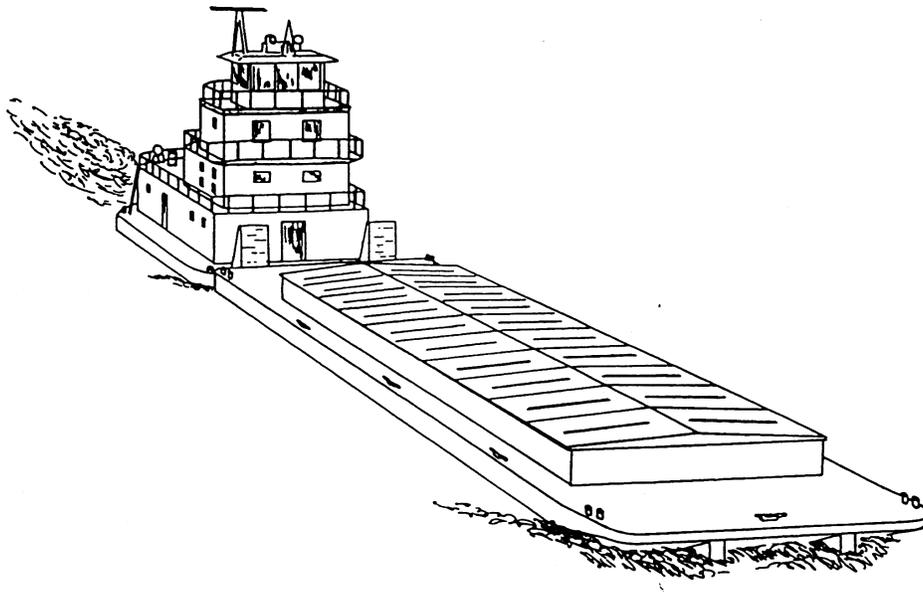


# THE GULF INTRACOASTAL WATERWAY IN TEXAS



2000



Prepared By

*Texas Department of Transportation*

# THE GULF INTRACOASTAL WATERWAY IN TEXAS

PRESENTED IN RESPONSE TO  
THE TEXAS COASTAL WATERWAY ACT OF 1975  
TRANSPORTATION CODE, CHAPTER 51  
AND  
SUBMITTED TO THE SEVENTY-SEVENTH SESSION  
OF THE TEXAS LEGISLATURE

PREPARED BY  
TRANSPORTATION PLANNING AND PROGRAMMING DIVISION  
TEXAS DEPARTMENT OF TRANSPORTATION  
AUSTIN, TEXAS  
2000

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February 21, 2001

Governor Rick Perry

Lieutenant Governor Bill Ratliff

Speaker of the House of Representatives Pete Laney

Members of the 77th Legislature

Prior to 1975, the need existed for a single, nonfederal sponsor of the Gulf Intracoastal Waterway in Texas. To fulfill that need, the 64th Texas Legislature passed the 1975 Texas Coastal Waterway Act, now codified as Transportation Code, Chapter 51. In this Act, the legislature appointed the State Highway and Public Transportation Commission, now the Texas Transportation Commission, to act as the state's agent in fulfilling the nonfederal sponsorship of the Gulf Intracoastal Waterway in Texas.

Through this Act, the legislature also required the commission to continually evaluate the Gulf Intracoastal Waterway as it relates to Texas, including an assessment of the importance of the waterway, an identification of principal problems and significant modifications to the waterway, and specific recommendations for legislative action, if any.

The mandated evaluation has been conducted and a report prepared. It represents information based on available data and reflects the current status of waterway-related matters. It also reiterates the desire of the commission to foster the importance of shallow-draft navigation in Texas, while simultaneously fostering the protection and enhancement of the coastal environment.

The report is hereby submitted to the 77th Legislature in accordance with V.T.C.A., Transportation Code, Section 51.007.

Sincerely,

A handwritten signature in cursive script, appearing to read "Charles W. Heald".

Charles W. Heald, P. E.  
Executive Director

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# PREFACE

Prior to 1975, the Gulf Intracoastal Waterway (GIWW) in Texas had no single nonfederal sponsor. Various navigation districts, river authorities, and port authorities located along the GIWW attempted to coordinate local management efforts with those of the federal sponsor, the United States Army Corps of Engineers (Corps).

In 1975, the Texas Legislature passed the Texas Coastal Waterway Act. This act authorized the state of Texas to act as the nonfederal sponsor of the GIWW in Texas and designated the State Highway and Public Transportation Commission, now the Texas Transportation Commission, to act as agent for the state in fulfilling the responsibilities of the nonfederal sponsor. Acting by and through the Texas Department of Transportation (TxDOT), the commission satisfies the responsibilities of the nonfederal sponsor as determined by federal law. See 1975 Texas Coastal Waterway Act, now codified as Transportation Code, Chapter 51 in Appendix A.

On behalf of the state's nonfederal sponsorship, TxDOT works closely with the Corps to provide local cooperation and input into federal projects. Nonfederal sponsorship requirements may vary as different projects are authorized by the United States Congress. Congress usually assigns the responsibility to the nonfederal sponsor of providing all land needed for construction and placement of dredged maintenance material of a project at no cost to the federal government. Many congressionally authorized projects also require that the nonfederal sponsor make necessary alterations or relocations to pipelines, cables, and other utilities, which may be located in the project area. For some projects the nonfederal sponsor may also be required to construct and/or maintain containment facilities for dredged material. Whatever the particular requirements may be of the nonfederal sponsor, it is a general requirement that the federal government be held free from any damage that might result from construction and maintenance of the project. In the case of the state's nonfederal sponsorship, this requirement can be fulfilled only to the extent permitted by state law. See Sponsorship Resolution of 1983 in Appendix B.

The purpose served by the state's fulfilling the nonfederal sponsorship of the GIWW is set forth in the Texas Coastal Waterway Act, Transportation Code, Chapter 51, wherein the state has declared its support of the shallow-draft navigation of the state's coastal waters in an environmentally sound fashion.

While supporting such navigation, the state will strive to prevent the waste of both publicly and privately owned natural resources; prevent or minimize adverse impacts to the environment; and maintain, preserve, and enhance wildlife and fisheries.

The act also requires the commission to continually evaluate the GIWW as it relates to Texas. Such an evaluation involves the consideration of both tangible and intangible values. If the state is to foster an efficient system of water transportation, while simultaneously preventing the waste of its coastal resources and minimizing adverse environmental impacts, it is first necessary to identify existing conditions and needs. This report, the thirteenth in the series as required by the act, is submitted to the Seventy-seventh Texas Legislature, summarizing the state's nonfederal sponsorship efforts to address the needs of the GIWW while protecting coastal resource.

# EXECUTIVE SUMMARY

The Gulf Intracoastal Waterway (GIWW) in Texas is an important component of the state's diversified multimodal transportation system. The GIWW provides Texas the commercial trades link to the inland waterway systems of the United States, is part of our national defense, and also provides protective passage for recreational and working vessels. In 1998, over 63.1 million short tons were moved on the Texas waterway, valued at more than \$25.2 billion. The entire GIWW between the Mexican Border and Florida is the nation's third busiest waterway with Texas handling 56 percent of that total amount in 1998. Considering the total waterborne tonnage moved in the United States (inland waterways and ports), Texas ranked second in the nation.

Maintenance and improvements as needed for the GIWW are crucial to ensuring an effective and safe performance of this transportation system. Because of periodic sedimentation, or shoaling of the channel bed, the United States Army Corps of Engineers (Corps) must annually dredge approximately eight million cubic yards of shoaled material to maintain the GIWW's navigable dimensions of a 125-foot bottom width and 12-foot depth. Various groups have objected to some of the traditional locations where the dredged materials are placed.

One location in particular, where objections have led to legal recourse, is the southernmost reach of the Texas GIWW which flows through an environmentally significant bay known as the Laguna Madre. One interest group has concerns about the impact of dredged material placement on ecologically valuable seagrass beds found in the shallow bay. Another group has concerns about the impact of proposed upland sites being used for alternative dredged material placement. Both have called for a new environmental impact statement to update the Corps' 1975 Environmental Impact Statement for the Texas section of the GIWW. Dedicated efforts are underway to determine acceptable methods of maintaining the navigation channel, while simultaneously fostering the protection and enhancement of the coastal environment.

The Corps has initiated two processes to evaluate the conditions of the GIWW and identify solutions to meet navigation needs while protecting the environment. The first of these, the Section 216 Study process, divides the waterway into five study reaches, the first being the Corpus Christi Bay to Port Isabel reach which includes the Laguna Madre.

There are many advantages to the Section 216 Study process. This process, as appropriate, may contribute to a long-term dredged material management plan (DMMP) and an updated environmental document for each reach of the GIWW that is studied. In addition, the Section 216 Study process will help identify alternatives for improving the efficiency of the GIWW and the potential environmental and economic impacts of each alternative. Using this information, the state, in coordination with the Corps, can direct efforts to address the GIWW's needs, including the continued acquisition of necessary upland placement sites to facilitate the waterway's maintenance dredging. Some of the Section 216 Studies are still awaiting congressional authorization and appropriation. As Congress continues striving to reduce the national deficit, the necessary authority and funding for the studies may experience delays or other setbacks. TxDOT considers the Section 216 Studies important and necessary for future planning.

The other process initiated by the Corps to address the GIWW's needs involves an interagency coordination team (ICT) for the Corpus Christi Bay to Port Isabel reach. Extensive scientific research is being conducted in coordination with a team of state and federal agency experts. The findings of these in-depth studies, together with the Section 216 Study findings, will augment the development of a long-term DMMP and updated environmental document for this reach of the waterway.

Two state activities affecting the GIWW and the placement of dredged material include the Texas Coastal Management Program (TCMP) and the state authorization (House Bill 1536) to participate in the cost-sharing of GIWW maintenance projects that use dredged material in a beneficial manner. The TCMP coordinates state, local, and federal programs for the management of Texas coastal resources, including the beneficial use of dredged material on all federally maintained, commercially navigable waterways. The key to effectively using dredged material in productive, beneficial ways lies in regarding the material as a useful resource, rather than as an unwanted by-product. Dredged material from the GIWW has largely tested as uncontaminated and, therefore, is potentially feasible for beneficial uses.

The 74th Texas Legislature amended the Texas Coastal Waterway Act of 1975, Transportation Code, Chapter 51, and authorized the Texas Transportation Commission, through the department, to enter into agreements with the Corps to participate in the cost of beneficial use projects using material dredged from the GIWW. Although House Bill 1536 authorized cost participation in such beneficial use projects, no funding was additionally appropriated for this purpose. See Appendix A. When costs of a beneficial use project exceed the Corps' budget authority, then a cost-sharing sponsor is necessary. Avenues that may help to partially fund beneficial use projects include the Corps' federal programs for beach nourishment or environmental enhancements. See Section 933 and Section 1135 programs in Appendix D. Other possible funding avenues include federal appropriation through the TCMP grants or funding from other interested sponsors who would receive the benefits of the beneficial use projects.

To continue support of the state's nonfederal sponsorship of the GIWW in Texas and facilitate planning, maintenance, preservation, research, and improvement of the waterway, the following are recommended for consideration by the Texas Legislature:

- ◆ The state continues to recognize and promote the Gulf Intracoastal Waterway as an integral and valuable part of the state's multimodal transportation system by providing for the financial resources to accomplish the nonfederal responsibilities in the areas of acquisition of disposal areas and beneficial use projects of dredged material.
- ◆ The state advocates the continuation of the U.S. Army Corps of Engineer's Section 216 Studies, which will address current and long-term needs of the GIWW in Texas.

# CHAPTER 1

## THE TEXAS WATERWAY STORY

The Gulf Intracoastal Waterway (GIWW) parallels the Gulf of Mexico's coastline from Brownsville, at the southernmost tip of Texas, to St. Marks, Florida. This man-made channel, authorized by the United States Congress, is maintained by the U. S. Army Corps of Engineers (Corps) at a bottom width of 125 feet and a minimum depth of 12 feet. Because it is less than 25 feet deep, the waterway is defined as a shallow-draft canal. It facilitates the water transportation of millions of tons and is used by a wide variety and a great number of vessels. The GIWW is an integral part of the total inland waterway transportation system of the United States, which also includes the Atlantic Coast, Mississippi River and Antilles, Great Lakes, Pacific Coast, Alaskan, and Hawaiian waterway systems. The GIWW is a vital link in the transportation network that moves many of the commodities called for by this nation, as well as foreign markets.

### Development of the Gulf Intracoastal Waterway in Texas

The beginning of an inland waterway transportation system in Texas came in 1850, just five years after Texas was admitted to the Union. Coastal business interests, who pioneered inland navigation in Texas, connected portions of the state's coastline by dredging links between the natural bays, lakes, rivers, and bayous. The construction of Texas' first navigable segment of the GIWW, the Galveston and Brazos Canal, was completed around 1853. This canal's depth ranged from 3 to 6 feet and connected West Galveston Bay and the Brazos River.

The first federal step toward construction of a continuous water transportation system west of the Mississippi River was the Rivers and Harbors Act of 1873. This act appropriated funds for a survey to "connect the inland waters along the margin of the Gulf of Mexico from Donaldsonville, Louisiana, to the Rio Grande River in Texas by cuts and canals."<sup>1</sup>

The expansion of the inland waterway system throughout the coastline of Texas was not accomplished in one effort. A series of congressional acts passed between 1925 and 1942 allowed the gradual extension of the waterway. See Appendix C. By 1941, the GIWW in Texas extended from the Sabine River to Corpus Christi and was 100 feet wide by 9 feet deep. Improvement of the canal to its current status was authorized by legislation passed in 1942; construction was completed by 1949. The result was an extended route from the Sabine River to Brownsville, Texas, with the dimensions of 125 feet wide by 12 feet deep. Figure 1 depicts the GIWW in Texas.

## **The Path of the Waterway**

The length of the GIWW in Texas is 423 miles<sup>2</sup> and a variety of sights are encountered along the way. Dunes, flats, fishing cabins, bays, rivers and streams, farm and ranch lands, wetlands, wildlife and marine life, parks, refuges, and historic landmarks: all can be seen from the canal. Other frequently seen features along the waterway include industrial, recreational, and residential developments.

The path of the waterway is etched through many shallow bays that lie on the landward side of the natural barrier islands, which protect most of the Texas coastline. This inward course gives the waterway its inland classification. Many creeks and streams empty into the GIWW, but only two major rivers flow directly into it on their way to the Gulf of Mexico. These rivers, the Colorado and the Brazos, have currents strong enough to require protective flood control gates for the waterway during high-water stages.

The route of the GIWW leads through some of the most biologically productive, yet sensitive, areas of the Texas coast. Known as wetland areas, they are widely recognized as nurseries for the many species of finfish and shellfish, so valuable to commercial and recreational industries. The environmentally delicate wetlands are also the nesting or feeding grounds for vast numbers of waterfowl, mammals, and reptiles. Native wetland vegetation is an important ecological contribution to the coastal system, providing sustenance for the animal inhabitants and retarding erosion by holding onto the unstable soil that is common among coastal regions. Much has been learned in recent years about the importance

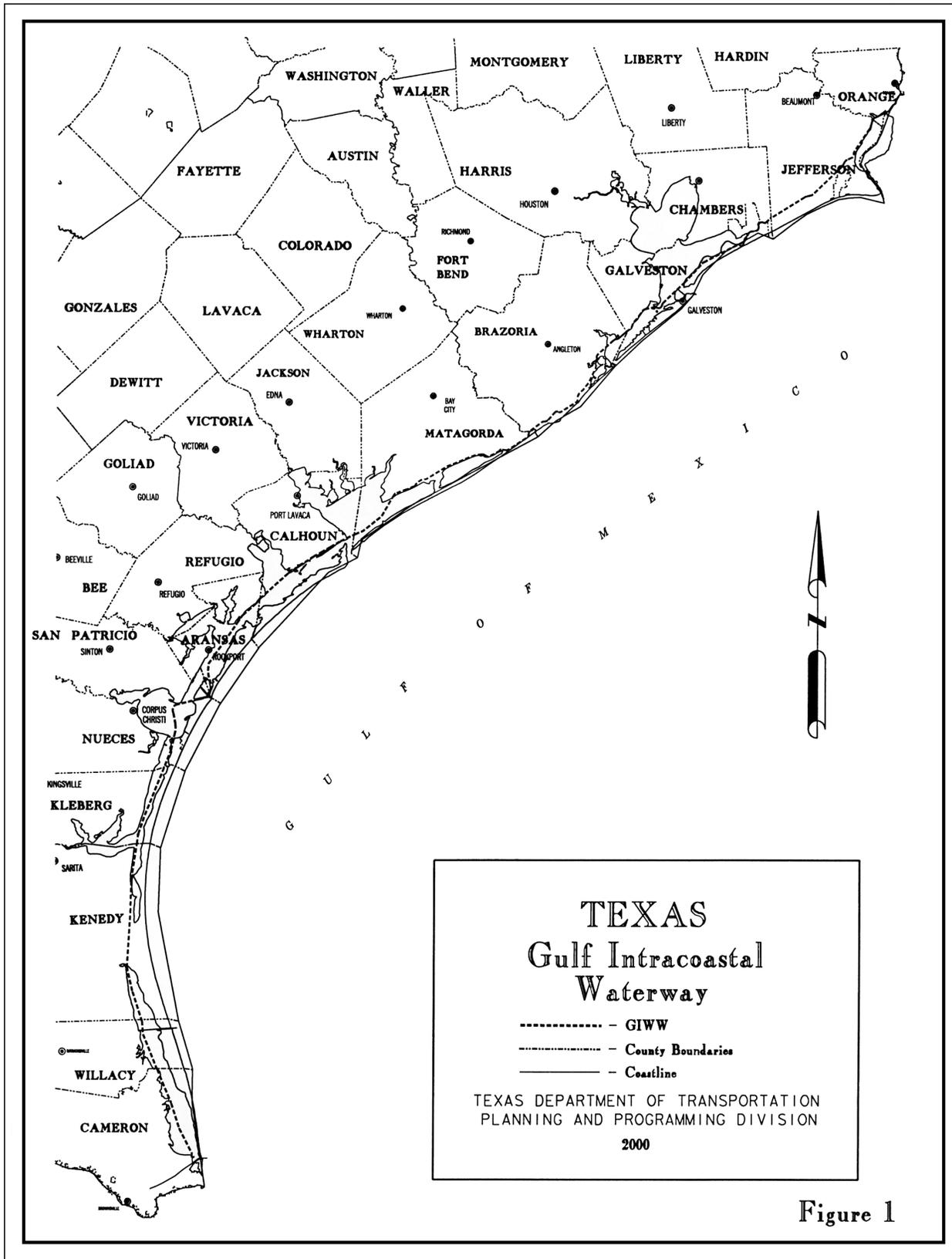


Figure 1

of maintaining a balanced relationship between the delicate nature of wetlands and the effects on them from water management projects. As a result, there are many state and federal regulations administered to protect the fragile wetlands and the coastal environment.

Another biologically significant feature that the waterway encounters at times is that of the ecologically valuable seagrass beds, located in various shallow bays along the Texas coastline. These seagrass beds are important because they contribute many nutrients for fish and wildlife. They also form a protective nursery area for larval and juvenile shrimp, crabs, and fish; and their roots bind soils to help prevent erosion and turbidity. As determined by numerous empirical analyses, many of the seagrass beds in Texas appear to be declining in number, reportedly for many different reasons including storms; diseases and plankton blooms; and natural changes in the environment. Other potential factors causing the decline of seagrasses are human-related causes such as subsidence from oil and gas pumping and groundwater pumping, land use projects, stormwater runoff, channel dredging and disposal of dredged material, and vessel wakes and propellers. State and federal agencies with responsibilities related to seagrass protection have elevated the consideration of this valuable resource when maintenance of the GIWW is necessary.

## **A Busy Transportation Artery**

One of the initial functions of the GIWW as we know it today was to provide protected inland transportation of goods and troops during World War II. It has since evolved into a multipurpose waterway with a wide assortment of users. Today, many individuals associate the GIWW with recreation. Sports fishing and boating are very popular along the Texas coast, and many recreational facilities have been established on or near the waterway. However, it is the commercial trade link that the waterway provides, and the subsequent economic prosperity for the Texas coastal region and the state as a whole, that accounts for much of the waterway's value.

Many industries have concentrated in the coastal region of Texas to capitalize on the economic benefits of water transportation efficiency. Thousands of jobs are directly and indirectly linked to the waterway and much of the state's movement of domestic and international cargo is moved by water. In fact, in 1998, Texas was second nationally only to Louisiana in the amount of goods shipped by

water.<sup>3</sup> The transfer of goods by inland waterways is approximately two and one-half times more efficient than rail and eight times more efficient than trucking.<sup>4</sup> Commercial trade between Texas ports and other port centers of the United States, as well as foreign trade markets, is greatly facilitated by the GIWW. The waterway is directly linked with Texas' 12 deep-draft port channels, and it greatly increases the level of access and level of service to many other Texas tributaries and private channels. The deep-draft port channels in Texas are Sabine Pass Harbor, Port Arthur Canal, Beaumont Ship Channel, Orange Ship Channel, Galveston Ship Channel, Houston Ship Channel, Texas City Ship Channel, Freeport Ship Channel, Matagorda Ship Channel, Corpus Christi Ship Channel, Port Isabel Ship Channel, and Brownsville Ship Channel.

The GIWW is effectively used by barge traffic, and according to the latest available waterborne commerce statistics compiled by the Corps, an annual average of 64.7 million tons of goods was barged along the Texas GIWW between 1992 and 1998. Petroleum products, chemicals, and crude petroleum accounted for approximately 85% of the 1998 tonnage moved on the waterway. Other bulk materials such as minerals, metals, grains, shell, manufactured goods, and miscellaneous materials accounted for the remaining annual percentage.

Commercial fishing boats and boats associated with the oil and gas drilling industry in the Gulf of Mexico utilize the waterway, as well as recreational boats. Not only is the GIWW used as a reliable transportation corridor between coastal regions, but it is also used for skiing, fishing, and sightseeing. For smaller and less seaworthy vessels, the waterway offers protected passage from the stormy Gulf of Mexico, and moorings are located periodically along the canal for those who may need them. Larger vessels use the waterway because it has sufficient depth for their deeper draft hulls.

## **Overview of 1998**

In 1998, 63.1 million short tons (one short ton equals 2,000 pounds) of goods were moved on the Texas Gulf Intracoastal Waterway. The estimated value of those goods, transported in a safe, efficient, and economic manner, amounted to \$25.2 billion.<sup>5</sup> In 1998, 113 million short tons were moved on the GIWW between Brownsville, Texas and St. Marks, Florida. The Texas GIWW handled 56 percent of the total amount. The Corps compiles tonnage statistics<sup>6</sup> and also provides estimates

for evaluating the commercial impact of the waterway. Revised estimates for the average number of tons per barge indicate that it would require approximately 29,350 barges to move the 63.1 million tons transported on the GIWW in Texas during 1998. If the same volume of goods were moved via railroad transportation, approximately 440,267 railroad carloads would have been required. If moved via truck transportation, it would have required approximately 1,761,107 semitrailer truckloads, resulting in considerable wear and tear on the roadway surfaces.<sup>7</sup> Statistics substantiating the safe transportation of barged materials, many of which are hazardous, can be obtained from the Office of Hazardous Materials Safety (OHMS), which is within the U.S. Department of Transportation's Research and Special Programs Administration. This office is responsible for the coordination of a national safety program for the transportation of hazardous materials by air, rail, highway and water.

According to the OHMS, statistics for calendar year 1999 indicate the total number of documented, hazardous spills in Texas included 1579 by air, 14,377 by highway, 1059 by railway, and eight by water transportation.

In addition to facilitating commercial goods movements and serving recreational boaters, the GIWW also provides access to the prime fishing areas for the commercial industry and sport fishing boats. This group produced a 1996 catch of 89.2 million pounds of shrimp, oysters, crabs, and finfish amounting to an ex-vessel value (value received at wholesaler's dock) exceeding \$182.7 million.<sup>8</sup>

## **Conclusion**

The early settlers of Texas colonized along natural water routes because they knew that a close proximity to water transportation would bring many advantages. Since the dredging of Texas' first segment, the waterway's service, value, and subsequent effect on economic prosperity have grown significantly. The GIWW, which is extensively used by a wide variety of people, imparts many benefits both directly and indirectly to the state and the nation, thereby accounting for the wisdom of protecting and maintaining this important transportation mode.

## Endnotes

1. Rivers and Harbors Act of 1873, "House Document 1491, 62nd Congress," Volume 1.
2. Mileage of the Gulf Intracoastal Waterway in Texas, as reported by the Galveston District, U.S. Army Corps of Engineers.
3. U.S. Army Corps of Engineers, Water Resources Support Center, Waterborne Commerce of the United States. Part 5, 2000, p. 4-2.
4. U.S. Maritime Administration. Environmental Advantages of Inland Barge Transportation. Figure 2, Relative Energy Efficiencies, August 1994, Page 10.
5. Texas Transportation Institute, Policy and Management Division, Texas A&M University System, College Station, Texas. 1996 values determined by updating a 1982 Data Resources, Inc. Study for the U.S. Army Corps of Engineers. (See Bibliography.)
6. U.S. Army Corps of Engineers, Water Resources Support Center. Waterborne Commerce of the United States. Parts 2 and 5, 2000.
7. Average estimated number of tons per barge (2,150) was provided by the Galveston District Corps of Engineers, Economic and Social Analysis Branch. 1990. Translations from barges to railroad cars and semitrailer trucks given by Brigadier General Patrick Kelly, U.S. Army Corps of Engineers. Speech. Presented at the meeting of the American military engineers in Houston, Texas, September 22, 1998.
8. Texas Parks and Wildlife Department, Trends in Texas Commercial Fishery Landings, 1972-1996.

## **CHAPTER 2 MAJOR GIWW ACTIVITIES**

Interest in the Gulf Intracoastal Waterway (GIWW) in Texas generated many new activities during fiscal years 1998-2000, September 1, 1998 through August 31, 2000. The concerns over potential adverse environmental impacts resulting from maintenance of the waterway have given rise to a number of studies and the development of various interagency groups. The GIWW's federal sponsor, the U.S. Army Corps of Engineers (Corps), has also initiated or continued several key projects to protect the GIWW. In fulfilling the state's nonfederal sponsorship of the GIWW, the Texas Transportation Commission, acting by and through the Texas Department of Transportation (TxDOT), will continue to acquire upland sites for the placement of dredged material, and will convey easements to the Corps for such use.

### **Section 216 Studies**

One of the activities involving the GIWW during fiscal years 1998-2000 is the Corps' Section 216 Studies. These studies, which address the Texas waterway in specific study reaches, are authorized by the Federal Flood Control Act of 1970. A Section 216 Study is also described in Appendix D. Through this federal authority, the Corps can conduct a study of its existing water resources projects, which may have changed because of physical or economic reasons. TxDOT acts as the nonfederal sponsor for the Section 216 Studies involving the GIWW in Texas.

The Section 216 Study process is divided into two phases. The first of these phases is the reconnaissance study, lasting an average of one year. This study identifies project changes, if any, and determines the federal government's interest in proceeding with the next phase. If a reconnaissance study indicates such federal interest, the process will proceed to a feasibility study that includes detailed engineering, economic, and environmental studies, requiring three to four years for completion. Based on the results of those detailed studies, the Corps will then recommend the most cost-effective solution which responds to the project's needs, while protecting the environment. Important aspects of the

feasibility study include the preparation of an environmental document in accordance with the National Environmental Policy Act (NEPA) and sometimes the evaluation of the operations and maintenance of the GIWW for a specific study reach. A report on the feasibility study is presented to the United States Congress, recommending that a solution, or project, be implemented. Congress must decide whether to authorize and fund the recommended project.

For the Texas GIWW, five separate Section 216 Studies will address specific reaches of the waterway; three other Section 216 Studies focus on unique or special areas along the GIWW. Figure 2 illustrates the locations of the study reaches. The three special areas in Texas and five study reaches are being addressed in the following order, pending congressional authorization and appropriation of each phase:

Three Special Areas:

- ◆ Sargent Beach (initiated in 1987)
- ◆ Aransas National Wildlife Refuge (initiated in 1988)
- ◆ GIWW Modifications: Colorado River Locks/Brazos River Floodgates (initiated in 2000)

Five Study Reaches:

- ◆ Corpus Christi Bay to Port Isabel (initiated in 1993)
- ◆ High Island to Brazos River (initiated in 1994)
- ◆ Port O'Connor to Corpus Christi Bay (initiated in 1997)
- ◆ Brazos River to Port O'Connor (initiated in 1997)
- ◆ Sabine River to High Island (scheduled to begin 2001)

## ***Sargent Beach***

A Section 216 Reconnaissance Study, which addressed the 10-mile GIWW reach of the Sargent Beach special area, was completed in 1989. The Section 216 Feasibility Study, completed in 1992, included the development of a Final Environmental Impact Statement and recommended that an 8-mile, combination concrete-block revetment and concrete sheetpile wall be constructed against the eroding forces of the Gulf of Mexico to stabilize the beach at Sargent, Texas in Matagorda County. The protective

seawall would not only prevent further losses of property and high quality wetland habitats, but also would eliminate any need to relocate the waterway through wetlands.

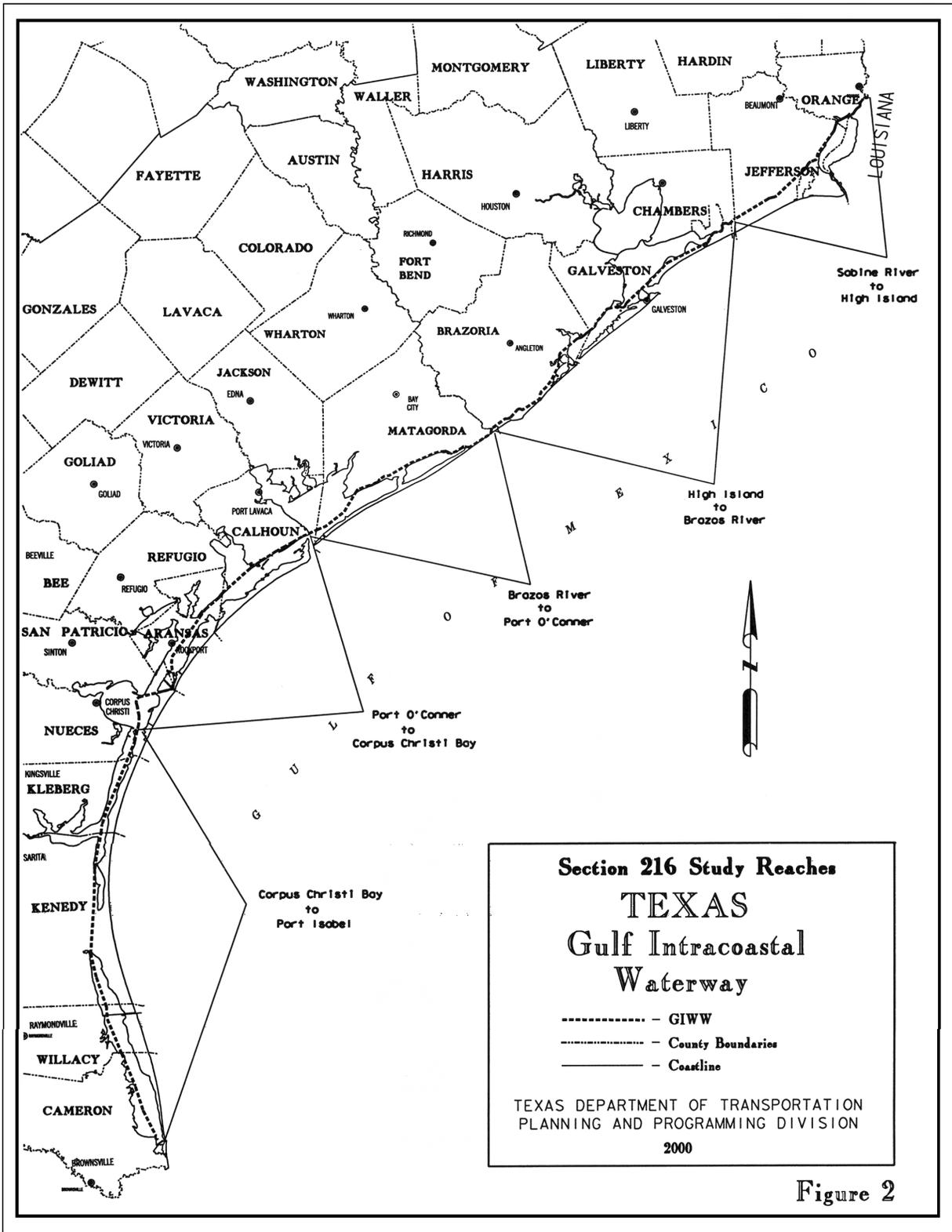


Figure 2

The construction contract for the 8-mile revetment was awarded in February 1995. The construction contractor elected to use quarried granite blocks from Marble Falls, Texas rather than concrete blocks for the revetment. The project was completed January 1998. The completion of the project accomplished several milestones by first of all, being under budget by more than \$20 million and secondly, ahead of schedule by six months. The local cost-share (25% of the total cost) of the project was provided by the Inland Waterways Trust Fund. TxDOT sold dredged material placement area (PA) 98 and part of PA 100 to the Corps for construction of the combination concrete-block revetment and sheetpile wall. In addition to providing right-of-way, TxDOT also participated in the planning, design and coordination efforts undertaken for this project. Dedication ceremonies were held May 27, 1998 at Sargent Beach with key congressional and industry representatives in attendance, underscoring the importance of the GIWW and its significance to the state of Texas.

### ***Aransas National Wildlife Refuge***

A Section 216 Feasibility Study, finalized in November 1995, addressed a 30-mile reach of the GIWW along the Aransas National Wildlife Refuge and the critical habitat of the endangered whooping cranes, which extends beyond the refuge. The feasibility study evaluated a possible realignment of the waterway, identified various beneficial uses of dredged material, and generated a plan for reducing bank erosion along the GIWW within the environmentally sensitive refuge and extended area of the endangered cranes' critical habitat. Study activities in fiscal years 1998-2000 included the creation of an interagency coordination team to assist the Corps in implementing its recommended 50-year Dredged Material Management Plan (DMMP), the continuation of environmental coordination, the initiation of the Pre-construction, Engineering and Design (PED) phase of various beneficial uses projects, and the installation of articulated concrete matting for bank protection of the whooping crane habitat. The study's final recommendations pertaining to reducing bank erosion will be implemented and completed by calendar year 2000<sup>1</sup>.

## ***GIWW - Modifications: Colorado River Locks/Brazos River Floodgates***

During the Brazos River to Port O'Connor Section 216 Reconnaissance Study, the Corps determined the concerns identified with the Colorado River Locks/ Brazos River Floodgates were complex and that a detailed study of associated operational problems experienced by vessels while moving through the floodgates was warranted. The Corps initiated a reconnaissance study that began in August 2000. The study will address the need of modifying the referenced navigational structures on the GIWW to reduce traffic accidents and delays. Delay costs are estimated to exceed \$1 million annually at each location. Additionally, the dimensions of the structures need to be evaluated for upgrades to accommodate current vessels that possess a major safety threat. The crossings were designed when barges were carried astern on a topline rather than the current practice of pushing a string of barges, making navigation of crossings more difficult. Thus, the result of numerous tows having to "trip" or break down and moor their barges while taking one barge across at a time which, in turn, causes delays, particularly during high river stages.

## ***Corpus Christi Bay to Port Isabel***

In July 1994, the Corps submitted a report to its Washington, D.C. headquarters for review and certification of the Section 216 Reconnaissance Study of the GIWW's 117-mile Corpus Christi Bay to Port Isabel reach. This report, which addressed the GIWW through the environmentally significant bay waters of the Laguna Madre, was released before certification was obtained from the Corps' headquarters. Because of litigation in September 1994 involving dredging and dredged material placement in the Laguna Madre, the U.S. Justice Department released the reconnaissance report, bearing a disclaimer of the unofficial status. The unofficial report demonstrated the following points concerning the GIWW:

- ◆ the existing channel is economically justified;
- ◆ there is no interest in a Port Isabel realignment plan;
- ◆ there exists a large-scale ecosystem restoration plan;
- ◆ there exists a feasible long-term dredged material placement plan; and

- ◆ continuance of the study into the feasibility phase is recommended.<sup>2</sup>

After reviewing the report on the Section 216 Reconnaissance Study, the Corps' headquarters requested the Galveston District to restructure the study based on more traditional navigation features, re-evaluate the benefit/cost ratio to possibly realign the GIWW at Port Isabel, and address delays incurred by automobiles waiting to cross over the GIWW swing bridge at Port Isabel when the bridge is opened for waterway traffic. In January 1997, the Corps completed the re-evaluation of the Reconnaissance Study at Port Isabel. The study showed that realignment of the GIWW was not economically justified and if realigned, the channel may create new hazards for commercial navigation rather than enhance navigation. The re-evaluation report recommended that no further studies be undertaken for this reach of the GIWW under the Section 216 authority. Studies to address optimum channel dimensions, the re-evaluation of the economic feasibility of the project, the assessment of dredged material placement practices, and an update of the Environmental Impact Statement for this reach of the GIWW are continuing under the direction of the Dredged Material Management Plan (DMMP).<sup>3</sup> As a result of the September 1994 litigation and subsequent Spring 1995 appeals proceedings, the parties agreed to the formation of an interagency group by the Corps to work under the DMMP to pursue studies needed for addressing the optimum channel dimensions, assessing dredged material placement practices, and updating the Environmental Impact Statement for this reach of the GIWW. The actions taken by this interagency group are further discussed in Chapter 4 of this report.

### ***High Island to Brazos River***

In February 1994, the Corps initiated the Section 216 Reconnaissance Study for the 85-mile GIWW reach from High Island to the Brazos River. To help determine physical or economic problems associated with this section of the GIWW, the Corps initiated a vigorous public involvement program. A large number of comments and concerns were provided, and were categorized as follows:

- ◆ environmental problems and opportunities;
- ◆ long-term dredged material placement plan;
- ◆ dredging frequency/shoaling;
- ◆ eroding areas needing repair;

- ◆ mooring problems and opportunities;
- ◆ navigation problems;
- ◆ problems which fall under other programs or agencies; and
- ◆ problems outside the scope of the study.

In addition, significant interest was expressed in a beach nourishment project at Rollover Pass in Galveston County and in a project to straighten restricting curvature of the GIWW at the State Highway 332 bridge near Freeport, Texas. The Section 216 Reconnaissance Study was completed in March 1996 and findings indicated a federal interest in proceeding to the feasibility phase to resolve these problems and identify ways to increase efficiency of the waterway in this reach.<sup>4</sup> Upon congressional authorization and appropriation, the Section 216 Feasibility Study was initiated in April 1996 immediately after the completion of the Section 216 Reconnaissance Study.

With Texas congressional support for appropriations, the feasibility study has steadily progressed. The Corps has completed the following activities: public involvement, initial screening of problems, real estate activities, technical review, feasibility scoping meeting, environmental evaluation, ship simulation study, economic traffic model, preliminary engineering design and cost, and economic optimization. The Corps' tentative feasibility schedule includes working on the DMMP formulation, public review, sediment model, selected DMMP detailed analysis, draft feasibility report, public review of report and final feasibility report.<sup>5</sup>

During the fiscal years 1999-2000, the Corps' study in working with the users has identified the following operational problems: negotiating the bends near High Island, shoaling problems at Rollover Pass, alignment problems at Sievers Cove, problems accessing the Chocolate Bayou and Texas City Channel from the GIWW, alignment problems with the Galveston Railroad Causeway, mooring modifications, and difficulties negotiating a double "s" curve near Freeport. The feasibility study is scheduled to be completed by August 2001.

## ***Port O'Connor to Corpus Christi Bay***

The Section 216 Reconnaissance Study of the 80-mile GIWW reach from Port O'Connor to Corpus Christi Bay, exclusive of the Aransas National Wildlife Refuge area, was initiated in 1997 upon congressional authorization and appropriation. The reconnaissance study evaluated operational problems and considered environmental and cultural concerns. The Reconnaissance Report was completed October 1997 and approved August 1998. The report identified the following problems:

- ◆ Port O'Connor Area - Congestion at mooring facilities forces slow barge movement and prevents full utilization of existing navigational facilities.
- ◆ Channel to Victoria Wye - Groundings and inefficient use of the Wye intersection.
- ◆ Rockport to Ingleside, Texas - Congestion from Rockport to Ingleside, including the intersection of the GIWW with the Corpus Christi Ship Channel, which forces slow barge movement along this reach. This congestion prevents the movement of empty barges and multiple-barge tows, forcing these tows to utilize the longer route of the Lydia Ann Channel.
- ◆ Rerouting the GIWW across Corpus Christi Bay - A high shoaling rate at Channel Mile 542, just west of the Corpus Christi Ship Channel, forces most tow operators to use a more preferable route to the north across unmarked waters of the Corpus Christi Bay.

The report also included the following proposed alternative solutions:

- ◆ Port O'Connor Area - Relocation of mooring buoys to allow barges to moor and maneuver without fear of colliding with a commercial dock or residence.
- ◆ Channel to Victoria Wye - Alternatives range from no action, to reconstructing the intersection, to reduce time lost to groundings and reconfiguring barge arrangements.
- ◆ Rockport to Ingleside, Texas - Alternatives for this reach would involve structural and possibly nonstructural modifications to allow the tows to maintain a normal speed.
- ◆ Rerouting the GIWW across Corpus Christi Bay - The alignment of the GIWW, west of the Corpus Christi Ship Channel, at Channel Mile 542, cuts through an island created with dredged material. The GIWW channel at this point continually shoals with sand eroding from this placement area. The channel is often narrow and shallow through this cut, and most tow captains travel north to open water, then head southwest across the unmarked Corpus Christi Bay. This route may be less expensive to create and maintain because very little, if any, dredging would be required. This and other alternative adjustments require evaluation to optimize various operational, safety, and environmental factors.<sup>6</sup>

The Reconnaissance Report recommended that a feasibility study be conducted. The Corps initiated the feasibility study and held a public involvement meeting in August 1998 in Corpus Christi, Texas to inform the public as well as receive public input.

The feasibility studies during FY 1999-2000 evaluated possible solutions to the four problem areas. In the Port O'Connor moorings, the Corps is continuing to analyze mooring locations. In the Victoria Wye area, the Corps has redesigned the intersection and now is determining the size and disposal area locations for selection.

### ***Brazos River to Port O'Connor***

The Section 216 Reconnaissance Study for the 72-mile GIWW reach from the Brazos River to Port O'Connor began in April 1997, upon congressional authorization and appropriation. The study evaluated operational problems and considered environmental and cultural concerns. The Reconnaissance Report was completed in October 1997 and approved by Corps' headquarters in August 1998.

The report identified the following problems:

- ◆ Jones Creek (Channel Mile 404) - An area of high shoaling exists in the GIWW near Jones Creek, which impacts waterway traffic.
- ◆ Jones Lake (Channel Mile 404) - Jones Lake may have been a freshwater lake prior to construction of the GIWW. Maintenance dredging has caused the lake to be filled since the last dredging cycle. Restoration of the lake has been suggested.
- ◆ San Bernard River (Channel Mile 405) - The mouth of the San Bernard River is restricted by a large sandbar causing the flow of the river to divert into the GIWW and out the West Brazos River Floodgate instead of the Gulf of Mexico. Not only does this cause shoaling and debris to collect in the GIWW, but also the added hydraulic force causes high currents when the west floodgate is opened. Westbound tows have a difficult time pushing against this current.
- ◆ Matagorda Bay (Channel Mile 454-473) - Industry has self-imposed, one-way traffic in West Matagorda Bay because of currents and shoaling. High maintenance requirements exist and numerous groundings have occurred within this reach, creating safety concerns.
- ◆ Bank Erosion (Channel Mile 408-420 and 446-451) - Industry experiences delays because of difficulties identifying channel boundaries.<sup>7</sup>

The report will evaluate an array of alternatives that include structural and non-structural improvements to this portion of the GIWW. The Corps has developed a preliminary list of alternatives as follows:

- ◆ Jones Creek - Alternatives to be considered include increased channel dimensions and bank stabilization techniques. The San Bernard to Jones Lake/Creek stretch includes approximately three miles. A 1 to 1.2 mph increase through this stretch would generate annual savings of \$146,000 for 6,800 annual trips. Annual costs of dredging for increased dimensions are estimated at \$1.1 million.
- ◆ Jones Lake - Alternatives to be considered include restoration of Jones Lake through shoreline stabilization and control for saltwater intrusion. Opportunities exist for environmental restoration projects. Extensive coordination and environmental planning as well as archaeological surveys will be required prior to restoration of this area.

- ◆ San Bernard River - Alternatives to be developed include dredging the mouth of the San Bernard to increase flow to the Gulf of Mexico and stabilizing the shoreline to counteract coastal processes. It is suggested that the currents from the San Bernard River contribute to the duration of "tripping" or the single barge movement of a multiple-barge tow at the Brazos River floodgates. For a two-barge tow, tripping takes a minimum of 3 hours and, therefore, costs about \$455 per occurrence; a 5-hour tripping occurrence for a two-barge tow costs \$660. Time delay savings should be realized with project improvements. The annual cost associated with tripping presently exceeds \$3 million. An industry spokesman suggested that a reduction in the currents from the San Bernard might reduce the frequency of tripping occurrences at the Brazos River for small multiple-barge tows. The two-barge tows that would be affected contain at least one barge in the 155 x 54-foot class. In addition, a reduction in currents would help the tows move through the gates at a faster speed. A 1 to 1.2 mph increase through this stretch would generate annual savings of \$146,000 for 6,800 annual trips. Proposed actions may impact historic properties present at the mouth of this river. Extensive coordination with environmental agencies and groups will be required prior to making changes to the mouth of this river. The estimated cost of alternatives range from \$300,000 annually for dredging to a construction cost of \$3 million for coastal stabilization.
- ◆ Matagorda Bay - An alternative to be developed is to reroute the GIWW to follow deeper water to the north. See Figure 3 for proposed GIWW reroute at Matagorda Ship Channel. Rerouting the GIWW may be less expensive to maintain and should minimize safety concerns. Although the proposed route will not necessarily be shorter, reduced transit times should be realized by faster tow speeds. In addition, the operators' practice of one-way passage of tows to avoid bay encounters results in significant delays. The bay reach is approximately 18 miles long and at 5 mph takes over 3.6 hours to transit. An annual cost of \$2.5 million for one-way passage of tows in the bay was estimated based on 1995 traffic levels and randomly generated arrival times at Matagorda Bay for eastbound and westbound tows. The potential for significant historic shipwrecks in realignment corridors is high. The estimated construction cost is \$3 million. A saving of \$1.2 million annually could be realized from decreased maintenance.
- ◆ Bank Erosion - Alternatives include bank stabilization and more reliable channel markers from Channel Miles 408-420 and 446-451. New work excavation in the vicinity of Channel Miles 409-420 will impact historic animal fossils and possibly Indian artifacts. These project modifications would allow for increases in vessel speeds. A 1 to 1.2 mph increase in speed for these stretches would generate annual savings in excess of \$700,000 for 6,800 annual trips. Construction cost is estimated at \$1.8 million for Channel Miles 408-420 and 446-451. The Corps has recommended in the Reconnaissance Report that the above-referenced bank erosion alternatives meet federal criteria and a feasibility study be conducted.

The feasibility study is currently being developed at an estimated cost of \$3.8 million. The Corps has progressed through feasibility and scheduled a public involvement meeting in Freeport, Texas.<sup>8</sup> At the urgency of the waterway users and due to groundings in Matagorda Bay and strong currents at the intersection of the Matagorda Ship Channel making navigation a major safety threat, the Corps expedited the analysis and interim report to identify an independent solution quickly for this reach. Disposal plan activities have delayed the submission of the interim report on the Matagorda Bay reach until March 2001. Initial Corps' Waterways Experiment Station modeling and economic analyses for Matagorda have been completed, and detailed analyses are underway. Analysis for the remainder of the study reach will resume in FY 2001 when additional funds are available.

### ***Sabine River to High Island***

The Section 216 Reconnaissance Study for the 50-mile GIWW reach from the Sabine River to High Island is scheduled to begin in federal fiscal year 2002 and has a targeted six-month fast track completion date. These scheduled dates are subject to change, pending congressional action.

### ***Summation***

As the nonfederal sponsor of the GIWW, TxDOT believes there are many advantages to be gained from the Section 216 Study process. Those studies which proceed through the feasibility phase may contribute to both the development of a long-term DMMP and an updated environmental document for each of the GIWW reaches studied. The Section 216 process offers a faster, less expensive alternative to preparing an updated environmental document for the entire waterway. In addition, the process will help identify alternatives for improving the efficiency of the GIWW and the potential environmental and economic impacts of each alternative. Using this information, the state, in coordination with the Corps, can direct efforts to address the GIWW's needs.

## Other Studies

In addition to the Corps' Section 216 Studies, TxDOT initiated several water transportation and waterway related studies. Several of these TxDOT water-related studies were developed through the department's cooperative research program. The program includes the State Planning and Research Program, which is co-funded by the state and Federal Highway Administration, and the 100% State-Funded Research Program. The department has used these research programs plus, an interagency agreement, to participate in several studies that address various needs associated with the GIWW in Texas. Throughout the years, TxDOT has funded and participated in the research studies shown in Table 2-1.

TABLE 2-1  
TxDOT SPONSORED RESEARCH

PROGRAM	STUDY	RESEARCHER(S)
State Planning Research	Infrastructure Impacts and Operational Requirements Associated with the Container Ships and Megaships on the Texas Transportation System	University of Texas, Center for Transportation Research
State Planning Research	The Value of Pipelines to the Transportation System of Texas	Texas A&M University, Texas Transportation Institute
State Planning Research	State Programs for Financing Port Development (Phase III)	University of Texas, LBJ School of Public Affairs and Center for Transportation Research
State Planning Research	Alternative Dredging and Disposal Methods for the Texas GIWW	Texas A&M University, Texas Transportation Institute and Center for Dredging Studies
State Funded Research	Section 1135 –Seagrass Enhancement	United States Army Corps of Engineers
State Funded Research	Identify the Economic Impact to Texas Attributed to Barge Transportation on the GIWW and Extension of the GIWW into Mexico	Texas A&M University, Texas Transportation Institute and Center for Ports and Waterways / University of Texas at Brownsville
State Funded Research	Identify and Assess the Collective Contribution of Texas Ports to Texas and the Nation	Texas A&M University, Texas Transportation Institute and Center for Ports and Waterways
Interagency Agreement	Christmas Bay Erosion Protection	United States Army Corps of Engineers / United States Fish and Wildlife Service / Texas

PROGRAM	STUDY	RESEARCHER(S)
		Department of Transportation

***Infrastructure Impacts and Operational Requirements Associated with Containerships Study***

In order to assess the landside infrastructure impacts and operational requirements associated with the container ships on the Texas Transportation System, TxDOT has initiated a study with the University of Texas' Center for Transportation Research. The study will focus on the location(s) of a containership terminal(s) in Texas and identify the operating and infrastructure impacts of increased containerized freight movement on the state's multimodal transportation network, including the GIWW, airports, pipelines, rail, highway and marine facilities.

***The Value of Pipelines to the Transportation System of Texas Study***

In order to assess and evaluate pipelines in the state's multimodal transportation network, TxDOT has initiated a study with the Texas Transportation Institute. The study will focus on a comprehensive inventory of the state's pipeline infrastructure and its connections with other modes of transportation, examining the potential of becoming more fully integrated with the state transportation system, evaluating the movement of other commodities via pipelines as a means of reducing highway congestion, examining current state and federal responsibilities with respect to pipelines to determine whether a realignment of these functions can improve the potential for seamless intermodal transportation and economic development, and proposing appropriate new roles and responsibilities for TxDOT and other agencies in regard to the pipeline mode, if results warrant such action.

***State Programs for Financing Port Development Study (Phase III)***

After evaluating the trends of the nation's ports and the economic impact of federal legislation on the water transportation industry, TxDOT continued the Phase II study with the University of Texas, LBJ School of Public Affairs and Center for Transportation Research. The Phase III study includes an in-depth look at state programs that provide financial assistance to ports in the areas of marketing and infrastructure improvement. The programs studied in this report were previously identified in the Phase II report, but examined in greater detail relating to port development, educational and funding programs, and trends in state port development and diversification. This report is intended to provide a more

detailed appraisal of a spectrum of the financial programs from which policy makers in Texas could select the types of financial assistance that would be most advantageous and appropriate to the state. This report is organized as a reference manual rather than a research manual. The findings include nine case studies, with a section that outlines the lessons to be drawn for the State of Texas.

### ***Alternative Dredging and Disposal Methods Study***

The Corps spends millions of dollars every year to dredge material from the Texas GIWW. The historical locations for placement of this dredged material are designated open-water and upland sites. Due to environmental objections to open-water placement, alternative placement methods are being explored.

TxDOT, as the nonfederal sponsor of the GIWW, has a great interest in alternative dredging and dredged material placement, due to the increasing challenges of locating and obtaining placement solutions that are environmentally and operationally acceptable. The department initiated a study with the Texas A&M University, Texas Transportation Institute and Center for Dredging Studies to explore alternative dredging and dredged material placement methods for the Texas GIWW and to identify beneficial use products using dredged materials to facilitate TxDOT's beneficial use program. See 1975 Texas Coastal Waterway Act, now codified as Transportation Code, Chapter 51 in Appendix A.

### ***Section 1135 Seagrass Enhancement Study***

Under the federal authority of Section 1135 of the 1970 Federal Flood Control Act, the Corps sponsored a Seagrass Enhancement Study in the lower Laguna Madre reach of the GIWW. The Section 1135 authority is described in Appendix D. TxDOT participated in the Seagrass Enhancement Study, which was timed to correspond with the November 1994 maintenance dredging of the Port Isabel to Arroyo Colorado reach of the GIWW. Data was gathered and evaluated resulting from a modification to the existing dredged material placement plan. The maintenance project modification consisted of transplanting seagrass from nearby seagrass meadows onto freshly deposited dredged material within two of the GIWW's designated open-bay placement areas.

The intent of the study was to determine whether dredged material placement operations could be adjusted to increase the seagrass colonization rate between dredging cycles. The study findings indicated a 10% survival rate for the transplanted seagrasses. The low survival rate was attributable to the sediments being unstable and rapidly dispersed by high cross-currents.

### ***Economic Impact of Barge Transportation to Texas and Mexican GIWW Extension Study***

The inland waterway system in Texas is a primary link in the nation's freight transportation network. As such, TxDOT completed a study with the Texas A&M University, Texas Transportation Institute and Center for Ports and Waterways, in addition to the center's consortium member, the University of Texas at Brownsville. The study provides information on the economic value of the GIWW to Texas, including direct, indirect, and induced benefits. Additionally, an assessment of the GIWW's economic importance reflects the impacts attributed to barges, as compared to other modes of transportation. This study has provided TxDOT with a better understanding of the current economic value of the GIWW. Also, as the state of Tamaulipas, Mexico moves forward in its attempt to build an Intracoastal Waterway, the study has assisted in determining the economic feasibility of providing a connection to the proposed Mexican waterway.

### ***Collective Contribution of Texas Ports Study***

For Texas' deep and shallow-draft ports, the GIWW is the connecting link to the total inland waterway transportation system of the United States, and several Texas ports rank in the nation's top twenty for tonnage movements. To explore the value of Texas port activities, TxDOT, in conjunction with the Texas Ports Association, contracted a study with the Texas A&M University, Texas Transportation Institute and Center for Ports and Waterways to document the direct, indirect and induced impacts of Texas ports to the state and the nation; to assess economic impacts of the North American Free Trade Agreement (NAFTA) on trade growth due to new or increased trade links with Mexico and other nations; and to use the data and findings of this study to help develop potential programs to improve the state's services to Texas ports. Examples of potential state programs that would require minimal state resources include development of an information clearinghouse or improved transportation signage for ports. Other potential

programs that may require a higher level of state resources include planning or marketing assistance programs, or loan programs for port infrastructure development and improvements.

### ***Christmas Bay Erosion Protection Study***

In April 1994, the U.S. Fish and Wildlife Service recommended an erosion-protection study be completed where the GIWW parallels the environmentally significant Christmas Bay in Brazoria County. A designated coastal preserve, Christmas Bay is separated from the GIWW by only a narrow strip of land. This narrow strip could breach from ongoing erosion, impacting the bay's ecosystem and introducing shoaling, or sedimentation, to this area of the GIWW, which has required no maintenance dredging since its construction. In 1996, approximately 400 feet of concrete matting was placed along the eroding narrow strip of land. The erosion-protection study will evaluate the effectiveness of this technology between two bodies of water. TxDOT participated in this study with the U.S. Fish and Wildlife Service (USFWS) to gather valuable technical information, which the Corps can apply in similar situations.

In 1997, TxDOT, Corps, and USFWS produced and distributed a video highlighting the use of concrete matting for erosion protection at Christmas Bay and their partnering efforts.

### **Beneficial Uses of Dredged Material**

The Corps spends an average of \$14 million dollars a year to dredge approximately eight million cubic yards of material from the Texas GIWW. The historical locations for placement of this dredged material are designated open-water and upland sites. However, as environmental objections to open-water placement increase and as upland placement sites become less available due to technical, economic, and environmental considerations, alternative placement methods must be explored.

One alternative placement method is the beneficial use of dredged material. The key to effectively using dredged material in productive, beneficial ways lies in regarding the material as a useful resource, rather than as an unwanted by-product. Dredged material from the GIWW has largely tested as uncontaminated and, therefore, is feasible for beneficial uses.

In recent years, the Corps has focused on such opportunities, identifying 10 broad categories of beneficial uses, based on the dredged material's function at the placement site. These beneficial use categories include the following: habitat development; beach nourishment; aquaculture; parks and recreation; agriculture; forestry and horticulture; strip mine reclamation, solid waste management, shoreline stabilization and erosion control; construction and industrial use; material transfer (fill, dikes, levees, parking lots, roads); and multiple purposes, i.e., the combination of categories on a dredging project. As this list indicates, dredged material has the potential to be productive in a wide variety of projects.

TxDOT was authorized by the 74th Texas Legislature to cost-share with the Corps in GIWW projects utilizing dredged material beneficially, and subsequently the Texas Transportation Commission adopted rules for the cost-sharing program. After adopting the rules, TxDOT submitted its beneficial uses of GIWW dredged material rules to the Texas Coastal Coordination Council for a concurrence on the department's assessment on consistency with the Texas Coastal Management Program (TCMP). TxDOT believes its beneficial uses rules complement the TCMP and the Corps' maintenance of the GIWW.

During fiscal years 1999-2000, three projects related to the Texas GIWW involved the beneficial use of dredged material. One project involved the replenishment of bird habitat on Sundown Island in Matagorda Bay, the second project involved placement activities for a beach nourishment project along the gulf beach near Rollover Bay (see Figure 4 for the general project locations), and the third involved restoring a barrier island that has eroded due to wave energies of West Galveston Bay.

### ***Sundown Island***

Sundown Island is located in Matagorda Bay near the intersection of the GIWW and the Matagorda Ship Channel. This island, which forms a portion of the waterway's dredged material Placement Area (PA) 116A, is an unconfined, partially emergent placement area, and is shown in Figure 5. The 50-acre emergent portion of the placement area supports a variety of waterbird nesting colonies including brown pelicans, herons, egrets, ibises, roseate spoonbills, gulls, terns, and black skimmers.

During maintenance dredging of the waterway, material is placed on the northwest, submerged portion of PA 116A in order to protect the emergent portion from erosion. In 1999 and 2000, approximately over 200,000 cubic yards of dredged material were placed in this manner. To avoid

negative impacts to nesting birds during the dredged material placement, precautions were taken, such as restricting operations to the birds' non-nesting season and prohibiting all personnel and equipment from the emergent island. When this reach of the waterway is dredged again, approximately 200,000 more cubic yards of dredged material will be placed beneficially and in a similar manner to further nourish and protect this island and important habitat.

## ***Rollover Bay***

Rollover Bay, a small bay south of East Bay in Galveston County, cuts through the Bolivar Peninsula by way of the Rollover Pass, which flows under State Highway 87 and continues into the Gulf of Mexico. See Figure 6. The beach on the gulf side of the peninsula, west of Rollover Pass is eroding at a considerable rate. Because of various physical factors, the involved state and federal agencies have agreed that this area has future potential for beach nourishment through the beneficial use of material dredged from the nearby GIWW during regular maintenance of the waterway.

Initially, the Texas General Land Office (TGLO) requested the Corps to conduct a study of the situation under the federal authority of Section 933 of the 1986 Water Resources Development Act and agreed to act as the study's nonfederal sponsor. A description of the Section 933 Study authority is in Appendix D. The Corps concluded, however, that a beach nourishment project in this situation did not qualify for consideration and funding assistance under the Section 933 Study guidelines.

Funding assistance from a nonfederal sponsor was necessary for this proposed project, because the costs of applying dredged material to the beach involved expenses exceeding the Corps' authorized budget for maintaining this reach of the GIWW. To help the beach nourishment project come to fruition, the TGLO approached various parties to share the necessary costs that exceeded the Corps' budget. The TGLO obtained the necessary financial commitments from interested nonfederal sponsors who would receive the benefits of the beach nourishment project. To provide access for the project's dredged material placement pipeline, TxDOT furnished a right-of-entry under the State Highway 87 bridge to the gulf beach at Rollover Pass.

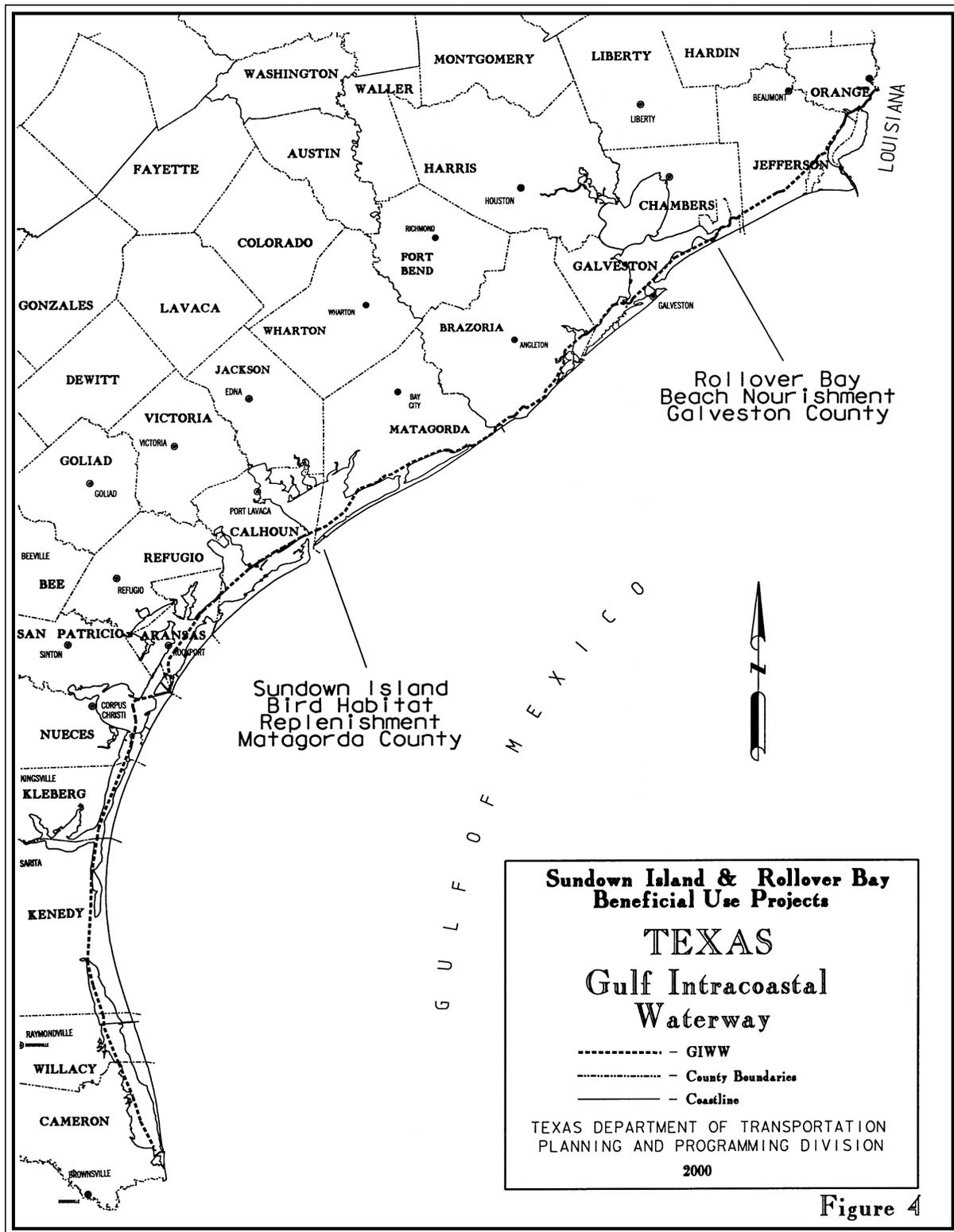
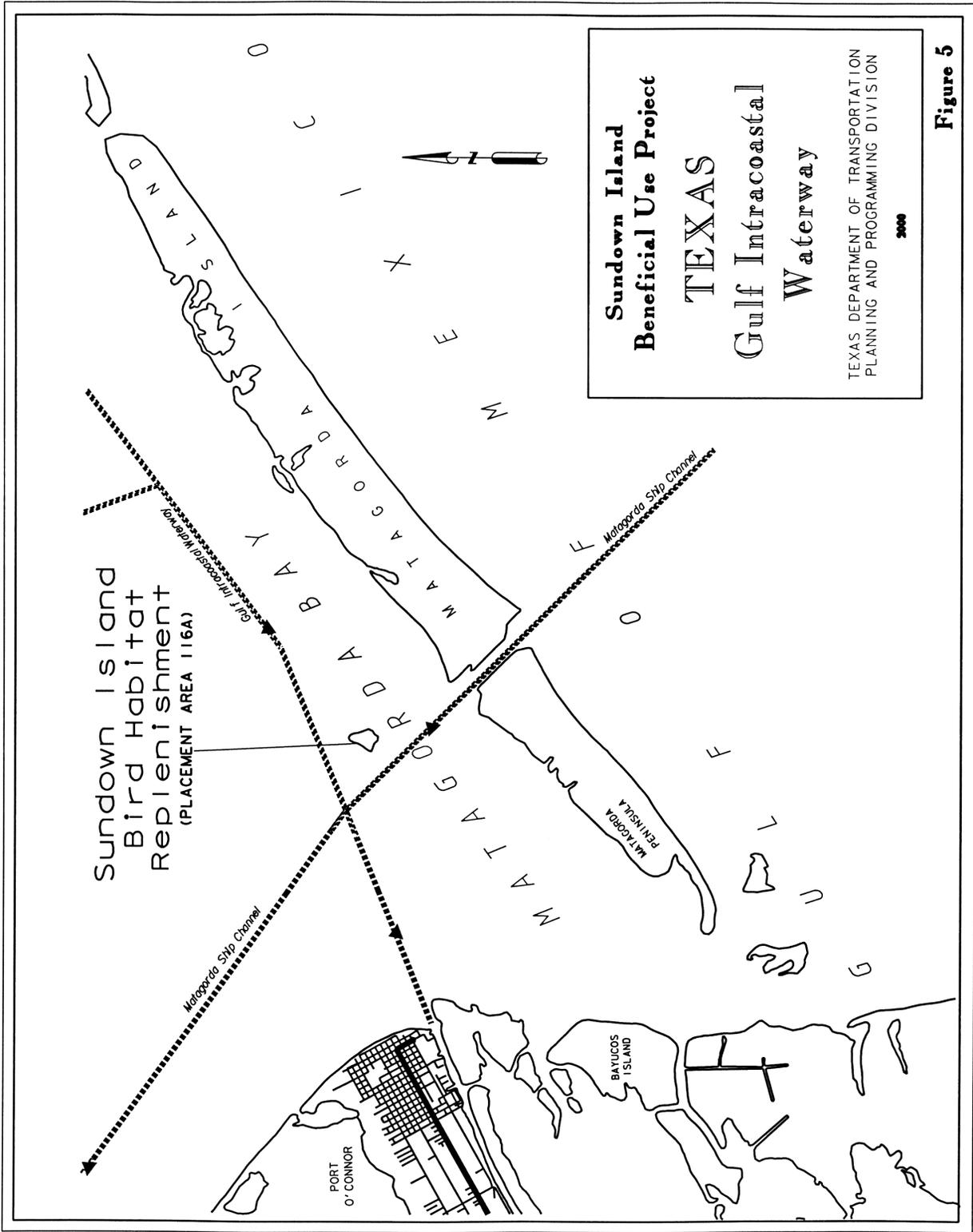


Figure 4



**Figure 5**



## **Funding Beneficial Use Projects**

The 74th Texas Legislature amended the Texas Coastal Waterway Act of 1975, Transportation Code, Chapter 51, in 1996 and authorized the Texas Transportation Commission, through the department, to enter into agreements with the Corps to participate in the cost of beneficial use projects using material dredged from the GIWW. Although House Bill 1536 authorized cost participation, no funding was appropriated for this purpose (See Appendix A). When costs of a beneficial use project exceed the Corps' budget authority, a cost-sharing sponsor will be necessary. Some of the avenues that may help partially fund beneficial use projects include the Corps' federal programs for beach nourishment or environmental enhancements (see Section 933 and Section 1135 programs in Appendix D), federal appropriation through the TCMP grants, or funding from other interested sponsors who would receive the benefits of the beneficial use projects.

## **Acquisitions and Conveyances**

For the 1999-2000 biennium, September 1998 through August 2000, the Texas Legislature appropriated \$1.35 million for acquiring upland dredged material placement sites, requested by the Corps, which would facilitate maintenance dredging of the GIWW. It is estimated that approximately 900 acres could be purchased with that funding. To continue support of the waterway in an environmentally sound manner, the state, as the nonfederal sponsor, will continue its upland site acquisition program. Continued state funding will be needed to provide upland placement for materials dredged from the waterway.

In June 1998, the Corps had provided TxDOT with disposal capacity needs in the area of Bolivar Peninsular (Placement Areas 42 and 43) in Galveston County. Preliminary acquisition activities commenced in July 1998, with site investigations. The Gulf Intracoastal Waterway Advisory Committee (GIWAC) Task Force evaluated the existing dredged material placement areas. The Task Force recommended that the acquisitions would be appropriate for TxDOT to acquire. The proposed acquisition sites are current placement areas, which are already NEPA compliant from previous environmental clearance. TxDOT, in proceeding with the identification of landowners, discovered that some of the

property was under bankruptcy. Further investigation also revealed the existence of unidentifiable heirs during title searches on Placement Area (PA) 42. In 2000, bankruptcy court sold the property to a new landowner. TxDOT met with the landowner to inform them of its interest in the land that encompasses PA 42 and explained its acquisition process. TxDOT has arranged to have properties surveyed. Once surveyed, TxDOT will begin the public involvement process for a fiscal year 2001 acquisition.

### ***Suspended Acquisitions***

In February 1994, at the request of the Corps, the Texas Transportation Commission suspended departmental actions to acquire four upland sites for the placement of materials dredged from the GIWW. These sites, totaling approximately 750 acres, are located in Kleberg and Kenedy Counties, near Baffin Bay in the upper Laguna Madre region. See Figure 7. As a result of the commission's suspension, TxDOT postponed the expenditure of appropriated funds for these acquisitions.

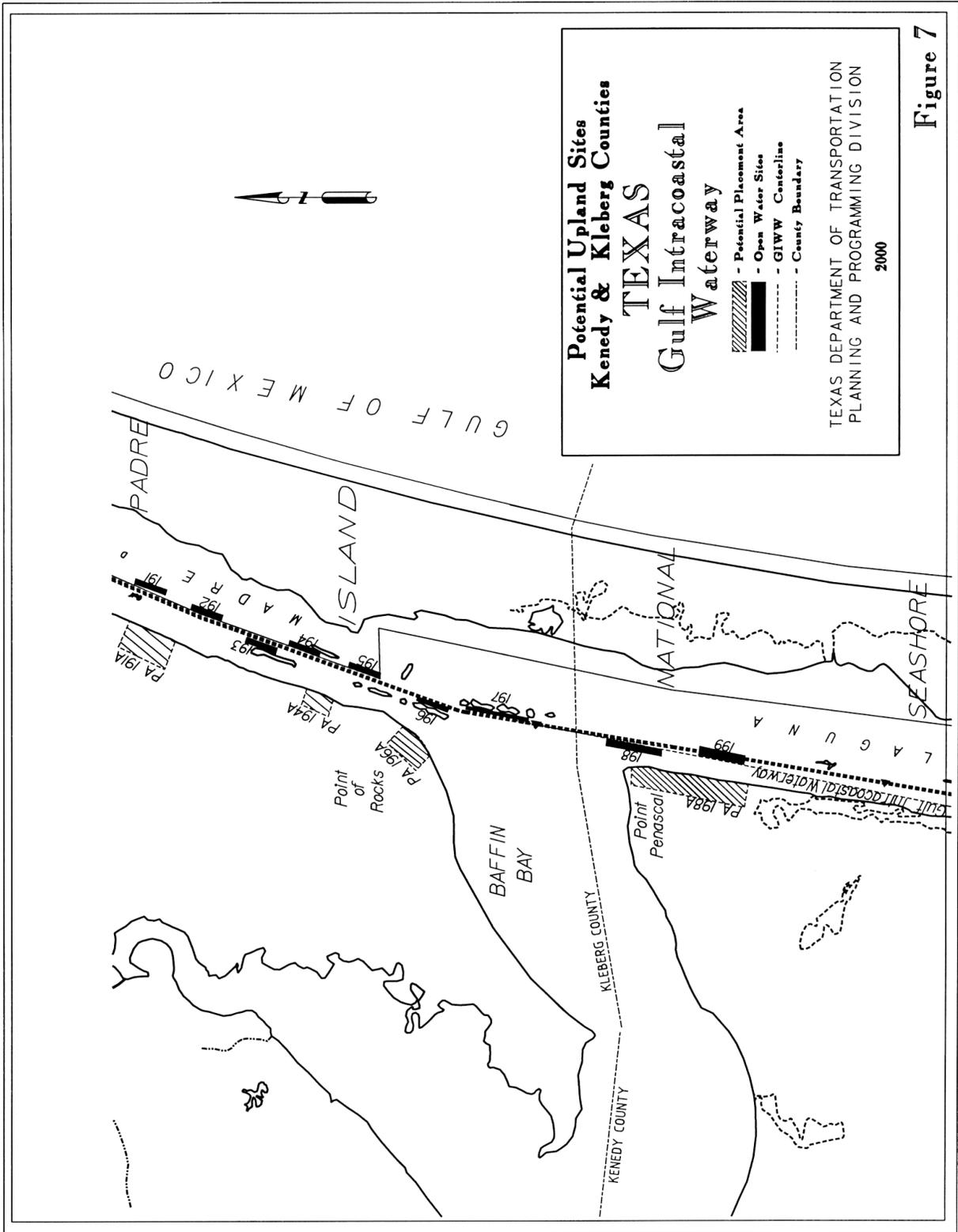
The Corps is conducting a Dredged Material Management Plan (DMMP) study for the Corpus Christi Bay to Port Isabel reach of the GIWW, which encompasses the region of these four proposed upland sites. If the DMMP study findings indicate a federal interest in the waterway's needs in this location, a long-term plan and environmental document will be developed. Upon completion of the DMMP study, the commission will review the long-term plan and determine if acquisition of the four sites is necessary. Continued legislative appropriation is needed should acquisition become necessary.

### **Other Waterway Initiatives**

In February 1997, the Corps identified facility concerns in East Matagorda Bay (PA 104) and West Galveston Bay (adjacent to PA 65). Placement Area 104 consists of a barrier island, which has breached at several areas. The continued loss of the existing barrier island between the GIWW and East Matagorda Bay will increase shoreline erosion and shoaling in this reach. Such erosion would impact existing state owned disposal sites and adjoining Big Boggy National Wildlife Refuge. Placement Area 65

is an upland confined placement area near West Galveston Bay across from an eroding-barrier island. TxDOT and the Corps are exploring potential solutions to erosion in the area.

TxDOT's Gulf Intracoastal Waterway Advisory Committee (GIWAC) task force conducted site investigations and has initiated coordination with member agencies on potential alternatives.



**Figure 7**

## Interagency Groups

State and federal agencies charged with overseeing activities along the GIWW have agreed to the use of interagency groups as a method of partnering and decision-making. Such agreements allow for synergy from a diverse group of individuals in developing potential solutions to the complex challenges of maintaining and operating the GIWW in an acceptable and desirable manner. These interagency groups have been developed at different levels, from agency executives to working staff. They have played a vital part by assisting, through consensus, the resolution of critical issues pertaining to the GIWW. Table 2-2 lists the interagency groups that have been formed, their purposes, and memberships.

TABLE 2-2  
LIST OF INTERAGENCY GROUPS

GROUP	PURPOSE	MEMBERS
Gulf Intracoastal Waterway Advisory Committee (GIWAC)	To advise and assist TxDOT in the following: developing a unified method to address problems and recommend solutions for the needs of the GIWW; developing proposals for a plan that will address dredged material placement in an identified area of need; and on the acquisition of placement sites in an environmentally sensitive and operationally suitable manner.	TxDOT [chair], TPWD, TGLO, TNRCC, Texas Historical Commission (THC), Texas Department of Economic Development (TDED), Office of the Governor
Interagency Coordination Teams (ICT) - Laguna Madre & Aransas National Wildlife Refuge	To develop scopes of work for a designated GIWW reach which address environmental concerns associated with the GIWW; participate in development of necessary environmental products; and promote better coordination between the USACE and state/federal member agencies for the management of dredged material.	USACE [chair], United States Fish and Wildlife Service (USFWS), National Marine Fisheries Service (NMFS), United States Environmental Protection Agency (USEPA), United States Coast Guard (USCG), TxDOT, TPWD, TGLO, TNRCC, Texas Water Development Board(TWDB)

## Endnotes

1. U.S. Army Corps of Engineers. District Commander's Executive Summary, Galveston District, July Reports, GIWW – Aransas National Wildlife Refuge (Sec 216). August 2000.
2. U.S. Army Corps of Engineers. District Commander's Executive Summary, Galveston District, July Reports. August 2000.
3. U.S. Army Corps of Engineers. Gulf Intracoastal Waterway – Corpus Christi Bay to Port Isabel (Section 216), Reconnaissance Report, January 1997.
4. U.S. Army Corps of Engineers. District Commander's Executive Summary, Galveston District, July Reports. August 2000.
5. U.S. Army Corps of Engineers. Gulf Intracoastal Waterway – High Island to Brazos River (Section 216), Project Study Plan, Revised Edition, October 1998.
6. U.S. Army Corps of Engineers. Gulf Intracoastal Waterway – Port O'Connor to Corpus Christi Bay (Section 216), Reconnaissance Report, August 1998.
7. U.S. Army Corps of Engineers. Gulf Intracoastal Waterway – Brazos River to Port O'Connor (Section 216), Reconnaissance Report, July 1998.
8. Ibid.

## CHAPTER 3

# SIGNIFICANT WATERWAY ISSUES

The Gulf Intracoastal Waterway (GIWW) in Texas is an important component of the state's multimodal transportation system. It is part of our national defense system and it facilitates national and international trade by providing the connecting link to other inland waterway transportation systems of the United States. Texas' 12 deep-draft ports, 15 shallow-draft ports, and many private industrial facilities utilize the GIWW to move commerce and generate significant economic activity. Facilitating the movement of goods between the Mexican Border and Florida, the GIWW is the nation's third busiest waterway.<sup>1</sup> The waterway also provides protected passage for military movement of supplies, recreational boats, and vessels associated with the commercial fishing and oil and gas industries.

Maintenance and improvements of the GIWW are crucial to ensuring an effective and safe performance of this transportation system. The United States Army Corps of Engineers (Corps), the waterway's federal sponsor, is responsible for the maintenance and operation of the waterway, while the state of Texas is its nonfederal sponsor. Acting on behalf of the state and through the Texas Transportation Commission, the Texas Department of Transportation (TxDOT) works closely with the Corps' Galveston District to provide local cooperation and input into federal projects concerning the GIWW in Texas. In this capacity, TxDOT has observed significant issues facing the waterway. Among these issues are concerns about GIWW maintenance, funding, navigational safety, and channel improvement needs.

## GIWW Maintenance

### Dredged Material Placement

Routine maintenance of the GIWW is necessary to provide safe and efficient operation of the waterway. During maintenance, sediment that periodically falls into the channel bed is removed by a hydraulic pipeline dredge device and placed into specific, authorized areas. Three types of dredged material placement areas are typically used for the GIWW in Texas: upland confined areas, semi-confined areas, and unconfined areas that are typically in open bay waters. Various groups have strongly objected to the placement of GIWW dredged materials into open bay waters and onto uplands. Objections to open-

water placement include concerns about potential impacts to seagrass beds and other marine habitat. Upland placement objections include concerns about blowing sand and salt impacts to native vegetation, visual obstruction from containment levees, and the potential to provide unwanted public access to private property.

The Galveston District has initiated a process that will evaluate the GIWW's dredging and dredged material placement needs. This process, known as the Dredged Material Management Plan (DMMP) and Section 216 Studies, will address the 423-mile Texas GIWW by five major reaches. Chapter 2 and Appendix D provide additional information on the Section 216 Studies. As appropriate for each specific reach of the waterway, these studies will assist in the development of an environmental document, which will update the GIWW's 1975 Environmental Impact Statement and a long-term DMMP.

The Corps has also initiated another effort, which utilizes input from an interagency coordination team for the southernmost segment of the GIWW. This team effort, which will identify study needs and evaluate findings, will help augment development of a DMMP for the Corpus Christi Bay to Port Isabel reach of the waterway. The studies will address the 120-mile GIWW reach, including the dredged material placement needs of the environmentally significant waters of the Laguna Madre.

## ***Erosion***

The coastal environment, by nature, is susceptible to erosion. Wind and waves, rain runoff, storm surges, and strong tidal currents contribute to the erosional condition seen in many locations along the Texas coastline, including the banks of the GIWW. Other forces that encourage erosion and cause the loss of uplands include vessel wakes and land subsidence.

Solutions to erosion problems along the GIWW are complex. Federal authorization to operate and maintain the GIWW provides only limited authority to address the waterway's shoreline erosion. Shoreline stabilization techniques have been possible in the following three examples by using research funds or demonstration programs that evaluated different erosion protection technologies on the Texas GIWW.

In the Galveston Bay area, a narrow strip of land is eroding that separates the GIWW from the pristine waters of Christmas Bay. A breach along the narrow land strip could impact the bay's valuable seagrass beds, as well as introduce sedimentation into the channel bed, increasing the waterway's maintenance needs and expenditures. Other locations along the GIWW are also experiencing erosion problems, with similar effects, such as the Halls Lake area in Brazoria County and the Aransas National

Wildlife Refuge in Aransas County. Again, to address these problems, the Corps had to use research or demonstration program funds. See Figure 8 for general locations.

Long-term solutions are needed to address erosion problems along the GIWW to prevent breaches and protect the valuable environment through which the waterway flows. The federal government shall preserve the GIWW by providing programs that the Corps can use to address necessary erosion control measures. In fulfilling the state's nonfederal sponsorship duties, TxDOT will provide input into GIWW erosion control projects on behalf of the state's water transportation needs.

## **Funding Concerns**

To help address the national deficit and create a balance, Congress is reducing the federal budget. In 1998, the Corps' Galveston District was notified of a 15 percent budget reduction that would occur over the next several federal fiscal years. In addition to budget decreases, the Galveston District's operation and maintenance expenses are increasing with both new projects and added costs for environmentally related activities. The district is reviewing waterway maintenance expenditures to determine ways of lowering or shifting expenditures elsewhere. As the Texas Coastal Management Program requires the consideration of beneficial uses of dredged material, any such costs exceeding the Corps' budget authority must be passed onto a cost-sharing sponsor.

In addition to reduced funding for the operations and maintenance of the waterway, federal funds have been omitted at various stages of the federal budgeting process for some of the GIWW's Section 216 Studies. Some of these important studies are still awaiting congressional authorization and appropriation.

## **Navigational Safety**

Water transportation is a comparatively safe mode for the movement of freight. However, in order to enhance the navigational safety of the Texas GIWW, waterway operator interest groups have identified the following navigational safety concerns:

- ◆ Abandoned concrete rubble and other debris along the waterway's edge and in the channel bed.
- ◆ Inadequate fendering systems that protect railroad and highway bridge pilings.
- ◆ Inadequate bridge lighting and signage for landmark bearings and safety.
- ◆ Riprap or concrete blocks for erosion control.

- ◆ Unmarked shoaled areas.
- ◆ Inadequate mooring facilities.<sup>2</sup>

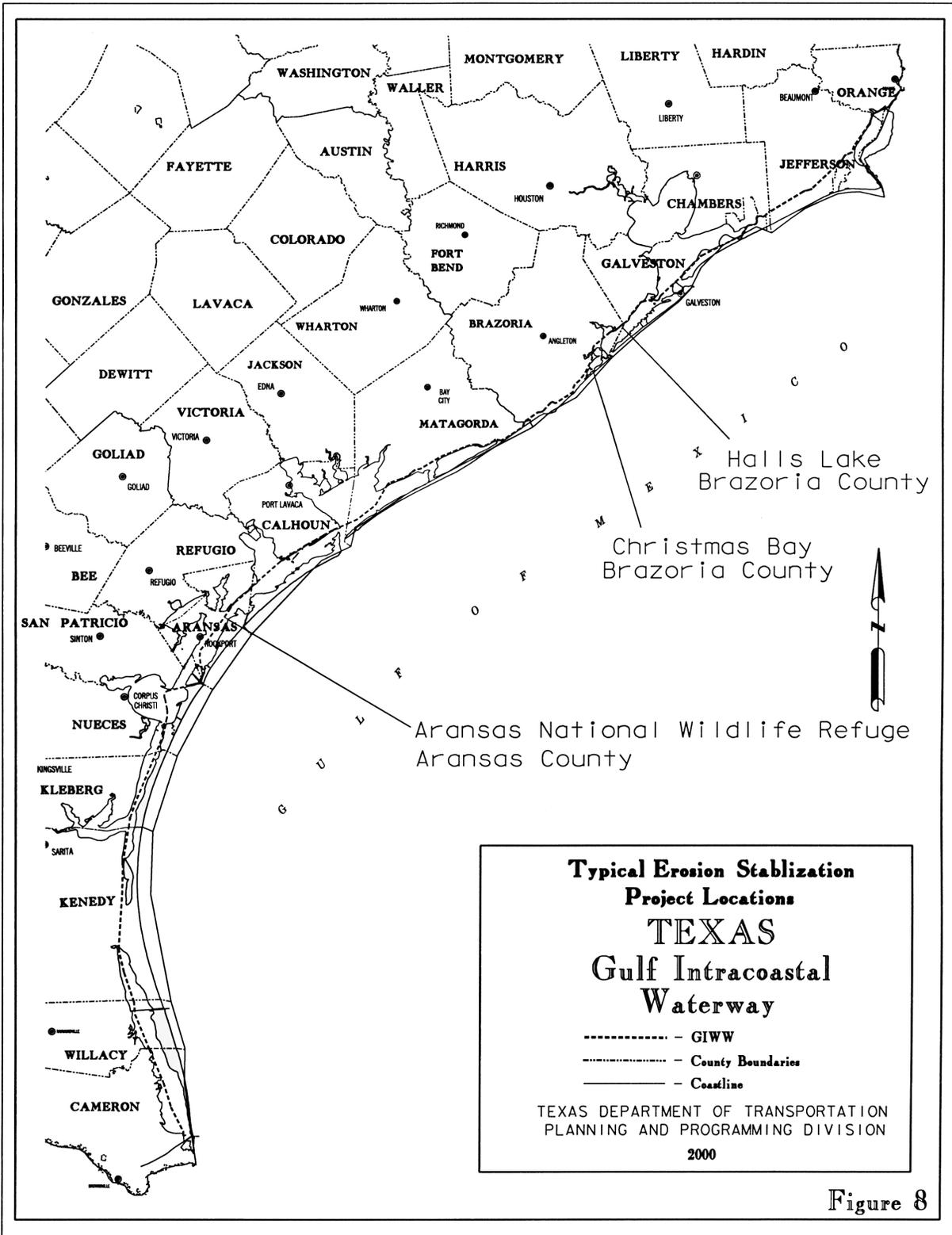


Figure 8

## Channel Improvement Needs

To provide improved navigational safety and enhanced transportation efficiency, specific areas of the GIWW should be evaluated for straightening or rerouting. Restricting curvatures on the waterway affect navigation efficiency in the High Island and Freeport areas.

Frequent sedimentation or shoaling occurring in Matagorda Bay could be addressed by rerouting or relocating the main channel to an area with a lower sedimentation rate and natural deeper water.

The GIWW, being a tidal facility, uses locks to prevent siltation or salt water intrusion into the waterway at some river crossings. Both the Colorado River locks and the Brazos River floodgates restrict marine vessel traffic during certain flood levels or when currents reach certain speeds. These facilities should be evaluated to improve the movement of vessel traffic.

These and other needs of the GIWW will be addressed as necessary through the Corps' Section 216 Studies. Any construction projects that the studies may recommend, such as straightening or rerouting the channel's alignment, or replacing or relocating river locks, must first be authorized by Congress, who will also at that time, determine the nonfederal sponsorship duties for a project. Congress usually assigns to a nonfederal sponsor the responsibility of providing all land needed to construct and operate the project, at no cost to the federal government. Many congressionally authorized projects also require that a nonfederal sponsor make necessary alterations or relocations to pipelines, cables, and other utilities, which may be located in the project area.

## Endnotes

1. U.S. Army Corps of Engineers, Water Resources Support Center. Waterborne Commerce of the United States. Parts 2 and 5, 2000.
2. Gulf Intracoastal Canal Association, Texas Waterways Operators Association and The American Waterway Operators Association. Navigation Problem Report for the Gulf Intracoastal Waterway and Connecting Tributaries. October 1999.

# CHAPTER 4

## LAGUNA MADRE - SEEKING SOLUTIONS

The Laguna Madre is a long, partially enclosed body of saltwater, which reaches from Corpus Christi, south along the Texas coastline into Mexico. It is one of only three biologically productive hypersaline lagoons in the world. Although its depth varies from three to five feet, the Laguna Madre is nevertheless one of the most productive fishery areas along the Texas coast. Recognized for its abundant flora and fauna, the Laguna Madre holds a special attraction for those who appreciate its many natural features.

The GIWW extends approximately 120 miles through the Laguna Madre from the Corpus Christi Bay to Port Isabel, where it intersects the Brownsville Ship Channel. To facilitate the GIWW's original construction along this reach of the canal, right-of-way easements were granted to the Corps for both the channel and the necessary placement areas for the project's dredged materials. Many of the designated placement areas used in maintaining the waterway lie in the open waters of the Laguna Madre. Some of the placement areas are emergent, extending above the waterline; others are completely submerged.

The GIWW in South Texas is an important transportation mode used by barge operators, other commercial businesses, and recreationists. It facilitates national and international trade through connections with the Texas seaport system, is a part of our national defense, and is designated as part of the total inland waterway system of the United States. Its connection links this southern region of the state to other Gulf States, as well as the Mississippi River and tributary systems.

The Laguna Madre and the GIWW are important to many diverse groups, for equally diverse reasons. Environmental groups have expressed concerns about impacts of open-water dredged material placement within the unique and prolific Laguna Madre, to the extent of seeking closure along this reach of the waterway. Transportation interests have responded by emphasizing the importance of the GIWW to the economy and its benefits to the environment. It is important to Texas that concerned interests strive through teamwork to provide for shallow-draft navigation in an environmentally sound fashion.

## Chronological Events Involving Issues

This chapter is a condensed chronology of the events involving the Laguna Madre and the GIWW during the last six fiscal years, September 1, 1994 through August 31, 2000. The related events in this time period, as in recent years, have claimed much attention, stressing the need to address waterway issues in new and innovative ways. Dedicated efforts are underway to determine acceptable methods of maintaining the navigation channel through the lagoon, while simultaneously fostering the protection and enhancement of the coastal environment.

During the early part of the first two fiscal years, challenges to the GIWW's future resulted in legal recourse. On September 2, 1994, the National Audubon Society, in conjunction with six local environmental organizations, filed a lawsuit against the Corps. The plaintiffs were seeking an injunction to stop what they regarded as environmentally destructive dredged material placement practices in the Corpus Christi Bay to Port Isabel reach of the GIWW. After a week-long hearing and based on the available evidence and testimony, the judge ruled to deny the plaintiffs' request. The plaintiffs later appealed the suit and a settlement was reached wherein the Corps agreed to pursue a supplemental environmental impact statement (SEIS) for this reach of the GIWW and to conduct a public scoping meeting on development of the SEIS as well.

Just before the initial lawsuit was filed, the Corps conducted a partnering session that involved federal and state natural resource agencies and the Texas Department of Transportation (TxDOT), the GIWW's nonfederal sponsorship agency. The partnering session centered on an upcoming maintenance-dredging project for the Arroyo Colorado to Port Isabel reach of the GIWW. Significant interest in this maintenance project focused on the repeated removal of shoaled material; i.e. sedimentation in the channel bottom, and its open-water placement in the GIWW at two locations: GIWW mile-marker 660 north of Port Isabel, and the turning wye near the mouth of the Arroyo Colorado. See Figure 9.

The partnering session allowed the Corps to present dredging and dredged material placement plans for the 1994-dredging project while the involved parties relayed their concerns. These plans were developed in coordination with the Gulf Intracoastal Waterway Advisory Committee (GIWAC)(see Table 4-1), which is chaired by TxDOT. In addition, the Corps identified plans for experimental methods of dredging and dredged material placement.



TABLE 4-1

GULF INTRACOASTAL WATERWAY ADVISORY COMMITTEE

Texas Department of Transportation (chair)
Texas Parks and Wildlife Department
Texas General Land Office
Texas Natural Resource Conservation Commission
Texas Department of Economic Development
Texas Historical Commission
Office of the Governor

After the court ruled to deny the plaintiffs' request to halt the dredged material placement for the GIWW maintenance project from the Arroyo Colorado to Port Isabel, the necessary dredging continued in accordance with the identified plans specified in the contract for this project. The dredging and dredged material placement plan included the following features: seagrass planting; experimental methods of open-water sediment control (submerged levees) and monitoring thereof; the deferment of dredging 100,000 cubic yards at TxDOT's request; and maximum collaboration with environmental agencies on issues critical to the overall health of the Laguna Madre. In addition, other studies were also initiated by the Corps to help assess impacts of open-water placement, including studies on historic dredging and dredged material placement practices, and hydrodynamics – the science that deals with the motion of fluids and the forces acting on solid bodies immersed in fluids; i.e. sediments.

While the information gathered from this project would be valuable in addressing the next maintenance dredging of this 30,000-foot reach, it was clear that environmental concerns were not alleviated. Scientific research and documentation on the GIWW and the Laguna Madre would be needed to accurately assess the situation and help develop solutions to secure continued navigation of the waterway while protecting and enhancing the environment associated with it.

## Interagency Coordination Team

Striving to secure continued navigation of the GIWW in the Laguna Madre reach, the Corps, as the waterway's federal sponsor, and TxDOT, the nonfederal sponsor, made a commitment to find solutions for navigation needs and environmental concerns. This commitment culminated in the development of an Interagency Coordination Team (ICT) for the Corpus Christi Bay to Port Isabel reach of the GIWW in the Spring of 1995. The Corps provided a \$4 million budget for the ICT to conduct research that might provide solutions.

This interagency coordination team (also referred to as the Laguna Madre ICT) improved coordination between agencies and environmental interests through the study of environmental concerns and issues related to the GIWW within the Laguna Madre. The findings of this extensive scientific research will be applied toward the Corps' and TxDOT's effort to develop a long-term dredged material management plan (DMMP) and updated environmental document for the Corpus Christi Bay to Port Isabel reach of the GIWW.

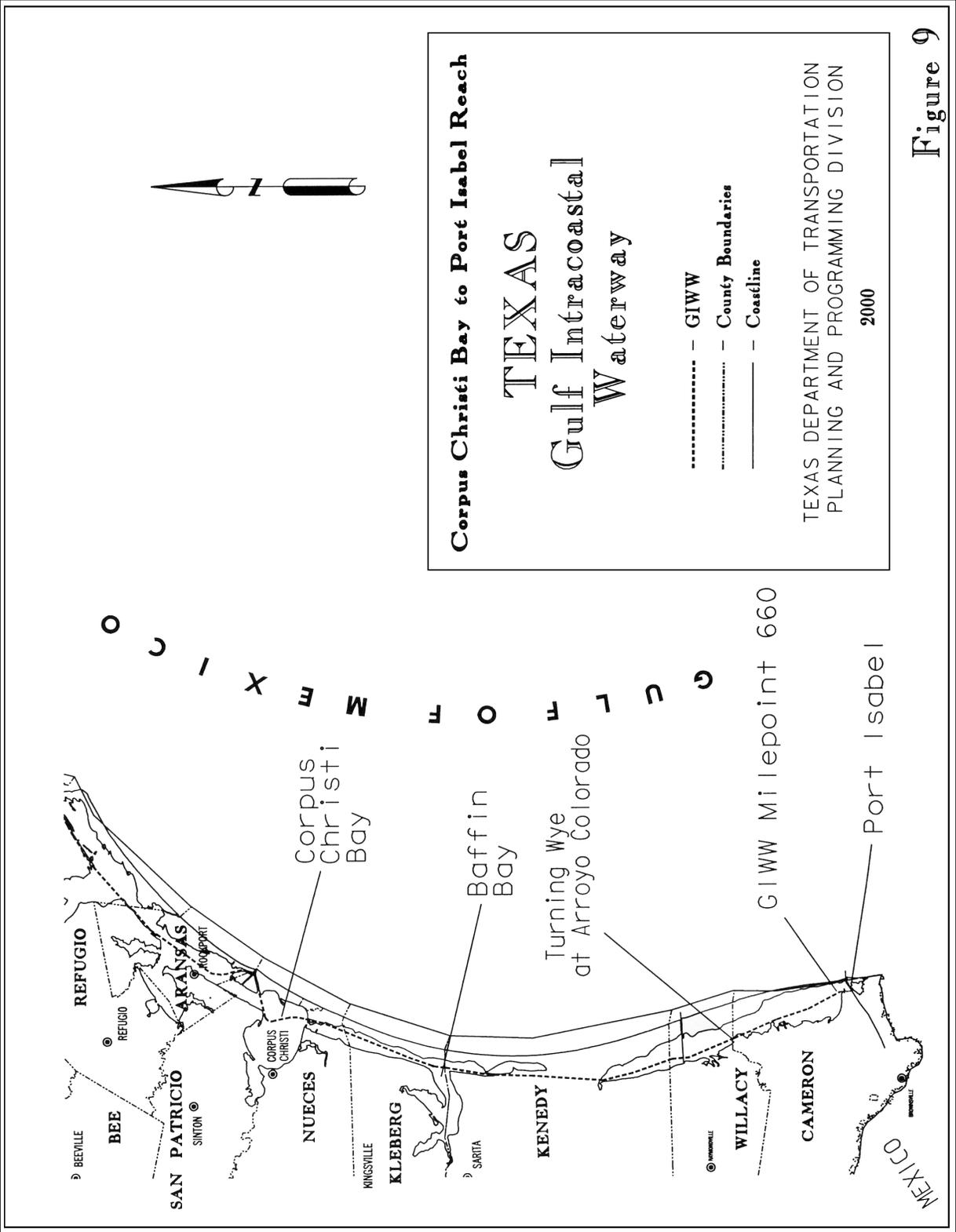
While awaiting completion of that long-term plan and environmental document, TxDOT will continue its suspension of acquisition activities for providing upland dredged material placement areas in the Baffin Bay area.

Fashioned after the successful ICT for the Houston-Galveston Navigation Channels, the Laguna Madre ICT is recognized by both the GIWW's federal and local sponsor as an appropriate mechanism for consensus-building and decision-making, and for solicitation of input from its members and their interest groups.

Table 4-2 lists the agencies involved in the Laguna Madre ICT, including the Corps as the team's chair and TxDOT as the lead state agency.

The Laguna Madre ICT first met in February 1995 to develop a charter, which included the following objectives:

- (1) Identify those environmental concerns associated with the GIWW in the Laguna Madre;
- (2) Develop scopes of work to address environmental concerns;
- (3) Ensure effective teamwork among state and federal agencies; and
- (4) Contribute to and expedite completion of the dredged material management plan (DMMP) and environmental assessment for the GIWW.



**Figure 9**

## **Identifying Study Needs**

In order to comprehensively identify DMMP study needs of environmental issues concerning the GIWW and the Laguna Madre, the Laguna Madre ICT utilized information from various sources, including comments from a series of public meetings on Laguna Madre maintenance dredging activities held by the Corps between 1993-1996. The ICT also used input solicited from environmental groups, waterway users, and resource agencies, as well as findings from the Corps' Section 216 Reconnaissance Study of the Corpus Christi Bay to Port Isabel reach of the GIWW. A great number of study needs were identified for the Laguna Madre and the GIWW, and are listed in the Comprehensive List of Study Needs on the following pages.

TABLE 4-2

GIWW CORPUS CHRISTI BAY TO PORT ISABEL  
INTERAGENCY COORDINATION TEAM (ICT)  
(Laguna Madre ICT)

<b>AGENCY</b>	<b>TEAM ROLE</b>
United States Army Corps of Engineers	Chair
United States Environmental Protection Agency	Member
United States Fish and Wildlife Service	Member
United States National Marine Fisheries Service	Member
Texas Department of Transportation	Lead State Agency
Texas General Land Office	Member
Texas Natural Resource Conservation Commission	Member
Texas Parks and Wildlife Department	Member
Texas Water Development Board	Member
Corpus Christi Bay National Estuary Program	Advisory
Padre Island National Seashore	Advisory

## COMPREHENSIVE LIST OF STUDY NEEDS

### DREDGING IMPACTS

1. Determine what changes in Laguna Madre are directly related to dredging and maintaining the GIWW, whether the changes can be quantified, and how long they persist.
2. Determine impacts to benthic community.
3. Determine historical, cumulative impacts of dredging on the Laguna Madre.
4. Depending on the outcome of the Scanning Hydrographic Operational Airborne Lidar Survey/Compact Airborne Spectrographic Imager (SHOALS/CASI) survey system, complete a bathymetric survey of the Laguna to ascertain historical and cumulative impacts of dredging in the Laguna Madre.
5. Complete a sediment budget analysis, including the fate of dredged material, particularly mud flow impacts to the lagoon outside designated disposal area's. Also, determine impacts to accessibility of certain areas by boaters.

### ALTERNATIVE DISPOSAL METHODS

1. Determine the feasibility of using upland disposal sites as an alternative to open-water disposal.
2. Identify suitable upland disposal sites for primary and alternative use.
3. Identify costs of pumping dredged material over longer distances.

### CONTAMINANTS

1. Check for contaminants in dredged material and whether they are released in suspended sediments.
2. Determine general water quality and impacts of contaminants on the lagoon.
3. Identify and prioritize areas in the Laguna Madre to be protected in the event of spills of oil or hazardous materials being transported on the GIWW.

### WATER QUALITY

1. Make a point source inventory of contributions to the Laguna Madre; specifically agricultural drainage ditches not normally mapped or monitored and without a specific outfall observable from the Laguna Madre.
2. Sample isolated oxbows, resacas, and other catch basins along the Laguna Madre margin to determine what nutrients/contaminants are stored/released during flood events.

### TURBIDITY

1. Determine dredging's contribution to the decline of seagrass in the Laguna Madre.
2. Determine what effect changes in salinity have on seagrass species composition and distribution.
3. Identify short-and long-term impacts on turbidity (water clarity), seagrasses, benthic and epiphytic algae, and atrophic dynamics/interactions.
4. Quantify the destruction of seagrass by boat propellers in shallow water.
5. Study trends in seagrass changes related to the GIWW and complete an inventory of seagrass distribution in the Laguna Madre.

## CIRCULATION/HYDRODYNAMICS

1. Determine circulation/hydrodynamics of the Laguna Madre.
2. Determine whether increased circulation created by GIWW is beneficial or detrimental, and whether it would be beneficial to increase circulation by increasing the size of the Land Cut and/or cuts through the Kennedy Causeway.
3. Determine changes in salinity patterns since 1949, and whether the changes have been negative or positive.
4. Determine whether the GIWW affects the flow and distribution of salinity, turbidity, and pollution from the Arroyo Colorado.
5. Determine if the Rio Grande discharge (pollution) gets into the Laguna Madre.

## BENEFICIAL USES OF DREDGED MATERIAL

1. Determine if disposal on rookery islands increases potential for predator invasion and how predator invasion can be avoided.
2. Determine potential use of leveed disposal sites as rookeries.
3. Explore beneficial uses of dredged material in the Laguna Madre and determine which uses or procedures will minimize impacts to or enhance productivity of fishery species.
4. Study beneficial uses of the dredged material from the Laguna Madre as nourishment for erosion of Gulf of Mexico beaches.

## THREATENED AND ENDANGERED SPECIES

1. Determine effects on state and federally listed endangered species (or candidate species) and their habitats.

## BROWN TIDE

1. Determine if brown tide is caused by or related to dredging and disposal in the Laguna Madre.
2. Determine if research into dredging and disposal impacts on the lagoon (habitats and fisheries) can be separated from impacts of the brown tide, and whether the brown tide overshadows or interacts additively or synergistically with all other problems.
3. Determine if dredged materials are a nutrient source for brown tide.

## FISHERY CONCERNS

1. Determine whether these habitat changes cause changes in fishery and forage species' utilization of those habitats and for how long.
2. Determine if there is an impact of GIWW dredging on fishery productivity, if it is measurable, and its significance to the overall system's productivity.
3. Determine if there are economic impacts from dredging and disposal to commercial and recreational fisheries.
4. Compare fish productivity in pre- and post-1949 periods and relate it to the channel's effects on fish kills due to hypersalinity and freezes.

MISCELLANEOUS CONCERNS

1. Study nutrient cycling in the Laguna Madre.
2. Determine impacts of the Texas Water Plan on the Laguna Madre and how this related to the GIWW.
3. Review environmental implications of the extension of the GIWW into Mexico.
4. Research existing data on Laguna Madre sediments, water and tissue monitoring programs, and on Corps/State permits in the Laguna, and convert these data into Geographic Information System (GIS) format to facilitate analysis of human impacts on the system.
5. Provide all information developed, especially raw data, to all interested parties in a usable format.
6. Identify habitat/species utilization maps for the Laguna Madre as a whole, not just sea grass and endangered species.
7. Look at the environmental monitoring that is being conducted in the Laguna Madre, and make recommendations as to its coverage and completeness.

GENERAL

1. Update the 1975 EIS for the GIWW and factor in the new benefit/cost ratio, including costs of dredging alternatives.
2. Determine whether dredged material is having an impact on the Laguna Madre. Seek technical advice from scientific community to solve this problem.
3. Consider alternative disposal methods, sites, and costs and complete an alternatives analysis.

The Comprehensive Study Needs List can be categorized into 12 major areas as shown in Table 4-3.

TABLE 4-3

MAJOR AREAS OF STUDY NEEDS

<b>Study Areas</b>
Dredging Impacts
Alternative Disposal Methods
Contaminants
Water Quality
Turbidity
Circulation/Hydrodynamics
Beneficial Uses of Dredged Material
Threatened and Endangered Species
Brown Tide
Fishery Concerns
Miscellaneous Concerns
General

Because of the large number of study needs identified, there were more needs than the Laguna Madre ICT's \$4 million budget could address; therefore, a prioritized list of study needs became necessary. To ensure coverage of identified concerns, the Laguna Madre ICT drew from its diverse membership and wide range of expertise to categorize the study needs into two major areas: physical/chemical studies and biological concerns, thereby, ranking needs within each category based on importance. See the Prioritized List of Study Needs in Table 4-4.

TABLE 4-4  
PRIORITIZED LIST OF STUDY NEEDS

CATEGORIES OF STUDY NEEDS*
<p>Category A - Physical/Chemical Studies</p> <ol style="list-style-type: none"> <li>1. Fate of the dredged material</li> <li>2. Sediment Budget</li> <li>3. Circulation Model</li> <li>4. Brown tide &amp; dredging</li> <li>5. Contaminants</li> <li>6. Bathymetry</li> <li>7. Nutrients</li> </ol> <p>Turbidity</p> <p>Category B – Biological Concerns</p> <ol style="list-style-type: none"> <li>1. Habitat studies               <ol style="list-style-type: none"> <li>a. Mapping/Distribution</li> <li>b. Physiology</li> <li>c. Sediment Entrapment</li> <li>d. Recovery/Colonization rates</li> <li>e. Faunal Utilization</li> </ol> </li> <li>2. Habitat Types               <ol style="list-style-type: none"> <li>a. Seagrass/Epiphytes</li> <li>b. Algal Flats</li> <li>c. Threatened &amp; Endangered Species</li> <li>d. Unvegetated Bottom (subtidal)</li> <li>e. Water Column (plankton, etc.)</li> <li>f. Hard Substrate</li> <li>g. Island</li> <li>h. Shorelines</li> <li>i. Sand/Mud Flats</li> </ol> </li> <li>3. Brown Tide</li> <li>4. Benthos</li> <li>5. Macrofauna (Fisheries Productivity)</li> </ol> <p>*Priority ranked within each category.</p>

## ***Initiating Studies***

Before the Laguna Madre ICT initiated research contracts on any of the prioritized study needs, the Corps implemented its authority to fast track the award of two research contracts and funded them under its Operations and Maintenance budget, rather than with ICT funds. These two contracts provided for environmental monitoring of dredging and bay processes in the upper and lower areas of the Laguna Madre. By quickly initiating these studies, research could be conducted on the impacts of a maintenance-dredging project underway in the lower Laguna Madre.

Having identified a list of prioritized study needs, the Laguna Madre ICT began developing scopes of work for the research to be conducted, followed by reviews of contract proposals, and recommendations for contract awards. Through August 1998, 26 study contracts were awarded and funded by the Laguna Madre ICT for approximately \$4.2 million. See Table 4-5. The Corps funded two environmental monitoring studies for \$628,769, and the U.S. Environmental Protection Agency funded two environmental characterization studies totaling \$126, 868.

To determine if the scopes of work being developed would address the identified and prioritized study needs, the Laguna Madre ICT conducted an evaluation of its efforts. This evaluation showed that the scopes of work had not covered relationships or impacts of dredging and dredged material placement on brown tide, threatened and endangered species, and the water column. See Table 4-6. The Laguna Madre ICT will determine whether to develop scopes of work to fill these voids.

TABLE 4-5  
LAGUNA MADRE STUDIES

<b>Study Identification Code</b>	<b>Study Name and Contractor</b>	<b>Cost</b>
CBI-L1	Environmental Monitoring of Dredging and Processes in the Lower Laguna Madre. Conrad Blucher Institute	\$300,000*
CBI-L2	Extension of the Monitoring in the Lower Laguna Madre. Conrad Blucher Institute	\$165,000
CBI-L3	Relocation of Monitoring Platforms in Lower Laguna Madre. Conrad Blucher Institute	\$138,486
WES-1	Hydrographic Characterization and Bottom Characterization, Laguna Madre. U.S. Army Waterways Experiment Station	\$586,550
NMFS	Temporal and Spatial Effects of Open Water Dredge Material Disposal on Habitat Utilization by Fishery Species in Disposal Areas. National Marine Fisheries Service	\$581,800
CBI-U1	Environmental Monitoring of Dredging and Processes in the Upper Laguna Madre. Conrad Blucher Institute	\$328,769*
CBI-U2	Extension of the Monitoring in the Upper Laguna Madre. Conrad Blucher Institute	\$219,424
EHA-1	Review of Available Water and Sediment Quality Data in the Laguna Madre. Espey, Huston, and Associates	\$ 22,722
BEG	Sediment Characteristics, History, and Recent Transport, Laguna Madre. University of Texas, Bureau of Economic Geology	\$310,969
WES-2	Laguna Madre Fluid Mud Survey. U.S. Army Waterways Experiment Station	\$125,000
TAMU-1	Predictive Model of Seagrass Impacts. Texas A&M University, University of Texas Marine Science Institute, and Texas Parks and Wildlife Department	\$530,349
EHA-2	Laguna Madre Open Water Dredged Material Disposal Study. Espey, Huston & Associates	\$157,862
EHA-3	Date Reduction and Trend Analysis. Espey, Huston & Associates	\$ 26,939
* Funding provided by Corps of Engineers, Galveston District's Operations and Maintenance budget, not ICT funding.		

continued

TABLE 4-5 (continued)

## LAGUNA MADRE STUDIES

<b>Study Identification Code</b>	<b>Study Name and Contractor</b>	<b>Cost</b>
EPA-1	Characterization of Dredged Material in Laguna Madre. United States Environmental Protection Agency	\$64,584**
EPA-2	Alternatives for Beneficial Use of Dredged Material. United States Environmental Protection Agency	\$62,284**
TAMU-1a	Link for Hydrodynamic/Seagrass Models. Texas A&M University, University of Texas Marine Science Institute, and Texas Parks and Wildlife Department	\$77,217
TAMU-1b	Extend Monitoring for UTMSI. Texas A&M University, University of Texas Marine Science Institute, and Texas Parks and Wildlife Department	\$22,851
TAMU-2	Economic Analysis. Texas A&M University, University of Texas Marine Science Institute, and Texas Parks and Wildlife Department	\$95,658
EHA-2a	Additional Statistical Analysis. Espey, Huston & Associates	\$6,375
EHA-4	Piping Plover Survey - Placement Areas. Espey, Huston & Associates	\$18,884
NAS/EHA	Piping Plover Survey - Habitat Use. National Audubon Society and Espey, Huston & Associates	\$117,515
GBA/EHA	Dredging Estimates for Advance Planning. Gahagan & Bryant Associates and Espey, Huston & Associates	\$35,254
WES-3	Hydrodynamic Circulation of the Upper and Lower Lagoons	\$580,000
EHA-5	Sediment Density Measurements (data for the BEG study). Espey, Huston & Associates	\$14,660
EHA-6	SEIS Support: Purpose, Study Description, Env. Setting. Espey, Huston & Associates	\$27,422
BEG-1a	Analyze Changes at PA 233 & PA 234. University of Texas, Bureau of Economic Geology	\$16,838
TAMU-1c	Verification Study for Seagrass Model. Texas A&M University, University of Texas Marine Science Institute, and Texas Parks and Wildlife Department	\$126,740
TAMU-1d	Linkage of Seagrass and Hydrodynamic Models. Texas A&M University, University of Texas Marine Science Institute, and Texas Parks and Wildlife Department	\$37,824
TAMU-King	Extend Piping Plover Study (NAS). Texas A&M University at Kingsville	\$48,635
UT/EHA	Analyze CBI Data. University of Texas and Espey, Huston & Associates	\$103,918
**Funding provided by United States Environmental Protection Agency, not ICT funding.		

TABLE 4-6  
EVALUATION OF LAGUNA MADRE STUDIES

PRIORITIZED STUDY NEEDS	STUDY IDENTIFICATION CODES
<b>Category A - Physical/Chemical Studies</b>	
1. Fate of the dredged material	BEG, WES-2, CBI Studies, Hydrodynamic Model
2. Sediment Budget	BEG, Hydrodynamic Model
3. Circulation Model	CBI Studies, Hydrodynamic Model
4. Brown tide & dredging	To be determined
5. Contaminants	EHA-1, EHA-3
6. Bathymetry	WES-1
7. Nutrients	TAMU/UTMSI/TPWD, CBI Studies
8. Turbidity	CBI Studies, BEG
<b>Category B - Biological Concerns</b>	
1. Habitat studies	
a. Mapping/Distribution	ICT Resources, All studies
b. Physiology	TAMU/UTMSI/TPWD
c. Sediment Entrapment	BEG
d. Recovery/Colonization rates	NMFS, BEG, EHA-2
e. Faunal Utilization	NMFS, EHA-2
2. Habitat Types	
a. Seagrass/Epiphytes	TAMU/UTMSI/TPWD
b. Algal Flats	WES-1
c. Threatened & Endangered Species	To be determined
d. Unvegetated Bottom (subtidal)	NMFS, EHA-2, WES-1
e. Water Column (plankton, etc.)	To be determined
f. Hard Substrate	To be determined
g. Island	WES-1, BEG
h. Shorelines	WES-1
i. Sand/Mud Flats	WES-1
3. Brown Tide	To be determined
4. Benthos	NMFS, EHA-2
5. Macrofauna (Fisheries Productivity)	NMFS

## ***Seagrass and Hydrodynamic Modeling Studies***

Perhaps the most significant and complex of the studies on the GIWW and the Laguna Madre will be addressed with computer modeling which can simulate the outcome of various scenarios under different conditions. The accuracy of simulations is related to the number of parameters entered into a computer model, with modeling costs increasing as the number of parameters used increases. The Laguna Madre ICT viewed modeling as the best tool available to closely simulate dredging and dredged material placement impacts under certain conditions.

The Laguna Madre ICT established a modeling task force, charged with developing a scope of work, analyzing research proposals, and identifying qualified contractors. The task force identified the need for two models: 1) an assessment of dredging and dredged material placement on seagrasses, and 2) an assessment of the hydrodynamics of the Laguna Madre with an additional sediment transport component.

Because other environmental monitoring studies were already underway in the Laguna Madre, the ICT initiated the seagrass modeling study first. Data collected from the other on-going studies, such as measurements for chlorophyll, water column, photosynthetically active radiation, and total suspended solids, would be used to validate parameters used in the seagrass model. The task force developed a scope of work and the study was subsequently initiated and completed during this biennium.

For the hydrodynamic modeling study, the task force continued its efforts and developed a scope of work for an appropriate model to simulate the complex hydrodynamics of the Laguna Madre. The Corps' Waterways Experiment Station (WES) was chosen to create the hydrodynamic model. As time progressed, WES completed and verified the model for the ICT's execution. After the ICT reached consensus, WES ran several scenarios dealing a "no dredging action" and a worst-case of simultaneous dredging for the entire Laguna Madre at the same time. The results of the hydrodynamic modeling will play a significant role in developing the supplemental environmental document and long-term dredged material management plan (DMMP) for the Corpus Christi Bay to Port Isabel reach of the GIWW.

## ***Public Involvement***

To ensure public involvement on all the Laguna Madre ICT studies, the Corps issued a public notice on the Laguna Madre ICT's activities, and extended an invitation to have a workshop conducted, upon request to the Corps. The Laguna Madre ICT also initiated public involvement by developing a list of concerned and interested parties, and concurrently mailed an invitation for a workshop on its activities. Public Involvement requests were received from the Lower Laguna Madre Foundation, the Gulf Intracoastal Canal Association, the Corpus Christi Bay National Estuary Program, and TxDOT, who requested a workshop for the major landowners adjacent to the Laguna Madre. The workshops, at requestors' designated locations, provided a forum for exchanging information on the Laguna Madre ICT studies, and the development of the DMMP and updated environmental document for the Corpus Christi Bay to Port Isabel reach of the GIWW.

After the Corps published notices of the workshops, major landowners from Kenedy and Kleberg Counties produced a White Paper, similar to the one produced in 1994. The 1996 White Paper related concerns about potential impacts of upland dredged material placement in the landowners' regions, such as blowing sand and salt impacts to native vegetation, obstruction of bay views by containment levees, and the potential to provide unwanted public access to private property.

As the supplemental environmental document is drafted, the ICT will again begin its public involvement process to receive input and finalize the updated environmental document.

## ***Summary***

Since inception, the Laguna Madre ICT has worked effectively as a team to identify, as comprehensively as possible, the environmental concerns associated with the GIWW in the Laguna Madre. This ICT, drawing from its wide range of expertise, has developed scopes of work, reviewed proposals, initiated study contracts, and reviewed findings as produced. The information gained through the Laguna Madre ICT process, which is based upon scientific research and documentation, will be invaluable in helping develop an updated environmental document and a long-term DMMP for the Corpus Christi Bay to Port Isabel reach of the GIWW. The dedicated efforts of the Laguna Madre ICT have

endured in seeking new information that allowed the GIWW's continued navigation through the Laguna Madre, while simultaneously fostering the protection and enhancement of the environment.

# CHAPTER 5

## TEXAS COASTAL MANAGEMENT PROGRAM

For years, significant population growth and economic development have occurred within the coastal region of Texas. The region's many attributes have contributed to this growth, including a temperate climate, aesthetically pleasing environment, and a well-developed transportation infrastructure which provides landside and water access for local, intrastate, interstate, and international trade markets. More than one-third of the state's population resides in thirty counties within 100 miles of the Texas coastline.<sup>1</sup> Future projections indicate that the population in this region will grow from the 1996 figure of 5.9 million to 8.3 million in the year 2020, placing stress on the surrounding natural resources. In addition, natural forces such as currents, flooding, subsidence, and periodic violent storms have the potential to cause significant impacts to this sensitive setting.

In response to on-going and anticipated pressures on the Texas coastal region and to help ensure the long-term ecologic and economic productivity of the coast, the Texas Legislature fostered a program to comprehensively and efficiently manage the state's coastal natural resources. In a series of legislative acts between 1989 and 1995, the legislature provided the Texas General Land Office (TGLO) the authority to develop the Texas Coastal Management Program (TCMP) which works within the framework of the federal Coastal Zone Management Program. Many state and federal regulatory authorities already exist to manage coastal resources in Texas; however, the TCMP has employed a coordinated approach of increasing the efficiency of such management by linking regulations, programs, and the expertise of state, federal, and local entities that manage various aspects of coastal resource usage.

Management of the TCMP is overseen by the Coastal Coordination Council (CCC) who has been mandated to adopt uniform goals and policies for guiding the decisions of all entities that regulate or manage natural resource usage within the Texas coastal zone. Ultimately, the TCMP is designed to avoid duplication of effort and conflicts in agency policies and regulatory decisions, and to address five primary issues of concern to coastal communities: coastal erosion, wetlands protection, water supply and water quality, dune protection, and shoreline access.<sup>2</sup>

The CCC must review significant activities taken or authorized by state agencies and subdivisions that may adversely affect coastal natural resources to assure consistency with the goals and policies of the TCMP. Through a biennial report to the legislature, the CCC recommends statutory changes and reports on agencies' compliance with the program. Furthermore, the CCC must issue an annual report, reviewing the effectiveness of the program. Members of the CCC are listed in Table 5-1.

TABLE 5-1  
COASTAL COORDINATION COUNCIL MEMBERS

MEMBER	TITLE
Texas General Land Office	Commissioner *
Texas Parks and Wildlife Commission	Chairman
Texas Natural Resource Conservation Commission	Chairman
Texas Transportation Commission	Chairman
Texas Water Development Board	Chairman
Texas State Soil and Water Conservation Board	Member
Railroad Commission of Texas	Member
Gubernatorial Appointee	Local Elected Official (Coastal)
Gubernatorial Appointee	Coastal Resident
Gubernatorial Appointee	Coastal Business Person
Gubernatorial Appointee	Agriculture Representative
<i>* Denotes Chairman of Coastal Coordination Council</i>	

The appointment of the Texas Transportation Commission Chairman to the CCC membership was provided by House Bill 3226 in 1995 during the 74th legislative session. This membership to the CCC occurred during an important phase of the coastal management program's development: setting the program's policies for activities involving dredging and coastal construction. The TCMP policies related to these activities established regulations for considering beneficial uses of dredged material on all federally maintained, commercially navigable waterways, and for providing mitigation on coastal construction projects. The Texas Department of Transportation (TxDOT) is affected by the dredging and coastal construction policies, largely through its nonfederal sponsorship program for the GIWW.

The Texas Transportation Commission, through the department, worked with the TGLO to negotiate the TCMP's dredging and coastal construction policies, particularly, the policy on dredging and dredged material disposal and placement. Governor George W. Bush submitted the TCMP to the National Oceanic and Atmospheric Administration on October 19, 1995, and the TCMP received federal approval on January 10, 1997. Upon federal approval of the TCMP, Texas became eligible for program implementation funds under the federal Coastal Zone Management Act. The TGLO receives and administers the annual federal grants to further the goals and policies of the TCMP.

Although navigation projects in Texas have been previously determined environmentally acceptable through assessments of environmental impacts at the onset of those projects, the requirements of the TCMP include another environmental review of such projects in order to establish consistency with the state program. When the consistency reviews of these existing projects began, the explanatory sections of the dredging and dredged material placement policy and the development in critical areas policy helped with the process to seek a consistency status with the TCMP. Eventually, the language of the explanatory sections may need to be incorporated into the TCMP dredging and coastal construction policies.

For the fiscal years 1999-2000, the CCC and the Corps had taken the initiative to begin the implementation of the Memorandum of Agreement between the CCC and Corps and the TCMP. The reason for the agreement is the CCC's understanding that the Corps' statutory authority does not allow the Corps to completely fulfill the TCMP's beneficial uses requirements. Before deeming the maintenance of the navigation channel consistent with the TCMP, CCC staff would prefer that the Corps construct beneficial use projects from dredged material. Under the Corps' statutory authority, construction of a beneficial use project is allowed if it meets or is below the Corps' federal standard. The Corps' federal standard is statutorily defined as the least costly alternative, consistent with sound engineering practices and selected through the 404(b)(1) guidelines or ocean disposal criteria. For beneficial use projects, the Corps requires a cost-sharing partner to provide for incremental costs above the federal standard. The Corps' cost-sharing partnership can be accomplished by two methods. The first partnership method requires the cost-share partner to pay for 100 percent above the federal standard. The second partnership method allows the cost-share partner to apply for one of the Corps' continuing authorities programs under the Water Resource Development Act (WRDA). Cost-sharing responsibility of the

applicant is dependent upon the authority applied for under WRDA. The majority of beneficial use projects are usually above the federal standard, therefore, the Corps needs the participation of a cost-share partner. In some of the consistency determinations submitted by the Corps, they have identified a potential beneficial use project but have failed to identify a cost-share partner and will not be able to construct the beneficial use project until that partner can be identified.

With the CCC and Corps' agreement in place, the Corps started submitting consistency determinations, as per the modified schedule identified in the CCC/Corps Memorandum of Agreement, to the CCC for review. As the Texas Transportation Commission's staff, TxDOT through the Environmental Affairs and Transportation Planning and Programming Divisions has reviewed coastal permits and projects for consistency concurrence with the Texas Coastal Management Program.

## Endnotes

1. 1996 and Projected 2020 Populations in Thirty Texas Coastal Counties. Provided by Texas Comptroller of Public Accounts, *Winter 1997-1998 County Forecast*, and the Texas State Data Center at Texas A&M University.
2. Final Environmental Impact Statement, Texas Coastal Management Program; August 1996, Part II 1-2.

# CHAPTER 6

## LEGISLATIVE RECOMMENDATIONS

The Gulf Intracoastal Waterway (GIWW) in Texas is an important component of the state's multimodal transportation system. Maintenance and necessary improvements are crucial to ensuring an effective and safe performance of this transportation system. The United States Army Corps of Engineers (Corps) is responsible for the maintenance and operation of the waterway, while the state of Texas, through TxDOT, is its nonfederal sponsor. The state continues to recognize the importance of operating and maintaining a modern and diversified transportation infrastructure, while fostering the protection and enhancement of the coastal environment. As Texas enters the next millennium, both state and national economic activities are expected to grow, providing additional transportation opportunities and challenges.

As set forth by Congress, the nonfederal sponsor of the Texas GIWW will provide right of way to the Corps for use as dredged material placement sites. As requested by the Corps, TxDOT will acquire property and furnish easements to the Corps, using funds appropriated by the Texas Legislature. Although TxDOT's preferred method of acquiring upland sites for the placement of material dredged from the GIWW is to accept or purchase an unencumbered property title through negotiations, it is at times necessary to exercise the authority of eminent domain. This authority is crucial to the continued support of the waterway's maintenance program.

Acceptable sites for dredged material placement are becoming an increasingly complicated issue. Various interest groups object to the traditional placement of materials into authorized, open-water sites. Others object to upland placement of dredged material. Pumping dredged material over long distances to alternative placement areas can involve expenses that are cost-prohibitive. These issues raise challenges in continuing to provide for the GIWW's maintenance and subsequent safe and effective operation. Dedicated efforts are underway to determine acceptable methods of maintaining the navigation channel, while simultaneously fostering the protection and enhancement of the coastal environment.

The Corps is actively pursuing studies to update and address current and future needs of the GIWW, including dredged material placement needs, through the federal authority of Section 216 of the Federal Flood Control Act of 1970. TxDOT, an active participant in the Section 216 Studies, responds on behalf of the state's transportation needs and the needs of the waterway. Those studies which proceed through the feasibility phase may contribute to a long-term dredged material management plan (DMMP) and develop an updated environmental document as determined necessary.

These long-term DMMP's will aid the state's planning efforts to provide suitable dredged material placement needs. The long-term plans may indicate that traditional placement in many existing, authorized sites is environmentally acceptable. The long-term plans are also expected to identify projects implementing the beneficial use of dredged material.

As indicated earlier in this report, the beneficial use of materials dredged from the GIWW is becoming a more frequent alternative to the traditional methods of dredged material placement. However, the expense of implementing beneficial use projects may exceed the Corps' authorized maintenance budget. In this regard, the Corps may look for additional partnering from a nonfederal sponsor.

The 74th Texas Legislature amended the Texas Coastal Waterway Act of 1975, Transportation Code, Chapter 51 and authorized the Texas Transportation Commission to enter into agreements with the Corps to participate in the development of beneficial use projects using material dredged from the GIWW. Although House Bill 1536 authorized cost participation, no funding was appropriated for this purpose (see Appendix A). When costs of a beneficial use project exceed the Corps' budget authority, a cost-sharing sponsor will be necessary. Avenues that may help partially fund beneficial use projects include the Corps' federal programs for ecosystem restoration in connection with dredging, aquatic ecosystem restoration, beach nourishment, or environmental enhancements (see Sections 204, 206, 933 and Section 1135 programs in Appendix D). Other funding sources that have been identified are federal appropriation through the Texas Coastal Management Program grants, or funding from other interested sponsors who would receive the benefits of projects that result from productive and positive uses of the GIWW's dredged material.

To support the state's nonfederal sponsorship of the GIWW in Texas and facilitate planning, maintenance, preservation, research, and improvement of the waterway, the following are recommended for consideration by the Texas Legislature:

- ◆ The state continues to recognize and promote the Gulf Intracoastal Waterway as an integral and valuable part of the state's multimodal transportation system by providing for the financial resources to accomplish the nonfederal responsibilities in the areas of acquisition of disposal areas and beneficial use projects of dredged material.
- ◆ The state advocate the continuation of the U.S. Army Corps of Engineers' Section 216 Studies, which will address current and long-term needs of the Gulf Intracoastal Waterway in Texas.

**APPENDIX A**

**TEXAS TRANSPORTATION CODE**

**TITLE 4. NAVIGATION**

**SUBTITLE A: WATERWAYS AND PORTS**

**CHAPTER 51. TEXAS COASTAL WATERWAY ACT**

Sec. 51.001. Short Title.

This chapter may be cited as the Texas Coastal Waterway Act.

Acts 1995, 74th Leg., ch. 165, Sec. 1, eff. Sept. 1, 1995.

Sec. 51.002. Definitions.

In this chapter:

(1) "Coastal marshes" means those soft, low-lying watery or wet lands and drainage areas in the coastal areas of the state that are of ecological significance to the environment and to the maintenance, preservation, and enhancement of wildlife and fisheries.

(2) "Coastal public land" means:

(A) the state-owned submerged land and the water overlying that land; and

(B) state-owned islands or portions of islands that may be affected by the ebb and flow of the tide.

(3) "Commission" means the Texas Transportation Commission.

(4) "Gulf Intracoastal Waterway" means the main channel, not including tributaries or branches, of the shallow draft navigation channel running from the Sabine River southward to the Brownsville Ship Channel near Port Isabel that is known as the Gulf Intracoastal Canal.

(5) "Department" means the Texas Department of Transportation.

Acts 1995, 74th Leg., ch. 165, Sec. 1, eff. Sept. 1, 1995.

Amended by Acts 1997, 75th Leg., ch. 165, Sec. 30.06(a), eff. Sept. 1, 1997.

Sec. 51.003. Purpose.

This state shall act as the nonfederal sponsor of the main channel of the Gulf Coast Intracoastal Waterway from the Sabine River to the Brownsville Ship Channel in order to:

- (1) support the marine commerce and economy of this state by providing for the shallow draft navigation of the state's coastal waters in an environmentally sound manner;
- (2) prevent waste of publicly and privately owned natural resources;
- (3) prevent or minimize adverse impacts on the environment; and
- (4) maintain, preserve, and enhance wildlife and fisheries.

Acts 1995, 74th Leg., ch. 165, Sec. 1, eff. Sept. 1, 1995.

Sec. 51.004. Cooperation With Other Entities.

(a) The commission shall cooperate with the Department of the Army, other federal and state agencies, navigation districts, port authorities, counties, and other appropriate persons to determine the state's federal local sponsorship requirements relating to the Gulf Intracoastal Waterway, shall fulfill those requirements, and shall satisfy the responsibilities of the nonfederal sponsor as determined by federal law.

(b) The commission shall coordinate actions taken under this chapter that may have a significant environmental impact or effect on coastal public land, coastal marshes, wildlife, and fisheries with appropriate federal and state agencies that have environmental, wildlife, and fisheries responsibilities.

(c) Within its authority and available resources, an agency or political subdivision of the state shall assist the commission in performing its duties under this chapter.

Acts 1995, 74th Leg., ch. 165, Sec. 1, eff. Sept. 1, 1995.

Sec. 51.005. Land Acquisition.

(a) The commission may acquire by gift, purchase, or condemnation property or an interest in property that the commission considers necessary to enable it to meet its responsibilities under this chapter, including easements and rights-of-way for dredge material disposal sites or channel alteration.

(b) The commission may not:

(1) acquire oil, gas, sulphur, or other minerals that may be recovered without using the surface of land acquired by the commission for exploration, drilling, or mining purposes; or

(2) condemn any submerged public land under the jurisdiction of the School Land Board.

(c) An agency or political subdivision of the state may convey, without advertisement, title or rights and easements owned by the agency or political subdivision to any property the commission needs to meet its responsibilities under this chapter.

Acts 1995, 74th Leg., ch. 165, Sec. 1, eff. Sept. 1, 1995.

Sec. 51.006. Hearing Required Before Acquisition of Property.

(a) Before the commission approves or implements a plan or project to acquire property or an interest in property under Section 51.005 for a dredge material disposal site or for an alteration of the Gulf Intracoastal Waterway that requires the acquisition of additional property or an interest in property to meet its responsibilities under this chapter, the commission shall hold a public hearing to receive evidence and testimony concerning the desirability of the proposed dredge material disposal site or channel alteration.

(b) The commission shall publish notice of a plan or project and the date, time, and place of a hearing at least once a week for three successive weeks before the hearing in a newspaper of general circulation that is published in the county seat of each county in which any part of a proposed dredge material disposal site or channel alteration is located.

(c) The commission may approve the plan or project and implement it and acquire additional property if the commission determines, after the public hearing, that the proposed plan or project can be accomplished without an unjustifiable waste of publicly or privately owned natural resources or a permanent and substantial adverse impact on the environment, wildlife, or fisheries.

Acts 1995, 74th Leg., ch. 165, Sec. 1, eff. Sept. 1, 1995.

Sec. 51.007. Evaluation and Report.

(a) In cooperation with appropriate persons, the commission shall continually evaluate the impact of the Gulf Intracoastal Waterway on the state. The evaluation shall include:

(1) an assessment of the importance of the Gulf Intracoastal Waterway that includes identification of its direct and indirect beneficiaries;

(2) identification of principal problems and possible solutions to those problems that includes estimated costs, economic benefits, and environmental effects;

(3) an evaluation of the need for significant modifications to the Gulf Intracoastal Waterway; and

(4) specific recommendations for legislative action that the commission believes are in the best interest of the state in carrying out the state's duties under this chapter.

(b) The commission shall publish a report of its evaluation and present the report to each regular session of the legislature.

Acts 1995, 74th Leg., ch. 165, Sec. 1, eff. Sept. 1, 1995.

Sec. 51.008. School Land Board Power.

This chapter does not diminish the duty or power of the School Land Board to manage the coastal public land of the state.

Acts 1995, 74th Leg., ch. 165, Sec. 1, eff. Sept. 1, 1995.

Sec. 51.009. Beneficial Use of Dredge Material.

(a) The commission, through the department, may enter into an agreement with the Department of the Army to participate in the cost of a project to beneficially use material dredged from the Gulf Intracoastal Waterway.

(b) The commission by rule shall establish eligibility criteria for a project to beneficially use the dredge material.

(c) In this section and Sections 51.010 and 51.011, beneficial use of dredge material means any productive and positive use of dredge material and includes broad use categories such as fish and wildlife habitat development, human recreation, and industrial and commercial uses.

Added by Acts 1997, 75th Leg., ch. 165, Sec. 30.06(b), eff. Sept. 1, 1997.

Sec. 51.010. Property Acquisition.

The commission, through the department, may acquire an interest in property required for a project to beneficially use dredge material in the manner provided by Section 51.005.

Added by Acts 1997, 75th Leg., ch. 165, Sec. 30.06(b), eff. Sept. 1, 1997.

Sec. 51.011. Hearing Required Before Participation in Project.

(a) Before the department agrees to participate in the cost of a project to beneficially use dredge material that requires the acquisition of an interest in property, the commission shall hold a public hearing on the desirability of the project.

(b) The commission shall publish notice of the date, time, and place of the hearing at least once a week for three successive weeks before the hearing in a newspaper of general circulation published in the county seat of each county in which the project is located.

(c) The department may agree to participate in the cost of the project if the commission determines, after the public hearing, that the project can be accomplished without unjustifiable waste of publicly or privately owned natural resources or a permanent and substantial adverse effect on the environment, wildlife, or fisheries.

Added by Acts 1997, 75th Leg., ch. 165, Sec. 30.06(b), eff. Sept. 1, 1997

# APPENDIX B

## SPONSORSHIP RESOLUTION OF 1983

GULF INTRACOASTAL WATERWAY  
(MAIN CHANNEL - TEXAS SECTION)

RESOLUTION

W I T N E S S E T H:

THAT WHEREAS, the main channel of the Gulf Intracoastal Waterway running from the Sabine River southward to the Brownsville Ship Channel near Port Isabel, hereinafter referred to as the Main Channel Project, has been authorized in accordance with the following Federal legislation:

YEAR	PUBLIC LAW NUMBER	HOUSE DOCUMENT	DESCRIPTION
1927	560	No. 238, 68th Congress, 1st Session	9-foot channel from the Sabine River to Corpus Christi
1942	675	-----	12-foot enlargement of existing channel and its extension to the vicinity of the Mexican Border
1946	525	No. 700, 79th Congress, 2nd Session	Redfish Bay Relocation
1950	516	No. 196, 81st Congress, 1st Session	Galveston Bay Alternate Channel
1962	87-874	No. 556, 87th Congress, 2nd Session	16-foot channel from the Sabine River to the Houston Ship Channel with 12-foot relocations in Matagorda and Corpus Christi Bays; and

WHEREAS, various elements of non-Federal cooperation are required by the above referenced statutes and the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (Public Law No. 91-646); and,

WHEREAS, the State hereby represents that it has the authority by virtue of Articles 3266b and 5415e-2, Vernon's Texas Civil Statutes, and the capability to furnish said non-Federal cooperation for the Main Channel Project in accordance with Article 5415-e-2 section 7, V.T.C.S. which states, "The legislature is hereby authorized to appropriate from the General Revenue Fund funds in the amount necessary to accomplish the purposes of this Act."; and

WHEREAS, the State Highway and Public Transportation Commission, on the 20th day of June 1975, by Commission Minute No. 70103, authorized the State Engineer-Director for Highways and Public Transportation to execute these presents on its behalf and as its act and deed,

NOW THEREFORE, in consideration of the benefits accruing to its citizens by the construction, operation and maintenance of the Main Channel Project, the State, in accordance with the herein cited Federal legislation, assures the United States, to the extent permitted by Texas law, as follows;

1. With respect to the 1942 12-foot channel enlargement and extension, it shall defray the cost of constructing or remodeling all highway bridges, together with their subsequent maintenance and operation, and shall furnish, without cost to the United States, all rights-of-way and necessary spoil disposal areas as approved by the State. However, this resolution shall not have the effect of diminishing any rights or obligations the State would otherwise have under the terms of the Truman-Hobbs Act (33U.S.C.A. Sec. 511 et seq.). The State hereby gives the United States a right to enter upon, at reasonable times and in a reasonable manner, lands which the State owns or controls, for access to said highway bridges for the purpose of inspection, and for the purpose of discharging the obligations of local cooperation assumed by the State if such inspection shows that the State for any reason is failing to comply with its obligations concerning the operation and maintenance of said bridges and has persisted in such failure after a reasonable notice in writing by the United States delivered to the State Engineer-Director for Highways and Public Transportation. No such action by the United States in such event shall operate to relieve the State of responsibility to meet its obligations as set forth herein or to preclude the United States from pursuing any other remedy at law or equity.

2. With respect to the 1946 Redfish Bay Relocation, it will furnish free of cost to the United States all lands, easements, and rights-of-way as approved by the State necessary for construction of the project and for subsequent maintenance as and when required: and hold and save the United States free from damages due to the construction works, except for damages due to the fault or negligence of the United States or its contractors.

3. With respect to the 1950 Galveston Bay Alternate Channel, it will furnish without cost to the United States all lands, easements, rights-of-way, and suitable spoil disposal areas as approved by the State for construction and maintenance of the alternate channel, when and as required; and hold and save the United States free from any damages resulting from construction and maintenance of the alternate channel, except for damages due to the fault or negligence of the United States or its contractors.

4. With respect to the 1962 16-foot channel and the 12-foot relocations in Matagorda and Corpus Christi Bays it will provide without cost to the United States all lands, easements, and rights-of-way required for construction and subsequent maintenance of the project and of aids to navigation upon the request of the Chief of Engineers, including suitable areas determined by the Chief of Engineers and approved by the State to be required in the general public interest for initial and subsequent disposal of spoil, accomplish and maintain without cost to the United States all alterations to pipelines, cables, and any other utilities necessary for the construction of the project; and hold and save the United States free from damages resulting from the construction work and the maintenance of the channels, except for damages due to the fault or negligence of the United States or its contractors.

5. With respect to the Main Channel Project as required by the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (Public Law No. 91-646), hereinafter called the Act:

a. Fair and reasonable relocation payments and assistance shall be provided to or for displaced persons, as are required to be provided by a Federal agency under section 202, 203, 204 of the Act.

b. Relocation assistance programs offering the services described in section 205 of the Act shall be provided to such displaced persons.

c. Within a reasonable period of time prior to displacement, decent, safe and sanitary replacement dwellings will be available to displaced persons in accordance with section 205(c) (3) of the Act.

d. In acquiring real property it will be guided, to the greatest extent practicable under State Law, by the land acquisition policies in section 301 and the provisions of section 302 of the Act.

e. Property owners will be paid or reimbursed for necessary expenses as specified in section 303 and 304 of the Act.

# APPENDIX C

## LIST OF FEDERAL HOUSE DOCUMENTS AUTHORIZING CONSTRUCTION OF TEXAS GIWW

The authorization and construction of the Gulf Intracoastal Waterway (GIWW) in Texas was accomplished through a series of congressional House Documents over a period of years between 1925 and 1949. Congress further authorized improvements to the main channel in years following.

### GIWW - MAIN CHANNEL TEXAS SECTION AUTHORIZATIONS

DATE AUTHORIZING ACT	PROJECT AND WORK AUTHORIZED	DOCUMENTS
Mar. 3, 1925	Channel 9 by 100 feet, Sabine River to Galveston Bay and a 20-inch pipeline dredge. Such passing places, widening at bends, locks or guard locks and railway bridges over artificial cuts as are necessary.	House Document 238, 68th Congress, 1st Session
Jan. 21, 1927	Channel 9 by 100 feet, Galveston Bay to Corpus Christi.	House Document 238, 68th Congress, 1st Session
Mar. 23, 1939	Enlarge waterway to depth of 12 feet and a width of 125 feet from Sabine River to Corpus Christi.	House Document 230, 76th Congress, 1st Session
Jul. 23, 1942	Enlarge waterway from Corpus Christi to vicinity of Mexican border to provide a depth of 12 feet and width of 125 feet throughout.	Public Law 675, 77th Congress
Jul. 24, 1946	Reroute main channel to north shore of Red Fish Bay between Aransas Bay and Corpus Christi Bay.	House Document 700, 79th Congress, 2nd Session
May 17, 1950	Alternate channel across South Galveston Bay between Port Bolivar and Galveston causeway.	House Document 196, 81st Congress, 1st Session
Oct. 23, 1962	Improve main channel 16 feet deep and 150 feet wide from Sabine River to Houston Ship Channel; with two relocations; relocate main channel in Matagorda Bay and Corpus Christi Bay and maintain existing Lydia Ann Channel.	House Document 556, 87th Congress, 2nd Session

# **APPENDIX D**

## **RELATED FEDERAL LEGISLATION**

### ***Section 216 of the Federal Flood Control Act of 1970 (P.L. 91-611)***

Under the authority of Section 216 of the Federal Flood Control Act of 1970, the U.S. Army Corps of Engineers (Corps) can conduct a study of the Corps' completed water resources projects which may have changed because of physical or economic reasons. The 216 Study process is divided into two phases. The first of these phases is the reconnaissance study, lasting an average of one year. The reconnaissance study identifies project changes, if any, and determines the interest of the federal government in proceeding with the next phase, or feasibility study. If the reconnaissance study identifies such interest, the process will then proceed to a three or four-year feasibility study, involving detailed engineering, economic, and environmental studies. Based on the results of those studies, the Corps then recommends the most cost-effective solution, which responds to the project needs, while protecting the environment. Important aspects of the feasibility study include the preparation of an environmental document in accordance with the National Environmental Policy Act (NEPA) and the development of a long-term disposal plan for a specific study reach. The product of the feasibility phase is a report which presents a recommendation to the United States Congress that the solution or project be implemented for the overall public interest. Congress must decide whether to authorize and fund the project.

### ***Section 204 of the Water Resources Development Act of 1992 (P.L. 92-611)***

Under the authority of Section 204 of the Water Resources Development Act of 1992, the Secretary of the Army, acting through the Corps, can conduct reviews of Corps' water resource projects to determine the need to restore, protect, and create aquatic and wetland habitats in connection with construction or maintenance dredging of an authorized federal project. Under Section 204, if the value of the lands, easements, right of way, relocations, and disposal areas plus the cash contribution does not equal or exceed 25 percent of the project cost, the sponsor must pay the additional amount necessary so that the sponsor's total contribution equals 25 percent of the project cost. Local expenditures less than of the 25 percent contribution will be reimbursed.

### ***Section 933 of the Water Resources Development Act of 1986 (P.L. 99-662)***

Under the authority of Section 933 of the Water Resources Development Act of 1986, the Secretary of the Army, acting through the Corps, can place beach-quality sand (which has been dredged during construction and maintenance of navigation inlets and channels) onto beaches under the following

conditions: a) if such action is requested by the state; b) if the Secretary of the Army deems such action to be in the public interest; and c) upon payment of the cost exceeding normal disposal costs. Section 933 will also increase the additional costs that may be borne by the federal government to 50 percent above that required for the least-cost method of dredged material disposal during the construction and maintenance of navigation inlets onto adjacent beaches. Accordingly, this authority provides for 50-50 cost sharing between federal and nonfederal participants for costs above the federal standard. In addition, the nonfederal sponsor must provide any necessary additional lands, easements, rights-of-way, and relocations for the project. After completion of constructed project, the local sponsor must maintain and operate the project.

***Section 206 of the Water Resources Development Act of 1996 (P.L. 99-662)***

Under the authority of Section 206 of the Water Resources Development Act of 1996, the Secretary of the Army, acting through the U.S. Army Corps of Engineers, can conduct reviews of the Corps' water resources project to determine the need to restore degraded aquatic ecosystems. The restoration project will be constructed only after the investigation shows that it will improve the environment along with being in the public's interest and cost-effective. The projects are limited each to a Federal cost of not more than \$5 million. Cost limitation includes all project-related costs for feasibility studies, planning, engineering, construction, supervision, and administration. Accordingly, this authority provides for 65-35 cost sharing between federal and nonfederal participants for costs above the federal standard. In addition, the nonfederal sponsor must provide any necessary additional lands, easements, rights-of-way, and relocations for the project. After completion of constructed project, the local sponsor must maintain and operate the project.

***Section 1135 of the Water Resources Development Act of 1986 (P.L. 99-662)***

Under the authority of Section 1135 of the Water Resources Development Act of 1986, the Secretary of the Army, acting through the U.S. Army Corps of Engineers, can conduct reviews of the Corps' water resources projects to determine the need for modifications to improve the environment's quality in the public interest. The reviews must address those needs within a program as a result of a Corps' project and must provide restoration or enhancement of the environmental quality. Projects under this authority must have a nonfederal cost-sharing sponsor to provide at least 25 percent of the total cost of project planning, engineering and design, and construction. In addition, project application does not automatically guarantee funding; it must go through the Corps' approval process.

# APPENDIX E

## RELATED STATE LEGISLATION

### Art. 5415e-4. Dredged Materials Act

#### Short Title

Section 1. This Act may be cited as the Dredge Materials Act.

#### Policy

Sec. 2. (a) It is the declared policy of the state to seek, to the fullest extent permissible under all applicable federal law or laws, the delegation to the state of the authority which the corps of engineers exercises under Section 404, as defined in this Act, over the discharge of dredged or fill material in the navigable waters of the State of Texas.

(b) It is the declared policy of the state that the state should not duplicate the exercise of such authority by the corps of engineers, but should instead exercise such authority in lieu of the corps of engineers, so that no permit application is subject to duplicate levels of regulation.

#### Definitions

Sec. 3 As used in this Act, unless the context clearly requires otherwise:

(a) "Agency" means the Texas Water Quality Board.<sup>1</sup>

(b) "Agreement" means a written agreement or contract between the State of Texas and the United States, authorizing the State of Texas, through (name of an existing agency), to regulate the discharge of dredged or fill material in the navigable waters of the state under the authority granted by Section 404, as defined in this Act.

(c) "Corps of engineers" means the United States Army Corps of Engineers.

(d) "Discharge of dredged or fill material" has the same meaning as it has in Section 404 as defined in this Act.

(e) "Navigable waters" has the same meaning within the boundaries of the State of Texas as it has in Section 404 as defined in this Act.

(f) "Section 404" means Section 404, Federal Water Pollution Control Act Amendments of 1972 (33 U.S.C. Section 1844), as it may be amended, and such regulations as may be from time to time promulgated thereunder.

See, now, the Department of Water Resources, V.T.C.A. Water Code, ' 5.001 et seq.

## Limitations

Sec. 4 (a) Nothing in this Act shall be construed as authorizing any state agency or political subdivision to regulate the discharge of dredged or fill material in the navigable waters of the state in any manner different from or inconsistent with the requirements of Section 404.

(b) Nothing in this Act shall be construed as authorizing any state agency or political subdivision to regulate the discharge of dredged or fill material in the navigable waters of the state:

(1) by the corps of engineers

(2) by persons operating under contract with the corps of engineers;

(3) when the corps of engineers certifies that such discharge is incidental to a project undertaken by the corps of engineers or persons operating under contract with the corps of engineers, and that such incidental discharge was announced and reviewed at the same time and under the same conditions as such project; or

(4) by cities which own and operate deepwater port facilities, or by navigation districts or port authorities, or by persons operating under contract with such cities, navigation districts, or port authorities, when such discharges are part of or incidental to a navigation project to be paid for with public funds or when such navigation project is to be owned by such cities, navigation districts, or ports.

(c) Nothing in this Act shall be construed as authorizing any state agency or political subdivision to regulate the discharge of dredged or fill material in the navigable waters of the state in any manner unless and until an agreement as described in this Act is validly entered into and in effect.

(d) Nothing in this Act shall be construed as authorizing any state agency or political subdivision to exercise any authority under this Act except in accordance with an executive order of the governor.

(e) Nothing in this Act shall be construed as authorizing any state agency or political subdivision to regulate the discharge of dredged or fill material in the navigable waters of the state in any manner different from, or inconsistent with, the agreement described in this Act.

(f) Nothing in the Act shall be construed as affecting any application for a permit from the corps of engineers to discharge dredged or fill material in the navigable waters of the state if such application is received by the corps of engineers or postmarked before the effective date of the agreement described in the Act.

## Agreement

Sec. 5. (a) The governor is hereby authorized to enter into an agreement on behalf of the State of Texas, with the United States, acting through its authorized officials, under the terms of which the agency will regulate the discharge of dredged or fill material in the navigable waters of the state.

(b) The governor is expressly authorized to include whatever terms and conditions in such agreement he may deem to be in the best interest of the state, including provisions regarding the termination of such agreement.

(c) The authority of the governor under the Act to enter into such an agreement shall not be delegated.

(d) The legislature expressly finds that the provisions of this section are necessary to enable the governor to carry out his responsibilities under this Act.

**Not severable**

Sec. 6. The provisions of this Act are expressly declared not to be severable, and if any provision of this Act shall be found to be invalid, the entire Act shall be null and void and of no further force or effect.

Acts 1977, 65th Leg., p. 1906, ch. 759, eff. Aug. 29, 1977. On September 1, 1993, the name of the Texas Water Commission is changed to the Texas Natural Resource Conservation Commission by Acts 1991, 72nd Leg., 1st C.S., ch.3 ' 1.085.

# PARKS AND WILDLIFE CODE

## CHAPTER 14. POWERS AND DUTIES CONCERNING WETLANDS

### SUBCHAPTER A. GENERAL POWERS AND DUTIES

#### Sec. 14.001. Definitions.

In this chapter:

- (1) "Department" means the Parks and Wildlife Department.
- (2) "Land office" means the General Land Office.
- (3) "Mitigation" means the sequential process of avoiding impacts to wetlands, minimizing impacts to wetlands, and providing compensation for losses to wetlands.
- (4) "State-owned coastal wetlands" mean wetlands owned by state agencies underlying or adjacent to tidal waters.

Added by Acts 1991, 72nd Leg., ch. 265, Sec. 3, eff. June 5, 1991.

#### Sec. 14.002. State-Owned Wetland Conservation Plan.

(a) The department and the land office, in conjunction, shall develop and adopt a State Wetlands Conservation Plan for state-owned coastal wetlands. The Texas Natural Resource Conservation Commission and other state agencies and local governments shall assist in developing and implementing the plan. The department and the land office shall consult with federal agencies in developing and adopting the plan.

(b) The plan shall include:

- (1) a definition of the term "wetlands" consistent to the greatest extent practicable with the definition under Subchapter J, Chapter 11, Water Code, and federal law;
- (2) a policy framework for achieving a goal of no overall net loss of state-owned coastal wetlands, which framework shall include monitoring and enforcement of the no overall net loss policy;
- (3) provisions for an inventory of state-owned coastal wetlands to determine gains and losses in areal extent, wetland types, wetland function, and the causes of wetlands alterations;
- (4) provisions for an inventory of sites for compensatory mitigation, enhancement, restoration, and acquisition priorities;
- (5) clarification and unification of wetland mitigation policies within the department, the land office, and the Texas Natural Resource Conservation Commission, and other state agencies and subdivisions;
- (6) development of guidelines and regulations for mitigation done in advance for losses due to possible future development and for which credit may be received when such future development occurs;

(7) evaluation of requirements of freshwater inflow to estuaries that affect state-owned coastal wetlands;

(8) preparations for a long-range navigational dredging and disposal plan, in consultation with the Texas Department of Transportation, port authorities, and navigation districts, including the recommendations set out in the department's Texas Outdoor Recreation Plan;

(9) provisions for scientific studies examining the effects of boat traffic in sensitive coastal wetland areas and for education of the public with regard to the effects of boating in wetlands and proper nondamaging boating techniques;

(10) provisions to encourage the reduction of nonpoint source pollution of coastal wetlands, bays, and estuaries, in consultation with the Texas Natural Resource Conservation Commission, including the monitoring and adoption of non-point source pollution standards as they are developed by authorized state and federal agencies;

(11) development of a networking strategy to improve coordination among existing federal and state agencies with respect to coastal wetland permitting, review, and protection responsibilities, including the assessment of current state agency permitting and other processes concerning coastal wetlands;

(12) a public education program on wetlands with the responsibility for the production of such material to be jointly that of the land office and the department;

(13) participation in the establishment of a National Wetlands Information Center by the federal government;

(14) evaluation of the feasibility and effect of sediment bypassing from reservoirs to bays and estuaries;

(15) consideration of sea level rise as it relates to coastal wetlands;

(16) provisions consistent with the department's Texas Wetlands Plan;

(17) a plan to acquire coastal wetlands, following the guidelines provided for in Subchapter G, Chapter 33, Natural Resources Code; and

(18) any other matter affecting state-owned coastal wetlands.

(c) The department and the land office shall submit the plan to the Parks and Wildlife Commission and the School Land Board for review, comments, and approval.

(d) Following approval of the plan, the Parks and Wildlife Commission and the School Land Board shall adopt rules, policies, standards, and guidelines to implement the plan fully.

Added by Acts 1991, 72nd Leg., ch. 265, Sec. 3, eff. June 5, 1991. Amended by Acts 1995, 74th Leg., ch. 76, Sec. 11.279, eff. Sept. 1, 1995; Acts 1995, 74th Leg., ch. 165, Sec. 22(64), eff. Sept. 1, 1995.

Sec. 14.003. Gifts and Grants.

The department and the land office may apply for, request, solicit, contract for, receive, and accept gifts, grants, donations, and other assistance from any source to carry out the powers and duties provided by this subchapter.

Added by Acts 1991, 72nd Leg., ch. 265, Sec. 3, eff. June 5, 1991

# NATURAL RESOURCES CODE

## CHAPTER 33. MANAGEMENT OF COASTAL PUBLIC LAND

### SUBCHAPTER G. COASTAL WETLAND ACQUISITION

Sec. 33.231. Short Title.

This subchapter may be cited as the Coastal Wetland Acquisition Act.

Added by Acts 1979, 66th Leg., p. 1993, ch. 785, Sec. 2, eff. June 13, 1979.

Sec. 33.232. Policy.

It is the declared policy of the state:

(1) to protect the property rights of those who sell interests in land to the state by fairly compensating the sellers;

(2) to protect that coastal wetland which is most essential to the public interest by acquiring fee and lesser interests in the coastal wetland and managing it in a manner that will preserve and protect the productivity and integrity of the land as coastal wetland; and

(3) to assure that the state does not expend funds to acquire any coastal wetland to which it already holds a valid title at the time of the expenditure.

Added by Acts 1979, 66th Leg., p. 1993, ch. 785, Sec. 2, eff. June 13, 1979.

Sec. 33.233. Definitions.

In this subchapter:

(1) "Acquiring agency" means the Parks and Wildlife Department.

(2) "Land office" means the General Land Office.

(3) "Coastal wetland" means wetlands underlying or adjacent to tidal waters in the coastal area.

(4) "Wetlands" has the meaning assigned under Subchapter J, Chapter 11, Water Code.

(5) "Seawater" means any water containing a concentration of one-twentieth of one percent or more by weight of total dissolved inorganic salts derived from the marine water of the Gulf of Mexico.

Added by Acts 1979, 66th Leg., p. 1993, ch. 785, Sec. 2, eff. June 13, 1979. Amended by Acts 1991, 72nd Leg., ch. 265, Sec. 4, eff. June 5, 1991.

Sec. 33.234. Duties and Authority of Acquiring Agency.

(a) The acquiring agency shall do the following:

(1) accept gifts, grants, or devises of interests in land;

(2) acquire, by purchase or condemnation, fee and lesser interests in the surface estate in coastal wetland certified as most essential to protection of the public interest, provided that in each instance in which an interest in land is acquired by the acquiring agency pursuant to this section, a sufficient interest shall be acquired to preserve and protect the productivity and integrity of such land as coastal wetland; and

(3) manage interests in land acquired pursuant to this section in a manner that will preserve and protect the productivity and integrity of the land as coastal wetland.

(b) This subchapter shall not be construed to authorize the condemnation of any interest in the mineral estate in any coastal wetland.

(c) The acquiring agency shall promulgate reasonable rules and regulations necessary to preserve and protect the productivity and integrity of the land as coastal wetland acquired pursuant to this subchapter. The rules and regulations shall include regulations governing activities conducted on the land in conjunction with mineral exploration, development, and production.

(d) If the acquiring agency seeks to condemn an interest less than the fee interest in the surface estate in any coastal wetland, the owner of the coastal wetland may demand that the acquiring agency instead seek condemnation of the fee interest in the surface estate in the coastal wetland. Upon this demand, the acquiring agency shall either:

(1) seek to condemn the fee interest in the surface estate in the coastal wetland; or

(2) cease all condemnation proceedings pursuant to this subchapter against the coastal wetland.

Added by Acts 1979, 66th Leg., p. 1993, ch. 785, Sec. 2, eff. June 13, 1979. Amended by Acts 1991, 72nd Leg., ch. 265, Sec. 5, eff. June 5, 1991.

Sec. 33.235. Agricultural Exemption.

Coastal wetland used only for farming or ranching activities, including maintenance and repair of buildings, earthworks, and other structures, shall not be subject to any power of condemnation exercised pursuant to this subchapter. However, this exemption from condemnation shall terminate upon the receipt by any state or federal agency of an application for a permit, license, or other authorization to conduct on the wetland, activities other than farming and ranching activities, including irrigation and water well drilling, and activities necessary to exploration, development, or production of the underlying mineral estate.

Added by Acts 1979, 66th Leg., p. 1993, ch. 785, Sec. 2, eff. June 13, 1979.

Sec. 33.236. Duties and Authority to Certify.

(a) The land office and the acquiring agency, in coordination, shall do the following:

(1) certify coastal wetlands which are most essential to the public interest in accordance with criteria developed by the land office and the acquiring agency under Chapter 14, Parks and Wildlife Code, and this subchapter, assign priorities for acquisition of interests in the coastal wetland, and revoke certification made pursuant to this section when it is in the public interest to do so; and

(2) publicize the importance to the public interest of coastal wetland in general, and of designated coastal wetland in particular.

(b) A certification, assignment of priority for acquisition, or revocation of certification made pursuant to this subchapter does not constitute a "contested case" within the meaning of Chapter 2001, Government Code.

(c) to (h) Repealed by Acts 1991, 72nd Leg., ch. 265, Sec. 7, eff. June 5, 1991.

Added by Acts 1979, 66th Leg., p. 1993, ch. 785, Sec. 2, eff. June 13, 1979. Amended by Acts 1991, 72nd Leg., ch. 265, Secs.6, 7, eff. June 5, 1991; Acts 1995, 74th Leg., ch. 76, Sec.5.95(49), eff. Sept. 1, 1995.

Sec. 33.237. Most Essential Coastal Wetland Certification.

(a) In selecting and certifying coastal wetland most essential to the public interest, and in assigning priorities of acquisition to coastal wetland, the land office and the acquiring agency shall consider the following criteria:

(1) whether the land is coastal wetland within the definition, intent, and purpose of this subchapter;

(2) whether the state owns the coastal wetland or claims title to it, which title can be validated by bringing an appropriate action in a court of law;

(3) whether the biological, geological, or physical characteristics of the coastal wetland, including the interrelationship of the coastal wetland with other coastal wetland, is essential to the public interest;

(4) the degree to which the coastal wetland is in danger of being altered, damaged, or destroyed, and the imminence of that danger; and

(5) the cost of acquiring the coastal wetland.

(b) The legislature declares that certifications, assignments of priority for acquisition, and revocations of certifications made pursuant to Section 33.235 of this code are made only for the purpose of administering the provisions of this subchapter. No certifications, assignments of priority for acquisition, or revocations of certification shall be grounds for an inference, or admissible in a court of law to prove, that any coastal wetland is of greater or lesser value than any other coastal wetland for any purpose other than administering the provisions of this subchapter.

(c) A certification made pursuant to this subchapter shall expire one year from the date of certification.

(d) If on or before the expiration date of such certification the acquiring agency files suit in a court of law to condemn the certified coastal wetland, the certification shall extend until the suit is settled, dismissed, or otherwise terminated.

(e) If a contract of sale between the state and the owner of the certified coastal wetland is entered into on or before the expiration date of the certification, the certification shall extend until title to the coastal wetland is conveyed to the state or the contract is rescinded, invalidated, or otherwise terminated.

Added by Acts 1979, 66th Leg., p. 1993, ch. 785, Sec. 2, eff. June 13, 1979. Amended by Acts 1991, 72nd Leg., ch. 265, Sec. 8, eff. June 5, 1991.

Sec. 33.238. Funding.

The acquiring agency may compensate the seller of land acquired pursuant to this subchapter with funds obtained through:

- (1) gift, grant, or devise;
- (2) legislative appropriation; or
- (3) gift or grant from the United States.

Added by Acts 1979, 66th Leg., p. 1993, ch. 785, Sec. 2, eff. June 13, 1979.

# APPENDIX F

## THE GIWW ACQUISITION PROCESS

### ***Introduction and General Summary***

To acquire needed disposal sites, the Texas Department of Transportation (TxDOT) coordinates within its appropriate divisions, districts, and special offices to handle land acquisitions. Several items are important in making acquisitions for disposal sites, including an understanding of applicable state and federal laws, identification of suitable sites, obtainment of required environmental clearances, public involvement, site-specific authorization, and promulgation of appropriate acquisition procedures. TxDOT's standard right-of-way acquisition procedures fully comply with the federal requirements of the nonfederal sponsor, and these procedures are followed in acquiring the sites.

Through the U.S. Army Corps of Engineers (Corps), TxDOT has access to information on dredging frequencies, volumes of materials removed, and various disposal methods that are environmentally and operationally suitable for maintenance of the Gulf Intracoastal Waterway (GIWW) in Texas. TxDOT also consults with natural resources agencies regarding disposal-related environmental concerns. All these factors help determine the need for disposal capacity, location, size, and design of disposal sites.

### ***Steps to Site-Specific Authorization***

#### *Selection of Proposed Sites*

TxDOT has organized a state agency advisory committee, the Gulf Intracoastal Waterway Advisory Committee (GIWAC) (see page 4-4), to help address problems and recommend solutions concerning the waterway. To physically investigate coastal areas that need new or additional disposal capacity, TxDOT appoints members from GIWAC and representatives from federal agencies that include the National Marine Fisheries Service, U.S. Army Corps of Engineers, and U.S. Fish and Wildlife Service, to serve on a task force. This task force of engineers and resource experts makes preliminary identifications of environmentally and operationally suitable sites in the areas of need. After this preliminary identification and with the concurrence of GIWAC, the Corps proceeds to obtain the environmental clearance for use of the proposed sites. Only after environmental clearance has been assured will TxDOT conduct the

required public hearings on specific sites. As part of the hearing process, the Texas Transportation Commission must grant authorization to the agency for proceeding with site-specific acquisitions.

#### *Environmental Clearance*

In order for any area to be used for disposal of dredged material, there are federal and state laws, which mandate that such use, be environmentally acceptable. The National Environmental Policy Act sets federal guidelines, which the Corps must follow in making environmental evaluations of proposed sites. The Texas Coastal Waterway Act of 1975 requires that the Texas Transportation Commission determine whether proposed sites can be used without unjustifiable waste of publicly or privately owned natural resources and without permanent, substantial, adverse impact on the environment, wildlife, or fisheries.

Agencies involved with protecting natural and historical resources (the National Marine Fisheries Service, Texas General Land Office, Texas Parks and Wildlife Department, Texas Historical Commission, Texas Natural Resource Conservation Commission, and U.S. Fish and Wildlife Service) assist in developing recommendations during the environmental evaluation. After the environmental evaluation is completed and a proposed site has been found to be acceptable for disposal use, the Corps documents the analysis in an environmental assessment and issues a finding of no significant impact (EA/FONSI). The environmental assessment and finding of no significant impact is forwarded to the Environmental Protection Agency and TxDOT.

TxDOT conducts a final review of the environmental assessment and findings. If TxDOT determines the disposal site can be used in an environmentally acceptable manner, the agency then proceeds with the required public hearings for the site.

The environmental documents are kept on file at TxDOT and the Corps' Galveston District.

#### *Public Involvement*

The 1975 Texas Coastal Waterway Act requires the Texas Transportation Commission to hold public hearings for the purpose of receiving evidence and testimony concerning the desirability of proposed dredged material disposal sites. If the commission determines that the use of the sites is acceptable, the commission then authorizes the agency to proceed with acquisition. To better inform communities of the

proposed use of an area, TxDOT often conducts public meetings prior to the mandated public hearings. Public meetings are held in cities located near the proposed sites; the public hearings are held in Austin.

Public hearings are advertised in accordance with the 1975 Texas Coastal Waterway Act. Legal notices are published in newspapers that are circulated in the involved counties for three consecutive weeks before the public hearings, as well as in the *Texas Register*.

Environmental documents and aerial displays regarding the proposed sites are exhibited at the public meetings and hearings. The proceedings of each forum are documented and become a part of the official record. During these public forums, TxDOT explains the state's nonfederal responsibility for the GIWW, describes the waterway's maintenance program and disposal needs, and identifies the proposed sites. The public is given the opportunity to comment.

#### *Commission Authorization*

After due consideration of all evidence, testimonies, and environmental findings, the Texas Transportation Commission determines whether each proposed site can be used without unjustifiable waste of publicly or privately owned natural resources and without permanent, substantial, adverse impact on the environment, wildlife, or fisheries. Acting through commission minute orders, the commission then authorizes the agency to proceed with acquiring the approved sites.

### **Acquisition Steps**

#### *Surveying*

After commission authorization, the acquisition process begins by obtaining a survey of the site. Most landowners agree to allow access to their property and the areas are then surveyed to accommodate the size and design needed for the site. Aerial surveys may be used if a landowner does not grant access to the property.

Surveyors develop plats of the sites showing ownership, area, the disposal site perimeter, property access, and improvements, if any, such as pipelines or structures. TxDOT does not intend to encumber habitable structures or dedicated roads. Legal description, or metes and bounds are written to be recorded with the plats.

Since erosion is widespread along the Texas coastline, surveys of some properties may determine certain boundaries to be submerged. To provide access for disposal operations, the state may acquire property to the GIWW's right-of-way line. Eroded acreage between the GIWW's right-of-way and the bankside is considered in the appraisal process with the approved values for purchases reflecting this condition.

### *Appraisal*

In the initial stages of the appraisal process, TxDOT notifies landowners of a proposed acquisition. The Uniform Relocation Assistance and Real Property Assistance and Real Property Acquisition Policies Act of 1970, as amended, requires such notice. Landowners are further notified by TxDOT of an appraiser's upcoming contact with the landowner. Landowners are entitled to accompany an appraiser's inspection of the site. Correct legal and appraisal procedures are adhered to in determining the fair market value of the sites.

### *Negotiations*

After appraisals are completed, a negotiator from TxDOT personally contacts landowners and furnishes them a written offer. The agency negotiator explains the acquisition process and the landowners' alternatives should they not accept the proposed offer. Details on the proposed use of the land as a disposal site are explained when requested. In previous years, landowners who chose to donate the use their property for a disposal site became eligible for ad valorem tax breaks under the Legislative Law, S.B. 982; however, in August of 1994, the State Attorney General ruled that S.B. 982 conflicted with the Texas Constitution and was therefore invalid.

### *Acquisition*

TxDOT's preferred acquisition method is to accept or purchase in fee, since the leasing of the land over an extended period could approach or exceed the fee cost. Landowners are given not less than one month to consider offers. If an owner is dissatisfied and chooses to refuse the offer, the state may negotiate or may initiate condemnation proceedings through the authority of eminent domain. The Texas

Transportation Commission must grant authorization to TxDOT in order to undertake condemnation proceedings.

# BIBLIOGRAPHY

## General References

Alperin, Lynn M. History of the Gulf Intracoastal Waterway. NWS-83-9. Fort Belvoir, Virginia: U. S. Army Corps of Engineers' Institute for Water Resources, National Waterways Study, 1983.

Analysis of the Role of the Gulf Intracoastal Waterway in Texas. TAMU-SG-75-202. College Station, Texas: Texas A & M University Sea Grant Program, Texas Coastal and Marine Council and Texas Ports Association, 1975.

Davenport, Sally S. Texas 1980: Year of the Coast. Austin, Texas: Texas Coastal and Marine Council and General Land Office, 1981.

Delahoussaye, Jim. Dredging on the Texas Coast. Austin, Texas: General Land Office, 1981.

Diaz, Antonio and Mary Kelly. Subsidized Destruction: The Gulf Intracoastal Waterway and the Laguna Madre. Austin, Texas: Texas Center for Policy Studies, 1994.

Dredged Material Research Program. Publication Index and Retrieval System, Technical Report DS-78-23. Vicksburg, Mississippi: U. S. Army Corps of Engineers Waterways Experiment Station, 1980.

The Gulf Intracoastal Waterway: A Vital Link to the Rio Grande Valley. South Texas Association for Responsible Transportation. 1993.

Hardebeck, Suzanne; Betsy Vogel Boze; John Basilotto; James Michel McGuire; and Pablo Rhi-Perez. Economic Impact of Barge Transportation on the Texas Portion of the Gulf Intracoastal Waterway (GIWW) and Extension of the GIWW into Mexico. TX-98/2993-S. College Station, Texas: Texas Transportation Institute, 1998.

James, Wesley P.; Steven Giesler; Robert DeOtte; and Masamichi Inoue. Environmental Considerations Relating to the Operation and Maintenance of the Texas Gulf Intracoastal Waterway. TAMU-SG-78-204. College Station, Texas: Texas A & M University Sea Grant Program, and National Oceanic and Atmospheric Administration, Department of Commerce, 1977.

Kearney Management Consultants. Domestic Waterborne Shipping Market Analysis, Executive Summary. Washington, D.C.: U. S. Department of Commerce Maritime Administration, 1974.

Kearney Management Consultants. Evaluation of the Present Waterways System. Fort Belvoir, Virginia: U. S. Army Corps of Engineers' Institute for Water Resources, National Waterways Study, 1981.

Leggett, Jimmy W. Military Use of the Inland Waterways. Tulsa, Oklahoma: U. S. Army Engineer District, Tulsa, Planning Division, 1986.

Miget, Russel J. Hydrological and Ecological Effects in the Laguna Madre Resulting from Construction and Maintenance of the GIWW. Corpus Christi, Texas: Texas A&M University, 1993.

Miget, Russel M. Laguna Madre Maintenance Dredging Alternatives. Corpus Christi, Texas: Texas A & M University, 1994.

Navigation Problem Report for the Gulf Intracoastal Waterway and Connecting Tributaries. Gulf Intracoastal Canal Association, American Waterways Operators Association, Texas Waterway Operators Association. October 1999.

Onuf, Christopher P. Seagrasses, Dredging and Light in the Laguna Madre, Texas, USA. Corpus Christi, Texas: United States Fish and Wildlife Service, National Wetlands Research Center.

Phillips, Christian. Indirect Economic Effect from Gulf Intracoastal Waterway Commerce in Texas. TAMU-SG-74-218. College Station, Texas: Texas A & M University, 1974.

Roop, Stephen S. and Richard Dickenson. Economic Impacts of a Closure of the GIWW along the Laguna Madre. Research Report 405061. College Station, Texas: Texas Transportation Institute, 1994.

Roth, Daniel and Mary Kelly. Preliminary Report on the Proposed Mexican Intracoastal Canal. Austin, Texas: Texas Center for Policy Studies, 1994.

Tamaulipan Intracoastal Channel Intracoastal Crossings. Tamaulipas, Mexico: Government of the State of Tamaulipas, 1994.

Texas State Department of Highways and Public Transportation, (now the Texas Department of Transportation). The Gulf Intracoastal Waterway in Texas 1976, 1978, 1980, 1982, 1984, 1986, 1988, 1990, and 1992. Austin, Texas: State Department of Highways and Public Transportation, 1976, 1978, 1980, 1982, 1984, 1986, 1988, 1990, and 1992.

Texas Water Commission. Toxic Release Inventory Program: 1989 State Report. Austin, Texas: Texas Water Commission, 1992.

United States Army Corps of Engineers. Beneficial Uses of Dredged Materials. EM 1110-2-5026. Vicksburg, Mississippi: Waterways Experiment Station.

United States Army Corps of Engineers. Final Environmental Statement Maintenance Dredging Gulf Intracoastal Waterway Texas Section. Volumes 1-3. Galveston, Texas: U. S. Army Corps of Engineers, Galveston District, 1975.

United States Army Corps of Engineers. In the Era of Limits: A Galveston District History Update, 1976-1986. Galveston, Texas: U.S. Army Corps of Engineers, Galveston District, 1990.

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