CORPS OF ENGINEERS, U. S. ARMY

MR-GO
1D, 2D...

MISSISSIPPI RIVER - GULF OUTLET
LOUISIANA

DESIGN MEMORANDUM NO. 1-A

CHANNELS

MILE 63.77 - MILE 68.85

N.O. to St. Bernard
1D, 2D, 3D, 4D, 5D

PREPARED IN THE OFFICE OF THE DISTRICT ENGINEER
U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
NEW ORLEANS, LOUISIANA

APRIL 1957
(Revised July 1957)

3d Ind

SUBJECT: Design Memorandum No. 1-A, CHANNELS Mississippi River - Gulf Outlet (NOD ltr 30 Apr 57)

Office, Div Engr, USA Engr Div, LMV, CE, Vicksburg, Miss. 29 JUL 1957

TO: CofEngrs
Attn: ENGMR and ENGWE

1. Approval of Design Memorandum No. 1-A, CHANNELS Mississippi River - Gulf Outlet, is recommended.

2. Subject design memorandum is being submitted in advance of the general design memorandum, which is scheduled for submission 1 March 1958, in order that plans and specifications may be completed for a portion of the project in view of the possibility that construction funds will be made available during this fiscal year. This possibility is supported by the fact that the Senate Appropriations Committee in its report of 12 July added $625,000 for construction to the figure of $375,000 for planning allowed by the House of Representatives.

FOR THE ACTING DIVISION ENGINEER:

1 Incl (in quin)
3 cys w/d

/s/ NORMAN R. MOORE
Chief, Engineering Division

4th Ind

Office of the Chief of Engineers, Washington 25, D.C., 11 September 1957

TO: Division Engineer, U.S. Army Engineer Division, Lower Mississippi Valley Division, Vicksburg, Mississippi

The design memorandum is approved as recommended by the Division Engineer in 3rd indorsement.

FOR THE CHIEF OF ENGINEERS:

Incl 2/d

H. VELPEAU DARLING
Special Assistant for the
Mississippi River

5th Ind

Office, Div. Engr, USA Engr Div LMV, CE, Vicksburg, Miss. 16 Sep 57

TO: DE, USA Engr Dist, New Orleans

Referred to note approval of the Chief of Engineers of subject design memorandum.

FOR THE DIVISION ENGINEER:

NORMAN R. MOORE
Chief, Engineering Division

LMVGU 800.13 (Miss R.-Gulf Outlet) 1st Ind

SUBJECT: Design Memorandum No. 1-A, CHANNELS Mississippi River - Gulf Outlet (NOD ltr 30 Apr 57)

Office, Div Engr, USA Engr Div, LMV, CE, Vicksburg, Miss. 3 JUN 1957

TO: DE, USA Engr Dist, New Orleans

Subject design memorandum is returned for revision in accordance with the following comments:

a. Paragraph 14. Indicate station numbers for the beginning and ending of the work covered by the design memorandum.

b. Paragraph 15. The basis for selection of the shear strengths used in analyzing the stability of the excavation slopes should be given.

c. Paragraph 16. This paragraph should indicate whether the cost of providing channel protection is included in the over-all cost of the project.

d. Paragraph 24. Show a comparison between the cost estimate given in this paragraph and the estimate covering the same limits of work contained in the over-all estimate of $92,000,000 presented to Congress in April 1957 (FY 1958 Justification Sheet) and state the basis for change, if any.

e. Plate 1. Inasmuch as the alignment beyond the G.I.W.W. is still under study, a notation should be made on this plate that the alignment, retention dike, wing dike, and jetty are preliminary.

f. Plate 2. The shear strengths obtained for samples taken from borings 3-U and 1-U should be shown adjacent to the boring logs.

g. Plate 4. The cohesive strength of the stratum of peat is shown as 250 pounds per square foot in Case 1 and 150 in Case 2. This discrepancy should be corrected.

FOR THE DIVISION ENGINEER:

/s/ George B. Davis
for NORMAN R. MOORE
Chief, Engineering Division

1 Incl (7 cys)
1 cy w/d

JUL 19 1957

LMNGO 2nd Ind
SUBJECT: Design Memorandum No. 1-A, CHANNELS Mississippi River - Gulf Outlet (NOD ltr 30 Apr 57)

U. S. Army Engineer District, New Orleans, CE, New Orleans, La.

TO: Division Engineer, U. S. Army Engineer Division, Lower Mississippi Valley, P.O.Box 80, Vicksburg, Mississippi

1. Subject design memorandum has been revised in accordance with comments of 1st Indorsement.

2. A statement has been added to paragraph 13 in addition to changes made in paragraph 15 in response to the comment appearing in paragraph "b" of the 1st Indorsement.

3. Typical sections on Plate 5 have been revised to show spoil dike borrow areas being excavated by "local interests." Recently "local interests" have proposed that they be permitted to excavate the undesirable material from under the location of a proposed protection levee and to place this material in the form of a spoil retention dike to be made available for use by the Government. The spoil from the channel excavation will be graded and shaped into a levee by local interests.

4. Approval is recommended.

1 Incl.
1. W/D
.. Added
2. DM No. 1-A, Revised July 1957

WILLIAM H. LEWIS
Colonel, CE
District Engineer

U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
Foot of Prytania Street
New Orleans 9, Louisiana

30 April 1957

LMNGO

SUBJECT: Design Memorandum No. 1-A, CHANNELS
Mississippi River - Gulf Outlet

TO: The Division Engineer
U. S. Army Engineer Division
Lower Mississippi Valley
P.O. Box 80
Vicksburg, Miss.

1. In accordance with Paragraph 4214.12, Orders and Regulations, eight copies of subject design memorandum are forwarded herewith.

2. Approval is recommended.

1 Incl (8 cys)
Design Memorandum
No. 1-A - CHANNELS
Miss.River-Gulf Outlet

WILLIAM H. LEWIS
Colonel, CE
District Engineer

MISSISSIPPI RIVER - GULF OUTLET
LOUISIANA

DESIGN MEMORANDUM NO. 1-A

CHANNELS

MILE 63.77 - MILE 68.85

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MISSISSIPPI RIVER - GULF OUTLET
LOUISIANA

DESIGN MEMORANDUM NO. 1-A

CHANNELS

MILE 63.77 TO MILE 68.85

GENERAL

1. Project authorization. The Mississippi River-Gulf Outlet, La., a navigation improvement, is a modification of the existing project, "Mississippi River, Baton Rouge to the Gulf of Mexico." It was authorized by the River and Harbor Act approved 29 March 1956 (Public Law 455, 84th Congress, 2nd Session), substantially in accordance with report of the Chief of Engineers on the Mississippi River-Gulf Outlet dated 5 May 1948 printed in House Document No. 245, 82nd Congress, 1st Session. The work as authorized provides for a deep draft seaway canal 36 feet deep and 500 feet wide from the Inner Harbor Navigation Canal at New Orleans to the Gulf of Mexico, a turning basin, protective dikes and jetties, and a highway bridge, including approaches. Also provided for, when economically justified, is a new lock with suitable connections in the vicinity of Meraux, La., or replacement of the existing lock at the entrance of the Inner Harbor Navigation Canal with the Mississippi River.

2. Project location: The general location of the project, and its various features, situated in the southeast portion of the State of Louisiana, is as shown on Plate 1.

3. Design Memorandum authorization. This Design Memorandum is written pursuant to paragraph 2 of letter from the Division Engineer, U. S. Army Engineer Division, Lower Mississippi Valley, dated 24 May 1956, subject: "Responsibility for Preparation of Design Memoranda and

Plans and Specifications."

4. Purpose. The purpose of this design memorandum is to present pertinent information and data compiled and utilized in the design of the channel for that portion of the seaway canal extending from the existing Inner Harbor Navigation Canal to the vicinity of Louisiana State Highway 47 (Paris Road, formerly Hwy. No. 61). The remainder of the route between Highway No. 47 and the Gulf of Mexico will be presented in Design Memoranda 1-B, and 1-C, which will be prepared and submitted at a later date as the overall project planning progresses.

CHANNEL LOCATION

5. General. The detail location of the proposed channel between the Inner Harbor Navigation Canal and Louisiana State Highway No. 47 (Paris Road) is shown on Plate 2. The proposed alignment follows the project document alignment utilizing the existing Intracoastal Waterway - Gulf Section for this reach of the channel. Inasmuch as the Intracoastal Waterway with project dimensions of 12 ft. by 150 ft. is much smaller than the proposed channel, of 36 ft. by 500 ft., major enlargement of this section of the Intracoastal Waterway is necessary.

6. Route selection. In selecting the route for the overall project, numerous factors are being considered and carefully weighed in arriving at a proposed alignment. For the short reach covered by this design memorandum however, the route follows the existing Gulf Intracoastal Waterway and the selection is largely a matter of determination of the centerline of the proposed channel with respect to the existing waterway centerline. The Board of Commissioners of the Port of New Orleans in permit application dated 27 July 1956, requested permission to enlarge, realign and deepen the Gulf Intracoastal Waterway from its

junction with the Inner Harbor Navigation Canal to a point 8,000 feet eastward therefrom. In order to act upon this application it became necessary to finalize the alignment of the Mississippi River-Gulf Outlet in this area. Accordingly, the centerline of the proposed Mississippi River-Gulf Outlet channel was located 250 feet south of the centerline of the existing Gulf Intracoastal Waterway. By this arrangement the north side slope of the proposed channel coincides approximately with the north side slope of the existing waterway. This obviates the necessity of securing additional right of way on the north side where a protection levee is constructed near the existing right-of-way line. This levee would have to be removed and rebuilt if the proposed channel centerline was shifted northward. The Board of Commissioners of the Port of New Orleans was designated by the Governor of the State of Louisiana on 10 December 1956 to furnish the necessary assurances and rights of way for the project. At the entrance to the Inner Harbor Navigation Canal, the existing Gulf Intracoastal Waterway entrance curve of 2 degrees is being modified to a 1 degree curve (approx.) as an aid to navigation. On an important ship channel such as this one the curves should not exceed 1 degree if practicable. Due to prior commitments the proposed curve at the entrance, as shown on Plate 2 will actually be 1 degree and 7 minutes on the centerline of a transition section made in the bottom width of the channel from 500 ft. at Station 65+00 to 200 ft. at Station 4+15, the existing width of the Inner Harbor Navigation Canal at the point of entrance.

7. Channel design criteria. In order properly to provide for navigational and other requirements, and for future maintenance, the following design criteria is as authorized, or proposed for approval.

Datum Plane	Mean low Gulf (m.l.g.)
Channel width (authorized)	500 ft.
Channel depth (authorized)	36 ft. (below m.l.g.)
Required additional depth for advanced maintenance	2 ft.
Allowable overdepth (inaccuracies in dredging)	2 ft.
Channel side slopes	1 on 2
Berm width	140 ft. (Minimum)
Degree of curvature	1° - 07' (Maximum)
Tangent distance approaching a bridge	2,000 ft. (Minimum)

HYDROLOGY

8. Tidewater channel. The proposed outlet is a tidewater channel and its surface elevation will vary with the tides and other variations of the Gulf of Mexico. The upper terminus of the outlet is at the Inner Harbor Navigation Canal also a tidewater channel being connected to the Gulf of Mexico through the existing G.I.W.W. and also via Lake Pontchartrain and Lake Borgne.

9. Hydrographs. Gage records are available on the Inner Harbor Navigation Canal since it was excavated in 1922. These records provide a good indication of the water surface elevations that may be expected in the proposed outlet channel. Hydrographs showing the annual highwater and annual low water for the Inner Harbor Navigation Canal are shown on Plate 3. It will be noted that the all-time high occurred during the passing of Hurricane "Flossy" in 1956 at which time the gage on the Inner Harbor Navigation Canal Lock read 7.2 ft. m.l.g. The low, occurring during the period of record, was -0.7 m.l.g. during 1938.

GEOLOGY

10. General Geology of the area. The portion of the Mississippi River-Gulf Outlet covered by this design memorandum is located in the lowlands bounded on the south by the natural levee ridges of the Mississippi River and on the north by a natural levee of an ancient distributary of the Mississippi River now occupied by Bayou Gentilly and Bayou Sauvage. The lowlands are composed of Recent marine deltaic and marsh soil deposits which were accumulated as sea level rose during the waning of the late Wisconsin Glacial Stage and since sea level reached its present stand. These Recent soil deposits are underlain by stiff clays of the Pleistocene age. The top of the Pleistocene clays as disclosed by the borings is shown on Plate 2. Between the Inner Harbor Navigation Canal and State Highway 47 (Paris Road) the Recent deposits consist predominantly of clay with a highly organic layer about 10 feet thick at the surface and sandy and silty soils at the base. From State Highway 47 (Paris Road) to Bayou Bienvenue, the Recent deposit is predominantly silty, but organic layers at the surface are also present. A more detailed description and plate showing a generalized geologic section of the entire project area will be included in later Design Memoranda.

11. Faulting. There is no indication of active faulting along the channel route that would be deterimental to construction of the waterway.

SOILS

12. Field Exploration. General type soil borings extending to depths of 55 to 70 feet were made at intervals of 4,000 feet along the proposed channel location. Two undisturbed borings, 1-U and 3-U, extending to depths of 80 and 47 feet respectively, were made at Station 273+50 and Station 120+10. These undisturbed borings are considered representative

of the two different soil conditions found along this portion of the project.

13. Laboratory Tests. Visual classification and water content determinations were made on all soil samples obtained from the general type and undisturbed borings. Unconfined compression tests were made on undisturbed clay samples. In addition to the tests made on the undisturbed borings, numerous unconfined compression tests were run on cores from the general type borings and the results of these tests are shown on Plate 2. Consolidation tests were run on typical clay samples from the undisturbed borings. The water contents, shear strength, densities and consolidation data for the undisturbed borings are shown on Plate 4.

14. Soil Conditions. The soil borings shown plotted on Plate 2 disclose that the soils along this portion of the proposed waterway from the beginning Sta. 0+00 to approximate Station 265+00 consists of a surface layer of peat 3 to 10 feet thick with water contents of 200 to 700% overlying fat clay with water contents of 50 to 100% which extends to elevation -38 to -44 m.l.g. Beneath the clay there is a layer of silty sand and fine sand with lenses of clay and with few thin lenses of shell about 5 to 20 feet thick which is underlain by firm clays of the Pleistocene formation. From approximate Station 265+00 to Station 268+00 the end of the channel covered by this design memorandum, the soils as disclosed by borings consist of interspersed lenses of clay, silt, sandy silt and fine sand.

15. Stability Analysis. Based on past experience in areas where the soil conditions are similar to those along this location, it has been found impracticable to construct fills for retaining dikes higher than

6 to 7 feet above the ground surface or to spoil hydraulic fill higher than about 10 feet above ground surface and with slopes steeper than approximately 1 on 40. The design of the spoil cross sections were governed by these practical requirements. The stability of the excavation slope and spoil distances were determined by the method of planes based on the shear strengths determined from the undisturbed and general type borings. The results of the stability analyses and the strength values used are shown on Plate 4. The strengths used were determined from tests made on samples from the undisturbed borings and also on the results of unconfined compression tests performed on small core samples obtained from the general type borings, as shown on the boring logs on Plate 2. Based on these analyses of stability requirements the toe of the spoil should be a minimum of 470 feet from the centerline of channel with slopes of the channel cut not deeper than 1 on 2. (See Plate 4).

16. Channel protection. No channel protection is recommended initially, however, erosion due to wave wash in open areas can be expected in the upper part of the channel slope where the peat and highly organic clays are exposed. Protection for this area can be provided if and when the need for it becomes necessary. No channel protection is included in the overall cost of the project. It is presumed that sufficient rights of way will be furnished by local interests to preclude use of channel protection or that additional rights of way will be furnished when the need arises. The reach covered by this report lies in the proposed new harbor development area and the construction of slips, wharves, piers and other structures will probably provide for some channel protection that may be required.

RIGHTS OF WAY

17. Requirements. The rights-of-way for the channel and spoil disposal required for this reach are as indicated on Plate 2. It will be noted that all the additional rights-of-way is on the south side, being 750 ft. wide for the channel and 2,000 ft. for spoil disposal except where modified by the entrance transition section.

18. Status. Assurances of Local Cooperation dated 4 April 1957 have been furnished by the Board of Commissioners for the Port of New Orleans and was forwarded to OCE for approval on 7 June 1957 by the Division Engineer, U. S. Army Engineer Division, Lower Mississippi Valley. The acquisition of lands in Orleans Parish is being purused by the Port Commissioners, both for project requirements and for port development purposes.

RELOCATIONS

19. Existing facilities. There is an existing 2 circuit, 8 wire, 110,000 volt, 3 phase, electric aerial transmission line that crosses the existing GIWW and the proposed outlet channel near the entrance to the Inner Harbor Navigation Canal (Approx. Sta. 16+50). This is a major transmission line of the New Orleans Public Service, Inc., and will require relocation to provide the necessary vertical and horizontal clearances for the ship canal. The present span of 1,248 ft. provides a minimum vertical clearance of 135 ft. above m.l.g. over the Gulf Intracoastal Waterway, however, the south tower lies in the proposed ship channel alignment. No other relocations are known to exist in this reach of the project.

20. Responsibility. The above mentioned transmission line relocation as well as all other utility and pipeline crossings in other reaches

of the project are the responsibility of "local interests." "Local interests" pending formal acceptance of Acts of Assurances have been informally notified that the above transmission line would have to be relocated promptly.

EXCAVATION

21. General. The clays, silts and sands to be encountered in excavating the channel do not present any unusual problems and can be readily excavated by hydraulic dredge. The size of the channel makes dragline equipment impractical for this work.

22. Plans and specifications. Plans and specifications will be prepared for performing the work by a hydraulic pipeline dredge. The spoil will be confined behind retention dikes to prevent re-entry into the channel and from interfering with existing drainage. Typical sections of the proposed channel excavation, minimum berm distances, spoil disposal requirements and proposed rights-of-way are indicated on Plate 5. For advance maintenance it is proposed to require the contractor to excavate the channel 2 feet below the authorized project depth. An allowable overdepth up to a maximum of 2 feet will also be permitted in order to care for inaccuracies in dredging operations.

COSTS

23. Summary of cost. The cost of excavating the channel between Mile 63.77 and Mile 68.85 exclusive of rights-of-way which is a non-Federal obligation, is estimated to be $3,387,000.

24. Detail cost estimate. A comparison of detail cost estimates covering the same limits of work covered by this design memorandum and that contained in the overall project estimate of $92,000,000 submitted to Congress in April 1957 is as follows:

	Latest Estimate Submitted to Congress (Apr 1957)	Design Memo Estimate (Jan. 1957 Price Level)
Excavation 18,000,000 c.y. @ $.154 cu.yd.	$ 2,772,000	$2,772,000
Contingencies	416,000	333,000
Engineering & Design 1%	31,000	31,000
Supervision & Administration	257,000	251,000
	3,476,000	3,387,000

It will be noted that the above estimates are based upon the same unit prices and quantities. The contingency item has been reduced from 15% to 12% in the design memorandum to conform to the more advanced stage of the planning.

LAKE PONTCHARTRAIN

INNER HARBOR NAVIGATION CANAL

BRIDGE

G I W W

LAKE BORGNE

NEW ORLEANS

TURNING BASIN

Meraux

LOCK AND CONNECTING CHANNEL (LOCATION TO BE APPROVED BY CHIEF OF ENGINEERS WHEN ECONOMICALLY JUSTIFIED)

GULF INTRACOASTAL WATERWAY

LOUISIANA

36 FT. x 500 FT. CHANNEL

Bayou Loutre

PLAQUEMINES PARISH

ST. BERNARD PARISH

JEFFERSON PARISH

MISSISSIPPI RIVER

CHANDELEUR SOUND

CHANDELEUR ISLANDS

RETENTION DIKE

WING DIKE

JETTY

BRETON SOUND

EASED ENTRANCE TO 38 FT. x 600 FT.

-20 ft. Contour

-38 ft. Contour

MI. 0

South Pass

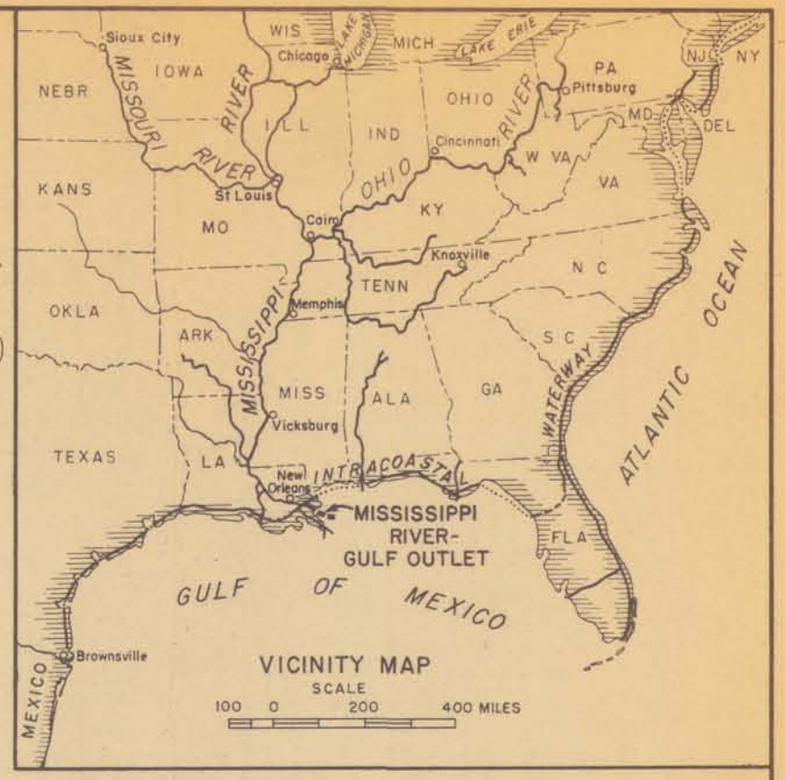
Southwest Pass

GULF OF MEXICO

N

SCALE
10 0 10 MILES

Note: Channel alignment beyond G.I.W.W., retention dike, wing dike and jetty are preliminary and subject to change as detail planning progresses.



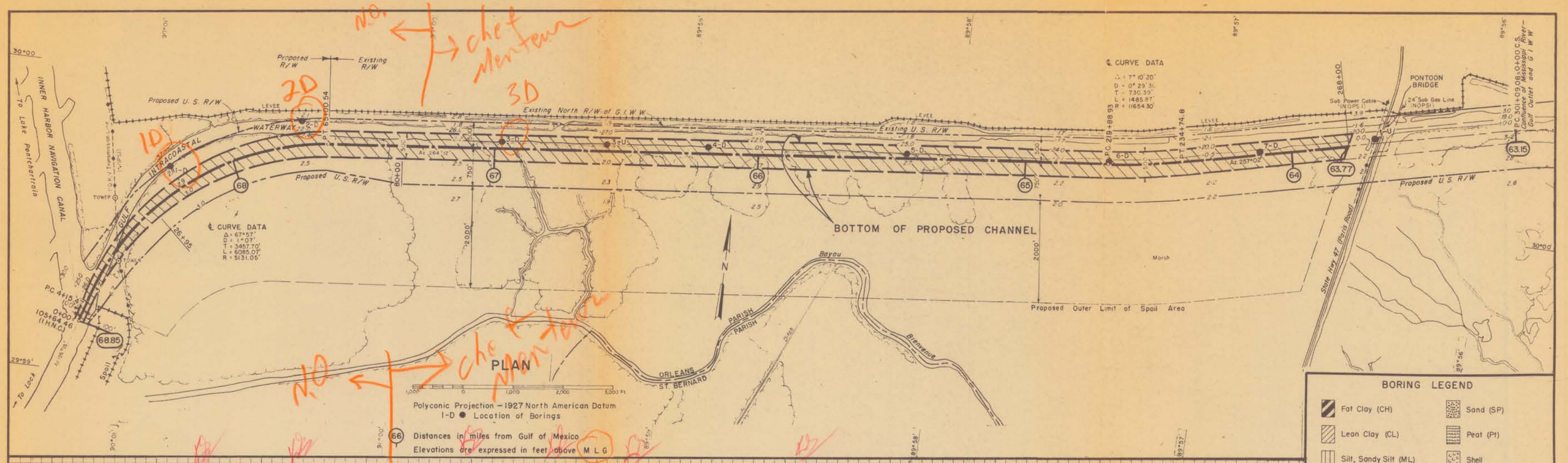
REVISED JULY 1957

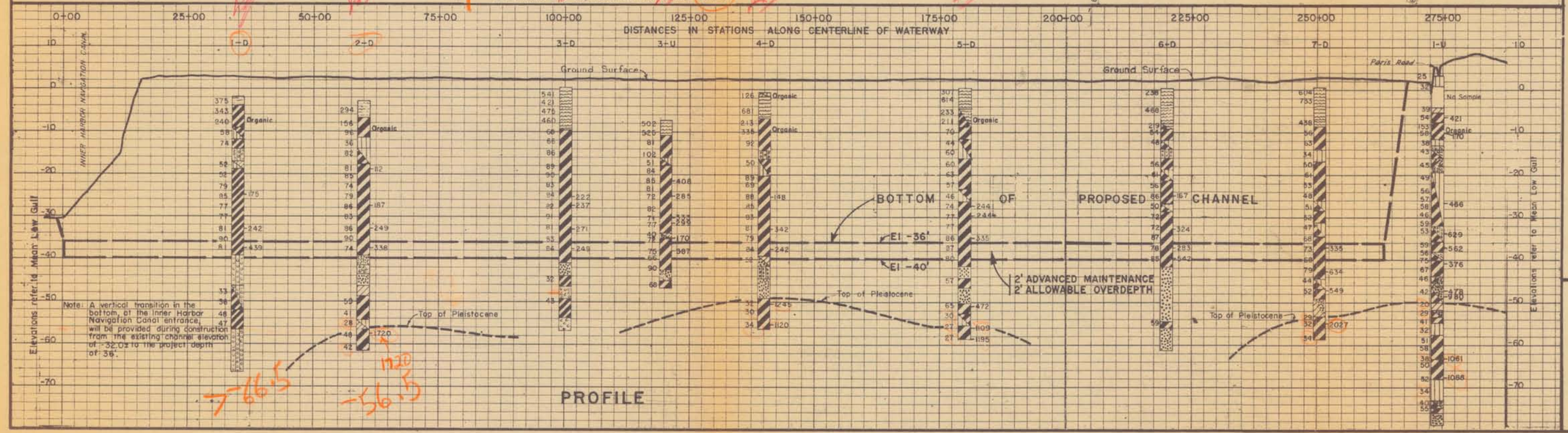
MISSISSIPPI RIVER—GULF OUTLET
LOUISIANA
DESIGN MEMORANDUM NO. 1-A
CHANNELS
MILE 63.77 TO MILE 68.85

PROJECT LOCATION

SCALES AS SHOWN
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS, LA.
CORPS OF ENGINEERS
APRIL 1957 FILE NO. H-2-20745

PLATE 1





BORING LEGEND

- Fat Clay (CH)
- Lean Clay (CL)
- Silt, Sandy Silt (ML)
- Silty Sand (SM)
- Sand (SP)
- Peat (Pt)
- Shell
- Alternate thin layers

BORING NOTES

Figures to left of boring logs indicate percent of water content based on weight of oven dry soil.

Figures to right of boring logs are shear strength in pounds per square foot based on results of unconfined compression tests on small core samples.

Test results on 5" undisturbed borings 1-U and 3-U are shown on Plate 4.

Borings 1-D through 7-D were taken October-November 1956 with a 1 7/8" I.D. wire line core barrel sampler.

Borings 1-U and 3-U were taken October-November 1956 with a 5" thin wall piston type undisturbed sampler.

REVISED JULY 1957

MISSISSIPPI RIVER—GULF OUTLET
LOUISIANA

DESIGN MEMORANDUM NO. 1-A

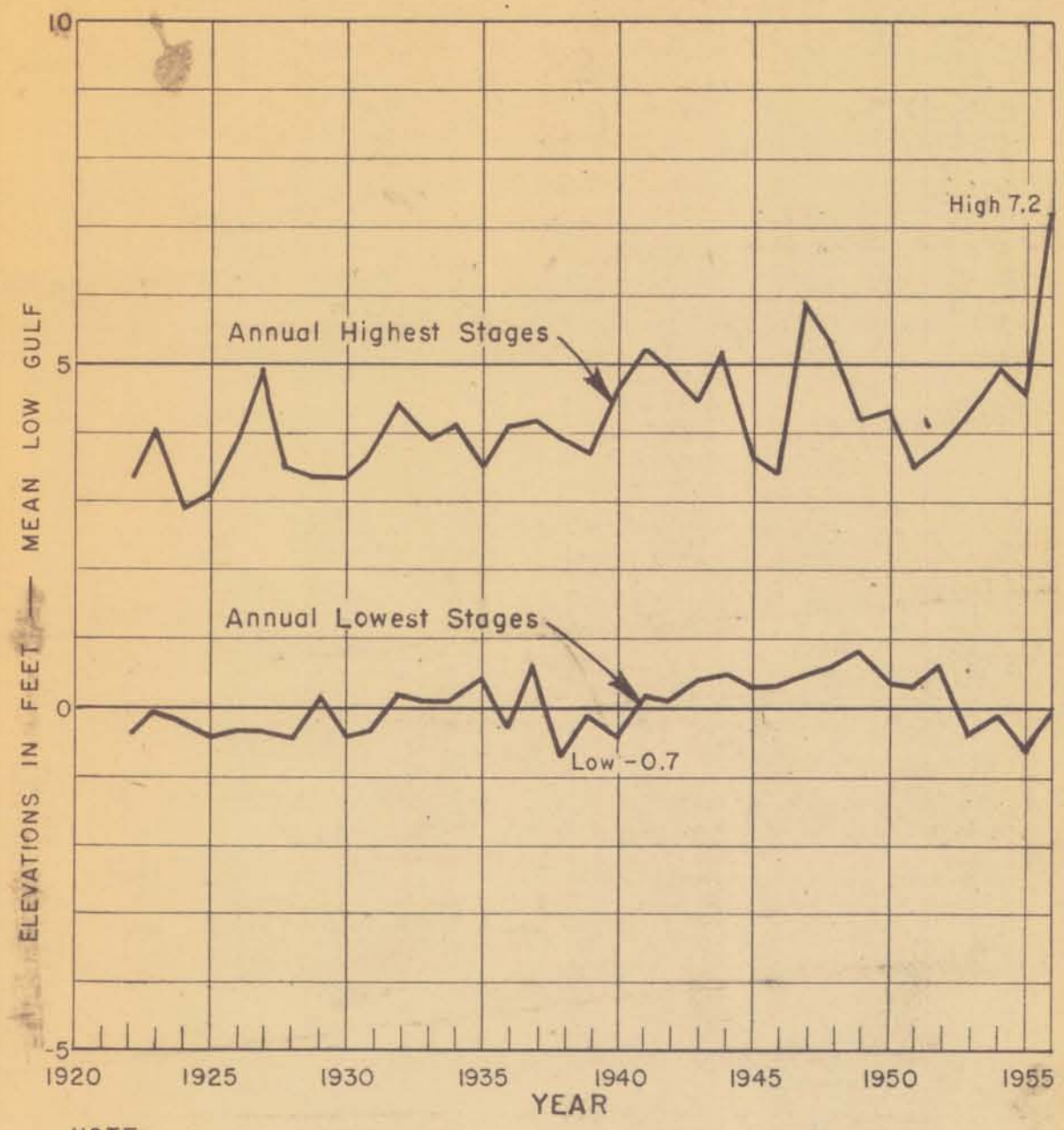
CHANNELS
MILE 63.77 TO MILE 68.85

PLAN, PROFILE AND SOIL BORINGS

SCALES AS SHOWN
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS, LA.
CORPS OF ENGINEERS
APRIL 1957 FILE NO. H-2-20745

PLATE 2

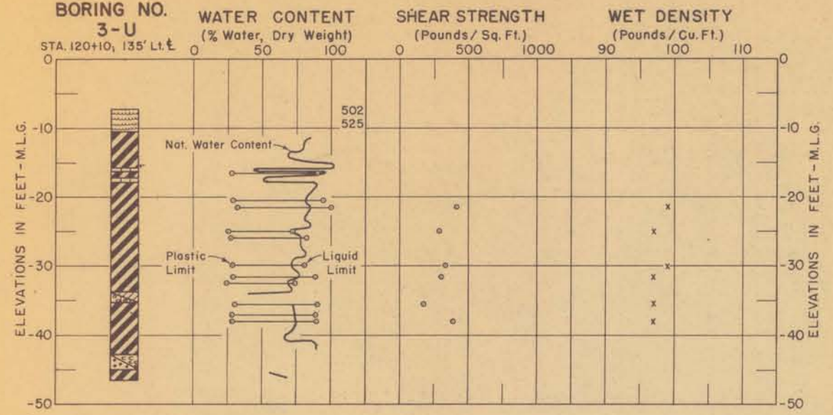
WATER SURFACE
INNER HARBOR NAVIGATION CANAL

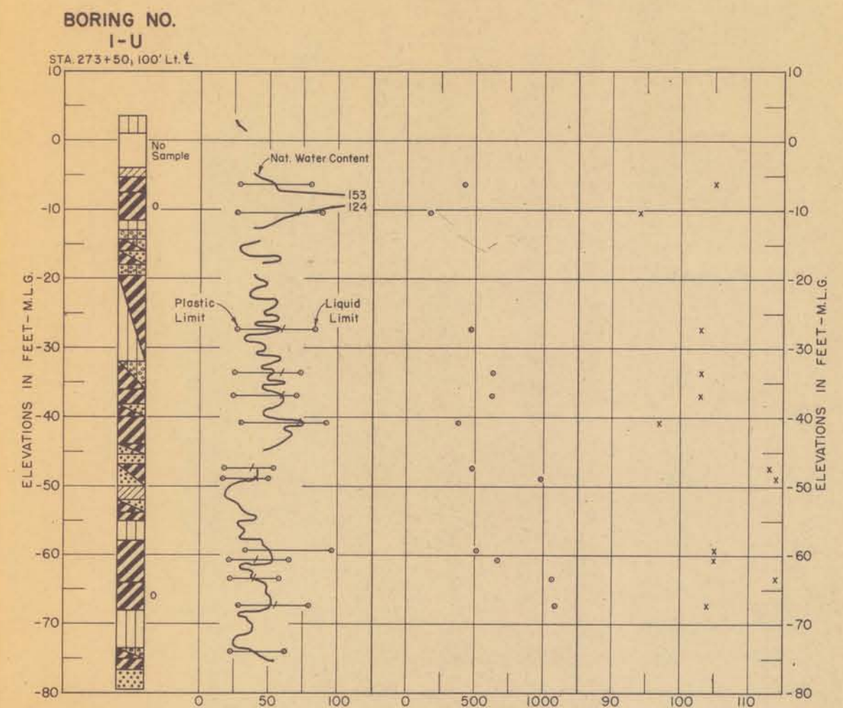


NOTE:
Gage located at North End of Inner Harbor Navigation Canal Lock

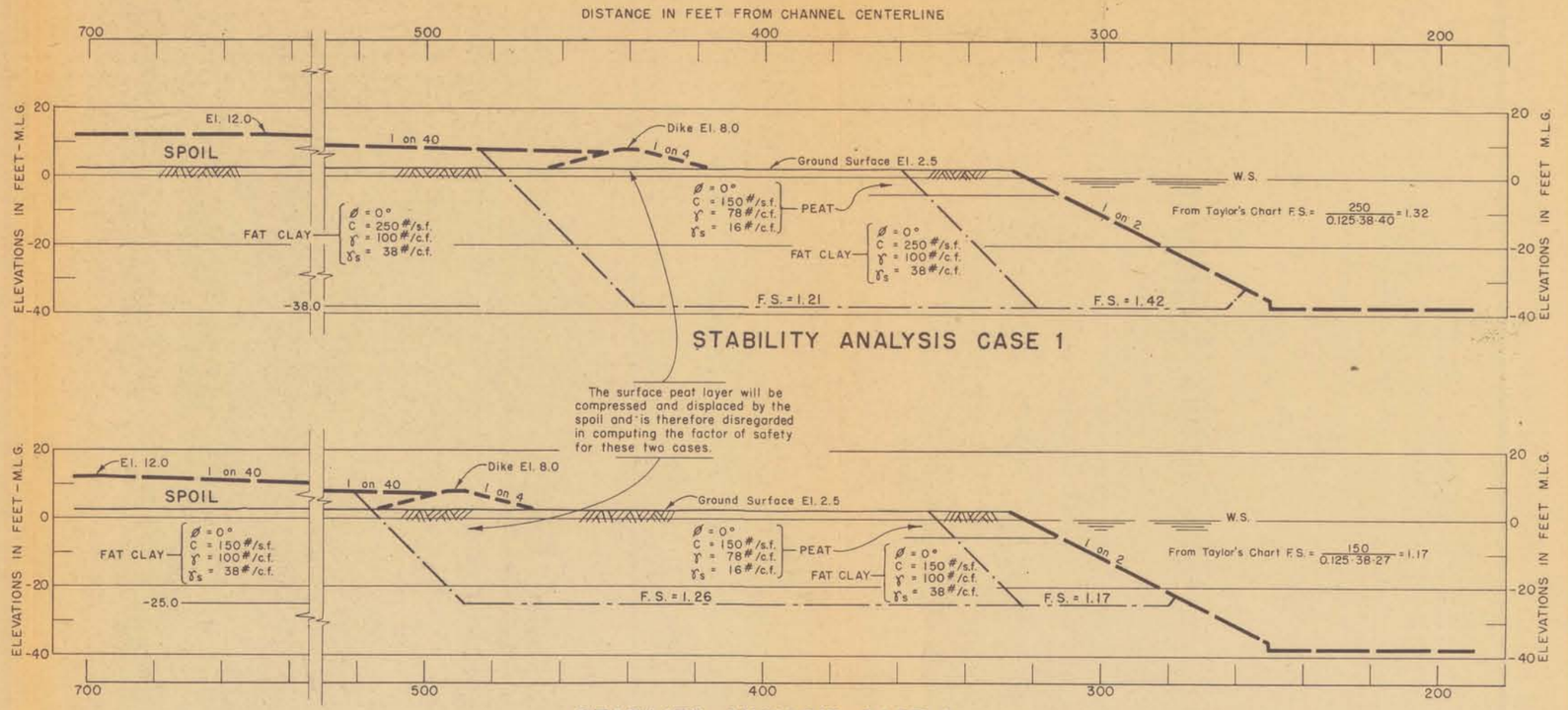
MISSISSIPPI RIVER — GULF OUTLET
LOUISIANA
DESIGN MEMORANDUM NO. 1-A
CHANNELS
MILE 63.77 TO MILE 68.85
HYDROGRAPHS
SCALES AS SHOWN
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS, LA.
CORPS OF ENGINEERS
APRIL 1957 FILE NO. H-2-20745

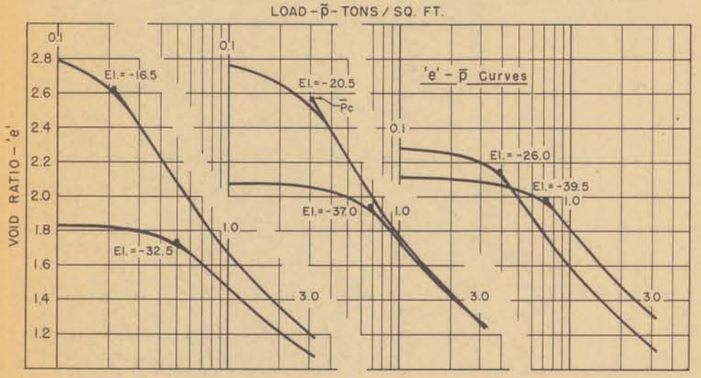
PLATE 3





UNDISTURBED BORING DATA





CONSOLIDATION DATA
BORING NO. 3-U

GENERAL NOTES

- Ø Friction angle in degrees
- C Shear strength (Cohesion) in pounds per square foot
- γ Unit weight in pounds per cubic foot (Unsubmerged)
- γs Submerged unit weight in pounds per cubic foot
- F.S. Factor of safety against assumed shear failure
- p̄c Preconsolidation load

BORING LEGEND

- Sand (poorly graded)(SP)
- Silty Sand (SM)
- Sandy Silt (ML)
- Lean Clay (CL)
- Fat Clay (CH)
- Peat (Pt)
- Shell
- Alternate thin layers
- Unconfined Compression Test
- % Organic matter in the soil

REVISED JULY 1957

MISSISSIPPI RIVER — GULF OUTLET
LOUISIANA
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SOIL DATA AND STABILITY ANALYSIS

SCALES AS SHOWN
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS, LA.
CORPS OF ENGINEERS
APRIL 1957 FILE NO. H-2-20745

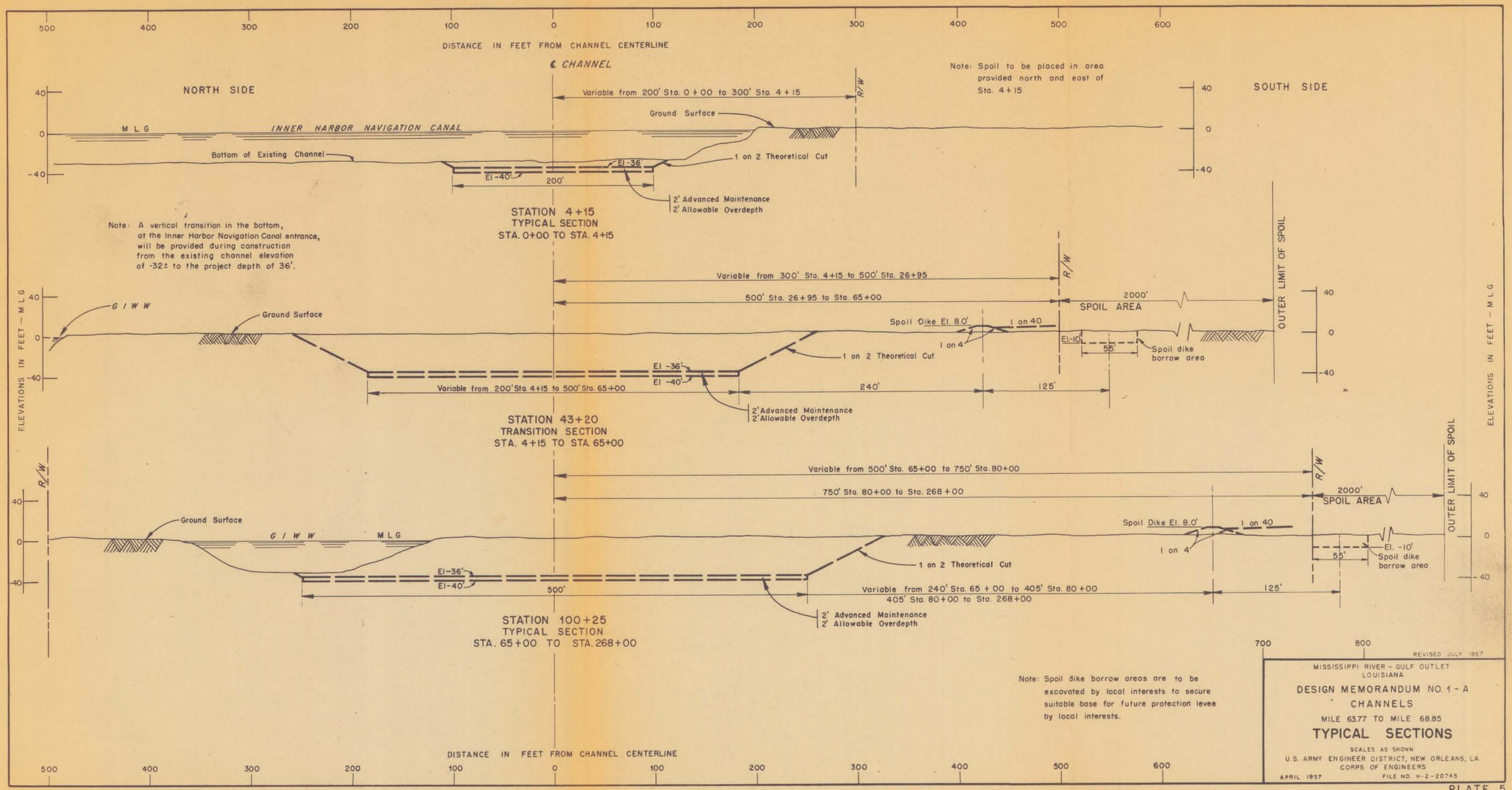

PLATE 5

14186