10944 THRU 10957

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Diag. Cht. No. 1272-3

Form 504

U. S. DEPARTMENT OF COMMERCE

COAST AND GEODETIC SURVEY

DESCRIPTIVE REPORT

Type of Survey Planimetric

Field No. Ph-5903 *Office No.* T-10944 thru T-10957

LOCALITY

State Louisiana

General locality Mississippi Delta

Locality

1958-59

CHIEF OF PARTY

L. W. Swanson

LIBRARY & ARCHIVES

DATE November 15, 1963

USCOMM-DC 5087

LOW-WATER LINE MAPPING--LOUISIANA COAST

In the period 1958 to 1961, the Coast and Geodetic Survey mapped the mean low-water line of the entire outer coast of Louisiana for the Bureau of Land Management and the State of Louisiana. This mapping was divided into three projects:

Project 20,000-808: This project comprised 41 maps covering all of the outer coast of Louisiana except the Mississippi Delta, and the Atchafalaya Bay and Marsh Island area.

Project 20,000-819, Part I: This project covered the outer coast of the Mississippi River Delta.

Project 20,000-819, Part II: This project covered the Atchafalaya Bay - Marsh Island area.

The records for these three projects are filed as follows:

PROJECT 20,000-808

The detailed report for this project is filled in the Coast and Geodetic Survey Archives under the title "Project Completion Report - Special Low-Water Line Maps - Louisiana Coast - Project 20,000-808."

The 41 maps were numbered for Coast Survey files: "RS634 to RS674." The compilation manuscripts and a set of the maps identical to those sent to the Bureau of Land Management are filed in the Federal Records Center under accession number 59A2429 - Box 152.

A very brief report on the compilation phase of this project is filed in the Photogrammetry Division general files which also probably contain one or more sets of maps RS634 to RS674.

PROJECT 20,000-819, PART I
MISSISSIPPI RIVER DELTA

The original report giving details of both the field and office phases of this project is filed in the Coast and Geodetic Survey Archives under the name "Special Report 1959, No. 101, - Aerial Photography and Field Inspection Report - Mississippi Delta, Louisiana," by Jones, Battley, and Shofnos.

A duplicate of the above mentioned report is filed in the Coast and Geodetic Survey map vault as "Descriptive Report No. T10944 to T10957."

A narrative account of this project by Jones and Shofnos was also published in the International Hydrographic Review of January 1961, volume 38, No. 1.

The field inspection photographs, listed in the above reports are filed in the Federal Records Center, under accession number 66A1888. (See Photogrammetry Division file section in order to draw these records from the Federal Records Center).

Map numbers T10944 to T10957 are filed in the Coast and Geodetic Survey map vault as original records. This set, however, does not contain the angle points and coordinates of angle points shown on the maps sent to the Bureau of Land Management. The manuscript drawings for these maps which do show the angle points and coordinates of angle points are filed in the Federal Records Center under accession number 64A1677 - Box 41 and Box 42. These accession numbers are recorded in the Photogrammetry Division file section under map numbers T10944 to T10957.

PROJECT 20,000-891, PART II
ATCHAFALAYA BAY AND MARSH ISLAND AREA

The original copy of the detailed report for this project that describes both the field and office work is filed in the Coast and Geodetic Survey Archives as "Special Report 1961, No. 2, - "Shoreline and Mean Low-Water Line Mapping, Atchafalaya Bay, Louisiana," by Wilson, Townsend, and Photogrammetry Division.

A duplicate of the report mentioned in the preceding paragraph is also filed in the Coast and Geodetic Survey map vault as "Descriptive Report T11993 through T11997."

The field records, that is field inspection photographs and notebooks mentioned in the report, are filed in the Federal Records Center under accession number 66A1888. This accession number is recorded in the file section, Photogrammetry Division and the field records can be drawn by application to that section.

One set of the maps on this project are filed in the Coast and Geodetic Survey map vault as original map records under numbers T11993 through T11997. This set of maps does not, however, show the angle points and coordinates of angle

points shown on the maps sent to the Bureau of Land Management. The original manuscripts showing these angle points are still in the Photogrammetry Division general files. These original manuscripts will be sent to the Federal Records Center and the accession number will be recorded in the Photogrammetry Division file section under the map numbers T11993 through T11997.

The field records that were formerly filed in the Office of the Chief, Photogrammetry Division, are the records now filed in the Federal Records Center, under accession number 66A1888.

November 5, 1965

FORM C&GS-181a
(12-61)

U.S. DEPARTMENT OF COMMERCE
COAST AND GEODETIC SURVEY

DESCRIPTIVE REPORT - DATA RECORD

T-10944 thru 10957

PROJECT NO. (III):

Ph - 5903

FIELD OFFICE (II):	CHIEF OF PARTY
Buras, Louisiana	L.W.Swanson
PHOTOGRAMMETRIC OFFICE (III):	**OFFICER-IN-CHARGE**
Washington, D.C.	

INSTRUCTIONS DATED (II) (III):

6 November 1959 ... Field Instructions Coordination of Low Water Photography & Low Water Verification

16 November 1959 ... Aerial Photography (No. 702-5903)

METHOD OF COMPILATION (III):

Graphic

MANUSCRIPT SCALE (III):	STEREOSCOPIC PLOTTING INSTRUMENT SCALE (III):
1:20,000	
DATE RECEIVED IN WASHINGTON OFFICE (IV):	**DATE REPORTED TO NAUTICAL CHART BRANCH (IV):**
control for plot: Aug. 1959 field-photo inspection: Jan 1960	

APPLIED TO CHART NO.	DATE:	DATE REGISTERED (IV):

GEOGRAPHIC DATUM (III):	VERTICAL DATUM (III):
N.A. 1927	MEAN SEA LEVEL EXCEPT AS FOLLOWS: *Elevations shown as (25) refer to mean high water* *Elevations shown as (5) refer to sounding datum* *i.e., mean low water or mean lower low water*

REFERENCE STATION (III):

LAT.:	LONG.:	☐ ADJUSTED ☐ UNADJUSTED

PLANE COORDINATES (IV):	STATE	ZONE
Y = X =		

ROMAN NUMERALS INDICATE WHETHER THE ITEM IS TO BE ENTERED BY (II) FIELD PARTY, (III) PHOTOGRAMMETRIC O OR (IV) WASHINGTON OFFICE.
WHEN ENTERING NAMES OF PERSONNEL ON THIS RECORD GIVE THE SURNAME AND INITIALS, NOT INITIALS ONLY.

USCOMM-

FORM C&GS-181b
(12-61)

U.S. DEPARTMENT OF COMMERCE
COAST AND GEODETIC SURVEY

DESCRIPTIVE REPORT - DATA RECORD

FIELD INSPECTION BY (II):	DATE:
B. G. Jones, J. K. Wilson, R. W. Franklin	Nov.-Dec. 1959

MEAN HIGH WATER LOCATION (III) (STATE DATE AND METHOD OF LOCATION):

The majority of the shoreline in this area is apparent and was delineated from office stereoscopic determination assisted by some color field photographs and nine lens field prints.

PROJECTION AND GRIDS RULED BY (IV): D. Dempsey	DATE 8/18/59
PROJECTION AND GRIDS CHECKED BY (IV): R. Shoup	DATE 8/19/59
CONTROL PLOTTED BY (III): J. Amburn	DATE Aug. 1959
CONTROL CHECKED BY (III): R. Sugden	DATE Aug. 1959
RADIAL PLOT OR STEREOSCOPIC CONTROL EXTENSION BY (III): J. Battley	DATE Oct. 1959
STEREOSCOPIC INSTRUMENT COMPILATION (III): PLANIMETRY	DATE
CONTOURS	DATE
MANUSCRIPT DELINEATED BY (III): R. Sugden, J. B. Phillips, H. Lucas J. Amburn	DATE Nov. 1959 thru August 1960
SCRIBING BY (III):	DATE
PHOTOGRAMMETRIC OFFICE REVIEW BY (III):	DATE

REMARKS: Upon completion of the radial plot, compilation was begun on the planimetric manuscripts in Nov. 1959 and continued through the delineation of the low water line phase until completion in August 1960.

USCOMM-DC 16276B-P61

FORM C&GS-181c
(12-61)

U.S. DEPARTMENT OF COMMERCE
COAST AND GEODETIC SURVEY

DESCRIPTIVE REPORT - DATA RECORD

CAMERA (KIND OR SOURCE) (III):

9-lens and Infra red

PHOTOGRAPHS (III)

NUMBER	DATE	TIME	SCALE	STAGE OF TIDE
59L8592 thru 8782	30 Nov 1959	see remarks below	1:20,000	see remarks below
59L8829 thru 8976	1 Dec 1959			
59L8977 thru 9078	3 Dec 1959			
58918 thru 58928 58942 " 58954 58961 " 58970 58972 " 58980 58993 " 58997	11 Oct 1958		1:20,000	

TIDE (III)

	RATIO OF RANGES	MEAN RANGE	SPRING RANGE
REFERENCE STATION:			
SUBORDINATE STATION:			
SUBORDINATE STATION:			

WASHINGTON OFFICE REVIEW BY (IV):		DATE:
PROOF EDIT BY (IV):		DATE:
NUMBER OF TRIANGULATION STATIONS SEARCHED FOR (II):	RECOVERED: 26	IDENTIFIED: 26
NUMBER OF BM(S) SEARCHED FOR (II):	RECOVERED:	IDENTIFIED
NUMBER OF RECOVERABLE PHOTO STATIONS ESTABLISHED (III):		
NUMBER OF TEMPORARY PHOTO HYDRO STATIONS ESTABLISHED (III):		

REMARKS:

The infra red photography was flown under tide controlled conditions. Eight tide stations were established in the area for this survey. See the compilation report for a comprehensive listing of the stages of tide for the various days, time and flights.

Projects 5903 and 20,000-319

Mississippi Delta

Mean-Low Water Line Mapping

1959

Chief of Party - Joseph K. Wilson

Statement

A duplicate of this report is filed in the Library as a special report under the name of the Chief of Party and the date, 1959.

Field Inspection Report

AERIAL PHOTOGRAPHY AND [illegible]
MISSISSIPPI DELTA - [illegible] 20-819 -
PART I - PLANIMETRIC BASE MAPPING AND MEAN-LOW WATER LINE MAPPING

December 23, 1959

References - the following references are attached as appendices:

a. Project diagram (refer to Nautical Chart 1272 for a more detailed map of the area).

b. List of infrared photographs showing tide stages at the time they were taken.

c. Tabulation of tide stages

d. Tabulation of staff readings for mean-low water and mean-high water at each tide station.

e. Instructions for field surveys, Project 20,000-819, dated November 6, 1959.

f. Instructions for aerial photography dated November 16, 1959.

g. Tide curves for ~~November 30,~~ December 1 1959 showing the predicted and actual tides.

PURPOSE AND SCOPE

1. This is a cooperative project between the Coast and Geodetic Survey, the Federal Bureau of Land Management, and the State of Louisiana. The purpose of the project is to provide basic tidal data and new planimetric maps for Coast and Geodetic Survey purposes and to provide the Bureau of Land Management and State of Louisiana with a special set of the maps showing the mean-low water line and the coordinates of turning points selected along that line by the State of Louisiana and the Bureau of Land Management. The mean low-water line and the selected turning points will be the base line for determining the offshore line of division between Federal and State ownership of mineral rights. The maps will be used for administering the offshore prospecting and development of minerals (oil and gas).

OUTLINE OF PROCEDURES

2. Nine-Lens Photography: The nine-lens photographs for the preparation of 1:20,000 scale base planimetric maps were taken in October 1958.

3. Tide Program: The eight tide stations indicated on Reference (a) were established by the Division of Tides and Currents in April 1959, and will be continued for twelve or thirteen months to April or May 1960. Lt.(jg) R. W. Franklin with Coast Survey Launch 180 (launch moored at Venice) with headquarters at Buras, Louisiana, is in charge of the three-man tide party. One photogrammetrist, Mr. Hartford, from the Division of Photogrammetry, is attached to this party under Lt. Franklin.

4. Identification of Horizontal Control: The identification of horizontal control for nine-lens radial plotting was done by Lt. Franklin and Mr. Hartford in the spring and summer of 1959.

5. Base Maps: The compilation of planimetric manuscripts is in progress in the Washington Office. These will be completed after receipt of the field inspection data in January, 1960.

6. Low-Water Infrared Photography: This was completed on November 30, December 1, and December 3, 1959. The tides in this area are diurnal and low tides occur during photographic daylight only from late November to late January. Consequently, it was necessary to do this photography in the winter of 1959-60 or in the winter of 1960-61. The tidal program has progressed very satisfactorily and it is believed that the tidal planes established by observations to October 1959 are correct within 0.1 feet, thus permitting photography now while the tide party is still in the area. It was obviously much more economical and desirable to do the photography this year rather than to wait until 1960-61 when the tide party would have moved to another area.

7. Field Inspection of Low-Water Line: The low-water photography was processed immediately at Washington and field prints returned to the field party for inspection of the low-water photographs during low tides between December 5 and December 21, 1959.

8. Map Completion: Field inspection of other features for the preparation of the planimetric base maps will be completed ~~in early January 1960~~. It is anticipated that the compilation of base maps and the compilation of the low-water line will be completed in Washington by late 1960 or early 1961.

LOW-WATER AERIAL PHOTOGRAPHY

9. The mean-low water line will be mapped from the infrared aerial photography that was taken as closely as possible to the tide stage of mean-low water. The infrared photography is ideal for this purpose as it provides a sharp contrast between water and land and the mean-low water line contour is extremely well defined even on the mud flats where the depths at the edge of the water are 0.1 foot or less.

10. Several characteristics of the Mississippi Delta tides are pertinent to this type of operation and are listed as follows:

a. As mentioned previously, low tides occur in photographic daylight only between late November and late January; and most of these occur so early in the morning that it was essential to plan photography when minus tides were expected and to take the photography on the flood tide at the time that tide reached the plane of mean-low water. This permitted little more than one hour of photography on each tide. Photography was planned for the predicted minus tides as indicated on page 4 of reference (f).

b. The tides in this area are appreciably affected by local wind conditions. A prevailing northerly wind of 20-25 miles per hour will cause the tides to run perhaps one-half foot lower than predicted and; consequently, to stay below the plane of mean-low water for longer periods than predicted. Similarly, prevailing southerly winds will prevent the Delta tides from getting as low as predicted. This was known to a degree prior to commencing this project. It was amply verified by experience on the project. A typical example is shown in the tide-curve reference (g).

11. Mr. B. G. Jones, of the Division of Photogrammetry, Washington Office, and Mr. Joseph K. Wilson, Chief of Photogrammetric Field Party 720, joined Lt.(jg) R. W. Franklin on November 27 ~~and 28~~ and this group worked as a combined party for the coordination of low-water photography and for the field inspection of aerial photographs. The low-water photography was planned and carried out as follows:

a. Air Photographic Mission 701 with the Aero Commander Aircraft and with the Wild-Infragon camera in charge of Lcdr. Holmes was based at New Orleans.

b. The mean-low water photography was controlled by tide observers at Breton Island (Wilson); Empire Jetty (Launch 180); and South Pass (Jones). The tide observers and the aircraft were equipped with portable radios for communication. The South Pass tide station (Jones) also had telephone communications with New Orleans by Coast Guard telephone line and was used as a command post for directing the aerial photography.

c. Tide observers were placed one day in advance of photography (November 29) to observe the tides and to inform the Air Photographic Mission of possibilities for the next day. At the South Pass station, a tide curve was plotted early each morning from the hourly staff readings for the previous six or eight hours. This curve was then projected and the Air Photographic Mission was informed by telephone by 6:00 a.m. at what time they should arrive on the project. After arrival on the project, the photography on each line was controlled by the observers who gave the aircraft staff readings and instructions by radio. Five of the tide stations were not occupied, but the time of mean-low water at these stations could be predicted approximately by the tide observers by utilizing the staff readings at their stations and applying the time differences provided by the Tide Division for the times of low-water at the several stations.

12. The entire plan for mean-low water photography was extremely tenuous since it was essential that we have clear skies on two or three of the days when low tides were expected to occur (see page 4 of reference (f). We were extremely fortunate. A norther blew into the area on November 28 and continued through December 3. This brought low tides and clear weather on November 30, December 1, and December 3. Low-water photography was completed on December 3.

13. A flight inspection of the shoreline at a minus tide early on December 28 showed the western shore to be steep and showed the most extensive mud flats to be on the eastern shore. This flight inspection was invaluable in directing the photography.

14. The unusual combination of clear weather and photographic daylight low tides could not be expected to last and it was essential to obtain satisfactory photography as quickly as possible. It was not feasible to attempt all photography at the exact stage of mean-low water since this would have required a minimum of five or six such days. Consequently, the photography was taken at zero and slightly minus tides, and all lines were photographed at least twice at slightly different low-water stages so as to provide information for interpolation of the mean-low water line where this was necessary. Less attention was paid to the steep western shore and more attention ot the south and east shores because of the extensive mud flats, particularly on the latter. Line 8, for example, shown on reference (a) was photographed four times.

FIELD INSPECTION OF THE MEAN-LOW WATER LINE

15. The purpose of the field inspection of the mean-low water line was to examine the infrared photographs and compare them with the shoreline at the tide stage of mean-low water:

a. To find any small mean-low water islands or spots that might not be readily seen on the photographs. As, for example, on the mud lumps off Pass A Loutre and on the oyster bars in Grand Bay. In these areas, some of the mean-low water islands are extremely small but all were identifiable on the infrared photographs when the latter were examined at low water.

b. To verify the low-water line on the mud flats visible on the infrared photography by comparing this with the shoreline seen during inspection at the mean-low water tide stage.

c. And finally to identify the low-water line where this, in a few cases, was inside the edge of the wild cane vegetation.

d. This inspection also served to disprove the existence of some of the small islands and low-water spots shown on the present nautical chart, particularly off of Southeast Pass and Northeast Pass.

16. The low-water line was inspected by float plane or helicopter, mostly by helicopter. The practice was to fly to the controlling tide station, to read the staff at that station and wait on the tide until the staff showed a tide stage of about minus 0.1 foot. The low-water line was then inspected in the area of that tide station. The time and stage of tide of the low-water line inspection is indicated in reference (c).

17. The mean-low water line on the salient points along the outer shore has been inked on the field inspection photographs listed in reference (c). The mean-low water line has not been inked in the closed bays but can be readily interpreted by analogy from the inked notes referred to in the previous sentence.

18. The mean-low water line along most of the shore is on mud banks or mud flats. In some cases it is just inside the edge of the wild cane. The wild cane will, in some instances, grow just over the edge of mean-low water, but in every case inspected, bare mud spots or lumps were found just inside the edge of this cane. Apparently, as the cane develops a mud bank builds up inside the early growth. The growth then works outward slightly beyond the mean-low water line and the outer fringes of the cane are often seen in water at mean-low tide.

The following legend will be found on the mean low-water field inspection photographs and is recorded in the field note book.

1. Small grass clump - mean-low water is around outer edge.

2. Small bare mean low-water spot (mud or shell - no grass).

3. Clump of wild cane - mean-low water line is just inside the edge of the cane.

19. Records: Permanent records relative to the mean-low water line mapping consist of:

a. The aerial negatives
b. The tide-gauge marigrams
c. One field-inspection notebook
d. Field inspection photographs with inked notes

FIELD INSPECTION FOR BASE PLANIMETRIC MAPS

20. Aerial Photographs: Color photography was taken along the Mississippi River and Southwest Pass, South Pass, and Main Pass primarily for the identification of aids to navigation. This color photography also covers most of the culture along the river and some of the larger mining (oil and sulfur) developments on the Delta. Consequently, there are available for field inspection nine-lens photographs, infrared photography of the outer shore, and color photography. A list of field inspection data giving the type and numbers of photographs will be attached to this report.

21. Shoreline: Most of the shoreline on these maps will be "apparent" shoreline (line of contact of mean high water with vegetation) on marsh, wild cane, or mangrove. "Shoreline on fast land" (line of contact of mean high water with the ground) has been mapped (1) on the mud lumps off the passes where these are above mean high water; (2) the jetties at South Pass and Southwest Pass; (3) the natural levees along the main river, Southwest Pass, South Pass, and to a limited extent, along Pass A Loutre, and Main Pass; (4) on the man-made or artificial levees that surround the highway and towns along the west bank of the river, (5) a few places where levees have been built up for mining purposes. There probably are places in the tremendous marsh areas where the ground (mud) is above mean high water but the "shoreline on fast land" in these places is obscured by the grass and no attempt was made to map it. The mangrove in this area is low growing and is limited largely to the shoreline in Grand Bay. The remainder of the outer shoreline is on marsh or wild cane. The natural levees are indicated by a growth of trees which show quite well on the photographs. The artificial levees are generally visible on the photographs. Field inspection notes will indicate the places where the shoreline is on fast land. And, as mentioned before, these will nearly always be inside the passes of the river, not on the outer shore.

22. Boundaries: The Delta Wildlife Refuge, U. S. Department of Interior, is located in map T-10950. A map of the boundary limits is included with the field inspection data. An approximate boundary line has been shown on nine-lens photographs 58922, 58924, and 58926 only as an aid to the compilers. Your attention is invited to the fact that these boundaries do not necessarily follow natural features.

Boundaries of the Coast Guard properties have not been shown as their land areas are leased.

23. Culture: Most of the business establishments and dwellings in this area are concentrated along the road on the west bank of the river from Venice and the Jump northwestward including Triumph, Buras, and Empire. Along this road only the public and landmark buildings will be mapped. Dwellings will be omitted. Buildings to be mapped will be indicated by the field inspection, mostly by notes on the color and nine-lens photography.

24. Aside from the towns mentioned in the preceding paragraph, the project area is a vast marshland with extensive areas of shallow water in the marshes. Culture in these marshes is limited to trappers' shacks and the structures of the oil and sulfur industry, and to various structures immediately along the shore of the river. All structures in this area will be considered landmark features and will be indicated by the field inspection for mapping, the only exception being the oil wells.

25. On the Delta the drilling for oil and laying of pipelines is done from barges. Canals are dredged for these barges. After the development is completed, the barges are moved away. The pipelines are generally at the bottoms of the dredged canals and the oil wells, after the development is completed, consist of valves at the top of the oil pipes. These are called Christmas trees and are usually surrounded by small platforms. They generally show on the aerial photographs but are not visible thereon in all instances. There are hundreds of these oil wells and there seems to be little point in endeavoring to map each of them, which would require intensive and expensive field inspection. Therefore, they will be omitted from the maps.

26. There are also many offshore oil wells immediately along the outer shore of the Delta, particularly in Grand Bay, along the shore between Dead Woman Pass and Pass a Loutre, in East Bay and along both outer shores of Southwest Pass. Those close inshore will be indicated by the field inspection and will be mapped as structures in the water; most of these can be identified during the low-water line inspection. The field inspector will indicate when all are not identified and this fact shall be noted on the maps. Many of these oil wells are outside the limits of the photographs but positions of these can be obtained through our New Orleans Office if needed for charting.

27. Aids to Navigation: These will be identified by the field inspection, mostly on the color photographs. Field inspection notes will be made directly on the color photographs in black pelican ink. The field party has been provided with a small light table which can be placed on the launch so that the color photographs can be taken directly into the field for inspection.

28. Landmarks: Landmarks for charts include radio masts, tanks, and a lookout tower in the towns along the river and in scattered places throughout the Delta. They will be identified on the field inspection photographs, and heights above high water furnished.

29. Levees: The natural and artificial levees are a prominent feature of this area. The natural levees along the banks of the Mississippi River and at the upper ends of the larger passes consist of fine black soil built up by the river and provide excellent agricultural land. They

are limited in extent. Citrus fruits are the most important crop, and there is also a small amount of truck farming. The roads along the west bank and the towns are all built on these natural levees. The natural levees appear to be at about the normal elevation of the river or only slightly higher. Consequently, they must be protected by artificial levees or dikes, and the entire area from Venice northward is completely surrounded by such an artificial levee. The natural levees are indicated by trees on the photographs. The outlines of the natural levees and the artificial levees will be indicated on the field inspection photographs.

30. Vegetation: The trees along the natural levees include willow, gum, and other deciduous trees together with cypress and some arborvitae. Otherwise, the Delta is a tremendous marsh, for the most part covered with a rather short marsh grass. A low brush; namely, bacharis and wax myrtle, grows along the banks of some of the bayous. This is a bright green and shows white on the infrared photography. While not so extensive as the marsh grass, the wild cane (roseau) is a prominent vegetation feature, particularly in the western part of the Delta and along the shores of the southern section. This cane grows ten or twelve feet high, is very dense, and is easily distinguished on the photographs because of its height and the fact that it is greener than the usual marsh grass and shows whiter on the infrared photographs. Some low-growing mangrove is found along the outer shore, mostly in the northeastern section around Grand Bay.

31. Marshes: The interior area of the Delta also has tremendous shallow water areas and large mud flats bare of grass. Some of these are covered with water hyacinth. In many of these areas the drainage is poorly defined. It is suggested that the apparent shoreline be drawn along the well-defined bayous, but when these shade into the interior mud flats without definite banks it might be well to omit shoreline entirely and show some of these interior areas with the marsh symbol only.

32. Acknowledgments: This project has been concluded in a much shorter time than anticipated because of favorable breaks in the weather and also because of assistance received in the area. In closing this report, I wish to acknowledge the very considerable help received from many sources:

From Dr. Gordon Atwater for his interest and assistance in discussing this project with me and in taking me on a preliminary flight inspection of the entire project area.

From Mr. Martin Standard of the Texaco Company for his assistance in briefing us on the nature of the country, weather and tidal characteristics, and for assisting with tide observations at Lonesome Bayou.

From the Coast Guard, particularly the personnel on the Coast Guard South Pass Range Front Station for providing quarters for me, for assisting with communications, and for their very generous assistance in reading the tide staffs during the night so that I would have information early each day to plan that day's work.

From Cdr. Reed and his staff at New Orleans for making detailed prior arrangements regarding communications and for his assistance and interest throughout the project.

From Lt. Franklin and the personnel of his party for their generous cooperation and help. In fact the photogrammetric and tide personnel actually combined as one unit to take care of all of their operations including tides, field inspection, and coordination of photography.

From the Kerr-McGee Oil Company for quartering Mr. Wilson at their station on Breton Island.

Bennett G. Jones

Bennett G. Jones, Tech. Asst. to
Chief, Photogrammetry Division

December 23, 1959

COMPILATION REPORT
MISSISSIPPI DELTA, LOUISIANA
COMBINED PROJECTS 5903 and 20,000-819, Part 1
MAP NUMBERS T-10944 through 10957
BUREAU OF LAND MANAGEMENT NUMBERS 1 through 8
June 1961

1. The manuscripts were compiled by graphic methods at a scale of 1:20,000. The nine-lens photography afforded complete coverage for the area and the base maps (Project 5903) were compiled from this photography. The low-water line was delineated from the infrared photography described in the preceding field report. Color photography was used as an aid in interpreting the cultural features and in locating the aids to navigation and landmarks. Field inspection of the mean low-water line, apparent shoreline, and other features of the project was generally adequate for compilation.

2. The manuscripts were compiled in pencil in accordance with Method 2 of the standard compilation instructions except that the mean low-water line, the apparent shoreline, and some conjested cultural features were inked for clarity.

3. Control

The control was adequate as to identification, density and placement. However, the photographic coverage of the Southwest Pass strip was limited to one flight which caused weak intersections in tieing into the control along this Pass. A flight of the single-lens infrared photographs were therefore worked into the plot along Southwest Pass to provide stronger intersections of pass points and a stronger tie into the control. The positions of the centers of these single-lens photographs are shown on the manuscripts. After delineation of the manuscript of the Southwest Pass area (T-10957) geographic positions for two oil wells and tank battery near the mouth of the Pass that had been located by the plot were also obtained from oil companies in this area (See the letter attached to this report). These positions were plotted and fell on the correspondent features as delineated from the photogrammetric plot, thus substantiating the accuracy of the plot in this area.

4. Supplemental Data

Snapshots taken at the time of installation of the tide gauges were used to identify the position of the tide stations on the aerial photographs and thus for locating them on the manuscripts.

5. Drainage

The Delta is a vast marsh area including many small streams, bayous, and canals. Changes occur due to natural causes, that is, to the building up of the Delta, and to the oil development in the area which requires the dredging of many canals. Consequently, many of the ponds, bayous and small passes shown on existing charts are no longer there and new ones have been formed.

6. Shoreline

In delineating the apparent shoreline, no attempt was made to differentiate between the marsh and wild cane. The only actual mean high-water line on fast land is along the natural levees of the larger passes and along the artificial levees as explained in the field inspection report. There may be points in the marshes in the wild cane where the actual ground is above the plane of mean high water but no attempt was made on this project to dig these out. Nor could it be done accurately without an extensive scheme of tidal control.

7. Mean Low Water Line

The method of field inspecting the mean low-water line on infrared photographs is discussed in the field inspection report and no difficulty was encountered in transferring the field inspected mean low-water line to the manuscripts.

8. No field inspection of the mean low-water line was made for map T-10944 as this was outside of the interest of the Bureau of Land Management and State of Louisiana.

9. The infrared photography and field inspection of this photography for mapping the mean low-water line were done on the basis of preliminary mean low-water datums for the reasons stated in paragraph 6 of the field report. The final mean low water datums were 0.1 ft.

higher than the preliminary values at Jack Bay; Lonesome Bayou; South Pass; Joseph Bayou; and Southwest Pass. Consequently, in the areas controlled by these stations, the photographs were taken and were inspected at a slightly lower tide than anticipated at the time the work was done (tide stages of 0.1 to 0.2 feet below mean low water). In these areas the mean low-water line as inked on the field inspection photographs has been office inspected and adjusted slightly to the mean low water (0.0) position by stereoscopic study and comparison and interpolation between photographs taken at slightly different tide stages. This adjustment was done by Mr. B. G. Jones of the Washington Office who did much of the field inspection of the mean low water. The adjustments in the mean low-water line in these areas are shown in red pencil on the field inspection photographs.

10. Offshore Details

The mud lumps shown on T-10952 south of the entrance of North Pass were outside the 1:20,000 scale nine-lens photographic coverage. Positioning of these features was done by extending the radial plot with 1:15,000 scale nine-lens photographs and some 1:20,000 scale singel-lens infrared photographs. The south mud lumps also on T-10952 that fall just south of the area discussed above were positioned by extending the Reef and Hog Island (T-10944) shown on existing charts and maps no longer exists. The field inspection indicates detail in the approximate area as shifting shell banks.

11. Landmarks and Aids to Navigation

Two landmark towers namely Pass A Loutre radio tower and a tower at South Pass, could not be found on the photographs in the areas indicated by the field inspection and have not been mapped.

12. The group of private daybeacons or daymarkers now charted in Dennis Pass were not located. These are reported by the field inspection as temporary structures with the recommendation that they should be deleted from the charts. They are not onppiles but are supported.

13. Field Inspection Photographs

These photographs are filed in a locked file in the Office of Chief Division of Photogrammetry. Field Inspection Photos are administratively restricted. Not to be shown to or released to the public until released by the Bureau of Land Management

Lak for B G Jones

merely by stakes and are there for the convenience of the Freeport Sulpher Company.

13. Comparison with Nautical Charts

These maps show many changes when compared with Nautical Chart #1272 revised 8/24/59.

14. Geographic Names

The geographic names shown on the manuscripts were approved by the Geographic Names Section on 11/23/59.

15. Maps delivered to the Bureau of Land Management and the State of Louisiana

Eight maps from this project were especially prepared and printed for the Bureau of Land Management and the State of Louisiana. These are the maps around the rim of the Delta, numbers T-10948, T-10952, T-10956, T-10955, T-10954, T-10957, T-10953, and T-10949. The numbers shown on the specially prepared maps are numbers 1 to 8 inclusive and apply in the order of the preceding listing of C&GS numbers. Both sets of map numbers are shown on the diagram reference A.

16. The basic manuscripts were delivered to the Review and Edit Section for scribing. Upon completion of scribing, ozalid prints of each of the 8 maps mentioned in the preceding paragraph were forwarded to the Bureau of Land Management. That agency and representatives of the State of Louisiana then selected angle points, or turning points along the mean low-water line and indicated these on the ozalid prints which were then returned to the Coast and Geodetic Survey where the angle points were plotted on the maps and State Coordinates for each point scaled and checked. The printed maps for the Bureau of Land Management and State of Louisiana show these turning points with small black circles and show the coordinates of each point in red numerals. The work of scaling, plotting, checking and lettering the angle points was done cooperatively between the Compilation Section and the Review and Edit Section

17. At the date of this report, the maps have been delivered to the Bureau of Land Management with the exception of T-10952. This latter map was delivered but will be reprinted because of the omission of a mud lump on the eastern edge of the map. A separate set of negatives of

the 8 maps delivered to the Bureau of Land Management are to be held in a confidential file and copies from these negatives are not to be released to any person without prior authority from the Bureau of Land Management.

18. Pending registration of the maps on this project, all landmark information has been forwarded to the Nautical Chart Branch and the maps are available for chart revision except for the addition of the mean low-water line. It is understood that the mean low-water line information will be released by the committee in a short time.

Addendum, June 6, 1963: It appears that the only information that the "Committee" wants held confidential is the coordinate positions of angle points and the circled indicating angle points. Consequently, these maps have been prepared for registration by removing the angle points and positions of angle points from them. They will be registered without any restriction regarding distribution. They are the same as the originals except for the omission of the angle points, or turning points, and the omission of the coordinates of those points.

Compilation Report by:

Peter P. Battley Jr.
Peter P. Battley, Jr.
Chief, Graphic Compilation Unit

and

B. G. Jones
B. G. Jones, Tech. Asst. to
Chief, Photogrammetry Division

Approved by:

Charles Lemon
Chief, Photogrammetric Branch

Lowell G. Taylor
Chief, Nautical Charts Division

J. E. Waugh 11/15/63
Chief, Photogrammetry Division

Horace G. Conely
Chief, Operations Division

MISSISSIPPI RIVER DELTA
PROJECT PH-5903
PHOTOGRAMMETRIC PLOT REPORT
OCTOBER 1959

21. Area Covered

This radial plot comprises fourteen manuscripts covering the lower Mississippi River Delta. The surveys included are T-10944 thru T-10957.

22. Method

The plot was laid on vinylite base sheets with a Mississippi state grid ruled at 10,000-foot intervals.

The photographs used were nine-lens positype paper prints.

1958 Master calibration templet No. 57218 was used to prepare the templets.

The attached sketch shows photographs and control used in the plot.

In bridging this plot, a section was laid at the S.E. and N.W. extremeties, where the control was most plentiful. The area between was then bridge, maintaining scale thus achieved.

The photogrammetric pass points established by this plot for delineation were transferred from the base sheets to the manuscript.

23. Adequacy of Control

Twenty-eight triangulation stations and one three-point fix were used to control this plot. Two of these stations, BURAS MUNICIPAL TANK,1955 and TRIUMPH GULF RADIO MAST, 1955 were office-identified. The remainder were field-identified by two field parties, one in 1955, the other in 1959.

Some of the triangulation stations identified by the 1955 field party on 1954 and 1955 single-lens photography could not be identified on the 1958 nine-lens office photography. This necessitated additional field control identification in 1959. With this additional recovery, the control was considered adequate to bridge the plot.

Of the twenty-nine control points used in the plot, twenty-six held within 0.3mm. Three stations, RAIN 2, 1955 sub. pt., BAPTIST RMI, 1955 and UPPER CAVE LIGHT, 1955 did not hold and are discussed herein:

RAIN 2, 1955 sub. pt..... 0.4mm S. of plotted position. The physical feature-point of mud, appears as described, but this point is subject to change in position due to different degrees of inundation between time of photography and time of field identification.

BAPTIST RMI, 1955 ..... 0.4mm S.E. of plotted position. The point chosed by the field party could not be positively identified on the office prints and was subject to an error of this amount.

UPPER CAVE LIGHT, 1955 ..... 127mm N.W. of plotted position. The position listed for this station was unchecked. It is believed to be identified accurately and the radial plot position to be correct. A form 526 card discussing this discrepancy has been forwarded to Geodesy Division.

24. Supplemental Data

None.

25. Photography

The photography was adequate as to coverage, overlap and definition.

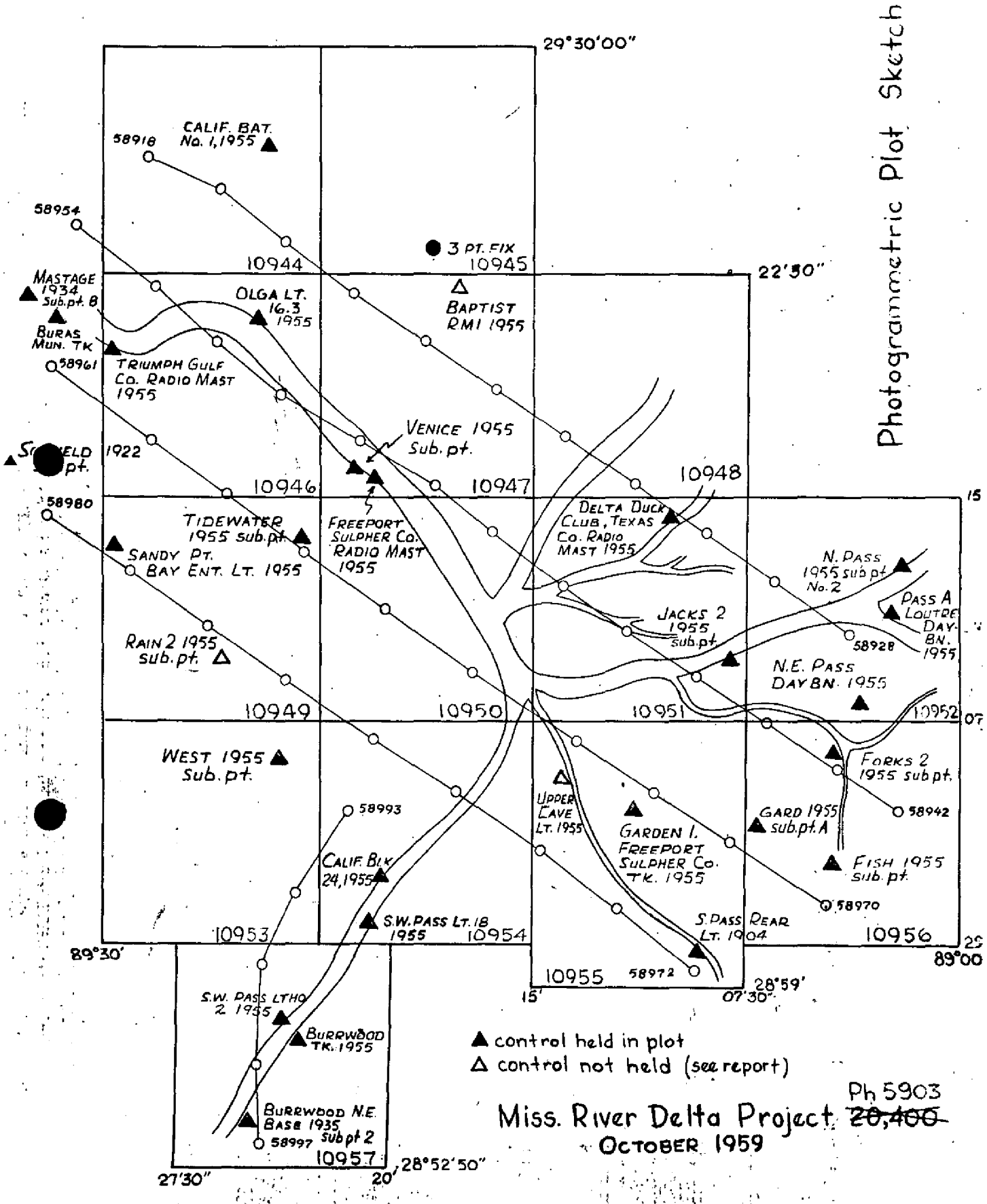
SUBMITTED BY:

Jeter P. Battley Jr

Jeter P. Battley, Jr.

APPROVED BY:

Everett H. Ramey
Chief, Graphic Unit


Photogrammetric Plot Sketch
29°30'00"
22'30"
CALIF. BAT. No. 1, 1955
58918
58954
3 PT. FIX
10944
10945
BAPTIST RMI 1955
MASTAGE 1934 Sub. pt. B
OLGA LT. 16.3 1955
BURAS MUN. TK
58961
TRIUMPH GULF CO. RADIO MAST 1955
VENICE 1955 Sub. pt.
1922
10946
10947
10948
58980
TIDEWATER 1955 sub. pt.
FREEPORT SULPHER CO. RADIO MAST 1955
DELTA DUCK CLUB, TEXAS CO. RADIO MAST 1955
SANDY PT. BAY ENT. LT. 1955
N. PASS 1955 sub pt No. 2
PASS A LOUTRE DAY. BN. 1955
JACKS 2 1955 sub. pt.
58928
RAIN 2 1955 sub. pt.
N.E. PASS DAY BN. 1955
10949
10950
10951
10952
WEST 1955 Sub. pt.
FORKS 2 1955 sub pt.
58993
UPPER CAVE LT. 1955
GARDEN I. FREEPORT SULPHER CO. TK. 1955
GARD 1955 sub. pt. A
58942
CALIF. BLK. 24, 1955
FISH 1955 sub. pt.
58970
S.W. PASS LT. 18 1955
S. PASS REAR LT. 1904
10953
10954
10956
89°30'
89°00
10955
58972
28°59'
07'30"
S.W. PASS LTHO 2 1955
BURRWOOD TK. 1955
BURRWOOD N.E. BASE 1935
58997 sub pt 2
10957
27'30"
20'
28°52'50"
▲ control held in plot
△ control not held (see report)
Ph 5903
Miss. River Delta Project 20,400
OCTOBER 1959

73/crj
6 November 1959

To: Mr. Joseph K. Wilson
Chief, Photo Party 720
Coast and Geodetic Survey
P. O. Box 1395
Fairhope, Alabama

Subject: Instructions, Field - Coordination of Low Water Photography and Low Water Verification - Mississippi Delta - Project 20,000-819

1. General Information

The Coast and Geodetic Survey is mapping the low water line of the Mississippi Delta Area for the Bureau of Land Management and the State of Louisiana on a reimbursable basis.

Tidal observations have progressed very well; accurate tidal planes can now be determined. Since infrared photography shows a positive contact line between water and land areas, infrared photographs will be taken at low water. The infrared low water line will be field verified and later delineated on Bureau maps T-10944 thru T-10957, Project FR-5903.

2. Assignment

The coordination of low water aerial photography to the actual tide staff readings and the related field verification of the low water line is assigned to your party. Mr. Emmett C. Jones, Technical Assistant to the Chief Photogrammetry Division, will arrive at New Orleans on 23 November and on the working grounds, Buras, Louisiana, on 25 November. You will meet Mr. Jones the evening of 28 November at Buras. Tide observations will start on 29 November and aerial photography on 30 November. All personnel and equipment of USS Franklin's Tide Party will be at the disposal of Mr. Jones. During these operations priority will be given to this phase and servicing of secondary tide stations will be postponed or as mutually agreed.

3. Methods

Two way radios will be furnished by Washington for coordinating the aerial photography with low water tide staff readings.

3. Methods continued

The verification and any clarification of the low water line that may be required on the infrared photographs shall be done in December and January. Details and methods will be worked out by Mr. Jones while on the working grounds and he will furnish oral instructions for that phase. The examination will probably be done by float plane or helicopter.

4. Travel and Per Diem Authorization

Employees in addition to the Chief of Party 720 and ENS Franklin's personnel may be required, and if so, they shall be drawn promptly as required from Party 720. Written orders will not be required for civilian personnel. Travel will be by government truck and the $7.00 per diem rate authorized to Tidal Parties in accordance with Chapter T-8 of the Bureau Finance Manual will prevail.

5. Cost Data

The salaries, per diem, travel to and from, and any other expenses incurred while executing this project shall be charged to Project 20,000-819. Care shall be exercised in computing travel roll vouchers so that the costs of other projects worked on during the reporting periods are properly separated. Vouchers should indicate the project numbers, the place, time, date and speedometer readings of departures and arrivals for each employee assigned to this duty.

6. Standby Orders

In the event of an enemy attack you will immediately contact your nearest District Officer and inform him of your mailing and telegraphic address and telephone number at which you can be reached and stand by for further instructions.

If the personnel on your party are needed to assist in Civil Defense activities during the survival phase of the emergency, you shall inform the District Officer and request his permission to assist the Civil Defense authorities. If he cannot be reached, you shall comply with the requests of Civil Defense authorities.

7. Receipt

Receipt of these instructions shall be acknowledged.

R B Roberts

Acting Assistant Director

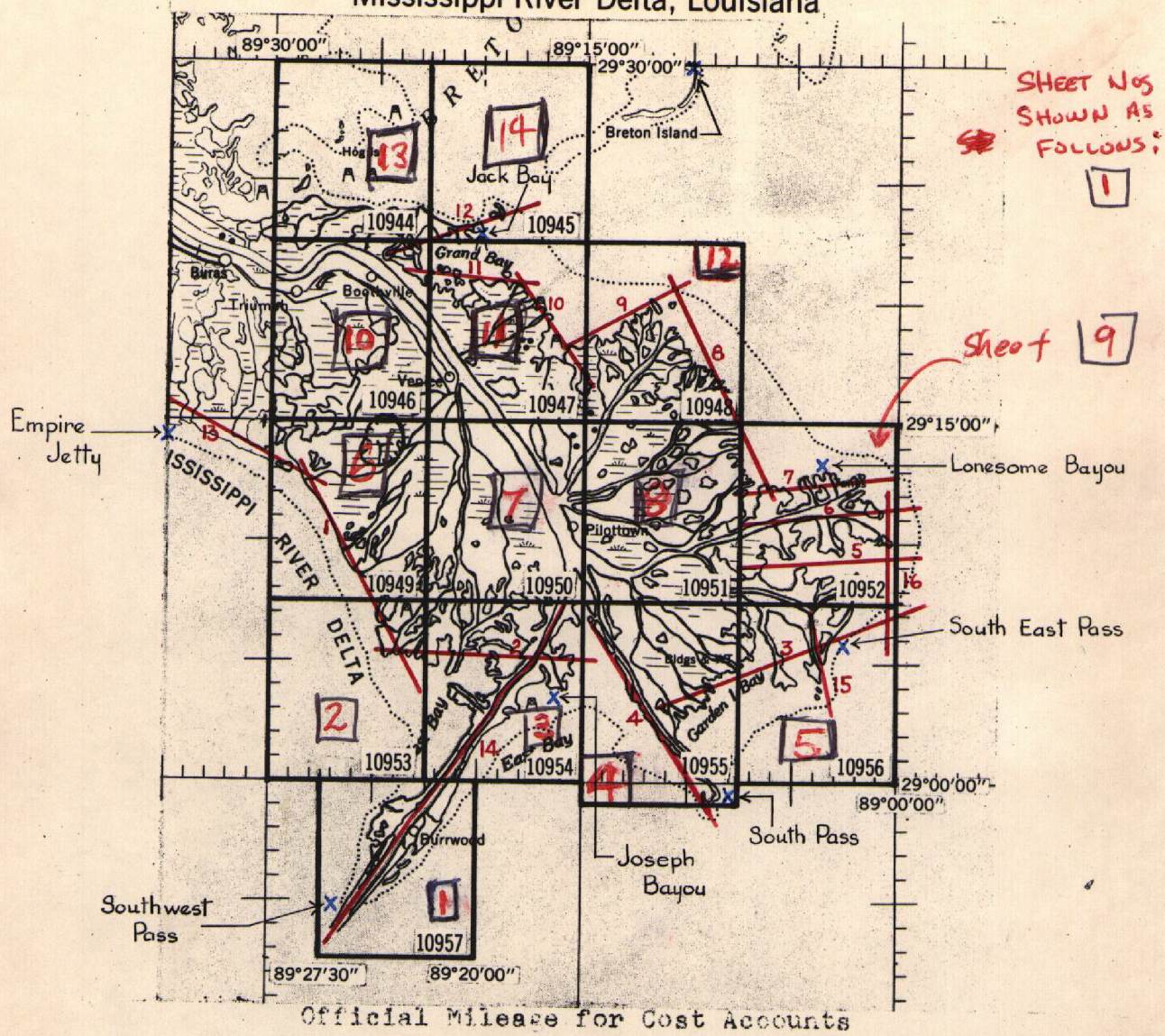
cc: 73-(2), 30, 50, 75, 702
NDO, Messrs. Reynolds, Wilson
ENS Franklin

PROJECT PH5903

~~Ref 2~~ Ref 1

Planimetric Mapping Scale 1:20,000

Mississippi River Delta, Louisiana



Official Mileage for Cost Accounts

Sheet Number	Area Sq. Mi.	Lin. Mi. Shoreline	Sheet Number	Area Sq. Mi.	Lin. Mi. Shoreline
10944	3	36	10951	24	117
10945	2	12	10952	8	94
10946	25	55	10953	6	27
10947	16	90	10954	14	128
10948	11	93	10955	14	109
10949	18	43	10956	4	45
10950	23	64	10957	3	42

TOTALS--- Area 171 Sq. Mi. Shoreline 955 Mi.

73/rrj
16 November 1959

To: Chief, Air Photo Mission No. 702
Coast and Geodetic Survey
Washington 25, D. C.

Subject: Instructions - Aerial Photography (No. 702-5903)

1. Purpose

These instructions are for aerial photography to be taken by Air Photo Mission No. 702 with aircraft contracted from Holladay-Aero, Inc., during the latter part of November and December 1959 and January 1960.

The air photo mission will be activated at this time for the single purpose of obtaining low water infrared photography of the Mississippi Delta Area, Project 20,000-819. Photography of airports and omni ranges is assigned in these instructions; it is of secondary importance and shall be taken enroute and during the periods when low water does not occur on Project 20,000-819.

2. Assignments

Photography shall be undertaken in accordance with flight maps furnished for projects as follows:

.01 Project 20,000-819, Mississippi Delta, Louisiana, shall be photographed with the infrared cone at low water and with anscochrome for location of aids to navigation. Approximately 190 lin. mi. of 1:10,000 scale and 150 lin. mi. of 1:20,000 scale infrared low water photography is required and approximately 80 lin. mi. of 1:10,000 scale color.

The New Orleans District Office has 5 rolls of infrared film for the assignment. Request additional infrared from Washington, if required. One roll of Anscochrome is available now and additional film is on order. If delivery is not made before your immediate need, you are authorized to complete the Anscochrome photography with monocolor plus X film. Observe for sun spot picture loss through the viewfinder before taking color photography. The color flight lines are in a general N-S direction and picture loss can be compensated for by adjusting the end lap. Sixty percent end lap shall be observed, if the sun spot penetrates into the picture ½" or less. A 75% end lap shall be observed if sun spot penetrates into 4½ inches (from edge to photo center) or more of the picture. A straight proration of end lap between 60% and 75° shall be used for penetrations between ½" and 4½"; for example, an end lap of 67½% would be applicable for a 2½" penetration.

Details regarding the purpose, specific requirements and coordination of the low water photography shall be observed as follows:

The purpose of the photography is to accurately map the mean low water line. The ideal will be photography taken at mean low water, zero tide. This may not be feasible for the entire project because of weather and time limitations. Consequently, photography taken at minus tides will be acceptable but this must be taken as near mean low water (zero) tides as possible. Photography taken at a stage of tide above mean low water will not be accepted.

The successful completion of this photography is extremely important since zero and minus tides will not again occur (to any appreciable extent) during photographic daylight until November 1960. The photography will be difficult because of marginal weather and the early morning occurrence of the lows.

Because of the expected marginal conditions, we must use every ingenuity to complete this photography:

(a) Flight lines may be broken as necessary.

(b) We think that shadows will not be a problem on most of this project, and it probably will be necessary to start photography as early in morning as possible, i.e., under minimum light conditions. The normal requirement of 30 degrees sun altitude may be ignored. The light will have to be determined by meter reading and shadows on the water line judged during flight. We think that photography can be started as early as 8:00 or 8:30 a.m. local time.

The time and stage of the tide will be recorded at 3 tide stations as shown on the flight map. The photography will be coordinated with the tides by observers on the stations at Empire Jetty, South Pass and Breton Island. Personnel assignments to these stations have tentatively been made as follows:

LTJG Franklin with launch 180	-	Empire Jetty
Mr. B. G. Jones or Mr. Wilson	-	South Pass
Mr. Wilson or member party 720	-	Breton Island

The tide observers will be posted one or two days prior to photography. The action of the tide on any day will indicate probabilities of a zero or minus tide the next day. This information will be telephoned from the South Pass Station to the Photo Mission based at New Orleans.

The photography will be controlled by radio communications between the aircraft and the tide observers. The tide observers will keep the Photo Mission informed of the staff readings and as to when the tide is at zero or minus stages.

The predicted time and duration of zero and minus tides are shown in the following table. These predictions will be affected by local wind conditions and may vary considerably from the observations. The table also shows the staff reading for mean low water (zero tide) at each station.

Except for a small area at north side of East Bay and the shoreline west of Main Pass, the zero and minus tides occur at about the same time over the entire project.

Photography must be undertaken at every opportunity and marginal photography reflown later if the opportunity occurs.

Flight layouts are furnished for both 1:20,000 and 1:10,000 photography. The 1:20,000 scale photography shall be taken at the first opportunity so as to secure the complete coverage as quickly as possible. Low altitude photography shall be next taken if weather conditions permit; this is desirable for interpretation of the low water line.

This photography is to be used for detailing and for limited radial plotting; not for bridging. Consequently, coverage of the shoreline indicated on the flight map at larger scales is acceptable in lieu of the 1:20,000 or 1:10,000 coverage. For example, it will be permissible to photograph under an overcast when it would be impossible to take photography at the exact scales stated above.

Assuming the 1:20,000 scale photography is taken first, the 1:10,000 scale photography (or low altitude) is at present assumed to be needed for the entire project for the purpose of more detailed interpretation of the shoreline and to insure photography as near as possible to exact low water. However, Mr. Jones will endeavor to fly and observe the low water line at the first opportunity, and, if possible, prior to photography. If interpretation of the low water line proves to be less difficult than we anticipate, he is authorized to limit the extent of large-scale coverage to something less than the entire project.

Predicted Times and durations of zero or minus Tides (90th Meridian Time)

Mean Low water on Tide Staff =	1 Empire Jetty 2.3		2 S.W. Pass 3.5		3 East Bay 2.3		4 South Pass 2.3		5 S.E. Pass 3.2		6 Lonesome Bayou 2.8		7 Jack Bay 1.8		8 Breton Island 2.6	
11-30-59	3:45	8:45	4:00	9:00	4:30	9:30	4:00	9:00	4:05	9:05	4:05	9:05	6:20	11:25	6:25	11:30
12-1-59	4:15	10:15	4:30	10:30	5:00	11:00	4:30	10:30	4:35	10:35	4:35	10:35	6:55	12:55	7:00	13:00
2	5:00	11:00	5:15	11:15	5:45	11:45	5:15	11:15	5:20	11:20	5:20	11:20	7:35	13:35	7:40	13:40
3	7:30	11:30	7:45	11:45	8:15	12:15	7:45	11:45	7:50	11:50	7:50	11:50	10:05	14:05	10:10	14:10
4	7:30	11:30	7:45	11:45	8:15	12:15	7:45	11:45	7:50	11:50	7:50	11:50	10:05	14:05	10:10	14:10
5	9:00	11:00	9:15	11:15	9:45	11:45	9:15	11:15	9:20	11:20	9:20	11:20	11:35	13:35	11:40	13:40
15	4:00	9:00	4:15	9:15	4:45	9:45	4:15	9:15	4:20	9:20	4:20	9:20	6:35	11:35	6:40	11:40
16	4:30	9:30	4:45	9:45	5:15	10:15	4:45	9:45	4:50	9:50	4:50	9:50	7:05	12:05	7:10	12:10
17	5:15	10:15	5:30	10:30	6:00	11:00	5:30	10:30	5:35	10:35	5:35	10:35	7:55	12:55	8:00	13:00
18	5:45	10:45	6:00	11:00	6:30	11:30	6:00	11:00	6:05	11:05	6:05	11:05	8:25	13:25	8:30	13:30
19	6:30	10:30	6:45	10:45	7:15	11:15	6:45	10:45	6:50	10:50	6:50	10:50	9:10	13:10	9:15	13:15
20	7:30	10:30	7:45	10:45	8:15	11:15	7:45	10:45	7:50	10:50	7:50	10:50	10:10	13:10	10:15	13:15
21	8:00	10:00	8:15	10:15	8:45	10:45	8:15	10:15	8:20	10:20	8:20	10:20	10:25	12:25	10:30	12:30
29	2:15	10:15	2:30	10:30	3:00	11:00	2:30	10:30	2:35	10:35	2:35	10:35	4:55	12:55	5:00	13:00
30	4:00	11:00	4:15	11:15	4:45	11:45	4:15	11:15	4:20	11:20	4:20	11:20	6:40	13:40	6:45	13:45
31	4:15	11:15	4:30	11:30	5:00	12:00	4:30	11:30	4:35	11:35	4:35	11:35	6:55	13:55	7:00	14:00
1-1-60	5:30	11:30	5:45	11:45	6:15	12:15	5:45	11:45	5:50	11:50	5:50	11:50	7:55	13:55	8:00	14:00
2	7:00	11:00	7:15	11:15	7:45	11:45	7:15	11:15	7:20	11:20	7:20	11:20	9:40	13:40	9:45	13:45
3	8:00	10:00	8:15	10:15	8:45	10:45	8:15	10:15	8:20	10:20	8:20	10:20	10:40	12:40	10:45	12:45
13	3:30	9:30	3:45	9:45	4:15	10:15	3:45	9:45	3:50	9:50	3:50	9:50	6:10	12:10	6:15	12:15
14	4:00	10:00	4:15	10:15	4:45	10:45	4:15	10:15	4:20	10:20	4:20	10:20	6:40	12:40	6:45	12:45
15	5:00	10:00	5:15	10:15	5:45	10:45	5:15	10:15	5:20	10:20	5:20	10:20	7:40	12:40	7:45	12:45
16	5:15	10:15	5:30	10:30	6:00	11:00	5:30	10:30	5:35	10:35	5:35	10:35	7:55	12:55	8:00	13:00
17	6:00	10:00	6:15	10:15	6:45	10:45	6:15	10:15	6:20	10:20	6:20	10:20	8:40	12:40	8:45	12:45
18	6:45	9:45	7:00	10:00	7:30	10:30	7:00	10:00	7:05	10:05	7:05	10:05	9:25	12:25	9:30	12:30
27	2:00	10:00	2:15	10:15	2:45	10:45	2:15	10:15	2:20	10:20	2:20	10:20	4:40	12:40	4:45	12:45
28	3:15	10:15	3:30	10:30	4:00	11:00	330	10:30	3:35	10:35	3:35	10:35	5:55	12:55	6:00	13:00

* Photography in vicinity of Main Pass (see area bracketed on flight map) will be Photographed twice; once on time of tide at Jack Bay and once on time of tide at Lonesome Bayou.

BET

.02 Airports and Omni Ranges in States as follows:

State	Airport Project 30,100 = "O" 30,200 = "R"	Omni Project 40,000-826	Priority	Scale	Min. Width Line
Kentucky					
	Louisville "R"		2	1:24,000	10
Louisiana					
		Thibodaux	2	1:30,000	15
	Baton Rouge "R"		3	1:30,000	30
Maryland					
	Cumberland "O"		3	1:30,000	20
Massachusetts					
	Boston "R"		3	1:30,000	25
Mississippi					
	Jackson "R"		3	1:30,000	25
North Carolina					
	Winston Salem "R"		3	1:30,000	30
		Pinehurst	2	1:30,000	25
	Rocky Mount "R"		3	1:30,000	15
	New Bern "R"		2	1:30,000	20
New Jersey					
	Newark "R"		2	1:30,000	35
	Teterboro "R"		2	1:30,000	35
Ohio					
	Columbus "R"		2	1:36,000	25
	Mansfield "R"		2	1:30,000	30
Pennsylvania					
	Erie "R"		2	1:30,000	20
	Pittsburgh "R"		2	1:30,000	30
	Allentown "R"		2	1:30,000	35
	Reading "R"		2	1:30,000	15
South Carolina					
		Holly Hill	2	1:30,000	20
	Columbia "R"		3	1:30,000	35
Virginia					
	Roanoke "R"		2	1:30,000	25
	Norfolk "R"		3	1:24,000	30

State	Airport Project 30,100 = "O" 30,200 = "R"	Omni Project 40,000-826	Priority	Scale	Lin. Flight Line
West Virginia					
	Parkersburg "R"		3	1:30,000	25
	Wheeling "R"		3	1:30,000	30
	Charleston "R"		2	1:30,000	35
	Elkins "R"		3	1:30,000	40
	Bluefield "R"		3	1:24,000	20
	Beckley "R"		3	1:24,000	15
	Huntington "R"		2	1:30,000	25

.03 Project 20,000-818 - Dulles Airport, Chantilly, Va., photograph for controlled mosaic with plus X film, 1:24,000 scale. 40 Lin. Mi. flight line - Priority 2.

3. Schedule

The schedule for aerial photography of the Mississippi Delta Area is fixed by the tides, see table. The scheduling of the remaining photography is flexible. It shall be taken up in any order that offers maximum efficiency in operation without interfering with the Delta Project.

4. Basic Instructions

All photography shall be taken with the Wild camera equipment. Photography shall be taken in accordance with Section 24 of the Topographic Manual Part II, except that the end lap shall be increased from 60 to 64% as a safety precaution. Test prints need not be processed in the field. However, you will be required to forward film to Washington promptly for processing so that you can be informed of its quality.

5. Liaison with Washington Office and District Offices

In order that supplemental instructions can be forwarded, you will keep the Washington Office informed by telegraph as to your location, movements and accomplishments. Also, contact each District Officer when you arrive in his district, informing him of your address and proposed schedule.

6. Reports

In addition to the usual routine reports, you will report weekly by air mail all factors which affect your day-to-day activities, movements and accomplishments. These reports shall be summarized monthly and forwarded to Washington in time to arrive the first of each month.

7. Standby Emergency Orders

In the event of an enemy attack you will immediately contact your nearest District Officer and inform him of your mailing andtelegraphic address and a telephone number at which you can be reached and stand by for further instructions.

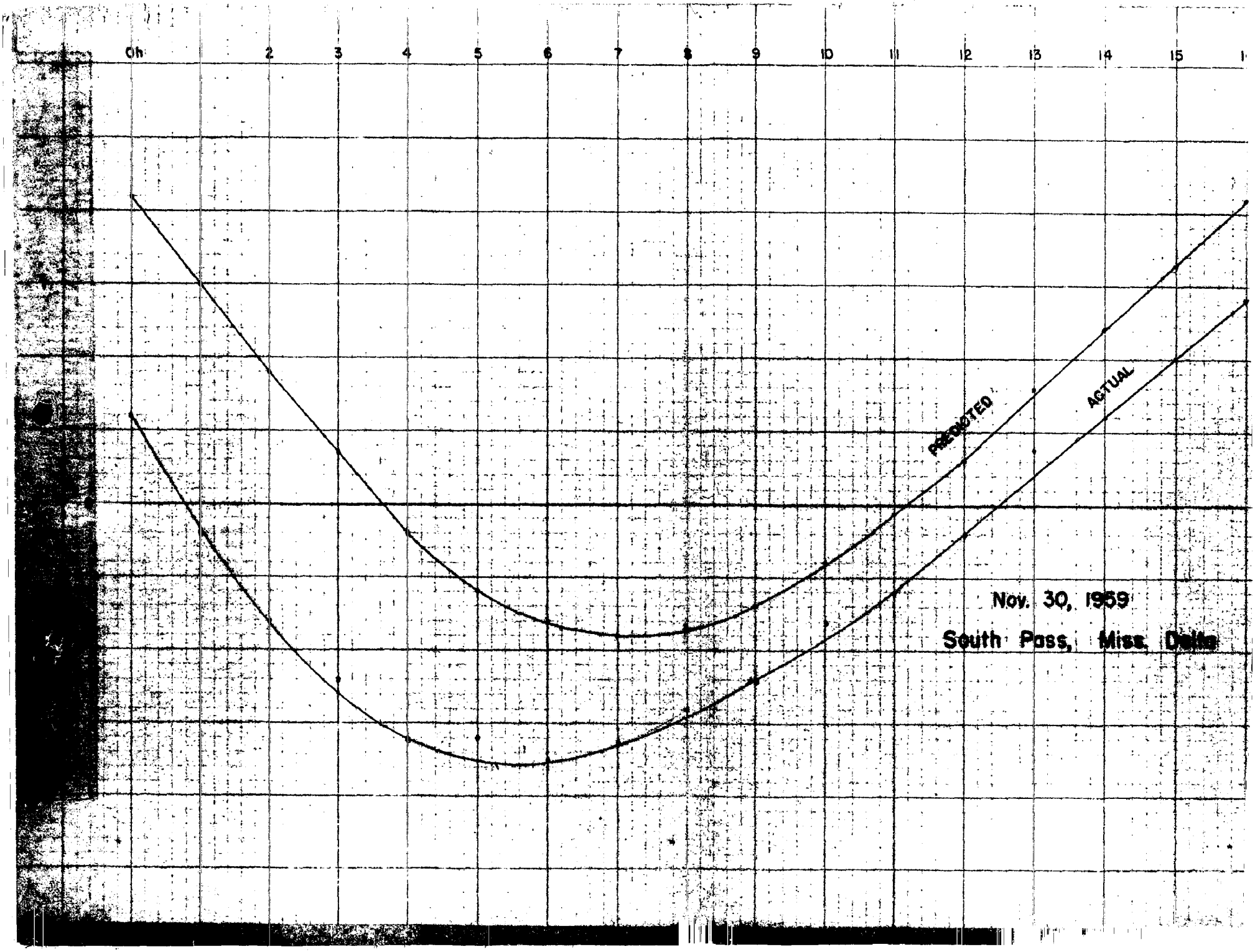
If the personnel on your party are needed to assist in Civil Defense activities during the survival phase of the emergency, you shall inform the District Officer and request his permission to assist the Civil Defense authorities. In the event the District Officer cannot be reached, you shall comply with the requests of Civil Defense authorities.

8. Receipt of Instructions

Receipt of these instructions shall be acknowledged.

R B Roberts
Acting Assistant Director

cc: All District Officers
LTJG Franklin
6 of P 720
20, 30, 40, 50, 72, 75,
76, 77, 733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PREDICTED
ACTUAL
Nov. 30, 1959
South Pass, Miss. Delta

Reference f

Flight Line	Photo Numbers	1434 date	Time	Tide station	Gauge Reading	M.L.W. on Gauge	Stage of Tide
7	8638 - 45	11/30	11 15	L. Bayou	2.4	2.8	-0.4
7	~~8885 - 92~~	12/1	2:02		2.7	"	-0.1
8	8647 - 61	11/30	11:30	L. Bayou	2.4	2.8	-0.4
				J. Bay	1.2	1.8	-0.6
8	8767 - 82	11/30	13:30	L. Bayou	2.8	2.8	0.0
				J. Bay	1.6	1.8	-0.2
8	8873 - 83	12/1	11:52	L. Bayou	2.6	2.8	-0.2
				J. Bay	1.2	1.8	-0.6
8	8936 - 46	12/1	14 46	L. Bayou	3.2	2.8	+0.4
				J. Bay	1.7	1.8	-0.1
9	8663 - 69	11/30	11:41	J. Bay	1.2	1.8	-0.6
				L. Bayou	2.5	2.8	-0.3
9	8927 - 33	12/1	14:37	J. Bay	1.7	1.8	-0.1
				L. Bayou	3.1	2.8	+0.3
9	9044 - 50	12/3	13:14	J. Bay	1.6	"	-0.2
				L. Bayou	2.9	2.8	+0.1
10	8671 - 78	11/30	11:52	J. Bay	1.3½	1.8	-0.5
10	8920 - 25	12/1	14:30	"	1.7½	"	-0.1
10	9052 - 58	12/3	13:27	"	1.6½	"	-0.2
11	8910 - 18	12/1	14:22	"	1.7½	"	-0.1
11	9060 - 67	12/3	13.86		1.6½		-0.2
~~12~~	~~8829 - 36~~	~~11/30~~	~~14 15~~	"	1.6		0.0
12	9069 - 75	12/3	13:45	"	1.6½		-0.2

Reference 4

Flight Line	Photo Numbers	1959 date	Time	Time Station	Gauge Reading	M.L.W. Gauge	Time of Time
13	8592 - 98	11/30	10:35	E. Jetty	1.6 ✓	2.3	-0.7
13	8894 - 8900	12/1	12:16	"	2.2 ✓	"	-0.1
1	8600 - 12	11/30	10 46	"	1.6 ✓	"	-0.7
				S.W. Pass	3.23.2	3.5	-0.3
1	9029 - 42	12/3	13:02	E. Jetty	1.9 ✓	2.3	-0.4
				S.W. Pass	3.3/3.3	3.5	-0.2
2	8703 - 13	11/30	12.30	E. Jetty	2.3 ✓	2.2	+0.1
				J. Bayou	2.5 ✓	2.3	+0.2
2	8991 - 9003	12/3	12 24	[illegible]	[illegible] ✓	[illegible]	-0.2
				J Bayou	2.0 ✓	2.3	-0.3
4	8715 - 29	11/30	12 44	J Bayou	2.5 ✓	2.3	+0.2
				S Pass	2.4 ✓	2.3	+0.1
4	8977 - 89	12/3	12 15	J Bayou	2.0 ✓	2.3	-0.3
				S Pass	2.3 ✓	2.3	0.0
3	8781 - 50	11/30	12.57	S Pass	2.5 ✓	2.3	+0.2
				SE Pass	3.2	3.2	0.0
3	8845 - 62	12/1	11 30	S. Pass	2.1	2.3	-0.2
				SE Pass	2.9 ✓	3.2	-0.3
15	8752 - 67	11/30	13:10	SE Pass	3.3/3.3	3.2	+0.1
15	8858 - 43	12/1	11:20	"	2.9 ✓	3.2	-0.3
16	8759 - 65	11/30	13:18	"	3.3 ✓	3.2	+0.1
16	8864 - 71	12/1	11:41	"	3.0 ✓	3.2	-0.2
5	8614 - 25	11/30	11:01	"	2.8/2.9	"	-0.3
6	8627 - 36	11/30	11:08	"	2.9 ✓	"	-0.3
14	8680 - 8701	11/30	12:17	2nd Pass	3.5 ✓	3.5	0.0
14	9005 - 9012	12/3	12:45	"	3.2 ✓	3.5	-0.3

Reference a.

PHOTOGRAPHY						Field Inspection			
PHOTO	DATE	TIME	GAGE	STAFF	PHASE	DATE	TIME	STAFF	PHASE
8900	1-12-59	12:16	EMR.J.	2.2	-0.1	15-12-59	08:50	2.4	+0.1
8898	1-12-59	12:16	EMR.J.	2.2	-0.1	15-12-59	08:55	2.4	+0.1
8896	1-12-59	12:16	EMR.J.	2.2	-0.1	15-12-59	09:00	2.4	+0.1
8895	1-12-59	12:16	EMR.J.	2.2	-0.1	15-12-59	09:10	2.4	+0.1
8604	30-11-59	10:46	EMR.J.	1.6	-0.1	15-12-59	09:20	2.4	+0.1
8606	30-11-59	10:46	EMR.J.	1.6	-0.1	15-12-59	09:25	2.4	+0.1
8607	30-11-59	10:46	EMR.J.	1.6	-0.1	15-12-59	09:35	2.4	+0.1
8608	30-11-59	10:46	EMR.J.	1.6	-0.1	15-12-59	09:40	2.4	+0.1
8609	30-11-59	10:46	EMR.J.	1.6	-0.1	15-12-59	09:45	2.4	+0.1
8703	30-11-59	12:30	EMR.J.	2.3	0.0	18-12-59	08:16	3.6	+0.1
8705	30-11-59	12:30	EMR.J.	2.3	0.0	18-12-59	08:18	3.6	+0.1
8707	30-11-59	12:30	EMR.J.	2.3	0.0	18-12-59	08:20	3.6	+0.1
[illegible]08	30-11-59	12:30	EMR.J.	2.3	0.0	18-12-59	08:22	3.6	+0.1
8688	30-11-59	12:17	S.W.P.	3.5	0.0	18-12-59	08:24	3.6	+0.1
8690	30-11-59	12:17	S.W.P.	3.6	0.0	18-12-59	08:26	3.6	+0.1
8692	30-11-59	12:17	S.W.P.	3.5	0.0	18-12-59	08:28	3.6	+0.1
694	30-11-59	12:17	S.W.P.	3.5	0.0	18-12-59	08:30	3.6	+0.1
8696	30-11-59	12:17	S.W.P.	3.5	0.0	18-12-59	08:32	3.6	+0.1
8698	30-11-59	12:17	S.W.P.	3.6	0.0	18-12-59	08:34	3.6	+0.1
8698	30-11-59	12:17	S.W.P.	3.5	0.0	18-12-59	09:05	3.6	+0.1
8696	30-11-59	12:17	S.W.P.	3.5	0.0	18-12-59	09:03	3.6	+0.1
8694	30-11-59	12:17	S.W.P.	3.5	0.0	18-12-59	09:02	3.6	+0.1
8692	30-11-59	12:17	S.W.P.	3.5	0.0	18-12-59	09:01	3.6	+0.1
[illegible]90	30-11-59	12:17	J.BAYOU	2.4	+0.1	18-12-59	08:59	2.2	-0.1
8689	30-11-59	12:17	J.BAYOU	2.4	+0.1	18-12-59	08:57	2.2	-0.1
[illegible]688	30-11-59	12:17	J.BAYOU	2.4	+0.1	18-12-59	08:55	2.2	-0.1
[illegible]86	30-11-59	12:17	J.BAYOU	2.4	+0.1	18-12-59	08:53	2.2	-0.1
8694	3-12-59	12:24	J. BAYOU	2.0	-0.3	20-12-59	09:45	2.2	-0.1
8993	3-12-59	12:24	J. BAYOU	2.0	-0.3	20-12-59	09:50	2.2	-0.1
8991	3-12-59	12:24	J. BAYOU	2.0	-0.3	20-12-59	09:55	2.2	-0.1
8981	3-12-59	12:15	J. BAYOU	2.0	-0.3	20-12-59	09:58	2.2	-0.1
8983	3-12-59	12:15	J. BAYOU	2.0	-0.3	20-12-59	10:00	2.2	-0.1
8985	3-12-59	12:15	S. PASS	2.3	0.0	19-12-59	09:05	2.3	0.0
8987	3-12-59	12:15	S. PASS	2.3	0.0	19-12-59	09:07	2.3	0.0
8989	3-12-59	12:15	S. PASS	2.3	0.0	19-12-59	09:08	2.3	0.0
8727	30-11-59	12:44	S. PASS	2.4	+0.1	19-12-59	09:10	2.3	0.0
8733	30-11-59	12:57	SE PASS	3.2	0.0	6-12-59	11:40	3.1	-0.1
734	30-11-59	12:57	SE PASS	3.2	0.0	6-12-59	11:35	3.1	-0.1
8736	30-11-59	12:57	SE PASS	3.2	0.0	6-12-59	11:30	3.1	-0.1
8737	30-11-59	12:57	SE PASS	3.2	0.0	6-12-59	11:20	3.1	-0.1
8738	30-11-59	12:57	SE PASS	3.2	0.0	6-12-59	11:19	3.1	-0.1
8754	30-11-59	13:10	SE PASS	3.2	0.0	6-12-59	11:10	3.1	-0.1

PHOTO	DATE	TIME	GAGE	STAFF	PHASE	DATE	TIME	STAFF	PHASE
8756	30-11-59	13:10	SE PASS	3.2	0.0	6-12-59	11:05	3.1	-0.1
8741	30-11-59	12:57	SE PASS	3.2	0.0	5-12-59	09:05	3.1	-0.1
8743	30-11-59	12:57	SE PASS	3.2	0.0	5-12-59	09:10	3.1	-0.1
8744	30-11-59	12:57	SE PASS	3.2	0.0	5-12-59	09:12	3.1	-0.1
8747	30-11-59	12:57	SE PASS	3.2	0.0	5-12-59	09:45	3.1	-0.1
8748	30-11-59	12:57	SE PASS	3.2	0.0	5-12-59	09:45	3.1	-0.1
8619	30-11-59	11:01	SE PASS	2.8	-0.4	19-12-59	08:25	2.9	-0.3
8632	30-11-59	11:08	SE PASS	2.9	0.3	19-12-59	08:30	2.9	-0.3
8617	30-11-59	11:01	SE PASS	2.8	-0.4	19-12-59	08:35	2.9	-0.3
8[illegible]6	1-12-59	11:41	SE PASS	3.0	-0.2	19-12-59	08:12	2.9	-0.3
8[illegible]8	1-12-59	11:41	SE PASS	3.0	-0.2	19-12-59	08:15	2.9	-0.3
8869	1-12-59	11:41	SE PASS	3.0	-0.2	19-12-59	08:20	2.9	-0.3
[illegible]8	30-11-59	11:08	SE PASS	2.9	-0.3	5-12-59	09:30	3.1	-0.1
[illegible]9	1-12-59	12:02	L. BAYOU	2.7	-0.1	14-12-59	09:12	2.7	-0.1
8887	1-12-59	12:02	L. BAYOU	2.7	-0.1	14-12-59	09:23	2.7	-0.1
8875	1-12-59	11:52	L. BAYOU	2.6	-0.2	14-12-59	09:30	2.7	-0.1
749	30-11-59	13:30	L. BAYOU	2.8	0.0	14-12-59	09:32	2.7	-0.1
8171	30-11-59	13:30	L. BAYOU	2.8	0.0	5-12-59	10:05	2.8	0.0
8946	1-12-59	14:46	L. BAYOU	3.2	+0.4	5-12-59	10:05	2.8	0.0
8773	30-11-59	13:30	L. BAYOU	2.8	0.0	5-12-59	10:17	2.8	0.0
8774	30-11-59	13:30	L. BAYOU	2.8	0.0	5-12-59	10:20	2.8	0.0
8776	30-11-59	13:30	L.B & J.B.	2.8 - 1.6	00(-0.1)^{02}	14-12-59	09:55	2.7 - 1.6	$^{-01}(-0.1)^{02}$
8778	30-11-59	13:30	L.B. & J.B.	2.8 - 1.6	00(-0.1)^{02}	14-12-59	10:00	2.7 - 1.6	$^{-01}(-0.1)^{02}$
8[illegible]0	30-11-59	13:30	L.B. & J.B.	2.8 - 1.6	00(-0.1)^{02}	14-12-59	10:20	2.7 - 1.6	$^{-01}(-0.1)^{02}$
9049	3-12-59	13:14	JACK BAY	1.6	-0.2	20-12-59	10:50	1.9	+0.1
9048	3-12-59	13:14	JACK BAY	1.6	-0.2	20-12-59	10:54	1.9	+0.1
[illegible]6	3-12-59	13:14	JACK BAY	1.6	0.2	20-12-59	10:58	1.9	+0.1
8923	1-12-59	14:30	JACK BAY	1.1	-0.1	20-12-59	11:02	1.9	+0.1
8922	1-12-59	14:30	JACK BAY	1.7	-0.1	20-12-59	11:04	1.9	+0.1
8921	1-12-59	14:30	JACK BAY	1.7	-0.1	20-12-59	11:08	1.9	+0.1
8911	1-12-59	14:22	JACK BAY	1.7	-0.1	20-12-59	11:12	1.9	+0.1
8913	1-12-59	14:22	JACK BAY	1.7	-0.1	20-12-59	11:15	1.9	+0.1
8915	1-12-59	14:22	JACK BAY	1.7	-0.1	20-12-59	11:17	1.9	+0.1
8916	1-12-59	14:22	JACK BAY	1.7	-0.1	14-12-59	11:35	1.[illegible]7	[illegible]
8917	1-12-59	14:22	JACK BAY	1.7	-0.1	14-12-59	11:45	1.8	0.0
8902	1-12-59	14:14	JACK BAY	1.6	-0.2	14-12-59	12:00	1.8	0.0
8904	1-12-59	14:14	JACK BAY	1.6	-0.2	14-12-59	12:10	1.8	0.0
[illegible]906	1-12-59	14:14	JACK BAY	1.6	-0.2	14-12-59	12:20	1.8	0.0

[illegible] 8619 to 8[illegible] [illegible] on 20 Dec. 1959 between 10:12 and 10:25
[illegible] Jack Bay and Lonesome Bayou

Chief, Division of Photogrammetry
Coast & Geodetic Survey
Washington 25, D.C.
(Att'n: Mr. B.G. Jones)

DATA AS LISTED BELOW WERE FORWARDED TO YOU BY (Check):

☐ ORDINARY MAIL ☐ AIR MAIL ☐ EXPRESS

☒ REGISTERED MAIL ☐ G.B.L. (Give number) _____

DATA WERE FORWARDED (Date)

2 January 1959

(NOTE - A separate transmittal letter is to be used for each type of data, as tidal data, seismology, geomagnetism, etc. Show the number of packages and include an executed copy of the transmittal letter in each package. In addition the original and one copy of the letter should be sent under separate cover. The copy will be returned as a receipt. This form should not be used for correspondence or for transmitting accounting documents.)

Project Ph-5903
Mississippi River Delta

74 - Single-lens contact field photographs Nos: 59-L-8604, 8606, thru 8609, 8617, 8619, 8628, 8672, 8686, 8688 thru 8690, 8692, 8694, 8696, 8698, 8703, 8705, 8707, 8708, 8727, 8733, 8734, 8736 thru 8738, 8741, 8743, 8744, 8747, 8748, 8754, 8755, 8769, 8771, 8773, 8774, 8776, 8778, 8780, 8866, 8868, 8869, 8875, 8887, 8889, 8895, 8896, 8898, 8900, 8902, 8904, 8906, 8911, 8913, 8915, 8916, 8917, 8921, 8922, 8923, 8946, 8981, 8983, 8985, 8987, 8989, 8991, 8993, 8994, 9046, 9048 and 9049.
1 - Tabulation(listing low-water photos etc.)
1 - Tablet(Rough field notes)
1 - Chart 1272(with photo index)
1 - Field book

Joseph K. Wilson
Joseph K. Wilson
(Signature)

Chief, Photo Party 720
Division or Party

Location

Sent To Mr. Jones

JAN 6 - 1959

RECEIVED THE ABOVE

NAME M.C. Brown RJV
Chief, Operations Branch
Determination Division

TITLE

COLOR PHOTOS WHICH HAVE INKED NOTES

8503
8504
8506
8508
8514
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8633
8637
8639
8640
8645
8648
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8654
8663
8672
8675
8682

Oil wells in East Bay on Infra Red Photos Nos.

9081

9082

9084

9086

See also the following I.R. photos not listed in reference A

59 L 8768, ~~876~~ 9031, 9058, 9081, 9082, 9084, 9086, 9096, 9098, 9114, 9115 9116, 9174, 9181

In mapping oil wells in water (off the shoreline) use the infra Red photos taken Dec. 7, 1959

BJG

The following legend will be found on the mean low-water field inspection photographs and is recorded in the field note book.

1. Small grass clump - mean low water is around outer edge.
2. Small bare mean low-water spot (mud or shell--no grass)
3. Clump of wild cane - mean-low water line is just inside the edge of the cane. ✓

U.S. DEPARTMENT OF COMMERCE
COAST AND GEODETIC SURVEY

REFERENCE NO.

LETTER TRANSMITTING DATA

DATE

25 January 1960

TO:

Chief, Division of Photogrammetry
Coast & Geodetic Survey
Washington 25, D.C.

DATA AS LISTED BELOW WERE FORWARDED TO YOU BY (Check):

☐ ORDINARY MAIL ☐ AIR MAIL ☐ EXPRESS

☒ REGISTERED MAIL ☐ G.B.L. (Give number)

DATA WERE FORWARDED (Date)

25 January 1960

(NOTE - A separate transmittal letter is to be used for each type of data, as tidal data, seismology, geomagnetism, etc. State the number of packages and include an executed copy of the transmittal letter in each package. In addition the original and one copy of the letter should be sent under separate cover. The copy will be returned as a receipt. This form should not be used for correspondence or for transmitting accounting documents.)

Mississippi River Delta
Project Ph-7903

29 - Nine-lens field photographs Nos:
58918 thru 58920
58922,58923,58925,58927,58928,58962,58963,58964,58965,58966,58967,58968
58944,58946,58949,58950,58952,58953, 58972,58975,58976,58977
58978, 58994,58995,58996,59050

7 - uncut nine-lens photographs Nos:
58924,58926,~~58927~~,~~58947~~,~~58948~~,~~58979~~,~~59049~~

1 - Map of Delta National Refuge

7 - Form 526(duplicate)

X No F.I. Notes

2 pages "567" to be charted
1 pages 567 to be deleted
7 pages 567 Aids to be charted

Joseph K. Wilson
Joseph K. Wilson
(Signature)

Sent to 711

Chief, Photo Party 720
Division or Party

Location

JAN 29 1960 R.I.C.

RECEIVED THE ABOVE | NAME | TITLE

M R Grover
Chief, Operations Report
Photogrammetry Division

USCOMM-DC 27024

REPRINT
from the

INTERNATIONAL HYDROGRAPHIC REVIEW

Vol. XXXVIII, N° 1, January 1961

MAPPING THE LOW-WATER LINE OF THE MISSISSIPPI DELTA

by Bennett G. JONES and William SHOFNOS
United States Coast and Geodetic Survey

NOTE ON AUTHORS

Mr. William SHOFNOS, a native Washingtonian, graduated from the University of Maryland in 1924 with a B. S. degree in Civil Engineering. He also attended Georgetown Law School and received his LL. B. degree in 1929 and has been a member of the District of Columbia Bar since 1929. Mr. SHOFNOS entered the Coast and Geodetic Survey as a mathematician in 1925, assigned to the Division of Geodesy. In 1931 he was transferred to Tides and Currents Division and is at present the Chief of the Tides Branch. He is a member of the American Congress on Surveying and Mapping, American Geophysical Union, Washington Society of Engineers, and Tau Beta Pi Fraternity.

Mr. Bennett G. JONES is the Technical Assistant to the Chief, Photogrammetry Division, Coast and Geodetic Survey. He was graduated from the Virginia Military Institute with a degree in Civil Engineering in 1925 and has been with the Coast and Geodetic Survey since July 1925. He was employed on coastal field surveys until 1931 when he was assigned to the Photogrammetric Section in the Washington Office. Since then his major interest has been the application of photogrammetric surveys to the Bureau's aeronautical and nautical charting program.

INTRODUCTION

The Submerged Lands Act of 1953 (Public Law 31) which confirms and establishes titles of the States to lands beneath navigable waters within their *historic boundaries* has again brought into focus the importance of adequate tidal-boundary determinations. The Act stipulates that the base-line for the measurement of seaward boundaries of the states where no indentations exist is the *line of ordinary low water*. The term *ordinary low water* lacks the technical precision that is required in the establishment of tidal boundaries. However, *ordinary low water* where used is usually considered to be synonymous with mean low water.

The establishing of boundaries determined by the course of the tides involves two engineering aspects : a vertical one predicated on the height reached by the tide during its vertical rise and fall and constituting a tidal plane; and a horizontal one relating to the line where the tidal plane intersects the shore to form the boundary desired. The first is derived from tidal observations alone and once derived (on the basis of long-period observations) is for all practical purposes a permanent one. The second is

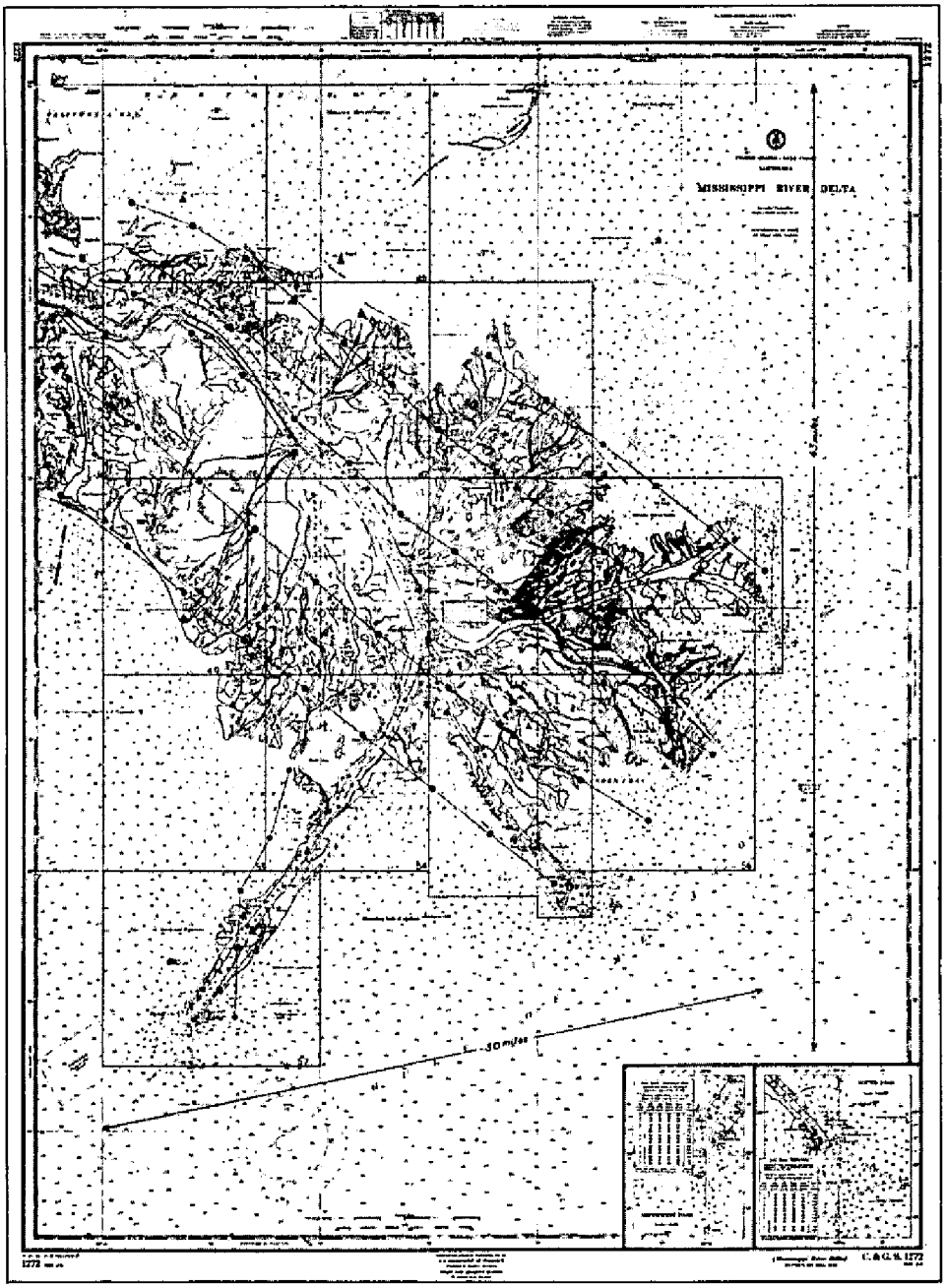

Fig. 1. — Project diagram showing layout, nine-lens photographs, and control stations.

dependent on the first and can be determined therefrom by leveling from tidal benchmarks, or by photographing the shore at the proper instant of the tidal cycle, i.e., at mean low water, or mean high water, etc. The boundary line thus determined and mapped on the national horizontal datum is permanently recorded in horizontal position as the boundary on the specific date of the survey. However, this boundary, the actual line on the

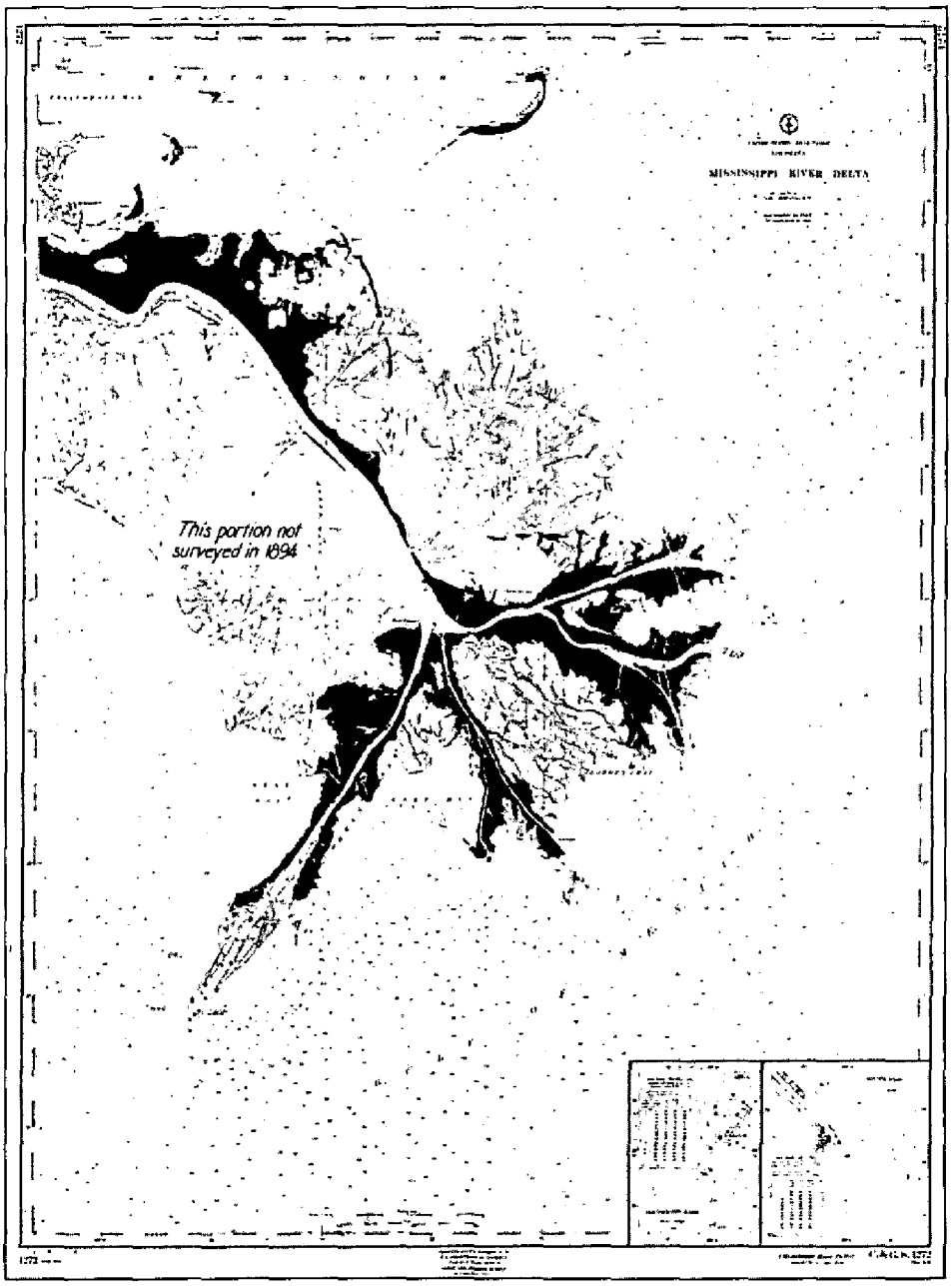

Fig. 2. — Comparison of 1894 and current nautical charts.

ground, is subject to change by erosion, accretion, and the works of man.

This paper describes the application of modern methods of infrared photography and photogrammetry to mapping of the mean-low-water line of the Mississippi Delta country where ground survey methods are prohibitively difficult and expensive because of the swampy character of the terrain. Of particular interest are the tidal characteristics of this area and

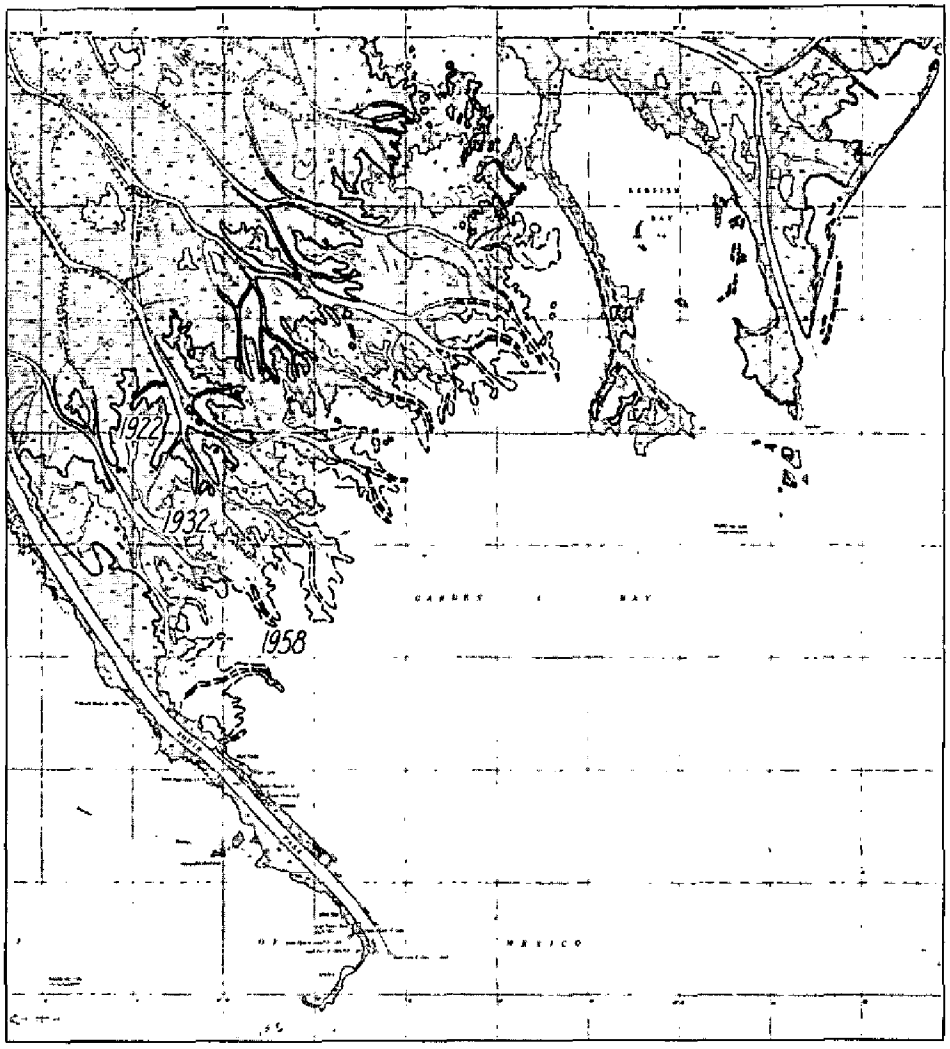

Fig. 3. — Comparison of shoreline from 1922, 1932, and 1958 surveys.

the facility with which the low-water contour is captured by the infrared photography even in extremely shallow and muddy waters.

This is a cooperative project between the Coast and Geodetic Survey, the Federal Bureau of Land Management, and the State Mineral Board of the State of Louisiana. The purpose of the project is to provide additional basic tidal data and up-to-date planimetric maps for revision of Coast and Geodetic Survey nautical charts; and to provide the Bureau of Land Management and the State of Louisiana with a special set of these maps showing the mean-low-water line and the coordinates of turning points selected along that line by the State of Louisiana and the Bureau of Land Management. The maps from this project will be used to administer the development of the extensive offshore oil and gas fields in this area. Figure 1 shows the map layout of the project comprising 14 - 7 ½ minute quadrangles and a land area of about 450 square miles.

Low-water-line mapping of most of the coast of Louisiana was completed about two years ago but the Mississippi Delta and the coastline around Atchafalaya Bay and Marsh Island, because of the more extensive foreshore areas and shoals, had to wait until arrangements could be made for detailed tidal surveys and the establishment of accurate tidal datums.

The changing nature of the Mississippi Delta and the consequent need for periodic remapping, or map revision, for the up-to-date maintenance of nautical charts is illustrated in figures 2 and 3. Figure 2 shows the limits of the Delta from an 1894 chart (shaded area) (surveys between 1859 and 1872) in contrast with the present limits (chart 1272). Extensive changes are apparent to the east and south; no comparison is indicated on the western shore as that area had not been surveyed and is not shown on the 1894 chart. The Coast and Geodetic Survey mapped this area with aerial photographs for the first time in 1922. Figure 3 shows the changes in the Garden Bay area between photogrammetric surveys of 1922, 1932, and the present.

MAPPING PLAN

The Delta, as one would expect, is low lying and predominantly marsh with many bayous and shallow bays, some of the latter being very large. Except for fringes of trees along the river and main passes the vegetation is principally marsh and wild cane. The latter is found in places throughout the Delta but predominates along much of the coast. It is extremely dense and grows to a height of perhaps ten feet (figure 4). The coast area floods at high tide, and seen from seaward the apparent mean-high-water line is against the marsh and wild cane. The mean-low-water line is mostly along the mud banks and flats, but is rarely seen because only a very few of the low waters occur during daylight — a circumstance peculiar to this area and extremely important as regards aerial photography at low-water stages. Travel in this area must be by float plane, helicopter, marsh buggy, or boat. Boats are of little use outside of the main channels because of the extremely shallow waters. Ground survey activities such as leveling, traverse, and so on are extremely difficult in any case and next to impossible around much of the coastline. Consequently, the plan for the project called for maximum use of aerial photography, and a minimum of ground work. The project included these primary phases or activities :

(1) Nine-lens photography for basic planimetric mapping was taken in October, 1958. Figure 1 shows the layout of photographs and the horizontal-control stations identified to control the plot with those photographs. The photogrammetric plot and the subsequent mapping was at scale 1/20 000 and the illustration shows the area covered by a single nine-lens photograph. This photography was a very real advantage because of the relative scarcity of existing control and the difficulty of identifying control on the aerial photographs.

(2) Tidal surveys, to establish basic tidal datums, started in April, 1959 and were to be completed in April, 1960.

Fig. 4. — Typical growth of wild cane.

(3) Low-water infrared aerial photography controlled from the tide stations after establishment of the mean-low-water datum was taken in December, 1959. Infrared photography was selected for mapping the low-water line because it provides a sharp contrast between land and water and thus captures the tide-stage contour accurately.

(4) Field examination of the infrared photography was made at mean low water by float plane or helicopter in December 1959 and early January 1960.

(5) Completion of the basic maps and compilation of the low-water line from the infrared photographs were to be completed the summer of 1960.

Prior to this project very little tidal data were available for the Mississippi River Delta area. Tidal datum planes (mean low water, half-tide level, mean high water, etc.) had to be determined. While the plane of half-tide level could be assumed to be at approximately the same elevation along considerable stretches of the outer shore of the Delta area, the range in tide and consequently the elevation of mean low water below half-tide level could vary appreciably from place to place due to differences in hydrographic features. Consequently, observations had to be made at a sufficient number of places to determine the mean low-water datum for all places around the entire outer shore of the Delta.

After a careful and extensive reconnaissance of the area, eight tide stations were established. Their locations are shown in figure 8. Two of these are standard tide gauges set on semi-permanent structures of the

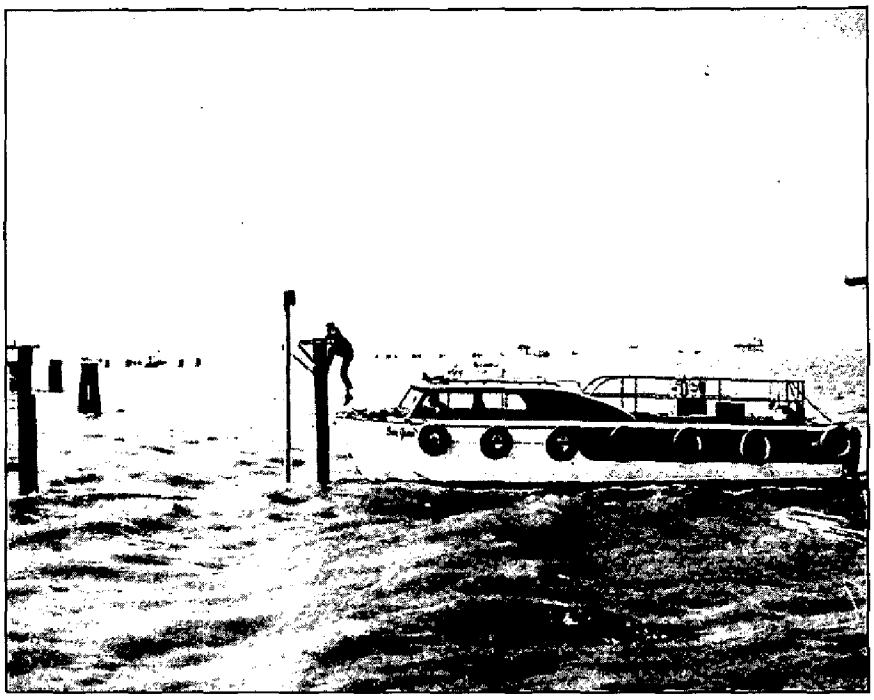

Fig. 5. — Portable tide-gauge installation.

Kerr-McGee Oil Co. at Breton Island and the U. S. Coast Guard at South Pass. The remaining six are portable gauges. These require servicing every three or four days. They had to be placed far enough offshore so that there would always be at least five feet of water at low tide. Consequently, many of the portable gauges and most of the tidal benchmarks (three to a station) are on wooden piles driven at least 20 feet into the Gulf bottom. A typical portable tide-gauge installation is show in figure 5.

Observations at all stations were started no later than April 1959 and were continued through April 1960.

A period of 19 years of tide observations is generally considered as constituting a full tidal cycle, for during this period of time the more

important of the tidal variations will have gone through complete cycles. Tidal datum planes thus determined may be taken to constitute a primary determination. However, long experience and analyses have disclosed that good determinations of mean values can also be obtained by a direct comparison with simultaneous observations at some nearby place with similar characteristics and, for which a 19-year series of observations is available. It became quite apparent when the tide observations at the various stations were examined that, without exception, the characteristics of the tide at the 8 tide stations were quite similar to those at Pensacola, Florida. Since a 19-year series of tide observations are available for Pensacola (1940-1958) mean low water and other tidal datums around the Delta will be determined from twelve months of observations compared with simultaneous observations at Pensacola.

Certain characteristics of the tide in this area are of critical significance as regards the taking of aerial photographs at mean low water. The tide in this area is principally diurnal, that is, there is but one high water and one low water a day except when the moon is on the equator. Figure 6 shows typical tide curves at the western, southern and eastern limits of the project. The mean range (the difference in height between mean high water and mean low water) is about 1¼ feet. The variation in rise and fall is related primarily to the declination of the moon and the sun. Maximum and minimum tides occur about the time of tropics, when the moon is at

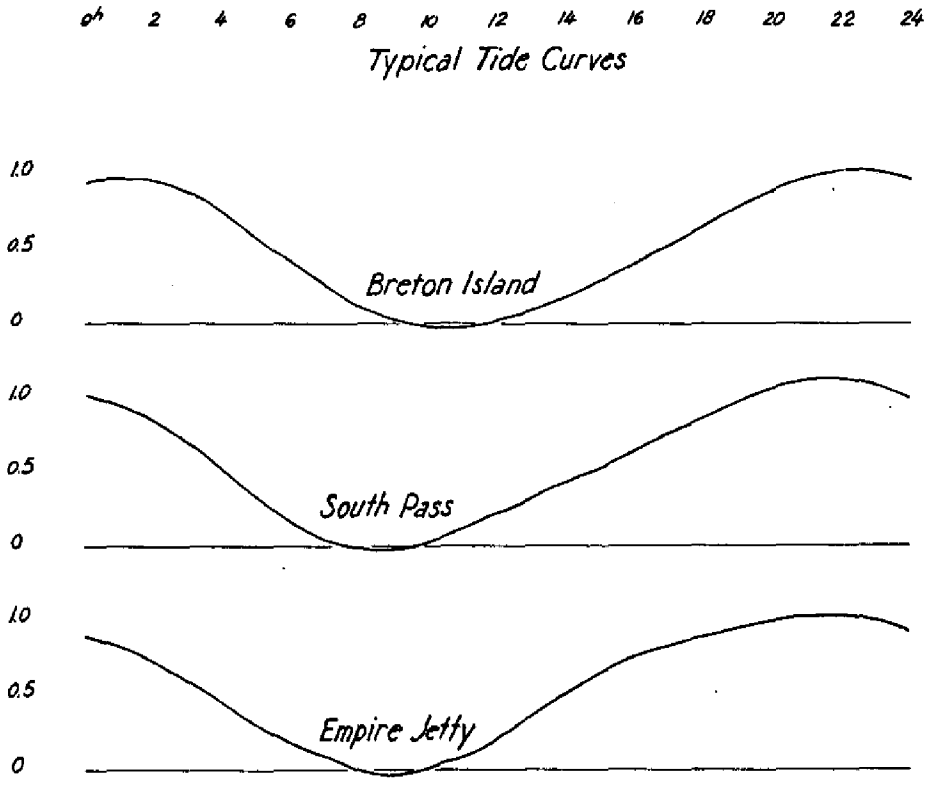

Fig. 6. — Typical tide curves.

maximum declination. Of more importance is the fact that most of the low tides reaching mean low water, or below, occur at night. This is due to a combination of factors which will not be discussed here. Daylight (photographic daylight) low waters occur almost exclusively during the period from late November to late January. Consequently our low-water aerial photography had to be taken during this period of 1959-60, after about six months of tide observations, or a year later in 1960-61.

The delay of one year was undesirable both from the standpoint of map needs and costs. Consequently it was decided to determine preliminary planes of low water at the tide stations based on about six months of tide observations, compared with the 1940-1958 series at Pensacola. This was done and it was on the basis of these tidal planes that the photogrammetric work was begun. It is very unlikely that the mean-low-water plane will change more than 0.1 foot when the complete year of observations is obtained. If there is a change, it now appears that the datums will be slightly higher than determined from the six-month series.

Several days of daylight low water and clear skies were needed for the aerial photography. From the foregoing it is evident that this is a rare combination on the Delta. It was not realized how rare until after arrival in the area. Tide predictions indicated some 25 low waters during photographic daylight (9:00 a.m. to 3:00 p.m.) between 28 November and 30 January. Long-term weather statistics indicated cloud cover of over 10 per cent for about 80 per cent of the time. Thus only five days for mean-low-water photography could be expected between 28 November and 30 January. Plans for the infrared photography had to be based on this estimate but there was still a wild card in the deck—the wind.

As previously stated the mean range of the tide is about $1\frac{1}{4}$ feet. Because of the extensive shallow waters surrounding the Delta, a continuing northerly wind can cause the tides to run as much as $\frac{1}{2}$ foot lower than predicted and a continuing southerly wind can make them $\frac{1}{2}$ foot higher than predicted, i.e., eliminate the predicted mean low water. Figure 7 illustrates this. This shows the predicted and actual tides for December 1, during a norther, and the predicted and actual curves for 16 December with fairly strong winds from the south. There was no way to predict what the winds would do to the plan of operations — one could only hope, pray, and worry.

Now let us see what actually occurred. Due to the norther that started just when the aerial photography was undertaken there were four days of combined low waters and photographic weather between 29 November and 7 December. Tide and weather records show that only one such day occurred for the entire period after that, that is, from 8 December to 30 January. The infrared photography was finished by 7 December and it is well that it was because waiting in the area for another seven weeks would have provided only one good photographic day.

The aircraft was based at New Orleans — a distance of some 80 miles. The primary tide station for controlling the photography was at South Pass where telephone communications with the flight crew were available. Figure 8 shows the tide stations and the infrared flight lines to be covered at an altitude of 10 000 feet, that is, at scale 1/20 000. A tide observer was

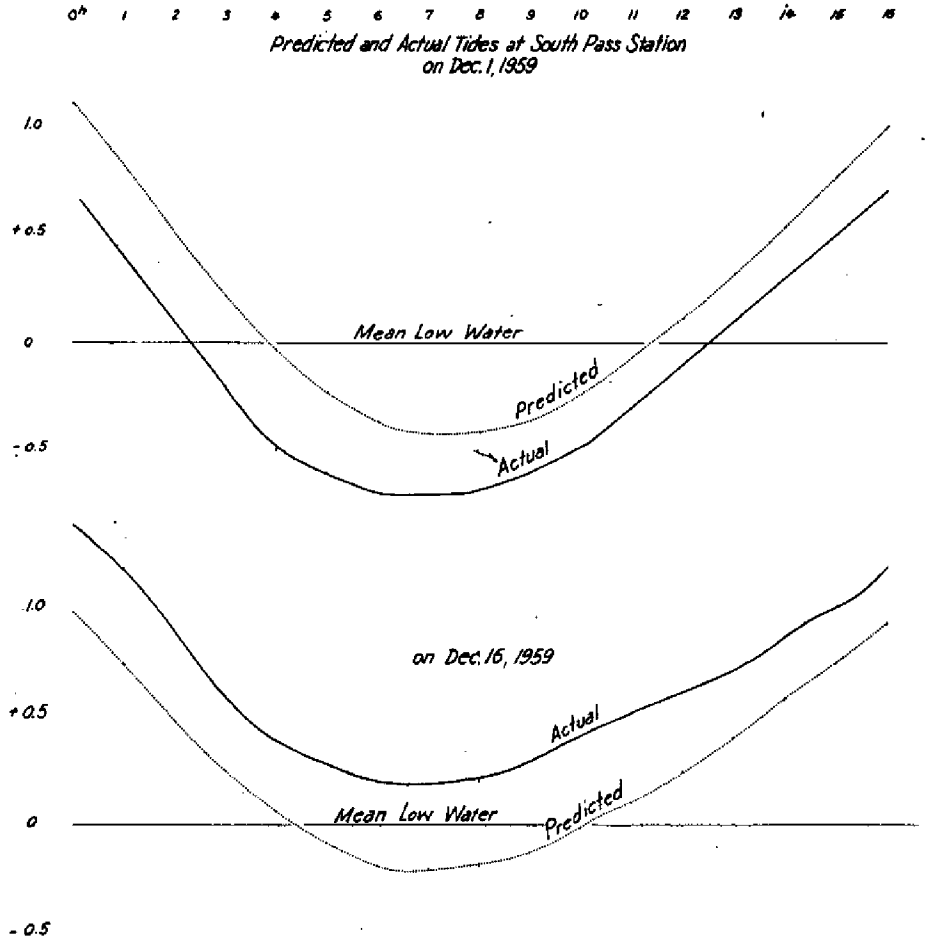

Fig. 7. — Tide curves for December 1 and December 16, 1959.

also quartered at Breton Island, this being the only other station where quarters were available for an observer. The remaining six stations in the project could be occupied only from a fairly large boat that could stand the weather and also provide protection for the observer. The Coast and Geodetic Survey launch was used to occupy first the Empire Jetty and later the Joseph Bayou Station. A launch, not equipped with radio, and observer loaned by the Texas Company through the good offices of Mr. Martin Standard also occupied the Lonesome Bayou Station for several days to read the staff in case of a gauge failure.

Communication between the tide observers and the aircraft was by handy-talkie radio and after installation of a proper aerial in the aircraft this communication worked very well.

At about 5:00 a.m. each morning, the observer at South Pass would plot a tide curve for the preceding eight or ten hours and then project this curve to determine the approximate time of mean low tide for that day. He would then call the flight crew telling them whether to come to the area and, if photography was to be attempted that day, when to arrive on

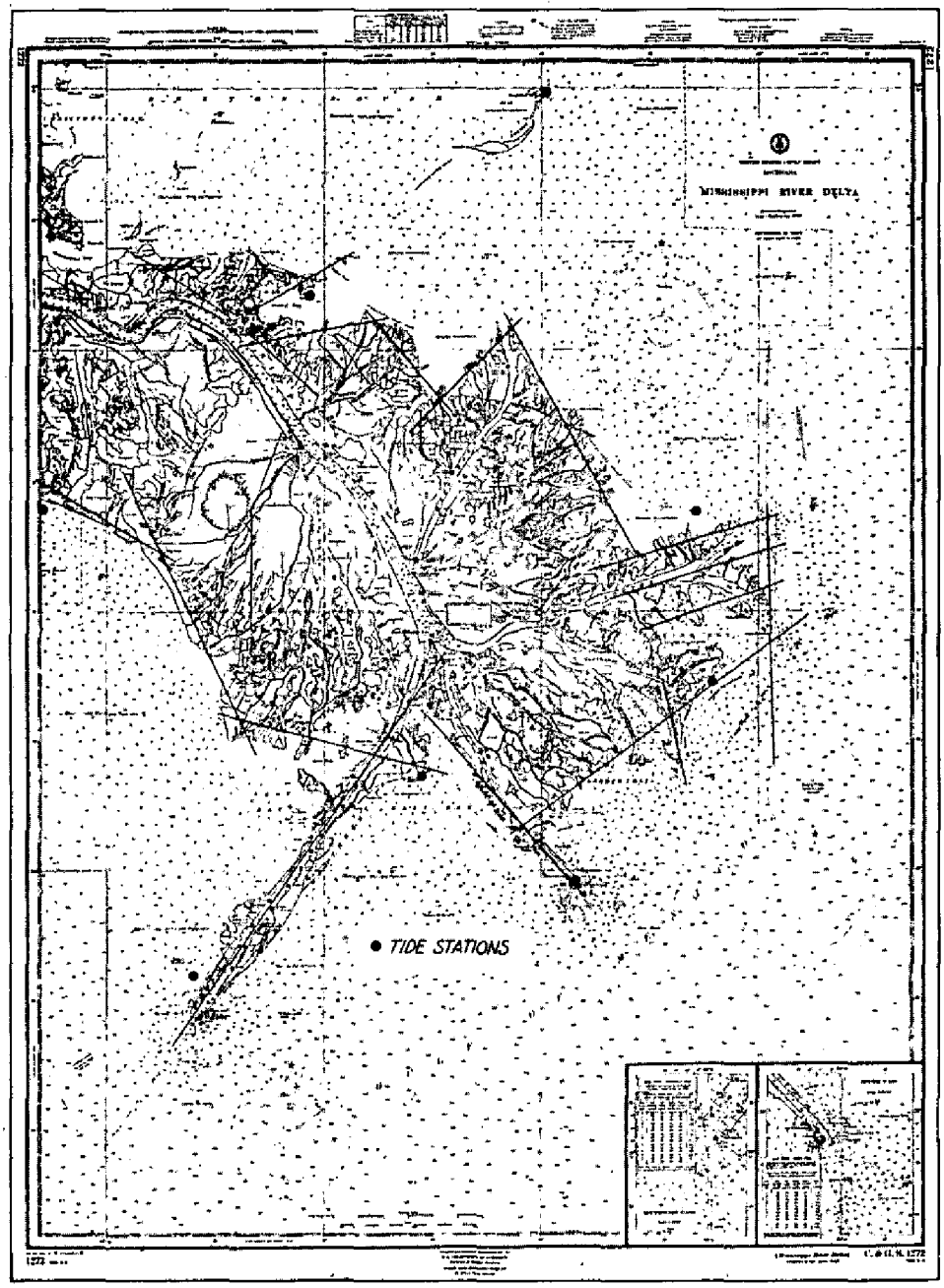

Fig. 8. — Tide stations and infrared flight lines.

the project. The latter was necessary because when strong winds were blowing the time of the tide might vary an hour or more from the predicted time. Once in the area the plane was directed by radio, that is, was told what line to fly at what time.

A preliminary flight inspection around the entire outer coast was made at low tide early on 29 November. This inspection was considered essential

since there were a number of unknowns critical to the project. For example, it was essential to know whether the low-water line was generally just inside or outside of the edge of the marsh and wild cane; where the shores were steep and represented an easy mapping job; and where the more extensive mud flats existed since these would be the more difficult to map. This inspection proved to be invaluable. The western shore was found to be generally steep and the more extensive flats on the eastern shore that had to be given particular attention were spotted. Needless to say, the field crew was delighted to find that the mean-low-water line in most instances, was outside the edge of the grass and wild cane.

Taking all of this photography exactly at mean low water would have required more flying days than could be expected even with extreme good luck. This is because of the obvious fact that the tides don't go exactly to mean low water and stand there, or at least only rarely. The tide will usually either not go as low as mean low water or it will go below mean low water. Figure 7 illustrates the conditions under which the infrared photography had to be taken. Because of the early morning occurence of mean low water, it was necessary to work on minus tides and to photograph the coastline as nearly as possible at the time the rising tide crossed mean-low-water datum; the rate of rise being about 0.2 feet per hour. The time difference between the occurrence of mean low water at different stations helped somewhat, that is, the tides could be followed, but these differences are small for most of the project.

The field crew had to assume that one good day might be the only and last day. Consequently, photography was started with the tide as much as 0.4 or 0.5 feet below mean low water on the less important lines, that is, on the west side where the shore was steep; then moved over onto the most important lines just before or at the time of mean low water; photography was then continued on other lines until the tide was up to 0.1 or 0.2 feet above mean low water. This latter photography might never be used but then again it might be better than nothing.

On subsequent days the same procedures, more or less, were followed, cleaning up the more important lines close to the mean-low-water datum and repeating those that had been flown slightly off. On the flat shores lines were deliberately repeated at slightly different stages of the tide so as to have a means of interpolation in cases where the photography couldn't be taken at exactly mean low water.

As mentioned previously the norther that blew into this area about 28 November continued more or less unabated for about a week. It held the water off the shore making the tides go lower than predicted and causing mean low water to occur later in the day. It was accompanied by generally clear skies providing four days of photography in the first nine days on the job.

In summary, the outer coastline, with the exception of a small section of the west shore, is covered with infrared photography taken between zero and —0.3 feet of tide. All lines on the project have been photographed from two to four times with coverage ranging between + 0.2 and — 0.4 feet for interpolation of the mean-low-water line. Figure 9 is a fair sample of the infrared photography.

Fig. 9. — Infrared photographs.

FIELD EXAMINATION

The next step after completion of the photography was to inspect the photographs, that is, compare them with the shoreline at, or very nearly at, the mean-low-water tide stage. This was done by float plane and helicopter, mostly by helicopter.

Such an inspection was necessary to, first, be certain to find small off-lying mean-low-water islands or spots that might not be detected from an office examination of the photographs. Examples of this are the numerous mud lumps off Pass A Loutre and Southeast Pass and the tops of shell

reefs in Grand Bay. Secondly, it was necessary to search out the mean-low-water line in the few instances where it occurs just inside the edge of the wild cane; and third, to check the interpolation of the mean-low-water line when the photographs had not been taken at exactly mean low water.

The practice was to fly to and read a staff at the controlling tide station and then to inspect that section of the shoreline reading the staff again upon completion of the inspection.

As regards the accuracy of the mean-low-water line, all the evidence indicates that it is located within about 0.1 feet vertically, and that this is about all one should expect in this area with any reasonable expenditure of time and money.

Color photography was used for the location of aids to navigation and for interpretation of natural and cultural features on the planimetric maps. Color photographs provide a wealth of detail not visible on panchromatic photography, and save a considerable amount of field time that would otherwise be necessary to clarify details on the photographs. It was relatively easy to identify the many aids to navigation on these photographs, and thus to locate them with very little ground examination and no real ground surveying.

FORM C&GS-8352
(3-25-63)

NAUTICAL CHART DIVISION

RECORD OF APPLICATION TO CHARTS

FILE WITH DESCRIPTIVE REPORT OF SURVEY NO. T-10944 thur T-10957

INSTRUCTIONS

A basic hydrographic or topographic survey supersedes all information of like nature on the uncorrected chart.
1. Letter all information.
2. In "Remarks" column cross out words that do not apply.
3. Give reasons for deviations, if any, from recommendations made under "Comparison with Charts" in the Review.

CHART	DATE	CARTOGRAPHER	REMARKS
1270	7-9-66	F. K. Scarcella	~~Full Part Before~~ After Verification Review Inspection Signed Via
			Drawing No.
1272	7/12/68	Helmer	~~Full Part Before~~ After Verification Review Inspection Signed Via
			Drawing No. Appd T-10955 in South Sandwich to replace tabulation appd T-10947 Revise position of 4 islets and dangers, some shoaling
			Full Part Before After Verification Review Inspection Signed Via
			Drawing No.
			Full Part Before After Verification Review Inspection Signed Via
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FORM C&GS-8352 SUPERSEDES ALL EDITIONS OF FORM C&GS-975.

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