CHAPTER FIVE

CROSSING THE T

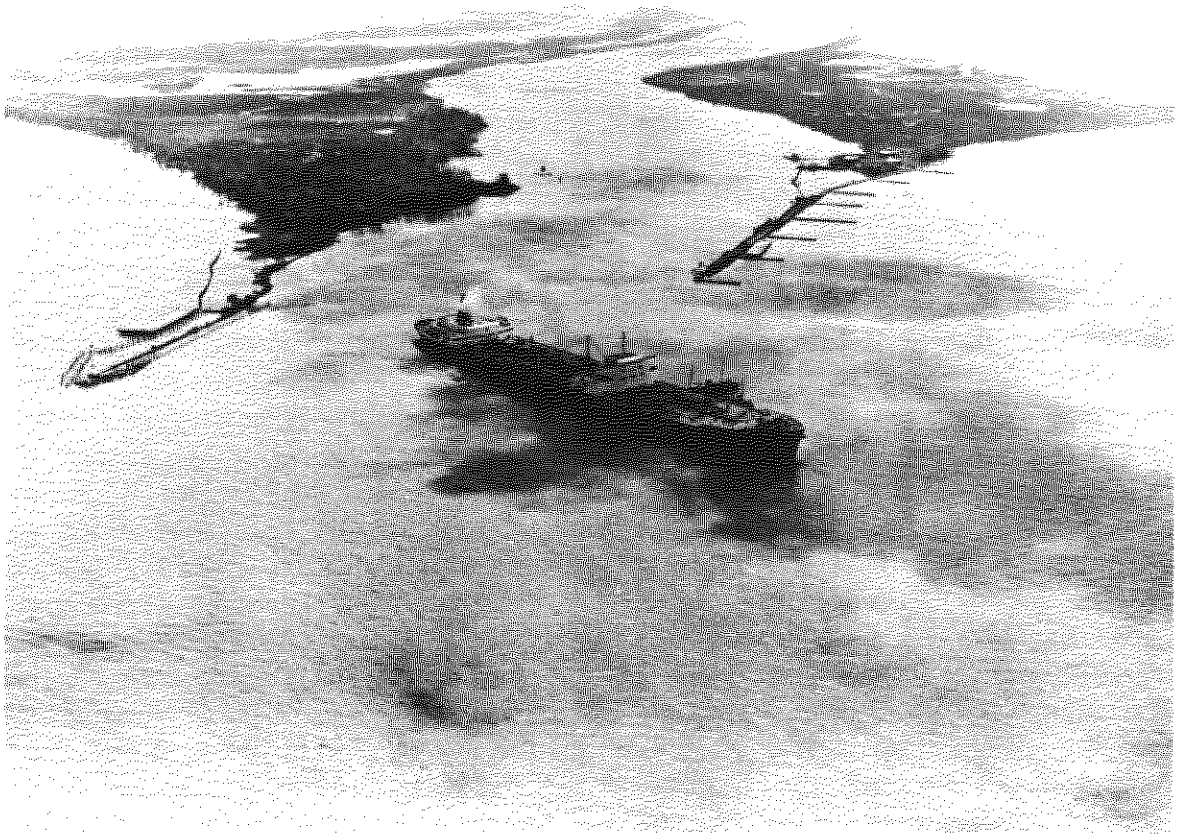
From 1882 to 1901 the work of the Fourth District on the Mississippi overshadowed the New Orleans Engineer Office. At one time, under Howell, the Engineer Office had taken charge of a broad range of projects, not only in Louisiana but in Texas. There had been no distinction between the work on the Mississippi River and that on the lesser streams, tributary and nontributary; the Office had handled it all. But when the work at South Pass was given to Eads (and later to his executors, who remained in control until 1901) and the Mississippi River above the Head of Passes to the Mississippi River Commission, the Engineer Office was left with drastically curtailed responsibilities. From 1882 until 1901, it concerned itself almost entirely with improvement of local waterways, with such special problems as control of the water hyacinth, and with the difficult but useful tasks of surveying and mapping a region that generally included southern Louisiana, eastern Texas, and the Homochitto River in Mississippi. Between 1895 and 1900 District Engineer Major James B. Quinn also directed construction of modern coast-defense batteries to protect New Orleans, Barataria Bay, and Sabine Pass.[1]

In organizational terms, the Engineer Office—unlike the Fourth District—was completely integrated into the Corps' civil-works structure. Though the Chief of Engineers in 1892 acquired the power to veto work proposed by the Mississippi River Commission, he remained unable to initiate projects. The Engineer Office, reporting directly to the Board of Engineers in New York, had no such autonomy. Instead, a measure of autonomy developed after 1888 within the Corps itself, as the organization decentralized, grouping its local offices under Division Engineers.[2] At first purely an administrative device, this new level in time would assume the significant tasks of project review, setting of priorities, and budgetary control, freeing the Engineer Offices—or Districts, as they were formally renamed in 1915—for day-to-day executive action. With this change, the national civil-works structure took on its matured form. Yet, despite clear distinctions between the Engineer District and the Fourth District, Mississippi River Commission, there was much trading of manpower between the two organizations. The New Orleans Office was at first assigned to the Southwest Division whose chief was president of the Mississippi River Commission. For a few years in the 1880's, Lieutenant Colonel Amos Stickney headed both the Engineer Office and the Fourth District. When in 1901 the Gulf Division was set up, the Division Engineer, Lieutenant Colonel Henry M. Adams, also served as Engineer Officer at New Orleans. As time went on, however, the duties of the

different organizations and levels of organization were more accurately defined, and such overlapping became rare.[3] The Engineer District represented the national civil-works system in New Orleans, while the Mississippi River Commission and its districts formed a special case operating under unique legislative authority.

In 1901 the Gulf Division was set up, with headquarters at New Orleans, and the New Orleans Engineer Office placed under its control. In effect, Major Chase's old command was brought back into existence, except that its headquarters was now at New Orleans, instead of Pensacola. Thus, by the turn of the century, the Engineers at New Orleans were linked to the Mississippi River by one chain of command, which ran from the Fourth District to the Commission, and thence through the office of the Chief of Engineers direct to the Secretary of War. A second chain of command linked the New Orleans Engineer Office to the Gulf Division, and thence to the Chief of Engineers. If the commercial pattern of the Mississippi-Gulf system is thought of as an inverted T, with its point of intersection at New Orleans, the vertical bar fell under the Commission, the horizontal bar fell under the Gulf Division. The setup was entirely logical.[4]

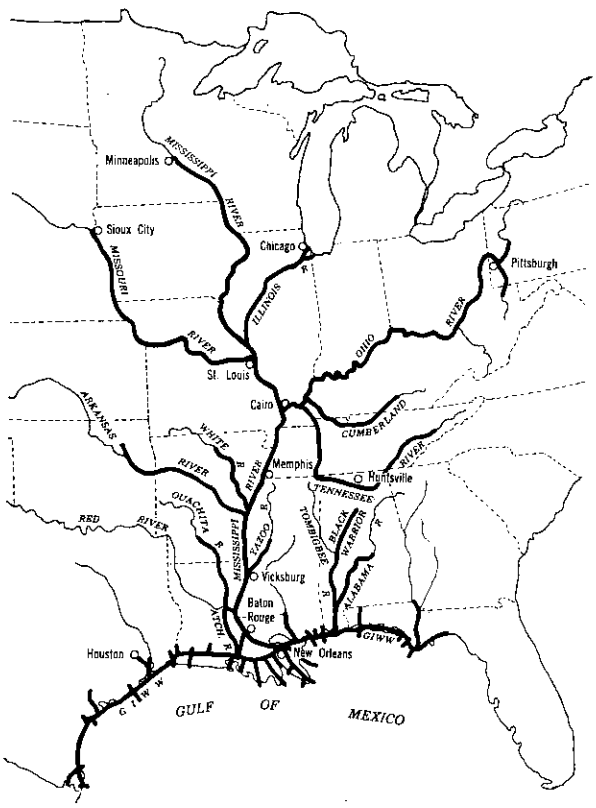
With the coming of the twentieth century, the Engineer Office began once more to undertake large, significant civil works. The expiration of the maintenance contract with Eads' heirs brought South Pass back under its jurisdiction. To this was added, in 1902, the immense job of providing a jetty system for



SS Manhattan outbound in Mississippi River.

Southwest Pass.[5] Not completed until 1923, the huge jettied channel (35 by 1,000 feet), would provide the broadest gateway yet into the Mississippi Valley. Finally, the decision of Congress to undertake the long-discussed Gulf Intracoastal Waterway led to extensive resurveys of the region, and finally to the construction of the Waterway itself. This was the most important work the District would undertake: by crossing the T of trade in the Mississippi Valley it helped to transform the economy of the region its served.

The concept of a protected waterway along the Gulf Coast originated, like so many other Engineer projects, early in the 19th century. Acquisition of Florida in 1819 created an ideal situation for east-west regional trade. The aim of connecting the Atlantic Ocean, Pensacola, Mobile, and New Orleans with its immense hinterland in the Mississippi Valley attracted planners throughout the century that followed. In 1826 the Board of Internal Improvements under Brigadier General Simon Bernard surveyed the new frontier of the Gulf Coast and considered, among other topics, the problem of east-west trade. The Engineers concluded that a proposed "Canal across Florida" was not practicable, except with a system of locks, but recommended that coastwise traffic from Florida to New Orleans be rendered "secure, safe, and commodious" by various improvements, including a connecting canal between Mobile and Pensacola Bays and between Lake Pontchartrain and the Mississippi at or near New Orleans.[6] In 1832 Congress appropriated $3,000 to survey portions of the eastern end of the route.[7] Surveys for a ship canal below New Orleans were made in 1852, and in 1873 Howell at New Orleans and Damrell at Mobile drew up plans for connecting the Mississippi to Mobile Bay by a canal 7 feet deep.[8] In 1876 Humphreys discussed anew the question of connecting the Mississippi with the Atlantic via inland and protected waterways.[9] Appropriations, however, were not made on any work directly associated with the eastern leg of the waterway until the twentieth century.[10]



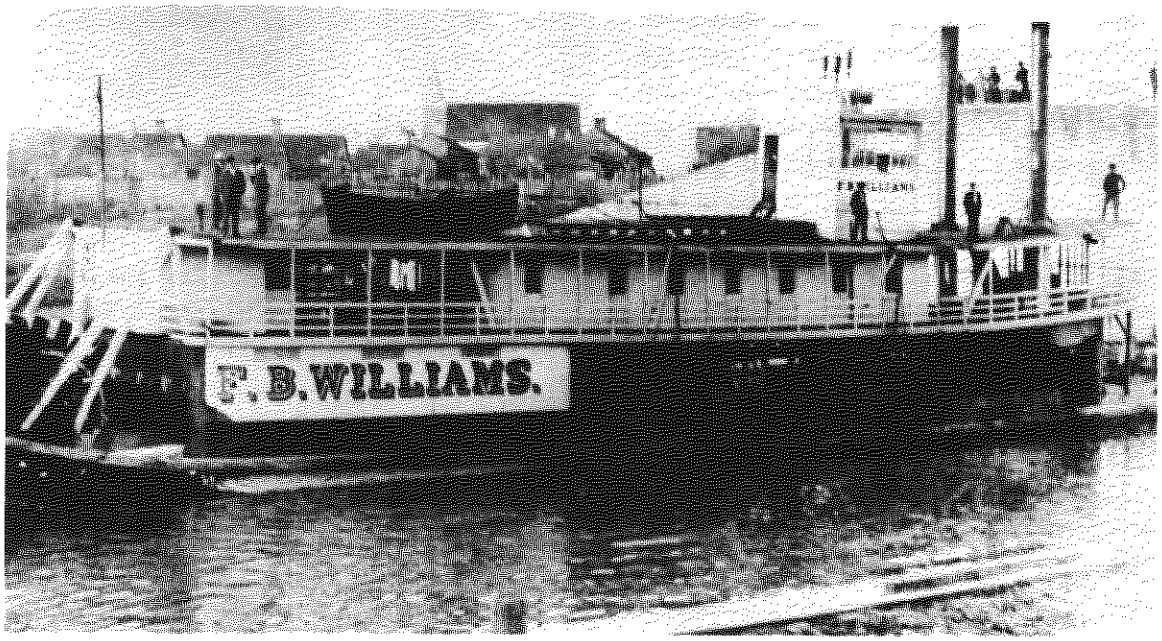
Mississippi River Navigation System.

The project for a western intracoastal waterway had a shorter history but was prosecuted with more vigor. The River and Harbor Act of 3 March 1873 provided $20,000 "For connecting the inland waters along the margin of the Gulf of Mexico from Donaldsonville, in Louisiana, to the Rio Grande River, in Texas, by cuts and canals. . ."[11] Humphreys assigned the work to Howell,[12] and the work was concluded just about the time their feud with Eads got well underway. Taken too soon and completely overshadowed by the Eads affair, the survey was forgotten for a generation.[13] Nevertheless, an important beginning was made. Extensive field work was

carried out by civilian assistants J. A. Hayward, H. C. Ripley, and J. S. Polhemus. The stretch from Galveston to Sabine Pass was surveyed in 1873, and the remaining work completed by 1875, Hayward working west from the Mississippi, Ripley moving east from Sabine Lake, and Polhemus west from Galveston.[14] They found the whole route desolate and difficult to traverse. Working in the hot season, on land that was partly swamp and partly desert, under a meager appropriation "the young gentlemen," as Howell called them, "suffered hardships rarely met in the line of their profession."[15]

The route which Howell proposed on the basis of this survey would have begun at Donaldsonville, where Bayou Lafourche was to be dammed and ships transferred from the Mississippi by means of an inclined plane and turntable. The route would have left the Lafourche by an existing waterway called the Attakapas Canal, which would have been extended to Lake Verret, and thence through Flat Lake to Brashear (Morgan) City. From that point Howell proposed alternate routes, to be adopted according to the amount Congress was ready to spend. The cheaper simply went down the Lower Atchafalaya and west along the coast through Atchafalaya, Cote Blanche, and Vermilion Bays. The costlier involved the use of Bayous Teche and Cypre Mort to provide an inland route to Vermilion Bay. West of this point the route would have been cut across the *prairies tremblants* through White, Grand, and Calcasieu Lakes to Sabine Lake and the Texas border. Howell proposed to make use of bayous which he believed to be the remnants of natural connections among these bodies of water, but he admitted freely that the cost of maintenance was likely to be high.[16]

Indeed, cost was the whole trouble with Howell's waterway. His justification for the work rested almost entirely upon economic development which might result from the waterway itself. For Congress to accept such justifications was by no means unknown, even



First passage through Plaquemine Lock on opening day, 9 October 1909. Steamer *F. B. Williams*, master and owner, Captain Joseph Chotin.

in the nineteenth century, but only in the case of projects with glamor and powerful backing. The proposed waterway possessed neither of these advantages. Reports of the civil assistants left an impression of a potentially rich but desolate region, with swamps giving way to sandy wastes and then to grey cactus-covered prairies. On the whole, it was not surprising that the project lapsed for 30 years, until a growing population, the discovery of oil in 1901, and the beginnings of the sulfur industry in 1903 enabled regional leaders to revive it.

The River and Harbor Act of 3 March 1905 gave the long-moribund project a new lease on life by providing for fresh surveys in Louisiana and Texas.[17] Donaldsonville was still regarded as the eastern terminus, and four sections were defined for survey purposes, three in Texas, and one in Louisiana. Major Edgar Jadwin, future Chief of Engineers, reported upon the Louisiana segment, citing coal, rice, oil, sugar, lumber, and cotton as products which the waterway was likely to transport.[18] However, since the Federal Government was then engaged in clearing and providing a lock for Bayou Plaquemine, he recommended that this waterway be utilized instead of Bayou Lafourche. Jadwin's proposal would have greatly benefitted Baton Rouge (and, in fact, a branch following a similar route was later added to the waterway) but at the time was unsatisfactory to New Orleans. By 1910 routes were being proposed that led directly to the city's back door: the first by the privately constructed Harvey Canal from Bayou Barataria to the Mississippi, the second by another private waterway, the Company Canal, from Lake Salvador southwest of New Orleans to the river.[19] Yet, cost still prevented adoption of any overall plan. The Board of Engineers for Rivers and Harbors decided that prospective through commerce was still not great enough to justify building the entire waterway. Instead, it suggested building a section here and there, and, if economic growth continued, adding others in time.[20]

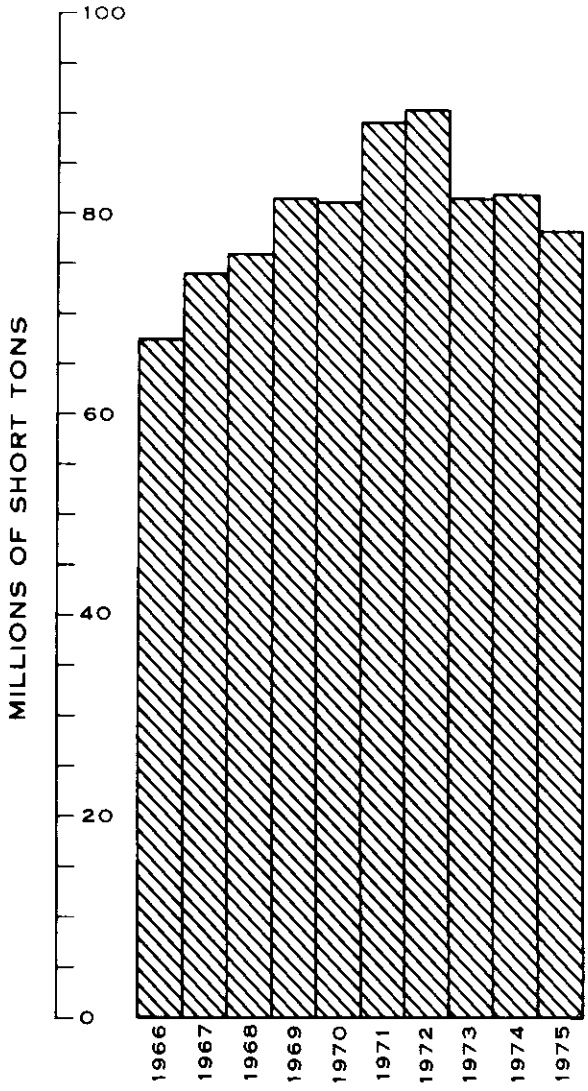
Thus the building of the waterway was like the forging of a chain. Nature had provided some of the links, but they lay scattered on the ground. A few connecting links would be added by men; the segment of the chain would be tested, and, if found satisfactory, another few links might be hammered out in time. "After careful consideration" the Board recommended that the Mermentau River be connected to the Teche at Franklin and Congress adopted the project on 2 March 1907.[21] Once work began in 1908, regular appropriations permitted the first segment to be completed in a few years. It provided a maximum draft of 5 feet at low water and a bottom width of 40 feet.[22] The next part of the waterway—from the Mermentau to the Sabine River—was approved in 1910, on condition that local interests contribute the right-of-way and make up a cost differential of $27,000 between this and an alternate route.[23] Organized as The Interstate Waterway League of Louisiana and Texas, local leaders secured the rights-of-way with the assistance of the New Orleans Engineer Office. Provision was also made for expanding the dimensions of the waterway.

Best news for the waterway, however, was a declaration of policy that Congress wrote into the River and Harbor Act of 3 March 1909.[24] Historians have called the first decades of the twentieth century the "Progressive Era"—a vigorous time of nationalism and sweeping demands for reform. Under the leadership of Theodore Roosevelt and Woodrow Wilson, the nation made new beginnings in many fields, among others in the conservation and development of national resources. There was a general revolt against domination by the railroads, and new demands for a balanced transportation system. Under these impulses Congress wrote the charter of the coastal waterways, providing for a continuous

protected route from Boston to the Rio Grande. Implementing such a gigantic project was, of course, gradual and subject to the vagaries of fiscal rain and drought. But from this time forward it was an acknowledged national goal.[25]

World War I interrupted work but also provided a stimulus to water transport that later benefitted the intracoastal waterways. In 1916 defense needs led to creation at Washington of a Committee on Inland Water Transportation chaired by the Chief of Engineers. This body and its successors—the Inland and Coastwise Waterways Service and the Inland Waterways Corporation—provided critical Federal aid to revive water transport injured by railroad rate-fixing abuses. As barge traffic increased and terminal facilities were erected, transport boomed on the Mississippi, stimulating tie-in routes like the GIWW. Surveying was resumed in Louisiana when peace returned,[26] and an act of 3 March 1923 authorized and directed another full-scale survey from the Mississippi to Corpus Christi.[27] By this time, too, Congress had authorized the dredging of channels from New Orleans to Bayou Teche via the Harvey Canal-Lake Salvador route; from Franklin on the Teche to the Mermentau River; from the Mermentau to the Calcasieu; and from the Calcasieu to the Sabine. Engineers admitted, however, that "no complete project.... exists for the proposed waterway."[28]

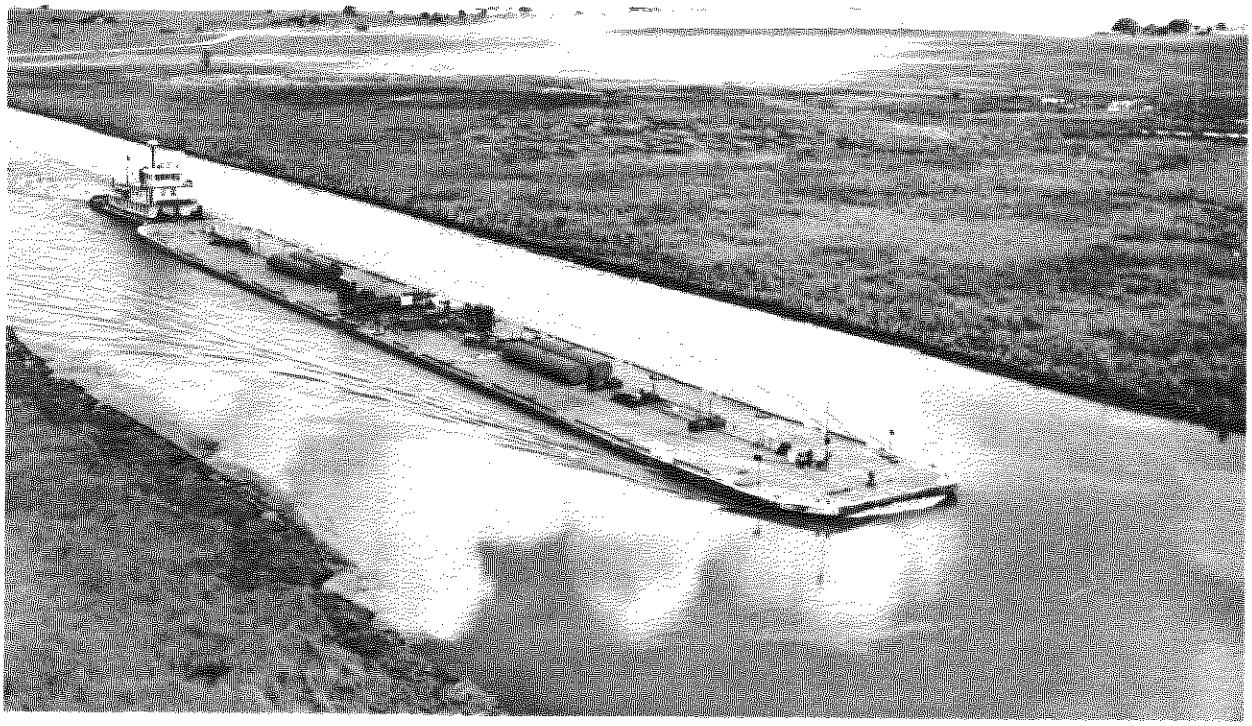
The report of the Board of Engineers for Rivers and Harbors which made this admission in 1924 was basically a plea for a comprehensive program. The Board pointed out the advantages of connecting the western Gulf region, with its rich resources of oil, sulfur, timber, and agricultural products, to the Mississippi-Ohio River system. The rapid growth of the area provided strong arguments to the friends of the waterway. The decade of the 1920's was a miraculous one for Houston, to name only the most obvious case. In 1920 Houston was a rambunctious town of 138,000; in 1930 it was reaching for 300,000 and was well started on its career as a southwestern Chicago. The critical economic fact, of course, was the growing importance of the great southwestern oilfields in the decade that saw mass-produced automobiles turn America into a nation on wheels.[29] And Houston was only the most obvious case in a picture of regional growth, based on petrochemicals, sulfur, and other resources, that changed the waterway from a dream to an inevitability.



Waterborne commerce, 1966-1975, Louisiana section.

Under the direction of the Gulf Division Engineer at New Orleans, the new routes laid out for the waterway avoided the shallow tidal bays along the coast, where storm and tide contradicted the basic purpose of providing a protected slack-water route for commerce. In successive plans the waterway migrated inland, changing its form as the Engineers dredged whenever possible in straightline segments across the swamp, instead of following the tangled skein of natural waterways. At the same time, more local canals were incorporated, since they had already been built where they could serve some profitable local trade.[30] The increasingly heavy private investment in terminal and handling facilities was sufficient to reassure even the administration of Calvin Coolidge that the government was not likely to lose money invested in the region. In 1924 the Board of Engineers for Rivers and Harbors confidently predicted "a general commerce of at least 500,000 tons per year between New Orleans and points west."[31] In fact, the trade would swell to 100 million tons in 45 years.[32]

The Board's report led Congress in 1925 to authorize the expenditure of $9 million to build the Louisiana and Texas Intracoastal Waterway, from the Mississippi at or near New Orleans to Galveston Bay, Texas.[33] In 1926 the Gulf Division Engineer was ordered to begin surveys for the eastern leg of the waterway as well.[34] In 1930, projects connected with this part of the waterway were authorized in the River and Harbor Act,[35] and construction was under way the next year.[36] The way was now open, and the national need to provide work for the victims of the Depression brought new support for this project as for many others. Ultimately the



Traffic on the Intracoastal Waterway. A football game could be played on some of the immense tows that pass through the waterway.

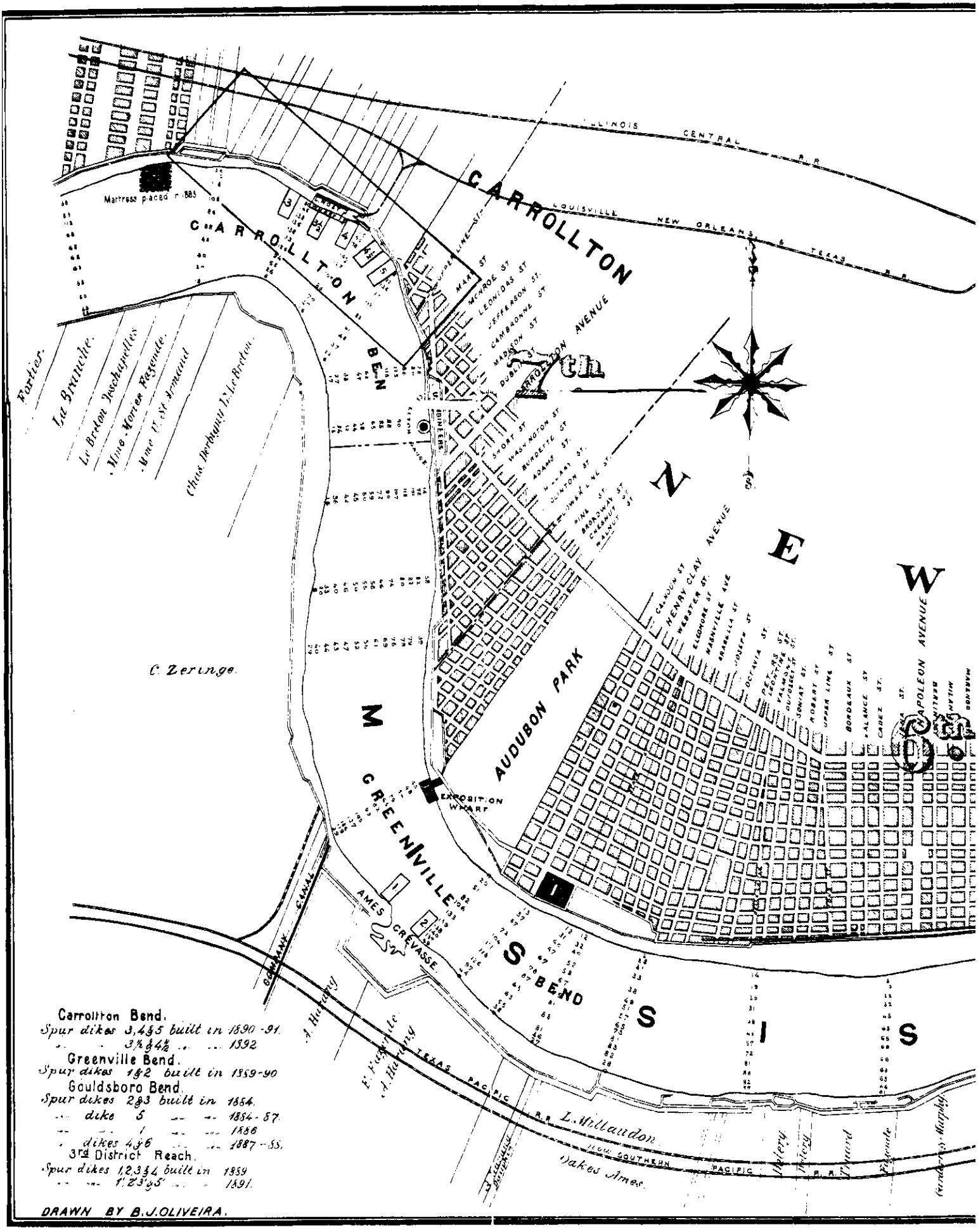
(Photo by C. Fortier)

waterway grew to provide at least 12-foot depths from Brownsville, Texas, to Apalachee Bay, Florida.

This was, however, by no means the end of the story. Engineers expected the segment within the New Orleans District to be ultimately 384.1 miles long, 16 feet deep, and 150 to 200 feet wide.[37] The 1970's brought a new outlet for the waterway, dimensioned to the needs of the offshore drilling platforms, in the 84- by 600-foot lock and channel through Freshwater Bayou to the Gulf of Mexico. For a water highway which, in 1968, carried 42 percent as much cargo as the whole Mississippi River,[38] continued growth seemed assured. Long prepared and slowly put together, the canal that crossed the T of trade in the Mississippi Valley was one of the most protracted, arduous, and successful regional achievements of the Corps of Engineers.

Post-Civil War efforts by the Federal Government to help the Port of New Orleans aimed entirely at improving the Mississippi.[39] The central figure in early harbor work was Captain Charles W. Howell. Born in Indiana and possessing an excellent record with the Army of the Potomac during the Civil War, Howell came to identify himself to a surprising degree with the interests of New Orleans. Enjoying strong local support for his planned St. Philip Canal, he was joined by local businessmen in his opposition to Eads' jetties. Though his life was short and his projects largely unsuccessful, he was a key figure in contemporary efforts to improve the network of trade at New Orleans and throughout Louisiana.[40] He hoped to secure riverbanks at New Orleans with mattress revetment, to prevent wharves from being undermined by the current. In 1878 at the request of the New Orleans City Council, a board of engineers convened "to examine and report upon the means necessary to protect the wharves and harbors from the incursions of the river."[41] This board recommended "brush matting" made in immense continuous carpets 200 feet wide and from 2,000 to 9,200 feet long. An act of 18 June 1878 appropriated $50,000 to commence the work.[42] In his report of 30 September 1879, Howell described his experiments with mattresses of "fishpole" cane, which he attached to pilings and sank with a ballast of "wornout boiler-tubes filled with sand."[43] He admitted that he was "not prepared to venture an opinion as to the permanence of the work," and, in fact, the cane mattresses proved too frail for the swift current complicated by the traffic of a busy port. Like other experiments tried by Howell, this one was given up within a few years, and the reorganization of 1882 saw the Port of New Orleans, along with Vicksburg and Natchez, turned over to the Fourth District of the Mississippi River Commission.[44]

Taking over the work, the Commission decided to maintain navigation and revet banks, but declined to aid in maintaining levees at New Orleans. Construction and maintenance ought to remain a local responsibility, reasoned the Commission, since valuable city property provided the Orleans Levee Board something rare in the experience of levee districts—an adequate tax base.[45] Instead, the Commission concentrated its efforts on protecting the concave bends of the river, where erosion was the worst. New Orleans had more than its share of these bends: it was not called the Crescent City for nothing. The current struck the east bank of the Carrollton Bend above the city, and crossed to the west bank of the Greenville Bend opposite Audubon Park where the Ames crevasse occurred in 1891. The west bank of the Gouldsboro Bend at Gretna was the next spot of attack, and then the current recrossed to strike the east bank again along "downtown" New Orleans at a spot called the Third District Reach. Between Gretna on the west bank and the Third District Reach across the river, the Algiers Point jutted out, an area of heavy

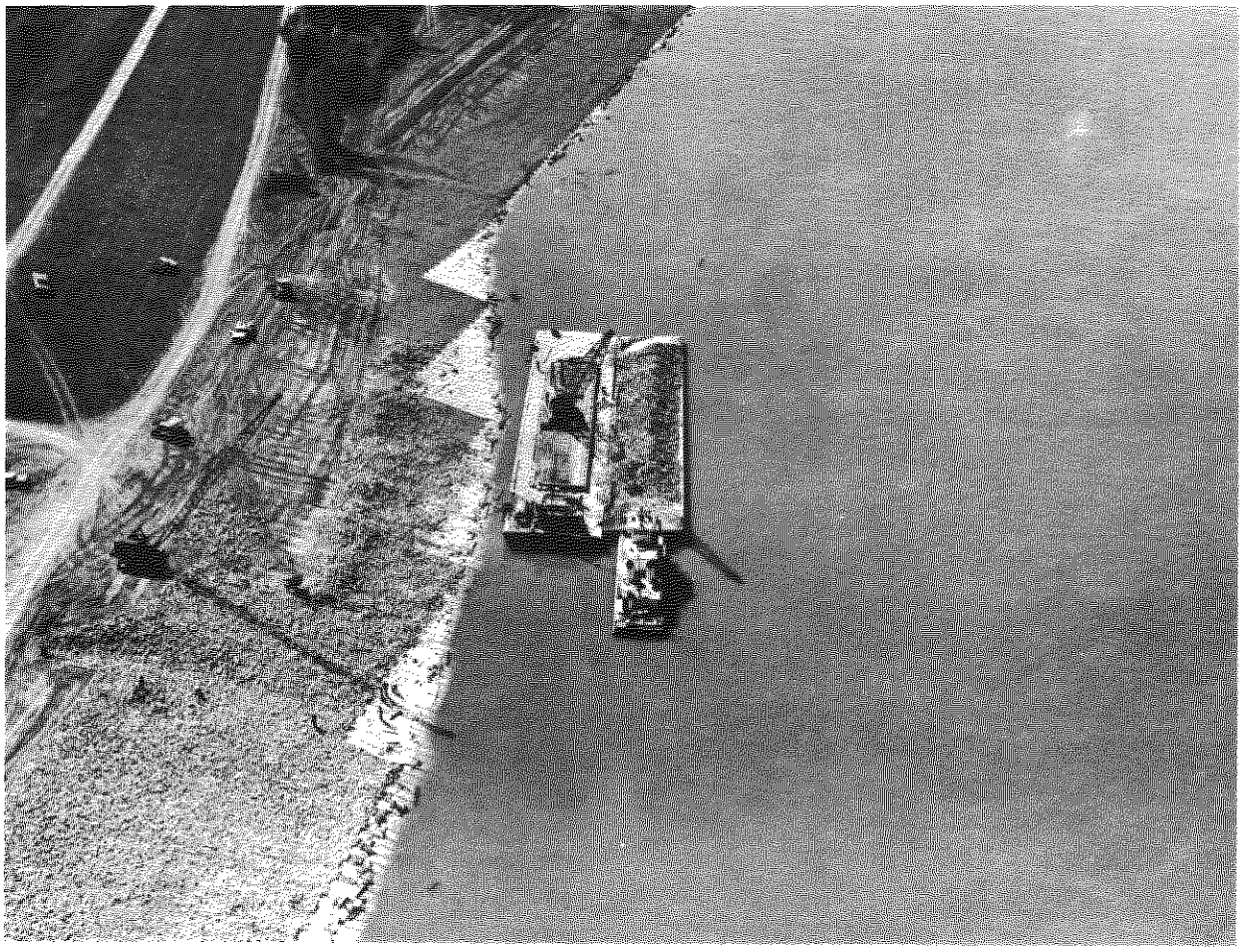


Carrollton Bend.
Spur dikes 3,4&5 built in 1890-91.
" " 3½&4½ " " 1892
Greenville Bend.
Spur dikes 1&2 built in 1889-90
Gouldsboro Bend.
Spur dikes 2&3 built in 1884.
" dike 5 " " 1884-87.
" " 1 " " 1886
" dikes 4&6 " " 1887-88.
3rd District Reach.
Spur dikes 1,2,3&4 built in 1889
" " 1,2,3&5 " " 1891.

DRAWN BY B.J.OLIVEIRA.

erosion where the land, reported an office, "does not wear away little by little, but at intervals of years caves away in large masses, destroying an acre or two....at a time."[46] To end this destruction, in 1884 the Fourth District began to build spur dikes protected by willow-mattresses. During the low-water season of 1896-1897 District Engineer Captain George McC. Derby began making mats at the sites where willows were obtained, and then towing them into place. This became standard practice, since the size of the river made towing easy at low water, when the current was not too swift.[47] Protection for the Port of New Orleans improved with the evolving technology of bank revetment,[48] as the 20th century saw the articulated concrete mat gradually replace the willow mattress.[49]

Major new Federal initiatives in developing New Orleans' harbor came in the mid-20th century, focussing on development of an artificial slack-water port for the city. Local interests had long viewed as a mixed blessing New Orleans' dependence on the Mississippi. Wharf facilities rested on the bank of an alluvial river, and the traffic of the port made the job of stabilizing those banks exceptionally difficult. An elaborate system of pilotage was required to bring ocean vessels safely up the winding channel against a strong current. The



Bank protection—new style. Riprap (broken stone) is laid to overlap the articulated concrete mats.
(Photo by S. R. Sutton)

river's course was unstable and constantly shifting near its mouths, and provided a route to the city that was long, slow, and indirect. When air warmed by contact with the Gulf touched the cold river water, dense low-lying fogs developed. Especially during spring and fall the levees defined a river of mist, even on days and nights which were otherwise clear. New Orleans businessmen wished to be free from complete dependence on a powerful and whimsical river, and vowed to create a slack-water port with straightline access to the Gulf.

But the city's efforts to persuade the Federal Government to undertake construction of an artificial port ran into difficulties at Washington. New Orleans' development might bring advantages to the nation, as local interests claimed. Other parts of the country took a less favorable view of the project. In the end, some imaginative work at the local level, the economic development of the Gulf region, and the increasing power of the Louisiana congressional delegation were required to bring the Engineers into the work. The 20th century riverport developed meantime under the Board of Commissioners for the Port of New Orleans, an agency of the state of Louisiana generally called the "Dock Board." Ownership and operation of most of the port's terminal facilities were brought under this public body, while the Public Belt Railroad was created by the city to connect the wharf facilities with New Orleans' twelve railroad trunk lines. The Dock Board built an Inner Harbor Navigation Canal (the "Industrial Canal")[50] at a cost of $18 million, fulfilling schemes as old as the city by providing a 5.5-mile waterway connection between the river and Lake Pontchartrain. In these developments the Federal Government had no part, though the First World War brought a $15 million Army Supply Base to the inner harbor. The work of the Mississippi River Commission was essential to the old riverside port, as New Orleans' Mayor Martin Behrman acknowledged. But the inner port was the work of local enterprise.[51]

A new departure began with an attempt by local interests to recover the money they had invested in the Industrial Canal by having the Federal Government take it over as part of the inland waterway system. The Corps of Engineers was cool to the idea. Though the River and Harbor Act of 1920 required a survey to be made of "Mississippi River, Louisiana, with a view to securing an outlet to deep water in the Gulf of Mexico by the most practicable route for a permanent channel of a depth not exceeding thirty-five feet,"[52] the Corps declined to recommend such a channel, since the river already provided adequate facilities for deep-draft vessels.[53] In 1929 a House committee asked the Board of Engineers for Rivers and Harbors to investigate the possibility of the government taking over the Industrial Canal. The New Orleans District Engineer found "no necessity for an auxiliary route between the Mississippi River at New Orleans and the Gulf," though he did find some merit in the idea of including the Industrial Canal in the inland waterway system. He believed instead that dependable channels could be maintained indefinitely through the mouths of the Mississippi.[54] In effect the Corps of Engineers had come around to Eads' position, while, as in Howell's time, businessmen still pressed, apparently with little hope, for an artificial means of circumventing as much of the river route as possible. In 1930, Major General Lytle Brown, Chief of Engineers, concluded that no action should be taken on the various proposals that New Orleans interests had pressed through the House Committee on Rivers and Harbors.[55]

In all these attempts, three separate proposals were involved: first, that the Federal Government should recompense the builders of the Industrial Canal; second, that the canal should be made part of the inland waterways system; third, that some sort of artificial

channel should be built to give New Orleans a more dependable and shorter route to the sea. The first of these was a forlorn hope. The last two, however, were essential elements in the creation of an inner port.

First success was scored in 1942, as Congress routed the eastern leg of the Intracoastal Waterway through the Industrial Canal—the state maintaining ownership—and via Lake Pontchartrain to the Mississippi Sound. Anxious over the submarine menace, the lawmakers provided for a land cut through the marsh from the Rigolets to a point on the canal about 2.25 miles from the Mississippi River. The passage through the lake, five drawbridges, and about 31 miles were eliminated from the Intracoastal Waterway by this route.[56] Wartime exigencies also caused the House Commerce Committee on 5 May 1943 to request a new report on a Mississippi-Gulf Outlet; the Senate committee had already made a similar request a few weeks earlier. The investigation was authorized by the River and Harbor Act of 1945, and was undertaken at a leisurely pace; completed 3 years later, the report was not transmitted to Congress until 25 September 1951.[57] However, the District's plan now showed the river-Gulf outlet in the form it would ultimately assume—jutting out of the eastern Intracoastal Waterway and running southeast into the Gulf of Mexico across the intervening marshlands. (An alternative route from the west bank direct to the Gulf was rejected when the Dock Board proposed to invest $30 million to develop port facilities along the east bank route.) The linkage of the river, the Industrial Canal, the Intracoastal Waterway, and the Mississippi-Gulf outlet emerged as a mature concept, which, if fully implemented, would make New Orleans quite a different kind of port from the one it had been throughout its history. And quite a different kind of city, too, since trade, industry, and settlement might ultimately move toward wastelands east of the city to cluster around the new connections to the sea.

Nevertheless the costs were shown to be high and the benefits of the outlet were speculative. At 1948 prices an initial investment of $67 million would be required, with annual maintenance estimated at $4 million. Practically the whole direct cost would be borne by the Federal Government, though very broad commitments would be required from local interests toward the indirect costs associated with the outlet.[58] In its review, the Bureau of the Budget found that the channel could not be justified, considered by itself. The benefits to be derived from the expansion of port facilities around the turning basin included as part of the project represented the only substantial savings to commerce. In other words, the ship channel could be justified only in terms of what would later be called the "centroport" feature. Taken together, the channel and turning basin constituted "valuable long-range improvements... to be undertaken as conditions permit." However, no appropriation was to be sought "until such time as the budgetary situation makes possible the initiation of such improvements."[59]

In plain fact, this qualified endorsement meant that not enough political steam had gathered behind the Gulf outlet. Costs were high, and whatever the country might gain indirectly by building New Orleans a slackwater outlet to the sea, the immediate and tangible benefits would accrue to local interests alone. The Louisiana Congressional delegation argued that the expansion of water commerce using New Orleans was steady and was likely to continue; that New Orleans, alone of American ports, served a hinterland of indefinite extent; and that the systematic development of the Mississippi and its tributaries logically demanded an equal development for the entrepot of the whole valley. These arguments gained strength during the early years of the Eisenhower administration. The end of the Korean War,

The Mississippi River-Gulf Outlet east of New Orleans. At lower left is the Intracoastal Waterway; top, the Gulf of Mexico.
(Photo by S. R. Sutton)

the growing strength of the Louisiana delegation, and the precedent established by the heavy Federal investments in other transport projects all contributed, directly or indirectly, to the eventual success of the proposal.

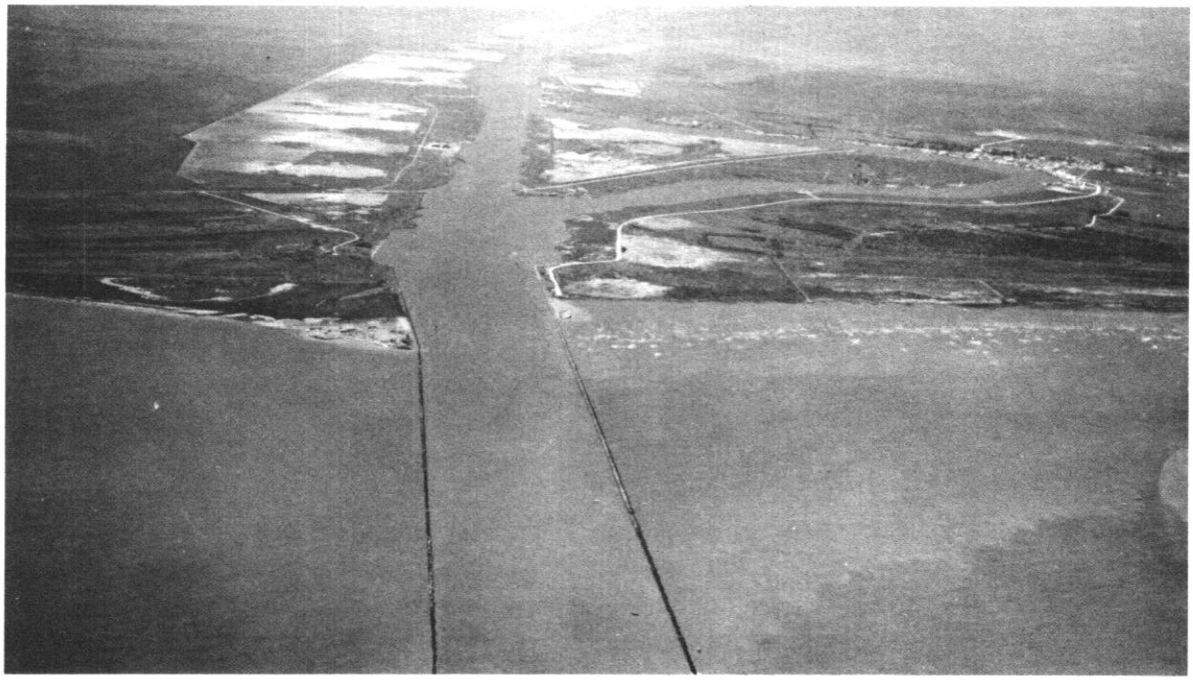
The decade of the 1950's saw heavy investments in the national transportation system. Congress approved such major schemes as the Interstate Highway System and the St. Lawrence Seaway. The Mississippi-Gulf outlet, so significant locally, was a small part of the far-reaching developments in road, water, and air transport that characterized the time. Backing for the project became increasingly well organized and powerful. The New Orleans Public Service, the Dock Board, and private transportation interests developed an effective spokesman in the Tidewater Development Association. Endorsement of the outlet was secured from eleven governors in the primary trade area of the Mississippi Valley. In 1956 strong backing and a favorable atmosphere resulted at last in the authorization of the Mississippi-Gulf Outlet.[61] In terms of the overall trade pattern of the Mississippi Valley and the Intracoastal Waterway, the development of new facilities geared to the waterway at New Orleans—the point of intersection of the T—was likely ultimately to be justified by the overall growth of the region which it served. But heavy local investment all along the artificial waterways of the inner harbor would be necessary to fulfill

the outlet's promise for the future.

Up to 1912, the Annual Reports of the Chief of Engineers listed some 860-odd rivers, bayous, lakes, and passes which the District had surveyed or improved since the end of the Civil War.[62] Once the basic pattern of the T emerged, these minor streams acquired new importance. Still necessary for local trade, they became part of a broad pattern of regional and national commerce as well. Some were incorporated into the inland waterway, supplying it exits to the Gulf, opening water access to the hinterland, or providing alternate routes to major production centers like Baton Rouge. The District built outlets from the Intracoastal Waterway to the Gulf utilizing the Mermentau River, the Calcasieu, Freshwater Bayou, Wax Lake, Bayou Lafourche, and the Lower Atchafalaya. These outlets were of great significance to the offshore oil industry, as well as to the shrimp and fishing fleets and general trade. An important development was the extension of the Intracoastal Waterway up the valley of the Atchafalaya by way of Grand River and land cuts to Port Allen, opposite Baton Rouge.[63] By 1970, new projects involved flood protection for the Mermentau north of the waterway, while channel improvements were planned for Bayous Teche and Lafourche. But the most extensive and complex work on the smaller streams was that undertaken on the Calcasieu River, of which the rapidly expanding city of Lake Charles became the principal beneficiary.

A small river running roughly parallel to the Mississippi in southwestern Louisiana, the Calcasieu's 3,500-square-mile basin was a mixture of low hills, prairie, and marsh. Rich oil and gas fields lay within the 100-mile curve of the upper river. Ricelands surrounded the city of Lake Charles, which lay 34 miles from the Gulf and just south of the point where the West Fork entered the mainstream of the Calcasieu.[64] Here the key to regional growth was the opening of a complex of water links to the ocean, the Gulf coast, and the Mississippi, in which local interests and the Engineers both took a hand. From 1872 on, the New Orleans District maintained a program of snagging and dredging on the Calcasieu.[65] However, the river even when cleared of obstructions was not an efficient route to the Gulf, for it flowed, south of Lake Charles, into Calcasieu Lake, which was only 5 to 6 feet deep, and thence by a pass into the Gulf. The parish undertook to build a deepwater canal to the more navigable Sabine River, which ran parallel to the Calcasieu on the western border of Louisiana. By 1926 this canal was functioning, making Lake Charles a deepwater port. Later the canal was absorbed into the western Intracoastal Waterway, gradually turning Lake Charles into the regional market for a broad arc of rich Gulf lands. In 1937 a program of improvement was proposed by the Engineers to make the Calcasieu useful for commerce.[66] Approved by Congress, the work was begun by the New Orleans District in 1941.[67] Engineers dredged a 40- by 400-foot channel from old Highway 90 at Lake Charles to the Gulf, where existing jetties were enlarged and straightened to enable the channel to maintain itself. An approach channel from the Gulf of Mexico was also opened, to provide ready access to deep water. Further provisions were made for a mooring and turning basin, a ship channel to Cameron, and a salt water guard lock at the intersection of the river and the Intracoastal Waterway.[68] These water links were one key to the phenomenonal growth of Lake Charles from drowsy town to bustling regional port city.

By constructing the Intracoastal Waterway and by aiding the expansion of the Port of New Orleans, the New Orleans District materially assisted regional economic development. In turn, the growth of trade along waterway and river, with its hub at New Orleans, encouraged



Calcasieu River and Pass.

Traffic jam in New Orleans Harbor.

the development of many smaller waterways throughout the Gulf region. In Louisiana this development of the smaller streams was especially noteworthy. No other state had so many miles of waterways. Undeveloped, they were mere obstructions to road and rail; cleared, dredged, and connected with markets, they became highways instead of barriers for economic growth and social development. The overall benefits of this growth would be disputed by few. Everywhere along the T of trade, isolated communities scarred by poverty and ignorance were brought—literally—into the mainstream of American life.

But the success brought its own problems. In their undeveloped state, the bayous of Louisiana preserved a rich regional culture as well as regions of rural poverty and ignorance. As a result of development, game preserves and areas of unique and exotic natural beauty were no longer protected by their remoteness. "Crossing the T" helped to bring the New Orleans District face to face with the most difficult problem of all—to integrate future patterns of economic development with the preservation of human and natural resources.

CHAPTER SIX

NEW DIRECTIONS

The reorganization of 1928 brought no more than a change of names to the Engineers at New Orleans. The old Engineer District became the First New Orleans District, while the Fourth District of the Mississippi River Commission, after a brief rechristening as the New Orleans River District, became the Second.[1] In 1940, however, a decisive administrative change occurred when the Gulf Division was abolished and the First and Second New Orleans Districts were united.[2] The new organization, occupying the Second District complex at Prytania Street and the river, was placed under the Lower Mississippi Valley Division Engineer at Vicksburg. The only trace of the old division of duties survived in the "two hats" worn by the Division Engineer. Henceforth projects dealing with the river were submitted to him for review as President of the Mississippi River Commission, while projects not connected with the river were submitted to the same officer in his capacity as Division Engineer.

The unified command was tested almost at once in military construction work during the Second World War. The period was a difficult one for the newly unified District. Many of its key personnel were called to military service; many were reserve officers of the 337th Engineer Battalion. The District was left to carry on its usual heavy responsibilities, including major flood fights in 1944 and 1945, the second of which required the opening of the Bonnet Carré Spillway.[3] For nearly two years (January 1941 to December 1942) the District carried out an extensive military program as well.[4] Construction of airbases, camps, an ordnance backup depot, seacoast fortifications, a wharf and Engineer depot, and oil and cargo barges to speed the delivery of war materiel to the eastern seaboard—all added to its work. Much credit for bringing the District successfully through the period belonged to George H. Hudson, a civilian employee and an officer of the Army Reserve, who became District Engineer during the war, and to older civilian employees who were not affected by the draft.[5]

As wartime troubles faded, the organization built up its depleted ranks. Many of its former employees returned from active service, and the customary civil works program was resumed. In addition, the years that followed the war saw new duties begin to take form: in hurricane control and disaster relief; in river basin planning; and ultimately, in gearing up old enforcement procedures to carry out a new national policy for improving the environment.

First came the new responsibilities in disaster control.[6] Though hurricanes came late to the District's agenda, the great equinoctial storms had for centuries been one of the insolvable problems of the Gulf Coast. From the tempest of 19 September 1559—the first

Hurricane Betsy—damage before the cleanup began.

tropical storm of record in the Gulf—to Hurricane "Camille" in August 1969, Louisiana was struck by about 160 hurricanes in 410 years. The storms seriously retarded the development of the coast, killing people and animals, destroying homes and businesses, ruining crops, and changing the ecology and even the topography of the land. As cities grew, they proved to be especially vulnerable. Protective levees were damaged, communications destroyed, dense populations endangered by wind and water, and, in the aftermath of great storms, intolerable burdens placed on every form of community service.[7]

Pending development of an effective means for aborting hurricanes (perhaps by "seeding" them at an early stage of growth), more traditional remedies had to be applied to the troubles brought by the big ill winds. The basic resource lay in the people of the region, where long experience and tradition of mutual assistance, served by an increasingly effective warning service, made survival and rapid recovery possible even after the worst storms. Systematic Federal assistance for those caught in hurricane disasters began in the 1950's.[8] As part of a comprehensive scheme of help coordinated by the Office of Emergency Planning, the local districts of the Corps were assigned work appropriate to their special skills. They were to guard the defensive works—mainly locks and levees—to protect the land, and, once a storm had passed, to carry out the immense cleanup job that followed.

After the storms of 1954 severely damaged the Atlantic Coast, Congress instructed the

Hurricane damage cleanup.

Chief of Engineers to begin surveys for protective works in areas endangered by hurricanes.[9] The New Orleans District undertook planning for the Lake Pontchartrain and Vicinity Protection Project, beginning with a scientific study of the region and an outline of the works that would be necessary to protect it. Turning to new account the skills they had learned in dealing with floods, the Engineers charged with the project established two hurricanes to serve as standards—in effect, to play the role that the Project Flood played in the Jadwin Plan. The first of these projected storms (the Standard Project Hurricane) was, in terms of intensity and path, the most severe storm likely to occur in the region; the second (the Probable Maximum Hurricane) was the worst storm assumed to be possible in the region. Lacking any means of protection against the winds (only comprehensive reform of local building codes could be of much value here) the District concentrated on guarding against the hurricane surge or "storm tide" from the Gulf of Mexico. Since most loss of life resulted from these surges, to which the flat coastline offered no obstacle, the District was aiming at a critical point in the work of storm control.

As determined by the Engineers, the Standard Project Hurricane critical to New Orleans would approach from the south, move inland west of the Mississippi's mouth, and curve eastward over Lake Borgne. With a central pressure of 27.6 inches of mercury and a maximum wind velocity of 100 miles per hour at a radius of 30 miles, this hurricane

would inundate about 700,000 acres with depths up to 16 feet. Though about 240,000 acres were marshland east of the city, the District's plan warned that the 460,000 acres remaining included "a major part of metropolitan New Orleans."[10] This grave warning was borne out when, on 9 September 1965, Hurricane "Betsy" struck New Orleans. With higher winds than the Standard Project Hurricane, but describing a path that lacked the ominous eastward curve over Lake Borgne, the storm inundated 531,000 acres in the four-parish New Orleans metropolitan area. Seventy-nine deaths and a half-billion dollars in property damage wrote a grim endorsement to the hurricane protection plan. Above all, the need had been demonstrated for protection against the storm tide, the principal instrument of death wielded by "Betsy."

Congress enacted the District's plan as part of the Flood Control Act of October 1965.[11] Scheduled for completion in 1991, the projected works would eventually provide the city and lakeside parishes with the same protection against storm surges that it already had against floods from the Mississippi. A new levee would protect the south shore of Lake Pontchartrain from Bonnet Carré Spillway to South Point. Steel and concrete floodwalls along the Industrial Canal, levees along the north side of the Intracoastal Waterway, and a connecting link roughly parallel to Highway 11 would protect the developing area called New Orleans East. Storm tides would be checked from entering the lake by a lock and control structure at the Rigolets, and a flood control structure at Chef Menteur. Another structure at Seabrook on the lakefront would

Hurricane surge—its meaning in human terms. The waters of Hurricane "Betsy," 1965.
(Photo by J. V. Crampes)

not only help to check hurricane surge, but would protect the valuable Pontchartrain fishing grounds from changes in the salinity gradient caused by saltwater intrusion. South of the Intracoastal Waterway and west of the Gulf Outlet another ring of levees and floodwalls would inclose the heavily settled suburbs of St. Bernard Parish and the lower Ninth Ward of New Orleans where the storm tide of 1965 did its worst work of destruction. Finally, a floodwall west of the Industrial Canal would prevent any possible danger to the central city. By 1975 floodwalls and levees along the Industrial Canal, the Gulf outlet, and in Chalmette were well advanced, and floodgates at Bayous Dupre and Bienvenue were completed.

The city of New Orleans, however, was not the only area for the Corps to protect. South Louisiana had many rich and vulnerable regions, and the aim of the hurricane protection plan was to safeguard as many of them as possible. Settled areas near Franklin and Morgan City, and in the vicinity of Golden Meadow, needed additional protection. The lower coast of the Mississippi River below New Orleans would be protected under the New Orleans to Venice Hurricane Project. This region was second only to New Orleans in the damages which it had received from hurricanes. Here losses from Hurricane "Betsy" reached $50 million, and those from "Camille" in 1969, $100 million. Not only were important industries growing in the region, but the service industries for offshore oil development would shortly represent an investment in excess of $1 billion. Rich, vulnerable, and often attacked by hurricanes, the protection of this region was one of the most pressing duties of the New Orleans District.[12]

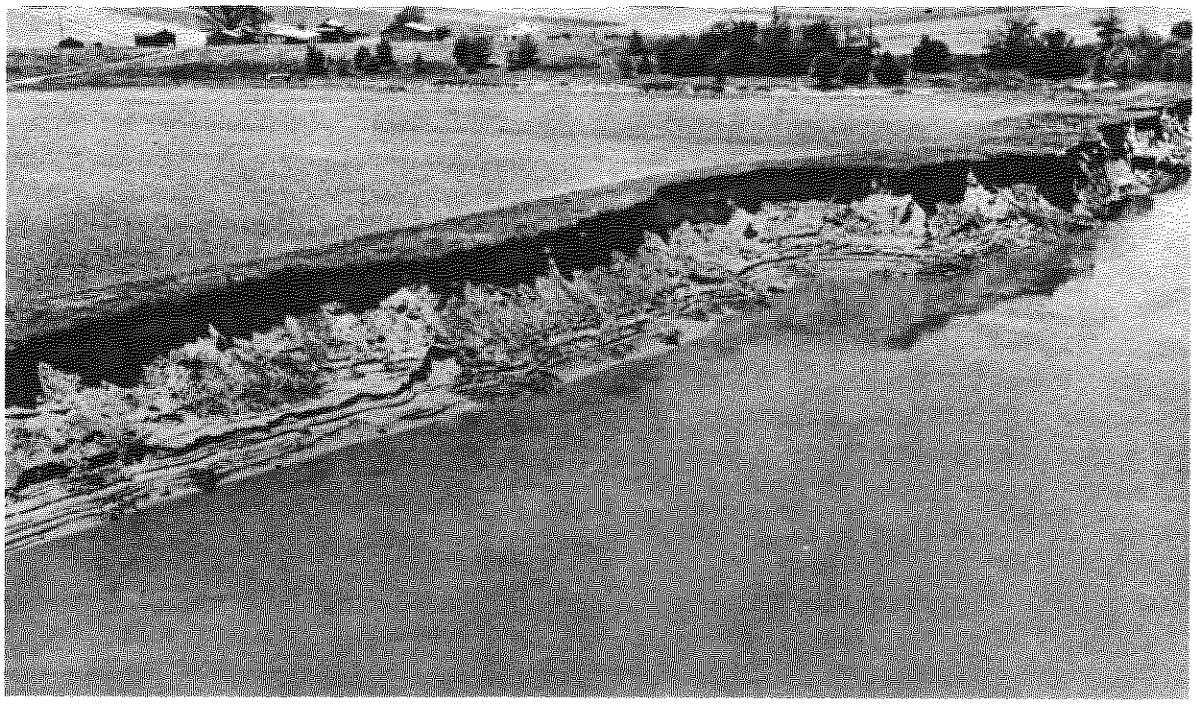
Aside from structural works, the District also took part in saving life and property during storms, and cleaning up the wreckage afterward. These jobs developed as a result of certain laws[13] and regulations of the Corps of Engineers[14] adopted between 1955 and 1970. Priorities established by these laws required local Division and District Engineers to give first attention to the Corp's own flood control works and other facilities; next, to furnish technical assistance to local authorities in protecting Federal works which they maintain; finally, to give direct aid to rescue and supply operations when the local powers had committed their resources, or were unable to cope with the flood or coastal storm situations.[15] Division Engineers were authorized to call upon other elements of the armed forces for emergency support.[16] Liaison was to be maintained with the Office of Civil Defense and the Office of Emergency Planning, the Red Cross, and local interests. After the emergency passed, the Corps—in the event that the President proclaimed a major disaster—might be authorized by the Office of Emergency Planning to survey damage, perform emergency channel clearance and shore protection, clear wreckage and debris, and repair or replace public facilities on an emergency basis.[17] In practice, however, the books were shelved in actual emergencies and a rapid and informal allocation of men and machines was made wherever the need was greatest. For example, while the official schedule was followed during Hurricane "Betsy," government property was so rapidly secured that Corps personnel and boats were the first to enter the flooded areas near the Industrial Canal and begin rescue operations there.[18]

Cleaning up the wreckage after the storm was the last part of the Corps program. Breakdowns in transport and communication needed quick attention. Restoring freedom of movement and an orderly appearance to a stricken city was essential, both to make police protection effective and to restore citizen morale. In this work—especially after "Betsy" and "Camille"—the District contributed equipment and skilled personnel to the

massive cooperative effort in which official agencies and citizen volunteers alike take part. Special problems requiring a high degree of specialized skill and large, sophisticated equipment—clearing roads blocked by boats and houses, or refloating massive barges carried inland by the hurricane surge—particularly required the professionalism of the Corps. In the still unsolved problem of the hurricanes, the New Orleans District became a critical element in disaster control before, during, and after the passage of a storm.[19]

Though important, the hurricane protection program was, in one sense, traditional in nature: it was essentially flood fight against saltwater instead of fresh. It was in the field of river development—in the ancient, basic problems of dealing with alluvial streams—that the boldest new programs of the District began to appear. In comprehensive basin development, the New Orleans District took the most complex forms of Engineer planning activity and applied them to the troubled Red River Valley.[20]

A major tributary of the Mississippi some 1,200 miles in length, the Red River had had a complex history since the Civil War. The part of the river within Louisiana was assigned to the New Orleans Engineer Office under Major Charles W. Howell, transferred to the Memphis Office when Major W. H. H. Benyaurd was in charge, later to Vicksburg, and finally back to New Orleans. For all who struggled with it, the Red was a baffling problem—the more so because its valley promised rich returns in human use and enjoyment if the stream could be controlled. Basic difficulties, however, lay in the river's erratic flow and the sandy soil of its flood plain. Typically, the valley experienced heavy spring rains, with light precipitation for the rest of the



The Red River problem. Erosion, destruction of farmland, the shoaling of the channel that will follow—these are the effects of the undisciplined Red.

(Photo by S. R. Sutton)

year. (This pattern was particularly noticeable toward the western end of the valley.) Floodwater was followed by low water, the highest flow generally coming at the time of year when it was least useful in moving agricultural products to market. Erosion was another curse. Spring floods undermined the banks and saturated the soil. When the river fell, the weakened banks collapsed into the channel. Erosion encouraged shoaling. By mid-summer, the river, so lately a torrent, became so shallow that small boats could scarcely maneuver in some reaches; the caving of forested banks added yearly another mass of dying snags to the stream, which the next high water carried down—if uncleared, to form a raft.

At its greatest extent in 1828 the Great Raft of the Red was 92 miles in length, extending from Loggy Bayou, 65 miles below the present site of Shreveport, to Hurricane Bluffs, 27 miles above.[21] Explosives and steam engines had to be used to open a way through this tough, resilient, matted obstacle that grew with the timber brought down by every high water. As superintendent of improvements on the western rivers, Henry Shreve broke through the lower sections of the raft and established Shreve's Landing (later Shreveport) in 1835.[22] However, the raft periodically re-formed, and between 1828 and 1841 the United States spent over $425,000 for its removal. The decline in Federally financed internal improvements interrupted the work, and appropriations failed between 1841 and 1852. During the brief revival of civil works activities in that year, another $100,000 was appropriated, and the way to Shreveport was reopened. The supply of funds then failed once more, in typical antebellum fashion, and Civil War and Reconstruction had to pass before work could be resumed. New appropriations were made in 1872, but when Federal work resumed, the years of neglect and war had left their mark.

> ... the river above Shreveport, La., was closed by a raft 32 miles long, and growing constantly. Below Shreveport the enlargement of an outlet through Tones Bayou was depleting the main channel and threatening its closure to navigation. At Alexandria, La., the falls were impassable at low stages. Navigation was difficult and dangerous at all places and at all times. The channel shifted frequently, and at flood the river overflowed the entire raft region. The banks were heavily timbered and each flood caused them to cave or slide.[23]

In the face of so many difficulties, the Engineers at first set about securing an effective channel for navigation. The whole economy of the region beyond Shreveport had been transformed by the raft, sometimes in surprising ways. Though the effect on the normal traffic of the river was adverse, the blockage of water had raised water levels in the bayous leading into the Red from eastern Texas. A brisk local trade had sprung up along these bayous, and the cotton of Texas found a way to market at New Orleans by devious streams that paralleled the Red. Ironically, clearing the main river caused the head of water in these streams to fall, cutting off the trade. Hence, the Engineer in charge of the work recommended "Fabian tactics" in clearing the river and reported the destruction of at least one dam by "a body of masked men."[24]

Despite everything, small but regular appropriations enabled a gradual improvement to take place. The raft was broken in 1873 and the major outlets gradually closed off. Scour increased, the channel deepened, and the perils of navigation, which had claimed nearly 200 steamboats up to 1887, steadily lessened.[25] To prevent new snags from getting into the channel, banks were cleared and the worst shoals were dredged. Efforts were begun to stop bank erosion by wing dams and revetment.[26] A period of optimism over the

river's future followed. In 1909, the Vicksburg Engineer Office reported that at high water the river was navigable as far as Denison, Texas—800 miles above the Atchafalaya junction. Between 1890 and 1909 considerable traffic moved on the Red, mostly agricultural and timber products with estimated values ranging from $1.5 to $9 million a year. The Red has not moved equivalent cargo values since that time.

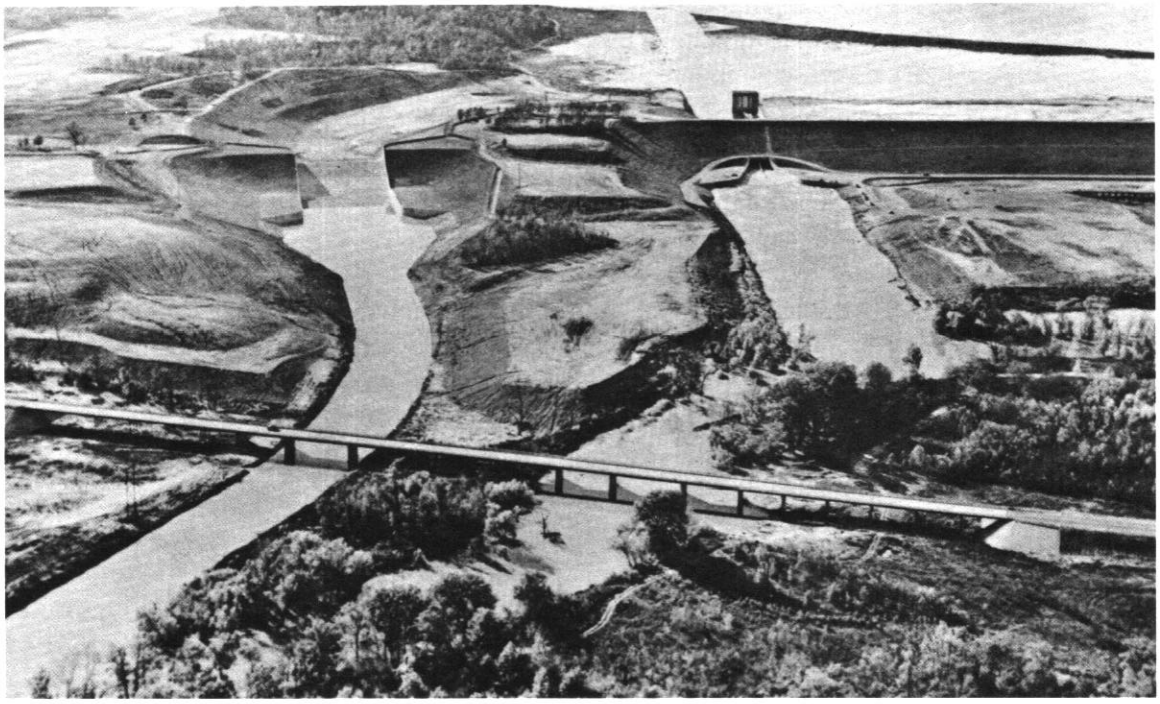
The trouble was that commerce on the Red had never been more than a *tour de force.* Commerce moved on the Red in spite of the river. The limited improvements which were possible under the small appropriations then available—and under narrow conceptions then current of what constituted "improvement"—were just not enough to cure the basic difficulties intrinsic in the nature of the river and of its valley. Railroads were successful in taking over the commerce of the region, and, in contrast to the Mississippi, commerce lost to the Red was lost for good. In 1908 Engineers noted a decline in the value of waterborne cargo,[27] and from that time on river trade fell precipitously until revived by the First World War.[28] Still, average commerce during the war years was only about half that of 1890-1908.[29] If river commerce was to revive permanently—and the land along the banks produced the sort of bulk products which were best adapted for water transport—a whole new approach to the problem must be made.

This need was underlined by the lagging social and economic development of the valley. Before the Civil War, the basin of the Red was sparsely inhabited, with not one town of 5,000 inhabitants. Development after the war was mainly directed to opening land for cotton production, which, by the twentieth century, had begun to produce destructive side effects in soil depletion and erosion. Then discovery of oil began to push the region toward a more diversified economy, and by the mid-20th century, manufacturing, trade, and services employed more workers than agriculture. Yet the valley remained essentially underdeveloped. In 1960 the average per capita income of its people was 40 percent below the national average. A 1968 report by the Red River Basin Coordinating Committee concluded that "the basin lacks the diversity and industrial base required to insure reasonable progress in closing the economic gap."[30]

Modern efforts by the Federal Government to assist development of the Red were varied and complex. In 1936 Congress authorized construction of 297,000-acre-foot Bayou Bodcau reservoir 35 miles northeast of Shreveport and smaller Wallace Lake southeast of the city. Spurred by Senator John Overton, the Flood Control Act of 1946 authorized a project to make the river navigable and authorized 2.65-million-acre-foot Texarkana Reservoir and 842,000-acre-foot Ferrels Bridge Reservoir now called Lake O' the Pines near Jefferson, Texas. These artificial lakes contributed to flood control and municipal and industrial water supply as well as making available major recreational resources to the growing "ArkLaTex" area.

Full plans for basin development followed. Originally devised during the Progressive Era, the concept of developing a whole river valley in integrated fashion for flood control, navigation, power production, and conservation of resources proved after 1925 to be a practical method for improving the nation's rivers. In the Flood Control Act of 1950, Congress applied the idea to the Arkansas-White-Red River systems, requiring a general survey

> ...with a view to developing comprehensive, integrated plans of improvement for navigation, flood control, domestic and municipal water supplies, reclamation and irrigation, development and utilization of hydroelectric power, conservation of soil, forest, and wildlife resources



Lake Texarkana under construction, 1954. This vast artificial lake now provides not only flood control for the Red River Valley but recreation for 2.5 million visitors a year.

(Photo by S. R. Sutton)

Ferrells Bridge and Lake O' the Pines.

> including such consideration of recreation uses, salinity and sediment control, and pollution abatement as may be provided for under federal policies...[31]

Sketching out the dimensions of basin planning, the law also indicated that the job was to be carried out by a mixed committee representing the Federal agencies and the states.

Study by an unwieldy body made up of representatives from seven agencies and eight states showed the desirability of separate plans for the basins.[32] A plan for the Red River below Denison, Texas, was developed by a coordinating committee which represented four states (Louisiana, Texas, Arkansas, and Oklahoma) and six Federal agencies, chaired by the New Orleans District Engineer. An interim report on navigation and bank stabilization was submitted in 1966, and in 1968 an eight-volume study put forward an overall plan for the transformation of the Red River Valley.[33] Meantime, in 1956 Louisiana voters set back development by rejecting a constitutional amendment providing for acquisition of rights-of-way, but in 1964 reconsidered and approved the project. Though Congress in 1968 ordered work to begin, many problems remained, including sharp clashes with environmentalists, especially over the proposed Kisatchie Reservoir. Pressures of the Vietnam War then led to impoundment of funds, which were not released until 1973. On 7 May of that year, the Shreveport *Journal* was able to announce "Big News for the Big Red," as Senator Russell B. Long informed the Red River Valley Association that President Nixon had released $600,000, enabling the Corps to let an initial contract for Dam No. 1.

Guiding work was a plan which gave first priority to navigation and bank stabilization, followed by flood control through reservoir storage and channel improvement. Aiming at an open channel for barge commerce, an end to bank caving, and a dependable flow of water, the plan sought to provide a basis for the growth of industry and recreation throughout the valley.[34] Following the existing channel of the Red as far as possible, the channel would provide a depth of nine feet from Old River Junction to Daingerfield, Texas. However, cutoffs would straighten the meanderings of the Red, creating oxbow lakes for fishing and recreation. Depth would be maintained by nine lock and dam combinations. Total cost of the project was estimated in 1974 at $1.09 billion, including $685.9 million Federal expenditure in Louisiana.[35]

Overall, the Red River Waterway project, when completed, would be the biggest single civil works project in the history of the New Orleans District. It gave promise of a new and more prosperous environment into which people and industry could flow, finding there not only cities, jobs, and transport, but wild and recreational areas as well. Of all forms of transport, only the waterway could improve life in so many different ways—and encourage other forms of transport as well, since road, rail, and air transport would follow the movement of people and industry to a newly developed area. Engineer work in developing the Arkansas River had already shown the practicality of such hopes. There was no less promise in the development of the Red, and Captain Shreve himself might have approved the boldness of the project for the final disciplining of his vagrant river.[36]

If planning was to be effective, however, improved resource management and more rigorous control of industrial pollution had to be applied wherever development took place. Through much of their history, the American people had accepted growth as an automatically desirable goal without pausing to examine its environmental cost or to make provision against its destructive side effects. In

the 1960's however, smog, congestion, and poisoned waters began to change the public outlook. For the New Orleans District the years of the "environmental crusade" meant new urgency in carrying out many traditional programs of pollution control, and new responsibilities under precedent-setting environmental legislation.

Many older District programs, though undertaken for other purposes, had positive environmental impact. For more than 70 years, the New Orleans Engineer Office and its successors struggled to improve navigation by controlling the water hyacinth, an aquatic herb native to tropical America. Growing prolifically, the plant blocked both lagoons and free-flowing streams, destroying aquatic life of all kinds and producing in some areas "a virtually sterile aquatic ecosystem."[37] District work in this field benefitted navigation, mitigated flooding, and preserved aquatic life as well.[38] Control of saltwater intrusion into freshwater streams was another long-standing District program with environmental implications. Because of the flatness of the Delta landscape, saltwater and fresh had always mingled to an unusual degree along the Louisiana coast. Cutting new channels increased a problem which was inherent in the landform. Hence, the Engineers undertook to build salinity control structures. On the Calcasieu River, for example, saltwater entering through new channels forced rice growers to irrigate by wells or diversion of upstream tributaries. Though local interests had earlier agreed to hold the United States free from claims for such damages,[39] sentiment veered around as difficulties mounted. In response to local demands, the New Orleans District began searching for a way of meeting the problem.[40] In 1962 the Engineers proposed a saltwater barrier, which would close the Calcasieu, and provide control and navigation facilities in an artificial channel. The program was approved by Congress, and construction began in 1965. Traffic was first routed through the artificial channel on 7 September 1967.[41] The control structure was basically a weir with movable floodgates over a fixed sill. When saltwater was high, the gates were closed; when low, they were opened to permit outflow of freshwater, while the undercurrent of heavier brine was stopped by the sill. The structure provided the key to continued development for the harbor of Lake Charles without destructive side effects to the region's agriculture. But a significant result was to restore, by artificial means, a boundary between two aquatic systems that earlier work had broken down.

Another salinity problem developed from the Mississippi-Gulf Outlet. Opening this channel permitted an influx of saltwater into Lake Pontchartrain which threatened the salinity gradient of the lake, an important nursery area for Louisiana's fisheries.[42] The Seabrook complex proposed by the Engineers for the Industrial Canal included structures to control this influx. The same sort of difficulty might have arisen where the Intracoastal Waterway crossed the rice-growing area of the Mermentau-Vermilion basins, except for the locks on the Waterway at Calcasieu, Vermilion, Schooner Bayou, and Catfish Point. The locks permitted navigation to continue without endangering the rice crop. When high water levels were required along the Mermentau to flood the ricefields, the locks helped to retain the water. When the freshwater of the basin was higher than the Gulf, and the flooding period was ended, the locks stood continuously open. When adverse winds piled up saltwater from the Gulf and threatened to invade the basin, the locks came into operation again, this time to keep out the salinity. Enormously busy (Calcasieu Lock passed above 42 million tons of cargo in an average year), these locks additionally helped to reduce saltwater intrusion, not only through the GIWW, but also through the natural

streams of the region. Here too devices intended to aid navigation and agriculture took on an environmental function.

Though Louisiana had never been a highly industrialized state, industrial pollution had long been a problem. Sugar refining and petroleum production both produced objectionable effluents, which were deliberately or accidentally dumped into the state's waterways. The responsibilities of the New Orleans District to regulate dumping originated in the so-called Refuse Act of 1899, which forbade depositing of refuse in navigable waters of the United States, except under a permit from the Chief of Engineers. To detect unlawful acts and bring charges against those responsible was a duty of the District for three generations, and, despite the fact that the law was clearly framed only to protect navigation, the environment benefitted.[43] Surviving records indicate that about 1,000 violations were cited by the District between 1955 and 1969 alone. When sugarmill effluent was polluting Bayou Teche, the Corps charged that the mill owners were obstructing navigation on a project stream by making it offensive to human use. Similarly, oil spills were frequently discovered and those responsible punished. In this way the District exercised a pollution-control function decades before the environment became a major public issue.

Deliberate and explicit environmental functions, on the other hand, came late to the Corps, for reasons that went deep into the nature of American society. Presented with a rich and unexploited continent, Americans were slow to be convinced that resources had a limit, that wild species were not inexhaustible, and that they themselves were tenants of their land and not owners in fee simple. Not until 1956 did Congress require effects on fish and wildlife to be taken into account in enforcing the Act of 1899. And not until passage of the National Environmental Policy Act in 1969 and the Federal Water Pollution Control Act Amendments in 1972 were basic laws rewritten to give the United States, for the first time in its history, an overall environmental policy. In 1970 the District set up the area's first environmental permit program under provisions of the Refuse Act. Though the program later passed to the Environmental Protection Agency, the District continued to act as advisor to the new agency on questions related to navigation and flood control. The contribution of the District itself, and of the Corps generally, to the new program had been a large one. In 1975 a court decision drastically expanded Engineer responsibilities for protecting wetlands. In line with these departures, change appeared in the District at many levels. Organizational restructuring gave greater weight to planning and recreation. A continuing search for nonstructural alternatives including a heavier emphasis on floodplain management underlined the importance which the new era brought to the District's intrinsic concern with the Louisiana environment.

Thus new duties took form. The district had to help inaugurate a new act in the relationship between man and nature in the Delta. No state possessed so great a proportion of water to land area as Louisiana, and in no other was the rational development of that water more significant. In no other did water provide such opportunities, if developed and protected, or present so many obstacles and dangers, if undeveloped or misused. And the management of the state's water resources had to take into account a strenuously growing economy, which saw Louisiana, by 1970, producing 20 percent of the nation's crude petroleum, 50 percent of its sulfur, and 24 percent of its salt. Sugar and rice were harvested from the fields, fur from the marshes. An immense fishing industry exploited the resources of the Gulf. Great wildlife preserves stretched along the

southwestern Louisiana coastline, and others were proposed for the wilderness of the Atchafalaya basin. None of these interests could be neglected, none could be sacrificed, and all came to a greater or lesser degree within the purview of the New Orleans District. To find a way through the tangle of political, economic, and environmental factors—to protect, develop, and conserve at the same time—was a unique and heavy reponsibility.

The District had come a long way from the brick forts of the 1820's. It began with military duties, took on civil functions, and gradually grew into the Federal agency primarily responsible for controlling and making useful the whole network of the Delta waterways. As it matured, it became a significant agent in transforming much of Louisiana from its primitive condition as a floodplain of the Mississippi to a settled region of cities, productive agriculture, and extractive industries. By changing the seemingly endless waterways of the state to facilitate navigation and by erecting works of flood control, the Corps of Engineers laid an indispensable groundwork for growth. Its work in mitigating the effects of hurricanes likewise provided the Delta a measure of protection against a major natural enemy. Development of many minor streams, of the Calcasieu, and planned river basin development of the Red promised major improvements in prosperity and the quality of life in north and south Louisiana. In the 1970's the New Orleans District also took on heavier responsibilities for controlling environmental pollution resulting from both natural and artificial causes. Faced with a new age in which conservation would mean as much as development, the Engineers carried on their complex duties under the Corps' traditional motto—*Essayons*, let us try.

NOTES

INTRODUCTION

[1] Harold N. Fisk, *Geological Investigation of the Alluvial Valley of the Lower Mississippi River* (Vicksburg: Mississippi River Commission, 1944), 67-69; Robert W. Harrison, *Alluvial Empire* (Little Rock: Pioneer Press, 1961), 12.

[2] A classic study of the meander phenomenon is J. F. Friedkin, *A Laboratory Study of the Meandering of Alluvial Rivers* (Vicksburg: Waterways Experiment Station, 1945). Friedkin found that meanders develop even in a perfectly straight channel with uniform banks and unvarying flow, the sole requirement being that the banks should be susceptible to erosion. Water can carry sand only a short distance downstream. For this reason erosion produces deposition in the channel; the bar deflects the current, producing increased erosion of the bank opposite, and this in turn produces more deposition. Meander begets meander, and is propagated downstream. Consequently, too, any factor which limits erosion will limit meander.

[3] "Six... delta complexes have been studied in lower Louisiana. From oldest to youngest, they are Bayou La Rose, Maringouin, Cocodrie, Teche, Lafourche, and Plaquemine-St. Bernard." Harold N. Fisk, *Geological Investigation of the Atchafalaya Basin and the Problem of Mississippi River Diversion* (Vicksburg: Waterways Experiment Station, 1952), 34.

[4] *Lafcadio Hearn, Chita* (New Young: Harper & Brothers, 1889), 15.

[5] The drainage basin is approximately 32 percent arid, 15 percent semiarid, and 53 percent humid. *House of Representatives Document 798*, 71 Congress, 3 Session (1931), 84. It ranges over 36 degrees of longitude and 21 degrees of latitude. *Ibid.*, 61. These great variations in climate and aridity not only make the flooding of the river extremely variable but, as a rule, prevent the synchronization of floods in the great tributaries. When even a partial exception to the rule occurs—as in 1927—the results are likely to be cataclysmic.

[6] "Above the mouth of Red River on the right bank, and above Baton Rouge on the left bank, the drainage of the alluvial valley finds its way through small streams and bayous into tributaries of the Mississippi River. Below these points the drainage is through numerous bayous, lakes, and streams, into the Gulf of Mexico." *Ibid.*, 67. This is not perfectly accurate (small tributaries do enter even below Baton Rouge) but it is true as regards the overall drainage pattern.

[7] Mark Twain, *Life on the Mississippi*, from *The Favorite Works of Mark Twain* (New York: Garden City, 1939), 127-128.

[8] For the purposes of this study, the following terminology will be adopted:

"Valley" means the Alluvial Valley—the Mississippi flood plain south of Cape Girardeau.

"Delta" means the deltaic plain—the part of the flood plain south of the Red River.

"Engineer" when capitalized means an officer of the U. S. Army Corps of Engineers, or a civilian engineer employed by the Corps.

"District" when capitalized means the New Orleans District of the Corps of Engineers.

CHAPTER ONE

[1] Major D. O. Elliott, *The Improvement of the Mississippi River for Flood Control and Navigation*, 2 vols. (Vicksburg: Waterways Experiment Station, 1932), II, 275. Hereafter cited as *Improvement of the Mississippi.*

[2] "...it was a beautiful thing," wrote Garciliasco de la Vega, "to look upon the sea where there had been fields, for on each side of the river the water extended over twenty leagues of land, and all this area was navigated by canoes,