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16. Abstract

This research establishes a baseline for the condition and utilization of the Gulf Intracoastal Waterway in Texas (GIWW-T). It looks at what is needed to restore and sustain the GIWW-T to its optimum level, the major operational concerns, the impacts of operational obstacles including a lack of dredging, and how the Texas Department of Transportation (TxDOT) might be able to play a more active role in achieving the goal of a highly efficient and safe GIWW-T.

Recommendations include:

- Urge the Corps to restart the study process for the Brazos River Floodgates (which will probably need to include the Colorado River Locks).
- Cooperate with environmental and conservation groups to fund the placement of revetments along placement areas.
- Provide funding assistance for the creation of new fleeting areas that would accommodate all barge traffic; stay actively involved in reviewing permit applications filed with the Corps for development along the GIWW-T.
- Expedite the construction of the replacement FM 457 swing bridge (Caney Creek Bridge).
- Begin exploring real estate options for the placement area with the least estimated remaining life (PA86 in Brazoria County with an estimated remaining life of 12 years).
- Set up and maintain a web page to periodically update and publish selected metrics.
- Continue to pursue funding through the TIGER grant program administered by the United States Department of Transportation.
- Apply for Marine Highway project designation.

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TEXAS GULF INTRACOASTAL WATERWAY MASTER PLAN: TECHNICAL REPORT

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DISCLAIMER

This research was performed in cooperation with the Texas Department of Transportation (TxDOT) and the Federal Highway Administration (FHWA). The contents of this report reflect the views of the authors, who are responsible for the facts and the accuracy of the data presented herein. The contents do not necessarily reflect the official view or policies of the FHWA or TxDOT. This report does not constitute a standard, specification, or regulation.

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- Caroline Mays, freight planning branch manager, Transportation Planning & Programming Division.
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- Matthew Mahoney, waterways coordinator, Maritime Division (not a member of the PMC, but provided valuable assistance).

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EXECUTIVE SUMMARY

BACKGROUND AND PURPOSE

This research establishes a baseline for the condition and utilization of the Gulf Intracoastal Waterway in Texas (GIWW-T). It looks at:

- What is needed to restore and sustain the GIWW-T to its optimum level.
- The major operational concerns.
- The impacts of operational obstacles and a lack of dredging.
- How the Texas Department of Transportation (TxDOT) might be able to play a more active role in achieving the goal of a highly efficient and safe GIWW-T.

The GIWW-T is a shallow-draft system that is a component of the overall marine transportation system in Texas, which includes 11 deep-draft ports. These deep-draft ports handle both shallow- and deep-draft vessels, so the two systems are intertwined. A report on the Texas port system[1] is being prepared concurrently with this report under the auspices of TxDOT's Maritime Division. That report will assist readers with developing a baseline understanding of the volumes and types of maritime cargoes being handled at Texas ports, the ports' existing infrastructure, and the current needs and concerns among port administrators. The report will also briefly review port funding mechanisms that other states in the Gulf of Mexico are using, as well as the State of Texas' current approach. Details can be obtained by contacting Maritime Division staff.

The maintenance of the Gulf Intracoastal Waterway (GIWW) is the responsibility of the U.S. Army Corps of Engineers (Corps). The State of Texas' local sponsorship of the waterway is governed through the Texas Transportation Code and the Texas Administrative Code. In 1975, TxDOT was named the official non-federal sponsor for the GIWW-T through the Texas Coastal Waterway Act. The primary responsibilities of TxDOT under the act are to provide right-of-way and disposal areas for byproducts of operations and maintenance.

Originally constructed to facilitate dry bulk commodity trade between Texas ports and to facilitate defense during World War II, the GIWW-T has become an integral component of the extensive supply chains of Texas petrochemical and manufacturing industries. High levels of vessel traffic reflect the GIWW-T's importance to Texas' economy.

The type of freight transportation that takes place on the GIWW-T is referred to as "inland towing" or "inland barge" transportation. The navigable portion of the GIWW-T begins at Texaco Island in Port Arthur and ends at the Brazos Island Harbor Ship Channel near Brownsville, Texas, a length of 379 miles. The GIWW-T links together 11 deep-draft ports (25 ft or deeper) and 13 shallow-draft channels. Figure ES-1 provides a map of the GIWW-T and the coastal counties that directly or indirectly benefit from it.

[1] The report focuses on members of the Texas Ports Association, which includes some shallow-draft ports as well as the 11 deep-draft ports.

Figure ES-1. GIWW-T Map.
Source: Texas Department of Transportation (*1*).

ECONOMIC IMPORTANCE OF THE GIWW-T

Several academic studies have quantified the importance of the GIWW-T; however, few to date have examined the economic benefit potential from a properly maintained GIWW-T. These studies find that the GIWW-T plays a large role in facilitating commerce throughout the Texas Gulf Coast region. Furthermore, the GIWW-T is especially important for some of the state's most important industries. In 2012, nearly 78 million short tons were moved on the GIWW-T, with 91 percent falling within the categories of petroleum- and chemical-related products. Considering both deep- and shallow-draft waterways, in 2012 Texas ranked second in the United States for total waterborne tonnage moved, with 486 million tons of cargo and more than one-fifth of the total U.S. maritime freight and vessel volume on its waterways. (*2*)

In terms of economic importance, the GIWW-T is one of the most highly utilized corridors in the U.S. inland waterway commerce network. Along the waterway, manufactured goods, farm products, machinery, petroleum products, and chemicals are transported into and out of the region.

Current forecasts suggest that GIWW-T tonnage will increase. For example, in 2010 Cambridge Systematics completed a study that shows total freight volumes could increase by 45 percent by 2035 (*3*). The most significant development expected to have a strong influence on GIWW-T

traffic is the Eagle Ford Shale play in South/Central Texas. This oil and gas play located near the state's Gulf Coast is quickly becoming an important area for the state's growing energy economy. As of January 2014, the Eagle Ford Shale play produced 1.2 million barrels of oil per day, representing an increase of 41 percent from January 2013, when 849,000 barrels per day were produced. Natural gas production from the Eagle Ford Shale play has also seen similar growth. From January 2013 to January 2014, natural gas production increased by 34 percent, from 4.6 million cubic ft per day in January 2013 to 6.1 million cubic ft per day in January 2014.

While no government forecast data are currently available, several firms with energy-sector expertise have offered their independent projections for Eagle Ford Shale production. Jefferies & Company, an investment banking firm specializing in oil and gas data analytics, announced in October 2013 that it expects Eagle Ford oil production to peak in 2022 at around 1.8 million barrels per day and to start to decline from there (*4*).

However, due to a lack of federal government funding, the GIWW-T is currently not maintained to its proper dimensions, despite strong evidence supporting the integral role it plays in facilitating commerce. As would be the case with any highly utilized transportation asset, failing to maintain the GIWW-T at authorized dimensions could present long-term challenges that could result in lost economic productivity.

DREDGING ISSUES

The condition of the channel has a direct bearing on the cost of barge companies using the GIWW-T. The researchers calculated the increase in operating costs if the GIWW-T was allowed to shoal to the point that current average drafts were reduced by 1 ft. Essentially, the analysis reduces the draft for all current trips on the GIWW-T as a whole, leaving 6.9 million tons stranded. To move this cargo will require additional trips costing $58.7 million, representing an increase of 14.8 percent in the cost of doing business (see Appendix C for calculations). Someone must bear this additional cost. Since companies are in business to make a profit, that someone is ultimately the consumer.

These additional operating costs must be compared to the expenditures necessary to avoid them. Table ES-1 shows the annual operations and maintenance (O&M) cost that the Corps of Engineers has incurred for dredging the main channel of the GIWW-T.

Table ES-1. Annual O&M Cost Incurred by Corps of Engineers.

FY	Original Cost	Price Adjusted Cost
1998	3,486,895	5,605,207
1999	13,850,685	21,723,229
2000	14,211,153	21,839,611
2001	21,621,467	32,650,622
2002	17,641,997	25,844,236
2003	13,319,042	19,068,326
2004	12,348,604	17,104,797
2005	10,405,599	13,760,012
2006	15,248,493	19,231,619
2007	19,305,837	23,397,318
2008	12,357,249	14,473,382
2009	19,344,115	21,872,477
2010	29,510,406	32,584,667
2011	31,340,676	33,493,113
2012	14,830,603	15,218,849
Average	**$16,588,188**	**$21,191,164**

Note: Table uses Civil Works Construction Cost Index System (EM 1110-2-1304) to reflect 2013 dollars.

The average annual cost of dredging is $21.2 million. However, this cost is offset by avoiding the above potential increase in operating costs of $58.7 million. The ratio of cost avoided to cost of dredging (or benefit-cost ratio) is 2.8:1.0. It is highly likely that the average annual cost of dredging would have to rise with a properly maintained GIWW-T, since current dredging practices are insufficient. However, the benefit-cost ratio is high enough that dredging costs could rise significantly and still show a strong benefit-cost ratio.

Texas A&M Transportation Institute (TTI) researchers were able to identify 218 main channel placement areas (PAs) for dredged material that are currently in use or available for use. A number of these would require environmental assessments and additional coordination with resource agencies before their use. Of the 218 main channel PAs, two (PA35 and PA86) have a remaining life of less than 25 years (24 and 12 years, respectively). All but five of the remaining active areas have an estimated remaining life of 40 years or more.

A number of these sites are involved in beneficial use initiatives. These are projects where dredged sediments are used as resource materials in ways that provide environmental, economic, or social benefit. There are possibilities for expanding beneficial use activities at GIWW-T placement area sites. Current beneficial use projects are described in the body of this report and may serve as a guide for identifying beneficial use possibilities at various locations along the waterway.

PHYSICAL INFRASTRUCTURE AND SAFETY ISSUES

Intersections with Ship Channels

Analysis of Coast Guard data indicated that most vessel collisions involving towboats take place in heavily transited areas and at intersections of waterways. However, collisions are a very small percentage of the total trips. Discussions with operators and the Coast Guard revealed that the level of cooperation and coordination is excellent and that focusing on this issue would probably not be a good use of TxDOT's limited resources.

Floodgates and Locks

There are two locations along the GIWW-T that have floodgates or locks: the intersection with the Brazos River (floodgates) and the intersection with the Colorado River (locks). The stakeholder working group was of the unanimous opinion that the Brazos River Floodgates by far represent the greatest problem in terms of safety and efficiency anywhere on the entire GIWW. The Colorado River Locks were of concern, but nowhere close to the level of the Brazos River Floodgates.

The Corps performed a reconnaissance-level study of both the locks and the floodgates in 2000 (*5*). Reconnaissance studies are typically high-level studies that define the issues and determine whether it makes sense to pursue a detailed feasibility study. In its 2000 study, the Corps indicated that there was a federal interest in pursuing a feasibility study. Since feasibility studies focused on improvements to inland waterways are exempt from cost sharing, the study would be a federal expense. However, that study has not been funded to date, so no further action has been taken. Because of the time that has elapsed since the reconnaissance study was done, it will most likely be necessary for the Corps to restart the entire study process.

Recent statistics show that an average of more than 40 accidents occurs each year at the two facilities combined due to allisions[2] between the barges and the lock/gate structures. These accidents cause damage to the structures and to the barges. Since most of the commodities that move through these facilities are petrochemical in nature, toxic spills could occur as a result of accidents. There has been a significant rise in the accident rate and the severity of the accidents since 2008. Further investigation through future research is necessary to be able to discuss the causes of this increase.

If the damages to the Brazos River Floodgates were indexed to 2013 prices, the average annual damage amount would be $799,249, resulting in an average of $22,201 per incident. There is no public information on the damage to the towboats in these incidents. That amount could be substantial as well.

The Brazos River Floodgates are not wide enough for modern configurations of tows to pass through. The floodgates were built in 1943 when barges were typically 26 ft to 35 ft wide. The floodgate chamber is 75 ft wide, and the maximum width it can accommodate is 55 ft. Today, it is common for towboat operators to push two 35-ft dry cargo barges side by side, for a total

[2] An allision is when a moving vessel strikes a stationary object.

width of 70 ft. A typical tank barge measures 54 ft across. The necessity to break the tow causes significant time delays.

TTI acquired three months of log entries for 2013 from the Brazos River Floodgates office for further analysis. Using these entries, TTI was able to develop statistics related to tows that had to be broken in order to pass through the floodgates. The additional annual operating cost attributable to the requirement to break tows is $11,352,250. If the cost of damages to the floodgates is added, the total annual cost due to the inefficient design of the floodgates is $12,151,499.

From 2001 to 2013, the annual number of lockages at the floodgates increased by 45 percent, from almost 10,000 to nearly 14,500. This indicates that the annual cost of delays is rising and will continue to rise.

The researchers obtained cost estimates to replace a lock facility from an ongoing feasibility study at the New Orleans District entitled Bayou Sorrel Lock, Louisiana. Bayou Sorrel Lock is located in Iberville Parish in south-central Louisiana. It is very similar in dimensions and construction to the lock facilities at the Colorado River. The feasibility study concluded that the best plan would be to replace the existing 56-ft × 797-ft lock (earthen chamber) with a 110-ft × 1,200-ft lock (concrete chamber). The cost for the replacement was about $60 million for one lock structure.

If the two floodgates can be replaced for a conservative estimate of about half the cost of two locks, or $60 million in total (as discussed in the full report) and $12 million in annual operating costs can be avoided, the payback time for this investment is less than five years at current traffic levels. If traffic increases due to Eagle Ford Shale activity and general economic trends are factored in, this payback period will be shortened considerably. Towboat and barge repair costs are confidential and are therefore not subject to inclusion in this estimate, but if those costs are avoided and added into the benefits, the payback period will be further reduced.

Fleeting Areas

One of the issues that all the operators participating in the stakeholder working group agreed on was the lack of fleeting area capacity that is affecting the safety and efficiency of barge operations on the GIWW-T. This is especially acute in the Corpus Christi area.

Fleeting areas are holding areas for barges that are between shipments. They may be used to clean, repair, or simply hold barges. Fleeting areas are typically private operations that may be used for a captive fleet (the owner's fleet) or as third-party enterprises that charge for services rendered. However, this does not preclude a port authority from being involved in the construction and/or operation of such a facility.

There is at least one fleeting area in each major port complex. (In the cases of Houston and Corpus Christi, there are a number of such facilities.) One additional fleeting area in each of the four major port complexes in Texas (Beaumont/Port Arthur, Houston, Freeport, and Corpus Christi) would lead to a significant improvement in operations along the GIWW-T. However, expanding fleeting capacity would require a capital investment of approximately $16 million,

assuming that each site would cost approximately $4 million (at a modest length of 2,000 ft of bank space for each).

Mooring Areas

Barge operators use mooring areas during inclement weather or other situations in which it would not be safe to proceed along the waterway. They are not intended to serve the same purposes as fleeting areas. The Corps of Engineers is in the final phase of a study to determine the condition and adequacy of mooring areas along the GIWW-T. The Corps study indicates that it is not necessary to add new mooring areas, but current mooring areas must be rehabilitated and expanded. Figure ES-2 shows the location of current mooring areas.

Figure ES-2. GIWW-T Mooring Areas.

The total estimated cost for all Corps-recommended improvements is $7,044,000, resulting in the placement of 61 new buoys and the creation of an additional 8,115 linear ft of mooring space. The funding for these improvements will come from the Galveston District's O&M funds. Since the study is a discretionary report, the authority is delegated to the district commander to expend O&M funds for the mooring basin expansions. The very minor dredging quantities associated with the expansion of each mooring basin would be included in regularly scheduled maintenance dredging contracts.

Encroachment

In August 2010, TxDOT published a report prepared by Texas A&M University at Galveston and TTI titled *Analysis and Recommendations on Protecting Waterways from Encroachment* (*6*). In that report, the authors prepared a set of recommendations for permitters (Corps) and another set for developers. Many of the concerns and recommendations were addressed in a new permitting procedure that the Corps instituted in October 2013. Appendix E is a copy of the body of the procedure.

ECONOMICS AND FUNDING ISSUES

A lack of sufficient funding is one reason why the GIWW-T is not being maintained at its authorized dimensions. The Corps, the entity responsible for maintenance and dredging of the GIWW-T, is forced to direct limited funding dollars toward critically urgent projects, thus leaving little money available for a number of high-priority capital projects. Furthermore, stakeholder interviews and Congressional appropriations data show that this funding shortfall will continue if no changes are made.

As mentioned above, based on stakeholder feedback and conversations with the Corps of Engineers, researchers identified the two areas of highest concern for the efficient movement of waterborne commerce on the GIWW-T:

- Lack of GIWW-T depth.
- Brazos River Floodgates.

Addressing these issues will require additional funding in order to ultimately ensure continued efficient operation on the GIWW-T.

Recent shortfalls in the Corps' budget mean that actual budgeted amounts for GIWW-T operations and maintenance dredging activities consistently fall short of the amount that the Corps has requested. The average annual amount budgeted and funded for GIWW-T operations and maintenance has been approximately $28 million. This is about $34 million less than the average amount that the Galveston District requested as "full funding capability" each year. Some of this shortfall has been carried forward each year, so it would not be necessary to raise the budget by the full $34 million to accomplish a first-rate maintenance program, but it is obvious that the Corps is not receiving anything close to what it needs. Additionally, as mentioned above, researchers obtained cost estimates for similar facilities and determined that a conservative total cost estimate to replace the floodgates is about $60 million.

TxDOT may want to consider funding part of the needs that are unmet due to the shortfalls in the Corps' budget. Based on conversations with stakeholders and independent research, the researchers selected and examined the following potential funding strategies for analysis:

- Pursue funding under the Resources and Ecosystems Sustainability, Tourist, Opportunities, and Revived Economies of the Gulf Coast States Act of 2012 (RESTORE Act).
- Pursue funding from the Coastal Impact Assistance Program (CIAP).

- Raise the priority of economically important GIWW-T projects to the Corps and to Congress.
- Seek funding from the Gulf of Mexico Energy Security Act of 2006 (GOMESA).
- Apply for Marine Highway designation funding.
- Apply for federal discretionary grant programs.
- Explore feasibility of the Florida model in Texas.
- Explore ending state diesel fuel tax exemption.
- Explore public-private partnerships.
- Consider using the Texas Rainy Day Fund.
- Consider a Panama Canal approach for Texas.

Researchers evaluated funding options based on three analysis criteria:

- Feasibility (i.e., what is the likelihood such an alternative could be reasonably implemented?).
- Sustainability (i.e., does this alternative provide long-term, sustainable funding?).
- Equity (i.e., how is the funding burden shared among all parties?).

The researchers determined that CIAP is no longer an alternative and the GOMESA funding scheme does not appear to hold much promise. It may also be difficult to structure GIWW-T projects so that they qualify for funding under the RESTORE Act grant program. The remaining alternatives are feasible for TxDOT to consider. A brief description of each remaining alternative follows.

Elevate the Priority of Economically Important GIWW-T Projects to the Corps and to Congress

One potentially effective and relatively low-cost strategy for TxDOT would be to develop a tenable economic and environmental case justifying why increased federal funding should be directed toward strategic GIWW-T projects. Corps districts are responsible for preparing a cost-benefit analysis for projects, ranking projects based on priority, and recommending high-priority projects for funding. TxDOT could assist the Corps' project prioritization process as described below.

Reconnaissance studies and feasibility studies are two necessary and critical first steps. Unfortunately, general appropriations have fallen far short of required funding amounts for a number of years. Furthermore, this amount is not likely to significantly increase in the coming years. TxDOT could take a very proactive stance in advocating for funding or even providing some of the funding.

There have been some legislative developments that TxDOT may wish to take advantage of. In May 2014, the U.S. House and Senate approved, and the president signed, the Water Resources Reform and Development Act (WRRDA), officially known as House of Representatives Bill 3080 (HR 3080). This act authorizes the U.S. Army Corps of Engineers to perform various water-related projects and make several changes to how waterway projects are prioritized (*7*). According to a conference report that the U.S. House Transportation and Infrastructure

Committee prepared, HR 3080 makes several reforms relevant to coastal and inland waterway infrastructure projects. Some of the provisions most relevant to this research project include:

- Limiting the time period for studies to be completed.
- Providing permanent authority for the Corps to accept funds from non-federal public interests.
- Authorizing non-federal sponsors to provide funds to the Corps to carry out studies.
- Authorizing non-federal sponsors to carry out water resources development projects.
- Authorizing the Corps to accept funds from non-federal interests to operate, maintain, and improve the nation's inland waterways transportation system.

It will be important to monitor how these provisions are implemented and how TxDOT might be able to take advantage of them.

Another strategy for TxDOT is to monitor and participate in the activities of the Inland Waterways User Board (IWUB). The Water Resources Development Act (WRDA) of 1986 established this board as an industry federal advisory committee responsible for "monitor[ing] the Inland Waterways Trust Fund and to make recommendations to the Army and to Congress on investment priorities using resources from the Fund" (*8*). In 2010, IWUB, in a joint effort with the Corps, published a Capital Projects Business Model (CPBM). The CPBM provides a list of long-term capital needs for the inland navigation system intended to "balance reliability with affordability" (*9*). One strategy for TxDOT is to work with stakeholders to elevate the priority of the Brazos River Floodgates and Colorado River Locks project (labeled GIWW Modifications, TX) in the CPBM. This project is listed as a Phase 3 project in the CPBM, the lowest priority level in the model. Additionally, TxDOT could continue monitoring the activities of this committee to ensure that other strategic Texas waterway projects are considered.

Apply for Marine Highway Designation

The America's Marine Highway Program is a United States Department of Transportation (USDOT)-led program to expand the use of navigable waterways to relieve landside congestion, reduce emissions, and generate other public benefits by increasing the efficiency of the surface transportation system.

On April 15, 2010, the U.S. Department of Transportation Marine Administration (MARAD) issued a call to public agencies for Marine Highway project applications. MARAD received 35 applications in response to the call. In August 2010, the Secretary of Transportation selected eight projects from these applications for designation as Marine Highway projects under the program. Many of these projects represent new or expanded marine highway services that offer the promise of public benefit and long-term sustainability without long-term federal financial support. They will receive preferential treatment for federal assistance from USDOT and MARAD.

On May 27, 2014, MARAD initiated another call for project applications. The window for submitting applications (Marine Highway Project Open Season) will close on September 30, 2016. There will be five project review sessions during the Marine Highway Project Open Season, and route designation recommendations will continue to be accepted and reviewed at

any time. Qualified projects will be announced shortly after the completion of each project review session. The application submittal deadlines for the review sessions are:

- June 30, 2014.
- December 31, 2014.
- June 30, 2015.
- December 31, 2015.
- June 30, 2016.

The first round of Marine Highway grants ($7 million) was awarded in September 2010. Should additional funding be made available, a notice in the *Federal Register* will be published.

Apply for Federal Discretionary Grant Programs

Some federal discretionary grants could be available. For example, the Transportation Investment Generating Economic Recovery (TIGER) grant program is an annual supplementary discretionary grant program that awards public-sector sponsors, on a competitive basis, funds for capital investments for surface transportation projects. A notice of funding availability is usually published in early March, and applications are generally due to the USDOT by early May.

The 2014 TIGER discretionary grant program appropriated $600 million to be awarded on a competitive basis for the 2014 funding cycle. This program also appropriated $35 million (of the $600 million total) for project planning-related activities. It appears that several GIWW-related projects would be eligible to apply for TIGER funding. The application period for FY 2014 TIGER grants closed on April 28, 2014, but there are indications that Congress will also fund a 2015 cycle. In 2013, TxDOT submitted an unsuccessful application for a TIGER V discretionary grant to provide "crucial major restoration and modernization of the Texas GIWW infrastructure" (*10*, *11*). Further applications could be submitted to meet some of the capital costs required for the GIWW-T.

While discretionary grant programs can help meet the funding requirements needed to help maintain the GIWW-T, these funds would have to be focused on one-time projects that will have a fairly long-term effect.

Explore Feasibility of Florida Inland Navigation District Model for Texas

One possibility is to adopt a state-based model similar to the Florida Inland Navigation District (FIND) model. In 1927, the Florida Legislature created FIND through Chapter 12026, Special Acts of 1927. FIND was given taxing authority in specific regions along the Florida coastline. The mission of FIND is to "perform the functions of the 'local sponsor' of the Atlantic Intracoastal Waterway project in Florida, a federal navigation project. In this capacity the District provides all lands required for the navigation project including rights of way and lands for the management of dredged materials removed from the waterway during dredging activities" (*12*). It remits tax revenues to the Corps to be used for dredging the waterway within its jurisdiction.

Consider Utilizing Coastal Erosion Planning and Response Funds

The Coastal Erosion Planning and Response Act (CEPRA) may provide some limited funding opportunities. The purpose of this program is to implement coastal erosion response projects and related studies to reduce the effects and to understand the processes of coastal erosion. Under CEPRA, the Texas General Land Office (GLO) implements erosion response projects and studies through collaboration and matching fund partnerships with federal, state, and local governments, nonprofits, and other potential project sponsors. While funding from this program is not directly related to navigation, it is possible that some GIWW-T-related projects could be eligible to receive some funding under this program. The deadline for Cycle 8 funding (the most recent funding cycle) has already passed, but GLO, at its discretion, may accept applications that address an emergency situation on a rolling basis. TxDOT should stay in touch with GLO regarding possible future funding cycles, which typically occur every two years.

Explore Ending State Diesel Tax Exemptions for Certain GIWW-T Users

Another possibility is to consider ending state diesel fuel tax exemptions for GIWW-T users. Currently, Texas Tax Code Section 153.222 allows a refund for taxes paid on excepted uses of diesel fuel. If Texas were to consider pursuing this option, it would be important to first consider revisiting relevant provisions outlined in the Texas Tax Code Sec. 153 and to work with key state legislative officials in advance of the 2015 Legislative Session. Legislative changes would be required to allow the additional tax to be used for GIWW-T maintenance purposes.

Explore Public-Private Partnership (P3) Opportunities and Monitor Possible Inland Waterway P3 Pilot Projects That Might Be Pursued in the Future

Possible opportunities to take advantage of innovative financing approaches may be available by increasing participation with the private sector, especially with respect to lock and dam and other waterway infrastructure projects. In the context of waterway infrastructure, a public-private partnership would likely take the form of a contractual agreement between a federal or state public-sector waterway stakeholder agency (e.g., the Corps, Texas) and a private-sector entity to deliver a public service.

In order for a public-private partnership approach to be feasible, a revenue stream such as a lockage fee, dockage fee, annual license fee, or some other form of taxes or fees would be required.

Explore Utilizing Texas Rainy Day Fund for Waterway Projects

Another area of interest is the use of the Texas Rainy Day Fund. The Rainy Day Fund is a savings fund that allows the state to set aside excess revenue for use in times of unexpected revenue shortfall. Money comes in from several sources to this fund, but natural gas and oil tax revenues have been the driving factors in the fund's growth. In August 2013, lawmakers passed legislation to let voters decide whether to increase funding for transportation by diverting some oil and natural gas tax revenue from reserve accounts. If voters approve this proposal in November 2014, transportation funding will increase to about $1.2 billion, or by 12 percent, in 2015, forecasts show. However, if the proposal is passed, the legislation stipulates that this

money is "for the sole purpose of constructing, maintaining, and acquiring rights-of-way for public roadways other than toll roads." This specific wording of the legislation precludes the use of this money for dredging and other maintenance activities on the GIWW-T. Another public referendum would be required to allow the use of any Rainy Day funds for GIWW-T purposes.

Consider the Panama Canal Approach for Texas

The Panama Canal expansion proposal calls for the execution of a tolls policy that will focus on capturing the value the canal adds to each segment of its market, and tolls are expected to be set in a manner that will double them within the next 20 years. The loans taken out to finance the construction of this proposal are expected to be paid back rapidly—less than 10 years.

A similar approach in Texas would be interesting. Texas already has experience creating authorities to help meet infrastructure mobility needs for surface transportation projects. For example, in 2001 the state authorized regional mobility authorities. These authorities are authorized under state law to finance, design, construct, operate, maintain, and expand a wide range of transportation facilities and services. In practice, they mostly are used to deliver critically needed tollway projects to the state.[3] A similar type of authority could be authorized to help finance, design, construct, operate, and maintain the GIWW-T.

Another approach the Panama Canal employs is the imposition of tolls on its users. Such an authority in Texas could be authorized to finance the construction, operations, and maintenance of the GIWW-T system.

TXDOT LEGISLATIVE OBSTACLES

The level of TxDOT's involvement in the maintenance and potential improvement of the GIWW is a matter for policymakers to decide. Such participation could theoretically range from a full takeover to very targeted financial assistance. Because federal law stipulates that (a) the GIWW-T is totally under federal control, and (b) the Corps is responsible for the maintenance of and any improvements to this asset, any type of TxDOT involvement would require significant negotiations with the Corps and Congressional approval. Furthermore, the Corps' rulemaking structure would require several administrative and regulatory changes to take place. Corps representatives interviewed for this study noted that at the very least, a nonstandard agreement (pending a complex approval process involving the Fort Worth Corps Division headquarters) would likely be required. Since a state agency can engage only in activities for which it is specifically authorized, the Texas Legislature would need to grant approval to pursue this option, and the option would require extensive coordination with several of the state and local agency stakeholders.

The Corps could theoretically subcontract GIWW-T maintenance activities to TxDOT. Legislative barriers to the subcontractor approach are not as formidable as a full takeover but still pose challenges. TxDOT's authority for engaging as a subcontractor would require legislative approval and increased institutional capacity for conducting such work.

[3] Chapter 270 of Texas Statutes.

Perhaps the fewest legislative obstacles exist where a partnership scenario for GIWW-T maintenance and dredging activities involves multiple parties. Many different approaches exist, but in essence, such an approach keeps the Corps as the responsible party for GIWW-T dredging and maintenance activities, while relying on non-federal sponsors to provide a greater share of funding. Although the federal legislative framework for this type of agreement is in place, state legislative changes would be required. For example, Chapter 51 of the Texas Transportation Code "Texas Coastal Waterway Act" would need to be amended to allow broadened authority for partnering with federal sponsors in GIWW-T maintenance beyond acquiring land for dredging materials.

A few recent proposals were introduced in the last legislative session (2013) to provide additional funding for transportation. For example, the Texas Legislature passed House Bill (HB) 1 during the third called session of the 83rd Legislature that would (pending voter approval in November 2014) transfer a portion of revenues deposited in the Economic Stabilization Fund to the State Highway Fund. An additional constitutional amendment would be required for such a transfer to occur for navigation purposes.

When it comes to providing funding for activities such as the construction of fleeting areas, the challenge is finding a funding source that is not statutorily dedicated to highway planning and construction. Most funding collected in the State Highway Fund (Fund 0006) is required to be spent toward highway projects. Section 7-a, Article VIII of the Texas Constitution dedicates net revenues from motor vehicle registration fees and taxes on motor fuels and lubricants to be used only for "acquiring rights-of-way, constructing, maintaining, and policing public roadways"; Section 7-b dedicates federal revenues received for highway-related purposes to be spent on highway-related projects. However, revenues from vehicle certificate sales, special vehicle registrations, and commercial transportation fees collected in Fund 0006 that are remitted to TxDOT are not required to be spent on highway-related projects (*13*). Established in 2001, the Texas Mobility Fund allows the Texas Transportation Commission to borrow money for the construction and maintenance of the state highway system with revenues from a mix of transportation-related fees. However, Section 49-k, Article III of the Texas Constitution prohibits the Texas Mobility Fund from financing the construction of non-highway projects. Any use of these funds for the GIWW-T would likely require a constitutional amendment. Proposition 12, which voters approved in 2007, allows the Texas Transportation Commission to issue up to $5 billion in general obligation bonds under the authority of Article III, Section 49-p of the Texas Constitution. Legislative approval and statutory changes would likely be required for using Proposition 12 bonds for non-highway purposes (*14*).

PERFORMANCE METRICS

The researchers identified a number of potential performance metrics discussed in recent research literature.

Table ES-2. Partial List of Potential Marine Transportation Metrics.

Category	Performance Metric	Notes
Congestion	Average vessel delay at locks	Corps can provide this.
	Average vessel delay at floodgates	Corps can provide this.
	Average time in transit per barge tow	May want to establish certain origin-destination (O-D) pairs for reporting. This metric is not currently tracked and will require coordination with the Corps or the barge industry.
	Miles of GIWW-T with inadequate channel width	TxDOT needs to define "unsuitable." Corps can provide the data.
	Miles of GIWW-T with inadequate channel depth	TxDOT needs to define "unsuitable." Corps can provide the data.
	Miles of GIWW-T with difficult turns or one-way transits	Corps can provide this. Gulf Intracoastal Canal Association also tracks this.
Safety	Collisions involving GIWW-T tows	Main source is Coast Guard, but reporting is sketchy.
	Allisions involving GIWW-T tows	Main source is Coast Guard, but reporting is sketchy.
	Hazardous spills on the GIWW-T	Main source is Coast Guard, but reporting is sketchy.
Economy	Tons transported on the GIWW-T	Corps tracks this.
	Value of freight moving on the GIWW-T	TxDOT will have to estimate value.
System Preservation	Acreage of developed properties along GIWW-T (or miles with developed properties)	This could probably be done in conjunction with GLO.
	Annual lock and floodgate maintenance costs	Corps tracks this.
	Cubic yards of sediment dredged	Corps tracks this.

CONCLUSIONS AND RECOMMENDATIONS

Several important recommendations to TxDOT flow from the research. These recommendations are listed in summary form. The important next step for each recommendation is provided in Chapter 6 of this report.

- Urge the Corps to restart the study process for the Brazos River Floodgates (which will probably need to include the Colorado River Locks).
- Cooperate with entities such as Ducks Unlimited to fund the placement of revetments along placement areas.
- Provide funding assistance for the creation of new fleeting areas that would accommodate all barge traffic.
- Stay actively involved in reviewing permit applications filed with the Corps for development along the GIWW-T.

- Expedite the construction of the replacement FM 457 swing bridge (Caney Creek Bridge).
- Begin exploring real estate options for the placement area with the least estimated remaining life (PA86 in Brazoria County with an estimated remaining life of 12 years).
- Set up and maintain a web page to periodically update and publish selected metrics.
- Continue to pursue funding through the TIGER grant program administered by USDOT.
- Apply for Marine Highway project designation.

CHAPTER 1: INTRODUCTION AND BACKGROUND

PROJECT PURPOSE

Ship channels and navigable waterways in the United States are constructed and maintained by the U.S. Army Corps of Engineers. In many cases, these navigation projects require a non-federal sponsor to participate in the planning, design, and funding of the project. This report focuses on the GIWW-T. The GIWW begins in St. Marks, Florida, and runs all the way to the Port of Brownsville, Texas. In the case of the GIWW-T, TxDOT is the non-federal sponsor. TxDOT's role is limited by statute to acquiring real estate that can be used by the Corps as dredged material placement areas for dredging activities in the main channel of the GIWW-T.

TxDOT may want to expand its role in the maintenance of the GIWW-T and/or associated assets. This report looks at what is needed to restore and sustain the GIWW-T to its optimum level, and how TxDOT might be able to play a more active role in the realization of this goal. It describes the following:

- Needs.
- Costs.
- Obstacles to TxDOT taking a more active role.
- Shortfall in federal funding.
- Potential funding sources to fill the gap.
- Performance metrics to enable TxDOT to measure, monitor, and manage the condition and utility of the GIWW-T.

This research establishes a baseline for the condition and utilization of the GIWW-T. Although the authorized dimensions of the GIWW-T are 12 ft deep and 125 ft wide, there are many portions of the channel that are not being maintained to those dimensions, primarily because of a lack of funding. Consequently, users that move freight on the waterway have to load barges at less than capacity, which raises the cost on a per-unit basis. This light loading necessitates additional trips to move the freight that could not be carried because of the reduced water depth, which leads to additional costs, delays, and inefficiencies throughout the supply chain down to the end consumer. Additionally, there are floodgates and locks at the Brazos River and Colorado River, respectively, that are points of concern, especially the floodgates. Finally, users have often expressed other concerns related to operations on the GIWW-T, specifically mooring areas (places that tows tie up during inclement weather or emergencies) and fleeting areas (holding/repair areas for barges not currently being used).

This research looks at:

- What is needed to restore and sustain the GIWW-T to its optimum level.
- What the major operational concerns, the impacts of a lack of dredging, and operational obstacles are.
- How TxDOT might be able to play a more active role in achieving the goal of a highly efficient and safe GIWW-T.

A separate master plan that provides the basis for TxDOT to evaluate potential courses of action accompanies this research report.

GIWW-T PUBLIC STAKEHOLDERS

The Corps is responsible for the maintenance of the GIWW-T. The State of Texas' local sponsorship of the waterway is governed through the Texas Transportation Code and the Texas Administrative Code. The Texas Transportation Commission works with the Corps and other federal and state agencies and authorities to determine the role the state will play in sponsorship of the waterway. Under the Texas Transportation Code, the Texas Transportation Commission "is responsible for conducting a continual evaluation of the waterway based on four criteria: importance to indirect and direct beneficiaries; principal problems of costs, economic benefits, and environmental effects; significantly needed modifications; and recommendations for legislative action." In addition, the Transportation Code authorizes the commission to enter into a contract with the Corps through TxDOT for the use of dredged materials from the GIWW-T.[4]

In 1975, TxDOT was named the official non-federal sponsor for the GIWW-T through the Texas Coastal Waterway Act. The primary responsibilities of TxDOT under the act are to provide right-of-way and disposal areas for byproducts of operations and maintenance. Appendix A provides more information regarding the major legislative actions and milestones concerning the GIWW-T. Table 1 provides a list of the major stakeholders involved in the GIWW-T and their role in its operation and/or maintenance.

[4] Texas Transportation Code, Title 4, Subtitle A, Chapter 51.

Table 1. GIWW-T Major Stakeholders.

Stakeholder	Agency Mission	Involvement in GIWW-T
U.S. Army Corps of Engineers (Corps)	Deliver vital public and military engineering services; partnering in peace and war to strengthen the nation's security, energize the economy, and reduce risks from disasters.	Conducts dredging of the GIWW-T and maintenance of the Brazos River Floodgates and the Colorado River Locks.
Texas Department of Transportation (TxDOT)	Work with others to provide safe and reliable transportation solutions for Texas.	Acquires land for disposal of dredging material.
U.S. Coast Guard (USCG)	Protect the public, the environment, and U.S. economic interests—in the nation's ports and waterways, along the coast, on international waters, or in any maritime region as required to support national security.	Polices traffic on the GIWW-T and ensures safe, secure operations.
Texas Railroad Commission (RRC)	Serves Texas through stewardship of natural resources and the environment, concern for personal and community safety, and support of enhanced development and economic vitality for the benefit of Texans.	Regulates the oil and gas companies that use the GIWW-T for transport of equipment and product.
Texas General Land Office (GLO)	Serves the schoolchildren, veterans, and all people of Texas by preserving their history, protecting their environment, expanding economic opportunity, helping communities rebuild after disasters, and maximizing state revenue through innovative administration and prudent stewardship of state lands and resources.	Manages submerged lands and grants leases for residential and commercial shoreline developments.
Texas Commission on Environmental Quality (TCEQ)	Strives to protect the state's public health and natural resources consistent with sustainable economic development. TCEQ's goal is clean air, clean water, and the safe management of waste.	Monitors water quality.
Texas Department of State Health Services	To improve health and well-being in Texas.	Through its Seafood and Aquatic Life Group, ensures that activities in the state's waters will not adversely affect the health of consumers or recreational fishermen.
Texas Water Development Board	To provide leadership, planning, financial assistance, information, and education for the conservation and responsible development of water for Texas.	Ensures the continued availability of water supplies and the maintenance of the ecological health and productivity of Texas rivers, streams, reservoirs, bays, and estuaries.
Texas Department of Agriculture	Partner with all Texans to make Texas the nation's leader in agriculture, fortify our economy, empower rural communities, promote healthy lifestyles, and cultivate winning strategies for rural, suburban, and urban Texas through exceptional service and the common threads of agriculture in our daily lives.	Regulates the import/export of agricultural goods.
Texas Parks and Wildlife Department (TPWD)	To manage and conserve the natural and cultural resources of Texas; and to provide hunting, fishing, and outdoor recreation opportunities for the use and enjoyment of present and future generations.	Enforces policy for coastal fisheries.

Note: Mission statements were obtained directly from agency websites.

U.S. Army Corps of Engineers

The Corps is tasked with maintaining the GIWW-T to ensure that this important component of the Texas and U.S. maritime system remains open for commerce. The Corps is also tasked with monitoring the channel conditions and maintaining sufficient depth and width within the GIWW-T. "Sufficient" means the depth and width that Congress authorized (12 ft × 125 ft). Monitoring is accomplished by performing hydrographic surveys, while the depth is maintained through periodic maintenance dredging where and when needed. Approximately 5 million cu yd of dredged material is either placed in authorized placement areas and/or used for beneficial use[5] such as beach nourishment projects annually. The staff is also tasked with operating and maintaining the Brazos River Floodgates and Colorado River Locks.

Texas Department of Transportation

According to the Texas Coastal Waterway Act and Executive Order 4-90, TxDOT is responsible for administering legislation as specified under the Texas Coastal Waterway Act of 1975 and serves as the non-federal sponsor of the main channel of GIWW-T from the Sabine River to the Brownsville Ship Channel. Two TxDOT divisions have a role in TxDOT responsibilities for the GIWW-T: Maritime Division (MRD) and Right of Way (ROW). Table 2 provides information regarding these TxDOT divisions and their responsibilities.

Table 2. TxDOT Division Responsibilities for GIWW-T.

Maritime Division (MRD)
• Oversee local sponsorship requirements for evaluation, planning, maintenance, preservation, enhancement, and future improvements of the Gulf Intracoastal Waterway. • Evaluate and select sites for the disposal of dredged material. • Coordinate with Corps of Engineers and state and federal agencies for environmental impact studies. • Conduct public meetings and commission hearings.
Right of Way (ROW)
• Negotiate purchase of sites for the disposal of dredged material in conjunction with the Transportation Planning and Programming Division. • Coordinate with owners of prospective dredged material placement sites. Specifically, these activities include the identification of landowners, preparing right of entry request, and informing landowners of methods used in acquiring land for dredged material placement.

[5] Beneficial use projects are projects where dredged sediments are used as resource materials in ways that provide environmental, economic, or social benefit.

U.S. Coast Guard

The U.S. Coast Guard (USCG) is another GIWW-T stakeholder. Specifically, USCG operates six programs:

- Maritime Security Operations.
- Maritime Law Enforcement.
- Maritime Prevention.
- Maritime Response.
- Defense Operations.
- Marine Transportation System Management.

The services that these programs provide consist of:

- Rescue and response.
- Vessel searches.
- Port safety and environmental exams.
- Policing and safety on the waterway.
- Worker verification screenings (*15*).

USCG is responsible for working with the Corps regarding any safety or security liabilities that exist in the waterway. For example, in 2000, the Corps and USCG established an agreement that "constructed a process for issuing permits related to fixed or floating structures, including but not limited to permanently moored vessels and facilities, on the navigable waters, harbors, and rivers." This agreement established a link between the two agencies for risk assessment of structures and safe passage for all traffic on the waterway. This type of interaction with other agencies on the GIWW-T makes USCG an active stakeholder in statutory and regulatory matters (*16*).

Texas Railroad Commission

The Texas Railroad Commission (RRC) is the state agency with primary regulatory jurisdiction over the oil and natural gas industry, pipeline transporters, the natural gas and hazardous liquid pipeline industry, natural gas utilities, the liquefied petroleum gas (LPG) or propane industry, alternative fuels, coal surface mining, and uranium exploration operations. In its regulatory role, RRC has environmental and safety responsibilities related to oil and gas production. An overarching agency goal is to encourage the responsible development of natural resources while protecting the environment.

RRC's primary concern is the state's oil and gas industry. As mentioned above, the majority of traffic seen on the GIWW-T comes from natural resource industries such as oil and gas and petrochemicals. RRC no longer regulates other modes of transportation such as buses, trucks, and railroads, but it is still actively involved in production and transportation aspects of energy-related industries (*17*). This puts the Texas Railroad Commission in a prominent position as a contributor to the development of the GIWW-T.

Texas General Land Office

The General Land Office is invested in the status of the coastline, which includes the GIWW-T. Similarly, federal and local governments are invested in GLO. Over the past 13 years, the CEPRA program (administered by GLO) has received $62 million in matching federal funds. The purpose of the CEPRA program is to implement coastal erosion response projects and related studies to reduce the effects and understand the processes of coastal erosion as it continues to threaten public beaches, natural resources, coastal development, public infrastructure, and public and private property. Under CEPRA, GLO implements erosion response projects and studies through collaboration and a matching-funds partnership with federal, state, and local governments, nonprofit organizations and other potential project partners. CEPRA is part of a larger initiative called "Caring for the Coast," which has programs focused on environmental protection, permit assistance, coastal erosion, coastal construction, hurricane/disaster preparation and response, and oil spills (in conjunction with USCG) (*18*). The GIWW-T directly affects GLO in many of these areas. For example, GLO works with the Corps to dispose of dredged material into any number of environmental reconstruction improvement sites such as new reefs, waste management/landfills, or shore stabilization erosion projects. It also carries the burden of informing such persons or owners affected by the redistribution of dredged material of all applicable benefits, policies, and procedures for this project. GLO is an important distributor of information for the public, GIWW-T industries, and the State of Texas.

Texas Commission on Environmental Quality

The Texas Commission on Environmental Quality (TCEQ) is the state's representative to the Environmental Protection Agency (EPA). With regard to the GIWW-T, TCEQ's goal is to protect the human and natural resources on the coast and maintain or improve the quality of water in each estuary or bay. Since the coastal population in Texas is growing at a rapid rate, the natural increase of shipping, transportation, and recreation will inevitably lead to more traffic (recreational and industrial) for many along the coastline (*19*). TCEQ is actively involved in issues related to the quality of water and environment surrounding the GIWW-T. In addition, if there were any type of oil spill or destruction of the environment due to traffic on the waterway, TCEQ would be involved as a major stakeholder. Through its Clean Rivers Program, TCEQ maintains standards of quality for all rivers, estuaries, and bays along the Texas coast.

GIWW-T STAKEHOLDER WORKING GROUP

In collaboration with TxDOT, the researchers assembled a GIWW-T stakeholder working group to provide input and feedback to the research effort. This group, which included primarily operators and federal agencies but also had shipper representation, provided the researchers with insights into what the primary concerns of users are and feedback regarding the initial findings of the researchers. Where this report refers to user or operator input, it is referring to the input of this group.

LITERATURE REVIEW

Several published academic studies explored issues related to the GIWW-T that help set the context for an understanding of the history and development of the GIWW-T and its economic importance to Texas. Alperin provided a detailed history of the development of the GIWW beginning with the early days of the country up to 1983 (*20*). Hardebeck et al. (*21*) provided useful statistical and historical information on the GIWW. Although the statistics presented in this study are now outdated, they provided insight into the types and sources of statistics that can be used in the current research effort. They also reported that several studies conducted during the first 20 years after the dredging of the Laguna Madre—one of the last reaches dredged during initial construction—found that the canal's hypersalinity was reduced in the upper and lower Laguna Madre to levels that support fish and sea grasses.

Recent studies conducted regarding potential opportunities for dredging fixes were also examined. Randall et al. provided dredging frequencies and amounts for the GIWW-T split among 18 reaches. They also provided background on the concept of beneficial uses of dredged material (*22*). Giammona et al. provided a detailed description of the various ways in which dredged material can be used beneficially (*23*).

Several studies provided GIWW-T legislative context and issues salient to its stakeholders. Roop et al. provided a summary of the state agencies that are involved with or affect the GIWW-T in some fashion and provided statistics on shoaling rates for various parts of the GIWW-T. In addition, they provided some historical insight into closures or limited uses of various parts of the GIWW-T and identified high-risk areas (*24*). Mileski et al. provided detailed insights into the state and federal agencies involved in permitting or reviewing permits for waterfront development along the GIWW-T. The report explained how encroachment affects the safety and productivity of the GIWW-T (*6*). Hardebeck et al. provided insights into chemical and petroleum companies using the GIWW-T and their reasons for doing so (*25*). Turnbull provided information on the issues of most importance to GIWW-T stakeholders and provided information on the tonnage handled along each of three GIWW-T reaches (*26*).

Academic studies regarding economic methodologies also provide useful context. Foster Wheeler Environmental Corporation provided a good, succinct explanation of the theory behind economic impact modeling and gave some information regarding the possibility of using a pipeline in lieu of the GIWW-T for shipments to and from South Texas (*27*). Siegesmund et al. provided a methodology for understanding and estimating the cost of light loading on shallow-draft operations (*28*). In studies conducted for the Corps of Engineers, Protopapas et al. documented the transportation rate savings that accrue to users of waterborne freight services (*29*).

What was not found in the literature review was that other than for very limited samples, there was no information on specific origins and destinations of cargo moving on the GIWW-T, nor was there insight into potential changes in the use of the GIWW-T or the composition of freight. There was good information on approximately 2/3 of the GIWW-T placement areas (dredged material disposal sites), but approximately 1/3 (placement areas between Galveston and Corpus Christi) had almost no descriptive information at all. Most of the studies done on the GIWW-T incorporated very little input from the shippers; the studies were primarily based on public data and contacts with the barge industry.

PROJECT BACKGROUND/IMPORTANCE OF THE GIWW-T

History[6]

In 1873, the federal government enacted legislation that appropriated funding for a survey to "connect the inland waters along the margin of the Gulf of Mexico"; this action marked the beginning of the waterway's formal development (*30*). The Rivers and Harbors Act in 1925 authorized, for the first time, a continuous Louisiana–Texas waterway from New Orleans to Galveston. Two years later, Congress authorized construction of an extension of this canal west to Corpus Christi.

After two decades of inactivity, legislation was passed in 1942 that authorized an enlarged channel extending from Florida west to the vicinity of the Mexican border. World War II provided the impetus to take the next step in the growth of the main channel. The movement of personnel, troops, and defense materials emphasized the need for protected inland transportation. The presence of German submarines along the Eastern and Gulf Coast of the United States demonstrated the extreme vulnerability of coastal traffic; German vessels sank more than two dozen merchant ships in the Gulf of Mexico, severely disrupting commerce. Towboats, tugs, and barges, pressed into service on the protected inland waterways, moved tremendous quantities of strategic commodities essential to wartime production. For purposes of national defense, Congress authorized enlargement of the entire waterway and its extension from its eastern terminus at Apalachee Bay in Florida to the vicinity of the Mexican border. The project was given such a high priority that by 1945, a continuous waterway with minimum dimensions of 12 ft deep by 125 ft wide extended from Carrabelle, Florida, to Corpus Christi, Texas. The final expansion cut was made and the channel was opened on June 18, 1949, affording a continuous inland water route from Carrabelle, Florida, to Brownsville, Texas.

The Brazos River Floodgates were completed in 1943, followed by the Colorado River Floodgates within the next year. Between the early 1950s and 1957, the Corps converted the Colorado River Floodgates into locks. The Brazos Floodgates and Colorado Locks are still in place today. In the decades that followed, continued maintenance and a few rehabilitation projects were conducted on the GIWW-T through omnibus federal legislation authorized about every 5–7 years.

Enacted into law in 1975, the Texas Coastal Waterway Act, as amended (codified as Chapter 51 of the Texas Transportation Code), provided several specific guidelines that establish context for the relationship between the GIWW-T and TxDOT. This act established Texas as a non-federal sponsor of the GIWW-T for the purposes of:

- Supporting the state economy and commerce.
- Avoiding wasting natural resources in the state.
- Minimizing negative environmental impacts.
- Maintaining state wildlife and fisheries.

[6] See Appendix A for a complete legislative history of the GIWW-T.

Section 3 stipulates, “In recognition of the economic benefits to the state of the Gulf Intracoastal Waterway, this state shall act as the non-federal sponsor of the main channel of the Gulf Intracoastal Waterway from the Sabine River to the Brownsville Ship Channel.”

Also specified in this legislation is the extent to which the Texas Transportation Commission should cooperate with other agencies with respect to the GIWW-T. Section 4 requires that “the commission shall cooperate with the Department of the Army, other federal and state agencies, navigation districts, port authorities, counties, and other appropriate persons to determine the state’s federal local partnership requirements relating to the Gulf Intracoastal Waterway.” Finally, this law specifies the process for acquiring land for dredged material disposal and the process for who will be responsible for establishing contracts for that land. Due to the current structure of federal law concerning the GIWW-T, the state can support the Department of the Army and other federal agencies only with the acquisition of dredged material disposal sites required for maintaining the waterway.

In 2001, the Army Corps of Engineers entered into a memorandum of agreement with the Texas GLO describing the conditions under which dredged material could be placed on beaches and coastal shore areas. Through this agreement, GLO is responsible for supplying right-of-way, land, or easements that the federal government deems necessary; in addition, GLO must pay any discrepancy between the estimated cost of dredging and material disposal and the actual cost of performing these actions. Actions the state takes that are related to fulfilling the non-federal sponsorship duties outlined in this agreement are at no cost to the Corps of Engineers and the federal government (*31*).

Importance

Originally constructed to facilitate dry bulk commodity trade between Texas ports and bolster defense during World War II, the GIWW-T has become an integral component to the extensive supply chains of Texas petrochemical and manufacturing industries. The GIWW-T’s high levels of vessel traffic reflect its importance to Texas’ economy.

The type of freight transportation that takes place on the GIWW-T is referred to as inland towing or inland barge transportation. The navigable portion of the GIWW-T begins at Texaco Island in Port Arthur and ends at the Brazos Island Harbor Ship Channel near Brownsville, Texas, a length of 379 miles. The GIWW-T links together 11 deep-draft ports (25 ft or deeper) and 13 shallow-draft channels. Figure 1 provides a map of the GIWW-T and the coastal counties that directly or indirectly benefit.

Figure 1. GIWW-T Location.
Source: Texas Department of Transportation (*1*).

Traffic on the GIWW-T is composed of fishing boats, barges, light transport freighters, and towboats. GIWW-T private-sector stakeholders are diverse, with representatives in the petrochemical, manufacturing, agriculture, and fishing industries that all depend on its continued use for navigation. From a transportation modal comparison perspective, the GIWW-T is unique because it encourages goods movement that is economical and generates fewer externalities relative to other freight transportation modes. As shown in Figure 2, one inland barge can carry the unit dry cargo equivalent of 16 rail cars or 70 trucks. A tank barge can carry the equivalent of 46 rail cars or 144 trucks (*32*).

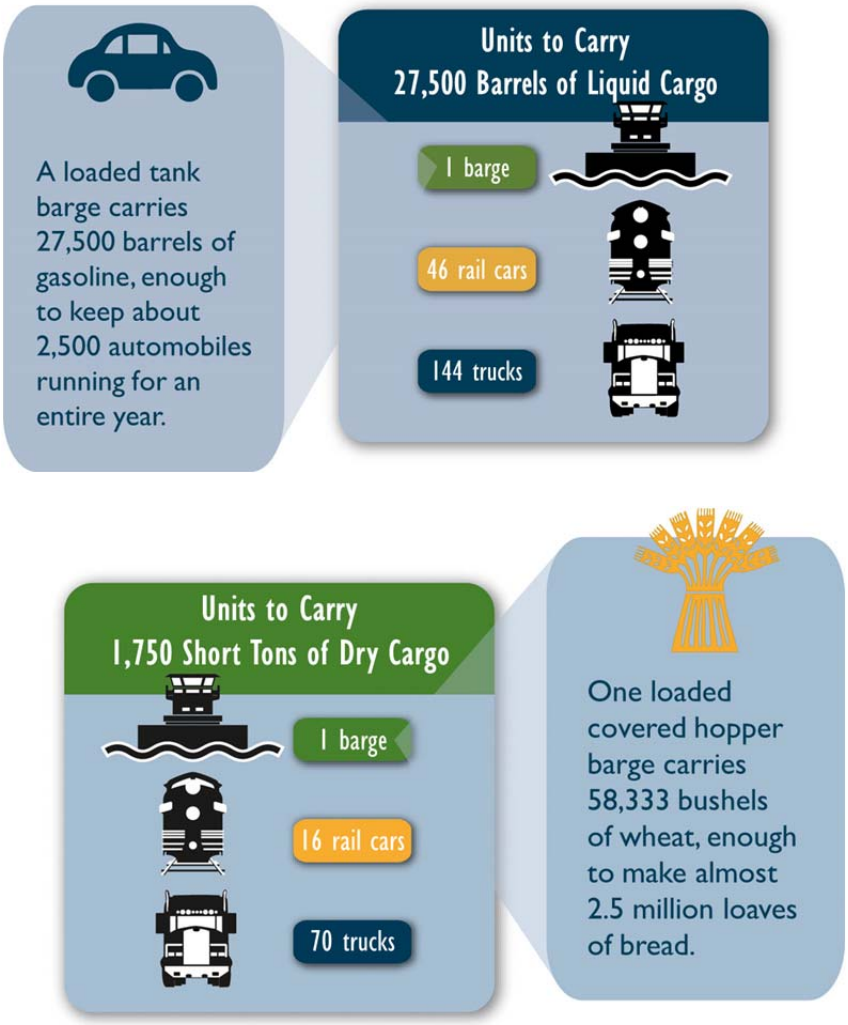

Figure 2. Comparison of Transport Unit Capacity.
Source: TTI (*32*).

In addition to its advantage in transport unit capacity, inland towing is also a highly fuel-efficient transportation mode. Figure 3 shows that inland barge transportation can yield 616 ton-miles per gallon of fuel, which is 310 percent greater than the truck mode.

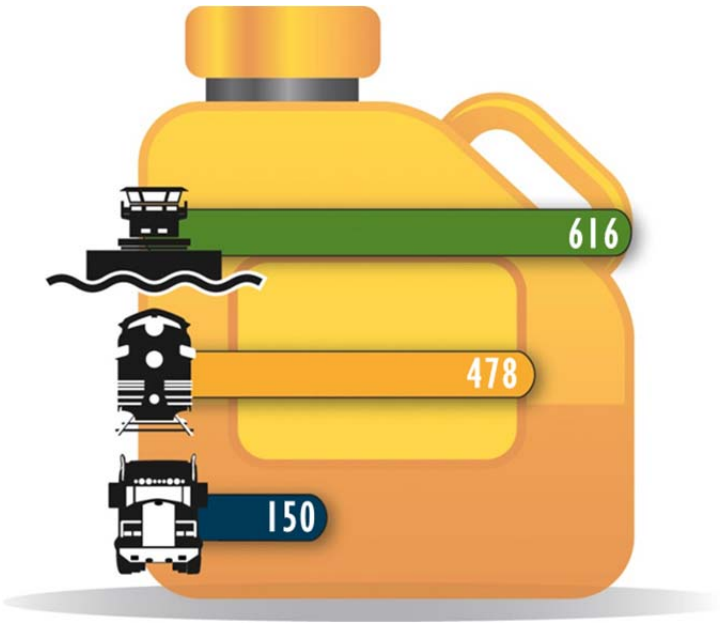

Figure 3. Ton-Miles Traveled per Gallon of Fuel.
Source: TTI (32).

Inland barge transportation also has several environmental advantages over truck and rail transportation. Figure 4 shows that the rate of spills in gallons per million ton-miles for tank barges was less than 1/3 of what was experienced for tank truck freight transportation. The GIWW-T is associated with additional environmental benefits. Table 3 shows that inland towing produces significantly fewer emissions per ton-mile than other freight transportation modes.

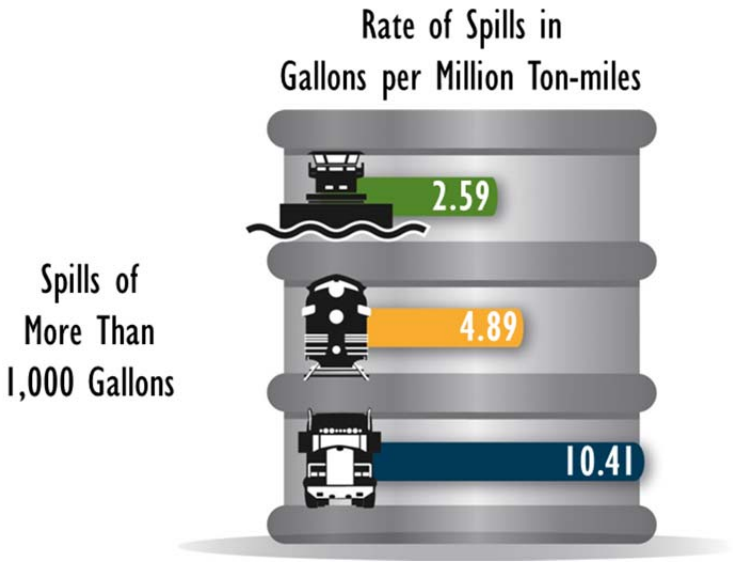

Figure 4. Comparison of Spill Rates.
Source: TTI (32).

Table 3. Summary of Emissions (Grams per Ton-Mile) 2009.

Mode	Emissions (grams/ton-mile)				
	Hydrocarbons (HC) or Volatile Organic Compounds (VOC) for Truck	Carbon Monoxide (CO)	Nitrogen Oxides (NO_x)	Particulate Matter (PM-10)	Carbon Dioxide (CO_2)*
Inland Towing	0.014123	0.0432	0.27435	0.007955	16.41
Railroad	0.018201	0.0556	0.3536	0.010251	21.14
Truck	0.10	0.37	1.45	0.06	171.83

Note: Source: TTI (32).
** CO_2 emissions for railroads were calculated on a system-wide basis.*

Finally, inland towing is the safest mode of freight transportation. Figure 5 shows that the rate of injuries per million ton-miles for inland towing is significantly lower than truck freight and railroad freight movement.

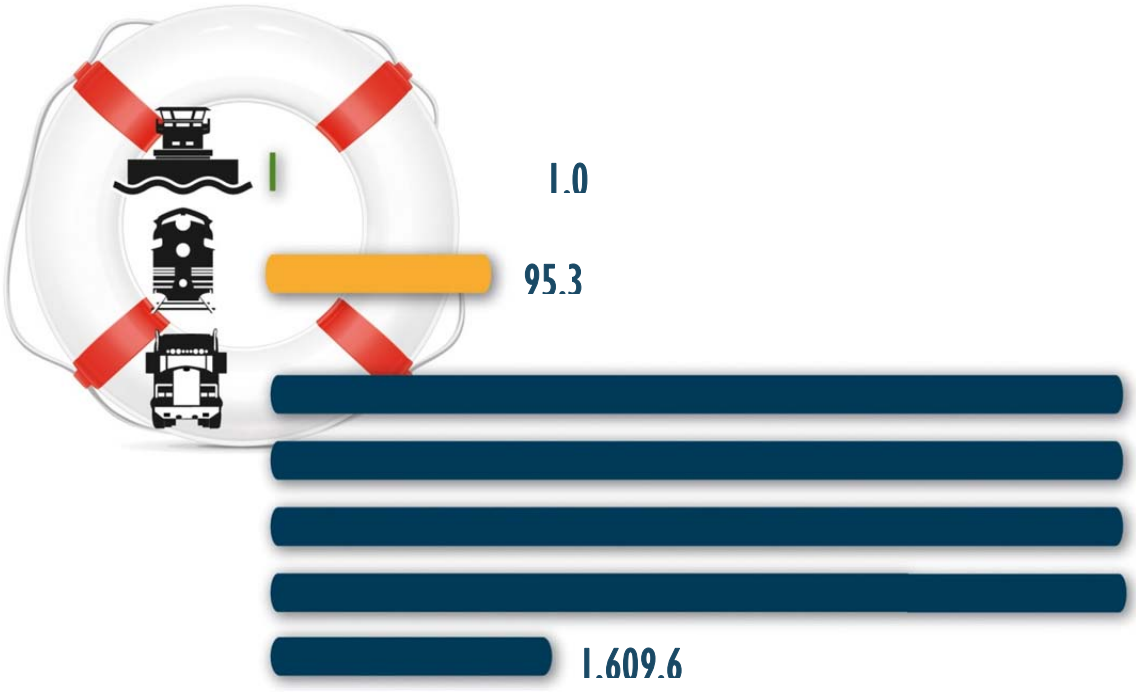

Figure 5. Rate of Injuries per Million Ton-Miles.
Source: TTI (32).

Several academic studies have quantified the importance of the GIWW-T; however, few to date have examined the economic benefit potential from a properly maintained GIWW-T. These studies find that the GIWW-T plays a large role in facilitating commerce throughout the Texas Gulf Coast region. Furthermore, the GIWW-T is especially important for some of the state's most important industries. In 2012, nearly 78 million short tons were moved on the GIWW-T, with 91 percent falling within the categories of petroleum and chemical-related products. Considering both deep- and shallow-draft waterways, in 2012 Texas ranked second in the United States for total waterborne tonnage moved with 486 million tons of cargo and more than 1/5 of the total U.S. maritime freight and vessel volume on its waterways. (*2*)

However, the GIWW-T is currently not maintained to its proper dimensions, despite strong evidence supporting the integral role it plays in facilitating commerce. As would be the case with any highly utilized transportation asset, failing to maintain the GIWW-T at authorized dimensions could present long-term challenges that could result in lost economic productivity.

In terms of economic importance, the GIWW-T is one of the most highly utilized corridors in the U.S. inland waterway commerce network. Along the waterway, manufactured goods, farm products, machinery, petroleum products, and chemicals are transported into and out of the region.

The ports of Texas are significant to the local, national, and international economies on a large scale because of the refineries located along the coast and the amount of petroleum imported and exported. In 2012, a total of 78 million tons[7] were transported over the GIWW-T—an increase of 23 percent over 2002 total tonnage. Petroleum and petroleum products comprised 67 percent by tonnage of all commodities moved through the GIWW-T. Petroleum/petroleum products and chemicals together comprised 90 percent of all commodities. From 2002–2012, the Corps Institute for Water Resources reported an average of 5 percent annual increase in short tons of petroleum and petroleum products transported through the GIWW-T (*33*). Figure 6 illustrates the tonnage growth from 2002–2012 for the top three commodities along the waterway (*4*).

[7] Note that this is not the sum of tonnage moved in each reach of the GIWW-T, as goods are counted within every reach they transit during a single trip (causing double or triple counting).

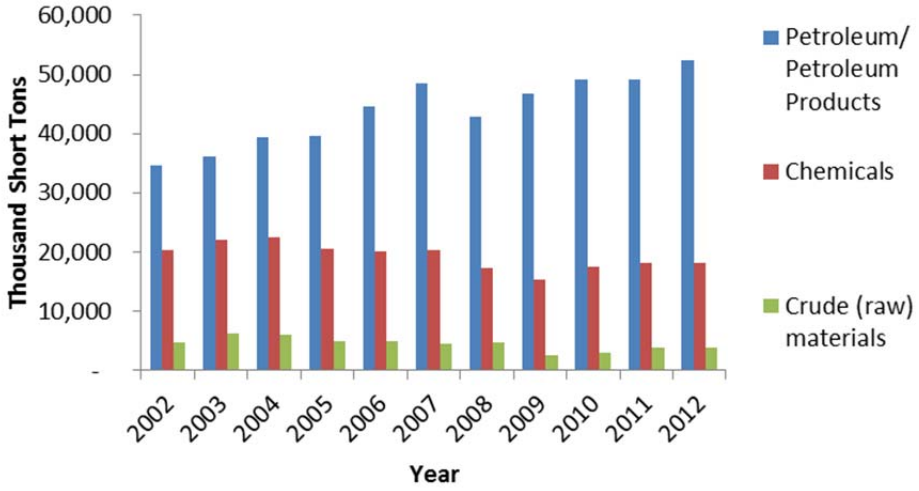

Figure 6. GIWW-T Top Three Commodities 2002–2012.
Note: "Chemicals" refer to fertilizers, alcohols, acids, liquid sulfur, etc.
Source: U.S. Army Corps of Engineers Institute for Water Resources (*33*).

A characteristic unique to the GIWW-T is the relatively large proportion of petroleum and petroleum products transported relative to other commodities. In 2012, petroleum and petroleum products comprised nearly 52.4 million tons, compared to chemicals (18.2 million tons) and crude (raw) materials (3.9 million tons). Other commodities transported on the GIWW-T include:

- Coal.
- Primary manufactured goods.
- Food and farm products.
- Manufactured equipment and machinery.
- Waste and scrap products.

These other commodities collectively made up 3.4 million tons, representing only 4 percent of the total 2012 commodity tonnage.

Table 4 shows the tonnage of each commodity transported in 2002, 2007, and 2012 on the GIWW-T.

Table 4. Tonnage for GIWW-T Commodities.

Commodities (thousand short tons)	2002	2007	2012
Coal	75	197	54
Petroleum/petroleum products	34,662	48,452	52,426
Crude (raw) materials	20,314	20,434	18,237
Primary manufactured goods	4,713	4,518	3,928
Chemicals	1,536	2,403	2,154
Food and farm products	957	413	433
Manufactured equipment/machinery	356	177	165
Waste/scrap	686	684	591
Total	63,299	77,278	77,988

Figure 7 is an illustration of how important the GIWW-T is to the flow of commerce along the Texas coast.

A recent incident illustrates just how important the GIWW-T is. On March 22, 2014, at 12:35 p.m., a collision occurred in the Houston Ship Channel just inside the junction known as the Texas City "Y." This is an extremely busy intersection of various shipping lanes—both deep sea and shallow draft.

In response to the spill, the U.S. Coast Guard established a safety zone, which only authorized vessels were allowed to enter. This effectively shut down all marine traffic in the area. Towboat transits decreased dramatically from an average of 86 per day to 21 on the day of the incident, two on the day after, and none on the second day after. On the third day after the accident, traffic was allowed to resume at a measured pace, and on the fourth day, March 26, the restrictions were removed.

Thirty-seven tows that were under way at the time of the incident were delayed. The estimated increase in operating costs was $785,000. An additional 244 tows had to be postponed while the security zone was in effect. For comparison purposes, these postponed shipments were the equivalent of almost 21,000 truckload shipments.

The Coast Guard required 32 towboats to be decontaminated. The decontamination process was a fairly simple one consisting of a basic power wash—no chemical additives were required. For reasons of confidentiality and pending litigation, it was not possible to determine the cost of decontamination.

Refineries depend on both shallow-draft and deep-draft vessels to supply them with feedstock and to move their products out. Typically, they hold enough feedstock to keep the operation going for three to five days without any shipments. In this case, the closure was just over three days. While ExxonMobil reported slowing down production, no refinery was forced to close. Refinery shutdowns and restarts are extremely long and costly processes. Had any of the refinery units been shut down, it would have had an immediate effect on the national economy.

Figure 7. March 22, 2014, Collision and Oil Spill.

The GIWW-T has historically been divided into three segments (reaches):

- Upper reach—Sabine River to Galveston.
- Middle reach—Galveston to Corpus Christi.
- Lower reach—Corpus Christi to Brownsville.

Upper Reach

The upper reach extends 69 miles from the Texaco Island near Port Arthur to Galveston, Texas, and includes several ports. In addition to serving commercial interests, the section provides residents of Bolivar Island access to Galveston Island and an emergency escape route for hurricane evacuation. Figure 8 shows a map of this reach.

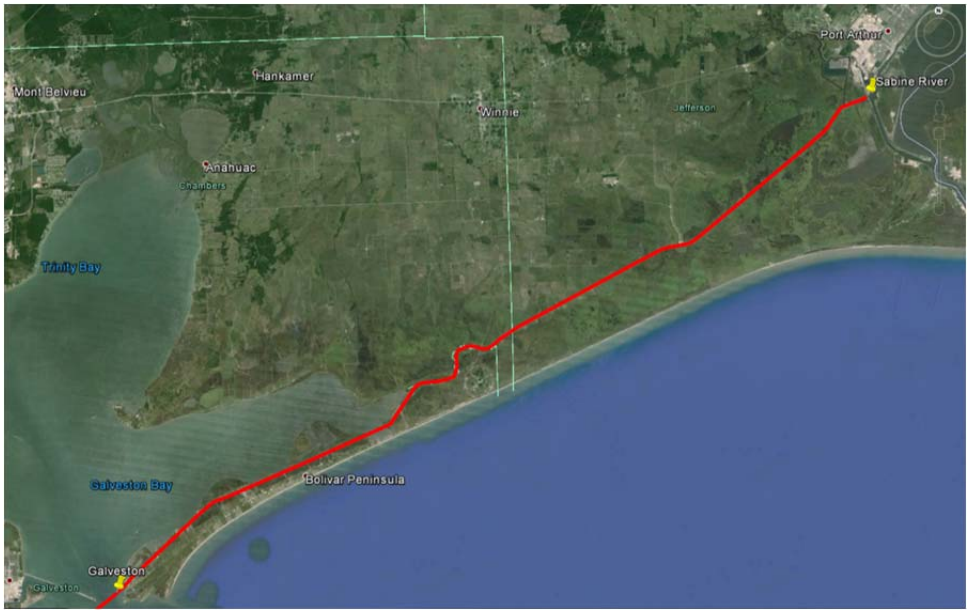

Figure 8. GIWW-T Upper Reach from Sabine River to Galveston.
Source: Google® Earth.

In 2012, nearly 60 million tons were transported along this reach, representing a 1.1 percent increase in total tonnage compared to 2011 and a 28 percent increase since 2002. From 2002–2012, the top two commodities shipped along this section were petroleum/petroleum products and chemicals. Petroleum and petroleum products comprised nearly 69 percent of the tonnage transported in 2012. Figure 9 illustrates the annual tonnage for the top three commodities transported on this GIWW-T section from 2002–2012.

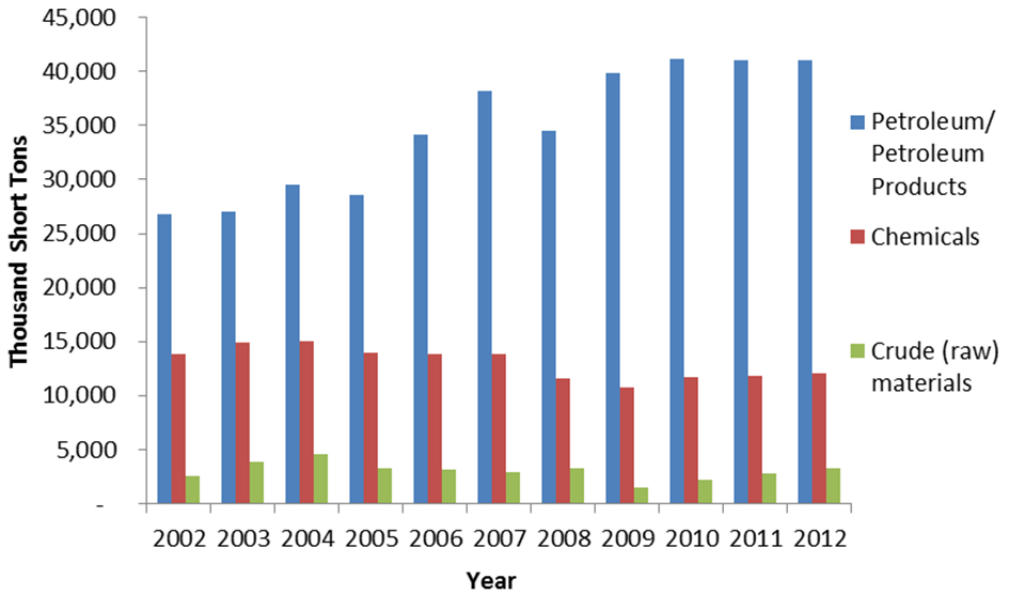

Figure 9. Sabine River to Galveston Top Three Commodities Transported 2002–2012.
Source: U.S. Army Corps of Engineers Institute for Water Resources (*33*).

Chemicals accounted for just over 20 percent of the tonnage at 12 million short tons moved along this section in 2012, a decrease from over 30 percent in 2002 at nearly 13.8 million short tons. From 2002–2012, petroleum/petroleum products and chemicals combined comprised over 87 percent of the tonnage transported along the waterway stretch.

Other commodities transported through this reach include:

- Coal.
- Primary manufactured goods.
- Food and farm products.
- Manufactured equipment and machinery.
- Waste and scrap.

Table 5 shows the tonnage of each commodity transported in 2002, 2007, and 2012 in the region. Note that the sum of tons of goods moved in each reach will not match that of the GIWW-T overall, as goods are counted within every reach they transit during a single trip, causing double or triple counting.

Table 5. Tonnage for GIWW-T Upper Reach Commodities.

Commodity (thousand short tons)	2002	2007	2012
Coal	68	146	30
Petroleum/petroleum products	26,734	38,218	41,090
Chemicals	13,803	13,824	12,006
Crude (raw) materials	2,513	2,850	3,221
Primary manufactured goods	1,528	2,394	2,152
Food and farm products	885	407	433
Manufactured equipment/machinery	205	125	55
Waste/scrap	686	681	591
Total	46,422	58,645	59,578

Note: Source: U.S. Army Corps of Engineers Institute for Water Resources (*33*).

In 2012, these commodities, with the exception of the top three, had a combined total of 5 percent of all tonnage transported through the upper reach.

Middle Reach

The middle reach of the GIWW-T extends from Galveston Bay to Corpus Christi, a length of 183 miles. Notable landmarks on this reach include the Brazos River Floodgates and the Colorado River Locks. Figure 10 illustrates this reach.

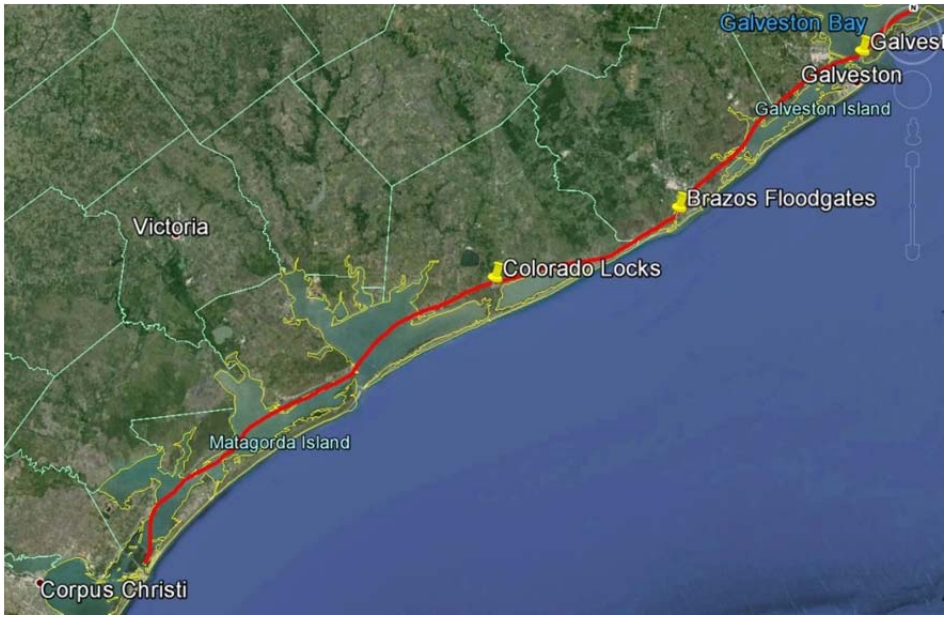

Figure 10. GIWW-T Middle Reach from Galveston to Corpus Christi.
Source: Google Maps.

In 2012, this central reach accounted for 29 million tons, with petroleum/petroleum products comprising the largest share of commodities transported. Figure 10 shows that several ports on this reach of the GIWW-T are in close proximity to significant generators of petroleum commodity traffic, such as the refineries at Texas City, Freeport, and Port Lavaca. Figure 11 illustrates the annual tonnage for the top three commodities transported on this GIWW-T section from 2002–2012.

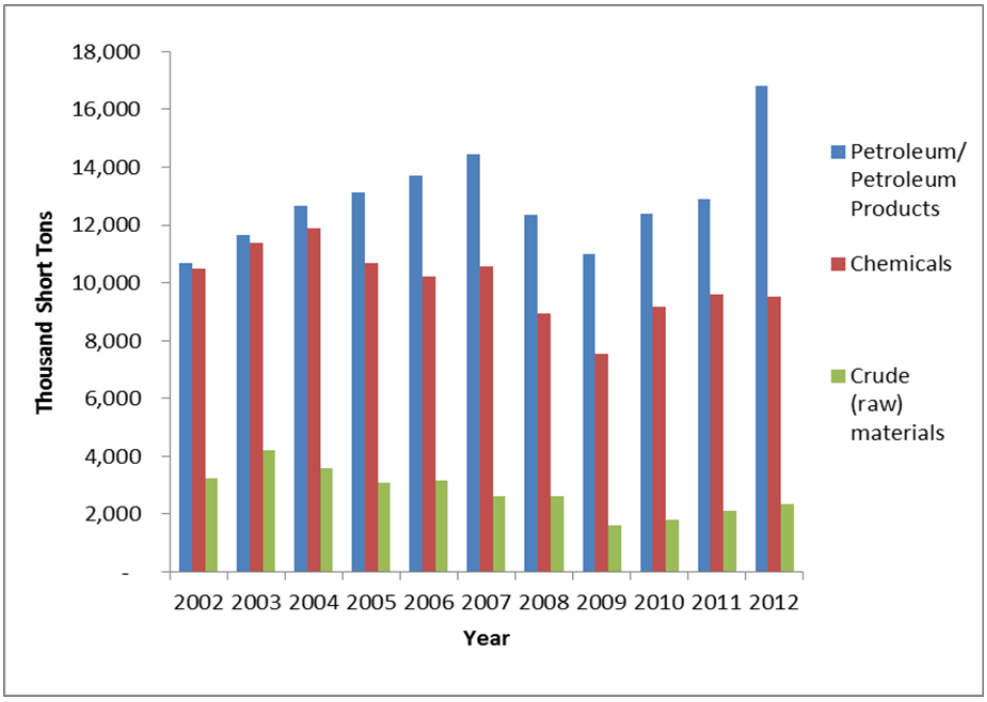

Figure 11. Galveston to Corpus Christi Top Three Commodities Transported 2002–2012.
Source: U.S. Army Corps of Engineers Institute for Water Resources (*33*).

In addition to the three major commodities, other commodities transported along this reach include:

- Coal.
- Primary manufactured goods.
- Food and farm products.
- Manufactured equipment and machinery.
- Waste and scrap.

Table 6 shows the tonnage of each commodity transported in 2002, 2007, and 2012 in the middle reach. Note that the total tons of goods moved in each reach will not match that of the GIWW-T overall, as goods are counted within every reach they transit during a single trip, causing double or triple counting.

Table 6. Tonnage for GIWW-T Middle Reach Commodities.

Commodity (thousand short tons)	2002	2007	2012
Coal	17	89	30
Petroleum/petroleum products	10,698	14,462	16,825
Chemicals	10,484	10,561	9,506
Crude (raw) materials	3,222	2,610	2,356
Primary manufactured goods	265	392	231
Food and farm products	467	330	248
Manufactured equipment/machinery	159	55	118
Waste/scrap	45	41	N/A
Total	25,357	28,540	29,314

Note: Source: U.S. Army Corps of Engineers Institute for Water Resources (*33*).

With the exception of the top three commodities, all other commodities combined accounted for 2 percent of the total tonnage transported through the middle reach.

Lower Reach

Figure 12 shows that the lower reach stretches from the Port of Corpus Christi, past Baffin Bay, and behind Padre Island down to the Port of Brownsville.

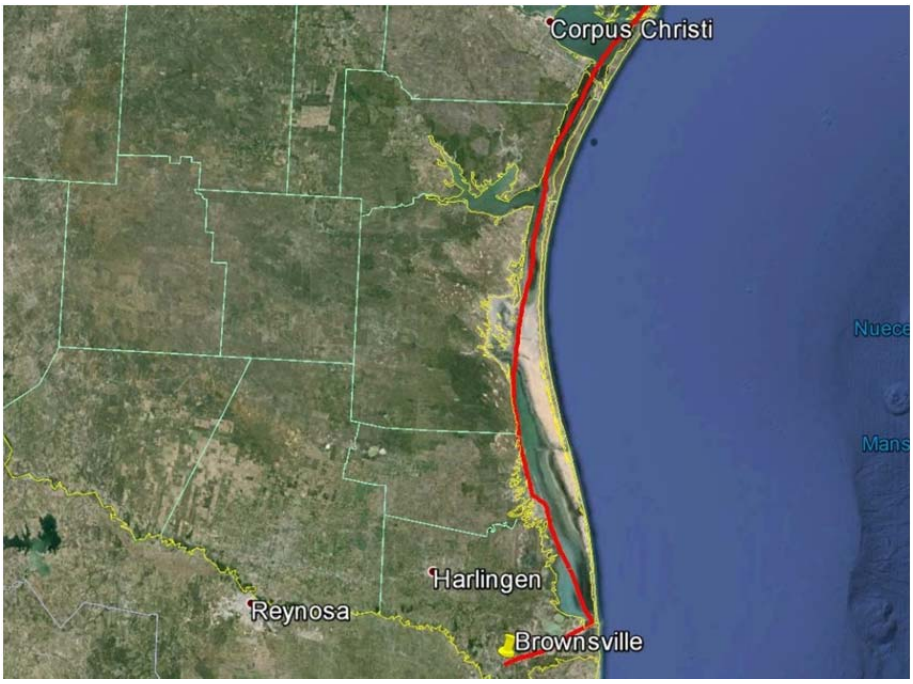

Figure 12. GIWW-T Lower Reach from Corpus Christi to Brownsville.
Source: Google Maps.

In 2012, this reach accounted for 1.9 million tons transported. At 47 percent of all commodities, petroleum and petroleum products were the items transported the most during that year. Corpus Christi has three refineries that generate most of the traffic in the aforementioned percentage.

The second and third most transported commodities were primary manufactured products (e.g., concrete, cement, iron) and crude (raw) materials (e.g., soil, stone, ores, salt) at 23 percent and 11 percent, respectively. Figure 13 shows the top three commodities transported in the reach from 2002−2012.

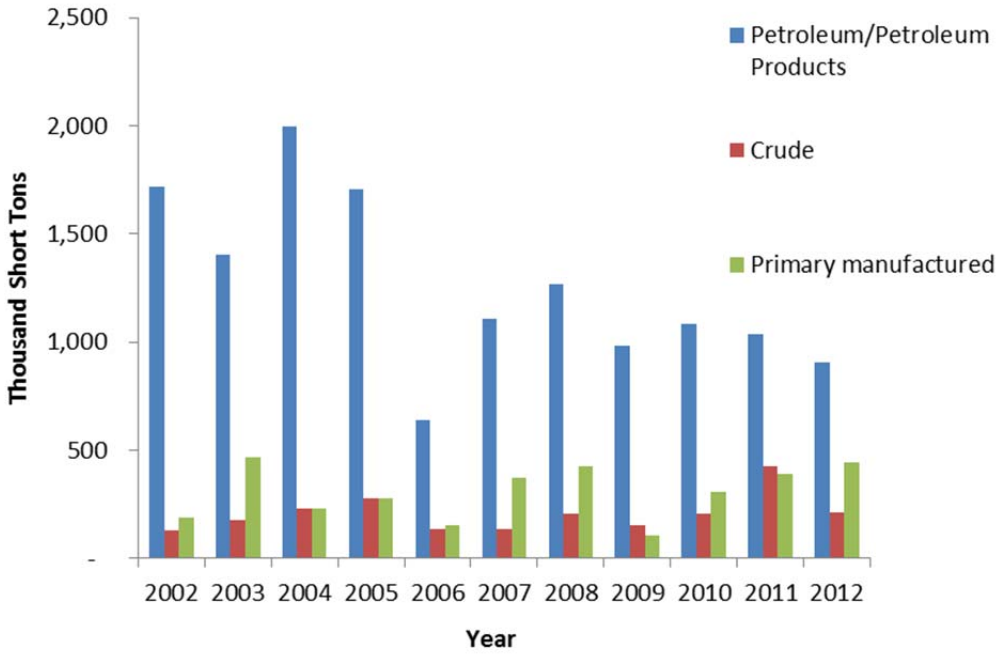

Figure 13. Corpus Christi to Brownsville Top Three Commodities Transported 2002–2012.
Source: U.S. Army Corps of Engineers Institute for Water Resources (*33*).

Other commodities transported in the reach include:

- Coal.
- Chemicals.
- Food and farm products.
- Manufactured equipment and machinery.

Table 7 shows the tonnage of each commodity transported in 2002, 2007, and 2012 in the lower reach. Note that the total tons of goods moved in each reach will not match that of the GIWW-T overall, as goods are counted within every reach they transit during a single trip, causing double or triple counting.

Table 7. Tonnage for GIWW-T Lower Reach Commodities.

Commodities (thousand short tons)	2002	2007	2012
Coal	2	7	3
Petroleum/petroleum products	1,718	1,110	906
Crude (raw) materials	129	137	211
Primary manufactured goods	186	375	443
Chemicals	98	152	231
Food and farm products	172	168	126
Manufactured equipment/machinery	1	N/A	N/A
Total	2,306	1,949	1,920

Note: Source: U.S. Army Corps of Engineers Institute for Water Resources (*33*).

With the exception of the three commodities previously shown in Figure 13 and Table 7 (petroleum/petroleum products, crude [raw] materials, and primary manufactured goods), these commodities combined accounted for 29 percent of all commodity tonnage transported along the reach in 2012.

FUTURE OF THE GIWW-T

Most forecasts predict that waterborne freight tonnage in Texas (deep and shallow draft) is expected to increase. Figure 14 shows that by 2035, the average overall tonnage for Texas seaports is expected to grow by at least 50 percent (of 2008 tonnage) to more than 800 million tons.

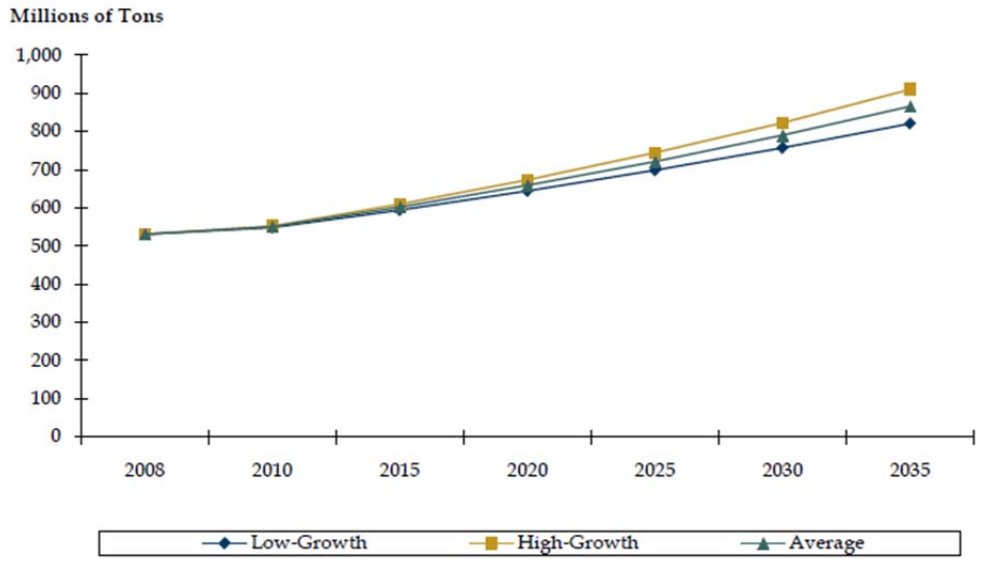

Figure 14. Statewide Waterborne Tonnage Forecasts to 2035.[8]
Source: Texas Waterborne Freight Corridor Study (*3*).

[8] In 2008, Cambridge Systematics conducted this forecast, which does not include freight impacts attributed to recent growth in oil and natural gas activity experienced along the Texas Gulf Coast.

With regard to the GIWW-T (shallow draft), current forecasts also suggest tonnage will increase. For example, a study completed in 2010 by Cambridge Systematics shows that total freight volumes could increase by 45 percent by 2035 (*3*).

The most significant development expected to have a strong influence on GIWW-T traffic is the Eagle Ford Shale play in South/Central Texas. The U.S. energy sector has seen a recent boom in activity, brought about in large part by recent advancements in oil and natural gas extraction technology. For example, in 2014, oil and gas production in the United States is projected to match its peak production year of 1970, when it reached 9.6 million barrels per day. In 2008, U.S. oil production stood at 5 million barrels per day, but by the summer of 2013, this figure had risen to 7.5 million.

In Texas, the Eagle Ford Shale, an oil and gas play located near the state's Gulf Coast, is quickly becoming an important area for the state's growing energy economy. The race to extract these new South Texas reserves began in 2007 and is the result of recent advancements in technology, favorable oil and natural gas prices, and ready access to the Gulf Coast (*34*). As of January 2014, the Eagle Ford Shale play produced 1.2 million barrels of crude oil per day, representing an increase of 41 percent from January 2013, when 849,000 barrels per day were produced. Natural gas production from the Eagle Ford Shale play has also seen similar growth. From January 2013 to January 2014, natural gas production increased by 34 percent, from 4.6 million cubic ft per day in January 2013 to 6.1 million cubic ft in January 2014. Figure 15 shows the production statistics for Eagle Ford Shale oil and natural gas.

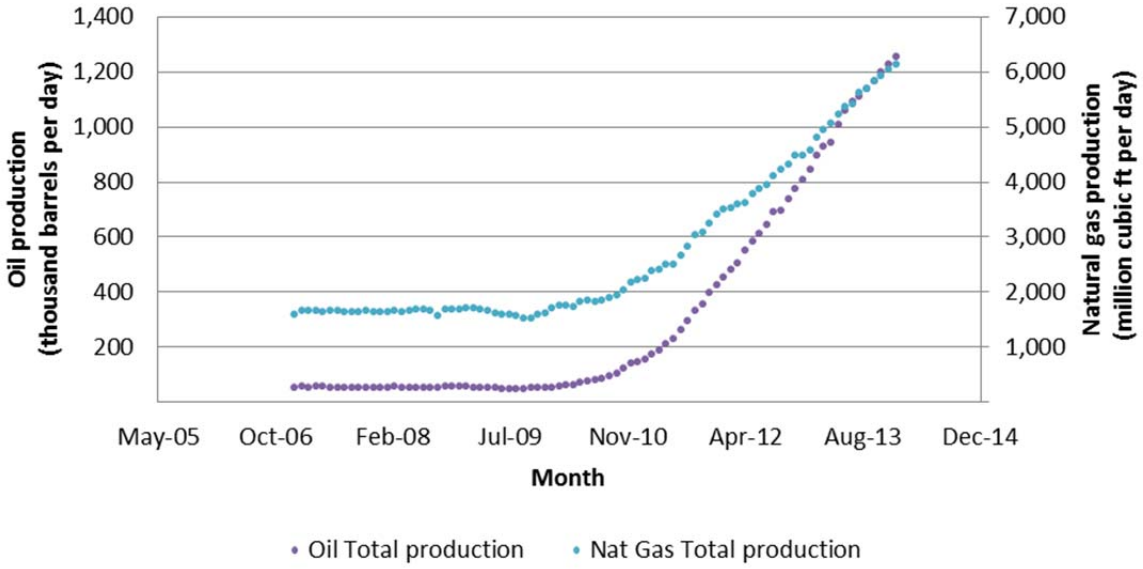

Figure 15. Daily Oil Production for the Texas Eagle Ford Shale Play.
Source: Energy Information Administration (35).

While no government forecast data are currently available, several firms with energy-sector expertise have offered their independent projections for Eagle Ford Shale production. Jefferies & Company, an investment banking firm specializing in oil and gas data analytics, announced in October 2013 that it expects Eagle Ford oil production to peak in 2022 at around 1.8 million

barrels per day and then start to decline from there (*4*). This represents an increase of 547,000 barrels per day compared to January 2014 production statistics.

Using these assumptions, it is possible to estimate possible growth in demand for barge transportation as a result of continued activity in the Eagle Ford Shale play for peak production in 2022. For example, the following can be calculated for oil production:

$$\frac{1.8\ million\ barrels/day\ in\ 2022 \times 365\ days \times 306\ lb/barrel}{2000\ lb}$$

$$= 100.5\ million\ tons/year\ by\ 2022 \qquad \text{(Eq. 1)}$$

According to data obtained from the Energy Information Administration, in 2012, around 4 percent of U.S. refinery receipts of crude oil were transported by barge. Assuming this transportation mode share remains unchanged, the *increase* in crude oil transported by barge from the Eagle Ford Shale play could be calculated as follows:

$$\frac{547{,}000\ additional\ barrels/day\ in\ 2022 \times 365\ days \times 306\ lb\ /barrel}{2000\ lb} \times 4\%$$

$$= 1.2\ million\ additional\ tons/year\ by\ 2022 \qquad \text{(Eq. 2)}$$

As shown in the calculation above, it is estimated that as the activity in the Eagle Ford Shale increases over the next several years, so will barge activity along the GIWW-T. For example, in 2022, it is estimated that an additional 1.2 million tons, or an additional 445 barges,[9] will be transported via the GIWW-T.

Furthermore, as a result of this increased activity, companies are also increasingly investing along the Texas Gulf Coast. According to the American Chemistry Council, U.S. petrochemical companies recently announced a proposed 100 new major projects worth a total of $71 billion, with many planned along the Texas Gulf Coast. The following list provides a brief review of recently announced plans for investment along the Texas Gulf Coast:

- Chevron Philips currently has a $5 billion project in Baytown, Texas, and received an air quality permit in January for a cracker plant in Cedar Bayou, Texas.
- Cheniere Energy announced that its wholly owned subsidiary, Corpus Christi Liquefaction, LLC, will develop a $10 billion liquefied natural gas export terminal at one of its existing sites previously used for a regasification terminal (*36*).

[9] Assumes one barge can transport 2,694 tons, as explained in Appendix B: The Effect of Light Loading, GIWW-T Reach Analysis.

- M&G Group, one of the largest producers of thermoplastic resins used for packages and soft drink bottles, announced that it will invest $900 million for two facilities located in Corpus Christi.
- Tianjin Pipe Corporation started construction on a $1 billion Corpus Christi facility that will manufacture seamless pipes for the oil and gas industry.
- Voestalpine plans to invest $700 million in Corpus Christi to produce two million tons of iron annually and plans to use natural gas from the Eagle Ford Shale play to power the plant.
- Kinder Morgan Energy Partners LP has a $430 million crude oil expansion project under way at its Bostco site along the Houston Ship Channel. Kinder Morgan is investing $75 million to build five new tanks for refined products and $170 million to purchase 42 acres for new storage facilities.
- Targa Resources Partners is in the process of investing $480 million in increase capabilities at its Galena Park site along the Houston Ship Channel.
- Odfjell NA on the Houston Ship Channel is adding 10 natural gas storage tanks for natural gas liquids derivative chemicals (*37*).

Other private-sector announcements suggest Texas Gulf Coast waterborne freight demand will increase. On example is that the Port of Corpus Christ designed and constructed improvements to the Viola barge dock to accommodate four 30,000-barrel tank barges, with Plains Eagle Ford installing utilities and equipment to load and unload the barges (*38*).

ORGANIZATION OF REPORT

The remainder of this report looks at the physical characteristics and the most important issues affecting the efficiency and safety of the GIWW-T. Funding issues are also discussed.

Chapter 2 discusses the lack of maintenance dredging and the effect it has on GIWW-T barge operations as well as the status of the GIWW-T placement areas, the issue where TxDOT is currently directly involved.

Chapter 3 discusses the condition and issues relating to the infrastructure associated with the waterway. Specifically, the Brazos River Floodgates, fleeting areas, and mooring areas are discussed in detail. Other structures are also documented, but they are not discussed in detail because:

- The needed projects are already well under way.
- The users of the GIWW-T indicated they were not a major concern.

Chapter 4 discusses potential funding scenarios. It estimates the level of funding that might be required and then looks at possible sources.

Chapter 5 provides some performance metrics that TxDOT might use to monitor the condition and utilization of the GIWW-T.

Chapter 6 provides the conclusions and recommendations of this research effort.

The appendices provide the following additional information on several topics mentioned in the report:

- Appendix A: Selected Milestones and Legislative History of the GIWW.
- Appendix B: Texas Administrative Code: GIWW Advisory Committee.
- Appendix C: The Effect of Light Loading.
- Appendix D: Calculation of Towboat Costs.
- Appendix E: Standard Operating Procedure—Department of the Army Permit Evaluation of Setbacks along the Gulf Intracoastal Waterway.
- Appendix F: AICPA Dimensions of Tax Equity and Fairness.
- Appendix G: History of the Florida Inland Navigation District (FIND).

A master plan based on this research is contained in a separate document titled *Master Plan for the Gulf Intracoastal Waterway in Texas*.

CHAPTER 2: GIWW-T DREDGING

BACKGROUND

This chapter has three main objectives:

- Document the status of existing placement area sites for dredged material coming from the main channel of the GIWW-T.
- Assess potential environmental concerns with those placement areas.
- Assess the potential for beneficial uses (BUs) of the dredged material.

To accomplish these objectives, TTI researchers:

- Reviewed a number of studies and reports focused on dredging and placement areas.
- Discussed the findings with Corps Galveston District personnel to verify the data.

The studies that were reviewed included:

- Analysis of Rollover Pass Impacts to Adjacent Beaches and the Littoral System (2010).
- Beneficial Use of Dredged Material in the Galveston District (PowerPoint, 2012).
- Beneficial Uses of Dredged Material: GIWW and HGNC Projects (PowerPoint, 2004).
- Draft Environmental Assessment, Rollover Pass Closure Project, 2010.
- Environmental Assessment, Beneficial Use of Dredged Material for Marsh Preservation in the Vicinity of Greens Lake, Galveston County, Texas, Gulf Intracoastal Waterway, Galveston Causeway to Bastrop Bayou (2007).
- Final Environmental Impact Statement, Maintenance Dredging of the Gulf Intracoastal Waterway, Laguna Madre, Texas—Nueces, Kleberg, Kenedy, Willacy, and Cameron Counties, Texas (2003).
- Gulf Intracoastal Waterway Aransas National Wildlife Refuge Dredged Material Management Plan—Draft (2000).
- Gulf Intracoastal Waterway, Texas High Island to Brazos River Dredged Material Management Plan Final Preliminary Assessment (2012).
- Gulf Intracoastal Waterway, Texas Sabine River to High Island Dredged Material Management Plan Final Preliminary Assessment (2012).
- Optimum Disposal Methods for Use on the Gulf Intercoastal (sic) Waterway (1989).
- Texas Gulf Intracoastal Waterway (GIWW) Dredged Material: Beneficial Uses, Estimating Costs, Disposal Analysis Alternatives, and Separation Techniques (2000).
- West Galveston Bay Regional Sediment Management Plan Report (2012).

Initially, TTI planned to review the Chocolate Bayou beneficial use site. However, conversations with Corps personnel revealed that this site is not associated with the dredging of the GIWW-T main channel. Sediments coming from the GIWW-T cannot be used in BU alternatives or added to the placement areas used for Chocolate Bayou Navigation Channel dredging material, and vice versa. For these reasons, the Chocolate Bayou beneficial use site was dropped from further consideration.

IMPORTANCE OF ANNUAL MAINTENANCE DREDGING

The condition of the channel has a direct bearing on the cost of barge companies using the GIWW-T. To illustrate this fact, the researchers calculated the increase in operating costs if the GIWW-T were allowed to shoal to the point that current average drafts were reduced by 1 ft. See Appendix C for more information on assumptions and base data.

Essentially the analysis reduced the draft for all current trips on the GIWW-T as a whole, leaving 6.9 million tons stranded. To move this cargo would require additional trips costing $58.7 million, representing an increase of 14.8 percent in the cost of doing business (see Appendix C for calculations). Someone must bear this additional cost. Since companies are in business to make a profit, that someone is ultimately the consumer.

These additional operating costs must be compared to the expenditures necessary to avoid them. Table 8 shows the annual cost that the Corps of Engineers has incurred for dredging the main channel of the GIWW-T.

Table 8. Annual O&M Cost Incurred by Corps of Engineers.

FY	Original Cost	Price Adjusted Cost
1998	3,486,895	5,605,207
1999	13,850,685	21,723,229
2000	14,211,153	21,839,611
2001	21,621,467	32,650,622
2002	17,641,997	25,844,236
2003	13,319,042	19,068,326
2004	12,348,604	17,104,797
2005	10,405,599	13,760,012
2006	15,248,493	19,231,619
2007	19,305,837	23,397,318
2008	12,357,249	14,473,382
2009	19,344,115	21,872,477
2010	29,510,406	32,584,667
2011	31,340,676	33,493,113
2012	14,830,603	15,218,849
Average	**$16,588,188**	**$21,191,164**

Note: This table uses Civil Works Construction Cost Index System (EM 1110-2-1304) to reflect 2013 dollars.

The average annual cost of dredging is $21.2 million. The benefit (or cost avoided) would be the potential increase in annual operating costs of $58.7 million. Therefore, the benefit-cost ratio (BCR) is 2.8:1.0.

The researchers performed an economic analysis of these dredging benefits and costs using an in-house input-output model that TTI researchers maintain. An input-output model is a quantitative economic tool that represents the interdependencies between different sectors of a national economy or different regional economies. The core of an input-output model is data

tables that describe the transaction flows among the various sectors of the economy, where the output of one sector can provide input to another. Input-output models also allow for the estimation of induced effects that arise from direct and indirect effects. A fundamental theory of this approach is that gains in employment will translate to gains in household income that by boosting consumer demand, will further stimulate the economy.[10]

The TTI input-output model estimates that the $58.7 million in avoided operating costs will result in estimated economic impacts of 119 jobs and $27.8 million in economic activity.

It is highly likely that the average annual cost of dredging would rise with a properly maintained GIWW-T since current dredging practices are insufficient. However, the BCR is high enough that dredging costs could rise significantly and still lead to a strong BCR.

DOCUMENTATION OF PLACEMENT AREAS

From 1998 through 2012, an average of 6.2 million cubic yards was dredged each year from the GIWW-T main channel. The majority of this dredged material was placed in open water bay disposal sites and confined disposal facilities.

The method of disposing of dredged material is a major factor in the cost of dredging. Typically, the dredged material is placed in approved open water or upland disposal sites. The fact that the upland (confined) disposal sites are required to satisfy increasingly stringent environmental regulations have complicated the use of such sites. Open water disposal sites are sometimes economically attractive but also face stringent environmental regulations. As these sites become full, the task of obtaining new open water disposal sites becomes more difficult because of new environmental regulations and opposition from special interest groups. In some cases, open water disposal sites are forced into much deeper waters located further offshore, and the distance offshore increases the cost of the dredging project.

TTI was able to identify 218 main channel placement areas that are available for use or are currently in use. A number of these would require environmental assessments and additional coordination with resource agencies before their use. An additional 33 placement areas (numbers in parentheses) were identified that were not being used due to:

- Recent construction of flood control gates and canal within PA (1).
- Full and not available for new material (3).
- Reserved for the Galveston Channel (1).
- Environmental issues preclude use (6).
- Not “currently viable” (2).
- EPA prohibited use in 1975 (1).
- Land has been developed and is in use by others (3).
- Set aside for Freeport Harbor dredging (3).
- No record of ever being used (2).
- Reserved for Channel to Harlingen (3).

[10] For more information or specific calculation methods, please contact TTI Senior Research Scientist Dr. David Ellis at d-ellis@tamu.edu.

- Reserved for Port Isabel (3).
- Dedicated to BU only (5).

Only two of the active placement areas (the 218 main channel PAs), PA35 and PA86, had a remaining life of less than 25 years (24 and 12, respectively). All but five of the remaining active areas had an estimated remaining life of 40 years or more.

Because of the lengthy process in acquiring new properties for placement areas, it is advisable for TxDOT to begin the acquisition process for PA86 as soon as possible. This will require coordination with the Corps' Galveston District personnel to determine the desired characteristics of the new site, especially its location. The site must be made available to the Corps with all legal and environmental requirements having been met. In most cases, an environmental assessment or even an environmental impact statement will be required, which will have to be performed under the auspices of TxDOT. The Corps usually assists with real estate issues, such as determining proper values for the land, but the onus is on TxDOT to perform all the necessary steps for the Corps to be able to use the site. The procedure for acquiring property is spelled out in Title 43, Part 1, Chapter 2, Subchapter F, Rule §2.132 of the Texas Administrative Code (TAC), which is included as Appendix B.

There does not appear to be a documented process for determining the need for TxDOT to initiate a real estate acquisition process. It would be advisable for the Corps and TxDOT to jointly prepare a procedure for identifying the need for a new placement area and the steps required to actually accomplish that acquisition.

The largest amount of dredged material placement occurs from Matagorda Bay north, but the frequency of dredging is slightly greater south of Matagorda Bay. The GIWW-T main channel is managed in segments that are roughly 5–6 miles long because that is the mechanical limitation of a dredge to economically pump dredged material to a disposal site.

Dredging data from 1999–2012 indicate that there are several hot spots on the main channel that require much more frequent dredging than other reaches (more than three dredging events in this period). They are:

- High Island to Rollover Pass.
- Galveston Causeway to Bastrop Bayou.
- Matagorda Bay (primarily alternate route).
- Aransas Bay.

In addition, there are a few more reaches that are borderline high frequency (three dredging events in the 1999–2012 period):[11]

- Rollover Pass to Galveston Causeway.
- Freeport Harbor to Brazos River.
- Upper Matagorda Bay.

[11] The mouth of the Colorado River was initially placed on this list, but Corps personnel have indicated that they have, for all practical purposes, discontinued that dredging activity.

Although it was not apparent in the data the researchers reviewed, Corps personnel indicated two additional areas that might be considered as high-maintenance reaches of the channel: the Sheryl Shoals area in the Laguna Madre, just a few miles north of Port Isabel, and the Caney Creek crossing.

Table 9 provides a list of all placement areas that are available for disposal of GIWW-T dredged material. The term "cycle" denotes the average time period between dredging events. Although a number of sites show that no readily accessible information is available, the Corps indicated that there is no capacity concern with any of these sites. Additionally, open water sites show "N/A" in the column for remaining life. Since it is open water, there is no capacity restriction; hence, the calculation of remaining life is unnecessary.

Periodically, the Corps will prepare a Dredged Material Management Plan (DMMP) for defined reaches of the GIWW-T. This plan determines the future requirements for placement areas. The Corps is currently undertaking a DMMP for the reach of GIWW-T from High Island to Brazos River Crossing. The Corps will consult with TxDOT, the non-federal sponsor, during the DMMP process.

Table 9. GIWW-T Main Channel Placement Areas.

Placement Area No.	Type	County	Rem. Life (Years)	Cycle Years	Cycle Amt.	Notes/Additional Information
1	Confined Upland	Jefferson	N/A	N/A	N/A	Reach does not historically shoal and PA is not used for other reaches
2	Confined Upland	Jefferson	N/A	N/A	N/A	Reach does not historically shoal and PA is not used for other reaches
3	Confined Upland	Jefferson	N/A	N/A	N/A	Reach does not historically shoal and PA is not used for other reaches
4	Confined Upland	Jefferson	1,720	20	17,880	No add'l coordination required for use
5	Confined Upland	Jefferson	80	20	33,880	Infrequently used, would require coordination with owner
6	Confined Upland	Jefferson	380	20	37,300	No add'l coordination required for use
7	Confined Upland	Jefferson	180	20	44,520	Infrequently used, would require coordination with owner
8	Confined Upland	Jefferson	56	7	46,242	No add'l coordination required for use
9	Confined Upland	Jefferson	28	7	51,751	Infrequently used, would require coordination with owner
10	Confined Upland	Jefferson	49	7	26,026	Infrequently used, would require coordination with owner
11	Confined Upland	Jefferson	63	7	38,717	No add'l coordination required for use
12	Confined Upland	Jefferson	28	7	60,690	Infrequently used, would require coordination with owner
13	Confined Upland	Jefferson	240	5	102,965	No add'l coordination required for use
14	Upland Partially Conf. (UPC)	Jefferson	0	5	54,090	Not available because of recent construction of flood control gates and canal within PA
15	Upland Partially Conf.	Jefferson	N/A	5	45,890	Capacities of UPCs assumed to have no engineering limitation
16	Confined Upland	Jefferson	210	5	42,000	Infrequently used, would require coordination with owner
17	Confined Upland	Jefferson	95	5	80,815	No add'l coordination required for use
18	Confined Upland	Jefferson	80	5	75,755	Infrequently used, would require coordination with owner
19	Upland Partially Conf.	Jefferson	N/A	5	81,055	Infrequently used, would require coordination with owner
20	Upland Partially Conf.	Jefferson	N/A	5	156,880	No add'l coordination required for use
21	Confined Upland	Jefferson	N/A	N/A	N/A	Infrequently used, would require coordination with owner
22	Confined Upland	Jefferson	55	5	39,380	Infrequently used, would require coordination with owner
23	Confined Upland	Jefferson	55	5	38,370	No add'l coordination required for use
24	Confined Upland	Jefferson	45	5	48,155	No add'l coordination required for use
25	Confined Upland	Chambers	75	5	52,750	Infrequently used, would require coordination with owner

Table 9. GIWW-T Main Channel Placement Areas (Continued).

Placement Area No.	Type	County	Rem. Life (Years)	Cycle Years	Cycle Amt.	Notes/Additional Information
26	Confined Upland	Chambers	35	5	47,610	No add'l coordination required for use
27	Confined Upland	Galveston	55	5	30,435	Infrequently used, would require coordination with owner
28	Confined Upland	Galveston	45	3	117,570	
29	Confined Upland	Galveston	0	N/A	N/A	This is full—must pump to 28 or 32
30	Confined Upland	Galveston	0	N/A	N/A	This is full—must pump to 28 or 33
31	Confined Upland	Chambers	0	N/A	N/A	This is full—must pump to 28 or 34
32	Confined Upland	Galveston	140	4	29,040	
33	Confined Upland	Galveston	114	3	29,445	
34	Confined Upland	Galveston	105	3	109,044	
35	Confined Upland	Galveston	24	2	212,122	
36	Confined Upland	Galveston	44	2	267,008	
37	Confined Upland	Galveston	475	5	66,710	
38	Upland Partially Conf.	Galveston	No Info	7	81,312	Will need environmental assessment (EA) and additional coordination
39	Confined Upland	Galveston	413	7	59,731	Will need EA and additional coordination
40	Confined Upland	Galveston	244	4	67,588	
41	Upland Partially Conf.	Galveston	No Info	3	93,429	Must be leveed and confined when it becomes emergent to a distance of 1,350 ft from GIWW centerline
42	Confined Upland	Galveston	123	3	108,681	
43	Upland Partially Conf.	Galveston	No Info	2	310,248	Must be leveed and confined when it becomes emergent to a distance of 1,350 ft from GIWW centerline
45	Upland Partially Conf.	Galveston	N/A	4	150,212	Used only when renourishment of created wildlife habitat required
46	Open Water	Galveston	N/A	4	104,092	
47	Open Water	Galveston	N/A	4	88,972	
48	Open Water	Galveston	N/A	4	90,860	
49	Open Water	Galveston	N/A	5	73,620	
50	Open Water	Galveston	N/A	10	141,220	Needs to be reevaluated/recoordinated
51	Open Water	Galveston	N/A	10	322,220	Needs to be reevaluated/recoordinated

Table 9. GIWW-T Main Channel Placement Areas (Continued).

Placement Area No.	Type	County	Rem. Life (Years)	Cycle Years	Cycle Amt.	Notes/Additional Information
52	Open Water	Galveston	N/A	10	105,400	Needs to be reevaluated/recoordinated
53	Open Water	Galveston	N/A	N/A	N/A	Environmental issues preclude use
54	Open Water	Galveston	N/A	N/A	N/A	Environmental issues preclude use
55	Open Water	Galveston	N/A	N/A	N/A	Environmental issues preclude use
56	Open Water	Galveston	N/A	N/A	N/A	Environmental issues preclude use
57	Open Water	Galveston	N/A	N/A	N/A	Environmental issues preclude use
58	Open Water	Galveston	N/A	10	138,600	Needs to be reevaluated/recoordinated
58A	Confined Upland	Galveston	220	10	157,700	
59	Open Water	Galveston	N/A	N/A	N/A	Environmental issues preclude use
60	Open Water	Galveston	N/A	10	158,630	Needs to be reevaluated/recoordinated
61	Upland Partially Conf.	Galveston	N/A	5	114,785	Needs to be reevaluated/recoordinated
62	Upland Partially Conf.	Galveston	N/A	5	252,070	Needs to be reevaluated/recoordinated
62A	Beneficial Use	Galveston	N/A	N/A	N/A	Beneficial use site
63	Upland Partially Conf.	Galveston	N/A	5	249,515	Needs to be reevaluated/recoordinated
64	Confined Upland	Brazoria	119	7	122,003	
65	Upland Partially Conf.	Brazoria	63	7	253,050	
66	Upland Partially Conf.	Brazoria	N/A	N/A	N/A	Needs to be reevaluated/recoordinated
67	Open Water/BU	Brazoria	N/A	7	267,211	Proposed for BU (bird island creation)
68	Open Water	Brazoria	N/A	7	89,292	Not currently viable—needs to be reevaluated/recoordinated
69	Open Water	Brazoria	N/A	7	79,632	Not currently viable—needs to be reevaluated/recoordinated
70	Confined Upland	Brazoria	161	7	242,956	Requires coordination with Brazoria NWR
71	Confined Upland	Brazoria	434	7	44,310	Requires coordination with Brazoria NWR
72	Confined Upland	Brazoria	245	7	49,679	Requires coordination with Brazoria NWR
73	Confined Upland	Brazoria	N/A	N/A	N/A	Not used since 1968—reach hasn't historically shoaled
74	Confined Upland	Brazoria	N/A	N/A	N/A	Not used since 1968—reach hasn't historically shoaled
75	Upland Partially Conf.	Brazoria	N/A	N/A	N/A	Replaced by 75A-75C

Table 9. GIWW-T Main Channel Placement Areas (Continued).

Placement Area No.	Type	County	Rem. Life (Years)	Cycle Years	Cycle Amt.	Notes/Additional Information
75A	Confined Upland	Brazoria	N/A	N/A	N/A	Available but not used due to lack of shoaling
75B	Confined Upland	Brazoria	N/A	N/A	N/A	Available but not used due to lack of shoaling
75C	Confined Upland	Brazoria	N/A	N/A	N/A	Available but not used due to lack of shoaling
76	Upland Partially Conf.	Brazoria	N/A	N/A	N/A	Not used since 1968—reach hasn't historically shoaled
77	Confined Upland	Brazoria	N/A	N/A	N/A	Not used since 1968—reach hasn't historically shoaled
78	Confined Upland	Brazoria	N/A	N/A	N/A	Not used since 1968—reach hasn't historically shoaled
79	Upland Unconfined	Brazoria	N/A	N/A	N/A	EPA prohibited use in 1975
80	Upland Partially Conf.	Brazoria	0	N/A	N/A	Land has been developed and is in use by others
81	Upland Partially Conf.	Brazoria	0	N/A	N/A	Land has been developed and is in use by others
82	Upland Partially Conf.	Brazoria	0	N/A	N/A	Land has been developed and is in use by others
86	Confined Upland	Brazoria	12	3	558,597	
87	Confined Upland	Brazoria	No Info	No Info	No Info	
88	Confined Upland	Brazoria	34	4	170,664	
89	Confined Upland	Brazoria	34	2	139,294	
90	Confined Upland	Brazoria	No Info	No Info	No Info	
92	Confined Upland	Brazoria	No Info	No Info	No Info	
93	Confined Upland	Brazoria	No Info	No Info	No Info	
94A	Confined Upland	Brazoria	No Info	No Info	No Info	
95A	Confined Upland	Brazoria	No Info	No Info	No Info	
95B	Confined Upland	Brazoria	No Info	No Info	No Info	
96A	Confined Upland	Matagorda	No Info	No Info	No Info	
96B	Surfzone Placement Area	Matagorda	N/A.	No Info	No Info	Surfzone placement area (beach nourishment)
97	Surfzone Placement Area	Matagorda	N/A	No Info	No Info	Surfzone placement area (beach nourishment)
98	Surfzone Placement Area	Matagorda	N/A	No Info	No Info	

Table 9. GIWW-T Main Channel Placement Areas (Continued).

Placement Area No.	Type	County	Rem. Life (Years)	Cycle Years	Cycle Amt.	Notes/Additional Information
98A	Surfzone Placement Area	Matagorda	N/A	No Info	No Info	
99	Confined Upland	Matagorda	No Info	No Info	No Info	
100	Confined Upland	Matagorda	No Info	No Info	No Info	
101	Partially Conf. In Water	Matagorda	No Info	No Info	No Info	
101A	Upland Partially Conf.	Matagorda	No Info	No Info	No Info	
102A	Open Water	Matagorda	N/A	No Info	No Info	
102B	Open Water	Matagorda	N/A	No Info	No Info	
102C	Confined Upland	Matagorda	No Info	No Info	No Info	
102D	Upland Partially Conf.	Matagorda	No Info	No Info	No Info	
102E	Upland Partially Conf.	Matagorda	No Info	No Info	No Info	
103	Upland Partially Conf.	Matagorda	No Info	No Info	No Info	
104	Open Water	Matagorda	N/A	No Info	No Info	
104A	Confined Upland	Matagorda	No Info	No Info	No Info	
104B	Confined Upland	Matagorda	No Info	No Info	No Info	
105	Upland Partially Conf.	Matagorda	No Info	No Info	No Info	
106	Confined Upland	Matagorda	No Info	No Info	No Info	
108	Confined Upland	Matagorda	No Info	No Info	No Info	
108A	Confined Upland	Matagorda	No Info	No Info	No Info	
109	Confined Upland	Matagorda	No Info	No Info	No Info	
110	Confined Upland	Matagorda	No Info	No Info	No Info	
111	Upland Partially Conf.	Matagorda	No Info	No Info	No Info	
112A	Upland Partially Conf.	Matagorda	No Info	No Info	No Info	
112B	Confined Upland	Matagorda	No Info	No Info	No Info	
112C	Confined In Water	Matagorda	No Info	No Info	No Info	Beneficial use site
113	Open Water	Matagorda	N/A	No Info	No Info	
114	Open Water	Matagorda	N/A	No Info	No Info	

Table 9. GIWW-T Main Channel Placement Areas (Continued).

Placement Area No.	Type	County	Rem. Life (Years)	Cycle Years	Cycle Amt.	Notes/Additional Information
115	Open Water	Matagorda	N/A	No Info	No Info	
116	Open Water	Matagorda	N/A	No Info	No Info	
116B	Open Water	Matagorda	N/A	No Info	No Info	
117	Confined Upland	Calhoun	No Info	No Info	No Info	
118	Upland Partially Conf.	Calhoun	No Info	No Info	No Info	
119	Upland Partially Conf.	Calhoun	No Info	No Info	No Info	
120	Upland Partially Conf.	Calhoun	No Info	No Info	No Info	
121A	Confined Upland	Calhoun	No Info	No Info	No Info	
122	Open Water	Calhoun	N/A	No Info	No Info	
123	Open Water	Calhoun	N/A	No Info	No Info	
124	Open Water	Calhoun	N/A	No Info	No Info	
125	Open Water	Calhoun	N/A	No Info	No Info	
127	Confined Upland	Calhoun	No Info	No Info	No Info	
129	Confined Upland	Aransas	No Info	No Info	No Info	
131	Confined Upland	Aransas	No Info	No Info	No Info	
132	Open Water	Aransas	N/A	No Info	No Info	
133	Open Water	Aransas	N/A	No Info	No Info	
134	Open Water	Aransas	N/A	No Info	No Info	
135	Open Water	Aransas	N/A	No Info	No Info	
136	Open Water	Aransas	N/A	No Info	No Info	
137	Open Water	Aransas	N/A	No Info	No Info	
138	Open Water	Aransas	N/A	No Info	No Info	
139	Open Water	Aransas	N/A	No Info	No Info	
140	Open Water	Aransas	N/A	No Info	No Info	
141	Open Water	Aransas	N/A	No Info	No Info	

Table 9. GIWW-T Main Channel Placement Areas (Continued).

Placement Area No.	Type	County	Rem. Life (Years)	Cycle Years	Cycle Amt.	Notes/Additional Information
146	Upland Partially Conf.	Aransas	No Info	No Info	No Info	
147	Partially Conf. In Water	Aransas	No Info	No Info	No Info	
147A	Confined Upland	Aransas	No Info	No Info	No Info	
148	Open Water	Aransas	N/A	No Info	No Info	
149	Confined in Water	Aransas	No Info	No Info	No Info	
150	Open Water	Aransas	N/A	No Info	No Info	
151	Open Water	Aransas	N/A	No Info	No Info	
152	Open Water	Aransas	N/A	No Info	No Info	
153	Open Water	Aransas	N/A	No Info	No Info	
154	Open Water	Aransas	N/A	No Info	No Info	
155	Confined in Water	Aransas	No Info	No Info	No Info	
156	Open Water	San Patricio	N/A	No Info	No Info	
157	Confined Upland	San Patricio	No Info	No Info	No Info	
158	Partially Conf. In Water	San Patricio	No Info	No Info	No Info	
159	Open Water	San Patricio	N/A	No Info	No Info	
160	Open Water	San Patricio	N/A	No Info	No Info	
161	Open Water	San Patricio	N/A	No Info	No Info	
162	Partially Conf. In Water	San Patricio	No Info	No Info	No Info	
165	Open Water	Nueces	N/A	No Info	No Info	
166	Open Water	Nueces	N/A	No Info	No Info	
167	Open Water	Nueces	N/A	No Info	No Info	
168	Open Water	Nueces	N/A	No Info	No Info	
169	Open Water	Nueces	N/A	No Info	No Info	
170	Open Water	Nueces	N/A	No Info	No Info	
171	Open Water	Nueces	N/A	No Info	No Info	

Table 9. GIWW-T Main Channel Placement Areas (Continued).

Placement Area No.	Type	County	Rem. Life (Years)	Cycle Years	Cycle Amt.	Notes/Additional Information
172	Partially Conf. In Water	Nueces	No Info	No Info	No Info	
173	Partially Conf. In Water	Nueces	No Info	No Info	No Info	
174	Partially Conf. In Water	Nueces	No Info	No Info	No Info	
175	Open Water	Nueces	N/A	N/A	N/A	No record of ever being used
176	Open Water	Nueces	830	46.4	2,760	
177	Open Water	Nueces	N/A	46.4	1,610	
178	Open Water	Nueces	N/A	23.2	4,328	
179	Open Water	Nueces	N/A	23.2	1,334	
180	Open Water	Kleberg	N/A	9.28	13,207	
181	Open Water	Kleberg	N/A	7.73	9,472	
182	Open Water	Kleberg	N/A	15.5	3,952	
183	Open Water	Kleberg	N/A	15.5	7,436	
184	Open Water	Kleberg	N/A	11.6	7,297	
185	Open Water	Kleberg	N/A	7.73	13,504	
186	Open Water	Kleberg	N/A	4.64	27,262	
187	Open Water	Kleberg	N/A	3.57	51,522	
188	Open Water	Kleberg	N/A	3.31	59,380	
189	Open Water	Kleberg	N/A	3.31	47,501	Used for bird island protection and enlargement
190	Open Water	Kleberg	N/A	4.22	27,066	
191	Open Water	Kleberg	N/A	5.8	16,402	
192	Open Water	Kleberg	N/A	5.16	15,519	
193	Open Water	Kleberg	N/A	5.16	16,917	
194	Open Water	Kleberg	N/A	3.887	23,935	
195	Open Water	Kleberg	N/A	4.64	24,306	
196	Open Water	Kleberg	84	6.63	15,531	
197	Open Water	Kleberg	N/A	3.09	103,102	

Table 9. GIWW-T Main Channel Placement Areas (Continued).

Placement Area No.	Type	County	Rem. Life (Years)	Cycle Years	Cycle Amt.	Notes/Additional Information
198	Open Water	Kenedy	N/A	2.58	51,500	
199	Open Water	Kenedy	N/A	2.9	48,570	
200	Open Water	Kenedy	N/A	3.09	50,605	
201	Open Water	Kenedy	N/A	3.31	53,449	
202	Open Water	Kenedy	70	2.9	67,373	
203	Unconfined in Water	Kenedy	124	7.73	19,316	
204	Confined in Water	Kenedy	376	9.28	10,838	
206	Confined in Water	Kenedy	107	9.28	37,995	
207	Confined in Water	Kenedy	110/244	9.28	56,505	PA contains two separate confined areas, north and south. The expected useful life of the north area is listed first.
208	Confined in Water	Kenedy	73/54	5.16	138,694	PA contains two separate confined areas, north and south. The expected useful life of the north area is listed first.
209	Confined in Water	Kenedy	N/A	7.73	14,268	
210	Unconfined in Water	Kenedy	N/A	3.57	22,949	
211	Partially Conf. In Water	Kenedy	N/A	3.09	37,903	
212	Open Water	Kenedy	N/A	3.09	56,892	
213	Open Water	Kenedy	N/A	3.31	30,741	
214	Open Water	Kenedy	N/A	5.16	41,962	
215	Open Water	Kenedy	N/A	4.22	45,783	
216	Open Water	Kenedy	N/A	7.73	19,351	
217	Open Water	Kenedy	N/A	5.8	31,294	
218	Open Water	Kenedy	N/A	3.87	56,439	
219	Open Water	Willacy	N/A	4.64	24,269	
220	Open Water	Willacy	N/A	4.64	33,138	Used for bird island protection and enlargement.
221	Open Water	Willacy	N/A	2.73	64,928	

Table 9. GIWW-T Main Channel Placement Areas (Continued).

Placement Area No.	Type	County	Rem. Life (Years)	Cycle Years	Cycle Amt.	Notes/Additional Information
222	Partially Conf. In Water	Willacy	119	4.64	39,607	
223	Open Water	Willacy	241	7.73	11,907	
227	Open Water	Cameron	N/A	9.28	98,920	
228	Open Water	Cameron	587/466	9.28	13,159	PA contains two separate confined areas, north and south. The expected useful life of the north area is listed first.
229	Open Water	Cameron	N/A	15.5	1,794	
230	Open Water	Cameron	N/A	46.4	932	
231	Open Water	Cameron	N/A	46.4	1,508	
232	Open Water	Cameron	N/A	3.87	14,744	
233	Open Water	Cameron	N/A	1.93	203,158	
234	Open Water	Cameron	N/A	1.86	122,582	
235	Open Water	Cameron	N/A	9.28	4,639	
236	Open Water	Cameron	N/A	N/A	N/A	No record of ever being used
239	Open Water	Cameron	N/A	7.73	86,056	

Occasionally, third parties will request permission to dispose of their own dredged material in a GIWW-T placement area. The Corps is developing a formal standard operating procedure (SOP) to deal with such requests. The SOP will essentially have the following requirements:[12]

- A dredging permit application must be submitted to the regulatory branch of the Galveston District of the Corps. The Corps will evaluate the permit with respect to Section 10 (waters of the United States) and Section 404 (wetlands). The Corps does not evaluate permit applications based on the ownership of the placement area. If the permit application designates a non-GIWW-T placement area and the application has no Section 10/404 issues, the permit will be approved without caveats. If the application designates a federal/GIWW-T placement area and has no Section 10/404 issues, the permit will be approved with caveats ("special conditions"). The caveats would require a Corps real estate license agreement prior to disposal.
- A real estate license agreement must be executed for disposal in federal placement areas. The Corps will initially coordinate with TxDOT to determine if the non-federal sponsor concurs with the placement. If TxDOT does concur, the agreement will be issued with the following special conditions:

    - Sediment testing must be performed and the results must be satisfactory to the Corps.
    - The timing of the placement activity will be scheduled to avoid conflicting with federal activities.
    - Fees may be charged for depleted capacity.

Other stipulations may be involved on a case-by-case basis. There are no current agreements that allow open use of a GIWW-T placement area.

BENEFICIAL USES

According to information that the Corps' Galveston District Office supplied, approximately 16 to 20 percent of all dredged material is disposed of in a BU site. Table 10 shows statistics that the Corps presented at the 2012 Beneficial Uses of Dredged Material workshop (*39*).

Table 10. Galveston District Beneficial Use Statistics.

	FY 10	FY 12	FY 13
Total Amount Dredged (Cubic Yards)	24,500,000	20,000,000	20,500,000
Total Amount Used for BU (Cubic Yards)	4,000,000	3,200,000	4,300,000
Percent Beneficial Use	16	16	21

These statistics are for the District's entire dredging program, both deep and shallow draft. Data specifically for dredged material acquired through GIWW-T main channel dredging operations are not readily available. However, the available statistics indicate that the Galveston District's BU initiative is substantial and ongoing.

[12] This is essentially a codification of current practices.

The Corps recognizes the following 10 categories of beneficial uses of dredged material:

- Habitat development (wetlands, bird islands, upland habitat).
- Beach nourishment.
- Aquaculture.
- Parks and recreation.
- Agriculture.
- Land reclamation and solid waste management.
- Shoreline stabilization and erosion control.
- Industrial use (port development, airports, residential).
- Material transfer (dikes, levees, parking lots, highways).
- Multiple purposes.

As with all beneficial uses, it costs more to beneficially use dredged material than to simply place the material in a disposal area. The question then becomes, "Is the extra cost feasible and valid?" There are quite a few potential beneficial uses of dredged material. In *Optimum Disposal Methods for Use on the Gulf Intercoastal (sic) Waterway* (*23*), the following are listed:

1. Habitat Development.
    a. Wetland.
    b. Upland.
    c. Island.
    d. Aquatic.
    e. Other.
2. Beach Nourishment.
3. Aquaculture.
4. Parks and Recreation.
    a. Commercial.
    b. Non-commercial.
5. Agriculture, Forestry, and Horticulture.
6. Strip Mine Reclamation and Solid Waste.
7. Shoreline Stabilization and Erosion Control.
8. Construction and Industrial Use.
    a. Port Development.
    b. Airports.
    c. Urban.
    d. Residential.
9. Material Transfer.
    a. Fill.
    b. Dikes.
    c. Levees.
    d. Parking Lots.
    e. Roads.
10. Multiple Purpose.

Unfortunately, very few of these options are actually feasible along the Texas coast due to the unsuitability of the dredged material for these various purposes and the cost to create a BU project. Note that if a proposed restoration/BU feature will cost more than the base plan the Corps selected according to their principles and guidelines, then as a rule, the non-federal project sponsor must bear the additional costs or cost share under one of the authorities given to the Corps.

There are several ways the Corps can fund BU projects. The available authorities are summarized (*40*) below. Most of the funding is awarded on a nationally competitive basis.

Section 204 (Regional Sediment Management) of the Water Resources Development Act (WRDA) 1992, as amended[13]—Implementing Restoration Projects in Connection with Dredging: This is the most commonly used authority for BU projects using dredged material. It allows the Corps—as part of a regional sediment management plan—to select a disposal method that is not the least-cost option if the incremental costs are deemed reasonable to the environmental benefits to be achieved. Section 204 funding is intended for projects that use dredged material to (1) reduce storm damage to property, (2) protect, restore, and create aquatic and ecologically related habitats, including wetlands, and (3) transport and place suitable sediment. No benefit-cost ratio is required, but the quantity and quality of the protection, restoration, and creation must be reconciled against costs associated with working beyond the dredging project's base plan. Costs above the base plan are funded via cost-sharing, with 65 percent of costs funded from federal sources and 35 percent of costs funded from non-Federal sources (i.e., a local sponsor). The non-federal sponsor must pay 100 percent of all operations, maintenance, and replacement costs once the project is constructed. The federal share of the above-base cost per project is $5 million or less, with an annual appropriation limit of $30 million. Local sponsors must be legally-constituted public bodies.

When Congress amended Section 204 in WRDA 2007, it also listed 11 regional sediment management priority areas. These named areas will be considered in establishing priorities for Section 204 programmatic funding. Galveston Bay is one of those areas.

Section 206 (Aquatic Ecosystem Restoration) of WRDA 1996:[14] Section 206 funding is intended to restore degraded ecosystem structure, function, and dynamic processes, usually through manipulation of hydrology. Projects must improve the quality of the environment, be in the public interest, and be cost effective. No relationship to a Corps project is required. No benefit-cost ratio is required, but the project's ability to improve the environment must be qualified and quantified. The federal share of the above-base cost per project is $5 million or less, with an annual appropriation limit of $25 million. Cost sharing allows for 65 percent federal funding and 35 percent non-federal funding. Work in-kind can constitute part or all of the non-federal 35 percent funding for the project, with the exception that work-in-kind is not applicable to the feasibility study phase of the project. The non-federal sponsor will be responsible for 100 percent of

[13] See the Water Resources Development Act of 2007 (PL 110–114) for the complete text.
[14] See the Water Resources Development Act of 1996 (PL 104–303) for the complete text.

operations, maintenance, and replacement costs once the project is constructed. Local sponsors must be legally-constituted public bodies.

Because this authority relates to "aquatic ecosystem restoration," proposals associated with shoreline nourishment or erosion protection will usually not qualify under this authority unless aquatic ecosystem benefits are clearly demonstrated as a result. This authority enjoys a high demand within both coastal and non-coastal Corps districts and, consequently, there is strong nationwide competition for the limited funds appropriated each year.

Section 1135 (Project Modification for the Improvement of the Environment) of WRDA 1996, as amended:[14] Section 1135 is intended for restoration of degraded ecosystem structure, function, and dynamic processes. Categories include modification of existing Corps projects, restoration where existing Corps projects contributed to environmental degradation, or restoration where construction or funding by the Corps or another federal agency contributed to degradation of the environment. All Section 1135 restoration projects must have some connection to a Corps project. No benefit-cost ratio is required, but the project's ability to improve the environment must be qualified and quantified. No more than $5 million of project costs may come from federal funding and there is an annual appropriation limit of $25 million. Cost sharing allows for 75 percent federal funding and 25 percent non-federal funding. The non-federal sponsor will be responsible for 100 percent of operations, maintenance, and replacement costs once the project is constructed. Non-federal sponsors may be public agencies, national non-profit groups, and private interests.

Only two Section 1135 projects have been performed in the Galveston District.

One of the downsides of working with the authorities listed above is the uncertainty of the federal budgeting process. Use of these authorities requires advanced planning to allow the Corps to include the funding in its budgeting process, which is normally two years in advance.

TxDOT's Role in Beneficial Use Projects

Under Title 43, Part 1, Chapter 2, Subchapter F, Rule §2.132 of the Texas Administrative Code, TxDOT is able to participate in BU projects that use dredged material from the main channel of the GIWW-T. Appendix B contains relevant excerpts from this rule. TxDOT's role is limited to the acquisition of property to be used as a BU site. Such projects are initiated as a result of proposals submitted by the Corps. If the commission decides to act on a disposal proposal or beneficial use proposal related to the GIWW-T, TxDOT will assist the Corps with the preparation of the environmental review document under 42 U.S.C. §§4321 et seq. and applicable federal rules. TxDOT will also assist with any public participation process that the Corps conducts. If the commission decides to participate in the cost of a project to beneficially use dredged material that requires the acquisition of an interest in real property, the procedures it must follow are set out in the TAC. As part of this process, the commission will establish an eligible cost of the proposed beneficial use project by calculating the total estimated cost of the project in excess of the established federal standard for dredged material disposal. As a rule, the department's financial participation in the project will not exceed 50 percent of eligible cost.

However, the commission may authorize participation at levels exceeding 50 percent if the members determine that the additional participation will result in extraordinary environmental or economic benefits, or the costs are reasonably comparable to the costs of providing property to accommodate traditional upland disposal. Department funding may not be used for maintenance or operation of a beneficial use project.

Beneficial Use Projects in the Galveston District

A number of the Galveston District's BU projects were one-time efforts and will not receive any further action from the Corps. These sites are not included in this analysis since they do not affect the Corps' dredged material disposal plans for maintenance dredging of the main channel, nor are they included in the National Economic Development plan for the GIWW-T. Examples are projects such as beach nourishment at Rollover Pass and marsh creation at multiple West Bay BU sites.

The current BU sites associated with the GIWW-T main channel are:

- Aransas National Wildlife Refuge.
- Port O'Connor.
- Rollover Pass Closure.
- Bolivar Ferry Landing/Little Beach nourishment with beneficial uses of dredged material (BUDM).
- Greens Lake.
- West Bay mooring area (just east of Chocolate Bayou).
- PA62-63.
- PA220/Channel to Port Mansfield.

The following paragraphs provide some of the relevant features of the listed projects.

Aransas National Wildlife Refuge—1,600 Acres of Marsh

This site is in the vicinity of PA127. The area is located approximately 35 miles northeast of Corpus Christi, Texas, in Aransas and Calhoun Counties. Part of this project has already been completed. Work that the WRDA of 1996 authorized provides for erosion protection and limited spill containment for the existing alignment of the Gulf Intracoastal Waterway. This work includes marsh creation with beneficial uses of dredged material along a 31-mile reach of the waterway, which crosses the critical wintering habitat of the rare and endangered whooping crane, including a 13.25-mile reach within the boundary of the Aransas National Wildlife Refuge. The initial project was completed in 2001. Construction cost was $14,123,500, which the federal government (Corps) shouldered.

The dredged material management plan for this section of the waterway calls for marsh creation to occur in conjunction with maintenance dredging cycles scheduled throughout the 50-year life of the DMMP. Table 11 lists the schedule for marsh creation as set out in the DMMP. The "Year" column indicates the year from the commencement of the 50-year DMMP, which was published in 2000. The schedule and acreages are subject to change as dredging needs and site conditions change.

Table 11. Schedule for Marsh Creation—Aransas National Wildlife Refuge DMMP.

Site	Year	Acres (Cumulative)	Site	Year	Acres (Cumulative)
A	2.5	42 (42)	D	4	90 (90)
A	5	42 (84)	E	4	49 (49)
A	7.5	18.5 (102.5)	E	12	49 (98)
A	10	42 (144.5)	E	20	49 (147)
A	12.5	42 (186.5)	F	12	24 (24)
A	17.5	42 (228.5)	F	20	24 (48)
A	20	42 (270.5)	F	28	24 (72)
A	22.5	18.5 (289)	F	36	24 (96)
A	25	42 (331)	G	4	24 (24)
A	27.5	42 (373)	H	4	10 (10)
A	37.5	18.5 (391.5)	I	4	37 (37)
B	12	47 (47)	I	12	37 (74)
B	20	90 (137)	I	28	74 (148)
B	28	90 (227)	I	36	74 (222)
B	36	90 (317)	J	12	74 (74)
B	44	90 (407)	J	20	74 (148)
C	12	43 (43)	K	4	35 (35)

Port O'Connor

The existing Matagorda Bay reach of the GIWW-T was constructed in the 1940s and extends from channel mile 454 to 473, a distance of about 19 miles. Since the completion of the existing GIWW-T channel, strong crosscurrents have developed as a result of the interplay with the natural bay opening at Pass Cavallo and the deep-draft Matagorda Ship Channel and its jettied entrance channel, which were constructed in the 1960s. These crosscurrents result in significant vessel delays, property damages, and high waterway maintenance costs for the existing Matagorda Bay reach of the GIWW-T.

In 2002, Corps planners recommended that the portion of the existing GIWW-T across Matagorda Bay, between mile markers 460 and 472, be rerouted approximately 6,000 ft north of and parallel to the existing alignment. In the vicinity of bends in the channel, the bottom width now averages 300 ft. The project makes beneficial use of dredged material to provide for the construction and maintenance of marsh at Palacios Point (a location 8 miles south of Palacios on the southeast border of Matagorda Bay) and near Port O'Connor. Local interests are investigating the possibility of additional marsh creation sites. The material is also being used to nourish beaches at Sundown Island, a National Audubon Society site, and Kingfisher Beach. Dredging in this area is done approximately on a 10-year cycle.

Rollover Pass Closure

Funds provided under the CEPRA grant program finance this project. The money provides for the design, permitting, and construction for the closure of Rollover Pass on Bolivar Peninsula.

Since its creation in 1955, the manmade pass has been shown to exacerbate erosion of the Bolivar Peninsula Gulf-facing beaches. The proposed action entails the closure of Rollover Pass to:

- Alleviate beach erosion along the Bolivar Peninsula.
- Reduce the required frequency and costs of maintenance dredging the GIWW-T.
- Increase the effectiveness of beach restoration projects.
- Restore the bay waters to more natural water quality (salinity) conditions.

Additional funding will provide for the implementation of projects that will mitigate the loss of recreational fishing opportunities brought about by the closure of the pass.

Bolivar Ferry Landing/Little Beach Nourishment

This project is being developed under the auspices of the Texas GLO, with the CEPRA grant program providing some funding. It will result in the beneficial use of dredged material to restore three severely eroded beaches. These beaches provide:

- Public access for recreation and fishing.
- Storm damage reduction/protection benefits for private and public infrastructure, including State Highway 87.
- Potential nesting areas for endangered sea turtles.

Greens Lake

The project uses dredged material excavated during routine periodic maintenance dredging along the reach of the GIWW-T between the Galveston Causeway and Bastrop Bayou to protect and restore marsh habitat. The segment being addressed involves a 2-mile reach of channel in Galveston County, Texas, that begins approximately 7 miles west of the Galveston Causeway and includes the channel and the immediate environs.

This project focuses on the construction and maintenance of low berms along the GIWW-T. Dredged materials from routine periodic maintenance dredging are used beneficially to preserve and enhance marsh habitats by restricting saltwater intrusion into historically fresh to intermediate marshes. This area provides some erosion protection by acting as sacrificial material to help replace lost material. Dredged material is used to raise elevations in drowned marsh of other low areas. This area benefits an estimated 250 acres of wetlands and facilitates long-term maintenance of the GIWW-T in this region. Anywhere from 50,000 to 180,000 cubic yards are placed in a thin layer over the site during each dredging cycle.

West Bay Mooring Area

The primary objective of the West Bay Mooring Area is plant habitat creation. Reef balls were placed at this site in mid-2012 to create and protect the bank and adjacent marshlands. The West Bay Mooring Site Marsh is a 64-acre predominantly intertidal marsh site, built from dredged material, adjacent to the Gulf Intracoastal Waterway.

PA62-63

PA62 and PA63 are located along the GIWW-T just southwest of the Greens Lake area. Material is deposited in these sites approximately every three years. The purpose of the project is to:

- Minimize sea grass impacts from dredging utilizing thin layer deposition and winter placement.
- Nourish emergent land to protect the GIWW-T and marshes north of the GIWW-T from the strong fetch across West Bay.

Without periodic renourishment, the existing sea grass beds would erode to a depth where sea grass growth could not be sustained. Tides and storms will rework recently placed sediment, and sediment depth will significantly decrease in the span of just a few months.

PA220

This project protects an unconfined placement area, an important bird nesting island, from further erosion. The L-shaped disposal site contains an emergent island located at the bend of the site, but much of it is outside the boundary of the PA and is eroding severely on the north side. The recommended management plan for this site includes the placement of geotubes on the shallow shelf around the existing island on three sides, leaving the south end open. Dredged sandy material from the Port Mansfield Channel is stockpiled on the north side of the site and used to fill the geotubes later. Silty material in the GIWW-T from future dredging cycles (approximately every two years) would be used to fill in the horseshoe-shaped site surrounding the bird island to enhance bird nesting habitat. This will also protect sea grass near the site from burial and high turbidity to the north. The open southern end could be closed with geotubes later, if it is determined there is more erosion occurring there than is currently believed to exist.

West Galveston Bay Interagency Recommendations

An interagency coordination team (ICT) has prepared a regional sediment management (RSM) plan for West Galveston Bay (WGB). During the planning process, several recommendations were developed that could eventually have an impact on the beneficial use of dredged material in this reach of the GIWW-T. Table 12 summarizes these recommendations.

Table 12. West Galveston Bay Regional Sediment Management Recommended Action Items.

Action Item	Description	Authority and Funding Sources
GIWW Barrier Islands and PAs		
RSM Action 10 Restore the GIWW barrier island to reduce dredging of the GIWW and decrease erosion of the mainland north shoreline of WGB.	Restoring the GIWW barrier island or creating new PAs/habitat restoration areas on the south side of the GIWW will reduce the rates of shoaling on the channel and will protect marshes on the north side from storm surges.	U.S. Army Corps of Engineers (USACE) GIWW maintenance and Section 204 of the continuing authorities program.
RSM Action 11 Continue searching BUDM alternatives for habitat restoration on the proximities of the GIWW. These habitats may include marshes on the north side and sea grasses on the bay side of the GIWW.	Continue searching for BUDM opportunities using the dredged sediments beneficially on habitats may be the best habitat alternative. Dredged sediments can be placed on private marshes on the north side of the GIWW, create new PAs, or support the establishment of the sea grasses on the GIWW barrier island.	USACE GIWW maintenance and Section 204 of the continuing authorities program.
RSM Action 12 Develop a BUDM plan in coordination with the subdivisions close to Jones Bay and Highland Bayou for habitat restoration and protection.	Develop a BUDM plan with the subdivisions in the area, taking advantage of the closeness of the GIWW to the area for transportation of specific dredging equipment. Coordination between subdivisions to develop a large-scale BUDM plan may reduce the overall dredging costs.	CEPRA, GOMESA, and other sources.
RSM Action 13 Build consensus through the Upper Texas Coast GIWW Interagency Coordination Team (Upper GIWW ICT) in ways to manage BUDM alternatives for the long-term benefits of the habitats and infrastructure located close to the GIWW and Chocolate Bayou.	The newly formed Upper Texas Coast GIWW ICT could be used to explore and implement more effective beneficial use habitat protection/restoration disposal alternatives by working in partnership with USACE and the two local sponsors of the GIWW and Chocolate Bayou Navigation Channels to overcome existing obstacles that have historically limited effective sediment management.	None identified.

Table 12. West Galveston Bay Regional Sediment Management Recommended Action Items (Continued).

Action Item	Description	Authority and Funding Sources
West Galveston Bay East Basin		
RSM Action 14 Continue the expansion of the restoration of North and South Deer Island and Jigsaw Island through BUDM opportunities.	Significant losses of colonial water bird nesting habitat and sea grasses have occurred in Galveston Bay. Island restoration will promote reestablishment of sea grass habitat. Continue to develop alternative analyses and engineering designs on these islands in order to prepare them for future BUDM opportunities. The islands may need shoreline protection measures as part of the restoration.	USACE 204, CEPRA, GOMESA, and other sources. Any other BUDM-restoration funding opportunity.
WGB Galveston Island East and West Basins		
RSM Action 15 Restore marshes in the zone of marsh establishment to develop habitats that can be sustainable.	Restore the marshes preferentially on the protected areas of the island using the concept of the zone of marsh establishment on the lee side of the energy flow.	CEPRA, Coastal Wetlands Protection and Restoration Act, and other sources.
RSM Action 16 Discontinue dredging sediments close to the shorelines in areas that do not have active sediment transport. Active areas of sediment transport are located at the base of the island slope in contact with the bay bottom.	Borrow sites within WGB should be located in areas of active sediment flow to allow them to refill by natural sediment movement instead of locating the borrow sites in areas of limited sediment transport. These borrow sites should be carefully selected and located to ensure they do not impact existing productive habitats and change the slope of the island shorelines. Dredging should follow the morphology of the submerged sediment bars close to the bay bottom to minimize impacts to the island shoreface.	None identified.
RSM Action 17 Develop pilot projects using the concept of living shorelines as shoreline protection as part of the restoration initiatives.	The large presence of oyster reefs, shallow environments, and elongated peninsulas on WGB East Basin make the area suitable for pilot projects using the living shorelines concept. When conditions allow it, the program can be expanded to other areas in WGB.	CEPRA, GOMESA, and National Oceanic and Atmospheric Administration (NOAA).

Table 12. West Galveston Bay Regional Sediment Management Recommended Action Items (Continued).

Action Item	Description	Authority and Funding Sources
RSM Action 18 Develop a BUDM plan that includes the island canal subdivisions and marinas in WGB.	Continue the development of BUDM opportunities with the canal subdivisions and marinas. Although these projects are small, they may provide significant sources of funding and sediments for BUDM. Maintenance dredged material from residential subdivision channels and marinas can supply valuable sediments for coastal restoration and protection. Planning efforts could include permitting and engineering design of potential BUDM projects.	CEPRA, GOMESA, NOAA, and private sources.
RSM Action 19 Continue to evaluate shoreline protection alternatives beyond the use of geotextile tubes.	Geotextile tubes have been used extensively for shoreline protection in WGB. Since the longevity of these tubes is limited, new alternatives, such as living shorelines, or other alternatives that may help reroute sediments into the marshes should be considered. These new alternatives should consider the direction of energy and sediment transport as the main component in the final design.	None identified.

State-Managed Programs that Include Beneficial Use Projects

Coastal Erosion Planning and Response Act

The CEPRA program implements coastal erosion response projects and related studies to reduce the effects and to understand the processes of coastal erosion, which continues to threaten public beaches, natural resources, coastal development, public infrastructure, and public and private property. Under CEPRA, GLO implements erosion response projects and studies through collaboration and a matching-funds partnership with federal, state, and local governments, non-profit organizations, and other potential project partners.

The CEPRA program has received funding biennially since its creation in 1999. If the legislature continues to appropriate funding, the CEPRA program will continue providing funding on a biennial basis for the following types of projects and studies, with priority given to projects that include construction of an erosion response solution during the biennium:

- Beach nourishment on both Gulf of Mexico and bay beaches.
- Shoreline stabilization.
- Habitat restoration and protection.

- Dune restoration.
- Beneficial uses of dredged material for beach nourishment, habitat restoration, etc.
- Coastal erosion-related studies and investigations.
- Demonstration projects.
- Structure relocation and debris removal.

Project partners are required to cost share 25 to 40 percent, depending on the type of project. Restoration projects may require the maximum 40 percent match. More information can be found on GLO's CEPRA website: http://www.glo.texas.gov/what-we-do/caring-for-the-coast/coastal-erosion/index.html.

In the Cycle 7 biennium (the latest), $15.3 million in CEPRA funding was leveraged against $42 million in both matching and other contributing funds, for a total operating budget of $57.3 million.

Texas Coastal Management Program

The Texas Coastal Management Program (CMP) helps ensure the long-term environmental and economic health of the Texas coast through management of the state's coastal natural resource areas. The program supports the protection of natural habitats and wildlife. Each year, GLO receives approximately $2.2 million annually under the Coastal Zone Management Act (CZMA) to implement the state's coastal program, most of which goes to state and local entities to implement projects and program activities. Texas is one of only a few coastal states that pass the majority of CZMA funds (90 percent) through to coastal communities and other groups for projects in the coastal zone. Projects have been funded in all areas of the coastal zone for a wide variety of purposes. The following categories have been established for use of these funds by coastal communities and other groups:

- Coastal natural hazards response.
- Critical areas enhancement.
- Shoreline access.
- Waterfront revitalization and ecotourism development.
- Permit streamlining/assistance and governmental coordination.
- Information and data availability.
- Public education and outreach.
- Water quality improvement.

In the past, the CMP has used Sections 306/306A of the Coastal Management Grant Funds to fund small-scale projects. While continuing to fund individual small-scale projects up to $100,000, the CMP will also consider funding individual, large-scale 306A projects up to $400,000 for on-the-ground habitat protection/restoration and land acquisition projects. The 2014 grant cycle is Cycle 20 for the CMP.

More information can be found on GLO's CMP website: http://www.glo.texas.gov/what-we-do/caring-for-the-coast/grants-funding/cmp/index.html.

Coastal Impact Assistance Program

Initially, CIAP may have been an opportunity for TxDOT to tap into some additional funding. Unfortunately, it appears that all of the funds for this program have already been committed, and there will not be an opportunity for TxDOT to tap into this funding source until further funds are allocated to the program.

The CIAP is a federally funded program that the U.S. Fish and Wildlife Service (USFWS) currently administers. In Texas, GLO administers the CIAP, while the Texas Coastal Land Advisory Board (CLAB) manages the program. CLAB is composed of three members, with the land commissioner as chairman and the other two members being the Texas RRC and a commissioner of TCEQ. Funded with federal royalties from offshore oil and gas leases, the CIAP assists those states that have either supported or been impacted from oil and gas exploration and development along the outer continental shelf (OCS). Onshore impacts can include:

- Increased need for production and support facilities.
- Air and water quality issues.
- An increasing demand for infrastructure and social systems due to an influx of OCS workforce.

USFWS directly provides 35 percent of CIAP funding to the 18 Texas coastal counties. State and federal agencies are eligible to receive the other 65 percent of CIAP funding, along with universities (public or private), county and local governments, other state subdivisions, and non-profit organizations. The program requires no match, and CLAB prefers a project be completed within three years. Multi-phase projects are allowed.

CIAP funds must be used in the 18 coastal counties of Texas and may be used only for one or more of the following authorized uses:

- Projects and activities for the conservation, protection, or restoration of coastal areas, including wetlands.
- Mitigation of damage to fish, wildlife, or natural resources.
- Planning assistance and administrative costs of complying with this section.
- Implementation of a federally approved marine, coastal, or comprehensive conservation management plan.
- Mitigation of the impact of OCS activities through funding of onshore infrastructure projects and public service needs.

State and county competitive projects are included in a state plan and plan amendment that USFWS must approve. Once projects are approved in the state plans, counties do not need GLO approval and work directly with USFWS.

Related Beneficial Use Initiatives

Although it does not fit neatly within any one of the BU categories that the Corps of Engineers has established, Ducks Unlimited (DU) has undertaken an initiative that is described as an attempt to balance GIWW-T economic values with environmental concerns resulting from the effects of barge movements on adjacent coastal marsh systems along the Texas coast. Continued shoreline erosion and alteration or loss of marsh through saltwater intrusion impact the ability of these wetland systems to support wintering waterfowl populations, as well as other coastal fish and wildlife. DU promotes the construction of rock breakwaters or revetments along the GIWW-T main channel, primarily because these structures are robust, dependable structures that:

- Dissipate wave energy.
- Stabilize shorelines.
- Support reestablishment of emergent marsh along the GIWW-T shoreline through retention of sediments.
- Protect against degradation of interior marshes.

However, implementation can be costly. In the case of the Corps, such structures compete for dollars from the same operations budget as dredging and placement area maintenance.

Because of budget limitations, DU has taken the approach of being ready to capitalize on funding as it becomes available, whether it consists of private capital or tax dollars. Through the use of geographic information systems and aerial imagery, DU has developed a decision support tool for landowners, agencies, private industry, and conservation organizations to use for identifying immediate threats to coastal marshes and for prioritizing implementation of breakwaters as funding becomes available. More than 50 miles of high-priority and another 100 miles of medium-priority shorelines have been identified through this exercise. DU offers this information to its partners and interested parties as a method to evaluate, prioritize, and strategically deliver breakwater protection where it is most urgently needed and compatible with navigation and land management.

Successful attempts to reduce or prevent erosion will possibly benefit the Corps in two ways:

- Erosion abatement projects will reduce the amount of material sloughing into the channel, hence reducing the need or frequency for dredging.
- Where erosion abatement structures can be placed on or adjacent to placement areas, they should increase the capacity and stability of these placement areas.

Unfortunately, there are no studies available that quantify these potential impacts at this time.

CHAPTER 3: GIWW-T-RELATED INFRASTRUCTURE AND SAFETY ISSUES

BACKGROUND

Initially, the project scope called for TTI to document the issues arising from the intersection of the GIWW-T with the ship channels at the various ports along the Texas coast. Additionally, TTI proposed to assess operational issues at the current locks and floodgates, as well as the condition and maintenance requirements of the existing structures at these sites.

During meetings of the stakeholder's working group, it was mentioned that the lack of fleeting areas and mooring areas was a major concern of waterway operators. These concerns included both efficiency issues and safety issues. Given the level of concern of the stakeholders, this task was expanded to include an assessment of fleeting areas and mooring areas for GIWW-T users.

In recent years, users of the GIWW-T have expressed concern regarding encroachment on the GIWW-T through real estate development. That topic is discussed briefly at the end of this chapter.

The stakeholders mentioned one additional area of concern, the FM 457 swing bridge in Sargent, which TxDOT refers to as the Sargent Swing Bridge and industry often calls the Caney Creek Bridge. According to the Coast Guard's Division 8 Bridge Program Office, the bridge is struck almost once a month. This is due to the narrow span and the high level of development in the area, which prevents barges from being able to push into shore or moor temporarily. The Coast Guard has a program that is labeled the Truman Hobbs program, which is a mechanism to use federal funds to remove or replace troublesome bridges. Unfortunately, Caney Creek is not in that program. There are no publicly available records or a condition assessment of the bridge from a navigation perspective.

TxDOT is proposing to replace the swing bridge with a concrete bridge that would span the GIWW-T to provide access to residents on the south side of the waterway. The project is currently in the conceptual design/environmental study phase. It is scheduled to be advertised for bid in spring 2016, and construction is expected to take two years.

INTERSECTION WITH SHIP CHANNELS

Because it runs along the entire length of the Texas coastline, the GIWW-T intersects every ship channel in Texas. This does not create any dredging concerns because ship channels are much deeper than the authorized 12-ft depth of the GIWW-T. However, these intersections are high-activity locations that could potentially create safety trouble spots.

TTI analyzed publicly available Coast Guard data on collisions occurring in the GIWW-T channel from 2001 onwards. Figure 16 illustrates where these reported events occurred.

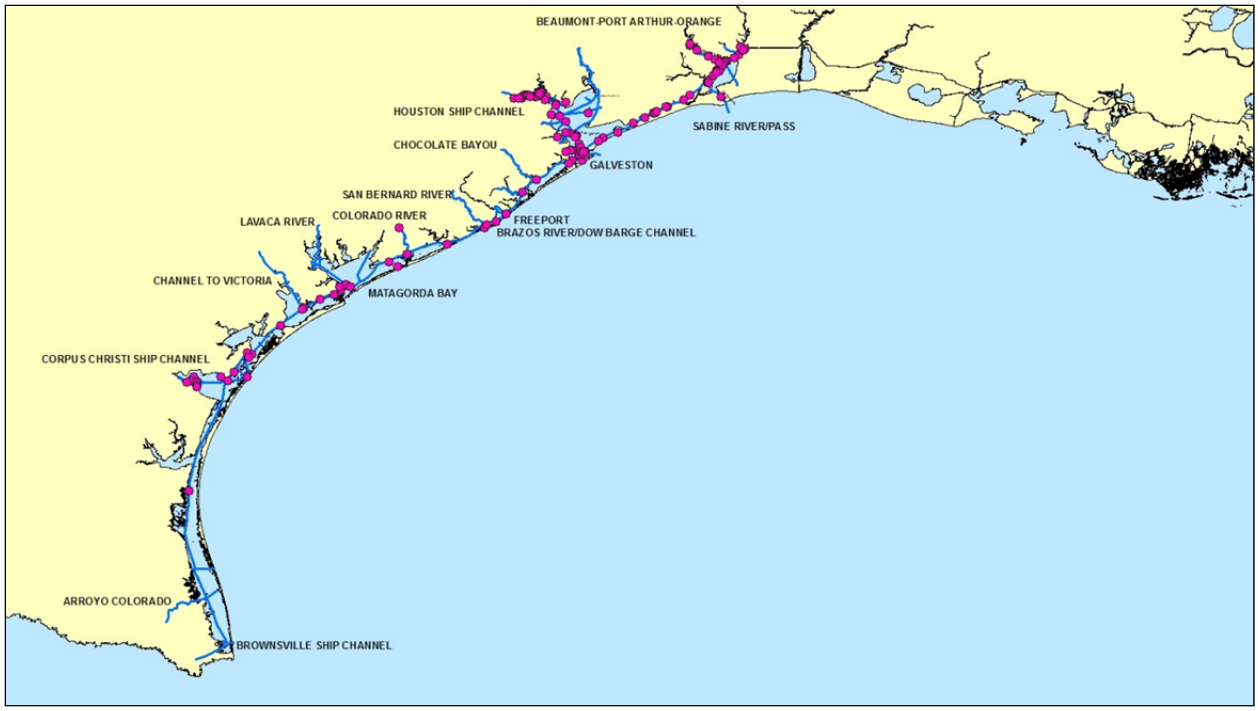

Figure 16. Reported Collision Locations, 2001–2012.

As the figure indicates (and as one would expect), these events are clustered in the high-traffic portions of the GIWW-T (particularly from Galveston to Louisiana) and at the intersections with the ship channels. Although at first glance there seems to be an abundance of collision locations, the collisions shown in Figure 16 represent a very small percentage of the total when considering that there were 396,000 tugboat trips in the 2001–2011 period. Figure 17 through Figure 21 zoom in on five segments of the GIWW-T and provide a clearer picture of where these events are occurring.

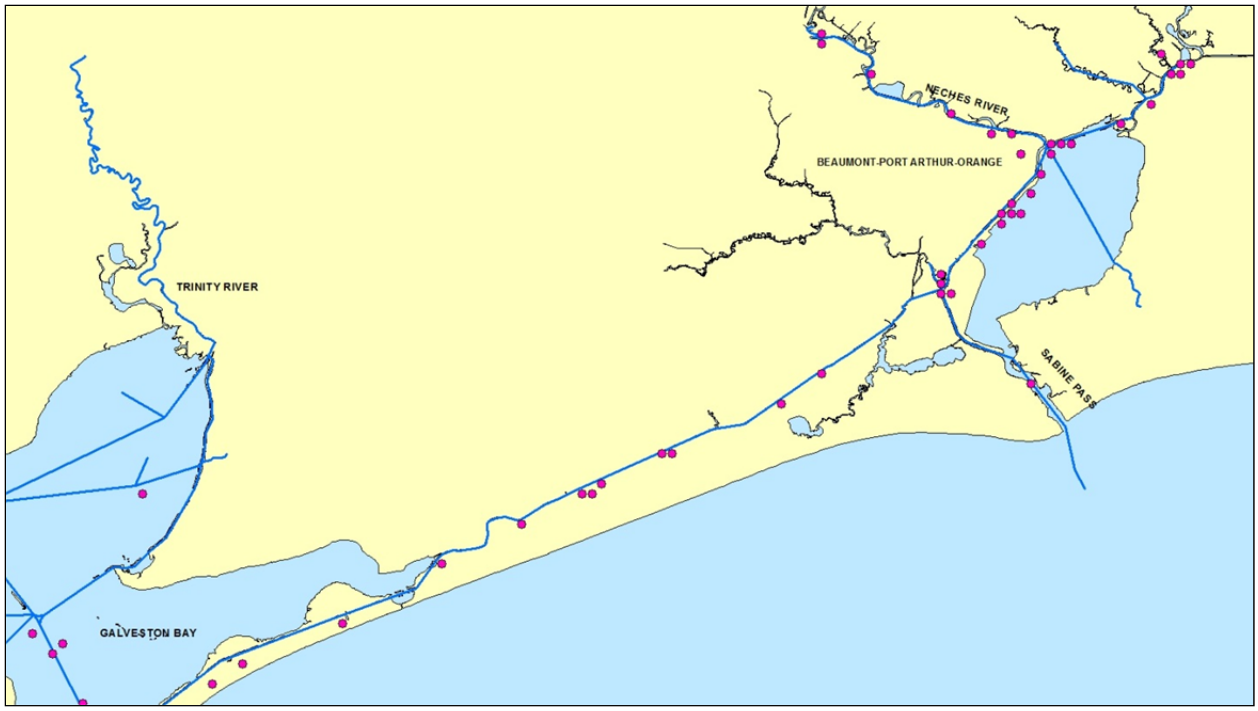

Figure 17. Upper Coast Collision Locations.

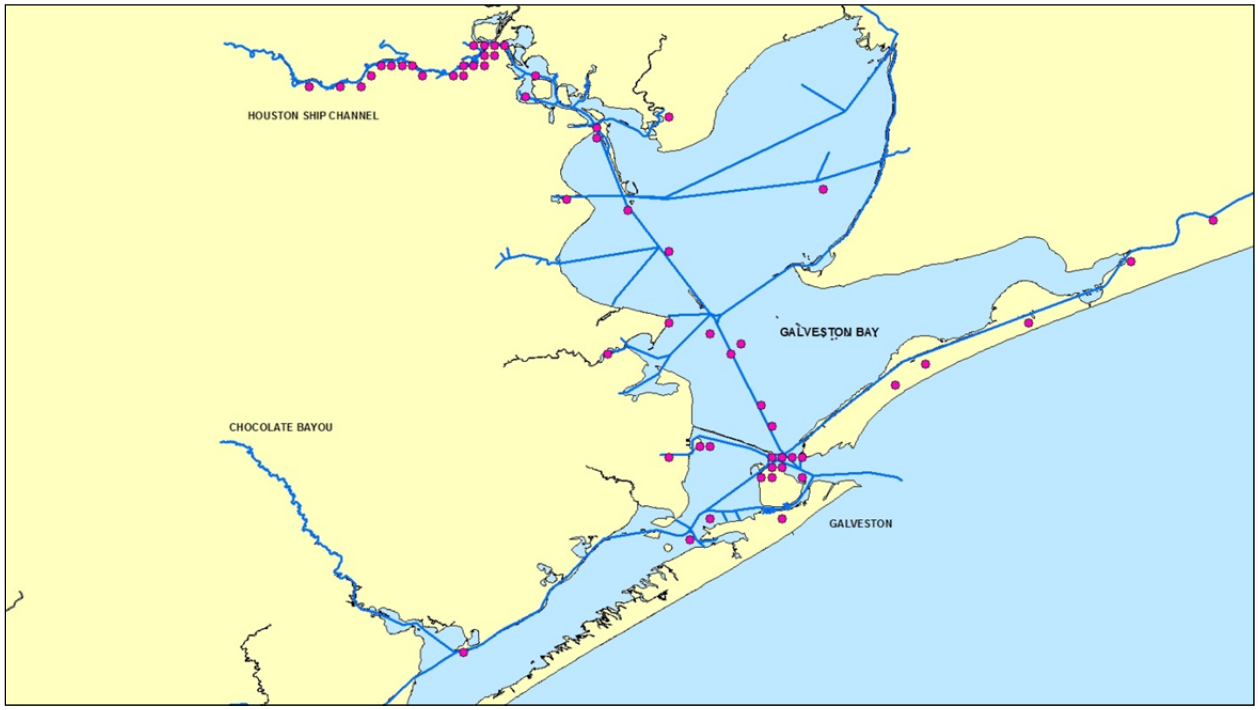

Figure 18. Houston–Galveston Area Collision Locations.

Figure 19. Freeport to Port Lavaca Collision Locations.

Figure 20. Corpus Christi Area Collision Locations.

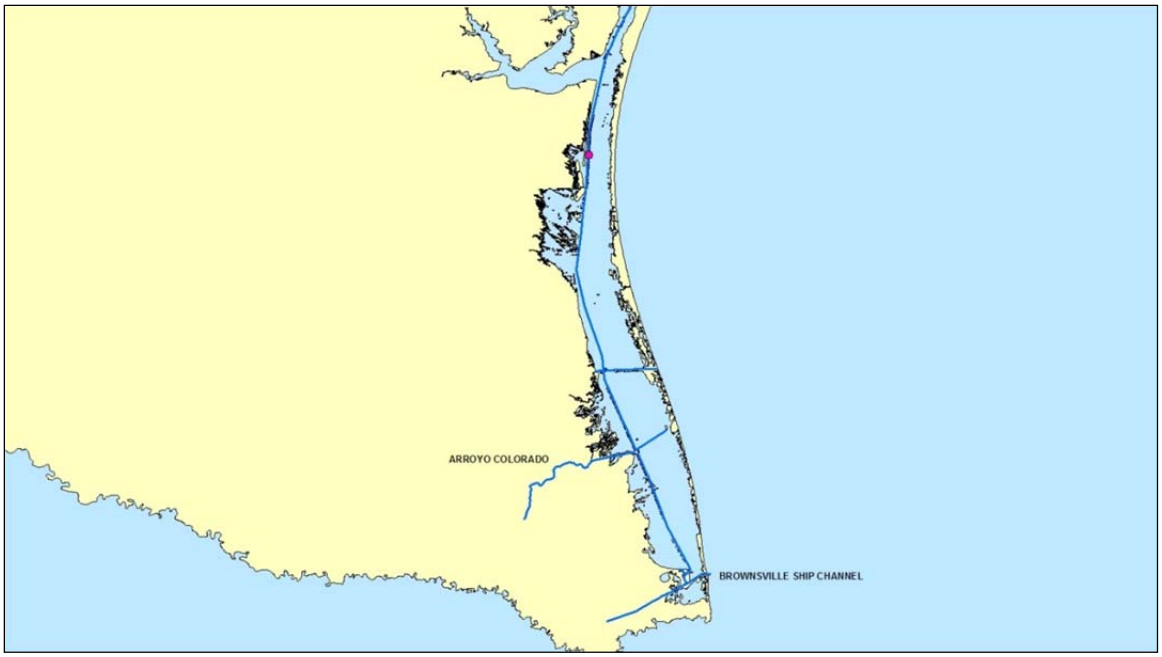

Figure 21. Lower Laguna Madre Collision Locations.

Since insurance covers many of these incidents, there are few data available to the public on how severe or costly these incidents were. However, it is clear that they did not involve any fatalities in the 2001–2011 period that TTI analyzed.

During the stakeholder working group meeting held November 7, 2013, the stakeholders were asked for their opinions regarding the accident rate and the need for improvement. There was strong consensus that these incidents were not a major cause of concern in planning or managing the waterway. There seems to be good coordination between the Coast Guard and carriers in these intersection areas, and neither party believed that a focused effort on this matter would yield significant benefits. Given this consensus, TTI did not pursue any possible measures to address any issues related to intersections with ship channels.

FLOODGATES AND LOCKS

Two locations along the GIWW-T have floodgates or locks: the intersection with the Brazos River (floodgates) and the intersection with the Colorado River (locks). The stakeholder working group was of the unanimous opinion that the Brazos River Floodgates by far represent the greatest problem in terms of safety and efficiency anywhere on the entire GIWW. The Colorado River Locks were of concern, but nowhere close to the level of the Brazos River Floodgates.

Both the Brazos River Floodgates and the Colorado River Locks serve to:

- Control flood flows from the rivers into the GIWW-T.
- Improve navigational safety by controlling traffic flow and currents at the intersection of the GIWW-T and the two rivers.
- Control sand and silt deposition from the rivers into the GIWW-T.

The Colorado River Locks have an additional purpose: raise the navigation traffic from the GIWW-T attempting to cross the river to the water level of the river during flood stages, and then lower the traffic to the water level of the GIWW-T after crossing. Figure 22 and Figure 23 are aerial photos of these two locations on the GIWW-T.

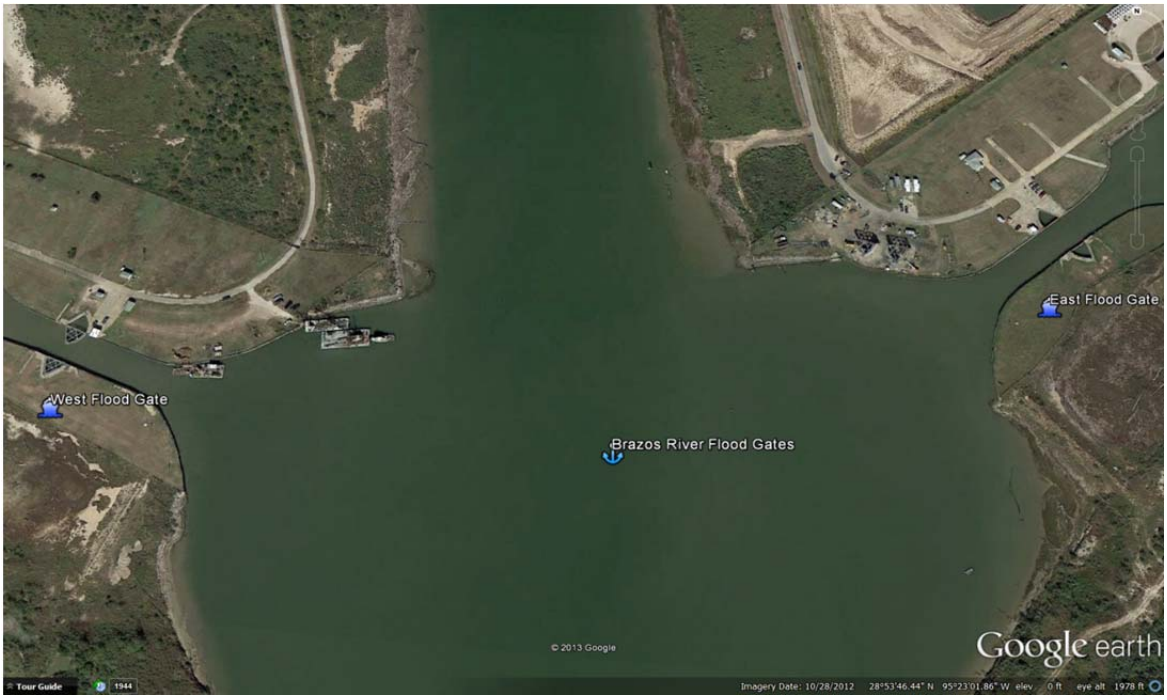

Figure 22. Brazos River Floodgates.

Figure 23. Colorado River Locks.

The Corps performed a reconnaissance-level study of both the locks and the floodgates in 2000 (*5*). Reconnaissance studies are typically high-level studies that define the issues and determine whether it makes sense to conduct a detailed feasibility study. In its 2000 study, the Corps indicated that there was a federal interest in conducting a feasibility study. Since feasibility studies focused on improvements to inland waterways are exempt from cost sharing, the study would be a federal expense. However, since that study has not been funded to date, no further action has been taken.

Because of the time that has elapsed since the reconnaissance study was done, it will most likely be necessary for the Corps to restart the entire study process. To do so, the Corps will have to receive a letter from the non-federal sponsor (TxDOT) requesting the study. The study will take approximately 18 months to be completed and approved. Assuming the Corps finds that it is in the federal interest to go on to the feasibility study phase, TxDOT will need to request that the Corps proceed with the feasibility study. At that point, the study would enter the legislative process. The Federal Energy & Water Development Appropriations Subcommittee would have to provide funding for the effort to the Galveston District of the Corps. The study itself would take about three years. After adding up the reconnaissance study time, the feasibility study time, and the legislative process time, the researchers found that it will take at least six years (more likely seven to eight years) to move the process to construction.

The findings of the 2000 reconnaissance study help in understanding the issues and the potential measures that could be taken to alleviate the identified problems. The main problems at the Brazos River Floodgates and Colorado River Locks consist of navigational difficulties for tow operators through the facilities, across the rivers, and along the GIWW-T. Most of these problems are due to the narrow width of the lock and gate structures, and the proximity of the

structures to the rivers. Because of the narrow structures, tows have to stop, break down their barges, and then trip across the rivers as many times as necessary to get the entire tow through. This results in significant delays through the facilities.

Recent statistics show that an average of more than 40 accidents occurs each year at the two facilities combined due to allisions between the barges and the lock/gate structures. Table 13 shows the tally of the number, frequency, and costs of these accidents at the Brazos River Floodgates for 2002–2011, as compiled by the Brazos River Floodgate office personnel. These accidents cause damage to the structures and to the barges. Since most of the commodities that move through these facilities are petrochemical in nature, toxic spills could occur as a result of frequent accidents. There has been a significant rise in the accident rate and the severity of the accidents since 2008. Further investigation through future research is necessary to be able to discuss the causes of this increase.

Table 13. Accident History, Brazos River Floodgates, 2002–2011.

Year	Incidents per Year	Trips on Middle Reach			Rate per 1000 Trips	Total Damage[15]	Interval between Incidents (days)	Damage per Incident
		Up	Down	Total				
2002	22	6,784	6,762	13,546	1.6	$350,300	17	$15,923
2003	33	7,855	7,693	15,548	2.1	$683,625	11	$20,716
2004	33	9,064	9,093	18,157	1.8	$566,000	11	$17,152
2005	37	7,824	7,801	15,625	2.4	$1,107,600	10	$29,935
2006	25	6,674	6,674	13,348	1.9	$287,500	15	$11,500
2007	39	7,626	7,626	15,252	2.6	$783,585	9	$20,092
2008	38	6,761	6,733	13,494	2.8	$482,860	10	$12,707
2009	49	6,119	5,966	12,085	4.1	$773,720	7	$15,790
2010	46	6,381	6,262	12,643	3.6	$803,850	8	$17,475
2011	41	6,852	6,809	13,661	3.0	$720,250	9	$17,567
Avg.	**36**			**14,336**	**2.5**	**$655,929**	**10**	**$18,220**

If these damages were indexed to 2013 prices, the average annual damage amount would be $799,249, resulting in an average of $22,201 per incident. There is no public information on the damage to the towboats in these incidents. That amount could be substantial as well.

In 2000, the Corps estimated that delay costs exceeded $4 million annually at both locations. (As will be demonstrated later in this report, this number has grown substantially since then, primarily due to the increased cost of fuel.) The 75-ft gated thruway is too narrow to accommodate the new modern, wider barges, posing a major safety threat. The crossings were designed when barges were pulled astern on a towline rather than the current practice of pushing a string of barges, which makes navigation through the crossing more difficult. Tows transiting the GIWW-T today

[15] Damages shown are in reported dollars and are not adjusted for inflation.

usually consist of one to four barges, with the assembled tow varying in length from about 400 ft up to 1,100 ft, up to 70 ft wide, and drafting up to 10 ft. According to data that the Corps provided, the average tow size in this reach of the GIWW-T is 1.5 barges (loaded and empty). For tows with only loaded barges, the average is 2.4 barges per tow.

Restrictions are placed on the size of a tow that can cross the Colorado River when current speed in the river immediately upstream of the intersection is equal to or greater than 2.0 mph (3.0 fps). These restrictions require that only up to two empty barges or one loaded barge can cross, unless a helper boat is provided or a bow thruster is available. Brazos River Floodgate personnel indicate that similar restrictions exist at their location. Many tows have to "trip," or break down and moor their barges while taking one barge across at a time, causing significant delays.

Brazos River Floodgates

The following discussion focuses on the cost of inefficient or unsafe practices to the towboat operator and the Corps lockmaster. It does not take into account the carrying cost for commodities in transit, nor the effect that these issues may have on the decisions of corporations relying on the GIWW-T as a major transportation artery regarding whether to locate on the Texas coast. Reducing the cost of operations and the likelihood of accidents could be expected to have positive impacts on economic development efforts along the Texas coast.

The floodgates are not wide enough for modern configurations of tows to pass through. The floodgates were built in 1943 when barges were typically 26 ft to 35 ft wide. The floodgate chamber is 75 ft wide, and the maximum width it can accommodate is 55 ft. Today, it is common for towboat operators to push two 35-ft dry cargo barges side by side, for a total width of 70 ft. A typical tank barge measures 54 ft across, so tank barges must transit singly. The necessity to break the tow causes significant time delays.

Frequent accidents occur when tows strike the facilities while trying to line up to enter the floodgates after crossing the Brazos River. The floodgates are only about 600 ft from the river, and the towboat operators do not have enough time to recover their course after struggling with the river currents. As a result, an average of 36 accidents occurs per year, causing damages worth approximately $800,000 annually to the facility and to the barges. When these accidents involve tank barges, there is also a risk for hazardous material spills.

Unusually strong easterly currents flow through the West Brazos River Floodgates during normal river stage. The inability of tows to push through results in time delays. Sometimes they are unable to proceed even with a 1,000-HP assisting vessel.

TTI acquired three months of log entries for 2013 from the Brazos River Floodgates office for further analysis. Using these entries, the researchers developed statistics related to tows that had to be broken in order to pass through the floodgates. Using the detailed data for three months in 2013 (April, July, and October), TTI calculated the extra time and the additional trips that the

necessity to cut the tow required.[16] Table 14 shows the summary data for those three months, while Table 15 averages these statistics and then extrapolates them to an entire year.

Table 14. Brazos River Floodgates Tow Distribution (Three-Month Sample).

	Normal			Affected by Closure			3-Month
Tow Type	April	July	October	April	July	October	Total
Single Pass	497	520	437	49	14	81	1,598
2 Passes	223	300	209	28	11	75	846
3 Passes	9	15	14	3		9	50
4 Passes	1	2	1			2	6
5 Passes	1	2	1			1	5
6 Passes	1	4	1				6
Cross Month	1	1	1				3
Single Gate	16	10	24				50
Others	10	14	19			1	44
Total	**759**	**868**	**707**	**80**	**25**	**169**	**2,608**

Table 15. Brazos River Floodgates Tow Distribution—Estimated Annual Totals.

Tow Type	Normal	Affected by Closure	Total Tows	Estimated Passes of Tugs w/Barges
Single Pass	5,816	576	6,392	6,392
2 Passes	2,928	456	3,384	6,768
3 Passes	152	48	200	600
4 Passes	16	8	24	96
5 Passes	16	4	20	100
6 Passes	24	0	24	144
Cross Month	12	0	12	12
Single Gate	200	0	200	200
Others	172	4	176	176
Totals	**9,336**	**1,096**	**10,432**	**14,488**

The total estimated passes of tows (as opposed to tugs traveling alone) compares favorably with the total commercial lockages[17] that the Corps reported for the Brazos River West Floodgates (14,460) and the Brazos River East Floodgates (14,462) for 2013.

Using the data and the method described in the analysis of light loading in Appendix C, TTI was able to estimate the cost to the operators resulting from these additional maneuvers. Appendix D has the summary of the towboat and barge operating cost calculations.

[16] In this memorandum, a "pass" equals a trip through the pair of floodgates with one or more barges in the tow. Some individuals may use the term "cut" in the same way.

[17] A commercial lockage is one involving the movement of one or more barges through the facility, as opposed to recreational vessels or government-owned vessels.

The floodgate office personnel supplied a list of tows that were affected by closures of the floodgates for maintenance. In calculating the monetary cost of delays, first the researchers removed the tows that were affected by closures. The research team also eliminated tows that passed through only one gate, tows that apparently crossed the month-end of the detailed data set, and tows with data anomalies (the bottom three rows in Table 15). As described in Appendix D, an hourly operating cost of $490.08 was calculated for towboats and a weighted average hourly operating cost of $30.41 per barge was calculated. With these cost parameters, the researchers calculated the additional operating costs that the operators directly incurred due to the necessity to break the tows.

The first step was to calculate how much additional time each tow spends in passing through the floodgates because of the need to cut the tows and move the barges through in multiple passes. Table 16 provides the statistics for tows not affected by closures during the three months that the researchers analyzed in detail.

Table 16. Time Penalty Caused by Breaking Tows without Closures.

	----------April----------				----------July----------				----------October----------			
Tow Type	**Number**	**Avg. Time per Tow (hr)**	**Extra Time per Tow (hr)**	**Total Extra Time (hr)**	**Number**	**Avg. Time per Tow (hr)**	**Extra Time per Tow (hr)**	**Total Extra Time (hr)**	**Number**	**Avg. Time per Tow (hr)**	**Extra Time per Tow (hr)**	**Total Extra Time (hr)**
Single Pass*	497	2.22	N/A	N/A	520	1.15	N/A	N/A	437	1.82	N/A	N/A
2 Passes	223	6.22	4.00	892.00	300	4.18	3.03	909.00	209	5.21	3.39	708.51
3 Passes	9	5.97	3.75	33.75	15	6.82	5.67	85.05	14	7.52	5.70	79.8
4 Passes	1	7.73	5.51	5.51	2	10.52	9.37	18.74	1	6.83	5.01	5.01
5 Passes	1	9.32	7.10	7.10	2	11.20	10.05	20.10	1	8.47	6.65	6.65
6 Passes	1	13.77	11.55	11.55	4	11.47	10.32	41.28	1	11.88	10.06	10.06
TOTALS	**732**			**949.91**	**843**			**1074.17**	**663**			**810.03**

**Tows not broken.*

If the extra costs calculated in Table 16 are avoided, they result in a cost savings to the operator. An estimated 6 percent return on investment is then used as an income input to the input-output model that TTI maintains. The TTI input-output model described earlier calculates that the cost savings have an estimated positive economic impact of 13 jobs and $3.0 million in additional economic activity. Table 17 provides the weighted averages for the year based on the statistics shown in Table 16.

Table 17. Weighted Average Processing Times without Closures.

Tow Type	Total Number for 3 Months	Weighted Average Processing Time (hr)
Single Pass	1,454	1.72
2 Passes	732	5.10
3 Passes	38	6.88
4 Passes	4	8.90
5 Passes	4	10.05
6 Passes	6	11.92

Table 18 uses the estimated annual number of tows by category, the weighted average processing times, and the towboat and barge operating costs shown in Appendix D to calculate the extra costs incurred due to the requirement to cut the tows and trip through the floodgates. The table includes only the tows that were not affected by closures.

Table 18. Estimated Cost of Breaking Tows without Closures, Brazos River Floodgates, 2013.

	Number	Weighted Avg. Time per Tow (hr)	Extra Time per Tow (hr)	Total Extra Time (hr)	Extra Towboat Cost*	Weighted Average Barges/Tow	Extra Barge Cost*	Total Extra Cost
Single Pass	5,816	1.72	N/A	N/A	N/A	N/A	N/A	N/A
2 Passes	2,928	5.10	3.38	9,896.64	$4,850,145	2.1	$632,009	$5,482,154
3 Passes	152	6.88	5.16	784.32	$384,380	3	$71,554	$455,934
4 Passes	16	8.90	7.18	114.88	$56,300	4	$13,974	$70,274
5 Passes	16	10.05	8.33	133.28	$65,318	5.3	$21,481	$86,799
6 Passes	24	11.92	10.20	244.8	$119,972	6	$44,666	$164,638
TOTALS	**8,952**			**11,173.92**	**$5,476,115**		**$783,684**	**$6,259,799**

**Based on operating costs of $490.08/hr for towboats and $30.41/hr for barges.*

Table 19 provides the statistics for processing times for tows affected by closures during the three months that the researchers analyzed in detail. These statistics were calculated in the same manner as the statistics in Table 16, but in this instance, only the tows affected by closures were included. Also, in this instance, costs were calculated for single-pass tows as well as multiple-pass categories since all tows are forced to wait for an additional time during a closure. The extra time per tow with closure is based on the weighted average time per single-pass tow without closure shown above (1.72 hours).

Table 19. Time Penalty Caused by Breaking Tows with Closures.

	----------April----------				----------July----------				----------October----------			
Tow Type	**Number**	**Avg. Time per Tow (hr)**	**Extra Time per Tow (hr)**	**Total Extra Time (hr)**	**Number**	**Avg. Time per Tow (hr)**	**Extra Time per Tow (hr)**	**Total Extra Time (hr)**	**Number**	**Avg. Time per Tow (hr)**	**Extra Time per Tow (hr)**	**Total Extra Time (hr)**
Single Pass	49	7.25	5.53	270.97	14	7.42	5.70	79.8	81	7.73	6.01	486.81
2 Passes	28	12.10	10.38	290.64	11	14.37	12.65	139.15	75	12.95	11.23	842.25
3 Passes	3	19.65	17.93	53.79	0	0	0	0	9	12.29	10.57	95.13
4 Passes	0	0	0	0	0	0	0	0	2	19.4	17.68	35.36
5 Passes	0	0	0	0	0	0	0	0	1	23.15	21.43	21.43
6 Passes	0	0	0	0	0	0	0	0	0	0	0	486.81
TOTALS	**80**			**615.40**	**25**			**218.95**	**168**			**1480.98**

Table 20 provides the weighted average processing time for tows based on the statistics shown in Table 19.

Table 20. Weighted Average Processing Times with Closures.

Tow Type	Total Number for 3 Months	Weighted Average Processing Time (hr)
Single Pass	144	7.54
2 Passes	114	12.88
3 Passes	12	14.13
4 Passes	2	19.40
5 Passes	1	23.15
6 Passes	0	0

Table 21 uses the estimated annual number of tows by category, the weighted average processing times, and the towboat and barge costs (see Appendix D) to calculate the extra costs incurred due to the requirement to cut the tows and trip through the floodgates. The table only includes tows that were affected by closures.

Table 21. Estimated Cost of Breaking Tows with Closures, Brazos River Floodgates, 2013.

	Number	Weighted Avg. Time per Tow (hr)	Extra Time per Tow (hr)	Total Extra Time (hr)	Extra Towboat Cost	Weighted Average Barges/Tow	Extra Barge Cost	Total Extra Cost
Single Pass	576	7.54	5.82	3,352.32	$1,642,905	1.4	$142,722	$1,785,627
2 Passes	456	12.88	11.16	5,088.96	$2,493,998	2.1	$324,986	$2,818,984
3 Passes	48	14.13	12.41	595.68	$291,931	3	$54,344	$346,275
4 Passes	8	19.4	17.68	141.44	$69,317	4	$17,205	$86,522
5 Passes	4	23.15	21.43	85.72	$42,010	5	$13,034	$55,044
6 Passes	0	0	0	0	0	0	$142,722	$1,785,627
TOTALS	**1,092**			**9,275.04**	**$4,540,160**		**$552,290**	**$5,092,451**

**Based on operating costs of $490.08/hr for towboats and $30.41/hr for barges.*

If the extra costs calculated in Table 21 are avoided, they result in a cost savings to the operator. An estimated 6 percent return on investment is then used as an income input to the TTI input-output model described earlier. The cost savings has an estimated positive economic impact of 10 jobs and $2.4 million in additional economic activity.

From the totals of Table 18 and Table 21, readers can deduce that annually, the additional operating cost attributable to the requirement to break tows is $11,352,250. If the cost of damages to the floodgates shown in Table 13 is indexed to 2013 dollars and added in, the total annual cost due to the inefficient design of the floodgates is $12,151,499.

From 2001 to 2013, the number of commercial lockages at the west floodgates increased overall, but with variable rates. On the whole, the number of lockages at the floodgates increased by 45 percent, from almost 10,000 to nearly 14,500. Figure 24 shows the number of commercial lockages over time.

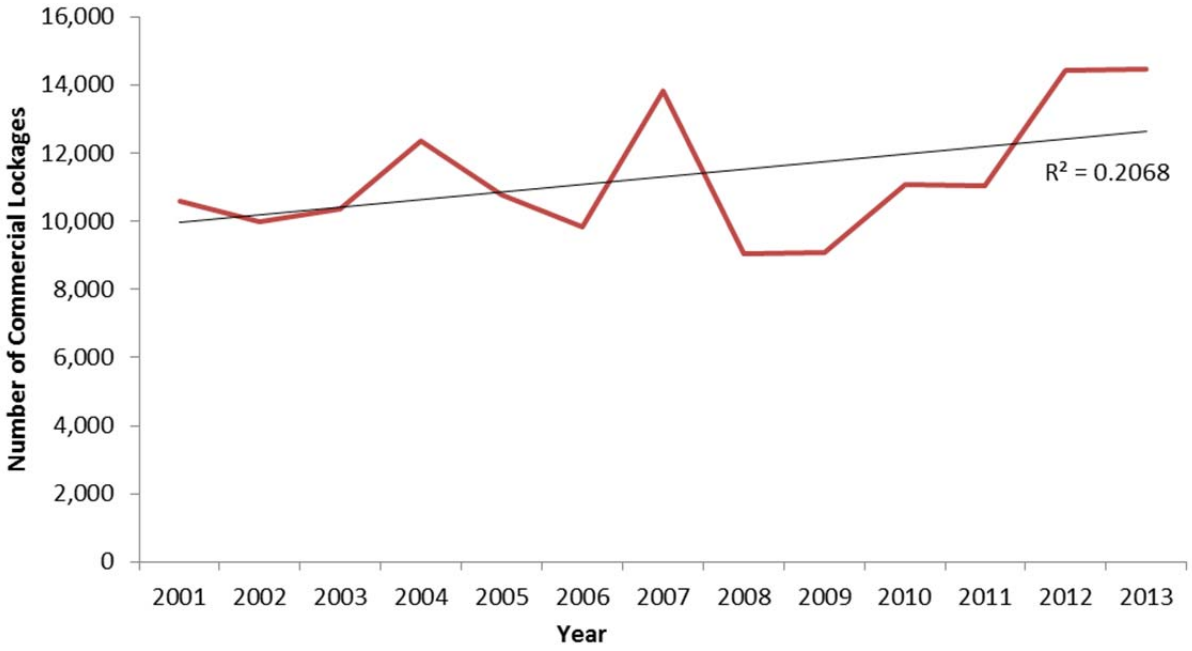

Figure 24. Commercial Lockages at the West Floodgates.
Source: U.S. Army Corps of Engineers Lock Performance Monitoring System (*41*).

During the period between 2001 and 2009, the number of annual lockages fluctuated between 9,000 and 11,000. However, peaks of 12,000 and almost 14,000 were seen in 2004 and 2007, respectively. In 2011, the number of lockages began an average increase of 10 percent.

The researchers obtained cost estimates to replace a lock facility from an ongoing feasibility study at the New Orleans District entitled *Bayou Sorrel Lock, Louisiana*. Bayou Sorrel Lock is located in Iberville Parish in south-central Louisiana. It is very similar in dimensions and construction to the lock facilities at the Colorado River. The feasibility study concluded that the best plan would be to replace the existing 56-ft × 797-ft lock (earthen chamber) with a 110-ft × 1,200-ft lock (concrete chamber). The cost for the replacement was about $60 million for one lock structure.

If the floodgates can be replaced for a conservative estimate of about half the cost of two locks, or $60 million (as discussed later in this section), the payback time for this investment will be less than five years at current traffic levels. If traffic increases due to Eagle Ford Shale activity and general economic trends, this payback period will be shortened considerably. Towboat and barge repair costs are confidential and are therefore not subject to inclusion in this estimate. However, if those costs are avoided and added into the benefits, the payback period will be further reduced.

There are additional costs, most notably due to the lost time and inefficiency caused by having towboats tied up longer than they should be. If towboats can move through the floodgates more quickly, they can deliver their cargo and pick up the next load sooner. Over a year's time and across a fleet of towboats, this could easily allow an operator to use fewer towboats to deliver the

same amount of cargo, or use the same number of towboats to deliver more cargo in the same time. However, this type of analysis is beyond the scope of this master plan.

Weather conditions will also affect operations regardless of the infrastructure in place. The researchers were unable to determine how often weather conditions actually restrict operations at the floodgates. The floodgates themselves remain open, even during severe weather events such as hurricanes, but operators' guidelines prohibit them from passing through the floodgates under such conditions. This will need to be further researched in a comprehensive feasibility study for the floodgates.

Colorado River Locks

The Corps' 2000 reconnaissance study on the Brazos River Floodgates and the Colorado River Locks reported that the southwest corner of the Colorado River/GIWW-T intersection had eroded considerably. Towboat pilots use the southwest corner as a pivoting point to line up with the approach to the west lock. Without this point, more time is required to recover their course through the locks.

There is increased difficulty in navigating across the intersection, especially when going east to west, due to eddies in the currents near the eroded southwest corner. Navigation past the opening to the bypass channel is difficult because of strong tidal currents in the channel itself. Time delays occur due to the lock chamber width. Accidents occur that can be attributed to the proximity of the facility to the river.

Tows have trouble tying off to mooring walls during the winter months. The walls are located along the northern bank, and north winds during winter push the tows to the south. Additionally, tows collide with mooring buoys and have a difficult time tying to them. Table 22 shows the number and frequency of accidents at the locks for the 2002–2011 period. The accident rate is about 1/6 of the rate at the Brazos River Floodgates (2.5 per thousand trips), which helps explain the difference in the level of concern of the stakeholders between the two structures.

Table 22. Accident History, Colorado River Locks, 2002–2011.

Year	Incidents per Year	Trips on Middle Reach			Rate per 1000 Trips	Total Damage*	Interval between Incidents (days)	Damage per Incident
		Up	Down	Total				
2002	3	6,784	6,762	13,546	0.22	$35,860	122	$11,953
2003	4	7,855	7,693	15,548	0.26	$108,540	91	$27,135
2004	7	9,064	9,093	18,157	0.39	$106,560	52	$15,223
2005	9	7,824	7,801	15,625	0.58	$209,844	41	$23,316
2006	4	6,674	6,674	13,348	0.30	$39,000	91	$9,750
2007	11	7,626	7,626	15,252	0.72	$198,400	33	$18,036
2008	3	6,761	6,733	13,494	0.22	$78,000	122	$26,000
2009	6	6,119	5,966	12,085	0.50	$363,000	61	$60,500
2010	11	6,381	6,262	12,643	0.87	$502,000	33	$45,636
2011	4	6,852	6,809	13,661	0.29	$103,000	91	$25,750
Avg.	**6**			**14,336**	**0.42**	**$174,420**	**61**	**$28,132.32**

**Damages shown are in reported dollars and are not adjusted for inflation.*

Unfortunately, the research team was not able to obtain statistical data for the Colorado River Locks, so it was not possible to quantify the effect of the aforementioned issues. However, given the low level of concern on the part of stakeholders, this lack of analysis is unlikely to have a significant effect on the findings of the master plan study.

Potential Measures to Address Lock/Floodgate Issues

Non-Structural Measures

The non-structural measures that might be considered at both facilities include:

- The use of helper boats that are owned by either the Corps or the users.
- The use of bow thrusters.
- The use of tugs to assist the longer strings of barges: one to pull, and one to push.

Structural Measures

The structural measures that were recommended for consideration in the reconnaissance study include the following:

- Brazos River Floodgates:
  - Move the gates back away from the river.
  - Widen the gates.
  - Reconfigure the guide wall to lessen its angle to the GIWW-T.
  - Create a guide to pivot against.

    - Straighten the crossing at the river, aligning the GIWW-T at a near-90-degree angle with the Brazos River. The old bypass channel might be used for this purpose, or the new channel could be routed between the old bypass channel and the existing channel.
    - Construct a true lock on the west end of the Brazos River Floodgates.
    - Establish a more direct outlet for the San Bernard River.
    - Remove the floodgates and dredge to maintain the crossing.
- Colorado River Locks:
    - Move the locks back away from the river.
    - Widen the locks.
    - Move the intersection of the bypass channel and the GIWW-T further east of the locks.
    - Build a gate in the dam to operate as a water control structure. The gate would be opened as the tow approaches, allowing some river flow to divert through the dam and lessening the difficult effects of the river flow.
    - Open the dam to allow for split flow from the river into the bay/gulf, allowing 20–30 percent of the flow to go into the old channel and out to the gulf.
    - Restore/replace the southwest point of the Colorado River/GIWW-T intersection.
    - Dredge a small opening between the old channel and West Matagorda Bay at Parkers Cut, or between the old channel and the southwest corner of East Matagorda Bay.

Preliminary Evaluation of Measures

In the reconnaissance report, the Corps analyzed a number of project alternatives and reached the following conclusions.

One preliminary plan that may be considered for feasibility at both the Colorado River Locks and the Brazos River Floodgates would be to replace the existing structures with 110-ft × 1,200-ft structures, and to move the structures away from the river about 600 ft to 1,200 ft. Many other districts with responsibilities for the inland waterways have performed cost-effectiveness/incremental analyses to find the most efficient width for lock and gate facilities for inland waterways. Consistently around the United States, it has been shown that 110 ft is the most efficient width. Widening the locks to 110 ft would reduce the time delays that occur when tows have to stop and break down their barges to get them through the locks. It would also bring the two facilities up to date with the rest of the facilities along the GIWW-T. Moving the structures back from their present location would give towboat operators more time to regain their course after crossing the rivers. This would reduce:

- The difficulty of navigating across the rivers.
- The number of accidents that occur when tows run into the facilities.
- The time delays associated with these problems.

Replacing the existing locks and gates at the Colorado River Locks and Brazos River Floodgates with new locks similar to the Bayou Sorrel Lock (two new structures at each location) would cost about $180 million. There would be two new lock structures on each side of the Colorado River at $60 million each. There have not been any engineering studies to determine what it would cost to replace the floodgates, but new floodgates would certainly cost less than the locks.

To be conservative, the researchers used a figure of $30 million for each side of the river, for a total of $60 million for the floodgates. Galveston District Corps personnel indicated that this figure is frequently used in high-level analyses that include the floodgates.

FLEETING AREAS

One of the issues that all the operators participating in the stakeholder working group agreed on was the lack of fleeting area capacity that is affecting the safety and efficiency of barge operations on the GIWW-T. This is especially acute in the Corpus Christi area.

Fleeting areas are holding areas for barges that are in between shipments. They may be used to clean, repair, or simply hold barges. Fleeting areas are typically private operations that may be used for a captive fleet (the owner's fleet) or as third-party enterprises that charge for services rendered. However, this does not preclude a port authority from being involved in the construction and/or operation of such a facility.

The Port of Corpus Christi Authority has plans for a barge fleeting area estimated to cost $6 million, which it plans to have in operation by the end of 2014. It has not been determined if the port will operate the facility or lease it to a third-party operator, but whoever operates the site will be required to service all barge traffic in the ship channel. The facility will have approximately 3,000 ft of bank space and have the capacity to hold 40 to 45 30,000-bbl tank barges. Existing facilities at Corpus Christi include Kirby Marine (~25 barges), the North Bank fleeting area (~20 barges), and the Accutrans fleeting area (~six barges). The new facility should help alleviate the current capacity problems, although the growth of the fracking industry may absorb this new capacity quickly.

Because each fleeting area is in a unique environment, both in terms of the ecology and the level of development around the site, it is not particularly useful to speak of an "average" fleeting area. Conversations with the executive director of the Gulf Intracoastal Canal Association (who in turn consulted with its members) indicated that establishing a fleeting area would cost approximately $1.5 million for every 1,000 ft of shoreline. Corpus Christi's engineering estimate is roughly $2 million per 1,000 ft. Since Corpus Christi is constructing its site in a highly developed area requiring a number of special design considerations, the port's estimate appears to be on the high end of the likely cost range and seems to be the most conservative number to use for budget estimation purposes.

There is at least one fleeting area in each major port complex. In the cases of Houston and Corpus Christi, there are a number of such facilities. Table 23 shows the fleeting areas that the researchers identified.[18]

[18] Source: Kirby Marine.

Table 23. Sample List of Fleeting Areas on Texas GIWW-T.

Port Area	Fleeting Site
Beaumont/Port Arthur/Orange	1000 Ft Cut Fleeting (Port Neches)
	Bean's Fleet (Port Neches)
	Kirby Marine (Beaumont)
	Port of Orange Fleeting (small, 8–10 barges)
	Sabine Fleet Service (Beaumont)
Houston/Galveston	ACL Carpenters Bayou
	ACL Old River and Houston Ship Channel
	Barge Fleeting Newport (Galveston)
	Bolivar Terminal (jointly owned by Kirby and ACL)
	Boone Towing (Old River)
	Cedar Bayou Fleeting
	Cheryl K Towing (San Jacinto River)
	Enterprise Marine Services (Old River)
	Greens Bayou Fleeting (jointly owned by Kirby and Kinder Morgan)
	Hard's Marine (Old River)
	Kirby Exxon Baytown
	Kirby Texas City
	Kirby Houston Ship Channel Locations* • San Jacinto River Fleet. • Old River Fleet. • Houston Ship Channel at mouth of Carpenters Bayou. • Carpenters Bayou.
	McDonough Towing (Old River)
	Web Fleeting/Blessey (Old River)
Freeport	Kirby Freeport
	Kirby Seadrift
	VIT
Victoria	Devall Towing (under development, open July 2014)
	Turning Basin
Corpus Christi	Accutrans (South Bank, private use only)
	Kirby Marine (North Bank)
	Kirby Marine (Tule Lake)
Brownsville/Port Isabel	Iron Mike Marine (Brownsville)
	Pilot Terminals (Port Isabel)

**Taken together, these areas can hold about 300 barges, the largest capacity under single ownership on the Texas coast.*

One additional fleeting area in each of the four major port complexes in Texas (Beaumont/Port Arthur, Houston, Freeport, and Corpus Christi) would lead to a significant improvement in

operations along the GIWW-T. However, expanding fleeting capacity would require a capital investment of approximately $16 million, assuming that each site would cost approximately $4 million (at a modest length of 2,000 ft of bank space for each).

MOORING AREAS

Barge operators use mooring areas during inclement weather or other situations when it would not be safe to proceed along the waterway. They are not intended to serve the same purposes as a fleeting area. The Corps of Engineers is in the final phase of a study to determine the condition and adequacy of mooring areas along the GIWW-T. The Corps study indicates that it is not necessary to add new mooring areas, but current mooring areas must be rehabilitated and expanded. The preliminary findings of the study indicate that every evaluated alternative will produce a strong benefit-cost ratio, which allows for the alternatives with the maximum number of buoys considered in the study to be recommended at each location. Figure 25 shows the location of current mooring areas.

Figure 25. GIWW-T Mooring Areas.

The preliminary indications are that the following projects will be recommended for funding:

- **Port Arthur Mooring Basin**—11 new buoys west of the current buoys (75-ft × 1,925-ft extension of existing facility). Estimated cost is $947,000.
- **Port Bolivar Mooring Basin**—11 new buoys west of the current buoys (75-ft × 1,925-ft extension of existing facility). Estimated cost is $947,000.
- **Pelican Island Mooring Basin**—seven new buoys west of the current buoys (75-ft × 1,225-ft extension of existing facility). Estimated cost is $1,824,000.
- **East Brazos Mooring Basin**—16 new buoys, with eight new buoys on the south side of the channel east of the existing buoys at 190-ft spacing (75-ft × 1,520-ft extension of existing facility) and eight new buoys on the north side of the channel—four east of the existing buoys and four west of the existing buoys—at 190-ft spacing (75-ft × 1,520-ft extension of existing facility). Estimated cost is $1,707,000.
- **West Brazos Mooring Basin**—16 new buoys (eight new buoys on the south side of the channel—three east of the existing buoys and five west of the existing buoys—at 190-ft spacing (75-ft × 1,520-ft extension of existing facility) and eight new buoys on the north side of the channel west of the existing buoys at 190-ft spacing—four existing buoys to be relocated to the west end of the existing buoys (75-ft × 1,520-ft extension of existing facility). Estimated cost is $1,619,000.

The total estimated cost for all improvements is $7,044,000, resulting in the placement of 61 new buoys and the creation of an additional 8,115 linear ft of mooring space. The funding for these improvements will come from the Galveston District's operations and maintenance funds. Since the study is a discretionary report, the authority is delegated to the district commander to expend O&M funds for the mooring basin expansions. The very minor dredging quantities associated with the enlargement of each mooring basin would be included with regularly scheduled maintenance dredging contracts.

ENCROACHMENT

In August 2010, TxDOT published a report prepared jointly by Texas A&M University at Galveston and TTI titled "Analysis and Recommendations on Protecting Waterways from Encroachment" (*6*). In that report, the authors prepared recommendations for permitters (Corps) and another set for developers. The recommendations for permitters follow:

- Hard et al., 2008 (*42*), noted that there is a need to develop a corridor strategy for the GIWW-T, establishing a multi-jurisdictional approach There is a clear need for a master plan to create zones of non-development in order to allow for strategic mooring locations for traffic, weather issues, and safe bridge approaches.
- A more aggressive review of the "public use" and "reduction in navigable capacity" criteria under the permitting regulations of the U.S. Army Corps of Engineers should be pursued in granting permits. According to Dolan Dunn[19] of the Corps' Galveston District, comments about encroachment receive more weight in a permit's evaluation if the comments come from the Corps in its Operations Division. TxDOT should work closely

[19] Comments and correction in an email to the research team dated July 13, 2009

with the Operations Division of the Corps to evaluate the accumulative and types of structure effects on the waterway and develop preferred types of structures.

- The Texas General Land Office should take a more proactive role in permitting by reviewing the impacts of structures on state commerce, being mindful of the accumulative and locational effects of development particularly with regard to the reduction of navigable capacity under Section 403 of Title 33 of the U.S. Code ("Obstruction of navigable waters generally; wharves; piers, etc.; excavations and filling in").
- County judges should be made aware of the commerce impacts on Texas and their counties of the placement and scope of construction of development along the waterway, emphasizing the importance of waterborne freight to Texas.
- There must be a better mechanism for policing of permits after they are issued. Various stakeholders perceive that there is no mechanism currently to determine if the structure was built according to the approved permit.
- The water transportation industry (such as industry organizations and not merely another division of the U.S. Army Corps in its Navigation and Operations Division) needs to have input in the permitting process.
- A developer guidebook should be made available to each developer and property owner along the GIWW-T.
- Time limits may be required on permits to better coordinate development along the waterway.

Many of the concerns and recommendations were addressed in a new permitting procedure that the Corps instituted in October 2013. Appendix E is a copy of the body of the procedure.

CHAPTER 4: ECONOMICS AND FUNDING ISSUES

FUNDING REQUIREMENTS

A lack of sufficient funding is one reason why the GIWW-T is not being maintained at its authorized dimensions. The Corps, the entity responsible for maintenance and dredging of the GIWW-T, is forced to direct limited funding dollars toward critically urgent projects, thus leaving little money available for a number of high-priority capital projects. Furthermore, stakeholder interviews and Congressional appropriations data show this funding shortfall will continue if no changes are made. To ensure a safe and efficient GIWW-T, it is important to secure a sustainable revenue stream while also taking advantage of possible one-time funding sources. This chapter evaluates, analyzes, and summarizes potential resource streams for covering the estimated costs for GIWW-T improvements and maintenance shortfalls.

Chapter 4 provides an overview of various funding strategies and then focuses on those that seem to have a higher probability of success in the short term based on stakeholder input and research findings in other areas. During the stakeholder meetings and throughout the research period, several possible funding strategies were noted for consideration. For evaluation, researchers developed a two-stage approach. First, criteria were selected for evaluating alternatives. Then, different alternatives were selected and evaluated based on the analysis criteria. The analysis criteria and possible funding alternatives are discussed in detail.

Based on stakeholder feedback and conversations with the Corps of Engineers, researchers identified the two areas of highest concern for the efficient movement of waterborne commerce on the GIWW-T:

- Lack of GIWW-T depth.
- Brazos River Floodgates.

Addressing these issues will require additional funding in order to ultimately ensure continued efficient operation on the GIWW-T.

Funding Requirements for Maintaining Channel Depth

As previously noted, the capital and operational costs required to maintain the GIWW-T at authorized dimensions would first require additional funding to bring it up to its authorized dimensions. The Corps is responsible for performing the dredging of the channel to its project dimensions. Typically, the Corps submits its budget request for the fiscal year based on expected needs that the Department of Defense refers to as “full funding capability.” However, recent shortfalls in the Corps’ budget mean that actual budgeted amounts for GIWW-T operations and maintenance dredging activities consistently fall short of the requested amount. Table 24 shows the GIWW-T full funding capability amount for operations and maintenance and the actual budgeted amount from 2006–2014.

Table 24. GIWW-T Operations and Maintenance Activities, 2006–2014.

Fiscal Year	Actual Budgeted Amount (thousands)	Full Funding Capability (thousands)	Difference (thousands)
2006	$29,312	$41,092	−$11,780
2007	$33,190	$58,187	−$24,997
2008	$24,161	$91,175	−$67,014
2009	$31,874	$42,018	−$10,144
2010	$26,046	$53,434	−$27,388
2011	$27,792	$78,605	−$50,813
2012	$24,277	$78,191	−$53,914
2013	$25,570	$60,635	−$35,065
2014	$28,885	$56,285	−$27,400
Total	**$251,107**	**$559,622**	**−$308,515**

Note: Source: U.S. Army Corps of Engineers, Galveston District.

Funding Requirements for Replacement of the Brazos River Floodgates

The Brazos River Floodgates have posed many problems for GIWW-T users. Stakeholders noted many concerns, such as painfully long queuing times and significant safety issues (see Figure 26).

Figure 26. Hazardous Conditions at the Brazos River Floodgates.
Source: TxDOT 2005 (43).

As discussed earlier, researchers obtained cost estimates to replace similar facilities and determined that a conservative total cost estimate is about $60 million (see Table 25).[20]

[20] These estimates are 50 percent of the estimates for the Colorado River Locks, which is a number that the Corps' Galveston District staff uses for ballpark estimates. There has been no engineering analysis of the floodgates that would determine a more accurate cost estimate.

Table 25. Brazos River Floodgates Estimated Replacement Cost.

Floodgate Description	Cost (millions)
Brazos River West Floodgates	$30
Brazos River East Floodgates	$30
Total	**$60**

Note: Source: TTI Estimate.

BENEFICIARIES

Maintaining the GIWW-T at its authorized dimensions provides several benefits to its public-sector stakeholders. Although the maintenance of the GIWW-T is the primary responsibility of the U.S. Army Corps of Engineers, with TxDOT serving as its non-federal sponsor, many federal and state agencies have an important stake in the GIWW-T and could benefit from its proper maintenance. Table 26 shows the public-sector GIWW-T stakeholders that could benefit from these improvements.

Table 26. Public-Sector Stakeholder Beneficiaries.

Stakeholder	Possible Benefits of a Properly Maintained GIWW-T
U.S. Army Corps of Engineers	Possible reduction in operation and maintenance costs on some facilities.
Texas Department of Transportation	Possibility for transportation mode shift benefits. For example, a properly maintained GIWW-T could improve reliability. This improved reliability could incentivize some shippers to choose to transport freight by barge rather than rail or truck.
U.S. Coast Guard	Reduction in congestion at mooring areas, resulting in increased safety benefits.
Texas Railroad Commission (TRRC)	The TRRC is responsible for spill cleanup if the spill resulted from crude pipelines and storage facilities. As oil and gas operations continue to expand in Texas, the amount of oil transported along the GIWW-T will increase, a situation that will be exacerbated by the need to make more barge trips if the channel is not properly maintained.
Texas Parks and Wildlife Department	TPWD's Kills and Spills Team is responsible for minimizing the impact of the spill on the environment and coordinating rehabilitation programs. Improving and maintaining the GIWW-T means less time that hazardous materials are on the waterway and safer maneuvers through the floodgates that can reduce the risk of an accident.
Texas General Land Office (TGLO)	The TGLO Oil Spill Prevention and Response Program is responsible for responding to oil and other hazardous material spills that threaten coastal waters. A well-maintained waterway could mean fewer barges will have to queue at the floodgates, reducing spill risk along the Texas Gulf Coast.

Note: Source: Texas Parks and Wildlife Department (*44*).

In addition to the public sector, several private-sector industries are also likely to benefit. As discussed previously, petroleum products, chemicals, and crude oil are heavily transported on the GIWW-T; therefore, the companies that greatly depend on the GIWW-T are most likely to benefit from its proper maintenance. The list highlights Texas Gulf Coast industries that could benefit from a properly maintained GIWW-T:

- **Petroleum and Chemical.** The petroleum industry generally includes companies that are involved in the processes of exploring, extracting, refining, transporting, and marketing petroleum products. This industry is integral to the local and regional economy; nearly 50 percent of the total chemical and gasoline production in the United States takes place in the Galveston Bay Area of Texas. A variety of refinery companies operate farther inland in areas around Houston, Bay City, Beaumont, and other cities along the coast. The Texas Gulf Coast chemical industry comprises mostly companies that produce industrial chemicals to be transported to other places along the Gulf Coast. A properly maintained GIWW-T could improve transportation reliability and reduce transportation costs for these industries (*45*, *46*, *47*, *48*, *49*).
- **Transportation and Logistics.** The transportation and logistics industry generally refers to companies that manage the flow of products from a point of origin to destination. The logistics industry usually involves the integration of:
  - Information.
  - Material handling.
  - Production.
  - Packaging.
  - Inventory.
  - Transportation.
  - Warehousing.
  - Security of products transported.

  A poorly maintained GIWW-T means that transportation and logistics companies will be wary of transporting products that require timely delivery, and whose transportation consumes unnecessary resources when the waterway is used. On the other hand, a properly maintained GIWW-T provides Texas Gulf Coast transportation and logistics companies an additional efficient transportation mode choice to move their products.
- **Other**. Other industries are also likely to benefit from a properly maintained GIWW-T, such as sailing, fishing, and other recreational and tourism industries that depend on the GIWW-T (*50*).

ALTERNATIVE ANALYSIS CRITERIA

Based on stakeholder panel input and their own research, researchers evaluated funding options based on three analysis criteria:

- Feasibility (i.e., what is the likelihood such an alternative could be reasonably implemented?).
- Sustainability (i.e., does this alternative provide long-term, sustainable funding?).
- Equity (i.e., how is the funding burden shared among all parties?).

Evaluation criteria used for this analysis are discussed in greater detail in the following subsections.

Feasibility: Will This Alternative Be Feasible to Implement Administratively?

The first evaluation criterion used for this analysis was feasibility (i.e., the ability to implement or administer a possible funding option). According to a recently published Government Accountability Office (GAO) assessment of best practices for government tax and funding structure, administrable tax systems allow the government to collect taxes and fees as cost effectively as possible. Generally, it is understood that all tax and fee systems have administrative costs. A more administrable system collects more of the statutorily required taxes and fees at a lower cost per dollar collected. GAO summarized key tasks required for administering federal and sub-federal tax systems. Two of those key tasks relevant for this analysis are presented below (*51*):

- **Enforcing the tax code.** One of the government's more challenging roles in administering any tax scheme is detecting and penalizing taxpayer noncompliance.
- **Providing taxpayer assistance.** To reduce compliance burden and increase compliance rates, tax administrators generally provide assistance to taxpayers by such means as publishing forms and answering questions.

Furthermore, GAO provided a list of key questions to consider regarding administrative feasibility of a tax structure (*51*):

- What impact is the tax proposal likely to have on the compliance burden that taxpayers face?
- Does the proposal contain any estimates of its effect on compliance burden?
- How would the tax system be administered?
- What would be the role of taxpayers, employers, and information return providers under this alternative?
- What enforcement tools would be added or taken away from tax administrators?

Finally, in addition to reviewing the feasibility of pursuing a new tax or fee structure, this analysis also reviewed the feasibility of pursuing grant programs from the perspective of the GIWW-T stakeholder. Applying for discretionary grants on an annual basis (rather than receiving funding from a reliable revenue stream) can place additional administrative challenges on agencies seeking to maintain funding for the GIWW-T.

Sustainability: Does This Alternative Provide Long-Term, Predictable, and Reliable Funding?

Sustainability, in the context of tax policy, generally refers to whether a funding alternative raises enough funds to sustain the level of public services that citizens and policymakers demand. According to the Institute on Taxation and Economic Policy (ITEP), two factors that contribute to the sustainability of a tax alternative are its stability and elasticity. For example, ITEP considers a stable tax to be one "that grows at a predictable pace," and as a result, this "predictable growth makes it easier for lawmakers to put together budgets that match anticipated revenues to

spending" (*52*). ITEP defines elasticity as a measure of whether the growth in tax revenues keeps pace with the local, regional, and national economy. Elasticity is considered an important component of how sustainable a tax alternative is because the cost of providing public services usually grows at least as fast as the economy. A tax alternative that is highly elastic is generally one that grows faster than the economy during good times but can fall faster than the economy during bad economic times. ITEP recommends that generally, a good government practice is to consider a mix of stable and elastic tax strategies to achieve long-term sustainability.

Equity: How Is the Burden Shared under This Alternative?

Equity is one criterion frequently used to evaluate tax policy. Often, many differing (and sometimes opposing) ideas emerge concerning equity. It is generally accepted that taxes and fees are the necessary price that must be paid for benefitting from critical infrastructure. In a complex legal environment, it may be impossible to design and administer an equitable tax system; however, it is generally understood that achieving a tax system that is largely perceived as fair and equitable is a desirable goal.

In a 2007 paper on guiding principles for tax equity and fairness, the American Institute of Certified Public Accountants (AICPA) recommended that the following seven dimensions be considered when determining tax equity and fairness.

- **Exchange Equity and Fairness.** Over the long run, taxpayers receive appropriate value for the taxes they pay.
- **Process Equity and Fairness.** Taxpayers have a voice in the tax system and are given due process. Tax administrators treat them with respect.
- **Horizontal Equity and Fairness.** Similarly situated taxpayers are taxed similarly.
- **Vertical Equity and Fairness.** Taxes are based on the ability to pay.
- **Time-Related Equity and Fairness.** Taxes are not unduly distorted when income or wealth levels fluctuate over time.
- **Inter-Group Equity and Fairness.** No group of taxpayers is favored to the detriment of another without good cause.
- **Compliance Equity and Fairness.** All taxpayers pay what they owe on a timely basis.

Appendix F gives additional information on these dimensions. Finally, GAO provided a list of key questions to consider regarding equity and fairness of a tax structure (*51*):

- How is a taxpayer's ability to pay broadly defined: Income? Consumption? A broader definition of overall wealth?
- Will taxpayers with equal ability to pay taxes pay the same amount?
- How will the tax system tax people with differing ability to pay?

[21] The AICPA notes two important caveats to these tax equity dimensions. First, equity should be evaluated within the context of the entire tax system, not just the income tax, and not on a proposal-by-proposal basis. Vertical equity provided by progressive income tax rates may be structurally offset by sales, Social Security, and property taxes. Second, whether a tax system is equitable is largely a matter of perception. Feelings about whether a particular aspect of the tax system is fair or unfair are influenced by prior experiences and information (or misinformation).

- Are there any components of the tax proposal that are justified on the benefits-received principle? If so, what mechanisms are in place to determine that taxpayers who pay taxes for a particular government program are the same taxpayers who benefit from the provisions of that program?

DESCRIPTION OF STRATEGIES FOR CONSIDERATION

With these three criteria in mind, researchers selected the following funding alternatives for additional study:

- Pursue funding under the Resources and Ecosystems Sustainability, Tourist, Opportunities, and Revived Economies of the Gulf Coast States Act of 2012 (RESTORE Act).
- Pursue funding from the CIAP.
- Elevate the priority of economically important GIWW-T projects to the Corps and to Congress.
- Seek funding from the Gulf of Mexico Energy Security Act of 2006.
- Apply for Marine Highway designation funding.
- Apply for federal discretionary grant programs.
- Explore feasibility of the Florida model in Texas.
- Explore ending state diesel fuel tax exemption.
- Explore public-private partnerships.
- Consider using the Texas Rainy Day Fund.
- Consider a Panama Canal approach for Texas.

Several of these sources cannot provide funding directly for GIWW-T maintenance, but a careful project design may enable a project that is beneficial to the GIWW-T to qualify for funding.

Pursue RESTORE Act/Deepwater Horizon Claims Funding

On April 20, 2010, an explosion on the Deepwater Horizon, an ultra-deep-water offshore oil drilling rig, caused a chain of events that eventually led to one of the largest offshore oil spills in U.S. history. The RESTORE Act established a Gulf Coast Ecosystem Restoration Council, comprised of governors from the five affected Gulf States and other federal cabinet members. Notably, this act dedicates 80 percent of all administrative and civil penalties related to the Deepwater Horizon spill to a Gulf Coast Restoration Trust Fund and outlines a structure by which funds can be used to restore and protect the natural resources, ecosystems, fisheries, marine and wildlife habitats, beaches, coastal wetlands, and economy of the Gulf Coast region.

Among other areas, the RESTORE Act allows 35 percent of the trust fund "to be divided among the five States for ecological restoration, economic development, and tourism promotion" (*53*). It requires each Gulf state suffering from the effects of the BP Deepwater Horizon oil spill to submit to the Restoration Council a state expenditure plan describing each program, project, and activity for which the state seeks funding. In Texas, the Office of the Governor is responsible for implementing this program and creating this plan. In November 2013, the Office of the Governor created the Texas RESTORE Act Advisory Board (TxRAB) and, as of April 2014, is developing a draft framework for funding projects based on RESTORE Act requirements. According to a

representative from the Texas Commission on Environmental Quality coordinating the implementation of the Texas program, a draft plan is expected by fall 2014 and will be made available at the following URL: www.restorethetexascoast.org (*54*).

To pursue this funding, Texas should first consider monitoring the activities of the Texas RESTORE Act Advisory Board. This board first met on October 3, 2013. Representatives from 11 state agencies came together for this meeting, including officials representing Texas. According to the Texas Council on Environmental Quality, Texas' representative agency on the Gulf Coast Restoration Council, "Members of the board will help develop a multiyear implementation and state expenditure plan for the state, as required by the RESTORE Act" and "will also assist in selecting projects to be sent to the Gulf Coast Ecosystem Restoration Council for consideration" (*55*). As of April 2014, no official plans or web resources have been created for this program; however, it is likely that those plans will be forthcoming by late 2014.

When evaluating this option in the context of the three evaluation criteria discussed previously, this option would be relatively feasible to implement. The primary activity involved for pursuing this option would be to monitor the activities of TxRAB and prioritize when opportunities could become available. From a sustainability perspective, this funding option would provide only a one-time grant. This option would not be a viable strategy for ensuring long-term sustainability. Finally, from an equity and fairness perspective, RESTORE Act funding is expected to be remitted to states as part of the BP lawsuit. This could be interpreted as an example of horizontal equity because it requires BP to pay for the damages it caused to the Texas Gulf Coast. Table 27 illustrates this option based on the evaluation criteria.

Table 27. Pursue RESTORE Act/Deepwater Horizon Claims Funding—Evaluation.

Evaluation Criteria	Analysis
Feasible	This alternative would be relatively feasible to implement. The primary activity required would be to monitor the activities of TxRAB and apply for eligible RESTORE Act Claims funding.
Sustainable	This alternative would likely provide only a one-time funding. There are few indications to suggest that RESTORE Act funding will be available on a long-term basis.
Equitable	RESTORE Act funding is expected to be remitted to states as part of the BP lawsuit. This is an example of horizontal equity because it is based on the ability of BP to pay for the undue harm it caused to the Texas Gulf Coast.

Pursue Funding from the Coastal Impact Assistance Program

CIAP is a federally funded grants program that the U.S. Fish and Wildlife Service is currently administering. Established under the Energy Policy Act of 2005, this program assists states that are impacted by oil and gas exploration and development. According to the U.S. Fish and Wildlife Service, "Federal grant funds must be used to directly benefit an authorized use to conserve, restore, enhance, and protect renewable natural resources" (*56*). This program does not require states to provide match funding.

In Texas, this act requires funds to be used in the 18 coastal counties to support the following projects and activities:

- Conservation, protection, or restoration of coastal areas, including wetlands.
- Mitigation of damage to fish, wildlife, or natural resources.
- Planning assistance and the administrative costs of complying with this section.
- Implementation of a federally approved marine, coastal, or comprehensive conservation management plan.
- Mitigation of the impact of outer continental shelf activities through funding of onshore infrastructure projects and public service needs.

Texas may encounter several challenges to obtaining funding from the CIAP. First, Congress does not appear likely to allocate additional funding to the CIAP in the near future. From 2007–2009, the U.S. Fish and Wildlife Service allocated a total of $109 million in CIAP funds to the state and $58 million directly to 18 Texas coastal counties. At this time, Congress has not allocated additional funding to the program, and the Coastal Land Advisory Board (a federal board that approves CIAP projects) is no longer soliciting applications (*57*). Assuming that funding would be made available in the future, Texas would likely have to submit a project recommendation to CLAB. Established in 2006 by Governor Rick Perry, CLAB is responsible for providing recommendations to the governor on the best use of CIAP funds. This board is also responsible for preparing the CIAP plan. The last known activity of CLAB was on February 11, 2011.

Similar to the RESTORE Act funding alternative, from a feasibility perspective, this option would also be relatively simple to implement because it would involve monitoring the funding activities of the CIAP. From a sustainability perspective, if funding were secured from this program, it would likely be only a one-time funding. Finally, from an equity perspective, this could be considered an example of the exchange equity principle of tax policy, where funding from the federal government is distributed to states for the promotion of coastal and ecological restoration. Table 28 illustrates this option based on the evaluation criteria.

Table 28. Pursue CIAP—Evaluation.

Evaluation Criteria	Analysis
Feasible	Relatively straightforward to implement because it would only involve monitoring the funding activities of the CIAP.
Sustainable	This option would provide only one initial shot of funding; it would be unlikely for additional funding to be secured for the future. Texas policymakers would have to reapply for funding for every new funding cycle.
Equitable	This option could be considered an example of the exchange equity principle of tax policy, where funding from the federal government is distributed to states for the promotion of coastal and ecological restoration.

Elevate the Priority of Economically Important GIWW-T Projects to the Corps and to Congress

Several stakeholder panel members noted that one of the most effective and relatively low-cost strategies for Texas would be to develop a tenable economic and environmental case justifying why increased federal funding should be directed toward strategic GIWW-T projects. Corps districts are responsible for:

- Preparing a cost-benefit analysis for projects.
- Ranking projects based on priority.
- Recommending high-priority projects for funding.

Texas could assist the Corps project prioritization process in at least two ways.

First, Texas could work with federal stakeholders to initiate (or in some cases, reinitiate) the reconnaissance and feasibility study process for key projects. This could be done by first working with Corps officials to identify projects most deserving of receiving study funding.[22] Furthermore, and perhaps just as important, Texas could coordinate with key Congressional leaders to authorize federal funding to perform these studies. During the third stakeholder meeting, Corps officials noted that study authorization does not necessarily have to go through any future WRDA legislation, but Congress will have to authorize it somehow.

Second, Texas could agree to conduct (and pay for) a feasibility study as a non-federal sponsor. According to Corps officials at a stakeholder working group meeting held on April 1, 2014, nothing precludes a non-federal sponsor from taking on its own project feasibility study. During this meeting, Corps officials said this option could possibly speed up the final approval process; however, they also noted this option is not likely to save any money or manpower. Also, this study must be conducted under Corps supervision, and there is no guarantee that the federal government will reimburse a non-federal sponsor for costs incurred to perform a feasibility study. Therefore, the overriding reason to pursue this alternative is to make funding available quicker than the regular appropriations process and accelerate the benefits expected from a project.

Regardless of how (and by whom) reconnaissance and feasibility studies are conducted, it is a necessary and critical first step. Corps officials noted that the entire process, from the beginning of the feasibility study process to final construction under ideal conditions, can take as long as five to six years.[23] The downside to this approach is that general appropriations have fallen far short of required funding amounts for a number of years. Funding amounts are not likely to significantly increase in the coming years.

In May 2014, the U.S. House and Senate approved, and the president signed, the Water Resources Reform and Development Act, officially known as HR 3080. This act authorizes the U.S. Army Corps of Engineers to perform various water-related projects and make several changes to how waterway projects are prioritized (*58*). According to a conference report that the

[22] During the second stakeholder meeting on January 30, 2014, stakeholders identified the Brazos River Floodgates as one such project that the Corps should reinitiate a reconnaissance study on.
[23] Third Stakeholder Working Group Meeting Minutes, April 1, 2014.

U.S. House Transportation and Infrastructure Committee prepared, HR 3080 makes several reforms relevant to coastal and inland waterway infrastructure projects. These key reforms include the following (*59*):

- Limits most Corps feasibility studies to three years and caps federal cost of these studies at $3 million.
- Requires Corps district, division, and headquarters personnel to conduct concurrent reviews of a feasibility study, eliminating the current practice of sequential reviews.
- Provides the Corps with permanent authority to accept funds from non-federal public interests.
- Creates an accelerated process that allows non-federal project sponsors and the Corps to proceed directly with a feasibility study, and repeals a requirement that the Corps reevaluate cost estimates immediately after initial cost estimates have been completed.
- Terminates the authorization for any project that the legislation authorized after seven years unless construction has been initiated.
- Requires assessment of all properties under control of the Corps and provides an opportunity for non-federal interests to take over those properties.
- Requires the Corps to annually publish a notice in the *Federal Register* requesting proposals from non-federal interests regarding water resources development needs. The Corps will review the proposed submissions, and only those proposals on that list will be eligible for Congressional authorization.
- Authorizes non-federal sponsors to provide funds to the Corps to carry out studies and authorizes non-federal project sponsors to carry out federal water resources development projects.
- Authorizes the Secretary of the Army to accept funds from non-federal interests to operate, maintain, and improve the nation's inland waterways transportation system.

HR 3080 will likely result in an increased opportunity for GIWW-T non-federal stakeholders to submit project proposals for Corps (and Congressional) consideration. For example, under this new law, a non-federal sponsor will have an opportunity to respond to an annual Corps request for proposals regarding water resources development needs. Texas leaders should continue to monitor specific rules and regulations from the Corps related to HR 3080.

One issue that had received attention in previous bill versions was a proposal to increase the tax on diesel fuel by 6 to 9 cents per gallon.[24] For representative purposes, a Congressional Research Service analysis found that $99.1 million in revenues was collected and deposited into the Inland Waterways Trust Fund (IWTF) in 2013 (*60*). TTI internal calculations suggest that an increase in 6 cents per gallon would yield an additional $29.7 million, and a 9-cent increase would yield an additional $44.6 million for that year into the IWTF. This proposal is not included in HR 3080. Rather, this proposed tax increase is expected to go through the House Ways and Means Committee and Senate Finance Committee and will be packaged as part of a comprehensive tax reform proposal that House Ways and Means Chairman Republican David Camp will champion.

[24] Currently, the Inland Waterways Trust Fund is supported by a 20-cent per gallon tax that is collected from commercial barge fuel. Since the Water Resources Development Act of 1986, expenditures for construction and major rehabilitation projects on inland waterways have been cost-shared on a 50/50 basis between the federal government and commercial users through this fund.

However, this comprehensive tax reform legislation is unlikely to receive serious consideration from Congress in 2014 (*61*).

The most important thing to note about the IWTF is that it may only be used for major rehabilitation and new construction. In terms of the needs defined in this report, this would limit its use to replacing the Brazos River Floodgates (and possibly the Colorado River Locks).

The Waterways Council, Inc. (WCI), a coalition of U.S. waterway commerce interests, is closely monitoring (and participating) in the development of future relevant federal legislation.[25] Specifically, this council has issued an official statement recommending that the U.S. House of Representatives enact legislation that will "increase the amount of user fees it pays as an investment in the future system." Further, WCI recommended that WRDA legislation "contain provisions that prioritize the completion of navigation projects across the entire waterways system" and that legislation direct the Corps to "reform its project cost allocation system." One option for Texas is to monitor and remain engaged with WCI to ensure agency interests are considered in forthcoming federal legislation.

Another alternative for Texas is to monitor and participate in the activities of the Inland Waterways User Board. The WRDA of 1986 established this board as an industry federal advisory committee responsible for "monitor[ing] the Inland Waterways Trust Fund and to make recommendations to the Army and to Congress on investment priorities using resources from the Fund" (*8*). According to the IWUB website, an 11-member board typically meets three times a year to conduct its business, with meetings open to the public (*62*).

In 2010, a committee was formed to develop an investment alternative for maintaining the U.S. inland marine transportation system. This committee, a joint effort between the Corps and IWUB, took input from stakeholders around the United States and published a Capital Projects Business Model (*63*). The CPBM provides a list of long-term capital needs for the inland navigation system that intended to "balance reliability with affordability" (*63*). One alternative for Texas is to work with stakeholders to advance the priority of the Brazos River Floodgates and Colorado River Locks project (labeled GIWW Modifications, TX) in the CPBM. This project is listed as a Phase 3 project in the CPBM, the lowest priority level in the model. Phase 3 projects are defined as those that Corps districts identified as potential future projects over the 20-year time horizon, a few of which are already under study, assuming the availability of completely unconstrained funding—in other words, a wish list. Texas may want to take a more active role in convincing IWUB to give this project a higher priority. Finally, Texas could continue monitoring the activities of this committee to ensure that other strategic Texas waterway projects are considered.

[25] The Obama Administration has also proposed other bills. In May 2014, the Obama Administration introduced the Generating Renewal, Opportunity, and Work with Accelerated Mobility, Efficiency, and Rebuilding of Infrastructure and Communities throughout America (GROW AMERICA) Act. Among other provisions, this legislative proposal would provide $10 billion over four years for targeted investments in the nation's transportation system to improve the movement of freight and would create a tiered multimodal freight incentive program to allow states to use grant funding for (a) the development of corridor freight plans, and (b) one or more phases of capital projects, equipment, or operational improvements on intermodal connectors included in a state freight plan. While it is not clear whether this plan is expected to be enacted into law, it is possible that this legislation may form the basis for future federal surface transportation reauthorization (current legislation expires Oct. 1, 2014). More information concerning the GROW AMERICA Act can be found at the following URL: http://www.dot.gov/grow-america.

From a feasibility perspective, this alternative would be relatively easy to implement; however, it would require close coordination and cooperation with federal and state elected leaders, as well as close coordination with the Corps. HR 3080 is expected to standardize the process for how non-federal sponsors will be able to provide input to the Corps and Congress regarding planning and project selection decisions; however, because rulemaking for HR 3080 is currently underway, it is unclear exactly how this process will impact state and local GIWW-T stakeholders. From a sustainability perspective, raising the priority of strategic Texas waterway projects could help to ensure that capital projects, such as lock and dam replacement or rehabilitation, receive adequate funding in the years that follow. From an equity perspective, this alternative would be an example of the exchange equity and fairness dimension of tax policy, where over the long run, governmental agencies provide adequate public goods and services to meet the needs of taxpayers and their families. Table 29 illustrates this option based on the evaluation criteria.

Table 29. Elevate Priority of GIWW-T—Evaluation.

Evaluation Criteria	Analysis
Feasible	This option would be relatively easy to implement; however, it would require close coordination and cooperation with federal and state elected leaders, as well as close coordination with the Corps. Enacted into law in 2014, HR 3080 is expected to clarify the process for non-federal sponsor participation. This should help reduce uncertainty for non-federal stakeholders seeking to take a greater role in the GIWW-T.
Sustainable	Raising the priority of strategic Texas waterway projects could help to ensure that capital projects, such as lock and dam rehabilitation, receive adequate funding in the years that follow.
Equitable	This option would be an example of the exchange equity and fairness dimension of tax policy, where over the long run, government agencies provide adequate public goods and services to meet the needs of taxpayers and their families.

Seek Funding from the Gulf of Mexico Energy Security Act of 2006

The Gulf of Mexico Energy Security Act of 2006 aimed to expand oil and gas operations in the outer continental shelf of the United States. This region is defined as beginning 9 nautical miles (about 10.4 statute miles) off the coast of Texas and extending to 200 nautical miles (about 230.2 statute miles) off the shoreline (*64*). The OCS is considered federal land, making the Bureau of Ocean Energy Management (BOEM) and the Bureau of Safety and Environmental Enforcement (BSEE) in the Department of the Interior (DOI) the regulating agencies for oil and gas exploration in the area. These operations can produce large economic benefits to the coastal states and the nation as a whole; however, costs accrue to the coastal states as a result of increased port usage and other activity along the shoreline. A portion of GOMESA's purpose is to share federal government revenue collected from taxes on OCS operations with the states that experience costs as a result of oil and gas operations (*65*).

In 2009, Texas received nearly $2.7 million in GOMESA disbursements. However, following the 2010 Deepwater Horizon oil spill, the federal government has increased restrictions on OCS

permitting and limited the amount of operations that can take place in the region. As a result of these restrictions and other factors, the level of GOMESA disbursements fell to $33,300 in 2013.[26] In 2017, a second phase of GOMESA will begin and will expand on definitions created during the initial 2006 meeting. Uncertainties with the status of Phase 2 revenue sharing and the future of oil and gas operations in the OCS make the GOMESA revenue stream unpredictable moving forward.

If Texas seeks GOMESA funding for GIWW-T projects, a case would have to be made for how a project repairs damages that OCS oil and gas activity have caused, or how a project better enables oil and gas operators to perform their OCS operations. With the recent challenges concerning oil and gas drilling on the OCS, it is unlikely that revenue from GOMESA will increase significantly. The official federal position on OCS activity is to promote increased safety protocols and limit potentially risky operations in the Gulf of Mexico. However, this position conflicts with GOMESA's original goal to increase production from the Gulf of Mexico. The current political climate, coupled with uncertainty about the second phase of the program, makes GOMESA a challenging source of funding for projects on the GIWW-T.

From a feasibility perspective, similar to pursuing RESTORE Act funding, this alternative would be relatively easy to administer because from Texas' perspective, it would require more of a monitor-and-apply process rather than the creation of any new taxing or funding scheme. From a sustainability perspective, this alternative would not yield significantly new funding for a long time. Rather, it would most likely provide only a one-time shot of funding that state leaders would have to reapply for on a regular basis. Finally, from an equity perspective, this alternative would be an example of the exchange equity and fairness dimension of tax policy, where over the long run, governmental agencies provide adequate public goods and services to meet the needs of taxpayers and their families. Table 30 illustrates this option based on the evaluation criteria.

Table 30. Seek GOMESA Funding—Evaluation.

Evaluation Criteria	Analysis
Feasible	Similar to pursuing RESTORE Act funding, this alternative would be relatively easy to administer because from Texas' perspective, it would require more of a monitor-and-apply process rather than creation of any new taxing or funding scheme.
Sustainable	This alternative would not yield significantly new funding for a long time. Rather, it would most likely provide only a one-time shot of funding that state leaders would have to reapply for on a regular basis.
Equitable	This alternative would be an example of the exchange equity and fairness dimension of tax policy, where over the long run, government agencies provide adequate public goods and services to meet the needs of taxpayers and their families.

[26] Data obtained from *U.S. Department of the Interior Office of Natural Resources Revenue*. http://statistics.onrr.gov/ReportTool.aspx.

Apply for Marine Highway Designation

The America's Marine Highway Program is a USDOT-led program to expand the use of navigable waterways to relieve landside congestion, reduce emissions, and generate other public benefits by increasing the efficiency of the surface transportation system. Figure 27 illustrates the USDOT-designated marine highway routes.

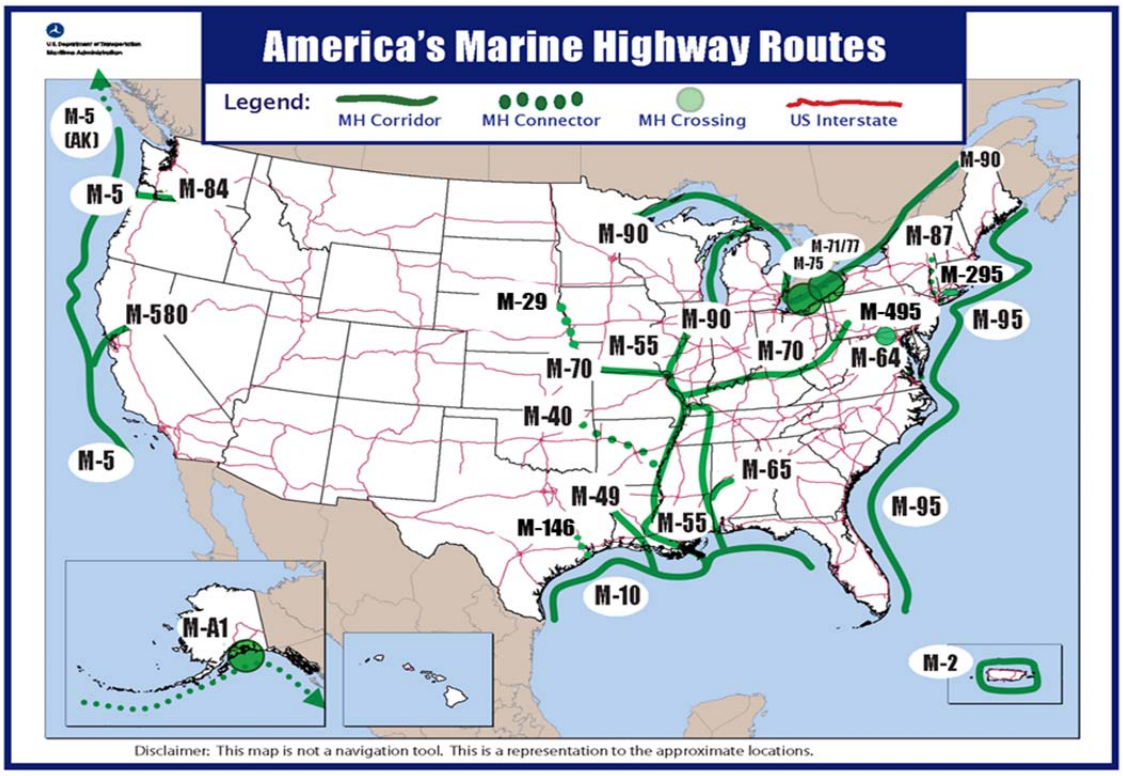

Figure 27. Marine Highway Routes: Corridors, Connectors, and Crossings.
Source: USDOT MARAD.

Section 1121 of the Energy Independence and Security Act of 2007 established the America's Marine Highway Program to reduce landside congestion through the designation of marine highway routes (*66*). A call for projects is held periodically, and notices are published through the *Federal Register*. A call is issued so that state and local agencies, such as Texas, can apply for funding as part of this program.

On April 15, 2010, the U.S. Department of Transportation Marine Administration issued a call for Marine Highway project applications by public agencies and received 35 applications in response. In August 2010, the Secretary of Transportation selected eight projects from these applications for designation as Marine Highway projects under the program. Many of these projects represent new or expanded marine highway services that offer the promise of public benefit and long-term sustainability without long-term federal financial support. They will receive preferential treatment for federal assistance from USDOT and MARAD. One of these

selected projects was the Cross Gulf Container Expansion Project, which connects Brownsville, Texas, to Manatee, Florida.

On May 27, 2014, MARAD initiated another call for project applications. The window for submitting applications (Marine Highway Project Open Season) will close on September 30, 2016. There will be five project review sessions during the Marine Highway Project Open Season, and route designation recommendations will continue to be accepted and reviewed at any time. Qualified projects will be announced shortly after the completion of each project review session. The application submittal deadlines for the review sessions are:

- June 30, 2014.
- December 31, 2014.
- June 30, 2015.
- December 31, 2015.
- June 30, 2016.

The first round of Marine Highway grants was awarded in September 2010 ($7 million). Should additional funding be made available, a notice in the *Federal Register* will be published. The difficulty with this program is that it is focused on containers and trailers rather than the liquid products that make up much of the GIWW-T traffic. However, if the proponents can show that a Texas (M-69) corridor would enable traffic currently moved by truck to go by water, it may be possible to attract funding to the GIWW-T that would benefit all parties.

From a feasibility perspective, seeking out M-69 Corridor designation would be relatively easy to implement. State leaders would be required to pursue the formal application process and apply for funding during the call for projects phase, but no new tax or funding structure would need to be created. From a sustainability perspective, this option would likely provide only a one-time shot of funding. The project would have to reapply every time a new call for projects is issued. Finally, from an equity perspective, this alternative would be an example of the exchange equity and fairness dimension of tax policy, where over the long run, governmental agencies provide adequate public goods and services to meet the needs of taxpayers and their families. Table 31 illustrates this option based on the evaluation criteria.

Table 31. Apply for M-69 Corridor Designation—Evaluation.

Evaluation Criteria	Analysis
Feasible	Seeking M-69 Corridor designation would be relatively easy to implement. State leaders would be required to pursue the formal application process and apply for funding during the call for projects phase, but no new tax or funding structure would have to be created.
Sustainable	From a sustainability perspective, this option would likely only provide a one-time shot of funding. The project would have to reapply every time a new call for projects is issued.
Equitable	This alternative would be an example of the exchange equity and fairness dimension of tax policy, where over the long run, government agencies provide adequate public goods and services to meet the needs of taxpayers and their families.

Apply for Federal Discretionary Grant Programs

Some federal discretionary grants could be available. For example, the Transportation Investment Generating Economic Recovery program is a supplementary discretionary grant program that awards sponsors, on a competitive basis, funding for capital investments or planning activities related to surface transportation projects. In 2013, Texas submitted an unsuccessful application for a TIGER V discretionary grant to provide "crucial major restoration and modernization of the Texas GIWW infrastructure" (*10*, *11*). Further applications could be submitted to meet some of the capital costs required for the GIWW-T. However, two challenges arise from relying on this funding source.

- First, federal discretionary funding is usually a one-time allotment of cash. Future funding is contingent upon reapplying and winning—a time-consuming and often labor-intensive process.
- Second, since this funding is usually a one-time allotment, it is commonly restricted toward capital spending only. There is no funding for ongoing maintenance and operations.

While discretionary grant programs can be part of helping to meet the funding requirements needed to help maintain the GIWW-T, this alternative would have to be focused on one-time projects that will have a fairly long-term effect.

From a feasibility perspective, this option would be relatively easy to implement. Texas leaders have extensive knowledge and expertise submitting TIGER grant applications. Texas has submitted a TIGER grant application in the past for GIWW-T-related projects without success. Going forward, it will probably be necessary to select potential projects that align with the TIGER grant program's main selection criteria. According to the TIGER grant program website:

> The competitive structure of the TIGER program and its broad eligibility allow project sponsors at the State and local level to avoid narrow, formula-based categories, and fund multi-modal, multi-jurisdictional projects not eligible for funding through traditional department of transportation (DOT) programs. TIGER can fund port and freight rail

> projects, for example, which play a critical role in our ability to move freight, but which are not eligible for any other sources of Federal funds. Similarly, TIGER can provide capital funding directly to any public entity, including municipalities, counties, port authorities, tribal governments, MPOs, or others in contrast to traditional Federal programs which provide funding to very specific groups of applicants (mostly State DOTs and transit agencies). This flexibility allows TIGER and our traditional partners at the state and local level to work directly with a host of entities that own, operate and maintain much of our transportation infrastructure, but otherwise cannot turn to the Federal government for support.[27]

This would seem to indicate that projects such as new fleeting areas or revetments along the GIWW-T would fall squarely within the criteria of the program if they solve or mitigate a transportation problem. It may be possible to apply for funding for items such as the floodgates, but USDOT clarification would be needed. The language above is ambiguous as to whether the program is focusing on projects that cannot obtain traditional USDOT support or projects that cannot obtain *any* federal support. It is also possible that this language might change from year to year and broaden the project eligibility criteria.

From a sustainability perspective, TIGER grants only provide a one-time shot of funding. TIGER grants would not be sufficient to meet long-term funding needs for maintaining GIWW-T waterway infrastructure. Finally, from an equity perspective, this alternative would be an example of the exchange equity and fairness dimension of tax policy, where over the long run, governmental agencies provide adequate public goods and services to meet the needs of taxpayers and their families. Table 32 illustrates this option based on the evaluation criteria.

Table 32. Apply for TIGER Funding—Evaluation.

Evaluation Criteria	Analysis
Feasible	Texas leaders have extensive knowledge and expertise in submitting TIGER grant applications. Texas has submitted a TIGER grant application in the past for GIWW-T-related projects. Revisions to the one that was submitted in 2013 may be necessary to help ensure a successful application in the future.
Sustainable	TIGER grants provide only a one-time shot of funding. TIGER grants would not be sufficient to meet long-term funding needs for operating or maintaining GIWW-T waterway infrastructure.
Equitable	This alternative would be an example of the exchange equity and fairness dimension of tax policy, where over the long run, government agencies provide adequate public goods and services to meet the needs of taxpayers and their families.

Explore Feasibility of Florida Inland Navigation District Model for Texas

Several other, state-based sources of funding could also be considered. One possibility is to adopt a state-based model similar to the Florida Inland Navigation District model. In 1927, the

[27] http://www.dot.gov/tiger/about

Florida Legislature created FIND through Chapter 12026, Special Acts of 1927. FIND was given taxing authority in specific regions along the Florida coastline. The mission of FIND is to "perform the functions of the local sponsor of the Atlantic Intracoastal Waterway project in Florida, a federal navigation project. In this capacity the District provides all lands required for the navigation project including rights of way and lands for the management of dredged materials removed from the waterway during dredging activities" (*12*). Since the District's inception in 1927, the Florida Legislature has granted additional authority to FIND (*67*) (Appendix G gives a full legislative history):

- **Chapter 14723, Special Acts of 1931**. This act reenacted the 1927 act and added the authority to provide lands for a wider and deeper waterway, limited the amount that the District must pay for rights-of-way and spoil disposal areas to $1,037,000, and established an ad valorem tax limit of $1,000,000.
- **Chapter 17020, Special Acts of 1935**. This act authorized the District to:
  - Expend funds for publicizing the completion of the waterway and its availability to watercraft.
  - Print and distribute information regarding the waterway.
  - Promote its use in navigation by watercraft of all kinds.
- **Chapter 19122, Special Acts of 1939**. This act authorized and empowered the District to collect, compile, and furnish to the United States data, statistics, and other appropriate information as to the advantages, benefits, desirability, and usefulness of the further improvement of the waterway from Jacksonville to Miami. The act authorized and empowered the District to acquire and convey to the United States, free of cost, any lands, easements, rights-of-way, and spoil disposal areas as the United States might require for the improvement of the waterway to a depth of 12 ft and a width appropriate to such depth.
- **Chapter 20430, Special Acts of 1941**. This act authorized and empowered the District to be the local sponsor of the Atlantic Intracoastal Waterway from St. Marys River to the St. Johns River. The act also gave authority to acquire and convey the necessary spoil areas with a depth of 12 ft and a width of 125 ft.
- **Chapter 65-900, Laws of Florida.** This law established an ad valorem taxing limit of 0.1 mil and directed the governor to appoint commissioners from each of the 11 counties in lieu of the former requirement for local election of commissioners.
- **1990 Amendment to Chapter 374, Florida Statutes**. This amendment to Chapter 374 reauthorized the District for an additional five years and expanded the duties to include the installation of boat speed regulatory signage for the protection of manatees.
- **1995 Amendment to Chapter 374, Florida Statutes.** This amendment continued the District indefinitely. It required the governor to appoint District commissioners and the Senate to confirm these appointments.
- **1996 Amendment to Chapter 374, Florida Statutes.** This amendment rewrote all district authority into Part II of Chapter 374 and provided authority to the District to assist the United States with the maintenance of the waterway or perform such work itself.
- **2004 Amendment to Chapter 374, Florida Statutes.** This amendment expanded the District's taxing authority by adding Nassau County and providing for a commissioner to be appointed from Nassau County.

- **2005 Amendment to Chapter 374, Florida Statutes.** This amendment expanded the District's responsibility as local interest sponsor for the sole purpose of maintaining navigability over a portion of the waterway.
- **2008 Amendment to Chapter 374, Florida Statutes**. This amendment transferred the duty for the installation of boat speed regulatory signage for the protection of manatees to the Florida Fish and Wildlife Conservation Commission.

If Texas were to consider a similar approach, Table 33 illustrates the possible revenue this alternative might raise if it were imposed in 2012, the last year when property tax data were available for all 12 Texas coastal counties (*68*).

Table 33. Estimated Annual Revenue under the FIND Scheme in Texas Based on 2012 Property Values.

Texas Coastal County	Total Taxable Value for County Property Tax Purposes–2012	Estimated Annual Revenue			
		0.01 mil	0.05 mil	0.10 mil	1.00 mil
Jefferson	$25,252,988,514	$252,530	$1,262,649	$2,525,299	$25,252,989
Chambers	$6,854,774,065	$68,548	$342,739	$685,477	$6,854,774
Galveston	$21,052,203,761	$210,522	$1,052,610	$2,105,220	$21,052,204
Brazoria	$20,299,210,483	$202,992	$1,014,961	$2,029,921	$20,299,210
Matagorda	$4,561,847,750	$45,618	$228,092	$456,185	$4,561,848
Calhoun	$3,533,922,813	$35,339	$176,696	$353,392	$3,533,923
Aransas	$2,822,930,762	$28,229	$141,147	$282,293	$2,822,931
Nueces	$19,502,178,530	$195,022	$975,109	$1,950,218	$19,502,179
Kleberg	$1,383,215,815	$13,832	$69,161	$138,322	$1,383,216
Kenedy	$972,577,583	$9,726	$48,629	$97,258	$972,578
Willacy	$676,366,343	$6,764	$33,818	$67,637	$676,366
Cameron	$16,288,286,535	$162,883	$814,414	$1,628,829	$16,288,287
	Total	**$1,232,005**	**$6,160,025**	**$12,320,050**	**$123,200,503**

Note: 2012 is the latest year when taxable value information for all Texas coastal counties was available. Source: Texas Comptroller of Public Accounts Reports of Property Value (2012). Also, 1 mil is $1.00 for every $1,000 of assessed value.

From a feasibility perspective, this alternative might be a bit more difficult to implement. For example, this alternative would require creating a new mechanism to collect a fee levied from coastal counties. An agreement would have to be made between all 12 Texas coastal counties to fund this initiative. From a sustainability perspective, however, this would provide a long-term, relatively reliable source of revenue. Once this scheme is established, revenue coming in from county governments would help provide funding that could help meet ongoing operations and maintenance activities for GIWW-T dredging. Finally, from an equity perspective, this alternative is in line with the exchange equity dimension of tax policy. In other words, people and corporations in coastal counties would be expected to pay because they would receive the

greatest benefit from a properly maintained GIWW-T. Table 34 illustrates this option based on the evaluation criteria.

Table 34. Implement FIND Model—Evaluation.

Evaluation Criteria	Analysis
Feasible	This alternative might be a bit more difficult to implement than previously discussed alternatives because it would require creating a new mechanism to collect a fee levied from coastal counties. An agreement would likely have to be formed between all 12 Texas coastal counties to fund this initiative.
Sustainable	This alternative would provide a long-term, relatively reliable source of revenue. Once this scheme is established, revenue coming in from county governments would help provide funding that could help meet ongoing operations and maintenance activities for GIWW-T dredging.
Equitable	This alternative is in line with the exchange equity dimension of tax policy. People and corporations in coastal counties could be reasonably expected to pay because they would receive the greatest benefit from a properly maintained GIWW-T.

Consider Utilizing Coastal Erosion Planning and Response Act Funds

In 1999, the 75th Texas Legislature passed the Coastal Erosion Planning and Response Act, enabling the first-ever coastal erosion program in Texas. The purpose of this program is to implement coastal erosion response projects and related studies to reduce the effects of and to understand the processes of coastal erosion. Under CEPRA, the Texas GLO implements erosion response projects and studies through collaboration and matching-funds partnerships with federal, state, and local governments, nonprofits, and other potential project sponsors. The CEPRA program provides funding on a biennial basis for the following types of projects and studies (*69*):

- Beach nourishment on both Gulf of Mexico and bay beaches.
- Shoreline stabilization.
- Habitat restoration and protection.
- Dune restoration.
- Beneficial uses of dredged material for beach nourishment, habitat restoration, etc.
- Coastal erosion-related studies and investigation.
- Demonstration projects.
- Structure relocation and debris removal.

While funding from this program is not directly related to navigation, it is possible that some GIWW-T-related projects could be eligible to receive some funding under this program. The deadline for Cycle 8 funding (the most recent funding cycle) has already passed, but GLO, at its discretion, may accept applications that address an emergency situation on a rolling basis (*70*). Texas should stay in touch with GLO regarding future funding cycles, which typically occur every two years.

From a feasibility perspective, seeking CEPRA funding would be relatively easy to implement. State leaders would be required to pursue the formal application process and apply for funding during the next funding cycle, but no new tax or funding structure would have to be created. From a sustainability perspective, this option would likely provide only a one-time shot of funding. This funding would have to be reapplied for every new funding cycle. Finally, from an equity perspective, this alternative would be an example of the exchange equity and fairness dimension of tax policy, where over the long run, government agencies provide adequate public goods and services to meet the needs of taxpayers and their families. Table 35 illustrates this option based on the evaluation criteria.

Table 35. Utilize CEPRA Funding—Evaluation.

Evaluation Criteria	Analysis
Feasible	Seeking CEPRA funding would be relatively easy to implement. State leaders would be required to pursue the formal application process and apply for funding during the next funding cycle, but no new tax or funding structure would have to be created.
Sustainable	From a sustainability perspective, this option would likely provide only a one-time shot of funding. This funding would have to be reapplied every new funding cycle.
Equitable	This alternative would be an example of the exchange equity and fairness dimension of tax policy, where over the long run, government agencies provide adequate public goods and services to meet the needs of taxpayers and their families.

Explore Ending State Diesel Tax Exemptions for Certain GIWW-T Users

Another possibility is to consider ending state diesel fuel tax exemptions for GIWW-T users. Currently, Texas Tax Code Section 153.222 allows a refund for taxes paid on excepted uses of diesel fuel. For example, a taxpayer may file a claim for refund for taxes paid for "any purpose other than propelling a motor vehicle on the public highways in the state." The Motor Fuels Tax Legislative Update explained that effective September 1, 2000, diesel fuel "retailers/deliverers may continue to sell dyed and undyed (clear) diesel fuel tax-free when they deliver the diesel fuel directly into the fuel supply tank or reefer units or other off-highway equipment, such as wielding units, auxiliary generators, boats, and off-highway equipment being transported on trailers" (*71*). If Texas were to consider pursuing this option, it would be important to first consider revisiting relevant provisions outlined in the Texas Tax Code Sec. 153 and to work with key state legislative officials in advance of the 2015 Legislative Session.

When this option is examined based on the evaluation criteria discussed previously, it would be relatively feasible to implement administratively and would provide a relatively sustainable long-term source of revenue if state diesel tax revenue collected from GIWW-T users were used for GIWW-T waterway purposes. Finally, this alternative would be considered equitable from a "user pays, user benefits" perspective. Table 36 illustrates this option based on the evaluation criteria.

Table 36. End State Diesel Tax Exemptions for Certain GIWW-T Users—Evaluation.

Evaluation Criteria	Analysis
Feasible	This alternative would be relatively easy to implement because a system is largely already in place to collect federal and state motor fuel taxes from fuel distributors.
Sustainable	This alternative would provide a stable source of revenue because revenues would increase with increased purchase of diesel fuel. This alternative is also relatively elastic: as purchase of diesel fuel increased, so would revenue. However, as purchase of diesel fuel declined, revenue would also decline.
Equitable	The exemption was put into place in part because of the inter-group equity and fairness dimension of equitable tax policy. This dimension implies that no group is favored to the detriment of another without good cause. In this case, because state motor fuels taxes are constitutionally dedicated to state highway infrastructure only, this could be seen as a concern; however, if spending were authorized for GIWW-T purposes, the inter-group equity concern would no longer apply.

Explore Public-Private Partnership Opportunities and Monitor Possible Inland Waterway P3 Pilot Projects That Might Be Pursued in the Future

Possible opportunities to take advantage of innovative financing approaches may be available by increasing participation with the private sector, especially with respect to lock and dam projects. According to the USDOT, "A public-private partnership is a contractual agreement formed between public and private sector partners, which allow more private sector participation than is traditional. The agreements usually involve a government agency contracting with a private company to renovate, construct, operate, maintain, and/or manage a facility or system" (*72*). In the context of waterway infrastructure, a public-private partnership would likely take the form of a contractual agreement between a federal or state public-sector waterway stakeholder agency (e.g., the Corps, Texas) and a private-sector entity to deliver a public service.

The Soybean Export Council, a key industry U.S. inland waterway stakeholder user's group, published a report in 2013 that evaluated the feasibility of pursuing public-private partnership projects for U.S. inland waterway infrastructure (*73*). In general, this report outlined two possible P3 pilot projects: one involving two locks and dams on the Illinois River (Peoria and La Grange), and another involving four locks and dams on the Upper Mississippi River (Locks 24, 25, Melvin Price, and 27). This report noted that private investors would most likely be interested in a P3 project containing the Melvin Price Locks and Dam, and Locks and Dam 27.

To be willing to participate in a P3 approach, the private sector must have a reasonable expectation that it will earn an acceptable return on its investment. In other words, a revenue

stream is required for any P3 approach. The Soybean Export Council identified possible revenue streams to support a P3 contract approach that could include the following:[28]

- Levying some type of user (lockage) fee, possibly through a congestion-based scheme.
- Receiving a share of funds distributed from the Inland Waterway Trust Fund for a specified period of time.
- Receiving a part of the federal appropriations for the operations and maintenance of inland waterways for a specified period.
- Receiving part of the federal appropriations for major rehabilitation (but not new construction) of inland waterways for a specified time period.
- Imposing fees, such as an annual license or dockage fee, on recreational vessels, commercial fishing vessels, and seasonal concessionaires such as kayak rentals, and a per-vehicle surcharge on commercial ferry services, among other possibilities.
- Obtaining an assignment from the federal government of rental payments from relevant, existing long-term recreational leases.
- Entering into and receiving rental payments from new long-term recreational leases, including new marina and resort developments and other types of development, such as commercial load-out and terminal facilities located on Corps navigation operational project lands.
- Utilizing various incentives, such as tax abatements, which regional, state, or local entities offer as part of an economic development plan oriented around a part of an inland waterway.

In May 2014, Congress enacted legislation (the Water Resources Reform and Development Act, or HR 3080) that established an innovative pilot financing program to carry out and manage the design and construction of Corps projects by involving the private sector. According to Section 5014 (a) of HR 3080 (*74*):

> The Secretary shall establish a pilot program to evaluate the cost effectiveness and project delivery efficiency of allowing non-Federal pilot applicants to carry out authorized water resources development projects for coastal harbor improvement, channel improvement, inland navigation, flood damage reduction, aquatic ecosystem restoration, and hurricane and storm damage reduction.

HR 3080 Sections 5014 (d) and (e) outline key administrative provisions and pilot project selection criteria for this program:

> (d) Administration—In carrying out this pilot program established under section (a), the Secretary shall—
>
> > (1) identify for inclusion in the program at least 15 projects that are authorized for construction for coastal harbor improvement, channel improvement, inland navigation, flood damage reduction, or hurricane and storm damage reduction;

[28] Most strategies would require Congressional approval.

(2) notify in writing the Committee on Environment and Public Works of the Senate and the Committee on Transportation and Infrastructure of the House of Representatives of each project identified under paragraph (1);

(3) in consultation with the non-Federal pilot applicant associated with each project identified under paragraph (1), develop a detailed project management plan for the project that outlines the scope, financing, budget, design, and construction resource requirements necessary for the non-Federal pilot applicant to execute the project, or a separable element of the project;

(4) at the request of the non-Federal pilot applicant associated with each project identified under paragraph (1), enter into a project partnership agreement with the non-Federal pilot applicant under which the non-Federal pilot applicant is provided full project management control for the financing, design, or construction (or any combination thereof) of the project, or a separable element of the project, in accordance with plans approved by the Secretary,

(5) following execution of a project partnership agreement under paragraph (4) and completion of all work under the agreement, issue payment, in accordance with subsection (g), to the relevant non-Federal pilot applicant for that work; and

(6) regularly monitor and audit each project carried out under the program to ensure that all activities related to the project are carried out in compliance with plans approved by the Secretary and that construction costs are reasonable.

(e) Selection Criteria—In identifying projects under subsection (d)(1), the Secretary shall consider the extent to which the project—

(1) is significant to the economy of the United States;

(2) leverages Federal investment by encouraging non-Federal contributions to the project;

(3) employs innovative project delivery and cost-saving methods;

(4) received Federal funds in the past and experienced delays or missed scheduled deadlines;

(5) has unobligated Corps of Engineers funding balances; and

(6) has not received Federal funding for recapitalization and modernization since the project was authorized.

This public-private partnership pilot program is likely to give non-federal GIWW-T sponsors new options to carry out feasibility studies and projects. Public-private partnerships can, in some cases, open up new opportunities for designing, financing, and delivering waterway infrastructure projects. GIWW-T stakeholders should monitor closely the selection and implementation of these

15 pilot public-private partnership projects and assess how such projects could be implemented in Texas.

From a feasibility perspective, this option would be somewhat simple to implement, although it may require some federal and state legislative and rule changes. A public-private partnership approach would likely require several changes and close coordination with federal, state, local, and industry stakeholders. HR 3080 Section 5014 (a) authorizes the establishment of a public-private partnership program. However, because rulemaking procedures are expected throughout most of 2014, GIWW-T non-federal stakeholders should monitor this program closely and identify opportunities for private participation as the Corps releases specific projects and rules.

From a sustainability perspective, usually the private sector requires a sustainable revenue stream. Therefore, in order for a public-private partnership approach to be feasible, a revenue stream such as a lockage fee, dockage fee, annual license fee, or some other form of tax or fee would be required to support a public-private partnership approach. Finally, from an equity perspective, it would depend primarily on the revenue stream used to pay back the private sector. A lockage fee would be an example of the exchange equity and fairness dimension of tax policy, where those that pay for the services are also the ones that benefit most from that infrastructure. In the example of a lockage fee, while GIWW-T users would be the only ones that paid for this infrastructure, they would also benefit the most from having an efficient transportation asset made available to them. Table 37 illustrates this option based on the evaluation criteria.

Table 37. Pursue Public-Private Partnerships—Evaluation.

Evaluation Criteria	Analysis
Feasible	This option would be somewhat simple to implement, although it may require some federal and state legislative and rule changes. In 2014, HR 3080 authorized the creation of a public-private partnership program and directed the Secretary of the Army to identify for inclusion in the program at least 15 projects that are authorized for construction for channel improvement. A public-private partnership approach would likely require several changes and close coordination with federal, state, local, and industry stakeholders.
Sustainable	Generally, the private sector requires a sustainable revenue stream. Therefore, in order for a public-private partnership approach to be feasible, a revenue stream such as a lockage fee, dockage fee, annual license fee, or some other form of tax or fee would be required to support a public-private partnership approach.
Equitable	The equity of this option would depend on the revenue stream used to pay back the private sector. A lockage fee would be an example of the exchange equity and fairness dimension of tax policy, where those that pay for the services are also ones that benefit most from that infrastructure. In the example of a lockage fee, while GIWW-T users would be the only ones that paid for this infrastructure, they would also benefit the most from having an efficient transportation asset made available to them.

Explore Using Texas Rainy Day Fund for Waterway Projects

Another area of interest is funding under a proposed constitutional amendment for transportation enacted during the 83rd Legislative Session. Senate Joint Resolution 1 is a constitutional amendment that, if Texas voters approve in November 2014, would divert 50 percent of oil and gas severance taxes above a 1987 baseline level from the Economic Stabilization Fund (ESF), commonly known as the Texas Rainy Day Fund, to the State Highway Fund (*75*). After conducting a fiscal impact analysis, the Legislative Board discovered that if voters pass the amendment, then an estimated $878 million could be transferred from the ESF to the State Highway Fund in 2015 (*76*). However, for Texas to pursue this funding, the agency would have to work with the legislature to enact legislation approving such a transfer. Most likely, another state constitutional amendment would be required to authorize this funding for GIWW-T projects. Table 38 illustrates this option based on the evaluation criteria.

From a feasibility perspective, using Rainy Day funds for GIWW-T-related purposes may be somewhat challenging. Several legislative and administrative changes would be required in order to pursue that option. From a sustainability perspective, however, this option could provide a stable, long-term source of revenue for GIWW-T purposes. Since this option would authorize funds from the ESF to be spent for GIWW-T purposes, then a predictable revenue stream could be established. Finally, from an equity perspective, this alternative would be an example of the exchange equity and fairness dimension of tax policy, where over the long run, governmental agencies provide adequate public goods and services to meet the needs of taxpayers and their families. Since the GIWW-T can benefit the Texas oil and gas industry directly (which pays in to the ESF), a case can be made that it should receive a public benefit. The public benefit in this case could be having a properly maintained GIWW-T. Table 38 illustrates this option based on the evaluation criteria.

Table 38. Use Rainy Day Fund—Evaluation.

Evaluation Criteria	Analysis
Feasible	Using Rainy Day funds for GIWW-T-related purposes may be somewhat challenging. Several legislative and administrative changes would be required in order to pursue this option.
Sustainable	From a sustainability perspective, however, this option could provide a stable, long-term source of revenue for GIWW-T purposes. Since this option would authorize funds from the ESF for GIWW-T purposes, a predictable revenue stream could be established.
Equitable	This alternative is an example of the exchange equity and fairness dimension of tax policy, where over the long run, government agencies provide adequate public goods and services to meet the needs of taxpayers and their families. Since the GIWW-T can benefit the Texas oil and gas industry directly (which pays in to the ESF), a case can be made that it should receive a public benefit.

Consider the Panama Canal Approach for Texas

Another option is to explore an approach that the Panamanian government used to fund and finance the expansion of the Panama Canal. With the handover of the Panama Canal from the United States to Panama in 1999, Panamanian lawmakers established an authority, called the Panama Canal Authority (PCA), to oversee activities associated with the maintenance and dredging of the canal. PCA received the exclusive right to oversee all operations, administration, management, preservation, maintenance, and modernization of the canal (*77*). As demand for shipping increased, the size of ships on the world market also increased.[29] Therefore, PCA embarked on an expansion project to double the capacity of the canal and allow for longer, wider ships to enter and exit safely. This effort consisted of the construction of two new sets of locks—one on the Pacific side and one on the Atlantic side of the canal. Each lock is designed to have three chambers that will each have three water utilization basins.

According to an expansion financing proposal that PCA prepared, the PCA expansion project is expected to "double its capacity, increase its operational efficiency, and provide economic benefits to Panama" (*78*). Specifically, this project will be able to transit 1,250 million PCUMS tons[30] during its first 11 years of operation. Because the PCA receives its funding through tolls, this expansion is estimated to result in total revenues of $6.0 billion in 2025, producing a 12 percent internal rate of return for the authority. This proposal also called for the execution of a tolls policy that will focus on capturing the value the canal adds to each segment of its market, and tolls are expected to be set in a manner that will double them within the next 20 years. The loans taken out to finance the construction of this proposal are expected "to be paid [back] rapidly—with investment costs expected to be paid back in less than 10 years." The financing package for the canal package includes the following loans:

- $800 million from the Japan Bank for International Cooperation.
- $500 million from the European Investment Bank.
- $400 million from the Inter-American Development Bank.
- $300 million from the Corporación Andina de Fomento.
- $300 million from the International Finance Corporation.

A similar approach in Texas would be interesting. Texas already has experience creating authorities to help meet infrastructure mobility needs for surface transportation projects. For example, in 2001, the state authorized regional mobility authorities. These authorities are authorized under state law to finance, design, construct, operate, maintain, and expand a wide range of transportation facilities and services. In practice, they are used mostly to deliver critically needed tollway projects to the state.[31] A similar type of authority could be authorized to

[29] For example, in 2008 the International Finance Corporation estimated that 37 percent of the world's container ships would not be able to be transported through the canal. For more information: http://www.ifc.org/wps/wcm/connect/region__ext_content/regions/latin+america+and+the+caribbean/news/multilateral+institutions+to+lend+$2.3+billion+for+panama+canal.

[30] The volume of cargo transiting the canal is measured in PCUMS tons; the acronym stands for Panama Canal Universal Measurement System. The PCUMS ton is the unit used at the canal to establish tolls, and it measures vessels' volumetric cargo capacity. A PCUMS ton is equivalent to approximately 100 cubic ft of cargo space, and a 20-ft-long container is equivalent to approximately 13 PCUMS tons.

[31] The Texas Legislature authorized the creation of RMAs in 2001 under Senate Bill 342.

help finance, design, construct, operate, and maintain the state's GIWW-T. Another approach the Panama Canal employs is the imposition of tolls on its users. Such an authority in Texas could be authorized to finance the construction, operations, and maintenance of the GIWW-T system.

From a feasibility perspective, this option may be somewhat complex to implement. Extensive federal and state legislative changes would be required to enable such an authority. Changes authorizing waterway fees would also be required. From a sustainability perspective, however, this option would provide a stable, long-term revenue stream. Similar to how PCA mostly self-funds improvements needed for maintaining and operating the Panama Canal, this option represents one of the few opportunities for a stable and elastic source of funding. Finally, from an equity perspective, this approach best represents the exchange equity and fairness dimension of tax policy. In other words, users of the GIWW-T would directly pay in order to use the GIWW-T (and shoulder most of the payment burden). However, the GIWW-T users would also benefit the most from a properly maintained GIWW-T. Table 39 illustrates this option based on the evaluation criteria.

Table 39. Implement Panama Canal Approach—Evaluation.

Evaluation Criteria	Analysis
Feasible	This option may be somewhat complex to implement. Extensive federal and state legislative changes would be required to enable such an authority. Changes authorizing waterway fees would also be required.
Sustainable	This option would provide a stable, long-term revenue stream. Similar to how PCA mostly self-funds improvements needed for maintaining and operating the Panama Canal, this option represents one of the few opportunities for a stable and elastic source of funding.
Equitable	This approach best represents the exchange equity and fairness dimension of tax policy. In other words, users of the GIWW-T would directly pay in order to use the GIWW-T (and shoulder most of the payment burden). However, the GIWW-T users would also benefit the most from a properly maintained GIWW-T.

TXDOT LEGISLATIVE OBSTACLES

The level of TxDOT's involvement in the maintenance and potential improvement of the GIWW is a matter for policymakers to decide. Such participation could theoretically range from a full takeover to very targeted financial assistance.

Legislative Barriers to TxDOT Takeover of GIWW-T Maintenance/Dredging Activities

Because federal law stipulates that (a) the GIWW-T is totally under federal control, and (b) the Corps is responsible for the maintenance of and any improvements to this asset, any type of TxDOT involvement would require significant negotiations with the Corps and Congressional approval. Furthermore, the Corps' rulemaking structure would require several administrative and regulatory changes to take place. Corps representatives interviewed for this study noted that at the very least, a nonstandard agreement (pending a complex approval process by Fort Worth Corps Division headquarters) would likely be required. Since a state agency can engage only in activities

for which it is specifically authorized, the Texas Legislature would need to grant approval to pursue this option, and the agency would require extensive coordination with several of the state and local agency stakeholders.

Legislative Barriers to TxDOT Subcontractor Approach

Under this approach, the Corps would subcontract GIWW-T maintenance activities to TxDOT. Legislative barriers to the subcontractor approach are not as formidable as a full takeover but still pose challenges. First, while subcontractors are currently permitted under law, Corps representatives noted that contracting out all GIWW-T maintenance activities would not be an efficient approach because the Corps has already undertaken most of the planning and preliminary engineering work required and has reduced much of the work to a fairly routine level. TxDOT would have to duplicate much of this underlying work and do so without any institutional memory or experience. Furthermore, TxDOT's authority for engaging as a subcontractor would require legislative approval and increased institutional capacity for conducting such work.

Legislative Barriers to Symbiotic Relationship Approach

Perhaps the fewest legislative obstacles exist where a partnership scenario for GIWW-T maintenance and dredging activities involves multiple parties. Many different approaches exist, but in essence, such an approach keeps the Corps as the responsible party for GIWW-T dredging and maintenance activities, while relying on non-federal sponsors to provide a greater share of funding. The WRRDA bill that Congress recently passed specifically encourages the development of public-private partnerships—at least on a pilot program basis. Multiple federal maritime experts have expressed their endorsement for the Corps to engage in such an agreement. For example, one Corps stakeholder, as part of a recent study that the National Research Council conducted, said the following:

> The modern context for water resources management involves smaller budgets, cost sharing, an expanded range of objectives, and inclusion of more public and private stakeholders in management decisions. Two important implications of these conditions are 1) given current budget realities, the nation may have to consider more flexible, innovative, and lower cost solutions to achieving water-related objectives, and 2) the Corps of Engineers will by necessity work in settings with more collaboration and public and private participation in the past. (*79*)

Table 40 shows that the current federal legislation already in place does provide opportunities for non-federal sponsors to participate in Corps activities that include GIWW-T dredging and maintenance.

Table 40. Non-federal Funding of Corps Activities.

Legislation	Description
33 U.S.C. Section 701h	Allows the Secretary of the Army to accept contributed funds from states and their political subdivisions for work on any authorized Corps water resources development study or project in connection with federal funds when considered in the public interest by the Secretary.
33 U.S.C. Section 560	Allows the Secretary to accept funds that private parties contribute for authorized work for public improvement of rivers and harbors if considered advantageous for navigation.
33 U.S.C. Section 2231	Provides that a non-federal interest may use its funds to undertake a study of a proposed harbor or inland harbor project and may be credited for its portion of the work subject to the Secretary's approval.
33 U.S.C. Section 2232	Provides that a non-federal interest may perform navigation construction activities for authorized projects with the Secretary's approval, and may be reimbursed for the non-federal portion of the construction work if federal funds become available.

Note: Source: Edited excerpts from Army Corps of Engineers: Water Resource Authorizations, Appropriations, and Activities (*80*).

While the federal legislative framework for this type of agreement is in place, state legislative changes would be required. For example, Chapter 51 of the Texas Transportation Code, Texas Coastal Waterway Act, would need to be amended to allow broadened authority for partnering with federal sponsors in GIWW-T maintenance beyond acquiring land for dredging materials. GIWW-T stakeholders have stated that the Brazos River Floodgates are the worst spot on the entire GIWW with regard to efficiency and safety. Under the authorities shown in

Table 40, TxDOT could actually pay for or conduct its own study (which must be compliant with applicable federal laws and regulations) on the options for resolving this problem. To date, this has been primarily used for deep-draft projects, but the precedent has been established. Once the realistic options and costs are known, the state can then pursue the best funding option to implement the best alternative.

Some legislative actions would be required to provide state funding necessary to maintain the GIWW-T under a cost-sharing scheme because currently, state transportation funding mechanisms do not authorize spending for non-highway infrastructure. Article VIII, Section 7-a of the Texas Constitution requires 3/4 of all net revenue from motor fuels taxes to be used only for:

- Acquiring rights-of-way.
- Constructing, maintaining, and policing public roadways.
- Paying principal and interest on certain road district bonds or warrants.

The remaining 1/4 is dedicated to public education. Established in 2001, the Texas Mobility Fund (Texas Constitution Article III Section 49-k) may be used to finance the acquisition, construction, maintenance, reconstruction, and expansion of state highways, including costs associated with design and right-of-way acquisition.

A few recent proposals were introduced in the last legislative session (2013) to provide additional funding for transportation. For example, the Texas Legislature passed HB 1 during the third called session of the 83rd Legislature that would (pending voter approval in November 2014) transfer a portion of revenues deposited in the Economic Stabilization Fund to the State Highway Fund. An additional constitutional amendment would be required for such a transfer to apply to navigable waters.

Since the GIWW-T spans the entire Texas coast, the creation of a local partnership scheme presents challenges regarding who would likely be involved and how to coordinate all the ports. Texas ports are one possible beneficiary group at the local level, but it would be an inequitable approach to require only one or two ports to contribute the required local funding needed over the entire GIWW-T; it would not constitute a symbiotic relationship. Therefore, an agreement between all Texas ports and TxDOT would be required to determine funding needs and an acceptable funding scheme. Furthermore, there is little precedent for such an approach based on previous Texas statute. Port authorities are created acts of the legislature that stipulate that ports can levy an ad valorem tax on nearby properties and charge a fee or lease agreements for port facility use. These revenues must be channeled back into the port authority's infrastructure in accordance with legislatively authorized purposes. The creation of something along the lines of a GIWW-T management district or other such cross-cutting oversight/governing body would require new enabling legislation. Regardless of the approach, new or modified state and local legal statutes would be required for such a program to work.

Barriers to Targeting Key Inefficiencies

There are certain situations that produce inefficiencies and safety issues along the GIWW-T that could be addressed independently of the Corps. For instance, one of the primary concerns that the operators on the GIWW-T have expressed is that there are insufficient fleeting areas,[32] especially in the vicinity of major ports. TxDOT could make funding available for the development of fleeting areas, possibly through a grant program or a revolving loan program. Several possible transportation funding programs exist; however, the challenge is finding a funding source that is not statutorily dedicated to highway planning and construction. Most funding collected in the State Highway Fund (Fund 0006) is required to be spent toward highway projects. Section 7-a, Article VIII of the Texas Constitution dedicates net revenues from motor vehicle registration fees and taxes on motor fuels and lubricants to be used only for "acquiring rights-of-way, constructing, maintaining, and policing public roadways." Section 7-b dedicates federal revenues received for highway-related purposes to be spent on highway-related projects. However, revenues from vehicle certificate sales, special vehicle registrations, and commercial transportation fees collected in Fund 0006 that are remitted to TxDOT are not required to be spent on highway-related projects (*13*).

Established in 2001, the Texas Mobility Fund allows the Texas Transportation Commission to borrow money for the construction and maintenance of the state highway system with revenues from a mix of transportation-related fees. However, Section 49-k, Article III of the Texas Constitution prohibits the Texas Mobility Fund from financing the construction of non-highway

[32] A fleeting area is a facility where a barge can be parked while not in use. While in the fleeting area, a barge can also be cleaned, repaired, or made ready for another tow.

projects. Any use of these funds for the GIWW-T would likely require a constitutional amendment. Proposition 12, which voters approved in 2007, allows the Texas Transportation Commission to issue up to $5 billion in general obligation bonds under the authority of Article III, Section 49-p of the Texas Constitution. Legislative approval and statutory changes would likely be required for using Proposition 12 bonds for non-highway purposes (*14*).

CONCLUSION

As shown above, the funding alternatives that the researchers reviewed present several opportunities and challenges for Texas policymakers to consider. Some alternatives would be easy to implement because they would involve simply applying for or monitoring discretionary grant program opportunities that might be eligible for GIWW-T purposes. The GIWW-T stakeholder working group also tends to favor these options. However, those options also tend not to provide a sustainable, long-term revenue source required to meet ongoing GIWW-T operations and maintenance needs. Grants are typically funded through appropriations from the general fund, which is a highly unreliable process. Grants are not free money, either—in effect, U.S. taxpayers would share the burden of funding improvements to the GIWW-T under an approach that requires dedicating appropriations toward rehabilitating, operating, and maintaining the GIWW-T.

User-based funding options, while less popular with the GIWW-T stakeholder working group, tend to provide a more sustainable revenue stream. While these options would require GIWW-T users to share a major share of the financial burden, the GIWW-T users would also be the primary beneficiaries in terms of time and productivity benefits. These efficiency benefits would most likely be passed on to other critically important Texas industries, such as petrochemical and manufacturing.

The selection of the most appropriate alternatives to pursue is a matter for policymakers to determine. This analysis was designed to help frame the discussion by providing a set of possible criteria and a review of those benefits and limitations. Ultimately, deciding which funding alternative is most appropriate is a public policy decision.

CHAPTER 5: PERFORMANCE METRICS

BACKGROUND

To be considered for implementation, potential performance metrics should:

- Be consistent with TxDOT's vision and strategic goals. Similar to the current transportation performance metrics that TxDOT tracks, any newly developed performance metrics should align with goals in the current 2011 to 2015 Strategic Plan.
- Be consistent with national efforts of the National Cooperative Freight Research Program (NCFRP) of the Transportation Research Board of the National Academies, the Corps, MARAD, and others. Performance metrics from national groups and agencies should be considered, and selected metrics should be consistent with performance metrics nationally.
- Have minimal data collection and processing requirements. It is important that data used to create performance metrics be either readily available or not difficult or time-intensive to collect and process.
- Address key waterborne issues. Performance metrics and efforts track progress on major identified issues.
- Be based on best practices. There are a number of states that already have developed and implemented waterborne performance metrics. Understanding and learning from these experiences will strengthen the performance metrics developed as part of this effort.

RELEVANT MARINE TRANSPORTATION SYSTEM METRICS PROPOSED IN PREVIOUS RESEARCH

A number of research efforts have focused on the topic of freight performance metrics, including those of:

- The Permanent International Association of Navigational Congresses.
- The NCFRP.
- The University of Texas.
- The Oregon Department of Transportation.
- The University of Natural Resources and Applied Science/Austria Tech.

These studies vary considerably in scope. Some set out to provide a recommended list of performance metrics for measuring waterway performance, while others discuss in detail some of the key features of ports and waterways that are critical to effective and efficient goods movement. Relevant findings are summarized in the following sections.

National Cooperative Freight Research Program: Report 10

In October 2011, the NCFRP published a nationwide study on freight performance measures entitled *NCFRP Report 10: Performance Measures for Freight Transportation* (*81*). Though the report had a multimodal focus, the waterborne system was included as one of the transportation modes.

The report found that other states throughout the United States have implemented performance metrics to measure the effectiveness of their transportation system. Some states are still in the process of developing major statewide transportation performance metrics. Others, such as Missouri, have already created many metrics to monitor a wide variety of transportation-related subjects. For further detail about what each state is doing in terms of transportation performance measurement, Washington State has created an online report with links to each state's performance measurement and strategic planning mechanisms (*82*).

Florida

In 2003, Florida established a Strategic Intermodal System (SIS) to help prioritize freight investments. The SIS includes waterborne freight assets, such as waterways and ports. Florida DOT has created a new website that focuses solely on communicating the performance of the transportation system (*83*).The long-range goals of the 2025 Florida Transportation Plan guide the performance measurement of the SIS. On the website, Florida DOT has made available an SIS Performance Report, which outlines key SIS performance goals and metrics to highlight whether the SIS is moving toward meeting the stated goals (*84*). Waterborne freight currently is a part of the SIS system and is discussed in the performance measure discussion. However, there are only a few performance metrics that relate to SIS waterways and facilities, and they focus on deep-water operations, not barge operations.

Missouri

The Missouri Department of Transportation (MoDOT) tracks an extensive list of performance metrics every quarter to assess how well the department delivers products and services to its customers. This process and tool, known as the MoDOT TRACKER (*85*), currently monitors more than 120 performance metrics on a quarterly basis. The two that relate directly to waterborne freight are:

- Freight tonnage by mode.
- Missouri River and Mississippi River waterborne freight tonnage.

Background information on the metrics is provided and updated on a quarterly basis. For instance, Missouri is attempting to increase waterborne freight on the Missouri River and is therefore tracking tonnage on the Missouri River to monitor how these efforts are progressing.

Louisiana

Louisiana's Department of Administration publishes performance metrics for every agency receiving an appropriation, as required by the 1997 Louisiana Government Performance and Accountability Act (*86*). This includes the Department of Transportation and Development, which has a variety of performance metrics that it collects to meet two key objectives:

1. To develop and implement a Statewide Marine Transportation System Program for Louisiana's navigable waterways to facilitate economic development and mitigate highway congestion (scheduled for completion in 2014).

2. To conduct the state's maritime infrastructure development activities to ensure that Louisiana maintains its top position in maritime commerce as measured by total foreign and domestic cargo tonnage.

Within these two objectives, further performance indicators exist to measure how well they are being met:

- Number of navigation projects completed in Louisiana.
- Number of navigation projects initiated in Louisiana.
- Return on investment.
- State's share of construction expenditures.
- Total construction expenditures (federal and state).

TxDOT Waterborne Freight Corridor Study: Phase II

The TxDOT Waterborne Freight Corridor Study: Phase II report (*87*) provides a number of performance metrics that might be useful in monitoring the performance of marine transportation assets. Several of these measures are directly relevant to the condition of the GIWW-T. Table 41 lists the ones that most directly address the issues discussed in this report.

Table 41. Relevant Marine Transportation Metrics from Freight Corridor Study, Phase II.

Category	Performance Metric	Notes
Congestion	Average vessel delay at locks	Corps can provide this.
	Average vessel delay at floodgates	Corps can provide this.
	Average time in transit per barge tow	May want to establish certain O-D pairs for reporting. This metric is not currently tracked and will require coordination with the Corps or the barge industry.
	Miles of GIWW-T with inadequate channel width	TxDOT needs to define "unsuitable." Corps can provide the data.
	Miles of GIWW-T with inadequate channel depth	TxDOT needs to define "unsuitable." Corps can provide the data.
	Miles of GIWW-T with difficult turns or one-way transits	Corps can provide this. Gulf Intracoastal Canal Association also tracks this.
Safety	Collisions involving GIWW-T tows	Main source is Coast Guard, but reporting is sketchy.
	Allisions involving GIWW-T tows	Main source is Coast Guard, but reporting is sketchy.
	Hazardous spills on the GIWW-T	Main source is Coast Guard, but reporting is sketchy.
Economy	Tons transported on the GIWW-T	Corps tracks this.
	Value of freight moving on the GIWW-T	TxDOT will have to estimate value.
System Preservation	Acreage of developed properties along the GIWW-T (or miles with developed properties)	This could probably be done in conjunction with GLO.
	Annual lock and floodgate maintenance costs	Corps tracks this.
	Cubic yards of sediment dredged	Corps tracks this.

TxDOT Waterborne Freight Corridor Study: Task 3

The TxDOT Waterborne Freight Corridor Study, Task 3: Waterborne Freight Performance Measures (*88*) suggested an additional metric consisting of total one-way barge trips.

World Association for Waterborne Transport Infrastructure

The same study reported a number of measures that the World Association for Waterborne Transport Infrastructure (PIANC) suggested (*89*). PIANC is a nonpolitical and nonprofit organization established in 1885 to bring together international experts on technical, economic, and environmental issues pertaining to waterborne transport infrastructure. Members include national governments and public authorities, corporations, and interested individuals. A group of representatives from Austria, Belgium, France, Germany, the Netherlands, Spain, and the United States completed PIANC's most recent report on waterborne performance metrics. Table 42 lists the relevant metrics that have not already been mentioned before in this section.

Table 42. Additional Relevant Marine Transportation System Metrics That PIANC Proposed.

Category	Performance Metric	Notes
Infrastructure	Number of hours lock/floodgate is closed to traffic	Might want hours and days (to track frequency). Corps can provide this.
	Number of lockages in a year	Corps tracks this.
Economic Development	GIWW-T transport volume compared to gross domestic product (GDP)	TxDOT will have to prepare this.
	Regional and local development	May require a joint effort with other agencies or a university.

CHAPTER 6: CONCLUSIONS AND RECOMMENDATIONS

RECOMMENDED ACTION ITEMS

The GIWW-T is clearly an important transportation asset, especially to the oil and gas and petrochemical industries. As a transportation corridor, it has several issues that either the state or federal government needs to address. Currently, TxDOT participation is limited to acquiring real estate for dredged material placement areas. However, there are several avenues for further involvement that TxDOT may want to explore.

The key element in evaluating increased financial participation from the State of Texas is whether it will actually increase expenditures in Texas or merely replace federal funds with state funds. Since the federal government has responsibility for maintaining the GIWW-T, TxDOT should explore opportunities to assist that would not assume part of the ongoing federal responsibility. There are several such possibilities:

- **Urge the Corps to restart the study process for the Brazos River Floodgates (which will probably need to include the Colorado River Locks).** This entails making a formal request to the Corps and advocating for funding the study. Once the study process enters the feasibility study phase, TxDOT should investigate the feasibility of funding all or part of the Brazos River Floodgates replacement structure. This will most likely involve a concerted effort to get a higher priority level placed on the Brazos River Floodgates replacement project for funding from the Inland Waterways Trust Fund.
- **Cooperate with environmental and conservation entities such as Ducks Unlimited to fund the placement of revetments along placement areas.** This will reduce required maintenance dredging necessitated by the sloughing of placement area retaining dikes, and will shore up placement areas, possibly extending their useful life in some cases. The Corps can certainly provide insight into where such projects would have the greatest impact.
- **Provide funding assistance for the creation of new fleeting areas that would accommodate all available barge traffic.** This could be done in a number of ways, ranging from acquiring federal grant money to directly funding construction. The need for and location of such facilities could easily be determined by consulting with organizations such as the Texas Waterways Operators Association.
- **Stay actively involved in reviewing permit applications for development along the GIWW-T filed with the Corps.** It is important to avoid any further encroachment on the GIWW-T to avoid degradation of safety or efficiency on the waterway. It may also be important in terms of protecting needed placement areas, both existing and future.
- **Expedite the construction of the replacement FM 457 swing bridge (Caney Creek Bridge).** Barge operators have indicated that while this bridge is not as critical as the Brazos River Floodgates, it is nevertheless a concern from a safety viewpoint. Anything TxDOT can do to avoid any slippage in the project timeline would be of benefit to GIWW-T users.
- **Begin exploring real estate options for the placement area with the least estimated remaining life (PA86 in Brazoria County, with an estimated remaining life of 12 years).** Since the acquisition of property for a placement area will involve a lengthy

administrative process, an environmental assessment or environmental impact statement, and extensive coordination with other agencies, it is not too early to begin the process of acquiring property for a placement area in the vicinity of PA86.

- **Set up and maintain a web page to periodically update and publish selected metrics.** As explained in this report, there are a number of metrics that would indicate the condition and safety of the GIWW-T. TxDOT may want to consider creating a website that will track these metrics. A group such as the Port Authority Advisory Committee could advise TxDOT as to which metrics would be most important and how frequently they should be updated.
- **Continue to pursue funding through the TIGER grant program that USDOT administers.** The goal of programs like TIGER is to promote multimodal infrastructure that moves beyond the individual modes (highway, rail, or marine) to an enhanced transportation system network. TxDOT has already pursued one such grant and should consider submitting further applications that will enhance the operation of the GIWW-T and its role as part of the state's freight transportation network.
- **Apply for Marine Highway project designation.** While such a designation does not have an immediate benefit, it does place the GIWW-T in line for future Marine Highway grants, and it raises the profile of this corridor on a national level. TxDOT can apply for such a designation to the U.S. Maritime Administration at any point it chooses.

POTENTIAL FUNDING MECHANISMS

There are no funding mechanisms readily accessible to TxDOT that will provide a predictable and reliable long-term funding source for GIWW-T construction and maintenance. Any such funding streams will most likely require significant legislative changes and may be politically difficult to implement. The recommendations provided above are focused on expediting and enhancing existing programs and taking advantage of "one-off" funding sources and other measures that will enhance the GIWW-T without requiring a long-term funding commitment on TxDOT's part.

POSSIBLE LEGISLATIVE REQUIREMENTS

The recommendations provided in this chapter do not call for legislative action. Any initiative focused on new long-term funding sources will most likely require such action. The triggers are discussed in this report.

APPENDIX A: SELECTED MILESTONES AND LEGISLATIVE HISTORY OF THE GIWW

Table 43. Selected Milestones and Legislative History of the GIWW.

Year	Event	Documents
1873	Rivers and Harbors Act provided funds for a survey of the Texas coastline.	
1874	Texas coastline survey completed.	
1901	Oil discovery at Spindletop in Texas renewed interest in a canal for transportation of petroleum products.	
1905	Construction of GIWW began (connecting Corpus Christi to Aransas Pass; Aransas Pass to Pass Cavallo; Brazos River to West Galveston Bay).	
1905	Channel 4 ft ×100 ft from West Galveston Bay across Chocolate Bay to 4 ft of water in Chocolate Bay.	H Doc 445, 56th Cong., 1st Sess.
1909	Above canals (dredged 5 ft deep × 40 ft wide) completed.	
1925	Congress appropriated $9 million for GIWW extension to connect Galveston.	
1925	Channel 9 ft × 100 ft, Sabine River to Galveston Bay, and a 20-inch pipeline dredge. Such passing places, widening at bends, locks, or guard locks and railway bridges over artificial cuts as necessary.	H Doc 238, 68th Cong., 1st Sess.
1927	Channel 9 ft × 100 ft, Galveston Bay to Corpus Christi.	H Doc 238, 68th Cong., 1st Sess.
1934	Construction connecting segment between Sabine River and Galveston Bay.	
1937	Maintenance of flood-discharge channel in Colorado River.	S committee print, 75th Cong., 1st Sess.
1938	Channel 9 ft × 100 ft in San Bernard River, Texas.	H Doc 640, 75th Cong., 1st Sess.
1938	Channel in Colorado River, 9 ft × 100 ft, with basin.	H Doc 642, 75th Cong., 3rd Sess.
1938	Channel 9 ft × 100 ft from main channel to harbor at Rockport and improve harbor to 9-ft depth.	H Doc 564, 75th Cong., 3rd Sess.
1938	Channel 9 ft × 200 ft from main channel to harbor at Rockport and improve harbor to 9-ft depth.	H Doc 641, 75th Cong., 3rd Sess.
1939	Enlarge waterway to depth of 12 ft and a width of 125 ft from Sabine River to Corpus Christi.	H Doc 230, 76th Cong., 1st Sess.

Table 43. Selected Milestones and Legislative History of the GIWW (Continued).

Year	Event	Documents
1939	Channel 6 ft × 100 ft from main channel to Aransas Pass, Texas.	H Doc 643, 75th Cong., 3rd Sess.
1942	9-ft channel completed to Corpus Christi.	
1942	Construct waterway from Corpus Christi to vicinity of Mexican border and provide a depth of 12 ft and width of 125 ft throughout.	PL 675, 77th Cong.
1945	Channel 6 ft × 60 ft from GIWW to a point in Chocolate Bayou near Liverpool.	H Doc 337, 76th Cong., 1st Sess.
1945	Channel 6 ft deep and 60 ft wide from main channel near Port O'Connor, Texas, in Barrom Bay.	H Doc 428, 76th Cong., 1st Sess.
1945	Enlarge channel from main channel to Aransas Pass, Texas, providing a depth of 9 ft and width of 100 ft.	H Doc 383, 77th Cong., 1st Sess.
1945	Channel 12 ft × 125 ft from main channel to Red Fish Landing, Texas, with basin.	S Doc 248, 78th Cong., 2nd Sess.
1945	Channel 12 ft × 125 ft from main channel to vicinity of Harlingen, Texas, via Arroyo Colorado with basin.	H Doc 402, 77th Cong., 1st Sess. (See PL 14, 79th Cong.)
1946	Fill a portion of shallow-draft channel adjacent to Port Isabel Turning Basin; construct a channel to connect shallow-draft channel with main channel near shoreline of Laguna Madre; and enlarge shallow-draft channel west of this connection, all to 12-ft depth and bottom width of 125 ft.	H Doc 627, 79th Cong., 2nd Sess.
1946	Reroute main channel to north shore of Red Fish Bay between Aransas Bay and Corpus Christi Bay; deepen tributary channel from Port Aransas to Aransas Pass, Texas, 12 ft and extended basin at same depth.	H Doc 700, 79th Cong., 2nd Sess.
1949	Channel completed between Corpus Christi and Brownsville.	
1949	GIWW dredged 12 ft deep and 125 ft wide.	
1950	Deauthorized 6-ft × 60-ft channel in Chocolate Bayou and reauthorized the 4 × 100-ft channel.	H Doc 768, 80th Cong., 2nd Sess.
1950	Alternate channel across South Galveston Bay between Port Bolivar and Galveston causeway.	H Doc 196, 81st Cong., 1st Sess.
1950	"Red Fish Landing" changed to "Port Mansfield, Texas."	PL 516, 81st Cong.
1952	Incorporate as part of intracoastal waterway a channel 9 ft × 100 ft from main channel via Seadrift to point on Guadalupe River 3 miles above Victoria, Texas, authorized by the River and Harbor Act of 1945.	PL 527, 82nd Cong., 2nd Sess.

Table 43. Selected Milestones and Legislative History of the GIWW (Continued).

Year	Event	Documents
1954	Small craft harbor 9 ft × 200 ft by 1,000 ft at Seadrift with an entrance channel 9 ft ×100 ft.	H Doc 478, 81st Cong., 2nd Sess.
1954	Widen tributary channel between Port Aransas and Aransas Pass, Texas, to 125 ft; straighten and widen to 125 ft connecting channel to Conn Brown Harbor; and maintain Conn Brown Harbor at federal expense, all to 12 ft deep.	H Doc 376, 83rd Cong., 2nd Sess.
1959	Improve channels and basins comprising channel to Port Mansfield constructed in part by federal government and in part by local interest; construct turnout curves at GIWW intersection and bend easing at maintenance of locally dredged jetty channel 16 ft × 250 ft; and conduct maintenance of small craft basin.	S Doc 11, 86th Cong., 1st Sess.
1960	Entrance channel 7 ft deep × 75 ft wide from main channel to Gulf of Mexico to inside shoreline at Port Isabel, Texas, an inner channel 6 ft deep × 50 ft wide from entrance channel to East Harbor Basin, and an irregular-shaped harbor basin 6 ft deep having a surface area of about 7 acres.	Sec. 107, PL 645, 86th Cong.
1960	Deepen the existing 6-ft channel at Port Isabel to 12 ft and remove the submerged bars.	Sec. 107, PL 86-645
1960	Deepen the existing channel to 12 ft × 125 ft, and extend southeasterly from the GIWW main channel in West Galveston Bay, into Offatts Bayou, a distance of 2.2 miles, and a west turnout 12 ft × 125 ft between the proposed Offatts Bayou Channel and the GIWW.	Sec. 107, PL 86-645
1960	Deepen Aransas Pass tributary channel to 14 ft from mile 0 at Harbor Island to mile 6.1 at the city of Aransas Pass; widen to 175 ft between miles 3.5 and 4.6; and deepen Conn Brown Harbor, turning basin and connecting channel between Conn Brown Harbor and turning basin.	Sec. 107, PL 86-645
1961	Total of almost 90 tributaries incorporated into GIWW.	
1962	Improve main channel 16 ft deep and 150 ft wide from Sabine River to Houston Ship Channel, with two relocations; relocate main channel in Matagorda Bay and Corpus Christi Bay; and maintain existing Lydia Ann Channel.	H Doc 556, 87th Cong., 2nd Sess.
1962	Deepen and widen channel to Palacios; construct two protective breakwaters; maintain and deepened existing basins; and deepen, enlarge and maintain existing approach channel to basin No. 2.	H Doc 504, 87th Cong., 2nd Sess.

Table 43. Selected Milestones and Legislative History of the GIWW (Continued).

Year	Event	Documents
1962	Eliminate requirement of local interest to construct bridge at mile 29.2 turning basin at Victoria, and maintain turning basins at Victoria and Seadrift; provide federal construction of vertical-lift railroad bridge at Missouri-Pacific Railroad mainline crossing, mile 29.2; construction and future maintenance of basin near Victoria, Texas, and maintenance of basin constructed by local interests at Seadrift, Texas.	H Doc 288, 87th Cong., 2nd Sess.
1965	Modify existing federal navigation project to provide a channel extending from GIWW through Chocolate Bay and Chocolate Bayou to project channel mile 8.2, thence to a turning basin near channel mile 13.52 and for saltwater barrier in Chocolate Bayou about 3.7 miles upstream from basin (channel mile 16.9).	H Doc 217, 89th Cong., 1st Sess.
1968	Entrance channel 15 ft deep and 200 ft wide at the mouth of Colorado River Channel protected an east jetty 3,500 ft long extending to 5-ft contour; make channel 12 ft × 100 ft from Gulf shore to Matagorda including recreation facility, a turning basin 12 ft × 300 ft wide and 1,450 ft long, and a new diversion channel 250 ft wide and varying in depth from 20–23 ft including a closure dam across the present river channel.	S Doc 102, 90th Cong., 2nd Sess.
1968	Modified 1968 authorization to provide that diversion features shall be constructed at federal expense, and that operation and maintenance shall be shared 75 percent federal/25 percent non-federal.	S Doc 812, PL 99-662
1968	Enlarge existing Channel to Victoria from a depth of 9 ft and a width of 100 ft to a depth of 12 ft and width of 125 ft.	Sec. 3, PL 100-676
1972	Federal Water Pollution Control Act amendments "provide for potentially severe penalties for the discharge into water of a hazardous substance determined to be non-removable."	
1972	Marine Protection Research and Sanctuaries Act (MPRSA), as amended, requires that the Corps evaluate proposed projects that require the transportation of dredged material for the purpose of disposal in the open ocean.	
1975	The Texas Coastal Waterway Act appointed the State Highway and Public Transportation Commission (now Texas Transportation Commission) to act as an agent of the State of Texas as the non-federal sponsor for the GIWW in Texas. The act also instructed the commission to evaluate continually the GIWW as it relates to Texas.	
1975	Final environmental impact statement (EIS) for entire portion of the GIWW prepared.	

Table 43. Selected Milestones and Legislative History of the GIWW (Continued).

Year	Event	Documents
1976	Resource Conservation and Recovery Act (RCRA), as amended, prohibits land disposal of hazardous wastes unless the wastes meet specified treatment standards.	
1977	Clean Water Act (CWA), as amended, includes separate programs for wetlands protection and for dredging and dredged material disposal.	
1989	Issue paper that the maintenance dredging working group (NMFS, TGLO, TPWD, USFWS, and National Park Service) prepared using a new EIS because of concerns over effects of dredged material disposal and changes in circumstances and new information since the 1975 EIS.	
1990	Corps prepared environmental assessment with a finding of no significant impact (EA/FONSI) for an upland disposal on the Kenedy/King Ranch.	
1992	Provide 8 miles of erosion protection for the existing waterway in the vicinity of Sargent, Texas.	Sec. 101 (20), PL 120-580
1993	King Ranch prepared white paper on environmental effects of dredged material disposal on the Kenedy/King Ranch.	
1994	Acquisition of 750 upland acres in the Baffin Bay area of the upper Laguna Madre area suspended by the Texas Transportation Commission pending the completion and review of the U.S. Army Corps of Engineers' Section 216 feasibility.	
1994	Dredging operations planned for March temporarily deferred in the lower Laguna Madre area due to concerns about the environmental impacts of open water disposal.	
1994	Corps completed draft reconnaissance report for Section 216 study (authorized by the Flood Control Act 1970) on Corpus Christi's Bay to Port Isabel segment. Section 216 studies initiated for the entire GIWW (to be done in five separate sections) in response to the concerns raised in the 1989 issue paper.	
1994	The Corps completed a draft of the first phase of a two-phase Section 216 study.	

Table 43. Selected Milestones and Legislative History of the GIWW (Continued).

Year	Event	Documents
1994	The National Audubon Society, the Lower Laguna Madre Foundation, the Sierra Club, the National Wildlife Foundation, the Gulf Coast Conservation Association, and the Sportsmen Conservation of Texas file suit to enjoin the Corps from dredging to greater depths than legally required; enjoin the disposal of spoil to sites below mean low tide in the Laguna Madre; and request completion of a new or supplemental EIS covering GIWW dredging program from Corpus Christi to Port Isabel, Texas.	
1994	U.S. District Court for the Southern District of Texas, Brownsville Division, denied the plaintiffs' request and dismissed the above case based on the court's finding that the Corps "is currently engaged in a review of the maintenance and operation… pursuant to the National Environmental Policy Act."	
1994	National Harbors Program: Dredged Material Management Plans.	
1995	First meeting of ICT composed of TxDOT, TGLO, Texas Water Development Board, Texas Parks and Wildlife Department, Texas Natural Resource Conservation Commission, Corps, USFWS, National Marine Fisheries Service, EPA, and CCBNEP (Corpus Christi Bay National Estuary Program—advisory). Charter to identify environmental concerns associated with the GIWW in the Laguna Madre and to develop scopes of work to address those concerns.	
1996	Corps announces intent to prepare supplemental EIS.	
1996	Joint Motion for Voluntary Dismissal of Audubon's appeal of 1994 suit. Stipulation of Settlement provided that Corps would use its best efforts to complete a Supplemental EIS by 12/31/98; to conduct public scoping and evaluate reasonable alternatives; and to hold a public scoping meeting in Cameron County, Texas, before October 1, 1996.	
1996	Corps holds series of workshops as part of National Environmental Policy Act (NEPA) scoping process.	
1996	Corps holds public meeting as part of NEPA scoping process.	

Table 43. Selected Milestones and Legislative History of the GIWW (Continued).

Year	Event	Documents
1996	Provides for erosion protection along a 31-mile reach of the GIWW, which crosses the critical wintering habitat of the endangered whooping crane, including a 13.25-mile reach within the boundary of Aransas National Wildlife Refuge. Also provides for limited oil spill containment features and equipment to protect those areas from accidental hazardous spills.	Sec. 101(29), PL 104-303
2007	Reroute the portion of the existing GIWW across Matagorda Bay, between mile marker 460 and 472, approximately 6,000 ft north of and parallel to the existing channel. In the vicinity of bends in the channel, the bottom width will average 300 ft. Beneficial use of dredged material will provide for the construction of approximately 135 acres of marsh at Palacios Point and 160 acres of marsh near Port O'Connor and also nourish beaches at Sundown Island and the beach at Port O'Connor. The cost of construction to be paid 1/2 from amounts appropriated from the General Fund of the Treasury and 1/2 from amounts appropriated from the Inland Waterways Trust Fund.	Sec. 1001 (41), PL 110-303
2007	Along the GIWW, High Island to Brazos River construction a 24-acre sediment trap at Rollover Pass, widen the west approach opening at Sievers Cove from 125 ft to 200 ft. Abandon the existing turning channel of the Texas City "Y" (Texas City Wye), widen the Texas Channel at the intersection with the GIWW, and remove the navigational aids. Widen the Pelican Island Mooring Basin on the north side from 75 ft to 155 ft and combine this feature with the Texas City Wye. Construct a single 24-ft circumference, 10,000-ft long geotube barrier between the GIWW and the West Bay. The cost of construction to be paid 1/2 from amounts appropriated from the general find of the Treasury and 1/2 from amounts appropriated from the Inland Waterways Trust Fund.	Sec. 1001 (42), PL 110-114

APPENDIX B: TEXAS ADMINISTRATIVE CODE: GIWW ADVISORY COMMITTEE (GIWAC)

(in part)

Texas Administrative Code

TITLE 43:	**TRANSPORTATION**
PART 1:	**TEXAS DEPARTMENT OF TRANSPORTATION**
CHAPTER 2:	**ENVIRONMENTAL REVIEW OF TRANSPORTATION PROJECTS**
SUBCHAPTER F:	**REQUIREMENTS FOR SPECIFIC TYPES OF PROJECTS AND PROGRAMS**
RULE §2.132:	**Gulf Intracoastal Waterway Projects**

….

(c) Initiation of proposed disposal plans or beneficial use projects.

(1) Disposal plan. The department may participate in the development of a disposal plan for dredged material.

(2) Laguna Madre disposal plans. Legislative approval is necessary for any substantive changes to the disposal plan developed for the Laguna Madre reach of the GIWW dated October 11, 2002.

(3) Beneficial use project. The department may participate in the development of a beneficial use project for dredged material.

(A) Proposals. The department will accept from the U.S. Army Corps of Engineers proposals for beneficial use projects in the broad use categories of:

(i) habitat development;

(ii) beach nourishment;

(iii) aquaculture;

(iv) parks and recreation;

(v) agriculture, forestry, and horticulture;

(vi) strip mine reclamation and solid waste management;

(vii) shoreline stabilization and erosion control;

(viii) construction and industrial use;

(ix) material transfer, such as transfer for fill, dikes, levees, parking lots, roads; and

(x) multiple purposes, which is a combination of two or more of the categories listed in this subparagraph on a single dredging project.

(B) Submittal of proposals. The U.S. Army Corps of Engineers will submit proposals in writing to the executive director or the executive director's designee. The proposals will include:

(i) a description of the proposed beneficial use project and anticipated benefits;

(ii) a map delineating the location or locations of the proposed beneficial use project;

(iii) a proposed project schedule including an anticipated completion date;

(iv) a detailed estimate of the project cost, including an estimate of the U.S. Army Corps of Engineers' financial contributions to the project; and

(v) a plan addressing the operation and maintenance of the facility created by or benefiting from the beneficial use project.

(4) Early coordination. The department will initiate and oversee early coordination with appropriate state and federal agencies to develop a proposal for disposal plans or beneficial use projects.

(5) Investigation.

(A) The department will use a task force to investigate disposal plans and beneficial use projects and evaluate the environmental and operational suitability of each. The task force will include representatives from state and federal agencies having jurisdiction in the protection of the state's natural, historic, and economic resources, and the GIW AC or federal interagency coordination team.

(B) The department or U.S. Army Corps of Engineers will lead any field investigations. The task force agencies will be requested to participate in field investigations and to provide to the department written evaluations of the disposal plans and beneficial use projects investigated.

(C) The GIWAC or federal interagency coordination team will review the investigations and discuss with the department any proposed disposal alternatives or beneficial use projects.

(d) Preparation of environmental review document. Upon the identification of a disposal proposal or beneficial use proposal related to the GIWW, the department will assist with the preparation of the environmental review document by the U.S. Army Corps of Engineers under 42 U.S.C. §§4321 et seq. and applicable federal rules. The department will assist with any public participation process conducted by the U.S. Army Corps of Engineers.

(e) Procedures for state acquisition of real property…

(2) Commission approval….

(B) For a project to beneficially use dredge material, in addition to the requirements of subparagraph (A) of this paragraph, the project:

(i) is proposed by the U.S. Army Corps of Engineers;

(ii) proposes one or more beneficial use activities having a direct relationship of function or impact to the GIWW;

(iii) has substantial local support, as evidenced through the public participation process and documentation, including, at a minimum, a resolution or other official document from the governing body of the city or county with jurisdiction over the project area or if the project area is located in more than one jurisdiction, from the governing body of the city or county within which a majority of the project area is located, in consultation with the other involved jurisdictions. For the purposes of this clause, the jurisdiction of a city is the area within the incorporated limits and the extraterritorial jurisdiction of the city, and the jurisdiction of a county is the area within the boundaries of the county, excluding incorporated areas and areas within the extraterritorial jurisdiction of a city;

(iv) is limited to a logical unit of work and capable of being implemented and completed within a reasonable time as determined by the department;

(v) is consistent with the Texas Coastal Management Program; and

(vi) is consistent with the financial participation requirements of this clause.

(I) The commission will establish an eligible cost of the proposed beneficial use project by calculating the total estimated cost of the project in excess of the established federal standard for dredged material disposal. Except as provided in subclause (II) of this clause, the department's financial participation in the project will not exceed 50 percent of eligible cost.

(II) The commission may authorize participation at levels exceeding 50 percent if the commission determines the additional participation will result in extraordinary environmental or economic benefits or the costs are reasonably comparable to the costs of providing property to accommodate traditional upland disposal.

(III) Department funding may not be used for maintenance or operation of a beneficial use project.

APPENDIX C: THE EFFECT OF LIGHT LOADING

ANALYSIS OF EFFECT OF LOSING 1 FT OF DRAFT FOR ENTIRE TEXAS REACH OF THE GIWW-T

Assumptions and Base Data

The main assumption regarding shoaling is that the GIWW-T will be allowed to shoal to the point that current average drafts will be reduced by 1 ft.

The costs being estimated here are from the operator's perspective. It is assumed that operators will incur costs on a per-tow basis; that is, the cost to perform a tow is independent of how much tonnage is actually moved. The actual rate charged to the shipper will vary based on time sensitivity, market demand, and other contractual issues.

All barge and fleet characteristics are based on summary trip data that the Galveston District of the Corps of Engineers provided. These data were compiled from the confidential trip data for calendar year 2011, the most recent year available. However, all costs (operating and dredging) are indexed and stated in 2013 dollars to provide consistency in comparisons.

Since dredging affects only the loaded barges, the analysis is limited to barges drafting more than 8 ft. For tows requiring more than 8 ft of draft, these data indicate an average of 2.4 barges per tow. There is a wide variety of barge configurations. The predominant draft is 1.7 ft for empty barges; therefore, 1.7 ft is used as the standard for empty barges in this analysis.

Cost figures for operating towboats and barges were taken from the USACE's *Economic Guidance Memorandum (EGM) 05-06* (*90*), which provides shallow-draft vessel operating costs for 2003. This is the most recent information that is publicly available. An adjustment was made to fuel costs for this analysis due to the dramatic increases in fuel costs since 2003 and the now-prevalent use of ultra-low sulfur diesel. At the time the EGM was prepared, the standard fuel was No. 2 high sulfur diesel fuel (HSDF). Due to new emissions and sulfur content regulations, the fuel used in this analysis was No. 2 ultra-low sulfur diesel (ULSD). According to the Energy Information Administration, the average price per gallon of ULSD in 2013 was $3.922. The Inland Waterway Fuel Tax of $0.20 per gallon was added on to get the total cost per gallon of $4.122. This is 354 percent (3.54 times) of the cost per gallon used in the EGM.

The other operating costs that the USACE reported were inflated using the Inland Waterways Towing Transportation Producer Price Index[33] to reflect 2013 dollars. This caused a 37.9 percent increase to the costs provided in the memorandum (or 1.379 times as much).

The towboat HP used for this analysis is the 1800-2000 HP category. For liquid barges, the 297.5-ft × 54-ft barge without coils was used. For dry cargo barges, the 195-ft × 35-ft covered hopper barge was used.

[33] This index can be found on the Bureau of Labor Statistics website, http://www.bls.gov/www.bls.gov.

Using USACE data, the average trip length for tows drafting more than 8 ft was 422 miles. This resulted in an average trip duration of 422 miles ÷ 5 mph = 84.4 hours or 3.5 days.

Towboat cost per trip in 2013 dollars:
Non-fuel daily cost: ($5,057.63 − $2,215.40) × 1.379 = $3,919.44
Fuel: $2,215.40 × 3.54 = $7,842.52
Cost per day: $3,919.44 + $7,842.52 = $11,761.96
Cost per trip: $11,761.96 × 3.5 = $41,166.86

Tanker barge cost per trip in 2013 dollars:
EGM daily cost: $597.34
Adjust daily cost: $597.34 × 1.379 = $823.73
Trip cost: $823.73 × 3.5 = $2,883.06

Dry barge cost per trip in 2013 dollars:
EGM daily cost: $107.98
Adjust daily cost: $107.98 × 1.379 = $148.90
Trip cost: $148.90 × 3.5 = $521.15

Weighted average barge cost per trip in 2013 dollars:
Approximately 86.1 percent of the barges carrying this tonnage were liquid cargo barges.
Weighting by type of barge yields an average barge cost of:
(0.861 × $2,883.06) + (0.139 × $521.15) = $2,554.75
Trip cost: $41,167 + ($2,555 × 2.4 barges/tow) = $47,299 in 2013 dollars

Light Loading Analysis

The number of barges drafting over 8 ft was 20,311.
The number of tows with barges drafting more than 8 ft was 8,383.
The cost of these trips is 8,383 × $47,299 or $396,507,517.
Tons actually transported on these barges came to 54,721,797.

With Reduced Draft

Current weighted average barge draft for the selected barge population is 9.53 ft.
Weighted average tons per loaded barge is 2,694 (54,721,797/20,311).
Average tons/ft = 2,694/(9.53 − 1.7) = 344.06.
Required cargo reduction per barge with loss of 1 ft draft is 344.06 tons.

Adjusted tons transported (amount that could be moved in the same number of barges with maximum draft of 8.53 ft): 20,311 × (2,694 − 344) = 47,730,850.
This leaves 54,721,797 − 47,730,850 = 6,990,947 tons "stranded." To move this cargo will require additional trips. The additional trips required with an average draft of
8.53 ft = 6,990,947 ÷ (2.4 barges/tow × 2,350 tons/barge) = 1,240.
(Note: 2,350 = 2,694 − 344, as shown in the previous equation.)

Cost of additional trips is 1,240 × $47,299 = $58,650,760.

This is an increase of 14.8 percent in the cost of doing business ($58,650,760) / $396,507,517. Someone must bear this additional cost. Since companies are in business to make a profit, that "someone" is ultimately the consumer.

COST OF DREDGING

Table 44. Annual O&M Cost Incurred by Corps of Engineers.

FY	Original Cost	Price Adjusted Cost
1998	3,486,895	5,605,207
1999	13,850,685	21,723,229
2000	14,211,153	21,839,611
2001	21,621,467	32,650,622
2002	17,641,997	25,844,236
2003	13,319,042	19,068,326
2004	12,348,604	17,104,797
2005	10,405,599	13,760,012
2006	15,248,493	19,231,619
2007	19,305,837	23,397,318
2008	12,357,249	14,473,382
2009	19,344,115	21,872,477
2010	29,510,406	32,584,667
2011	31,340,676	33,493,113
2012	14,830,603	15,218,849
Average	**$16,588,188**	**$21,191,164**

Note: This table uses Civil Works Construction Cost Index System, EM 1110-2-1304 to reflect 2013 dollars.

DIFFERENTIAL BETWEEN COSTS AVOIDED BY DREDGING AND COST OF DREDGING (ANNUAL BASIS)

Costs Avoided	Cost of Dredging
$58,650,760	$21,191,164

Ratio of cost avoided to cost of dredging: 2.8:1.0

APPENDIX D: CALCULATION OF TOWBOAT COSTS

Cost figures for operating towboats and barges were taken from the U.S. Army Corps of Engineers' *Economic Guidance Memorandum 05-06*,[34] which provides shallow-draft vessel operating costs for 2003. This is the most recent information that is publicly available. An adjustment was made to fuel cost for this analysis due to the dramatic increases in fuel costs since 2003 and the now-prevalent use of ultra-low sulfur diesel. At the time the EGM was prepared, the standard fuel was No. 2 HSDF. Due to new emissions and sulfur content regulations, the fuel used in this analysis was No. 2 ULSD. According to the Energy Information Administration, the average price per gallon of ULSD in 2013 was $3.922. The Inland Waterway Fuel Tax of $0.20 per gallon was added on to get the total cost per gallon of $4.122. This is 354 percent (3.54 times) of the cost per gallon used in the EGM.

The other operating costs that the USACE reported were inflated using the Inland Waterways Towing Transportation Producer Price Index[35] to reflect 2013 dollars. This caused a 37.9 percent increase to the costs provided in the memorandum (or 1.379 times as much).

The towboat HP used for this analysis is the 1800-2000 HP category. For liquid barges, the 297.5-ft × 54-ft barge without coils was used. For dry cargo barges, the 195-ft × 35-ft covered hopper barge was used.

Towboat cost in 2013 dollars:

Non-fuel daily cost: ($5,057.63 − $2,215.40) × 1.379 = $3,919.44
Fuel: $2,215.40 × 3.54 = $7,842.52
Cost per day: $3,919.44 + $7,842.52 = $11,761.96
Cost per hour: $490.08

Tanker barge cost in 2013 dollars:

EGM daily cost: $597.34
Adjust daily cost: $597.34 × 1.379 = $823.73
Cost per hour: $34.32

Dry barge cost per 2013 dollars:

EGM daily cost: $107.98
Adjust daily cost: $107.98 × 1.379 = $148.90
Cost per hour: $6.20

Weighted average barge cost in 2013 dollars:

Approximately 86.1 percent of the barges carrying this tonnage were liquid cargo barges.
Weighting by type of barge yields an average barge cost of:
(.861 x 823.73) + (.139 x 148.90) = $729.93
Average weighted cost per hour: $729.93/24 = $30.41

[34] Accessible at http://planning.usace.army.mil/toolbox/library/EGMs/egm05-06.pdf as of February 7, 2014.
[35] This index can be found on the Bureau of Labor Statistics website, www.bls.gov.

APPENDIX E: STANDARD OPERATING PROCEDURE—DEPARTMENT OF THE ARMY PERMIT EVALUATION OF SETBACKS ALONG THE GULF INTRACOASTAL WATERWAY

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P.O. BOX 1229
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OCT 0 2 2013

CESWG-CDR (1145)

MEMORANDUM FOR Galveston District Regulatory and Navigation Branch Personnel

SUBJECT: Standard Operating Procedure – Department of the Army Permit Evaluation Setbacks Along the Gulf Intracoastal Waterway

1. Purpose. This memorandum provides a standard operating procedure (SOP) for evaluation of Department of the Army (DA) permits along the Gulf Intracoastal Waterway Navigation Channel (GIWW). It is the intent of this SOP to provide a rapid and repeatable procedure for evaluating the construction of structures and/or the deposition of dredge and fill along the GIWW in order to preserve the Government's ability to maintain such waterway, and provide a margin of safety to those who use such waterway by maintaining established setbacks from the GIWW.

2. Applicability. This SOP applies to all DA permit applications pursuant to Section 10 of the Rivers and Harbor Act of 1899, and/or Section 404 of the Clean Water Act, received after the date of this memorandum, where the project site is within or along the GIWW.

3. Definitions.

a. The GIWW is a shallow-draft navigation channel that is federally maintained with the project depth dimension equal to or less than 16 feet mean low water, which includes advanced maintenance and allowable over-depth.

b. Authorized dimensions are the depth and width of the channel authorized by Congress to be constructed and maintained by the U.S. Army Corps of Engineers. These authorized channel dimensions are generally based on maximizing net transportation savings in consideration of the characteristics of vessels using the channel and include consideration of safety, physical conditions, and vessel operating characteristics.

c. Advance maintenance is dredging to a specified depth and/or width beyond the authorized channel dimensions in critical and fast shoaling areas to avoid frequent re-dredging and ensure the reliability and least overall cost of operating and maintaining the project authorized dimensions. For maintenance dredging of existing projects, Major Subordinate Commanders (MSC) (Division Commanders) are authorized to approve advance maintenance based on written justification. For

new navigation projects, advance maintenance is approved as part of the feasibility report review and approval process based on justification provided in the feasibility report.

d. Overdepth is a construction design method for dredging that occurs outside the required authorized dimensions and advance maintenance (as applicable) to compensate for physical conditions and inaccuracies in the dredging process and allow for efficient dredging practices.

e. Waterfront structures include any structure placed below the mean high water line of a waterway. The term structure shall include, without limitation, any pier, boat dock, boat ramp, wharf, dolphin, weir, boom, breakwater, bulkhead, revetment, riprap, jetty, artificial island, artificial reef, permanent mooring structure, power transmission line, permanently moored floating vessel, piling, aid to navigation, or any other obstacle or obstruction.

f. Work shall include, without limitation, any dredging or disposal of dredged material, excavation, filling, or other modification of a navigable water of the United States.

g. Fill means material placed in waters of the United States where the material has the effect of replacing any portion of a water of the United States with dry land; or changing the bottom elevation of any portion of a water of the United States. Fill materials include, but are not limited to; rock, sand, soil, clay, plastics, construction debris, wood chips, overburden from mining or other excavation activities, and materials used to create any structure or infrastructure.

h. A setback is defined as the distance from a federally authorized channel, landward, to a proposed structure (i.e., the distance that a structure must be "set back" from the edge of the channel). All setbacks are measured from the near bottom edge of the channel to the nearest point of the structure, whether that point is fixed or floating.

i. Maintenance is defined in Nationwide Permit 3 (NWP 3) as the repair, rehabilitation, or replacement of any previously authorized, currently serviceable structure, or fill, or of any currently serviceable structure or fill authorized by 33 CFR 330.3, provided that the structure or fill is not to be put to uses differing from those uses specified or contemplated for it in the original permit or the most recently authorized

modification, authorizes maintenenace of structures or fill without prior notification to the U.S. Army Corps of Engineers. In addition, NWP 3 authorizes the repair, rehabilitation, or replacement of those structures or fills destroyed or damaged by storms, floods, fire or other discrete events, provided the repair, rehabilitation, or replacement is commenced, or is under contract to commence, within two years of the date of their destruction or damage. DA permit conditions require the applicant to maintain the activity authorized by the permit in good condition and in conformance with the terms and conditions of this permit. If an applicant wishes to cease to maintain the authorized activity or should desire to abandon it they must obtain a modification of their DA permit, which may require restoration of the area.

j. Redevelopment is the re-building or re-assembling of any structure that is no longer functional or serviceable in its original capacity, specifically pertaining to its framing and structural components. This would include beams, girders, joists, stringers, and/or pilings.

k. A mooring facility is a collection of devices that is fixed in navigable waters to which a vessel can be made fast including buoys, chains, ropes, piles, spars and dolphins.

l. General Permit means a DA authorization that is issued on a nationwide or regional basis for a category or categories of activities when those activities are substantially similar in nature and cause only minimal individual and cumulative environmental impacts. (See 33 CFR 325.2(e) and 33 CFR part 330)

m. Letter of Permission means a type of individual permit issued in accordance with the abbreviated procedures of 33 CFR 325.2(e).

n. Individual permit means a DA authorization that is issued following a case-by-case evaluation of a specific structure or work in accordance with the procedures of 33 CFR part 325, and a determination that the proposed structure or work is in the public interest pursuant to 33 CFR part 320.

4. General. The following setbacks are designed to ensure that no structures or fill encroach beyond the top edge of the navigation channel, including appropriate side slopes, and there is sufficient clearance for dredging the navigation channel to its full width and depth, including side slopes. Additionally, considerations are made for safe passage of commercial vessels through the GIWW. Absent unusual circumstances, the following guidelines will apply:

a. Standard Setback. The Standard Setback is designed to establish a distance from the near bottom edge of the GIWW where structures or fill should not extend past. Other work, such as dredging, will be evaluated on a case-by-case basis. The Standard Setback for the GIWW is no closer to the near bottom edge of the GIWW Federal channel than 100 feet. This 100-foot setback is calculated by summing the 12-foot project depth + 2-foot advanced maintenance depth + 2-foot over-depth equaling a 16-foot deep channel. The 16 feet is then multiplied by 3 (side slope ratio) and added to a 52-foot (safety factor) equaling a 100-foot setback from near bottom edge of the channel. This will allow for full maintenance dredging of the federal project with allowable over-depth and appropriate side slopes (generally a 3:1 slope), and give dredging contractors adequate room to conduct operations without endangering docks and other structures. Additionally, these setbacks allow for the safe passage of vessels appropriately sized to navigate the GIWW. Reference Annex A - Standard Setback for the GIWW.

b. Standard Setback Exceptions. During the development of this SOP, 5 areas of navigation concern were identified through coordination with U.S. Army Corps of Engineers Area Offices, U.S. Coast Guard, Texas Department of Transportation, Texas General Land Office, Gulf Intracoastal Canal Association, and numerous towing vessel operators. The 5 areas of concern include Bends, Bridges, Mooring Facilities, Waterfront Structural Congestion/Encroachment areas, and Land Encroachment.

(1) Bends in the GIWW Navigation Channel. Bends can be especially dangerous for vessels, especially those pushing barges. Large vessels negotiating turns, particularly when currents are swift, require additional clearance to safely navigate through bends in the GIWW. During coordination, 29 bends were identified as areas of concern. For these bends, where the angle of deflection of the centerline of the GIWW channel from straight is 30 degrees or more, the setback is expanded to 150 feet on the inside of the bend and 150 feet on the outside of the bend from the near bottom edge of the Federal channel for 500 feet in length of the centerline of the channel, going both directions from the point of intersection at the channel bend. In certain cases, existing waterfront structures restrict the setback to 100 feet. Those locations are listed in Paragraph 3 of Annex B - Setback Design for Bends in the GIWW.

(2) Bridges over the GIWW Navigation Channel. Bridges and the associated fender systems can be dangerous for vessels, especially those pushing barges. Large vessels negotiating the bumpers and pilings, particularly when currents are swift, require additional clearance to safely navigate through the bridges along the GIWW. During coordination, 11 bridges were identified as areas of concern. For these bridges, the setback is expanded starting at the intersection of the base of the bridge and the pre-established 100-feet setback. The expanded setback flares at an approximate 16 degree angle towards the near shore bank for 1,000 feet. The setback will be limited to the bank and will parallel opening of inlets. For the purpose of this SOP, bridge and causeway structures are considered synonymous. Additional information may be found in Annex C- Setback Design for Bridges in the GIWW.

(3) Mooring Facilities in the GIWW Navigation Channel. Mooring Facilities consist of the designated mooring basin and the associated mooring buoys. Waterfront structures constructed in vicinity of the mooring facility could present an impediment to vessel movements and moorings. During coordination, 10 mooring facilities were identified as areas of concern. For these mooring facilities, the setback is expanded to the near bank for the entire length of the mooring facility. Additional information may be found in Annex D - Setback Design for Mooring Facilities on the GIWW.

(4) Waterfront Structure Congestion/Encroachment in the GIWW. Waterfront structure encroachments can be dangerous for vessels, especially when numerous encroachments have created congested areas. There are four occurrences along the GIWW where waterfront structures were issued a DA permit and constructed within this Standard Setback. Accordingly, an adjustment to the setback is instated for these locations in order to maintain safe navigability and protect the existing waterfront structures. The adjusted setback is geographically tied to reinforced bulkheads in each location. To maintain safe navigability, the reduced setback distance is added to the opposite side of the channel. Additional information, as well as the locations of the existing congestion areas, may be found in Annex E - Waterfront Structure Congestion Exemptions and Setback Design for the GIWW.

(5) Land Encroachments into the GIWW Navigation Channel. Land encroachments into the GIWW can be dangerous for vessels, especially those pushing barges. Large vessels negotiating the land encroachments, particularly when currents are swift, require additional clearance to safely navigate around the land encroachment. Accordingly, the setback is expanded from the 100-foot standard to 150 feet on the opposite side of the land encroachment to provide additional clearance. The GIWW will be analyzed land encroachments no less than every decade to determine whether erosion/accretion has created natural encroachments that may require adjustment to the SOP. Any encroachments resulting from activities performed without the required DA permit or not in compliance with the terms and conditions of

an issued DA permit will be addressed pursuant to the enforcement policies and procedures prescribed in 33 CFR part 326. Currently, only one land encroachment exists, a natural accretion on land owned by the Corps, and can be referenced in Annex F - Setback Design for Land Encroachments on the GIWW.

5. Proposed Department of the Army Permits Evaluation Procedure. The U.S. Army Corps of Engineers Regulatory program regulations, specifically 33 CFR 320.4, require permit decisions in navigable waters balance the inherit right to reasonable private land use with the rights and interests of the public. When the activity is in the area of a federal project, such as the GIWW, the activity must be evaluated to ensure that they are compatible. In the case where a permit proposal will create undue interference with access to, or use of, a navigable water, the authorization may be denied after a thorough case-by-case evaluation. In addition to an evaluation of the proposed impact to the aquatic environment and any other relevant factors of the public interest, proposed DA permits for structures and /or fill along the GIWW will be evaluated for their impacts to safety and navigation based on the setback established at the proposed site. The following procedures will be implemented for permit applications located along the GIWW.

1. Standard Setback. DA permit applications proposed shoreward of the setback will be evaluated using a permit type commensurate with the proposed impact. DA permits with proposed structure and/or fill located on or within the standard setback will be evaluated using an individual permit, including letter of permission if applicable. DA permits for proposed work, i.e. dredging, within the Standard Setback areas of the GIWW will be evaluated using the permit type commensurate with the proposed impact.

2. Standard Setback Exceptions. DA permit applications proposed shoreward of the setback lines will be evaluated using an individual permit, including letter of permission if applicable. General permits shall not be used to evaluate DA permits within Standard Setback Exemption areas. DA permits for structures and/or fill proposed within the Standard Setback Exemptions will be considered to create undue interference with, access to, or use of, navigable waters and authorization may be denied by the district engineer pursuant to 33 CFR 325.8(b). DA permits for proposed work within the Standard Setback Exemption areas of the GIWW will be evaluated using an individual permit, including letter of permission if applicable.

3. General Permits. In accordance with the policy and procedures of the Nationwide Permit Program, 33 CFR 330.2(d), and Processing of Department of the Army Permits,33 CFR part 325.2(e)(2), the district engineer will use discretionary authority to suspend and/or modify, all general permits, including Nationwide General Permits, Programmatic General Permits and Regional General Permits eligible for use in the GIWW. All eligible general permits will be modified to include a regional general condition requiring pre-construction notification if the proposed

work is along the GIWW. Furthermore, the use of general permits in Standard Setback Exemption areas will be suspended.

6. Existing Structures and Non-reporting Nationwide Permits. Previously authorized existing piers, docks, fill or other waterfront structures will not be required to be removed. However, if these structures and/or fill are damaged or destroyed beyond repair by a storm, act of nature, or other sudden event, the evaluation of their replacement shall be conducted in accordance with this SOP. The change in purpose and need, redevelopment and/or expansion of existing piers, docks, fill or other waterfront structures, (e.g., the conversion of commercial seafood docks to a residential marina), shall be subject to the setback SOP and any required regulatory permit action. The general and routine maintenance and repair of existing piers, docks, fill or other waterfront structures located in the GIWW setback may be authorized under NWP 3 provided the work does not increase the footprint of the existing structure and does not result in additional encroachment into the setback. Activities along the GIWW performed without the required DA permit or not in compliance with the terms and conditions of an issued DA permit will be addressed pursuant to the enforcement policies and procedures prescribed in 33 CFR part 326

7. Application. This SOP, as well as all setbacks graphics and applicable documents will be downloadable from the Galveston District's Regulatory and Navigation webpage.

RICHARD P. PANNELL
Colonel, EN
Commanding

APPENDIX F: AICPA DIMENSIONS OF TAX EQUITY AND FAIRNESS

In 2007, the AICPA developed a statement on guiding principles for tax equity and fairness. The Tax Equity and Fairness Task Force developed this statement with input from the Institute's 2006–2007 Tax Legislation and Policy Committee and the 2006–2007 Tax Executive Committee. The 2006–2007 Tax Legislation and Policy Committee and the 2007–2008 Tax Executive Committee approved this statement. As part of this effort, the committee developed seven dimensions to be considered in determining tax equity and fairness.

EXCHANGE EQUITY AND FAIRNESS

Taxes are the price we pay for the essential infrastructure and services that federal, state, and local governments provide. Exchange equity and fairness means that over the long run, governmental agencies provide adequate public goods and services to meet the needs of taxpayers and their families. Exchange equity does not mean that during a specific period, the amount of taxes that a particular taxpayer pays will exactly correspond with the value of the tax benefits directly or indirectly received.

Tax revenues must be pooled to fund essential shared services, such as education, defense, health care, public safety, social services, and even tax administration. Substantial amounts of tax revenue must be invested in long-lived assets, such as airports, bridges, highways, schools, and public buildings. This investment in infrastructure will benefit both current and future taxpayers. Although individuals may not currently need to use all of the facilities or services that governmental units offer, the lack of such facilities or services could have a negative impact on their quality of life. For example, the presence of a police or fire department is reassuring, even if they are never actually needed.

Exchange equity also allows for the sharing of pooled resources with others in return for the promise of future benefits if and when needed. As an example, the Social Security system largely relies on the taxes that current workers pay to fund the benefits of retired workers. This is done with the implicit promise that when today's workers retire, others will fund their benefits. The funding of disaster relief can also be viewed as implicit exchange equity. Taxpayers are willing to assist the victims of natural or manmade disasters, not only because it is the right thing to do, but because they all have the expectation that similar aid would be available for them if they were victims of such a disaster.

For a tax system based on the concept of voluntary compliance to function effectively, taxpayers must have a positive *perception* of exchange equity. According to Moser, Evans, and Kim, they must feel that in the long run, they are getting their money's worth for the taxes they pay (*91*).

PROCESS EQUITY AND FAIRNESS

There are three key aspects to process equity and fairness. First, political processes give taxpayers an opportunity to influence how and to what extent they are taxed. Second, tax systems include safeguards that permit taxpayers to challenge the taxes assessed. Third, tax administrators are expected to treat taxpayers with respect.

In the interest of both exchange and process equity, taxpayers should have some direct or indirect voice in how tax revenues are spent. Citizens who strongly disagree with how the government spends its money may be inclined to engage in tax protests or be noncompliant.

By agreeing to be taxed through a representative, democratic government, citizens have an indirect voice in tax matters when they elect legislative bodies at the national, state, and local levels. Congress, state legislatures, city councils, and even school boards are then responsible for approving budgets and the taxes necessary to fund those budgets. In certain instances, taxpayers are given a direct voice in tax matters when state and local sales or property tax rates must be approved by referendum.

Unfortunately, too many taxpayers perceive that they have little or no voice in tax matters. Others believe that tax agencies, rather than legislative bodies, have the primary responsibility for making tax laws.

One danger in any tax system is that those charged with enforcing tax laws and collecting the tax will abuse their authority. Safeguards to prevent abuse of power are a necessary condition for process equity in any system of laws, including the tax system. Communications from tax agencies should clearly describe taxpayer obligations and the legal basis for any additional assessments or penalties. There should be procedures to appeal the amount of tax to be paid. There should also be appropriate limits on the methods tax agencies can use to enforce payment. Any appeals procedures or taxpayer rights should be available to all taxpayers, not just those who are able to afford professional assistance.

Finally, taxpayers should be treated with respect and assisted with (not coerced into) meeting their tax reporting and payment obligations. Federal and state governments have adopted the Taxpayer Bill of Rights in recent years. Respect, however, is an attitude or point of view and cannot be achieved solely by legislation. In many tax agencies, cultural change may be necessary to fully achieve this aspect of process equity.

HORIZONTAL EQUITY AND FAIRNESS

Horizontal equity and fairness is the most often cited aspect of tax equity. Horizontal equity means that taxpayers with equal amounts of income (or property) should pay the same amount of tax. Horizontal equity also suggests that similarly situated taxpayers should be taxed similarly. Unfortunately, these two definitions are not synonymous. Taxpayers may have equal amounts of income but different tax liabilities because income from capital is generally taxed at more favorable rates than earned income.[36] Congress uses the tax system to create incentive structures that change consumer behaviors. Using this system, the incentive structure could be changed to favor capital investments by reducing the relative tax liability that these investments carry. Despite the effectiveness of this policy to change consumer behavior, concerns arise over horizontal equity.

[36] Congress uses the tax system to provide economic and social incentives. Preferential tax treatment of dividends and capital gains may provide economic incentives for capital investment. However, these provisions may also diminish the perceived horizontal equity of the tax system.

To fully explain horizontal equity, it is necessary to return to the idea that equity or fairness is related to needs fulfillment. Two households may earn exactly the same income but may not be "similarly situated," and therefore have differing abilities to pay taxes. A certain amount of each family's income is needed to provide for basic human needs—the definition of which changes as our society changes. This amount should not be subject to tax. The amount of income that should not be taxed depends on several factors, including the cost of living,[37] the size and structure of the family, the age of family members, and extenuating circumstances such as disabilities or illness. A cost-of-living adjustment would factor in the cost of maintaining a reasonable household and the differences in good prices between geographic areas. The current federal tax system does not include a cost-of-living adjustment, but this consideration has been brought up several times.

Horizontal equity is the justification for personal and dependency exemptions for income taxes and homestead credits for property taxes. Other income tax deductions and credits for personal expenses such as child care, education, and medical expenses attempt to achieve horizontal equity with varying degrees of success. Unfortunately, most of these provisions increase complexity and decrease perceptions of equity for taxpayers who fail to qualify for these deductions or credits.

Another issue in determining whether taxpayers are similarly situated relates to family structure. Income tax laws at the federal level, and in most states, employ a very traditional definition of family. An individual's filing status and tax rate is determined by marital status. Married couples are then taxed as a family, rather than as individuals. Although there is a penalty on earned income taxes for married couples, there is a tax break for Social Security taxation when filing as a married couple. Although recent legislation has sought to mitigate this marriage penalty, other family-related horizontal equity issues need to be addressed. Should unmarried couples raising children together be taxed as a family? Should extended families that include grandparents or elderly parents in the same household be given a larger tax-free base? Should credits related to children favor two-earner families or reward families with a stay-at-home parent?

Extenuating circumstances can also affect the ability of an individual or family to pay taxes. Individuals who are seriously ill, physically or mentally impaired, or too young or too old to care for themselves can strain family finances. In the past, federal tax laws granted extra income tax exemptions for the elderly and blind.[38] One problem with using this approach to enhance horizontal equity is that the list of conditions that should be given special consideration would be extremely long. Further, this would be an area that could be prone to abuse and could actually favor families who have the resources to have maladies or disabilities diagnosed and documented.

[37] This often includes the basic cost to maintain a household of modest means and could include differences among geographic locations. Currently, the federal tax system does not take cost-of-living differences among geographic locations into consideration (California versus Arkansas).

[38] Increased standard deductions are available to elderly or blind taxpayers, although this only results in lower taxes for those who do not itemize. The income tax laws in many states still grant extra exemptions if the taxpayer or the taxpayer's spouse is elderly or blind.

VERTICAL EQUITY AND FAIRNESS

Vertical equity and fairness means that the tax burden should be based on the taxpayer's ability to pay. Clearly, individuals with subsistence levels of income should not be subject to all types of taxes because they need all their resources to provide for themselves and their families. Beyond this subsistence or poverty level of income, exchange equity suggests that all citizens should pay some taxes, even a relatively small amount.

Vertical equity is generally the justification for progressive tax rate structures in income and wealth transfer taxes. As income or wealth levels rise, the tax rates rise. Likewise, the marginal utility of further earnings or wealth accumulation declines. If tax rates rise without limit, there is a danger that taxpayers will reach tipping points at which they either stop working or move to a different tax jurisdiction. States have been particularly sensitive to the latter problems. Taxpayers are mobile and can move if they perceive that state tax rates are excessive. Therefore, the range between the highest and lowest income tax rates is smaller at the state level than it is at the federal level. However, state taxpayers tend to reach the highest marginal rate at lower levels of income than they do under federal rate structures.

Alternatives to the current federal income tax system (consumption tax, flat tax, retail sales tax, and value-added tax regimes) can result in greater regressivity and lower vertical equity (*92*). Advocates of a flat tax system argue that vertical equity can be achieved only if a single rate is applied to all income, i.e., there are no deductions and no differential treatment of earned income versus income from capital. They further suggest that progressive tax rates actually lead to vertical inequity. While attractive to those with sufficient income to control discretionary spending subject to a sales or consumption tax, these taxes could be seen as a burden on middle- and lower-income taxpayers who must spend all or nearly all their income on necessities.

Vertical equity is the one dimension of equity that is readily measurable, both as a percentage and an amount of each family's tax burden. Economists use a variety of techniques to assess the extent to which tax burdens are shifted among income classes (*93*). The theoretical question is to what extent tax burdens can be shifted among taxpayers with higher versus middle versus lower income or property values without impairing exchange or inter-group equity.

TIME-RELATED EQUITY AND FAIRNESS

Time-related equity and fairness means that the total tax obligation is appropriate over the long run and not unduly distorted by fluctuations in income or wealth. Two factors contribute to potential time-related inequities. First, tax liabilities are based on short-term or single-time measures. Second, changes in the general price level affect the value of the monetary unit, as well as the relative value of various tax provisions.

Taxable income is measured in one-year increments and then taxed using progressive rates. Taxpayers with significantly higher income one year may potentially pay more in taxes than they would have paid if the same income had been spread over a couple of years. Likewise, individuals who temporarily leave the work force to raise families, attend college, or recover from an illness experience time-related tax inequities. Time-related equity within the income tax

system could be improved if taxpayers were once again permitted to average income over multiyear periods. Alternatively, the progressive rate structure could be replaced with a proportional rate structure, but that would impair vertical equity and fairness.

Homeowners in areas with rapidly rising real estate values experience another form of time-related inequity. Property taxes are based on market values, whether or not property owners intend to sell their homes in the foreseeable future. Market values may, in fact, drop before the homeowner decides to sell his or her property. Prior to a sale or exchange transaction, the true value of the home is its value in use. Unfortunately, value in use is difficult to measure.

Inflation eventually erodes the equity of certain tax provisions. Although many items are now adjusted on an annual basis for inflation, others are not. Over time, taxpayers find themselves paying higher marginal tax rates, not because they have experienced real growth in earnings but because inflation has caused "bracket creep." Two examples of tax benefits that have not kept pace with inflation are the IRA contribution limit and the capital loss limitation.[39] IRAs were first available in 1975 with a $1,500 limit that remained unchanged until 1982, when it was raised to $2,000. For the next 20 years, the IRA limit remained at $2,000. The 2007 limit is $4,000 ($5,000 for taxpayers 50 or older). If the IRA limitation had been adjusted for inflation since 1975, it would be closer to $5,700 today. If the limit had been indexed for inflation in $500 increments, consistent with the current method for going forward after 2008, the same taxpayer could have contributed an additional $44,000 ($35,000 for catch-up eligible) over the same period. The limit would have risen to $2,000 in 1979, be $4,000 by 1993, $5,000 by 2002, and $5,500 by 2006.[40] In contrast, the capital loss limitation (initially set at $1,000 in 1942, then raised to the current $3,000 limit in 1978) has not been adjusted for almost 30 years. Indexing for inflation would have resulted in a capital loss limitation closer to $12,600 (if indexed since 1954) or $9,500 (if indexed since 1978).

Increasingly frequent changes to the tax law also affect time-related equity and fairness by disrupting taxpayer expectations and making tax planning more difficult. Temporary changes that "sunset" in a few years further disrupt taxpayers' ability to evaluate the long-term impact of the tax law and, therefore, its overall equity and fairness.

INTER-GROUP EQUITY AND FAIRNESS

Inter-group equity and fairness implies that no group is favored to the detriment of another without good cause. While some shifting of tax burdens based on the ability to pay may be appropriate, tax burden and benefit inequities should be minimized.

Several examples of actual or perceived inequities can be found in the system for determining Social Security benefits (*94*).Women, low-income retirees, and married people receive higher rates of return when their Social Security benefits are compared to the Social Security taxes they paid. Historically, retirees have received benefits far in excess of their contributions plus a

[39] In contrast, the capital loss limitation—initially set at $1,000 in 1942, then raised to the current $3,000 limit in 1978—has not been adjusted for almost 30 years. Indexing for inflation would have resulted in a capital loss limitation closer to $12,600 (if indexed since 1954) or $9,500 (if indexed since 1978). (Calculations made using the Inflation Calculator at http://www.bls.gov/cpi/.)

[40] Calculations made using the Inflation Calculator at http://www.bls.gov/cpi/.

normal return. Increases in the wage base subject to Social Security taxes made these higher-than-normal returns possible. Given current demographics, that pattern cannot be sustained. As the post-World War II Baby Boomer generation begins to retire, serious intergenerational inequities will arise as the burden of sustaining Social Security benefits shifts to younger workers (*92*).

Tax laws tend to favor homeowners by providing deductions for property taxes and mortgage interest. This indirect subsidy of home ownership could be viewed as an inter-group inequity by those who, for age, economic, or lifestyle reasons, are not homeowners.

One often-overlooked aspect of inter-group equity is the shifting of tax revenues or spending mandates between levels of government. The framers of the Constitution envisioned a concurrent tax system where certain public services, such as defense and transportation infrastructure, were funded at the federal level, and other items, such as education and public safety, were funded at the state and local level (*95*). Over time, the myriad services that taxpayers expect from government, as well as the cost of infrastructure, has increased substantially, resulting in budgetary pressures.

COMPLIANCE EQUITY AND FAIRNESS

Compliance equity and fairness means that all taxpayers pay what they owe on a timely basis. Significant noncompliance depresses perceptions of equity, increases tax administration costs, shifts tax burdens, and enlarges the tax gap. A large current tax gap makes it necessary for legislative bodies to raise future tax rates, borrow additional funds, or reduce costs or benefits. Changes in tax law or tax administration that make it easier for taxpayers to comply (or more difficult to not comply) result in fairer tax systems.

For a tax system to achieve full and voluntary taxpayer compliance, all the other equity dimensions must also be met. Taxpayers are more likely to feel a natural moral duty to pay their taxes if they have an adequate voice in how tax burdens and benefits are distributed and if they perceive that the tax system and its administration are fair and just (*96*). In addition, taxpayer compliance should improve with a perception that most are complying and those who do not comply experience adverse consequences.

APPENDIX G: HISTORY OF THE FLORIDA INLAND NAVIGATION DISTRICT (FIND)

The following description was obtained from the Florida Inland Navigation District's History website. A full description of the FIND program can be found here: http://www.aicw.org/history.jsp.

"The Florida Coastline Canal, from Jacksonville to Miami, has been a matter of concern not only to the people of the east coast of Florida, but also to the executive and legislative branches of the State Government for many years. The canal that existed prior to the creation of the Florida Inland Navigation District in 1927 was constructed by the Florida Coast Line Canal and Transportation Company, which received Letters Patent under the Laws of Florida on May 23, 1881. The canal then contemplated by the Company was one connecting the Matanzas River with the Indian River. By subsequent resolution filed with the Secretary of State on June 27, 1882, by the Canal Company, the scope of the project was extended to connect the navigable waters of the St. Johns River at the mouth of Pablo Creek through the Matanzas and the Indian Rivers through Lake Worth with the waters of Biscayne Bay. By the same resolution the charter was construed to contemplate a canal allowing the passage of vessels drawing 3 ft of water or less.

By Chapter 3995, Acts of 1889, the Legislature declared that canals and waterways of the Canal Company should be not less than 50 ft wide and not less than 5 ft deep at mean low water, for the entire distance between the St. Johns River and Biscayne Bay, and should be so maintained by the Company. Approximately a million acres of public lands were granted by the State to the Company to aid in effecting the purposes for which it was formed. The work was begun in 1883 and finally completed in 1912. (See the report of P. B. Elliott, State drainage Engineer, on Florida Coastline Canals, filed with the Trustees of the Internal Improvement Fund, January 4, 1915).

The total cost of the canal to October 1, 1914, approximated $3,500,000 and the aggregate amount received from land sales approximated $1,400,000. The remaining $2,000,000 or thereabouts, of the cost was provided by the Company from other sources. Tolls were charged on the canal.

The completion of the canal did not solve the problem of inland water transportation from Jacksonville to Miami, even to the extent that a canal of the minimum width of 50 ft and a minimum depth of 5 ft at mean low water could solve it. There was the difficult task of maintaining the minimum depth. Like most pioneers, the Canal Company had its troubles. Default was made in the terms of a trust deed or mortgage securing an issue of bonds and covering the canal property, and at the instance of the Rhode Island Hospital Trust Company, as trustees, the trust deed or mortgage was foreclosed in the Circuit Court of St. Johns County, Florida, and the property sold on September 3, 1923, to satisfy a debt of $937,931.31 to Florida Canal and Transportation Company. The growth and development of the east coast of Florida had brought about during the past 20 years or more a general demand for adequate inland water transportation. Repeatedly during that period attempts had been made by public bodies to induce the federal government under some terms and circumstances to provide that inland transportation

either by the so-called coastal route, via the canal along the east coast, or by the so-called St. Johns River route via Sanford then to Titusville—thence by the coastal route to Miami.

Finally, a survey of the two projects was ordered by the River and Harbors Act of Congress approved June 5, 1920. After an investigation running over more than six years, a voluminous report upon that survey was made by the Secretary of War to Congress, December 14, 1926. The contents of the report are summed up in a brief letter directed by the Chief of Engineers of the U.S. Army to the Secretary of War, wherein he summarized the benefits to accrue to the inhabitants of the east coast of Florida, including a saving on transportation charges, under improved conditions, of an amount estimated variously from $400,000 per year to $1,600,000 per year. He also pointed out the importance of completing this great length of the inland waterway extending between New England and Key West. He concluded his report by declaring that an inland waterway in general 75 ft wide and 8 ft deep at mean low water, following the coastal route from Jacksonville to Miami, was deemed advisable at an estimated cost of $4,220,000 and with $125,000 annually for maintenance, and recommended the approval of that project subject to the following conditions:

(a) That local interests shall acquire the necessary rights-of-way and the privately owned waterway known as Florida East Coast Canal and transfer them free of cost to the United States, and

(b) That local interests shall furnish suitable areas for deposit of dredged materials in connection with the work and its subsequent maintenance.

The River and Harbor Act, approved January 21, 1927, authorized the establishment and maintenance of an inland waterway in general 75 ft wide and 8 ft deep at mean low water, following the coastal route from Jacksonville, Florida, and subject to the conditions set forth above.

So the construction and maintenance of an inland waterway 50 percent wider and 60 percent deeper than was ever contemplated by any State legislative enactment or contractual undertaking was assured to the people of Florida, subject to the conditions requiring support by local interests. The new and greater canal would be toll-free, and in order to bring about the construction of the canal and the maintenance thereof by the federal government, there remained for the people of the east coast of Florida only to comply with the conditions imposed by Congress.

It was to fulfill these conditions that the Florida Inland Navigation District was created by the Florida Legislature at its Session in 1927, by Chapter 12026. This Act authorized the Navigation District to purchase the existing Coast Line Canal for a price of not more than $800,000 and convey it free of cost to the United States and authorized it to issue bonds to enable it to perform the other conditions imposed upon local interests by the Act of Congress.

The District purchased the canal at a price of $750,000 plus accrued interest to date of closing of $26,266.66, a total cost of $776,266.66. At an election in the 11 counties of the District, the voters authorized a bond issue of $1,887,000 to pay the purchase price of the Coast Line Canal and Transportation Company and to purchase the rights-of-way and spoil areas needed by the

United States for the enlargement and improvement of the waterway. However, the Navigation District used only $850,000 of these bonds, and the remaining $1,037,000 thereof were subsequently canceled and destroyed by the District. All of these acts of the Navigation District occurred prior to 1931 when the Act creating the District was amended and reenacted by the State Legislature by Chapter 14723, Special Acts of 1931.

This 1931 Act placed upon the Navigation District the duty and responsibility of performing the conditions imposed on local interests by the Acts of Congress authorizing the improvement of the waterway, as amended by the River and Harbor Act approved July 3, 1930, which increased the width of the waterway from 75 ft to 100 ft. The amount to be paid by the District for rights of-way and spoil disposal areas was limited to $1,037,000, the amount of the bonds which had been previously destroyed. The taxing power of the District was limited to 1 mil.

In 1935, by Chapter 17020, the Legislature authorized the District to expend funds for publicizing the completion of the waterway and its availability to watercraft, to print and distribute information regarding the waterway, and to promote its use in navigation by watercraft of all kinds.

In 1939, by Chapter 19122, the Legislature authorized and empowered the District to collect, compile and furnish to the United States data, statistics and other appropriate information as to the advantages, benefits, desirability and usefulness of the further improvement of the waterway from Jacksonville to Miami, and authorized and empowered the District to acquire and convey to the United States, free of cost, any lands, easements, rights-of-way, and spoil disposal areas as might be required by the United States for the improvement of the waterway to a depth of 12 ft and a width appropriate to such depth.

The Navigation District consists of the 12 counties along the east coast of Florida from Nassau to Miami-Dade, both inclusive. However, an important link of the Intracoastal Waterway in Florida is that from the St. Marys River on the Georgia-Florida line to the St. Johns River in Duval County, and traversing Nassau County. The waterway from Trenton, New Jersey, to the St. Marys River was 12 ft in depth and the United States desired to deepen it to the same depth from the St. Marys River to the St. Johns River, but upon the same conditions that local interests should provide the necessary rights-of-way, spoil disposal areas, etc. as were placed upon the Navigation District for the improvement of the waterway from Jacksonville to Miami. However, there was no local agency authorized by law or willing to perform these conditions to obtain the improvement, so in 1941, the Legislature by Chapter 20430 authorized and empowered the Navigation District to do this. Subsequently, the Navigation District has acquired and conveyed these areas to the United States and has furnished the necessary rights-of-way and the United States has deepened and improved the waterway from the St. Marys River to the St. Johns River near Jacksonville to a depth of 12 ft and a width of 125 ft.

For several years, the United States had been considering the deepening of the Intracoastal Waterway from Jacksonville to Miami to a depth of 12 ft, to correspond with the depth from Jacksonville to Trenton, New Jersey. In 1942, however, the project was unfavorably reported to the Board of Engineers. The Navigation District appealed from that report and succeeded, ultimately, in obtaining a favorable report, which was incorporated in the River and Harbor Bill, which was submitted to the Congress of the United States in January, 1944, authorizing an

expenditure of $11,788,000 to improve the waterway from Jacksonville to Miami, and an additional expenditure of $1,830,000 to deepen likewise the waterway from Miami to Key West.

The principal function of the Navigation District has been to furnish to the United States that necessary cooperation that the United States requires as a condition precedent to its improvement of the waterway. A partnership exists between the United States and the State of Florida, acting by and through the Navigation District whereby the United States agrees to construct and maintain the Intracoastal Waterway and the Navigation District agrees to furnish to it, free of cost, the necessary rights-of-way and areas for the deposit of dredged material in connection with the subsequent maintenance of the canal. The nature of the land through which the waterway runs is such that shoaling occurs, requiring repeated dredging to provide the minimum channel. So long as the United States does the work necessary to maintain the waterway to the depth of 10 ft or 12 ft, just so long will it be necessary for local interests, acting through the Navigation District, or some other similar agency, to provide rights-of-way and spoil disposal areas. When local interests discontinue doing their part of the work, then we may expect the United States to discontinue its part.

The 1965 Legislature enacted Chapter 65-900, Laws of Florida that established the taxing power of the District at $0.1 million and directed the Commissioners from each of the 11 counties be appointed by the Governor in lieu of the former requirement for local election of Commissioners.

By 1965, the United States had completed the project from Jacksonville to Fort Pierce, Florida, to the authorized depth of 12 ft and the project width of 125 ft. From Fort Pierce to Miami, Florida, the project has been completed to a depth of 10 ft for the full project width of 125 ft.

In 1977, the U.S. Congress appropriated sufficient funds for the U.S. Army Corps of Engineers to undertake an economic feasibility study of the costs and benefits to be derived from deepening the channel from 10 ft to 12 ft from Fort Pierce to Miami. This study revealed the costs of deepening the channel 2 ft would exceed the benefits. In view of these findings the Navigation District Board of Commissioners decided that until circumstances change, further study on deepening the Waterway would be inappropriate.

During the early 1980s, it became apparent to the District and the Army Corps of Engineers that the inventory of existing spoil disposal sites did not meet the current or future maintenance needs of the waterway. The majority of the existing spoil sites were found to be unusable because of their environmental sensitivity or their small size. The Florida Inland Navigation District through coordination with the Army Corps of Engineers, Department of Environmental Regulation and the Department of National Resources formulated a plan for a pilot study to determine the spoil disposal needs of the waterway in Nassau and Duval Counties for the next fifty years and to provide a permanent infrastructure of sites to manage this material for potential reuse.

Taylor Engineering was hired in 1986 to perform this Phase I study. The study was completed in September 1986 and resulted in the identification of 7 parcels of property to be acquired. These parcels along with one existing site will be able to manage all material dredged from this 38 mile stretch of waterway during the next 50 years. Phase II of this project has led to the acquisition of

these parcels and the engineering, geo-technical studies, environmental analysis and boundary surveys of all sites.

The District then committed to evaluating and updating the inventory of dredged material management sites throughout the waterway to meet 50 year dredging needs. A comprehensive plan was developed to perform these additional studies and implement the necessary land acquisitions over a 15 year period. To date, in addition to Nassau and Duval Counties, Phase I Long Range Dredged Material Management studies have been completed in St. Johns, Flagler, Volusia, Brevard, Martin, and Palm Beach Counties. These studies have identified 47 sites to manage approximately 41.5 million cubic yards of dredged material from 282 miles of waterway channel during the next 50 years. This includes 21.5 million cubic yards of material to be placed on six beach areas to serve as feeder beaches on the Atlantic Coast.

Phase II studies and land acquisition are now completed in Nassau, Duval, Flagler, Brevard, Martin, and Palm Beach Counties. Three sites have been constructed and several more are in different stages of construction of site preparation. Phase I Long Range Dredged Material Management Studies are currently underway in Indian River and St. Lucie counties. The entire waterway study project will be completed by the year 2000.

The 1985 Florida Legislature reviewed the functions of the inland navigation districts and enacted Chapter 85-200, which recognized the continuing need for inland navigation districts and re-authorized the districts until 1990. This legislation also recognized “the continuing need for inland navigation districts to undertake programs necessary to accomplish the purposes of construction, maintenance, and operation of Florida’s inland waterways.” This amendment to Chapter 374 Florida Statutes created the District's Assistance Programs through which the District assists state, regional, and local governments within the District with waterway improvement projects. These projects fall in the general categories of navigation, waterway access facilities, boating safety, recreation, and environmental education. Since 1986, the District has participated in 290 projects contributing $32.3 million in District assistance funding to provide $97.7 million in waterway improvements and benefits.

In 1990, the Florida Legislature reviewed the inland navigation districts functions and determined again that the districts were “fulfilling an important and essential role in the management of their respective waterways.” The districts were re-authorized for an additional five years and their duties were expanded to include the installation of boat speed regulatory signage for the protection of manatees. Since 1990, the District has accomplished the largest in-water signage project in the history of the state. The District has installed approximately 2500 signs to denote the boat speed zones for manatee protection. As a result, the number of manatees killed by a collision with a vessel within the District has been reduced by approximately 40 percent.

As a result of the manatee protection effort the District increased the distribution of free waterway information to vessel operators. The District now publishes 26 waterway brochures and manuals covering topics such as boat speed zones, bridge regulations, waterway guides, hurricane preparedness, channel conditions, and spoil island usage. The District also distributes brochures produced by others covering boating and fishing regulations. In 1995, the District distributed approximately 300,000 free brochures and manuals.

In 1995, the Florida Legislature reviewed the functions of the District for the final time and found that the "District should be continued indefinitely." Included in this legislation was a provision designating the District as the "local navigation sponsor" for the Okeechobee Waterway in Martin County. The District will now be responsible for providing dredged material management areas for this waterway channel that connects the east and west coast Intracoastal Waterways. The 1995 legislation also requires District commissioners to be confirmed by the Senate after their appointment by the Governor.

Looking to the future, with the cut backs in all federal programs the District is being forced to increase our commitment to the implementation of our Long Range Dredged Material Management Program. The District is assisting our federal partner in the Phase I development of the permanent sites and in the construction of the largest site in the system. As the land acquisition program winds down the development and management program will increase. The District is also proceeding with a Geographical Information System to integrate our expanding data resources with our extensive mapping resources. District assistance to governments for waterway improvement projects and programs is expected to increase as state and federal funding sources decline. Projects with navigation partners will be important in the future to maintain navigation throughout the District's waterways. The manatee sign program has shifted into a maintenance and minor modification program. The District's public information program will continue to increase in importance as the number of vessels in the District approaches one million."

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