



Summary Report:

Analysis of the Role of the Gulf Intracoastal Waterway in Texas

Presented By

TEXAS PORTS ASSOCIATION

TEXAS COASTAL AND MARINE COUNCIL

SEA GRANT PROGRAM
TEXAS A&M UNIVERSITY

TAMU-SG-75-203

Table of Contents

INTRODUCTION	1
ENVIRONMENTAL IMPLICATIONS OF MAINTENANCE AND IMPROVEMENT OF THE GULF INTRACOASTAL WATERWAY IN TEXAS	3
ENGINEERING ASPECTS OF OPERATION AND MAINTENANCE OF THE GULF INTRACOASTAL WATERWAY IN TEXAS	5
SOCIOLOGICAL CHARACTERISTICS OF THE GULF INTRACOASTAL WATERWAY IN TEXAS	7
ECONOMIC IMPACT OF THE GULF INTRACOASTAL WATERWAY IN TEXAS	9
AN EVALUATION OF FUNDING ALTERNATIVES FOR STATE SPONSORSHIP OF THE GULF INTRACOASTAL WATERWAY IN TEXAS	13
LEGAL ASPECTS RELATING TO THE GULF INTRACOASTAL WATERWAY IN TEXAS	17

Introduction

JOHN MILOY

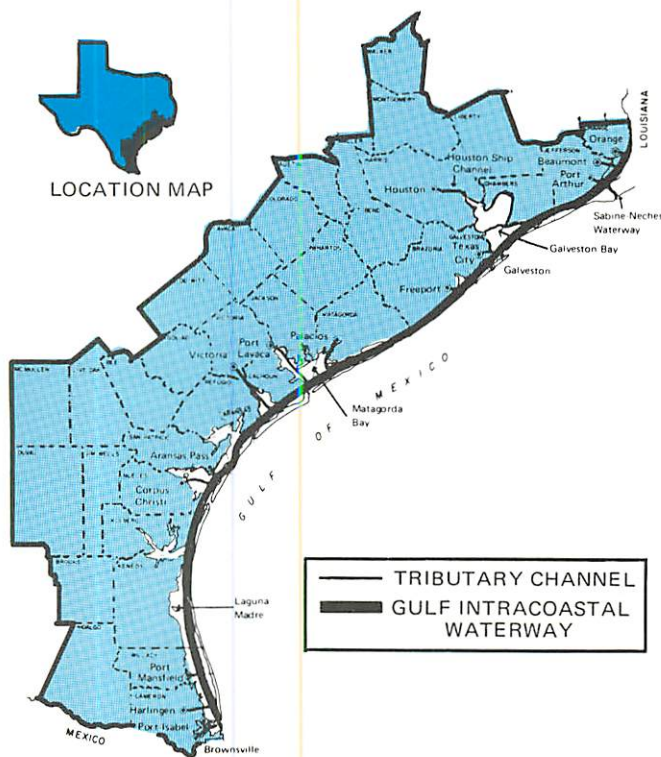
*Project Coordinator
Industrial Economics Research Division
Texas Engineering Experiment Station
Texas A&M University*



In Texas, the past five years have been marked by a rising level of interest in marine-related affairs and activities in the coastal zone. There is growing awareness that the land and water domains of the coastal zone comprise a valuable heritage for Texas and the nation.

The Gulf Intracoastal Waterway, an integral artery in the water transportation system of Texas, extends 426 miles along the entire coast of Texas (Figure 1). Reaching from

FIGURE 1



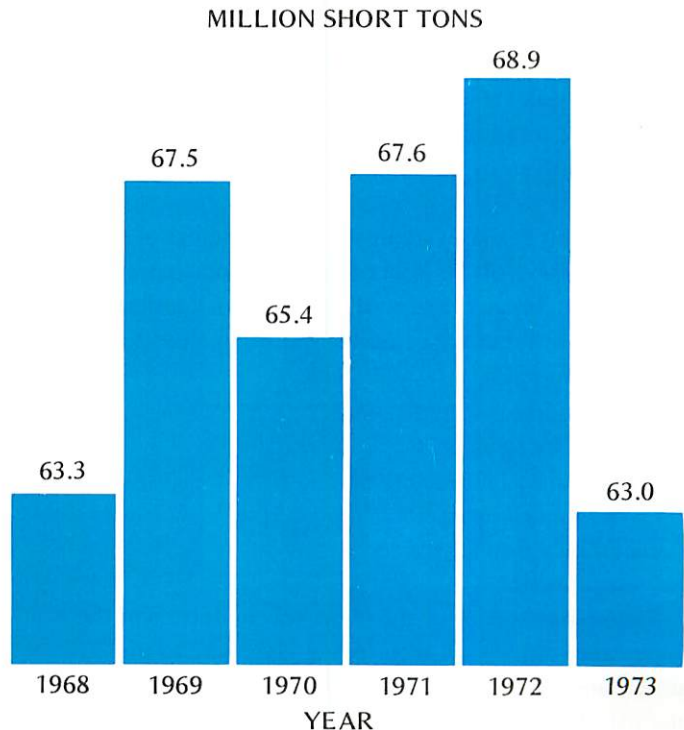
Gulf Intracoastal Waterway in Texas

Texas to Florida, this waterway system connects with other navigable rivers in the South and throughout middle America. The resulting transportation network allows industrial and commercial firms to receive and ship liquid and bulk commodities in large volumes at comparatively low rates. Relatively low water transportation costs stimulate industrial development and expansion

at sites having access to inland waterways. For the past 25 years, an increasing number of industries have sought Waterway locations to benefit from low transportation costs.

In 1937, while hearings were being held to obtain authorization for extension of the Gulf Intracoastal Waterway, the total annual volume of shipments in Texas was estimated at 5 million tons. Figure 2 illustrates the annual volume of commodities transported in Texas on the Waterway in recent years. The significant point is that, consistently, well over 60 million tons move on the Waterway annually. Such a consistent volume translates into a vital force in the economic life of all Texans. Some of the benefits related to activities dependent on the Waterway are employment, income, taxes, energy savings,

FIGURE 2



Waterborne Commerce on the Gulf Intracoastal Waterway in Texas

and reduced prices on consumer products.

If future benefits are to be a certainty, maintenance and development of the Gulf Intracoastal Waterway in Texas is a necessity. In the past, the U.S. Army Corps of Engineers has borne the burden of maintaining and developing the Gulf Intracoastal Waterway. Once developed, segments of the Waterway are maintained by periodic dredging to remove accumulations of sediment and siltation. A continuing problem of the Corps of Engineers is disposal of dredged materials. Both upland disposal sites and deep ocean dumping are considered too costly; and securing diked dredge sites in the adjacent coastal area may be even more expensive due to ownership and environmental considerations. Regardless of where dredged materials are placed, the central issue is that additional monies are needed to secure sites for disposal of dredged materials. Rising land prices and inflation accentuate the difficulties which must be overcome to resolve the issue.

Financial assistance and sponsorship by the State of Texas to maintain the Gulf Intracoastal Waterway merit serious consideration. Viewing present and anticipated economic benefits to Texas, assistance and support by the State of Texas to maintain the Waterway are priority items. Texas has never provided financial assistance to maintain or develop the Waterway.

TASK FORCE FORMED

Recognizing the need for possible solutions or alternatives to resolve immediate and future problems related to the Waterway, Dr. Robert C. Stephenson of Texas A&M University took the lead in generating financial support and developing a task force of researchers to conduct an objective analysis of various aspects of the Waterway in Texas.

This report is a brief summary of the findings of that study, "Analysis of the Role of the Gulf Intracoastal Waterway in Texas." The study comprises six task reports by Texas A&M researchers on the following aspects of the Gulf Intracoastal Waterway in Texas:

- environmental implications
- engineering aspects
- sociological characteristics
- economic impact
- funding alternatives
- legal aspects

A dominant theme of the effort was to document the importance of the Gulf Intracoastal Waterway to the people and the economy of Texas. This summary presents the gist of the six reports, including the findings and alternatives expressed by the researchers.

Grateful appreciation is directed to the many outstanding contributions to the total effort by Mr. Dow Wynn of

the Port of Port Arthur and Mr. Al Cisneros of the Port of Brownsville. Both played a vital role in drawing on the resources and expertise of representatives of Texas ports.

Particular thanks are given to Senator A. R. Schwartz and Mr. Joe C. Moseley of the Texas Coastal and Marine Council for their valuable assistance and support of the project.

Appreciation is extended to Col. Don S. McCoy and his staff, Department of the Army, Corps of Engineers, Galveston District, for their assistance and patience in responding to requests for information by the task force researchers.

Both this summary report and the study, "Analysis of the Role of the Gulf Intracoastal Waterway in Texas," received funding support from the Texas Ports Association and the Texas Coastal and Marine Council. Also, partial support was derived from an institutional grant 04-3-158-18 made to Texas A&M University through the National Sea Grant Program, National Oceanic and Atmospheric Administration, United States Department of Commerce.

Environmental Implications of Maintenance and Improvement of the Gulf Intracoastal Waterway in Texas

ROBERT B. DITTON and RONALD L. SCHMIED
 Department of Recreation and Parks
 College of Agriculture
 Texas A&M University



In 1970, the National Environmental Policy Act (PL 91-190) established a national policy for the environment. Mandating federal agencies to develop environmental impact statements for actions significantly affecting the quality of the human environment, the Act requires agencies to consider the ultimate environmental impacts of their proposed alternatives. Such an analytical procedure should reveal the true costs of contemplated resource development projects. When PL 91-190 is coupled with state agency responsibilities under the U.S. Fish and Wildlife Coordination Act, it becomes apparent that environmental considerations have taken on a new importance in natural resources decisionmaking.

From the viewpoint of productive activities, the Texas coastal zone contains the most valuable and diverse grouping of natural resources in the state. Bays, estuaries, marshes, and plains support myriad uses which have a major impact upon the state as well as the nation. Sport and commercial fishing industries wax or wane to the same degree as the populations of fish and crustaceans are sustained by the food chain in the coastal waters. Birds, waterfowl, and other wildlife migrate, nest, and reproduce in habitats throughout the coastal zone.

Figure 3 illustrates the comparative production rates of six terrestrial and aquatic systems ranging from desert to open ocean productivity areas. Not generally recognized is the startling fact that estuaries are our most productive areas. Estuaries producing at their minimum rate per acre still equal the most productive agricultural areas. At a maximum rate, an estuary can outproduce moist-land agriculture by a factor of two. Considering the abundance of U.S. agriculture, the productivity of estuarine areas is phenomenal.

A wide range of thriving industries exist in the Texas coastal zone. They generated an income of over \$10.8 billion in 1970. Leading contributors to this total were recreation and tourism, petroleum and natural gas drilling

and refining, agriculture, forestry, manufacturing, ship-building, port activities, and mining of natural resources. One-third of the Texas population resides in the coastal zone. Projections indicate that the 3.5 million population in 1970 will increase to approximately 5 million by 1990. Such dynamic growth implies a parallel expansion in industrial activities. Regardless of magnitude, future development in the Texas coastal zone will be marked by conflicts between productive uses of coastal resources and environmental preservation and enhancement.

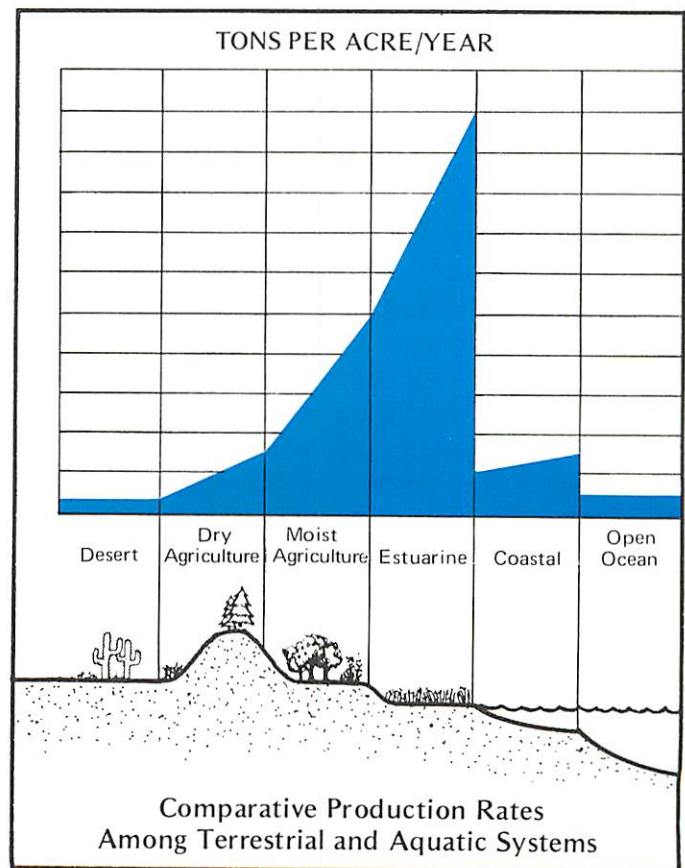


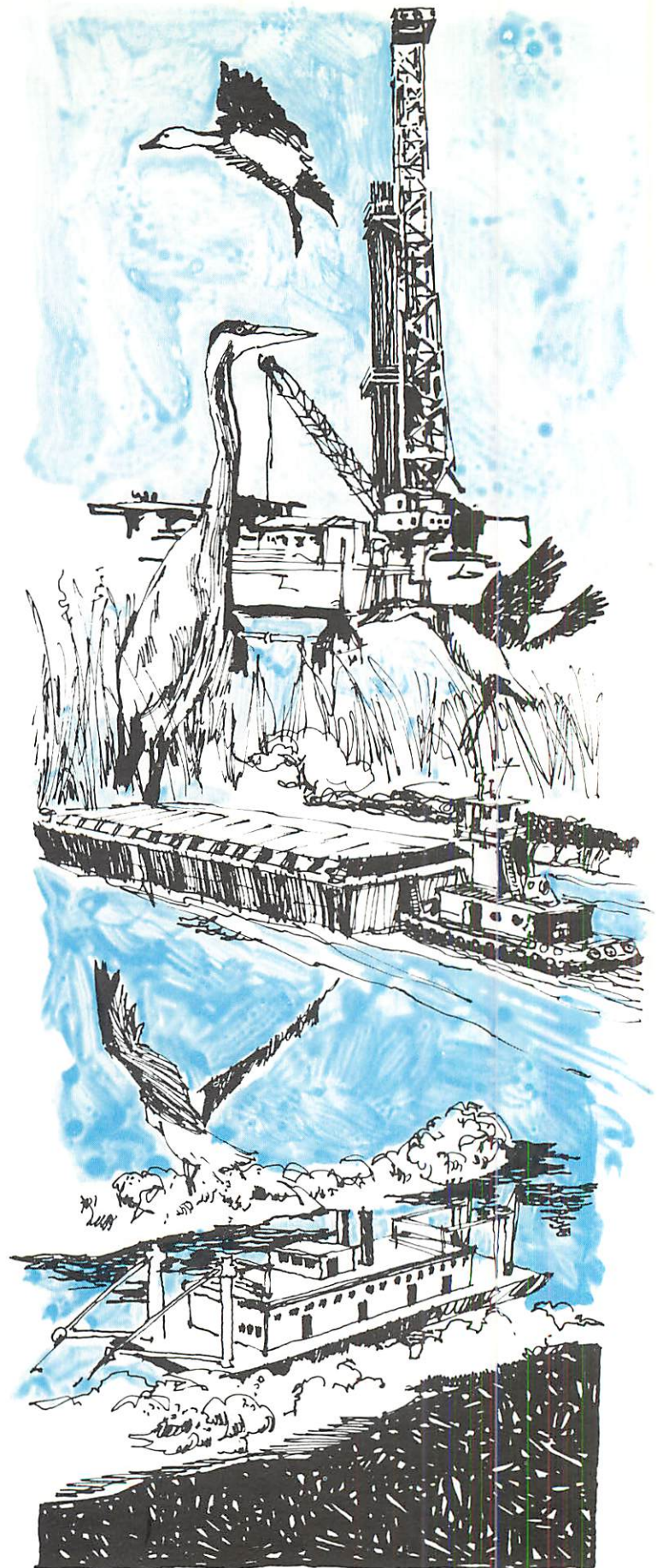
FIGURE 3

Relative to dredging to maintain and improve the Gulf Intracoastal Waterway, several environmental viewpoints can be identified:

- **The Total Destruction Argument** -- dredging will permanently destroy the coastal ecology.
- **The Develop with Nature Argument** -- organisms readily adapt to modifications in the environment.
- **The Protection by Location Argument** -- protect selected productive areas (estuarine areas).
- **The Out-of-Sight, Out-of-Mind Argument** -- favors disposal and habitat destruction as long as it takes place elsewhere.
- **The User Group-Oriented Argument** -- special interest groups are concerned with impacts on areas they presently have under lease, i.e., bird sanctuaries.

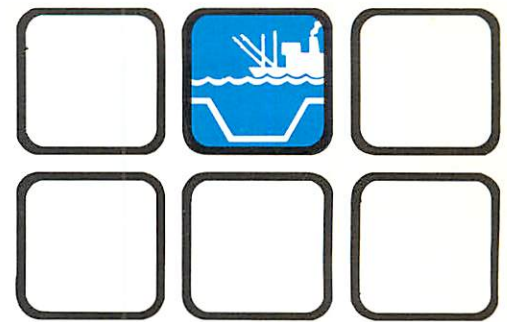
Maintenance and development of the Gulf Intracoastal Waterway in a period of growing public and governmental environmental concern are difficult tasks. Some of the alternative ways to minimize environmental degradation are:

- **Cessation of Maintenance**
 - economic losses occur.
 - impairment of water circulation would increase water salinity, destroy marshes and cause fish kills and vegetation destruction.
- **Maintenance at Lower Depth**
 - lower depth would still need maintenance.
 - volume of traffic and growing barge sizes indicate existing depths may be inadequate for future traffic.
- **Different Dredging Methods**
 - hydraulic dredges are replacing other less efficient dredges.
 - technological advances in new dredges minimize environmental damage.
- **Coordination of Dredge Disposal Site Selection**
 - federal, state, local, and private sectors can coordinate interests to select dredge disposal sites to accommodate excess shoaling rates, protect biologically fragile and valuable biotope areas, and acquire dredge disposal sites with minimum interference from private landholders.
- **Dredge Disposal Alternatives to Reduce Environmental Damage**
 - improve dredge material disposal techniques.
 - regulate timing of dredging and materials placement more effectively.
 - use levees and dikes to reduce environmental effects of materials placement.
 - use deep water disposal sites where practicable.
 - obtain additional upland dredged materials easements for future dredged materials use. Next to deep water disposal, upland materials disposal creates the least adverse environmental impacts.



Engineering Aspects of Operation and Maintenance of the Gulf Intracoastal Waterway in Texas

JOHN B. HERBICH
*Ocean Engineering Program
College of Engineering
Texas A&M University*



The purely engineering aspects of maintenance of the Gulf Intracoastal Waterway in Texas are not difficult. Over the years, technical knowledge has been translated into the necessary operational equipment for dredging and maintenance of the system.

A far more serious obstacle to successful maintenance of the Waterway arises from the proliferation of regulatory constraints of an environmental nature. Disposal of dredged material is a serious problem due not only to environmental regulations, but also to the increasing opposition of landowners. Both the maintenance and improvement of the Waterway are in jeopardy at present and the situation will continue until other land disposal sites are found or additional offshore disposal areas are designated. However these issues are resolved, future dredging efforts and the need for new materials disposal practices to meet environmental standards will require a significant increase in manpower, technologically advanced equipment, and costs.

A major force constantly degrading the Waterway is siltation from a variety of processes including density-induced currents, bank erosion, sediment carried by rivers, and sediment blown by wind. Density currents and sediments carried by rivers or by wind are natural phenomena and little can be done to control them economically. However, bank erosion is to a large extent man-made and can be corrected. Although not included in this brief report, the original study does include a series of maps of the Texas Waterway delineating critical and noncritical areas of bank erosion.

Several areas where siltation is a major problem are well known. Between Port Arthur and High Island, the Gulf Intracoastal Waterway is subject to siltation from bank erosion. These banks are unprotected since the Corps of Engineers does not have funds allocated for protective devices. Since the Waterway is only 125 feet wide, passing vessels generate waves which erode the unprotected banks. Material in this section of the Waterway

is very fine and even small waves cause erosion. In several areas, erosion has progressed beyond the boundary line of property originally donated to the government for the construction of the Waterway.

In the Laguna Madre area, windblown sand is a major siltation problem. A separate study, "Siltation Mechanisms--Intracoastal Waterway: Kenedy County Area," has been sponsored by the Sea Grant Program at Texas A&M University. The study is expected to determine the quantity, rate, and seasonal variability of sand transport across Padre Island and Laguna Madre to the Waterway and the resultant silting of the Waterway in relation to the sand transport.

TYPES OF EQUIPMENT

Dredging equipment is of two main types: mechanically operating and hydraulically operating. Salient features of these dredges are:

Mechanical Dredges

Types---grapple dredge, dipper dredge and bucket dredge.

Description---similar to land based excavating machines.

Advantage---ability to operate in restricted locations such as around docks or jetties.

Hydraulic Dredges

Types---dustpan dredge, hydraulic pipeline cutterhead dredge, and self-propelled hopper dredge.

Description---self contained units which dig the material and dispose of it through pipelines by pumping or by storing in hoppers for subsequent disposal.

Advantage---more efficient, versatile and economical to operate due to continuous, self-contained digging and disposal operation.

Disadvantage---hopper dredges generally require a greater draft than cutterhead dredges.

Present maintenance of the Waterway is done by hydraulic cutterhead dredges.

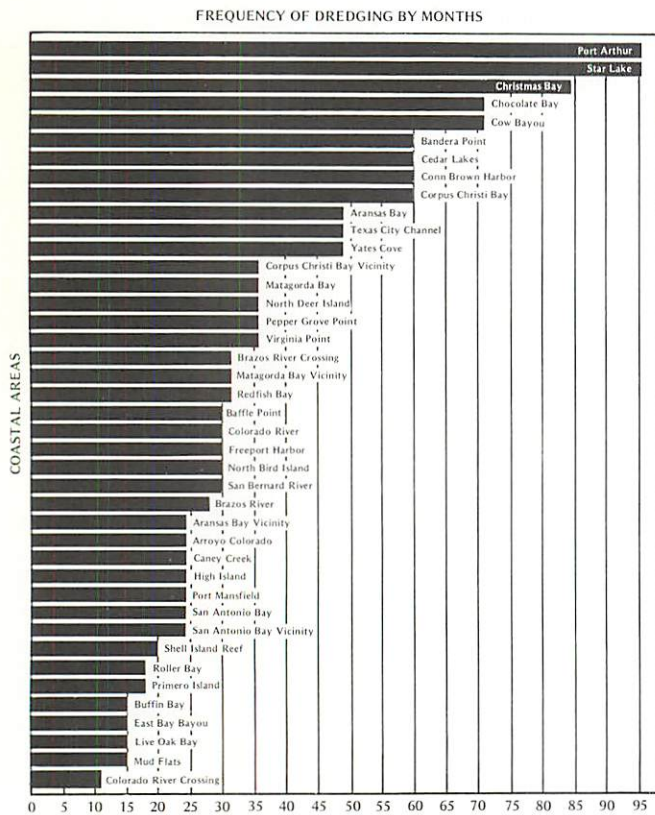
DREDGING FREQUENCY

Frequency of dredging activity varies on sectors of the Waterway. Complete records of dredging since the 1930's have been obtained and frequency of dredging for each of the sections of the Waterway has been evaluated. Figure 4 indicates the dredging frequency, on a monthly basis, at various locations on the Waterway.

Disposal of dredged material is accomplished by three methods:

- disposal on land areas adjacent to the Waterway.
- disposal of dredged materials on land areas with a dike system.
- open water disposal of dredged material.

FIGURE 4



Dredging Frequency at Various Locations Along the Waterway

WATERWAY EXPANSION

House Document number 556 of the 85th Congress, Second Session, contains a letter dated July 6, 1962, from the Secretary of the Army transmitting a report and all the accompanying papers and illustrations from the Chief of Engineers to the Speaker of the House of Representatives.

The following agencies and interested parties were consulted in connection with the recommendations for

widening and deepening of the canal between Galveston and Port Arthur: American Waterways Operators, Inc., Oil Companies, Towing Companies, U.S. Bureau of Public Roads, U.S. Fish and Wildlife Services, Louisiana Department of Public Works, Louisiana Department of Wildlife and Fisheries, Policy Juries of Louisiana, Louisiana Department of Highways, Navigation Districts in Texas, Texas Game and Fish Commission, Texas Highway Department, and County Authorities in Texas.

The recommendation of the Army Engineers was that since the restricted channel dimensions (12 by 125 feet) result in hazardous operating conditions and extensive losses for tugs and large vessels now using the Waterway, it should be deepened and widened. The Gulf Intracoastal Waterway is one of the most important inland waterways of the United States. The tonnages of crude oil, chemicals, sulphur, and other commodities have reached large proportions, and further increases are expected. Exploitation of the inshore and offshore oil lands and development of the petrochemical and light industries along the Gulf shore assure the future heavy use of the Waterway and increased tonnages.

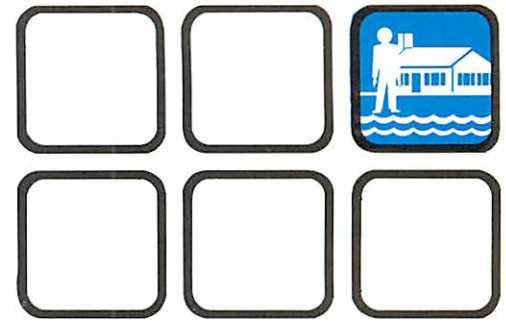
The existing traffic and future economic projections for the waterway justify enlargement to provide:

- A channel 16 feet deep and 150 feet wide from the Mississippi River, via Algiers Canal and a bypass route at Houma, Louisiana, to Atchafalaya River;
- A channel 16 feet deep and 200 feet wide through the reach from Atchafalaya River to the Sabine River;
- A channel 16 feet deep and 150 feet wide through the reach from the Sabine River to the Houston Ship Channel with two relocations:
 - A channel 12 feet deep and 125 feet wide through a relocation route in Matagorda Bay (mile 454.3 and mile 471.3);
 - A channel 12 feet deep and 125 feet wide through a relocated route in Corpus Christi Bay (mile 439.4 and 550);
- Maintenance of channel 12 feet deep and 125 feet wide through the existing Lydia Ann Channel between Aransas Bay and Aransas Pass; and
- Maintenance of the existing Waterway to 12 feet deep and 125 feet wide between 50.5 and mile 63.5, the reach which would be shunted by the Houma Bypass.

Sociological Characteristics of the Gulf Intracoastal Waterway in Texas

CARLTON E. RUCH

*Industrial Economics Research Division
Texas Engineering Experiment Station
Texas A&M University*



In view of the energy problems the nation has experienced in past years, the critical nature of the Gulf Intracoastal Waterway has become apparent. Approximately 25 percent of the nation's petroleum, petrochemical, and related industries are located in the Texas coastal area and are dependent to some degree on the Waterway.

On the state level, nearly 75 percent of all goods are shipped by water. Petroleum and petroleum refining industries are the major waterway users, accounting for about 60 percent of all waterborne commerce in Texas. Two other major users are the chemical industry, 17.4 percent, and the non-metallic minerals industries, 16.7 percent. These industries located in coastal counties pay wages of over \$700 million annually. Jobs supported by such expenditures are the key to the social and economic well-being of coastal area inhabitants. For every 100 workers employed in manufacturing jobs, the U.S. Chamber of Commerce estimates an additional 68 jobs are created in non-manufacturing supportive and service activities. Last year, the Chamber's Economic Analysis and Study Group reported on a study of the effect of 100 factory workers in 127 metropolitan areas.

An increase of 100 jobs in these areas means:

- Personal income up \$872,000 yearly.
- Two more retail establishments.
- Retail sales - up \$395,000 per year.
- Bank deposits - up \$481,000.
- Population - up 245, including 69 families.
- School enrollment - up 80 students.

As an economic artery, the Gulf Intracoastal Waterway plays a vital role in industrial activities and the creation of jobs. Although scientific validity might be questioned, there appears to be a direct correlation between the degree of utilization of the Waterway and the socio-economic well-being of residents of counties through which the main channel of the Waterway flows.

An analysis of volume of traffic on the Waterway for 1970 on the basis of low, medium, and high utilization sectors indicate the following movements:

<u>Rating</u>	<u>Utilization Sector</u>	<u>Tonnage</u>
Low	Mexican Border to Corpus Christi	2,345,252
Medium	Corpus Christi to Galveston	20,212,427
High	Galveston to Sabine River	42,843,601

With nearly twice the tonnage of the low and medium sectors combined, the Galveston to Sabine River sector of the Waterway is an area of intense activity and should generate higher socio-economic factors than the low and medium use sectors. A look at 11 socio-economic measures including income levels, housing characteristics, and welfare, health, and education indicators seems to confirm the relationship between utilization of the Waterway and socio-economic well-being of residents in the coastal area. Averaging indicators for each sector produces the levels shown in Table 1.

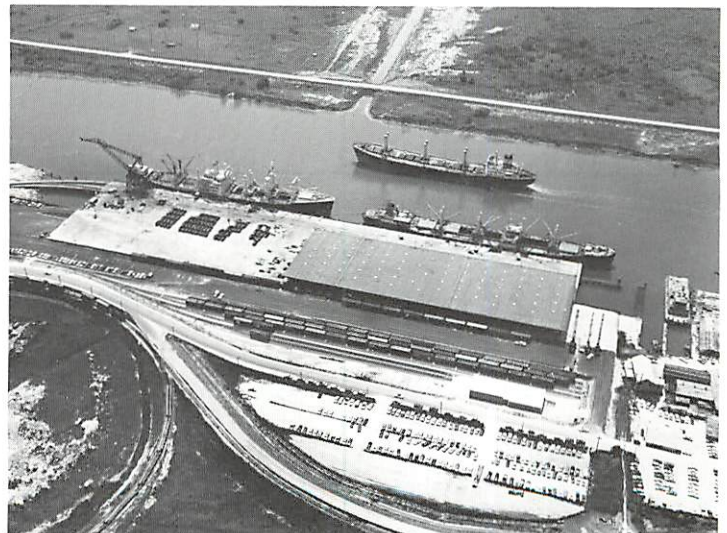
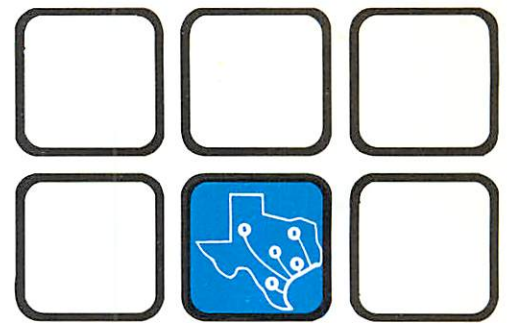


TABLE 1, 1970 SUMMARY OF SOCIO-ECONOMIC INDICATORS

Indicators	GIWW Usage Areas		
	Low	Medium	High
Median Family Income (Texas \$8,490)	\$5,789	\$8,184	\$9,069
Percent of Population With Incomes Below Poverty Level (Texas 14.6%)	30.78%	17.51%	12.82%
Percent of Families With Incomes of \$15,000 or More (Texas 16.5%)	11.0%	13.5%	15.4%
Median Value of Owner Occupied Homes (Texas \$12,000)	\$8,020	\$10,688	\$11,175
Median Contract Rent (Texas \$76)	\$52.40	\$59.90	\$62.50
Percent of Year-round Houses Lacking Some or All Plumbing Facilities (Texas 8.5%)	16.66%	11.0%	6.26%
Percent of Population Receiving Monthly Welfare	6.72%	5.31%	4.19%
Physicians Per 1,000 Population (Texas 1.01)	.4392	.9314	1.242
Dentists Per 1,000 Population (Texas .4162)	.2126	.2889	.3353
Hospital Beds Per 1,000 Population (Texas 4.10)	3.078	5.020	5.3618
Median Years of Education (Texas 11.6)	9.02	10.94	11.23

SOURCE: Industrial Economics Research Division, Texas A&M University, College Station, Texas.

Economic Impact of the Gulf Intracoastal Waterway in Texas

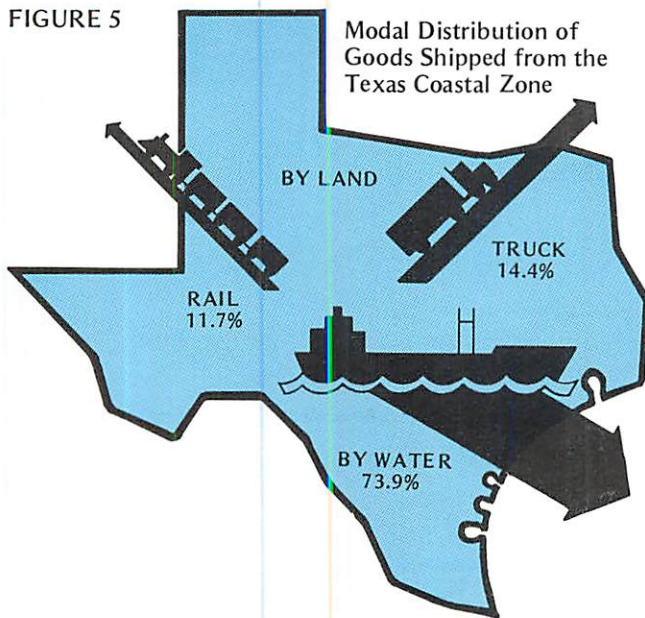


CHRISTIAN PHILLIPS

Industrial Economics Research Division
Texas Engineering Experiment Station
Texas A&M University

Texans have a vital resource in the Gulf Intracoastal Waterway (GIWW). Annually, the Waterway generates a total direct economic impact to Texas of \$1.8 billion. Not only does this amount reflect a level of economic significance, but it clearly depicts industry's recognition of low-cost water transportation as an important element of its operating strategy. Ample evidence of this recognition exists in the growing number of new plant locations and expansions and in consistently high volumes of cargo shipped annually on the Waterway. An analysis of these factors on the basis of past and present trends confirms industry's use of the Waterway to maintain competitive postures and profits. Figure 5 depicts the distribution of goods by various modes of transportation from the Texas coastal zone.

FIGURE 5



Few Texans realize the importance of water transportation to the Coastal Zone and to Texas. Over 120 million tons of goods are shipped by water from Texas ports each year. This represents almost 75% of all goods shipped from the State as a whole.

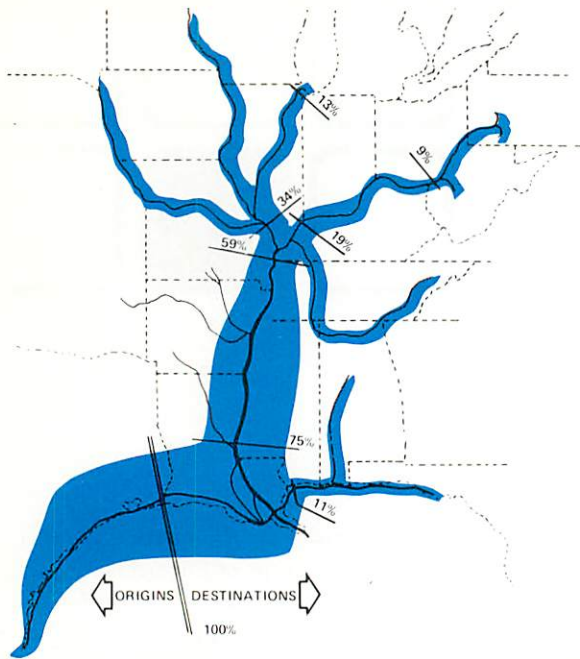
Commodity flows on America's inland waterways have risen at tremendous rates. U. S. Corps of Engineers preliminary estimates for 1973 reveal that more than 1.7 billion tons, equivalent to a 7.4 percent increase over 1972 tonnages, were moved by water. Of this amount, 600 million tons traveled on the inland waterway system. While unemployment was rising and production in many plants was reduced, 301 new plants and expansions appeared along the waterways, representing a total investment of \$5.5 billion. The attractiveness of economical water transportation for industrial growth appears clear as nearly 9,000 waterside plants have been constructed since 1950.

Industrial growth on the Gulf Intracoastal Waterway in Texas and associated tributaries reflects events at the national level. Well established as an industrial center, the portion of the Waterway from Freeport to the Sabine River continues to lead the way in expansions and sitings for new plants. An influential factor in such growth is access to other firms and distribution centers located on the inland waterway network. Figure 6 illustrates the percentage of goods from Texas moving on the inland waterway system to destinations throughout middle America.

A historic overview indicates that the marine environment has a strategic economic role in the world:

- All major industrial nations have extensive coastlines.
- An estimated two-thirds of the gross world product is produced in coastal zones.
- More than 80 percent of the world metropolitan areas are coastal areas.
- Of the 25 largest United States cities, 18 are coastal cities.
- More than 75 percent of the total population of the United States resides in coastal or Great Lakes states.
- More than 45 percent of the nation's urban population resides in coastal counties.
- All of the major megalopoli now projected for the year 2000 are located in coastal zones.

Movement of Texas Goods on Inland Waterways



About 36 million tons of goods crossed the Texas-Louisiana border on the inland waterway in 1970. Shipments from Texas went to such far-flung markets as Pittsburgh, Chicago, and Minneapolis. All of this traffic must pass through several locks between the Mississippi River and Texas which cause severe delays.

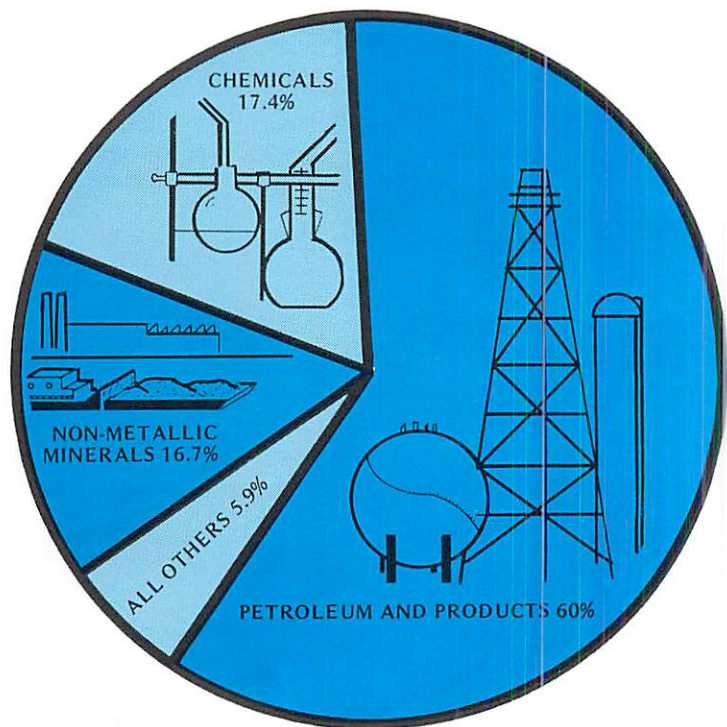
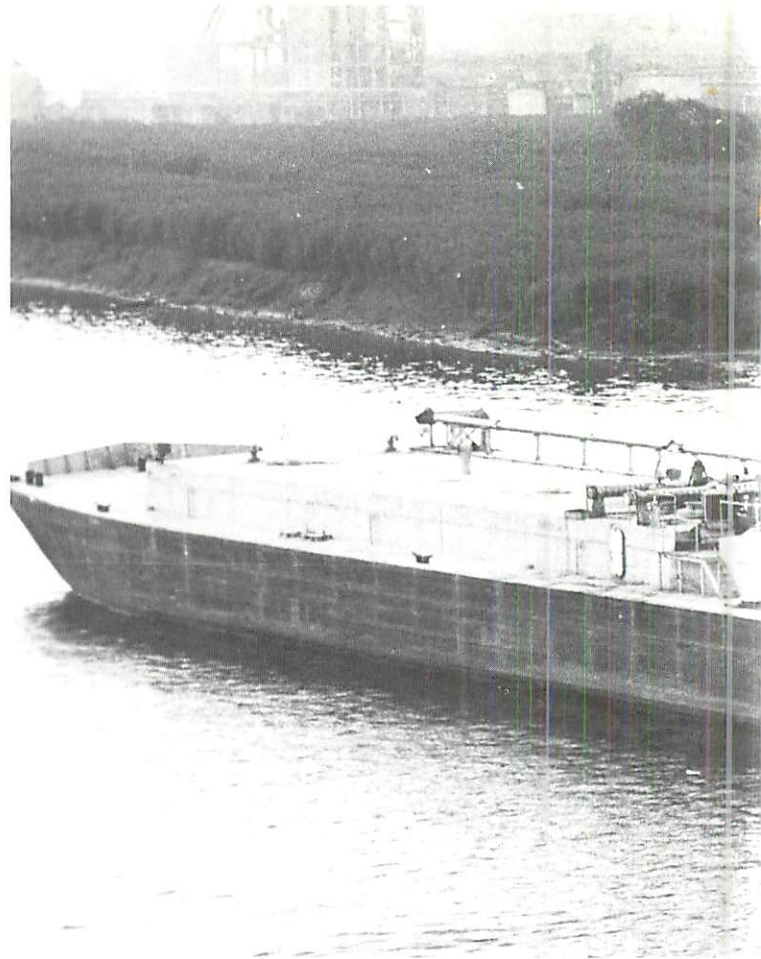
FIGURE 6

OIL TRIGGERS GROWTH

Discovery of oil and natural gas along the state's coastal region and the subsequent development of port and harbor facilities along the eastern half of the Texas coast provided the primary thrust for industrial growth and population expansion. Increased population, greater industrial diversification, and specialized industrial growth stemming from oil and gas contributed to the transformation of the coastal region from a rural zone to an urban industrial complex.

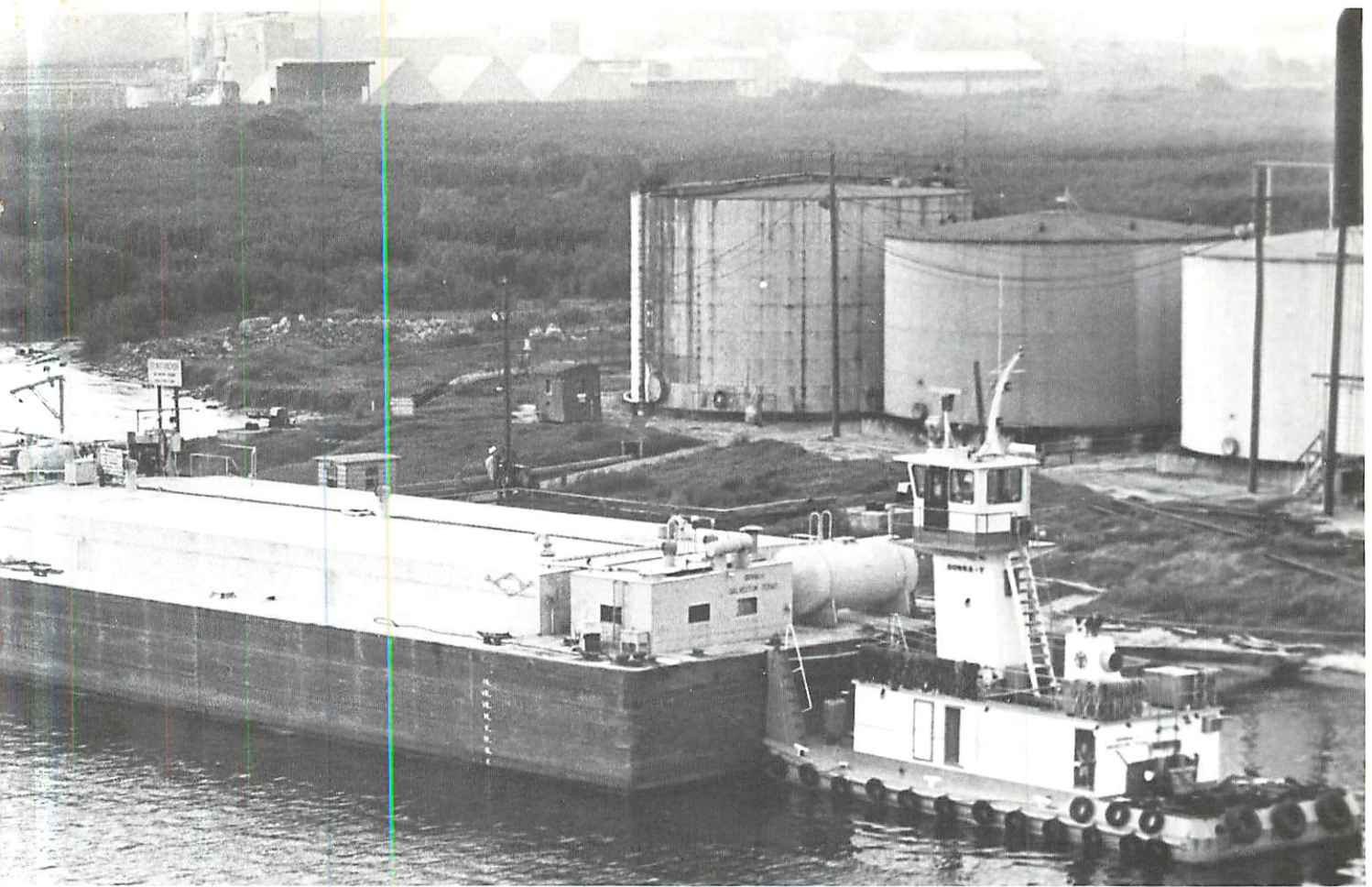
Since the Texas Gulf coast currently has the world's largest petrochemical capacity and contains the most important reserves of natural gas in the United States (more than one trillion cubic feet), it is not surprising that the major Waterway users are the petroleum and petroleum refining industries. Other major users of the Waterway are the chemical and non-metallic minerals industries. These four industries annually ship goods valued at over \$9.2 billion. Figure 7 shows the percentage volume of major Waterway users in Texas.

In terms of commerce, the Gulf Intracoastal Waterway in Texas has experienced steady growth. The 67 million tons carried by the Texas portion of the Waterway in 1971 represent an increase of almost 90 percent over 1961, when approximately 36 million tons were moved. Contrary to the United States as a whole, Texas is unique in that more goods are exported each year than are imported.



Major Waterway Users

FIGURE 7



The Waterway's direct economic contribution to the State can be calculated from the value of cargo to ports, from expenditures on the Waterway itself, and from the economic impact of water transportation and water transportation industries.

Each ton of cargo arriving in a port generates a certain amount of dollar expenditures in that jobs and businesses are needed to handle and store cargo and to perform other miscellaneous services. Based on Texas port receipts in 1970 and assuming that 40 percent of their receipts are due to the Gulf Intracoastal Waterway, the economic impact of cargo value would total approximately \$888 million.

As reported by the U. S. Corps of Engineers, new work and maintenance expenditures in 1970 were \$6.3 and \$10.5 million, respectively. Total economic impact of these expenditures would be \$18.9 million for new work and \$33.5 million for maintenance and repair.

Applying appropriate regional multipliers to payrolls and revenues of the water transportation and related industries produces a total economic impact of \$876.7 million.

If the economic impacts of the three sections previously described are combined, the Waterway's total direct

economic contribution for Texas amounts to over \$1.8 billion annually. Preliminary estimates from ongoing research indicate that the combined direct and indirect economic impact of the Waterway for Texas is nearly \$19 billion annually.

RECREATION IMPACT

Another important economic effect is the impact of the recreation industry.

A recent recreation study described leisure activities and associated expenditures for the entire coastal zone. No real attempts have been made to evaluate quantitatively the importance of the GIWW in the recreation sector of the economy.

As a land protected water transportation route, the Waterway provides sheltered passage to small boating and fishing vessels along a large portion of the Texas coast. Concurrently, the Waterway directly connects all ports, bays, and estuaries, minimizing unnecessary ventures into the open unprotected waters of the Gulf, and saving travel time, energy, and expense. This encourages mobility and makes recreational waters readily accessible.

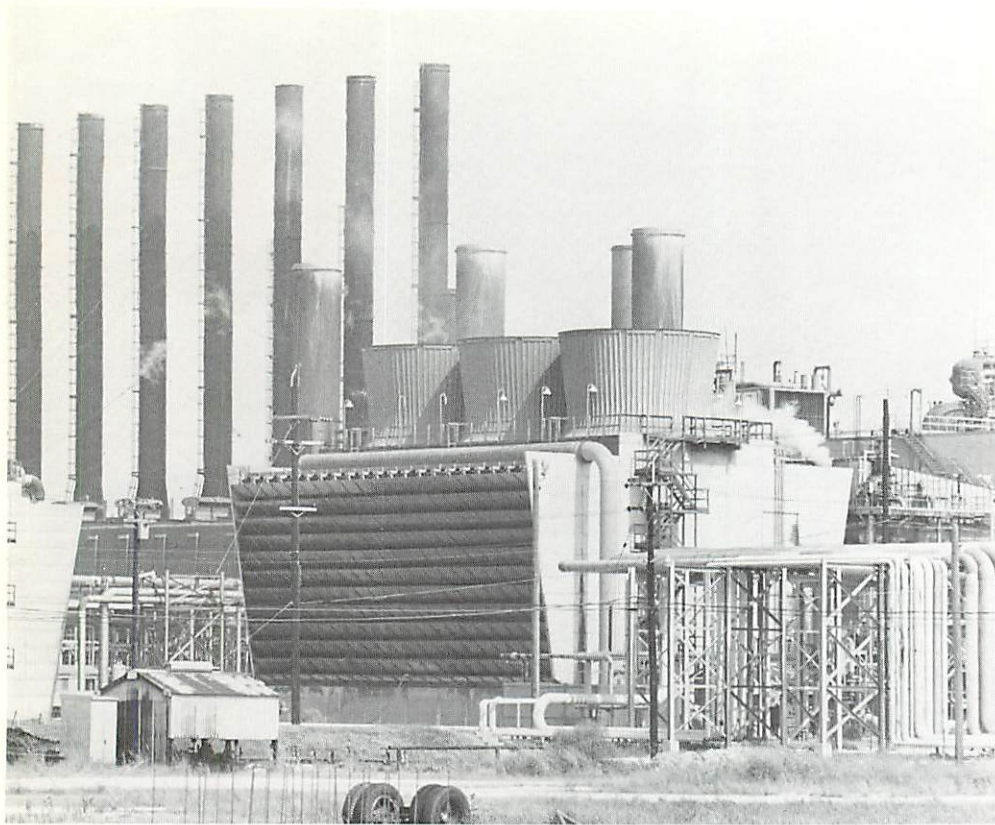
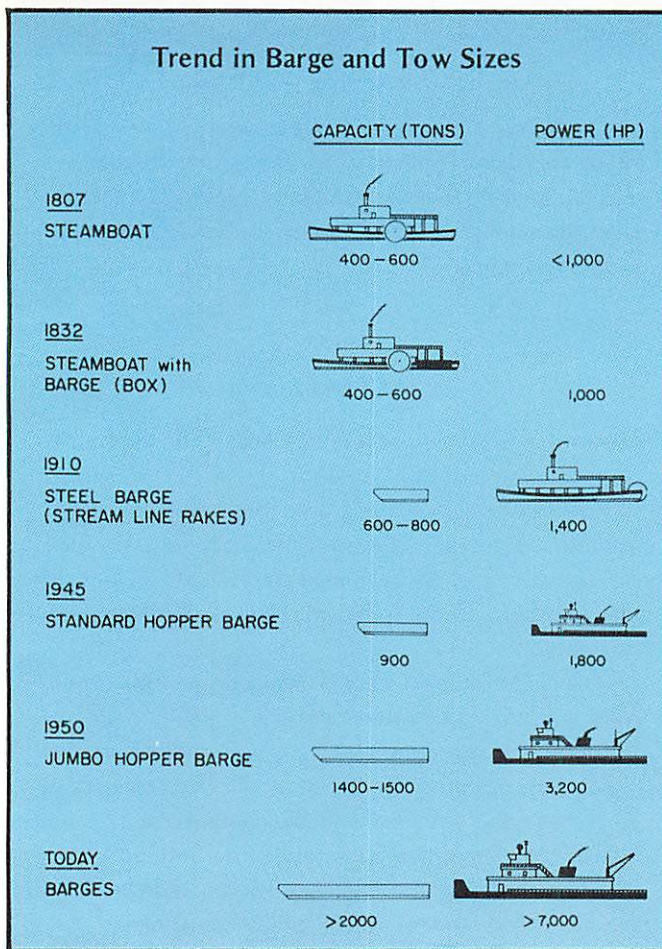


FIGURE 8



It has been advocated that the Waterway also may effect fishing in what used to be restricted and shallow water areas. Again, detailed studies of the magnitude of the effects of the Waterway on fishing are needed. Also, development of artificial reefs along the Texas coast presages more intensive use of the Waterway by small fishing boats and vessels.

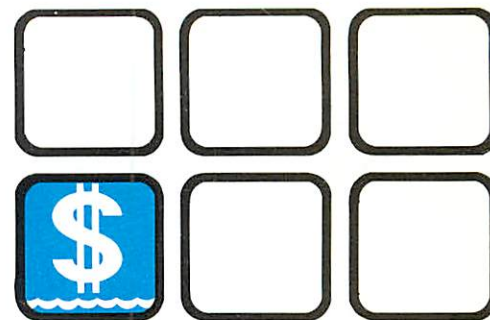
Although documentation of the implied benefits is lacking, the overall effect of the Waterway on recreation appears to be significant.

To a limited extent, the Waterway also is being used to transport drilling rigs for development of oil and gas leases domestically and worldwide.

If a deepwater terminal to import large volumes of crude oil becomes a reality for Texas, the additional economic impact on the Waterway will bring with it a greater shipping burden. Economies of scale dictate that the barging industry will use available technology to build bigger and better barges and tugs to accommodate the increasing volume of commerce. Figure 8 indicates the historical trend in the growth of barge and tug sizes. Viewing these steady pressures against the inherent limitations embodied in the existing physical dimensions of the Waterway, reality dictates a growing awareness of the fact that we may be approaching the carrying capacity of the Waterway.

If future benefits are to remain at a high level, proper maintenance and development of the Waterway must be a priority concern for all Texans.

An Evaluation of Funding Alternatives for State Sponsorship of the Gulf Intracoastal Waterway in Texas



WAYNE E. ETTER
*Department of Finance
College of Business Administration
Texas A&M University*

and

CHARLES A. NICKERSON
*Department of Accounting
College of Business Administration
Texas A&M University*

Maintenance costs for the Gulf Intracoastal Waterway (GIWW) are borne by the U.S. government and by state and/or local governments. The U.S. government, operating through the U.S. Corps of Engineers, bears the costs of dredging and maintaining the Waterway. In return, states and/or local governments incur certain obligations:

- To 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 to be required in the general public interest for initial and subsequent disposal of dredged material and necessary retaining dikes, bulkheads, and embankments therefore or the cost of such retaining works;
- To hold and save the United States free from damage that may result from construction and subsequent maintenance of the project; except for damages due to the fault or negligence of the United States or its contractors.
- To accomplish, without the cost to the United States, all alterations of pipelines, powerlines, cables, and other utility facilities when and as required for construction of the project.

In maintaining an existing portion of the GIWW, the principal nonfederal costs are for disposal of dredged materials. For the Texas portion of the GIWW, the U.S. Army Corps of Engineers is concerned that the present arrangements for dredge disposal are not adequate. In their opinion, it may be necessary to renegotiate an unknown number of present arrangements for dredge disposal on private lands to allow for the erection of dikes around the disposal areas. It is not the purpose of

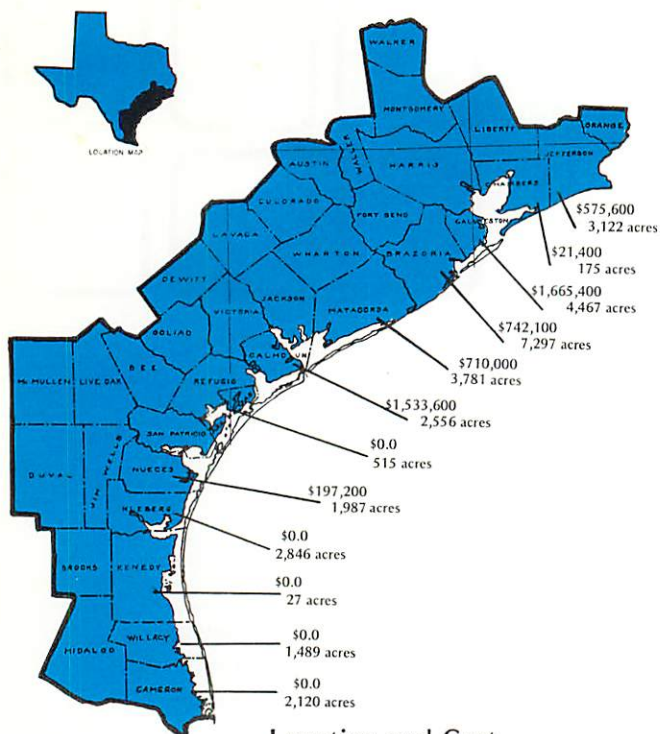
this study to evaluate the validity of this assumption or the need for diking these areas. Rather, it is to estimate the cost of renegotiating these arrangements should it become necessary to do so.

If it becomes necessary to renegotiate the arrangements with private landowners along the GIWW, the State of Texas, a local governmental unit on or about the GIWW, or private interests will have to provide the funds required to secure appropriate agreements with the landowners. This study is concerned with estimating the amount of funds required for securing these agreements and with evaluating alternative public sources for these funds.

An estimate of the amount of funds that potentially might be required to renegotiate the dredge disposal easement agreements with private landowners was made as follows:

- Each parcel of real estate desired by the Corps of Engineers for dredge disposal was identified according to size, location, and ownership.
- The cost per acre for renegotiating the dredge disposal easement agreements was estimated for each parcel.
- The size, location, ownership, and cost data were aggregated.

A computer software package titled Statistical Analysis System was employed to compute the products of acres and costs per acre and to analyze the data by relevant variables. Summaries of these analyses are shown in Tables 2 and 3, and graphically in Figure 9. As indicated by the tables, the total acreage involved is 30,382 acres, and the estimated total cost of desired improvements is \$5,445,400. The Corps of Engineers estimates that the funds will be required ratably over a period of not less than five years.



Location and Cost of Material Disposal Areas Required

FIGURE 9

TABLE 2, DREDGE MATERIAL DISPOSAL AREAS REQUIRED BY COUNTY

COUNTY	ACRES	COST
Aransas	515	0
Brazoria	7,297	\$ 742,100
Calhoun	2,556	1,533,600
Cameron	2,120	0
Chambers	175	21,400
Galveston	4,467	1,665,400
Jefferson	3,122	575,600
Kenedy	27	0
Kleberg	2,846	0
Matagorda	3,781	710,100
Nueces	1,987	197,200
Willacy	1,489	0
TOTAL	30,382	\$ 5,445,400

SOURCE: U.S. Army, Corps of Engineers, Galveston District, Galveston, Texas.

If the State of Texas supplies the nonfederal share of the maintenance costs of the GIWW, the method of raising these funds would have to be considered. As developed in the previous section, the potential fund requirements are approximately \$5.5 million. While there is no way to forecast the time within which these funds would be required, the Corps of Engineers suggests that the total amount probably will not be needed in less than five years. Based on these forecasts of potential financial need, several financial alternatives for the State of Texas are examined. There are five methods of funding theoretically available to the state: borrowing, intergovernmental transfers, user charges, state taxes, and funds supplied by private interests.

TABLE 3, DREDGE MATERIAL DISPOSAL AREAS REQUIRED BY TYPE OF OWNER

TYPE	ACRES	COST
Local Sponsor	390	0
Possible Emergent*	5,399	\$829,200
Public Land	12,258	0
Private Land	12,335	4,616,200
TOTAL	30,382	\$5,445,400

* There is some question as to whether some of these parcels are privately owned. Emergent land is defined as land that has been created by disposal of material in open water. This land may be emergent only at low tide and is generally considered to be public land.

SOURCE: U.S. Army, Corps of Engineers, Galveston District, Galveston, Texas.

BORROWING BY THE STATE

The State of Texas cannot borrow for the purpose of obtaining these funds without amending the present state constitution unless revenue bonds are issued which do not pledge the state's credit. Article III, Section 49 states: "Purpose for Which Debts May be Created: No debt shall be created by or on behalf of the state, except to supply casual deficiencies of revenue....and the debt... shall never exceed in the aggregate at any one time \$200,000." Because of the estimated amount of funds required, it does not seem likely that a constitutional amendment to approve tax bonds could be

justified. But, the use of revenue bonds which do not pledge the state's credit is an alternative that could be considered.

Advantage---repayment period could be spread over many years.

Disadvantage---identification of specific sources of funds, interest costs of such funds, and costs for collection of revenues.

INTERGOVERNMENTAL TRANSFERS

The bulk of the GIWW maintenance cost already is supplied by the federal government; the federal government specifically requires the balance of the funds be provided by a local sponsor. Since many areas along the GIWW do not receive greater benefits from the Waterway than areas far removed from it, cities or other governmental units adjacent to the Waterway probably will not supply funds to maintain the GIWW unless new sources of revenues for such purposes are identified.

Despite this, it may be possible to create additional navigation/port districts, enlarge the present ones (so that all of the GIWW will be within the boundaries of a navigation district), or create a "GIWW" district. These governmental units would be subordinate to the state which could require them to levy taxes or collect fees from the users of the GIWW. The collected funds could be used to service debt issued by the "GIWW" district, turned over to the state for meeting the debt service requirements of revenue bonds issued by the state, or used directly for purchasing the necessary easement modifications.

Advantage---low tax rate and repayment period could be for 20 years or more.

Disadvantage---service costs for long term debt would be prohibitive.

USER CHARGES

Tolls, a form of user charges, probably are prohibited by the U.S. Constitution. In Article I, Section 9, the following appears: "No preference shall be given by any Regulation of Commerce or Revenue to the Ports of one State over those of another: nor shall vessels bound to, or from, one state, be obliged to enter, clear or pay duties in another."

Boat license fees and fuel tax levies conceivably could be levied to finance the nonfederal share of the GIWW. The advisability of this course of action is open to question. To apply such charges one must consider the following:

- Are there externalities in consumption? In the case of the GIWW, the benefits are broadly received throughout the state and are not restricted to the users.

- What are the costs of exclusion? Could the GIWW be policed to insure that nonpaying users are excluded? Would this be legal?

Such charges are most applicable when the government can identify the beneficiaries of particular government outputs and can exclude nonpayers. Although the users of the GIWW can be identified, it is doubtful that all of the beneficiaries of the GIWW can be charged for its benefits because of the secondary economic impact of the waterway. These externalities mean that the benefits are widely enjoyed even though the direct users can be identified.

Advantage---users pay for benefits.

Disadvantage---may be unconstitutional; all beneficiaries would not pay; policing aspects to exclude nonpaying users would be formidable.

STATE TAX FUNDS

Another source of funding is the appropriation of general tax revenues by the Texas legislature. There are several strong arguments for this approach.

- This approach may be the only one available.
- This approach would be simple. A special district would not have to be created; user charges or additional taxes would not have to be collected.
- In terms of all feasible activities that could be considered by the State of Texas, maintaining the GIWW as a waterway should have an extremely high priority. Indeed the adoption of zero-base budgeting by Texas should accentuate the attractiveness of this expenditure. The estimated cost to the state, when compared with the demonstrated economic impact of the GIWW, should establish the continued existence of the GIWW as an essential item in the state budget.
- An appropriation of general tax revenue would be fairer because the cost of maintaining the GIWW would fall on all beneficiaries, not just the direct users or the taxpayers in adjacent counties.
- According to the U.S. Bureau of the Census the state and local government tax burden borne by Texans is low. On a per capita basis, the burden of state and local taxes in the U.S. are as follow:

<u>Item</u>	<u>1971-72</u>
U.S. Average	\$522.49
Median State	461.15
Texas	384.25

Advantage---simple to implement; all beneficiaries would share costs.

Disadvantage---special interest groups may resist any general tax revenue.

When the estimated costs to acquire acreage for disposal of dredged materials are compared to the economic benefits and impacts generated by activities on the Waterway, justification for such assistance or even substantially greater investments is overwhelming. Even if the required assistance was ten times greater, benefits emanating from the investment are of sufficient magnitude to be ranked as a compelling bargain. Considering what is at stake concerning the dynamic contribution water transportation makes to the economy of Texas, assistance and support by Texans to maintain and develop the Gulf Intracoastal Waterway for future benefits should be an item of highest priority.

PRIVATE FUNDS

Another possible source of funds to maintain the Gulf Intracoastal Waterway is the sector represented by private interests. Trade associations and/or industries that utilize the Waterway could supply all or part of the funding by donations. Principal industrial and commercial users might cooperate if they were convinced that the Waterway would not be maintained in the future without such support. Assuming donations were apportioned evenly among direct users, such costs may be transferred in the form of higher prices to beneficiaries who ultimately would pay the costs to maintain the Waterway.

Advantage---direct users and beneficiaries provide funds.

Disadvantage---difficulty in apportionment and collection of funds from direct users; and possible higher prices in the future to beneficiaries.

WHICH TO CHOOSE?

If funds are needed to renegotiate the easement agreements with private landowners along the GIWW, the easiest and fairest approach would be an appropriation by the State of Texas. The funds could be provided as required and the program could be terminated when no longer needed. The second choice is the creation of a special GIWW district which would levy an ad valorem tax and remit to the state as funds are required. Borrowing is financially unrealistic; a user charge would be difficult to impose and administer---in some forms user charges may even be illegal.

Legal Aspects Relating to the Gulf Intracoastal Waterway in Texas

JOHN L. SEYMOUR
*Management Department
College of Business Administration
Texas A&M University*

Legal issues pertinent to the Gulf Intracoastal Waterway center around the Federal requirements for local sponsorship. These requirements, recent environmental legislation, and the lack of a designated "local sponsor" for much of the main channel of the Waterway, combine to place in jeopardy the continued maintenance of the canal.

Modern environmental legislation has increased the concern which must be given to water quality and to the fish and wildlife that may be affected by the operation of the canal. These laws have occasioned the United States Army Corps of Engineers to reassess their techniques for maintaining the existing Waterway. Some of these techniques may require the acquisition of additional dredge disposal areas and easements or the alteration of the present easements for disposal of the dredged material.

In the various Federal acts authorizing construction of the Waterway, local interests were required to provide the dredge disposal easements. This was provided and the various portions of the Waterway were constructed. Only recently has there been a question of whether continued local sponsorship would be needed to provide or obtain additional easements. Unfortunately, no specific arrangements were made when the Waterway was constructed to identify an entity or entities which would provide this function on a continuing basis. An institutional mechanism is now being sought which would correct this situation.

Generally, the requirements for a local sponsor to construct a waterway were fulfilled by counties through which the Waterway ran or by private landowners along the Waterway. At the time it appeared that once the initial sponsorship requirements were obtained there would be no future need for a local interest to continue sponsorship. The requirements for local sponsorship vary from one Congressional act to the next. The requirements are found partially in the Congressional acts themselves and in specific Corps of Engineers reports submitted to Congress which are then referred to in the authorizing

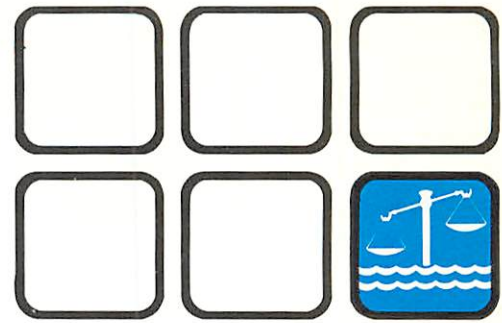
statute. Those reports become House Documents and are adopted as law by reference to the report. Due to more recent federal legislation, particularly the National Environmental Policy Act and the Fish and Wildlife Coordination Act, it has become apparent that there may need to be a renewal of effort to provide requirements of local sponsorship. This is especially true in the area of contribution requirements to provide easements for dredge disposal, because of the questions already being raised regarding the adequacy of the present easements. This issue was not foreseen until recently, and there may be others not presently recognized which will arise in the future.

The Corps of Engineers has provided maintenance of the Waterway since its construction. Keeping the Waterway open requires periodic dredging and disposal of the dredged material, and the annual maintenance costs to the Federal government are substantial.

Recent maintenance operations have resulted in at least one law suit being filed against a contractor of the Corps of Engineers. The court was asked to enjoin certain dredge disposal methods. Although the suit was dismissed, there has been no judicial interpretation regarding the adequacy of the presently held dredge disposal easements.

Some institutional questions regarding the GIWW for Texas include:

- should the State of Texas sponsor the main channel of the Gulf Intracoastal Waterway and coordinate the policies and operation of it?
- should the Waterway continue to be sponsored on a piecemeal basis by county, navigation district, or private contribution?
- should the State of Texas institute efforts to establish an interstate compact with Louisiana, Mississippi, Alabama, and Florida to coordinate local sponsorship for the entire Waterway?



STATE SPONSORSHIP ALTERNATIVES

Decisions regarding local sponsorship of the Texas portion of the Gulf Intracoastal Waterway necessarily will be political ones. The purpose of this discussion is not to provide recommendations concerning the merits or deficiencies of any of the many approaches that may be taken. It is merely designed to illustrate some of the many institutional arrangements which could be employed.

The present system of counties and private individuals providing the various requirements for local sponsorship has resulted in a situation whereby those local interests believe their responsibilities to have been completed. The Corps of Engineers procedures during those early days were not so precise that they obtained contractual guarantees from the various counties and other local interests for continuing local sponsorship. Once the immediate local cooperation requirements were satisfied, even the Corps of Engineers assumed that the requirements were completed. Since the responsibilities for continuing support were not contractual, they exist only in perhaps a moral sense.

Individual land owners who donated many of the rights-of-ways and dredge disposal easements did so because the land at the time had little or no value. These lands are now quite valuable. The private land-owners no longer are willing to "donate" rights of way and easements across their properties.

The counties through which the Gulf Intracoastal Waterway runs could be approached to determine their willingness to assume further responsibilities for local sponsorship. Some counties do not see themselves benefitting from the Waterway as much as others. Often the counties which see the least benefit would be asked to supply the most local support. The counties where the Waterway traverses private property are the ones where the greatest amount of local cooperation may be needed to obtain expanded or additional easements.

Private sources might be approached to provide the necessary local cooperation. The Gulf Intracoastal Canal Association might be asked to assume these responsibilities. It has in the past agreed that it would provide assistance in the local sponsorship process. That association is a private organization whose membership includes both private and public members interested in the Intracoastal Waterway. These interests generally are considered to be those benefitting most directly from the operation of the Waterway. Another approach might be to ask the industries in the state which benefit most directly from the Waterway to develop a private fund from which monies could be spent for additional demands for local sponsorship.

Should Texas decide that it is in the State's interest

for it to assume the responsibilities of local sponsorship and coordination for the main channel of the Gulf Intracoastal Waterway, there are numerous institutional mechanisms it might use.

The State of Texas could follow the Florida design and develop legislation providing for a single special purpose district composed of the counties through which the Gulf Intracoastal Waterway runs. This special purpose district would have as its major purpose the management of the Waterway. An additional method of using special purpose districts might be to allow the various navigation districts to expand their jurisdiction over the Gulf Intracoastal Waterway in those locations immediately adjacent to their waterways so that the entire Waterway would have local sponsorship, provided for by the various navigation districts. The Arroyo Colorado Navigation District experience could be used as a model. Legislation similar to that found in Art. 8263i and 5244a Vernon's Annotated Texas Statutes (V.A.T.S.) would be required.

In examining other possibilities for the state to assume local sponsorship, the Governor of Texas has the power under Art. 5240 V.A.T.S. to condemn all lands which are to be used for a public purpose. Thus, the Governor's Office could provide those items of local sponsorship which are necessary. In the 1962 Rivers and Harbors Appropriations Act, which authorized deepening and widening of the Gulf Intracoastal Waterway from the Louisiana border to Galveston, the Governor did, in fact, agree to cooperate in furnishing items of local cooperation. If the requirements for local cooperation were developed through the Governor's Office, no new legislation would be needed. However, matters of this type are not routinely handled through that office. The Governor also appoints a director for the Office of State Federal Relations who functions as a liaison from the State to the Federal Government. It is conceivable that the Director could assume responsibility for coordinating state sponsorship with the Corps of Engineers.

Another possibility might be a wholly new State agency whose purpose would be the management of the Gulf Intracoastal Waterway within Texas. This would, of course, require new legislation. On the other hand, several State agencies already have functions, powers, or responsibilities which deal with waterways in one or more respects. These state agencies are:

Governor's Office

- Governor of Texas already has powers necessary to provide requirements for local sponsorship. State appropriations would need to be made when the requirements of local sponsorship dictated that funds were needed for specific purposes.

Texas Highway Department

- In addition to the basic responsibility to construct

and maintain the state road system, the agency builds, alters, and removes bridges over the waterway system, and operates and maintains the state ferry system.

- Uses funds collected from diesel and motor fuel taxes.

General Land Office

- Authorized agency to manage public lands of Texas including 4.2 million acres of submerged lands (shore to the three marine league line).
- Designated by the Governor of Texas to implement a Coastal Zone Management Program to preserve and enhance the coast of Texas.

Texas Water Development Board

- Responsible for conservation and development of the water resources of the State including river systems.
- Specifically designated to be the agency to provide coordination and cooperation with the Corps of Engineers or the Bureau of Reclamation in planning water resources projects.
- Manages multi-million dollar Water Development Fund.
- Experienced in managing funds for water resource projects.

Texas Water Rights Commission

- Reviews all proposed Federal water projects and passes on whether or not they are appropriate for implementation in the State of Texas.
- Responsible for issuing permits for the use of surface water in the State of Texas.
- Maintains records on water wells.

Texas Offshore Terminal Commission

- Responsible for the development of a plan leading to the creation of deep draft harbors or terminals for Texas; such plans are to include financing, construction, site location, operational, and maintenance provisions.

Texas Coastal and Marine Council

- Identifies problem areas relating to coastal resources and marine-related affairs and assembles data for informed decision-making.
- Provides advisory assistance in assessing and planning of coastal and marine-related matters in Texas including their relationship to national and international concerns.

Texas Parks and Wildlife Department

- Responsible for game and fish resources of Texas including promotion of commercial coastal fisheries.
- Manages and maintains state parks system.
- Makes recommendations to the Corps of Engineers under the Federal Fish and Wildlife Coordination Act.

- Financial resources available from the Special Game and Fish Fund, the Land and Water Conservation Fund.

State agencies may use taxation (ad valorem or fuel taxes) to collect revenue; however, they would be specifically prohibited from charging tolls on the waterway as long as it is a Federal navigation project.

Any of these funds or agencies might be designated to provide local sponsorship requirements. There also is a need for whatever agency assumes responsibility for local sponsorship to coordinate all activities regarding the Gulf Intracoastal Waterway. Consequently, it would be necessary to develop a systematic coordination effort to take into consideration the submerged lands of the General Land Office, the game, fish, and habitat protection requirements of the Texas Parks and Wildlife Department, the removal or alteration of bridges by the Texas Highway Department, the planning coordination required of the Texas Water Development Board, and the Review of Federal proposals by the Texas Water Rights Commission.

FIGURE CREDITS

Figure

- 1, 7 & 8 Miloy, John and Christian Phillips, Primary Economic Impact of the Gulf Intracoastal Waterway in Texas, Sea Grant Program, TAMU-SG-74-211, Texas A&M University, 1974.
- 2 Waterborne Commerce of the United States, Preliminary Statistics, Part 2, Corps of Engineers, U. S. Department of the Army, 1973.
- 3 Institute of Ecology, Man in the Living Environment, 1972. From Global Ecological Problems Workshop, University of Wisconsin Press, Madison, Wisconsin, 1971.
- 4 U.S. Army, Corps of Engineers, Galveston District, Galveston, Texas, 1973.
- 5 & 6 Holder, Ronald W., Texas Transportation Institute, Texas A&M University; Conceptual Report, Transportation in the Texas Coastal Zone, Coastal Resources Management Program, Division of Planning Coordination, Office of the Governor, Austin, Texas, 1973.
- 9 Etter, Wayne E. and Charles A. Nickerson, College of Business, Texas A&M University. Data derived from U. S. Army, Corps of Engineers, Galveston District, Galveston, Texas, 1974.