THE GULF INTRACOASTAL WATERWAY

IN TEXAS

PRESENTED IN RESPONSE TO

THE TEXAS COASTAL WATERWAY ACT OF 1975

AND

SUBMITTED TO

THE SIXTY-SIXTH SESSION

OF THE TEXAS LEGISLATURE

PREPARED BY
TRANSPORTATION PLANNING DIVISION

THE STATE DEPARTMENT OF HIGHWAYS
AND PUBLIC TRANSPORTATION

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COMMISSION
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IN REPLY REFER TO
FILE NO.

Governor William P. Clements, Jr.

Lieutenant Governor William P. Hobby

Members of the Sixty-Sixth Legislature

Prior to 1975, the need existed for a single, local nonfederal sponsor of the Gulf Intracoastal Waterway in Texas. The Texas Coastal Waterway Act of 1975 filled that need by appointing the State Highway and Public Transportation Commission to act as agent for the State of Texas as the nonfederal sponsor of the Gulf Intracoastal Waterway in Texas.

The Act also instructed the Commission to 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 possible solutions to these problems, an evaluation of the need for significant modifications to the Waterway, and specific recommendations for legislative action, if any.

The evaluation mandated by the Act has been conducted and a report prepared; it represents information based upon available data and reflects the current status of Waterway-related matters as well as the possible future of these matters. It also reiterates the desire of the Commission to foster the growth of shallow-draft navigation in Texas while simultaneously fostering the protection and enhancement of the coastal environment.

The report is hereby submitted to the Sixty-Sixth Legislature in accordance with the Texas Coastal Waterway Act of 1975.

Sincerely yours,

B. L. DeBerry
Engineer-Director

FOREWORD

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World history teaches that each culture, every society and every nation in the history of man has had to face and solve complex problems. America has faced and surmounted her share of these difficult problems; she is now facing another crucial issue, an issue to which there is no single clear-cut solution but one which is fraught with emotion and electrified by far-reaching consequences. The issue of how to preserve or maintain the natural environment without damaging the nation's economy must be settled in such a way that neither the environmental nor the economic quality of life of future generations is unnecessarily restricted.

The presence of the Gulf Intracoastal Waterway in Texas has altered the coastal configuration as well as the coastal environment. This alteration occurred almost thirty years ago. Maintenance of the waterway has been performed periodically, but not without increasing opposition due to the impact on the environment. Decisions about future management practices for the waterway must be based on the best and most current information available. It is the purpose of this study to provide a broad base of factual information about the waterway and the controversies which accompany it in order to aid the decision-making process. To maintain the present vitality of the waterway commerce, decision-makers must consider the essential economic benefits in light of equally important environmental issues. Continued prosperity along the coast of Texas is dependent on maintaining this deliciate balance between the economy and the environment.

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PREFACE

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

In 1975, the state legislature passed the Texas Coastal Waterway Act. This Act authorized the State of Texas to act as local nonfederal sponsor of the GIWW in Texas and designated the State Highway and Public Transportation Commission to act as agency for the State in fulfilling the responsibilities of the nonfederal sponsor.

The nonfederal sponsor works closely with the United States Army Corps of Engineers to provide local cooperation and input into federal projects. Local sponsorship requirements may vary as different projects are authorized by the United States Congress. It is usually the responsibility of the nonfederal sponsor to provide all land needed for construction and maintenance of the project at no cost to the federal government. Many projects also require that the local sponsor make any necessary alterations to pipelines, cables and other utilities which may be located in the project area. The local sponsor may also be required to construct and/or maintain containment facilities for disposal material. Whatever the particular requirements of the local nonfederal sponsor may be, it is a general requirement that the federal government be held free from any damage that might result from con-

struction and maintenance of the project. In the case of state sponsorship, this requirement can be fulfilled only to the extent permitted by state law. Presently, there exists a conflict on this point between state and federal law which has delayed the implementation of full state sponsorship.

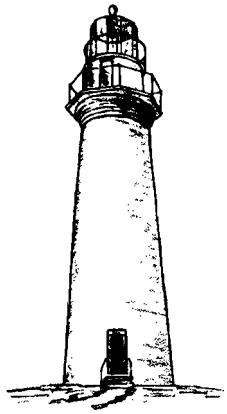
In addition to serving as the nonfederal sponsor of the GIWW, the State Highway and Public Transportation Commission received a legislative mandate to carry out the coastal policy of the State of Texas. The State has declared its support of the shallow-draft navigation of the state's coastal waters in an environmentally sound fashion and its' desire to prevent the waste of both publicly and privately owned natural resources while at the same time preventing or minimizing adverse impacts on the environment. The State has also pledged itself to maintaining, preserving and enhancing wildlife and fisheries. Much of the state's coastal policy emphasizes the importance of protecting the environment while supporting navigation functions at the same time.

To carry out the legislative mandate and to further discharge the duties of the nonfederal sponsor, the Commission was instructed 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 prevent the waste of its coastal resources and minimize adverse environmental impacts while simultaneously fostering an efficient system of navigation, it is first necessary to identify existing conditions and needs. This report, the second in the series required by the Act, is submitted to the Sixty-Sixth Legislature to assist in

achieving usage of the GIWW to its full potential while protecting coastal resources.

SUMMARY

SUMMARY



The Gulf Intracoastal Waterway (GIWW) in Texas was identified in the previous report to the Texas Legislature as a vital marine highway for the transportion of the products vital to the Texas economy. The intervening study period has only reinforced the concept that this waterway plays an important role in the Texas transportation system.

This waterway provides a connecting link between the deep-water ports of Texas and the industrial complexes that have developed around them. More important, however, is the role the waterway plays in connecting the Texas industrial complexes to the trade markets of the Gulf coast and the midwest. The nearly 62 million tons of commodities that moved over the GIWW in Texas in 1976, consisted of petroleum products (34.7%), chemicals (23.3%), crude petroleum (22.6%), non-metallic minerals (7.5%), marine shell (5.0%) and other commodities (6.9%).

Between 1974 and 1976, there has been a decrease in traffic moved over the GIWW; however, a recovery has begun and preliminary figures for 1977 indicate that the traffic will exceed 66 million tons. This volume of traffic will be the highest tonnage figure since the peak tonnage in 1972. Most of the decreases in traffic since 1972 have been identified as caused by heavy decreases in the amount of crude petroleum and marine shell moved in commerce. The lower production of these natural resources in recent years has led to substitution of foreign imports or other materials which do not often move by barge.

The losses to the total tonnage transported caused by the first two commodities has begun to be offset by substantial increases in the amount of petroleum products and industrial chemicals moved in commerce. Since these two commodities moved either in intrastate traffic or in interstate imports to Texas, a decline in these two categories was also apparent. On the other hand, most petroleum products and industrial chemicals are Texas products destined for markets in other states so an increase in interstate shipments from Texas has occurred.

While over 82% of products shipped into Texas originate along the Gulf Coast, over 50% of Texas products moving out of the state via the GIWW are destined for inland ports along the Mississippi, Ohio, Illinois and Tennessee Rivers. This area in mid-America represents a major part of the market for Texas exports.

While the commerce on the waterway remains a major factor in the Texas economy, the concern for the preservation of the state's wetlands must be a major consideration in any plan for improvements to the waterway. Likewise, development of the Gulf coast of Texas as the playground of Texas continues. This also produces greater pressures on the marine commerce as more recreational craft use the waterway. This growing use is especially apparent on summer weekends when the number of recreational craft reaches astounding proportions.

All of this usage continues to make safety a primary concern regarding the waterway. This is especially true since the majority of products moving are hazardous cargoes, both to the human and the natural environment. To protect lives and our natural resources, it is imperative that improvements to the waterway be initiated. In addition to these

concerns, Texas industry must remain competitive with other regions to protect the state economy.

Many of the major markets receiving Texas products are located on rivers whose channels may be only 9 feet deep, but have widths of over 200 feet. Many important markets can handle barge tows consisting of 20-40 barges while the GIWW is restricted to a maximum of 5 barges in single file. To remain competitive, the GIWW must be improved to allow larger tows moving these Texas products.

The current U.S. Army Corps of Engineers study regarding improvements to the Texas-Louisiana section of the GIWW is now in progress and should be completed in 1981 with the final recommendations to Congress being submitted in 1984. This study will look at channel dimensions, lock restrictions, channel alignment, bank erosion, salt water intrusion and the impact of improvements on the environment.

Our study has shown that the alignment of the channel is the major restriction on larger tows. The present widths are not even sufficient for the present maximum tow size when the sharp curvature is considered. Model studies are needed to determine the most efficient curvature that should be used in conjunction with increased channel dimensions.

Of increasing concern to navigation interests and supporters is the changing political climate regarding navigation projects. A major step initiated by the last session of Congress is the imposition of a fuel tax on commercial users of the inland navigation system. The first user tax ever imposed on the inland navigation industry culminated from a two year battle in Congress. Of more concern to the states is

the increasing clamor for cost-sharing by the states on all water projects. Currently proposed is a 10% up-front share of all new navigation project costs to be borne by the states.

This study did an engineering estimate of the required work items necessary for various proposed channel dimensions to improve the GIWW in Texas. The accompanying cost estimates show that the state would need to contribute approximately 10% of the total project costs for these improvements. This is only the sponsorship costs and could be further increased should cost-sharing proposals be initiated. Over 50% of the state's share of project sponsorship costs could be saved if the reuse of containment facilities could be inaugurated. In addition to the cost savings, such methods could reduce the pressure on the existing wetlands and still provide an environmentally acceptable project.

The formal inauguration of state sponsorship responsibilities has been delayed due to a conflict between federal statutes and state constitutional requirements. Attempts to solve this impasse through special federal legislation was thwarted during the closing days of the last session of Congress when the House of Representatives failed to take action on the legislation during the last-minute adjournment rush. Attempts to resolve this conflict will continue when the next session of Congress convenes in January, 1979.

CHAPTER ONE

A SUMMARY

OF THE PREVIOUS REPORT

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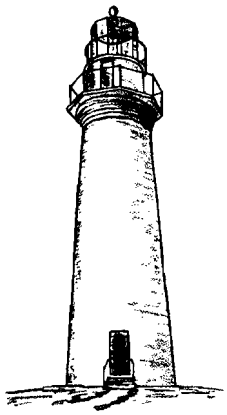


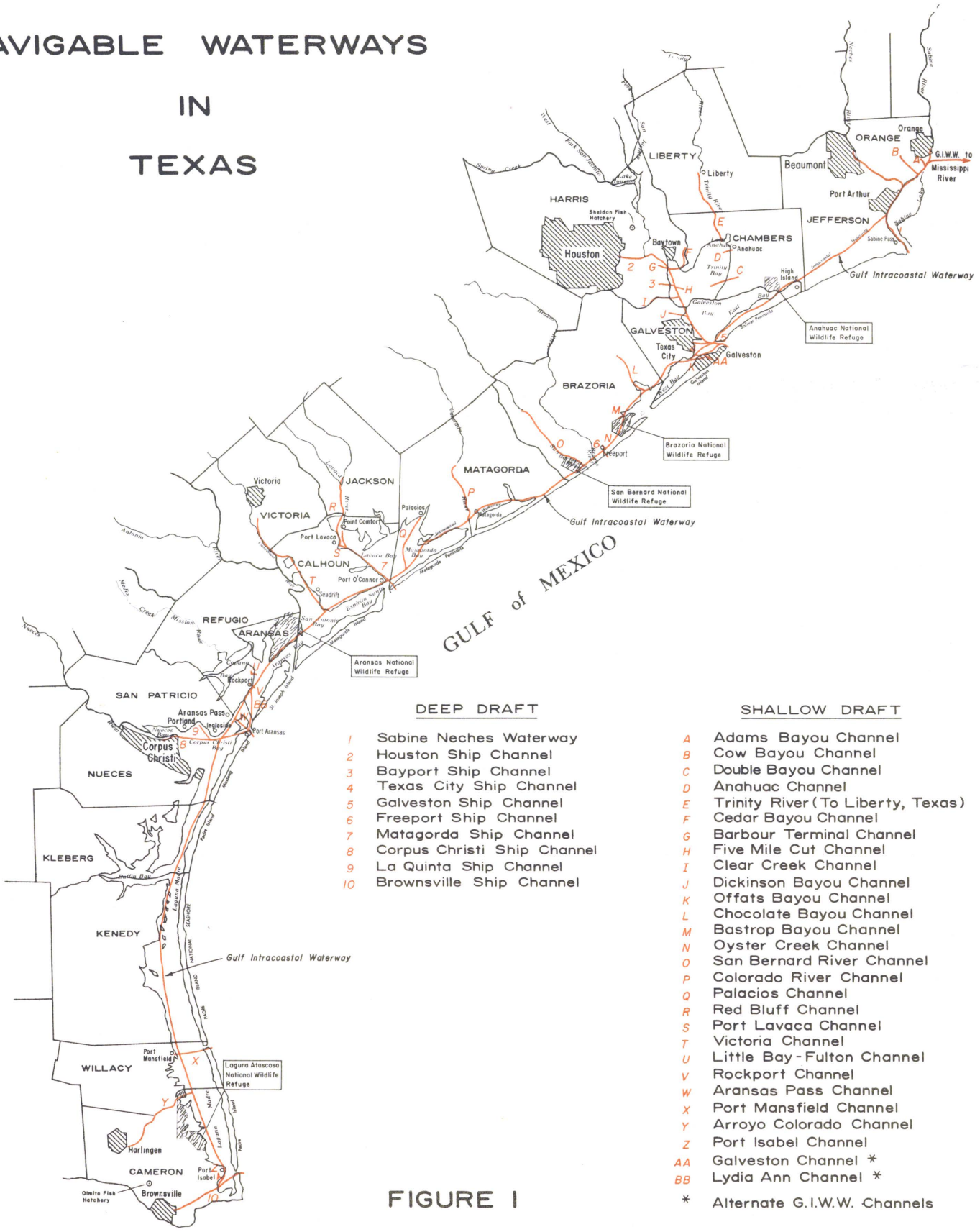
The Gulf Intracoastal Waterway (hereinafter cited as the GIWW) extends approximately 426 miles along the entire Texas coast. Stretching in all over 1,100 miles from Florida to the Mexican border, the waterway has for years served to connect Texas with other major waterways of America. Figure 1 shows the major navigable waterways in Texas.

Through the GIWW, Texas' economic development has been enhanced by advantageous trade exchanges with markets in other states and nations. Increasing competition with other regions in world trade, coupled with a growing dependence on foreign imports for a large proportion of essential raw materials, has created an increased interest in this waterway as a vital link in our state's total transportation system. Most of the GIWW tonnage consists of low-cost liquid and dry bulk commodities which lend themselves well to the economies and energy-efficiencies of barge transport. These factors in turn stimulate further industrial development along the Texas coast.

Development of the Waterway

The Texas coast is composed of an almost continuous series of shallow bays, protected from the storms of the Gulf of Mexico by many low barrier islands and peninsulas. These shallow bays were not originally well-suited for modern navigation. As Texas entered the twentieth century, deep draft channels were dredged to enable modern vessels to service our ports. Likewise, the canals and shallow channels

NAVIGABLE WATERWAYS IN TEXAS



DEEP DRAFT

1	Sabine Neches Waterway
2	Houston Ship Channel
3	Bayport Ship Channel
4	Texas City Ship Channel
5	Galveston Ship Channel
6	Freeport Ship Channel
7	Matagorda Ship Channel
8	Corpus Christi Ship Channel
9	La Quinta Ship Channel
10	Brownsville Ship Channel

SHALLOW DRAFT

A	Adams Bayou Channel
B	Cow Bayou Channel
C	Double Bayou Channel
D	Anahuac Channel
E	Trinity River (To Liberty, Texas)
F	Cedar Bayou Channel
G	Barbour Terminal Channel
H	Five Mile Cut Channel
I	Clear Creek Channel
J	Dickinson Bayou Channel
K	Offats Bayou Channel
L	Chocolate Bayou Channel
M	Bastrop Bayou Channel
N	Oyster Creek Channel
O	San Bernard River Channel
P	Colorado River Channel
Q	Palacios Channel
R	Red Bluff Channel
S	Port Lavaca Channel
T	Victoria Channel
U	Little Bay - Fulton Channel
V	Rockport Channel
W	Aransas Pass Channel
X	Port Mansfield Channel
Y	Arroyo Colorado Channel
Z	Port Isabel Channel
AA	Galveston Channel *
BB	Lydia Ann Channel *
*	Alternate G.I.W.W. Channels

FIGURE 1

connecting the bays were widened and deepened somewhat to enable the institution of an inland marine transport system between ports.

The federal government assumed control of the waterways along the Gulf Coast in 1925. Work on the first channel to connect Texas with the Mississippi River was authorized in that year by the United States Congress. By 1941, a nine-foot deep, 100-foot wide waterway extended from the Sabine River to Corpus Christi Bay. The United States Army Corps of Engineers completed dredging of the entire GIWW to 12-foot by 125-foot dimensions in 1949. This waterway has been maintained at those same dimensions for over 25 years.

In light of the continually growing traffic on the GIWW, Congress in 1962 authorized the expansion of certain segments from 12-foot depth to 16-foot, and from 125-foot width to 150-foot or 200-foot in some cases. For reasons which will be explained below, this expansion was never begun. Meanwhile, the dimensions which were authorized in 1962 have already become obsolete. Due to the phenomenal growth of traffic in recent years, as well as the improved technology of barge transport, the Corps of Engineers has begun a new study to bring desirable waterway dimensions in line with modern navigation needs. This study will not be completed until 1984. Only then will Congress decide whether to reauthorize expansion of the waterway.

Commerce On The Waterway

Approximately 100 million tons of commerce per year are moved up and down the length of the GIWW. For many years, the Texas portion alone has handled over 60 million tons. Total commerce on the GIWW in Texas for 1976 was 62 million tons. An additional indication of the

importance of this waterway to our state economy is that nearly 75% of all Texas exports currently leave the state by water. All inland domestic waterborne commerce in the Texas coastal zone uses the GIWW or its' tributaries to some extent.

Since 1962, the growth rate for commerce on any section of the GIWW in Texas has averaged at least 4.4% per year. Demand for low cost, energy efficient transport shows no signs of letting up. If the growth rate continues, as an expanding industrial complex along the coast might indicate, traffic on the GIWW in Texas will have doubled by the year 1990. The dominant products transported on the GIWW in Texas are petroleum products, chemicals, and crude petroleum.

In spite of an oil embargo and a sluggish economy in recent years, new refinery and petrochemical plant construction currently underway suggests that the need for transporting commodities in this category also will continue to increase. The planned construction of onshore or offshore terminals along the Texas coast would indicate a continued need for low-cost barge transportation to supplement pipelines. As the energy crisis forces conversion from natural gas to coal and fuel oil, much of these energy sources will also be transported by barge, thus further increasing traffic on the GIWW.

The importance of an efficient, navigable, shallow-draft channel to Texas commerce is significant. Approximately 35% of the total commerce at Texas ports is transported on the GIWW or its tributaries. The total value to these port cities is estimated at over $890 million annually, or almost 9% of their total income.

Other Users of the Waterway

The transportation of industrial raw materials or products is not the only beneficiary of the GIWW and its tributary channels. Commercial fishing boats have been major users of the navigation channels. Indeed, some of the navigable channels are maintained more for the use of fishing and private craft than for commercial traffic. In addition, records show that for one 43-mile segment of the GIWW, commercial traffic constituted only 63% of the total. The remaining traffic was recreational (19%), fishing vessels (11%), and work boats (7%). Safe harbors have been provided all vessels for protection against storms. Small craft are now able to move from one area of the coast to another without exposing themselves to the hazards of open-water navigation. In the event of portending hurricanes, many of the small craft use the channels to flee the area due to be hit by the storm, some traveling inland on the river channels maintained for this and other purposes.

Aside from the advantage of water transportation to the industrial complex that has developed along the coast and the enormous effect industry has had on the Texas economy, there are substantial boosts to our economy from other sources. The fishing industry has a measurable impact as does the recreational boating which has become a part of the life style for Texans. For instance, the Clear Lake Chamber of Commerce has reported 3,000 boat slips for lease and 500 dry dock storage facilities available. This constitutes a greater amount of storage space in this one area than is available in the City of Chicago. Much of the growth in sports fishing, residential development, recreational boating and tourism along the coast is attributable to ready access to the bays through the channels connecting them.

Technological Improvements Saved The Day

Many of the changes in lifestyle and the resulting demand on coastal waters have taken place within the last twenty-five years. During this same time period the demand for commercial marine transportation has more than tripled. Without improvements in equipment and operating methods, the impacts of increased tonnage on marine transportation could have been catastrophic.

Since 1940, standard 900-ton-capacity barges have been replaced by jumbo barges with a capacity of 1,400 tons. Even larger barges of over 2,000 ton capacity are now in service in some areas. Even more important than size and capacity is the new, more efficient design of barges that permit much larger tows with fewer horsepower required to push them to their destination. Improved hull design, reduction gears and steering mechanisms have increased the efficiency of modern towboats. It has been such innovations in equipment that has enabled the industry to keep pace with the growth in demand for marine transportation services.

Unfortunately, such prosperity has been accompanied by many problems. The GIWW is presently handling many times the amount of traffic it was designed to accommodate. Tonnage has increased 90% from 1961, and yet the canal has remained the same since 1949. Petroleum refiners and others who use the waterway are attempting to meet today's big tonnage demands on a facility designed in the 1930's. It is as if a heavily-traveled urban freeway had never been expanded beyond two lanes.

Safety Hazards and Restrictions

Aside from actual channel dimensions of the waterway, other

restrictions exist along the GIWW which can affect traffic. In the past, a number of bridges over the GIWW constituted a hazard to safe navigation, resulting in numerous collisions of ships or barges with bridge structures. The most hazardous of these bridges have been replaced in recent years.

Two major restrictions on GIWW traffic remain a problem. The GIWW, being a tidal facility, uses locks to prevent siltation or salt water intrusion at river crossings. In Texas there are two of these structures, the Colorado River Locks and the Brazos River floodgates. When these two rivers reach certain flood levels, or when currents reach certain speeds, traffic must be substantially restricted or terminated. At the Brazos River floodgates, for example, all traffic is suspended when the river level is 1.8 feet above that of the GIWW.

Shipping delays are the result of either the closing of these Texas structures or the increase in traffic beyond the ability of other locks to pass traffic through quickly and efficiently. This is especially the case at the Vermillion Locks in Louisiana, an outmoded structure that is already approaching its ultimate capacity. Replacement of this structure with a modern facility is a must for any major increase in Texas commerce to become a reality.

Existing physical restrictions and the resulting congestion along the waterway present a substantial threat of accidents. Currently petrochemical products constitute almost 80% of all commodities transported on the GIWW in Texas. On some sections of the waterway, such as in the Galveston to Port Arthur area, this percentage is even higher. Most of these products transported are of a highly volatile, flammable

or toxic nature. A recent study by the United States Coast Guard has termed the GIWW between the Mississippi River and Galveston Bay as the most hazardous waterway in the United States.

The Gulf coast of Texas is the location of 25% of the state's population and 25% of the total United States refining capacity as well as 40% of the nation's petrochemical capacity. Restrictive dimensions of the waterway only add to the existing hazards: curves, treacherous currents, narrow bridge spans. All of these conditions, coupled with some expectable human error, make the GIWW potentially one big accident waiting to happen. To date, very little serious environmental or property damage has occurred because of accidents, but if the present 12-foot x 125-foot dimensions are maintained, more accidents are inevitable. Any one of those accidents could seriously impact an entire community, industrial complex, ecological system, or worse.

The Coastal Wetlands Are Threatened

The course of the GIWW in Texas leads through some of the most productive areas on earth, the wetlands, and at the same time parallels other productive areas, the uplands. Not generally realized is the fact that this coastal zone is more productive than any agricultural area of the state. Estuarine marshes may return an annual total of $4,150 per acre by their natural uses for fish-nurseries, aquaculture potential and tertiary waste treatment. The capitalized value of each acre of estuarine marsh could reach $83,000 per acre.

At least two-thirds of the commercially important species harvested on the Atlantic and Gulf Coasts are estuarine-dependent, and well over one-half of the total production of organic matter in a Gulf Coast

esturary originates from the surrounding marshes. In addition to these marshes, the shallow bays lining the Texas coast are primary habitat for many species of finfish and shellfish. Submerged vegetation found in shallow bay waters provide feeding areas for many species, while the marshes also serve an important recycling function for inorganic material coming into coastal waters from populized areas upstream. In essence, the wetlands perform many necessary environmental functions which if interrupted can spark a chain reaction of environmental degradation.

One important potential threat to the fragile environmental balance of this area comes from the dredging of navigation channels and the disposal of material dredged from them. Dredging is a continual process required to remove accumulations of sediment. Dredging itself alters bay bottoms, often removing desirable marine habitat. The turbidity introduced into bay waters by dredging is also destructive to less mobile marine life.

Problems of Dredge Disposal

The primary problem associated with dredging, however, is the disposal of dredged materials. Maintenance of the GIWW alone requires the removal and disposal of over 11 million cubic yards of material per year. Both upland disposal and deep ocean disposal are quite costly, due to the great distances which the material must be transported. The most efficient and economical dredging method, hydraulic dredging, involves disposal of dredged material adjacent to the waterway.

By redepositing this material adjacent to a channel in open water, islands or near-emergent shoals are formed parallel to the channel.

Many of these mounds cut off water circulation in the bays and can block migration of fish. Land disposal, filling in large areas of the marshes, not only destroys parts of the marshes as fish nurseries but can also alter adjacent areas by diverting the natural drainage flow.

In some instances, however, the impacts of dredging can be positive. Emergent "spoil" islands have often become the nesting area for various waterfowl. The isolation of these islands makes them inaccessible to predators. Dredging can sometimes improve the circulation in highly saline bay areas, thus improving the habitat for marine organisms. Furthermore, the accidents which may result from present restrictions on the waterway could ultimately result in far greater and more lasting damage to the coastal environment than any damage resulting from disposal of dredged material to maintain the waterway at safer dimensions.

In recent years, the Corps of Engineers has begun building levees around disposal areas to help contain dredged material and limit the extent of damage to the wetlands. While many serious environmental implications remain, research is seeking the best answers to these problems.

Solutions Sought to Disposal Problems

One partial solution to the problem of dredge disposal which the Corps of Engineers has been developing in recent years is the use of long-term planning for dredge disposal. Careful planning is required to predict the total dredging requirements for the design life of a project. Efforts are then made to procure containment facility sites of sufficient size to handle the dredged material. Modern investigative

and design methods can allow the construction of safe, efficient containment facilities, while using fewer, smaller disposal sites.

Even containment is not always a perfect solution. Poor construction and foundation materials coupled with the extremely low elevation of coastal land make construction of containment facilities both difficult and costly. The levees themselves are often subject to erosion, foundation settlement and seepage. Other problems associated with such facilities include odor, mosquito breeding, excessive dust and noise, and the aesthetic impact of the facility itself.

Current studies are seeking new methods to make containment more efficient in both operation and function. These include modern investigative and design techniques, techniques to facilitate desiccation of the material, alternative uses for the facility such as agriculture and aquaculture, and, particularly, future land uses for the facility once it has fulfilled its original purpose. All of these objectives are to help make such facilities a more useful or desirable neighbor for adjacent or nearby property owners.

Beginning with the National Environmental Policy Act of 1970, an increasing number of regulatory constraints have been exercised with regard to dredge disposal. A growing concern of the public with environmental considerations has been coupled with the complex federal coordinating procedures. Environmental awareness, perhaps more than any other single factor, has subjected the timely maintenance and improvement of the GIWW to costly, time-consuming procedures. Under the most favorable circumstances, compliance with federal environmental policies now requires an average of ten to twelve years to initiate major work

on a waterway.

The Need For State Sponsorship

In many cases, expenses of initial non-federal sponsorship were borne by counties who derived little or no economic benefit from proximity to the waterway. Continued maintenance dredging costs coupled with citizen resistance to higher local property taxes were among factors which caused local governments to resist continuation of local sponsorship for the GIWW. State sponsorship became an increasingly necessary solution. In 1975, the Texas Legislature decided that the state would be responsible for the GIWW in Texas.

Specifically, the Texas Coastal Waterway Act of 1975 directed the State Highway and Public Transportation Commission to cooperate with all appropriate state and federal agencies to determine and to fulfill all sponsorship requirements relating to the GIWW in a manner consistent with policy of the State of Texas; to acquire all property or interest in property deemed necessary to fulfill its' responsibilities under the act; and to coordinate with appropriate state and federal agencies all actions or proposed actions which have potential for significant environmental impact on the coastal resources. The Commission was further directed to continually evaluate the GIWW as it relates to Texas. Such evaluations are to include assessment of the importance of the GIWW; identification of principal problems and solutions; evaluation of the need for modifications to the GIWW; and specific recommendations for legislative actions. The results of the evaluation are to be published in a report to be presented to each regular session of the Legislature.

State Recommendations for Improvements

This evaluation of the GIWW has shown a dramatic increase in commerce on the Texas portion of the GIWW in recent years. It is predicted that this increase will continue in the future, overcrowding the waterway, and endangering life and property if improvements are not forthcoming. In light of the long delays now facing any proposed improvement on the GIWW, the Commission in 1976 recommended that a study of the following four improvements be initiated without delay:

1) The GIWW from the Sabine River to Corpus Christi Bay should be enlarged to provide a minimum 250 foot wide channel to permit wider tows in an attempt to relieve the growing congestion on the GIWW.

2) The depth of this section of the GIWW should be increased to 16 feet to allow more efficient movement of larger tows with less frictional bottom drag due to the increasing draft of the barges.

3) The improved channel between the Sabine River and Corpus Christi Bay should be straightened where possible and all curves eased and widened to allow safer navigation of this improved channel.

4) A feasibility study should be inaugurated to determine the cost and justification for converting the Brazos River floodgates to full locking facilities. The delays necessary during rises on the Brazos River can be reaching the point where they can no longer be tolerated.

In its 1976 report to the Texas Legislature, the Commission noted that if these four recommendations were implemented, substantial state and federal funding would be required.

While ultimate solutions to the environmental problems herein discussed are being sought through research and the coordination of efforts, dredging for navigation purposes must continue. To prevent these ac-

tivities from further altering the marine environment, the present trend is to improve dredging practices whenever possible and to contain almost all dredged materials in containment facilities.

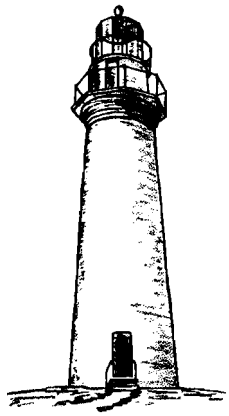
There are no practicable means available to protect the adjacent wetlands when the ultimate control of the disposal property rests with a third party. Easements would be suitable only when the term of the easement is sufficient to fully satisfy the anticipated dredging needs, when the property is not located in or adjacent to wetlands vulnerable to damage, and when the right to build and maintain containment facilities can be obtained.

In accordance with the improved dredging and disposal practices, the Commission has expressed its' desire to acquire with title in fee simple all lands required by the Corps of Engineers for dredge disposal purposes, whenever it is deemed advisable to do so to protect marine resources, and so long as the necessary funds are available.

CHAPTER TWO

THE GIWW - A MULTI-PURPOSE WATERWAY

THE GIWW --- A MULTI-PURPOSE WATERWAY



The Gulf coast of Texas, as civilized man first viewed it, had much the same configuration as we know it today. The retreat of the glaciers and the subsequent rising of the ocean's waters produced the series of shallow bays at the drowned mouths of the state's rivers. The forces of nature constructed the barrier islands from the tremendous volumes of sediment carried into the Gulf from the nation's interior. These barrier islands produced a further series of shallow bays between the islands and the mainland coast. Only in the extreme northern part of the Texas coast were there no connecting bays produced.

The shallow bay bottoms, the grass flats, and the salt or brackish marshes lining the edges of the bays combined to provide one of the world's most perfect habitats and nurseries for the marine creatures. The presence of these creatures and the favorable winter climate caused many varieties of aquatic fowl to make this area their wintering range, if not their permanent habitat.

It was the wealth of marine food resources that also attracted the early Amerind tribes to settle along the coast. These early settlers adjusted to their environment rather than attempt to change the environment to match their former lifestyle. However, it was a different story with the settlement of the area by European settlers.

Civilized man, as we know him, has never been completely content to adjust his lifestyle to his surroundings. Instead he has a driving

desire to change his surroundings to suit the way of life he has previously known. Settlement along the coast was relatively slow except for the establishment of the ports necessary to communicate with other areas of the world or nation. Immediately the coastal environment became a challenge to this new settler.

Nature Presented Challenges to Man

Only three rivers, the San Bernard, the Rio Grande and the Brazos had direct exits into the Gulf of Mexico. All other rivers discharged into the bay system along the coast. The only major passes into the bays were the Brazos Santiago Pass between Brazos Island and Padre Island; Aransas Pass between Mustang Island and San Jose Island; Pass Cavallo between Matagorda Island and the Matagorda Peninsula; San Luis Pass between Follets Island and Galveston Island; Bolivar Roads between Galveston Island and Bolivar Peninsula; and Sabine Pass at the state's eastern border.

In all cases, whether river mouth or entrance pass, the bars obstructing the entrances presented one of the first challenges to these new settlers. The hazards of navigating the constantly shifting bars to seek the shelter required for the unloading of settlers and supplies or the loading of Texas products called for changes to be made to the existing environment. From this point on, man has been changing the coastal environment.

Most of man's activities in settling a new country will have significant impact on the previously pristine environment. Establishment of settlements and farms will bring pollution and loss of marshland or

forest. Diversion and blocking of streams to protect settlements against flooding, provide stable water supplies, or irrigate farmlands all change the ratio of fresh waters to salt waters at their interface or reduce the amounts of nutrients or eroded materials carried by the streams. The dredging of channels across the bars and the construction of jetties to protect these new channels have also had tremendous effect on the coastal environment. Finally, the series of shallow channels built by man to connect the coastal bays, which evolved into the GIWW in Texas, completed the transformation of this fragile coastal environment.

It is not meant to imply that all changes to the environment are necessarily of an adverse nature. Some changes permit improved fresh water inflows to combat hypersalinity in certain bays or provide escape routes for mobile creatures to prevent or reduce massive fishkills due to extreme temperature changes. Other effects are increased safe nesting areas for many waterfowl species provided by the emerging spoil disposal islands in open bay areas. However, the major effect of man's activities has been a loss of habitat for certain species.

In recent years, attempts have begun to reduce the pressures on the remaining prime habitat areas. One method has been the acquisition of key remaining areas to preserve them in their existing condition. Problems of pollution are being attacked by stricter controls on the pollution sources. Also, attempts to determine the necessary fresh water inflow have been inaugurated and controls regulating such flows will be considered. Dredging and filling of wetlands has come under strict control and attempts are constantly being made to mitigate the

impacts of such actions when the projects are deemed necessary.

Pressures On The Environment Continue

However, the pressures of man on the coastal environment continue to build. The previous report to the legislature identified the 19 counties directly involved with the GIWW as possessing 25% of the state's population in 1970, on only 6% of the land area. In the same period, nationwide, at least 75% of the American population lived in coastal states.[1] Some researchers predict that by the year 2000, 80% of the nation's population will live within 50 miles of the nation's coast.[2] Such trends for urbanization of the nation's coasts are typical of what has been happening along the Texas coast.

The five major deep-draft channels constructed at the major natural passes through the barrier islands and the diversion of the Brazos River to permit another deep-draft port set the sites for the major urbanization and industrialization concentrations along the Texas coast. The coastal industrial complexes are dependent on the shallow-draft channel connecting them to each other and to the trade markets along the Gulf coast and the Mississippi River system. Most of the marine trade transported to or from these areas moves by barge over the GIWW, while the marine trade with the Atlantic or Pacific coasts moves via ocean-going vessels.

[1] Christian Phillips, Indirect Economic Effect From Gulf Intracoastal Waterway Commerce in Texas, TAMU-SG-74-218, page 7.

[2] "States Rights vs Federal Power in Coastal States", Washington Post, October 5, 1978.

The extent of the trade conveyed by the GIWW and the problems associated with the restrictive channel dimensions under the conditions of the heavy traffic are covered in detail elsewhere in this report. The estimated value of this trade to the economy of Texas was addressed in the previous report. However, two major questions have so far remained unanswered in our studies.

Questions Still Unanswered

The first of these questions was the mandate in the Texas Coastal Waterway Act of 1975 to identify the direct and indirect beneficiaries of the waterway. Two easy, but superficial, answers would be to limit these beneficiaries to those directly involved in the commercial transport of commodities on the waterway for the direct beneficiaries, and to every citizen of Texas as the indirect beneficiaries because of the effect of the trade on the total Texas economy. Neither answer would be a valid answer to this mandate.

The first problem involved in finding an answer to this question involves the lack of data to give a true insight into the role of shallow-draft navigation in the total state transportation system. Only when the relationship of this one mode to all of the other modes is clearly defined can the beginnings of an answer be approached. Preparations for a complete statewide commodity transportation study are now in progress. The results of such a study may enable the true and complete definition of the role of each transportation mode. Even with the role defined, the problem of tracing each of the beneficiaries will still be difficult. Recent studies of the benefits derived from the marine trade through the port of New York have shown these benefits to

be much more widely dispersed than had previously been identified in other such studies. Actual benefits are even dispersed across state and regional lines since the eventual consumer of every product, so transported, must be included as a beneficiary.

The second question that has been left unanswered is the complete assessment of the importance of the waterway to Texas. The difficulty in assessing the role of a waterway that saw the first section opened to traffic in 1933, and final completion in 1949, is almost insurmountable. The forty-five years of the life of this project have seen many changes in the Texas economy, population growth and distribution, and in the lifestyles of these persons. It becomes impossible to separate the role that improved water transportation had in these changes because of the other factors having their own effects during this same period of time. There is a similar problem in assessing the importance of marine transportation along many of the major rivers of the United States because of the time interval of their utilization.

A Look At A Newer Waterway

Perhaps the clearest picture of the importance of a navigable waterway can be best illustrated by looking at a more recent addition to the navigation system, where the changes are more identifiable. The McClellan-Kerr Arkansas River Navigation System is a prime example. This project was completed in 1970 and has been in complete operation for only 8 years. The total cost of the project was $1.8 billion and it took 25 years for final completion.

The project is surrounded by 28 counties in Arkansas and Oklahoma.

These counties in 1950 had a population of 1.14 million persons, 18.2% of whom were employed in agriculture. Modern farming methods were already reducing the demand for farm workers, so that by 1960 there was a net migration of nearly 100,000 persons away from the area.[3] In 1967, navigation was opened on the completed portions of the waterway with a total of 739,000 tons of commodities being transported. With the full project opened in 1970, the trade had grown to nearly 4 million tons and in 1976, reached a peak of 6½ million tons. During the first eight months of this year, the traffic has already exceeded 7 million tons.

During this period of increasing use of the waterway, the population of the area had reached 1.5 million by 1975 and the negative migration away from the area had been reversed with a net increase of 53,000 persons moving in during the 1970-1975 period. The percentage of agricultural workers had fallen to 3.9% and the per capita income, adjusted for inflation, has risen from $2,703 in 1967, to $3,239 in 1974. Likewise, the total personal income had increased by 31.1% in the 1967-1974 period.[4]

Some of these changes were due to the 497 new or expanded plants opened along the waterway between 1970-1975. Twenty-one percent of these facilities listed access to water transportation as one important factor for the change in facilities and 37% listed low transportation rates as an important factor.[5]

3 The Waterway, The Kerr Foundation, June 1977.

4 Ibid

5 Ibid

The increase of tonnage on the waterway saw the outbound shipments reach parity with the inbound shipments in 1976. Half of all of these shipments are now involved in trade with markets on other waterways. The agricultural shipments have risen to 14.1% of the total shipments in 1976. This growth, combined with the construction of new fertilizer plants and grain facilities is having a substantial impact on the region's agriculture.[6]

The lakes formed by the main-stem dams have seen attendance at the recreation facilities grow from zero in 1964 to almost 12 million visitor-days in 1976. The average expenditure for these visitors is estimated at $9.50 per day, not including expenditures for major recreational equipment.[7]

Aside from these financial gains from the existance of the waterway, about 3 billion kilowatt-hours of electrical energy is produced annually by the six hydro-electric plants associated with the project. In addition, the upper lakes on the system have provided additional recreational usage as well as flood protection for the area.[8]

Since this waterway was completed after the passage of the National Environmental Policy Act of 1969, post-completion development is proceeding under strict environmental controls. The pressures on the environment caused by increased population, industrial development, and the heavy recreational usage are being controlled and limited by more

[6] Ibid

[7] Ibid

[8] Ibid

recent environmental legislation.

Although no dollar figure has been placed on many of the values received from this project, it is evident that the entire cost of this project will soon be matched by local investments and the increase in the regional economy. The short term in which this project has been in operation points out, most dramatically, the benefits that can come from such a multi-purpose project

The GIWW was constructed in a different era and the prime purpose of the project was the economical transportation of the region's products. For all practical purposes, the sole purpose of this project was navigation. Unlike the Arkansas River project, there are no dams for water supply, hydro-electric power generation, or flood control. Also there was little consideration given to recreational or other uses for the waterway. However, the industrialization of the Texas coast caused many coastal urban areas to experience unusual growth. The transition of these areas from a basic agricultural economy to an industrial one produced new lifestyles for the inhabitants. The increase in incomes and available free time led to a new emphasis on recreation.

Coastal Recreation Becomes A Dominant Force

Early residents along the coast had always been attracted to the nearby sources of seafood and the enjoyment of sports fishing. Many of these older residents had made a living in commercial fishing or as providers of sporting facilities for the inland residents. Now, however, the new lifestyles enabled many others to participate in recreational activities in the coastal waters.

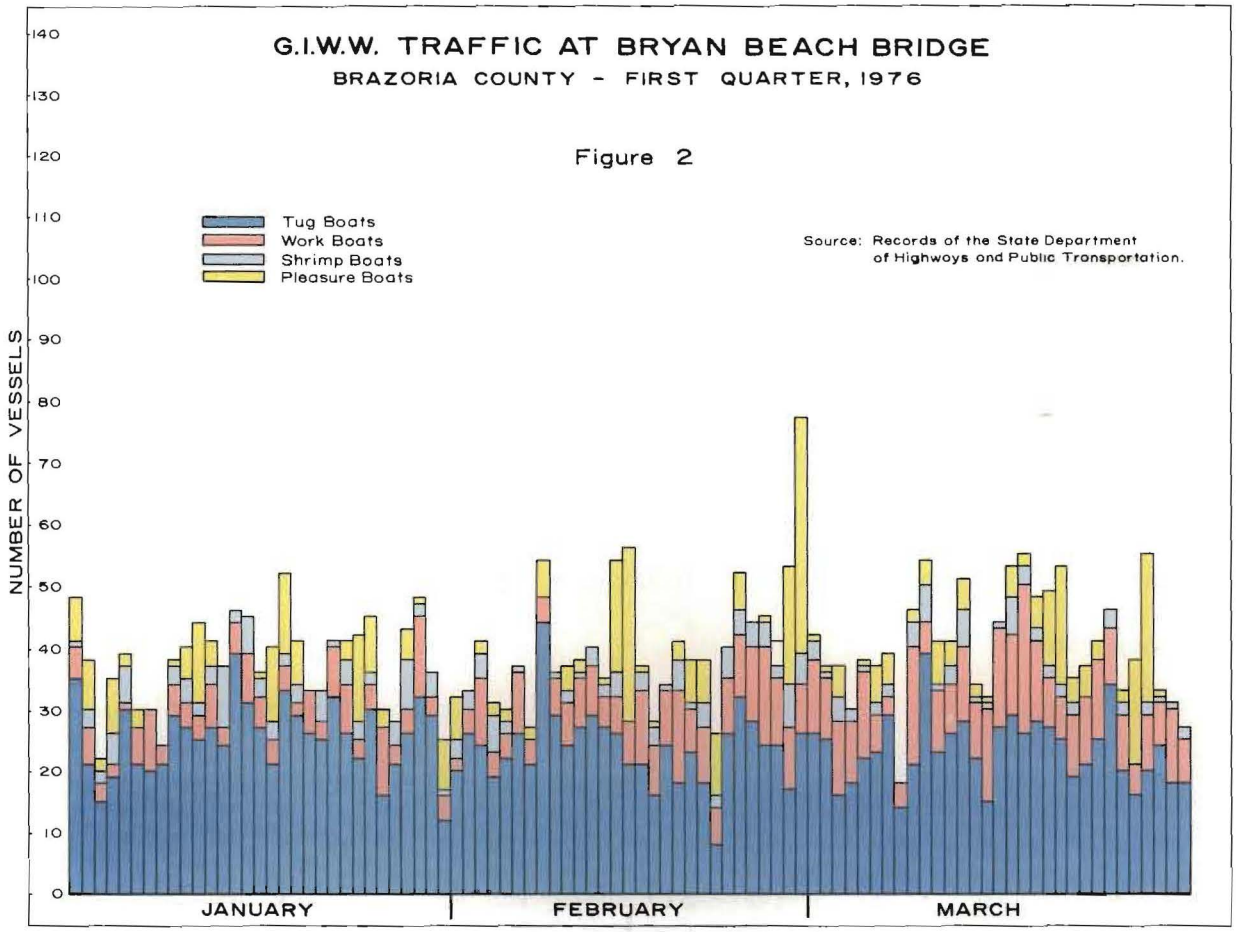
The new affluence of this urban population led to many new pressures on these waters. At first, it was the mushrooming of week-end beach homes; later came the influx of condominiums, live-in marinas, and even permanent residences. Improved transportation facilities enabled many people to commute to their places of employment and others to travel greater distances to the coast for recreation. Today, the bays and near Gulf have become the state's largest playground. All of these activities have had a tremendous impact on the local and state economies but there has also been a substantial adverse impact on the coastal environment.

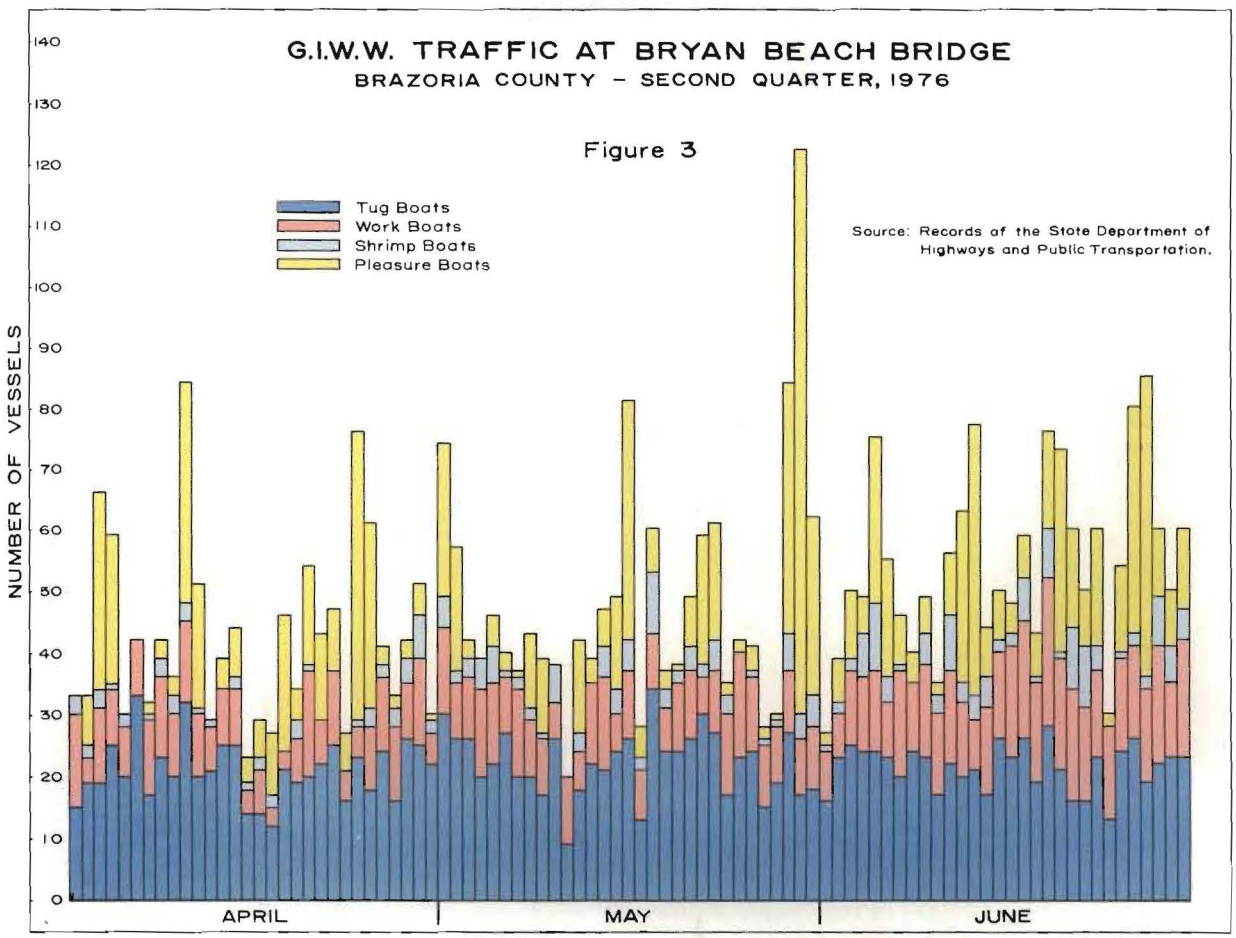
Since the only safe access to the Gulf is through the jettied channels, most of the recreational facilities have tended to concentrate in those areas. Although sportsmen often use the bays between these channels for fishing or hunting, there is a definite lack of waterside facilities in many of these areas. On many of the other inland waterways there are recreational facilities available every few miles along the shores. However, such is not the case for the GIWW. Recreationists who travel up or down this waterway find long stretches where there is neither access to the bays nor facilities where small craft can stop or tie-up overnight without being anchored in the main channel. Even many of the marinas, when reached, are found to be filled to capacity with no facilities for transients. Plans should be formulated to reduce such unsafe practices by the provision of needed facilities.

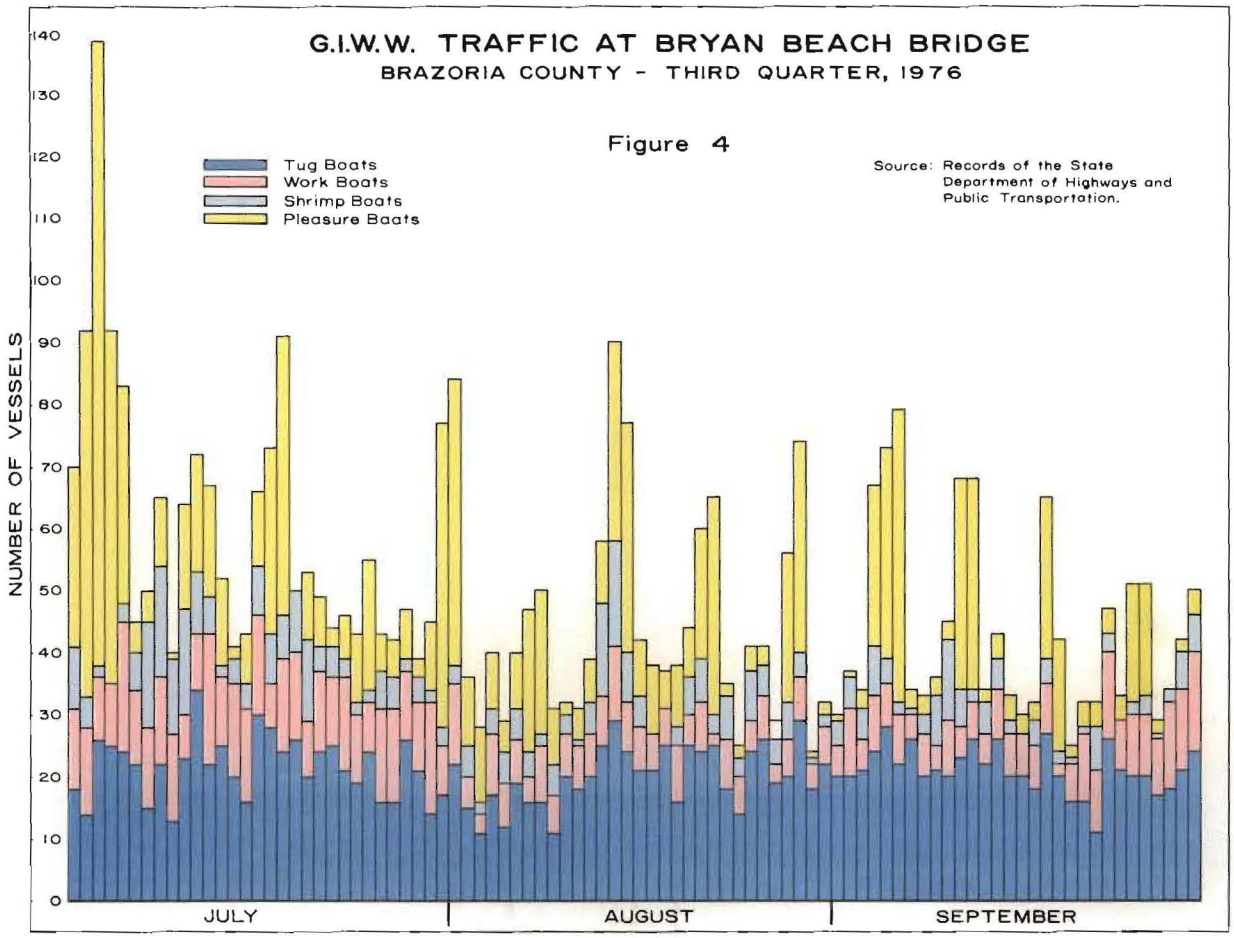
Safe boating practices must be encouraged along the bays and channels. However, at this time no one knows exactly how many recreational craft can be expected to be found using the total waterway on

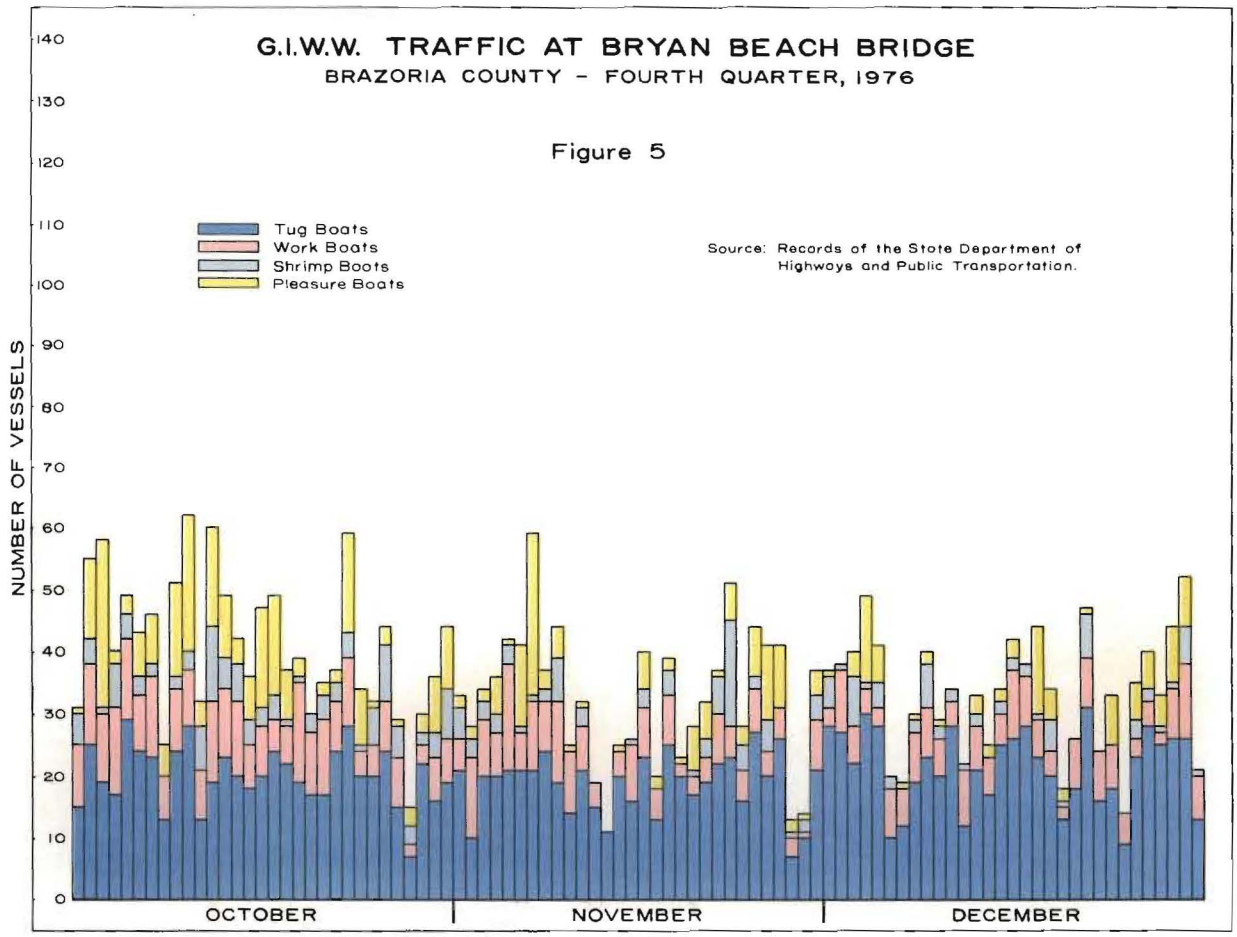
any given day. Fishing surveys and moveable bridge openings have given some insight into this problem but no complete tally for the entire waterway has ever been undertaken. Such a survey of recreational traffic is essential for any true understanding of the complete role of the GIWW today. Even the annual number of recreational craft known to have used the waterway does not show the complete picture. Figures 2 thru 5 indicate that the day of the week or the season of the year have too much effect on the numbers using the waterway to judge it on an annual basis.

Although designed for one primary purpose, commercial navigation, the GIWW has developed on its own into a multi-purpose waterway. The use of this waterway for purposes other than the original one has presented new challenges to the environment and to the safety of all those using it. These challenges will have to be addressed and solutions found.


G.I.W.W. TRAFFIC AT BRYAN BEACH BRIDGE
BRAZORIA COUNTY - FIRST QUARTER, 1976
Figure 2
Tug Boats
Work Boats
Shrimp Boats
Pleasure Boats
Source: Records of the State Department of Highways and Public Transportation.
NUMBER OF VESSELS
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
JANUARY
FEBRUARY
MARCH


G.I.W.W. TRAFFIC AT BRYAN BEACH BRIDGE
BRAZORIA COUNTY - SECOND QUARTER, 1976
Figure 3
Tug Boats
Work Boats
Shrimp Boats
Pleasure Boats
Source: Records of the State Department of Highways and Public Transportation.
NUMBER OF VESSELS
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
APRIL
MAY
JUNE

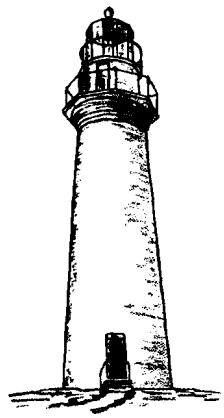

G.I.W.W. TRAFFIC AT BRYAN BEACH BRIDGE
BRAZORIA COUNTY - THIRD QUARTER, 1976
Figure 4
Tug Boats
Work Boats
Shrimp Boats
Pleasure Boats
Source: Records of the State Department of Highways and Public Transportation.
NUMBER OF VESSELS
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
JULY
AUGUST
SEPTEMBER


G.I.W.W. TRAFFIC AT BRYAN BEACH BRIDGE
BRAZORIA COUNTY - FOURTH QUARTER, 1976
Figure 5
Tug Boats
Work Boats
Shrimp Boats
Pleasure Boats
Source: Records of the State Department of Highways and Public Transportation.
NUMBER OF VESSELS
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
OCTOBER
NOVEMBER
DECEMBER

CHAPTER THREE

THE CHANGING POLITICAL ENVIRONMENT FOR NAVIGATION PROJECTS

THE CHANGING POLITICAL ENVIRONMENT FOR NAVIGATION PROJECTS



In the last few years a new dimension in the future of all water projects has begun to take form. This new dimension applies particularly to inland navigation projects. In addition to the pressures of increasing concern for the natural environment, other new pressures are forcing changes in the political environment. Any study of a navigation project must consider these changes in both environments. Although the changes in the political criteria have not generally been implemented as of this date, a review of these proposed changes became necessary so that the proposals can be studied for future effects. This chapter attempts to review the history of the political environment and the increasing demand for changes.

The Beginnings of Federal Responsibility

Federal interest in the use of our lakes, harbors and rivers for public navigation became apparent early in this nation's history. Beginning with Article 1, Section 9 of the U.S. Constitution, governmental policy affecting navigation was legally structured to be free from competitive or developmental bias:

> "No preference shall be given by any regulation of commerce on revenue to the ports of one State over those of another..."[1]

Another document drafted in the same year as the Constitution would become even more the cornerstone for all future U.S. waterway

[1] United States Constitution, Article 1, Section 9.

policy. Article IV of the Northwest Ordinance of 1787 made clear that our founding fathers placed a special value on unhindered water transportation. As a result of the efforts of such men as George Washington and Richard Henry Lee, this document established freedom of the waterways in these words:

> "The navigable waters leading into the Mississippi and St. Lawrence, and the carrying places between the same, shall be common highways and forever free, as well to the inhabitants of said territory as to citizens of the United States, and those of other States that may be admitted into the confederacy, without any tax, impost or duty therefore."[2]

In the time since 1787, an essentially two-pronged federal water policy has evolved:

1) Maintenance, wherever possible, of a competitive equality between ports; and,

2) Federal obligation to provide, without charge, a "free and unhindered" inland waterway network.

Attempts to continue this policy in recent years have resulted in more than a few problems: physical, economic, environmental, organizational. Efforts by the federal government to address some of these problems have resulted in a drastic change in the overall political environment regarding water transportation. The first step in perceiving the status of the GIWW in Texas is to understand the changing federal political environment.

Federal Organizational Structure

More than thirty separate federal agencies influence national water resource/transportation policy. These agencies provide financial

[2]Henry Steele Commager, Documents of American History (7th Edition, Appleton-Century-Crofts, 1963), p.131.

and technical aid, develop and operate transportation facilities and services, administer economic regulations, conduct research and development, or enforce environmental and safety regulations.

Federal agencies to be discussed herein fall into three general categories: independent economic regulatory agencies, executive branch agencies, and the legislative branch of the federal government.

Independent Economic Regulatory Agencies

There are three major independent economic regulatory agencies dealing with transportation. Each agency operates independent of the executive branch, except in the appointment by the President of commission members who head these agencies. Two of these three agencies have water transportation responsibilities.

The Federal Maritime Commission (FMC) was established in 1961 to regulate waterborne commerce between the United States and foreign countries, and between noncontiguous ports of the United States; subject, of course, to treaties and tariffs.[3] Foreign commerce was never considered from the same perspective as was domestic commerce because of its effects on foreign relations. It was this viewpoint that kept marine commerce from being consolidated with other transportation modes when the U.S. Department of Transportation was formed.

The Interstate Commerce Commission (ICC), created in 1887, regulates all common carriers engaged in domestic surface transportation.

[3]Henry S. Marcus et al, Federal Port Policy in the United States, United States Department of Transportation, pp. 58-59.

In general, the ICC oversees questions of rate changes, mergers, acquisitions and consolidation of transport companies.

Presently, most liquid and dry bulk commodities carried in marine commerce are exempt from ICC regulation. Since most of the freight shipped by barge consists of these products, less than 15% of all inland waterways freight is regulated by the ICC.[4] This agency's primary impact on water transportation is in the regulation of the marine mode's primary competitors: railroads and pipelines. It is important to realize that water carriers, unlike their competitors, are largely exempt from any form of rate regulation, except for the intense competition within the industry.

For the most part, there is little duplication or overlap in responsibilities of the above two agencies, and little justification for reorganizing or combining them. Any existing problems of coordination are confined to one single agency, ICC, which regulates domestic rail, truck, pipeline and some water commerce.

A recent study done by the U.S. Senate Governmental Affairs Committee found two basic problems with the current regulatory structure:

1) There is no unified set of national transportation goals guiding the priorities set by the regulatory agencies. Each regulatory agency has its own separate goals and policies which sometimes conflict with other federal programs, and which impede the formulation of a comprehensive national policy.

2) Although the U.S. Department of Transportation is charged with leading the federal government in development of a national policy, the Department has no authority to initiate policy-related proceedings before the regulatory agencies. The Department's only opportunity to address

[4]Gary M. Broemser, "Role of Waterways in the Nation's Transportation System," Transporation Research Record No. 545 (1975), p.2.

> ICC actions, for example, is after proceedings have begun in a specific case. At that time, the Department may offer testimony in an attempt to broaden the scope of the proceedings to encompass national issues.[5]

While rulemaking and rate setting proceedings often affect national transportation goals, those proceedings appear to be poorly integrated with the planning and policy formulation activities of other agencies.

Executive Branch Agencies

The primary agency in the area of transportation is now the Department of Transportation (DOT), established in 1966. Included under this umbrella department are seven separate modal agencies, including the Federal Railroad Administration, the Federal Highway Administration, and the U.S. Coast Guard. The only major agency within DOT having specific water-related responsibilities is the U.S. Coast Guard, which will be discussed separately.

The Secretary of Transportation is responsible for the overall planning, direction and control of all departmental activities. Most program planning and budgeting, however, is still done by each separate operating agency. Congressional appropriations procedure favors this arrangement, with only minimal attention being given to the Secretary's overall budgetary presentation.[6]

In addition to the Secretary's limited budgetary control and limited power to initiate regulatory proceedings, he has no explicit legislative

[5] Inland Waterways Weekly (Congressional Information Bureau, Inc., Washington, D.C., 2 January 1978), Vol. 3, No. 1, p.2.

[6] Marcus, p.185.

authority to comprehensively plan departmental programs. He has no means of considering intermodal impacts of proposed actions, of making trade-offs between spending for different programs and modes, or of planning for future long-term national needs.[7]

The fragmentation of program planning is compounded in the area of water transportation. Much of the planning and budgeting for marine programs rests in two other cabinet-level departments: the U.S. Army Corps of Engineers of the Defense Department, and the Maritime Administration of the Commerce Department. As a result, DOT is basically restricted on marine-related issues to those water safety responsibilities of the U.S. Coast Guard. Thus, there exists within the Department a serious gap in attempts to set transportation policies based on all modes.

The 1966 act creating a Department of Transportation originally called for transfer of the Maritime Administration from the Department of Commerce to DOT. The maritime industry and many members of Congress opposed the transfer, believing marine transportation would receive better representation in Commerce. Those opposing the transfer prevailed on this issue in the House of Representatives by a vote of 261 to 117.[8]

Certain policy trends in recent years have begun to require a more active role for DOT in the area of water transportation. The Department, when created, was charged with coordinating all transportation policy, but in a very nebulous sense. As explained, much of the responsibility for marine transport has remained in other departments. Furthermore,

[7] Inland Waterways Weekly, Vol. 3, No. 1, p. 4.

[8] Marcus, p. 180.

the Secretary has very little real authority to coordinate policies or programs of those modal agencies already within the Department.

Gradually, the realization has come in Congress, within DOT and other federal agencies that transportation planning cannot be effective without a comprehensive, multimodal approach. Funding decisions, subsidy levels and extent of regulation in one mode, in turn affect all other modes. Congress is becoming more and more hesitant to appropriate funds without knowing the full competitive effects on other modes.

The U.S. Coast Guard was established in 1915 and made a component of DOT in 1967. This agency administers a wide range of federal marine programs, including search and rescue, aids to navigation, environmental protection, research, and law enforcement. In terms of expenditures, the Coast Guard has the largest federal role in water transportation, with budget authority of $1.3 billion for 1978.[9]

Two of the Coast Guard's most recent and significant responsibilities are the enforcement of pollution controls and clean-up operations, and the establishment of sophisticated vessel traffic systems on busier waterways.

The U. S. Army Corps of Engineers, (Corps), Department of Defense, is responsible for administering many federal water resource development programs. In addition to navigation, these programs include flood control, hydro-electric construction and port development. Only the U.S. Coast Guard expends more than the Corps on water transportation. In

[9] Inland Waterways Weekly, Vol, 3, No. 1, p. 5.

1977, Corps expenditures attributed to navigation improvement projects amounted to $600 million.[10] Although, as we shall see later, federal expenditures are difficult to allocate by function or by waterway as present government accounting procedures were not designed for that purpose.

Over the years, Congress has expanded the Corps' civil works responsibilities, but has retained close control over these activities by requiring specific congressional approval for every project undertaken. The Corps recommends feasible civil works projects to Congress on an individual basis. Historically, there has been little consideration given to regional or national goals. Indeed, none of the agencies herein discussed have yet successfully formulated any kind of comprehensive policy for an integrated intermodal transportation system.[11]

For many years, the Corps has been maintaining, operating and constructing navigable waterways at only limited cost to the users. Primary policy consideration has always been to maintain the equal, competitive status of every harbor, even at the expense of duplication of facilities or the development of excess capacity for the marketing of a service. This policy is now under attack as being too wasteful of resources and even damaging to the industry it seeks to serve.

The Maritime Administration, (MarAd), U.S. Department of Commerce, administers federal programs to aid in developing, promoting and operating the U.S. Merchant Marine. In terms of financial expenditures, Marad

[10] Ibid.

[11] Ibid, p. 11.

is the third largest federal agency involved in water transportation. MarAd administers two major financial assistance programs: subsidies to the U.S. shipbuilding industry and subsidies to operators of U.S. merchant vessels.

The construction differential subsidy program pays the difference between costs of constructing ships in the United States vs. foreign shipyards. The operating differential subsidy program pays the difference between certain costs of operating ships under the U.S. flag and under the flags of other countries. Together, the two subsidy programs received $504 million in 1976.[12]

Also within this agency is the Division of Inland Waterways. Since its inception in 1971, the Inland Waterways Division has concerned itself with questions primarily relating to shallow-draft, inland marine transport. It has sponsored two national planning conferences on domestic shipping and recently published an extensive study on the same subject. This study is the first comprehensive market analysis of the domestic waterborne shipping industry and many of the conditions affecting it.[13]

The Environmental Protection Agency (EPA) was established in 1970 to accomplish effective governmental control over the quality of the environment. The Administrator of EPA is charged with administering the National Environmental Policy Act of 1969, the Federal Water

[12] Ibid, p.6.

[13] Kearney: Management Consultants, Domestic Waterborne Shipping Market Analysis, (United States Department of Commerce, Maritime Administration, 1974) Executive Summary, p.3.

Pollution Control Act, the Clean Air Act, and others.

Under the National Environmental Policy Act of 1969, all federal agencies were directed to initiate a systematic planning approach that would consider the impacts of their programs on the environment. At the heart of this act was Section 102, which requires all proposals for legislation, funding, or other major federal action to include a detailed Environmental Impact Statement.

Each Environmental Impact Statement must describe:

1) The environmental impact;
2) Any unavoidable environmental effects expected;
3) Alternatives to the proposed action;
4) Consideration of short-term uses of the environment vs maintenance and enhancement of long-term productivity; and
5) Any irreversible or irretrievable commitments of resources involved in the proposed action.

The Act provides for review and comment by any federal agency having legal jurisdiction or special expertise regarding any environmental impact involved.

All civil works projects affecting the marine environment must receive both a water quality certificate and EPA approval before work can begin. The effect of EPA actions on the Corps of Engineers has been particularly dramatic. Every year the Corps dredges 300 million cubic yards of material in maintenance work and 80 million cubic yards of new marine construction.[14]

By EPA pollution standards, 350 of 1,100 total projects by the Corps in 1971 were either modified, delayed or halted. Staggering administra-

[14] John W. Morris, "Our Troubled Waterways," Water Spectrum, Vol. 6, No. 4, p.7.

tive problems, higher costs and longer start-up times have resulted from the Environmental Impact Statement procedure and EPA's active policy role in the navigation development process.[15]

One executive branch agency, often overlooked, having increasing impact on water policy is the President's Office of Management and Budget (OMB). OMB is often referred to as the president's "economic watchdog". In general, OMB reviews all annual budget requests and attempts to insure that all executive agency proposals are in accord with Presidential priorities.

OMB influence over certain programs has sometimes caused substantive policy or program shifts. In the water resource area, this office is known to favor cost recovery for water projects. As a result, the fate of any navigation projects proposed by the Corps of Engineers can be influenced in the budget process by a loosely defined policy preference of OMB which has yet to be clearly embraced by the legislative branch.[16]

The Water Resources Council (WRC) is an interagency organization charged with the comprehensive conservation, utilization and development of water resources. The Council is composed of representatives from such cabinet-level agencies as DOT, EPA and OMB.

In 1973, WRC adopted Principles and Standards for planning federal water projects. These Principles and Standards have two primary

[15]John W. Morris, "Maintaining the Nation's Waterways," Transportation Research Record No. 545 (1975) p. 26.

[16]Marcus, pp.54-56.

objectives:

1) To enhance national economic efficiency; and
2) To enhance the quality of the environment.

The Corps of Engineers is required to comply with these planning criteria for all federally-funded projects, in addition to other environmental requirements promulgated by EPA.

Many actions of WRC in accordance with the Principles and Standards have been highly controversial. The limited, two-fold objectives have been particularly criticized in that other desirable ends such as social well-being and regional development are not presently considered. A study currently being conducted by WRC at the request of President Carter is considering broadening the Principles and Standards to include some of these other objectives in the evaluation of water projects.[17]

United States Congress

In the sense that final appropriations for all federal projects are passed by Congress, this body has significantly affected the direction and scope of water resource and transportation policies. Congress has maintained individual project authorization powers over all Corps of Engineers civil works projects. Congress approves, modifies or rejects the budgets of all agencies discussed previously. Although the President can veto congressional actions, Congress can still override a veto by a two-thirds vote of both houses.

Congress, for the most part, has long maintained a close working

[17] Federal Register (United States Government Printing Office, 15 July 1977), Vol. 42, No. 136, pp. 36788-36790.

relationship with the Corps of Engineers. Members of Congress, having sectional political interests, initiate public works projects in their own constituencies and, if the project is determined to be feasible by initial studies, oversee the project through the authorization and funding processes. Since such projects are usually of local or regional benefit, cooperation between members of Congress is necessary to achieve sufficient support to insure final approval. This process has been labeled the "pork barrel", but it is the only mechanism for needed local projects to be planned or implemented. Such projects, however, usually do not fit into any comprehensive planning process and their individual impact on other transportation modes or other regions are often not determined in advance.

In summary, the pattern of federal oversight of transportation and water resource policy has been largely one of fragmented authority. The diffusion of responsibilities to a number of overlapping agencies has developed over time and remained unchecked throughout recent history. The current situation is basically a function of this lack of coordination both within and between agencies, including even Congress itself.

Reorganization Proposals

While any major reform of the congressional implementation procedures is still unlikely, executive agency reorganization is becoming more and more probable. Several reorganization proposals have been put forward in recent years by various agencies and interest groups. The most significant of these proposals will be discussed below.

National Water Commission

Some progress toward federal policy coordination began in 1968. In that year, Congress established the National Water Commission to study national water resource management problems and policies. This Commission, no longer active, was one of the first to recommend a stronger role for DOT in the water transportation sector. The Commission also advocated user charges be established to recover federal expenditures for operation and maintenance of the inland waterway system.[18]

Congressional Studies

A two-year study conducted by the U.S. Senate Governmental Affairs Committee released in 1977 recommended:

1) Passage of a National Transportation Act to establish a unified national transportation policy;

2) Giving the Secretary of Transportation greater powers to propose rules, regulations and statements of policy before any of the transportation regulatory agencies.

3) Instituting a combined transportation budget account to include all modes, whether under the authority of DOT or not; and,

4) Transferring the MarAd subsidy programs to DOT, as well as navigation projects of the Corps of Engineers.[19]

In 1974, Senate Resolution 222 called for a National Oceans Policy Study to be conducted by the Senate Commerce Committee. This group is considering all aspects of maritime policy. It is expected to propose a Federal Oceans Agency, transferring certain functions of the U.S. Coast Guard, Corps of Engineers, and Department of Interior to a new centralized agency.[20]

[18] Marcus, p. 29.

[19] Inland Waterways Weekly, Vol. 3, No. 1, pp. 15-16.

[20] Marcus, p. 38.

Office of Management and Budget

As part of President Carter's overall federal reorganization plan, the Office of Management and Budget began in December, 1977, to study whether natural resources and environmental programs are effectively organized. Issue and option papers have been circulated to various local, state and federal agencies, the waterway industry, environmental groups, and agricultural organizations, soliciting input.

Organizational alternatives being considered by the OMB study group include:

1) Transferring of navigation functions from the Corps of Engineers to the Department of Transportation;

2) Consolidating in a single water agency all water resource development functions, to include everything from early planning to construction and operation (This agency would take on responsibilities now resting with the Corps of Engineers, Department of Interior, Department of Agriculture.);

3) Consolidating all natural resource and environmental regulations under a new Department of Natural Resources and Environment;

4) Strengthening the interagency coordination process, by giving an agency such as the Water Resources Council more powers and responsibilities, including budgetary control; or,

5) Decreasing federal involvement in the water resources area, shifting many functions to state, regional or local levels. [21]

Water Resources Council

In an environmental message, dated May, 1977, President Carter called for a complete review of all aspects of the nation's water

[21] Federal Register (19 December 1977), Vol 42, No. 243, pp. 63665-63669.

resource policy. Responsibility for this study was given to the Water Resources Council, with assistance from OMB.[22]

Among the issue questions to be dealt with will be possible reorganization of some federal agencies. These reorganizational options track, to a great degree, those options being considered by OMB. As OMB is a participant in this water resource study, it is unlikely that any organizational proposals put forward by one group will conflict with those being simultaneously put forward by the other.

Other aspects of the WRC water policy study are considered elsewhere in this section

Competition Among Transportation Modes

Total U.S. freight flow by all transport modes in 1970 was estimated at nearly 5 billion tons. Of that traffic, trucks handled 34%, rail 32% and water 17.6%.[23] In 1976, the GIWW in Texas itself handled nearly 62 million tons, 76% of that tonnage in petroleum and chemical products. Almost 74% of all Texas exports currently leave the state by water transport.[24]

Each of the transportation modes (air, rail, water, truck, pipeline) has inherent advantages and disadvantages. In a marketing context, the four most important characteristics of a transport mode are: flexibility, capacity, speed and cost. Previous studies have shown that the domestic

[22]Federal Register (6 July 1977), Vol. 42, No. 129, p. 34563.

[23]Kearney, Executive Summary, p.6.

[24]Jack T. Lamkin and W.R. Lowrey, Texas Waterborne Commerce Commodity Flow Statistics, Sea Grant Program, Texas A&M University (June, 1973) p.11-3.

marine mode ranks more favorably on cost and capacity than on flexibility and speed.[25]

The prime competition for barge transportation is from rail and pipeline. Truck, although occasionally competitive, is primarily complementary to marine, providing feeder and distributor services. Air transport is not competitive for bulk shipments but is used primarily for small shipments requiring fast delivery (See Tables 1 and 2).

TABLE 1
Inherent Line-Haul Characteristics of Domestic Modes

Mode	Flexibility	Typical Unit Capacity (Tons)	Speed (mph)	Cost (Cents per Ton-Mile)
Marine	Many Cargos Between Ports	1,000 to 60,000	3 to 30	0.1 to 1.1
Pipeline	Limited Cargos Between Terminals	30,000 to 2,500,000	3 to 6	0.1 to 0.25
Rail	All Cargos Between Rail Sidings	50 to 12,000	20 to 45	0.5 to 2.5
Truck	All Cargos Between All Points	10 to 25	40 to 60	2.0 to 4.0
Airline	Many Cargos Between Airports	5 to 125	300 to 600	15 to 20

TABLE 2
Competitive Advantage

High Flexibility	High Capacity	High Speed	Low Cost
1. Truck	1. Pipeline	1. Airline	1. Pipeline
2. Rail	2. Marine	2. Truck	2. Marine
3. Marine	3. Rail	3. Rail	3. Rail
4. Pipeline	4. Truck	4. Marine	4. Truck
5. Airline	5. Airline	5. Pipeline	5. Airline

The marine mode is dominated by pipeline only in those commodities which lend themselves economically to pipeline transportation. Because of the capital intensive nature of pipeline transport, a pipeline will

[25]Kearney, Executive Summary, pp. 6-8.

not be built until there already exists a large, steady flow of commodities susceptible to pipeline movement. Once constructed, the pipeline route is usually more direct than waterway or rail. Pipeline is well-suited for unbalanced, one-way commodity flows and does not require the return of an empty carrier to the point of origin. The pipeline mode has an inherent ability to provide continuous and reliable movement of large volumes of bulk commodities at very low cost. One great disadvantage associated with pipeline is its inflexibility, offering direct service only to those customers who are directly linked with the system. Another disadvantage is that only certain liquid and gaseous commodities can be shipped by pipeline.[26]

In many instances, rail is the marine mode's most important competitor. The rail mode operates over a private right-of-way which permits it to offer door to door service between many inland points. This enables rail to reach a large portion of shippers and receivers with direct service. Rail transport is less competitive with marine in terms of cost and capacity; although the development of 12,000 ton-capacity unit trains has helped enhance rail's competitive position.[27]

Marine mode shipments should generally be of high volume to utilize the high unit-carrying capacity, and of relatively low-unit values because of slowness in delivery and the resulting need to maintain high inventory levels. Bulk products, liquid and dry, are especially likely to be captured by water carriers since these products have the necessary

[26] National Transportation: Trends and Choices to the Year 2000, U.S. Department of Transportation (January 1977) p.289.

[27] Kearney, Executive Summary, pp. 6-8.

characteristics and can easily be handled by mechanized terminal facilities. If sufficient pipeline capacity is not available to an area, or if the product cannot be pumped through a pipeline, the competitive position of water carriers in that area is enhanced.

Since 1929, the railroad share of freight traffic has dropped from 75% to 32%. While transporting 32% of total freight, rail now receives only 20% of U.S. freight revenues.[28] Far too many factors have contributed to the declining financial health of many U.S. railroads to be discussed here. It must be noted, however, that the attempts to preserve and strengthen the nation's rail systems have caused increasing pressures to be applied to the other transportation modes. In addition. proposals for total transportation planning have received increasing support as a prime necessity in the efforts to save our rail systems.

Cost Recovery Becomes An Issue

A prime focus of the rail industry's lobby effort in recent years has been in protest of the government's preferential treatment of commercial waterway users. As the railroads fight for increased federal subsidy to revitalize an ailing industry, increasing attention is being given to the issue of cost recovery for navigation projects.

The sensitive question of water project cost recovery has been continually debated in Congress since the 1930's. Due to the perceived imbalance between transport modes with regard to federal subsidy, proponents argue that commercial waterway users should repay some or all of the navigation expenditures. Currently, federal navigation expen-

[28] Trends and Choices, p. 182.

ditures are funded from general revenues at no special cost to the users of that system.

Supporters of cost recovery, including the railroads, argue that the present level of funding for navigation has several undesirable results. Water carriers are given a substantial competitive advantage over other surface carriers. Particular regions and groups of shippers are benefited at the expense of others not so favorably located. Unlimited public subsidy can encourage overdevelopment and overinvestment instead of a more rational use of available resources.[29]

Opponents of cost recovery, on the other hand, see it as unfairly penalizing the efficient performance of the barge industry and a reversing of years of national policy as set out in the Northwest Ordinance and subsequent programs. They also argue that the U.S. government continues to heavily subsidize the competing modes of rail, air and highway transport far in excess of the total federal subsidy to waterways. For example, over and above user tax collections, the federal government in 1974 spent $1.2 billion on roads and highways; while only $382 million went to shallow draft navigation. In 1976, $6.4 billion went to railroads under the Railroad Revitalization and Regulatory Reform Act, in addition to the federal government's shoring up of the Railroad Retirement System.[30] Another argument advanced by marine proponents concerns the potential inflationary impacts of navigation cost recovery on specific sectors of the economy (transportation and agricul-

[29] Trends and Choices, p.285.

[30] J.W. Hershey, "The Waterway Fuel Tax-Pros and Cons of HR 8309." Statement before Committee on Ways and Means, U.S. House of Representatives, 22 July 1977.

ture, for example) as well as numerous adverse regional impacts.

Admittedly, the total amount of federal money going to waterways is relatively small (only 1/8 of 1% of the total federal budget).[31] The navigation right-of-way is, nontheless subsidized 100% by the federal government while those of other modes are not.

Waterway congestion, aging and outdated structures, increased dredging problems, concern for an ailing rail industry are all combining in a way that makes continuation of present water policy very difficult. Collectively, these factors represent intermodal competition for traffic and for federal funds. This is leading to increasing acceptance of some form of cost recovery as a means to avoid what many believe is an unequal federal subsidy to the various modes.

Definition of Terms

Although every administration since President Franklin Roosevelt has proposed some form of waterway cost recovery legislation, much of the terminology associated with such proposals is not widely understood. Three terms, each having its own distinct meaning, are particularly important and yet particularly confusing.

Navigation cost recovery is the payback to the federal treasury by commercial users of some percent of various federal expenditures, such as operation, maintenance and rehabilitation (O,M&R) and/or new construction costs. Although recreational vessels also use the inland waterways, contributing to the congestion at certain locks and dams,

[31] Marvin J. Barloon. Testimony before the Water Resources Subcommittee, Committee on the Environment and Public Works, U.S. Senate, 20 April 1977.

these vessels have consistently been exempted from most cost recovery proposals over the years.

User Charge options are methods, such as taxes or tolls, of recovering federal expenditures. User charges can be enacted with or without a cost recovery provision included. Unless some level of cost recovery is specified in the legislation or a transportation trust fund established, revenue from user charges would be deposited in the general revenue and would not necessarily be applied toward the cost of future water projects.

Cost Sharing, as opposed to cost recovery, is simply the sharing by non-federal interests (usually state or local governments) of some portion of project costs. A state could enact, if it chose to do so and federal enabling legislation permits, a user charge on navigation within its boundaries in order to finance the state's share of these expenditures. A state could even specify, in its user charge legislation, some desired level of cost recovery. Likewise, the federal share could also be recovered through some form of user fees. Nevertheless, cost sharing and cost recovery are two entirely separate concepts.

Problems Associated With Cost Recovery

One of the most difficult problems in enacting a cost recovery provision for navigation lies in determining the actual federal costs attributable to navigation. The multipurpose nature (such as flood control, navigation, power production, recreation) of many water resource projects makes specific cost allocation difficult. Existing Corps of Engineers and Coast Guard cost accounts are not broken down by function, nor by specific river segment. In other words, the high

navigation costs attributed to a certain river may, in reality, be for a very small segment of that river, and may also include costs for flood control, recreation, or irrigation expenditures besides costs of navigation features. Until a better form of cost accounting is initiated, commercial water carriers could be the sole non-federal financial support of activities from which they derive no special benefit, while other interests would continue to receive substantial benefits from navigation projects at no cost to themselves.

The level of cost recovery attempted is also an important consideration. Should a user charge attempt 100% recovery of all costs or some smaller percentage thereof? If a partial level of recovery is chosen, such as 10%, what is the rationale for choosing 10% instead of 5% or 15%?

Types of costs recovered can pose another significant difficulty. Most user charges aim for recovering some percentage of operation, maintenance and rehabilitation costs attributable to navigation. Some of the more sweeping proposals are geared to recover new construction and capital costs as well.

The timing of cost recovery imposition may be very critical for new or recently constructed waterways, in that traffic has not yet grown to the levels projected for the future. Nor, perhaps, have port and terminal facilities been completely developed. If current costs are all assessed against existing traffic, this may prevent future traffic from ever fully developing. Indeed, all existing traffic may be driven from a waterway, thus permanently stymying future regional development. If recovery is phased in over time, however, traffic and

facilities can be allowed to develop and each unit of traffic will be better able to bear its fair share of the assessed costs.

Recovery Mechanisms

After all of the above determinations have been made regarding cost recovery, a specific mechanism for the recovery must also be decided. User charges can be divided into two general categories: uniform or system-wide, and localized or segment-specific.

The most commonly proposed systemwide user charge is a uniform fuel tax. Uniform fuel taxes across all waterway segments would act to cross-subsidize the high-expenditure, low-traffic waterways by imposing the same tax on every gallon of fuel consumed, regardless of the segment.[32] Other proposals in this category include equipment taxes or registration fees, and transportation taxes on commodities transported by this mode. All proposals have far-reaching impacts and must be carefully evaluated before imposition.

Localized, segment-specific user charges include lockage fees and segment tolls. Segment tolls would tax each waterway segment for the amount of federal expenditures on that section alone. Such a toll would likely penalize high-cost waterways and could result in total abandonment of some segments. Recent studies indicate that traffic loss, even total traffic loss, on some of these high-cost waterways would have marginal traffic impact on the rest of the inland waterway system. Economic effects on specific regions or river valleys, however, could be devasta-

[32] Regional Market, Industry and Transportation Impacts of Waterway User Charges, U.S. Department of Transportation (August 1977), Final Report, p. I-3.

ting. In essence, such abandonment of traffic would cause a total loss of existing federal and local investments in the marine transport mode. Such tolls would also effectively prevent the development of any new waterways regardless of national or regional needs for such development.[33]

Recent Developments In Cost Recovery Proposals

In November, 1972, a seven-member National Water Commission, after four years' study, issued a report advocating cost recovery via some unspecified form of user charge. The Commission recommended that Congress enact legislation requiring non-federal interests to assume an appropriate share of the costs for federal waterway projects. The Commission said such legislation should require:

1) That carriers using any federal waterway pay a user charge such that the total collections on all federal waterways be sufficient to cover federal operation and maintenance expenditures for the entire system.

2) That, as far as practicable, user charges for individual segments of waterway reflect differences in the cost of operating and maintaining them;

3) That charges be phased in over a ten-year period, so that by the end of that time they would be sufficient to recover annually all costs of operating and maintaining the U.S. inland waterway system; and,

4) That full construction cost recovery be made a requirement of federal participation in any future waterway project.[34]

The Water Resources Development Act of 1974 directed the President to "make a full and complete study and investigation" of the nation's

[33]William J. Hull, "Economic Policy of Waterway Transportation," Transportation Research Record No. 545 (1975), pp. 6-7.

[34]Marcus, pp. 29-31.

water resource policy. This study was subsequently assigned to the Water Resources Council. (WRC)

From the beginning, the Council's approach to the study was predisposed in favor of some form of cost sharing for federal water projects. As expected, in December of 1975, WRC sent its study to President Ford, recommending certain minimum levels of cost sharing to be attained through cost recovery. A non-federal cost sharing level of 10% for navigation projects was recommended. The study recommended only the level of non-federal cost sharing and specified no specific cost recovery or user charge mechanism to be employed.

Little action was taken on the WRC recommendations before President Ford left office. In May, 1977, President Carter issued a national water policy statement. He directed the Water Resources Council and the Office of Management and Budget to "review existing water resource policy and recommend reforms." Primary responsibility for the study was again given to WRC. Issue and Option Papers have been circulated to various state and federal agencies, industry, and environmental groups. Final recommendations to the President are expected to be made in late 1978.

Four key areas have been identified as being of special concern to the President which will be addressed by the WRC study group:

1) Revision of water resource planning and evaluation procedures (primarily the WRC Principles and Standards discussed earlier);

2) Non-federal cost sharing for federal water projects (navigation as well as hydro-electric, flood control, irrigation, etc.);

3) Institutional reorganization proposals (also discussed earlier); and,

4) Water conservation measures.[35]

With regard to cost sharing, five specific options have thus far been considered, most of which provide for some level of cost recovery as well. Other alternatives may be proposed before final recommendations are made to the President. The cost sharing concept, as proposed by WRC, will apply to all water-related programs and not just expenditures for navigation projects.

The first option being considered by the WRC study group is continuation of current arrangements, presuming that any inconsistencies in policy which now exist are supported by valid reasons. In this case, navigation projects would continue to be funded primarily out of general revenue.

A second option, embraced by the President, would set a minimum cost sharing floor of 10% for navigation projects with other percentages set for other water programs. This option would apply to all projects not yet underway on the date of enactment.

A joint venture concept is the third option being considered by the study group. 50% of the initial capital implementation or financing costs of projects would be provided by the federal government, the other 50% by non-federal entities. Financing would be recovered through the marketing of vendible services of the projects. All operation and maintenance costs would be borne by non-federal sponsors.

The block grant option provides for grants to states in amounts equal to the average annual federal expenditures in each state over several years' time. Each state would select the projects to be built

[35]Federal Register (15 July 1977), Vol. 42, No. 136, p. 36788.

in that state and would provide any additional funding required.

The fifth option embraces the concept of full cost recovery from state or local entities. The federal government would plan, finance, implement and operate projects and programs as it does today. However, terms of service for each project would require repayment by non-federal interests of all costs incurred by the federal government (including interest charges, operation and maintenance, construction).[36]

Almost from the beginning of this study, two of the participating agencies were at odds as to the desirable level of cost recovery and the mechanism to be employed. OMB's proposal, put forward in late 1975 and again in 1977, would levy a user charge via river segment tolls and lockage fees. Almost 50% of federal O,M&R costs on inland waterways would be recovered the first year. Two years later, the recovery level would be raised to 100%, with segment and lockage fees increased accordingly. As each segment's toll would reflect the costs of operating that segment, some of the tolls on new or high-cost rivers would be very high.

Differing Viewpoints

For many years, the Department of Transportation had been an advocate of the cost recovery concept and had attempted through various policy statements to link waterway cost recovery with the issues of comprehensive transportation planning and railroad revitalization. Nevertheless, when the OMB proposal was first put forward, DOT resisted supporting it for a number of reasons.

[36] Ibid, pp. 36791-36792.

First of all, the OMB recovery levels of 50% and then 100% of O,M&R were considered far too radical. Secondly, the revenue yield from OMB's proposed segment tolls would surpass the desired 50% recovery levels. In addition, no consideration was given by OMB as to the impact segment tolls would have on certain regions and industries dependent on high cost rivers, nor to the carriers operating on those rivers.

DOT's counter-proposal, as advanced in 1975, would adhere to WRC's originally proposed non-federal cost sharing level of 10% for navigation costs. These costs would be recouped through a uniform, system-wide fuel tax of 6¢ per gallon on commercial vessels. As many impacts of cost sharing and cost recovery are still undetermined, the DOT Proposal also called for a three-year study to further consider the effects of such programs.[37]

Recent Studies

Before any user charge/cost recovery scheme is implemented, a comprehensive impact study should examine the complete array of user charge mechanisms, implementation options and economic impacts. Too little is known yet of the effects cost recovery would have on specific sectors of the economy (in increases in the prices of consumer products, on specific regional economies, on rates of competitive modes) or of the cumulative effects over time. Recent user charge proposals have seemed to recognize these problems. Most of the legislation introduced in Congress in recent years has provided for some form of comprehensive study before a major user charge is levied.

[37]Harry N. Cook, "Memorandum: Progress and Status Report," Newsletter by National Waterways Conference, Inc., 20 February 1976, pp. 2-3.

Since 1975, however, several studies on the impacts of cost sharing/ cost recovery have been done. Most address very specific questions, such as modal traffic diversion or the effect on barge rates. Nevertheless, some commonality is beginning to surface in the major studies done in the last two or three years.

Discussion here will focus not so much on individual findings of each study but on those points on which all recent studies seem to be in agreement:

1) Recovery of 100% of federal O,M&R expenditures on the inland waterway system is unlikely to result in total traffic losses exceeding 10% under either a fuel tax or segment toll. Initial recovery of 10% of these outlays, as proposed by President Carter, would have considerably smaller traffic impacts, perhaps less than 1% of system ton-miles.

2) While overall traffic impacts are similar under the two collection approaches, differences do appear in regional and commodity impacts. Under a segment toll, traffic impacts will be relatively isolated on newer, or high-cost rivers. Under a fuel tax, traffic impacts would be more dispersed with traffic on high-cost segments being cross-subsidized by traffic on low-cost segments which have already developed substantial traffic.

3) Pass-through of user charges will lead to very small overall price increases or income losses. Most predicted effects measured in fractions of 1%.[38]

Congress And User Charges - The Birth Of A Tax

While cost-sharing proposals continue to be studied, cost-recovery proposals began to attract more attention. The authorization of a replacement for Lock and Dam 26 on the Upper Mississippi River became the battleground for the implementation of some form of user-fee or

[38] Modal Traffic Impacts of Waterway User Charges, Volume 1, U.S. Department of Transportation, August, 1977, pp. 130-137.

cost-recovery. The replacement of this structure had become critical to navigation interests. Congestion and delays caused by this antequated facility had already led to increased shipping rates on all shipments transiting it. Its location, just downriver from the entrance to the Illinois Waterway, compounded the effects on shipping in the upper midwest. In addition, erosion had made both the locks and dam unsafe and presented the possibility of failure of either or both of the facilities. Such a failure would halt all shipping to the area and present a catastrophic loss to agriculture and others dependent on the two waterways.

Opposition to the replacement developed from two groups: environmental interests who perceived it as the first step in deepening the Upper Mississippi River Channel, and the region's railroads who feared the diversion of more commodities with the completion of a modern facility. Together, these interests have battled to prevent this project being implemented. While litigation continued, they sought to use this project to force the implementation of cost recovery measures.

In June, 1977, a House-passed measure (H.R. 5885) authorizing a number of water projects was amended in the Senate by Senator Peter Dominici (Rep. - New Mexico) to tie a user charge provision to replacement of Locks and Dam 26. Senator Dominici's amendment proposed the recovery of 50% of new construction costs and 100% of O,M&R expenditures on inland waterways. DOT was charged in the act with prescribing the form of user charges to be imposed. Furthermore, no user charge affecting a certain type of shipment could exceed 1% of the value of that shipment.

H.R. 5885, with the Dominici amendment attached, was never considered by the House of Representatives after it was passed by the Senate and returned. House Speaker Thomas O'Neill (Dem.-Mass.) determined that a user charge constituted a taxation measure which could only originate in the House. Although H.R. 5885 died in the House with the Senate amendment attached, the issue of waterway user charges was not so easily laid to rest.[39]

With the Senate vote on Dominici's Amendment, it became apparent that they were strongly favoring a stringent cost recovery/user charge proposal. As a result, the House reluctantly began considering a more moderate proposal of its own. H.R. 8309, passed by the House in October, 1977, called for a specific fuel tax beginning in 1979 at 4¢ per gallon, increasing in 1981 to 6¢ per gallon.

This tax would apply only to commercial vessels operating on certain inland or intracoastal waterways, including the GIWW. Testimony before the House Ways and Means Committee at the time indicated that the recovery level from such a tax, if limited only to commercial shallow-draft carriers, would be around 6%.[40]

On the other hand, to recover the 100% of O,M&R and 50% of new construction expenditures, as proposed by the Senate, OMB and others, would require an estimated 42¢ per gallon fuel tax. When faced with that alternative, the waterway industry reluctantly endorced the 4-6¢ per gallon fuel tax contained in H.R. 8309, despite their previously

[39] Harry N. Cook, Memorandum, National Waterways Conference, Inc., 25 July 1977, pp. 1-3.

[40] Congressional Record (House of Representatives, 11 October 1977), Vol. 23, No. 163.

unwavering opposition to any form of user charge.

Meanwhile, DOT Secretary Brock Adams, speaking for the Administration, endorsed the 100%, O,M&R and 50% new construction cost recovery levels, phased in over ten years. Again, these recovery levels would require a fuel tax of approximately 42¢ per gallon, rather than the 6¢ per gallon tax which DOT itself had originally supported.[41]

H.R. 8309 met the same fate in the Senate that other House measures had met previously: it was amended. After repeated attempts by Senator Dominici to substitute a 42¢ per gallon fuel tax, a slightly less-stringent fuel tax proposal passed the Senate which would impose a 12¢ per gallon fuel tax (implemented in 2¢ increments every two years). The House (6¢ per gallon) and Senate (12¢ per gallon) versions were sent to a conference committee charged with working out the differences between the two bills.[42]

As the 95th Congress began preparing to adjourn, the crush of last minute legislation prevented any further action on H.R. 8309. Even as a compromise between user charge advocates and opponents began to take shape, not enough time remained for H.R. 8309 to make its way out of conference committee and through both houses before adjournment.

Senator Russell Long (Dem.-La.) is credited with working out a last minute compromise and then finding the vehicle for passage. Key elements of the compromise legislation are:

1) Authorization for the replacement of Locks and Dam 26.

[41]Harry N. Cook, Memorandum, National Waterways Conference, Inc., 17 June 1977, pp. 2-3.

[42]"Senate Okays User Tax," Waterways Journal Weekly (6 May 1978), Vol. 92, No. 6, p.5.

2) Creation of the Upper Mississippi Basin Commission to prepare a comprehensive master plan for the environmental management of the Upper Mississippi River Basin.

3) Requirement that the Secretary of Transportation and Secretary of Commerce, in cooperation with other federal agencies, conduct a full and complete study of inland waterway user charges, then make findings and policy recommendations to Congress by September 30, 1981.

4) Imposition of an inland waterways fuel tax on 26 shallow-draft waterways, including the GIWW. The tax is to begin October 1, 1980, at 4¢ per gallon and increase in stages to 10¢ per gallon by 1985. Revenues from the fuel tax are to be deposited in an open-ended navigation trust fund which shall be available for inland waterway projects. This tax is not tied to any specific cost-recovery percentage, nor is it declared to be the sole source of funding for future projects.[43]

With all concerned parties agreeing to the compromise, including the administration, a suitable vehicle for passage had to be found. H.R. 8533, a measure which had already reached the Senate floor, was chosen. This measure was stripped of its contents and the compromise provisions were substituted. The revised bill quickly passed both houses of Congress and was dispatched to the administration for signing into law.[44] The bill imposing the first user charge was signed into law on October 21, 1978.

At this point, the future effects of this measure on Texas and the users of the GIWW are still not clear. Until the proper guidelines regarding the collection of this tax are forthcoming, many questions regarding this tax will remain unanswered. Tentatively, the filing of quarterly statements reporting the amount of fuel consumed on the de-

[43] Congressional Record (Senate, 10 October 1978), Vol. 124, No. 164.

[44] "Alton Dam, User Fees Approved By Congress," Waterways Journal Weekly (21 October 1978), Vol, 92, No. 30, p. 27.

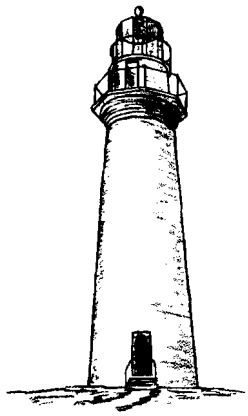
signated waterways will be required. However, since only the GIWW is a designated waterway in Texas, the question of overlapping waterways remains an uncertainty. Another problem in Texas is that almost all traffic on the GIWW originates and terminates on other channels which are not designated for taxation. How the tax will be determined in these cases will have to await the implementation guidelines.

The implementation of this user-fee will be a giant step toward the beginnings of cost-recovery. What other measures in this changing political environment will follow, only the future will tell.

CHAPTER FOUR

COMMERCE ON THE GIWW IN TEXAS

COMMERCE ON THE GIWW IN TEXAS

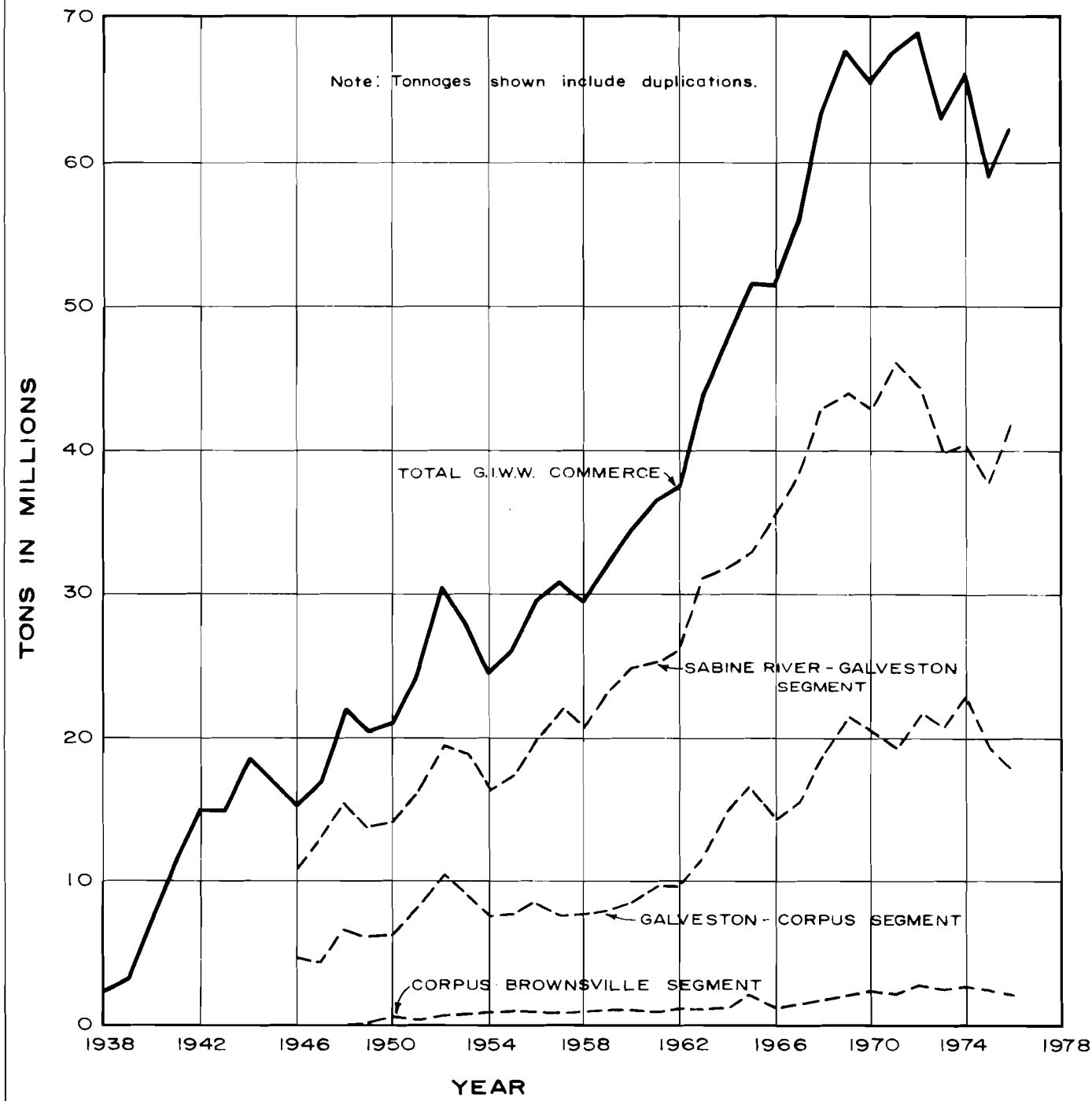


The total commerce on the GIWW in Texas identified in the previous report, as in most such summaries, includes duplications. These duplications are inherent in calculating tonnage totals and are caused by totaling the tonnage reports for individual segments, as reported, to secure the collective totals. However, the trends indicated by such tonnage totals are still pertinent despite the inclusion of duplications. This is especially true for Texas figures since the southernmost segment of the waterway usually reports only 3.4% of total state traffic while the middle segment usually reports only 29.0%. Thus over 67% of the total tonnage will not often be susceptible to duplication.

This description of the problem of duplications is offered to explain the descrepancies in total figures that will become apparent when a close scrutiny and comparison of tonnage figures is attempted. Readers of this report must recognize such comparisons are not always accurate due to the format in which the statistics are published. It is anticipated that future state tonnage totals will be arrived at without the inclusion of duplications. This will be possible due to the recent availability of statistics for individual marine movements which will allow the accurate accumulation of state tonnage totals.

In the previous report, the state total for tonnage moved on the GIWW in Texas was reported as 66,055,628 tons in 1974, the latest year for which statistics were available. The intervening two-year period, as shown in Figure 6, shows a drop in total tonnage in 1975

MARINE COMMERCE ON THE G.I.W.W.



Source: U.S. Army Corps of Engineers Waterborne Commerce of the United States.

Figure 6

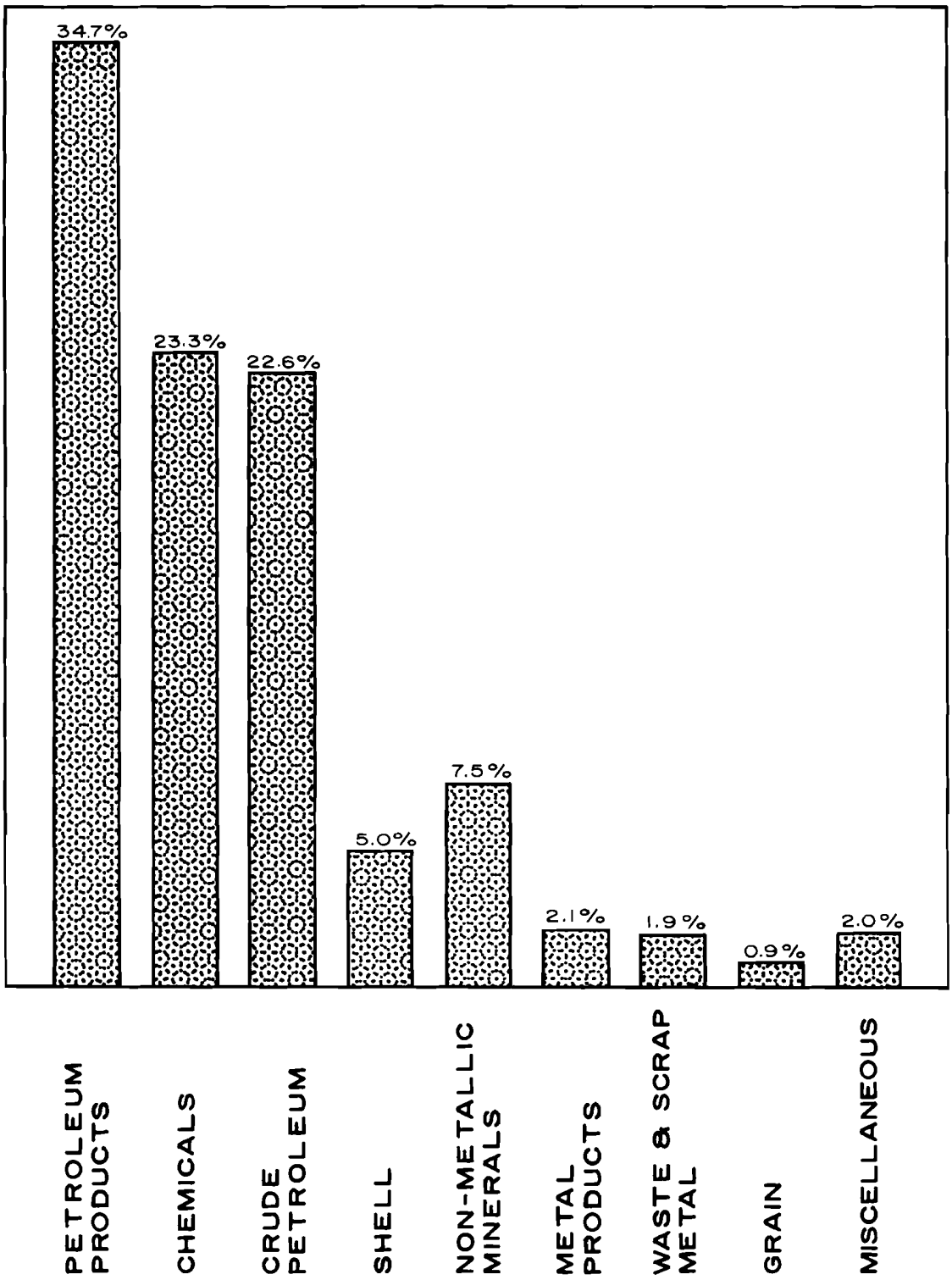
to 59,275,675 tons. This was followed by a partial recovery in commerce for 1976, when 61,880,649 tons was reported. Figure 6 indicates that most of this loss of traffic in 1975 was on the waterway segments from Galveston to Brownsville. Moreover, the losses on these segments continued in 1976, even while the commerce on the Sabine River to Galveston segment recovered in 1976 and produced the highest tonnage record since 1972. Preliminary figures for 1977 indicate that over 66 million tons of goods moved on the total GIWW in Texas, the highest total since the peak tonnage in 1972.

What Commodities Are Involved in these Movements

Figure 7 indicates that statewide, the major loss in traffic is due to the marine shell movements decreasing from 8.3% of total tonnage in 1974 to 5.0% of the 1976 total. Also, the movement of metal products decreased from 3.3% to 2.1% and the movement of grains decreased from 1.5% to 0.9%. These losses totaling 5.1% were made up by gains of 1.4% each in the movements of petroleum products and chemicals, a gain of 1.0% in the movement of crude petroleum, a gain of 0.7% in non-metallic mineral movements and gains of 0.3% in movements of the waste and scrap metal and miscellaneous categories.

However, this picture of statewide shifts in commodity movements between 1974 and 1976 does not appear the same as the pictures of the individual GIWW segments shown in Figure 8. For instance, the chart shows that the Sabine River to Galveston segment experienced gains in the movements of petroleum products, shell, non-metallic minerals and waste and scrap metal categories. Losses on this segment were experienced in the categories of chemicals, crude petroleum, metal

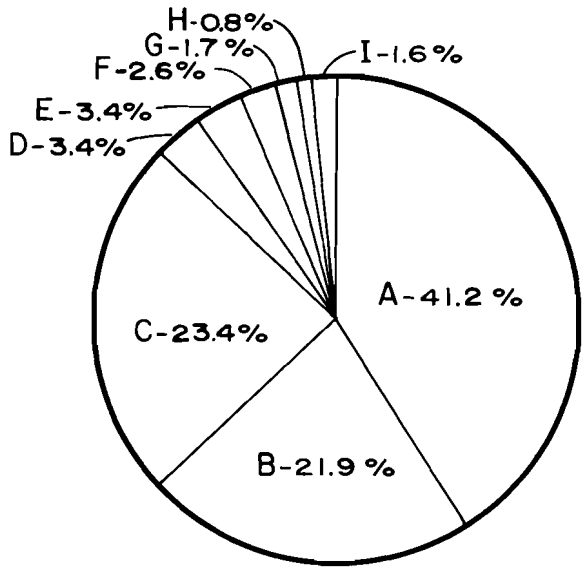
TOTAL G.I.W.W. COMMODITIES



Source: U.S. Army Corps of Engineers Waterborne Commerce of the United States Calendar Year 1976.

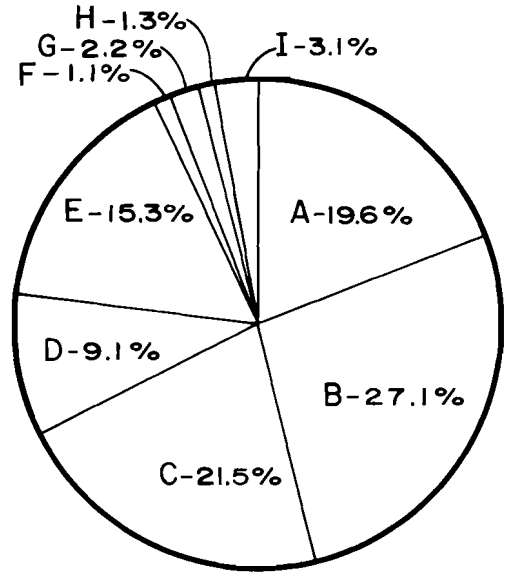
Figure 7

G.I.W.W. COMMODITIES BY WATERWAY SEGMENT



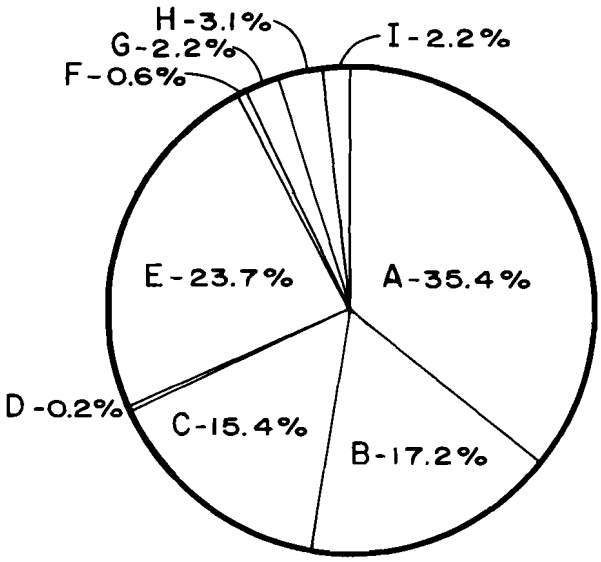
SABINE TO GALVESTON

Total= 41,782,923 Tons



GALVESTON TO CORPUS

Total= 18,148,984 Tons



CORPUS TO BROWNSVILLE

Total= 1,948,742 Tons

LEGEND

A PETROLEUM PRODUCTS
B CHEMICALS
C CRUDE PETROLEUM
D SHELL
E NON-METALLIC MINERALS
F METAL PRODUCTS
G WASTE AND SCRAP METAL
H GRAINS
I MISCELLANEOUS

Source: U.S. Army Corps of Engineers
Waterborne Commerce of the
United States Calendar Year 1976.

Figure 8

products and grains. These changes took place while the total segment tonnage was increasing.

The segment from Galveston to Corpus Christi, meanwhile, showed percentage increases in the movements of chemicals, crude petroleum, non-metallic minerals, waste and scrap metal and miscellaneous categories. Losses were experienced in the movements of petroleum products, shell, metal products, and grains. These changes, however, are obscured by the fact that the total tonnage on this segment showed a considerable decrease of 5,161,101 tons from 1974 to 1976. In this case, the only true gains were minor gains in the non-metallic minerals, scrap metal and miscellaneous categories.

A similar situation exists for the segment from Corpus Christi to Brownsville, where the apparent gains in the petroleum products, chemicals, crude petroleum, and waste and scrap metal categories were percentage gains only and were caused by the 28.1% loss in total tonnage reported. Actually, all commodities transported showed a decrease in the movements since 1974.

Trading Areas Also Change

The Texas interstate trade movements, meanwhile, show an 8.3% increase in exports from 19,209,212 tons in 1974 to 20,821,224 tons in 1976. This increase in exports was partially offset by a 4.2% decrease in imports, however, where only 11,269,391 tons entered the state in 1976, versus a total of 11,769,995 tons in 1974. It should be noted at this point that the tonnages reflect only selected commodities that have been chosen because of their importance on the

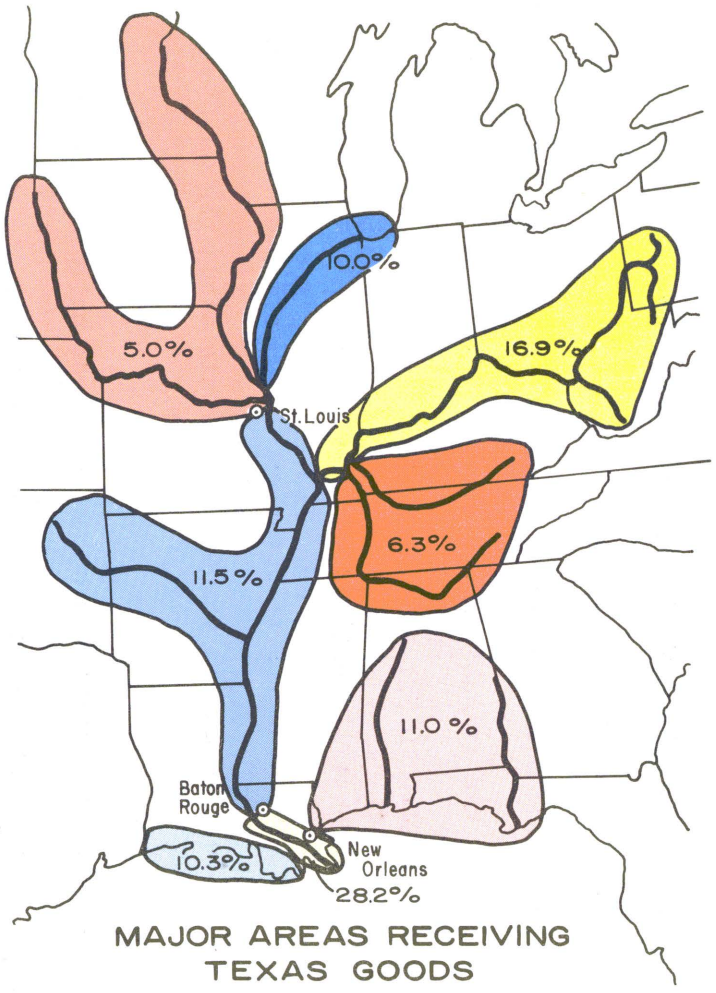
waterways nationwide. These products consist of: certain classifications of grains, coal, crude petroleum, petroleum products, chemicals, and iron and steel. Fortunately, most of these commodities do constitute the majority of the products moving in the marine interstate trade of Texas.

The trading areas involved in these movements are shown in Figure 9. The imports show a major drop in trade from the area signified by the GIWW in Louisiana where a 7.7% decrease in traffic was recorded. Minor decreases were also recorded in the Middle Mississippi River area, and the Illinois and Ohio River systems. On the other hand, an increase of 6.4% was recorded along the eastern Gulf section of the GIWW with other minor increases recorded in the Lower and Upper Mississippi River areas and the Cumberland-Tennessee Rivers system.

The trade areas showing increases in receiving Texas exports were the Upper Mississippi River (3.4%), the Lower Mississippi River (2.1%), the Louisiana portion of the GIWW (1.6%), the Cumberland-Tennessee Rivers system (0.9%), and the Middle Mississippi River areas (0.2%). Those areas registering decreases in trade received were the Ohio River system (4.1%), the Illinois River system (3.3%), and the eastern Gulf section of the GIWW (0.7%). Despite these changes over 50% of the Texas products are still destined for the upper midwest area served by the Mississippi River and its tributaries. However, over 82% of the products imported into Texas via the GIWW originate along the Gulf Coast.

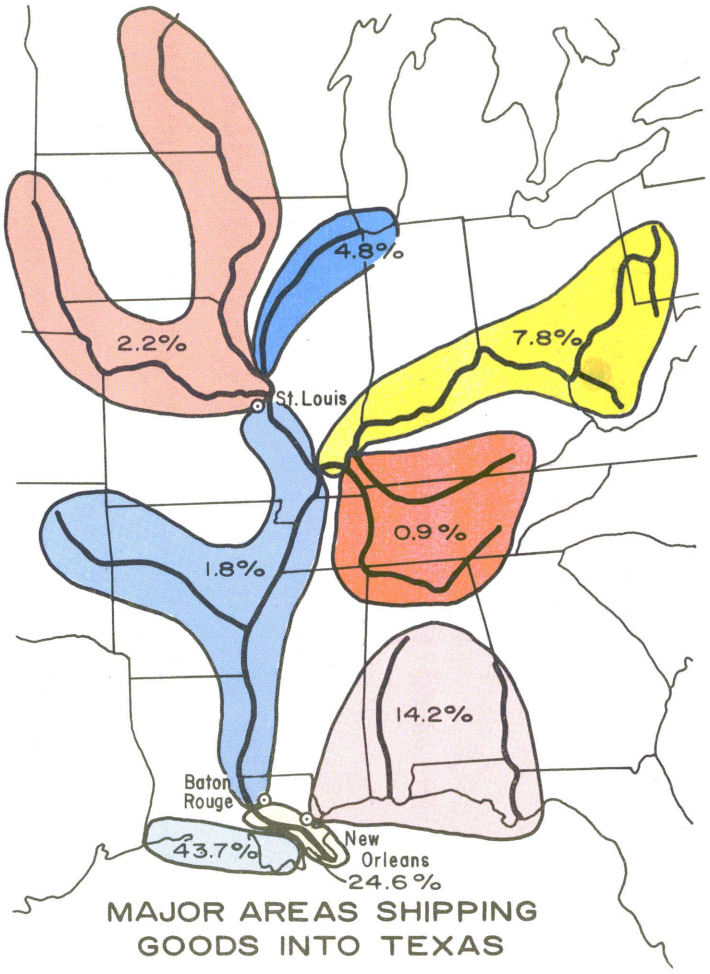
The importance of distinguishing marine trade patterns cannot be overemphasized. To illustrate this premise, since 1960 the marine

MARINE COMMERCE TRADE AREAS FOR SELECTED TEXAS PRODUCTS



MAJOR AREAS RECEIVING TEXAS GOODS

1976 EXPORTS
20,821,224 TONS



MAJOR AREAS SHIPPING GOODS INTO TEXAS

1976 IMPORTS
11,269,391 TONS

G.I.W.W. TRADING AREA

- G.I.W.W. (Louisiana)
- G.I.W.W. (Eastern Gulf of Mexico)
- Lower Mississippi River
- Middle Mississippi River
- Upper Mississippi River and Missouri River
- Illinois River System
- Ohio River System
- Cumberland and Tennessee Rivers System

Figure 9

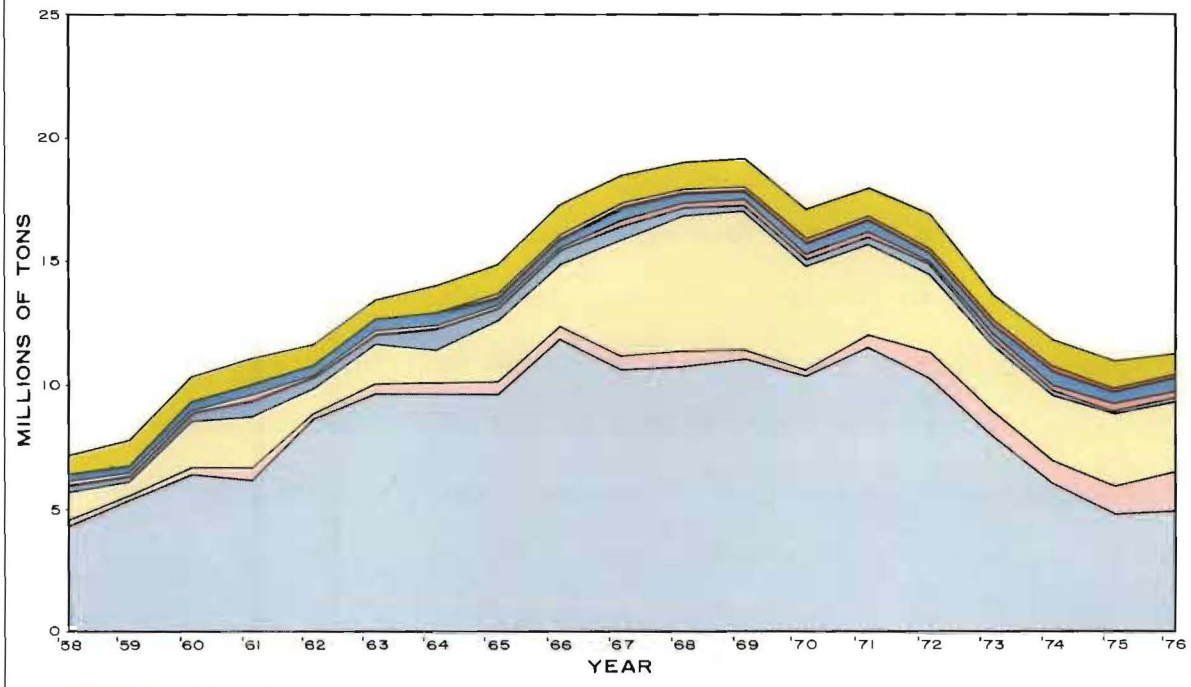
Source: U.S. Army Corps of Engineers
Waterborne Commerce of the
United States Calendar Year 1976.

trade of the entire midwest and Gulf coast that moves by barge has increased from 169 million tons to over 317 million tons, a growth of 86.7% in the seventeen year period. The movements of Texas commodities, both exports and imports, have experienced a 73.6% growth in the same period. Prior to the last two years, Texas led this trade area in growth rate but now has fallen slightly behind. The principal explana- for this behavior would be the drop in crude petroleum shipsments, due to the increasing dependence on foreign imports, and the growth of grain and coal movements in the total trade area. Texas is neither a major origin nor destination for grain and coal movements. Nevertheless, Texas generally contributes approximately 17% of all movements in this vast trade area.

Figure 10, showing the trends of changing trade areas shipping commodities into Texas, indicates that the Louisiana section of the GIWW and the Lower Mississippi River segment have shown substantial drops in these commodity movements since reaching a peak volume of traffic in 1969. These areas have caused a major decline in imports since no other trade area could overcome this general decline. Figure 11 shows the commodities received in Texas and pinpoints the cause of the traffic decline to be the decline in domestic imports of crude petroleum.

On the contrary, Figure 12 showing the historic destinations of Texas domestic barge exports indicates a substantial growth in those shipments to the Mississippi River system but only minor growth in Gulf Coast traffic. Figure 13 shows that most of this growth is due to increases in the shipment of petroleum products and industrial chemicals. Finally, the total picture of the commodities involved in

TEXAS INTERSTATE BARGE RECEIPTS BY ORIGIN
SELECTED COMMODITIES

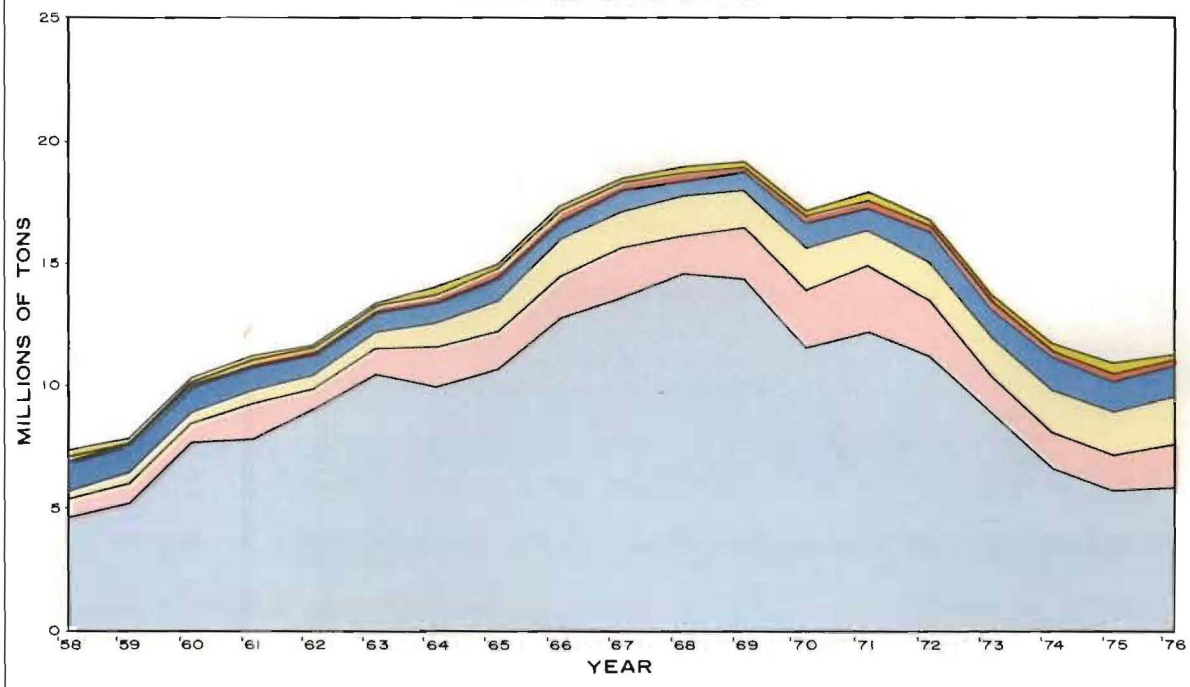


- G.I.W.W. (Louisiana)
- G.I.W.W. (Eastern Gulf of Mexico)
- Lower Mississippi River
- Middle Mississippi River
- Upper Mississippi River and Missouri River
- Illinois River System
- Cumberland and Tennessee Rivers System
- Ohio River System

Figure 10

Source: Waterborne Commerce of the United States.

SHALLOW-DRAFT MARINE RECEIPTS OF TEXAS
SELECTED COMMODITIES



- Crude Petroleum
- Petroleum Products
- Chemicals
- Iron and Steel
- Coal
- Grains

Figure 11

Source: Waterborne Commerce of the United States.

TEXAS INTERSTATE BARGE SHIPMENTS BY DESTINATION
SELECTED COMMODITIES

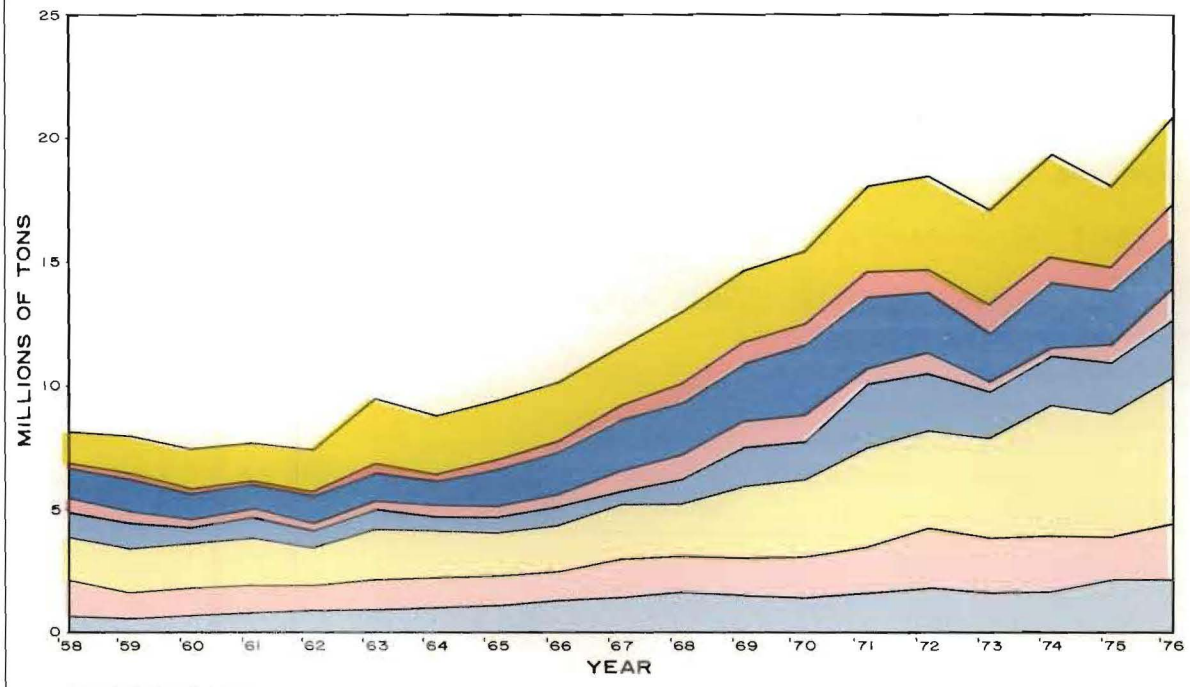


Figure 12

Source: Waterborne Commerce of the United States.

SHALLOW-DRAFT MARINE SHIPMENTS OF TEXAS
SELECTED COMMODITIES

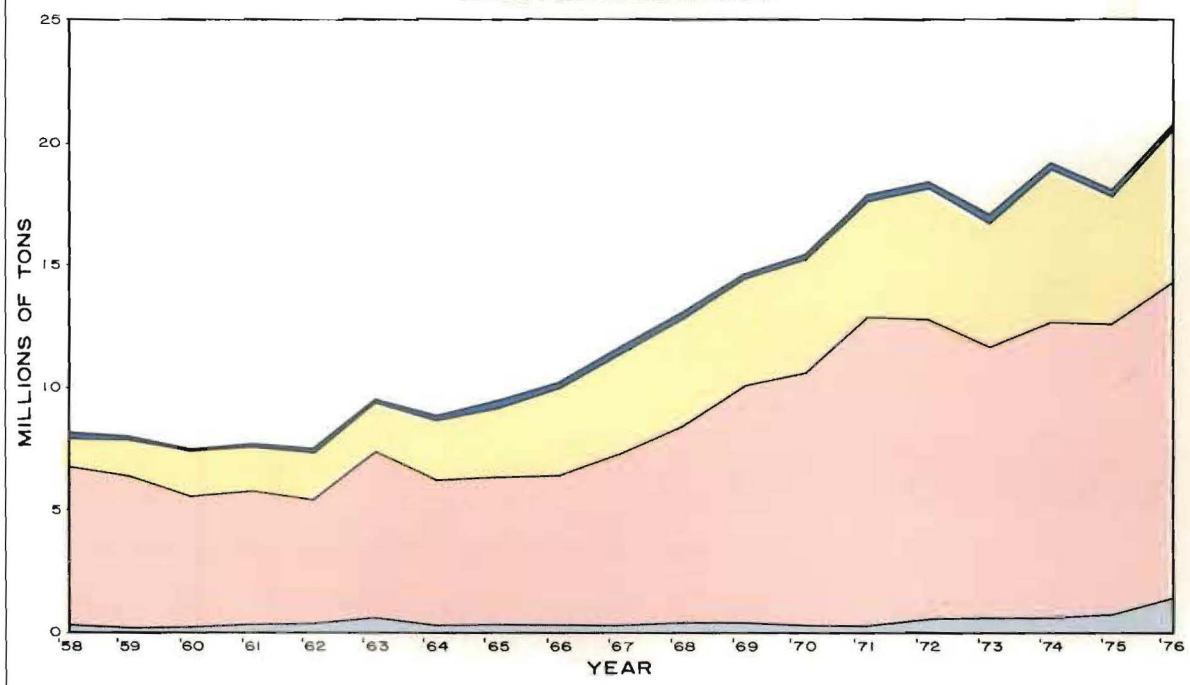


Figure 13

Source: Waterborne Commerce of the United States.

the interstate traffic is delineated in Figure 14. Once again the decline in the movement of domestic crude petroleum has caused a decline in total tonnage involved in this trade, although the total effect is not nearly so severe as that shown in Figures 10 and 11. This is due to the partially offsetting gain in exports as shown in Figures 12 and 13.

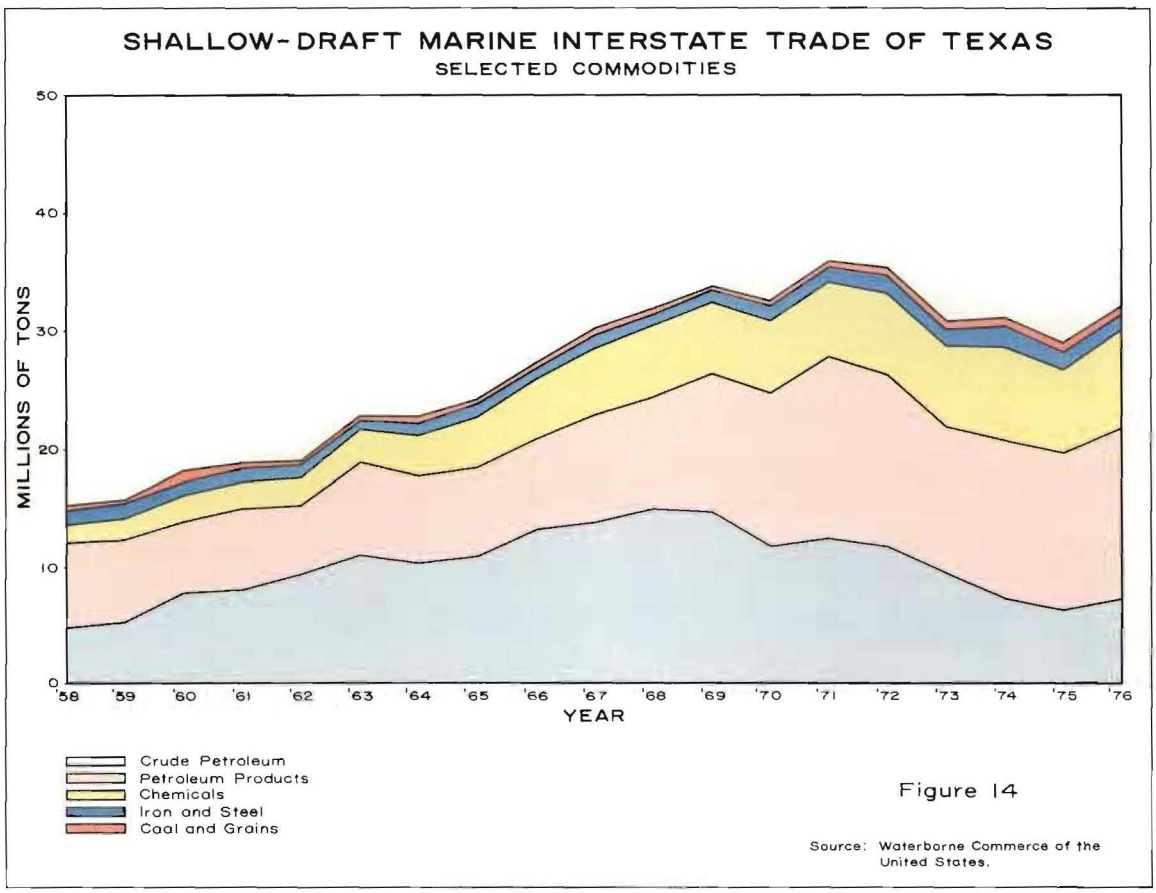


Figure 14

Intrastate and Interstate Trade

Also of importance to understanding the inland marine commerce of Texas is the ratio of intrastate to interstate traffic. Since 1960, Texas intrastate trade has represented from 29% - 40% of the Texas total movements. Approximately 15% of the total movements included

herein consist of local movements, which are those movements entirely within a single segment of the waterway. For these statistics there are five Texas segments of the GIWW. Thus, approximately 60% - 71% of all Texas movements represent interstate trade. The current percentage is 63.0% of the total Texas movements, which was held consistent within recent years. The ratios of the Texas local, intrastate and interstate movements is illustrated in Figure 15 wherein the growth of the various movements over the last 19 years is depicted.

The statewide breakdown of these movements, however, does not present the complete picture of such movements. Figures 16 through 20 depict the individual breakdown of the traffic on each of the five segments listed for the GIWW in Texas. The traffic depicted in these charts does not indicate the total traffic moving over a segment of the waterway, but is restricted to that traffic that either originates or terminates on that particular segment of the waterway. For this reason, the segment of the GIWW from the Sabine River to Galveston shown in Figure 17, although the most heavily traveled segment of the GIWW, shows only a very small volume of traffic, none of which is local traffic, since there are practically no origin or destination points along this segment.

The Sabine-Neches Waterway segment of the GIWW, shown in Figure 16 differs from the statewide pattern in that only a minor part of the traffic is defined as local movements. Figure 18, however, shows that the Galveston Bay segment conforms more to the statewide pattern and, in fact, provides a substantial part of all of the local movements statewide. The two remaining segments, Galveston to Corpus Christi (Figure 19) and Corpus Christi to Brownsville (Figure 20), show a

SELECTED SHALLOW-DRAFT MARINE TRADE MOVEMENTS

ENTIRE G.I.W.W.

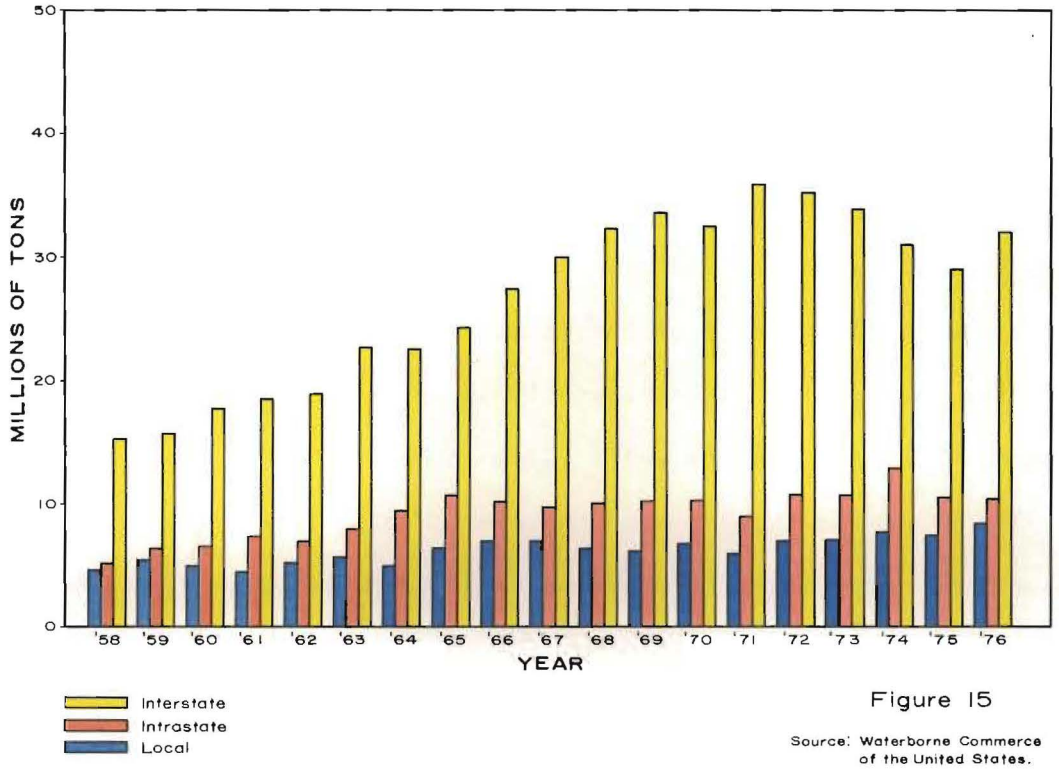


Figure 15

Source: Waterborne Commerce of the United States.

SELECTED SHALLOW-DRAFT MARINE TRADE MOVEMENTS

SABINE - NECHES SECTION OF THE G.I.W.W.

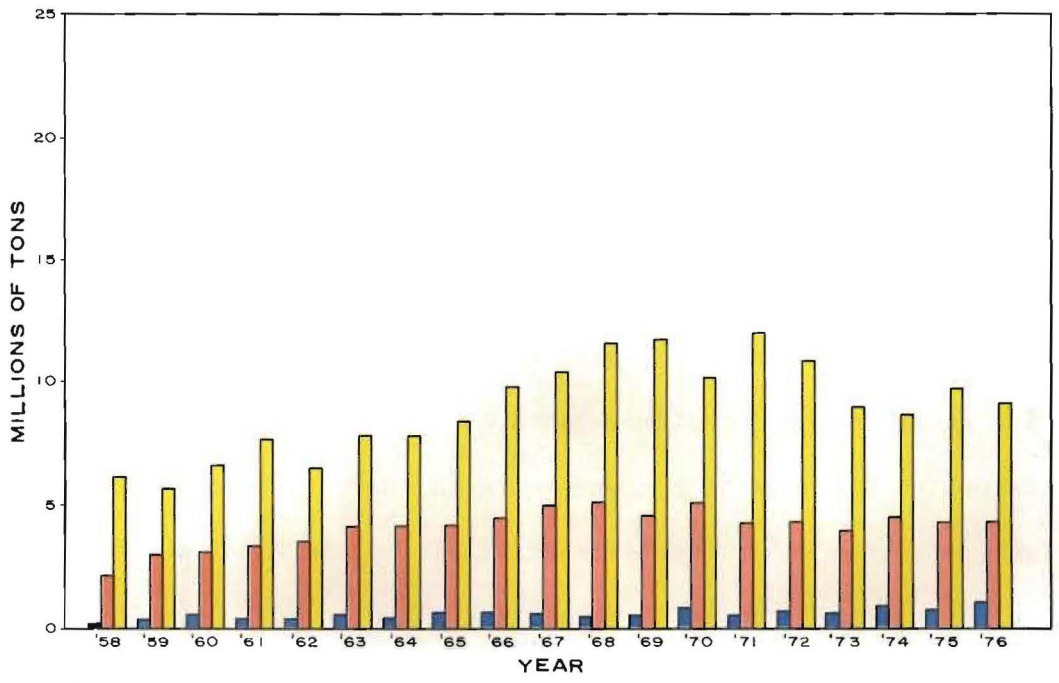


Figure 16

Source: Waterborne Commerce of the United States.

SELECTED SHALLOW-DRAFT MARINE TRADE MOVEMENTS

SABINE RIVER-GALVESTON SECTION OF THE G.I.W.W.

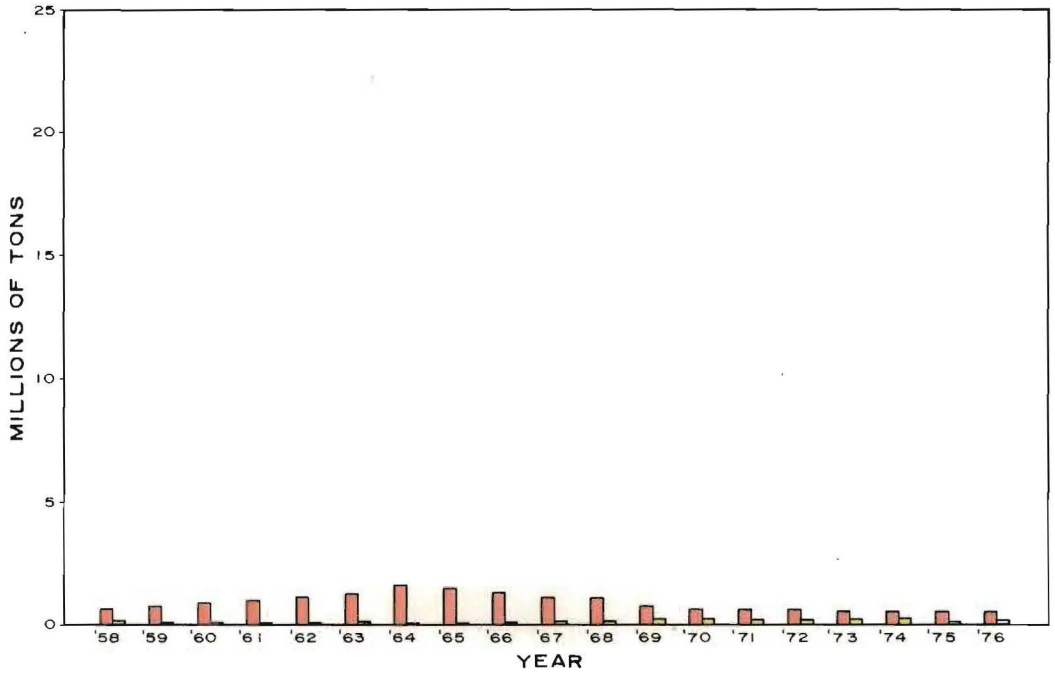


Figure 17

Source: Waterborne Commerce of the United States.

SELECTED SHALLOW-DRAFT MARINE TRADE MOVEMENTS

GALVESTON BAY SECTION OF THE G.I.W.W.

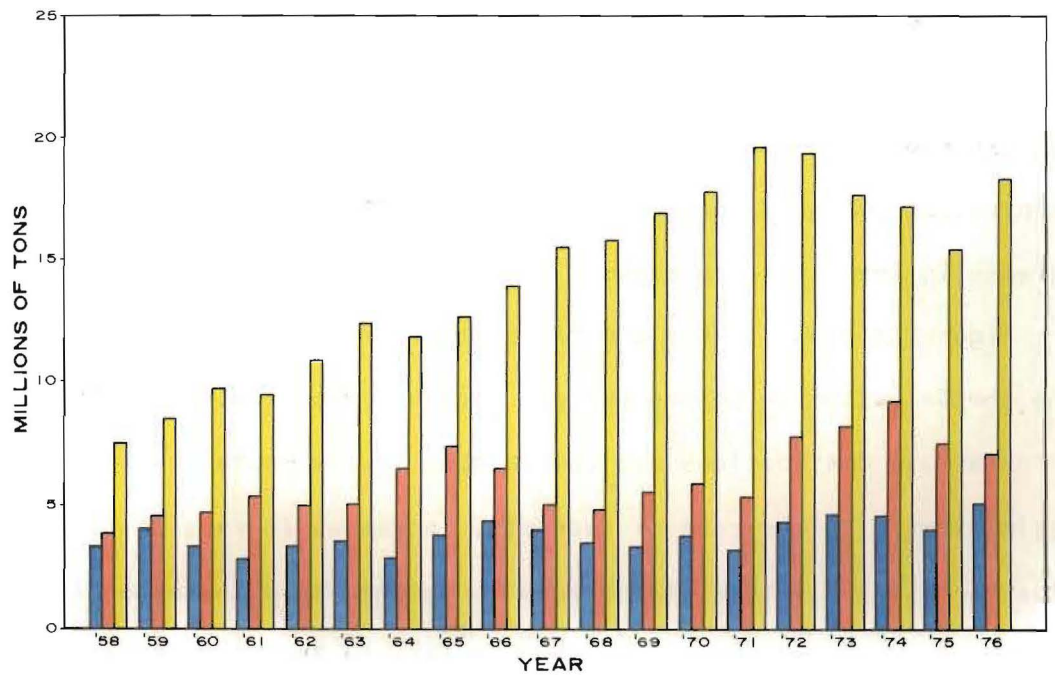


Figure 18

Source: Waterborne Commerce of the United States.

consistent pattern of high intrastate movements with varying amounts of interstate movements and only minor local movements.

Patterns In Intrastate Trade

As was the case in interstate movements, the tonnages depicted for intrastate movements are restricted to selected commodities and do not reflect the entire tonnages of commodities that actually move in commerce. The trading areas for the Sabine-Neches waterway segment, depicted in Figure 21, indicate only minor changes in the tonnage have occured since 1974. The most significant change is a decrease of 6.6% in exports and a 2.1% decrease in imports in trade with the Galveston Bay segment. A 4.8% increase in the exports to the Interstate market and a 4.4% increase in the imports from the Corpus Christi to Brownsville segment provide the major compensation for these decreases.

While Figure 22 shows substantial changes in market trade areas, the low volume of commodities involved in this traffic makes the percentage changes too subject to extreme variations to make the figures meaningful. The Galveston Bay segment shows only minor variations in the destinations of traffic on Figure 23; however, substantial declines in intrastate markets for shipments is compensated for by an 11.7% increase in interstate receipts.

Figure 24 shows that a similar pattern prevails regarding shipments from the Galveston to Corpus Christi segment, where slight decreases in intrastate destinations are compensated for by increases in interstate destinations. In the case of receipts, increases in receipts from Galveston Bay and interstate sources is matched by a corresponding decrease in receipts from the Corpus Christi to Brownsville segment.

SELECTED SHALLOW-DRAFT MARINE TRADE MOVEMENTS

GALVESTON-CORPUS CHRISTI SECTION OF THE G.I.W.W.

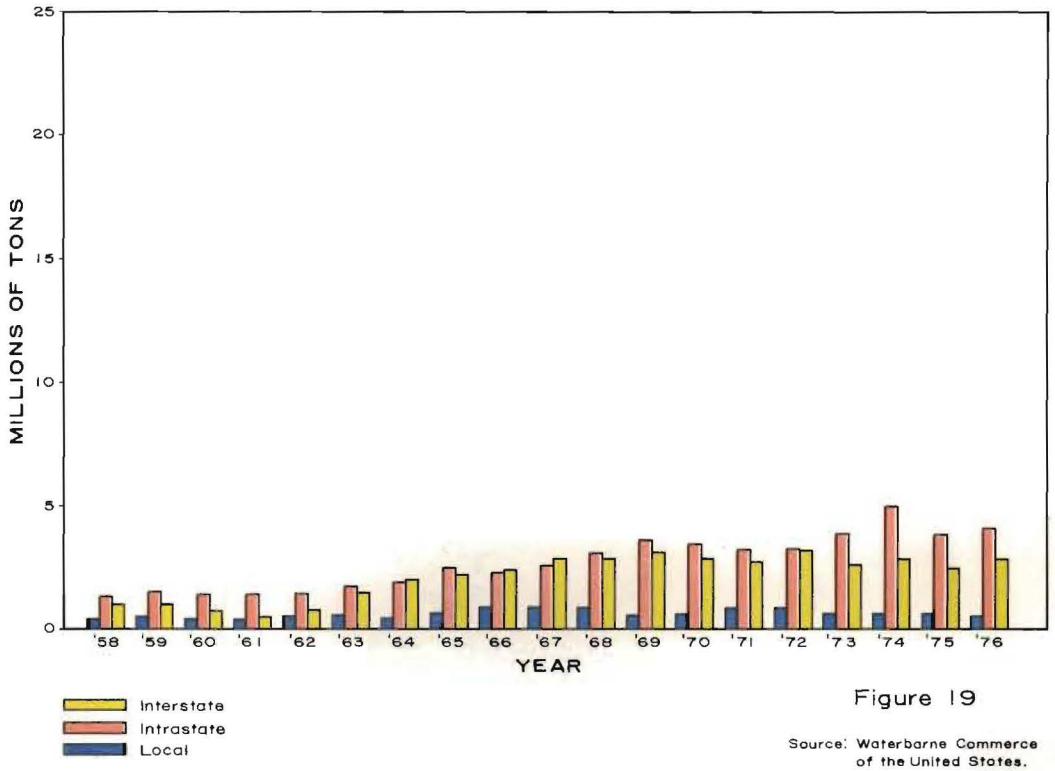


Figure 19

Source: Waterborne Commerce of the United States.

SELECTED SHALLOW-DRAFT MARINE TRADE MOVEMENTS

CORPUS CHRISTI-BROWNSVILLE SECTION OF THE G.I.W.W.

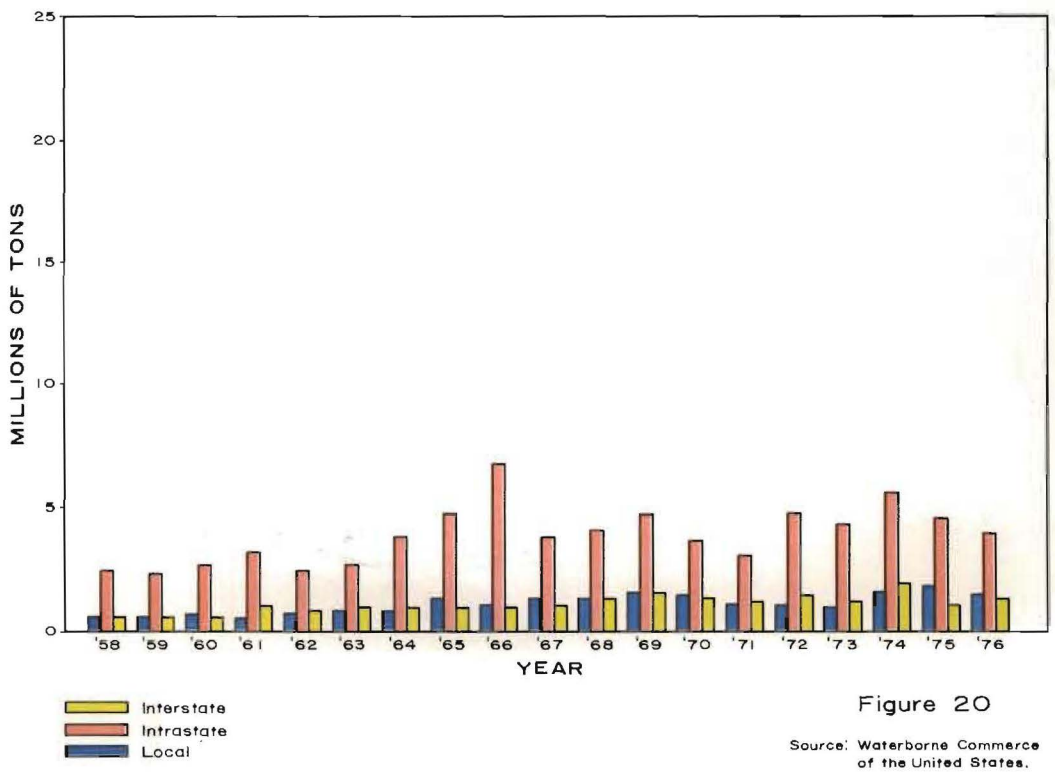
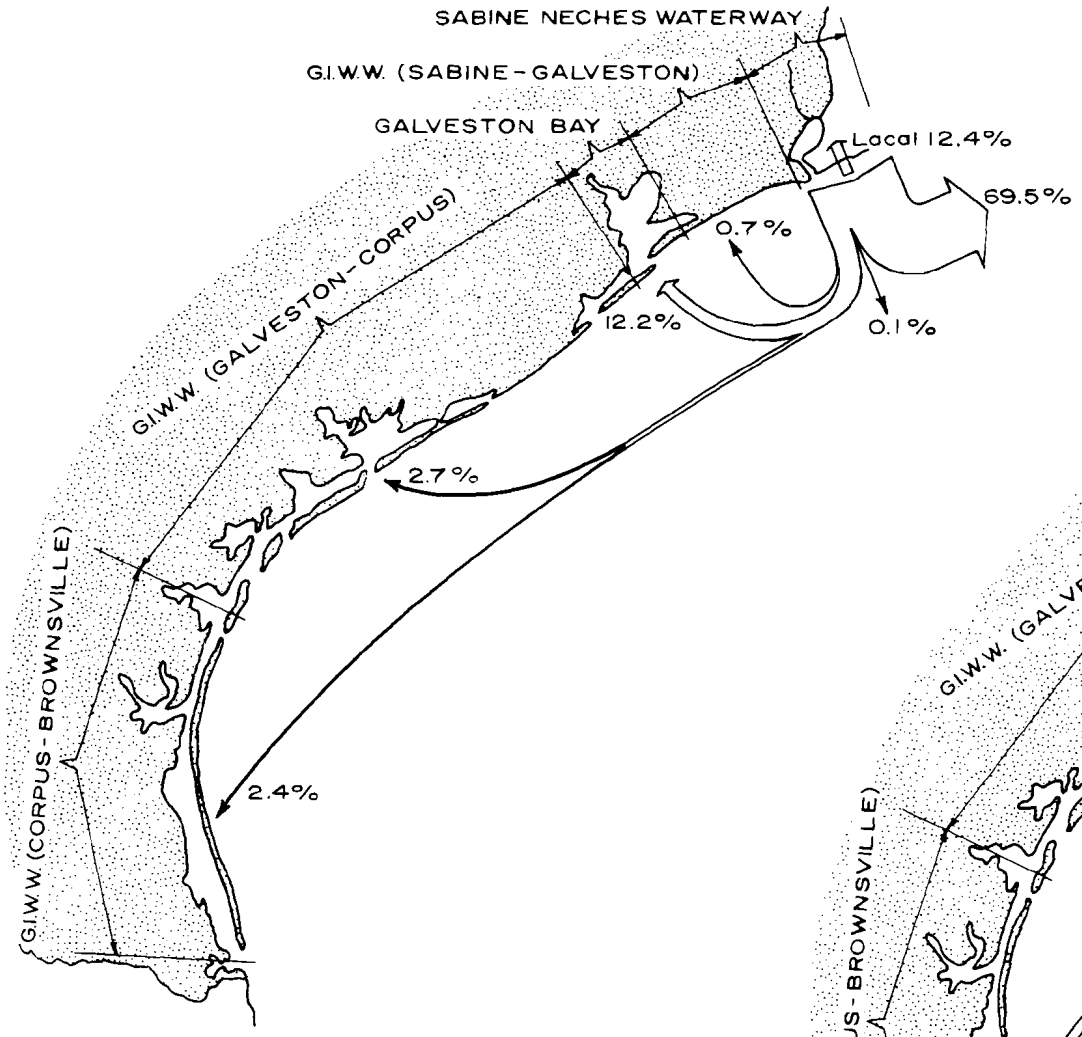


Figure 20

Source: Waterborne Commerce of the United States.

TRADING AREAS
SABINE NECHES WATERWAY

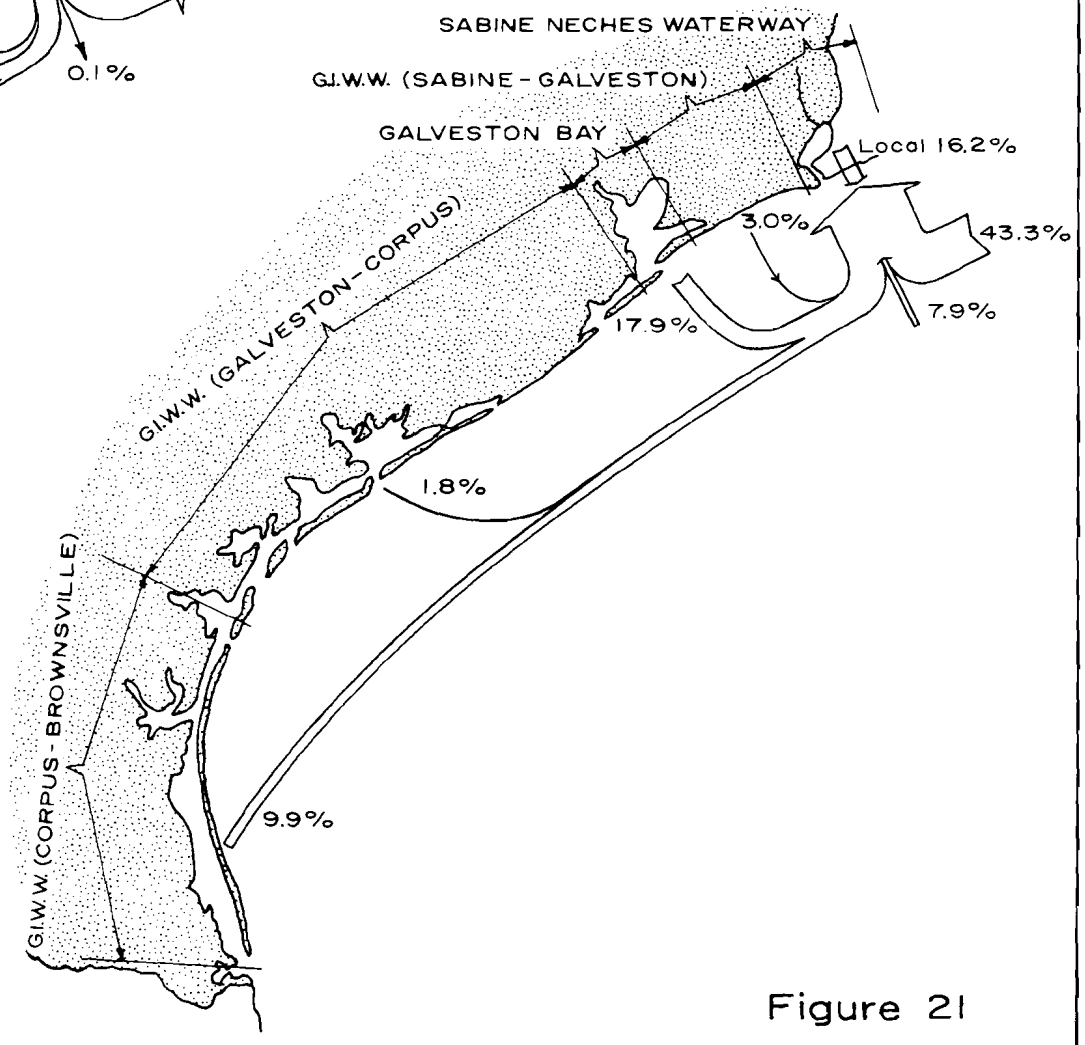


SHIPMENTS

TOTAL TONS - 8,961,525

RECEIPTS

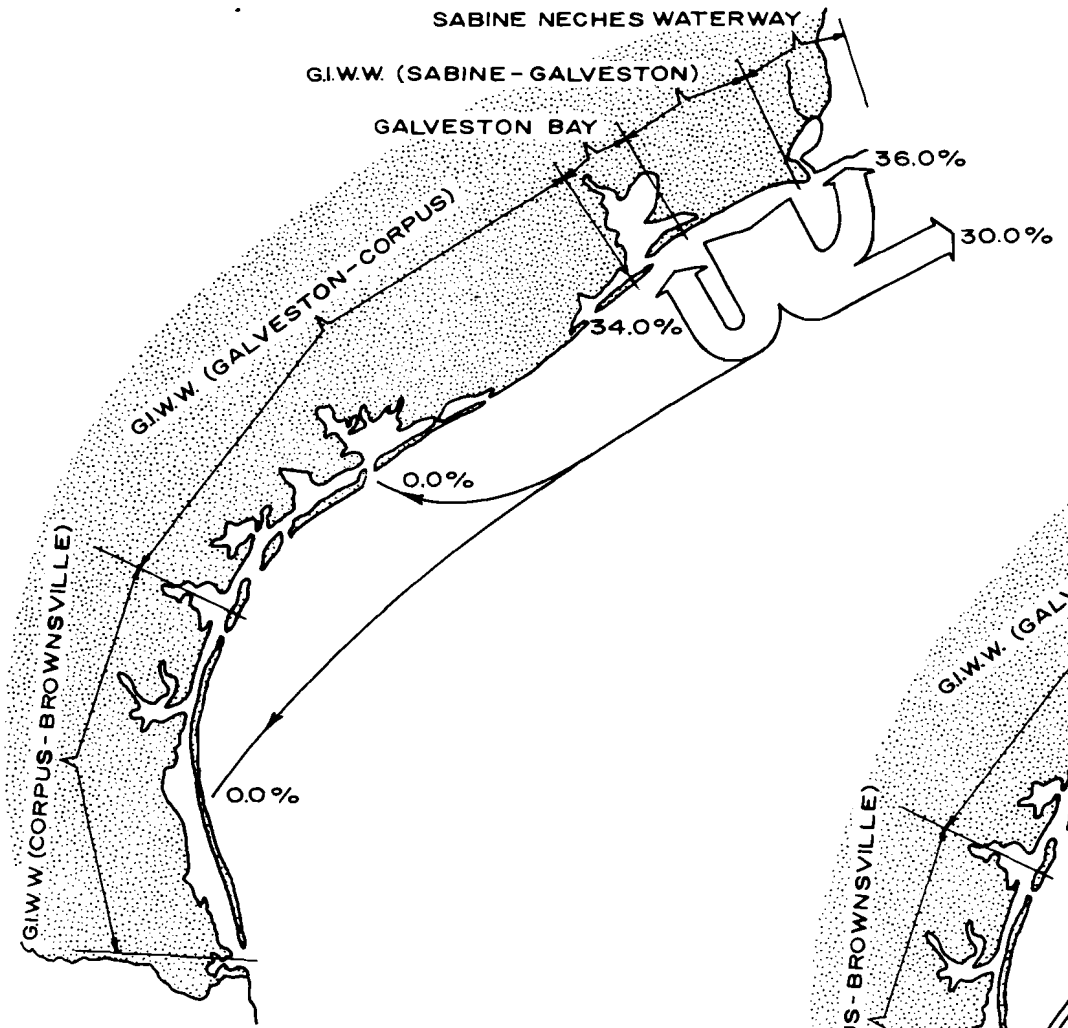
TOTAL TONS - 6,836,002



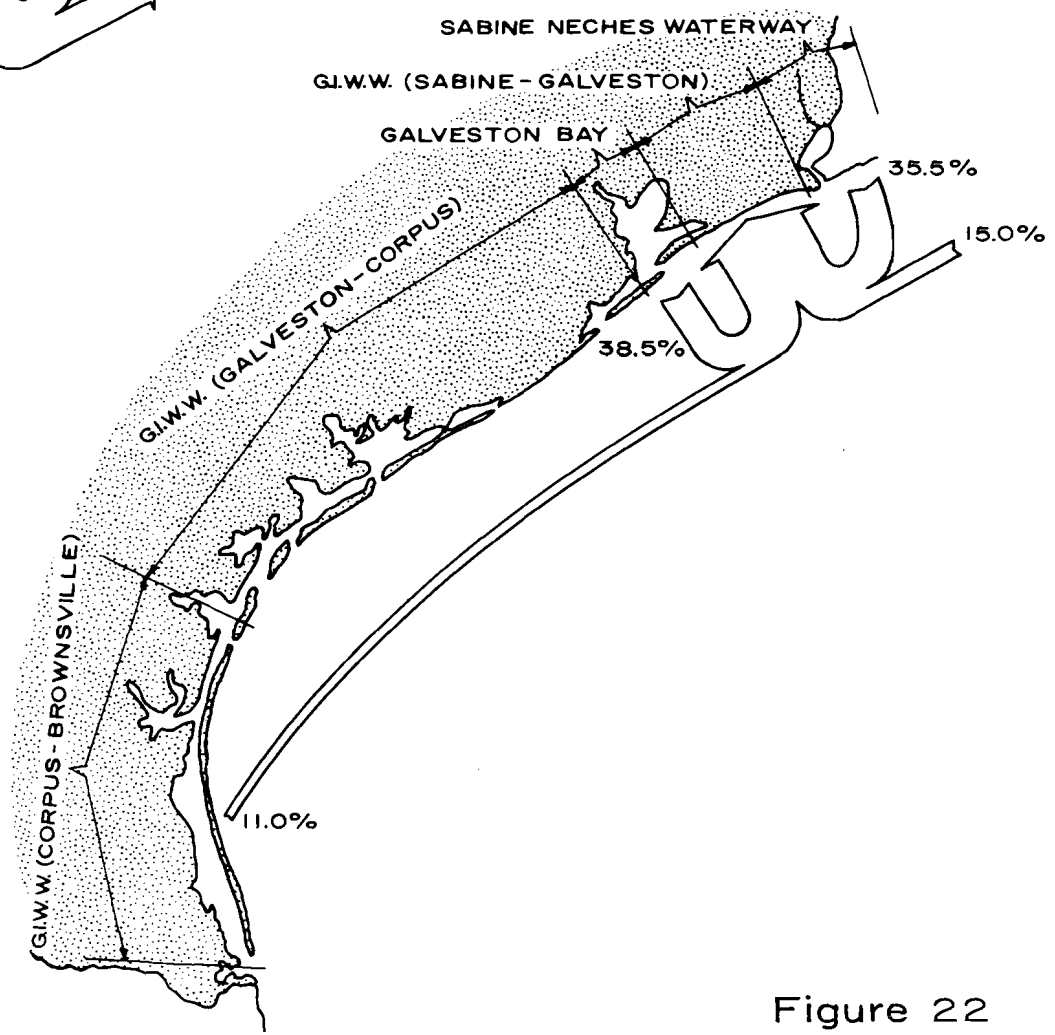
Source: U.S. Army Corps of Engineers Waterborne Commerce of the United States Calendar Year 1976.

Figure 21

TRADING AREAS
G.I.W.W. (SABINE - GALVESTON)



SHIPMENTS
TOTAL TONS - 571,496

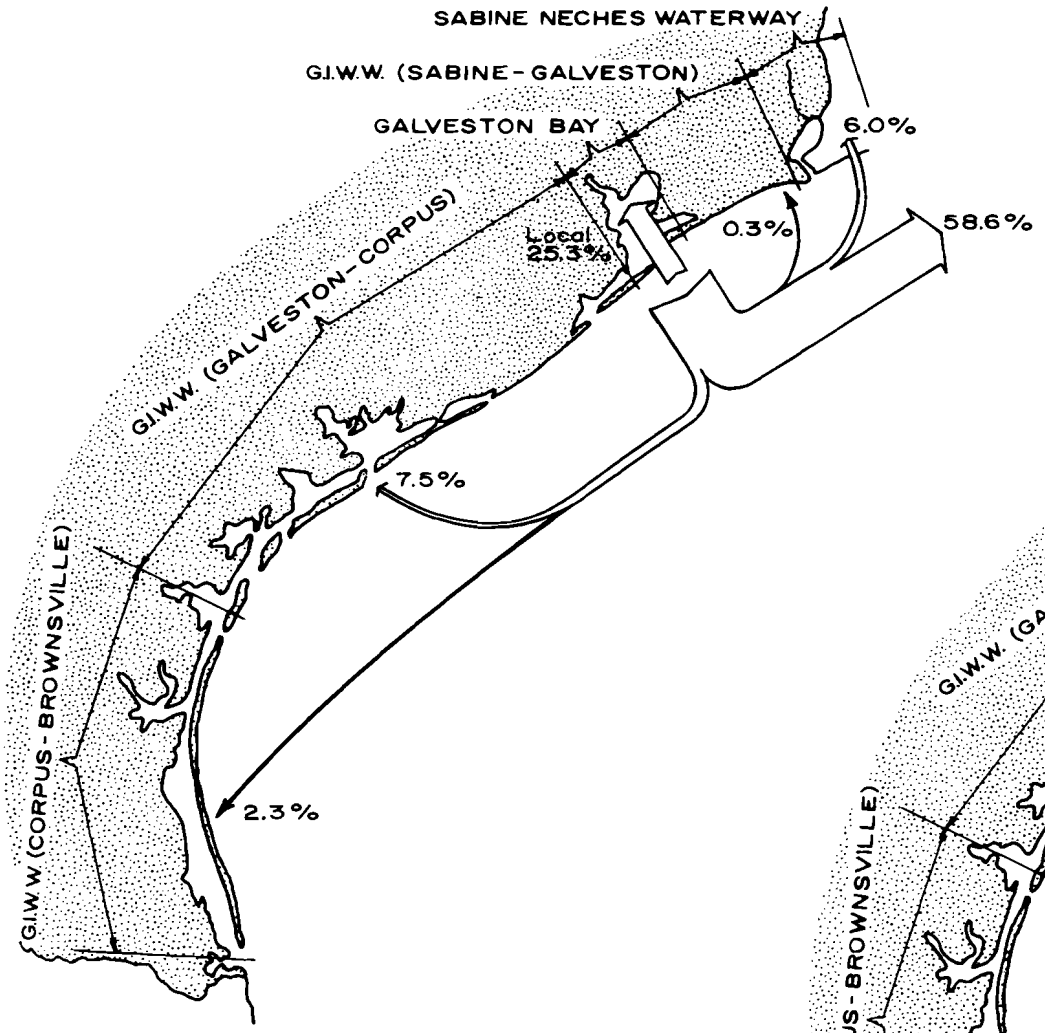


RECEIPTS
TOTAL TONS - 182,040

Source: U.S. Army Corps of Engineers Waterborne Commerce of the United States Calendar Year 1976.

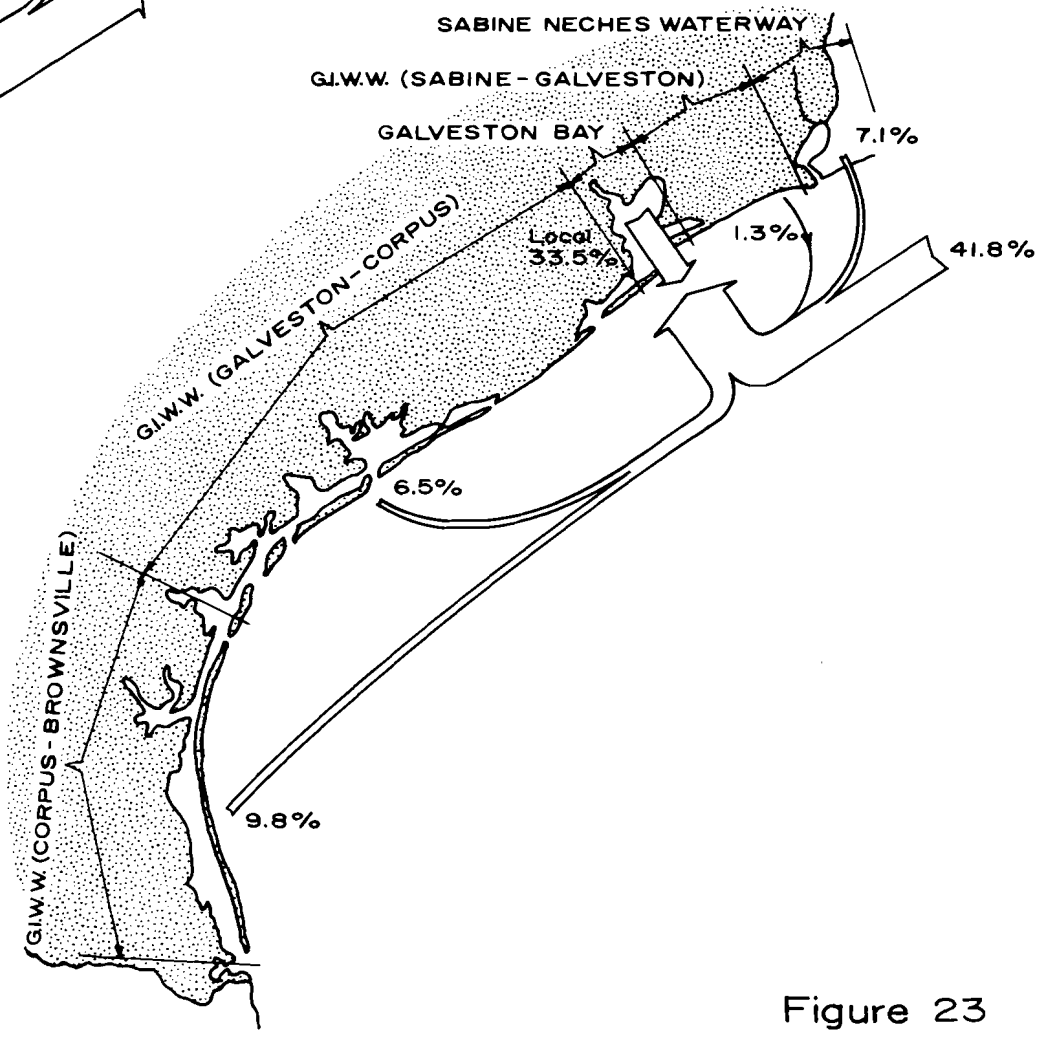
Figure 22

TRADING AREAS
GALVESTON BAY



SHIPMENTS

TOTAL TONS - 20,451,873



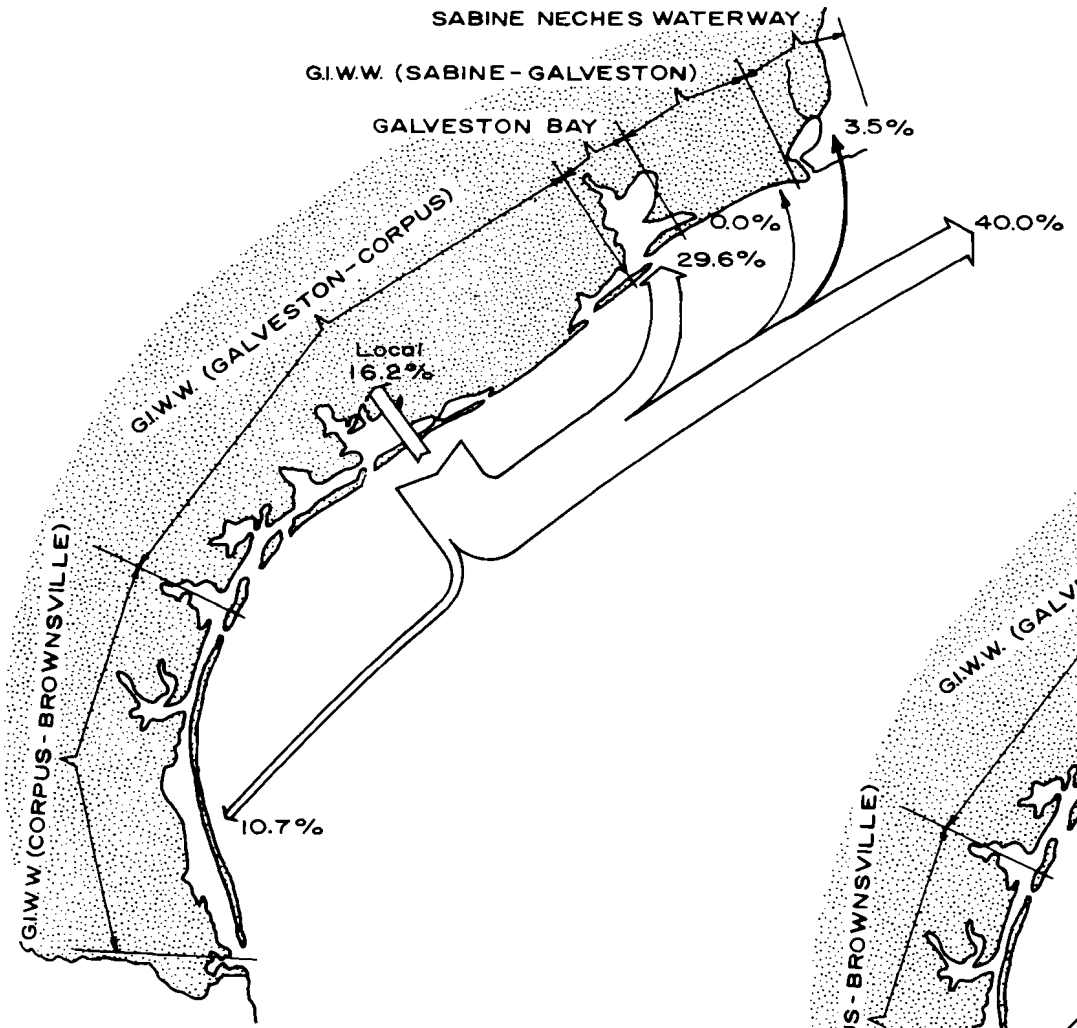
RECEIPTS

TOTAL TONS - 15,467,271

Source: U.S. Army Corps of Engineers Waterborne Commerce of the United States Calendar Year 1976.

Figure 23

TRADING AREAS
G.I.W.W. (GALVESTON - CORPUS)

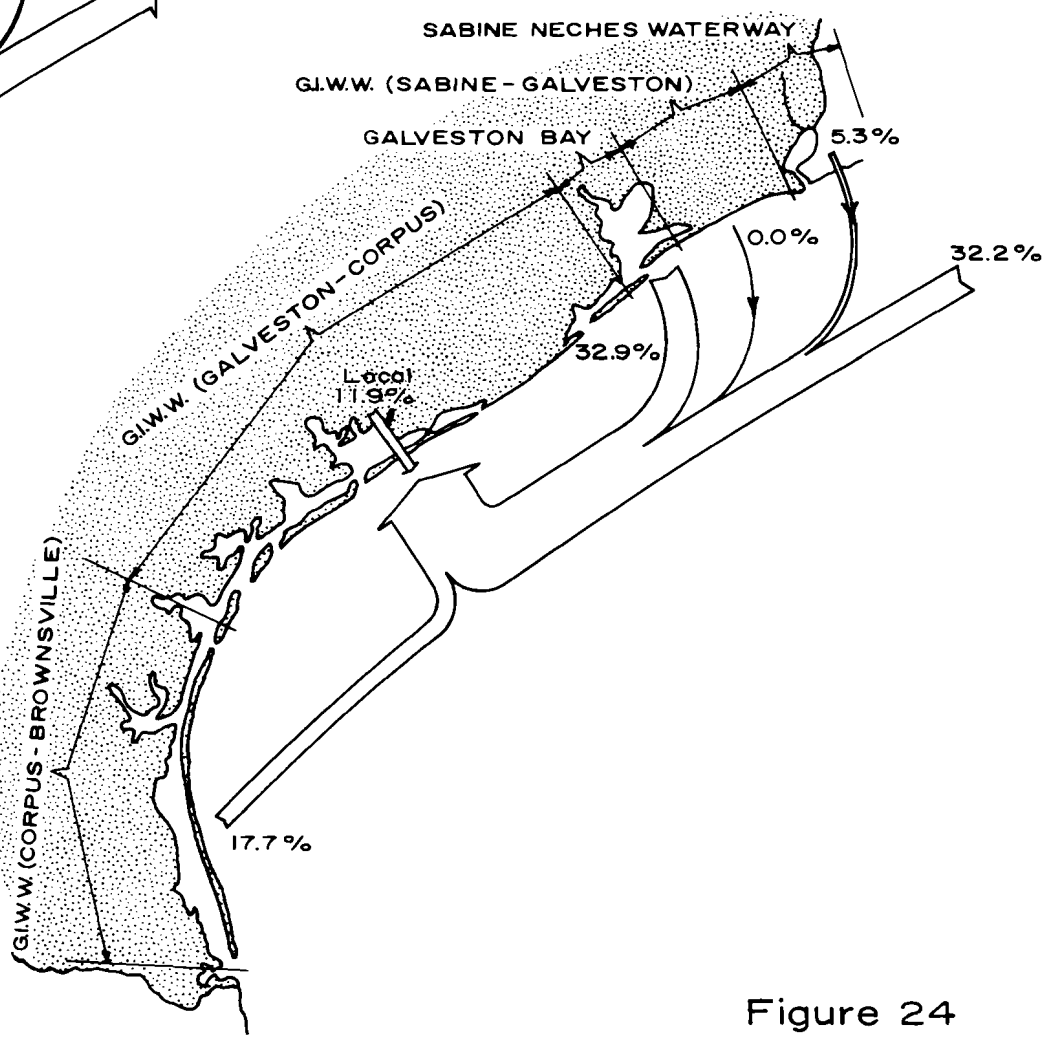


SHIPMENTS

TOTAL TONS - 3,420,389

RECEIPTS

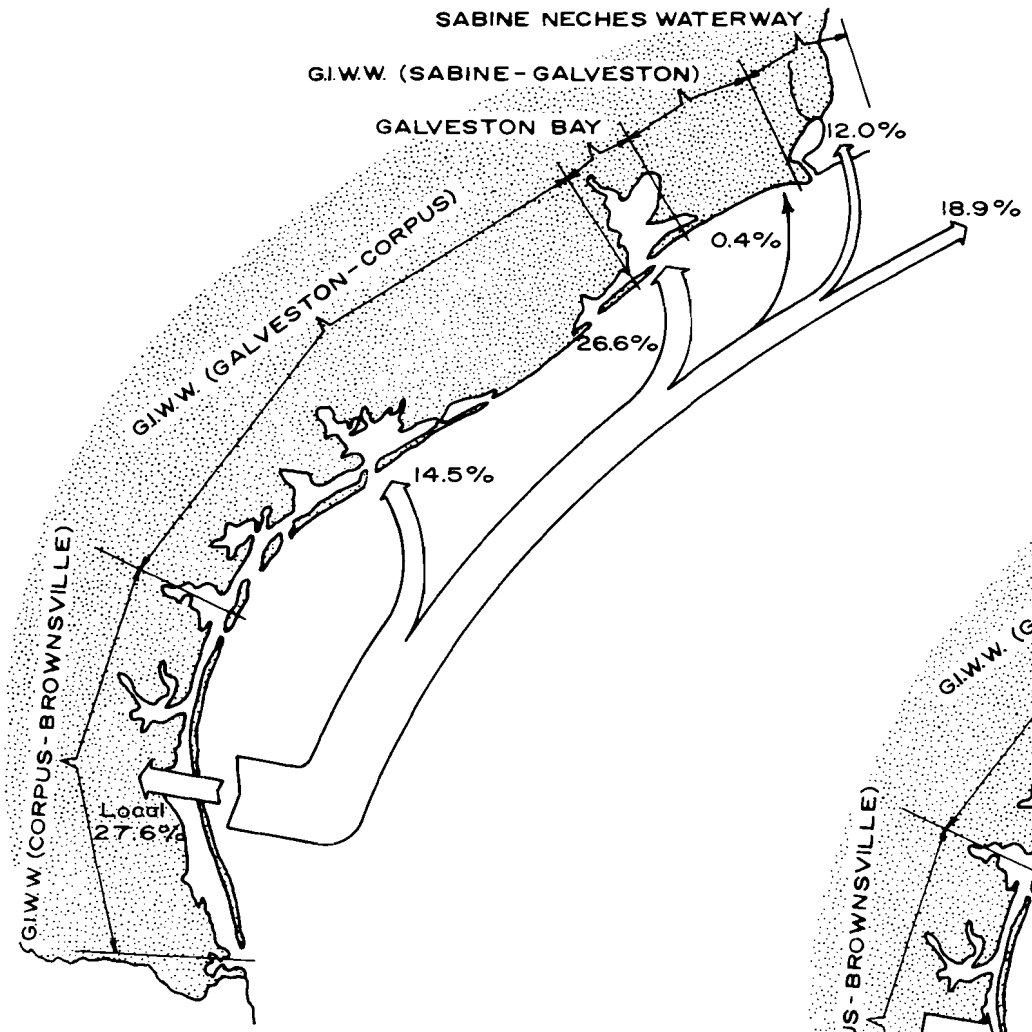
TOTAL TONS - 4,656,162



Source: U.S. Army Corps of Engineers Waterborne Commerce of the United States Calendar Year 1976.

Figure 24

TRADING AREAS
G.I.W.W. (CORPUS - BROWNSVILLE)

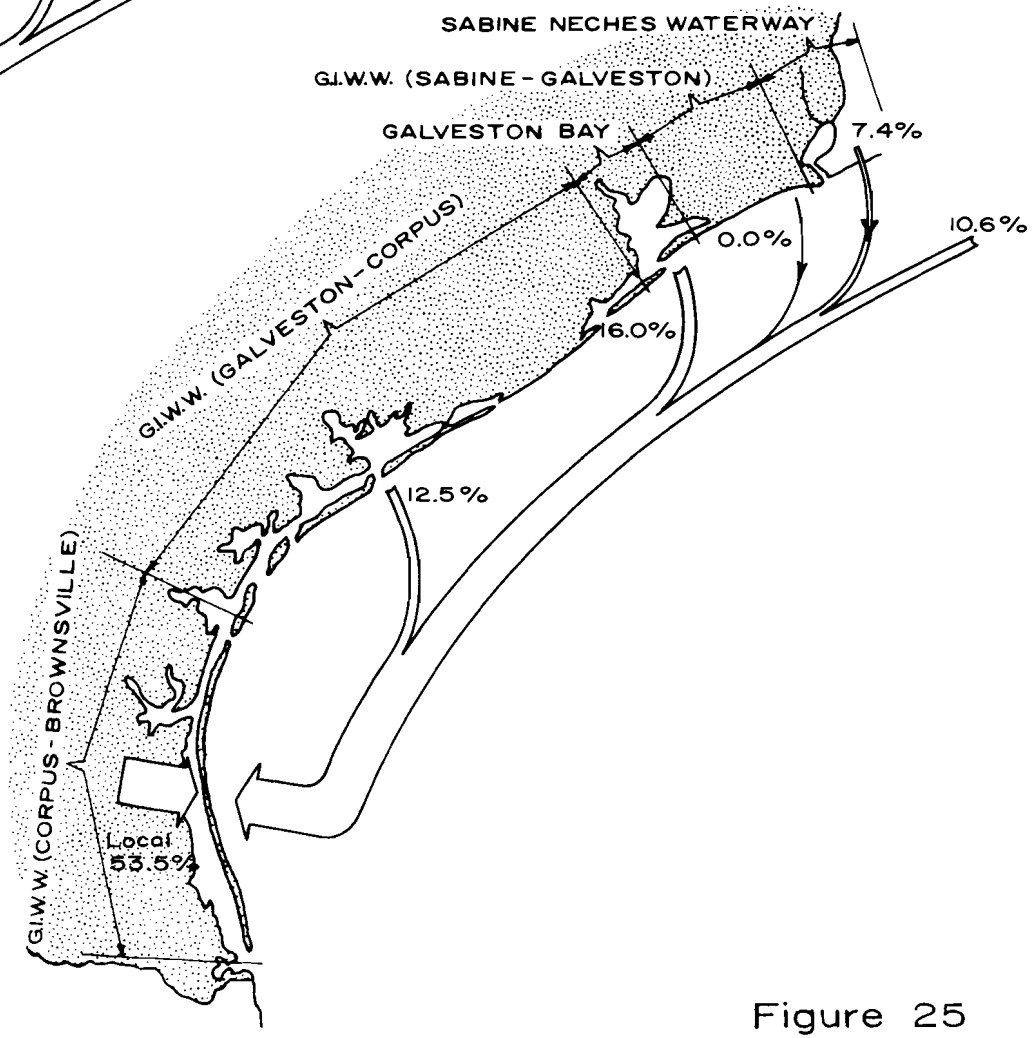


SHIPMENTS

TOTAL TONS - 5,683,720

RECEIPTS

TOTAL TONS - 2,936,933



Source: U. S. Army Corps of Engineers Waterborne Commerce of the United States Calendar Year 1976.

Figure 25

Finally, Figure 25 shows that a 7.4% increase in shipments to the Sabine-Neches Waterway segment and a 4.2% increase in local movements are offset by decreases in the other intrastate markets. Likewise an 8.2% increase in receipts in local movements is compensated by an 8.5% decrease in receipts from interstate sources.

What Caused the Drop in Traffic

The first report in this series, The Gulf Intracoastal Waterway in Texas - 1976, was able to establish the existance of a growing marine traffic on this vital waterway. Although this traffic, including the ever present duplications, has declined slightly since it reached a peak in 1972, it was not apparent at that time what had been the principal reason for the decline. In the interim, accumulation of more data on past movements has identified the chief factor for this decline to be the decrease in movements of domestic crude petroleum and marine shell. The declining production of these two products has become evident by the decline in total traffic. Substitutes for marine shell are being utilized but they currently do not ordinarily move by barge. Likewise, the increase in imported foreign crude petroleum to replace declining domestic supplies is carried directly to the port refineries in deep-draft vessels rather than by barge.

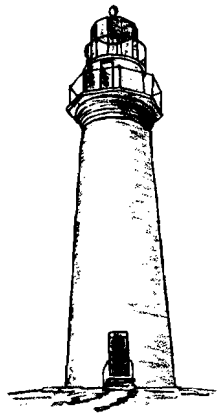
In the past, the major commodities moving by barge in Texas commerce have been crude petroleum, petroleum products, industrial chemicals, marine shell and non-metallic minerals. Although these five commodities have consistently maintained an average of 94% of all goods moved on the GIWW in Texas, from 1960 through 1976 the share of the total traffic represented by crude petroleum and marine shell

have shown the following decline: 1960 - 50.4%; 1965 - 50.9%; 1970 - 44.1%; 1976 - 27.6%. These declines have taken place during a period in which the total traffic has risen from 34,470,000 tons in 1960 to 61,880,000 tons in 1976. Petroleum products and industrial chemical categories, both dependent on crude petroleum as the basic feed stock, have experienced a significant rise in tonnage. Crude petroleum on the other hand, has taken a substantial decline. This indicates that it is not a slow-down in production that is involved but rather that a new source of the petroleum feed-stock has been developed in the past six years.

CHAPTER FIVE

A STUDY OF NEEDED IMPROVEMENTS TO THE GULF INTRACOASTAL WATERWAY

A STUDY OF NEEDED
IMPROVEMENTS TO THE GULF INTRACOASTAL WATERWAY



The first report of the evaluation of the GIWW in Texas, as submitted to the sixty-fifth session of the Texas Legislature, identified a growing problem of congestion on the GIWW. This was due to the steadily increasing flow of commodities transported on this vital waterway. As was noted in the report, this growth in tonnage had been safely transported primarily due to technological improvements in the equipment utilized for this purpose. It is the general concensus of those directly involved in the inland navigation industry that further such advances in technology can no longer be depended on to carry the brunt of such increasing traffic. Already some transportation consultants contend that further efficiencies in the inland marine transportation industry will be dependent on improvements in port layout and material handling facilities for increased throughput of cargo at the port level. The line-haul capacity will remain essentially unchanged in the future.

Safety On The GIWW Continues To Be A Problem

Further analysis of the Texas inland marine trade indicates significant changes in both the commodities transported and the markets served. The ratio of intrastate to interstate movements has remained an average of 37%/63% of all of the total movements during the period 1958-1976. However, the leading commodities transported are now petroleum products and industrial chemicals, which have increased from 28.5% of the total commodities in 1958 to 57.9% in 1976. These commodities plus crude

petroleum (22.6%) represent the most hazardous cargoes that move in marine commerce.

As identified in the previous report, the Louisiana section of the GIWW continues to be the most accident-prone segment. In 1976, there were 81 accidents on this segment versus 42 on the Texas segment. However, the first nine months of 1977 showed 77 accidents on the Louisiana segment versus 56 on the Texas segment. These two time periods have also shown a substantial increase in accidents involving the Bryan Beach and Matagorda swing bridges operated by the state near the Brazos River Floodgates and the Colorado River Locks.[1] It is probable that the restriction to marine traffic caused by the proximity of these two structures is a major contributor to this increase in accidents. The possibility of extensive damage or possible destruction to these structures caused by an accident involving volatile or toxic cargoes is indeed a tragic possibility.

The types of commodities transported on the GIWW is not the only major change in this traffic. The markets served have also undergone major change. In 1958 approximately 44% of the interstate trade originated or terminated along the GIWW. By 1976, this source of trade had fallen to 34%. Thus, the Mississippi River System currently accounts for 66% of the interstate inland marine trade of Texas. In Texas exports, this system currently provides the markets for approximately 79% of all such shipments. Although this percentage has not changed much over this time period, the export tonnage has increased from 8,092,632 tons in 1958 to 20,821,224 tons in 1976. Approximately 50% of these

[1] United States Coast Guard Casualty Reports for 1976 and 1977.

exports travel to such distant ports as Minneapolis, Chicago, Cincinnati, Louisville and Pittsburgh.

Channel Dimensions Critical To Competitive Trade

In order to hold such distant marine markets for Texas products, the GIWW must have the improvements necessary to allow competitive shipping costs. Table 3 shows the channel dimensions for the Mississippi River System and Table 4 shows the channel dimensions for all Gulf coast waterways. Figure 26 shows the major waterways included in these systems. It should be noted that the major markets served by Texas exporters are situated on the Mississippi, Ohio, Illinois, and Tennessee Rivers. Most of these rivers have channels only 9 feet in depth, but with channel widths from 225 feet to 1,100 feet. This is in contrast to the 12 feet by 125 feet channel dimensions of the GIWW.

Due to the channel dimensions, tows on the GIWW are restricted to a total length of 1,180 feet and a maximum width of 55 feet. Thus, with average barge dimensions of 195 feet by 35 feet, a maximum GIWW tow would consist of 5 barges. If the larger size barges measuring 290 feet by 50 feet are used, only a 3-barge tow is allowed. These maximum tow sizes compare with maximums of 40-barge tows on the Mississippi River south of Cairo, Illinois; 20-barge tows on the Ohio River; and 15-barge tows on the Monongahela River, the Illinois River, and the Upper Mississippi River.[2] Thus, not only do Texas shippers have to compete with areas having shorter line-hauls, but they must also move commodities in smaller tows, which increases the cost per ton-mile over areas using more favorable channel dimensions.

[2]Domestic Waterborne Shipping Market Analysis, 1974, Page 1-B-2 A.T. Kearney, Inc.

TABLE 3

Mississippi River Navigation Systems

Waterway	Length Miles	Channel Depth (ft.)	Channel Width (ft.)
Lower Mississippi River	977	12-40	300-1,100
Upper Mississippi River	860	9	300-1,100
Yazoo River	167	9	---
White River	247	5	---
Arkansas-Verdigris Rivers	448	9	150-300
Wolf River	3	9	---
Kaskaskia River	36	9	---
Missouri River	735	9	300
Illinois Waterway	354	9	225
St. Croix River	25	9	---
Minnesota River	26	9	---
Ohio River	981	9	400-600
Tennessee River	650	9	300-500
Cumberland River	381	9	---
Green-Barren Rivers	180	5.5-9	100-200
Kentucky River	255	6	100
Big Sandy River	7	9	---
Kanawha River	91	9	300
Little Kanawha River	14	9	---
Monongahela River	129	9	300
Allegheny River	72	9	200

Sources: 1. Waterborne Commerce of the United States, Part 2, U.S. Army Corps of Engineers

2. Big Load Afloat, Chapter 23, The American Waterways Operators, Inc.

TABLE 4

Gulf Coast Navigation Systems

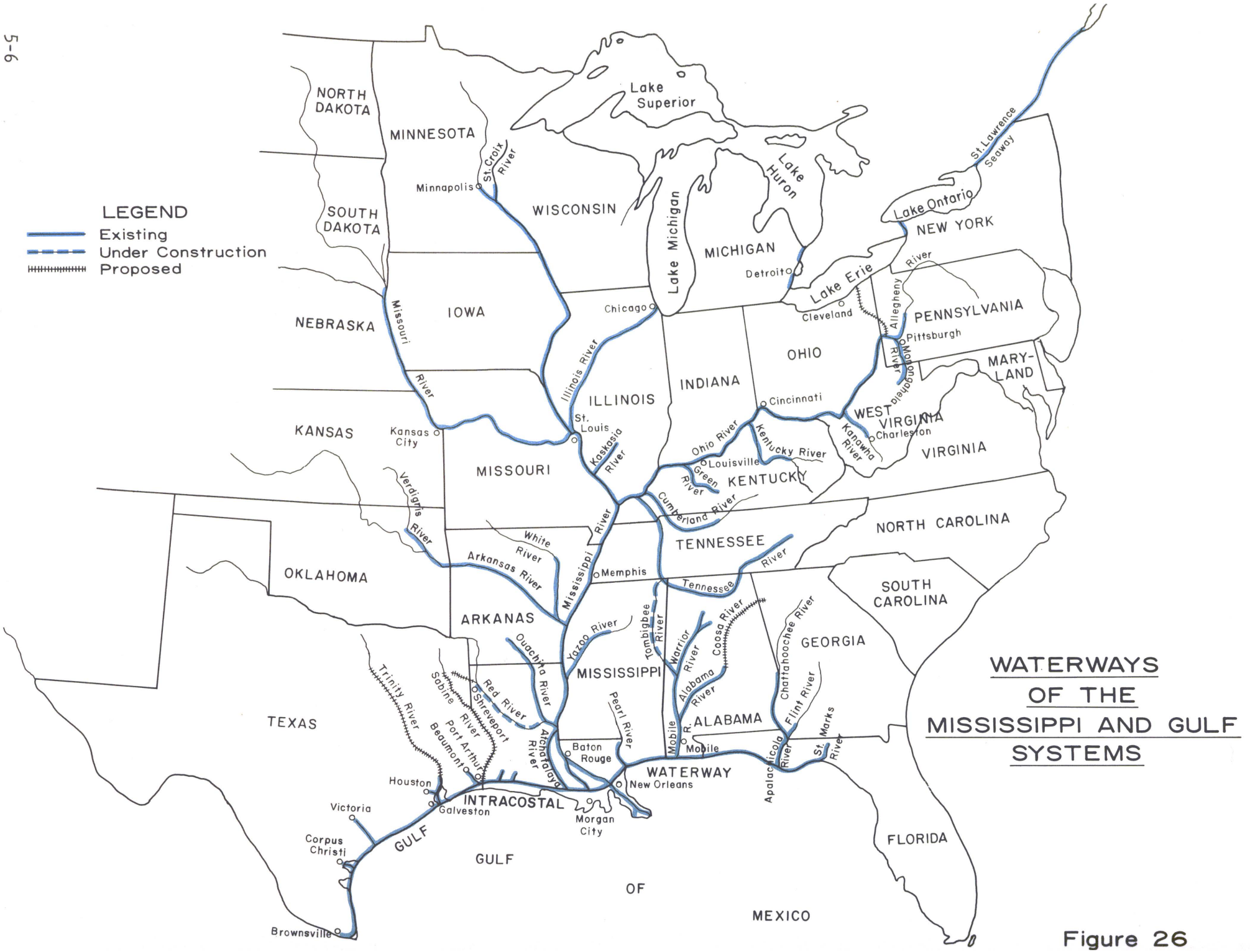
Waterway	Length Miles	Channel Depth (ft.)	Channel Width (ft.)
Gulf Intracoastal Waterway	1,109	12	125
St. Marks River	---	9	---
Appalachicola-Chattahoochee-Flint Rivers	297	9	100
Alabama-Coosa Rivers	305	9	200
Tombigbee-Black Warrior Rivers	427	9	200
Empire Waterway	10	9	---

TABLE 4(Continued)

Waterway	Length Miles	Channel Depth (ft.)	Channel Width (ft.)
Barataria Waterway	40	12	---
Bayou Lafourche	73	5-10	---
Houma Canal	36	12	---
Atchafalaya River	121	12	---
Quachita-Black Rivers	336	9	---
Red River	34	9	---
Morgan City-Port Allen Cut-off	64	12	125
Bayou Teche	---	8	---
Vermillion River	51	9	---
Mermentau River	97	12	---
Calcasieu River	---	39	---
Johnsons Bayou	5	6	---
Adams Bayou	2	12	100
Cow Bayou	7	13	100
Sabine River	82	30-40	200-400
Neches River	20	40	400
Houston-Texas City Channels	59	40	400
Galveston Channel	14	40	400
Trinity River	41	6	100
Dickinson Bayou	---	6	60
Offats Bayou	2	12	125
Chocolate Bayou	16	12	125
Oyster Creek	---	-	---
Freeport Ship Channel	11	36	200
San Bernard River	30	9	100
Colorado River	15	9-12	100
Palacios Channel	16	12	125
Matagorda Ship Channel	25	36	200
Victoria Channel	35	9	100
Aransas Pass Channel	12	14	125
Corpus Christi Channel	32	40	300
Port Mansfield Channel	10	14	125
Arroyo Colorado Channel	26	12	125
Port Isabel Channel	6	27	200
Brownsville Ship Channel	19	36	200

Sources: 1. Waterborne Commerce of the United States, Part 2
U.S. Army Corps of Engineers

2. Big Load Afloat, Chapter 23
The American Waterways Operators, Inc.



WATERWAYS OF THE MISSISSIPPI AND GULF SYSTEMS

Figure 26

Examples of this disadvantage are shown in that the upstream line-haul time from New Orleans to Pittsburgh is 14 days and 2 hours versus 16 days and 6 hours from Houston to Pittsburgh and 18 days and 21 hours from Brownsville to Pittsburgh.[3] Other destinations show similar line-haul time comparisons. In addition, a 40-barge tow possible on the Mississippi River portion of the trip would typically have ton-mile costs of 0.084¢ at 3 miles per hour, while a 20-barge tow on the Ohio River portion would have ton-mile costs of 0.137¢ at the same speed.[4] Smaller tow sizes would probably have proportionate costs. The Tennessee-Tombigbee Waterway, now under construction, will substantially shorten the line-haul distance and transit-time from the Ohio River territory to the Gulf Coast at Mobile, Alabama. This will put Texas shippers at a further disadvantage in certain markets.

It was this competitive disadvantage caused to Texas shippers that led to the recommendations for channel improvements contained in the previous report. The recommendations called for the GIWW channel from the Sabine River to Corpus Christi Bay to be deepened to 16 feet and widened to a minimum width of 250 feet. In addition, it was also recommended that the improved channel be straightened where possible and that all curves be eased and widened to allow safer navigation.

Sharp Curvature Presents A Further Restriction

The importance of lessening the degree of curvature on bends for

[3] Big Load Afloat, 1965, Pages 15, 16; The American Waterways Operators, Inc.

[4] Domestic Waterborne Shipping Market Analysis, 1974, Page 1-B-8, A. T. Kearney, Inc.

safe navigation cannot be overemphasized. Recently the results of a study of the relationship of tow size and degree of curvature to required channel widths was published by the Department of the Army.[5] According to this study, the safe channel width for a tow measuring 1,180 feet by 55 feet would require the following channel widths: 1^{o} curve, 164 feet; 2^{o} curve, 198 feet; and 3^{o} curve, 283 feet. For these purposes, the safe width was determined to be the required tow width plus a clearance of 10 feet on each side of the tow to prevent grounding on the channel banks. These widths are for one-way traffic only on the curve. Two-way traffic would require almost twice as much channel width.

At present, the standard channel alignment on the GIWW in Texas utilizes curves of 1^{o} curvature. However, in certain sections the curvature exceeds 2^{o} and may even exceed 3^{o}. Safety and efficiency will not permit these sharp curves to remain. The GIWW has been effectively restricted to one-way traffic on all curves and has caused delays while a tow of near maximum size must perform intricate maneuvers to negotiate the curve. Attempts to double the tow size by widening the channel would require channel widths of 215 feet for one-way traffic and 425 feet for two-way traffic, if the maximum curvature is held to 1^{o}. Model studies should be performed to determine what radius of curvature would permit two-way traffic within a more reasonable channel width. This channel width should be that width which will permit doubling of the tow size on the straight sections on the channel.

[5]Engineer Technical Letter No. 1110-2-225, July 1, 1977.

Savings Can Come From Improved Channel

The advantages of an increase in depth to 16 feet, as originally authorized for a portion of the GIWW in 1962, were effectively demonstrated in a presentation by Captain William N. Lay of the American Commercial Barge Lines.[6] This company's current practice is to utilize a tow of four, 195' x 35' barges, pushed by a 760 horsepower towboat. Barge drafts are restricted to 9 feet for an average load of 1,500 tons per barge. If a 16 foot draft were provided, local shipments moving over an improved segment of the GIWW could load these barges to a draft of 11 feet to increase the cargo carried to 1,950 tons per barge. For this one company, the result would be 79 fewer movements for a saving of 24,000 barge miles. Annual operating costs would be reduced by nearly $50,000. If new deeper barges were provided, loading to 14 foot drafts would allow loads of 2,600 tons per barge, further increasing savings in transportation costs. Other tows, not intended for local destinations, would also benefit due to higher possible speeds, with less horsepower required, due to decreased bottom friction on barges still using 8 foot drafts.

Captain Lay contends that improvements to channel width, however, present the greatest opportunity for transportation savings. Widening to 200 feet would permit an increase of tow size from four medium size barges to ten of the same size. A tow boat of approximately 1,800 horsepower would now be required. This particular company's boat-hours would decrease from 42,000 hours to 16,000 hours, while performing the same movements, resulting in a cost-saving of $554,500. Such efficiencies

[6] Records of Public Meeting, Gulf Intracoastal Waterway, Louisiana-Texas Section, New Orleans, Louisiana, November 17, 1976.

industry-wide could represent a cost saving of 1.17 mills per ton-mile for GIWW shippers. Other savings produced by adequate channel improvements for this company would be represented by a fuel reduction of 19% and a capital saving of over $1,000,000 due to these efficiencies.

New National Waterways Study

Some of the channel dimension inconsistencies of the inland navigation system may be solved upon the completion of a new study. This study, the National Waterways Study, is currently beginning the second year of a three-year effort. The study authorized by the U.S. Congress is being performed by the U.S. Army Corps of Engineers, Institute of Water Resources. The study is charged with the following tasks:[7]

1) A description of the physical and operational characteristics of the national water transportation system.

2) A measure of past and current waterborne commerce as well as future projections.

3) An examination of the waterways as a multipurpose system.

4) An analysis of the existing water transportation system's ability to meet existing and future needs, especially in relation to other modes of transportation.

5) Definition and ranking of the most significant problems and needs of the water transportation system.

6) Recommendations to enable the water transportation system to meet future national needs.

Hopefully, upon the completion of this study, scheduled for October 1980, the steps necessary to provide an efficient, integrated national navigation system will have been identified.

[7] National Waterways Study Information Bulletin, Volume 1 - Issue 1, October, 1978.

GIWW Improvements Study Gets Underway

In the interim, the second step on the long road to GIWW improvements on the Louisiana-Texas section has been taken. A draft of the study plan has been prepared by the Galveston and New Orleans District Offices of the Corps of Engineers. The study plan will determine the following:[8]

1) The nature and extent of navigation inefficiencies and safety hazards associated with channel dimensions and alignment; lock placement, sizes and operations; and bridge crossings.

2) The magnitude of the environmental problems associated with waterway operation and maintenance, bank erosion, and saltwater intrusion.

3) The measures available for improving waterway operations and protecting the surrounding environment.

4) The accompanying costs and benefits.

5) The selection of the most feasible plans.

Of special concern to navigation interests are the lock sizes on this section of the GIWW and the Morgan City-Port Allen Cut-Off. The sizes of the existing locks are shown in Table 5.

TABLE 5

Navigation Locks Along GIWW
Louisiana-Texas Section

Lock	Usable Length in Feet	Width In Feet	Sill Elevation In Feet
Port Allen Lock+	1,202	84	-13.75 MLG
Bayou Sorrel Lock+	797	56	-14.0 MLG
Harvey Lock	425	75	-12.0 MLG
Algiers Lock‡	760	75	-13.0 MLG

[8]Gulf Intracoastal Waterway, Louisiana-Texas Section, Draft Plan of Study, U.S. Army Corps of Engineers.

TABLE 5 (Continued)

Lock	Usable Length in Feet	Width In Feet	Sill Elevation In Feet
Bayou Boeuf Lock	1,156	75	-13.0 MLG
Vermillion Lock*	1,182	56	-11.3 MLG
Calcasieu Lock	1,206	75	-13.0 MLG
Brazos River Floodgates	---	75	-15.65 MLG
Colorado River Locks	1,200	75	-15.65 MLG

+ - Located on Morgan City-Port Allen Cut-Off
‡ - Located on alternate channel at Mississippi River
* - Replacement authorized 1,200 feet x 110 feet at -15.0 MLG
Expected completion, September, 1981
MLG - Mean Low Gulf

Source: Gulf Intracoastal Waterway Louisiana-Texas Section Draft Plan of Study, U.S. Army Corps of Engineers.

The study intends to address the following possible measures pertaining to these locks: enlarge the Bayou Sorrel Lock; relocate or replace the Brazos River Floodgates; relocate the Colorado River Locks. Since the Vermillion Lock is already authorized for replacement, enlarging the Bayou Sorrel Lock would leave single-locking tow width restrictions for much of the Texas traffic to be limited to less than 75 feet. This width would permit the doubling up of 35 foot wide barges, a highly desired navigation efficiency. The relocation of the Colorado River Locks and the relocation and replacement of the Brazos River Floodgates were measures advocated in the previous report.

The draft study plan has scheduled the completion of the study for October, 1981. The completion of the final report on the study is scheduled for October, 1983. These schedules are, of course, dependent on adequate funding at the federal level and may also be delayed due to further efforts required as the study progresses.

What Is The Cost Of Improvements

The study for possible improvements to the Louisiana-Texas Section of the GIWW includes the 669 miles of the GIWW from the Mississippi River to the Brownsville Ship Channel, the 64 miles of the Morgan City-Port Allen Cut-Off, and the 10 miles of the Algiers Alternate Route; a total length of project of some 743 miles. Approximately 403 miles or 54% of the total mileage of this project is in Texas. Since a project of this magnitude will necessarily have a high cost, a portion of which will be a state responsibility, we have done a preliminary estimate of the major construction items for the Texas portion of the project.

The estimate, which appears in full in Appendix A, had to be based on certain assumptions. These assumptions were:

1) The improved channel will follow the same alignment as the existing channel.

2) The excavation quantities could be based on the original natural ground elevations present at the time of the original construction.

3) The existing disposal areas, including only those posessing perpetual easements, will not be disturbed or reduced in area during the improvement project.

4) Maintenance dredging quantities are not increased or decreased regardless of channel dimensions.

5) The channel side slopes will be the same as those of the original construction.

Based on the preceding assumptions, the following procedure was followed. The GIWW project was estimated from the junction with the Sabine-Neches Waterway to the junction with the Port Isabel turning basin. This length of the waterway was broken into five segments as follows:

Segment No. 1 - Sabine-Neches Waterway to the Houston Ship Channel

Segment No. 2 - Houston Ship Channel to the Freeport Harbor Channel

Segment No. 3 - Freeport Harbor Channel to the Matagorda Ship Channel

Segment No. 4 - Matagorda Ship Channel to the Corpus Christi Channel

Segment No. 5 - Corpus Christi Channel to the Brownsville Ship Channel

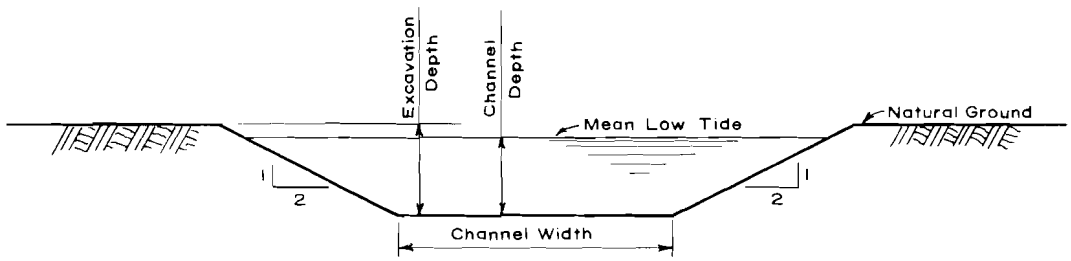
In addition, the entire project was further divided into reaches of 5,000 feet each, based on the stationing of the waterway. The excavation required was based on channel configurations as shown in Figure 27. Any additional disposal areas required were calculated using the configuration for enclosing levees shown in Figure 28, as were the quantities of required levee construction.

The estimate was calculated for the following six channel dimensions; 250 feet x 12 feet, 250 feet x 14 feet, 250 feet x 16 feet, 300 feet x 12 feet, 300 feet x 14 feet, and 300 feet x 16 feet. In calculating the excavation required, the natural ground elevation was determined from the original excavation quantities for the initial construction of the waterway. The required annual maintenance quantities used were those derived in the report, Shoaling Characteristics of the Gulf Intracoastal Waterway in Texas.[9] The area and existing capacity of disposal areas were those determined by a 1976 investigation by personnel of the Galveston District of the Corps of Engineers. Excavation and maintenance materials were assumed to be distributed to the nearest

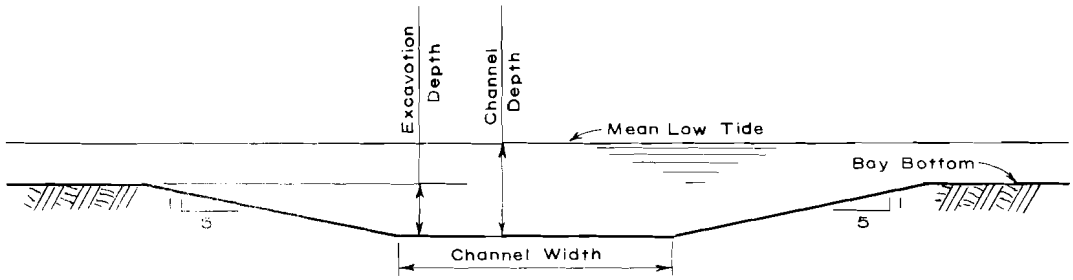
[9]TAMU-SG-76-207, Atturio, Basco, and James

Figure 27

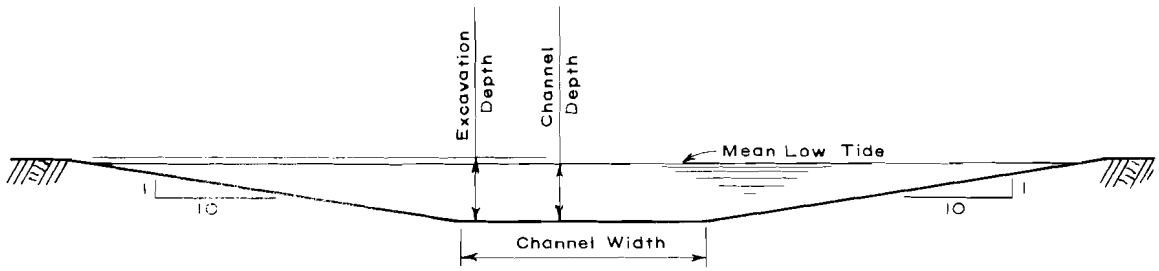
CHANNEL CONFIGURATIONS USED FOR ESTIMATE



LAND-CUT CHANNEL

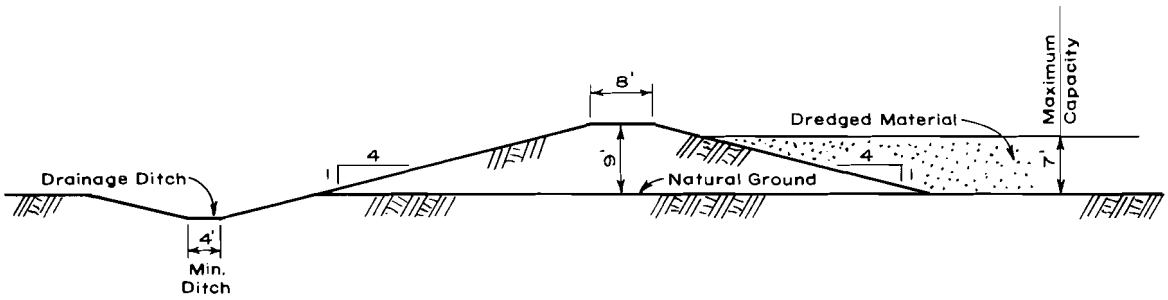


OPEN-WATER CHANNEL



KENEDY COUNTY LAND-CUT CHANNEL

Figure 28



DESIGN LEVEE SECTION FOR CONTAINMENT

available disposal area. Only areas covered by perpetual easements were utilized and any portions that were denied use for maintenance dredging in the Final Environmental Statement, Maintenance Dredging Gulf Intracoastal Waterway, Texas Section were excluded from this estimate. As a result, two sections of the waterway did not have any available disposal area within the required reasonable distance. Therefore, for this estimate, they were supplemented by two non-existant areas, X-1 and X-2.

The project for this estimate was assumed to begin in 1987. This required the capacities of all disposal areas to be reduced by the quantity of maintenance dredging that would be required within 10 years. The project was also assumed to be a plan for the full 50 year life of the proposed project. Thus, the disposal areas also had to be capable of containing the 50 years of maintenance dredging after the improvements had been completed.

A summary of the quantities required for this total project is shown in Table 6. This summary includes quantities for the full length of the GIWW in Texas for each of the six channel configurations studied. A break-down of the quantities required for each of the five segments

TABLE 6

ESTIMATED QUANTITIES FOR CHANNEL IMPROVEMENTS

Property Requirements

Channel	Right-of-Way	Disposal Sites	Total Property
250' x 12'	2,046.5 Ac.	6,493.8 Ac.	8,540.3 Ac.
250' x 14'	2,046.5 Ac.	7,579.4 Ac.	9,625.9 Ac.
250' x 16'	2,046.5 Ac.	8,899.9 Ac.	10,946.4 Ac.
300' x 12'	3,070.8 Ac.	7,739.8 Ac.	10,810.6 Ac.
300' x 14'	3,070.8 Ac.	9,698.5 Ac.	12,769.3 Ac.
300' x 16'	3,070.8 Ac.	11,531.6 Ac.	14,602.4 Ac.

Dredging Requirements

Channel	Construction	Maintenance	Total
250' x 12'	116,893,000 C.Y.	401,756,000 C.Y.	518,649,000 C.Y.
250' x 14'	167,192,000 C.Y.	401,756,000 C.Y.	568,948,000 C.Y.
250' x 16'	219,696,000 C.Y.	401,756,000 C.Y.	621,452,000 C.Y.
300' x 12'	163,656,000 C.Y.	401,756,000 C.Y.	565,412,000 C.Y.
300' x 14'	221,269,000 C.Y.	401,756,000 C.Y.	623,025,000 C.Y.
300' x 16'	281,135,000 C.Y.	401,756,000 C.Y.	682,891,000 C.Y.

Levee Requirements

Channel	Construction	Maintenance	Total
250' x 12'	805,380 C.Y.	7,006,980 C.Y.	7,812,360 C.Y.
250' x 14'	1,630,170 C.Y.	7,704,990 C.Y.	9,335,160 C.Y.
250' x 16'	2,897,650 C.Y.	8,399,420 C.Y.	11,297,070 C.Y.
300' x 12'	1,764,890 C.Y.	8,000,330 C.Y.	9,765,220 C.Y.
300' x 14'	3,395,090 C.Y.	8,479,450 C.Y.	11,874,540 C.Y.
300' x 16'	5,553,820 C.Y.	8,199,270 C.Y.	13,753,090 C.Y.

Open-Water Disposal Requirements

Channel	Construction	Maintenance	Total
250' x 12'	26,337,000 C.Y.	168,057,000 C.Y.	194,394,000 C.Y.
250' x 14'	40,779,000 C.Y.	168,057,000 C.Y.	208,836,000 C.Y.
250' x 16'	56,091,000 C.Y.	168,057,000 C.Y.	224,148,000 C.Y.
300' x 12'	35,026,000 C.Y.	168,057,000 C.Y.	203,083,000 C.Y.
300' x 14'	51,533,000 C.Y.	168,057,000 C.Y.	219,590,000 C.Y.
300' x 16'	68,234,000 C.Y.	168,057,000 C.Y.	236,291,000 C.Y.

of the GIWW studied may be found in Appendices C through H. The only quantities studied were property requirements, dredging requirements, levee requirements, and required open-water disposal. Any changes in locks or bridges which might be found necessary in the study were not included. In addition, the number of pipelines to be lowered or relocated is not known at this time, so no provision was made for these items. These pipeline costs would be an expense to the state under usual sponsorship agreements.

A summary of the project cost estimates detailed in Appendices C through H is shown in Table 7. These costs also reflect channel improvements for the entire GIWW in Texas. The totals are broken-down into those costs necessary for the initial construction and those required for the maintenance during the fifty-year life of the project. The costs are all calculated using 1978 dollars and no attempt was made to adjust these costs using projected inflation pressures on the dollar nor to anticipate any increase in basic costs due to possible additional environmental restrictions. The costs, although not accurate for the time period anticipated for the project life, are valuable to compare the relative costs of various channel configurations and to determine the segments of the waterway having the best benefit-cost ratio for improvements.

Table 8 provides a breakdown of the federal and state shares of the project costs. It should be noted that the federal share of the total project costs includes the dredging costs for maintenance during the fifty year life of the project. Using the cost distribution shown in the table, the state's share of the total project costs average 9.6% of the total. If the cost of the maintenance dredging was removed from

TABLE 7

COST SUMMARY FOR CHANNEL IMPROVEMENTS

Channel	Construction	50-Year Maintenance*	Total Project*
250' x 12'	$172,647,000	$269,686,000	$442,333,000
250' x 14'	$247,183,000	$272,926,000	$520,109,000
250' x 16'	$327,025,000	$275,816,000	$602,841,000
300' x 12'	$244,865,000	$274,338,000	$519,203,000
300' x 14'	$333,718,000	$276,801,000	$610,519,000
300' x 16'	$427,923,000	$276,083,000	$704,006,000

* Includes estimated federal cost for maintenance dredging during 50-year period of $235,801,000. This cost may be deducted to determine required initial cost of project.

TABLE 8

COST DISTRIBUTION FOR CHANNEL IMPROVEMENTS

Channel	Federal Cost*	State Cost	Total Project*
250' x 12'	$402,041,000	$40,292,000	$442,333,000
250' x 14'	$472,694,000	$47,415,000	$520,109,000
250' x 16'	$546,345,000	$56,496,000	$602,841,000
300' x 12'	$468,543,000	$50,660,000	$519,203,000
300' x 14'	$549,544,000	$60,975,000	$610,519,000
300' x 16'	$633,620,000	$70,386,000	$704,006,000

* Includes estimated federal cost for maintenance dredging during 50-year period of $235,801,000.

the total project costs, this average percentage would increase to 16.8%. These ratios should be compared with the proposed requirement of a 10% up-front cost to the state for all water projects. If the cost of relocating pipelines had been determined, the state share would exceed this 10% requirement.

At the 1978 National Waterways Conference annual meeting,[10] Mr. Daniel Beard, Assistant Secretary of the Interior, described the administration's views regarding federal water policy. When questioned as to the status of this cost-sharing proposal in regard to non-federal sponsorship costs, Mr. Beard replied that it had not yet been determined if these costs would be cumulative or not. Thus, the possibility still exists that the state's share of the project costs could be increased by an additional 10%.

The relatively high share of the project costs that the state must assume is due primarily to the increased concern for the coastal environment. A major portion of these costs is caused by the assumption that all land disposal will be contained within properly designed levees. The need to provide containment areas for both the new construction disposal and the maintenance requirements has substantially increased the costs of these disposal areas. A large portion of these requirements could be eliminated if means of reusing disposal areas were developed.

The reuse of containment facilities must take one of two forms. The dredged material may be treated to facilitate desiccation, thus

[10]Birmingham, Alabama, September 20-22, 1978.

enabling the material to be removed and utilized elsewhere for fill material or other purposes. The alternative approach would be to remove the slurry from the containment area as soon as the excess water has been decanted. The slurry material could then be transported by barge to the Gulf of Mexico for deep water disposal.

Either method of reuse of the containment facilities would be expensive and time-consuming, however these costs could be considerably less than the cost to the state of providing the additional sites and facilities to permanently contain the maintenance dredging quantities. In addition, these alternatives would allow the additional sites to remain in their natural state, thus reducing the environmental impact of the project. These alternatives will be studied further as the project develops.

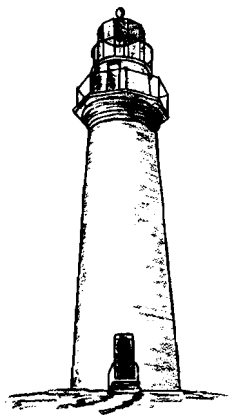
This cost study has been based on the presumption that the state will not only be required to provide the disposal sites, but will also be required to construct and maintain the required containment levees. Although the exact terms of sponsorship will not be determined until the final plans for improvements are complete, these responsibilities are usually included in most current navigation projects.

Even without implementation of any of the proposals to shift additional responsibility for navigation projects to the states, Texas will be an active partner in the maintenance or improvement of the GIWW. This is properly so, considering the importance of this waterway to the Texas economy and the state's concern for the preservation of the wetlands in which it is located. Texas must take a strong, active role to protect both of these valuable resources.

CHAPTER SIX

THE STATE AS LOCAL SPONSOR

THE STATE AS LOCAL SPONSOR



In the previous report, The Gulf Intracoastal Waterway in Texas, 1976, a description was given of the responsibilities required for non-federal sponsorship of this waterway. These descriptions were those as defined in the original authorizations of the various segments and relocations of the waterway. At the initial briefings given to departmental representatives by the Corps of Engineers personnel, the impression was received that sponsorship requirements, as defined in the project authorizations, remained permanently in effect until a new authorization was required for new construction.

Therefore, of the various segments constructed or authorized for the main channel, only the two channel relocations in Corpus Christi Bay and Matagorda Bay, which were authorized in 1962 under House Document 556 of the Eighty-Seventh Congress, contained requirements that the non-federal sponsor "hold and save the United States free from damages resulting from the construction work and the maintenance of the channels".

The Corpus Christi Bay channel relocation was completed in December, 1976, with the local navigation district serving as the non-federal sponsor. The Matagorda Bay channel relocation, after preconstruction planning studies in 1976, has been placed in the inactive catagory as of January, 1978, due to an unfavorable benefit-cost ratio. This project may be reactivated in the future if project justification appears

likely or the project may be deauthorized after a certain time limit in accordance with Public Law 93-251.

Although in 1976, the Commission received initial requests from the Corps of Engineers to provide dredge disposal sites at certain locations along the GIWW and preliminary surveys to locate available sites had been initiated by the Department, progress in the acquisition of such sites had come to a standstill. Funding for such acquisitions was provided by the Sixty-fifth session of the Texas Legislature. However, a new stumbling block in the form of Public Law 91-611, the Federal Flood Control Act of 1970, entered the picture.

State Sponsorship Hits a Snag

The provisions of Section 221 of this Act, shown in Appendix B, forbid the commencement of construction activity on any water resources project until "each non-Federal interest has entered into a written agreement with the Secretary of the Army to furnish its required cooperation for the project". The proposed contract as received from the Corps of Engineers contained the requirement that the Commission, acting for the State of Texas, hold and save the United States free from damages resulting from the construction work and the maintenance of the channels. Futhermore, certification was also required from the Departments Chief Legal Officer that the effects of Section 221 of the Act had been considered and that the State was capable of responding in damages.

It was the opinion of the Departmental Counsel that the Commission could not legally sign a contract with the indemnity clause included,

since such action would pledge the credit of the State in violation of the Texas Constitution. This opinion was subsequently verified by the Attorney General's representatives. The counsel for the Corps of Engineers, meanwhile, was restricted in bargaining by the terms of Section 221. After numerous efforts at rewording the offending clause to satisfy both parties proved impossible, a stalemate in the negotiations was reached.

Such an impasse between the federal statutes and state constitutions or statutes has repeatedly sprung up since the passage of the Federal Flood Control Act of 1970. Finally, it was determined that certain states in recent years had been able to have a waiver or limitation of these indemnity requirements inserted in federal legislation. By such action, the indemity requirements can be opened to negotiation by the Corps of Enigneers to seek a satisfactory solution to the problem. Such action has recently been taken for projects involving the states of West Virginia and Tennessee, among others.

Since similar action appeared to be the only means out of the stalemate in this case, the Commission began efforts to have some limitation placed on this required payment of damages. Senator Bentsen of Texas succeeded in having an amendment to Section 221 of the Flood Control Act of 1970, (Public Law 91-611), inserted in H.R. 8309, the legislation before Congress authorizing certain public works on rivers for navigation. The amendment included the insertion of the following new sentence at the end of Section 221(b), (See Appendix B),:

> "Where the non-Federal interest is the State itself, performance and payment of damages may be contingent upon the legislative appropriations process of the State."

In addition, this requirement would not apply to contracts with non-federal interests for water supply storage under the Water Supply Act of 1958, (Public Law 85-500), or for recreational development under the Federal Water Project Recreation Act of 1965, (Public Law 89-72). The proposed amendment to Section 221 would have resolved once and for all this conflict between state and federal statuatory or constitutional requirements.

Unfortunately, the bill, as noted earlier, also contained the authorization for Locks and Dam 26 and the imposition of the first user tax on inland navigation. This bill was highly controversial and faced a long battle in Congress. In the final rush for adjournment, the bill never reached the House floor and died in committee. Although a compromise user tax proposal and the long-needed Lock and Dam 26 authorization were incorporated in another bill and eventually passed and signed into law, the remaining portions of H.R. 8309, including the desired amendment, did not see further action in the Ninety-fifth U.S. Congress.

It is anticipated that the next session of Congress will attempt to take action for speedy passage of the remaining river and harbor authorizations contained in this bill. The Commission intends to take the necessary steps to try to ensure that this amendment, or a similar limitation to Section 221(b), will be included once again in the authorization bill.

During this period of negotiations and the seeking of a legal solution for both of the parties involved, all further actions as a legal non-federal sponsor have necessarily been stalemated. Until a contract satisfactory to the requirements of both parties is concluded,

no official non-federal sponsorship by the State is possible. However, immediately upon the signing of the necessary contract, the Commission is prepared to begin immediate assumption of the responsibilities thereby incurred.

Waterway Evaluation Continues

The requirement of the Texas Coastal Waterway Act of 1975, that a continuing evaluation of the waterway be conducted, was the only other action that was possible by the Commission in the absence of a formal contract for sponsorship with the Corps of Engineers. The evaluation of the waterway has been continuously in progress since first authorized by this Act in 1975. The latest findings of this evaluation are contained in this report to the Sixty-sixth Session of the Texas Legislature.

Progress is being made on studies seeking proper solutions to the environmental and navigation needs of the GIWW. An example of this is the completion in March, 1978, of the Dredged Material Research Program. The results of this five-year project are currently being published and made available to interested parties. These published results will ultimately consist of 221 papers and reports. In addition, twenty-one synthesis reports summarizing the original reports will also be published. It is to be hoped that such a major research effort will contain the possible solutions to the environmental concerns so prominent in dredging the waterways of Texas. These results may enable the Commission to implement the proper disposal practices to preserve the fragile coastal environment.

Other studies underway seek the determination of the needs of

shallow-draft marine transportation for an effective, interlocking system of waterways and the need of future improvements to the GIWW, in particular. These study results will aid the Commission in formulating recommendations for the proper position the State of Texas should take regarding any proposed improvements or the lack of such proposals.

Of special interest to the Texas Legislature are the recommendations contained in a recent report on the Gulf Intracoastal Waterway in Louisiana. The report, prepared for the Ozark Regional Commission, made the following policy recommendations. The Louisiana State Legislature should make an appropriation of general tax revenues to supply the non-federal share of the waterway project; the Department of Transportation and Development, Office of Public Works, should be designated to act in the sponsorship role for the main channel of the GIWW throughout Louisiana; a state clearinghouse should be established to review proposed navigation projects and to assist in their orderly development and implementation; and, comprehensive research should be undertaken to study existing and planned port development projects in tourism in order to formulate a coastal port plan. Should the first two of these recommendations be implemented by the Louisiana State Legislature, it will make much more effective all attempts to coordinate state efforts to maintain and improve this waterway. The Commission, in such an event, would act immediately to develop effective coordination procedures with their neighboring counterparts.

The subject of Commission actions and legislative recommendations must be postponed at this time, due to the delay in assuming the official responsibilities of non-federal sponsorship. Only when a contract

satisfying both federal statuatory and state constitutional restrictions can be formulated, can the Commission legally begin to satisfy the full role required for such sponsorship.

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APPENDICES

APPENDIX A

ENGINEERING ESTIMATE
FOR
VARIOUS CHANNEL IMPROVEMENTS

RIGHT-OF-WAY REQUIREMENTS

SEGMENT #1 - SABINE-NECHES WATERWAY TO HOUSTON SHIP CHANNEL

STATIONING Beginning	Ending	Reach	Existing ROW/Remarks	Existing Acreage	Additional Required Acreage 250' Width 400' ROW	300' Width 450' ROW
0+000	9+000	1,2	Transition (300' to 1650') @ Port Arthur	139.46	0.01	0.01
9+000	207+000	2-42	Normal ROW - 300'	1363.64	454.55	681.82
207+000	211+000	42,43	Open Water (Galveston-Rollover Bay)	-	-	-
211+000	304+000	43-61	Normal ROW 300'	640.50	213.50	320.25
304+000	311+000	61-63	ROW - 360'	57.85	19.28	28.92
311+000	325+000	63-65	Open Water (Galveston Bay)	-	-	-
			Total Required Acreage		687.34	1031.00

SEGMENT #2 - HOUSTON SHIP CHANNEL TO FREEPORT HARBOR CHANNEL

325+000	43+000 *	66-79	Open Water (Galveston Bay)	-	-	-
43+000	106+000	79-91	Normal ROW - 300'	433.88	144.63	216.94
106+000	122+000	92-95	Open Water (Chocolate Bay)	-	-	-
122+000	131+000	95,96	Normal ROW - 300'	61.98	20.66	30.99
131+000	134+000	97	Open Water (Oyster Lake)	-	-	-
134+000	144+500	97-99	Normal ROW - 300'	72.31	24.10	36.16
144+500	145+500	99	Open Water (Bastrop Bayou)	-	-	-
145+500	212+000	99-112	Normal ROW - 300'	457.99	152.66	229.00
			Total Required Acreage		342.05	513.09

SEGMENT #3 - FREEPORT HARBOR CHANNEL TO MATAGORDA SHIP CHANNEL

212+000	214+000	113	Open Water (Freeport Harbor Channel)	-	-	-
214+000	237+050	113-118	Normal ROW - 300'	158.75	52.92	79.38
237+050	244+000	118,119	ROW - 700'	111.69	-	-
244+000	451+000	119-160	Normal ROW - 300'	1425.62	475.21	712.81
451+000	453+350	161	ROW - 700'	37.76	-	-
453+350	454+280	161	Transition (700' to 1650') @ Colorado River	29.36	-	-
454+280	455+430	161	Open Water (Colorado River)	-	-	-
455+430	456+288	161,162	Transition (1650' to 700') @ Colorado River	27.08	-	-
456+288	458+473	162	ROW - 700'	35.11	-	-
458+473	534+780**	162-177	Normal ROW 300'	486.16	162.05	243.08
534+780	616+000	177-193	Open Water (Matagorda Bay)	-	-	-
			Total Required Acreage		690.18	1035.27

* Equation: 358+286 Back = 9+360 Forward
** Equation: 472+644.77 Back = 478+361.18 Forward

SEGMENT #4 - MATAGORDA SHIP CHANNEL TO CORPUS CHRISTI CHANNEL

STATIONING Beginning	STATIONING Ending	Reach	Existing ROW/Remarks	Existing Acreage	Additional Required Acreage 250' Width 400' ROW	Additional Required Acreage 300' Width 450' ROW
616+000	629+000	194-196	Open Water (Matagorda Bay)	--	--	--
629+000	718+600	196-214	Normal R.O.W. - 300'	617.08	205.69	308.54
718+600	774+400	214-225	Open Water (San Antonio Bay)	--	--	--
774+400	780+200	225,226	Normal R.O.W. - 300'	39.95	13.32	19.98
780+200	787+255	226-228	Open Water (San Antonio Bay)	--	--	--
787+255	788+445	228	Normal R.O.W. - 300'	8.2	2.73	4.1
788+445	791+700	228,229	Open Water (San Antonio Bay)	--	--	--
791+700	796+000	229	Normal R.O.W. - 300'	29.61	9.87	14.80
796+000	808+300	230-232	Open Water (Sundown Bay)	--	--	--
808+300	829+300	232-236	Normal R.O.W. - 300'	144.63	48.21	72.32
829+300	902+650	236-251	Open Water (Aransas Bay)	--	--	--
902+650	916+500	251-254	Normal R.O.W. - 300'	95.39	31.80	47.70
916+500	918+100	254	Open Water (Red Fish Bay)	--	--	--
918+100	918+800	254	Land Tip (0.44 Acres)	0.44	1.09	1.81
918+800	942+300	254-259	Open Water Red Fish Bay)	--	--	--
942+300	943+800	259	Normal R.O.W. - 300'	10.33	3.44	5.16
943+800	944+600	259	Open Water (Aransas Pass Channel)	--	--	--
944+600	945+500	259	Normal R.O.W. - 300'	6.20	2.07	3.10
945+500	950+500	259,260	Open Water (Red Fish Bay)	--	--	--
950+500	950+600	260	Peninsula Tip (0.51 Acres)	0.51	0.11	0.17
950+600	956+500	260-262	Open Water (Red Fish Bay)	--	--	--
956+500	958+800	262	Land Tips (2.80 Acres)	2.80	3.05	5.00
958+800	960+500	262	Open Water (Red Fish Bay)	--	--	--
960+500	961+100	262,263	Island Tip (1.79 Acres)	1.79	0.57	0.86
961+100	963+100	263	Open Water (Red Fish Bay)	--	--	--
963+100	964+600	263	Land Tip (1.68 Acres)	1.68	1.66	2.84
964+600	972+400	263-265	Open Water (Red Fish Bay)	--	--	--
972+400	973+400	265	Land Tip (2.58 Acres)	2.58	1.72	2.67
973+400	976+000	265	Open Water (Red Fish Bay)	--	--	--
976+000	977+500	266	Land Tips (3.61 Acres)	3.61	1.61	2.41
977+500	981+000	266	Open Water (Red Fish Bay & Corpus Christi Channel)	--	--	--
			Total Required Acreage		326.94	491.46

SEGMENT #5 - CORPUS CHRISTI CHANNEL TO BROWNSVILLE SHIP CHANNEL

981+000	5+000*	267-275	Open Water (Corpus Christi Bay)	--	--	--
5+000	310+980.8	276-337	Laguna Madre	--	--	--
327+661.6	3+642**	+337-401	Laguna Madre	--	--	--
			Total Required Acreage		--	--
			GRAND TOTALS		2046.51	3070.82

* Equation: 1021 + 744.65 Back = 0+000 Forward

** Equation: 310 + 980.8 Back = 327 + 661.6 Forward

+ Station Numbers Decreasing

REQUIRED EXCAVATION FOR CHANNEL IMPROVEMENTS - CUBIC YARDS

SEGMENT #1 - SABINE NECHES WATERWAY TO HOUSTON SHIP CHANNEL

Reach	Existing Annual Maintenance	Channel Width 250' Channel Depth 12'	14'	16'	Channel Width 300' Channel Depth 12'	14'	16'
1	3,896	326,389	438,389	553,352	456,944	587,463	720,944
2	2,071	359,028	470,154	584,243	484,120	613,765	746,372
3	2,754	307,870	418,685	555,611	431,018	560,352	692,648
4	3,484	"	"	"	"	"	"
5	3,437	337,963	452,185	569,370	473,148	605,889	741,592
6	3,259	"	"	"	"	"	"
7	3,334	"	"	"	"	"	"
8	3,416	328,704	442,333	558,926	460,185	592,333	727,444
9	3,838	"	"	"	"	"	"
10	7,703	"	"	"	"	"	"
11	8,165	344,907	459,574	577,203	482,870	616,055	752,203
12	8,506	"	"	"	"	"	"
13	6,883	"	"	"	"	"	"
14	6,915	340,277	454,648	571,981	476,388	609,277	745,129
15	6,536	"	"	"	"	"	"
16	6,730	"	"	"	"	"	"
17	6,719	355,555	470,904	589,215	497,778	631,644	768,474
18	6,674	358,796	474,352	592,870	502,315	636,389	773,426
19	6,728	335,648	449,722	566,759	469,907	602,500	738,056
20	6,805	340,277	454,648	571,981	476,388	609,277	745,129
21	7,122	368,056	484,204	603,315	515,278	649,944	787,574
22	8,258	"	"	"	"	"	"
23	8,241	"	"	"	"	"	"
24	8,576	402,778	544,296	642,481	563,889	700,778	840,630
25	8,836	"	"	"	"	"	"
26	8,835	398,148	516,222	637,259	557,407	694,000	833,556
27	8,701	"	"	"	"	"	"
28	8,432	381,944	498,981	618,981	534,722	670,278	808,796
29	7,610	"	"	"	"	"	"
30	7,465	360,694	476,372	595,011	504,972	639,170	776,326
31	6,831	340,277	454,648	571,981	476,388	609,277	745,129
32	6,832	317,454	430,363	546,237	444,435	575,863	710,256
33	13,401	300,925	412,778	527,593	421,296	551,667	685,000
34	18,523	"	"	"	"	"	"
35	15,072	"	"	"	"	"	"
36	13,193	"	"	"	"	"	"
37	13,337	"	"	"	"	"	"
38	13,888	"	"	"	"	"	"

Reach	Existing Annual Maintenance	Channel Width 250' Channel Depth 12'	14'	16'	Channel Width 300' Channel Depth 12'	14'	16'
39	19,967	300,925	412,778	527,593	421,296	551,667	685,000
40	28,009	"	"	"	"	"	"
41	23,910	"	"	"	"	"	"
42	28,121	"	"	"	"	"	"
43	39,371	"	"	"	"	"	"
44	33,989	"	"	"	"	"	"
45	20,008	"	"	"	"	"	"
46	18,836	"	"	"	"	"	"
47	14,789	"	"	"	"	"	"
48	14,695	"	"	"	"	"	"
49	12,423	"	"	"	"	"	"
50	12,090	"	"	"	"	"	"
51	13,315	"	"	"	"	"	"
52	13,317	"	"	"	"	"	"
53	13,925	"	"	"	"	"	"
54	18,006	"	"	"	"	"	"
55	15,628	"	"	"	"	"	"
56	13,485	"	"	"	"	"	"
57	16,005	"	"	"	"	"	"
58	18,044	"	"	"	"	"	"
59	25,668	"	"	"	"	"	"
60	18,411	"	"	"	"	"	"
61	28,203	"	"	"	"	"	"
62	29,888	"	"	"	"	"	"
63	21,458	"	"	"	"	"	"
64	53,113	"	"	"	"	"	"
65	2,971	"	"	"	"	"	"
Segment #1 Totals	858,651	21,165,844	28,576,426	36,133,267	29,613,694	38,181,669	46,942,198

SEGMENT #2 - HOUSTON SHIP CHANNEL TO FREEPORT HARBOR CHANNEL

Reach	Existing Annual Maintenance	Channel Width 250' Channel Depth 12'	14'	16'	Channel Width 300' Channel Depth 12'	14'	16'
66	8,079	437,500	596,389	762,685	612,583	789,907	974,722
67	46,700	"	"	"	"	"	"
68	38,640	"	"	"	"	"	"
69	44,142	145,833	258,056	377,685	204,167	334,907	473,056
70	43,489	"	"	"	"	"	"
71	38,539	"	"	"	"	"	"
72	28,946	159,722	274,167	396,019	223,611	356,574	496,944
73	7,047	182,870	301,019	426,574	256,019	392,685	536,759
74	9,270	196,759	317,130	444,907	275,463	414,352	560,648
75	14,684	222,222	346,667	478,519	311,111	454,074	604,444
76	6,066	240,741	368,148	502,963	337,037	482,963	636,296
77	5,724	245,370	373,519	509,074	343,519	490,185	644,259

78	32,771	296,296	432,593	576,296	414,815	569,630	731,852
79	28,265	331,481	460,133	591,081	464,074	611,244	764,044
80	22,963	384,259	501,444	621,593	537,963	673,667	812,333
81	23,660	349,537	464,500	582,426	489,352	622,833	759,278
82	16,326	356,481	471,889	590,259	499,074	633,000	769,889
83	15,225	361,111	476,815	595,481	505,556	639,778	776,963
84	13,937	372,685	489,130	608,537	521,759	656,722	794,648
85	12,768	381,944	498,981	618,981	534,722	670,278	808,796
86	13,046	384,259	501,444	621,593	537,963	673,667	812,333
87	13,300	386,574	503,907	624,204	541,204	677,056	815,870
88	10,724	340,277	454,648	571,981	476,388	609,277	745,129
89	11,894	"	"	"	"	"	"
90	17,380	"	"	"	"	"	"
91	19,674	"	"	"	"	"	"
92	37,213	"	"	"	"	"	"
93	36,031	"	"	"	"	"	"
94	33,375	328,704	442,333	558,926	460,185	592,333	727,444
95	23,616	"	"	"	"	"	"
96	16,891	"	"	"	"	"	"
97	15,540	"	"	"	"	"	"
98	15,077	"	"	"	"	"	"
99	16,844	"	"	"	"	"	"
100	10,277	372,685	489,130	608,537	521,759	656,722	794,648
101	3,425	"	"	"	"	"	"
102	569	"	"	"	"	"	"
103	299	"	"	"	"	"	"
104	1,163	"	"	"	"	"	"
105	897	"	"	"	"	"	"
106	766	354,167	469,426	587,648	495,833	629,611	766,352
107	144	326,389	439,870	556,315	456,944	588,944	723,907
108	0	"	"	"	"	"	"
109	0	"	"	"	"	"	"
110	0	"	"	"	"	"	"
111	0	"	"	"	"	"	"
112	0	"	"	"	"	"	"
Segment #2 Totals	755,386	15,164,807	20,770,133	26,571,819	21,230,981	27,706,417	34,381,810

SEGMENT #3 - FREEPORT HARBOR CHANNEL TO MATAGORDA SHIP CHANNEL

Reach	Existing Annual Maintenance	Channel Width 250' Channel Depth 12'	14'	16'	Channel Width 300' Channel Depth 12'	14'	16'
113	1,679	335,648	449,722	566,759	469,907	602,500	738,056
114	11,547	342,593	457,111	574,593	479,630	612,667	748,667

Reach	Existing Annual Maintenance	Channel Width 250' Channel Depth 12'	250' 14'	250' 16'	Channel Width 300' Channel Depth 12'	300' 14'	300' 16'
115	16,631	342,593	457,111	574,593	479,630	612,667	748,667
116	19,798	"	"	"	"	"	"
117	29,833		"	"	"	"	"
118	38,660	"	"	"	"	"	"
119	92,176	"	"	"	"	"	"
120	34,587	"	"	"	"	"	"
121	27,853	"	"	"	"	"	"
122	29,687	"	"	"	"	"	"
123	34,980	"	"	"	"	"	"
124	25,654	"	"	"	"	"	"
125	5,314	"	"	"	"	"	"
126	7,810	"	"	"	"	"	"
127	2,481	"	"	"	"	"	"
128	14,830	"	"	"	"	"	"
129	14,626	"	"	"	"	"	"
130	11,494	"	"	"	"	"	"
131	8,512	"	"	"	"	"	"
132	2,545	"	"	"	"	"	"
133	2,613	"	"	"	"	"	"
134	2,678	"	"	"	"	"	"
135	2,687	"	"	"	"	"	"
136	2,945	"	"	"	"	"	"
137	3,974	"	"	"	"	"	"
138	10,416	"	"	"	"	"	"
139	10,449	356,481	471,889	590,259	499,074	633,000	769,889
140	12,738	"	"	"	"	"	"
141	11,067	"	"	"	"	"	"
142	13,040	"	"	"	"	"	"
143	7,742	"	"	"	"	"	"
144	9,317	"	"	"	"	"	"
145	14,525	"	"	"	"	"	"
146	18,720	"	"	"	"	"	"
147	25,077	"	"	"	"	"	"
148	27,227	"	"	"	"	"	"
149	24,746	"	"	"	"	"	"
150	27,302	"	"	"	"	"	"
151	41,157	"	"	"	"	"	"
152	34,106	"	"	"	"	"	"
153	24,315	"	"	"	"	"	"
154	26,133	"	"	"	"	"	"
155	34,002	"	"	"	"	"	"
156	31,353	"	"	"	"	"	"
157	23,919	"	"	"	"	"	"
158	23,025	"	"	"	"	"	"
159	25,961	"	"	"	"	"	"
160	26,561	"	"	"	"	"	"
161	28,129	"	"	"	"	"	"
162	48,656	384,259	501,444	621,593	537,963	673,667	812,333
163	28,175	"	"	"	"	"	"
164	26,639	"	"	"	"	"	"

165	6,808	384,259	501,444	621,593	537,963	673,667	812,333
166	9,490	"	"	"	"	"	"
167	26,633	"	"	"	"	"	"
168	26,408	"	"	"	"	"	"
169	24,884	"	"	"	"	"	"
170	24,040	"	"	"	"	"	"
171	34,483	"	"	"	"	"	"
172	52,038	"	"	"	"	"	"
173	35,577	"	"	"	"	"	"
174	31,304	"	"	"	"	"	"
175	37,254	"	"	"	"	"	"
176	59,201	217,593	341,296	472,407	304,630	446,851	596,481
177	93,505	"	"	"	"	"	"
178	111,991	"	"	"	"	"	"
179	103,866	"	"	"	"	"	"
180	63,735	"	"	"	"	"	"
181	32,642	"	"	"	"	"	"
182	5,411	0	92,593	188,889	0	111,111	225,926
183	4,187	0	"	"	0	"	"
184	"	0	"	"	0	"	"
185	"	0	"	"	0	"	"
186	"	0	"	"	0	"	"
187	"	0	"	"	0	"	"
188	"	0	"	"	0	"	"
189	"	0	"	"	0	"	"
190	"	0	"	"	0	"	"
191	"	0	"	"	0	"	"
192	"	0	"	"	0	"	"
193	2,220	0	"	"	0	"	"
Correction for Equation	0	-439,296	-573,265	-710,623	-615,014	-770,155	-928,682
Segement #3 Totals	1,903,451	23,345,424	32,336,787	41,600,330	32,683,607	43,153,796	53,896,156

SEGEMENT #4 - MATAGORDA SHIP CHANNEL TO CORPUS CHRISTI CHANNEL

Reach	Existing Annual Maintenance	Channel Width 250' Channel Depth 12'	14'	16'	Channel Width 300' Channel Depth 12'	14'	16'
194	3,647	0	92,593	188,889	0	111,111	225,926
195	4,187	0	"	"	0	"	"
196	26,737	344,907	459,574	577,203	482,870	616,055	752,203
197	13,057	"	"	"	"	"	"
198	11,423	"	"	"	"	"	"
199	11,934	"	"	"	"	"	"
200	12,610	"	"	"	"	"	"
201	12,119	"	"	"	"	"	"
202	11,632	"	"	"	"	"	"
203	9,501	"	"	"	"	"	"

Reach	Existing Annual Maintenance	Channel Width 250' Channel Depth 12'	14'	16'	Channel Width 300' Channel Depth 12'	14'	16'
204	6,542	344,907	459,574	577,203	482,870	616,055	752,203
205	5,511	"	"	"	"	"	"
206	5,596	337,963	452,185	569,370	473,148	605,889	741,592
207	5,770	"	"	"	"	"	"
208	6,382	"	"	"	"	"	"
209	12,691	"	"	"	"	"	"
210	12,328	"	"	"	"	"	"
211	11,900	"	"	"	"	"	"
212	7,922	"	"	"	"	"	"
213	7,197	"	"	"	"	"	"
214	8,748	"	"	"	"	"	"
215	12,471	"	"	"	"	"	"
216	51,308	"	"	"	"	"	"
217	62,420	245,370	373,519	509,074	343,519	490,185	644,259
218	63,066	"	"	"	"	"	"
219	63,304	"	"	"	"	"	"
220	64,099	"	"	"	"	"	"
221	64,253	"	"	"	"	"	"
222	64,502	"	"	"	"	"	"
223	58,691	"	"	"	"	"	"
224	58,933	"	"	"	"	"	"
225	61,055	"	"	"	"	"	"
226	36,848	"	"	"	"	"	"
227	36,359	"	"	"	"	"	"
228	35,683	"	"	"	"	"	"
229	21,458	"	"	"	"	"	"
230	12,136	"	"	"	"	"	"
231	12,918	247,685	376,204	512,130	346,759	493,796	648,241
232	10,991	"	"	"	"	"	"
233	5,127	"	"	"	"	"	"
234	2,897	"	"	"	"	"	"
235	9,102	"	"	"	"	"	"
236	6,650	"	"	"	"	"	"
237	47,408	"	"	"	"	"	"
238	62,575	"	"	"	"	"	"
239	61,477	"	"	"	"	"	"
240	36,627	"	"	"	"	"	"
241	31,350	"	"	"	"	"	"
242	38,370	"	"	"	"	"	"
243	46,015	"	"	"	"	"	"

244	34,745	141,204	252,685	371,574	197,685	327,685	465,093
245	32,647	"	"	"	"	"	"
246	32,185	"	"	"	"	"	"
247	30,985	"	"	"	"	"	"
248	20,792	"	"	"	"	"	"
249	13,490	120,685	231,204	347,130	171,759	298,796	413,241
250	12,820	"	"	"	"	"	"
251	8,851	293,981	433,611	580,648	411,574	569,702	735,278
252	11,953	"	"	"	"	"	"
253	14,482	"	"	"	"	"	"
254	11,710	"	"	"	"	"	"
255	"	268,519	401,852	535,185	375,926	527,778	689,630
256	11,114	"	"	"	"	"	"
257	73,580	293,981	433,611	580,648	411,574	569,702	735,278
258	25,521	312,596	462,411	612,596	445,004	605,930	774,633
259	13,953	"	"	"	"	"	"
260	5,978	"	"	"	"	"	"
261	5,603	275,463	412,130	556,204	385,648	540,833	703,426
262	4,944	303,241	444,167	592,870	424,537	583,981	751,204
263	8,217	287,037	425,370	577,020	401,852	558,702	721,667
264	7,586	277,778	414,815	559,259	388,889	544,444	707,407
265	11,604	296,296	436,296	583,704	414,815	573,331	739,059
266	9,341	"	"	"	"	"	"
Segment #4 Totals	1,759,338	19,449,980	28,528,778	38,013,893	27,257,694	37,661,984	48,471,471

SEGMENT #5 - CORPUS CHRISTI CHANNEL TO BROWNSVILLE SHIP CHANNEL

Reach	Existing Annual Maintenance	Channel Width 250' Channel Depth 12'	14'	16'	Channel Width 300' Channel Depth 12'	14'	16'
267	0	236,111	362,778	496,852	330,556	475,741	628,333
268	0	111,111	217,778	331,852	155,556	280,741	413,333
269	0	92,593	196,296	307,407	129,630	251,852	381,481
270	0	74,074	174,815	282,963	103,704	222,963	349,630
271	0	69,444	169,444	276,852	97,222	215,741	341,667
272	0	"	"	"	"	"	"
273	0	"	"	"	"	"	"
274	0	"	"	"	"	"	"
275	3,617	282,407	416,481	557,963	395,370	547,963	707,964

Reach	Existing Annual Maintenance	Channel Width 250' Channel Depth 12'	14'	16'	Channel Width 300' Channel Depth 12'	14'	16'
276	0	282,407	416,481	557,963	395,370	547,963	707,964
277	0	331,481	472,222	620,370	461,111	620,370	787,037
278	0	351,852	496,296	649,630	492,193	656,296	827,407
279	4,338	347,222	491,666	643,519	486,111	649,074	819,444
280	6,544	344,907	488,981	640,463	482,870	645,463	815,463
281	"	340,278	483,611	634,352	476,389	638,241	807,500
282	5,799	335,648	478,056	628,241	469,907	630,833	799,537
283	9,934	331,019	472,870	622,130	463,426	623,796	791,574
284	7,809	326,389	467,315	616,019	456,944	616,389	783,611
285	7,629	317,130	456,759	603,796	443,981	602,130	767,685
286	5,889	312,500	451,389	597,685	437,500	594,907	759,722
287	6,786	317,130	456,759	603,796	443,981	602,130	767,685
288	7,332	319,444	459,444	606,852	447,222	605,741	771,667
289	7,386	317,130	456,759	603,796	443,981	602,130	767,685
290	13,164	314,815	454,074	600,741	440,741	598,519	763,704
291	21,100	305,556	443,333	588,519	427,778	584,074	747,778
292	21,851	293,981	429,907	573,241	411,574	566,019	727,870
293	25,118	275,463	408,426	548,796	385,648	537,130	696,019
294	33,463	250,000	378,889	515,185	350,000	497,407	652,222
295	45,178	256,944	386,944	524,352	359,722	508,241	664,167
296	39,905	268,519	400,370	539,630	375,926	526,296	684,074
297	31,908	273,148	405,741	545,741	382,407	533,519	692,037
298	18,512	282,407	416,481	557,963	395,370	547,963	707,964
299	17,238	280,093	413,796	554,907	392,130	544,352	703,981
300	24,026	277,778	411,111	551,852	388,889	540,741	700,000
301	27,634	270,833	403,056	542,685	379,167	529,907	688,056
302	26,791	261,574	392,315	530,463	366,204	515,463	672,130
303	23,644	247,685	376,204	512,130	346,759	493,796	648,241
304	32,708	224,537	349,352	481,574	314,352	457,685	608,426
305	39,879	259,259	389,630	527,407	362,963	511,852	668,148
306	42,560	310,185	448,704	594,630	434,259	591,296	755,741
307	36,720	275,463	408,426	548,796	385,648	537,130	696,019
308	25,916	224,537	349,352	481,574	314,352	457,685	608,426
309	36,667	"	"	"	"	"	"
310	32,391	206,019	327,870	457,130	288,426	428,796	576,574
311	24,090	"	"	"	"	"	"
312	24,462	"	"	"	"	"	"
313	24,776	"	"	"	"	"	"
314	35,290	240,741	368,148	502,963	337,037	482,963	636,296
315	38,916	"	"	"	"	"	"
316	22,387	"	"	"	"	"	"
317	22,321	333,333	525,185	731,852	466,667	677,037	902,222
318	21,383	"	"	"	"	"	"
319	24,312	368,056	571,019	788,796	515,278	736,759	973,056
320	21,846	"	"	"	"	"	"

321	20,874	384,259	592,407	815,370	537,963	764,630	1,006,111
322	19,457	"	"	"	"	"	"
323	31,723	324,074	512,963	716,667	453,704	661,111	883,333
324	41,375	"	"	"	"	"	"
325	47,375	"	"	"	"	"	"
326	48,861	"	"	"	"	"	"
327	39,609	"	"	"	"	"	"
328	43,032	"	"	"	"	"	"
329	52,055	"	"	"	"	"	"
330	49,197	"	"	"	"	"	"
331	41,760	"	"	"	"	"	"
332	40,921	"	"	"	"	"	"
333	26,623	"	"	"	"	"	"
334	30,200	"	"	"	"	"	"
335	30,389	"	"	"	"	"	"
336	14,614	"	"	"	"	"	"
337	14,127	"	"	"	"	"	"
338	10,802	"	"	"	"	"	"
339	8,072	277,778	451,852	640,741	388,889	581,481	788,889
340	23,399	"	"	"	"	"	"
341	39,252	"	"	"	"	"	"
342	44,778	296,296	476,296	671,111	414,815	613,333	826,667
343	42,563	365,741	513,148	667,963	512,037	677,963	851,296
344	41,857	"	"	"	"	"	"
345	29,594	"	"	"	"	"	"
346	23,296	358,796	505,093	658,796	502,315	667,130	839,352
347	15,049	354,167	499,722	652,685	495,833	659,907	831,389
348	18,230	"	"	"	"	"	"
349	21,927	"	"	"	"	"	"
350	20,738	347,222	491,666	643,519	486,111	649,074	819,444
351	19,964	331,019	472,870	622,130	463,426	623,796	791,574
352	20,066	"	"	"	"	"	"
353	17,025	"	"	"	"	"	"
354	15,226	282,407	416,481	557,963	395,370	547,963	707,964
355	25,748	155,093	268,796	389,907	217,130	349,352	488,981
356	27,927	"	"	"	"	"	"
357	23,251	"	"	"	"	"	"
358	13,939	"	"	"	"	"	"
359	15,537	173,611	290,278	414,352	243,056	378,241	520,833
360	34,200	196,759	317,130	444,907	275,463	414,352	560,648
361	33,638	"	"	"	"	"	"
362	4,711	"	"	"	"	"	"
363	11,043	250,000	378,889	515,185	350,000	497,407	652,222
364	17,472	"	"	"	"	"	"
365	17,175	266,204	397,685	536,574	372,685	522,685	680,093
366	9,888	291,667	427,222	568,333	408,333	562,407	722,037

Reach	Existing Annual Maintenance	Channel Width 250' — Channel Depth 12'	14'	16'	Channel Width 300' — Channel Depth 12'	14'	16'
367	9,555	291,667	427,222	568,333	408,333	562,407	722,037
368	7,907	328,704	470,185	619,074	460,185	620,185	787,593
369	5,839	335,648	478,056	628,241	469,907	630,833	799,537
370	3,847	344,907	488,981	640,463	482,870	645,463	815,463
371	313	"	"	"	"	"	"
372	0	"	"	"	"	"	"
373	34,902	354,167	499,722	652,685	495,833	659,907	831,387
374	11,395	365,741	513,148	667,963	512,037	677,963	851,296
375	22,973	354,167	499,722	652,685	495,833	659,907	831,387
376	9,975	337,963	480,926	631,296	473,148	634,630	803,519
377	9,873	328,704	470,185	619,074	460,185	620,185	787,593
378	7,826	312,500	451,389	597,685	437,500	594,907	759,722
379	9,548	307,870	446,019	591,574	431,019	587,685	751,759
380	6,761	"	"	"	"	"	"
381	4,658	303,241	440,648	585,463	424,537	580,463	743,796
382	5,318	"	"	"	"	"	"
383	5,278	252,315	381,574	518,241	353,241	501,019	656,204
384	5,411	"	"	"	"	"	"
385	6,626	261,574	392,315	530,463	366,204	515,463	672,130
386	14,722	266,204	397,685	536,574	372,685	522,685	680,093
387	36,222	282,407	416,481	557,963	395,370	547,963	707,964
388	65,077	293,981	429,907	573,241	411,574	566,019	727,870
389	61,096	273,148	405,741	545,741	382,407	533,519	692,037
390	52,928	259,259	389,630	527,407	362,963	511,852	668,148
391	39,203	254,630	384,259	521,296	356,481	504,630	660,185
392	22,264	250,000	378,889	515,185	350,000	497,407	652,222
393	6,918	263,889	395,000	533,519	369,444	519,074	676,111
394	0	273,148	405,741	545,741	382,407	533,519	692,037
395	0	270,833	403,056	542,685	379,167	529,907	688,056
396	4,196	268,519	400,370	539,630	375,926	526,296	684,074
397	36,009	252,315	381,574	518,241	353,241	501,019	656,204
398	7,118	240,741	368,148	502,963	337,037	482,963	636,296
399	27,867	300,926	437,963	582,407	421,296	576,852	739,815
400	21,344	342,593	486,296	637,407	479,630	641,852	811,481
Segment #5 Totals	2,758,291	37,766,670	56,979,433	77,376,302	52,869,972	74,565,367	97,442,956
GRAND TOTALS	8,035,117	116,892,725	167,191,557	219,695,611	163,655,948	221,269,233	281,134,591

DREDGE DISPOSAL REQUIRED FOR CHANNEL IMPROVEMENT*
CUBIC YARDS

SEGMENT #1 - SABINE-NECHES WATERWAY TO HOUSTON SHIP CHANNEL

No.	Area No.	Channel Width 250' Channel Depth 12'	14'	16'	Channel Width 300' Channel Depth 12'	14'	16'
1	1	607,084	808,159	1,014,569	838,805	1,073,215	1,312,956
2	2	400,139	533,304	683,912	549,083	704,470	863,412
3	3	554,166	753,634	1,000,099	775,832	1,008,634	1,246,766
4	4	1,054,445	1,410,817	1,776,434	1,476,222	1,890,373	2,313,767
5	5	320,000	429,368	541,582	448,000	575,146	705,137
6	6	315,556	424,639	536,569	441,778	568,639	698,346
7	7	"	"	"	"	"	"
8	8	"	"	"	"	"	"
9	9	327,222	437,053	549,728	458,111	585,720	716,173
10	10	331,111	441,191	554,114	463,555	591,413	722,114
11	11	248,333	330,893	415,586	347,666	443,560	541,586
12	12	413,888	551,489	692,643	579,444	739,266	902,644
13	13	1,480,997	1,975,783	2,483,366	2,073,397	2,648,180	3,235,765
14	14	256,777	339,878	425,112	359,489	455,922	554,490
15	15	344,444	455,378	569,155	482,222	610,933	742,489
16	16	566,111	757,897	954,661	792,554	1,015,453	1,243,330
17	17	510,000	675,973	846,214	714,000	906,640	1,103,546
18	18	441,667	581,045	723,978	618,334	779,933	945,089
19	19	618,334	813,463	1,013,569	865,667	1,091,906	1,323,125
20	20	1,540,001	2,049,670	2,459,608	2,155,999	2,681,227	3,217,832
21	21	473,888	615,329	760,324	663,444	827,107	994,325
22	22	274,999	359,267	445,667	385,000	482,600	582,334
23	23	366,666	479,022	594,222	513,334	643,466	776,444
24	24	443,033	582,499	725,519	620,246	781,936	947,177
25	25	418,133	556,006	697,432	585,386	745,481	909,130
26	26	468,089	631,380	798,938	655,324	845,281	1,039,507
27	27	220,633	301,421	384,342	308,886	403,007	499,261
28	28	577,776	792,534	1,012,979	808,889	1,059,200	1,315,200
29	29	144,444	198,133	253,244	202,222	264,800	328,800
30	30	288,888	396,266	506,489	404,444	529,601	657,600
31	31	"	"	"	"	"	"
32	32	"	"	"	"	"	"
33	33	"	"	"	"	"	"
34	34	722,220	990,667	1,266,223	1,011,110	1,324,001	1,644,000

Number	Area No.	Channel Width 250' Channel Depth 12'	14'	16'	Channel Width 300' Channel Depth 12'	14'	16'
35	35	1,083,330	1,486,001	1,899,335	1,516,666	1,986,001	2,466,000
36	36	1,444,440	1,981,334	2,532,446	2,022,221	2,648,002	3,288,000
37	37	1,155,552	1,585,068	2,025,958	1,617,776	2,118,401	2,630,400
38	38	794,442	1,089,734	1,392,846	1,112,221	1,456,400	1,808,400
39	39	722,220	990,667	1,266,223	1,011,110	1,324,001	1,644,000
40	40	1,227,774	1,684,134	2,152,579	1,718,887	2,250,802	2,794,800
41	41	1,011,108	1,386,934	1,772,712	1,415,555	1,853,602	2,301,600
42	43	1,733,328	2,377,601	3,038,935	2,426,665	3,177,602	3,945,600
Segment #1 Totals		25,399,014	34,291,707	43,359,917	35,536,432	45,818,002	56,330,637

SEGMENT #2 - HOUSTON SHIP CHANNEL TO FREEPORT HARBOR CHANNEL

No.	Area No.	Channel Width 250' Channel Depth 12'	14'	16'	Channel Width 300' Channel Depth 12'	14'	16'
1	44	1,050,000	1,431,334	1,830,444	1,470,199	1,895,777	2,339,333
2	45	525,000	715,667	915,222	735,100	947,888	1,169,666
3	46	139,999	247,734	362,578	196,001	321,511	454,134
4	47	"	"	"	"	"	"
5	48	"	"	"	"	"	"
6	49	181,667	317,400	462,023	254,334	412,289	579,133
7	52	246,666	414,134	592,267	345,334	539,466	744,266
8	53	135,000	220,601	311,533	189,000	287,933	392,200
9	54	94,445	152,222	213,556	132,222	198,889	269,111
10	55	147,778	235,422	328,400	206,888	307,867	414,178
11	56	328,889	509,512	700,800	460,445	667,733	885,689
12	57	291,112	444,355	606,488	407,556	583,022	767,377
13	58	176,666	268,933	366,533	247,333	352,933	463,866
14	59	435,110	629,544	833,414	609,156	830,255	1,061,593
15	61	779,333	1,043,460	1,313,350	1,091,066	1,395,194	1,708,282
16	62	1,107,222	1,466,974	1,835,969	1,550,113	1,967,640	2,394,414
17	63	1,539,998	2,016,337	2,504,764	2,155,999	2,707,894	3,271,874
18	64	790,555	1,041,150	1,298,147	1,106,777	1,397,374	1,694,368
19	65	1,143,331	1,527,617	1,921,856	1,600,663	2,047,171	2,503,633
20	66	326,666	436,462	549,102	457,332	584,906	715,324
21	67	408,332	545,578	686,377	571,666	731,132	894,155
22	68	244,999	327,347	411,827	343,000	438,679	536,492
23	69	236,666	318,480	402,427	331,333	426,480	523,759
24	70	1,025,556	1,380,079	1,743,850	1,435,777	1,848,079	2,269,625
25	71	552,223	743,119	938,995	773,111	995,119	1,222,106
26	72	473,334	636,960	804,853	662,666	852,960	1,047,520
27	73	526,111	693,116	864,386	736,555	930,227	1,128,164
28	74	983,888	1,291,303	1,606,537	1,377,444	1,733,746	2,097,871
29	75	894,444	1,173,912	1,460,489	1,252,222	1,576,133	1,907,155
30	76	782,778	1,032,876	1,289,374	1,095,888	1,385,987	1,682,484

31	77	940,001	1,266,826	1,602,187	1,315,999	1,696,159	2,084,852
32	78	470,000	633,413	801,094	658,000	848,080	1,042,426
33	80	430,834	580,628	734,336	603,166	777,406	955,558
34	82	509,167	686,197	867,852	712,832	918,752	1,129,295
Segment #2 Totals		18,197,768	24,924,160	31,886,186	25,477,179	33,247,703	41,258,171

SEGMENT #3 - FREEPORT HARBOR CHANNEL TO MATAGORDA SHIP CHANNEL

		Channel Width 250'			Channel Width 300'		
		Channel Depth			Channel Depth		
No.	Area No.	12'	14'	16'	12'	14'	16'
1	86	2,047,224	2,733,799	3,438,157	2,866,112	3,663,802	4,479,269
2	87	164,444	219,413	275,804	230,222	294,080	359,360
3	88	411,112	548,533	689,512	575,556	735,200	898,400
4	89	1,397,779	1,865,012	2,344,339	1,956,890	2,499,682	3,054,562
5	90	493,334	658,240	827,414	690,667	882,240	1,078,080
6	91	82,223	109,706	137,902	115,111	147,040	179,680
7	92	1,562,224	2,084,426	2,620,144	2,187,113	2,793,762	3,413,922
8	96	2,631,114	3,510,612	4,412,874	3,683,558	4,705,283	5,749,763
9	97	1,068,890	1,426,187	1,792,730	1,496,446	1,911,521	2,335,841
10	98	411,112	548,533	689,512	575,556	735,200	898,400
11	99	"	"	"	"	"	"
12	100	641,666	849,401	1,062,467	898,333	1,139,400	1,385,801
13	102A	470,555	622,894	779,142	658,777	835,560	1,016,254
14	102B	2,309,996	3,057,841	3,824,879	3,234,000	4,101,840	4,988,881
15	103	171,110	226,507	283,325	239,556	303,840	369,547
16	104	1,711,109	2,265,067	2,833,243	2,395,555	3,038,400	3,695,467
17	105	"	"	"	"	"	"
18	106	2,395,553	3,171,094	3,966,540	3,353,777	4,253,760	5,173,654
19	107	342,222	453,013	566,648	479,111	607,680	739,093
20	108	1,146,110	1,497,239	1,857,259	1,604,556	2,011,241	2,426,813
21	109	810,066	1,057,108	1,310,396	1,134,094	1,420,175	1,712,501
22	110	645,556	842,426	1,044,276	903,778	1,131,761	1,364,719
23	111	1,567,777	2,045,892	2,536,099	2,194,889	2,748,562	3,314,318
24	112	2,575,555	3,553,686	4,570,934	3,605,779	4,735,021	5,903,375
25	113	156,667	245,734	340,133	219,334	321,733	429,467
26	114	261,112	409,555	566,888	365,556	536,221	715,777
27	115	156,667	245,734	340,133	219,334	321,733	429,467
28	116	261,112	409,555	566,888	365,556	536,221	715,777
29	XI	0	1,166,671	2,380,002	0	1,399,999	2,846,668
30	116A	0	111,112	226,667	0	133,333	271,111
31	116B	0	55,556	113,333	0	66,666	135,556
Segment #3 Totals		28,014,510	38,804,146	49,920,395	39,220,327	51,784,556	64,675,390

SEGMENT #4 - MATAGORDA SHIP CHANNEL TO CORPUS CHRISTI CHANNEL

No.	Area No.	Channel Width 250' Channel Depth 12'	14'	16'	Channel Width 300' Channel Depth 12'	14'	16'
1	X2	0	222,223	453,334	0	266,666	542,222
2	117	620,832	827,233	1,038,965	869,166	1,108,898	1,353,965
3	118	1,945,276	2,591,998	3,255,425	2,723,387	3,474,550	4,242,425
4	119	2,911,109	3,886,310	4,886,750	4,075,553	5,208,532	6,366,750
5	120	1,865,556	2,496,061	3,142,922	2,611,777	3,344,507	4,093,588
6	121	1,257,222	1,682,129	2,118,056	1,760,111	2,253,907	2,758,722
7	122	647,777	986,090	1,343,956	906,890	1,294,088	1,700,844
8	123	529,999	806,801	1,099,600	742,001	1,058,800	1,391,599
9	124	"	"	"	"	"	"
10	125	471,110	717,156	977,422	659,556	941,155	1,236,977
11	126	323,888	493,045	671,977	453,445	647,045	850,422
12	127	736,110	1,120,558	1,527,222	1,030,558	1,470,556	1,932,778
13	129	1,002,221	1,525,247	2,078,489	1,403,113	2,001,688	2,630,488
14	130	1,723,888	2,618,380	3,564,425	2,413,442	3,436,820	4,511,758
15	131	475,555	722,311	983,290	665,777	948,089	1,244,623
16	132	237,778	361,156	491,645	332,888	474,044	622,312
17	133	594,444	902,890	1,229,112	832,222	1,185,110	1,555,778
18	134	416,111	632,023	860,378	582,556	829,577	1,089,044
19	135	381,944	603,055	837,500	534,722	789,166	1,056,946
20	136	254,167	454,834	668,833	355,834	589,834	837,168
21	137	237,223	424,511	624,245	332,111	550,511	781,356
22	138	271,111	485,155	713,422	379,555	629,155	892,979
23	139	108,617	208,084	312,418	154,583	268,916	371,917
24	140	181,027	346,806	520,694	257,639	448,194	619,861
25	146	634,999	936,600	1,254,199	889,000	1,230,557	1,588,200
26	147	282,222	416,267	557,422	395,111	546,914	705,866
27	148	"	"	"	"	"	"
28	149	276,110	408,644	546,511	386,556	536,852	694,912
29	150	257,778	385,778	513,778	360,889	506,666	662,045
30	151	193,333	289,333	385,333	270,667	380,000	496,534
31	152	270,000	401,022	535,600	378,000	526,790	683,956
32	153	286,690	423,179	565,090	403,134	555,608	715,312
33	154	300,092	443,915	588,092	427,204	581,693	743,647
34	155	375,115	554,893	735,115	534,005	727,116	929,560
35	156	"	"	"	"	"	"
36	157	330,556	494,556	667,445	462,778	649,000	844,111
37	158	363,889	533,000	711,444	509,444	700,777	901,445
38	159	344,444	510,444	692,424	482,222	670,442	866,000
39	162	1,044,444	1,544,888	2,072,000	1,462,223	2,029,327	2,622,630
Segment #4 Totals		23,339,975	34,234,536	45,616,670	32,709,236	45,194,380	58,165,765

SEGMENT #5 - CORPUS CHRISTI CHANNEL TO BROWNSVILLE SHIP CHANNEL

No.	Area No.	Channel Width 250' Channel Depth 12'	14'	16'	Channel Width 250' Channel Depth 12'	14'	16'
1	164	113,333	174,133	238,489	158,666	228,355	301,660
2	165	"	"	"	"	"	"
3	166	190,000	348,401	517,466	266,000	451,067	646,800
4	167	200,000	445,333	708,444	280,001	569,778	877,333
5	168	83,333	203,333	332,222	116,666	258,889	410,000
6	169	"	"	"	"	"	"
7	170	166,666	406,666	664,445	233,333	517,778	820,001
8	171	440,555	649,710	870,422	616,777	854,822	1,104,424
9	172	1,057,222	1,512,066	1,992,689	1,476,076	1,992,288	2,532,023
10	173	375,000	530,999	695,000	525,000	701,000	885,000
11	174	124,445	176,356	230,933	174,222	232,800	294,044
12	175	248,333	352,067	461,134	347,666	464,734	587,134
13	176	652,223	927,156	1,216,489	913,111	1,223,600	1,548,488
14	177	241,667	344,201	452,334	338,333	454,200	575,666
15	178	632,222	903,911	1,190,089	885,110	1,192,355	1,514,089
16	179	308,890	443,556	585,511	432,444	584,890	744,622
17	180	528,334	762,200	1,008,511	739,667	1,004,645	1,282,067
18	181	455,556	656,444	868,000	637,777	865,333	1,103,555
19	182	383,333	551,333	728,222	536,666	726,889	926,000
20	183	607,223	875,044	1,157,089	850,111	1,153,489	1,471,088
21	184	444,445	643,555	853,334	622,223	848,000	1,084,445
22	185	355,555	519,110	691,556	497,778	683,556	878,222
23	186	401,111	593,288	796,133	561,556	780,401	1,009,912
24	187	484,999	733,266	995,755	679,000	962,822	1,260,866
25	188	511,111	763,555	1,030,223	715,555	1,003,555	1,305,778
26	189	397,777	589,422	791,734	556,889	775,200	1,004,178
27	190	337,777	498,488	668,089	472,889	655,823	847,645
28	191	368,334	544,600	730,644	515,666	716,378	926,867
29	192	361,667	536,867	721,844	506,334	705,978	915,401
30	193	318,334	475,933	642,422	445,667	625,489	814,200
31	194	363,334	549,467	746,267	508,667	721,466	944,934
32	195	328,889	509,512	700,800	460,445	667,733	885,689
33	196	311,111	467,556	632,888	435,556	614,222	801,778
34	197	972,222	1,447,778	1,950,000	1,361,111	1,903,333	2,472,223
35	198	417,778	655,289	907,022	584,890	857,956	1,145,244
36	199	346,112	550,822	767,978	484,555	720,377	968,645
37	200	494,446	786,888	1,097,112	692,222	1,029,110	1,383,778

Number	Area Number	Channel Width 250' Channel Depth 12'	14'	16'	Channel Width 300' Channel Depth 12'	14'	16'
38	201	577,778	883,555	1,207,111	808,889	1,159,111	1,527,110
39	202	768,888	1,198,044	1,657,422	1,076,444	1,554,488	2,062,754
40	203	1,480,001	2,301,156	3,182,755	2,072,000	2,968,711	3,925,867
41	204	1,034,444	1,610,800	2,229,822	1,448,222	2,077,912	2,750,266
42	206	1,166,666	1,846,667	2,580,001	1,633,334	2,380,000	3,180,000
43	207	"	"	"	"	"	"
44	208	3,344,443	5,293,778	7,396,003	4,682,225	6,822,666	9,115,997
45	209	688,889	1,113,778	1,574,222	964,445	1,433,777	1,938,667
46	210	822,222	1,330,667	1,881,778	1,151,112	1,712,887	2,317,334
47	211	702,223	985,244	1,282,489	983,111	1,301,689	1,634,489
48	212	958,889	1,346,978	1,754,622	1,342,445	1,779,422	2,235,955
49	213	851,112	1,200,622	1,567,910	1,191,554	1,585,511	1,997,245
50	214	843,334	1,191,599	1,557,644	1,180,661	1,573,378	1,983,866
51	215	798,335	1,139,399	1,498,246	1,117,667	1,503,178	1,906,466
52	216	747,778	1,080,755	1,431,511	1,046,888	1,424,311	1,819,512
53	217	402,779	680,555	976,110	563,890	886,111	1,226,111
54	218	372,223	645,110	935,777	521,112	838,445	1,173,554
55	219	245,556	412,844	590,800	343,778	537,733	742,355
56	220	472,222	761,112	1,067,777	661,111	994,445	1,345,555
57	221	1,435,556	2,177,245	2,959,820	2,009,777	2,858,132	3,747,378
58	222	1,136,668	1,638,355	2,164,399	1,591,332	2,159,688	2,752,400
59	223	908,333	1,288,288	1,687,889	1,271,665	1,700,512	2,149,000
60	224	1,190,000	1,679,065	2,193,022	1,666,000	2,217,288	2,793,464
61	225	512,778	722,822	943,534	717,888	954,600	1,201,975
62	226	405,556	577,111	757,555	567,778	761,556	964,223
63	227	394,445	564,222	742,889	552,222	744,222	945,112
64	228	1,332,222	1,929,379	2,558,533	1,865,112	2,542,266	3,251,422
65	229	630,556	923,444	1,232,334	882,778	1,215,667	1,564,555
66	230	363,334	549,467	746,267	508,667	721,468	944,934
67	231	658,612	987,989	1,336,033	922,056	1,298,100	1,692,812
68	232	681,666	1,004,065	1,344,245	954,332	1,321,178	1,705,800
69	233	989,166	1,478,100	1,994,588	1,384,832	1,942,657	2,528,033
70	234	907,223	1,361,712	1,841,978	1,270,110	1,789,044	2,333,755
71	235	648,888	966,044	1,300,978	908,444	1,270,044	1,649,423
72	236	399,445	602,022	816,156	559,223	790,690	1,033,711
73	239	469,445	704,556	952,999	657,222	925,667	1,207,445
74	240	591,667	846,334	1,114,332	828,334	1,116,334	1,417,666
Segment #5 Totals		45,320,011	68,375,321	92,851,553	63,443,955	89,478,443	116,931,550
GRAND TOTAL		140,271,278	200,629,870	263,634,721	196,387,129	265,523,084	337,361,513

* Channel Excavation has been multiplied by a bulking factor of 1.20 for required disposal quantities

CAPACITY OF EXISTING DISPOSAL AREAS*+

SEGMENT #1 - SABINE NECHES WATERWAY TO HOUSTON SHIP CHANNEL

Number	Area Number	Size Acres	Existing Capacity Cubic Yards	10-year Maintenance Cubic Yards	Available Capacity Cubic Yards	Channel Reaches
1	1	166	3,213,760	49,320	3,164,440	1-2
2	2	54	1,045,440	24,120	1,021,320	2-3
3	3	111	2,148,960	48,610	2,100,350	3-4
4	4	234	4,530,240	86,960	4,443,280	5-7
5	5	28	542,080	27,000	515,080	7-8
6	6	62	1,200,320	28,170	1,172,150	8-9
7	7	75	1,452,000	30,700	1,421,300	9
8	8	64	1,239,040	61,620	1,177,420	10
9	9	64	"	64,400	1,174,640	10-11
10	10	50	968,000	66,680	901,320	11-12
11	11	55	1,064,800	51,040	1,013,760	12
12	12	69	1,335,840	68,830	1,267,010	13
13	13	620	12,003,200	242,120	11,761,080	14-17
14	14	55	1,064,800	40,220	1,024,580	17-18
15	15	64	1,239,040	53,390	1,185,650	18
16	16	135	2,613,600	94,500	2,519,100	19-20
17	17	160	3,097,600	83,560	3,014,040	20-21
18	18	175	3,388,000	78,040	3,309,960	21-22
19	19	164	3,175,040	115,440	3,059,600	22-23
20	20	520	10,067,200	279,870	9,787,330	24-27
21	21	90	1,742,400	86,470	1,655,930	27-28
22	22	68	1,316,480	50,590	1,265,890	28
23	23	45	871,200	62,520	808,680	28-29
24	24	96	1,858,560	75,230	1,783,330	29-30
25	25	65	1,258,400	70,860	1,187,540	30-31
26	26	110	2,129,600	81,980	2,047,620	31-32
27	27	48	929,280	67,270	862,010	32-33
28	28	118	1,903,733	265,640	1,638,093	33-34
29	29	18	312,006	60,290	251,716	35
30	30	20	362,291	116,820	245,471	35-36
31	31	15	430,353	105,540	324,813	36
32	32	34	856,995	106,700	750,295	37
33	33	50	897,576	110,000	787,576	37-38
34	34	135	2,251,944	423,280	1,828,664	38-40
35	35	141	2,384,259	868,570	1,515,689	40-43
36	36	298	4,339,936	974,550	3,365,386	43-47
37	37	310	6,256,058	427,060	5,828,998	47-50
38	38	244	5,000,000	290,500	4,709,500	50-52
39	39	235	7,055,462	319,310	6,736,152	53-54
40	40	251	6,423,609	523,360	5,900,249	55-58

Number	Area Number	Size Acres	Existing Capacity Cubic Yards	10-Year Maintenance Cubic Yards	Available Capacity Cubic Yards	Channel Reaches
41	41	311	6,437,500	605,460	5,832,040	58-61
42	43	520	8,389,333	1,299,920	7,089,413	61-65
Segment #1 Totals		6,147	120,034,975	8,586,510	111,448,465	

SEGMENT #2 - HOUSTON SHIP CHANNEL TO FREEPORT HARBOR CHANNEL

Number	Area Number	Size Acres	Existing Capacity Cubic Yards	10-year Maintenance Cubic Yards	Available Capacity Cubic Yards	Channel Reaches
1	44	1,048	16,907,733	547,790	16,359,943	66-67
2	45	152	2,452,267	386,400	2,065,867	68
3	46	96	3,097,600	353,140	2,744,460	69
4	47	141	4,549,600	349,220	4,200,380	69-70
5	48	83	2,678,133	328,110	2,350,023	70-71
6	49	83	"	347,010	2,331,123	71-72
7	52	137	4,420,533	215,950	4,204,583	72-73
8	53	32	1,032,533	46,730	985,803	73-74
9	54	44	1,419,733	37,080	1,382,653	74
10	55	61	1,968,267	66,450	1,901,817	74-75
11	56	50	1,613,333	141,740	1,471,593	75-76
12	57	64	1,548,800	59,290	1,489,510	76-77
13	58	25	605,000	34,340	570,660	77
14	59	39	1,258,400	384,240	874,160	78-79
15	61	110	3,459,333	455,750	3,093,583	79-80
16	62	316	7,647,200	491,210	7,155,990	81-83
17	63	347	8,387,500	458,410	7,929,090	83-86
18	64	85	1,371,333	218,790	1,152,543	87-88
19	65	209	3,371,867	432,230	2,939,637	88-91
20	66	50	806,667	227,550	579,117	91-92
21	67	82	2,645,867	367,400	2,278,467	92-93
22	68	48	1,548,800	216,190	1,332,610	93
23	69	22	709,867	200,250	509,617	94
24	70	255	4,114,000	569,650	3,544,350	94-97
25	71	156	2,516,800	214,780	2,302,020	97-98
26	72	150	2,420,000	195,060	2,224,940	98-99
27	73	85	1,371,333	136,460	1,234,873	99-100
28	74	191	3,081,467	40,450	3,040,927	101-103
29	75	123	2,977,163	15,820	2,961,343	103-105
30	76	201	4,864,200	14,840	4,849,360	105-106
31	77	232	3,742,933	1,440	3,741,493	107-109
32	78	96	1,548,800	0	1,548,800	109-110
33	80	28	451,733	0	451,733	110-111
34	82	18	290,400	0	290,400	111-112
Segment #2 Totals		4,859	103,647,328	7,533,860	96,093,468	

SEGMENT #3 - FREEPORT HARBOR CHANNEL TO MATAGORDA SHIP CHANNEL

Number	Area Number	Size Acres	Existing Capacity Cubic Yards	10-year Maintenance Cubic Yards	Available Capacity Cubic Yards	Channel Reaches
1	86	100	1,613,333	794,880	818,453	113-117
2	87	40	645,333	154,640	490,693	118
3	88	204	3,291,200	600,660	2,690,540	118,119
4	89	871	14,052,133	1,414,950	12,637,183	119-122
5	90	137	2,210,267	409,170	1,801,097	122,123
6	91	14	225,867	51,310	174,557	124
7	92	230	3,710,667	361,280	3,349,387	124-127
8	96	249	4,024,344	556,910	3,467,434	128-134
9	97	232	1,871,467	72,390	1,799,077	134-136
10	98	72	1,161,600	39,740	1,121,860	137
11	99	32	258,133	104,160	153,973	138
12	100	80	1,290,667	168,180	1,122,487	139,140
13	102A	27	2,621,046	130,090	2,490,956	140-141
14	102B	162	3,931,569	677,710	3,243,859	141-146
15	103	151	3,654,200	100,310	3,553,890	147
16	104	144	3,489,291	1,107,840	2,381,251	147-151
17	105	499	12,075,800	1,228,490	10,847,310	151-155
18	106	795	19,239,000	1,512,200	17,726,800	155-160
19	107	106	1,710,133	225,030	1,485,103	161
20	108	396	6,388,800	904,480	5,484,320	161-164
21	109	229	3,694,533	402,720	3,291,813	164-167
22	110	195	3,146,000	371,510	2,774,490	167-168
23	111	401	6,469,467	939,700	5,529,767	168-171
24	112	790	19,118,000	3,984,720	15,133,280	172-178
25	113	52	1,677,867	639,450	1,038,417	178-179
26	114	83	2,678,133	878,140	1,799,993	179-180
27	115	52	1,677,867	382,410	1,295,457	180
28	116	52	1,677,867	326,420	1,351,447	181
29	XI	0	0	451,880	(451,880)	182-192
30	116A	19	306,533	32,040	274,493	192-193
31	116B	12	400,000	11,100	388,900	193
Segment #3 Totals		6,426	128,311,117	19,034,510	109,276,607	

SEGMENT #4 - MATAGORDA SHIP CHANNEL TO CORPUS CHRISTI CHANNEL

Number	Area Number	Size Acres	Existing Capacity Cubic Yards	10-Year Maintenance Cubic Yards	Available Capacity Cubic Yards	Channel Reaches
1	X2	0	0	78,340	(78,340)	194-195
2	117	126	2,032,800	332,650	1,700,150	196-197
3	118	579	9,341,200	569,400	8,771,800	197-202
4	119	652	10,518,933	524,150	9,994,783	202-209

Number	Area Number	Size Acres	Existing Capacity Cubic Yards	10-Year Maintenance Cubic Yards	Available Capacity Cubic Yards	Channel Reaches
5	120	455	7,340,667	475,110	6,865,557	209-213
6	121	295	4,759,333	732,470	4,026,863	213-216
7	122	190	6,130,667	1,381,470	4,749,197	217-219
8	123	130	4,194,667	1,147,420	3,047,247	219-220
9	124	145	4,678,667	1,158,550	3,520,117	221-222
10	125	114	3,678,400	951,650	2,726,750	222-224
11	126	76	1,226,133	658,870	567,263	224-225
12	127	98	1,897,280	1,037,340	859,940	225-227
13	129	130	1,355,200	744,440	610,760	228-231
14	130	568	9,163,733	519,990	8,643,743	231-237
15	131	111	2,148,960	879,860	1,269,100	237-238
16	132	51	1,645,600	494,010	1,151,590	238-239
17	133	191	6,162,933	800,280	5,362,654	239-241
18	134	115	3,710,667	509,100	3,201,567	241-242
19	135	149	4,807,733	633,880	4,173,853	243-244
20	136	133	4,291,467	500,200	3,791,267	244-245
21	137	119	3,839,733	445,790	3,393,943	246-247
22	138	135	5,445,000	393,830	5,051,170	247-248
23	139	92	3,710,667	101,180	3,609,487	249
24	140	109	3,517,067	161,920	3,355,147	249-250
25	146	120	1,936,000	184,130	1,751,870	251-252
26	147	46	1,113,200	110,800	1,002,400	252-253
27	148	57	1,839,200	104,770	1,734,430	253-254
28	149	69	2,226,400	93,680	2,132,720	254-255
29	150	46	1,484,267	93,680	1,390,587	255
30	151	46	1,484,267	66,680	1,417,587	256
31	152	46	1,484,267	338,780	1,145,487	256-257
32	153	46	1,113,200	492,520	620,680	257-258
33	154	46	1,113,200	204,170	909,030	258
34	155	79	1,529,440	139,530	1,389,910	259
35	156	73	2,355,467	59,780	2,295,687	260
36	157	80	1,936,000	56,030	1,879,970	261
37	158	32	774,400	49,440	724,960	262
38	159	16	387,200	82,170	305,030	263
39	162	31	750,200	285,310	464,890	264-265
Segment #4 Totals		5,596	127,124,215	17,593,370	109,530,845	

SEGMENT #5 - CORPUS CHRISTI CHANNEL TO BROWNSVILLE SHIP CHANNEL

Number	Area Number	Size Acres	Existing Capacity Cubic Yards	10-Year Maintenance Cubic Yards	Available Capacity Cubic Yards	Channel Reaches
1	164	18	145,200	0	145,200	267
2	165	33	106,480	0	106,480	267
3	166	76	122,613	0	122,613	267-268

4	167	185	1,492,333	0	1,492,333	269-270
5	168	65	524,333	0	524,333	271
6	169	142	1,145,467	0	1,145,467	272
7	170	109	879,266	0	879,266	273-274
8	171	121	4,880,333	36,170	4,844,163	275-276
9	172	272	4,388,267	0	4,388,267	276-278
10	173	15	242,400	39,040	202,960	279
11	174	55	887,333	17,430	869,903	279-280
12	175	33	532,400	39,260	493,140	280
13	176	127	2,048,933	101,720	1,947,213	280-282
14	177	32	774,400	34,790	739,610	282
15	178	119	2,879,800	146,190	2,733,610	283-234
16	179	40	968,000	61,750	906,250	284-285
17	180	127	3,073,400	92,890	2,980,510	285-286
18	181	98	2,371,600	79,640	2,291,960	286-287
19	182	60	1,452,000	73,320	1,378,680	288
20	183	135	3,267,000	152,840	3,114,160	289-290
21	184	99	2,395,800	221,460	2,174,340	290-291
22	185	92	2,226,400	217,010	2,009,390	291-292
23	186	103	3,323,467	294,880	3,028,587	292-293
24	187	129	4,162,400	605,700	3,556,700	294-295
25	188	142	4,581,867	643,580	3,938,287	295-297
26	189	108	3,484,800	329,310	3,155,490	297-298
27	190	67	2,161,867	180,020	1,981,847	298-299
28	191	64	2,065,067	223,560	1,841,507	299-300
29	192	87	2,807,200	285,930	2,521,270	300-301
30	193	90	2,904,000	271,280	2,632,720	301-302
31	194	101	3,258,933	296,320	2,962,613	302-303
32	195	76	2,452,267	374,320	2,077,897	303-304
33	196	99	3,194,400	398,790	2,795,610	305
34	197	298	9,615,467	1,051,960	8,563,507	306-308
35	198	133	4,291,467	561,020	3,730,447	309-310
36	199	108	3,484,800	370,460	3,114,340	310-311
37	200	191	6,162,933	492,380	5,670,553	312-313
38	201	172	5,549,867	742,060	4,807,807	314-315
39	202	183	5,904,800	489,850	5,414,950	316-318
40	203	345	5,566,000	757,890	4,808,110	318-321
41	204	179	2,887,867	595,300	2,292,567	321-323
42	206	433	6,985,733	1,376,110	5,609,623	324-326
43	207	339	5,469,200	1,346,960	4,122,240	327-329
44	208	1,089	17,569,200	2,543,110	15,026,090	330-338
45	209	193	3,113,733	264,320	2,849,413	338-340
46	210	216	3,484,800	933,900	2,550,900	340-342
47	211	147	3,557,400	676,770	2,880,630	343-344
48	212	193	4,670,600	649,740	4,020,860	344-346
49	213	193	6,227,467	342,920	5,884,547	346-348
50	214	193	"	421,630	5,805,837	348-350
51	215	193	"	401,640	5,825,827	350-352
52	216	193	"	332,210	5,895,257	352-354
53	217	193	"	511,350	5,716,117	354-356

Number	Area Number	Size Acres	Existing Capacity Cubic Yards	10-Year Maintenance Cubic Yards	Available Capacity Cubic Yards	Channel Reaches
54	218	193	6,227,467	399,880	5,827,587	356-358
55	219	113	3,646,133	183,250	3,462,883	358-359
56	220	216	6,969,600	678,380	6,291,220	360-361
57	221	301	9,712,267	583,110	9,129,157	362-366
58	222	207	6,679,200	241,110	6,438,090	366-369
59	223	159	5,130,400	53,280	5,077,120	369-371
60	224	175	4,235,000	490,180	3,744,820	372-374
61	225	85	2,057,000	252,520	1,804,480	374-375
62	226	246	5,953,200	99,740	5,853,460	376
63	227	76	2,452,267	98,730	2,353,537	377
64	228	293	9,454,133	269,300	9,184,833	378-381
65	229	129	3,121,800	92,920	3,028,880	381-383
66	230	83	2,008,600	64,130	1,944,470	383-384
67	231	127	3,073,400	190,950	2,882,450	384-386
68	232	127	4,097,867	861,930	3,235,937	386-388
69	233	207	6,679,200	1,649,100	5,030,100	388-391
70	234	191	6,162,933	370,280	5,792,653	391-394
71	235	127	4,097,867	29,370	4,068,497	394-396
72	236	150	4,840,000	372,680	4,467,320	396-397
73	239	50	1,613,333	210,510	1,402,823	398-399
74	240	29	701,800	352,780	349,020	399-400
Segment #5 Totals		11,587	289,564,295	27,622,960	261,941,335	

GRAND TOTALS

Number	Acres	Cubic Yards	Cubic Yards	Cubic Yards
218	34,615	768,681,930	80,391,210	688,290,720

* - Available capacity is the capacity remaining after the 10-year maintenance dredging is disposed.

+ - Figures in parenthesis indicate the negative capacity remaining

CAPACITY OF EXISTING DISPOSAL AREAS REMAINING AFTER CHANNEL IMPROVEMENTS +

CUBIC YARDS

SEGMENT #1 - SABINE-NECHES WATERWAY TO HOUSTON SHIP CHANNEL

Number	Area Number	Available Capacity Cubic Yards	Channel Width 250' Channel Depth 12'	14'	16'	Channel Width 300' Channel Depth 12'	14'	16'
1	1	3,164,440	2,557,356	2,356,281	2,149,871	2,325,635	2,091,225	1,851,484
2	2	1,021,320	621,181	488,016	337,408	472,237	316,850	157,908
3	3	2,100,350	1,546,184	1,346,716	1,100,251	1,324,518	1,091,716	853,584
4	4	4,443,280	3,388,835	3,032,463	2,666,846	2,967,058	2,552,907	2,129,513
5	5	515,080	195,080	85,712	(26,502)	67,080	(60,066)	(190,057)
6	6	1,172,150	856,594	747,511	635,581	730,372	603,511	473,804
7	7	1,421,300	1,105,744	996,661	884,731	979,522	852,661	722,954
8	8	1,177,420	861,864	752,781	640,851	735,642	608,781	479,074
9	9	1,174,640	847,418	735,587	624,912	716,529	588,920	458,467
10	10	901,320	570,209	460,129	347,206	437,765	309,907	179,206
11	11	1,013,760	765,427	682,867	598,174	666,094	570,200	472,174
12	12	1,267,010	853,122	715,521	574,367	687,566	527,774	364,366
13	13	11,761,080	10,280,083	9,785,297	9,277,714	9,687,683	9,112,900	8,525,315
14	14	1,024,580	767,803	684,702	599,468	665,091	568,658	470,090
15	15	1,185,650	841,206	730,272	616,495	703,428	574,717	443,161
16	16	2,519,100	1,952,989	1,761,203	1,564,439	1,726,546	1,503,647	1,275,770
17	17	3,014,040	2,504,040	2,338,067	2,167,826	2,300,040	2,107,400	1,910,494
18	18	3,309,960	2,868,293	2,728,915	2,585,982	2,691,626	2,530,027	2,364,871
19	19	3,059,600	2,441,266	2,246,137	2,046,031	2,193,933	1,967,694	1,736,475
20	20	9,787,330	8,247,329	7,737,660	7,327,722	7,631,331	7,106,103	6,569,498
21	21	1,655,930	1,182,042	1,040,601	895,606	992,486	828,823	661,605
22	22	1,265,890	990,891	906,623	820,223	880,890	783,290	683,556
23	23	808,680	442,014	329,658	214,458	295,346	165,214	32,236
24	24	1,783,330	1,340,297	1,200,831	1,051,811	1,163,084	1,001,394	836,153
25	25	1,187,540	769,407	631,534	490,108	602,154	442,059	278,410
26	26	2,047,620	1,579,531	1,416,240	1,248,682	1,392,296	1,202,339	1,008,113
27	27	862,010	641,377	560,589	477,668	553,124	459,003	362,749
28	28	1,638,093	1,060,317	845,559	625,114	829,204	578,893	322,893
29	29	251,716	107,272	53,583	(1,528)	49,494	(13,084)	(77,084)
30	30	245,471	(43,417)	(150,795)	(261,018)	(158,973)	(284,130)	(412,129)
31	31	324,813	35,925	(71,453)	(181,676)	(79,631)	(204,788)	(332,787)
32	32	750,295	461,407	354,029	243,806	345,851	220,694	92,695
33	33	787,576	498,688	391,310	281,087	383,132	257,975	129,976
34	34	1,828,664	1,106,444	837,997	562,441	817,554	504,663	184,664
35	35	1,515,689	432,359	29,688	(383,646)	(977)	(470,312)	(950,311)
36	36	3,365,386	1,920,946	1,384,052	832,940	1,343,165	717,384	77,386
37	37	5,828,988	4,673,446	4,243,930	3,803,040	4,211,222	3,710,597	3,198,598

Number	Area Number	Available Capacity Cubic Yards	Channel Width 250' Channel Depth 12'	14'	16'	Channel Width 300' Channel Depth 12'	14'	16'
38	38	4,709,500	3,915,058	3,619,766	3,316,654	3,597,279	3,253,100	2,901,100
39	39	6,736,152	6,013,932	5,745,485	5,469,929	5,725,042	5,412,151	5,092,152
40	40	5,900,249	4,672,475	4,216,115	3,747,670	4,181,362	3,649,447	3,105,449
41	41	5,832,040	4,820,932	4,445,106	4,059,328	4,416,485	3,978,438	3,530,440
42	43	7,089,413	5,356,085	4,711,812	4,050,478	4,662,748	3,911,811	3,143,813
		ADDITIONAL DISPOSAL CAPACITY REQUIRED FOR CHANNEL IMPROVEMENTS						
Segment #1			43,417	222,248	854,370	239,581	1,032,380	1,962,368

SEGMENT #2 - HOUSTON SHIP CHANNEL TO FREEPORT HARBOR CHANNEL

Number	Area Number	Available Capacity Cubic Yards	Channel Width 250' Channel Depth 12'	14'	16'	Channel Width 250' Channel Depth 12'	14'	16'
1	44	16,359,943	15,309,943	14,928,609	14,529,499	14,889,744	14,464,166	14,020,610
2	45	2,065,867	1,540,867	1,350,200	1,150,645	1,330,767	1,117,979	896,201
3	46	2,744,460	2,604,461	2,496,726	2,381,882	2,548,459	2,422,949	2,290,326
4	47	4,200,380	4,060,381	3,952,646	3,590,068	4,004,379	3,878,869	3,746,246
5	48	2,350,023	2,210,024	2,102,289	1,987,445	2,154,022	2,028,512	1,895,889
6	49	2,331,123	2,149,456	2,013,723	1,869,100	2,076,789	1,918,834	1,751,990
7	52	4,204,583	3,957,917	3,790,449	3,612,316	3,859,249	3,665,117	3,460,317
8	53	985,803	850,803	765,202	674,270	796,803	697,870	593,603
9	54	1,382,653	1,288,208	1,230,431	1,169,097	1,250,431	1,183,764	1,113,542
10	55	1,901,817	1,754,039	1,666,395	1,573,417	1,694,929	1,593,950	1,487,639
11	56	1,471,593	1,142,704	962,081	770,793	1,011,148	803,860	585,904
12	57	1,489,510	1,198,398	1,045,155	883,022	1,081,954	906,488	722,133
13	58	570,660	393,994	310,727	204,127	323,327	217,727	106,794
14	59	874,160	439,050	244,616	40,746	265,004	43,905	(187,433)
15	61	3,093,583	2,314,250	2,050,123	1,780,233	2,002,517	1,698,389	1,385,301
16	62	7,155,990	6,048,768	5,689,016	5,320,021	5,605,877	5,188,350	4,761,576
17	63	7,929,090	6,389,092	5,912,753	5,424,326	5,773,091	5,221,196	4,657,216
18	64	1,152,543	361,988	111,393	(145,604)	45,766	(244,831)	(541,825)
19	65	2,939,637	1,796,306	1,412,020	1,017,781	1,338,974	892,466	436,004
20	66	579,117	252,451	142,655	30,015	121,785	(5,789)	(136,207)
21	67	2,278,467	1,870,135	1,732,889	1,592,090	1,706,801	1,547,335	1,384,312
22	68	1,332,610	1,087,611	1,005,263	920,783	989,610	893,931	796,118
23	69	509,617	272,951	191,137	107,190	178,284	83,137	(14,142)
24	70	3,544,350	2,518,794	2,164,271	1,800,500	2,108,573	1,696,271	1,274,725
25	71	2,302,020	1,749,797	1,588,901	1,363,025	1,528,909	1,306,901	1,079,914
26	72	2,224,940	1,751,606	1,587,980	1,420,087	1,562,274	1,371,980	1,177,420
27	73	1,234,873	708,762	541,757	370,487	498,318	304,646	106,709

28	74	3,040,927	2,057,039	1,749,624	1,434,390	1,663,483	1,307,181	943,056
29	75	2,961,343	2,066,899	1,787,431	1,500,854	1,709,121	1,385,210	1,054,188
30	76	4,849,360	4,066,582	3,816,484	3,559,986	3,753,472	3,463,373	3,166,876
31	77	3,741,493	2,801,492	2,474,667	2,139,306	2,425,494	2,045,334	1,656,641
32	78	1,548,800	1,078,800	915,387	747,706	890,800	700,720	506,374
33	80	451,733	20,899	(128,895)	(282,603)	(151,433)	(325,673)	(503,825)
34	82	290,400	(218,767)	(395,797)	(577,452)	(422,432)	(628,352)	(838,895)

ADDITIONAL DISPOSAL CAPACITY REQUIRED FOR CHANNEL IMPROVEMENTS

Segment #2		218,767	524,692	1,005,659	573,865	1,204,645	2,222,327

SEGMENT #3 - FREEPORT HARBOR CHANNEL TO MATAGORDA SHIP CHANNEL

Number	Area Number	Available Capacity Cubic Yards	Channel Width 250' Channel Depth 12'	14'	16'	Channel Width 300' Channel Depth 12'	14'	16'
1	86	818,453	(1,228,771)	(1,915,346)	(2,619,704)	(2,047,659)	(2,845,349)	(3,660,816)
2	87	490,693	326,249	271,280	214,889	260,471	196,613	131,333
3	88	2,690,540	2,279,428	2,142,007	2,001,028	2,114,984	1,955,340	1,792,140
4	89	12,637,183	11,239,404	10,772,171	10,292,844	10,680,293	10,137,501	9,582,621
5	90	1,801,097	1,307,763	1,142,857	973,683	1,110,430	918,857	723,017
6	91	174,557	92,334	64,851	36,655	59,466	27,517	(5,123)
7	92	3,349,387	1,787,163	1,264,961	729,243	1,162,274	555,625	(64,535)
8	96	3,467,434	836,320	(43,178)	(954,440)	(216,124)	(1,237,849)	(2,282,329)
9	97	1,799,077	730,187	372,890	6,347	302,631	(112,444)	(536,764)
10	98	1,121,860	710,748	573,327	432,348	546,304	386,660	223,460
11	99	153,973	(258,139)	(395,560)	(536,539)	(422,583)	(582,227)	(745,427)
12	100	1,122,487	480,821	273,086	60,020	244,154	(16,913)	(263,314)
13	102A	2,490,956	2,020,401	1,868,062	1,711,814	1,832,179	1,655,396	1,474,702
14	102B	3,253,859	943,863	196,018	(571,020)	19,859	(847,981)	(1,735,022)
15	103	3,553,890	3,382,780	3,327,383	3,270,565	3,314,334	3,250,050	3,184,343
16	104	2,381,451	670,342	116,384	(451,792)	(14,104)	(656,949)	(1,314,010)
17	105	10,847,310	9,136,201	8,582,243	8,014,067	8,451,755	7,808,910	7,151,843
18	106	17,726,800	15,331,247	14,555,706	13,760,260	14,373,023	13,473,040	12,553,146
19	107	1,485,103	1,142,881	1,032,090	918,455	1,005,992	877,423	746,010
20	108	5,484,320	4,338,210	3,987,081	3,627,061	3,879,764	3,473,079	3,057,507
21	109	3,291,813	2,481,747	2,234,705	1,981,417	2,157,719	1,871,638	1,579,312
22	110	2,772,290	2,128,934	1,932,064	1,730,214	1,870,712	1,642,729	1,409,771
23	111	5,529,767	3,961,990	3,483,875	2,993,668	3,334,879	2,781,205	2,215,449
24	112	15,133,280	12,557,725	11,579,594	10,562,346	11,527,501	10,398,259	9,229,905
25	113	1,038,417	881,750	792,683	698,284	819,083	716,684	608,950

Number	Area Number	Available Capacity Cubic Yards	Channel Width 250' Channel Depth 12'	14'	16'	Channel Width 300' Channel Depth 12'	14'	16'
26	114	1,799,993	1,538,881	1,390,438	1,233,105	1,434,437	1,263,773	1,084,216
27	115	1,295,457	1,138,790	1,049,723	955,324	1,076,123	973,724	865,990
28	116	1,351,447	1,090,335	941,892	784,559	985,891	815,226	635,670
29	X1	(451,880)	(451,880)	(1,618,551)	(2,380,002)	(451,880)	(1,851,879)	(3,298,548)
30	116A	274,493	274,493	163,381	47,832	274,493	141,160	3,382
31	116B	388,900	388,900	333,344	275,567	388,900	322,234	253,344
			ADDITIONAL DISPOSAL CAPACITY REQUIRED FOR CHANNEL IMPROVEMENTS					
Segment #3			1,938,790	3,972,635	7,513,497	3,152,350	8,151,591	13,905,888

SEGMENT #4 - MATAGORDA SHIP CHANNEL TO CORPUS CHRISTI CHANNEL

Number	Area Number	Available Capacity Cubic Yards	Channel Width 250' Channel Depth 12'	14'	16'	Channel Width 300' Channel Depth 12'	14'	16'
1	X2	(78,340)	(78,340)	(300,563)	(531,674)	(78,340)	(345,006)	(620,562)
2	117	1,700,150	1,079,318	872,917	661,185	830,984	591,252	346,182
3	118	8,771,800	6,826,524	6,179,802	5,516,375	6,048,413	5,297,250	4,529,375
4	119	9,994,783	7,083,674	6,108,473	5,108,033	5,919,230	4,786,251	3,628,033
5	120	6,865,557	5,000,001	4,369,496	3,722,635	4,253,780	3,521,050	2,771,969
6	121	4,026,863	2,769,641	2,344,734	1,908,807	2,266,752	1,722,956	1,268,141
7	122	4,749,197	4,101,420	3,763,107	3,405,241	3,842,307	3,445,109	3.048,353
8	123	3,047,247	2,517,248	2,240,446	1,947,647	2,305,246	1,988,447	1,655,648
9	124	3,520,177	2,990,118	2,713,316	2,420,517	2,778,116	2,461,317	2,128,518
10	125	2,726,750	2,225,640	2,009,594	1,749,328	2,067,194	1,785,595	1,489,773
11	126	567,263	243,375	74,218	(104,714)	113,818	(79,782)	(283,159)
12	127	859,940	123,830	(260,618)	(667,282)	(170,618)	(610,616)	(1,072,838)
13	129	610,760	(391,461)	(914,487)	(1,467,729)	(792,353)	(1,390,928)	(2,019,728)
14	130	8,643,743	6,919,855	6,025,363	5,079,318	6,230,301	5,206,923	4,131,985
15	131	1,269,100	793,545	546,789	285,810	603,323	321,011	24,427
16	132	1,151,590	913,812	790,434	659,945	818,702	677,546	529,278
17	133	5,362,653	4,768,209	4,459,763	4,133,541	4,530,431	4,177,543	3,806,875
18	134	3,201,567	2,785,456	2,569,544	2,341,189	2,619,011	2,371,990	2,112,523
19	135	4,173,853	3,791,909	3,570,798	3,336,353	3,639,131	3,384,687	3,116,907
20	136	3,791,267	3,537,100	3,336,433	3,122,434	3,435,433	3,201,333	2,954,099
21	137	3,393,943	3,156,720	2,969,432	2,769,698	3,061,832	2,843,432	2,612,587
22	138	5,051,170	4,730,059	4,566,015	4,337,748	4,671,615	4,422,015	4,158,191
23	139	3,609,487	3,500,870	3,401,403	3,297,069	3,454,904	3,340,571	3,237,570
24	140	3,355,147	3,174,120	3,008,341	2,834,453	3,097,508	2,906,953	2,735,286
25	146	1,751,870	1,116,871	815,270	497,671	862,870	521,313	163,670

26	147	1,002,400	720,178	586,133	444,978	607,289	455,486	296,534
27	148	1,734,430	1,452,208	1,318,163	1,177,008	1,339,319	1,187,516	1,028,564
28	149	2,132,720	1,856,610	1,724,076	1,586,209	1,746,164	1,595,868	1,437,808
29	150	1,390,587	1,132,809	1,004,809	876,809	1,029,698	883,921	728,542
30	151	1,417,587	1,224,254	1,128,254	1,032,254	1,146,920	1,037,587	921,053
31	152	1,145,487	875,487	744,465	609,887	767,487	618,697	461,531
32	153	620,680	333,990	197,501	55,590	217,546	65,072	(94,632)
33	154	909,030	608,938	465,115	320,938	481,826	327,337	165,383
34	155	1,389,910	1,014,855	835,077	654,855	855,965	662,854	460,410
35	156	2,295,687	1,920,572	1,740,794	1,560,572	1,761,682	1,568,571	1,366,127
36	157	1,879,970	1,549,414	1,385,414	1,212,525	1,417,192	1,230,970	1,035,859
37	158	724,960	361,071	191,960	13,516	215,516	24,183	(176,485)
38	159	305,030	(39,414)	(205,414)	(387,394)	(177,192)	(365,412)	(560,970)
39	162	464,890	(579,554)	(1,079,998)	(1,607,110)	(997,333)	(1,564,437)	(2,157,740)

ADDITIONAL DISPOSAL CAPACITY REQUIRED FOR CHANNEL IMPROVEMENTS

Segment #4	1,088,769	2,761,080	4,765,903	2,215,836	4,356,181	6,986,114	

SEGMENT #5 - CORPUS CHRISTI CHANNEL TO BROWNSVILLE SHIP CHANNEL

Number	Area Number	Available Capacity Cubic Yards	Channel Width 250' Channel Depth 12'	14'	16'	Channel Width 300' Channel Depth 12'	14'	16'
1	164	145,200	31,857	(28,933)	(93,289)	(13,466)	(83,155)	(156,400)
2	165	106,480	(6,853)	(67,653)	(132,009)	(52,186)	(121,875)	(195,120)
3	166	122,613	(67,387)	(225,788)	(394,853)	(143,387)	(328,454)	(524,187)
4	167	1,492,333	1,292,333	1,047,000	783,889	1,212,332	922,555	615,000
5	168	524,333	441,000	321,000	192,111	407,667	265,444	114,333
6	169	1,145,467	1,062,134	942,134	813,245	1,028,801	886,578	735,467
7	170	879,266	712,600	472,600	214,821	645,933	361,488	59,265
8	171	4,844,163	4,403,608	4,194,453	3,973,741	4,227,386	3,989,341	3,739,739
9	172	4,388,267	3,331,045	2,876,201	2,395,578	2,912,191	2,396,039	1,856,244
10	173	202,960	(172,040)	(328,038)	(492,040)	(322,040)	(498,040)	(682,040)
11	174	869,903	745,458	693,457	638,970	695,681	637,103	575,859
12	175	493,140	244,807	141,073	32,006	145,474	28,406	(93,994)
13	176	1,947,213	1,294,990	1,020,057	730,724	1.034,102	723,613	398,725
14	177	739,610	497,943	395,409	287,276	398,277	282,410	160,944
15	178	2,733,610	2,101,388	1,829,699	1,543,521	1,848,500	1,541,255	1,219,521
16	179	906,250	597,360	462,694	320,739	473,806	321,360	161,628
17	180	2,980,510	2,452,176	2,218,310	1,971,999	2,240,843	1,975,865	1,698,443
18	181	2,291,960	1,836,404	1,635,516	1,423,960	1,654,183	1,426,627	1,188,405
19	182	1,378,680	995,347	827,347	650,458	842,014	651,791	452,680
20	183	3,114,160	2,506,937	2,239,116	1,957,071	2,264,049	1,960,671	1,643,072
21	184	2,174,340	1,729,895	1,530,785	1,321,006	1,522,117	1,326,340	1,089,895
22	185	2,009,390	1,653,835	1,490,280	1,317,834	1,511,612	1,325,834	1,131,168

Number	Area Number	Available Capacity Cubic Yards	Channel Width 250' Channel Depth 12'	14'	16'	Channel Width 300' Channel Depth 12'	14'	16'
23	186	3,028,587	2,627,476	2,435,299	2,232,454	2,467,031	2,248,186	2,018,675
24	187	3,556,700	3,071,701	2,823,434	2,560,945	2,877,700	2,593,878	2,295,834
25	188	3,938,287	3,427,176	3,174,732	2,908,064	3,222,732	2,934,732	2,632,509
26	189	3,155,490	2,757,713	2,566,068	2,363,756	2,598,601	2,380,290	2,151,312
27	190	1,981,847	1,644,070	1,483,359	1,313,758	1,508,958	1,326,024	1,134,202
28	191	1,841,507	1,473,173	1,296,907	1,110,863	1,325,841	1,125,129	914,640
29	192	2,521,270	2,159,603	1,984,403	1,799,426	2,014,936	1,815,292	1,605,869
30	193	2,632,720	2,314,385	2,156,787	1,990,298	2,187,053	2,007,231	1,818,520
31	194	2,962,613	2,599,279	2,413,046	2,215,346	2,453,946	2,241,147	2,107,679
32	195	2,077,897	1,749,008	1,568,385	1,377,097	1,617,452	1,410,164	1,192,208
33	196	2,795,610	2,484,499	2,328,054	2,162,722	2,360,054	2,181,388	1,993,932
34	197	8,563,507	7,591,285	7,115,729	6,613,507	7,202,396	6,660,174	6,091,284
35	198	3,730,447	3,312,669	3,075,158	2,823,425	3,145,557	2,872,491	2,585,203
36	199	3,114,340	2,768,228	2,563,518	2,346,362	2,629,785	2,393,963	2,145,695
37	200	5,670,553	5,176,107	4,883,665	4,573,441	4,978,331	4,641,443	4,286,775
38	201	4,807,807	4,230,029	3,924,252	3,600,696	3,998,918	3,648,696	3,280,697
39	202	5,414,950	4,646,062	4,216,906	3,757,528	4,338,506	3,860,462	3,352,196
40	203	4,808,110	3,328,110	2,506,954	1,625,355	2,736,110	1,839,399	882,243
41	204	2,292,567	1,258,123	681,767	62,745	844,345	214,655	(457,699)
42	206	5,609,623	4,442,957	3,762,956	3,029,622	3,976,289	3,229,623	2,429,623
43	207	4,122,240	2,955,574	2,275,573	1,542,239	2,488,906	1,742,240	942,240
44	208	15,026,090	11,681,647	9,732,312	7,630,087	10,343,865	8,203,424	5,910,093
45	209	2,849,413	2,160,524	1,735,526	1,275,191	1,884,968	1,415,636	910,746
46	210	2,550,900	1,728,678	1,220,233	669,122	1,399,788	838,013	233,566
47	211	2,880,630	2,178,407	1,895,386	1,598,141	1,897,519	1,578,941	1,246,141
48	212	4,020,860	3,061,971	2,673,882	2,266,238	2,678,415	2,241,438	1,784,905
49	213	5,884,547	5,033,435	4,683,925	4,316,637	4,692,993	4,299,036	3,887,302
50	214	5,805,837	4,962,503	4,614,238	4,248,193	4,625,176	4,232,459	3,821,971
51	215	5,825,827	5,027,492	4,686,428	4,327,581	4,708,160	4,322,648	3,919,361
52	216	5,895,257	5,147,479	4,814,502	4,463,746	4,848,369	4,470,946	4,075,745
53	217	5,716,117	5,313,338	5,035,562	4,740,007	5,152,227	4,830,006	4,490,000
54	218	5,827,587	5,455,364	5,182,477	4,891,810	5,306,475	4,989,142	4,654,033
55	219	3,462,883	3,217,327	3,050,039	2,459,239	3,119,105	2,925,150	2,720,528
56	220	6,291,220	5,818,998	5,530,108	5,223,443	5,630,109	5,296,775	4,945,665
57	221	9,129,157	7,693,601	6,951,912	6,169,337	7,119,380	6,271,025	5,381,779
58	222	6,438,090	5,301,422	4,799,735	4,273,691	4,846,758	4,278,402	3,685,690
59	223	5,077,120	4,168,787	3,788,832	3,389,231	3,805,455	3,376,608	2,298,120
60	224	3,744,820	2,554,820	2,065,755	1,551,798	2,078,820	1,527,532	951,356
61	225	1,804,480	1,291,702	1,081,650	860,946	1,086,592	849,880	602,505
62	226	5,853,460	5,447,904	5,276,349	5,095,905	5,285,682	5,091,904	4,889,237
63	227	2,353,537	1,959,015	1,789,238	1,610,571	1,801,238	1,609,238	1,408,348
64	228	9,184,833	7,852,611	7,255,454	6,626,300	7,319,721	6,642,567	5,933,411
65	229	3,028,880	2,398,324	2,105,436	1,796,546	2,146,102	1,813,213	1,464,325
66	230	1,944,470	1,581,136	1,395,003	1,198,203	1,435,803	1,223,002	999,536
67	231	2,882,450	2,223,838	1,894,461	1,546,417	1,960,394	1,584,350	1,189,638
68	232	3,235,937	2,544,271	2,231,872	1,891,692	2,281,605	1,914,759	1,530,137
69	233	5,030,100	4,040,934	3,552,000	3,035,512	3,645,268	3,087,443	2,502,067
70	234	5,792,653	4,885,430	4,430,941	3,950,675	4,522,543	4,003,609	3,458,898
71	235	4,068,497	3,419,609	3,102,453	2,767,519	3,160,053	2,798,453	2,419,074
72	236	4,467,320	4,067,875	3,865,298	3,651,164	3,908,097	3,676,630	3,433,609
73	239	1,402,823	933,378	698,267	449,824	745,601	447,156	195,378

74	240	349,020	(242,647)	(497,314)	(765,312)	(479,314)	(767,314)	(1,068,646)

ADDITIONAL DISPOSAL CAPACITY REQUIRED FOR CHANNEL IMPROVEMENTS

Segment #5		488,927	1,147,726	1,877,505	1,010,393	1,798,838	3,178,086
GRAND TOTALS		3,778,670	8,628,381	16,016,934	7,192,025	16,543,635	28,254,883

+ - Figures in parenthesis indicate the negative capacity remaining

ADDITIONAL DISPOSAL AREA REQUIRED FOR CHANNEL IMPROVEMENTS*+
ACRES
SEGMENT #1 - SABINE-NECHES WATERWAY TO HOUSTON SHIP CHANNEL

Number	Area Number	Channel Width 250' Channel Depth 12'	14'	16'	Channel Width 300' Channel Depth 12'	14'	16'
1	1	--	--	--	--	--	--
2	2	--	--	--	--	--	--
3	3	--	--	--	--	--	--
4	4	--	--	--	--	--	--
5	5	--	--	11.3	--	17.7	42.4
6	6	--	--	--	--	--	--
7	7	--	--	--	--	--	--
8	8	--	--	--	--	--	--
9	9	--	--	--	--	--	--
10	10	--	--	--	--	--	--
11	11	--	--	--	--	--	--
12	12	--	--	--	--	--	--
13	13	--	--	--	--	--	--
14	14	--	--	--	--	--	--
15	15	--	--	--	--	--	--
16	16	--	--	--	--	--	--
17	17	--	--	--	--	--	--
18	18	--	--	--	--	--	--
19	19	--	--	--	--	--	--
20	20	--	--	--	--	--	--
21	21	--	--	--	--	--	--
22	22	--	--	--	--	--	--
23	23	--	--	--	--	--	--
24	24	--	--	--	--	--	--
25	25	--	--	--	--	--	--
26	26	--	--	--	--	--	--
27	27	--	--	--	--	--	--
28	28	--	--	--	--	--	--
29	29	--	--	6.5	--	8.8	21.3
30	30	14.5	35.0	56.0	36.5	60.4	84.8
31	31	--	19.8	40.8	21.4	45.3	69.7
32	32	--	--	--	--	--	--
33	33	--	--	--	--	--	--
34	34	--	--	--	--	--	--
35	35	--	--	79.4	6.2	95.9	187.4
36	36	--	--	--	--	--	--
37	37	--	--	--	--	--	--
38	38	--	--	--	--	--	--
39	39	--	--	--	--	--	--
40	40	--	--	--	--	--	--

41	41	--	--	--	--	--	--
42	43	--	--	--	--	--	--

TOTAL DISPOSAL AREA REQUIRED

Segment #1	14.5	54.8	182.7	64.1	210.4	363.2

SEGMENT #2 - HOUSTON SHIP CHANNEL TO FREEPORT HARBOR CHANNEL

Number	Area Number	Channel Width 250' Channel Depth 12'	14'	16'	Channel Width 300' Channel Depth 12'	14'	16'
1	44	--	--	--	--	--	--
2	45	--	--	--	--	--	--
3	46	--	--	--	--	--	--
4	47	--	--	--	--	--	--
5	48	--	--	--	--	--	--
6	49	--	--	--	--	--	--
7	52	--	--	--	--	--	--
8	53	--	--	--	--	--	--
9	54	--	--	--	--	--	--
10	55	--	--	--	--	--	--
11	56	--	--	--	--	--	--
12	57	--	--	--	--	--	--
13	58	--	--	--	--	--	--
14	59	--	--	--	--	--	--
15	61	--	--	--	--	--	--
16	62	--	--	--	--	--	--
17	63	--	--	--	--	--	--
18	64	--	--	34.0	--	52.9	109.5
19	65	--	--	--	--	--	--
20	66	--	--	--	--	7.3	32.2
21	67	--	--	--	--	--	--
22	68	--	--	--	--	--	--
23	69	--	--	--	--	--	--
24	70	--	--	--	--	--	--
25	71	--	--	--	--	--	--
26	72	--	--	--	--	--	--
27	73	--	--	--	--	--	--
28	74	--	--	--	--	--	--
29	75	--	--	--	--	--	--
30	76	--	--	--	--	--	--
31	77	--	--	--	--	--	--
32	78	--	--	--	--	--	--

Number	Area Number	Channel Width 250' Channel Depth 12'	14'	16'	Channel Width 300' Channel Depth 12'	14'	16'
33	80	--	30.8	60.1	35.1	68.3	102.3
34	82	47.9	81.7	116.3	86.8	126.0	166.2
		TOTAL DISPOSAL AREA REQUIRED					
Segment #2		47.9	112.5	176.4	121.9	194.3	268.5

SEGMENT #3 - FREEPORT HARBOR CHANNEL TO MATAGORDA SHIP CHANNEL

Number	Area Number	Channel Width 250' Channel Depth 12'	14'	16'	Channel Width 300' Channel Depth 12'	14'	16'
1	86	240.5	371.5	505.8	396.7	548.8	704.3
2	87	--	--	--	--	--	--
3	88	--	--	--	--	--	--
4	89	--	--	--	--	--	--
5	90	--	--	--	--	--	--
6	91	--	--	--	--	--	7.2
7	92	--	--	--	--	--	18.5
8	96	--	14.4	169.1	47.4	242.3	441.4
9	97	--	--	--	--	27.6	108.6
10	98	--	--	--	--	--	--
11	99	55.4	81.6	108.5	86.8	117.2	148.4
12	100	--	--	--	--	9.4	56.4
13	102A	--	--	--	--	--	--
14	102B	--	--	115.1	--	167.9	337.1
15	103	--	--	--	--	--	--
16	104	--	--	92.3	8.9	131.5	256.8
17	105	--	--	--	--	--	--
18	106	--	--	--	--	--	--
19	107	--	--	--	--	--	--
20	108	--	--	--	--	--	--
21	109	--	--	--	--	--	--
22	110	--	--	--	--	--	--
23	111	--	--	--	--	--	--
24	112	--	--	--	--	--	--
25	113	--	--	--	--	--	--
26	114	--	--	--	--	--	--
27	115	--	--	--	--	--	--
28	116	--	--	--	--	--	--
29	X1	O.W.D. (92.4)	O.W.D. (314.9)	O.W.D. (460.1)	O.W.D. (92.4)	O.W.D. (359.4)	O.W.D. (635.2)
30	116A	--	--	--	--	--	--
31	116B	--	--	--	--	--	--

TOTAL DISPOSAL AREA REQUIRED

Segment #3		295.9	467.4	990.8	539.8	1,244.7	2,078.7

SEGMENT #4 - MATAGORDA SHIP CHANNEL TO CORPUS CHRISTI CHANNEL

Number	Area Number	Channel Width 250' Channel Depth 12'	14'	16'	Channel Width 300' Channel Depth 12'	14'	16'
1	X2	O.W.D. (21.1)	O.W.D. (63.5)	O.W.D. (107.6)	O.W.D. (21.1)	O.W.D. (71.9)	O.W.D. (124.5)
2	117	--	--	--	--	--	--
3	118	--	--	--	--	--	--
4	119	--	--	--	--	--	--
5	120	--	--	--	--	--	--
6	121	--	--	--	--	--	--
7	122	--	--	--	--	--	--
8	123	--	--	--	--	--	--
9	124	--	--	--	--	--	--
10	125	--	--	--	--	--	--
11	126	--	--	26.2	--	21.4	60.2
12	127	--	55.9	133.5	38.7	122.6	210.8
13	129	80.9	180.6	286.1	157.3	271.5	391.4
14	130	--	--	--	--	--	--
15	131	--	--	--	--	--	--
16	132	--	--	--	--	--	--
17	133	--	--	--	--	--	--
18	134	--	--	--	--	--	--
19	135	--	--	--	--	--	--
20	136	--	--	--	--	--	--
21	137	--	--	--	--	--	--
22	138	--	--	--	--	--	--
23	139	--	--	--	--	--	--
24	140	--	--	--	--	--	--
25	146	--	--	--	--	--	--
26	147	--	--	--	--	--	--
27	148	--	--	--	--	--	--
28	149	--	--	--	--	--	--
29	150	--	--	--	--	--	--
30	151	--	--	--	--	--	--
31	152	--	--	--	--	--	--
32	153	--	--	--	--	--	6.2
33	154	--	--	--	--	--	--
34	155	--	--	--	--	--	--
35	156	--	--	--	--	--	--
36	157	--	--	--	--	--	--

Number	Area Number	Channel Width 250' Channel Depth 12'	14'	16'	Channel Width 300' Channel Depth 12'	14'	16'
37	158	--	--	--	--	--	39.9
38	159	13.7	45.4	80.1	39.9	75.9	113.2
39	162	116.7	212.2	312.7	196.4	304.5	417.9
		TOTAL DISPOSAL AREA REQUIRED					
Segment #4		211.3	494.1	838.6	432.3	795.9	1,239.6

SEGMENT #5 - CORPUS CHRISTI CHANNEL TO BROWNSVILLE SHIP CHANNEL

Number	Area Number	Channel Width 250' Channel Depth 12'	14'	16'	Channel Width 300' Channel Depth 12'	14'	16'
1	164	--	O.W.D.(11.7)	O.W.D.(24.0)	O.W.D.(8.8)	O.W.D.(22.1)	O.W.D.(36.3)
2	165	O.W.D.(7.5)	" (19.1)	" (31.4)	" (16.2)	" (29.4)	" (43.4)
3	166	" (19.1)	" (49.3)	" (81.5)	" (33.5)	" (68.8)	" (106.2)
4	167	--	--	--	--	--	--
5	168	--	--	--	--	--	--
6	169	--	--	--	--	--	--
7	170	--	--	--	--	--	--
8	171	--	--	--	--	--	--
9	172	--	--	--	--	--	--
10	173	O.W.D.(39.0)	O.W.D.(68.8)	O.W.D.(100.0)	O.W.D.(67.6)	O.W.D.(101.2)	O.W.D.(136.3)
11	174	--	--	--	--	--	--
12	175	--	--	--	--	--	O.W.D.(24.1)
13	176	--	--	--	--	--	--
14	177	--	--	--	--	--	--
15	178	--	--	--	--	--	--
16	179	--	--	--	--	--	--
17	180	--	--	--	--	--	--
18	181	--	--	--	--	--	--
19	182	--	--	--	--	--	--
20	183	--	--	--	--	--	--
21	184	--	--	--	--	--	--
22	185	--	--	--	--	--	--
23	186	--	--	--	--	--	--
24	187	--	--	--	--	--	--
25	188	--	--	--	--	--	--
26	189	--	--	--	--	--	--
27	190	--	--	--	--	--	--
28	191	--	--	--	--	--	--
29	192	--	--	--	--	--	--

30	193	--	--	--	--	--	--
31	194	--	--	--	--	--	--
32	195	--	--	--	--	--	--
33	196	--	--	--	--	--	--
34	197	--	--	--	--	--	--
35	198	--	--	--	--	--	--
36	199	--	--	--	--	--	--
37	200	--	--	--	--	--	--
38	201	--	--	--	--	--	--
39	202	--	--	--	--	--	--
40	203	--	--	--	--	--	--
41	204	--	--	--	--	--	O.W.D.(93.5)
42	206	--	--	--	--	--	--
43	207	--	--	--	--	--	--
44	208	--	--	--	--	--	--
45	209	--	--	--	--	--	--
46	210	--	--	--	--	--	--
47	211	--	--	--	--	--	--
48	212	--	--	--	--	--	--
49	213	--	--	--	--	--	--
50	214	--	--	--	--	--	--
51	215	--	--	--	--	--	--
52	216	--	--	--	--	--	--
53	217	--	--	--	--	--	--
54	218	--	--	--	--	--	--
55	219	--	--	--	--	--	--
56	220	--	--	--	--	--	--
57	221	--	--	--	--	--	--
58	222	--	--	--	--	--	--
59	223	--	--	--	--	--	--
60	224	--	--	--	--	--	--
61	225	--	--	--	--	--	--
62	226	--	--	--	--	--	--
63	227	--	--	--	--	--	--
64	228	--	--	--	--	--	--
65	229	--	--	--	--	--	--
66	230	--	--	--	--	--	--
67	231	--	--	--	--	--	--
68	232	--	--	--	--	--	--
69	233	--	--	--	--	--	--
70	234	--	--	--	--	--	--
71	235	--	--	--	--	--	--
72	236	--	--	--	--	--	--
73	239	--	--	--	--	--	--
74	240	52.5	101.0	152.1	97.6	152.5	210.0
			TOTAL DISPOSAL AREA REQUIRED				
Segment #5		52.5	101.0	152.1	97.6	152.5	210.0
GRAND TOTAL		622.1	1,229.9	2,340.6	1,255.7	2,597.8	4.160.0

* - O.W.D. indicates Open Water Disposal
\+ - Figures in parenthesis indicate areas required for land disposal alternative and are not included in segment or grand totals

QUANTITY OF NEW LEVEES REQUIRED FOR CHANNEL IMPROVEMENTS
CUBIC YARDS
SEGMENT #1 - SABINE-NECHES WATER WAY TO HOUSTON SHIP CHANNEL

Number	Area Number	Channel Width 250' Channel Depth 12'	14'	16'	Channel Width 300' Channel Depth 12'	14'	16'
1	1	--	--	--	--	--	--
2	2	--	--	--	--	--	--
3	3	--	--	--	--	--	--
4	4	--	--	--	--	--	--
5	5	--	--	42,499	--	49,315	75,721
6	6	--	--	--	--	--	--
7	7	--	--	--	--	--	--
8	8	--	--	--	--	--	--
9	9	--	--	--	--	--	--
10	10	--	--	--	--	--	--
11	11	--	--	--	--	--	--
12	12	--	--	--	--	--	--
13	13	--	--	--	--	--	--
14	14	--	--	--	--	--	--
15	15	--	--	--	--	--	--
16	16	--	--	--	--	--	--
17	17	--	--	--	--	--	--
18	18	--	--	--	--	--	--
19	19	--	--	--	--	--	--
20	20	--	--	--	--	--	--
21	21	--	--	--	--	--	--
22	22	--	--	--	--	--	--
23	23	--	--	--	--	--	--
24	24	--	--	--	--	--	--
25	25	--	--	--	--	--	--
26	26	--	--	--	--	--	--
27	27	--	--	--	--	--	--
28	28	--	--	--	--	--	--
29	29	--	--	37,426	--	39,770	52,774
30	30	45,934	67,743	90,132	69,407	94,827	120,828
31	31	--	51,630	74,016	53,290	78,710	104,712
32	32	--	--	--	--	--	--
33	33	--	--	--	--	--	--
34	34	--	--	--	--	--	--
35	35	--	--	115,039	37,315	132,643	230,143
36	36	--	--	--	--	--	--
37	37	--	--	--	--	--	--
38	38	--	--	--	--	--	--
39	39	--	--	--	--	--	--
40	40	--	--	--	--	--	--

41	41	--	--	--	--	--	--
42	43	--	--	--	--	--	--

TOTAL LEVEES REQUIRED

Segment #1	45,934	119,373	359,112	160,012	395,265	584,178

SEGMENT #2 - HOUSTON SHIP CHANNEL TO FREEPORT HARBOR CHANNEL

Number	Area Number	Channel Width 250' Channel Depth 12'	14'	16'	Channel Width 300' Channel Depth 12'	14'	16'
1	44	--	--	--	--	--	--
2	45	--	--	--	--	--	--
3	46	--	--	--	--	--	--
4	47	--	--	--	--	--	--
5	48	--	--	--	--	--	--
6	49	--	--	--	--	--	--
7	52	--	--	--	--	--	--
8	53	--	--	--	--	--	--
9	54	--	--	--	--	--	--
10	55	--	--	--	--	--	--
11	56	--	--	--	--	--	--
12	57	--	--	--	--	--	--
13	58	--	--	--	--	--	--
14	59	--	--	--	--	--	75,187
15	61	--	--	--	--	--	--
16	62	--	--	--	--	--	--
17	63	--	--	--	--	--	--
18	64	--	--	66,690	--	86,846	147,172
19	65	--	--	--	--	--	--
20	66	--	--	--	--	38,292	64,780
21	67	--	--	--	--	--	--
22	68	--	--	--	--	--	--
23	69	--	--	--	--	--	39,987
24	70	--	--	--	--	--	--
25	71	--	--	--	--	--	--
26	72	--	--	--	--	--	--
27	73	--	--	--	--	--	--
28	74	--	--	--	--	--	--
29	75	--	--	--	--	--	--
30	76	--	--	--	--	--	--
31	77	--	--	--	--	--	--
32	78	--	--	--	--	--	--

Number	Area Number	Channel Width 250' Channel Depth 12'	14'	16'	Channel Width 300' Channel Depth 12'	14'	16'
33	80	--	63,295	94,519	67,875	103,265	139,451
34	82	79,520	117,510	154,408	122,920	164,747	207,513
			TOTAL LEVEES REQUIRED				
Segment #2		79,520	180,805	315,617	190,795	393,150	674,090

SEGMENT #3 - FREEPORT HARBOR CHANNEL TO MATAGORDA SHIP CHANNEL

Number	Area Number	Channel Width 250' Channel Depth 12'	14'	16'	Channel Width 300' Channel Depth 12'	14'	16'
1	86	286,708	426,161	569,231	453,036	615,066	780,702
2	87	--	--	--	--	--	--
3	88	--	--	--	--	--	--
4	89	--	--	--	--	--	--
5	90	--	--	--	--	--	--
6	91	--	--	--	--	--	38,157
7	92	--	--	--	--	--	50,224
8	96	--	--	--	81,014	288,547	500,690
9	97	--	--	--	--	59,950	146,143
10	98	--	--	--	--	--	--
11	99	89,549	117,463	230,982	122,949	155,379	188,527
12	100	--	--	--	--	40,551	90,599
13	102A	--	--	--	--	--	--
14	102B	--	--	153,102	--	209,359	389,535
15	103	--	--	--	--	--	--
16	104	--	--	128,884	39,979	44,518	304,018
17	105	--	--	--	--	--	--
18	106	--	--	--	--	--	--
19	107	--	--	--	--	--	--
20	108	--	--	--	--	--	--
21	109	--	--	--	--	--	--
22	110	--	--	--	--	--	--
23	111	--	--	--	--	--	--
24	112	--	--	--	--	--	--
25	113	--	--	--	--	--	--
26	114	--	--	--	--	--	--
27	115	--	--	--	--	--	--
28	116	--	--	--	--	--	--
29	X1	--	--	--	--	--	--
30	116A	--	--	--	--	--	--
31	116B	--	--	--	--	--	--

TOTAL LEVEES REQUIRED

Segment #3		376,257	672,526	1,082,199	696,978	1,413,370	2,488,595

SEGMENT #4 - MATAGORDA SHIP CHANNEL TO CORPUS CHRISTI CHANNEL

Number	Area Number	Channel Width 250' Channel Depth 12'	14'	16'	Channel Width 300' Channel Depth 12'	14'	16'
1	X2	--	--	--	--	--	--
2	117	--	--	--	--	--	--
3	118	--	--	--	--	--	--
4	119	--	--	--	--	--	--
5	120	--	--	--	--	--	--
6	121	--	--	--	--	--	--
7	122	--	--	--	--	--	--
8	123	--	--	--	--	--	--
9	124	--	--	--	--	--	--
10	125	--	--	--	--	--	--
11	126	--	--	58,384	--	53,320	94,630
12	127	--	90,053	101,584	71,772	161,144	255,032
13	129	116,629	222,864	335,242	198,060	319,642	447,365
14	130	--	--	--	--	--	--
15	131	--	--	--	--	--	--
16	132	--	--	--	--	--	--
17	133	--	--	--	--	--	--
18	134	--	--	--	--	--	--
19	135	--	--	--	--	--	--
20	136	--	--	--	--	--	--
21	137	--	--	--	--	--	--
22	138	--	--	--	--	--	--
23	139	--	--	--	--	--	--
24	140	--	--	--	--	--	--
25	146	--	--	--	--	--	--
26	147	--	--	--	--	--	--
27	148	--	--	--	--	--	--
28	149	--	--	--	--	--	--
29	150	--	--	--	--	--	--
30	151	--	--	--	--	--	--
31	152	--	--	--	--	--	--
32	153	--	--	--	--	--	56,336
33	154	--	--	--	--	--	--
34	155	--	--	--	--	--	--
35	156	--	--	--	--	--	--
36	157	--	--	--	--	--	--

Number	Area Number	Channel Width 250' Channel Depth 12'	14'	16'	Channel Width 300' Channel Depth 12'	14'	16'
37	158	--	--	--	--	--	72,963
38	159	45,122	78,840	89,396	73,106	111,337	151,060
39	162	55,517	256,484	363,552	239,693	354,885	475,396
			TOTAL LEVEES REQUIRED				
Segment #4		217,268	648,241	948,158	582,631	1,000,328	1,552,782

SEGMENT #5 - CORPUS CHRISTI CHANNEL TO BROWNSVILLE SHIP CHANNEL

Number	Area Number	Channel Width 250' Channel Depth 12'	14'	16'	Channel Width 300' Channel Depth 12'	14'	16'
1-73	164-239	--	--	--	--	--	--
74	240	86,400	138,130	192,567	132,474	192,972	254,178
			TOTAL LEVEES REQUIRED				
Segment #5		86,400	138,130	192,567	134,474	192,972	254,178
GRAND TOTAL		805,379	1,630,173	2,897,653	1,764,890	3,395,085	5,553,823

CAPACITY OF EXISTING DISPOSAL AREAS REMAINING AFTER TOTAL PROJECT COMPLETION+

CUBIC YARDS

SEGMENT #1 - SABINE-NECHES WATERWAY TO HOUSTON SHIP CHANNEL

Number	Area Number	50 Year Maintenance Dredging Cubic Yards	Channel Width 250' Channel Depth 12'	14'	16'	Channel Width 300' Channel Depth 12'	14'	16'
1	1	246,600	2,310,756	2,109,681	1,903,271	2,079,035	1,844,625	1,604,884
2	2	120,600	500,581	367,416	216,808	351,637	196,250	37,308
3	3	243,050	1,303,134	1,103,666	857,201	1,081,468	848,666	610,534
4	4	434,800	2,954,035	2,597,663	2,232,046	2,532,258	2,118,107	1,694,713
5	5	135,000	60,080	(126,488)	(161,502)	(67,920)	(195,066)	(325,057)
6	6	140,850	715,744	606,661	494,731	589,522	462,661	332,954
7	7	153,500	952,244	843,161	731,231	826,022	699,161	569,454
8	8	308,100	553,754	444,681	332,751	427,542	300,681	170,974
9	9	322,000	525,718	413,587	302,912	394,528	266,920	136,467
10	10	333,400	236,809	126,729	13,806	104,365	(23,493)	(154,194)
11	11	255,040	510,387	427,827	343,134	411,054	315,160	217,134
12	12	344,150	508,972	371,371	230,217	343,416	183,594	20,216
13	13	1,210,600	9,069,482	8,574,697	8,067,114	8,477,083	7,902,300	7,314,715
14	14	201,100	566,703	483,602	398,368	463,991	367,558	268,990
15	15	266,950	574,256	463,322	349,545	436,478	307,767	176,211
16	16	472,500	1,480,489	1,288,703	1,091,939	1,254,046	1,031,147	803,270
17	17	417,800	2,086,240	1,920,267	1,750,026	1,882,240	1,689,600	1,492,694
18	18	390,040	2,478,253	2,338,875	2,195,942	2,301,586	2,139,987	1,974,831
19	19	577,200	1,864,066	1,668,937	1,468,831	1,616,733	1,390,494	1,159,275
20	20	1,399,350	6,847,979	6,338,310	5,928,372	6,231,981	5,706,753	5,170,143
21	21	432,350	749,692	608,251	463,256	560,136	396,473	229,255
22	22	252,950	737,941	653,673	567,273	627,940	530,340	430,606
23	23	312,600	129,414	17,058	(98,142)	(17,254)	(147,386)	(280,364)
24	24	376,150	964,147	824,681	681,661	786,934	625,244	460,003
25	25	354,300	415,107	277,234	135,808	247,854	87,759	(75,890)
26	26	409,900	1,169,631	1,006,340	838,782	982,396	792,439	598,213
27	27	336,350	305,027	224,239	141,318	216,774	122,653	26,399
28	28	1,328,200	(267,883)	(482,641)	(703,086)	(498,996)	(749,307)	(1,005,307)
29	29	301,450	(194,178)	(247,867)	(302,978)	(251,956)	(314,534)	(378,534)
30	30	584,100	(627,517)	(734,895)	(845,118)	(743,073)	(868,230)	(996,229)
31	31	527,700	(491,775)	(599,153)	(709,376)	(607,331)	(732,488)	(860,487)
32	32	533,500	(72,093)	(179,471)	(289,694)	(187,649)	(312,806)	(440,805)
33	33	550,000	(51,312)	(158,690)	(268,913)	(166,868)	(292,025)	(420,024)
34	34	2,116,400	(1,009,956)	(1,278,403)	(1,553,959)	(1,298,846)	(1,611,737)	(1,931,736)
35	35	4,342,850	(3,910,491)	(4,313,162)	(4,726,496)	(4,343,827)	(4,813,162)	(5,293,161)
36	36	4,872,750	(2,951,804)	(3,488,698)	(4,039,810)	(3,529,585)	(4,155,366)	(4,795,364)
37	37	2,135,300	2,538,146	2,108,630	1,667,740	2,075,922	1,575,297	1,063,298
38	38	1,452,500	2,462,558	2,167,266	1,864,154	2,144,779	1,800,600	1,448,600
39	39	1,596,550	4,417,382	3,548,935	3,873,379	4,128,492	3,815,601	3,495,602
40	40	2,616,800	2,055,675	1,599,315	1,130,870	1,564,562	1,032,647	527,013
41	41	3,027,300	1,793,632	1,417,806	1,032,028	1,635,448	884,511	116,513

Number	Area Number	50 Year Maintenance Dredging Cubic Yards	Channel Width 250' Channel Depth 12'	14'	16'	Channel Width 300' Channel Depth 12'	14'	16'
42	43	6,499,600	(1,143,515)	(1,787,788)	(2,449,122)	(1,836,852)	(2,587,789)	(3,355,789)
			TOTAL ADDITIONAL DISPOSAL CAPACITY REQUIRED					
Segment #1			10,720,524	13,397,256	16,148,196	13,550,157	16,803,479	20,312,939

SEGMENT #2 - HOUSTON SHIP CHANNEL TO FREEPORT HARBOR CHANNEL

Number	Area Number	50 Year Maintenance Dredging Cubic Yards	Channel Width 250' Channel Depth 12'	14'	16'	Channel Width 300' Channel Depth 12'	14'	16'
1	44	2,738,950	12,570,993	12,189,659	11,790,549	12,150,794	11,725,216	11,281,660
2	45	1,932,000	(391,133)	(581,800)	(781,355)	(601,233)	(814,021)	(1,035,799)
3	46	1,765,700	838,761	731,026	616,182	782,759	657,249	524,626
4	47	1,746,100	2,314,281	2,206,546	1,843,968	2,258,279	2,312,769	2,000,146
5	48	1,640,550	569,474	461,739	346,895	513,472	387,962	359,596
6	49	1,735,050	414,406	278,673	134,050	341,739	183,784	16,940
7	52	1,079,750	2,878,167	2,710,699	2,532,566	2,779,499	2,585,367	2,380,567
8	53	233,650	617,153	531,552	440,620	563,153	464,220	359,953
9	54	185,400	1,102,808	1,045,031	983,697	1,065,031	998,364	928,142
10	55	332,250	1,421,789	1,334,145	1,241,167	1,362,679	1,261,700	1,155,389
11	56	708,700	434,004	253,381	62,093	302,448	95,160	(124,796)
12	57	296,450	901,948	748,705	586,572	785,504	610,036	425,683
13	58	171,700	222,294	130,027	32,427	151 627	46,027	(64,906)
14	59	1,921,200	(1,492,150)	(1,676,584)	(1,880,454)	(1,656,196)	1,877,295	(2,108,633)
15	61	2,278,750	35,400	(228,727)	(498,617)	(276,333)	(580,461)	(893,549)
16	62	2,456,050	3,592,718	3,232,966	2,863,971	3,149,827	2,732,300	2,305,526
17	63	2,292,050	4,097,042	3,620,703	3,132,276	3,591,041	2,929,146	2,365,166
18	64	1,093,950	(731,962)	(982,557)	(1,239,554)	(1,048,184)	(1,583,612)	(1,880,606)
19	65	2,161,150	(364,844)	(749,130)	(1,143,369)	(822,176)	(1,268,684)	(1,725,146)
20	66	1,137,750	(885,299)	(995,095)	(1,107,735)	(1,015,965)	(1,143,539)	(1,273,957)
21	67	1,837,000	(33,135)	(104,111)	(244,910)	(130,199)	(289,665)	(452,688)
22	68	1,080,950	6,661	(75,687)	(160,167)	(91,340)	(187,019)	(284,832)
23	69	1,001,250	(728,229)	(810,113)	(894,060)	(822,966)	(918,113)	(1,015,392)
24	70	2,848,250	(329,456)	(683,979)	(1,047,750)	(739,677)	(1,151,979)	(1,573,525)
25	71	1,073,900	675,897	485,001	289,125	455,009	233,001	6,014
26	72	975,300	776,306	612,680	444,787	586,974	396,680	202,120
27	73	682,300	26,462	(140,543)	(311,813)	(183,982)	(377,654)	(575,591)
28	74	202,700	1,854,339	1,546,924	1,231,690	1,460,786	1,104,841	740,356
29	75	79,100	1,987,799	3,495,762	1,421,754	1,630,021	1,306,110	975,088
30	76	74,200	3,992,382	3,742,284	3,485,786	3,679,272	3,389,173	3,092,679
31	77	7,200	2,794,293	2,467,467	2,132,106	2,418,294	2,038,134	1,649,441

32	78	0	1,078,800	915,387	747,706	890,800	700,720	506,374
33	80	0	20,899	(128,895)	(282,603)	(151,433)	(325,673)	(503,825)
34	82	0	(218,767)	(395,797)	(577,452)	(422,432)	(628,352)	(838,895)
				TOTAL ADDITIONAL DISPOSAL CAPACITY REQUIRED				
Segment #2			5,175,045	7,553,018	10,149,839	6,913,932	11,146,067	14,352,140

SEGMENT #3 - FREEPORT HARBOR CHANNEL TO MATAGORDA SHIP CHANNEL

Number	Area Number	50 Year Maintenance Dredging Cubic Yards	Channel Width 250' Channel Depth 12'	14'	16'	Channel Width 300' Channel Depth 12'	14'	16'
1	86	3,974,400	(5,203,171)	(5,889,746)	(6,594,104)	(6,022,059)	(6,819,749)	(7,635,216)
2	87	773,200	(446,951)	(501,920)	(558,311)	(512,729)	(576,587)	(641,867)
3	88	3,003,300	(723,872)	(861,293)	(1,002,272)	(888,316)	(1,047,960)	(1,211,160)
4	89	7,074,750	4,164,654	3,697,421	3,218,094	3,605,543	3,062,751	2,507,871
5	90	2,045,850	(738,087)	(902,993)	(1,072,167)	(935,420)	(1,126,993)	(1,322,833)
6	91	256,550	(164,216)	(191,699)	(219,895)	(197,104)	(229,033)	(261,673)
7	92	1,806,400	(19,237)	(541,439)	(1,077,157)	(644,126)	(1,250,775)	(1,870,935)
8	96	2,784,550	(1,948,230)	(2,827,728)	(3,738,990)	(3,000,674)	(4,022,399)	(5,066,879)
9	97	361,950	368,237	10,940	(355,603)	(59,319)	(474,394)	(898,714)
10	98	198,700	512,048	374,627	233,648	347,604	187,960	24,760
11	99	520,800	(778,939)	(916,360)	(1,057,339)	(943,383)	(1,103,027)	(1,266,227)
12	100	840,900	(360,079)	(567,814)	(780,880)	(616,746)	(857,813)	(1,104,214)
13	102A	650,450	1,369,951	1,217,612	1,061,364	1,181,729	1,004,946	824,252
14	102B	3,338,550	(2,444,687)	(3,192,532)	(3,959,570)	(3,368,691)	(4,236,531)	(5,123,572)
15	103	501,550	2,881,230	2,825,833	2,769,015	2,812,784	2,748,500	2,682,793
16	104	5,539,200	(4,868,858)	(5,422,816)	(5,990,992)	(5,525,096)	(6,196,149)	(6,853,210)
17	105	6,142,450	2,893,751	2,439,793	1,871,617	2,309,305	1,666,460	1,009,393
18	106	7,561,000	7,770,247	6,994,706	6,199,260	6,812,023	5,912,040	4,992,146
19	107	1,125,150	17,731	(93,060)	(206,695)	(119,158)	(247,727)	(379,049)
20	108	4,522,400	(184,190)	(535,319)	(895,339)	(642,636)	(1,049,321)	(1,464,893)
21	109	2,013,600	468,147	221,105	(32,183)	144,119	(141,962)	(434,288)
22	110	1,557,550	571,384	374,514	172,664	313,162	85,179	(147,779)
23	111	4,698,500	(736,510)	(1,214,625)	(1,704,832)	(1,363,621)	(1,917,295)	(2,483,051)
24	112	19,923,600	(7,365,875)	(8,344,006)	(9,361,254)	(8,396,099)	(9,525,341)	(10,693,695)
25	113	3,197,250	(2,315,500)	(2,404,567)	(2,498,966)	(2,378,167)	(2,480,566)	(2,588,300)
26	114	4,390,700	(2,851,819)	(3,000,262)	(3,157,595)	(2,956,263)	(3,126,927)	(3,306,484)
27	115	1,912,050	(783,260)	(862,327)	(956,726)	(835,927)	(938,326)	(1,046,060)
28	116	1,632,100	(541,765)	(690,208)	(847,541)	(646,209)	(816,874)	(996,430)
29	X1	2,259,400	(2,711,280)	(3,877,951)	(4,639,402)	(2,711,280)	(4,111,279)	(5,557,948)

Number	Area Number	50 Year Maintenance Dredging Cubic Yards	Channel Width 250' Channel Depth 12'	14'	16'	Channel Width 300' Channel Depth 12'	14'	16'
30	116A	160,200	114,293	3,181	(112,368)	114,293	(19,040)	(156,818)
31	116B	55,500	333,400	277,844	220,068	333,400	266,734	197,844
		TOTAL ADDITIONAL DISPOSAL CAPACITY REQUIRED						
			35,186,526	42,838,665	50,820,181	42,763,023	52,316,068	62,511,295

SEGMENT #4 - MATAGORDA SHIP CHANNEL TO CORPUS CHRISTI CHANNEL

Number	Area Number	50 Year Maintenance Dredging Cubic Yards	Channel Width 250' Channel Depth 12'	14'	16'	Channel Width 300' Channel Depth 12'	14'	16'
1	X2	391,700	(470,040)	(692,263)	(923,374)	(470,040)	(736,706)	(1,012,262)
2	117	1,663,250	(583,932)	(790,333)	(1,002,065)	(832,266)	(2,254,502)	(2,009,432)
3	118	2,847,000	3,979,524	3,332,802	2,669,375	3,201,413	2,450,250	1,682,375
4	119	2,620,750	4,462,924	3,487,723	2,487,283	3,298,480	2,165,501	1,007,283
5	120	2,375,550	2,624,451	1,993,946	1,347,085	1,878,230	1,145,500	396,419
6	121	3,662,350	(892,709)	(1,317,616)	(1,753,543)	(1,395,598)	(1,889,394)	(2,394,209)
7	122	6,907,350	(2,805,930)	(3,144,243)	(3,502,109)	(3,065,043)	(3,452,241)	(3,858,997)
8	123	5,737,100	(3,219,852)	(3,496,654)	(3,789,453)	(3,431,854)	(3,748,653)	(4,081,452)
9	124	5,792,750	(2,802,632)	(3,079,434)	(3,372,233)	(3,014,634)	(3,331,433)	(3,664,232)
10	125	4,758,250	(2,502,610)	(2,748,656)	(3,008,922)	(2,691,056)	(2,972,655)	(3,268,477)
11	126	3,294,350	(3,050,975)	(3,220,132)	(3,399,064)	(3,180,532)	(3,374,132)	(3,577,509)
12	127	5,186,700	(5,062,870)	(5,447,318)	(5,853,982)	(5,357,318)	(5,797,316)	(6,259,538)
13	129	3,722,200	(4,113,661)	(4,636,687)	(5,189,929)	(4,514,553)	(5,113,128)	(5,741,928)
14	130	2,559,950	4,319,905	3,425,413	2,479,368	3,630,351	2,606,973	1,522,035
15	131	4,399,300	(3,605,755)	(3,852,511)	(4,113,490)	(3,795,977)	(4,078,289)	(4,374,873)
16	132	2,470,050	(1,556,238)	(1,679,616)	(1,810,105)	(1,651,348)	(1,792,504)	(1,940,772)
17	133	4,001,400	766,809	458,363	132,141	529,031	176,143	(194,525)
18	134	2,545,500	239,956	24,044	(204,311)	73,511	(173,510)	(432,977)
19	135	3,169,400	622,509	401,396	166,953	469,731	215,287	(52,493)
20	136	2,501,000	1,036,100	835,433	621,434	934,433	700,333	453,099
21	137	2,228,950	927,770	740,482	540,748	832,882	614,482	383,637
22	138	1,969,150	2,810,909	2,596,865	2,368,590	2,702,465	2,452,865	2,189,041
23	139	505,900	2,994,970	2,895,503	2,791,169	2,949,004	2,834,671	2,731,670
24	140	809,600	2,364,520	2,198,741	2,024,853	2,287,908	2,097,353	1,925,686
25	146	920,650	196,221	(105,380)	(422,979)	(57,780)	(399,337)	(756,980)
26	147	554,000	166,178	32,133	(109,022)	53,289	(98,514)	(257,466)
27	148	523,850	928,358	794,313	653,158	815,469	663,666	504,714
28	149	468,400	1,388,210	1,255,676	1,117,809	1,277,764	1,127,468	969,408
29	150	468,400	664,409	536,409	408,409	561,298	415,521	260,142
30	151	333,400	890,854	794,854	698,854	813,520	704,187	587,653

31	152	1,693,900	(818,413)	(949,435)	(1,084,013)	(926,413)	(1,075,203)	(1,232,369)
32	153	2,462,600	(2,128,610)	(2,265,099)	(2,407,010)	(2,245,054)	(2,397,528)	(2,557,232)
33	154	1,020,850	(411,912)	(555,735)	(699,912)	(539,024)	(693,513)	(855,467)
34	155	697,650	317,205	137,427	(42,795)	(158,315)	(34,796)	(237,240)
35	156	298,900	1,621,672	1,441,894	1,261,672	1,462,782	1,269,671	1,067,227
36	157	280,150	1,269,264	1,105,264	932,375	1,137,042	950,820	755,709
37	158	247,200	113,871	(55,240)	(233,684)	(31,684)	(223,017)	(423,685)
38	159	410,850	(450,264)	(616,264)	(798,244)	(588,042)	(776,262)	(971,820)
39	162	1,426,550	(2,006,104)	(2,506,548)	(3,033,660)	(2,423,883)	(2,990,987)	(3,584,290)
			TOTAL ADDITIONAL DISPOSAL CAPACITY REQUIRED					
Segment #4			36,482,507	41,159,164	46,753,899	40,212,099	47,403,620	53,740,225

SEGMENT #5 - CORPUS CHRISTI CHANNEL TO BROWNSVILLE SHIP CHANNEL

Number	Area Number	50 Year Maintenance Dredging Cubic Yards	Channel Width 250' Channel Depth 12'	14'	16'	Channel Width 300' Channel Depth 12'	14'	16'
1	164	0	31,857	(28,933)	(93,289)	(13,466)	(83,155)	(156,400)
2	165	0	(6,853)	(67,653)	(132,009)	(52,186)	(121,875)	(195,120)
3	166	0	(67,387)	(225,788)	(394,853)	(143,387)	(328,454)	(524,187)
4	167	0	1,292,333	1,047,000	783,889	1,212,332	922,555	615,000
5	168	0	441,000	321,000	192,111	407,667	265,444	114,333
6	169	0	1,062,134	942,134	813,245	1,028,801	886,578	735,467
7	170	0	712,600	472,600	214,821	645,933	361,488	59,265
8	171	180,850	4,222,758	4,013,603	3,792,891	4,046,536	3,807,491	3,558,889
9	172	0	3,331,045	2,876,201	2,395,578	2,912,191	2,396,039	1,856,244
10	173	195,200	(367,240)	(523,238)	(687,240)	(517,240)	(693,240)	(877,240)
11	174	87,150	658,308	606,397	551,820	608,531	549,953	488,709
12	175	196,300	48,507	(55,227)	(164,294)	(50,826)	(167,894)	(290,294)
13	176	508,600	786,390	511,457	222,124	525,502	215,013	(109,875)
14	177	173,950	323,993	221,459	113,326	224,327	108,460	(13,006)
15	178	7,330,950	(5,229,562)	(5,501,251)	(5,787,429)	(5,482,450)	(5,789,695)	(6,111,429)
16	179	308.750	288,610	153,944	11,989	165,056	12,610	(147,122)
17	180	464,450	1,987,726	1,753,860	1,507,549	1,776,393	1,511,415	1,233,993
18	181	398,200	1,438,204	1,237,316	1,025,760	1,255,983	1,028,427	790,205
19	182	366,600	628,747	460,747	283,858	475,414	285,191	86,080
20	183	764,200	1,742,737	1,474,916	1,192,871	1,499,848	1,196,471	878,872
21	184	1,107,300	622,595	423,485	213,706	444,817	219,040	(17,405)
22	185	1,085,050	568,785	405,230	232,784	426,562	240,784	46,118
23	186	1,474,400	1,153,076	960,899	758,054	992,631	773,786	544,275
24	187	3,028,500	43,201	(205,066)	(467,555)	(150,800)	(434,622)	(732,666)

Number	Area Number	50-Year Maintenance Dredging Cubic Yards	Channel Width 250' Channel Depth 12'	14'	16'	Channel Width 300' Channel Depth 12'	14'	16'
25	188	3,217,900	209,276	(43,168)	(309,836)	4,832	(283,168)	(585,391)
26	189	1,646,550	1,111,163	919,518	717,206	952,051	733,740	504,762
27	190	900,100	743,970	583,259	413,658	608,858	425,924	234,102
28	191	1,117,800	355,373	179,107	(6,937)	208,041	7,329	(203,160)
29	192	1,429,650	729,953	554,753	369,775	585,286	385,642	176,219
30	193	1,356,400	957,985	800,387	633,898	830,653	650,831	462,120
31	194	1,481,600	1,117,679	931,446	734,746	972,346	759,547	626,079
32	195	1,871,850	(122,842)	(303,465)	(494,753)	(254,398)	(461,686)	(679,642)
33	196	1,993,950	490,549	334,104	168,772	366,104	187,438	(118)
34	197	5,259,800	2,331,485	1,855,929	1,353,707	1,942,596	1,400,374	831,484
35	198	2,805,100	507,569	270,058	18,325	340,457	67,391	(219,897)
36	199	1,852,300	915,928	711,218	494,062	777,485	541,663	293,395
37	200	2,461,900	2,714,207	2,421,765	2,111,541	2,516,431	2,179,543	1,824,875
38	201	3,710,300	591,729	213,952	(109,604)	288,618	(61,604)	(429,603)
39	202	2,449,250	2,196,812	1,767,656	1,308,278	1,889,256	1,411,212	902,946
40	203	3,789,450	(461,340)	(1,282,496)	(2,164,095)	(1,053,340)	(1,950,051)	(2,907,207)
41	204	2,976,500	(1,718,377)	(2,294,733)	(2,913,755)	(2,132,155)	(2,761,845)	(3,434,199)
42	206	6,880,550	(2,437,593)	(3,117,594)	(3,850,928)	(2,904,261)	(3,650,927)	(4,450,927)
43	207	6,734,800	(3,779,226)	(4,459,227)	(5,192,561)	(4,245,894)	(4,992,560)	(5,792,560)
44	208	12,715,550	(1,033,903)	(2,983,238)	(5,085,463)	(2,371,685)	(4,512,126)	(6,805,457)
45	209	1,321,600	838,924	413,926	(46,409)	563,368	94,036	(410,854)
46	210	4,669,500	(2,940,822)	(3,449,267)	(4,000,378)	(3,269,712)	(3,831,487)	(4,435,934)
47	211	3,383,850	(1,205,443)	(1,488,464)	(1,785,709)	(1,485,909)	(1,804,909)	(2,137,709)
48	212	3,248,700	(186,729)	(574,818)	(982,462)	(570,285)	(1,007,262)	(1,463,795)
49	213	1,714,600	3,318,835	2,969,325	2,602,037	2,978,393	2,584,436	2,172,702
50	214	2,108,150	2,854,353	2,506,088	2,140,043	2,517,026	2,124,309	1,713,821
51	215	2,008,200	3,019,292	2,678,228	2,319,381	2,699,960	2,314,448	1,911,161
52	216	1,661,050	3,486,429	3,153,452	2,802,696	3,187,319	2,809,896	2,414,695
53	217	2,556,750	2,756,588	2,478,812	2,183,257	2,595,477	2,273,256	1,933,250
54	218	1,999,400	3,455,964	3,183,077	2,892,410	3,307,075	2,989,742	2,654,633
55	219	916,250	2,301,077	2,133,789	1,542,989	2,202,855	2,008,900	1,804,278
56	220	3,391,900	2,427,098	2,138,208	1,831,543	2,238,209	1,904,875	1,553,765
57	221	2,915,550	4,778,051	4,036,362	3,253,787	4,203,830	3,355,475	2,466,229
58	222	1,205,550	4,095,872	3,594,185	3,068,141	3,641,208	3,072,852	2,480,140
59	223	266,400	3,902,387	3,522,432	3,122,831	3,539,055	3,110,208	2,661,720
60	224	2,450,900	103,920	(385,145)	(899,102)	(372,080)	(923,368)	(1,499,544)
61	225	1,262,600	29,102	(180,950)	(401,654)	(176,008)	(412,720)	(660,095)
62	226	498,700	4,949,204	4,777,649	4,597,205	4,786,982	4,593,204	4,390,537
63	227	493,650	1,465,365	1,295,588	1,116,921	1,307,588	1,115,588	914,698
64	228	1,346,500	6,506,111	5,908,954	5,279,800	5,973,221	5,296,067	4,619,911
65	229	464,600	1,933,724	1,640,836	1,331,946	1,681,502	1,348,613	999,725
66	230	3,220,650	(1,639,514)	(1,825,647)	(2,022,447)	(1,784,847)	(1,997,648)	(2,221,114)
67	231	954,750	1,269,088	939,711	591,667	1,005,644	629,600	234,888
68	232	4,309,650	(1,755,379)	(2,077,778)	(2,417,958)	(2,028,045)	(2,394,891)	(2,779,513)
69	233	8,245,500	(4,204,566)	(4,693,500)	(5,209,988)	(4,600,232)	(5,158,057)	(5,743,433)
70	234	1,851,400	3,034,030	2,579,541	2,099,275	2,671,143	2,152,209	1,607,498
71	235	146,850	3,272,759	2,955,603	2,620,669	3,013,203	2,651,603	2,272,224
72	236	1,863,400	2,204,475	2,001,898	1,787,764	2,044,697	1,813,230	1,570,209
73	239	1,052,550	(119,172)	(354,283)	(602,726)	(306,949)	(575,394)	(857,172)
74	240	1,763,900	(2,006,547)	(2,261,214)	(2,529,212)	(2,243,214)	(2,531,214)	(2,832,546)

	TOTAL ADDITIONAL DISPOSAL CAPACITY REQUIRED					
Segment #5	30,551,583	38,382,143	48,752,646	36,209,369	46,929,852	56,290,415
GRAND TOTALS	118,116,185	143,330,246	172,624,761	139,648,580	174,599,086	207,207,014

+ - Figures in parenthesis indicate the negative capacity remaining

ADDITIONAL DISPOSAL AREA REQUIRED FOR TOTAL PROJECT COMPLETION*+
ACRES
SEGMENT #1 - SABINE-NECHES WATERWAY TO HOUSTON SHIP CHANNEL

Number	Area Number	Channel Width 250' Channel Depth 12'	14'	16'	Channel Width 300' Channel Depth 12'	14'	16'
1	1	--	--	--	--	--	--
2	2	--	--	--	--	--	--
3	3	--	--	--	--	--	--
4	4	--	--	--	--	--	--
5	5	--	19.4	23.2	13.1	26.8	40.8
6	6	--	--	--	--	--	--
7	7	--	--	--	--	--	--
8	8	--	--	--	--	--	--
9	9	--	--	--	--	--	--
10	10	--	--	--	--	83.7	22.4
11	11	--	--	--	--	--	--
12	12	--	--	--	--	--	--
13	13	--	--	--	--	--	--
14	14	--	--	--	--	--	--
15	15	--	--	--	--	--	--
16	16	--	--	--	--	--	--
17	17	--	--	--	--	--	--
18	18	--	--	--	--	--	--
19	19	--	--	--	--	--	--
20	20	--	--	--	--	--	--
21	21	--	--	--	--	--	--
22	22	--	--	--	--	--	--
23	23	--	--	16.3	7.7	21.7	35.9
24	24	--	--	--	--	--	--
25	25	--	--	--	--	--	113.9
26	26	--	--	--	--	--	--
27	27	--	--	--	--	--	--
28	28	34.7	57.7	81.4	59.5	86.4	113.9
29	29	26.7	32.5	38.4	32.9	39.7	46.5
30	30	73.3	84.9	96.7	85.7	99.2	112.9
31	31	58.7	70.3	82.1	71.1	84.6	98.3
32	32	13.6	25.1	36.9	26.0	39.5	53.2
33	33	114.5	22.9	34.7	23.8	37.2	51.0
34	34	420.6	143.3	172.9	145.5	179.1	213.5
35	35	323.3	469.5	513.9	472.8	523.3	574.9
36	36	323.2	380.9	440.1	385.3	452.5	521.3
37	37	--	--	--	--	--	--
38	38	--	--	--	--	--	--
39	39	--	--	--	--	--	--

40	40	--	--	--	--	--	--
41	41	--	--	--	--	--	--
42	43	128.8	198.0	269.1	203.3	284.0	366.6

TOTAL DISPOSAL AREA REQUIRED

Segment #1		1,517.4	1,504.5	1,805.7	1,526.7	1,957.7	2,365.1

SEGMENT #2 - HOUSTON SHIP CHANNEL TO FREEPORT HARBOR CHANNEL

		Channel Width 250' Channel Depth			Channel Width 300' Channel Depth		
Number	Area Number	12'	14'	16'	12'	14'	16'
1	44	--	--	--	--	--	--
2	45	47.9	68.4	89.8	70.5	93.3	117.2
3	46	--	--	--	--	--	--
4	47	--	--	--	--	--	--
5	48	--	--	--	--	--	--
6	49	--	--	--	--	--	--
7	52	--	--	--	--	--	--
8	53	--	--	--	--	--	--
9	54	--	--	--	--	--	--
10	55	--	--	--	--	--	--
11	56	--	--	--	--	--	O.W.D.(19.3)
12	57	--	--	--	--	--	--
13	58	--	--	--	--	--	O.W.D.(12.8)
14	59	O.W.D.(166.2)	O.W.D.(186.1)	O.W.D.(207.9)	O.W.D.(183.9)	O.W.D.(207.6)	O.W.D.(232.5)
15	61	--	30.4	59.4	35.6	68.2	101.9
16	62	--	--	--	--	--	--
17	63	--	--	--	--	--	--
18	64	84.5	111.5	139.0	118.5	176.1	208.0
19	65	45.1	86.4	128.8	94.2	142.2	191.3
20	66	101.0	112.8	124.9	115.1	128.8	142.8
21	67	O.W.D.(9.4)	O.W.D.(17.0)	O.W.D.(32.2)	O.W.D.(19.8)	O.W.D.(36.9)	O.W.D.(54.5)
22	68	--	O.W.D.(14.0)	O.W.D.(23 1)	O.W.D.(15.9)	O.W.D.(25.9)	O.W.D.(36.5)
23	69	O.W.D.(84.1)	O.W.D.(92.9)	O.W.D.(101.9)	O.W.D.(94.3)	O.W.D.(104.5)	O.W.D.(114.9)
24	70	41.3	79.4	118.5	85.4	123.8	174.9
25	71	--	--	--	--	--	--
26	72	--	--	--	--	--	--
27	73	--	20.9	39.4	25.6	46.4	67.7
28	74	--	--	--	--	--	--
29	75	--	--	--	--	--	--
30	76	--	--	--	--	--	--

Number	Area Number	Channel Width 250' Channel Depth 12'	14'	16'	Channel Width 300' Channel Depth 12'	14'	16'
31	77	--	--	--	--	--	--
32	78	--	--	--	--	--	--
33	80	--	13.7	36.2	22.1	40.8	60.0
34	82	29.4	48.4	67.9	51.3	73.4	96.0
		TOTAL DISPOSAL AREA REQUIRED					
Segment #2		349.2	571.9	804.0	618.3	893.0	1,159.8

SEGMENT #3 - FREEPORT HARBOR CHANNEL TO MATAGORDA SHIP CHANNEL

Number	Area Number	Channel Width 250' Channel Depth 12'	14'	16'	Channel Width 300' Channel Depth 12'	14'	16'
1	86	565.2	638.9	714.7	653.2	738.9	826.6
2	87	53.9	59.8	65.9	60.9	67.8	74.8
3	88	83.7	98.4	113.6	101.3	118.5	136.0
4	89	--	--	--	--	--	--
5	90	85.2	102.9	121.1	106.4	126.9	148.0
6	91	23.5	26.4	29.5	27.0	30.5	33.9
7	92	7.9	64.0	121.6	75.1	140.3	206.9
8	96	215.3	309.8	407.8	326.9	438.2	550.5
9	97	--	--	44.1	12.2	56.8	102.5
10	98	--	--	--	--	--	--
11	99	89.6	104.3	119.5	107.3	124.4	141.9
12	100	44.5	66.9	39.8	72.1	98.1	124.5
13	102A	--	--	--	--	--	--
14	102B	268.6	349.0	429.5	367.9	461.3	556.6
15	103	--	--	--	--	--	--
16	104	529.2	588.8	646.9	599.8	671.9	742.6
17	105	--	--	--	--	--	--
18	106	--	--	--	--	--	--
19	107	--	15.8	27.9	18.6	32.5	46.6
20	108	25.6	63.4	101.6	74.9	118.6	163.3
21	109	--	--	9.3	--	21.0	52.5
22	110	--	--	--	--	--	27.1
23	111	85.0	136.4	24.3	152.4	210.9	272.8
24	112	O.W.D.(797.7)	O.W.D.(902.8)	O.W.D.(1,007.5)	O.W.D.(908.4)	O.W.D.(1,025.1)	O.W.D.(1,155.4)
25	113	" (254.8)	" (264.3)	" (273.2)	" (261.5)	" (272.5)	" (284.1)
26	114	" (312.4)	" (328.4)	" (343.7)	" (323.6)	" (341.9)	" (361.3)
27	115	" (90.0)	" (98.5)	" (108.2)	" (95.7)	" (106.7)	" (118.3)
28	116	" (64.1)	" (80.0)	" (96.5)	" (75.3)	" (93.7)	" (112.9)
29	X1	" (297.3)	" (422.9)	" (504.9)	" (297.3)	" (448.0)	" (603.6)
30	116A	--	--	" (17.9)	--	" (7.9)	" (22.7)
31	116B	--	--	--	--	--	--

TOTAL DISPOSAL AREA REQUIRED

Segment #3		2,077.2	2,624.8	3,017.1	2,756.0	3,456.6	4,207.1

SEGMENT #4 - MATAGORDA SHIP CHANNEL TO CORPUS CHRISTI CHANNEL

		Channel Width 250'			Channel Width 300'		
		Channel Depth			Channel Depth		
Number	Area Number	12'	14'	16'	12'	14'	16'
1	X2	O.W.D.(56.4)	O.W.D.(80.3)	O.W.D.(105.1)	O.W.D.(56.4)	O.W.D.(85.1)	O.W.D.(114.7)
2	117	68.6	90.8	113.5	95.3	248.2	216.0
3	118	--	--	--	--	--	--
4	119	--	--	--	--	--	--
5	120	--	--	--	--	--	--
6	121	101.8	147.4	194.3	155.8	208.9	263.2
7	122	O.W.D.(307.4)	O.W.D.(343.8)	O.W.D.(382.3)	O.W.D.(335.3)	O.W.D.(376.9)	O.W.D.(420.6)
8	123	" (351.9)	" (381.7)	" (413.2)	" (374.7)	" (408.8)	" (444.6)
9	124	" (307.1)	" (336.8)	" (368.3)	" (329.9)	" (363.9)	" (399.7)
10	125	" (274.8)	" (301.3)	" (329.3)	" (295.1)	" (325.4)	" (357.3)
11	126	333.8	351.9	371.2	347.7	368.5	390.4
12	127	550.1	591.4	635.1	581.7	629.0	678.7
13	129	448.0	504.2	563.7	491.1	555.5	623.1
14	130	--	--	--	--	--	--
15	131	393.4	419.9	448.0	413.9	444.2	476.1
16	132	O.W.D.(173.2)	O.W.D.(186.4)	O.W.D.(200.4)	O.W.D.(183.5)	O.W.D.(198.5)	O.W.D.(214.4)
17	133	--	--	--	--	--	" (26.7)
18	134	--	--	O.W.D.(27.8)	--	O.W.D.(24.5)	" (52.3)
19	135	--	--	--	--	--	11.4
20	136	--	--	--	--	--	--
21	137	--	--	--	--	--	--
22	138	--	--	--	--	--	--
23	139	--	--	--	--	--	--
24	140	--	--	--	--	--	--
25	146	--	17.1	51.3	12.0	48.7	87.2
26	147	--	--	17.5	--	16.4	33.5
27	148	--	--	--	--	--	--
28	149	--	--	--	--	--	--
29	150	--	--	--	--	--	--
30	151	--	--	--	--	--	--
31	152	93.8	107.9	122.3	105.4	121.4	138.3
32	153	234.7	249.3	264.6	247.1	263.5	280.7
33	154	50.1	65.6	81.0	63.7	80.4	97.8
34	155	--	--	10.4	--	9.6	31.3
35	156	--	--	--	--	--	--
36	157	--	--	--	--	--	--

Number	Area Number	Channel Width 250' / Channel Depth 12'	14'	16'	Channel Width 300' / Channel Depth 12'	14'	16'
37	158	--	11.8	30.9	9.2	29.8	51.3
38	159	54.2	72.0	91.6	69.0	89.2	110.3
39	162	O.W.D.(221.5)	O.W.D.(275.3)	O.W.D.(331.9)	O.W.D.(266.4)	O.W.D.(327.3)	O.W.D.(391.1)
		TOTAL DISPOSAL AREA REQUIRED					
Segment #4		2,328.5	2,629.3	2,995.4	2,591.9	3,113.3	3,489.3

SEGMENT #5 - CORPUS CHRISTI CHANNEL TO BROWNSVILLE SHIP CHANNEL

Number	Area Number	Channel Width 250' / Channel Depth 12'	14'	16'	Channel Width 300' / Channel Depth 12'	14'	16'
1	164	--	O.W.D.(8.9)	O.W.D.(77.9)	O.W.D.(7.2)	O.W.D.(14.7)	O.W.D.(22.6)
2	165	O.W.D.(6.5)	" (13.1)	" (20.0)	" (11.4)	" (18.9)	" (26.8)
3	166	" (13.0)	" (30.1)	" (48.2)	" (21.2)	" (41.1)	" (62.2)
4	167	--	--	--	--	--	--
5	168	--	--	--	--	--	--
6	169	--	--	--	--	--	--
7	170	--	--	--	--	--	--
8	171	--	--	--	--	--	--
9	172	--	--	--	--	--	--
10	173	O.W.D.(45.3)	O.W.D.(62.0)	O.W.D.(79.7)	O.W.D.(61.4)	O.W.D.(80.3)	O.W.D.(100.1)
11	174	--	--	--	--	--	--
12	175	--	O.W.D.(11.7)	O.W.D.(23.5)	O.W.D.(11.3)	O.W.D.(23.8)	O.W.D.(37.0)
13	176	--	--	--	--	--	O.W.D.(17.6)
14	177	--	--	--	--	--	" (7.2)
15	178	O.W.D.(568.0)	" (597.2)	" (627.9)	" (595.2)	" (628.2)	" (662.8)
16	179	--	--	--	--	--	" (21.6)
17	180	--	--	--	--	--	--
18	181	--	--	--	--	--	--
19	182	--	--	--	--	--	--
20	183	--	--	--	--	--	--
21	184	--	--	--	--	--	O.W.D.(7.8)
22	185	--	--	--	--	--	--
23	186	--	--	--	--	--	--
24	187	--	O.W.D.(27.8)	O.W.D.(56.4)	O.W.D.(22.0)	O.W.D.(52.5)	O.W.D.(84.6)
25	188	--	" (10.4)	" (39.1)	--	" (36.2)	" (68.7)
26	189	--	--	--	--	--	--
27	190	--	--	--	--	--	--
28	191	--	--	O.W.D.(6.5)	--	--	O.W.D.(27.6)
29	192	--	--	--	--	--	--
30	193	--	--	--	--	--	--

31	194	--	--	--	--	--	--
32	195	O.W.D.(19.0)	O.W.D.(38.4)	O.W.D.(58.9)	O.W.D.(33.1)	O.W.D.(55.4)	O.W.D.(78.9)
33	196	--	--	--	--	--	O.W.D.(5.8)
34	197	--	--	--	--	--	--
35	198	--	--	--	--	--	O.W.D.(29.4)
36	199	--	--	--	--	--	--
37	200	--	--	--	--	--	--
38	201	--	--	O.W.D.(17.6)	--	O.W.D.(12.4)	O.W.D.(51.9)
39	202	--	--	--	--	--	--
40	203	O.W.D.(55.4)	O.W.D.(143.7)	O.W.D.(238.4)	O.W.D.(119.0)	O.W.D.(215.4)	O.W.D.(318.8)
41	204	O.W.D.(190.5)	O.W.D.(252.5)	O.W.D.(319.0)	O.W.D.(235.0)	O.W.D.(302.7)	O.W.D.(374.9)
42	206	" (267.8	" (340.9)	" (419.8)	" (318.0)	" (398.3)	" (484.3)
43	207	" (412.1)	" (485.2)	" (564.0)	" (462.2)	" (542.5)	" (628.5)
44	208	" (116.9)	" (326.5)	" (552.5)	" (260.8)	" (490.9)	" (737.4)
45	209	--	--	" (10.8)	--	--	" (50.0)
46	210	O.W.D.(321.9)	O.W.D.(376.6)	" (435.8)	O.W.D.(357.3)	O.W.D.(417.7)	" (482.7)
47	211	" (135.4)	" (165.8)	" (197.8)	" (165.5)	" (199.8)	" (235.6)
48	212	" (25.9)	" (67.6)	" (111.4)	" (67.1)	" (114.1)	" (163.2)
49	213	--	--	--	--	--	--
50	214	--	--	--	--	--	--
51	215	--	--	--	--	--	--
52	216	--	--	--	--	--	--
53	217	--	--	--	--	--	--
54	218	--	--	--	--	--	--
55	219	--	--	--	--	--	--
56	220	--	--	--	--	--	--
57	221	--	--	--	--	--	--
58	222	--	--	--	--	--	--
59	223	--	--	--	--	--	--
60	224	--	O.W.D.(47.2)	O.W.D.(102.5)	O.W.D.(45.8)	O.W.D.(105.1)	O.W.D.(167.0)
61	225	--	" (25.3)	" (48.9)	" (24.6)	" (50.1)	" (76.8)
62	226	--	--	--	--	--	--
63	227	--	--	--	--	--	--
64	228	--	--	--	--	--	--
65	229	--	--	--	--	--	--
66	230	O.W.D.(182.0)	O.W.D.(202.1)	O.W.D.(223.2)	O.W.D.(197.7)	O.W.D.(220.5)	O.W.D.(244.6)
67	231	--	--	--	--	--	--
68	232	O.W.D.(194.5)	O.W.D.(229.2)	O.W.D.(265.7)	O.W.D.(223.8)	O.W.D.(263.3)	O.W.D.(304.6)
69	233	" (457.8)	" (510.4)	" (565.9)	" (500.3)	" (560.3)	" (623.2)
70	234	--	--	--	--	--	--
71	235	--	--	--	--	--	--
72	236	--	--	--	--	--	--
73	239	O.W.D.(18.6)	O.W.D.(43.9)	O.W.D.(70.6)	O.W.D.(38.8)	O.W.D.(67.7)	O.W.D.(97.9)
74	240	221.5	248.9	277.7	246.9	277.9	310.3

TOTAL DISPOSAL AREA REQUIRED

Segment #5	221.5	248.9	277.7	246.9	277.9	310.3
GRAND TOTALS	6,493.8	7,579.4	8,899.9	7,739.8	9,698.5	11,531.6

* - O.W.D. indicates open water disposal
+ - Figures in parenthesis indicate areas required for land disposal alternative and are not included in segment or grand totals

QUANTITY OF NEW LEVEES REQUIRED FOR TOTAL PROJECT COMPLETION
CUBIC YARDS
SEGMENT #1 - SABINE-NECHES WATERWAY TO HOUSTON SHIP CHANNEL

Number	Area Number	Channel Width 250' Channel Depth 12'	14'	16'	Channel Width 300' Channel Depth 12'	14'	16'
1	1	--	--	--	--	--	--
2	2	--	--	--	--	--	--
3	3	--	--	--	--	--	--
4	4	--	--	--	--	--	--
5	5	--	51,222	55,233	44,515	59,076	73,966
6	6	--	--	--	--	--	--
7	7	--	--	--	--	--	--
8	8	--	--	--	--	--	--
9	9	--	--	--	--	--	--
10	10	--	--	--	--	39,424	54,393
11	11	--	--	--	--	--	--
12	12	--	--	--	--	--	--
13	13	--	--	--	--	--	--
14	14	--	--	--	--	--	--
15	15	--	--	--	--	--	--
16	16	--	--	--	--	--	--
17	17	--	--	--	--	--	--
18	18	--	--	--	--	--	--
19	19	--	--	--	--	--	--
20	20	--	--	--	--	--	--
21	21	--	--	--	--	--	--
22	22	--	--	--	--	--	--
23	23	--	--	47,974	38,711	53,616	68,846
24	24	--	--	--	--	--	--
25	25	--	--	--	--	--	45,427
26	26	--	--	--	--	--	--
27	27	--	--	--	--	--	--
28	28	67,241	92,016	117,266	93,891	122,562	151,884
29	29	58,976	65,126	65,217	65,593	72,760	80,095
30	30	108,611	120,910	133,535	121,846	136,185	150,846
31	31	93,254	105,383	117,988	106,299	120,634	135,296
32	32	44,993	57,292	69,914	58,228	72,564	87,225
33	33	42,610	54,910	67,535	55,849	70,184	84,845
34	34	152,418	183,167	214,731	185,508	221,347	258,001
35	35	484,656	530,778	574,894	534,290	588,050	643,030
36	36	374,842	436,342	499,467	441,024	512,702	586,011
37	37	--	--	--	--	--	--
38	38	--	--	--	--	--	--
39	39	--	--	--	--	--	--
40	40	--	--	--	--	--	--

41	41	--	--	--	--	--	--
42	43	167,716	241,512	317,265	247,134	333,147	421,114

TOTAL LEVEES REQUIRED

Segment #1		1,595,317	1,755,491	2,281,018	1,992,888	2,402,251	2,840,979

SEGMENT #2 - HOUSTON SHIP CHANNEL TO FREEPORT HARBOR CHANNEL

Number	Area Number	Channel Width 250' Channel Depth 12'	14'	16'	Channel Width 300' Channel Depth 12'	14'	16'
1	44	--	--	--	--	--	--
2	45	81,533	103,374	126,232	105,601	129,973	155,379
3	46	--	--	--	--	--	--
4	47	--	--	--	--	--	--
5	48	--	--	--	--	--	--
6	49	--	--	--	--	--	--
7	52	--	--	--	--	--	--
8	53	--	--	--	--	--	--
9	54	--	--	--	--	--	--
10	55	--	--	--	--	--	--
11	56	--	--	--	--	--	--
12	57	--	--	--	--	--	--
13	58	--	--	--	--	--	--
14	59	--	--	--	--	--	--
15	61	--	62,931	93,847	68,386	103,221	139,083
16	62	--	--	--	--	--	--
17	63	--	--	--	--	--	--
18	64	120,576	149,132	178,716	156,796	218,125	252,145
19	65	78,526	122,541	167,699	130,909	182,052	234,336
20	66	138,139	150,717	163,617	153,105	167,719	182,656
21	67	--	--	--	--	--	--
22	68	--	--	--	--	--	--
23	69	--	--	--	--	--	--
24	70	74,471	115,080	156,746	121,459	168,685	216,969
25	71	--	--	--	--	--	--
26	72	--	--	--	--	--	--
27	73	--	52,833	72,449	57,809	79,993	102,664
28	74	--	--	--	--	--	--
29	75	--	--	--	--	--	--
30	76	--	--	--	--	--	--
31	77	--	--	--	--	--	--
32	78	--	--	--	--	--	--

Number	Area Number	Channel Width 250' Channel Depth 12'	14'	16'	Channel Width 300' Channel Depth 12'	14'	16'
33	80	--	51,498	69,105	54,079	74,037	94,443
34	82	61,793	82,070	102,878	85,121	108,708	132,822
		TOTAL LEVEES REQUIRED					
Segment #2		555,038	890,176	1,131,285	933,265	1,232,513	1,510,497

SEGMENT #3 - FREEPORT HARBOR CHANNEL TO MATAGORDA SHIP CHANNEL

Number	Area Number	Channel Width 250' Channel Depth 12'	14'	16'	Channel Width 300' Channel Depth 12'	14'	16'
1	86	626,503	711,366	792,045	726,520	817,891	911,297
2	87	87,929	94,225	100,683	95,464	102,775	110,254
3	88	119,646	135,389	151,538	138,482	156,916	175,462
4	89	--	--	--	--	--	--
5	90	121,277	140,166	159,542	143,877	165,824	188,254
6	91	55,544	58,692	61,922	59,311	62,967	66,707
7	92	53,607	98,753	160,114	110,515	180,001	250,036
8	96	259,920	360,633	465,009	380,440	497,471	617,111
9	97	--	--	77,466	43,529	91,071	54,581
10	98	--	--	--	--	--	--
11	99	125,957	141,698	157,846	144,790	163,078	181,773
12	100	77,980	101,772	126,180	107,379	134,990	163,215
13	102A	--	--	--	--	--	--
14	102B	316,758	402,416	490,277	422,593	521,999	623,605
15	103	--	--	--	--	--	--
16	104	594,428	657,882	722,961	669,595	746,462	821,722
17	105	--	--	--	--	--	--
18	106	--	--	--	--	--	--
19	107	--	47,390	60,408	50,383	65,108	80,151
20	108	47,393	98,051	139,288	110,345	156,925	204,526
21	109	--	--	40,419	--	52,994	86,480
22	110	--	--	--	--	--	--
23	111	121,095	175,861	232,011	192,928	256,347	321,150
24	112	--	--	--	--	--	--
25	113	--	--	--	--	--	--
26	114	--	--	--	--	--	--
27	115	--	--	--	--	--	--
28	116	--	--	--	--	--	--
29	X1	--	--	--	--	--	--
30	116A	--	--	--	--	--	--
31	116B	--	--	--	--	--	--

TOTAL LEVEES REQUIRED

Segment #3		2,608,037	3,224,294	3,937,309	3,396,151	4,172,819	4,856,324

SEGMENT #4 - MATAGORDA SHIP CHANNEL TO CORPUS CHRISTI CHANNEL

Number	Area Number	Channel Width 250' Channel Depth 12'	14'	16'	Channel Width 300' Channel Depth 12'	14'	16'
1	X2	--	--	--	--	--	--
2	117	103,620	127,262	151,550	132,065	294,973	266,900
3	118	--	--	--	--	--	--
4	119	--	--	--	--	--	--
5	120	--	--	--	--	--	--
6	121	138,987	187,629	237,589	195,590	253,151	310,972
7	122	--	--	--	--	--	--
8	123	--	--	--	--	--	--
9	124	--	--	--	--	--	--
10	125	--	--	--	--	--	--
11	126	386,202	405,579	426,073	401,043	423,218	446,514
12	127	616,651	660,687	707,267	650,377	700,777	753,721
13	129	507,925	567,835	631,206	553,845	622,410	694,434
14	130	--	--	--	--	--	--
15	131	449,747	478,013	507,908	471,538	503,873	537,846
16	132	--	--	--	--	--	--
17	133	--	--	--	--	--	--
18	134	--	--	--	--	--	--
19	135	--	--	--	--	--	42,745
20	136	--	--	--	--	--	--
21	137	--	--	--	--	--	--
22	138	--	--	--	--	--	--
23	139	--	--	--	--	--	--
24	140	--	--	--	--	--	--
25	146	--	48,904	85,183	43,441	82,643	123,692
26	147	--	--	49,321	--	48,116	66,359
27	148	--	--	--	--	--	--
28	149	--	--	--	--	--	--
29	150	--	--	--	--	--	--
30	151	--	--	--	--	--	--
31	152	130,745	145,783	161,227	143,143	160,218	178,258
32	153	281,126	296,790	313,078	320,951	311,990	330,321
33	154	84,087	100,595	117,144	92,795	116,409	134,996
34	155	--	--	41,636	--	40,803	64,039
35	156	--	--	--	--	--	--
36	157	--	--	--	--	--	--

Number	Area Number	Channel Width 250' Channel Depth 12'	14'	16'	Channel Width 300' Channel Depth 12'	14'	16'
37	158	--	43,062	63,501	40,363	62,280	85,265
38	159	88,308	107,323	128,166	104,090	119,426	148,047
39	162	--	--	--	--	--	--
			TOTAL LEVEES REQUIRED				
Segment #4		2,787,398	3,169,462	3,621,023	3,149,241	3,740,287	4,184,109

SEGMENT #5 - CORPUS CHRISTI CHANNEL TO BROWNSVILLE SHIP CHANNEL

Number	Area Number	Channel Width 250' Channel Depth 12'	14'	16'	Channel Width 300' Channel Depth 12'	14'	16'
1-73	164-239	--	--	--	--	--	--
74	240	266,572	295,741	326,437	293,679	326,669	361,184
			TOTAL LEVEES REQUIRED				
Segment #5		266,572	295,741	326,437	293,679	326,669	361,184
GRAND TOTAL		7,812,362	9,335,164	11,297,072	9,765,224	11,874,539	13,753,093

APPENDIX B

FEDERAL FLOOD CONTROL ACT OF 1970
SECTION 221

"Sec. 221. (a) After the date of enactment of this Act, the construction of any water resources project by the Secretary of the Army, acting through the Chief of Engineers, or by a non-Federal interest where such interest will be reimbursed for such construction under the provisions of section 215 of the Flood Control Act of 1968 or under any other provision of law, shall not be commenced until each non-Federal interest has entered into a written agreement with the Secretary of the Army to furnish its required cooperation for the project.

(b) A non-Federal interest shall be a legally constituted public body with full authority and capability to perform the terms of its agreement and to pay damages, if necessary, in the event of failure to perform.

(c) Every agreement entered into pursuant to this section shall be enforcible in the appropriate district court of the United States.

(d) After commencement of construction of a project, the Chief of Engineers may undertake performance of those items of cooperation necessary to the functioning of the project for its purpose, if he has first notified the non-Federal interest of its failure to perform the terms of its agreement and has given such interest a reasonable time after such notification to so perform.

(e) The Secretary of the Army, acting through the Chief of Engineers, shall maintain a continuing inventory of agreements and the status of their performance, and shall report thereon annually

to the Congress.

(f) This section shall not apply to any project the construction of which was commenced before January 1, 1972."

APPENDIX C

COST ESTIMATE
FOR
250 FOOT x 12 FOOT CHANNEL

APPENDIX C

COST ESTIMATE FOR 250' x 12' CHANNEL

SEGMENT #1
SABINE-NECHES WATERWAY TO HOUSTON SHIP CHANNEL

New Construction

Item	Quantity	Unit Price	Cost	
ROW	687.3 Acres	$1,000.00	$ 687,300	
Dredging	21,165,840 C.Y.	$1.30	27,515,592	
Disposal Sites	14.5 Acres	$1,000.00	14,500	
Levees	45,934 C.Y.	$3.00	137,802	
			$28,355,194	
		Miscellaneous	7,372,350	
		Subtotal		$35,727,544
		Federal Share	$34,669,646	
		State Share	$ 1,057,898	

50-Year Maintenance

Item	Quantity	Unit Price	Cost	
Dredging	42,932,550 C.Y.	$0.54	$23,183,577	
Disposal Sites	1,502.9 Acres	$1,000.00	1,502,900	
Levees	1,549,383 C.Y.	$3.00	4,648,149	
			$29,334,626	
		Miscellaneous	7,627,003	
		Subtotal		$36,961,629
		Federal Share	$29,211,307	
		State Share	$ 7,750,322	
			Project Total	$72,689,173
		Total Federal Share	$63,880,953	
		Total State Share	$ 8,808,220	

SEGMENT #2
HOUSTON SHIP CHANNEL TO FREEPORT HARBOR CHANNEL

New Construction

Item	Quantity		Unit Price	Cost	
ROW	342.1	Acres	$1,000.00	$ 342,100	
Dredging	15,164,800	C.Y.	$1.15	17,439,520	
Disposal Sites	47.9	Acres	$1,000.00	47,900	
Levees	79,520	C.Y.	$3.00	238,560	
				$18,068,080	
			Miscellaneous	4,697,700	
			Subtotal		$22,765,780
			Federal Share	$21,973,795	
			State Share	$ 791,985	

50-Year Maintenance

Item	Quantity		Unit Price	Cost	
Dredging	37,769,300	C.Y.	$0.48	$18,129,264	
Disposal Sites	301.3	Acres	$1,000.00	301,300	
Levees	475,518	C.Y.	$3.00	1,426,554	
				$19,857,118	
			Miscellaneous	5,162,850	
			Subtotal		$25,019,968
			Federal Share	$22,842,873	
			State Share	$ 2,177,095	
				Project Total	$47,785,748
			Total Federal Share	$44,816,668	
			Total State Share	$ 2,969,080	

SEGMENT #3
FREEPORT HARBOR CHANNEL TO MATAGORDA SHIP CHANNEL

New Construction

Item	Quantity		Unit Price	Cost	
ROW	690.2	Acres	$1,000.00	690,200	
Dredging	23,245,420	C.Y.	$1.15	$26,847,000	
Disposal Sites	295.9	Acres	$1,000.00	295,900	
Levees	376,257	C.Y.	$3.00	1,128,771	
				$28,962,104	
			Miscellaneous	7,530,147	
			Subtotal		$36,492,251
			Federal Share	$33,827,514	
			State Share	$ 2,664,737	

50-Year Maintenance

Item	Quantity		Unit Price	Cost	
Dredging	95,172,550	C.Y.	$0.48	$45,682,824	
Disposal Sites	1,781.3	Acres	$1,000.00	1,781,300	
Levees	2,231,780	C.Y.	$3.00	6,695,340	
				$54,159,464	
			Miscellaneous	14,081,460	
			Subtotal		$68,240,924
			Federal Share	$57,560,358	
			State Share	$10,680,577	
				Project Total	$104,733,175
			Total Federal Share	$91,387,872	
			Total State Share	$13,345,303	

SEGMENT #4
MATAGORDA SHIP CHANNEL TO CORPUS CHRISTI CHANNEL

New Construction

Item	Quantity		Unit Price	Cost	
ROW	326.9	Acres	$1,000.00	$ 326,900	
Dredging	19,449,980	C.Y.	$1.15	22,367,477	
Disposal Sites	211.3	Acres	$1,000.00	211,300	
Levees	217,268	C.Y.	$3.00	651,804	
				$23,557,481	
			Miscellaneous	6,124,945	
			Subtotal		$29,682,426
			Federal Share	$28,183,021	
			State Share	$ 1,499,405	

50-Year Maintenance

Item	Quantity		Unit Price	Cost	
Dredging	87,966,900	C.Y.	$0.48	$42,224,112	
Disposal Sites	2,117.2	Acres	$1,000.00	2,117,200	
Levees	2,570,130	C.Y.	$3.00	7,710,390	
				$52,051,702	
			Miscellaneous	13,533,442	
			Subtotal		$65,585,144
			Federal Share	$53,202,381	
			State Share	$12,382,763	
				Project Total	$95,267,570
			Total Federal Share	$81,385,402	
			Total State Share	$13,882,168	

SEGMENT #5
CORPUS CHRISTI CHANNEL TO BROWNSVILLE SHIP CHANNEL

New Construction

Item	Quantity		Unit Price	Cost	
ROW	-		-	-	
Dredging	37,766,670	C.Y.	$1.00	$37,766,670	
Disposal Sites	52.5	Acres	$1,000.00	52,500	
Levees	86,400	C.Y.	$3.00	259,200	
				$38,078,370	
			Miscellaneous	9,900,376	
			Subtotal		$47,978,746
			Federal Share	$47,586,004	
			State Share	$ $392,742	

50-Year Maintenance

Item	Quantity		Unit Price	Cost	
Dredging	137,914,550	C.Y.	$0.42	$57,924,111	
Disposal Sites	169.0	Acres	$1,000.00	169,000	
Levees	180,172	C.Y.	$3.00	540,516	
				$58,633,627	
			Miscellaneous	15,244,743	
			Subtotal		$73,878,370
			Federal Share	$72,984,380	
			State Share	$ 893,990	
				Project Total	$121,857,116
			Total Federal Share	$120,570,384	
			Total State Share	$ $1,286,732	

COST SUMMARY

TOTAL GIWW - 250' x 12' CHANNEL

New Construction

Segment	Federal Share	State Share	Total
1	$ 34,669,646	$1,057,898	$ 35,727,544
2	21,973,795	791,985	22,765,780
3	33,827,514	2,664,737	36,492,251
4	28,183,021	1,499,405	29,682,426
5	47,586,004	392,742	47,978,746
	$166,239,980	$6,406,767	$172,646,747

50-Year Maintenance

Segment	Federal Share	State Share	Total
1	$ 29,211,307	$ 7,750,322	$ 36,961,629
2	22,842,873	2,177,095	25,019,968
3	57,560,358	10,680,566	68,240,924
4	53,202,381	12,382,763	65,585,144
5	72,984,380	893,990	73,878,370
	$235,801,299	$33,884,736	$269,686,035

Total Project

Segment	Federal Share	State Share	Total
1	$ 63,880,953	$ 8,808,220	$ 72,689,173
2	44,816,668	2,969,080	47,785,748
3	91,387,872	13,345,303	104,733,175
4	81,385,402	13,882,168	95,267,570
5	120,570,384	1,286,732	121,857,116
	$402,041,279	$40,291,503	$442,332,782

APPENDIX D

COST ESTIMATE
FOR
250 FOOT x 14 FOOT CHANNEL

APPENDIX D
COST ESTIMATE FOR 250' x 14' CHANNEL

SEGMENT #1
SABINE-NECHES WATERWAY TO HOUSTON SHIP CHANNEL

New Construction

Item	Quantity	Unit Price	Cost	
ROW	687.3 Acres	$1,000.00	$ 687,300	
Dredging	28,576,430 C.Y.	$1.30	37,149,359	
Disposal Sites	54.8 Acres	$1,000.00	54,800	
Levees	119,373 C.Y.	$3.00	358,119	
			$38,249,578	
		Miscellaneous	9,944,890	
		Subtotal		$48,194,468
		Federal Share	$46,808,192	
		State Share	$ 1,386,276	

50-Year Maintenance

Item	Quantity	Unit Price	Cost	
Dredging	42,932,550 C.Y.	$0.54	$23,183,577	
Disposal Sites	1,449.7 Acres	$1,000.00	1,449,700	
Levees	1,636,118 C.Y.	$3.00	4,908,354	
			$29,541,631	
		Miscellaneous	7,680,824	
		Subtotal		$37,222,455
		Federal Share	$29,211,307	
		State Share	$ 8,011,148	
			Project Total	$85,416,923
		Total Federal Share	$76,019,499	
		Total State Share	$ 9,397,424	

SEGMENT #2
HOUSTON SHIP CHANNEL TO FREEPORT HARBOR CHANNEL

New Construction

Item	Quantity		Unit Price	Cost	
ROW	342.1	Acres	$1,000.00	$ 342,100	
Dredging	20,770,133	C.Y.	$1.15	23,885,653	
Disposal Sites	112.5	Acres	$1,000.00	112,500	
Levees	180,805	C.Y.	$3.00	542,415	
				$24,882,668	
			Miscellaneous	6,469,494	
			Subtotal		$31,352,162
			Federal Share	$30,095,923	
			State Share	$ 1,256,239	

50-Year Maintenance

Item	Quantity		Unit Price	Cost	
Dredging	37,769,300	C.Y.	$0.48	$18,129,264	
Disposal Sites	459.4	Acres	$1,000.00	459,400	
Levees	709,371	C.Y.	$3.00	2,128,113	
				$20,716,777	
			Miscellaneous	5,386,362	
			Subtotal		$26,103,139
			Federal Share	$22,842,873	
			State Share	$ 3,260,266	
				Project Total	$57,455,301
			Total Federal Share	$52,938,796	
			Total State Share	$ 4,516,505	

SEGMENT #3
FREEPORT HARBOR CHANNEL TO MATAGORDA SHIP CHANNEL

New Construction

Item	Quantity		Unit Price	Cost	
ROW	690.2	Acres	$1,000.00	$ 690,200	
Dredging	32,336,787	C.Y.	$1.15	37,187,305	
Disposal Sites	467.5	Acres	$1,000.00	467,500	
Levees	543,624	C.Y.	$3.00	1,630,872	
				$39,975,877	
			Miscellaneous	10,393,728	
			Subtotal		$50,369,605
			Federal Share	$46,856,004	
			State Share	$ 3,513,601	

50-Year Maintenance

Item	Quantity		Unit Price	Cost	
Dredging	95,172,500	C.Y.	$0.48	$45,682,824	
Disposal Sites	2,157.3	Acres	$1,000.00	2,157,300	
Levees	2,680,670	C.Y.	$3.00	8,042,010	
				$55,882,134	
			Miscellaneous	14,529,355	
			Subtotal		$70,411,489
			Federal Share	$57,560,358	
			State Share	$12,851,131	
				Project Total	$120,781,094
			Total Federal Share	$104,416,362	
			Total State Share	$16,364,732	

SEGMENT #4
MATAGORDA SHIP CHANNEL TO CORPUS CHRISTI CHANNEL

New Construction

Item	Quantity	Unit Price	Cost	
ROW	326.9 Acres	$1,000.00	$ 326,900	
Dredging	28,528,780 C.Y.	$1.15	32,808,097	
Disposal Sites	494.1 Acres	$1,000.00	494,100	
Levees	648,241 C.Y.	$3.00	1,944,723	
			$35,573,820	
		Miscellaneous	9,249,193	
		Subtotal		$44,823,013
		Federal Share	$41,338,202	
		State Share	$ 3,484,811	

50-Year Maintenance

Item	Quantity	Unit Price	Cost	
Dredging	87,966,900 C.Y.	$0.48	$42,224,112	
Disposal Sites	2,135.2 Acres	$1,000.00	2,135,200	
Levees	2,521,221	$3.00	7,563,663	
			$51,922,975	
		Miscellaneous	13,499,973	
		Subtotal		$65,422,948
		Federal Share	$53,202,381	
		State Share	$12,220,567	
			Project Total	$110,245,961
		Total Federal Share	$94,540,583	
		Total State Share	$15,705,378	

SEGMENT #5
CORPUS CHRISTI CHANNEL TO BROWNSVILLE SHIP CHANNEL

New Construction

Item	Quantity		Unit Price	Cost	
ROW	--		--	--	
Dredging	56,979,433	C.Y.	$1.00	$56,979,433	
Disposal Sites	101.0	Acres	$1,000.00	101,000	
Levees	138,130	C.Y.	$3.00	414,390	
				$57,494,823	
			Miscellaneous	14,948,654	
			Subtotal		$72,443,477
			Federal Share	$71,794,086	
			State Share	$ 694,391	

50-Year Maintenance

Item	Quantity		Unit Price	Cost	
Dredging	137,914,550	C.Y.	$0.42	$57,924,111	
Disposal Sites	147.9	Acres	$1,000.00	147,900	
Levees	157,611	C.Y.	$3.00	472,833	
				$58,544,844	
			Miscellaneous	15,221,659	
			Subtotal		$73,766,503
			Federal Share	$72,984,380	
			State Share	$ 782,123	
				Project Total	$146,209,980
			Total Federal Share	$144,778,466	
			Total State Share	$ 1,431,514	

COST SUMMARY

TOTAL GIWW - 250' x 14' CHANNEL

New Construction

Segment	Federal Share	State Share	Total
1	$ 46,808,192	$ 1,386,276	$ 48,194,468
2	30,095,923	1,256,239	31,352,162
3	46,856,004	3,513,601	50,369,605
4	41,338,202	3,484,811	44,823,013
5	71,794,086	649,391	72,443,477
	$236,892,407	$10,290,318	$247,182,725

50-Year Maintenance

Segment	Federal Share	State Share	Total
1	$ 29,211,307	$ 8,011,148	$ 37,222,455
2	22,842,873	3,260,266	26,103,139
3	57,560,358	12,851,131	70,411,489
4	53,202,381	12,220,567	65,422,948
5	72,984,380	782,123	73,766,503
	$235,801,299	$37,125,235	$272,926,534

Total Project

Segment	Federal Share	State Share	Total
1	$ 76,019,499	$ 9,397,424	$ 85,416,923
2	52,938,796	4,516,505	57,455,301
3	104,416,362	16,364,732	120,781,094
4	94,540,583	15,705,378	110,245,961
5	144,778,466	1,431,514	146,209,980
	$472,693,706	$47,415,553	$520,109,259

APPENDIX E

COST ESTIMATE
FOR
250 FOOT x 16 FOOT CHANNEL

APPENDIX E

COST ESTIMATE FOR 250' x 16' CHANNEL

SEGMENT #1
SABINE-NECHES WATERWAY TO HOUSTON SHIP CHANNEL

New Construction

Item	Quantity	Unit Price	Cost	
ROW	687.3 Acres	$1,000.00	$ 687,300	
Dredging	36,133,270 C.Y.	$1.30	46,973,251	
Disposal Sites	182.7 Acres	$1,000.00	182,700	
Levees	359,112 C.Y.	$3.00	1,077,336	
			$48,920,587	
		Miscellaneous	12,719,353	
		Subtotal		$61,639,940
		Federal Share	$59,186,296	
		State Share	$ 2,453,644	

50-Year Maintenance

Item	Quantity	Unit Price	Cost	
Dredging	42,932,550 C.Y.	$0.54	$23,183,577	
Disposal Sites	1,623 Acres	$1,000.00	1,623,000	
Levees	1,921,906 C.Y.	$3.00	5,765,718	
			$30,572,295	
		Miscellaneous	7,948,797	
		Subtotal		$38,521,092
		Federal Share	$29,211,307	
		State Share	$ 9,309,785	
			Project Total	$100,161,032
		Total Federal Share	$88,397,603	
		Total State Share	$11,763,429	

SEGMENT #2
HOUSTON SHIP CHANNEL TO FREEPORT HARBOR CHANNEL

New Construction

Item	Quantity	Unit Price	Cost	
ROW	342.1 Acres	$1,000.00	$ 342,100	
Dredging	26,571,820 C.Y.	$1.15	30,557,593	
Disposal Sites	176.4 Acres	$1,000.00	176,400	
Levees	315,617 C.Y.	$3.00	946,851	
			$32,022,944	
		Miscellaneous	8,325,965	
		Subtotal		$40,348,909
		Federal Share	$38,502,567	
		State Share	$ 1,846,342	

50-Year Maintenance

Item	Quantity	Unit Price	Cost	
Dredging	37,769,300 C.Y.	$0.48	$18,129,264	
Disposal Sites	627.6 Acres	$1,000.00	627,600	
Levees	815,668 C.Y.	$3.00	2,447,004	
			$21,203,868	
		Miscellaneous	5,513,006	
		Subtotal		$26,716,874
		Federal Share	$22,842,873	
		State Share	$ 3,874,001	
			Project Total	$67,065,783
		Total Federal Share	$61,345,440	
		Total State Share	$ 5,720,343	

SEGMENT #3
FREEPORT HARBOR CHANNEL TO MATAGORDA SHIP CHANNEL

New Construction

Item	Quantity		Unit Price	Cost	
ROW	690.2	Acres	$1,000.00	$ 679,200	
Dredging	41,600,320	C.Y.	$1.15	47,840,368	
Disposal Sites	990.8	Acres	$1,000.00	990,800	
Levees	1,082,199	C.Y.	$3.00	3,246,597	
				$52,767,965	
			Miscellaneous	13,719,671	
			Subtotal		$66,487,636
			Federal Share	$60,278,864	
			State Share	$ 6,208,772	

50-Year Maintenance

Item	Quantity		Unit Price	Cost	
Dredging	95,172,550	C.Y.	$0.48	$45,682,824	
Disposal Sites	2,026.3	Acres	$1,000.00	2,026,300	
Levees	2,855,110	C.Y.	$3.00	8,565,330	
				$56,274,454	
			Miscellaneous	14,631,358	
			Subtotal		$70,905,812
			Federal Share	$57,560,358	
			State Share	$13,345,454	
				Project Total	$137,393,448
			Total Federal Share	$117,839,222	
			Total State Share	$ 19,554,226	

SEGMENT #4
MATAGORDA SHIP CHANNEL TO CORPUS CHRISTI CHANNEL

New Construction

Item	Quantity		Unit Price	Cost	
ROW	326.9	Acres	$1,000.00	$ 326,900	
Dredging	38,013,900	C.Y.	$1.15	43,715,985	
Disposal Sites	838.6	Acres	$1,000.00	838,600	
Levees	948,158	C.Y.	$3.00	2,844,474	
				$47,725,959	
			Miscellaneous	12,408,749	
			Subtotal		$60,134,708
			Federal Share	$55,082,141	
			State Share	$ 5,052,567	

50-Year Maintenance

Item	Quantity		Unit Price	Cost	
Dredging	87,966,900	C.Y.	$0.48	$42,224,112	
Disposal Sites	2,156.8	Acres	$1,000.00	2,156,800	
Levees	2,672,865	C.Y.	$3.00	8,018,595	
				$52,399,507	
			Miscellaneous	13,623,872	
			Subtotal		$66,023,379
			Federal Share	$53,202,381	
			State Share	$12,820,998	
				Project Total	$126,158,087
			Total Federal Share	$108,284,522	
			Total State Share	$ 17,873,565	

SEGMENT #5
CORPUS CHRISTI CHANNEL TO BROWNSVILLE SHIP CHANNEL

New Construction

Item	Quantity		Unit Price	Cost	
ROW	-		-	-	
Dredging	77,376,302	C.Y.	$1.00	$77,376,302	
Disposal Sites	152.1	Acres	$1,000.00	152,100	
Levees	192,567	C.Y.	$3.00	577,701	
				$78,106,103	
			Miscellaneous	20,307,587	
			Subtotal		$98,413,690
			Federal Share	$94,494,141	
			State Share	$ $919,549	

50-Year Maintenance

Item	Quantity		Unit Price	Cost	
Dredging	137,914,550	C.Y.	$0.42	$57,924,111	
Disposal Sites	125.6	Acres	$1,000.00	125,600	
Levees	133,870	C.Y.	$3.00	401,610	
				$58,451,321	
			Miscellaneous	15,197,343	
			Subtotal		$73,648,664
			Federal Share	$72,984,380	
			State Share	$ 664,284	
				Project Total	$172,062,354
			Total Federal Share	$107,478,521	
			Total State Share	$ 1,583,833	

COST SUMMARY

TOTAL GIWW - 250' x 16' CHANNEL

New Construction

Segment	Federal Share	State Share	Total
1	$59,186,296	$2,453,644	$61,639,940
2	38,502,567	1,846,342	40,348,909
3	60,278,864	6,208,772	66,487,636
4	55,082,141	5,052,567	60,134,708
5	97,494,141	919,549	98,413,690
Totals	$310,544,009	$16,480,874	$327,024,883

50-Year Maintenance

Segment	Federal Share	State Share	Total
1	$29,211,307	$9,309,785	$38,521,092
2	22,842,873	3,874,001	26,716,874
3	57,560,358	13,345,454	70,905,812
4	53,202,381	12,820,998	66,023,379
5	72,984,380	664,284	73,648,664
Totals	$235,801,299	$40,014,522	$275,815,821

Total Project

Segment	Federal Share	State Share	Total
1	$88,397,603	$11,763,429	$100,161,032
2	61,345,440	5,720,343	67,065,783
3	117,839,222	19,554,226	137,393,448
4	108,284,522	17,873,565	126,158,087
5	170,478,521	1,583,833	172,062,354
Totals	$546,345,308	$56,495,396	$602,840,704

APPENDIX F

COST ESTIMATE
FOR
300 FOOT x 12 FOOT CHANNEL

APPENDIX F

COST ESTIMATE FOR 300' x 12' CHANNEL

SEGMENT #1
SABINE-NECHES WATERWAY TO HOUSTON SHIP CHANNEL

New Construction

Item	Quantity		Unit Price	Cost	
ROW	1,031.0	Acres	$1,000.00	$ 1,031,000	
Dredging	29,613,690	C.Y.	$1.30	38,497,797	
Disposal Sites	64.1	Acres	$1,000.00	64,100	
Levees	160,012	C.Y.	$3.00	480,036	
				$40,072,933	
			Miscellaneous	10,418,963	
			Subtotal		$50,491,895
			Federal Share	$48,507,224	
			State Share	$ 1,984,671	

50-Year Maintenance

Item	Quantity		Unit Price	Cost	
Dredging	42,932,550	C.Y.	$0.54	$23,183,577	
Disposal Sites	1,462.6	Acres	$1,000.00	1,462,600	
Levees	1,832,876	C.Y.	$3.00	5,498,628	
				$30,244,805	
			Miscellaneous	7,863,649	
			Subtotal		$38,108,454
			Federal Share	$29,211,307	
			State Share	$ 8,897,147	
				Project Total	$88,600,349
			Total Federal Share	$77,718,531	
			Total State Share	$10,881,818	

SEGMENT #2
HOUSTON SHIP CHANNEL TO FREEPORT HARBOR CHANNEL

New Construction

Item	Quantity	Unit Price	Cost	
ROW	513.1 Acres	$1,000.00	$ 513,100	
Dredging	21,230,980 C.Y.	$1.15	24,415,627	
Disposal Sites	121.9 Acres	$1,000.00	121,900	
Levees	190,795 C.Y.	$3.00	572,385	
			$25,623,012	
		Miscellaneous	6,661,983	
		Subtotal		$32,284,995
		Federal Share	$30,763,690	
		State Share	$ 1,521,305	

50-Year Maintenance

Item	Quantity	Unit Price	Cost	
Dredging	37,769,300 C.Y.	$0.48	$18,129,264	
Disposal Sites	496.4 Acres	$1,000.00	496,400	
Levees	742,470 C.Y.	$3.00	2,227,410	
			$20,853,074	
		Miscellaneous	5,421,799	
		Subtotal		$26,274,873
		Federal Share	$22,842,873	
		State Share	$ 3,432,000	
			Project Total	$58,559,868
		Total Federal Share	$53,606,563	
		Total State Share	$ 4,953,305	

SEGMENT #3
FREEPORT HARBOR CHANNEL TO MATAGORDA SHIP CHANNEL

New Construction

Item	Quantity	Unit Price	Cost	
ROW	1,035.3 Acres	$1,000.00	$ 1,035,300	
Dredging	32,683,600 C.Y.	$1.15	37,586,140	
Disposal Sites	539.8 Acres	$1,000.00	539,800	
Levees	696,978 C.Y.	$3.00	2,090,934	
			$41,252,174	
		Miscellaneous	10,725,565	
		Subtotal		$51,977,739
		Federal Share	$47,358,536	
		State Share	$ 4,619,203	

50-Year Maintenance

Item	Quantity	Unit Price	Cost	
Dredging	95,172,550 C.Y.	$0.48	$45,682,824	
Disposal Sites	2,216.2 Acres	$1,000.00	2,216,200	
Levees	2,699,173 C.Y.	$3.00	8,097,519	
			$55,996,543	
		Miscellaneous	14,559,101	
		Subtotal		$70,555,644
		Federal Share	$57,560,358	
		State Share	$12,995,286	
			Project Total	$122,533,383
		Total Federal Share	$104,918,894	
		Total State Share	$ 17,614,489	

SEGMENT #4
MATAGORDA SHIP CHANNEL TO CORPUS CHRISTI CHANNEL

New Construction

Item	Quantity		Unit Price	Cost	
ROW	491.4	Acres	$1,000.00	$ 491,400	
Dredging	27,257,700	C.Y.	$1.15	31,346,355	
Disposal Sites	432.3	Acres	$1,000.00	432,300	
Levees	582,631	C.Y.	$3.00	1,747,893	
				$34,017,948	
			Miscellaneous	8,844,666	
			Subtotal		$42,862,614
			Federal Share	$59,496,407	
			State Share	$ 3,366,207	

50-Year Maintenance

Item	Quantity		Unit Price	Cost	
Dredging	87,966,900	C.Y.	$0.48	$42,224,112	
Disposal Sites	2,159.6	Acres	$1,000.00	2,159,600	
Levees	2,566,610	C.Y.	$3.00	7,699,830	
				$52,083,542	
			Miscellaneous	13,541,721	
			Subtotal		$65,625,263
			Federal Share	$53,202,381	
			State Share	$12,422,882	
				Project Total	$108,487,877
			Total Federal Share	$92,698,788	
			Total State Share	$15,789,089	

SEGMENT #5
CORPUS CHRISTI CHANNEL TO BROWNSVILLE SHIP CHANNEL

New Construction

Item	Quantity		Unit Price	Cost	
ROW	-		-	-	
Dredging	52,869,972	C.Y.	$1.00	$52,869,972	
Disposal Sites	97.6	Acres	$1,000.00	97,600	
Levees	134,474	C.Y.	$3.00	403,422	
				$53,370,994	
			Miscellaneous	13,876,458	
			Subtotal		$67,247,452
			Federal Share	$66,616,165	
			State Share	$ 631,287	

50-Year Maintenance

Item	Quantity		Unit Price	Cost	
Dredging	137,914,550	C.Y.	$0.42	$57,924,111	
Disposal Sites	149.3	Acres	$1,000.00	149,300	
Levees	159,205	C.Y.	$3.00	477,615	
				$58,551,026	
			Miscellaneous	15,223,267	
			Subtotal		$ 73,774,293
			Federal Share	$72,984,380	
			State Share	$ 789,913	
				Project Total	$141,021,745
		Total	Federal Share	$139,600,545	
		Total	State Share	$ 1,421,200	

COST SUMMARY

TOTAL GIWW - 300' x 12' CHANNEL

New Construction

Segment	Federal Share	State Share	Total
1	$ 48,507,224	$1,984,671	$ 50,491,895
2	30,763,690	1,521,305	32,284,995
3	47,358,536	4,619,203	51,977,739
4	39,496,407	3,366,207	42,862,614
5	66,616,165	631,287	67,247,452
Totals	$232,742,022	$12,122,673	$244,864,695

50-Year Maintenance

Segment	Federal Share	State Share	Total
1	$ 29,211,307	$ 8,897,147	$ 38,108,454
2	22,842,873	3,432,000	26,274,873
3	57,560,358	12,995,286	70,555,644
4	53,202,381	12,422,882	65,625,263
5	72,984,380	789,913	73,774,293
Totals	$235,801,299	$38,537,228	$274,338,527

Total Project

Segment	Federal Share	State Share	Total
1	$ 77,718,531	$10,881,818	$ 88,600,349
2	53,606,563	4,953,305	58,559,868
3	104,918,894	17,614,489	122,533,383
4	92,698,788	15,789,089	108,487,877
5	139,600,545	1,421,200	141,021,745
Totals	$468,543,321	$50,659,901	$519,203,322

APPENDIX G

COST ESTIMATE
FOR
300 FOOT x 14 FOOT CHANNEL

APPENDIX G
COST ESTIMATE FOR 300' x 14' CHANNEL

SEGMENT #1
SABINE-NECHES WATERWAY TO HOUSTON SHIP CHANNEL

New Construction

Item	Quantity		Unit Price	Cost	
ROW	1,031.0	Acres	$1,000.00	$ 1,031,000	
Dredging	38,181,670	C.Y.	$1.30	49,636,171	
Disposal Sites	210.4	Acres	$1,000.00	210,400	
Levees	395,265	C.Y.	$3.00	1,185,795	
				$52,063,366	
			Miscellaneous	13,536,475	
			Subtotal		$65,599,841
			Federal Share	$62,541,575	
			State Share	$ 3,058,266	

50-Year Maintenance

Item	Quantity		Unit Price	Cost	
Dredging	42,932,550	C.Y.	$0.54	$23,183,577	
Disposal Sites	1,747.3	Acres	$1,000.00	1,747,300	
Levees	2,006,986	C.Y.	$3.00	6,020,958	
				$30,951,835	
			Miscellaneous	8,047,477	
			Subtotal		$38,999,312
			Federal Share	$29,211,307	
			State Share	$ 9,788,005	
				Project Total	$104,599,153
			Total Federal Share	$91,752,882	
			Total State Share	$12,846,271	

SEGMENT #2
HOUSTON SHIP CHANNEL TO FREEPORT HARBOR CHANNEL

New Construction

Item	Quantity		Unit Price	Cost	
ROW	513.1	Acres	$1,000.00	$ 513,100	
Dredging	27,706,420	C.Y.	$1.15	31,862,383	
Disposal Sites	194.3	Acres	$1,000.00	194,300	
Levees	393,150	C.Y.	$3.00	1,179,450	
				$33,749,233	
			Miscellaneous	8,774,801	
			Subtotal		$42,524,034
			Federal Share	$40,146,603	
			State Share	$ 2,377,431	

50-Year Maintenance

Item	Quantity		Unit Price	Cost	
Dredging	37,769,300	C.Y.	$0.48	$18,129,264	
Disposal Sites	698.7	Acres	$1,000.00	698,700	
Levees	839,363	C.Y.	$3.00	2,518,089	
				$21,346,053	
			Miscellaneous	5,549,974	
			Subtotal		$26,896,027
			Federal Share	$22,842,873	
			State Share	$ 4,053,154	
				Project Total	$69,420,061
			Total Federal Share	$62,989,476	
			Total State Share	$ 6,430,585	

SEGMENT #3
FREEPORT HARBOR CHANNEL TO MATAGORDA SHIP CHANNEL

New Construction

Item	Quantity		Unit Price	Cost	
ROW	1,035.3	Acres	$1,000.00	$ 1,035,300	
Dredging	43,153,800	C.Y.	$1.15	49,626,870	
Disposal Sites	1,244.7	Acres	$1,000.00	1,244,700	
Levees	1,413,370	C.Y.	$3.00	4,240,110	
				$56,146,980	
			Miscellaneous	14,598,215	
			Subtotal		$70,745,195
			Federal Share	$62,529,856	
			State Share	$ 8,215,339	

50-Year Maintenance

Item	Quantity		Unit Price	Cost	
Dredging	95,172,550	C.Y.	$0.48	$45,682,824	
Disposal Sites	2,211.9	Acres	$1,000.00	2,211,900	
Levees	2,759,449	C.Y.	$3.00	8,278,347	
				$56,173,071	
			Miscellaneous	14,604,998	
			Subtotal		$70,778,069
			Federal Share	$57,560,358	
			State Share	$13,217,711	
				Project Total	$141,523,264
			Total Federal Share	$120,090,214	
			Total State Share	$ 21,433,050	

SEGMENT #4
MATAGORDA SHIP CHANNEL TO CORPUS CHRISTI CHANNEL

New Construction

Item	Quantity	Unit Price	Cost	
ROW	491.4 Acres	$1,000.00	$ 491,400	
Dredging	37,661,980 C.Y.	$1.15	43,311,277	
Disposal Sites	795.9 Acres	$1,000.00	795,900	
Levees	1,000,328 C.Y.	$3.00	3,000,984	
			$47,599,561	
		Miscellaneous	12,375,886	
		Subtotal		$59,975,447
		Federal Share	$54,472,209	
		State Share	$ 5,403,238	

50-Year Maintenance

Item	Quantity	Unit Price	Cost	
Dredging	87,966,900 C.Y.	$0.48	$42,224,112	
Disposal Sites	2,317.4 Acres	$1,000.00	2,317,400	
Levees	2,739,959 C.Y.	$3.00	8,219,877	
			$52,767,389	
		Miscellaneous	13,717,961	
		Subtotal		$66,479,350
		Federal Share	$53,202,381	
		State Share	$13,276,969	
			Project Total	$126,454,797
		Total Federal Share	$107,774,590	
		Total State Share	$18,680,207	

SEGMENT #5
CORPUS CHRISTI CHANNEL TO BROWNSVILLE SHIP CHANNEL

New Construction

Item	Quantity		Unit Price	Cost	
ROW	-		-	-	
Dredging	74,565,367	C.Y.	$1.00	$74,565,367	
Disposal Sites	152.5	Acres	$1,000.00	152,500	
Levees	192,972	C.Y.	$3.00	578,916	
				$75,296,783	
			Miscellaneous	19,577,164	
			Subtotal		$94,873,947
			Federal Share	$93,952,363	
			State Share	$ 921,584	

50-Year Maintenance

Item	Quantity		Unit Price	Cost	
Dredging	137,914,550	C.Y.	$0.42	$57,924,111	
Disposal Sites	125.4	Acres	$1,000.00	125,400	
Levees	133,697	C.Y.	$3.00	401,091	
				$58,450,602	
			Miscellaneous	15,197,157	
			Subtotal		$73,647,759
			Federal Share	$72,984,380	
			State Share	$ 663,379	
				Project Total	$168,521,706
			Total Federal Share	$166,936,743	
			Total State Share	$1,584,963	

COST SUMMARY

TOTAL GIWW - 300' x 14' CHANNEL

New Construction

Segment	Federal Share	State Share	Total
1	$62,541,575	$3,058,266	$65,599,841
2	40,146,603	2,377,431	42,524,034
3	62,529,856	8,215,339	70,745,195
4	54,572,209	5,403,238	59,975,447
5	93,952,363	921,584	94,873,947
Totals	$313,742,606	$19,975,858	$333,718,464

50-Year Maintenance

Segment	Federal Share	State Share	Total
1	$29,211,307	$9,788,005	$38,999,312
2	22,842,873	4,053,154	26,896,027
3	57,560,358	13,217,711	70,788,069
4	53,202,381	13,276,969	66,479,350
5	72,984,380	663,379	73,647,759
Totals	$235,801,299	$40,999,218	$276,800,517

Total Project

Segment	Federal Share	State Share	Total
1	$91,752,882	$12,846,271	$104,599,153
2	62,989,476	6,430,585	69,420,061
3	120,090,214	21,433,050	141,523,264
4	107,774,590	18,680,207	126,454,797
5	166,936,743	1,584,963	168,521,706
Totals	$549,543,905	$60,975,076	$610,518,981

APPENDIX H

COST ESTIMATE
FOR
300 FOOT x 16 FOOT CHANNEL

APPENDIX H
COST ESTIMATE FOR 300' x 16' CHANNEL

SEGMENT #1
SABINE-NECHES WATERWAY TO HOUSTON SHIP CHANNEL

New Construction

Item	Quantity		Unit Price	Cost	
ROW	1,031.0	Acres	$1,000.00	$ 1,031,000	
Dredging	46,942,200	C.Y.	$1.30	61,024,860	
Disposal Sites	363.2	Acres	$1,000.00	363,200	
Levees	584,178	C.Y.	$3.00	1,752,534	
				$64,171,594	
			Miscellaneous	16,684,614	
			Subtotal		$80,856,208
			Federal Share	$76,891,323	
			State Share	$ 3,964,885	

50-Year Maintenance

Item	Quantity		Unit Price	Cost	
Dredging	42,932,550	C.Y.	$0.54	$23,183,577	
Disposal Sites	2,001 9	Acres	$1,000.00	2,001,900	
Levees	2,256,801	C.Y.	$3.00	6,770,403	
				$31,955,880	
			Miscellaneous	8,308,529	
			Subtotal		$40,264,409
			Federal Share	$29,211,307	
			State Share	$11,053,102	
				Project Total	$121,120,617
			Total Federal Share	$106,102,630	
			Total State Share	$ 15,017,987	

SEGMENT #2
HOUSTON SHIP CHANNEL TO FREEPORT HARBOR CHANNEL

New Construction

Item	Quantity		Unit Price	Cost	
ROW	513.1	Acres	$1,000.00	$ 513,100	
Dredging	34,381,800	C.Y.	$1.15	39,539,070	
Disposal Sites	268.5	Acres	$1,000.00	268,500	
Levees	674,090	C.Y.	$3.00	2,022,270	
				$42,342,940	
			Miscellaneous	11,009,164	
			Subtotal		$53,352,104
			Federal Share	$49,819,228	
			State Share	$ 3,532,876	

50-Year Maintenance

Item	Quantity		Unit Price	Cost	
Dredging	37,769,300	C.Y.	$0.48	$18,129,264	
Disposal Sites	891.3	Acres	$1,000.00	891,300	
Levees	836,407	C.Y.	$3.00	2,509,221	
				$21,529,785	
			Miscellaneous	5,597,744	
			Subtotal		$27,127,529
			Federal Share	$22,842,873	
			State Share	$ 4,284,656	
				Project Total	$80,479,633
			Total Federal Share	$72,662,101	
			Total State Share	$ 7,817,532	

SEGMENT #3
FREEPORT HARBOR CHANNEL TO MATAGORDA SHIP CHANNEL

New Construction

Item	Quantity		Unit Price	Cost	
ROW	1,035.3	Acres	$1,000.00	$ 1,035,300	
Dredging	53,896,160	C.Y.	$1.15	61,980,584	
Disposal Sites	2,078.7	Acres	$1,000.00	2,078,700	
Levees	2,488,595	C.Y.	$3.00	7,465,785	
				$72,560,369	
			Miscellaneous	18,865,696	
			Subtotal		$91,426,065
			Federal Share	$78,095,537	
			State Share	$13,330,528	

50-Year Maintenance

Item	Quantity		Unit Price	Cost	
Dredging	95,172,550	C.Y.	$0.48	$45,682,824	
Disposal Sites	2,128.4	Acres	$1,000.00	2,128,400	
Levees	2,367,729	C.Y.	$3.00	7,103,187	
				$54,914,411	
			Miscellaneous	14,277,747	
			Subtotal		$69,192,158
			Federal Share	$57,560,358	
			State Share	$11,631,800	
				Project Total	$160,618,223
			Total Federal Share	$135,655,895	
			Total State Share	$ 24,962,328	

SEGMENT #4
MATAGORDA SHIP CHANNEL TO CORPUS CHRISTI CHANNEL

New Construction

Item	Quantity		Unit Price	Cost	
ROW	491.4	Acres	$1,000.00	$ 491,400	
Dredging	48,471,480	C.Y.	$1.15	55,742,202	
Disposal Sites	1,239.6	Acres	$1,000.00	1,239,600	
Levees	1,552,782	C.Y.	$3.00	4,658,346	
				$62,131,548	
			Miscellaneous	16,154,202	
			Subtotal		$78,285,750
			Federal Share	$70,235,174	
			State Share	$ 8,050,576	

50-Year Maintenance

Item	Quantity		Unit Price	Cost	
Dredging	87,966,900	C.Y.	$0.48	$42,224,112	
Disposal Sites	2,249.7	Acres	$1,000.00	2,249,700	
Levees	2,631,327	C.Y.	$3.00	7,893,981	
				$52,367,793	
			Miscellaneous	13,615,626	
			Subtotal		$65,983,419
			Federal Share	$53,202,381	
			State Share	$12,781,038	
				Project Total	$144,269,169
			Total Federal Share	$123,437,555	
			Total State Share	$ 20,831,614	

SEGMENT #5
CORPUS CHRISTI CHANNEL TO BROWNSVILLE SHIP CHANNEL

New Construction

Item	Quantity		Unit Price	Cost	
ROW	-		-	-	
Dredging	97,442,956	C.Y.	$1.00	$97,442,956	
Disposal Sites	210.0	Acres	$1,000.00	210,000	
Levees	254,178	C.Y.	$3.00	762,534	
				$98,415,490	
			Miscellaneous	25,588,027	
			Subtotal		$124,003,517
			Federal Share	$122,778,124	
			State Share	$1,225,393	

50-Year Maintenance

Item	Quantity		Unit Price	Cost	
Dredging	137,914,550	C.Y.	$0.42	$57,924,111	
Disposal Sites	100.3	Acres	$1,000.00	100,300	
Levees	107,006	C.Y.	$3.00	321,018	
				$58,345,429	
			Miscellaneous	15,169,812	
			Subtotal		$73,515,241
			Federal Share	$72,984,380	
			State Share	$ 530,861	
				Project Total	
			Total Federal Share	$195,762,504	
			Total State Share	$ 1,756,254	

COST SUMMARY

TOTAL GIWW - 300' x 16' CHANNEL

New Construction

Segment	Federal Share	State Share	Total
1	$76,891,323	$ 3,964,885	$80,856,208
2	49,819,228	3,532,876	53,352,104
3	78,095,537	13,330,528	91,426,065
4	70,235,174	8,050,576	78,285,750
5	122,778,124	1,225,393	124,003,517
Totals	$397,819,386	$30,104,258	$427,923,644

50-Year Maintenance

Segment	Federal Share	State Share	Total
1	$29,211,307	$11,053,102	$40,264,409
2	22,842,873	4,284,656	27,127,529
3	57,560,358	11,631,800	69,192,158
4	53,202,381	12,781,038	65,983,419
5	72,984,380	530,861	73,515,241
Totals	$235,801,299	$40,281,457	$276,082,756

Total Project

Segment	Federal Share	State Share	Total
1	$106,102,630	$15,017,987	$121,120,617
2	72,662,101	7,817,532	80,479,633
3	135,655,895	24,962,328	160,618,223
4	123,437,555	20,831,614	144,269,169
5	195,762,504	1,756,254	197,518,758
Totals	$633,620,685	$70,385,715	$704,006,400