

DELAWARE RIVER MAIN CHANNEL DEEPENING PROJECT (PENNSYLVANIA, NEW JERSEY, AND DELAWARE)

ECONOMIC UPDATE



**U.S. Army Corps of Engineers, Philadelphia District
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INTRODUCTION

This report presents an economic update of the Delaware River Main Channel Deepening Project. The last approved document is the Supplement to Comprehensive Economic Reanalysis Report, February 2004. The economic update has followed ER 1005-2-100, Appendix D.

Background

The history and background of economic studies for the Delaware River Main Channel Deepening are described below chronologically.

Feasibility Report

The Delaware River Comprehensive Navigation Study Main Channel Deepening Interim Feasibility Report and Environmental Impact Statement were completed in February 1992. The Division Engineer's Public Notice for that report was issued in February 1992. Thereafter, the report was reviewed by the Washington Level Review Center (WLRC), and the Board of Engineers for Rivers and Harbors (BERH). In June 1992, the WLRC concurred with the findings and recommendations of the reporting officers. Subsequently, the project was reviewed by the Office of Management and Budget. A Record of Decision (ROD) for the Final Environmental Impact Statement was completed in December 1992. Public Law 102-580, Section 101(6) of the Water Resources Development Act of 1992, authorized the recommended project for construction and was modified by Section 308 of the Water Resources Development Act of 1999 Public Law 106-53, and further modified by Section 306 of the Water Resources Development Act of 2000, Public Law 1-6-541.

Preconstruction, Engineering and Design

In 1992, the Preconstruction, Engineering, and Design (PED) study was initiated. The objective of this study was to refine the recommended plan, respond to concerns raised by the WLRC review of the 1992 Interim Feasibility Report and to perform additional supplementary environmental analyses as recorded in the December 1992 Record of Decision for the Final Environmental Impact Statement. The Project Management Plan called for preparation of a Design Memorandum (DM) and an appropriate NEPA document.

With the completion of the DM and Supplemental Environmental Impact Statement as part of the PED study, the project design features for the proposed deepening to 45 feet of the Delaware River Main Channel were finalized.

In May 1996, the results of the PED study were documented in a DM which was approved by the District, as per guidance contained in CECW-EP Memorandum dated 31 May 1995, Subject: Engineering, Design and Dam Safety Guidance. In addition, a Draft Supplemental Environmental Impact Statement (SEIS) was prepared in December 1996 and made available to the public and agencies. The Final SEIS was filed with the U.S. Environmental Protection Agency in July 1997. The July 1997 Final SEIS re-affirmed the environmental impacts that were presented in the 1992 Interim Feasibility Report and Final Environmental Impact Statement. A Record of Decision (ROD) for the Final SEIS was completed in December 1998.

Limited Reevaluation Report 1998

A Limited Reevaluation Report (LRR) was completed in February 1998 to obtain approval to initiate construction, and to serve as the decision document for budgetary purposes, and the Project Cooperation Agreement.

Comprehensive Economic Reanalysis Report, 2002

The U.S. General Accounting Office (GAO), since renamed the General Accountability Office, in a June 2002 report on the Delaware River Main Channel Deepening, recommended that a comprehensive reanalysis be conducted to address uncertainties that GAO identified in the project's economic analysis in the Limited Reevaluation Report (LRR). The Assistant Secretary of the Army (Civil Works) (ASA (CW)) and the Corps of Engineers Washington, D.C. Headquarters agreed with GAO on the need for the comprehensive reanalysis as well as a review by an external independent party to ensure that the reanalysis accurately represented expected benefits and costs for the proposed project. The Director of Civil Works approved the report on 18 December 2002 and provided the report to ASA (CW). Subsequently, ASA (CW) transmitted the report to GAO on the same date.

The project benefits included the reduced costs of transportation that will be realized through operational efficiencies (from reduced crude oil lightering and cargo lightloading) and the use of larger, more efficient vessels from the proposed navigation improvement. Reduced transportation costs result in reduced production and distribution costs and thereby increase the net value of the national output of goods and services. The quantification of benefits involved computing and comparing total transportation costs for the 40 and 45 foot channel depths for each pertinent vessel class, by trade route, commodity, and by terminal. Benefits were estimated for liquid bulk (crude oil and petroleum product imports), dry bulk (including blast furnace slag and slab steel), and containerized cargo. The Comprehensive Reanalysis Report in December 2002 concluded that the channel deepening of the Delaware River to a 45 foot depth was justified with a benefit-cost ratio of 1.18. Smaller projections of commodity growth were applied in this report compared to the LRR.

Supplement to Comprehensive Economic Reanalysis Report, 2004

Following the Comprehensive Economic Reanalysis completed in December 2002, the principal lightering company that offloaded crude oil from tankers in the lower Delaware Bay, since purchased by another lightering company, provided comments on the crude oil benefit methodology and results.

In order to address the lightering company comments, a refinement of the crude oil transportation cost savings benefits was accomplished. The supplemental analysis also included a review of the other benefiting commodities and incorporated an addition to project costs to assure compliance with the General Conformity Rule of the Clean Air Act. The Director of Civil Works approved this report on 12 March 2004. This supplement to the Comprehensive Economic Analysis Report verified justification for the deepening of the Delaware River channel to a depth of 45 feet with a benefit-cost ratio of 1.15.

DESCRIPTION OF THE AUTHORIZED PROJECT

Study Area

The study area is located along the northeastern coast of the United States. The Delaware River Port System is located in the center of the Eastern industrial corridor of the United States. The port complex is served by a highly efficient rail and highway network that brings some of the greatest centers of commerce within easy reach. The proposed 45-foot channel-deepening project is located within the Delaware River and Bay and the borders of the Commonwealth of Pennsylvania, and the States of New Jersey and Delaware. It extends over 100 river miles of the Delaware River and Bay, from Philadelphia, Pennsylvania to the mouth of Delaware Bay, following the alignment of the existing 40-foot Federal projects.

Summary Description

The authorized project consists of a navigation channel extending from deep water in the Delaware Bay to Philadelphia Harbor, Pennsylvania and to Beckett Street Terminal, Camden New Jersey, a distance of about 102.5 miles. The plan provides for modifying the existing Delaware River Federal Navigation Channel (Delaware River, Philadelphia to the Sea and Delaware River in the Vicinity of Camden) from 40 to 45 feet below Mean Low Water (MLW).

NATIONAL ECONOMIC DEVELOPMENT (NED) BENEFITS-AUTHORIZED PLAN (Indexed-PLAN A)

National Economic Development (NED) benefits were updated for this Economic Update following the guidelines and procedures established in the Economic and Environmental Principles for Water and Related Land Resources Implementation Studies, February 3, 1983; the Planning Guidance Notebook, ER 1105-2-100, 22 April 2000; and the National Economic Development Procedures Manual – Deep Draft Navigation, IWR-91-R-13, dated November 1991. The February 2004 report was applied as the basis for updating benefits.

The Principles and Guidelines defines NED benefits as follows:

“Contributions to national economic development (NED) are increases in the net value of the national output of goods and services, expressed in monetary units. Contributions to NED are the direct net benefits that accrue in the planning area and the rest of the Nation. Contributions to NED include increases in the net value of those goods and services that are marketed, and also of those that may not be marketed.”

The NED benefits quantified include the reduced costs of transportation realized through operational efficiencies (reduced lightering and lightloading), and the use of larger more efficient vessels, both resulting from navigation improvements at the harbor. Reduced transportation costs result in reduced production and distribution costs and thereby increase the net value of the national output of goods and services.

Benefits will result from the decrease in the cost per ton for shipping commodities into or out of the Delaware River Port System. While commodity movements will increase in the future as a function of regional demand, no induced tonnage (i.e., commodity shifts from other ports) is claimed from the project deepening. A deeper channel depth will allow some current vessels to carry more cargo as well as allow a fleet shift to larger vessels, thus more efficiently apportioning operating costs over a greater amount of tonnage. Other vessels, such as large crude oil vessels that currently lighter at Big Stone Anchorage in the naturally deep water of the lower Delaware Bay, will continue to carry equivalent tonnage but will be able to operate more efficiently with a deepened channel resulting in reduced lightering costs. Finally, benefits are claimed for cost reductions resulting from beneficial reuse of dredged material at the authorized Broadkill Beach. Benefits have been estimated for liquid bulk (crude oil and petroleum product imports), dry bulk (blast furnace slag and steel slabs) and containerized cargo.

Economic benefits are annualized for the 50-year study period. All project benefits are computed in the Fiscal Year 2008 Price Level and are discounted at the Federal Fiscal Year 2008 discount rate of 4-7/8%.

Categories of Benefits

The categories of benefits include:

- Vessel efficiencies,
- Vessel operating cost savings (such as for bunker fuel)
- Operational efficiencies,

Beneficial use of dredged material.

Vessel Efficiencies

In the category of transportation cost savings resulting from vessel efficiencies, benefits have been identified based on the shift to larger vessels on specific trade routes. Vessel efficiencies have been identified for container ships, liquid bulk and dry bulk vessels.

Vessel Operating Cost Savings (such as for Bunker Fuel)

Rising vessel operating costs in the ensuing years since the 2004 report, especially significant in terms of bunker fuel expense increases, strengthen the case for the magnitude of efficiency that can be garnered by deep-draft channel deepening improvements. Reductions in vessel trips will achieve significant reductions in operating expenses being incurred from the utilization of bunker fuel during vessel trips. A benefit scenario sensitivity (titled 1Benefits) presented later in this economic update has analyzed the impact of the changes in the Corps' Institute for Water Resources (IWR) Deep-Draft Vessel Operating Costs from FY 2002 to FY 2008. The weighted impact of the benefiting commodities was determined to increase total project benefits by 34.6% over that time period. Of note, the cost for bunkering, represented by Heavy Viscosity Oil (HVO), increased by 126.2% over this period (based on a three-year moving average applied by IWR). Bunkering, though, is only one component of the set of costs that are aggregated to determine vessel operating costs.

Operational Efficiencies

Benefits resulting from operational efficiencies have been identified for:

- Reduced liquid bulk (crude oil) lightering: Deeper channels would allow some of the liquid bulk vessels that require lightering to access port facilities with reduced or no lightering. In some cases, this will also result in reduced transit times.
- Reduced lightloading: Deeper channels would allow some vessels that cannot currently load to their design draft to more fully load their vessels, resulting in reduced per unit operating costs. This benefit will accrue to liquid bulk, dry bulk and container vessels.

Beneficial Use of Dredged Material at Broadkill Beach

The Corps of Engineers has conducted studies along Delaware Bay to determine Federal involvement in providing shoreline and environmental projects for various communities. Authorization to undertake these studies was established in a resolution adopted in October 1986 by the Public Works and Transportation Committee, United States House of Representatives. Based on the results of these investigations, a Federal project was recommended at Broadkill Beach. Subsequently, a feasibility study was initiated in January 1993. This study was cost shared between the Federal Government and the State of Delaware, Department of Natural Resources and Environmental Control. In September 1996, a final Feasibility Report and Environmental Impact Statement was completed for Broadkill Beach. The project calls for beach nourishment utilizing sand obtained from offshore borrow areas to provide storm damage and erosion control protection. Beach nourishment will consist of a berm and dune restoration along 13,500 linear feet of the bay front.

For the Delaware River Main Channel Deepening project, dredged material in the bay consists of a sand quality suitable for beach restoration at Broadkill Beach. This material would otherwise be placed in an existing federally owned upland confined disposal facility.

QUANTIFIED NED BENEFITS (Indexed-PLAN A)

Background

Economic benefit calculations to the National Economic Development (NED) Account include only the transportation cost savings associated with vessel efficiencies and operational efficiencies, and beach renourishment at Broadkill Beach. Benefits will also likely accrue due to improved safety and beneficial ecosystem uses of dredged material at Kelly Island and Egg Island Point, but have not been quantified in the project analysis.

The following sections discuss new economic information for the port that support the overall conclusions made in the February 2004 approved document. First, the summary results of the benchmark 2004 economic analysis are listed below. Benefits are displayed by category in descending order of monetary significance. Second, total historic port activity information follows to give an overall perspective on the importance of the Delaware River port system. Third, port activity by each individual benefiting commodity with new information that post-dates the 2004 report is provided. Commodities that have been particularly notable in exceeding the tonnages projected in the 2004 report are containers, steel slabs, and blast furnace slag.

As background, a summary of economic benefit information from the last approved decision document, February 2004 Supplement to the Comprehensive Economic Reanalysis, is shown in Table 1. The analysis was based upon a 5 5/8% discount rate (FY 04 Discount Rate) at a May 2002 price level.

Table 1
Average Annual Benefits by Commodity Type-Authorized Plan
February 2004 Report

Benefit Type	Average Annual Benefits
Transportation Cost Savings	
Crude Oil	\$11,778,000
Petroleum Products	\$352,000
Containerized Cargo	\$6,124,000
Slag	\$1,807,000
Steel Slabs	\$3,605,000
Subtotal Transportation Cost Savings	\$23,665,000
Beneficial Use Cost Savings at Broadkill Beach	\$583,000
Total	\$24,249,000

Waterborne Commerce

To provide an overall understanding of economic activity and health of the economy related to this project, the following data is provided for the Philadelphia to the Sea Project—Foreign and Domestic Commerce. These are the most recent years available from the **Corps' Waterborne Commerce Statistics Center (WCSC)**:

2002: 124.0 MILLION TONS

2003: 126.8 MILLION TONS

2004: 131.0 MILLION TONS

2005: 132.3 MILLION TONS

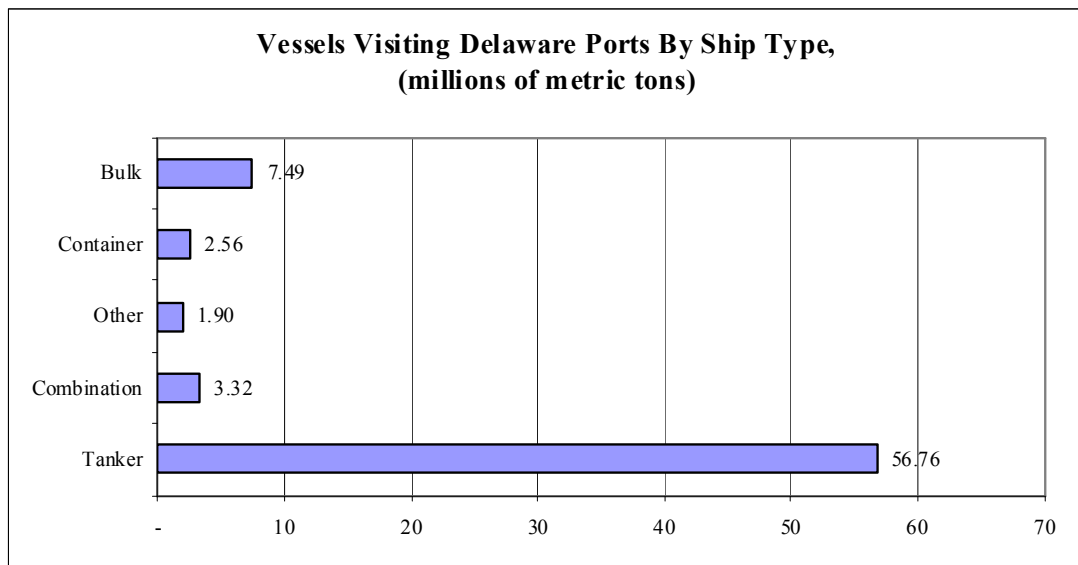
2006-2007: Not yet available from WCSC

The total tonnage through the port has been steady and displays an upward trend.

Fleet Composition

As depicted in Figure 1 (from the February 2004 report), historic data shows that the large majority of the tons of foreign commerce transported to the Delaware River consists of crude oil delivered on tankers, followed, in descending order, by bulk, combination, containerized cargo, and other vessels. Tanker vessels constitute the largest portion of vessel traffic. Nearly 44 percent of total Delaware River port system tonnage was carried on vessels in excess of 100,000 deadweight tons. Over 21 percent of total tonnage was carried on vessels in excess of 140,000 DWT.

Figure 1



Benefiting Commodities

The following sections provide updated economic data on each of the commodities included in the project's average annual benefits.

Crude Oil Benefits

NED benefits for crude oil imports are the reduced cost of transportation realized through operational efficiencies (reduced lightering) and more efficient loading of tankers that will result from navigation improvements at the harbor. Large crude oil vessels that currently lighter in the naturally deep water of the lower Delaware Bay will continue to carry equivalent tonnage into the system, but will be able to travel to the dock more fully laden in a deepened channel, thereby reducing the need for lightering. Reduced lightering costs result in reduced production and distribution costs and thereby increase the net value of the national output of goods and services.

Contracted lightering operations in the Delaware River System are primarily conducted by a single firm that also conducts lightering operations in the Gulf of Mexico and, to a lesser extent, for several other east coast refineries. In addition, several of the refineries conduct their own offshore lightering operations for tankers bound for the Delaware River, or contract with another lightering firm to operate the refineries' lightering vessels. This analysis expects, consistent with Corps guidelines and observations of past industry practices, that the lightering industry will adjust lightering fleet capacity to future conditions, whether the depth of the Delaware River channel is at 40 or 45 feet.

When calculating the NED benefits resulting from proposed navigation improvements, it is typically assumed that any productive resources no longer required will be available for productive use elsewhere in the nation. The resource cost savings associated with these "freed" resources are considered a positive contribution to the nation's productive capacity, and an NED benefit of a navigation improvement project.

An analysis was conducted in the February 2004 report to verify that adequate alternative deployment opportunities exist for the portion of Delaware River lightering resources that will no longer be required once the main ship channel is deepened to 45 feet. Typically, in an analysis of the NED benefits of navigation improvements, the business management decisions of a firm concerning alternative employment of the resources made extraneous by the improvements are not included in the analysis. From a national perspective, identification of the next best use of the resources saved (and the cost of those resources in their next best use) does not impact the expectation that the national need for resources will be reduced by the project. Although it is not appropriate to forecast the business management decisions of an individual firm for the purpose of estimating NED benefits, a listing of possible alternative employment decisions was developed. A lightering firm may choose to execute any one of these management decisions, or all of them, or any combination if the Delaware River channel is deepened:

Expand other operations within the Delaware River system.

Expand operations in Virginia and New York Harbor.

Reallocate vessels between the Gulf and the Delaware fleets.

Lease or sell extraneous resources.

Refit vessels for clean service.

Expand into the market for transport of other black oils.

The physical and cost characteristics of the existing Delaware River System lightering fleet is used in the analysis as the best approximation of physical and cost characteristics for the future fleet under both without and with project conditions. While it is expected that shifts will occur in the future fleet, this assumption is reasonable given that there are no significant changes predicted to occur within the system, i.e., similar tankers will be arriving with similar loads destined for the same refineries. The only expected change resulting from the project is the reduction in volume of lightering required under with-project conditions. The reduction in lightered volume will result in a reduction in the resources required to conduct lightering, freeing these resources for possible alternative uses and resulting in NED resource cost savings.

The operational characteristics of the existing fleet are also expected to represent the operational characteristics of the future fleet. Operational characteristics, such as the time it takes to load, offload, and transit the system, or observed vessel deployment protocols are expected to continue into the future under without and with-project conditions. The only expected changes in operational practices will be the reduced time to lighter, due to the reduced volumes that will need to be offloaded from tankers that will be able to transit the channel more fully laden under with project conditions.

The current fleet composition and observed utilization levels have been selected to balance the demands of customer satisfaction with the costs of vessel availability (i.e., that the existing fleet is sized efficiently for the current level of lightering that it performs). Current lightering vessel deployment provides an adequate amount of reserve lightering capacity to handle surges in demand without causing excessive delays and is considered to be an appropriate allocation of lightering resources.

Vessel utilization is determined by the volume of crude transported and the number of lightering trips, as well as weather delays, time for maintenance and repairs, and external constraints imposed by the refiners.

With-project resource cost savings are calculated as the proportional reduction in the costs of hull replacement, crew, lubes and stores, maintenance and repair, and administration; as well as the reduction in total fuel costs. The reduction in the costs of hull replacement, crew, lubes and stores, maintenance and repair, and administration is based upon the proportion of with-project vessel operating hours to without-project vessel operating hours. This approach to calculating resource savings is consistent with USACE policy, which is to use the change in vessel transportation costs – as a proxy for resource reductions – as the measure of project benefits. This approach focuses on the reduction in economic resources that would be required for conducting Delaware River lightering operations during the 50-year period of analysis, and does not attempt to predict in detail how any specific firm would conduct its future operations over the near or long term.

Lightering vessel operating costs were developed specifically for the February 2004 report. The Corps of Engineers Water Resources Support Center, Institute for Water Resources (WRSC-IWR) compiles information on deep draft and shallow draft vessel operating costs and publishes them approximately bi-annually in a series of Economic Guidance Memorandums. The published deep draft vessel operating costs were used in this analysis for all vessel categories, except lightering vessels. Because of the unique nature of the lightering vessels at the Delaware River (one U.S. flag double-hulled tanker and two large tug/barge combinations); the standard published vessel costs were not considered applicable for this cost component of this study. Therefore, WRSC-IWR was requested to compile vessel operating costs specifically for this

lightering fleet. These vessel-specific operating costs were developed in close cooperation with the lightering company. Cost savings are based on the difference in the proportion of the resource costs of the vessel consumed in Delaware River lightering operations under with and without project conditions.

Lightering service providers can be expected to respond to changes in future lightering demand by adjusting their fleet costs to continue to efficiently meet future lightering volume requirements under both without and with-project conditions. As described previously, over the 50 year project planning period, the lightering service providers have many other fleet configuration and deployment options (some of which have been exercised in the past), including seeking other spot market or contract work, swapping one or more vessels for smaller ones from the Gulf or elsewhere, or selling a vessel to one of the refiners or some other operator. In summary, because the analytic horizon for the deepening project is 50 years there is both time and flexibility for lightering service providers to explore alternative fleet utilization and to rationalize fleet composition to adjust to the reduction in demand resulting from the deepening project. Of the tonnage carried on tankers with design drafts greater than or equal to 40 feet (which represent 60% of total foreign commerce moved through the Delaware River port system), 35% of the tonnage was carried on tankers with design drafts between 55 feet and 60 feet, and 22% of the tonnage was carried on tankers with design drafts between 50 feet and 55 feet. There are a variety of foreign ports that are the origins of crude imports to the Delaware River. In general, vessels in the larger sizes carried cargo from the further origins in Africa, the Middle East, South America, and the North Sea. Vessels in the smaller size ranges generally carried cargo from closer origins in the Caribbean Sea and Canada. Many of these closer origins are actually transshipment facilities.

For crude oil, some facilities are expected to reconfigure their non-lightering fleet segments to allow some of the vessels to load deeper under the with project condition. Interviews with terminal operators for the February 2004 report indicated that the practice of filling vessels to the maximum allowable channel draft will continue under both with and without project conditions.

Crude Oil Imports (for Philadelphia to the Sea Project—Source WCSC)

2002: 62.4 MILLION TONS

2003: 63.9 MILLION TONS

2004: 63.9 MILLION TONS

2005: 62.8 MILLION TONS

2006-2007: Not yet available from WCSC

As was predicted in the 2004 decision document, crude oil tonnage has continued to remain stable. This finding is in accord with the relative fixed capacity at the area refineries. Technological advancements will allow for very modest growth in refinery capacity (and, thus, related crude oil imports) in future years. The 2004 benefit analysis in the approved decision document projected a minimal future average growth rate of 0.2% per year, or a total increase in refinery capacity in the study area by year 50 of the project life of 10%. The minor fluctuations in historic tonnage shown above track this expected stable level of tonnage per year for this benefit category that was applied as the baseline in the February 2004 report analysis, as the fluctuations reflect the normal maintenance practices in refinery operations.

The benefits for this commodity category are supported by the historic tonnage information for the above calendar years. The benefit magnitude for this category is affirmed, with the update of the average annual benefit estimate at \$14,852,100.

Container Benefits

Identification of containership-based benefits in the February 2004 report was based upon observations of current actual operations, including sailing drafts, port rotations, and cargo handling practices.

The Packer Avenue Terminal (PAMT) is the specific container facility in the study area that will benefit from the deepened channel. The terminal is located at the intersection of Delaware Avenue and Packer Avenue, adjacent to, and just south of the Walt Whitman Bridge in Philadelphia. The terminal facility is approximately a 106-acre terminal with six berths (3,800 linear feet of berthing space) with over 400,000 square feet of dry, cooler, and freezer warehouse space, a northern container gate, a south-end breakbulk and general cargo gate, administration offices, a vehicle maintenance and repair shop and several other terminal related buildings and operations. The terminal handles goods including containers, steel, meat, and fruit; has a 40-foot current berth depth commensurate with the existing Delaware River navigation channel; and rail service connections with CP Rail, CSX and Norfolk Southern; and 385 plugs to handle reefer container boxes. PAMT has four Kocks Cranes, one Paceco Crane, and two Hyundai Cranes which provide heavy lift direct access to truck, rail, and vessel. The facility is directly accessible to Interstate Highways I-95 and I-76. PAMT has also acquired national status as a Strategic Military Seaport in the Northeast Corridor. This designation, by the Defense Department's Military Traffic Management Command, requires the ability of the operator at the facility to load military equipment onto vessels with a minimum of advance notice. In addition, PAMT is an activated Foreign-Trade Zone.

The detailed analysis for the February 2004 report determined that some of the container lines using PAMT will benefit from a deepened channel. Other container lines use vessels that do not require a channel in excess of 40 feet. One benefiting container line provides service from the South America to the east coast of the United States. The port rotations, schedules, and vessel characteristics for these services were developed through negotiations among the multiple slot sharing partners who ship containers on these services. The schedules and port rotations were developed to achieve as many direct service calls as possible, while maintaining weekly service to each port of call. Also, two round-the-world weekly services that deliver goods between Australia-New Zealand (ANZ) and the U.S. east coast will benefit. One service is an east bound round-the-world service that originates in Australia. The same slot sharing partners also operate a west bound round-the-world service.

Because of the high proportion of refrigerated cargo carried on the east bound ANZ vessels, these vessels tend to "weigh out" instead of "cube out", which is somewhat uncommon among more typical containerships. This means that vessels on this service are more likely to achieve their maximum sailing draft due to the heavy weight of the refrigerated cargo. Data provided by the Packer Avenue Terminal in the February 2004 report presented that the average weight of a twenty foot container is 17.5 tons and the average weight of a forty foot container is 25.9 tons.

One of the major commodities imported to Philadelphia by the ANZ service is Australian meat. Other commodities imported to Philadelphia on this service include Australian wine and produce, and New Zealand meat, produce, and dairy products. Historically, imported meat was frozen for shipping, but the availability of large containerships on a weekly service has resulted in an increase in the volume of chilled meat imports from Australia (chilled meat was previously transported solely via air, at much greater cost). This shift towards chilled versus frozen meat has also been identified by the carriers and the warehouse operators.

There is an extensive refrigerated warehouse/distribution center infrastructure that has developed in the Philadelphia area, which has shifted from the Port of NYNJ region. This infrastructure includes many large refrigerated warehouses and USDA inspection facilities. The major cause of the shift in location from the Port of NYNJ to the Philadelphia-metro area is that refrigerated warehousing is a very land-intensive operation. Because of the high cost and limited availability of land in the New York metropolitan area, this industry (which services a broad geographic region), has been relocating to the relatively less expensive Philadelphia-metro area.

Discussions with the carriers for the February 2004 report determined that under with-project conditions (45 ft MLW controlling depth at the Delaware River), Philadelphia would become the port of call prior to the Port of NYNJ and that time sensitive cargo now being trucked from the Port of NYNJ to the Philadelphia-metro area warehouses would be landed in Philadelphia. Because landside transportation costs would be eliminated under the with-project condition, this would constitute a transportation cost savings for the deepening project. Therefore, an analysis of landside transportation costs was conducted to identify the differential in transportation costs that are incurred when Philadelphia-bound refrigerated cargo is routed through the Port of NYNJ (or other potential alternative ports), rather than through the Delaware River ports.

Future without-project conditions are based on a number of assumptions. These assumptions are conservative in the areas of future vessel size and growth in commodity volume. The without-project condition is based on vessels deployed on existing services.

The future sustainability of current operations is supported by five significant factors:

- There is an extensive refrigerated warehouse/distribution center infrastructure in the Philadelphia area that does not exist at the Port of NYNJ.
- The retail value and marketability of chilled meat and produce is very sensitive to the remaining shelf life of the product.
- The additional cost of trucking some time-sensitive goods from the Port of NYNJ to Philadelphia-based distributors would be negotiated as an increase in the average price across all of that customer's freight.
- Trucking of time-sensitive goods from other ports to Philadelphia-based distributors is a common industry practice. Warehouse operator indicated they regularly receive time sensitive goods from other ports.
- There are few, if any, reasonable alternatives for timely delivery of time-sensitive goods other than the current services. Although there are many carriers engaged in

this trade, they share slots on a very limited number of services and vessels, and trends towards industry consolidation and slot sharing are continuing.

In order to demonstrate that the without-project condition is the least-cost, long-term solution to the challenges of without-project cargo flows, an analysis of alternative without-project condition scenarios was conducted in the February 2004 report. This analysis of alternative without-project condition scenarios was based on estimated total transportation costs for each alternative and identification of any operational constraints associated with the alternatives.

The expected without project condition is the least cost alternative. The costs used in the analysis did not include the additional capital costs that would be required for the vessels to be refitted to carry the additional reefer cargo. Therefore, the cost differentials were considered conservative estimates of the differences in costs (i.e., benefits) between the expected without-project condition and the alternative scenarios. Similar to the without-project condition assumptions, the with-project condition is based on existing vessels deployed on existing services and future growth in commodity volumes beyond the base year during the project life is not claimed in the benefit analysis.

Historic container movements through PAMT reported by the Philadelphia Regional Port Authority (PRPA):

2005: 205,000 TEUs

2006: 247,800 TEUs

Growth Rate of TEUS from 2005-2006: 21%

The February 2004 benefit analysis projected future average growth rate of 3.4% per year to the base year. To be conservative, future growth in commodity volumes during the project life was not claimed in the benefit analysis. Annual actual tonnage growth container growth that post-dates that available for the February 2004 document was reported at 21% to 2006, with PRPA then projecting 18% per annum from 2006-2011. The actual and projections exceed the tonnage applied in the benefit analysis, and serve to confirm the reasonableness of the currently updated level of benefits (see Table 2).

**TABLE 2
PRPA FIVE-YEAR CARGO PROJECTIONS**

Cargo Type	2006-Actual	2007	2008	2009	2010	2011	PRPA % Growth Per Year	Feb 2004 Corps % Growth
Containers (TEUs)	247,817	280,624	331,136	390,740	461,073	544,066	18.0	3.4 to base year

The benefit magnitude for this category is affirmed by the historic tonnage that post-dates the 2004 report and augmented by the PRPA projections. In order to be conservative, the lower baseline tonnage from the 2004 report has been applied in the update, not the more recent higher level of tonnage data. Average annual containership benefits in this update are estimated at \$7,673,200.

Slag Benefits

Blast furnace slag (or clinker), used in the production of cement, is currently imported to the Camden Marine Terminal at Beckett Street. The existing fleet exhibits design drafts ranging from 42 feet to 46 feet and sailing drafts averaging 40 feet (with the current without project condition channel). This current fleet is expected to remain the same under the without project condition. Under the with project condition, however, the fleet is expected, through use of the charter market, to shift to larger vessels that can take advantage of the deeper channel depth. The primary port of origin for imported steel slabs has a depth of 74 feet, so that does not pose a constraint for the expected fleet shift.

The 2004 benefit analysis expected growth in tonnage to continue until capacity at the facility of 1,000,000 tons per year was reached. Actual growth in tonnage from WCSC shown below has exceeded the projected growth rate in the 2004 report. The figures below show total growth in tonnage of 164%, or 38.3% per annum. Capacity should be reached by the project base year, with no additional growth in annual tonnage over the project life.

2002: 323,000 TONS

2003: 450,000 TONS

2004: 606,000 TONS

2005: 851,000 TONS

2006-2007: Not yet available from WCSC

Interviews with the terminal operator for the February 2004 report determined that the slag imports would shift to larger bulk vessels with design drafts in excess of 45 feet under with project conditions. Bulk vessels are contracted from the charter market and there are no barriers to fleet replacement. Therefore, an 80,000 DWT foreign flag bulk vessel drafting 46 feet was selected to represent the with project condition fleet, in order to accommodate each year's total tonnage.

The benefit magnitude for this category is affirmed, with the updated average annual benefit estimate of \$2,263,500.

Steel Slab Benefits

Steel slabs are currently imported through Packer Avenue Terminal on a variety of vessels with design drafts ranging from 34 feet to 45 feet and sailing drafts ranging from 33 feet to 40 feet.

This existing fleet is expected to remain the same under the without project condition, with the use of similarly sized vessels to handle future commodity growth. Under with project conditions, the operator of Packer Avenue Terminal has indicated that it is likely that there will be a shift to larger vessels that could take full advantage of a 45-foot channel. These dry bulk vessels will be contracted from the charter market; therefore there are not any sunk investment costs that would mitigate against a fleet shift. The current steel slab charter fleet contains greater variability in design draft and sailing draft than the furnace slag fleet. Two vessel sizes were chosen to comprise the with project fleet: a 60,000 DWT, 42-foot design draft bulker and an 87,000 DWT, 47-foot design draft bulker.

The 2004 benefit analysis in the approved decision document had a projection of future average growth rate of only 1% per year for steel slabs.

PRPA provided the following historic data:

2005: 999,000 Tons

2006: 1,226,000 Tons

The growth rate of tons from 2005-2006 equals 23%, and is significantly above the projections in the February 2004 decision document. PRPA also has a projected growth rate for 2006 to 2011 for steel slabs of 7.5% per year, as shown in Table 3 below. The WCSC database could not be applied as an alternative reference for historic tonnage, since this Corps' source does not provide data categorized specifically as container movements.

**TABLE 3
PRPA FIVE-YEAR CARGO PROJECTIONS**

Cargo Type	2006-Actual	2007	2008	2009	2010	2011	PRPA % Growth Per Year	Feb 2004 Corps % Growth
Steel Slabs	1,226,126	1,318,085	1,416,941	1,523,225	1,637,466	1,760,275	7.5	1.0

The actual tonnage post-dating the February 2004 report exceeds the tonnage applied in the 2004 benefit analysis. The current tonnage of 1,226,000 tons is above the 1,000,000 tons used in the February 2004 report as the base year tonnage. The benefit magnitude for this category is affirmed and has applied the baseline tonnage from the 2004 report to be conservative in the update. The updated average annual benefit estimate is \$4,572,400.

Petroleum Product Benefits

A beneficiary is currently depth-constrained and handles refined petroleum products (#6 fuel oil, diesel, and home heating oil predominantly). This operational practice is expected to continue

under both the with project and without project conditions. A fleet of larger vessels would be employed to take advantage of the deeper 45-foot channel under the with project condition.

The 2004 benefit analysis from the decision document applied a minimal future average growth rate of 0.2% per year for the petroleum products, and this expectation is reasonable in relation to the historic tonnage reported by the **Corps' Waterborne Commerce Statistics Center:**

2002: 476,000 TONS

2003: 736,000 TONS

2004: 518,000 TONS

2005: 708,000 TONS

2006-2007: Not yet available from WCSC

Tonnage fluctuates, but the average amount of historic tonnage for the four available years shown above is 610,000 per year. This average level of tonnage is slightly above the 560,000 tons used in the February 2004 report as the baseline. The benefit magnitude for this category is affirmed and has applied the baseline tonnage from the 2004 report to be conservative in the update. The updated average annual benefit estimate is \$432,500.

Benefits from Beneficial Use Cost Savings at Broadkill Beach

Benefits would be realized due to cost savings resulting from jointly developing the Delaware River and Broadkill Beach projects rather than developing them independently. The Delaware River Main Channel Deepening Project has the capability to provide dredged material for beach nourishment for Broadkill Beach. In doing so, the Delaware River project is assigned the NED cost savings (i.e., NED benefits) from beneficial use of the disposal of material. The following approach was used in estimating potential NED cost savings. With the least cost option established (in the 2004 report), \$12.23 million (FY 2008 price level) in avoided borrow area sand source costs at Broadkill Beach is a benefit for the material provided by the Delaware River project. On an average annual basis, this is equal to \$657,100 in benefits (multiplying this cost savings by the Capital Recovery Factor, at the 4 7/8% discount rate, for the 50 year period of analysis).

AVERAGE ANNUAL BENEFITS (Indexed-PLAN A)

The economic update has reestimated benefits that would result from deepening the Delaware River Main Channel from its current authorized and maintained project depth of 40 feet below MLW to the recommended depth of 45 feet below MLW.

A three-step approach was used to update benefits. First, as a baseline, during the 2004 report analysis, the benefits, at a 2002 price level, had been computed at both the 5 7/8% and 5 5/8% discount rates. Using the relationships established for this 1/4% point change, adjustments in this current update were calculated at the 4 7/8% discount rate for each of the benefiting commodities. Second, the price level index factor of 26.1% from 2002 to 2008 was applied. Third, the change for the Broadkill Beach category due to the discount rate and price level changes was incorporated into the benefits. Applying all these steps sequentially, total average annual benefits have increased by 25.6% from the 2004 report (2002 price level) to the 2008 price level and discount rate.

An Internal Technical Review (ITR) of the benefit analysis for this economic update has been conducted by CENAE. All ITR comments have been resolved.

The average annual NED benefits of the 45-foot deepening plan are presented in FY 2008 Price Levels at the prevailing FY 2008 federal discount rate of 4-7/8 percent. Table 4 displays average annual benefits by individual category, with the total equal to \$30,450,800.

Table 4
Average Annual Benefits by Category-Authorized Plan

Benefit Type	Average Annual Benefits
Transportation Cost Savings	
Crude Oil	\$14,852,100
Petroleum Products	\$432,500
Containerized Cargo	\$7,673,200
Slag	\$2,263,500
Steel Slabs	\$4,572,400
Subtotal Transportation Cost Savings	\$29,793,700
Beneficial Use Cost Savings at Broadkill Beach	\$657,100
Total	\$30,450,800

BENEFIT SENSITIVITY (1Benefits) (APPLYING IMPACT OF INCREASE IN IWR DEEP-DRAFT VESSEL OPERATING COSTS FROM FY 2002 TO FY 2008)

Benefits have been revised in this scenario (here named 1Benefits) applying the weighted impact on the changes in IWR vessel operating costs for the benefiting commodities from the FY 2002 vessel operating cost summary table to the FY 2008 set of tables developed for individual vessel types. For the Broadkill Beach category, the benefits are the same as for the Indexed-Authorized plan. The net result of this benefit sensitivity, in Table 8, is an increase in the total benefit estimate of 34.6% from the prior report to this economic update. This is higher than the 25.6% increase displayed for benefits in the authorized plan indexed update presented in a prior section of this economic update.

Table 5
Average Annual Benefits

	Average Annual Results FY 2008
Transportation Cost Savings	
Crude Oil	\$15,223,600
Petroleum Products	\$456,700
Containerized Cargo	\$8,840,200
Blast Furnace Slag	\$2,493,200
Steel Slabs	\$4,973,800
Subtotal Transportation Cost Savings	\$31,987,600
Beneficial Use Cost Savings at Broadkill Beach	\$657,100
Total Project Benefits	\$32,644,600

NATIONAL ECONOMIC DEVELOPMENT (NED) COSTS- AUTHORIZED PLAN (Indexed-PLAN A)

This section presents the current indexed estimate (FY 2008 Price Levels) of NED costs for the Delaware River Main Channel Deepening Project authorized plan.

Initial Construction Costs

The cost estimate was updated from the February 2004 report for the initial dredging of the Federal portions of the project.

The estimate for the Federal portion of the project assumes using pipeline, clamshell and hopper dredges. Cost estimates take into account environmental windows that may be encountered during dredging or placement of dredged material.

Cost estimates were updated for disposal area preparation. The disposal area work consists of site clearing, raising dikes and constructing sluices. Construction schedules, disposal areas use schedule and all quantities for initial and maintenance dredging cost estimates, including disposal area development were updated in estimating the cost of the project.

Due to the amount of material to be dredged, disposal area capacity considerations and locations, construction is scheduled to take five years.

Real Estate Costs

Costs were updated to \$13,499,100 to acquire land and temporary easements for sand placement.

Navigation Aid Costs

Costs were updated to \$406,100 for the U.S. Coast Guard to relocate and install aids to navigation.

Air Quality Impacts (General Conformity- Clean Air Act)

The February 2004 report analysis demonstrated that several viable options exist to allow the channel deepening project to achieve general conformity compliance for carbon monoxide and nitrogen dioxide, with the recommended option having an updated cost of \$15,892,000.

Associated Costs

Associated costs are defined in the Planning Guidance Notebook, ER 1105-2-100, Appendix D. Economic and Social Considerations, D-3. NED Cost Evaluation Procedures, subparagraph f. Evaluation Procedure: Associated Costs.

“Associated costs are the costs of measures needed over and above project measures to achieve the benefits claimed during the period of analysis Base associated costs on the current market prices of goods and services required for the installation of measures needed over and above project measures (2) It is preferred that associated costs be explicitly treated as NED project related costs, and appear as costs in benefit-cost ratios.”

Associated costs for the Delaware River project consist of: a) any required initial construction and dredging costs necessary to achieve benefits from a deepened Federal channel, and b) any increase in the annual operations and maintenance costs of benefiting entities, in excess of those needed to maintain their facilities for the existing 40 foot project. Associated costs were updated for the benefiting facilities and are included in the NED project cost estimate, at \$28,454,900.

Summary of Initial Costs

Table 6 below displays the initial project costs for the cost categories. All costs are updated to FY 2008 Price Levels.

**Table 6: Project First Costs-Authorized Plan
(FY 2008 Price Level)**

Account	Item	Cost (Excluding PED)
01	Lands, Easements-Rights of Way	\$13,499,100
02	Relocations	\$0
12	Navigation, Ports and Harbors	\$248,429,100
12a	Navigation Aids	\$406,100
18	Cultural Mitigation	\$0
30	Engineering and Design (including Pre-PPA)	\$28,863,000
	Preconstruction Engineering and Design-Sunk	\$0
31	Construction Management	\$14,403,800
	Subtotal Project First Cost	\$305,421,100
	Associated First Cost	\$28,454,900
	Total Project First Cost	\$333,876,000

Operation and Maintenance Costs

Federal Project

Estimates were updated for maintenance costs of the Federal portions of the project. These costs were updated to a FY 2008 price level. Average annual maintenance dredging costs are equal to \$3,738,000, and average annual maintenance costs for navigation aids are \$117,000.

Associated Costs

Associated costs for operations and maintenance include any increase in the annual operations and maintenance costs of benefiting entities, in excess of those needed to maintain their facilities for the existing 40 foot project. The incremental maintenance costs for maintaining the 45-foot depth at the berthing area (s) (i.e., the difference between the maintenance costs of the 45 and 40 foot depths) is included in the update. Updated incremental average annual maintenance dredging costs are equal to \$173,000.

Interest during Construction

Interest during Construction (IDC) is an economic cost of the project and is therefore included in the NED cost estimate. ER 1105-2-100, paragraph 2-4.k.(3), defines Interest During Construction:

“Other direct costs are the costs of resources directly required for a project or a plan but for which no implementation outlays are made. Examples of these costs are interest during construction...”

The Planning Guidance Notebook, ER 1105-2-100, Appendix D. Economic and Social Considerations, D-3. NED Cost Evaluation Procedures, subparagraph D. (10) states:

“Interest During Construction. This represents the opportunity cost of capital incurred during the construction period. The cost of a project to be amortized is the investment incurred up to the beginning of the period of analysis. The investment cost at that time is the sum of construction and other initial cost plus interest during construction. Cost incurred during the construction period should be increased by adding compound interest at the applicable project discount rate from the date the expenditures are incurred to the beginning of the period of analysis. “

Interest during Construction (IDC) has been updated for the construction period, and is equal to \$44,401,000. Interest during construction was also updated for associated costs at \$1,599,000.

AVERAGE ANNUAL COSTS (INDEXED-PLAN A)

Average annual costs (AACs) have been indexed applying FY 2008 Price Levels and the federal FY 2008 discount rate of 4-7/8 percent. Average annual costs of \$24,436,000 are summarized in Table 7 below.

Table 7: Average Annual Costs-Authorized Plan

Cost Item	Cost (Excluding PED)
Financial First Costs	\$305,421,000
Interest During Construction (Financial First Costs)	\$44,401,000
Associated First Costs	\$28,455,000
Interest During Construction (Associated Cost)	\$1,599,000
Total Economic First Costs	\$379,876,000
Average Annual Economic First Costs	\$20,408,000
Annual Operations and Maintenance – Project	\$3,738,000
Annual Operations and Maintenance – Associated	\$173,000
Annual Operations and Maintenance – Navigation Aids	\$117,000
Total Average Annual Costs	\$24,436,000

SUMMARY OF BENEFITS AND COSTS (Indexed-PLAN A)

Table 8 below presents a summary of current indexed benefits and costs compared to those previously presented in the February 2004 report (at a May 2002 price level and 5 5/8% discount rate).

Table 8
Average Annual Benefits and Costs-Authorized Plan Comparison

	Average Annual Results Feb 04 Report	Average Annual Results FY 2008 Econ Update
Transportation Cost Savings		
Crude Oil	\$11,778,000	\$14,852,000
Petroleum Products	\$352,000	\$433,000
Containerized Cargo	\$6,124,000	\$7,673,000
Blast Furnace Slag	\$1,807,000	\$2,263,000
Steel Slabs	\$3,605,000	\$4,572,000
Subtotal Transportation Cost Savings	\$23,665,000	\$29,794,000
Beneficial Use Cost Savings at Broadkill Beach	\$583,000	\$657,000
Total Project Benefits	\$24,249,000	\$30,451,000
Total Project Costs	\$21,025,000	\$24,436,000
Benefit-Cost Ratio	1.15	1.25
Average Annual Net Benefits	\$3,223,000	\$6,014,000

BENEFIT-COST RATIO FOR AUTHORIZED PLAN OF IMPROVEMENT (Indexed-PLAN A)

For the authorized plan of improvement, all project costs and benefits are computed in FY 2008 Price Levels and are discounted at the current prevailing federal FY 2008 discount rate of 4-7/8%. The project life is 50 years. In accordance with ER 1105-2-100, expended PED costs are considered sunk, therefore the current benefit-cost ratio is 1.25 with net benefits annually of \$6,014,000.

SENSITIVITY 1

SENSITIVITY 1 INPUT: BENEFIT SCENARIO (1Benefits) (APPLYING IMPACT OF INCREASE IN IWR DEEP-DRAFT VESSEL OPERATING COSTS FROM FY 2002 TO FY 2008)

As discussed above, benefits have been revised in this scenario (1Benefits) applying the weighted impact on the changes in IWR vessel operating costs for the benefiting commodities from FY 2002 (the price level for the February 2004 report) to FY 2008. The net result, in Table 9, is an increase in the total benefit estimate of 34.6% from the prior report to this economic update. This is higher than the 25.6% increase displayed for benefits in the authorized plan indexed update presented in a prior section of this economic update.

Table 9
Average Annual Benefits-Sensitivity 1

	Average Annual Results FY 2008
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Transportation Cost Savings	
Crude Oil	\$15,223,600
Petroleum Products	\$456,700
Containerized Cargo	\$8,840,200
Blast Furnace Slag	\$2,493,200
Steel Slabs	\$4,973,800
Subtotal Transportation Cost Savings	\$31,987,600
Beneficial Use Cost Savings at Broadkill Beach	\$657,100
Total Project Benefits	\$32,644,600
<hr/>	

SENSITIVITY 1 INPUT: COST SCENARIO (1Costs): CHANGE IN FUEL COSTS TO INCORPORATE CURRENT SPOT PRICE FOR DREDGING OPERATION

This sensitivity scenario changes fuel costs to incorporate the current spot price for the dredging operation.

Summary of Initial Costs

Table 10 below displays the initial project costs for the cost categories. All costs are updated to FY 2008 Price Levels.

Table 10
Project First Costs-Sensitivity 1
(FY 2008 Price Level)

Account	Item	Cost (Excluding PED)
01	Lands, Easements-Rights of Way	\$13,499,100
02	Relocations	\$0
12	Navigation, Ports and Harbors	\$291,424,800
12a	Navigation Aids	\$406,100
18	Cultural Mitigation	\$0
30	Engineering and Design (including Pre-PPA)	\$28,683,000
	Preconstruction Engineering and Design-Sunk	\$0
31	Construction Management	\$16,872,100
	Subtotal Project First Cost	\$350,885,100
	Associated First Cost	\$28,454,900
	Total Project First Cost	\$379,340,000

Operation and Maintenance Costs

Federal Project

Estimates were calculated for maintenance costs of the Federal portions of the project at a FY 2008 price level. Average annual maintenance dredging costs are estimated to be \$5,126,000, and average annual maintenance costs for navigation aids are updated to \$117,000.

AVERAGE ANNUAL COSTS (1Costs)

Average annual costs have been determined applying FY 2008 Price Levels and the federal FY 2008 discount rate of 4-7/8 percent. Average annual costs of \$28,622,000 are summarized in Table 11 below.

Table 11
Average Annual Costs-Sensitivity 1

Cost Item	Cost (Excluding PED)
Financial First Costs	\$350,885,000
Interest During Construction (Financial First Costs)	\$51,011,000
Associated First Costs	\$28,455,000
Interest During Construction (Associated Cost)	\$1,599,000
Total Economic First Costs	\$431,950,000
Average Annual Economic First Costs	\$23,205,000
Annual Operations and Maintenance – Project	\$5,126,000
Annual Operations and Maintenance – Associated	\$173,000
Annual Operations and Maintenance – Navigation Aids	\$117,000
Total Average Annual Costs	\$28,622,000

SENSITIVITY 1: BENEFIT-COST RATIO INCORPORATING BOTH SENSITIVITY BENEFIT SCENARIO (1Benefits) (APPLYING IMPACT OF INCREASE IN IWR DEEP-DRAFT VESSEL OPERATING COSTS FROM FY 2002 TO FY 2008) AND SENSITIVITY COST SCENARIO (1Costs) (CHANGE IN FUEL COSTS TO INCORPORATE CURRENT SPOT PRICE FOR DREDGING OPERATION)

Table 12 below presents a summary of benefits and costs for the sensitivity 1 combination of these benefit and cost sensitivity scenarios.

**Table 12
Average Annual Benefits and Costs-Sensitivity 1**

	Average Annual Results FY 2008
Transportation Cost Savings	
Crude Oil	\$15,223,600
Petroleum Products	\$456,700
Containerized Cargo	\$8,840,200
Blast Furnace Slag	\$2,493,200
Steel Slabs	\$4,973,800
Subtotal Transportation Cost Savings	\$31,987,600
Beneficial Use Cost Savings at Broadkill Beach	\$657,100
Total Project Benefits (Rounded)	\$32,645,000
Total Project Costs (Rounded)	\$28,622,000
Benefit-Cost Ratio	1.14
Average Annual Net Benefits	\$4,023,000

For sensitivity 1, all benefits and costs are computed in FY 2008 Price Levels and are discounted at the current prevailing federal FY 2008 discount rate of 4-7/8%. The project life is 50 years. In accordance with ER 1105-2-100, expended PED costs are considered sunk, therefore the benefit-cost ratio is 1.14 with net benefits annually of \$4,023,000.

SENSITIVITY 2

SENSITIVITY 2 INPUT: COST SCENARIO (2Costs) (UTILIZATION OF FEDERAL DISPOSAL SITES ONLY AND CHANGE IN FUEL COSTS TO INCORPORATE CURRENT SPOT PRICE FOR DREDGING OPERATION)

Summary of Initial Costs

Table 13 below displays the initial project costs for the cost categories for the scenario utilizing a combination of 1) federal disposal sites only, and 2) the change in fuel costs to incorporate the current spot price for the dredging operation. All costs are updated to FY 2008 Price Levels.

**Table 13
Project First Costs-Sensitivity 2
(FY 2008 Price Level)**

Account	Item	Cost (Excluding PED)
01	Lands, Easements-Rights of Way	\$0
02	Relocations	\$0
12	Navigation, Ports and Harbors	\$300,154,700
12a	Navigation Aids	\$406,100
18	Cultural Mitigation	\$0
30	Engineering and Design (including Pre-PPA)	\$27,003,800
	Preconstruction Engineering and Design-Sunk	\$0
31	Construction Management	\$17,083,800
	Subtotal Project First Cost	\$344,648,500
	Associated First Cost	\$28,454,900
	Total Project First Cost	\$373,103,400

Operation and Maintenance Costs

Federal Project

Estimates were calculated for maintenance costs of the Federal portions of the project at a FY 2008 price level. Average annual maintenance dredging costs are estimated to be \$5,932,000, and average annual maintenance costs for navigation aids are updated to \$117,000.

AVERAGE ANNUAL COSTS (2Costs)

Average annual costs for sensitivity 2 have been determined applying FY 2008 Price Levels and the federal FY 2008 discount rate of 4-7/8 percent. Average annual costs of \$29,068,000 are summarized in Table 14 below.

Table 14
Average Annual Costs-Sensitivity 2

Cost Item	Cost (Excluding PED)
Financial First Costs	\$344,648,000
Interest During Construction (Financial First Costs)	\$50,104,000
Associated First Costs	\$28,455,000
Interest During Construction (Associated Cost)	\$1,599,000
Total Economic First Costs	\$424,806,000
Average Annual Economic First Costs	22,845,000
Annual Operations and Maintenance – Project	\$5,932,000
Annual Operations and Maintenance – Associated	\$173,000
Annual Operations and Maintenance – Navigation Aids	\$117,000
Total Average Annual Costs	\$29,068,000

SENSITIVITY 2: BENEFIT-COST RATIO INCORPORATING BOTH SENSITIVITY BENEFIT SCENARIO (1Benefits) (APPLYING IMPACT OF INCREASE IN IWR DEEP-DRAFT VESSEL OPERATING COSTS FROM FY 2002 TO FY 2008) AND SENSITIVITY COST SCENARIO (2Costs) (UTILIZATION OF FEDERAL DISPOSAL SITES ONLY AND CHANGE IN FUEL COSTS TO INCORPORATE SPOT PRICE FOR DREDGING OPERATION)

Table 15 below presents a summary of benefits and costs for this combination of benefit and cost sensitivity scenarios.

Table 15
Average Annual Benefits and Costs-Sensitivity 2

	Average Annual Results FY 2008
Transportation Cost Savings	
Crude Oil	\$15,223,600
Petroleum Products	\$456,700
Containerized Cargo	\$8,840,200
Blast Furnace Slag	\$2,493,200
Steel Slabs	\$4,973,800
Subtotal Transportation Cost Savings	\$31,987,600
Beneficial Use Cost Savings at Broadkill Beach	\$657,100
Total Project Benefits (Rounded)	\$32,645,000
Total Project Costs (Rounded)	\$29,068,000
Benefit-Cost Ratio	1.12
Average Annual Net Benefits	\$3,577,000

For sensitivity 2, all benefits and costs are computed in FY 2008 Price Levels and are discounted at the current prevailing federal FY 2008 discount rate of 4-7/8%. The project life is 50 years. In accordance with ER 1105-2-100, expended PED costs are considered sunk, therefore the benefit-cost ratio is 1.12 with net benefits annually of \$3,577,000.

CONCLUSION

The economic update presented in this document concludes that the project remains economically justified at the current FY 08 discount rate and price level for the authorized plan (indexed) as well as for two sensitivity analyses.

The authorized plan (Indexed-Plan A) has a BCR=1.25, with net benefits of \$6,014,000 per year.

The two sensitivity analyses displayed the following results:

Sensitivity 1: with both the benefit sensitivity scenario for updating deep-draft vessel operating costs and the cost sensitivity scenario that incorporates the current spot price of fuel for the dredging operation (i.e., 1Benefits/1Costs), the BCR=1.14, with net benefits of \$4,023,000 per year.

Sensitivity 2: with both the benefit sensitivity scenario for updating deep-draft vessel operating costs and the cost sensitivity scenario that incorporates the combination of the current spot price of fuel and utilizes only federal disposal sites (i.e., 1Benefits/2Costs) the BCR=1.12, with net benefits of \$3,577,000 per year.