



**Wilmington Harbor, North Carolina
Navigation Improvement Project**

**Integrated
Section 203 Study
&
Environmental Report**

INTEGRATED MAIN REPORT

June 2019

NORTH
CAROLINA
FERTILIZERS

Division of Agriculture, North Carolina
Department of Agriculture

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Executive Summary

1. Study Information

Study Authority: Construction of the Federal navigation channel to its current dimensions was originally authorized as three separate projects by the Water Resources Development Acts of 1986 (WRDA 86) Public Law 99-662 and 1996 (WRDA 96) Public Law 104-303. Public Law 105-62, The Energy and Water Development Appropriations Act of 1998, combined the Wilmington Harbor Northeast Cape Fear River Project (WRDA 1986), the Wilmington Harbor Channel Widening Project (WRDA 1996), and the Cape Fear-Northeast (Cape Fear) Rivers Project (WRDA 1996) under a single project known as the Wilmington Harbor 96 Act Project.

This study of potential navigation improvements to the Wilmington Harbor Federal navigation channel leading from the Atlantic Ocean to the Port of Wilmington, North Carolina has been prepared by the North Carolina State Ports Authority (NCSPA) under the authority granted by Section 203 of Water Resources Development Act (WRDA) of 1986 (P.L. 99-662), as amended.

Study Sponsor: The non-Federal interest is the State of North Carolina, acting through the North Carolina State Ports Authority (NCSPA).

Study Purpose and Scope: The NCSPA has conducted this Section 203 study to determine the feasibility of improvements to the Federal navigation project at Wilmington Harbor. Potential improvements include deepening and widening of the Federal navigational channel, extending the ocean entrance channel farther offshore, expansion of the Turning Basin, and expanded wideners at turns along the channel. The purpose of these potential improvements is to efficiently accommodate larger cargo vessels which are already using or are projected to use the port in the near future. This study identifies and evaluates alternatives that will:

1. accommodate recent and anticipated future growth in cargo vessel traffic;
2. improve the efficiency of operations for cargo vessels at Wilmington Harbor;
3. allow larger and more efficient cargo vessels to use Wilmington Harbor; and
4. allow for the Port of Wilmington to remain a port-of-call on major US East Coast containership services that also call at Asian ports.

Since the last major channel improvements were completed by the Corps of Engineers in 2002, the Port of Wilmington has experienced significant growth in cargo volume, and in the size of vessels calling at the port. Over the intervening years, the NCSPA has made major investments in landside infrastructure to accommodate growth at the Port of Wilmington and the region that it serves. At the present time, the Port of Wilmington is the largest port in North Carolina and is a major component of the State's economy. The NCSPA is currently implementing Master Plan recommendations valued at \$240 million for yard, gate, and operations improvements to increase annual throughput capacity to 1 million TEUs per year

Inadequate channel capacity currently impacts trade at the Port of Wilmington and is projected to have a greater detrimental impact on trade in the future, providing the impetus for the NCSPA to conduct this Section 203 study. Pursuant to Section 203 of WRDA 1986, this study is intended to determine the feasibility and extent of federal and non-federal participation in improving the

federal Wilmington Harbor navigation channel, consistent with the federal objective of maximizing contributions to National Economic Development (NED), and consistent with protecting the nation's environment.

Project Location/Congressional District: The Port of Wilmington, in southeastern North Carolina, is approximately 28 miles up the Cape Fear River from the Atlantic Ocean. The Cape Fear River borders Brunswick County to the west and New Hanover County to the east. The Port has excellent intermodal transportation connections. Interstate Highway 40 connects Wilmington with the state capital Raleigh, and to Interstate 95. State highway 74 and Interstate highway 74 connect the port to Charlotte, the state's most populous city. The CSX rail system connects the Port of Wilmington directly to intermodal transfer facilities in Charlotte. The Port of Wilmington is also connected to the CSX Carolina Connector rail hub. The project is located in the 7th Congressional District of North Carolina

Prior Reports and Existing Water Projects: The federal channel from the Atlantic Ocean to Wilmington has been incrementally improved for more than 100 years (USACE 1996). Over that time many reports have been developed. The most recent reports include the three reports combined by the Energy and Water Development Appropriations Act of 1998 into a single project known as the Wilmington Harbor 96 Act Project:

- U.S. Army Engineer District, Wilmington. 1990. Final Supplement to the Final Environmental Impact Statement for Wilmington Harbor – Northeast Cape Fear River, North Carolina. February 1996.
- Interim Feasibility Report and Environmental Impact Statement on Improvement of Navigation, Wilmington Harbor Channel Widening, USACE Wilmington District, March 1994. The recommended plan consists of widening the channel from 400 feet to 600 feet for a length of 6.2 miles to provide a passing lane. The Chief's Report is dated 24 June 1994. The work was completed in 2003.
- Final Feasibility Report and Environmental Impact Statement on Improvement of Navigation, Cape Fear – Northeast Cape Fear Rivers Comprehensive Study, Wilmington, North Carolina, USACE Wilmington District, June 1996. The recommended plan consists of:
 - Deepening the channel from the Atlantic Ocean to Wilmington from a depth of 38 feet to a depth of 42 feet, including the Anchorage Basin; along with deepening the ocean bar channel from 40 to 44 feet;
 - Deepening the 32-foot and 25-foot channel reaches in the upriver portion of the harbor to 38 feet and 34 feet, respectively; along with widening the channel from the existing width of 200 feet to 250 feet; and
 - Deepening the Turning Basin at the upper project limit in the Northeast Cape Fear River from 25 to 34 feet; along with widening the upper Turning Basin from 700 to 800 feet.

The Chief's Report is dated 09 September 1996. The project up to the Cape Fear Memorial Bridge was completed in 2003. The remaining authorized improvements from the Cape Fear

Memorial Bridge to the upper project limit (deepening the 32-foot and 25-foot channel reaches in the upriver portion of the harbor) were deferred due to a marginal cost to benefit ratio.

In 2011, USACE developed a Reconnaissance Report (Section 905(b) Report), which recommended that a Feasibility Study for additional improvements be performed. The Feasibility Study (2014) recommended realignment of the Entrance Channel, widening of the Battery Island channel, and assorted modifications that increase the radius of the turn at Battery Island.

- Section 905 (b) Analysis Wilmington Harbor Navigation Improvements, New Hanover and Brunswick Counties, North Carolina, USACE Wilmington District, April 2011. The section 905 (b) analysis recommended that the Wilmington Harbor Navigation Improvement study proceed into the feasibility phase only for channel widening, turning basin enlargement, and other modifications at the existing project depth.
- Final Integrated Feasibility Report and Environmental Assessment Wilmington Harbor Navigation Improvements, USACE Wilmington District, October 2018. The recommended plan combines the following components to increase the available turning radius of the Battery Island turn from 2,850 feet to 3,900 feet¹:
 - Realignment of the Entrance Channel reach 1 westward away from a shoal that forms to the east of the channel;
 - Widen Battery Island channel from 500 feet to 750 feet;
 - Provide additional tapers where Southport and Lower Swash channel join Battery Island Channel; and
 - Provide a 750 feet-wide by 1,300 feet long cutoff between Battery Island channel and Lower Swash channel.

Federal Interest: This Section 203 Integrated Feasibility Study and Environmental Report substantiates the federal interest in the Wilmington Harbor Navigation Improvement Project based on \$128.9 million average annual equivalent net National Economic Development benefits resulting from transportation cost savings.

2. Study Objectives

Problems and Opportunities: In general, the problem at Wilmington Harbor is that containerized trade, in terms of volume and size of vessels, has outgrown the Federal navigation channel that accesses the Port of Wilmington. The existing and projected future volume of trade and size of vessels using the Port of Wilmington are constrained by channel dimensions. The insufficient dimensions of the Federal channel limits vessel size, limits vessel loading, and increases the cost of trade through the Port. The limits on vessel size and operating drafts at Wilmington Harbor make it infeasible for the newer and more efficient vessels in the USEC-Asia

¹ Note that the design vessel for the October 2018 study is the same design vessel used in the 1996 report, which supported the recommended plan constructed in 2003. That design vessel is substantially smaller than the design vessel for this study.

services to call at the Port of Wilmington. Without the Port of Wilmington as a port-of-call on USEC-Asia services, cargo currently using the Port of Wilmington will be required to use other US east coast ports where channel conditions can accommodate the newer more efficient vessels.

There are opportunities for the NCSIPA to more effectively and efficiently meet the demand for the cargo services now and in the future. Opportunities for improvement include:

- Allow existing and projected future cargo vessels to have less restricted access to berths and terminals, reducing delays and increasing the efficiency of port operations;
- Allow existing and projected future cargo vessels to be loaded more efficiently;
- Allow larger cargo vessels to be used that can deliver more cargo at lower unit costs; and
- Achieve the full capability and efficiency of terminal and infrastructure improvements at the Port of Wilmington.

Improvements to the Federal navigation channel would increase the efficiency of cargo vessels currently using the Port, as well as allow the use of larger, more efficient vessels in the future. This increase in efficiency will result in significant transportation cost savings compared to the expected future without-project conditions, especially as the realization of opportunities for increased vessel efficiency allows the Port of Wilmington to remain a port-of-call on USEC-Asia services.

Planning Objectives: The primary planning goal for this study is to recommend a navigation plan for Wilmington Harbor that meets the Federal objective, which is to contribute to national economic development consistent with protecting the nation's environment, pursuant to national environmental statutes, applicable executive orders, and other Federal planning requirements. Contributions to NED are the direct net economic benefits that accrue in the planning area and in the rest of the nation. NED benefits for deep draft navigation projects are calculated as the transportation cost savings that typically result from improvements to general navigation features, such as channels, dredged material disposal facilities, turning basins, etc. Transportation cost savings are calculated as reductions in the cost of transporting goods from their ultimate origin to their ultimate destination, consistent with the Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies (U.S. Water Resources Council, 10 May 1983). The conceptual basis for NED benefits resulting from improvements to the Federal navigation channel at Wilmington Harbor is that the improved channel will reduce vessel inefficiencies, which allow the Port of Wilmington to continue to be a port-of-call on USEC-Asia services. Under without-project conditions, cargo from the Port of Wilmington's hinterland must travel to the alternative deep-water port (Savannah, GA), which is a substantially farther distance and more costly truck haul.

In addition to the Federal objective, project-specific planning objectives have been identified, and these objectives guided the plan formulation process in this study. Based on the problems posed by channel dimensions and the opportunities available through channel improvements (as detailed in Sections 4.1 and 4.2), the following planning objectives have been established to assist in the development of management measures and evaluation of alternative plans:

Objective 1: Reduce access restrictions for containerships on USEC-Asia services at the Port of Wilmington to accommodate use by larger vessels from 2027 to 2076.

Objective 2: Accommodate efficient loading of containerships on USEC-Asia services at the Port of Wilmington from 2027 to 2076.

Objective 3: Maintain the Port of Wilmington as a port-of-call for USEC-Asia services from 2027 to 2076.

Planning Constraints: In addition to the typical general constraints which impact the planning process, this analysis was also impacted by a set of project specific constraints. These planning constraints restrict the set of alternative plans developed and also influence the technical investigations conducted during the analysis. Constraints on the formulation of alternatives include:

- Avoid impacts to groundwater resources;
- Avoid impacts to existing waterfront infrastructure;
- Avoid impacts to marine facilities at MOTSU;
- Avoid or minimize impacts to recreational boaters and commercial fishing vessels using the channel; and
- Avoid or minimize impacts to natural and historic resources within the study area.

3. Alternatives

Plan Formulation Rationale: This study used the same project-specific planning criteria used in USACE project planning, to the extent possible by a non-Federal interest, as guided by the Principles and Guidelines (1983), the Planning Guidance Notebook, ER 1105-2-100 (22 Apr 2000), and The National Environmental Policy Act (NEPA) of 1969, and Procedures for Implementing NEPA, ER 200-2-2 (4 Mar 1988). The Technical Working Groups, including Federal and state agencies have assisted in the development of evaluation criteria for this study.

Management Measure Identification and Evaluation: Several management measures were identified to address the navigation-related problems at Wilmington Harbor including operational (i.e., non-structural) measures, locally implemented structural measures, structural measures implemented at other ports, and structural modification of the Federally authorized channel. The management measures identified and evaluated in this feasibility study were developed through discussions and interviews with Port of Wilmington operations and management personnel, Cape Fear River Pilots Association, terminal operators, shipping agents, and tugboat operators that work in Wilmington Harbor.

Non-structural measures identified as potential improvements to navigation at Wilmington Harbor include:

- Reduce vessel speed in the channel;

- Increase the use of tugboat assistance to improve vessel maneuverability;
- Relocate aids to navigation to take advantage of naturally deep areas;
- Use tidal advantage; and
- Use lightering.

Structural measures identified as potential improvements to navigation at Wilmington Harbor include:

- Channel deepening
- Stepped channel
- Improve existing turning areas and/or create new turning areas
- Improve existing anchorages and/or create new anchorages
- Channel widening to accommodate vessel meeting.

Local service facility improvements could increase terminal efficiency by using more and/or larger cranes and other equipment enhancements, which could potentially reduce the vessel's time at the dock and/or allow for larger vessels to be loaded and unloaded efficiently. Enhancement options discussed with the users include:

- Container terminal improvements;
- Relocation of cargo terminals;
- Berth deepening;
- Bulk terminal improvements, and
- Breakbulk/General Cargo terminal improvement.

The study constraints and planning objectives were used to screen the range of measures. Table ES-1 shows the measures considered for this study and the results of initial measures screening.

**Table ES-1
 Objectives – Measures Matrix**

Measure	Meets Objectives			Carried Forward	
	1	2	3		
Structural Modification Measures					
1	Channel Deepening	Yes	Yes	Yes	Yes
2	Stepped Channel	Yes	Yes	Yes	No
3	Turning Basin	No	No	No	No
4	Anchorage Basin	No	No	No	No
5	Channel Widening	No	No	No	No
Operational Measures					
6	Reduce vessel speed	No	No	No	No
7	Additional tug assistance	No	No	No	No
8	Additional aids to navigation	No	No	No	No
9	Tidal advantage	Yes	Yes	No	Yes
10	Lightering	No	No	No	No
Locally Implementable Measures					
11	Terminal improvements	No	No	No	No
12	Relocate cargo terminals	No	No	No	No
13	Berth deepening	Yes	Yes	Yes	Yes
14	Bulk Terminal improvements	No	No	No	No
15	BreakBulk Terminal	No	No	No	No

Preliminary Plan Formulation: The No Action Alternative and Preliminary Alternative Plans were developed to address the problems and opportunities at Wilmington Harbor. The no action alternative is the expected future without-project condition, which is used as the basis of comparison for all other alternative plans. Under the no action alternative, none of the operational measures (other than the existing practice of using tidal advantage), locally implementable measures, or the structural modifications to the Federal channel would be implemented. The result of the no action alternative plan would be constrained vessel operations at the Port of Wilmington, which would continue throughout the period of analysis. Under the No Action Alternative, vessels on USEC- Asia services would not include the Port of Wilmington as a port-of-call due to the high cost (to the carrier) of light-loading at Wilmington. Smaller vessels, which would not be restricted at the port of Wilmington under without-project conditions, would not replace larger vessels on USEC- Asia services because it is economically infeasible for small vessels to operate competitively on these services.

Asia cargo (imports and exports) on the USEC-Asia services with origins and destinations in the Port of Wilmington hinterland would use alternative ports under the No Action Alternative. Without the Port of Wilmington in the port rotation for these services, the most likely alternative ports are Savannah and Charleston, which are nearer to the Port of Wilmington hinterland than

other USEC ports. Savannah is the most likely alternative port for both services because it comes before Charleston in the port rotation, which reduces delivery times for carriers by offloading or picking up cargo at the first reasonable opportunity, which provides a competitive advantage for carriers.² In addition, Savannah has a greater throughput capacity than Charleston, which could readily absorb Port of Wilmington hinterland cargo.

Combining the three measures which were advanced for more detailed analysis (channel deepening, berth deepening, and use of tide) directly address Objectives 1 and 2, which allow use of larger vessels and allow more efficient vessel loading. However, the three measures combined do not necessarily meet Objective 3, which is to maintain the Port of Wilmington as a port-of-call for USEC-Asia services, if channel depths are not sufficient to maintain Wilmington as a port-of-call.

To meet Objective 3, (maintain the Port of Wilmington as a port-of-call on USEC-Asia services) the Port of Wilmington must be able to support the carrier's profit-making objective by ensuring that the decision to call at the Port of Wilmington is an economically rational decision. Existing conditions and projected future without-project conditions indicate that the Port of Wilmington has the TEU volume, terminal capacity, and vessel service capability to be a port-of-call on USEC-Asia services. However, with a maximum operating draft of 41 feet, it would not be economically rational for the carrier to extensively light-load on a regular basis in order to call at the Port of Wilmington (Table ES-2). Under without-project conditions, Wilmington's hinterland cargo would be handled at a deeper alternative port (Savannah), which is an existing ports-of-call on USEC-Asia services. Channel deepening to depths less than -47 feet (-44 feet through -46 feet) do not reduce Port of Wilmington unit costs to levels close to unit costs experienced at Savannah as they are under existing conditions.

Table ES-2
Weighted Average Unit Costs for PPX3 at Alternative Depths

Port	Project depth (ft)	\$/TEU/1,000 miles	Differential
Existing Condition			
Savannah	-42	\$39.79	
Wilmington	-42	\$42.30	6.3%
Without-Project Condition			
Savannah	-47	\$29.43	
Wilmington	-42	\$42.30	43.7%
With-Project Alternative Depths			
Wilmington	-44	\$37.52	27.5%
Wilmington	-45	\$35.44	20.4%
Wilmington	-46	\$33.53	13.9%
Wilmington	-47	\$30.85	4.8%
Wilmington	-48	\$29.43	0%

² Sensitivity analyses are conducted for Charleston as the alternative port and for a 50%/50% split between Savannah and Charleston.

Vessels on the USEC-Asia services are currently transitioning to PPX3 vessels, which includes the design vessel. These vessels are large enough to take advantage of a deeper channel at the Port of Wilmington but will not call at Wilmington under the without-project draft restrictions of a 42-foot channel, when ongoing improvements at other USEC ports in the port rotation having been completed. Incremental channel deepening plans reduce draft restrictions at the Port of Wilmington and reduce the difference in operating drafts between Wilmington and the other ports-of-call on the USEC-Asia services.

The 47-foot plan is the smallest plan that reduces the difference in operating drafts and differences in waterborne transportation costs down to differences experienced under existing conditions (Table ES-2). The 47-foot plan reduces the difference in operating cost per TEU down to 4.8% from the 43.7% differential projected for without-project conditions, which is similar to the 6.3% cost differential experienced under existing conditions. Carriers on the two USEC-Asia services are projected to call at the Port of Wilmington when the operating draft difference and associated unit costs between the ports-of-call are similar to the differences experienced under existing conditions, which first occurs with the -47-foot channel depth. The 46-foot plan provides a cost differential of 13.9%, which is more than double the existing cost differential and therefore considered insufficient to cause cargo to remain at Wilmington.

An incremental economic analysis was performed to identify the channel depths that would be included in the final array of alternatives. (Table ES-3). The incremental economic analysis shows that net benefits are negative for incremental depths of -44, -45, and -46 feet. This occurs because the channel is not deep enough at those depths for carriers to shift large vessels to Wilmington Harbor, and the vessels in the Wilmington Harbor without-project fleet are not large enough to take advantage of the deeper channel. At -47 feet the design vessel can load to an economically efficient depth and carriers will include Wilmington Harbor as a port of call for USEC-Asia services. Landside transportation cost savings are substantial because Wilmington's hinterland Asia cargo can use the Port of Wilmington instead of the Port of Savannah. Waterborne transportation costs increase slightly because of the additional distance incurred by adding Wilmington Harbor to the port rotation. At -48 feet and -49 feet net benefits are less than net benefits at -47 feet because the incremental waterborne transportation benefits of additional depth are less than the incremental construction costs.

Table ES-3
Preliminary Alternative Plan Evaluation: Average Annual Equivalent Net Benefits

	44-foot Plan	45-foot Plan	46-foot Plan	47-foot Plan	48-foot Plan	49-foot Plan
Landside Benefits	\$0	\$0	\$0	\$166,440	\$166,440	\$166,440
Waterborne Benefits	\$0	\$0	\$0	(\$7,948)	(\$7,624)	(\$7,313)
Total Benefits	\$0	\$0	\$0	\$158,492	\$158,816	\$159,127
Total Costs	\$11,780	\$17,670	\$23,560	\$29,630	\$35,810	\$43,279
Net Benefits	(\$11,780)	(\$17,670)	(\$23,560)	\$128,862	\$123,006	\$115,848

Note: Values in thousands of FY19 dollars discounted over 50 year at the FY19 discount rate of 2.875%

Final Array of Alternatives: The final array of alternatives includes the No Action Alternative and the -47-foot Plan. The -48-foot Plan is evaluated with detailed costs and benefits to confirm the NED Plan. Based on the preliminary evaluation of alternatives and to minimize environmental impacts, the NCSPA decided not to pursue a plan larger than the -47-foot plan. Plans smaller than the -47-foot plan are not economically justified and therefore are not included in the Final Array of Alternatives.

Alternative Plan Evaluation: Transportation Cost Savings: The projected future commodity tonnage and the projected future fleet are the same under without- and with-project conditions. The NED benefits generated by the project are the transportation cost reductions due to commodities with origins and destinations in the Port of Wilmington hinterland moving through alternative ports under without-project conditions and shifting to the Port of Wilmington under with-project conditions. Under existing conditions, the Asia cargo in question uses the Port of Wilmington. Under without-project conditions, including completion of the several channel deepening projects at USEC ports, the depth deficit at the Port of Wilmington will make it economically infeasible for the two USEC-Asia services to maintain the Port of Wilmington as a port-of-call. Under with-project conditions, channel deepening removes the depth deficit making the Port of Wilmington an economically rationale choice as a port-of-call, as it is under existing conditions.

The calculation of origin to destination transportation cost savings includes waterborne transportation costs and landside transportation costs (Table ES-4). Total transportation cost savings are net of any increases in transportation costs, which may occur due to cargo traveling additional distances under with-project conditions. Savannah is the most likely alternative port for both USEC-Asia services because Savannah comes before Charleston in the port rotation for both services and because carriers would reduce delivery times by offloading or picking up cargo at the first reasonable opportunity, which is a competitive advantage for carriers. Asia cargo with origins and destinations in the Port of Wilmington hinterland is projected to use Savannah under without-project conditions.

**Table ES-4
Total Transportation Cost Savings**

	-46-foot Plan	-47-foot Plan	-48-foot Plan
Waterborne Savings	\$0	(\$7,948,000)	(\$7,624,000)
Landside Savings	\$0	\$166,440,000	\$166,440,000
Total Benefits	\$0	\$158,492,000	\$158,816,000

Alternative Plan Evaluation: Environmental Impacts: Alternative plans have been formulated and evaluated to ensure that project-related adverse environmental impacts have been avoided or minimized to the extent practicable and that remaining unavoidable significant adverse impacts are mitigated. Avoidance and minimization were pursued wherever feasible. Avoidance and minimization efforts were integral to project planning and influenced channel design, dredged material placement locations, dredged material placement techniques, and mitigation plan formulation. Avoidance and minimization efforts include identification of the

minimal depth required to maintain Wilmington as a port-of-call, minimization of channel widths to maintain one-way traffic for the design vessel, locating widening areas to avoid induced erosion, and identifying beneficial use of dredged material opportunities to minimize the loss of sand within the system. The remaining unavoidable adverse impacts to ecological resources will be addressed by the mitigation plan in coordination with USACE and agency consultation.

Direct and indirect spatial and or temporal effects of the TSP on ecological resources that may require compensatory mitigation include the indirect effects of salinity shifts on tidal wetlands, direct effect of conversion of shallow water benthic habitat within Primary Nursery Area (PNA) to deeper (>4m) benthic habitat, and changes in suitable habitat for representative fish species.

Completion of the Uniform Mitigation Assessment Method functional assessment during the NEPA coordination process with the Tidal Wetlands Technical Working Group will serve as the principal basis for coming to a consensus on the total effects of salinity changes on wetland conversion and the extent of mitigation required. Further coordination with the Fish and Fish Habitat Technical Working Group during the NEPA process will serve as the basis for gaining concurrence on the analysis performed, as well as the selection of a preferred mitigation option for any unavoidable effects of the TSP on PNA's, fish, and fish habitat.

The environmental documentation provided with the Section 203 Report should be considered a preliminary draft document for review and comment by the USACE once authorized to do so by the ASA(CW). Upon formal consultation between USACE and federal resource agencies for environmental compliance, the effects of the TSP on resources within the study area will be finalized and resource impacts considered significant by the interagency Technical Working Groups will be identified. In addition, formal consultation between USACE and NMFS (i.e., Section 7, MMPA, Essential Fish Habitat) and between USACE and USFWS (Coordination Act Report) will include interagency teams to perform functional assessments for determining mitigation requirements, and for providing their required coordination documents. The mitigation and monitoring plan has not been completed, because completion requires agency consultation by USACE, which cannot occur at this stage of the Section 203 process. Environmental compliance tasks other than NEPA, to be performed by USACE in coordination with the NCSIPA upon ASA(CW) authorization to do so, include Section 106, Section 7, USFWS Coordination Act, Essential Fish Habitat (EFH), MMPA, and eventually Section 103. While not a comprehensive list of all the compliance requirements, these are the key items which affect development of the formal Draft Integrated Feasibility Study and Environmental Impact Statement for NEPA coordination and processing, and determination of the mitigation and monitoring program.

Key Assumptions: The key assumptions of the analysis include the forecasted without-project and with-project conditions as described below.

Without-project Conditions at USEC Ports: Under future without-project conditions, the Federal channel at Wilmington Harbor would remain at a depth of -42 feet MLLW. Planned improvements to USEC ports would become operational (Table ES-5) under without-project conditions. The container ship fleet on USEC-Asia services will consist of PPX3 and PPX3Max vessels, which would have a maximum operating draft of 41 feet at Wilmington Harbor and 48 feet at other USEC ports.

Table ES-5
Current and Future USEC Port Depths – Major Container Ports

Port	Current Depth	Future Depth & Status	Projected Completion
Boston*	40 feet	48 feet - under construction	2024
New York*	50 feet	50 feet - constructed	Complete
Philadelphia	45 feet	45 feet - constructed	Complete
Baltimore	50 feet	50 feet - constructed	Complete
Norfolk	50 feet	55 feet – in design	2025
Wilmington, NC	42 feet	42 feet – constructed	N/A
Charleston*	45 feet	52 feet – under construction	2021
Savannah*	42 feet	47 feet – under construction	2020
Jacksonville*	40 feet	47 feet – under construction	2025
Port Everglades	42 feet	48 feet – in design	2024
Miami	50 feet	50 feet - constructed	Complete

* USE*USEC-Asia service loop partners with Port of Wilmington, NC

Without-project and With-project Commodity Forecast: The without-project and the with-project conditions use the same USEC commodity forecast. The commodity forecast was capped with no additional growth in 2045.

Without-project and With-project Vessels and Vessel Operations: Under without-project conditions PPX3 and PPX3Max containerships, which are capable of operating with drafts as much as 50 feet, will be the vessel classes used on USEC-Asia services. Recent historical trends, existing conditions, and projected future conditions support the fleet forecast.

Selected Plan: The Selected Plan is the NED Plan, which includes navigation improvements to the existing channel and mitigation. The -47-foot plan maximizes net benefits at an average annual equivalent of \$128.9 million (FY 2019 price levels and discount rate; 2.875%). At the next increment (-48-foot plan), there is a decrease in net benefits, which indicates that a plan deeper than the -47-foot plan does not provide greater benefits. Therefore, the NED plan is positively identified as the -47-foot plan. The -47-foot Plan includes dredging the Federal navigation channel from its currently authorized and maintained depth of -42 ft MLLW in the river and -44 ft MLLW beginning at the Battery Island Reach and extending offshore to new depths of -47 ft MLLW in the river and -49 ft MLLW beginning at the Battery Island Reach and extending offshore. The FY 2019 construction cost of the Selected Plan (including interest during construction), is \$750,342,000. The Selected Plan FY 2019 annual average equivalent cost (including annual maintenance) is \$29,630,000. Selected Plan FY 2019 average annual equivalent benefits are \$158,492,000, which result in average annual equivalent net benefits of \$128,862,000 and a benefits-to-cost ratio of 5.4.

Technical Review and Independent External Peer Review: Technical review was performed by independent experts on economic and engineering modeling. Independent External Peer Review will be performed concurrent with formal NEPA compliance.

4. Expected Project Performance

Project Costs: The project costs include all project related costs such as costs related to construction, PED, interest during construction (IDC), real estate, additional O&M, and mitigation (Table ES-6). There are no utility relocations. Economic costs (i.e., those included in NED calculations) also include the associated costs related to port infrastructure that are required to ensure the realization of projected transportation cost savings. The single associated cost (borne entirely by the non-Federal sponsor) is for berth deepening. The project has a benefits-to-cost ratio of 2.6 at 7% (Table ES-7).

**Table ES-6
 47-foot Plan Cost (FY19 Dollars)**

Cost Item	Cost
Dredging	\$531,120,000
Aids to Navigation	\$8,675,000
Associated Costs (berths)	\$1,450,000
Interest During Construction	\$25,884,000
Construction Supervision & Admin	\$10,800,000
Preconstruction Engineering & Design	\$17,965,000
Contingency (23.7%)	\$124,448,000
Mitigation & Monitoring	\$30,000,000
Total	\$750,342,000
Incremental Maintenance Increase	\$1,155,000

Table ES-7
47-foot Plan Net Benefits (FY19 Dollars)

	-47-foot Plan (2.875%)	-47-foot Plan (7%)
Total Annual Benefits	\$158,492,000	\$153,492,000
Annualized Project Costs	\$28,470,000	\$57,170,000
Annual Maintenance Costs	\$1,160,000	\$1,160,000
Total Annual Costs	\$29,630,000	\$58,330,000
Net Benefits	\$128,862,000	\$95,162,000
Benefit to Cost Ratio	5.4	2.6

Cost Sharing: Cost sharing for the Selected NED Plan will be done in accordance with Section 101 of the WRDA 1986, as amended, and cost shared as a General Navigation Feature. Project cost sharing between the Federal government and the non-Federal sponsor (Table ES-8) is based on 100% of the project having a controlling depth less than -50 feet MLLW, indicating the project would be cost-shared 75% Federal / 25% non-Federal.

**Table ES-8
Project Cost Shares**

Cost Item	Total Cost	75% Federal	25% Non-Federal
Dredging Cost	\$531,120,000	\$398,340,000	\$132,780,000
Mitigation & Monitoring	\$30,000,000	\$22,500,000	\$7,500,000
Construction S&A	\$10,800,000	\$8,100,000	\$2,700,000
PED	\$17,965,000	\$13,474,000	\$4,491,000
Contingency (23.4%)	\$124,448,000	\$93,336,000	\$31,112,000
Total Construction of GNF	\$714,333,000	\$535,750,000	\$178,583,000
Lands & Damages	\$0	\$0	\$0
Total Project First Costs	\$714,333,000	\$535,750,000	\$178,583,000
Berthing Area Dredging Costs	\$1,450,000	\$0	\$1,450,000
Aids to Navigation	\$8,675,000	\$8,675,000	\$0
10% GNF Non-Federal		-\$71,433,000	\$71,433,000
Total Cost	\$724,458,000	\$472,992,000	\$251,466,000

Operation, Maintenance, Repair, Rehabilitation, and Replacement (OMRR&R):

Additional annual maintenance costs to the United States are estimated to be \$1,155,000 (FY 2019). Maintenance of any non-Federal ancillary facilities is a 100% non-Federal responsibility.

Environmental Compliance: Environmental Compliance will be completed by USACE upon direction of the ASA(CW).

State and Agency Review: State and Agency Review will be coordinated by USACE upon direction of the ASA(CW).

Certification of Peer and Legal Review: Certification of Peer and Legal Review will be completed by USACE upon direction of the ASA(CW).

Policy Compliance Review: USACE Policy Compliance Review will be completed by USACE upon direction of the ASA(CW).

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