U.S. Port and Inland Waterways Modernization Strategy

Options for the Future

Institute for Water Resources

U.S. Army Corps of Engineers

Working Draft

2 April 2012

WORKING DRAFT: DO NOT QUOTE OR ATTRIBUTE

Preface

[quote from Major General Michael Walsh]

Table of Contents

Preface ii

Executive Summary iv

Introduction 1

Chapter 1: Evolving World Trade and Maritime Transportation Technology 3

Chapter 2: Existing U.S. Port and Inland Waterways Infrastructure 15

Chapter 3: Environmental Impacts of Modernizing Inland Waterways and Deep-Draft Ports 30

Chapter 4: Maintaining the Existing System 39

Chapter 5: A Vision for a World Class Navigation System 41

Chapter 6: Financing Options for Modernizing the U.S. Ports and Inland Waterways 45

Chapter 7: The Future Federal Role in Navigation 54

Chapter 8: Considerations in a Modernization Strategy for U.S. Ports and Inlands Waterways 55

Executive Summary

The health of the U.S. economy depends upon the vitality and expansion of international trade. International trade depends upon the nation's navigation infrastructure, which serves as a conduit for transportation, trade and tourism and connects us to the global community. Marine transportation is one of the most efficient, effective, safe and environmentally sound ways to transport people and goods. It is a keystone of the U.S. economy. ___ percent *[data to be inserted in next draft]* of our international trade moves through the nation's ports.

The navigation industry is building ever larger ships to serve this global trade more effectively, reducing transportation costs across the world. These larger vessels, known as *post-Panamax* vessels, are expected to call at U.S. ports in increasing numbers, especially after the expansion of the Panama Canal in 2014.

A modern, robust navigation infrastructure can exist without significant harm to the environment, reduce the transportation system's carbon footprint and enhance economic opportunities for future generations. Sustaining a modern U.S. navigation system will require a coordinated effort between government, industry and other stakeholders.

Critical Need for Capacity Maintenance and Expansion

Congress has directed the USACE Institute for Water Resources to submit to the Senate and House committees on appropriations this report on how the Congress should address the critical need for additional port and inland waterways modernization to accommodate *post-Panamax* vessels. This report identifies the critical need for capacity maintenance and expansion on both the nation's inland waterways and blue water ports. This identification has been accomplished through an evaluation of the future demand for capacity in terms of freight forecasts and vessel size expectations and an evaluation of the current capacity of the nation's inland waterways and blue water ports.

Despite the recent worldwide recession, international trade is expected to grow as the world's population and standard of living grow. Export of U.S. agricultural goods could increase as larger bulk vessels reduce the cost of delivery to foreign markets. Trade at the nation's blue water ports is expected to expand as the population grows, especially in regions where most of that growth occurs. As international trade expands, the number of *post-Panamax* vessels is expected to increase. The nation's ability to attract these vessels and allow full use of their capacity is the key to realizing the trade opportunities these vessels represent.

There is a high degree of uncertainty in the details of when such vessels will arrive in large numbers, which ports they will call, how deep calling vessels will draft and, consequently, how deep and wide navigation channels and other related navigation infrastructure must be. One

pivotal uncertainly is the role that transshipment hubs in the Caribbean or on U.S. shores could play in transferring freight from large vessels to smaller feeder vessels. Over time these uncertainties will be reduced as experience replaces expectation. We can be more certain that in the absence of transshipment centers, *post-Panamax* vessels will call at ports in large numbers, they will call at most major ports and their sailing drafts and other dimensions will become known. Our challenge is to invest in capacity expansion in the right places at the right time consistent with industry needs.

Port capacity depends upon channel depths, channel widths, turning basin size, sufficient bridge heights and port support structures such as dock and crane capacity to offload and onload goods. Vessels can be filled to their weight capacity or their volume capacity. Vessels loaded to their weight capacity sail at their maximum design draft; they sit deeper in the water. The deepest channel requirements are likely to be driven by these "weight trade" services. The Asian export trade, however, is considered a "cube trade" (i.e. volume trade). For volume trade routes, channel width and turning basin size may be of greater importance than additional channel depth at some ports, as vessels loaded to their volume capacity often sail at significantly less than their design draft. Careful consideration is needed when determining channel depth requirements at U.S. ports for this trade route.

The deployment of *post-Panamax* vessels to deliver U.S. agricultural products to Asian markets through the expanded Panama Canal could significantly reduce the delivery costs. One estimate suggests cost reductions as high as $ 0.35 per bushel, which could result in a surge in exports and traffic on the inland waterway system. The inland waterway system can accommodate the forecasted increase in exported agricultural products as long as other non-grain traffic remains at current levels and the system is maintained at current capacity. Existing inland waterway system capacity is maintained through maintenance dredging and major rehabilitation projects.

A Vision for Sustaining a Globally Competitive Navigation System

As a maritime nation our economic prosperity is directly linked to our investments in navigation infrastructure. Just as current generations benefit from investments made in the past, the ability of future generations to prosper and grow will depend on infrastructure investment decisions made today. A globally competitive U.S. navigation transportation system for the 21st Century will have these characteristics:

- Environmentally compatible development, infrastructure and operations.
- Multi-modal connectivity.
- High-performance and reliable navigation channels, turning basins and other related navigation infrastructure that are maintained to constructed depths and widths.
- Channels and ports that are not the limiting component to competitive global freight movement.

- Navigation locks that are reliable and available to pass traffic on demand with lock chambers consistently sized for efficient movement of freight.
- Navigation jetties that are planned, constructed and maintained for safe, reliable and efficient freight movement.
- Dredged material placement facilities that are planned, constructed and maintained to be available when needed for navigation channel maintenance, never impeding dredging efforts.
- Capital investments in navigation locks for replacement, major rehabilitation, or expanded capacity that are established through a capital investment plan that identifies and prioritizes on a system basis.
- Capital investment plans that are shovel-ready as investment funds are identified.
- An identified mechanism for the financing of operations, maintenance and capacity improvements.

New, large vessels are typically deployed on the longest and largest trade service – Asia to Northern Europe. The "smaller" vessels on that service are forced to re-deploy to the next most efficient service for that vessel size. This cascading continues until the most marginal vessels in the fleet are forced to be scrapped. Cascading typically increases average vessel size for each trade service, placing demands on the port infrastructure to support larger capacity vessels. For U.S. ports to be ready to take advantage of *post-Panamax* vessel opportunities, major ports not only need to be "*post-Panamax* ready," but second tier ports need to be "cascade ready" to take advantage of larger vessels that begin to service their trade.

For a port to be considered "*post-Panamax* ready," in addition to dock and crane capacity a channel depth of about 50 feet is needed with allowances for tide. U.S. West Coast ports at Seattle, Oakland, Los Angeles and Long Beach all have 50-foot channels. Northeastern U.S. ports at Norfolk, Baltimore and New York have or will soon have 50-foot channels. Only along the Southeast U.S. and Gulf Coasts is there a dearth of ports with 50-foot channel depths. This is also the area of the country with the fastest forecasted population and trade growth.

The U.S. Army Corps of Engineers (USACE) currently has 17 *[validate number for next draft]* active studies investigating possible port improvements, most associated with the desire to be *post-Panamax* ready. One such study at the Port of Savannah is nearing completion and indicates a well justified project that will cost about $600 million. It is likely that other studies will also show well justified projects, either to become "*post-Panamax* ready" or "cascade ready." It is easy to see that the national investment to sustain a globally competitive navigation system could easily become billions of dollars.

Traffic levels on the inland waterway system are expected to increase in response to lower delivery cost of U.S. agricultural exports. Current capacity is estimated to be sufficient through 2020; however, traffic levels should be monitored and consideration given to lock expansion on

the upper Mississippi River. The inland waterway system of locks, dams and channels was largely built before World War II. *[Add data in next draft re: Xxx of the yyy locks are over zzz years old.]* Maintenance of the navigation channels has become increasingly costly and many river segments are maintained at less than their authorized depth. Unscheduled outages at the nation's locks are increasing as fatigued components finally fail. Over the last XX *[add data in next draft]* years the average annual expenditure for channel maintenance, major rehabilitation and emergency repairs on the inland system has been $ XXX *[add data in next draft]*. Going forward, to ensure that current capacity is maintained, increased outlays for major rehabilitation or emergency repairs are expected.

Financing Options

To fully meet the challenges of and realize the opportunities presented by increased use of *post-Panamax* vessels in global trade, the existing capacity of the nation's ports and waterways must be maintained and additional capacity must be built. Both paths require a significant financial commitment. The current level of USACE navigation funding is not adequate to meet the critical modernization needs of the nation and take advantage of these opportunities. Available financial options for meeting these needs vary from an increased Federal commitment to the divestiture of the Federal financial role.

There is a growing consensus that the existing budgeting process and budget levels are not adequate to meet the critical needs of future modernization. The current process collects revenues for funding the Harbor Maintenance Trust Fund (HMTF), allocating those dollars to USACE navigation programs according to Federal budget priorities and assigned budget ceilings and providing additional funding for channel deepening with revenues from the general treasury. With the continuing revenue stream dedicated to the HMTF and the fund's reserves, financial support for maintenance of existing channels could be secured for the near term. However, into the next decade the current processes (and budget ceilings) are not expected to provide significant funds for additional necessary channel deepening projects.

The Congress and its partners in the navigation industry must find ways to increase revenues for harbor deepening and inland navigation channel, lock and dam maintenance. Options for raising revenue are only limited by our imagination. They include:

- Deep draft ports
    - Continue HMTF user fee collection and implementation of a harbor deepening tax
    - Increase local cost share requirements
    - Increase the USACE budget ceiling for navigation
    - Dissolve the Federal role in harbor development and maintenance and transfer all responsibilities to non-Federal entities.
- Inland waterways

- Inland Waterways Trust Fund *[to be inserted in next draft]*
- *[additional information to be inserted in next draft]*

Numerous variations and refinements of these options can also be considered. They might include:

- An infrastructure bank
- HMTF allocations based on competitive grant programs
- Investment planning based on a national optimization model
- Expansion of authority of the HMTF for harbor deepening

Regardless of the Federal government's role in financing future critical needs, its regulatory oversight role is expected to remain unchanged.

Environmental Impacts

All forms of transportation have an environmental footprint. Development and maintenance of navigation-based transportation systems in the United States have contributed significantly to altered air, water, land and biological characteristics of waterways, coastlines, and rail and highway corridors. Sources of such environmental impacts include channel and basin excavation, maintenance dredging, lock and dam structures, intermodal links and vehicular/vessel emissions. Since the 1970s, implementation of the National Environmental Policy Act, Clean Water Act, Endangered Species Act and other regulatory legislation have contributed to reducing the persistent impacts of many previous practices.

Coastal ports and inland waterways occur within proximity of two of the scarcest ecosystem categories—free flowing rivers and estuarine wetlands. Further unmitigated impact is unlikely to be accepted. Any modernization strategy must consider possible alteration of the environmental footprint. Locks and dams have contributed substantially to the imperilment of numerous freshwater species by totally changing their riverine habitat. Excavation and dredging of navigation channels reduce abundances of submerged aquatic vegetation and various commercial, recreational and threatened animal species. In general, dredging of nontoxic bottoms impacts coastal and riverine benthic organisms temporarily and bottoms typically colonize quickly following disturbance. Dredging also has had more persistent effects, including some unavoidable taking of imperiled species (e.g. sea turtles). In 1992 USACE was authorized to beneficially use dredge material for environmental improvement. Since then, dredged material has also been used for habitat creation and other beneficial uses at other project sites. The specific environmental ramifications must be weighed for a dredged site or for a site that will environmentally benefit from the dredged material. Comparing navigation to other forms of transportation, however, navigation's footprint can be viewed favorable to truck and rail for many types of impacts.

Non-Financial Considerations

There are many non-financial factors to be considered when modernizing the nation's navigation infrastructure:

- Navigation infrastructure modernization will have an environmental impact.
- A modernization strategy should consider multi-modal connectivity and capacity of the intermodal freight transportation corridors being developed, which implies consistency with other Federal programs such as DOT Tiger Grants.
- Opportunities to contribute to President Obama's initiative to increase exports and energy independence and enhance national security must be considered.
- Local sponsor commitment in terms of cost sharing and community support should be taken into consideration.

Who Benefits?

Who benefits from deep water port and inland waterways maintenance and enhancement? The use of larger ships will reduce aggregate shipping costs across the industry. These cost savings will be shared by ocean shipping companies, ports and marine terminal operators, marine highway operators, foreign and domestic producers and consumers. Traffic that transits through the Panama Canal will also benefit the Panama Canal Authority. In fact it may be possible that the Panama Canal Authority through its fee structure will extract a majority of the benefits on routes that use the canal. A careful understanding of this is required when choosing which ports to deepen and how to finance the project.

The Panama Canal is set to double its capacity when it completes expansion plans in 2014. The new locks will pass vessels large enough to carry three times the volume of cargo carried by vessels that can pass today. While it should be noted that the existing locks will remain *Panamax* limited, the ability of larger, more efficient vessels passing though the new locks on the canal is expected to potentially have at least three major market effects. (1) Currently, there is significant freight shipped to the eastern half of the United States over the intermodal land bridge formed by the rail connections to West Coast ports. The reduced cost of the water route through the canal may cause freight traffic to shift from west coast to East Coast ports. (2) To take full advantage of the very largest vessels that will be able to fit through the expanded canal but may be too large to call at U.S. ports, a transshipment service in the Caribbean or a large U.S. port may develop. The largest vessels would unload containers at the transshipment hub for reloading on smaller feeder vessels for delivery to ports with less channel capacity. (3) On the export side the ability to employ large bulk vessels is expected to significantly lower the delivery cost of U.S. agricultural exports to Asia and other foreign markets. This could have a

significant impact on both the total quantity of U.S. agricultural exports and commodities moving down the Mississippi River for export at New Orleans.

There is great uncertainty concerning the extent to which any of these effects will manifest. What seems certain is that some mix of these impacts will be realized gradually over time as market participants gain better certainty of the options they face.

Developing a Modernization Strategy

To sustain the nation's globally competitive navigation system the nation must maintain our current system and prepare, where needed, to be "*post-Panamax*" and "cascade" ready. This report has identified that the critical needs are maintenance and rehabilitation of our current system and blue water port expansion on the Southeast and Gulf coasts. This is supported by forecasts of trade, population growth, vessel size and an assessment of the current capacity of U.S. ports. The economic and environmental merits of any specific port development project needs to be individually assessed.

The study process to identify individual navigation projects for Federal investment is well established. Recently USACE has taken steps to ensure the timely execution of this process, including the Planning Modernization Initiative that requires feasibility studies to be completed more expediently. This initiative will streamline and expedite the project delivery process and will identify the project-specific critical needs for sustaining the nation's globally competitive navigation system. However, completing studies on a shorter timeframe will only add to the nation's backlog of unfunded projects unless methods are developed to finance navigation infrastructure improvements.

The strategy to sustain the nation's globally competitive navigation system must ensure the maintenance of our current system, the timely authorization and execution of individual studies and identification of a method or methods for financing development projects. There are several financing methods available for all three requirements. While traditional methods of funding are challenged by the state of the overall Federal budget, the Administration and Congress can choose to continue the traditional methods and enhance the funds available for their execution. Alternatively, the navigation industry pays fees to cover all other port costs and it would be possible (for economically desirable projects) to charge fees to cover channel expansion cost. There are numerous ways to mix our traditional methods with new methods that place more financial responsibility on the local sponsor and their users, public-private partnerships with access to financing through an infrastructure bank being the most commonly referenced.

The modernization strategy should be part of an overall national intermodal freight transportation strategy. While the three dominant freight carrier modes – water, rail and truck – compete for market share, there is a growing recognition of the need for multi-modal linkages and for infrastructure investments to be coordinated between the modes to ensure that they

complement each other and serve the greater transportation needs of the nation. This can be accomplished by prioritizing navigation investment according to its multi-modal connectivity.

There is considerable uncertainty in the navigation industry regarding the expected impacts from the deployment of *post-Panamax* vessels. There is also considerable uncertainty regarding the type of partner the Federal government will be with industry in the future. Current budget priorities indicate the Federal government's role will be limited. Budgetary ceilings limit the total funds available to USACE. Potential navigation, flood control and environmental investments all must compete for these funds. Within the navigation program there is competition between maintenance of our current system and capacity expansion. The current level of funding is not adequate to meet the needs for maintenance of current capacity and needed expansion of blue water ports.

Sustaining the nation's globally competitive navigation system for future generations will require leadership and partnership. The main challenges are to finance the maintenance of our current system, to identify where to expand blue water port capacity and to determine how to finance its development. The Federal government needs to develop and articulate a clear message to industry answering these three challenges. Congress has asked for this study and the Administration has proposed a White House task force on navigation. The coincident interest of both the Congress and the Administration in this topic indicates an opportunity to work together to develop partnership guidelines, methods and expectations for a strategy to sustain the nation's globally competitive navigation system.

Introduction

The United States, its navigation industry and the customers it serves face a great opportunity. The continued expansion of international trade combined with the building of ever larger ships is reducing transportation costs across the navigation industry. These larger vessels are expected to call at U.S. ports in increasing numbers, especially after the expansion of the Panama Canal in 2014. However, the extent to which these larger vessels will call at U.S. ports and the degree to which these opportunities are realized for U.S. producers and consumers will depend on the strategic decisions made by the industry and the nation.

Congress has directed the USACE Institute for Water Resources to submit to the Senate and House committees on appropriations a report on how the Congress should address the critical need for additional port and inland waterways modernization to accommodate *post-Panamax* vessels. This report, the *U.S. Port and Inland Waterways Modernization Strategy: Options for the Future,* presents a strategic vision for meeting the need for U.S. port and inland waterways modernization and identifies possible options for implementing that vision.

The Panama Canal expansion will almost triple the size of container vessels able to transit the canal. How will this affect trade to the U.S., especially along the East and Gulf Coasts? To understand this impact, we must first understand the existing condition of our port, inland waterways and multi-modal infrastructure. Once we have a clear picture of the current condition and capacity of our waterway infrastructure, port and inland modernization needs can be described and a strategy developed to move forward.

Congress has asked the USACE Institute for Water Resources to consider the following factors:

- costs associated with deepening and widening deep-draft harbors
- ability of the waterways and ports to enhance the nation's export initiatives benefiting the agricultural and manufacturing sectors
- current and projected population trends that distinguish regional ports and ports that are immediately adjacent to population centers
- availability of inland intermodal access
- environmental impacts resulting from the modernization of inland waterways and deep-draft ports

Congressional Direction

Conference language from the Consolidated Appropriations Act of 2012 (H.R. 2055): Within the funds provided, the Institute for Water Resources is directed to submit to the Senate and House Committees on Appropriations within 180 days of enactment of this Act, a report on how the Congress should address the

critical need for additional port and inland waterway modernization to accommodate post-Panamax vessels. This study will not impede nor delay port or inland waterway projects already authorized by Congress. Factors for consideration should include costs associated with deepening and widening deep-draft harbors; the ability of the waterways and ports to enhance the nation's export initiatives benefiting the agricultural and manufacturing sectors; the current and projected population trends that distinguish regional ports and ports that are immediately adjacent to population centers; the availability of inland intermodal access; and the environmental impacts resulting from the modernization of inland waterways and deep-draft ports.

Report Organization

Discussion *[to be inserted in next draft]*

- Executive Summary
- Introduction
- Chapter 1: Evolving World Trade and Maritime Transportation Technology
- Chapter 2: Existing U.S. Port and Inland Waterways Infrastructure
- Chapter 3: Environmental Impacts of Modernizing Inland Waterways and Deep-Draft Ports
- Chapter 4: Maintaining the Existing System
- Chapter 5: A Vision for a World Class Navigation System
- Chapter 6: Financing Options for Modernizing U.S. Ports and Inland Waterways
- Chapter 7: The Future Federal Role in Navigation
- Chapter 8: Considerations in a Modernization Strategy for U.S. Ports and Inland Waterways

About the Study Author

[Description of USACE Institute for Water Resources and its role in providing future direction for port and inland waterway infrastructure capacity...to be developed in next draft.]

Planning a Modernization Strategy

[Discussion regarding the framing of this report....to be developed in next draft.]

Chapter 1: Evolving World Trade and Maritime Transportation Technology

The evolution of maritime transportation technology is inherently linked to growth in world trade. Global demands, trade and environmental policies, and population and income growth in the developing world all contribute to growth in the demand for goods and services worldwide. The U.S. participates in world trade through its import and export markets. Understanding these market behaviors requires an understanding of world trade markets, transportation requirements and how changes to the system impact international trade and trade routes.

Population and Income

[Discussion to be inserted in next draft]

World Income and Population Growth

World population is growing and incomes are rapidly rising, supported by strong world growth through 2007 and into 2008. This is particularly true in Northeast Asia and to some extent India. In India and China, heavy manufacturing industries like steel and electric generating utilities, massive construction projects like Three Gorges Dam and the near reconstruction of entire cities such as Beijing led to surging demands for basic metal, ore and mineral products like copper, steel, iron ore and coal. Population and income growth also drove growing demand for grains and oilseeds, along with processed grains and foods. While this trend was eventually dampened by the 2007-2009 recession in the developed world, a return to strong growth is expected. (*[reference]*)

[Discussion to be inserted in next draft]

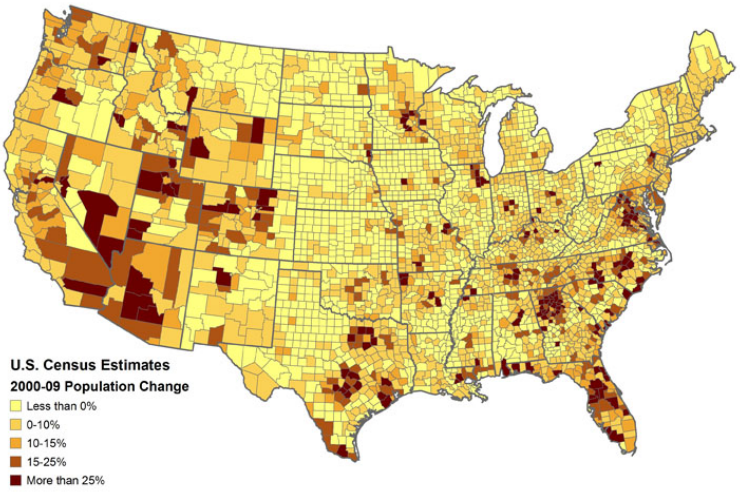
Graphic: World population forecast

Figure 1-1, Source

U.S. Population and Income by Region

Over the next several decades it is predicted that the population in the United States will continue to shift to warmer areas as well as urban areas. People are migrating to large cities in the Southeast including Charlotte, Atlanta, Jacksonville, Orlando and Ft. Lauderdale. Growth has also been seen in several states in the Southwest. The growth in demand for transportation infrastructure and services will be greatest in those areas of the U.S. with the highest population growth. *[Additional discussion in next draft]*

Change in U.S. Population Distribution



Source: DOT/USACE

Figure 1-2, Source: DOT/USACE

Northeast U.S.

Southeast U.S.

Gulf Coast

West Coast

Transportation Infrastructure and Global Trade

Global trade is encouraged by trade policies that act to remove barriers and protections for domestic producers. Seaborne trade linking continental land masses (e.g. Asia and North America) benefits from continuing advances in oceangoing vessel efficiencies and the supporting infrastructure.

In the U.S., this infrastructure includes port facilities, port channels, ocean-route canals and connecting channels, highway and rail connections to ports, and overland and waterway feeder systems and line routes. Any inefficiencies in this transportation system act as a damper on U.S. exporters' abilities to realize the full potential of the export market and the vessels engaged in that trade.

Panama Canal Expansion

The Panama Canal is set to double its capacity when it completes expansion plans in 2014. The new locks will move vessels large enough to carry three times the volume of what can move through the canal today. More efficient and larger vessels passing though the canal are expected to impact markets. The reduced cost of the water route through the canal may cause freight traffic to shift from calling at West Coast ports to calling at East Coast ports. If ships transiting the Panama Canal are too large to call at East Coast or Gulf Coast ports, a transshipment service in the Caribbean or at a large East or Gulf Coast port may develop. A transshipment service allows the largest vessels to unload containers at the transshipment hub for reloading on smaller feeder vessels for delivery to ports with less channel capacity.

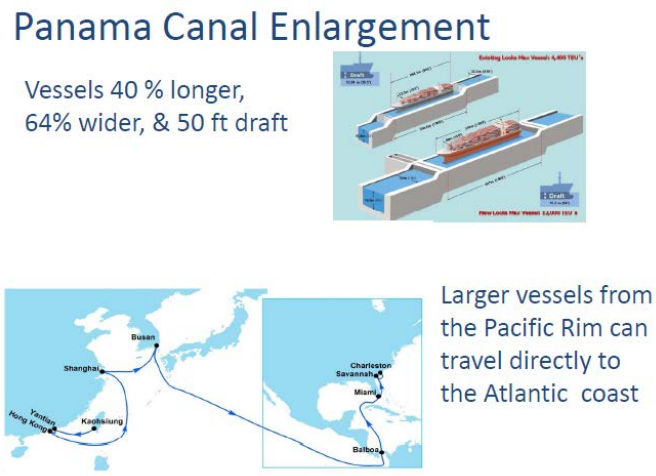


Figure 1-3, Source

The ability to employ larger bulk vessels is expected to significantly lower the delivery cost of U.S. agricultural exports to Asia. This could have a significant impact on the total quantity of U.S. agricultural exports moving down the Mississippi River for export at New Orleans.

There is great uncertainty concerning the extent to which the Panama Canal expansion and the growth in average vessel size will impact trade and trade routes, but the industry is preparing for expected changes. West Coast ports and their rail partners are investing heavily now to increase the capacity and efficiency of the intermodal land bridge to ensure it remains competitive and keeps market share. While the possibility of building transshipment hubs at

some ports is being explored, their use may add time and cost that may exceed the benefits of using larger vessels. The Panama Canal Authority may set their fee structure to capture the majority of transportation cost savings, which would limit the cost savings experienced by the shipper or carrier, the producer, or the consumer. What seems certain is that some mix of these impacts will be realized gradually over time as market participants gain better certainty of the options they face.

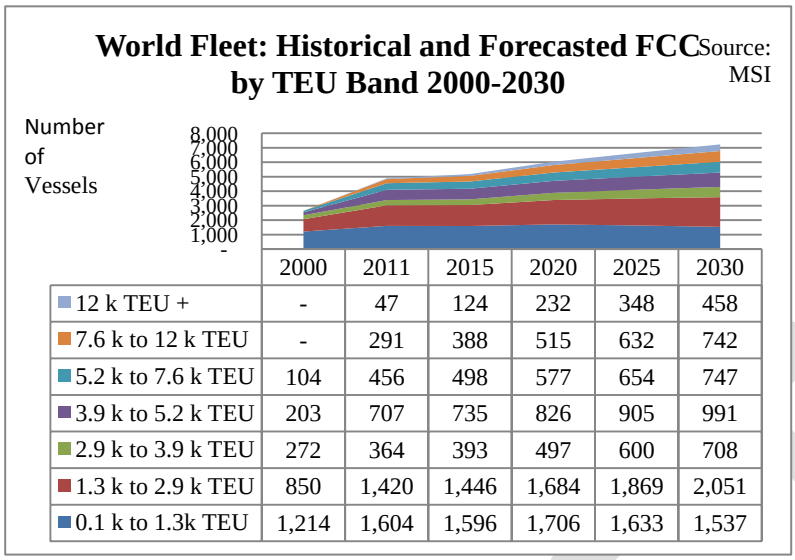
World Vessel Fleet

It is important to understand the composition of today's World Vessel Fleet and what portion of that fleet calls at U.S. East, West and Gulf Coast ports in order to begin to understand how the fleet is changing and the ramifications that changes in fleet composition could have on U.S. ports. Vessels can be characterized by type and size. Shippers and carriers are using larger ships in global trade to gain transportation efficiencies and cost savings, which have enormous importance in this very competitive market. The larger containerships, tankers and bulk commodity vessels are currently in excess of 1,000 feet long, more than 125 feet wide and can draw in excess of 50 feet of water. The World Vessel Fleet is not static. Every year new ships are built and added to the fleet.

Containerships

Containerships are cargo ships that carry their load in containers measured in Twenty Equivalent Unit (TEU) "boxes." Since the inception of containerized cargo in the 1950s, the container shipping industry has continued to evolve toward greater efficiency. Greater efficiency means moving more loaded boxes per voyage, which in turn creates incentives to build even larger vessels. However, there are constraints to increased vessel sizes. Perhaps the most obvious constraint is the size of the Panama Canal, which is currently undergoing an expansion. *Post-Panamax* vessels exceed 5,200 TEU.

According to the *Journal of Commerce*, half of containerships on order exceed 10,000 TEU capacities. Vessels of 10,000 TEUs and over accounted for 48 percent of the order book as of October 2011. It is evident that large ships are displacing smaller ships in all trade routes due to cost efficiencies of larger ships, which leads to a growth in average container vessel size over time. In 2000, the average container vessel size was 2,900 TEUs. In 2012, the average vessel size has grown to 6,100 TEUs. The following figure depicts this increase in size and number of larger vessels that make up the world fleet and shows the percent of total capacity by vessel size.



	2000	2011	2015	2020	2025	2030
12 k TEU +	-	47	124	232	348	458
7.6 k to 12 k TEU	-	291	388	515	632	742
5.2 k to 7.6 k TEU	104	456	498	577	654	747
3.9 k to 5.2 k TEU	203	707	735	826	905	991
2.9 k to 3.9 k TEU	272	364	393	497	600	708
1.3 k to 2.9 k TEU	850	1,420	1,446	1,684	1,869	2,051
0.1 k to 1.3k TEU	1,214	1,604	1,596	1,706	1,633	1,537

Figure 1 -4, Source: MSI

Container Vessels Calling at U.S. Ports

Containership calls at U.S. ports have likewise increased in size. The following graph clearly shows a decreasing trend in smaller vessels and an increasing trend in larger vessels. The number of containerships greater than 5,000 TEU deployed in U.S. trade increased by 129 percent from 2004 to 2009. (*[reference]*)

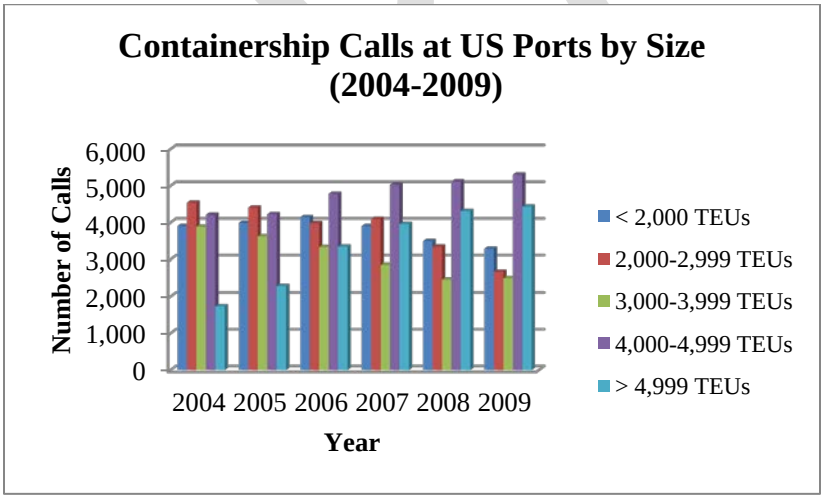


Figure 1-5, Source:

Bulk Carriers

A bulk carrier is specially designed to transport unpackaged bulk cargo such as grains, coal, ore and cement. The current trend is to "light load" bulk vessels. These vessels do not currently fill to their full capacity due to draft restrictions at the Panama Canal. It is expected that these vessels would be able to fully load after the Panama Canal expansion. "Small" *Capesize* vessels (80,000+ Dead Weight Tons (DWT)) will be able to fit through the expanded canal. They will be capable of redeployment to serve the U.S. export market.

Like containerships, bulk carriers on order are also trending to larger sizes. Ship designers are working on new *Panamax* vessel designs to maximize the capacity and efficiency of the expanded canal. (*[reference]*)

Bulk Carriers Calling at U.S. Ports

The Gulf Coast region of the U.S. experiences the majority of the bulk carrier calls with the Pacific Northwest region coming in second and the South Atlantic region third, as shown in Figure 1-5. In 2010, Port of New Orleans was the top port for dry bulk, totaling 2,646 calls by bulk carriers. In 2010, the Gulf of Mexico accounted for 46.3 percent of dry bulk calling the U.S. and the East Coast for 20 percent. (*[reference]*)

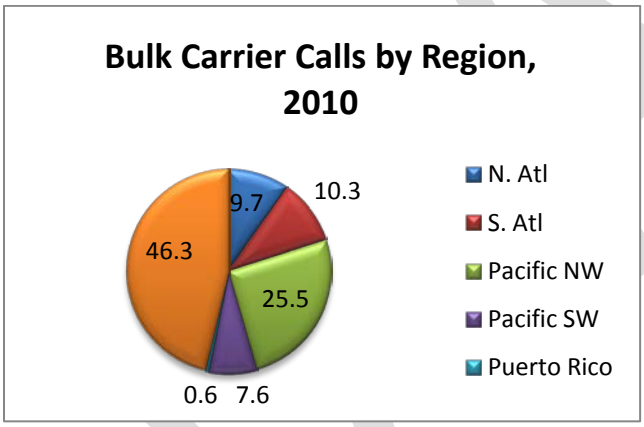


Figure 1-6, Source:

Panama Canal Expansion Impacts on Vessel Fleets

There are mixed opinions regarding what kind of changes the Panama Canal expansion will bring to the fleet mix calling at U.S. ports and the routes that they follow. Shipper responses to change are affected by delivery time, reliability, capacity limits on alternative routes and volume. These variables can be linked to port facilities. Port facilities differ regionally regarding channel depths, crane capabilities and landside intermodal operations. Gulf and East Coast ports mainly distribute containers by truck, whereas West Coast distribution occurs mainly by rail. Many of the West Coast ports already provide adequate water depths to accommodate large vessels.

Experts in the shipping industry expect that once the Panama Canal expansion is complete in 2014, deployment from Asia to the East Coast will begin to closely resemble the fleet mix calling at the West Coast. (*[reference]*)

Role of Inland Waterways in U.S. Export Trade

The inland waterway system is comprised of rivers, waterways, canals and the locks and dams that provide some 12,000 miles of commercially navigable waters, including the Intracoastal Waterway. The Greater Mississippi Basin together with the Intracoastal Waterway has more miles of navigable internal waterways than the rest of the world combined. Inland barges carry approximately 15 percent of the nation's freight at the lowest unit cost. Barge transportation offers an environmentally sound alternative to truck and rail transportation. If cargo transported on inland waterways each year were to be moved by another mode, it would take an additional 6.3 million rail cars or 25.2 million trucks to carry the load. (*[reference]*)

Figure 1-7, Source: U.S. Department of Transportation

Two-thirds of the traffic on inland waterways is domestic. Including lake, intraport and intraterritorial movements, the system typically handles more than a billion tons per year. The cargoes are mostly bulk commodities and raw materials such as coal (28% of the tonnage), petroleum (37%), grain and farm products (10%), chemicals (5%), aggregates, steel and fertilizer. The waterway system is particularly important to the inland transportation of U.S. agricultural commodity exports, the Mississippi River system being the primary conduit for cargoes from the nation's Midwest grain belt to Gulf ports. (*[reference]*)

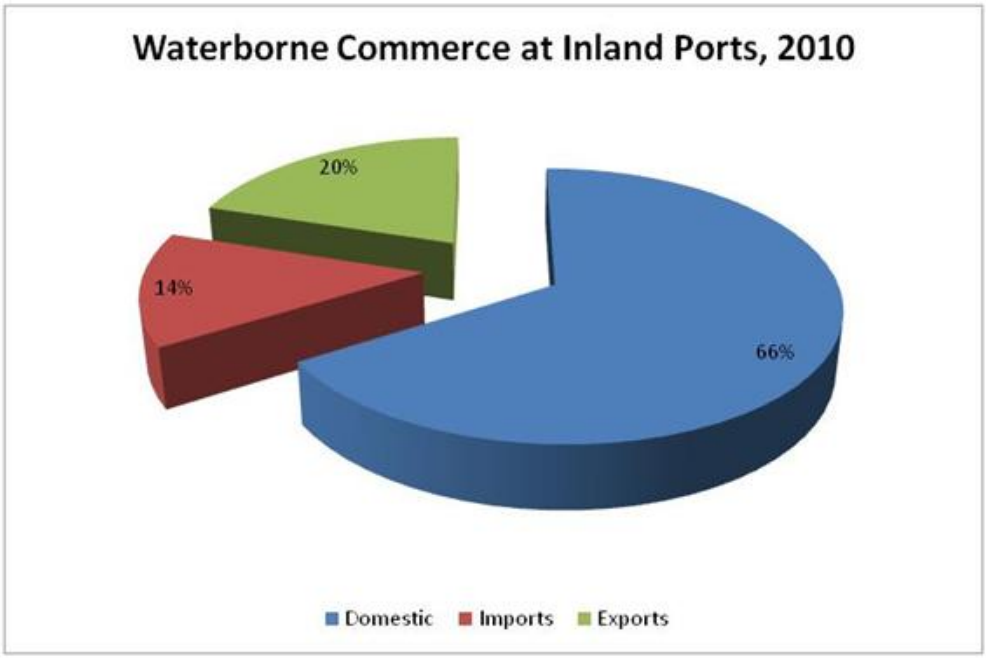


Figure 1-8, Source:

Trade Forecast

U.S. Export Commodity Composition

In 2010, U.S. exports were valued at $1.3 billion. Capital goods (industrial equipment, semiconductors, medical equipment, aircraft, etc.) accounted for 35 percent of U.S. exports (see Figure 1-8). Industrial supplies and materials (raw products and minerals, like petroleum products, chemicals, ores and coal, which is 1 percent of exports by dollar value) accounted for 30 percent, followed by Consumer Goods (13%), automobiles (9%), food (5%), and grains and feeds (4%).

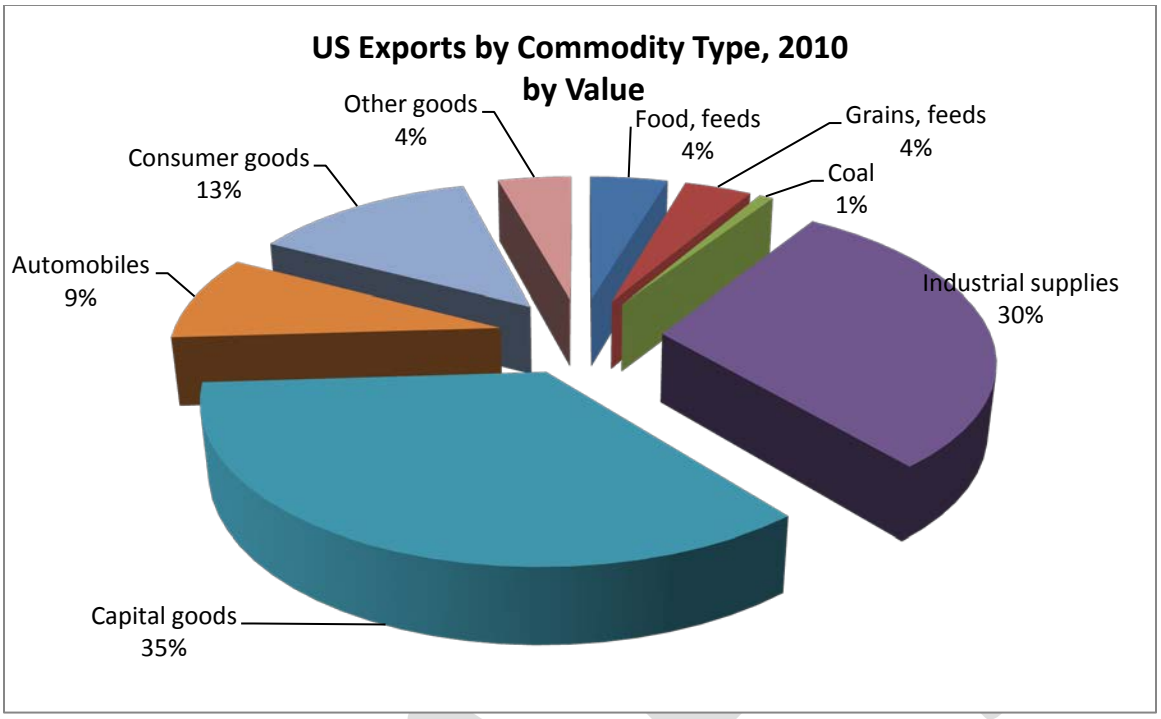


Figure 1-9, Source: US Census, Bureau of Economic Analysis

Though relatively small in dollar terms, coal and grains are the largest U.S. exports of dry bulk commodities by volume. The primary production areas for grains, oilseeds and coal are located in the interior of the United States. As a result, export movements of these bulk commodities rely on a multi-modal transportation system. Coal and grains are often hauled by truck to rail or river terminals for loading into railcars or barges for shipment to coastal ports and transfer to oceangoing vessels.

Export Forecast of Commodities by Type

[Discussion to be inserted in next draft]

Petroleum and Gas

Chemicals

Iron and Steel

Forest Products

Food

Grains and Soybeans

Grain exports from the U.S. are dominated by corn and wheat. Oilseed exports are dominated by soybeans. Figure 1-9 below shows U.S. Department of Agriculture (USDA) 2012 projections (the 2010 value is actual). Subsequent discussions of "grains" will refer to these three commodities. USDA is projecting a return to grain and soybean export growth. It also projects faster growth for U.S. competitors, particularly Argentina and Brazil.

American soybean interests contracted with Informa Economics, Inc. to evaluate the impact of the Panama Canal expansion on soybean exports. They developed forecasts for grain and soybean exports by U.S. region of origin. As is seen in the figure below, these forecasts indicate strong and steady growth in U.S. exports. Informa projects about half of the growth in Center Gulf exports will use the Panama Canal and that the Center Gulf will increase its share of total U.S. exports over the next 10 years.

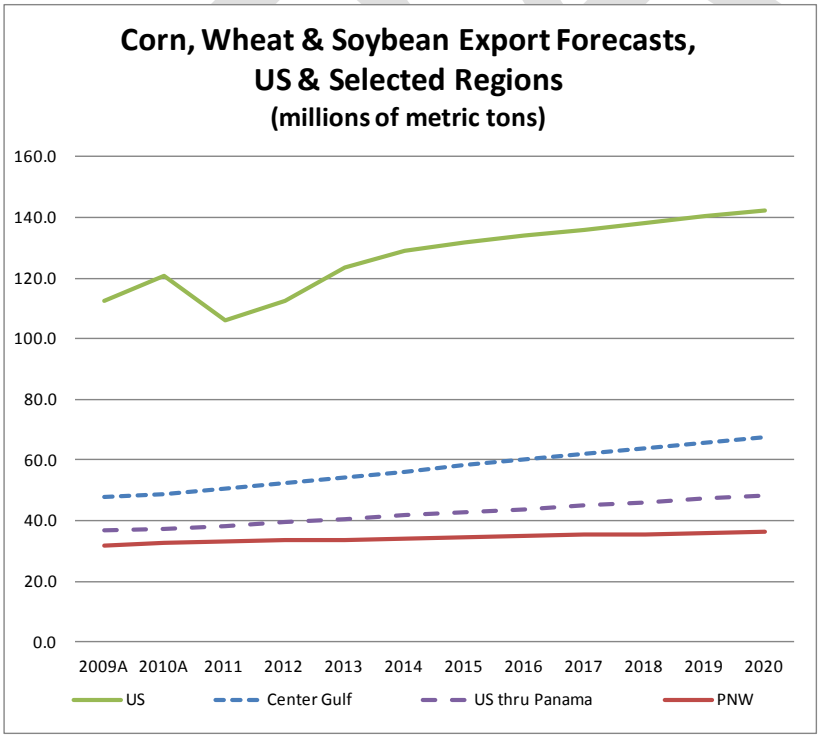


Figure 1-10, Source: Informa Economics, Inc.

Coal

The U.S. Department of Energy (Energy) prepares forecasts of coal production—imports by country and exports by country. The latest projections are presented in the Energy Information Administration's *Annual Energy Outlook, 2011* (AEO 2011). The total world coal trade is projected to grow from just under 1 billion tons to around 1.4 billion tons by 2035. The U.S. share of this trade is currently just under 10 percent but projected to fall to around 5 percent by 2035. Trade with Asia is relatively small at the current time and is expected to stay that way, as shown in Figure 1-10. Long distances between coal production regions and coastal export facilities places U.S. coal exporters at a distinct disadvantage relative to other countries competing in the China coal market. The comparatively high transportation costs associated with shipping coal from the eastern United States to Asian markets historically has meant that U.S. coal exports cannot compete economically in that region. Though a relatively small portion of the world coal trade, the Asian market for U.S. producers is expected to be strong. One obstacle to increasing U.S. coal exports is the lack of a large coal export terminal on the West Coast, which is closer to both Asian markets and the top U.S. steam coal-producing region in the Powder River Basin of Wyoming. In the short term, low bulk rates and the expansion of the Panama Canal may improve U.S. competitiveness in coal export markets. However, the United States is expected to remain a marginal supplier in world coal trade despite achieving higher export levels than in the early 2000s.

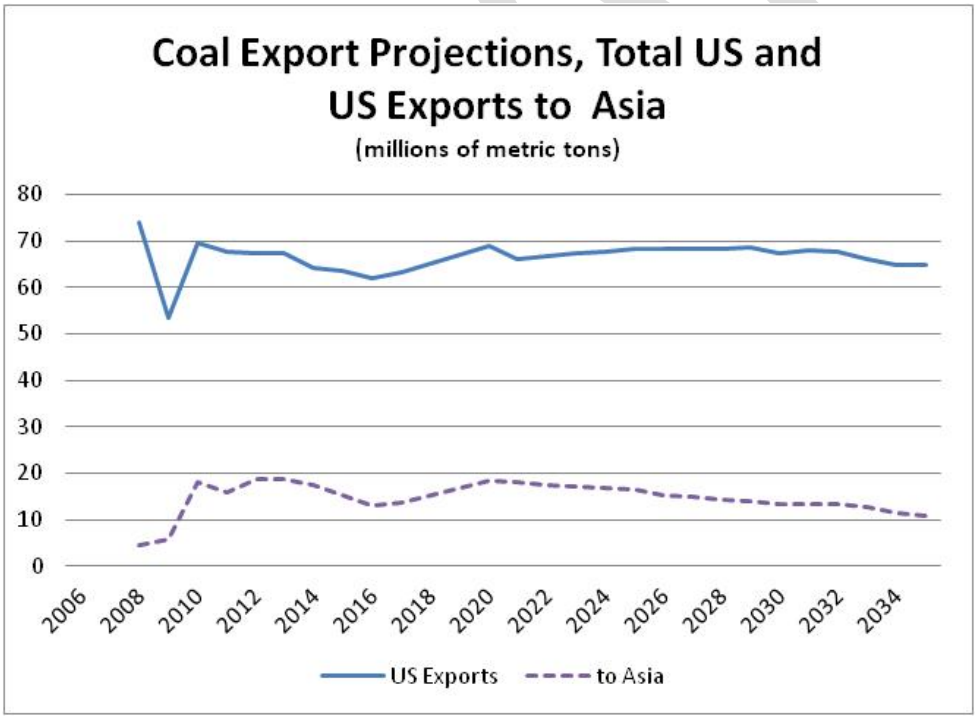


Figure 1-11, Source: Annual Energy Outlook 2011, U.S. Department of Energy

All Others

[Discussion to be inserted in next draft]

Import Forecast of Commodities by Type

[Discussion and data to be inserted in next draft]

U.S. Long-Term Trade Forecast in TEUs

The figure below shows the U.S. long-term trade forecast in TEUs. This forecast is based on total loaded trade inbound and outbound from regions of the Americas, Europe, Africa, Middle East/Indian Subcontinent, Asia and Oceania.

Figure 1-12, Source:

[additional discussion and graphs in next draft]

Summary

[Expanded discussion to be inserted in next draft: Despite the recent recession, international trade is expected to continue to grow following growth in population and income. This freight traffic will be carried by larger ships being deployed into the world fleet. These larger vessels are calling at U.S. ports and are expected to call increasingly in the future, especially after the expansion of the Panama Canal.]

Chapter 2: Existing U.S. Port and Inland Waterways Infrastructure

Multi-Modal Transportation System

The U.S. multi-modal freight transportation system is comprised of deep-water ports, inland waterways, railways and highways. They all play a role in the movement of goods domestically and internationally.

Inland waterways, such as the Mississippi, Columbia-Snake and Ohio River systems, have the highest impact on grains, oilseeds and coal exports. Alternatively, northeast Asia is the largest export trading partner for West Coast ports.

Ocean transportation rates determine the geographic break point between making the long, costly haul by rail from the Midwest to the West Coast versus the relatively inexpensive barge haul to New Orleans along the Mississippi River System to make the lengthy ocean voyage to Northeast Asia. Oceangoing containership rates are generally stable due to negotiated rates. Bulk carrier rates are more susceptible to swings in demand, like the sudden rise caused by the growing Chinese demand for ores, coal and grain.

In recent years, *post-Panamax* vessels have started to call at U.S. ports. It is believed that the Panama Canal expansion will increase the opportunities for trade as it will enable carriers to deploy larger, *post-Panamax* vessels to its Asia-East Coast and Asia-Gulf services ports. Previously large vessel class trade with Asian markets occurred mainly at West Coast ports.

Callout: "Multi-modal" vs "Intermodal"
Multi-modal refers to a multi-faceted transportation system, such as the one in the U.S. that encompasses deep-water ports, inland waterways, railways and highways in which freight carriers typically ship using at least two different methods of transportation but are liable from start to finish. Intermodal, on the other hand, refers to the ability to move containerized cargoes relatively seamlessly using a multi-modal transportation system; for example, moving goods in the same container from a ship to a truck or rail car.

U.S. Port Capacities

U.S. ports have been seeking ways to accommodate larger vessels as well as provide space for an anticipated increase in containers. Physical limitations such as channel depth, channel width, size and number of cranes for unloading and onloading, storage yard space, berthing facilities, turning basin dimensions and landside productivity (i.e., container turnover rates) determine how much throughput a port can potentially handle in a given year.

Growth in Average Vessel Loads and Containerized Cargo

A sharp rise in average vessel load has been experienced over the past twenty years (Figure 2-1). Containerized cargo is projected to increase through the year 2050 (Figure 2-2). *[Additional discussion and data to be inserted in next draft]*

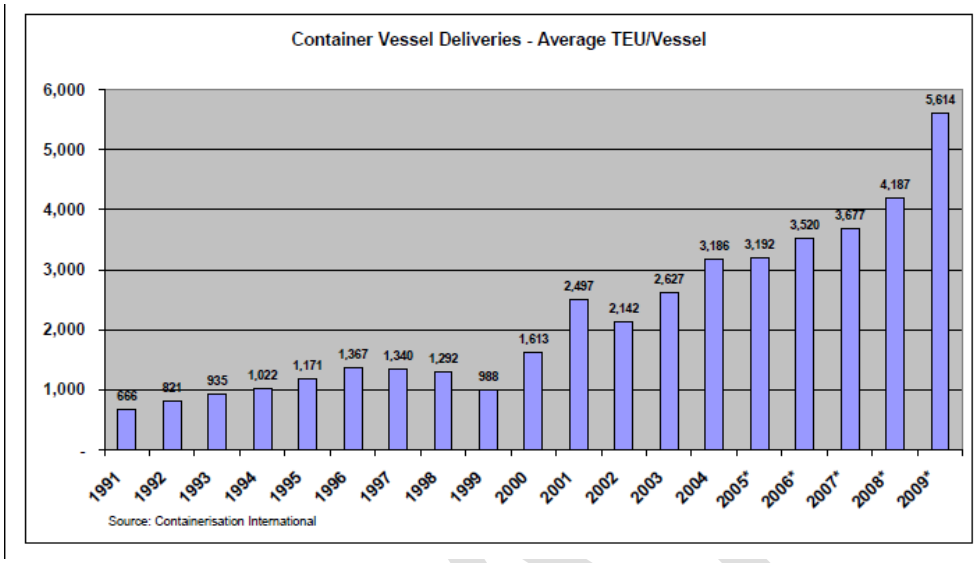


Figure 2-1, Source: Containerisation International

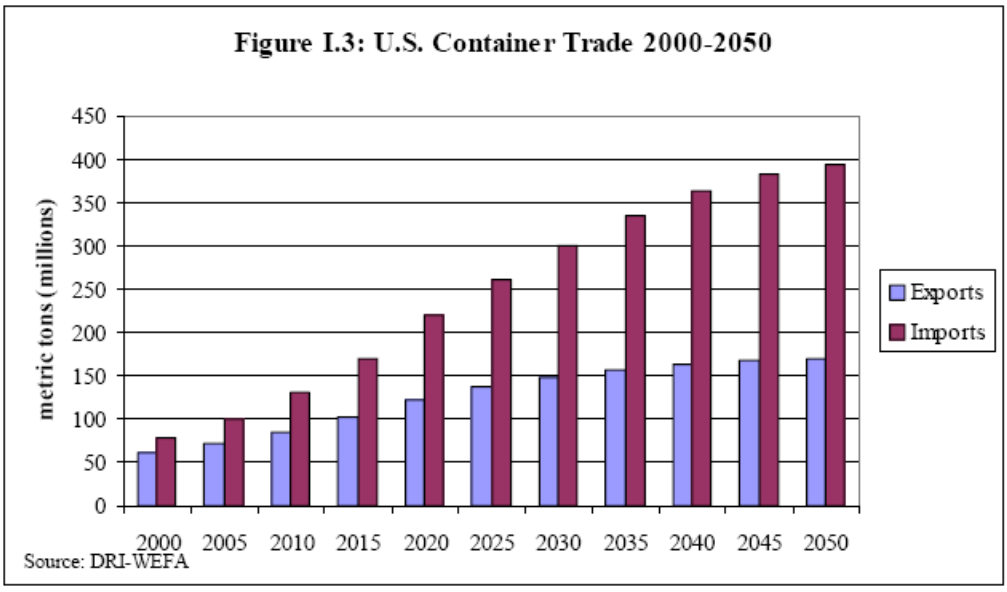


Figure 2-2, Source: DRI-WEFA

Port Utilization

A 2010 USACE IWR study compiled the near-term throughput capacities for a number of marine container terminals located on the East and Gulf Coasts. The study addressed the following questions:

- What are the near-term and long-term capacities of the major East Coast and Gulf Coast container ports?
- What factors constrain the capacities of those ports?
- How well is capacity currently utilized?
- How well are the major ports prepared to handle larger vessels?
- How do the smaller container ports or terminals fit into the picture?

The study concluded that as of 2008, most the ports on the East and Gulf Coasts have sufficient physical capacity to expand, particularly in the South Atlantic

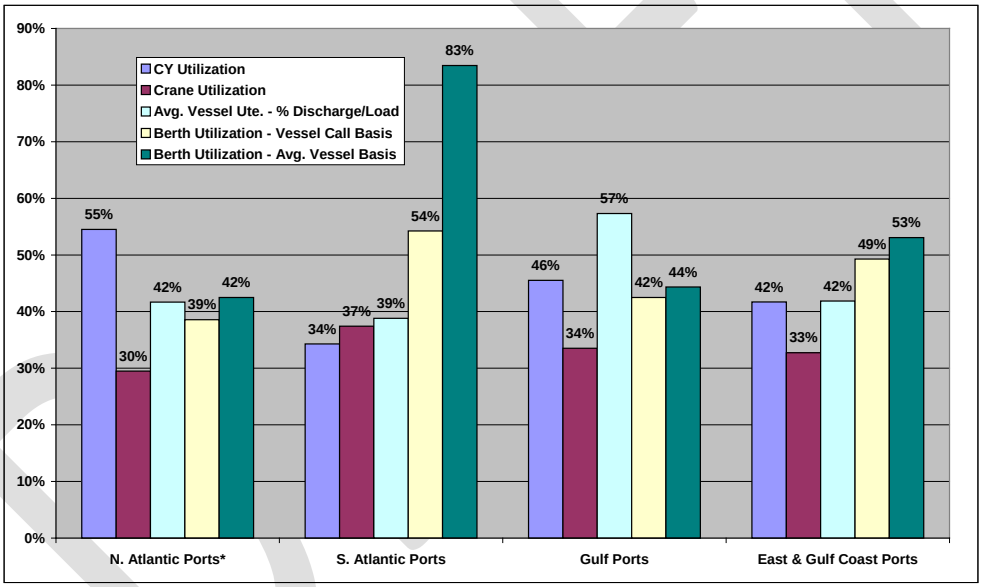


Figure 2-3: 2008 Port Utilization Summary

On average, the combined East Coast and Gulf Coast ports are using:

- 42% of container yard (CY) storage capacity given existing land uses
- 33% of the two-shift capacity of container cranes
- 49% of the berth capacity for vessel calls
- 42% of the vessel capacity for cargo discharge and load
- 53% of the berth TEU throughput capability using the maximum vessel sizes

Figure 2-4 summarizes the implied reserve container port capacity by region and for the East and Gulf Coast port total. Generally speaking, the system as a whole could handle roughly double the 2008 volume before hitting container yard (CY) or berth capacity constraints. However, that result would only be attained if the increased trade were distributed according to the available capacity – an unlikely outcome. A far more likely outcome is that some ports and terminals would see a disproportionate share of the cargo growth and hit capacity constraints while other ports and terminals remained underutilized.

Figure 2-4: Reserve Container Port Capacity by Coast

Metric	N. Atlantic Ports*	S. Atlantic Ports	Gulf Ports	East & Gulf Coast Ports
2008 TEU	8,744,838	6,676,245	2,229,877	17,650,961
Reserve CY Capacity - TEU	10,612,402	13,869,035	2,669,003	25,491,439
Reserve Crane Capacity - TEU	20,895,164	12,501,742	4,423,466	37,820,372
Reserve Berth Capacity - Vessel Calls	8884	4189	1555	12024
Reserve Berth Capacity - Avg. Vessel Basis	11,832,051	1,922,907	2,799,609	16,554,568
Reserve Berth Capacity - Max. Vessel Basis	29,332,298	3,193,986	2,554,332	35,080,616

The map below shows the location of primary and secondary ports in the Eastern and Southeastern U.S. Secondary ports are listed in a supplemental box. Primary ports often feature more dedicated container or bulk terminals. Secondary ports supplement the capacity of the major ports and handle trades and cargoes that do not fit in well with the large, dedicated container terminals.

Secondary ports handle a mix of containerized, bulk and break-bulk shipments. Their container capacities are difficult to determine with precision. This mix of capabilities does, however, provide flexibility, particularly for project cargoes and other limited-duration needs. While these ports handle relatively small volumes of containers, several have specific importance to the imported fruit trade (e.g. bananas) and other niche markets. Some, such as Wilmington and Beaumont, are part of larger complexes that include major military shipping points.

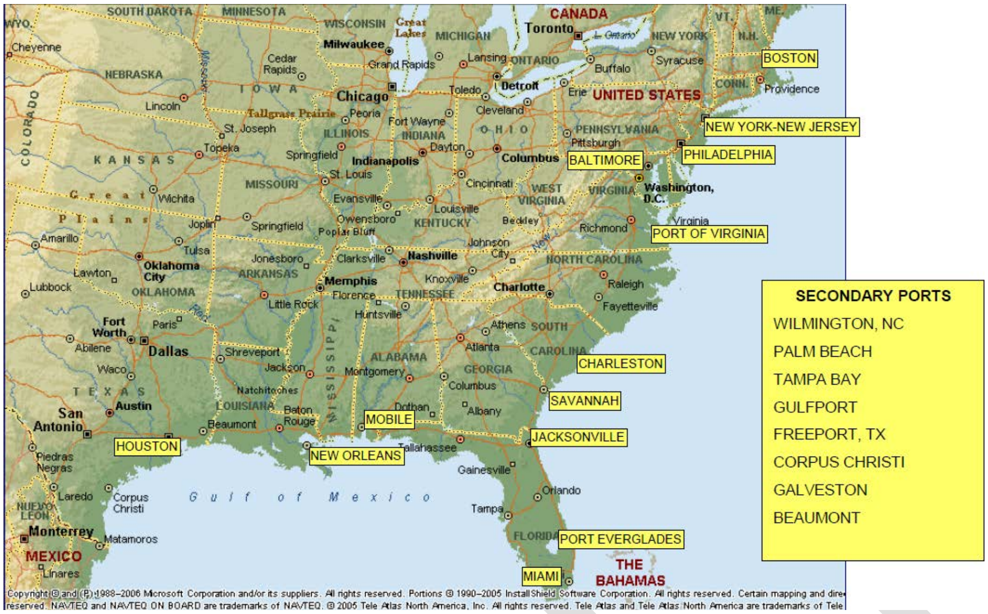


Figure 2-5, Source:

Overall, the North Atlantic, South Atlantic and Gulf ports have substantial inherent capacity for near-term growth. That growth can be achieved through more intensive use of existing terminals, cranes and berths. The existence of aggregate reserve capacity does not preclude slot shortages at ports and terminals that receive more than their share of growth.

Channel Depth Comparisons

An important consideration for a port's capacity is the vessel size it can accommodate. Along with other factors, channel width and depth determine the size of a vessel that can call at a port. For a port to be considered "*post-Panamax* ready," in addition to dock and crane capacity a channel depth of about 50 feet is needed with allowances for tide. U.S. West Coast ports at Seattle, Oakland, Los Angeles and Long Beach all have 50-foot channels. Northeastern U.S. ports at Norfolk, Baltimore and New York have or will soon have 50-foot channels. Only along the Southeast U.S. and Gulf Coasts is there a dearth of ports with 50-foot channel depths.

There are additional ports authorized to be deepened to 50 or 55 feet, such as Mobile Harbor, Alabama and Mississippi River from Baton Rouge to the Gulf; currently only 45 feet. Other ports that currently are 45 feet deep include Morehead City, NC; Charleston, SC; Houston, Galveston, Texas City, Freeport, and Corpus Christi, Texas. The Delaware River is being deepened from 40 feet to 45 feet. Several ports are under study to deepen their channels to depths between 47 and 50 feet, including Boston Harbor, Massachusetts; Savannah Harbor, Georgia; Charleston Harbor, South Carolina; Jacksonville Harbor, Miami Harbor, Port Everglades and Canaveral Harbor, Florida; and Sabine Neches Waterway, Freeport Harbor, Corpus Christi, and Brazos Island Harbor (Brownsville), Texas.

[Note: need better graphic for next draft.]

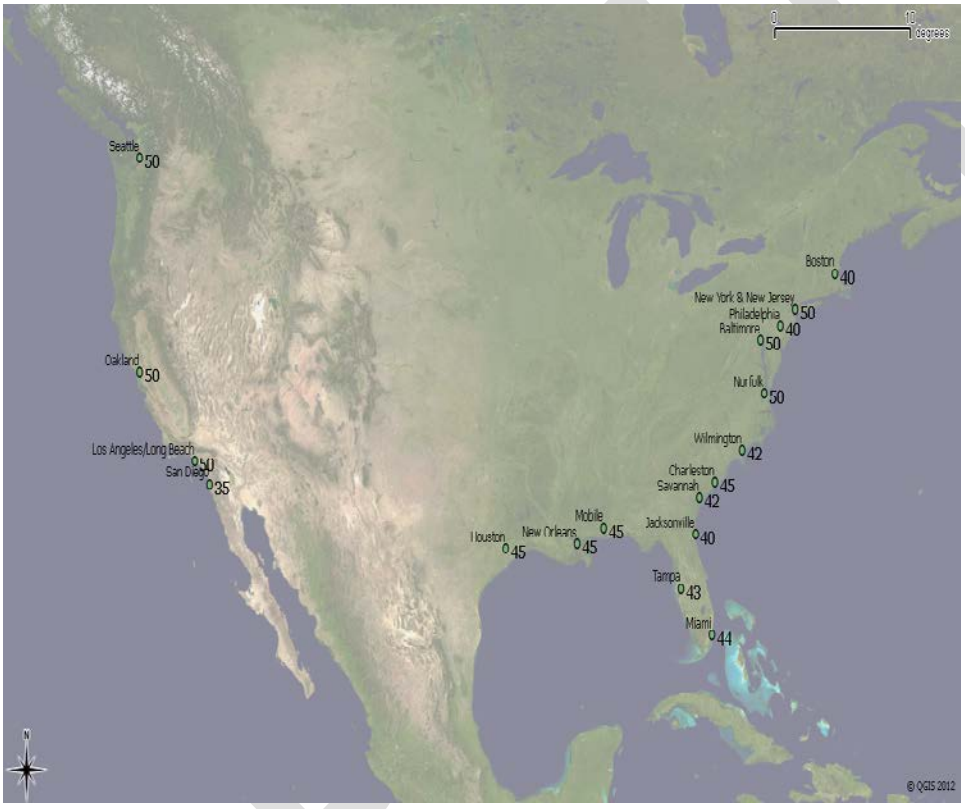


Figure 2-6, Source:

U.S. Port Capital Investment Plans

[add discussion in next draft]

Port's Projected Capital Expenditures 2012-2016	Projected Private Sector Capital Expenditures at ports 2012-2016	Port's Local Share of Security Expenditures Since 9-11	Port's % of Annual Budget for Security
$16,218,429,057	$21,418,700,008	$1,429,509,725	10.3% avg.

Figure 2-7 , Preliminary results of AAPA U.S. port authority infrastructure spending survey - 2012-2016

Other Factors

Other factors affecting port capacity include productivity, storage area, stacking height rules, operating hours and the capacity of surrounding highways, railroads, intermodal connectors to move containers to and from the ports, and the need for trained personnel to operate expanded terminals.

[Additional discussion to be inserted in next draft]

Regional Port Capacities – Current and Future Performance

[Discussion to be inserted in next draft]

Northeast U.S.

Southeast U.S.

Gulf Coast

West Coast

Surface Transportation System – Current and Future Performance

The maritime aspects of trade and travel, whether domestic or foreign, inland vessel or oceangoing ship, are part of a multi-modal system for the movement of bulk commodities from point of production to point of consumption. Whether truck, rail, barge, lake vessel or ocean freighter, each mode is dependent upon the other if the system is to operate efficiently. When the system operates efficiently, more markets are available to producers and the nation enjoys the benefit of the efficiencies incurred.

Port, Railroad and Interstate Network

Figure 2-8, Source:

Trucks

The trucking industry carries nearly three-quarters of all agricultural products and is the sole mode of freight service for more than 80 percent of all communities in the U.S. Trucks are critical to the efficient movement of goods in the U.S., making the first and last move in most supply chains, including coal and grains. The capacity of this mode is dependent upon: 1) drivers, 2) trucks and 3) roads.

Road condition (a function of weight restrictions) and congestion are limiting factors on the mode's capacity. Most observers do not report congestion as a problem for grain and coal shippers with most miles travelled occurring in rural areas, but projections vary widely for widespread road congestion in coming years. Congestion issues can become an issue for grain and coal shippers when hauling long distances to terminals near urban areas and could be a major issue in the event of lock outages should the shipper decide to truck around the obstacle and take a route through urban areas like St. Louis or Cincinnati.

Rail

U.S. railroads have steadily increased investments in both road and equipment. These investments allow West Coast ports to compete with Gulf Coast ports for both grain and coal export shipments out of the U.S. to Asia and improve the overall U.S. position globally in both the grain and coal export markets. Proposed coal terminal facilities on the Columbia River near Portland and at Cherry Point in Washington State (each with annual throughput capacity of roughly 30 million tons and representing an investment in excess of $500 million) are indicators of the private sector's view of the potential that exists in the Asian coal market. Without these terminal facilities, there are no terminals with the capability of handling coal in the volumes required by *Panamax* or *post-Panamax* vessels of any kind. This investment is made possible through the financial health of the major rail carriers. Investments are also underway to support increased capacity to handle containtership trade, which will also offer competition to East and Gulf Coast ports. *[Additional discussion in next draft.]*

Class I Railroad Capital Expenditures

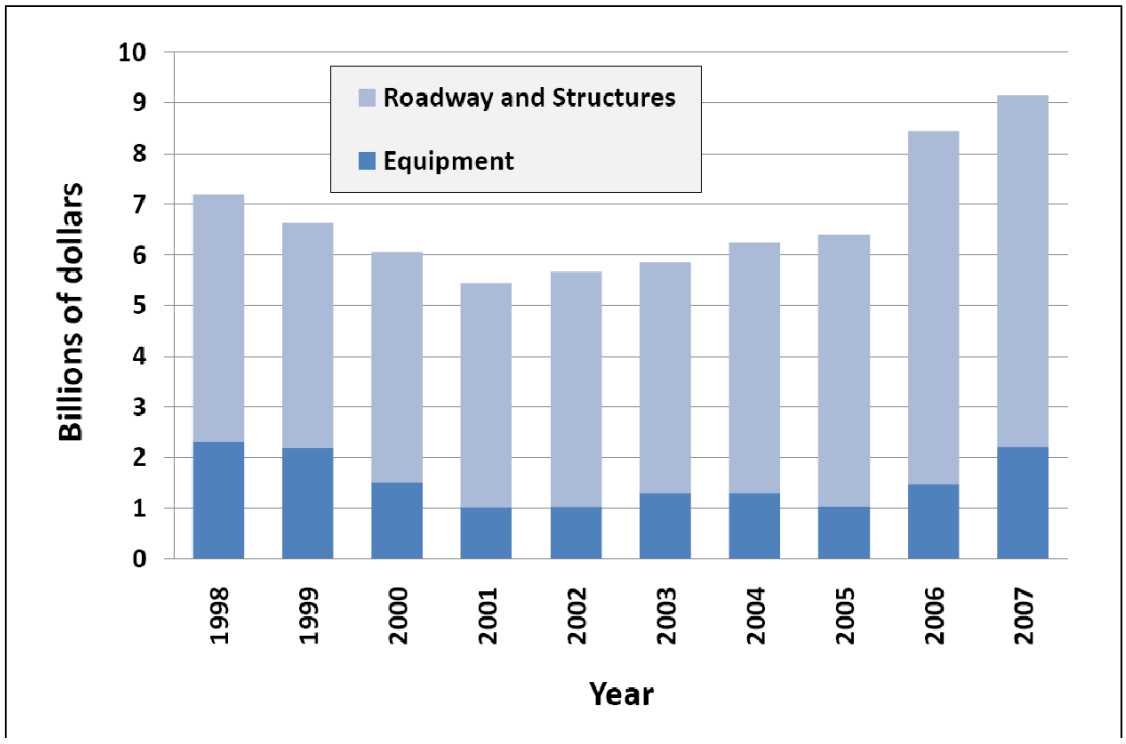


Figure 2-9, Source: The United States Department of Transportation; Study of Rural Transportation Issues; Published April 2010. page 341.

Railroad service and pricing revolve around the railroads' efforts to improve speeds and efficiency and to shift costs. They have accomplished this through investments in the access lanes to the ports (e.g. Alameda Corridor), obtaining more equipment, laying more track, relying more on unit and shuttle trains, and abandoning feeder lines. Cost burdens have shifted more toward the shipper. In the coal market entire trains are now owned by the shipper, while grain shippers often own the cars. Collection costs have been shifted to the coal producer and to the farmer, requiring truck haulage on rural roads to terminals that load out unit and shuttle trains. In addition to placing an additional cost burden on the producer, state and local governments are responsible for the additional maintenance costs on rural highways. A similar phenomenon is occurring with the relatively new container trade for grains where farmers must travel to find empty containers and then transport them to often distant assembly points near large population centers.

Despite efficiency gains, massive investments and a current climate of adequate locomotives, cars and operators, capacity concerns remain. The map below shows major rail lines and the capacity of each relative to the traffic each carried in 2007.

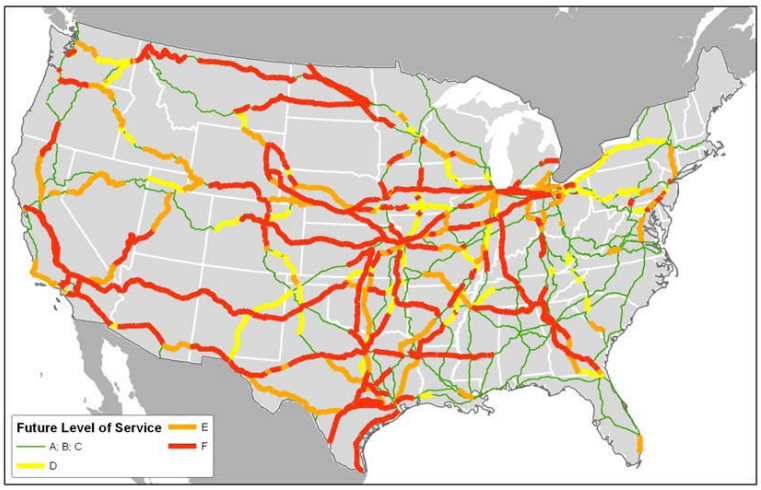


Figure 2-10, Source: Cambridge Systematics

Many rail lines near grain producing areas are near capacity, with a number of connecting lines at capacity and one line along the Tennessee-Mississippi border over capacity. With economic recovery and the return of higher traffic volumes, many of these near-capacity lines could become bottlenecks, particularly if the Panama Canal expansion and increasing ocean-going vessel size encourages the movement of grains to the Gulf. Eastern railroads do not indicate widespread capacity issues except for one line in Virginia.

Inland Waterway System – Current and Future Performance

The inland waterway system as defined in this report includes the 12,000 miles of navigable shallow-draft waterways (both rivers and the intracoastal waterways) and the extensive Great

Lakes Navigation System. This system of inland rivers and Great Lakes serves much of the geographic area of the United States and most of its population.

Upper Mississippi-Illinois Waterway

The commercially navigable portions of the Upper Mississippi River (UMR) extend from the confluence with the Ohio River to Upper St. Anthony Falls Lock in Minneapolis-St. Paul, Minnesota. The Illinois Waterway (IWW) extends from its confluence with the Mississippi River at Grafton, Illinois to T. J. O'Brien Lock in Chicago, Illinois. The UMR-IWW Navigation System contains 1,200 miles of 9-foot deep channels, 38 lock and dam sites, and thousands of channel training structures.

An average of nearly 55.6 million metric tons (mmt) of grain, oilseeds and other agricultural products—representing an average of 36 percent of total barge traffic—moved between Minneapolis and the mouth of the Missouri River on the UMR-IWW each year from 2000 through 2010. In addition, the UMR-IWW system provides an inbound conduit for fertilizers, fuel and other farm inputs. Commodities such as coal, chemicals, iron ore and petroleum products are shipped in bulk on the UMR.

There are 29 active projects on the UMR, most of these constructed in the 1930s. The two lowermost locks have a modern configuration of a 1200' x 110' main chamber and a 600' X 110' auxiliary chamber.

The IWW system has eight single-chamber lock and dam projects. The seven projects on the main part of the waterway have single 600' x 110' lock chambers and are over 60 years old. T. J. O'Brien Lock and Dam on the Calumet River have a 1000' x 110' chamber. Most barges moving to and from Lake Michigan use the O'Brien Lock. Grains, oilseeds and coal continue to be the dominant commodity groups on the UMR-IWW, together making up about 58 percent of total traffic in 2010. Petroleum products were the third largest commodity group in 2010, accounting for 8 percent of traffic.

Many of today's tows on river systems consist of 12 - 15 or more barges, which require the tow to be split and passed through the lock in two operations. Unscheduled maintenance due to mechanical-related issues is becoming a larger percentage of overall closure time on some river systems. Unscheduled outages are more costly than outages planned well in advance. Depending on the nature of the lock malfunction, protracted repair time can have major consequences for barge traffic that depends on the facility and for shippers and manufacturers that depend on timely delivery of their cargo. Aging of inland waterways infrastructure is not a concern if timely investments are made in maintenance and major rehabilitations, with some capacity and modernization improvements when needed.

Lock capacities at lock and dam projects with a single 600' x 110' lock chamber require two lockage operations (cuts) to accommodate the typical 12 – 15 barge tow and have annual throughput capacity in the neighborhood of 50 million short tons. Mel Price and LD 27 have a

1200’ x 110’ main chamber and 600’ x 110’ auxiliary chamber. These two lock projects have slightly more than double the capacity of the single chamber, 600-foot lock projects. Average annual delays on this river stretch ranged from just under 1 hour per tow to 2.5 hours per tow. These annual averages hide the more severe delays and stressing of lock capacity during grain harvest season.

Locks on the IWW have single 600‘ x 110’ chambers, with the exception of O’Brien Lock with its 1000-foot long chamber, which does not play prominently in the shipment of grains or coal. Average annual delays on the IWW range from 1 hour to almost 1.5 hours per tow. As with the UMR, these annual averages hide the more severe delays and stressing of lock capacity during grain harvest season. Annual throughput capacity is between 32 and 54 short million tons.

Using estimates of existing system capacity, a comparison was made to an existing forecast of agricultural exports. The forecast indicated approximately 40 percent potential growth in current Mississippi River agricultural exports by 2020. This forecast demand could be accommodated in 2020 with the current system infrastructure given the continuation of recent trends in non-grain traffic growth. However, significant growth above current trends in non-grain traffic could result in not all agricultural export demand being accommodated by the waterway system. A roughly 50 percent increase in non-grain traffic by 2020 would be required to create a system capacity constraint.

A determination that traffic can be accommodated in the future does not mean that it would be accommodated at existing cost levels. Any increase in traffic over the lock and dam portion of the system will result in additional congestion and additional cost. This analysis indicated that the implementation timeframe for the subset of authorized UMR-IWW improvements that is sufficient to address improved waterway efficiency and “capacity” from a system perspective is no earlier than the mid 2020s.

Ohio River

The navigation study area includes the entire main stem Ohio River, which extends 981 miles from the junction of the Allegheny and Monongahela Rivers at Pittsburgh, Pennsylvania, to near Cairo, Illinois where the Ohio flows into the Mississippi River. Year-round navigation is provided on the Ohio River by 20 locks and dams and periodic maintenance dredging. The entire Ohio River Navigation System comprises more than 2,600 miles of commercially navigable waterways. The basin comprises 204,000 square miles and encompasses all or portions of 14 states, including Alabama, Georgia, Kentucky, Indiana, Illinois, Maryland, Mississippi, New York, North Carolina, Ohio, Pennsylvania, Tennessee, Virginia and West Virginia.

During the time period 2000-2010, barges along the Ohio River main stem have carried the product of coal mines, petroleum refineries, stone quarries, cement plants and farms and the raw material for construction companies, steel mills, electric utilities, paper plants, aluminum manufacturers and chemical companies.

Ohio River main stem transportation consists largely of coal and other bulk or raw cargo. Most of the basin's coal moves to domestic markets, primarily to the electric utility industry.

The USACE experience at Ohio River navigation projects has been that major lock and dam components become a reliability concern when those components are from 40-70 years old. The aging lock and dam infrastructure is a critical concern since one-third of the lock chambers are currently beyond their design life and of inefficiently small lock sizes. There is a slight upward trend in the percentage of unscheduled maintenance on the Ohio River main stem systems of locks and dams. While not as drastic as the UMR-IWW trend, this is still a concern heading into the future.

With the exception of the uppermost locks and a lock project below Evansville, Indiana, the Ohio River projects have a main chamber measuring 1200' x 110' and an auxiliary chamber that is 600' x 110'. All Ohio River lock and dam projects have two chambers, which is reflected in the higher capacity and lower delays than on the UMR-IWW. Capacities range from 46 million tons to over 300 million tons. Delay only becomes a problem when main chamber lock outages occur. Several main chamber closure events over the last 20 years resulted in serious disruptions in the form of lengthy delays, diversions to other transportation modes and closure of some industrial facilities that could not receive or ship product.

Columbia Snake

The Columbia-Snake navigation system is located in the northwest United States, principally in the state of Oregon. The system extends from the Pacific Ocean to the Oregon-Idaho border area and includes sections of the Columbia, Snake and Clearwater Rivers with its headwater near the junction of the Clearwater and Snake Rivers and its mouth at the Pacific Ocean. Portland is located 112 miles upstream from the mouth; this 112-mile stretch of the Columbia is a deep draft channel of 43 feet in depth. The shallow draft system upstream of Portland is 364.5 miles in length with a minimum depth of 14 feet. The shallow draft system is served by eight lock and dam structures: four on the Columbia River and four on the Snake River. The chambers measure 675' x 86', which differs from the standard of 600' x 110' found at most projects elsewhere in the U.S. This system is also somewhat unusual in that it was constructed after World War II.

The major commodity movement on the Columbia-Snake is downbound shipments of grains and oilseeds for export. The second largest movement is upbound shipments of petroleum products moving to a terminal where it is pipelined to Salt Lake City. Together these two movements' tonnages account for about 59 percent of all foreign traffic and 63 percent of all domestic traffic.

The Columbia-Snake River System is relatively less busy than the UMR-IWW and Ohio River; however, a major unscheduled closure during the peak period of grain shipments could have significant impacts on the grain trade to northeast Asia. Locks at The Dalles, John Day and

Lower Monumental were closed for roughly 15 weeks in late 2010/early 2011 while repairs to lock gates and other machinery were made, reducing the likelihood of future outages. Capacity at John Day LD is 57.7 million tons, a representative estimate for all other locks on this system. *John Day Lock and Dam Major Maintenance Evaluation* traffic projections ranged from 9.6 to 12.4 million tons in the year 2020—well below the capacity of the locks on the Columbia-Snake.

Great Lakes

The Great Lakes provides a water highway for the grain industry of the U.S. and Canada. Typically, U.S. grain exports account for 40 percent of these tonnages, while Canadian exports account for 60 percent. Nearly all of the Canadian grain passes through the locks at Sault Ste. Marie, Michigan (the Soo Locks), while most of U.S. iron ore and large movements of western U.S. coal also use these locks. The Soo is especially important to the U.S. steel industry located along the shores of the Great Lakes as Minnesota iron ore mines rely heavily on the Soo Locks and lake vessels to carry product to their mills. The St. Lawrence Seaway locks at the Welland Canal and on the St. Lawrence River provide access to the Gulf of St. Lawrence and the Atlantic Ocean. Soo Locks accommodates all vessels capable of transiting the smaller dimension Seaway Locks (maximum dimensions 740-foot length, 78-foot beam and a maximum draft of 26 feet 9 inches). The intra-lake movements in the upper lakes dominate tonnage at the Soo and are made by large vessels (1,000-foot vessels with a 105-foot beam, drafting around 28 feet) capable of transiting the Poe locks 1200' x 110' chamber, but too large for the Seaway and Welland Canal locks.

Soo Locks traffic was 74.8 million short tons in 2011 (this includes both U.S. and Canadian traffic). This traffic transits through the large Poe Lock (1200' x 110') or the smaller MacArthur Lock (800' x 80'). The largest class of vessels capable of carrying 60,000 tons and primarily dedicated to the coal and iron ore trade is too large for the MacArthur lock. Most of the traffic at the Soo transits the Poe lock in these large vessels. The absence of an auxiliary lock for these large vessels is a concern for shippers as the Poe approaches 45 years of operation and MacArthur 79 years. A sharp rise in unscheduled maintenance at Soo Locks was experienced between 2006 and 2009, which has since trended downward. Data also reflects the absence of scheduled closures. Scheduled maintenance work is performed during the annual winter closure; as a result, outages are of lower order of magnitude than those experienced on the Mississippi or Ohio rivers.

Given the lock dimensions on the Welland Canal and St. Lawrence Seaway, Panama Canal expansion will not result in *post-Panamax* size vessels visiting Great Lakes grain exporting ports or iron ore and coal terminals; however, new *post-Panamax* sized vessels may affect the amount of grain shipped out of the Great Lakes. If the Mississippi River or the western railroads were to reach their economic carrying capacity, the Great Lakes could serve as an alternate trade route. The Great Lakes also has the potential to serve as an alternate trade route should catastrophic natural events or political events occur that disrupt competing trade routes. The ability of Great Lakes ports (U.S. and Canadian) to meet new export demands, particularly for grains, is

relatively substantial. Current system tonnage of around 37 million short tons per year represents approximately 60 percent of the system's current carrying capacity.

Summary

[Discussion to be inserted in next draft]

Chapter 3: Environmental Impacts of Modernizing Inland Waterways and Deep-Draft Ports

Potential environmental impacts and impact mitigation are important aspects of planning for port and waterway modernization in response to increasing international freight transport, intermodal container-based shipment and Panama Canal enlargement. In this chapter, the existing environmental footprint of ports, waterways and intermodal links is described and potential modernization impacts are forecast based on different assumptions about system responses. Considerations include impacts on environmental services that support commercial, recreational and other uses of natural marine, estuarine, freshwater and shore resources; public health and safety; and the sustainability of the nation's natural and cultural heritage. Potential impacts were tracked systemically from source through forecasts of potential ecosystem modification and effects of changes in air, water, land and biological qualities of the environment on environmental services and citizen welfare.

The Environmental Footprint

Development and maintenance of freight transportation systems in the United States have contributed to cumulative impacts from land and water use on the environmental quality of the nation's coasts, waterways, and rail and highway corridors. Since the 1970s, compliance with the National Environmental Policy Act, Clean Water Act, Endangered Species Act (ESA) and other regulatory legislation have contributed to reducing the impacts of many previous practices. Impact mitigation is expected to be an important consideration in determining the net benefits from investments in future transportation system modernization. In the following subsections, the environmental footprint of the existing intermodal transportation system is placed in perspective by comparison to other sources of impact on American lands and waters. Then the nature of past sources of the environmental footprint is summarized for each major category.

Cumulative Impacts of Land and Water Development and Use

Much of the conterminous United States has been altered by land and water development and use. The change has been mostly beneficial, but a large fraction of the nation's natural environment has been replaced with substantially different qualities, some of which are undesirable. Lubowski et al. (2006) summarized land and water use by category and reported that 13 percent is now reserved for light use in parks, wildlife refuges and wilderness areas where most natural qualities still prevail. Another 56 percent is more intensively used for forest management, grazing and other moderately intense resource use that sustains many natural qualities except where management is lax. In addition, many natural qualities have been lost in the 27 percent used for intensive crop culture and rural residential development. The remaining 4 percent is densely urban or used for rural transportation. It includes the geographical area of

landside port, highway and railroad impact, which is less than 1 percent in total. Relatively few natural qualities remain in the footprint of these densely impacted areas.

Despite many benefits, the transformation of the American landscape by human use has come at substantial environmental cost. It has degraded numerous commercial and recreational uses of water and associated land area (*[references]*), contributed to health and safety concerns and also contributed to the probable or possible extinction of at least 240 American species and decline of many more (Master et al. 2000). The freight transportation system has directly impacted a small percentage of the nation's geographic area, intensively and with effects that extend beyond the area of direct impact.

The broad view of geographical impact provides a perspective that misses an important aspect—the growing scarcity of wetland and open-water environments that are disproportionately impacted by ports, waterways and intermodal links. Wetlands have been reduced from about 11.1 percent to about 5.3 percent of the conterminous United States (Dahl and Alford 1996). Tidal wetlands have been substantially reduced during the past decade by the cumulative effects of rising sea level, channelization, sediment deprivation, other human impact and hurricanes (Dahl 2012). Now they are scarce, making up only 0.3 percent of the conterminous United States. Open waters comprise 5.3 percent of the conterminous United States, including the American portion of the Great Lakes and coastal oceanic waters to the 12-mile territorial limit (U. S. Census Bureau data). Without the Great Lakes and artificial reservoirs, the non-tidal inland waters of the conterminous U. S. amount to less than 1 percent of the total, much of that in lakes. The remaining free-flowing streams and rivers have become increasing scarce and are now about 0.5 percent of the conterminous total.

Despite improvements in recent decades, freshwaters have been hit hard by physical, chemical and biological changes and are targeted for protection in environmental impact considerations. Reservoir construction has increased the nation's open-water area in total while reducing the area of free-flowing water. Numerous non-native species have become established in them, some of which have caused costly changes (Pimentel et al. 2001). Nearly 50 percent of streams and lakes remain unnaturally contaminated with nutrients, sediment, metals and synthetic chemicals (EPA 2007). As a consequence of these and other changes, about five times as many freshwater species as terrestrial species have gone extinct (Ricciardi and Rasmussen 1999, Cole 2009). Species extinction and present imperilment is especially concentrated along the Pacific Coast (California) , Southeastern Coast (Florida) and in the states bordering the Ohio, Tennessee and Mississippi Rivers (Master et al. 2000, Stein et al. 2000). These are all areas with active ports and waterways.

Impacts of Excavation and Maintenance Dredging

Excavation of basins and channels, maintenance dredging and dredge material disposal have extensively impacted river, lake, estuarine and coastal-marine ecosystems. Over 926 harbors and 12,000 miles of waterways have been developed and maintained (USACE 2010). About 250

million cubic yards of bottom materials have been removed annually in recent years (USACE 2010). Similar rates of dredging have occurred for decades,disposed of in rivers, estuaries and deep ocean waters, as well as on shores and wetlands.

The precise area impacted by excavation and maintenance dredging is undocumented, but can be estimated. Based on average sediment removal rates, the equivalent of about 1,200 square miles covered with material averaging 10 feet deep has been deposited on aquatic and terrestrial habitat over a 50-year period. The river area impacted by original channelization is about 700 square miles (*[footnote explaining calculation]*). Harbor excavation is about 300 square miles (*[footnote explaining calculation]*). Some of this dredged material was severely contaminated with toxic materials before environmental laws of the 1970s required proper disposal.

The total estimate of 2,200 acres is 7.6 percent of the 29,000 acres of free-flowing rivers, lakes and estuarine wetlands, but not all impact occurred within them and many effects were temporary. After NEPA was passed, numerous studies of dredging took place and were reviewed in Allen and Hardy (1980). In general, dredging of nontoxic bottom sediment impacts coastal and riverine benthic organisms temporarily and bottoms that were dredged or covered with dredged material often recovered living biomass quickly following disturbance except in chemically altered environment, such as deep channels exposed to different salinities and low oxygen. Species composition changes often persist in deeper channels, however, because of changes in currents, light, salinity and oxygen concentration. Disposal on land creates new habitat on existing habitat, which may be more or less desirable depending on the site and how it is drained and otherwise managed. Some dredging has had more persistent effects on productivity, scarce species and scarce ecosystems such as shallow estuary wetlands (Ray 2007) and coral reefs, as well as unavoidable take of threatened and endangered species (USACE 2006).

Since the 1970s, USACE has taken care to avoid damage to wetlands and other sensitive ecosystems and to assure that contaminated sediments are contained on land or in new islands. In 1992, USACE was authorized to beneficially use dredge material for environmental improvement, but no data have been compiled to indicate the percentage of total dredged material used beneficially.

Impacts of Transportation System Infrastructure

The development of waterway and coastal structures designed to facilitate freight transport have eliminated much natural habitat and altered hydraulics, erosion and sediment deposition dynamics in ways that favor some species while adversely impacting others. In large rivers, the adverse effects of navigation reservoirs on species survival outweigh any beneficial effects (Parmalee and Bogan, Cole 2009). Locks and dams have converted several thousand miles of the upper Mississippi, Ohio, Columbia, Illinois, Cumberland, Tennessee, Arkansas, Alabama and other smaller rivers to chains of artificial lakes. Their effects on river hydraulics are frequently

cited as among the major factors contributing to the decline of many freshwater species, especially freshwater mollusks (Parmalee and Bogen 1998, Watters 1999). Many of these species are listed for protection under the ESA. Other waterway and coastal infrastructural change has less adverse impact but contributes cumulatively to habitat change that adversely affects numerous plant and animal species and the condition of scarce ecosystems (Cole 2009).

Highways, railroads and pipeline infrastructure and rights of way have contributed significantly to environmental degradation. Their development has converted about 0.5 percent of the natural landscape to totally inhabitable space for native species. Much more damaging, however, is the habitat fragmentation that has contributed to declines of numerous terrestrial and semi-aquatic species (Fahrig et al. 1995, Forman and Alexander 1998, Trombulak and Frissell. 2000). Because they stretch over many more miles and cover a much greater area of land surface, highway development and operation generally have more impact than railroads and pipelines. Highways alter hydrology and contribute contaminated runoff into fresh and estuarine waters (Gjessing et al. 1994, Jones et al. 2000).

Impacts of Transportation System Operations

Perhaps the most evident environmental impact of the transportation system is caused by atmospheric emissions associated with fuel consumption, including green house gasses. The land- and water-based freight transportation system consumes 8.6 percent of the total energy used in the U.S. (from data reported in USDOF 2012). Fuel efficiency is an important consideration in seeking the most beneficial combination of transport modes, including atmospheric impacts. Trucks consume over 72 percent of the freight-transport energy in part because they are least fuel efficient (from data reported in USDOF 2012). They need to be used at points of freight origin and delivery and, despite higher fuel costs, are the most cost-effective mode for short freight hauls. While large ocean-going vessels are highly fuel efficient (*[reference]*), tugs used in waterway barge transport are substantially less so. Separate assessments by USDOF (2012) and OEE (2011) indicate freight trains and smaller freight vessels in the United States and Canada have similar fuel efficiencies and trucks are much less energy efficient. Greenhouse gas emissions have similar ratios (OEE 2011). Efficiencies from all modes have been increasing.

Transportation system operations have had other adverse environmental effects. Vessel wakes contribute to shoreline erosion, including wetland and bottom community changes (Koch 2002, Bishop 2005a and Bishop 2005b). Vessel-caused turbulence also disturbs bottom communities and contributes to turbidity (Allen and Hardy 1980), which deprives submerged plants and sight-feeding species of necessary light. However, this is a minor source of turbidity compared to nutrient enrichment and sediment runoff resulting from human caused changes in watersheds. Vessel, port, train and truck operations often are sources of oil, metals and other water pollutants. Vessel cargo and ballast water have been major vectors for non-native invasive species with adverse environmental effects (NRC 1996, Corn et al. 2002). Trucks and trains are major means for nonnative species invasion of inland areas (Greenberg et al. 1997). All modes

contribute to noise pollution and unequal distribution of unhealthy pollutants where people with low incomes live. Intermodal trucks, in particular, contribute to traffic congestion near busy ports.

Accidents

Accidents occur throughout the transportation system and contribute to human safety and health concerns as well as to ecosystem threats. Accidents include ship, train, truck and car collisions and pipeline breaks and leaks. Accidents often receive attention disproportionate to their contribution to all transportation system impacts, but can be locally to regionally costly as signified by large oil spills, which are most associated with vessel collisions and pipeline breaks (Etkins 2001). Accidents in and around ports are a function of increasing traffic rates and counteracting facilities and operations improvements (Etkin 2001). Collisions of vessels with endangered marine mammals, sea turtles and other species is a significant concern in some port areas ((Vanderlann and Taggart 2006, Laist and Shaw 2006). Vehicular traffic is increasingly recognized as a significant source of mortality for some endangered species (Fahrig et al. 1995).

Impact Distribution and Environmental Justice

The distribution of environmental impacts from ports and waterways depend on port and waterway activity and human population distribution and demographics. Because property values are typically low near busy ports with noise, congestion and unpleasant appearances, the inequity of environmental impacts often is high, disproportionately affecting low income groups. Ports near population centers typically have more impact on human health, safety and resource use than rural ports. Ecological heritage value, on the other hand, tends to be inversely related to population density because most ecological heritage of public preservation interest persists in low density areas.

Indicators of Potential Environmental Impact

Indicators of the potential impact of future modernization are revealed in the environmental footprint of past intermodal navigation system impacts. These indicate potential mitigation requirements of any future development and new operations. Indicators include: 1) distributions of vulnerable species and ecosystems; 2) distance of port facilities to deep water; 3) existing width and depth of dredged channels and turnaround basins; 4) sediment removal maintenance requirements ; 5) port sediment contamination; 6) human population size, density and demographics in the port vicinity; 7) age of existing intermodal transportation facilities; 8) capacity of existing intermodal transportation facilities; and 9) size and age of vessels calling at ports. Specific measures of these indicators were used to assess the environmental impacts of transportation system modernization in the next section.

Forecast Scenarios

Scenario 1: Increased Vessel Traffic and Size at East Coast Ports

Panama Canal enhancements may significantly shift transport cost advantages from Western to Eastern and Gulf ports. The environmental impact of this shift in large part depends on the extent and location of modernization requirements. Eastern and Gulf ports differ substantially in the amount of development required to become *post-Panamax* ready. Port expansion may require mitigation of impacts much like those that have occurred in the past. Channel, basin and berth enlargement requirements would physically impact marine and estuarine bottoms, the turbidity of overlying waters and inhabitant communities of estuarine ecosystems. The difference between the existing and *post-Panamax* capacity of channels and turning basins are indicators of impact on bottom communities. The proximity to existing opportunities for beneficial use of dredged material and to acceptable offshore disposal areas also is an important consideration. Chemically contaminated sediment adds a potentially critical dimension to environmentally responsible disposal or use of dredged material.

Mitigation of adverse effects need careful consideration wherever Federal investments are made in modernization of port facilities, intermodal rail and highway terminals, and cargo transfer facilities. Potential impacts at port locations vary widely depending on proximity of ports and intermodal links to scarce species, ecosystems and recreationally or commercially important resource-use areas. Distance of ports to final freight destination and the means of transport (rail, road, pipeline, vessel) are indicators of air quality degradation, including carbon dioxide emission. Any required rail and railroad expansion also needs to be considered for its impact on scarce species, ecosystems and resource use.

Some preliminary observations about potential environmental impacts of modernization are possible based on indicators, but require more complete analysis for a more confident assessment. In the Northeast, New York-New Jersey modernization to make the port *post-Panamax* is underway, so completion would have relatively little environmental impact. This port is likely to handle northeastern needs for a significant period (population growth rates are low), including needs in New England, New York and Pennsylvania. The Port of Baltimore has modernization efforts underway and would have comparatively little environmental impact. It complements New York by serving populations in Pennsylvania, Maryland, northern Virginia, Ohio and West Virginia. The ports of Philadelphia and Wilmington (DE) require more development and probably more environmental impact mitigation before becoming *post-Panamax* ready.

In the mid to South Atlantic region, the Port of Norfolk-Hampton Roads is *post-Panamax* ready and is environmentally in a good position to serve freight needs in rapidly growing population centers of northern Virginia, North Carolina, Kentucky and Tennessee. Its future environmental impacts would be limited mostly to increased vessel, port and intermodal rail and highway operations. Potentially serving a similar region, the Port of Wilmington (NC) has significant

expansion needs and is not much better situated than Norfolk-Hampton Roads. Further south, Charleston and Savannah are closer to and environmentally better intermodal links to rapidly growing populations around Atlanta and elsewhere in Georgia, South Carolina and Alabama. Savannah appears to have more significant environmental limitations associated largely with dredging and terminal expansion requirements.

Florida ports serve Florida needs best because of proximity to growing Florida markets and links to intracoastal waterway transport of bulk goods to northern locations. Further development of Florida ports may involve significant environmental issues associated with excavation, dredge-material disposal/use and expansion of port and intermodal connectivity. Florida port expansions are among the most likely to affect sensitive wetland and marine ecosystems and endangered species due to southerly distributions. Port Everglades expansion appears to have environmental advantages except for the greater distance trucks need to carry freight to population centers.

In general, Gulf ports west of Tampa do not have the transport cost advantages of Eastern and Western ports and none are *post-Panamax* ready. All would have significant environmental impacts to contend with if developed for *post-Panamax* capability.

West Coast ports would improve environmentally if future freight traffic is diverted eastward. There would be less increase in port traffic congestion and air quality degradation by West Coast ports and by intermodal traffic across the west and Midwest.

In general, the trend toward larger new vessels portends lower emission of carbon dioxide and other air pollutants per ton of freight shipped than continued reliance on smaller vessels.

Scenario 2: Increased East Coast Traffic with Limited Change in Vessel Size

Existing *post-Panamax* port and international ports in the Caribbean have potential for becoming deepwater transport hubs for vessels of all sizes. That may favor smaller feeder vessel delivery of transferred freight to East Coast ports (*[references]*). In such an event, Norfolk, New York and Baltimore could serve *post-Panamax* vessels with feeder vessels to other northern coastal ports while *post-Panamax* ready ports in the Caribbean provide feeder-vessel service to southern Atlantic and Gulf ports. If this should happen, environmental impact from channel and basin expansion and dredge material disposal may be avoided. The impact of intermodal links would differ little from conditions involving port expansion as intermodal traffic will also increase. There could be greater air quality degradation and port congestion associated with additional freight transfer from *post-Panamax* to feeder ships and barges.

Scenario 3: Increased West Coast Traffic

Western ports are better prepared than Eastern and Gulf Coast ports to accept *post-Panamax* vessel sizes and container traffic, have transport-time advantages, are projected to serve rapidly growing populations west of the Appalachians and are likely to become more competitive by cutting intermodal costs (*[references]*). Such advantages could result in relatively little change in

the proportion of freight moving into East and West Coast ports despite Panama Canal enlargement. If this should happen, total environmental impacts might be substantially less than the extensive development required by East Coast ports except for increased intermodal air quality degradation and port congestion. However, proposals to stack containers on railroads and increase truck trailer lengths up to three or more containers to cut intermodal costs also could significantly reduce the atmospheric emission rate per ton of freight transported (*[references]*).

Scenario 4: Increased Export of Grains and Other Goods via Inland Waterways

Panama Canal enlargement may make shipment of grains and other goods out of the Midwest to Gulf ports and Asian markets more attractive than existing routes. That would increase barge traffic down Mississippi tributaries to the port of New Orleans, which may increase the existing demand for larger locks and other waterway improvements and also increase the attractiveness of further port development at or near New Orleans. The Columbia and Alabama rivers, Great Lakes-St Lawrence and the intracoastal waterways may carry significant increases in grain export traffic. Inland waterway vulnerabilities vary significantly in terms of species and ecosystem vulnerabilities to possible alterations of barge traffic and lock sizes. Environmental impact is most associated with increased lock lengths built to pass longer rafts of barges and increased traffic. The total impact depends on local conditions as well as the total number of locks modernized. In general, impacts are forecast to be small even with relatively substantial changes in locks and traffic because the lock footprint is small in comparison to total river habitat and traffic impacts are moderated by river channel size.

Navigation vs Other Modes of Transportation

All forms of transportation have an environmental footprint. Development and maintenance of navigation-based transportation systems in the United States have contributed significantly to altered air, water, land and biological attributes of waterways, coastlines, and rail and highway corridors. Impact sources include channel and basin excavation, maintenance dredging, lock and dam structures, intermodal links and vehicular/vessel emissions. Since the 1970s, the National Environmental Policy Act, Clean Water Act, Endangered Species Act and other regulatory legislation reduced the persistent impacts of many previous practices.

Navigation's footprint can be viewed favorable to truck and rail for many types of impacts. Nevertheless, any modernization strategy must consider the environmental footprint of navigation. Excavation and dredging of navigation channels both temporarily and permanently reduce abundances of submerged aquatic vegetation and various commercial, recreational and threatened animal species. In general, dredging of nontoxic bottoms impacts coastal and riverine benthic organisms temporarily and bottoms typically colonize quickly following disturbance. But dredging also has had more persistent effects, including some unavoidable take of imperiled species (e.g. sea turtles). In 1992 USACE was authorized to beneficially use

dredge material for environmental improvement. Since then dredged material has been used for habitat creation and other beneficial use at several project sites.

Chapter 4: Maintaining the Existing System

[Discussion to be inserted in next draft related to

- *Historical USACE Budget Review*
- *Expected Cost to Maintain Current System]*

Historical USACE Budget Review

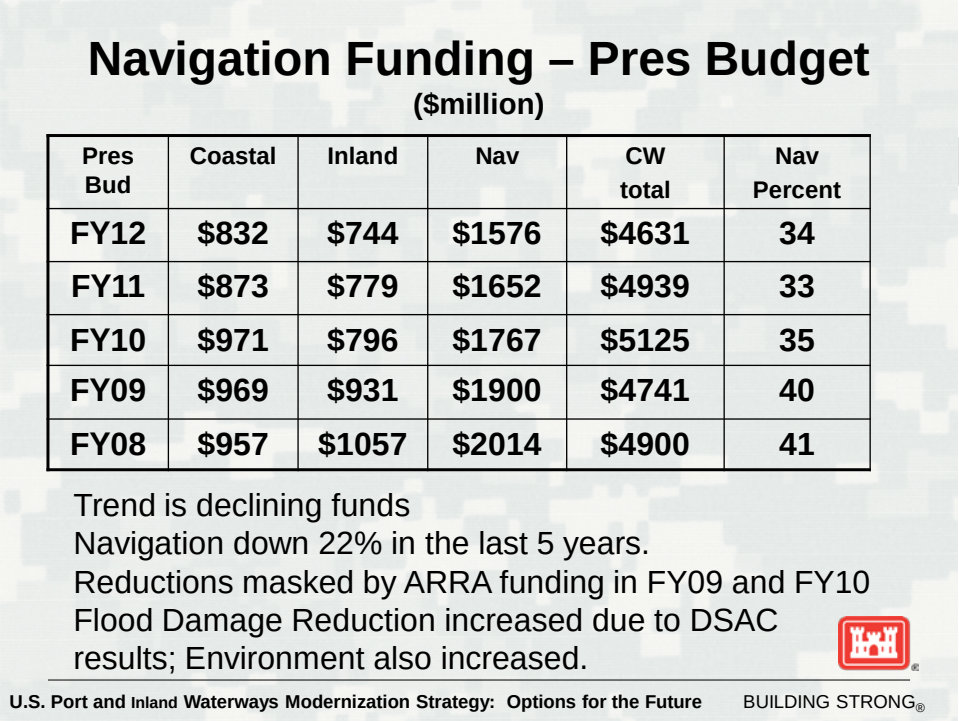


Figure 4-1, Source: USACE

Expected Cost to Maintain Current System

[Discussion to be inserted in next draft]

Inland Waterways

[Discussion to be inserted in next draft related to:

- *Dredging*
- *Major Rehabilitations**]***

Blue Water Ports

[Discussion to be inserted in next draft related to:

- *Channel Maintenance]*

Chapter 5: A Vision for a World Class Navigation System

As a maritime nation our economic prosperity is directly linked to our investments in navigation infrastructure. Just as current generations benefit from investments made in the past, the ability of future generations to prosper and grow will depend on infrastructure investment decisions made today. A globally competitive U.S. navigation transportation system for the 21st Century will have these characteristics:

- Environmentally compatible development, infrastructure and operations.
- Multi-modal connectivity.
- High-performance and reliable navigation channels, turning basins and other related navigation infrastructure that are maintained to constructed depths and widths.
- Channels and ports that are not the limiting component to competitive global freight movement.
- Navigation locks that are reliable and available to pass traffic on demand with lock chambers consistently sized for efficient movement of freight.
- Navigation jetties that are planned, constructed and maintained for safe, reliable and efficient freight movement.
- Dredged material placement facilities that are planned, constructed and maintained to be available when needed for navigation channel maintenance, never impeding dredging efforts.
- Capital investments in navigation locks for replacement, major rehabilitation, or expanded capacity that are established through a capital investment plan that identifies and prioritizes on a system basis.
- Capital investment plans that are shovel-ready as investment funds are identified.
- An identified mechanism for the financing of operations, maintenance and capacity improvements.

New, large vessels are typically deployed on the longest and largest trade service – Asia to Northern Europe. The "smaller" vessels on that service are forced to re-deploy to the next most efficient service for that vessel size. This cascading continues until the most marginal vessels in the fleet are forced to be scrapped. This cascading typically increases average vessel size for each trade service, placing demands on the port infrastructure to support larger capacity vessels. For U.S. ports to be ready to take advantage of *post-Panamax* vessel opportunities,

major ports not only need to be "*post-Panamax* ready," but second tier ports need to be "cascade ready" to take advantage of larger vessels that begin to service their trade.

For a port to be considered "*post-Panamax* ready," in addition to dock and crane capacity a channel depth of about 50 feet is needed with allowances for tide. U.S. West Coast ports at Seattle, Oakland, Los Angeles and Long Beach all have 50-foot channels. Northeastern U.S. ports at Norfolk, Baltimore and New York have or will soon have 50-foot channels. Only along the Southeast U.S. and Gulf Coasts is there a dearth of ports with 50-foot channel depths. This is the area of the country with the fastest forecasted population and trade growth.

USACE currently has 17 *[check data for next draft]* active studies investigating possible port improvements, most associated with the desire to be *post-Panamax* ready. One example is a study at the Port of Savannah that is nearing completion and indicates a well justified project that will cost about $600 million. It is likely that other studies will also show well justified projects, either to become "*post-Panamax* ready" or "cascade ready." It is easy to see that the national investment to sustain a globally competitive navigation system could easily become billions of dollars.

Traffic levels on the inland waterway system are expected to increase in response to lower delivery cost of U.S. agricultural exports. Current capacity is estimated to be sufficient through 2020, however traffic levels should be monitored and consideration given to lock expansion on the upper Mississippi River.

The inland waterway system of locks, dams and channels was largely built before World War II. *[add data in next draft: Xxx of the yyy locks are over zzz years old.]* Maintenance of the navigation channels has become increasingly costly and many river segments are maintained at less than their authorized depth. Unscheduled outages at the nation's locks are increasing as fatigued components finally fail. Over the last XX years *[add data in next draft]* the average annual expenditure for channel maintenance, major rehabilitation and emergency repairs on the inland system has been $ XXX *[add data in next draft]*. Going forward, to ensure that current capacity is maintained, increased outlays for major rehabilitation or emergency repairs are expected.

SIDEBAR:

PLANNING MODERNIZATION INITIATIVE

When developing recommendations on specific projects, USACE follows a well established process derived from the Water Resource Council's 1983 "Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies." The USACE Civil Works Program is undergoing a transformation initiative to better align this project

development process with national priorities in order to better address the water resources challenges and needs of the Nation.

To ensure the timely execution of this process, USACE has taken steps including adopting a new planning paradigm and instituting a 3x3x3 rule. The Planning Modernization Initiative consists of five concepts:

1. Uncertainty and Level of Detail: Balancing the level of uncertainty and risk with the level of detail of the study.
2. Vertical Team Integration: Ensure early vertical team (District, sponsor, MSC, HQUSACE and ASA(CW)) integration and engagement of decision makers, which will continue throughout the study process.
3. Determine Federal Interest: Identify the Federal Interest early in the study, including the level of Federal Interest and level of Federal Investment looking beyond National Economic Development (NED) and National Ecosystem Restoration (NER).
4. Alternative Comparison and Selection: This concept recognizes that there is no single "best" plan and there are a variety of approaches (quantitative and qualitative) to multi-criteria decision making.
5. Funding and Resourcing: Ensure that all resources needed for the study – funding, human resources, data and information – are identified and available for the duration of the study.

All feasibility studies that had not reached their feasibility scoping meeting by December 2011 will follow the 3x3x3 rule:

- They will be completed in a target goal of eighteen months but no more than 3 years;
- The cost of the study will be no greater than $3M; and
- The report will be of a reasonable size. The target for length of the main report for feasibility studies will be one hundred pages or less and the entire feasibility report and appendices shall not exceed one 3-inch binder. This requirement does not preclude proper scoping, risk assessment and compliance with laws, regulations and policy guidance.

These initiatives will provide for faster, less expensive decisions regarding authorization recommendations to Congress. At the same time, USACE is consciously accepting the higher degree of uncertainty in its data and analyses and the increase in associated risks related to both benefit and cost estimates in exchange for faster, less expensive decisions. Furthermore, absent new methods of financing USACE projects, this process could exacerbate the backlog of authorized but unfunded projects.

Project	action	3x3x3
Bayou Cassotte Widening Feasibility Study(Sec-204B) MS	widening	
Boston Harbor (Feasibility Study), MA	deepening	no
Canaveral Harbor (Feasibility Study) (Sec-203), FL	deepening	no
Charleston Harbor, SC		Yes
Columbia River (Mouth) Feasibility Report, OR		no
Corpus Christi Ship Channel(Limited Re-evaluation Report) (LRR), TX		no
Freeport Harbor (Feasibility), TX		
Jacksonville Harbor (General Re-evaluation Report) (GRR), FL	Deepening	
Palm Beach Harbor / Lake Worth Inlet (Sec-107), FL	Navigation induced erosion	
Port Everglades (Feasibility Study), FL	Deepening	no
Sacramento Deep Water Ship Canal, CA		
Savannah Harbor, GA	Deepening	no
Searsport Harbor, ME		
Wilmington Harbor, NC		
Houston- Galveston Channel Extension		
Tampa Harbor	GRR & DMMP	

Chapter 6: Financing Options for Modernizing the U.S. Ports and Inland Waterways

[The next draft will

- *Rely on and refer to Chapters 1-5.*
- *Will be in a narrative as opposed to detailed outline form.*
- *Include a substantial discussion of pros and cons of the options described]*

Setting the Stage

USACE funding for the inland waterway system is budgeted separately from funding for harbors. This distinction is maintained in this chapter on funding options, even while recognizing that certain bulk commodities are moved by barge toward a specific port destination and for some commodities there is a link between the movements on the inland waterways and port shipments.

Harbor Funding

[Data will be inserted in the next draft]

Over the past five fiscal years the average appropriations for channel deepening and channel maintenance were $ X and $ Y, respectively.

Of these appropriations, P percent were from general revenues, with the remainder of the appropriation from fees collected under the provisions of Harbor Maintenance Trust Fund (HMTF) based on the value of cargo.

During the same five fiscal years $ A were collected for the HMTF and of those $B, or Z percent of the total collected, were allocated to harbor maintenance; the rest remain unspent in the HMTF account.

Harbor Deepening

The general revenues dedicated to harbor deepening were spent at N harbors. These harbors taken together have a final estimated construction cost of T dollars. (See table 1). Meanwhile, there have been concerns expressed in Congress and by the shipping industry about the adequacy of funding for deepening several harbors along the East Coast (Charleston, Wilmington, Savannah, others), not now under construction in total could represent costs in excess of $B billion, even as there are delays in planning and implementing deepening projects.

Table 1 funding goes here

Decisions on funding for harbor deepening follow after USACE led planning and project justification includes a harbor specific economic analysis as well as a detailed environmental evaluation, mitigation plan and permitting. Both the planning effort and implementation requires having a cost share partner that agrees to pay for a portion of the study costs for the deepening. The cost share requirements are displayed in Table 2.

Table 2 on cost share goes here.

Harbor Maintenance funding under the HMTF

History of the HMTF, the structure of the cargo fee, revenue stream and process for making expenditures for the fund will be described here, even if introduced elsewhere in the report.

Decisions on spending HMTF dollars for maintenance dredging are made through a hierarchical process that begins with requests made at the USACE district level and ends with allocations made in the President's budget by the Office of Management and Budget (OMB). Modest adjustments have been made in the past during the congressional appropriations process.

Inland waterways funding

Over the past five fiscal years the average appropriations for lock and dam improvements and for maintenance of inland waterway navigation structures and channels were $ X and $ Y, respectively.

Of these appropriations, P percent were from general revenues with Z percent from revenues collected through the barge fuel tax and administered under the provisions of Inland Waterways Trust fund.

During the same five fiscal years the $ A collected through the fuel tax were allocated to waterway improvements, under the direction of the waterway users board.

Inland waterways improvements funding under the IWTF

History of the IWTF, the fuel tax, revenue stream and IWTF users board process for making expenditures for the fund will be described here, even if introduced elsewhere in the report.

Decisions on funding for inland waterways improvements follow after USACE led planning and project justification includes economic analysis as well as a detailed environmental evaluation, mitigation plan and permitting.

The IWTF revenues were spent on N lock and dam systems, with the Olmstead lock being the major construction activity. Olmstead plus the other projects have a total estimated construction cost of T dollars. (See table 4). Given the revenue flow to the IWTF there have been concerns expressed in Congress and by the barge industry about the adequacy of funding for lock improvements, which in total could represent costs in excess of $B billion and about

delays in planning and implementing projects. At present there is industry support for raining the fuel tax.

Table 3 funding goes here

Inland waterways operations and maintenance

Decisions on appropriations for operations, maintenance and minor repair are made through a process that begins with requests made at the USACE district level and ends with allocations made in the President's budget by OMB. Modest adjustments in annual appropriations have been made in the past during the congressional appropriations process.

Key Funding Questions

Harbor Development and Maintenance

Question 1: Harbor deepening

Will construction general funding be adequate to deepen harbors as needed to accommodate new container traffic as a result of Panama Canal improvements?

> First, without regard to the Panama Canal expansion, appropriations from general revenues for construction funding for harbors has essentially been zero for the last five fiscal years and there is no evidence that that funding will increase in the near-term.
>
> Second, even if increased funding were available total costs for harbor deepening in a series of East Coast and Gulf harbors will be substantial.

Question 2: Harbor maintenance

Will the level of collections and disbursements from the HMTF be adequate to maintain harbors at levels sufficient to provide reliable service to shippers? *[This is a different question than whether harbors are maintained at authorized depths and requires further discussion of the definition of "sufficient". Will that discussion be here or elsewhere in the report?]*

> First, will the funds collected for the HMTF be allocated in ways that meet the maintenance needs of the harbors?
>
> Second, will the revenues collected with the current value of cargo fee system keep pace with increasing costs of dredging over time (possible causes of increasing costs include increased shoaling, increases in unit costs of dredging, etc.), even if all collected funds were allocated to maintenance.

Inland Waterways

Question 1: Inland waterway improvements and major rehabilitation

Will the level of collections and disbursements from the IWTF be adequate to expand and rehabilitate facilities at levels sufficient to provide reliable service?

> Concerns expressed about future availability of IWTF funds fall into two categories.
>
> First, how can the inland waterways users board best allocate funds?
>
> Second, will the revenues collected with the current fuel tax keep pace with increasing costs of construction and needs for major rehab over time (possible causes of increasing costs include fragility of aging structures increases at an increasing rate with time and increases in unit costs of construction).

Question 2: Inland waterway operations, maintenance and repair

Will general funding be adequate to operate and maintain waterway locks, dams and channels, especially if there is a lag in modernizing and rehabilitating aging projects? Appropriations from general revenues have been static for the last five fiscal years and there is no evidence that funding will substantially increase in the near-term.

Harbor Development and Harbor Maintenance Funding Options

The discussion of funding options recognizes that construction / major rehab are now planned for funded in different ways when compared with operations, maintenance and repair. However, some of the options do not maintain that distinction.

Option 1: Business as usual for deepening and for maintenance

This would mean continuing to collect revenues at their current rate for funding the HMTF, assigning budget ceilings to the USACE program without regard to the HMTF revenue stream and then budgeting under that ceiling according to administration budget priorities, based on analyses of project justification provided through the existing USACE evaluation and justification processes.

General revenues would provide funding for deepening at the same or perhaps a slightly increased level. However, over the next decade the baseline approach will not provide significant funds for project deepening. (*Note: whether the finds will be "adequate" depends on the findings of Chapters 1-5.*)

Because of the continuing revenue streams dedicated to the HMTF and because of the reserves in that fund, financial support for maintenance of existing channels would be assured, at least for the near term. [1]

Option 2: Increase general revenues for harbor deepening

Congress follows the historic and traditional model of support for harbor deepening, but *increases* general tax revenues appropriated for funding harbor deepening projects whenever USACE analyses reports that investment will be economically justified and environmentally acceptable.

Federal funds to deepen harbors still would be matched by cost share requirements from the harbors as cost share partners, in current proportions. Currently cost share partners raise revenues to meet their cost share requirements using a variety of revenue sources (Harbors have multiple strategies for securing payment to recover their costs of providing services. These include entry fees draft fees landside facility fees and more.)

With this option, maintenance dredging would continue to rely on revenues collected at the current level of user fee, deposited to the HMTF and allocated to harbors on an annual basis following current practice.

Option3: Increase cost share contributions to harbor deepening

Two possibilities can be described for changing cost share requirements, in combination with either Option 1 or 2.

1) Raise cost share requirements across the board by a specific percentage (ex 30%) of the amounts shown in Table 2.

2) Establish by policy that federal participation in harbor deepening is limited to depths of 45 feet (or some number close to 45 feet) and that further deepening will be at nonfederal cost paid by the harbors - perhaps on a sliding scale.

In either case the cost share partners would be expected to raise funds using existing or new revenue sources.

With this option, maintenance dredging would continue to rely on revenues collected at the current level of user fee, deposited to the HMTF and allocated to harbors on an annual basis following current practice.

[1] One argument made for not fully expending revenues received by the HMTF is that funds collected at those harbors where maintenance is not required remain in the national treasury and funds collected for the harbors that do require dredging are adequate to meet the maintenance dredging requirements.

Option 4: Modify Authority to use HMTF for Harbor Deepening

Instead of seeking additional revenues from the general treasury, an alternative revenue source for channel deepening would be to raise the fees collected for the harbor maintenance trust fund and then extend the use of those funds beyond maintenance dredging. The logic for such an argument would be that the beneficiaries of the deeper projects can be readily identified and such an increase in fees would simply be a beneficiary tax. In this adjustment the decision-making process would remain as is: that is the USACE planning process would determine which projects are economically justified for deepening and would then receive appropriations for managing the construction of such projects.

Option 5: Individual Port Initiative

Under this option the HMTF could be phased out, as would the current fees creating the revenues that are dedicated to the fund. Individual port authorities would include the costs of maintenance in their overall cost structure and would levy fees in whatever form they deem appropriate for cost recovery for harbor improvements and maintenance.

Individual port authorities would secure all the necessary funding for harbor deepening either by borrowing, perhaps with access to a newly formed infrastructure bank (See Box 6.1) or by entering into partnership (Private-public) with shippers who would use the deeper harbor [2]. The funds borrowed or otherwise advanced for purposes of construction would be repaid using revenues from the same kinds of user fees now currently in place for paying cost share. [3]

Box 6.1 Infrastructure Bank

If an infrastructure bank is created under federal authority, provisions could be made to allow cost share partners or ports that make their own investments to borrow from that bank for providing their cost share in a timely manner and then repay the bank with user fees collected.

USACE analyses could continue and would provide a report to the bank on whether the applicant can earn a revenue stream sufficient to repay the loan and on the applicant's compliance with environmental laws and regulations.

[2] If individual harbors were to be responsible for their own deepening there is a risk that expenditures made for that deepening may not be recovered by user fees if those fees cause a change in shipment patterns. One way to address this for any given harbor would be to enter into a partnership agreement with the shipping company so that both parties are invested in the deepening activity and paying for the costs (perhaps repaying a loan) over a fixed period of time. Such a contract would be established between the harbor and one or more shipping companies.

[3] With this option the required revenues will exceed those now required for paying current cost share.

The shift of responsibility for securing funds and repayment (relative to options 1,2 and 3) would be accompanied by a parallel shift of responsibility for evaluating the justification for harbor deepening and harbor maintenance. Each individual harbor authority would establish whether the expenditure of funds was economically justified, as opposed to relying on USACE analyses. This shift of responsibility on whether to deepen the harbor, by how much and what depths to then maintain, from the USACE led planning process to the individual harbor is the fundamental difference between this option and simply raising the required cost share for the harbors (Option 3).

Assessing the Options: Harbor Development and Harbor Maintenance

[This section will narratively compare the pros and cons of each option according to criteria such as the following.]

[Each option will be narratively compared with the business as usual option as the base case, as well as with the other options. The tabular display with some discussion in the cells is offered ***to illustrate the concept of a narrative description.]***

Criteria	
Revenue adequacy	Nothing currently prevents harbors from initiating a deepening project without seeking federal funding (option 4) but there is uncertainty over whether raising fees at their harbor in order to recover costs would result in shippers changing destination points and revenues falling below those needed to repay any loans.
Administrative feasibility	
Required legislative change	Significant shifts of fund raising and disbursement would require new and substantially modified authorities. Congressional appropriators do not want to lose control over picking harbor winners and losers and so are unlikely to provide such authorities.
Budget process	Concern that there will be a substantial increase in federal funding and any harbor that "goes it alone" will have missed out on a federal contribution; Surpluses generated by the HMTF contribute to meeting deficit reduction targets created support at OMB for the current system; OMB is concerned about harbors investing on their own and then seeking reimbursement for that advanced investment, even if that investment is not national justified; OMB will not re-allocate any savings to other business lines that are realized by options that shift cost to beneficiates creating a resistance within USACE to promoting such options.
Pace of improvement	
Effects on traffic and trade patterns and	

transport system efficiency	
Low use and regional harbors and waterways	Beneficiaries by themselves may not be able to pay the full cost of structure and operations over time. If users can pay then maintaining waterways and ports may not be in inherently governmental function. However it situations such as this there may be a role for government analogous to the provision of lifeline rates for vital services such as electricity and water supply.
USACE responsibilities in analysis	For options 1-4, the USACE investment optimization models would be used; however, an initiative could be taken to allocate deepening funds to individual harbors in accord with minimizing the total costs of origin to destination transport of goods (or some other objective function). This model would replace individual harbor by harbor justification as is currently now done. The reality is that efforts at such multiport analysis have been attempted over many decades and proved to be both technically challenging and politically difficult to implement as a budget guide.
USACE responsibilities in environmental review	In all options federal agencies would retain the responsibility for completing analyses needed for establishing the environmentally acceptable project, to include considerations of mitigation and then issue permits for the project instruction. In fact, the ability to navigate the regulatory process in ways that will expedite decision-making on harbor development is one of the principal reasons given for maintaining a significant USACE role in the planning and execution of harbor deepening projects (Options 1, 2 and 3). The only reason why regulatory delays would be greater under Option 4, where individual harbors make planning decisions and then apply for environmental permits, is that the USACE itself is more likely to receive in environmental permit than a harbor would. This is more an assertion that argument based on experience.

Inland Waterways Improvements and Operations and Maintenance Funding Options

The discussion of funding options recognizes that construction / major rehab are now planned for funded in different ways when compared with operations, maintenance and repair. However, some of the options do not maintain that distinction.

Option 1: Business as usual for improvements and OM&R

This would mean continuing to collect revenues at their current rate for funding the IWTF, assigning budget ceilings to the USACE program without regard to the IWTF revenue stream and then budgeting under that ceiling according to administration budget priorities, based on analyses of project justification provided through the existing USACE evaluation and justification processes.

IWTF revenues would provide funding for improvements and major rehabilitation as revenues from the existing fuel tax permit. However, over the next decade this approach will not provide significant funds for inland system improvements and rehabilitation. (*Note: whether the finds will be "adequate" depends on the findings of Chapters 1-5.*)

Financial support for maintenance and repair would continue to be funded from general revenues, at the same level as the average of the past 5 years.

Option 2: Increase Revenues for waterway improvements and OM&R

First, increase fuel tax and in turn expenditures from the IWTF for investments in improvements that are economically justified and environmentally acceptable. This USACE analyses will report instances where the benefits of reducing the risk of system failure (lock and dam or channel depth/width) exceed the costs of the investment.

Second, increase general tax revenues appropriated for maintenance at X percent per year based on a formula based on XX.

Option3: Decentralize decision making

This option is under development.

Option 4. Modify Authority to use IWTF for project maintenance

Instead of seeking additional revenues from the general treasury, an alternative revenue source for OM&R would be to raise the fuel tax or other fees collected for the IWTF and then extend the use of those funds beyond project construction. The logic for such an argument would be that the immediate beneficiaries of the waterways can be readily identified and such an increase in fees would simply be a beneficiary tax. In this adjustment the decision-making process would remain as is: that is the USACE planning process would determine which projects are economically justified for deepening and would then receive appropriations for managing the construction of such projects.

Assessing the Options: Inland Waterways Improvements and Operations and Maintenance

See tabular display on harbors for sample of the approach.

Chapter 7: The Future Federal Role in Navigation

The vision to maintain our existing infrastructure and to expand it where and when needed can only be achieved through a successful partnership between the Federal government, local sponsors and the navigation industry. The Federal role in navigation maintenance and development is coming under increased scrutiny from waterway users, shippers, port authorities, environmental groups and local governments. The USACE budget has been challenged to meet both the needs to maintain the existing system and increase capacity where needed. The USACE construction budget has declined in real terms from about $2.6 billion in FY 2006 to less than $1.7 billion in FY 2012 in constant 2010 dollars. (USACE) Only a fraction of these funds are available for navigation capacity expansion. The current budgetary environment will not sustain the dual needs to maintain and expand the nation's navigation capacity.

There will always be a Federal role in the nation's navigation infrastructure. The need for compliance with the National Environmental Policy Act, the Clean Water Act and the Endangered Species Act ensures this. However, the current financial role played by the Federal government can only be continued with increased Federal funding. The aging infrastructure, especially on the inland waterways, is becoming increasingly costly to maintain or rehabilitate. The declining Corps budget for construction does not allow for the capacity expansions needed to meet navigation's critical needs of the future.

As explained in chapter 6, there are many options and variations of options to be considered. Existing policies and procedures can work if additional funds are provided. New cost sharing rules could be changed to place more responsibility on the local sponsor. Public private partnerships combined with an infrastructure bank could provide access to funding for local sponsors. The combinations of these ideas are almost limitless.

There is a growing discussion surrounding the need for new methods to plan, choose, finance and maintain the nation's navigation infrastructure. In order to move this discussion forward, Congress and the Administration must take action. Congress should make clear its preferences for future partnering. What level of Federal funding will be available for maintaining and expanding the nation's navigation infrastructure? What alternative types of partnership options (PPPs Infrastructure Banking) will be available? How can the industry and local sponsor best help Congress achieve this? What is needed most critically is a clear statement of intent from the Federal government explaining the type and level of partner it will be in future navigation capacity maintenance and development.

Chapter 8: Considerations in a Modernization Strategy for U.S. Ports and Inlands Waterways

[Expanded summary and discussion in next draft.]

To sustain the nation's globally competitive navigation system the nation must maintain our current system and prepare, where needed, to be "*post-Panamax*" and "cascade" ready. This report has identified that the critical needs are maintenance and rehabilitation of our current system and blue water port expansion on the Southeast and Gulf coasts. This is supported by forecasts of trade, population growth, vessel size and an assessment of the current capacity of U.S. ports. The economic and environmental merits of any specific port development project needs to be individually assessed.

The study process to identify individual navigation projects for Federal investment is well established. Recently USACE has taken steps to ensure the timely execution of this process, including the Planning Modernization Initiative that requires feasibility studies to be completed more expediently. This initiative will streamline and expedite the project delivery process and will identify the project-specific critical needs for sustaining the nation's globally competitive navigation system. However, completing studies on a shorter timeframe will only add to the nation's backlog of unfunded projects unless methods are developed to finance navigation infrastructure improvements.

The strategy to sustain the nation's globally competitive navigation system must ensure the maintenance of our current system, the timely authorization and execution of individual studies and identification of a method or methods for financing development projects. There are several financing methods available for all three requirements. While traditional methods of funding are challenged by the state of the overall Federal budget, the Administration and Congress can choose to continue the traditional methods and enhance the funds available for their execution. Alternatively, the navigation industry pays fees to cover all other port costs and it would be possible (for economically desirable projects) to charge fees to cover channel expansion cost. There are numerous ways to mix our traditional methods with new methods that place more financial responsibility on the local sponsor and their users, public-private partnerships with access to financing through an infrastructure bank being the most commonly referenced.

The modernization strategy should be part of an overall national intermodal freight transportation strategy. While the three dominant freight carrier modes – water, rail and truck – compete for market share, there is a growing recognition of the need for multi-modal linkages and for infrastructure investments to be coordinated between the modes to ensure that they complement each other and serve the greater transportation needs of the nation. This can be accomplished by prioritizing navigation investment according to their multi-modal connectivity.

There is considerable uncertainty in the navigation industry regarding the expected impacts from the deployment of *post-Panamax* vessels. There is also considerable uncertainty regarding the type of partner the Federal government will be with industry in the future. Current budget priorities indicate the Federal government's role will be limited. Budgetary ceilings limit the total funds available to USACE. These funds are competed across navigation, flood control and environmental investments. Within the navigation program there is competition between maintenance of our current system and capacity expansion. The current level of funding is not adequate to meet the needs for maintenance of current capacity and needed expansion of blue water ports.

Sustaining the nation's globally competitive navigation system for future generations will require leadership and partnership. The main challenges are to finance the maintenance of our current system, to identify where to expand blue water port capacity and to determine how to finance its development. The Federal government needs to develop and articulate a clear message to industry answering these three main issues. Congress has asked for this study and the Administration has proposed a White House task force on navigation. The coincident interest of both the Congress and the Administration in this topic indicates an opportunity to work together to develop partnership guidelines, methods and expectations for a strategy to sustain the nation's globally competitive navigation system.