Final Independent External Peer Review Report Wilmington Harbor 403 Letter Report and Environmental Impact Statement, North Carolina

Prepared by
Battelle Memorial Institute

Prepared for
Department of the Army
U.S. Army Corps of Engineers
Deep Draft Navigation Planning Center of Expertise
Mobile District

Contract No. W912HQ25P0093

November 25, 2025

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It can be done

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Executive Summary

Project Background and Purpose

The draft Letter Report and EIS were prepared by the U.S. Army Corps of Engineers (USACE) in accordance with USACE policies, the National Environmental Policy Act (NEPA), as amended, and in accordance with USACE Procedures for Implementing NEPA found at 33 Code of Federal Regulations (CFR) Part 230. It presents the results of investigations and analyses conducted to evaluate potential navigation system improvements at Wilmington Harbor, North Carolina.

Introduction

It is important to note that the 403 Letter Report and EIS are not documentation of a feasibility study (a feasibility report). The 403 documents are supplemental to prior efforts of the State of North Carolina, acting through the North Carolina State Ports Authority (NCSPA). The NCSPA completed a feasibility study through the authority of Section 203 of the Water Resources Development Act (WRDA) of 1986 (P.L. 99-662), as amended. The study was conducted to determine the feasibility of potential improvements to the Federal Navigation System (FNS) at Wilmington Harbor. The report recommending deepening the harbor from -42 feet mean lower low water (MLLW) to -47 feet MLLW, was submitted to the Assistant Secretary of the Army (Civil Works) (ASA(CW)) for review in February 2020. In May 2020, the document was transmitted to Congress for authorization. Accompanying the report was the ASA(CW)'s Assessment Report which identified unresolved issues and included recommendations to perform the following work to resolve those issues:

- Reframe assumptions and the screening of alternatives
- Perform economic analysis for multiple depth alternatives using the USACE methodology
- Conduct NEPA analysis including supporting engineering modeling and appropriate sea level change information
- Finalize mitigation and real estate plans
- Conduct an Independent External Peer Review (IEPR)

Congress conditionally authorized the recommended navigation improvements, at a total cost of $834,093,000, through Section 403 of WRDA 2020. The conditional authorization included a requirement to address the issues and concerns identified in the ASA(CW) Assessment Report. In 2022, the USACE Wilmington District (CESAW) was tasked with producing a Letter Report (LR) and NEPA documentation to address those outstanding issues through a cost-shared effort with the NCSPA.

The Letter Report documents the results of efforts performed to address the unresolved engineering, economic, environmental and policy comments as identified in the ASA(CW)'s Assessment Report. The

EIS is an attachment to the Letter Report and responds to the need to fulfill NEPA requirements. Therefore, to summarize:

- The 403 effort is not considered a Feasibility Study.
- The 403 documents are supplemental to the Section 203 Feasibility Report (which has already been reviewed by Congress).
- The recommended plan, as documented in the Section 203 Feasibility report, has been conditionally approved by Congress.
- Congress only asked for the outstanding issues to be addressed, and a final assessment to be provided by the ASA(CW); therefore, the scope of the 403 effort is limited to addressing the unresolved issues identified in the ASA(CW) Review Assessment.
- Feasibility study milestones, SMART Planning processes, typical milestone products, and related criteria do not apply to the 403 effort.
- Any topics outside the issues identified as unresolved in the Review Assessment are not to be addressed by the 403 effort.

Proposed Federal Action

The CESAW is evaluating potential improvements to the FNS at Wilmington Harbor to determine if the proposed deepening would improve cargo transportation efficiencies and better accommodate the larger vessels that are anticipated to comprise the vessel fleet that will serve Wilmington Harbor in the future.

The EIS evaluates the No Action Alternative (NAA; Future Without Project (FWOP) condition) and two action alternatives. The action alternatives being considered would deepen most of the FNS from its current authorized depth of -42 feet MLLW to a new depth of either -47 feet MLLW (Alternative 1) or -46 feet MLLW (Alternative 2). In both alternatives, the Entrance Channel reaches (Battery Island to Bald Head Shoal Reach 4) would be authorized an additional 2 feet of depth to account for ocean conditions. Furthermore, the proposed Federal action would also expand the width of several of the reaches along the channel and add an additional reach to the Outer Ocean Bar, Baldhead Shoal Reach 4. The Entrance Channel extension would be approximately 9 miles long and would connect the current Entrance Channel to the closest naturally occurring desired depth. In addition to lengthening and deepening the existing FNS, the proposed action would widen all or parts of all reaches except for the Upper and Lower Midnight and Bald Head Shoal- Reach 2.

Proposed placement areas for both the initial action and operation and maintenance include the Ocean Dredged Material Disposal Site (ODMDS) and various beneficial use placement areas (beaches, bird islands, intertidal marsh restoration, fish habitat enhancement structures, riverbank protection, and back bay marsh restoration). Approximately half of the material dredged for initial construction would be used beneficially rather than placed in the ODMDS.

In summary, the proposed action would deepen, widen, and extend the existing FNS, and would place material in various areas with respect to both beneficial use application and the ODMDS.

Purpose and Need for Proposed Action

The Port of Wilmington is the largest port in North Carolina and is a major component of the State's economy. Since the last major channel improvements were completed in 2002, the Port of Wilmington has experienced significant growth in cargo volume, and in the size of vessels calling at the port has increased. Over the intervening years, the NCSPA has invested in landside infrastructure to

accommodate growth at the Port of Wilmington and the region it serves. The NCSPA is currently implementing Master Plan recommendations valued at over $300 million for yard, gate, and terminal operations improvements to increase annual throughput capacity to 1 million TEUs (twenty-foot equivalent unit: standard unit for container ship capacity) per year. The purpose of the proposed federal action is to contribute to national economic development (NED) by addressing transportation inefficiencies for the forecasted vessel fleet, consistent with protecting the Nation's environment. Action is needed to address the constraints that contribute to inefficiencies in the existing navigation system's ability to safely and efficiently serve the forecasted vessel fleet and process the forecasted cargo types and volumes.

Tentatively Selected Plan

The results of the origin-destination transportation cost saving benefit analysis are included in the report. The 46-foot alternative marginally maximizes net NED benefits, but both the 46-foot and the 47-foot alternatives are justified based on benefits exceeding costs.

The difference in average annual net benefits between the 46-foot and the 47-foot plans is small, about $325,000 per year. Additionally, no unacceptable environmental impacts were identified for either alternative, and the environmental impacts are similar in nature and are not out of proportion in magnitude when compared with each other and the NAA. Considering these results along with the scope and intent of this analysis, as well as its existing conditional authorization, the 47-foot alternative is identified as the NED Plan and the Tentatively Selected Plan.

Independent External Peer Review Process

Independent, objective peer review is regarded as a critical element in ensuring the reliability of scientific analysis. USACE is conducting an IEPR of the Wilmington Harbor 403 LR and EIS, North Carolina (including Brunswick, New Hanover, Bladen, and Pender Counties) (hereinafter: Wilmington Harbor 403 LR/EIS IEPR). As a 501(c)(3) non-profit science and technology organization, Battelle is independent, free from conflicts of interest (COIs), and meets the requirements for an Outside Eligible Organization per guidance described in USACE (2024). Battelle has experience in establishing and administering peer review panels for USACE and was engaged to coordinate this IEPR. The IEPR was external to the agency and conducted following USACE and Office of Management and Budget (OMB) guidance described in USACE (2024) and OMB (2004). This final report presents the Final Panel Comments of the IEPR Panel (the Panel). Details regarding the IEPR (including the process for selecting panel members, the panel members' biographical information and expertise, and the charge submitted to the Panel to guide its review) are presented in appendices.

Based on the technical content of the decision documents and the overall scope of the project, Battelle identified potential candidates for the Panel in the following key technical areas: Civil Works planning/economics; environmental; hydrology, hydraulics and coastal engineer; and geotechnical engineer/geology. Battelle screened the candidates to identify those most closely meeting the selection criteria and evaluated them for COIs and availability. USACE was given the list of all the final candidates to independently confirm that they had no COIs, and Battelle made the final selection of the four-person Panel from this list.

The Panel received electronic versions of the decision documents (2,940 pages in total), along with a charge that solicited comments on specific sections of the documents to be reviewed. Following guidance

provided in USACE (2024) and OMB (2004), USACE prepared the charge questions, which were included in the draft and final Work Plans.

The USACE Project Delivery Team (PDT) briefed the Panel and Battelle during a kick-off meeting held via teleconference at the start of the review to provide the Panel with an opportunity to ask questions of USACE and clarify uncertainties. Other than Battelle-facilitated teleconferences, there was no direct communication between the Panel and USACE during the peer review process.

IEPR panel members reviewed the decision documents individually and produced individual comments in response to the charge questions. The panel members then met via teleconference with Battelle to review key technical comments and reach agreement on the Final Panel Comments to be provided to USACE. Each Final Panel Comment was documented using a four-part format consisting of (1) a comment statement; (2) the basis for the comment; (3) the significance of the comment (high, medium/high, medium, medium/low, or low); and (4) recommendations on how to resolve the comment. Overall, 19 Final Panel Comments were identified and documented. Of these, four have been identified as having high significance, two have medium/high significance, five have medium significance, five have medium/low significance, and three have low significance.

Battelle received public comments from USACE on the Wilmington Harbor 403 LR/EIS (approximately 186 total pages of comments) and provided them to the IEPR panel members. The panel members were charged with determining if any information or concerns presented in the public comments raised any additional discipline-specific technical concerns with regard to the Wilmington Harbor 403 LR/EIS review documents. After completing its review, the Panel confirmed that no new issues or concerns were identified other than those already covered in the Final Panel Comments.

Results of the Independent External Peer Review

The panel members agreed on their “assessment of the adequacy and acceptability of the economic, engineering, and environmental methods, models, and analyses used” (USACE, 2024) in the Wilmington Harbor 403 LR/EIS review documents. Note that the Panel took into consideration the information provided in the original Section 203 report attached to the Draft LR when conducting their review. Table ES-1 lists the Final Panel Comment statements by level of significance. The full text of the Final Panel Comments is presented in Section 4.2 of this report. The following summarizes the Panel’s findings.

Based on the Panel’s review, the Draft LR and EIS were well-written and organized. Both documents, when considered with the original Section 203, provide supporting documentation on the engineering, environmental, economic, and plan formulation findings. However, the Panel identified several elements of the Draft LR and EIS modeling and assessment where additional analyses are warranted and places where clarification of project assumptions and findings need to be documented or revised.

Engineering: The Panel stated the Draft LR and EIS did a good job of identifying and incorporating existing subsurface data and leveraging that data to complete a wide array of analyses to frame the alternative configurations, impacts, and design needs. They also noted that state-of-the-art modeling tools were used to evaluate the alternatives. However, the Panel identified several concerns regarding the hydrodynamic modeling that should be further investigated, clarified, and if needed, corrected. These concerns are focused on the use of different data to calibrate and run the models when calculating cohesive sediment transport, including whether the model reliably predicts the effects of the alternatives. The Panel also found the Draft EIS does not provide sufficient evidence that the spatial distribution of

shoaling along the navigation channel is accurately represented using morphological acceleration factor parameter (*morfac*)-based simulations, as opposed to full-period simulations without morphological factors. The Panel is concerned that the future maintenance dredging volumes may be overestimated by 50% or more due to uncertainty in the shoaling calibration. The Draft EIS does not clearly compare modeled shoaling rates to historical annual averages across channel reaches. Available data suggest the modeled total shoaling rate is approximately 50% or more higher than historical averages for the entire channel, raising concerns about accuracy and cost implications.

The Panel is also concerned that waves were excluded from the cohesive sediment transport simulations. Wind-generated waves, particularly during storm events or strong winds aligned with the channel axis, can resuspend fine sediments and accelerate shoaling. Although the hydrodynamic and water quality model calibration and validation methods are well documented, the comparison of modeled and measured data does not demonstrate the model's ability to capture intraday variability, spatial variability, or accurately simulate stratification and layered flow dynamics.

Economic/ Plan Formulation: The Panel recognizes that a significant amount of work was put into the cost estimate, however, information on how the future containerized shipping forecast was specifically derived has not been included. This is a concern because the forecast is not supported by publicly available information. In addition, the Panel identified a lack of uncertainty bounds associated with the calculation of future benefits within the Draft LR and EIS. Without a transparent assessment of uncertainty, decision-makers cannot fully evaluate the reliability of the economic justification, nor can they determine the extent to which benefits may vary under alternative and reasonable future conditions. The Panel also noted that the cost analysis provided in the Draft LR and EIS appears to exclude operation and maintenance (O&M) costs, and a rationale for excluding the O&M costs has not been documented.

Environmental: The Panel noted that the mitigation measures were transparent and well done. To ensure that all potential impacts are taken into consideration, the Panel states that potential underwater ecological impacts of noise on fish and other marine biota from dredging operations should be addressed in the Draft LR and EIS. The Panel recommended inclusion of data from chemical and bioassay testing of sediments and presenting the basis for the conclusion that those sediments are acceptable for disposal at the ODMDS and in beneficial use applications.

The Panel also stated that, based on the terminology used throughout the Conceptual Blast Mitigation Plan, it is unclear what actions will be required in the contractor's final blasting plan, because there is no direct linkage or required actions between the Conceptual Blasting Plan and the contractor-developed Comprehensive Blasting Plan. Right now, the Conceptual Plan includes a lot of terms like "may be" and "examples" rather than more definitive statements.

Table ES-1. Overview of 19 Final Panel Comments Identified by the Wilmington Harbor 403 LR/EIS IEPR Panel

No.	Final Panel Comment
Significance – High	
1	The hydrodynamic modeling of cohesive sediment transport does not account for changes in the resuspension and deposition of the riverbed fine sediments due to seasonal flow variability, which can significantly influence cohesive sediment transport and shoaling in the navigation channel.
2	The inconsistency in applying boundary data between hydrodynamic and sediment transport model calibration and production runs raises concerns about the reliability of the model's predictive capability for evaluating alternatives.
3	The Draft EIS does not provide sufficient evidence that the spatial distribution of shoaling along the navigation channel is accurately represented using *morfac*-based simulations, as opposed to full-period simulations without morphological factors.
4	Future containerized shipping forecast is insufficiently explained and not supported by publicly available information.
Significance – Medium/High	
5	Future maintenance dredging volumes may be overestimated by 50% or more due to uncertainty in model shoaling calibration.
6	The rationale used to exclude operation and maintenance costs in the cost analyses are not presented.
Significance – Medium	
7	The uncertainty associated with the calculations of future benefits is not characterized in the Draft LR and EIS.
8	The modeling included ship-generated primary and secondary waves, but the modeling excluded wind-generated wave effects in cohesive sediment transport and shoaling, which may have removed a significant driver of sediment mobility and shoaling within the navigation channel and impacts to shoreline morphology.
9	Although the hydrodynamic and water quality model calibration and validation methods are well documented, the comparison of modeled and measured data does not demonstrate the model's ability to capture intraday variability, spatial variability, or accurately simulate stratification and layered flow dynamics.

No.	Final Panel Comment
10	The Draft LR and EIS do not fully integrate climate-affected hydrology, sea level rise–driven marsh degradation, or reasonably foreseeable regional sediment contributions into its evaluation of future sediment transport, shoaling patterns, and long-term operation, maintenance, repair, replacement, and rehabilitation (OMRR&R) dredging needs.
11	Based on the terminology used throughout the Conceptual Blast Mitigation Plan, it is unclear what actions will be required in the contractor-developed final Comprehensive Blasting Plan.
Significance – Medium/Low	
12	Potential underwater ecological impacts of noise on fish and other marine biota from dredging operations are not addressed in the Draft LR or EIS.
13	The assumption that upstream and downstream sediment sources remain unchanged across alternatives is not supported by data.
14	The Draft LR and EIS do not provide sufficient information to demonstrate that the dredged material does not contain chemical contamination at toxicity levels that would unacceptably impact the ODMDS or when used beneficially for beach nourishment, to enhance intertidal areas, or build up bird islands.
15	The conclusions regarding emissions from dredging and transport equipment reported in Appendix K - Air Quality cannot be tracked back to the original analyses and assumptions.
16	The Draft EIS does not quantify spatial differences in water quality between alternatives and does not address the implications of the model's bias—underpredicting high dissolved oxygen (DO) values and overpredicting low DO values—on evaluating alternatives.
Significance – Low	
17	The water quality analysis does not include an evaluation of changes in water residence time for NAA, Action Alternative (AA) 1 (AA1), and AA2.
18	Throughout the Draft LR and EIS there are inconsistent statements regarding whether the dredged material will be disposed above the Mean High-Water Line (MHWL) or below.
19	Appendix B Model Documentation does not indicate whether the sediment parameters assigned in the GenCade model are representative of site-specific conditions leading to the appropriate modeling of shoreline change.

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LIST OF ACRONYMS

AA	Action Alternative
ASA(CW)	Assistant Secretary of the Army (Civil Works)
BUDM	Beneficial Use of Dredged Material
CESAW	Wilmington District
CFR	Code of Federal Regulations
COI	Conflict of Interest
CWA	Clean Water Act
DDN	Deep Draft Navigation
DO	Dissolved Oxygen
DrChecks	Design Review and Checking System
EFDC	Environmental Fluid Dynamics Code
EIS	Environmental Impact Statement
ELT	Engineer Technical Letter
EPA	U.S. Environmental Protection Agency
ER	Engineer Regulation
ERDC	Engineer Research and Development Center
EV	Electric Vehicle
FNP	Federal Navigation Project
FNS	Federal Navigation System
FWOP	Future without Project
FWP	Future with Project
GRR	General Reevaluation Report
HEC-RAS	Hydrologic Engineering Center River Analysis System
IEPR	Independent External Peer Review
IWR	Institute for Water Resources
IWW	Intracoastal Waterway
LR	Letter Report
MHW	Mean High Water
MHWL	Mean High-Water Line
MLLW	Mean Lower Low Water

morfac	Morphological Acceleration Factor Parameter
MOTSU	Military Ocean Terminal Sunny Point
MPRSA	Marine Protection Research and Sanctuaries Act
NAA	No Action Alternative
NAVD88	North American Vertical Datum of 1988
NC	North Carolina
NCSPA	North Carolina State Ports Authority
NED	National Economic Development
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service (also known as NOAA Fisheries)
NSBKB	Naval Submarine Base Kings Bay
O&M	Operation and maintenance
OGV	Ocean-going Vessels
OMRR&R	Operation, Maintenance, Repair, Replacement, and Rehabilitation
ODMDS	Ocean Dredged Material Disposal Site
OMB	Office of Management and Budget
PAH	Polynuclear Aromatic Hydrocarbon
PFAS	Per- and Polyfluoroalkyl Substances
PBT	Persistent Bioaccumulative Toxic
PCB	Polychlorinated Biphenyl
PDT	Project Delivery Team
SAV	Submerged Aquatic Vegetation
SERIM	Southeast Regional Implementation Manual
SLC	Sea Level Change
SLR	Sea Level Rise
TEU	Twenty-foot Equivalent Unit
TSS	Total Suspended Solids
USACE	United States Army Corps of Engineers
USFWS	United States Fish and Wildlife Service
WRDA	Water Resources Development Act

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1. INTRODUCTION

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Tentatively Selected Plan

The results of the origin-destination transportation cost saving benefit analysis are included in the report. The 46-foot alternative marginally maximizes net NED benefits, but both the 46-foot and the 47-foot alternatives are justified based on benefits exceeding costs.

The difference in average annual net benefits between the 46-foot and the 47-foot plans is small, about $325,000 per year. Additionally, no unacceptable environmental impacts were identified for either alternative, and the environmental impacts are similar in nature and are not out of proportion in magnitude when compared with each other and the No Action Alternative. Considering these results along with the scope and intent of this analysis, as well as its existing conditional authorization, the 47-foot alternative is identified as the NED Plan and the Tentatively Selected Plan.

Independent, objective peer review is regarded as a critical element in ensuring the reliability of scientific analysis. The objective of the work described here was to conduct an IEPR of the Wilmington Harbor 403 LR and EIS, North Carolina (hereinafter: Wilmington Harbor 403 LR/EIS IEPR) in accordance with procedures described in the Department of the Army, USACE, Engineer Regulation (ER) *Civil Works Review Policy* (ER 1165-2-217) (USACE, 2024) and the Office of Management and Budget (OMB), *Final Information Quality Bulletin for Peer Review* (OMB, 2004). Supplemental guidance on evaluation for conflicts of interest (COIs) was obtained from the *Policy on Committee Composition and Balance and Conflicts of Interest for Committees Used in the Development of Reports* (The National Academies, 2003).

This final report presents the Final Panel Comments of the IEPR Panel (the Panel) on the existing engineering, economic, environmental, and plan formulation analyses contained in the Wilmington Harbor 403 LR/EIS IEPR documents (Section 4). Appendix A describes in detail how the IEPR was planned and conducted, including the schedule followed in executing the IEPR. Appendix B provides biographical information on the IEPR panel members and describes the method Battelle followed to select them. Appendix C presents the final charge to the IEPR panel members for their use during the review; the final charge was submitted to USACE in the final Work Plan according to the schedule listed in Table A-1. Appendix D presents the organizational COI form that Battelle completed and submitted to the Institute for Water Resources (IWR) prior to the award of the Wilmington Harbor 403 LR/EIS IEPR.

2. PURPOSE OF THE IEPR

To ensure that USACE documents are supported by the best scientific and technical information, USACE has implemented a peer review process that uses IEPR to complement the Agency Technical Review, as described in USACE (2024).

In general, the purpose of peer review is to strengthen the quality and credibility of the USACE decision documents in support of its Civil Works program. IEPR provides an independent assessment of the engineering, economic, environmental, and plan formulation analyses of the project study. In particular, the IEPR addresses the technical soundness of the project study's assumptions, methods, analyses, and calculations and identifies the need for additional data or analyses to make a good decision regarding implementation of alternatives and recommendations.

In this case, the IEPR of the Wilmington Harbor 403 LR/EIS was conducted and managed using contract support from Battelle, which is an Outside Eligible Organization (as defined by ER 1165-2-217). Battelle,

a 501(c)(3) organization under the U.S. Internal Revenue Code, has experience conducting IEPRs for USACE.

3. METHODS FOR CONDUCTING THE IEPR

The methods used to conduct the IEPR are briefly described in this section; a detailed description can be found in Appendix A. The IEPR was completed in accordance with established due dates for milestones and deliverables as part of the final Work Plan; the due dates are based on the award/effective date and the receipt of review documents.

Battelle identified, screened, and selected four panel members to participate in the IEPR based on their expertise in the following disciplines: Civil Works planning/economics; environmental; hydrology, hydraulics and coastal engineer; and geotechnical engineer/geology. The Panel reviewed the Wilmington Harbor 403 LR/EIS documents and produced 19 Final Panel Comments in response to 44 charge questions provided by USACE for the review. This charge also included two overview questions and one public comment question added by Battelle, for a total of 47 questions. Battelle instructed the Panel to develop the Final Panel Comments using a standardized four-part structure:

1. Comment Statement (succinct summary statement of concern)
2. Basis for Comment (details regarding the concern)
3. Significance (high, medium/high, medium, medium/low, or low; in accordance with specific criteria for determining level of significance)
4. Recommendation(s) for Resolution (at least one implementable action that could be taken to address the Final Panel Comment).

Battelle reviewed all Final Panel Comments for accuracy, adherence to USACE guidance (ER 1165-2-217), and completeness prior to determining that they were final and suitable for inclusion in the Final IEPR Report. There was no direct communication between the Panel and USACE during the preparation of the Final Panel Comments. The Panel's findings are summarized in Section 4.1; the Final Panel Comments are presented in full in Section 4.2.

4. RESULTS OF THE IEPR

This section presents the results of the IEPR. A summary of the Panel's findings and the full text of the Final Panel Comments are provided.

4.1 Summary of Final Panel Comments

The panel members agreed on their "assessment of the adequacy and acceptability of the economic, engineering, and environmental methods, models, and analyses used" (USACE, 2024) in the Wilmington Harbor 403 LR/EIS IEPR review documents. The following summarizes the Panel's findings.

Based on the Panel's review, the Draft LR and EIS were well-written and organized. Both documents, when considered with the original Section 203, provide supporting documentation on the engineering, environmental, economic, and plan formulation findings. However, the Panel identified several elements of the Draft LR and EIS modeling and assessment where additional analyses are warranted and places where clarification of project assumptions and findings need to be documented or revised.

Engineering: The Panel stated the Draft LR and EIS did a good job of identifying and incorporating existing subsurface data and leveraging that data to complete a wide array of analyses to frame the alternative configurations, impacts, and design needs. They also noted that state-of-the-art modeling tools were used to evaluate the alternatives. However, the Panel identified several concerns regarding the hydrodynamic modeling that should be further investigated, clarified, and if needed, corrected. These concerns are focused on the use of different data to calibrate and run the models when calculating cohesive sediment transport, including whether the model reliably predicts the effects of the alternatives. The Panel also found the Draft EIS does not provide sufficient evidence that the spatial distribution of shoaling along the navigation channel is accurately represented using morphological acceleration factor parameter (*morfac*)-based simulations, as opposed to full-period simulations without morphological factors. The Panel is concerned that the future maintenance dredging volumes may be overestimated by 50% or more due to uncertainty in the shoaling calibration. The Draft EIS does not clearly compare modeled shoaling rates to historical annual averages across channel reaches. Available data suggest the modeled total shoaling rate is approximately 50% or more higher than historical averages for the entire channel, raising concerns about accuracy and cost implications.

The Panel is also concerned that waves were excluded from the cohesive sediment transport simulations. Wind-generated waves, particularly during storm events or strong winds aligned with the channel axis, can resuspend fine sediments and accelerate shoaling. Although the hydrodynamic and water quality model calibration and validation methods are well documented, the comparison of modeled and measured data does not demonstrate the model's ability to capture intraday variability, spatial variability, or accurately simulate stratification and layered flow dynamics.

Economic/ Plan Formulation: The Panel recognizes that a significant amount of work was put into the cost estimate, however, information on how the future containerized shipping forecast was specifically derived has not been included. This is a concern because the forecast is not supported by publicly available information. In addition, the Panel identified a lack of uncertainty bounds associated with the calculation of future benefits within the Draft LR and EIS. Without a transparent assessment of uncertainty, decision-makers cannot fully evaluate the reliability of the economic justification, nor can they determine the extent to which benefits may vary under alternative and reasonable future conditions. The Panel also noted that the cost analysis provided in the Draft LR and EIS appears to exclude operation and maintenance (O&M) costs, and a rationale for excluding the O&M costs has not been documented.

Environmental: The Panel noted that the mitigation measures were transparent and well done. To ensure that all potential impacts are taken into consideration, the Panel states that potential underwater ecological impacts of noise on fish and other marine biota from dredging operations should be addressed in the Draft LR and EIS. The Panel recommended inclusion of data from chemical and bioassay testing of sediments and presenting the basis for the conclusion that those sediments are acceptable for disposal at the ODMDS and in beneficial use applications.

The Panel also stated that, based on the terminology used throughout the Conceptual Blast Mitigation Plan, it is unclear what actions will be required in the contractor's final blasting plan, because there is no direct linkage or required actions between the Conceptual Blasting Plan and the contractor-developed Comprehensive Blasting Plan. Right now, the Conceptual Plan includes a lot of terms like "may be" and "examples" rather than more definitive statements.

4.2 Final Panel Comments

This section presents the full text of the Final Panel Comments prepared by the IEPR panel members.

Final Panel Comment 1

The hydrodynamic modeling of cohesive sediment transport does not account for changes in the resuspension and deposition of the riverbed fine sediments due to seasonal flow variability, which can significantly influence cohesive sediment transport and shoaling in the navigation channel.

Basis for Comment

In the model calibration, actual measured flow data were used at the upstream boundaries, while the model production runs for evaluating the effects of the No Action Alternative (NAA), Action Alternative 1 (AA1), and Action Alternative 2 (AA2) relied on constant average flows derived from measurements—i.e., Appendix B Model Documentation, Section B-9.2.2.1 states that "a typical year and intermediate flow conditions were assumed for all simulations," with constant discharge rates of 89.55 m^3/s, 13.55 m^3/s, and 11.05 m^3/s applied at the Cape Fear River, Black River, and Northeast Cape Fear River boundaries, respectively. These model boundary rates represent median annual flows and were assumed to reflect a typical year when averaged annually. Thus, the modeling approach does not account for seasonal flow variability because of the model boundary conditions.

Cohesive sediment dynamics are highly sensitive to changes in flow velocity, particularly during high-flow or low-flow seasonal events. Seasonal flow variability can alter the balance between sediment resuspension and deposition—

- In dry seasons or low-flow conditions, the river's ability to transport sediment downstream decreases; fine cohesive sediments settle and accumulate in the navigation channel, leading to shoaling (buildup of material on the channel bed); and shoaling reduces channel depth, which can restrict vessel drafts and require more frequent dredging.
- During high-flow or flood events, strong currents resuspend previously deposited fine sediments, which can temporarily clear sediments in some areas but also redistribute material into critical navigation zones; and sudden sediment movement during flood events can create unpredictable channel conditions, affecting navigation safety.

Shoaling increases maintenance dredging costs and can disrupt shipping schedules. If not managed, reduced channel depth can force vessels to light-load cargo, increasing transportation costs. Seasonal variability without proper modeling can lead to inaccurate sediment forecasts. This can affect channel design, maintenance planning, and risk management for ports and waterways.

The modeling and analysis do not demonstrate how AA1 and AA2 differ from the NAA in terms of cohesive sediment shoaling under seasonal flow conditions, limiting the robustness of the comparison. Excluding seasonality from the model production runs can: (a) significantly alter predictions of cohesive sediment transport and shoaling; (b) obscure accurate estimation of navigation channel shoaling volumes; (c) underestimate risks and benefits of the proposed transportation inefficiencies,

Final Panel Comment 1

and (d) distort cost-benefit analyses for NAA, AA1, and AA2. Each of these factors should be used to influence the overall channel design.

Significance – High

Using constant flows may lead to unreliable forecasts of future sediment dynamics, thereby undermining the credibility of model outputs that inform critical project decisions.

Recommendation for Resolution

1. Confirm whether using constant average flows, instead of time-varying boundary conditions, yields comparable hydrodynamic behavior and shoaling rates along the navigation channel.
2. If not, apply flows that characterize an average hydrological year and reflect seasonal hydraulic conditions.

Final Panel Comment 2

The inconsistency in applying boundary data between hydrodynamic and sediment transport model calibration and production runs raises concerns about the reliability of the model's predictive capability for evaluating alternatives.

Basis for Comment

According to the model boundary conditions described in the validation section and Appendix B Model Documentation (Section B-9.2.2.1), different approaches were used for hydrodynamic and sediment transport model calibration and production simulations:

- Calibration: Actual measured flow data were applied at upstream boundaries.
- Production runs (NAA, AA1, AA2): Constant average flows derived from measurements were used instead of time-varying conditions.

The study does not confirm whether using constant average flows produces hydrodynamic behavior and shoaling rates comparable to those obtained with time-varying boundary conditions. Furthermore, Appendix B Model Documentation does not provide evidence that statistical boundary conditions yield results consistent with a well-calibrated model. Applying the same boundary condition methodology in both calibration and production runs would maintain consistency and improve reliability in evaluating project alternatives.

Significance – High

Without evidence that constant boundary conditions replicate the behavior of a calibrated model, the validity of the hydrodynamic and sediment model is questionable. This could lead to inaccurate predictions of alternative impacts on channel navigation shoaling and inaccurate estimations of transportation efficiency benefits under AA1 and AA2, and maintenance dredging costs.

Recommendation for Resolution

1. Confirm whether constant average flows produce hydrodynamic behavior and shoaling rates comparable to time-varying boundary conditions.
2. If substantial differences exist, apply a consistent boundary condition approach that reflects average hydrological flows for both model calibration and production simulations.

Final Panel Comment 3

The Draft EIS does not provide sufficient evidence that the spatial distribution of shoaling along the navigation channel is accurately represented using *morfac-based* simulations, as opposed to full-period simulations without morphological factors.

Basis for Comment

The use of a morphological acceleration factor parameter (*morfac*) to accelerate sediment transport simulations can introduce errors, particularly in bi-directional flow environments where sediment dynamics depend on the sequence of hydrodynamic events.

Appendix B Model Documentation, Section B-9.2.2.4 describes the use of selected wave classes and *morfac* values to simulate long-term inlet morphology. In tidal estuaries with bi-directional flow, the timing and interaction of ebb and flood flows strongly influence sediment transport, erosion, and deposition patterns.

Because morphological changes are sensitive to the progression of flow and wave conditions, applying *morfac* omits the actual temporal sequence of events, potentially undermining the reliability of modeled outcomes and leading to inaccurate shoaling estimates.

Table 9-3 lists representative wave/wind conditions and associated *morfac* values used in the model simulation schematization. However, the study does not validate whether this approach reproduces longshore sediment transport rates and shoreline morphology comparable to those derived from actual wave data. The Panel also found no evidence that the selected wave classes combined with *morfac* accurately predict shoaling distribution along the navigation channel. This raises concerns that the methodology may not account for non-cohesive sediment transport from the nearshore zone into the channel or typical tidal effects on waves and inlet bi-directional flows—both critical to sediment dynamics.

Significance – High

Excluding the temporal sequence of wave events, channel flows, and associated morphological responses can alter shoaling patterns and volumes for NAA, AA1, and AA2. This could significantly affect navigation channel maintenance dredging cost and benefits estimates.

Recommendation for Resolution

1. Validate that the simplified wave schematization and *morfac* application provide reliable predictions of sediment transport and shoaling. This validation should include a comparison of:
    - *Morfac*-based simulations
    - Full-period simulations without *morfac*

    Check whether both approaches produce substantially similar shoaling patterns and volumes in the navigation channel.

Final Panel Comment 3

2. If significant differences exist, assess how these discrepancies affect model results for NAA, AA1, and AA2.

Final Panel Comment 4

Future containerized shipping forecast is insufficiently explained and not supported by publicly available information.

Basis for Comment

One of the unresolved issues identified by the ASA(CW) was the need for a robust, justified, and transparent economic analysis consistent with USACE planning requirements. Although the updated Draft LR and EIS present revised forecasts of TEU (Twenty-foot Equivalent Unit) throughput and vessel calls, the documentation does not demonstrate how these forecasts were derived, include the economic or trade assumptions utilized, or document how they relate to publicly available forecasts from recognized sources such as United Nations Conference on Trade and Development, Organisation for Economic Co-operation and Development-International Transport Forum, the U.S. Maritime Administration, or major global container shipping indices.

The benefits of this project are contingent upon shipping forecasts including containerized shipping. That is, the transportation cost savings from being able to have larger cargo ships transit fewer passages to achieve the same quantities of goods delivered, hinge on the forecasts for future shipping. For containerized shipping, the source is “S&P Global (formerly IHS Global Insight) for international seaborne trade by World region” (Draft LR Attachment 5 Economic Considerations, page 34) but no documentation or reference was provided for this source.

Further, these rates for the projections are then modified with little explanation except to say that capital investments have been made and it appears that the rates from S&P have been adjusted upward because of the upgraded processing facilities (Draft LR Attachment 5 Economic Considerations, page 34). This is understandable, but because the rates are very high to begin with, more detailed support should be provided for the additional boosts to projection rates.

Also, absent better documentation, the Panel endeavored to corroborate the rates with publicly available shipping forecast data, but none of these sources were quite as high as those used in the benefit calculation. For example, elaborations on data from DNV (2025), suggest that global containerized shipping will increase from 2018 to 2050 by approximately two percent per year. This does not mean that North American rates will not be higher, but more information is needed to understand how USACE came to that conclusion. Building on data from Attachment 5, the following table was developed showing a compound annual growth rate for containers of 3.4 percent for the 36-year period.

TOTALs	Base	2025 (2026)	2030	2036	2042	2046	2056	36 Yr. chng	CAGR
Container Tons	2.1	2.4	2.9	5.7	6.9	6.9	6.9	333%	3.4%
Liquid Bulk	1.9	2.0	0.0	2.3	0.0	2.5	2.7	144%	1.0%
Dry Bulk	3.9	4.8	0.0	5.9	0.0	7.0	8.1	208%	2.1%
Total	**7.8**	**9.3**	**2.9**	**13.9**	**6.9**	**16.4**	**17.7**	**226%**	**2.3%**

Final Panel Comment 4

This suggests that 49 percent of the increased roughly 10 million tons (17.7 minus 7.8, above) will come from containers (6.9 minus 2.1). Given the forecast noted above, this should be more fully explained to demonstrate such a large increase.

Also, the Panel did not find supporting documentation or data to substantiate the assumption of increased electric vehicle (EV) imports from the Far East. This comment is confusingly stated as:

- "influx of Far East imports from electric vehicle manufacturers in Central North Carolina" (Draft LR Attachment 5 Economic Considerations page 39 and 46)

This leaves the reader unclear as to whether the EVs are coming from Asia, or maybe are going to Asia, or perhaps inputs are coming from Asia to support manufacturers in central Carolina.

Additional concerns related to the economic analysis include:

- Reported rates of increase in containerized shipments are presented in whole numbers. Over 50 years (or rather, most are only increasing to year 2046, so closer to 26 years) the difference between a three percent increase and a two percent increase is significant. Perhaps more refined rates were used but not reported?
- Petroleum exports may well decrease over the next 50 years. As part of the energy transition, EVs should increase, but petroleum exports might decrease. Assuming that EV rates will increase and petroleum exports will also increase will require some more thorough discussion as the two are seemingly at odds.

Accurate forecasting of containerized shipping volumes is a critical determinant of project benefits, vessel call patterns, transportation cost savings, and the justification of channel deepening. If future shipping volumes are overstated or insufficiently supported, the economic benefits of the project may be mischaracterized. Conversely, if the forecast assumptions are not transparent or traceable to external sources, reviewers and decision-makers cannot assess the reliability of the economic justification or the consistency of the forecast with national and global container trade trends.

Although this issue does not invalidate the engineering or environmental analyses, addressing it would improve the rigor, credibility, and defensibility of the economic analysis and ensure that decisions are grounded in well-supported and publicly verifiable trade data.

Significance – High

Funding for this project is contingent upon completing an economic analysis of the transportation cost savings using the stated goal of a NED benefit (LR page 1-1). Absent better support for containerized increases, the document does not meet this standard, and risks not being funded.

Recommendation for Resolution

1. Clarify the derivation of the TEU and vessel call forecasts, including data sources, analytical steps, and key assumptions used to construct the future demand scenario.

Final Panel Comment 4

2. Explain more about where the increased rates of TEUs are supported by market changes. The EV market needs to be explained more clearly, and other markets might be mentioned in terms of trends in shipping.
3. Acknowledge the uncertainty in the forecasts in terms of timing, product types, and future development. Support the idea that these volumes are reasonable.
4. The simplifying assumption that the same volume of cargo will transit the Port of Wilmington with or without the project is a legitimate analytic construct. But if the shipping forecast rates cannot be made public, consider relaxing this constraint and recalculating benefits.
5. Cross-reference the container forecast with publicly available trade outlooks, such as DNV's Ocean's Future to 2050, to demonstrate consistency or explain differences.
6. Provide a clear justification for the selected forecast scenario, noting whether it is intended to represent a base case, likely case, or high-growth case, and document the uncertainties associated with it.

Literature Cited:

DNV (2025). Ocean's Future to 2050. https://www.dnv.com/oceansfuture/ Accessed November 2025.

Final Panel Comment 5

Future maintenance dredging volumes may be overestimated by 50% or more due to uncertainty in model shoaling calibration.

Basis for Comment

Appendix B Model Documentation, Section B-9.5.1 notes a morphology model uncertainty of ±100,000 cubic yards per year. However, the report does not clearly compare modeled shoaling rates to historical annual averages across channel reaches. Available data suggest the modeled total shoaling rate is approximately 50% or more higher than historical averages for the entire channel, raising concerns about accuracy and cost implications.

Sole reliance on modeled shoaling volumes—without validation against measured data—introduces risk and potential bias in maintenance dredging cost estimates and in assessments of channel hydraulic and water quality responses to deepening and widening. The model appears to overestimate shoaling, which could significantly affect economic evaluations and channel deepening/widening-effect analyses. The Panel found no formal integration of risk and uncertainty into cost estimates, hydraulics, or water quality assessments for AA1 and AA2, despite the model's tendency to overestimate shoaling. This omission introduces significant risk to the economic analysis and creates potential bias in projected maintenance dredging costs and assessed hydraulic and water quality impacts.

If the model overestimates shoaling for the NAA, AA1, and AA2 alternatives, the resulting maintenance dredging volumes—and associated costs—will likely be inflated. Conducting a sensitivity analysis or applying an uncertainty adjustment is critical to evaluate how these potential overestimations could affect long-term maintenance costs, channel water conditions, and overall project feasibility. Incorporating this uncertainty ensures that cost estimates remain realistic, channel effects are acceptable, and that benefit-cost evaluations are robust.

Additionally, Appendix B Model Documentation lacks sufficient detail on hydrologic conditions used in simulations, limiting confidence in whether modeled shoaling rates represent future conditions. To properly assess the reliability of the modeled shoaling rate, it is essential to relate the modeled shoaling rate to the hydrologic regime (e.g., dry year, average year, or wet year) used in the model simulation. Without this context, the comparison of modeled and measured shoaling rates lacks critical insight into whether the modeled results are representative of future hydraulic conditions.

Significance – Medium/High

Overestimating shoaling rates can (1) misrepresent channel sedimentation volumes and patterns, (2) distort hydraulic and water-quality responses to channel deepening or widening, and (3) inflate maintenance dredging costs—affecting total project expenditures and potentially altering the ranking of alternatives.

Recommendation for Resolution

1. Estimate future NAA and AA1 maintenance dredging costs by applying the percent change in

Final Panel Comment 5

shoaling rate (AA1 versus NAA) to historical shoaling rates for each channel reach.

2. Compare these adjusted estimates to model-based estimates and determine whether maintenance dredging costs should be re-estimated.

Final Panel Comment 6

The rationale used to exclude operation and maintenance costs in the cost analyses are not presented.

Basis for Comment

Typically, the NED approach involves considering all benefits and all costs including project costs; operation, maintenance, repair, replacement, and rehabilitation (OMRR&R), interest during construction, and all other costs. In the NED Manual for Deep Draft Navigation (USACE, 2010), there is even a cautionary note that, “All project related cost must be considered in an alternative, no matter who pays” (USACE, 2010; Section 3.21 NED Costs, p. 22).

Significance – Medium/High

Excluding these costs suggests that the NED benefits of the project may be distorted, and the feasibility of the project is in question.

Recommendation for Resolution

1. Explain the rationale for excluding the OMRR&R costs.
2. Estimate what the difference in costs for OMRR&R might be between the NAA and the others and include that in the explanation.

Literature Cited:

USACE (2010). USACE IWR National Economic Development Deep Draft Navigation. IWR Report 10-R-4. April 2010. https://planning.erdc.dren.mil/toolbox/library/IWRServer/10-R-4_NED_DeepDraft.pdf

Final Panel Comment 7

The uncertainty associated with the calculations of future benefits is not characterized in the Draft LR and EIS.

Basis for Comment

There is uncertainty related to all forecasts, and the shipping forecasts depend upon a host of uncertain forces related to markets, global trade, policies such as the energy transition, demographics, etc. The panel believes there should be additional acknowledgement of this uncertainty. Engineer Regulation (ER) 1105-2-103, Policy for Conducting Civil Works Planning Studies lists “Risk-Based Decision Making” as one of the planning fundamentals stating that risk is the effect of uncertainty on objectives and recommends study teams use risk analysis to compare plans in terms of the “likelihood and variability of their benefits, costs, impacts, and residual risks.” (USACE, 2023, p. 13).

Although the cargo forecasts are assumed to be the same for the NAA and the alternatives, this does not mean that the uncertainty can be passed over. All benefits hinge on these forecasts, and the variability of benefits should be addressed.

The mechanism for keeping the forecasts the same for the NAA and alternatives is a reasonable approach to measuring transportation cost savings, given the many other uncertainties in global shipping. In truth, the project could improve the long run shipping and economy through the Port, but it is difficult to provide detailed support for that argument and so the other approach is fine. However, conducting a sensitivity analysis or applying an uncertainty adjustment is critical to evaluate how the potential variability could affect long-term maintenance costs and overall project feasibility. Incorporating this uncertainty ensures that cost estimates remain realistic and that benefit-cost evaluations are robust.

The study team has done a nice job comparing the risk and potential variability of costs in the Draft LR Attachment 4. Cost Engineering, and in the spreadsheet provided titled, “October 2025 WH Deepening Study 47 – 49 ft. CSRA” showing a detailed cost schedule risk analysis. But this is starkly contrasted with the lack of risk or uncertainty associated with the benefits.

National economic development (NED) calculations depend on both costs and benefits, and so the calculation of NED benefits should undergo an equal level of risk and uncertainty analysis. If uncertainty in the benefit calculations is not described, the Draft LR and EIS may present an incomplete picture of project performance. Without a transparent assessment of uncertainty, decision-makers cannot fully evaluate the reliability of the economic justification, nor can they determine the extent to which benefits may vary under alternative but reasonable future conditions.

Significance – Medium

While this does not invalidate the economic analysis, addressing uncertainty would strengthen confidence in the study’s projections and improve alignment with USACE planning expectations for long-term navigation projects. The uncertainty of benefits needs to be addressed to be consistent with risk-based decision-making.

Final Panel Comment 7

Recommendation for Resolution

1. Identify key variables that drive project benefits—such as TEU growth, vessel fleet composition, transit frequency, transportation cost differentials, and productivity gains—and describe the degree of uncertainty associated with each.
2. Qualitatively discuss how variations in these drivers could influence the magnitude of future benefits, using ranges or scenarios already implied by terminal development plans, fleet data, and regional trade patterns.
3. Clarify the assumptions underlying the selected benefit forecast, including whether it represents a likely, base, or high-growth scenario, and explain why that scenario is appropriate.
4. Use existing sensitivity information (fleet deployment, vessel draft/delay interactions, or throughput limits) to describe how project benefits might increase or decrease under alternative but reasonable future conditions.
5. Document uncertainties and limitations in the economic analysis to increase transparency, acknowledging where assumptions are based on external data, terminal operator estimates, or professional judgment.

Literature Cited:

USACE (2023). Policy for Conducting Civil Works Planning Studies. Engineering Regulation 1105-2-103. December 7, 2023. https://www.publications.usace.army.mil/Portals/76/ER%201105-2-103_7Nov2023.pdf.

Final Panel Comment 8

The modeling included ship-generated primary and secondary waves, but the modeling excluded wind-generated wave effects in cohesive sediment transport and shoaling, which may have removed a significant driver of sediment mobility and shoaling within the navigation channel and impacts to shoreline morphology.

Basis for Comment

Erosion is a serious problem along vulnerable shorelines and is also a contributor to rates of shoaling. Page 3-22 of the Draft EIS recognizes the threat: “larger vessels and higher traffic volumes generate vessel wakes to induce river shoreline erosion. Some of the erosion hotspots along the river shorelines of the shipping channel include – Placement Areas: 7, 8, and 9, MOTSU, Brunswick Town/Fort Anderson, Ferry Slip, South Pelican Island, and Fort Fisher. This erosion not only threatens ecological habitats such as marshes and riparian forests but also poses risks to infrastructure, including docks, seawalls, and utilities.”

Modeling of vessel primary and secondary wakes to assess the potential impacts on shorelines was conducted, and details are provided in Appendix B Model Documentation. Those wake analyses are not described in the Draft EIS. Instead, the text presents bed shear stresses resulting from NAA, AA1, and AA2. The relationship and impacts of bed shear stresses on shoreline erosion are not presented. A presentation of the bed shear impacts and vessel wake impacts in plain English is very important to include in Section 3.3.3, River Shorelines of the Draft EIS. Further, Appendix B Model Documentation, Section B-9.2.1.1 states that waves were excluded from cohesive sediment transport simulations due to their minimal impact in the estuary. However, this assumption may underestimate the influence of wind-generated waves, particularly during storm events or strong winds aligned with the channel axis. Such conditions can resuspend fine sediments and accelerate shoaling.

The proposed channel widening in AA1 and AA2 increases fetch and water depth, allowing larger wind-generated waves to develop compared to the NAA condition. Breaking of these larger waves near shorelines could also increase erosion relative to NAA conditions.

Significance – Medium

Shoreline erosion is a major concern and the potential impact from larger wakes from larger vessels needs to be addressed in the Draft EIS. Excluding wind-wave effects during episodic high-energy events may lead to:

- Underestimation of sediment mobility and shoaling distribution
- Misrepresentation of maintenance dredging requirements and costs
- Underestimation of shoreline erosion impacts.

Recommendation for Resolution

1. A plain English explanation in Section 3.3.3 should be included on the results of the modeling

Final Panel Comment 8

of bed shear stress, vessel wakes, and shoreline erosion.

2. For NAA and NA1, compare shoaling volume and distribution in the navigation channel for:
    - Without wind-generated waves (as modeled in Section 403 Study)
    - With wind-generated waves
3. Confirm whether wind-generated waves aligned with the channel axis substantially affect shoaling volume/distribution or shoreline erosion.
4. If inclusion of wind-generated waves results in significant changes to shoaling, quantify the impact on navigation channel maintenance dredging costs.

Final Panel Comment 9

Although the hydrodynamic and water quality model calibration and validation methods are well documented, the comparison of modeled and measured data does not demonstrate the model's ability to capture intraday variability, spatial variability, or accurately simulate stratification and layered flow dynamics.

Basis for Comment

Appendix B Model Documentation compares modeled and measured data only at monthly intervals for salinity (Figures 6-7 to 6-9), dissolved oxygen (Figures 6-10 to 6-14), temperature (Figures 6-15 to 6-19), and suspended solids (Figures 6-20 to 6-24). This approach does not validate the model's ability to reproduce short-term (intraday) fluctuations, such as diurnal dissolved oxygen cycles or tidal salinity variations. While the Panel understands that only monthly water quality data were available, this limitation was not clearly acknowledged in Appendix B Model Documentation or the Draft EIS, nor were potential implications on alternative evaluations discussed. Consequently, confidence in the model's ability to simulate critical short-term dynamics—important for ecological risk assessments—remains uncertain.

Confirmation of intraday variability is essential because aquatic species can be sensitive to short-term changes in dissolved oxygen and temperature. Without this validation, the reliability of water quality predictions is reduced. Failure to validate intraday variability in hydrodynamic, water quality, and turbidity (or suspended sediment concentration) modeling introduces uncertainty in predicting short-term fluctuations in flow velocity, salinity, and suspended sediment concentrations. These fluctuations can significantly influence ecological processes such as benthic habitat stability, nutrient cycling, and turbidity-sensitive species behavior. The potential ecological impacts can include:

- Benthic Habitat Disturbance: Unaccounted high-frequency variability may lead to episodic sediment resuspension, smothering benthic organisms, or altering substrate composition.
- Water Quality and Light Penetration: Increased turbidity during short-term events can reduce light availability for submerged aquatic vegetation (SAV), impairing photosynthesis and growth.
- Species Stress and Migration: Sudden changes in salinity or turbidity can stress estuarine species, disrupt feeding patterns, and alter migration timing for sensitive organisms.
- Nutrient Flux and Biogeochemical Cycling: Intraday variability can drive pulses of nutrient release from sediments, potentially triggering localized algal blooms or oxygen depletion events.

Additionally, Appendix B Model Documentation Table 6-1 does not provide station-specific performance metrics, limiting the ability to identify areas where the model performs well or poorly. Except for salinity profiles, the Panel observed insufficient vertical comparisons for other parameters (e.g., dissolved oxygen, temperature, suspended solids). Without these, the model's ability to simulate stratification and layered flow dynamics cannot be confirmed—critical for estuarine environments where vertical gradients influence habitat conditions.

Significance – Medium

Final Panel Comment 9

Demonstrating the model's ability to capture intraday variability, spatial variability, and vertical stratification is essential to building confidence in water quality modeling results and ecological evaluations. If intraday variability remains unvalidated, ecological risk assessments may underestimate episodic stressors, leading to incomplete mitigation strategies and potential non-compliance with environmental performance objectives.

Recommendation for Resolution

1. If multi-intraday observed data are available, evaluate modeled outputs against these data. If not, include in the report time-series plots of modeled dissolved oxygen, salinity, and temperature to illustrate intraday fluctuations and assess whether tidal and diurnal trends are reasonably captured.
2. Provide in the Draft EIS station-specific performance metrics for hydrodynamic and water quality parameters (similar to Table 6-1) to characterize spatial reliability.
3. Include in the Draft EIS vertical comparisons for dissolved oxygen, temperature, and suspended solids at representative locations to confirm stratification and layered flow dynamics.

Final Panel Comment 10

The Draft LR and EIS do not fully integrate climate-affected hydrology, sea level rise–driven marsh degradation, or reasonably foreseeable regional sediment contributions into its evaluation of future sediment transport, shoaling patterns, and long-term OMRR&R dredging needs.

Basis for Comment

The ASA(CW) previously identified the lack of climate hydrology analysis and its implications for long-term OMRR&R cost and cost risk as an unresolved issue. While the Draft LR and EIS significantly improve the treatment of sea level change (SLC) and incorporate SLC into hydrodynamic, morphological, and vessel-wake modeling, the study does not explicitly address climate-driven changes in watershed hydrology, precipitation intensity, or riverine discharge that may influence sediment transport and channel shoaling.

In addition, although the modeling evaluates future channel conditions under SLC, it does not assess how marsh degradation, marsh migration constraints, or conversion to open water under higher water levels could alter sediment supply, shoreline stability, or shoaling in adjacent channel reaches. These processes are well documented in coastal ecosystems undergoing SLC and can influence sediment budgets over a 50-year project life.

Finally, the Draft LR and EIS do not fully consider reasonably foreseeable effects, including interactions between AA1 and other ongoing or planned projects within the estuary (e.g., shoreline stabilization, restoration activities, or regional dredging and placement programs). Without integrating these factors, the study may not fully characterize future sediment dynamics or OMRR&R implications under FWOP and Future With Project (FWP) conditions. Addressing these elements would improve confidence in FWOP/FWP comparisons, economic justification, and long-term project sustainability.

Significance – Medium

Although the existing modeling framework provides a strong foundation, the lack of a systematic evaluation of climate-affected hydrology, marsh system change, and reasonably foreseeable effects on sediment contributions may result in underestimating OMRR&R dredging requirements and associated costs.

Recommendation for Resolution

The panel offers the following recommendations for USACE consideration, structured to build directly upon analysis already completed in the Draft LR and EIS:

1. Use the existing Delft3D and morphology modeling outputs as a platform to qualitatively describe how climate-related changes in watershed hydrology (e.g., precipitation intensity, inflow variability) could influence sediment transport and shoaling. This does not require new model runs, but rather an interpretive synthesis using current model sensitivity results and boundary conditions.

Final Panel Comment 10

2. Supplement the SLC-driven morphology assessment with a qualitative evaluation of how marsh degradation, marsh edge retreat, or reduced marsh stability under higher water levels may alter sediment contributions to adjacent channel reaches. Existing marsh mapping, habitat impact assessments, and morphological model grids can support this discussion.
3. Integrate a narrative assessment of reasonably foreseeable actions—using current regional knowledge of ongoing dredging, restoration, or shoreline projects—to explain how these activities might interact with AA1 to influence sediment budgets and channel performance. This may be developed using available planning documents and qualitative evaluation rather than quantitative modeling.
4. Clarify how SLC-influenced morphology model results inform OMRR&R dredging expectations by describing the potential range of future dredging scenarios using existing modeling outputs (e.g., differences in bed shear stress, sediment mobilization hotspots, or channel infilling patterns across SLC scenarios).
5. Explicitly document the assumptions, uncertainties, and limitations related to climate hydrology, marsh system response, and cumulative effects. This can be done by expanding the uncertainty section in the Draft LR and EIS without requiring additional technical studies.

These actions allow USACE to strengthen the unresolved elements of the analysis using already-completed modeling and environmental evaluations, consistent with the scope and intent of the 403 study.

Final Panel Comment 11

Based on the terminology used throughout the Conceptual Blast Mitigation Plan, it is unclear what actions will be required in the contractor-developed final Comprehensive Blasting Plan.

Basis for Comment

It is unclear how close Appendix L, the Conceptual Blast Mitigation Plan, is to what will be the actual blasting plan included in the blasting contractor's Comprehensive Plan. The link between the Conceptual Plan in Appendix L and the contractor's Comprehensive plan is very weak. The Conceptual Plan includes an excellent array of mitigation procedures, but the language used in Appendix L does not lend the reader to clearly understand whether they will actually be included in the final Comprehensive Plan. In addition, the footnote to Table 2 on page L-20 states "the steps outlined in this table are recommendations only," therefore, what will actually be required is currently unclear.

Appendix L states the final Comprehensive Plan is to be developed by the blasting contractor using the Conceptual Plan as "guidelines" (page L-3). Even the review process of the contractor-developed Comprehensive Plan has not been explicitly stated, as currently Table 2 uses terms like "it is recommended" and "Coordination with federal agencies such as NMFS and USFWS….NC Wildlife Resources Commission" rather than "including" (page L-18).

Furthermore, Table 2, page L-19, states "*The Comprehensive Plan details the mitigation and monitoring measures and how they will be implemented. Contractor prepares Comprehensive Plan based on engineering plans, environmental compliance documents (such as Biological Opinions), and contractor's means and methods."* There is no specific link stated to the Conceptual Plan, just "environmental compliance documents (such as Biological Opinions)."

On page L-10, in the introductory paragraph to the mitigation measures, the first sentence states "*This section includes examples of mitigation and monitoring measures that may be considered during the development of the Comprehensive Plan."* Although the measures are very good, calling them "examples" does not require them in the final plan. Section L.5.2 uses strong words, including "would be required" or "must be" but these are still introduced in the overriding first sentence on page L-10 as "examples." The concern is that the contractor that wins the bid does not provide sufficient safeguards because the Conceptual Plan does not specify measures as required, being just examples to be considered.

Finally, blasting was conducted in the early 2000s for the Wilmington Cape Fear River channel deepening. A discussion of lessons learned from that experience should be added, including how well the mitigation and monitoring measures worked and what was known about impacts to living marine biota including mammals, fish, and turtles.

Significance – Medium

If the Comprehensive Plan does not meet the rigorous mitigation and monitoring measures specified in the Conceptual Plan, there is potential for serious harm/mortality to living resources in the aquatic environment of Cape Fear River.

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Recommendation for Resolution

1. Link the Conceptual Plan directly to development of the Comprehensive Plan such that the mitigation and monitoring measures are to be included in the contractor-developed Comprehensive Plan. Use of “such as” should be replaced by the word “including.”
2. Specify that the review of the contractor Comprehensive Plan should explicitly include (not such as) NMFS and USFWS and the NC Wildlife Resources Commission, and others as appropriate.
3. Provide a summary of the 1998/1999 blasting investigations to assess impacts to marine biota.

Final Panel Comment 12

Potential underwater ecological impacts of noise on fish and other marine biota from dredging operations are not addressed in the Draft LR or EIS.

Basis for Comment

Noise impacts to marine mammals from dredging and disposal were addressed in Attachment 2 of the Draft LR (i.e., in the original Section 203 report). Regarding noise generated by the operation of dredges and placement activity, there is no mention of the potential underwater impacts to fish and other marine biota. On page 4-3 of the Draft EIS, it states "*AA1 impacts to noise would be minor during construction, placement, and mitigation. Most areas of disturbance are in relatively secluded areas outside of tourist season, and would not elevate the overall noise level of the region."* However, the text does not provide explicit data and information on underwater sounds and the potential for impacts to fish and other marine biota, such as turtles, due to sounds generated by dredges and the placement of dredged material.

The concerns are that dredging-induced sounds may interrupt or impair communication, foraging, migratory, and other behaviors of marine mammals, fish, and other marine biota. Mortality of aquatic organisms is generally limited to high intensity sounds, such as those generated by underwater blasting.

Research on the effects of underwater sound on aquatic life has been conducted for several decades, but there are still many uncertainties, especially with regard to the effect of sound from dredging activities. Important data gaps include the impacts of dredging-induced sound (e.g., excavation, transit, and placement) on aquatic biota and the potential impacts of dredging-induced sound in the context of other anthropogenic sources. See below for references.

Significance – Medium/Low

While the Panel notes that information and data will likely show that underwater noise from dredging operations and placement operations will not cause unacceptable impacts to marine living animals, there should be a presentation and analysis of the level of underwater noise caused by the construction and the potential ecological impacts in Cape Fear River.

Recommendation for Resolution

1. Update the Draft LR or EIS to include information on the specific levels of underwater sounds generated by the different dredges and the planned methods of placement.
2. Provide an analysis of the potential impacts of underwater sounds generated during construction to marine biota, which would include a literature review of pertinent studies of dredging and impacts. Several recent references are available upon request.

References

1. McQueen, Andrew D, Suedel, Burton C, and Wilkens, Justin L.; March 2019; WEDA Journal of Dredging. Review of the Adverse Biological Effects of Dredging-Induced Underwater Sounds. Volume 17, No. 1.

2. USACE, ERDC TN-DOER-E14 (August 2001). Characterization of Underwater Sounds Produced by Bucket Dredging Operations.

3. CEDA and IADC. Underwater Sound in Relation to Dredging.(undated). https://www.iadc-dredging.com/wp-content/uploads/2017/02/article-ceda-position-paper-underwater-sound-in-relation-to-dredging-125-4.pdf

Final Panel Comment 13

The assumption that upstream and downstream sediment sources remain unchanged across alternatives is not supported by data.

Basis for Comment

Section 3.3.1 of the Draft EIS states that “in the upper reaches, the sediment entering the system is the same regardless of alternatives,” and similarly for the lower reaches, referencing Appendix B Model Documentation Sections 9.2.3.1 and 9.2.3.2. However, these sections do not provide sufficient evidence to substantiate this claim.

Channel deepening can alter ebb and flood tidal prisms, potentially changing sediment transport patterns. This may increase upstream movement of cohesive sediments and enhance downstream transport of noncohesive sediments. Therefore, assuming constant sediment sources for NAA, AA1, and AA2 may not be valid. A deeper channel configuration could fundamentally modify sediment dynamics, and this potential change should be explicitly addressed.

Significance – Medium/Low

Applying similar sediment source assumptions across alternatives may lead to inaccurate shoaling rate estimates, affecting maintenance dredging cost projections.

Recommendation for Resolution

1. Provide evidence that model boundary sediment sources are not substantially altered by channel deepening and/or widening.
2. Demonstrate that model boundaries—particularly upstream—are located sufficiently far from areas of interest so that shoaling results are not sensitive to boundary sediment source inputs (e.g., suspended sediment concentrations).
3. If model boundary sediment sources are substantially altered by channel deepening and/or widening, or upstream model boundaries are not located sufficiently far from areas of interest, then apply more robust boundary conditions and re-estimate shoaling for NAA, AA1, and AA2. If shoaling rates are substantially different, check how the re-estimated shoaling rates affect project cost and benefits.

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The Draft LR and EIS do not provide sufficient information to demonstrate that the dredged material does not contain chemical contamination at toxicity levels that would unacceptably impact the ODMDS or when used beneficially for beach nourishment, to enhance intertidal areas, or build up bird islands.

Basis for Comment

Water quality is presented but only for salinity, dissolved oxygen, and total suspended solids (TSS). Some mention of turbidity is included. Hazardous, toxic, and radioactive waste (HTRW) is presented as a non-problem. However, completely missing from the Draft EIS are the results and analyses from chemical and toxicity testing for water column and sediments that demonstrate the acceptability for dredged materials to be disposed in the ODMDS or in placement locations for beneficial use.

Wilmington is an industrial city with the usual types of industrial and municipal discharges and nonpoint discharges, and with potential contaminants also coming from upstream point and nonpoint discharges. This is not recognized in the Draft EIS and is a giant hole in the supporting information.

The Draft LR states that “No 103 testing is required” (page 1-7). This is incorrect and is in conflict with later discussion in the Draft EIS. Any dredged material placed in the ODMDS must be tested under Marine Protection Research and Sanctuaries Act (MPRSA) Section 103 with guidance in the Green Book or Southeast Regional Implementation Manual (SERIM). Perhaps the statement is intended to mean that no additional testing is required, but that is also incorrect as reflected in Appendix I Wetland Impact Assessment and 404(b)(1), page 13, Contaminant availability. Testing is also required by the Clean Water Act (CWA) 404 for placement in river and estuarine waters.

The bottom paragraph on page 3-63, Draft EIS, is a good summary of what and when testing has been done. Appendix I states that “the most problematic contaminants in both bedded and suspended sediments are metals and persistent bioaccumulative toxics (PBTs), such as pesticides and methyl mercury” (Page 13 [PDF page 35] of the CWA Section 404(b)(1) Analysis). Sediments were analyzed in 2013 for the following: metals, total organic carbon, total petroleum hydrocarbons (oil and grease), organochlorine pesticides, polynuclear aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs) congeners and aroclors, dioxins/furans, organotins.

The Panel raised concerns regarding the general statement about “problematic contaminants.” The Panel understands that the statement is from a reference on sediment transport, but that statement alone does not provide a clear picture of what and how much contamination may be in the sediment. No data are presented to address the concern. The issue of acceptability of sediments for disposal at the ODMDS or for beneficial use applications needs to be demonstrated. Data and information on the presence and levels of contaminants and toxicity are not explicitly presented, other than essentially using descriptive words such as unlikely, not expected, or temporary to describe ecological impacts. Several areas need to be addressed:

- Identify the contaminants and the levels in the sediments to be dredged.
- Identify the contaminants and the levels in the water column before dredging, during dredging, and during disposal and placement.

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- Present the results of acute and chronic (i.e., bioaccumulation) toxicity testing.
- Present the standards/guidelines for the sediments and the water column from which contaminant and toxicity testing results are judged to be acceptable for disposal at the ODMDS and in beneficial use placement locations.

The Panel understands that the dredged material is new work, or virgin material, and would not be expected to be contaminated. However, deepening of the channel will also include the O&M material, which could contain contaminants from upstream sources. The Draft EIS should include explicit results and analyses showing that sediments and the water column are not contaminated to an unacceptable level for disposal in the ODMDS or in the beneficial use placement locations (e.g., intertidal mudflats).

The Draft EIS and Appendix I both include important dates on when testing was conducted and approved by EPA.

- Most recently, toxicity and bioaccumulation tests were performed in 2013 for the entirety of the Wilmington Harbor Federal Navigation Project (FNP) and in 2016 for improvements to the channel near Battery Island and Bald Head Island.
- The Draft EIS states that toxicity and bioaccumulation data are valid for a 10-year period.
- Wilmington Harbor FNP materials proposed for ODMDS placement most recently obtained concurrence from the EPA on April 3, 2023. Concurrence documentation provided by the U.S. Environmental Protection Agency (EPA) is valid for three years.

The dredging is not targeted to begin until 2030 and last for six years. Page 3-66 of the Draft EIS states that “no material would be placed in the ODMDS until EPA, Region 4, concurs that ocean placement of dredged material complies with Section 103 of the MPRSA and other applicable regulations and criteria.” That is a good statement, but a plan to redo the testing is needed, since EPA concurred in 2023 on old testing data, and that concurrence is only good until 2026.

The issue of per- and polyfluoroalkyl substances (PFAS) and GenX (A tradename--Industry developed GenX chemicals to partially replace legacy PFAS) were raised in the public comments. The Panel would not expect the virgin sediments to be dredged to contain these anthropogenic contaminants. However, this should be discussed, but also address the fact that O&M dredging will occur at the time. The Panel recognizes that PFAS are quite ubiquitous and are included in the sediment testing regimes for acute and chronic toxicity for disposal at the ODMDS or at beneficial use locations.

Significance – Medium/Low

Dredging of navigational channels can be viewed as presenting a negative environmental effect, and without presenting the findings from contaminant and toxicity sediment testing, the project cannot be said to be without unacceptable human and ecological risks.

Recommendation for Resolution

1. Provides data and information on contaminants and toxicity levels in the sediments to be

Final Panel Comment 14

dredged and the water column before dredging, during dredging, and during disposal and placement.

2. Present the potential pathways of contaminants including industrial and municipal discharges, nonpoint discharges, and upriver sources.
3. Present results of testing, i.e., levels of chemical contaminants and toxicity testing, both acute toxicity and bioaccumulation for sediments and the water column.
4. Demonstrate the acceptability of disposal at the ODMDS and placement operations by presenting the standards/guidelines against which judgements will be made.
5. Clarify the apparent confusion regarding old testing data, EPA's concurrence, and when testing will be conducted again for review before the project commences. Identify the source that states toxicity data are good for 10 years.

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The conclusions regarding emissions from dredging and transport equipment reported in Appendix K Air Quality cannot be tracked back to the original analyses and assumptions.

Basis for Comment

Draft EIS Appendix K Air Quality states, "*The Project will have temporary construction related emissions, but these are more than offset by efficiencies gained from the project in the form of reduced number of Ocean-going vessels (OGV) required to transport goods to the Port of Wilmington"* (page 3.2). Two issues are apparent:

1. Not shown are the construction-related emissions from dredging and transport to the ODMDS and to beneficial use placement locations.
2. Not shown are the emissions from the reduced number of OGVs over the 50 years that contribute to the conclusion that the construction emissions will be offset by a reduced number of vessels.

Appendices A and B of Draft EIS Appendix K Air Quality include the raw data from which the summary emission information in Table 3.1.2 was generated. Not presented are the specific data and analyses showing the emissions from construction activity and from the OGVs demonstrating a decrease in emissions over the 50 years. These analyses should be presented in the main body of Appendix K Air Quality, including at a minimum emissions from construction, the size of OGVs, the estimated emissions from the types and sizes of OGVs, and the number of OGVs. These data may be in the Appendices, but are extremely difficult to follow. The overall problem of understanding the conclusions regarding emissions is that the information and data in Appendices A and B are not explained nor linked to the conclusions in the main text of Appendix K Air Quality.

In addition, Appendix K Air Quality states on page 1.1 "*The overwater geographical boundary for this analysis is defined as starting at the Bald Head Shoal Channel and ending at the Anchorage Basin as shown by the blue line in Figure 1.2 in Appendix C."* However, Bald Head Shoal was not shown in Figure 1.2. More importantly, the upfront discussion should state why emissions outside Bald Head Shoal are not included in the estimates. The Panel is not questioning the overall conclusions, but it is not apparent how the conclusions were reached, and that work should be explicitly shown in the main body of Appendix K Air Quality.

Significance – Medium/Low

The credibility of the emissions analysis could be undermined if the discussion regarding emission impacts on air quality is not clearly presented.

Recommendation for Resolution

1. Provide and include in the main body of Appendix K Air Quality an explicit analysis showing emissions from OGVs and how those will decrease and contribute to the overall reductions in emissions over 50 years for AA1 and AA2.

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2. Provide and include in the main body of Appendix K Air Quality an analysis of emissions from dredging and transport of dredged material to the ODMDS and to beneficial use placement actions for AA1 and AA2.
3. Based on the analyses in #1 and #2, provide and present a basis for the conclusion that the temporary increase in emissions during construction will be offset by decreased OGV visits over the 50 years.
4. Link the information in Appendices A and B to the main body of Appendix K Air Quality.

Final Panel Comment 16

The Draft EIS does not quantify spatial differences in water quality between alternatives and does not address the implications of the model's bias—underpredicting high dissolved oxygen (DO) values and overpredicting low DO values—on evaluating alternatives.

Basis for Comment

Appendix B Model Documentation, Section B-6.3 states:

> "Overall, the dredging alternatives have a minimal impact on dissolved oxygen, but increasing sea level change (SLC) shows concentrations increasing outside the middle of the channel while decreasing in the channel."

The above statement is difficult to verify because Figures 6-25 to 6-33 only present modeled water quality conditions (DO, temperature, salinity) as May–April averages, without showing spatial differences between alternatives (NAA, AA1, AA2) or SLC scenarios. Without spatial difference maps, it is unclear whether modeled changes meet North Carolina water quality standards.

Further, Appendix B Model Documentation Section B-6.2.3.2.2 notes that the model tends to overpredict low DO values and underpredict high DO values, reducing variance. This raises questions about reliability when evaluating low-DO conditions, which are critical for compliance and ecological health. The report does not explain how this bias affects the interpretation of channel deepening/widening impacts.

Significance – Medium/Low

Clear spatial difference plots are essential for assessing water quality impacts and understanding compliance with state standards. Model bias may compromise reliability in predicting low-DO events and potential ecological impacts.

Recommendation for Resolution

1. Provide maps of differences in DO, salinity, water temperature, and suspended solids between AA1 vs. NAA and AA2 versus NAA for all SLC scenarios to enable evaluation against state standards.
2. Explain how the model's tendency to overpredict low DO and underpredict high DO affects the interpretation of results and compliance assessment.

Final Panel Comment 17

The water quality analysis does not include an evaluation of changes in water residence time for NAA, AA1, and AA2.

Basis for Comment

Water residence time is the average time a parcel of water (and its constituents) remains in an estuary before being flushed out to the ocean. It is a critical metric because it influences water quality dynamics, including nutrient cycling, salinity intrusion, and dissolved oxygen levels.

Channel deepening and widening can alter the navigation channel's flushing characteristics, potentially improving water exchange and reducing pollutant retention. Changes in water residence time can affect:

1. Water Quality and Eutrophication
    - Longer residence times allow nutrients and organic matter to accumulate, increasing the risk of eutrophication, algal blooms, and hypoxia.
    - Well-flushed estuaries (short water residence time) are more resilient to nutrient loading because contaminants are quickly exported to coastal waters.
    - Studies show that residence time is a major driver of eutrophication and water quality degradation in systems like Barnegat Bay, New Jersey (Defne and Ganju, 2015).
2. Sediment Transport and Deposition
    - Residence time affects sediment retention – longer residence provides more time for fine cohesive sediments to settle, increasing shoaling.
    - Hydrodynamic changes (e.g., channel deepening) can alter residence time, which in turn can change sedimentation patterns.
3. Biogeochemical Processes
    - Extended residence times expose water parcels to multiple environments, influencing nutrient cycling, oxygen dynamics, and contaminant transformation.
    - Reactive constituents (e.g., nitrogen, phosphorus) undergo more transformation during longer retention, which can amplify water quality issues.

Without assessing residence time, the analysis cannot fully characterize the potential water quality benefits of AA1 and AA2.

Significance – Low

Omitting water residence time evaluation limits understanding of environmental impacts and potential secondary benefits of the proposed alternatives. A definitive assessment of the navigation channel's flushing capacity could identify additional project advantages.

Final Panel Comment 17

Recommendation for Resolution

1. Evaluate advection–dispersion flushing for the navigation channel under NAA, AA1, and AA2.
2. Indicate whether water residence time increases, decreases, or remains unchanged for each alternative and provide its effect on water quality, i.e., dissolved oxygen, temperature, salinity, and TSS.

Literature Cited

Defne, Z. and Ganju, N.K. 2015. *Quantifying the Residence Time and Flushing Characteristics of a Shallow, Back-Barrier Estuary: Application of Hydrodynamic and Particle Tracking Models. Estuaries and Coasts, Vol. 38, 1719–1734 (2015).* https://doi.org/10.1007/s12237-014-9885-3.

Final Panel Comment 18

Throughout the Draft LR and EIS there are inconsistent statements regarding whether the dredged material will be disposed of above the Mean High-Water Line (MHWL) or below.

Basis for Comment

Attachment 6. Real Estate Plan states in several places that all placements are expected to be below the MHWL. For example:

- In section 3.1, page 5: ”*As of the date of this report, all beneficial use material is expected to be placed below the Mean High-Water Line (MHWL).”*
- In section 4.0, page 6: “ …. *all placements are currently planned below the MHWL*. It goes on in the same paragraph to caveat that statement: *Should any placement occur above the MHWL because of further alignment or design refinements, additional real estate interests may be required.”*
- In Section 21.1, page 16: “*The current plan anticipates placement of beneficial use material below the MHWL, within areas typically under state jurisdiction and not requiring acquisition of private property.”*

However, several places in the Draft LR and EIS indicate that placement of dredged material is planned above the MHWL.

- In the LR:
  - Page 3-5: “*Intertidal mudflat creation via beneficial use includes the deposition of silt and mixed sediments onto the benthic area of a tidal or nontidal area abutting a wetland environment and/or shoreline above the MHW line of a system.”*
  - Page 3-7: “*Bird islands are historically a more common form of BUDM USACE has implemented along the United States east coast that involves the deposition of primarily sand above the MHW mark, creating sandy islands for bird habitat……These two islands will also have intertidal placement around the “skirt” of the island, creating different types of habitats.”*
- In the EIS:
  - Page 2-16: “*Intertidal mudflat creation via beneficial use includes the deposition of silt and mixed sediments onto the benthic area of a tidal or nontidal area abutting a wetland environment and/or shoreline above the MHW line of a system.”*
  - Page 2-18: “*Bird islands are historically a more common form of BUDM USACE has implemented along the United States coasts that involves the deposition of primarily sand above the MHW mark.”*
  - Page 3-79. **“***The direct impacts of AA1 would be the covering and killing of current vegetation during placement of material above mean high water to South Pelican Island and Ferry Slip Island, but it is expected to provide terrestrial habitat that was once under water, recolonizing and succeed to maturity quickly.”*

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Significance – Low

The Panel does not believe this is a significant issue, but it is one that needs clarification and should be addressed in Attachment 6. Real Estate Plan or fixed in the Draft LR and EIS.

Recommendation for Resolution

1. Determine whether the statements in the Draft LR and EIS are correct that placement will be above the MHWL, and, if so, address the real estate interests in Attachment 6. Real Estate Plan, or modify the text in the Draft LR and EIS to reflect that no dredged material will be placed above the MHWL.

Final Panel Comment 19

Appendix B Model Documentation does not indicate whether the sediment parameters assigned in the GenCade model are representative of site-specific conditions leading to the appropriate modeling of shoreline change.

Basis for Comment

Appendix B Model Documentation, Section B-8.3.1.6 notes that the GenCade model uses an effective grain size of 0.25 mm, an average berm height of 6 ft NAVD88, and a closure depth of 25 ft NAVD88. However, Appendix B Model Documentation does not clearly explain how sediment sizes and variability were determined or assigned in the model. The basis for selecting these sediment parameters—particularly the effective grain size—should be clarified to ensure they are representative of site-specific conditions and appropriate for modeling shoreline change.

Significance – Low

Using an effective grain size in the GenCade model that is not representative of the area of interest can provide different GenCade model results and potentially lead to a different assessment of the project's effect on shoreline erosion and coastal structures.

Recommendation for Resolution

1. Provide the basis for the selection of the effective grain size, an average berm height, and closure depth in the GenCade model to support their use as representative sediment parameters in the model.
2. Provide a response if the selected grain size is sufficient to represent shoreline change along non-sandy shorelines.

5. REFERENCES

Defne, Z. and Ganju, N.K. 2015. *Quantifying the Residence Time and Flushing Characteristics of a Shallow, Back-Barrier Estuary: Application of Hydrodynamic and Particle Tracking Models. Estuaries and Coasts, Vol. 38, 1719–1734 (2015). https://doi.org/10.1007/s12237-014-9885-3.*

DNV (2025). Ocean's Future to 2050. https://www.dnv.com/oceansfuture/ Accessed November 2025.

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The National Academies (2003). Policy on Committee Composition and Balance and Conflicts of Interest for Committees Used in the Development of Reports. The National Academy of Science, National Academy of Engineering, Institute of Medicine, National Research Council. May 12.

USACE (2010). USACE IWR National Economic Development Deep Draft Navigation. IWR Report 10-R-4. April 2010. https://planning.erdc.dren.mil/toolbox/library/IWRServer/10-R-4_NED_DeepDraft.pdf.

USACE (2023). Policy for Conducting Civil Works Planning Studies. Engineering Regulation 1105-2-103. December 7, 2023. https://www.publications.usace.army.mil/Portals/76/ER%201105-2-103_7Nov2023.pdf

USACE (2024). Water Resources Policies and Authorities: Civil Works Review Policy. Engineer Regulation (ER) 1165-2-217. Department of the Army, U.S. Army Corps of Engineers, Washington, D.C. September 2.

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APPENDIX A

IEPR Process for the Wilmington Harbor 403 LR/EIS Project

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A.1 Planning and Conduct of the Independent External Peer Review (IEPR)

Table A-1 presents the major milestones and deliverables of the Independent External Peer Review (IEPR) of the Wilmington Harbor 403 Letter Report and Environmental Impact Statement (EIS), North Carolina (hereinafter: Wilmington Harbor 403 LR/EIS IEPR). Due dates for milestones and deliverables are based on the award/effective date listed in Table A-1. The review documents were provided by U.S. Army Corps of Engineers (USACE) on October 6, 2025. Note that the actions listed under Task 6 occur after the submission of this report. Battelle anticipates submitting the pdf printout of the USACE's Design Review and Checking System (DrChecks) project file (the final deliverable) on February 2, 2026. The actual date for contract end will depend on the date that all activities for this IEPR are conducted and subsequently completed.

Table A-1. Major Milestones and Deliverables of the Wilmington Harbor 403 LR/EIS IEPR

Task	Action	Due Date
1	Award/Effective Date	9/30/2025
	Review documents available	10/6/2025
	Public comments available	11/5/2025
	Battelle submits draft Work Plan[a]	10/6/2025
	USACE provides comments on draft Work Plan	10/14/2025
	Battelle submits final Work Plan[a]	10/14/2025
2	Battelle submits list of selected panel members[a]	10/8/2025
	USACE confirms the panel members have no COI	10/9/2025
3	Battelle convenes kick-off meeting with USACE	10/6/2025
	Battelle convenes kick-off meeting with panel members	10/13/2025
	Battelle convenes kick-off meeting with USACE and panel members	10/16/2025
4	Panel members complete their individual reviews	11/10/2025
	Panel members provide draft Final Panel Comments to Battelle	11/17/2025
	Battelle sends public comments to panel members for review	11/6/2025
	Panel confirms no additional Final Panel Comment is necessary with regard to the public comments	11/11/2025
	Panel finalizes Final Panel Comments	11/21/2025
5	Battelle submits Final IEPR Report to USACE[a]	11/25/2025
6[b]	Battelle convenes Comment Response Teleconference with panel members and USACE	1/16/2026
	Battelle submits pdf printout of DrChecks project file[a]	2/2/2026
	Contract End/Delivery Date	11/20/2026

[a] *Deliverable.*

[b] *Task 6 occurs after the submission of this report.*

At the beginning of the period of performance for the Wilmington Harbor 403 LR/EIS IEPR, Battelle held a kick-off meeting with USACE to review the preliminary/suggested schedule, discuss the IEPR process, and address any questions regarding the scope (e.g., terminology to use, access to DrChecks, etc.). Any revisions to the schedule were submitted as part of the final Work Plan. The final charge consisted of 44 charge questions provided by USACE, two overview questions and one public comment question added by Battelle (all questions were included in the draft and final Work Plans), and general guidance for the Panel on the conduct of the peer review (provided in Appendix C of this final report).

Prior to beginning their review and after their subcontracts were finalized, all the members of the Panel attended a kick-off meeting via teleconference planned and facilitated by Battelle in order to review the IEPR process, the schedule, communication procedures, and other pertinent information for the Panel. Battelle planned and facilitated a second kick-off meeting via teleconference during which USACE presented project details to the Panel. Before the meetings, the IEPR Panel received an electronic version of the final charge, as well as the review documents and reference/supplemental materials listed in Table A-2.

Table A-2. Documents to Be Reviewed and Provided as Reference/Supplemental Information

Review Documents	No. of Review Pages
Letter Report	68
Letter Report Attachment 3: EIS	220
Appendix A: General Engineering	76
Appendix B: Hydrology, Hydraulics, & Coastal Engineering	1189
Appendix C: Geology & Geotechnical Engineering	250
Appendix D: Beneficial Use of Dredged Material	88
Appendix E: Cultural Resources	22
Appendix F: Biological Assessment (NMFS)	84
Appendix H: Aquatic Habitat Suitability	135
Appendix I: Wetlands Assessment	25
Appendix J: Essential Fish Habitat	59
Appendix K: Air Quality Analysis	259
Appendix L: Conceptual Blast Mitigation Plan	151
Appendix M: Mitigation Plan	152
Letter Report Attachment 4: Cost Engineering	26
Letter Report Attachment 5: Economic Considerations	79
Letter Report Attachment 6: Real Estate Plan	58
Total Number of Review Pages	**2940**
Public Review Comments[a]	100
Supplemental/Reference Documentation[a]	
Letter Report Attachment 1: OASA(CW) Review Assessment	91
Letter Report Attachment 2: NCSPA Section 203 Report	394
Appendix C: Geology & Geotechnical Engineering	2863
Appendix G: Biological Assessment (USFWS)	302
Appendix N: Environmental Compliance	20
Appendix O: Public Comment Summary	92
Appendix P: Site Management and Monitoring Plan	80
Total Number of Supplemental/Reference Pages	**3650**

[a] *Supporting documentation only. These documents are not for Panel review and should be used as information sources only. They are not included in the total page count.*

In addition to the materials provided in Table A-2, the panel members were provided with the following USACE guidance documents.

- Civil Works Review Policy (ER 1165-2-217, September 2, 2024)
- Office of Management and Budget's Final Information Quality Bulletin for Peer Review (December 16, 2004)
- Foundations of SMART Planning
- Feasibility Study Milestones (PB 2018-01, September 30, 2018 and PB 2018-01(S), June 20, 2019)
- SMART – Planning Overview
- Planning Modernization Fact Sheet
- USACE Climate Change Adaptation Plan (2015)
- Procedures to Evaluate SLR Change Impacts Responses Adaptation (ETL 1100-2-1 – June 30, 2014)
- Incorporating SLR Change in CW Programs (ER 1100-2-8162 – December 31, 2013).

About halfway through the review, a teleconference was held with USACE, Battelle, and the Panel so that USACE could answer any questions the Panel had concerning either the review documents or the project. Prior to this teleconference, Battelle submitted 14 panel member questions to USACE. USACE was able to provide written responses to all the questions prior to the teleconference, and addressed addition follow on questions during the teleconference.

Additional documents were also provided in response to some of the Panel's questions. These documents were provided to Battelle and then sent to the Panel as supporting information only and were not part of the official review.

A.2 Review of Individual Comments

The Panel was instructed to address the charge questions/discussion points within a charge question response form provided by Battelle. At the end of the review period, the Panel produced individual comments in response to the charge questions/discussion points. Battelle reviewed the comments to identify overall recurring themes, areas of potential conflict, and other overall impressions. At the end of the review, Battelle summarized the individual comments into a preliminary list of overall comments and discussion points. Each panel member's individual comments were shared with the full Panel.

A.3 IEPR Panel Teleconference

Battelle facilitated a teleconference with the Panel so that the panel members could exchange technical information. The main goal of the teleconference was to identify which issues should be carried forward as Final Panel Comments in the Final IEPR Report and decide which panel member should serve as the lead author for the development of each Final Panel Comment. This information exchange ensured that the Final IEPR Report would accurately represent the Panel's assessment of the project, including any conflicting opinions. The Panel engaged in a thorough discussion of the overall positive and negative comments, added any missing issues of significant importance to the findings, and merged any related individual comments. At the conclusion of the teleconference, Battelle reviewed each Final Panel

Comment with the Panel, including the associated level of significance, and confirmed the lead author for each comment.

A.4 Preparation of Final Panel Comments

Following the teleconference, Battelle distributed a summary memorandum for the Panel documenting each Final Panel Comment (organized by level of significance). The memorandum provided the following detailed guidance on the approach and format to be used to develop the Final Panel Comments for the Wilmington Harbor 403 LR/EIS IEPR:

- Lead Responsibility: For each Final Panel Comment, one panel member was identified as the lead author responsible for coordinating the development of the Final Panel Comment and submitting it to Battelle. Battelle modified lead assignments at the direction of the Panel. To assist each lead in the development of the Final Panel Comments, Battelle distributed a summary email detailing each draft final comment statement, an example Final Panel Comment following the four-part structure described below, and templates for the preparation of each Final Panel Comment.

- Directive to the Lead: Each lead was encouraged to communicate directly with the other panel members as needed and to contribute to a particular Final Panel Comment. If a significant comment was identified that was not covered by one of the original Final Panel Comments, the appropriate lead was instructed to draft a new Final Panel Comment.

- Format for Final Panel Comments: Each Final Panel Comment was presented as part of a four-part structure:

    1. Comment Statement (succinct summary statement of concern)
    2. Basis for Comment (details regarding the concern)
    3. Significance (high, medium/high, medium, medium/low, and low; see description below)
    4. Recommendation(s) for Resolution (see description below).

- Criteria for Significance: The following were used as criteria for assigning a significance level to each Final Panel Comment:

    1. **High:** There is a fundamental issue within study documents or data that will influence the technical or scientific basis for selection of, justification of, or ability to implement the recommended plan.

    2. **Medium/High:** There is a fundamental issue within study documents or data that has a strong probability of influencing the technical or scientific basis for selection of, justification of, or ability to implement the recommended plan.

    3. **Medium:** There is a fundamental issue within study documents or data that has a low probability of influencing the technical or scientific basis for selection of, justification of, or ability to implement the recommended plan.

    4. **Medium/Low:** There is missing, incomplete, or inconsistent technical or scientific information that affects the clarity, understanding, or completeness of the study documents, and there is

uncertainty whether the missing information will affect the selection of, justification of, or ability to implement the recommended plan.

5. **Low:** There is a minor technical or scientific discrepancy or inconsistency that affects the clarity, understanding, or completeness of the study documents but does not influence the selection of, justification of, or ability to implement the recommended plan.

- Guidelines for Developing Recommendations: The recommendation section was to include specific actions that USACE should consider to resolve the Final Panel Comment (e.g., suggestions on how and where to incorporate data into the analysis, how and where to address insufficiencies, areas where additional documentation is needed).

Battelle reviewed and edited the Final Panel Comments for clarity, consistency with the comment statement, and adherence to guidance on the Panel's overall charge, which included ensuring that there were no comments regarding either the appropriateness of the selected alternative or USACE policy. At the end of this process, 19 Final Panel Comments were prepared and assembled. There was no direct communication between the Panel and USACE during the preparation of the Final Panel Comments. The full text of the Final Panel Comments is presented in Section 4.2 of the main report.

A.5 Conduct of the Public Comment Review

Following the schedule in Table A-1, Battelle received two PDF files containing 186 pages of public comments on the Wilmington Harbor 403 LR/EIS from USACE. Battelle then sent the public comments to the panel members in addition to the following charge question:

1. **Do the public comments raise any additional discipline-specific technical concerns with regard to the overall report?**

The Panel produced individual comments in response to the charge question. Each panel member's individual comments for the public comment review were shared with the full Panel. Battelle reviewed the comments to identify any new technical concerns that had not been previously identified during the initial IEPR. Upon review, Battelle determined and the Panel confirmed that no new issues or concerns were identified other than those already covered in the Final Panel Comments. However, the Panel noted that some of the issues raised in the public comments were similar to concerns raised in the IEPR Final Panel Comments, particularly issues regarding potential contamination in the dredged material and the analysis of reasonably foreseeable impacts from other projects on the same resources.

A.6 Final IEPR Report

After concluding the review and preparation of the Final Panel Comments, Battelle prepared a final IEPR report (this document) on the overall IEPR process and the IEPR panel members' findings. Each panel member and Battelle technical and editorial reviewers reviewed the IEPR report prior to submission to USACE for acceptance.

A.7 Comment Response Process

As part of Task 6, Battelle will enter the 19 Final Panel Comments developed by the Panel into USACE's DrChecks, a Web-based software system for documenting and sharing comments on reports and design documents, so that USACE can review and respond to them. USACE will provide responses (Evaluator

Responses) to the Final Panel Comments, and the Panel will respond (BackCheck Responses) to the Evaluator Responses. All USACE and Panel responses will be documented by Battelle. Battelle will provide USACE and the Panel a pdf printout of all DrChecks entries, through comment closeout, as a final deliverable and record of the IEPR results.

APPENDIX B

Identification and Selection of IEPR Panel Members for the Wilmington Harbor 403 LR/EIS Project

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B.1 Panel Identification

The candidates for the Independent External Peer Review (IEPR) of the Wilmington Harbor 403 Letter Report (LR) and Environmental Impact Statement (EIS), North Carolina (hereinafter: Wilmington Harbor 403 LR/EIS IEPR) Panel were evaluated based on their technical expertise in the following key areas: Civil Works planning/economics; environmental; hydrology, hydraulics and coastal engineer; and geotechnical engineer/geology. These areas correspond to the technical content of the review documents and overall scope of the Wilmington Harbor 403 LR/EIS project.

To identify candidate panel members, Battelle reviewed the credentials of the experts in Battelle's Peer Reviewer Database, sought recommendations from colleagues, contacted former panel members, and conducted targeted Internet searches. Battelle evaluated these candidate panel members in terms of their technical expertise and potential conflicts of interest (COIs). Of these candidates, Battelle chose the most qualified individuals, confirmed their interest and availability, and ultimately selected four experts for the final Panel. The remaining candidates were not proposed for a variety of reasons, including lack of availability, disclosed COIs, or lack of the precise technical expertise required.

Candidates were screened for the following potential exclusion criteria or COIs. These COI questions were intended to serve as a means of disclosure in order to better characterize a candidate's employment history and background. Battelle evaluated whether scientists in universities and consulting firms that are receiving USACE-funding have sufficient independence from USACE to be appropriate peer reviewers. Guidance in OMB (2004, p. 18) states,

> "…when a scientist is awarded a government research grant through an investigator-initiated, peer-reviewed competition, there generally should be no question as to that scientist's ability to offer independent scientific advice to the agency on other projects. This contrasts, for example, to a situation in which a scientist has a consulting or contractual arrangement with the agency or office sponsoring a peer review. Likewise, when the agency and a researcher work together (e.g., through a cooperative agreement) to design or implement a study, there is less independence from the agency. Furthermore, if a scientist has repeatedly served as a reviewer for the same agency, some may question whether that scientist is sufficiently independent from the agency to be employed as a peer reviewer on agency-sponsored projects."

The term "firm" in a screening question referred to any joint venture in which a firm was involved. It applied to any firm that serves in a joint venture, either as a prime or as a subcontractor to a prime. Candidates were asked to clarify the relationship in the screening questions.

Panel COI Screening Questionnaire for the IEPR of the Wilmington Harbor 403 LR and EIS, North Carolina (including Brunswick, New Hanover, Bladen, and Pender Counties)
1. Previous and/or current involvement by you or your firm in the Wilmington Harbor 403 LRand EIS, North Carolina (including Brunswick, New Hanover, Bladen, and Pender Counties) (hereinafter: Wilmington Harbor 403 LR/EIS) and related projects.
2. Previous and/or current involvement by you or your firm in deep draft navigation channel improvement projects in Brunswick, New Hanover, Bladen, and Pender Counties, North Carolina.

Panel COI Screening Questionnaire for the IEPR of the Wilmington Harbor 403 LR and EIS, North Carolina (including Brunswick, New Hanover, Bladen, and Pender Counties)

3. Previous and/or current involvement by you or your firm in the conceptual or actual design, construction, or operation and maintenance (O&M) of any projects in the Wilmington Harbor 403 LR/EIS and related projects.
4. Current employment by the U.S. Army Corps of Engineers (USACE).
5. Previous and/or current involvement with paid or unpaid expert testimony related to the Wilmington Harbor 403 LR/EIS project.
6. Previous and/or current employment or affiliation with the non-Federal sponsors or any of the following cooperating Federal, State, County, local and regional agencies, environmental organizations, and interested groups *(for pay or pro bono):*
    - North Carolina State Ports Authority (NCSPA)
    - Military Ocean Terminal Sunny Point (MOTSU)
    - National Marine Fisheries Service (NMFS)
    - U.S. Coast Guard
    - U.S. Fish and Wildlife Service (USFWS)
    - U.S. Environmental Protection Agency (EPA).
7. Past, current, or future interests or involvements (financial or otherwise) by you, your spouse, or your children related to Wilmington Harbor and Brunswick, New Hanover, Bladen, and Pender Counties, North Carolina.
8. Current personal involvement with other USACE projects, including whether involvement was to author any manuals or guidance documents for USACE. If yes, provide titles of documents or description of project, dates, and location (USACE district, division, Headquarters, Engineer Research and Development Center [ERDC], etc.), and position/role. Please highlight and discuss in greater detail any projects that are specifically with the Wilmington District.
9. Previous or current involvement with the development or testing of models that were used for, or in support of, the Wilmington Harbor 403 LR/EIS project.

    Note: Models used included HarborSym, Habitat Suitability Index, Habitat Evaluation Procedure, Uniform Mitigation Assessment Method (UMAM), MODFLOW, Delft 3-D, IMPLAN, GenCade, and XBeach.
10. Current firm involvement with other USACE projects, specifically those projects/contracts that are with the Wilmington District. If yes, provide title/description, dates, and location (USACE district, division, Headquarters, ERDC, etc.), and position/role. Please also clearly delineate the percentage of work you personally are currently conducting for the Wilmington District. Please explain.

Panel COI Screening Questionnaire for the IEPR of the Wilmington Harbor 403 LR and EIS, North Carolina (including Brunswick, New Hanover, Bladen, and Pender Counties)
11. Any previous employment by USACE as a direct employee, notably if employment was with the Wilmington District. If yes, provide title/description, dates employed, and place of employment (district, division, Headquarters, ERDC, etc.), and position/role.
12. Any previous employment by USACE as a contractor (either as an individual or through your firm) within the last 10 years, notably if those projects/contracts are with the Wilmington District. If yes, provide title/description, dates employed, and place of employment (district, division, Headquarters, ERDC, etc.), and position/role.
13. Previous experience conducting technical peer reviews. If yes, please highlight and discuss any technical reviews concerning deep draft navigation channel improvement projects and include the client/agency and duration of review (approximate dates).
14. Pending, current, or future financial interests in contracts/awards from USACE related to the Wilmington Harbor 403 LR/EIS project.
15. Significant portion of your personal or office's revenues within the last three years came from USACE contracts.
16. Significant portion of your personal or office's revenues within the last three years came from NCSPA contracts.
17. Any publicly documented statement (including, for example, advocating for or discouraging against) related to the Wilmington Harbor 403 LR/EIS project or the NCSPA's Section 203 Report.
18. Participation in relevant prior and/or current Federal studies related to the Wilmington Harbor 403 LR/EIS project or the NCSPA's Section 203 Report.
19. Previous and/or current participation in prior non-Federal studies related to the Wilmington Harbor 403 LR/EIS project or the NCSPA's Section 203 Report.
20. Has your research or analysis been evaluated as part of the Wilmington Harbor 403 LR/EIS project or the NCSPA's Section 203 Report?
21. Is there any past, present, or future activity, relationship, or interest (financial or otherwise) that could make it appear that you would be unable to provide unbiased services on this project? If so, please describe.

Providing a positive response to a COI screening question did not automatically preclude a candidate from serving on the Panel. For example, participation in previous USACE technical peer review committees and other technical review panel experience was included as a COI screening question. A positive response to this question could be considered a benefit.

B.2 Panel Selection

In selecting the final members of the Panel, Battelle chose experts who best fit the expertise areas and had no COIs. Table B-1 provides information on each panel member's affiliation, location, education, and overall years of experience. Battelle established subcontracts with the panel members when they indicated their willingness to participate and confirmed the absence of COIs through a signed COI form. USACE was given the list of candidate panel members, but Battelle selected the final Panel.

Table B-1. Wilmington Harbor 403 LR/EIS IEPR Panel: Summary of Panel Members

Name	Affiliation	Location	Education	P.E.	Exp. (yrs)
Civil Works Planning / Economics (Dual Role)					
Gretchen Greene	Greene Economics, LLC	Ridgefield, WA	Ph.D. in Food and Resource Economics	No	30+
Environmental					
Craig Vogt	Craig Vogt, Inc.	Hacks Neck, VA	M.S. in Environmental Engineering	No	50
Hydrology, Hydraulics, and Coastal Engineering					
Michael Kabiling	Taylor Engineering, Inc.	Jacksonville, FL	Ph.D. in Hydraulic and Coastal Engineering	Yes	30+
Geotechnical Engineering/Geologist					
Rune Storesund	Storesund Consulting	Kensington, CA	D.Eng., Civil & Geotechnical Engineering	Yes	25+

Table B-2 presents an overview of the credentials of the final four members of the Panel and their qualifications in relation to the technical evaluation criteria. More detailed biographical information on the panel members and their areas of technical expertise is given in Section B.3.

Table B-2. Wilmington Harbor 403 LR/EIS IEPR Panel: Technical Criteria and Areas of Expertise

Technical Criterion	Greene	Vogt	Kabiling	Storesund
Civil Work Planner / Economist (Dual Role)				
Minimum 10 years of demonstrated experience as a water resources planner for deep draft navigation (DDN) channel improvement projects	X			
Master of Science (M.S.) degree in a related field (Civil Works) and at least a bachelor's degree in economics and an M.S. degree in either economics or a related field (Economist)	X			
Demonstrated experience applying USACE plan formulation processes, procedures, and standards to DDN channel improvement projects and dredged material management evaluations and recommendations (e.g., beneficial use, upland placement, ocean placement)	X			
At least 10 years of demonstrated experience performing economic evaluations of waterborne containerized commercial trade moving on DDN projects and applying USACE procedures and standards to evaluate alternative plans for channel improvement projects	X			
Experience using tools employed for economic analysis, applying risk analysis, and developing trade/fleet forecasts is required	X			
Experience with or using models similar to the Corps' HarborSym model to estimate transportation cost savings is required	X			
Active participation in related professional societies is preferred	X			
Environmental				
10 years of demonstrated experience directly related to performing water resources environmental evaluations and National Environmental Policy Act compliance for DDN channel improvement and dredged material placement projects (e.g., beneficial use, upland placement, ocean placement)		X		
M.S. degree or higher in a related field		X		
Extensive experience in evaluating environmental compliance documents and cultural resources assessments in support of navigation projects, including those that required blasting to construct channel improvements		X		
Expert in compliance requirements of environmental laws, policies, and regulations, including the Fish and Wildlife Coordination Act, the Magnuson Stevens Fish Conservation and Management Act, and the Endangered Species Act		X		

Table B-2. Wilmington Harbor 403 LR/EIS IEPR Panel: Technical Criteria and Areas of Expertise (continued).

Technical Criterion	Greene	Vogt	Kabiling	Storesund
Hydrology, Hydraulics, and Coastal Engineer				
Registered Professional Engineer			X	
M.S. degree in civil, coastal, or hydraulic engineering			X	
10 years of demonstrated experience in the design of DDN channel improvement projects and related navigation infrastructure and have expertise in the field of coastal and riverine hydraulics and dredged material placement (e.g., beneficial use, upland placement, ocean placement)			X	
Demonstrated experience in port and harbor development, dredging, sediment transport, shoreline or coastal structure engineering, developing channel cross-sections, establishing design depths and side slopes, and applying sediment transport and hydrodynamic principles to ensure navigational efficiency and long-term stability			X	
Experience in calculating dredge and fill volumes using digital terrain models, bathymetric survey data, and appropriate software is required (e.g., Civil 3D, HEC-RAS, SMS)			X	
Familiar with the application of USACE risk and uncertainty analyses and coastal engineering requirements for feasibility studies (including channel design and effects of currents, sea level rise, sedimentation, and water quality on navigation channels)			X	
Familiar with standard USACE hydraulic/coastal computer models, Delft3D, and have 5 - 10 years of experience working with numerical modeling applications for navigation projects			X	
Expertise in climate change assessments for both inland and coastal navigation projects			X	
Geotechnical Engineer/Geologist				
Registered Professional Engineer				X
Minimum of 10 years' demonstrated experience in design/evaluation of DDN channel improvement projects including assessment of the behavior of soils, site characterization, slope stability, channel design, blasting as means of constructing proposed improvements, risk analysis, and dredged material placement requirements (e.g., beneficial use, upland placement, ocean placement)				X
M.S. or higher in engineering or a related field and actively participate in professional engineering societies/organizations				X

B.3 Panel Member Qualifications

Detailed biographical information on each panel members' credentials, qualifications and areas of technical expertise is provided in the following paragraphs.

Name	Gretchen Greene, Ph.D.
Role	Civil Works Planner/Economist (Dual Role)
Affiliation	Greene Economics, LLC

Dr. Greene is an independent consultant in the private sector who earned a Ph.D. in Food and Resource Economics from the University of Florida. For more than 30 years, Dr. Greene has specialized in water resource economics, environmental valuation, regional economic impact assessment, benefit-cost analysis, regulatory analysis, population projections, urban water demand forecasting, trade/fleet forecasting, and public infrastructure investment. She also has over 28 years of working with USACE and conducting Civil Works planning on numerous projects related to water resources, including port development, navigation benefits, dam feasibility, levee alterations, flood protection, and ecosystem service payments.

Dr. Greene has used the USACE plan formulation process as a contractor to USACE. The process forms the basis for benefit-cost analysis that she uses every day as an economist. She is familiar with the Institute for Water Resources (IWR) Planning Suite and has more than 27 years of experience using the USACE six-step planning process (following Engineer Regulation 1105-2-100) for a number of projects, including the Lewiston Levee project; a Water Supply Reallocation Report for the Savannah District; and an analysis of recreational benefits of a Proposed Water Storage Facility on the Fort Apache Indian Reservation in Arizona. She reviewed the Savannah Harbor General Reevaluation Report (GRR) and Transportation Cost Savings Model, which addressed how deep draft navigation would alter containerized shipping and bulk transit patterns. The analysis involved a Transportation Cost Savings Model. She also used the USACE six-step planning process in her context as a reviewer for Fargo Moorhead Flood Risk Management, the Port Fourchon Integrated Section 203 Feasibility Report and EIS, and the Tampa Harbor Navigation Improvements Study Integrated GRR and EIS, which involved HarborSym and RECONS USACE models. Most of the projects described above also included an element of National Economic Development (NED) benefits calculation and review.

For the National Academies of Sciences, Engineering, and Medicine, Dr. Greene conducted a review of the historical and projected future energy trends and transportation (e.g., trade/fleet forecast) in support of a study titled, *Oil in the Sea IV: Inputs, Fates, and Effects*. Projections for hydrocarbon production, consumption, and transportation for the period between 2020 and 2050 were developed under three scenarios: current trends, partial decarbonization, and full decarbonization. The review assisted the Oil in the Sea IV research committee in understanding the range of potential decarbonization pathways in the future, and better understand the potential inputs, fates, and effects of marine transportation.

Dr. Greene has extensive experience in economic analysis of water resource development, having worked on numerous Indian Water Rights litigation cases that hinge on benefit-cost analyses following the *Principles and Guidelines for Water Resource Development,* using the NED approach. She also led the Dredged Material Management Study titled "Risk-Based Analysis of the Lewiston Levee," part of a dredged material management EIS for the Snake River system in which she estimated flood damage reduction benefits of the Lewiston Levee system. Dr. Greene also prepared a benefit-cost economic

analysis of various dredge plans, levee alterations, and dredged material disposal options for USACE Walla Walla District. For this effort, she estimated flood damage reduction benefits using the Hydrologic Engineering Center-Flood Damage Reduction Analysis model; environmental benefits and costs were evaluated separately. The model and results were performed and presented in a manner consistent with USACE Engineering Manual 1110-2-1619, Risk Based Analysis for Flood Damage Reduction Studies. She also developed and analyzed a dredging alternatives analysis involving open water as one alternative for the Kishon River in Israel and presented the results of the analysis at the Society of Environmental Toxicology and Chemistry. Other projects, such as one for Port Hueneme, analyzed the status of navigation in California related to climate adaptation.

She has reviewed and completed several navigation benefit analyses for the Columbia River system, including an analysis of the socioeconomic implications of developing an additional marine terminal at the Port of Portland based on shipping forecasts. This analysis used a forecast of bulk and containerized trade to evaluate potential gains and losses associated with development of a marine terminal on West Hayden Island.

Dr. Greene has studied marine transportation as part of the economic analysis of rules that currently govern the transfer of oil within Washington State waters. This effort focused on the costs and benefits associated with changes in oil transfer safety procedures affecting vessels and four different types of marine facilities that transfer oil on or over state waters. In addition, she recently worked with the Marine Institute of Ireland on a national marine spatial planning process.

Active Memberships: American Water Resources Association; Western International Economic Association; the Society for Benefit-Cost Analysis

Name	Craig Vogt
Role	Environmental
Affiliation	Craig Vogt Inc.

Mr. Vogt is an independent ocean and coastal environmental consultant, focusing on such areas as dredging and dredged material management, National Environmental Policy Act (NEPA) and environmental compliance, ecosystem restoration techniques, and sediment management for wetlands, shorelines, and coastal restoration. He earned his B.S. in civil engineering and M.S. in environmental engineering from Oregon State University.

Mr. Vogt worked 37 years for the EPA, the last 20 years of which was in the Oceans & Coastal Protection Division (OCPD) at EPA Headquarters. His time at EPA provided him with wide-ranging knowledge and experience in addressing environmental, estuarine, and coastal issues.

Mr. Vogt has extensive experience in evaluating environmental compliance documents and cultural resources assessments in support of navigation projects. The NEPA requirements for developing descriptions of the environmental impacts of a proposed project and its alternatives form the basis for nearly all the work he has been involved in since the late 1980s, as a regulator and as a consultant.

As Deputy Director of OCPD at EPA, Mr. Vogt was responsible for national implementation of the Ocean Dumping Act (i.e., Marine Protection, Research and Sanctuaries Act (MPRSA)) for dredged material, including establishing environmental criteria, testing requirements, and designation of ocean disposal

sites. Close coordination with USACE counterparts was essential. One example: under the MPRSA, NEPA must be met and an environmental impact assessment and EIS are required for EPA designation of Ocean Dredged Material Disposal Sites (ODMDS) around the country. As Deputy Director, Mr. Vogt was responsible for preparation and publication of those documents for public review. This included assessments of endangered species, critical fish habitat, and historical and cultural resources (under National Historic Preservation Act). Mr. Vogt worked with National Marine Fisheries Service (NMFS) and USFWS to ensure that the policies and requirements were met as required in the Fish and Wildlife Coordination Act, Magnuson Stevens Fish Conservation and Management Act, and the Endangered Species Act. The requirements in the Clean Water Act and Clean Air Act were also evaluated.

While Deputy Director, Mr. Vogt also served as Co-chair of the National Dredging Team, an interagency team established to bring together the Federal agencies involved in dredging and dredged material management to address major issues relating to navigation projects. He was involved in facilitating and supporting the operations of the Regional Dredging Teams, which were established to bring federal, state and local government agencies together to move dredging and restoration projects forward. Working with NMFS and USFWS on endangered species and critical habitat was key to proceeding with approvals of dredging projects. Also, in that role, great progress was made in understanding—and EPA allowing—placement of clean dredged material in the littoral drift along shorelines, with the objective of rebuilding beaches, mudflats, and coastal wetlands.

At EPA, Mr. Vogt was also responsible for national implementation of the National Estuary Program, under the Clean Water Act, charged with ecosystem restoration in the nation's most significant estuaries, i.e., the 28 individual Estuary Programs across the country. Much of the focus was on the restoration of aquatic resources, including beneficially using dredged material for restoration and beach nourishment; restoration activities involved such resources as fish/eelgrass beds and wetlands/marshes.

Since his retirement from EPA in 2008, Mr. Vogt has applied his knowledge of dredged material management and ecosystem restoration techniques for the creation of wetlands, beaches, dunes, and oyster reefs in a variety of projects. He provided consulting services to USACE under the National Shoreline Management Study, the objective of which is to assess the environmental, economic, and social impacts of accretion and erosion on coastal shorelines, including shoreline infrastructure. In these efforts for the USACE, Mr. Vogt prepared comprehensive reports on the coastlines of California, Hawaii, Alaksa, and each of the five great lakes. For the Alaska Report, sea level change was evaluated using Engineer Regulation 1100-2-8162. Another project was conducting an in-depth review of the NEPA documents for a controversial coal transport project on the Columbia River, which included underwater blasting for construction of the coal transport terminal and channel. In addition, Mr. Vogt has participated in independent external peer review panels for navigation projects in Redwood City, Tampa Bay, Matagorda Bay, and Camulet River as well as the Hudson-Raritan USACE Coastal Restoration Project.

Other experience in water resource environmental evaluation and for DDN channel improvement and dredged material management projects (i.e., open water, ocean disposal, and beneficial use) include experience preparing a guidance manual for USACE on tracking beneficial use of dredged material by USACE Districts. The manual categorized beneficial uses, including beach/dune restoration and wetlands/marsh restoration, with the objective of increasing shoreline and ecosystem restoration. To assist the Great Lakes Commission, Mr. Vogt prepared a report on beneficially using dredged materials to create/restore habitat and restore brownfields. And, while at EPA, Mr. Vogt was responsible for development of the EPA/USACE Beneficial Use Planning Manual published in 2007. In addition, Mr. Vogt

is well informed on adaptive management techniques, having co-authored with the USACE in 2012 a report on applying adaptive management.

Other pertinent projects as a consultant include participating in the development of the London Convention & Protocol (a Division of the United Nations) International Guidelines for Disposal of Dredged Material in Marine Waters, and preparation of *Guidance for Site Selection for Disposal of Wastes into Marine Waters for Environment Canada*.

Active Memberships: Mr. Vogt is an active member of the Western (Hemisphere) Dredging Association, having served 31 years on its Board and Chairing the Environmental Commission. Mr. Vogt participates in annual meetings of the United Nation's London Convention & Protocol as the representative of the World Organization of Dredging Associations.

Name	Michael Kabiling, Ph.D., P.E., CFM
Role	Hydrology, Hydraulics, and Coastal Engineer
Affiliation	Taylor Engineering, Inc.

Dr. Kabiling is an independent consultant in the private sector and a registered professional engineer in Florida, Georgia, South Carolina, and Washington. He holds a bachelor's in civil engineering, a master's in water resources engineering, and a Ph.D. in hydraulic & coastal engineering.

Dr. Kabiling has more than 30 years of experience and specializes in hydraulic, coastal, and riverine engineering, as well as hydrology, water resources, numerical modeling, and climate change resiliency. He has accumulated more than 15 years of experience in several key areas, including: (a) modeling, analyzing, and reviewing deep-draft navigation improvement projects; (b) sediment transport and shoreline structure engineering, dredging, port and harbor development, developing channel cross-sections, establishing design depths and side slopes, and applying sediment transport and hydrodynamic principles to ensure navigational efficiency and long-term stability; (c) calculating dredge and fill volumes using digital terrain models, bathymetric survey data, and various software applications (e.g., Hydrologic Engineering Center River Analysis System [HEC-RAS], SMS); (d) conducting climate change assessments for both inland and coastal navigation projects; and (e) beneficial use of dredged material (BUDM), including upland and ocean placement—based on his hydraulic/coastal engineering and/or lead modeler professional experience in the USACE Jacksonville Harbor Deepening Project Impact Assessment, USACE Port Everglades Project Engineering, and USACE Kings Bay Sedimentation and Beneficial Use of Dredged Material Strategic Implementation Plan.

His project experience includes using one-, two-, and three-dimensional hydrodynamic, advection-dispersion, wave, sediment transport, and morphology models. He is proficient in the MIKE11/MIKE21/MIKE3 model suites, Delft3D model suites, CMS-Flow, ADCIRC, EFDC, HEC-RAS, MIKE21 Spectral Wave, Boussinesq Wave, Nearshore Wave, Delft3D-Wave/SWAN, STWAVE, and CMS-Wave models and is familiar with Civil 3D related files. Dr. Kabiling is familiar with standard USACE hydraulic and coastal computer models, having spent over 10 years working with numerical modeling applications for navigation projects and deep-draft navigation design. He has applied these models to over 40 hydraulic and scour studies across Florida, South Carolina, Massachusetts, Louisiana, Texas, and Puerto Rico, as well as more than 80 numerical modeling projects related to hydrology, hydrodynamics, coastal and riverine hydraulics, wave dynamics, riverine and coastal flooding, dam

breaks, water quality, contaminant transport, sediment transport, morphology, dredged material placement, and sea level rise.

Dr. Kabiling is experienced in applying USACE risk and uncertainty analyses and coastal engineering requirements in feasibility studies, particularly regarding channel design and the effects of currents, sea level rise, sedimentation, and water quality on navigation channels, based on his analysis and review of various navigation channel sedimentation studies.

The Port Everglades Sediment Transport Modeling, Broward County, Florida, demonstrates Dr. Kabiling's extensive understanding and experience of coastal systems. As coastal and hydraulic engineer, his sediment transport modeling work supported USACE and Port Everglades planning for navigation channel deepening and widening. For this project, Dr. Kabiling designed a field measurement program of tides, currents, and waves to support model setup and validation; developed and applied state-of-the-art modeling with integrated three-dimensional MIKE hydrodynamic, wave, and particle tracking models; applied the model to determine the fate of the dredged material plume and deposition pattern for normal and extreme tides, waves, Florida currents, and 25 dredging scenarios; and determined the best dredging method with the least deposition and suspended sediment impact.

The Jacksonville Harbor Project demonstrates Dr. Kabiling's extensive experience in deep draft navigation and channel modification. For that project, he supervised Environmental Fluid Dynamics Code (EFDC) model validation and application for various harbor dredging scenarios, and performed quality assurance/quality control model reviews. The EFDC modeling of the St. Johns River provided the means to evaluate the effect on river hydraulics, salinity, ecology, and water quality of the channel deepening, channel widening at select locations, and construction of new turning basins, as well as the cumulative impacts of other projects.

As a hydraulic and coastal engineer, Dr. Kabiling worked on the USACE Kings Bay Sedimentation and Beneficial Use of Dredged Material Strategic Implementation Plan, Camden County, Georgia. This project involved expertise in mixed sand and fine sediment transport in riverine, estuarine, and coastal environments; deep-draft navigation; erosion/deposition volume estimations; dredged material placement for beneficial use, upland placement, and ocean placement; and riverine, estuarine, and coastal hydraulics. As lead modeler, Dr. Kabiling analyzed the hydrodynamic forcings and sediment transport pathways contributing to the shoaling within the Naval Submarine Base Kings Bay (NSBKB) channel to provide information for the NSBKB Beneficial Use of Dredged Material Strategic Implementation Plan. He reviewed the existing Delft3D hydrodynamic, wave, and sediment transport model, developed and validated a new three-dimensional mixed sand and mud transport and morphology model that integrates with three-dimensional hydrodynamic and wave models, and performed three-dimensional sediment transport and morphology modeling of the NSBKB channel, Cumberland Sound, Crooked River, Amelia River, St. Marys River, and portion of the Atlantic Ocean to understand the sources, dominant forcings, and conditions of the shoaled sediments settling within the NSBKB channel. Dr. Kabiling (1) developed and recommended alternatives to reduce shoaling (or frequency of dredging events) within the NSBKB channel; (2) evaluated engineering with nature solutions that leverage tidal currents and other natural forces to decrease or minimize dredging requirements; and (3) evaluated the effects of climate change (sea level rise, marsh degradation, and marsh restoration) on NSBKB channel shoaling and resiliency. Additional evaluations included the cost estimates for disposal to dredged material management areas (DMMA) and ocean dredged material disposal sites.

Dr. Kabiling's additional experience with channel navigation, dredge and fill volume estimations, dredged material disposal, shoreline or coastal structure engineering, developing channel cross-sections, establishing design depths and side slopes, and numerical modeling of navigation channels includes work on four projects in Nassau, Duval, Volusia, Palm Beach, and Miami-Dade Counties, Florida, for the Florida Inland Navigation District Dredging Efficiencies Program. At these four projects, Dr. Kabiling, as coastal engineer, designed field measurement program for measured flow velocity and water level to validate and apply a state-of-the-art modeling tool—the dynamically-integrated suite of two-dimensional hydrodynamic, spectral wave, particle tracking, sand transport, and morphology models—to evaluate the sediment transport mechanisms and alternatives to reduce sediment inflow into the Atlantic Intracoastal Waterway (IWW). Dr. Kabiling identified and analyzed the existing features, sediment erosion/deposition rates, wave climate, hydrodynamics, and sediment characteristics of the IWW near Sawpit Creek, Ponce de Leon Inlet, Jupiter Inlet, and Bakers Haulover Inlet vicinity areas to determine whether any dredging efficiency management alternatives would reduce sediment inflow into the IWW and thereby reduce the frequency and costs of IWW maintenance dredging.

Dr. Kabiling's experience with sedimentation (erosion/deposition) in navigation channel also includes: the Feasibility Study of Sediment Basins near Cut 1 of Okeechobee Waterway, Martin County, Florida (an effort that also required experience in channel modification), and the Assessment of Canal and Embankment Impacts on Hydraulics and Sediment Transport in the Atchafalaya Basin, Louisiana (an effort that also required experience in erosion and deposition). Other erosion-related projects include the South Carolina Bridge Replacements Project mentioned above. For the South Carolina Bridge Replacements Project, Dr. Kabiling designed and supervised tide and flow velocity measurements; supervised the application of the one-dimensional HEC-RAS model of the Stono River-North Edisto River System; supervised the development and application of two-dimensional surge models at the proposed bridge locations; and supervised erosion depth estimation. For the Florida Power and Light Project, Dr. Kabiling analyzed scenarios that included shoreline structures like a seawall to minimize shoreline erosion and coastal structures like submerged breakwaters to dissipate erosive wave action in the nearshore area. An integrated hydrodynamic, wave, and sediment transport model provided the means to evaluate the impact of the seawall and breakwater along the beach. As the lead modeler, Dr. Kabiling set up an integrated MIKE21 hydrodynamic, wave, and sediment transport model; calibrated and verified the performance of the hydrodynamic and wave models using available hindcasted data; and evaluated the short- and long-term performances of various submerged breakwater layouts and geometries to reduce shoreline erosion.

Dr. Kabiling's expertise in coastal currents includes the following projects: Estimation of Waves, Coastal Currents, and Erosion at the Barrier Island, Peninsulas, and Ring Levee in Lakeshore Estates Project in St. Tammany Parish, Louisiana (managing efforts to estimate waves, coastal currents, and concomitant erosion) and other projects. He applied his expertise in coastal and riverine currents to evaluate for the USACE Numerical Modeling in Support of the Green Harbor Navigation Improvement Project, Plymouth County, Massachusetts, the performances of (a) the No-Action Plan, (b) construction of a settling basin within the harbor, (c) extension of the east jetty, (d) raising a portion of the east jetty, (e) advance navigation channel pre-dredging, and (f) combination of navigation pre-dredging to reduce the volume of sediment deposition in the navigation channel, extend the dredging interval, and thereby reduce the cost of maintenance dredging.

Active Memberships: Dr. Kabiling is an active member of the American Society of Civil Engineers, the Association of State Floodplain Managers, and the International Association of Hydraulic Engineering and Research.

Name	Rune Storesund, D.Eng, P.E.
Role	Geotechnical Engineer/Geologist
Affiliation	Storesund Consulting

Dr. Storesund is a Principal Engineer in the private sector and the Director of the non-profit SafeR3. He is a registered civil engineer in California, Louisiana, Hawaii, Nevada, Texas, and Washington, and registered geotechnical engineer in California. He holds both a bachelor's degree and a master's degree in civil engineering with specialization in geotechnical engineering, as well as a Doctor of Engineering degree (D.Eng) in civil engineering systems.

Dr. Storesund has over 25 years of experience in planning, design, engineering, construction, and decommissioning of Civil Works structures and has worked on a variety of projects throughout the United States and internationally. He has over 10 years of experience in nearshore marine geotechnical work related to geotechnical practices for design and construction of navigation channels and dredged material placement, including assessment of the behavior of soils and rock characteristics, site characterization, slope stability, channel design, risk analysis, and dredged material placement requirements (including ocean placement, upland placement, and beneficial use for upland fill, island restoration, beach placement, seagrass restoration, and hardbottom creation). For the Perris Dam Remediation Project, Dr. Storesund provided geotechnical support for blasting and other activities associated with seismic improvements.

He has worked on numerous USACE projects and is familiar with USACE design guidelines and standards. Dr. Storesund provides consulting services in all aspects of civil, geotechnical, water resources, ecological, restoration, and sustainability engineering projects. His expertise includes the application of reliability and risk-based approaches to civil works projects. Dr. Storesund has participated in all aspects of engineering projects from preliminary reviews to detailed analyses to construction observations and post-project monitoring. Dr. Storesund serves as an on-call expert Geotechnical Engineer to the State of California's Department of Consumer Affairs for its annual examination.

He has over 10 years of demonstrated experience performing geotechnical evaluations and geo-civil design for USACE projects with dredged material disposal sites and using dredged material for ecosystem restoration. He served as a geotechnical engineer of record for the final shaping of the Hamilton Wetland Restoration project in Novato, California. The project involved deepening the Port of Oakland, transporting the material via barge to an off-coast pumping station, then pumping the dredged materials into a former Army airbase to create constructed beneficial wetland and upland habitats. He performed site characterization, engineering analyses (e.g., settlement, static/dynamic slope stability, seepage, wave runup), construction oversight, and post-project monitoring (terrestrial light detection and ranging). Dr. Storesund also provided geotechnical design and monitoring support on this reclamation and restoration project within the Port of Oakland (California) in which dredged spoils were used to abandon a deep-draft U.S. Navy pier at the Port of Oakland and create a tidal habitat.

Dr. Storesund served as the project engineer for the Brooklyn Basin Dredging Study in Oakland, California. This maintenance dredging study commissioned by the San Francisco USACE. Work entailed in-situ site characterization, evaluation of sediment contamination, and dredging plan configuration.

Dr. Storesund has geotechnical slope stability numerical modeling experience that includes GeoStudio SlopeW as well as Rocscience's SLIDE. He has performed thousands of slope stability evaluations for both drained and undrained loading cases as well as fully and partially submerged slopes. These evaluations required the establishment of (a) soil stratigraphy; (b) soil strength parameters; (c) loading conditions; (d) phreatic surfaces; and (e) calibration against field performance (where possible).

Active Memberships: He has been an active participant in American Society of Civil Engineers committees on the local and national level since 1998.

APPENDIX C

Final Charge for the Wilmington Harbor 403 LR/EIS IEPR

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Charge Questions and Guidance to the Panel Members for the Independent External Peer Review (IEPR) of the Wilmington Harbor 403 Letter Report and Environmental Impact Statement (EIS), North Carolina

This is the final Charge to the Panel for the Wilmington Harbor 403 LR/EIS IEPR. This final Charge was submitted to USACE as part of the final Work Plan, originally submitted on October 14, 2025. The dates and page counts in this document have not been updated to match actual changes made throughout the project.

BACKGROUND

The draft Letter Report and EIS were prepared by the U.S. Army Corps of Engineers (USACE) in accordance with USACE policies, the National Environmental Policy Act (NEPA), as amended, and in accordance with USACE Procedures for Implementing NEPA found at 33 CFR Part 230. It presents the results of investigations and analyses conducted to evaluate potential navigation system improvements at Wilmington Harbor, North Carolina.

Introduction

It is important to note that the 403 Letter Report and EIS are not documentation of a feasibility study (a feasibility report). The 403 documents are supplemental to prior efforts of the State of North Carolina, acting through the North Carolina State Ports Authority (NCSPA). The NCSPA completed a feasibility study through the authority of Section 203 of the Water Resources Development Act (WRDA) of 1986 (P.L. 99-662), as amended. The study was conducted to determine the feasibility of potential improvements to the Federal Navigation System (FNS) at Wilmington Harbor. The report recommending deepening the harbor from -42 feet mean lower low water (MLLW) to -47 feet MLLW, was submitted to the Assistant Secretary of the Army (Civil Works) (ASA(CW)) for review in February 2020. In May 2020, the document was transmitted to Congress for authorization. Accompanying the report was the ASA(CW)'s Assessment Report which identified unresolved issues and included recommendations to perform the following work to resolve those issues:

- Reframe assumptions and the screening of alternatives
- Perform economic analysis for multiple depth alternatives using USACE methodology
- Conduct NEPA analysis including supporting engineering modeling and appropriate sea level change information
- Finalize mitigation and real estate plans
- Conduct an IEPR

Congress conditionally authorized the recommended navigation improvements, at a total cost of $834,093,000, through Section 403 of WRDA 2020. The conditional authorization included a requirement to address the issues and concerns identified in the ASA(CW) Assessment Report. In 2022, the USACE Wilmington District (CESAW) was tasked with producing a Letter Report and NEPA documentation to address those outstanding issues through a cost-shared effort with the NCSPA.

The Letter Report documents the results of efforts performed to address the unresolved engineering, economic, environmental and policy comments as identified in the ASA(CW)'s Assessment Report. The EIS is an attachment to the Letter Report and responds to the need to fulfill NEPA requirements. Therefore, to summarize:

- The 403 effort is not considered a Feasibility Study.
- The 403 documents are supplemental to the Section 203 Feasibility Report (which has already been reviewed by Congress).
- The recommended plan, as documented in the Section 203 Feasibility report, has been conditionally approved by Congress.
- Congress only asked for the outstanding issues to be addressed, and a final assessment be provided by the ASA(CW); therefore, the scope of the 403 effort is limited to addressing the unresolved issues identified in the ASA(CW) Review Assessment.
- Feasibility study milestones, SMART Planning processes, typical milestone products, and related criteria do not apply to the 403 effort.
- Any topics outside the issues identified as unresolved in the Review Assessment are not to be addressed by the 403 effort.

Proposed Federal Action

The CESAW is evaluating potential improvements to the FNS at Wilmington Harbor to determine if proposed deepening would improve cargo transportation efficiencies and better accommodate the larger vessels that are anticipated to comprise the vessel fleet that will serve Wilmington Harbor in the future.

The EIS evaluates the No Action Alterative (Future Without Project (FWOP) condition) and two action alternatives. The action alternatives being considered would deepen most of the FNS from its current authorized depth of -42 feet mean lower low water (MLLW) to a new depth of either - 47 feet MLLW (Alternative 1) or -46 feet MLLW (Alternative 2). In both alternatives, the Entrance Channel reaches (Battery Island to Bald Head Shoal Reach 4) would be authorized an additional 2 feet of depth to account for ocean conditions. Furthermore, the proposed Federal action would also expand the width of several of the reaches along the channel and add an additional reach to the Outer Ocean Bar, Baldhead Shoal Reach 4. The Entrance Channel extension would be approximately 9 miles long and would connect the current Entrance Channel to the closest naturally occurring desired depth. In addition to lengthening and deepening the existing FNS, the proposed action would widen all or parts of all reaches except for the Upper and Lower Midnight and Bald Head Shoal- Reach 2.

Proposed placement areas for both the initial action and operation and maintenance include the Ocean Dredged Material Disposal Site (ODMDS) and various beneficial use placement areas (beaches, bird islands, intertidal marsh restoration, fish habitat enhancement structures, riverbank protection, and back bay marsh restoration). Approximately half of the material dredged for initial construction would be used beneficially rather than placed in the ODMDS.

In summary, the proposed action would deepen, widen, and extend the existing FNS, and would place material in various areas in respect to both beneficial use application and the ODMDS.

Purpose and Need for Proposed Action

The Port of Wilmington is the largest port in North Carolina and is a major component of the State's economy. Since the last major channel improvements were completed in 2002, the Port of Wilmington has experienced significant growth in cargo volume, and in the size of vessels calling at the port has increased. Over the intervening years, the NCSPA has invested in landside infrastructure to accommodate growth at the Port of Wilmington and the region it serves. The NCSPA is currently implementing Master Plan recommendations valued at over $300 million for yard, gate, and terminal operations improvements to increase annual throughput capacity to 1 million TEUs (twenty-foot equivalent unit: standard unit for container ship capacity) per year. The purpose of the proposed federal action is to contribute to national economic development (NED) by addressing transportation inefficiencies for the forecasted vessel fleet, consistent with protecting the Nation's environment. Action is needed to address the constraints that contribute to inefficiencies in the existing navigation system's ability to safely and efficiently serve the forecasted vessel fleet and process the forecasted cargo types and volumes.

Tentatively Selected Plan

The results of the origin-destination transportation cost saving benefit analysis are included in the report. The 46-foot alternative marginally maximizes net NED benefits, but both alternatives are justified based on benefits exceeding costs.

The difference in average annual net benefits between the 46-foot and the 47-foot plans is small, about $325,000 per year. Additionally, no unacceptable environmental impacts were identified for either alternative, and the environmental impacts are similar in nature and are not out of proportion in magnitude when compared with each other and the No Action Alternative. Considering these results along with the scope and intent of this analysis, as well as its existing conditional authorization, the 47-foot alternative is identified as the NED Plan and the Tentatively Selected Plan.

OBJECTIVES

The objective of this work is to conduct an independent external peer review (IEPR) of the Wilmington Harbor 403 Letter Report and Environmental Impact Statement (EIS), North Carolina (including Brunswick, New Hanover, Bladen, and Pender Counties) (hereinafter: Wilmington Harbor 403 LR/EIS IEPR) in accordance with the Department of the Army, U.S. Army Corps of Engineers (USACE), Water Resources Policies and Authorities' *Civil Works Review Policy* (Engineer Regulation [ER] 1165-2-217, dated September 2, 2024), and the Office of Management and Budget's (OMB's) *Final Information Quality Bulletin for Peer Review* (December 16, 2004). Peer review is one of the important procedures used to ensure that the quality of published information meets the standards of the scientific and technical community. Peer review typically evaluates the clarity of hypotheses, validity of the research design, quality of data collection procedures, robustness of the methods employed, appropriateness of the methods for the hypotheses being tested, extent to which the conclusions follow from the analysis, and strengths and limitations of the overall product.

The purpose of the IEPR is to "assess the adequacy and acceptability of the economic and environmental assumptions and projections, project evaluation data, economic analyses, environmental analyses, engineering analyses, formulation of alternative plans, methods for integrating risk and uncertainty, models used in evaluation of economic or environmental impacts, and any biological opinions" (ER 1165-

2-217; p. 39) for the decision documents. The IEPR will be limited to technical review and will not involve policy review. The IEPR will be conducted by subject matter experts (i.e., IEPR panel members) who meet the technical criteria and areas of expertise required for and relevant to the project.

The Panel will be "charged" with responding to specific technical questions as well as providing a broad technical evaluation of the overall project. Per ER 1165-2-217 (p.41), review panels should identify, explain, and comment upon assumptions that underlie all the analyses, as well as evaluate the soundness of models, surveys, investigations, and methods. Review panels should be able to evaluate whether the interpretations of analysis and the conclusions based on analysis are reasonable. Reviews should focus on assumptions, data, methods, and models. The panel members may offer their opinions as to whether there are sufficient analyses upon which to base a recommendation.

DOCUMENTS PROVIDED

The following is a list of documents, supporting information, and reference materials that will be provided for the review. The review assignments for the panel members may vary slightly according to discipline.

Review Documents	No. of Review Pages	Subject Matter Experts			
		Civil Works Planner/ Economist (Dual Role)	Environ-mental	Hydrology, Hydraulics, and Coastal Engineer	Geotechnical Engineer/ Geologist
Letter Report	68	68	68	68	68
Letter Report Attachment 3: EIS	220	220	220	220	220
Appendix A: General Engineering	76			76	76
Appendix B: Hydrology, Hydraulics, & Coastal Engineering	1189			1189	
Appendix C: Geology & Geotechnical Engineering	250				250
Appendix D: Beneficial Use of Dredged Material	88		88		88
Appendix E: Cultural Resources	22		22		
Appendix F: Biological Assessment (NMFS)	84		84		
Appendix H: Aquatic Habitat Suitability	135		135		
Appendix I: Wetlands Assessment	25		25		
Appendix J: Essential Fish Habitat	59		59		

Review Documents	No. of Review Pages	Subject Matter Experts			
		Civil Works Planner/ Economist (Dual Role)	Environ-mental	Hydrology, Hydraulics, and Coastal Engineer	Geotechnical Engineer/ Geologist
Appendix K: Air Quality Analysis	259		259		
Appendix L: Conceptual Blast Mitigation Plan	151		151	151	151
Appendix M: Mitigation Plan	152		152		
Letter Report Attachment 4: Cost Engineering	26	26		26	
Letter Report Attachment 5: Economic Considerations	79	79			
Letter Report Attachment 6: Real Estate Plan	58	58	58		
Total Number of Review Pages	**2940**	**451**	**1321**	**1730**	**853**
Public Review Comments[a]	100	100	100	100	100
Supplemental/Reference Documentation					
Letter Report Attachment 1: OASA(CW) Review Assessment	91	91	91	91	91
Letter Report Attachment 2: NCSPA Section 203 Report	394	394	394	394	394
Appendix C: Geology & Geotechnical Engineering	2863				2863
Appendix G: Biological Assessment (USFWS)	302		302		
Appendix N: Environmental Compliance	20		20		
Appendix O: Public Comment Summary	92		92		
Appendix P: Site Management and Monitoring Plan	80		80		
Total Number of Supplemental/Reference Pages	**3650**	**485**	**787**	**485**	**3348**

[a] The Public Comment Page count was not included in the overall Review Pages due to the hours being considered separately and Option 1 being implemented if they increase.

Documents for Reference

- Civil Works Review Policy, (ER 1165-2-217, September 2, 2024)
- Office of Management and Budget's Final Information Quality Bulletin for Peer Review (December 16, 2004)
- USACE Climate Change Adaptation Plan (2015)
- ETL 1100-2-1 – Procedures to Evaluate SLR Change Impacts Responses Adaptation
- ER 1100-2-8162 – Incorporating SLR Change in CW Programs.

SCHEDULE & DELIVERABLES

This schedule is based on the receipt date of the final review documents. This schedule may also change due to circumstances out of Battelle's control such as changes to USACE's project schedule and unforeseen changes to panel member and USACE availability. As part of each task, the panel member will prepare deliverables by the dates indicated in the table (or as directed by Battelle). All deliverables will be submitted in an electronic format compatible with Microsoft® Word (Office 2003).

Task	Action	Due Date
Meetings	Battelle sends review documents to panel members	10/13/2025
	Battelle convenes kick-off meeting with panel members	10/15/2025
	Battelle convenes kick-off meeting with USACE and panel members	10/16/2025
	Battelle convenes mid-review teleconference for panel members to ask clarifying questions of USACE	10/23/2025
Review	Panel members complete their individual reviews	11/10/2025
	Battelle provides talking points for Panel Review Teleconference to panel members	11/11/2025
	Battelle convenes Panel Review Teleconference	11/12/2025
	Battelle provides Final Panel Comment templates and instructions to panel members	11/12/2025
	Panel members provide draft Final Panel Comments to Battelle	11/17/2025
	Battelle provides feedback to panel members on draft Final Panel Comments; panel members revise Final Panel Comments	11/18/2025 - 11/20/2025
	Panel finalizes Final Panel Comments	11/21/2025
Public Comment Review	Battelle receives public comments from USACE	11/5/2025
	Battelle sends public comments to Panel	11/12/2025
	Panel completes its review of public comments	11/14/2025
	Battelle and Panel review the Panel's responses to the charge question regarding the public comments	11/17/2025

Task	Action	Due Date
	Panel drafts Final Panel Comment for public comments, if necessary	11/19/2025
	Panel finalizes Final Panel Comment regarding public comments, if necessary	11/20/2025
Final Report	Battelle provides Final IEPR Report to panel members for review	11/24/2025
	Panel members provide comments on Final IEPR Report	11/26/2025
	*Battelle submits Final IEPR Report to USACE	12/1/2025
	USACE Planning Center of Expertise (PCX) provides decision on Final IEPR Report acceptance	12/3/2025
Comment Response Process	Battelle inputs Final Panel Comments to Design Review and Checking System (DrChecks) and provides Final Panel Comment response template to USACE	12/5/2025
	Battelle convenes teleconference with Panel to review the Comment Response process	12/5/2025
	USACE Project Delivery Team (PDT) provides draft Evaluator Responses to USACE PCX for review	12/30/2025
	USACE PCX reviews draft Evaluator Responses and works with USACE PDT regarding clarifications to responses, if needed	1/6/2026
	USACE PCX provides draft PDT Evaluator Responses to Battelle	1/7/2026
	Battelle provides draft PDT Evaluator Responses to panel members	1/9/2026
	Panel members provide draft BackCheck Responses to Battelle	1/14/2026
	Battelle convenes teleconference with panel members to discuss draft BackCheck Responses	1/15/2026
	Battelle convenes Comment Response Teleconference with panel members and USACE	1/16/2026
	USACE inputs final PDT Evaluator Responses to DrChecks	1/23/2026
	Battelle provides final PDT Evaluator Responses to panel members	1/26/2026
	Panel members provide final BackCheck Responses to Battelle	1/29/2026
	Battelle inputs panel members' final BackCheck Responses to DrChecks	1/30/2026
	*Battelle submits pdf printout of DrChecks project file	2/2/2026
	Contract End/Delivery Date	11/20/2026

***** Deliverables

****** Battelle will provide public comments to panel members after they have completed their individual reviews of the project documents to ensure that the public comment review does not bias the Panel's review of the project documents.

CHARGE FOR PEER REVIEW

Members of this IEPR Panel are asked to determine whether the technical approach and scientific rationale presented in the decision documents are credible and whether the conclusions are valid. The Panel is asked to determine whether the technical work is adequate, competently performed, and properly documented; satisfies established quality requirements; and yields scientifically credible conclusions. The Panel is being asked to provide feedback on the economic, engineering, environmental resources, and plan formulation. The panel members are not being asked whether they would have conducted the work in a similar manner.

Specific questions for the Panel (by report section or attachment/appendix) are included in the general charge guidance, which is provided below.

General Charge Guidance

Please answer the scientific and technical questions listed below and conduct a broad overview of the decision documents. Please focus your review on the review materials assigned to your discipline/area of expertise and technical knowledge. Some sections have no questions associated with them; however, you may still comment on them. Please feel free to make any relevant and appropriate comment on any of the sections and attachments/appendices you were asked to review. In addition, please note that the Panel will be asked to provide an overall statement related to 2 and 3 below per USACE guidance (ER 1165-2-217).

1. Your response to the charge questions should not be limited to a “yes” or “no.” Please provide complete answers to fully explain your response.
2. Assess the adequacy and acceptability of the economic and environmental assumptions and projections, project evaluation data, and any biological opinions of the project study.
3. Assess the adequacy and acceptability of the economic analyses, environmental analyses, engineering analyses, formulation of alternative plans, methods for integrating risk and uncertainty, and models used in evaluating economic or environmental impacts of the proposed project.
4. If appropriate, offer opinions as to whether there are sufficient analyses upon which to base a recommendation.
5. Identify, explain, and comment upon assumptions that underlie all the analyses, as well as evaluate the soundness of models, surveys, investigations, and methods.
6. Evaluate whether the interpretations of analysis and the conclusions based on analysis are reasonable.
7. Please focus the review on assumptions, data, methods, and models.

Please **do not** make recommendations on whether a particular alternative should be implemented, or whether you would have conducted the work in a similar manner. Also, please **do not** comment on or make recommendations on policy issues and decision making. Comments should be provided based on your professional judgment, **not** the legality of the document.

1. If desired, panel members can contact one another. However, panel members **should not** contact anyone who is or was involved in the project, prepared the subject documents, or was part of the USACE Agency Technical Review (ATR).
2. Please contact the Battelle Project Manager Lynn McLeod; mcleod@battelle.org for requests or additional information.
3. In case of media contact, notify the Battelle Project Manager, Lynn McLeod (mcleod@battelle.org) immediately.
4. Your name will appear as one of the panel members in the peer review. Your comments will be included in the Final IEPR Report but will remain anonymous.

Please submit your comments in electronic form to the Project Manager, no later than 10 pm ET by the date listed in the schedule above.

Independent External Peer Review of the Wilmington Harbor 403 Letter Report and Environmental Impact Statement (EIS), North Carolina (including Brunswick, New Hanover, Bladen, and Pender Counties)

Charge Questions and Relevant Sections as Supplied by USACE

The following Review Charge to Reviewers outlines the objectives of the Independent External Peer Review (IEPR) for the subject study and identifies specific items for consideration for the IEPR Panel.

The objective of the IEPR is to obtain an independent evaluation of whether the interpretations of analysis and conclusions based on analysis are reasonable for the subject study. The IEPR Panel is requested to offer a broad evaluation of the overall study decision document in addition to addressing the specific technical and scientific questions included in the Review Charge. The Panel has the flexibility to bring important issues to the attention of decision makers, including positive feedback or issues outside those specific areas outlined in the Review Charge. The Panel can use all available information to determine what scientific and technical issues related to the decision document may be important to raise to decision makers. This includes comments received from agencies and the public as part of the public review process.

The Panel review is to focus on scientific and technical matters, leaving policy determinations for USACE and the Army. The Panel should not make recommendations on whether a particular alternative should be implemented or present findings that become “directives” in that they call for modifications or additional studies or suggest new conclusions and recommendations. In such circumstances, the Panel would have assumed the role of advisors as well as reviewers, thus introducing bias and potential conflict in their ability to provide objective review.

Panel review comments are to be structured to fully communicate the Panel’s intent by including the comment, why it is important, any potential consequences of failure to address, and suggestions on how to address the comment.

The Panel is asked to consider the following items as part of its review of the decision document and supporting materials.

Broad Evaluation Charge Questions

1. Is the need for, scope, and intent of the decision document clearly stated?
2. Does the decision document adequately address the stated need and intent relative to scientific and technical information?

Given the need for and intent of the decision document, assess the adequacy and acceptability of the following:

3. Project evaluation data used in the study analyses,
4. Economic, environmental, and engineering assumptions that underlie the study analyses,
5. Economic, environmental, and engineering methodologies, analyses, and projections,
6. Models used in the evaluation of existing and future without-project conditions and of economic or environmental impacts of alternatives,

7. Methods for integrating risk and uncertainty,
8. Formulation of alternative plans and the range of alternative plans considered,
9. Quality and quantity of the surveys, investigations, and engineering sufficient for conceptual design of alternative plans, and
10. Overall assessment of significant environmental impacts and any biological analyses.

Further,

11. Evaluate whether the interpretations of analysis and the conclusions based on analysis are reasonable, and
12. Assess the considered and tentatively selected alternatives from the perspective of systems, including systemic aspects being considered from a temporal perspective, including the potential effects of climate change.

For the tentatively selected plan, assess whether:

13. The models used to assess environmental impacts are appropriate,
14. The assumptions made for the engineering and economics analyses are appropriate,
15. The quality and quantity of the surveys, investigations, and engineering are sufficient, and
16. The analyses adequately address the uncertainty and residual risks.

Specific Technical and Scientific Charge Questions

17. Has the study used appropriate, up-to-date data and scientific methodologies?
18. Are data gaps and limitations clearly identified and their implications explained?
19. Are cumulative impacts from this and other nearby or connected projects sufficiently addressed?
20. Is there a robust analysis of potential long-term environmental degradation from increased vessel traffic?

General Engineering

21. Is the quantity of dredged material estimated accurate (new work and operations and maintenance (O&M), the channel design and placement areas technically sound (e.g., beneficial use placement sites, offshore placement sites, and confined disposal facilities)?
22. Are mitigation measures clearly defined, designed appropriately, feasible, and likely to be effective?
23. Are the proposed channel dimensions (depth, width, side slopes) appropriate based on sound engineering judgement, vessel traffic, and sediment characteristics?
24. Are there any aspects of the civil design that raise concerns about feasibility, performance, or longevity of the project?

Hydrology, Hydraulics, and Coastal Engineering

25. Are the engineering assumptions and methodologies used in channel deepening (e.g., hydrodynamic modeling, sediment transport) appropriate and defensible?
26. Does the study account for changes in wave climate or longshore transport processes resulting from the deeper channel?
27. Are impacts to adjacent shorelines and coastal infrastructure from waves due to the deeper channel adequately addressed?

28. Does the hydrodynamic model (Delft3D and GenCade) accurately simulate tidal range, salinity intrusion, and current velocities for existing, future without project, and future with project?
29. Are the boundary conditions, model calibration, and validation methods used in H&H modeling appropriate and documented clearly?
30. Does the hydrodynamic modeling sufficiently represent existing, future without project, and future with project conditions?
31. Are the predicted changes in shoaling, groundwater, erosion, vessel wake, tidal impacts, and water quality reasonable given the input data and assumptions?
32. Have seasonal and extreme weather conditions (e.g., hurricanes, low river flow events) been adequately accounted for in sediment transport modeling?
33. Are the assessments of potential water quality impacts from dredging and disposal activities modeled appropriately?
34. Does the study adequately incorporate sea level change and climate change projections into the design and impact analysis?
35. Does the hydrodynamic model accurately represent the changes in water quality (specifically dissolved oxygen, temperature, salinity) standards defined by the State of North Carolina and are model results presented in a way to evaluate?

Geotechnical and Geological

36. Does the geotechnical analysis adequately address the stability of channel slopes and potential impacts from deepening?
37. Are subsurface investigations (e.g., boring logs, Cone Penetration Tests, washprobes, geophysical surveys, sediment characterization) sufficient in spatial extent and depth to support channel deepening design?
38. Is the dredged material properly classified and characterized for suitability of disposal (open water, beneficial use, or confined)?
39. Are the confined underwater blasting assumptions related to current available geotechnical data and execution adequate?
40. Are the modeling tools (MODFLOW and SEAWAT) appropriate for the site conditions and objectives of the study?
41. Does the groundwater model address the potential mobilization of containments from adjacent industrial areas due to the deepening?
42. Is the conceptual model of the site's hydrogeology (aquifer systems, confining layers, recharge areas) well developed and supported by data?
43. Are subsurface conditions (e.g., lithology, permeability, aquifer boundaries) adequately characterized to support model inputs and assumptions?
44. Does the groundwater model adequately address the potential for saltwater intrusion due to the deepened channels?

Does the groundwater modeling accurately depict the existing, future without project, and future with project while incorporating the correctly the various sea-level change scenarios?

Battelle Summary Charge Questions to the Panel Members[1]

Summary Questions

45. Please identify the most critical concerns (up to five) you have with the project and/or review documents. These concerns can be (but do not need to be) new ideas or issues that have not been raised previously.

46. Please provide positive feedback on the project and/or review documents.

Public Comment Questions

47. Do the public comments raise any additional discipline-specific technical concerns with regard to the overall report?

[1] Questions 45 through 47 are Battelle-supplied questions and should not be construed or considered part of the list of USACE-supplied questions. These questions were delineated in a separate appendix in the final Work Plan submitted to USACE.

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APPENDIX D

Conflict of Interest Form

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David Kaplan USACE
September 12, 2025
B-2

Conflicts of Interest Questionnaire

Independent External Peer Review (IEPR) for the Matagorda Ship Channel

The purpose of this document is to help the U.S. Army Corps of Engineers identify potential organizational conflicts of interest on a task order basis as early in the acquisition process as possible. Complete the questionnaire with background information and fully disclose relevant potential conflicts of interest. Substantial details are not necessary; USACE will examine additional information if appropriate. Affirmative answers will not disqualify your firm from this or future procurements.

NAME OF FIRM: **Battelle Memorial Institute Corporate Operations**
REPRESENTATIVE'S NAME: **Brian Wallace**
TELEPHONE: **(614) 424-7853**
ADDRESS: **505 King Avenue, Columbus, Ohio 43201**
EMAIL ADDRESS: **wallaceb@battelle.org**

I. INDEPENDENCE FROM WORK PRODUCT. Has your firm been involved in any aspect of the preparation of the subject study report and associated analyses (field studies, report writing, supporting research etc.) No Yes (if yes, briefly describe):

II. INTEREST IN STUDY AREA OR OUTCOME. Does your firm have any interests or holdings in the study area, or any stake in the outcome or recommendations of the study, or any affiliation with the local sponsor? No Yes (if yes, briefly describe):

III. REVIEWERS. Do you anticipate that all expert reviewers on this task order will be selected from outside your firm? No **Yes** (if no, briefly describe the difficulty in identifying outside reviewers):

IV. AFFILIATION WITH PARTIES THAT MAY BE INVOLVED WITH PROJECT IMPLEMENTATION. Do you anticipate that your firm will have any association with parties that may be involved with or benefit from future activities associated with this study, such as project construction? No Yes (if yes, briefly describe):

V. ADDITIONAL INFORMATION. Report relevant aspects of your firm's background or present circumstances not addressed above that might reasonably be construed by others as affecting your firm's judgment. Please include any information that may reasonably: impair your firm's objectivity; skew the competition in favor of your firm; or allow your firm unequal access to nonpublic information.

No additional information to report.

Brian Wallace _____ 9/12/2025 _____
Brian Wallace Date

BATTELLE

It can be done