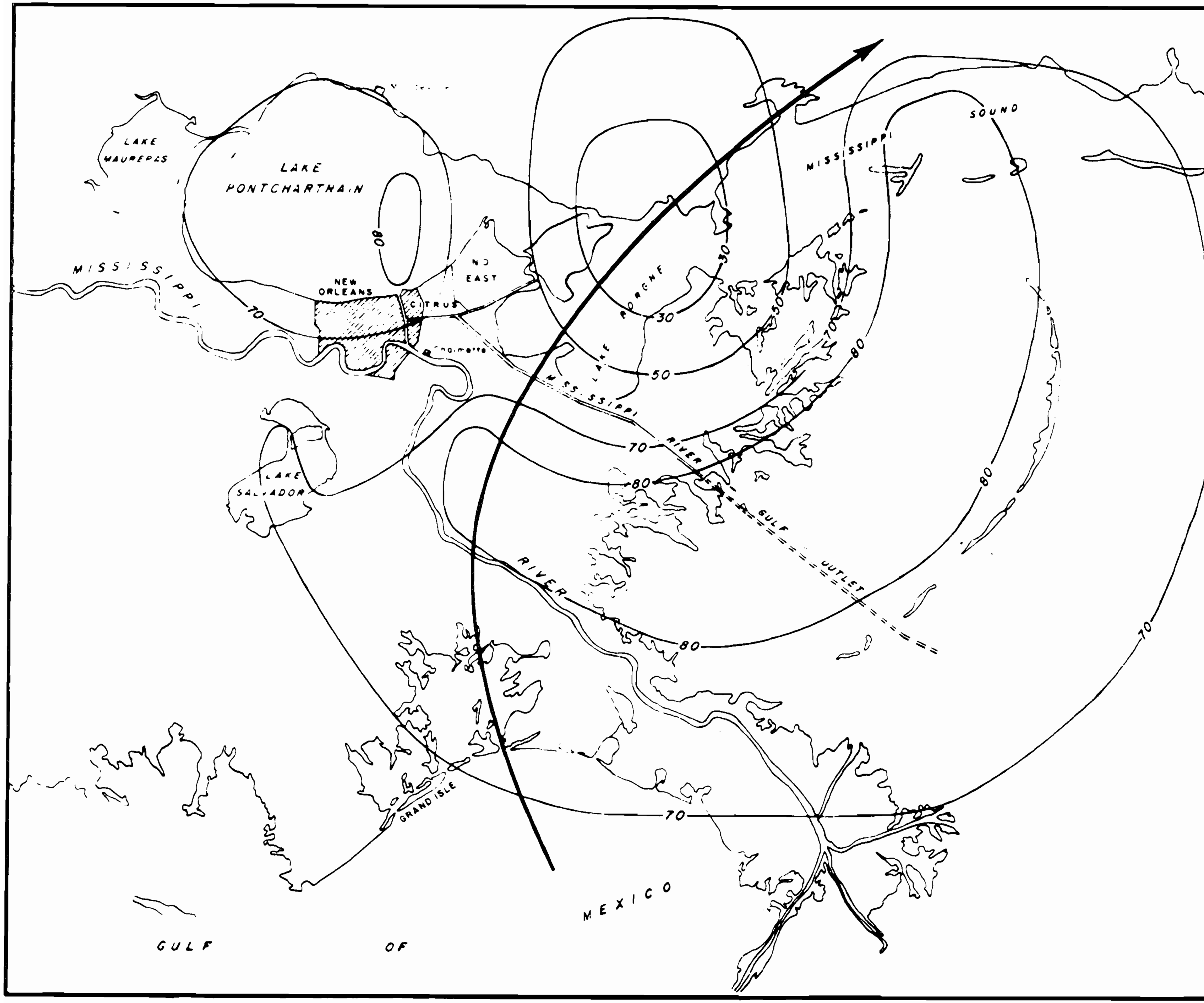
PLATE A- 5

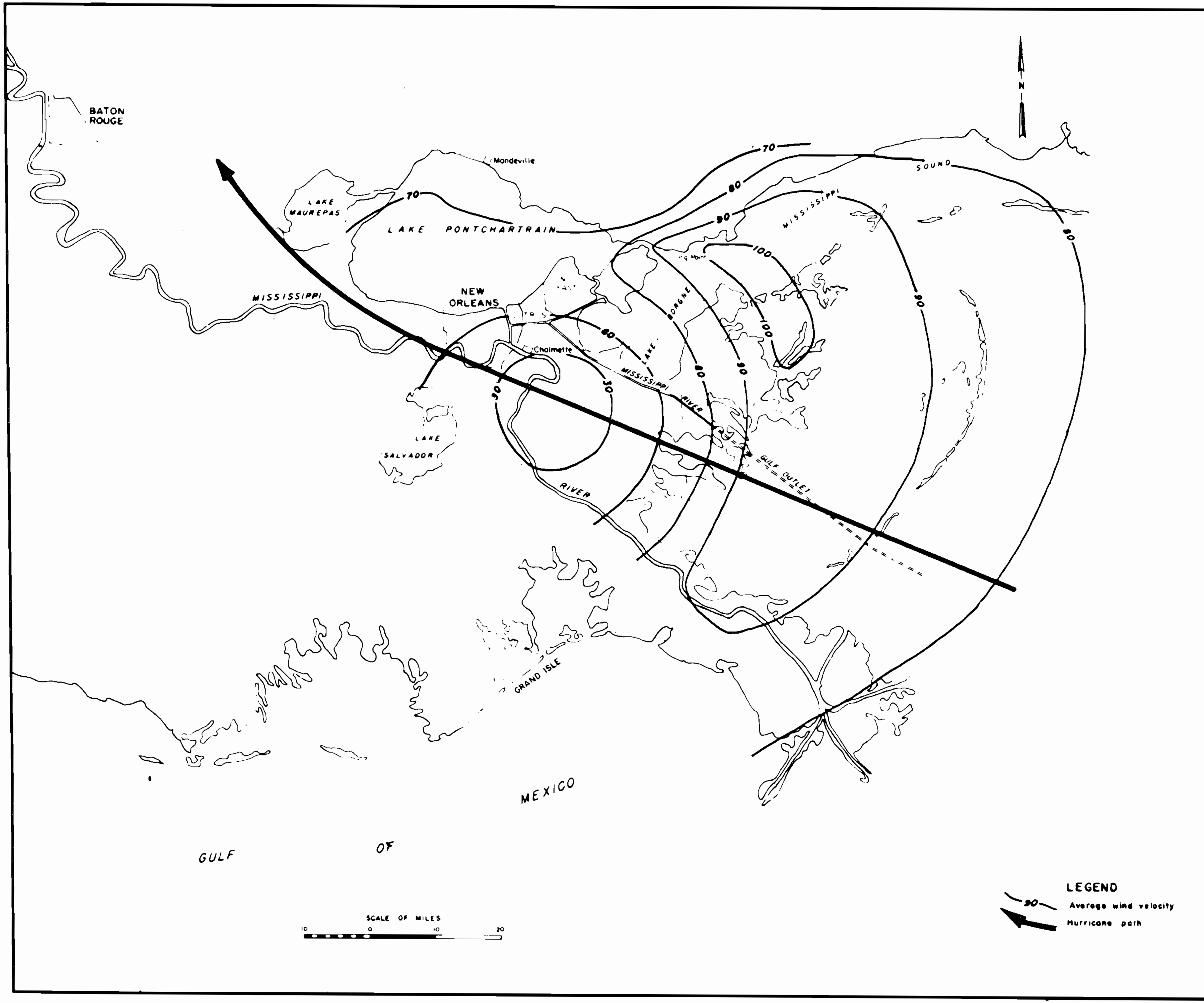


LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 16, GENERAL DESIGN
NEW ORLEANS EAST LEVEE
SOUTH POINT TO GIWW

ISOVEL PATTERN STANDARD PROJECT HURRICANE TRACK A CRITICAL TO SOUTH SHORE

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS, LA.
CORPS OF ENGINEERS
APRIL 1987 FILE NO. H-2-30236

PLATE A-6



LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 16, GENERAL DESIGN
NEW ORLEANS EAST LEVEE
SOUTH POINT TO GIWW

ISOVEL PATTERN STANDARD PROJECT HURRICANE TRACK F

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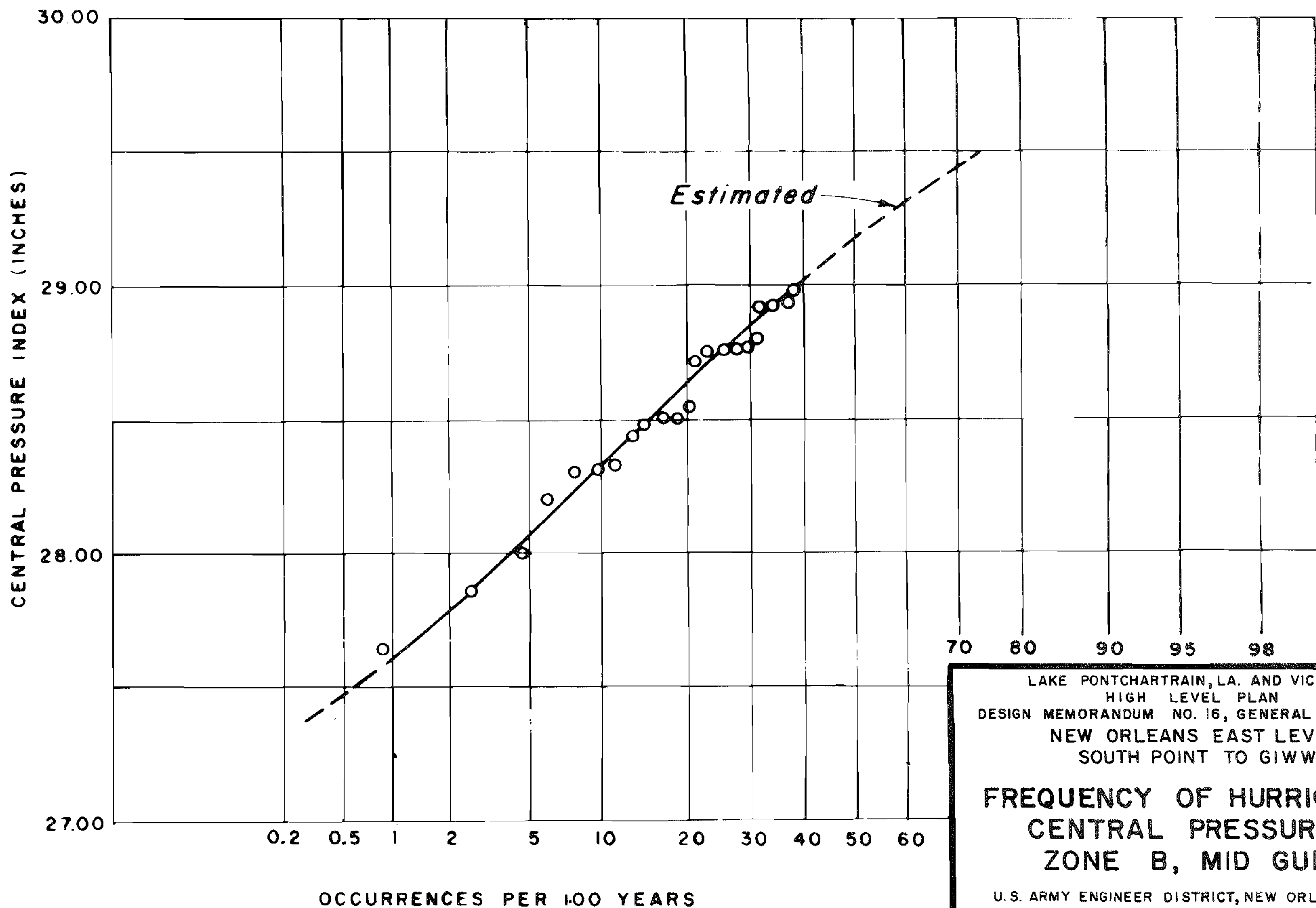
PLATE A-7

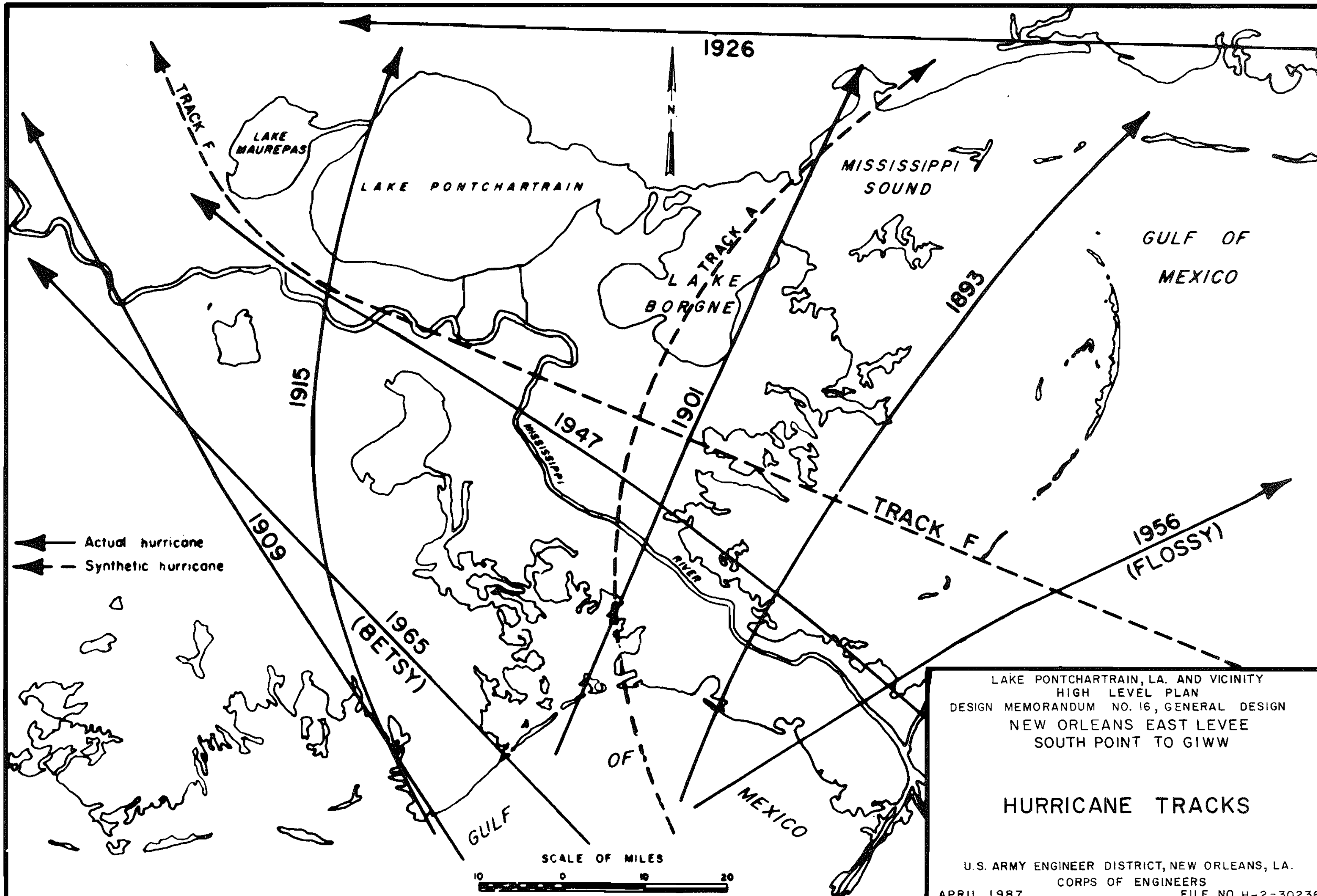


LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 16, GENERAL DESIGN
NEW ORLEANS EAST LEVEE
SOUTH POINT TO GIWW

FREQUENCY OF HURRICANE CENTRAL PRESSURES ZONE B, MID GULF

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS, LA.
CORPS OF ENGINEERS
APRIL 1987 FILE NO. H-2-30236

PLATE A-8



LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
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NEW ORLEANS EAST LEVEE
SOUTH POINT TO GIWW

HURRICANE TRACKS

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS, LA.
CORPS OF ENGINEERS
APRIL 1987 FILE NO. H-2-30236

PLATE A-9

HOURS REFERENCED TO LANDFALL	EL. IN LAKE BORGNE: EL. IN L. BORGNE	EL. IN LAKE BORGNE: AV. OF (2)	EL. IN LAKE PONTCHARTRAIN: AV. EL. IN L. PONT.	EL. IN LAKE PONTCHARTRAIN: EL. AT HWY. 11	EL. IN LAKE PONTCHARTRAIN: AV. OF (5)	FLOW INTO LAKE PONTCHARTRAIN: HEAD BETWEEN L. BORGNE & L. PONT.	FLOW INTO LAKE PONTCHARTRAIN: FLOW INTO L. PONT.	FLOW INTO LAKE PONTCHARTRAIN: VOLUME OF FLOW FOR 2 HOURS	FLOW INTO LAKE PONTCHARTRAIN: RAIN IN L. PONT.	FLOW INTO LAKE PONTCHARTRAIN: VOLUME OF RAIN FOR 2 HOURS	FLOW INTO LAKE PONTCHARTRAIN: TOTAL INFLOW INTO L. PONT.	L. PONT. STORAGE: STORAGE IN L. PONT. FOR EL. IN (4)	L. PONT. STORAGE: Δ STORAGE IN L. PONT.	OVERFLOW: FLOW OVER L. PONT LEVEES FOR 2 HOUR	FLOW INTO L. MAUREPAS: (12)-(14)-(15)
(1)	(2) FEET N.G.V.D.	(3) FEET N.G.V.D.	(4) FEET N.G.V.D.	(5) FEET N.G.V.D.	(6) FEET N.G.V.D.	(7) FEET	(8) 1000 C.F.S.	(9) 1000 D.S.F.	(10) FEET	(11) 1000 D.S.F.	(12) 1000 D.S.F.	(13) 1000 D.S.F.	(14) 1000 D.S.F.	(15) 1000 D.S.F.	(16) 1000 D.S.F
2	9.46		3.94	2.33					0.115			1970.6			
		9.86			1.21	8.65	4214.0	351.2		13.7	364.9		346.5	2.3	16.1
4	10.25		5.26	0.09					0.052			2317.1			
		9.91			1.62	8.29	4043.2	336.9		48.0	370.9		351.7	11.6	15.6
6	9.56		6.65	3.14					0.165			2660.8			
		9.11			4.55	4.56	2310.6	192.6		49.6	242.2		202.5	25.8	13.9
8	8.66		7.28	5.96					0.180			2871.3			
		7.43			7.43	0.00	0.0	0.0		21.0	21.0		-47.7	54.9	13.8
10	6.19		7.11	8.90					0.075			2823.6			

VERIFICATION

HOURS REFERENCED TO LANDFALL	EL. IN LAKE MAUREPAS: STORAGE IN L. MAUREPAS	EL. IN LAKE MAUREPAS: AV. EL. IN L. MAUREPAS	STAGES IN PASS MANCHAC, L. PONT. SIDE: EL. IN PASS MANCHAC	STAGES IN PASS MANCHAC, L. PONT. SIDE: AV. OF (19)	STAGES IN PASS MANCHAC, LAKE MAUREPAS SIDE: TILT IN L. PONT.	STAGES IN PASS MANCHAC, LAKE MAUREPAS SIDE: TILT IN L. MAUREPAS	STAGES IN PASS MANCHAC, LAKE MAUREPAS SIDE: EL. IN PASS MANCHAC	STAGES IN PASS MANCHAC, LAKE MAUREPAS SIDE: AV. OF (23)	FLOW INTO LAKE MAUREPAS: HEAD BETWEEN L. PONT & L. MAUREPAS	FLOW INTO LAKE MAUREPAS: FLOW INTO L. MAUREPAS	FLOW INTO LAKE MAUREPAS: VOLUME OF FLOW FOR 2 HOURS	STAGE IN LAKE MAUREPAS: STORAGE IN L. MAUREPAS	STAGE IN LAKE MAUREPAS: EL. IN L. MAUREPAS
(1)	(17) 1000 D.S.F.	(18) FEET N.G.V.D.	(19) FEET N.G.V.D.	(20) FEET N.G.V.D.	(21) FEET	(22) FEET	(23) FEET N.G.V.D.	(24) FEET N.G.V.D.	(25) FEET	(26) 1000 C.F.S.	(27) 1000 D.S.F	(28) 1000 D.S.F.	(29) FEET N.G.V.D.
2	225.1	1.12	3.54		1.21	0.24	1.00					226.2	1.13
				4.52				0.86	3.66	165.8	13.8		
4	241.8	1.27	5.50		5.91	1.08	0.73					240.0	1.26
				6.02				0.90	5.18	181.6	15.4		
6	256.8	1.41	6.55		3.41	0.68	1.07					255.4	1.40
				6.08				1.32	4.76	180.5	15.0		
8	270.7	1.58	5.61		-0.35	-0.07	1.57					270.4	1.53
				5.11				1.82	3.29	160.2	13.4		
10	284.5	1.65	4.61		-4.29	-0.86	2.08					283.8	1.69

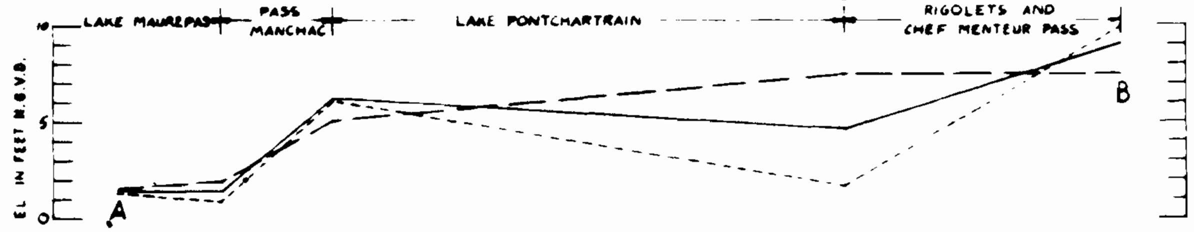
SAMPLE ROUTING

EXPLANATION:

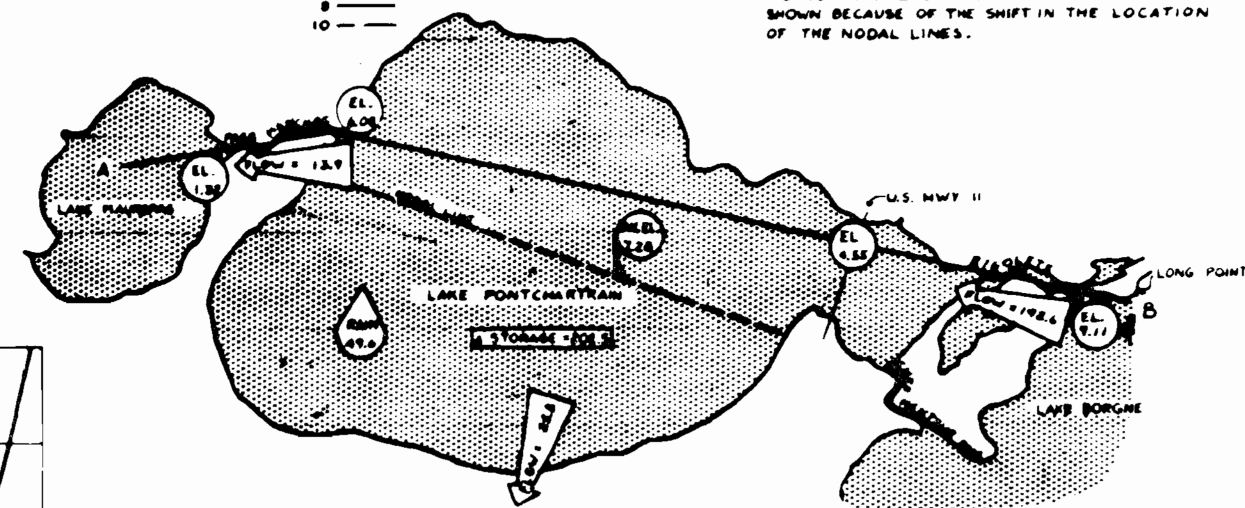
COLUMN (2) FROM LAKE BORGNE HYDROGRAPH DERIVED BY THE METHOD DESCRIBED IN PARAGRAPH 1-5 (1) AND SHOWN ON PLATE A-13
(4) ASSUMED
(5) OBTAINED FROM WATER SURFACE CONTOURS DERIVED FROM WIND SETUP COMPUTATIONS FOR LAKE PONT., SAMPLE SHOWN ON PLATE A-15
(7) (3) - (6)
(8) FROM CHEF MENTEUR PASS AND RIGOLETS RATING CURVE SHOWN BELOW
(10) FROM RAINFALL ESTIMATES DESCRIBED IN PARAGRAPH 1-5E(A)
(12) (9) + (11)
(13) FROM LAKE PONT. STORAGE CURVE SHOWN BELOW FOR THE ELEVATION IN (4)

COLUMN (14) (13) - (13)
(15) BY THE PROCEDURES DESCRIBED IN PARAGRAPH 1-7E
(17) (16) + (17)
(18) CORRESPONDING ELEVATION FOR VOLUME IN (17) FROM LAKE MAUREPAS STORAGE CURVE SHOWN BELOW
(19) SAME AS EXPLANATION FOR (5)
(21) (19) - (5)
(22) 1/5 OF (21), ESTIMATED AS 1/5 OF THE TILT OF LAKE PONTCHARTRAIN SINCE LAKE MAUREPAS IS 1/5 AS WIDE.
(23) (18) - (22)/2
(25) (20) - (24)
(26) FROM PASS MANCHAC RATING CURVE SHOWN BELOW
(28) (17) + (27)
(29) CORRESPONDING ELEVATION FOR VOLUME IN (28) FROM LAKE MAUREPAS STORAGE CURVE SHOWN BELOW

WATER SURFACE PROFILES



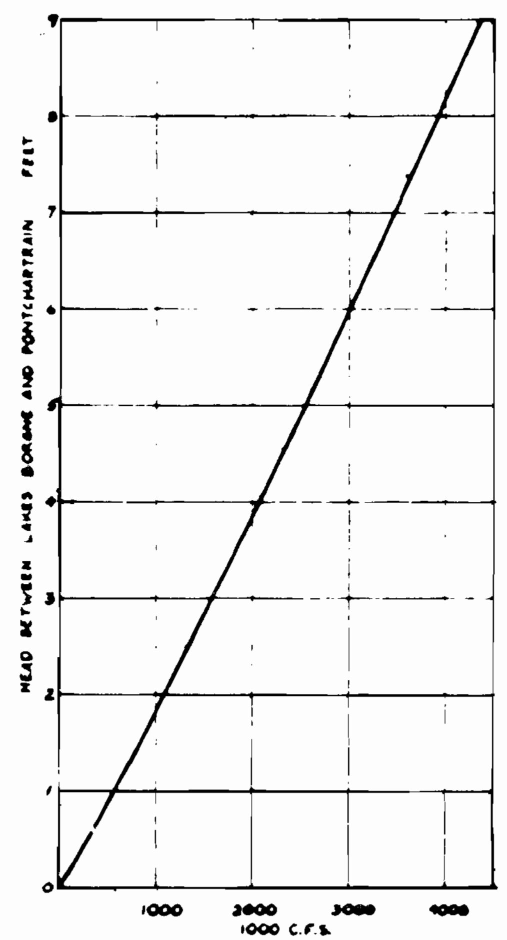
NOTE: THE LAKE PONTCHARTRAIN PROFILES DO NOT REFLECT THE AVERAGE LAKE ELEVATIONS FOR THE HOURS SHOWN BECAUSE OF THE SHIFT IN THE LOCATION OF THE NODAL LINES.



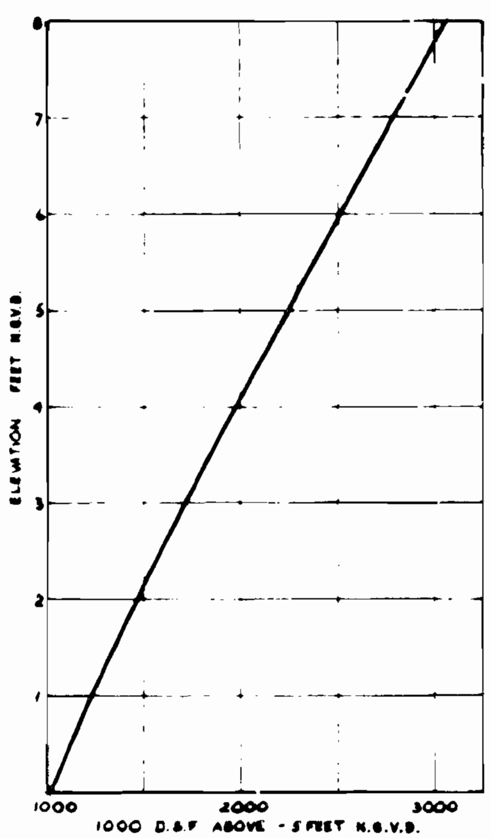
ROUTING DIAGRAM

6 TO 8 HOURS AFTER LANDFALL

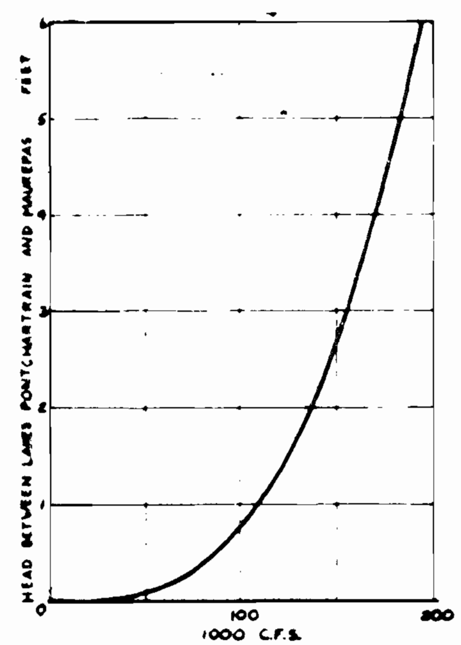
NOTE:
FLOW AND RAIN IN 1000 D.S.F.
ELEVATIONS IN FEET N.G.V.D



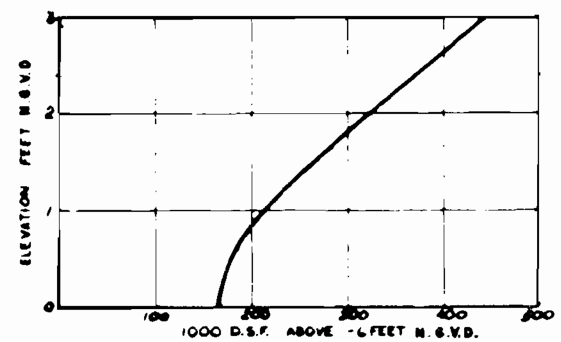
CHEF MENTEUR PASS & RIGOLETS FLOW



LAKE PONTCHARTRAIN STORAGE



PASS MANCHAC FLOW



LAKE MAUREPAS STORAGE

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 16, GENERAL DESIGN
NEW ORLEANS EAST LEVEE
SOUTH POINT TO GIWW

LAKE PONTCHARTRAIN ROUTING

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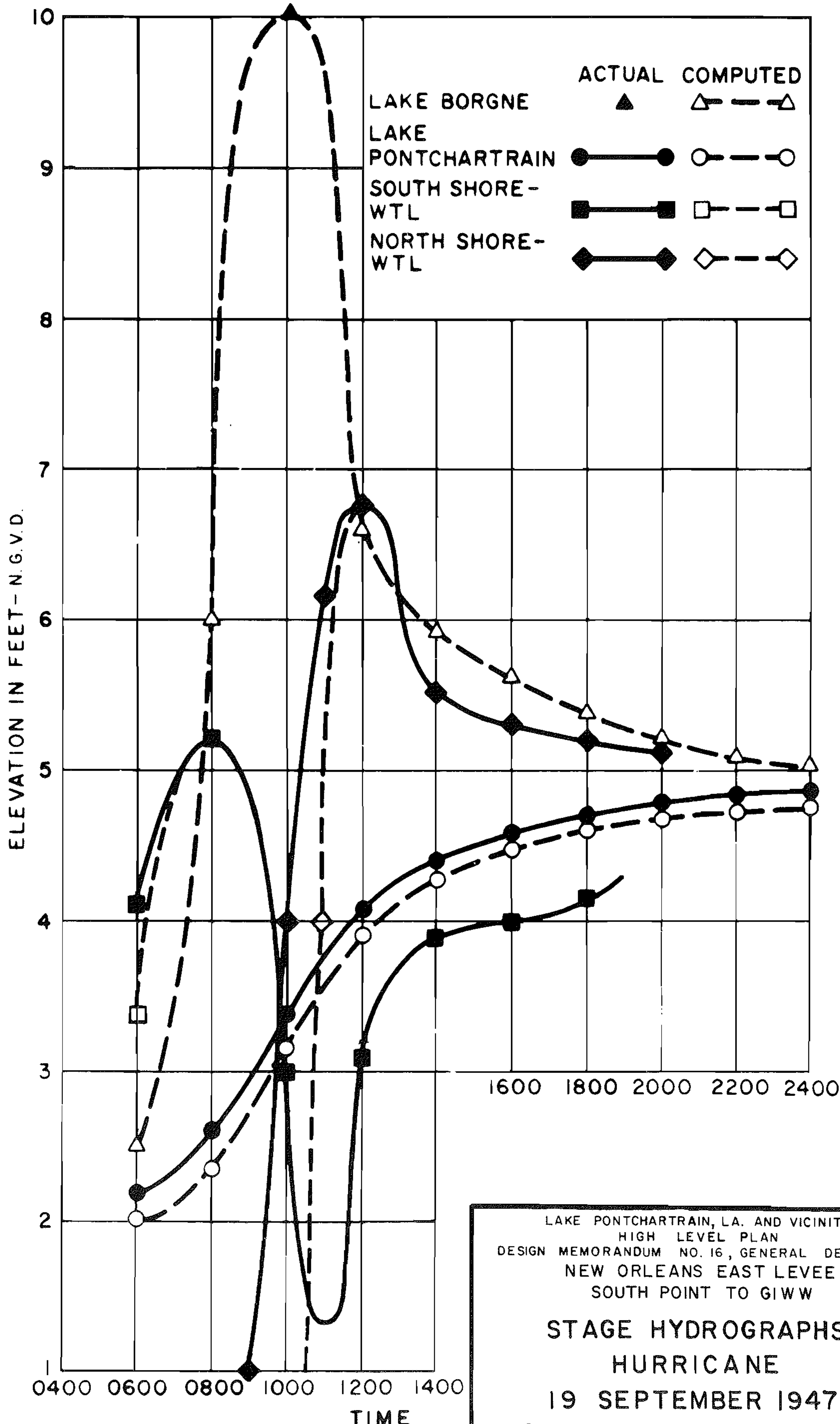
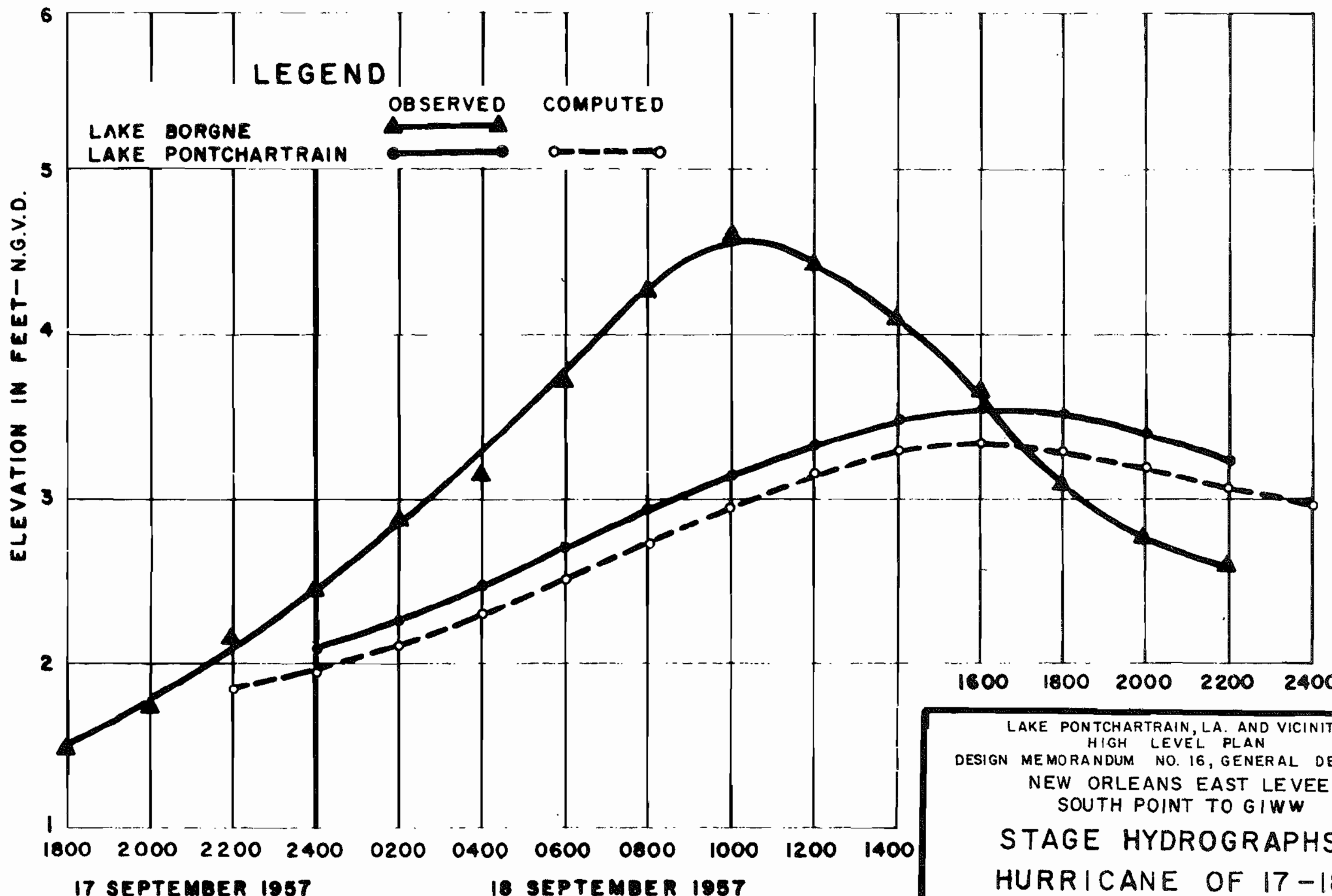


LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 16, GENERAL DESIGN
NEW ORLEANS EAST LEVEE
SOUTH POINT TO GIWW

STAGE HYDROGRAPHS
HURRICANE
19 SEPTEMBER 1947

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS, LA.
CORPS OF ENGINEERS
APRIL 1987 FILE NO. H-2-30236

PLATE A-11



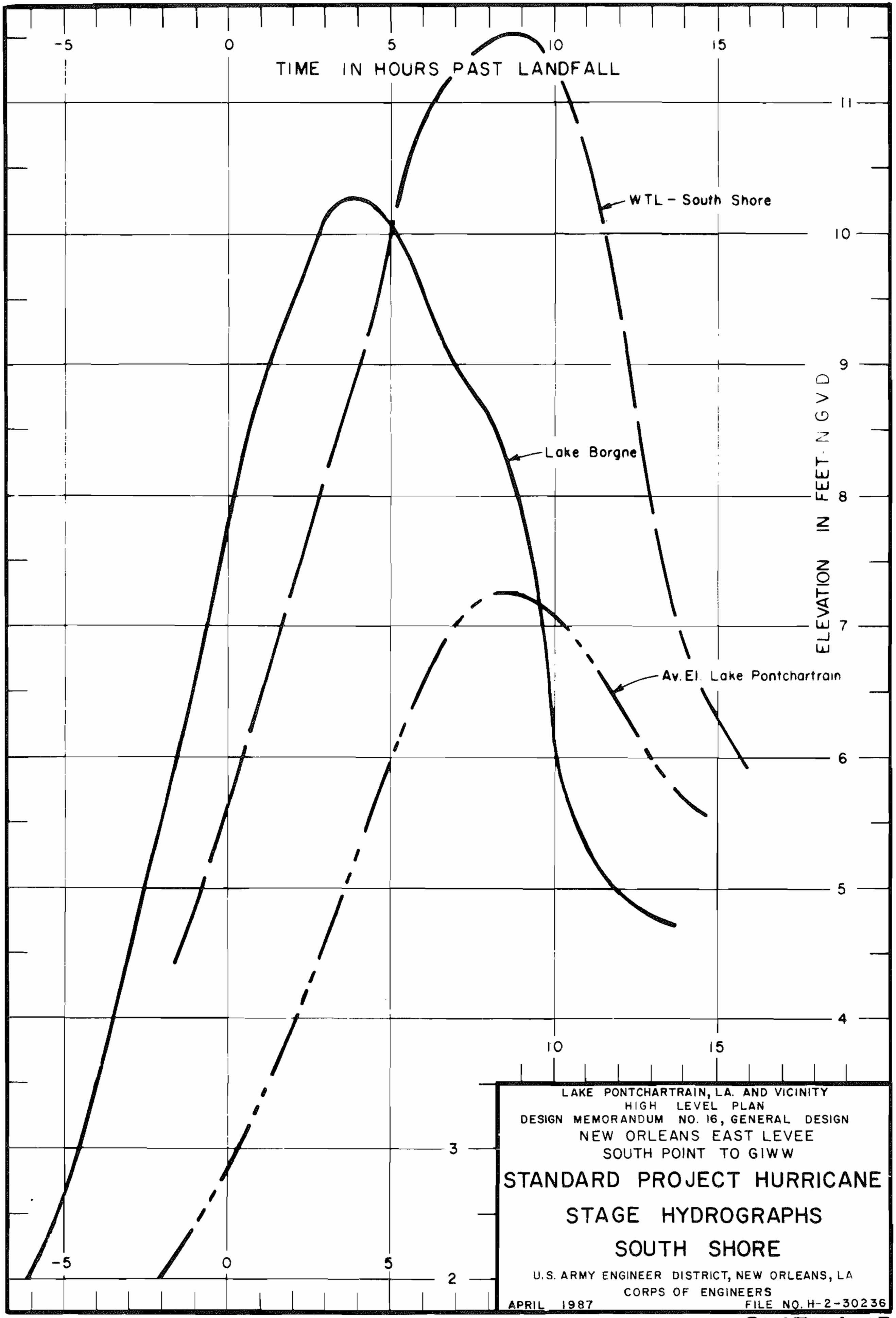
LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 16, GENERAL DESIGN
NEW ORLEANS EAST LEVEE
SOUTH POINT TO GIWW

STAGE HYDROGRAPHS
HURRICANE OF 17-18
SEPTEMBER 1957

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

APRIL 1987 FILE NO. H-2-30236

PLATE A-12

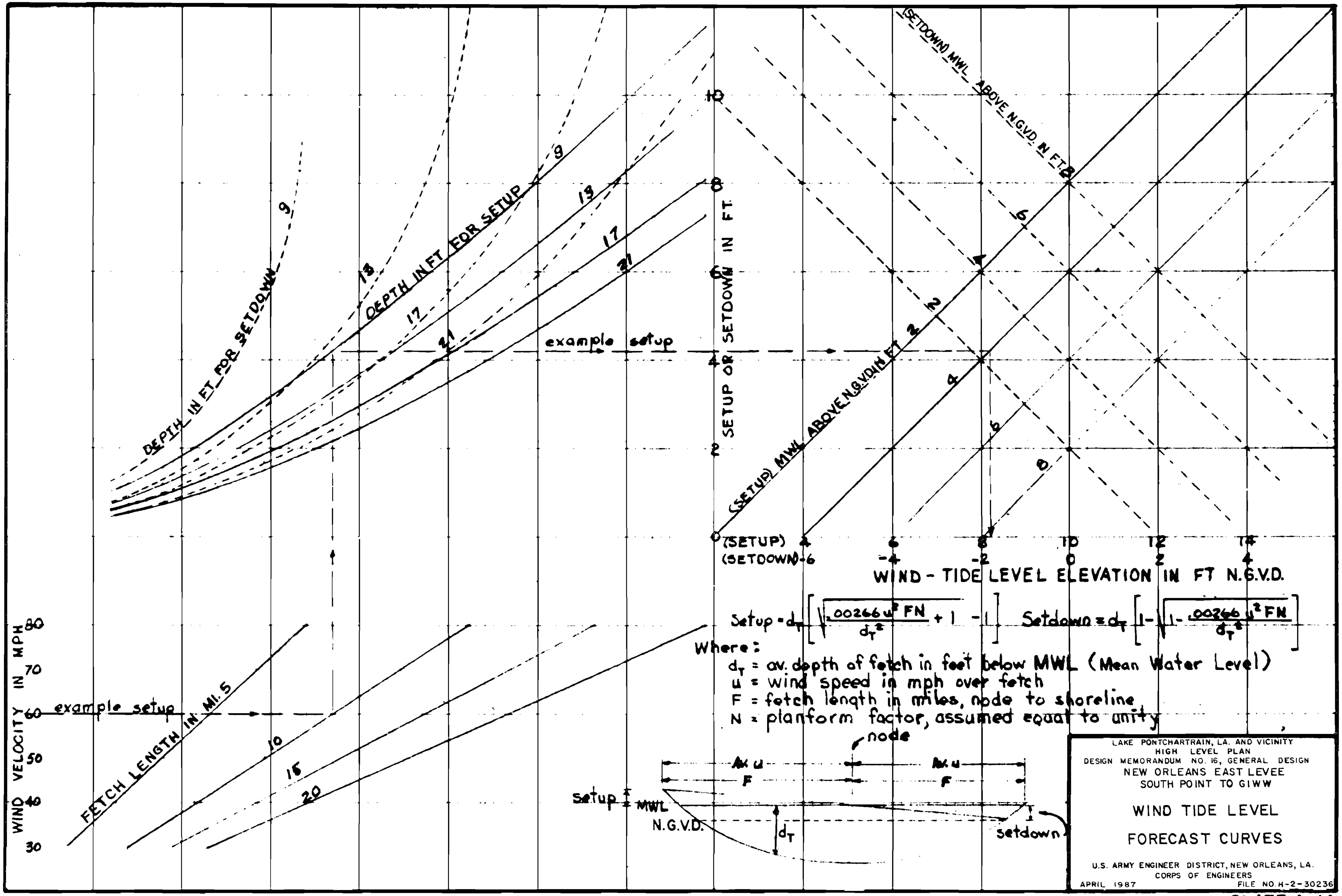


LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 16, GENERAL DESIGN
NEW ORLEANS EAST LEVEE
SOUTH POINT TO GIWW

STANDARD PROJECT HURRICANE
STAGE HYDROGRAPHS
SOUTH SHORE

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS, LA
CORPS OF ENGINEERS
APRIL 1987 FILE NO. H-2-30236

PLATE A-13



$$\text{Setup} = d_T\left[\sqrt{\frac{.00266\,u^2 FN}{d_T^2}+1}-1\right] \qquad \text{Setdown} = d_T\left[1-\sqrt{1-\frac{.00266\,u^2 FN}{d_T^2}}\right]$$

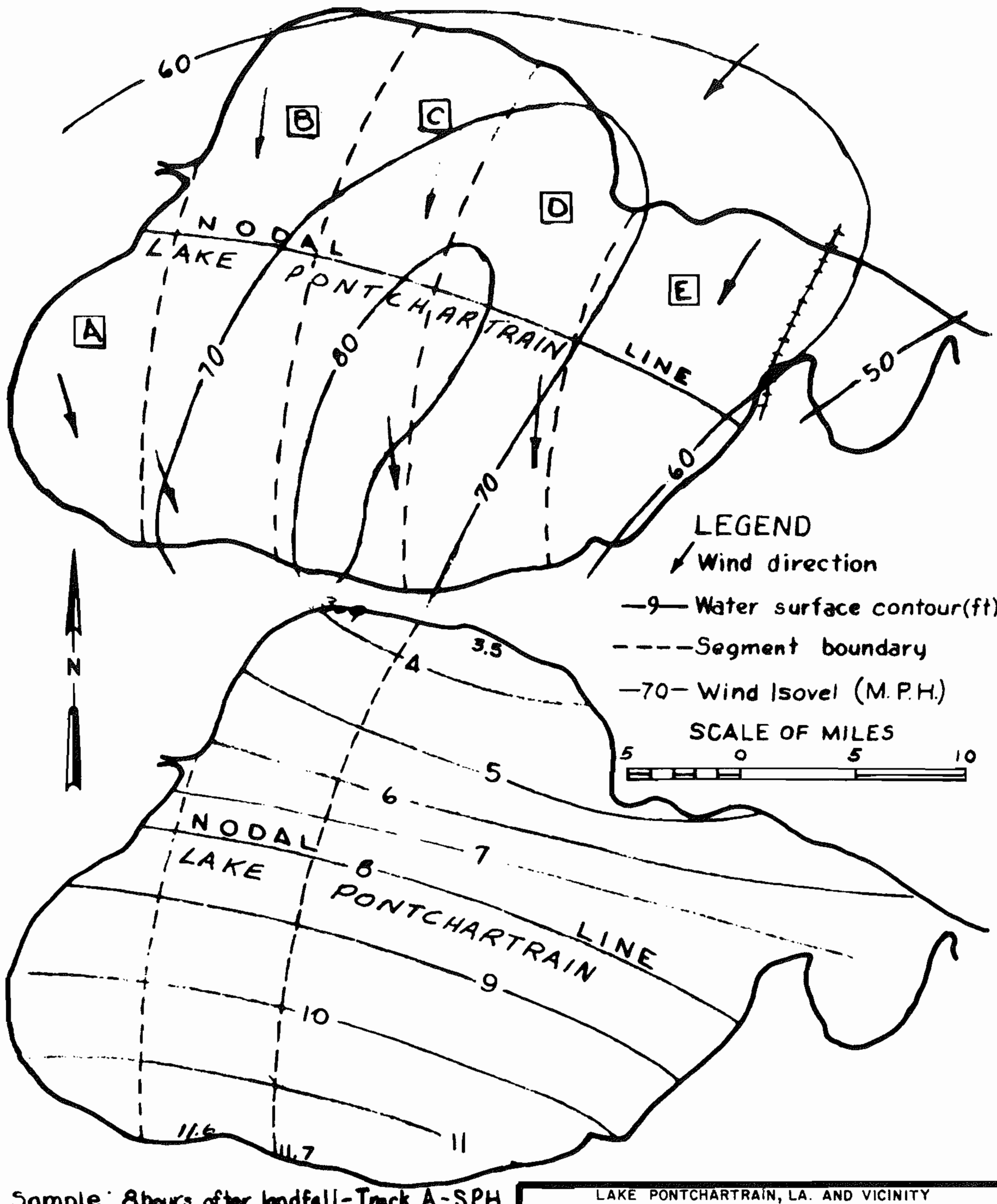
Where:
- d_T = av. depth of fetch in feet below MWL (Mean Water Level)
- u = wind speed in mph over fetch
- F = fetch length in miles, node to shoreline
- N = planform factor, assumed equal to unity

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 16, GENERAL DESIGN
NEW ORLEANS EAST LEVEE
SOUTH POINT TO GIWW

WIND TIDE LEVEL
FORECAST CURVES

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS, LA.
CORPS OF ENGINEERS
APRIL 1987 FILE NO. H-2-30236

PLATE A-14



<u>Sample</u>: 8 hours after landfall-Track A-SPH

<u>Setdown</u>:

$$S = 19.2\left[\sqrt{1 - \frac{0.00266(66)^2(12.5)(1.0)}{(19.2)^2}}\right] = -4.1$$

+8.0 = MWL
−4.1
+3.9 = WTL

<u>Setup</u>:

$$S = 20.5\left[\left(\sqrt{\frac{0.00266(70)^2(12.5)(1.0)}{(20.5)^2}+1}\right)-1\right] = +3.6'$$

+3.6'
8.0 = MWL
+11.6 = WTL

Interpolate with data for MWL = 6.0'
to obtain WTL's for routed MWL = +7.28'.

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 16, GENERAL DESIGN
NEW ORLEANS EAST LEVEE
SOUTH POINT TO GIWW

LAKE PONTCHARTRAIN TYPICAL WIND TIDE CONTOURS

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

APRIL 1987 FILE NO. H-2-30236

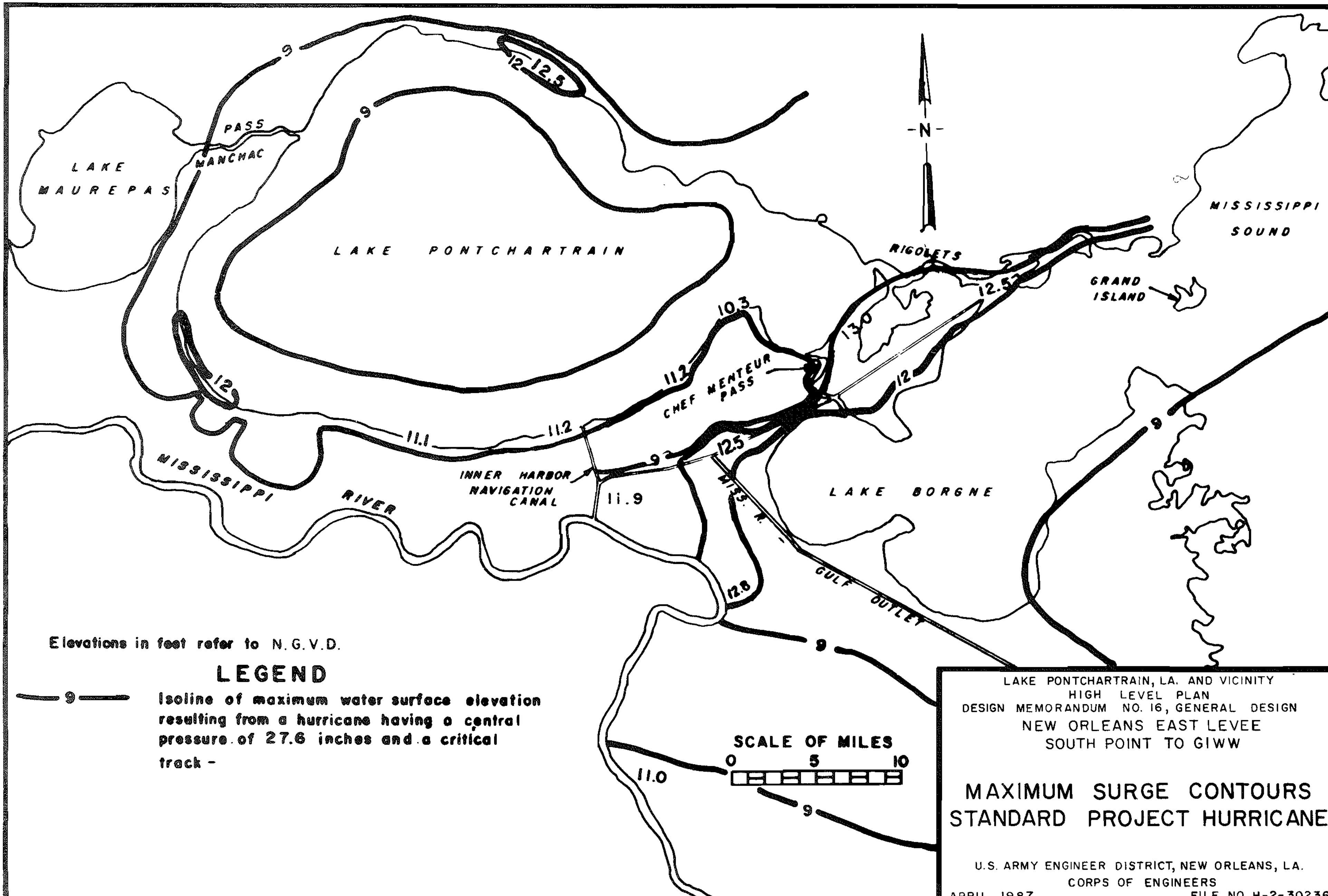
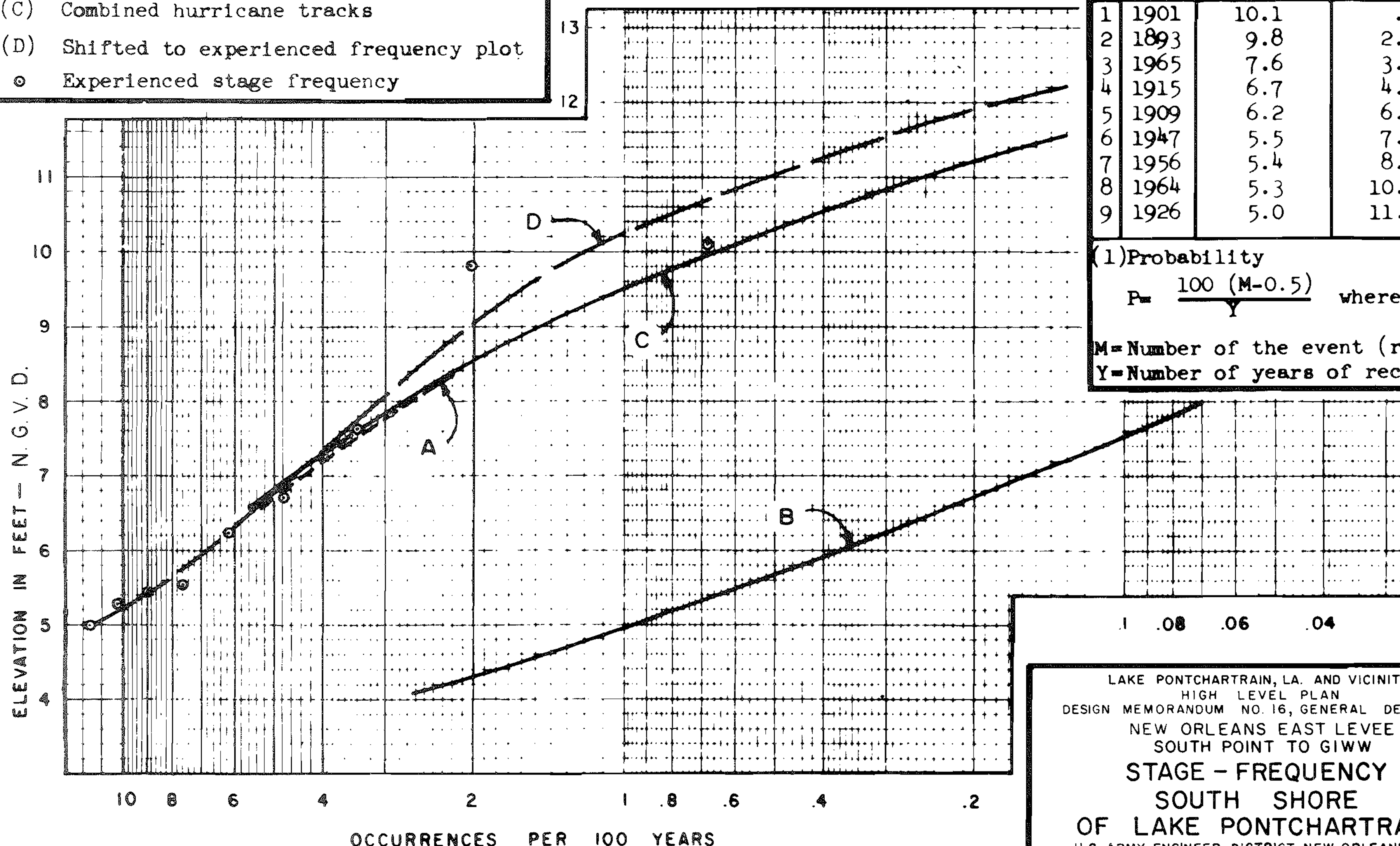

LAKE MAUREPAS
PASS MANCHAC
LAKE PONTCHARTRAIN
RIGOLETS
MISSISSIPPI SOUND
GRAND ISLAND
CHEF MENTEUR PASS
INNER HARBOR NAVIGATION CANAL
MISSISSIPPI RIVER
LAKE BORGNE
MISS. R. - GULF OUTLET
N
9
12
12.5
10.3
11.2
11.1
11.9
12.5
13.0
12.8
11.0
Elevations in feet refer to N.G.V.D.
LEGEND
9 Isoline of maximum water surface elevation resulting from a hurricane having a central pressure of 27.6 inches and a critical track -
SCALE OF MILES
0 5 10
LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 16, GENERAL DESIGN
NEW ORLEANS EAST LEVEE
SOUTH POINT TO GIWW
MAXIMUM SURGE CONTOURS
STANDARD PROJECT HURRICANE
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS, LA.
CORPS OF ENGINEERS
APRIL 1987
FILE NO. H-2-30236

PLATE A-16

LEGEND

(A) Hurricane tracks from the south
(B) Hurricane tracks from the east
(C) Combined hurricane tracks
(D) Shifted to experienced frequency plot
⊙ Experienced stage frequency



FREQUENCY ANALYSIS			
M	Years	Wind tide level (ft.)	(1) Probability
1	1901	10.1	.685
2	1893	9.8	2.05
3	1965	7.6	3.42
4	1915	6.7	4.79
5	1909	6.2	6.16
6	1947	5.5	7.53
7	1956	5.4	8.90
8	1964	5.3	10.27
9	1926	5.0	11.64

(1) Probability

$$P = \frac{100\ (M-0.5)}{Y} \quad \text{where}$$

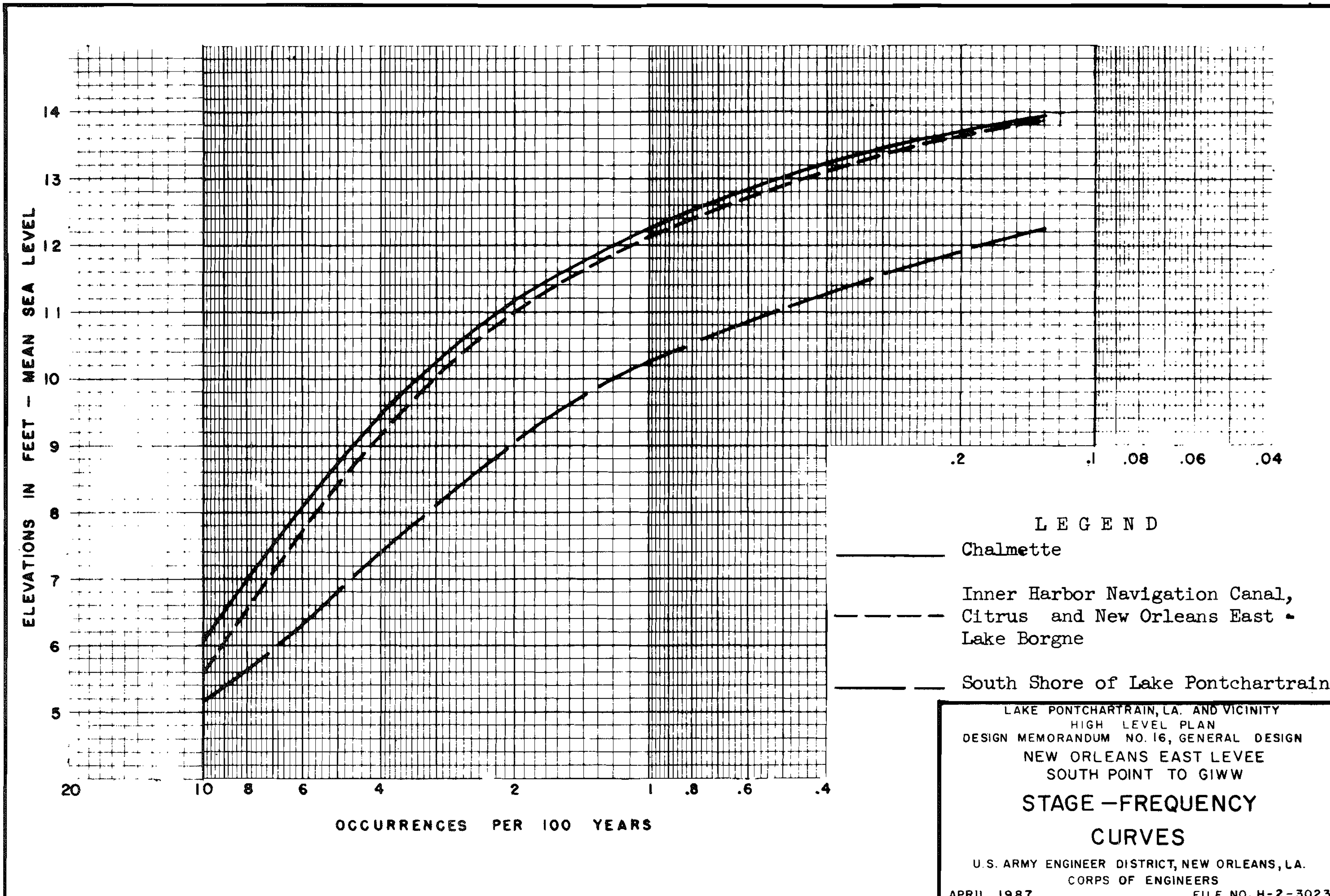
M = Number of the event (rank)
Y = Number of years of record (73)

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 16, GENERAL DESIGN
NEW ORLEANS EAST LEVEE
SOUTH POINT TO GIWW

STAGE – FREQUENCY SOUTH SHORE OF LAKE PONTCHARTRAIN

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS, LA.
CORPS OF ENGINEERS
APRIL 1987 FILE NO. H-2-30236

PLATE A-17



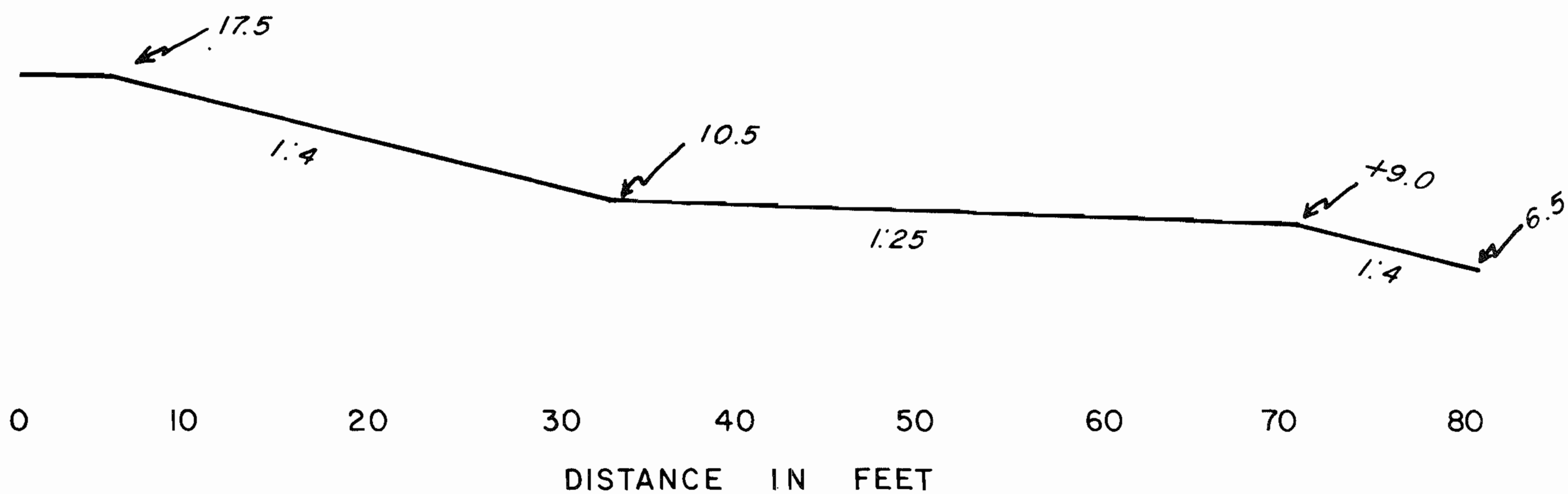
LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 16, GENERAL DESIGN
NEW ORLEANS EAST LEVEE
SOUTH POINT TO GIWW

STAGE — FREQUENCY CURVES

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

APRIL 1987 FILE NO. H-2-30236

PLATE A-18



NOTE:

All elevations shown on this plate are in feet N.G.V.D.

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 16, GENERAL DESIGN
NEW ORLEANS EAST LEVEE
SOUTH POINT TO GIWW

TYPICAL CROSS SECTION

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS, LA.
CORPS OF ENGINEERS
APRIL 1987 FILE NO. H-2-30236

PLATE A-19

LAKE PONTCHARTRAIN, LOUISIANA AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 16 - GENERAL DESIGN
NEW ORLEANS EAST LEVEE
SOUTH POINT TO GIWW

APPENDIX B

LOCAL COOPERATION AGREEMENT

THE UNITED STATES OF AMERICA

AND

THE ORLEANS LEVEE DISTRICT

FOR LOCAL COOPERATION AT

LAKE PONTCHARTRAIN AND VICINITY HIGH LEVEL PLAN

THIS AGREEMENT entered into this 21 day of June 1985 by and between the UNITED STATES OF AMERICA (hereinafter called the "Government"), represented by the Contracting Officer executing this Agreement, and the Board of Commissioners of the Orleans Levee District, WITNESSETH THAT:

WHEREAS, construction of the Lake Pontchartrain and Vicinity (hereinafter called the "Project") was authorized by the Flood Control Act, approved October 27, 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; and

WHEREAS, on January 2, 1971, the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, Public Law 91-646 was enacted; and

WHEREAS, Section 92 of the Water Resources Development Act of 1974, (Public Law 251, 93d Congress) authorized, inter alia, a plan under which the non-Federal interest may pay its cash obligations for the project on a deferred basis; and

WHEREAS, Lake Pontchartrain, Louisiana, and Vicinity Hurricane Protection Project Reevaluation Study, dated December 1983, approved February 7, 1985, has authorized construction of the High Level Plan, rather than the Barrier Plan; and

WHEREAS, on July 28, 1966, the Board of Commissioners of the Orleans Levee District granted two Assurances for the Lake Pontchartrain and Vicinity Project to the United States of America, one Assurance was for the Chalmette Area Plan and one was for the Barrier Plan, accepted by the Chief, Real Estate Division for and in behalf of the United States of America on September 30, 1966, containing the following items of local cooperation for the Chalmette Area Plan and the Barrier Plan, respectively:

CHALMETTE AREA PLAN

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

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;

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

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:

Project	Total Contribution for Construction	Lands and Relocations	Cash Contribution for Construction
Chalmette	$1,246,300	$ 377,900	$868,400

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

f. 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;

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; and

BARRIER PLAN

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

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;

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

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:

Project	Total Contribution for Construction	Lands and Relocations	Cash Contribution for Construction
Lake Pontchartrain Barrier Plan	$28,940,400	$6,241,100	$22,699,300

e. 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;

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

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, seawalls, and stoplog structures, but excluding the Rigolets navigation lock and its appurtenant navigation channels and the modified dual purpose Seabrook Lock;

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

WHEREAS, on September 16, 1971, said Assurances were amended to obligate the Orleans Levee District for only that portion of the Project within Orleans Parish and to reflect an increase in cost participation, accepted by the Chief, Real Estate Division for and in behalf of the United States of America on March 29, 1974, containing the following items of local cooperation, to wit:

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

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;

c. [redacted] ~~save the United States free from damages due to the~~ [redacted]struction works;

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:

LAKE PONTCHARTRAIN PROJECT
ESTIMATE OF FIRST COSTS

			NON-FEDERAL COSTS		
UNIT DESCRIPTION	TOTAL FIRST COSTS	FEDERAL COSTS	Total	Lands Damages Relocations	Cash Contribution
BARRIER UNIT					
Seabrook Complex*	20,920,000	17,782,000	3,138,000	13,000	3,125,000
Chef Menteur Complex	30,138,000	21,097,000	9,041,000	913,000	8,128,000
Rigolets Complex	41,045,000	28,731,000	12,314,000	400,000	11,914,000
Capitalized operation and maintenance of Rigolets Lock	(See subparagraph (e) below)				
TOTAL BARRIER UNIT	92,103,000	67,610,000	24,493,000	1,326,000	23,167,000

LAKE PONTCHARTRAIN PROJECT
ESTIMATE OF FIRST COSTS

UNIT DESCRIPTION	TOTAL FIRST COSTS	FEDERAL COSTS	NON-FEDERAL COSTS Total	Lands Damages Relocations	Cash Contribution
LEVEES, FLOOD-WALLS, AND APPURTENANT STRUCTURES UNIT					
Improvements in Orleans Levee District (Orleans Par.)	77,337,000	54,136,000	23,201,000	18,737,000	4,464,000
Improvements in St. Charles, Jefferson and St. Tammany Parishes	23,220,000	16,426,000	6,794,000	1,340,000	5,454,000
TOTAL LEVEES, FLOODWALLS, AND APPURTEN-ANT STRUCTURES UNIT	100,557,000	70,562,000	29,995,000	20,077,000	9,918,000
TOTAL BARRIER PLAN	192,660,000	138,172,000	54,488,000	21,403,000	33,085,000

*Total Non-Federal cost includes only cost of Seabrook Complex applicable to hurricane protection purposes (30 percent of half the estimated first cost of construction);

e. 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;

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

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, seawalls, and stoplog structures, but excluding the Rigolets Navigation Lock and its appurtenant navigation channels and the modified dual purpose Seabrook Lock;

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

WHEREAS, on September 21, 1973, said Assurances were amended again, as to the Barrier Plan, to include Public Law 91-646, the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 which was enacted into law on January 2, 1971; said Supplemental Assurance accepted by the Chief, Real Estate Division for and in behalf of the United States of America, on April 2, 1974; and

WHEREAS, on May 29, 1975, said Assurances were amended again, as to the Chalmette Area Plan to include Public Law 91-646, the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, which was enacted into law on January 2, 1971, said Supplemental Assurance approved by the Chief, Real Estate Division for and in behalf of the United States of America, on July 8, 1975; and

WHEREAS, on March 30, 1976, the President of the Board of Commissioners of the Orleans Levee District agreed to a plan whereby said Levee Board would pay its cash obligations for the Project on a deferred basis pursuant to Section 92 of the Water Resources Development Act of 1974 (Public Law 251, 93d Congress), executed by the Acting District Engineer Contracting Officer on February 15, 1977, and approved on December 7, 1977 by the Acting Director of Real Estate for the Secretary of the Army, containing the following items of local cooperation, to wit:

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

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;

c. [redacted];

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:

LAKE PONTCHARTRAIN PROJECT
ESTIMATE OF FIRST COSTS
1 January 1976

UNIT DESCRIPTION	TOTAL FIRST COSTS	FEDERAL COSTS	NON-FEDERAL COSTS Total	NON-FEDERAL COSTS Lands, Damages Relocations	NON-FEDERAL COSTS Cash Contribution
	$	$	$	$	$
BARRIER UNIT					
Seabrook Complex*	30,150,000	25,630,000	4,520,000	20,000	4,500,000
Chef Menteur Complex	41,820,000	29,270,000	12,550,000	1,130,000	11,420,000
Rigolets Complex	63,780,000	44,810,000	18,970,000	875,000	18,095,000
SUB-TOTAL BARRIER UNIT	135,750,000	99,710,000	36,040,000	2,025,000	34,015,000
Capitalized operation and maintenance of Rigolets Lock		-9,230,000	9,230,000		9,230,000
TOTAL BARRIER UNIT	135,750,000	90,480,000	45,270,000	2,025,000	43,245,000

LAKE PONTCHARTRAIN PROJECT
ESTIMATE OF FIRST COSTS
1 January 1976

UNIT DESCRIPTION	TOTAL FIRST COSTS	FEDERAL COSTS	NON-FEDERAL COSTS Total	Lands, Damages Relocations	Cash Contribution
	$	$	$	$	$
LEVEES, FLOOD-WALLS, AND APPURTENANT STRUCTURES UNIT					
Improvements in Orleans Levee District (Orleans Par. Barrier Plan)	103,300,000	72,150,000	31,150,000	14,100,000	17,050,000
Improvements in St. Charles, Jefferson and St. Tammany Parishes	33,320,000	23,570,000	9,750,000	1,885,000	7,865,000
TOTAL LEVEES, FLOODWALLS, AND APPURTENANT STRUCTURES UNIT	136,620,000	95,720,000	40,900,000	15,985,000	24,915,000
TOTAL BARRIER PLAN	272,370,000	186,200,000	86,170,000	18,010,000	68,160,000
CHALMETTE PLAN					
Improvements in Orleans Levee District (Orleans Par.)	18,610,000	13,050,000	5,560,000	4,540,000	1,020,000
Improvements in (St. Bernard Parish)	61,020,000	42,750,000	18,270,000	5,590,000	12,680,000
TOTAL CHALMETTE PLAN	79,630,000	55,800,000	23,830,000	10,130,000	13,700,000
TOTAL PROJECT	352,000,000	242,000,000	110,000,000	28,140,000	81,860,000

*Total non-Federal cost includes only cost of Seabrook Complex applicable to hurricane protection purposes (30 percent of half the estimated first cost of construction);

e. Provide an additional cash contribution equivalent to 67.1% of the estimated capitalized value of maintenance and operation of the Rigolets Navigation Lock and Channel to be undertaken by the United States, the cash contribution is presently estimated at $6,193,300, 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;

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

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, seawalls, and stoplog structures, but excluding the Rigolets Navigation Lock and its appurtenant navigation channels and the modified dual purpose Seabrook Lock;

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;

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

j. Assume the responsibility to pay its share of the non-Federal project costs, presently estimated to be $67,086,140. This amount consists of $24,182,840, which is Orleans Levee District's pro rata share (67.1 percent) of the non-Federal cost of construction of the barrier unit; $36,710,000, which is the non-Federal cost of construction in Orleans Parish exclusive of the barrier unit; and $6,193,300, which is 67.1% of the capitalized value of maintenance and operation of the Rigolets navigation lock and channel.

k. As a minimum, adhere to the payment schedule of the deferred payment plan attached hereto as exhibit 1, the apportionment of costs to be made as actual costs, values and schedules are determined. The first payment under the deferred payment plan is 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. Recognized 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; and

WHEREAS, the Board of Commissioners of the Orleans Levee District, represented by Emile W. Schneider its President, pursuant to and by virtue of the provisions of its resolution, adopted May 22, 1985, a duly certified copy of such resolution being annexed hereto and made a part hereof, who declared that, in accordance with said resolution and pursuant thereto, he, the said President of the Board of Commissioners of the Orleans Levee District, has assured and does hereby assure the Secretary of the Army of the United States that said Board of Commissioners of the Orleans Levee District has the authority and capability to furnish the non-Federal cooperation required by the Federal legislation authorizing the project and by other applicable law; and

WHEREAS, the Orleans Levee District agrees to comply with all the required conditions and provisions of local cooperation listed in the previous Assurances granted by said Levee District, dated September 30, 1966; March 29, 1974; April 2, 1974; July 8, 1975; and December 7, 1977, applicable to the High Level Plan.

NOW, THEREFORE, the Board of Commissioners of the Orleans Levee District, in consideration of the construction to be done by the United States of America on the High Level Plan, agrees that it will, without cost to the United States:

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

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.~~

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 because it pertains only to the barrier plan:

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;

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

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];

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;

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];

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;

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.

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 grounds of race, creed, or national origin.

FURTHER, the parties agree that the unaltered provisions in the previous Assurances, dated September 30, 1966; March 29, 1974; April 2, 1974; July 8, 1975; and December 7, 1977, remain in full force and effect.

IN WITNESS WHEREOF, the parties hereto have executed this contract as of the day and year first above written.

THE UNITED STATES OF AMERICA

By: Eugene S Witherspoon
Colonel, CE
District Engineer
Contracting Officer

DATE: 21 June 85

BOARD OF COMMISSIONERS
ORLEANS LEVEE DISTRICT

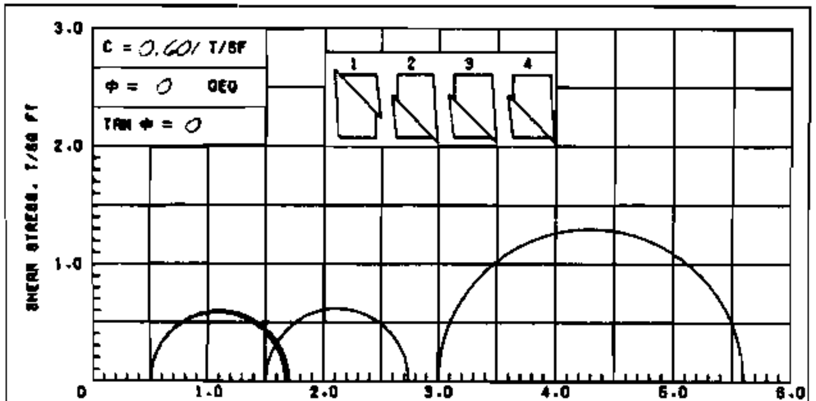
By: [signature]
President

DATE: 5/29/85

LAKE PONTCHARTRAIN, LOUISIANA AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 16 - GENERAL DESIGN
NEW ORLEANS EAST LEVEE
SOUTH POINT TO GIWW

APPENDIX C

LABORATORY TEST REPORTS (SOIL SAMPLES)



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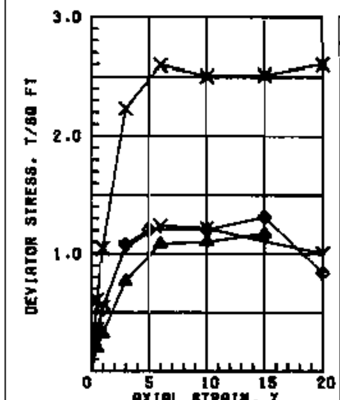


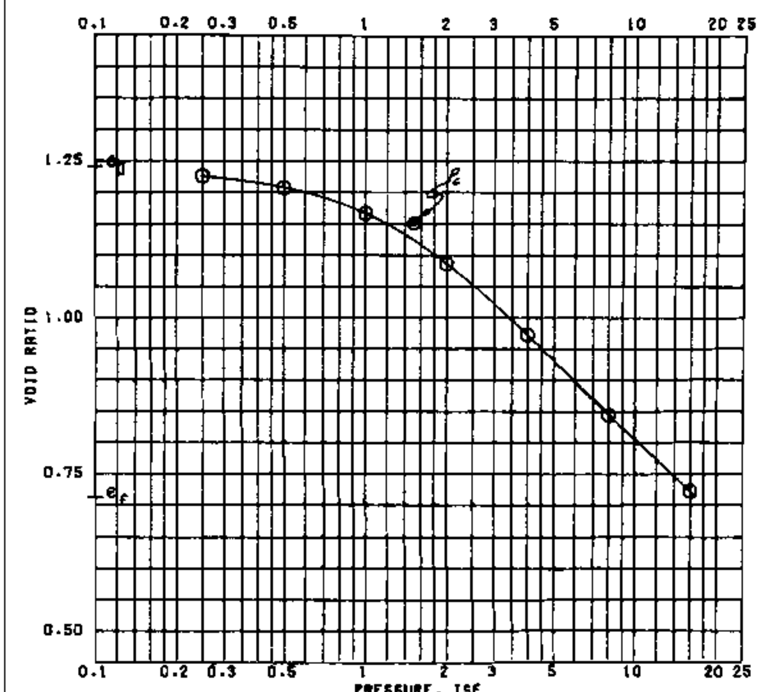
SPECIMEN NO.		▲1	Y2	X3	◇4	AVG
INITIAL	WATER CONTENT, %	42.2	43.0	56.4	40.9	42.03
	DRY DENSITY, PCF	76.4	73.5	57.4	76.6	75.57
	SATURATION, %	94.6	89.7	76.7	92.4	92.25
	VOID RATIO	1.205	1.294	1.936	1.196	
BEFORE SHEAR	WATER CONTENT, %					
	DRY DENSITY, PCF					
	SATURATION, %					
	VOID RATIO					
	BACK PRESS., TSF					
MIN PRIN. STRESS, TSF		0.5	1.5	3.0	0.5	
MAX. DEV. STRESS, TSF		1.17	1.24	2.59	1.20	
TIME TO FAILURE, MIN.		30	12	12	10	
RATE OF STRAIN INCR.%						
INITIAL DIAMETER, IN.		1.40	1.40	1.40	1.40	
INITIAL HEIGHT, IN.		3.00	3.00	3.00	3.00	

CONTROLLED-STRAIN TEST

DESCRIPTION OF SPECIMENS: PLASTIC CLAY (CH), GRAY; ORGANIC MATERIAL

LL 78	PL 28	PI 50	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:	PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER	
	PLAN N.O. E. LEV (SO. POINT TO GIWW	
	BORING NO. 10-USP	SAMPLE NO. 3-B
	DEPTH/ELEV 5.3/6.2	TECH. KOC
	LABORATORY USAE WES	DATE 12 MAR 86
	TRIAXIAL COMPRESSION TEST REPORT	

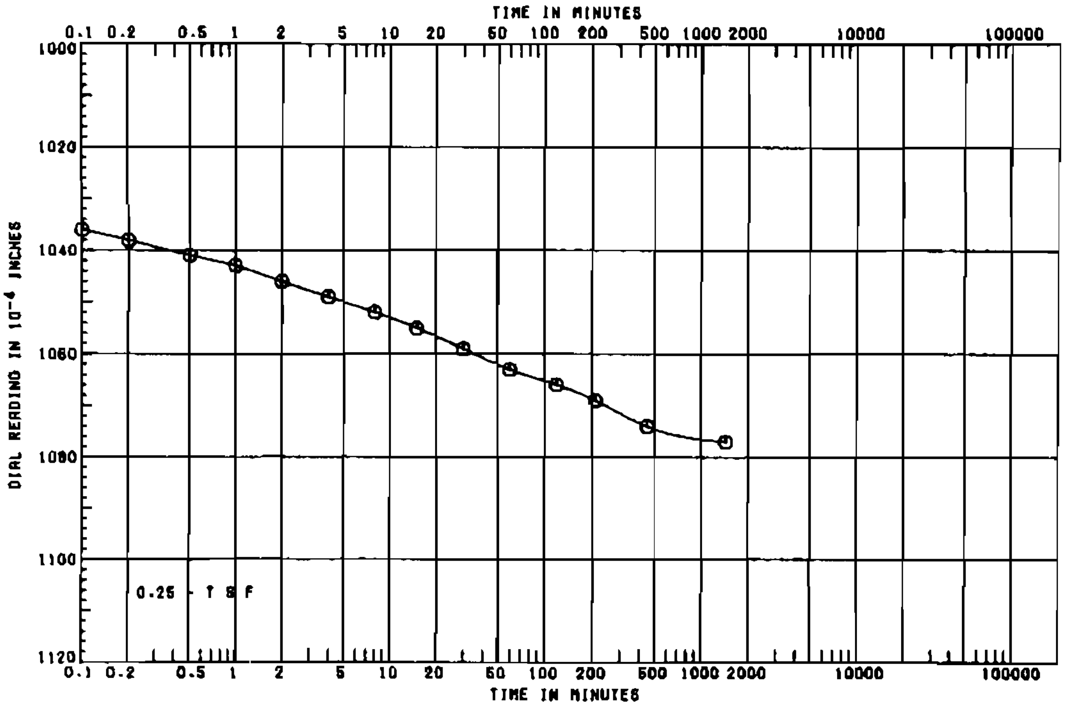


γ Sat = 110

			BEFORE TEST	AFTER TEST
OVERBURDEN PRESSURE, TSF		WATER CONTENT, %	41.7	26.2
PRECONSOL. PRESSURE, TSF	1.5	DRY DENSITY, PCF	75.3	98.6
COMPRESSION INDEX	0.42	SATURATION, %	90.9	99.6
TYPE SPECIMEN	UNDISTURBED	VOID RATIO	1.239	0.710
DIA. IN 4.44	HT. IN 1.137	BACK PRESSURE, TSF		

CLASSIFICATION PLASTIC CLAY (CH), GRAY; FINE SAND LENSES			
LL 70 / PL 21 / PI 49	PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER		
GS 2.70 (EST) / D_{10}	PLAN N.O. E. LEV (SO. POINT TO GIWW)		
REMARKS	BORING NO. 10-USP	SAMPLE NO. 3-C	
	DEPTH/ELEV 6.2/7.30	DATE 06 MAY 86	
	CONSOLIDATION TEST REPORT		

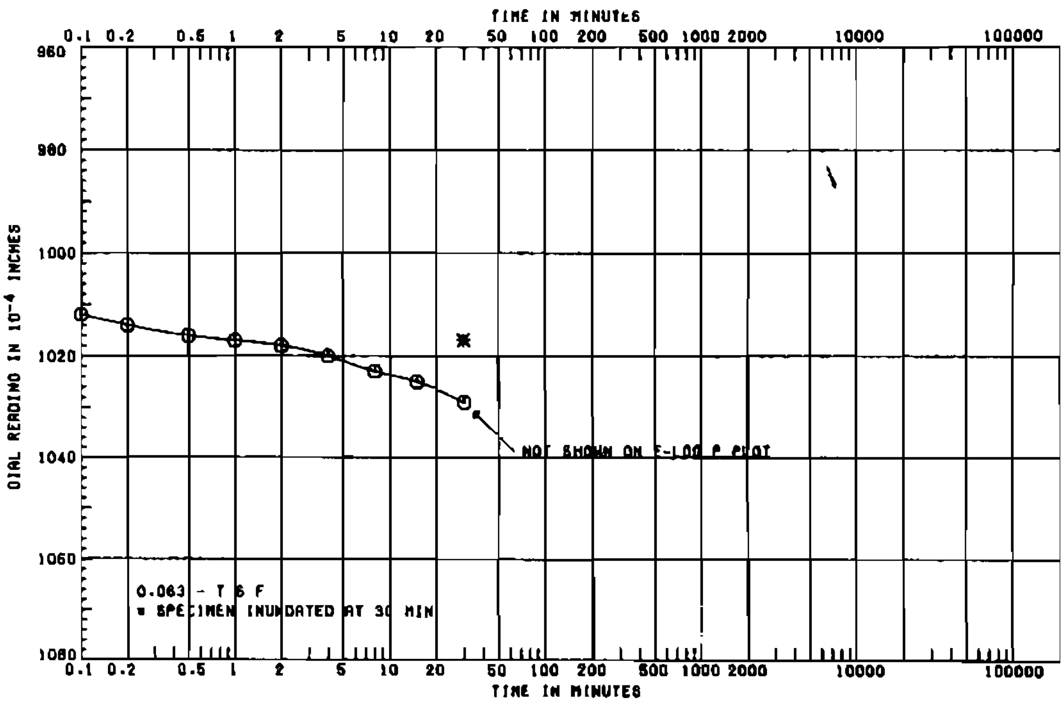
SHEET 1 OF 9



PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER	
PLAN N.O. E. LEV (SO. POINT TO OIHH)	
BORING 10-USP	SAMPLE NO. 3-C
DEPTH/ELEV 6.2/7.30	DATE 06 MAY 86

CONSOLIDATION TEST
TIME CURVES

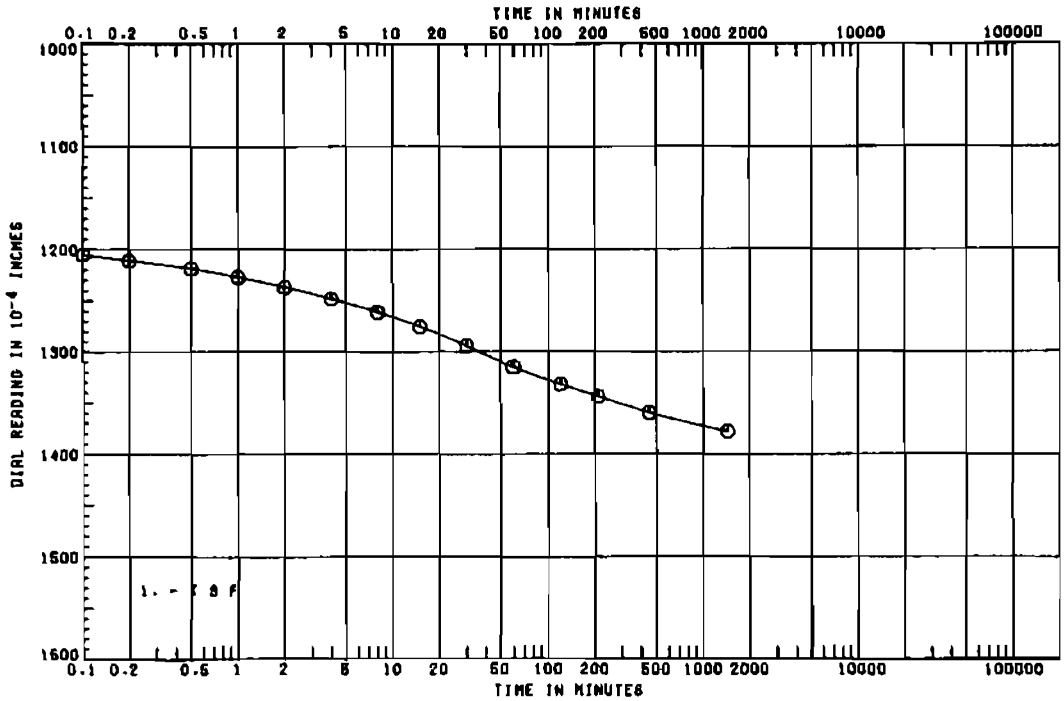
SHEET 3 OF 9



PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER	
PLAN N.O. E. LEV (SO. POINT TO OIHH)	
BORING 10-USP	SAMPLE NO. 3-C
DEPTH/ELEV 6.2/7.30	DATE 06 MAY 86

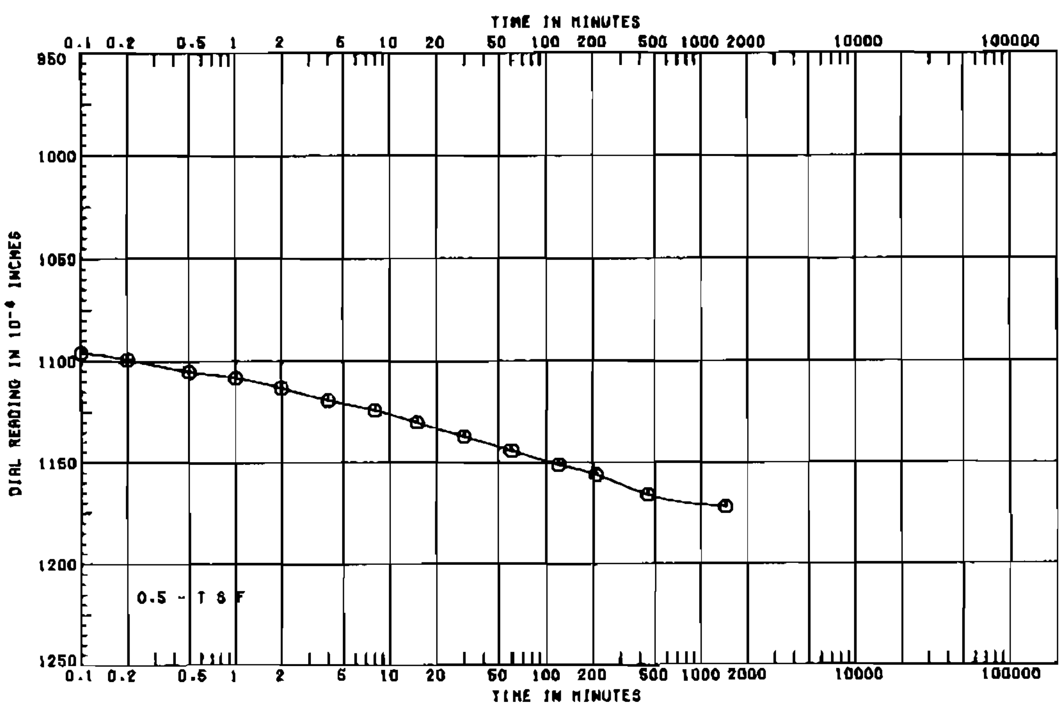
CONSOLIDATION TEST
TIME CURVES

SHEET 2 OF 9



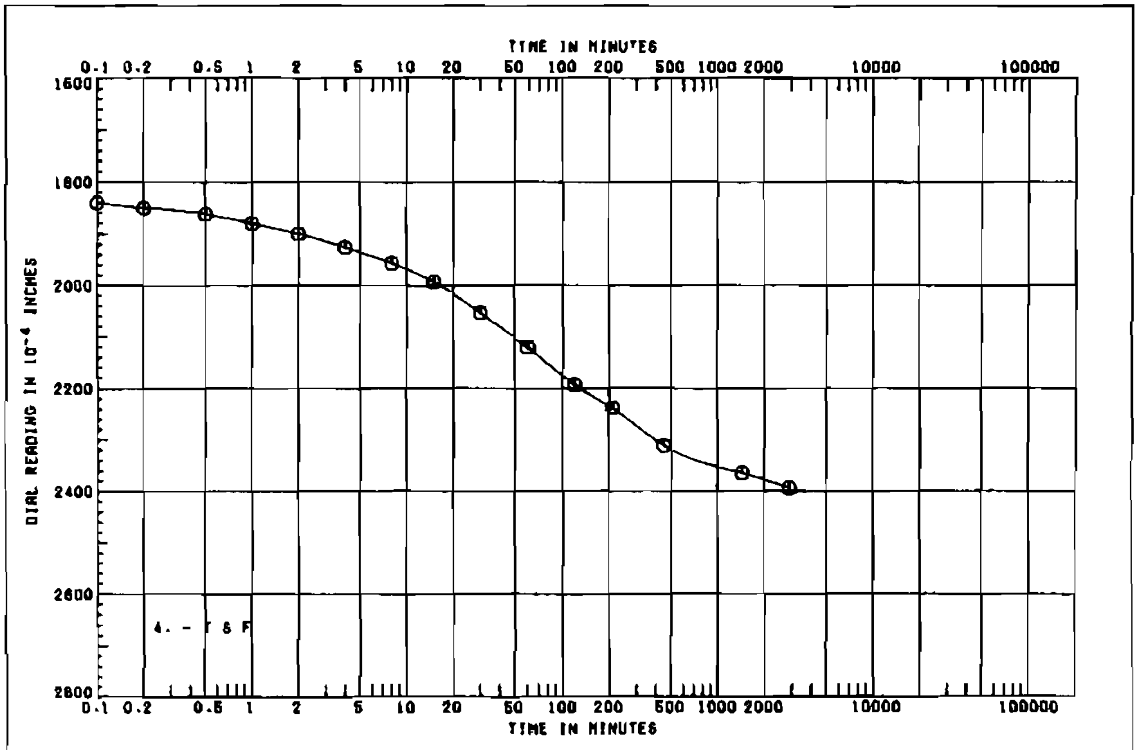
PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER	CONSOLIDATION TEST TIME CURVES
PLAN N.O. E. LEV (SO. POINT TO GIWW)	
BORING 10-USP	SAMPLE NO. 3-C
DEPTH/ELEV 6.2/7.30	DATE 06 MAY 86

SHEET 5 OF 9



PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER	CONSOLIDATION TEST TIME CURVES
PLAN N.O. E. LEV (SO. POINT TO GIWW)	
BORING 10-USP	SAMPLE NO. 3-C
DEPTH/ELEV 6.2/7.30	DATE 06 MAY 86

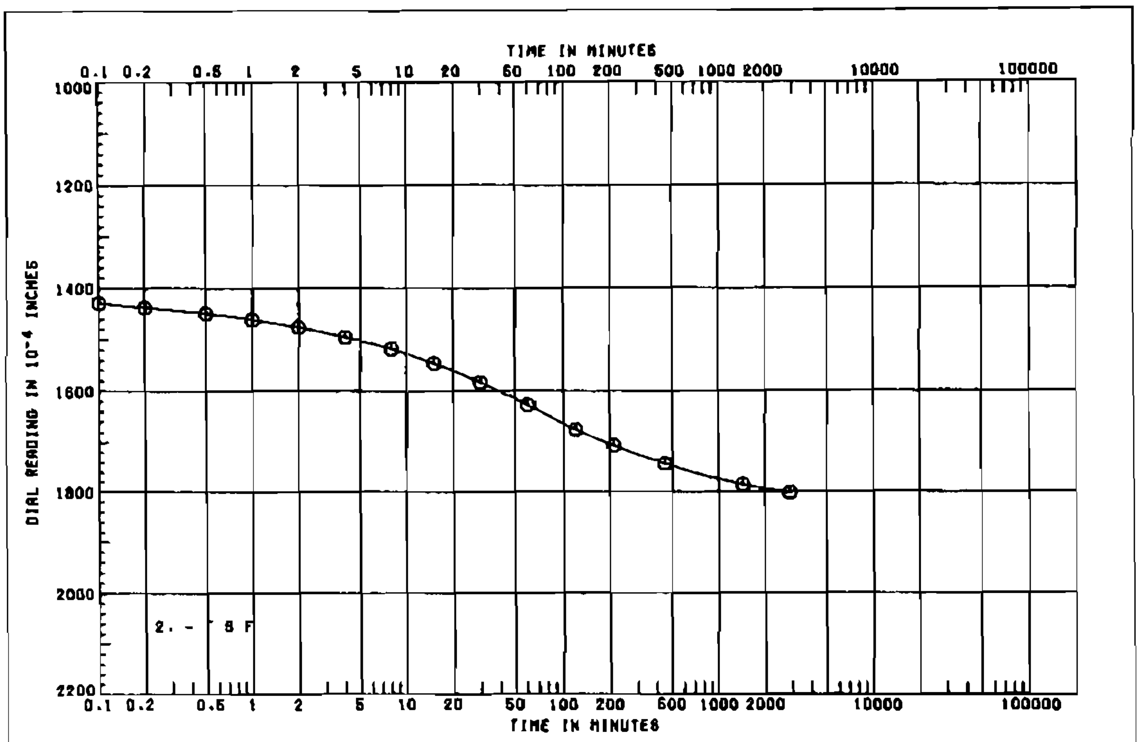
SHEET 4 OF 9



PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER	
PLAN N.O. E. LEV (SO. POINT TO OIWW)	
BORING 10-USP	SAMPLE NO. 3-C
DEPTH/ELEV 6.2/7.30	DATE 06 MAY 86

CONSOLIDATION TEST
TIME CURVES

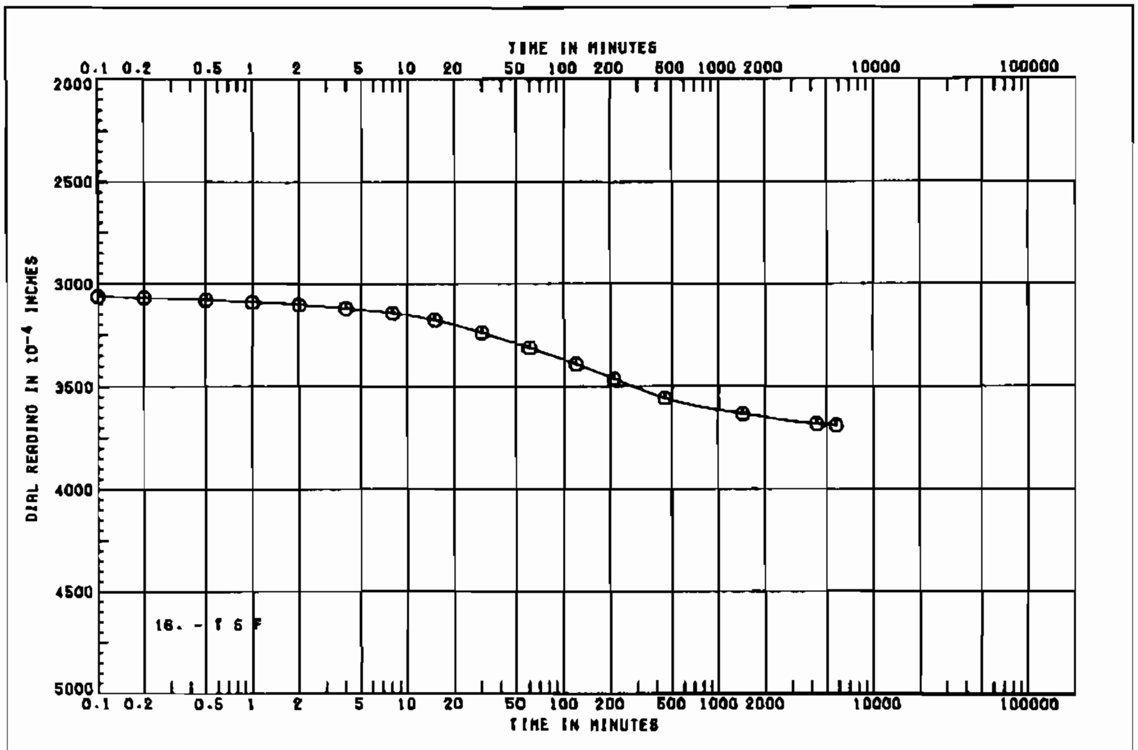
SHEET 7 OF 9



PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER	
PLAN N.O. E. LEV (SO. POINT TO OIWW)	
BORING 10-USP	SAMPLE NO. 3-C
DEPTH/ELEV 6.2/7.30	DATE 06 MAY 86

CONSOLIDATION TEST
TIME CURVES

SHEET 8 OF 9

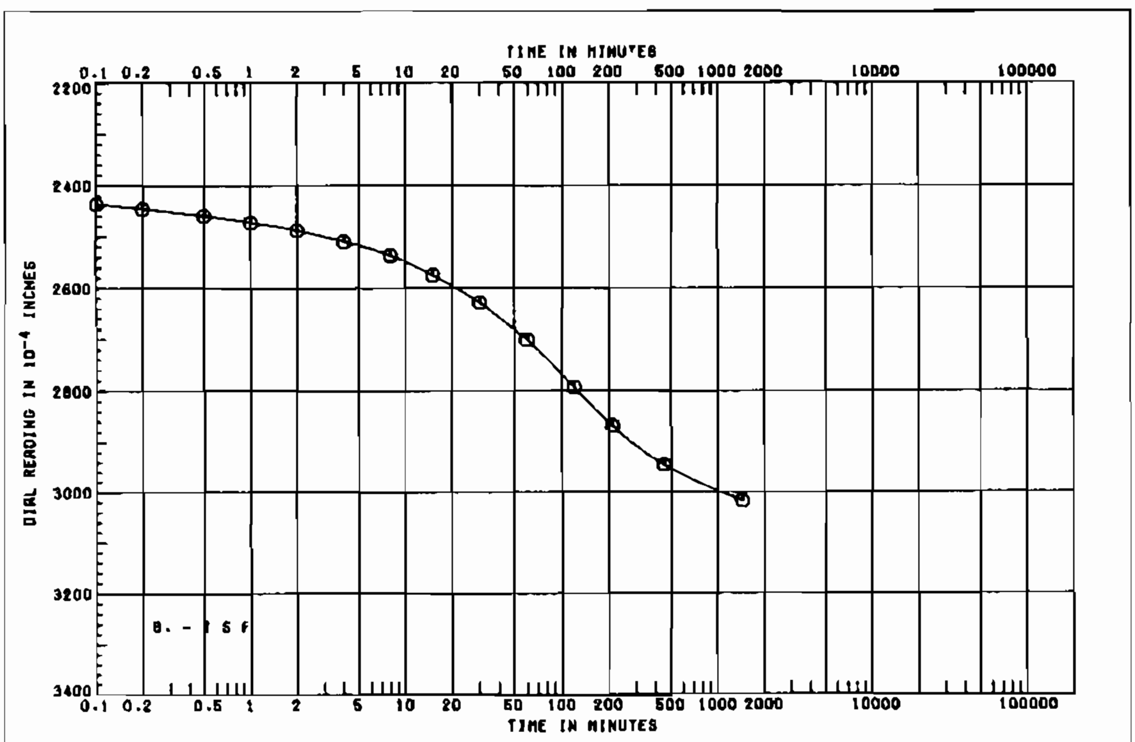


PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER	
PLAN N.O. E. LEV (SO. POINT TO OIWW)	
BORING 10-USP	SAMPLE NO. 3-C
DEPTH/ELEV 6.2/7.30	DATE 06 MAY 86

CONSOLIDATION TEST

TIME CURVES

SHEET 9 OF 9

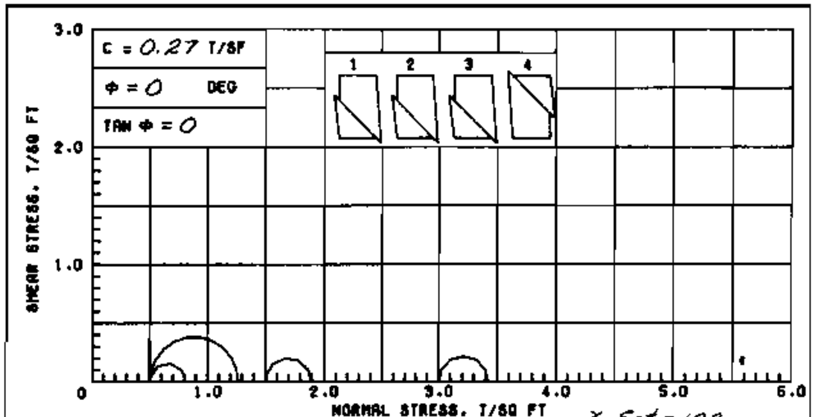


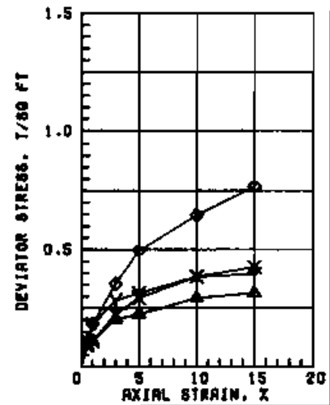
PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER	
PLAN N.O. E. LEV (SO. POINT TO OIWW)	
BORING 10-USP	SAMPLE NO. 3-C
DEPTH/ELEV 6.2/7.30	DATE 06 MAY 86

CONSOLIDATION TEST

TIME CURVES

SHEET 9 OF 9





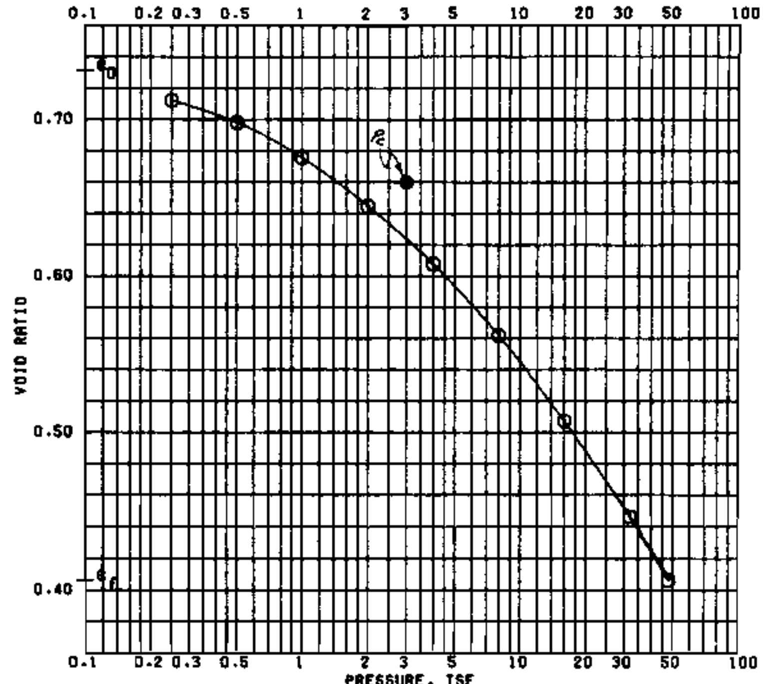
SPECIMEN NO.		▲1	Y2	X3	◇4	AVG.
INITIAL	WATER CONTENT, %	27.5	27.5	25.0	21.8	26.67
	DRY DENSITY, PCF	93.4	94.5	96.5	104.2	94.80
	SATURATION, %	92.7	95.2	90.8	95.8	92.93
	VOID RATIO	0.798	0.777	0.740	0.612	
BEFORE SHEAR	WATER CONTENT, %					
	DRY DENSITY, PCF					
	SATURATION, %					
	VOID RATIO					
	BACK PRESS., TSF					
MIN PRIN. STRESS, TSF		0.5	1.5	3.0	0.5	
MAX. DEV. STRESS, TSF		0.31	0.38	0.48	0.77	
TIME TO FAILURE, MIN.		30	30	30	30	
RATE OF STRAIN INCR.%						
INITIAL DIAMETER, IN.		1.39	1.39	1.39	1.39	
INITIAL HEIGHT, IN.		3.00	3.00	3.00	3.00	

CONTROLLED-STRAIN TEST

DESCRIPTION OF SPECIMENS: SANDY CLAY (CL), GRAY

LL 35	PL 14	PI 21	GS 2.69 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:	PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER	
	PLAN N.O. E. LEV (SO. POINT TO GIWW	
	BORING NO. 10-USP	SAMPLE NO. 5-B
	DEPTH/ELEV 12.3/1.2	TECH. KOC
	LABORATORY USAE WES	DATE 04 MAR 86
	TRIAXIAL COMPRESSION TEST REPORT	



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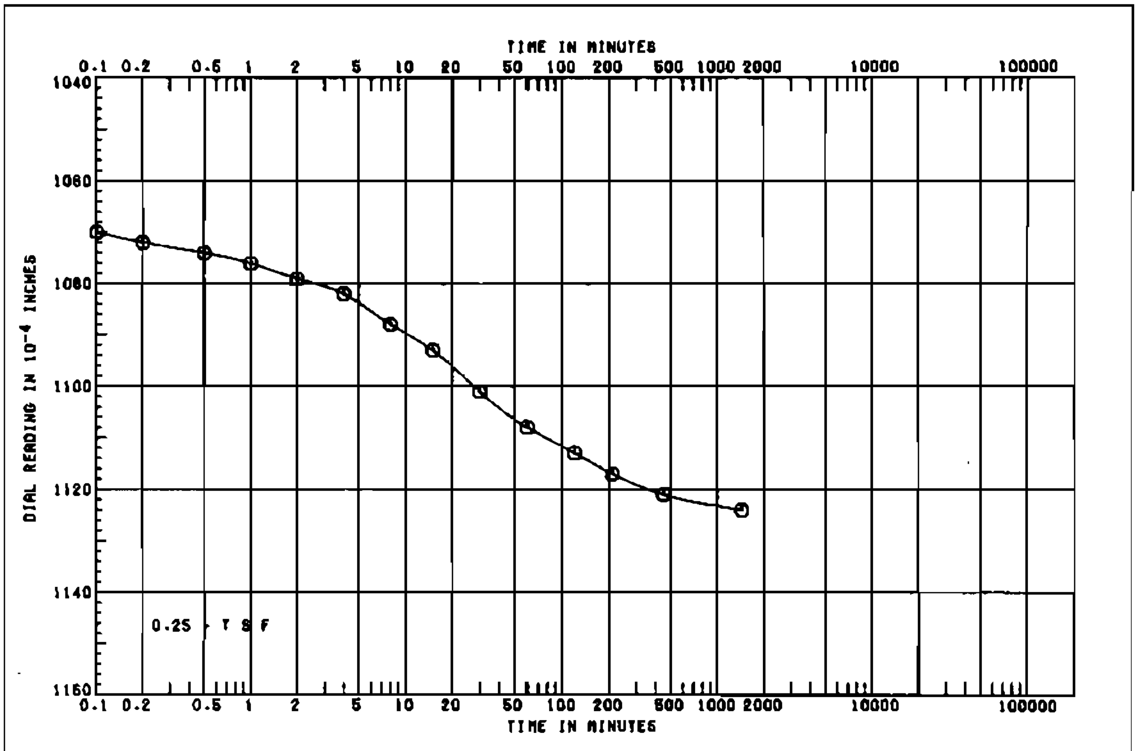
			BEFORE TEST	AFTER TEST
OVERBURDEN PRESSURE, TSF		WATER CONTENT, %	25.7	16.4
PRECONSOL. PRESSURE, TSF	3.0	DRY DENSITY, PCF	97.4	119.9
COMPRESSION INDEX	0.21	SATURATION, %	95.1	100 +
TYPE SPECIMEN	UNDISTURBED	VOID RATIO	0.731	0.406
DIA. IN 4.44	HT. IN 1.115	BACK PRESSURE, TSF		

CLASSIFICATION SANDY CLAY (CL), GRAY

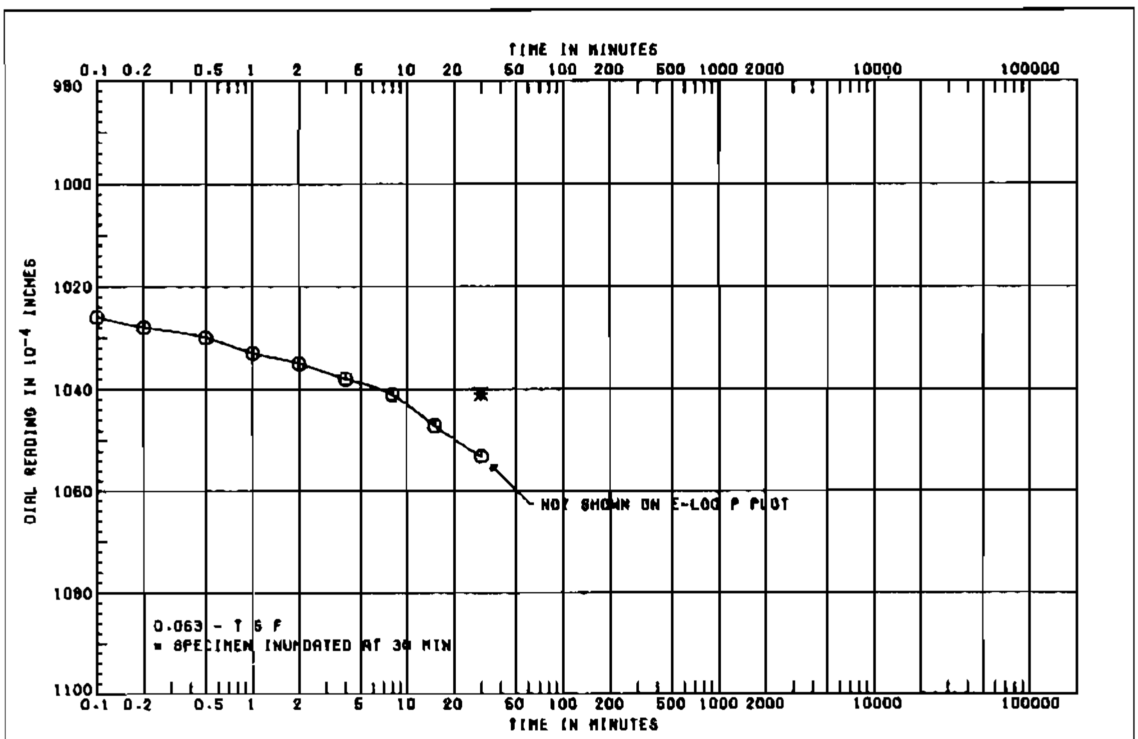
LL	PL	PI	PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER	
GS 2.70 (EST)	D_{10}		PLAN N.O. E. LEV (SO. POINT TO GIWW)	
REMARKS			BORING NO. 10-USP	SAMPLE NO. 5-C
			DEPTH/ELEV 13.2/0.30	DATE 06 MAY 86
			CONSOLIDATION TEST REPORT	

SHEET 1 OF 11



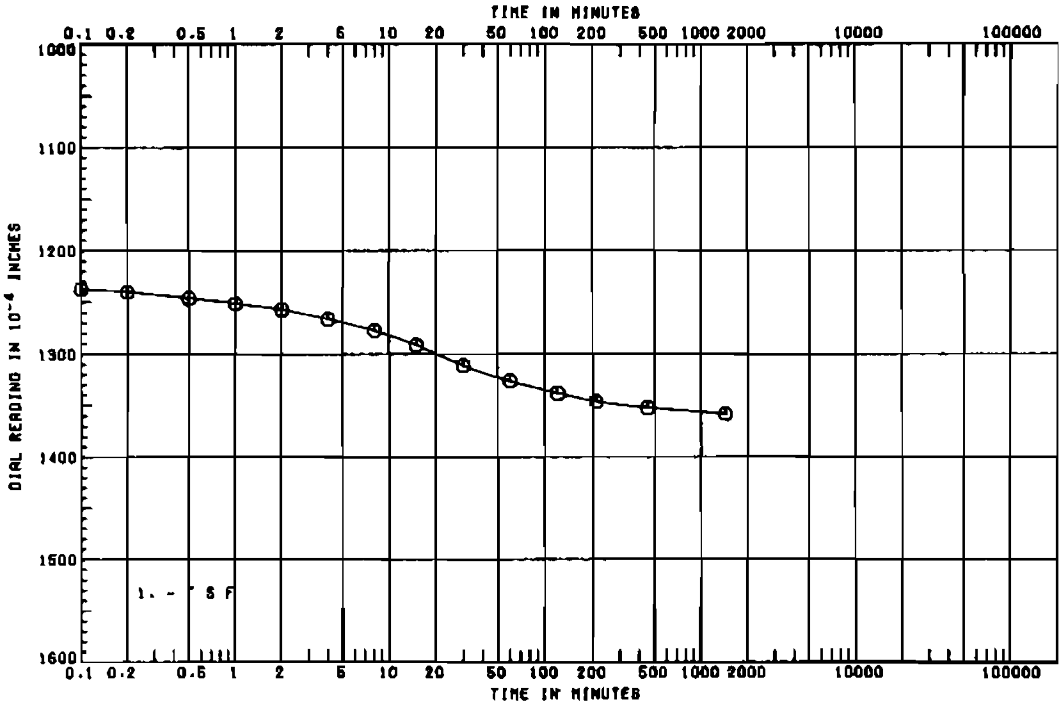
PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER	CONSOLIDATION TEST
PLAN N.O. E. LEV (SO. POINT TO GIWW)	TIME CURVES
BORING 10-USP / SAMPLE NO. 5-C	
DEPTH/ELEV 13.2/0.30 / DATE 08 MAY 86	

SHEET 3 OF 11



PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER	CONSOLIDATION TEST
PLAN N.O. E. LEV (SO. POINT TO GIWW)	TIME CURVES
BORING 10-USP / SAMPLE NO. 5-C	
DEPTH/ELEV 13.2/0.30 / DATE 08 MAY 86	

SHEET 2 OF 11

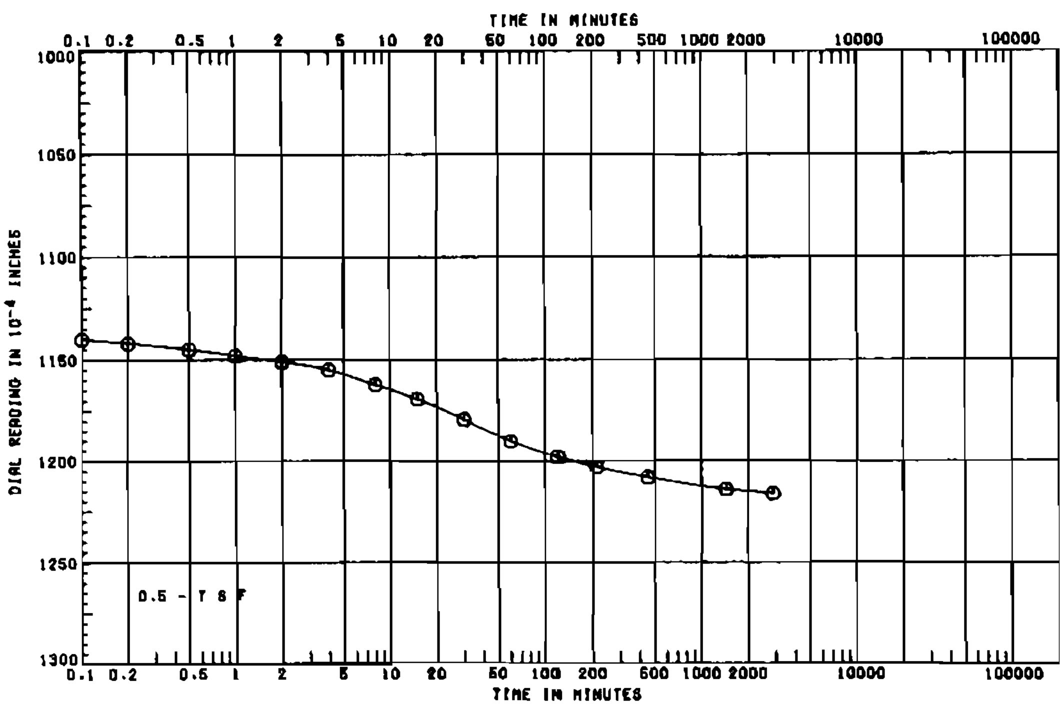


PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER	
PLAN N.O. E. LEV (60. POINT TO OINW)	
BORING 10-USP	SAMPLE NO. 5-C
DEPTH/ELEV 13.2/0.30	DATE 08 MAY 86

CONSOLIDATION TEST

TIME CURVES

SHEET 5 OF 11

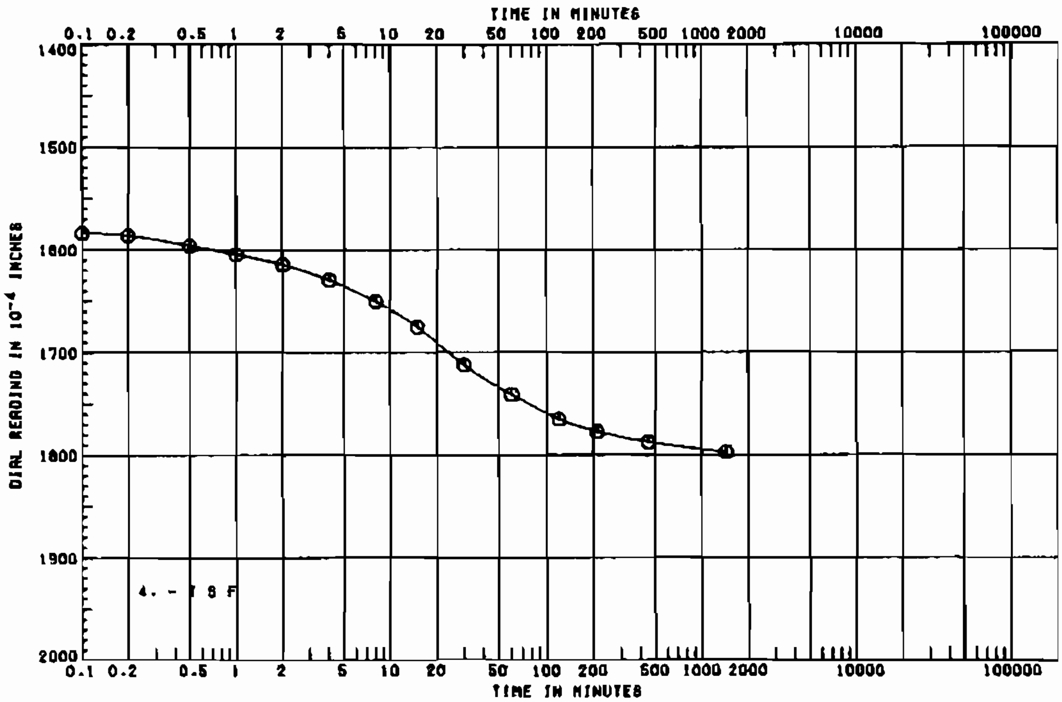


PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER	
PLAN N.O. E. LEV (60. POINT TO OINW)	
BORING 10-USP	SAMPLE NO. 5-C
DEPTH/ELEV 13.2/0.30	DATE 08 MAY 86

CONSOLIDATION TEST

TIME CURVES

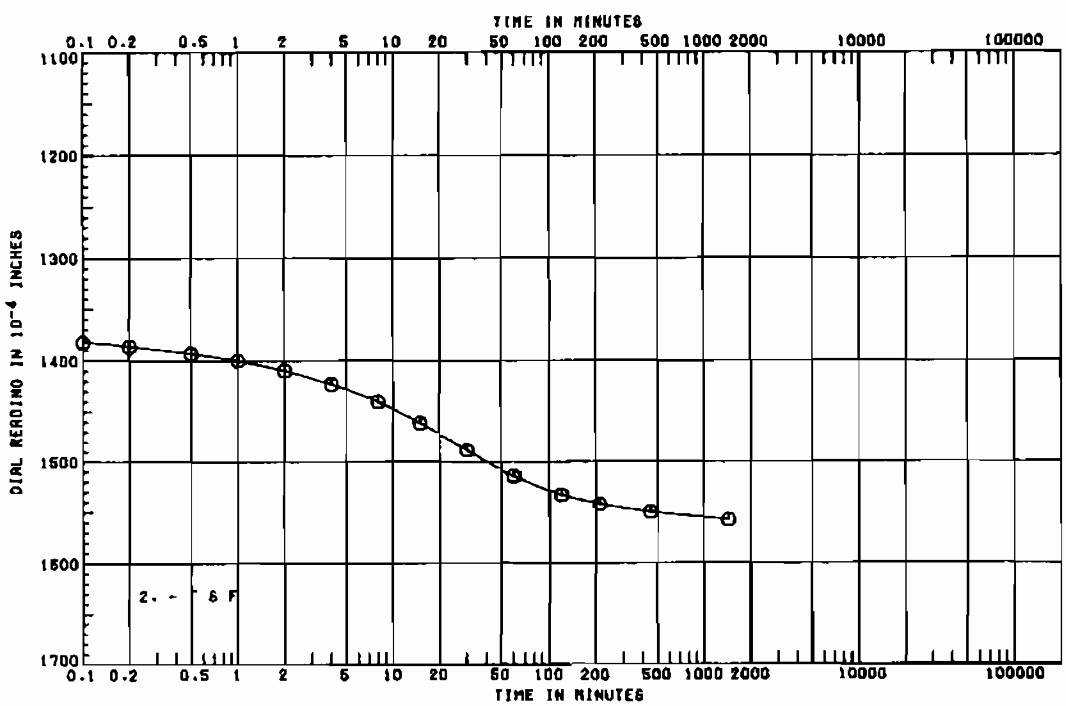
SHEET 4 OF 11



PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER	
PLAN N.O. E. LEV (SO. POINT TO OIWW)	
BORING 10-USP	SAMPLE NO. 5-C
DEPTH/ELEV 13.2/0.30	DATE 08 MAY 86

CONSOLIDATION TEST
TIME CURVES

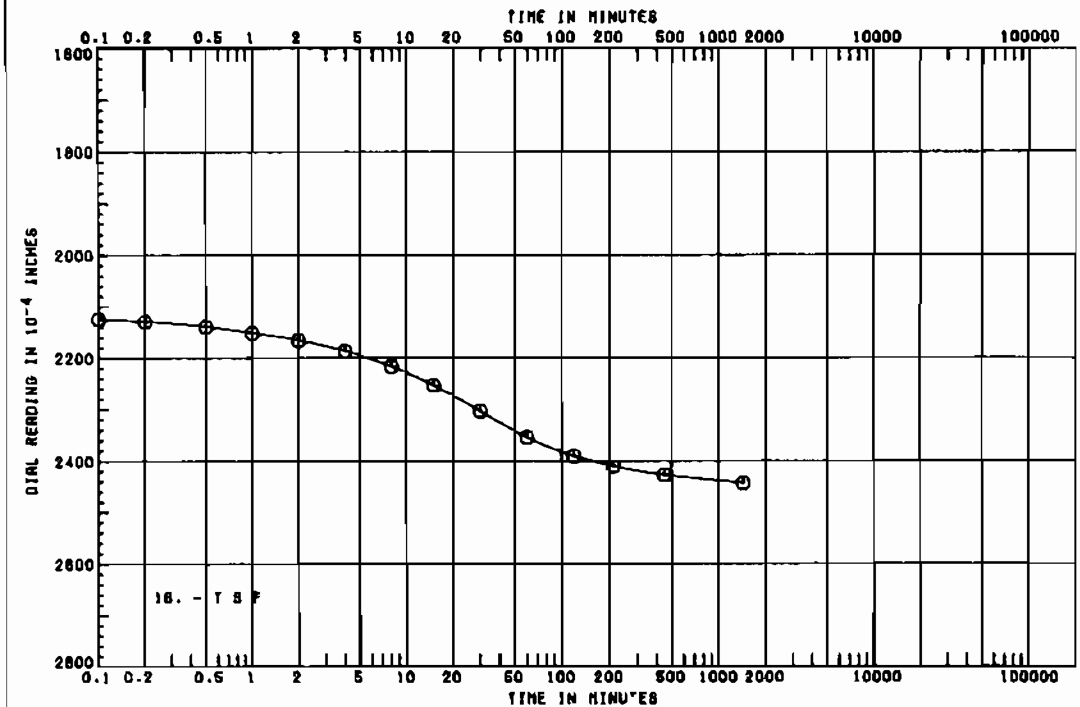
SHEET 7 OF 11



PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER	
PLAN N.O. E. LEV (SO. POINT TO OIWW)	
BORING 10-USP	SAMPLE NO. 5-C
DEPTH/ELEV 13.2/0.30	DATE 08 MAY 86

CONSOLIDATION TEST
TIME CURVES

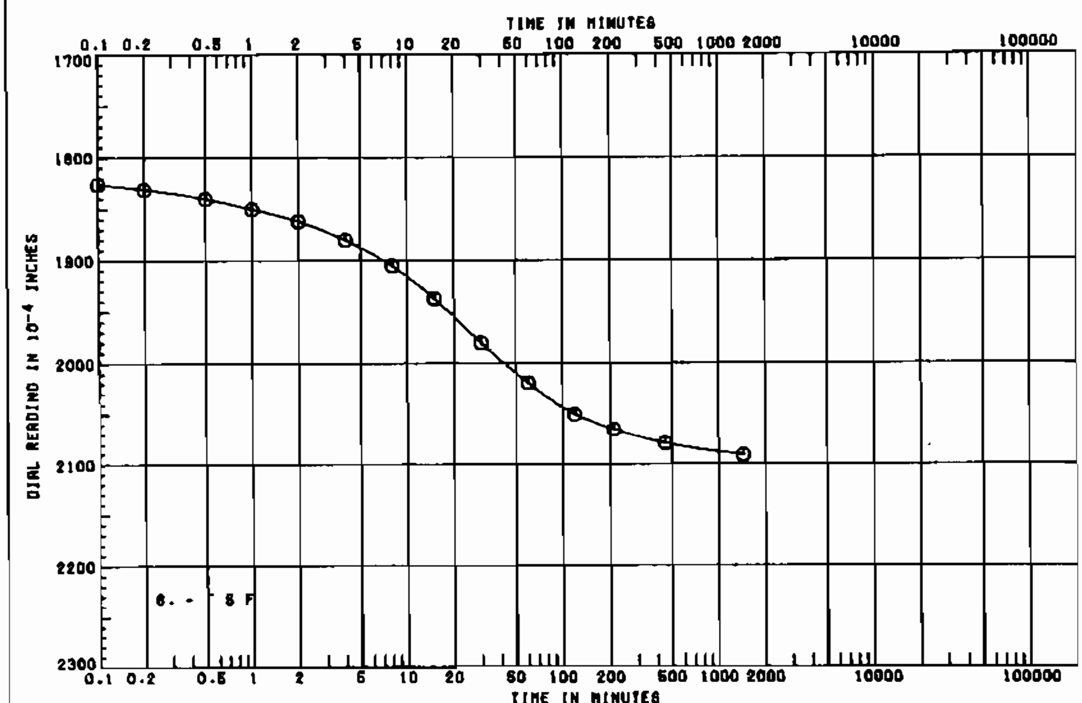
SHEET 6 OF 11



PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER	
PLAN N.O. E. LEV (SO. POINT TO OIWW)	
BORING 10-USP	SAMPLE NO. 5-C
DEPTH/ELEV 13.2/0.30	DATE 08 MAY 86

CONSOLIDATION TEST
TIME CURVES

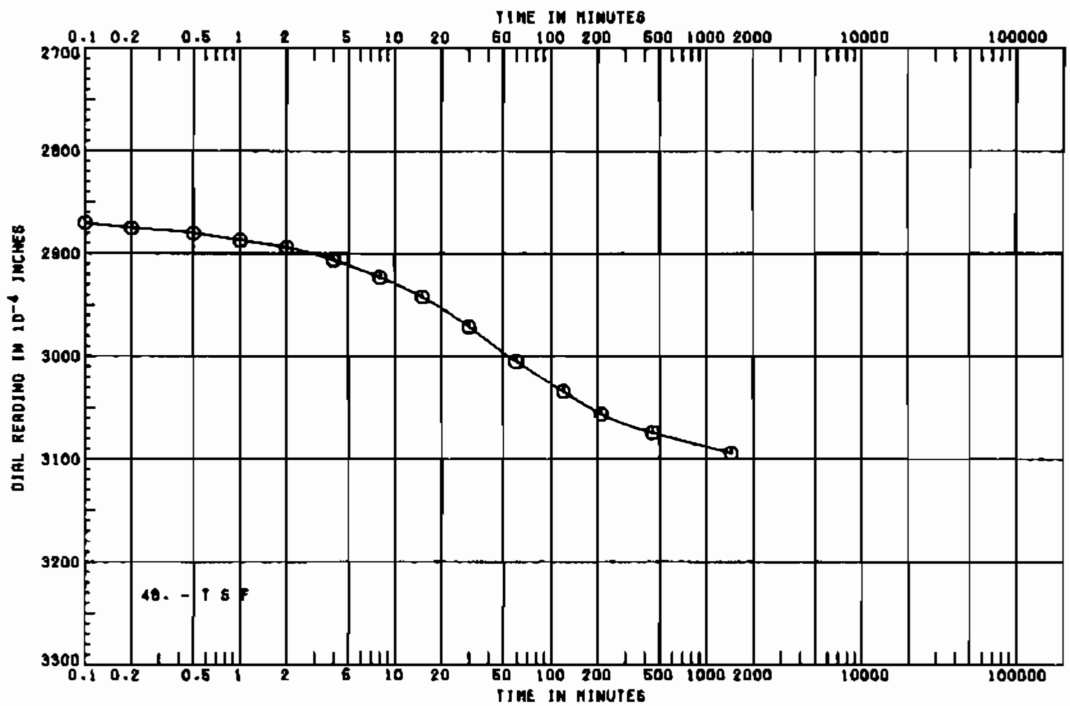
SHEET 9 OF 11



PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER	
PLAN N.O. E. LEV (SO. POINT TO OIWW)	
BORING 10-USP	SAMPLE NO. 5-C
DEPTH/ELEV 13.2/0.30	DATE 08 MAY 86

CONSOLIDATION TEST
TIME CURVES

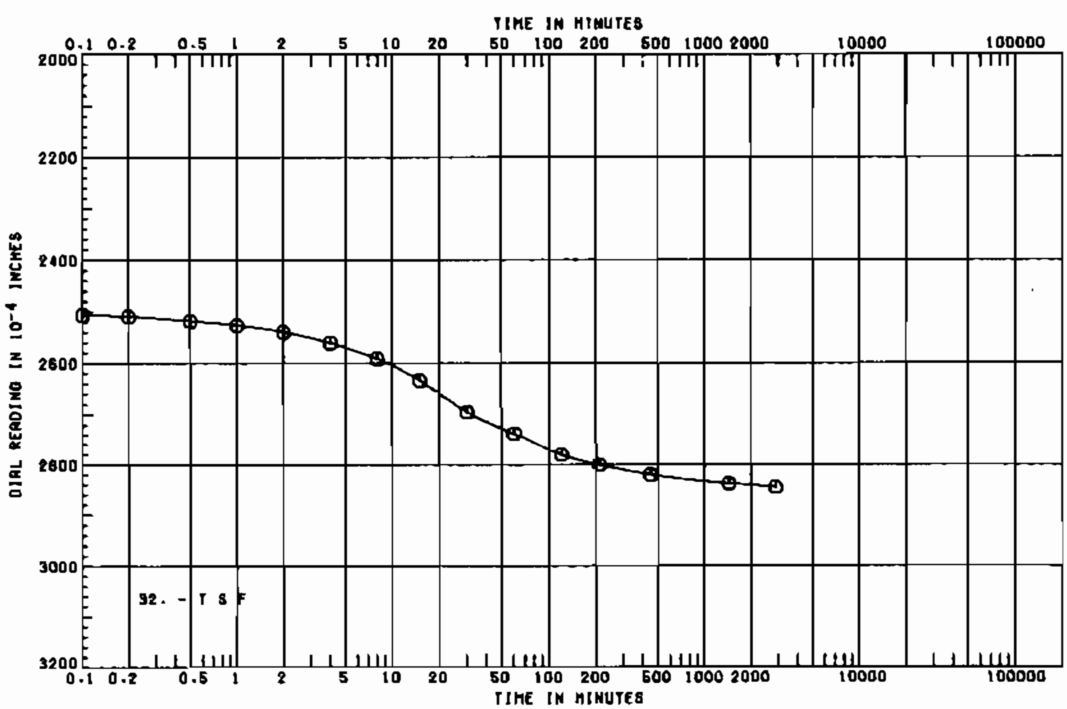
SHEET 8 OF 11



PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER	
PLAN N.O. E. LEV (SO. POINT TO GIWW)	
BORING 10-USP	SAMPLE NO. 5-C
DEPTH/ELEV 13.2/0.30	DATE 08 MAY 86

CONSOLIDATION TEST
TIME CURVES

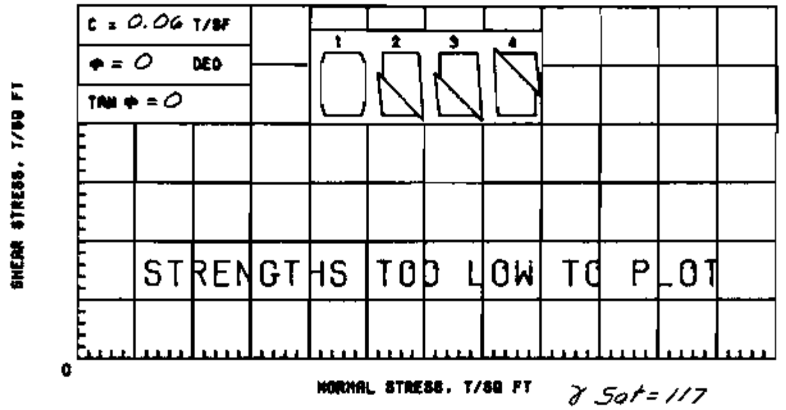
SHEET 11 OF 11



PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER	
PLAN N.O. E. LEV (SO. POINT TO GIWW)	
BORING 10-USP	SAMPLE NO. 5-C
DEPTH/ELEV 13.2/0.30	DATE 08 MAY 86

CONSOLIDATION TEST
TIME CURVES

SHEET 10 OF 11



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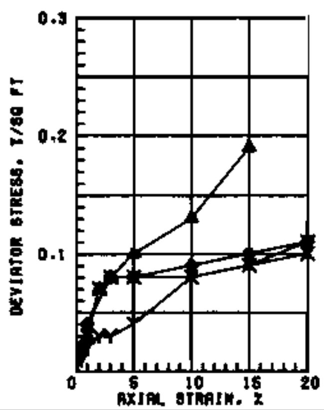


SPECIMEN NO.		▲1	Y2	X3	◆4	AVG
INITIAL	WATER CONTENT, %	32.7	33.6	33.8	32.5	33.15
	DRY DENSITY, PCF	88.0	88.6	84.7	85.3	36.15
	SATURATION, %	96.8	96.3	92.6	90.1	93.95
	VOID RATIO	0.908	0.936	0.982	0.970	
BEFORE SHEAR	WATER CONTENT, %					
	DRY DENSITY, PCF					
	SATURATION, %					
	VOID RATIO					
	BACK PRESS., TSF					
MIN PRIN. STRESS, TSF		0.5	1.5	3.0	1.5	
MAX. DEV. STRESS, TSF		0.19	0.03	0.08	0.08	
TIME TO FAILURE, MIN.		30	4	6	18	
RATE OF STRAIN INCR.%					8	
INITIAL DIAMETER, IN.		1.40	1.40	1.40	1.40	
INITIAL HEIGHT, IN.		3.00	3.00	3.00	3.00	

CONTROLLED-STRAIN TEST

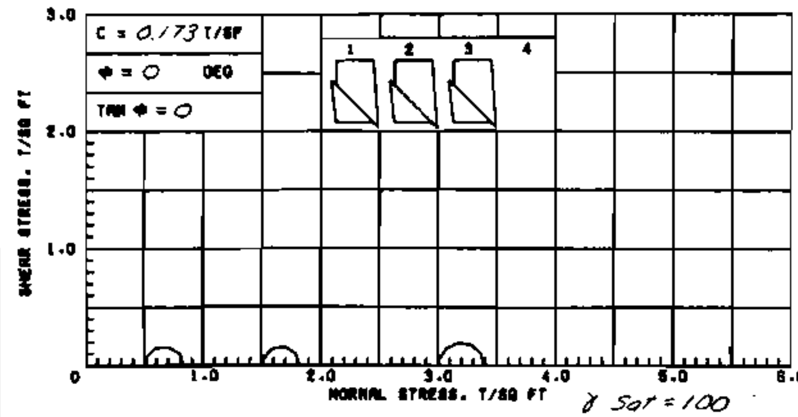
DESCRIPTION OF SPECIMENS: CLAY (CL), GRAY; FINE SAND POCKETS

LL 40	PL 14	PI 26	GS 2.69 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:

PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER	
PLAN N.O. E. LEV (SO. POINT TO GIWW	
BORING NO. 10-USP	SAMPLE NO. 6-6
DEPTH/ELEV 18.2/-2.7	TECH. KOC
LABORATORY USAE WES	DATE 12 MAR 86

TRIAXIAL COMPRESSION TEST REPORT



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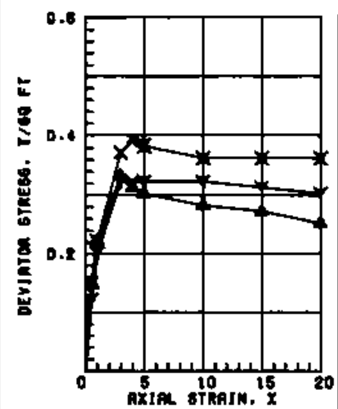


SPECIMEN NO.		▲1	Y2	X3	4	AVG.
INITIAL	WATER CONTENT, %	66.1	70.6	63.0		66.57
	DRY DENSITY, PCF	59.9	57.4	61.1		59.47
	SATURATION, %	98.4	98.3	96.7		97.80
	VOID RATIO	1.815	1.939	1.759		
BEFORE SHEAR	WATER CONTENT, %					
	DRY DENSITY, PCF					
	SATURATION, %					
	VOID RATIO					
	BACK PRESS., TSF					
MIN PRIN. STRESS, TSF		0.5	1.5	3.0		
MAX. DEV. STRESS, TSF		0.33	0.32	0.39		
TIME TO FAILURE, MIN.		6	18	24		
RATE OF STRAIN INCR.%			8	8		
INITIAL DIAMETER, IN.		1.39	1.39	1.39		
INITIAL HEIGHT, IN.		3.00	3.00	3.00		

CONTROLLED-STRAIN TEST

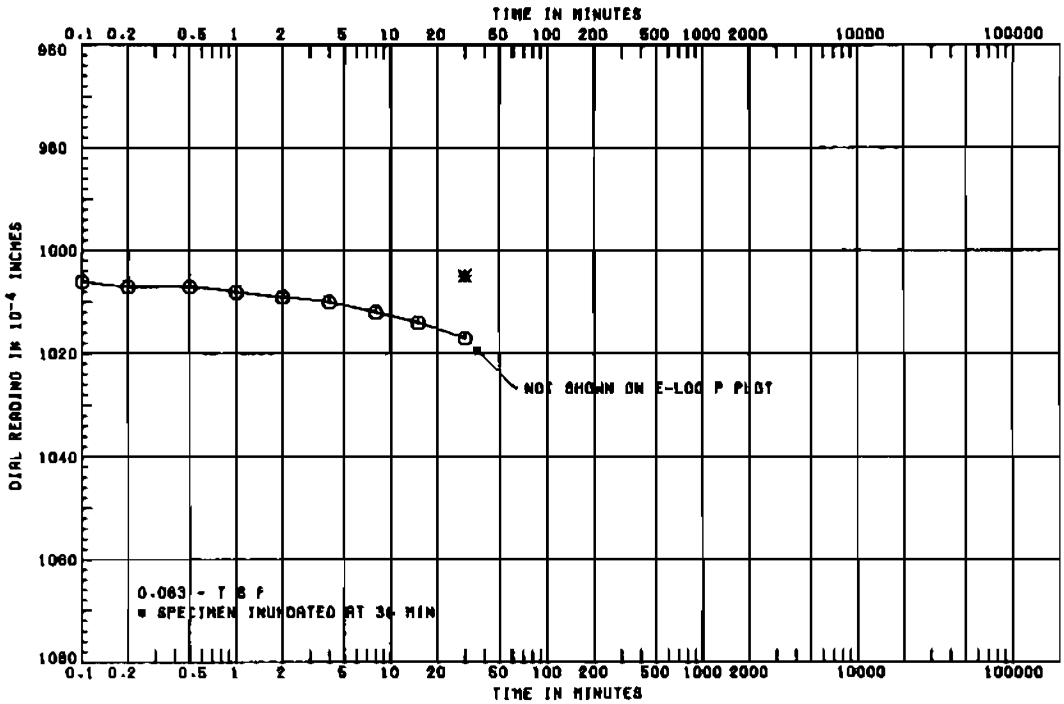
DESCRIPTION OF SPECIMENS: PLASTIC CLAY (CH), GRAY; SILT POCKETS AND SEAMS

LL 87	PL 24	PI 63	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:

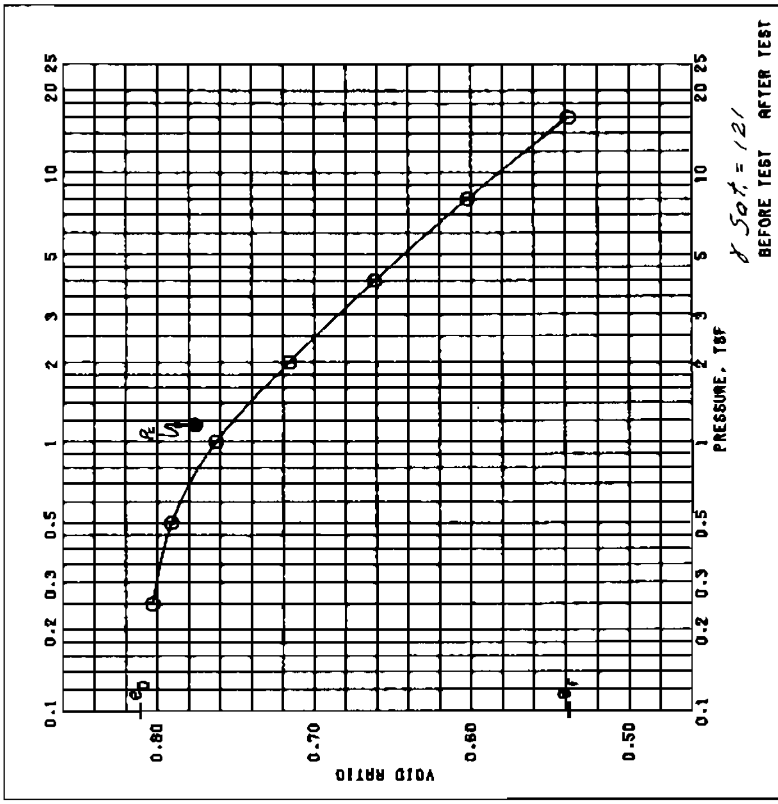
PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER	
PLAN N.O. E. LEV (SO. POINT TO GIWW	
BORING NO. 10-USP	SAMPLE NO. 9-8
DEPTH/ELEV 28.3/-14 8	TECH. KOC
LABORATORY USAE WES	DATE 13 MAR 86

TRIAXIAL COMPRESSION TEST REPORT



PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER PLAN N.O. E. LEV (SO. POINT TO GIWW)		CONSOLIDATION TEST TIME CURVES
BORING 10-USP	SAMPLE NO. 7-C	
DEPTH/ELEV 21.1/-7.6	DATE 14 MAY 86	

SHEET 2 OF 9



	BEFORE TEST	AFTER TEST
WATER CONTENT, %	28.4	20.3
DRY DENSITY, PCF	93.1	109.6
SATURATION, %	94.8	100 +
VOID RATIO	0.810	0.537
BACK PRESSURE, TSF		

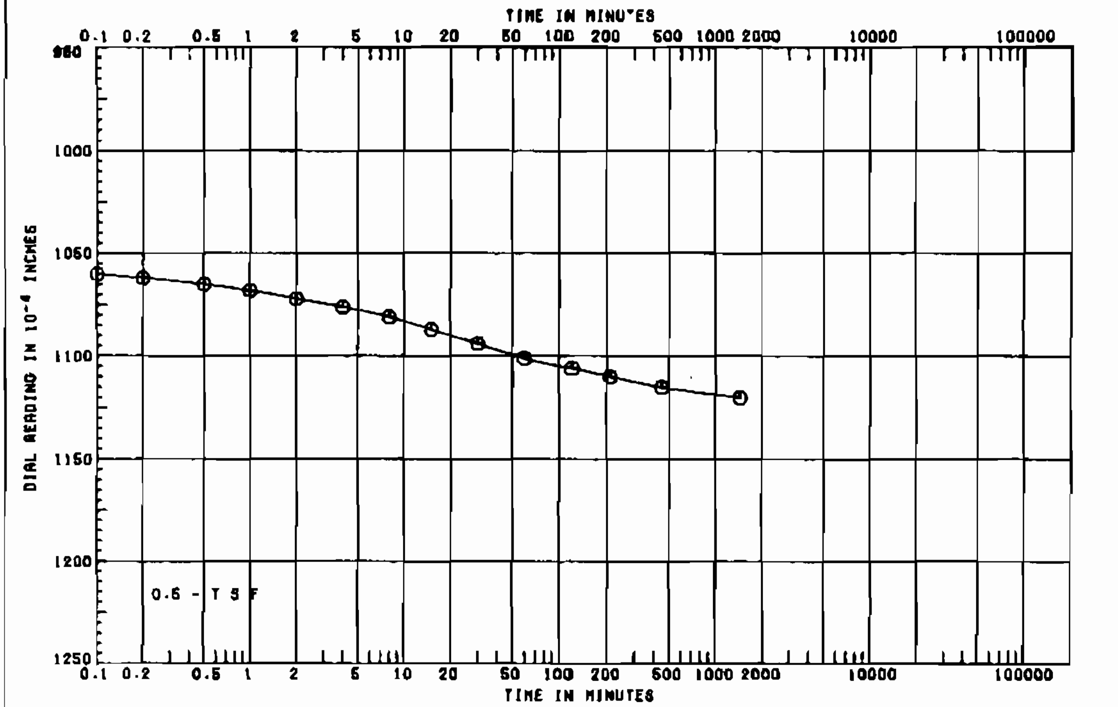
γ Sat = 121

OVERBURDEN PRESSURE, TSF	
PRECONSOL. PRESSURE, TSF	1.10
COMPRESSION INDEX	0.21
TYPE SPECIMEN	UNDISTURBED
DIA. IN 4.44	HT. IN 1.111
CLASSIFICATION	SANDY CLAY (CL), GRAY
LL 39 PL 15 PI 24	
GS 2.70 (EST)	D_{10}
REMARKS	

PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER
PLAN N.O. E. LEV (SO. POINT TO GIWW)
BORING NO. 10-USP | SAMPLE NO. 7-C
DEPTH/ELEV 21.1/-7.6 | DATE 14 MAY 86

CONSOLIDATION TEST REPORT

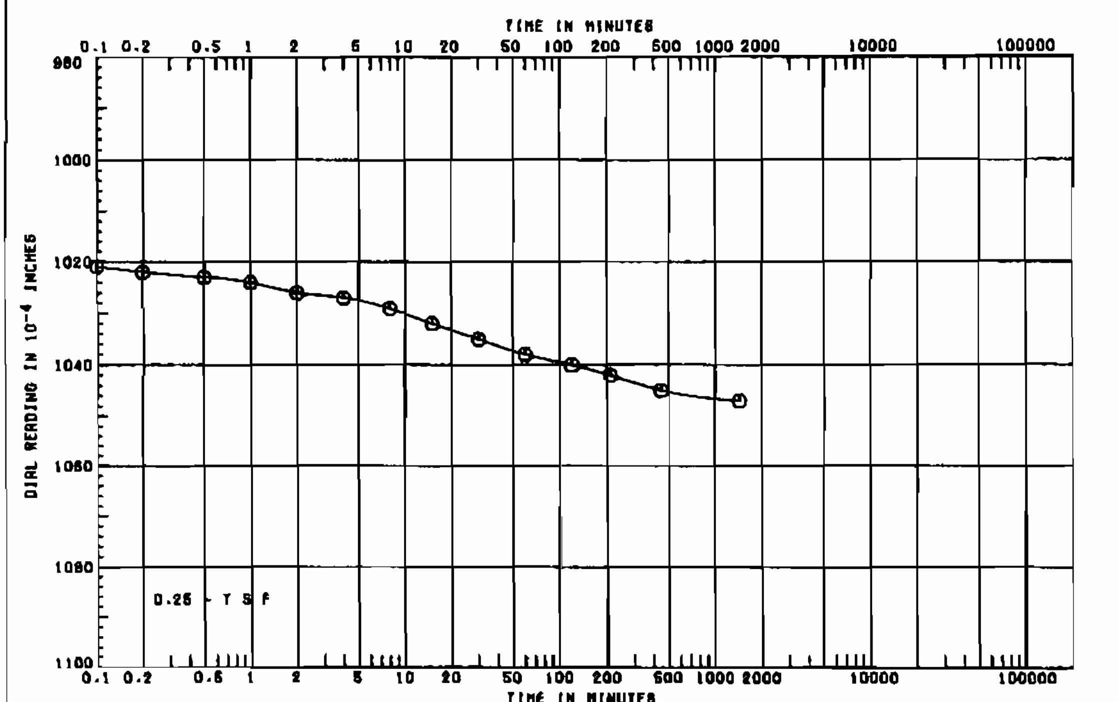
SHEET 1 OF 9



PROJECT LAKE PONT LA 4 VIC LAKE PONT BARRIER	
PLAN N.O. E. LEV (SO. POINT TO DIWN)	
BORING 10-USP	SAMPLE NO. 7-C
DEPTH/ELEV 21.1/-7.6	DATE 14 MAY 86

CONSOLIDATION TEST
TIME CURVES

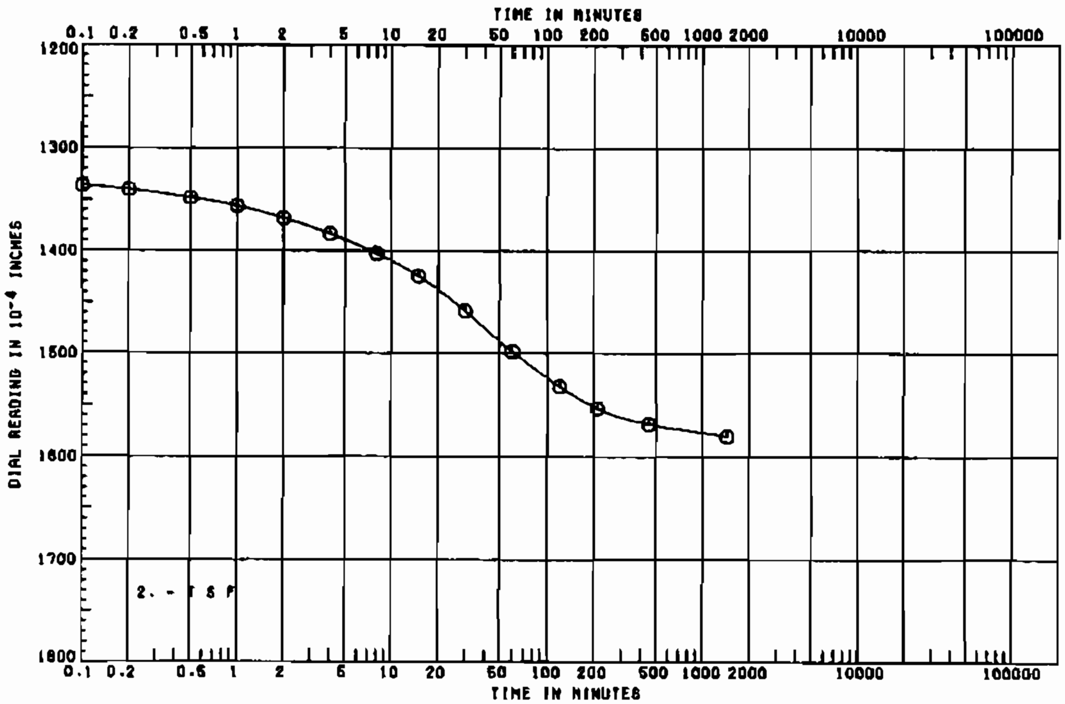
SHEET 4 OF 9



PROJECT LAKE PONT LA 4 VIC LAKE PONT BARRIER	
PLAN N.O. E. LEV (SO. POINT TO DIWN)	
BORING 10-USP	SAMPLE NO. 7-C
DEPTH/ELEV 21.1/-7.6	DATE 14 MAY 86

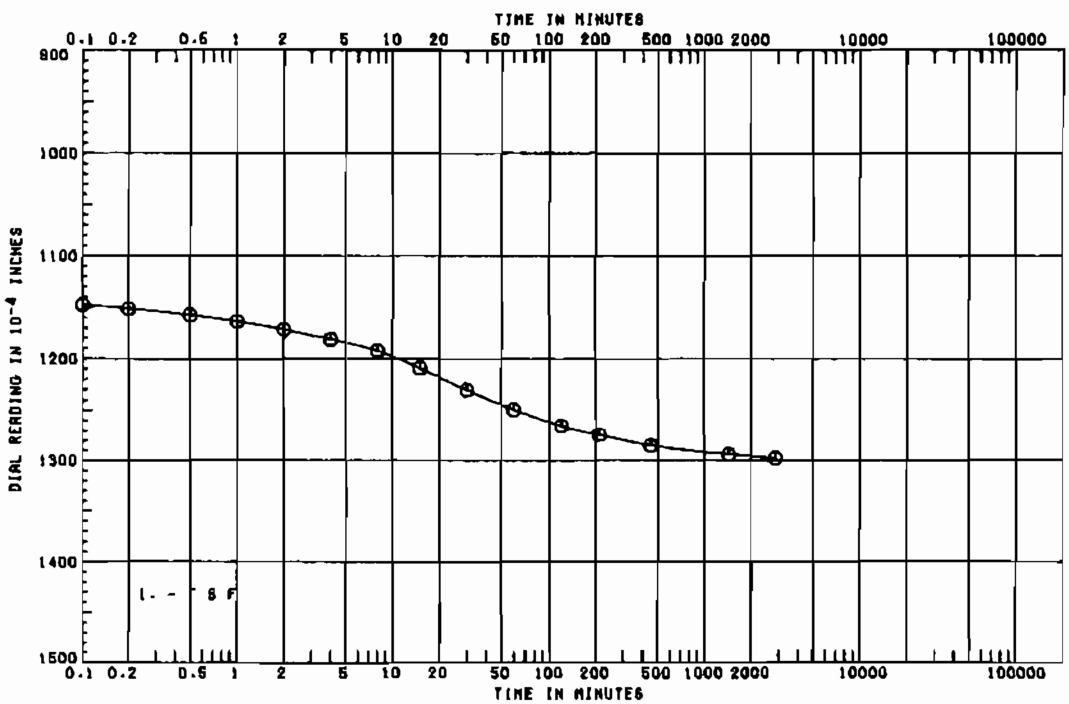
CONSOLIDATION TEST
TIME CURVES

SHEET 3 OF 9



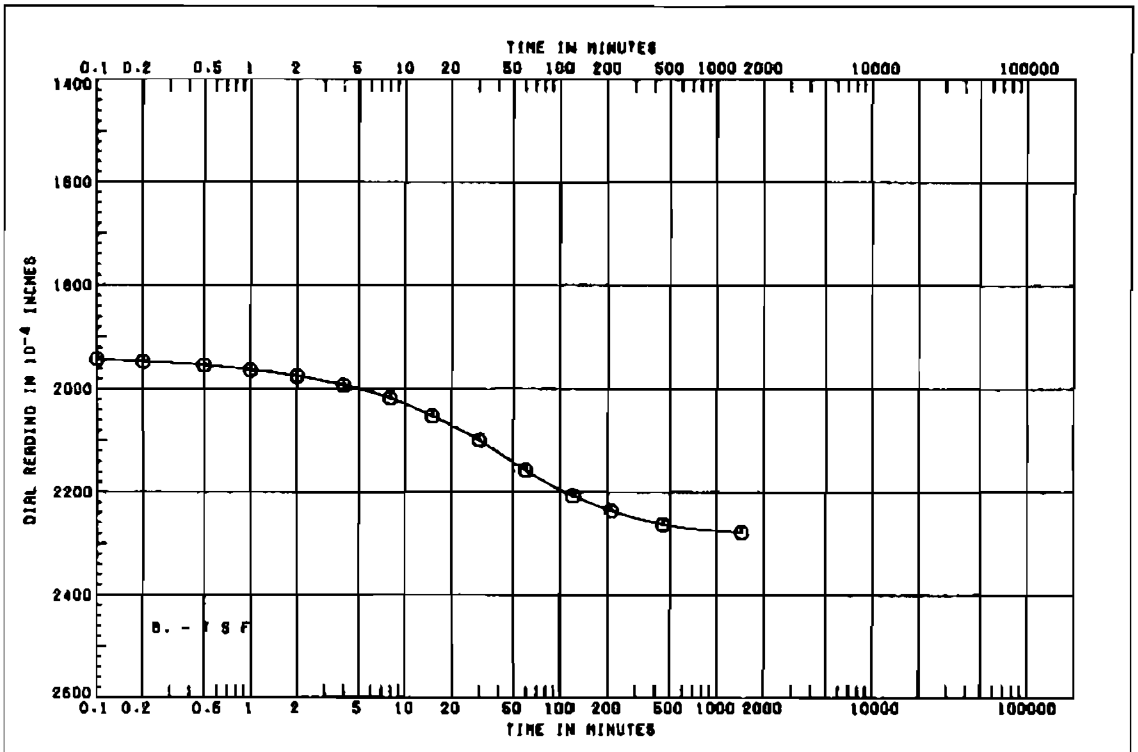
PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER		CONSOLIDATION TEST
PLAN N.O. E. LEV (80. POINT TO OIMW)		TIME CURVES
BORING 10-USP	SAMPLE NO. 7-C	
DEPTH/ELEV 21.1/-7.6	DATE 14 MAY 86	

SHEET 6 OF 9



PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER		CONSOLIDATION TEST
PLAN N.O. E. LEV (80. POINT TO OIMW)		TIME CURVES
BORING 10-USP	SAMPLE NO. 7-C	
DEPTH/ELEV 21.1/-7.6	DATE 14 MAY 86	

SHEET 5 OF 9

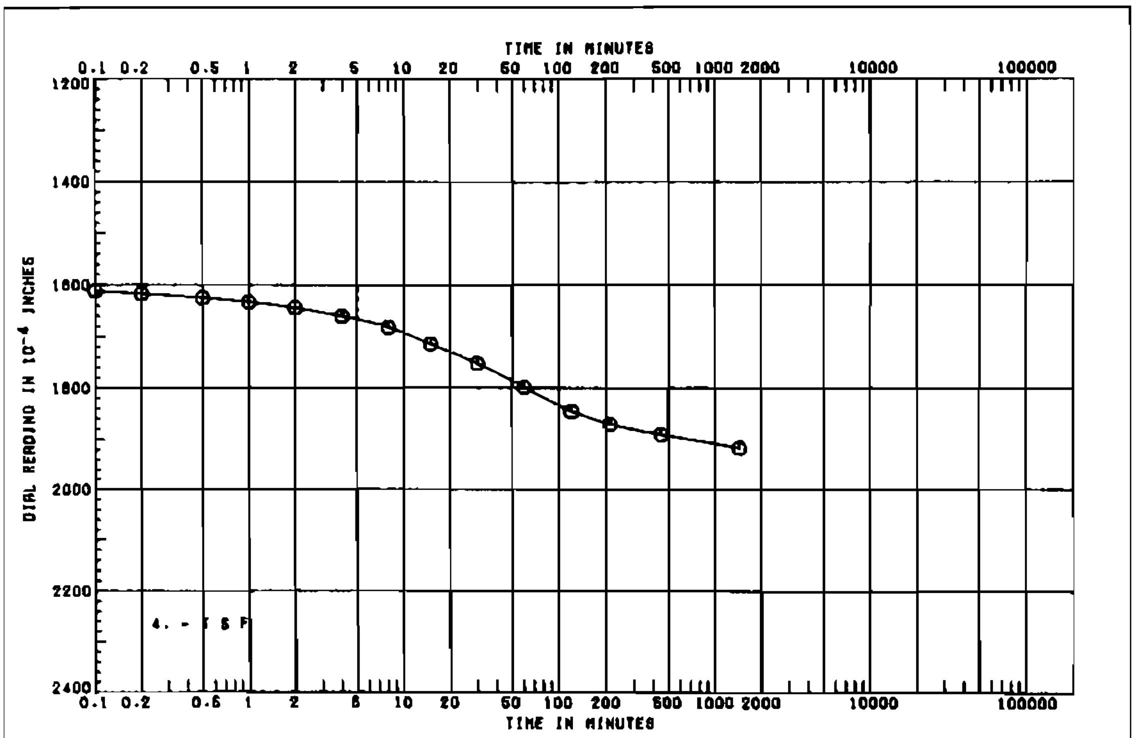


PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER	
PLAN N.O. E. LEV (SO. POINT TO OIWW)	
BORING 10-USP	SAMPLE NO. 7-C
DEPTH/ELEV 21.1/-7.6	DATE 14 MAY 86

CONSOLIDATION TEST

TIME CURVES

SHEET 6 OF 9

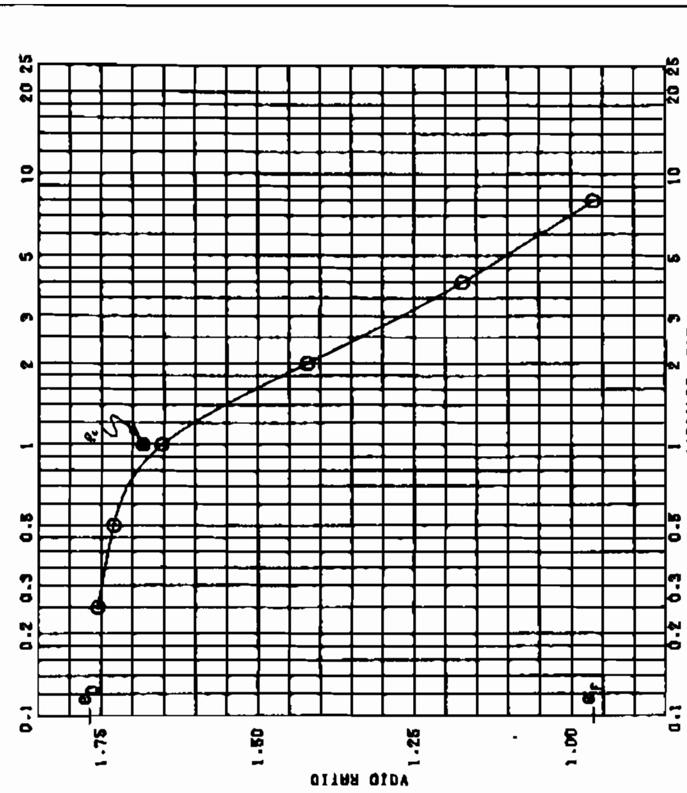


PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER	
PLAN N.O. E. LEV (SO. POINT TO OIWW)	
BORING 10-USP	SAMPLE NO. 7-C
DEPTH/ELEV 21.1/-7.6	DATE 14 MAY 86

CONSOLIDATION TEST

TIME CURVES

SHEET 7 OF 9



γ sat. = 101

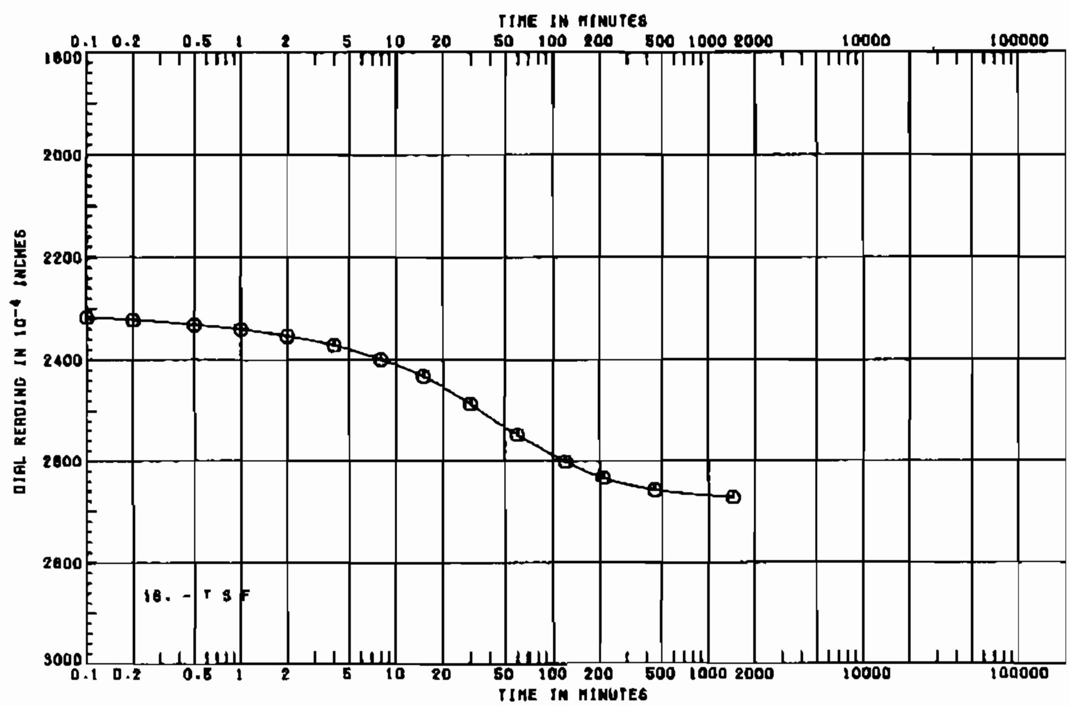
				BEFORE TEST	AFTER TEST
OVERBURDEN PRESSURE, TSF			WATER CONTENT, %	64.9	37.3
PRECONSOL. PRESSURE, TSF		1.00	DRY DENSITY, PCF	60.9	85.9
COMPRESSION INDEX		0.88	SATURATION, %	99.2	100 +
TYPE SPECIMEN	UNDISTURBED		VOID RATIO	1.766	0.963
DIA. IN 4.44	HT. IN 1.124		BACK PRESSURE, TSF		

CLASSIFICATION	PLASTIC CLAY (CH), GRAY	
LL	PL	PI
GS 2.70 (EST)	D_{10}	
REMARKS		

PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER	
PLAN N.O. E. LEV (SO. POINT TO DIWW)	
BORING NO. 10-USP	SAMPLE NO. 9-C
DEPTH/ELEV 29.2/-15.7	DATE 15 MAY 86

CONSOLIDATION TEST REPORT

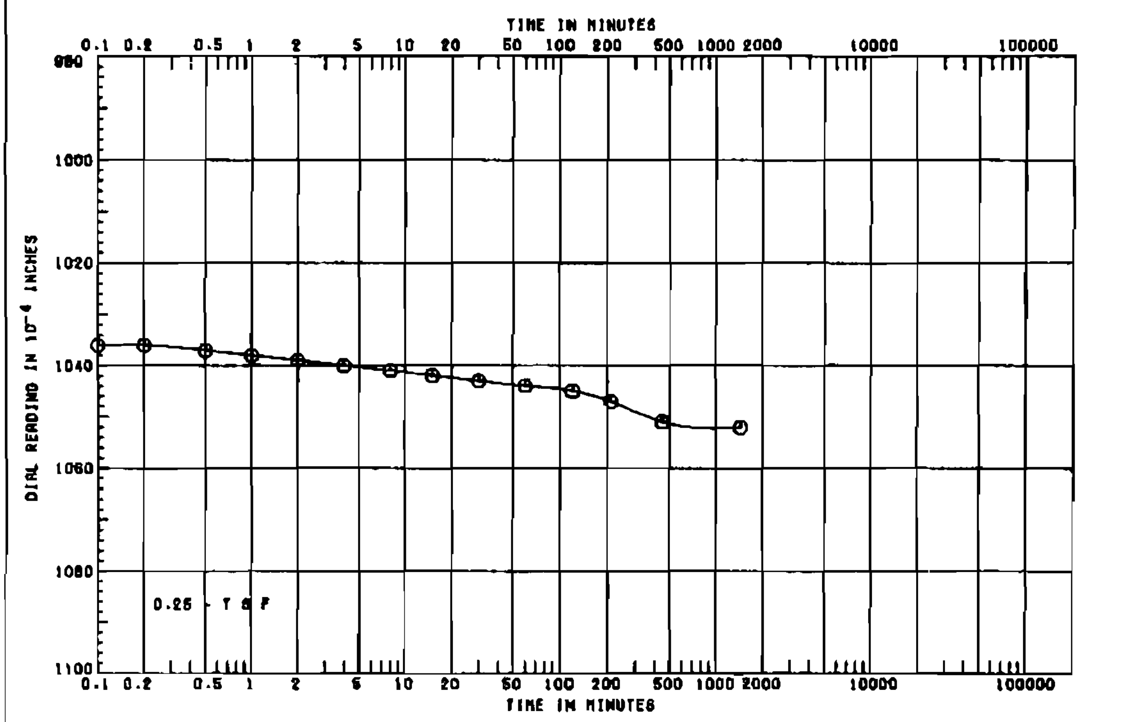
SHEET 1 OF 8



PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER	
PLAN N.O. E. LEV (SO. POINT TO DIWW)	
BORING 10-USP	SAMPLE NO. 7-C
DEPTH/ELEV 21.1/-7.6	DATE 14 MAY 86

CONSOLIDATION TEST
TIME CURVES

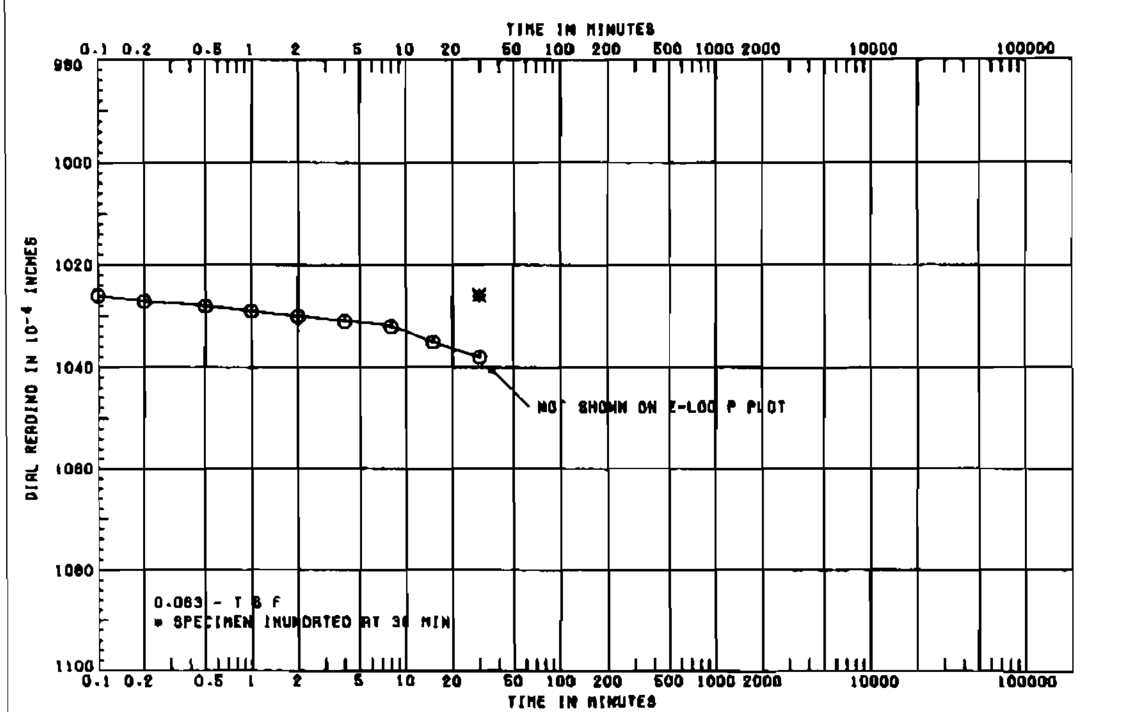
SHEET 8 OF 8



PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER	
PLAN N.O. E. LEV (80. POINT TO OINW)	
BORING 10-USP	SAMPLE NO. 9-C
DEPTH/ELEV 29.2/-15.7	DATE 15 MAY 86

CONSOLIDATION TEST
TIME CURVES

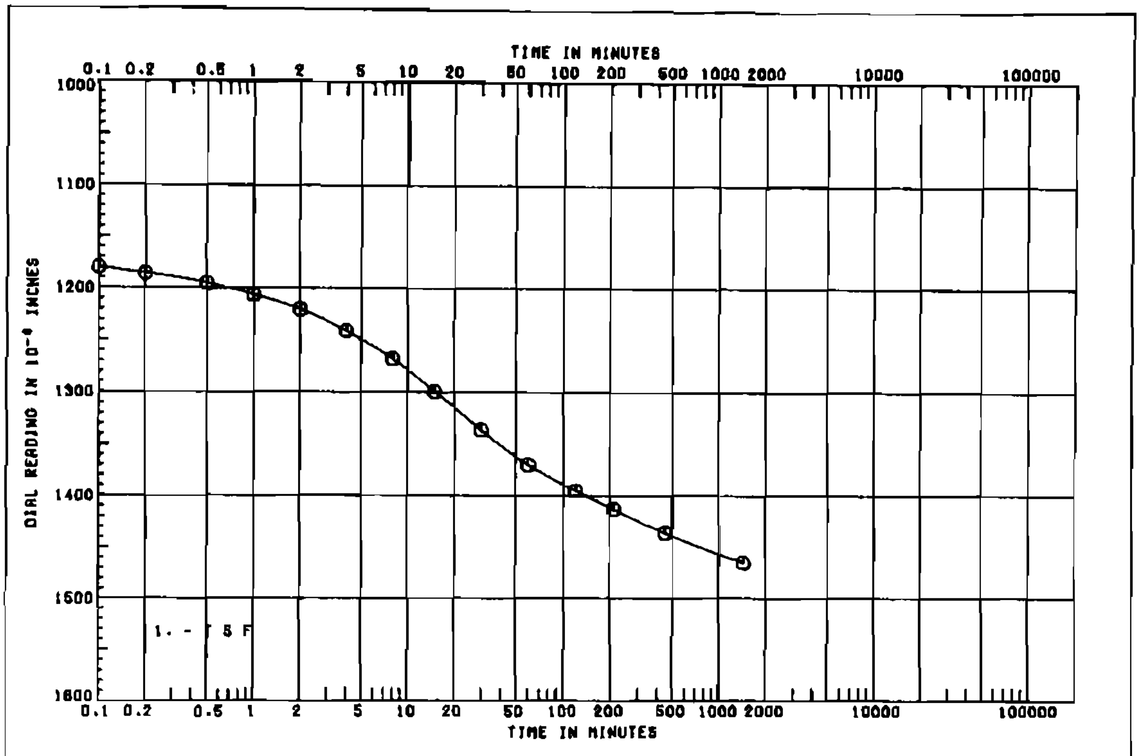
SHEET 3 OF 8



PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER	
PLAN N.O. E. LEV (80. POINT TO OINW)	
BORING 10-USP	SAMPLE NO. 9-C
DEPTH/ELEV 29.2/-15.7	DATE 15 MAY 86

CONSOLIDATION TEST
TIME CURVES

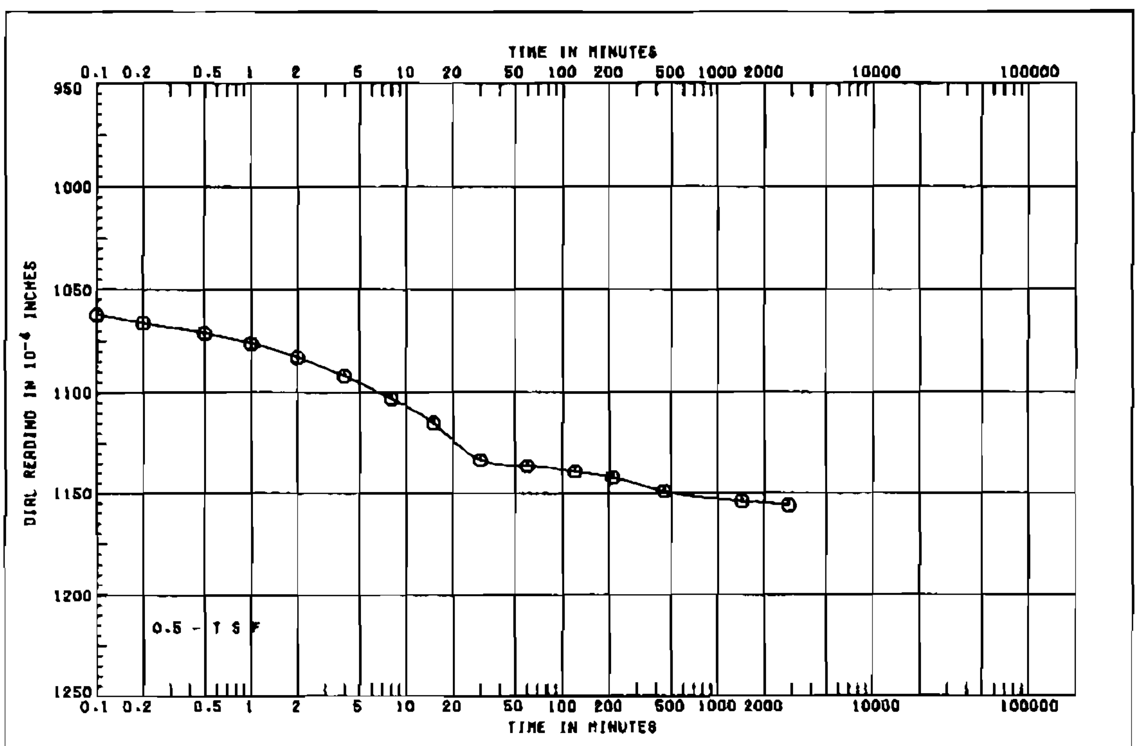
SHEET 2 OF 8



PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER	
PLAN N.O. E. LEV (SO. POINT TO OIHW)	
BORING 10-USP	SAMPLE NO. 9-C
DEPTH/ELEV 29.2/-15.7	DATE 15 MAY 86

CONSOLIDATION TEST
TIME CURVES

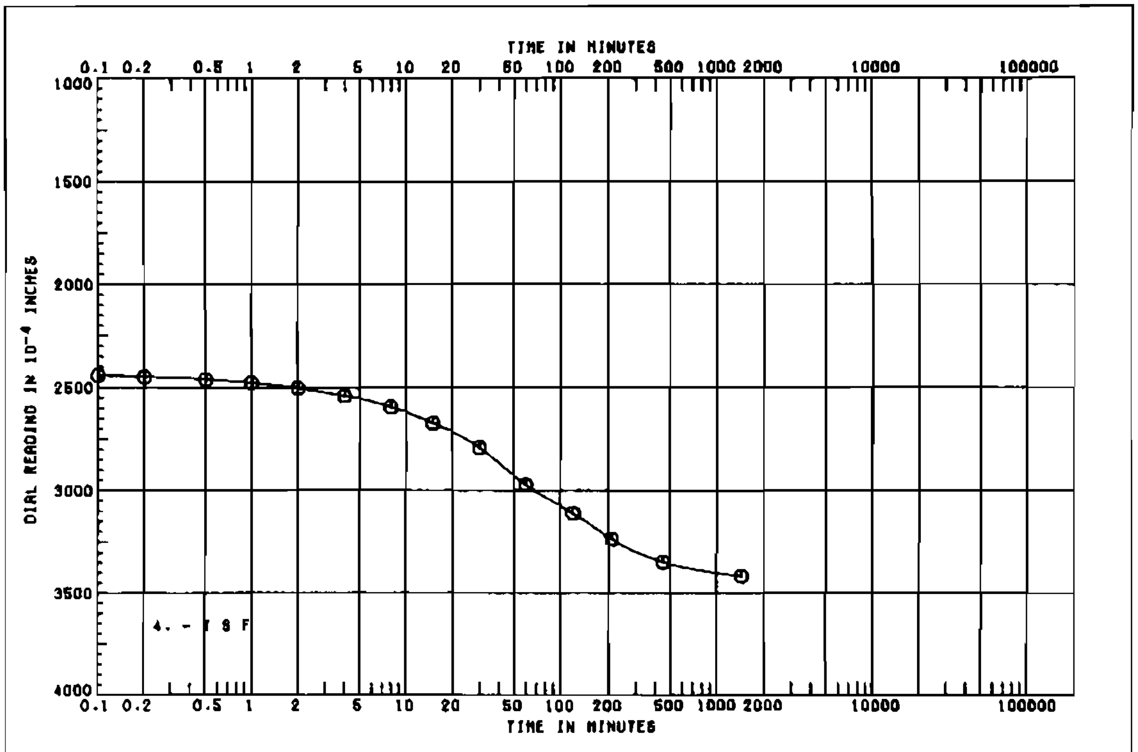
SHEET 5 OF 8



PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER	
PLAN N.O. E. LEV (SO. POINT TO OIHW)	
BORING 10-USP	SAMPLE NO. 9-C
DEPTH/ELEV 29.2/-15.7	DATE 15 MAY 86

CONSOLIDATION TEST
TIME CURVES

SHEET 4 OF 8

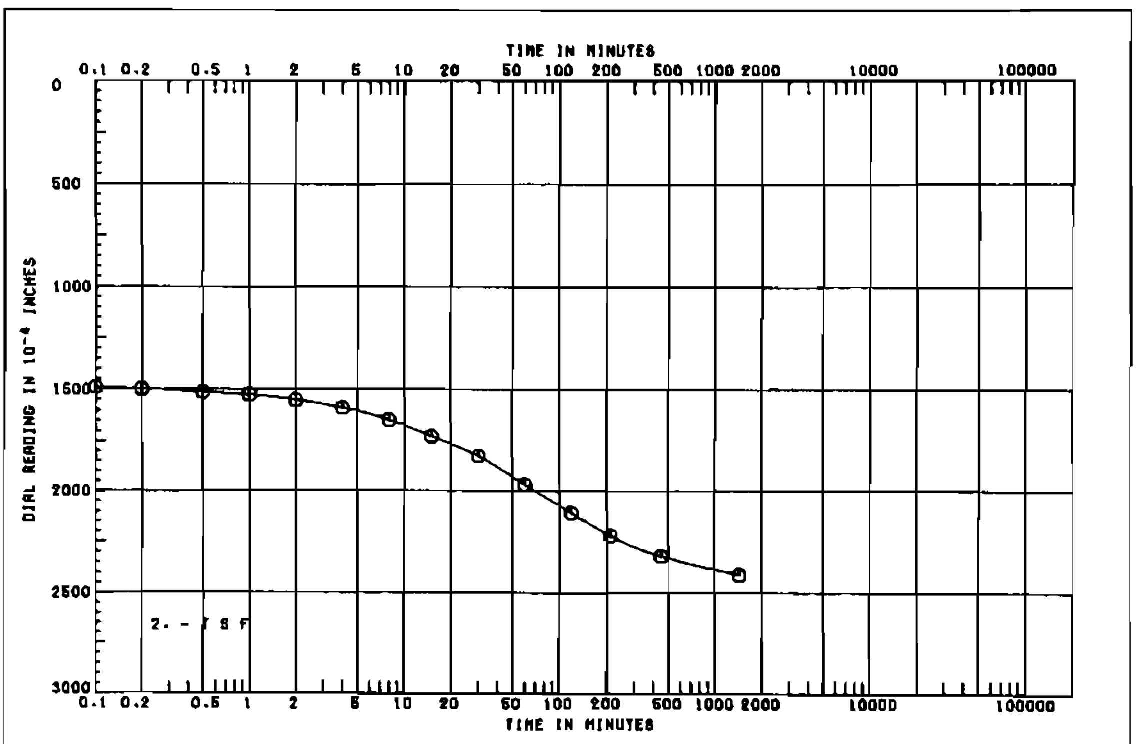


PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER	
PLAN N.O. E. LEV (SO. POINT TO GIWW)	
BORING 10-USP	SAMPLE NO. 9-C
DEPTH/ELEV 29.2/-15.7	DATE 15 MAY 86

CONSOLIDATION TEST

TIME CURVES

SHEET 7 OF 8

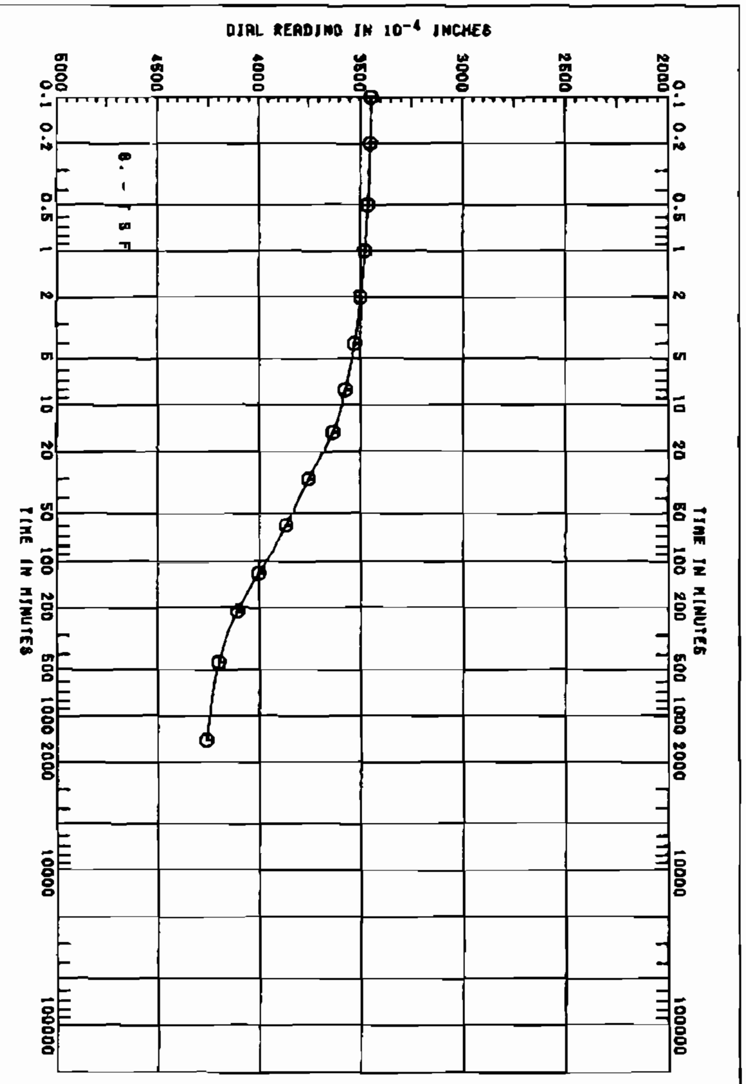


PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER	
PLAN N.O. E. LEV (SO. POINT TO GIWW)	
BORING 10-USP	SAMPLE NO. 9-C
DEPTH/ELEV 29.2/-15.7	DATE 15 MAY 86

CONSOLIDATION TEST

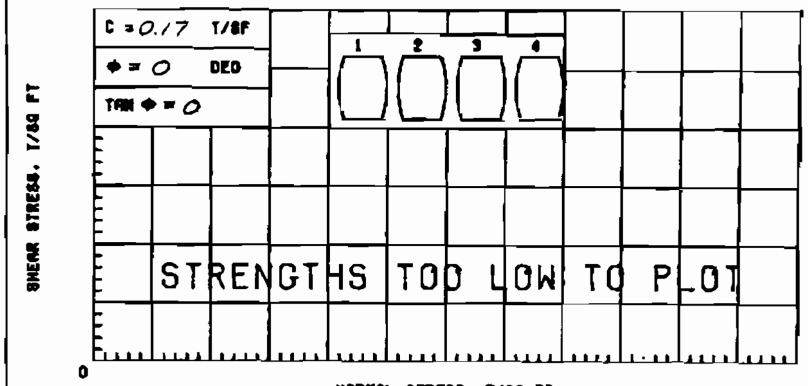
TIME CURVES

SHEET 6 OF 8

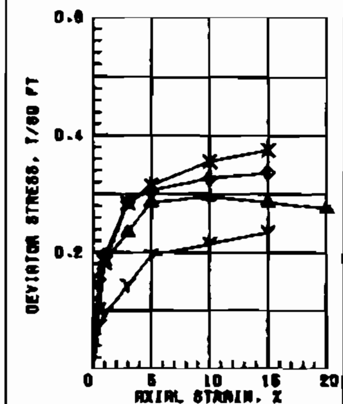


PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER	CONSOLIDATION TEST TIME CURVES
PLAN N.O. E. LEV (SO. POINT TO DIWN)	
BORING 10-USP	SAMPLE NO. 9-C
DEPTH/ELEV 29.2/-15.7	DATE 15 MAY 86

SHEET 8 OF 8



γ Sat = 118



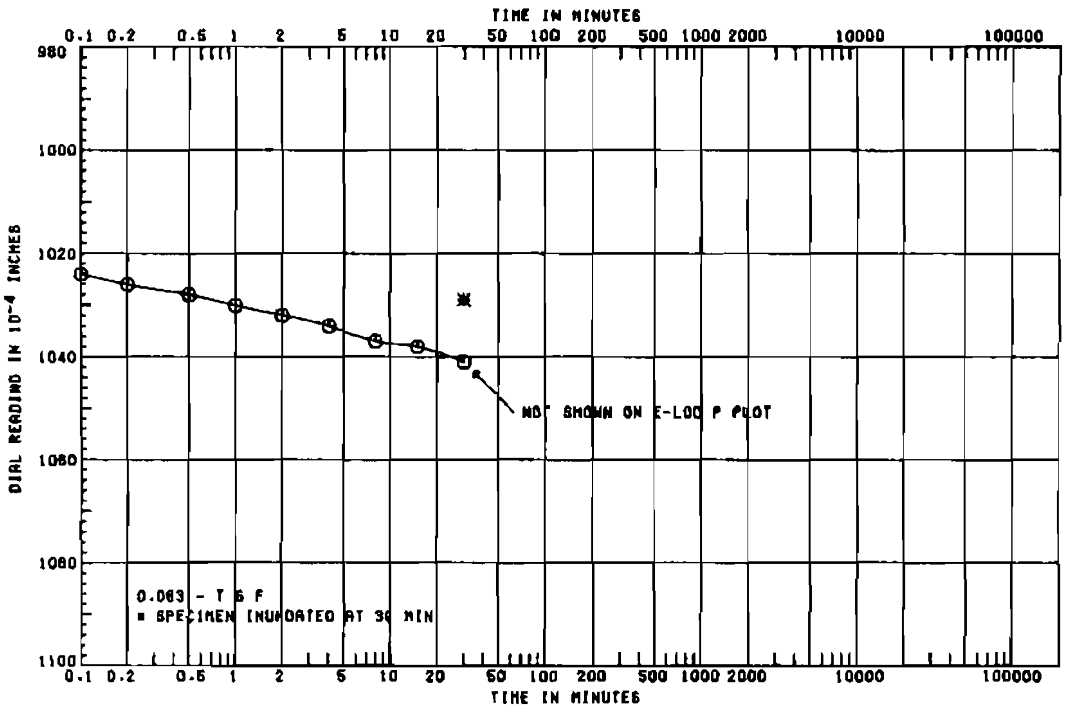
	SPECIMEN NO.	A1	Y2	X3	Φ4	AVG.
INITIAL	WATER CONTENT, %	32.8	32.4	28.8	31.8	31.10
	DRY DENSITY, PCF	87.9	86.6	91.0	87.6	88.83
	SATURATION, %	95.7	90.3	91.6	93.2	93.50
	VOID RATIO	0.917	0.909	0.852	0.924	
BEFORE SHEAR	WATER CONTENT, %					
	DRY DENSITY, PCF					
	SATURATION, %					
	VOID RATIO					
	BACK PRESS., TSF					
MIN PRIN. STRESS, TSF		0.5	1.5	3.0	1.5	
MAX. DEV. STRESS, TSF		0.30	0.29	0.38	0.34	
TIME TO FAILURE, MIN.		20	30	30	30	
RATE OF STRAIN (NCR,%						
INITIAL DIAMETER, IN.		1.39	1.39	1.39	1.39	
INITIAL HEIGHT, IN.		3.00	3.00	3.00	3.00	

CONTROLLED-STRAIN TEST

DESCRIPTION OF SPECIMENS: CLAY (CL), GRAY; SILT POCKETS

LL 34	PL 15	PI 19	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

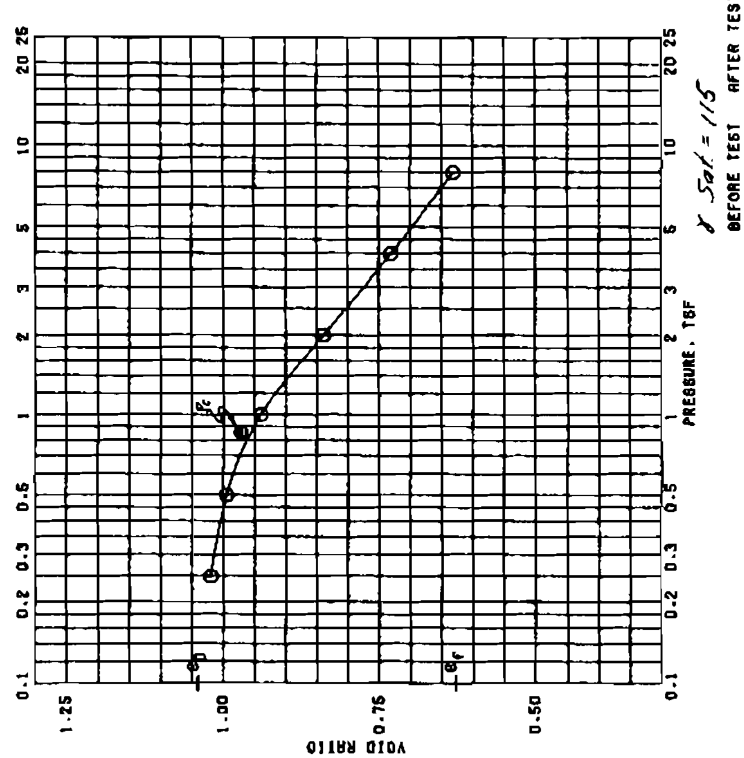
REMARKS:	PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER	
	PLAN N.O. E. LEV (SO. POINT TO DIWN	
	BORING NO. 10-USP	SAMPLE NO. 10-B
	DEPTH/ELEV 32.3/-18.8	TECH. KOC
	LABORATORY USAE WES	DATE 13 MAR 86
	TRIAXIAL COMPRESSION TEST REPORT	



PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER	
PLAN N.O. E. LEV (SO. POINT TO DIWW)	
BORING 10-USP	SAMPLE NO. 10-C
DEPTH/ELEV 33.2/-19.70	DATE 17 MAY 86

CONSOLIDATION TEST
TIME CURVES

SHEET 2 OF 8

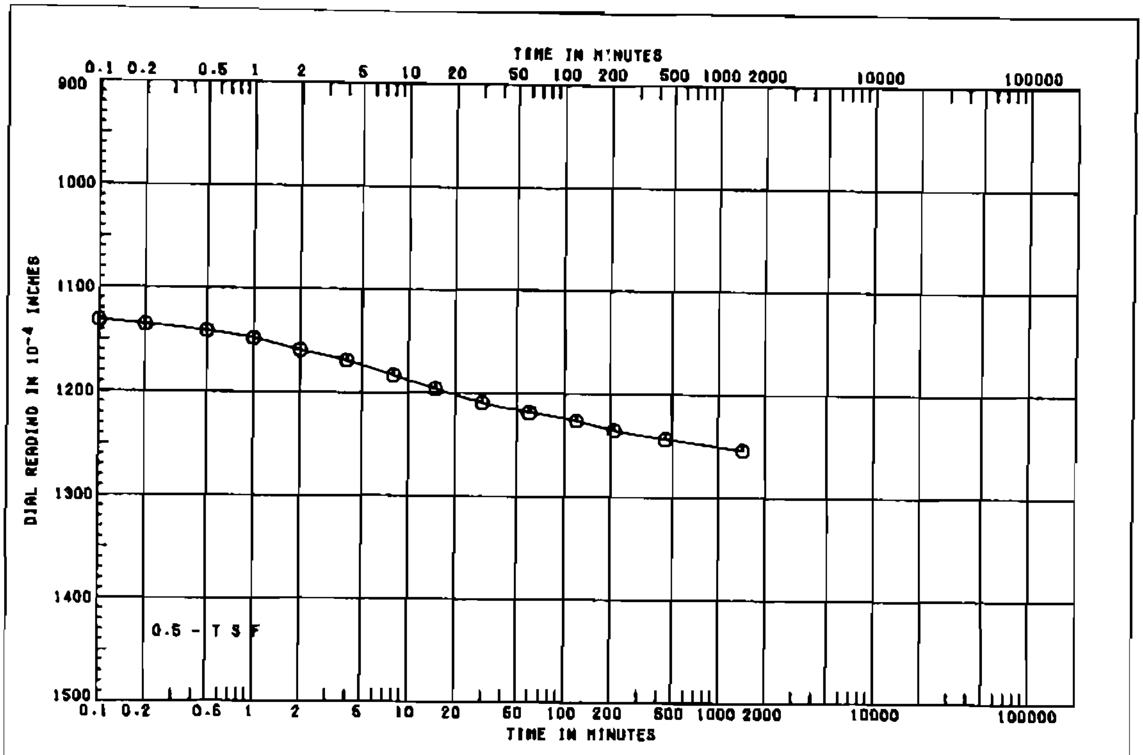


γ Sat. = 115

			BEFORE TEST	AFTER TEST
OVERBURDEN PRESSURE, TSF		WATER CONTENT, %	36.9	23.5
PRECONSOL. PRESSURE, TSF	0.86	DRY DENSITY, PCF	82.7	103.8
COMPRESSION INDEX	0.37	SATURATION, %	96.0	100 +
TYPE SPECIMEN	UNDISTURBED	VOID RATIO	1.039	0.627
DIA. IN 4.44	HT. IN 1.128	BACK PRESSURE, TSF		
CLASSIFICATION	CLAY (CL), GRAY; SILT LENSES; SHELLS			
LL / PL / PI		PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER		
GS 2.70 (EST)	D_{10}	PLAN N.O. E. LEV (SO. POINT TO DIWW)		
REMARKS		BORING NO. 10-USP	SAMPLE NO. 10-C	
		DEPTH/ELEV 33.2/-19.70	DATE 17 MAY 86	

CONSOLIDATION TEST REPORT

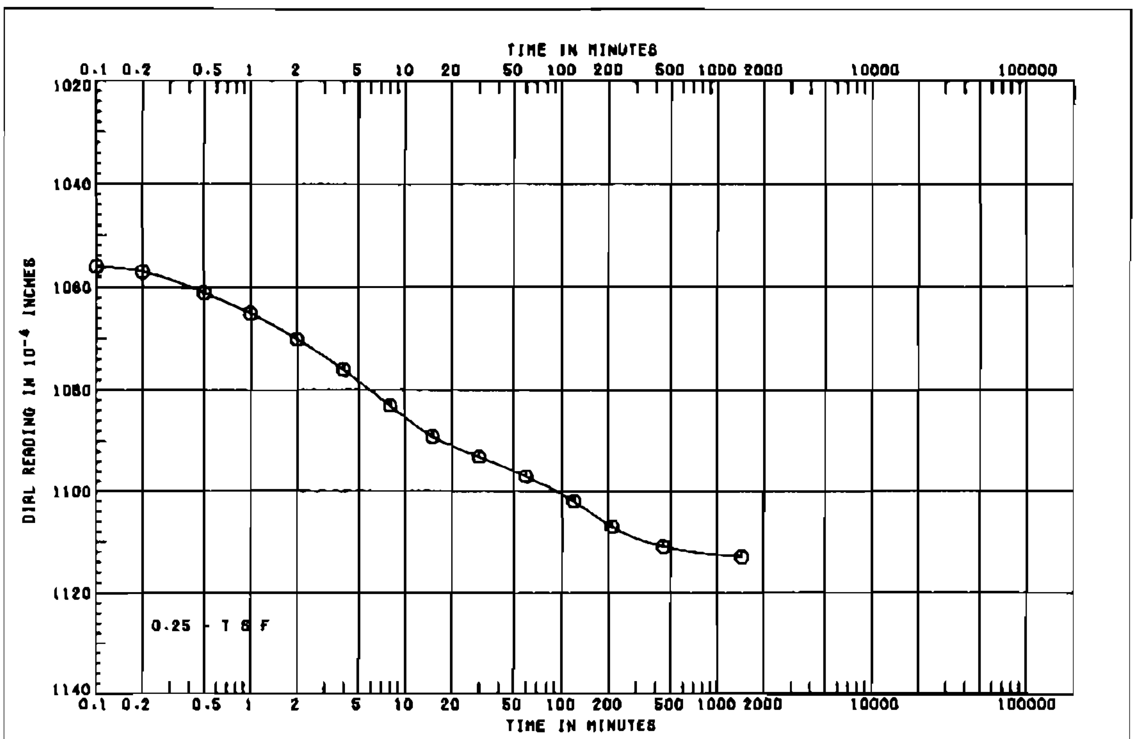
SHEET 1 OF 8



PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER	
PLAN N.O. E. LEV (SO. POINT TO GIWW)	
BORING 10-USP	SAMPLE NO. 10-C
DEPTH/ELEV 33.2/-19.70	DATE 17 MAY 86

CONSOLIDATION TEST
TIME CURVES

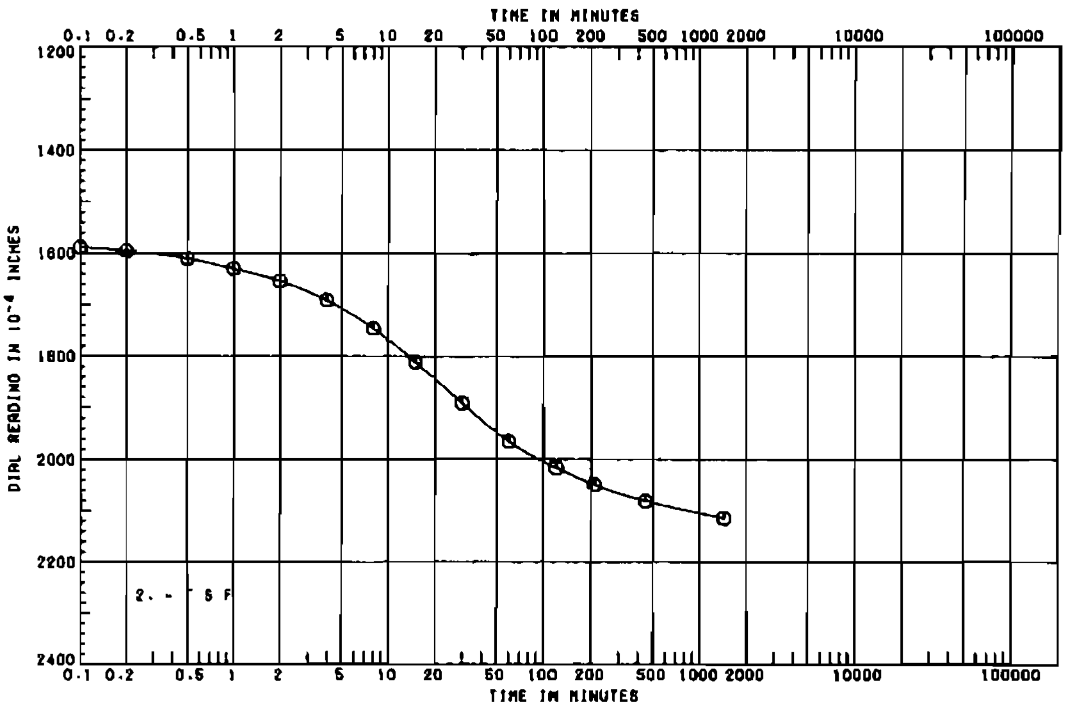
SHEET 4 OF 8



PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER	
PLAN N.O. E. LEV (SO. POINT TO GIWW)	
BORING 10-USP	SAMPLE NO. 10-C
DEPTH/ELEV 33.2/-19.70	DATE 17 MAY 86

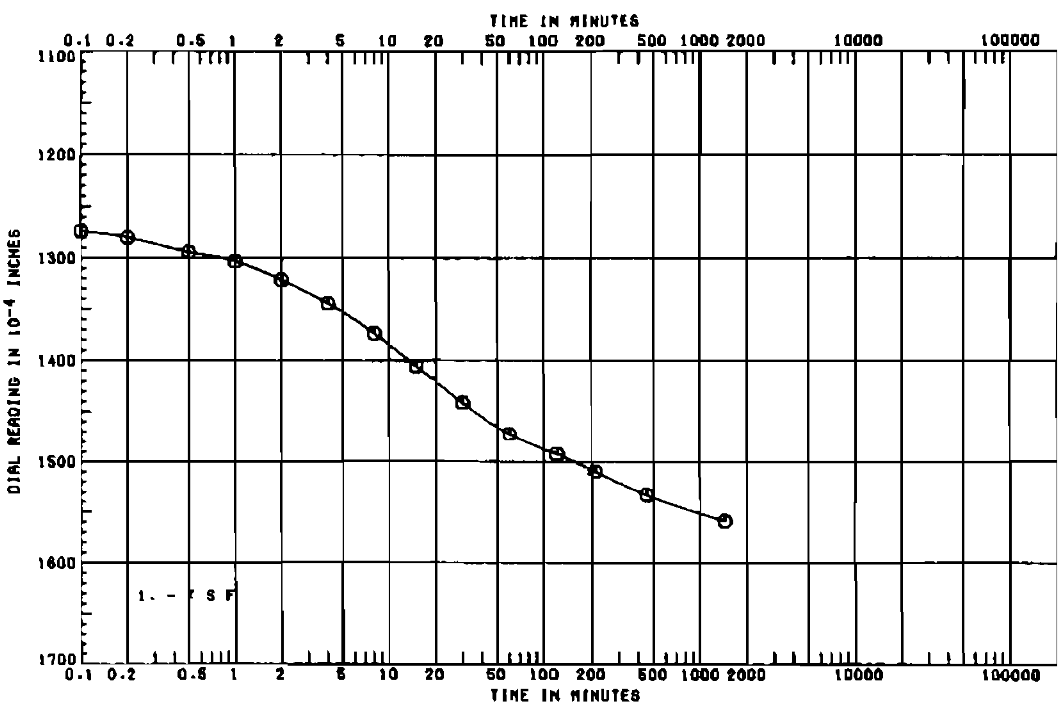
CONSOLIDATION TEST
TIME CURVES

SHEET 3 OF 8



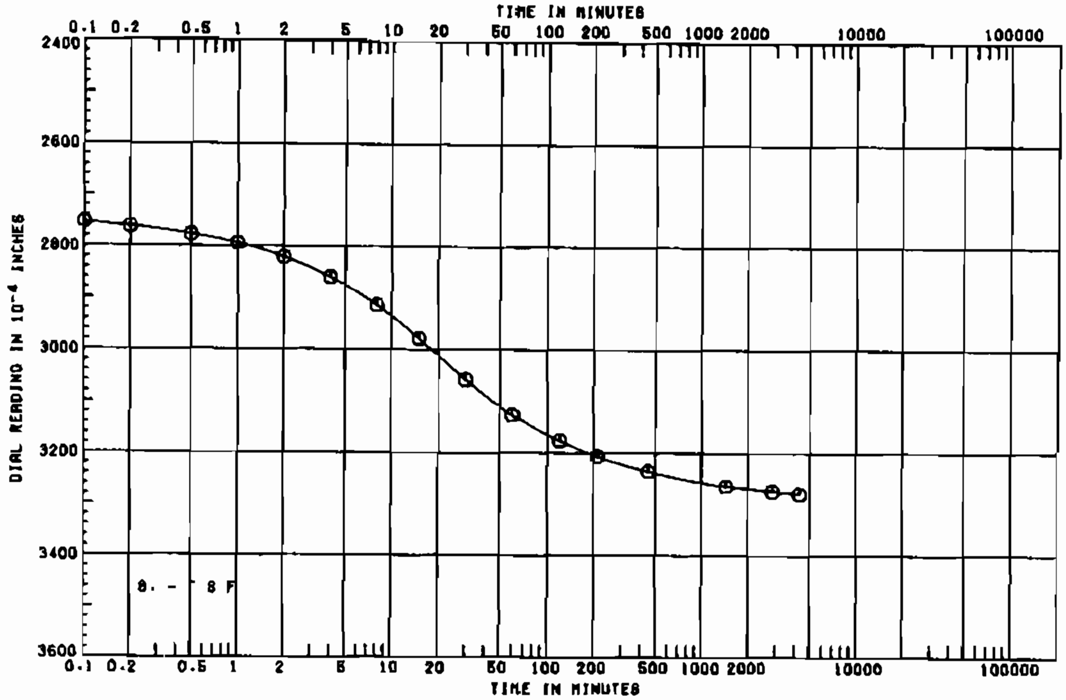
PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER		CONSOLIDATION TEST TIME CURVES
PLAN N.O. E. LEV (SO. POINT TO OIWW)		
BORING 10-USP	SAMPLE NO. 10-C	
DEPTH/ELEV 33.2/-19.70	DATE 17 MAY 86	

SHEET 6 OF 8



PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER		CONSOLIDATION TEST TIME CURVES
PLAN N.O. E. LEV (SO. POINT TO OIWW)		
BORING 10-USP	SAMPLE NO. 10-C	
DEPTH/ELEV 33.2/-19.70	DATE 17 MAY 86	

SHEET 5 OF 8

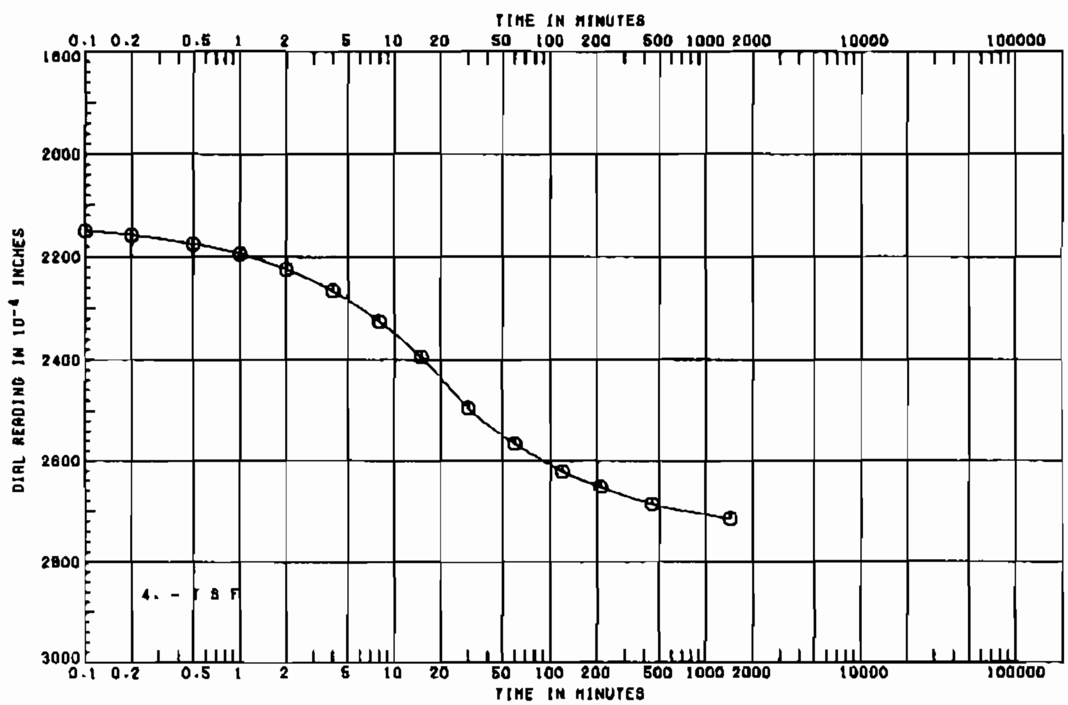


PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER	
PLAN N.O. E. LEV (SO. POINT TO OIWW)	
BORING 10-USP	SAMPLE NO. 10-C
DEPTH/ELEV 33.2/-19.70	DATE 17 MAY 86

CONSOLIDATION TEST

TIME CURVES

SHEET 8 OF 8

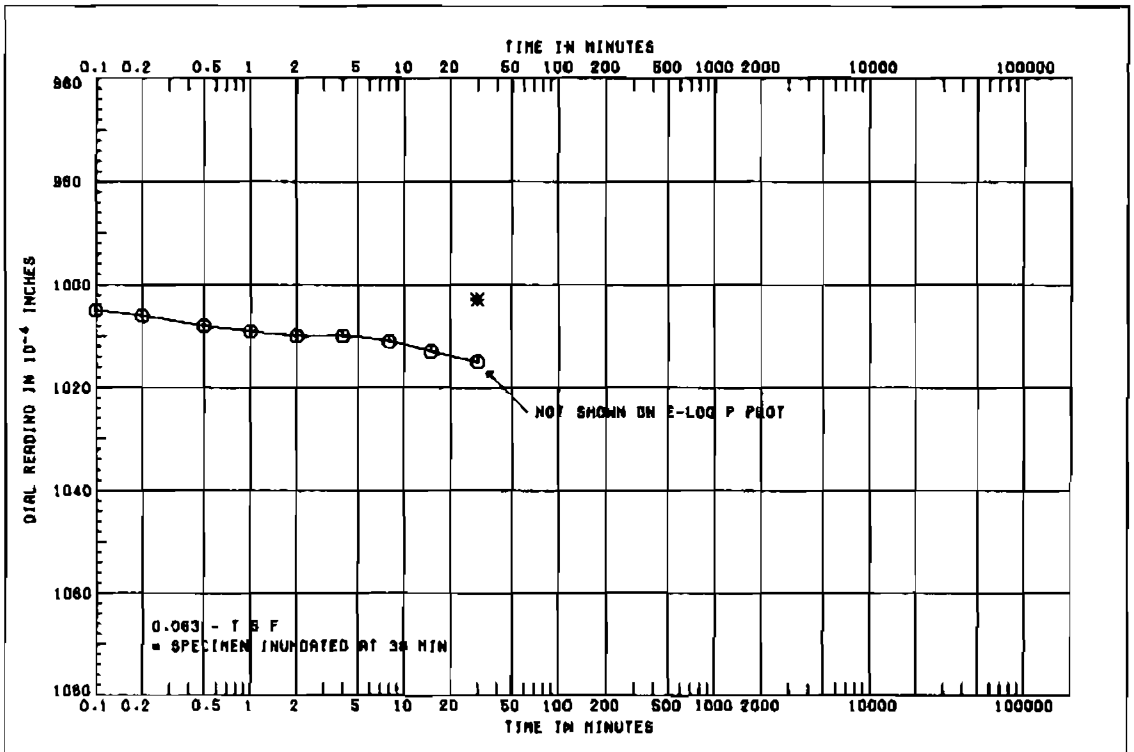


PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER	
PLAN N.O. E. LEV (SO. POINT TO OIWW)	
BORING 10-USP	SAMPLE NO. 10-C
DEPTH/ELEV 33.2/-19.70	DATE 17 MAY 86

CONSOLIDATION TEST

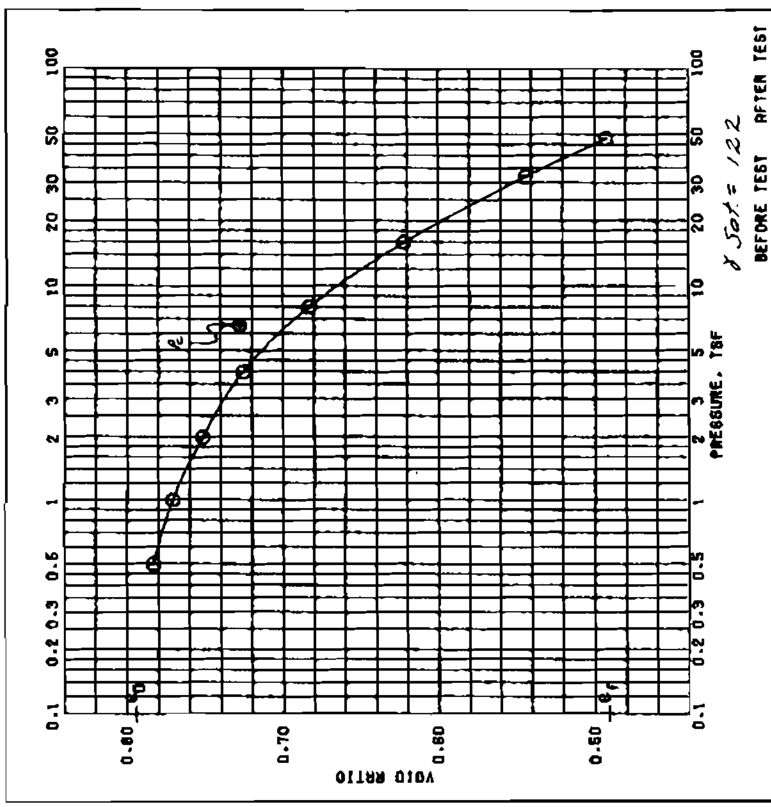
TIME CURVES

SHEET 7 OF 8



PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER		CONSOLIDATION TEST TIME CURVES
PLAN N.O. E. LEVEE IS. POINT TO OIWW		
BORING 11-USP	SAMPLE NO. 3-C	
DEPTH/ELEV 6.4/6.4	DATE 21 MAY 86	

SHEET 2 OF 10



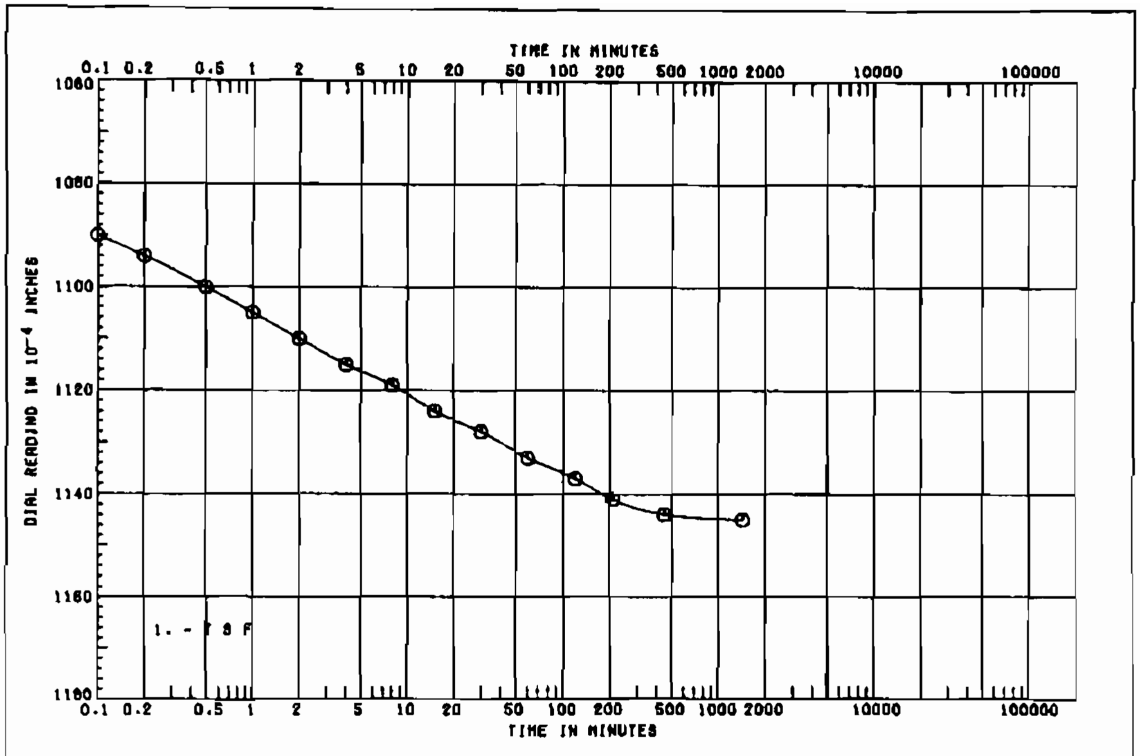
			BEFORE TEST	AFTER TEST
OVERBURDEN PRESSURE, TSF		WATER CONTENT, %	23.8	17.8
PRECONSOL. PRESSURE, TSF	6.0	DRY DENSITY, PCF	94.0	113.1
COMPRESSION INDEX	0.27	SATURATION, %	81.9	98.5
TYPE SPECIMEN	UNDISTURBED	VOID RATIO	0.793	0.481
DIA. IN 4.44	HT. IN 1.124	BACK PRESSURE, TSF		

CLASSIFICATION	SANDY CLAY (CL), GRAY; SHELL PARTICLES	
LL	PL	PI
GS 2.70 (EST)	D_{10}	
REMARKS		

PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER	
PLAN N.O. E. LEVEE IS. POINT TO OIWW	
BORING NO. 11-USP	SAMPLE NO. 3-C
DEPTH/ELEV 6.4/6.4	DATE 21 MAY 86

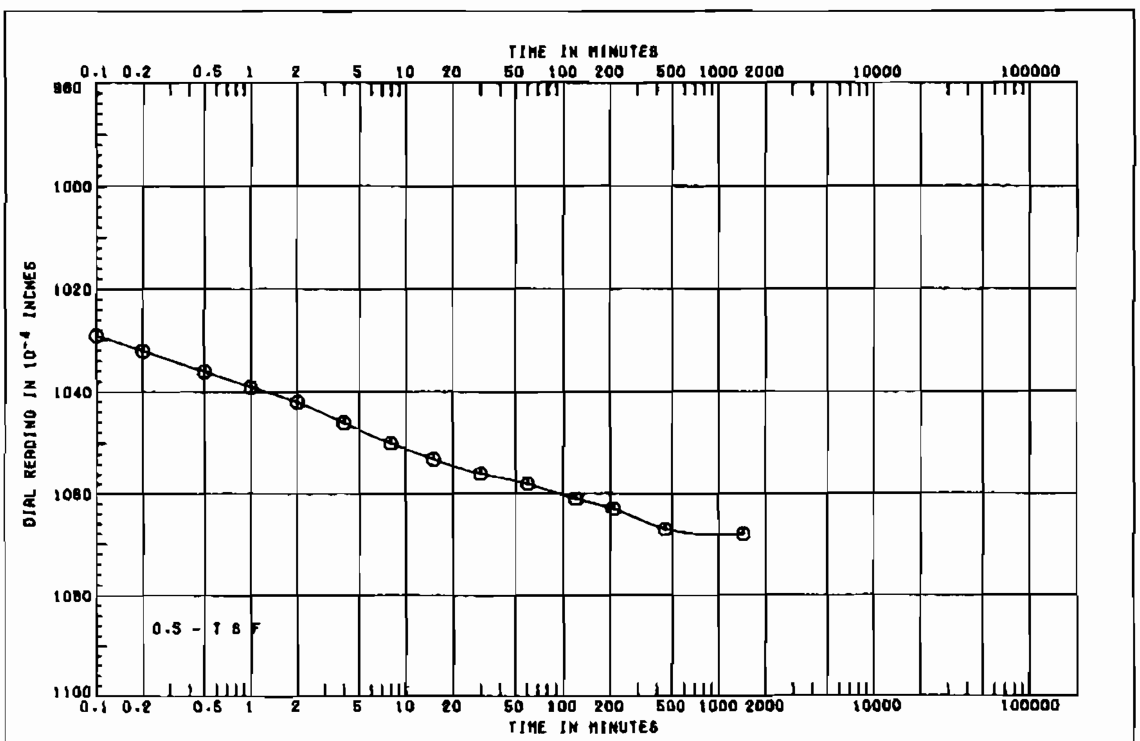
CONSOLIDATION TEST REPORT

SHEET 1 OF 10



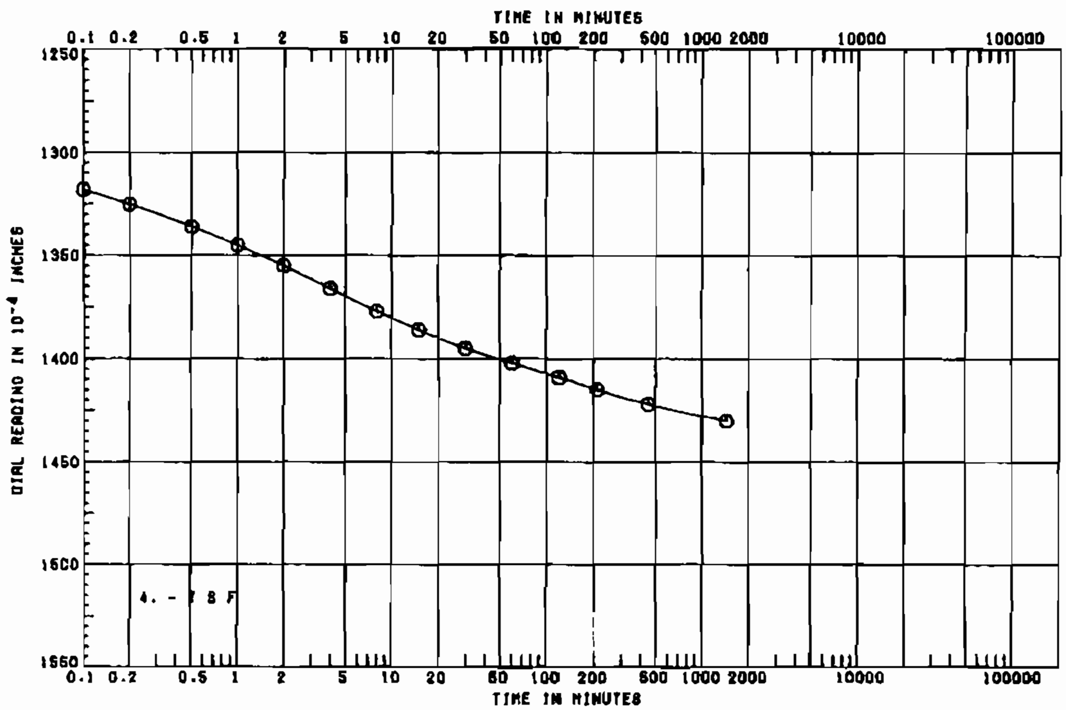
PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER		CONSOLIDATION TEST TIME CURVES
PLAN N.O. E. LEVEE IS. POINT TO OIMW		
BORING 11-USP	SAMPLE NO. 3-C	
DEPTH/ELEV 6.4/6.4	DATE 21 MAY 86	

SHEET 4 OF 10



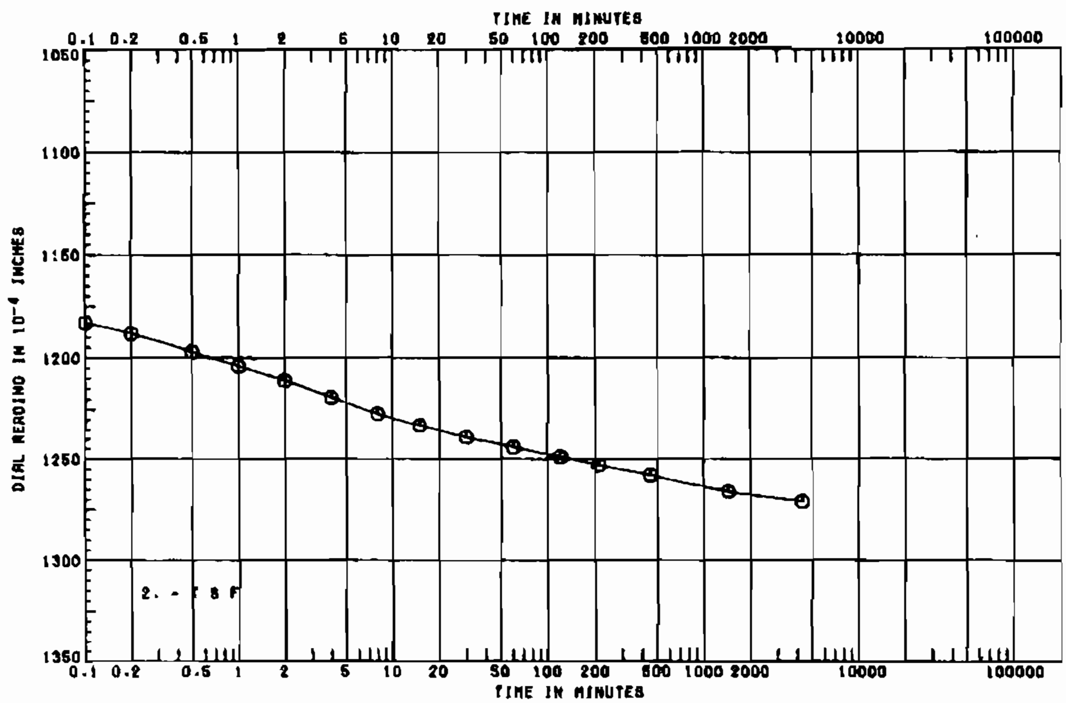
PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER		CONSOLIDATION TEST TIME CURVES
PLAN N.O. E. LEVEE IS. POINT TO OIMW		
BORING 11-USP	SAMPLE NO. 3-C	
DEPTH/ELEV 6.4/6.4	DATE 21 MAY 86	

SHEET 3 OF 10



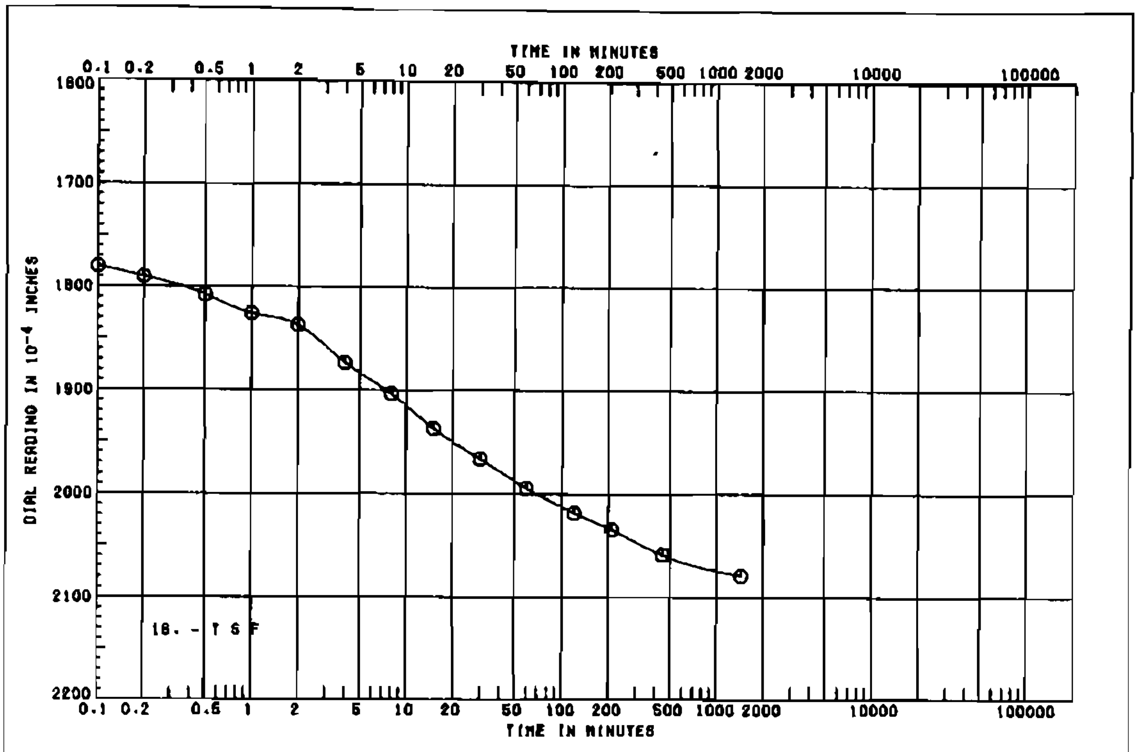
PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER		CONSOLIDATION TEST
PLAN N.O. E. LEVEE (S. POINT TO DINN		TIME CURVES
BORING 11-USP	SAMPLE NO. 3-C	
DEPTH/ELEV 6.4/6.4	DATE 21 MAY 86	

SHEET 6 OF 10



PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER		CONSOLIDATION TEST
PLAN N.O. E. LEVEE (S. POINT TO DINN		TIME CURVES
BORING 11-USP	SAMPLE NO. 3-C	
DEPTH/ELEV 6.4/6.4	DATE 21 MAY 86	

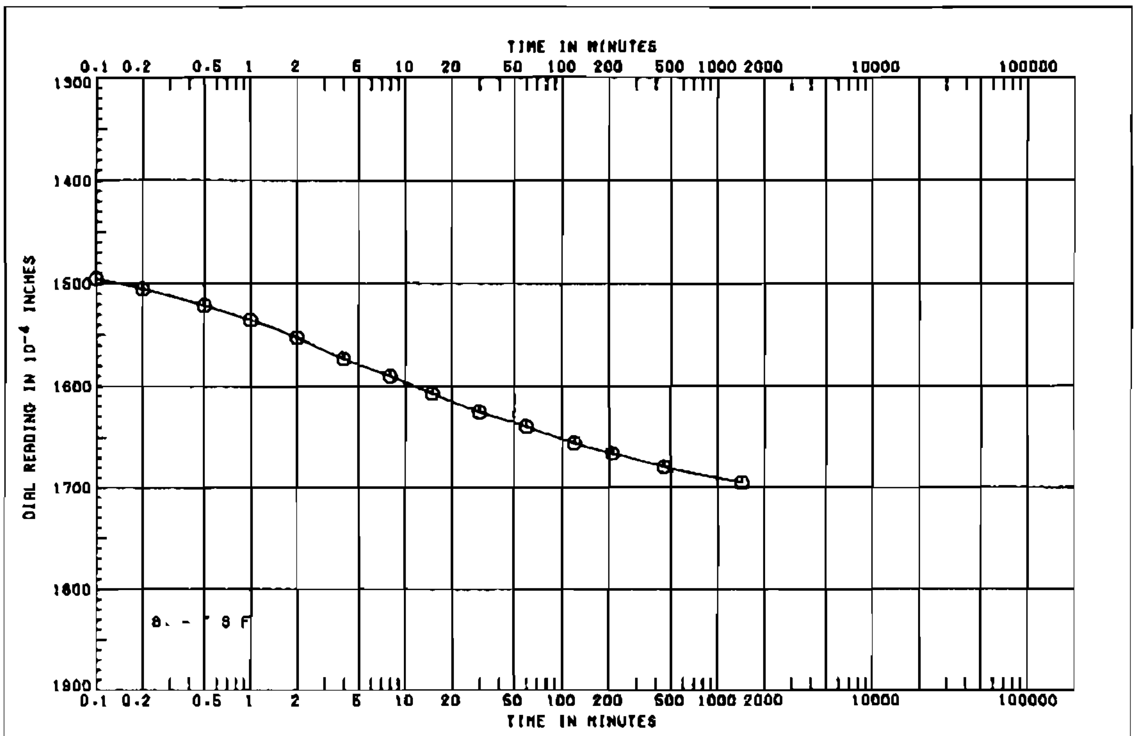
SHEET 5 OF 10



PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER	
PLAN N.O. E. LEVEE (S. POINT TO OIWW	
BORING 11-USP	SAMPLE NO. 3-C
DEPTH/ELEV 6.4/6.4	DATE 21 MAY 86

CONSOLIDATION TEST
TIME CURVES

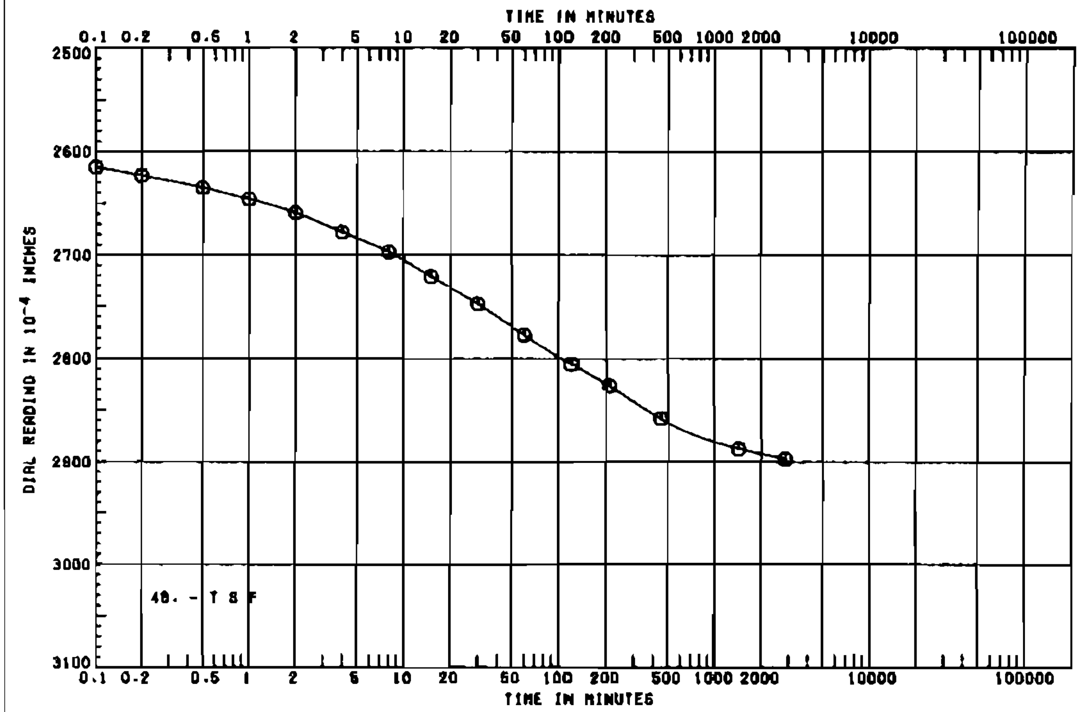
SHEET 8 OF 10



PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER	
PLAN N.O. E. LEVEE (S. POINT TO OIWW	
BORING 11-USP	SAMPLE NO. 3-C
DEPTH/ELEV 6.4/6.4	DATE 21 MAY 86

CONSOLIDATION TEST
TIME CURVES

SHEET 7 OF 10

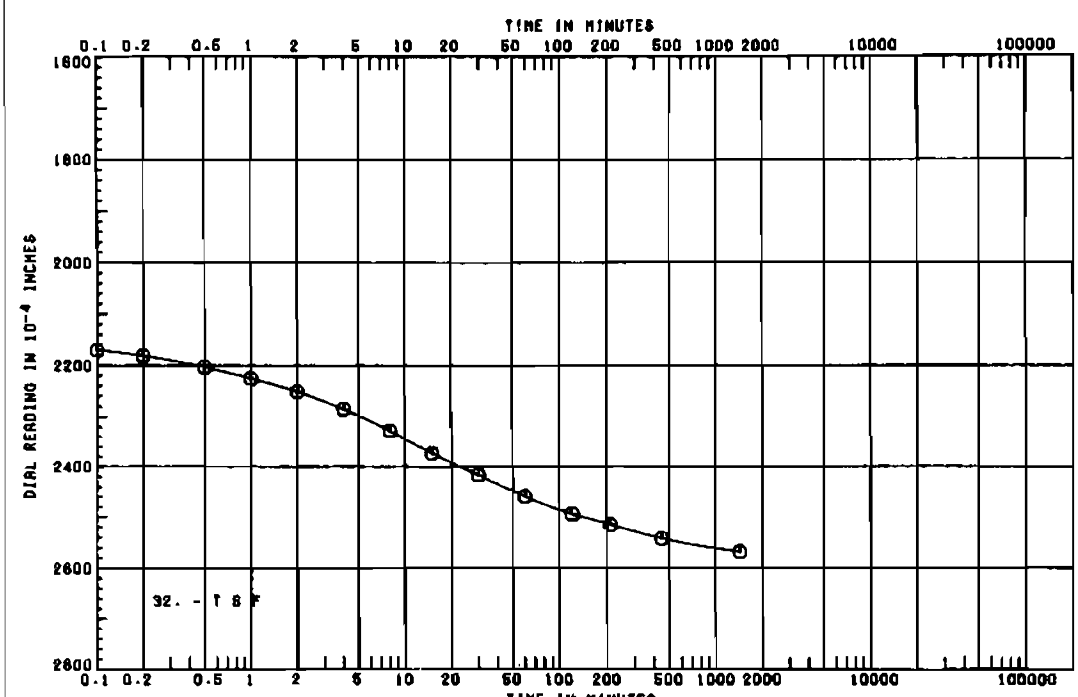


PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER	
PLAN N.O. E. LEVEE IS. POINT TO GINN	
BORING 11-USP	SAMPLE NO. 3-C
DEPTH/ELEV 6.4/6.4	DATE 21 MAY 86

CONSOLIDATION TEST

TIME CURVES

SHEET 10 OF 10

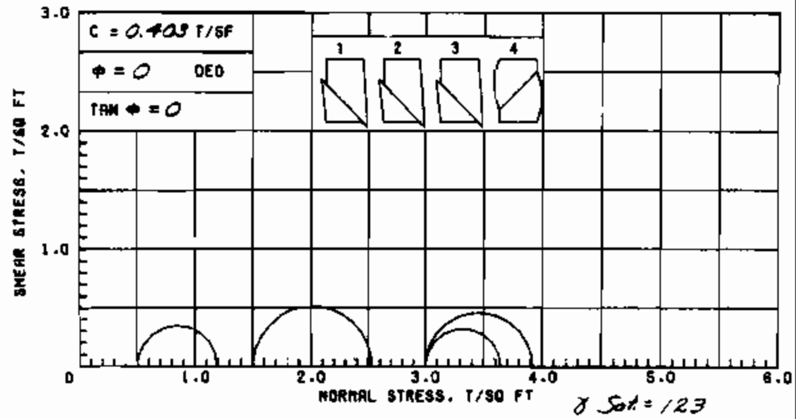


PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER	
PLAN N.O. E. LEVEE IS. POINT TO GINN	
BORING 11-USP	SAMPLE NO. 3-C
DEPTH/ELEV 6.4/6.4	DATE 21 MAY 86

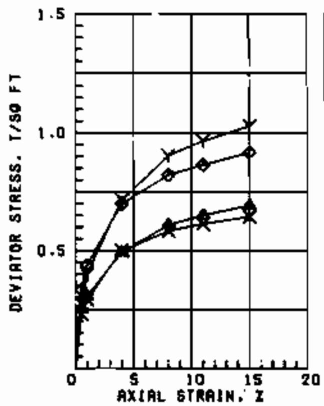
CONSOLIDATION TEST

TIME CURVES

SHEET 9 OF 10



γ Sat = 123



SPECIMEN NO.		▲1	Y2	X3	◆4	AVG
INITIAL	WATER CONTENT, %	26.2	26.5	29.7	25.6	26.10
	DRY DENSITY, PCF	95.5	97.6	91.6	97.7	96.3
	SATURATION, %	92.8	98.9	95.8	96.8	95.4
	VOID RATIO	0.759	0.721	0.834	0.719	
BEFORE SHEAR	WATER CONTENT, %					
	DRY DENSITY, PCF					
	SATURATION, %					
	VOID RATIO					
	BACK PRESS., TSF					
MIN PRIN. STRESS, TSF		0.5	1.5	3.0	3.0	
MAX. DEV. STRESS, TSF		0.69	1.03	0.65	0.92	
TIME TO FAILURE, MIN.		45	35	29	36	
RATE OF STRAIN INCR.%						
INITIAL DIAMETER, IN.		1.37	1.37	1.37	1.37	
INITIAL HEIGHT, IN.		3.00	3.00	3.00	3.00	

CONTROLLED-STRAIN TEST

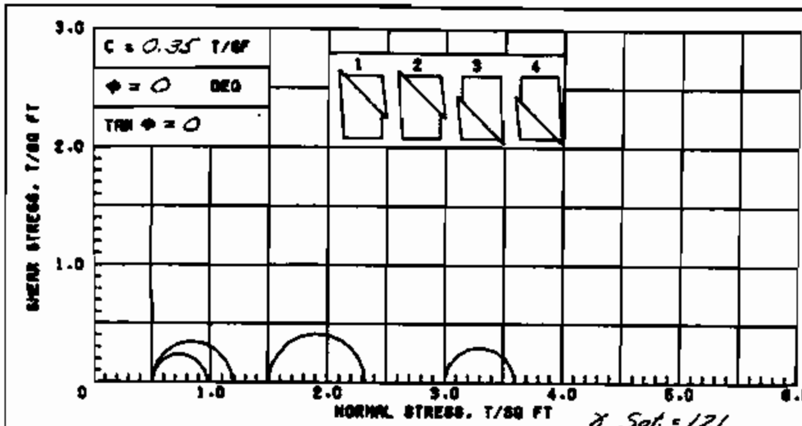
DESCRIPTION OF SPECIMENS: SANDY CLAY (CL), GRAY

LL 35	PL 20	PI 15	GS 2.69 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

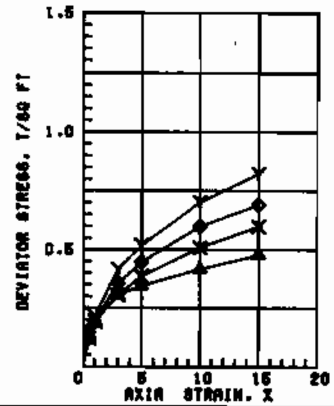
REMARKS:
3.0 TSF AND CHECK TEST TAKEN FROM DIFFERENT LIFT.

PROJECT LK PONT LA & VIC LK PONT BARR PLAN N.O EAST LEVEE (SOUTH POINT TO GIWW	
BORING NO. 11-USP	SAMPLE NO. 5-C
DEPTH/ELEV 13.3/-0.50	TECH. JMS
LABORATORY USAE WES	DATE 27 AUG 86

TRIAXIAL COMPRESSION TEST REPORT



γ Sat = 121



SPECIMEN NO.		▲1	Y2	X3	◆4	AVG.
INITIAL	WATER CONTENT, %	27.7	28.2	[illegible]	27.8	28.43
	DRY DENSITY, PCF	94.4	92.7	89.6	94.7	92.83
	SATURATION, %	95.3	93.0	91.4	96.5	94.05
	VOID RATIO	0.785	0.818	0.883	0.781	
BEFORE SHEAR	WATER CONTENT, %					
	DRY DENSITY, PCF					
	SATURATION, %					
	VOID RATIO					
	BACK PRESS., TSF					
MIN PRIN. STRESS, TSF		0.5	1.5	3.0	0.5	
MAX. DEV. STRESS, TSF		0.49	0.82	0.60	0.62	
TIME TO FAILURE, MIN.		30	30	30	30	
RATE OF STRAIN INCR.%						
INITIA DIAMETER, IN.		1.39	1.39	1.39	1.39	
INITIAL HEIGHT, IN.		3.00	3.00	3.00	3.00	

CONTROLLED-STRAIN TEST

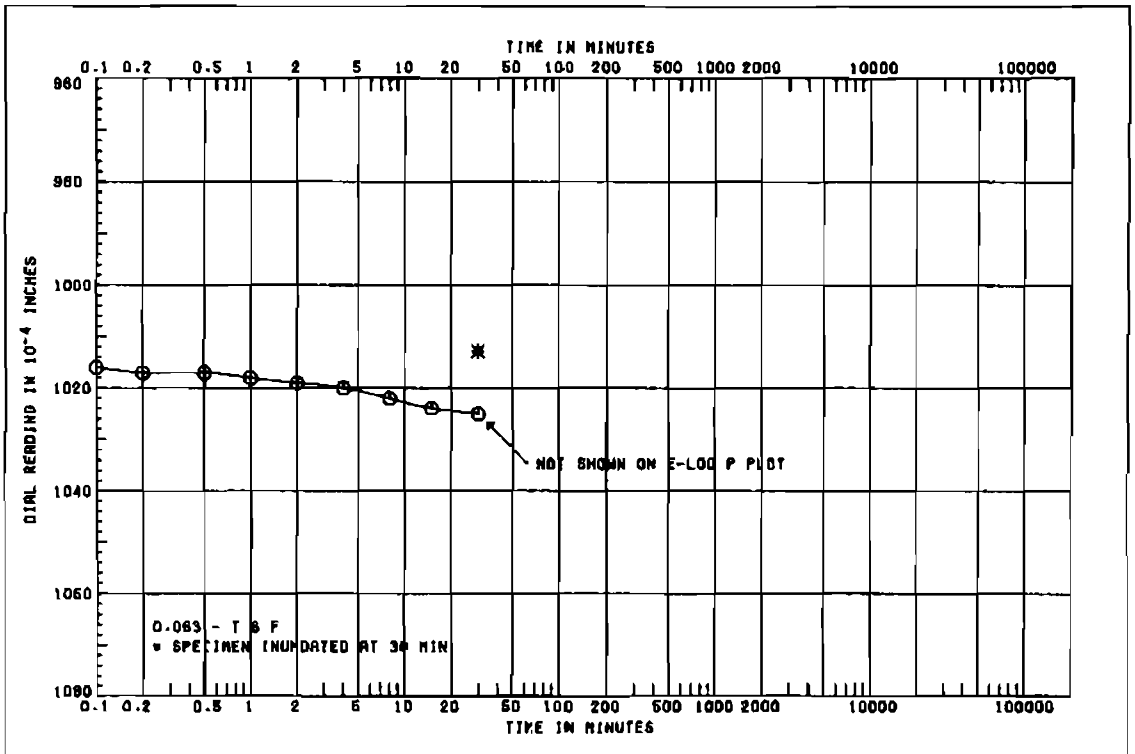
DESCRIPTION OF SPECIMENS: CLAY (CL), GRAY; SILT POCKETS

LL 36	PL 15	PI 21	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:

PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER PLAN N.O. E. LEV (SO. POINT TO GIWW	
BORING NO. 11-USP	SAMPLE NO. 6-B
DEPTH/ELEV 10.3/-3.5	TECH. KOC
LABORATORY USAE WES	DATE 14 MAR 86

TRIAXIAL COMPRESSION TEST REPORT

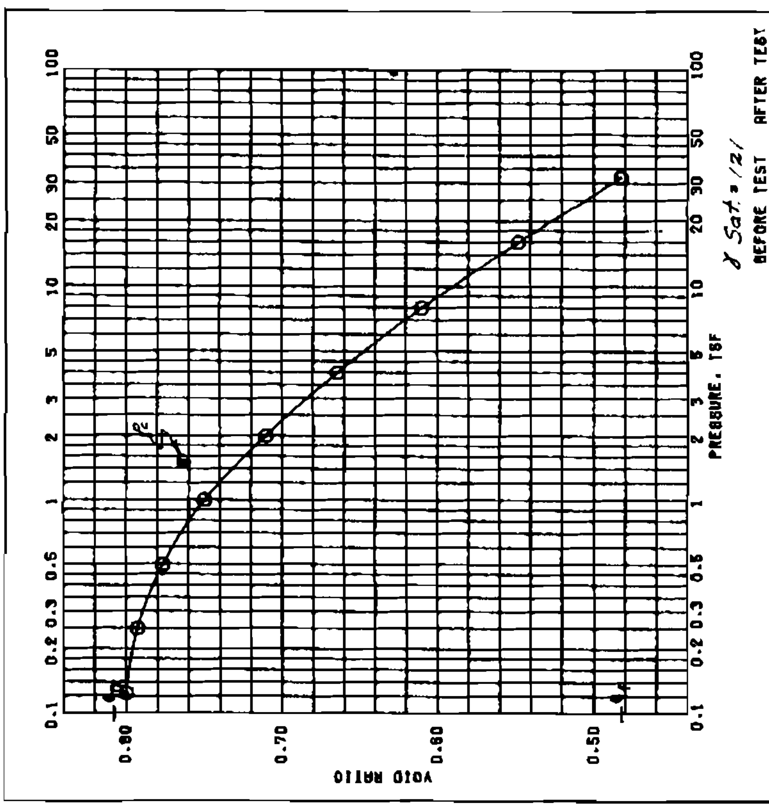


PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER	
PLAN N.O. E. LEVEE IS. POINT TO OIWW	
BORING 11-USP	SAMPLE NO. 6-C
DEPTH/ELEV 16.8/-4.10	DATE 23 MAY 86

CONSOLIDATION TEST

TIME CURVES

SHEET 2 OF 11

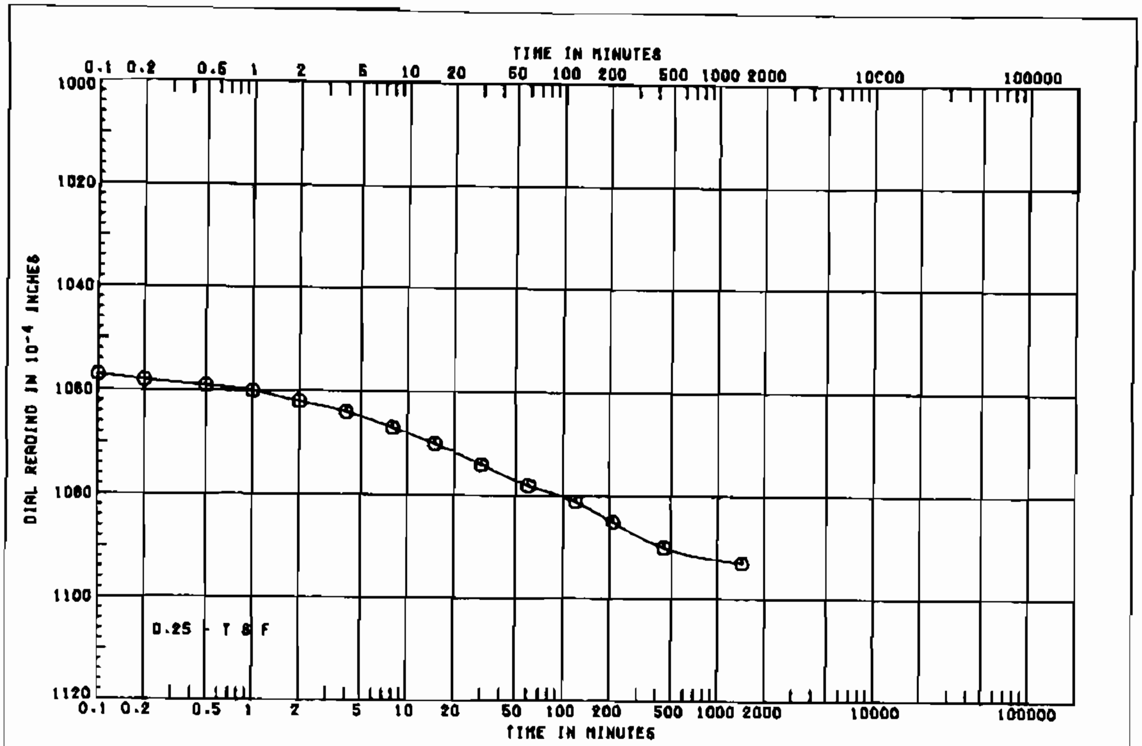


γ Sat = 121

				BEFORE TEST	AFTER TEST
OVERBURDEN PRESSURE, TSF			WATER CONTENT, %	26.5	16.6
PRECONSOL. PRESSURE, TSF	1.5		DRY DENSITY, PCF	93.9	113.8
COMPRESSION INDEX	0.21		SATURATION, %	95.2	100 +
TYPE SPECIMEN	UNDISTURBED		VOID RATIO	0.807	0.482
DIA. IN 4.44	HT. IN 1.125		BACK PRESSURE, TSF		
CLASSIFICATION SANDY CLAY (CL), GRAY					
LL	PL	PI	PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER		
GS 2.70 (EST)	D_{10}		PLAN N.O. E. LEVEE (S. POINT TO OIWW)		
REMARKS			BORING NO. 11-USP	SAMPLE NO. 6-C	
			DEPTH/ELEV 16.8/-4.10	DATE 23 MAY 86	

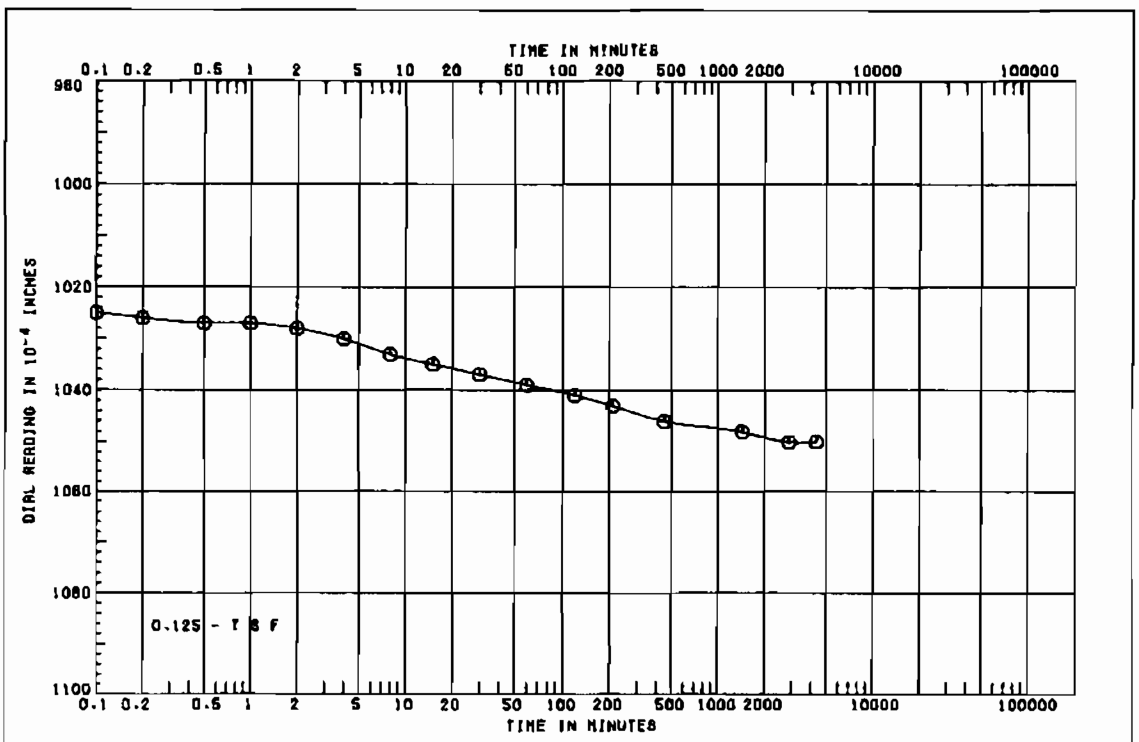
CONSOLIDATION TEST REPORT

SHEET 1 OF 11



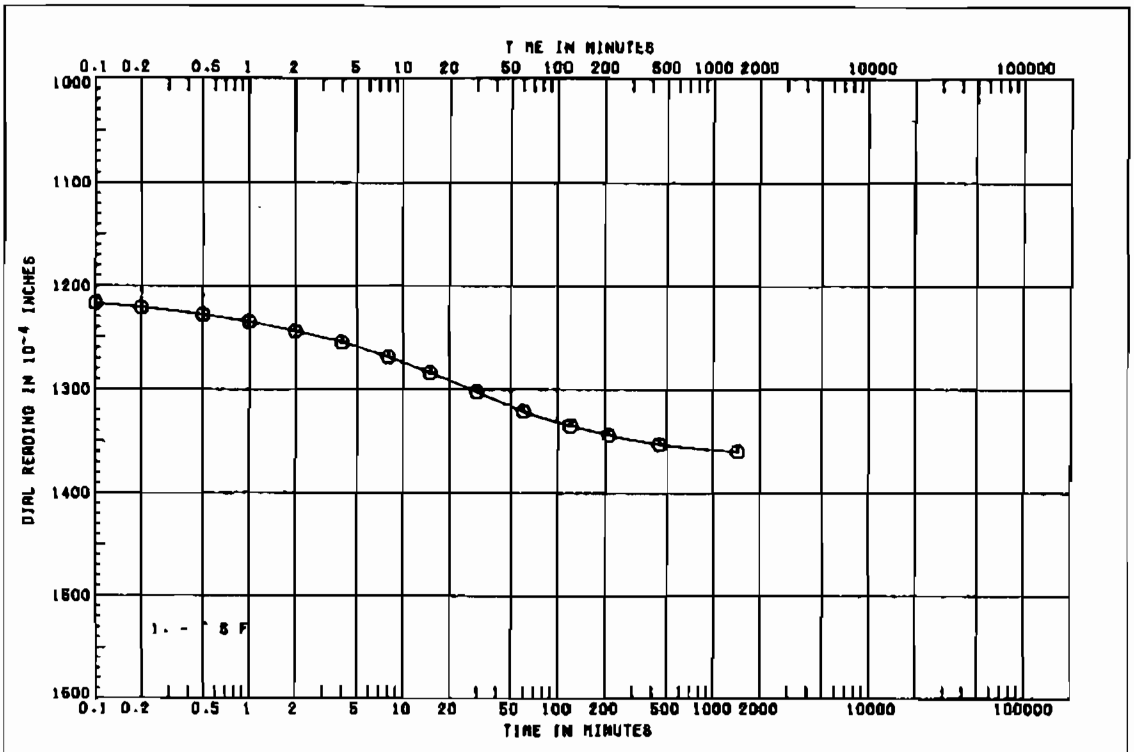
PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER		CONSOLIDATION TEST	
PLAN N.O. E. LEVEE (S. POINT TO GIWW		TIME CURVES	
BORING 11-USP	SAMPLE NO. 6-C		
DEPTH/ELEV 16.9/-4.10	DATE 23 MAY 86		

SHEET 4 OF 11



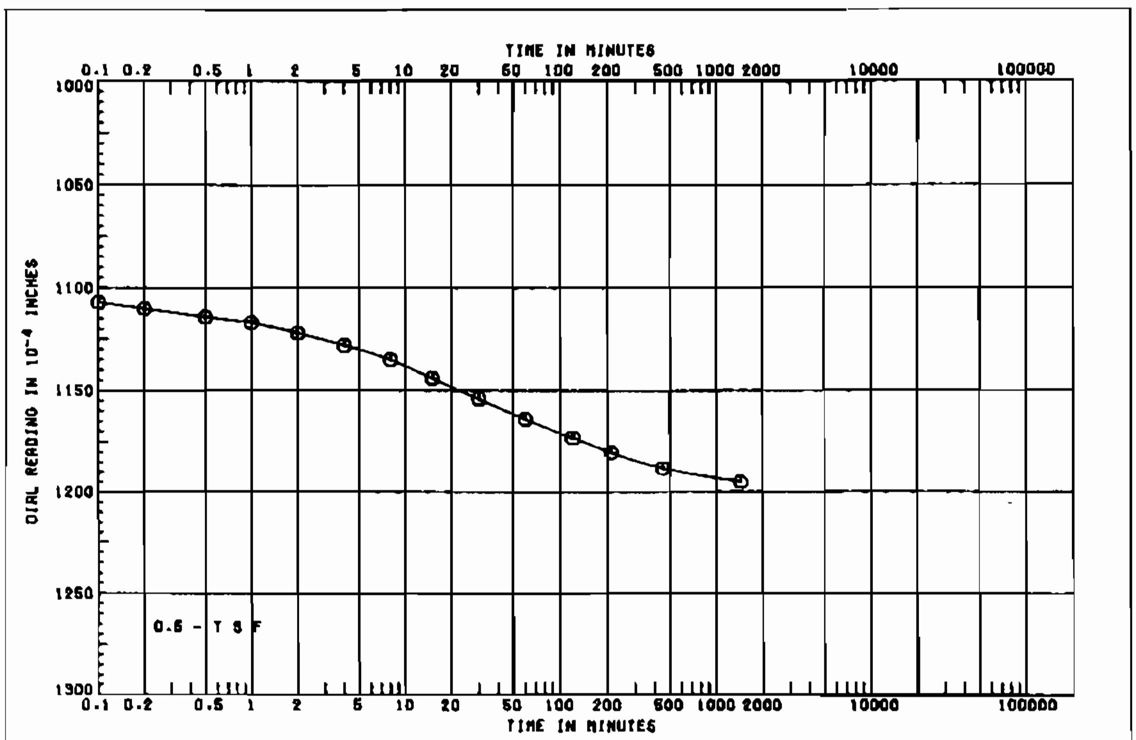
PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER		CONSOLIDATION TEST	
PLAN N.O. E. LEVEE (S. POINT TO GIWW		TIME CURVES	
BORING 11-USP	SAMPLE NO. 6-C		
DEPTH/ELEV 16.9/-4.10	DATE 23 MAY 86		

SHEET 3 OF 11



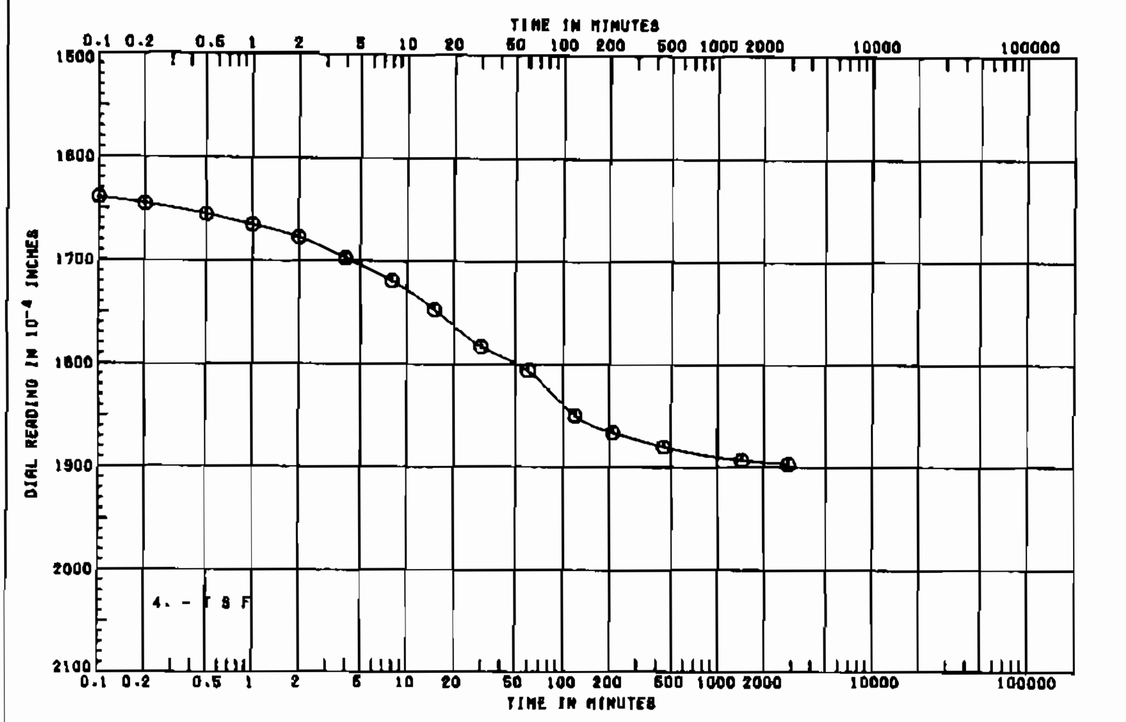
PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER		CONSOLIDATION TEST TIME CURVES
PLAN N.O. E. LEVEE (S. POINT TO DIWW		
BORING 11-USP	SAMPLE NO. 6-C	
DEPTH/ELEV 16.9/-4.10	DATE 23 MAY 86	

SHEET 6 OF 11



PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER		CONSOLIDATION TEST TIME CURVES
PLAN N.O. E. LEVEE (S. -OINT TO DIWW		
BORING 11-USP	SAMPLE NO. 6-C	
DEPTH/ELEV 16.9/-4.10	DATE 23 MAY 86	

SHEET 5 OF 11

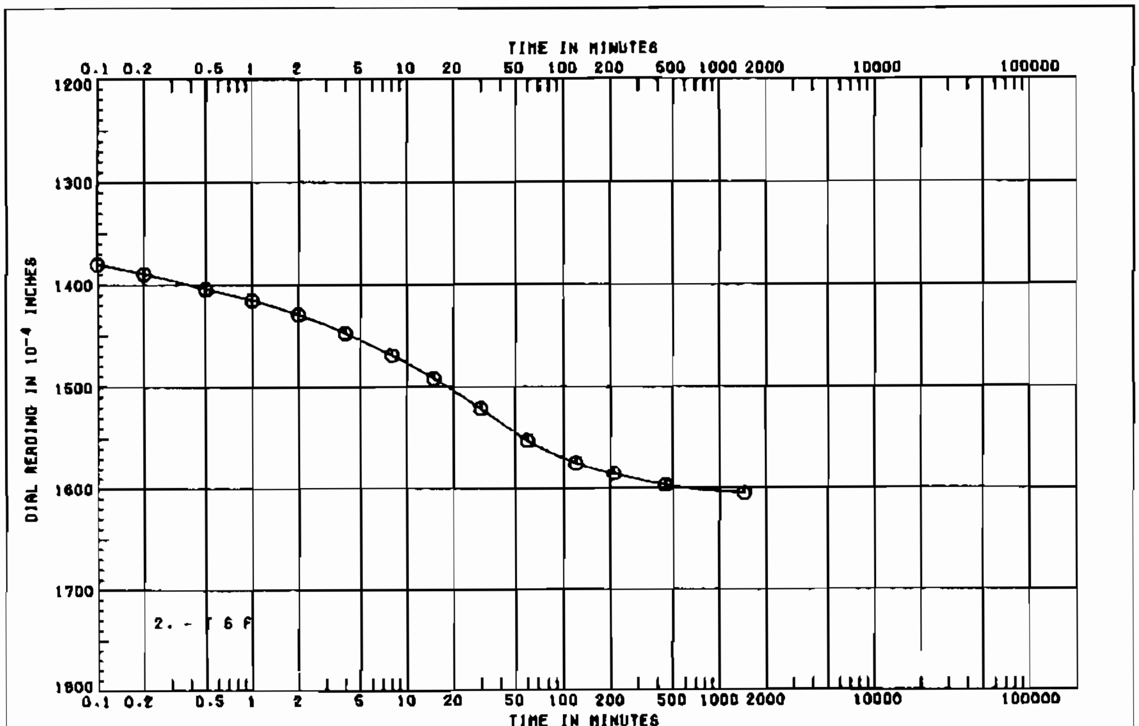


PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER	
PLAN N.O. E. LEVEE (S. POINT TO OIWW	
BORING 11-USP	SAMPLE NO. 6-C
DEPTH/ELEV 16.9/-4.10	DATE 23 MAY 86

CONSOLIDATION TEST

TIME CURVES

SHEET 8 OF 11

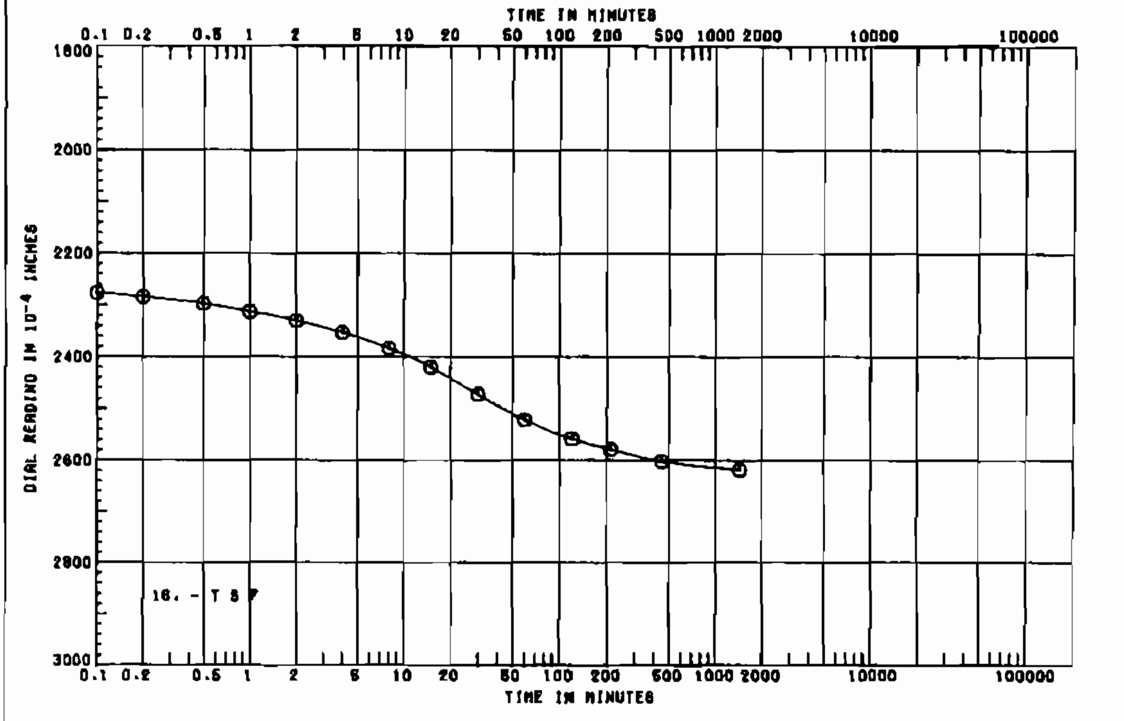


PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER	
PLAN N.O. E. LEVEE (S. POINT TO OIWW	
BORING 11-USP	SAMPLE NO. 6-C
DEPTH/ELEV 16.9/-4.10	DATE 23 MAY 86

CONSOLIDATION TEST

TIME CURVES

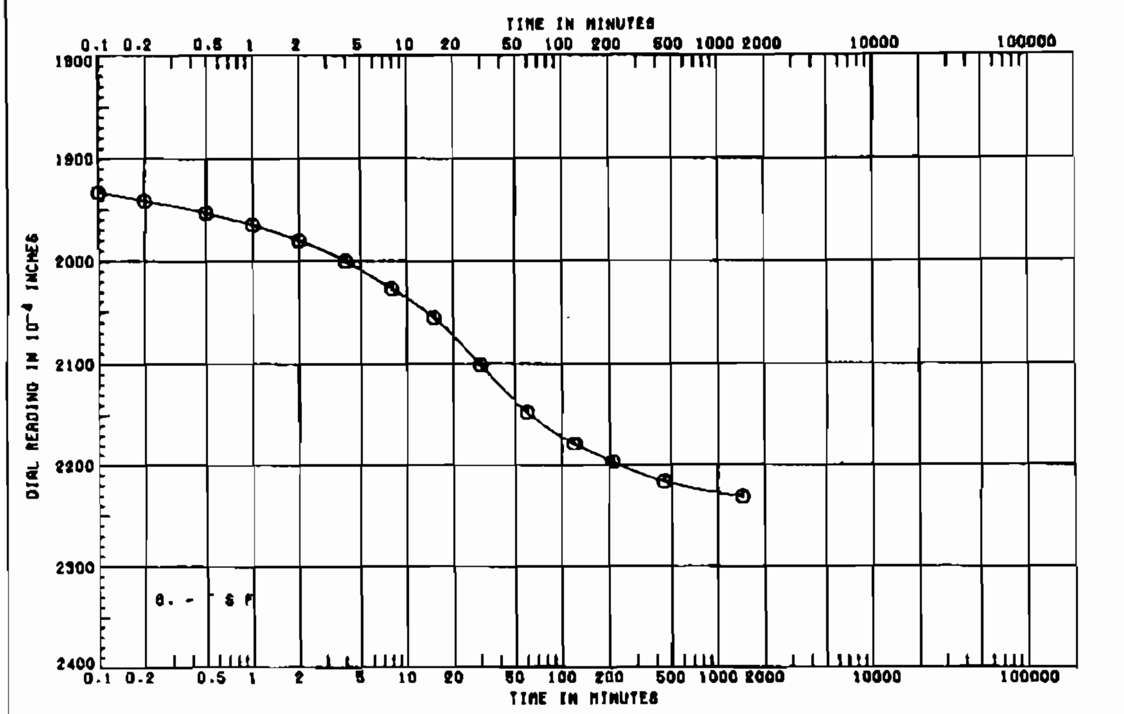
SHEET 7 OF 11



PROJECT LAKE PONT LA 4 VIC LAKE PONT BARRIER	
PLAN N.O. E. LEVEE (S. POINT TO GIWW	
BORING 11-USP	SAMPLE NO. 6-C
DEPTH/ELEV 16.9/-4.10	DATE 23 MAY 86

CONSOLIDATION TEST
TIME CURVES

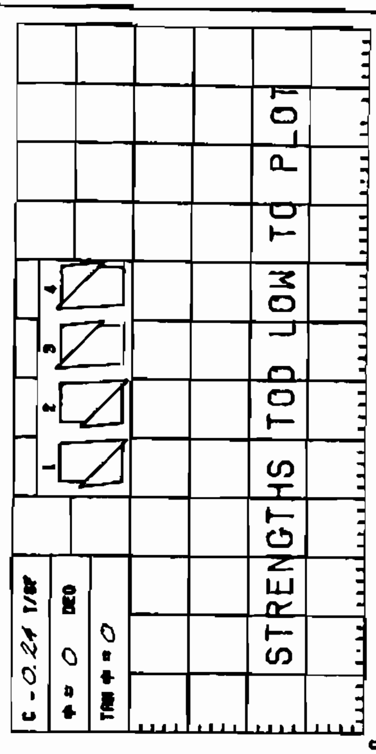
SHEET 10 OF 11

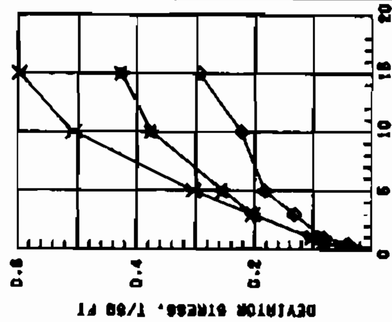


PROJECT LAKE PONT LA 4 VIC LAKE PONT BARRIER	
PLAN N.O. E. LEVEE (S. POINT TO GIWW	
BORING 11-USP	SAMPLE NO. 6-C
DEPTH/ELEV 16.9/-4.10	DATE 23 MAY 86

CONSOLIDATION TEST
TIME CURVES

SHEET 9 OF 11





SPECIMEN NO.	1	2	3	4	AVG.
INITIAL: WATER CONTENT, %	29.9	31.5	28.8	30.3	30.15
DRY DENSITY, PCF	90.2	96.7	95.1	90.8	91.20
SATURATION, %	93.0	84.5	100+	96.6	96.05
VOID RATIO	0.868	0.800	0.772	0.856	
BEFORE SHEAR: WATER CONTENT, %					
DRY DENSITY, PCF					
SATURATION, %					
VOID RATIO					
BACK PRESS., TSF					
MIN PRIN. STRESS, TSF	0.6	1.5	3.0	0.5	
MAX. DEV. STRESS, TSF	0.49	0.49	0.60	0.29	
TIME TO FAILURE, MIN.	30	30	30	30	
RATE OF STRAIN INCR.,%					
INITIAL DIAMETER, IN.	1.38	1.39	1.39	1.39	
INITIAL HEIGHT, IN.	3.00	3.00	3.00	3.00	

CONTROLLED-STRAIN TEST

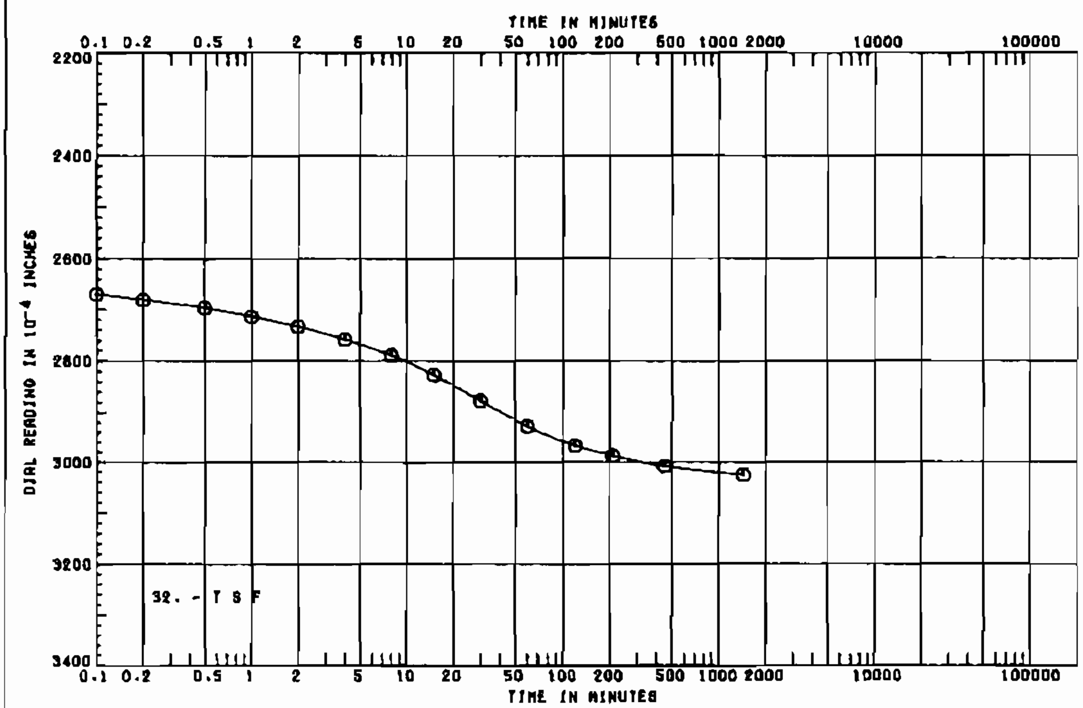
DESCRIPTION OF SPECIMENS: CLAY (CL), GRAY; SHELLS TO 1"

LL 40 | PL 14 | PI 26 | GS 2.70 (ESTIMATED) | UNDISTURBED SPECIMEN | Q TEST

REMARKS:

PROJECT LAKE PONT LA 4 VIC LAKE PONT BARRIER
PLAN N.O. E. LEV (S. POINT TO OIWW
BORING NO. 11-USP | SAMPLE NO. 6-B
DEPTH/ELEV 24.5/-11.5 | TECH. KOC
LABORATORY LMVD WES | DATE 17 MAR 86

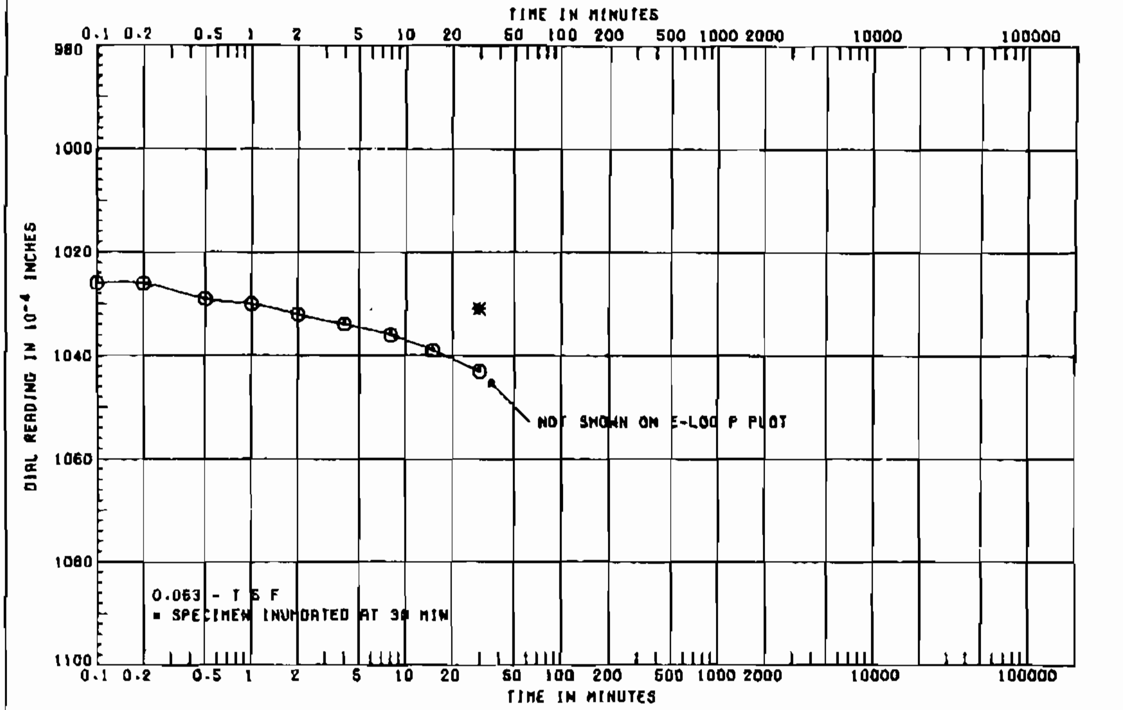
TRIAXIAL COMPRESSION TEST REPORT



PROJECT LAKE PONT LA 4 VIC LAKE PONT BARRIER	
PLAN N.O. E. LEVEE (S. POINT TO OIWW	
BORING 11-USP	SAMPLE NO. 6-C
DEPTH/ELEV 16.9/-4.10	DATE 23 MAY 86

CONSOLIDATION TEST
TIME CURVES

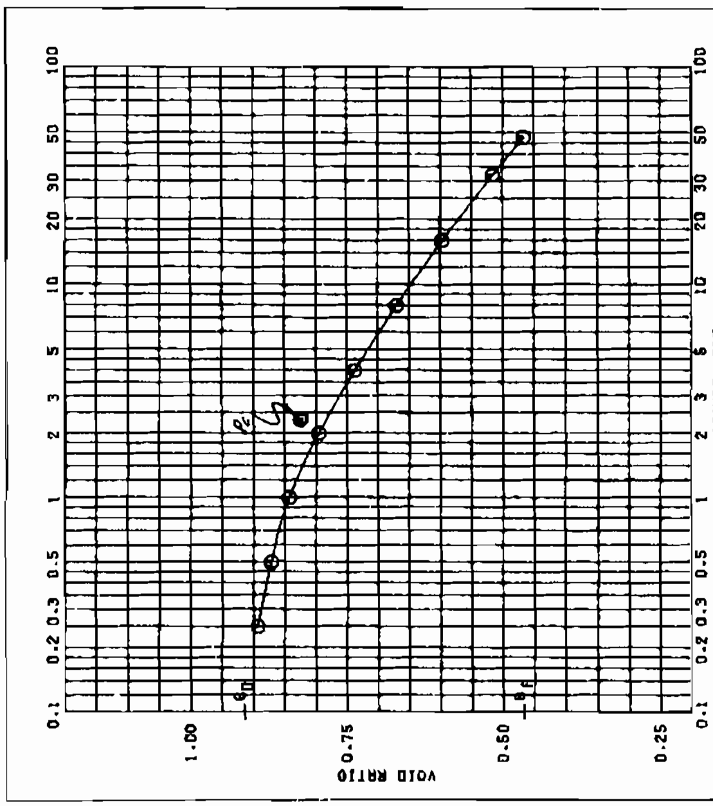
SHEET 11 OF 11



PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER	
PLAN N.O. E. LEV (SO. POINT TO GINN)	
BORING 11-USP	SAMPLE NO. 8-C
DEPTH/ELEV 25.2/-12.40	DATE 28 MAY 86

CONSOLIDATION TEST
TIME CURVES

SHEET 2 OF 11



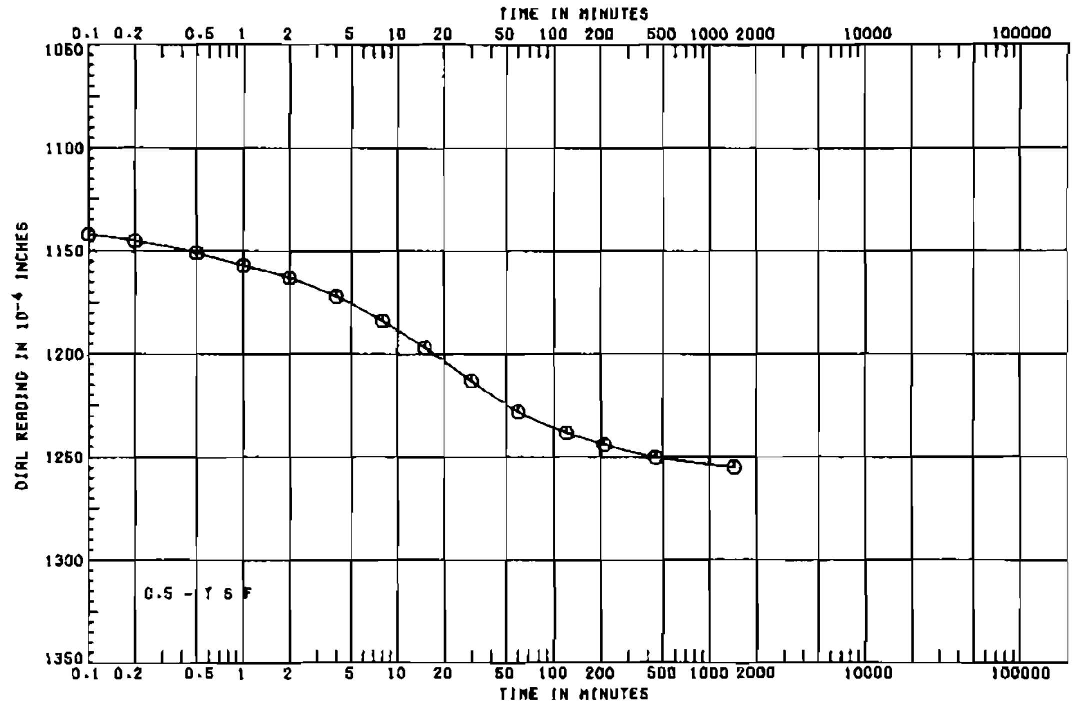
			BEFORE TEST	AFTER TEST
OVERBURDEN PRESSURE, TSF		WATER CONTENT, %	32.7	18.8
PRECONSOL. PRESSURE, TSF	2.3	DRY DENSITY, PCF	88.1	115.0
COMPRESSION INDEX	0.21	SATURATION, %	98.7	100 +
TYPE SPECIMEN	UNDISTURBED	VOID RATIO	0.913	0.465
DIA. IN 4.44	HT. IN 1.128	BACK PRESSURE, TSF		

CLASSIFICATION CLAY (CL), GRAY; FINE SAND LENSES

LL	PL	PI	PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER
GS 2.70 (EST)	D_{10}		PLAN N.O. E. LEV (SO. POINT TO GINN)
REMARKS			BORING NO. 11-USP / SAMPLE NO. 8-C
			DEPTH/ELEV 25.2/-12.40 / DATE 28 MAY 86

CONSOLIDATION TEST REPORT

SHEET 1 OF 11

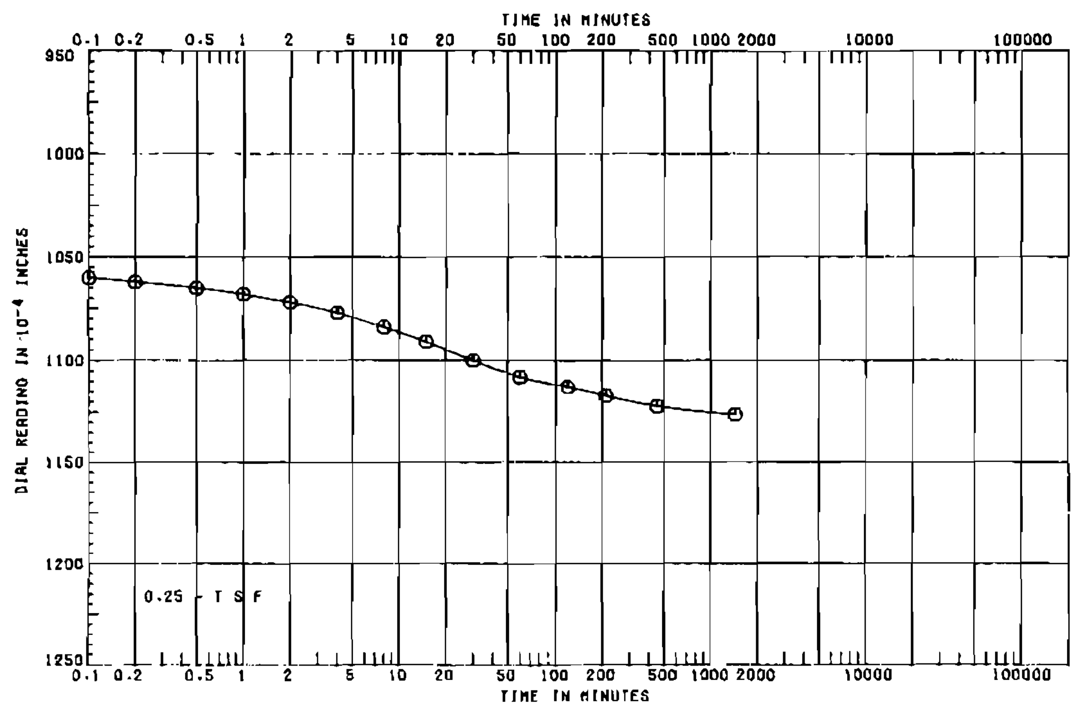


PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER	
PLAN N.O. E. LEV (SO. POINT TO OIWW)	
BORING 11-USP	SAMPLE NO. 8-C
DEPTH/ELEV 25.2/-12.40	DATE 28 MAY 86

CONSOLIDATION TEST

TIME CURVES

SHEET 4 OF 11

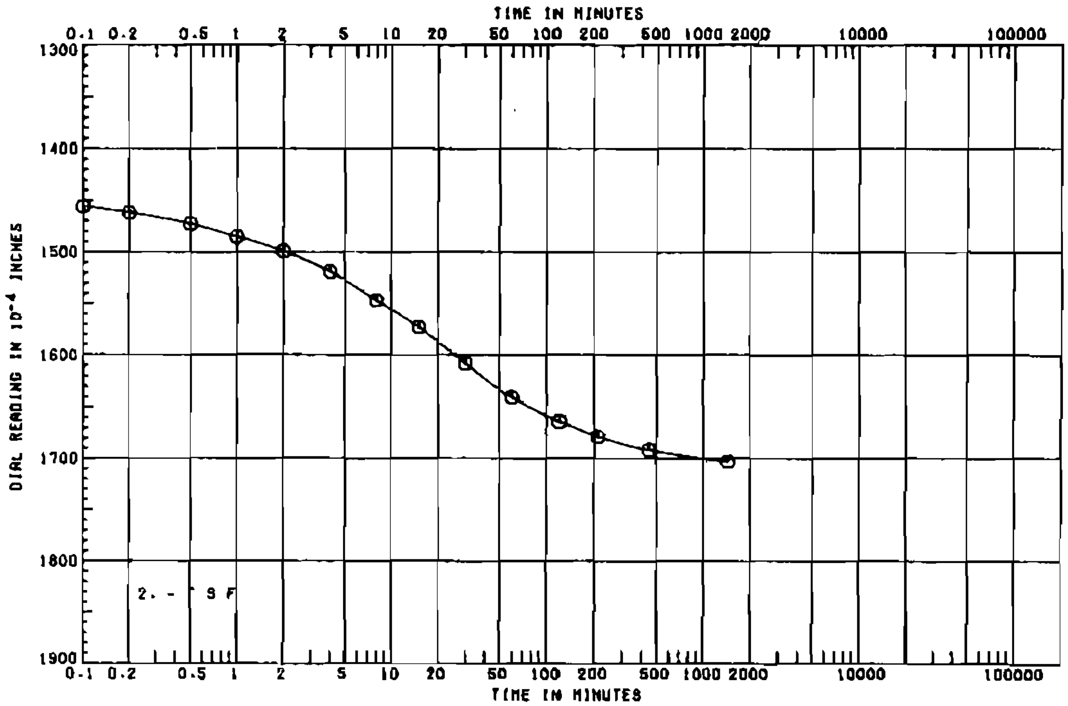


PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER	
PLAN N.O. E. LEV (SO. POINT TO OIWW)	
BORING 11-USP	SAMPLE NO. 8-C
DEPTH/ELEV 25.2/-12.40	DATE 28 MAY 86

CONSOLIDATION TEST

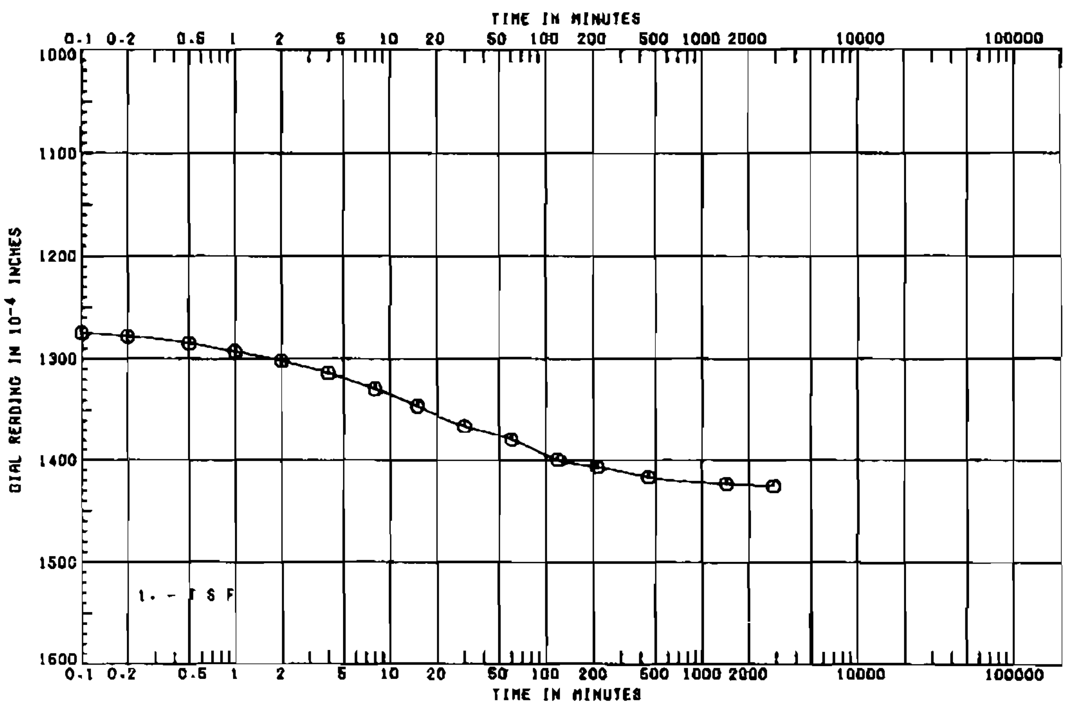
TIME CURVES

SHEET 3 OF 11



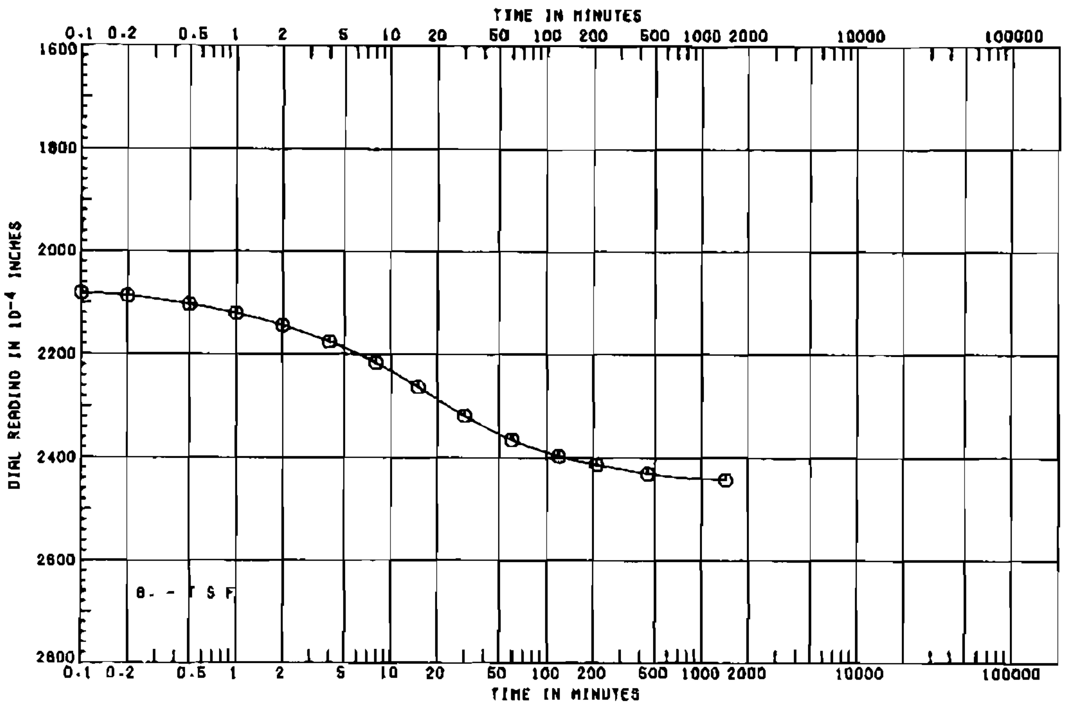
PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER		CONSOLIDATION TEST TIME CURVES
PLAN N.O. E. LEV (SO. POINT TO OIWW)		
BORING 11-USP	SAMPLE NO. 8-C	
DEPTH/ELEV 25.2/-12.40	DATE 28 MAY 86	

SHEET 6 OF 11



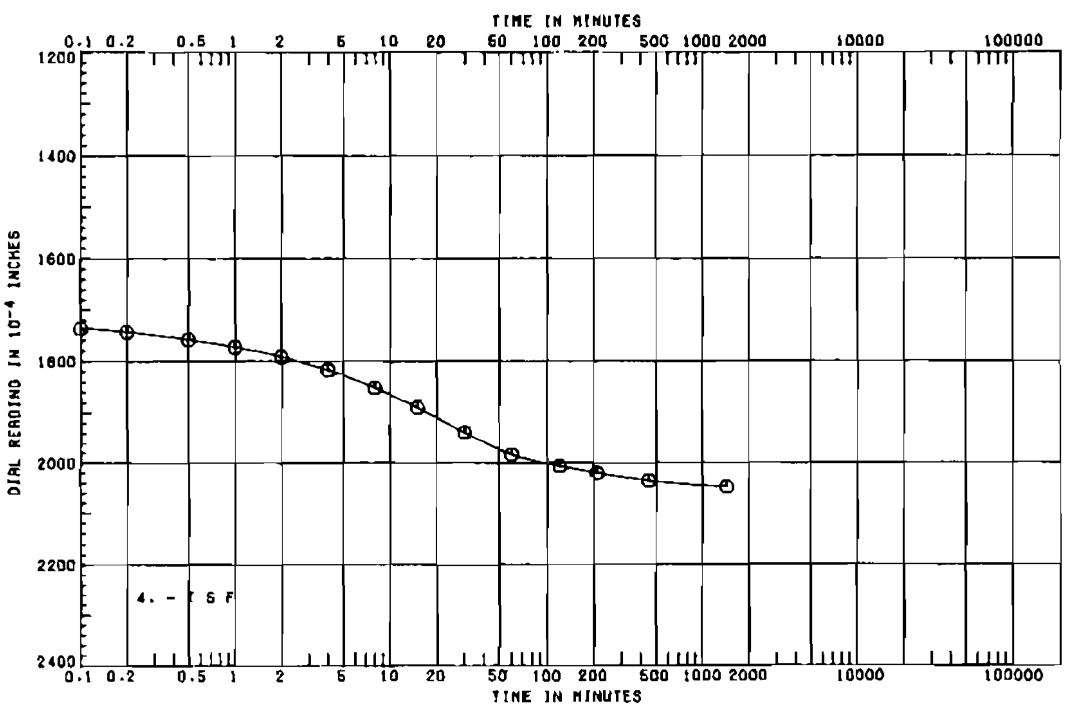
PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER		CONSOLIDATION TEST TIME CURVES
PLAN N.O. E. LEV (SO. POINT TO OIWW)		
BORING 11-USP	SAMPLE NO. 8-C	
DEPTH/ELEV 25.2/-12.40	DATE 28 MAY 86	

SHEET 5 OF 11



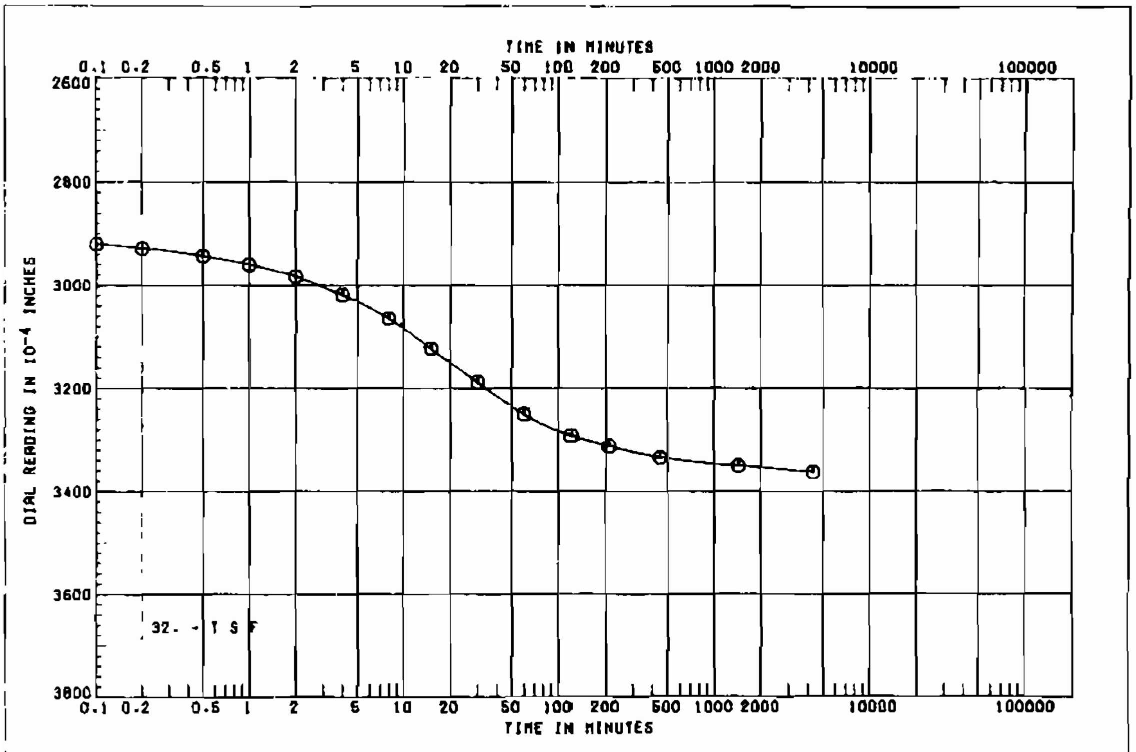
PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER		CONSOLIDATION TEST TIME CURVES
PLAN N.O. E. LEV (50. POINT TO OIWW)		
BORING 11-USP	SAMPLE NO. 8-C	
DEPTH/ELEV 25.2/-12.40	DATE 28 MAY 86	

SHEET 8 OF 11



PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER		CONSOLIDATION TEST TIME CURVES
PLAN N.O. E. LEV (60. POINT TO OIWW)		
BORING 11-USP	SAMPLE NO. 8-C	
DEPTH/ELEV 25.2/-12.40	DATE 28 MAY 86	

SHEET 7 OF 11

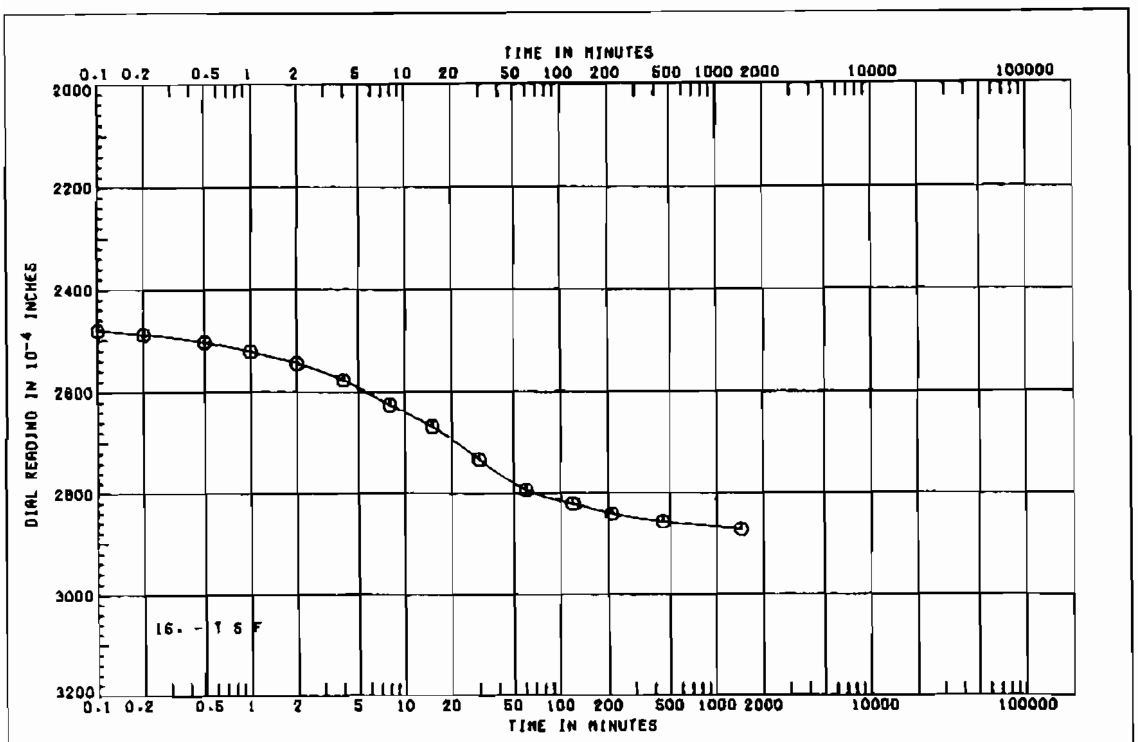


PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER	
PLAN N.O. E. LEV (SO. POINT TO OIHW)	
BORING 11-USP	SAMPLE NO. 9-C
DEPTH/ELEV 25.2/-12.40	DATE 28 MAY 86

CONSOLIDATION TEST

TIME CURVES

SHEET 10 OF 11

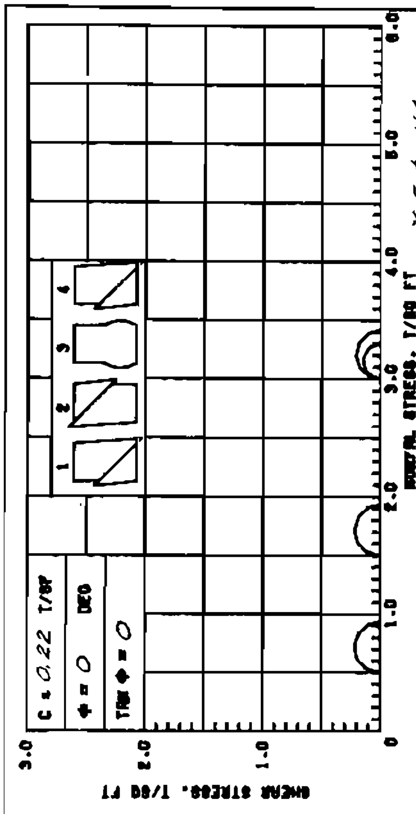


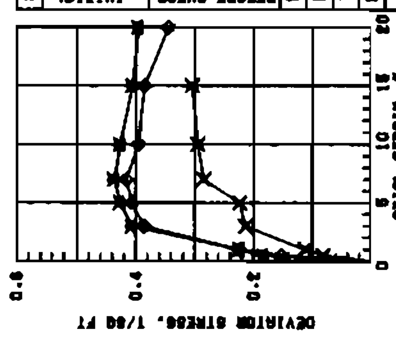
PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER	
PLAN N.O. E. LEV (SO. POINT TO OIHW)	
BORING 11-USP	SAMPLE NO. 6-C
DEPTH/ELEV 25.2/-12.40	DATE 28 MAY 86

CONSOLIDATION TEST

TIME CURVES

SHEET 9 OF 11





	SPECIMEN NO.	▲1	Y2	X3	◆4	AVG.
INITIAL	WATER CONTENT, %	37.1	38.8	37.7	37.4	37.25
	DRY DENSITY, PCF	82.8	82.8	80.0	82.9	82.18
	SATURATION, %	97.0	96.2	91.8	97.6	95.63
	VOID RATIO	1.039	1.032	1.107	1.034	
BEFORE SHEAR	WATER CONTENT, %					
	DRY DENSITY, PCF					
	SATURATION, %					
	VOID RATIO					
	BACK PRESS., TSF					
	MIN PRIN. STRESS, TSF	0.5	1.5	3.0	3.0	
	MAX. DEV. STRESS, TSF	0.44	0.44	0.30	0.42	
	TIME TO FAILURE, MIN.	14	14	30	14	
	RATE OF STRAIN INCR.%				20	
	INITIAL DIAMETER, IN.	1.39	1.39	1.39	1.39	
	INITIAL HEIGHT, IN.	3.00	3.00	3.00	3.00	

CONTROLLED-STRAIN TEST

DESCRIPTION OF SPECIMENS: PLASTIC CLAY (CH), GRAY; SILT POCKETS AND SHELLS

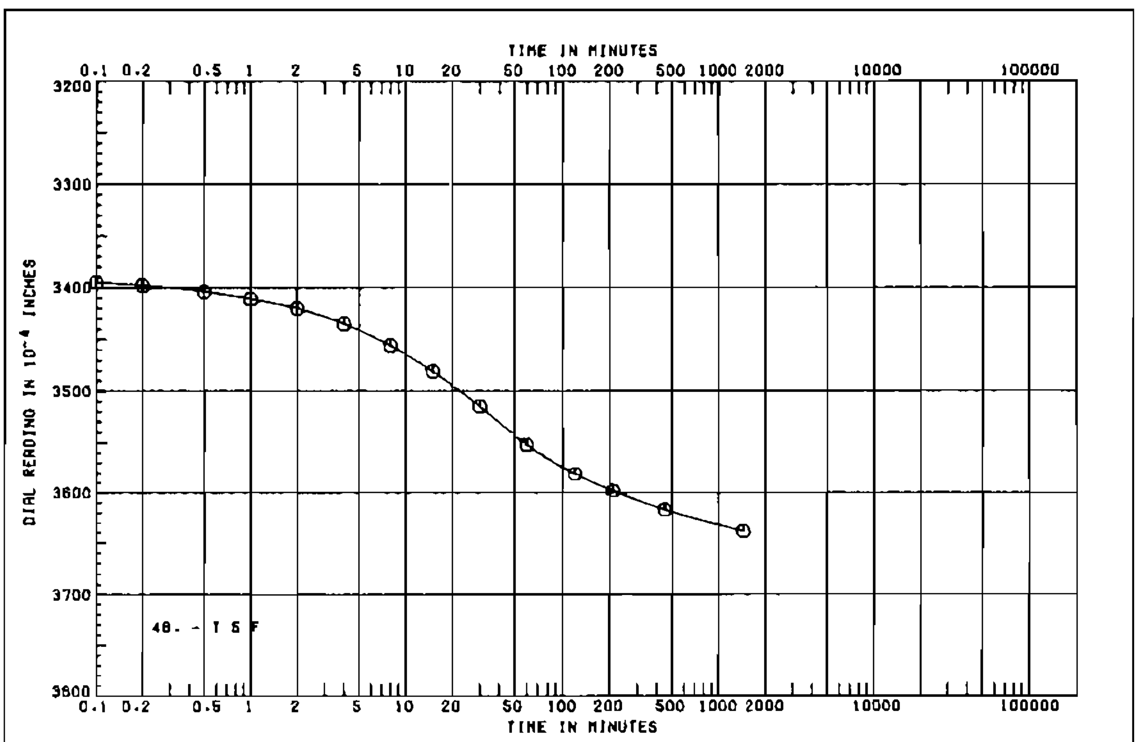
LL 48	PL 15	PI 33	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:

LIMITS ON MIXTURE OF MATERIAL.

PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER	
PLAN N.O. E. LEV (SO. POINT TO OIWW)	
BORING NO. 11-USP	SAMPLE NO. 11-C
DEPTH/ELEV 37.1/-24.3	TECH. KOC
LABORATORY USAE WES	DATE 17 MAR 86

TRIAXIAL COMPRESSION TEST REPORT

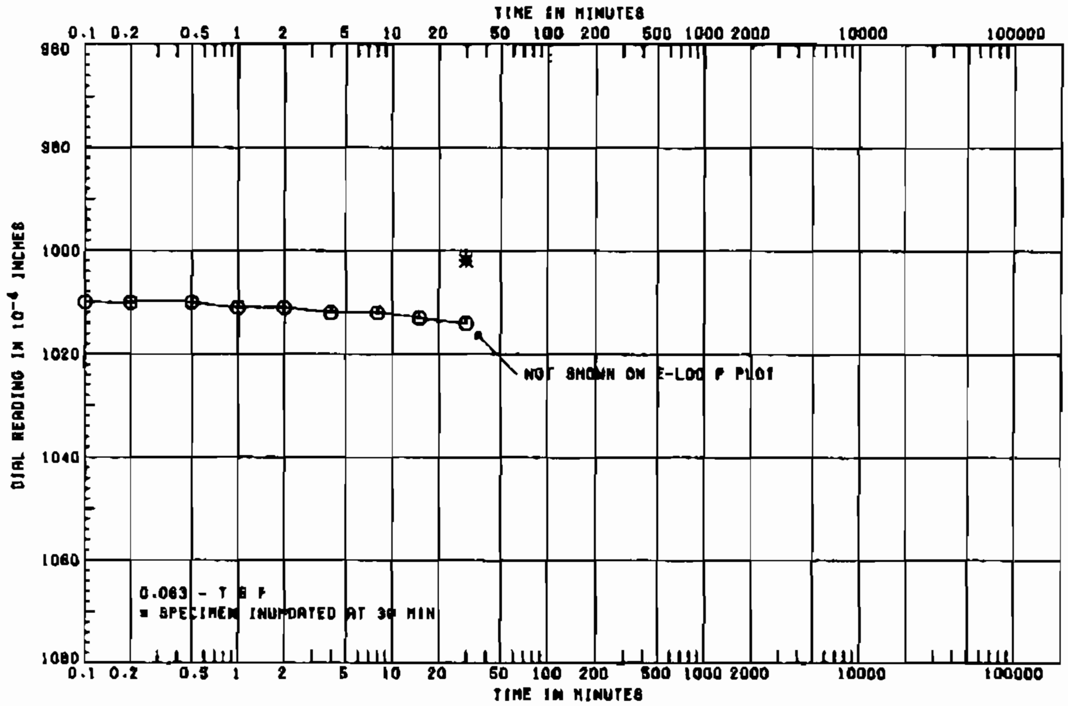


PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER	
PLAN N.O. E. LEV (SO. POINT TO OIWW)	
BORING 11-USP	SAMPLE NO. 8-C
DEPTH/ELEV 25.2/-12.40	DATE 28 MAY 86

CONSOLIDATION TEST

TIME CURVES

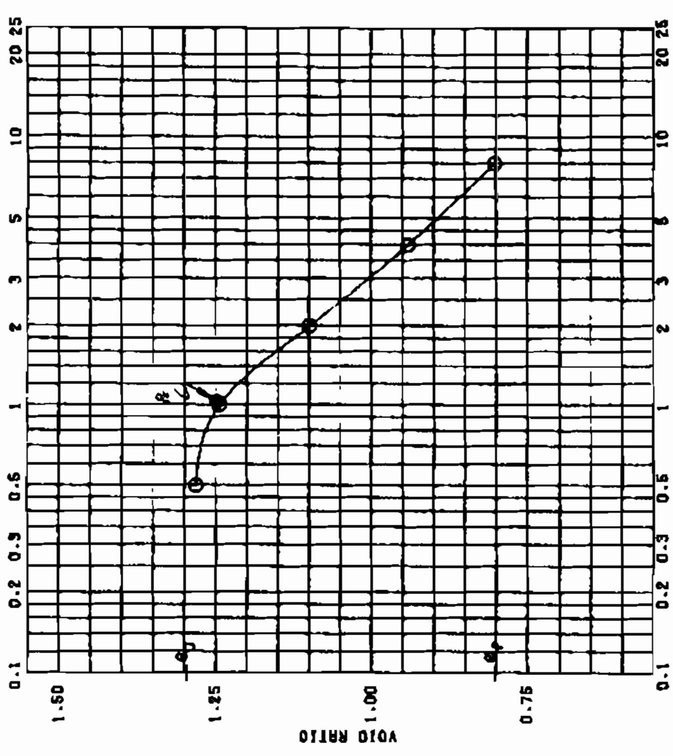
SHEET 11 OF 11



PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER	
PLAN N.O. E. LEVEE (S. POINT TO OIWW)	
BORING 11-USP	SAMPLE NO. 12-B
DEPTH/ELEV 40.3/-27.5	DATE 29 MAY 86

CONSOLIDATION TEST
TIME CURVES

SHEET 2 OF 7



γ Sat = 109

			BEFORE TEST	AFTER TEST
OVERBURDEN PRESSURE, TSF		WATER CONTENT, %	46.8	30.3
PRECONSOL. PRESSURE, TSF	1.02	DRY DENSITY, PCF	73.6	93.6
COMPRESSION INDEX	0.51	SATURATION, %	95.5	100 +
TYPE SPECIMEN	UNDISTURBED	VOID RATIO	1.294	0.800
DIA. IN 4.44	HT. IN 1.118	BACK PRESSURE, TSF		

CLASSIFICATION PLASTIC CLAY (CH), GRAY

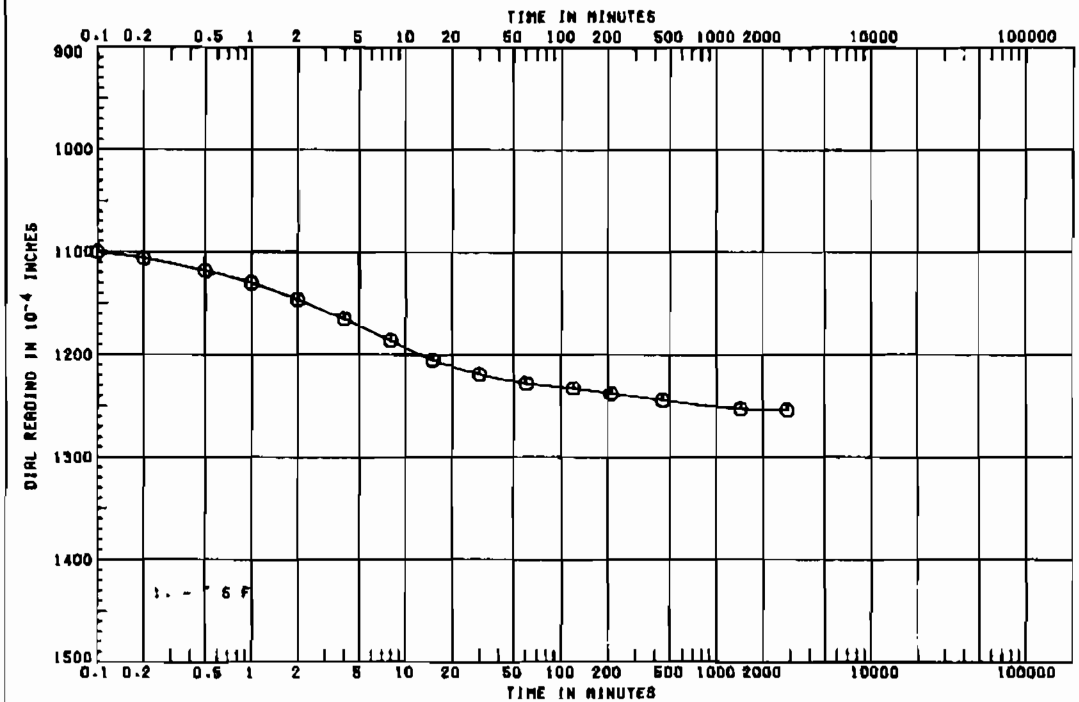
LL 65	PL 19	PI 46
GS 2.70 (EST)	D_{10}	
REMARKS		

PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER
PLAN N.O. E. LEVEE (S. POINT TO OIWW)

BORING NO. 11-USP	SAMPLE NO. 12-B
DEPTH/ELEV 40.3/-27.5	DATE 29 MAY 86

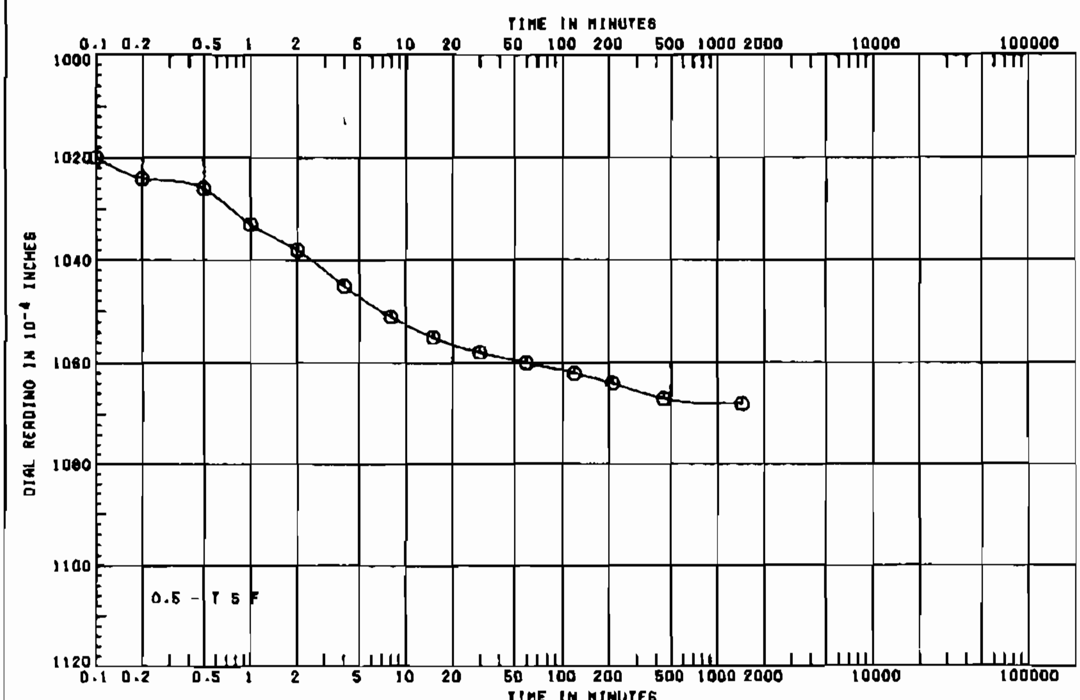
CONSOLIDATION TEST REPORT

SHEET 1 OF 7



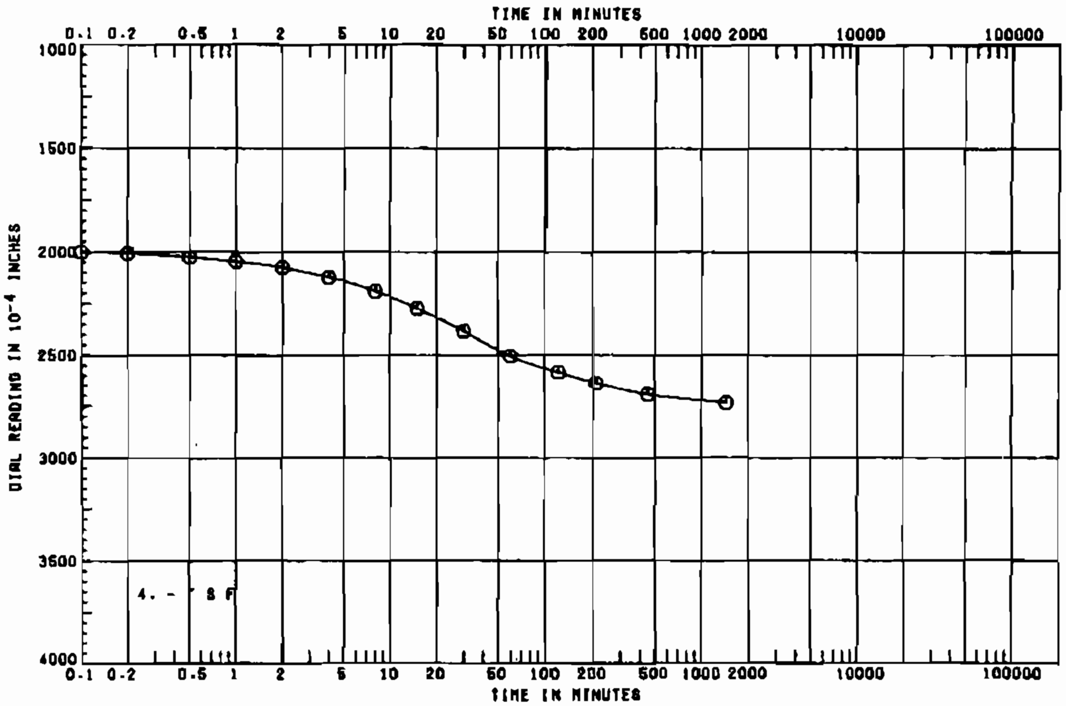
PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER		CONSOLIDATION TEST
PLAN N.O. E. LEVEE IS. POINT TO OIWW		TIME CURVES
BORING 11-USP	SAMPLE NO. 12-B	
DEPTH/ELEV 40.3/-27.5	DATE 29 MAY 86	

SHEET 4 OF 7



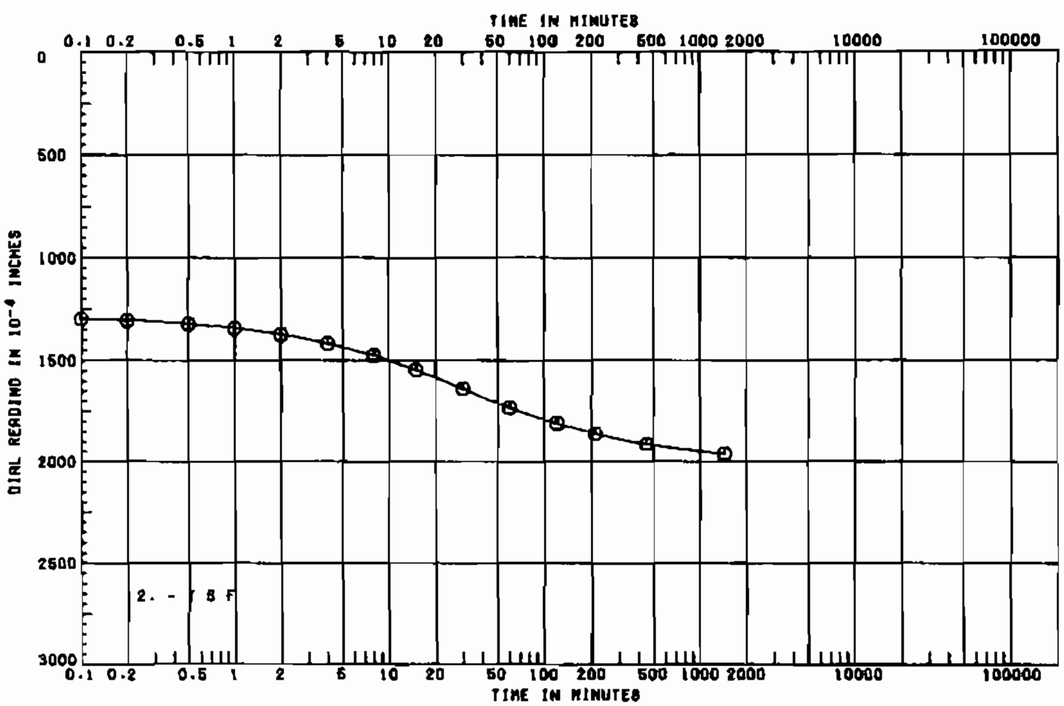
PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER		CONSOLIDATION TEST
PLAN N.O. E. LEVEE IS. POINT TO OIWW		TIME CURVES
BORING 11-USP	SAMPLE NO. 12-B	
DEPTH/ELEV 40.3/-27.5	DATE 29 MAY 86	

SHEET 3 OF 7



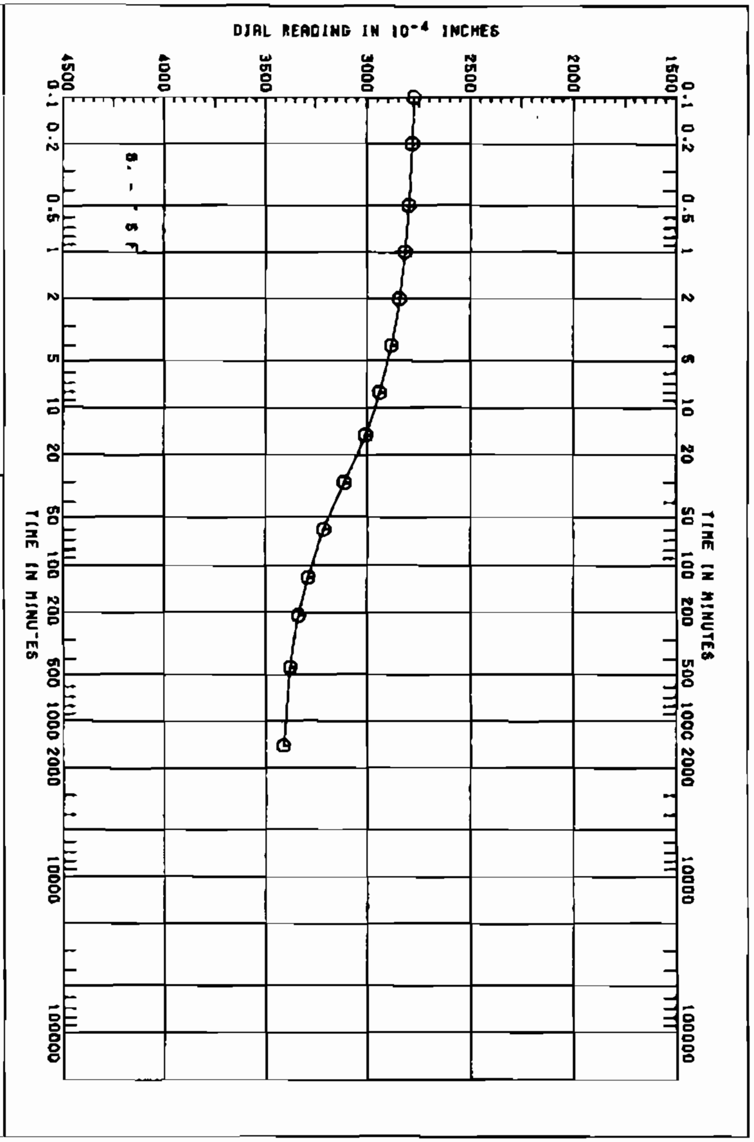
PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER		CONSOLIDATION TEST TIME CURVES
PLAN N.O. E. LEVEE (S. OINT TO OINM		
BORING 11-USP	SAMPLE NO. 12-B	
DEPTH/ELEV 40.3/-27.5	DATE 29 MAY 86	

SHEET 6 OF 7



PROJECT LAKE PONT LA & V C LAKE PONT BARRIER		CONSOLIDATION TEST TIME CURVES
PLAN N.O. E. LEVEE (S. POINT TO OINM		
BORING 11-USP	SAMPLE NO. 12-B	
DEPTH/ELEV 40.3/-27.5	DATE 29 MAY 86	

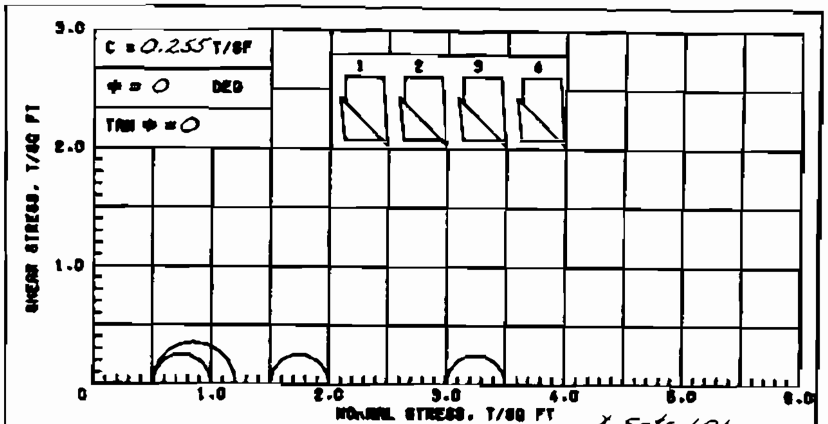
SHEET 5 OF 7



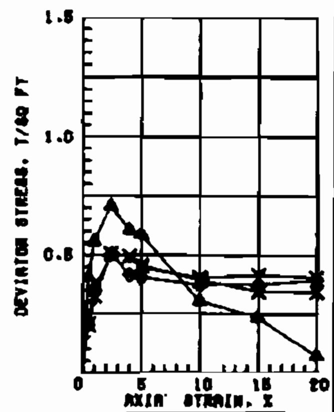
PROJECT LAKE PONT LA & V C LAKE PONT BARRIER	
PLAN N.O. E. LEVEE (S. POINT TO OIWW	
BORING 11-USP	SAMPLE NO. 12-B
DEPTH/ELEV 40.3/-27.5	DATE 29 MAY 86

CONSOLIDATION TEST
TIME CURVES

SHEET 7 OF 7



γ Sat = 101



CONTROLLED-STRAIN TEST

	SPECIMEN NO.	A1	Y2	X3	Φ4	AVG.
INITIAL	WATER CONTENT, %	63.6	66.8	65.1	63.5	64.75
	DRY DENSITY, PCF	62.0	59.1	60.3	61.3	60.6[illegible]
	SATURATION, %	98.8	97.4	97.8	99.0	98.25
	VOID RATIO	1.720	1.851	1.798	1.749	
BEFORE SHEAR	WATER CONTENT, %					
	DRY DENSITY, PCF					
	SATURATION, %					
	VOID RATIO					
	BACK PRESS., TSF					
	MIN PRIN. STRESS, TSF	0.5	1.5	3.0	0.6	
	MAX. DEV. STRESS, TSF	0.71	0.51	0.51	0.51	
	TIME TO FAILURE, MIN.	5	14	14	15	
	RATE OF STRAIN INCR,%		6	6	6	
	INITIAL DIAMETER, IN.	1.39	1.38	1.39	1.39	
	INITIAL HEIGHT, IN.	3.00	3.00	3.00	3.00	

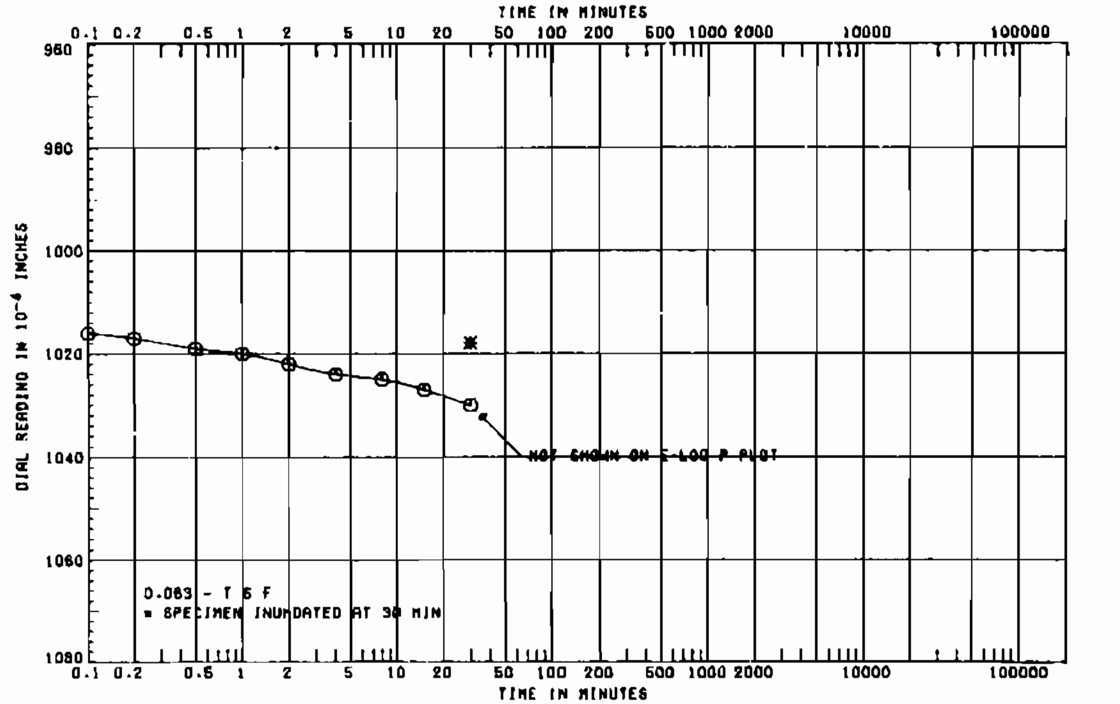
DESCRIPTION OF SPECIMENS: PLASTIC CLAY (CH), GRAY; SILT POCKETS

LL 94	PL 22	PI 72	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:

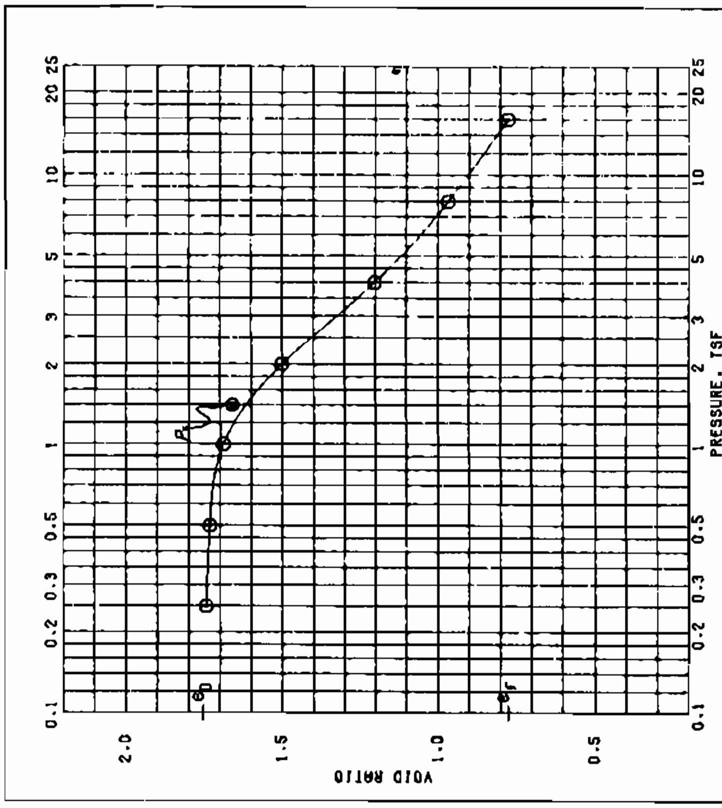
PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER	
PLAN N.O. E. LEV (SO. POINT TO OIWW	
BORING NO. 11-USP	SAMPLE NO. 14-B
DEPTH/ELEV 47.8/-35.1	TECH. KOC
LABORATORY USAE WES	DATE 18 MAR 86

TRIAXIAL COMPRESSION TEST REPORT



PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER	CONSOLIDATION TEST
PLAN N.O. E. LEV (SO. POINT TO GIWW)	TIME CURVES
BORING 11-USP / SAMPLE NO. 14-C	
DEPTH/ELEV 49.1/-36.3 / DATE 31 MAY 86	

SHEET 2 OF 9



	BEFORE TEST	AFTER TEST
WATER CONTENT, %	82.4	30.1
DRY DENSITY, PCF	61.3	95.1
SATURATION, %	96.2	100 +
VOID RATIO	1.750	0.772
BACK PRESSURE, TSF		

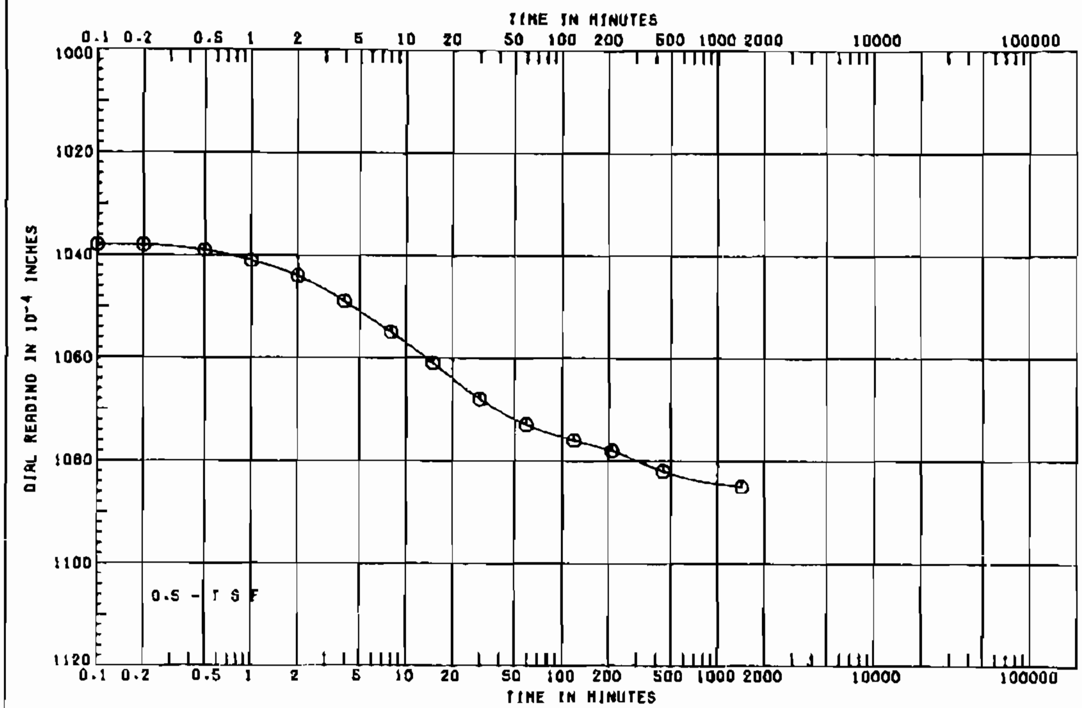
γ Sat = 101

OVERBURDEN PRESSURE, TSF	
PRECONSOL. PRESSURE, TSF	1.40
COMPRESSION INDEX	1.01
TYPE SPECIMEN	UNDISTURBED
DIA. IN 4.44	HT. IN 1.127
CLASSIFICATION	PLASTIC CLAY (CH), GRAY
LL / PL / PI	
GS 2.70 (EST)	D_{10}
REMARKS	

PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER
PLAN N.O. E. LEV (SO. POINT TO GIWW)
BORING NO. 11-USP — SAMPLE NO. 14-C
DEPTH/ELEV 49.1/-36.3 — DATE 31 MAY 86

CONSOLIDATION TEST REPORT

SHEET 1 OF 9

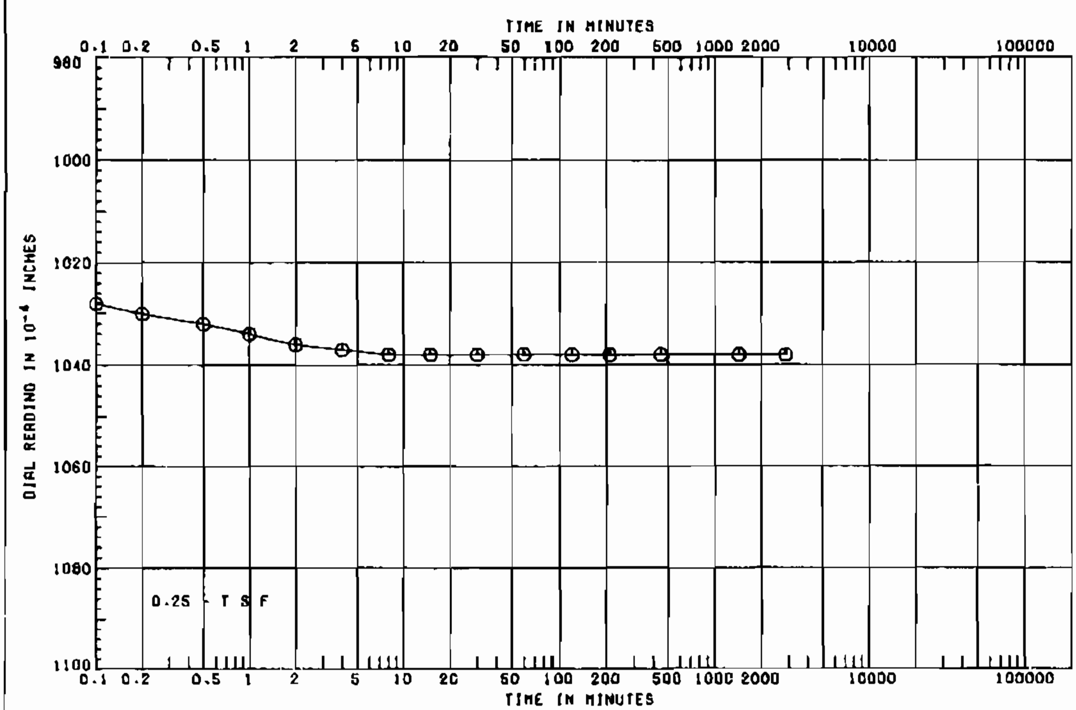


PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER	
PLAN N.O. E. LEV (SO. POINT TO GIWW)	
BORING 11-USP	SAMPLE NO. 14-C
DEPTH/ELEV 49.1/-36.3	DATE 31 MAY 86

CONSOLIDATION TEST

TIME CURVES

SHEET 4 OF 9

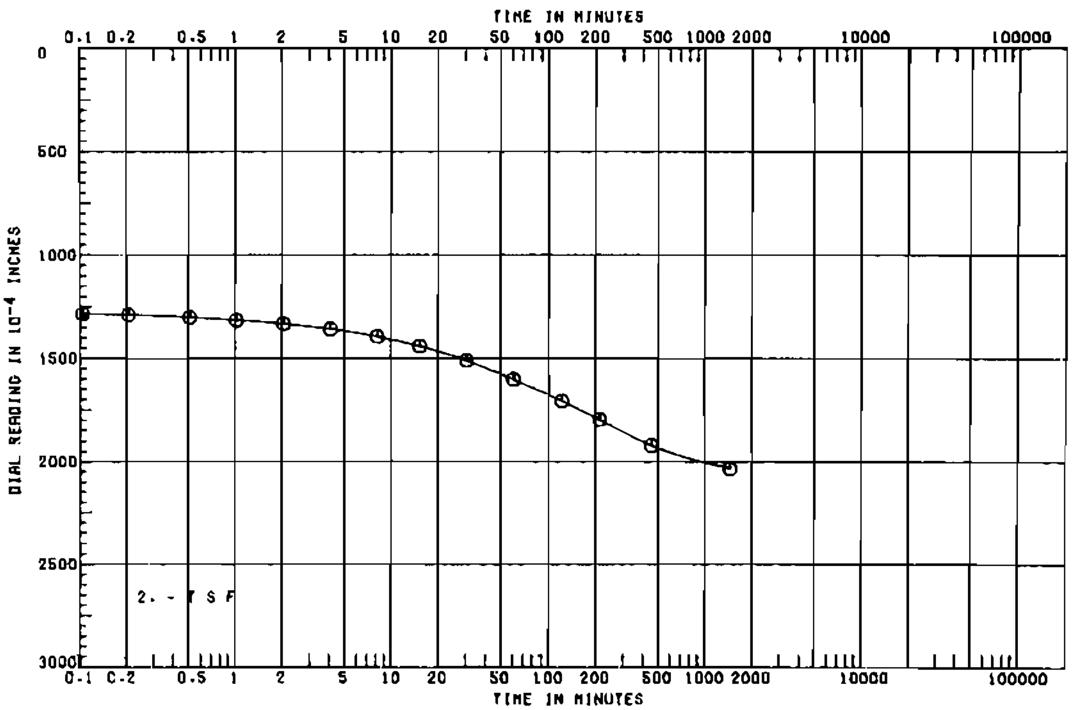


PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER	
PLAN N.O. E. LEV (SO. POINT TO GIWW)	
BORING 11-USP	SAMPLE NO. 14-C
DEPTH/ELEV 49.1/-36.3	DATE 31 MAY 86

CONSOLIDATION TEST

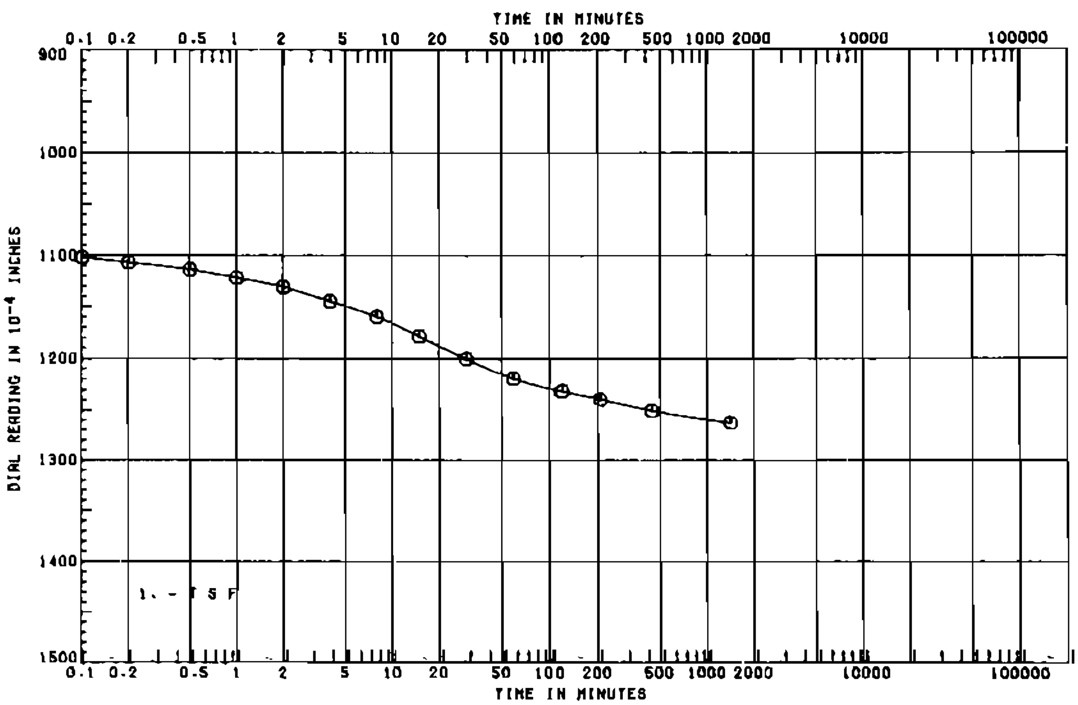
TIME CURVES

SHEET 3 OF 9



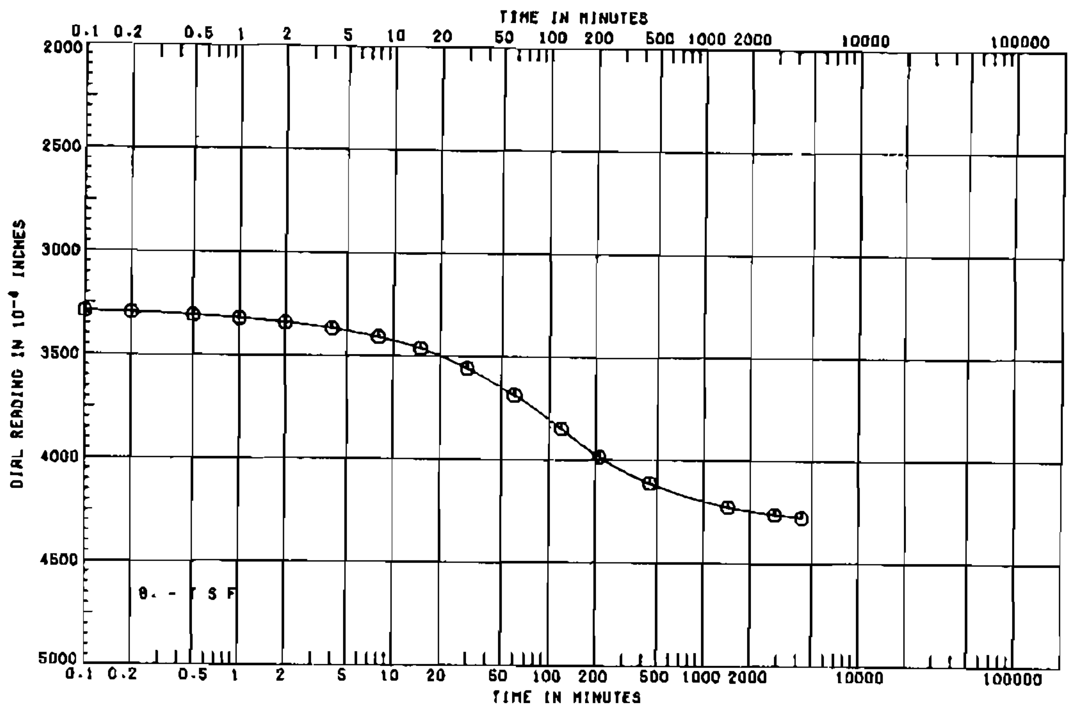
PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER		CONSOLIDATION TEST TIME CURVES
PLAN N.O. E. LEV (SO. POINT TO OIWW)		
BORINO 11-USP	SAMPLE NO. 14-C	
DEPTH/ELEV 49.1/-36.3	DATE 31 MAY 86	

SHEET 6 OF 9



PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER		CONSOLIDATION TEST TIME CURVES
PLAN N.O. E. LEV (SO. POINT TO OIWW)		
BORINO 11-USP	SAMPLE NO. 14-C	
DEPTH/ELEV 49.1/-36.3	DATE 31 MAY 86	

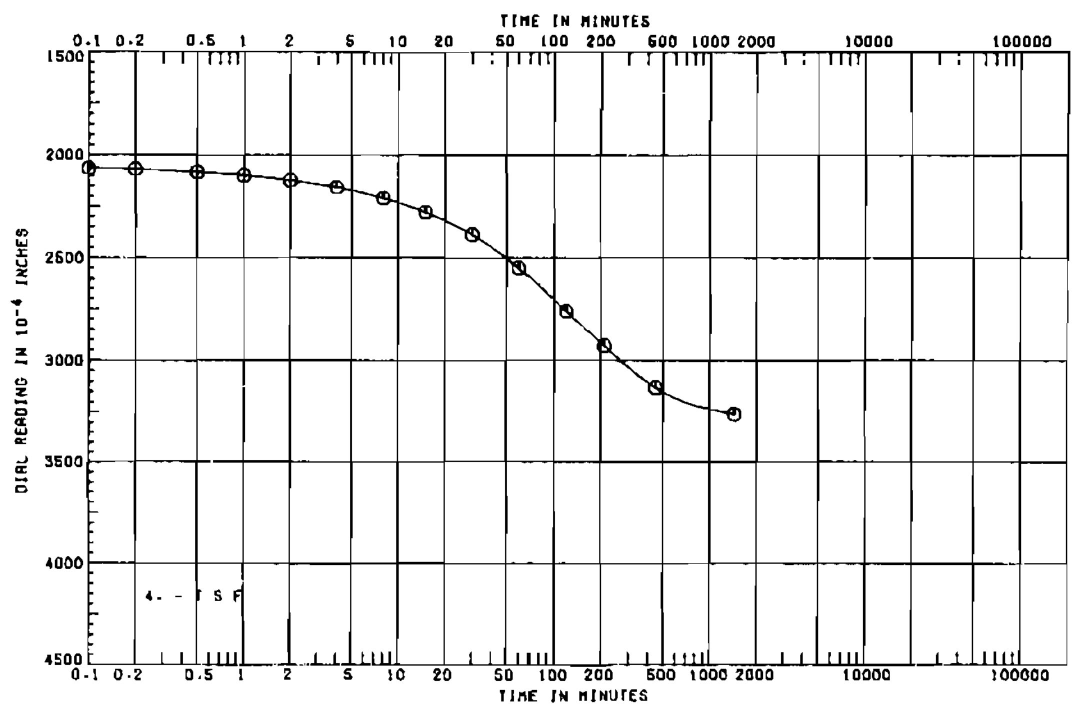
SHEET 5 OF 9



PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER	
PLAN N.O. E. LEV (SO. POINT TO OIHW)	
BORING 11-USP	SAMPLE NO. 14-C
DEPTH/ELEV 49.1/-36.3	DATE 31 MAY 86

CONSOLIDATION TEST
TIME CURVES

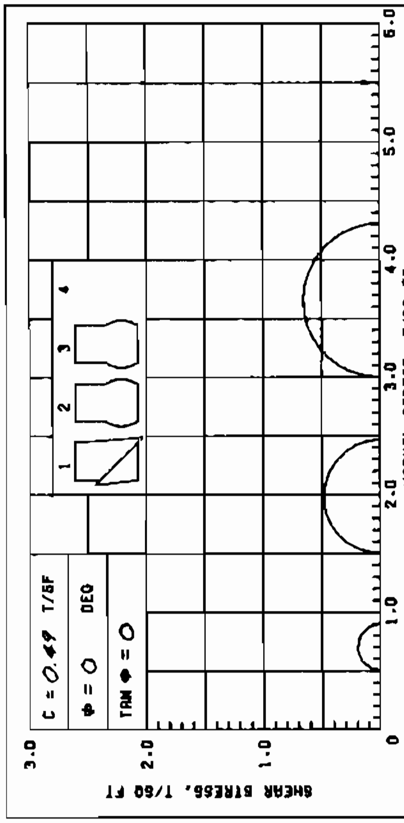
SHEET 8 OF 9

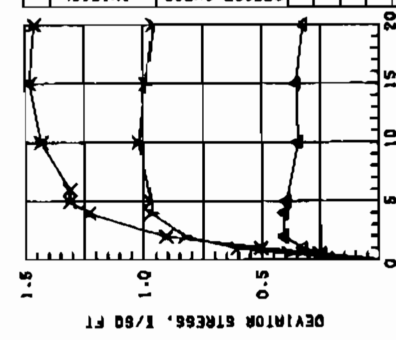


PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER	
PLAN N.O. E. LEV (SO. POINT TO OIHW)	
BORING 11-USP	SAMPLE NO. 14-C
DEPTH/ELEV 49.1/-36.3	DATE 31 MAY 86

CONSOLIDATION TEST
TIME CURVES

SHEET 7 OF 9





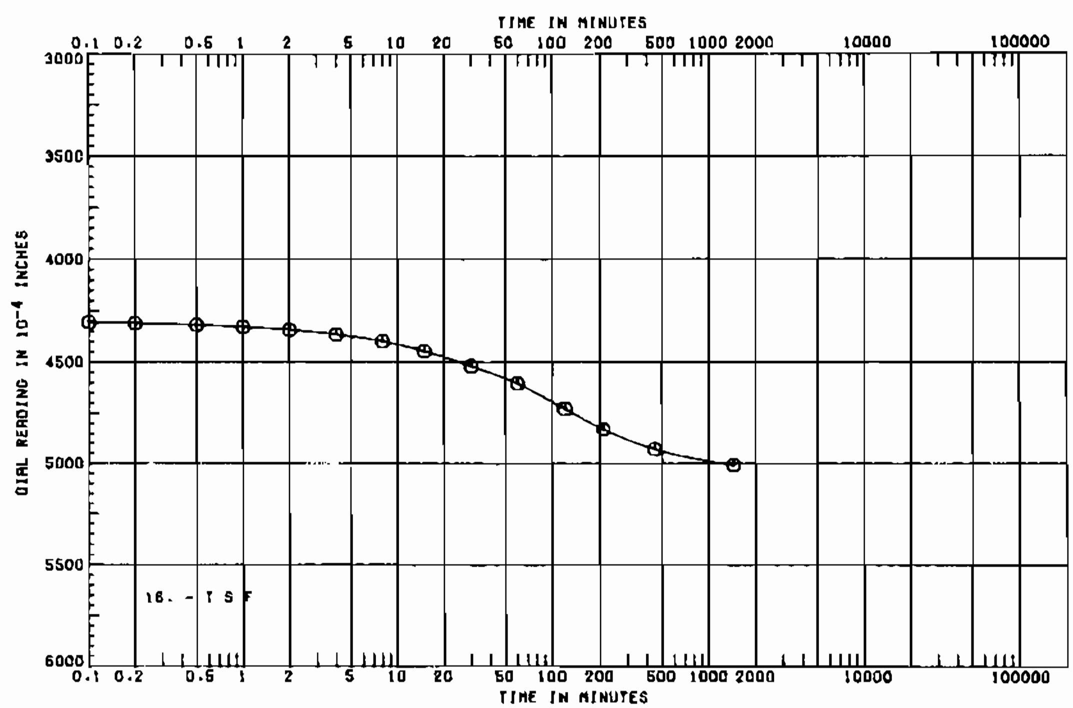
SPECIMEN NO.		Δ1	Y2	X3	4	AVG.
INITIAL	WATER CONTENT, %	41.1	37.3	39.5		37.30
	DRY DENSITY, PCF	73.8	76.8	78.3		76.70
	SATURATION, %	86.6	84.6	80.3		83.83
	VOID RATIO	1.281	1.191	1.126		
BEFORE SHEAR	WATER CONTENT, %					
	DRY DENSITY, PCF					
	SATURATION, %					
	VOID RATIO					
	BACK PRESS., TSF					
MIN PRIN. STRESS, TSF		0.5	1.5	3.0		
MAX. DEV. STRESS, TSF		0.40	0.97	1.31		
TIME TO FAILURE, MIN.		4	24	31		
RATE OF STRAIN INCR.%			6	6		
INITIAL DIAMETER, IN.		1.39	1.39	1.39		
INITIAL HEIGHT, IN.		3.00	3.00	3.00		

CONTROLLED-STRAIN TEST

DESCRIPTION OF SPECIMENS: PLASTIC CLAY (CH), BROWN

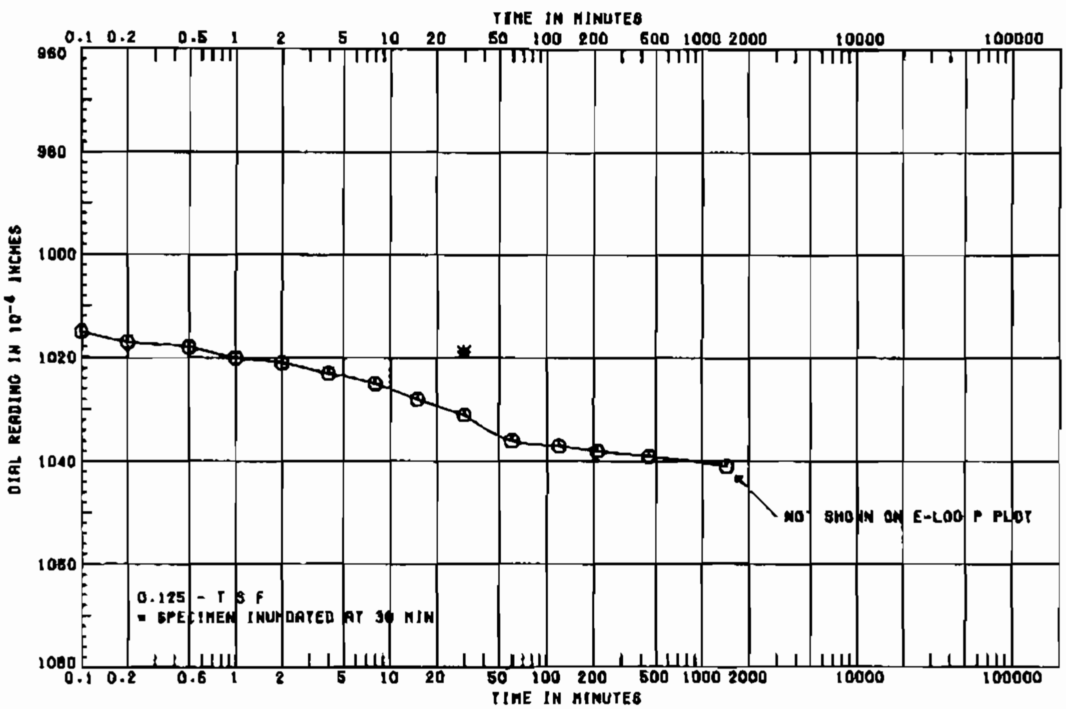
LL 52	PL 15	PI 37	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:	PROJECT LAKE PONT LA & VIC NEW ORLEANS	
	EAST LEV (SOUTH POINT TO GIWW)	
	BORING NO. 12-USP	SAMPLE NO. 2-B
	DEPTH/ELEV 4.6	TECH. KOC
	LABORATORY USAE WES	DATE 30 APR 86
	TRIAXIAL COMPRESSION TEST REPORT	



PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER		CONSOLIDATION TEST TIME CURVES
PLAN N.O. E. LEV (SO. POINT TO GIWW)		
BORING 11-USP	SAMPLE NO. 14-C	
DEPTH/ELEV 49.1/-36.3	DATE 31 MAY 86	

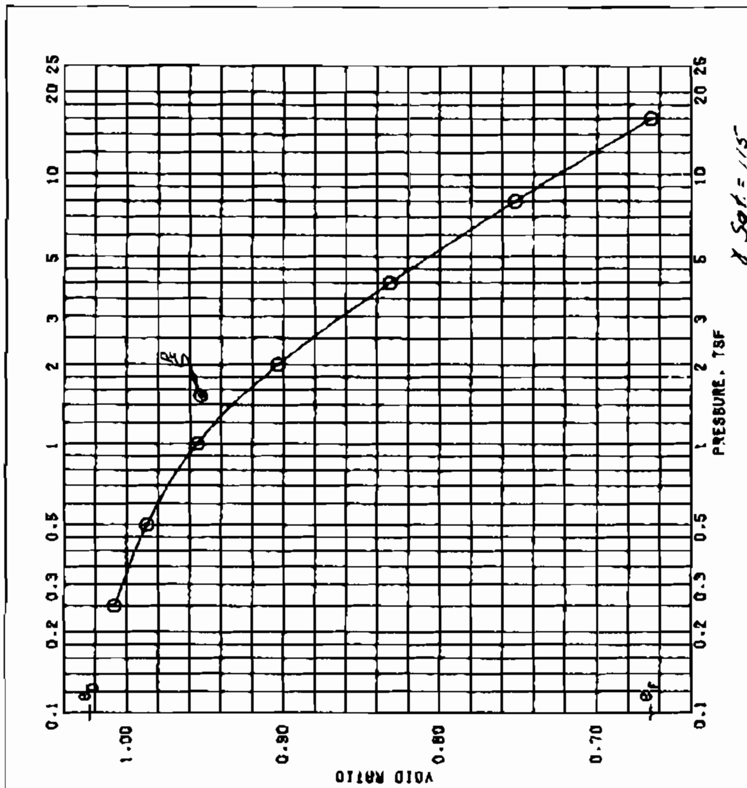
SHEET 9 OF 9



PROJECT LAKE PONT LA & V C NEW ORLEANS	
EAST LEV (SOUTH POINT TO OIWW)	
BORING 12-USP	SAMPLE NO. 2-C
DEPTH/ELEV 5 5	DATE 07 MAY 86

CONSOLIDATION TEST
TIME CURVES

SHEET 2 OF 9



γ Sat = 115

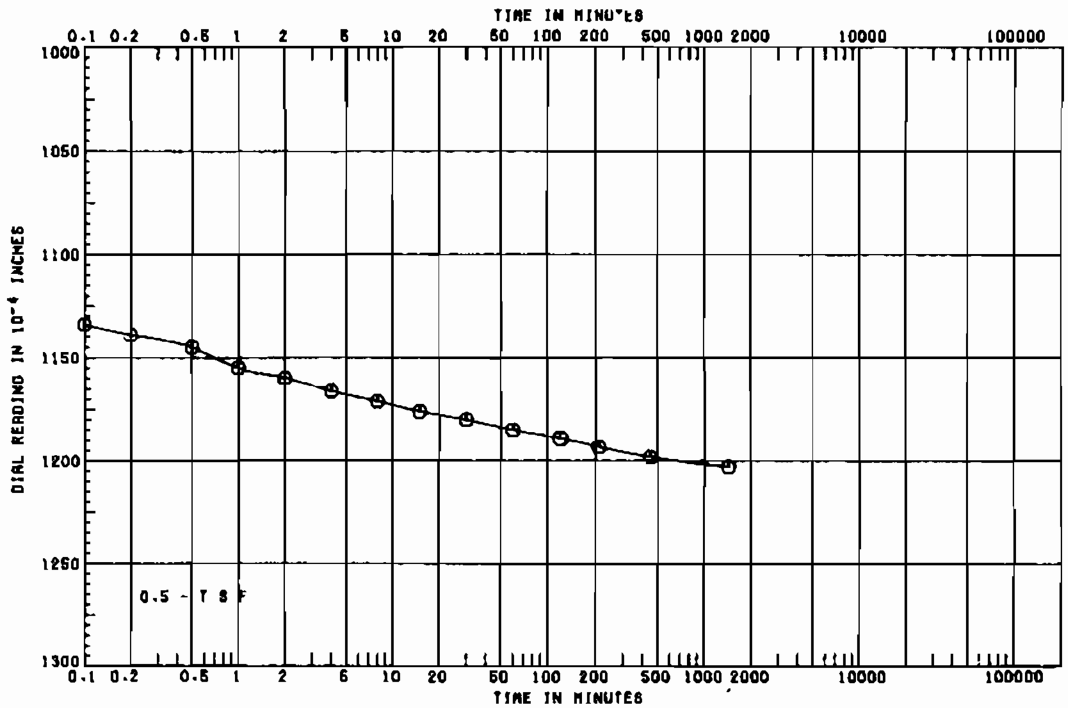
			BEFORE TEST	AFTER TEST
OVERBURDEN PRESSURE, TSF		WATER CONTENT, %	30.5	23.9
PRECONSOL. PRESSURE, TSF	1.52	DRY DENSITY, PCF	83.3	101.3
COMPRESSION INDEX	0.28	SATURATION, %	80.5	97.1
TYPE SPECIMEN	UNDISTURBED	VOID RATIO	1.023	0.665
DIA. IN 4.44	HT. IN 1.129	BACK PRESSURE, TSF		

CLASSIFICATION PLASTIC CLAY (CH), GRAY; SILT POCKETS		
LL	PL	PI
GS 2.70 (EST)	D_{10}	
REMARKS		

PROJECT LAKE PONT LA & VIC NEW ORLEANS	
EAST LEV (SOUTH POINT TO OIWW)	
BORING NO. 12-USP	SAMPLE NO. 2-C
DEPTH/ELEV 6.5	DATE 07 MAY 86

CONSOLIDATION TEST REPORT

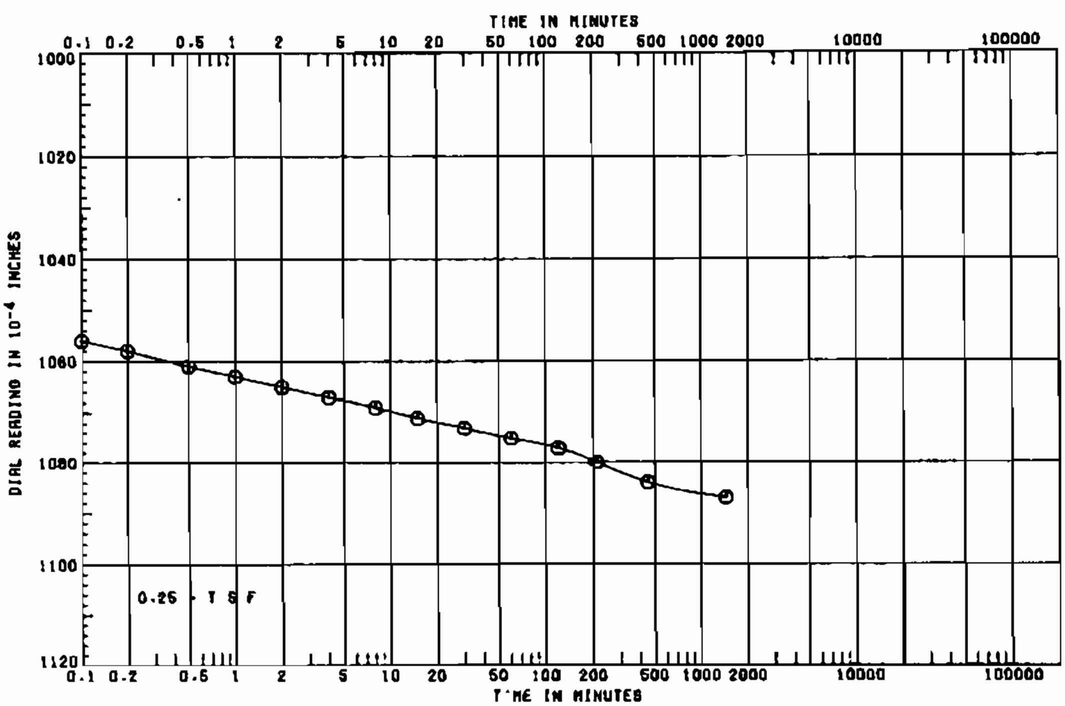
SHEET 1 OF 9



PROJECT LAKE PONT LA & VIC NEW ORLEANS	
EAST LEV (SOUTH POINT TO OIWW)	
BORING 12-USP	SAMPLE NO. 2-C
DEPTH/ELEV 5.5	DATE 07 MAY 86

CONSOLIDATION TEST
TIME CURVES

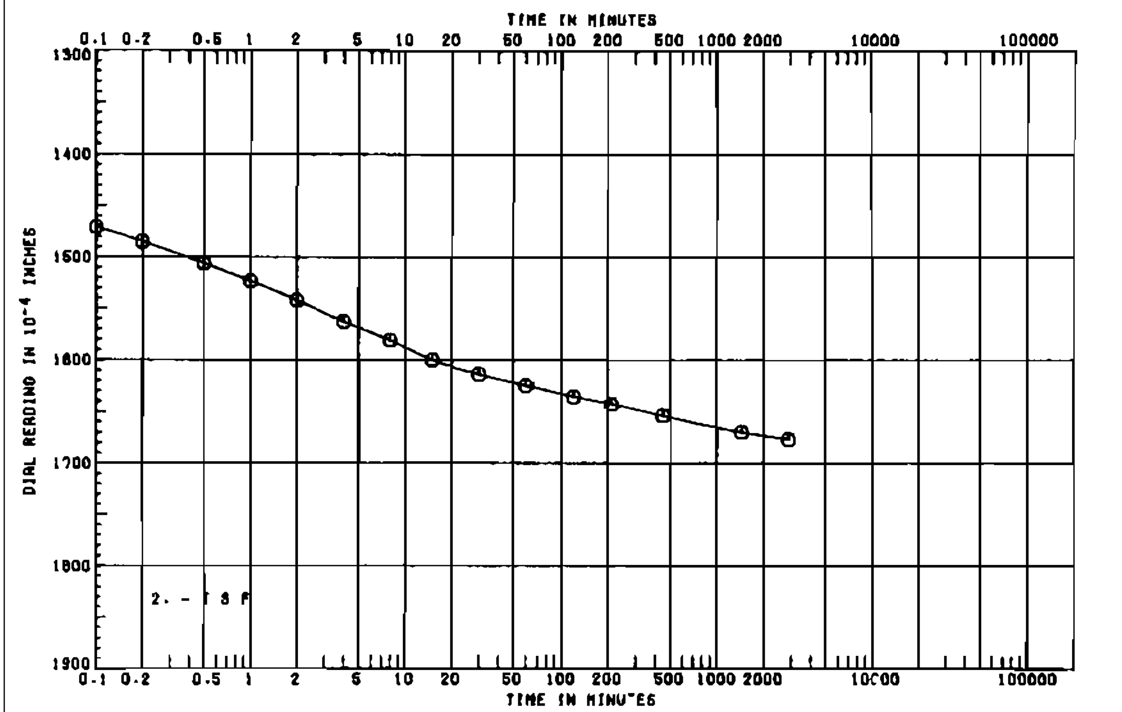
SHEET 4 OF 9



PROJECT LAKE PONT LA & VIC NEW ORLEANS	
EAST LEV (SOUTH POINT TO OIWW)	
BORING 12-USP	SAMPLE NO. 2-C
DEPTH/ELEV 5 5	DATE 07 MAY 86

CONSOLIDATION TEST
TIME CURVES

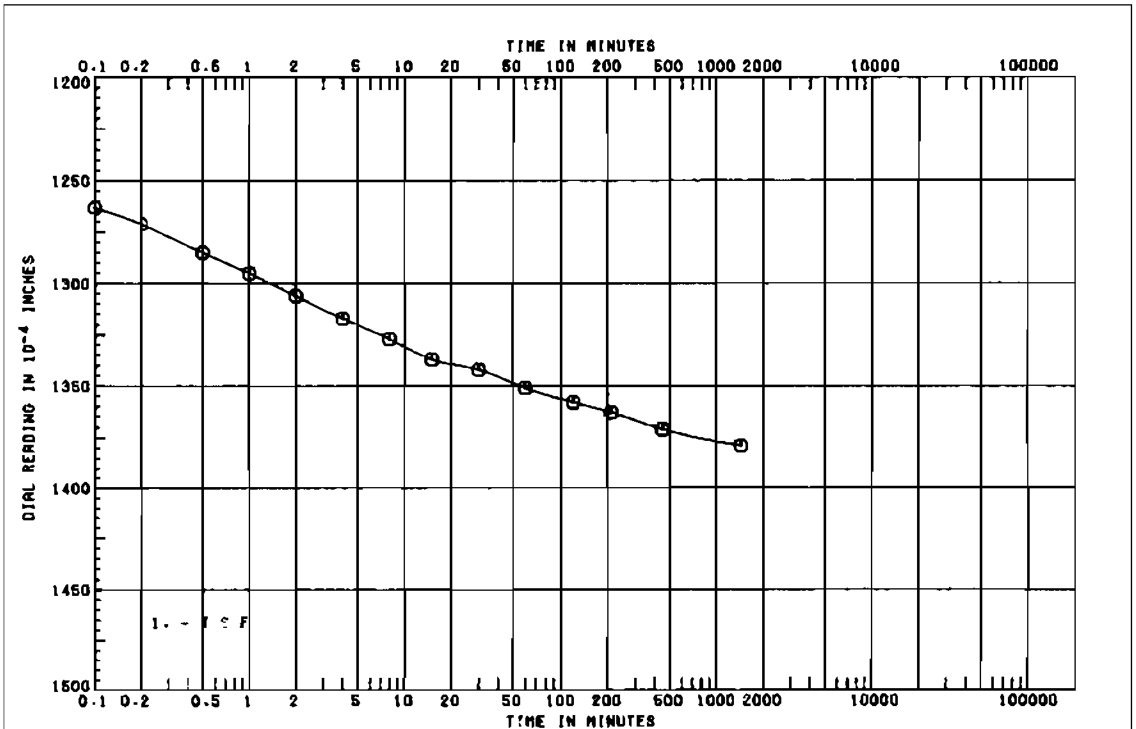
SHEET 3 OF 9



PROJECT LAKE PONT LA & VIC NEW ORLEANS	
EAST LEV (SOUTH POINT TO O(WW)	
BORING 12-USP	SAMPLE NO. 2-C
DEPTH/ELEV 5.5	DATE 07 MAY 86

CONSOLIDATION TEST
TIME CURVES

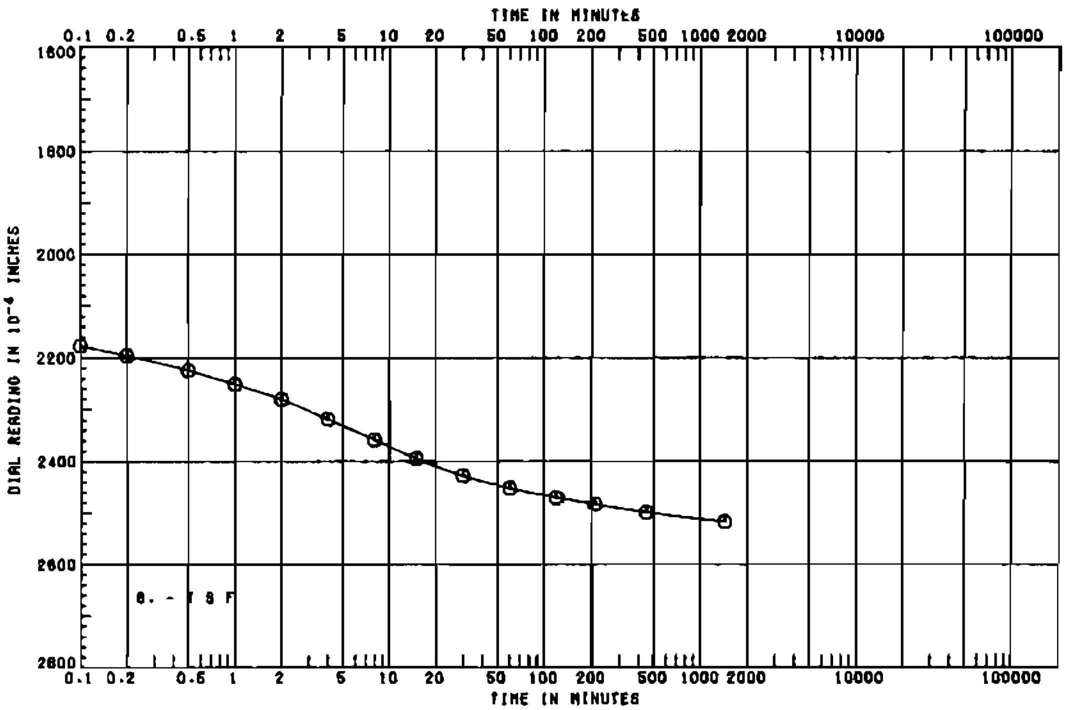
SHEET 6 OF 9



PROJECT LAKE PONT LA & VIC NEW ORLEANS	
EAST LEV (SOUTH POINT TO O(WW)	
BORING 12-USP	SAMPLE NO. 2-C
DEPTH/ELEV 5 5	DATE 07 MAY 86

CONSOLIDATION TEST
TIME CURVES

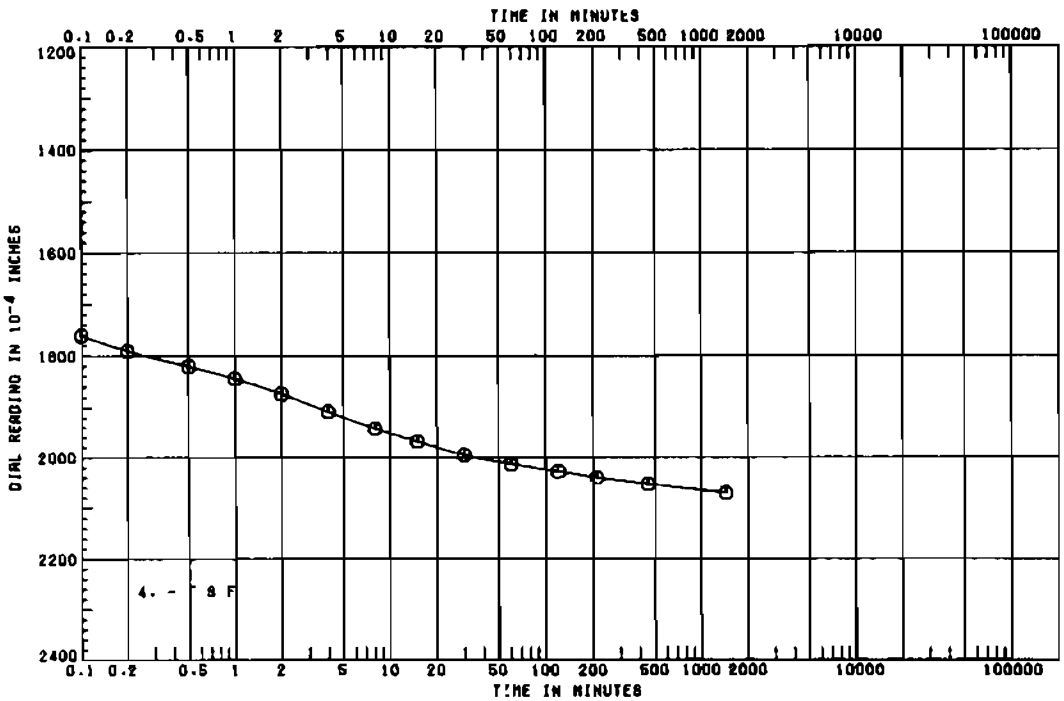
SHEET 5 OF 9



PROJECT LAKE PONT LA & VIC NEW ORLEANS	
EAST LEV (SOUTH POINT TO OINW)	
BORING 12-USP	SAMPLE NO. 2-C
DEPTH/ELEV 5.5	DATE 07 MAY 86

CONSOLIDATION TES
TIME CURVES

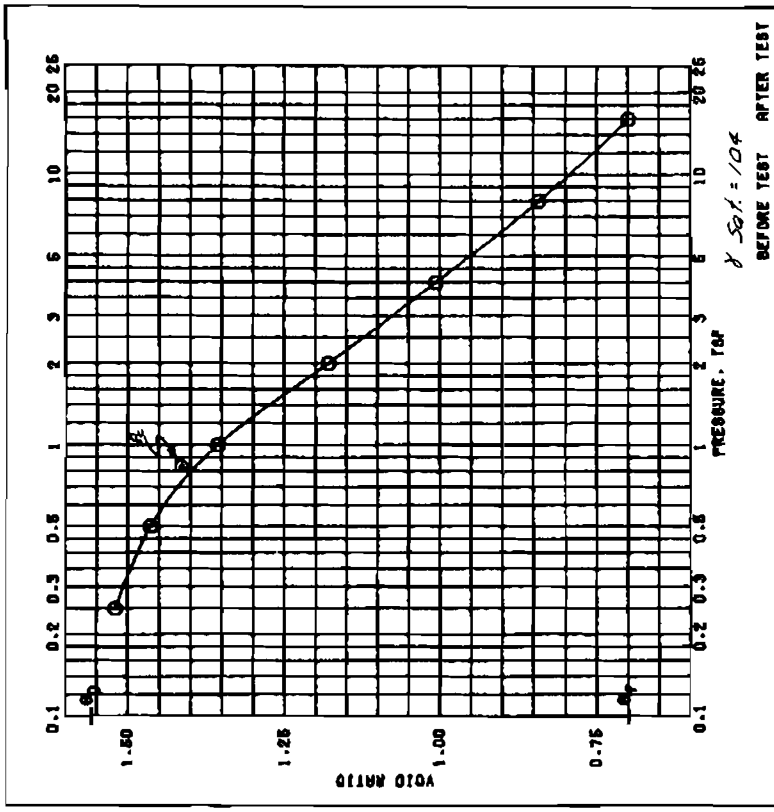
SHEET 8 OF 9



PROJECT LAKE ONT LA & VIC NEW ORLEANS	
EAST LEV (SOUTH POINT TO OINW)	
BORING 12-USP	SAMPLE NO. 2-C
DEPTH/ELEV 5.5	DATE 07 MAY 86

CONSOLIDATION TEST
TIME CURVES

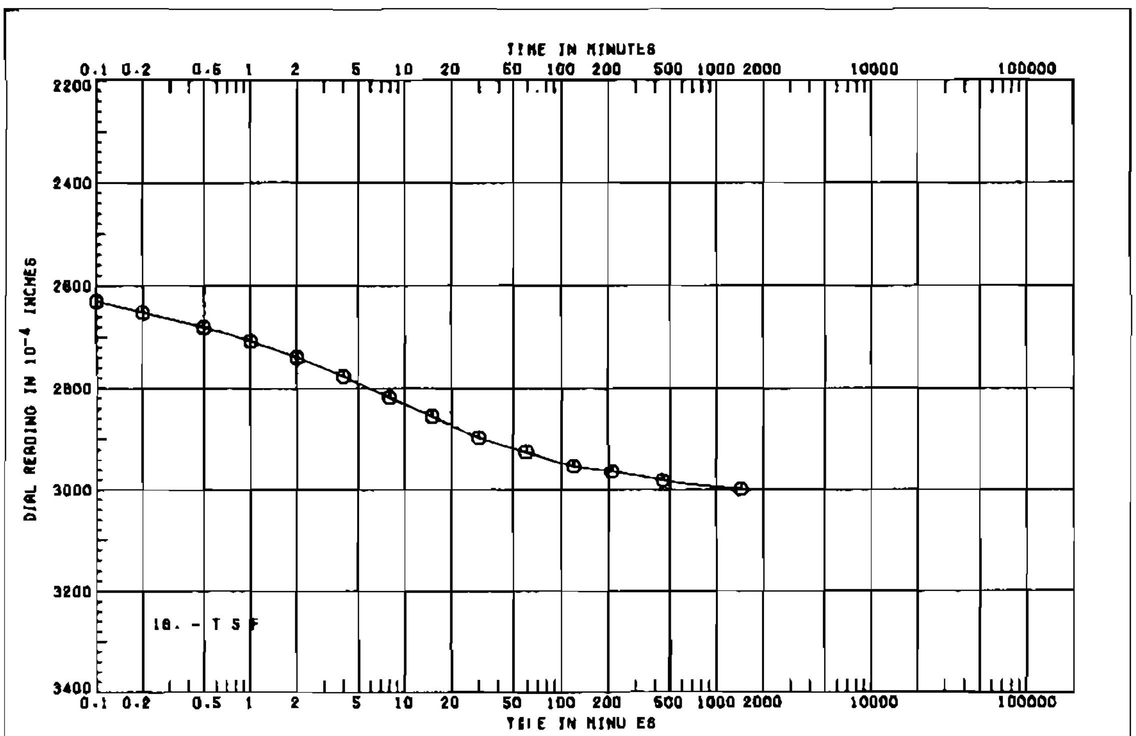
SHEET 7 OF 9



				BEFORE TEST	AFTER TEST
OVERBURDEN PRESSURE, TSF			WATER CONTENT, %	55.1	27.3
PRECONSOL. PRESSURE, TSF		0.82	DRY DENSITY, PCF	65.9	89.3
COMPRESSION INDEX		0.61	SATURATION, %	98.6	100 +
TYPE SPECIMEN	UNDISTURBED		VOID RATIO	1.556	0.698
DIA. IN 4.44	HT. IN 1.198		BACK PRESSURE, TSF		
CLASSIFICATION	PLASTIC CLAY (CH), GRAY; SHELLS				
LL	PL	PI	PROJECT LAKE PONT LA & VIC NEW ORLEANS		
GS 2.70 (EST)	D_{10}		EAST LEV (SOUTH POINT TO DIWW)		
REMARKS			BORING NO. 12-USP	SAMPLE NO. 3-C	
			DEPTH/ELEV 8.8	DATE 07 MAY 86	

CONSOLIDATION TEST REPORT

SHEET 1 OF 9

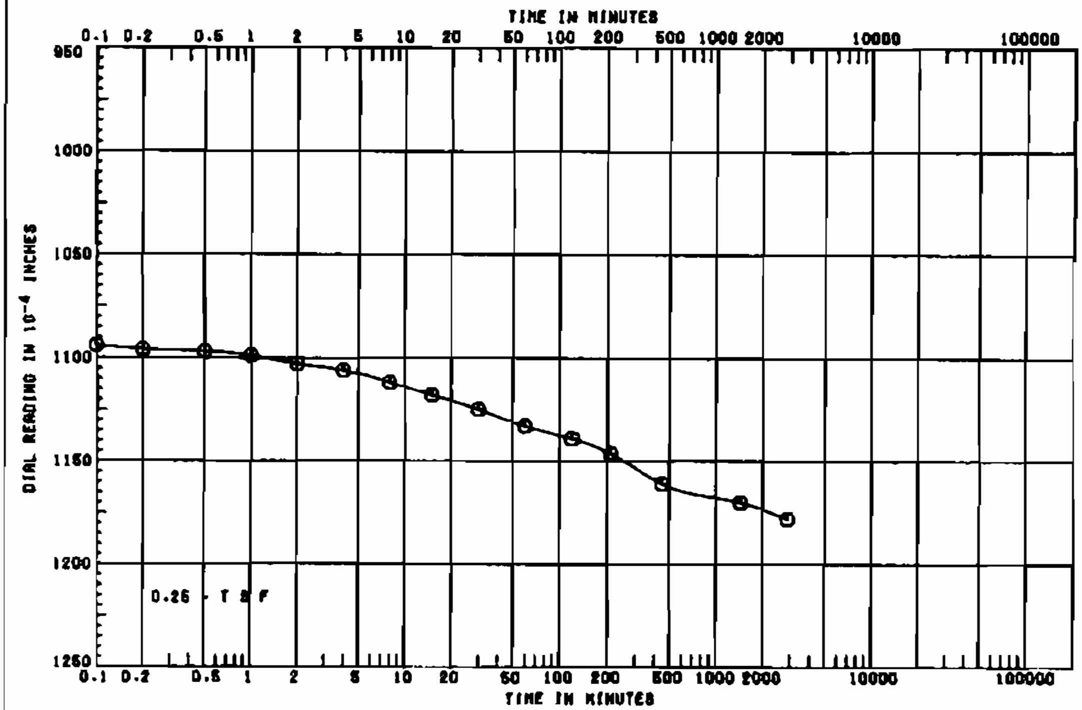


PROJECT LAKE PON LA & V'C NEW ORLEANS	
EAST LEV (SOUTH POINT TO DIWW)	
BORING 12-USP	SAMPLE NO. 2-C
DEPTH/ELEV 5.5	DATE 07 MAY 86

CONSOLIDATION TEST

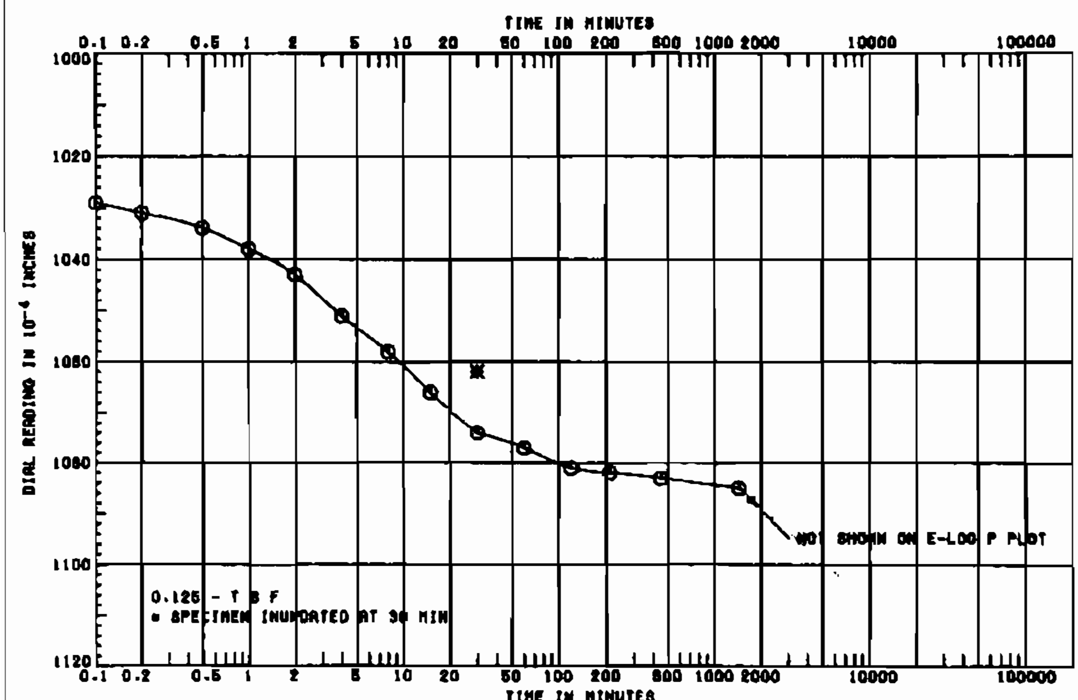
TIME CURVES

SHEET 9 OF 9



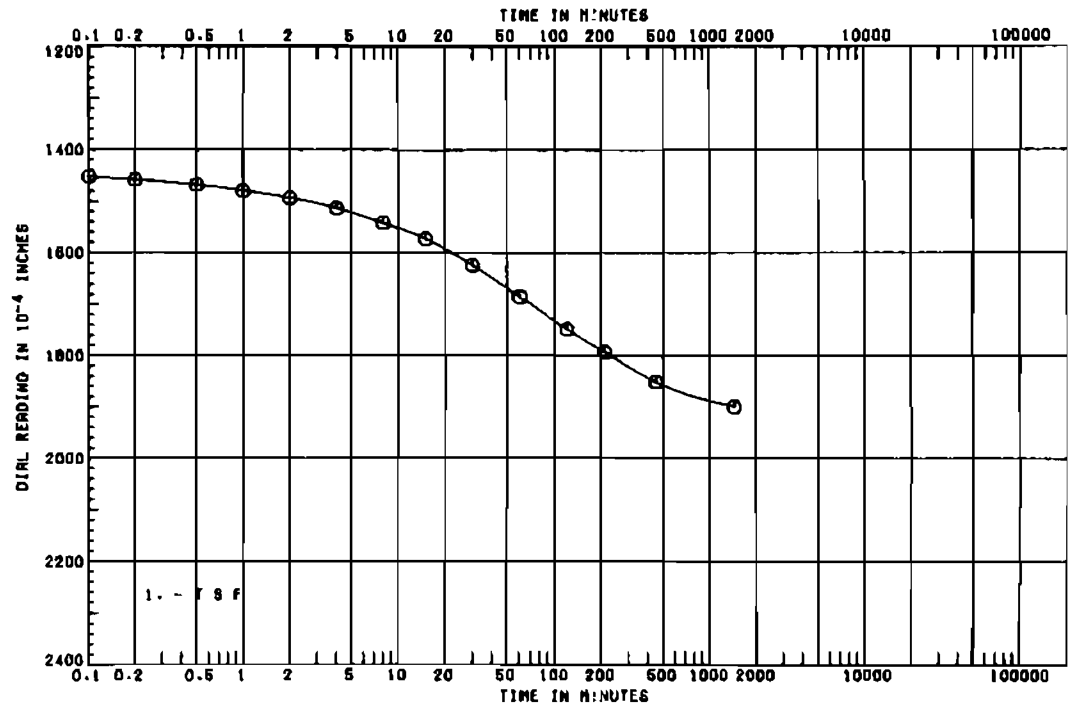
PROJECT LAKE PONT LA & VIC NEW ORLEANS		CONSOLIDATION TEST TIME CURVES
EAST LEV (SOUTH POINT TO GIWW)		
BORING 12-USP	SAMPLE NO. 3-C	
DEPTH/ELEV 8.9	DATE 07 MAY 88	

SHEET 3 OF 9



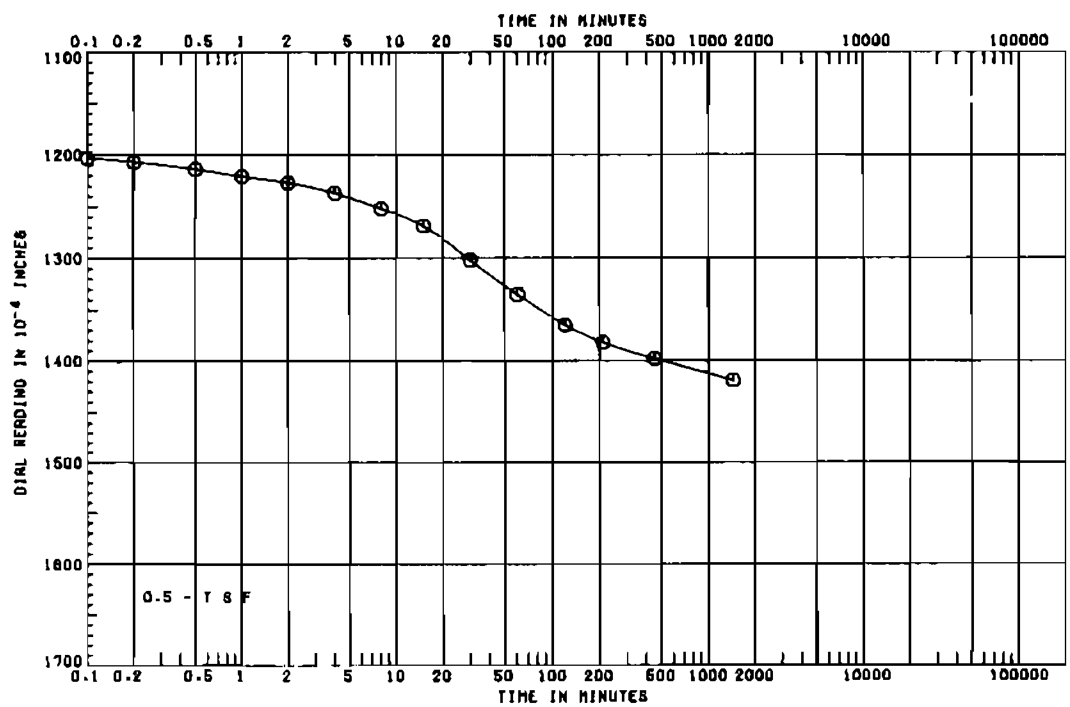
PROJECT LAKE PONT LA & VIC NEW ORLEANS		CONSOLIDATION TEST TIME CURVES
EAST LEV (SOUTH POINT TO GIWW)		
BORING 12-USP	SAMPLE NO. 3-C	
DEPTH/ELEV 8.9	DATE 07 MAY 88	

SHEET 2 OF 9



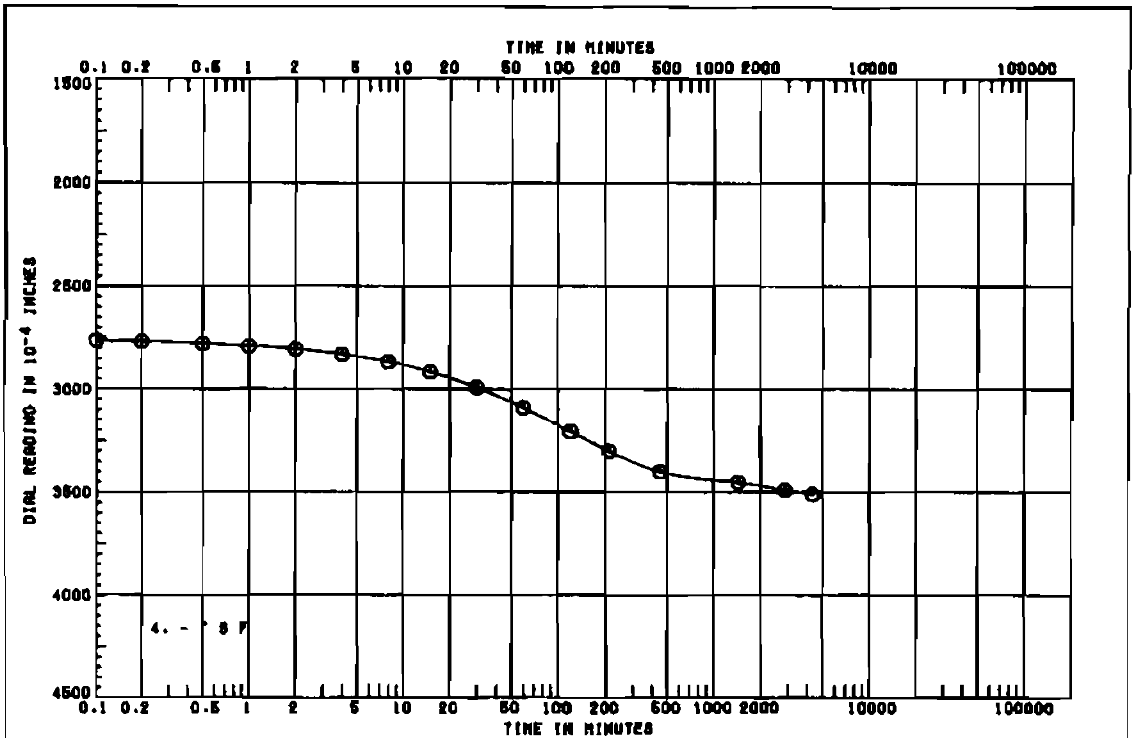
PROJECT LAKE PONT LA & VIC NEW ORLEANS		CONSOLIDATION TEST TIME CURVES
EAST LEV (SOUTH POINT TO GIWW)		
BORIN 12-USP	SAMPLE NO. 3-C	
DEPTH/ELEV 8.9	DATE 07 MAY 86	

SHEET 5 OF 9



PROJECT LAKE PONT LA & VIC N W OR EANS		CONSOLIDATION TEST TIME CURVES
EAST LEV (SOUTH POINT TO GIWW		
BORING 12-USP	SAMPLE NO. 3-C	
DEPTH/ELEV 8.9	DATE 07 MAY 86	

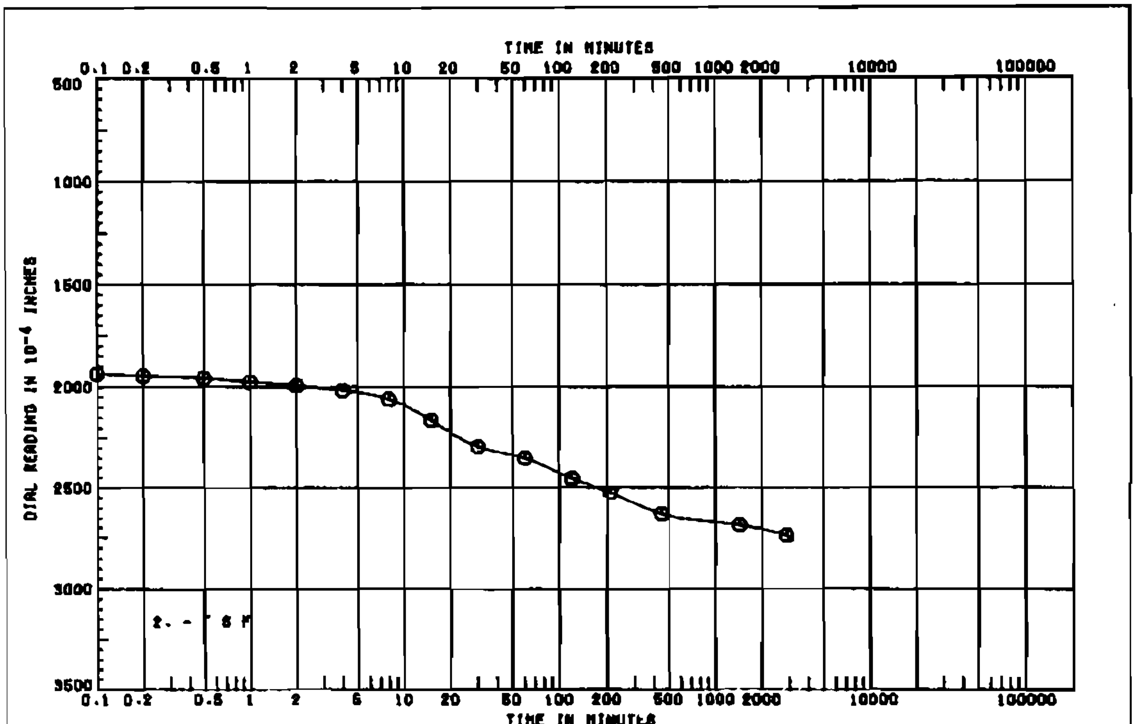
SHEET 4 OF 9



PROJECT LAKE PONT LA & VIC NEW ORLEANS	
EAST LEV (SOUTH POINT TO GIWW)	
BORING 12-USP	SAMPLE NO. 3-C
DEPTH/ELEV 8.9	DATE 07 MAY 86

CONSOLIDATION TEST
TIME CURVES

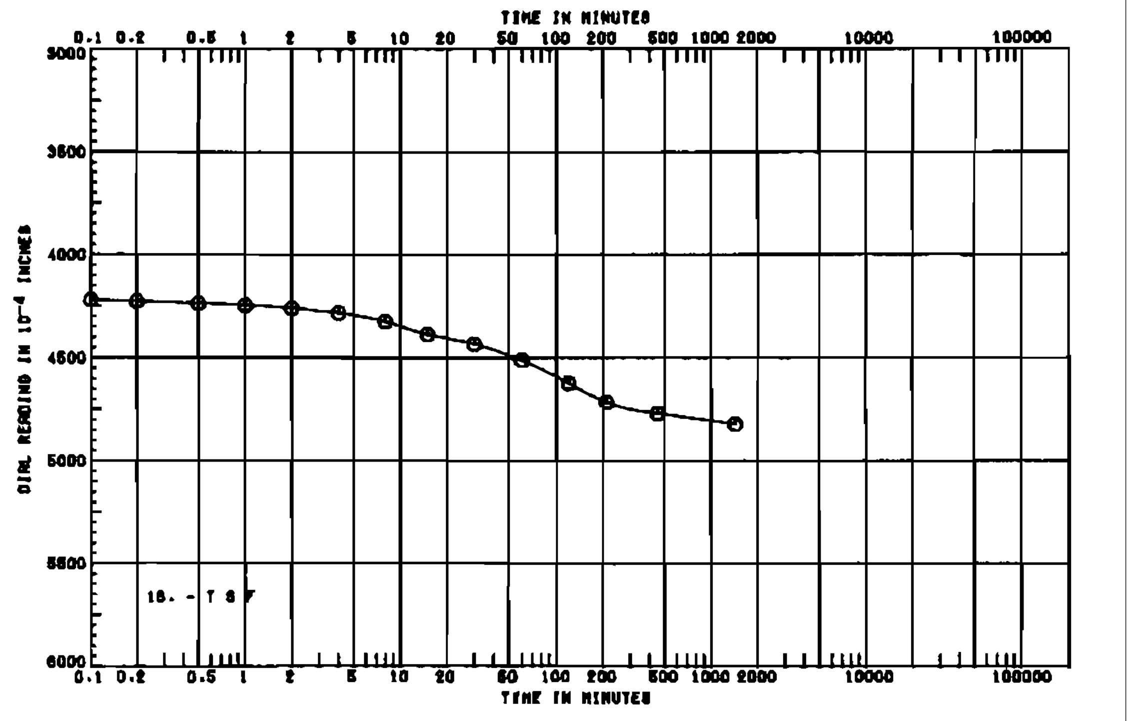
SHEET 7 OF 9



PROJECT LAKE PONT LA & VIC NEW ORLEANS	
EAST LEV (SOUTH POINT TO GIWW)	
BORING 12-USP	SAMPLE NO. 3-C
DEPTH/ELEV 8.9	DATE 07 MAY 86

CONSOLIDATION TEST
TIME CURVES

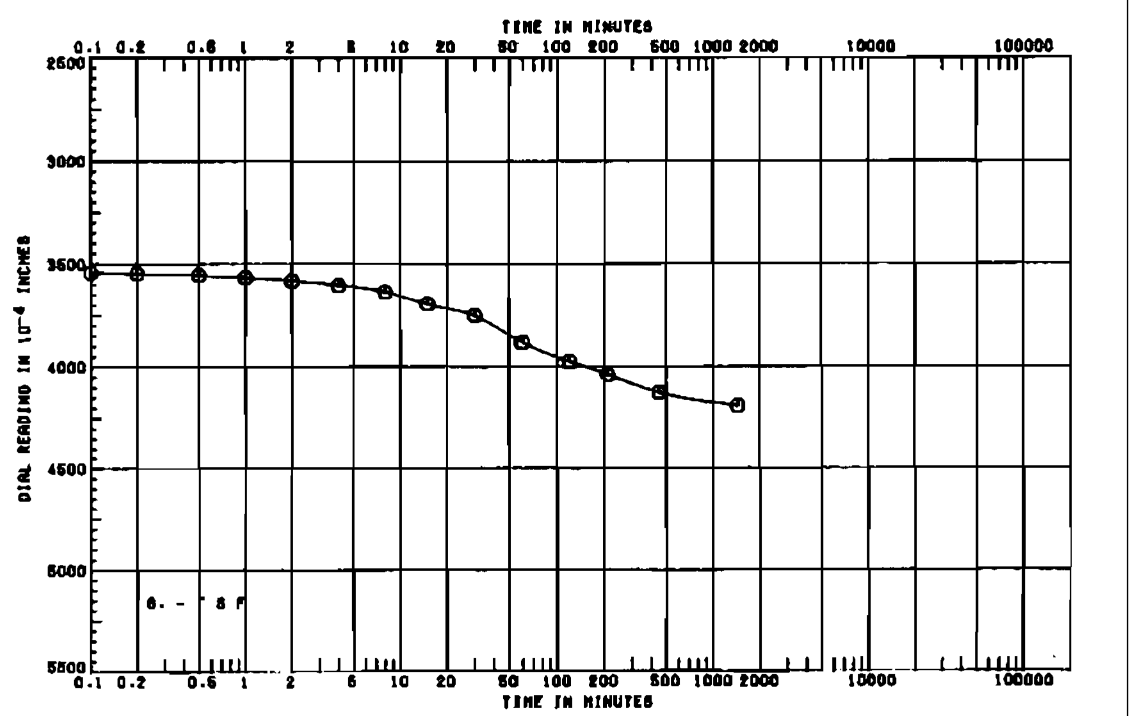
SHEET 6 OF 9



PROJECT LAKE PONT LA & VIC NEW ORLEANS	
EAST LEV (SOUTH POINT TO GIWW)	
BORING 12-USP	SAMPLE NO. 3-C
DEPTH/ELEV 6.9	DATE 07 MAY 86

CONSOLIDATION TEST
TIME CURVES

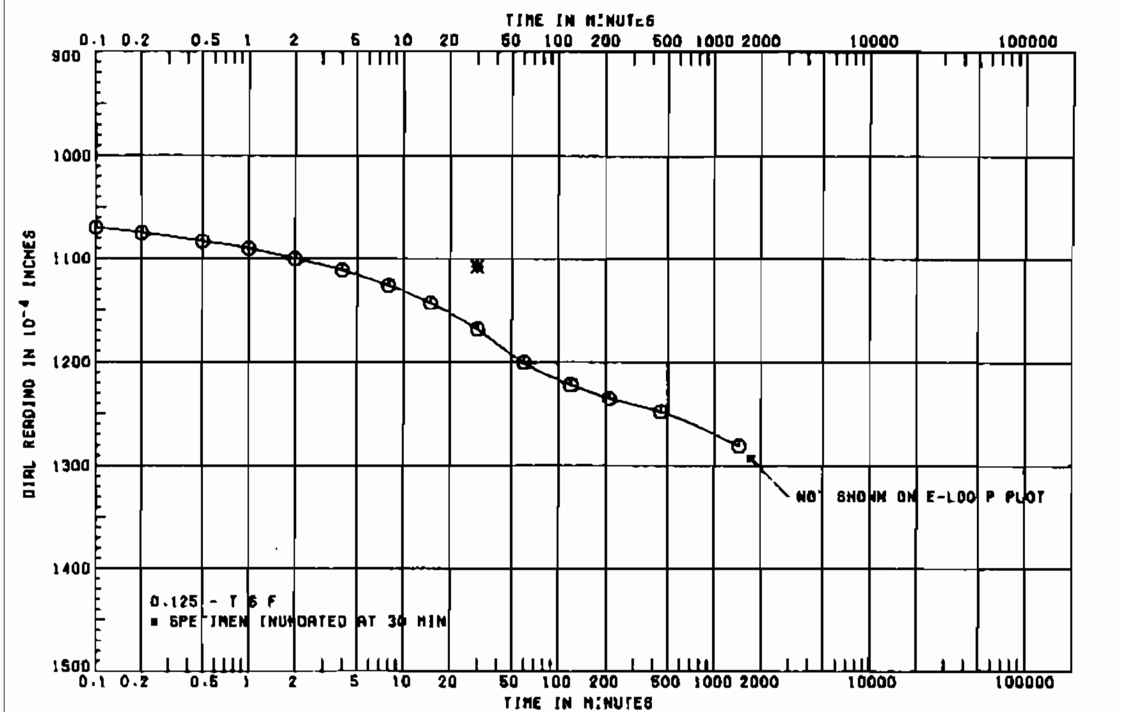
SHEET 8 OF 9



PROJECT LAKE PONT LA & VIC NEW ORLEANS	
EAST LEV (SOUTH POINT TO GIWW)	
BORING 12-USP	SAMPLE NO. 3-C
DEPTH/ELEV 6.9	DATE 07 MAY 86

CONSOLIDATION TEST
TIME CURVES

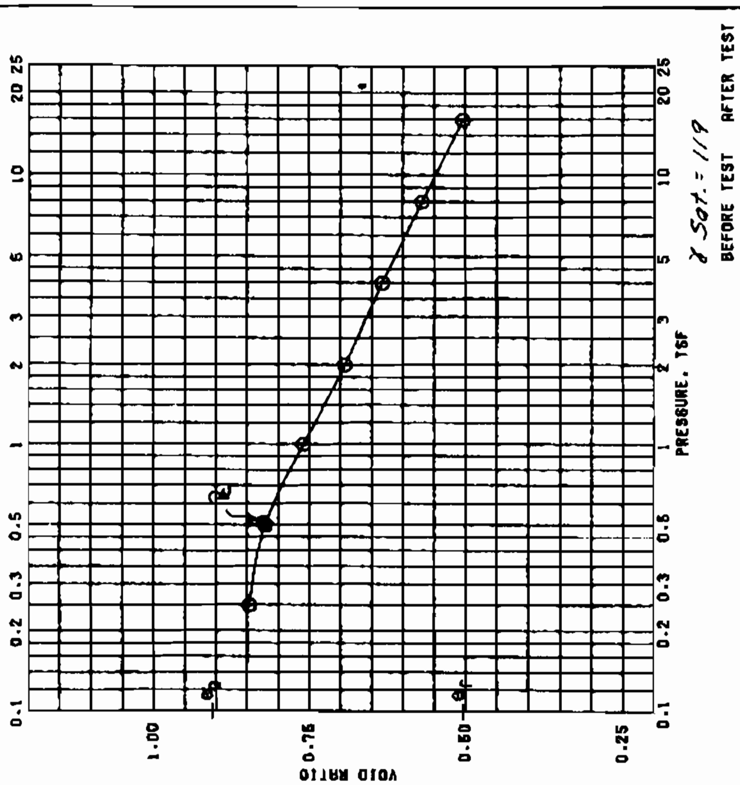
SHEET 8 OF 9



PROJECT LAKE PONT LA & VIC NEW ORLEANS	
EAST LEV (SOUTH POINT TO OIWW)	
BORING 12-USP	SAMPLE NO. 5-B
DEPTH/ELEV 15.9	DATE 07 MAY 86

CONSOLIDATION TEST
TIME CURVES

SHEET 2 OF 9



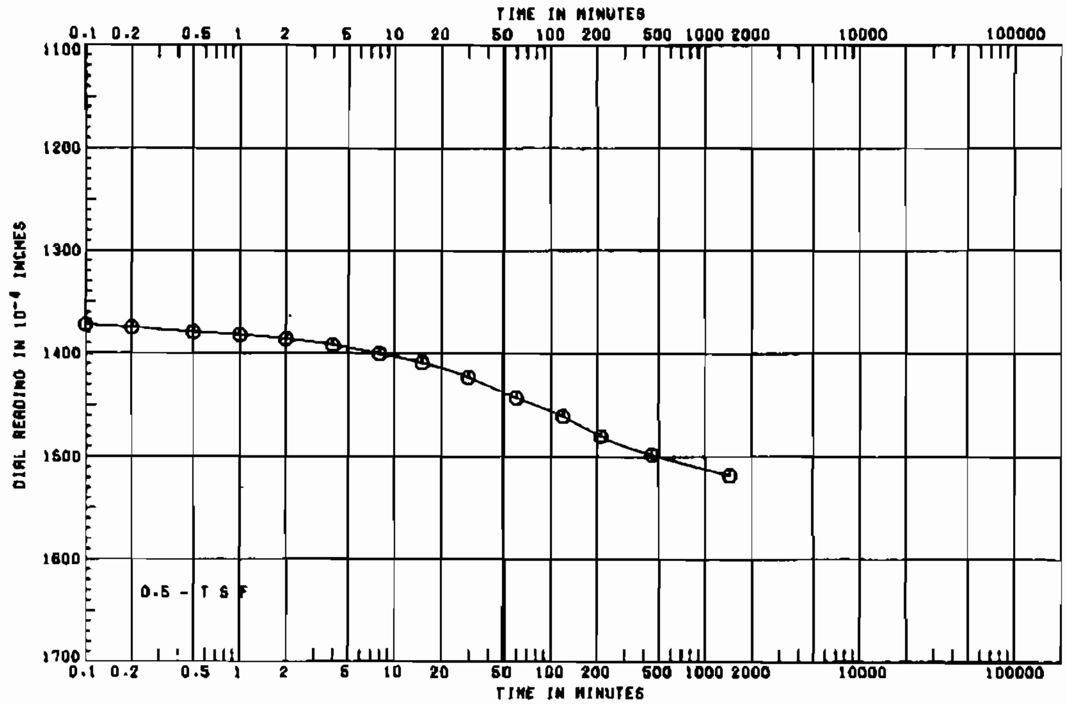
	BEFORE TEST	AFTER TEST
WATER CONTENT, %	34.6	19.0
DRY DENSITY, PCF	88.5	112.2
SATURATION, %	100 +	100 +
VOID RATIO	0.804	0.502
BACK PRESSURE, TSF		

OVERBURDEN PRESSURE, TSF			
PRECONSOL. PRESSURE, TSF	0.52		
COMPRESSION INDEX	0.22		
TYPE SPECIMEN	UNDISTURBED		
DIA. IN 4.44	HT. IN 1.181		
CLASSIFICATION	CLAY (CL), GRAY		
LL 39	PL 14	PI 25	
GS 2.70 (EST)	D_{10}		
REMARKS			

PROJECT LAKE PONT LA & VIC NEW ORLEANS	
EAST LEV (SOUTH POINT TO OIWW)	
BORING NO. 12-USP	SAMPLE NO. 5-B
DEPTH/ELEV 15.9	DATE 07 MAY 86

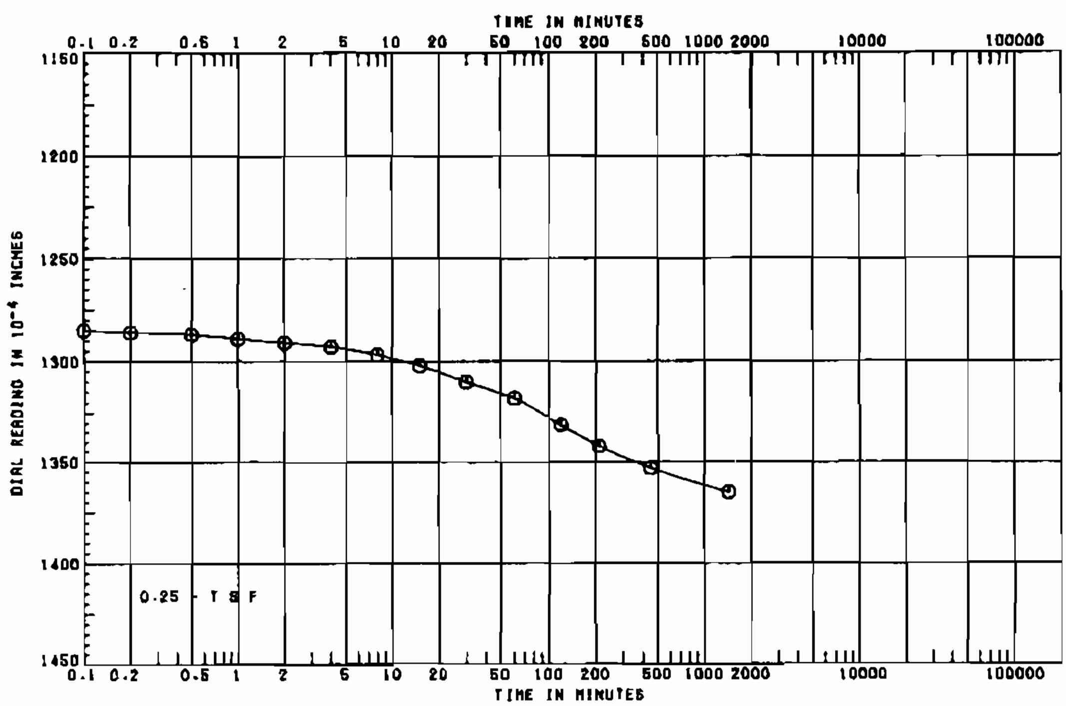
CONSOLIDATION TEST REPORT

SHEET 1 OF 9



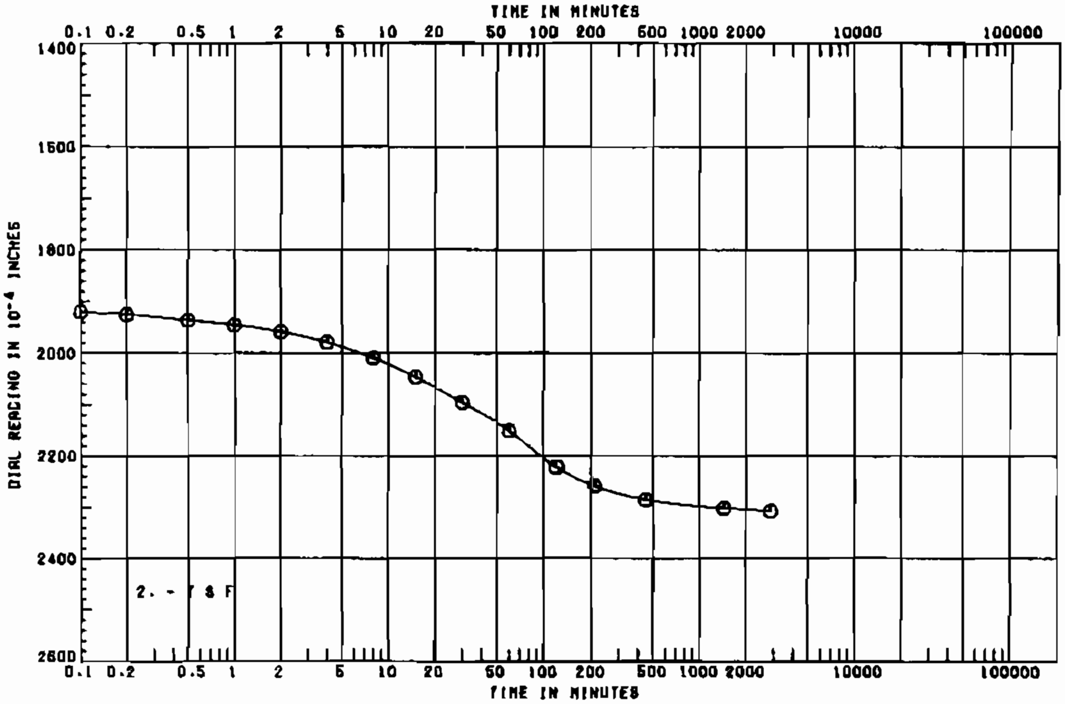
PROJECT LAKE PONT LA & VIC NEW ORLEANS		CONSOLIDATION TEST TIME CURVES	
EAST LEV (SOUTH POINT TO GIWW)			
BORING 12-USP	SAMPLE NO. 5-8		
DEPTH/ELEV 15.9	DATE 07 MAY 86		

SHEET 4 OF 9



PROJECT LAKE PONT LA & VIC NEW ORLEANS		CONSOLIDATION TEST TIME CURVES	
EAST LEV (SOUTH POINT TO GIWW)			
BORING 12-USP	SAMPLE NO. 5-8		
DEPTH/ELEV 15.9	DATE 07 MAY 86		

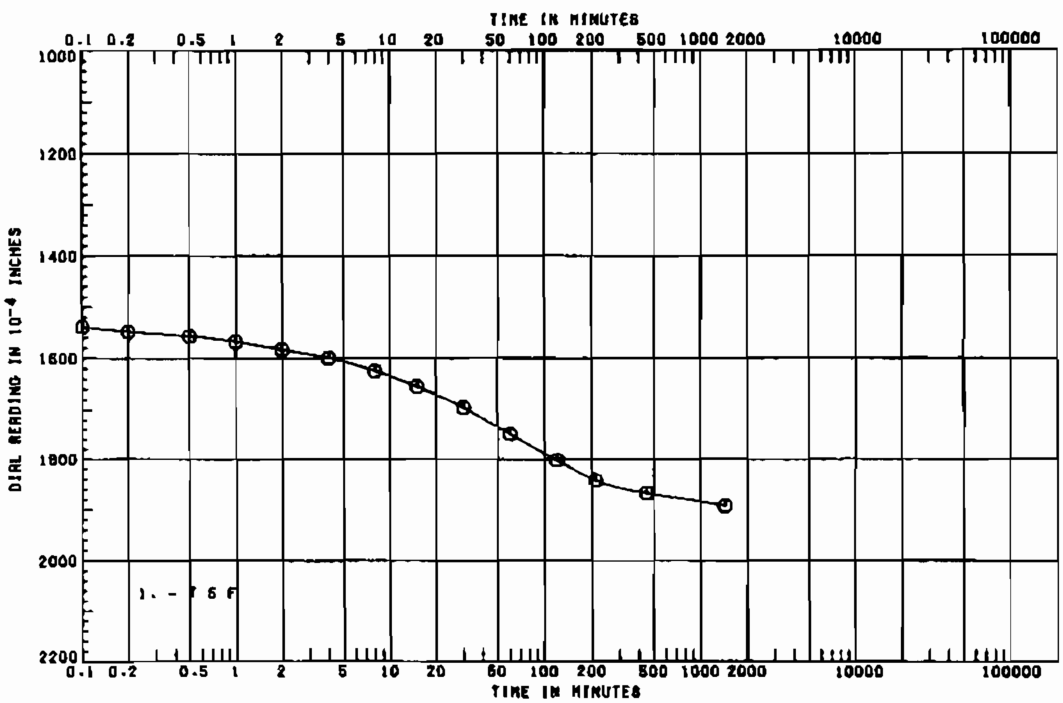
SHEET 3 OF 9



PROJECT LAKE PONT LA & VIC NEW ORLEANS	
EAST LEV (SOUTH POINT TO GIWW)	
BORING 12-USP	SAMPLE NO. 5-B
DEPTH/ELEV 15.9	DATE 07 MAY 86

CONSOLIDATION TEST
TIME CURVES

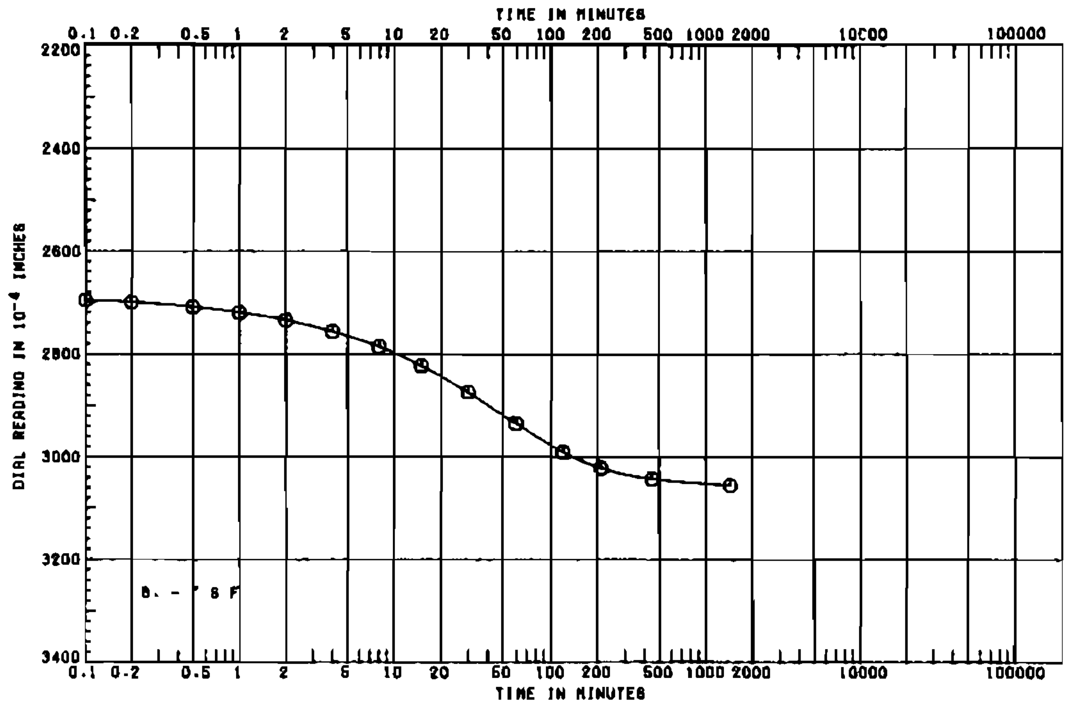
SHEET 6 OF 9



PROJECT LAKE PONT LA & VIC NEW ORLEANS	
EAST LEV (SOUTH POINT TO GIWW)	
BORING 12-USP	SAMPLE NO. 5-B
DEPTH/ELEV 15.9	DATE 07 MAY 86

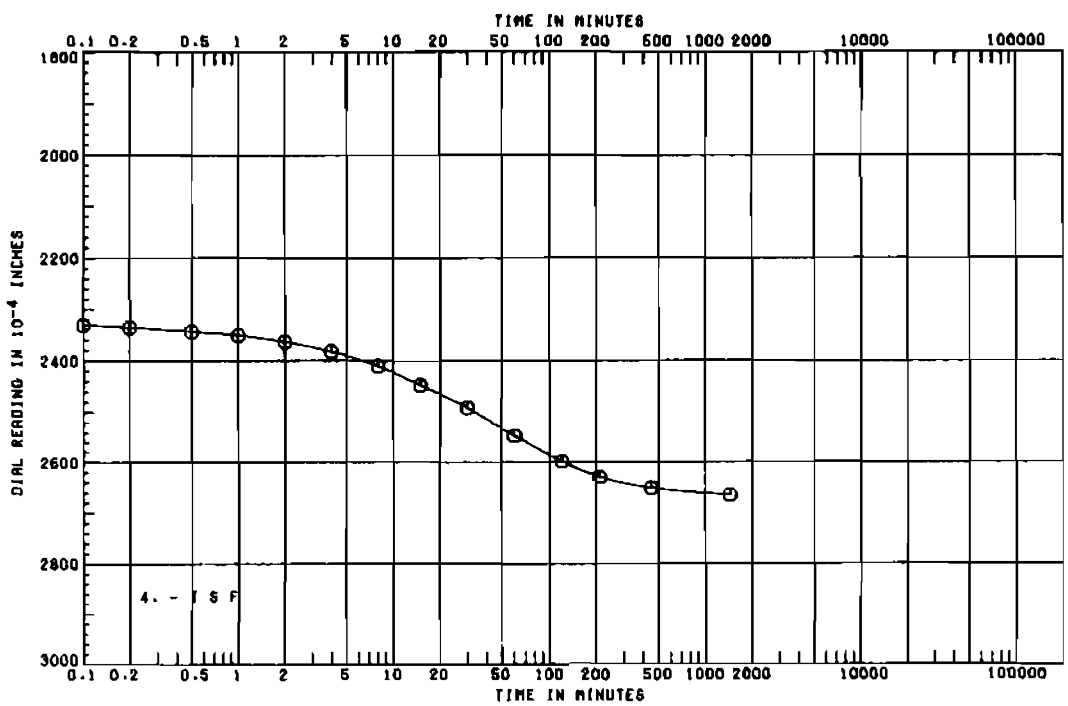
CONSOLIDATION TEST
TIME CURVES

SHEET 5 OF 9



PROJECT LAKE PONT LA & VIC NEW ORLEANS		CONSOLIDATION TEST TIME CURVES
EAST LEV (SOUTH POINT TO GIWW)		
BORING 12-USP	SAMPLE NO. 5-B	
DEPTH/ELEV 15.9	DATE 07 MAY 86	

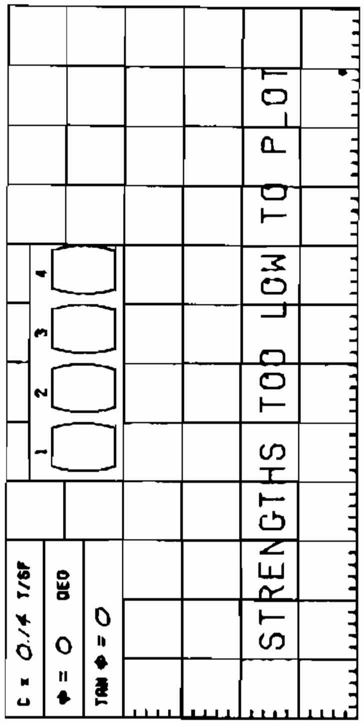
SHEET 8 OF 9



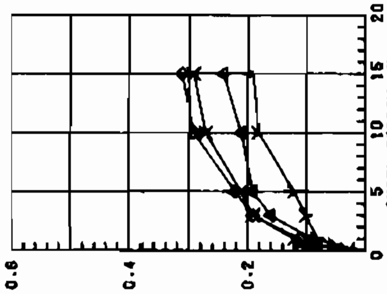
PROJECT LAKE PONT LA & VIC NEW ORLEANS		CONSOLIDATION TEST TIME CURVES
EAST LEV (SOUTH POINT TO GIWW)		
BORING 12-USP	SAMPLE NO. 5-B	
DEPTH/ELEV 15.9	DATE 07 MAY 86	

SHEET 7 OF 9

AVG.
26.03
96.80
94.88



γ Sat = 123



	SPECIMEN NO.	A1	Y2	X3	◇4
INITIAL	WATER CONTENT, %	26.6	26.8	26.3	24.6
	DRY DENSITY, PCF	97.0	95.7	96.7	97.8
	SATURATION, %	97.1	95.1	96.4	91.8
	VOID RATIO	0.737	0.761	0.744	0.723
BEFORE SHEAR	WATER CONTENT, %				
	DRY DENSITY, PCF				
	SATURATION, %				
	VOID RATIO				
	BACK PRESS., TSF				
	MIN PRIN. STRESS, TSF	0.5	1.5	3.0	1.5
	MAX. DEV. STRESS, TSF	0.24	0.18	0.28	0.31
	TIME TO FAILURE, MIN.	30	30	30	30
	RATE OF STRAIN (NCR.%)				
	INITIAL DIAMETER, IN.	1.39	1.39	1.39	1.39
	INITIAL HEIGHT, IN.	3.00	3.00	3.00	3.00

CONTROLLED-STRAIN TEST

DESCRIPTION OF SPECIMENS: CLAY (CL), GRAY & BROWN

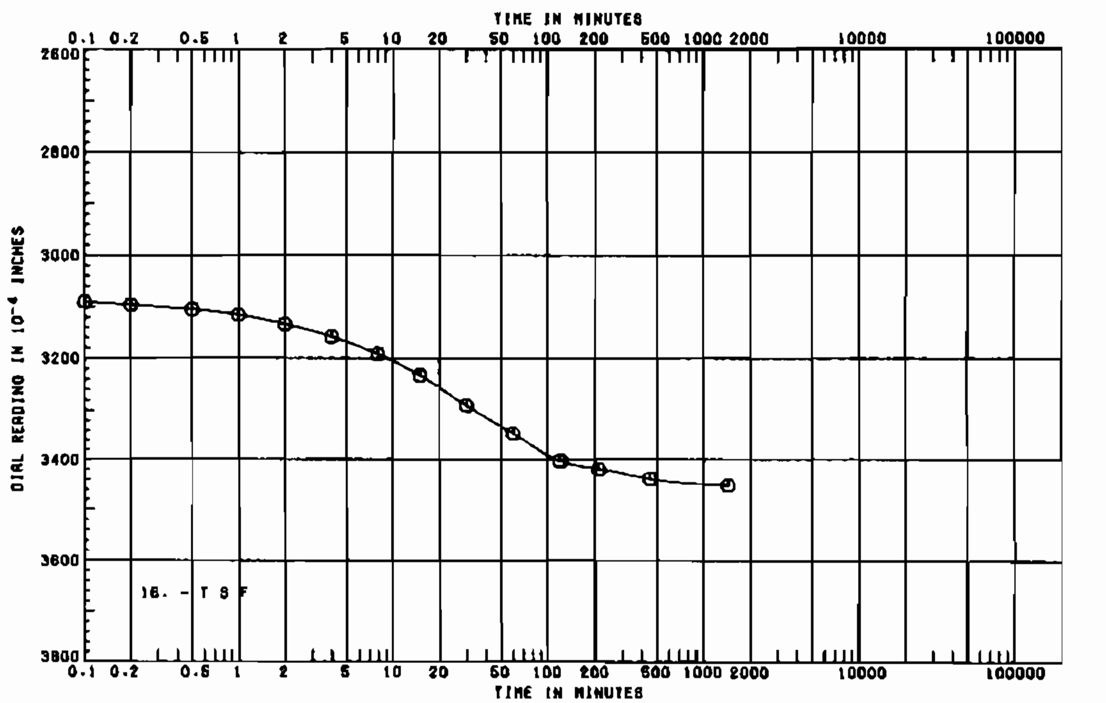
LL	PL	PI	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:

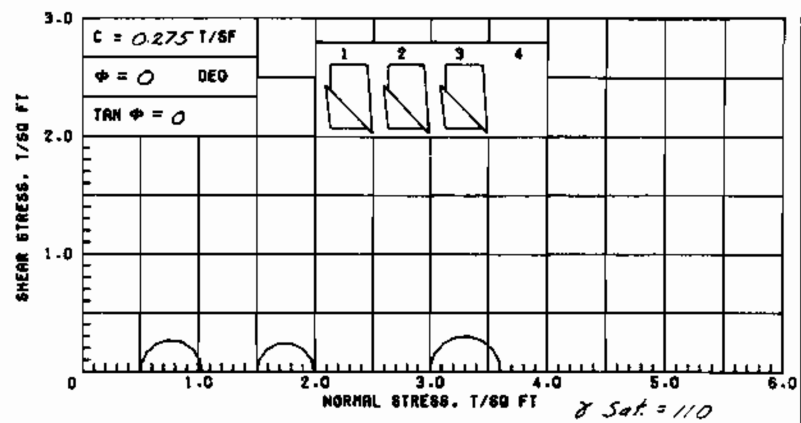
PROJECT LAKE PONT LA & VIC NEW ORLEANS
EAST LEV (SOUTH POINT TO DIMM)

BORING NO. 12-USP | SAMPLE NO. 5-C
DEPTH/ELEV 15.8 | TECH. KOC
LABORATORY USAE WES | DATE 30 APR 86

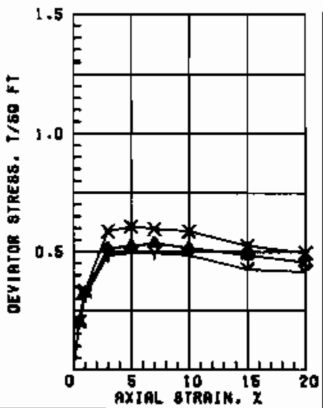
TRIAXIAL COMPRESSION TEST REPORT



PROJECT LAKE PONT LA & VIC NEW ORLEANS		CONSOLIDATION TEST TIME CURVES
EAST LEV (SOUTH POINT TO DIMM)		
BORING 12-USP	SAMPLE NO. 5-B	
DEPTH/ELEV 15.8	DATE 07 MAY 86	



γ Sat. = 110



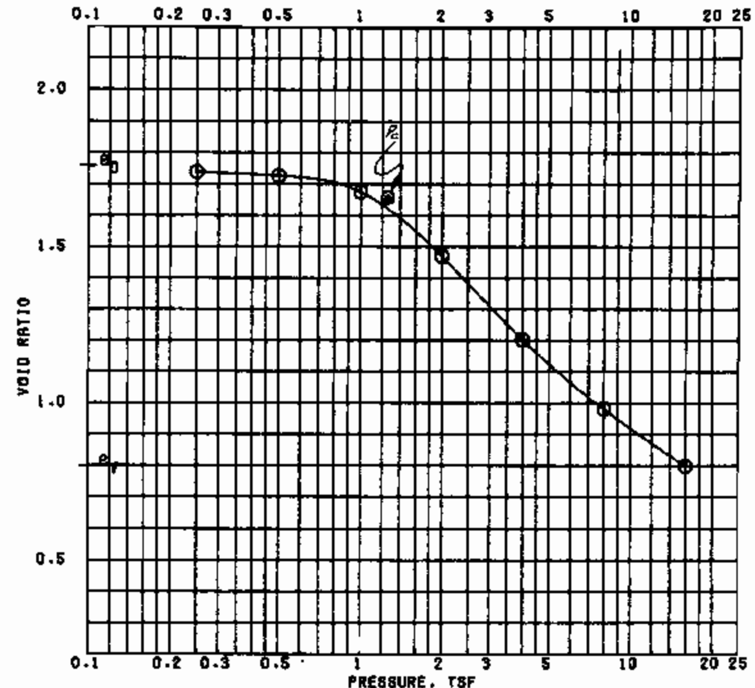
	SPECIMEN NO.	▲1	Y2	X3	4	AVG.
INITIAL	WATER CONTENT, %	46.9	47.1	47.0		47.00
	DRY DENSITY, PCF	75.3	74.7	74.5		74.8
	SATURATION, %	100+	100+	100+		100.0
	VOID RATIO	1.240	1.256	1.261		
BEFORE SHEAR	WATER CONTENT, %					
	DRY DENSITY, PCF					
	SATURATION, %					
	VOID RATIO					
	BACK PRESS., TSF					
	MIN PRIN. STRESS, TSF	0.5	1.5	3.0		
	MAX. DEV. STRESS, TSF	0.54	0.50	0.61		
	TIME TO FAILURE, MIN.	14	10	10		
	RATE OF STRAIN INCR.%					
	INITIAL DIAMETER, IN.	1.39	1.39	1.39		
	INITIAL HEIGHT, IN.	3.00	3.00	3.00		

CONTROLLED-STRAIN TEST

DESCRIPTION OF SPECIMENS: PLASTIC CLAY (CH), GRAY; SILT SEAMS

LL 61	PL 19	PI 42	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:	PROJECT LAKE PONT LA & VIC NEW ORLEANS	
	EAST LEV (SOUTH POINT TO GIWW)	
	BORING NO. 12-USP	SAMPLE NO. 6-B
	DEPTH/ELEV 28.3/-14.7	TECH. KOC
	LABORATORY USAE WES	DATE 02 MAY 86
	TRIAXIAL COMPRESSION TEST REPORT	



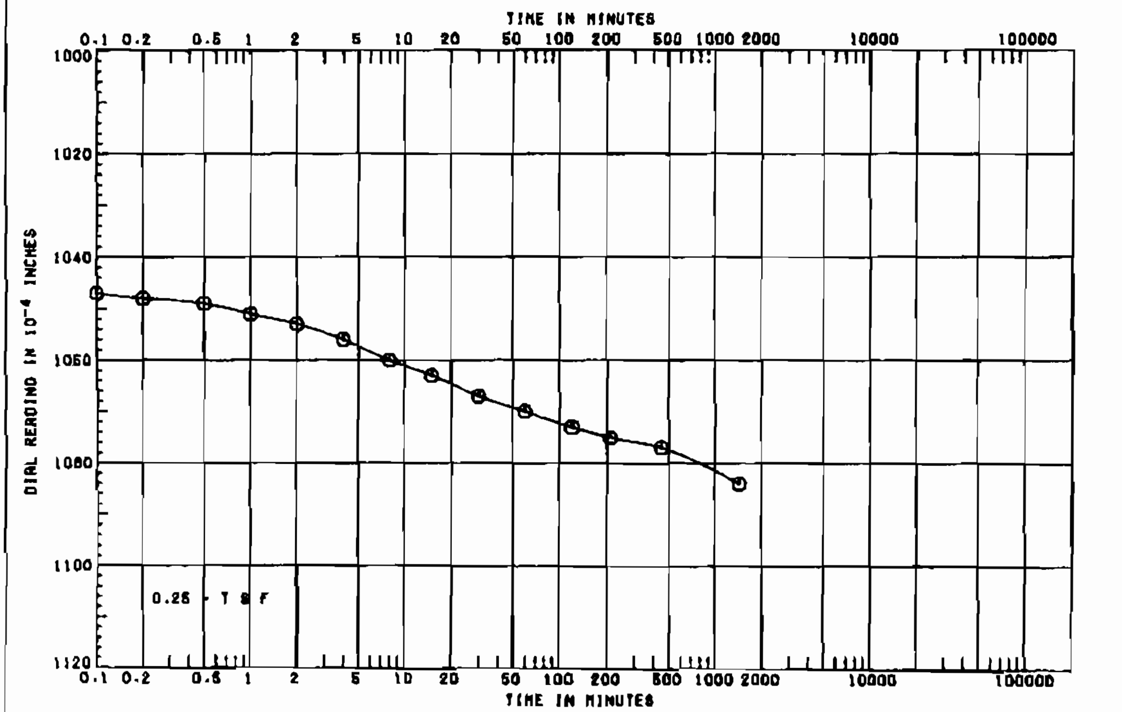
γ Sat. = 102

			BEFORE TEST	AFTER TEST
OVERBURDEN PRESSURE, TSF		WATER CONTENT, %	65.6	32.5
PRECONSOL. PRESSURE, TSF	1.25	DRY DENSITY, PCF	61.2	93.9
COMPRESSION INDEX	0.82	SATURATION, %	100 +	100 +
TYPE SPECIMEN UNDISTURBED		VOID RATIO	1.756	0.795
DIA. IN 4.44	HT. IN 1.124	BACK PRESSURE, TSF		

CLASSIFICATION	PLASTIC CLAY (CH), GRAY		
LL	PL	PI	PROJECT LAKE PONT LA & VIC NEW ORLEANS
GS 2.70 (EST)	D_{10}		EAST LEV (SOUTH POINT TO GIWW)

REMARKS	BORING NO. 12-USP	SAMPLE NO. 6-C
	DEPTH/ELEV 29.2	DATE 07 MAY 86
	CONSOLIDATION TEST REPORT	

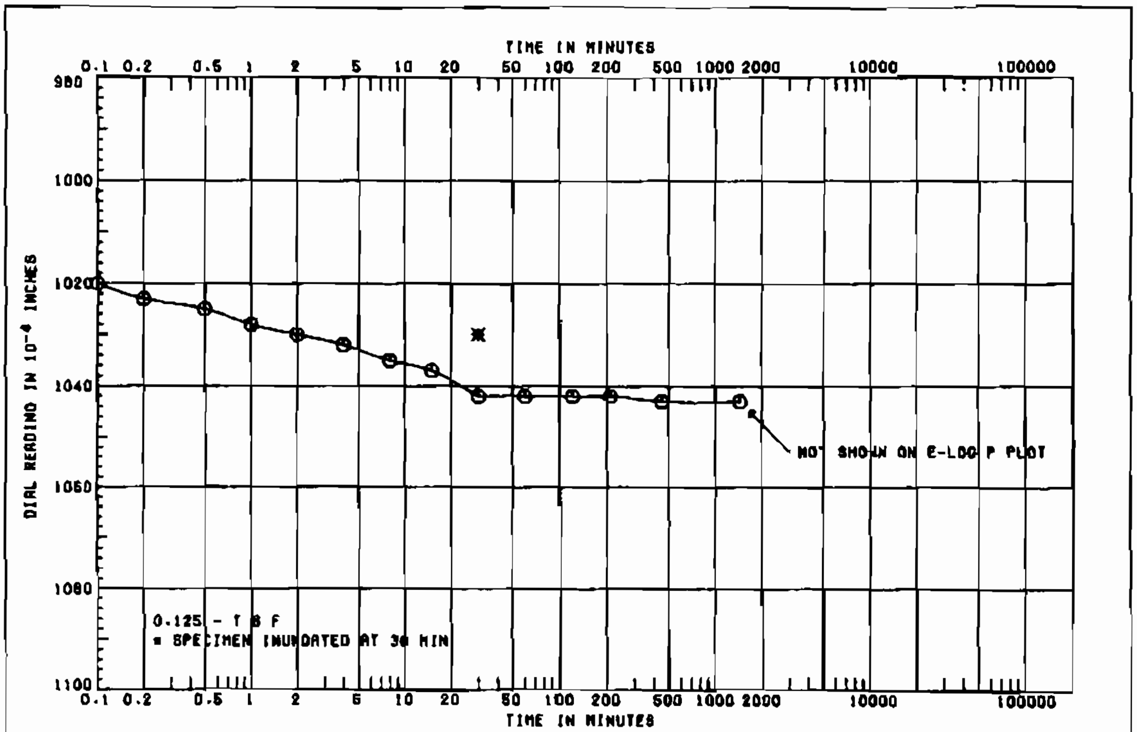
SHEET 1 OF 9



PROJECT LAKE PONT LA & VIC NEW ORLEANS	
EAST LEV (SOUTH POINT TO DIWW)	
BORING 12-USP	SAMPLE NO. 9-C
DEPTH/ELEV 29.2	DATE 07 MAY 86

CONSOLIDATION TEST
TIME CURVES

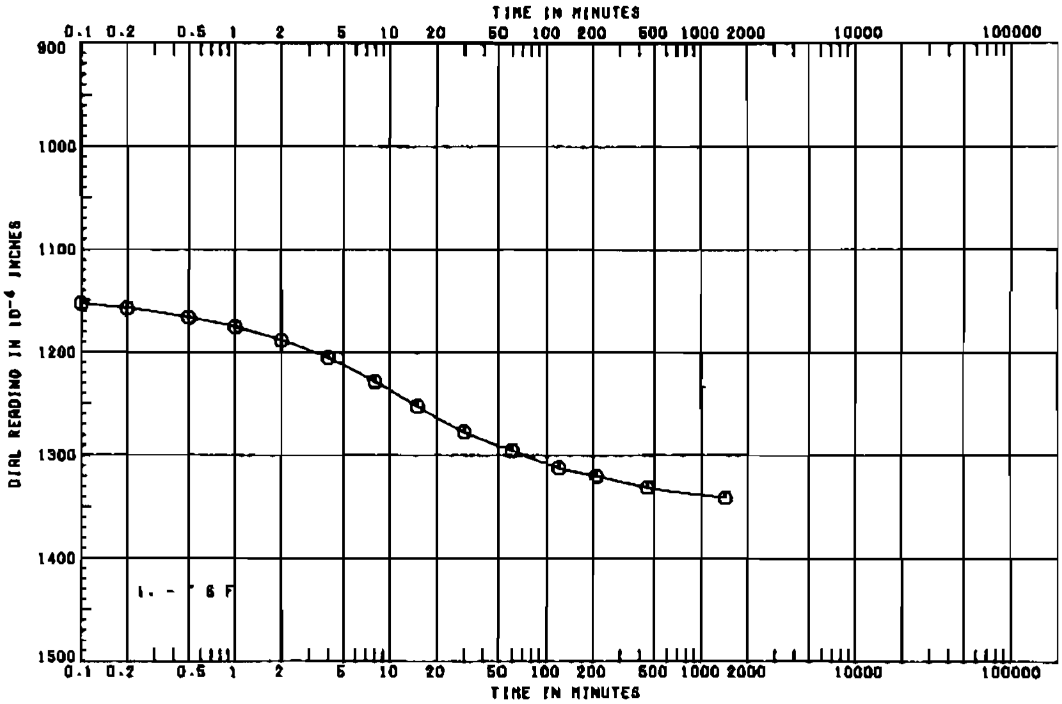
SHEET 3 OF 9



PROJECT LAKE PONT LA & VIC NEW ORLEANS	
EAST LEV (SOUTH POINT TO DIWW)	
BORING 12-USP	SAMPLE NO. 9-C
DEPTH/ELEV 29.2	DATE 07 MAY 86

CONSOLIDATION TEST
TIME CURVES

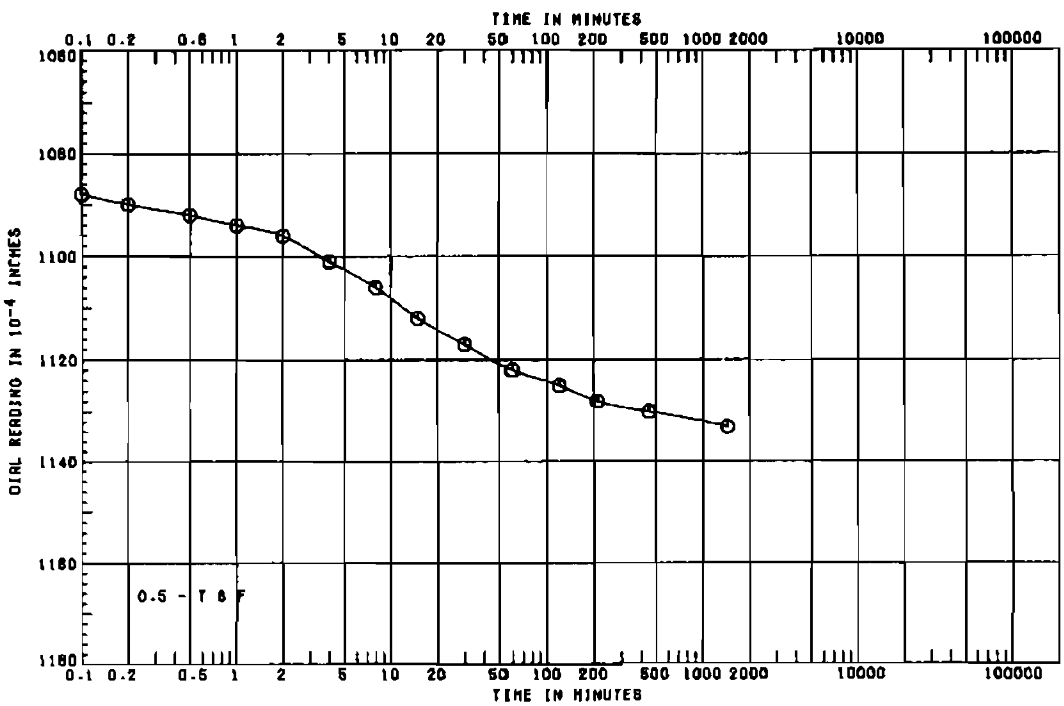
SHEET 2 OF 9



PROJECT LAKE -ONT LA & VIC NEW ORLEANS	
EAST LEV (SOUTH POINT TO GIWW)	
BORING 12-USP	SAMPLE NO. 8-C
DEPTH/ELEV 29.2	DATE 07 MAY 86

CONSOLIDATION TEST
TIME CURVES

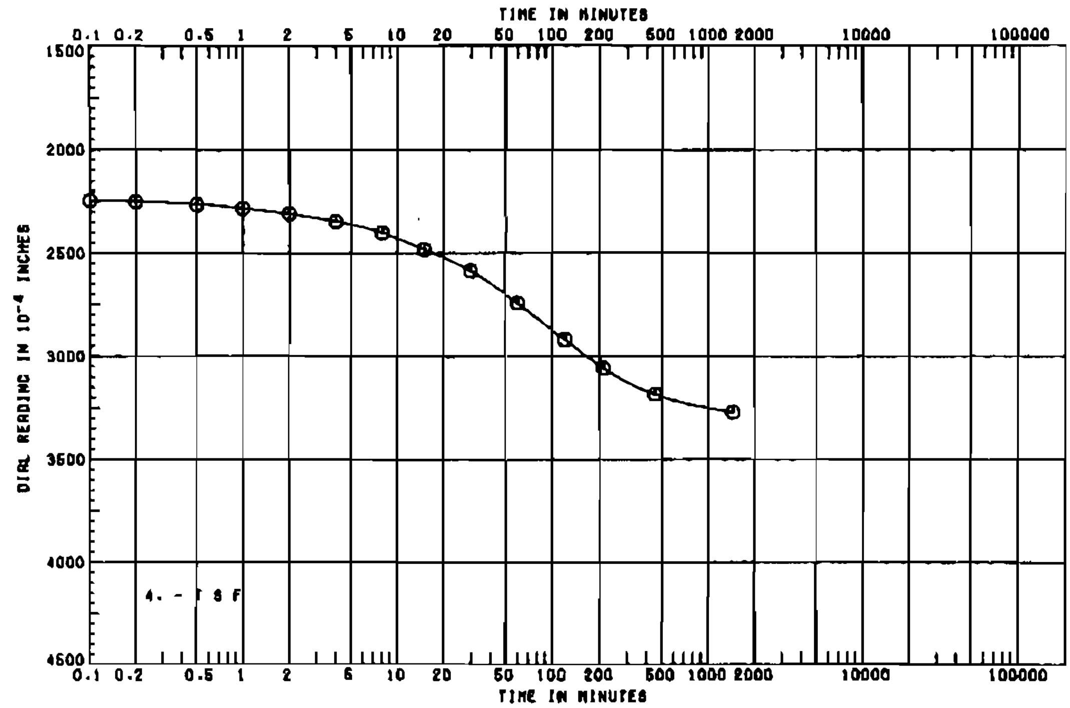
SHEET 5 OF 9



PROJECT LAKE PONT LA & VIC NEW ORLEANS	
EAST LEV (SOUTH POINT TO GIWW)	
BORING 12-USP	SAMPLE NO. 8-C
DEPTH/ELEV 29.2	DATE 07 MAY 86

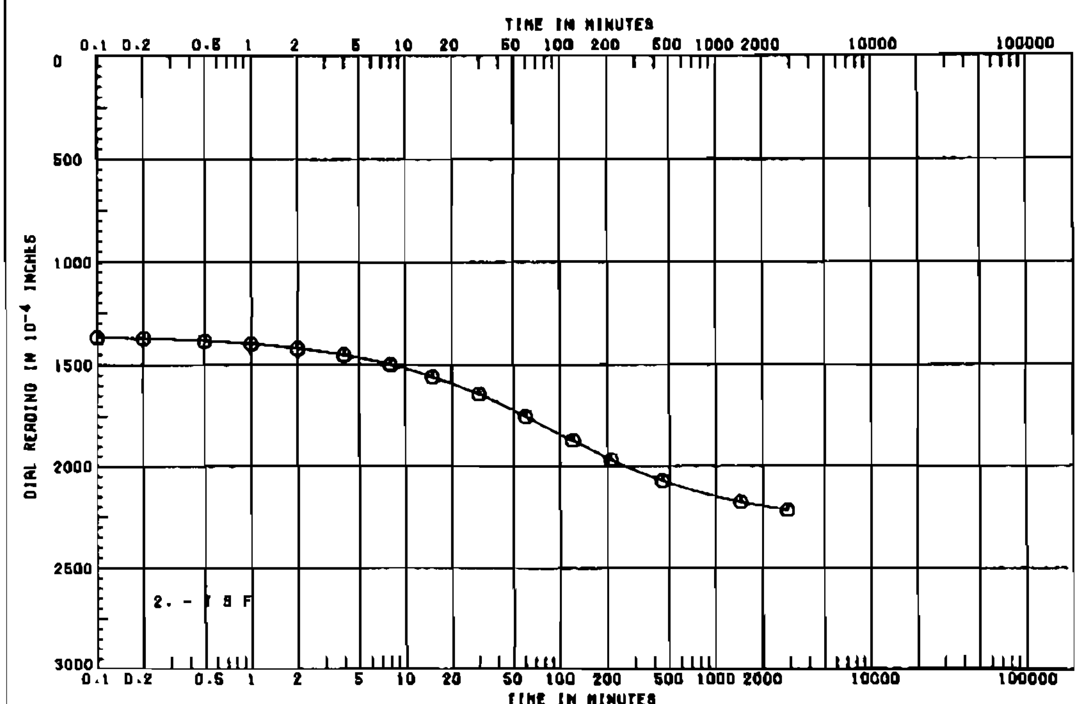
CONSOLIDATION TEST
TIME CURVES

SHEET 4 OF 9



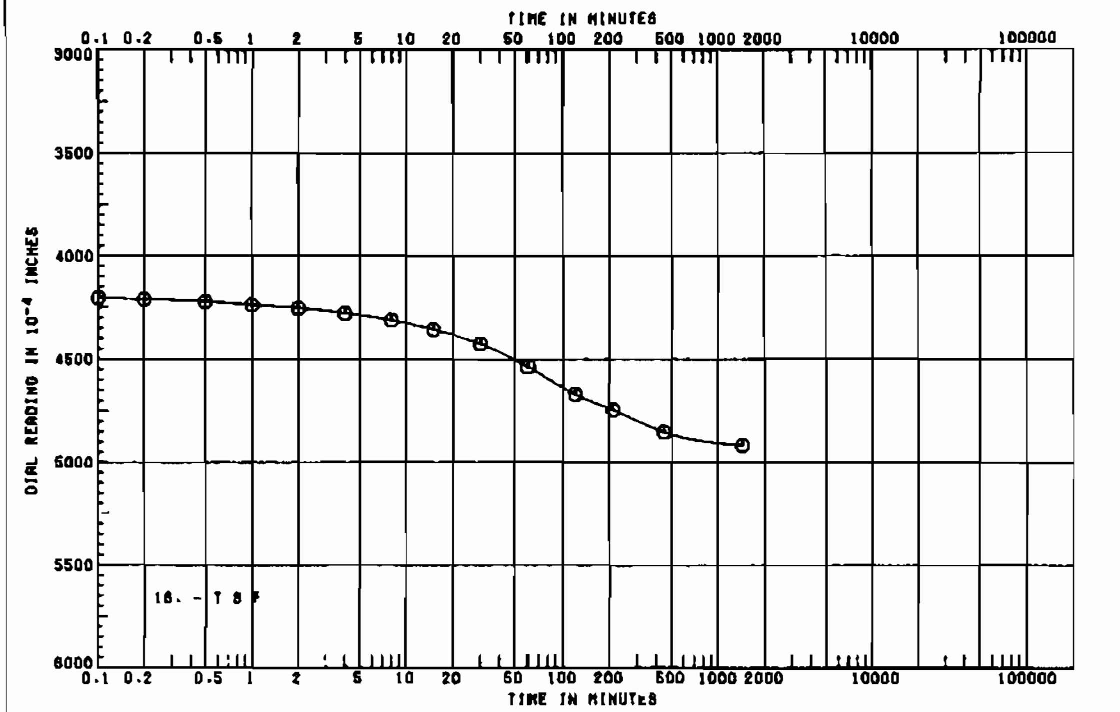
PROJECT LAKE PONT LA & VIC NEW ORLEANS		CONSOLIDATION TEST TIME CURVES
EAST LEV (SOUTH POINT TO GIWW)		
BORING 12-USP	SAMPLE NO. 9-C	
DEPTH/ELEV 29.2	DATE 07 MAY 86	

SHEET 7 OF 9



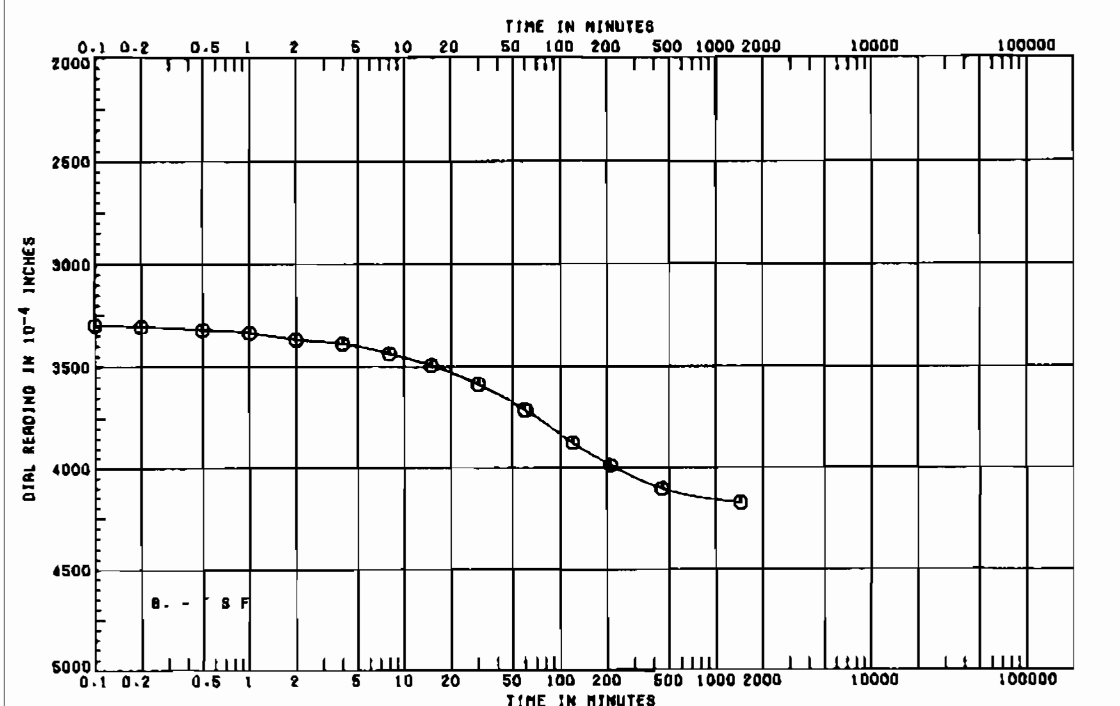
PROJECT LAKE PONT LA & VIC NEW OR'EANS		CONSOLIDATION TEST TIME CURVES
EAST LEV (SOUTH POINT TO GIWW)		
BORING 12-USP	SAMPLE NO. 9-C	
DEPTH/ELEV 29.2	DATE 07 MAY 86	

SHEET 6 OF 9



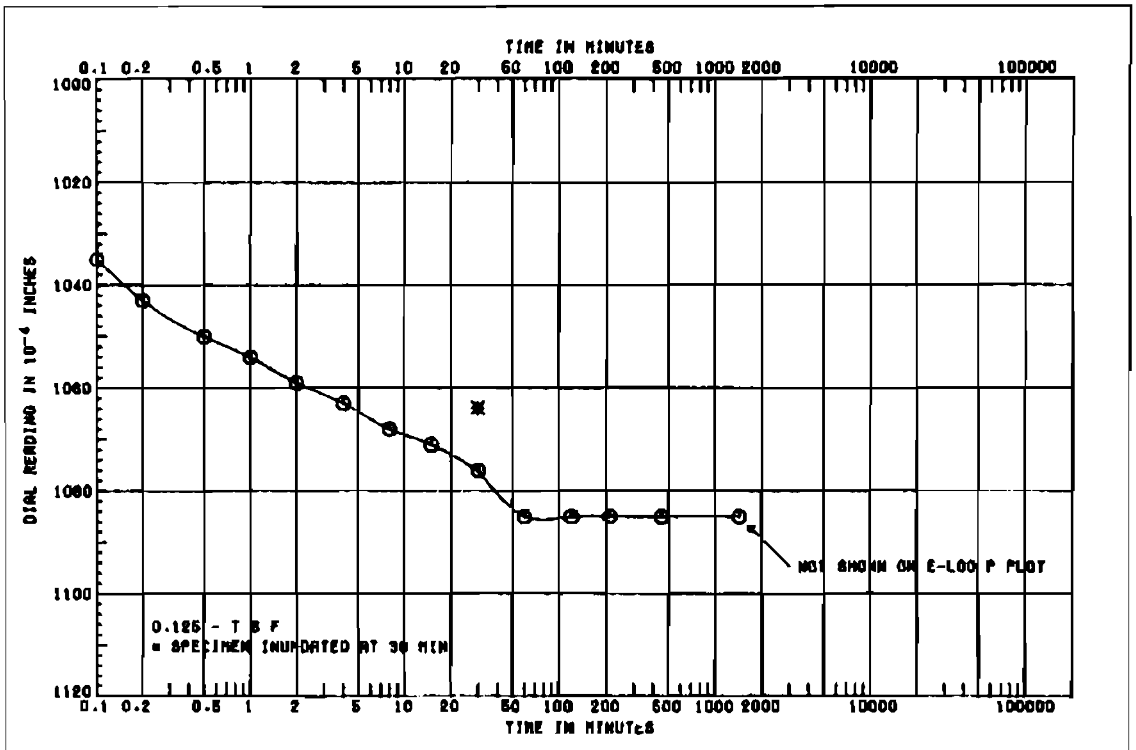
PROJECT LAKE PONT LA & VIC NEW ORLEANS		CONSOLIDATION TEST TIME CURVES
EAST LEV (SOUTH POINT TO OIWW)		
BORING 12-USP	SAMPLE NO. 8-C	
DEPTH/ELEV 29.2	DATE 07 MAY 86	

SHEET 9 OF 9



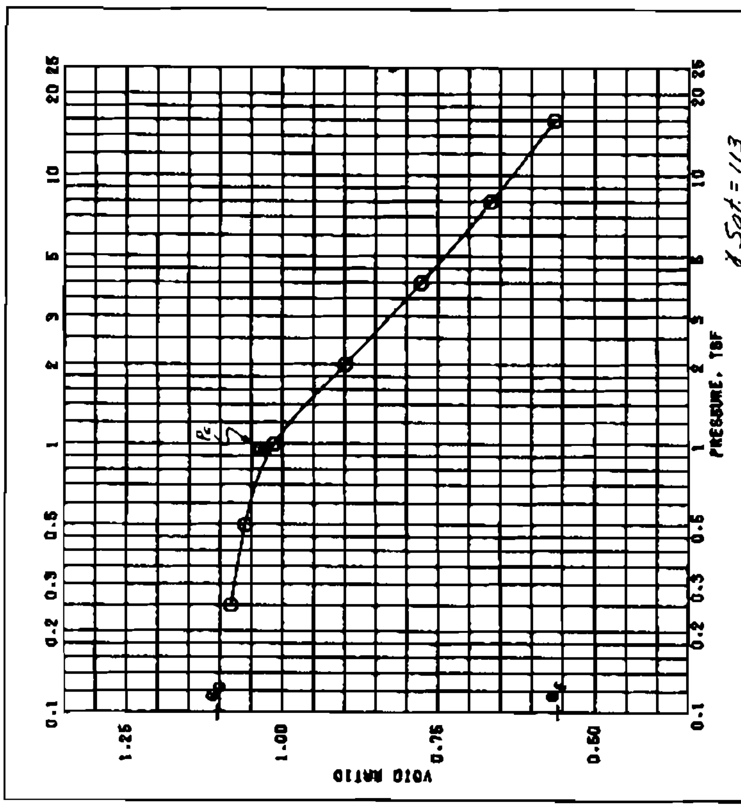
PROJECT LAKE PONT LA & VIC NEW ORLEANS		CONSOLIDATION TEST TIME CURVES
EAST LEV (SOUTH POINT TO OIWW)		
BORING 12-USP	SAMPLE NO. 8-C	
DEPTH/ELEV 29.2	DATE 07 MAY 86	

SHEET 8 OF 9



PROJECT LAKE PONT LA & VIC NEW ORLEANS		CONSOLIDATION TEST TIME CURVES
EAST LEV (SOUTH POINT TO GIWW)		
BORING 12-USP	SAMPLE NO. 10-B	
DEPTH/ELEV 36.1	DATE 15 MAY 86	

SHEET 2 OF 9



γ Sat = 113

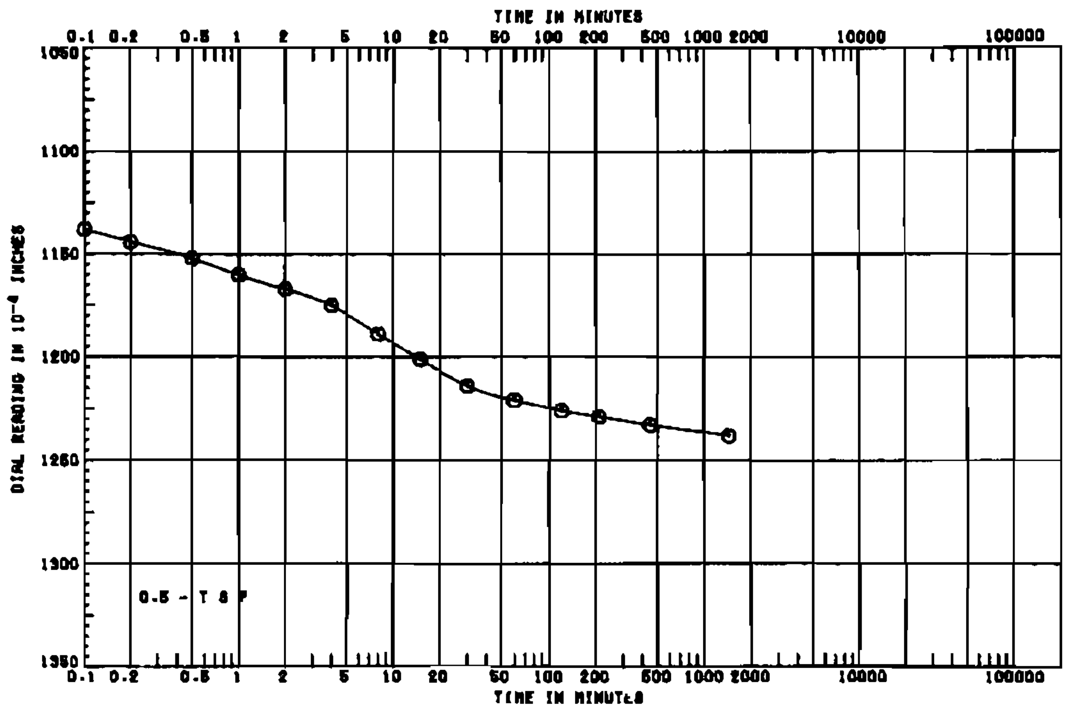
				BEFORE TEST	AFTER TEST
OVERBURDEN PRESSURE, TSF			WATER CONTENT, %	38.9	22.1
PRECONSOL. PRESSURE, TSF	0.95		DRY DENSITY, PCF	80.2	108.9
COMPRESSION INDEX	0.42		SATURATION, %	95.4	100 +
TYPE SPECIMEN	UNDISTURBED		VOID RATIO	1.102	0.556
DIA. IN 4.44	HT. IN 1.129		BACK PRESSURE, TSF		

CLASSIFICATION PLASTIC CLAY (CH), GRAY		
LL 62	PL 16	PI 46
GS 2.70 (EST)	D_{10}	
REMARKS		

PROJECT LAKE PONT LA & VIC NEW ORLEANS	
EAST LEV (SOUTH POINT TO GIWW)	
BORING NO. 12-USP	SAMPLE NO. 10-B
DEPTH/ELEV 36.1	DATE 15 MAY 86

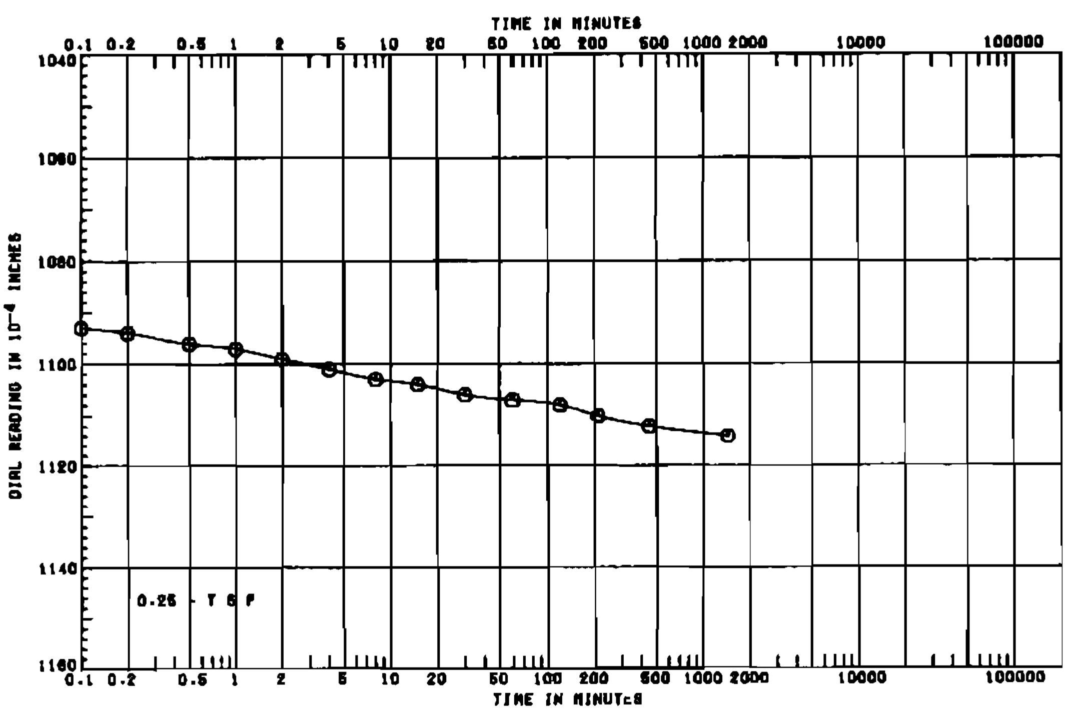
CONSOLIDATION TEST REPORT

SHEET 1 OF 9



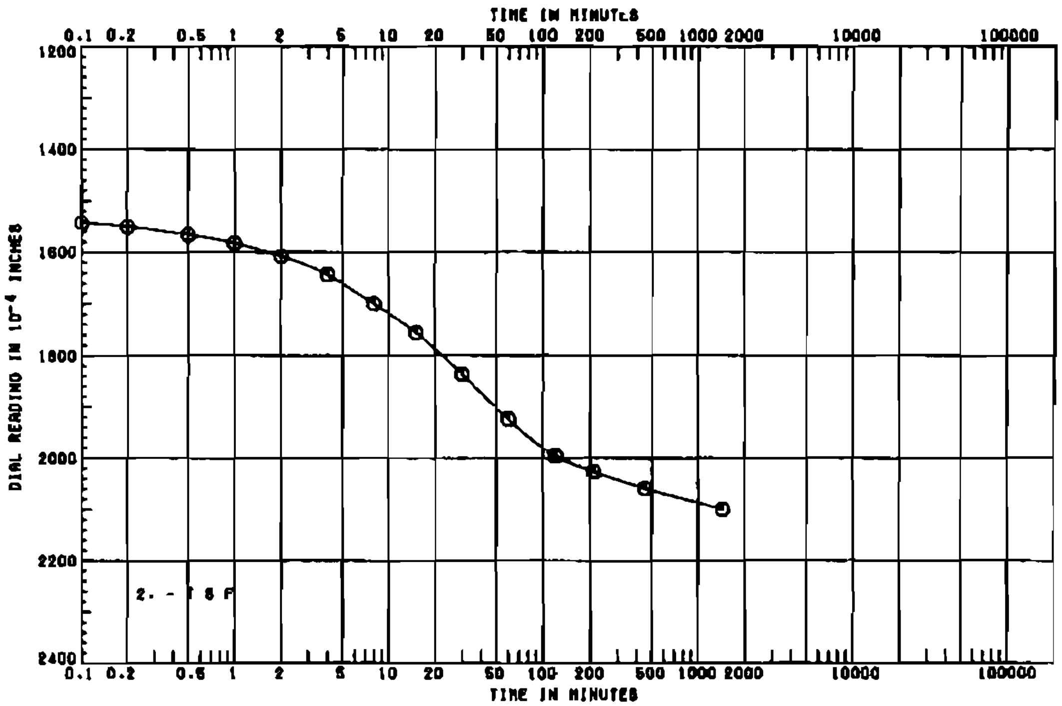
PROJECT LAKE PONT LA & VIC NEW ORLEANS		CONSOLIDATION TEST TIME CURVES
EAST LEV (SOUTH POINT TO GIWW)		
BORING 12-USF	SAMPLE NO. 10-B	
DEPTH/ELEV 38.1	DATE 15 MAY 86	

SHEET 4 OF 9



PROJECT LAKE PONT LA & VIC NEW ORLEANS		CONSOLIDATION TEST TIME CURVES
EAST LEV (SOUTH POINT TO GIWW)		
BORING 12-USF	SAMPLE NO. 10-B	
DEPTH/ELEV 38.1	DATE 15 MAY 86	

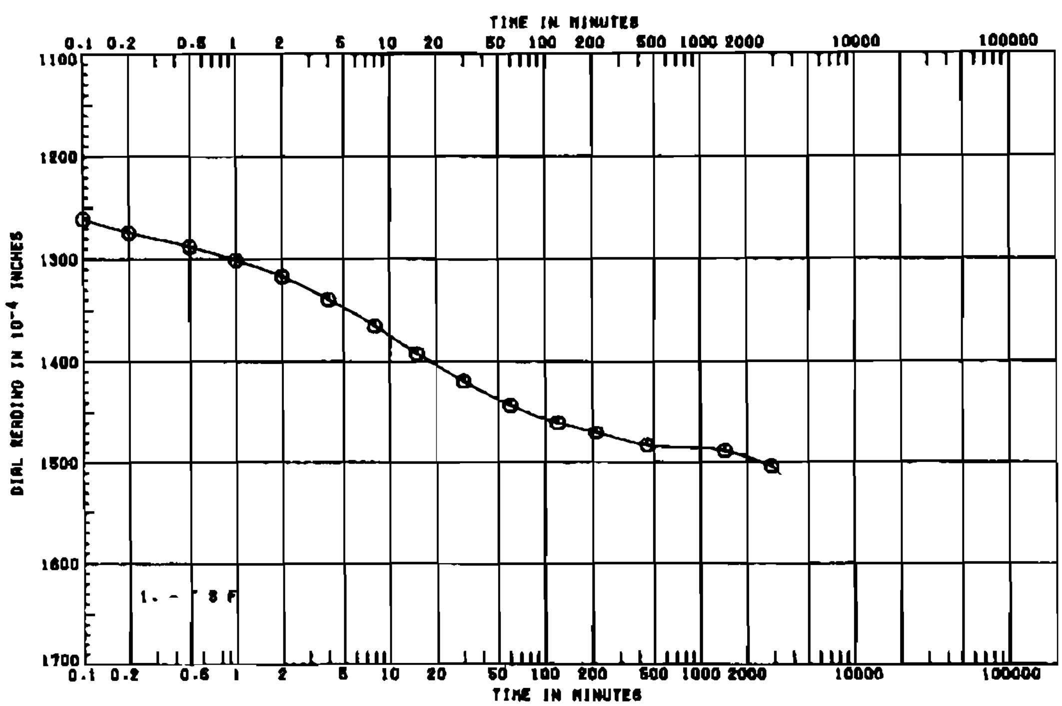
SHEET 3 OF 9



PROJECT LAKE PONT LA & VIC NEW ORLEANS	
EAST LEV (SOUTH POINT TO GIWW)	
BORING 12-USP	SAMPLE NO. 10-8
DEPTH/ELEV 36.1	DATE 15 MAY 86

CONSOLIDATION TEST
TIME CURVES

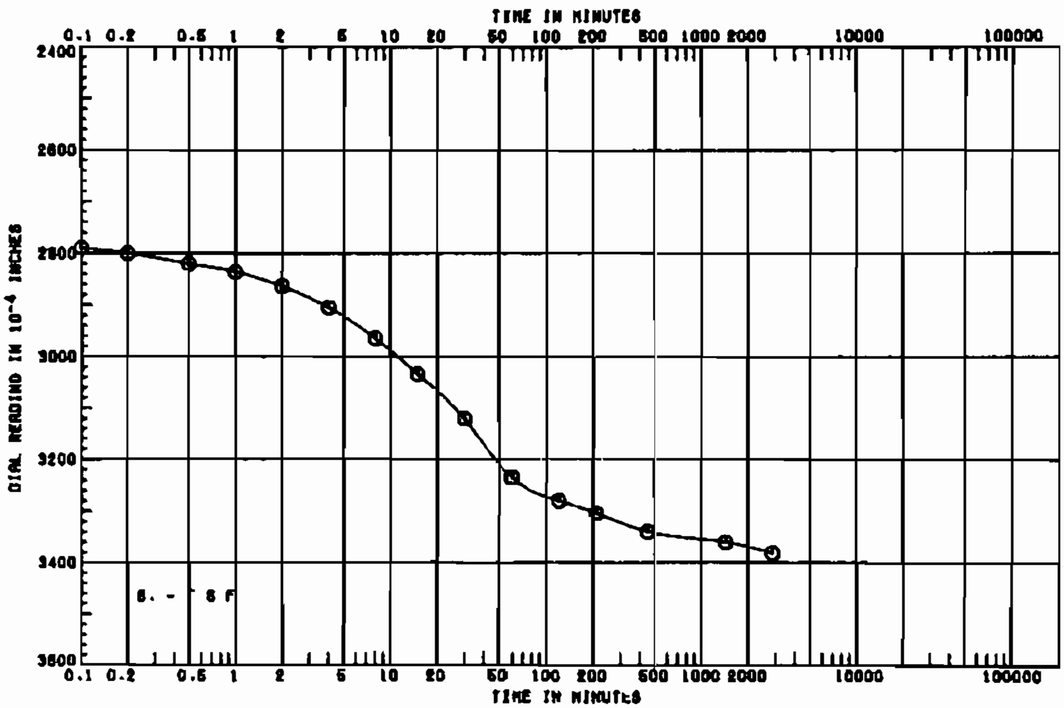
SHEET 6 OF 9



PROJECT LAKE PONT LA & VIC NEW ORLEANS	
EAST LEV (SOUTH POINT TO GIWW)	
BORING 12-USP	SAMPLE NO. 10-8
DEPTH/ELEV 36.1	DATE 15 MAY 86

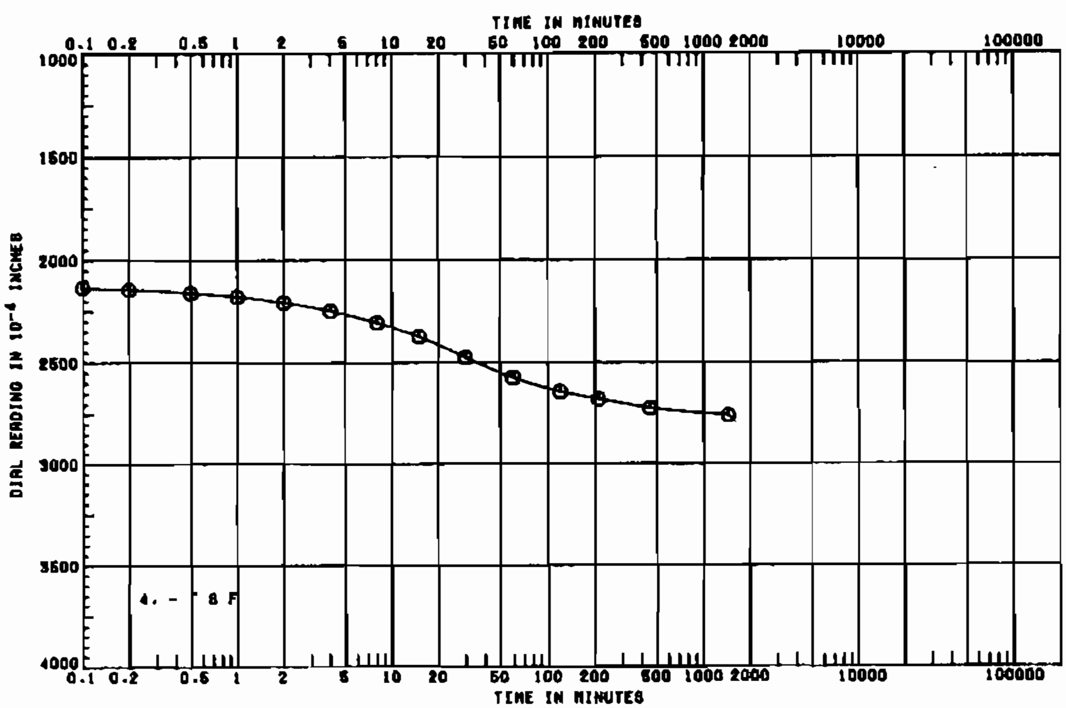
CONSOLIDATION TEST
TIME CURVES

SHEET 5 OF 9



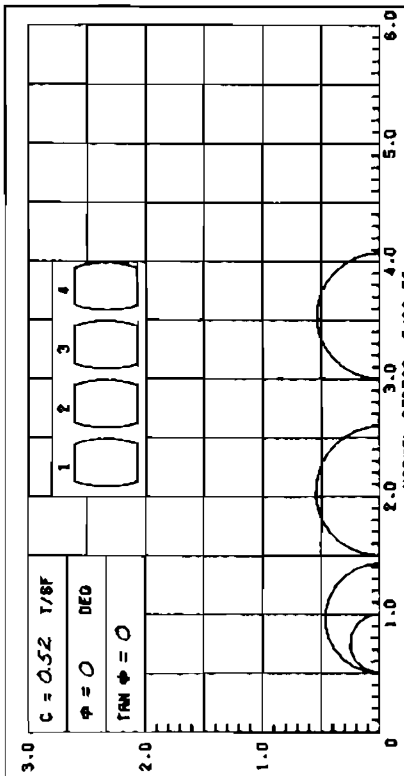
PROJECT LAKE PONT LA & VIC NEW ORLEANS		CONSOLIDATION TEST TIME CURVES
EAST LEV (SOUTH POINT TO GIWW)		
BORING 12-USF	SAMPLE NO. 10-8	
DEPTH/ELEV 38.1	DATE 15 MAY 86	

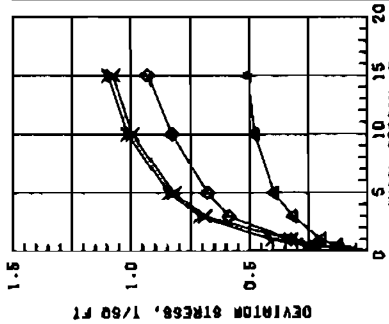
SHEET 8 OF 9



PROJECT LAKE PONT LA & VIC NEW ORLEANS		CONSOLIDATION TEST TIME CURVES
EAST LEV (SOUTH POINT TO GIWW)		
BORING 12-USF	SAMPLE NO. 10-8	
DEPTH/ELEV 38.1	DATE 15 MAY 86	

SHEET 7 OF 9





	SPECIMEN NO.	▲1	Y2	X3	◆4	AVG.
INITIAL	WATER CONTENT, %	21.7	20.6	21.6	21.5	21.23
	DRY DENSITY, PCF	97.0	101.9	102.0	102.3	102.3
	SATURATION, %	79.3	85.1	89.3	89.6	88.3
	VOID RATIO	0.739	0.654	0.653	0.648	
BEFORE SHEAR	WATER CONTENT, %					
	DRY DENSITY, PCF					
	SATURATION, %					
	VOID RATIO					
	BACK PRESS., TSF					
	MIN PRIN. STRESS, TSF	0.5	1.5	3.0	0.5	
	MAX. DEV. STRESS, TSF	0.51	1.10	1.08	0.93	
	TIME TO FAILURE, MIN.	30	30	30	30	
	RATE OF STRAIN INCR.%					
	INITIAL DIAMETER, IN.	1.39	1.39	1.39	1.38	
	INITIAL HEIGHT, IN.	3.00	3.00	3.00	3.00	

CONTROLLED-STRAIN TEST

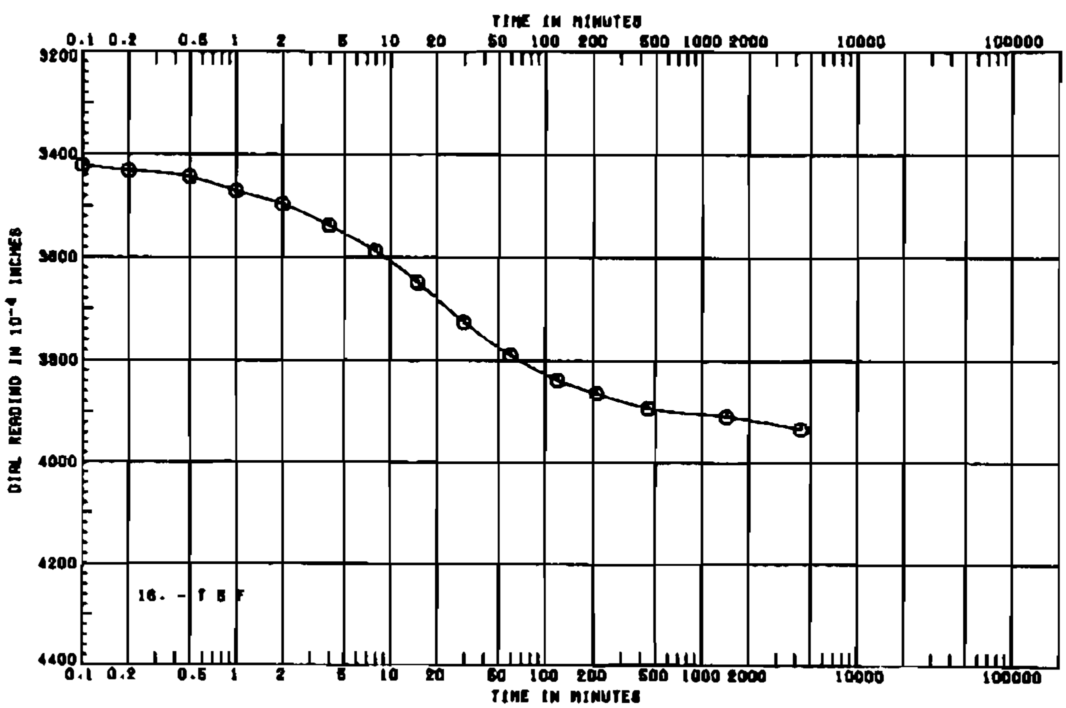
DESCRIPTION OF SPECIMENS: CLAY (CL), BROWN

LL 31	PL 13	PI 18	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:

PROJECT LAKE PONT LA & VIC NEW ORLEANS	
EAST LEV (SOUTH POINT TO GIWW)	
BORING NO. 13-USP	SAMPLE NO. 3-B
DEPTH/ELEV 9.3	TECH. KGC
LABORATORY USAE WES	DATE 05 MAY 86

TRIAXIAL COMPRESSION TEST REPORT

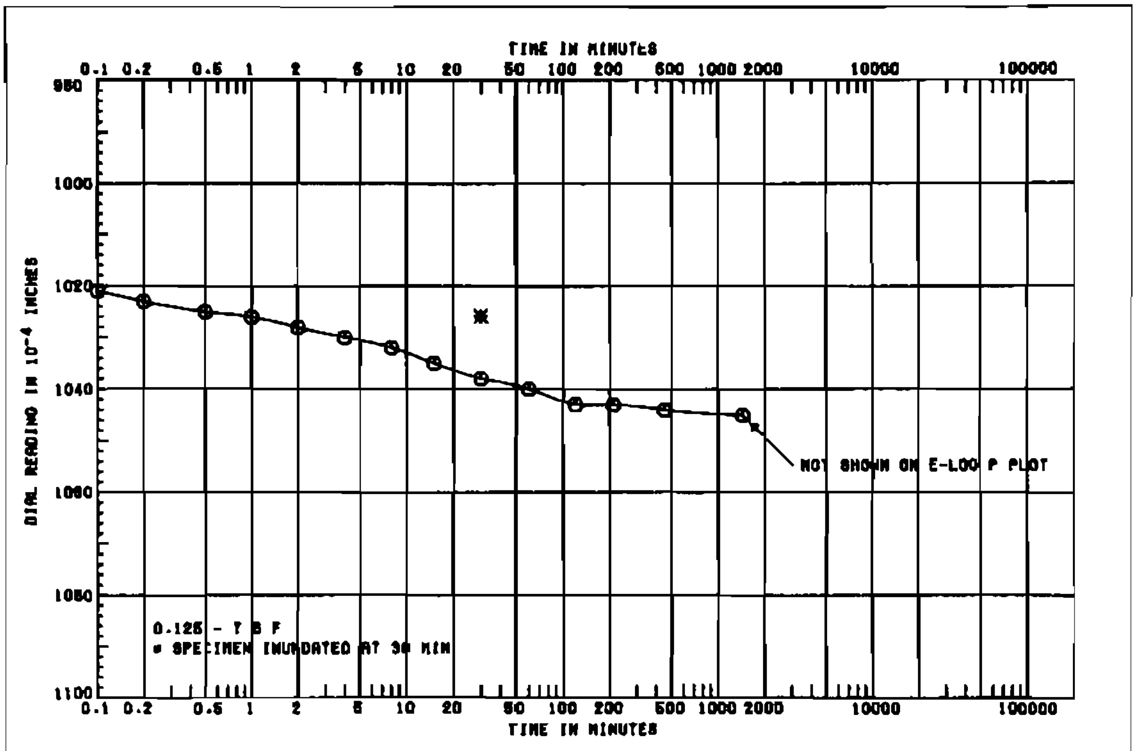


PROJECT LAKE PONT LA & VIC NEW ORLEANS	
EAST LEV (SOUTH POINT TO GIWW)	
BORING 12-USP	SAMPLE NO. 10-5
DEPTH/ELEV 36.1	DATE 15 MAY 86

CONSOLIDATION TEST

TIME CURVES

SHEET 8 OF 9

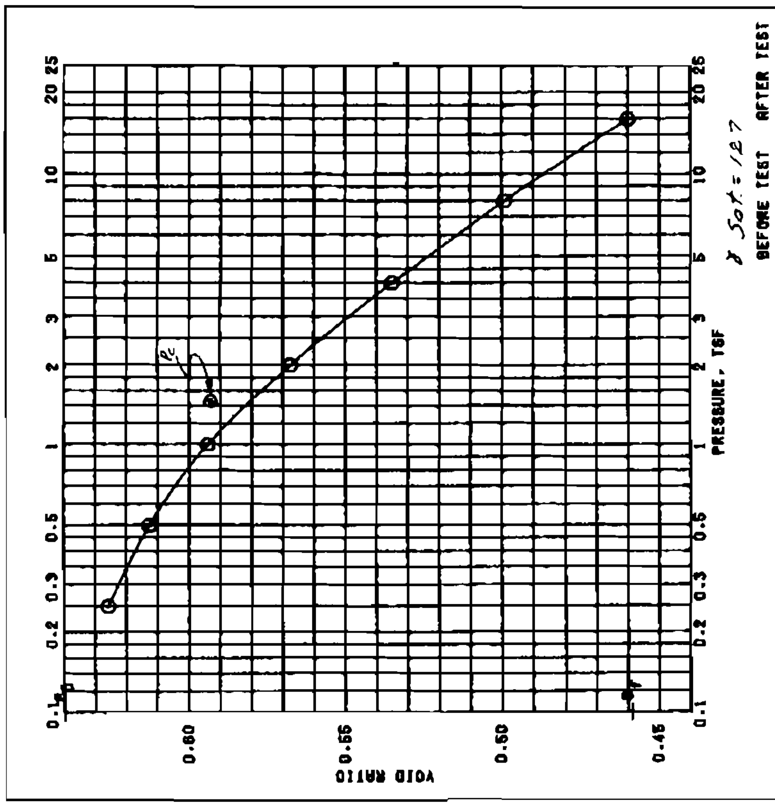


PROJECT LAKE PONT LA & VIC NEW ORLEANS	
EAST LEV (SOUTH POINT TO GIWW)	
BORING 13-USP	SAMPLE NO. 3-C
DEPTH/ELEV 9.2	DATE 16 MAY 86

CONSOLIDATION TEST

TIME CURVES

SHEET 2 OF 9



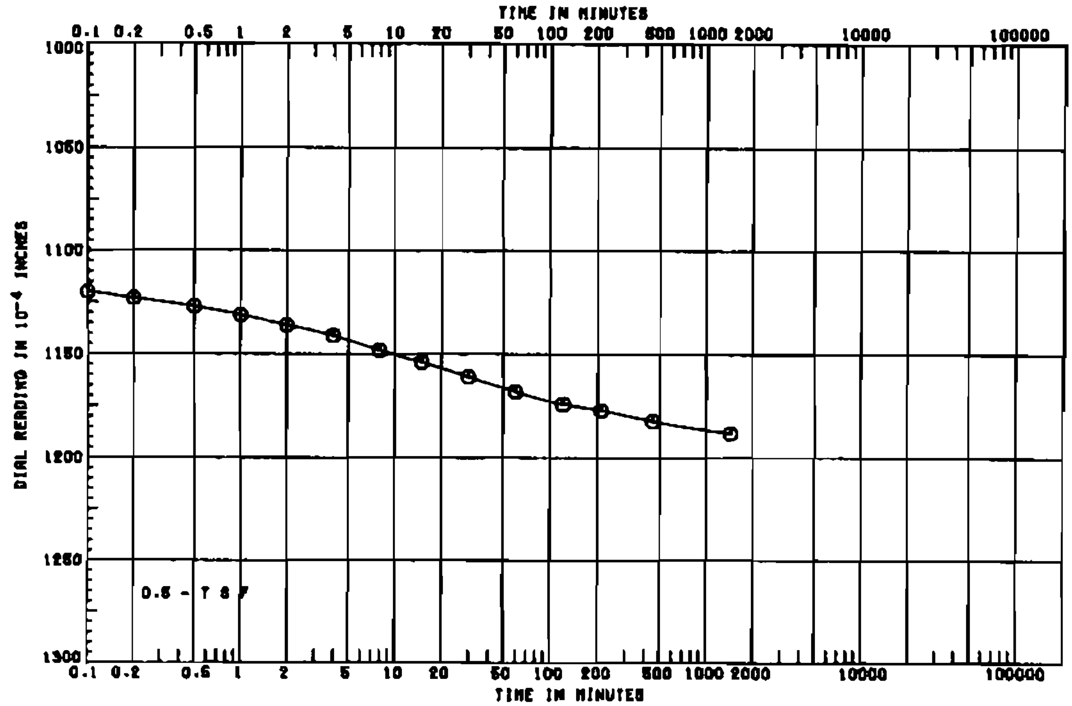
γ Sat = 127

			BEFORE TEST	AFTER TEST
OVERBURDEN PRESSURE, TSF		WATER CONTENT, %	19.9	16.0
PRECONSOL. PRESSURE, TSF	1.45	DRY DENSITY, PCF	102.8	115.6
COMPRESSION INDEX	0.13	SATURATION, %	84.2	98.9
TYPE SPECIMEN	UNDISTURBED	VOID RATIO	0.640	0.458
DIA. IN 4.44	HT. IN 1.130	BACK PRESSURE, TSF		

CLASSIFICATION CLAY (CL), LIGHT GRAY; FINE SAND POCKETS				
LL	PL	PI	PROJECT LAKE PONT LA & VIC NEW ORLEANS	
GS 2.70 (EST)		D_{10}	EAST LEV (SOUTH POINT TO GIWW)	
REMARKS			BORING NO. 13-USP	SAMPLE NO. 3-C
			DEPTH/ELEV 9.2	DATE 16 MAY 86

CONSOLIDATION TEST REPORT

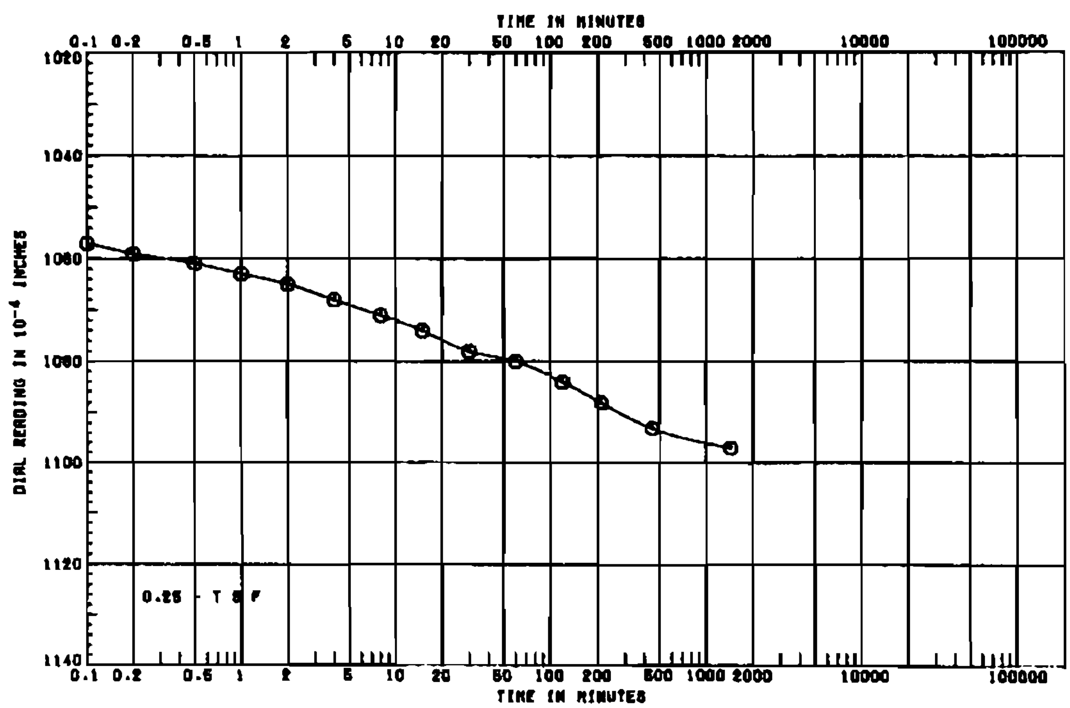
SHEET 1 OF 9



PROJECT LAKE PONT LA & VIC NEW ORLEANS	
EAST LEV (SOUTH POINT TO GIWW)	
BORING 13-USP	SAMPLE NO. 3-C
DEPTH/ELEV 9.2	DATE 16 MAY 66

CONSOLIDATION TEST
TIME CURVES

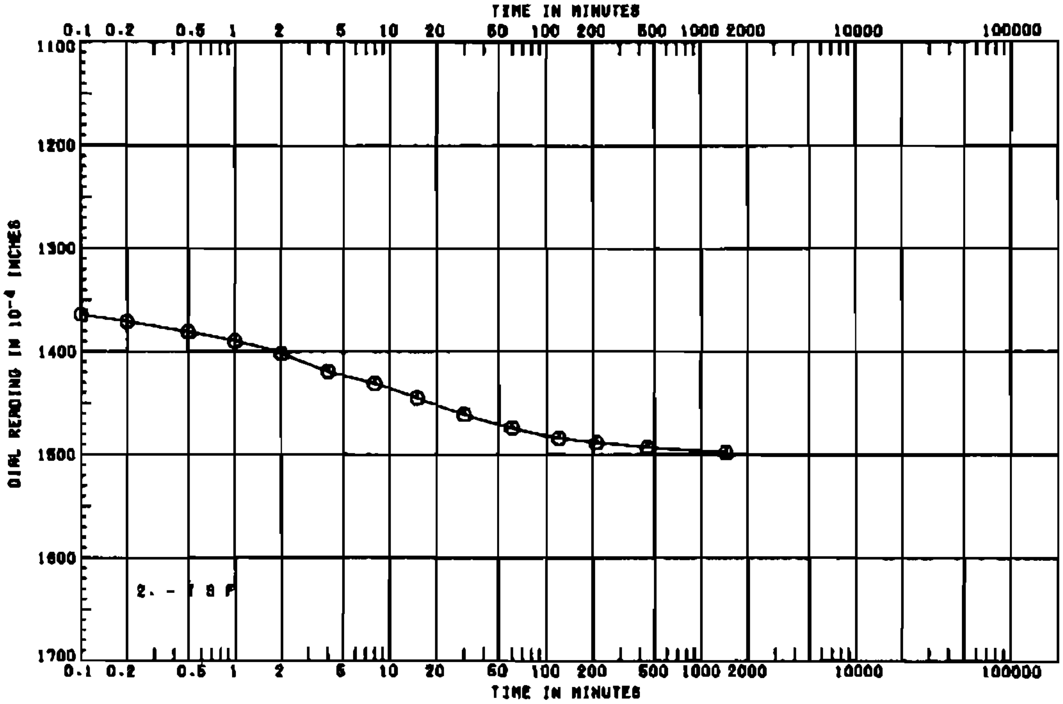
SHEET 4 OF 9



PROJECT LAKE PONT LA & VIC NEW ORLEANS	
EAST LEV (SOUTH POINT TO GIWW)	
BORING 13-USP	SAMPLE NO. 3-C
DEPTH/ELEV 9.2	DATE 16 MAY 66

CONSOLIDATION TEST
TIME CURVES

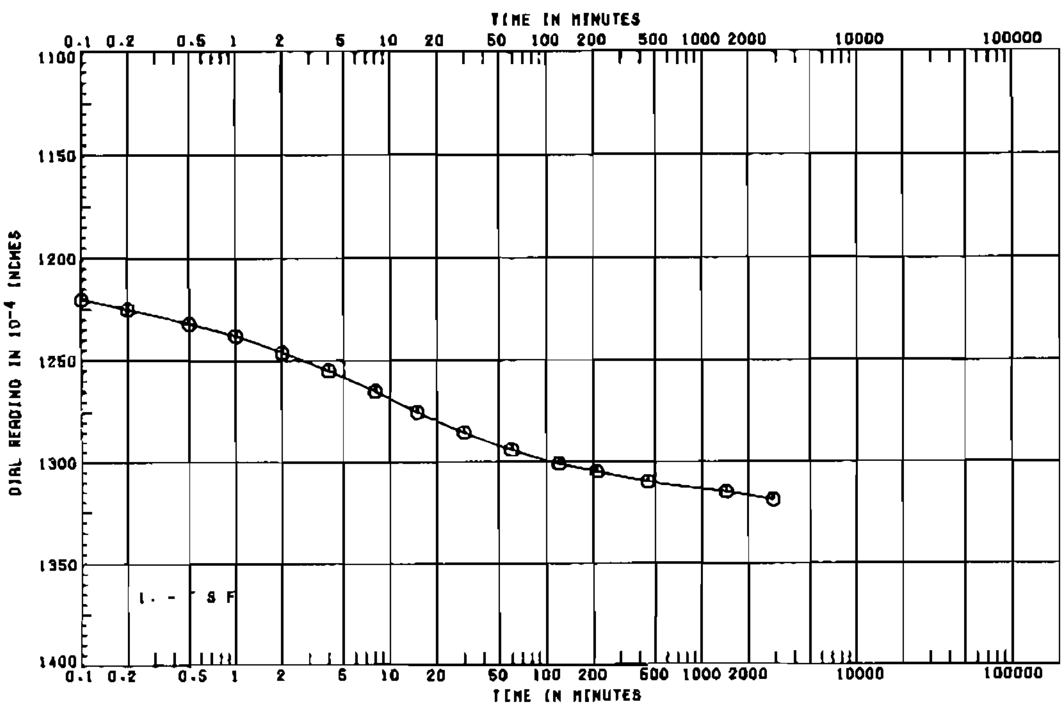
SHEET 3 OF 9



PROJECT LAKE PONT LA & VIC NEW ORLEANS	
EAST LEV (SOUTH POINT TO GIWW)	
BORING 13-USP	SAMPLE NO. 3-C
DEPTH/ELEV 9.2	DATE 16 MAY 86

CONSOLIDATION TEST
TIME CURVES

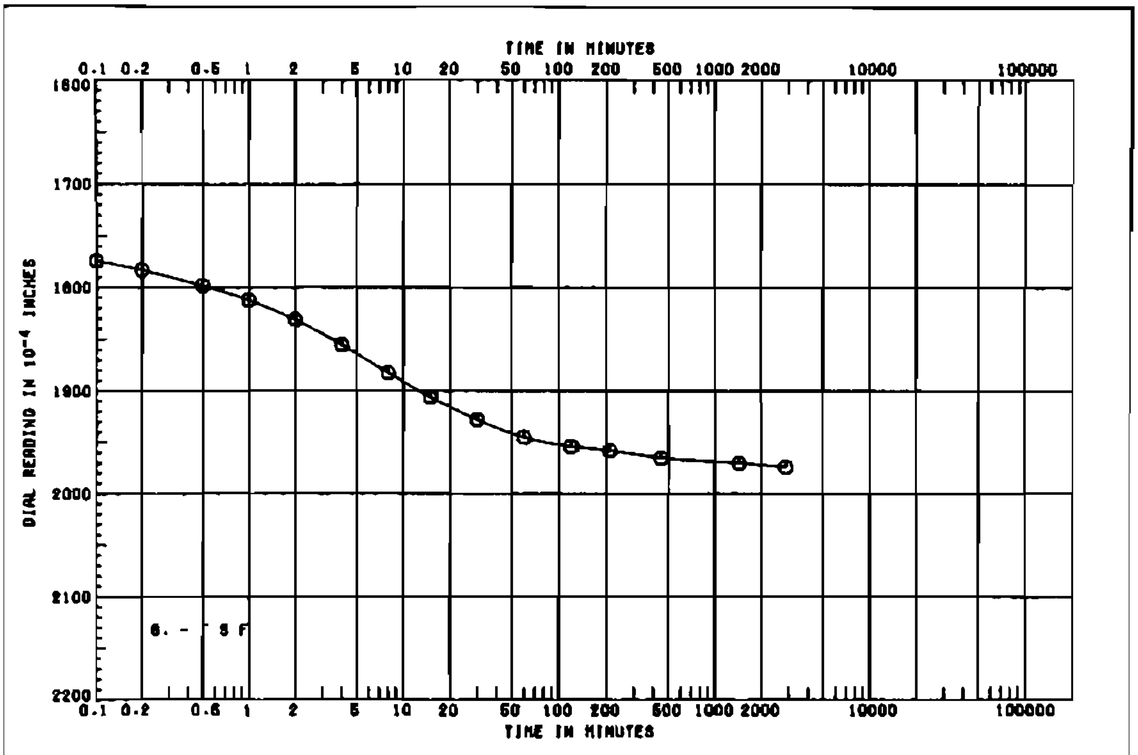
SHEET 6 OF 9



PROJECT LAKE PONT LA & VIC NEW OR EANS	
EAST LEV (SOUTH POINT TO GIWW)	
BORING 13-USP	SAMPLE NO. 3-C
DEPTH/ELEV 9.2	DATE 16 MAY 86

CONSOLIDA ION TEST
TIME CURVES

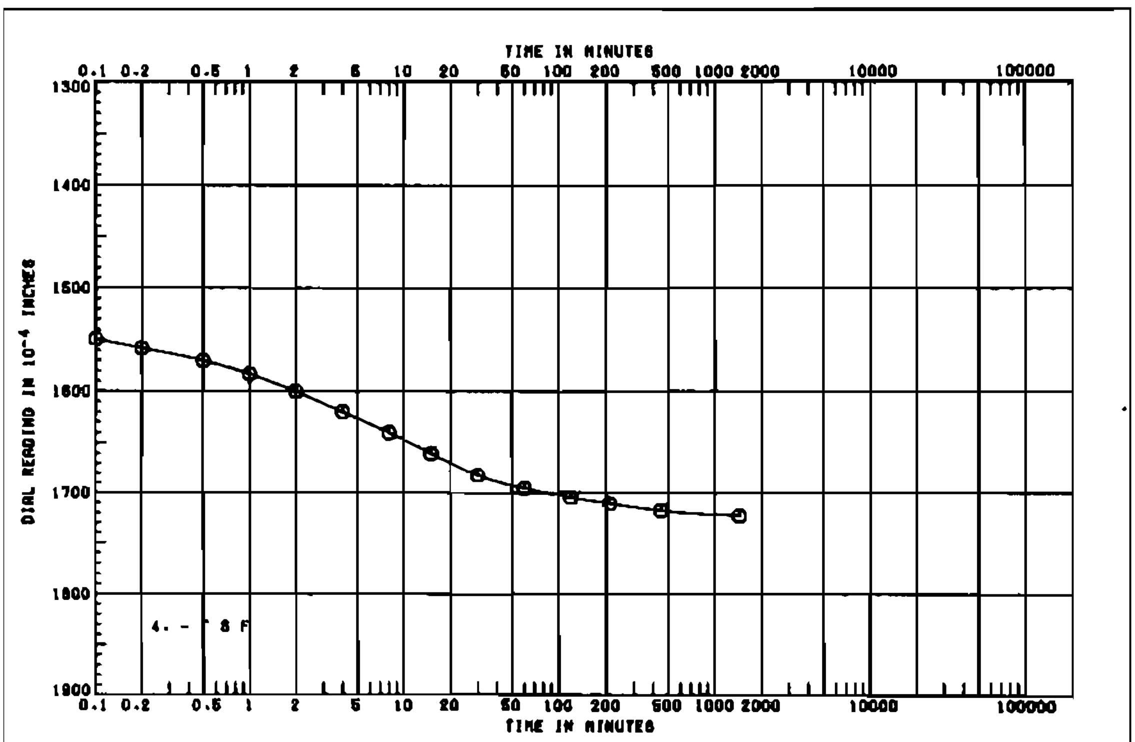
SHEET 5 OF 9



PROJECT LAKE PONT LA & VIC NEW ORLEANS	
EAST LEV (SOUTH POINT TO GIWW)	
BORING 13-USP	SAMPLE NO. 3-C
DEPTH/ELEV 9.2	DATE 15 MAY 86

CONSOLIDATION TEST
TIME CURVES

SHEET 6 OF 9



PROJECT LAKE PONT LA & VIC NEW ORLEANS	
EAST LEV (SOUTH POINT TO GIWW)	
BORING 13-USP	SAMPLE NO. 3-C
DEPTH/ELEV 9.2	DATE 18 MAY 86

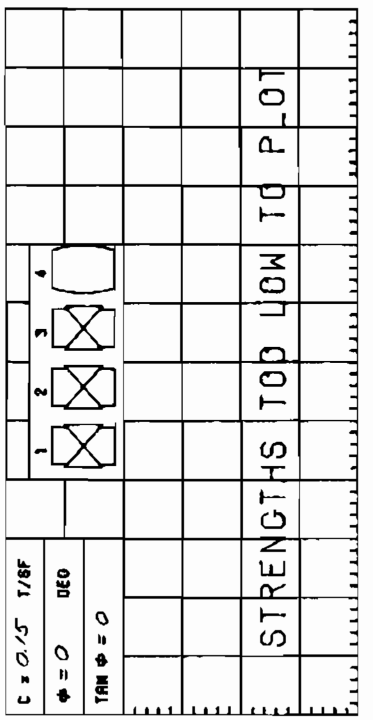
CONSOLIDATION TEST
TIME CURVES

SHEET 7 OF 9

c = 0.15 T/SF

φ = 0 DEG

TAN φ = 0



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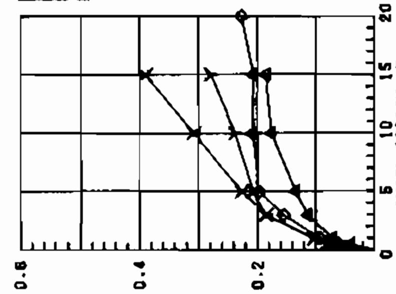


	SPECIMEN NO.	△1	Y2	X3	◇4	AVG.
INITIAL	WATER CONTENT, %	35.0	35.8	31.0	33.2	33.75
	DRY DENSITY, PCF	88.8	84.7	90.6	87.4	87.40
	SATURATION, %	100+	97.7	97.3	96.6	97.90
	VOID RATIO	0.941	0.998	0.861	0.928	
BEFORE SHEAR	WATER CONTENT, %					
	DRY DENSITY, PCF					
	SATURATION, %					
	VOID RATIO					
	BACK PRESS., TSF					
	MIN PRIN. STRESS, TSF	0.5	1.5	3.0	0.5	
	MAX. DEV. STRESS, TSF	0.19	0.28	0.39	0.21	
	TIME TO FAILURE, MIN.	30	30	30	20	
	RATE OF STRAIN INCR.%					
	INITIAL DIAMETER, IN.	1.38	1.38	1.38	1.38	
	INITIAL HEIGHT, IN.	3.00	3.00	3.00	3.00	

CONTROLLED-STRAIN TEST

DESCRIPTION OF SPECIMENS: CLAY (CL), GRAY

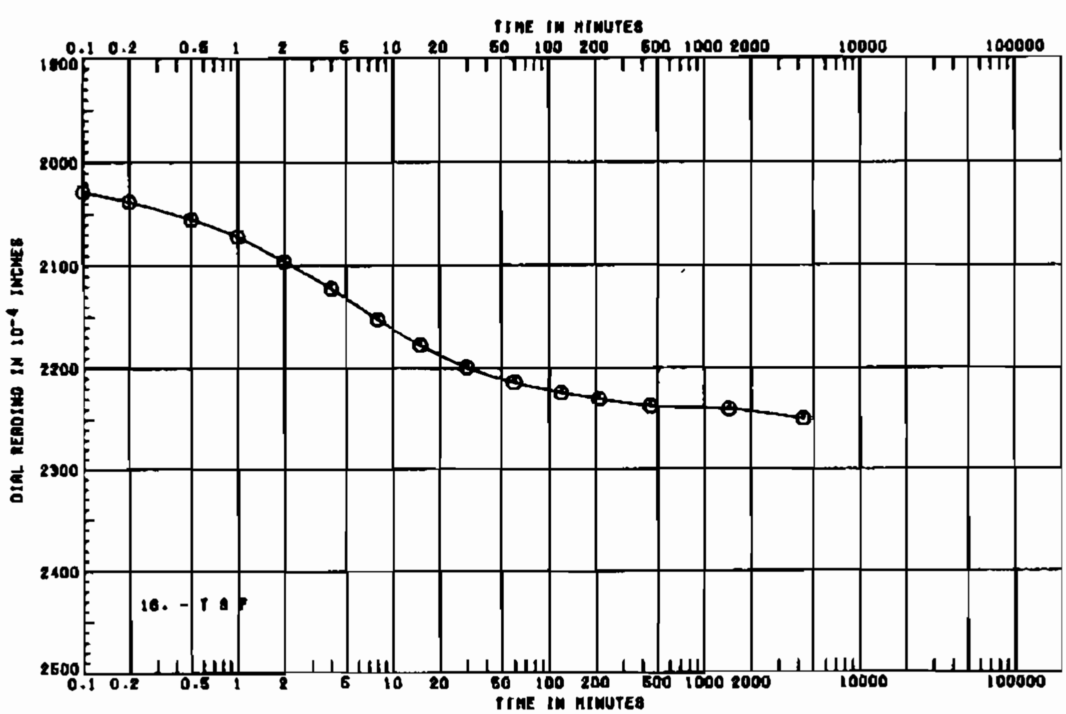
LL 45	PL 13	PI 32	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:

PROJECT LAKE PONT LA & VIC NEW ORLEANS
EAST LEV (SOUTH POINT TO GIWW)

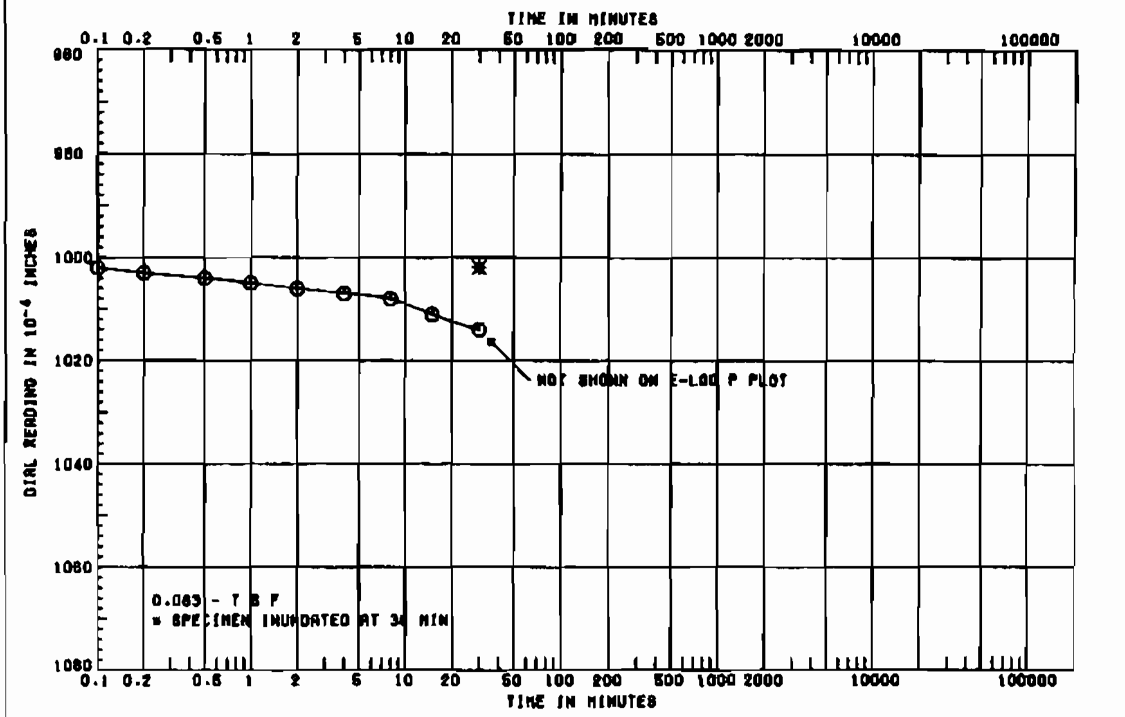
BORING NO. 13-USP	SAMPLE NO. 6-B
DEPTH/ELEV 19.8/-6.0	TECH. KOC
LABORATORY USAE WES	DATE 05 MAY 86

TRIAXIAL COMPRESSION TEST REPORT



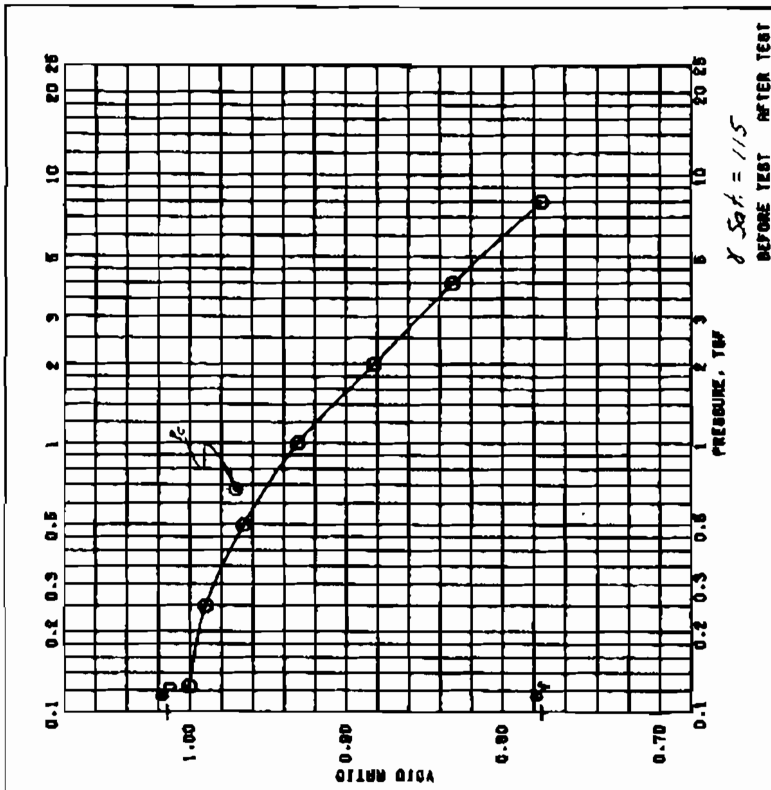
PROJECT LAKE PONT LA & VIC NEW ORLEANS	
EAST LEV (SOUTH POINT TO GIWW)	
BORING 13-USP	SAMPLE NO. 3-C
DEPTH/ELEV 9.2	DATE 16 MAY 86

CONSOLIDATION TEST
TIME CURVES



PROJECT LAKE PONT LA & VIC NEW ORLEANS		CONSOLIDATION TEST TIME CURVES
EAST LEV (SOUTH POINT TO DINH)		
BORING 13-USP	SAMPLE NO. 6-C	
DEPTH/ELEV 20.8	DATE 09 JUN 86	

SHEET 2 OF 9



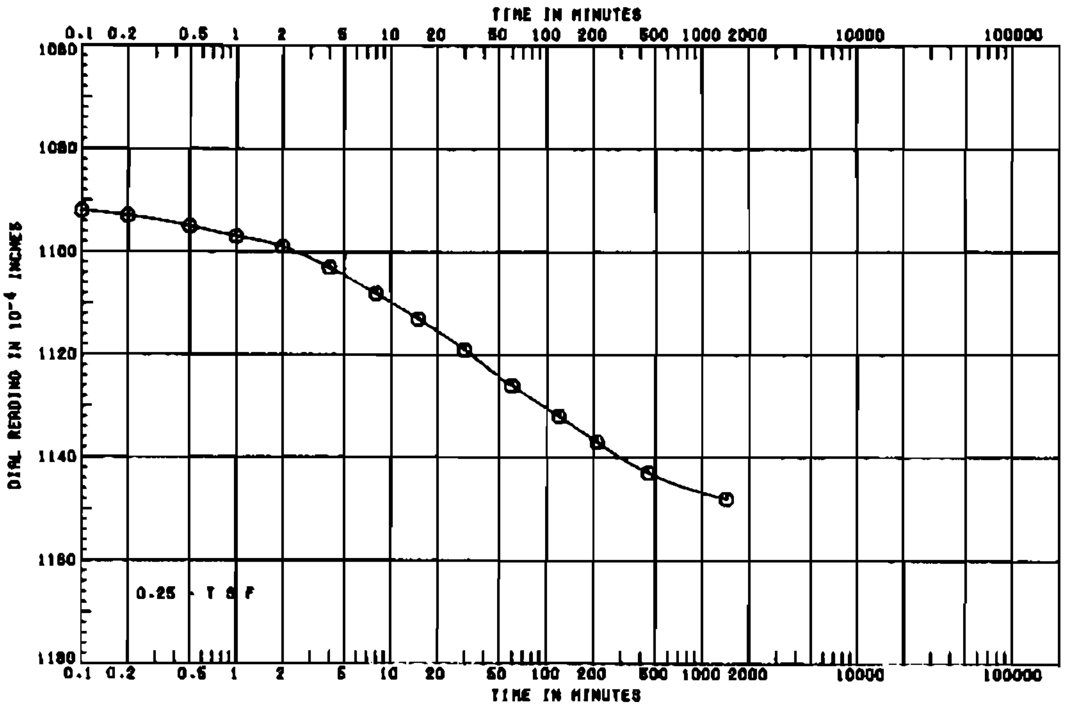
	BEFORE TEST	AFTER TEST
WATER CONTENT, %	28.2	21.4
DRY DENSITY, PCF	83.7	95.0
SATURATION, %	77.8	74.6
VOID RATIO	1.013	0.774
BACK PRESSURE, TSF		

OVERBURDEN PRESSURE, TSF	
PRECONSOL. PRESSURE, TSF	0.67
COMPRESSION INDEX	0.18
TYPE SPECIMEN	UNDISTURBED
DIA. IN 4.44	HT. IN 1.220
CLASSIFICATION CLAY (CL), GRAY: FINE SAND LENSES	
LL	PL / PI
GS 2.70 (EST)	D_{10}
REMARKS	

PROJECT LAKE PONT LA & VIC NEW ORLEANS	
EAST LEV (SOUTH POINT TO DINH)	
BORING NO. 13-USP	SAMPLE NO. 6-C
DEPTH/ELEV 20.8	DATE 09 JUN 86

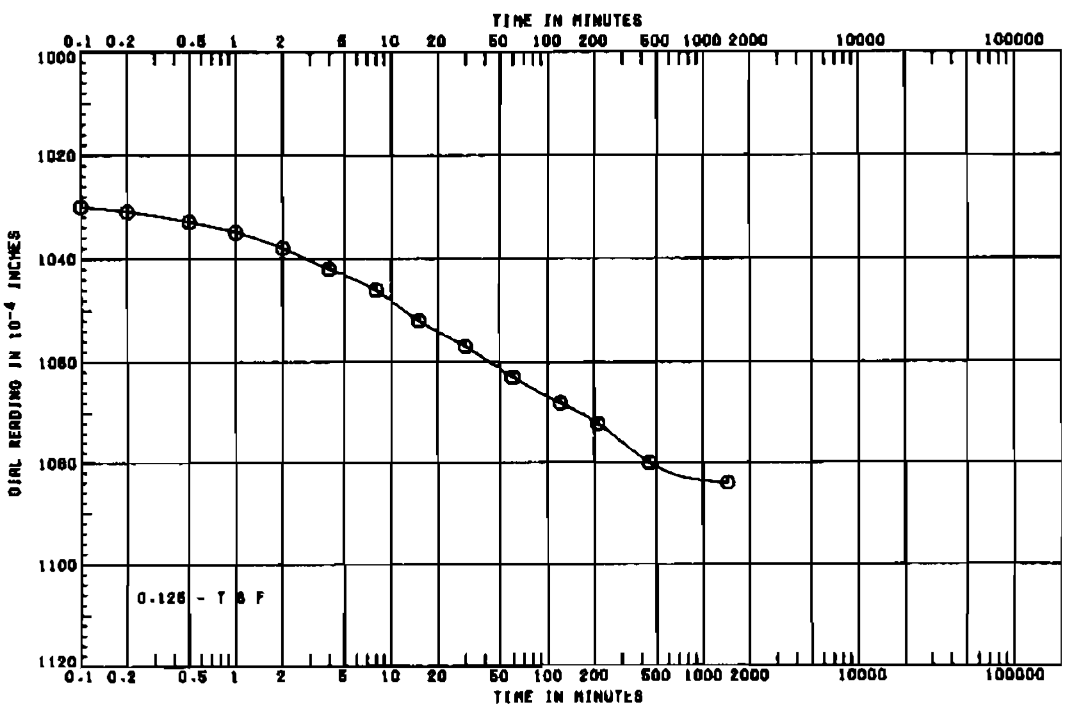
CONSOLIDATION TEST REPORT

SHEET 1 OF 9



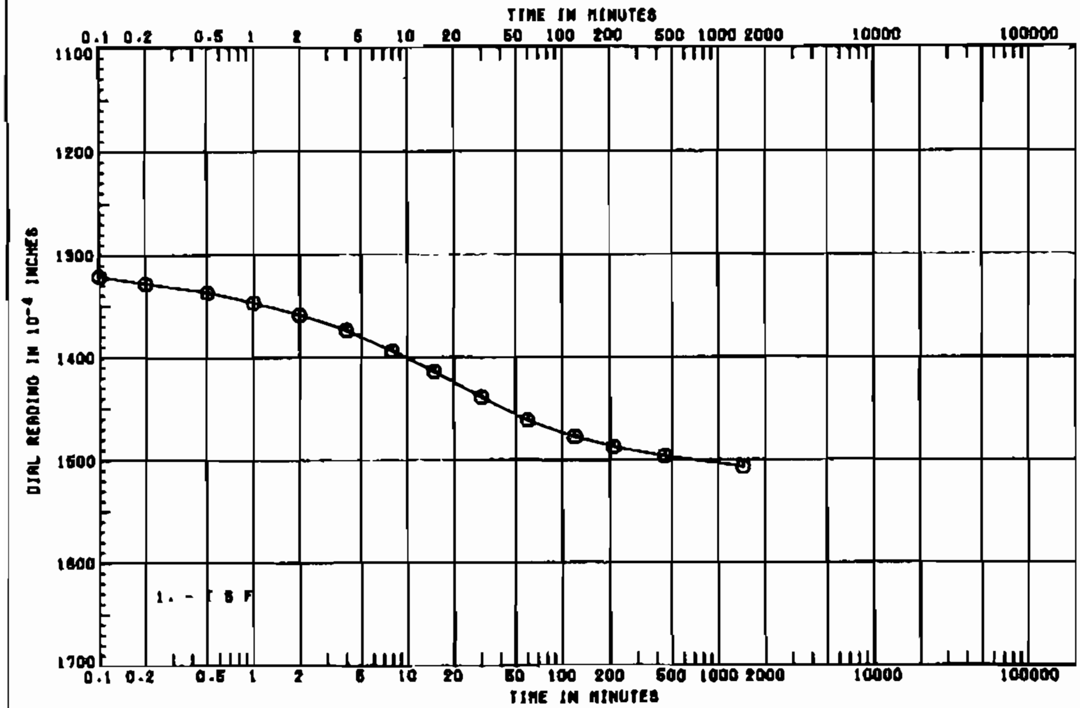
PROJECT LAKE PONT LA & VIC NEW ORLEANS		CONSOLIDATION TEST TIME CURVES
EAST LEV (SOUTH POINT TO GIWW)		
BORING 13-USP	SAMPLE NO. 6-C	
DEPTH/ELEV 20.8	DATE 09 JUN 86	

SHEET 4 OF 9



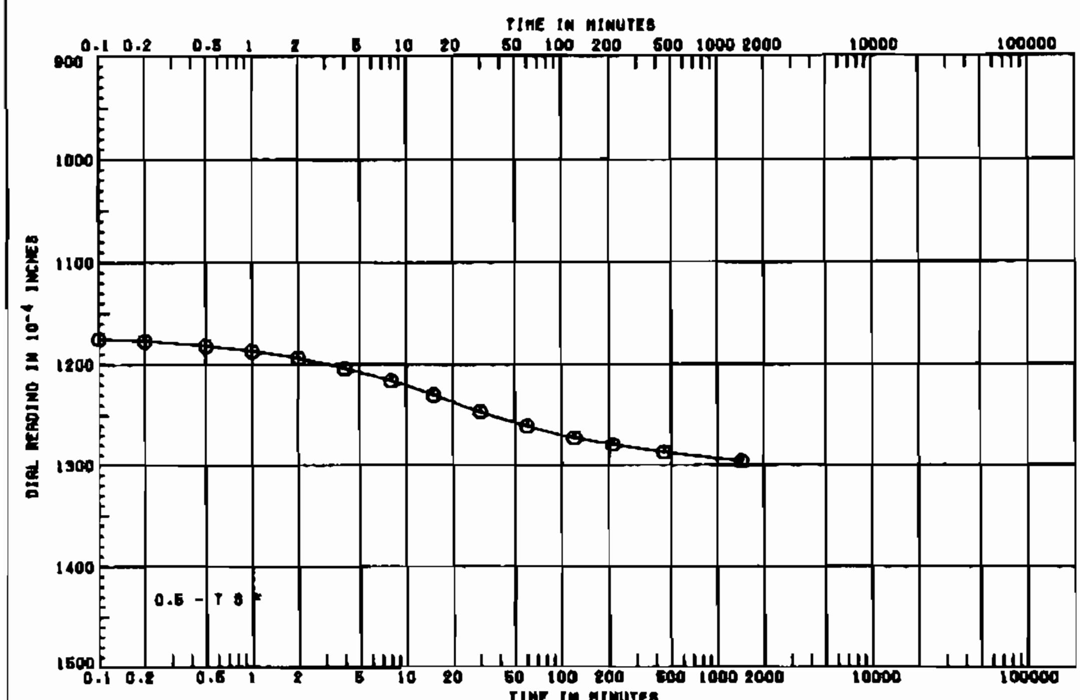
PROJECT LAKE PONT LA & VIC NEW ORLEANS		CONSOLIDATION TEST TIME CURVES
EAST LEV (SOUTH POINT TO GIWW)		
BORING 13-USP	SAMPLE NO. 6-C	
DEPTH/ELEV 20.8	DATE 09 JUN 86	

SHEET 3 OF 9



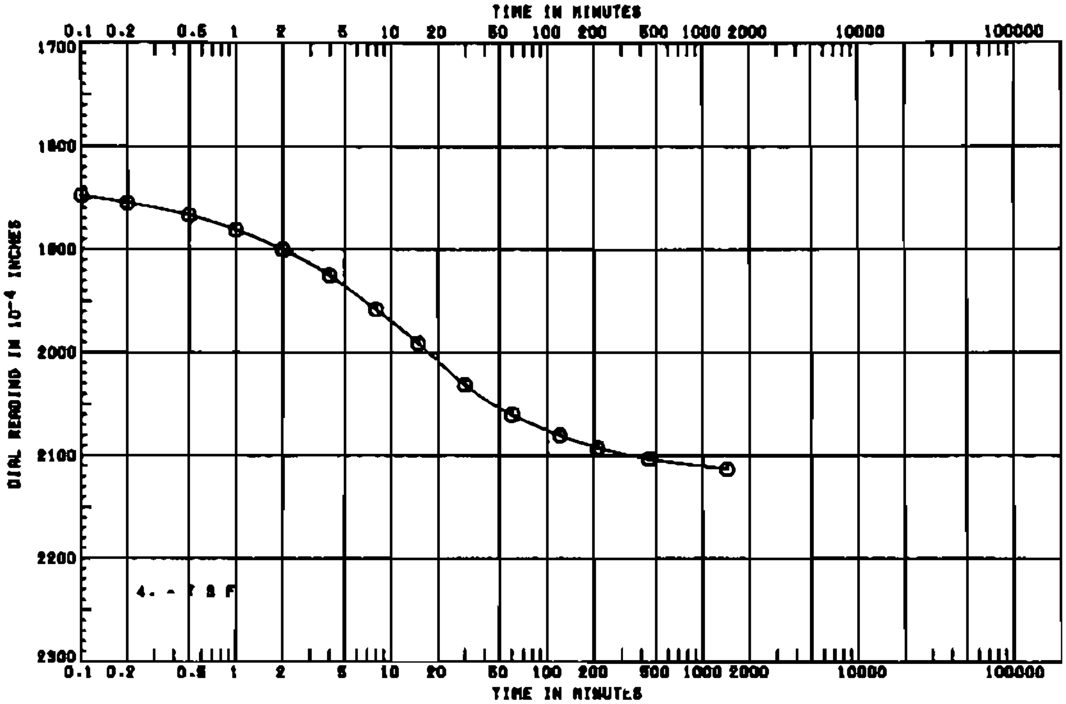
PROJECT LAKE PONT LA & VIC NEW ORLEANS		CONSOLIDATION TEST TIME CURVES
EAST LEV (SOUTH POINT TO GIWW)		
BORING 13-USP	SAMPLE NO. 6-C	
DEPTH/ELEV 20.8	DATE 09 JUN 86	

SHEET 6 OF 9



PROJECT LAKE PONT LA & VIC NEW ORLEANS		CONSOLIDATION TEST TIME CURVES
EAST LEV (SOUTH POINT TO GIWW)		
BORING 13-USP	SAMPLE NO. 6-C	
DEPTH/ELEV 20.8	DATE 09 JUN 86	

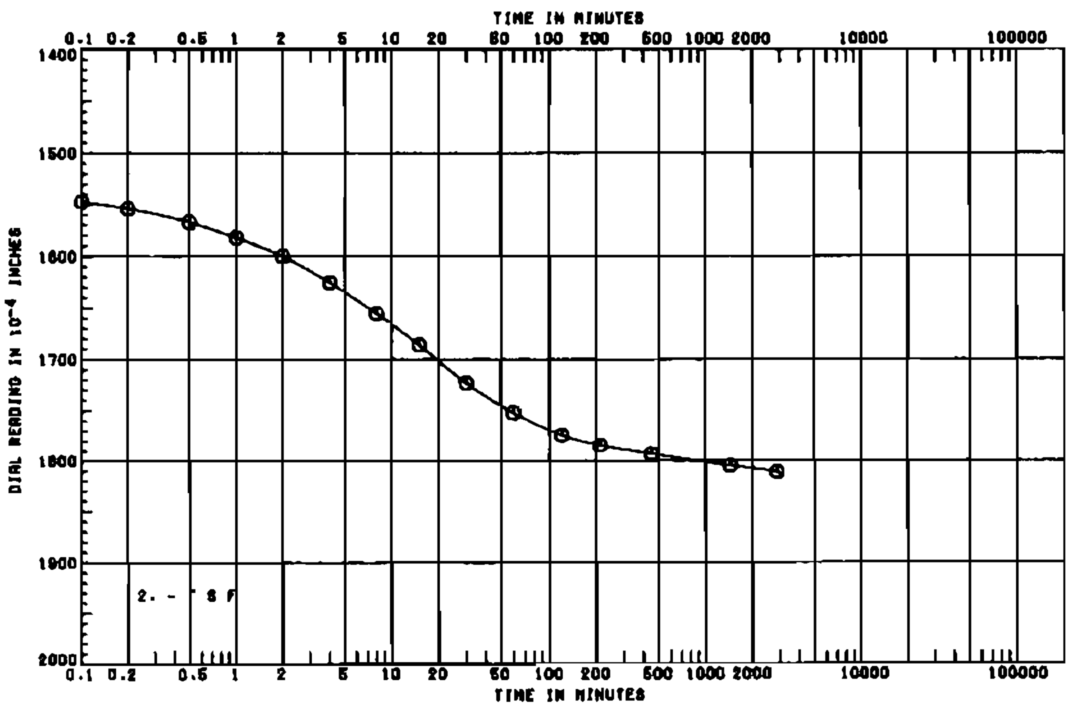
SHEET 5 OF 9



PROJECT LAKE PONT LA & VIC NEW ORLEANS
EAST LEV (SOUTH POINT TO GIWW)
BORING 13-USP
SAMPLE NO. 6-C
DEPTH/ELEV 20.6
DATE 09 JUN 86

CONSOLIDATION TEST
TIME CURVES

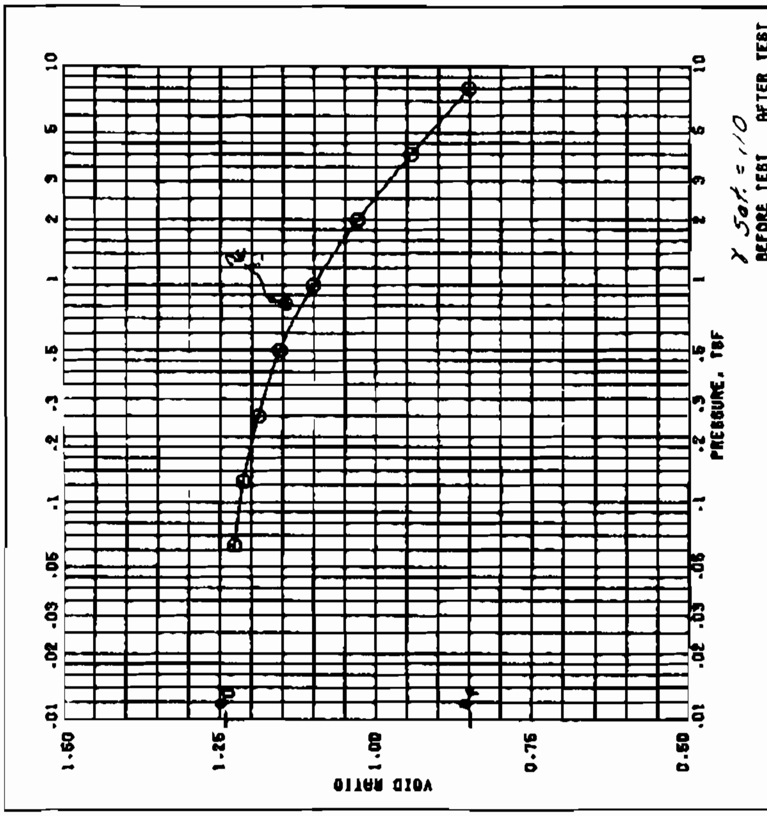
SHEET 8 OF 9



PROJECT LAKE PONT LA & VIC NEW ORLEANS
EAST LEV (SOUTH POINT TO GIWW)
BORING 13-USP
SAMPLE NO. 6-C
DEPTH/ELEV 20.6
DATE 09 JUN 86

CONSOLIDATION TEST
TIME CURVES

SHEET 7 OF 9



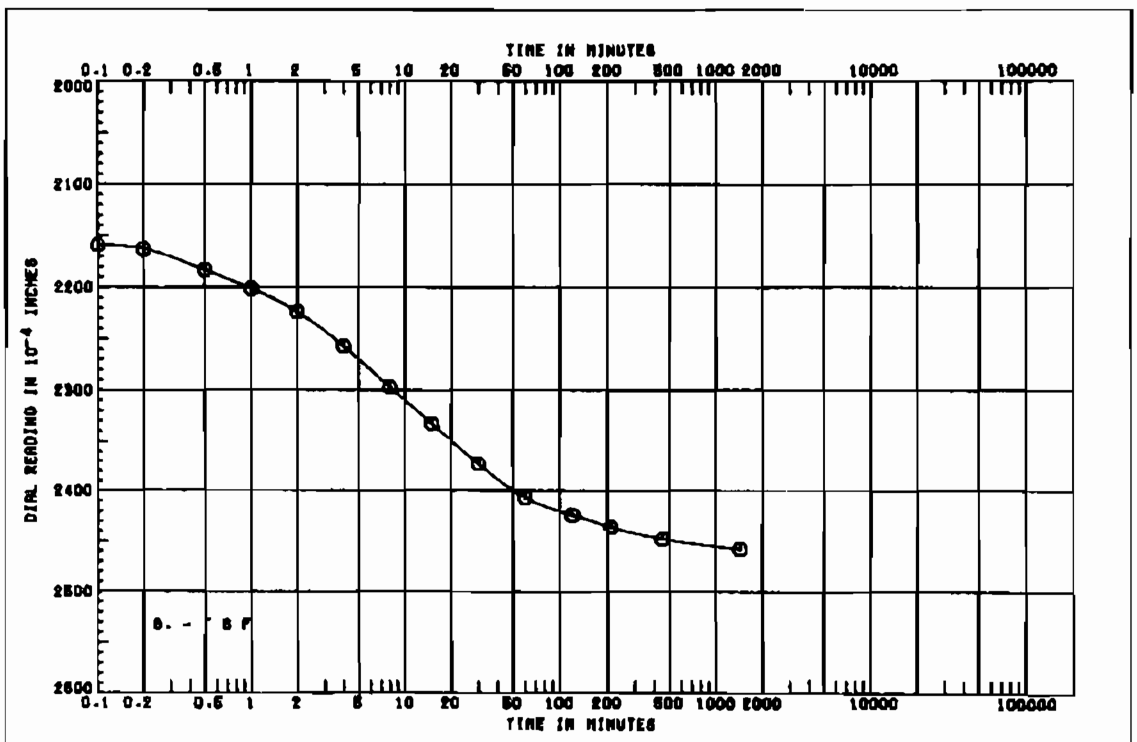
OVERBURDEN PRESSURE, TSF			
PRECONSOL. PRESSURE, TSF	0.85		
COMPRESSION INDEX	0.60		
TYPE SPECIMEN	UNDISTURBED		
DIA. IN 4.44	HT. IN 1.125		
CLASSIFICATION	SILTY CLAY (CL), GRAY		
LL 42	PL 26	PI 16	
GS 2.70 (EST)	D_{10}		
REMARKS			

	BEFORE TEST	AFTER TEST
WATER CONTENT, %	42.3	30.4
DRY DENSITY, PCF	78.3	91.3
SATURATION, %	92.3	98.8
VOID RATIO	1.239	0.847
BACK PRESSURE, TSF		

PROJECT LAKE PONT LA & VIC NEW ORLEANS	
EAST LEV (SOUTH POINT TO DINW)	
BORING NO. 13-USP	SAMPLE NO. 7-B
DEPTH/ELEV 24.5	DATE 11 JUN 86

CONSOLIDATION TEST REPORT

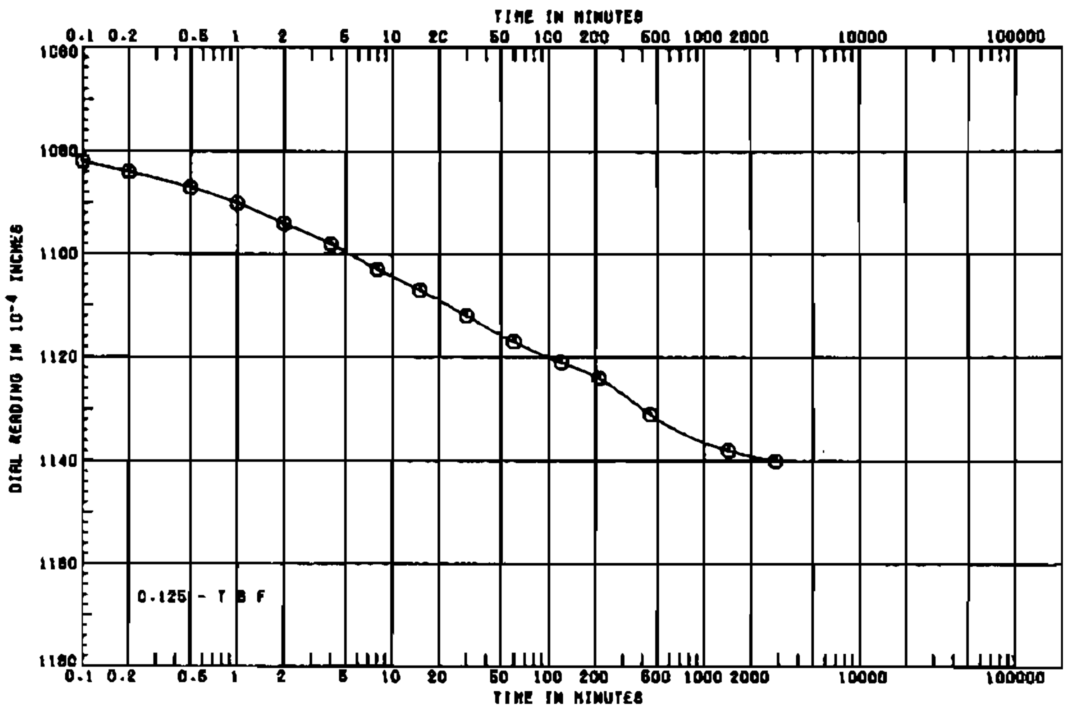
SHEET 1 OF 9



PROJECT LAKE PONT LA & VIC NEW ORLEANS	
EAST LEV (SOUTH POINT TO DINW)	
BORING 13-USP	SAMPLE NO. 8-C
DEPTH/ELEV 20.8	DATE 09 JUN 86

CONSOLIDATION TEST
TIME CURVES

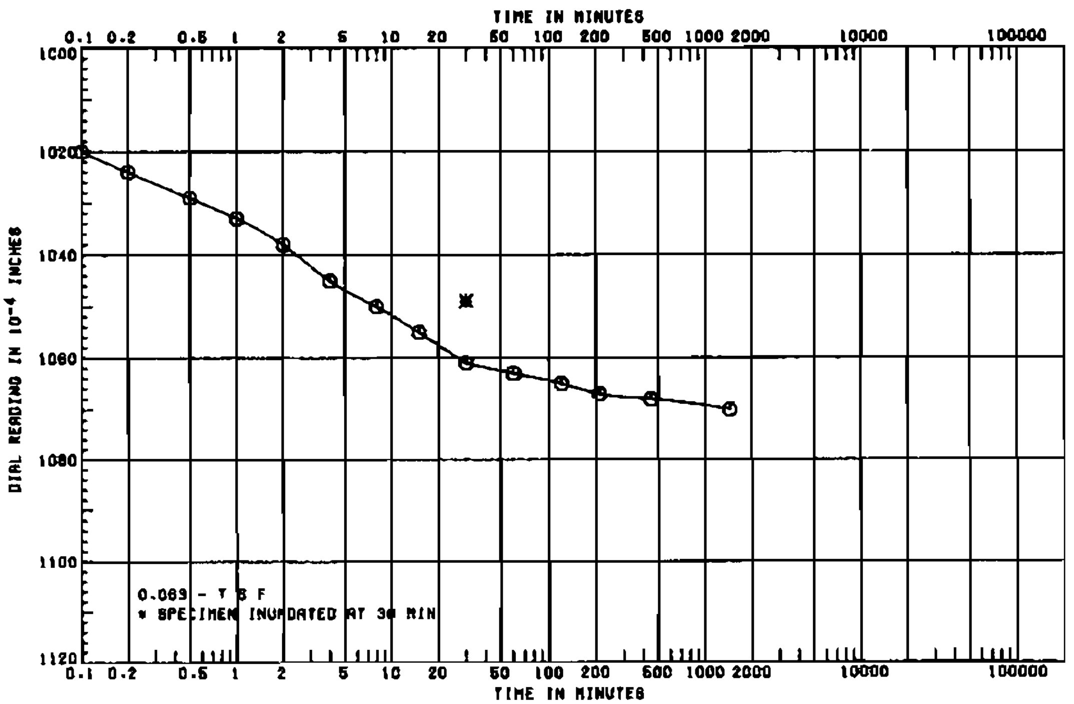
SHEET 9 OF 9



PROJECT LAKE PONT LA & VIC NEW ORLEANS	
EAST LEV (SOUTH POINT TO GIWW)	
BORING 13-USP	SAMPLE NO. 7-B
DEPTH/ELEV 24.5	DATE 11 JUN 86

CONSOLIDATION TEST
TIME CURVES

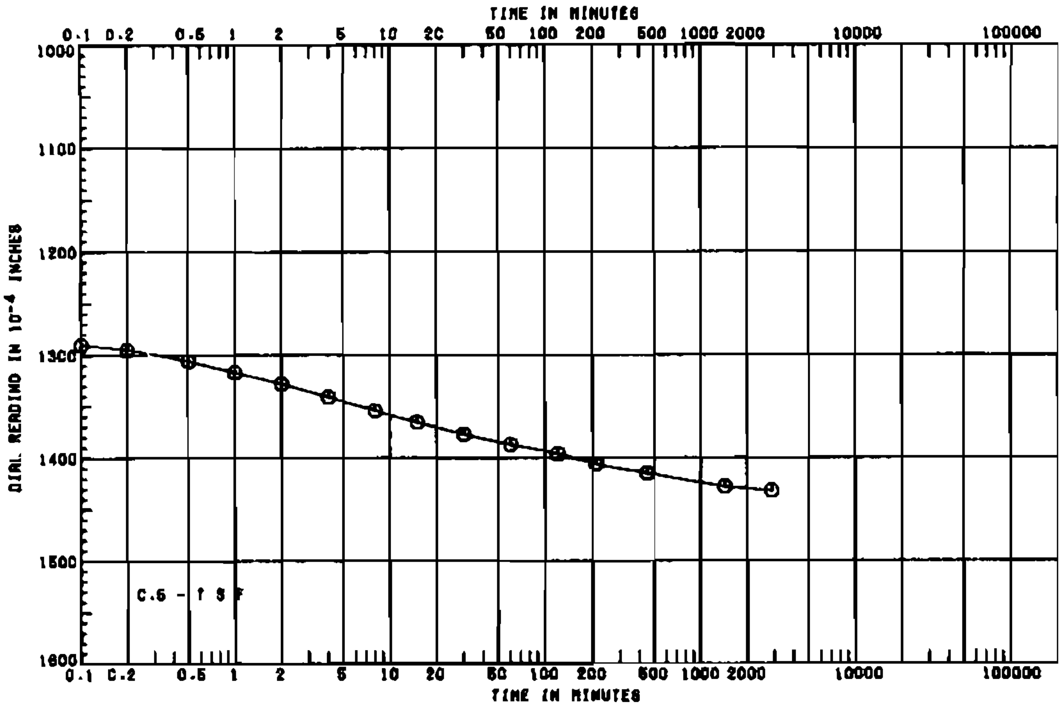
SHEET 3 OF 9



PROJECT LAKE PONT LA & VIC NEW ORLEANS	
EAST LEV (SOUTH POINT TO GIWW)	
BORING 13-USP	SAMPLE NO. 7-B
DEPTH/ELEV 24.5	DATE 11 JUN 86

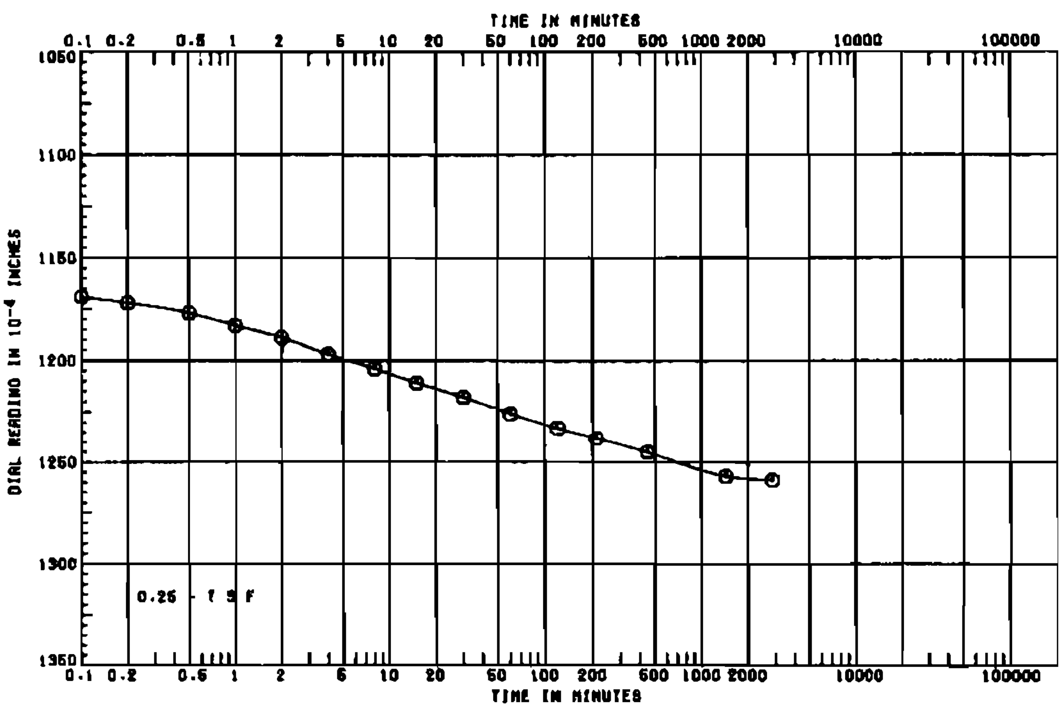
CONSOLIDATION TEST
TIME CURVES

SHEET 2 OF 9



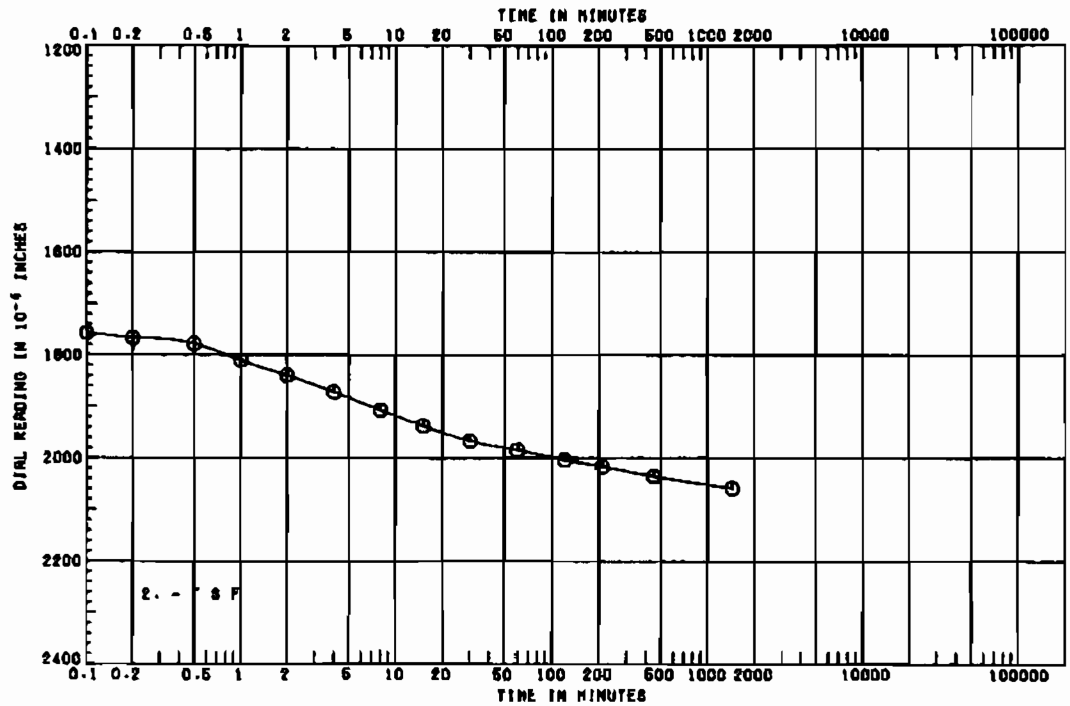
PROJECT LAKE PONT LA & VIC NEW ORLEANS		CONSOLIDATION TEST TIME CURVES
EAST LEV (SOUTH POINT TO OINN)		
BORING 13-USP	SAMPLE NO. 7-B	
DEPTH/ELEV 24.5	DATE 11 JUN 86	

SHEET 5 OF 9



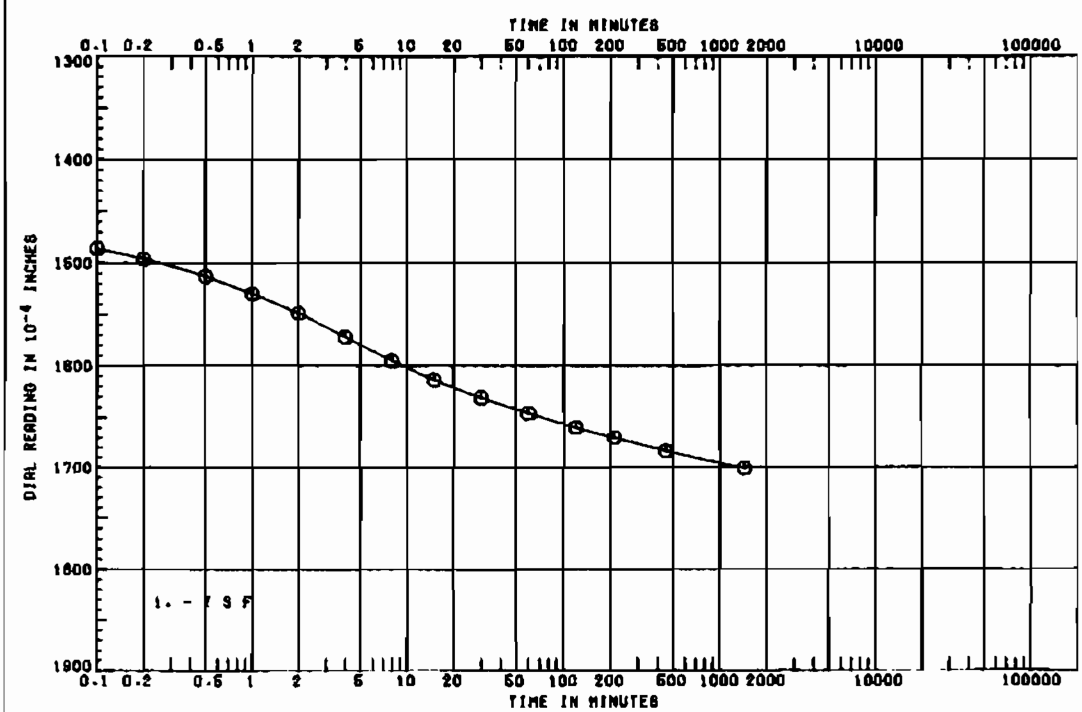
PROJECT LAKE PONT LA & VIC NEW ORLEANS		CONSOLIDATION TEST TIME CURVES
EAST LEV (SOUTH POINT TO OINN)		
BORING 13-USP	SAMPLE NO. 7-B	
DEPTH/ELEV 24.5	DATE 11 JUN 88	

SHEET 4 OF 9



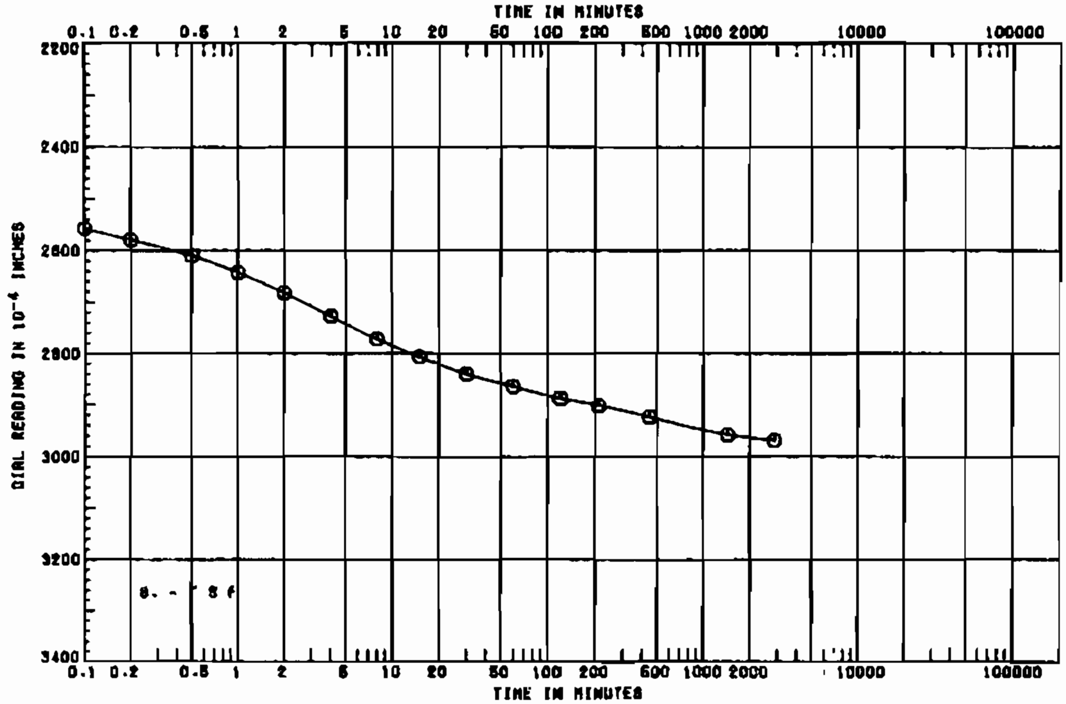
PROJECT LAKE PONT LA & VIC NEW ORLEANS		CONSOLIDATION TEST TIME CURVES
EAST LEV (SOUTH POINT TO GIWW)		
BORING 13-USP	SAMPLE NO. 7-8	
DEPTH/ELEV 24.5	DATE 11 JUN 86	

SHEET 7 OF 9



PROJECT LAKE PONT LA & VIC NEW ORLEANS		CONSOLIDATION TEST TIME CURVES
EAST LEV (SOUTH POINT TO GIWW)		
BORING 13-USP	SAMPLE NO. 7-8	
DEPTH/ELEV 24.5	DATE 11 JUN 86	

SHEET 8 OF 9

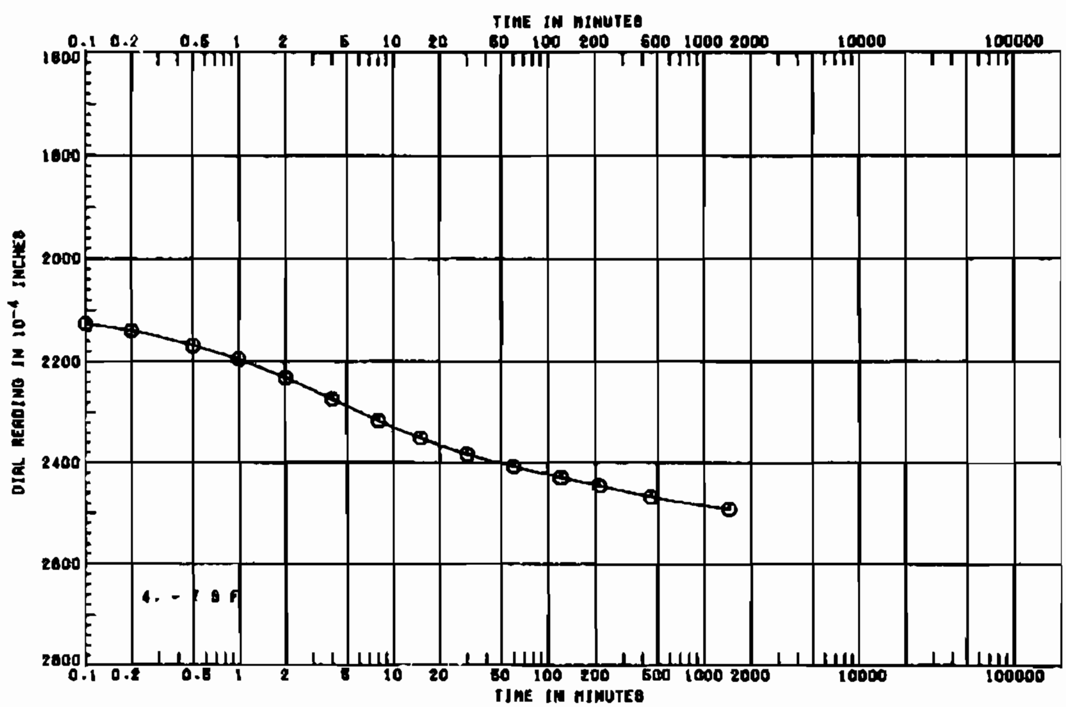


PROJECT LAKE PONT LA & VIC NEW ORLEANS	
EAST LEV (SOUTH POINT TO OIWW)	
BORING 13-USP	SAMPLE NO. 7-B
DEPTH/ELEV 24.5	DATE 11 JUN 66

CONSOLIDATION TEST

TIME CURVES

SHEET 9 OF 9

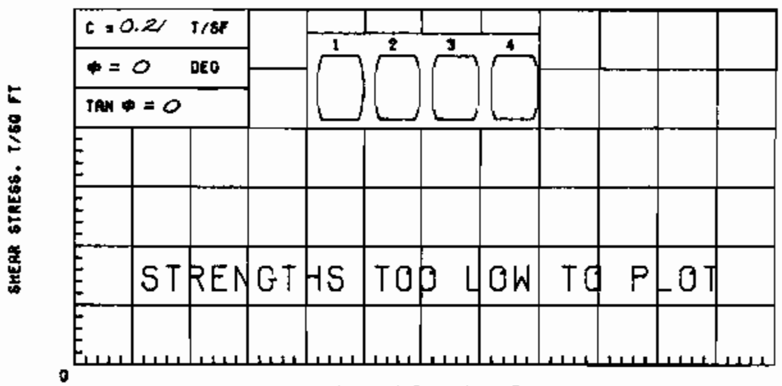


PROJECT LAKE PONT LA & VIC NEW ORLEANS	
EAST LEV (SOUTH POINT TO OIWW)	
BORING 13-USP	SAMPLE NO. 7-B
DEPTH/ELEV 24.5	DATE 11 JUN 66

CONSOLIDATION TEST

TIME CURVES

SHEET 9 OF 9



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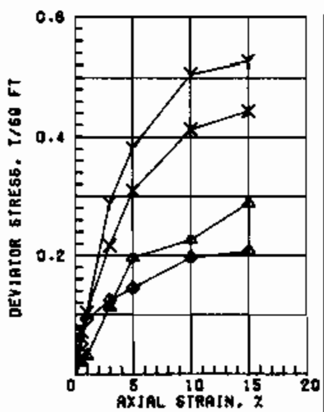


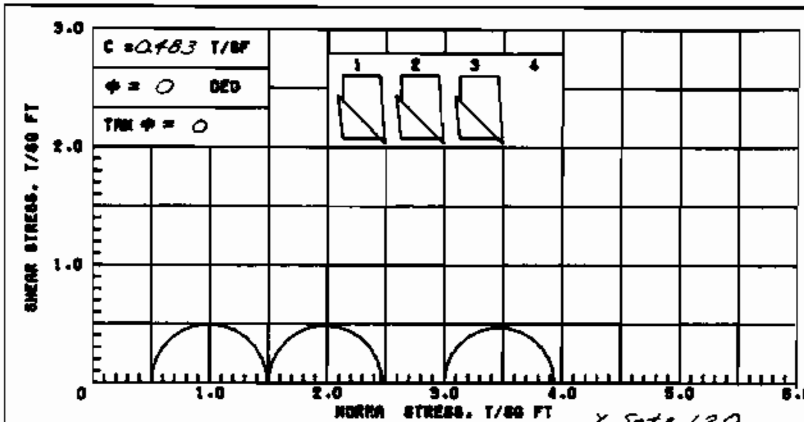
	SPECIMEN NO.	▲1	Y2	X3	◇4	AVG
INITIAL	WATER CONTENT, %	34.8	34.2	32.8	47.0	33.93
	DRY DENSITY, PCF	85.7	85.7	87.5	73.7	86.30
	SATURATION, %	97.6	95.8	96.0	98.8	96.50
	VOID RATIO	0.959	0.960	0.919	1.280	
BEFORE SHEAR	WATER CONTENT, %					
	DRY DENSITY, PCF					
	SATURATION, %					
	VOID RATIO					
	BACK PRESS., TSF					
	MIN PRIN. STRESS, TSF	0.5	1.5	3.0	0.5	
	MAX. DEV. STRESS, TSF	0.29	0.53	0.44	0.21	
	TIME TO FAILURE, MIN.	30	30	30	30	
	RATE OF STRAIN INCR.%					
	INITIAL DIAMETER, IN.	1.38	1.38	1.38	1.38	
	INITIAL HEIGHT, IN.	3.00	3.00	3.00	3.00	

CONTROLLED-STRAIN TEST

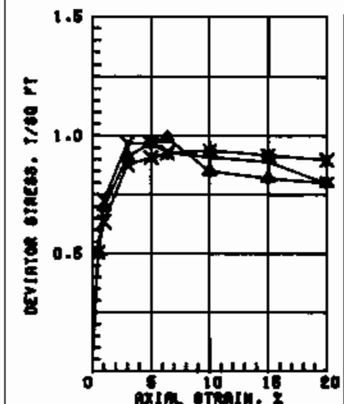
DESCRIPTION OF SPECIMENS: SILTY CLAY (CL), GRAY; 3/4" ROOT

LL	PL	PI	GS 2.68 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:	PROJECT LAKE PONT LA & VIC NEW ORLEANS	
CHECK TEST SPECIMEN TAKEN	EAST LEV (SOUTH POINT TO GIWW)	
FROM DIFFERENT LIFT.	BORING NO. 13-USF	SAMPLE NO. 7-C
	DEPTH/ELEV 25.2/-11.3	TECH. KOC
	LABORATORY USAE WES	DATE 06 MAY 86
	TRIAXIAL COMPRESSION TEST REPORT	



γ Sat = 120



	SPECIMEN NO.	▲1	Y2	X3	4	AVG.
INITIAL	WATER CONTENT, %	27.0	26.5	27.1		26.87
	DRY DENSITY, PCF	90.3	91.4	94.2		92.00
	SATURATION, %	84.1	84.8	92.7		87.20
	VOID RATIO	0.867	0.844	0.788		
BEFORE SHEAR	WATER CONTENT, %					
	DRY DENSITY, PCF					
	SATURATION, %					
	VOID RATIO					
	BACK PRESS., TSF					
	MIN PRIN. STRESS, TSF	0.5	1.5	3.0		
	MAX. DEV. STRESS, TSF	0.99	0.97	0.94		
	TIME TO FAILURE, MIN.	13	6	20		
	RATE OF STRAIN INCR.%					
	INITIA DIAMETER, IN.	1.39	1.39	1.39		
	INITIAL HEIGHT, IN.	3.00	3.00	3.00		

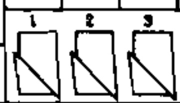
CONTROLLED-STRAIN TEST

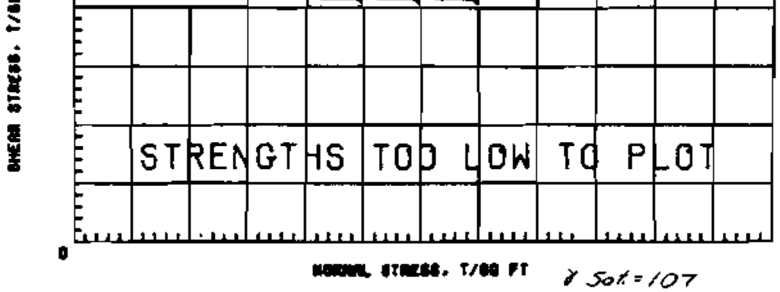
DESCRIPTION OF SPECIMENS: PLASTIC CLAY (CH), GRAY; ORGANIC MATERIAL

LL 57	PL 18	PI 39	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

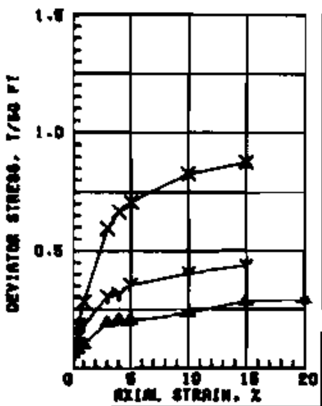
REMARKS:	PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER	
	PLAN N.O. E. LEV (SO. POINT TO GIWW	
	BORIN NO. 14-USF	SAMPLE NO. 2-8
	DEPTH/ELEV 4.0/0.7	TECH. KOC
	LABORATORY USAE WES	DATE 18 MAR 86
	TRIAXIAL COMPRESSION TEST REPORT	

C = 0.252 T/SF	
Φ = 0 DEG	
TAN Φ = 0	





γ Sat = 107



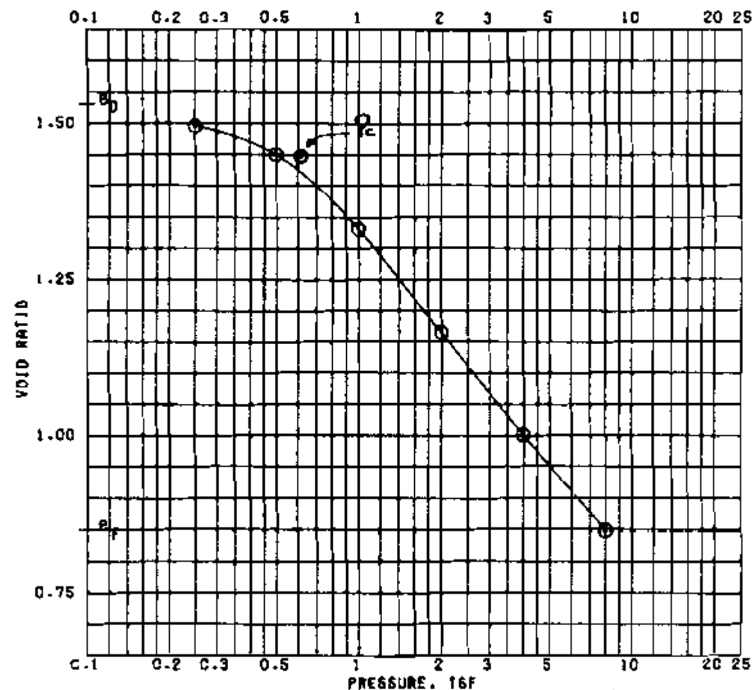
	SPECIMEN NO.	▲1	Y2	X3	4	AVG.
INITIAL	WATER CONTENT, %	42.3	44.6	39.2		42.03
	DRY DENSITY, PCF	70.3	68.8	70.8		69.97
	SATURATION, %	81.7	83.0	76.7		80.47
	VOID RATIO	1.390	1.460	1.380		
BEFORE SHEAR	WATER CONTENT, %					
	DRY DENSITY, PCF					
	SATURATION, %					
	VOID RATIO					
	BACK PRESS., TSF					
	MIN PRIN. STRESS, TSF	0.5	1.5	3.0		
	MAX. DEV. STRESS, TSF	0.20	0.43	0.88		
	TIME TO FAILURE, MIN.	8	30	30		
	RATE OF STRAIN INCR.%					
	INITIAL DIAMETER, IN.	1.39	1.39	1.39		
	INITIAL HEIGHT, IN.	3.00	3.00	3.00		

CONTROLLED-STRAIN TEST

DESCRIPTION OF SPECIMENS; PLASTIC CLAY (CH). GRAY; ORGANIC MATERIAL

LL	PL	PI	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:	PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER	
INSUFFICIENT MATERIAL FOR	PLAN N.O. E. LEV (SO. POINT TO GINN	
CHECK TEST.	BORING NO. 14-USP	SAMPLE NO. 3-C
	DEPTH/ELEV 8.6/6.0	TECH. XOC
	LABORATORY WORE NES	DATE 18 MAR 86
	TRIAXIAL COMPRESSION TEST REPORT	



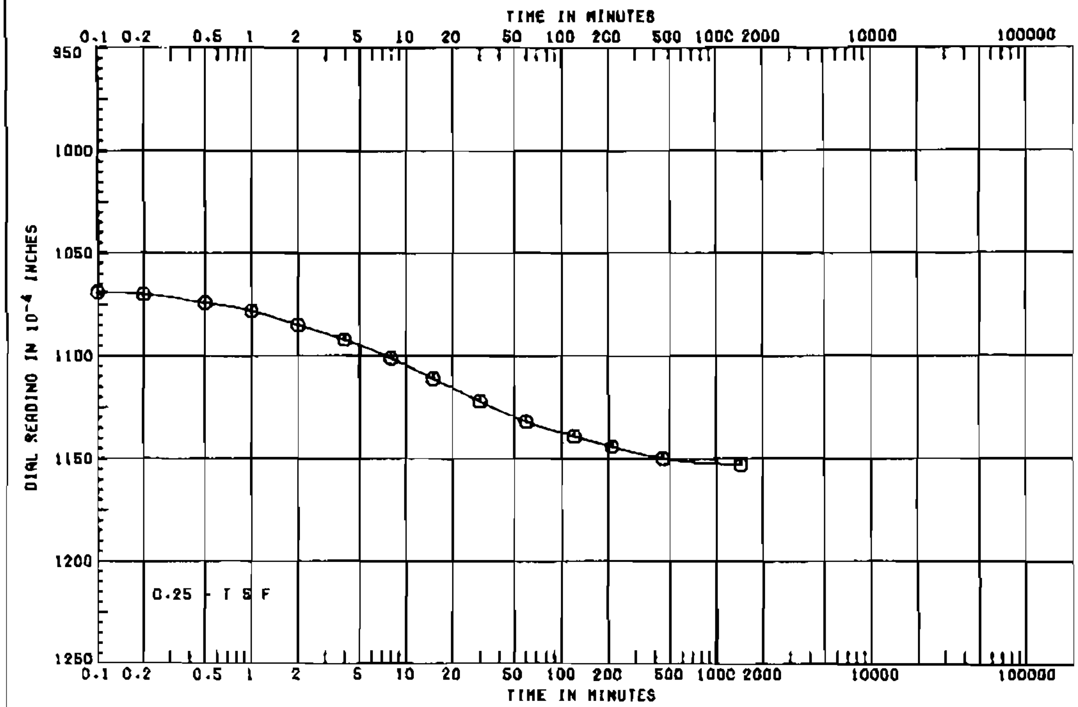
γ Sat = 105

			BEFORE TEST	AFTER TEST
OVERBURDEN PRESSURE, TSF		WATER CONTENT, %	55.7	32.9
PRECONSOL. PRESSURE, TSF	0.61	DRY DENSITY, PCF	66.7	91.3
COMPRESSION INDEX	0.55	SATURATION, %	98.4	100 +
TYPE SPECIMEN	UNDISTURBED	VOID RATIO	1.529	0.847
DIA. IN 4.44	HT. IN 1.110	BACK PRESSURE, TSF		

CLASSIFICATION PLASTIC CLAY (CH), GRAY; CONCRETIONS TO 1/4"

LL 83	PL 20	PI 63	PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER	
GS 2.70 (EST)	D_{10}		PLAN N.O. E. LEV (SO. POINT TO GINN)	
REMARKS			BORING NO. 14-USP	SAMPLE NO. 4-B
			DEPTH/ELEV 12.3/1.20	DATE 03 JUN 86
			CONSOLIDATION TEST REPORT	

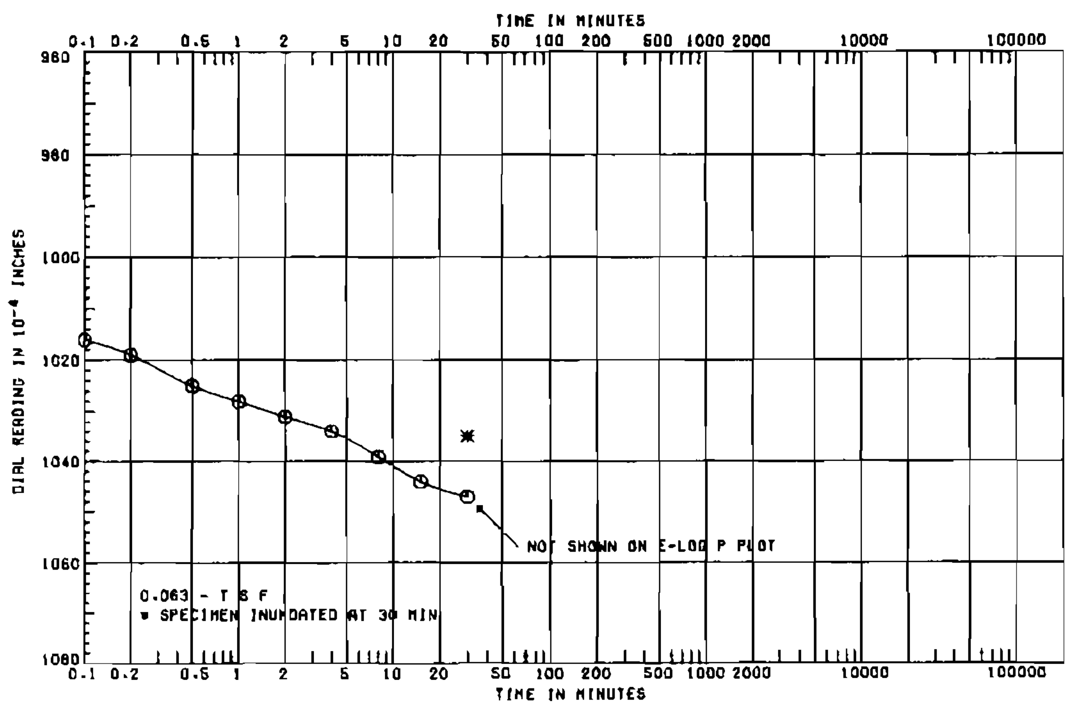
SHEET 1 OF 8



PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER	
PLAN N.O. E. LEV (SO. POINT TO GIWW)	
BORING 14-USP	SAMPLE NO. 4-B
DEPTH/ELEV 12.3/1.20	DATE 03 JUN 86

CONSOLIDATION TEST
TIME CURVES

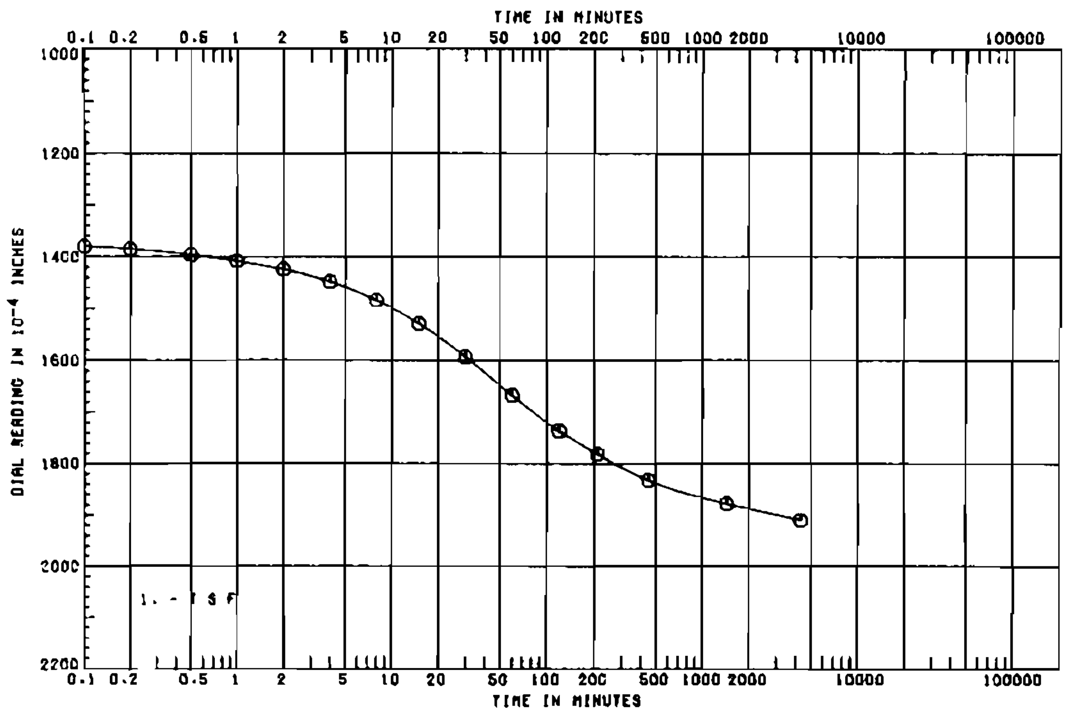
SHEET 3 OF 8



PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER	
PLAN N.O. E. LEV (SO. POINT TO GIWW)	
BORING 14-USP	SAMPLE NO. 4-B
DEPTH/ELEV 12.3/1.20	DATE 03 JUN 86

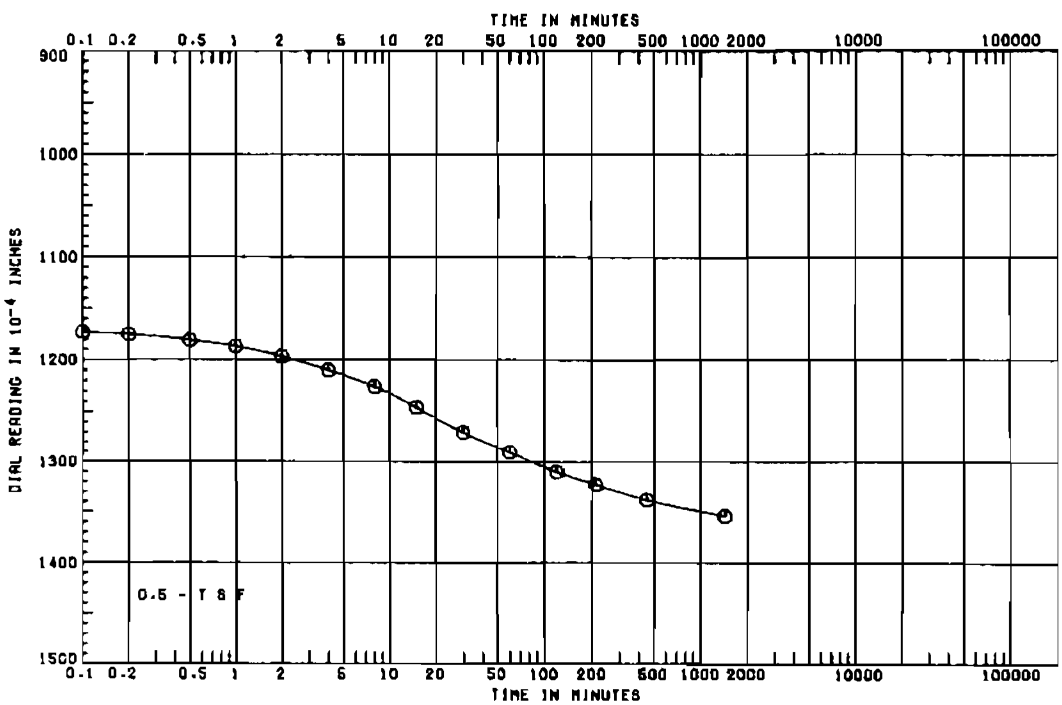
CONSOLIDATION TEST
TIME CURVES

SHEET 2 OF 8



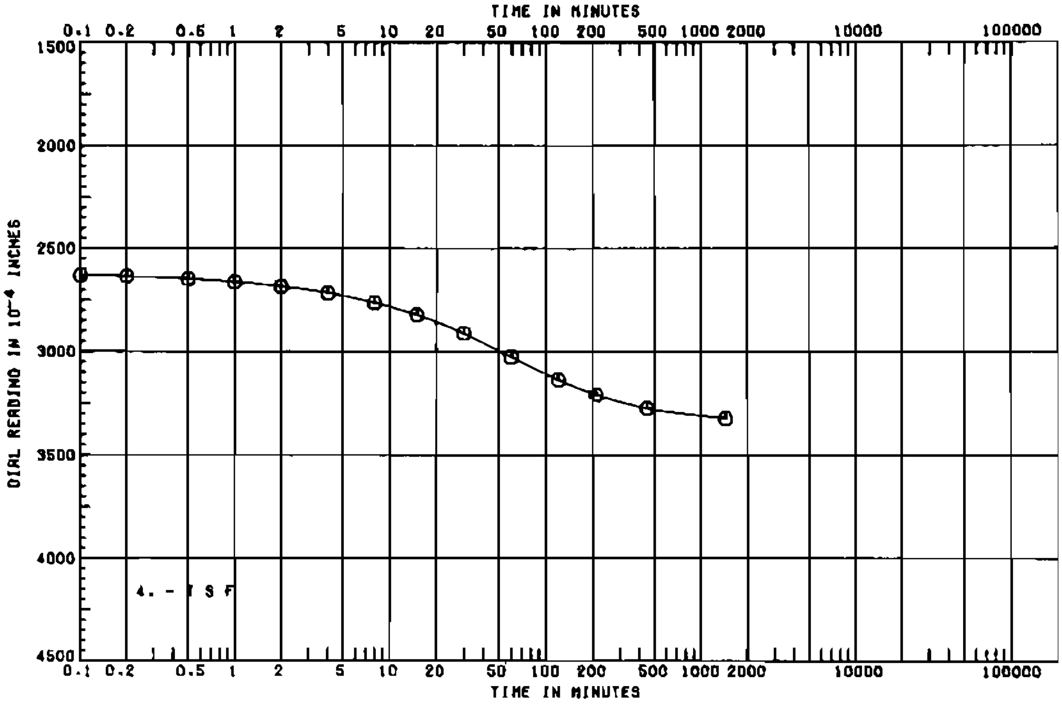
PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER		CONSOLIDATION TEST TIME CURVES
PLAN N.O. E. LEV (SO. POINT TO DIWW)		
BORING 14-USP	SAMPLE NO. 4-B	
DEPTH/ELEV 12.3/1.20	DATE 03 JUN 86	

SHEET 5 OF 8



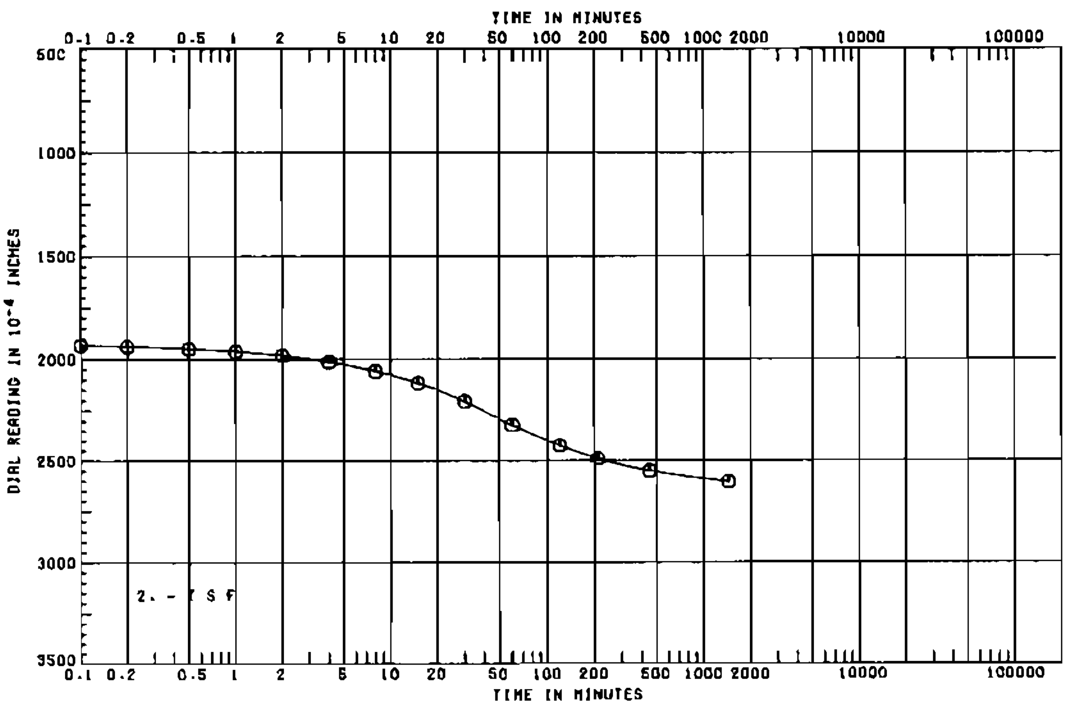
PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER		CONSOLIDATION TEST TIME CURVES
PLAN N.O. E. LEV (SO. POINT TO DIWW)		
BORING 14-USP	SAMPLE NO. 4-B	
DEPTH/ELEV 12.3/1.20	DATE 03 JUN 86	

SHEET 4 OF 8



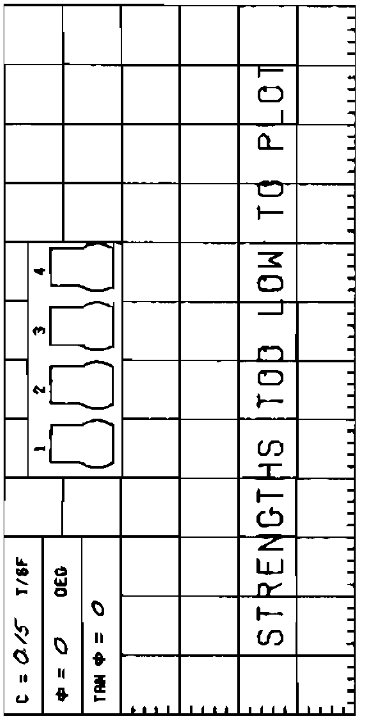
PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER		CONSOLIDATION TEST TIME CURVES
PLAN N.O. E. LEV (SO. POINT TO OIWW)		
BORING 14-USP	SAMPLE NO. 4-8	
DEPTH/ELEV 12.3/1.20	DATE 03 JUN 86	

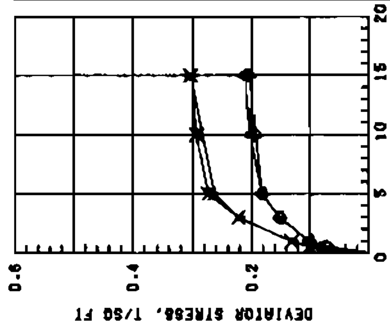
SHEET 7 OF 8



PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER		CONSOLIDATION TEST TIME CURVES
PLAN N.O. E. LEV (SO. POINT TO OIWW)		
BORING 14-USP	SAMPLE NO. 4-8	
DEPTH/ELEV 12.3/1.20	DATE 03 JUN 86	

SHEET 6 OF 8





γ Sat = 113

		SPECIMEN NO.	A1	Y2	X3	Φ4
	INITIAL	WATER CONTENT, %	38.8	41.0	41.1	45.8
		DRY DENSITY, PCF	81.8	79.3	79.8	75.2
		SATURATION, %	98.9	98.3	100+	99.7
		VOID RATIO	1.058	1.126	1.108	1.241
	BEFORE SHEAR	WATER CONTENT, %				
		DRY DENSITY, PCF				
		SATURATION, %				
		VOID RATIO				
		BACK PRESS., TSF				
		MIN PRIN. STRESS, TSF	0.5	1.5	3.0	0.5
		MAX. DEV. STRESS, TSF	0.21	0.30	0.30	0.20
		TIME TO FAILURE, MIN.	30	30	30	30
		RATE OF STRAIN INCR.,%				
		INITIAL DIAMETER, IN.	1.39	1.39	1.39	1.39
		INITIAL HEIGHT, IN.	3.00	3.00	3.00	3.00

AVG. 40.30 80.33 99.10

CONTROLLED-STRAIN TEST

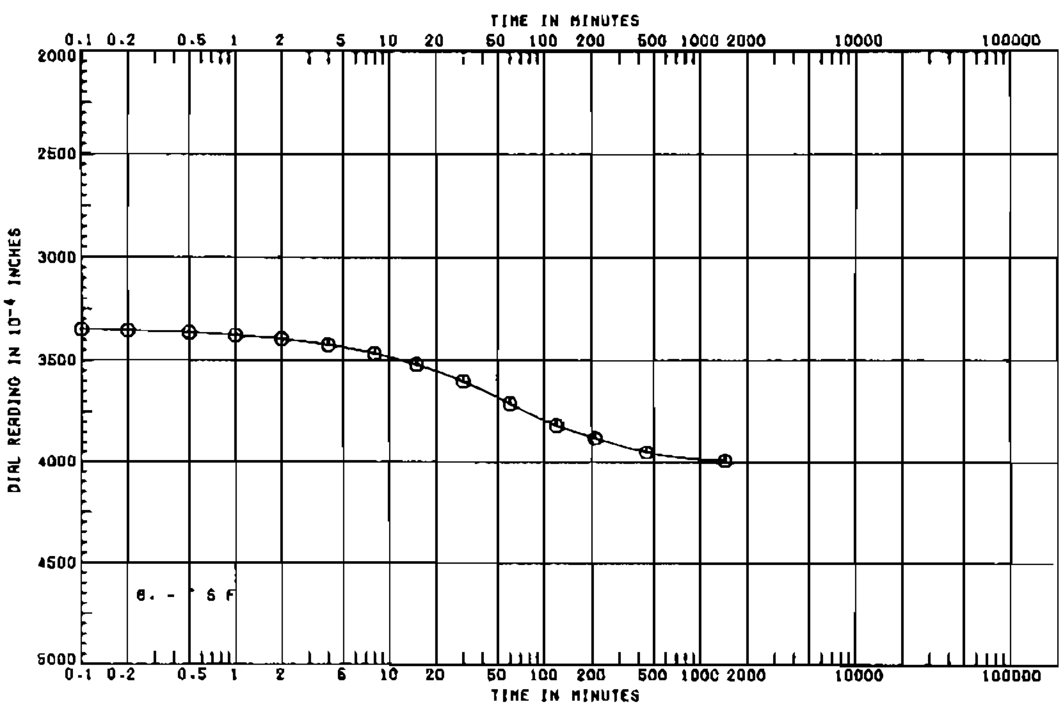
DESCRIPTION OF SPECIMENS: PLASTIC CLAY (CH), GRAY

LL 54	PL 16	PI 38	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:

PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER	
PLAN N.O. E. LEV (SO. POINT TO GIWW)	
BORING NO. 14-USP	SAMPLE NO. 5-B
DEPTH/ELEV 16.3/-2.8	TECH. KOC
LABORATORY USAE WES	DATE 19 MAR 86

TRIAXIAL COMPRESSION TEST REPORT

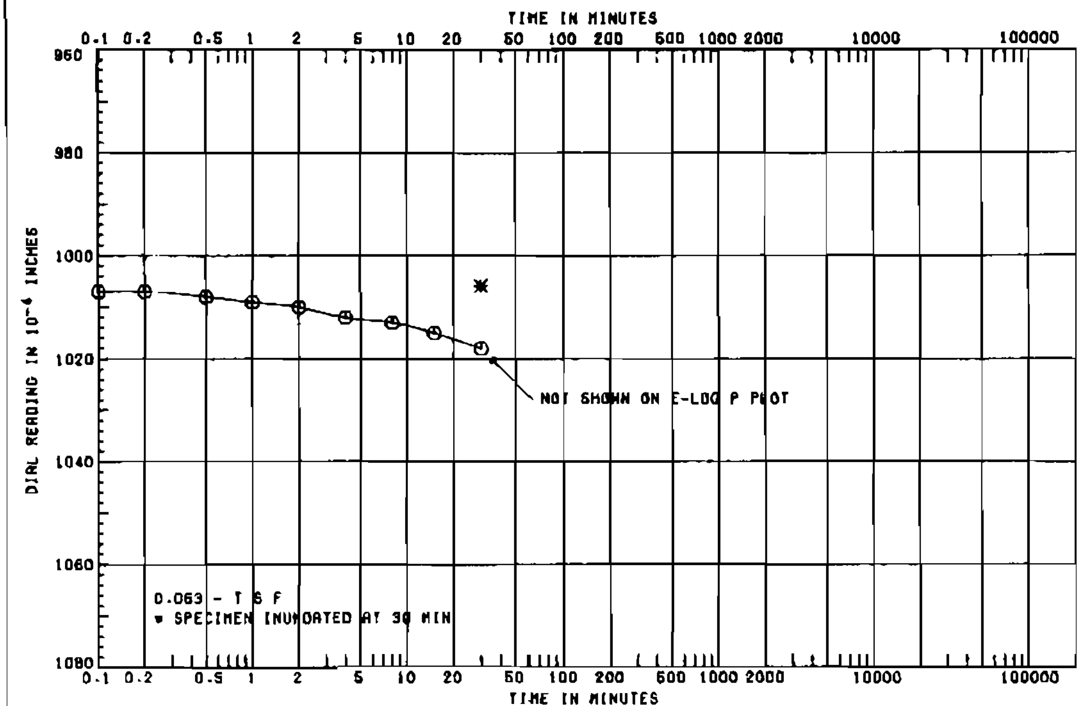


PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER	
PLAN N.O. E. LEV (SO. POINT TO GIWW)	
BORING 14-USP	SAMPLE NO. 4-B
DEPTH/ELEV 12.3/1.20	DATE 03 JUN 86

CONSOLIDATION TEST

TIME CURVES

SHEET 8 OF 8

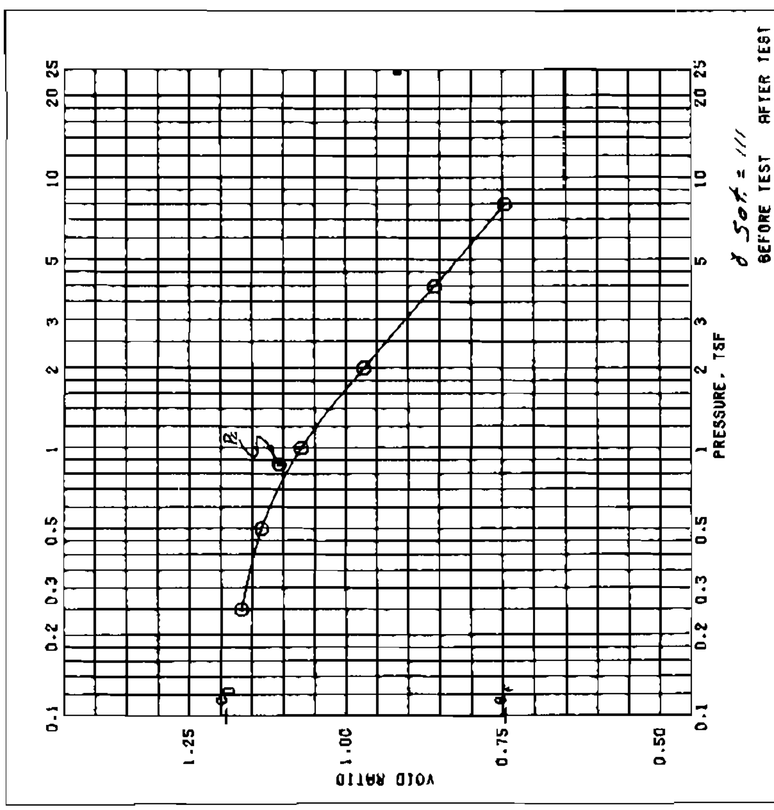


PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER PLAN N.O. E. LEV (SO. POINT TO OIWW)	
BORING 14-USP	SAMPLE NO. 5-C
DEPTH/ELEV 16.9/-3.40	DATE 03 JUN 86

CONSOLIDATION TEST

TIME CURVES

SHEET 2 OF 8



OVERBURDEN PRESSURE, TSF			BEFORE TEST / AFTER TEST
PRECONSOL. PRESSURE, TSF	0.88	WATER CONTENT, %	42.4 / 28.7
COMPRESSION INDEX	0.37	DRY DENSITY, PCF	77.0 / 96.6
TYPE SPECIMEN	UNDISTURBED	SATURATION, %	96.3 / 100+
DIA. IN 4.44	HT. IN 1.125	VOID RATIO	1.189 / 0.744
		BACK PRESSURE, TSF	

γ Sat = 111

CLASSIFICATION PLASTIC CLAY (CH), GRAY

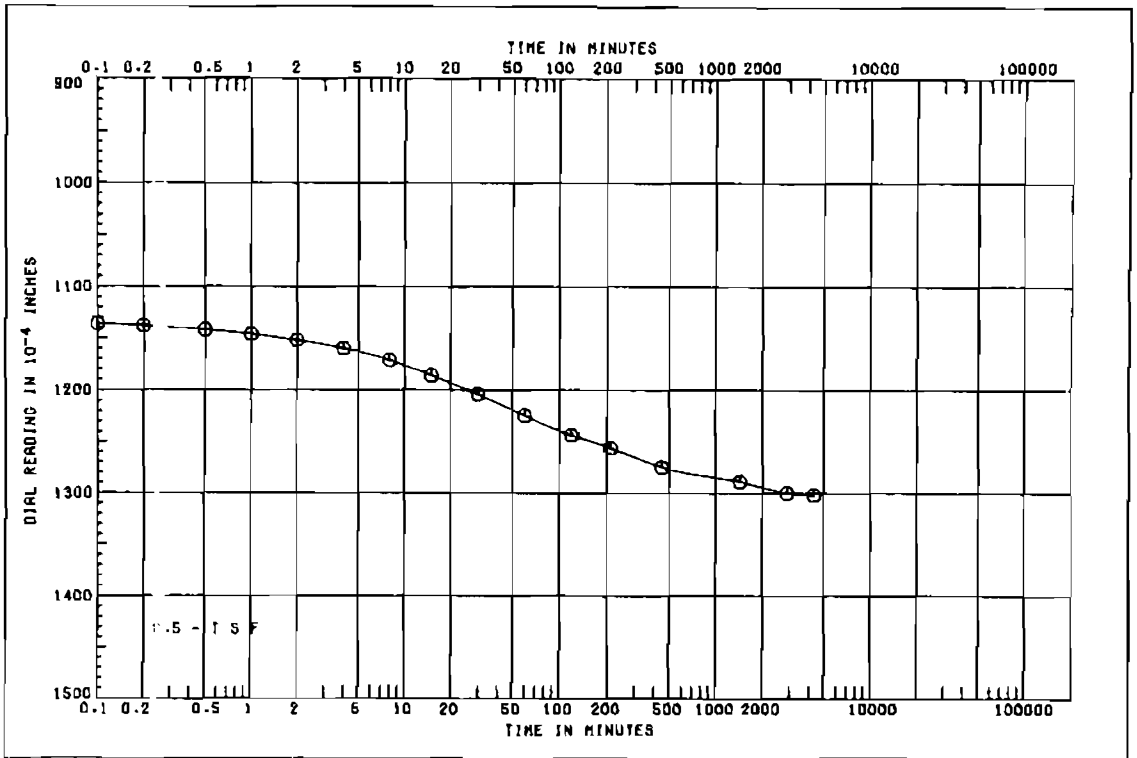
LL	PL	PI
GS 2.70 (EST)	C_{10}	
REMARKS		

PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER
PLAN N.O. E. LEV (SO. POINT TO OIWW)

BORING NO. 14-USP | SAMPLE NO. 5-C
DEPTH/ELEV 16.9/-3.40 | DATE 03 JUN 86

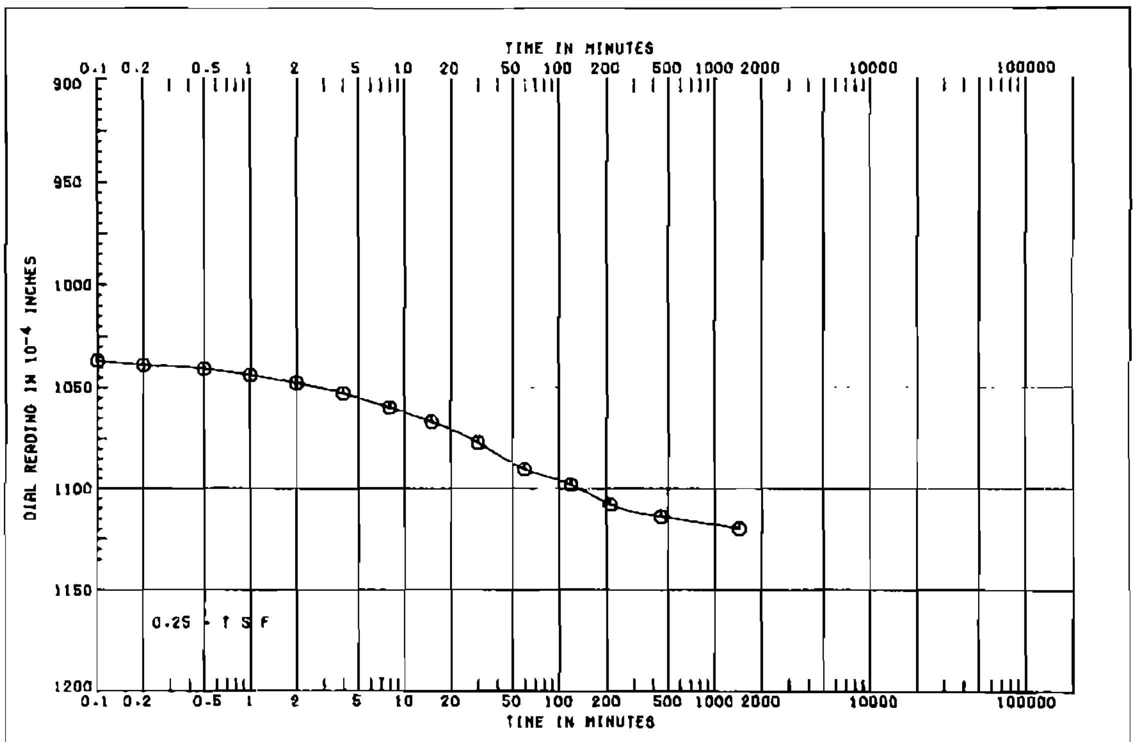
CONSOLIDATION TEST REPORT

SHEET 1 OF 8



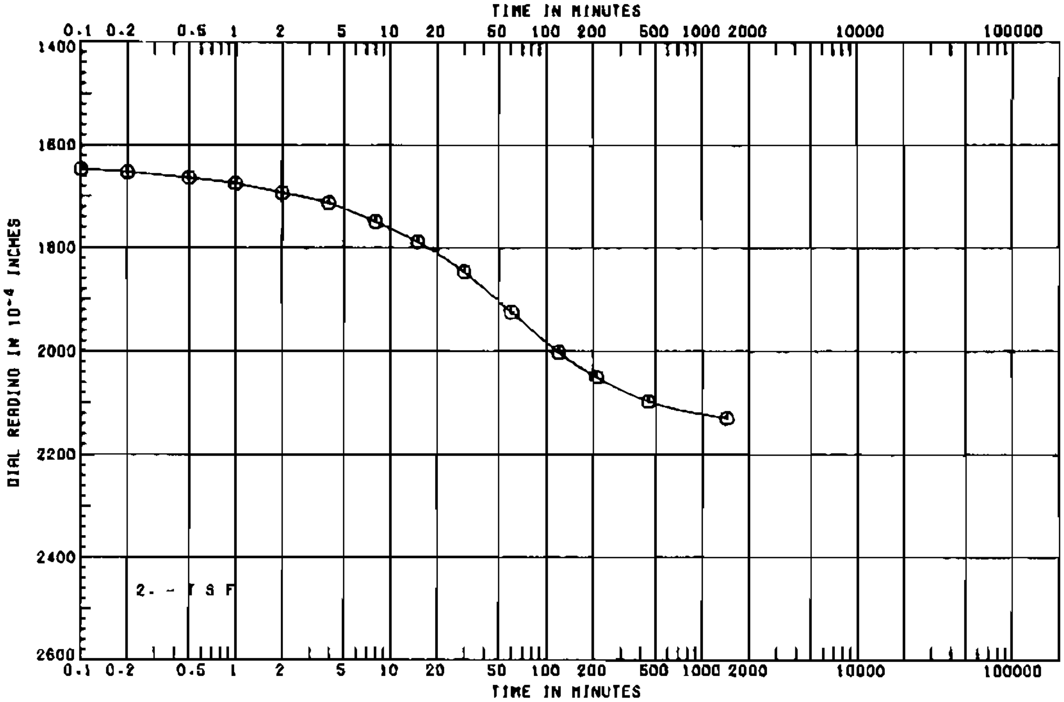
PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER		CONSOLIDATION TEST TIME CURVES
PLAN N.O. E. LEV (SO. POINT TO OIHW)		
BORING 14-USP	SAMPLE NO. 5-C	
DEPTH/ELEV 16.9/-3.40	DATE 03 JUN 86	

SHEET 4 OF 8



PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER		CONSOLIDATION TEST TIME CURVES
PLAN N.O. E. LEV (SO. POINT TO OIHW)		
BORING 14-USP	SAMPLE NO. 5-C	
DEPTH/ELEV 16.9/-3.40	DATE 03 JUN 86	

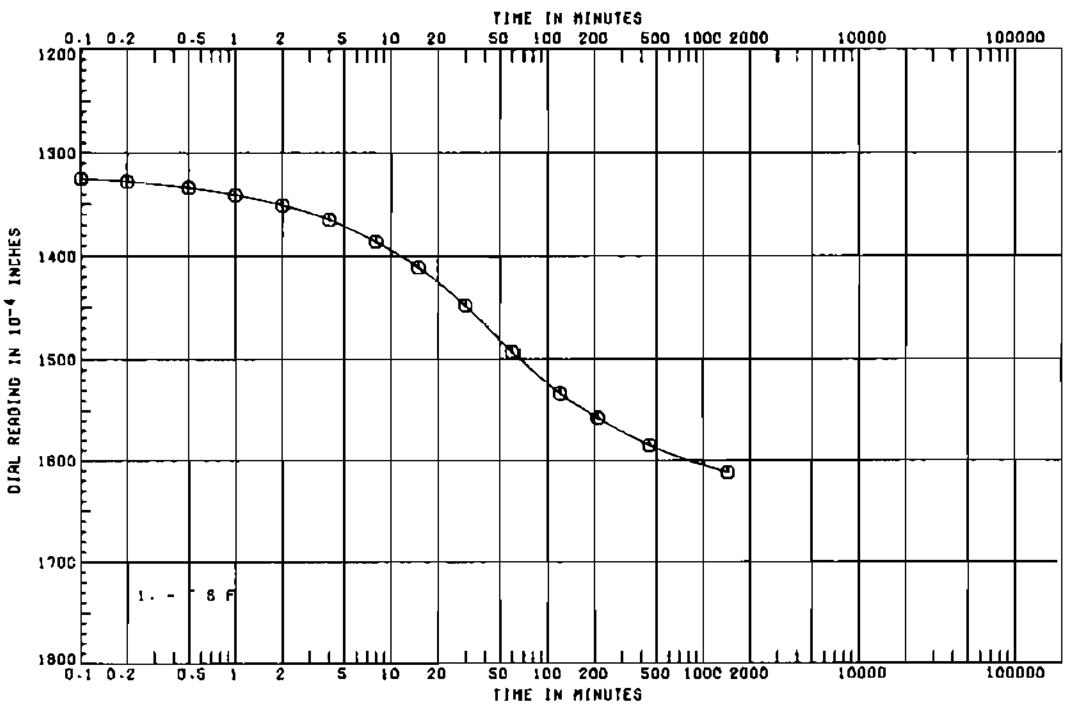
SHEET 3 OF 8



PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER	
PLAN N.O. E. LEV (SO. POINT TO OIHW)	
BORING 14-USP	SAMPLE NO. 5-C
DEPTH/ELEV 16.9/-3.40	DATE 03 JUN 86

CONSOLIDATION TEST
TIME CURVES

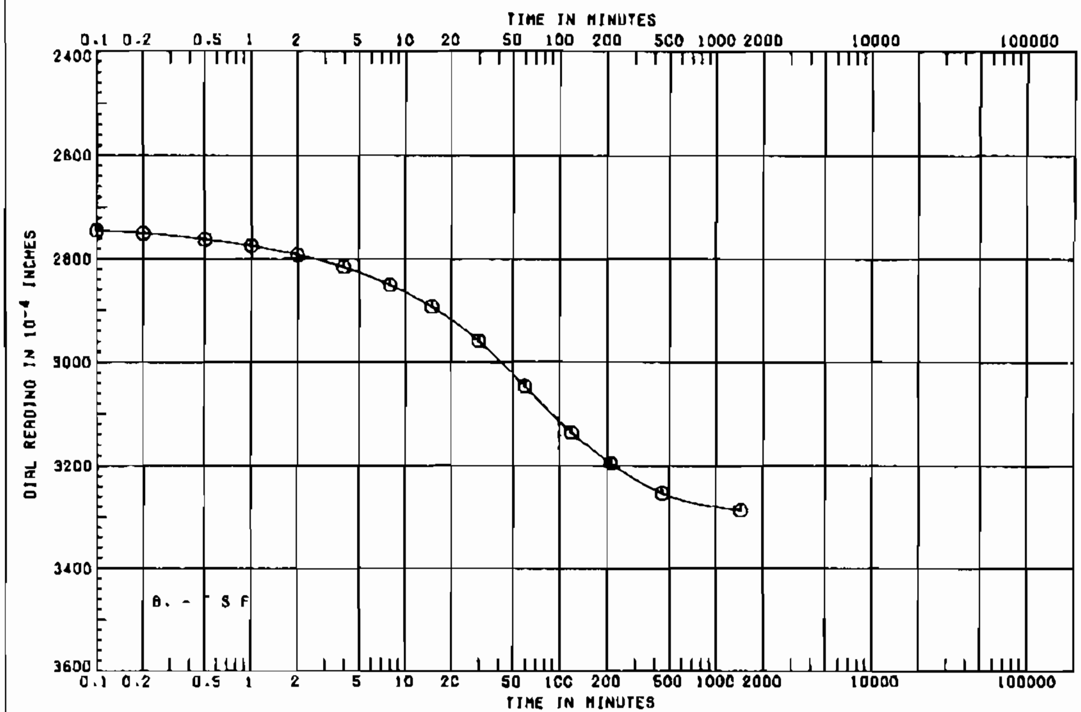
SHEET 6 OF 8



PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER	
PLAN N.O. E. LEV (SO. POINT TO OIHW)	
BORING 14-USP	SAMPLE NO. 5-C
DEPTH/ELEV 16.9/-3.40	DATE 03 JUN 86

CONSOLIDATION TEST
TIME CURVES

SHEET 5 OF 8

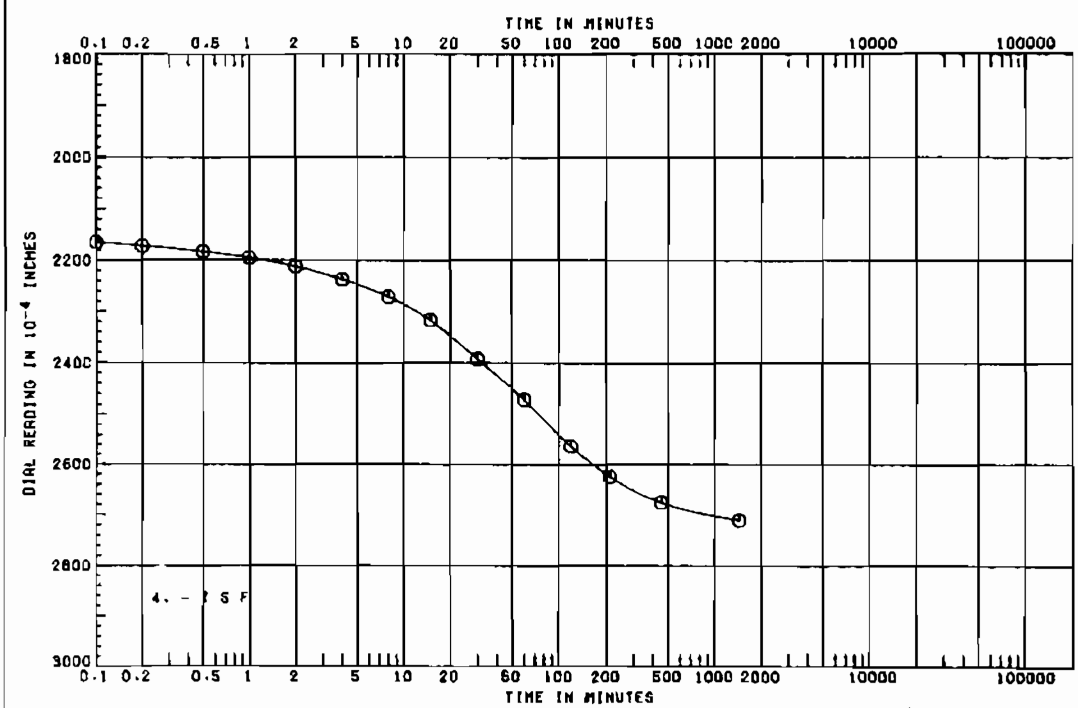


PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER	
PLAN N.O. E. LEV (SO. POINT TO OIWW)	
BORING 14-USP	SAMPLE NO. 5-C
DEPTH/ELEV 16.9/-3.40	DATE 03 JUN 86

CONSOLIDATION TEST

TIME CURVES

SHEET 8 OF 8



PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER	
PLAN N.O. E. LEV (SO. POINT TO OIWW)	
BORING 14-USP	SAMPLE NO. 5-C
DEPTH/ELEV 16.9/-3.40	DATE 03 JUN 86

CONSOLIDATION TEST

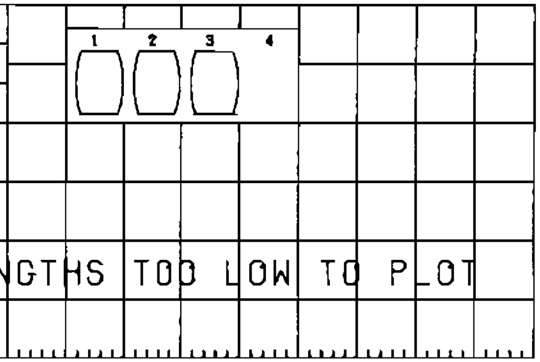
TIME CURVES

SHEET 7 OF 8

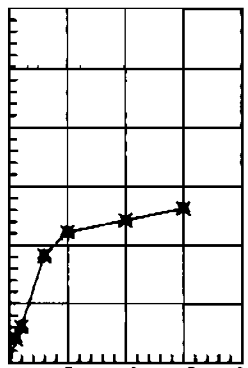
C = 0.065 T/SF

Φ = 0 DEG

TAN Φ = 0



γ Sat = 69



	SPECIMEN NO.	▲1	Y2	X3	4	AVG
INITIAL	WATER CONTENT, %	318.7	345.9	341.0		335.2
	DRY DENSITY, PCF	15.6	14.1	14.7		14.80
	SATURATION, %	93.2	90.2	93.5		92.30
	VOID RATIO	5.811	6.521	6.200		
BEFORE SHEAR	WATER CONTENT, %					
	DRY DENSITY, PCF					
	SATURATION, %					
	VOID RATIO					
	BACK PRESS., TSF					
	MIN PRIN. STRESS, TSF	0.5	1.5	3.0		
	MAX. DEV. STRESS, TSF	0.13	0.13	0.13		
	TIME TO FAILURE, MIN.	30	30	30		
	RATE OF STRAIN INCR.%					
	INITIAL DIAMETER, IN.	1.39	1.39	1.39		
	INITIAL HEIGHT, IN.	3.00	3.00	3.00		

CONTROLLED-STRAIN TEST

DESCRIPTION OF SPECIMENS: PEAT (PT), DARK BROWN

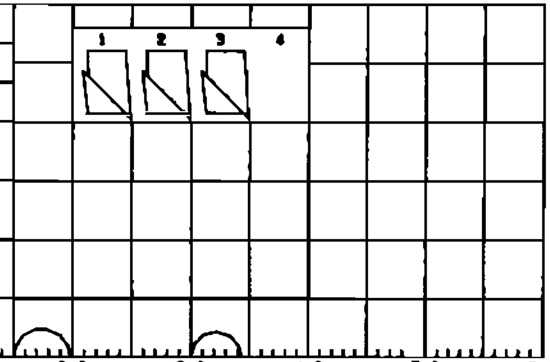
LL 336	PL 142	PI 194	GS 1.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:	
	PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER
	PLAN N.O. E. LEV (SO. POINT TO GIWW)
	BORING NO. 14-USP / SAMPLE NO. 7-8
	DEPTH/ELEV 24.3/-10.8 / TECH. KOC
	LABORATORY USAE WES / DATE 20 MAR 86
	TRIAXIAL COMPRESSION TEST REPORT

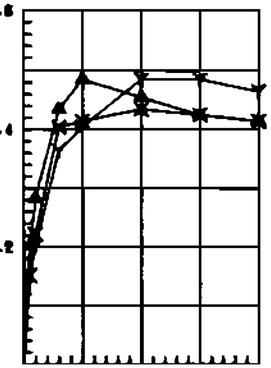
C = 0.232 T/SF

Φ = 0 DEG

TAN Φ = 0



γ Sat = 110



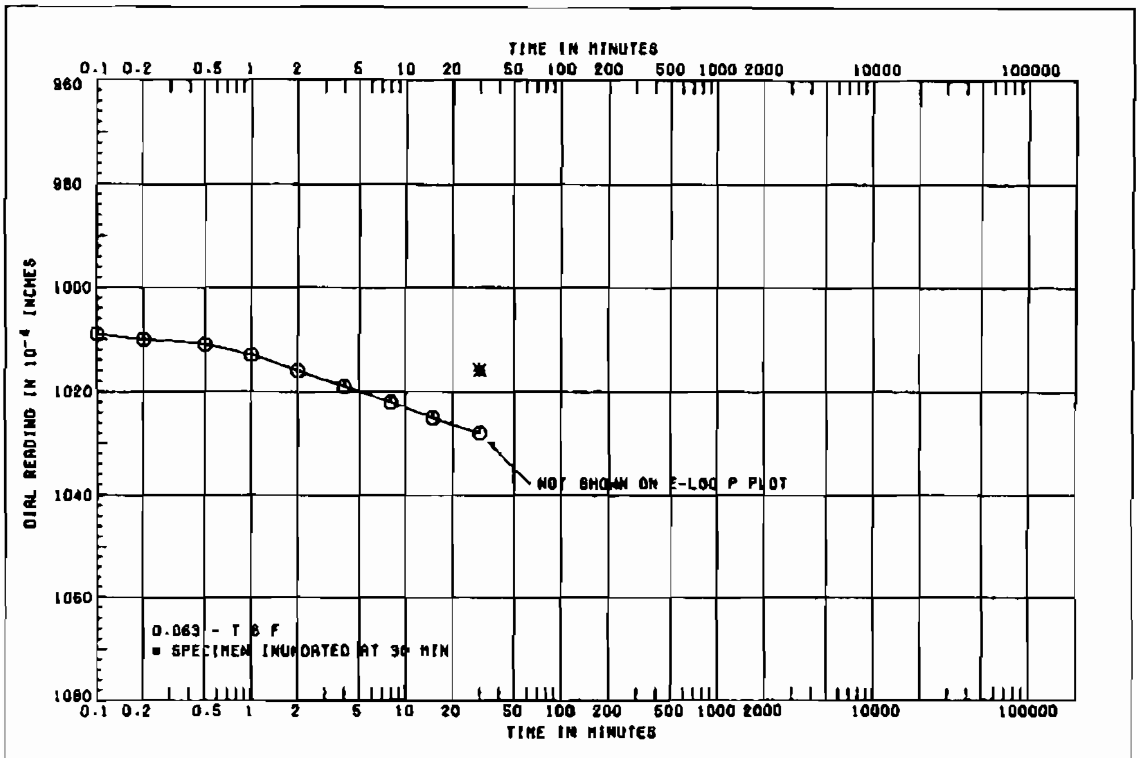
	SPECIMEN NO.	▲1	Y2	X3	4	AVG.
INITIAL	WATER CONTENT, %	46.1	44.5	45.1		45.2
	DRY DENSITY, PCF	74.0	75.7	74.8		74.83
	SATURATION, %	97.3	97.9	97.2		97.47
	VOID RATIO	1.279	1.220	1.259		
BEFORE SHEAR	WATER CONTENT, %					
	DRY DENSITY, PCF					
	SATURATION, %					
	VOID RATIO					
	BACK PRESS., TSF					
	MIN.PRIN. STRESS, TSF	0.5	1.5	3.0		
	MAX. DEV. STRESS, TSF	0.48	0.49	0.43		
	TIME TO FAILURE, MIN.	10	20	20		
	RATE OF STRAIN INCR.%					
	INITIAL DIAMETER, IN.	1.39	1.39	1.39		
	INITIAL HEIGHT, IN.	3.00	3.00	3.00		

CONTROLLED-STRAIN TEST

DESCRIPTION OF SPECIMENS: CLAY (CL), GRAY; SILT SEAMS

LL 46	PL 20	PI 26	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

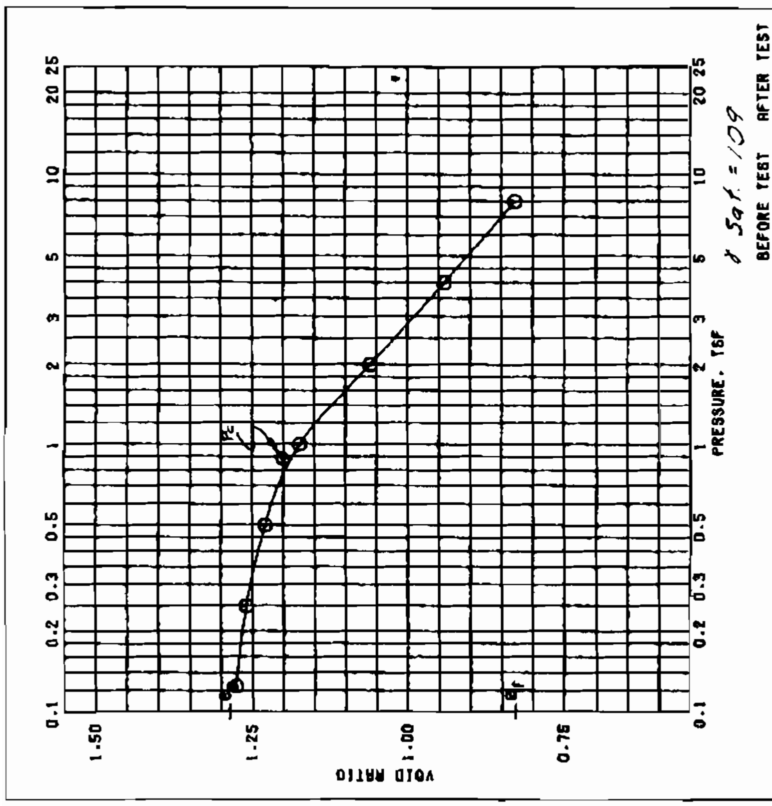
REMARKS:	
	PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER
	PLAN N.O. E. LEV (SO. POINT TO GIWW)
	BORING NO. 14-USP / SAMPLE NO. 9-9
	DEPTH/ELEV 32.3/-18.8 / TECH. KOC
	LABORATORY USAE WES / DATE 30 MAR 86
	TRIAXIAL COMPRESSION TEST REPORT



P OJECT LAKE PONT LA & VIC LAKE PONT BARRIER	
PLAN N.O. E. LEV (SO. POINT TO OIWW)	
BORIN 14-USP	S MPLE N . 9-C
DEP /E_EV 33.4/-19.9	DATE 06 JUN 86

C NSOLIDATION TEST
TIME CURVES

SHEE 2 OF 9



γ sat = 109

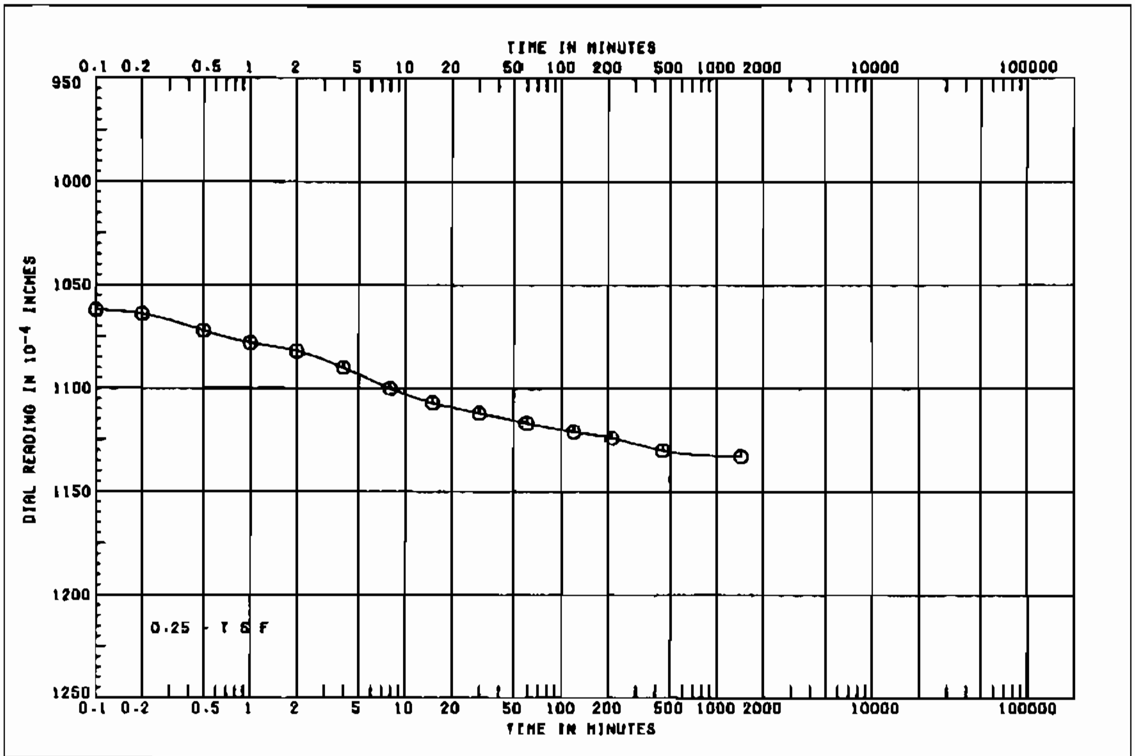
	BEFORE TEST	AFTER TEST
WATER CONTENT, %	46.1	31.2
DRY DENSITY, PCF	73.8	92.3
SATURATION, %	96.8	100 +
VOID RATIO	1.285	0.826
BACK PRESSURE, TSF		

OVERBURDEN PRESSURE, TSF	
PRECONSOL. PRESSURE, TSF	0.90
COMPRESSION INDEX	0.39
TYPE SPECIMEN	UNDISTURBED
DIA. IN 4.44	HT. IN 1.118
CLASSIFICATION	CLAY (CL), GRAY; SILT SEAMS
LL	PL / PI
GS 2.70 (EST)	D_{10}
REMARKS	

PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER	
PLAN N.O. E. LEV (SO. POINT TO OIWW)	
BORING NO. 14-USP	SAMPLE NO. 9-C
DEPTH/ELEV 33.4/-19.9	DATE 06 JUN 86

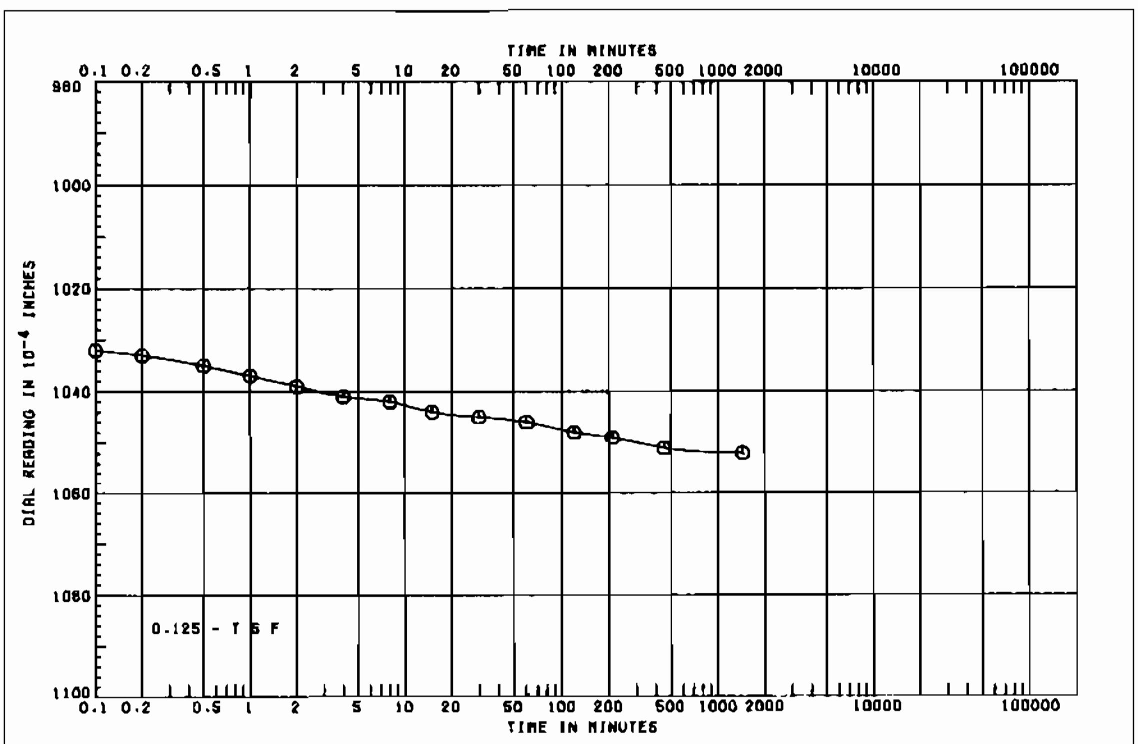
CONSOLIDATION TEST REPORT

SHEET 1 OF 9



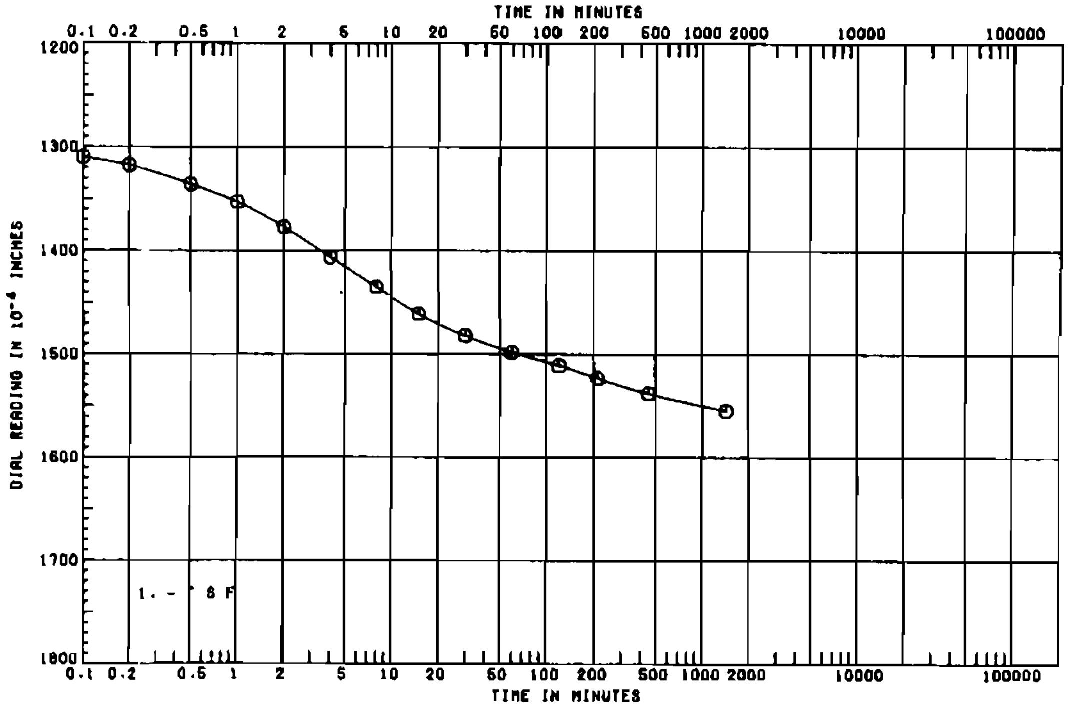
PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER		CONSOLIDATION TEST
PLAN N.O. E. LEV (SO. POINT TO OIHW)		TIME CURVES
BORING 14-USP	SAMPLE NO. 9-C	
DEPTH/ELEV 33.4/-19.9	DATE 06 JUN 86	

SHEET 4 OF 9



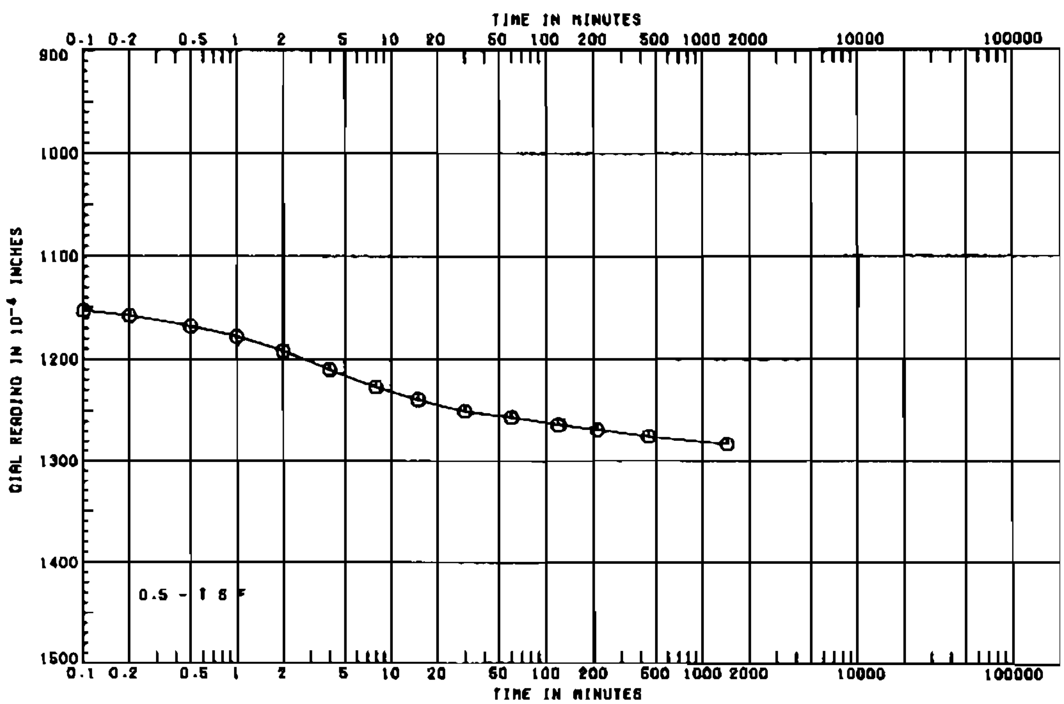
PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER		CONSOLIDATION TEST
PLAN N.O. E. LEV (SO. POINT TO OIHW)		TIME CURVES
BORING 14-USP	SAMPLE NO. 9-C	
DEPTH/ELEV 33.4/-19.9	DATE 06 JUN 86	

SHEET 3 OF 9



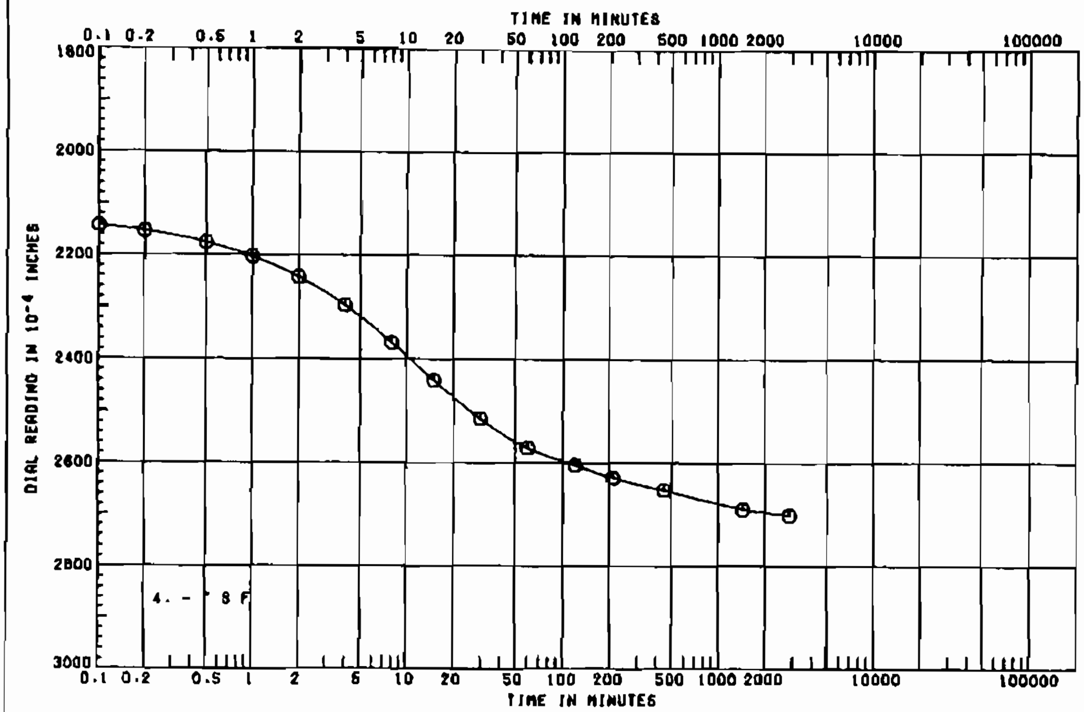
PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER		CONSOLIDATION TEST TIME CURVES
PLAN N.O. E. LEV (SO. POINT TO OIWW)		
BORING 14-USP	SAMPLE NO. 9-C	
DEPTH/ELEV 33.4/-19.9	DATE 06 JUN 86	

SHEET 6 OF 9



PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER		CONSOLIDATION TEST TIME CURVES
PLAN N.O. E. LEV (SO. POINT TO OIWW)		
BORING 14-USP	SAMPLE NO. 9-C	
DEPTH/ELEV 33.4/-19.9	DATE 06 JUN 86	

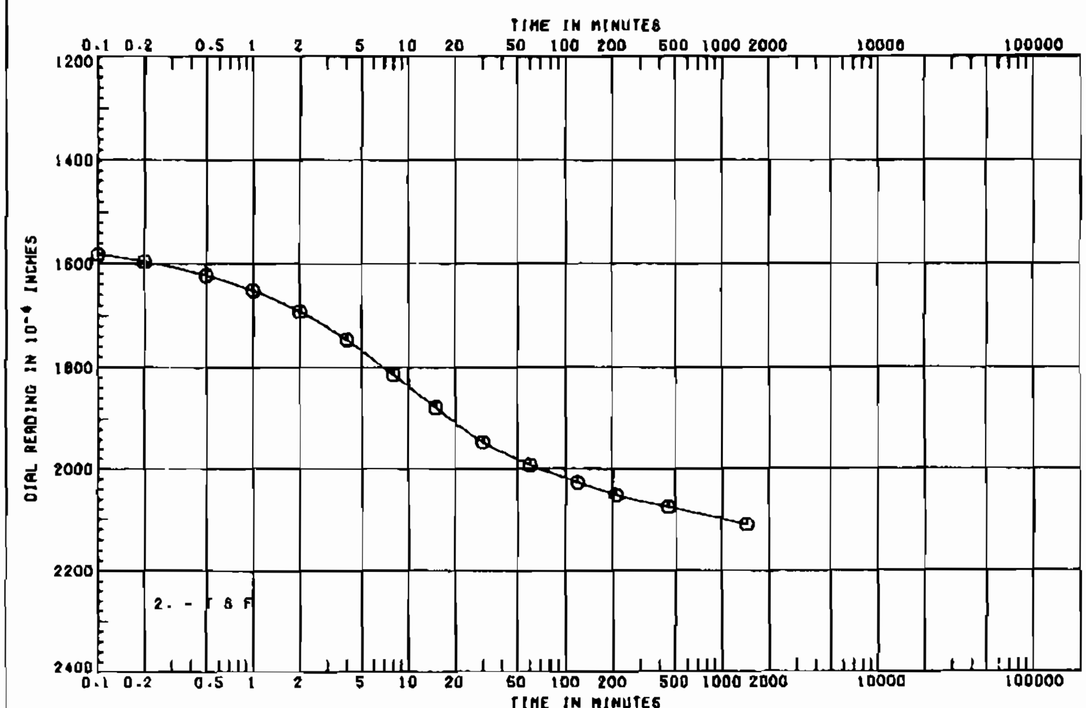
SHEET 6 OF 9



PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER	
PLAN N.O. E. LEV (SO. POINT TO GIWW)	
BORING 14-USP	SAMPLE NO. 9-C
DEPTH/ELEV 33.4/-19.9	DATE 06 JUN 86

CONSOLIDATION TEST
TIME CURVES

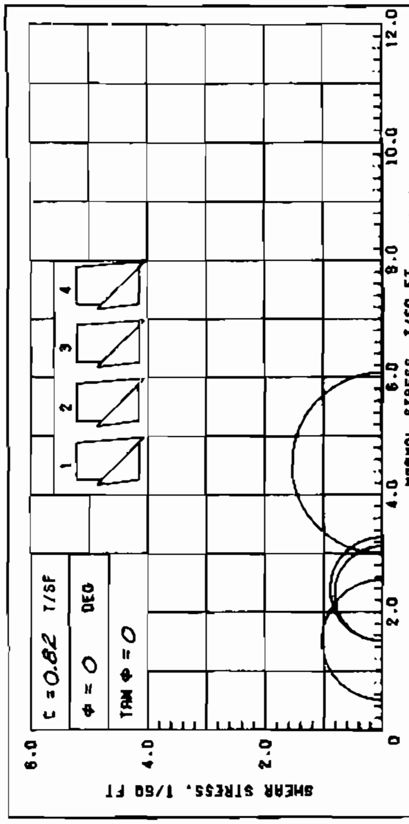
SHEET 8 OF 9

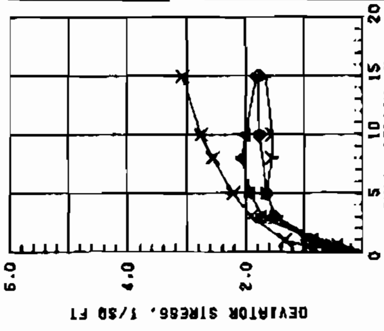


PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER	
PLAN N.O. E. LEV (SO. POINT TO GIWW)	
BORING 14-USP	SAMPLE NO. 9-C
DEPTH/ELEV 33.4/-19.9	DATE 06 JUN 86

CONSOLIDATION TEST
TIME CURVES

SHEET 7 OF 9





SPECIMEN NO.		1	2	3	4	AVG.
INITIAL	WATER CONTENT, %	18.8	17.5	15.8	26.2	17.6
	DRY DENSITY, PCF	100.5	107.7	109.1	97.8	106.?
	SATURATION, %	74.2	83.7	83.2	97.9	80.4
	VOID RATIO	0.677	0.565	0.545	0.723	
BEFORE SHEAR	WATER CONTENT, %					
	DRY DENSITY, PCF					
	SATURATION, %					
	VOID RATIO					
	BACK PRESS., TSF					
MIN PRIN. STRESS, TSF		0.5	1.5	3.0	1.5	
MAX. DEV. STRESS, TSF		2.06	1.63	3.07	1.78	
TIME TO FAILURE, MIN.		16	10	30	30	
RATE OF STRAIN (%/MIN)						
INITIAL DIAMETER, IN.		1.39	1.39	1.39	1.39	
INITIAL HEIGHT, IN.		3.00	3.00	3.00	3.00	

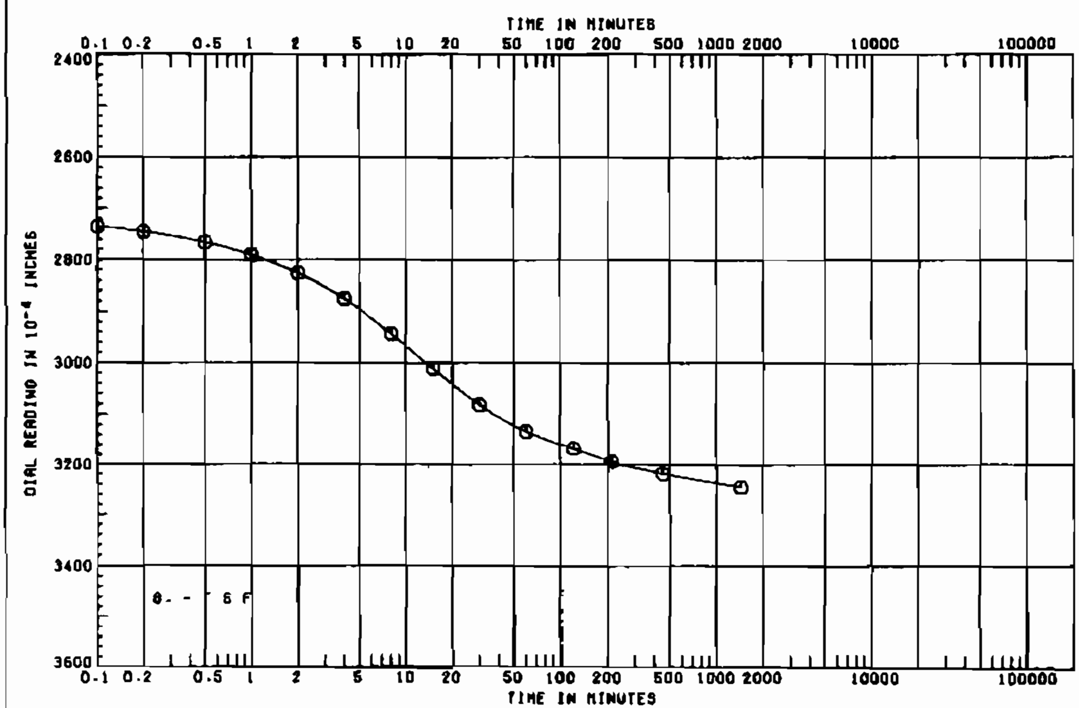
CONTROLLED-STRAIN TEST

DESCRIPTION OF SPECIMENS: CLAY (CL), GRAY

LL 34	PL 13	PI 21	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:	PROJECT LK PONT LA & VIC LK PONT BARR PLAN N.O EAST LEVEE (SOUTH POINT TO GIWW)
	BORING NO. 15-USP / SAMPLE NO. 1-C
	DEPTH/ELEV 2.0/12.40 / TECH. KDC
	LABORATORY JSAE WES / DATE 27 AUG 85

TRIAXIAL COMPRESSION TEST REPORT

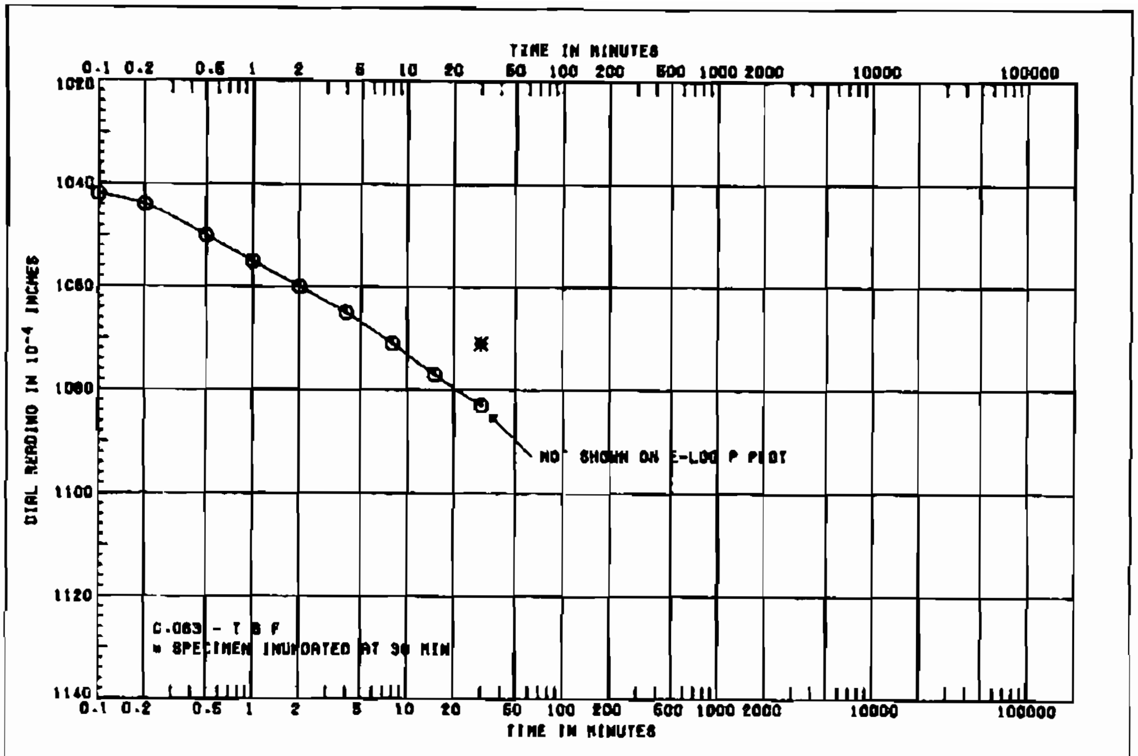


PROJECT LAKE PONT LA & VIC LAKE PONT BARRIER	
PLAN N.O. E. LEV (SO. POINT TO GIWW)	
BORING 14-USP	SAMPLE NO. 8-C
DEPTH/ELEV 33.4/-19.9	DATE 06 JUN 86

CONSOLIDATION TEST

TIME CURVES

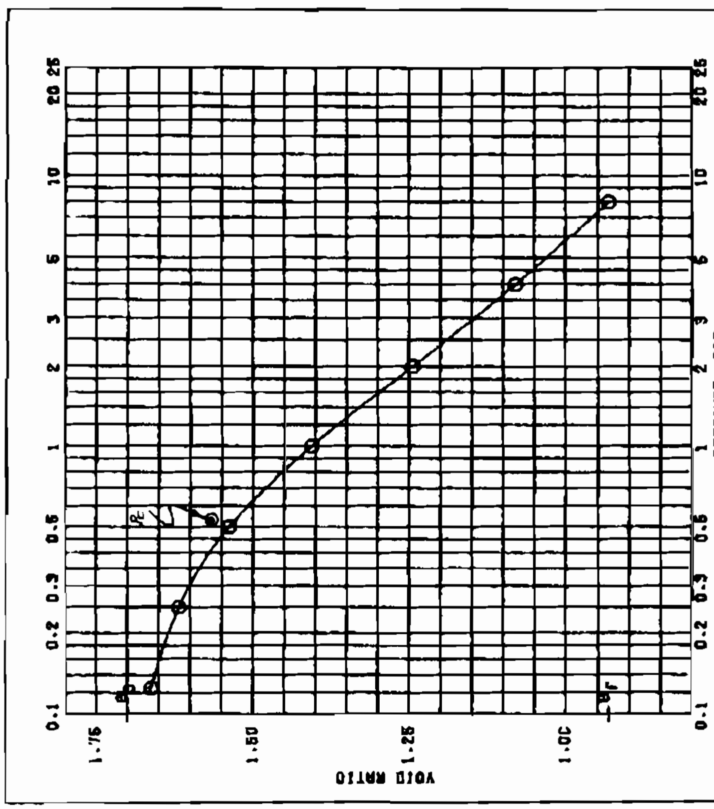
SHEET 9 OF 9



PROJECT LAKE PONT LA & VIC NEW ORLEANS	
EAST LEV (SOUTH POINT TO DINH)	
BORING 15-USP	SAMPLE NO. 4-B
DEPTH/ELEV 11.8/2.50	DATE 11 JUN 86

CONSOLIDATION TEST
TIME CURVES

SHEET 2 OF 9



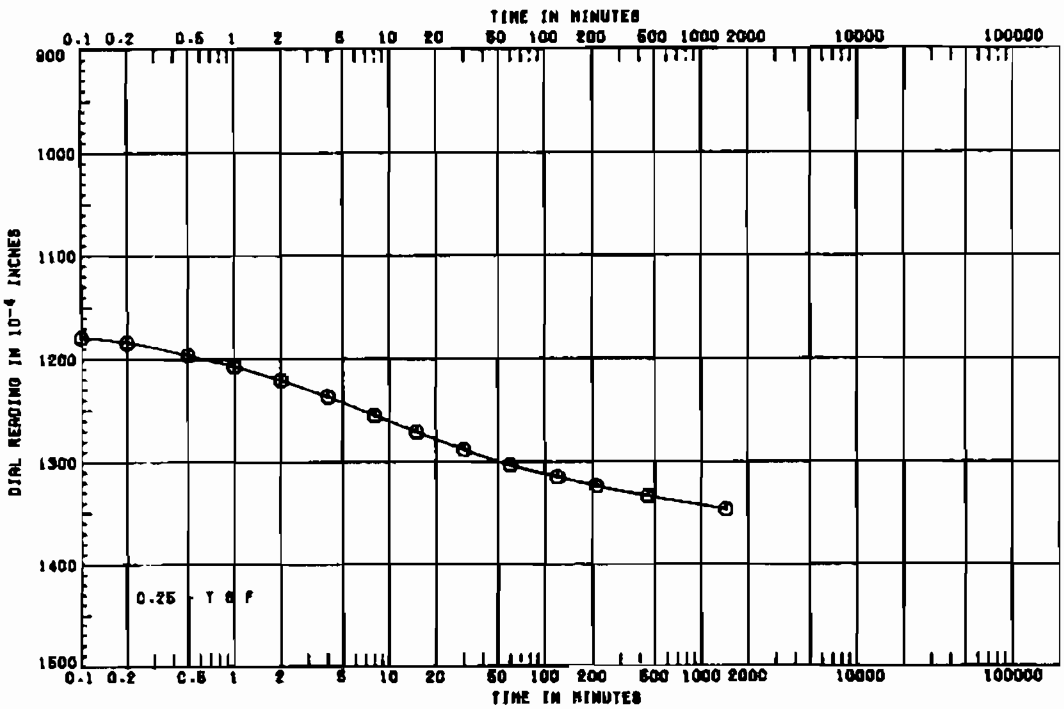
$\gamma_{sat} = 102$

	BEFORE TEST	AFTER TEST
WATER CONTENT, %	58.5	34.1
DRY DENSITY, PCF	62.4	87.9
SATURATION, %	82.9	95.9
VOID RATIO	1.698	0.931
BACK PRESSURE, TSF		

OVERBURDEN PRESSURE, TSF	
PRECONSOL. PRESSURE, TSF	0.53
COMPRESSION INDEX	0.56
TYPE SPECIMEN	UNDISTURBED
DIA. IN 4.44	HT. IN 1.124
CLASSIFICATION	SANDY CLAY (CH), GRAY
LL 53	PL 16 PI 37
GS 2.70 (EST)	D_{10}
PROJECT	LAKE PONT LA & VIC NEW ORLEANS EAST LEV (SOUTH POINT TO DINH)
REMARKS	BORING NO. 15-USP SAMPLE NO. 4-B
	DEPTH/ELEV 11.8/2.5C DATE 11 JUN 86

CONSOLIDATION TEST REPORT

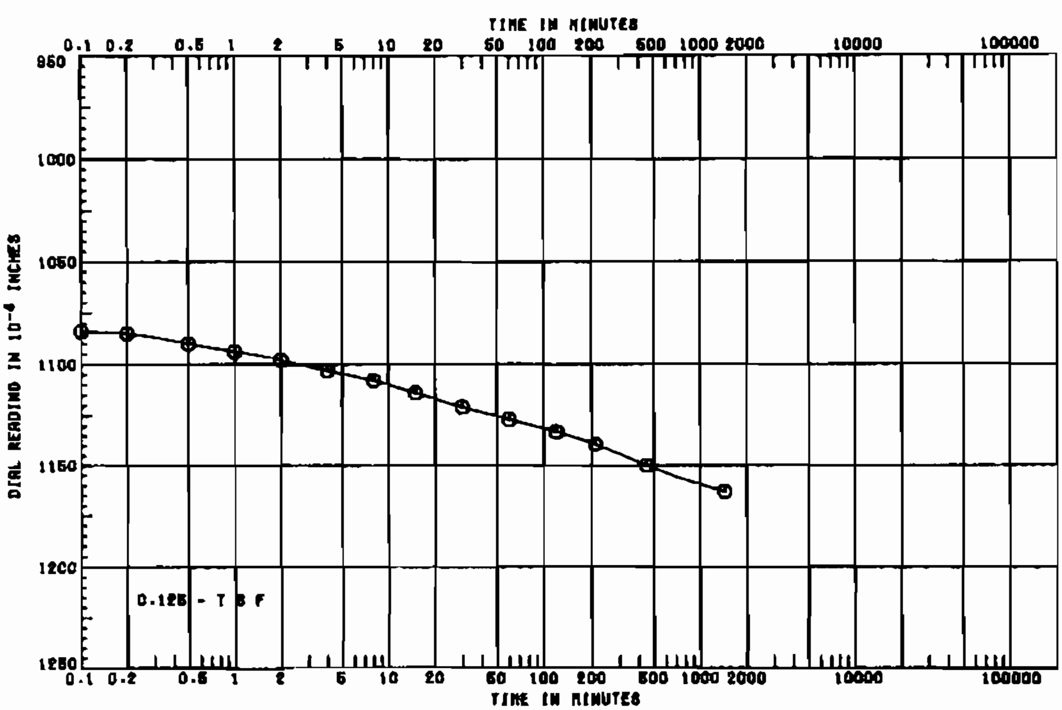
SHEET 1 OF 9



PROJECT LAKE PONT LA & VIC NEW ORLEANS	
EAST LEV (SOUTH POINT TO GIWW)	
BORING 15-USP	SAMPLE NO. 4-B
DEPTH/ELEV 11.9/2.5C	DATE 11 JUN 86

CONSOLIDATION TEST
TIME CURVES

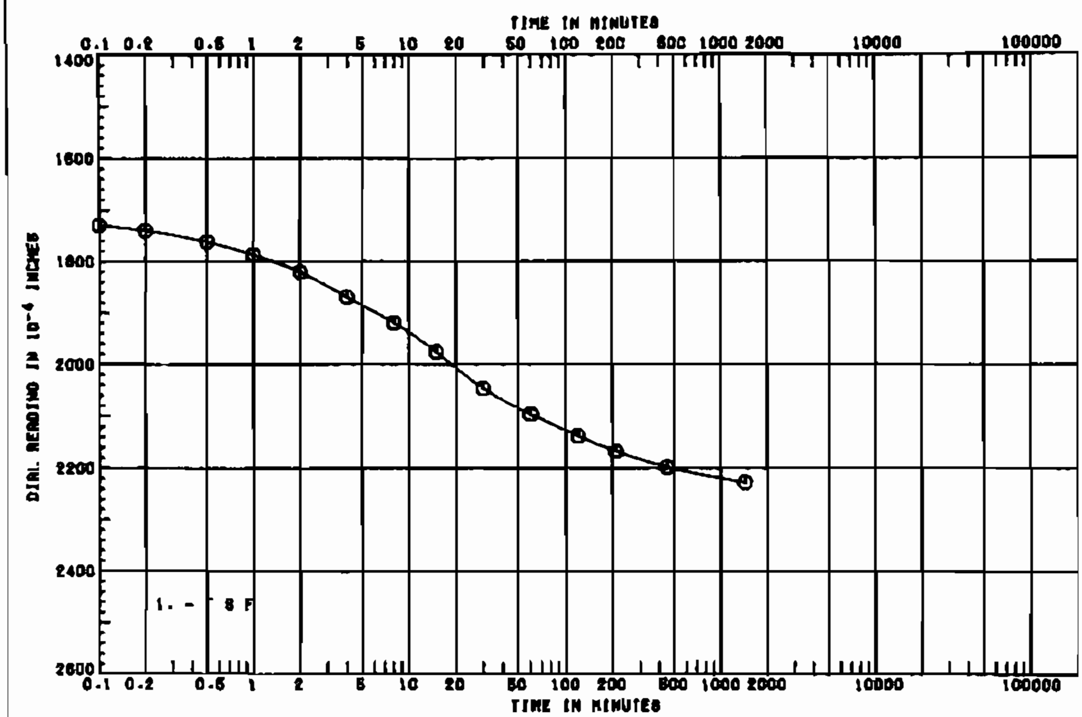
SHEET 4 OF 9



PROJECT LAKE PONT LA & VIC NEW ORLEANS	
EAST LEV (SOUTH POINT TO GIWW)	
BORING 15-USP	SAMPLE NO. 4-B
DEPTH/ELEV 11.9/2.5C	DATE 11 JUN 86

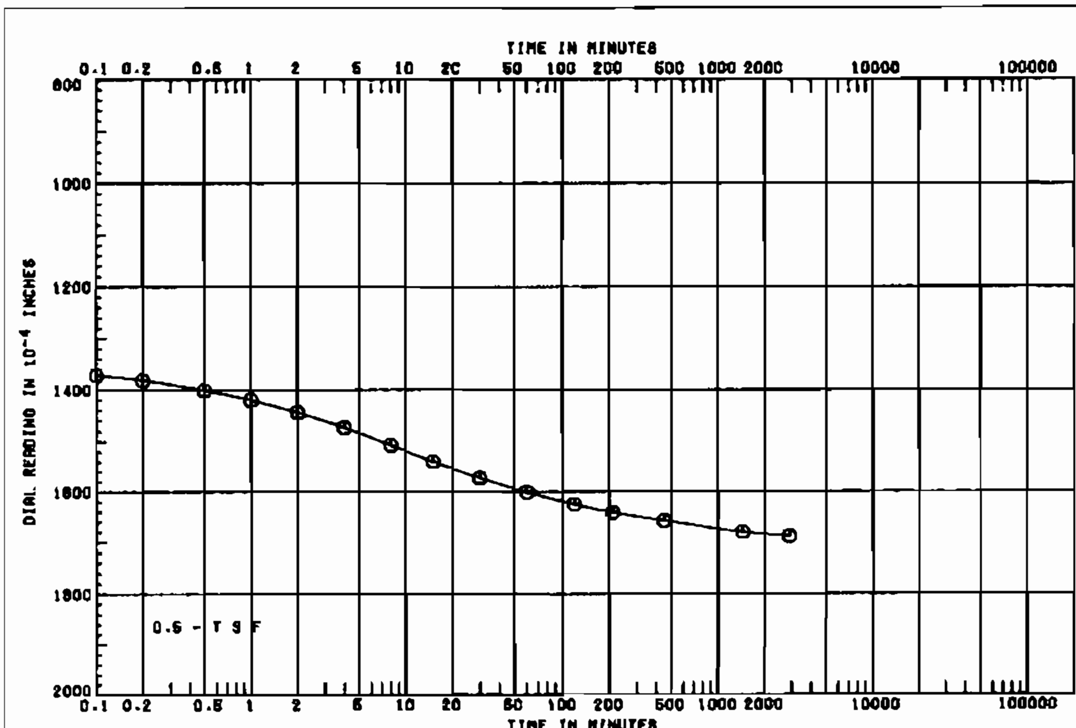
CONSOLIDATION TEST
TIME CURVES

SHEET 3 OF 9



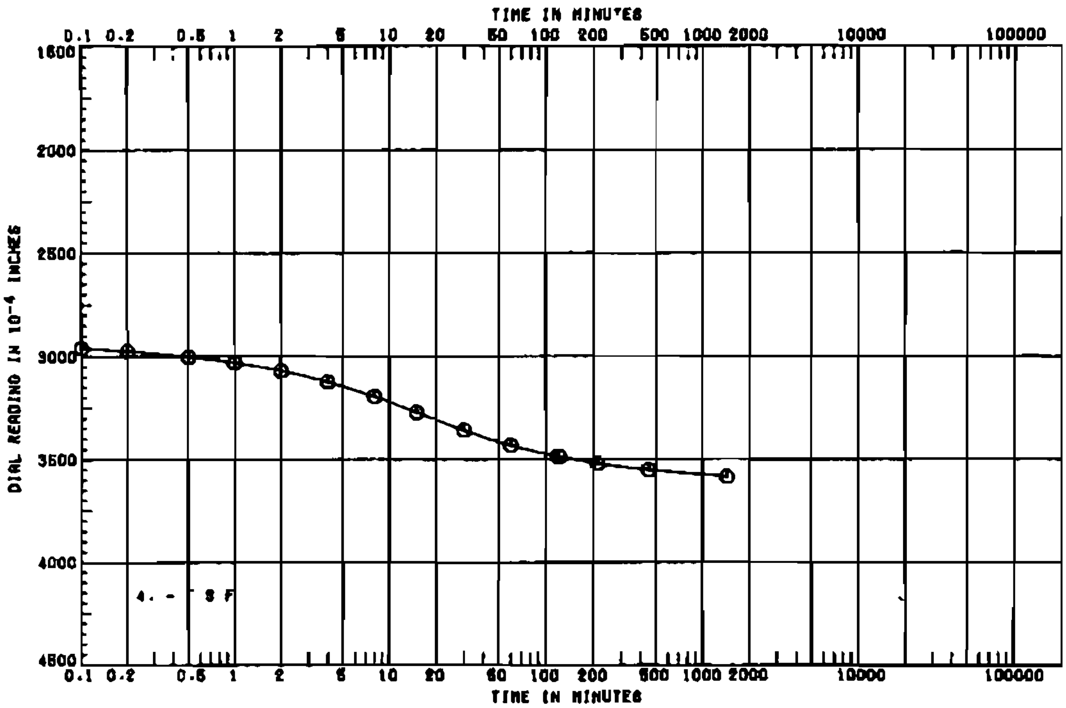
PROJECT LAKE PONT LA & VIC NEW ORLEANS		CONSOLIDATION TEST
EAST LEV (SOUTH POINT TO GIWW)		TIME CURVES
BORING 15-USP	SAMPLE NO. 4-B	
DEPTH/ELEV 11.9/2.5C	DATE 11 JUN 86	

SHEET 6 OF 9



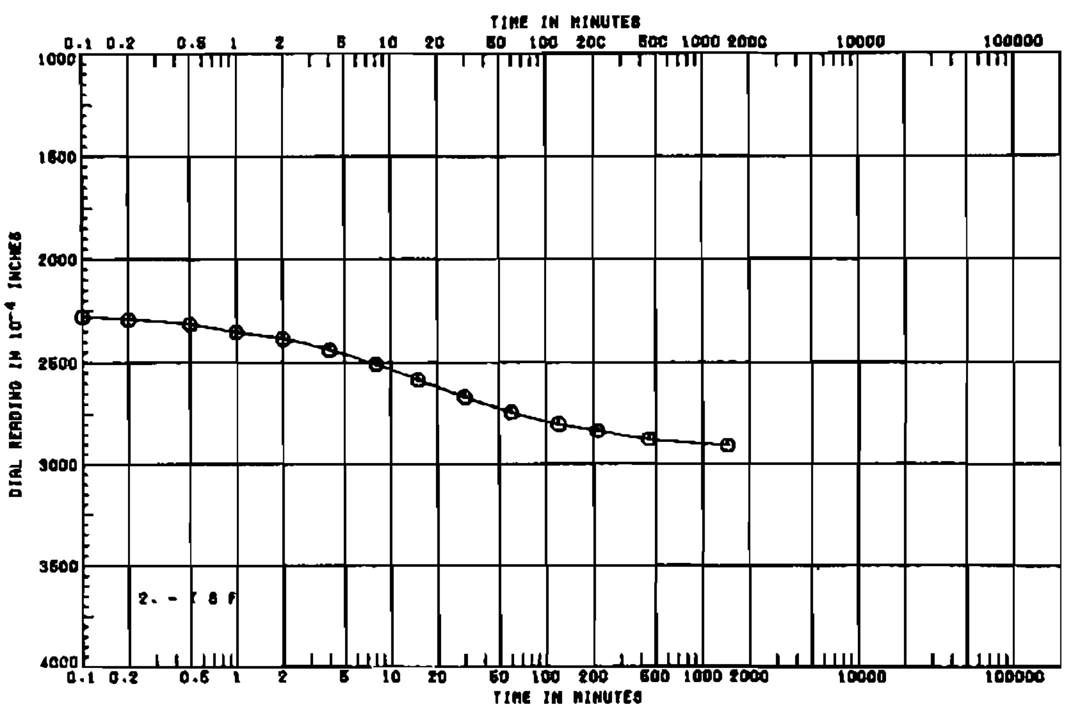
PROJECT LAKE PONT LA & VIC NEW ORLEANS		CONSOLIDATION TEST
EAST LEV (SOUTH POINT TO GIWW)		TIME CURVES
BORING 15-USP	SAMPLE NO. 4-B	
DEPTH/ELEV 11.9/2.5C	DATE 11 JUN 86	

SHEET 5 OF 9



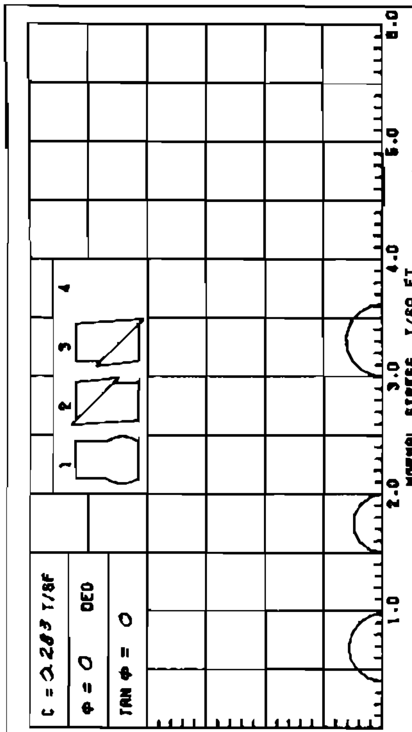
PROJECT LAKE PONT LA & VIC NEW ORLEANS		CONSOLIDATION TEST TIME CURVES
EAST LEV (SOUTH POINT TO OINN)		
BORING 15-USP	SAMPLE NO. 4-5	
DEPTH/ELEV 11.9/2.5C	DATE 11 JUN 86	

SHEET 8 OF 9



PROJECT LAKE PONT LA & VIC NEW ORLEANS		CONSOLIDATION TEST TIME CURVES
EAST LEV (SOUTH POINT TO OINN)		
BORING 15-USP	SAMPLE NO. 4-6	
DEPTH/ELEV 11.9/2.5C	DATE 11 JUN 86	

SHEET 7 OF 9



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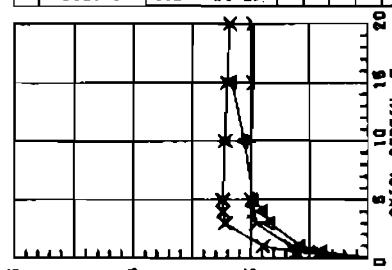


	SPECIMEN NO.	▲1	Y2	X3	4	AVG.
INITIAL	WATER CONTENT, %	39.1	41.6	42.2		40.97
	DRY DENSITY, PCF	80.6	77.8	77.9		78.77
	SATURATION, %	96.7	96.3	97.9		96.97
	VOID RATIO	1.092	1.166	1.164		
BEFORE SHEAR	WATER CONTENT, %					
	DRY DENSITY, PCF					
	SATURATION, %					
	VOID RATIO					
	BACK PRESS., TSF					
	MIN PRIN. STRESS, TSF	0.5	1.5	3.0		
	MAX. DEV. STRESS, TSF	0.58	0.60	0.62		
	TIME TO FAILURE, MIN.	30	10	8		
	RATE OF STRAIN INCR.%					
	INITIAL DIAMETER, IN.	1.38	1.39	1.39		
	INITIAL HEIGHT, IN.	3.00	3.00	3.00		

CONTROLLED-STRAIN TEST

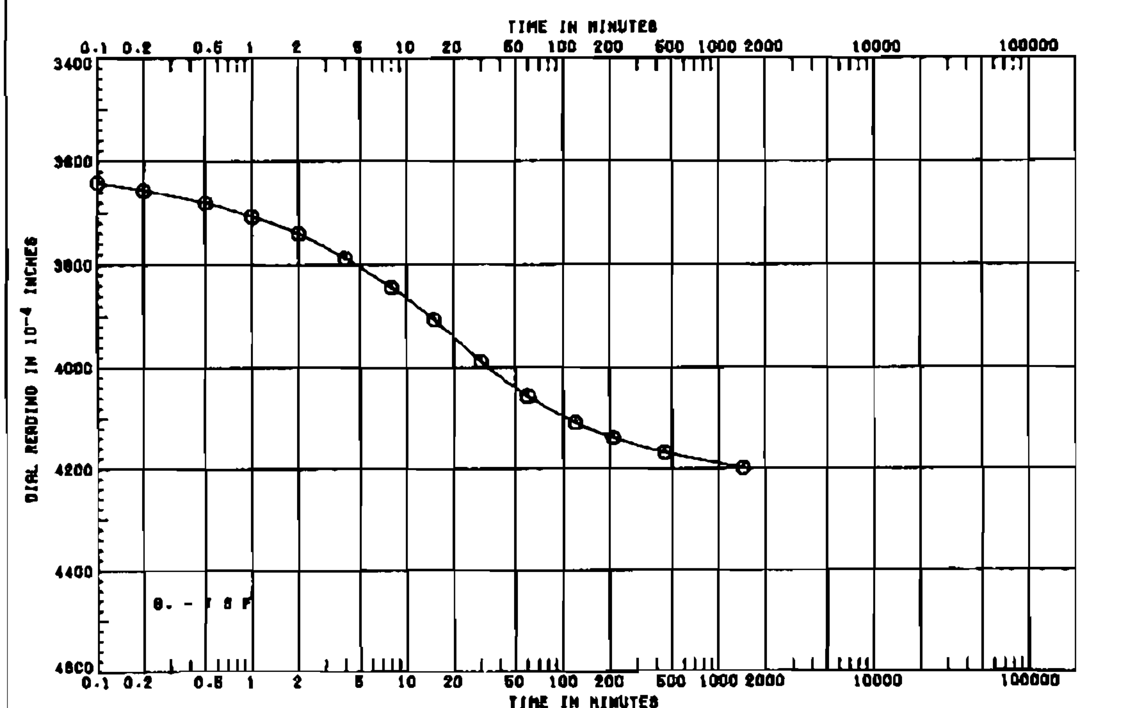
DESCRIPTION OF SPECIMENS: PLASTIC CLAY (CH), GRAY

LL 62	PL 16	PI 46	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:

PROJECT LAKE PONT LA & VIC NEW ORLEANS	
EAST LEV (SOUTH POINT TO GIWW)	
BORING NO. 15-USP	SAMPLE NO. 7-B
DEPTH/ELEV 24.3/-9.8	TECH. KOC
LABORATORY USAE WES	DATE 12 MAY 86

TRIAXIAL COMPRESSION TEST REPORT

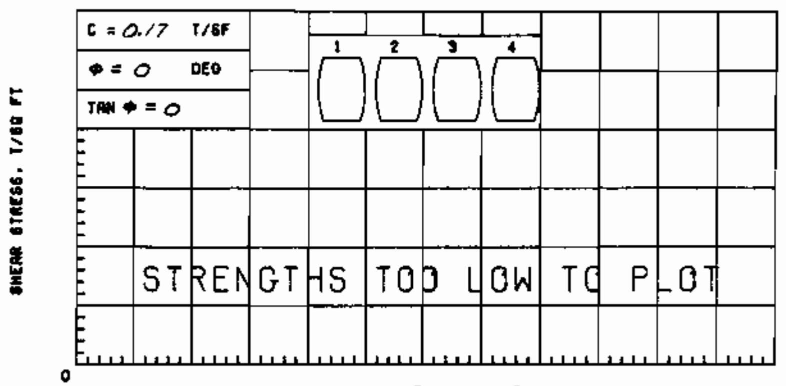


PROJECT LAKE PONT LA & VIC NEW ORLEANS	
EAST LEV (SOUTH POINT TO GIWW)	
BORING 15-USP	SAMPLE NO. 4-B
DEPTH/ELEV 11.9/2.50	DATE 11 JUN 86

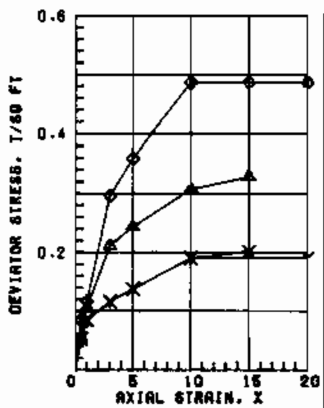
CONSOLIDATION TEST

TIME CURVES

SHEET 9 OF 9



γ Sat = 117



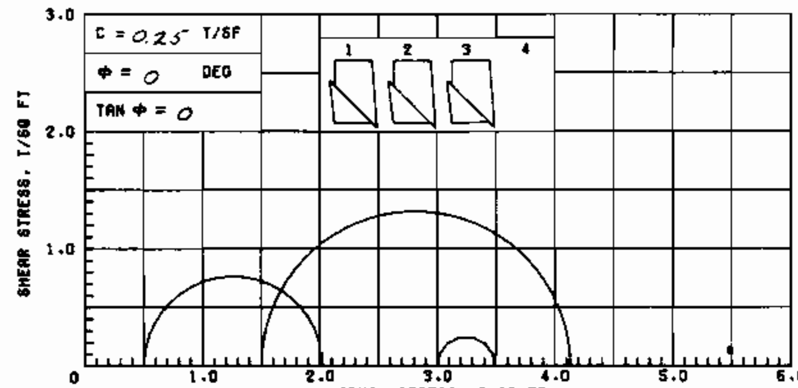
SPECIMEN NO.		▲1	Y2	X3	◇4	AVG.
INITIAL	WATER CONTENT, %	35.6	38.7	38.2	37.1	37.65
	DRY DENSITY, PCF	83.7	82.3	85.7	86.6	84.59
	SATURATION, %	94.9	100+	100+	100+	98.73
	VOID RATIO	1.013	1.047	0.966	0.946	
BEFORE SHEAR	WATER CONTENT, %					
	DRY DENSITY, PCF					
	SATURATION, %					
	VOID RATIO					
	BACK PRESS., TSF					
MIN PRIN. STRESS, TSF		0.5	1.5	3.0	3.0	
MAX. DEV. STRESS, TSF		0.33	0.19	0.20	0.49	
TIME TO FAILURE, MIN.		30	20	30	20	
RATE OF STRAIN INCR.%						
INITIAL DIAMETER, IN.		1.36	1.36	1.36	1.36	
INITIAL HEIGHT, IN.		3.00	3.00	3.00	3.00	

CONTROLLED-STRAIN TEST

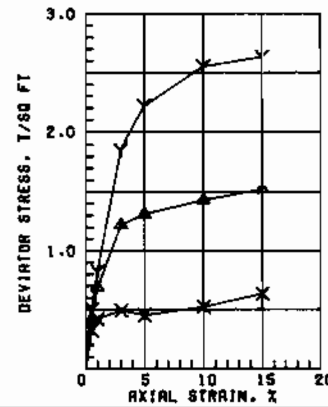
DESCRIPTION OF SPECIMENS: SILTY CLAY (CL), GRAY; PLASTIC CLAY (CH), POCKETS

LL 30	PL 18	PI 12	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:	PROJECT LAKE PONT LA & VIC NEW ORLEANS	
	EAST LEV (SOUTH POINT TO GIWW)	
	BORING NO. 15-USP	SAMPLE NO. 10-C
	DEPTH/ELEV 37.2/-22.8	TECH. KOC
	LABORATORY USAE WES	DATE 12 MAY 86
	TRIAXIAL COMPRESSION TEST REPORT	



γ Sat = 117



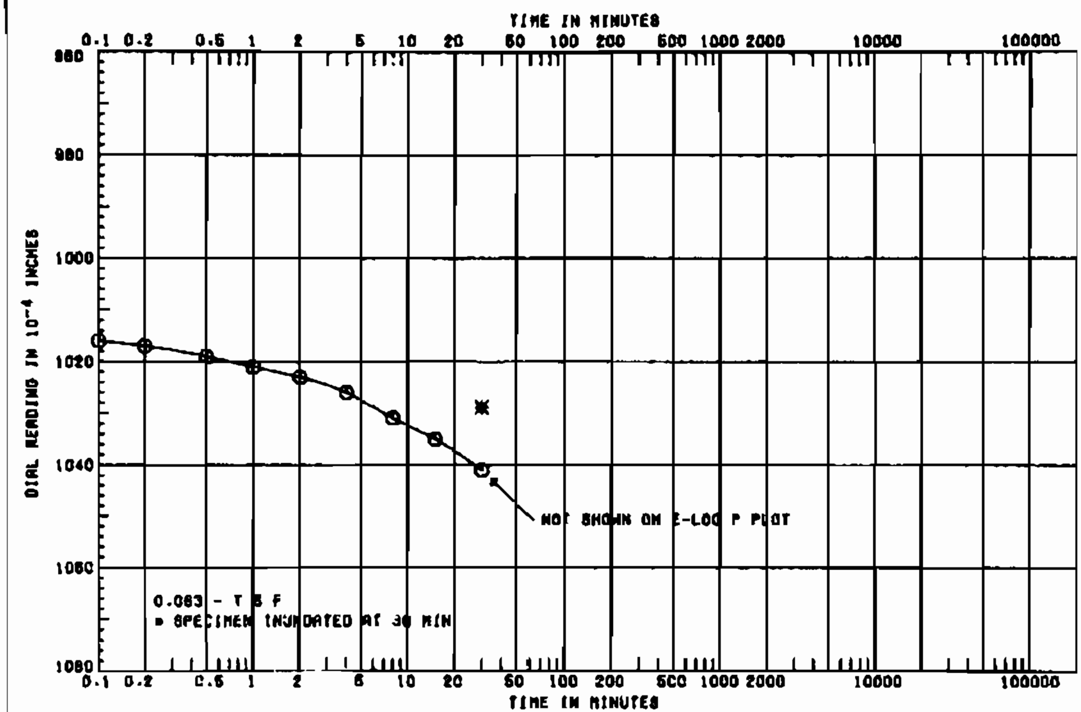
SPECIMEN NO.		▲1	Y2	X3	4	AVG.
INITIAL	WATER CONTENT, %	20.9	21.9	40.1		27.63
	DRY DENSITY, PCF	91.7	89.4	71.6		84.25
	SATURATION, %	67.3	66.8	79.9		71.33
	VOID RATIO	0.639	0.885	1.354		
BEFORE SHEAR	WATER CONTENT, %					
	DRY DENSITY, PCF					
	SATURATION, %					
	VOID RATIO					
	BACK PRESS., TSF					
MIN PRIN. STRESS, TSF		0.5	1.5	3.0		
MAX. DEV. STRESS, TSF		1.62	2.63	0.49		
TIME TO FAILURE, MIN.		30	30	6		
RATE OF STRAIN INCR.%						
INITIAL DIAMETER, IN.		1.39	1.39	1.40		
INITIAL HEIGHT, IN.		3.00	3.00	3.00		

CONTROLLED-STRAIN TEST

DESCRIPTION OF SPECIMENS: CLAY (CL), GRAY

LL 36	PL 15	PI 21	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

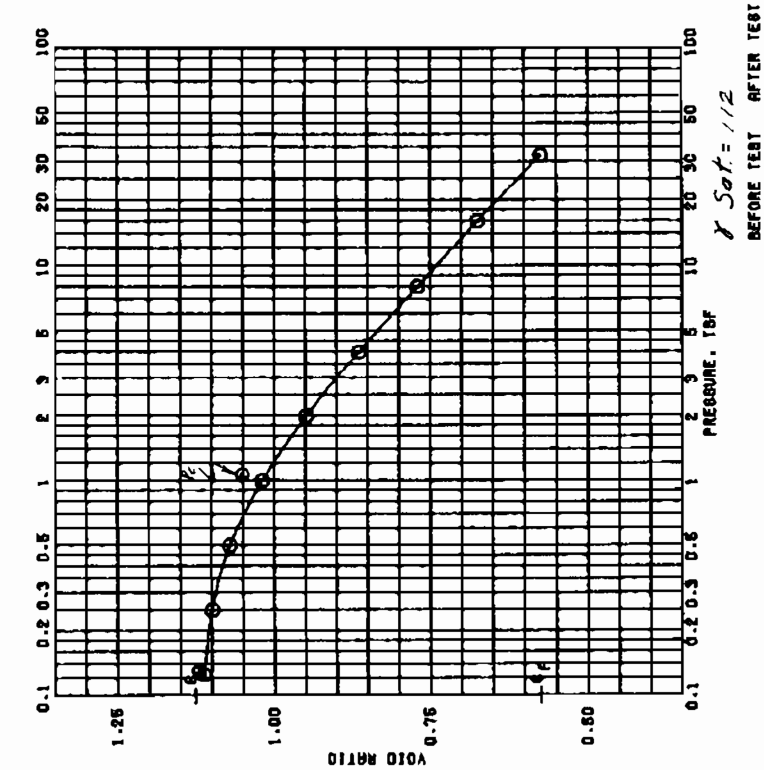
REMARKS:	PROJECT LAKE PONT LA & VIC NEW ORLEANS	
THIRD SPECIMEN TAKEN FROM	EAST LEV (SOUTH POINT TO GIWW)	
DIFFERENT LIFT.	BORING NO. 16-USP	SAMPLE NO. 2-B
	DEPTH/ELEV 4.6/9.08	TECH. KOC
	LABORATORY USAE WES	DATE 13 MAY 86
	TRIAXIAL COMPRESSION TEST REPORT	



PROJECT LAKE PONT LA 4 VIC NEW ORLEANS	
EAST LEV (SOUTH POINT TO OIHW)	
BORING 16-USP	SAMPLE NO. 3-B
DEPTH/ELEV 7.8/5.88	DATE 18 JUN 86

CONSOLIDATION TEST
TIME CURVES

SHEET 2 OF 11



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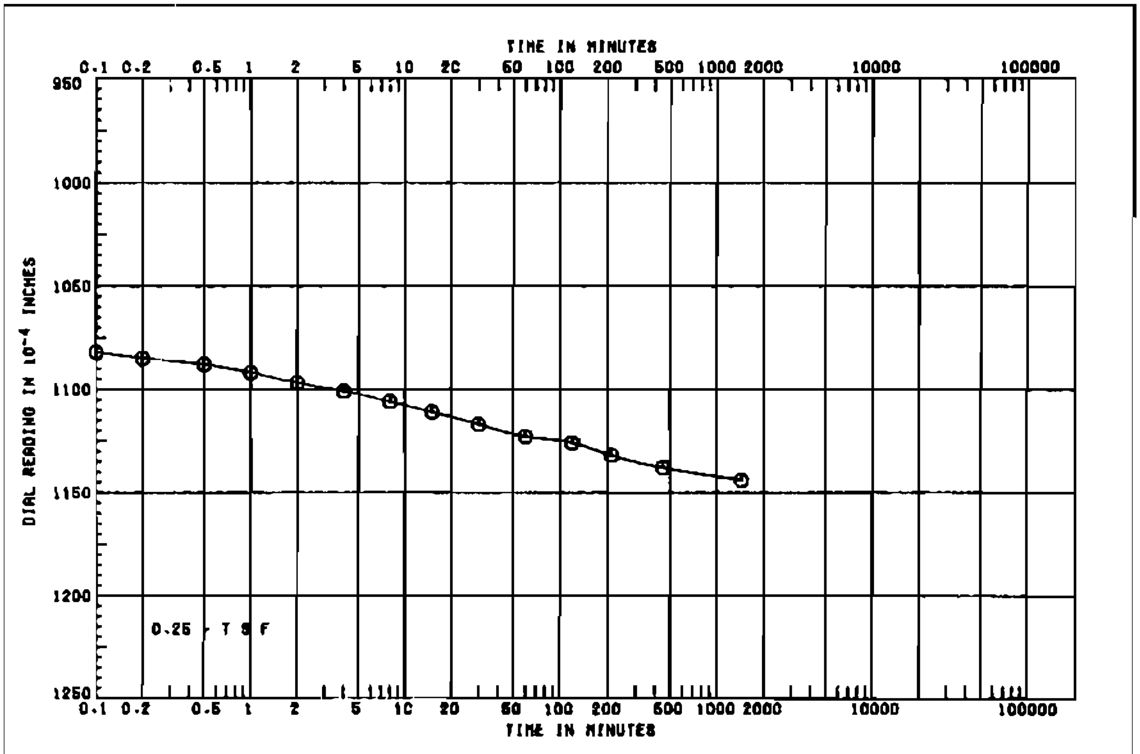
	BEFORE TEST	AFTER TEST
WATER CONTENT, %	37.6	21.6
DRY DENSITY, PCF	79.3	107.3
SATURATION, %	90.4	100 +
VOID RATIO	1.124	0.572
BACK PRESSURE, TSF		

OVERBURDEN PRESSURE, TSF		
PRECONSOL. PRESSURE, TSF	1.05	
COMPRESSION INDEX	0.32	
TYPE SPECIMEN	UNDISTURBED	
DIA. IN 4.44	HT. IN 1.130	
CLASSIFICATION	CLAY (CL), GRAY	
LL 46	PL 19	PI 27
GS 2.70 (EST)	D_{10}	
REMARKS		

PROJECT LAKE PONT LA 4 VIC NEW ORLEANS	
EAST LEV (SOUTH POINT TO OIHW)	
BORING NO. 16-USP	SAMPLE NO. 3-B
DEPTH/ELEV 7.8/5.88	DATE 18 JUN 86

CONSOLIDATION TEST REPORT

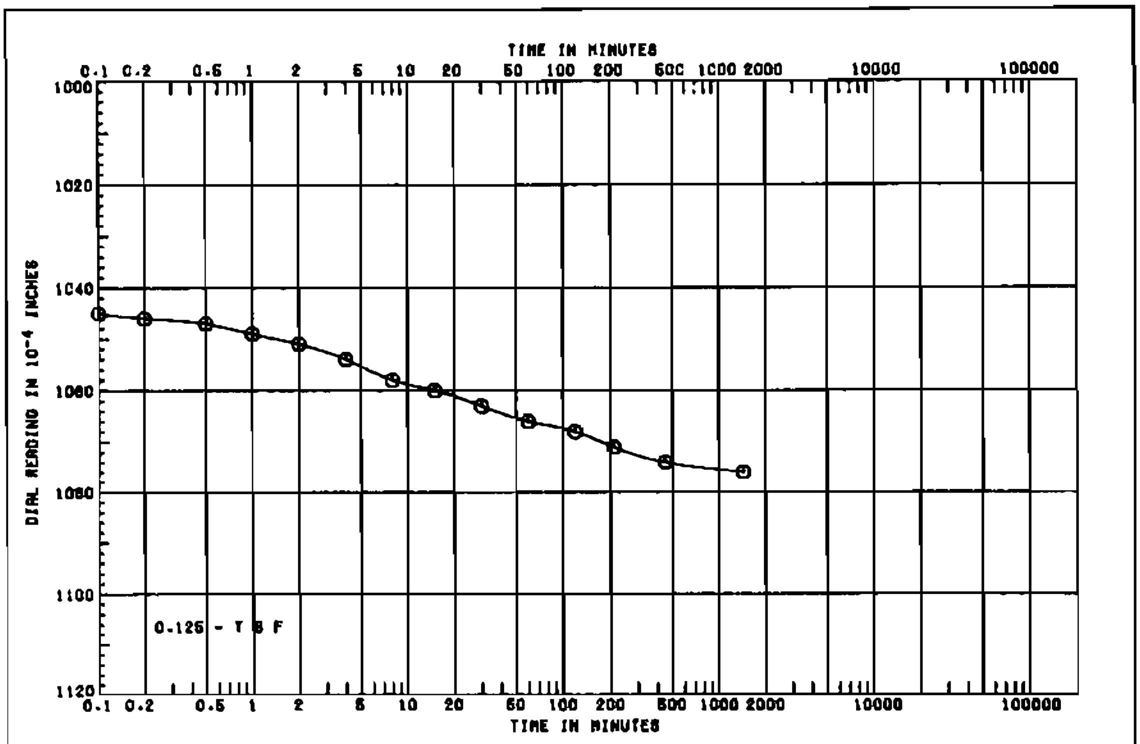
SHEET 1 OF 11



PROJECT LAKE PONT LA & VIC NEW ORLEANS	
EAST LEV (SOUTH POINT TO OIWW)	
BORING 16-USP	SAMPLE NO. 3-B
DEPTH/ELEV 7.6/5.68	DATE 18 JUN 86

CONSOLIDATION TEST
TIME CURVES

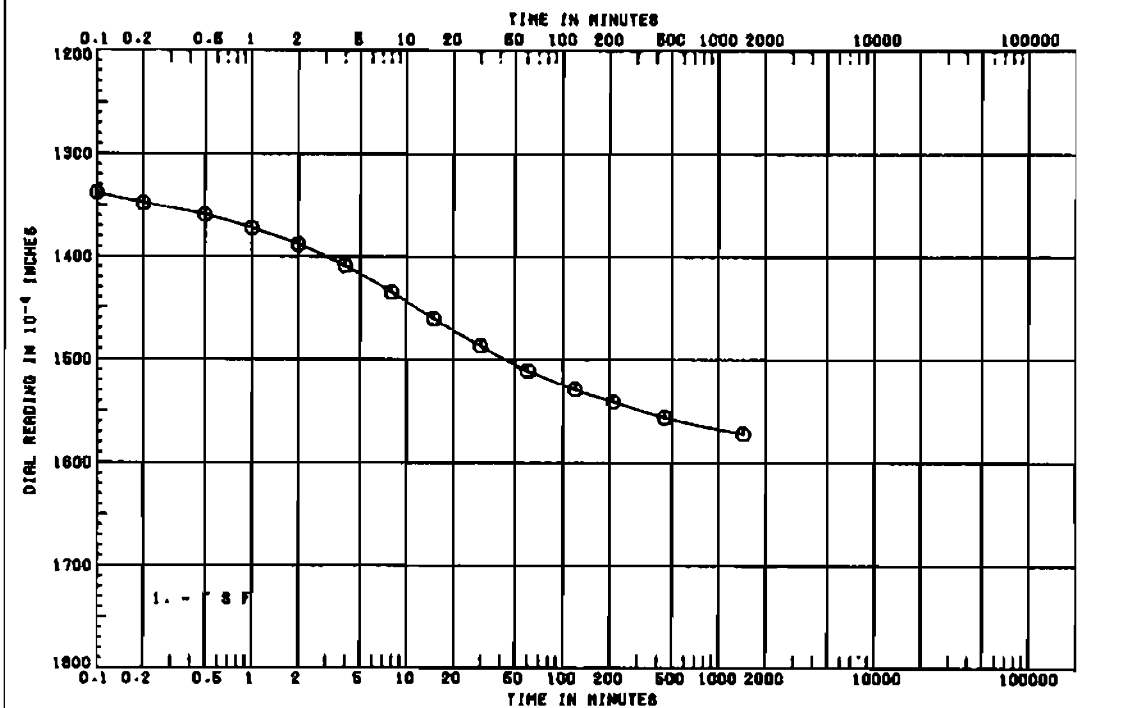
SHEET 4 OF 11



PROJECT LAKE PONT LA & VIC NEW ORLEANS	
EAST LEV (SOUTH POINT TO OIWW)	
BORING 16-USP	SAMPLE NO. 3-B
DEPTH/ELEV 7.8/5.68	DATE 18 JUN 86

CONSOLIDATION TEST
TIME CURVES

SHEET 3 OF 11

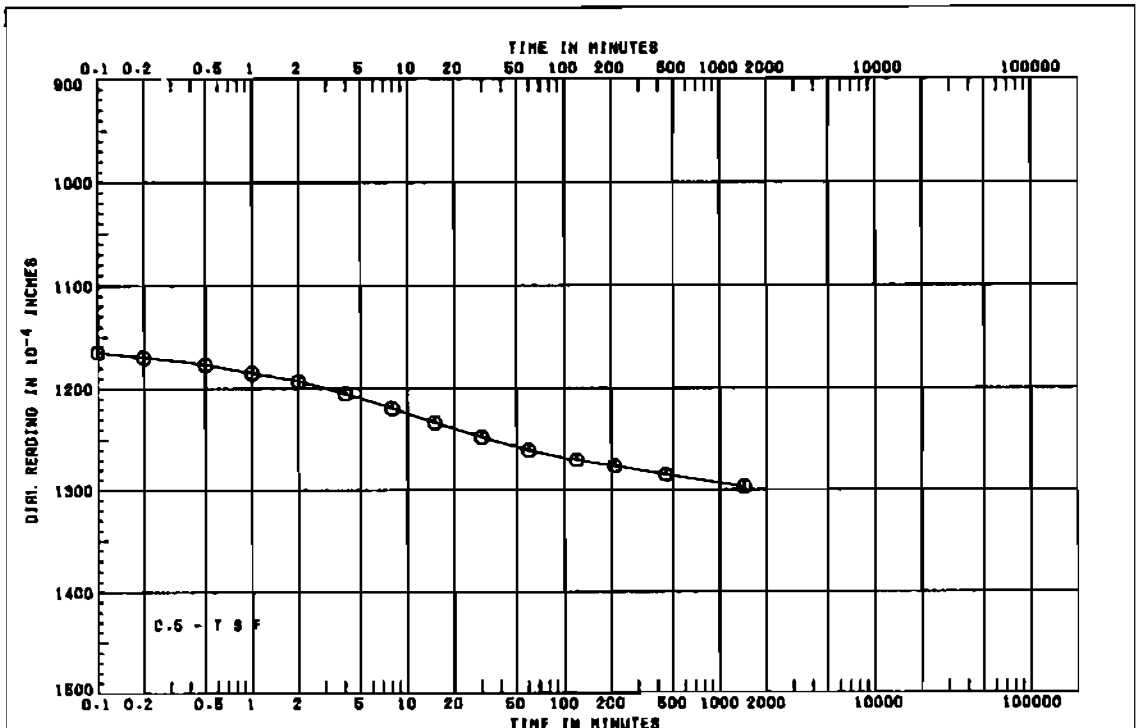


PROJECT LAKE PONT LA & VIC NEW ORLEANS
EAST LEV (SOUTH POINT TO GIWW)

BORING 16-USP	SAMPLE NO. 3-B
DEPTH/ELEV 7.8/5.88	DATE 18 JUN 86

CONSOLIDATION TEST
TIME CURVES

SHEET 6 OF 11

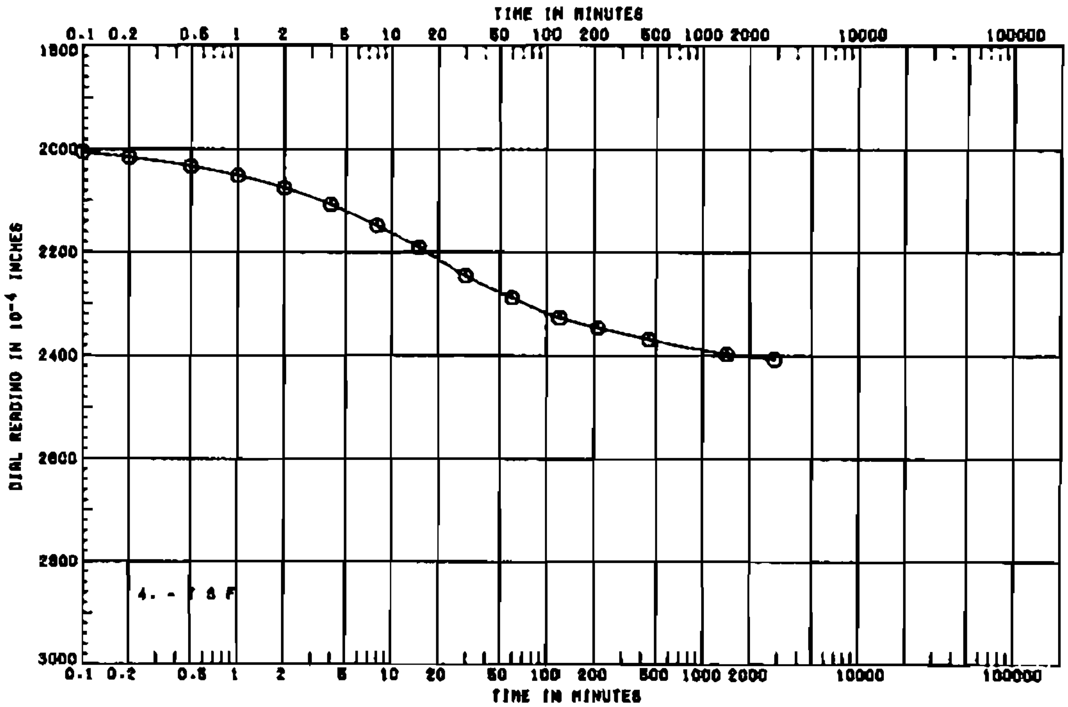


PROJECT LAKE PONT LA & VIC NEW ORLEANS
EAST LEV (SOUTH POINT TO GIWW)

BORING 16-USP	SAMPLE NO. 3-B
DEPTH/ELEV 7.8/5.88	DATE 18 JUN 86

CONSOLIDATION TEST
TIME CURVES

SHEET 5 OF 11

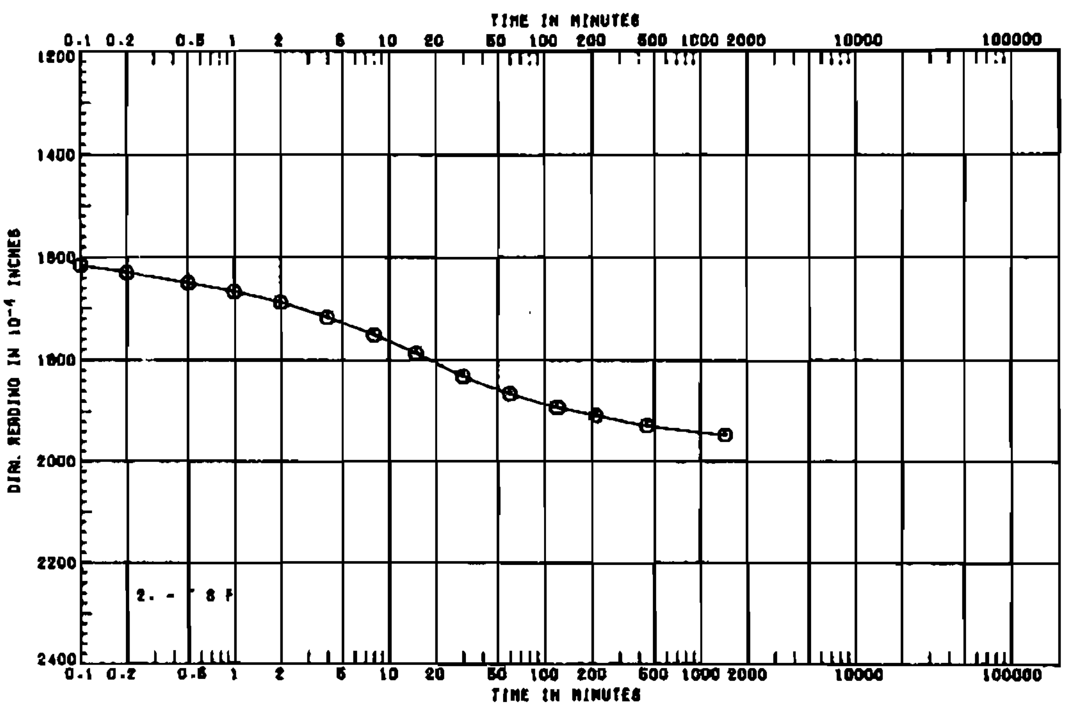


PROJECT LAKE PONT LA & VIC NEW ORLEANS	
EAST LEV (SOUTH POINT TO OIWW)	
BORING 16-USP	SAMPLE NO. 3-B
DEPTH/ELEV 7.6/5.66	DATE 18 JUN 86

CONSOLIDATION TEST

TIME CURVES

SHEET 6 OF 11

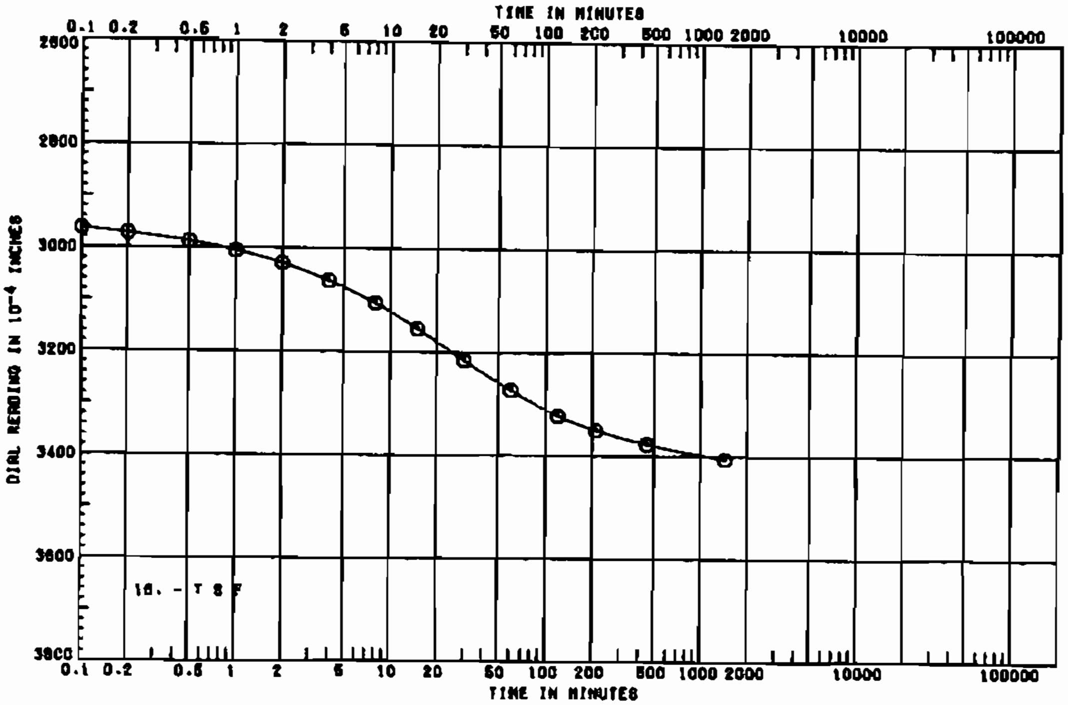


PROJECT LAKE PONT LA & VIC NEW ORLEANS	
EAST LEV (SOUTH POINT TO OIWW)	
BORING 16-USP	SAMPLE NO. 3-B
DEPTH/ELEV 7.6/5.66	DATE 18 JUN 86

CONSOLIDATION TEST

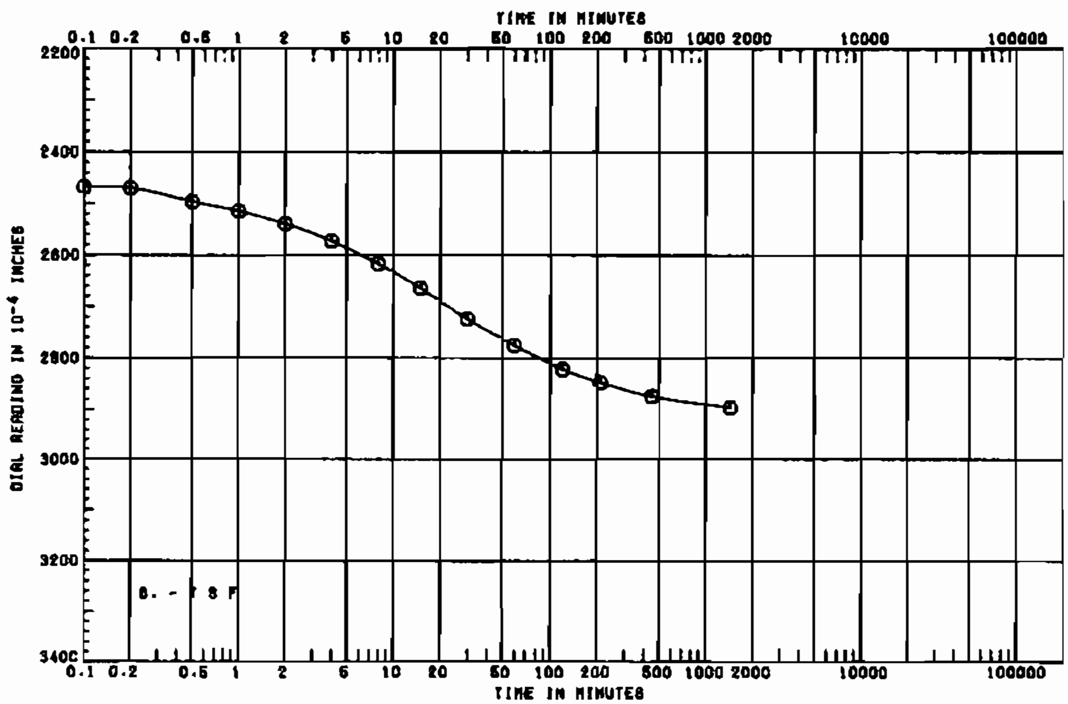
TIME CURVES

SHEET 7 OF 11



PROJECT LAKE PONT LA & VIC NEW ORLEANS		CONSOLIDATION TEST TIME CURVES
EAST LEV (SOUTH POINT TO GIWW)		
BORING 16-USP	SAMPLE NO. 3-6	
DEPTH/ELEV 7.8/5.88	DATE 18 JUN 86	

SHEET 10 OF 11



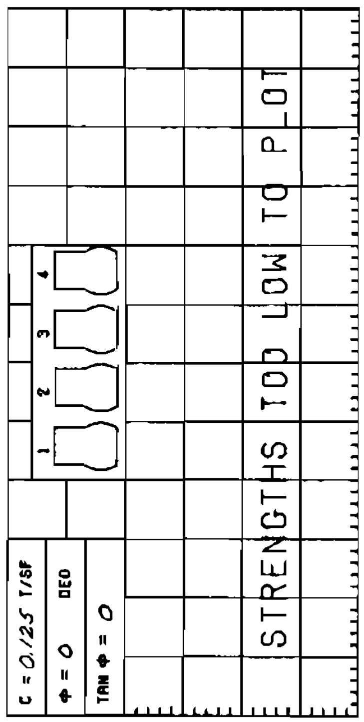
PROJECT LAKE PONT LA & VIC NEW ORLEANS		CONSOLIDATION TEST TIME CURVES
EAST LEV (SOUTH POINT TO GIWW)		
BORING 16-USP	SAMPLE NO. 3-B	
DEPTH/ELEV 7.8/5.88	DATE 18 JUN 86	

SHEET 9 OF 11

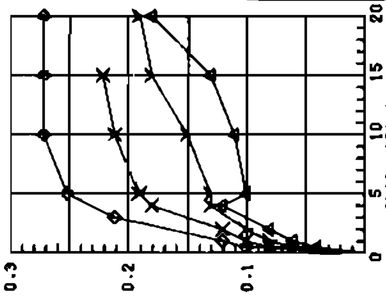
C = 0.125 T/SF

Φ = 0 DEG

TAN Φ = 0



γ Sat = 107



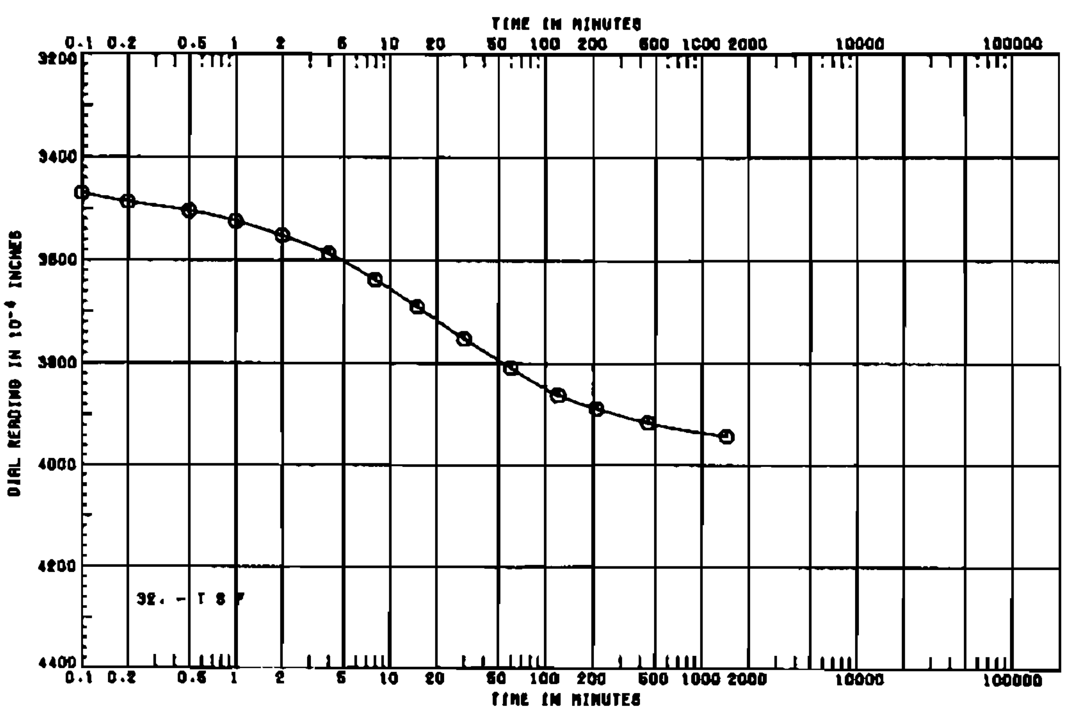
SPECIMEN NO.		▲1	Y2	X3	◆4	AVG.
INITIAL	WATER CONTENT, %	49.4	48.2	49.4	51.2	49.55
	DRY DENSITY, PCF	70.1	71.8	70.3	70.3	70.53
	SATURATION, %	95.0	98.1	95.5	99.0	96.40
	VOID RATIO	1.404	1.354	1.396	1.396	
BEFORE SHEAR	WATER CONTENT, %					
	DRY DENSITY, PCF					
	SATURATION, %					
	VOID RATIO					
	BACK PRESS., TSF					
MIN PRIN. STRESS, TSF		0.5	1.5	3.0	0.5	
MAX. DEV. STRESS, TSF		0.12	0.13	0.22	0.27	
TIME TO FAILURE, MIN.		8	8	30	20	
RATE OF STRAIN INCR.,%						
INITIAL DIAMETER, IN.		1.39	1.39	1.39	1.39	
INITIAL HEIGHT, IN.		3.00	3.00	3.00	3.00	

CONTROLLED-STRAIN TEST

DESCRIPTION OF SPECIMENS: PLASTIC CLAY (CH), GRAY; SILT POCKETS; SHELL PARTICLES

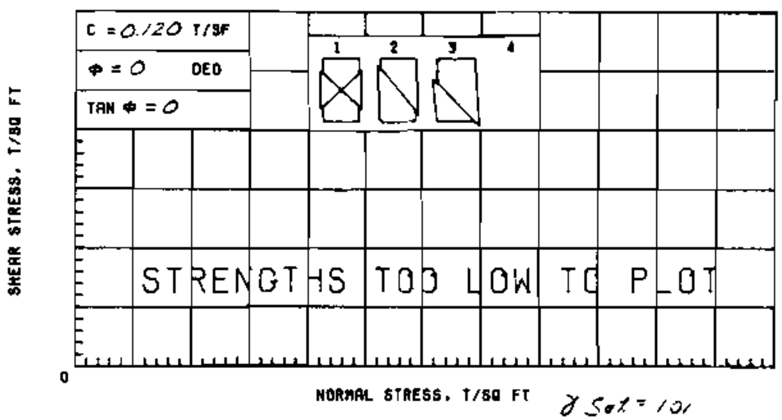
LL 66	PL 17	PI 49	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:	PROJECT LAKE PONT LA & VIC NEW ORLEANS	
	EAST LEV (SOUTH POINT TO GIWW)	
	BORING NO. 16-USP	SAMPLE NO. 4-8
	DEPTH/ELEV 11.7/-1.98	TECH. KOC
	LABORATORY USAE WES	DATE 13 MAY 86
	TRIAXIAL COMPRESSION TEST REPORT	

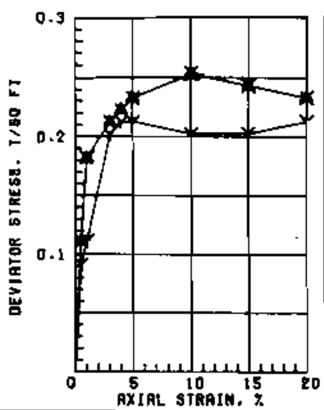


PROJECT LAKE PONT LA & VIC NEW ORLEANS		CONSOLIDATION TEST TIME CURVES
EAST LEV (SOUTH POINT TO GIWW)		
BORING 16-USP	SAMPLE NO. 3-8	
DEPTH/ELEV 7.8/5.88	DATE 18 JUN 86	

SHEET 11 OF 11



γ Sat = 101



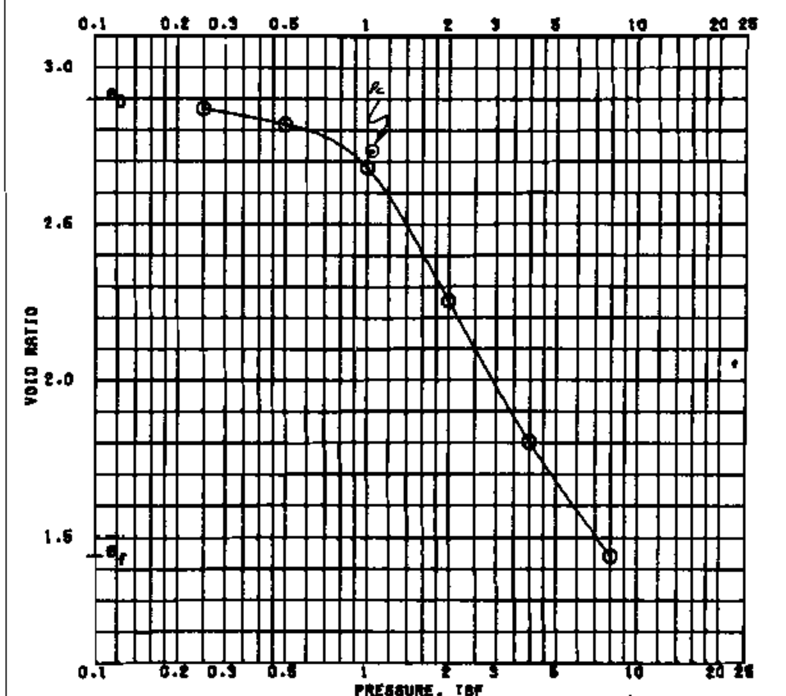
		SPECIMEN NO.	▲1	Y2	X3	4	AVG.
INITIAL		WATER CONTENT, %	63.1	63.8	62.4		63.3
		DRY DENSITY, PCF	61.4	60.9	62.2		61.50
		SATURATION, %	97.6	97.5	98.6		97.90
		VOID RATIO	1.746	1.767	1.708		
BEFORE SHEAR		WATER CONTENT, %					
		DRY DENSITY, PCF					
		SATURATION, %					
		VOID RATIO					
		BACK PRESS., TSF					
MIN PRIN. STRESS, TSF			0.5	1.5	3.0		
MAX. DEV. STRESS, TSF			0.25	0.21	0.25		
TIME TO FAILURE, MIN.			20	8	20		
RATE OF STRAIN INCR.%							
INITIAL DIAMETER, IN.			1.39	1.39	1.39		
INITIAL HEIGHT, IN.			3.00	3.00	3.00		

CONTROLLED-STRAIN TEST

DESCRIPTION OF SPECIMENS: PLASTIC CLAY (CH), GRAY

LL 78	PL 24	PI 54	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:		
	PROJECT LAKE PONT LA & VIC NEW ORLEANS	
	EAST LEV (SOUTH POINT TO GIWW)	
	BORING NO. 16-USP	SAMPLE NO. 7-8
	DEPTH/ELEV 24.0/-1032	TECH. KDC
	LABORATORY USAE WES	DATE 14 MAY 66
	TRIAXIAL COMPRESSION TEST REPORT	



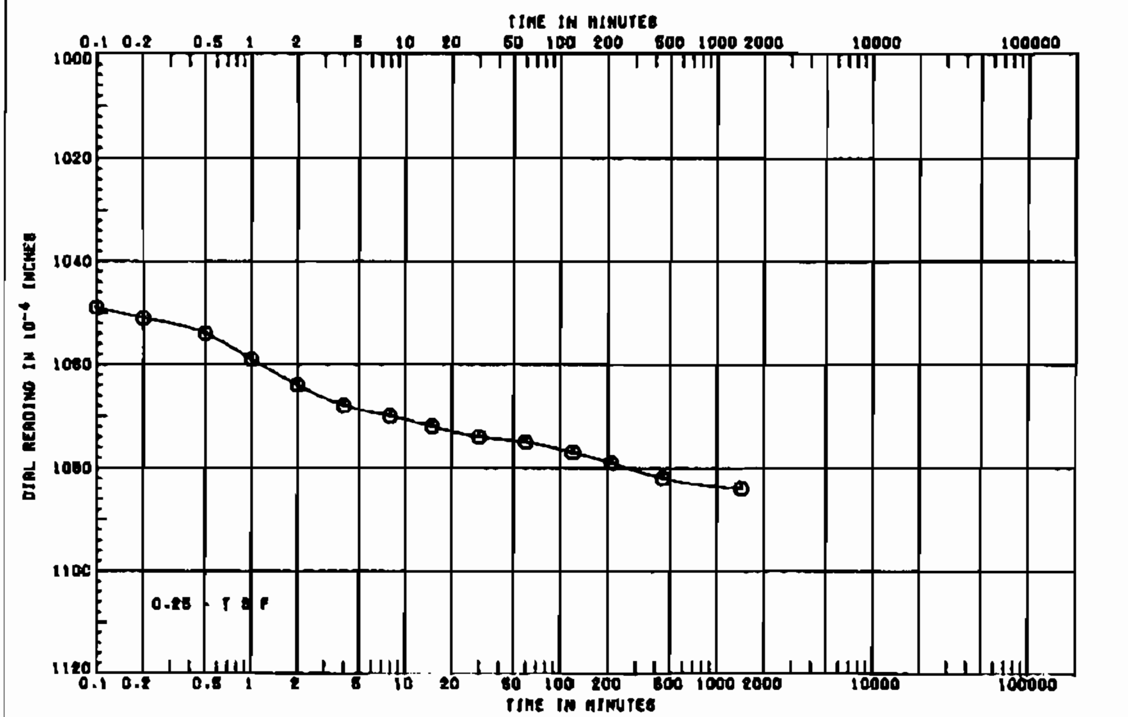
γ Sat = 90

			BEFORE TEST	AFTER TEST
OVERBURDEN PRESSURE, TSF		WATER CONTENT, %	100.5	52.7
PRECONSOL. PRESSURE, TSF	1.01	DRY DENSITY, PCF	43.3	69.1
COMPRESSION INDEX	1.60	SATURATION, %	93.7	99.0
TYPE SPECIMEN	UNDISTURBED	VOID RATIO	2.894	1.439
DIA. IN 4.44	HT. IN 1.111	BACK PRESSURE, TSF		

CLASSIFICATION PLASTIC CLAY (CH), GRAY

LL 119	PL 29	PI 90	PROJECT LAKE PONT LA & VIC NEW ORLEANS	
GS 2.70 (EST)	D_{10}		EAST LEV (SOUTH POINT TO GIWW)	
REMARKS			BORING NO. 16-USP	SAMPLE NO. 8-8
			DEPTH/ELEV 26.2/-14.52	DATE 16 JUN 66
			CONSOLIDATION TEST REPORT	

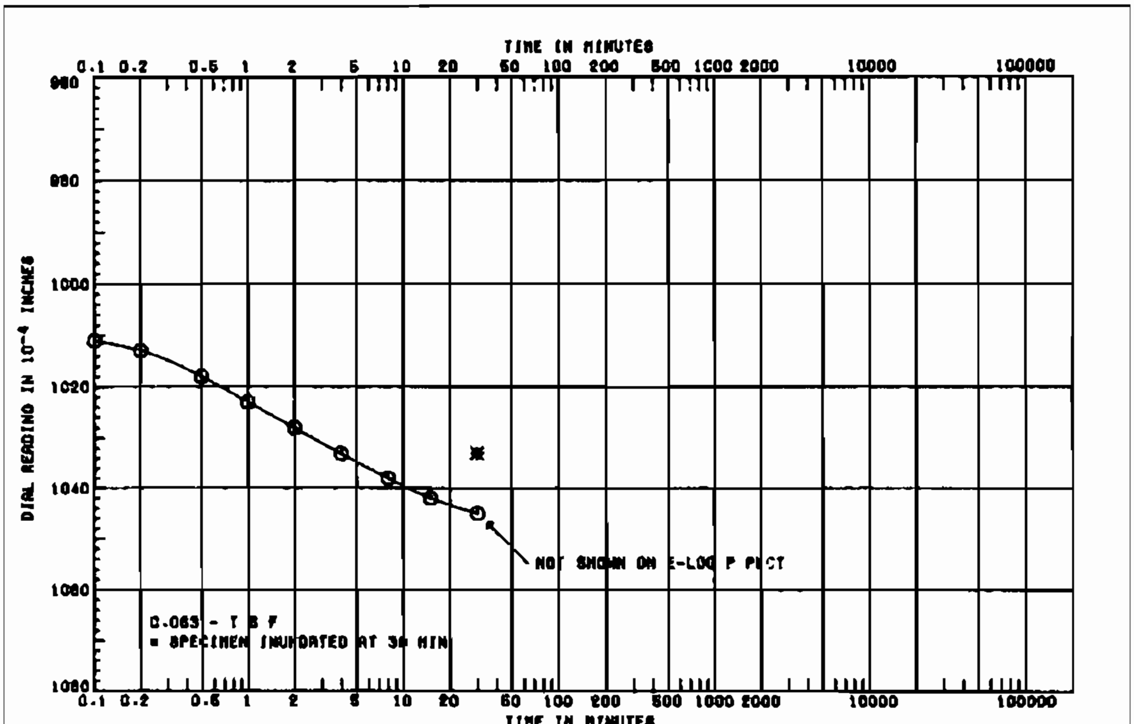
SHEET 1 OF 8



PROJECT LAKE PONT LA & VIC NEW ORLEANS	
EAST LEV (SOUTH POINT TO GIWW)	
BORING 16-USP	SAMPLE NO. 5-B
DEPTH/ELEV 28.2/-14.52	DATE 16 JUN 66

CONSOLIDATION TEST
TIME CURVES

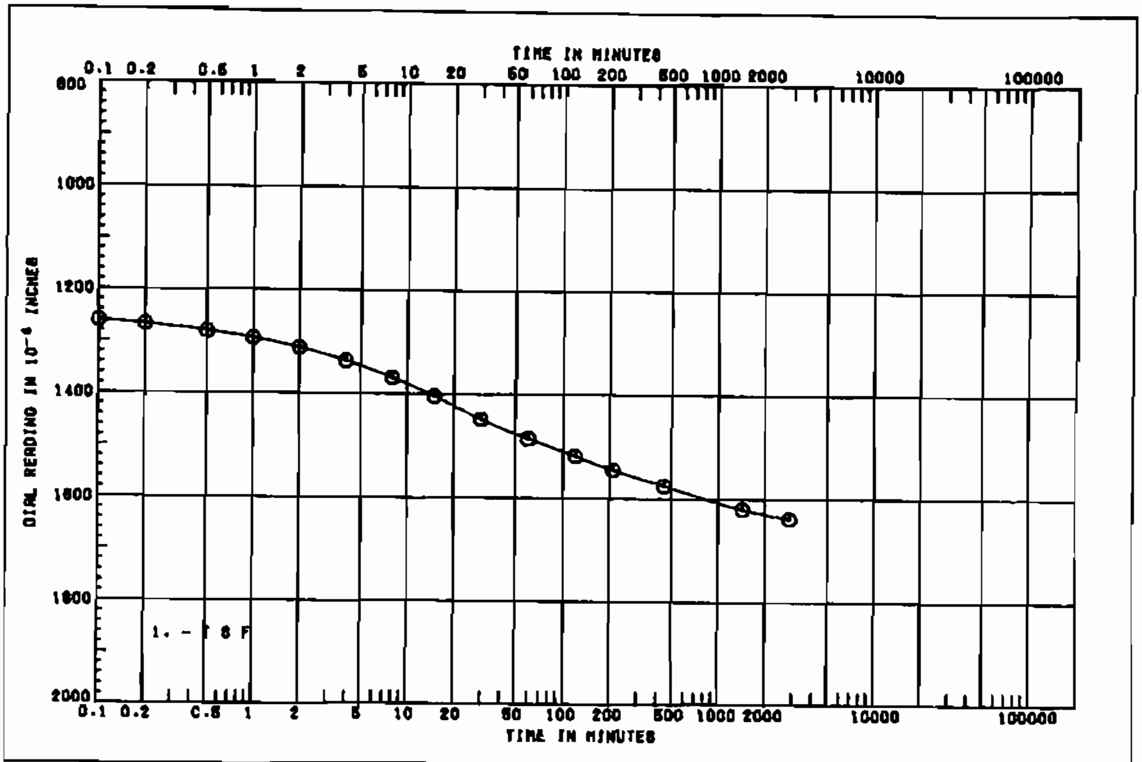
SHEET 3 OF 8



PROJECT LAKE PONT LA & VIC NEW ORLEANS	
EAST LEV (SOUTH POINT TO GIWW)	
BORING 16-USP	SAMPLE NO. 5-B
DEPTH/ELEV 28.2/-14.52	DATE 16 JUN 66

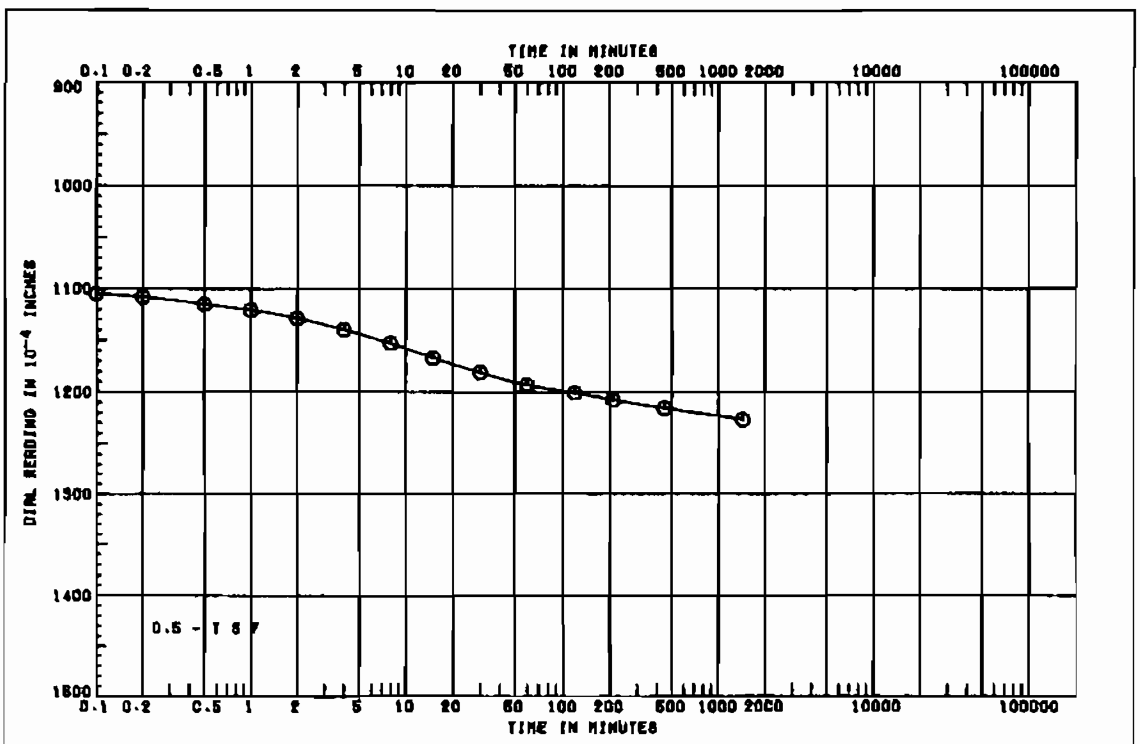
CONSOLIDATION TEST
TIME CURVES

SHEET 2 OF 8



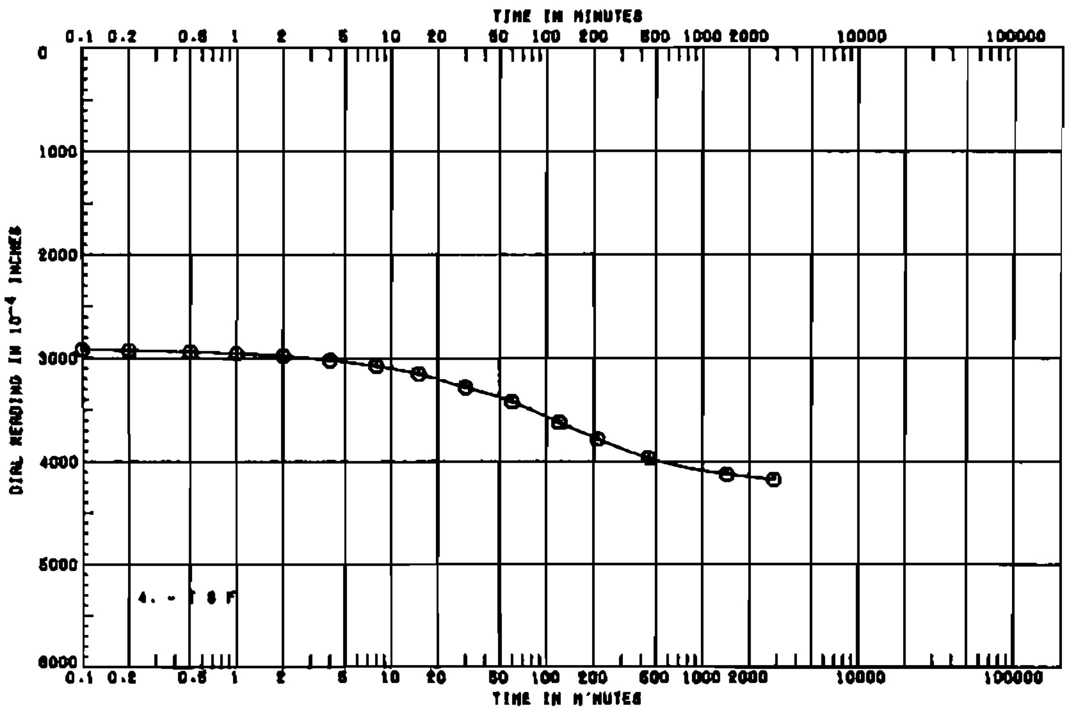
PROJECT LAKE PONT LA & VIC NEW ORLEANS		CONSOLIDATION TEST TIME CURVES
EAST LEV (SOUTH POINT TO GIWW)		
BORING 16-USP	SAMPLE NO. S-8	
DEPTH/ELEV 28.2/-14.52	DATE 16 JUN 86	

SHEET 5 OF 8



PROJECT LAKE PONT LA & VIC NEW ORLEANS		CONSOLIDATION TEST TIME CURVES
EAST LEV (SOUTH POINT TO GIWW)		
BORING 16-USP	SAMPLE NO. S-8	
DEPTH/ELEV 28.2/-14.52	DATE 16 JUN 86	

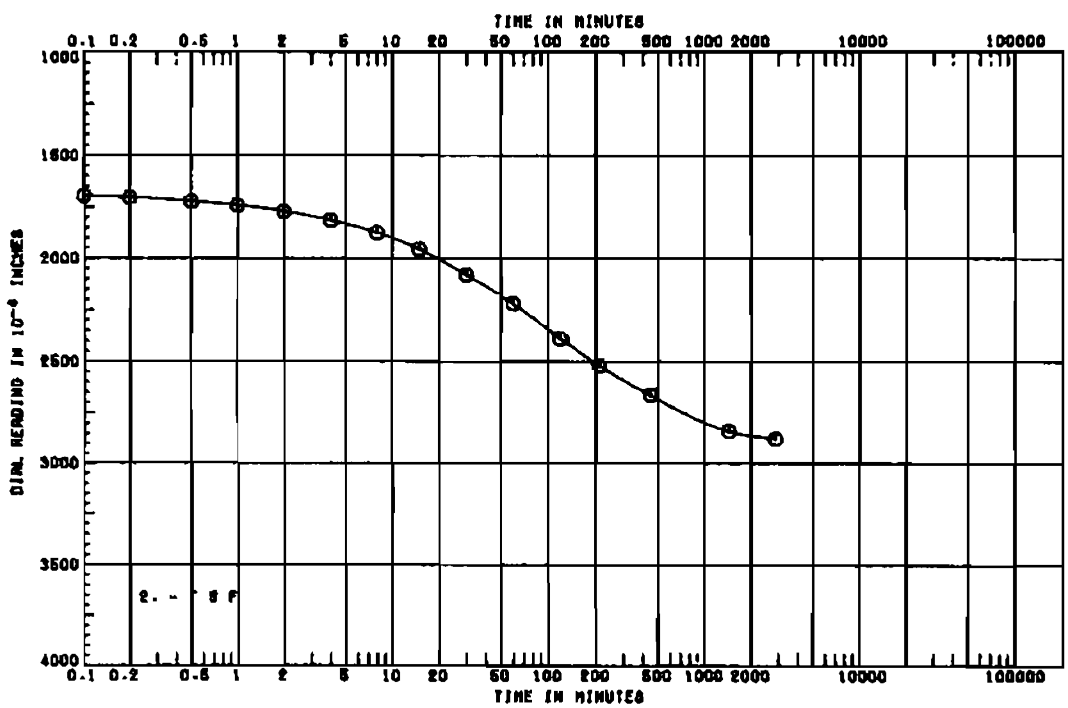
SHEET 4 OF 8



PROJECT LAKE PONT LA & VIC NEW ORLEANS	
EAST LEV (SOUTH POINT TO DIWW)	
BORING 18-USP	SAMPLE NO. 8-B
DEPTH/ELEV 28.2/-14.52	DATE 18 JUN 86

CONSOLIDATION TEST
TIME CURVES

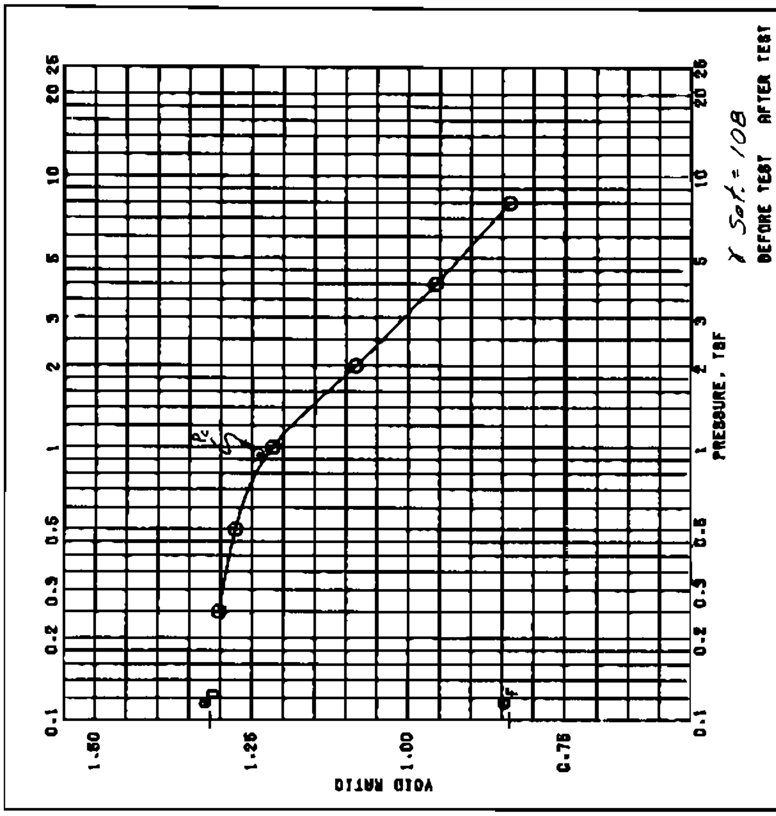
SHEET 7 OF 8



PROJECT LAKE PONT LA & VIC NEW ORLEANS	
EAST LEV (SOUTH POINT TO DIWW)	
BORING 18-USP	SAMPLE NO. 8-B
DEPTH/ELEV 28.2/-14 52	DATE 16 JUN 86

CONSOLIDATION TEST
TIME CURVES

SHEET 8 OF 8



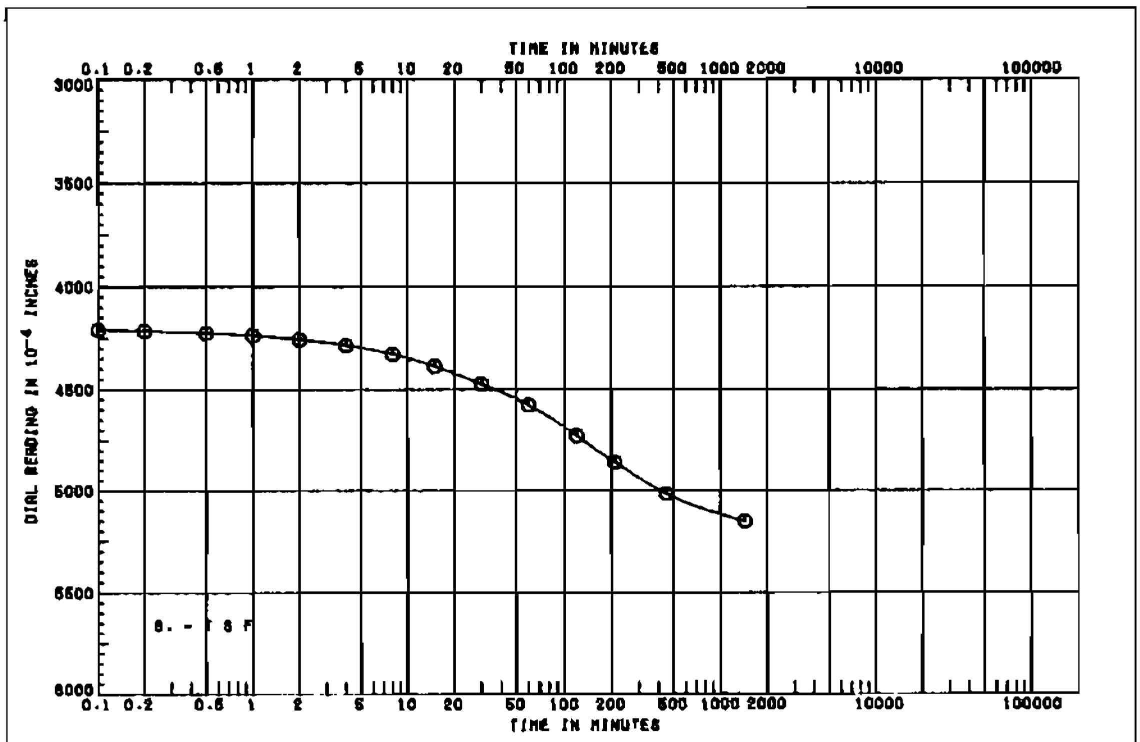
			BEFORE TEST	AFTER TEST
OVERBURDEN PRESSURE, TSF		WATER CONTENT, %	46.3	30.8
PRECONSOL. PRESSURE, TSF	0.95	DRY DENSITY, PCF	72.8	91.6
COMPRESSION INDEX	0.48	SATURATION, %	95.1	99.9
TYPE SPECIMEN	UNDISTURBED	VOID RATIO	1.314	0.837
DIA. IN 4.44	HT. IN 1.116	BACK PRESSURE, TSF		

CLASSIFICATION SANDY CLAY (CL), GRAY

LL 41	PL 17	PI 24	PROJECT LAKE PONT LA & VIC NEW ORLEANS
GS 2.70 (EST)	D_{10}		EAST LEV (SOUTH POINT TO DINN)
REMARKS			BORING NO. 16-USP / SAMPLE NO. 10-8
			DEPTH/ELEV 36.3/-22.62 / DATE 17 JUN 86

CONSOLIDATION TEST REPORT

SHEET 1 OF 8

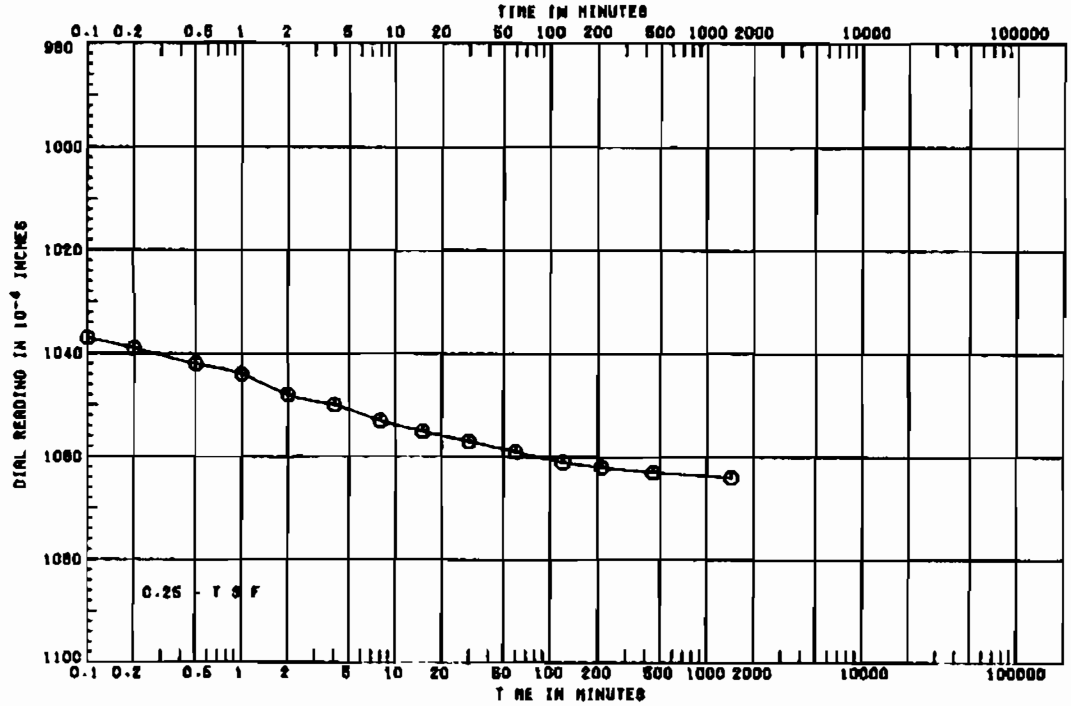


PROJECT LAKE PONT LA & VIC NEW ORLEANS	
EAST LEV (SOUTH POINT TO DINN)	
BORING 16-USP	SAMPL NO. 8-8
DEPTH/ELEV 28.2/-14.52	DATE 16 JUN 86

CONSOLIDATION TEST

TIME CURVES

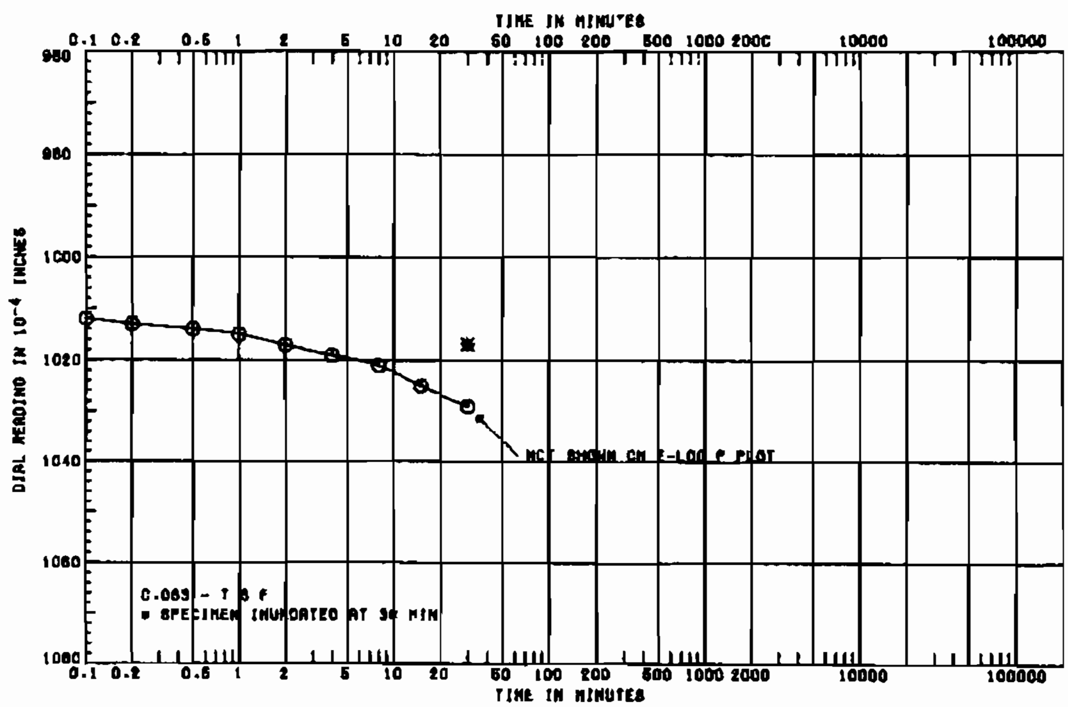
SHEET 8 OF 8



PROJECT LAKE PONT LA & VIC NEW ORLEANS	
EAST LEV (SOUTH POINT TO OINM.	
BORING 16-USP	SAMPLE NO. 10-B
DEPTH/ELEV 36.3/-22.62	DATE 17 JUN 86

CONSOLIDATION TEST
TIME CURVES

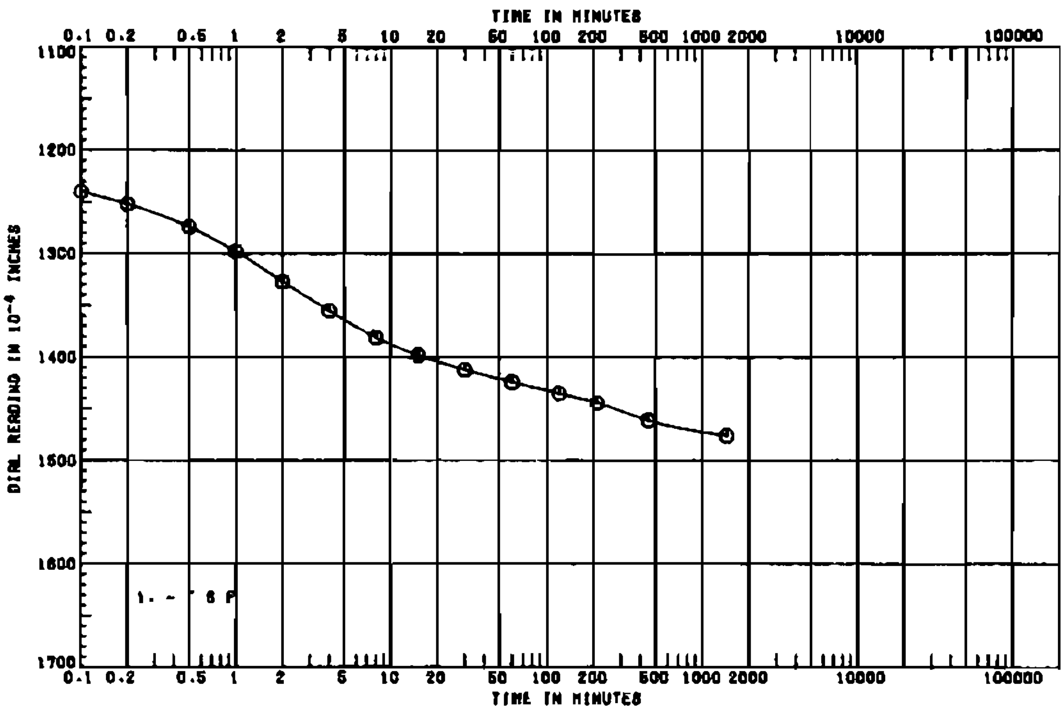
SHEET 3 OF 8



PROJECT LAKE PONT LA & VIC NEW ORLEANS	
EAST LEV (SOUTH POINT TO OINM)	
BORING 16-USP	SAMPLE NO. 10-B
DEPTH/ELEV 36.3/-22.62	DATE 17 JUN 86

CONSOLIDATION TEST
TIME CURVES

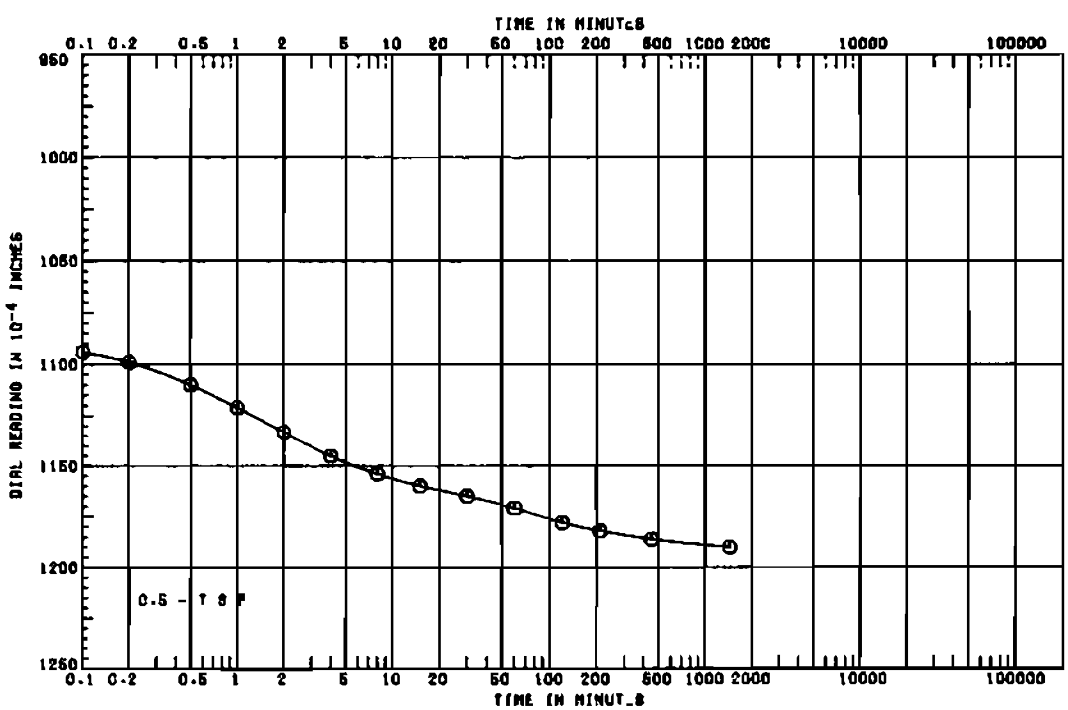
SHEET 2 OF 8



PROJECT LAKE PONT LA & VIC NEW ORL_ANS	
EAST LEV (SOUTH POINT TO GIWW)	
BORING 16-USP	SAMPLE NO. 10-B
DEPTH/ELEV 36.3/-22.62	DATE 17 JUN 86

CONSOLIDATION TEST
TIME CURVES

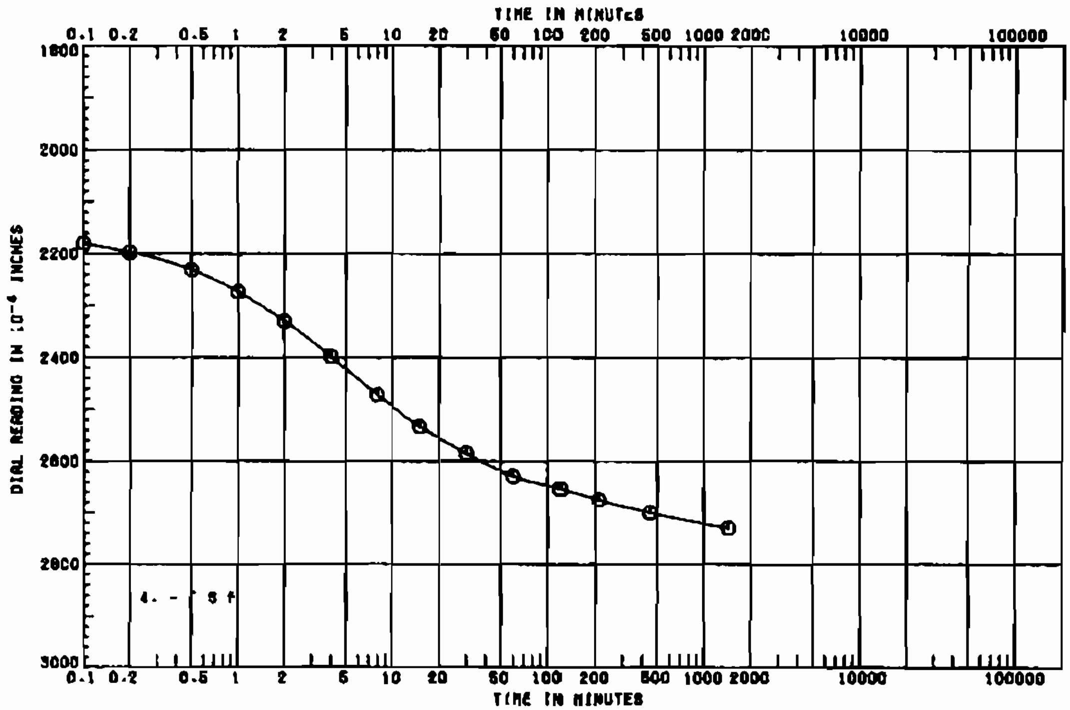
SHEET 5 OF 8



PROJECT LAKE PONT LA & V C NEW ORLEANS	
EAST LEV (SOUTH POINT TO GIWW)	
BORING 16-USP	SAMPLE NO. 10-B
DEPTH/ELEV 36.3/-22.62	DATE 17 JUN 86

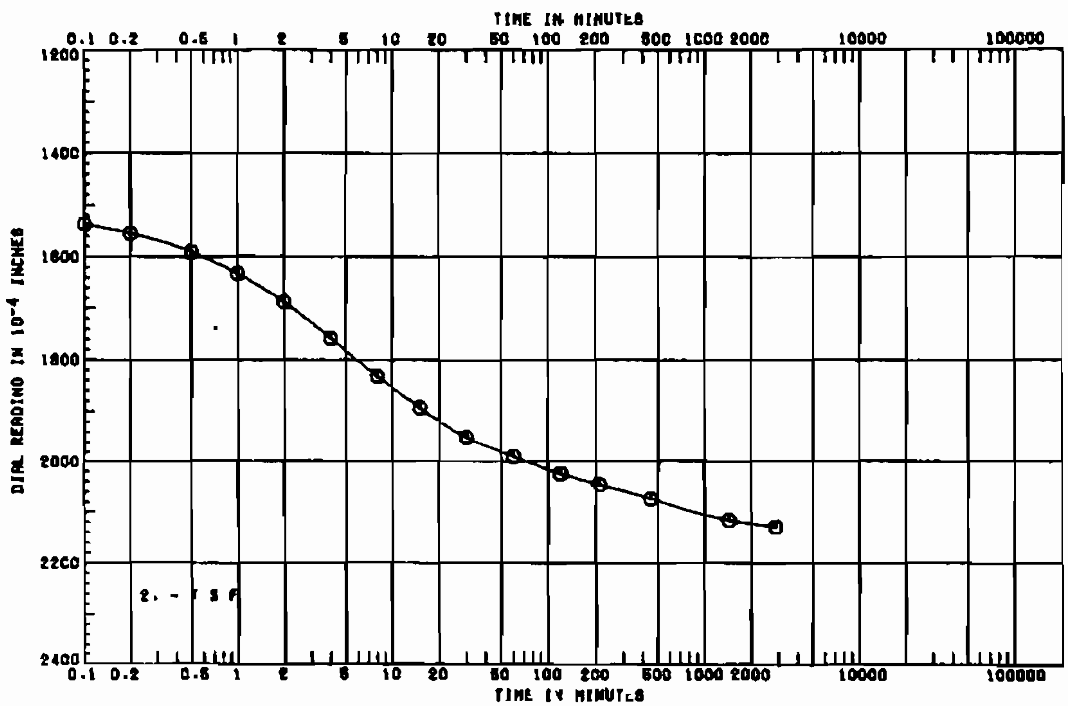
CONSOLIDATION TEST
TIME CURVES

SHEET 4 OF 8



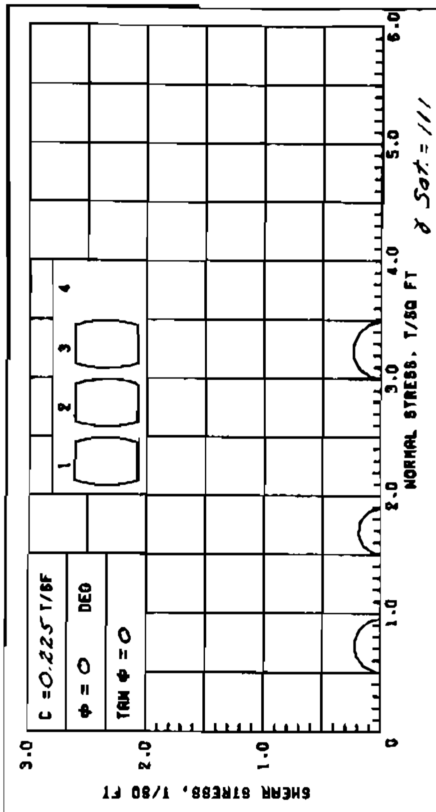
PROJECT LAKE PONT LA & VIC NEW ORLEANS		CONSOLIDATION TEST TIME CURVES
EAST LEV (SOUTH POINT TO GIWW)		
BORING 16-USP	SAMPLE NO. 10-B	
DEPTH/ELEV 36.3/-22.62	DATE 17 JUN 86	

SHEET 7 OF 8

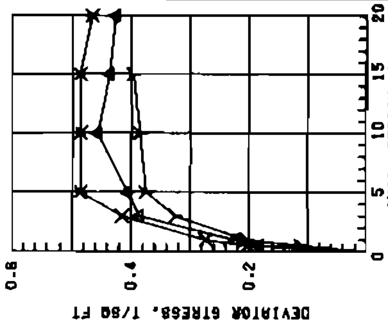


PROJECT LAKE PONT LA & VIC NEW ORLEANS		CONSOLIDATION TEST TIME CURVES
EAST LEV (SOUTH POINT TO GIWW)		
BORING 16-USP	SAMPL NO. 10-B	
DEPTH/ELEV 36.3/-22.62	DATE 17 JUN 86	

SHEET 6 OF 8



γ Sat = 111



	SPECIMEN NO.	▲1	Y2	X3	4	AVG.
INITIAL	WATER CONTENT, %	41.0	41.6	43.1		41.90
	DRY DENSITY, PCF	77.1	77.0	76.4		76.83
	SATURATION, %	93.2	94.5	96.5		94.73
	VOID RATIO	1.187	1.188	1.205		
BEFORE SHEAR	WATER CONTENT, %					
	DRY DENSITY, PCF					
	SATURATION, %					
	VOID RATIO					
	BACK PRESS., TSF					
	MIN PRIN. STRESS, TSF	0.5	1.5	3.0		
	MAX. DEV. STRESS, TSF	0.46	0.40	0.49		
	TIME TO FAILURE, MIN.	20	30	10		
	RATE OF STRAIN INCR.%					
	INITIAL DIAMETER, IN.	1.39	1.39	1.38		
	INITIAL HEIGHT, IN.	3.00	3.00	3.00		

CONTROLLED-STRAIN TEST

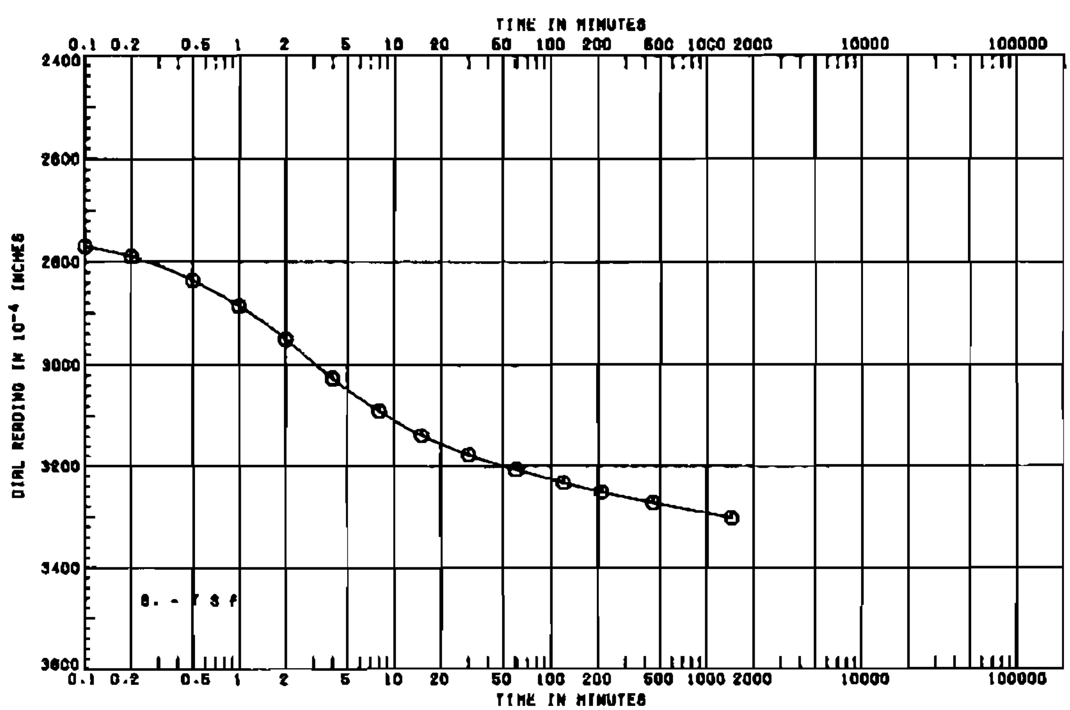
DESCRIPTION OF SPECIMENS: CLAY (CL), GRAY

LL	PL	PI	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:

PROJECT LAKE PONT LA & VIC NEW ORLEANS	
EAST LEV (SOUTH POINT TO OIWW)	
BORING NO. 16-USP	SAMPLE NO. 10-C
DEPTH/ELEV 37.1/-23.42	TECH. KOC
LABORATORY USAE WES	DATE 14 MAY 86

TRIAXIAL COMPRESSION TEST REPORT

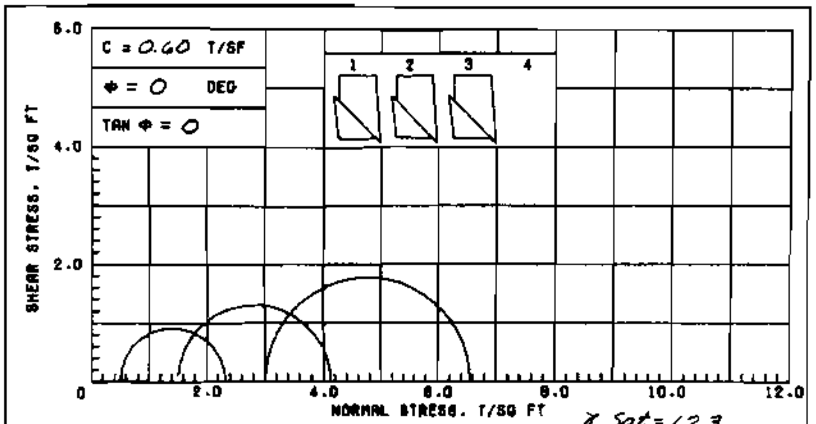


PROJECT LAKE PONT LA & VIC NEW ORL ANS	
EAST LEV (SOU H POINT TO OIWW)	
BORING 16-USP	SAMPLE NO. 10-B
DEPTH/_LEV 36.3/-22.62	DATE 17 JUN 86

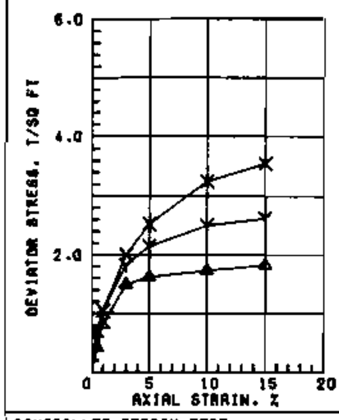
CONSOLIDATION TEST

TIME CURVES

SHEET 6 OF 6



γ Sat = 123



SPECIMEN NO.		▲1	Y2	X3	4
INITIAL	WATER CONTENT, %	17.4	17.7	17.8	
	DRY DENSITY, PCF	95.0	95.8	97.7	
	SATURATION, %	60.7	62.9	66.3	
	VOID RATIO	0.773	0.759	0.725	
BEFORE SHEAR	WATER CONTENT, %				
	DRY DENSITY, PCF				
	SATURATION, %				
	VOID RATIO				
	BACK PRESS., TSF				
MIN PRIN. STRESS, TSF		0.5	1.5	3.0	
MAX. DEV. STRESS, TSF		1.83	2.62	3.58	
TIME TO FAILURE, MIN.		30	30	30	
RATE OF STRAIN INCR,%					
INITIAL DIAMETER, IN.		1.38	1.38	1.38	
INITIAL HEIGHT, IN.		3.00	3.00	3.00	

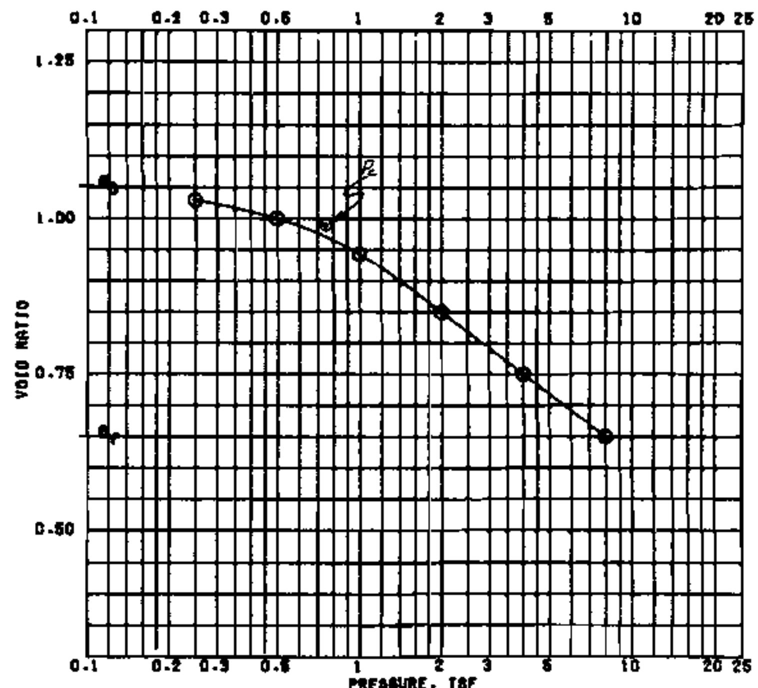
AVG.
.63
96
63.3

CONTROLLED-STRAIN TEST

DESCRIPTION OF SPECIMENS: CLAY (CL), BROWN

LL 45	PL 14	PI 31	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:	PROJECT LAKE PONT LA 4 VIC NEW ORLEANS	
	EAST LEV (SOUTH POINT TO DIWW)	
	BORING NO. 17-USP	SAMPLE NO. 1-8
	DEPTH/ELEV 1.2/11.7	TECH. KPC
	LABORATORY USAE WES	DATE 15 MAY 66
	TRIAXIAL COMPRESSION TEST REPORT	

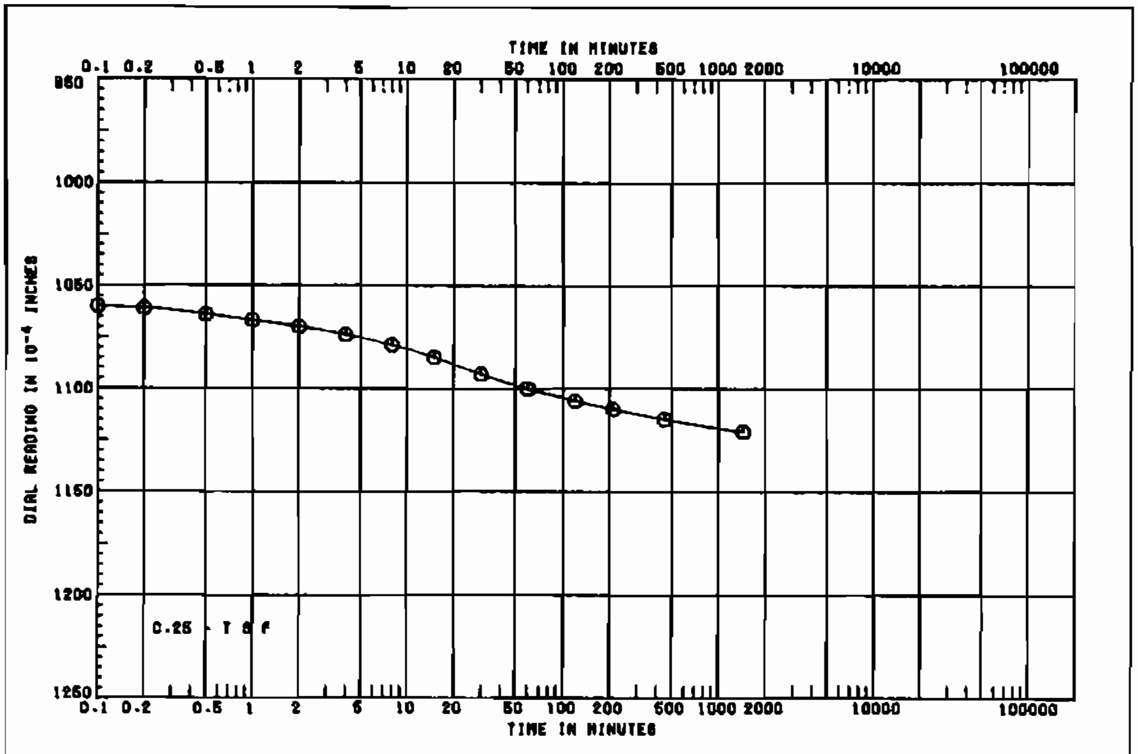


γ Sat = 114

			BEFORE TEST	AFTER TEST
OVERBURDEN PRESSURE, TSF		WATER CONTENT, %	37.3	24.4
PRECONSOL. PRESSURE, TSF	0.75	DRY DENSITY, PCF	82.2	102.2
COMPRESSION INDEX	0.33	SATURATION, %	95.9	100 +
TYPE SPECIMEN	UNDISTURBED	VOID RATIO	1.050	0.649
DIA. IN 4.44	HT. IN 1.143	BACK PRESSURE, TSF		

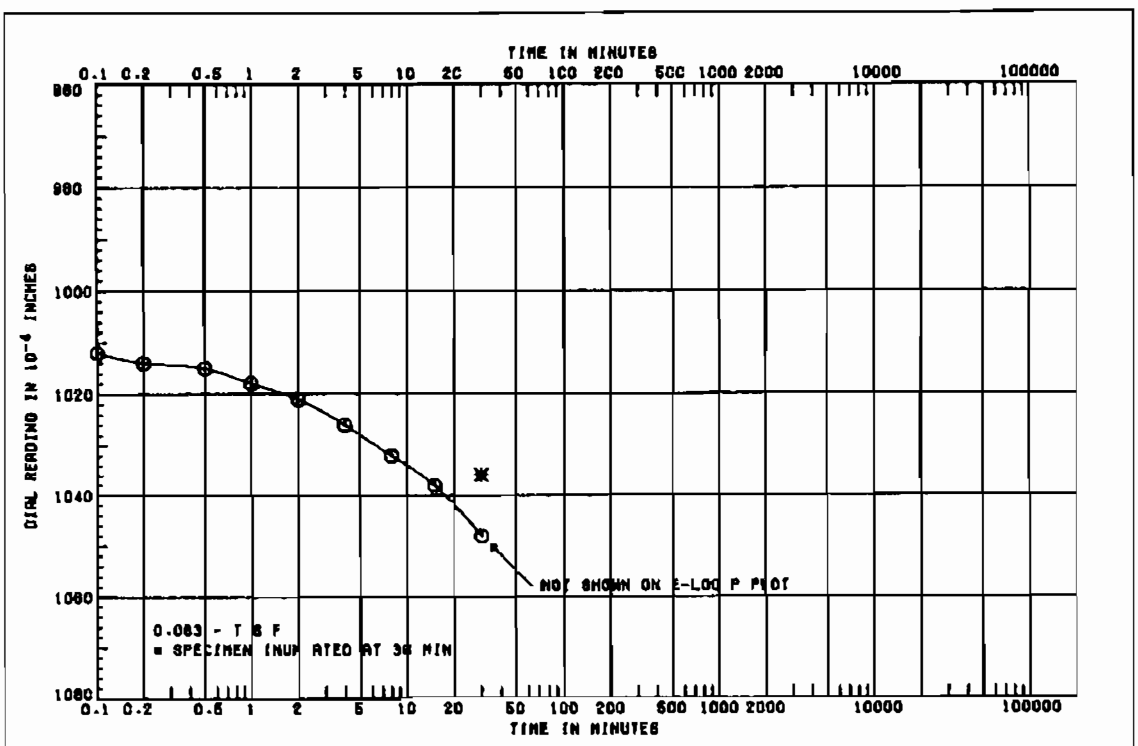
CLASSIFICATION	PLASTIC CLAY (CH), GRAY; SILT POCKETS; SHELL PARTICLES		
LL 49	PL 15	PI 34	PROJECT LAKE PONT LA 4 VIC NEW ORLEANS
GS 2.70 (EST)	D_{10}		EAST LEV (SOUTH POINT TO DIWW)
REMARKS		BORING NO. 17-USP	SAMPLE NO. 4-8
LIMITS ON MIXTURE OF MATERIAL		DEPTH/ELEV 12.4/0.50	DATE 15 JUN 66
		CONSOLIDATION TEST REPORT	

SHEET 1 OF 8



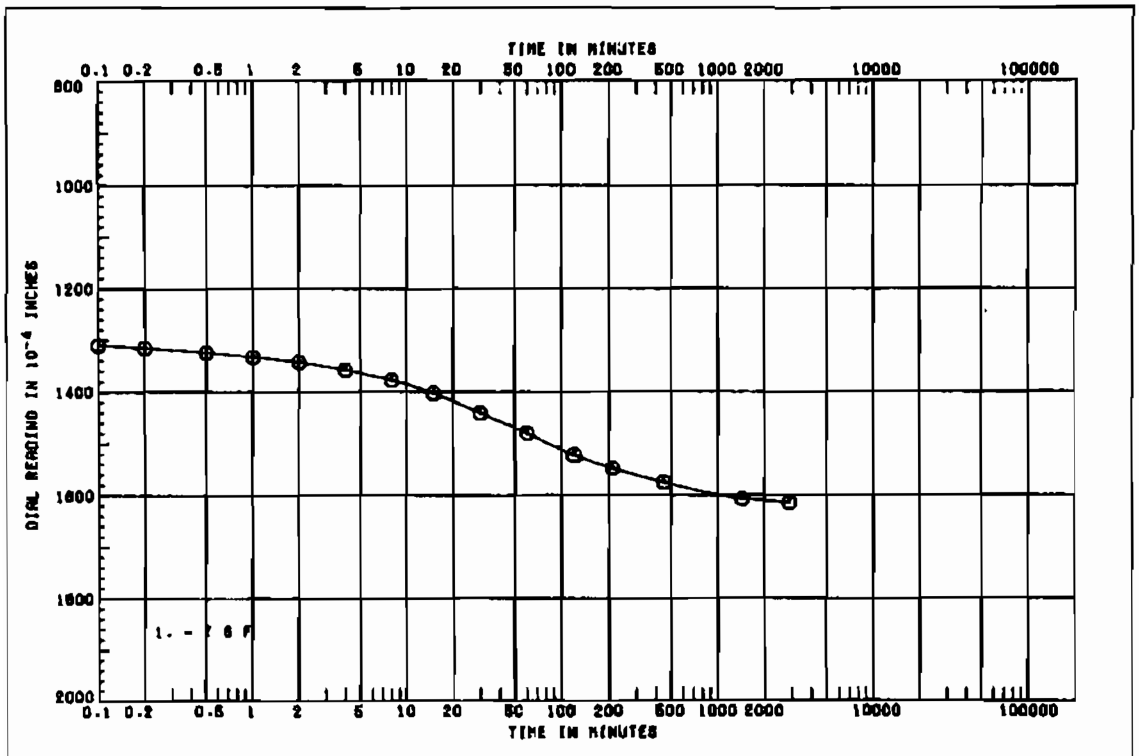
PROJECT LAKE PONT LA & VIC NEW ORLEANS		CONSOLIDATION TEST TIME CURVES
EAST LEV (SOUTH POINT TO GIWW)		
BORING 17-USP	SAMPLE NO. 4-B	
DEPTH/ELEV 12.4/0.60	DATE 18 JUN 86	

SHEET 3 OF 9



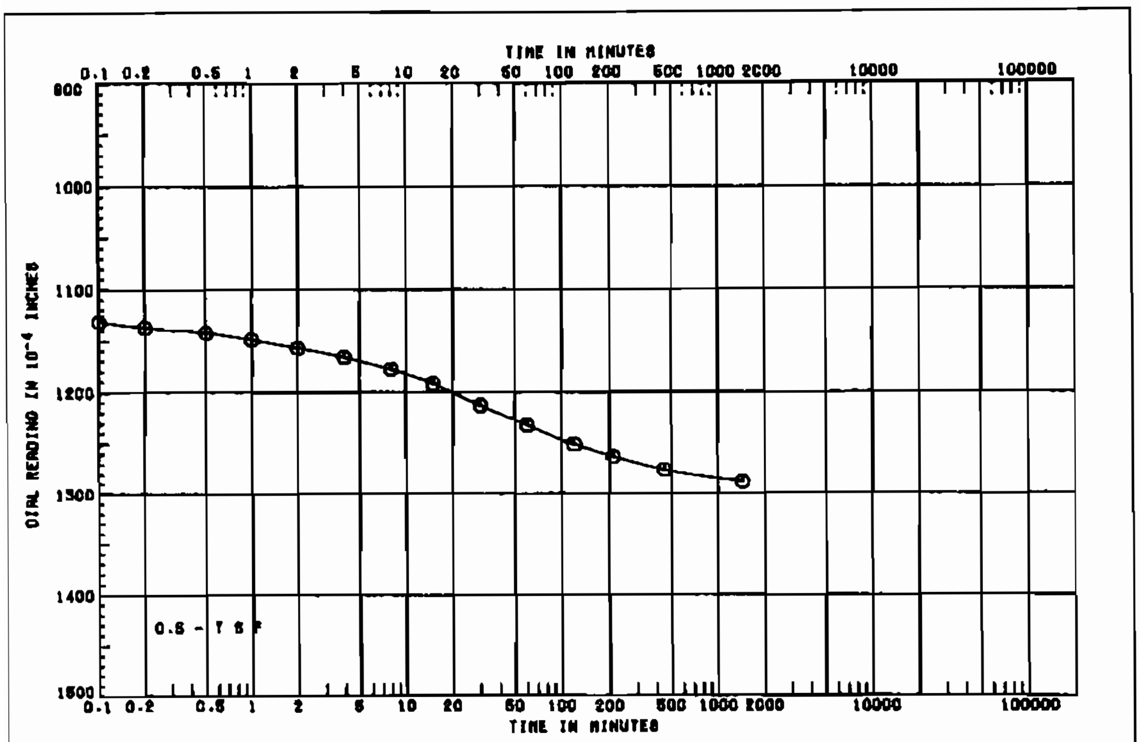
PROJECT LAKE PONT LA & VIC NEW ORLEANS		CONSOLIDATION TEST TIME CURVES
EAST LEV (SOUTH POINT TO GIWW)		
BORING 17-USP	SAMPLE NO. 4-B	
DEPTH/ELEV 12.4/0.60	DATE 18 JUN 86	

SHEET 2 OF 9



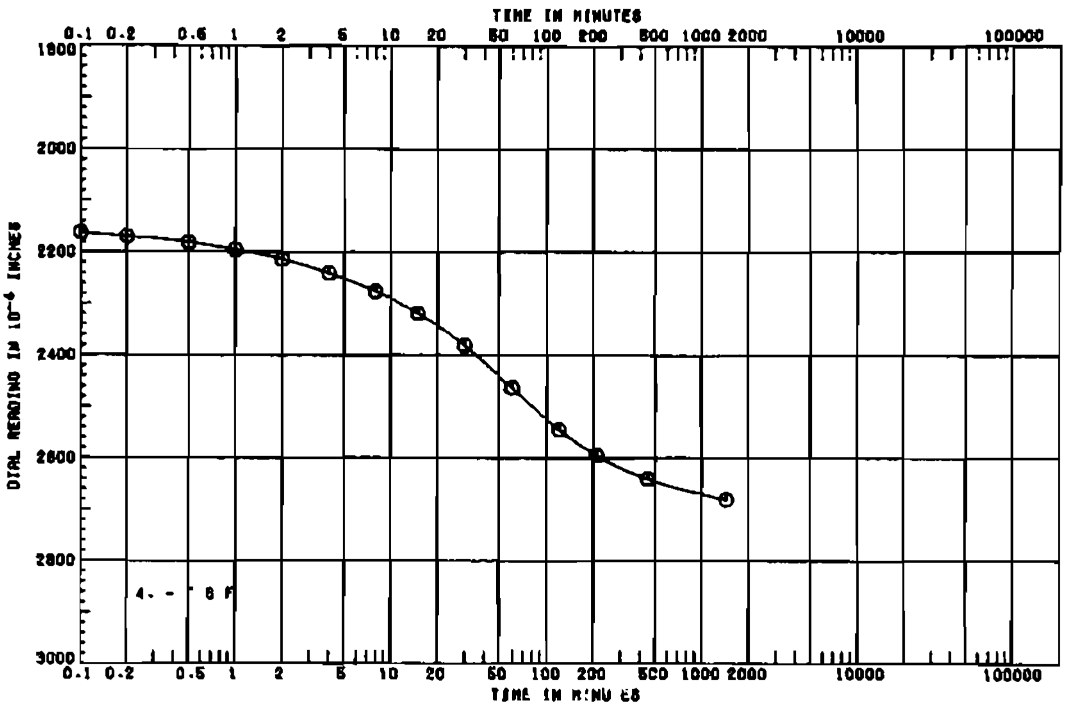
PROJECT LAKE PONT LA & VIC NEW ORLEANS		CONSOLIDATION TEST TIME CURVES
EAST LEV (SOUTH POINT TO DINK)		
BORING 17-USP	SAMPLE NO. 4-B	
DEPTH/ELEV 12.4/0.50	DATE 18 JUN 86	

SHEET 5 OF 8



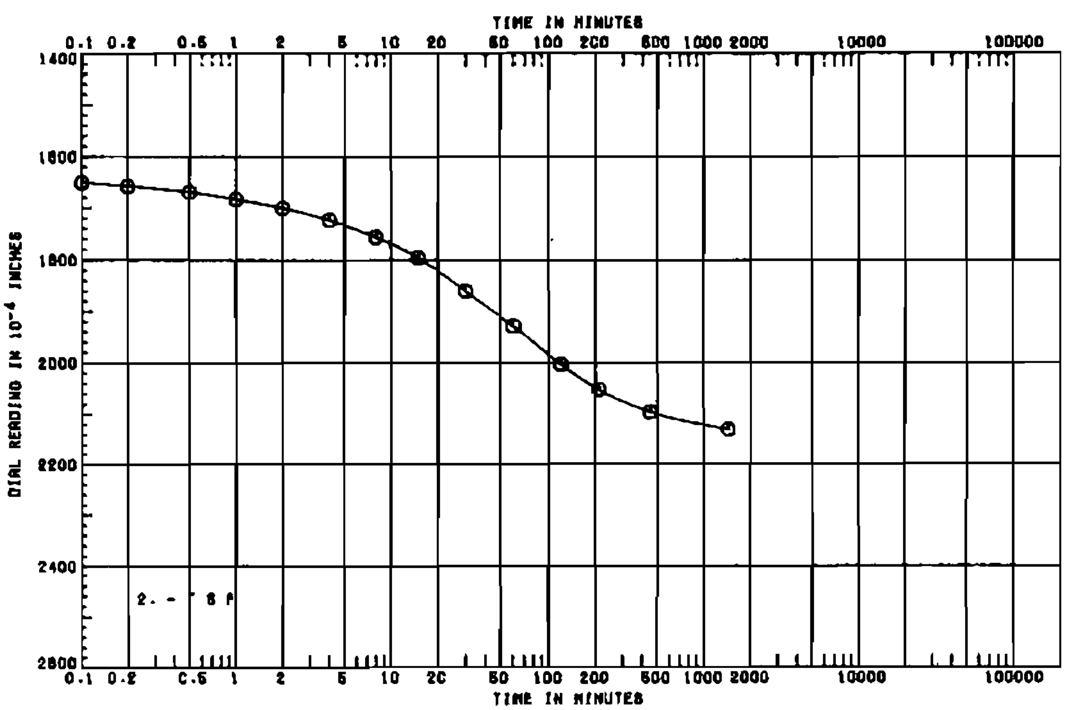
PROJECT LAKE PONT LA & VIC NEW ORLEANS		CONSOLIDATION TEST TIME CURVES
EAST LEV (SOUTH POINT TO DINK)		
BORING 17-USP	SAMPLE NO. 4-B	
DEPTH/ELEV 12.4/0.50	DATE 18 JUN 86	

SHEET 4 OF 8



PROJECT LAKE PONT LA & VIC NEW ORLEANS			CONSOLIDATION TEST TIME CURVES
EAST LEV (SOUTH POINT TO GIWW)			
BORING 17-USP	SAMPLE NO. 4-B		
DEPTH/ELEV 12.4/0.5C	DATE 18 JUN 86		

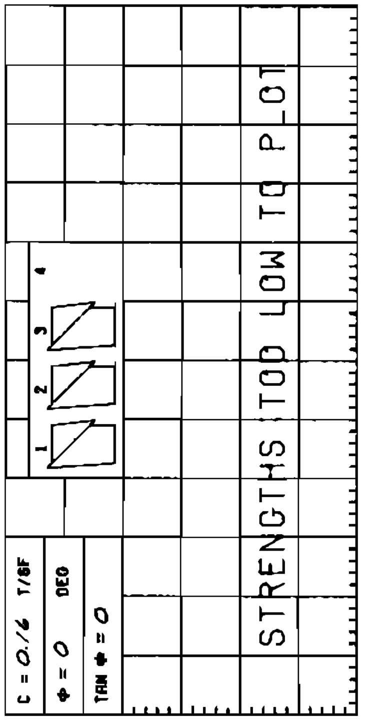
SHEET 7 OF 8



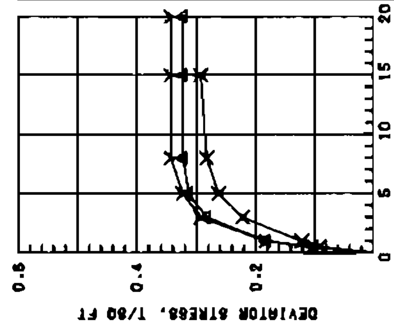
PROJECT LAKE PONT LA & VIC NEW ORLEANS			CONSOLIDATION TEST TIME CURVES
EAST LEV (SOUTH POINT TO GIWW)			
BORING 17-USP	SAMPLE NO. 4-B		
DEPTH/ELEV 12.4/0.50	DATE 18 JUN 86		

SHEET 8 OF 8

C = 0.16 T/SF
Φ = 0 DEG
TAN Φ = 0



γ Sat = 112



SPECIMEN NO.		1	2	3	4	AVG.
INITIAL	WATER CONTENT, %	39.8	40.2	40.1		40.03
	DRY DENSITY, PCF	78.9	78.2	77.8		78.30
	SATURATION, %	94.6	93.8	92.8		93.73
	VOID RATIO	1.138	1.157	1.166		
BEFORE SHEAR	WATER CONTENT, %					
	DRY DENSITY, PCF					
	SATURATION, %					
	VOID RATIO					
	BACK PRESS., TSF					
MIN PRIN. STRESS, TSF		0.5	1.5	3.0		
MAX. DEV. STRESS, TSF		0.32	0.34	0.29		
TIME TO FAILURE, MIN.		18	18	30		
RATE OF STRAIN INCR.,%						
INITIAL DIAMETER, IN.		1.39	1.39	1.39		
INITIAL HEIGHT, IN.		3.00	3.00	3.00		

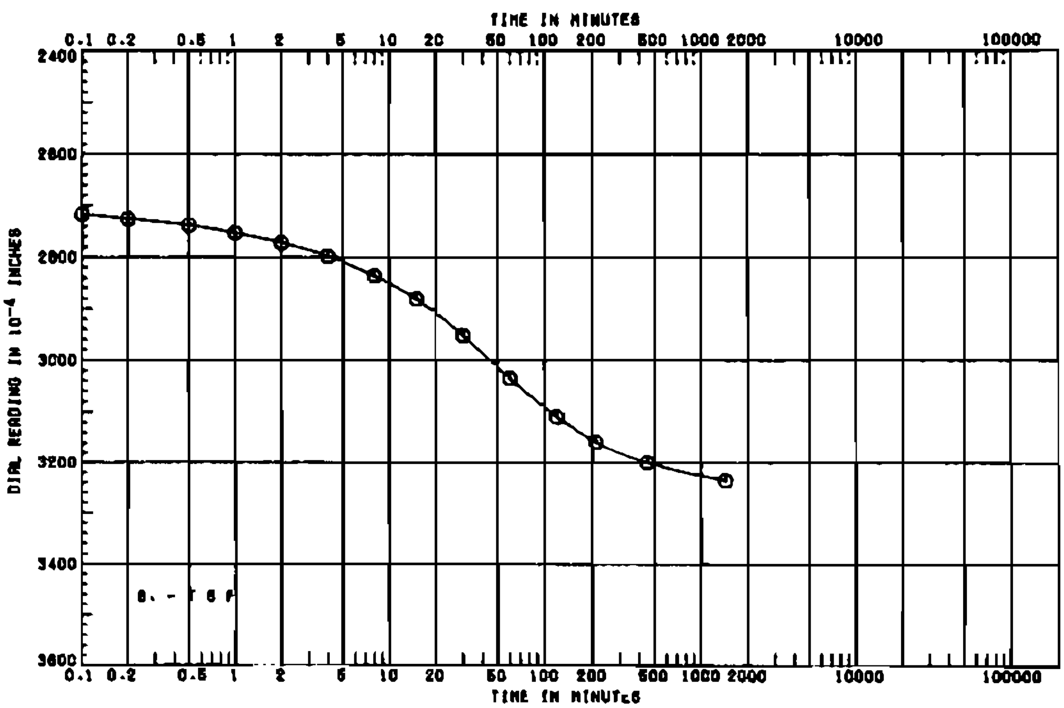
CONTROLLED-STRAIN TEST

DESCRIPTION OF SPECIMENS: PLASTIC CLAY (CH), GRAY; SILT POCKETS; SHELL PARTICLES

LL	PL	PI	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:	PROJECT LAKE PONT LA & VIC NEW ORLEANS
	EAST LEV (SOUTH POINT TO GIWW)
	BORING NO. 17-USP / SAMPLE NO. 4-C
	DEPTH/ELEV 13.1/-0.2 / TECH. KPC
	LABORATORY USAE WES / DATE 15 MAY 86

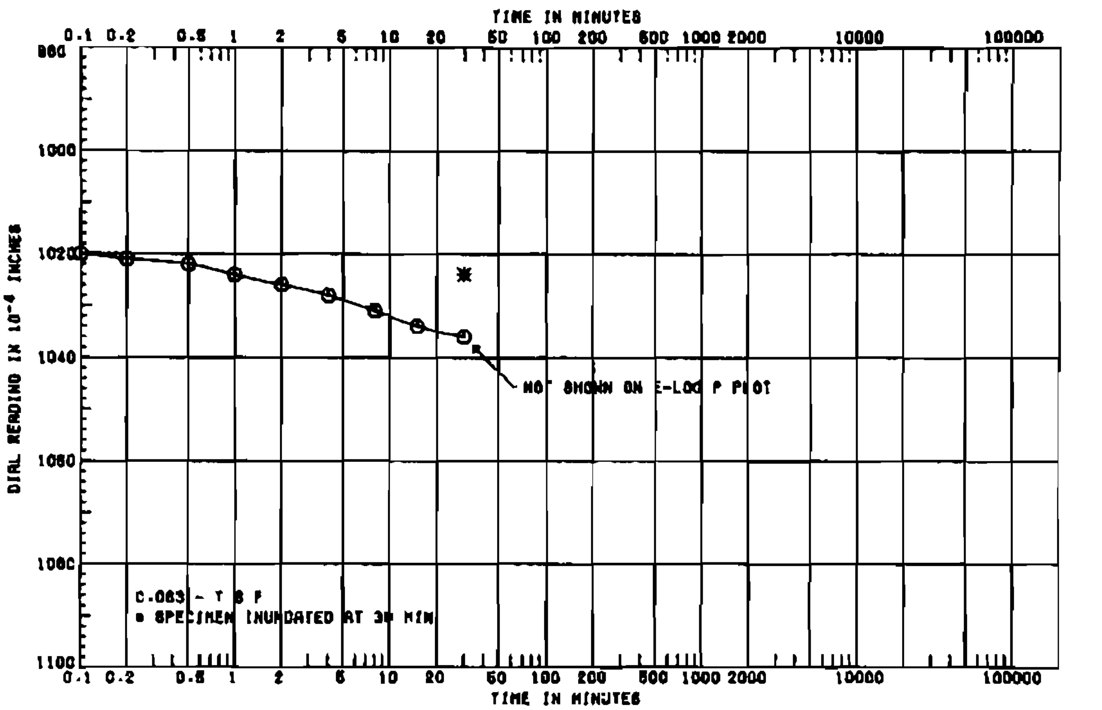
TRIAXIAL COMPRESSION TEST REPORT



PROJECT LAKE PONT LA & VIC N.H ORLEANS	
EAST LEV (SOUTH POINT TO GIWW)	
BORING 17-USP	SAMPLE NO. 4-B
DEPTH/ELEV 12.4/0.5C	DATE 19 JUN 86

CONSOLIDATION TEST
TIME CURVES

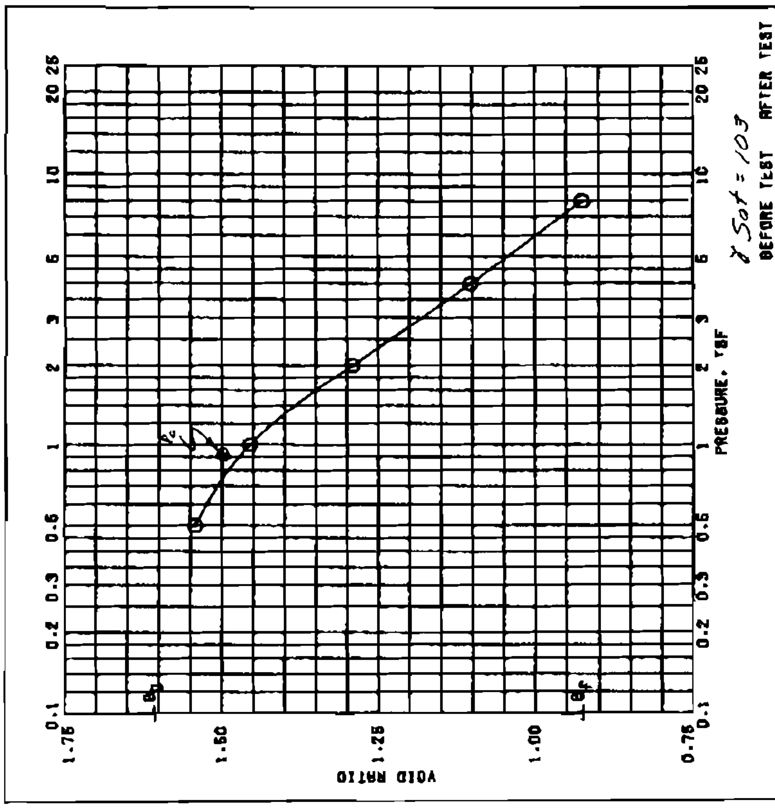
SHEET 8 OF 9



PROJECT LAKE PONT LA & VIC NEW ORLEANS	
EAST LEV (SOUTH POINT TO GIWW)	
BORING 17-USP	SAMPLE NO. 6-A
DEPTH/ELEV 20.6/-7.7	DATE 20 JUN 86

CONSOLIDATION TEST
TIME CURVES

SHEET 2 OF 7



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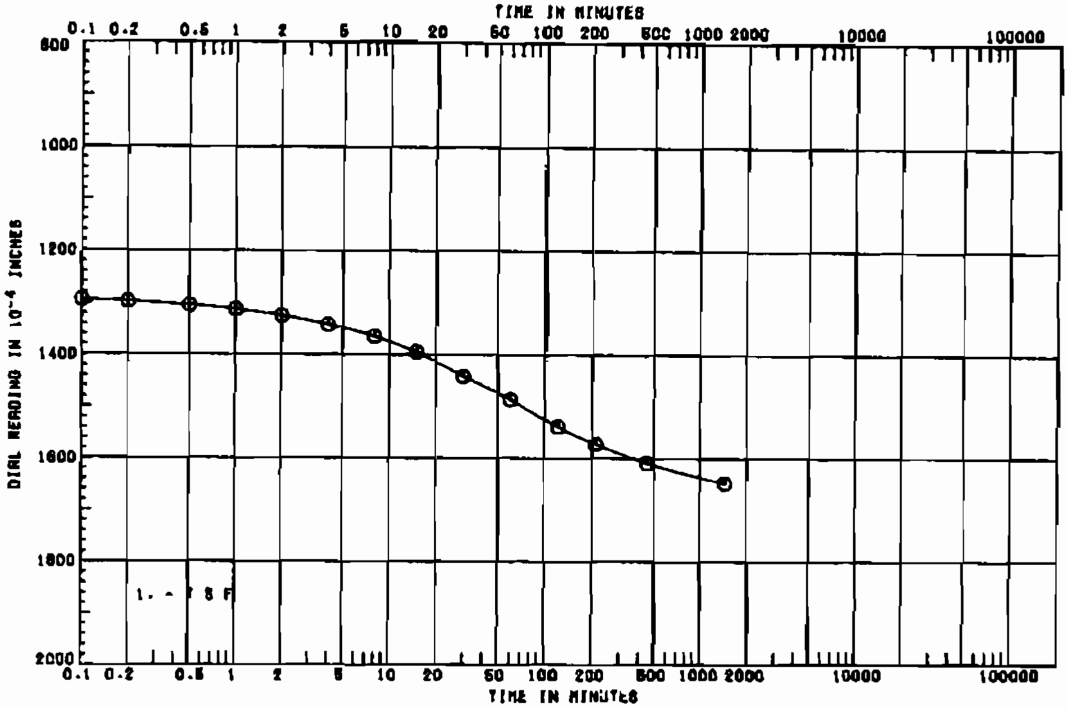
			BEFORE TEST	AFTER TEST
OVERBURDEN PRESSURE, TSF		WATER CONTENT, %	58.4	36.7
PRECONSOL. PRESSURE, TSF	0.92	DRY DENSITY, PCF	64.7	87.6
COMPRESSION INDEX	0.56	SATURATION, %	98.3	100 +
TYPE SPECIMEN	UNDISTURBED	VOID RATIO	1.605	0.924
DIA. IN 4.44	HT. IN 1.114	BACK PRESSURE, TSF		

CLASSIFICATION PLASTIC CLAY (CH), GRAY; SILT POCKETS; SHELL PARTICLES

LL 72	PL 22	PI 53	PROJECT LAKE PONT LA & VIC NEW ORLEANS	
GS 2.70 (EST)	D_{10}		EAST LEV (SOUTH POINT TO GIWW)	
REMARKS			BORING NO. 17-USP	SAMPLE NO. 6-B
			DEPTH/ELEV 20.6/-7.7	DATE 20 JUN 86

CONSOLIDATION TEST REPORT

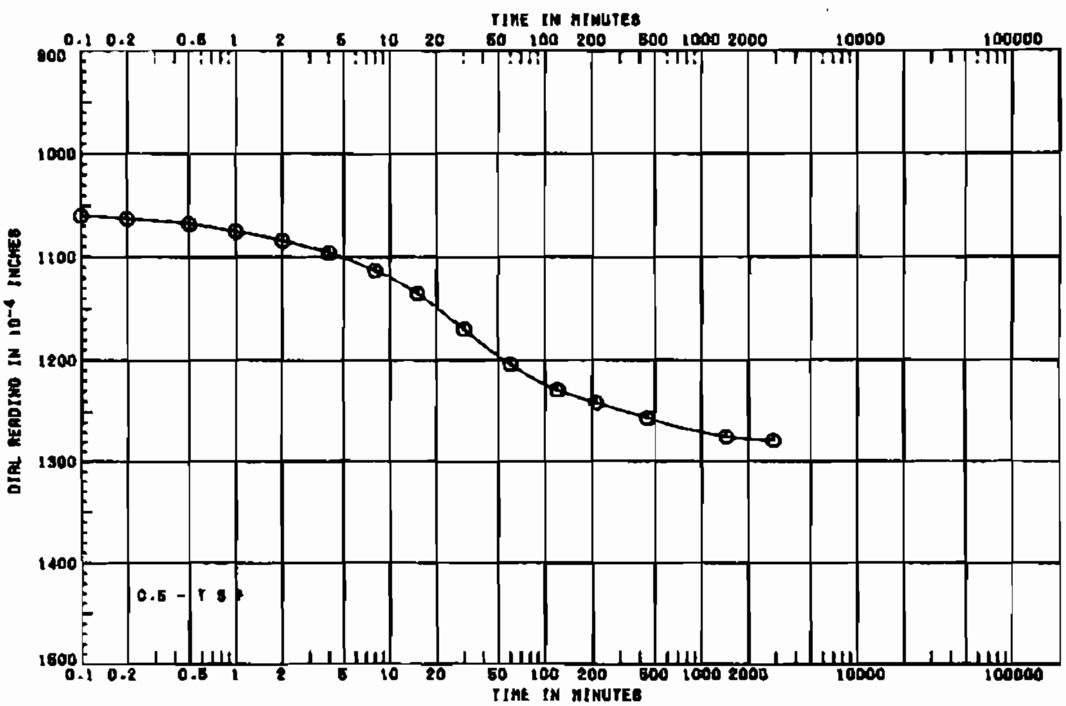
SHEET 1 OF 7



PROJECT LAKE PONT LA & VIC NEW ORLEANS	
EAST LEV (SOUTH POINT TO GIWW)	
BORING 17-USP	SAMPLE NO. 6-4
DEPTH/ELEV 20.6/-7.7	DATE 20 JUN 86

CONSOLIDATION TEST
TIME CURVES

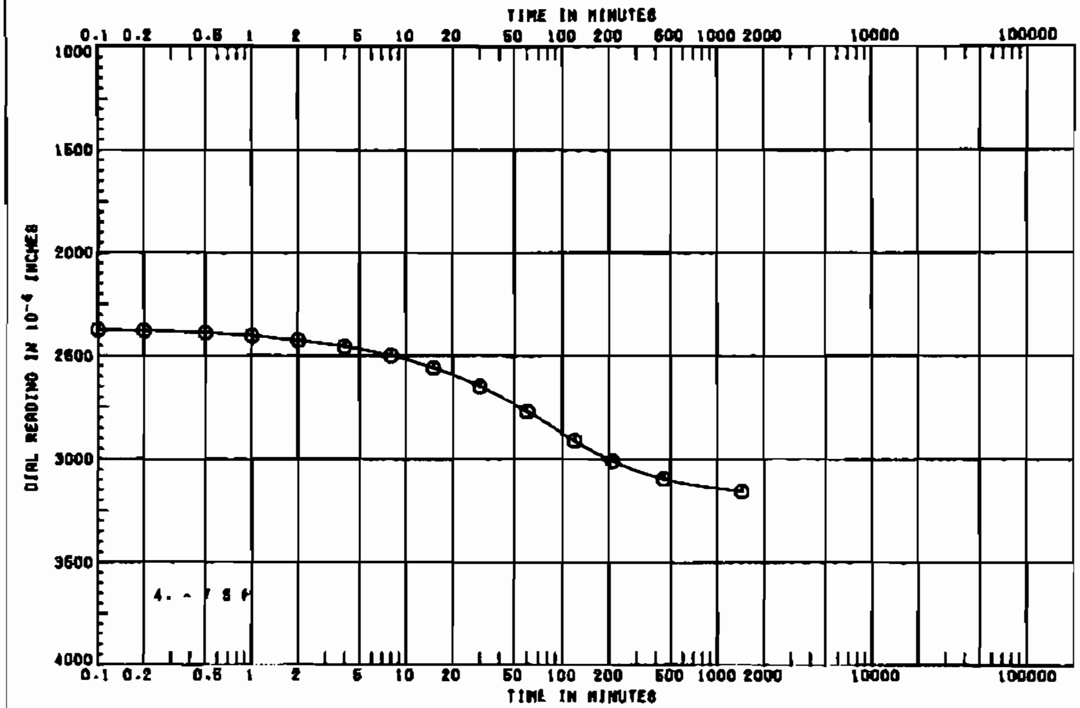
SHEET 4 OF 7



PROJECT LAKE PONT LA & VIC NEW ORLEANS	
EAST LEV (SOUTH POINT TO GIWW)	
BORING 17-USP	SAMPLE NO. 6-B
DEPTH/ELEV 20.6/-7.7	DATE 20 JUN 86

CONSOLIDATION TEST
TIME CURVES

SHEET 3 OF 7

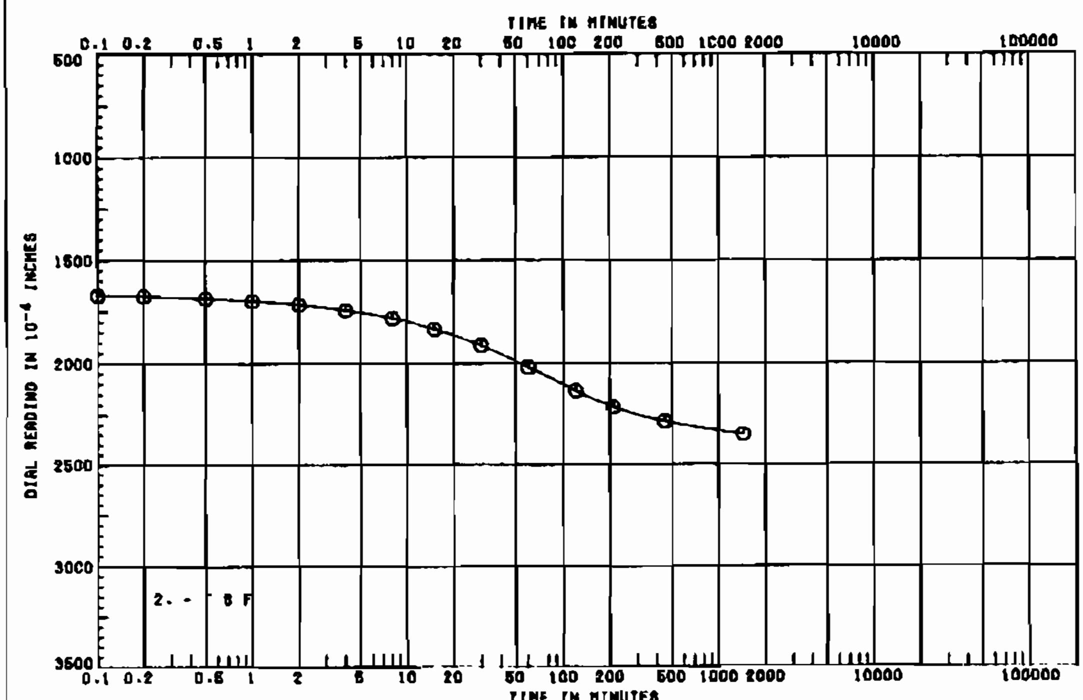


PROJECT LAKE PONT LA & VIC N N ORLEANS	
EAST LEV (SOUTH POINT TO GIWW)	
BORING 17-USP	SAMPLE NO. 6-B
DEPTH/ELEV 20.6/-7.7	DATE 20 JUN 86

CONSOLIDATION TEST

TIME CURVES

SHEET 6 OF 7



PROJECT LAKE PONT LA & VIC NEW ORLEANS	
EAST LEV (SOUTH POINT TO GIWW)	
BORING 17-USP	SAMPLE NO. 6-B
DEPTH/ELEV 20.6/-7.7	DATE 20 JUN 86

CONSOLIDATION TEST

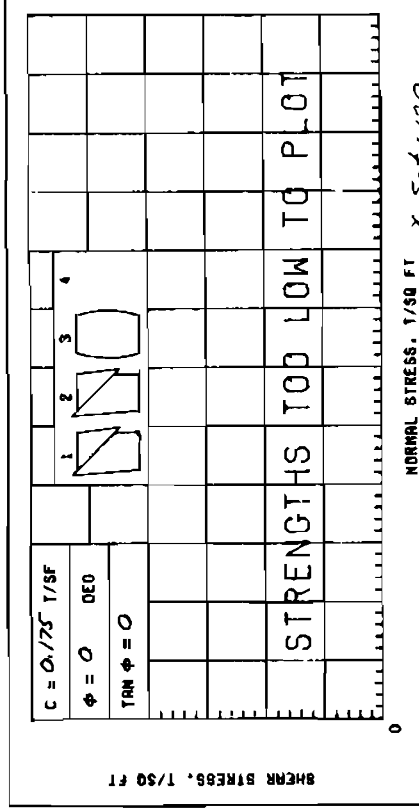
TIME CURVES

SHEET 5 OF 7

$c = 0.175$ T/SF

$\phi = 0$ DEG

TAN $\phi = 0$



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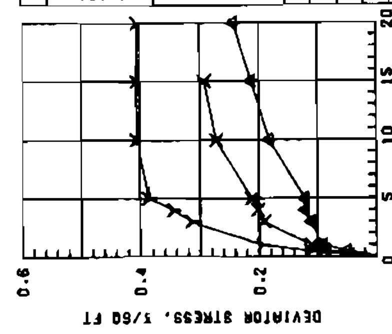


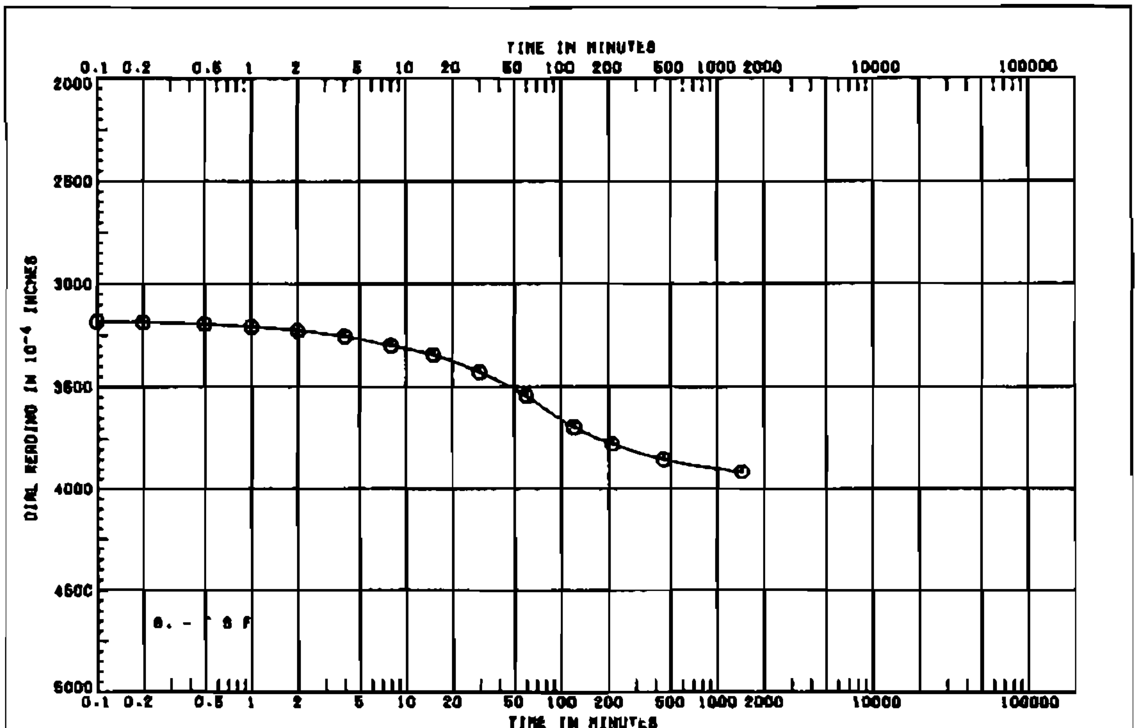
	SPECIMEN NO.	1	2	3	4	AVG.
INITIAL	WATER CONTENT, %	30.6	32.0	25.5		29.37
	DRY DENSITY, PCF	88.4	87.4	95.7		90.83
	SATURATION, %	93.3	93.0	90.3		92.20
	VOID RATIO	0.886	0.929	0.762		
BEFORE SHEAR	WATER CONTENT, %					
	DRY DENSITY, PCF					
	SATURATION, %					
	VOID RATIO					
	BACK PRESS., TSF					
	MIN PRIN. STRESS, TSF	0.5	1.5	3.0		
	MAX. DEV. STRESS, TSF	0.12	0.41	0.29		
	TIME TO FAILURE, MIN.	8	20	30		
	RATE OF STRAIN INCR.%					
	INITIAL DIAMETER, IN.	1.39	1.39	1.39		
	INITIAL HEIGHT, IN.	3.00	3.00	3.00		

CONTROLLED-STRAIN TEST

DESCRIPTION OF SPECIMENS: CLAY (CL), GRAY; FINE SAND POCKETS; SHELLS

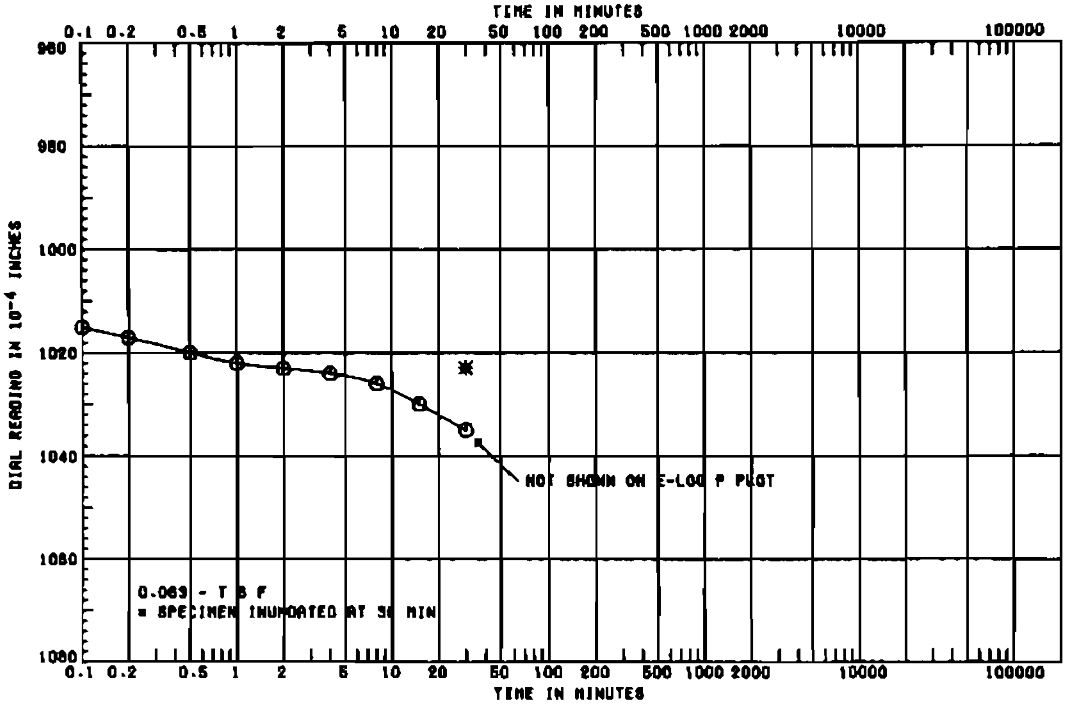
LL 41	PL 14	PI 27	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:	PROJECT LAKE PONT LA & VIC NEW ORLEANS	
INSUFFICIENT MATERIAL FOR	EAST LEV (SOUTH POINT TO GIWW)	
CHECK TEST.	BORING NO. 17-USP	SAMPLE NO. 6-C
	DEPTH/ELEV 21.2/-8.3	TECH. KOC
	LABORATORY USAE WES	DATE 16 MAY 86
	TRIAXIAL COMPRESSION TEST REPORT	



PROJECT LAKE PONT LA & VIC NEW ORLEANS	CONSOLIDATION TEST TIME CURVES
EAST LEV (SOUTH POINT T GIWW)	
BORING 17-USP	SAMPLE NO. 6-4
DEPTH/ELEV 20.6/-7.7	DATE 20 JUN 86

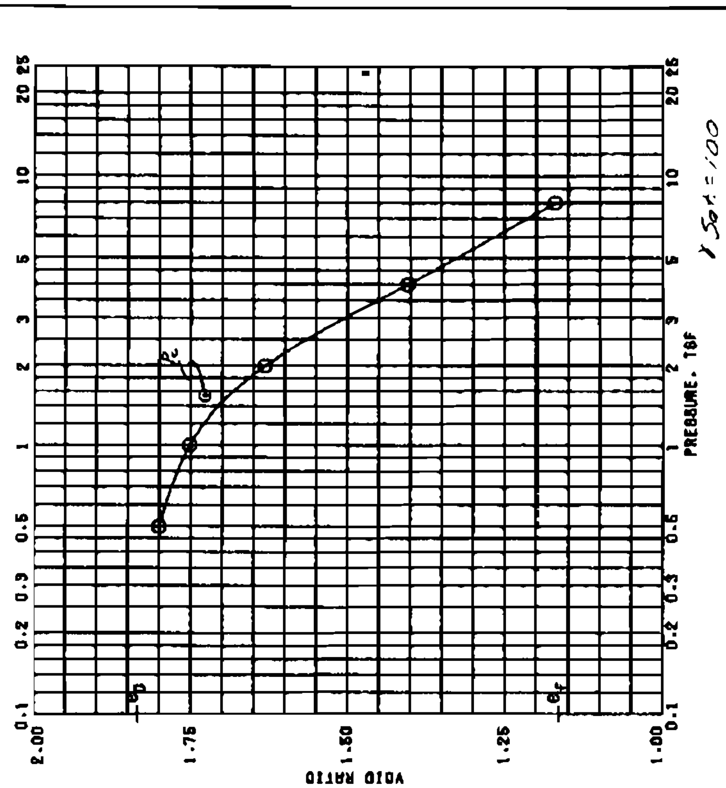
SHEET 7 OF 7



PROJECT LAKE PONT LA & VIC NEW ORLEANS	
EAST LEV (SOUTH POINT TO DIWW)	
BORING 17-USP	SAMPLE NO. 8-C
DEPTH/ELEV 29.1/-16.2	DATE 23 JUN 86

CONSOLIDATION TEST
TIME CURVES

SHEET 2 OF 7



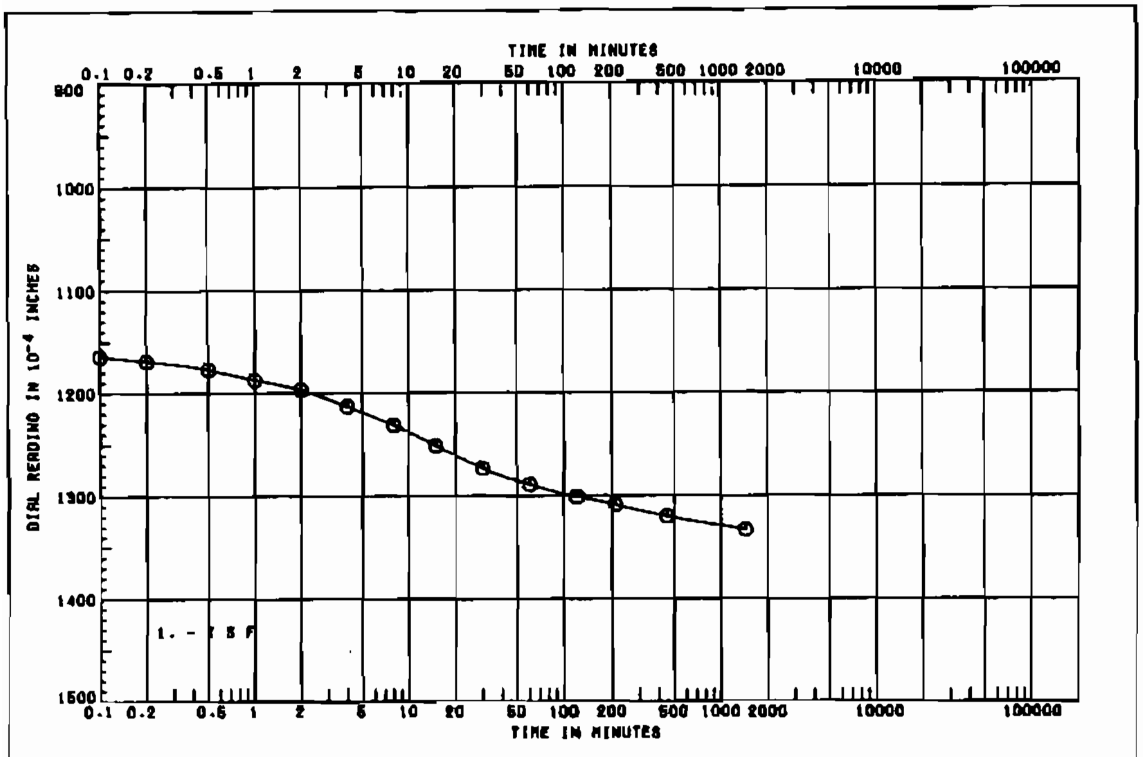
OVERBURDEN PRESSURE, TSF	
PRECONSOL. PRESSURE, TSF	1.55
COMPRESSION INDEX	0.79
TYPE SPECIMEN	UNDISTURBED
DIA. IN 4.44	HT. IN 1.130
CLASSIFICATION	PLASTIC CLAY (CH), BROWN; ORGANIC MATERIAL
LL 92 PL 30	PI 62
GS 2.70 (EST)	D_{10}
REMARKS	

	BEFORE TEST	AFTER TEST
WATER CONTENT, %	63.8	42.4
DRY DENSITY, PCF	59.6	77.8
SATURATION, %	94.0	98.3
VOID RATIO	1.833	1.164
BACK PRESSURE, TSF		

PROJECT LAKE PONT LA & VIC NEW ORLEANS	
EAST LEV (SOUTH POINT TO DIWW)	
BORING NO. 17-USP	SAMPLE NO. 8-C
DEPTH/ELEV 29.1/-16.2	DATE 23 JUN 86

CONSOLIDATION TEST REPORT

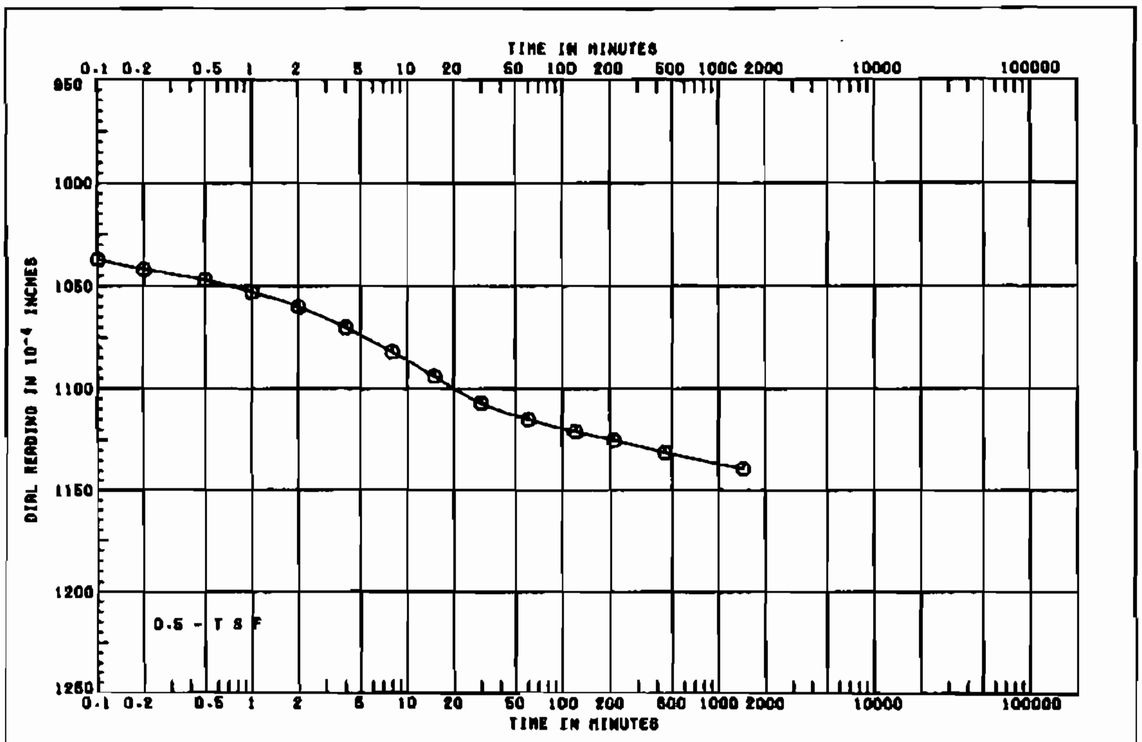
SHEET 1 OF 7



PROJECT LAKE PONT LA & VIC NEW ORLEANS	
EAST LEV (SOUTH POINT TO DIWN)	
BORING 17-USP	SAMPLE NO. 8-C
DEPTH/ELEV 29.1/-16.2	DATE 23 JUN 86

CONSOLIDATION TEST
TIME CURVES

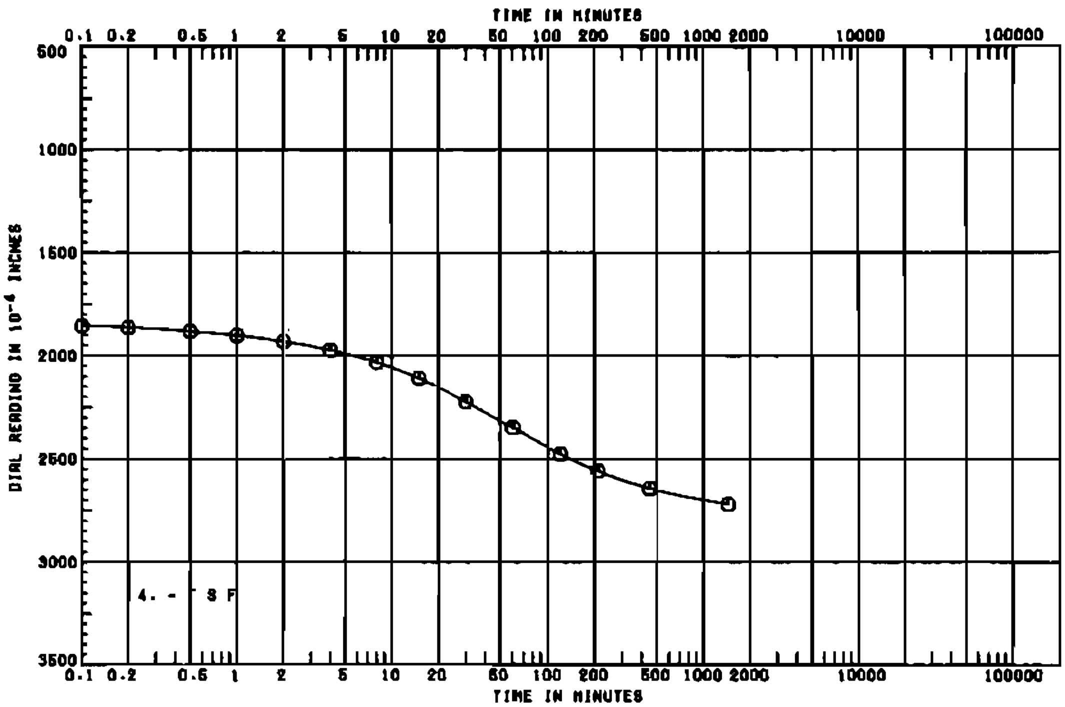
SHEET 4 OF 7



PROJECT LAKE PONT LA & VIC NEW ORLEANS	
EAST LEV (SOUTH POINT TO DIWN)	
BORING 17-USP	SAMPLE NO. 8-C
DEPTH/ELEV 29.1/-16.2	DATE 23 JUN 86

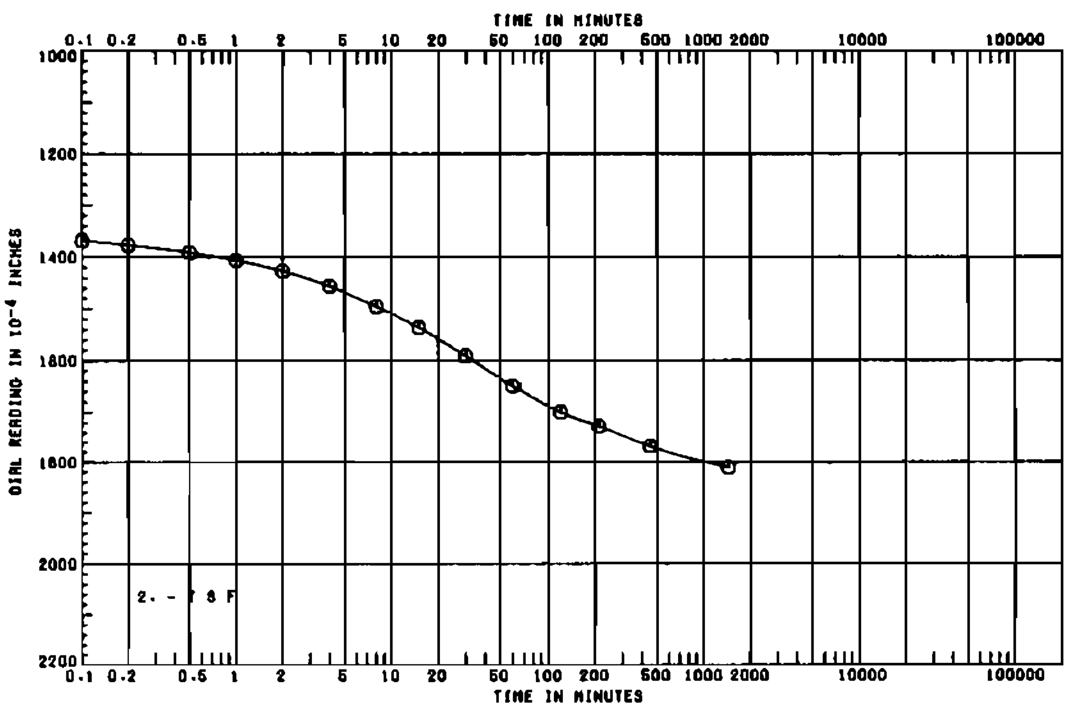
CONSOLIDATION TEST
TIME CURVES

SHEET 3 OF 7



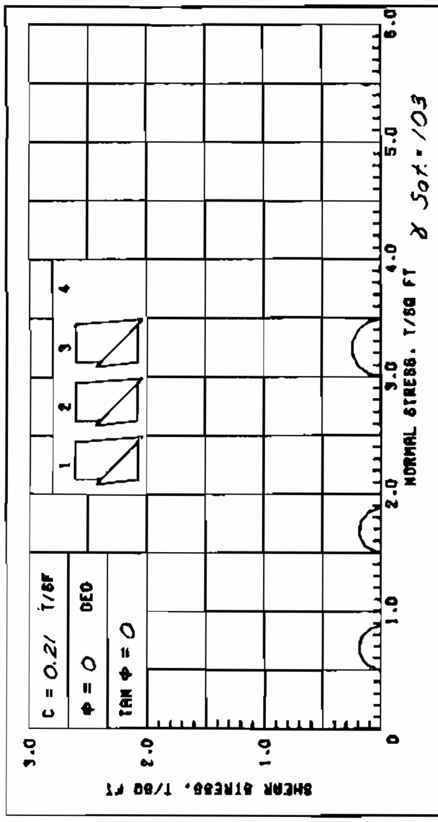
PROJECT LAKE PONT LA & VIC NEW ORLEANS		CONSOLIDATION TEST TIME CURVES
EAST LEV (SOUTH POINT TO GIWW)		
BORING 17-USP	SAMPLE NO. 8-C	
DEPTH/ELEV 29.1/-16.2	DATE 23 JUN 86	

SHEET 6 OF 7



PROJECT LAKE PONT LA & VIC NEW ORLEANS		CONSOLIDATION TEST TIME CURVES
EAST LEV (SOUTH POINT TO GIWW)		
BORING 17-USP	SAMPLE NO. 8-C	
DEPTH/ELEV 29.1/-16.2	DATE 23 JUN 86	

SHEET 5 OF 7



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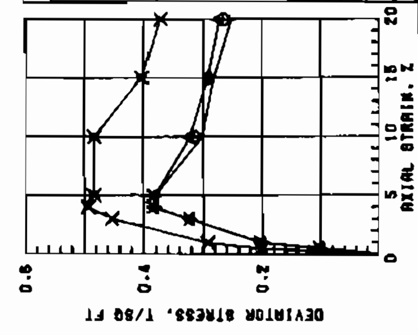


		SPECIMEN NO.	△1	Y2	X3	4	AVG
INITIAL		WATER CONTENT, %	61.0	59.2	58.6		5960
		DRY DENSITY, PCF	63.7	64.4	64.2		64.10
		SATURATION, %	100+	98.7	97.2		98 ..
		VOID RATIO	1.647	1.619	1.627		
BEFORE SHEAR		WATER CONTENT, %					
		DRY DENSITY, PCF					
		SATURATION, %					
		VOID RATIO					
		BACK PRESS., TSF					
		MIN PRIN. STRESS, TSF	0.5	1.5	3.0		
		MAX. DEV. STRESS, TSF	0.38	0.38	0.49		
		TIME TO FAILURE, MIN.	8	24	24		
		RATE OF STRAIN INCR,%		6	6		
		INITIAL DIAMETER, IN.	1.39	1.39	1.39		
		INITIAL HEIGHT, IN.	3.00	3.00	3.00		

CONTROLLED-STRAIN TEST

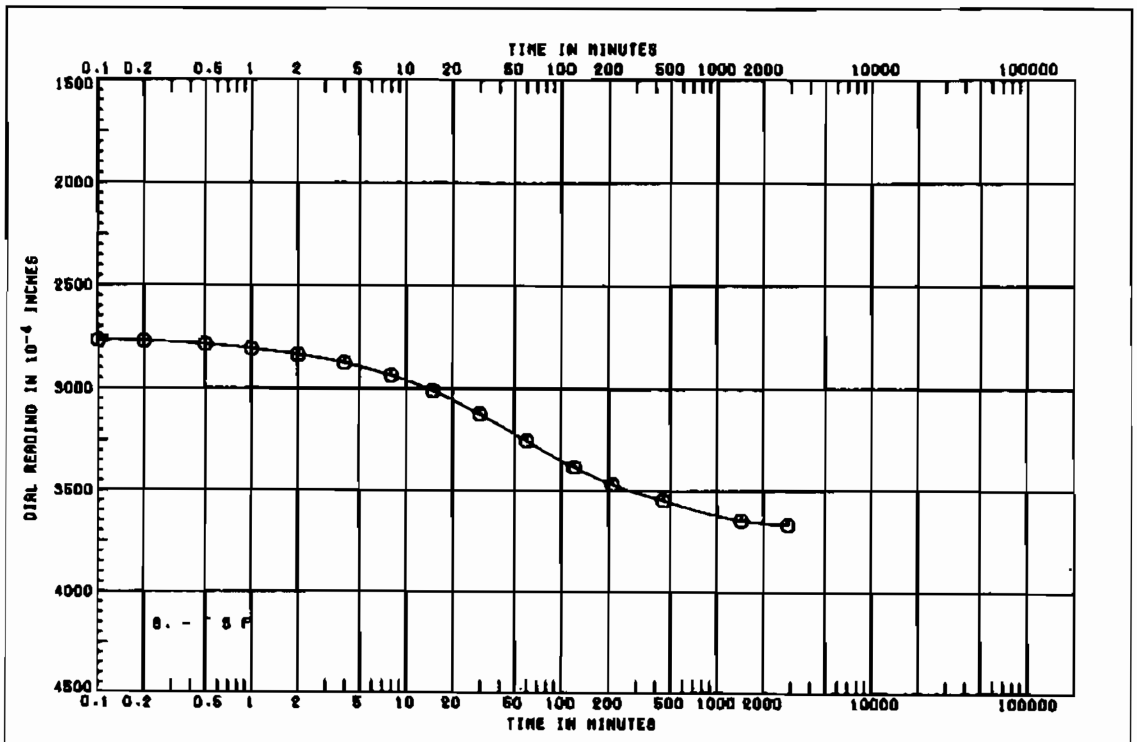
DESCRIPTION OF SPECIMENS: PLASTIC CLAY (CH), GRAY

LL 78	PL 20	PI 58	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:

PROJECT LAKE PONT LA & VIC NEW ORLEANS	
EAST LEV (SOUTH POINT TO OIWW)	
BORING NO. 17-USP	SAMPLE NO. 9-C
DEPTH/ELEV 33.1/-20.2	TECH. KOC
LABORATORY USAE WES	DATE 16 MAY 86

TRIAXIAL COMPRESSION TEST REPORT

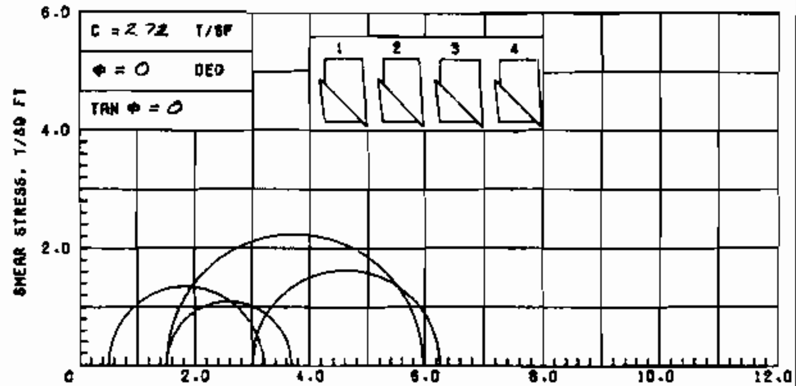


PROJECT LAKE PONT LA & VIC NEW ORLEANS	
EAST LEV (SOUTH POINT TO OIWW)	
BORING 17-USP	SAMPLE NO. 8-C
DEPTH/ELEV 29.1/-16.2	DATE 23 JUN 86

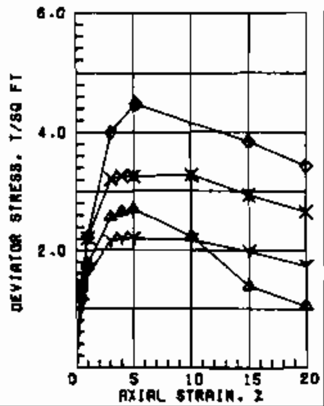
CONSOLIDATION TEST

TIME CURVES

SHEET 7 OF 7



γ-Sat 127



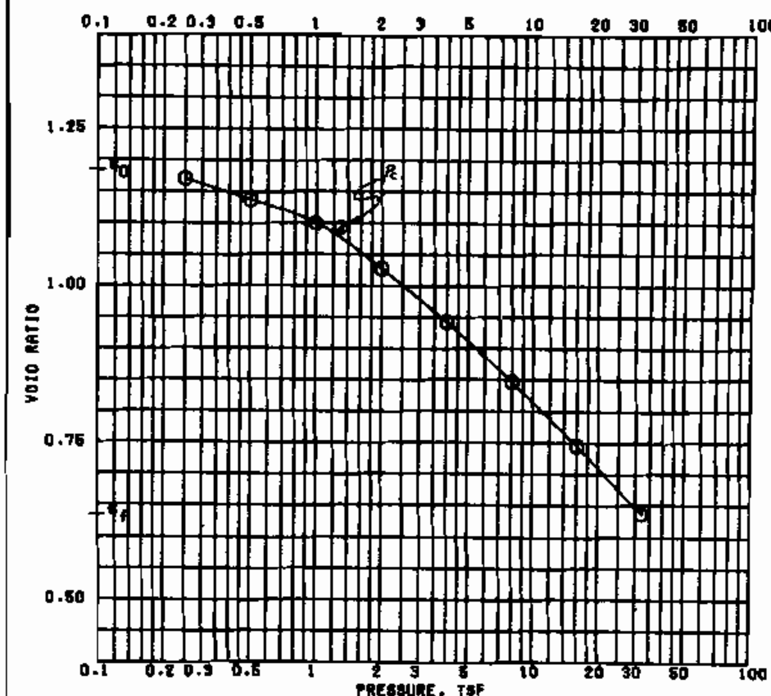
SPECIMEN NO.		▲1	Y2	X3	◆4	AVG.
INITIAL	WATER CONTENT, %	22.5	25.3	20.7	17.9	22.8?
	DRY DENSITY, PCF	103.6	97.8	105.5	109.8	102.3
	SATURATION, %	96.8	94.5	93.4	90.3	??
	VOID RATIO	0.627	0.723	0.598	0.535	
BEFORE SHEAR	WATER CONTENT, %					
	DRY DENSITY, PCF					
	SATURATION, %					
	VOID RATIO					
	BACK PRESS., TSF					
MIN PRIN. STRESS, TSF		0.5	1.5	3.0	1.5	
MAX. DEV. STRESS, TSF		2.70	2.20	3.28	4.48	
TIME TO FAILURE, MIN.		10	24	24	31	
RATE OF STRAIN INCR.%			6	6	6	
INITIAL DIAMETER, IN.		1.40	1.39	1.40	1.40	
INITIAL HEIGHT, IN.		3.00	3.00	3.00	3.00	

CONTROLLED-STRAIN TEST

DESCRIPTION OF SPECIMENS: PLASTIC CLAY (CH), GRAY & BROWN; SILT POCKETS

LL 47	PL 13	PI 34	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:	PROJECT LAKE PONT LA & VIC NEW ORLEANS
LIMITS ON MIXTURE OF MATERIAL.	EAST LEV (SOUTH POINT TO GIWW)
	BORING NO. 16-USP — SAMPLE NO. 2-6
	DEPTH/ELEV 4.8/8.4 — TECH. KOC
	LABORATORY USAE WES — DATE 19 MAY 86
	TRIAXIAL COMPRESSION TEST REPORT



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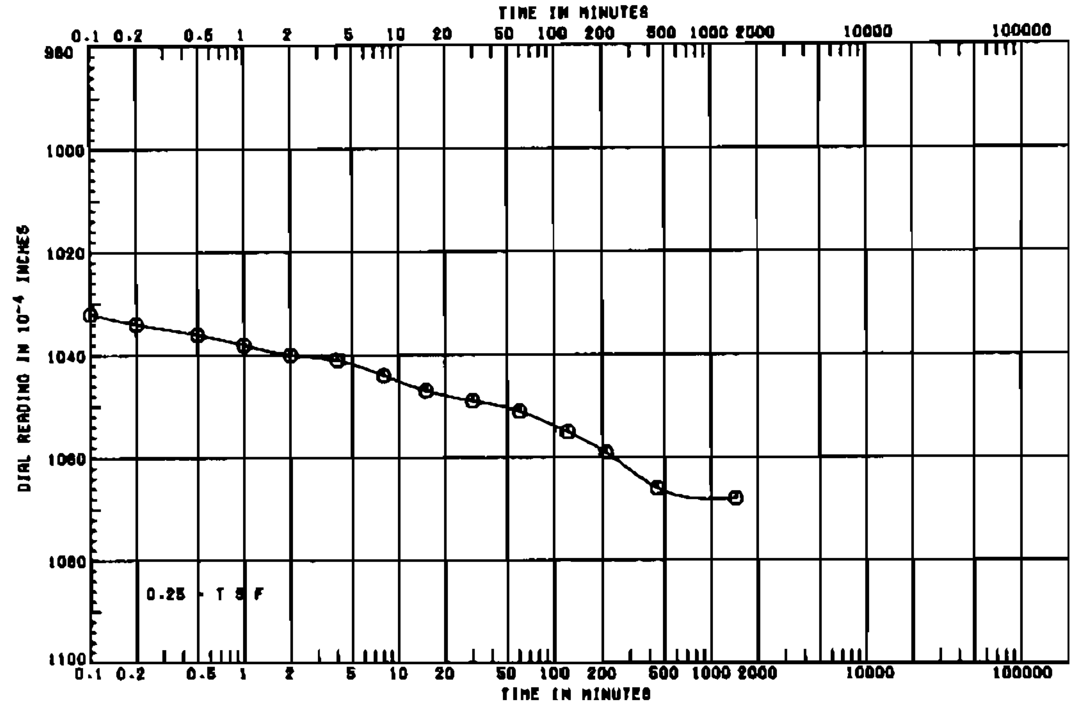
			BEFORE TEST	AFTER TEST
OVERBURDEN PRESSURE, TSF		WATER CONTENT, %	37.1	22.8
PRECONSOL. PRESSURE, TSF	1.30	DRY DENSITY, PCF	77.2	103.3
COMPRESSION INDEX	0.31	SATURATION, %	84.7	97.4
TYPE SPECIMEN	UNDISTURBED	VOID RATIO	1.182	0.632
DIA. IN 4.44	HT. IN 1.118	BACK PRESSURE, TSF		

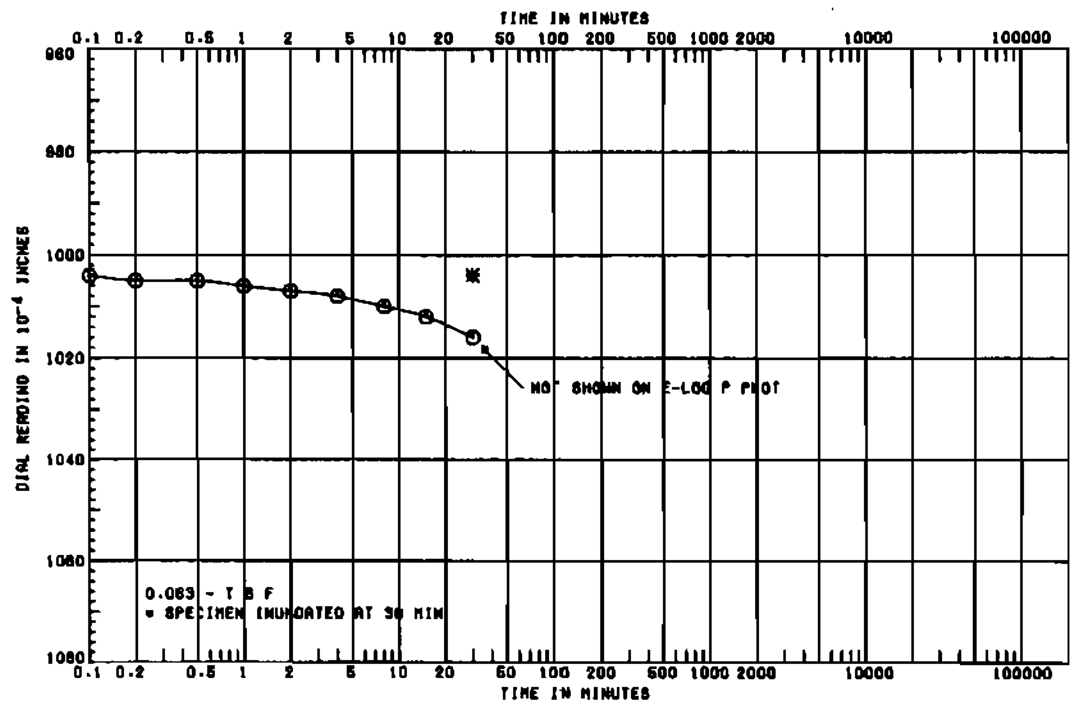
CLASSIFICATION PLASTIC CLAY (CH), DARK GRAY

LL 56	PL 20	PI 36	PROJECT LAKE PONT LA & VIC NEW ORLEANS
GS 2.70 (EST)	D_{10}		EAST LEV (SOUTH POINT TO GIWW)
REMARKS			BORING NO. 16-USP — SAMPLE NO. 3-8
			DEPTH/ELEV 8.3/4.90 — DATE 25 JUN 86
			CONSOLIDATION TEST REPORT



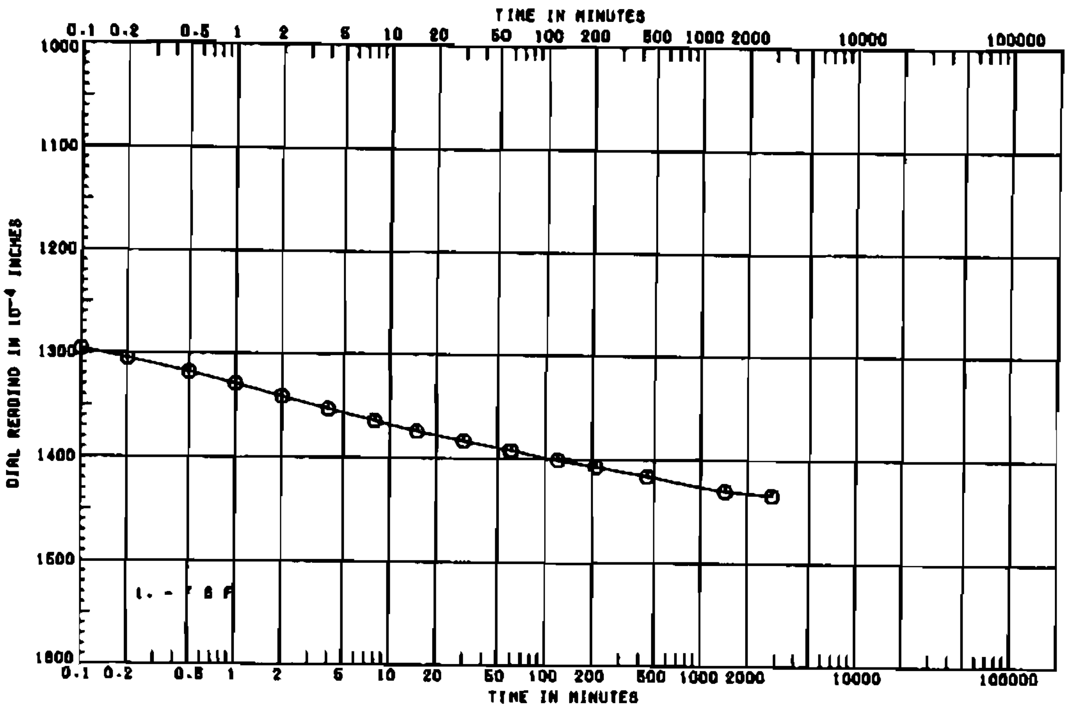
PROJECT LAKE PONT LA & VIC NEW ORLEANS		CONSOLIDATION TEST TIME CURVES
EAST LEV (SOUTH POINT TO GIWW)		
BORING 16-USP	SAMPLE NO. 3-B	
DEPTH/ELEV 8.3/4.90	DATE 25 JUN 86	

SHEET 3 OF 10



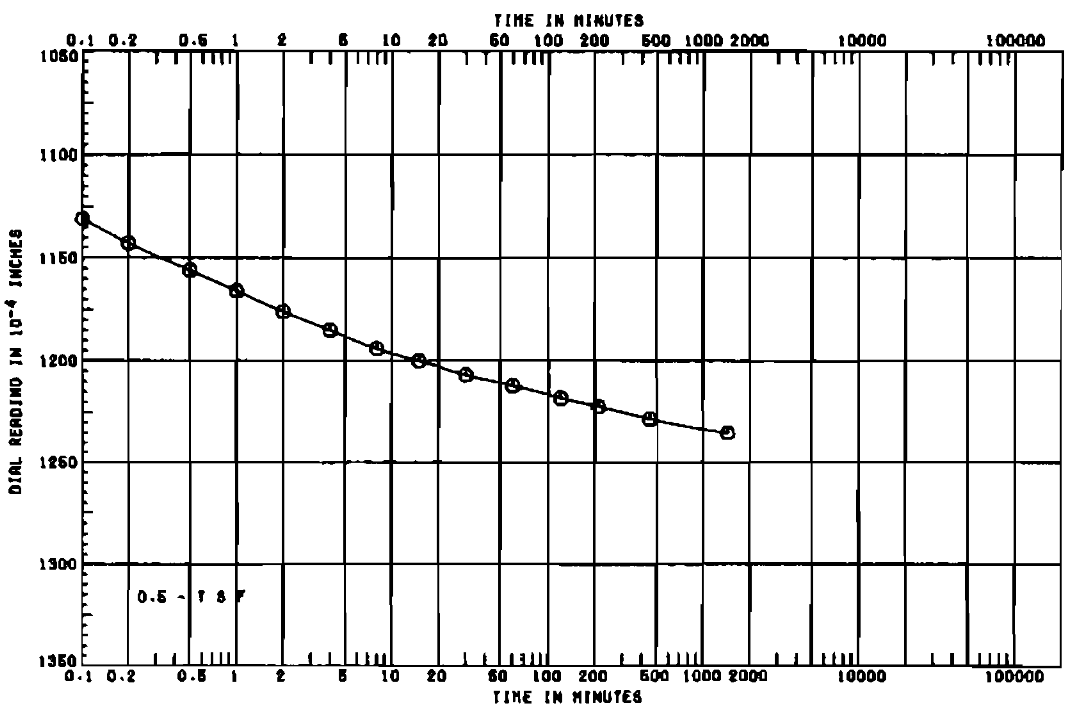
PROJECT LAKE PONT LA & VIC NEW ORLEANS		CONSOLIDATION TEST TIME CURVES
EAST LEV (SOUTH POINT TO GIWW)		
BORING 16-USP	SAMPLE NO. 3-B	
DEPTH/ELEV 8.3/4.90	DATE 25 JUN 86	

SHEET 2 OF 10



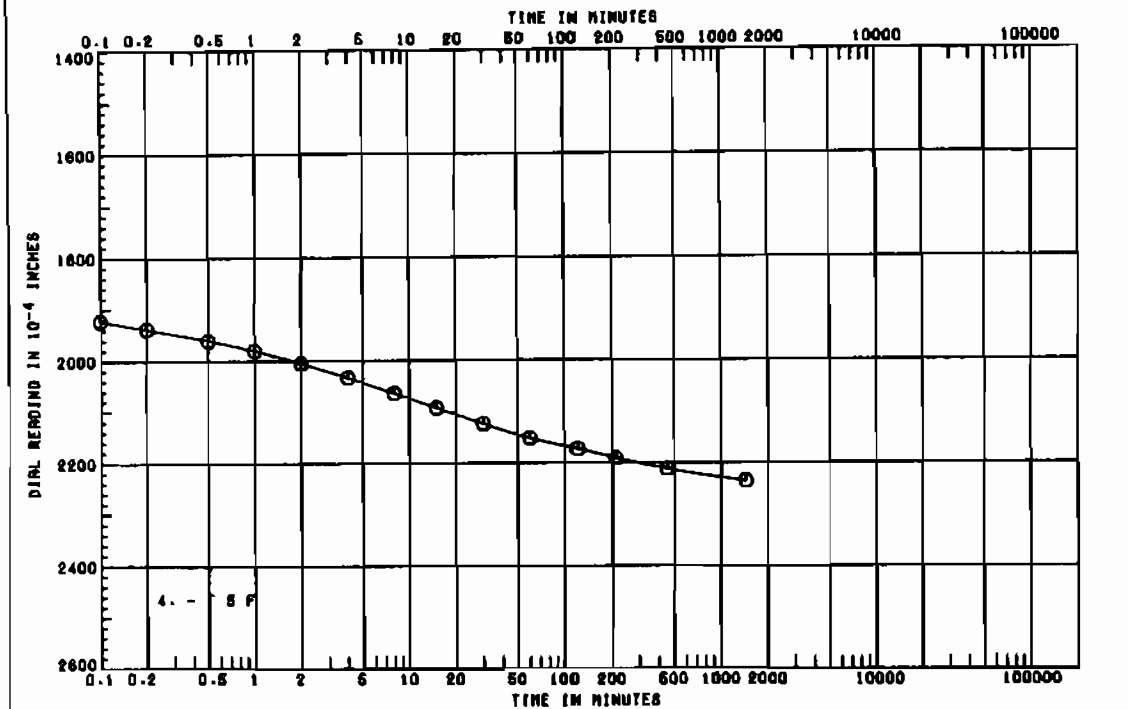
PROJECT LAKE PONT LA & VIC NEW ORLEANS	CONSOLIDATION TEST TIME CURVES
EAST LEV (SOUTH POINT TO DINN)	
BORING 16-USP / SAMPLE NO. 3-B	
DEPTH/ELEV 6.3/4.80 / DATE 25 JUN 86	

SHEET 5 OF 10



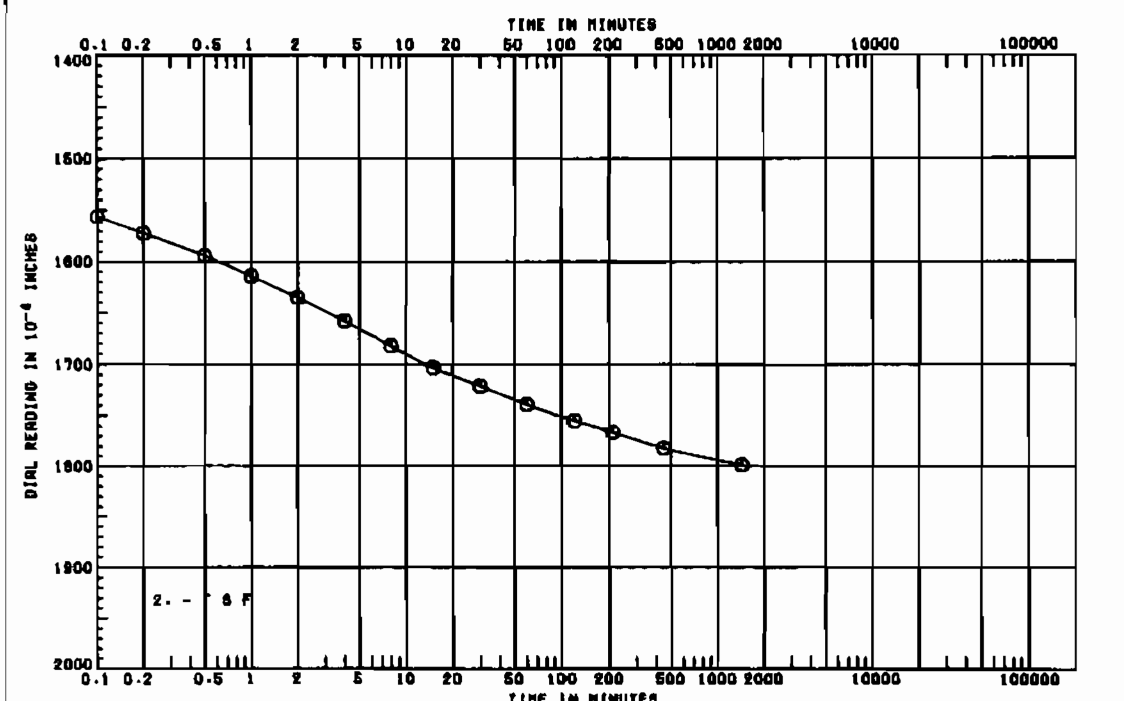
PROJECT LAKE PONT LA & VIC NEW ORLEANS	CONSOLIDATION TEST TIME CURVES
EAST LEV (SOUTH POINT TO DINN)	
BORING 16-USP / SAMPLE NO. 3-B	
DEPTH/ELEV 6.3/4.80 / DATE 25 JUN 86	

SHEET 4 OF 10



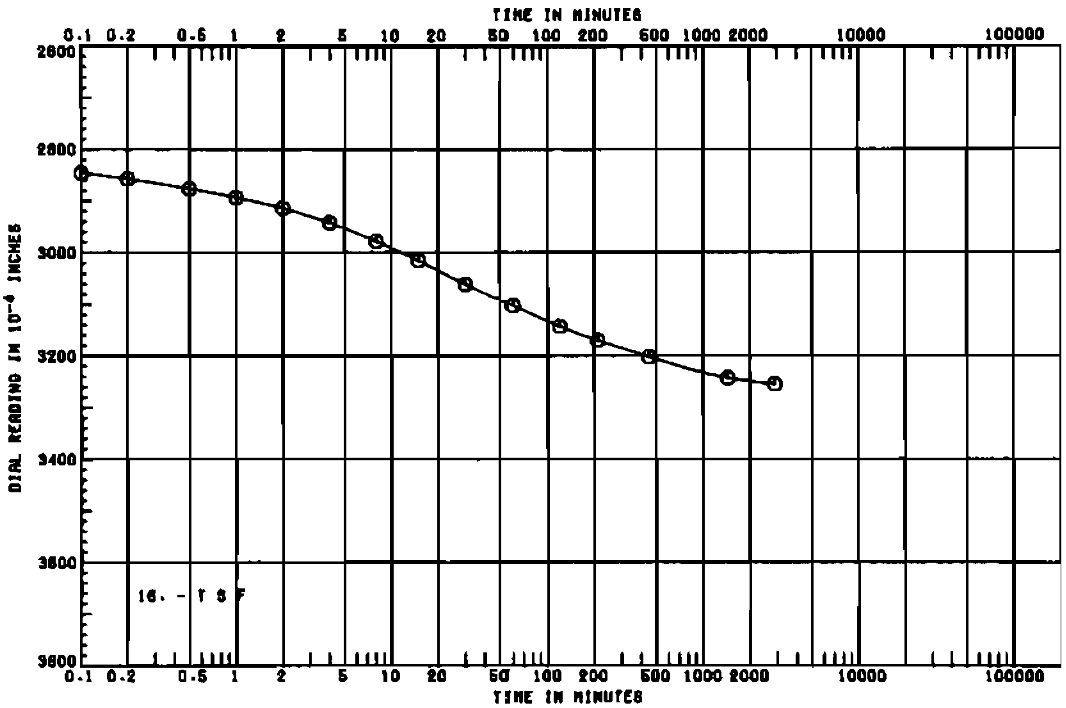
PROJECT LAKE PONT LA & VIC NEW ORLEANS		CONSOLIDATION TEST TIME CURVES
EAST LEV (SOUTH POINT TO OIWW)		
BORING 18-USP	SAMPLE NO. 3-B	
DEPTH/ELEV 8.3/4.90	DATE 25 JUN 86	

SHEET 7 OF 10



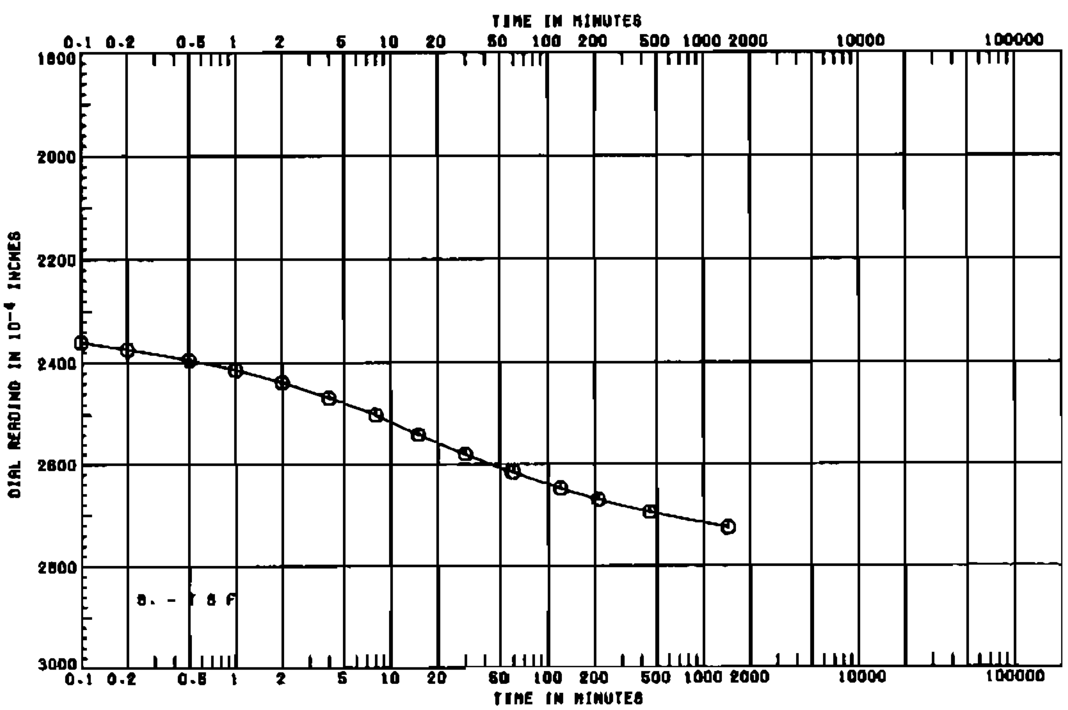
PROJECT LAKE PONT LA & VIC NEW ORLEANS		CONSOLIDATION TEST TIME CURVES
EAST LEV (SOUTH POINT TO OIWW)		
BORING 18-USP	SAMPLE NO. 3-B	
DEPTH/ELEV 8.3/4.90	DATE 25 JUN 86	

SHEET 8 OF 10



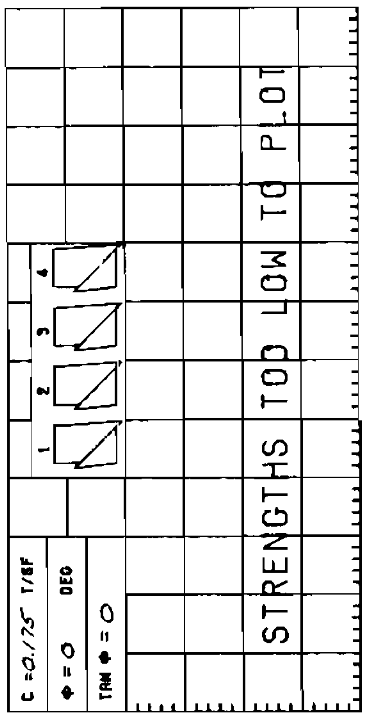
PROJECT LAKE PONT LA & VIC NEW ORLEANS		CONSOLIDATION TEST TIME CURVES
EAST LEV (SOUTH POINT TO OIWW)		
BORING 1B-USP	SAMPLE NO. 3-B	
DEPTH/ELEV 8.3/4.90	DATE 25 JUN 86	

SHEET 9 OF 10

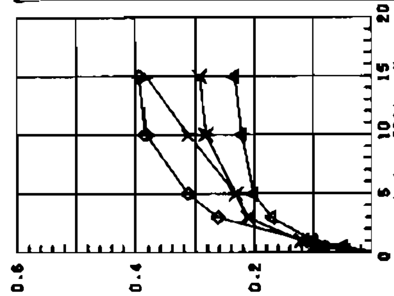


PROJECT LAKE PONT LA & VIC NEW ORLEANS		CONSOLIDATION TEST TIME CURVES
EAST LEV (SOUTH POINT TO OIWW)		
BORING 1B-USP	SAMPLE NO. 3-B	
DEPTH/ELEV 8.3/4.90	DATE 25 JUN 86	

SHEET 8 OF 10



γ Sat = 105



	SPECIMEN NO.	▲1	Y2	X3	◇4	AVG.
INITIAL	WATER CONTENT, %	49.2	51.9	57.8	51.2	52.53
	DRY DENSITY, PCF	71.7	67.6	63.5	68.2	67.75
	SATURATION, %	98.3	93.9	94.3	93.9	95.10
	VOID RATIO	1.351	1.493	1.655	1.472	
BEFORE SHEAR	WATER CONTENT, %					
	DRY DENSITY, PCF					
	SATURATION, %					
	VOID RATIO					
	BACK PRESS., TSF					
	MIN PRIN. STRESS, TSF	0.5	1.5	3.0	0.5	
	MAX. DEV. STRESS, TSF	0.23	0.36	0.29	0.39	
	TIME TO FAILURE, MIN.	30	30	30	30	
	RATE OF STRAIN INCR.%					
	INITIAL DIAMETER, IN.	1.38	1.38	1.38	1.38	
	INITIAL HEIGHT, IN.	3.00	3.00	3.00	3.00	

CONTROLLED-STRAIN TEST

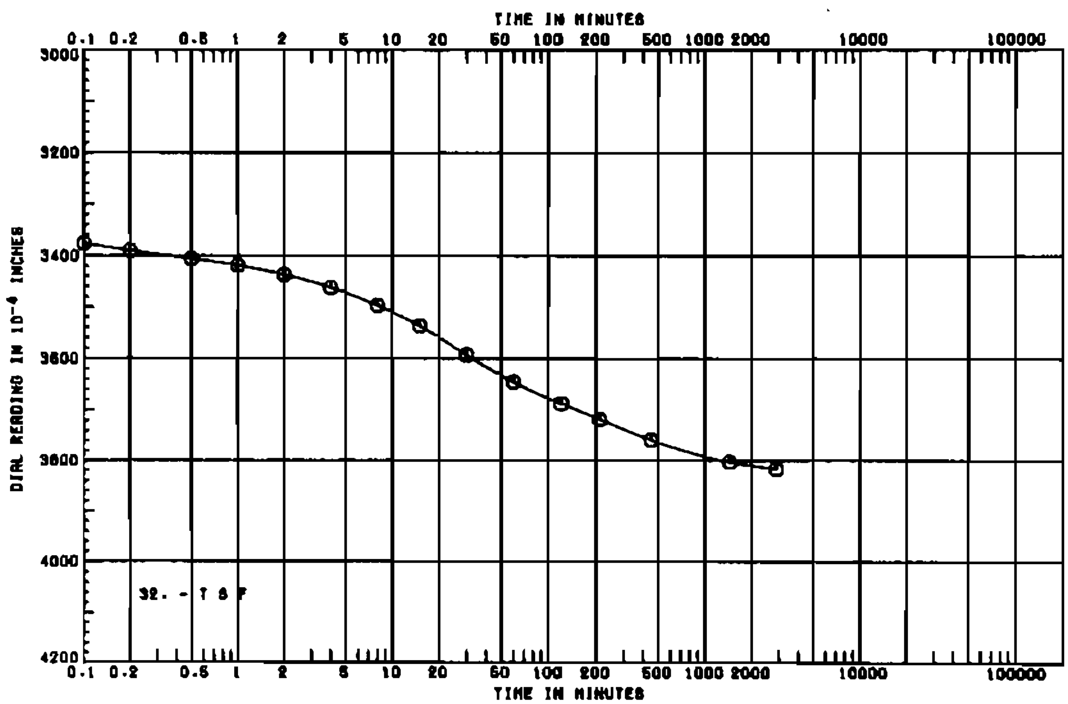
DESCRIPTION OF SPECIMENS: PLASTIC CLAY (CH), GRAY; ORGANIC MATERIAL

LL 61	PL 25	PI 66	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:

PROJECT LAKE PONT LA & VIC NEW ORLEANS	
EAST LEV (SOUTH POINT TO OIWW)	
BORING NO. 16-USP	SAMPLE NO. 4-C
DEPTH/ELEV 12.8/0.3	TECH. KOC
LABORATORY USAE WES	DATE 19 MAY 86

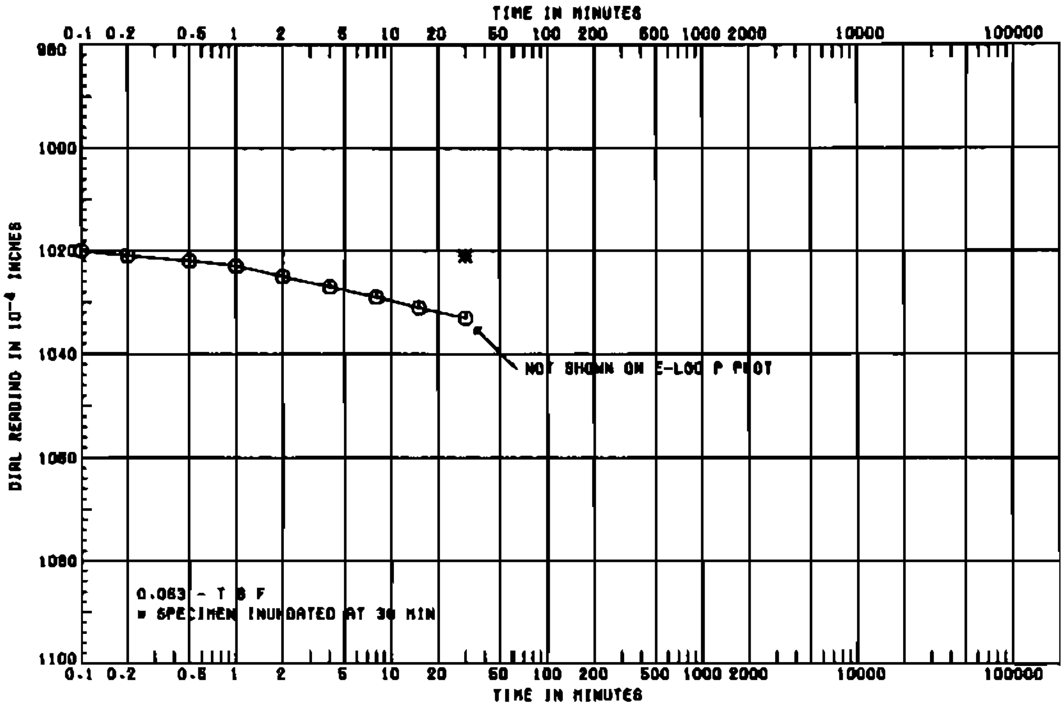
TRIAXIAL COMPRESSION TEST REPORT



PROJECT LAKE PONT LA & VIC NEW ORLEANS	
EAST LEV (SOUTH POINT TO OIWW)	
BORING 16-USP	SAMPLE NO. 3-B
DEPTH/ELEV 8.3/4.80	DATE 25 JUN 86

CONSOLIDATION TEST
TIME CURVES

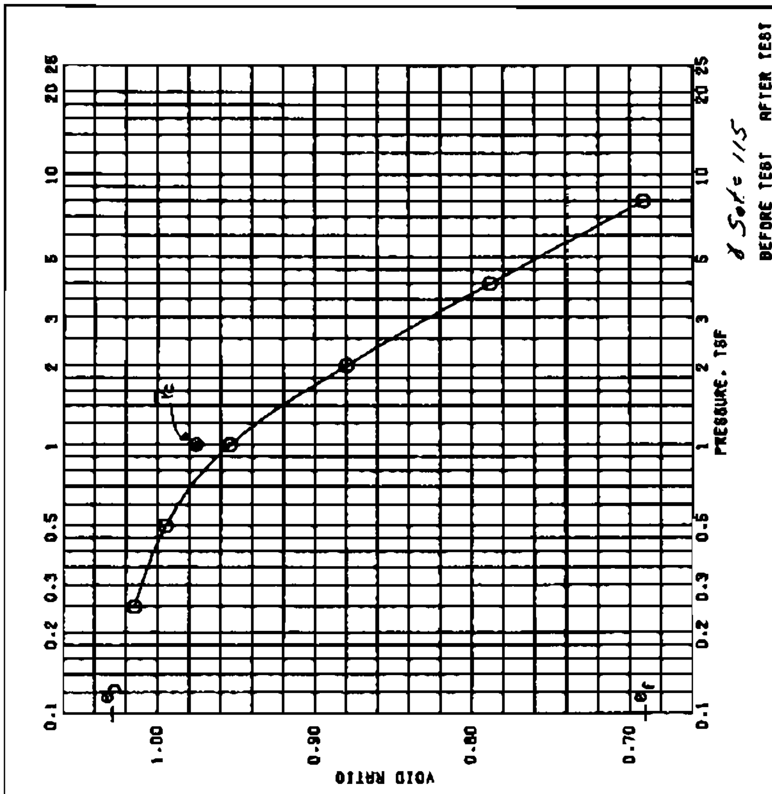
SHEET 10 OF 10



PROJECT LAKE PONT LA & VIC NEW ORLEANS	
EAST LEV (SOUTH POINT TO OINN)	
BORING 16-USP	SAMPLE NO. 5-C
DEPTH/ELEV 17.2/-4.0	DATE 26 JUN 86

CONSOLIDATION TEST
TIME CURVES

SHEET 2 OF 8



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			BEFORE TEST	AFTER TEST
OVERBURDEN PRESSURE, TSF		WATER CONTENT, %	36.4	26.7
PRECONSOL. PRESSURE, TSF	1.00	DRY DENSITY, PCF	83.1	99.6
COMPRESSION INDEX	0.32	SATURATION, %	95.5	100 +
TYPE SPECIMEN	UNDISTURBED	VOID RATIO	1.028	0.689
DIA. IN 4.44	HT. IN 1.122	BACK PRESSURE, TSF		

CLASSIFICATION PLASTIC CLAY (CH), GRAY

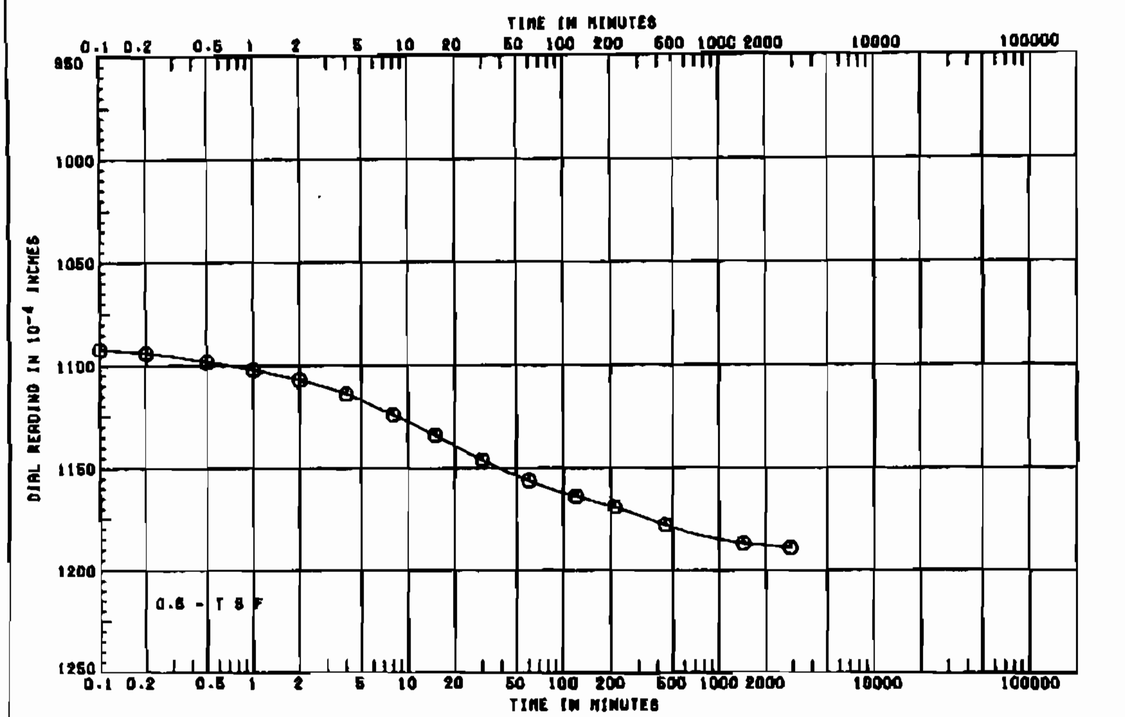
LL 54	PL 15	PI 39
GS 2.70 (EST)	D_{10}	
REMARKS		

PROJECT LAKE PONT LA & VIC NEW ORLEANS
EAST LEV (SOUTH POINT TO OINN)

BORING NO. 16-USP	SAMPLE NO. 5-C
DEPTH/ELEV 17.2/-4.0	DATE 26 JUN 86

CONSOLIDATION TEST REPORT

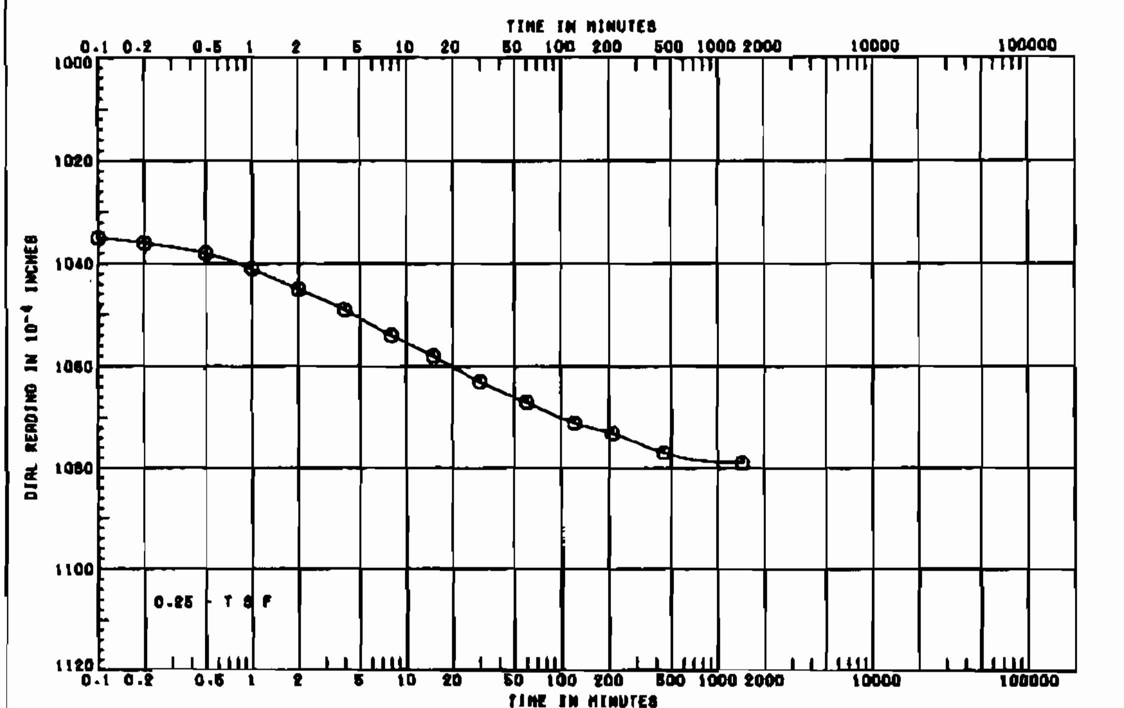
SHEET 1 OF 8



PROJECT LAKE PONT LA & VIC NEW ORLEANS	
EAST LEV (SOUTH POINT TO GIWW)	
BORING 18-USP	SAMPLE NO. 5-C
DEPTH/ELEV 17.2/-4.0	DATE 26 JUN 86

CONSOLIDATION TEST
TIME CURVES

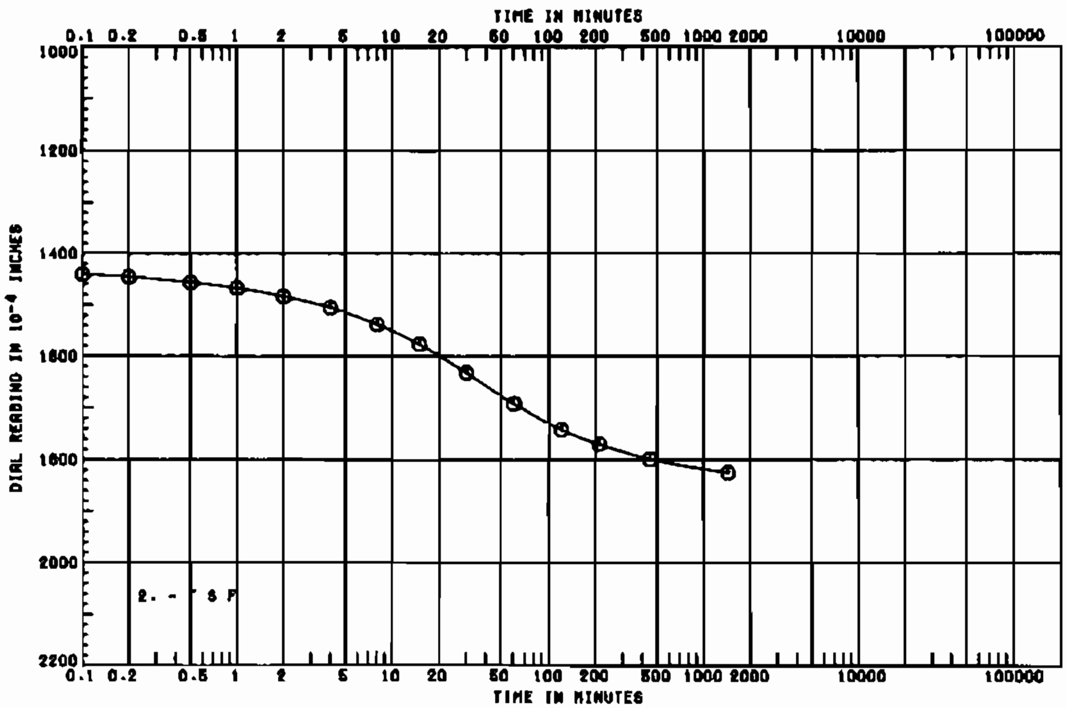
SHEET 4 OF 8



PROJECT LAKE PONT LA & VIC NEW ORLEANS	
EAST LEV (SOUTH POINT TO GIWW)	
BORING 18-USP	SAMPLE NO. 5-C
DEPTH/ELEV 17.2/-4.0	DATE 26 JUN 86

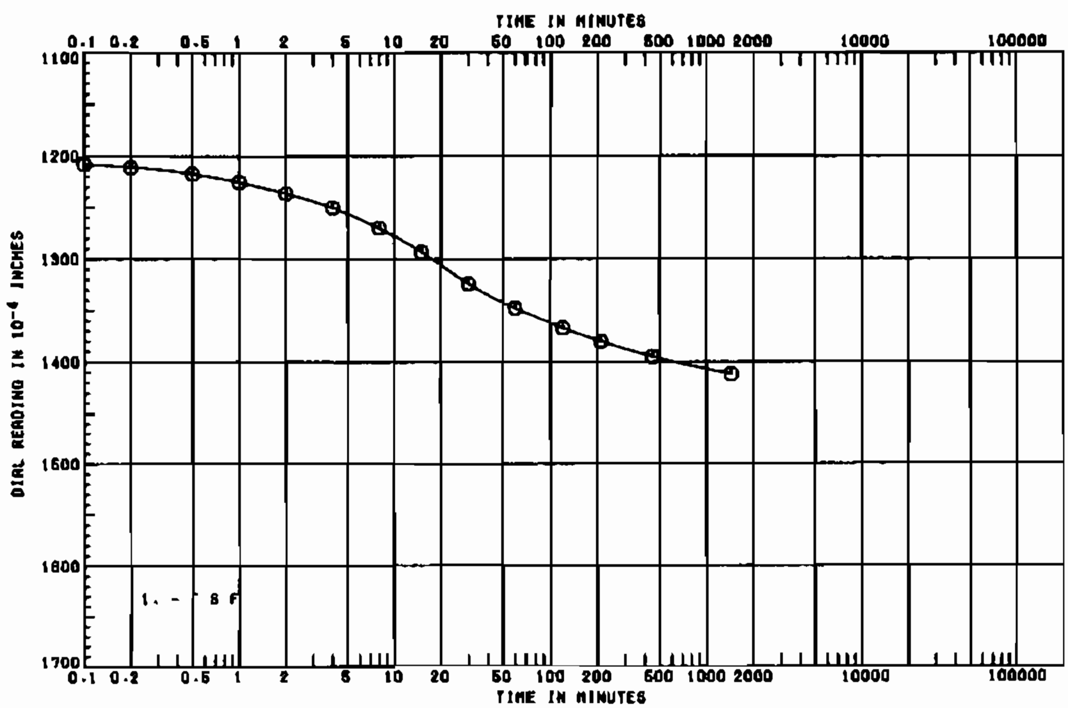
CONSOLIDATION TEST
TIME CURVES

SHEET 3 OF 8



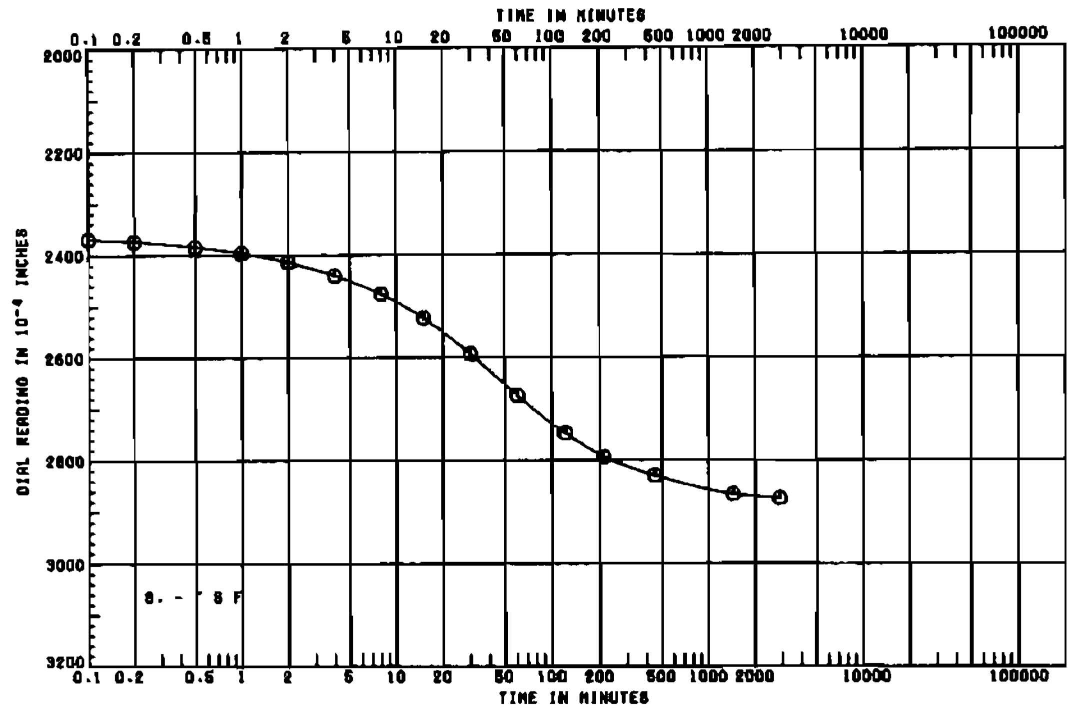
PROJECT LAKE PONT LA & VIC NEW ORLEANS		CONSOLIDATION TEST TIME CURVES
EAST LEV (SOUTH POINT TO DINW)		
BORING 15-USP	SAMPLE NO. 5-C	
DEPTH/ELEV 17.2/-4.0	DATE 26 JUN 86	

SHEET 6 OF 8



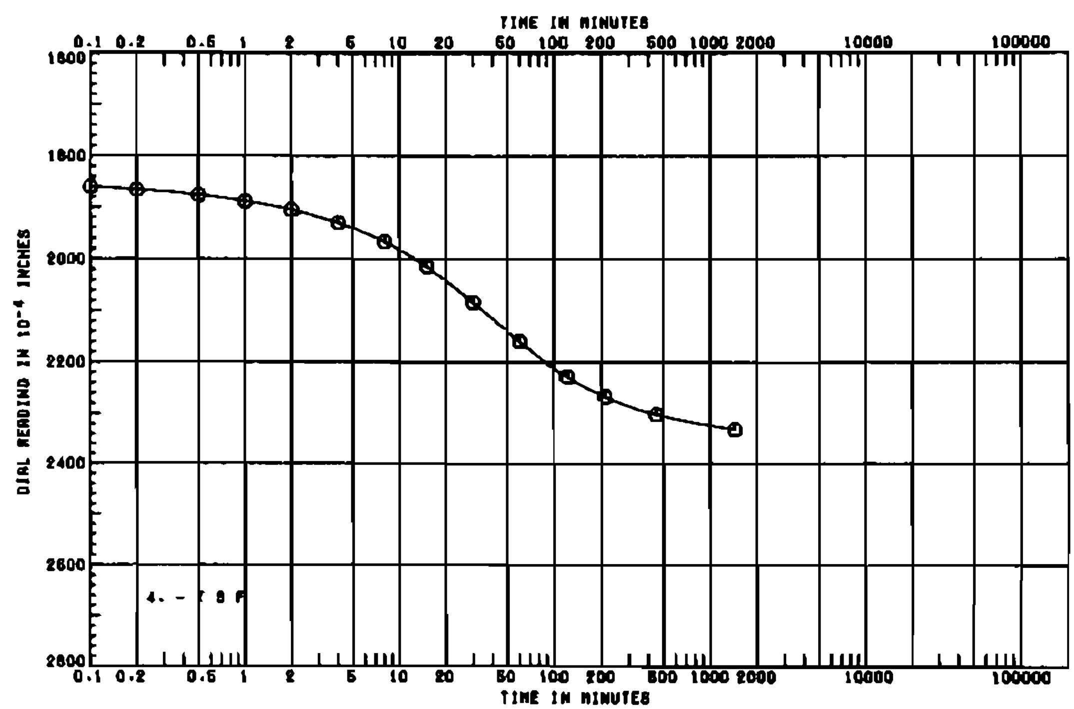
PROJECT LAKE PONT LA & VIC NEW ORLEANS		CONSOLIDATION TEST TIME CURVES
EAST LEV (SOUTH POINT TO DINW)		
BORING 15-USP	SAMPLE NO. 5-C	
DEPTH/ELEV 17.2/-4.0	DATE 26 JUN 86	

SHEET 5 OF 8



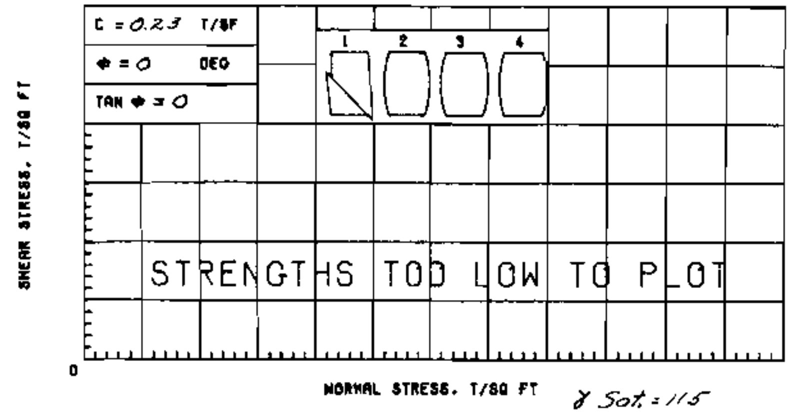
PROJECT LAKE PONT LA & VIC NEW ORLEANS		CONSOLIDATION TEST TIME CURVES
EAST LEV (SOUTH POINT TO GIWW)		
BORING 18-USP	SAMPLE NO. 5-C	
DEPTH/ELEV 17.2/-4.0	DATE 26 JUN 86	

SHEET 8 OF 8

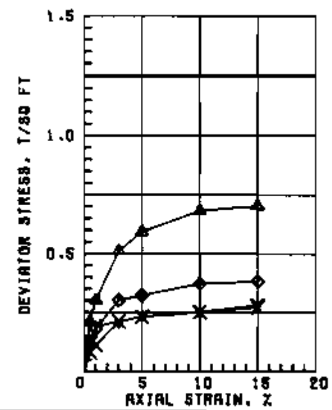


PROJECT LAKE PONT LA & VIC NEW ORLEANS		CONSOLIDATION TEST TIME CURVES
EAST LEV (SOUTH POINT TO GIWW)		
BORING 18-USP	SAMPLE NO. 5-C	
DEPTH/ELEV 17.2/-4.0	DATE 26 JUN 86	

SHEET 7 OF 8



γ Sat. = 115



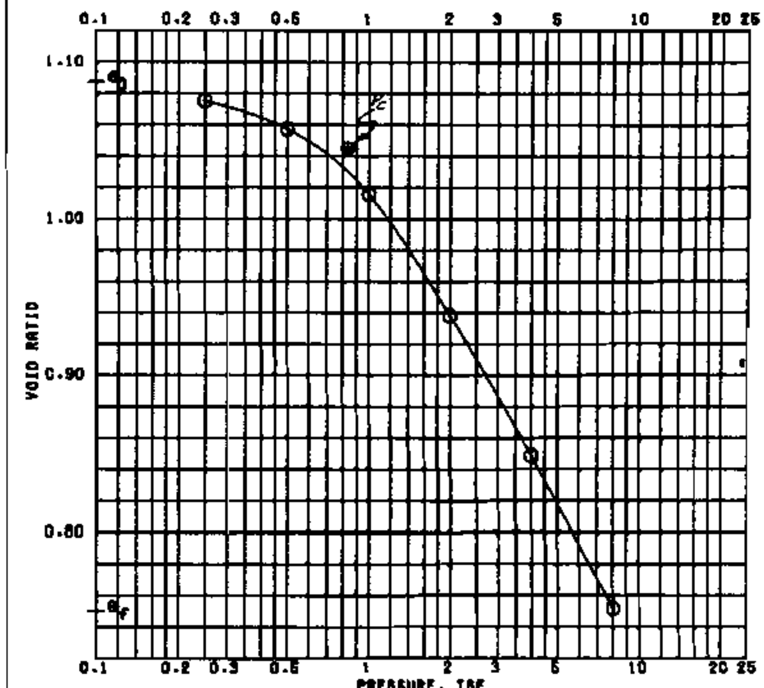
SPECIMEN NO.		▲1	Y2	X3	◇4	AVG.
INITIAL	WATER CONTENT, %	32.8	40.7	42.7	39.8	39.00
	DRY DENSITY, PCF	90.2	80.3	78.0	80.4	82.23
	SATURATION, %	100+	100+	99.4	98.0	99.35
	VOID RATIO	0.888	1.099	1.160	1.097	
BEFORE SHEAR	WATER CONTENT, %					
	DRY DENSITY, PCF					
	SATURATION, %					
	VOID RATIO					
	BACK PRESS., TSF					
MIN PRIN. STRESS, TSF		0.5	1.5	3.0	3.0	
MAX. DEV. STRESS, TSF		0.70	0.28	0.27	0.38	
TIME TO FAILURE, MIN.		30	30	30	30	
RATE OF STRAIN INCR.%						
INITIAL DIAMETER, IN.		1.40	1.39	1.39	1.39	
INITIAL HEIGHT, IN.		3.00	3.00	3.00	3.00	

CONTROLLED-STRAIN TEST

DESCRIPTION OF SPECIMENS: PLASTIC CLAY (CH), GRAY; SILT POCKETS

LL 56	PL 16	PI 40	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

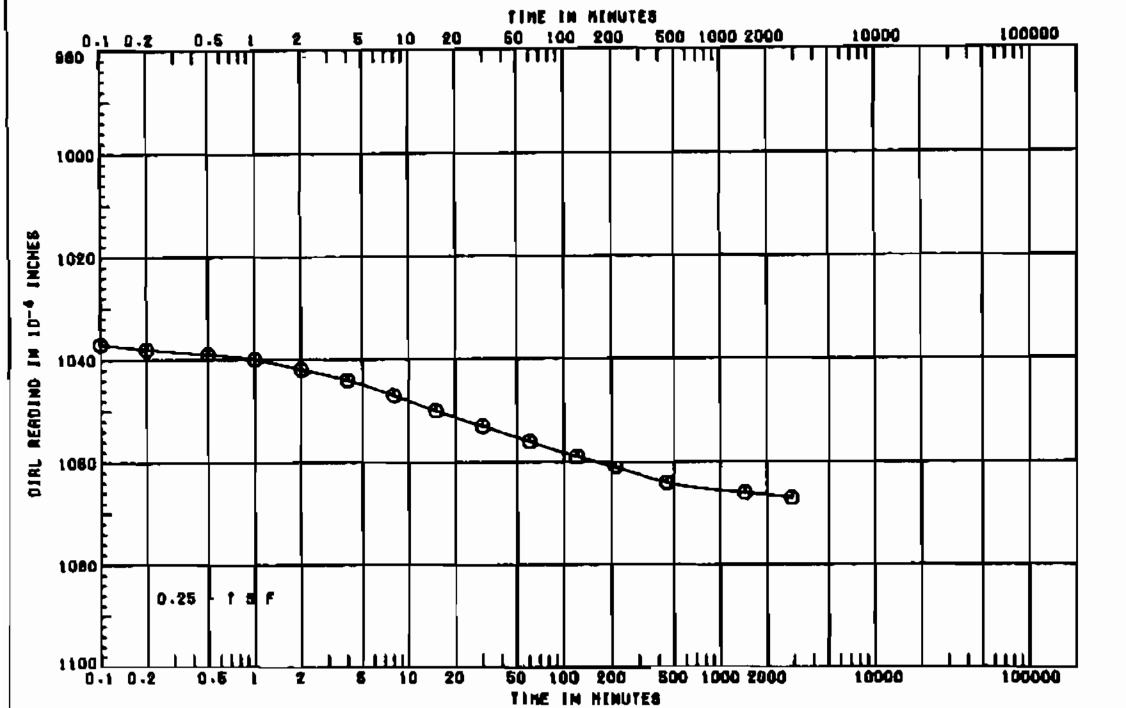
REMARKS:	PROJECT LAKE PONT LA & VIC NEW ORLEANS	
	EAST LEV (SOUTH POINT TO GIWW)	
	BORING NO. 16-USP	SAMPLE NO. 7-B
	DEPTH/ELEV 24.0/-10.8	TECH. KOC
	LABORATORY USAE WES	DATE 22 MAY 86
	TRIAXIAL COMPRESSION TEST REPORT	



γ Sat. = 113

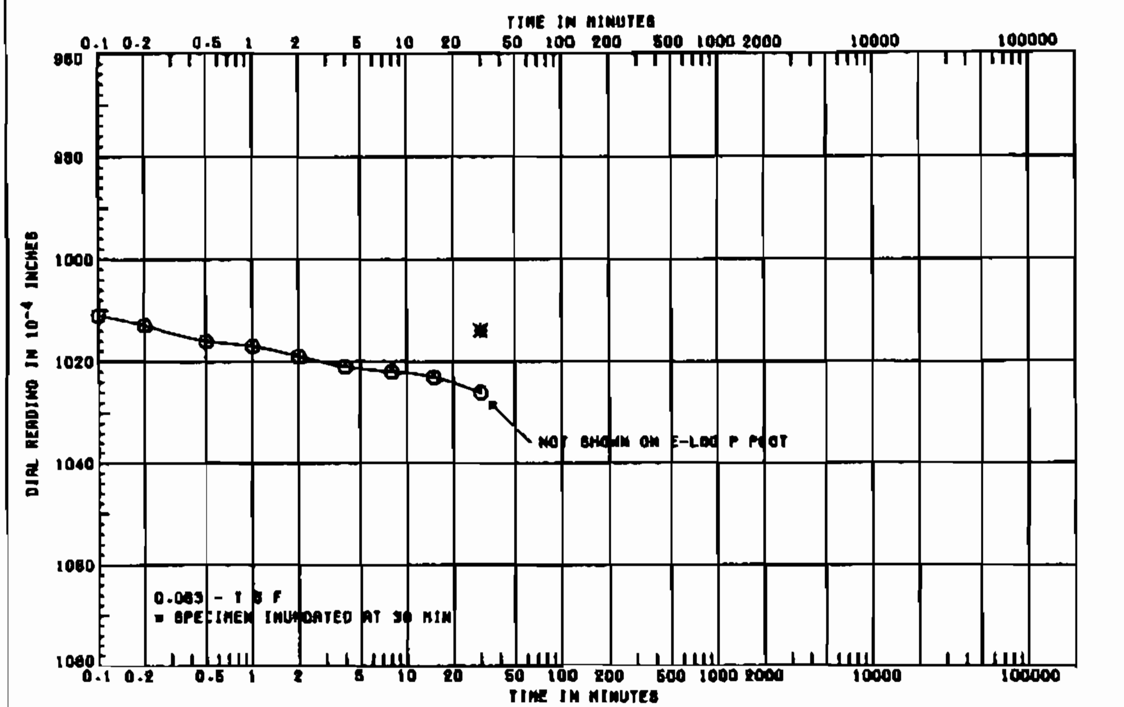
			BEFORE TEST	AFTER TEST
OVERBURDEN PRESSURE, TSF		WATER CONTENT, %	38.5	29.1
PRECONSOL. PRESSURE, TSF	0.87	DRY DENSITY, PCF	80.8	96.4
COMPRESSION INDEX	0.30	SATURATION, %	95.8	100 +
TYPE SPECIMEN	UNDISTURBED	VOID RATIO	1.087	0.749
DIA. IN 4.44	HT. IN 1.128	BACK PRESSURE, TSF		

CLASSIFICATION PLASTIC CLAY (CH), GRAY; SILT POCKETS				
LL	PL	PI	PROJECT LAKE PONT LA & VIC NEW ORLEANS	
GS 2.70 (EST)	D_{10}		EAST LEV (SOUTH POINT TO GIWW)	
REMARKS			BORING NO. 16-USP	SAMPLE NO. 7-C
			DEPTH/ELEV 24.9/-11.7	DATE 27 JUN 86
			CONSOLIDATION TEST REPORT	



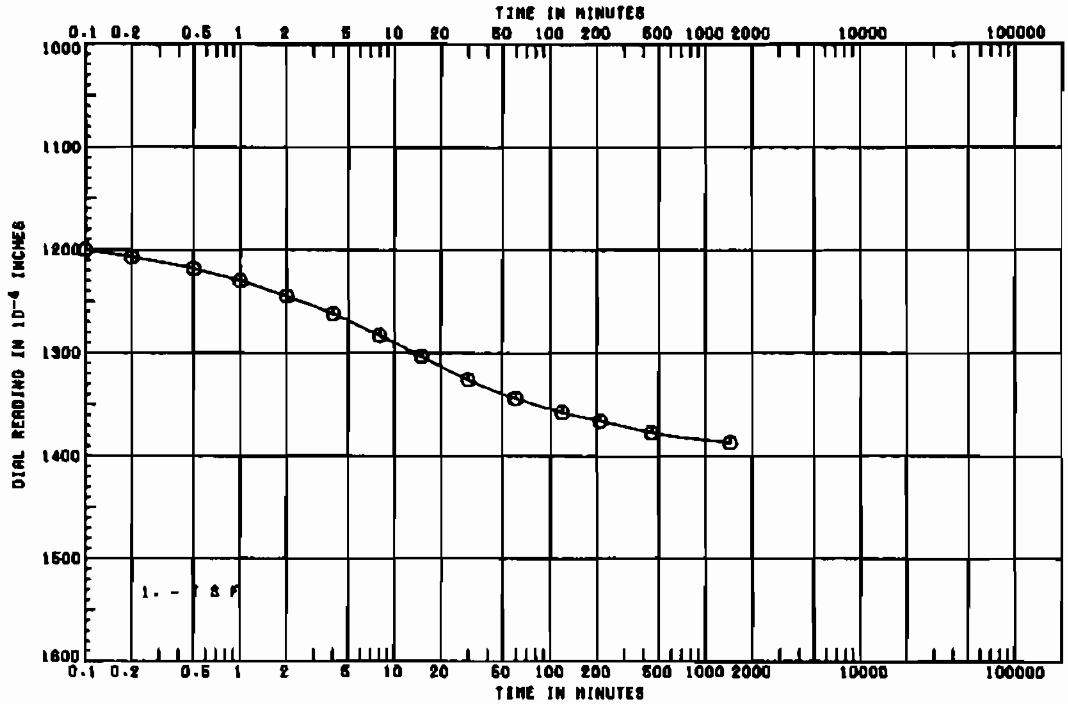
PROJECT LAKE PONT LA & VIC NEW ORLEANS		CONSOLIDATION TEST
EAST LEV (SOUTH POINT TO GIWW)		TIME CURVES
BORING 18-USP	SAMPLE NO. 7-C	
DEPTH/ELEV 24.8/-11.7	DATE 27 JUN 88	

SHEET 3 OF 8



PROJECT LAKE PONT LA & VIC NEW ORLEANS		CONSOLIDATION TEST
EAST LEV (SOUTH POINT TO GIWW)		TIME CURVES
BORING 18-USP	SAMPLE NO. 7-C	
DEPTH/ELEV 24.8/-11.7	DATE 27 JUN 88	

SHEET 2 OF 8

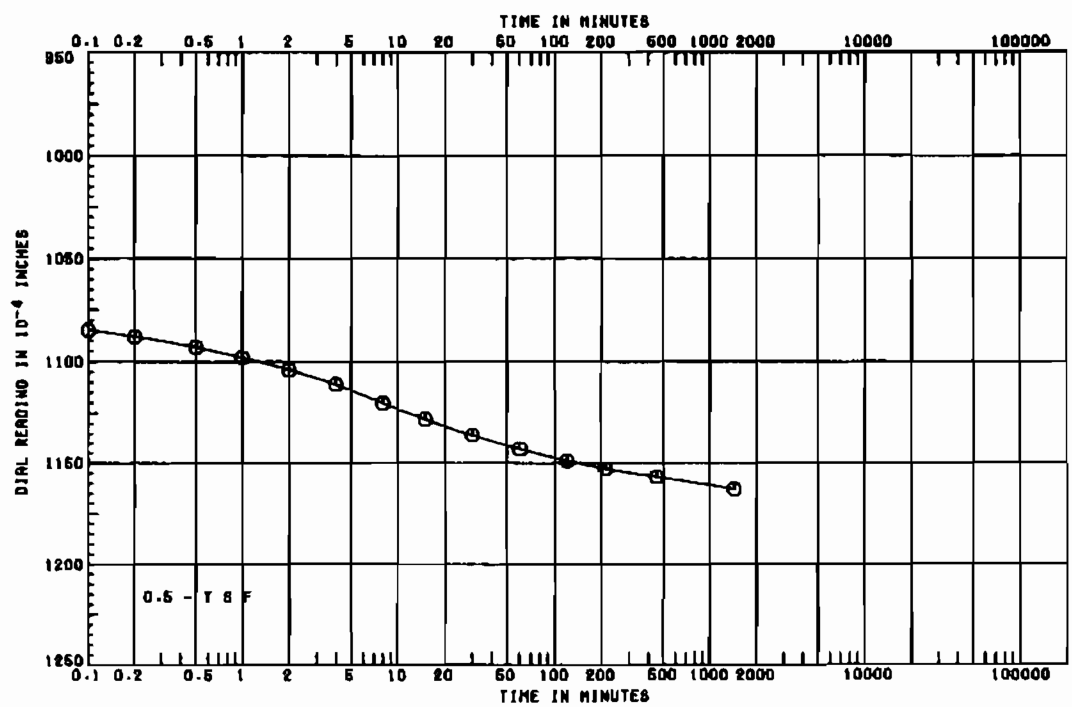


PROJECT LAKE PONT LA & VIC NEW ORLEANS	
EAST LEV (SOUTH POINT TO GIWW)	
BORING 16-USP	SAMPLE NO. 7-C
DEPTH/ELEV 24.9/-11.7	DATE 27 JUN 86

CONSOLIDATION TEST

TIME CURVES

SHEET 5 OF 8

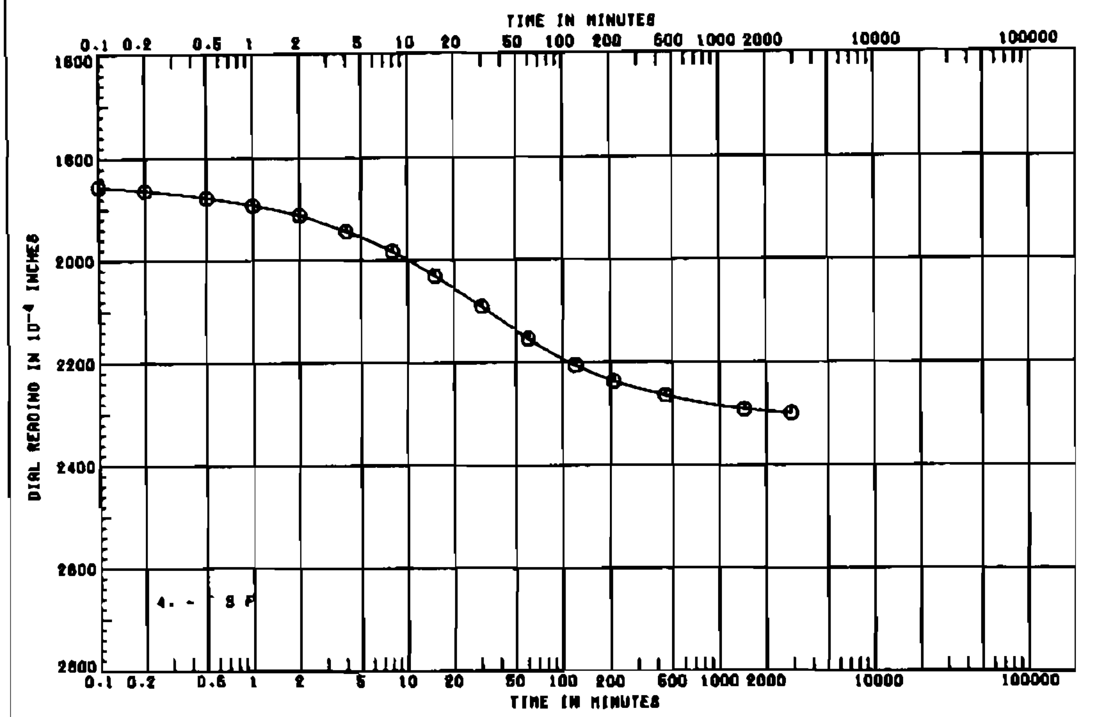


PROJECT LAKE PONT LA & VIC NEW ORLEANS	
EAST LEV (SOUTH POINT TO GIWW)	
BORING 16-USP	SAMPLE NO. 7-C
DEPTH/ELEV 24.9/-11.7	DATE 27 JUN 86

CONSOLIDATION TEST

TIME CURVES

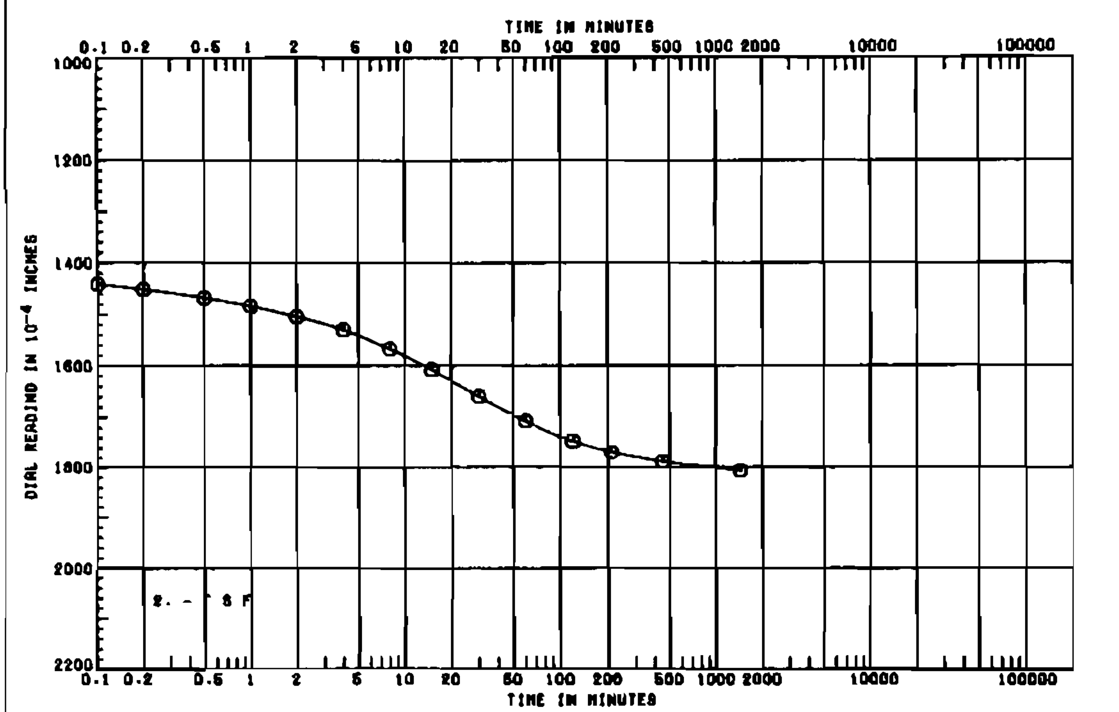
SHEET 4 OF 8



PROJECT LAKE PONT LA & VIC NEW ORLEANS	
EAST LEV (SOUTH POINT TO DIWN)	
BORING 18-USP	SAMPLE NO. 7-C
DEPTH/ELEV 24.9/-11.7	DATE 27 JUN 86

CONSOLIDATION TEST
TIME CURVES

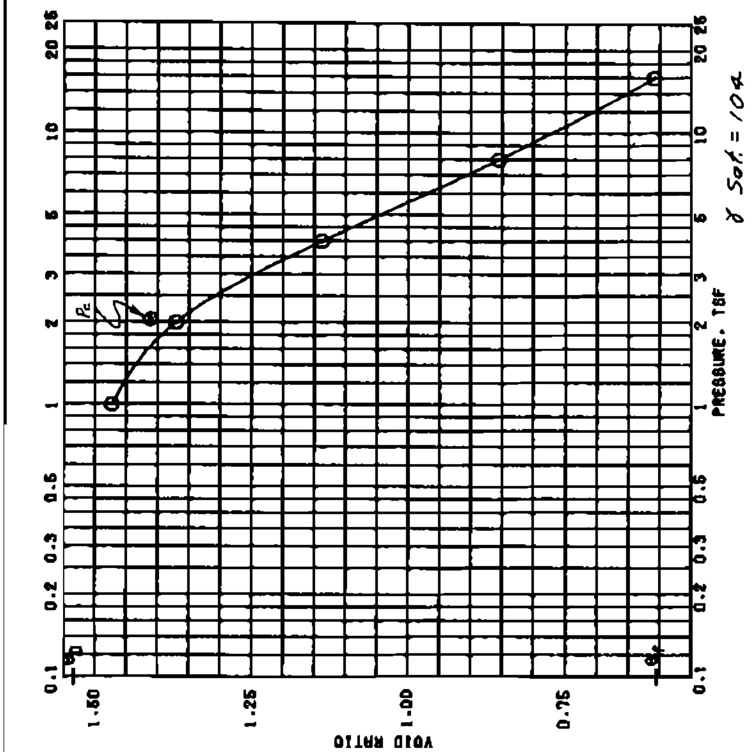
SHEET 7 OF 8



PROJECT LAKE PONT LA & VIC NEW ORLEANS	
EAST LEV (SOUTH POINT TO DIWN)	
BORING 18-USP	SAMPLE NO. 7-C
DEPTH/ELEV 24.9/-11.7	DATE 27 JUN 86

CONSOLIDATION TEST
TIME CURVES

SHEET 6 OF 8



			BEFORE TEST	AFTER TEST
OVERBURDEN PRESSURE, TSF		WATER CONTENT, %	55.4	31.7
PRECONSOL. PRESSURE, TSF	2.05	DRY DENSITY, PCF	66.8	106.1
COMPRESSION INDEX	0.92	SATURATION, %	97.8	100 +
TYPE SPECIMEN	UNDISTURBED	VOID RATIO	1.532	0.603
DIA. IN 4.44	HT. IN 1.112	BACK PRESSURE, TSF		

CLASSIFICATION PLASTIC CLAY (CH), GRAY

LL 79	PL 25	PI 54
GS 2.70 (EST)	D_{10}	

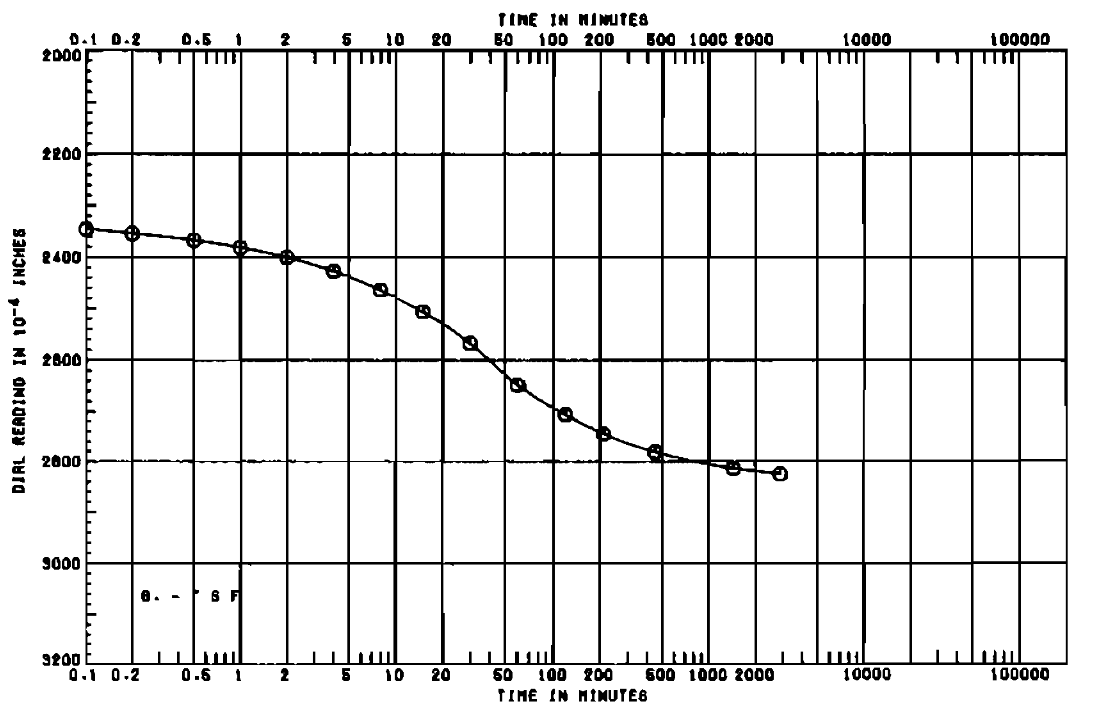
REMARKS

PROJECT LAKE PONT LA & VIC NEW ORLEANS
EAST LEV (SOUTH POINT TO DINN)

BORING NO. 1B-USP	SAMPLE NO. 1D-B
DEPTH/ELEV 35.8/-22.7	DATE 27 JUN 88

CONSOLIDATION TEST REPORT

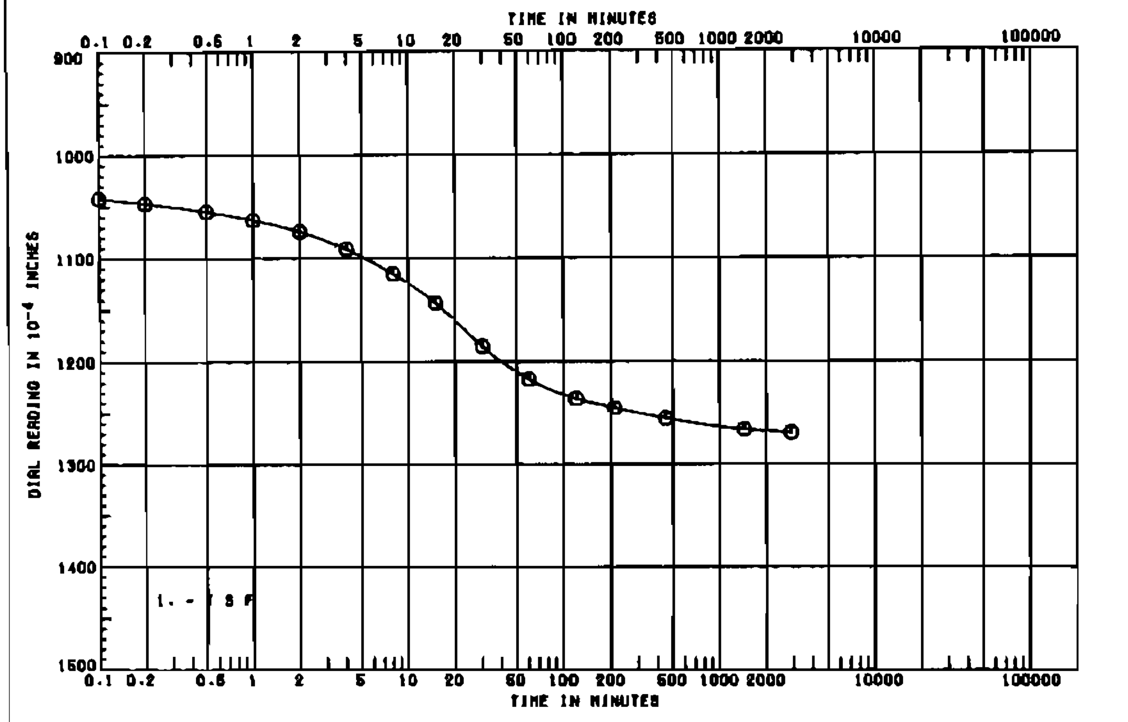
SHEET 1 OF 7



PROJECT LAKE PONT LA & VIC NEW ORLEANS	
EAST LEV (SOUTH POINT TO DINN)	
BORING 1B-USP	SAMPLE NO. 7-C
DEPTH/ELEV 24.8/-11.7	DATE 27 JUN 86

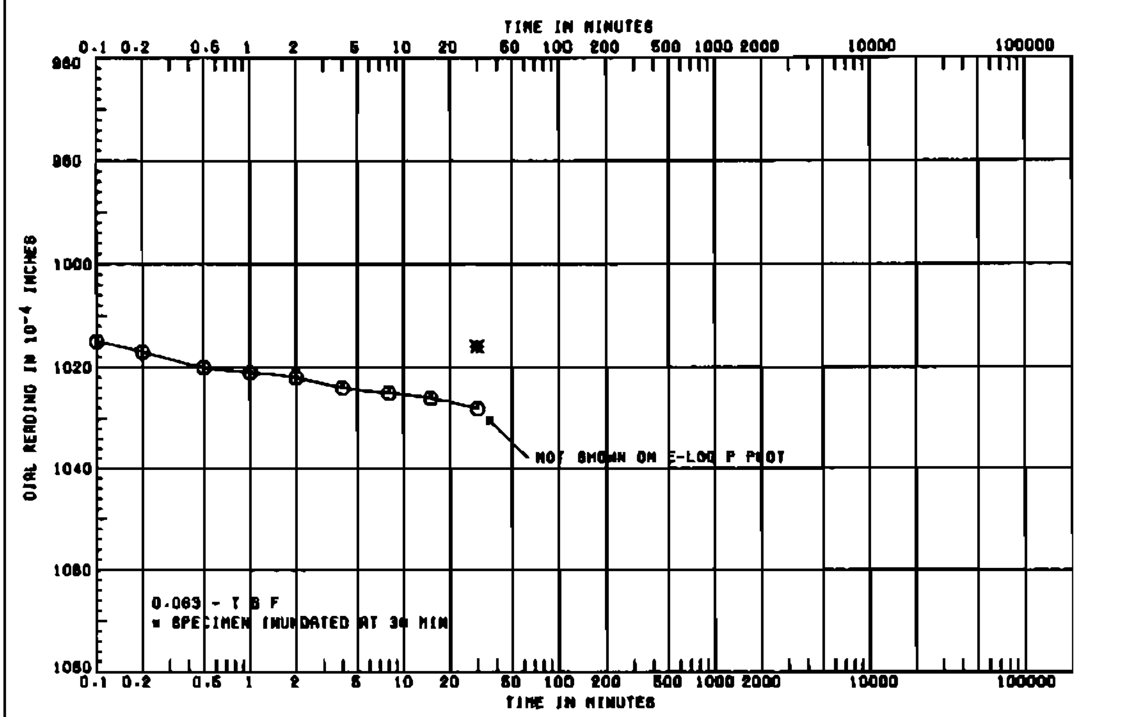
CONSOLIDATION TEST
TIME CURVES

SHEET 6 OF 8



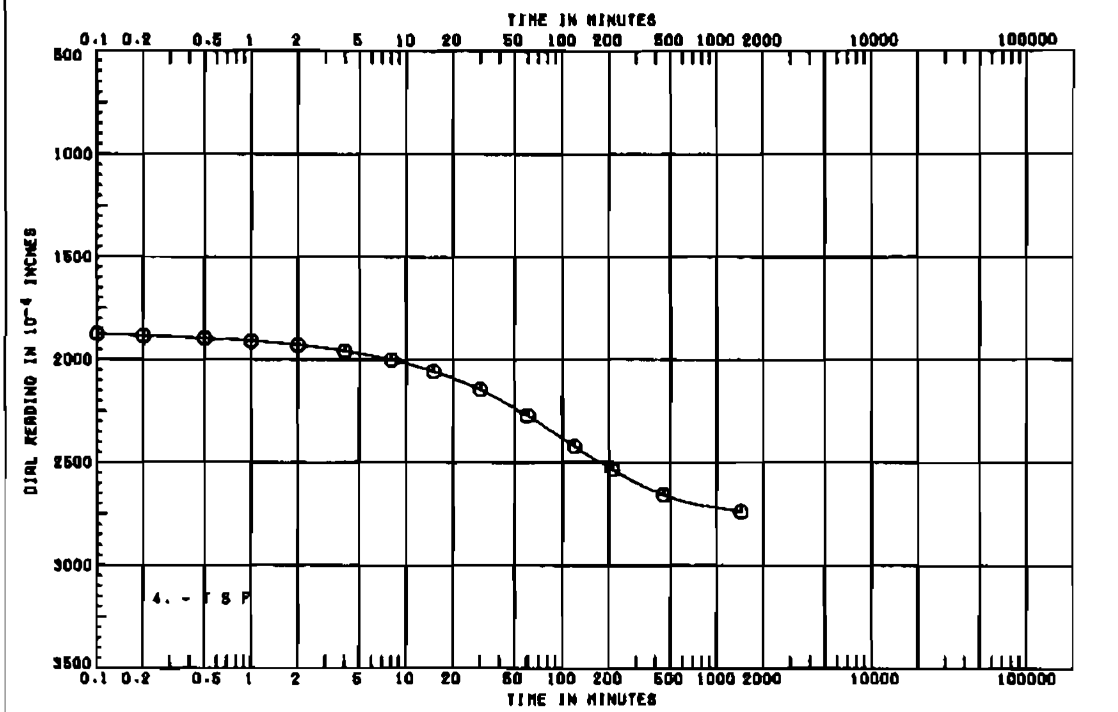
PROJECT LAKE PONT LA & VIC NEW ORLEANS		CONSOLIDATION TEST TIME CURVES
EAST LEV (SOUTH POINT TO DINH)		
BORING 16-USP	SAMPLE NO. 10-B	
DEPTH/ELEV 35.8/-22.7	DATE 27 JUN 86	

SHEET 3 OF 7



PROJECT LAKE PONT LA & VIC NEW ORLEANS		CONSOLIDATION TEST TIME CURVES
EAST LEV (SOUTH POINT TO DINH)		
BORING 16-USP	SAMPLE NO. 10-B	
DEPTH/ELEV 35.8/-22.7	DATE 27 JUN 86	

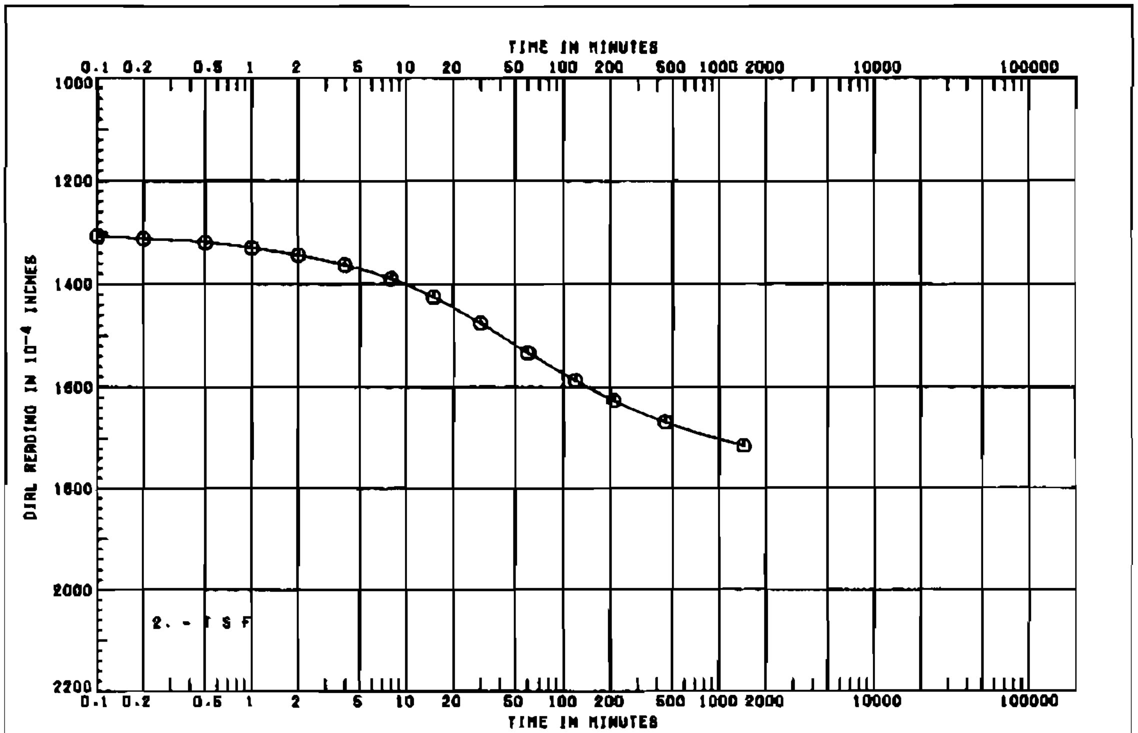
SHEET 2 OF 7



PROJECT LAKE PONT LA & VIC NEW ORLEANS	
EAST LEV (SOUTH POINT TO GIWW)	
BORING 18-USP	SAMPLE NO. 10-B
DEPTH/ELEV 36.8/-22.7	DATE 27 JUN 86

CONSOLIDATION TEST
TIME CURVES

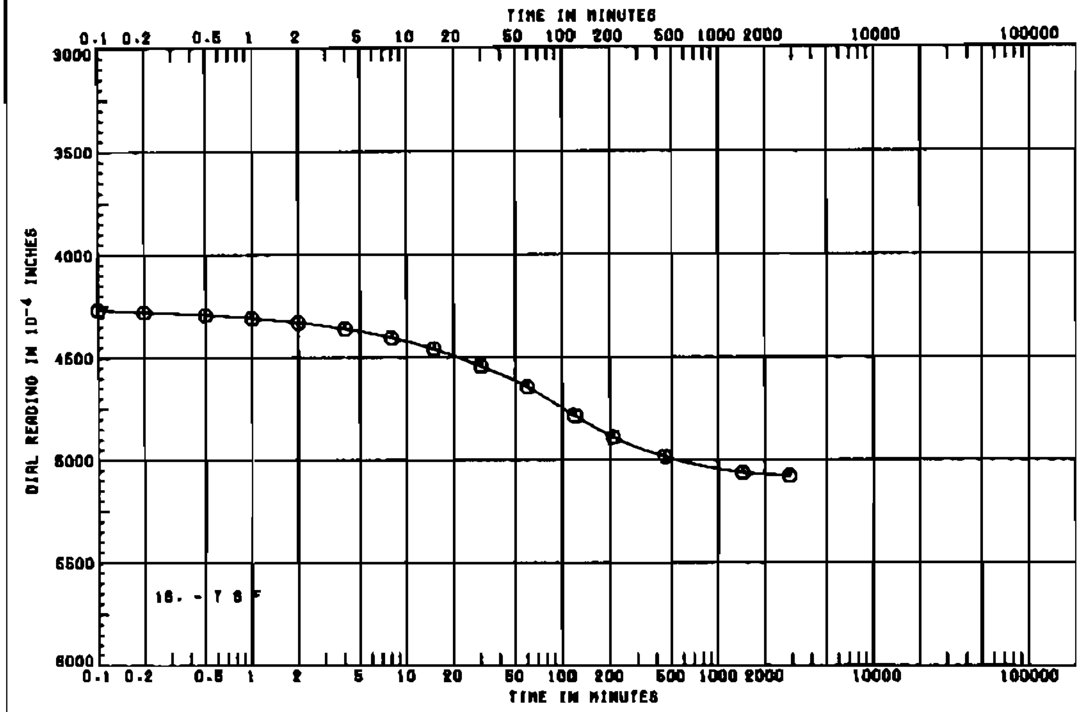
SHEET 5 OF 7



PROJECT LAKE PONT LA & VIC NEW ORLEANS	
EAST LEV (SOUTH POINT TO GIWW)	
BORING 18-USP	SAMPLE NO. 10-B
DEPTH/ELEV 36.8/-22.7	DATE 27 JUN 86

CONSOLIDATION TEST
TIME CURVES

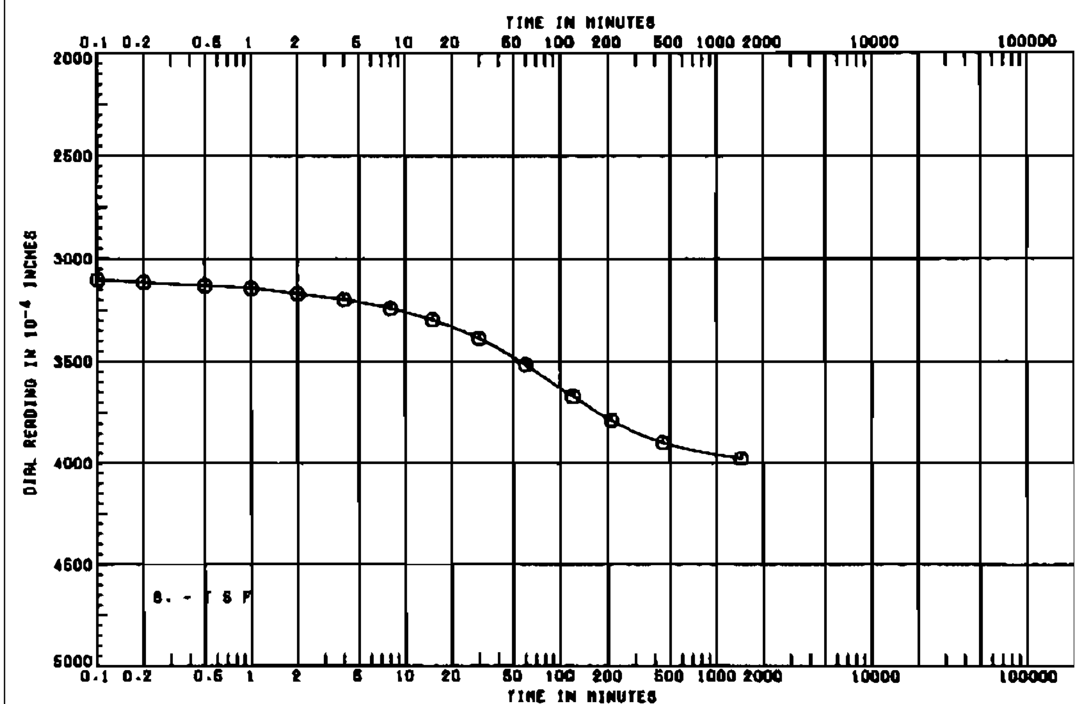
SHEET 4 OF 7



PROJECT LAKE PONT LA & VIC NEW ORLEANS	
EAST LEV (SOUTH POINT TO GIWW)	
BORING 16-USP	SAMPLE NO. 10-B
DEPTH/ELEV 35.9/-22.7	DATE 27 JUN 86

CONSOLIDATION TEST
TIME CURVES

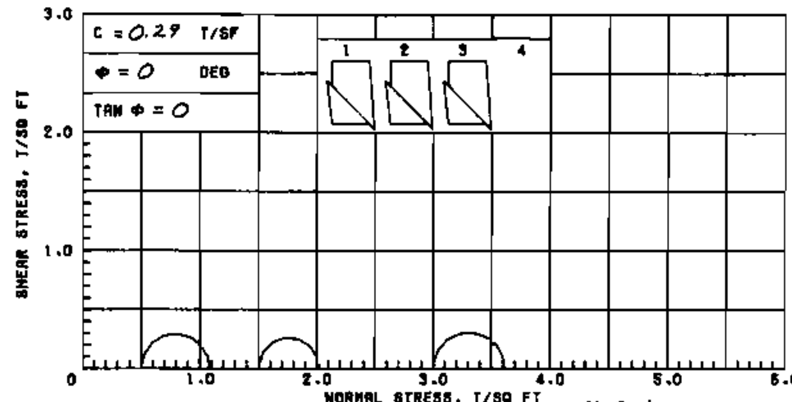
SHEET 7 OF 7



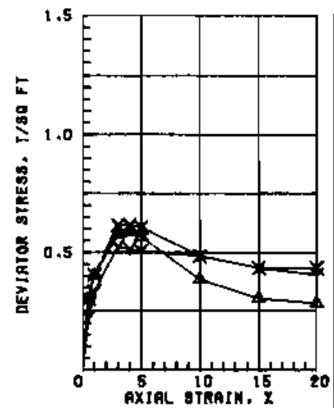
PROJECT LAKE PONT LA & VIC NEW ORLEANS	
EAST LEV (SOUTH POINT TO GIWW)	
BORING 16-USP	SAMPLE NO. 10-B
DEPTH/ELEV 35.9/-22.7	DATE 27 JUN 86

CONSOLIDATION TEST
TIME CURVES

SHEET 6 OF 7



γ Sat = 106



SPECIMEN NO.		▲1	Y2	X3	4	AVG.
INITIAL	WATER CONTENT, %	53.7	52.9	52.9		53.17
	DRY DENSITY, PCF	68.7	68.9	68.1		68.57
	SATURATION, %	99.8	98.7	96.7		98.40
	VOID RATIO	1.453	1.447	1.477		
BEFORE SHEAR	WATER CONTENT, %					
	DRY DENSITY, PCF					
	SATURATION, %					
	VOID RATIO					
	BACK PRESS., TSF					
MIN PRIN. STRESS, TSF		0.5	1.5	3.0		
MAX. DEV. STRESS, TSF		0.59	0.53	0.62		
TIME TO FAILURE, MIN.		8	10	18		
RATE OF STRAIN INCR.%			6	6		
INITIAL DIAMETER, IN.		1.39	1.39	1.38		
INITIAL HEIGHT, IN.		3.00	3.00	3.00		

CONTROLLED-STRAIN TEST

DESCRIPTION OF SPECIMENS: PLASTIC CLAY (CH), GRAY; SILT SEAMS

LL 83	PL 23	PI 60	GS 2.70 (ESTIMATED)	UNDISTURBED SPECIMEN	Q TEST

REMARKS:	PROJECT LAKE PONT LA & VIC NEW ORLEANS	
	EAST LEV (SOUTH POINT TO GIWW)	
	BORING NO. 16-USP	SAMPLE NO. 10-C
	DEPTH/ELEV 37.0/-23.8	TECH. KOC
	LABORATORY USAE WES	DATE 22 MAY 86
	TRIAXIAL COMPRESSION TEST REPORT	